

# Technical, Installation and Service Handbook

*Hi-Therma* SERIES

### BASIC MODELS

Hi-Therma Split/Integra Outdoor Unit

AHW-044HCDS1

AHW-060HCDS1

AHW-080HCDS1

Hi-Therma Split Indoor Unit

AHM-044HCDSAA

AHM-060HCDSAA

AHM-080HCDSAA

Hi-Therma Integra Indoor Unit

AHM-044HCDSAA-23

AHM-060HCDSAA-23

AHM-080HCDSAA-23

Hi-Therma Monobloc

AHZ-044HCDS1

AHZ-080HCDS1







**English**

Specifications in this manual are subject to change without notice in order that Hisense may bring the latest innovations to their customers.

The English version is the original one; other languages are translated from English. Should any discrepancy occur between the English and the translated versions, the English version shall prevail.

**Français**

Les caractéristiques publiées dans ce manuel peuvent être modifiées sans préavis, Hisense souhaitant pouvoir toujours offrir à ses clients les dernières innovations.

La version anglaise est la version originale; les autres langues sont traduites de l'anglais. En cas de divergence entre les versions anglaise et traduite, la version anglaise prévaudra.

**Español**

Las especificaciones de este manual están sujetas a cambios sin previo aviso a fin de que Hisense pueda ofrecer las últimas innovaciones a sus clientes.

La versión en inglés es la original, y las versiones en otros idiomas son traducciones de la inglesa. En caso de discrepancias entre la versión inglesa y las versiones traducidas, prevalecerá la versión inglesa.

**Italiano**

Le specifiche di questo manuale sono soggette a modifica senza preavviso affinché Hisense possa offrire ai propri clienti le ultime novità.

La versione inglese è l'originale e le versioni in altre lingue sono traduzioni dall'inglese. In caso di divergenze tra la versione inglese e quelle tradotte, fa fede la versione inglese.

**Deutsch**

Bei den technischen Angaben in diesem Handbuch sind Änderungen vorbehalten, damit Hisense seinen Kunden die jeweils neuesten Innovationen präsentieren kann.

Die englische Fassung ist das Original, und die Fassungen in anderen Sprachen werden aus dem Englischen übersetzt. Sollten die englische und die übersetzten Fassungen voneinander abweichen, so hat die englische Fassung Vorrang.

**Português**

As especificações apresentadas neste manual estão sujeitas a alterações sem aviso prévio, de modo a que a Hisense possa oferecer aos seus clientes, da forma mais expedita possível, as inovações mais recentes.

A versão inglesa é a original; as versões em outras línguas são traduzidas do inglês. Em caso de divergência entre a versão em língua inglesa e as versões traduzidas, faz fé a versão em língua inglesa.

**Nederlands**

De specificaties in deze handleiding kunnen worden gewijzigd zonder verdere kennisgeving zodat Hisense zijn klanten kan voorzien van de nieuwste innovaties.

De Engelse versie is de originele; andere talen zijn vertaald uit het Engels. In geval van verschillen tussen de Engelse versie en de vertaalde versies, heeft de Engelse versie voorrang.

**Polski**

Zamieszczone w niniejszej instrukcji obsługi dane techniczne mogą ulec zmianie bez uprzedniego powiadomienia ze względu na innowacyjne rozwiązania, jakie firma Hisense nieustannie wprowadza z myślą o swoich klientach. Wersja angielska jest wersją oryginalną - wszystkie pozostałe stanowią jej tłumaczenie na odpowiednie języki. W przypadku stwierdzenia jakichkolwiek rozbieżności między oryginałem a jego tłumaczeniem, rozstrzygająca jest wersja w języku angielskim.

**Türkçe**

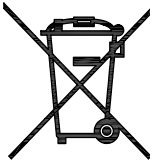
Bu kılavuzdaki teknik özellikler Hisense'nin müşterilerine en yeni inovasyonları sunabilmesi için önceden haber verilmeden değiştirilebilir.

İngilizce sürüm orijinal olanıdır ve diğer diller İngilizce'den çevrilmiştir. İngilizce ve çevrilmiş sürümler arasında farklılık olması durumunda İngilizce sürüm esas alınmalıdır.

**Română**

Specificațiile din acest manual pot fi modificate fără notificare prealabilă, pentru ca Hisense să poată pune la dispoziția clienților noștri ultimele inovații.

Versiunea originală este cea în limba engleză; versiunile în alte limbi sunt traduse din limba engleză. Dacă există vreo discrepanță între versiunile în limba engleză și versiunea tradusă, prevalează versiunea în limba engleză.



**⚠ CAUTION**

This product shall not be mixed with general house waste at the end of its life and it shall be retired according to the appropriated local or national regulations in an environmentally correct way.  
Due to the refrigerant, oil and other components contained in heat pump, its dismantling must be done by a professional installer according to the applicable regulations. Contact to the corresponding authorities for more information.

**⚠ ADVERTISSEMENT**

Ne doit pas être mélangé aux ordures ménagères ordinaires à la fin de sa vie utile et qu'il doit être éliminé conformément à la réglementation locale ou nationale, dans le plus strict respect de l'environnement.

En raison du frigorigène, de l'huile et des autres composants que contient la pompe à chaleur, son démontage doit être effectué par un installateur professionnel conformément aux réglementations en vigueur.

**⚠ PRECAUCIÓN**

Este producto no se debe eliminar con la basura doméstica al final de su vida útil y se debe desechar de manera respetuosa con el medio ambiente de acuerdo con los reglamentos locales o nacionales aplicables.

Debido al refrigerante, el aceite y otros componentes contenidos en la bomba de calor, su desmontaje debe realizarlo un instalador profesional de acuerdo con la normativa aplicable. Para obtener más información, póngase en contacto con las autoridades competentes.

**⚠ AVVERTENZE**

Indicazioni per il corretto smaltimento del prodotto ai sensi della Direttiva Europea 2011/65/EU e D.Lgs 4 marzo 2014 n.27

Il simbolo del cassonetto barrato riportato sull'apparecchiatura indica che il prodotto alla fine della propria vita utile deve essere raccolto separatamente dagli altri rifiuti

L'utente dovrà, pertanto, conferire l'apparecchiatura giunta a fine vita agli idonei centri di raccolta differenziata dei rifiuti elettronici ed elettrotecnici, oppure riconsegnarla al rivenditore al momento dell'acquisto di una nuova apparecchiatura di tipo equivalente. L'adeguata raccolta differenziata delle apparecchiature dismesse, per il loro avvio al riciclaggio, al trattamento ed allo smaltimento ambientalmente compatibile, contribuisce ad evitare possibili effetti negativi sull'ambiente e sulla salute e favorisce il riciclo dei materiali di cui è composta l'apparecchiatura.

Non tentate di smontare il sistema o l'unità da soli poiché ciò potrebbe causare effetti dannosi sulla vostra salute o sull'ambiente. Vogliate contattare l'installatore, il rivenditore, o le autorità locali per ulteriori informazioni.

Lo smaltimento abusivo del prodotto da parte dell'utente può comportare l'applicazione delle sanzioni amministrative di cui all'articolo 50 e seguenti del D.Lgs. n. 22/1997.

**⚠ VORSICHT**

Dass Ihr Produkt am Ende seiner Betriebsdauer nicht in den allgemeinen Hausmüll geworfen werden darf, sondern entsprechend den geltenden örtlichen und nationalen Bestimmungen auf umweltfreundliche Weise entsorgt werden muss.

Aufgrund des Kältemittels, Öls und anderer Komponenten in der Wärmepumpe muss ihr Ausbau von einem professionellen Installateur entsprechend der anwendbaren Vorschriften durchgeführt werden. Für weitere Informationen setzen Sie sich bitte mit den entsprechenden Behörden in Verbindung.

**⚠ CUIDADO**

O seu produto não deve ser misturado com os desperdícios domésticos de carácter geral no final da sua duração e que deve ser eliminado de acordo com os regulamentos locais ou nacionais adequados de uma forma correcta para o meio ambiente.

Por causa do refrigerante, do óleo e de outros componentes na bomba de calor, o desmantelamento deve ser realizado por um instalador profissional em conformidade com os regulamentos aplicáveis. Co tate as autoridades correspondentes para obter mais informações.

**⚠ VOORZICHTIG**

Dit houdt in dat uw product niet wordt gemengd met gewoon huisvuil wanneer u het weg doet en dat het wordt gescheiden op een milieuvriendelijke manier volgens de geldige plaatselijke en landelijke reguleringen.

Wegens de aanwezigheid van koelmiddel, olie en andere componenten in de warmtepomp moet het apparaat volgens de toepasselijke regelgeving door een professionele installateur worden gedemonteerd. Neem contact op met de betreffende overheidsdienst voor meer informatie.

**⚠ OSTROŻNIE**

Po zakończeniu okresu użytkowania produktu, nie należy go wyrzucać z odpadami komunalnymi, lecz dokonać jego usunięcia w sposób ekologiczny zgodnie z obowiązującymi w tym zakresie przepisami prawa lokalnego lub krajowego.

Ponieważ pompa ciepła zawiera czynniki chłodnicze i oleje oraz innego rodzaju elementy składowe, jej demontaż należy powierzyć wskazanemu w obowiązujących przepisach specjalistycznemu podmiotowi. Szczegółowe informacje na ten temat można uzyskać, kontaktując się z właściwymi organami władzy samorządowej.

**⚠ DİKKAT**

Bu ürün kullanım ömrü dolduğunda genel ev atıklarıyla karıştırılmamalı ve belirlenmiş yerel veya ulusal yönetmeliklere göre çevre dostu biçimde bertaraf edilmelidir.

Isı pompasında yer alan soğutucu madde, yağ ve diğer bileşenlerden dolayı sökme işlemi, uygulanır yönetmeliklere göre profesyonel bir tesisatçı tarafından yapılmalıdır. Daha fazla bilgi için ilgili merciye başvurun.

**⚠ PRECAUȚIE**

Acest produs nu trebuie aruncat la gunoii menajeri la sfârșitul duratei sale de viață, ci trebuie scos din uz în conformitate cu reglementările locale sau naționale adecvate și într-un mod corect din punct de vedere al protecției mediului.

Datorită agentului frigorific, a uleiului și a altor componente pompei de căldură, demontarea acestuia trebuie făcută de un instalator profesionist în conformitate cu reglementările aplicabile. Contactați autoritățile competente pentru mai multe informații.

## TECHNICAL PARAMETERS

**English**

Following Regulation EU No. 517/2014 on Certain Fluorinated Greenhouse gases, it is mandatory to fill in the label attached to the unit with the total amount of refrigerant charged on the installation.

Do not vent R32 into the atmosphere: R32 are fluorinated greenhouse gases covered by the Kyoto protocol global warming potential (GWP) R32 = 675. Tn of CO2 equivalent of fluorinated greenhouse gases contained is calculated by indicated GWP \* Total Charge (in kg) indicated in the product label and divided by 1000.

**Français**

En fonction de la Réglementation CE N° 517/2014 concernant certains gaz à effet de serre fluorés, il est obligatoire de remplir l'étiquette attachée à l'unité en indiquant la quantité de fluide frigorigène qui a été chargée à l'installation.

Ne laissez pas le R32 se répandre dans l'atmosphère: le R32 sont des gaz à effet de serre fluorés, couverts par le protocole de Kyoto avec un potentiel de réchauffement global (PRG) R32 = 675.

Les Tn d'équivalent-CO2 de gaz à effet de serre fluorés contenus est calculé par le PRG \* Charge Totale (en kg) indiquée dans l'étiquette du produit et divisé par 1,000.

**Español**

De acuerdo con el reglamento UE N° 517/2014 sobre determinados gases fluora os de efecto invernadero, es obligatorio rellenar la etiqueta suministrada con la unidad con la cantidad total de refrigerante con que se ha cargado la instalación.

No descargue el R32 en la atmósfera: R32 son gases fluorados cubiertos por el protocolo de Kyoto con un potencial de calentamiento global (GWP) = 675.

Las Tn de CO2 equivalente de gases fluorados de efecto invernadero contenidos se calcula por el PCA indicado \* Carga Total (en kg) indicada en la etiqueta del producto y dividida por 1000.

**Italiano**

In base alla Normativa EC N° 517/2014 su determinati gas fluorurati ad effetto serra, è obbligatorio compilare l'etichetta che si trova sull'unità inserendo la quantità totale di refrigerante caricato nell'installazione.

Non scaricare R32 nell'atmosfera: R32 sono gas fluorurati ad effetto serra che in base al protocollo di Kyoto presentano un potenziale riscaldamento globale (GWP) R32 = 675.

Le Tn di CO2 equivalente di gas fluorurati ad effetto serra contenuti si calcola dal GWP indicato \* Carica Totale (in kg) indicato nella etichetta del prodotto e diviso per 1000.

**Deutsch**

Folgende Verordnung EG Nr. 517/2014 Bestimmte fluorierte Treibhausgase, auf dem Schild, das sich am Gerät befindet, muss die Gesamtkältemittelmenge verzeichnet sein, die bei der Installation eingefüllt wird.

Lassen sie R32 nicht in die luft entweichen: R32 sind fluorierte treibhausgase, die durch das Kyoto-protokoll erfasst sind. Sie besitzen folgendes treibhauspotential (GWP) R32 = 675.

Die Menge an CO2-Äquivalent fluorierte Treibhausgase enthalten (in Tn) wird von GWP \* die auf dem Produktetikett angegebenen Gesamtfüllmenge (in kg und durch 1000 geteilt berechnet.

**Português**

Em conformidade com a Regulamentação da UE N° 517/2014 sobre determinados gases fluorados com efeito de estufa, é obrigatório preencher a etiqueta afixada na unidade com a quantidade total de refrigerante carregada na instalação.

Não ventilar R32 para a atmosfera: o R32 são gases fluorados com efeito de estufa abrangidos pelo potencial de aquecimento global (GWP) do protocolo de Quioto = 675.

Tn de CO2 equivalente de gases fluorados com efeito de estufa é calculado pelo GWP indicado \* Carga Total (em kg) indicado no rótulo de produto e dividido por 1000.

**Nederlands**

Conform richtlijn EC N° 517/2014 voor bepaalde fluorbroeikasgassen, dient u de tabel in te vullen op de unit met het totale koelmiddelvolume in de installatie.

Laat geen R32 ontsnappen in de atmosfeer: R32 zijn fluorbroeikasgassen die vallen onder het protocol van Kyoto inzake klimaatverandering global warming potential (GWP) R32 = 675.

Tn van CO2-equivalent van fluorbroeika gassen wordt berekend door het aangegeven GWP \* Totale Hoeveelheid (in kg) aangegeven in het product label en gedeeld door 1000.

**Polski**

Zgodnie z Rozporządzeniem UE nr 517/2014 w sprawie fluorowanych gazów cieplarnianych, wymagane jest podanie na etykiecie informacyjnej umieszczonej na klimatyzatorze ilości czynnika chłodniczego wprowadzanego do obiegu instalacji klimatyzacyjnej.

Nie należy uwalniać czynnika chłodniczego R32 do atmosfery: w jego skład wchodzi uwzględnione w protokole z Kioto fluorowane gazy cieplarniane o potencjalnym wpływie na globalne ocieplenie (GWP), R32 = 675.

W celu obliczenia wyrażonej równoważnikiem CO2 ilości fluorowanych gazów cieplarnianych (w tonach), mnożymy podaną wartość GWP przez wskazaną na etykiecie całkowitą masę gazu w instalacji (w kg) i uzyskany wynik dzielimy przez 1000.

**Türkçe**

Florlu Belli Sera gazları hakkındaki AB Yönetmeliği No. 517/2014 uyarınca üniteye iliştirilmiş etikete kurulmuş toplam soğutma gazı miktarının yazılması zorunludur.

R32'yi atmosfere tahliye etmeyin: R32, Kyoto protokolü küresel uyarı potansiyeli (GWP) R32 = 675 kapsamında florlu sera gazlarıdır.

Florlu sera gazlarının CO2 eşdeğer tonu, ürün etiketinde belirtilen endike GWP \* Toplam Dolu miktarı (kg olarak) çarpımının 1000'e bölünmesiyle hesaplanır.

**Română**

În conformitate cu Regulamentul UE 517/2014 privind anumite gaze fluorurate cu efect de seră, este obligatorie completarea etichetei atașate la unitate cu cantitatea totală de agent frigorific încărcat în instalație.

Nu evacuați R32 în atmosferă: R32 sunt gaze fluorurate cu efect de seră care cad sub incidența potențialului de încălzire globală al Protocolului de la Kyoto (GWP) R32 = 675.

Tonajul echivalent CO2 al gazelor fluorurate cu efect de seră conținute se calculează prin indicarea GWP \* Cantitate totală (în kg) indicată în eticheta produsului și împărțită la 1000.

**IMPORTANT NOTICE**

English (Only when using R32)

 **WARNING****BURST HAZARD**

Do not allow air or any gas mixture containing oxygen into refrigerant cycle (i.e. piping)

**RISK OF EXPLOSION**

The compressor must be stopped before removing the refrigerant pipes.

All service valves must be fully closed after pumping down operation.

 **WARNING**

This symbol displayed on the unit indicates that this appliance is filled with R32, an odourless flammable refrigerant gas with low burning velocity (A2L class pursuant to ISO 817). If the refrigerant is leaked, there is a possibility of ignition if it enters in contact with an external ignition source.

 **CAUTION**

This symbol displayed on the unit indicates that this appliance shall be handled by authorized service personnel only, referring to the Installation Manual.

 **CAUTION**

This symbol displayed on the unit indicates that there is relevant information included in the Operation Manual and/or Installation Manual.

Français (Seulement en utilisant R32)

 **AVERTISSEMENT****DANGER D'ÉCLATEMENT**

Évitez que de l'air ou un mélange de gaz contenant de l'oxygène ne pénètre dans le cycle frigorifique (c.-à-d. tuyauterie)

**RISQUE D'EXPLOSION**

Veillez à arrêter le compresseur avant de retirer les tuyauteries frigorifiques.

Veillez à fermer complètement toutes les vannes de service après la vidange.

 **AVERTISSEMENT**

Ce symbole affiché sur l'appareil indique que l'appareil est chargé avec R32, un gaz frigorigène inflammable sans odeur à basse vitesse de combustion (Classe A2L selon ISO 817). En cas de fuite de frigorigène, il existe un risque d'incendie si celui-ci est exposé à une source d'inflammation externe.

 **ATTENTION**

This symbol displayed on the unit indicates that this appliance shall be handled by authorized service personnel only, referring to the Installation Manual.

 **ATTENTION**

Ce symbole affiché sur l'appareil indique que le manuel de fonctionnement et/ou le manuel d'installation contient des informations importantes.

Español (Sólo cuando se utiliza R32)

 **ADVERTENCIA****RIESGO DE EXPLOSIÓN**

Evite la entrada de aire o cualquier mezcla de gases que contenga oxígeno en el ciclo de refrigerante, por ejemplo, en las tuberías.

**RIESGO DE EXPLOSIÓN**

Antes de retirar las tuberías de refrigerante debe detener el compresor.

Tras recuperar el refrigerante todas las válvulas de servicio deben estar completamente cerradas.

 **ADVERTENCIA**

Este símbolo mostrado en el aparato indica que este está cargado con R32, un gas refrigerante inflamable e inodoro con una velocidad de combustión lenta (Clase A2L de acuerdo con ISO 817). Una fuga de refrigerante puede provocar un incendio si entra en contacto con una fuente de combustión externa.

 **PRECAUCIÓN**

Este símbolo mostrado en el aparato indica que este debe ser manipulado únicamente por personal de un servicio autorizado con el soporte del manual de instalación.

 **PRECAUCIÓN**

Este símbolo mostrado en el aparato indica que los manuales de funcionamiento y/o de instalación contienen información importante.

Italiano (Solo quando si usa R32)

 **AVVERTENZA****PERICOLO DI SCOPPIO**

Fare in modo che all'interno del ciclo di refrigerazione non entrino aria o qualsiasi miscela di gas contenente ossigeno (per es. le tubazioni).

**RISCHIO DI ESPLOSIONE**

Il compressore deve essere arrestato prima di rimuovere i tubi del refrigerante.

Tutte le valvole di servizio devono essere completamente chiuse dopo lo svuotamento della pompa.

 **AVVERTENZA**

Questo simbolo visualizzato sull'unità indica che l'unità è caricata con R32, un gas refrigerante infiammabile e inodore con una velocità di combustione lenta (Classe A2L secondo ISO 817). Una perdita di refrigerante può provocare un incendio se entra a contatto con una fonte di combustione esterna.

 **AVVERTENZA**

Questo simbolo visualizzato sull'unità indica che l'unità deve essere gestita solo da personale di servizio autorizzato, facendo riferimento al Manuale di Installazione.

 **AVVERTENZA**

Questo simbolo visualizzato sull'unità indica che ci sono informazioni rilevanti incluse nel Manuale d'uso e/o nel Manuale di Installazione.

Deutsch (Nur bei Verwendung von R32)

 **WARNUNG****BERSTGEFAHR**

Lassen Sie nicht zu, dass Luft oder eine Sauerstoff enthaltene Gas-mischung in den Kältemittelkreislauf (z. B. Rohrleitungen) gelangt.

**EXPLOSIONSGEFAHR**

Der Kompressor muss abgeschaltet werden, bevor die Kältemittel-leitungen entfernt werden.

Alle Betriebsventile müssen nach dem Abpumpbetrieb vollständig geschlossen sein.

 **AVVERTENZA**

Dieses auf dem Gerät angezeigte Symbol zeigt an, dass das Gerät ist mit dem R32 geruchlosen brennbaren Kältemittel mit niedriger Brenngeschwindigkeit gefüllt (Klasse A2L gemäß ISO 817). Bei ei-nem Kältemittelaustritt besteht die Gefahr der Entzündung, wenn das Kältemittel in Kontakt mit einer äußeren Zündquelle kommt.

 **AVVERTENZA**

Dieses auf dem Gerät angezeigte Symbol zeigt an, dass dieses Gerät ein entzündbares Kältemittel verwendet. Bei einem Kältemittelaustritt besteht die Gefahr der Entzündung, wenn das Kältemittel in Kontakt mit einer äußeren Zündquelle kommt.



## VORSICHT

Dieses auf dem Gerät angezeigte Symbol zeigt an, dass wichtige Informationen im Betriebshandbuch und/oder Installationshandbuch enthalten sind.

Português (Somente quando usar R32)



## ATENÇÃO

### PERIGO DE REBENTAMENTO

Não permitir a entrada de ar ou de qualquer mistura de gás com oxigênio para o ciclo de refrigeração (isto é, para tubagem).

### RISCO DE EXPLOÇÃO

O compressor deve ser desligado antes da remoção dos tubos de refrigerante.

As válvulas de manutenção devem estar completamente fechadas depois da eliminação do refrigerante.



## ATENÇÃO

Este símbolo mostrado na unidade indica que a unidade contém R32, um gás refrigerante inflamável e inodoro com uma baixa velocidade de queima (Classe A2L de acordo com ISO 817). Em caso de fuga de refrigerante, existe a possibilidade de ignição se entrar em contacto com uma fonte de ignição externa.



## CUIDADO

Este símbolo mostrado na unidade indica que a unidade deve ser manuseada apenas por pessoal autorizado, mediante consulta do Manual de Instalação.



## CUIDADO

Este símbolo mostrado na unidade indica que o Manual de Funcionamento e/ou Instalação inclui informação relevante.

Nederlands (Alleen bij gebruik van R32)



## WAARSCHUWING

### BARSTGEVAAR

Laat geen lucht of een gasmengsel dat zuurstof bevat in de koelmiddelcyclus (d.w.z. leidingen).

### EXPLOSIEGEVAAR

De compressor moet worden gestopt alvorens de koelmiddelpijpen te verwijderen.

Alle onderhoudskranen moeten volledig gesloten zijn na het pompen.



## WAARSCHUWING

Dit symbool op het apparaat geeft aan dat het apparaat is gevuld met R32, een geurloos ontvlambaar koelmiddel met een lage brandsnelheid (klasse A2L volgens ISO 817). Als het koelmiddel lekt, kan het ontbranden wanneer het in contact komt met een ex-terne ontstekingsbron.



## LET OP

Dit symbool op het apparaat geeft aan dat het apparaat alleen door bevoegd personeel mag worden gebruikt, met verwijzing naar de installatiehandleiding.



## LET OP

Dit symbool op het apparaat geeft aan dat er relevante informatie is opgenomen in de gebruiksaanwijzing en / of installatiehandleiding.

Polski (Tylko w przypadku stosowania czynnika chłodniczego R32)



## OSTRZEŻENIE

### ZAGROŻENIE WYBUCHEM

Niedopuszczalne jest przedostanie się powietrza lub mieszaniny gazowej zawierającej tlen do obiegu (tj. przewodów rurowych) czynnika chłodniczego.

### RYZIKO WYBUCHU

Przed odłączeniem przewodów rurowych czynnika chłodniczego należy wyłączyć sprężarkę.

Po odzyskaniu chłodziwa, niezbędne jest całkowite zamknięcie wszystkich zaworów serwisowych.



## OSTRZEŻENIE

Umieszczenie tego symbolu na jednostce oznacza, że jest ona napełniona czynnikiem chłodniczym R32, bezwonnym i palnym gazem o niskiej prędkości spalania (klasa A2L zgodnie z normą ISO 817). Wyciek chłodziwa może spowodować pożar, gdyby doszło do kontaktu z zewnętrznym źródłem zapłonu.



## OSTROŻNIE

Umieszczenie tego symbolu na jednostce oznacza, że może być ona obsługiwana wyłącznie przez pracowników autoryzowanego serwisu w oparciu o informacje zawarte w Instrukcji instalacji.



## OSTROŻNIE

Umieszczenie tego symbolu na jednostce oznacza, że w Instrukcji obsługi i/lub Instrukcji instalacji znajdują się ważne informacje na dany temat.

Türkçe (Yalnızca R32'yi kullanırken)



## UYARI

### PATLAMA TEHLİKESİ

Soğutucu madde döngüsünün (ör. boruların) içine havanın ya da oksijen içeren herhangi bir gaz karışımının girmesine izin vermeyin.

### PATLAMA RİSKİ

Soğutucu madde boruları sökülmeden önce kompresör mutlaka durdurulmalıdır.

Pompayla boşaltma işleminden sonra tüm servis valfleri mutlaka tamamen kapatılmalıdır.



## UYARI

Ünitede görüntülenen bu sembol, bu cihazın düşük yanma hızına sahip kokusuz ve tutuşucu soğutucu gazı olan R32 ile dolu olduğunu gösterir (ISO 817'ye göre A2L sınıfı). Soğutucu gazı sızarsa harici bir ateşleme kaynağına temas etmesi durumunda tutuşma olasılığı vardır.



## DİKKAT

Ünitede görüntülenen bu sembol, bu cihazla ilgili işlemlerin yalnızca yetkili servis personeli tarafından Kurulum Kılavuzuna başvurularak yapılacağını gösterir.



## DİKKAT

Ünitede görüntülenen bu sembol, Kullanım Kılavuzunda ve/veya Kurulum Kılavuzunda ilgili bilgilerin mevcut olduğunu gösterir.

Română (numai când se folosește R32)



## AVERTISMENT

### PERICOL DE DEFLAGRAȚIE

Nu permiteți pătrunderea aerului sau oricărui amestec de gaz care conține oxigen în ciclul agentului frigorific (adică în conducte).

### RISC DE EXPLOZIE

Trebuie să opriți compresorul înainte de a decupla conductele de agent frigorific.

Toate supapele de serviciu trebuie să fie complet închise după finalizarea operației de evacuare a agentului frigorific.



## AVERTISMENT

Această pictogramă afișată pe unitate indică faptul că acest aparat este umplut cu R32, un gaz frigorific inflamabil inodor, cu viteză de ardere redusă (clasa A2L conform standardului ISO 817). Pierderea de agent frigorific pot cauza pericol de aprindere dacă intră în contact cu o sursă de aprindere externă.



## PRECAUȚIE

Această pictogramă afișată pe unitate indică faptul că acest aparat trebuie să fie manipulat doar de personal de service autorizat, respectându-se instrucțiunile din manualul de instalare.



## PRECAUȚIE

Această pictogramă afișată pe unitate indică faptul că manualul de operare și/sau manualul de instalare conțin informații importante.



## 1. IMPORTANT NOTICE

### 1.1 GENERAL NOTES

- This manual gives a common description and information for this heat pump air conditioner which you operate as well for other models.
- This manual should be considered as a permanent part of the heat pump air conditioning equipment and should remain with the air conditioning equipment.
- No part of this publication may be reproduced, copied, filed or transmitted in any shape or form without the permission of Hisense.
- Within the policy of continuous improvement of its products, Hisense reserves the right to make changes at any time without prior notification and without being compelled to introducing them into products previously sold. This document may therefore have been subject to amendments during the life of the product.
- As a result, some of the images or data used to illustrate this document may not refer to specific models. No claims will be accepted based on the data, illustrations and descriptions included in this manual.
- This heat pump air conditioner has been designed for the following ambient temperatures. Please operate the air conditioner within the ranges.

Working range (Space Heating)	Outdoor ambient temp.	°C (DB)	-25~35
	Outlet water temp.	°C	15~60
Working range (Space Cooling)	Outdoor ambient temp.	°C (DB)	5~46
	Outlet water temp.	°C	5~22
Working range (DHW)	Outdoor ambient temp.	°C (DB)	-25~40
	Tank water temp.	°C	30~55(75*)
Working range (SWP)	Outdoor ambient temp.	°C (DB)	-25~40
	Swimming pool water temp.	°C	24~33

DB: Dry Bulb

\* When there is an DHW electric heater mounted in the DHW tank, the setting temperature can reach 75°C.

- Upon receiving this product, inspect it for any shipping damage. Claims for damage, either apparent or concealed, in a written form, should be filed immediately with the shipping company.
- Check the model number, electrical characteristics (power supply, voltage and frequency) and accessories to determine if they are correct.
- The standard utilization of the unit shall be explained in these instructions. Therefore, the utilization of the unit other than those indicated in these instructions is not recommended. Please contact your local agent, as the occasion arises.
- If you have any questions, please contact your dealer or designated service center of Hisense.

### 1.2 GENERAL SAFETY

- **Notice: Servicing shall be performed only as recommended by the manufacturer.**
- **Qualification of workers**

Warning: Every working procedure that affects safety means shall only be carried out by competent persons.

Examples for such working procedures are:

- breaking into the refrigerating circuit.
- opening of sealed components.
- opening of ventilated enclosures.
- **Information on servicing**
  - Prior to beginning work on systems, safety checks are necessary to ensure that the risk of ignition is minimized.
  - Work shall be undertaken under a controlled procedure so as to minimize the risk of flammable gas or vapor being present while the work is being performed.
  - Work in confined spaces shall be avoided. The area around the workspace shall be sectioned off. Ensure that the conditions within the area have been made safe by control of flammable material.
- **Checking for presence of refrigerant**
  - The area shall be checked with an appropriate refrigerant detector prior to and during work. The leak detection equipment should be suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe.
- **Presence of fire extinguisher**
  - If any hot work is to be conducted, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO<sub>2</sub> fire extinguisher adjacent to the charging area.
- **No ignition sources**
  - All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed.
- **Ventilated area**
  - Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.
- **Checks to the refrigeration equipment**
  - where electrical components are being changed, they shall be fit for the purpose and to the correct specification.

At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer's technical department for assistance. The following checks shall be applied to installations.

  - The charge size is in accordance with the room size within which the refrigerant containing parts are installed.

- The ventilation machinery and outlets are operating adequately and are not obstructed.
- If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant.
- Marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected.
- Refrigeration pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.
- **Checks to electrical devices**
  - Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment, so that all parties are advised.
  - Initial safety checks shall include:
    - (1) that capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking;
    - (2) that no live electrical components and wiring are exposed while charging, recovering or purging the system;
    - (3) that there is continuity of earth bonding.
- **Repairs to sealed components**
  - During repairs to sealed components, all electrical supplies shall be disconnected prior to any removal of sealed covers, etc. If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.
  - Ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected, including damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.
  - Ensure that the apparatus is mounted securely.
  - Ensure that seals or sealing materials have not degraded to the point that they no longer serve the purpose of preventing the ingress of flammable atmospheres. Replacement parts shall be in accordance with the manufacturer's specifications.
- **Repair to intrinsically safe components**
  - Do not apply any permanent inductive or capacitance loads to the circuit without ensuring that this will not exceed the permissible voltage and current permitted for the equipment in use.
- Intrinsically safe components are the only types that can be worked on while live in the presence of a flammable atmosphere.
- Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.
- **Cabling**
  - Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.
- **Detection of flammable refrigerants**
  - Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.
- **Leak detection methods**
  - Electronic leak detectors may be used to detect refrigerant leaks but the sensitivity may not be adequate, or may need re-calibration for the flammable refrigerants.
  - Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed.
  - The use of detergents containing chlorine shall be avoided.
  - If a leak is suspected, all naked flames shall be removed/extinguished.
  - If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. Oxygen free nitrogen (OFN) shall then be purged through the system both before and during the brazing process.
- **Removal and evacuation**
  - The refrigerant charge shall be recovered into the correct recovery cylinders and the system shall be "flushed" with OFN to render the unit safe. This process may need to be repeated several times.
  - Compressed air or oxygen shall not be used for purging refrigerant systems.
  - Flushing shall be achieved by breaking the vacuum in the system with OFN and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system. When the final OFN charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. This operation is absolutely vital if brazing operations on the pipe-work are to take place.
  - The outlet for the vacuum pump is not close to any ignition sources and that ventilation is available.

- **Charging procedures**
  - Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimise the amount of refrigerant contained in them.
  - Cylinders shall be kept upright.
  - Ensure that the refrigeration system is earthed prior to charging the system with refrigerant.
  - Label the system when charging is complete (if not already).
  - Extreme care shall be taken not to overfill the refrigeration system.
  - Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.
- **Decommissioning**
  - Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail.
  - Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of reclaimed refrigerant.
  - Electrical power must be available before the task is commenced.
  - Become familiar with the equipment and its operation.
  - Isolate system electrically.
  - Before attempting the procedure, ensure that:
    - (1) mechanical handling equipment is available, if required, for handling refrigerant cylinders;
    - (2) all personal protective equipment is available and being used correctly;
    - (3) the recovery process is supervised at all times by a competent person;
    - (4) recovery equipment and cylinders conform to the appropriate standards.
  - Pump down refrigerant system, if possible.
  - If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
  - Make sure that cylinder is situated on the scales before recovery takes place.
  - Start the recovery machine and operate in accordance with manufacturer's instructions.
  - Do not overfill cylinders. (No more than 80 % volume liquid charge).
  - Do not exceed the maximum working pressure of the cylinder, even temporarily.
  - When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
  - Recovered refrigerant shall not be charged into another refrigeration system unless it has been cleaned and checked.
- **Labelling**
  - Equipment shall be labelled stating that it has been decommissioned and emptied of refrigerant. The label shall be dated and signed.
  - Ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.
- **Recovery**
  - When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed.
  - Ensure that the correct number of cylinders for holding the total system charge are available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i.e. special cylinders for the recovery of refrigerant).
  - Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.
  - The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of all appropriate refrigerants.
  - A set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release.
  - The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant waste transfer note arranged.
  - Do not mix refrigerants in recovery units and especially not in cylinders.
  - If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant.
  - The evacuation process shall be carried out prior to returning the compressor to the suppliers.
  - Only electric heating to the compressor body shall be employed to accelerate this process.
  - When oil is drained from a system, it shall be carried out safely.

## 2. SAFETY

### 2.1 APPLIED SYMBOLS

- During normal heat pump system design work or unit installation, greater attention must be paid in certain situations requiring particular care in order to avoid damage to the unit, the installation or the building or property.
- Situations that pose a risk to the safety of those in the surrounding area or to the unit itself are clearly indicated in this manual.
- A series of special symbols are used to clearly identify these situations.
- Pay close attention to these symbols and to the messages following them, as your safety and that of others depends on it.

#### DANGER

- *The text following this symbol contains information and instructions relating directly to your safety.*
- *Not taking these instructions into account could lead to serious, very serious or even fatal injuries to you and others.*

#### CAUTION

- *The text following this symbol contains information and instructions relating directly to your safety.*
- *Not taking these instructions into account could lead to minor injuries to you and others.*
- *Not taking these instructions into account could lead to unit damage.*

#### NOTE

- *The text following this symbol contains information and instructions that may be use or that require a more thorough explanation.*
- *Instructions regarding inspections to be made on unit parts or systems may also be included.*



Caution, risk of fire!

***This appliance is filled with R32, an odourless low burning velocity refrigerant. If the refrigerant is leaked, there is a possibility of ignition if it enters in contact with an external ignitions source.***




#### DANGER



*This symbol shows that this equipment uses a low burning velocity refrigerant. If the refrigerant is leaked, there is a possibility of ignition if it enters in contact with an external ignition source.*

#### RISK OF EXPLOSION

*The compressor must be stopped before removing the refrigerant pipes. All service valves must be fully closed after pumping down operation.*

Symbol	Explanation
	Before installation, read the installation and operation manual, and the wiring instruction sheet.
	Before performing maintenance and service tasks, read the service manual.
	For more information, see the Technical, Installation and Service Handbook.

### 2.2 ADDITIONAL INFORMATION

#### DANGER

- ***Do not pour water into the unit. These products are equipped with electrical parts. If the electrical components are in contact with water, a serious electrical shock will take place.***
- ***Do not touch or adjust safety devices inside the unit. If these devices are touched or adjusted, a serious accident can take place.***
- ***Do not open the service cover or access inside the unit with-out disconnecting the main power supply.***
- ***In case of fire Turn OFF the main switch, put out the fire at once and contact your service contractor.***
- ***Disconnect the appliance from its power source during service and when replacing parts.***
- ***It must be ensured that the heat pump cannot operate accidentally without water neither with air inside hydraulic system.***
- ***Check that the earth wire is securely connected. If the unit is not properly earthed, it may lead to electric shock. Do not connect the earth wire to gas piping, water piping, lighting conductor or earth wire of a telephone.***
- ***Fix the cables securely. External forces on the terminals could lead to a fire.***
- ***Use an ELB (earth leakage breaker, with an actuation time of 0.1s or less). In the event of a fault, there is danger of an electric shock or a fire if it is not used.***
- ***Do not charge oxygen, acetylene or other flammable and poisonous gases into the refrigerant cycle when performing a leakage test or an air-tightness test. These types of gases are extremely dangerous and can cause an explosion.***
- ***Do not install the unit in the following places, otherwise, it may lead to a fire, deformation, corrosion or failure.***
  - Places where oil (including machinery oil) splashes.
  - Places where flammable gas may generate or flow.
  - Places where there is splashing water.
  - Places where sulfide gas drifts such as in hot spring.
  - Places where strong wind with high salinity blows such as coast regions, or places with an atmosphere of acidity or alkalinity.
- ***Do not install the unit in the place where silicon gas drifts. If the silicon gas attaches to the surface of heat exchanger, the fin surface repels water. As a result, drain water splashes outside of the drain pan and splashed water runs inside of electrical box. In the end, water leakage or electrical devices failure may occur.***



- **Means for disconnection from the supply mains, which have a contact separation in all poles that provide full disconnection under overvoltage category III conditions, must be incorporated in the fixed wiring in accordance with the wiring rules.**
- **The appliance shall be installed in accordance with national wiring regulations.**
- **The installation and service of this product shall be carried out by professional personnel, who have been trained and certified by national training organizations that are accredited to teach the relevant national competency standards that may be set in legislation.**
- **Mechanical connectors used indoors shall comply with ISO 14903. When mechanical connectors are reused indoors, sealing parts shall be renewed. When flared joints are reused indoors, the flare part shall be re-fabricated.**
- **Reusable mechanical connectors and flared joints are not allowed indoors.**
- **Disconnect the appliance from its power source during service and when replacing parts.**

### CAUTION

- Do not use any sprays such as insecticide, lacquer, hair spray or other flammable gases within approximately 1 meter from the system.
- If circuit breaker or fuse is often activated, stop the system and contact your service contractor.
- Do not make service or inspections tasks by yourself. This work must be performed by qualified service person.
- Do not put any foreign material (sticks, etc..) inside the units. These units have high speed rotating fans and it is dangerous when any object touches them.
- Refrigerant leakage can cause difficulty with breathing due to insufficient air.
- Installation and service engineering must comply with local standards, laws and regulations. The standards (British Standard, BS4434) may be applicable if local regulations are not available.
- This air to water heat pump has been designed for standard water heating for human beings only. Do not use this for other functions that are not included in the wired controller.
- Do not install the unit in the place where the breeze directly catches the animals and plants. It could adversely affect the animals and plants.
- Pay attention to the following points when the unit is installed in hospital or other facilities where there are strong electromagnetic waves from medical equipment.
  - Do not install the unit where the electromagnetic wave is directly radiated to the electrical box, wiring, wired controller and adapter.
  - At least 3 meters from strong electromagnetic wave radiators, such as radio equipment.

- If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
- This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.

### NOTE

- It is recommended to ventilate the room every 3 or 4 hours.
- The air conditioner may not work properly in the following cases.
  - The power supplied by the power transformer is less than or equal to the electric power of the air conditioner.
  - The large power-consuming equipment is too close to the power supply wiring of the air conditioner, large surge voltage may be inducted in the power supply wiring of the air conditioner.



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**DESIGN**

## 1. General information

### 1.1 General information

Hisense R32 Hi-Therma series units produce heating and domestic hot water like any oil or gas boiler, but transforming renewable energy from the outside air into heat. Air to water heat pumps extract the free energy present in the air, which is enough to heat a home up to a comfortable temperature, even on the coldest winter day. Every kW of electricity used to power the heat pump can yield up to more than 5.1kW of energy for heating; this provides savings of up to 80% on heating expenses compared to a traditional fossil fuel boiler.

The newest R32 Hi-Therma series, based on state-of-the-art technology, does not only achieve an outstanding performance in space heating and cooling but also provides domestic hot water with high efficiency.

The system is simple to control; its new user controller improves the acclaimed and successful design used with the existing LCD controller and provides a great deal of new functions.

#### 1.1.1 Line-Up of Hi-Therma Split

It consists of one outdoor unit and one indoor unit. The outdoor unit extracts the heat present in the air, increases its refrigerant temperature and transmits it to the water circuit using the plate heat exchanger of the indoor unit, where the heat is taken to radiators (fan-coils), underfloor heating components or both (two circuit temperature area). The indoor unit is designed for space heating, in wall-mounted installation. It is convenient for new installations with low capacity requirements (Well insulated installations, high efficiency radiators...)

##### Outdoor Unit

Capacity	HP	2	2.5	3
	kW	4.4	6.0	8.0
Model		AHW-044HCDS1	AHW-060HCDS1	AHW-080HCDS1

##### Indoor Unit

Capacity	HP	2	2.5	3
	kW	4.4	6.0	8.0
Model		AHM-044HCDSAA	AHM-060HCDSAA	AHM-080HCDSAA



Model: AHW-044/060/080HCDS1



Model: AHM-044/060/080HCDSAA



**1.1.2 Line-Up of Hi-Therma Integra**

It consists of one outdoor unit and one indoor unit. The outdoor unit extracts the heat present in the air, increases its refrigerant temperature and transmits it to the water circuit using the plate heat exchanger of the indoor unit, where the heat is taken to radiators (fan-coils), underfloor heating components or both (two circuit temperature area). In terms of outdoor unit, the Hi-Therma Integra series adopt the same outdoor unit as that of the Hi-Therma Split. As for the Hi-Therma Integra indoor unit, water module and DHW are integrated as a whole, making it more convenient to provide customers with domestic hot water. It is also more convenient to place Integra indoors to be more consistent with the furniture and appliances styles. Integra takes up a smaller area, which is easier for installation and maintenance.

Outdoor Unit

Capacity	HP	2	2.5	3
	kW	4.4	6.0	8.0
Model		AHW-044HCDS1	AHW-060HCDS1	AHW-080HCDS1

Indoor Unit

Capacity	HP	2	2.5	3
	kW	4.4	6.0	8.0
Model		AHS-044HCDSAA-23	AHS-060HCDSAA-23	AHS-080HCDSAA-23



Model: AHW-044/060/080HCDS1

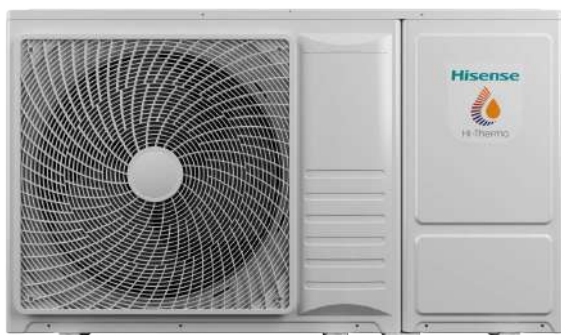


Model: AHS-044/060/080HCDSAA-23






**1.1.3 Line-Up of Hi-Therma Monobloc**

Hi-Therma Monobloc is a monobloc air to water heat pump system composed by only a special outdoor unit, which carries out the function of an air-to-water heat pump. This results in an excellent solution when installation space available is limited. Hi-Therma Monobloc is designed to be installed outdoors, in any kind of dwelling (house, apartment, villa...), whether in a new construction or in an existing building. Installation work is greatly simplified thanks to the lack of refrigerant piping connections.

Capacity	HP	2	3
	kW	4.4	8.0
Model		AHZ-044HCDS1	AHZ-080HCDS1



### 1.1.4 List of Accessories

Accessory	Name	Figure	Function
HC-T-01M	Second Outdoor Ambient temperature sensor		Detect Outdoor ambient temperature with the second sensor
HTS-E1000A1	Water temperature sensor		Detect water temperature e.g. DHW/Tow2/Tow3 etc.
HCT-S01E	Indoor ambient temperature sensor		Detect room temperature
HSXE-VC04	Wired Remote Controller		Room thermostat for room temperature control
HESE-3W25A	3-way Valve		Valve to divert different water flow for different operation (Only for Hi-Therma Split and Monobloc)

## 1.2 Summary of operations

### Space heating

Hi-Therma units are factory-supplied ready for space heating operation. Different heating installation configurations can be selected, providing a comfortable atmosphere all year long, even in the coldest climates: The air to water heat pump is sized to provide 100% of the heating requirements on the coldest day the year. For installations with an existing heating system by boiler and when is needed to heat the supplied water temperature to the circuit up to high temperatures (60°C), the boiler can be configured to alternate with the air to water heat pump.

By selecting the different configuration types, it is possible to adapt the system to all customer requirements, providing a wide application range from the simplest configuration to complete configuration: Radiator, heating floor or both (two circuit temperature area).

### Domestic hot water

Hi-Therma units give the option of domestic hot water production, allowing the user to benefit from the heat pump's high efficiency and achieve domestic hot water. An electric heater is incorporated inside both remote and integrated tanks in order to allow an immediate heating of the domestic hot water in accordance with the user's needs.

### Space cooling

Hi-Therma units can also be operated in cooling operation. the reversible models become available. In this case, combination with fan-coils, refreshing floor or both (two circuit temperature area) can be applied.

### Swimming pool water heating operation

For summer session period, Hi-Therma units can be used to heat up the water temperature of swimming pools up to a value between 24 and 33°C.

2. General data

2.1 Key Parameter

2.1.1 Hi-Therma Split

The heating capacity tables show the capacity and performance data in integrated values.

- The heating and cooling capacities are based on the EN 14511 standard:  
Piping length: 7.5 meters; Piping lift: 0 meters.
- The noise values are measured in the anechoic chamber without reflected echo, therefore the impact of the reflected echo must be taken into consideration at the scene, in accordance with the standard EN12102.  
Measurement point: Outdoor unit, 1m from the service cover surface and 0.88m from floor level.  
Indoor unit, 1m from the service cover surface and 1.5m from floor level.

Keywords:

- COP: Coefficient of performance
- EER: Energy efficiency ratio
- DB: Dry bulb(°C); WB: Wet bulb (°C)

OAT: Outdoor ambient temperature

IWT: Inlet water temperature

OWT: Outlet water temperature

Model				44(2.0 HP)	60(2.5 HP)	80(3.0 HP)				
Outdoor Unit Type				AHW-044HCDS1	AHW-060HCDS1	AHW-080HCDS1				
Power Supply				220-240V~50Hz						
Heating Operation	OAT (DB/WB)	IWT / OWT	-	Unit	Heating operation					
			7 / 6°C	30 / 35°C	Capacity (Min./Nom./Max.)	kW	1.85 / 4.40 / 7.00	1.95 / 6.00 / 8.90	2.10 / 8.00 / 11.0	
				COP (Nom.)	-	5.10	5.00	4.90		
				47 / 55°C	Capacity (Nom./Max.)	kW	4.40 / 6.00	6.00 / 7.50	8.00 / 9.00	
					COP (Nom.)	-	3.00	3.05	2.80	
				-7 / -8°C	30 / 35°C	Capacity (Nom./Max.)	kW	4.40 / 5.00	5.30 / 5.90	5.80 / 7.30
					COP (Nom.)	-	3.26	3.16	3.14	
					47 / 55°C	Capacity (Nom./Max.)	kW	4.00 / 4.20	4.70 / 5.10	5.00 / 6.40
				COP (Nom.)	-	1.97	2.04	1.94		
Cooling Operation	35 / --°C	12 / 7 °C	Nominal Capacity	kW	4.40	5.00	6.00			
			EER	-	3.90	3.70	3.60			
		23 / 18 °C	Nominal Capacity	kW	5.60	6.00	7.00			
			EER	-	5.60	5.60	5.10			
Sound data*1	Normal Mode (Heating/Cooling)		Sound Pressure	dB(A)	47/47	48/47	50/47			
			Sound Power	dB(A)	61/61	62/61	64/61			
	Quiet Mode (Heating/Cooling)		Sound Pressure	dB(A)	39/39	42/42	43/43			
			Sound Power	dB(A)	54/54	56/56	57/57			
	Night shift Mode (Heating/Cooling)		Sound Pressure	dB(A)	35/35	38/38	39/39			
			Sound Power	dB(A)	50/50	51/51	53/53			
Outer Dimensions	Height		mm	750	750	750				
	Width		mm	900	900	900				
	Depth		mm	340	340	340				
Packing Dimensions	Height		mm	807	807	807				
	Width		mm	1022	1022	1022				
	Depth		mm	445	445	445				
Net Weight			kg	49.5	49.5	50.5				
Gross Weight			kg	53.5	53.5	54.5				
Refrigerating Installation	Compressor	Type	-	Rotary						
		Quantity	-	1	1	1				
	Refrigeration Oil	Type	-	ACS-68R	ACS-68R	FW68S				
		Charge	L	0.47	0.47	0.46				
	Refrigeration Charge	Type	-	R32						
		Before Shipment	kg	1.23	1.23	1.26				
	Refrigerent Flow Control			-	Micro-computer Control Expansion Valve					
	Heat Exchanger Type			-	Multi-way Cross-flow Finned Tube Type					
	Gas Pipe (Piping diameter)			mm	Ø12.7	Ø12.7	Ø15.88			
				in.	1/2"	1/2"	5/8"			
	Liquid Pipe (Piping diameter)			mm	Ø6.35	Ø6.35	Ø6.35			
				in.	1/4"	1/4"	1/4"			
	Gas Pipe (Between IU and OU)			mm	Ø12.7	Ø12.7	Ø15.88			
				in.	1/2"	1/2"	5/8"			
	Liquid Pipe (Between IU and OU) *2			mm	Ø6.35 (Ø9.53)	Ø6.35 (Ø9.53)	Ø6.35 (Ø9.53)			
in.				1/4" (3/8)	1/4" (3/8)	1/4" (3/8)				

Fan	Condenser Fan Quantity	—	1	1	1
	Air Flow Rate	m <sup>3</sup> /h	2700	2700	2700
Minimum piping length		m	5		
Maximum chargeless piping length		m	15		
Maximum piping length		m	40	40	45(50*3)
Height difference between OU and IU (higher OU / lower OU)		m	30 / 20		
Working range (Space Heating)	Outdoor ambient temperature	°C (DB)	-25~35		
	Outlet water temperature	°C	15~60		
Working range (Space Cooling)	Outdoor ambient temperature	°C (DB)	5~46		
	Outlet water temperature	°C	5~22		
Working range (DHW)	Outdoor ambient temperature	°C (DB)	-25~40		
	Tank water temperature	°C	30~55(75*4)		
Working range (SWP)	Outdoor ambient temperature	°C (DB)	-25~40		
	Swimming pool water temperature	°C	24~33		

Model		44(2.0 HP)	60(2.5 HP)	80(3.0 HP)	
Indoor Unit Type		AHM-044HCDSAA	AHM-060HCDSAA	AHM-080HCDSAA	
Power Supply		220-240V~50Hz			
Nominal water flow	IWT: 30 °C / OWT: 35 °C ΔT: 5 °C	m <sup>3</sup> /h	0.76	1.03	1.38
Outer Dimensions (with connections)	Height	mm	890	890	890
	Width	mm	520	520	520
	Depth	mm	320	320	320
Packing Dimensions	Height	mm	419	419	419
	Width	mm	1160	1160	1160
	Depth	mm	650	650	650
Net Weight		kg	41.5	41.5	42.5
Gross Weight		kg	48.5	48.5	49.5
Refrigerating Installation	Connection type	-	Flare nut connection		
	Liquid pipe (Piping diameter)	mm	Ø6.35		
		in.	1/4"		
	Gas pipe (Piping diameter)	mm	Ø12.7	Ø12.7	Ø15.88
in.		1/2"	1/2"	5/8"	
Space heating pipes connection	Connection type	-	Screwed connection		
	Shutdown valves	mm (in.)	G 1" (male) - G 1" (male)		
	Inlet pipe diameter	mm (in.)	G 1" (female)		
	Outlet pipe diameter	mm (in.)	G 1" (female)		
Noise level (sound pressure)*1		dB(A)	28	28	28
Noise level (sound power)		dB(A)	42	42	42

#### Note

- \* 1. The above noise values are measured in the anechoic chamber without reflected echo, therefore the impact of the reflected echo must be taken into consideration at the scene.
- \* 2. The ambient temperature of the outdoor unit shall be  $\geq 10^{\circ}\text{C}$ , and the refrigerant charge of the unit shall be less than the maximum refrigerant charge allowed by the unit.
- \* 3. When there is a DHW electric heater mounted in the DHW tank, the setting temperature can reach  $75^{\circ}\text{C}$ .

2.1.2 Hi-Therma Integra

The heating capacity tables show the capacity and performance data in integrated values.

- The heating and cooling capacities are based on the EN 14511 standard:  
Piping length: 7.5 meters; Piping lift: 0 meters.
- The noise values are measured in the anechoic chamber without reflected echo, therefore the impact of the reflected echo must be taken into consideration at the scene, in accordance with the standard EN12102.  
Measurement point: 1m from the service cover surface and 0.9m from floor level.

Keywords:

- COP: Coefficient of performance
- EER: Energy efficiency ratio
- DB: Dry bulb(°C); WB: Wet bulb (°C)

OAT: Outdoor ambient temperature

IWT: Inlet water temperature

OWT: Outlet water temperature

For the outdoor unit capacity table of Hi-Therma Integra, please refer to 2.1.1 Hi-Therma Split outdoor unit type.

Model			44 (2.0 HP)	60 (2.5 HP)	80 (3.0 HP)
Indoor Unit Type			AHS-044HCDSAA-23	AHS-060HCDSAA-23	AHS-080HCDSAA-23
Power Supply			220-240V ~ 50Hz		
Nominal water flow	IWT: 30 °C / OWT: 35 °C ΔT: 5 °C	m <sup>3</sup> /h	0.76	1.03	1.38
Outer Dimensions (with connections)	Height	mm	1885	1885	1885
	Width	mm	595	595	595
	Depth	mm	625	625	625
Packing Dimensions	Height	mm	2070	2070	2070
	Width	mm	700	700	700
	Depth	mm	710	710	710
Net Weight		kg	124.5	124.5	125.0
Gross Weight		kg	145.0	145.0	145.5
Refrigerating Installation	Connection type	-	Flare nut connection		
	Liquid pipe (Piping diameter)	mm	Ø6.35	Ø6.35	Ø6.35
		in.	1/4"	1/4"	1/4"
	Gas pipe (Piping diameter)	mm	Ø12.7	Ø12.7	Ø15.88
in.		1/2"	1/2"	5/8"	
Space heating pipes connection	Connection type	-	Screwed connection		
	Shutdown valves	in.	G 1" (male) - G 1" (male)		
	Inlet pipe diameter	in.	G 1" (female)		
	Outlet pipe diameter	in.	G 1" (female)		
DHW pipes connection	Connection type	-	Screwed connection		
	Inlet pipe diameter	in.	G 3/4" (female)		
	Outlet pipe diameter	in.	G 3/4" (female)		
DHW tank rated volume		L	230		
Noise level (sound pressure)*1		dB(A)	26	26	26
Noise level (sound power)		dB(A)	42	42	42

Note

- \* 1. The above noise values are measured in the anechoic chamber without reflected echo, therefore the impact of the reflected echo must be taken into consideration at the scene.
- \* 2. The ambient temperature of the outdoor unit shall be ≥10°C, and the refrigerant charge of the unit shall be less than the maximum refrigerant charge allowed by the unit.
- \* 3. With the factory-supplied DHW electric heater in the DHW tank, the setting temperature can reach 75°C.



**2.1.3 Hi-Therma Monobloc**

The heating capacity tables show the capacity and performance data in integrated values.

- The heating and cooling capacities are based on the EN 14511 standard:  
Piping length: 7.5 meters; Piping lift: 0 meters.
- The noise values are measured in the anechoic chamber without reflected echo, therefore the impact of the reflected echo must be taken into consideration at the scene, in accordance with the standard EN12102.  
Measurement point: 1m from the service cover surface and 0.9m from floor level.

Keywords:

- COP: Coefficient of performance
- EER: Energy efficiency ratio
- DB: Dry bulb(°C); WB: Wet bulb (°C)

OAT: Outdoor ambient temperature

IWT: Inlet water temperature

OWT: Outlet water temperature

Model					44(2.0HP)	80(3.0HP)	
Outdoor Unit Type					AHZ-044HCDS1	AHZ-080HCDS1	
Power Supply					220-240V~50Hz		
Heating Operation	OAT (DB/WB)	IWT / OWT	-	Unit	Heating operation		
			7 / 6 °C	30 / 35 °C	Capacity (Min./Nom./Max.)	kW	1.85 / 4.40 / 7.00
				COP (Nom.)	-	5.10	4.90
		47 / 55 °C	Capacity (Nom./Max.)	kW	4.40 / 6.00	8.00 / 9.00	
			COP (Nom.)	-	3.00	2.80	
		-7 / -8 °C	30 / 35 °C	Capacity (Nom./Max.)	kW	4.40 / 5.00	5.80 / 7.30
			COP (Nom.)	-	3.26	3.14	
			47 / 55 °C	Capacity (Nom./Max.)	kW	4.00 / 4.20	5.00 / 6.40
			COP (Nom.)	-	1.97	1.94	
Cooling Operation	35 / -- °C	12 / 7 °C	Nominal Capacity	kW	4.40	6.50	
			EER	-	4.00	3.35	
		23 / 18 °C	Nominal Capacity	kW	5.60	7.00	
			EER	-	5.60	5.10	
Sound data*1	Normal Mode (Heating/Cooling)		Sound Pressure	dB(A)	47/47	50/47	
			Sound Power	dB(A)	61/61	64/61	
	Quiet Mode (Heating/Cooling)		Sound Pressure	dB(A)	40/40	43/43	
			Sound Power	dB(A)	55/55	58/58	
	Night shift Mode (Heating/Cooling)		Sound Pressure	dB(A)	36/36	39/39	
			Sound Power	dB(A)	50/50	54/54	
Outer Dimensions	Height		mm	815	815		
	Width		mm	1270	1270		
	Depth		mm	340	340		
Packing Dimensions	Height		mm	890	890		
	Width		mm	1400	1400		
	Depth		mm	440	440		
Net Weight				kg	88	88	
Gross Weight				kg	104	105	
Refrigerating Installation	Compressor	Type	—	Rotary			
		Quantity	—	1	1		
	Refrigeration Oil	Type	—	ACS-68R	FW68S		
		Charge	L	0.47	0.46		
	Refrigeration Charge	Type	—	R32			
		Before Shipment	kg	1.17	1.21		
	Refrigerant Flow Control			—	Micro-computer Control Expansion Valve		
	Heat Exchanger Type			—	Multi-way Cross-flow Finned Tube Type		
	Gas Pipe(Piping diameter)			mm	—	—	
				in.	—	—	
Liquid Pipe(Piping diameter)			mm	—	—		
			in.	—	—		

Fan	Condenser Fan Quantity	-	1	1
	Air Flow Rate	m <sup>3</sup> /h	2700	2700
Minimum piping length		m	—	—
Maximum chargeless piping length		m	—	—
Maximum piping length		m	—	—
Height difference between OU and IU (higher OU / lower OU)		m	—	—
Working range (Space Heating)	Outdoor ambient temperature	°C (DB)	-25~35	
	Outlet water temperature	°C	15~60	
Working range (Space Cooling)	Outdoor ambient temperature	°C (DB)	5~46	
	Outlet water temperature	°C	5~22	
Working range (DHW)	Outdoor ambient temperature	°C (DB)	-25~40	
	Tank water temperature	°C	30~55(75*2)	
Working range (SWP)	Outdoor ambient temperature	°C (DB)	-25~40	
	Swimming pool water temperature	°C	24~33	
Nominal water flow	IWT: 30°C / OWT: 35°C ΔT: 5°C	m <sup>3</sup> /h	0.77	1.38
Space heating pipes connection	Connection type	-	Screwed connection	
	Shutdown valves	mm (in.)	G 1" (female) - G 1" (female)	
	Inlet pipe diameter	mm (in.)	G 1" (female)	
	Outlet pipe diameter	mm (in.)	G 1" (female)	

Note:

- \* 1. The above noise values are measured in the anechoic chamber without reflected echo, therefore the impact of the reflected echo must be taken into consideration at the scene.
- \* 2. When there is a DHW electric heater mounted in the DHW tank, the setting temperature can reach 75°C.

## 2.2 ERP performance data for space heating

This appliance must be installed, maintained and dismantled by professionals. Do not pour contained refrigerant into the atmosphere since this refrigerant fluid is a fluorinated greenhouse gas regulated under European Regulation (EU)N° 517/2014. ERP performance data is tested in accordance with the standard EN14825.

### 2.2.1 ERP data - Hi-Therma Split

For space heating

Model		44(2.0 HP)		60(2.5 HP)		80(3.0 HP)		
		Outdoor unit	AHW-044HCDS1	AHW-060HCDS1	AHW-080HCDS1	Indoor unit	AHM-044HCDSAA	AHM-060HCDSAA
Water outlet temperature			35°C	55°C	35°C	55°C	35°C	55°C
Product description	Air to water heat pump	-	Yes					
	Indication if the heater is equipped with a supplementary heater	-	No					
	Parameters shall be declared for	-	Low temperature /Medium temperature application					
	Parameters shall be declared for the average heating season							
	Outdoor side heat exchanger of air conditioner/heat pump	-	Air					
	Indoor side heat exchanger of air conditioner/heat pump	-	Water					
	Type	-	Compressor driven vapour compression					
	Driver of compressor	-	Electric motor					
	Capacity Control		Variable					
Indoor heat exchanger		Variable outlet						
Rated heating capacity (Prated,h)	kW	4.44	3.87	6.10	5.37	6.50	5.90	
Seasonal space heating energy efficiency ( $\eta_{s,h}$ )	%	197	126	194	130	194	134	
Seasonal energy efficiency ratio heating mode(SCOP)	-	5.00	3.23	4.93	3.33	4.92	3.42	
Type of energy used	-	Electricity						
Declared heating capacity and coefficient of performance for part load at indoor temperature 20°C and outdoor temperature Tj								
Outdoor temperature (Tj) = -7°C	Pdh	kW	3.9	3.4	5.4	4.7	5.8	5.2
	COPd	-	3.29	1.97	3.13	2.04	3.14	1.85
Outdoor temperature (Tj) = +2°C	Pdh	kW	2.4	2.1	3.3	3.0	3.5	3.2
	COPd	-	4.80	3.22	4.67	3.21	4.84	3.40
Outdoor temperature (Tj) = +7°C	Pdh	kW	1.7	1.4	2.0	2.0	2.3	2.1
	COPd	-	6.44	3.97	6.63	4.34	5.98	4.50
Outdoor temperature (Tj) = +12°C	Pdh	kW	2.2	2.0	2.2	2.0	2.0	2.1
	COPd	-	9.92	7.24	9.92	7.24	9.67	7.71
Outdoor temperature (Tj) = Bivalent temperature (Tbiv)	Pdh	kW	3.9	3.4	5.4	4.7	5.8	5.2
	COPd	-	3.29	1.97	3.13	2.04	3.14	1.85
Outdoor temperature (Tj) = Limit operation temperature (TOL)	Pdh	kW	4.3	3.5	5.3	4.5	6.2	5.7
	COPd	-	2.62	1.68	2.66	1.75	2.66	1.54
Bivalent temperature (Tbiv) heating/Average	°C	-7	-7	-7	-7	-7	-7	
Limit operation temperature (TOL) heating/Average	°C	-10	-10	-10	-10	-10	-10	
Degradation coefficient (Cdh)	-	0.9	0.9	0.9	0.9	0.9	0.9	
Supplementary capacity (PSUP)	kW	0.102	0.303	0.729	0.805	0.343	0.179	
Annual energy consumption (QHE)	kW·h	1824	2457	2539	3312	2732	3536	

For Domestic Hot Water heating

Model		44 (2.0 HP)		60 (2.5 HP)		80(3.0 HP)		
		Outdoor unit	AHW-044HCDS1	AHW-060HCDS1	AHW-080HCDS1	Indoor unit	AHS-044HCDSAA	AHS-060HCDSAA
Domestic Hot Water		HDHWT-200L30HE	HDHWT-300L30HE	HDHWT-200L30HE	HDHWT-300L30HE	HDHWT-200L30HE	HDHWT-300L30HE	
Declared profile	-	L	XL	L	XL	L	XL	
Average climate conditions								
Water heating energy efficiency ( $\eta_{wh}$ )	%	125	137	125	137	130	137	
Water heating energy class	-	A+	A+	A+	A+	A+	A+	
Daily energy consumption	kW·h	3.85	5.73	3.85	5.73	3.72	5.67	
Annual energy consumption	kW·h	820	1223	820	1223	791	1213	

2.2.2 ERP data - Hi-Therma Integra

For space heating

Model			44(2.0 HP)		60(2.5 HP)		80(3.0 HP)	
	Outdoor unit		AHW-044HCDS1		AHW-060HCDS1		AHW-080HCDS1	
	Indoor unit		AHS-044HCDSAA-23		AHS-060HCDSAA-23		AHS-080HCDSAA-23	
Water outlet temperature			35°C	55°C	35°C	55°C	35°C	55°C
Product description	Air to water heat pump	-	Yes					
	Indication if the heater is equipped with a supplementary heater	-	No					
	Parameters shall be declared for	-	Low temperature /Medium temperature application					
	Parameters shall be declared for the average heating season							
	Outdoor side heat exchanger of air conditioner/heat pump	-	Air					
	Indoor side heat exchanger of air conditioner/heat pump	-	Water					
	Type	-	Compressor driven vapour compression					
	Driver of compressor	-	Electric motor					
	Capacity Control	-	Variable					
Indoor heat exchanger	-	Variable outlet						
Rated heating capacity (Prated,h)	kW	4.44	3.87	6.10	5.37	6.50	5.90	
Seasonal space heating energy efficiency ( $\eta_{s,h}$ )	%	197	126	194	130	194	134	
Seasonal energy efficiency ratio heating mode(SCOP)	-	5.00	3.23	4.93	3.33	4.92	3.42	
Type of energy used	-	Electricity						
Declared heating capacity and coefficient of performance for part load at indoor temperature 20°C and outdoor temperature Tj								
Outdoor temperature (Tj) = -7°C	Pdh	kW	3.9	3.4	5.4	4.7	5.8	5.2
	COPd	-	3.29	1.97	3.13	2.04	3.14	1.85
Outdoor temperature (Tj) = +2°C	Pdh	kW	2.4	2.1	3.3	3.0	3.5	3.2
	COPd	-	4.80	3.22	4.67	3.21	4.84	3.40
Outdoor temperature (Tj) = +7°C	Pdh	kW	1.7	1.4	2.0	2.0	2.3	2.1
	COPd	-	6.44	3.97	6.63	4.34	5.98	4.50
Outdoor temperature (Tj) = +12°C	Pdh	kW	2.2	2.0	2.2	2.0	2.0	2.1
	COPd	-	9.92	7.24	9.92	7.24	9.67	7.71
Outdoor temperature (Tj) = Bivalent temperature (Tbiv)	Pdh	kW	3.9	3.4	5.4	4.7	5.8	5.2
	COPd	-	3.29	1.97	3.13	2.04	3.14	1.85
Outdoor temperature (Tj) = Limit operation temperature (TOL)	Pdh	kW	4.3	3.5	5.3	4.5	6.2	5.7
	COPd	-	2.62	1.68	2.66	1.75	2.66	1.54
Bivalent temperature (Tbiv) heating/Average	°C	-7	-7	-7	-7	-7	-7	
Limit operation temperature (TOL) heating/Average	°C	-10	-10	-10	-10	-10	-10	
Degradation coefficient (Cdh)	-	0.9	0.9	0.9	0.9	0.9	0.9	
Supplementary capacity (PSUP)	kW	0.102	0.303	0.729	0.805	0.343	0.179	
Annual energy consumption (QHE)	kW·h	1824	2457	2539	3312	2732	3536	

For Domestic Hot Water heating

Model			44 (2.0 HP)	60 (2.5 HP)	80(3.0 HP)
	Outdoor unit		AHW-044HCDS1	AHW-060HCDS1	AHW-080HCDS1
	Indoor unit		AHS-044HCDSAA-23	AHS-060HCDSAA-23	AHS-080HCDSAA-23
Declared profile		-	XL	XL	XL
Average climate conditions					
Water heating energy efficiency ( $\eta_{wh}$ )	%		135	135	135
Water heating energy class	-		A+	A+	A+
Daily energy consumption	kW·h		5.74	5.74	5.77
Annual energy consumption	kW·h		1230	1230	1235

## 2.2.3 ERP data - Hi-Therma Monobloc

Model	Outdoor unit		44(2.0 HP)		80(3.0 HP)	
	AHZ-044HCDS1		AHZ-044HCDS1		AHZ-080HCDS1	
Water outlet temperature			35°C	55°C	35°C	55°C
Product description	Air to water heat pump	-	Yes			
	Indication if the heater is equipped with a supplementary heater	-	No			
	Parameters shall be declared for	-	Low temperature /Medium temperature application			
	Parameters shall be declared for the average heating season					
	Outdoor side heat exchanger of air conditioner/heat pump	-	Air			
	Indoor side heat exchanger of air conditioner/heat pump	-	Water			
	Type	-	Compressor driven vapour compression			
	Driver of compressor	-	Electric motor			
	Capacity Control	-	Variable			
Indoor heat exchanger	-	Variable outlet				
Rated heating capacity (Prated,h)	kW	4.61	4.09	6.52	6.07	
Seasonal space heating energy efficiency ( $\eta_{s,h}$ )	%	204	136	197	137	
Seasonal energy efficiency ratio heating mode(SCOP)	-	5.17	3.47	5.00	3.50	
Type of energy used	-	Electricity				
Declared heating capacity and coefficient of performance for part load at indoor temperature 20 °C and outdoor temperature Tj						
Outdoor temperature (Tj) = -7°C	Pdh	kW	4.05	3.60	5.74	5.34
	COPd	-	3.26	2.08	3.09	2.18
Outdoor temperature (Tj) = +2°C	Pdh	kW	2.48	2.26	3.47	3.11
	COPd	-	5.02	3.44	4.76	3.41
Outdoor temperature (Tj) = +7°C	Pdh	kW	1.67	1.49	2.44	2.09
	COPd	-	6.70	4.33	6.65	4.36
Outdoor temperature (Tj) = +12°C	Pdh	kW	1.14	1.02	1.48	1.23
	COPd	-	8.74	6.66	9.58	6.52
Outdoor temperature (Tj) = Bivalent temperature (Tbiv)	Pdh	kW	4.05	3.60	5.74	5.34
	COPd	-	3.26	2.08	3.09	2.18
Outdoor temperature (Tj) = Limit operation temperature (TOL)	Pdh	kW	4.56	3.59	6.14	5.81
	COPd	-	2.68	1.77	2.84	1.72
Bivalent temperature (Tbiv) heating/Average	°C	-7	-7	-7	-7	
Limit operation temperature (TOL) heating/Average	°C	-10	-10	-10	-10	
Degradation coefficient (Cdh)	-	0.9	0.9	0.9	0.9	
Supplementary capacity (PSUP)	kW	0.022	0.483	0.389	0.172	
Annual energy consumption (QHE)	kW·h	1830	2425	2680	3574	



2.3 Cooling mode application (EN 14825)

2.3.1 Cooling data- Hi-Therma Split

Model		44(2.0 HP)		60(2.5 HP)		80(3.0 HP)		
		Outdoor unit	AHW-044HCDS1	AHW-060HCDS1	AHW-080HCDS1	Indoor unit	AHM-044HCDSAA	AHM-060HCDSAA
Water outlet temperature		7°C	18°C	7°C	18°C	7°C	18°C	
Product description	Outdoor side heat exchanger of air conditioner/heat pump	Air						
	Indoor side heat exchanger of air conditioner/heat pump	Water						
	Type	Compressor driven vapour compression						
	Driver of compressor	Electric motor						
	Capacity Control	Variable						
	Indoor heat exchanger	Variable	Fixed	Variable	Fixed	Variable	Fixed	
Rated Cooling Capacity (PRATED,C)	kW	4.40	5.60	5.0	6.00	6.0	7.0	
Seasonal space cooling energy efficiency (ηS,C)	%	227	352	231	346	226	339	
Seasonal energy efficiency ratio cooling mode (SEER)	-	5.75	8.87	5.85	8.73	5.73	8.54	
Declared cooling capacity and coefficient of performance for part load at indoor temperature 27(19) °C and outdoor temperature Tj								
Outdoor temperature (Tj) = 35°C	Pdc	kW	4.4	5.6	5.0	6.0	6.0	7.0
	EERd	-	3.90	5.60	3.70	5.60	3.60	5.10
Outdoor temperature (Tj) = 30°C	Pdc	kW	3.3	4.2	3.7	4.4	4.4	5.1
	EERd	-	4.98	7.36	5.00	7.01	5.10	6.81
Outdoor temperature (Tj) = 25°C	Pdc	kW	2.2	2.6	2.5	2.9	2.8	3.2
	EERd	-	6.36	10.81	6.59	10.51	6.56	8.87
Outdoor temperature (Tj) = 20°C	Pdc	kW	1.2	1.4	1.2	1.4	2.6	1.58
	EERd	-	8.28	12.27	8.28	12.27	7.93	9.93
Degradation coefficient (Cdc)	-	0.9	0.9	0.9	0.9	0.9	0.9	

2.3.2 Cooling data- Hi-Therma Integra

Model		44(2.0 HP)		60(2.5 HP)		80(3.0 HP)		
		Outdoor unit	AHW-044HCDS1	AHW-060HCDS1	AHW-080HCDS1	Indoor unit	AHS-044HCDSAA-23	AHS-060HCDSAA-23
Water outlet temperature		7°C	18°C	7°C	18°C	7°C	18°C	
Product description	Outdoor side heat exchanger of air conditioner/heat pump	Air						
	Indoor side heat exchanger of air conditioner/heat pump	Water						
	Type	Compressor driven vapour compression						
	Driver of compressor	Electric motor						
	Capacity Control	Variable						
	Indoor heat exchanger	Variable	Fixed	Variable	Fixed	Variable	Fixed	
Rated Cooling Capacity (PRATED,C)	kW	4.40	5.60	5.0	6.0	6.0	7.0	
Seasonal space cooling energy efficiency (ηS,C)	%	227	352	231	346	226	339	
Seasonal energy efficiency ratio cooling mode (SEER)	-	5.75	8.87	5.85	8.73	5.73	8.54	
Declared cooling capacity and coefficient of performance for part load at indoor temperature 27(19) °C and outdoor temperature Tj								
Outdoor temperature (Tj) = 35°C	Pdc	kW	4.4	5.6	5.0	6.0	6.0	7.0
	EERd	-	3.90	5.60	3.70	5.60	3.60	5.10
Outdoor temperature (Tj) = 30°C	Pdc	kW	3.3	4.2	3.7	4.4	4.4	5.1
	EERd	-	4.98	7.36	5.00	7.01	5.10	6.81
Outdoor temperature (Tj) = 25°C	Pdc	kW	2.2	2.6	2.5	2.9	2.8	3.2
	EERd	-	6.36	10.81	6.59	10.51	6.56	8.87
Outdoor temperature (Tj) = 20°C	Pdc	kW	1.2	1.4	1.2	1.4	2.6	1.58
	EERd	-	8.28	12.27	8.28	12.27	7.93	9.93
Degradation coefficient (Cdc)	-	0.9	0.9	0.9	0.9	0.9	0.9	

## 2.3.3 Cooling data- Hi-Therma Monobloc

Model				44(2.0 HP)		80(3.0 HP)	
		Outdoor unit		AHZ-044HCDS1		AHZ-080HCDS1	
Water outlet temperature				7°C	18°C	7°C	18°C
Product description	Outdoor side heat exchanger of air conditioner/heat pump			Air			
	Indoor side heat exchanger of air conditioner/heat pump			Water			
	Type			Compressor driven vapour compression			
	Driver of compressor			Electric motor			
	Capacity Control			Variable			
Indoor heat exchanger			Variable	Fixed	Variable	Fixed	
Rated Cooling Capacity (PRATED,C)		kW	4.40	5.60	6.5	7.0	
Seasonal space cooling energy efficiency ( $\eta_{S,C}$ )		%	227	399	230	292	
Seasonal energy efficiency ratio cooling mode (SEER)		-	5.75	10.06	5.83	7.38	
Declared cooling capacity and coefficient of performance for part load at indoor temperature 27(19) °C and outdoor temperature Tj							
Outdoor temperature (Tj) = 35°C		Pdc	kW	4.40	5.60	6.50	7.00
		EERd	-	4.00	5.60	3.35	5.10
Outdoor temperature (Tj) = 30°C		Pdc	kW	3.36	4.32	4.92	4.87
		EERd	-	5.43	8.40	5.00	5.55
Outdoor temperature (Tj) = 25°C		Pdc	kW	2.02	2.74	3.18	3.28
		EERd	-	7.47	12.72	6.87	9.00
Outdoor temperature (Tj) = 20°C		Pdc	kW	0.89	1.14	1.37	1.58
		EERd	-	5.30	12.61	7.35	9.93
Degradation coefficient (Cdc)		-	0.9	0.9	0.9	0.9	

2.4 Component data

2.4.1 Hi-Therma Split

Outdoor unit

Model			44(2.0HP)	60(2.5HP)	80(3.0HP)	
Heat Exchanger	Heat exchanger Type		-	Multi-way cross-flow finned tube type		
	Tube	Material	-	Copper		
		Outer diameter	mm	7		
		Rows	-	2		
	Number of tubes in the heat exchanger		-	44		
	Fin	Material	-	Aluminum		
		Pitch	mm	1.40		
	Max. operating pressure		MPa	4.15		
Max. frontal area		m <sup>2</sup>	0.68			
Number of heat exchanger per unit		-	1			
Fan Part	Fan	Type	-	Axial flow fan		
		Quantity	-	1		
		Outer diameter	mm	556		
		Rotating speed	rpm	900		
	Fan Motor	Model	-	ZWB278D04A	ZWB278D04A	ZWB278D04A
		Type	-	Waterproof brushless DC motor		
		Start-up mode	-	Soft driving		
		Nominal output power	W	100		
		Quantity	-	1		
		Insulation grade	-	E		
Degree of Protection	-	IP24	IP24	IP24		
	-	IP24	IP24	IP24		
Compressor Part	Design pressure	High Side	MPa	4.15	4.15	4.15
		Low Side	MPa	2.21	2.21	2.21
	Compressor Motor	Model	-	WHP06840GUKQA8JT6	WHP06840GUKQA8JT6	SVB200FCNMC-L
		Start-up mode	-	VFD	VFD	VFD
		Polarities	-	6	6	6
		Quantity	-	1	1	1
		Insulation grade	-	E	E	E
	Refrigerator Oil	Brand	-	ACS68R	ACS68R	FW68S
		Volume	L	0.47	0.47	0.46

## Indoor unit

Model		44(2.0HP)	60(2.5HP)	80(3.0HP)	
Water heat exchanger	Type	-	Brazed plate		
	Material	-	Stainless steel		
	Transfer fluids	-	R32 - H <sub>2</sub> O		
	Quantity	-	1		
	Internal refrigerant volume	L	0.45	0.45	0.57
	Internal water volume	L	0.61	0.61	0.76
	Insulation material	-	EPS		
Water pump	Model	-	PARA RS15/7.0; GRUNDFOS UPM4K15-75 130		
	Type	-	Inverter		
	Control	-	PWM		
	Power supply	-	1~ 230V 50Hz		
	Maximum head	mwc	7.6		
	Maximum water flow	m <sup>3</sup> /h	3.5		
	Maximum power input	W	50		
	Piping	Water inlet	inches	G 1"	
Water outlet		inches	G 1"		
Inlet/outlet distance		mm	130		
Water auxiliary electric heater	Material	-	AISI 316L (Stainless steel)		
	Power supply	-	1~ 230V 50Hz		
	Maximum electric heater power	kW	3.0		
	Regulated electric heater power (step 1/ step 2/ step 3)	kW	1.0/2.0/3.0		
	Automatic Reset Thermostat	-	Yes (Cut-out: 75°C±4°C)		
	Temperature fuse	-	94°C <sup>+0</sup> <sub>-10</sub> °C		
Water pressure sensor	Material	-	AISI 304L(Stainless steel)		
	Pressure range	-	0-9.0Bar		
Expansion vessel	Material	-	Steel (with stainless/galvanized steel connections)		
	Internal water volume	L	8.0		
	Working pressure	bar	3.0		
	Pre-loading pressure (Air side)	bar	1.0±0.3		
Shut-off valve with filter	Type	-	Shut-off valve with filter		
	Material	-	Brass		
	Piping connection	inches	1", DN25		
	Mesh	in.	30.0		
	Self-cleaning (with back flush) filter	-	Yes		
Safety valve	-	Yes (3 bar)			
Shut-off valve	in.	1", DN25			
Air purge valve	-	Yes			
Unit controller	-	Yes			

2.4.2 Hi-Therma Integra

For the outdoor unit component data of Hi-Therma Integra, please refer to 2.4.1 Hi-Therma Split outdoor unit.

Indoor unit

Model			44(2.0HP)	60(2.5HP)	80(3.0HP)
			AHS-044HCDSAA-23	AHS-060HCDSAA-23	AHS-080HCDSAA-23
Water heat exchanger	Type	-	Brazen plate		
	Material	-	Stainless steel		
	Transfer fluids	-	R32 - H <sub>2</sub> O		
	Quantity	-	1		
	Internal refrigerant volume	L	0.45	0.45	0.57
	Internal water volume	L	0.61	0.61	0.76
	Insulation material	-	EPS		
Water pump	Model	-	APM25-9-130 PWM1		
	Type	-	Inverter		
	Control	-	PWM		
	Power supply	-	1~ 230V 50/60Hz		
	Maximum head	mwc	9.0		
	Maximum water flow	m <sup>3</sup> /h	4.5		
	Maximum power input	W	95		
	Piping	Water inlet	inches	G 1-1/2"	
Water outlet		inches	G 1-1/2"		
Inlet/outlet distance		mm	130		
Water auxiliary electric heater	Material	-	AISI 316L (Stainless steel)		
	Power supply	-	1~ 230V 50Hz		
	Maximum electric heater power	kW	3.0		
	Regulated electric heater power (step 1/ step 2/ step 3)	kW	1.0/2.0/3.0		
	Automatic Reset Thermostat	-	Yes (Cut-out: 75°C±4°C)		
	Temperature fuse	-	94°C <sup>+0</sup> <sub>-10</sub> °C		
Water pressure sensor	Material	-	AISI 304L(Stainless steel)		
	Pressure range	-	0-9.0Bar		
Expansion vessel	Material	-	Steel (with stainless/galvanized steel connections)		
	Internal water volume	L	10.0		
	Working pressure	bar	3.0		
	Pre-loading pressure (Air side)	bar	1.0±0.3		
Shut-off valve with filter	Type	-	Shut-off valve with filter		
	Material	-	Brass		
	Piping connection	inches	1", DN25		
	Mesh	in.	30.0		
	Self-cleaning (with back flush) filter	-	Yes		
Safety valve	-	Yes (3 bar)			
Shut-off valve	in.	1", DN25			
Air purge valve	-	Yes			
Unit controller	-	Yes			
Domestic hot water tank	DHW Tank	Tank rated volume	L	230	
		Material	-	Stainless steel	
		Max. water temperature	°C	75	
		Max. water pressure	bar	10	
		Max. heating coil water temperature	°C	75	
		Max. heating coil water pressure	bar	3	
	DHW Tank Insulation	Material	-	Polyethylene Foam	
		Thickness	mm	45	
		Quantity	-	1	
	Heat exchanger	Coil surface area	m <sup>2</sup>	1.8	
		Internal coil volume	L	9.7	
		Quantity	-	1	
	DHW electric heater	Power supply	-	1~ 220V 50Hz	
		Max. electric heater power	kW	3	
Mechanical thermostat		-	Cut-out: 85°C±5°C, manual reset		
Pressure relief valve	Max. water pressure	bar	7±0.5		
3WV DHW	Power supply	-	1~ 230V 50Hz		
	Piping connection	in.	G 1" / G 3/4"		



2.4.3 Hi-Therma Monobloc

		MODEL		44(2.0HP)	80(3.0HP)	
Outdoor part	Heat Exchanger	Heat exchanger Type		Multi-way cross-flow finned tube type		
		Tube	Material	-	Copper	
			Outer diameter	mm	7	
			Rows	-	2	
		Number of tubes in the heat exchanger		-	44	
		Fin	Material	-	Aluminum	
			Pitch	mm	1.40	
		Max. operating pressure		MPa	4.15	
		Max. frontal area		m <sup>2</sup>	0.68	
		Number of heat exchanger per unit		-	1	
	Fan Part	Fan	Type	-	Axial flow fan	
			Quantity	-	1	
			Outer diameter	mm	556	
			Rotating speed	rpm	900	900
		Fan Motor	Model	-	ZWB278D04A	ZWB278D04A
			Type	-	Waterproof brushless DC motor	
			Start-up mode	-	Soft driving	
			Nominal output power	W	100	
			Quantity	-	1	
			Insulation grade	-	E	
	Compressor Part	Design pressure	High Side	MPa	4.15	4.15
			Low Side	MPa	2.21	2.21
		Compressor Motor	Model	-	WHP06840GUKQA8JT6	SVB200FCNMC-L
			Start-up mode	-	VFD	VFD
			Polarities	-	6	6
			Quantity	-	1	1
			Insulation grade	-	E	E
Refrigerator Oil		Brand	-	ACS68R	FW68S	
		Volume	L	0.47	0.46	

		MODEL		44(2.0HP)	80(3.0HP)	
Indoor part	Water heat exchanger	Type	-	Brazen plate		
		Material	-	Stainless steel		
		Transfer fluids	-	R32 - H <sub>2</sub> O		
		Quantity	-	1		
		Internal refrigerant volume	L	0.45	0.57	
		Internal water volume	L	0.61	0.76	
		Insulation material	-	EPS		
	Water pump	Model	-	Para 25-130/9-87/IPWM1-3; SHIMGE APM25-9-130		
		Type	-	Inverter		
		Control	-	PWM		
		Power supply	-	1~ 230V 50Hz		
		Maximum head	mwc	9.0		
		Maximum water flow	m <sup>3</sup> /h	4.5		
		Maximum power input	W	87		
		Piping	Water inlet	inches	G 1"	
	Water outlet		inches	G 1"		
	Inlet/outlet distance		mm	130		
	Water auxiliary electric heater	Material	-	---		
		Power supply	-	---		
		Maximum electric heater power	kW	---		
		Regulated electric heater power (step 1/ step 2/ step 3)	kW	---		
		Capillary thermostat	-	---		
		Surface thermostat	-	---		
	Water pressure sensor	Material		AISI 304L(Stainless steel)		
		Pressure range		0-9.0Bar		
	Expansion vessel	Material	-	Steel (with stainless/galvanized steel connections)		
		Internal water volume	L	8.0		
		Working pressure	bar	3.0		
Pre-loading pressure (Air side)		bar	1.0±0.3			
Shut-off valve with filter	Type	-	Isolated water strainer (Shut-off valve with filter)			
	Material	-	Brass			
	Piping connection	in.	1", DN25			
	Mesh (hole size)	In.	30.0			
	Self-cleaning (with back flush) filter	-	Yes			
Safety valve		-	Yes (3 bar)			
Shut-off valve		in.	1", DN25			
Air purge valve		-	Yes			
Unit controller		-	Yes			

## 2.5 Safety and control Device

### Compressor protection

The compressor is protected by the following devices and their combinations.

- (1) High pressure switch: This switch cuts out the operation of the compressor when the discharge pressure exceeds the setting.
- (2) Low pressure switch: This switch cuts out the operation of the compressor when the suction pressure exceeds the setting.

### Fan motor protection

When the thermistor temperature is reached to the setting, motor output is decreased. The other way, when the temperature becomes lower, limitation is canceled.

### 2.5.1 Hi-Therma Split

#### Outdoor unit

MODEL			044(2.0HP)/060(2.5HP)/080(3.0HP)
For compressor	Pressure switches		Automatic reset, non-adjustable
	High	Cut-out	MPa
		Cut-in	
	Low	Cut-out	MPa
		Cut-in	
	Fuse capacity on PCB1 (PF1)	220-240V ~ 50Hz	A
CCP timer		-	
Setting time		min.	
For condenser fan motor	Internal Thermostat		-

#### Indoor unit

MODEL			044(2.0HP)/060(2.5HP)/080(3.0HP)
For Auxiliary electric heaters	Automatic Reset Thermostat		°C
	Temperature fuse		°C
	Fuse capacity	220-240V ~ 50Hz	A
For water circulation	Low water pressure protection		Condition 1
	High water pressure protection		Condition 2
	Minimum water flow rate		m <sup>3</sup> /h
	Water pump control		-
For the control circuit	Fuse capacity	220-240V ~ 50Hz	A
For DHW Electric Heater	Fuse capacity	220-240V ~ 50Hz	A

### 2.5.2 Hi-Therma Integra

For outdoor unit safety and control device parameters, please refer to 2.5.1 Hi-Therma Split outdoor unit.

#### Indoor unit

MODEL			044(2.0HP)/060(2.5HP)/080(3.0HP)
Auxiliary electric heater	Automatic Reset Thermostat		°C
	Temperature fuse		°C
	Fuse capacity	220-240V ~ 50Hz	A
Water circulation	Low water pressure protection		Condition 1
	High water pressure protection		Condition 2
	Minimum water flow rate		m <sup>3</sup> /h
	Water pump control		-
Control circuit	Safety valve		bar
	Fuse capacity	220-240V ~ 50Hz	A
DHW Electric Heater	Fuse capacity	220-240V ~ 50Hz	A
	Mechanical thermostat		°C
DHW Tank	Pressure relief valve		bar

2.5.3 Hi-Therma Monobloc

Outdoor part

MODEL			044(2.0HP)/080(3.0HP)	
For compressor	Pressure switches		Automatic reset, non-adjustable	
	High	Cut-out	4.4±0.15	
		Cut-in	3.40±0.2	
	Low	Cut-out	0.05±0.03	
		Cut-in	0.15±0.03	
	Fuse capacity on PCB6 (F201)	220-240V ~ 50Hz	A	30
	CCP timer			Non adjustable
Setting time			3	
For condenser fan motor	Internal Thermostat	-	Automatic Reset, Non-Adjustable	

Indoor part

MODEL			044(2.0HP)/080(3.0HP)	
For Auxiliary electric heaters	Automatic Reset Thermostat		°C	--
	Temperature fuse		°C	--
	Fuse capacity	220-240V ~ 50Hz	A	20
For water circulation	Low water pressure protection		Condition 1	Pw<0.3Bar for 180 seconds
	High water pressure protection		Condition 2	Pw>4.0Bar for 180 seconds
	Minimum water flow rate		m <sup>3</sup> /h	0.5(044)/0.6(080)
	Water pump control		-	Water Pump status by feedback control
For the control circuit	Fuse capacity	220-240V ~ 50Hz	A	10 (Inside PCB1,EFR1)
For DHW Electric Heater	Fuse capacity	220-240V ~ 50Hz	A	20

3. Capacity and selection data

3.1 Hi-Therma Split/Integra

3.1.1 Maximum heating capacity table (kW)

		Ambient temperature (°C WB)										
		-25		-20		-15		-10		-7		
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)
55								3.65	1.95	4.20	1.89	
50					3.84	1.93	4.23	1.91	4.34	1.85		
45	3.47	2.15	3.88	2.05	4.12	1.89	4.57	1.82	4.62	1.78		
40	3.80	2.12	4.02	2.01	4.25	1.84	4.78	1.76	4.90	1.73		
35	3.98	2.09	4.17	1.98	4.36	1.76	4.87	1.68	5.00	1.63		
30	4.09	2.06	4.36	1.91	4.65	1.72	5.15	1.59	5.25	1.58		
25	4.20	1.95	4.56	1.84	4.94	1.68	5.43	1.50	5.74	1.50		
20	4.31	1.81	4.75	1.75	5.23	1.64	5.71	1.41	5.95	1.37		
		-2		2		7		12		15		
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)
55	4.82	1.94	5.16	1.93	6.00	1.91	6.78	1.83	6.96	1.70		
50	5.22	1.84	5.55	1.83	6.62	1.83	7.16	1.73	7.38	1.63		
45	5.62	1.72	5.81	1.66	6.78	1.66	7.54	1.65	7.79	1.56		
40	5.73	1.70	5.99	1.64	6.89	1.53	7.81	1.50	8.06	1.44		
35	5.84	1.58	6.09	1.47	7.00	1.40	8.08	1.36	8.32	1.32		
30	6.13	1.51	6.32	1.45	7.22	1.36	8.35	1.32	8.59	1.29		
25	6.41	1.42	6.59	1.41	7.43	1.32	8.62	1.29	8.86	1.25		
20	6.70	1.35	6.87	1.31	7.65	1.28	8.88	1.26	9.13	1.21		
		20		25		30		35				
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)
55	7.25	1.50	7.54	1.32	7.60	1.29	7.66	1.27				
50	7.72	1.45	8.08	1.29	8.24	1.26	8.37	1.25				
45	8.21	1.40	8.62	1.25	8.90	1.23	8.96	1.22				
40	8.48	1.33	8.88	1.23	9.05	1.21	9.17	1.20				
35	8.74	1.26	9.15	1.20	9.22	1.19	9.29	1.18				
30	9.01	1.22	9.42	1.16	9.49	1.14	9.55	1.12				
25	9.28	1.18	9.69	1.11	9.76	1.07	9.82	1.04				
20	9.55	1.14	9.96	1.07	10.18	1.04	10.22	1.01				



		Ambient temperature (°C WB)										
		-25		-20		-15		-10		-7		
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)
55								4.47	2.49	5.10	2.40	
50					4.46	2.34	4.86	2.36	5.34	2.24		
45	4.03	2.53	4.38	2.40	4.76	2.27	5.24	2.23	5.52	2.15		
40	4.16	2.45	4.57	2.32	5.02	2.20	5.46	2.15	5.79	2.10		
35	4.41	2.45	4.76	2.32	5.14	2.20	5.64	2.11	5.90	2.03		
30	4.60	2.40	5.00	2.28	5.43	2.16	5.83	2.01	6.05	1.97		
25	4.80	2.36	5.24	2.24	5.71	2.12	6.01	1.91	6.32	1.89		
20	5.00	2.27	5.47	2.16	5.81	2.04	6.20	1.84	6.59	1.83		
		-2		2		7		12		15		
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)
60	4.88	2.42	5.48	2.30	6.42	2.24	6.73	2.21	6.89	2.16		
55	5.63	2.29	6.00	2.20	7.50	2.18	7.76	2.14	8.00	2.09		
50	6.11	2.24	6.52	2.25	7.74	2.11	8.28	2.03	8.60	1.98		
45	6.58	2.14	7.04	2.13	8.25	2.04	8.80	1.91	8.92	1.78		
40	6.74	2.07	7.14	2.01	8.57	2.08	9.16	1.87	9.31	1.77		
35	6.89	1.96	7.24	1.95	8.90	1.92	9.52	1.70	9.72	1.60		
30	7.06	1.94	7.43	1.93	9.16	1.85	9.83	1.60	9.97	1.53		
25	7.21	1.87	7.61	1.81	9.42	1.79	10.14	1.52	10.21	1.44		
20	7.38	1.82	7.78	1.72	9.68	1.72	10.45	1.43	10.46	1.36		
		20		25		30		35				
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)
60	7.17	2.03	7.45	1.96	7.51	1.92	7.52	1.91				
55	8.40	1.97	8.80	1.85	8.87	1.81	8.94	1.79				
50	8.79	1.82	9.06	1.65	9.24	1.62	9.38	1.59				
45	9.17	1.75	9.31	1.57	9.62	1.56	9.69	1.54				
40	9.57	1.59	9.83	1.42	10.02	1.40	10.14	1.39				
35	10.04	1.44	10.36	1.28	10.43	1.27	10.52	1.26				
30	10.18	1.38	10.40	1.24	10.47	1.22	10.54	1.19				
25	10.33	1.32	10.45	1.20	10.52	1.17	10.59	1.13				
20	10.52	1.26	10.55	1.15	10.64	1.12	10.78	1.09				

		Ambient temperature (°C WB)									
		-25		-20		-15		-10		-7	
Water outlet temp (°C)	Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)
		AHW-080HCDS1 + AHM-080HCDSAA	60								
55								5.76	3.55	6.40	3.17
50						5.34	3.19	6.00	2.99	6.49	2.92
45	4.84		3.07	5.25	2.99	5.71	2.95	6.31	2.86	6.68	2.80
40	5.13		3.05	5.64	2.96	6.20	2.88	6.76	2.80	7.09	2.75
35	5.77		2.83	6.01	2.79	6.33	2.76	7.04	2.64	7.30	2.54
30	6.00		2.81	6.26	2.76	6.53	2.71	7.24	2.58	7.66	2.52
25	6.22		2.81	6.51	2.73	6.81	2.65	7.43	2.53	7.81	2.47
20	6.44		2.79	6.76	2.69	7.09	2.60	7.63	2.49	7.95	2.42
AHW-080HCDS1 + AHS-080HCDSAA-23			-2		2		7		12		15
	60	5.78	3.29	6.32	3.26	7.87	3.22	8.32	3.14	8.39	3.09
	55	6.60	3.18	7.16	3.17	9.00	3.10	9.81	2.96	9.86	2.92
	50	6.84	3.02	7.44	2.96	9.16	2.87	9.91	2.77	10.04	2.74
	45	7.25	2.85	7.71	2.76	9.31	2.66	10.01	2.57	10.22	2.55
	40	7.65	2.76	8.10	2.63	10.16	2.58	10.76	2.47	10.89	2.46
	35	8.05	2.52	8.48	2.51	11.00	2.50	11.51	2.38	11.56	2.37
	30	8.37	2.45	8.95	2.41	11.16	2.40	11.66	2.21	11.71	2.19
	25	8.70	2.37	9.41	2.31	11.31	2.29	11.81	2.05	11.86	2.01
	20	9.10	2.32	10.01	2.24	11.51	2.04	12.01	1.90	12.17	1.87
		20		25		30		35			
	60	8.59	3.03	8.78	3.00	8.85	2.93	8.86	2.91		
	55	9.93	2.86	10.01	2.80	10.09	2.73	10.17	2.70		
	50	10.25	2.69	10.46	2.65	10.67	2.60	10.89	2.55		
	45	10.56	2.53	10.91	2.50	11.27	2.47	11.35	2.45		
	40	11.10	2.44	11.31	2.41	11.52	2.38	11.67	2.35		
	35	11.63	2.34	11.71	2.32	11.79	2.30	11.87	2.28		
	30	11.78	2.15	11.86	2.11	11.94	2.07	12.02	2.04		
	25	11.93	1.96	12.01	1.90	12.09	1.85	12.17	1.79		
	20	12.44	1.83	12.71	1.78	12.99	1.73	13.11	1.69		

NOTE:

CAP: Capacity at compressor maximum frequency. Capacity is valid for difference between water inlet and water outlet of 3-8°C.

IPT: Total input power.

The table above shows the input power (IPT) at maximum capacity (CAP). Most of the time, the unit will run at partial load, so that the actual input power will be lower.

Measuring procedure follows EN-14511.

3.1.2 Maximum cooling capacity table (kW)

		Ambient temperature (°C WB)									
		5		10		15		20		25	
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	
											AHW-044HCDS1 + AHM-044HCDSAA
22											
18					7.85	0.94	7.65	0.96	7.24	0.99	
15	7.22	0.91	7.14	0.95	7.06	0.98	6.97	1.00	6.89	1.02	
10	6.89	0.93	6.78	0.97	6.71	1.01	6.50	1.04	6.27	1.08	
7					6.22	1.03	6.12	1.07	5.92	1.12	
5					5.61	1.08	5.30	1.17	5.00	1.26	
		30		35		40		45			
AHW-044HCDS1 + AHS-044HCDSAA-23											
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)			
22	7.09	1.02	6.58	1.10	6.12	1.18	5.61	1.26			
18	6.83	1.06	6.27	1.16	5.71	1.25	5.20	1.32			
15	6.40	1.10	5.91	1.19	5.42	1.29	4.93	1.38			
10	5.82	1.17	5.37	1.25	4.92	1.36	4.46	1.47			
7	5.51	1.23	5.10	1.33	4.64	1.43	4.18	1.52			
5	4.69	1.34	4.39	1.43	4.08	1.52	3.77	1.61			

		Ambient temperature (°C WB)									
		5		10		15		20		25	
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	
											AHW-060HCDS1 + AHM-060HCDSAA
22											
18					9.14	1.17	8.93	1.20	8.72	1.23	
15	8.58	1.15	8.51	1.19	8.43	1.22	8.36	1.24	8.10	1.27	
10	8.12	1.21	7.98	1.24	7.84	1.27	7.71	1.29	7.57	1.33	
7					7.35	1.32	7.25	1.34	6.99	1.37	
5					6.93	1.38	6.75	1.41	6.37	1.46	
		30		35		40		45			
AHW-060HCDS1 + AHS-060HCDSAA-23											
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)			
22	8.51	1.26	7.88	1.33	7.25	1.40	6.62	1.48			
18	8.30	1.34	7.56	1.44	6.93	1.54	6.30	1.65			
15	7.72	1.37	7.15	1.48	6.58	1.59	6.02	1.70			
10	7.07	1.44	6.55	1.55	6.05	1.67	5.53	1.78			
7	6.62	1.56	6.30	1.72	5.78	1.86	5.25	2.00			
5	5.99	1.67	5.60	1.84	5.22	1.99	4.83	2.12			

		Ambient temperature (°C WB)											
		5		10		15		20		25			
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	
													AHW-080HCDS1 + AHM-080HCDSAA
22													
18					10.44	1.35	10.22	1.50	10.01	1.62			
15	10.08	1.19	9.94	1.31	9.79	1.44	9.50	1.57	9.36	1.68			
10	9.33	1.25	9.14	1.37	8.96	1.50	8.78	1.64	8.50	1.78			
7					8.26	1.60	8.06	1.71	7.85	1.83			
5					7.99	1.65	7.78	1.77	7.42	1.89			
AHW-080HCDS1 + AHS-080HCDSAA-23													
		30		35		40		45					
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)			
22	10.18	1.64	9.57	1.71	8.95	1.77	8.33	1.83					
18	9.77	1.71	9.07	1.79	8.23	1.85	7.56	1.93					
15	9.11	1.78	8.38	1.86	7.65	1.95	6.98	2.03					
10	8.19	1.89	7.61	1.99	7.04	2.11	6.45	2.21					
7	7.70	1.95	7.20	2.08	6.69	2.20	6.17	2.33					
5	7.23	2.00	6.77	2.12	6.33	2.27	5.76	2.39					

NOTE:

CAP: Capacity at compressor maximum frequency. Capacity is valid for difference between water inlet and water outlet of 3-8°C.

IPT: Total input power.

3.2 Hi-Therma Monobloc

3.2.1 Maximum heating capacity table (kW)

		Ambient temperature (°C WB)										
		-25		-20		-15		-10		-7		
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)
55								3.65	1.95	4.20	1.89	
50					3.84	1.93	4.23	1.91	4.34	1.85		
45	3.47	2.15	3.88	2.05	4.12	1.89	4.57	1.82	4.62	1.78		
40	3.80	2.12	4.02	2.01	4.25	1.84	4.78	1.76	4.90	1.73		
35	3.98	2.09	4.17	1.98	4.36	1.76	4.87	1.68	5.00	1.63		
30	4.09	2.06	4.36	1.91	4.65	1.72	5.15	1.59	5.25	1.58		
25	4.20	1.95	4.56	1.84	4.94	1.68	5.43	1.50	5.74	1.50		
20	4.31	1.81	4.75	1.75	5.23	1.64	5.71	1.41	5.95	1.37		
		-2		2		7		12		15		
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)
55	4.82	1.94	5.16	1.93	6.00	1.91	6.78	1.83	6.96	1.70		
50	5.22	1.84	5.55	1.83	6.62	1.83	7.16	1.73	7.38	1.63		
45	5.62	1.72	5.81	1.66	6.78	1.66	7.54	1.65	7.79	1.56		
40	5.73	1.70	5.99	1.64	6.89	1.53	7.81	1.50	8.06	1.44		
35	5.84	1.58	6.09	1.47	7.00	1.40	8.08	1.36	8.32	1.32		
30	6.13	1.51	6.32	1.45	7.22	1.36	8.35	1.32	8.59	1.29		
25	6.41	1.42	6.59	1.41	7.43	1.32	8.62	1.29	8.86	1.25		
20	6.70	1.35	6.87	1.31	7.65	1.28	8.88	1.26	9.13	1.21		
		20		25		30		35				
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)
55	7.25	1.50	7.54	1.32	7.60	1.29	7.66	1.27				
50	7.72	1.45	8.08	1.29	8.24	1.26	8.37	1.25				
45	8.21	1.40	8.62	1.25	8.90	1.23	8.96	1.22				
40	8.48	1.33	8.88	1.23	9.05	1.21	9.17	1.20				
35	8.74	1.26	9.15	1.20	9.22	1.19	9.29	1.18				
30	9.01	1.22	9.42	1.16	9.49	1.14	9.55	1.12				
25	9.28	1.18	9.69	1.11	9.76	1.07	9.82	1.04				
20	9.55	1.14	9.96	1.07	10.18	1.04	10.22	1.01				

		Ambient temperature (°C WB)										
		-25		-20		-15		-10		-7		
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)
55								5.76	3.55	6.40	3.17	
50						5.34	3.19	6.00	2.99	6.49	2.92	
45	4.84	3.07	5.25	2.99	5.71	2.95	6.31	2.86	6.68	2.80		
40	5.13	3.05	5.64	2.96	6.20	2.88	6.76	2.80	7.09	2.75		
35	5.77	2.83	6.01	2.79	6.33	2.76	7.04	2.64	7.30	2.54		
30	6.00	2.81	6.26	2.76	6.53	2.71	7.24	2.58	7.66	2.52		
25	6.22	2.81	6.51	2.73	6.81	2.65	7.43	2.53	7.81	2.47		
20	6.44	2.79	6.76	2.69	7.09	2.60	7.63	2.49	7.95	2.42		
			-2		2		7		12		15	
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)
60	5.78	3.29	6.32	3.26	7.87	3.22	8.32	3.14	8.39	3.09		
55	6.60	3.18	7.16	3.17	9.00	3.10	9.81	2.96	9.86	2.92		
50	6.84	3.02	7.44	2.96	9.16	2.87	9.91	2.77	10.04	2.74		
45	7.25	2.85	7.71	2.76	9.31	2.66	10.01	2.57	10.22	2.55		
40	7.65	2.76	8.10	2.63	10.16	2.58	10.76	2.47	10.89	2.46		
35	8.05	2.52	8.48	2.51	11.00	2.50	11.51	2.38	11.56	2.37		
30	8.37	2.45	8.95	2.41	11.16	2.40	11.66	2.21	11.71	2.19		
25	8.70	2.37	9.41	2.31	11.31	2.29	11.81	2.05	11.86	2.01		
20	9.10	2.32	10.01	2.24	11.51	2.04	12.01	1.90	12.17	1.87		
			20		25		30		35			
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)
60	8.59	3.03	8.78	3.00	8.85	2.93	8.86	2.91				
55	9.93	2.86	10.01	2.80	10.09	2.73	10.17	2.70				
50	10.25	2.69	10.46	2.65	10.67	2.60	10.89	2.55				
45	10.56	2.53	10.91	2.50	11.27	2.47	11.35	2.45				
40	11.10	2.44	11.31	2.41	11.52	2.38	11.67	2.35				
35	11.63	2.34	11.71	2.32	11.79	2.30	11.87	2.28				
30	11.78	2.15	11.86	2.11	11.94	2.07	12.02	2.04				
25	11.93	1.96	12.01	1.90	12.09	1.85	12.17	1.79				
20	12.44	1.83	12.71	1.78	12.99	1.73	13.11	1.69				

NOTE:

CAP: Capacity at compressor maximum frequency. Capacity is valid for difference between water inlet and water outlet of 3-8°C.

IPT: Total input power.

The table above shows the input power (IPT) at maximum capacity (CAP). Most of the time, the unit will run at partial load, so that the actual input power will be lower.

Measuring procedure follows EN-14511.

3.2.2 Maximum cooling capacity table (kW)

		Ambient temperature (°C WB)										
		5		10		15		20		25		
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)
18					7.85	0.94	7.65	0.96	7.24	0.99		
15	7.22	0.91	7.14	0.95	7.06	0.98	6.97	1.00	6.89	1.02		
10	6.89	0.93	6.78	0.97	6.71	1.01	6.50	1.04	6.27	1.08		
7					6.22	1.03	6.12	1.07	5.92	1.12		
5					5.61	1.08	5.30	1.17	5.00	1.26		
			30		35		40		45			
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)
22	7.09	1.02	6.58	1.10	6.12	1.18	5.61	1.26				
18	6.83	1.06	6.27	1.16	5.71	1.25	5.20	1.32				
15	6.40	1.10	5.91	1.19	5.42	1.29	4.93	1.38				
10	5.82	1.17	5.37	1.25	4.92	1.36	4.46	1.47				
7	5.51	1.23	5.10	1.33	4.64	1.43	4.18	1.52				
5	4.69	1.34	4.39	1.43	4.08	1.52	3.77	1.61				

		Ambient temperature (°C WB)										
		5		10		15		20		25		
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)
18					10.44	1.35	10.22	1.50	10.01	1.62		
15	10.08	1.19	9.94	1.31	9.79	1.44	9.50	1.57	9.36	1.68		
10	9.33	1.25	9.14	1.37	8.96	1.50	8.78	1.64	8.50	1.78		
7					8.26	1.60	8.06	1.71	7.85	1.83		
5					7.99	1.65	7.78	1.77	7.42	1.89		
			30		35		40		45			
Water outlet temp (°C)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)	CAP (kW)	IPT (kW)
22	10.18	1.64	9.57	1.71	8.95	1.77	8.33	1.83				
18	9.77	1.71	9.07	1.79	8.23	1.85	7.56	1.93				
15	9.11	1.78	8.38	1.86	7.65	1.95	6.98	2.03				
10	8.19	1.89	7.61	1.99	7.04	2.11	6.45	2.21				
7	7.70	1.95	7.20	2.08	6.69	2.20	6.17	2.33				
5	7.23	2.00	6.77	2.12	6.33	2.27	5.76	2.39				

NOTE:

CAP: Capacity at compressor maximum frequency. Capacity is valid for difference between water inlet and water outlet of 3-8°C.

IPT: Total input power.

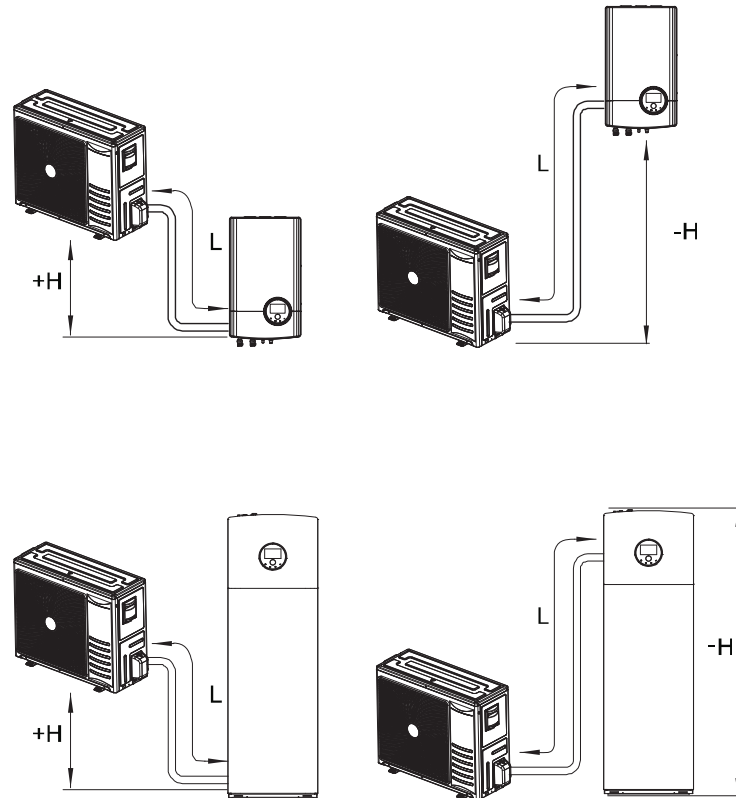
Measuring procedure follows EN-14511.



3.3 Correction factors

3.3.1 Piping length correction factor

The correction factor is based on the equivalent piping length in metres (EL) and the height difference between outdoor unit and indoor unit in metres (H).



**H:** Height difference between indoor unit and outdoor unit (m).

- $H > 0$ : Outdoor unit is placed higher than indoor unit (m).
- $H < 0$ : Outdoor unit is placed lower than indoor unit (m).

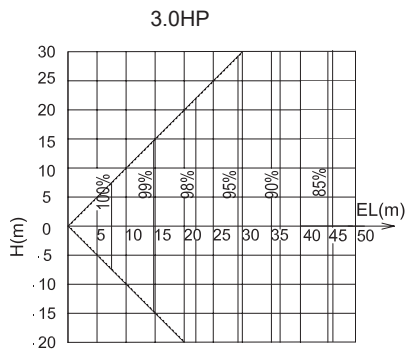
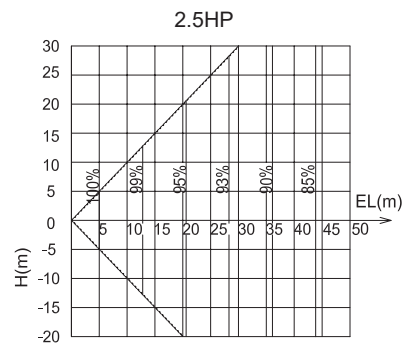
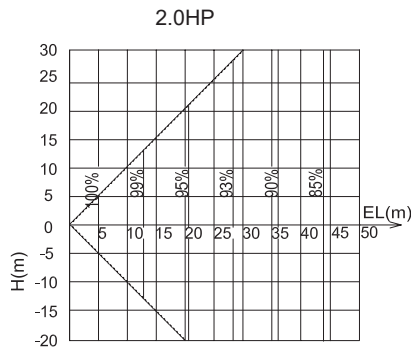
**L:** Actual one-way piping length between indoor unit and outdoor unit (m).

**EL:** Equivalent one-way piping length between indoor unit and outdoor unit (m).

- One 90° elbow is 0.5 m.
- One 180° bend is 1.5 m.

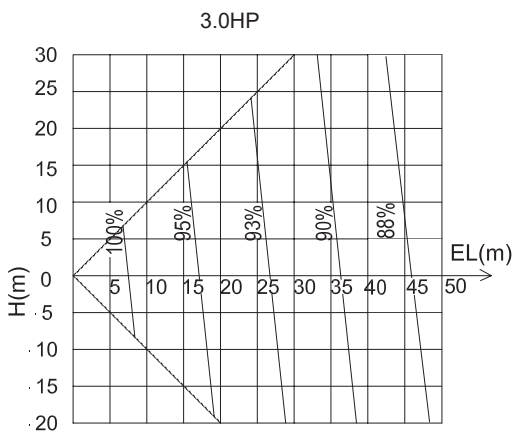
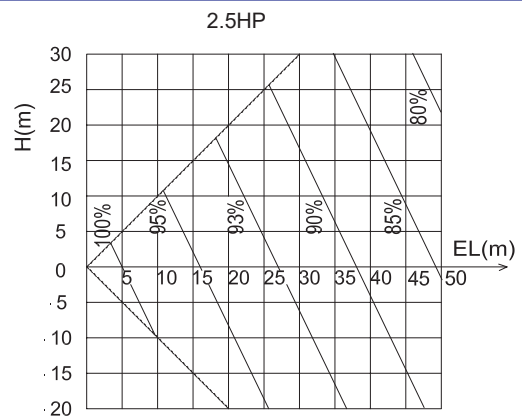
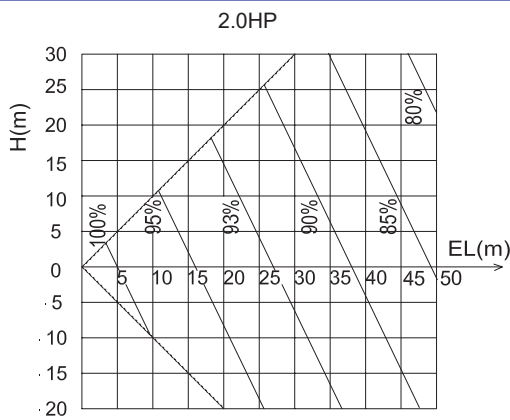
◆ Heating piping length correction factor

Heating



◆ Heating piping length correction factor

Cooling



### 3.3.2 Correction factor owing to use of glycol (only for Hi-Therma Monobloc)

Application at low ambient temperature

When the ambient temperature is low in winter, the water in the pipes and circulating pump may freeze and damage the pipes and water pumps during shutdown periods.

To prevent this, it is useful to drain the water from the installation or not to cut off the power supply of the installation, anti-freezing function will be triggered to prevent freezing.

In addition, in cases where it is difficult to drain the water, it is advisable to use a mixture with antifreeze glycol (ethylene or propylene at a concentration between 10% and 35%).

When glycol is added to the system, the performance of the unit will be affected. The correction factor of the unit capacity, flow rate and pressure drop of the system is listed in the tables below.

-Ethylene glycol

Concentration of ethylene glycol (%)	Modification coefficient				Freezing point (°C)
	Capacity	Power input	Water flow	Water resistance	
0	1.000	1.000	1.000	1.000	0
10	1.000	0.998	1.010	1.030	-4
20	1.000	0.995	1.010	1.090	-9
30	0.990	0.992	1.020	1.160	-16
35	0.990	0.991	1.030	1.210	-20

-Propylene glycol

Concentration of propylene glycol (%)	Modification coefficient				Freezing point (°C)
	Capacity	Power input	Water flow	Water resistance	
0	1.000	1.000	1.000	1.000	0
10	1.000	0.996	1.020	1.240	-3
20	1.000	0.992	1.020	1.310	-7
30	0.990	0.988	1.040	1.390	-13
35	0.990	0.986	1.050	1.450	-18

Uninhibited glycol will turn acidic under the influence of oxygen. This process is accelerated by presence of copper and at higher temperatures. The acidic uninhibited glycol attacks metal surfaces and forms galvanic corrosion cells that cause severe damage to the system. It is of extreme importance:

- That the water treatment is correctly executed by a qualified water specialist.
- That a glycol with corrosion inhibitors is selected to counteract acids formed by the oxidation of glycols.
- That in case of an installation with a domestic hot water tank, only the use of propylene glycol is allowed. In other installations the use of ethylene glycol is fine.
- That no automotive glycol is used because their corrosion inhibitors have a limited lifetime and contain silicates that can foul or plug the system;
- That galvanized piping is not used in glycol systems since it may lead to the precipitation of certain elements in the glycol's corrosion inhibitor;
- To ensure that the glycol is compatible with the materials used in the system.

## CAUTION

The use of glycol affects to the reading of some parameters like "water flow level" and "capacity" shown through the unit controller menu. When glycol is used, these data are not correct and must be not used.

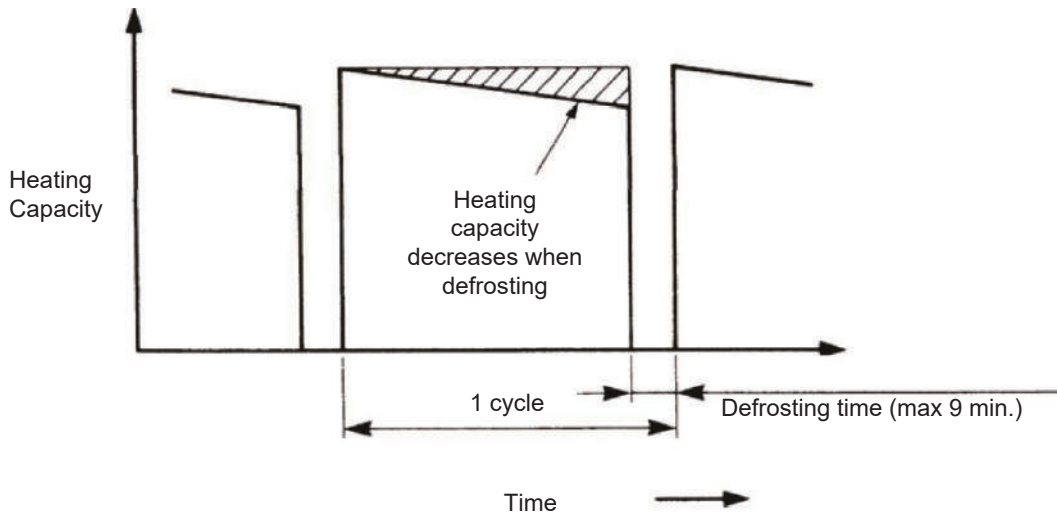
**3.3.3 Correction Factor owing to defrosting operation**

The heating capacity in the preceding paragraph does not include defrost operation periods.

Therefore, capacity should be corrected as follows:

Corrected Heating Capacity = Correction Factor x Heating Capacity

Outdoor Inlet Air Temp. (°C DB) (Humidity=85% RH)	-7	-5	-3	0	3	5	7
Correction Factor	0.95	0.93	0.88	0.85	0.87	0.90	1.00



**NOTES:**

- The correction factor is not available for special conditions like snowfall or operation in a transitional period.
- When the outdoor inlet air temperature is higher than 7 °C, this correction coefficient is 1.0. And when the outdoor inlet air temperature is lower than -7 °C, this correction coefficient is 0.95.
- If the outdoor inlet air temperature is not shown in the above table (for example, 1 °C), an interpolation should be carried out using the values before and after (0 °C and 3 °C) the outdoor inlet air temperature.

### 3.4 Selection method

To select the outdoor units, it will be necessary to consult and/or use a series of parameters shown in tables and graphics presented in the different chapters of this handbook. A summarized list is shown below:

For cooling and heating maximum capacities: refer to chapters 3.1&3.2.

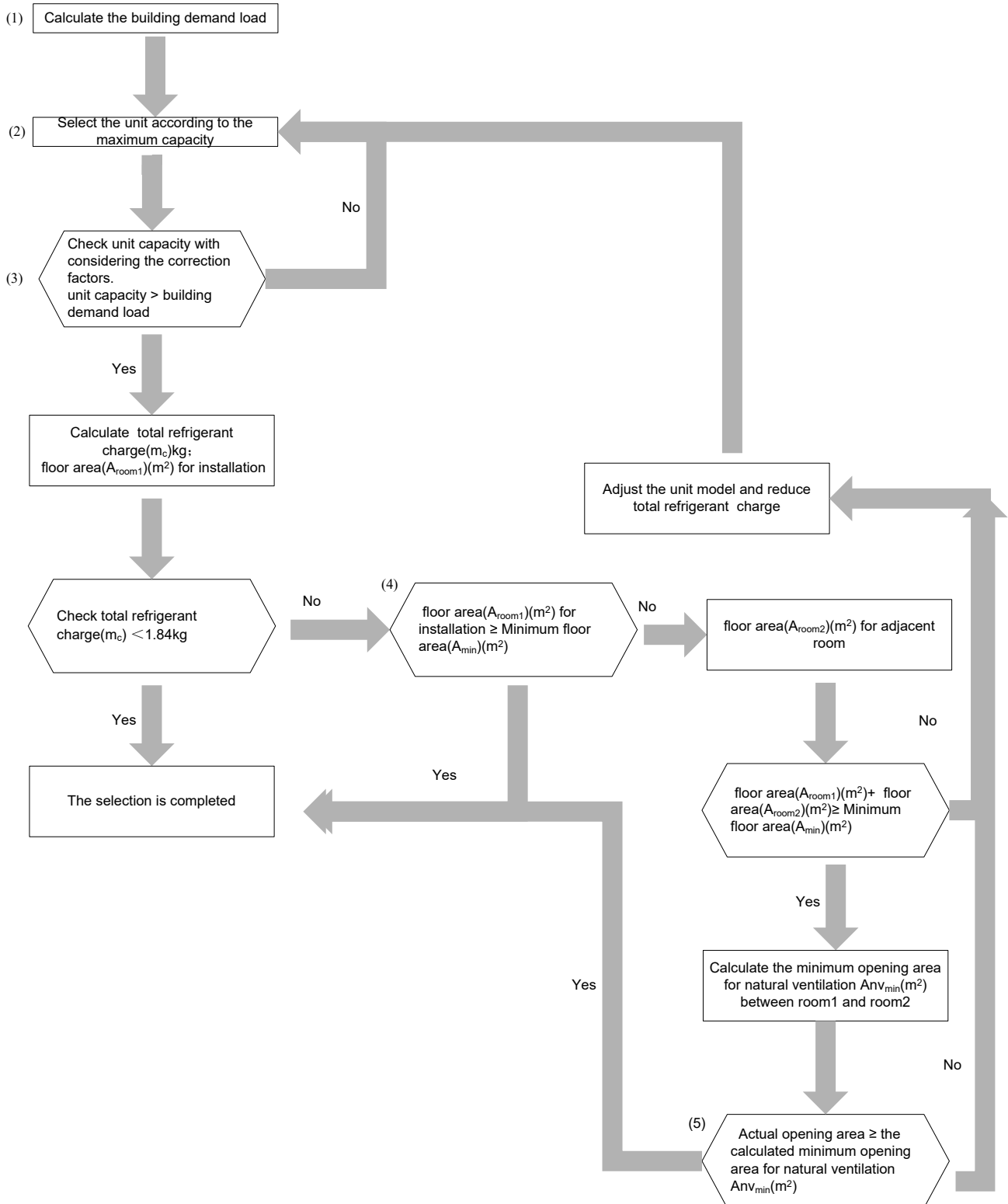
For cooling and heating correction factor depending on the piping length: refer to chapters 3.3.1.

For Hi-Therma Monobloc series, heating correction factor owing to use of glycol: refer to chapters 3.3.2.

For heating correction factor owing to deforst operation: refer to chapters 3.3.3.

#### 3.4.1 Selection procedure

For selecting the unit capacity, perform the selection procedure with checking the refrigerant concentration at leakage in order not to exceed the maximum permissible concentration.



(1) Calculate the building demand load

Calculate the building demand load according to the local climatic conditions. The building's location, insulation and the other essential parameters should be taken into account. The calculation procedure should be performed by professionals.

(2) Select the unit according to the maximum capacity

According to the calculation results of the building demand load, select the unit with the maximum capacity at setting condition.

(3) Check unit's capacity with considering the correction factors

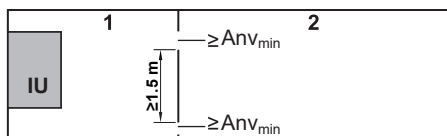
Calculate unit's capacity with considering the correction factors according to piping length, defrosting correction factor (for heating operation), and heating correction factor owing to use of glycol (for Hi-Therma Monobloc series). The calculation is required for cooling and heating operation:

$$\text{Unit's capacity} = \text{Unit's maximum capacity at setting condition} \times \text{Correction factors}$$

Compare the unit's capacity with the building demand load. If the unit's capacity is insufficient, select the unit according to the maximum capacity again.

(4) Minimum floor area ( $A_{inst}$ )( $m^2$ ) for installation  $\geq$  Minimum floor area ( $A_{min}$ )( $m^2$ )

(5) Floor area ( $A_{room1}$ )( $m^2$ ) for installation  $<$  Minimum floor area ( $A_{min}$ )( $m^2$ ), calculate the minimum opening area for natural ventilation  $Anv_{min}$ ( $m^2$ ) between room1 and room2.



IU Indoor unit

1 Room where the indoor unit is installed.

2 Room adjacent to room 1.

$$Anv_{min} = 0.0156 \times (m_c - m_{max}) \times (A_{room1} / m_{max})^{1/2}$$

$$m_{max} = 0.571 \times h_0 \times (A_{room1})^{1/2}$$

$Anv_{min}$  is the minimum opening for natural ventilation in  $cm^2$ ;

$m_c$  is the actual refrigerant charge of refrigerant in the system in kg;

$m_{max}$  is the allowable maximum refrigerant charge in the system in kg.

$h_0$  is the installation height of the bottom side of the indoor unit + distance from the indoor unit bottom side to the lowest part for which a refrigerant leak may release to the indoor area.

Indoor Unit can be installed at room 1 if:

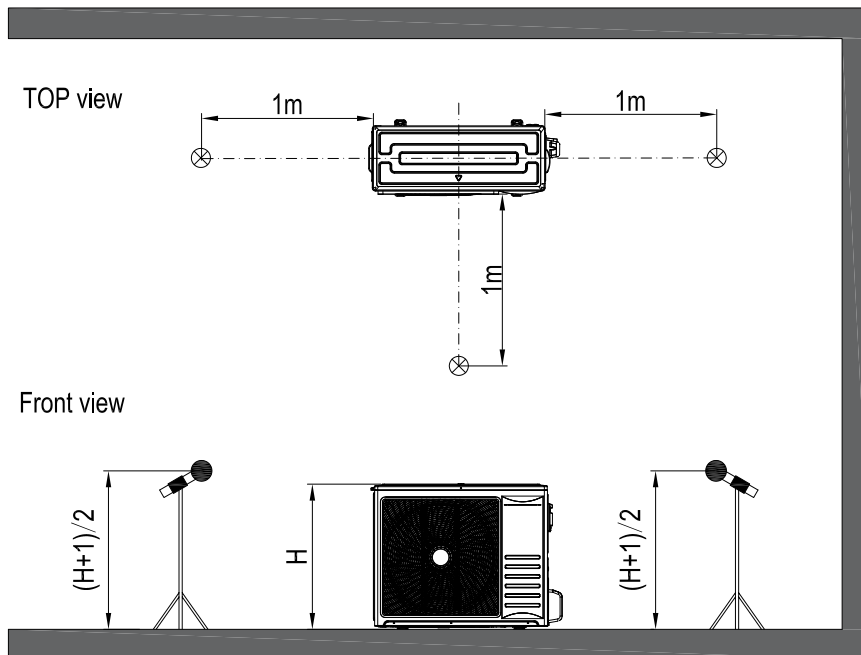
- 2 ventilation openings (permanently open) are provided between room 1 and 2, 1 at the top and 1 at the bottom.
- Bottom opening: The bottom opening must meet the minimum area requirements ( $Anv_{min}$ ). It must be as close as possible to the floor. If the ventilation opening starts from the floor, the height must be  $\geq 20$  mm. The bottom of the opening must be situated  $\leq 100$  mm from the floor. At least 50% of the required opening area must be situated  $< 200$  mm from the floor. The entire area of the opening must be situated  $< 300$  mm from the floor.
- Top opening: The area of the top opening must be larger than or equal to the bottom opening. The bottom of the top opening must be situated at least 1.5 m above the top of the bottom opening.

### 4. Acoustic characteristic curves

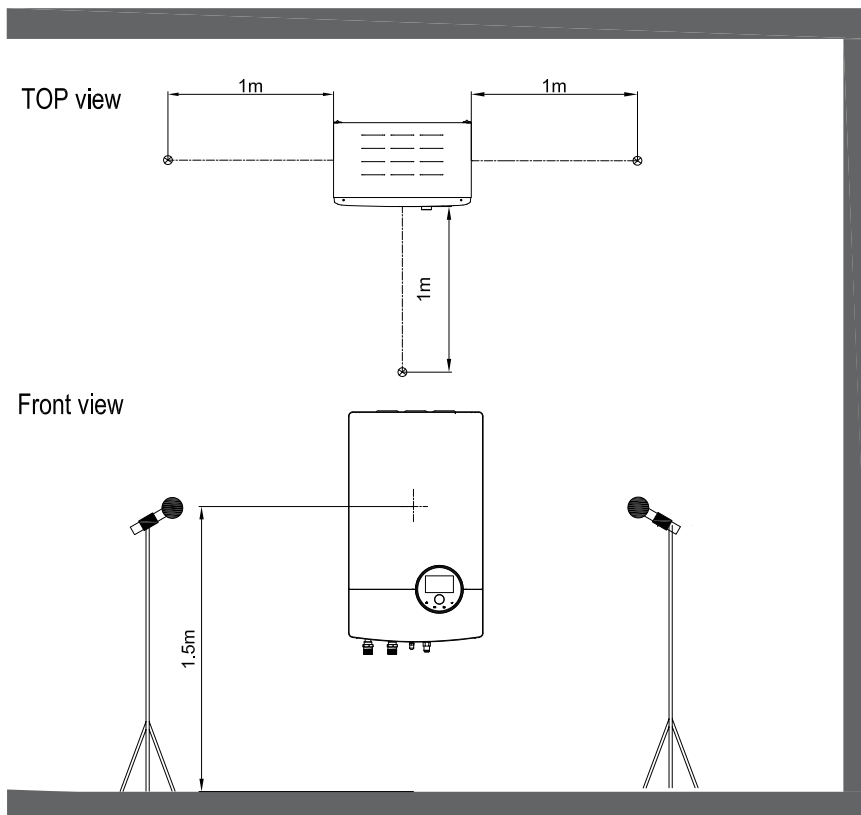
#### 4.1 Considerations

- 1. Distance of the unit from the measuring point, as shown in the figure below.

Outdoor unit

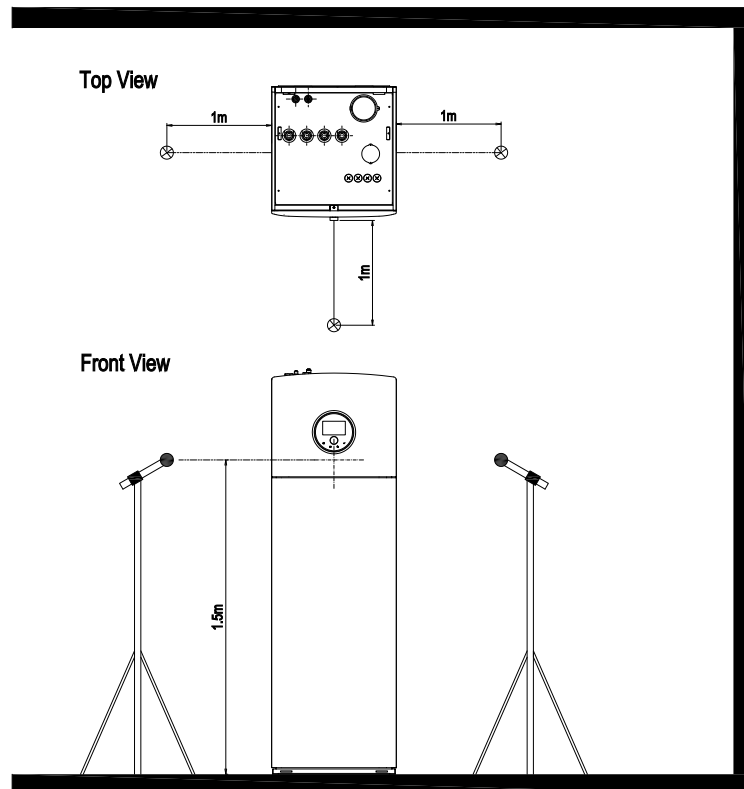


Split Indoor unit



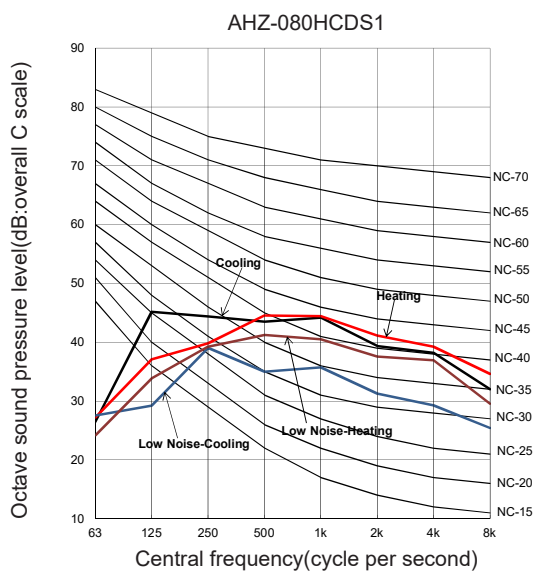
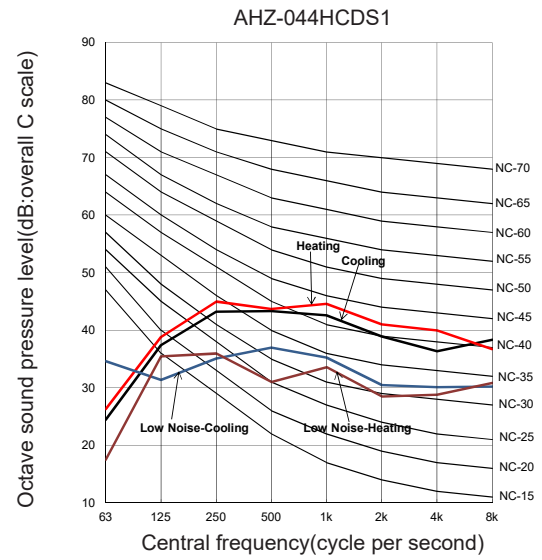
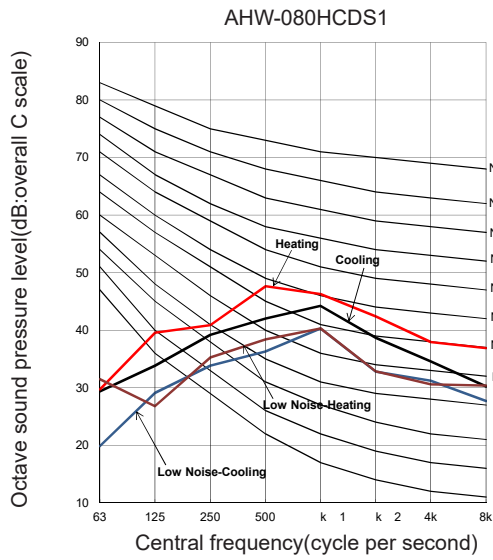
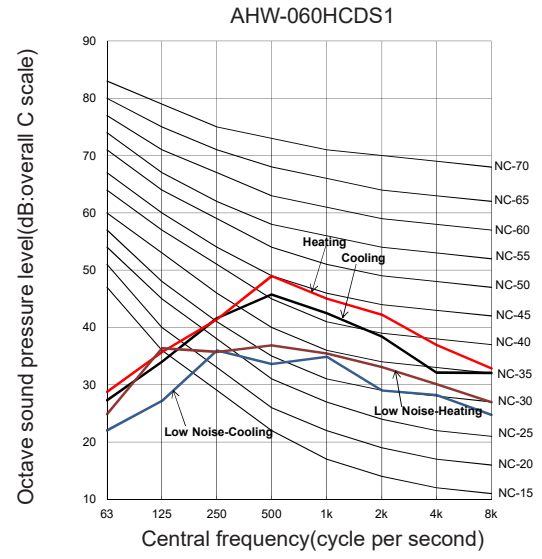
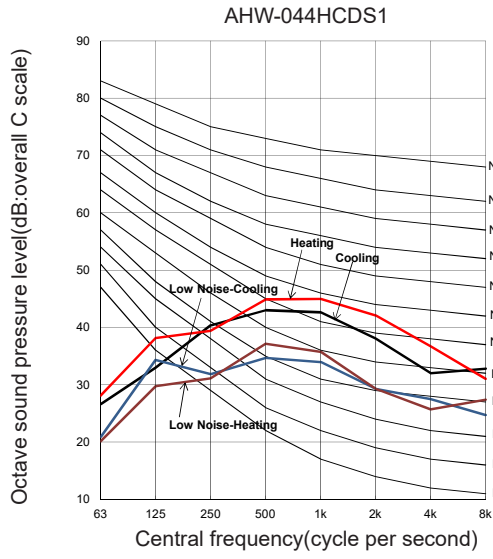


Integra Indoor unit



2. The data is measured in an anechoic chamber, so reflected sound should be taken into consideration when installing the unit.
3. The sound measured with the curve A shown in dB(A) represents the attenuation in function of frequency as perceived by the human ear.
4. Reference acoustic pressure 0 dB=20  $\mu$ Pa

4.2 Sound pressure level



**Working range**

**5. Working range**

**5.1 Power supply working range**

**Nominal power supply**

Single phase: 220-240V~ 50Hz

**Operating voltage**

Between 90 and 110% of the nominal voltage.

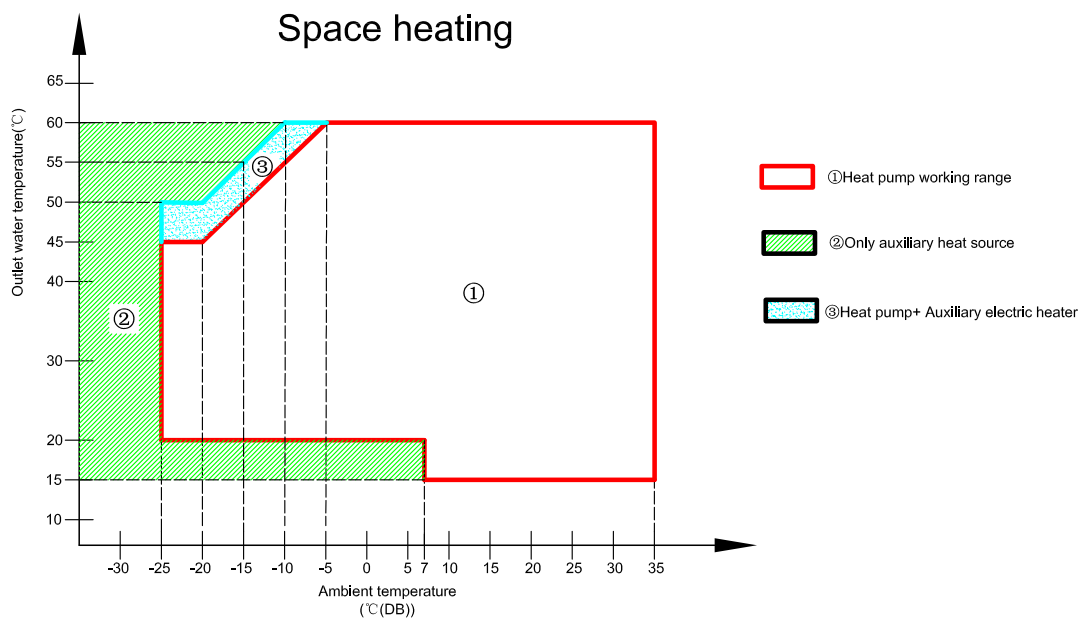
**Starting voltage**

Always higher than 85% of the nominal voltage.

**5.2 Temperature working range**

Model		44(2.0HP)	60(2.5HP)	80(3.0HP)
Water temperature	°C	Refer to the graphics for each case		
Indoor ambient temperature	°C	5~30		

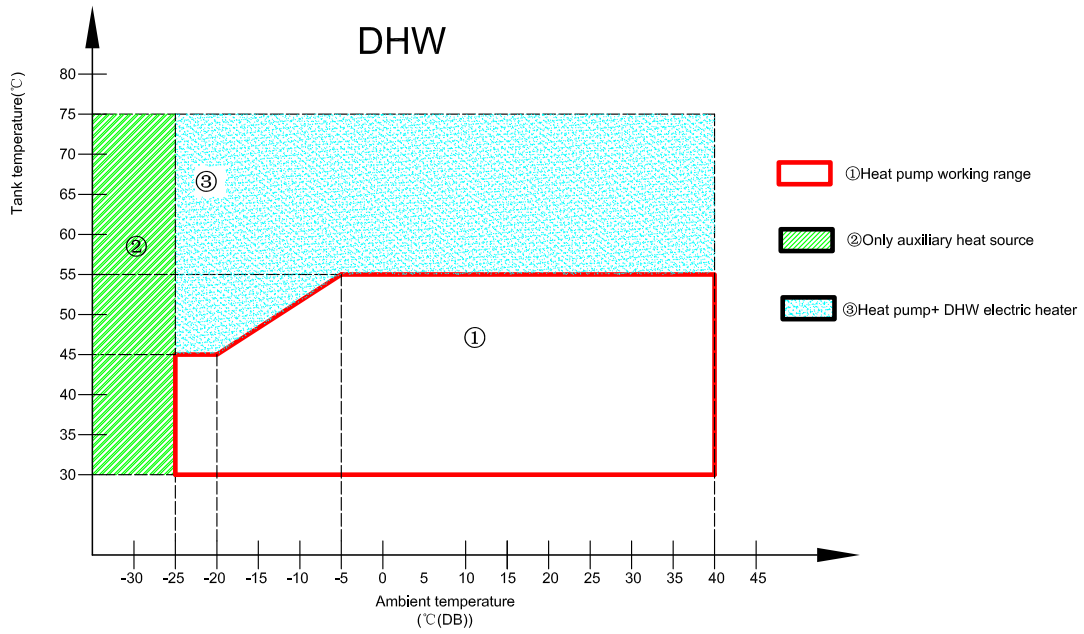
**5.2.1 Space heating**



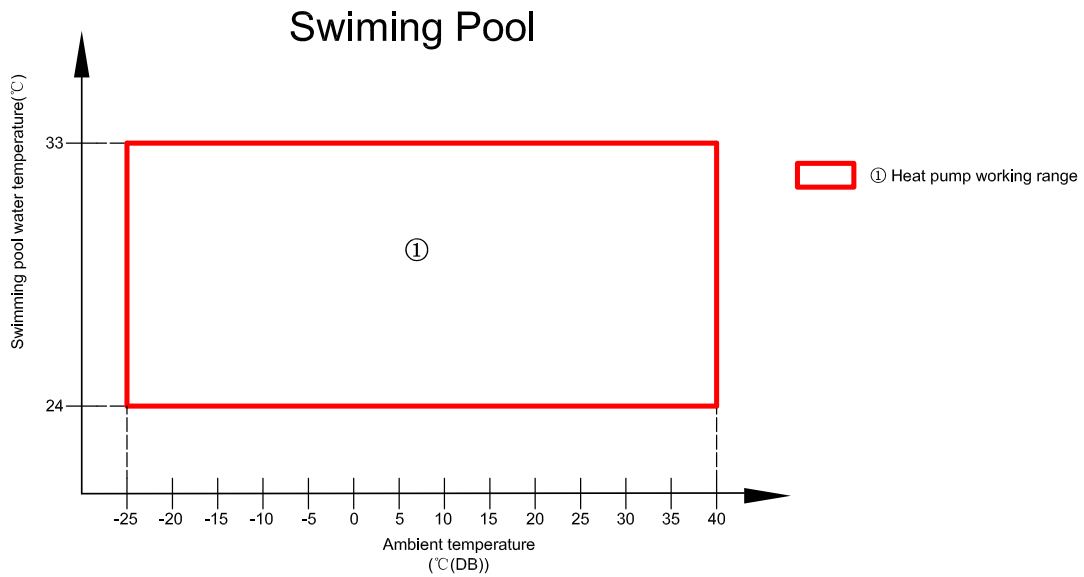
**NOTE**

Item ③ only available if auxiliary electric heater is enabled.

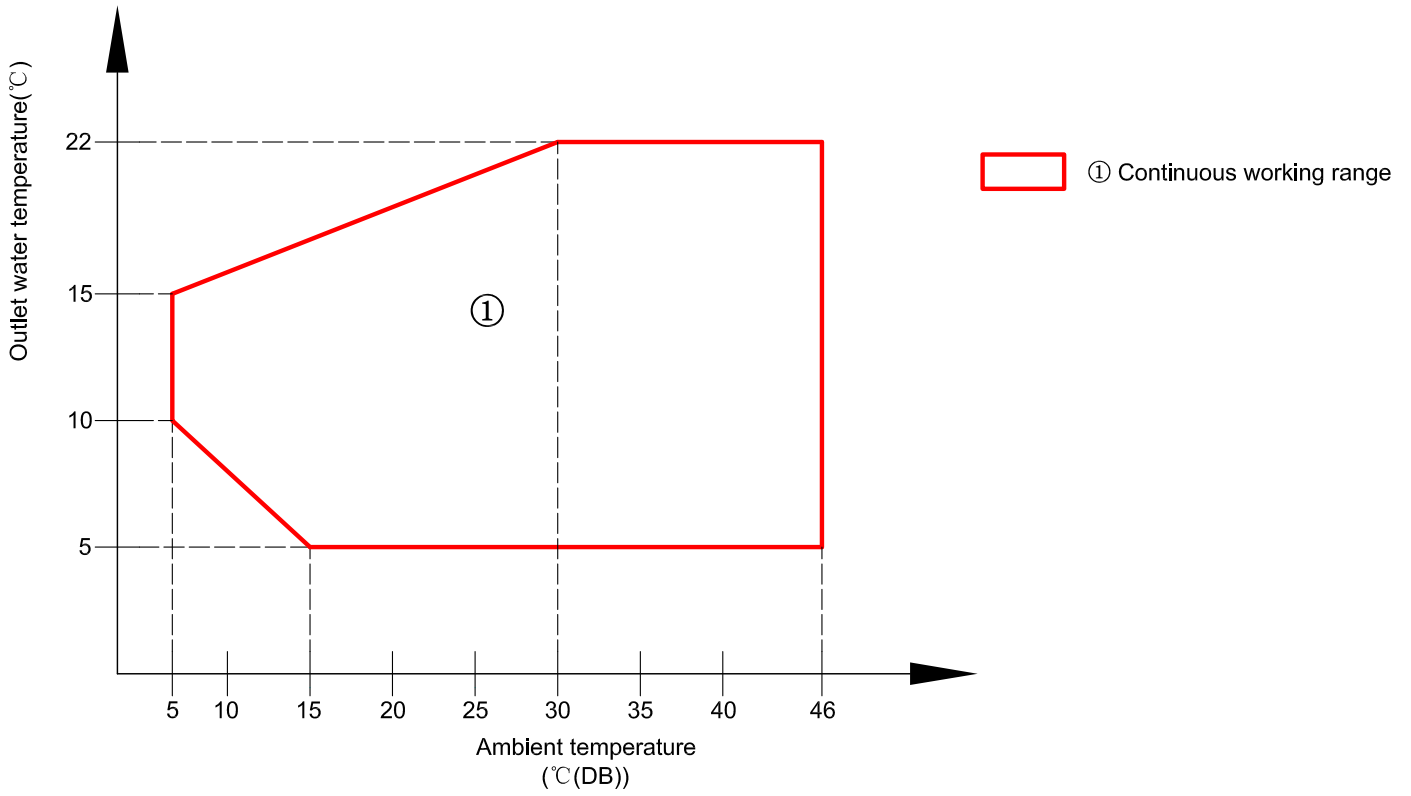
5.2.2 DHW



5.2.3 Swimming pool



5.2.4 Space cooling



### 5.3 Hydraulic working range

#### 5.3.1 Hydraulic data

- Hi-Therma Split

Model		044 (2.0HP)	060 (2.5HP)	080 (3.0HP)
Minimum water flow rate (*1)	m <sup>3</sup> /h	0.5	0.6	0.6
Maximum water flow rate (*1)	m <sup>3</sup> /h	1.75	1.75	1.9
Minimum allowable water pressure	MPa	0.1		
Maximum allowable water pressure	MPa	0.3		

- Hi-Therma Integra

Model		044 (2.0HP)	060 (2.5HP)	080 (3.0HP)
Minimum water flow rate (*1)	m <sup>3</sup> /h	0.5	0.6	0.6
Maximum water flow rate (*1)	m <sup>3</sup> /h	1.75	1.75	1.9
Minimum allowable water pressure	MPa	0.1		
Maximum allowable water pressure	MPa	0.3		
Maximum DHW pressure	MPa	0.6		

- Hi-Therma Monobloc

Model		044 (2.0HP)	080 (3.0HP)
Minimum water flow rate (*1)	m <sup>3</sup> /h	0.5	0.6
Maximum water flow rate (*1)	m <sup>3</sup> /h	2.4	2.7
Minimum allowable water pressure	MPa	0.1	
Maximum allowable water pressure	MPa	0.3	

#### NOTE

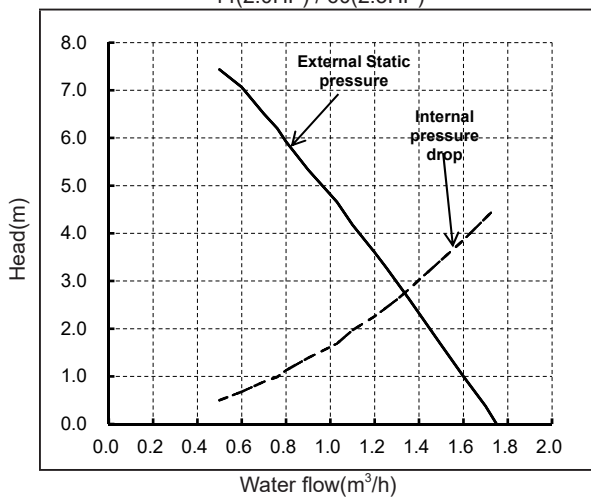
(\*1): Values calculated based on a ΔT (inlet/outlet): 3~8 °C

#### 5.3.2 Pump performance curves

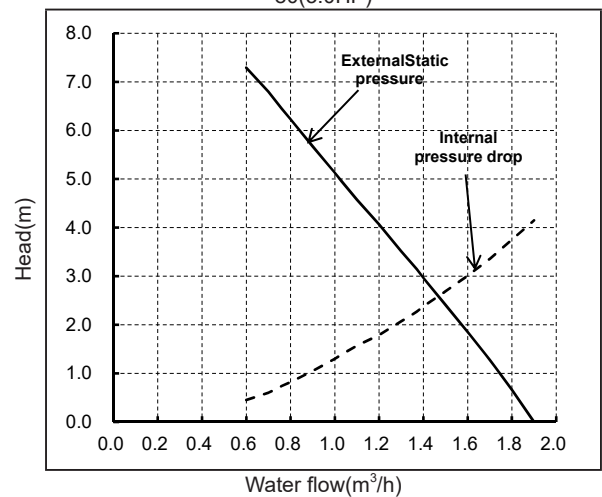
##### Split

WILO Para RA15/7.0

44(2.0HP) / 60(2.5HP)

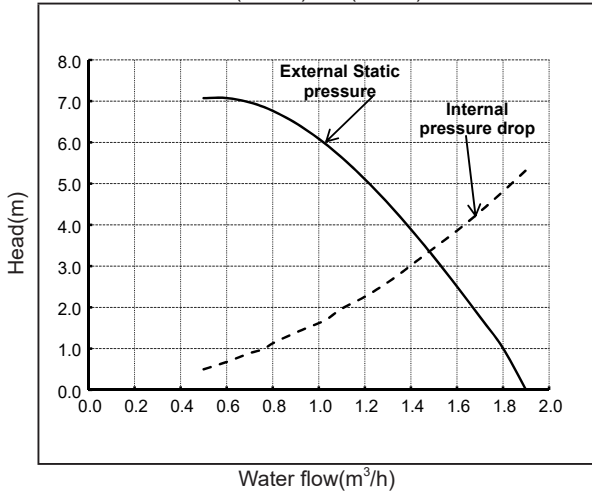


80(3.0HP)

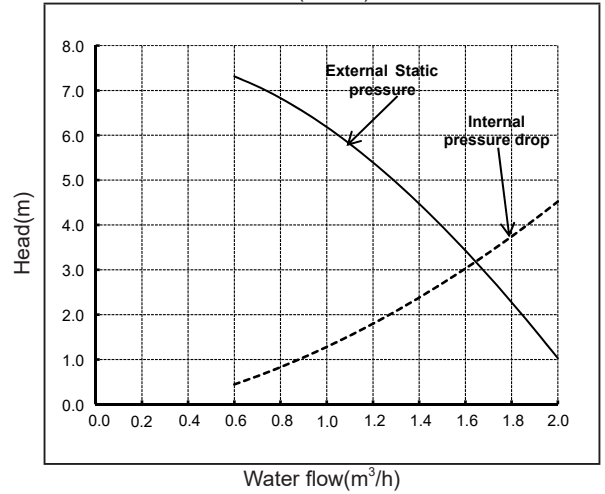


GRUNDFOS UPM4K 15-75 130

44(2.0HP) / 60(2.5HP)



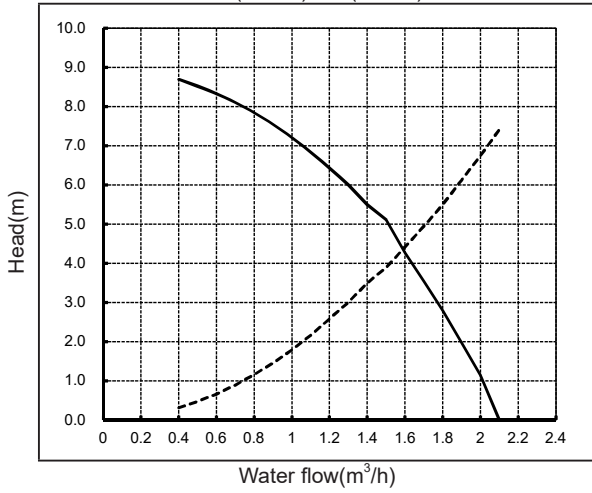
80(3.0HP)



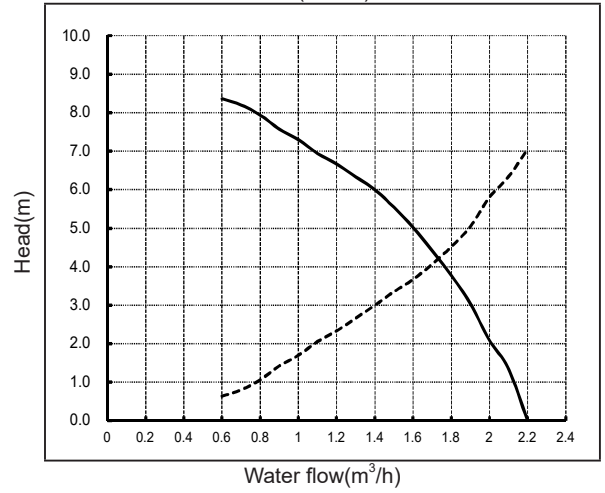
Integra

SHIMGE APM25-9-130

44(2.0HP) / 60(2.5HP)



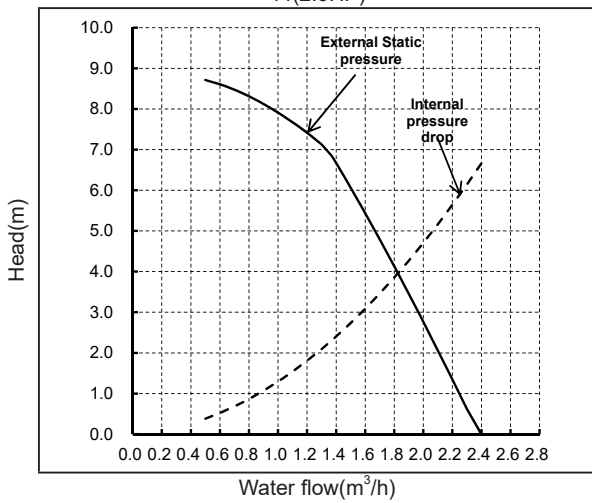
80(3.0HP)



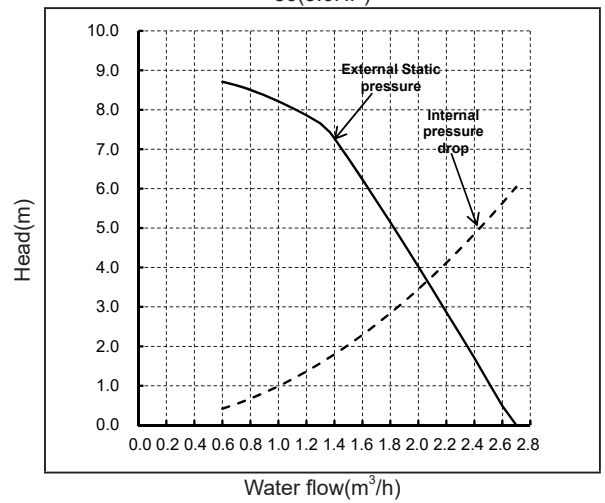
Monobloc

WILO Para 25-130/9-87/IPWM1-3

44(2.0HP)



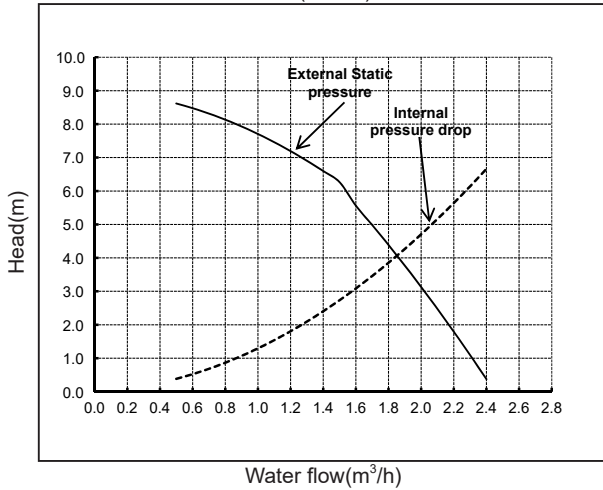
80(3.0HP)



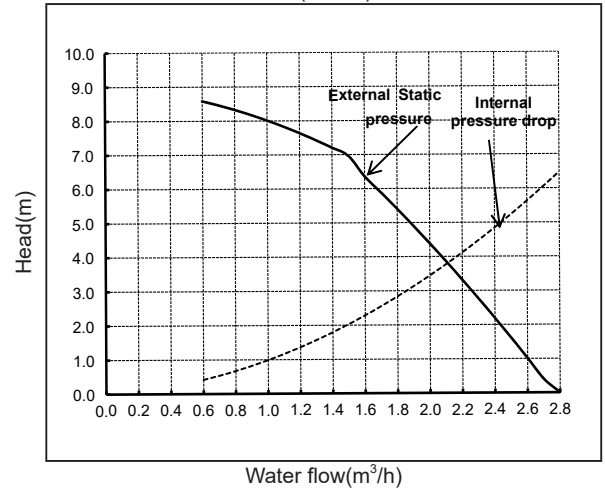


SHIMGE APM25-9-130

44(2.0HP)



80(3.0HP)



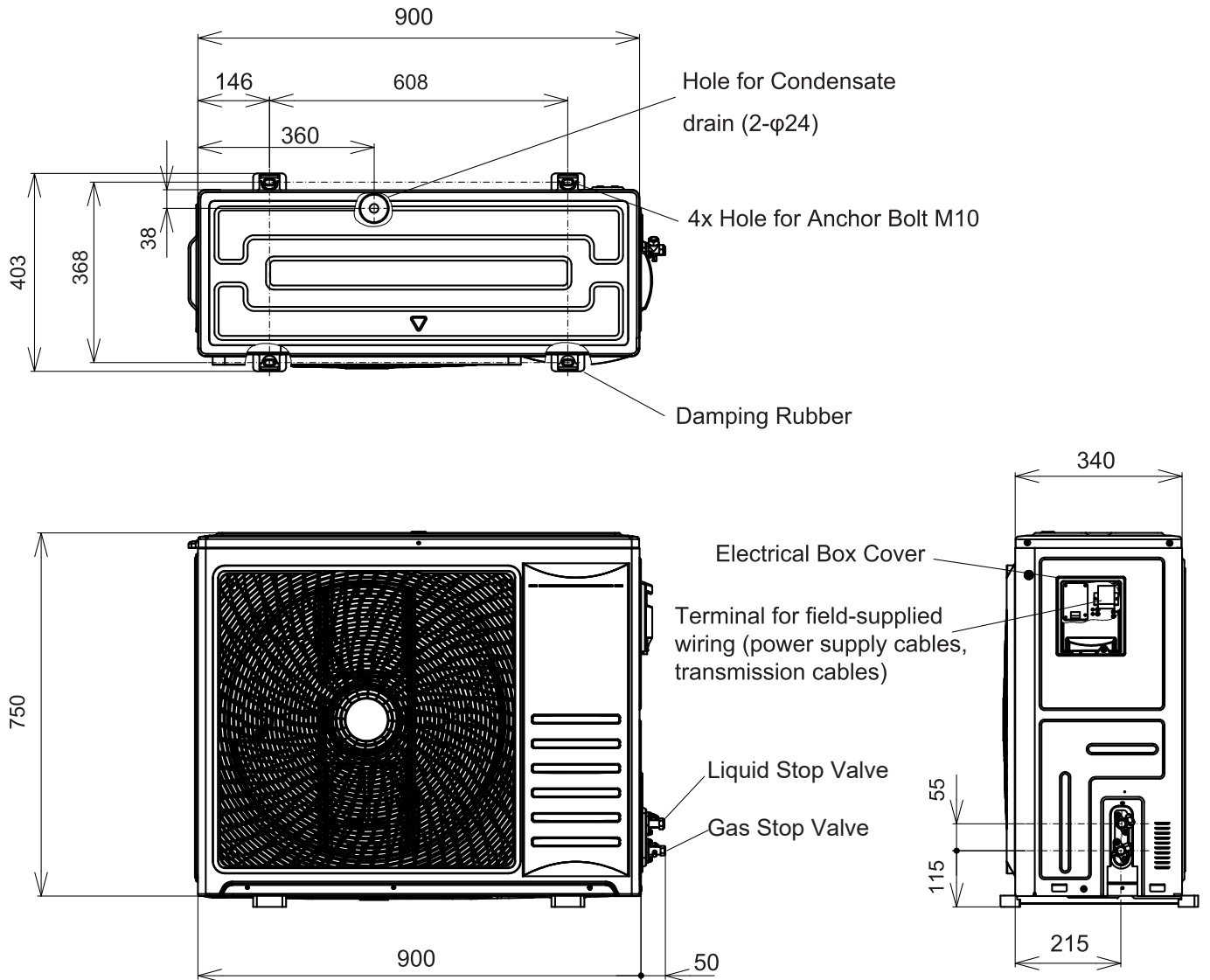
**NOTE**

- If a water flow rate is selected out of the working range of the unit, it can cause malfunction on the unit. Please, try to operate the pump within the minimum and maximum water flow of the indoor unit.
- The external static pressure curves in the figures above are measured at the highest speed (iPWM in =5%) of the pump.

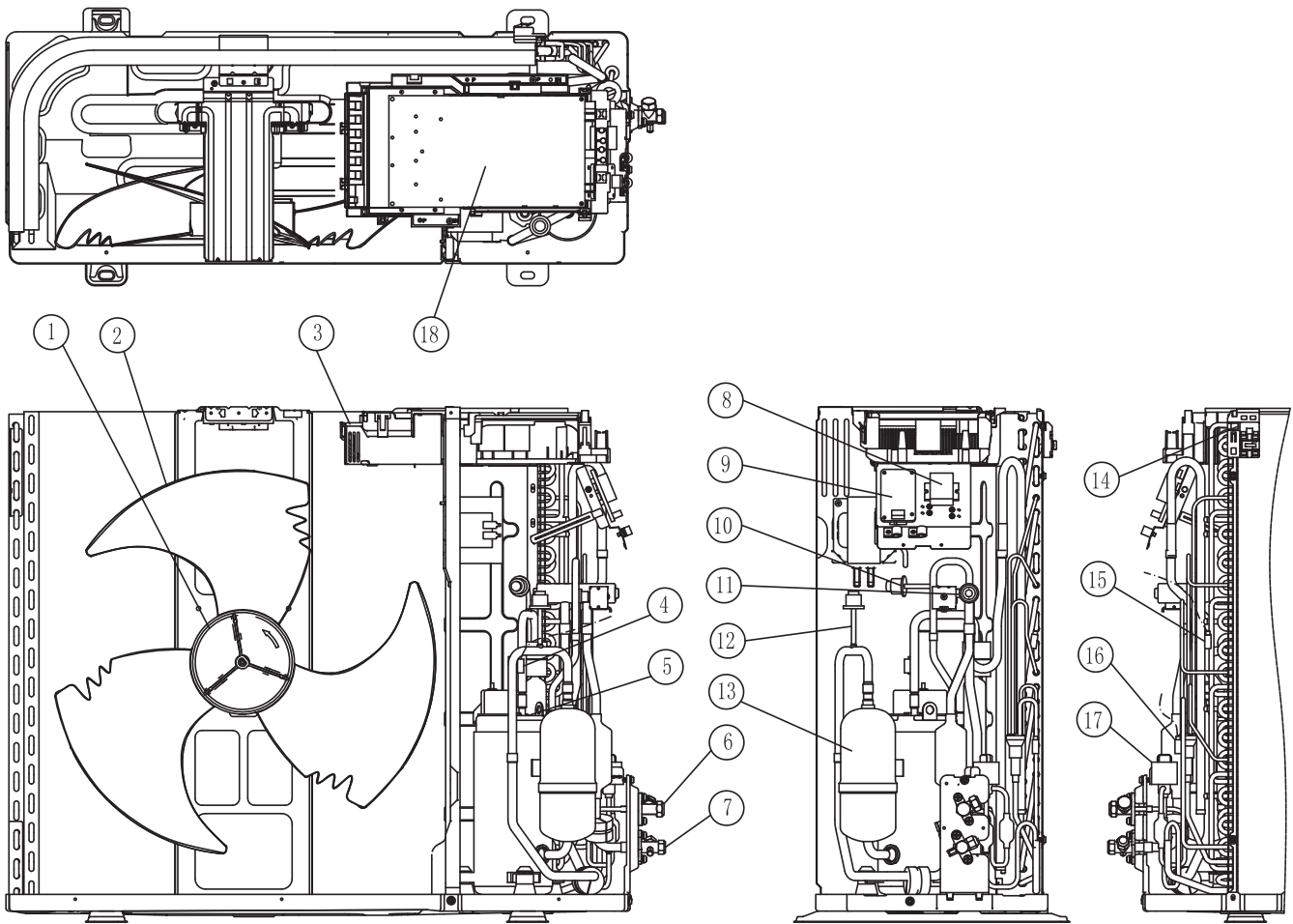
6. General dimensions

6.1 Hi-Therma Split/Integra Outdoor Unit

6.1.1 Dimensional Data of Hi-Therma Split/Integra Outdoor Unit



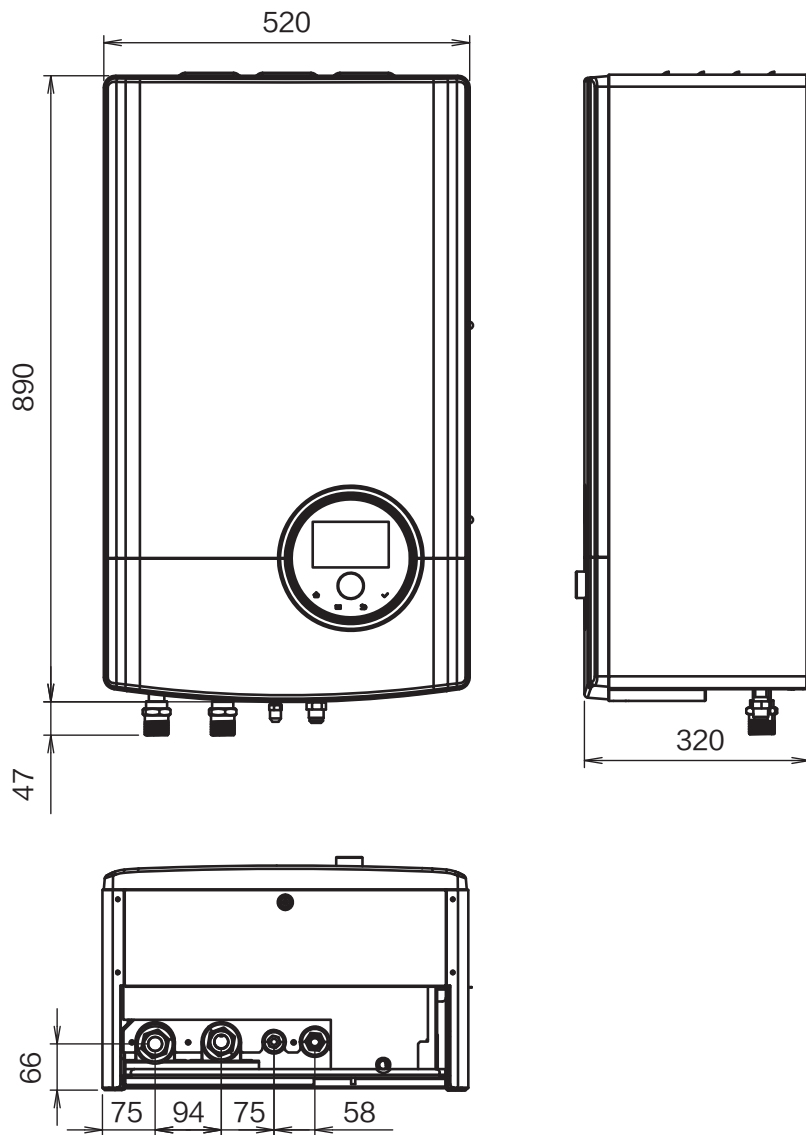
6.1.2 Structure of Hi-Therma Split/Integra Outdoor Unit



Mark	Part Name
1	Fan Motor
2	Propeller Fan
3	Electrical Box
4	Compressor Discharge Gas Thermistor(Td)
5	Compressor
6	Gas Stop Valve
7	Liquid Stop Valve
8	Terminal Board for Power Supply(TB1)
9	Terminal Board for Transmission(TB2)
10	High Pressure Switch(PSH)
11	4-way Reversing Valve and Coil
12	Low Pressure Switch(PSL)
13	Accumulator
14	Outdoor Unit Ambient Thermistor(Ta)
15	Heat Exchanger Liquid Pipe Thermistor 2(Te2)
16	Heat Exchanger Liquid Pipe Thermistor(Te)
17	Electronic Expansion Valve and Coil
18	PCB

6.2 Hi-Therma Split Indoor Unit

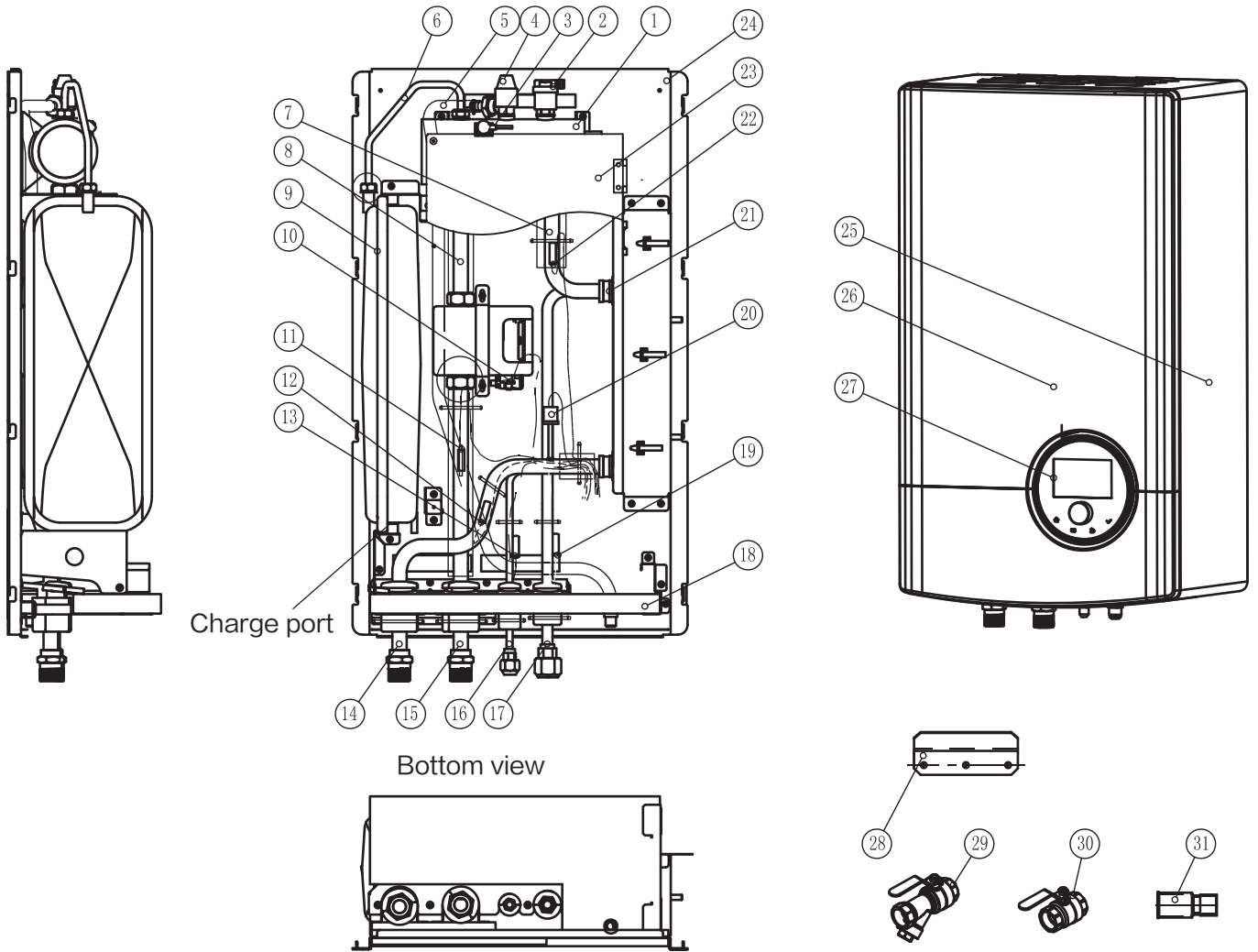
6.2.1 Dimensional Data of Hi-Therma Spit Indoor Unit



6.2.2 Structure of Hi-Therma Indoor Unit

Side view

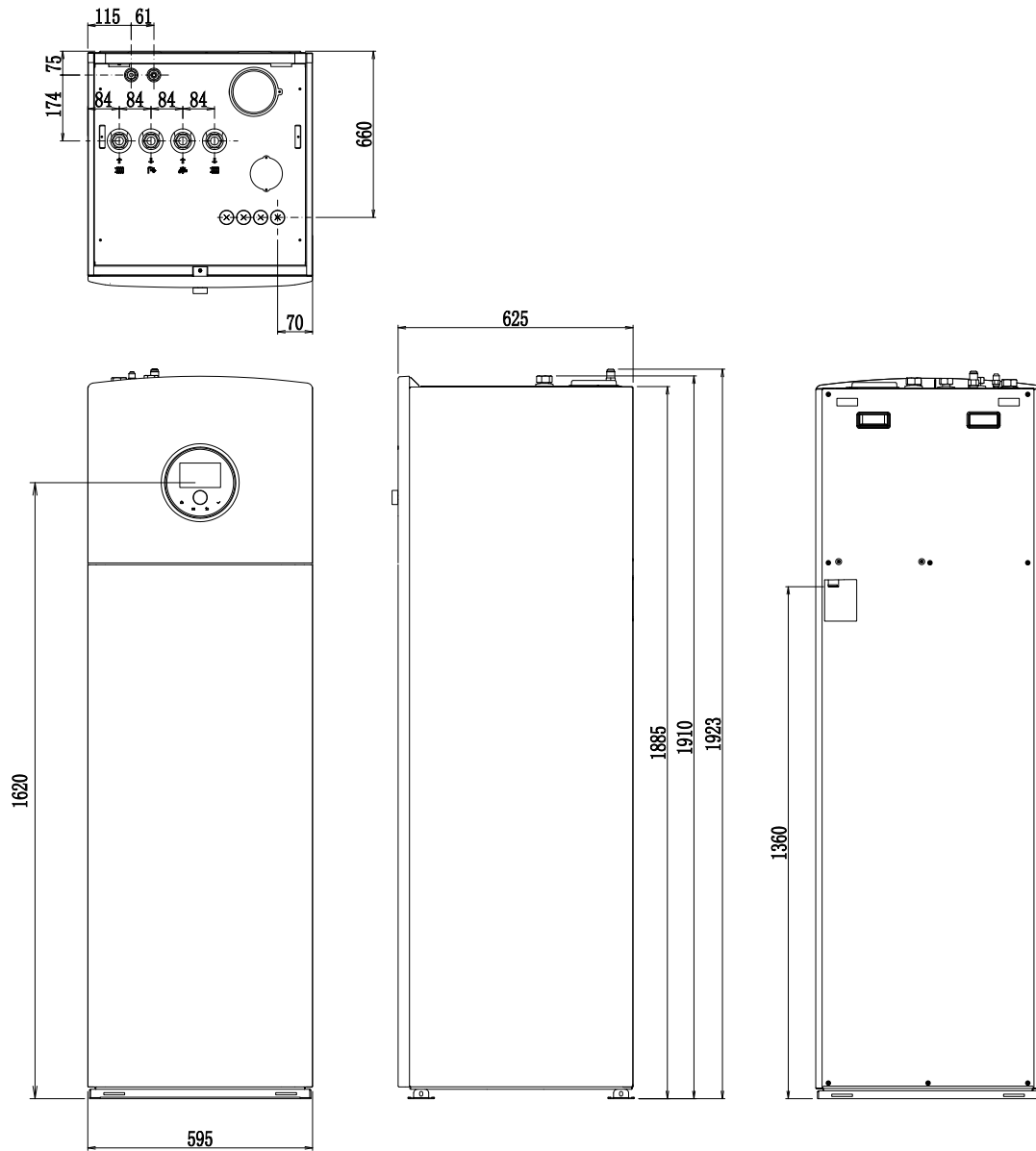
Front view



Mark	Part name	Mark	Part name
1	Auxiliary Electric Heater(AEH)	17	Refrigerant Gas Pipe
2	Air purge valve	18	Drain Pan
3	Electric Heater Thermostat	19	Gas Refrigerant Pipe Thermistor(Tg)
4	Safety valve	20	Water Pressure Sensor(PW)
5	Drain pipe for safety valve	21	Plate Heat Exchanger
6	Expansion Vessel Connection Pipe	22	Outlet HP Water Thermistor(TowHP)
7	Heat Exchanger Water Outlet Pipe	23	Electrical Box
8	Electric Heater Water Outlet Pipe	24	Back Panel
9	Expansion vessel	25	Side Panel
10	Water pump	26	Front Panel
11	Outlet Water Thermistor(Tow)	27	Controller
12	Inlet Water Thermistor(Tiw)	28	Wall Support
13	Liquid Refrigerant Pipe Thermistor(TL)	29	Shut-off Valve with Filter
14	Water Inlet	30	Shut-off Valve
15	Water Outlet	31	Adapter Tube
16	Refrigerant Liquid Pipe		

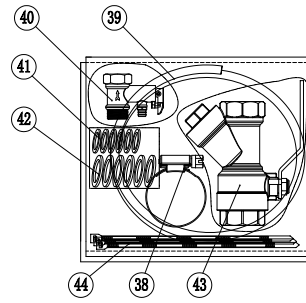
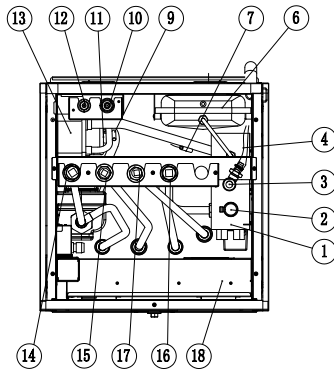
6.3 Hi-Therma Integra Indoor Unit

6.3.1 Dimensional Data of Hi-Therma Integra Indoor Unit

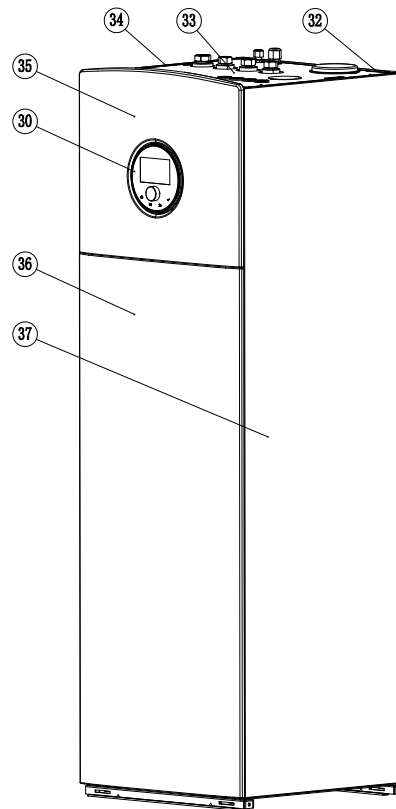
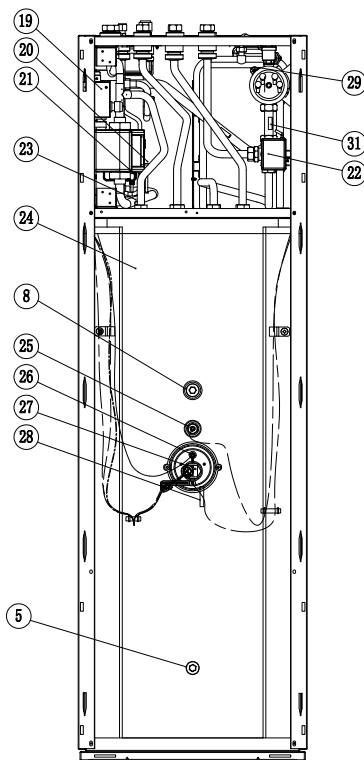


6.3.2 Structure of Hi-Therma Integra Indoor Unit

Top view



Front view

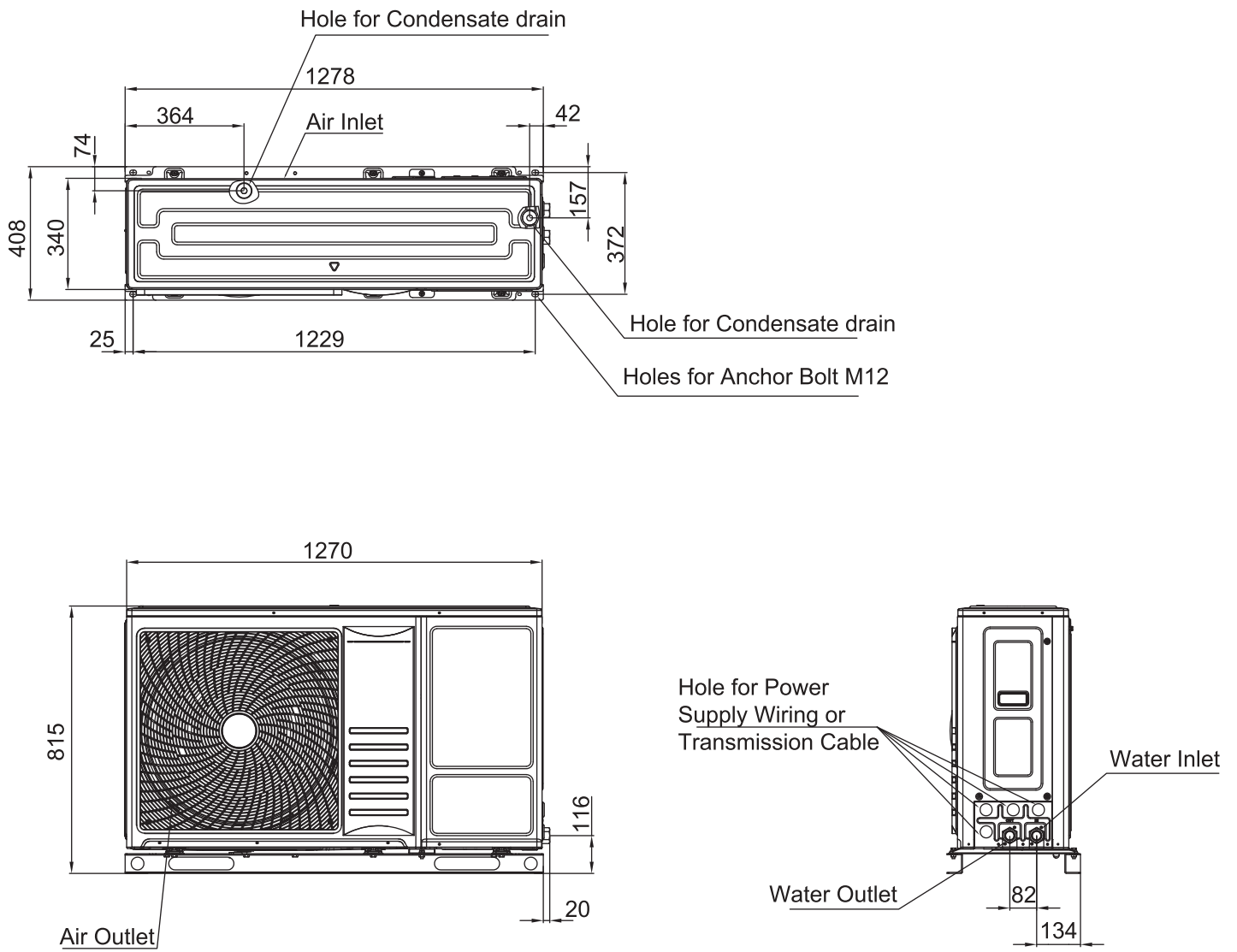


Mark	Part Name	Mark	Part Name	Mark	Part Name
1	Auxiliary Electric Heater(AEH)	16	Space Heating/Cooling Water Outlet	31	Outlet Water Thermistor(Tow)
2	Air purge valve	17	DHW Inlet (Cold Water)	32	Back Panel
3	Safety valve	18	Electrical Box	33	Top Panel
4	Drain pipe for safety valve	19	Safety Thermostat	34	Left Side Panel
5	Drainage Outlet	20	Water Pressure Sensor(Pw)	35	Upper Front Panel
6	Expansion Vessel	21	Water Pump	36	Lower Front Panel
7	Outlet HP Water Thermistor(TowHP)	22	3-Way Valve	37	Right Side Panel
8	Electronic Anode	23	Inlet Water Thermistor(Tiw)	38	Drain pipe clamp
9	Gas Refrigerant Pipe Thermistor(Tg)	24	DHW Tank	39	Drain pipe
10	Refrigerant Gas Pipe	25	DHW Thermistor (TDHW)	40	Pressure Relief Valve
11	Liquid Refrigerant Pipe Thermistor(TL)	26	Safety Thermostat	41	Gasket 1(G 3/4")
12	Refrigerant Liquid Pipe	27	DHW Electric Heater	42	Gasket 2(G 1")
13	Plate Heat Exchanger	28	DHW Thermistor (TDHW1)	43	Shut-off Valve
14	Space Heating/Cooling Water Inlet	29	Electric Heater Thermostat	44	Cable Tie
15	DHW Outlet (Hot Water)	30	Controller		

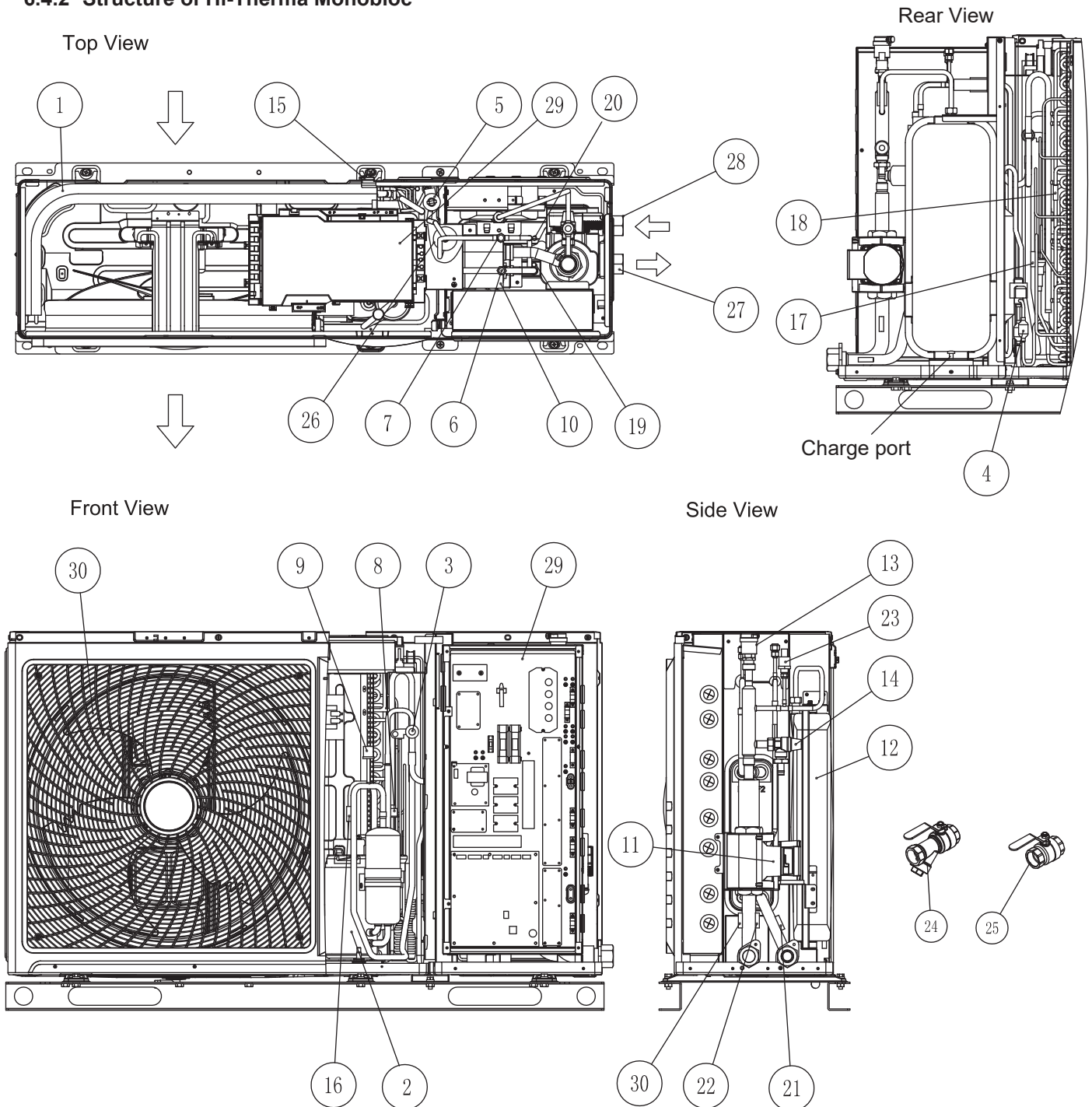


6.4 Hi-Therma Monobloc

6.4.1 Dimensional Data of Hi-Therma Monobloc



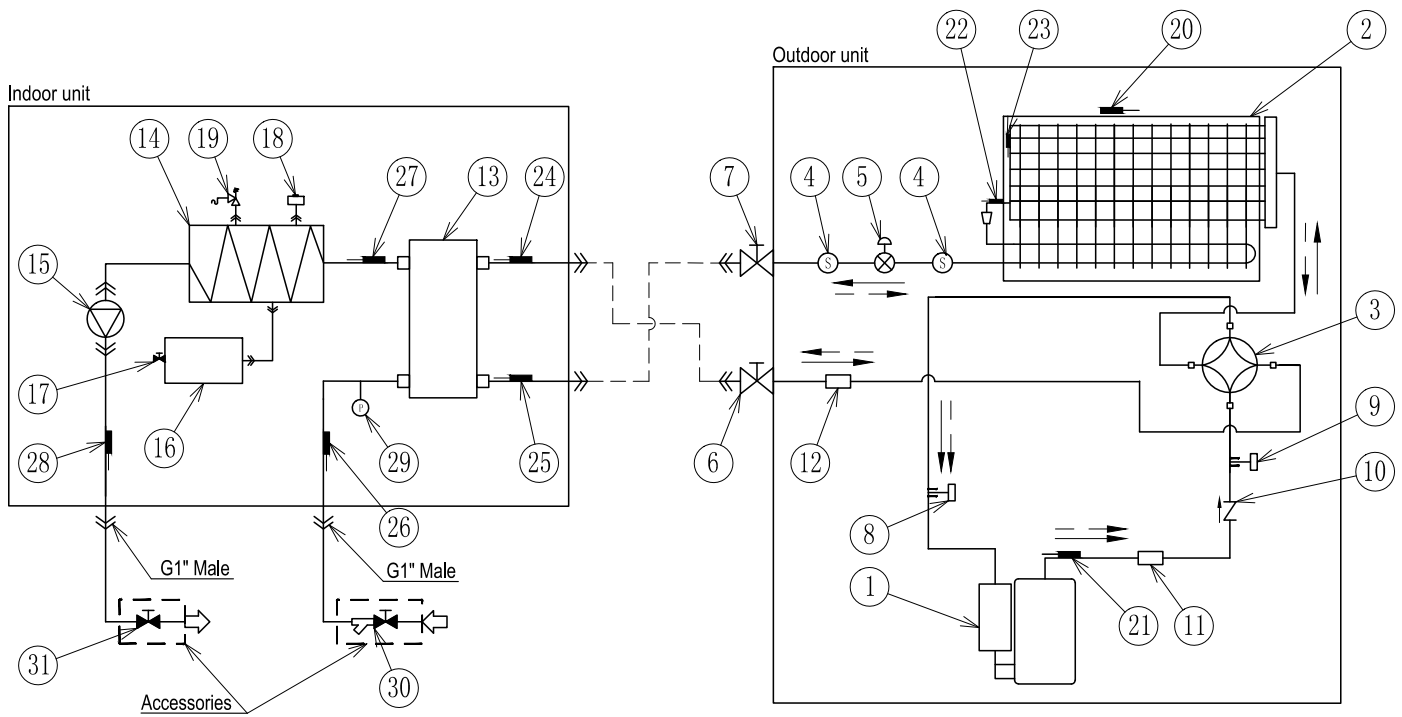
6.4.2 Structure of Hi-Therma Monobloc



Number	Part name	Number	Part name
1	Heat Exchanger	17	Heat Exchanger Liquid Pipe Thermistor(Te)
2	Compressor	18	Heat Exchanger Liquid Pipe Thermistor2(Te2)
3	4-way Reversing Valve and Coil	19	Gas Refrigerant Pipe Thermistor(Tg)
4	Strainer	20	Liquid Refrigerant Pipe Thermistor(TL)
5	Electronic Expansion Valve and Coil	21	Inlet Water Thermistor(Tiw)
6	Refrigerant Check Joint(Gas)	22	Outlet Water Thermistor(Tow)
7	Refrigerant Check Joint(Liquid)	23	Water Pressure Sensor(Pw)
8	Low Pressure Switch(PSL)	24	Shut-off Valve with Filter
9	High Pressure Switch(PSH)	25	Shut-off Valve
10	Plate Heat Exchanger	26	Accumulator
11	Water Pump	27	Water Outlet
12	Expansion Vessel	28	Water Inlet
13	Air Purge Valve	29	Electrical Box
14	Safety Valve	30	Propeller Fan
15	Outdoor Unit Ambient Thermistor(Ta)	31	Outlet HP Water Thermistor(TowHP)
16	Compressor Discharge Gas Thermistor(Td)		

7. Refrigerant cycle and hydraulic circuit

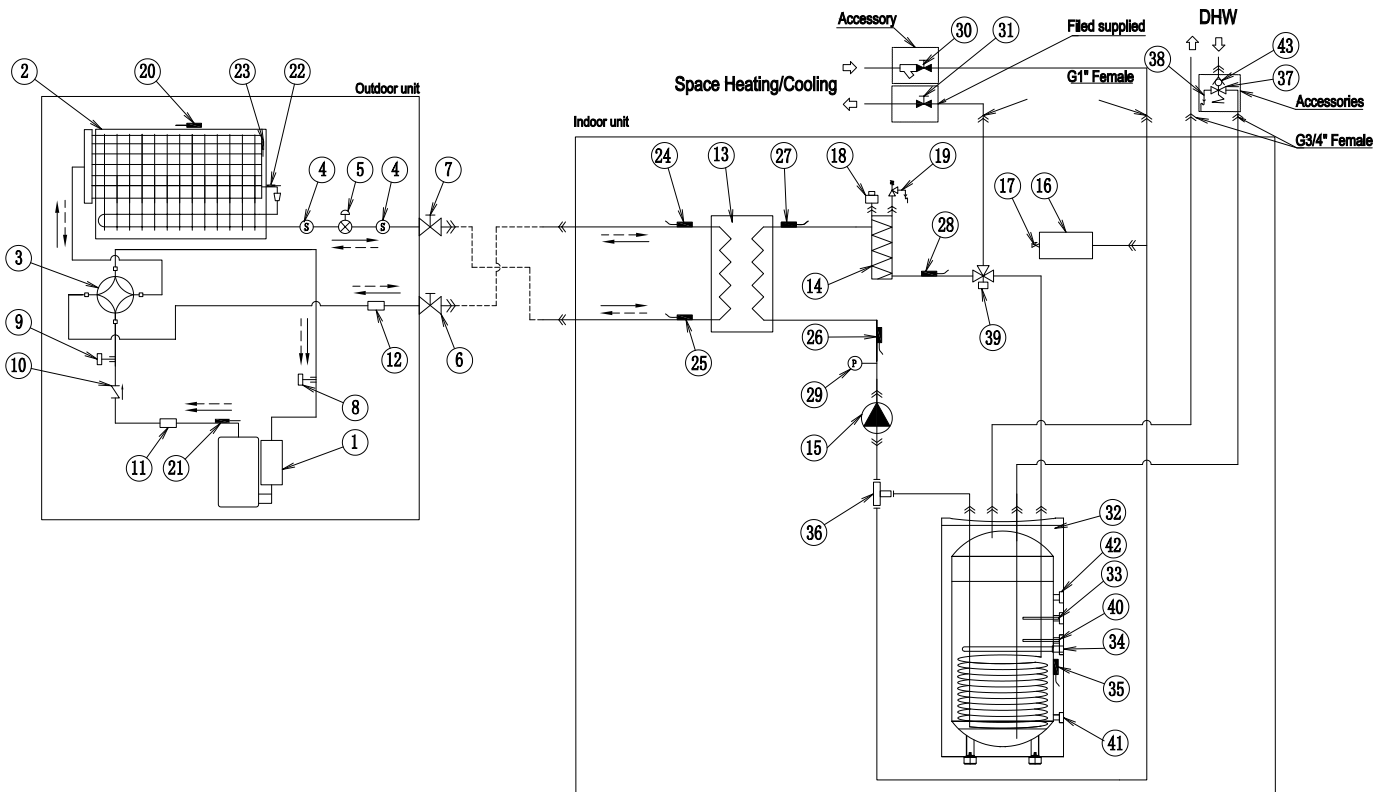
7.1 Refrigerant cycle and hydraulic circuit of Hi-Therma Split



					Refrigerant
Cooling refrigerant flow	Heating refrigerant flow	Field supplied piping line	Water flow (Heating/Cooling)	Flare nut connection	R32

No.	Part name	No.	Part name	No.	Part name	No.	Part name
1	Compressor	9	High Pressure Switch (PSH)	17	Pressure Adjustment Valve of Expansion Vessel	25	Liquid Refrigerant Pipe Thermistor (TL)
2	Heat exchanger	10	Refrigerant Check Valve	18	Air Purge Valve	26	Inlet Water Thermistor (Tiw)
3	4-way Reversing Valve and Coil	11	Silencer	19	Safety Valve	27	Outlet HP Water Thermistor (TowHP)
4	Strainer	12	Silencer	20	Outdoor Unit Ambient Thermistor (Ta)	28	Outlet Water Thermistor (Tow)
5	Electronic Expansion Valve and Coil	13	Plate Heat Exchanger	21	Compressor Discharge Gas Thermistor (Td)	29	Water Pressure Sensor (Pw)
6	Gas Stop Valve	14	Auxiliary Electric Heater (AEH)	22	Heat Exchanger Liquid pipe Thermistor (Te)	30	Shut-off Valve with Filter
7	Liquid Stop Valve	15	Water Pump	23	Heat Exchanger Liquid pipe Thermistor 2 (Te2)	31	Shut-off Valve
8	Low Pressure Switch (PSL)	16	Expansion Vessel	24	Gas Refrigerant Pipe Thermistor (Tg)		

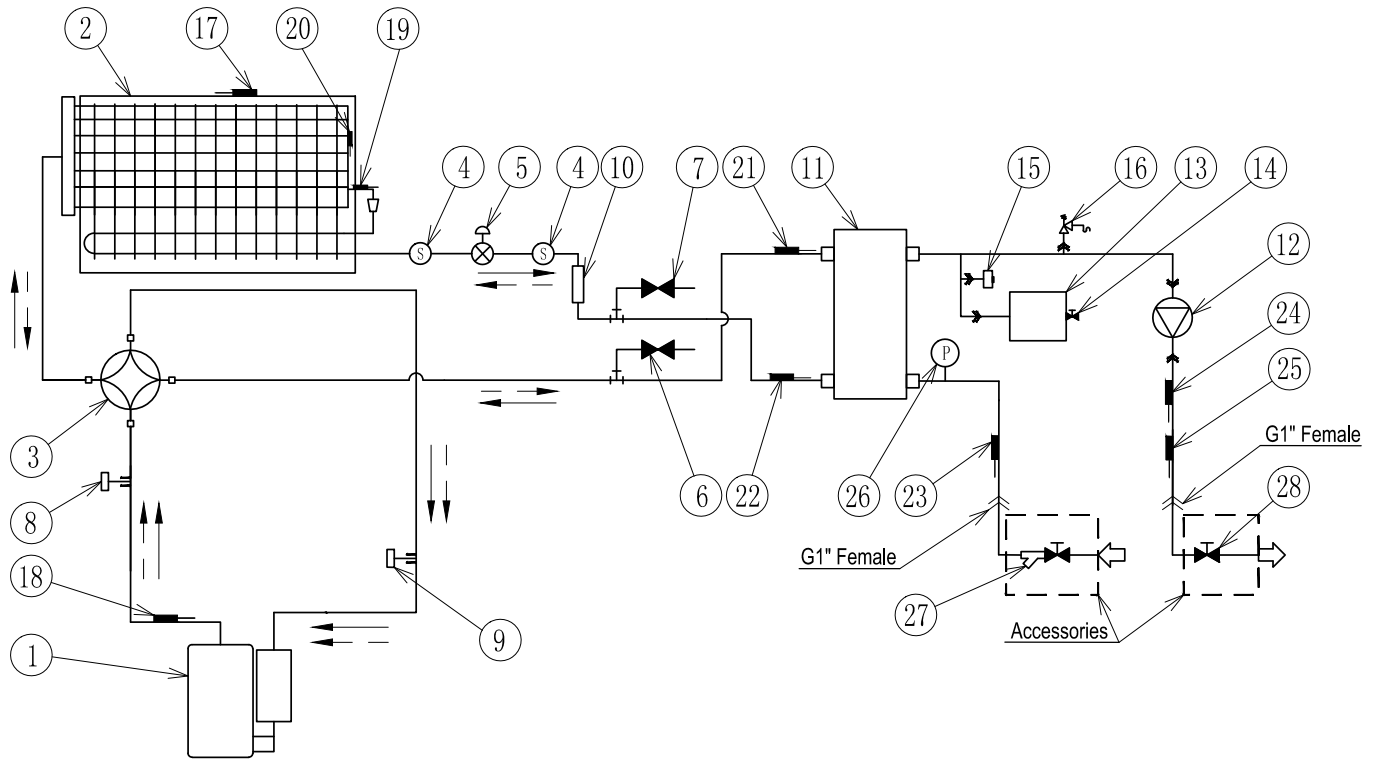
7.2 Refrigerant cycle and hydraulic circuit of Hi-Therma Integra



←	- - - ←	- - - - -	⇨	⇐⇐	Refrigerant
Cooling refrigerant flow	Heating refrigerant flow	Field supplied piping line	Water flow (Heating/Cooling)	Flare nut connection	R32

No.	Part name	No.	Part name	No.	Part name	No.	Part name	No.	Part Name	No.	Part Name
1	Compressor	9	High Pressure Switch (PSH)	17	Pressure Adjustment Valve of Expansion Vessel	25	Liquid Refrigerant Pipe Thermistor (TL)	33	DHW Thermistor (TDHW)	41	Stop for Drainage Outlet
2	Heat exchanger	10	Refrigerant Check Valve	18	Air Purge Valve	26	Inlet Water Thermistor (Tiw)	34	DHW Electric Heater	42	Stop for Electronic Anode
3	4-way Reversing Valve and Coil	11	Silencer	19	Safety Valve	27	Outlet HP Water Thermistor (TowHP)	35	DHW Thermistor (TDHW1)	43	Water Check Valve
4	Strainer	12	Silencer	20	Outdoor Unit Ambient Thermistor (Ta)	28	Outlet Water Thermistor (Tow)	36	3-Way Pipe		
5	Electronic Expansion Valve and Coil	13	Plate Heat Exchanger	21	Compressor Discharge Gas Thermistor (Td)	29	Water Pressure Sensor (Pw)	37	Pressure Relief Valve		
6	Gas Stop Valve	14	Auxiliary Electric Heater (AEH)	22	Heat Exchanger Liquid pipe Thermistor (Te)	30	Shut-off Valve with Filter	38	Drain Pipe		
7	Liquid Stop Valve	15	Water Pump	23	Heat Exchanger Liquid pipe Thermistor 2 (Te2)	31	Shut-off Valve	39	3-Way Valve for DHW		
8	Low Pressure Switch (PSL)	16	Expansion Vessel	24	Gas Refrigerant Pipe Thermistor (Tg)	32	DHW Tank	40	Thermostat Assembly		

7.3 Refrigerant cycle and hydraulic circuit of Hi-Therma Monobloc



				Refrigerant
Cooling refrigerant flow	Heating refrigerant flow	Water flow (Heating/Cooling)	Flare nut connection	R32

No.	Part name	No.	Part name	No.	Part name	No.	Part name
1	Compressor	9	Low Pressure Switch (PSL)	17	Outdoor Unit Ambient Thermistor (Ta)	25	Outlet Water Thermistor (Tow)
2	Heat Exchanger	10	Accumulator	18	Compressor Discharge Gas Thermistor (Td)	26	Water Pressure Sensor (Pw)
3	4-way Reversing Valve and Coil	11	Plate Heat Exchanger	19	Heat Exchanger Liquid pipe Thermistor (Te)	27	Shut-off Valve with Filter
4	Strainer	12	Water Pump	20	Heat Exchanger Liquid pipe Thermistor 2 (Te2)	28	Shut-off Valve
5	Electronic Expansion Valve and Coil	13	Expansion Vessel	21	Gas Refrigerant Pipe Thermistor (Tg)		
6	Refrigerant Check Joint	14	Pressure Adjustment Valve of Expansion Vessel	22	Liquid Refrigerant Pipe Thermistor (TL)		
7	Refrigerant Check Joint	15	Air Purge Valve	23	Inlet Water Thermistor (Tiw)		
8	High Pressure Switch (PSH)	16	Safety Valve	24	Outlet HP Water Thermistor (TowHP)		

## 8. Installation

### 8.1 Installation of Hi-Therma Split Indoor Unit

#### 8.1.1 GENERAL INFORMATION

This manual gives a common description and information for this heat pump air conditioner which you operate as well for other models.

This manual should be considered as a permanent part of the heat pump air conditioning equipment and should remain with the air conditioning equipment.

No part of this publication may be reproduced, copied, filed or transmitted in any shape or form without the permission of Hisense.

Within the policy of continuous improvement of its products, Hisense reserves the right to make changes at any time without prior notification and without being compelled to introducing them into products previously sold. This document may therefore have been subject to amendments during the life of the product.

As a result, some of the images or data used to illustrate this document may not refer to specific models. No claims will be accepted based on the data, illustrations and descriptions included in this manual.

This heat pump air conditioner has been designed for the following temperatures. Please operate the air conditioner within the ranges.

Temperature

		Min.	Max.
Outdoor unit	Space heating	-25°C DB	35°C DB
	Domestic hot water (DHW)	-25°C DB	40°C DB
	Space cooling	5°C DB	46°C DB
Indoor unit	Space heating	15°C	60°C
	Domestic hot water (DHW)	30°C	55°C (75°C*)
	Space cooling	5°C	22°C
	Temperature around	5°C DB	30°C DB
	Water pressure	1 bar	3 bar

DB: Dry Bulb

\*: When there is an DHW electric heater mounted in the DHW tank, the setting temperature can reach 75°C.

- Upon receiving this product, inspect it for any shipping damage. Claims for damage, either apparent or concealed, in a written form, should be filed immediately with the shipping company.
- Check the model number, electrical characteristics (power supply, voltage and frequency) and accessories to determine if they are correct.
- The standard utilization of the unit shall be explained in these instructions. Therefore, the utilization of the unit other than those indicated in these instructions is not recommended.
- Please contact your local agent, as the occasion arises.
- If you have any questions, please contact your dealer or designated service center of HISENSE.

### 8.1.2 SAFETY

#### 8.1.2.1 APPLIED SYMBOLS

During normal heat pump system design work or unit installation, greater attention must be paid in certain situations requiring particular care in order to avoid damage to the unit, the installation or the building or property.

Situations that pose a risk to the safety of those in the surrounding area or to the unit itself are clearly indicated in this manual.

A series of special symbols are used to clearly identify these situations.

Pay close attention to these symbols and to the messages following them, as your safety and that of others depends on it.

#### DANGER

- *The text following this symbol contains information and instructions relating directly to your safety.*
- *Not taking these instructions into account will lead to personal injury or death.*

#### CAUTION

- *The text following this symbol contains information and instructions relating directly to your safety.*
- *Not taking these instructions into account could lead to unit damage.*

#### NOTE

- *The text following this symbol contains information and instructions that may be use or that require a more thorough explanation.*
- *Instructions regarding inspections to be made on unit parts or systems may also be included.*



Caution, risk of fire!

***This appliance is filled with R32, an odourless low burning velocity refrigerant. If the refrigerant is leaked, there is a possibility of ignition if it enters in contact with an external ignitions source.***




#### DANGER



*This symbol shows that this equipment uses a low burning velocity refrigerant. If the refrigerant is leaked, there is a possibility of ignition if it enters in contact with an external ignition source.*

#### RISK OF EXPLOSION

*The compressor must be stopped before removing the refrigerant pipes. All service valves must be fully closed after pumping down operation.*

Symbol	Explanation
	Before installation, read the installation and operation manual, and the wiring instruction sheet.
	Before performing maintenance and service tasks, read the service manual.
	For more information, see the Technical, Installation and Service Handbook.



## 8.1.2.2 ADDITIONAL INFORMATION ABOUT SAFETY

 **DANGER**

- **DO NOT CONNECT THE POWER SUPPLY TO THE INDOOR UNIT PRIOR TO FILLING THE SPACE HEATING CIRCUIT (AND DHW CIRCUIT IF IT WERE THE CASE) WITH WATER AND CHECKING WATER PRESSURE AND THE TOTAL ABSENCE OF ANY WATER LEAKAGE.**
- Do not pour water over the indoor unit electrical parts. If the electrical components are in contact with water a serious electric shock will take place.
- Do not touch or adjust the safety devices inside the heat pump indoor unit. If these devices are touched or adjusted, a serious accident can take place.
- Do not open the service cover or access inside the indoor unit without disconnecting the main power supply.
- In case of fire Turn OFF the main switch, put out the fire at once and contact your service contractor.
- It must ensure that the heat pump cannot operate accidentally without water neither with air inside hydraulic system.

 **CAUTION**

- Do not use any sprays such as insecticide, lacquer, hair spray or other flammable gases within approximately one meter from the system.
- If installation circuit breaker or the unit fuse is often activated, stop the system and contact your service contractor.
- Do not make service or inspections tasks by your-self. This work must be performed by a qualified service person.
- This appliance must be used only by adult and capable people, having received the technical information or instructions to handle this appliance properly and safely.
- Children should be supervised to ensure that they do not play with the appliance.
- Do not let any foreign body into the water inlet and outlet piping of the air to water heat pump.

 **DANGER**

Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

- The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).
- Do not pierce or burn.
- Be aware that refrigerants may not contain an odour.

 **CAUTION**

- This unit is designed for commercial and light industrial application. If installed in house hold appliance, it could cause electromagnetic interference.
- This product contains fluorinated greenhouse gases. Do not vent into the atmosphere.  
Refrigerant type: R32  
Mass of charged refrigerant: refer to chapter 8.1.  
GWP: 675  
GWP=global warming potential

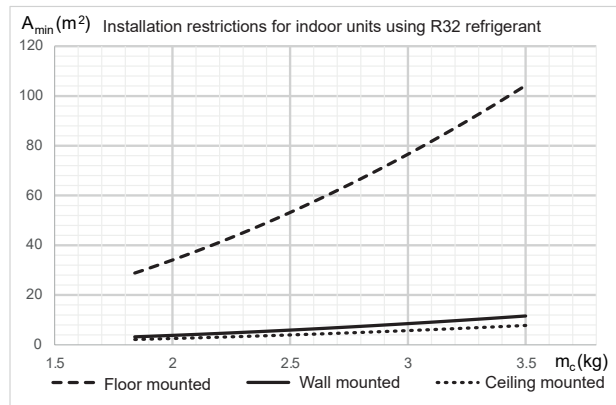
 **CAUTION**

- Without reading the installation manual, do not carry out refrigerant piping connection, water piping connection and wiring connection.
- Check whether the earth wire connection is correct and firm.
- Connect to the fuse of specified capacity.  
The user should not replace the power cord and this must be conducted by professional repair personnel.
- If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
- This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.
- The appliance is not to be used by children or person with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to insure that they do not play with the appliance.
- Means for disconnection from the supply mains, which have a contact separation in all poles that provide full disconnection under overvoltage category III conditions, must be incorporated in the fixed wiring in accordance with the wiring rules.
- The appliance shall be installed in accordance with national wiring regulations.
- The installation and service of this product shall be carried out by professional personnel, who have been trained and certified by national training organizations that are accredited to teach the relevant national competency standards that may be set in legislation.
- Mechanical connectors used indoors shall comply with ISO 14903.  
When mechanical connectors are reused indoors, sealing parts shall be renewed. When flared joints are reused indoors, the flare part shall be refabricated.
- Reusable mechanical connectors and flared joints are not allowed indoors.
- Disconnect the appliance from its power source during service and when replacing parts.
- Heat pump indoor unit, controller and wires should not be installed 3m from the strong electromagnetic wave radiation source, such as medical appliances.

8.1.3 IMPORTANT NOTICE

8.1.3.1 INFORMATION

- **PLEASE READ THE MANUAL CAREFULLY BEFORE STARTING TO WORK ON THE INSTALLATION OF THE AIR TO WATER HEAT PUMP SYSTEM.** Failure to observe the instructions for installation, use and operation described in this documentation may result in operating failure including potentially serious faults, or even the destruction of the air to water heat pump system.
- Verify, in accordance with the manuals which appear in the outdoor and indoor units, that all the information required for the correct installation of the system is included. If this is not the case, contact with your dealer.
- Hisense pursues a policy of continuous improvement in product design and performance. The right is therefore reserved to vary specifications without notice.
- Hisense cannot anticipate every possible circumstance that might involve a potential hazard.
- This air to water heat pump has been designed for standard water heating for human beings only. Do not use this for other functions that are not included in the master controller.
- No part of this manual may be reproduced without written permission.
- If you have any questions, contact with your dealer.
- Check and make sure that the explanations of each part of this manual correspond to your air to water heat pump model.
- Refer to the models codification to confirm the main characteristics of your system.
- Signal words (NOTE, DANGER and CAUTION) are used to identify levels of hazard seriousness. Definitions for identifying hazard levels are provided in initial pages of this document.
- The operation modes of these units are controlled by the master controller.
- This manual should be considered as a permanent part of the air to water heat pump. It gives a common description of and information for this heat pump indoor unit.
- Keep the water temperature of the system above the freezing temperature.



$$A_{min} = (m_c / (2.5 * LFL^{(5/4)} * h_0)^2) \quad (EQU.1)$$

- A<sub>min</sub>: Minimum installation area of an Indoor unit for a given refrigerant charge m<sub>c</sub> (kg) and considering the installation height h<sub>0</sub> (m²).
- h<sub>0</sub>: Installation height of the bottom side of the indoor unit + distance from the indoor unit bottom side to the lowest part for which a refrigerant leak may release to the indoor area.
- m<sub>c</sub>: total system refrigerant charge that could be released to the indoor area in case of undetected refrigerant leak.
- LFL: Lower Flammability Limit for R32, 0,307 kg/m<sup>3</sup> as established by EN 378-1:2016 and ISO 817.

Minimum floor area for equipment installed inside			
m <sub>c</sub> (kg)	A <sub>min</sub> (m <sup>2</sup> )	A <sub>min</sub> (m <sup>2</sup> )	A <sub>min</sub> (m <sup>2</sup> )
	Floor mounted	Wall mounted	Ceiling mounted
1.84	28.81	3.20	2.14
1.9	30.72	3.41	2.29
2.0	34.04	3.78	2.53
2.1	37.53	4.17	2.79
2.2	41.19	4.58	3.06
2.3	45.02	5.00	3.35
2.4	49.02	5.45	3.65
2.5	53.19	5.91	3.96
2.6	57.53	6.39	4.28
2.7	62.04	6.89	4.61
2.8	66.72	7.41	4.96
2.9	71.58	7.95	5.32
3.0	76.6	8.51	5.70
3.1	81.79	9.09	6.08
3.2	87.15	9.68	6.48
3.3	92.68	10.30	6.89
3.4	98.39	10.93	7.32
3.5	104.26	11.58	7.75

8.1.3.2 MINIMUM FLOOR AREA REQUIREMENTS

- The following chart and table shows the minimum floor area (A<sub>min</sub>) required for the installation of an indoor unit from a refrigerant system containing a certain refrigerant charge (m<sub>c</sub>) of R32 (A2L refrigerant), and supposing a total room height not lower than 2.2 m. (According to IEC 60335-2-40:2018 and EN 378-1:2016).
- For m<sub>c</sub><1.84 kg, IEC 60335-2-40:2018 and EN 378-1:2016 do not establish any minimum floor area restriction. In that case check local regulations to ensure that no hard restrictions may apply.

- The A<sub>min</sub> in the table above is calculated according to the formula (EQU.1) under the following conditions:
- Floor mounted: h<sub>0</sub> = 0.6m
- Wall mounted: h<sub>0</sub> = 1.8m
- Ceiling mounted: h<sub>0</sub> = 2.2m
- For safety, the A<sub>min</sub> must be calculated according to the actual installation by professionals.



**⚠ CAUTION**

- Do not charge OXYGEN, ACETYLENE, or other flammable and poisonous gases into the refrigerant because an explosion can occur. It is recommended that oxygen free nitrogen be charged for these types of tests cycle when performing a leakage test or an airtightness test. These types of gases are extremely dangerous.
- Insulate the unions and flare-nuts at the piping connection part completely.
- Insulate the liquid piping completely to avoid a decrease of performance; if not, it will cause sweating on the surface of the pipe.
- Charge refrigerant correctly. Overcharging or insufficient charging could cause a compressor failure.
- Check for refrigerant leakage in detail. If a large refrigerant leakage occurred, it would cause difficulty with breathing or harmful gases would occur if a fire were being used in the room.
- If the flare nut is tightened too hard, the flare nut may crack after a long time and cause refrigerant leakage.
- The heat pump indoor unit is suitable for the floor mounted condition ( $h_0 = 0.6m$ ) for most installations.

**8.1.4 BEFORE OPERATION**

**8.1.4.1 GENERAL NOTES**

**8.1.4.1.1 Selection of the installation location**

The indoor unit of the system with air to water heat pump must be installed following these basic requirements:

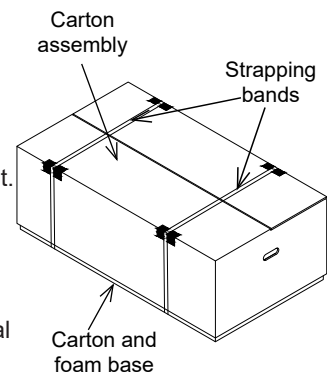
- The indoor unit is intended to be installed in an indoor place and for ambient temperatures ranging 5~30°C. The ambient temperature around the indoor unit must be higher than 5°C to prevent water from freezing.
- The unit is prepared to be wall mounted (wall support is factory supplied), so make sure that selected wall is flat and is made of a non-combustible surface, strong enough for supporting the indoor unit weight.
- Be sure to maintain the recommended servicing space for future unit servicing and guarantee enough air circulation around the unit (See "8.1.5.1 Service space" section).
- Take into account that shut-off valve with filter and shut-off valve (factory supplied) must be installed at the indoor unit inlet and outlet connections.
- Keep water draining provisions. The safety valve is provided with a drain pipe which are located at the drain pan of the unit.
- Protect the indoor unit against the entry of small animals (like rats) which could making contact with the wires, the drain pipe, electrical parts and may damage unprotected parts, and at the worst, a fire will occur.
- Install it in a no-frost environment.
- Do not install the indoor unit in a location with very high humidity.
- Do not install the indoor unit where electromagnetic waves are directly radiated to the electrical box.

- Install the unit in a place where in case of water leakage, any damage to the installation space cannot be produced.
- Install noise filter when the power supply emits harmful noises.
- To avoid fire or explosion, do not install the unit in flammable environment.
- The air to water heat pump must be installed by a service technician. The installation must comply with local and European regulations.
- Try to avoid to put any objects or tools above the indoor unit.

**8.1.4.1.2 Unpacking**

All units are packed by a cardboard box and plastic bag. Firstly to unpack it, place the unit on the assembly area as close as possible to its final installation location, to avoid damages in transport. Two persons are required.




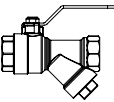






1. Cut the strapping bands and remove the adhesive tapes.
2. Remove the carton assembly and then the plastic bag around the unit.
3. Remove the indoor unit from the carton and foam base and place it carefully on the floor, as near as possible to its final location.



**⚠ CAUTION**

- Be careful with the Installation and Operation manual and with the factory-supplied accessories located besides the unit.
- Two people are required when lifting because of the weight of the unit.

**8.1.4.2 FACTORY-SUPPLIED INDOOR UNIT COMPONENTS**

Accessory	Image	Qty.	Remarks
Wall support		1	For hanging the unit on the wall
Gasket		6	Six gaskets for each connections between the indoor unit and shutoff valves (inlet/outlet)
Shut-off valve (G1")		1	Connect at the water inlet/ outlet of indoor unit, used to shut off the water flow.
Shut-off valve with filter (G1")		1	Connect at the water inlet/ outlet of indoor unit, used to shut off the water flow and filter impurities in water.
Cable tie		3	Used for wiring binding.
Drain pipe clamp		1	Used for fastening drain hose and drain pipe.
Drain pipe clamp		1	Used for fastening drain hose and drain pipe.
Drain pipe		1	Used for drain hose connection
Bolts		2	Used to fix the machine to the wall support
Instruction manual		1	Basic instructions for the installation of the device.

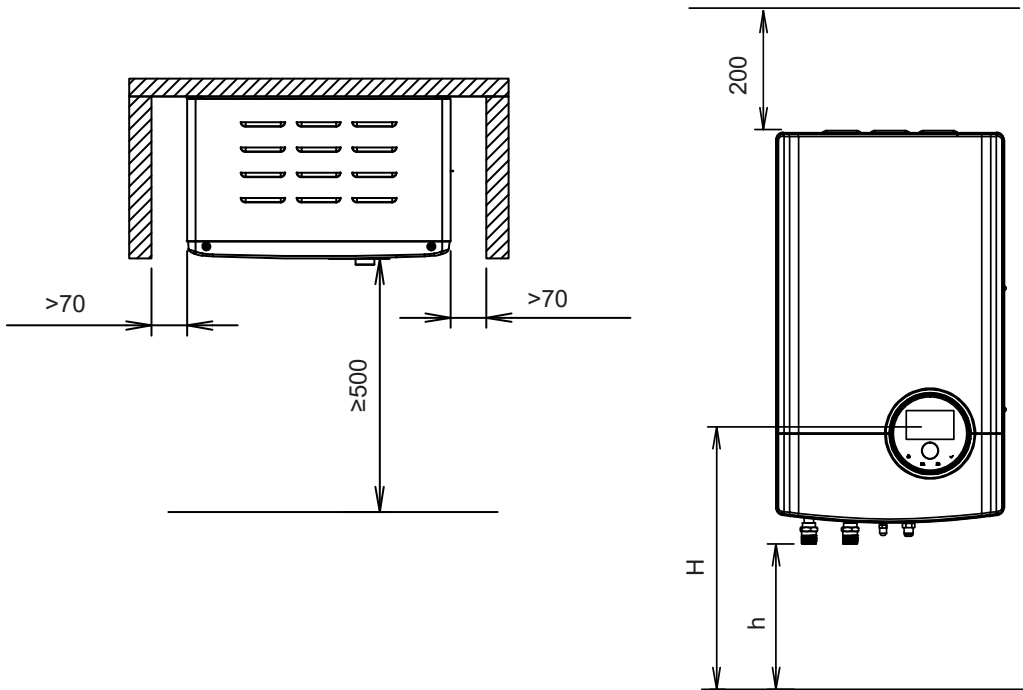
**NOTE**

- *The previous accessories are supplied inside the packing assembly (besides the indoor unit).*
- *Additional refrigerant piping (field supplied) for connections to outdoor unit needs to be available.*
- *If some of these accessories are not packed with the unit or any damage to the unit is detected, please contact your dealer.*

8.1.5 GENERAL DIMENSIONS

8.1.5.1 SERVICE SPACE

Unit: mm



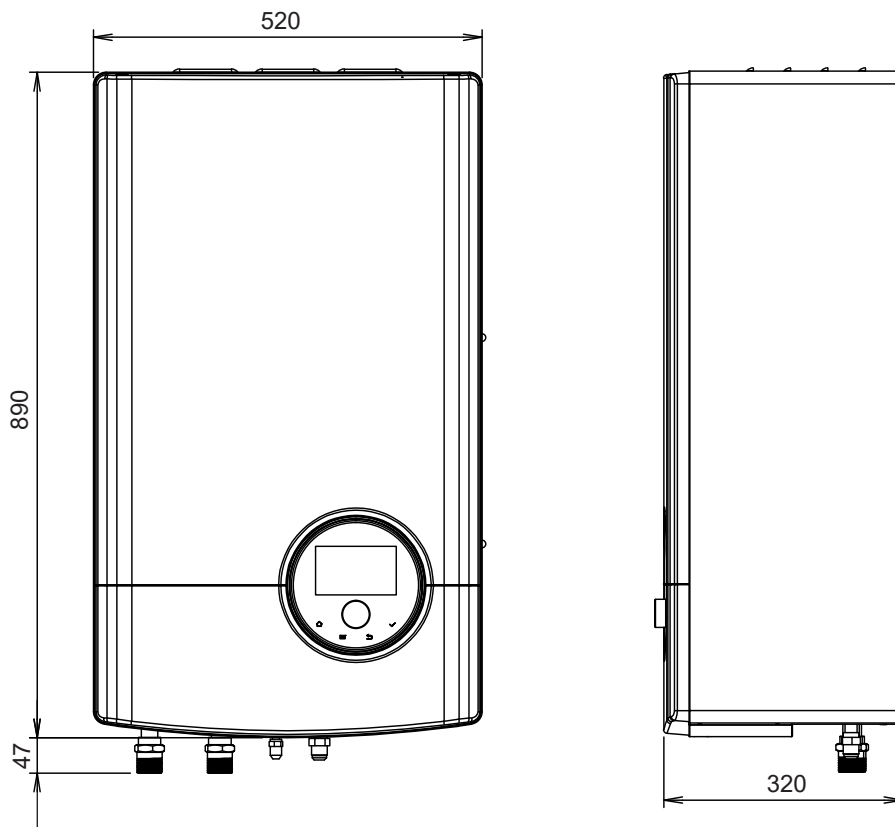
H: 1200~1500 mm

Recommended unit height for proper access to the controller.

h: 350 mm

Minimum unit height for installing the shut-off valves and the first bending pipe line.

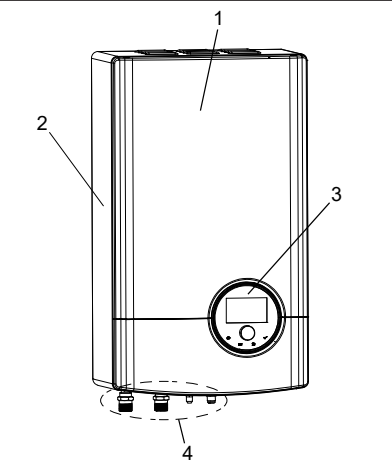
8.1.5.2 DIMENSIONAL DATA



8.1.6 Installation of Hi-Therma Split Indoor Unit

8.1.6.1 MAIN PARTS (DESCRIPTIONS)

No.	Part
1	Indoor unit front panel
2	Indoor unit surrounding panel
3	Master controller & controller frame
4	Piping connections



8.1.6.2 REMOVING THE PANELS

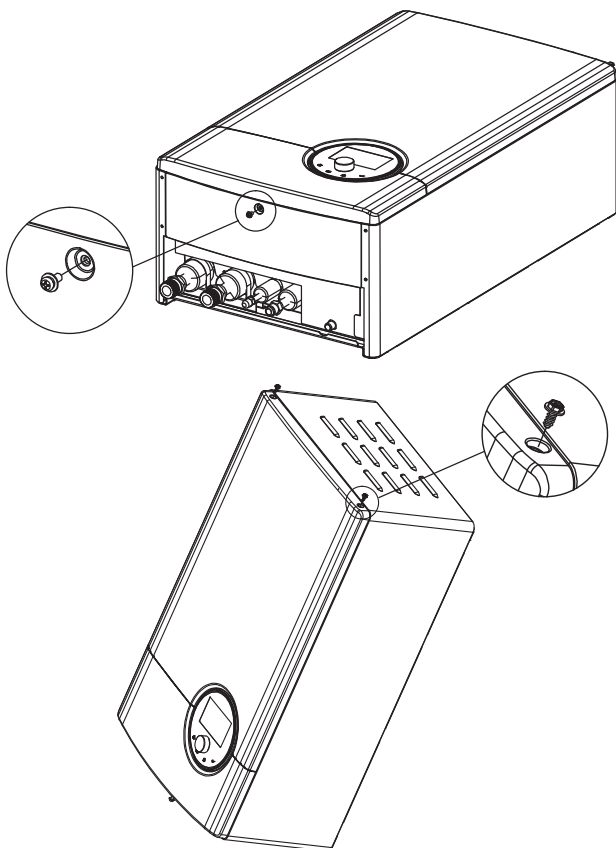
If it is necessary to access to the indoor unit components, please follow these operations.

8.1.6.2.1 Removing the front panel

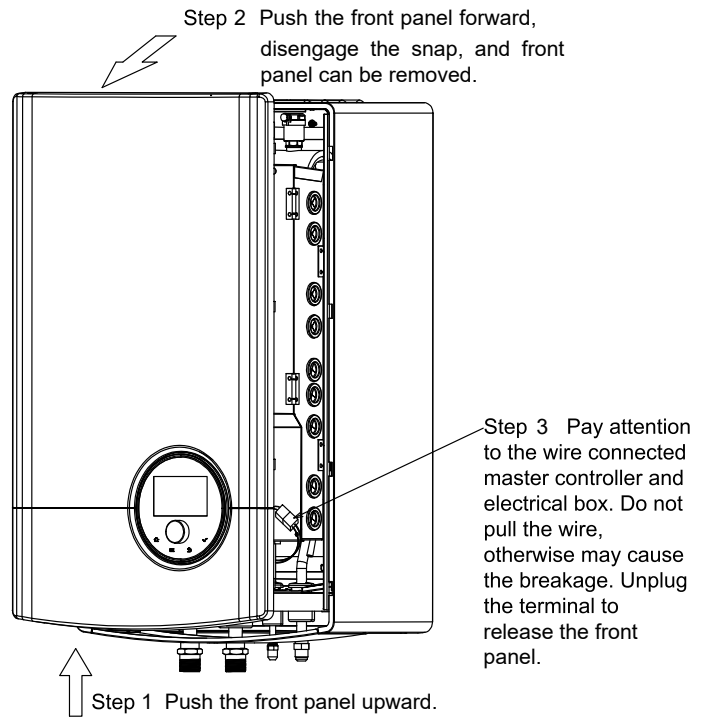
**i** NOTE

The indoor unit front panel needs to be removed for any task inside the indoor unit.

1. Unscrew 1 screw at the bottom of the indoor unit and 2 screws on the top of unit.



2. Remove the front panel.



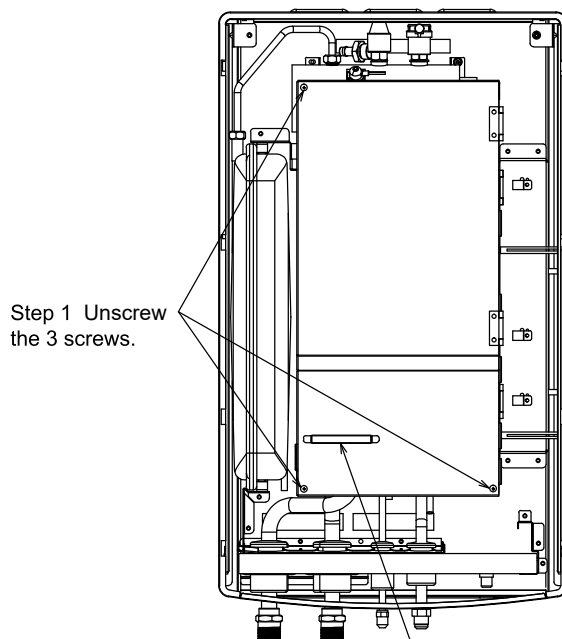
**!** CAUTION

- Take care with the LCD display of the master controller while removing the front panel.
- Be careful not to drop the front panel during operation.
- Take care when removing front panel, the parts inside the unit could be hot.

8.1.6.2.2 Opening the electrical box

**!** DANGER

- Disconnect the unit from the power supply before touching any of the parts in order to avoid an electric shock.

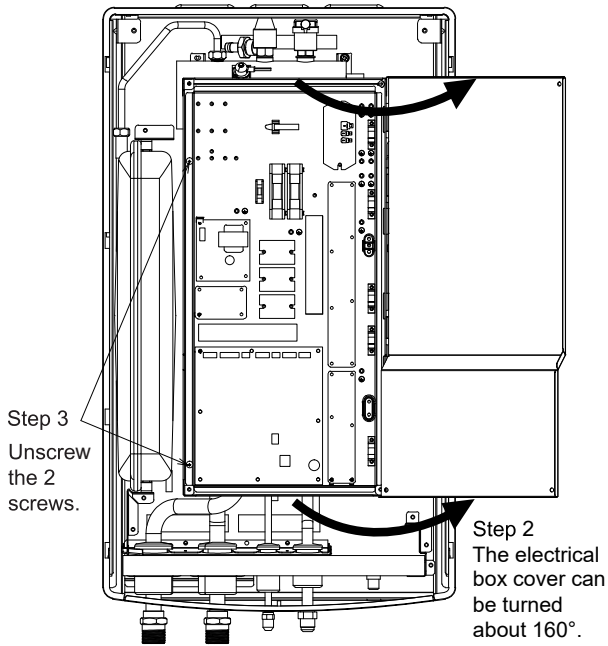


\*Handle on electrical box cover can be used to hang the master controller.

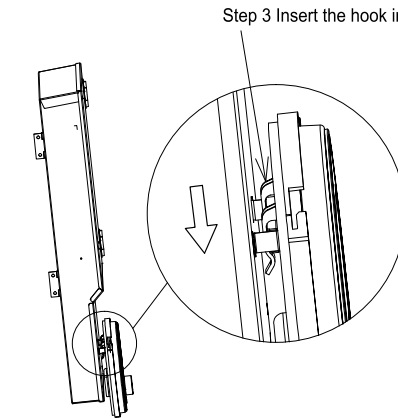
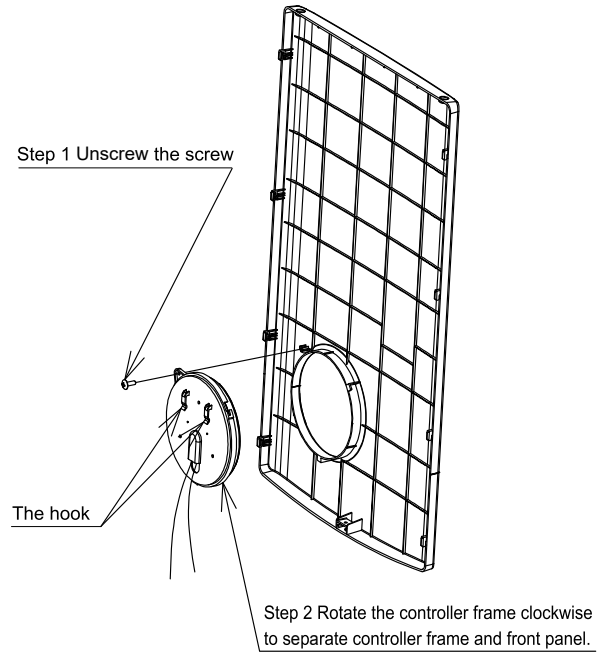
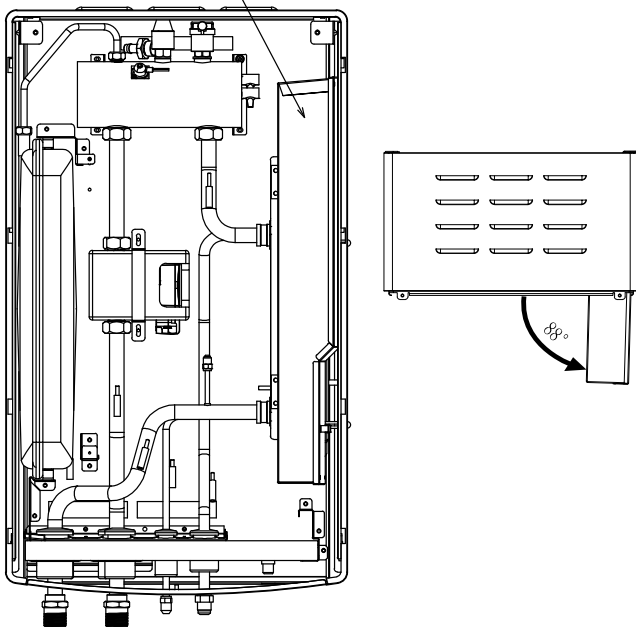
8.1.6.2.3 Hanging the master controller

**i** NOTE

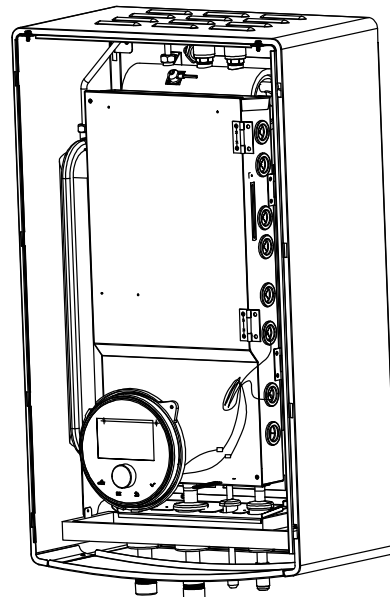
The master controller can be hung on the handle of the electrical box cover.



Step 4 The electrical box can be turned about 88°.



Step 4 Complete hanging.



**⚠ CAUTION**

Take care with the electrical box components in order to avoid damaging.

8.1.6.3 WALL MOUNTING

**i** NOTE

Installation procedure

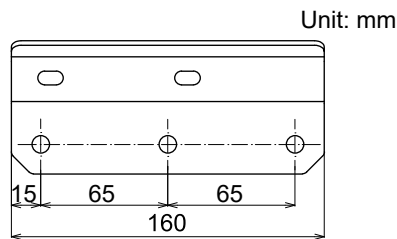
- 1 Wall mounting procedure
- 2 Water piping connection
- 3 Drain pipes connection
- 4 Refrigerant piping connection
- 5 Power and transmission wiring connection
- 6 Cover assembly
- 7 Test and check

**Wall mounting procedure**

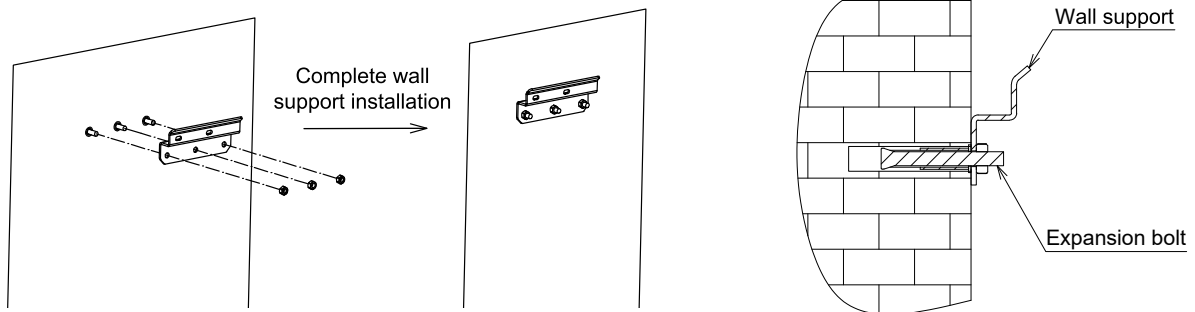
**⚠ CAUTION**

Make sure the wall has adequate strength to hang weight of the indoor unit.

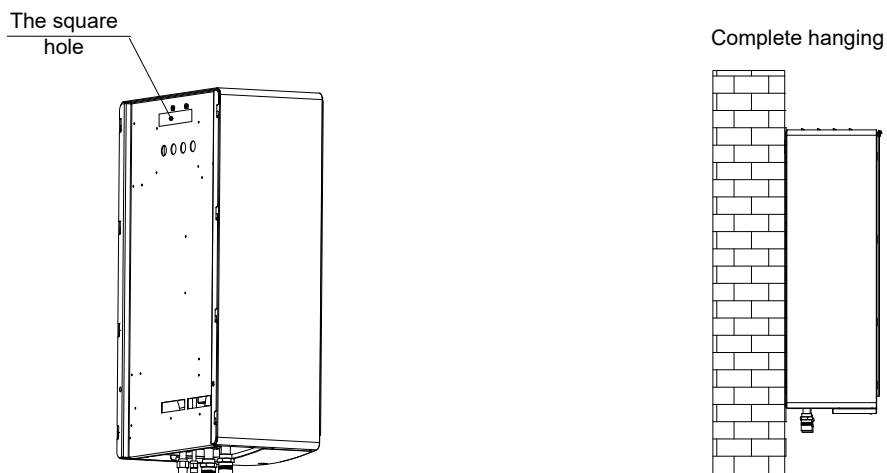
1. Fix the wall support (factory-supplied accessory) to the wall.  
 Drill 3 holes according to the circular hole position of the wall support as shown below, and the hole diameter shall meet the requirements of M8 expansion bolts.



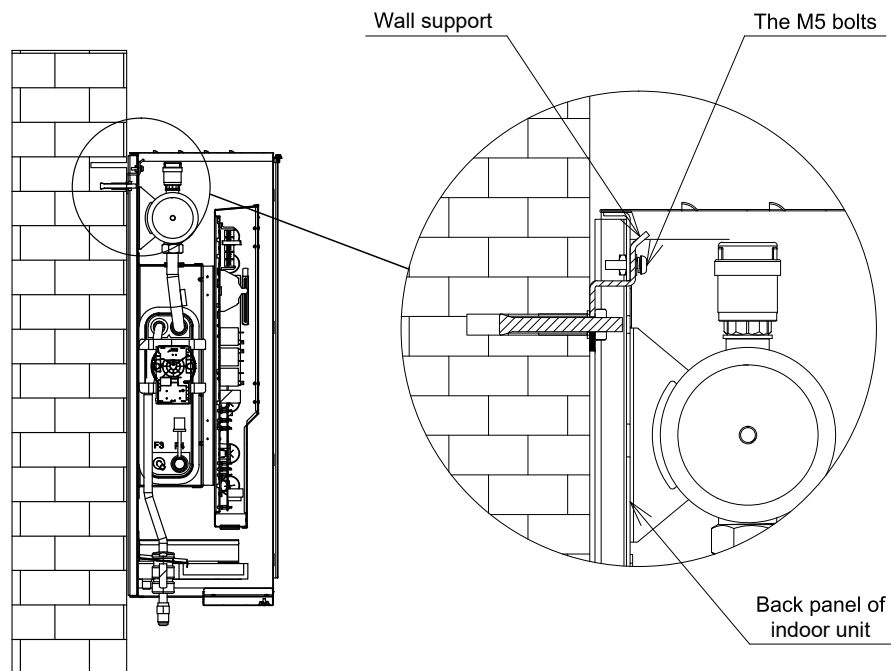
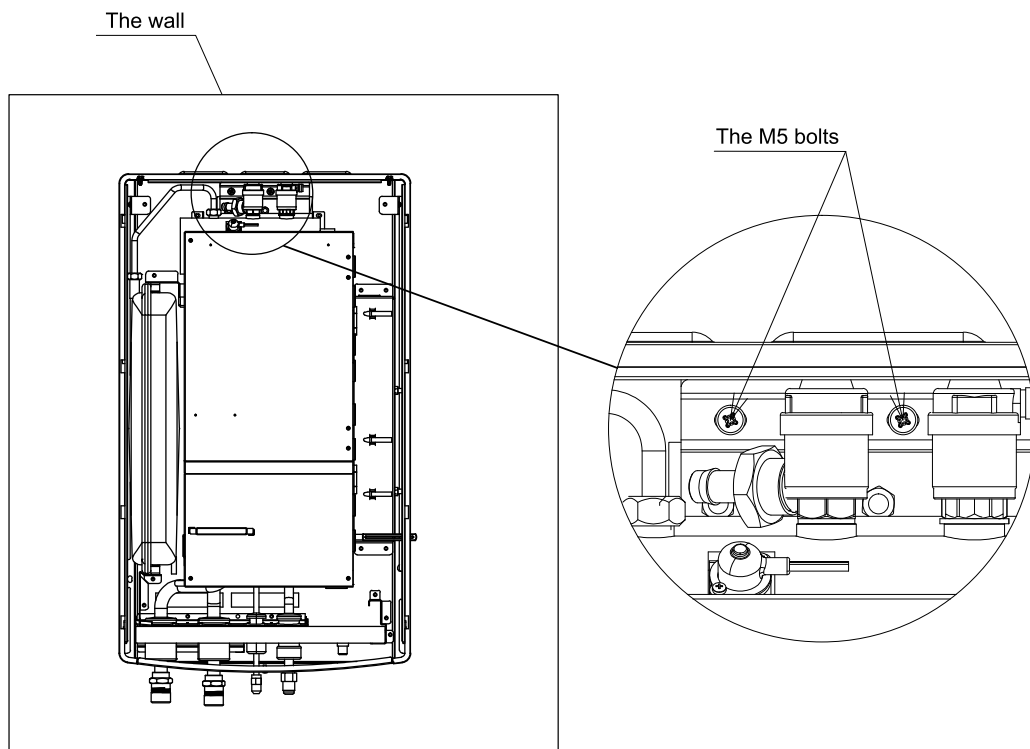
Using 3 M8 expansion bolts Fix the wall support to the wall. Make sure that the wall support is completely levelled.



2. Hang the indoor unit on the wall support, using the square hole on the back panel of indoor unit. At least two persons are required in order to lift the unit because of its weight.



3. Fix the indoor unit to the wall support using the two M5 bolts (factory-supplied accessory).



8.1.7 PIPING WORK

Make sure that refrigerant piping installation complies with the legislation EN378 and local legislation.

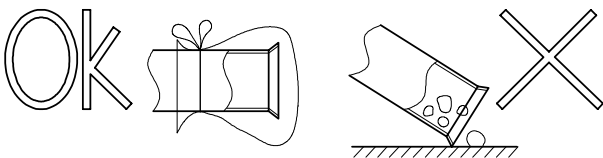
8.1.7.1 GENERAL NOTES BEFORE PERFORMING PIPING WORK

- Prepare locally-supplied copper pipes.
- Select the piping size with the correct thickness and correct material able to withstand sufficient pressure.
- Select clean copper pipes. Make sure that there is no dust or moisture inside the pipes. Blow the inside of the pipes with oxygen free nitrogen to remove any dust and foreign materials before connecting them.

**i** NOTE

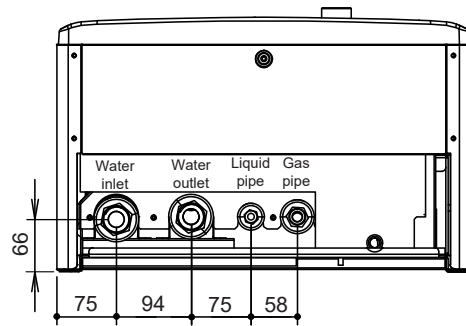
A system with no moisture or oil contamination will give maximum performance and lifecycle compared to that of a poorly prepared system. Take particular care to ensure that all copper piping is clean and dry internally.

- Cap the end of the pipe when pipe is to be inserted through a wall hole.
- Do not put pipes on the ground directly without a cap or vinyl tape at the end of the pipe.



- If piping installation is not completed until next day or over a longer period of time, braze off the ends of the piping and charge with oxygen free nitrogen through a Schrader valve type access fitting to prevent moisture and particle contamination.
- It is advisable to insulate the water pipes, joints and connections in order to avoid heat loss and dew condensation on the surface of the pipes or accidental injuries due to excessive heat on piping surfaces.
- Do not use insulation material that contains NH3, as it can damage copper pipe material and become a source of future leakage.
- It is recommended to use flexible joints for the water piping inlet and outlet in order to avoid vibration transmission.
- Refrigerant circuit and water circuit must be performed and inspected by a licensed technician and must comply with all relevant European and national regulations.
- Proper water pipe inspection should be performed after piping work to assure there is no water leakage in the water circuit.

- Location of Refrigerant and Water Pipeline are shown below.



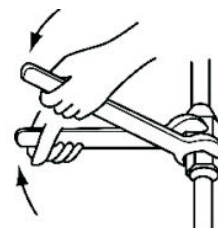
8.1.7.2 REFRIGERANT PIPING CONNECTION

Piping connection size of indoor unit is shown below.

Model	Gas pipe	Liquid pipe
044(2.0HP)	Ø 12.7 (1/2")	Ø 6.35 (1/4")
060(2.5HP)		
080(3.0HP)	Ø 15.88 (5/8")	

Torque required is shown below.

Pipe Diameter	Torque(N•m)
Ø 6.35	14~18
Ø 9.53	33~42
Ø 12.7	50~62
Ø 15.88	63~77



**i** NOTE

Screw up the nut cap by two wrenches. Heat preservation material on site should be used to prevent heat leakage of gas pipe, liquid pipe and connecting nut cap.

8.1.7.3 WATER PIPING CONNECTION

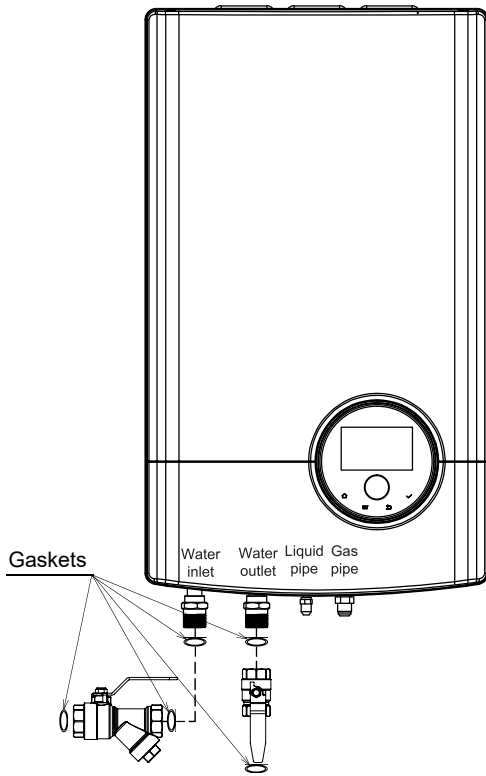
(1) Piping connection size of indoor unit.

Model	Gas pipe	Liquid pipe
044(2.0HP)	G1" (male)	G1" (male)
060(2.5HP)		
080(3.0HP)		



## (2) Install shut-off valves

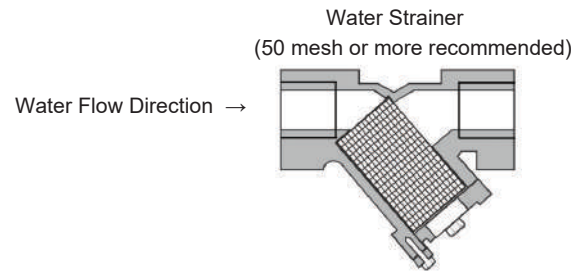
A shut-off valve and a shut-off valve with filter are provided with the unit. For convenience of repair and maintenance, install the shut-off valve with filter on water inlet pipe and the shut-off valve on water outlet pipe of indoor unit as follow.



## (3) Additional water strainer

### ⚠ CAUTION

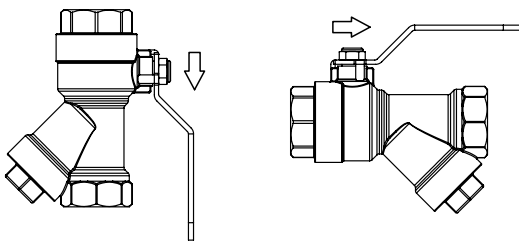
- Provide a 50 mesh or more water strainer at the water inlet side of water piping. Otherwise, damage to the plate heat exchanger may occur. In the plate heat exchanger, water flows through a narrow space between the plates. Therefore, there is a possibility that freezing or corrosion may occur if foreign particles or dust clog the flow of water between the plates.
- This is not required when cooling mode is not used.



- The water piping connection needs to be completed after flushing the water system.

### **i** NOTE

The shut-off valve can connect to the water inlet of indoor unit directly. The shut-off valve with filter must be installed at water inlet of indoor unit, and water flow direction and installation direction must be confirmed as shown below. The gasket in accessories can be installed at the two connections of shut-off valve and shut-off valve with filter.



### ⚠ CAUTION

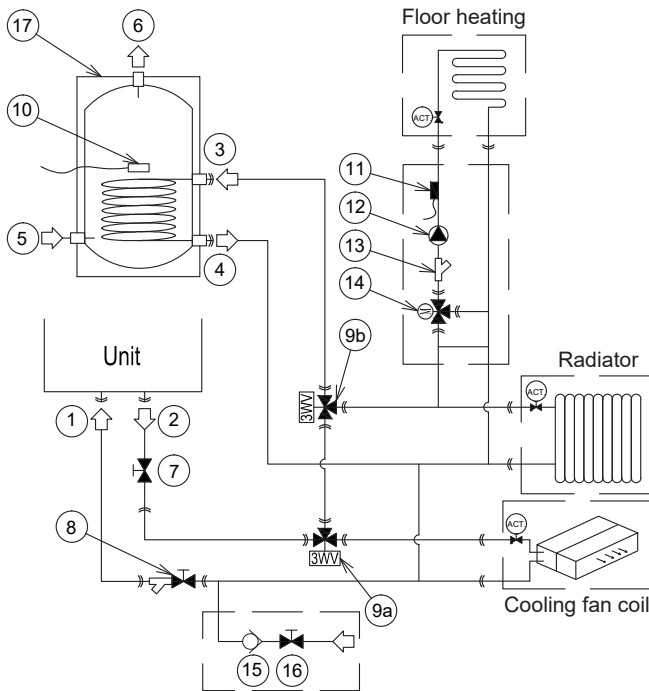
- Rubber gasket must be mounted (accompanied with the unit), otherwise water leakage may be caused.
- Note the location of shut-off valves, and the direction of shut-off valves and drain valve, which are essential to maintenance.
- Screw up shut-off valves by using two wrenches.

8.1.8 SPACE HEATING AND DHW

8.1.8.1 ADDITIONAL HYDRAULIC NECESSARY ELEMENTS

**⚠ DANGER**

Do not connect the power supply to the unit prior to filling the space heating circuit (and DHW circuit if it were the case) with water and checking water pressure and the total absence of any water leakage.



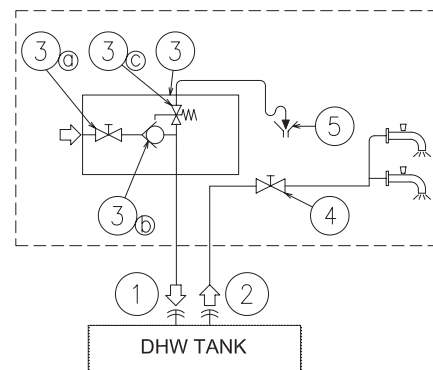
Nature	No.	Part name
Piping connections	1	Water inlet of the unit
	2	Water outlet of the unit
	3	DHW tank inner coil inlet
	4	DHW tank inner coil outlet
	5	Water inlet (DHW)
Factory supplied	7	Shut-off valve
	8	Shut-off valve with filter
Optional accessories	9	9a 3WV Cooling
		9b 3WV DHW
	10	Thermistor (for DHW))
Field supplied	11	Thermistor (for Space heating))
	12	Water pump
	13	Filter
	14	Mixing valve
	15	Check valve
	16	Shut-off valve
	17	Domestic hot water tank

As an installation example of space heating / cooling and Domestic hot water (DHW), the following hydraulic elements are necessary to correctly perform the space heating / cooling and DHW water circuit:

- The factory supplied shut-off valve (7) need to be installed at water outlet of the unit, and shut-off valve with filter (8) need to be installed horizontally at water inlet of the unit.

- A water check valve (15) with a shut-off valve (16) must be connected to the water filling point when filling the water circuit. The check valve acts as a safety device to protect the installation.
- A domestic hot water tank (17) has to be installed in combination with the space heating / cooling.
- 3-way valves (9) must be connected at one point of the water outlet pipe of the installation, used to divert the water circulation for specific functions. As shown in example, connect straight through of 3-way valve to DHW tank inner coil.
- DHW thermistor (10) must be installed to reach the inner wall of the DHW tank and keep in good contact with it. Space heating thermistor (10) must be installed on the metal tube close to space heating, and keep in good contact with it.
- Mixing valve (14) is recommended to use ESBE ARA661, which operation mode is 3-point SPDT. If mixing valve of other brands or models are used, the operation mode must be 3-point SPDT, and power supply must be 220-240V ~ 50Hz. The rotation time can be set in the master controller.

Additionally, the following elements are required for the DHW circuit:



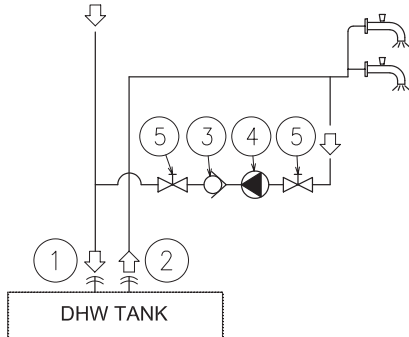
Nature	No.	Part name
Piping connections	1	Supplementary water inlet of DHW tank
	2	DHW tank outlet
Field supplied	3	Pressure and temperature relief valve
		3a Shut-off valve
		3b Water check valve
	3c Safety valve	
	4	Shut-off valve
5	Draining	

- A Shut-off valve (field supplied):**  
The shut-off valve (4) must be connected after the DHW tank outlet (2) in order to make easier any maintenance work.
- A Security water valve (Field-supplied):**  
This accessory (3) is a pressure and temperature relief valve that must be installed as near as possible to the Supplementary water inlet of DHW tank (1). It should ensure a correct draining (5) for the discharge valve of this valve. This security water valve should provide the following:
  - Pressure protection
  - Non-return function
  - Shut-off valve
  - Filling
  - Draining

**i NOTE**

The discharge pipe should always be open to the atmosphere, free of frost and in continuous slope to the down side in case that water leakage exists.

In case of a recirculation circuit for the DHW circuit, the following elements are required:



Nature	No.	Part name
Piping connections	1	Supplementary water inlet of DHW tank
	2	DHW tank outlet
Field supplied	3	Water check valve
	4	Water pump
	5	Shut-off valve

- **A Recirculation water pump (field supplied):** This water pump (3) will help to correctly recirculate the hot water to the DHW inlet.
- **A Water check valve (field supplied):** This accessory (3) is connected after the recirculation water pump (4) in order to ensure the nonreturn of water.
- **Two Shut-off valves (field supplied) (5):** One before the recirculation water pump (4) and other after the water check valve accessory (3).

**CAUTION**

The water check valve shall be confirmed installed in the correct direction. Otherwise, serious damages may occur in the DHW tank.

**8.1.8.2 Requirements and Recommendations for Hydraulic Circuit**

**8.1.8.2.1 REQUIREMENTS FOR ANTI-FREEZING**

- When the unit is stopped during shut-off periods and the ambient temperature is very low, the water inside the pipes and the circulating pump may freeze, thus damaging the pipes and the water pump. In these cases, the installer shall ensure that the water temperature inside the pipes does not fall below the freezing point. In order to prevent this, the unit has a self-protection mechanism which should be activated (refer to “8.1.9.5 DIP Switch Setting of PCB1”).
- Even if the unit is stopped, the water pump may run under some circumstances, i.e, when the anti-freezing function is triggered.
- Keep the unit power on and water system unblocked to prevent water freezing, otherwise an alarm may occur.
- If the water system is blocked, an alarm of water flow will occur to stop the whole system.

- If machine is stopped for a long period of time in winter, drain out water in circuit and water pipes to prevent freezing.
- The anti-freezing protection is effective better with Auxiliary electric heater connected. It is advisable to install the Auxiliary electric heater for those models in which these are not supplied but optional.
- However, in case of a power failure or unit failure, these functions cannot guarantee protection.

**8.1.8.2.2 MINIMUM REQUIRED WATER VOLUME**

The following part shows the minimum water volume in the system for product protection (anti-hunting) and temperature drop at defrosting.

- *Minimum required water volume in each single water circuit of DHW / SWP for product protection (anti-hunting). Water volume in each single water circuit of DHW / SWP need be greater than 20L.*
- *Minimum required water volume in single water circuit of space cooling for product protection (anti-hunting). The following table shows the minimum water volume needed in single water circuit of space cooling.*

Model	044/060(2.0HP/2.5HP)	080(3.0HP)
Minimum required water volume	30L	45L

- *Minimum required water volume during defrosting. The following table shows the minimum water volume needed in single water circuit of space heating in case of safe defrosting.*

Lowest possible operation water temperature in single water circuit of space heating	044/060 (2.0/2.5HP)	080(3.0HP)
≥25°C	61 L	61 L
20-25°C	99 L	99 L
15-20°C	158 L	158 L
10-15°C	198 L	198 L

**i NOTE**

- *The values shown on the table are based on theoretical installation conditions. And the value can be different depending on each specific installation.*
- *To calculate minimum water volume the internal water volume of the unit is NOT included.*
- *Consult with local technical engineer under the special occasions where operation water temperature in single water circuit of space heating is lower than 20°C.*

**8.1.8.2.3 MINIMUM REQUIRED WATER FLOW**

Check that the water pump of the water circuit works within the pump operating range and that the water flow is over the unit minimum value.

Model	min. water flow(L/min)
044(2.0HP)	8.3
060(2.5HP)/080(3.0HP)	10.0

#### 8.1.8.2.4 Additional Information about HYDRAULIC CIRCUIT

- An additional special water filter is highly recommended to be installed on the space heating (field installation), in order to remove possible particles remaining from brazing which cannot be removed by the field supplied shut-off valve with filter.
- Put insulation on the pipes in order to avoid heat losses.
- Whenever possible, sluice valves should be installed for water piping, in order to minimize flow resistance and to maintain sufficient water flow.
- Ensure that the installation complies with applicable legislation in terms of piping connection and materials, hygienic measures, testing and the possible required use of some specific components like thermostatic mixing valves.
- The maximum water pressure is 3 bar (nominal opening pressure of the safety valve). Provide adequate reduction pressure device in the water circuit to ensure that the maximum pressure is NOT exceeded.
- The water pressure can be read on master controller, detected by the water pressure sensor located at inlet of plate heat exchanger. If water pressure exceeded 3 bar, the water pressure displayed on master controller would flash.
- Ensure that the drain pipes connected to the safety valve and to the air purge valve are properly driven to avoid water being in contact with unit components.
- Make sure that all field supplied components installed in the piping circuit can withstand the water pressure and the water temperature range in which the unit can operate. The units are conceived for exclusive use in a closed water circulation.
- The internal air pressure of the expansion vessel will be adapted to the water volume of the final installation (factory supplied with 1 bar of internal air pressure).
- Drain taps must be provided at all low points of the installation to permit complete drainage of the circuit during servicing.
- The maximum piping length depends on the maximum pressure availability in the water outlet pipe. Please check the pump curves.
- The unit is equipped with an air purge valve (factory supplied) at the highest location of the unit. If this location is not the highest of the water installation, air might be trapped inside the water pipes, which could cause system malfunction. In that case additional air purge valves (field supplied) should be installed to ensure no air enters the water circuit.
- For heating floor system, the air should be purged by mean of an external pump and an open circuit to avoid air bags.

#### 8.1.8.3 WATER FILLING

- (1) Check that a water check valve (field supplied) with a shutoff valve (field supplied) is connected to the water filling point (water inlet connection) for filling the hydraulic circuit (see "8.1.8.1 Additional hydraulic necessary elements).
- (2) Make sure all the valves are open (water inlet/outlet shut-off valves and the rest of valves of the water circuit installation components).
- (3) Ensure that the air purge valve of the unit is open when installation (turn the screw cap of air purge valve twice at least).
- (4) Check that the drain pipes connected to the safety valve (keep the outlet of drain pipes located in the drain pan) are correctly connected to the general draining system. The safety valve is later used as an air purging device during the water filling procedure.
- (5) Fill the water circuit with water until the pressure displayed on the controller reaches  $2.0 \pm 0.2$  bar. During all the operation conditions, the normal pressure range of water circuit is 1 ~ 2.5 bar.

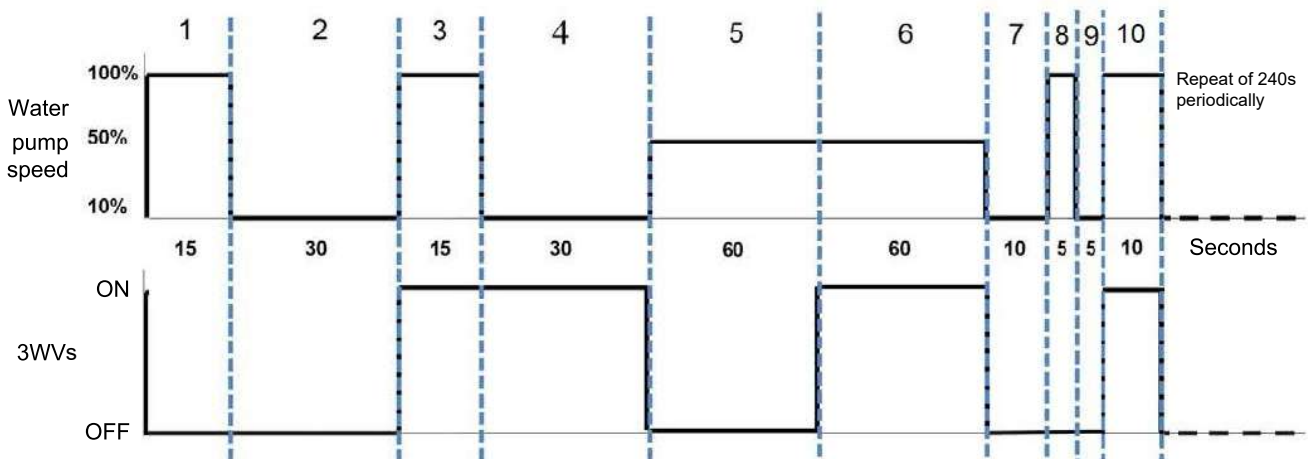
#### NOTE

*While the system is being filled with water, it is highly recommended to operate the safety valve manually so as to help with the air purging procedure.*

- (6) Remove as much air from inside the water circuit as possible through the air purge valve and other air vents in the installation (fan coils, radiators...).
- (7) There are two methods to start the air purge procedure:
  - a. Using the master controller to start air purge. (Refer to the master controller manual)
  - b. Using DSW4-1 of the PCB1:  
DSW4-1 ON: Start air purge  
DSW4-1 OFF: Stop air purge
- (8) If a little quantity of air is still remaining in the water circuit, it will be removed by the automatic air purge valve of the unit during the first hours of operation. Once the air in the installation has been removed, a reduction of water pressure in the circuit is very likely to occur. Therefore, additional water should be filled by booster pump until water pressure returns to approximate 2.0 bar.

**i** NOTE

- The unit is equipped with an automatic air purge valve (factory supplied) at the highest location of the unit. Anyway, if there are higher points in the water installation, air might be trapped inside water pipes, which could cause system malfunction. In that case, additional air purge valves (field supplied) should be installed to ensure no air enters into the water circuit. The air purge valve should be located at points which are easily accessible for servicing.
- The water pressure indicated on the master controller may vary depending on the water temperature (the higher temperature, the higher pressure). Nevertheless, it must remain above 1 bar in order to prevent air from entering the circuit.
- Fill in the circuit with tap water. The water in the heating installation must comply with EN directive 98/83 EC. Non-sanitary controlled water is not recommended (for example, water from wells, rivers, lakes, etc.) .
- The maximum water pressure is 3 bar (nominal opening pressure of the safety valve). Provide adequate reduction pressure device in the water circuit to ensure that the maximum pressure is NOT exceeded.
- For heating floor system, air should be purged by means of an external pump and an open circuit to prevent the formation of air pockets.
- Check carefully for leaks in the water circuit, connections and circuit elements.
- During water filling, it is necessary to ensure that water enters the unit from the water inlet to ensure that all water passes through the shut-off valve with filter to filter impurities, otherwise it may block the components inside the unit.



**NOTE**

- The unit will stop for at least 6 min before starting next air purge cycle.

(9) Check Water Volume:

The unit has a built-in 8L expansion vessel, and default initial pressure is 1 bar. To ensure the unit works normally, the initial pressure of expansion vessel should be adjusted according to the circulated water volume.

- Use water volume checklist below to decide whether initial pressure of expansion vessel needs to be adjusted.
- Use water volume checklist to confirm the total volume of water in installation system is below the allowed maximum water volume.
- Installation height difference: height difference between highest point of water circulation and the unit. If the unit is mounted at the highest point, above all water pipes, the installation height is deemed to be 0 m.
- Calculate initial pressure of expansion vessel. Decide initial pressure (Pg) according to the maximum installation height difference (H), seen below:

$$P_g = H/10 + 0.3$$

Unit: H (m), P<sub>g</sub> (bar)

- The process of calculating allowed maximum water volume in whole circulation is:
  - Calculate maximum water volume corresponding to initial pressure P<sub>g</sub> by using maximum water volume curve as shown below.
  - Confirm the total maximum water volume in water circulation is smaller than above value. Otherwise, the expansion vessel in the unit is smaller for system.

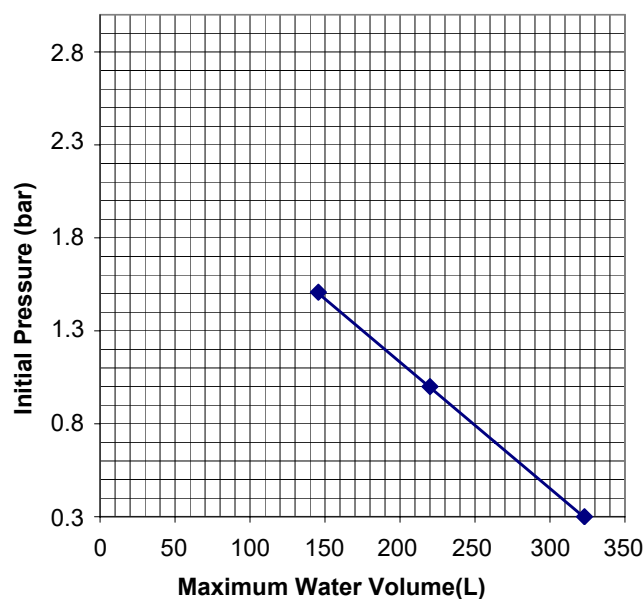
**i** NOTE

- 0.3 bar is the minimum initial pressure and 1.5 bar is the maximum initial pressure of expansion vessel set outside the factory.
- When initial pressure in expansion vessel is set as 0.3 bar at minimum, the water quantity required by system is higher than the limit value, it may be considered replacing expansion vessel with bigger volume.

**Water Volume Checklist**

	Installation height difference (a)	Water Volume	
		≤220L	>220L
Safety Valve (3 bar)	≤7m	No need to adjust initial pressure of expansion vessel	Things need to do : Must reduce initial pressure. Calculate it based on the section "Check water volume". Ensure water volume is lower than allowed maximum water volume (using the figures below).
	>7m	Things need to do : Must increase initial pressure. Calculate it based on the section "Check water volume". Ensure water volume is lower than allowed maximum water volume (using the figures below).	The expansion vessel is too small to install. (It needs proper expansion vessel or use safety valve with high activated pressure that is supplied from local place)

**Maximum Water Volume Curve Graph**





8.1.8.4 DHW TANK SELECTION AND INSTALLATION

**i** NOTE

- This DHW tank is designed for heat pump type heating system. DHW shall be selected according to the requirements in this instruction and on-site use requirements.
- If the selection, installation and wiring are not carried out according to the requirements in this instruction, we would not be responsible for the problems caused by the DHW tank.
- Hot water may cause serious burns. Test water temperature with hands. Use after the water is mixed till proper temperature.
- Connecting of water pipe with tap water pipe should be operated by qualified staff using proper piping material according to local regulations and standards.
- When the high domestic hot water temperature can be a potential risk for human injuries, a mixing valve (field supplied) shall be installed at the hot water outlet connection of the DHW tank. This mixing valve shall secure that the hot water temperature at the hot water tap never rise above a set maximum value. This maximum allowable hot water temperature shall be selected according to the applicable legislation.

8.1.8.4.1 DHW tank selection

When selecting a tank for DHW operation, take into consideration the following points:

- The volume of the tank has to meet with the daily consumption in order to avoid stagnation of water.
- Fresh water must circulate inside the DHW tank water circuit at least one time per day during the first days after the installation has been performed. Additionally, flush the system with fresh water when there is no consumption of DHW during long periods of time.
- Try to avoid long runs of water piping between the tank and the DHW installation in order to decrease possible temperature losses.
- If the domestic cold water entry pressure is higher than the equipment's design pressure, a adequate pressure reducer must be installed to ensure that the maximum pressure is NOT exceeded.

**1 Storage capacity**

The storage capacity of the DHW tank depends on the daily water demand and the combination method. The daily water demand is estimated with the following calculation formula for consumption:

$$D_i(T) = D_i(60\text{ °C}) \times (60 - T_i / T - T_i)$$

Where:

- Di (T): Water demand at T temperature
- Di (60°C): Domestic hot water demand at 60 °C
- T: Temperature of the DHW tank
- Ti: Temperature of the inlet cold water

- Calculation of Di (60 °C):

The standard consumption, expressed in daily litres per person and determined by technical installation regulations of each country, is used to calculate the domestic hot water demand at 60 °C, Di(60 °C). This quantity is then multiplied by the expected number of users of the installation. In the following example, the domestic hot water demand at 60 °C has been considered as 30 litres per person, in a detached house with 4 residents.

- Calculation of T:

The temperature of the DHW tank refers to the temperature of the accumulated water inside the tank, prior to operation. This temperature is usually between 45 °C and 65 °C. It has been considered as 45 °C in this example.

- Calculation of Ti:

The temperature of the inlet cold water refers to the temperature of the water being supplied to the tank. Since this temperature is usually between 10 °C and 15 °C, it has been considered as 12 °C in this example.

- Example:

$$D_i(T) = 30 \times 4 \times (60 - 12 / 45 - 12) = 174.5 \text{ litres/day}$$

$$174.5 \times 2(*) = 349 \text{ litres/day approximate demand of hot water}$$

**i** NOTE

(\*) It is recommended to multiply the calculated consumption by two, in case that the installation is in a detached house. This is done to ensure a steady supply of hot water. In the case of a multifamily installation, it is not necessary to increase the forecast of hot water demand, given the lower simultaneity factor.

**2 Coil Face Area**

The coil face area is a key parameter for DHW tank. To improve the heating efficiency, the coil face area should be adjusted according to the capacity.

The coil face area should be no less than the values listed in the table below.

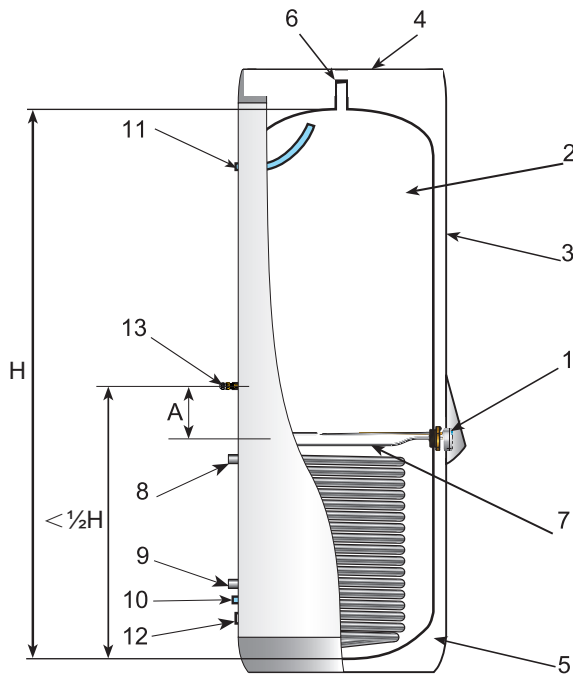
Storage Capacity(L)	100	150	200	250	300
Coil Face Area(m <sup>2</sup> )	1.5	1.5	1.8	1.8	2.0

**i** NOTE

Smaller coil face area will lead to worse heating efficiency. In that condition, the heat pump will start and stop frequently which causes more time and more power consumption to heat up the DHW tank.

3 Structural Drawings

The typical structure of the DHW tank is shown as below (only for example):



Ref.	Name
1	Control panel
2	Storage tank
3	External covering
4	Top covering
5	Thermal insulation
6	Temperature pressure valve connection port
7	DHW electric heater
8	DHW tank inner coil inlet
9	DHW tank inner coil outlet
10	DHW tank water inlet
11	DHW tank water outlet
12	Drainage outlet
13	Thermistor for DHW

For different storage capacity, the structural design of the DHW tank may be different. The parameters of the typical structure shown in the left are recommended as follows:

Ref.	Recommended value(mm)*
A	Min.150

\*Please check and adjust according to the actual situation.

**i NOTE**

(1) Thermistor for DHW

- ① The DHW tank including the thermistor, the DHW electric heater and the DHW tank inner coil must be designed and installed in accordance with the local regulation.
- ② The position of the thermistor is very important. The reasonable position will help to ensure the detection accuracy of the DHW emperature. It is related to the operation of the heat pump.

(2) DHW electric heater

- ① The electric heater is necessary to heat up the DHW tank in the following conditions:
  - Supplement the heat pump to heat up the DHW tank when the heating capacity of the heat pump is insufficient in low ambient temperature.
  - Heat up the DHW tank when the operating conditions exceed the limitation, see details in Section "8.1.1 GENERAL INFORMATION".
- ② The capacity of the DHW electric heater is related to the storage capacity of the DHW tank, and should be selected according to the following demand.
  - Larger capacity of the DHW electric heater is beneficial to heat up the DHW tank, but will consume more power, while smaller capacity of the electric heater will cost more time to heat up the DHW tank.

**! CAUTION**

- The temperature pressure valve and the temperature protection device (covered by the control panel ) must be installed according to local regulation and performed by qualified professionals referring to Section "8.1.8.5.2 Safety device".



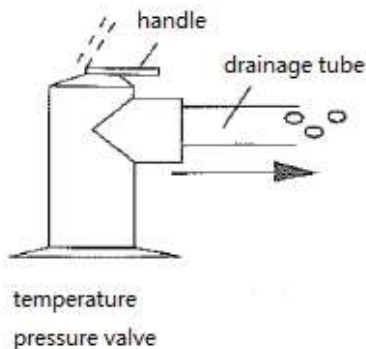
## Installation

### 8.1.8.4.2 Safety device

#### 1 Temperature pressure valve

A temperature pressure valve which fit with local national requirements should be installed together with DHW tank to avoid the excessive higher temperature and pressure.

- Temperature pressure valve must be tightly connected with drainage pipe. Drainage pipe must be connected as shown below and introduced to building down corner (The water temperature in drainage pipe may be high, note burns).
- Temperature pressure valve in DHW tank can not be connected for other purposes.
- Check temperature pressure valve once half a year. When checking, open temperature pressure valve handle (seen below), temperature pressure valve will smoothly drain water out. The water temperature may be high, note burns. Reset after it is errorless. If drainage fails, contact local dealer for repair.
- Temperature pressure valve and its drainage pipe must keep smooth and not blocked.



#### CAUTION

- If DHW tank is not used for more than 2 weeks, a certain amount of hydrogen will gather in DHW tank. It is recommended to open temperature pressure valve handle or water outlet faucet for several minutes to release hydrogen. However, do not open hot water faucet in dishcleaning machine and washing machine, etc. When hydrogen is released, do not make open flame or operate other electrical apparatus. When gas is released, releasing sound will be heard.
- Temperature pressure valve is used to prevent too high temperature in DHW tank (> 94°C, recommended) and water pressure (> 0.85MPa, recommended).

#### 2 Temperature protection switch

- When using the DHW electric heater, an Auto Restore Temperature Protection Switch (THe2) has to be installed to prevent the DHW temperature from being heated uncontrollable. When DHW temperature exceeds the protection value, the temperature protection switch opens, and auto restores when DHW temperature reduces below the protection value. The protection value can be selected according to temperature requirement of DHW. The recommended protection value is 80°C.

- Temperature Protection Switch / Temperature fuse (THe1) is connected in the DHW electric heater power supply circuit, which can directly cut off the power supply of DHW electric heater when DHW temperature exceeds the protection value. The recommended protection value is 90°C.
- The detail wiring diagram of DHW tank is shown in section “8.1.9.3.3 Wiring of DHW”.

#### CAUTION

- Do not install DHW electric heater without temperature protection device.
- Electrical box cover must be opened by qualified electrician. Power off before open electrical box cover.

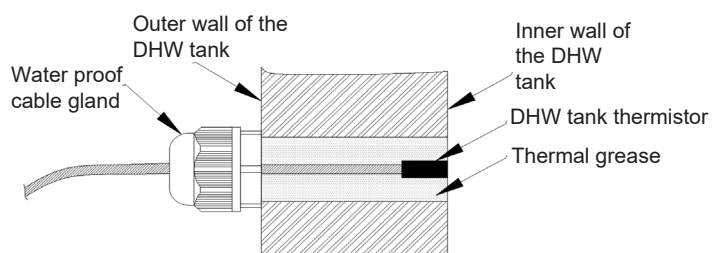
### 8.1.8.4.3 DHW tank installation

#### NOTE

- Recommend installing this equipment to balcony or outdoor at temperature from 0°C to 43°C.
- DHW tank is mounted near floor drain to connect temperature pressure valve drainage pipe.
- Do not install DHW tank in place with corrosive gas.
- Installation location is free from frosting.
- Installation location must bear weight of DHW tank containing water.
- Ensure dimension of water pipe is above 1 inch (recommend DN40 water pipe), provide enough volume to pipeline and reduced resistance in pipeline system.
- DHW tank is located in a place that is convenient for repair and ensure electrical box is open.
- No accumulated water around installation location.
- Arrange filter at water inlet pipe, preventing domestic water contaminated by impurities.
- Ensure DHW tank is full of water before energizing.

#### Install DHW tank

- (1) Check DHW tank for complete accessories.
- (2) When mounted on ground, ensure the bottom of DHW tank is flat and vertically. If mounted in bath room where water exists, recommend installing on a foundation higher than ground, preventing the bottom being soaked by water.
- (3) To ensure the measurement accuracy, the DHW tank thermistor should be coated with thermal grease. The water proof cable gland (field supplied) is recommended to secure the sensor firmly. The DHW tank sensor must be installed to reach the inner wall of the DHW tank and keep in good contact with it.



**CAUTION**

- DHW tank supplies hot water from tap water. Domestic hot water is only used when tap water is connected.
- For safety, do not add ethylene glycol into water circulation. If added, water will be contaminated when heat exchanger coil leaks.
- When water hardness is more than 250-300 ppm, recommend using softened water to reduce DHW tank scale.
- Immediately flush DHW tank with fresh water after installation. Flush once every day in first five days of installation.
- Try to avoid long runs of water piping between the tank and the DHW installation in order to decrease possible temperature losses.  
If the domestic cold water entry pressure is higher than the DHW tank's design pressure, a pressure reducer must be fitted.
- After used for a while (depend on local water quality and use frequency), clean DHW tank and remove scales.
  - a. Power off and close water inlet valve.
  - b. Open water outlet valve and drainage valve to empty DHW tank.

**CAUTION**

When scales are removed, temperature in DHW tank may be a little high, it should prevent burns or drainage equipment damaged.

- c. Close drainage valve after cleaning several minutes with water inlet valve opened. Ensure effluent water is closed after DHW tank is full of water. Power on and get back to work.

8.1.8.5 WATER CONTROL

It is necessary to analyse the quality of water by checking pH, electrical conductivity, ammonia ion content, sulphur content, and others. The following is the recommended standard water quality.

Item	Chilled water system		Tendency (1)	
	Circulating water (20°C less than)	Supply water	Corrosion	Deposits of scales
Standard Quality pH (25 °C)	6.8 ~ 8.0	6.8 ~ 8.0	•	•
Electrical Conductivity (mS/m) (25 °C) {µS/cm} (25 °C) (2)	Less than 40 Less than 400	Less than 30 Less than 300	•	•
Chlorine Ion (mg Cl <sup>-</sup> /l)	Less than 50	Less than 50	•	
Sulphur Acid Ion (mg H <sub>4</sub> SO <sub>4</sub> <sup>-</sup> /l)	Less than 50	Less than 50	•	
The amount of Acid consumption (pH 4.8) (mg CaCO <sub>3</sub> /l)	Less than 50	Less than 50		•
Total Hardness (mg CaCO <sub>3</sub> /l)	Less than 70	Less than 70		•
Calcium Hardness (mg CaCO <sub>3</sub> /l)	Less than 50	Less than 50		•
Silica L (mg SiO <sub>2</sub> /l)	Less than 30	Less than 30		•
Reference Quality Total Iron (mg Fe/l)	Less than 1.0	Less than 0.3	•	•
Total Copper (mg Cu/l)	Less than 1.0	Less than 0.1	•	
Sulphur Ion (mg S <sup>2-</sup> /l)	It shall not be detected		•	
Ammonium Ion (mg NH <sub>4</sub> <sup>+</sup> /l)	Less than 1.0	Less than 0.1	•	
Remaining Chlorine (mg Cl/l)	Less than 0.3	Less than 0.3	•	
Floating Carbonic Acid (mg CO <sub>2</sub> /l)	Less than 4.0	Less than 4.0	•	
Index of Stability	6.8 ~ 8.0	-	•	•

**NOTE**

- (1) The mark “•” in the table means the factor concerned with the tendency of corrosion or deposits of scales.
- (2) The value showed in “{ }” are for reference only according to the former unit.

8.1.9 Electrical and control settings

8.1.9.1 General check

- (1) Ensure all electrical apparatus used on site (power switch, circuit breaker, lead, conduit and terminal board) are selected according to technical manual and national and local codes. Wiring must be made according to national and local codes.
- (2) Check voltage is within rated voltage  $\pm 10\%$ . In case of low voltage, system will not start. In case of high voltage, electrical parts will be burnt out.
- (3) Confirm earth wire is connected.

Use wires which are not lighter than the polychloroprene sheathed flexible cord (code designation 60245 IEC 57).

Model	Power supply	Operation mode	Max. current (A)	Power supply cables	Transmitting cables	CB (A)	ELB (No. of poles/A/mA)
				EN60335-1	EN60335-1		
AHM- (044/060/080) HCDSSA	220-240V ~ 50/60Hz	Without DHW electric heater	16	3 x 2.5 mm <sup>2</sup>	2 x 0.75 mm <sup>2</sup>	20	2/20/30
		With DHW electric heater	31	3 x 6.0 mm <sup>2</sup>		40	2/40/30

CB: Air circuit breaker.

ELB: Earth leakage breaker.

**CAUTION**

- Turn OFF the main power switch of the indoor unit and the outdoor unit and wait for more than 10 minutes before electrical wiring work or a periodical check is performed.
- The data corresponding to DHW electric heater is calculated in combination with the domestic hot water tank with 3kW DHW electric heater. The DHW electric heater which power is equal or lower than 3kW, can be driven directly by indoor unit. As for the DHW electric heater which power is over 3kW, the unit can only provide control signal.

**NOTE**

- (1) Field wiring shall be in conformity to local laws and regulations, and all wiring operations must be performed by qualified professionals.
- (2) Refer to relevant standards for Above-noted power supply cables size.
- (3) Where power supply cable is connected through junction box in series, be sure to determine the total current and choose wires based on the table below. Selection according to EN 60335-1.

Current i (A)	Wire size (mm <sup>2</sup> )
$i \leq 6$	2.5
$6 < i \leq 10$	2.5
$10 < i \leq 16$	2.5
$16 < i \leq 25$	4
$25 < i \leq 32$	6
$32 < i \leq 40$	10
$40 < i \leq 63$	16
$63 < i$	※1

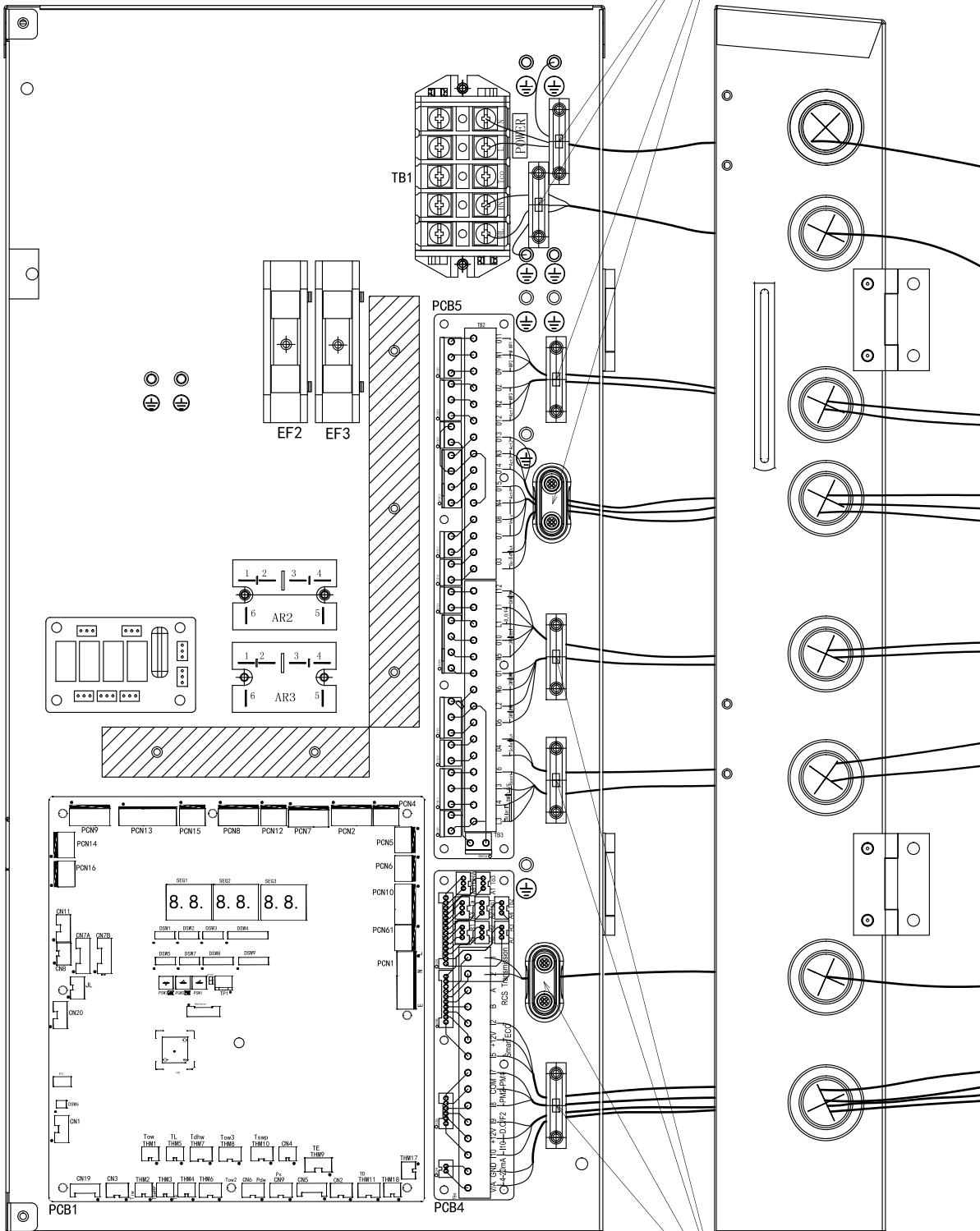
※ 1: In the case that current exceeds 60A, do not connect cables in series.

- (4) As a minimum, the chosen wires shall not be lighter than the polychloroprene sheathed flexible cord (code designation 60245 IEC 57).
- (5) The wiring specifications for weak current transmission circuit shall not be lower than that for RVV(S)P shielded wires or equivalent, and the shielding layer shall be grounded.
- (6) A switch that can ensure all-pole disconnection shall be installed between power supply and air conditioning unit in such a manner that the contact spacing shall not be less than 3 mm.
- (7) Once the power cord is damaged, the dealer or the professionals from designated maintenance department must be contacted in a timely manner for repair and replacement.
- (8) For the installation of power cord, the earth wire must be longer than the current-carrying conductor.

8.1.9.2 WIRING

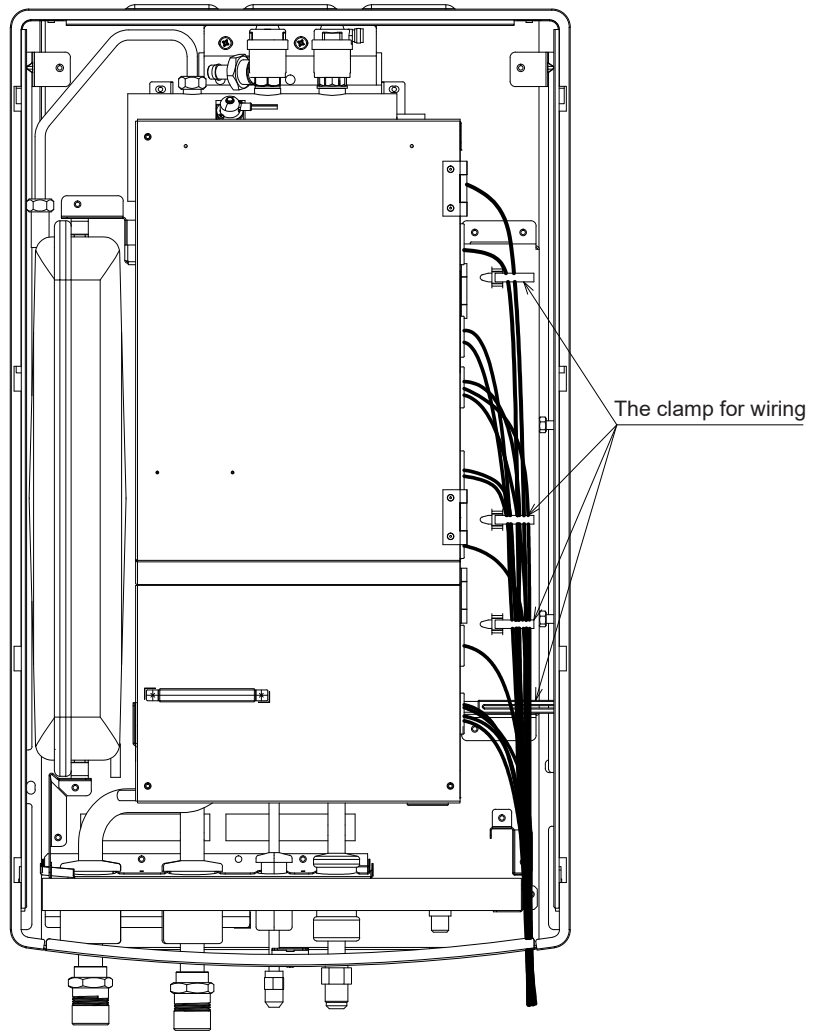
1. The electrical box inner wiring and wire fixing shall be operated as shown below.

All wires shall be firmly fixed with fixing clamps, and ensure that each wire is reliably grounded.

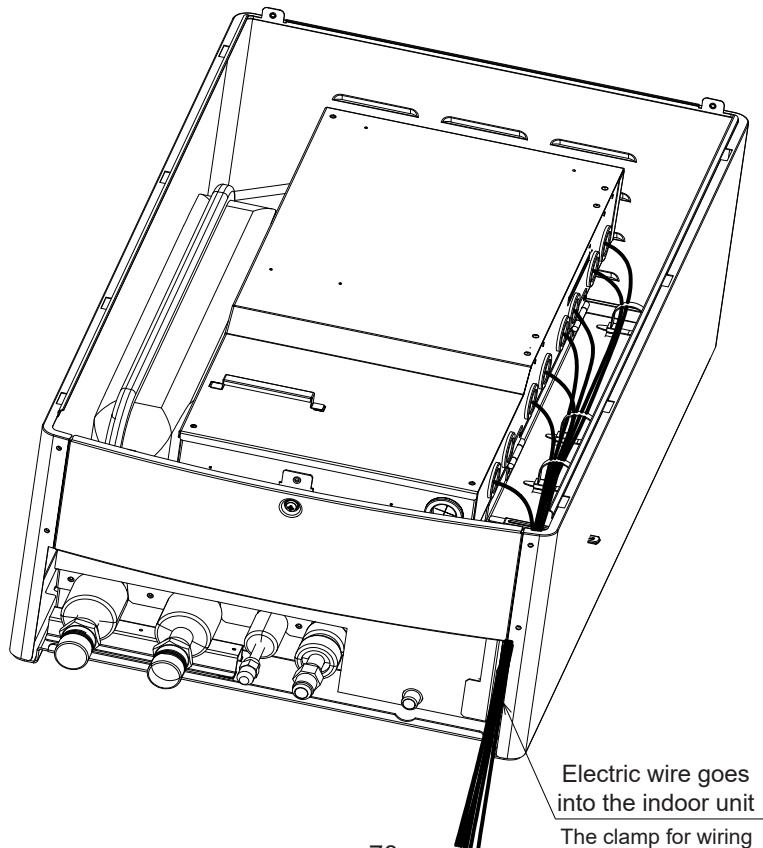


All wires shall be firmly fixed with fixing clamps, and ensure that each wire is reliably grounded.

2. The wiring route outside electrical box, as below.



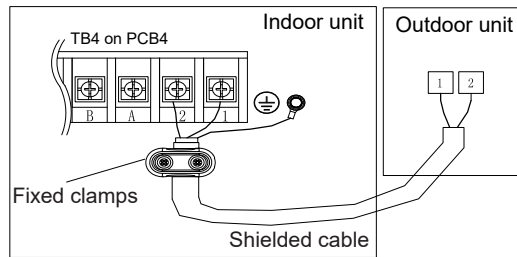
3. All wires enter the unit.



8.1.9.3 TERMINAL BOARD CONNECTIONS

8.1.9.3.1 Indoor / outdoor transmission wiring

- The transmission is wired to terminals 1-2.
- The shielding layer shall be grounded.



- Use twist pair wires (0.75 mm<sup>2</sup>) for transmission wiring between outdoor unit and indoor unit. The wiring must consist of 2-core wires (Do not use wire with more than 3 cores).
- Use shielded wires for transmission wiring to protect the units from noise interference, with a length of less than 300 m and a size in compliance with local codes.
- In the event that a conduit tube for field-wiring is not used, fix rubber bushes to the panel with adhesive.

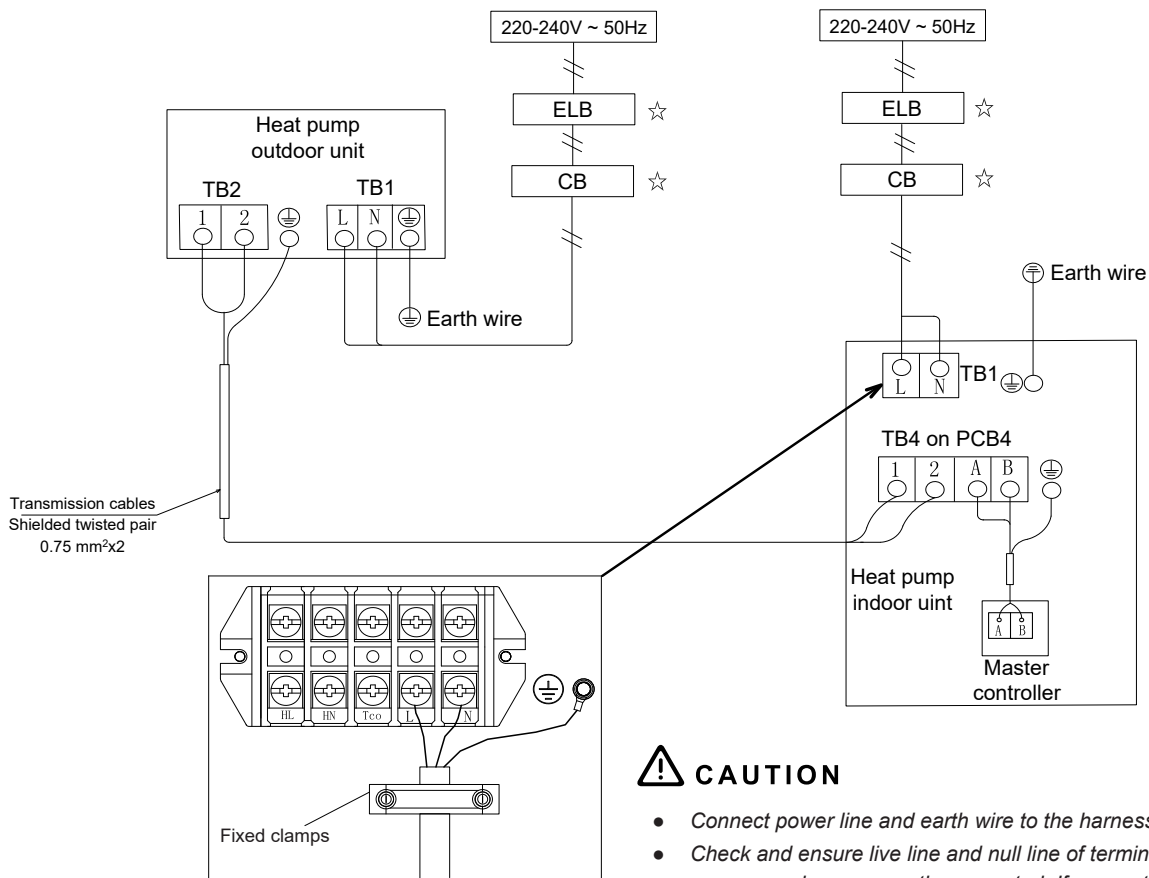
**CAUTION**

Ensure that the transmission wiring is not wrongly connected to any live part that could damage the PCB.

8.1.9.3.2 Terminal board 1 (Main power supply)

The main power supply connection is wired to the Terminal board (TB1) as follows:

- TB: Terminal board
- CB: Air circuit breaker
- ELB: Earth leakage breaker
- //—: Power supply cables
- : Transmission cables
- ☆: Field supplied, not contained in the indoor unit



**CAUTION**

- Connect power line and earth wire to the harness.
- Check and ensure live line and null line of terminal boards in power supply are correctly connected. If connected incorrectly, some parts may be damaged.

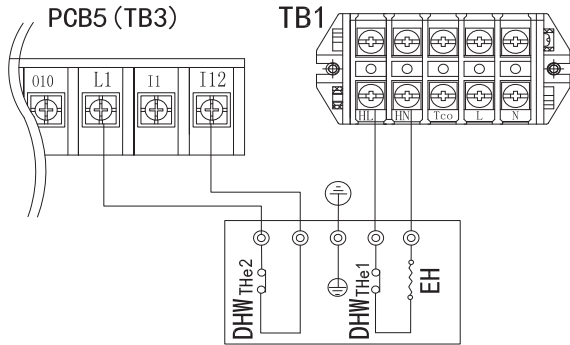
8.1.9.3.3 Wiring of DHW

**CAUTION**

The electric heater of the DHW tank needs to meet the relevant requirements of local laws and regulations. It is necessary to protect it through a temperature fuse and a temperature protection switch.

**1 Electric heater power ≤ 3 kW.**

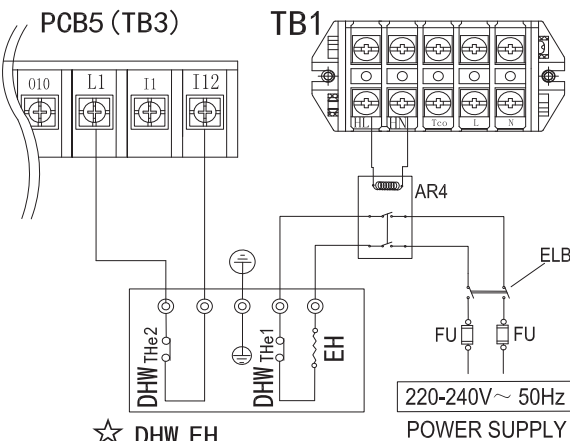
Power line connection should give concern to live line and null line, and be grounded strictly.



☆ DHW EH

**2 Electric heater power > 3 kW.**

When the capacity of the electric heater is greater than 3 kW, the terminal HL/HN only provides control signals to control the ON/OFF of the AC contactor.



☆ DHW EH

**CAUTION**

Electrical wiring must be performed by professional technician according to national regulations.

- Correctly mount cable water proof head and electrical box cover, preventing short circuit caused by water intruding into electrical box.
- To install the DHW electric heater which power is ≤ 3kW, power line requirements are shown below:

	Power Source	Rated Current	Power Source Cable Size
			EN60335-1*
DHW tank power supply	220V-240V ~ 50Hz	15A	3 × 2.5mm <sup>2</sup>
DHW tank temperature switch	220V-240V ~ 50Hz	-	2 × 0.75~2.5mm <sup>2</sup>

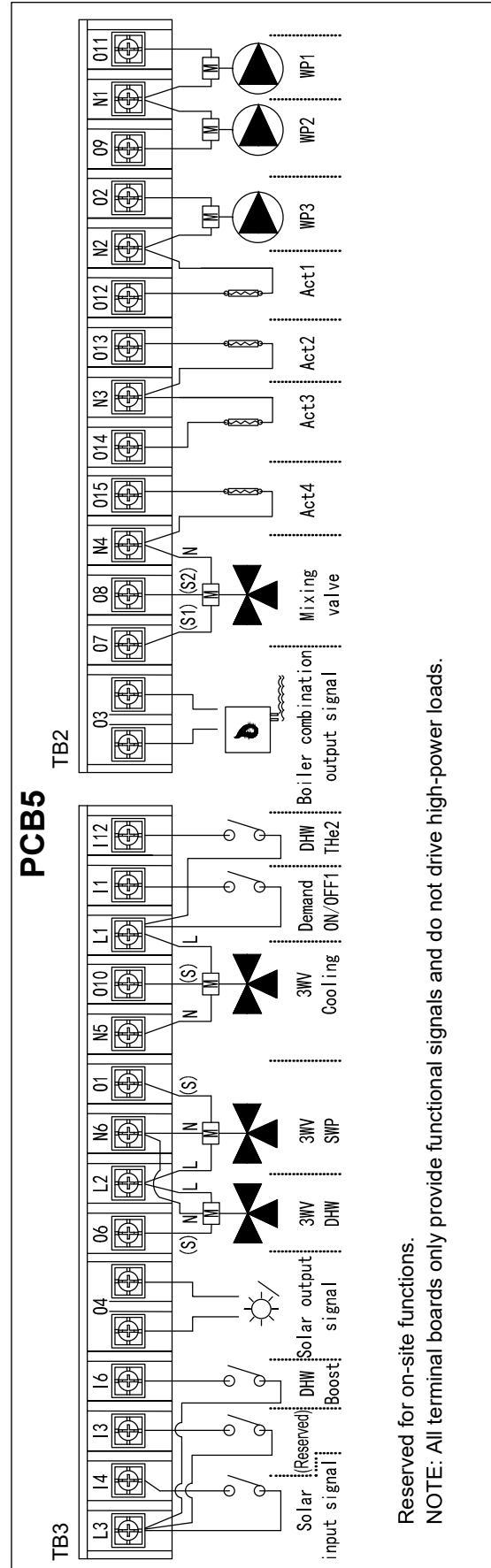
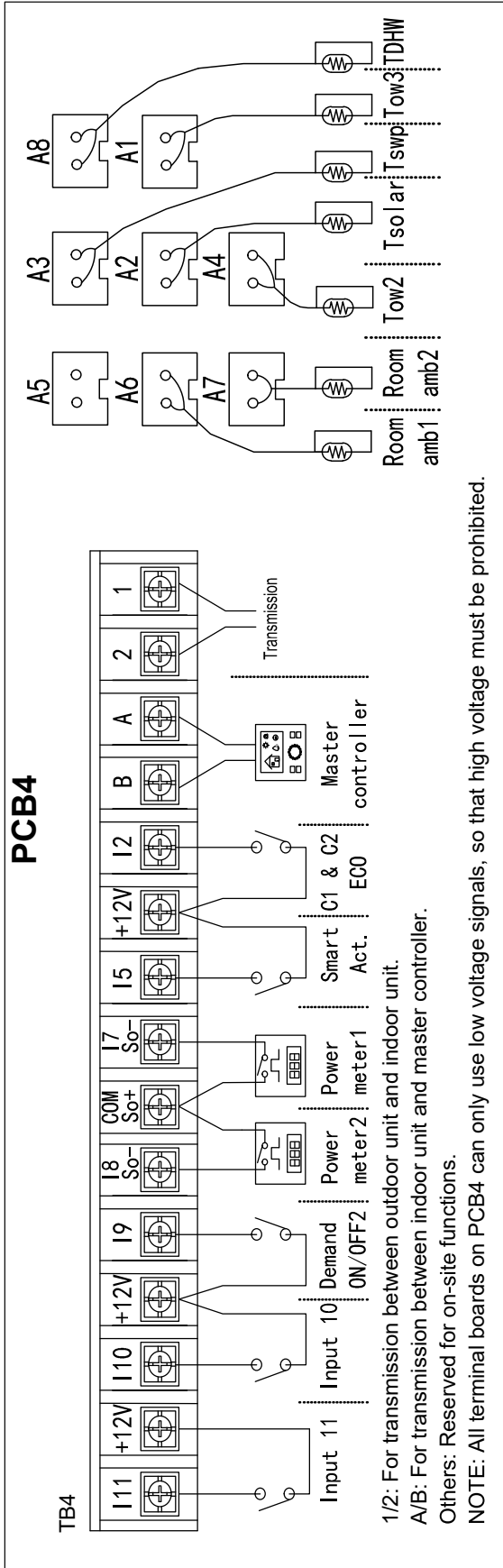
\* Code designation 60245 IEC 57

- Installation of on-site wire must complies with applicable legislation.
  - When power line is connected in series, total current value selects power line specification.
- Thermistor of DHW tank is weak current signal, preventing mixed with strong current signal.
  - The DHW tank must have temperature protection devices recommended in this section to ensure the power supply of DHW electric heater can be cut off in time when the DHW temperature is too high.

Codes	Indications	Recommended parameters
DHW EH	DHW electric heater assembly	
EH	DHW electric heater	
ThE1	Temperature protection switch / Temperature fuse Connected in the DHW electric heater power supply circuit, directly cut off the power supply of DHW electric heater when DHW temperature exceeds the protection value.	Protection value 90 °C
ThE2	Temperature protection switch (Auto restore) When DHW temperature exceeds the protection value, the temperature protection switch open, and auto restore when DHW temperature reduce below the protection value. The unit can detect this temperature protection switch is open and cuts off the power supply DHW electric heater.	Protection value 80 °C
AR4	AC contactor (repeater)	Selection according to EH (DHW) specifications
FU	Fuse	



8.1.9.4 OPTIONAL INDOOR UNIT WIRING (ACCESSORIES)



**NOTE**

Inputs and outputs printed on the board are the setting before shipment options. By means of the master controller, some other inputs and output functions can be configured and used.



Input - Setting before shipment

Mark	Description	Default settings	Available input codes	Terminals	Specification
I1	Input 1	i - 08 (Demand ON/OFF 1)	i - 00~17 (Except i - 07/12)	I1, L1 on TB3	Closed/Open 220-240V ~ 50/60Hz
I2	Input 2	i - 13 (Cycle 1 and 2 ECO mode)	i - 00~17 (Except i - 07/12)	I2, +12V on TB4	Closed/Open 12V DC
I3	Input 3	i - 00 (No function)	i - 00~17 (Except i - 07/12)	I3, L3 on TB3	Closed/Open 220-240V ~ 50/60Hz
I4	Input 4	i - 04 (Solar in)	i - 00~17 (Except i - 07/12)	I4, L3 on TB3	Closed/Open 220-240V ~ 50/60Hz
I5	Input 5	i - 02 (Smart Act.)	i - 00~17 (Except i - 07/12)	I5, +12V on TB4	Closed/Open 12V DC
I6	Input 6	i - 06 (DHW Boost)	i - 00~17 (Except i - 07/12)	I6, L3 on TB3	Closed/Open 220-240V ~ 50/60Hz
I7	Input 7	i - 07 (Power meter 1)	i - 00~17	I7, COM on TB4	Closed/Open 12V DC
I8	Input 8	i - 12 (Power meter 2)	i - 00~17	I8, COM on TB4	Closed/Open 12V DC
I9	Input 9	i - 09 (Demand ON/OFF 2)	i - 00~17 (Except i - 07/12)	I9, +12V on TB4	Closed/Open 12V DC
I10	Input 10	i - 00 (No function)	i - 00~17 (Except i - 07/12)	I10, +12V on TB4	Closed/Open 12V DC
I11	Input 11	i - 00 (No function)	i - 00~17 (Except i - 07/12)	I11, +12V on TB4	Closed/Open 12V DC

 CAUTION

*Functions i - 05(Forced Heating/Cooling) /Functions i - 10(Forced heating)/Functions i - 11(Forced cooling) cannot be used at the same time.*

**Input - All input codes descriptions:**

Input codes	Mark	Description
i - 00	No Function	-
i - 02	Smart Act./ SG Ready Input 1	This function must be used to stop or limit the heat pump and Auxiliary electric heater when restricted by Electric company. It allows an external Smart switch device to switch off or reduce consumption of the heat pump and Auxiliary electric heater during time of peak electricity demand. In case of using Smart Grid application, this input is used as a digital input 1 and allows four different operating modes.
i - 03	Swimming pool Demand ON/OFF	Optional input signal can be configured as function of "Swimming pool Demand ON/OFF" to operate SWP. Switch ON/OFF of SWP can also be controlled by master controller. Closed: Start SWP operation (Switch ON and Demand ON) Open: Stop SWP operation (Switch OFF and Demand OFF)
i - 04	Solar in	In case of combining Unit with solar panels, this input is used as a feedback for solar station ready operation. Closed: Solar in ON to trigger solar pump operation ON Open: Solar in OFF to trigger solar pump operation OFF
i - 05	Forced Heating/Cooling	Heating/cooling can be changed by an input of an external contact signal. Heating/cooling can also be changed over by master controller. Closed: Heating mode Open: Cooling mode
i - 06	DHW Boost	With this function enabled, it is possible to request a heating up of the DHW when user requires an instantaneous delivery of DHW. Triggering input signal can also Switch ON DHW.
i - 07	Power meter 1	Input used as kW/h pulse count for Energy data recording, used to count energy data or the total energy data.
i - 08	Demand ON/OFF 1	Optional input signal can be configured as function of "Demand ON/OFF 1" or "Demand ON/OFF 2" and selected as room thermostat. Closed: Corresponding room thermostat Switch ON and Thermo ON. Open: Corresponding room thermostat Switch OFF and Thermo OFF. Corresponding room thermostat can also be Switch ON/OFF by Rooms function on Master controller.
i - 09	Demand ON/OFF 2	
i - 10	Forced heating	Forced Heating mode by input of contact signal, Heating can also be changed over by master controller. Closed: Forced Heating mode Open: No action
i - 11	Forced cooling	Forced Cooling mode by input of contact signal, Cooling can also be changed over by master controller. Closed: Forced Cooling mode Open : No action
i - 12	Power meter 2	Input used as kW/h pulse count for Energy data recording, used to count energy data or the total energy data.
i - 13	Cycle 1 and 2 ECO mode	Cycle 1 and Cycle 2 Water ECO offset. Current water temperature setting is reduced or increased by the indicated parameter in space heating mode or space cooling mode. Closed: Cycle 1 and Cycle 2 Water ECO offset enabled Open: Cycle 1 and Cycle 2 Water ECO offset disabled
i - 14	Cycle 1 ECO mode	Cycle 1 Water ECO offset. Current water temperature setting is reduced or increased by the indicated parameter in space heating mode or space cooling mode. Closed: Cycle 1 Water ECO offset enabled Open: Cycle 1 Water ECO offset disabled
i - 15	Cycle 2 ECO mode	Cycle 2 Water ECO offset. Current water temperature setting is reduced or increased by the indicated parameter in space heating mode or space cooling mode. Closed: Cycle 2 Water ECO offset enabled Open: Cycle 2 Water ECO offset disabled
i - 16	Force OFF	Force OFF the unit include Water Cycle 1, Water Cycle 2, DHW and SWP. Switch ON/OFF of different function can also be controlled by master controller. Closed: Forced OFF the unit include Water Cycle 1, Water Cycle 2, DHW and SWP. Open: No action"
i - 17	SG Ready Input 2	In case of using Smart Grid application, this input is used as a digital input 2 and allows four different operating modes.

Output - Setting before shipment

Mark	Description	Default settings	Available output codes	Terminals		Specification
O1	Output 1	o - 01 (3WV SWP)	o - 00 ~ 29 (Except o - 02/08/17/21)	Power supply	L2, N6 on TB3	ON/OFF 220-240V ~ 50/60Hz Max. 1A
				Signal line	O1 on TB3	
O2	Output 2	o - 02 (WP3)	o - 00 ~ 29 (Except o - 17)	O2, N2 on TB2		ON/OFF 220-240V ~ 50/60Hz Max. 1A
O3	Output 3	o - 03 (Boiler combination)	o - 00 ~ 29 (Except o - 02/08/17/21)	O3 on TB2		Free voltage
O4	Output 4	o - 04 (Solar out)	o - 00 ~ 29 (Except o - 02/08/17/21)	O4 on TB3		Free voltage
O5	Output 5	o - 17 (DHW Electric Heater)	o - 00 ~ 29	HL, HN on TB1		ON/OFF 220-240V ~ 50/60Hz Max. 15A
O6	Output 6	o - 18 (3WV DHW)	o - 00 ~ 29 (Except o - 02/08/17/21)	Power supply	L2, N6 on TB3	ON/OFF 220-240V ~ 50/60Hz Max. 1A
				Signal line	O6 on TB3	
O7	Output 7	o - 19 (Mixing valve Close)	o - 00 ~ 29 (Except o - 02/08/17/21)	O7, N4 on TB2		ON/OFF 220-240V ~ 50/60Hz Max. 1A
O8	Output 8	o - 20 (Mixing valve Open)	o - 00 ~ 29 (Except o - 02/08/17/21)	O8, N4 on TB2		ON/OFF 220-240V ~ 50/60Hz Max. 1A
O9	Output 9	o - 21 (WP2)	o - 00 ~ 29 (Except o - 17)	O9, N1 on TB2		ON/OFF 220-240V ~ 50/60Hz Max. 1A
O10	Output 10	o - 22 (3WV Cooling)	o - 00 ~ 29 (Except o - 02/08/17/21)	Power supply	L1, N5 on TB3	ON/OFF 220-240V ~ 50/60Hz Max. 1A
				Signal line	O10 on TB3	
O11	Output 11	o - 08 (WP1)	o - 00 ~ 29 (Except o - 17)	O11, N1 on TB2		ON/OFF 220-240V ~ 50/60Hz Max. 1A
O12	Output 12	o - 23 (Act1)	o - 00 ~ 29 (Except o - 02/08/17/21)	O12, N2 on TB2		ON/OFF 220-240V ~ 50/60Hz Max. 1A
O13	Output 13	o - 24 (Act2)	o - 00 ~ 29 (Except o - 02/08/17/21)	O13, N3 on TB2		ON/OFF 220-240V ~ 50/60Hz Max. 1A
O14	Output 14	o - 25 (Act3)	o - 00 ~ 29 (Except o - 02/08/17/21)	O14, N3 on TB2		ON/OFF 220-240V ~ 50/60Hz Max. 1A
O15	Output 15	o - 26 (Act4)	o - 00 ~ 29 (Except o - 02/08/17/21)	O15, N4 on TB2		ON/OFF 220-240V ~ 50/60Hz Max. 1A

**Output - All output codes descriptions:**

Output codes	Mark	Description
o - 00	No Function	-
o - 01	3WV SWP	In case of combining Unit with swimming pool, this output is used to drive 3-way valve diverting to the swimming pool heat exchanger. Output ON signal when swimming pool function is operating.
o - 02	WP3	In case of combining Unit with hydraulic separator, this output is used to drive relay of water pump 3.
o - 03	Boiler combination	In case of combining Unit with boiler, this output is used to Start/Stop it.
o - 04	Solar out	In case of combining Unit with solar panel, this output is used to drive relay of solar pump.
o - 05	Alarm signal	Output ON signal when an Alarm Code is existence.
o - 06	SWP signal	Output ON signal in case that Swimming pool function is demand ON.
o - 07	Cooling signal	Output ON signal in case that Space Cooling is Thermo-ON.
o - 08	WP1	In case of the pipeline connected to the unit is long leading to low water flow rate, this output is used to drive relay of a extra WP1 that can be cascaded with inside EC WP1 to offer additional hydraulic head. The extra WP1 works equally with inside EC WP1.
o - 09	Heating signal	Output ON signal in case that Space Heating is Thermo-ON.
o - 10	DHW signal	Output ON signal in case that DHW is demand ON or DHW Electric Heater is ON.
o - 11	Solar overheat	Output ON signal in case that solar panels overheat protection is activated.
o - 12	Defrost	Output ON signal in case that the outdoor unit is defrosting.
o - 13	DHW re-circulation pump	Output ON signal to drive relay of a re-circulation pump in case of re-circulation pump is available for DHW tank.
o - 14	Heater relay 1	Copy ON/OFF signal of Auxiliary electric heater output terminal 1.
o - 15	Heater relay 2	Copy ON/OFF signal of Auxiliary electric heater output terminal 2.
o - 16	c1 water ON/OFF	Output ON signal in case that Water Cycle1 switch ON.
o - 17	DHW Electric Heater	Output ON signal in case the DHW Electric Heater is Enabled and meet the ON conditions.
o - 18	3WV DHW	In case of combining Unit with DHW, this output is used to drive 3-way valve diverting to the sanitary tank inner coil. Output ON signal when DHW function is operating.
o - 19	Mixing valve Close	Mixing valve has two operation terminals of closing valve and opening valve. Optional output signal need be configured as function of "Mixing valve Close" and "Mixing valve Open" to drive mixing valve.
o - 20	Mixing valve Open	
o - 21	WP2	When Water Cycle 2 is available Optional Output signal need be configured to drive relay of water pump 2.
o - 22	3WV Cooling	In case of combining Unit with cooling fan coil, this output is used to drive 3-way valve diverting to cooling fan coil. Output ON signal when space cooling is operating.
o - 23	Act1	Room actuators, output ON signal in case the corresponding Room Thermostat is Thermo ON (heating and cooling). And also meet follow condition Room actuators also Output ON: ① Air purge ② Anti-freezing ③ Screed Drying ④ Retry operation due to anti freezing (alarm-76 , d1-31, d1-03) ⑤ Outdoor Unit defrost without Room Thermostat Thermo ON ⑥ Overrun after requiring OFF
o - 24	Act2	
o - 25	Act3	
o - 26	Act4	
o - 27	Act5	
o - 28	Act6	
o - 29	Act7	

## Auxiliary sensor - Setting before shipment

Mark	Description	Default settings	Available auxiliary sensor codes
A1	Auxsensor 1	a - 01 (Tow3)	a - 00 ~ 13
A2	Auxsensor 2	a - 03 (Tsolar)	a - 00 ~ 13
A3	Auxsensor 3	a - 02 (Tswp)	a - 00 ~ 13
A4	Auxsensor 4	a - 05 (Tow2)	a - 00 ~ 13
A5	Auxsensor 5	a - 00 (No Function)	a - 00 ~ 13
A6	Auxsensor 6	a - 07 (Room_amb1)	a - 00 ~ 13
A7	Auxsensor 7	a - 08 (Room_amb2)	a - 00 ~ 13

## Auxiliary sensor codes - All Auxiliary sensor codes descriptions:

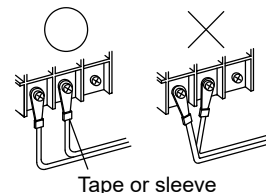
Auxiliary sensor codes	Mark	Description
a - 00	No Function	-
a - 01	Tow3	This sensor is used in case to combine Unit with hydraulic separator to detect Hot water temperature detection of hydraulic separator .
a - 02	Tswp	In case of combining Unit with swimming pool, this sensor is used to detect swimming pool water temperature.
a - 03	Tsolar	In case of combining Unit with solar panels, this sensor is used to Detect Hot water temperature of solar panels .
a - 04	Ta_ao	Optional Second Outdoor Ambient Temperature sensor accessory can be connected to the Auxiliary sensor in case that the heat pump is located in a non-suitable position for this measurement.
a - 05	Tow2	When Water Cycle 2 is available, auxiliary sensor need be configured as function of "Tow2" to detect outlet water temperature of Water Cycle 2.
a - 06	duty	Used to detect duty signal when duty signal control is Enabled, the duty signal type can be 0-10V, 0-5V or 10-20mA.
a - 07	Room_amb1	Rooms function on master controller is selected as room thermostat, and in this scenario, auxiliary sensor can be configured as function of "Room_amb1-7", and can be selected as room temperature detection of specific room.
a - 08	Room_amb2	
a - 09	Room_amb3	
a - 10	Room_amb4	
a - 11	Room_amb5	
a - 12	Room_amb6	
a - 13	Room_amb7	

### DANGER

- **Do not connect or adjust any wiring or connections unless the main power switch is OFF.**
- **When using more than one power source, check and ensure that all of them are turned OFF before operating the indoor unit.**
- **Avoid wiring installation in contact with the refrigerant pipes, water pipes, edges of plates and electrical components inside the unit to prevent damage, which may cause electric shock or short circuit.**

### CAUTION

- After changing the input settings, output settings and auxiliary sensor settings on the master controller, it needs to be powered off and on again to take effect.
- Use a dedicated power circuit for the indoor unit. Do not use a power circuit shared with the outdoor unit or any other appliance.
- Make sure that all wiring and protection devices are properly selected, connected, identified and fixed to the corresponding terminals of the unit, specially the protection (earth) and power wiring, taking into account the applicable national and local regulations. Establish proper earthing. Incomplete earthing may cause electric shock.
- Protect the indoor unit against the entry of small animals (like rodents) which could damage the drain pipe and any internal wire or any other electrical part, leading to electric shock or short-circuit.
- Keep a distance between each wiring terminal and attach insulation tape or sleeve as shown in the figure.



Tape or sleeve

8.1.9.5 SETTING OF DIP SWITCHES ON PCB1

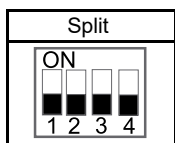
**i** NOTE

- The mark “■” indicates the dip switches positions.
- No mark “■” indicates pin position is not affected.
- The figures show the settings before shipment or after selection.
- “Not used” means that the pin must not be changed. A malfunction might occur if changed.

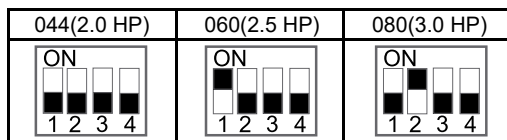
**⚠** CAUTION

Before setting dip switches, first turn the power supply OFF and then set the position of dip switches. If the switches are set without turning the power supply OFF, the contents of the setting are invalid.

(1) DSW1: Unit model setting  
No setting is required.



(2) DSW2: Unit capacity setting  
No setting is required.



(3) DSW3: Additional setting

Setting before shipment	GRUNDFOS UPM4K 15-75 130 	WILO Para RA15/7.0 
ON: Cancel 70 alarm (Water pressure abnormality)		
Anti-freezing settings ON: Whole water cycle does anti-freezing. OFF: Only primary cycle does anti-freezing.		

(4) DSW4: Additional setting

Setting before shipment	
Water pump forced ON	
Auxiliary electric heater forced OFF	
ON: Anti-freezing enabled OFF: Anti-freezing disabled	

Water pump mode when Thermo OFF ON: Operate periodically OFF: Operate constantly	
Manual emergency setting ON: Manual emergency enabled OFF: Manual emergency disabled	
DHW electric heater allowance setting ON: DHW electric heater cancel forced OFF OFF: DHW electric heater forced OFF	
DHW 3-way valve forced ON	
Start air purge	

(5) DSW5: Additional setting

Setting before shipment	
ON: Cancel 75/78 alarm (Water pump abnormalities)	
ON: WP3 operates in space cooling mode.	
ON: Cancel Alarm of Thermistor Tow2.	

(6) DSW6: Fuse reset

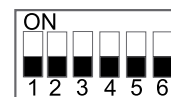
Setting before shipment	
-------------------------	--

(7) DSW7: Not used

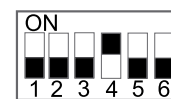
Setting before shipment	
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(9) DSW8: Refrigeration system No. setting

Setting is required.  
Use binary encoding method. Before shipment are all OFF.



Max No.63 are available to set when all the equipment are connected to corresponding Central Control System.  
Ex: Set refrigeration system No. as 8.



(8) DSW9: Indoor unit No. setting

No setting is required.

Setting before shipment	
-------------------------	--

8.1.10 TEST RUN

**i** NOTE

NEVER operate the unit without careful inspection.

8.1.10.1 CHECKLIST BEFORE TEST RUN

Do NOT operate the system before the following checks are OK:

You have read the complete installation instructions of outdoor unit, indoor unit and master controller carefully.	<input type="checkbox"/>
The indoor unit is properly mounted.	<input type="checkbox"/>
The outdoor unit is properly mounted.	<input type="checkbox"/>
The following field wiring has been carried out according to this document and the applicable legislation: <ul style="list-style-type: none"> <li>▪ Between the local power supply and the outdoor unit</li> <li>▪ Between indoor unit and outdoor unit</li> <li>▪ Between the local power supply and the indoor unit</li> <li>▪ Between the indoor unit and the valves (if applicable)</li> <li>▪ Between the indoor unit and the room thermostat (if applicable)</li> <li>▪ Between the indoor unit and the DHW tank (if applicable)</li> </ul>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
The system is properly earthed and the earth terminals are tightened.	<input type="checkbox"/>
The fuses or locally installed protection devices are installed according to this document, and have NOT been bypassed.	<input type="checkbox"/>
The power supply voltage matches the voltage on the Nameplate of the unit.	<input type="checkbox"/>
There are NO loose connections or damaged electrical components in the electrical box.	<input type="checkbox"/>
There are NO damaged components or squeezed pipes on the inside of the indoor and outdoor units.	<input type="checkbox"/>
Only for DHW tank with electric heater: Temperature protection switch (Auto restore) has been already wired. Temperature protection switch / Temperature fuse has been already wired.	<input type="checkbox"/>
There are NO refrigerant leaks.	<input type="checkbox"/>
The water pipes are thermally insulated.	<input type="checkbox"/>
The correct pipe size of refrigerant pipes (gas and liquid) are installed and the pipes are properly insulated.	<input type="checkbox"/>
There is NO water leakage inside the indoor unit.	<input type="checkbox"/>
The shut-off valves are properly installed and fully open.	<input type="checkbox"/>
The stop valves (gas and liquid) on the outdoor unit are fully open.	<input type="checkbox"/>
The air purge valve is open (at least 2 turns).	<input type="checkbox"/>
The safety valve purges water when open.	<input type="checkbox"/>
The minimum water volume is guaranteed in all conditions. See section 8.1.8.3 "Check water volume".	<input type="checkbox"/>
The DHW tank is filled completely.	<input type="checkbox"/>

**⚠ CAUTION**

- The unit starts only when all check points are cleared up.
- Pay attention when system is running:
  - (A) Do not touch any parts of discharge pipelines, because the discharge temperature of compressor can be more than 90°C.
  - (B) Do not press AC contactor button, otherwise serious accident may be caused.
- Do not touch any electrical components in 10 minutes after main power supply is cut off.

8.1.10.2 CHECKLIST DURING TEST RUN

The minimum flow rate during electric heater/defrost operation is guaranteed in all conditions. See section "8.1.8.2 Requirements and recommendations for hydraulic circuit" and "8.1.8.3 Water filling".	<input type="checkbox"/>
To perform an air purge.	<input type="checkbox"/>
To perform a test run.	<input type="checkbox"/>
To perform an actuator test run.	<input type="checkbox"/>
Underfloor screed drying function The underfloor screed drying function is started (if necessary).	<input type="checkbox"/>

**⚠ CAUTION**

- When performing test run of floor heating, higher temperature in indoor unit (up to 55 °C) will damage floors due to expansion and contraction. Recommend it is within 30 minutes.
- Use the controller to start test run (refer to the manual of master controller).
- It is normal that after indoor unit is energized, it may directly enter anti-freezing running mode, and water pump automatically runs if outdoor temperature is very low.

8.1.10.3 CHECK THE MINIMUM FLOW RATE

1	Check the hydraulic configuration to find out which space heating loops can be closed by mechanical, electronic, or other valves.	—
2	Close all space heating loops that can be closed.	—
3	Start the pump test run . See setting of DSW4-8 in section "8.1.9.5 DIP Switch Setting of PCB1" .	—
4	Read out the flow rate and modify the bypass valve setting to reach the minimum required flow rate + 2L/min.	—



## 8.2 Installation of Hi-Therma Integra Indoor Unit

### 8.2.1 GENERAL INFORMATION

This manual gives a common description and information for this heat pump air conditioner which you operate as well for other models.

This manual should be considered as a permanent part of the heat pump air conditioning equipment and should remain with the air conditioning equipment.

No part of this publication may be reproduced, copied, filed or transmitted in any shape or form without the permission of Hisense.

Within the policy of continuous improvement of its products, Hisense reserves the right to make changes at any time without prior notification and without being compelled to introducing them into products previously sold. This document may therefore have been subject to amendments during the life of the product.

As a result, some of the images or data used to illustrate this document may not refer to specific models. No claims will be accepted based on the data, illustrations and descriptions included in this manual.

This heat pump air conditioner has been designed for the following temperatures. Please operate the air conditioner within the ranges.

Temperature

		Min.	Max.
Outdoor unit	Space heating	-25°C DB	35°C DB
	Domestic hot water (DHW)	-25°C DB	40°C DB
	Space cooling	5°C DB	46°C DB
Indoor unit	Space heating	15°C	60°C
	Domestic hot water (DHW)	30°C	55°C (75°C*)
	Space cooling	5°C	22°C
	Temperature around	5°C DB	30°C DB
	Water pressure	1 bar	3 bar
	Ps (DHW Tank Pressure)	---	6 bar

DB: Dry Bulb

\*: When there is an DHW electric heater mounted in the DHW tank, the setting temperature can reach 75°C.

- Upon receiving this product, inspect it for any shipping damage. Claims for damage, either apparent or concealed, in a written form, should be filed immediately with the shipping company.
- Check the model number, electrical characteristics (power supply, voltage and frequency) and accessories to determine if they are correct.
- The standard utilization of the unit shall be explained in these instructions. Therefore, the utilization of the unit other than those indicated in these instructions is not recommended.
- Please contact your local agent, as the occasion arises.
- If you have any questions, please contact your dealer or designated service center of HISENSE.

### 8.2.2 SAFETY

#### 8.2.2.1 APPLIED SYMBOLS

During normal heat pump system design work or unit installation, greater attention must be paid in certain situations requiring particular care in order to avoid damage to the unit, the installation or the building or property.

Situations that pose a risk to the safety of those in the surrounding area or to the unit itself are clearly indicated in this manual.

A series of special symbols are used to clearly identify these situations.

Pay close attention to these symbols and to the messages following them, as your safety and that of others depends on it.

#### DANGER

- **The text following this symbol contains information and instructions relating directly to your safety.**
- **Not taking these instructions into account will lead to personal injury or death.**

#### CAUTION

- *The text following this symbol contains information and instructions relating directly to your safety.*
- *Not taking these instructions into account could lead to unit damage.*

#### NOTE

- *The text following this symbol contains information and instructions that may be use or that require a more thorough explanation.*
- *Instructions regarding inspections to be made on unit parts or systems may also be included.*



Caution, risk of fire!

**This appliance is filled with R32, an odorless low burning velocity refrigerant. If the refrigerant is leaked, there is a possibility of ignition if it enters in contact with an external ignitions source.**




#### DANGER



*This symbol shows that this equipment uses a low burning velocity refrigerant. If the refrigerant is leaked, there is a possibility of ignition if it enters in contact with an external ignition source.*

#### RISK OF EXPLOSION

*The compressor must be stopped before removing the refrigerant pipes. All service valves must be fully closed after pumping down operation.*

Symbol	Explanation
	Before installation, read the installation and operation manual, and the wiring instruction sheet.
	Before performing maintenance and service tasks, read the service manual.
	For more information, see the Technical, Installation and Service Handbook.



## 8.2.2.2 ADDITIONAL INFORMATION ABOUT SAFETY

 **DANGER**

- **DO NOT CONNECT THE POWER SUPPLY TO THE INDOOR UNIT PRIOR TO FILLING THE SPACE HEATING CIRCUIT (AND DHW CIRCUIT IF IT WERE THE CASE) WITH WATER AND CHECKING WATER PRESSURE AND THE TOTAL ABSENCE OF ANY WATER LEAKAGE.**
- Do not pour water over the indoor unit electrical parts. If the electrical components are in contact with water a serious electric shock will take place.
- Do not touch or adjust the safety devices inside the heat pump indoor unit. If these devices are touched or adjusted, a serious accident can take place.
- Do not open the service cover or access inside the indoor unit without disconnecting the main power supply.
- In case of fire Turn OFF the main switch, put out the fire at once and contact your service contractor.
- It must ensure that the heat pump cannot operate accidentally without water neither with air inside hydraulic system.

 **CAUTION**

- Do not use any sprays such as insecticide, lacquer, hair spray or other flammable gases within approximately one meter from the system.
- If installation circuit breaker or the unit fuse is often activated, stop the system and contact your service contractor.
- Do not make service or inspections tasks by your-self. This work must be performed by a qualified service person.
- This appliance must be used only by adult and capable people, having received the technical information or instructions to handle this appliance properly and safely.
- Children should be supervised to ensure that they do not play with the appliance.
- Do not let any foreign body into the water inlet and outlet piping of the air to water heat pump.

 **DANGER**

Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

- The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).
- Do not pierce or burn.
- Be aware that refrigerants may not contain an odour.

 **CAUTION**

- This unit is designed for commercial and light industrial application. If installed in house hold appliance, it could cause electromagnetic interference.
- This product contains fluorinated greenhouse gases. Do not vent into the atmosphere.

Refrigerant type: R32

Mass of charged refrigerant: refer to installation manual of outdoor unit.

GWP: 675

GWP=global warming potential

 **CAUTION**

- Without reading the installation manual, do not carry out refrigerant piping connection, water piping connection and wiring connection.
- Check whether the earth wire connection is correct and firm.
- Connect to the fuse of specified capacity. The user should not replace the power cord and this must be conducted by professional repair personnel.
- If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
- This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.
- This appliance can be used by children aged from 3 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.
- Children aged from 3 to 8 years are only allowed to operate the tap connected to the water heater.
- Means for disconnection from the supply mains, which have a contact separation in all poles that provide full disconnection under overvoltage category III conditions, must be incorporated in the fixed wiring in accordance with the wiring rules.
- The appliance shall be installed in accordance with national wiring regulations.
- The installation and service of this product shall be carried out by professional personnel, who have been trained and certified by national training organizations that are accredited to teach the relevant national competency standards that may be set in legislation.
- Mechanical connectors used indoors shall comply with ISO 14903. When mechanical connectors are reused indoors, sealing parts shall be renewed. When flared joints are reused indoors, the flare part shall be re-fabricated.
- Reusable mechanical connectors and flared joints are not allowed indoors.
- Disconnect the appliance from its power source during service and when replacing parts.
- Heat pump indoor unit, controller and wires should not be installed 3m from the strong electromagnetic wave radiation source, such as medical appliances.

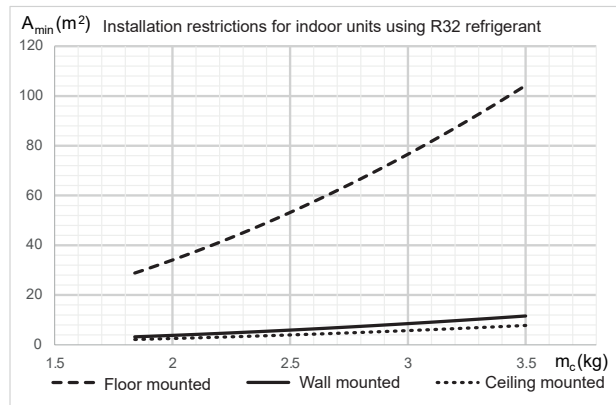
**8.2.3 IMPORTANT NOTICE**

**8.2.3.1 INFORMATION**

- **PLEASE READ THE MANUAL CAREFULLY BEFORE STARTING TO WORK ON THE INSTALLATION OF THE AIR TO WATER HEAT PUMP SYSTEM.** Failure to observe the instructions for installation, use and operation described in this documentation may result in operating failure including potentially serious faults, or even the destruction of the air to water heat pump system.
- Verify, in accordance with the manuals which appear in the outdoor and indoor units, that all the information required for the correct installation of the system is included. If this is not the case, contact with your dealer.
- Hisense pursues a policy of continuous improvement in product design and performance. The right is therefore reserved to vary specifications without notice.
- Hisense cannot anticipate every possible circumstance that might involve a potential hazard.
- This air to water heat pump has been designed for standard water heating for human beings only. Do not use this for other functions that are not included in the master controller.
- No part of this manual may be reproduced without written permission.
- If you have any questions, contact with your dealer.
- Check and make sure that the explanations of each part of this manual correspond to your air to water heat pump model.
- Refer to the models codification to confirm the main characteristics of your system.
- Signal words (NOTE, DANGER and CAUTION) are used to identify levels of hazard seriousness. Definitions for identifying hazard levels are provided in initial pages of this document.
- The operation modes of these units are controlled by the master controller.
- This manual should be considered as a permanent part of the air to water heat pump. It gives a common description of and information for this heat pump indoor unit.
- Keep the water temperature of the system above the freezing temperature.

**8.2.3.2 MINIMUM FLOOR AREA REQUIREMENTS**

- The following chart and table show the minimum floor area ( $A_{min}$ ) required for the installation of an indoor unit from a refrigerant system containing a certain refrigerant charge ( $m_c$ ) of R32 (A2L refrigerant), and supposing a total room height not lower than 2.2 m. (According to IEC 60335-2-40:2018 and EN 378-1:2016).
- For  $m_c < 1.84$  kg, IEC 60335-2-40:2018 and EN 378-1:2016 do not establish any minimum floor area restriction. In that case check local regulations to ensure that no hard restrictions may apply.



$$A_{min} = (m_c / (2.5 * LFL^{(5/4)} * h_0))^2 \quad (\text{EQU.1})$$

- $A_{min}$ : Minimum installation area of an Indoor unit for a given refrigerant charge  $m_c$  (kg) and considering the installation height  $h_0$  (m²).
- $h_0$ : Installation height of the bottom side of the indoor unit + distance from the indoor unit bottom side to the lowest part for which a refrigerant leak may release to the indoor area.
- $m_c$ : total system refrigerant charge that could be released to the indoor area in case of undetected refrigerant leak.
- LFL: Lower Flammability Limit for R32, 0,307 kg/m³ as established by EN 378-1:2016 and ISO 817.

Minimum floor area for equipment installed inside			
$m_c$ (kg)	$A_{min}$ (m²)	$A_{min}$ (m²)	$A_{min}$ (m²)
	Floor mounted	Wall mounted	Ceiling mounted
1.84	28.81	3.20	2.14
1.9	30.72	3.41	2.29
2.0	34.04	3.78	2.53
2.1	37.53	4.17	2.79
2.2	41.19	4.58	3.06
2.3	45.02	5.00	3.35
2.4	49.02	5.45	3.65
2.5	53.19	5.91	3.96
2.6	57.53	6.39	4.28
2.7	62.04	6.89	4.61
2.8	66.72	7.41	4.96
2.9	71.58	7.95	5.32
3.0	76.6	8.51	5.70
3.1	81.79	9.09	6.08
3.2	87.15	9.68	6.48
3.3	92.68	10.30	6.89
3.4	98.39	10.93	7.32
3.5	104.26	11.58	7.75

- The  $A_{min}$  in the table above is calculated according to the formula (EQU.1) under the following conditions:
- Floor mounted:  $h_0 = 0.6$ m
- Wall mounted:  $h_0 = 1.8$ m
- Ceiling mounted:  $h_0 = 2.2$ m
- For safety, the  $A_{min}$  must be calculated according to the actual installation by professionals.

**⚠ CAUTION**

- Do not charge OXYGEN, ACETYLENE, or other flammable and poisonous gases into the refrigerant because an explosion can occur. It is recommended that oxygen free nitrogen be charged for these types of tests cycle when performing a leakage test or an airtightness test. These types of gases are extremely dangerous.
- Insulate the unions and flare-nuts at the piping connection part completely.
- Insulate the liquid piping completely to avoid a decrease of performance; if not, it will cause sweating on the surface of the pipe.
- Charge refrigerant correctly. Overcharging or insufficient charging could cause a compressor failure.
- Check for refrigerant leakage in detail. If a large refrigerant leakage occurred, it would cause difficulty with breathing or harmful gases would occur if a fire were being used in the room.
- If the flare nut is tightened too hard, the flare nut may crack after a long time and cause refrigerant leakage.
- The heat pump indoor unit is suitable for the floor mounted condition ( $h_0 = 0.6m$ ) for most installations.

- Install the unit in a place where in case of water leakage, any damage to the installation space cannot be produced.
- Install noise filter when the power supply emits harmful noises.
- To avoid fire or explosion, do not install the unit in flammable environment.
- The air to water heat pump must be installed by a service technician. The installation must comply with local and European regulations.
- Try to avoid to put any objects or tools above the indoor unit.

**8.2.4 BEFORE OPERATION**

**8.2.4.1 GENERAL NOTES**

**8.2.4.1.1 Selection of the installation location**

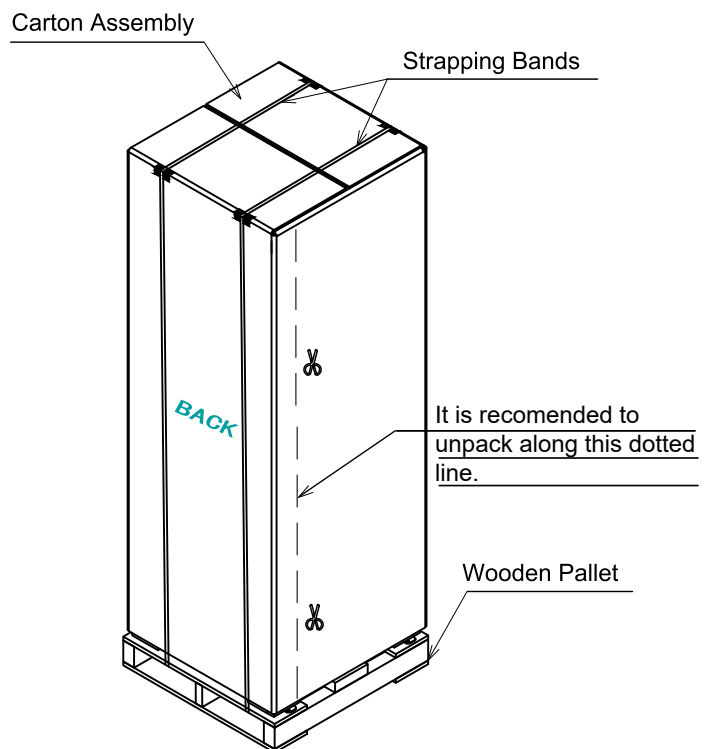
The indoor unit must be installed following these basic requirements:

- The indoor unit is intended to be installed in an indoor place and for ambient temperatures ranging 5~30°C. The ambient temperature around the indoor unit must be higher than 5°C to prevent water from freezing.
- Make sure that selected floor is flat, strong enough for supporting the indoor unit weight.
- Be sure to maintain the recommended servicing space for future unit servicing and guarantee enough air circulation around the unit (See "5.1 Service space" section).
- Take into account that shut-off valve with filter (factory supplied) must be installed at the indoor unit inlet connections.
- Keep water draining provisions. The safety valve is provided with a drain pipe which are located at the drain pan of the unit.
- Protect the indoor unit against the entry of small animals (like rats) which could making contact with the wires, the drain pipe, electrical parts and may damage unprotected parts, and at the worst, a fire will occur.
- Install it in a no-frost environment.
- Do not install the indoor unit in a location with very high humidity.
- Do not install the indoor unit where electromagnetic waves are directly radiated to the electrical box.

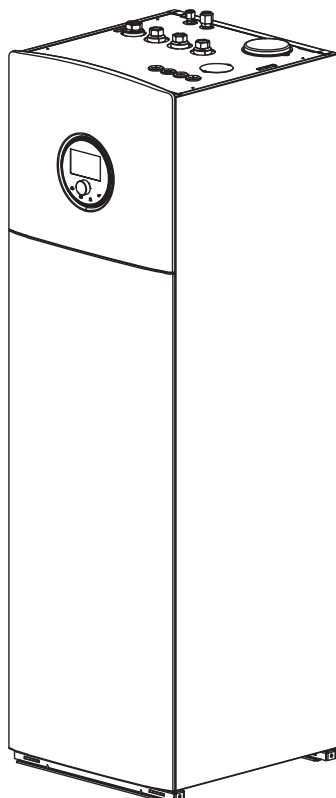
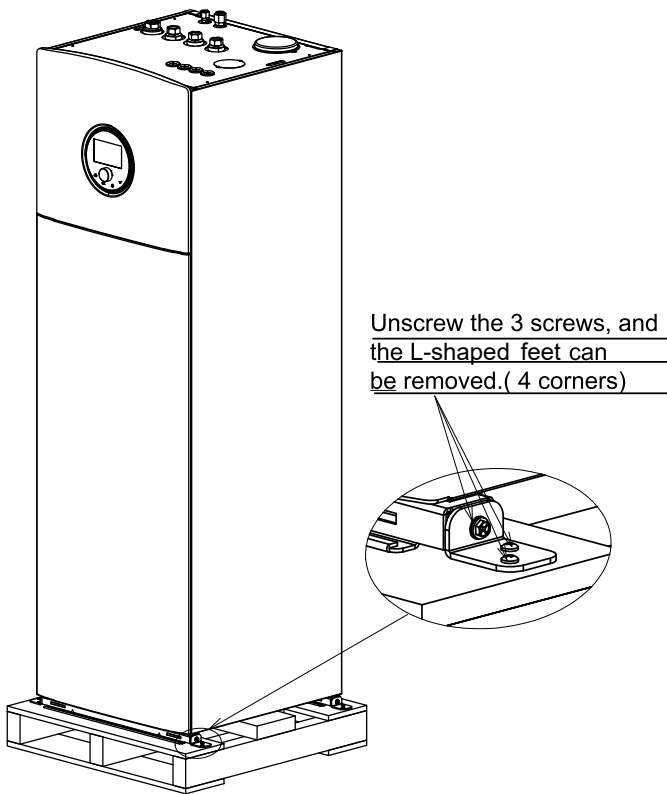
**8.2.4.1.2 Unpacking**

All units are packed by a wooden pallet and carton assembly. Firstly to unpack it, place the unit on the assembly area as close as possible to its final installation location, to avoid damages in transport. Two persons are required.

- 1 Cut the strapping bands and remove the adhesive tapes.
- 2 Remove the carton assembly and then the plastic bag around the unit.



3 Remove the 4 L-shaped feet at 4 corners, and then remove the indoor unit from wooden pallets, and place it carefully on the floor, as near as possible to its final location.



8.2.4.2 FACTORY-SUPPLIED INDOOR UNIT COMPONENTS

Accessory	Image	Qty.	Remarks
Gasket		12	12 gaskets for each connections between the indoor unit and shut-off valves (inlet/outlet) . (6 of G1" and 6 of G3/4")
Shut-off valve with filter (G1")		1	Connect at the water inlet of indoor unit, used to shut off the water flow and filter impurities in water.
Cable tie		3	Used for wiring binding.
Drain pipe clamp		1	Used for fastening drain hose and drain pipe.
Drain pipe		1	Used for drain hose of pressure relief valve connection
Instruction manual		1	Basic instructions for the installation of the device.
Energy efficiency label		1	Energy efficiency label
Pressure relief valve		1	Used for pressure relief for DHW

**i** NOTE

- The previous accessories are supplied inside the packing assembly (on the top of the indoor unit).
- Additional refrigerant piping (field supplied) for connections to outdoor unit needs to be available.
- If some of these accessories are not packed with the unit or any damage to the unit is detected, please contact your dealer.

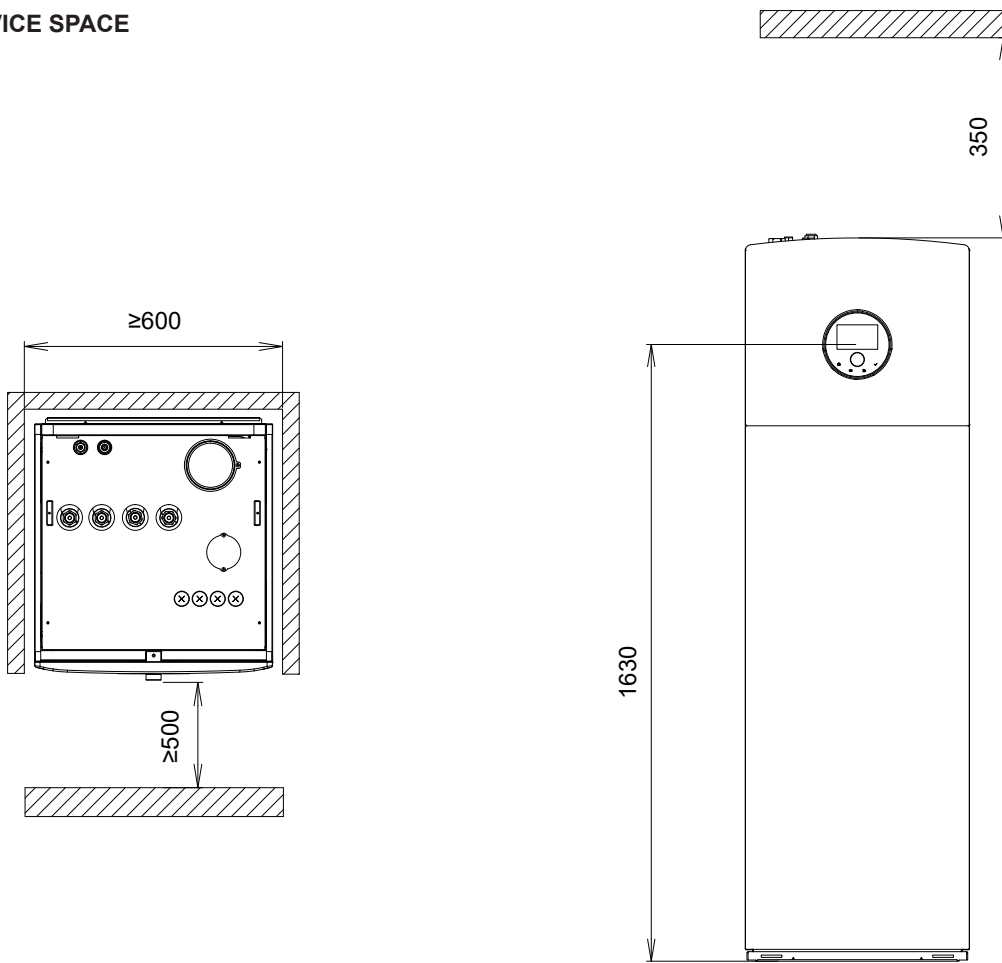
**⚠ CAUTION**

- Be careful with the Installation and Operation manual and with the factory-supplied accessories located on the top of the unit.
- Two people are required when handling because of the weight of the unit.

8.2.5 GENERAL DIMENSIONS

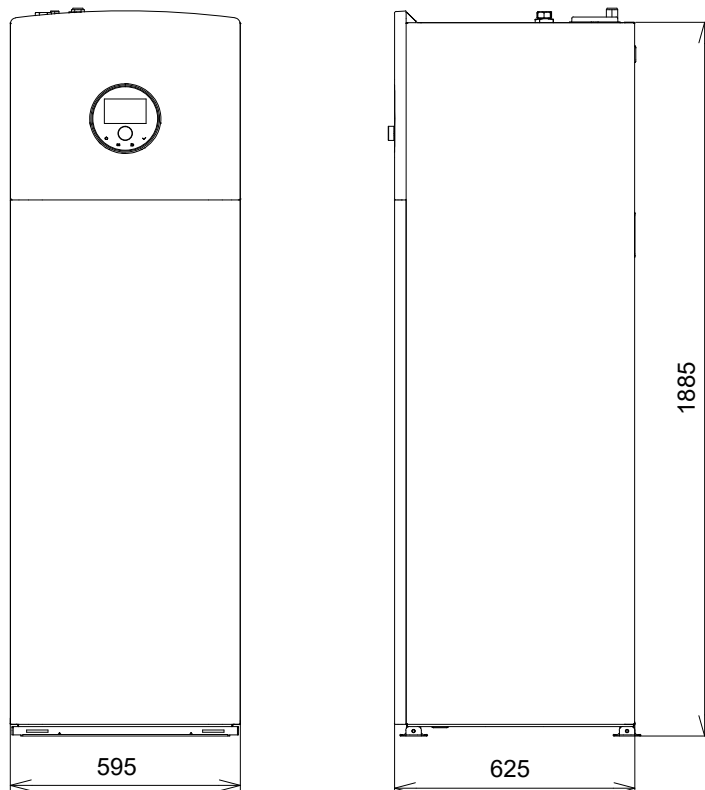
8.2.5.1 SERVICE SPACE

Unit: mm



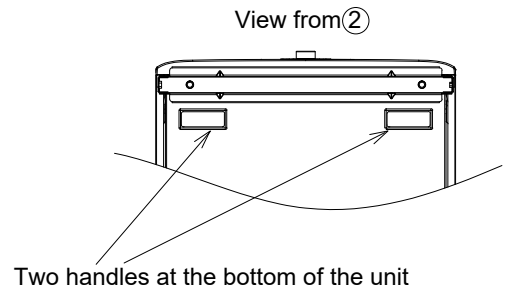
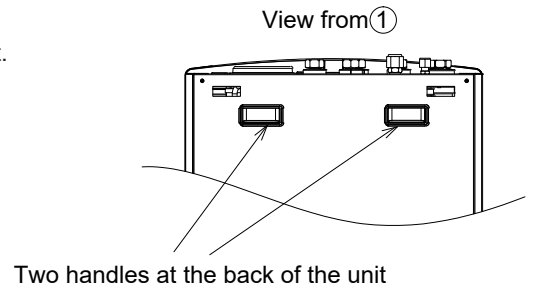
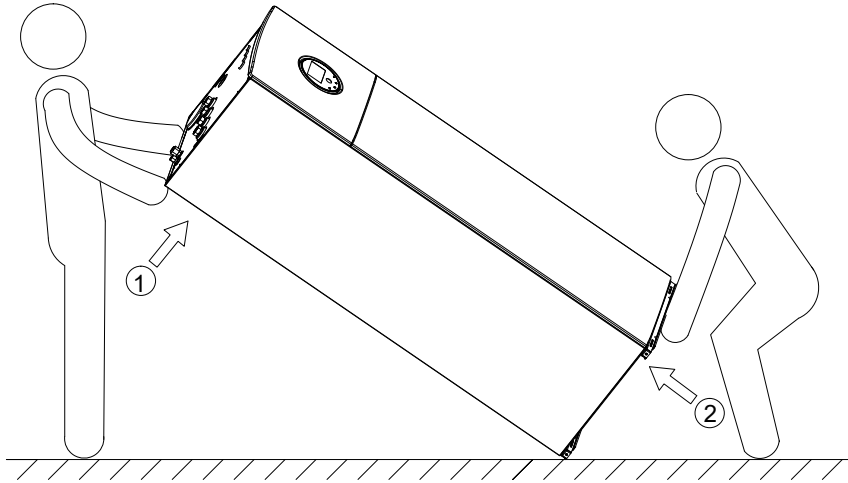
8.2.5.2 DIMENSIONAL DATA

Unit: mm

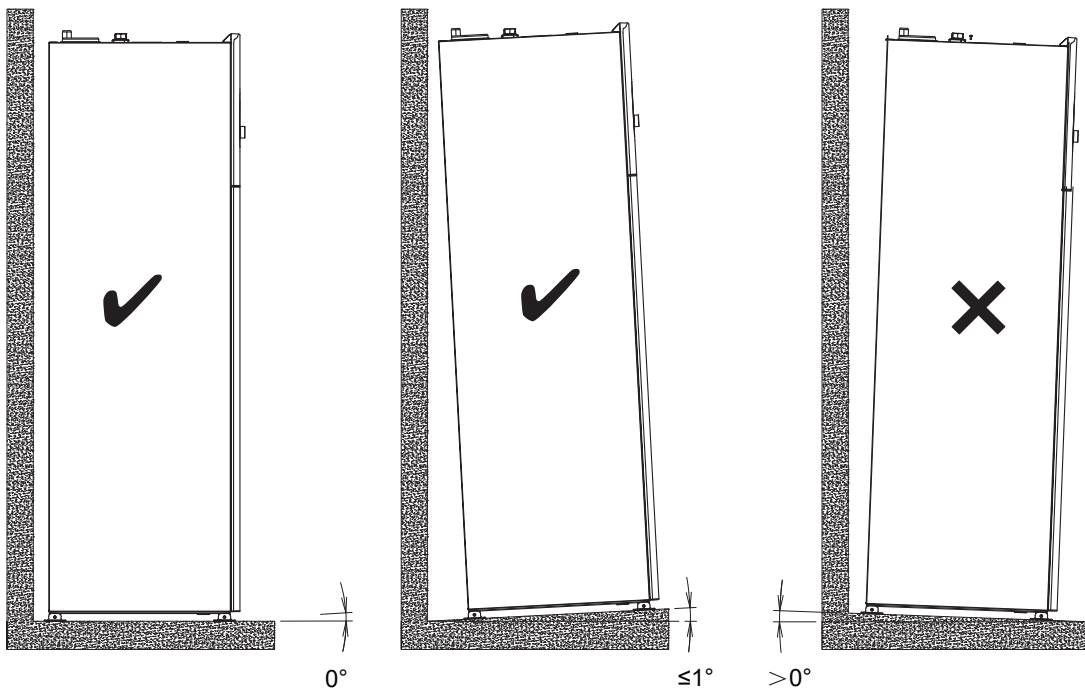


8.2.6 TO HANDLE THE UNIT

- Carefully tilt the unit to the back so that the handles become visible.
- Use the handles at the back and at the bottom to carry the unit.
- Two people are required when handling because of the weight of the unit.



- Keep the unit vertically, tilt backward ( tilt angle less than 1°) is allowed, while tilt forward is forbidden.



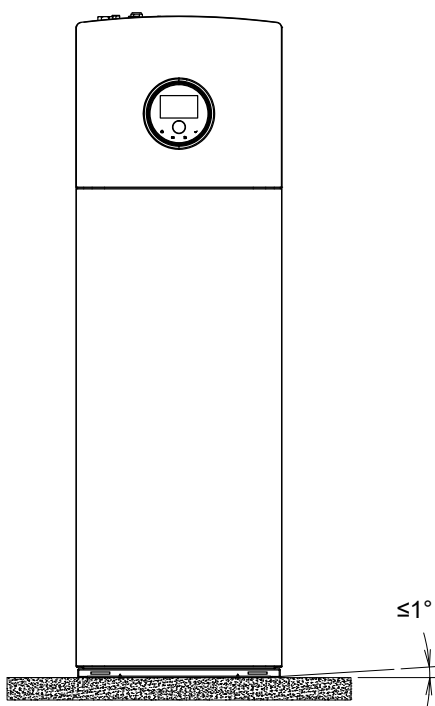
## 8.2.7 Unit Installation

### 8.2.7.1 MAIN PARTS (DESCRIPTIONS)

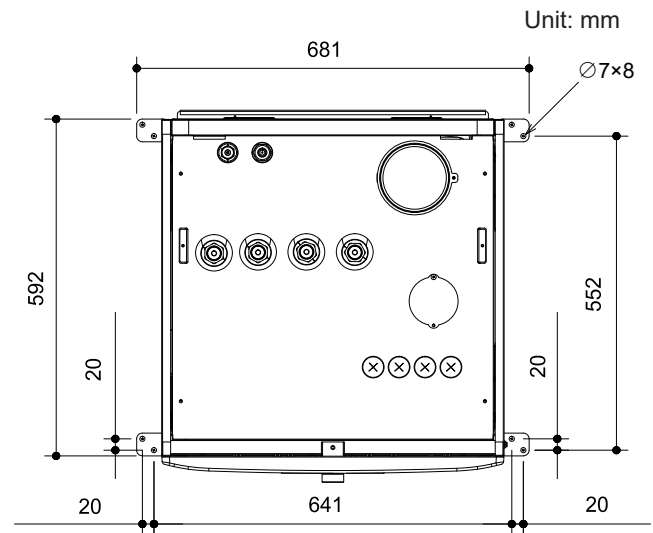
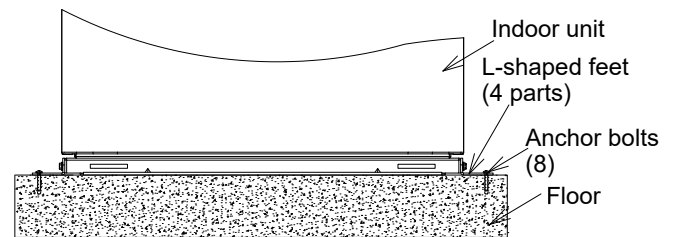
No.	Part
1	Upper front panel
2	Lower front panel
3	Side panel
4	Master controller
5	Piping connections
6	Hole for wiring
7	Window for charge port of expansion vessel
8	Window for air purge valve

### 8.2.7.2 UNIT INSTALLATION

- Adjust the installation to compensate for floor irregularities. The maximum allowed deviation is 1°.



- To prevent the indoor unit from tipping, it is recommended to fix the unit on the ground by four L-shaped feet with 8 anchor bolts (M6).



### 8.2.7.3 REMOVING THE PANELS

If it is necessary to access to the indoor unit components, please follow these operations.

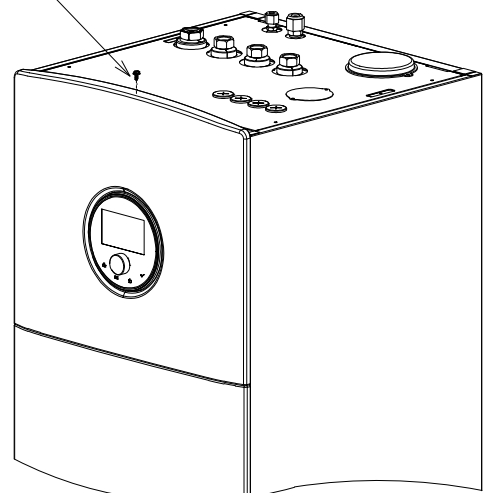
#### 8.2.7.3.1 Removing the upper front panel

#### **i** NOTE

The indoor unit front panel needs to be removed for any task inside the indoor unit.

- Unscrew 1 screw on the top of unit.

Unscrew the 1 screw.

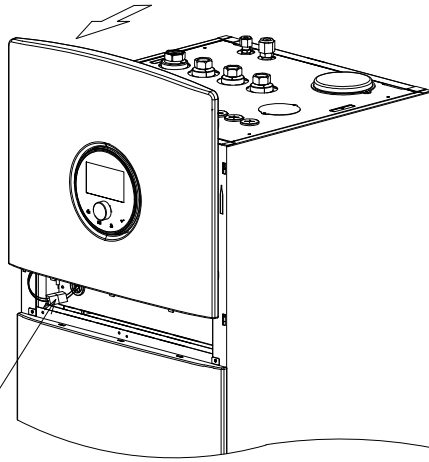




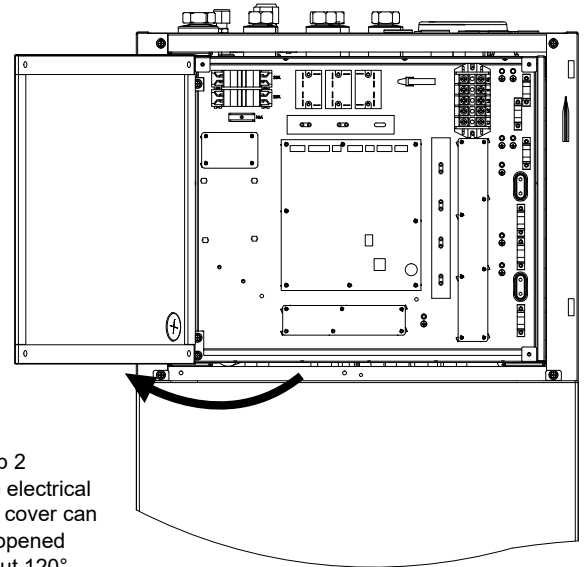
2. Remove the upper front panel.

Step 2 Push the front panel forward, disengage the snap, and upper front panel can be removed.

Step 1 Push the front panel upward.



Step 3 Pay attention to the wire connected master controller and electrical box. Do not pull the wire, otherwise may cause the breakage. Unplug the terminal to release the upper front panel.



Step 2 The electrical box cover can be opened about 120°.

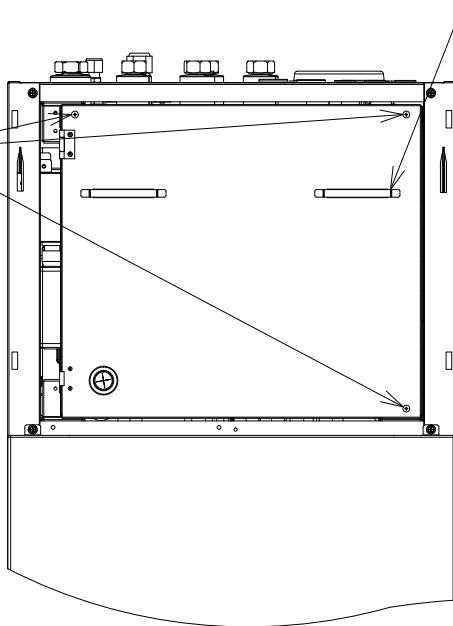
8.2.7.3.2 Opening the electrical box

**⚠ DANGER**

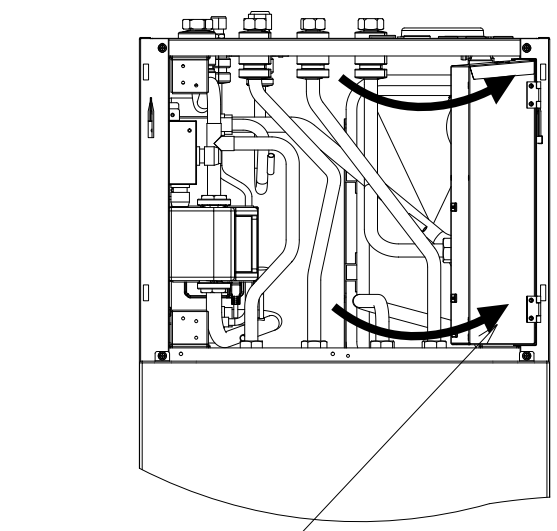
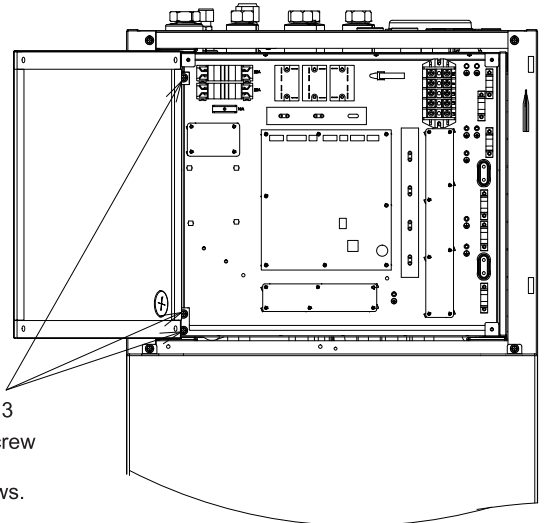
- *Disconnect the unit from the power supply before touching any of the parts in order to avoid an electric shock.*

\*Handle on electrical box cover can be used to hang the master controller.

Step 1 Unscrew the 3 screws.



Step 3 Unscrew the 3 screws.



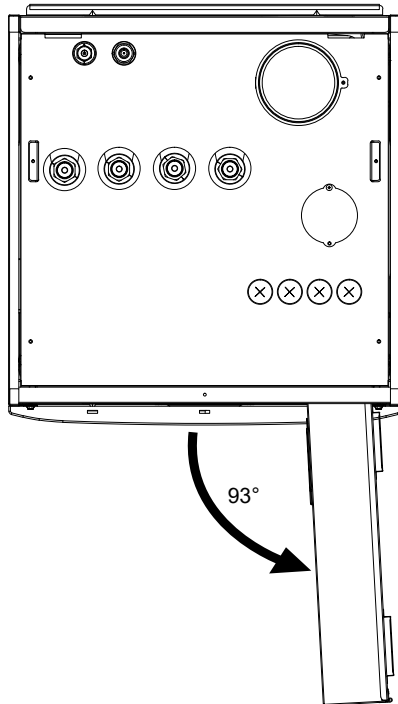
Step 4 The electrical box can be turned about 93°



8.2.7.3.3 Hanging the master controller

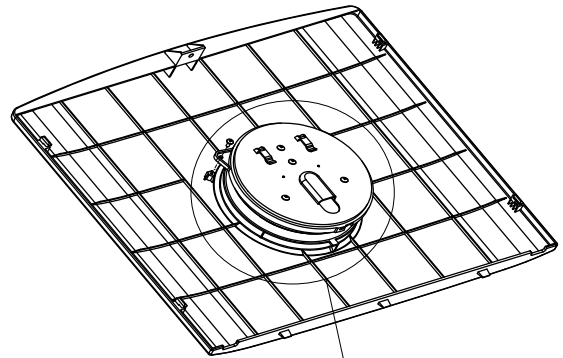
**i** NOTE

The master controller can be hung on the handle of the electrical box cover.

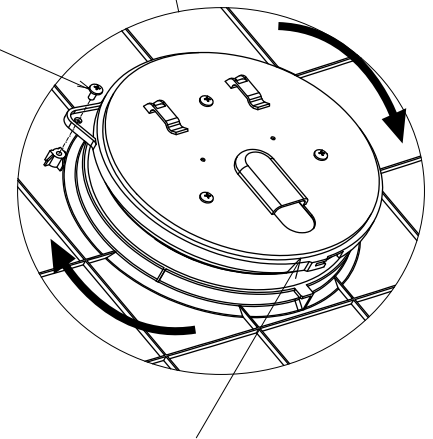


**!** CAUTION

Take care with the electrical box components in order to avoid damaging.

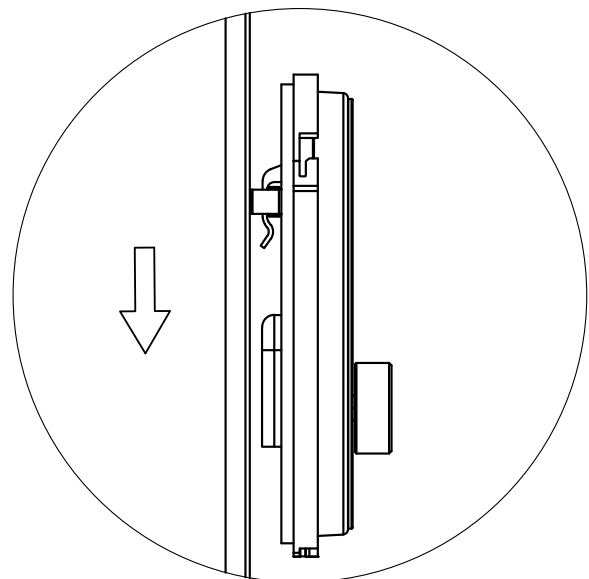


Step 1 Unscrew the 1 screw.

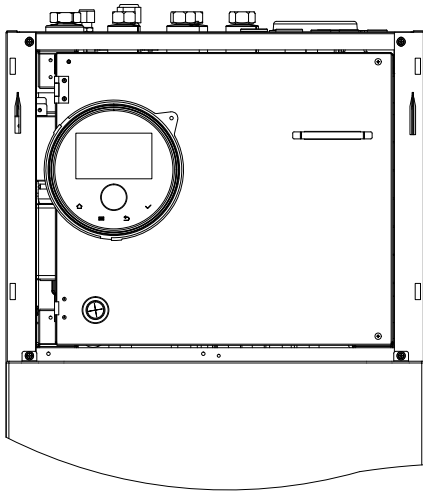


Step 2 Rotate the controller frame clockwise to separate controller frame and front panel.

Step 3 Insert the hook into the handle.

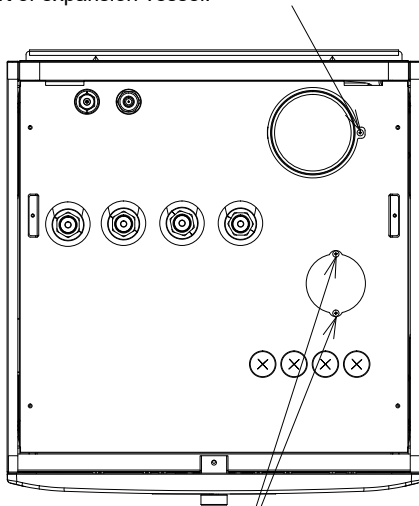


Step 4 Complete hanging.



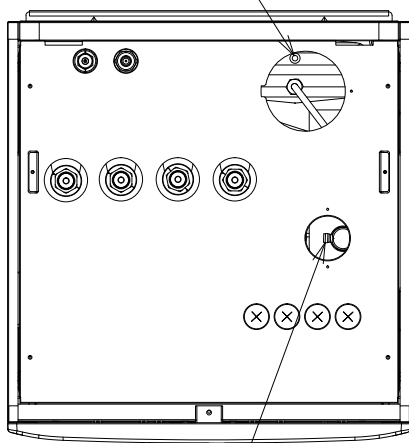
8.2.7.3.4 Position of the service windows

Step 1 Unscrew the 1 screw to reach the charge port of expansion vessel.



Step 2 Unscrew the 2 screws to reach the air purge valve.

Charge port of expansion vessel.



Air purge valve

8.2.8 PIPING WORK

Make sure that refrigerant piping installation complies with the legislation EN378 and local legislation.

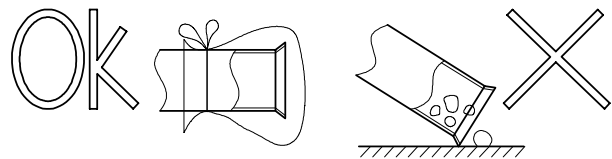
8.2.8.1 GENERAL NOTES BEFORE PERFORMING PIPING WORK

- Prepare locally-supplied copper pipes.
- Select the piping size with the correct thickness and correct material able to withstand sufficient pressure.
- Select clean copper pipes. Make sure that there is no dust or moisture inside the pipes. Blow the inside of the pipes with oxygen free nitrogen to remove any dust and foreign materials before connecting them.

**i** NOTE

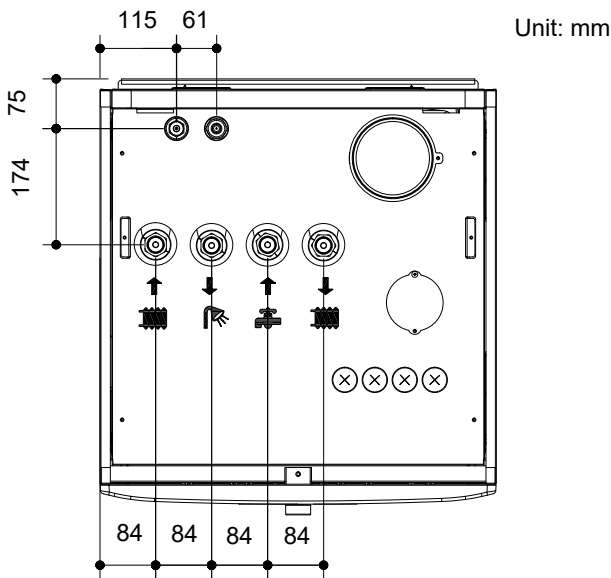
A system with no moisture or oil contamination will give maximum performance and life cycle compared to that of a poorly prepared system. Take particular care to ensure that all copper piping is clean and dry internally.

- Cap the end of the pipe when pipe is to be inserted through a wall hole.
- Do not put pipes on the ground directly without a cap or vinyl tape at the end of the pipe.



- If piping installation is not completed until next day or over a longer period of time, braze off the ends of the piping and charge with oxygen free nitrogen through a Schrader valve type access fitting to prevent moisture and particle contamination.
- It is advisable to insulate the water pipes, joints and connections in order to avoid heat loss and dew condensation on the surface of the pipes or accidental injuries due to excessive heat on piping surfaces.
- Do not use insulation material that contains NH<sub>3</sub>, as it can damage copper pipe material and become a source of future leakage.
- It is recommended to use flexible joints for the water piping inlet and outlet in order to avoid vibration transmission.
- Refrigerant circuit and water circuit must be performed and inspected by a licensed technician and must comply with all relevant European and national regulations.
- Proper water pipe inspection should be performed after piping work to assure there is no water leakage in the water circuit.

- Location of Refrigerant and Water Pipeline are shown below.



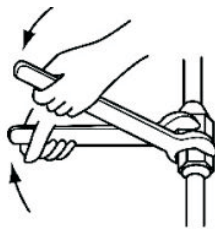
### 8.2.8.2 REFRIGERANT PIPING CONNECTION

Piping connection size of indoor unit is shown below.

Model	Gas pipe	Liquid pipe
044(2.0HP)	Ø 12.7 (1/2")	Ø 6.35 (1/4")
060(2.5HP)		
080(3.0HP)	Ø 15.88 (5/8")	

Torque required is shown below.

Pipe Diameter	Torque(N•m)
Ø 6.35	14~18
Ø 9.53	33~42
Ø 12.7	49~61
Ø 15.88	63~77



#### **i** NOTE

Screw up the nut cap by two wrenches. Heat preservation material on site should be used to prevent heat leakage of gas pipe, liquid pipe and connecting nut cap.

### 8.2.8.3 WATER PIPING CONNECTION

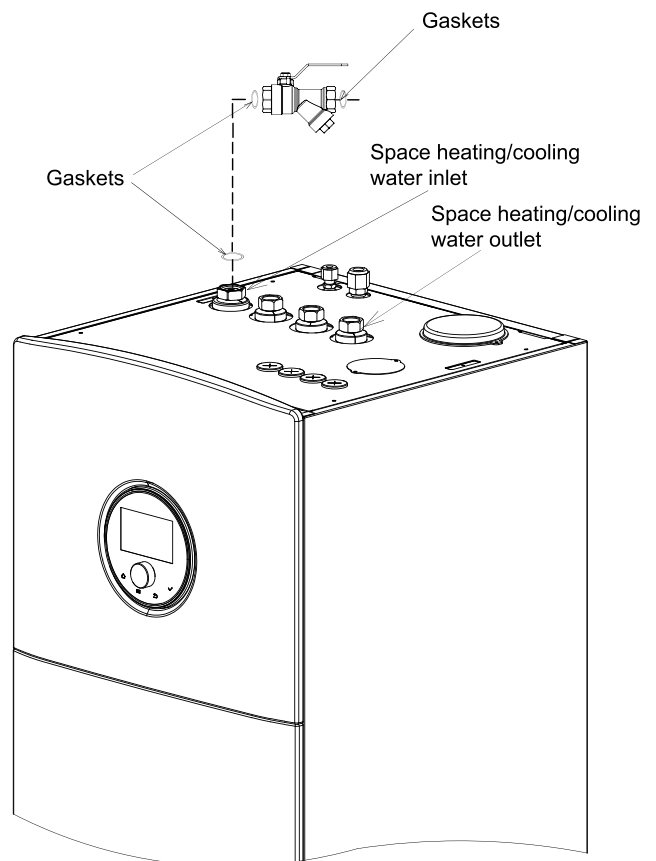
- Piping connection size of indoor unit.

Model	Space heating/cooling water inlet	DHW Outlet (Hot Water)	DHW Inlet (Cold Water)	Space heating/cooling water outlet
	↑ 	↓ 	↑ 	↓ 
044(2.0HP)	G1" (female)	G3/4" (female)	G3/4" (female)	G1" (female)
060(2.5HP)				
080(3.0HP)				
Torque Required	40~50(N•m)			

#### 8.2.8.3.1 Space heating/cooling pipes connection

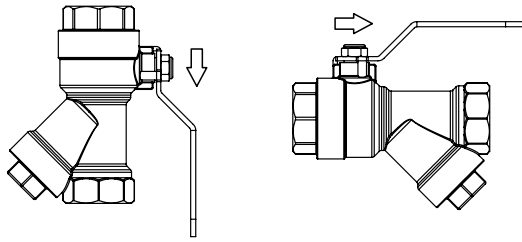
- Install shut-off valves

A shut-off valve with filter is provided with the unit. For convenience of repair and maintenance, install the shut-off valve with filter on water inlet pipe of indoor unit as follows. The space heating/cooling installation can be carried out referring to section 9.1.



#### **i** NOTE

The shut-off valve can be connected to the water outlet of indoor unit directly. The shut-off valve with filter must be installed at water inlet of indoor unit, and water flow direction and installation direction must be confirmed as shown below. The gasket in accessories can be installed at the two connections of shut-off valve and shut-off valve with filter.



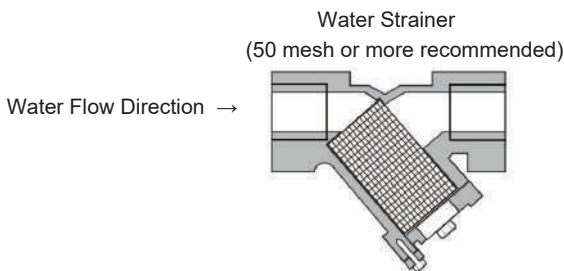
**CAUTION**

- Rubber gasket must be mounted (factory supplied), otherwise water leakage may be caused.
- Note the location of shut-off valves, and the direction of shut-off valves and drain valve, which are essential to maintenance.
- Screw up shut-off valves by using two wrenches.

(2) Additional water strainer

**CAUTION**

- Provide a 50 mesh or more water strainer at the water inlet side of water piping. Otherwise, damage to the plate heat exchanger may occur. In the plate heat exchanger, water flows through a narrow space between the plates. Therefore, there is a possibility that freezing or corrosion may occur if foreign particles or dust clog the flow of water between the plates.
- This is not required when cooling mode is not used.



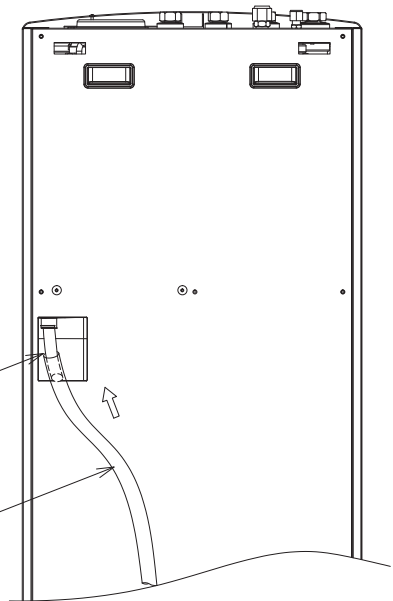
- The water piping connection needs to be completed after flushing the water system.

8.2.8.3.2 Drain pipes connection

For a correct drainage, connect the drain pipe for the unit to the general draining system.

Step 1 Insert the drain pipe for the safety valve into the drain pipe for the indoor unit.

Drain pipe for the safety valve (setting before shipment)  
 Drain pipe for the indoor unit (Field supplied)



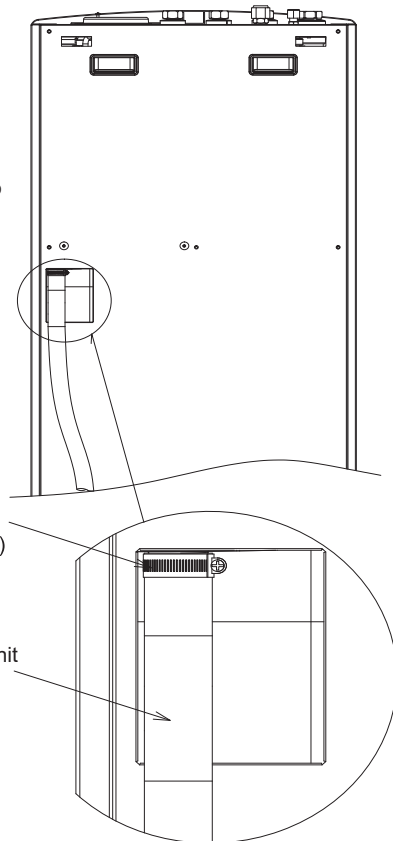
**NOTE**

- The safety valve is activated when water pressure reaches 3 bar.

Step 2 Insert the drain pipe of indoor unit completely to the end of the hose connection. Fasten the drain pipe to the drain hose with the factory supplied clamp.

Drain pipe clamp (Factory supplied)

Drain pipe of indoor unit (Field supplied)



Step 3 Insulate the drain pipe after connecting the drain hose.

**NOTE**

- Check if water flows without obstruction.
- Drain pipe is not needed if cooling operation is not used.
- The recommended drain pipe of the indoor unit is polyvinyl chloride pipe with a 1 inch inner diameter.
- Ensure that the drain pipe is firmly fixed through the clamp, otherwise it may cause water leakage.
- The drain pipe should always be open to the atmosphere, free of frost and in continuous slope to the down side in case that water leakage exists.

### 8.2.8.3.3 DHW pipes connection

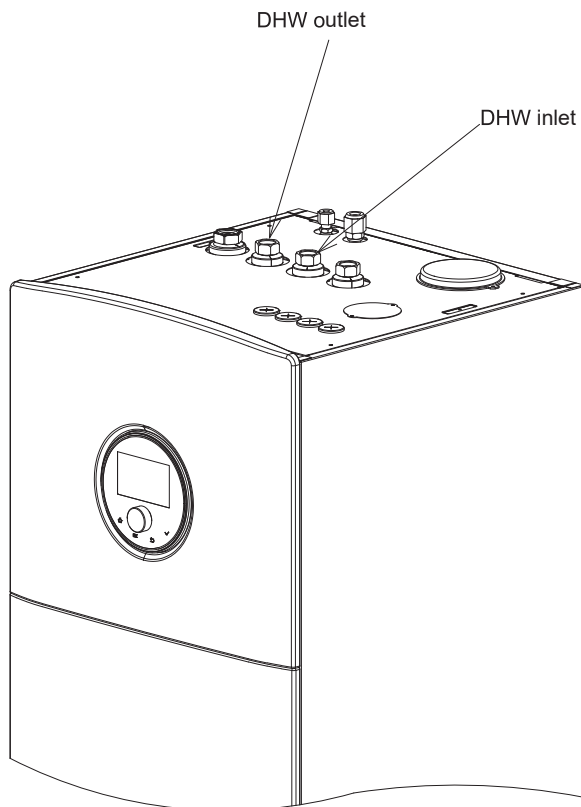
- The connection between the DHW installation and the DHW connections of the indoor unit must be done taking into account the following considerations:
- (3) Install a pressure relief valve ( factory supplied) at the DHW inlet connection (as close as possible to the DHW tank) to provide the following functions.
- Pressure protection
  - Non-return function
  - Shut-down valve
  - Filling
  - Draining

If not, a specific device for each function should be installed.

- (4) Install also a shut-off valve (field supplied) in the DHW outlet connection, in order to make easier any maintenance work.

### 8.2.8.3.4 To insulate the water piping

- The piping in the complete water circuit MUST be insulated to prevent condensation during cooling operation and reduction of the heating and cooling capacity.
- If the temperature is higher than 30°C and the humidity is higher than RH 80%, the thickness of the insulation materials should be at least 20 mm to prevent condensation on the surface of the insulation.



### **i** NOTE

For more details, refer to the section "9.1 ADDITIONAL HYDRAULIC NECESSARY ELEMENTS".

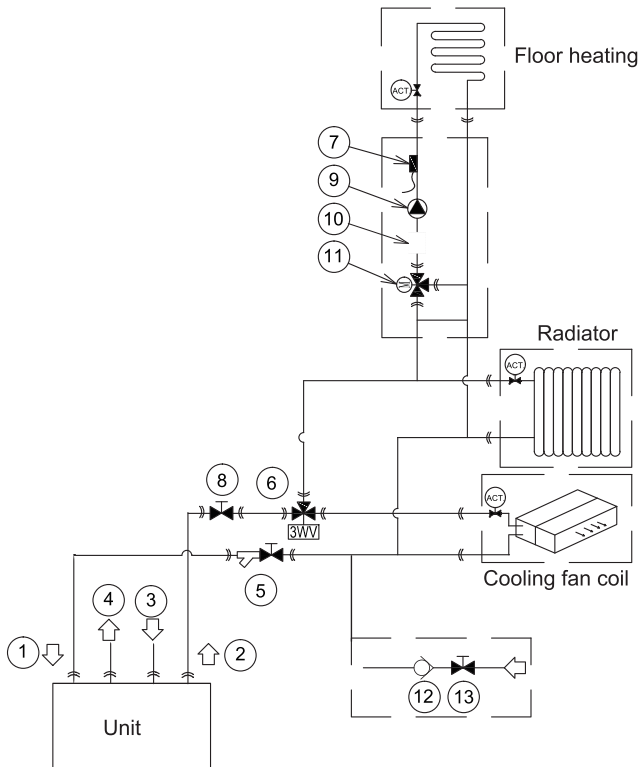
8.2.9 SPACE HEATING/COOLING AND DHW

8.2.9.1 ADDITIONAL HYDRAULIC NECESSARY ELEMENTS

**⚠ DANGER**

Do not connect the power supply to the unit prior to filling the space heating circuit with water and checking water pressure and the total absence of any water leakage.

8.2.9.1.1 Elements for space heating/cooling



Nature	No.	Part name
Piping connections	1	Space heating/cooling water inlet
	2	Space heating/cooling water outlet
	3	DHW inlet (Cold water)
	4	DHW outlet (Hot water)
Factory supplied	5	Shut-off valve with filter
Optional accessories	6	3WV Cooling
	7	Thermistor (for Space heating))
Field supplied	8	Shut-off valve
	9	Water pump
	10	Filter
	11	Mixing valve
	12	Check valve
	13	Shut-off valve

As an installation example of space heating / cooling, the following hydraulic elements are necessary to correctly perform the space heating / cooling water circuit:

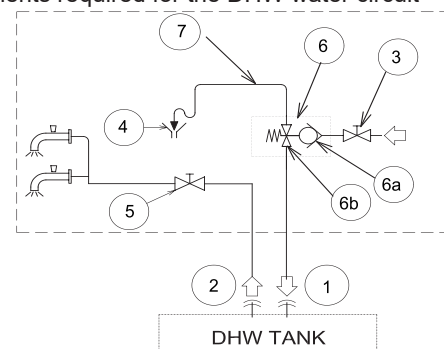
- The field supplied shut-off valve (8) need to be installed at water outlet of the unit, and shut-off valve with filter (5) need to be installed horizontally at water inlet of the unit.
- A water check valve (12) with a shut-off valve (13) must be connected to the water filling point when filling the water circuit. The check valve acts as a safety device to protect the installation.

- 3-way valves (6) must be connected at one point of the water outlet pipe of the installation, used to divert the water circulation for specific functions.
- Space heating thermistor (7) must be installed on the metal tube close to space heating, and keep in good contact with it.
- Mixing valve (11) is recommended to use ESBE ARA661, whose operation mode is 3-point SPDT. If mixing valve of other brands or models are used, the operation mode must be 3-point SPDT, and power supply must be 220-240V ~ 50Hz. The rotation time can be set in the master controller.

8.2.9.1.2 Elements for DHW

As an installation example of Domestic hot water (DHW), the following hydraulic elements are necessary to correctly perform the DHW water circuit:

(1) Elements required for the DHW water circuit



Nature	No.	Part name	
Piping connections	1	DHW inlet (Cold water)	
	2	DHW outlet (Hot water)	
Field supplied	3	Shut-off valve	
	4	Draining	
	5	Shut-off valve	
Factory supplied	6	Pressure relief valve	
		6a	Water check valve
		6b	Pressure relief valve
	7	Drain pipe	

- **A Shut-off valve (field supplied):**  
The shut-off valve (5) must be connected after the DHW tank outlet (2) in order to make easier any maintenance work.
- **A Pressure relief valve (Factory supplied):**  
The domestic hot water tank must be fed with cold water passing through a pressure relief valve (6) calibrated to about 7 bar (depending on local regulations). Operate the pressure relief valve according to manufacturer's specification. There must be no other valves between the pressure relief valve (6) and the tank. The pressure relief valve (6) must be installed as near as possible to the DHW inlet and connected to a drain pipe (7) leading to the sewer. This pressure relief valve can provide the following:
  - Pressure protection
  - Non-return function
  - Filling
  - Draining
 Check the pressure relief valve on the cold water supply inlet.  
The pressure relief valve must be operated regularly to remove scale deposits and verify that it is not blocked.

Specifications for pressure relief valve (6) (Factory supplied):

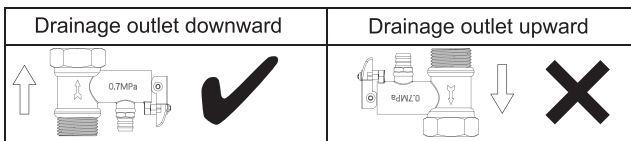
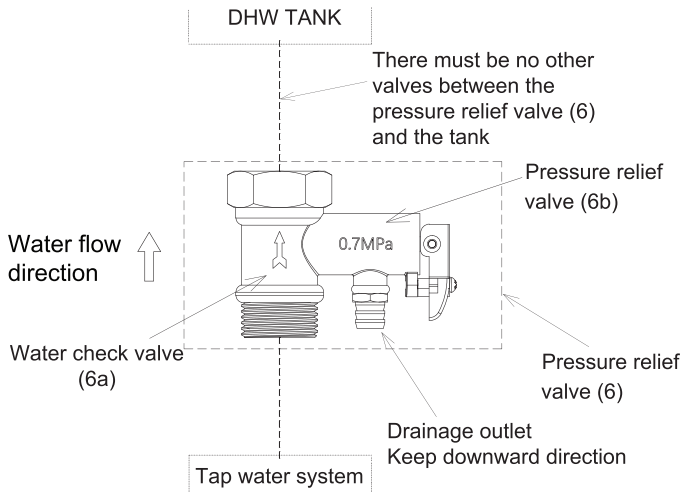
Relief Pressure: 0.7± 0.05 MPa

Water flow rate:

Pressure difference MPa	0.05	0.10	0.30
Water flow rate L/min.	7.2	10.0	19.8

Instructions for pressure relief valve (6) installation:

Make sure that the drainage outlet of the pressure relief valve is downward for complete drainage.



### **i** NOTE

The drain pipe should always be open to the atmosphere, free of frost and in continuous slope to the down side in case that water leakage exists.

The pressure relief valve is to be operated regularly to remove lime deposits and to verify that it is not blocked;

### **!** CAUTION

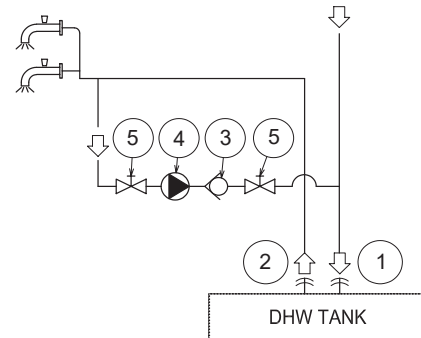
- DHW tank supplies hot water from tap water. Domestic hot water is only used when tap water is connected.
- For safety, do not add ethylene glycol into water circulation. If added, water will be contaminated when heat exchanger coil leaks.
- When water hardness is more than 250-300 ppm, recommend using softened water to reduce DHW tank scale.
- Immediately flush DHW tank with fresh water after installation. Flush once every day in first five days of installation.
- Try to avoid long runs of water piping between the tank and the DHW installation in order to decrease possible temperature losses.  
If the domestic cold water entry pressure is higher than the DHW tank's design pressure, a pressure reducer must be fitted.
- After used for a while (depend on local water quality and use frequency), clean DHW tank and remove scales.
  - a. Power off and close water inlet valve.
  - b. Open water outlet valve and drainage valve to empty DHW tank.

### **!** CAUTION

When scales are removed, temperature in DHW tank may be a little high, it should prevent burns or drainage equipment damaged.

- c. Close drainage valve after cleaning several minutes with water inlet valve opened. Ensure effluent water is closed after DHW tank is full of water. Power on and get back to work.
- Always check DHW tank and its surroundings has accumulated water or not. In case of leaking, contact local dealer.

(2) Elements required for the DHW recirculation circuit



Nature	No.	Part name
Piping connections	1	DHW inlet(Cold water)
	2	DHW outlet (Hot water)
Field supplied	3	Water check valve
	4	DHW pump
	5	Shut-off valve

- **A DHW pump (field supplied):** This DHW pump (4) will help to correctly recirculate the hot water to the DHW inlet. The optional output function of DHW pump (code 13) can be set to drive relay of a DHW pump in case of DHW pump is available, referring to 10.5.
- **A Water check valve (field supplied):** This accessory (3) is connected after the DHW pump (4) in order to ensure the non-return of water.
- **Two Shut-off valves (field supplied) (5):** One before the DHW pump (4) and other after the water check valve accessory (3).

### **!** CAUTION

The DHW tank is equipped with a safety thermostat and operating temperature of the safety thermostat will be affected by the altitude (atmospheric pressure). Make sure max. DHW temperature NOT higher than the following value.

Altitude (m)	Atmospheric pressure (mmHg)	Max. DHW temperature (°C)
4000	424	75
5000	340	70
6000	256	63



8.2.9.2 REQUIREMENTS AND RECOMMENDATIONS for HYDRAULIC CIRCUIT

8.2.9.2.1 Requirements for anti-freezing

- When the unit is stopped during shut-off periods and the ambient temperature is very low, the water inside the pipes and the circulating pump may freeze, thus damaging the pipes and the water pump. In these cases, the installer shall ensure that the water temperature inside the pipes does not fall below the freezing point. In order to prevent this, the unit has a self-protection mechanism which should be activated (refer to “10.5 SETTING OF DIP SWITCHES ON PCB1”).
- Even if the unit is stopped, the water pump may run under some circumstances, i.e, when the anti-freezing function is triggered.
- Keep the unit power on and water system unblocked to prevent water freezing, otherwise an alarm may occur.
- If the water system is blocked, an alarm of water flow will occur to stop the whole system.
- If machine is stopped for a long period of time in winter, drain out water in circuit and water pipes to prevent freezing.
- The anti-freezing protection is effective better with Auxiliary electric heater connected. It is advisable to install the Auxiliary electric heater for those models in which these are not supplied but optional.
- However, in case of a power failure or unit failure, these functions cannot guarantee protection.

8.2.9.2.2 Minimum required water volume

The following part shows the minimum water volume in the system for product protection (anti-hunting) and temperature drop at defrosting.

- *Minimum required water volume in each single water circuit of DHW / SWP for product protection (anti-hunting). Water volume in each single water circuit of DHW / SWP need be greater than 20L.*
- *Minimum required water volume in single water circuit of space cooling for product protection (anti-hunting). The following table shows the minimum water volume needed in single water circuit of space cooling.*

Model	044/060(2.0HP/2.5HP)	080(3.0HP)
Minimum required water volume	30L	45L

- *Minimum required water volume during defrosting. The following table shows the minimum water volume needed in single water circuit of space heating in case of safe defrosting.*

Lowest possible operation water temperature in single water circuit of space heating	044/060 (2.0/2.5HP)	080(3.0HP)
≥25°C	61 L	61 L
20-25°C	99 L	99 L
15-20°C	158 L	158 L
10-15°C	198 L	198 L



**NOTE**

- *The values shown on the table are based on theoretical installation conditions. And the value can be different depending on each specific installation.*

- *To calculate minimum water volume the internal water volume of the unit is NOT included.*
- *Consult with local technical engineer under the special occasions where operation water temperature in single water circuit of space heating is lower than 20°C.*

8.2.9.2.3 Minimum required water flow

Check that the water pump of the water circuit works within the pump operating range and that the water flow is over the unit minimum value.

Model	Min. water flow(L/min)
044(2.0HP)	8.3
060(2.5HP)/080(3.0HP)	10.0

8.2.9.2.4 Additional Information about hydraulic circuit

- An additional special water filter is highly recommended to be installed on the space heating (field installation), in order to remove possible particles remaining from brazing which cannot be removed by the field supplied shut-off valve with filter.
- Put insulation on the pipes in order to avoid heat losses.
- Whenever possible, sluice valves should be installed for water piping, in order to minimize flow resistance and to maintain sufficient water flow.
- Ensure that the installation complies with applicable legislation in terms of piping connection and materials, hygienic measures, testing and the possible required use of some specific components like thermostatic mixing valves.
- The maximum water pressure is 3 bar (nominal opening pressure of the safety valve). Provide adequate reduction pressure device in the water circuit to ensure that the maximum pressure is NOT exceeded.
- The water pressure can be read on master controller, detected by the water pressure sensor located at inlet of plate heat exchanger. If water pressure exceeded 3 bar, the water pressure displayed on master controller would flash.
- Ensure that the drain pipes connected to the safety valve and to the air purge valve are properly driven to avoid water being in contact with unit components.
- Make sure that all field supplied components installed in the piping circuit can withstand the water pressure and the water temperature range in which the unit can operate. The units are conceived for exclusive use in a closed water circulation.
- The internal air pressure of the expansion vessel will be adapted to the water volume of the final installation (factory supplied with 1 bar of internal air pressure).
- Drain taps must be provided at all low points of the installation to permit complete drainage of the circuit during servicing.
- The maximum piping length depends on the maximum pressure availability in the water outlet pipe. Please check the pump curves.



- The unit is equipped with an air purge valve (factory supplied) at the highest location of the unit. If this location is not the highest of the water installation, air might be trapped inside the water pipes, which could cause system malfunction. In that case additional air purge valves (field supplied) should be installed to ensure no air enters the water circuit.
- For heating floor system, the air should be purged by mean of an external pump and an open circuit to avoid air bags.

### 8.2.9.3 WATER FILLING

#### 8.2.9.3.1 To fill the water circuit

- (1) Check that a water check valve (field supplied) with a shut-off valve (field supplied) is connected to the water filling point (water inlet connection) for filling the hydraulic circuit (see "9.1 Additional hydraulic necessary elements).
- (2) Make sure all the valves are open (water inlet/outlet shut-off valves and the rest of valves of the water circuit installation components).
- (3) Ensure that the air purge valve of the unit is open when installation (Loosen the screw cap of air purge valve properly to completely discharge the air inside and ensure the air purge valve is open).
- (4) Check that the drain pipes connected to the safety valve (keep the outlet of drain pipes located in the drain pan) are correctly connected to the general draining system. The safety valve is later used as an air purging device during the water filling procedure.
- (5) Fill the water circuit with water until the pressure displayed on the controller reaches  $2.0 \pm 0.2$  bar. During all the operation conditions, the normal pressure range of water circuit is 1 ~ 2.5 bar.

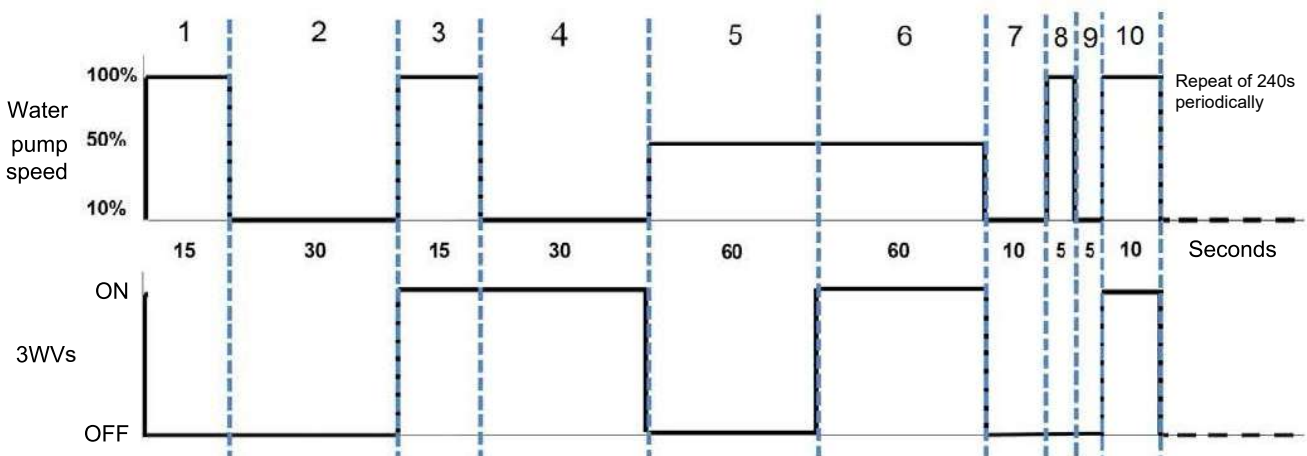
#### NOTE

*While the system is being filled with water, it is highly recommended to operate the safety valve manually so as to help with the air purging procedure.*

- (6) Remove as much air from inside the water circuit as possible through the air purge valve and other air vents in the installation (fan coils, radiators...).
- (7) There are two methods to start the air purge procedure:
  - a. Using the master controller to start air purge.  
(Refer to the master controller manual)
  - b. Using DSW4-1 of the PCB1:  
DSW4-1 ON: Start air purge  
DSW4-1 OFF: Stop air purge
- (8) If a little quantity of air is still remaining in the water circuit, it will be removed by the automatic air purge valve of the unit during the first hours of operation. Once the air in the installation has been removed, a reduction of water pressure in the circuit is very likely to occur. Therefore, additional water should be filled by booster pump until water pressure returns to approximate 2.0 bar.

## **i** NOTE

- The unit is equipped with an automatic air purge valve (factory supplied) at the highest location of the unit. Anyway, if there are higher points in the water installation, air might be trapped inside water pipes, which could cause system malfunction. In that case, additional air purge valves (field supplied) should be installed to ensure no air enters into the water circuit. The air purge valve should be located at points which are easily accessible for servicing.
- The water pressure indicated on the master controller may vary depending on the water temperature (the higher temperature, the higher pressure). Nevertheless, it must remain above 1 bar in order to prevent air from entering the circuit.
- Fill in the circuit with tap water. The water in the heating installation must comply with EN directive 98/83 EC. Non-sanitary controlled water is not recommended (for example, water from wells, rivers, lakes, etc.) .
- The maximum water pressure is 3 bar (nominal opening pressure of the safety valve). Provide adequate reduction pressure device in the water circuit to ensure that the maximum pressure is NOT exceeded.
- For heating floor system, air should be purged by means of an external pump and an open circuit to prevent the formation of air pockets.
- Check carefully for leaks in the water circuit, connections and circuit elements.
- During water filling, it is necessary to ensure that water enters the unit from the water inlet to ensure that all water passes through the shut-off valve with filter to filter impurities, otherwise it may block the components inside the unit.



## **i** NOTE

- The unit will stop for at least 6 min before starting next air purge cycle.

(9) Check Water Volume:

The unit has a built-in 8L expansion vessel, and default initial pressure is 1 bar. To ensure the unit works normally, the initial pressure of expansion vessel should be adjusted according to the circulated water volume.

- Use water volume checklist below to decide whether initial pressure of expansion vessel needs to be adjusted.
- Use water volume checklist to confirm the total volume of water in installation system is below the allowed maximum water volume.
- Installation height difference: height difference between highest point of water circulation and the unit. If the unit is mounted at the highest point, above all water pipes, the installation height is deemed to be 0 m.
- Calculate initial pressure of expansion vessel. Decide initial pressure (Pg) according to the maximum installation height difference (H), seen below:

$$P_g = H/10 + 0.3$$

Unit: H (m), P<sub>g</sub> (bar)

- The process of calculating allowed maximum water volume in whole circulation is:
  - Calculate maximum water volume corresponding to initial pressure P<sub>g</sub> by using maximum water volume curve as shown below.
  - Confirm the total maximum water volume in water circulation is smaller than above value. Otherwise, the expansion vessel in the unit is smaller for system.

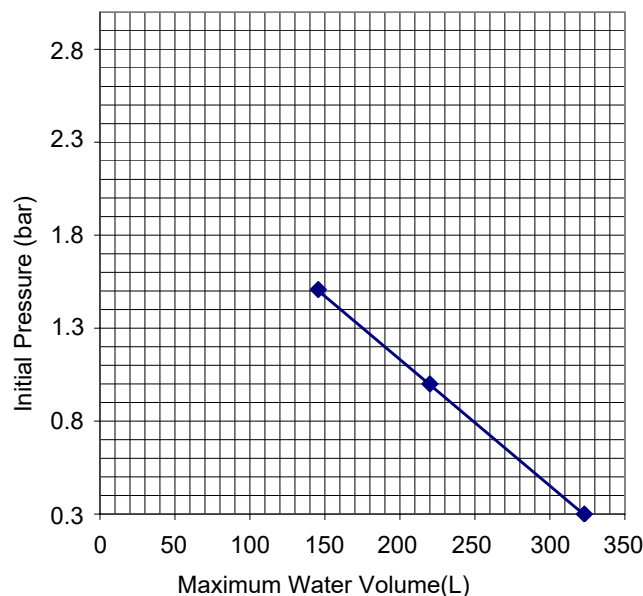
**i** NOTE

- 0.3 bar is the minimum initial pressure and 1.5 bar is the maximum initial pressure of expansion vessel set outside the factory.
- When initial pressure in expansion vessel is set as 0.3 bar at minimum, the water quantity required by system is higher than the limit value, it may be considered replacing expansion vessel with bigger volume.

**Water Volume Checklist**

	Installation height difference (a)	Water Volume	
		≤220L	>220L
Safety Valve (3 bar)	≤7m	No need to adjust initial pressure of expansion vessel	Things need to do : Must reduce initial pressure. Calculate it based on the section “Check water volume”. Ensure water volume is lower than allowed maximum water volume (using the figures below).
	>7m	Things need to do : Must increase initial pressure. Calculate it based on the section “Check water volume”. Ensure water volume is lower than allowed maximum water volume (using the figures below).	The expansion vessel is too small to install. (It needs proper expansion vessel or use safety valve with high activated pressure that is supplied from local place)

**Maximum Water Volume Curve Graph**



8.2.9.3.2 To fill and drain the domestic hot water tank

(10) To fill the domestic hot water tank

- Open every hot water tap in turn to purge air from the system pipe work.
- Open the cold water supply valve.
- Close all water taps after all air is purged.
- Check for water leaks.
- Manually operate the field-installed pressure relief valve to ensure a free water flow through the drain pipe.

(11) To drain the domestic hot water tank

**DANGER**

The water in the tank can be very hot.

**CAUTION**

Turn OFF the unit via the master controller.

Turn OFF the respective circuit breaker.

Close the cold water supply.

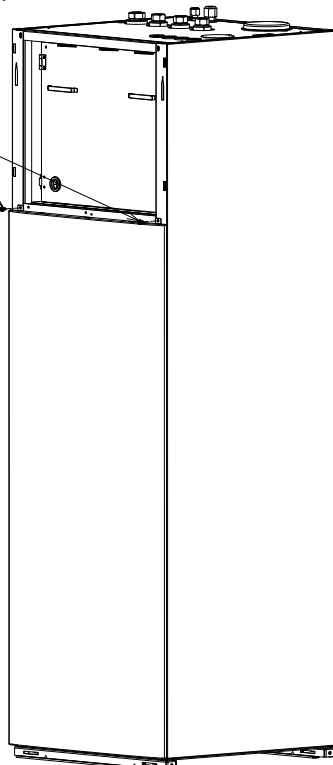
- 1) Remove the upper front panel and the lower front panel.
- 2) Hanging the master controller.
- 3) Remove the stop from the tank.
- 4) Use a drain hose and a pump to drain the tank via the drainage outlet.
- 5) Open all the hot water tapping points to allow air to enter the system.

**CAUTION**

- During the use of the water tank, there may be dirty sediments accumulated at the bottom of the water tank. In order to avoid the presence of dirty sediment affecting the heat exchange efficiency, resulting in increased energy consumption, it is necessary to carry out regular maintenance of the water tank.

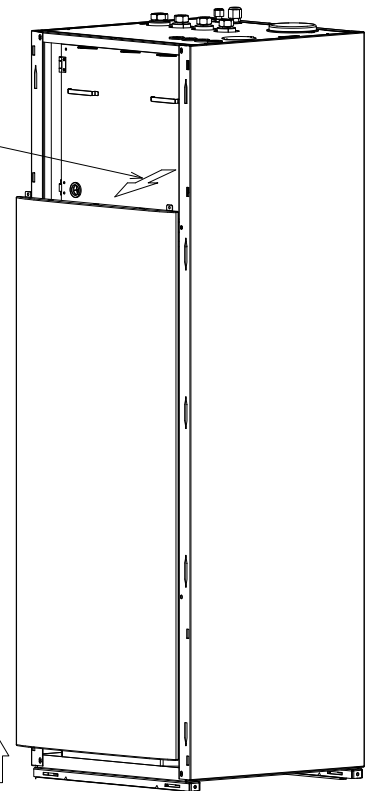
Remove the upper front panel, referring to 7.3.1, then remove the lower front panel as follows.

Step 1 Unscrew the 2 screws



Step 3 Push the front panel forward, disengage the snap, and lower front panel can be removed.

Step 2 Push the front panel upward.

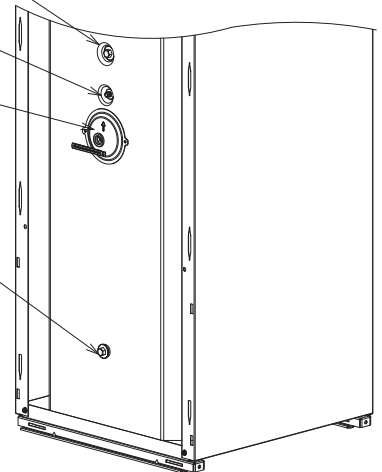


Stop (G3/4") for electronic anode (Optional Accessory)

DHW temperature sensor

DHW electric heater

Stop for drainage outlet (G3/4")



**CAUTION**

- Some water may be spilled when removing the stop for drainage outlet from the DHW.
- ALWAYS clean spilled water.

8.2.9.4 WATER CONTROL

It is necessary to analyze the quality of water by checking pH, electrical conductivity, ammonia ion content, sulphur content, and others. The following is the recommended standard water quality.

Item	Chilled water system		Tendency (1)	
	Circulating water (20°C less than)	Supply water	Corrosion	Deposits of scales
Standard Quality pH (25 °C)	6.8 ~ 8.0	6.8 ~ 8.0	•	•
Electrical Conductivity (mS/m) (25 °C) {μS/cm} (25 °C) <sup>(2)</sup>	Less than 40 Less than 400	Less than 30 Less than 300	•	•
Chlorine Ion (mg Cl <sup>-</sup> /L)	Less than 50	Less than 50	•	
Sulphur Acid Ion (mg H <sub>4</sub> SO <sub>3</sub> /L)	Less than 50	Less than 50	•	
The amount of Acid consumption (pH 4.8) (mg CaCO <sub>3</sub> /L)	Less than 50	Less than 50		•
Total Hardness (mg CaCO <sub>3</sub> /L)	Less than 70	Less than 70		•
Calcium Hardness (mg CaCO <sub>3</sub> /L)	Less than 50	Less than 50		•
Silica L (mg SiO <sub>2</sub> /L)	Less than 30	Less than 30		•
Reference Quality Total Iron (mg Fe/L)	Less than 1.0	Less than 0.3	•	•
Total Copper (mg Cu/L)	Less than 1.0	Less than 0.1	•	
Sulphur Ion (mg S <sup>2-</sup> /L)	It shall not be detected		•	
Ammonium Ion (mg NH <sub>4</sub> <sup>+</sup> /L)	Less than 1.0	Less than 0.1	•	
Remaining Chlorine (mg Cl/L)	Less than 0.3	Less than 0.3	•	
Floating Carbonic Acid (mg CO <sub>2</sub> /L)	Less than 4.0	Less than 4.0	•	
Index of Stability	6.8 ~ 8.0	-	•	•

Item	DHW space	Tendency <sup>(1)</sup>	
	Water supplied	Corrosion	Deposits of scales
Electrical Conductivity (mS/m) (25°C) {μS/cm} (25 °C) <sup>(2)</sup>	100~2000	•	•
Chlorine Ion (mg Cl <sup>-</sup> /L)	Max 250	•	
Sulphate (mg/L)	Max 250	•	
Combination of chloride and sulphate (mg/L)	Max 300	•	•
Total Hardness (mg CaCO <sub>3</sub> /L)	60~150		•

**i** NOTE

- (1) The mark “•” in the table means the factor concerned with the tendency of corrosion or deposits of scales.
- (2) The value showed in “{}” are for reference only according to the former unit.

**⚠ CAUTION**

- Water should be subjected to filtration or to a softening treatment with chemicals before application as treated water.
- No antifreeze agent shall be added to the water circuit.
- To avoid deposits of scale on the heat exchangers surface it is mandatory to ensure a high water quality with low levels of CaCO<sub>3</sub>.
- To prevent the storage tank from corrosion, the electronic anode(optional accessory) can be installed.

8.2.9.5 DHW TANK SELECTION

**i** NOTE

- DHW tank for heat pump type heating system shall be selected according to the requirements in this instruction and on-site use requirements.
- If the selection, installation and wiring are not carried out according to the requirements in this instruction, we would not be responsible for the problems caused by the DHW tank.
- Hot water may cause serious burns. Test water temperature with hands. Use after the water is mixed till proper temperature.
- Connecting of water pipe with tap water pipe should be operated by qualified staff using proper piping material according to local regulations and standards.
- When the high domestic hot water temperature can be a potential risk for human injuries, a mixing valve (field supplied) shall be installed at the hot water outlet connection of the DHW tank. This mixing valve shall secure that the hot water temperature at the hot water tap never rise above a set maximum value. This maximum allowable hot water temperature shall be selected according to the applicable legislation.

**DHW tank selection (Storage capacity)**

When selecting a tank for DHW operation, take into consideration the following points:

- The volume of the tank has to meet with the daily consumption in order to avoid stagnation of water.
- Fresh water must circulate inside the DHW tank water circuit at least one time per day during the first days after the installation has been performed. Additionally, flush the system with fresh water when there is no consumption of DHW during long periods of time.
- Try to avoid long runs of water piping between the tank and the DHW installation in order to decrease possible temperature losses.
- If the domestic cold water entry pressure is higher than the equipment's design pressure, an adequate pressure reducer must be installed to ensure that the maximum pressure is NOT exceeded.

The storage capacity of the DHW tank depends on the daily water demand and the combination method. The daily water demand is estimated with the following calculation formula for consumption:

$$D_i(T) = D_i(60\text{ °C}) \times (60 - T_i / T - T_i)$$

Where:

$D_i(T)$ :	Water demand at T temperature
$D_i(60\text{ °C})$ :	Domestic hot water demand at 60 °C
T:	Temperature of the DHW tank
$T_i$ :	Temperature of the inlet cold water

- Calculation of  $D_i(60\text{ °C})$ :

The standard consumption, expressed in daily liters per person and determined by technical installation regulations of each country, is used to calculate the domestic hot water demand at 60 °C,  $D_i(60\text{ °C})$ . This quantity is then multiplied by the expected number of users of the installation. In the following example, the domestic hot water demand at 60 °C has been considered as 30 liters per person, in a detached house with 4 residents.

- Calculation of T:

The temperature of the DHW tank refers to the temperature of the accumulated water inside the tank, prior to operation. This temperature is usually between 45 °C and 65 °C. It has been considered as 45 °C in this example.

- Calculation of  $T_i$ :

The temperature of the inlet cold water refers to the temperature of the water being supplied to the tank. Since this temperature is usually between 10 °C and 15 °C, it has been considered as 12 °C in this example.

- Example:

$$D_i(T) = 30 \times 4 \times (60 - 12 / 45 - 12) = 174.5 \text{ liters/day}$$

$$174.5 \times 2^{(*)} = 349 \text{ liters/day approximate demand of hot water}$$

## NOTE

*(\*) It is recommended to multiply the calculated consumption by two, in case that the installation is in a detached house. This is done to ensure a steady supply of hot water. In the case of a multifamily installation, it is not necessary to increase the forecast of hot water demand, given the lower simultaneity factor.*

**8.2.10 ELECTRICAL AND CONTROL SETTINGS**

**8.2.10.1 GENERAL CHECK**

- (1) Ensure all electrical apparatus used on site (power switch, circuit breaker, lead, conduit and terminal board) are selected according to technical manual and national and local codes. Wiring must be made according to national and local codes.
- (2) Check voltage is within rated voltage  $\pm 10\%$ . In case of low voltage, system will not start. In case of high voltage, electrical parts will be burnt out.
- (3) Confirm earth wire is connected.

Use wires which are not lighter than the polychloroprene sheathed flexible cord (code designation 60245 IEC 57).

Model	Power supply	Operation Mode	Max. current (A)	Power supply cables	Transmitting cables	CB (A)	ELB (No. of poles/A/mA)
				EN60335-1	EN60335-1		
AHS-(044/060/080) HCDSSA-23	220-240V ~ 50Hz	With DHW electric heater	29.56	3 x 6.0 mm <sup>2</sup>	2 x 0.75 mm <sup>2</sup>	40	2/40/30

CB: Air circuit breaker.

ELB: Earth leakage breaker.

**CAUTION**

- Turn OFF the main power switch of the indoor unit and the outdoor unit and wait for more than 10 minutes before electrical wiring work or a periodical check is performed.

**NOTE**

- (1) Field wiring shall be in conformity to local laws and regulations, and all wiring operations must be performed by qualified professionals.
- (2) Refer to relevant standards for Above-noted power supply cables size.
- (3) Where power supply cable is connected through junction box in series, be sure to determine the total current and choose wires based on the table below. Selection according to EN 60335-1.

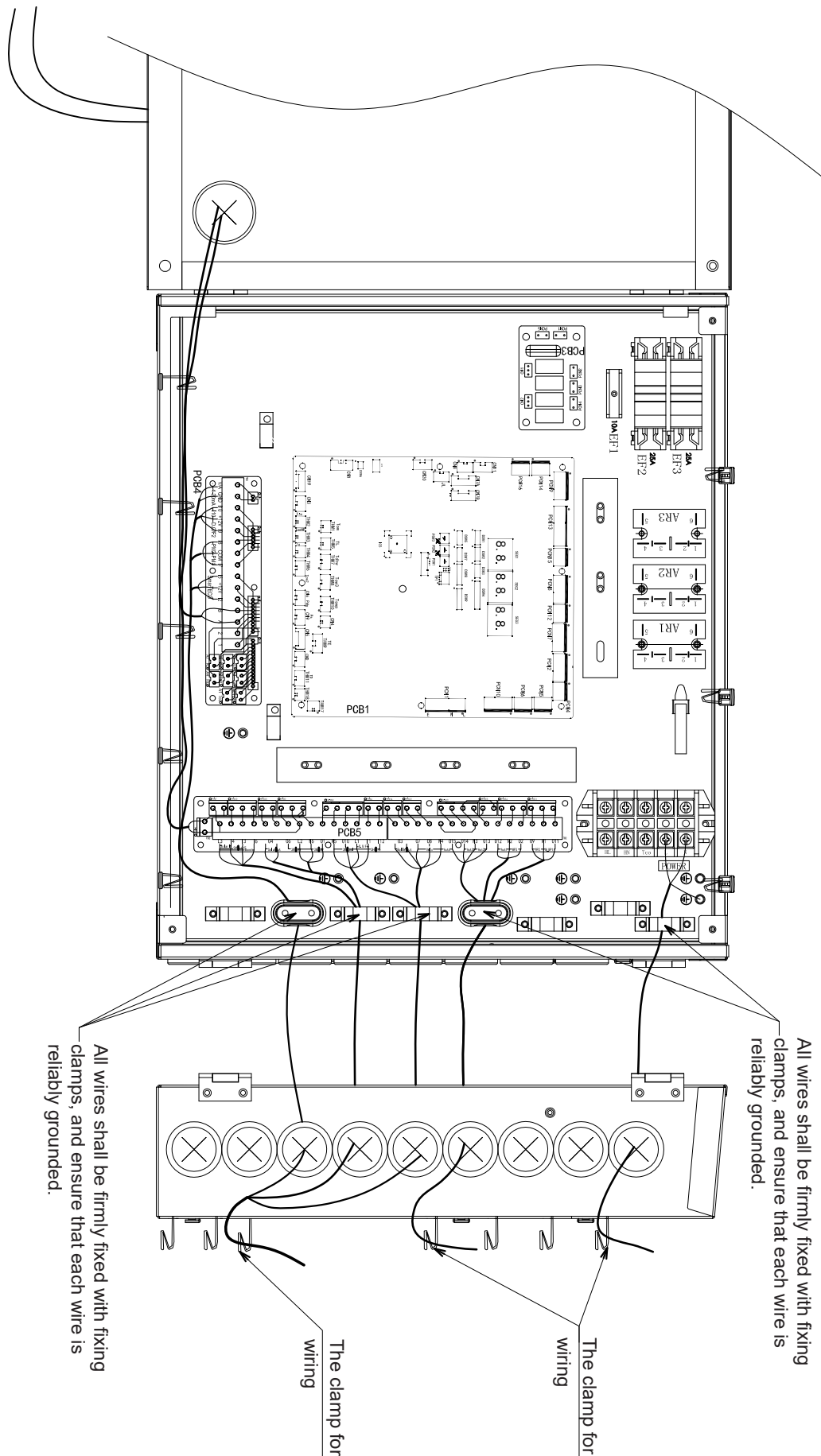
Current i (A)	Wire size (mm <sup>2</sup> )
$i \leq 6$	2.5
$6 < i \leq 10$	2.5
$10 < i \leq 16$	2.5
$16 < i \leq 25$	4
$25 < i \leq 32$	6
$32 < i \leq 40$	10
$40 < i \leq 63$	16
$63 < i$	※1

※ 1: In the case that current exceeds 60A, do not connect cables in series.

- (4) As a minimum, the chosen wires shall not be lighter than the polychloroprene sheathed flexible cord (code designation 60245 IEC 57).
- (5) The wiring specifications for weak current transmission circuit shall not be lower than that for RVV(S)P shielded wires or equivalent, and the shielding layer shall be grounded.
- (6) A switch that can ensure all-pole disconnection shall be installed between power supply and air conditioning unit in such a manner that the contact spacing shall not be less than 3 mm.
- (7) Once the power cord is damaged, the dealer or the professionals from designated maintenance department must be contacted in a timely manner for repair and replacement.
- (8) For the installation of power cord, the earth wire must be longer than the current-carrying conductor.

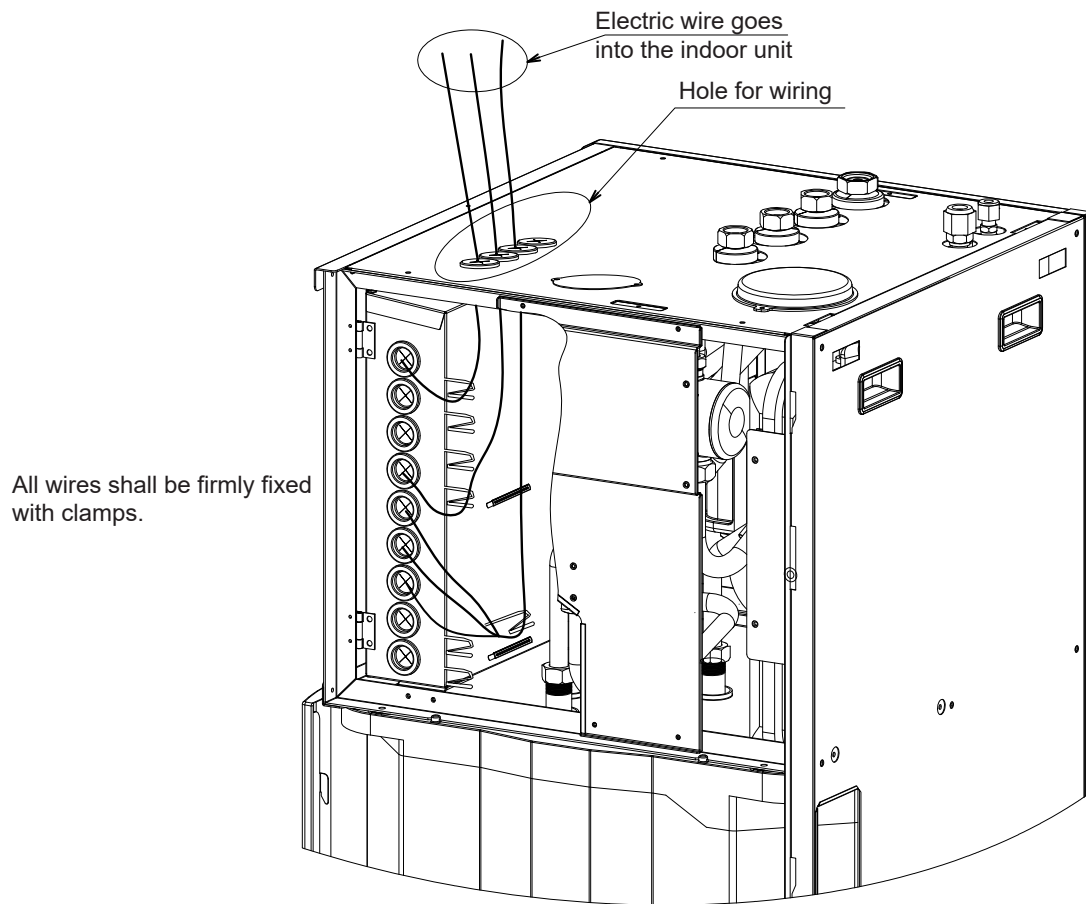
8.2.10.2 WIRING

1. The electrical box inner wiring and wire fixing shall be operated as shown below.





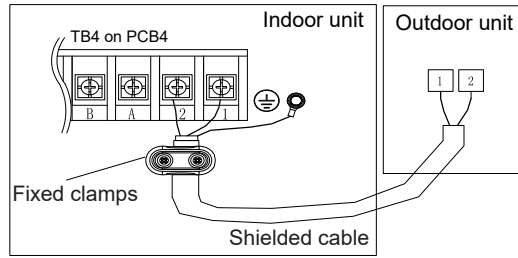
2. The wiring route outside electrical box, as below.



8.2.10.3 TERMINAL BOARD CONNECTIONS

8.2.10.3.1 Indoor / outdoor transmission wiring

- The transmission is wired to terminals 1-2.
- The shielding layer shall be grounded.



- Use twist pair wires (0.75 mm<sup>2</sup>) for transmission wiring between outdoor unit and indoor unit. The wiring must consist of 2-core wires (Do not use wire with more than 3 cores).
- Use shielded wires for transmission wiring to protect the units from noise interference, with a length of less than 300 m and a size in compliance with local codes.
- In the event that a conduit tube for field-wiring is not used, fix rubber bushes to the panel with adhesive.

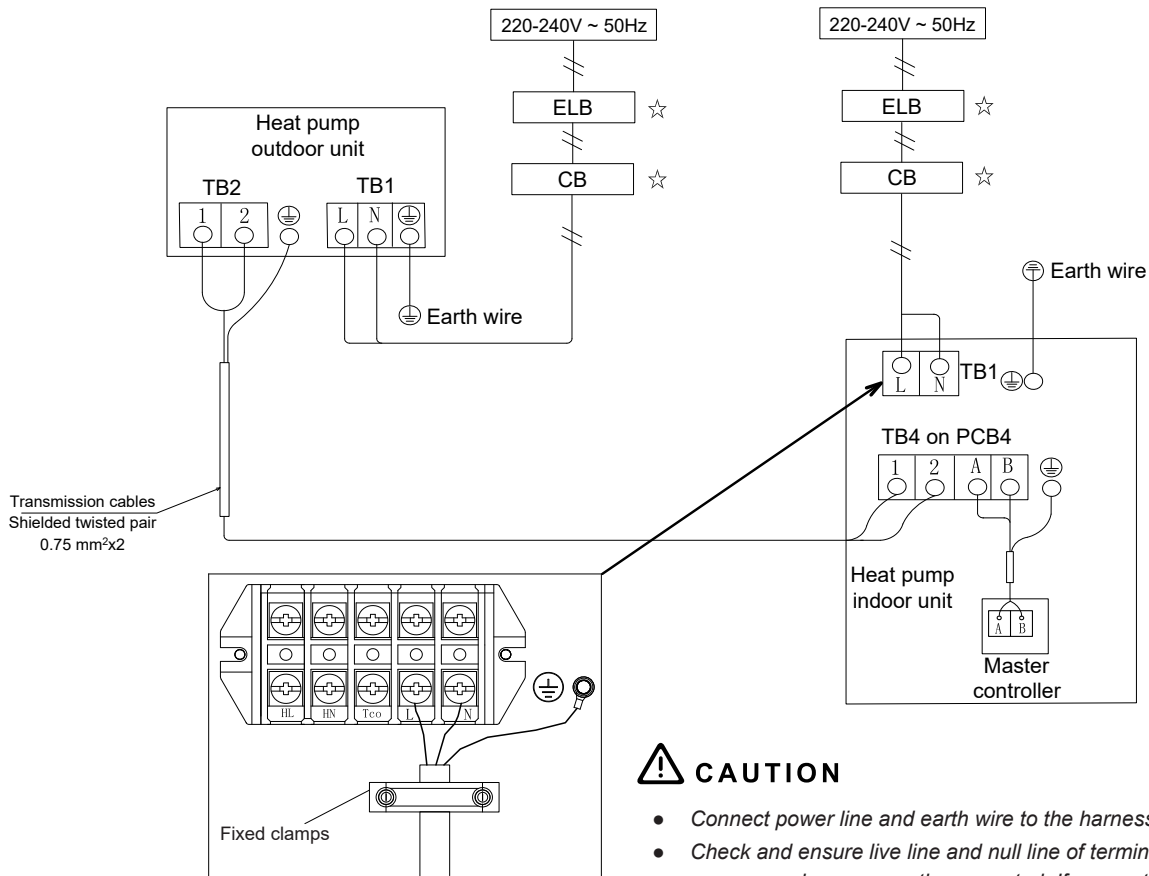
**CAUTION**

Ensure that the transmission wiring is not wrongly connected to any live part that could damage the PCB.

8.2.10.3.2 Terminal board 1 (Main power supply)

The main power supply connection is wired to the Terminal board (TB1) as follows:

- TB: Terminal board
- CB: Air circuit breaker
- ELB: Earth leakage breaker
- //—: Power supply cables
- : Transmission cables
- ☆: Field supplied, not contained in the indoor unit



**CAUTION**

- Connect power line and earth wire to the harness.
- Check and ensure live line and null line of terminal boards in power supply are correctly connected. If connected incorrectly, some parts may be damaged.



## Input - Setting before shipment

Mark	Description	Default settings	Available input codes	Terminals	Specification
I1	Input 1	i - 08 (Demand ON/OFF 1)	i - 00~17 (Except i - 07/12)	I1, L1 on TB3	Closed/Open 220-240V ~ 50Hz
I2	Input 2	i - 13 (Cycle 1 and 2 ECO mode)	i - 00~17 (Except i - 07/12)	I2, +12V on TB4	Closed/Open 12V DC
I3	Input 3	i - 00 (No function)	i - 00~17 (Except i - 07/12)	I3, L3 on TB3	Closed/Open 220-240V ~ 50Hz
I4	Input 4	i - 04 (Solar in)	i - 00~17 (Except i - 07/12)	I4, L3 on TB3	Closed/Open 220-240V ~ 50Hz
I5	Input 5	i - 02 (Smart Act.)	i - 00~17 (Except i - 07/12)	I5, +12V on TB4	Closed/Open 12V DC
I6	Input 6	i - 06 (DHW Boost)	i - 00~17 (Except i - 07/12)	I6, L3 on TB3	Closed/Open 220-240V ~ 50Hz
I7	Input 7	i - 07 (Power meter 1)	i - 00~17	I7, COM on TB4	Closed/Open 12V DC
I8	Input 8	i - 12 (Power meter 2)	i - 00~17	I8, COM on TB4	Closed/Open 12V DC
I9	Input 9	i - 09 (Demand ON/OFF 2)	i - 00~17 (Except i - 07/12)	I9, +12V on TB4	Closed/Open 12V DC
I10	Input 10	i - 00 (No function)	i - 00~17 (Except i - 07/12)	I10, +12V on TB4	Closed/Open 12V DC
I11	Input 11	i - 00 (No function)	i - 00~17 (Except i - 07/12)	I11, +12V on TB4	Closed/Open 12V DC

 **CAUTION**

*Functions i - 05(Forced Heating/Cooling) /Functions i - 10(Forced heating)/Functions i - 11(Forced cooling) cannot be used at the same time.*

**Input - All input codes descriptions:**

Input codes	Mark	Description
i - 00	No Function	-
i - 02	Smart Act./ SG Ready Input 1	This function must be used to stop or limit the heat pump and Auxiliary electric heater when restricted by Electric company. It allows an external Smart switch device to switch off or reduce consumption of the heat pump and Auxiliary electric heater during time of peak electricity demand. In case of using Smart Grid application, this input is used as a digital input 1 and allows four different operating modes.
i - 03	Swimming pool Demand ON/OFF	Optional input signal can be configured as function of "Swimming pool Demand ON/OFF" to operate SWP. Switch ON/OFF of SWP can also be controlled by master controller. Closed: Start SWP operation (Switch ON and Demand ON) Open: Stop SWP operation (Switch OFF and Demand OFF)
i - 04	Solar in	In case of combining Unit with solar panels, this input is used as a feedback for solar station ready operation. Closed: Solar in ON to trigger solar pump operation ON Open: Solar in OFF to trigger solar pump operation OFF
i - 05	Forced Heating/Cooling	Heating/cooling can be changed by an input of an external contact signal. Heating/cooling can also be changed over by master controller. Closed: Heating mode Open: Cooling mode
i - 06	DHW Boost	With this function enabled, it is possible to request a heating up of the DHW when user requires an instantaneous delivery of DHW. Triggering input signal can also Switch ON DHW.
i - 07	Power meter 1	Input used as kW/h pulse count for Energy data recording, used to count energy data or the total energy data.
i - 08	Demand ON/OFF 1	Optional input signal can be configured as function of "Demand ON/OFF 1" or "Demand ON/OFF 2" and selected as room thermostat.
i - 09	Demand ON/OFF 2	Closed: Corresponding room thermostat Switch ON and Thermo ON. Open: Corresponding room thermostat Switch OFF and Thermo OFF. Corresponding room thermostat can also be Switch ON/OFF by Rooms function on Master controller.
i - 10	Forced heating	Forced Heating mode by input of contact signal, Heating can also be changed over by master controller. Closed: Forced Heating mode Open: No action
i - 11	Forced cooling	Forced Cooling mode by input of contact signal, Cooling can also be changed over by master controller. Closed: Forced Cooling mode Open : No action
i - 12	Power meter 2	Input used as kW/h pulse count for Energy data recording, used to count energy data or the total energy data.
i - 13	Cycle 1 and 2 ECO mode	Cycle 1 and Cycle 2 Water ECO offset. Current water temperature setting is reduced or increased by the indicated parameter in space heating mode or space cooling mode. Closed: Cycle 1 and Cycle 2 Water ECO offset enabled Open: Cycle 1 and Cycle 2 Water ECO offset disabled
i - 14	Cycle 1 ECO mode	Cycle 1 Water ECO offset. Current water temperature setting is reduced or increased by the indicated parameter in space heating mode or space cooling mode. Closed: Cycle 1 Water ECO offset enabled Open: Cycle 1 Water ECO offset disabled
i - 15	Cycle 2 ECO mode	Cycle 2 Water ECO offset. Current water temperature setting is reduced or increased by the indicated parameter in space heating mode or space cooling mode. Closed: Cycle 2 Water ECO offset enabled Open: Cycle 2 Water ECO offset disabled
i - 16	Force OFF	Force OFF the unit include Water Cycle 1, Water Cycle 2, DHW and SWP. Switch ON/OFF of different function can also be controlled by master controller. Closed: Forced OFF the unit include Water Cycle 1, Water Cycle 2, DHW and SWP. Open: No action
i - 17	SG Ready Input 2	In case of using Smart Grid application, this input is used as a digital input 2 and allows four different operating modes.

## Output - Setting before shipment

Mark	Description	Default settings	Available output codes	Terminals		Specification
O1	Output 1	o - 01 (3WV SWP)	o - 00 ~ 30 (Except o - 02/08/17/21)	Power supply	L2, N6 on TB3	ON/OFF 220-240V ~ 50Hz Max. 1A
				Signal line	O1 on TB3	
O2	Output 2	o - 02 (WP3)	o - 00 ~ 30 (Except o - 17)	O2, N2 on TB2		ON/OFF 220-240V ~ 50Hz Max. 1A
O3	Output 3	o - 03 (Boiler combination)	o - 00 ~ 30 (Except o - 02/08/17/21)	O3 on TB2		Free voltage
O4	Output 4	o - 04 (Solar out)	o - 00 ~ 30 (Except o - 02/08/17/21)	O4 on TB3		Free voltage
O5	Output 5	o - 17 (DHW Electric Heater)	o - 00 ~ 30	HL, HN on TB1		ON/OFF 220-240V ~ 50Hz Max. 15A
O6	Output 6	o - 18 (3WV DHW)	o - 00 ~ 30 (Except o - 02/08/17/21)	Power supply	L2, N6 on TB3	ON/OFF 220-240V ~ 50Hz Max. 1A
				Signal line	O6 on TB3	
O7	Output 7	o - 19 (Mixing valve Close)	o - 00 ~ 30 (Except o - 02/08/17/21)	O7, N4 on TB2		ON/OFF 220-240V ~ 50Hz Max. 1A
O8	Output 8	o - 20 (Mixing valve Open)	o - 00 ~ 30 (Except o - 02/08/17/21)	O8, N4 on TB2		ON/OFF 220-240V ~ 50Hz Max. 1A
O9	Output 9	o - 21 (WP2)	o - 00 ~ 30 (Except o - 17)	O9, N1 on TB2		ON/OFF 220-240V ~ 50Hz Max. 1A
O10	Output 10	o - 22 (3WV Cooling)	o - 00 ~ 30 (Except o - 02/08/17/21)	Power supply	L1, N5 on TB3	ON/OFF 220-240V ~ 50Hz Max. 1A
				Signal line	O10 on TB3	
O11	Output 11	o - 08 (WP1)	o - 00 ~ 30 (Except o - 17)	O11, N1 on TB2		ON/OFF 220-240V ~ 50Hz Max. 1A
O12	Output 12	o - 23 (Act1)	o - 00 ~ 30 (Except o - 02/08/17/21)	O12, N2 on TB2		ON/OFF 220-240V ~ 50Hz Max. 1A
O13	Output 13	o - 24 (Act2)	o - 00 ~ 30 (Except o - 02/08/17/21)	O13, N3 on TB2		ON/OFF 220-240V ~ 50Hz Max. 1A
O14	Output 14	o - 25 (Act3)	o - 00 ~ 30 (Except o - 02/08/17/21)	O14, N3 on TB2		ON/OFF 220-240V ~ 50Hz Max. 1A
O15	Output 15	o - 26 (Act4)	o - 00 ~ 30 (Except o - 02/08/17/21)	O15, N4 on TB2		ON/OFF 220-240V ~ 50Hz Max. 1A

**Output - All output codes descriptions:**

Output codes	Mark	Description
o - 00	No Function	-
o - 01	3WV SWP	In case of combining Unit with swimming pool, this output is used to drive 3-way valve diverting to the swimming pool heat exchanger. Output ON signal when swimming pool function is operating.
o - 02	WP3	In case of combining Unit with hydraulic separator, this output is used to drive relay of water pump 3.
o - 03	Boiler combination	In case of combining Unit with boiler, this output is used to Start/Stop it.
o - 04	Solar out	In case of combining Unit with solar panel, this output is used to drive relay of solar pump.
o - 05	Alarm signal	Output ON signal when an Alarm Code occurs.
o - 06	SWP signal	Output ON signal in case that Swimming pool function is demand ON.
o - 07	Cooling signal	Output ON signal in case that Space Cooling is Thermo-ON.
o - 08	WP1	In case of the pipeline connected to the unit is long leading to low water flow rate, this output is used to drive relay of an extra WP1 that can be cascaded with inside EC WP1 to offer additional hydraulic head. The extra WP1 works equally with inside EC WP1.
o - 09	Heating signal	Output ON signal in case that Space Heating is Thermo-ON.
o - 10	DHW signal	Output ON signal in case that DHW is demand ON or DHW Electric Heater is ON.
o - 11	Solar overheat	Output ON signal in case that solar panels overheat protection is activated.
o - 12	Defrost	Output ON signal in case that the outdoor unit is defrosting.
o - 13	DHW pump	Output ON signal to drive relay of a re-circulation pump in case of re-circulation pump is available for DHW tank.
o - 14	Heater relay 1	Copy ON/OFF signal of Auxiliary electric heater output terminal 1.
o - 15	Heater relay 2	Copy ON/OFF signal of Auxiliary electric heater output terminal 2.
o - 16	c1 water ON/OFF	Output ON signal in case that Water Cycle1 switch ON.
o - 17	DHW Electric Heater	Output ON signal in case the DHW Electric Heater is Enabled and meet the ON conditions.
o - 18	3WV DHW	In case of combining Unit with DHW, this output is used to drive 3-way valve diverting to the sanitary tank inner coil. Output ON signal when DHW function is operating.
o - 19	Mixing valve Close	Mixing valve has two operation terminals of closing valve and opening valve. Optional output signal need be configured as function of "Mixing valve Close" and "Mixing valve Open" to drive mixing valve.
o - 20	Mixing valve Open	
o - 21	WP2	When Water Cycle 2 is available Optional Output signal need be configured to drive relay of water pump 2.
o - 22	3WV Cooling	In case of combining Unit with cooling fan coil, this output is used to drive 3-way valve diverting to cooling fan coil. Output ON signal when space cooling is operating.
o - 23	Act1	Room actuators, output ON signal in case the corresponding Room Thermostat is Thermo ON (heating and cooling). When the following conditions are met, Room actuators also Output ON: ① Air purge ② Anti-freezing ③ Screed Drying ④ Retry operation due to anti freezing (alarm-76 , d1-31, d1-03) ⑤ Outdoor Unit defrost without Room Thermostat Thermo ON ⑥ Overrun after requiring OFF
o - 24	Act2	
o - 25	Act3	
o - 26	Act4	
o - 27	Act5	
o - 28	Act6	
o - 29	Act7	
o - 30	WPc1	When Water Cycle 1 is available Optional Output signal can be configured to drive relay of exclusive water pump of Water Cycle 1..



**Auxiliary sensor - Setting before shipment**

Mark	Description	Default settings	Available auxiliary sensor codes
A1	Auxsensor 1	a - 01 (Tow3)	a - 00 ~ 14
A2	Auxsensor 2	a - 03 (Tsolar)	a - 00 ~ 14
A3	Auxsensor 3	a - 02 (Tswp)	a - 00 ~ 14
A4	Auxsensor 4	a - 05 (Tow2)	a - 00 ~ 14
A5	Auxsensor 5	a - 14 (TDHW1)	a - 00 ~ 14
A6	Auxsensor 6	a - 07 (Room_amb1)	a - 00 ~ 14
A7	Auxsensor 7	a - 08 (Room_amb2)	a - 00 ~ 14

**Auxiliary sensor codes - All Auxiliary sensor codes descriptions:**

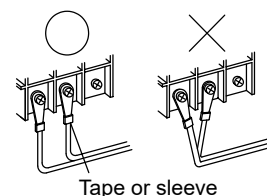
Auxiliary sensor codes	Mark	Description
a - 00	No Function	-
a - 01	Tow3	This sensor is used in case to combine Unit with hydraulic separator to detect Hot water temperature detection of hydraulic separator .
a - 02	Tswp	In case of combining Unit with swimming pool, this sensor is used to detect swimming pool water temperature.
a - 03	Tsolar	In case of combining Unit with solar panels, this sensor is used to Detect Hot water temperature of solar panels .
a - 04	Ta_ao	Optional Second Outdoor Ambient Temperature sensor accessory can be connected to the Auxiliary sensor in case that the heat pump is located in a non-suitable position for this measurement.
a - 05	Tow2	When Water Cycle 2 is available, auxiliary sensor need be configured as function of "Tow2" to detect outlet water temperature of Water Cycle 2.
a - 06	duty	Used to detect duty signal when duty signal control is Enabled, the duty signal type can be 0-10V, 0-5V or 10-20mA.
a - 07	Room_amb1	Rooms function on master controller is selected as room thermostat, and in this scenario, auxiliary sensor can be configured as function of "Room_amb1-7", and can be selected as room temperature detection of specific room.
a - 08	Room_amb2	
a - 09	Room_amb3	
a - 10	Room_amb4	
a - 11	Room_amb5	
a - 12	Room_amb6	
a - 13	Room_amb7	
a - 14	TDHW1	The sensor of TDHW1 is auxiliary sensor to detect tank water temperature of lower side.

**⚠ DANGER**

- Do not connect or adjust any wiring or connections unless the main power switch is OFF.
- When using more than one power source, check and ensure that all of them are turned OFF before operating the indoor unit.
- Avoid wiring installation in contact with the refrigerant pipes, water pipes, edges of plates and electrical components inside the unit to prevent damage, which may cause electric shock or short circuit.

**⚠ CAUTION**

- After changing the input settings, output settings and auxiliary sensor settings on the master controller, it needs to be powered off and on again to take effect.
- Use a dedicated power circuit for the indoor unit. Do not use a power circuit shared with the outdoor unit or any other appliance.
- Make sure that all wiring and protection devices are properly selected, connected, identified and fixed to the corresponding terminals of the unit, specially the protection (earth) and power wiring, taking into account the applicable national and local regulations. Establish proper earthing. Incomplete earthing may cause electric shock.
- Protect the indoor unit against the entry of small animals (like rodents) which could damage the drain pipe and any internal wire or any other electrical part, leading to electric shock or short-circuit.
- Keep a distance between each wiring terminal and attach insulation tape or sleeve as shown in the figure.



# Installation

## 8.2.10.5 SETTING OF DIP SWITCHES ON PCB1

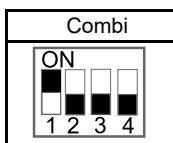
### **i** NOTE

- The mark “■” indicates the dip switches positions.
- No mark “■” indicates pin position is not affected.
- The figures show the settings before shipment or after selection.
- “Not used” means that the pin must not be changed. A malfunction might occur if changed.

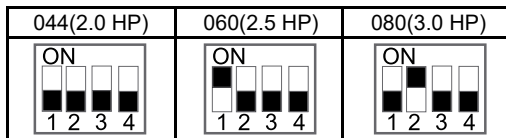
### **!** CAUTION

Before setting dip switches, first turn the power supply OFF and then set the position of dip switches. If the switches are set without turning the power supply OFF, the contents of the setting are invalid.

- (1) DSW1: Unit model setting  
No setting is required.



- (2) DSW2: Unit capacity setting  
No setting is required.



- (3) DSW3: Additional setting

Setting before shipment	
ON: Cancel 70 alarm (Water pressure abnormality)	
Anti-freezing settings ON: Whole water cycle does anti-freezing. OFF: Only primary cycle does anti-freezing.	

- (4) DSW4: Additional setting

Setting before shipment	
Water pump forced ON	
Auxiliary electric heater forced OFF	
ON: Anti-freezing enabled OFF: Anti-freezing disabled	

Water pump mode when Thermo OFF ON: Operate periodically OFF: Operate constantly	
Manual emergency setting ON: Manual emergency enabled OFF: Manual emergency disabled	
DHW electric heater allowance setting ON: DHW electric heater cancel forced OFF OFF: DHW electric heater forced OFF	
DHW 3-way valve forced ON	
Start air purge	

- (5) DSW5: Additional setting

Setting before shipment	
ON: Cancel 75/78 alarm (Water pump abnormalities)	
ON: WP3 operates in space cooling mode.	
ON: Cancel Alarm of Thermistor Tow2.	

- (6) DSW6: Fuse reset

Setting before shipment	
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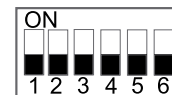
- (7) DSW7: Not used

Setting before shipment	
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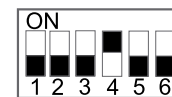
- (8) DSW8: Refrigeration system No. setting

Setting is required.

Use binary encoding method. Before shipment are all OFF.



Max No.63 are available to set when all the equipment are connected to corresponding Central Control System.  
Ex: Set refrigeration system No. as 8.



- (9) DSW9: Indoor unit No. setting.

No setting is required.

Setting before shipment	
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8.2.11 TEST RUN

**i** NOTE

NEVER operate the unit without careful inspection.

8.2.11.1 CHECKLIST BEFORE TEST RUN

Do NOT operate the system before the following checks are OK:

You have read the complete installation instructions of outdoor unit, indoor unit and master controller carefully.	<input type="checkbox"/>
The <b>indoor unit</b> is properly mounted.	<input type="checkbox"/>
The <b>outdoor unit</b> is properly mounted.	<input type="checkbox"/>
The following field wiring has been carried out according to this document and the applicable legislation: <ul style="list-style-type: none"> <li>▪ Between the local power supply and the outdoor unit</li> <li>▪ Between indoor unit and outdoor unit</li> <li>▪ Between the local power supply and the indoor unit</li> <li>▪ Between the indoor unit and the valves (if applicable)</li> <li>▪ Between the indoor unit and the room thermostat (if applicable)</li> <li>▪ Between the indoor unit and the DHW tank (if applicable)</li> </ul>	<input type="checkbox"/>
The system is properly <b>earthed</b> and the earth terminals are tightened.	<input type="checkbox"/>
The <b>fuses</b> or locally installed protection devices are installed according to this document, and have NOT been bypassed.	<input type="checkbox"/>
The <b>power supply voltage</b> matches the voltage on the <b>Nameplate</b> of the unit.	<input type="checkbox"/>
There are NO <b>loose connections</b> or damaged electrical components in the electrical box.	<input type="checkbox"/>
There are NO <b>damaged components</b> or <b>squeezed pipes</b> on the inside of the indoor and outdoor units.	<input type="checkbox"/>
Only for DHW tank with <b>electric heater</b> : <b>Temperature protection switch (Auto restore)</b> has been already wired. <b>Temperature protection switch / Temperature fuse</b> has been already wired.	<input type="checkbox"/>
There are NO <b>refrigerant leaks</b> .	<input type="checkbox"/>
The <b>water pipes</b> are thermally insulated.	<input type="checkbox"/>
The correct pipe size of <b>refrigerant pipes</b> (gas and liquid) are installed and the <b>pipes</b> are properly insulated.	<input type="checkbox"/>
There is NO <b>water leakage</b> inside the indoor unit.	<input type="checkbox"/>
The <b>shut-off valves</b> are properly installed and fully open.	<input type="checkbox"/>
The <b>stop valves</b> (gas and liquid) on the outdoor unit are fully open.	<input type="checkbox"/>
The <b>air purge valve</b> is open.	<input type="checkbox"/>
The <b>safety valve</b> purges water when open.	<input type="checkbox"/>
The <b>minimum water volume</b> is guaranteed in all conditions. See "Check Water Volume" under section 9.3 "Water Filling".	<input type="checkbox"/>
The <b>DHW tank</b> is filled completely.	<input type="checkbox"/>

**⚠ CAUTION**

- The unit starts only when all check points are cleared up.
- Pay attention when system is running:
  - (A) Do not touch any parts of discharge pipelines, because the discharge temperature of compressor can be more than 90°C.
  - (B) Do not press AC contactor button, otherwise serious accident may be caused.
- Do not touch any electrical components in 10 minutes after main power supply is cut off.

8.2.11.2 CHECKLIST DURING TEST RUN

The <b>minimum flow rate</b> during electric heater/defrost operation is guaranteed in all conditions. See section "8.2 Requirements and recommendations for hydraulic circuit" and "8.3 Water filling".	<input type="checkbox"/>
To perform an <b>air purge</b> .	<input type="checkbox"/>
To perform a <b>test run</b> .	<input type="checkbox"/>
To perform an <b>actuator test run</b> .	<input type="checkbox"/>
<b>Underfloor screed drying function</b> The underfloor screed drying function is started (if necessary).	<input type="checkbox"/>

**⚠ CAUTION**

- When performing test run of floor heating, higher temperature in indoor unit (up to 55 °C) will damage floors due to expansion and contraction. Recommend it is within 30 minutes.
- Use the controller to start test run (refer to the manual of master controller).
- It is normal that after indoor unit is energized, it may directly enter anti-freezing running mode, and water pump automatically runs if outdoor temperature is very low.

8.2.11.3 CHECK THE MINIMUM FLOW RATE

1	Check the hydraulic configuration to find out which space heating loops can be closed by mechanical, electronic, or other valves.	—
2	Close all space heating loops that can be closed.	—
3	Start the pump test run . See setting of DSW4-8 in section "10 DIP Switch Setting of PCB1" .	—
4	Read out the flow rate and modify the bypass valve setting to reach the minimum required flow rate + 2L/min.	—

## 8.2.12 TECHNICAL PARAMETERS

### Technical parameters

Outdoor unit:	AHW-044HCDS1	Indoor unit:	AHS-044HCDSAA-23				
Outdoor side heat exchanger of air conditioner/heat pump: air							
Indoor side heat exchanger of air conditioner/heat pump: water							
Type: compressor driven vapour compression							
Driver of compressor: electric motor							
Indication if the heater is equipped with a supplementary heater: yes							
Parameters shall be declared for the average heating season							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
Heating							
Parameters shall be declared for:				Low temperature application			
Indoor heat exchanger:				Variable outlet			
Rated heating capacity	$P_{rated,h}$	4.44	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	197	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature $T_j$				Declared coefficient of performance/Average season, at indoor temperature 20 °C and outdoor temperature $T_j$			
$T_j = -7^\circ\text{C}$	$P_{dh}$	3.9	kW	$T_j = -7^\circ\text{C}$	$COP_d$	3.29	—
$T_j = 2^\circ\text{C}$	$P_{dh}$	2.4	kW	$T_j = 2^\circ\text{C}$	$COP_d$	4.80	—
$T_j = 7^\circ\text{C}$	$P_{dh}$	1.7	kW	$T_j = 7^\circ\text{C}$	$COP_d$	6.44	—
$T_j = 12^\circ\text{C}$	$P_{dh}$	2.2	kW	$T_j = 12^\circ\text{C}$	$COP_d$	9.92	—
$T_j = \text{bivalent temperature}$	$P_{dh}$	3.9	kW	$T_j = \text{bivalent temperature}$	$COP_d$	3.29	—
$T_j = \text{operating limit}$	$P_{dh}$	4.3	kW	$T_j = \text{operating limit}$	$COP_d$	2.62	—
Bivalent temperature				Operating limit temperature			
heating/Average	$T_{biv}$	-7	°C	heating/Average	Tol	-10	°C
heating/Warmer	$T_{biv}$	—	°C	heating/Warmer	Tol	—	°C
heating/Colder	$T_{biv}$	—	°C	heating/Colder	Tol	—	°C
Degradation co-efficient	$C_d$	0.9					
Power consumption in modes other than 'active mode'							
Off mode	$P_{OFF}$	0.010	kW	Standby mode	PSB	0.010	kW
Thermostat-off mode(heating)	$P_{TO}$	0.011	kW	Crankcase heater mode	PCK	0.001	kW
Supplementary heater							
Supplementary capacity	$P_{SUP}$	0.102	kW	Type of energy input	Electric		
Other items							
Capacity control		Variable		Air flow rate, outdoor		2700	m <sup>3</sup> /h
Reference annual heating demand	$Q_H$	9119	kWh	Sound power level , indoor/ outdoor measured	LWA	42/61	dB(A)
Annual energy consumption	$Q_{HE}$	1824	kWh	Global warming potential	GWP	675	kgCO <sub>2</sub> eq.
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						

## Technical parameters

Outdoor unit:	AHW-044HCDS1	Indoor unit:	AHS-044HCDSAA-23				
Outdoor side heat exchanger of air conditioner/heat pump: air							
Indoor side heat exchanger of air conditioner/heat pump: water							
Type: compressor driven vapour compression							
Driver of compressor: electric motor							
Indication if the heater is equipped with a supplementary heater: yes							
Parameters shall be declared for the average heating season							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
Heating							
Parameters shall be declared for:				Medium temperature application			
Indoor heat exchanger:				Variable outlet			
Rated heating capacity	$P_{rated,h}$	3.87	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	126	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature $T_j$				Declared coefficient of performance/Average season, at indoor temperature 20 °C and outdoor temperature $T_j$			
$T_j = -7^\circ\text{C}$	$P_{dh}$	3.4	kW	$T_j = -7^\circ\text{C}$	$COP_d$	1.97	—
$T_j = 2^\circ\text{C}$	$P_{dh}$	2.1	kW	$T_j = 2^\circ\text{C}$	$COP_d$	3.22	—
$T_j = 7^\circ\text{C}$	$P_{dh}$	1.4	kW	$T_j = 7^\circ\text{C}$	$COP_d$	3.97	—
$T_j = 12^\circ\text{C}$	$P_{dh}$	2.0	kW	$T_j = 12^\circ\text{C}$	$COP_d$	7.24	—
$T_j = \text{bivalent temperature}$	$P_{dh}$	3.4	kW	$T_j = \text{bivalent temperature}$	$COP_d$	1.97	—
$T_j = \text{operating limit}$	$P_{dh}$	3.5	kW	$T_j = \text{operating limit}$	$COP_d$	1.68	—
Bivalent temperature				Operating limit temperature			
heating/Average	$T_{biv}$	-7	°C	heating/Average	$T_{ol}$	-10	°C
heating/Warmer	$T_{biv}$	—	°C	heating/Warmer	$T_{ol}$	—	°C
heating/Colder	$T_{biv}$	—	°C	heating/Colder	$T_{ol}$	—	°C
Degradation co-efficient	$C_d$	0.9					
Power consumption in modes other than 'active mode'							
Off mode	$P_{OFF}$	0.010	kW	Standby mode	$P_{SB}$	0.010	kW
Thermostat-off mode(heating)	$P_{TO}$	0.011	kW	Crankcase heater mode	$P_{CK}$	0.001	kW
Supplementary heater							
Supplementary capacity	$P_{SUP}$	0.303	kW	Type of energy input	Electric		
Other items							
Capacity control		Variable		Air flow rate, outdoor		2700	$\text{m}^3/\text{h}$
Reference annual heating demand	$Q_H$	7944	kWh	Sound power level, indoor/outdoor measured	LWA	42/61	dB(A)
Annual energy consumption	$Q_{HE}$	2457	kWh	Global warming potential	GWP	675	$\text{kgCO}_2 \text{ eq.}$
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						

## Technical parameters

Outdoor unit:	AHW-060HCDS1			Indoor unit:	AHS-060HCDSAA-23		
Outdoor side heat exchanger of air conditioner/heat pump: air							
Indoor side heat exchanger of air conditioner/heat pump: water							
Type: compressor driven vapour compression							
Driver of compressor:electric motor							
Indication if the heater is equipped with a supplementary heater: yes							
Parameters shall be declared for the average heating season							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
Heating							
Parameters shall be declared for:				Low temperature application			
Indoor heat exchanger:				Variable outlet			
Rated heating capacity	$P_{rated,h}$	6.10	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	194	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature $T_j$				Declared coefficient of performance/Average season, at indoor temperature 20 °C and outdoor temperature $T_j$			
$T_j = -7^\circ\text{C}$	$P_{dh}$	5.4	kW	$T_j = -7^\circ\text{C}$	$COP_d$	3.13	—
$T_j = 2^\circ\text{C}$	$P_{dh}$	3.3	kW	$T_j = 2^\circ\text{C}$	$COP_d$	4.67	—
$T_j = 7^\circ\text{C}$	$P_{dh}$	2.0	kW	$T_j = 7^\circ\text{C}$	$COP_d$	6.63	—
$T_j = 12^\circ\text{C}$	$P_{dh}$	2.2	kW	$T_j = 12^\circ\text{C}$	$COP_d$	9.92	—
$T_j = \text{bivalent temperature}$	$P_{dh}$	5.4	kW	$T_j = \text{bivalent temperature}$	$COP_d$	3.13	—
$T_j = \text{operating limit}$	$P_{dh}$	5.3	kW	$T_j = \text{operating limit}$	$COP_d$	2.66	—
Bivalent temperature				Operating limit temperature			
heating/Average	$T_{biv}$	-7	°C	heating/Average	Tol	-10	°C
heating/Warmer	$T_{biv}$	—	°C	heating/Warmer	Tol	—	°C
heating/Colder	$T_{biv}$	—	°C	heating/Colder	Tol	—	°C
Degradation co-efficient	$C_d$	0.9					
Power consumption in modes other than 'active mode'							
Off mode	$P_{OFF}$	0.010	kW	Standby mode	$P_{SB}$	0.010	kW
Thermostat-off mode(heating)	$P_{TO}$	0.011	kW	Crankcase heater mode	$P_{CK}$	0.001	kW
Supplementary heater							
Supplementary capacity	$P_{SUP}$	0.729	kW	Type of energy input	Electric		
Other items							
Capacity control		Variable		Air flow rate, outdoor		2700	m <sup>3</sup> /h
Reference annual heating demand	$Q_H$	12507	kWh	Sound power level , indoor/ outdoor measured	LWA	42/62	dB(A)
Annual energy consumption	$Q_{HE}$	2539	kWh	Global warming potential	GWP	675	kgCO <sub>2</sub> eq.
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						

## Technical parameters

Outdoor unit:	AHW-060HCDS1	Indoor unit:	AHS-060HCDSAA-23				
Outdoor side heat exchanger of air conditioner/heat pump: air							
Indoor side heat exchanger of air conditioner/heat pump: water							
Type: compressor driven vapour compression							
Driver of compressor: electric motor							
Indication if the heater is equipped with a supplementary heater: yes							
Parameters shall be declared for the average heating season							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
Heating							
Parameters shall be declared for:				Medium temperature application			
Indoor heat exchanger:				Variable outlet			
Rated heating capacity	$P_{rated,h}$	5.37	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	130	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature $T_j$				Declared coefficient of performance/Average season, at indoor temperature 20 °C and outdoor temperature $T_j$			
$T_j = -7^\circ\text{C}$	$P_{dh}$	4.7	kW	$T_j = -7^\circ\text{C}$	$COP_d$	2.04	—
$T_j = 2^\circ\text{C}$	$P_{dh}$	3.0	kW	$T_j = 2^\circ\text{C}$	$COP_d$	3.21	—
$T_j = 7^\circ\text{C}$	$P_{dh}$	2.0	kW	$T_j = 7^\circ\text{C}$	$COP_d$	4.34	—
$T_j = 12^\circ\text{C}$	$P_{dh}$	2.0	kW	$T_j = 12^\circ\text{C}$	$COP_d$	7.24	—
$T_j = \text{bivalent temperature}$	$P_{dh}$	4.7	kW	$T_j = \text{bivalent temperature}$	$COP_d$	2.04	—
$T_j = \text{operating limit}$	$P_{dh}$	4.5	kW	$T_j = \text{operating limit}$	$COP_d$	1.75	—
Bivalent temperature				Operating limit temperature			
heating/Average	$T_{biv}$	-7	°C	heating/Average	$T_{ol}$	-10	°C
heating/Warmer	$T_{biv}$	—	°C	heating/Warmer	$T_{ol}$	—	°C
heating/Colder	$T_{biv}$	—	°C	heating/Colder	$T_{ol}$	—	°C
Degradation co-efficient	$C_d$	0.9					
Power consumption in modes other than 'active mode'							
Off mode	$P_{OFF}$	0.010	kW	Standby mode	$P_{SB}$	0.010	kW
Thermostat-off mode(heating)	$P_{TO}$	0.011	kW	Crankcase heater mode	$P_{CK}$	0.001	kW
Supplementary heater							
Supplementary capacity	$P_{SUP}$	0.805	kW	Type of energy input	Electric		
Other items							
Capacity control		Variable		Air flow rate, outdoor		2700	m <sup>3</sup> /h
Reference annual heating demand	$Q_H$	11032	kWh	Sound power level, indoor/outdoor measured	LWA	42/62	dB(A)
Annual energy consumption	$Q_{HE}$	3312	kWh	Global warming potential	GWP	675	kgCO <sub>2</sub> eq.
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						



## Technical parameters

Outdoor unit:	AHW-080HCDS1	Indoor unit:	AHS-080HCDSAA-23				
Outdoor side heat exchanger of air conditioner/heat pump: air							
Indoor side heat exchanger of air conditioner/heat pump: water							
Type: compressor driven vapour compression							
Driver of compressor: electric motor							
Indication if the heater is equipped with a supplementary heater: yes							
Parameters shall be declared for the average heating season							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
Heating							
Parameters shall be declared for:				Low temperature application			
Indoor heat exchanger:				Variable outlet			
Rated heating capacity	$P_{rated,h}$	6.50	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	194	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature $T_j$				Declared coefficient of performance/Average season, at indoor temperature 20 °C and outdoor temperature $T_j$			
$T_j = -7^\circ\text{C}$	$P_{dh}$	5.8	kW	$T_j = -7^\circ\text{C}$	$COP_d$	3.14	—
$T_j = 2^\circ\text{C}$	$P_{dh}$	3.5	kW	$T_j = 2^\circ\text{C}$	$COP_d$	4.84	—
$T_j = 7^\circ\text{C}$	$P_{dh}$	2.3	kW	$T_j = 7^\circ\text{C}$	$COP_d$	5.98	—
$T_j = 12^\circ\text{C}$	$P_{dh}$	2.0	kW	$T_j = 12^\circ\text{C}$	$COP_d$	9.67	—
$T_j = \text{bivalent temperature}$	$P_{dh}$	5.8	kW	$T_j = \text{bivalent temperature}$	$COP_d$	3.14	—
$T_j = \text{operating limit}$	$P_{dh}$	6.2	kW	$T_j = \text{operating limit}$	$COP_d$	2.66	—
Bivalent temperature				Operating limit temperature			
heating/Average	$T_{biv}$	-7	°C	heating/Average	$T_{ol}$	-10	°C
heating/Warmer	$T_{biv}$	—	°C	heating/Warmer	$T_{ol}$	—	°C
heating/Colder	$T_{biv}$	—	°C	heating/Colder	$T_{ol}$	—	°C
Degradation co-efficient	$C_d$	0.9					
Power consumption in modes other than 'active mode'							
Off mode	$P_{OFF}$	0.010	kW	Standby mode	$P_{SB}$	0.010	kW
Thermostat-off mode(heating)	$P_{TO}$	0.011	kW	Crankcase heater mode	$P_{CK}$	0.001	kW
Supplementary heater							
Supplementary capacity	$P_{SUP}$	0.343	kW	Type of energy input	Electric		
Other items							
Capacity control		Variable		Air flow rate, outdoor		2700	m <sup>3</sup> /h
Reference annual heating demand	$Q_H$	13441	kWh	Sound power level, indoor/outdoor measured	LWA	42/64	dB(A)
Annual energy consumption	$Q_{HE}$	2732	kWh	Global warming potential	GWP	675	kgCO <sub>2</sub> eq.
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						

## Technical parameters

Outdoor unit:	AHW-080HCDS1	Indoor unit:	AHS-080HCDSAA-23				
Outdoor side heat exchanger of air conditioner/heat pump: air							
Indoor side heat exchanger of air conditioner/heat pump: water							
Type: compressor driven vapour compression							
Driver of compressor:electric motor							
Indication if the heater is equipped with a supplementary heater: yes							
Parameters shall be declared for the average heating season							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
Heating							
Parameters shall be declared for:				Medium temperature application			
Indoor heat exchanger:				Variable outlet			
Rated heating capacity	$P_{rated,h}$	5.90	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	134	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature $T_j$				Declared coefficient of performance/Average season, at indoor temperature 20 °C and outdoor temperature $T_j$			
$T_j = -7^\circ\text{C}$	$P_{dh}$	5.2	kW	$T_j = -7^\circ\text{C}$	$COP_d$	1.85	—
$T_j = 2^\circ\text{C}$	$P_{dh}$	3.2	kW	$T_j = 2^\circ\text{C}$	$COP_d$	3.40	—
$T_j = 7^\circ\text{C}$	$P_{dh}$	2.1	kW	$T_j = 7^\circ\text{C}$	$COP_d$	4.50	—
$T_j = 12^\circ\text{C}$	$P_{dh}$	2.1	kW	$T_j = 12^\circ\text{C}$	$COP_d$	7.71	—
$T_j = \text{bivalent temperature}$	$P_{dh}$	5.2	kW	$T_j = \text{bivalent temperature}$	$COP_d$	1.85	—
$T_j = \text{operating limit}$	$P_{dh}$	5.7	kW	$T_j = \text{operating limit}$	$COP_d$	1.54	—
Bivalent temperature				Operating limit temperature			
heating/Average	$T_{biv}$	-7	°C	heating/Average	$T_{ol}$	-10	°C
heating/Warmer	$T_{biv}$	—	°C	heating/Warmer	$T_{ol}$	—	°C
heating/Colder	$T_{biv}$	—	°C	heating/Colder	$T_{ol}$	—	°C
Degradation co-efficient	$C_d$	0.9					
Power consumption in modes other than 'active mode'							
Off mode	$P_{OFF}$	0.010	kW	Standby mode	$P_{SB}$	0.010	kW
Thermostat-off mode(heating)	$P_{TO}$	0.011	kW	Crankcase heater mode	$P_{CK}$	0.001	kW
Supplementary heater							
Supplementary capacity	$P_{SUP}$	0.179	kW	Type of energy input	Electric		
Other items							
Capacity control		Variable		Air flow rate, outdoor		2700	m <sup>3</sup> /h
Reference annual heating demand	$Q_H$	12081	kWh	Sound power level , indoor/ outdoor measured	LWA	42/64	dB(A)
Annual energy consumption	$Q_{HE}$	3536	kWh	Global warming potential	GWP	675	kgCO <sub>2</sub> eq.
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						

### 8.3 Installation of Hi-Therma Split/Integra Outdoor Unit

#### 8.3.1 GENERAL INFORMATION

##### 8.3.1.1 GENERAL NOTES

- This manual gives a common description and information for this heat pump air conditioner which you operate as well for other models.
- This manual should be considered as a permanent part of the heat pump air conditioning equipment and should remain with the air conditioning equipment.
- No part of this publication may be reproduced, copied, filed or transmitted in any shape or form without the permission of Hisense.
- Within the policy of continuous improvement of its products, Hisense reserves the right to make changes at any time without prior notification and without being compelled to introducing them into products previously sold. This document may therefore have been subject to amendments during the life of the product.
- As a result, some of the images or data used to illustrate this document may not refer to specific models. No claims will be accepted based on the data, illustrations and descriptions included in this manual.
- This heat pump air conditioner has been designed for the following ambient temperatures. Please operate the air conditioner within the ranges.

		Min.	Max.
Outdoor unit	Space heating	-25°C DB	35°C DB
	Domestic hot water (DHW)	-25°C DB	40°C DB
	Space cooling	5°C DB	46°C DB

DB: Dry Bulb

- Upon receiving this product, inspect it for any shipping damage. Claims for damage, either apparent or concealed, in a written form, should be filed immediately with the shipping company.
- Check the model number, electrical characteristics (power supply, voltage and frequency) and accessories to determine if they are correct.
- The standard utilization of the unit shall be explained in these instructions. Therefore, the utilization of the unit other than those indicated in these instructions is not recommended. Please contact your local agent, as the occasion arises.
- If you have any questions, please contact your dealer or designated service center of Hisense.

##### 8.3.1.2 GENERAL SAFETY

- **Notice: Servicing shall be performed only as recommended by the manufacturer.**
- **Qualification of workers**

Warning: Every working procedure that affects safety means shall only be carried out by competent persons.

Examples for such working procedures are:

- breaking into the refrigerating circuit.
- opening of sealed components.
- opening of ventilated enclosures.
- **Information on servicing**
  - Prior to beginning work on systems, safety checks are necessary to ensure that the risk of ignition is minimized.
  - Work shall be undertaken under a controlled procedure so as to minimized the risk of flammable gas or vapor being present while the work is being performed.
  - Work in confined spaces shall be avoided. The area around the workspace shall be sectioned off. Ensure that the conditions within the area have been made safe by control of flammable material.
- **Checking for presence of refrigerant**
  - The area shall be checked with an appropriate refrigerant detector prior to and during work. The leak detection equipment should be suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe.
- **Presence of fire extinguisher**
  - If any hot work is to be conducted, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.
- **No ignition sources**
  - All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed.
- **Ventilated area**
  - Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.
- **Checks to the refrigeration equipment**
  - where electrical components are being changed, they shall be fit for the purpose and to the correct specification.

At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer's technical department for assistance. The following checks shall be applied to installations.

- The charge size is in accordance with the room size within which the refrigerant containing parts are installed.

- The ventilation machinery and outlets are operating adequately and are not obstructed.
- If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant.
- Marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected.
- Refrigeration pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.
- **Checks to electrical devices**
  - Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment, so that all parties are advised.
  - Initial safety checks shall include:
    - (1) that capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking;
    - (2) that no live electrical components and wiring are exposed while charging, recovering or purging the system;
    - (3) that there is continuity of earth bonding.
- **Repairs to sealed components**
  - During repairs to sealed components, all electrical supplies shall be disconnected prior to any removal of sealed covers, etc. If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.
  - Ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected, including damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.
  - Ensure that the apparatus is mounted securely.
  - Ensure that seals or sealing materials have not degraded to the point that they no longer serve the purpose of preventing the ingress of flammable atmospheres. Replacement parts shall be in accordance with the manufacturer's specifications.
- **Repair to intrinsically safe components**
  - Do not apply any permanent inductive or capacitance loads to the circuit without ensuring that this will not exceed the permissible voltage and current permitted for the equipment in use.
- Intrinsically safe components are the only types that can be worked on while live in the presence of a flammable atmosphere.
- Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.
- **Cabling**
  - Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.
- **Detection of flammable refrigerants**
  - Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.
- **Leak detection methods**
  - Electronic leak detectors may be used to detect refrigerant leaks but the sensitivity may not be adequate, or may need re-calibration for the flammable refrigerants.
  - Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed.
  - The use of detergents containing chlorine shall be avoided.
  - If a leak is suspected, all naked flames shall be removed/extinguished.
  - If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. Oxygen free nitrogen (OFN) shall then be purged through the system both before and during the brazing process.
- **Removal and evacuation**
  - The refrigerant charge shall be recovered into the correct recovery cylinders and the system shall be "flushed" with OFN to render the unit safe. This process may need to be repeated several times.
  - Compressed air or oxygen shall not be used for purging refrigerant systems.
  - Flushing shall be achieved by breaking the vacuum in the system with OFN and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system. When the final OFN charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. This operation is absolutely vital if brazing operations on the pipe-work are to take place.
  - The outlet for the vacuum pump is not close to any ignition sources and that ventilation is available.

- **Charging procedures**

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimise the amount of refrigerant contained in them.
- Cylinders shall be kept upright.
- Ensure that the refrigeration system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigeration system.
- Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

- **Decommissioning**

- Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail.
- Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of reclaimed refrigerant.
- Electrical power must be available before the task is commenced.
- Become familiar with the equipment and its operation.
- Isolate system electrically.
- Before attempting the procedure, ensure that:
  - (1) mechanical handling equipment is available, if required, for handling refrigerant cylinders;
  - (2) all personal protective equipment is available and being used correctly;
  - (3) the recovery process is supervised at all times by a competent person;
  - (4) recovery equipment and cylinders conform to the appropriate standards.
- Pump down refrigerant system, if possible.
- If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
- Make sure that cylinder is situated on the scales before recovery takes place.
- Start the recovery machine and operate in accordance with manufacturer's instructions.
- Do not overfill cylinders. (No more than 80 % volume liquid charge).
- Do not exceed the maximum working pressure of the cylinder, even temporarily.
- When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
- Recovered refrigerant shall not be charged into another refrigeration system unless it has been cleaned and checked.

- **Labelling**

- Equipment shall be labelled stating that it has been decommissioned and emptied of refrigerant. The label shall be dated and signed.
- Ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.

- **Recovery**

- When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed.
- Ensure that the correct number of cylinders for holding the total system charge are available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i.e. special cylinders for the recovery of refrigerant).
- Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.
- The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of all appropriate refrigerants.
- A set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release.
- The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant waste transfer note arranged.
- Do not mix refrigerants in recovery units and especially not in cylinders.
- If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant.
- The evacuation process shall be carried out prior to returning the compressor to the suppliers.
- Only electric heating to the compressor body shall be employed to accelerate this process.
- When oil is drained from a system, it shall be carried out safely.



8.3.2 SAFETY

8.3.2.1 APPLIED SYMBOLS

- During normal heat pump system design work or unit installation, greater attention must be paid in certain situations requiring particular care in order to avoid damage to the unit, the installation or the building or property.
- Situations that pose a risk to the safety of those in the surrounding area or to the unit itself are clearly indicated in this manual.
- A series of special symbols are used to clearly identify these situations.
- Pay close attention to these symbols and to the messages following them, as your safety and that of others depends on it.

 **DANGER**

- *The text following this symbol contains information and instructions relating directly to your safety.*
- *Not taking these instructions into account could lead to serious, very serious or even fatal injuries to you and others.*

 **CAUTION**

- *The text following this symbol contains information and instructions relating directly to your safety.*
- *Not taking these instructions into account could lead to minor injuries to you and others.*
- *Not taking these instructions into account could lead to unit damage.*

 **NOTE**

- *The text following this symbol contains information and instructions that may be use or that require a more thorough explanation.*
- *Instructions regarding inspections to be made on unit parts or systems may also be included.*



Caution, risk of fire!

***This appliance is filled with R32, an odourless low burning velocity refrigerant. If the refrigerant is leaked, there is a possibility of ignition if it enters in contact with an external ignitions source.***




 **DANGER**



*This symbol shows that this equipment uses a low burning velocity refrigerant. If the refrigerant is leaked, there is a possibility of ignition if it enters in contact with an external ignition source.*

**RISK OF EXPLOSION**

*The compressor must be stopped before removing the refrigerant pipes. All service valves must be fully closed after pumping down operation.*

Symbol	Explanation
	Before installation, read the installation and operation manual, and the wiring instruction sheet.
	Before performing maintenance and service tasks, read the service manual.
	For more information, see the Technical, Installation and Service Handbook.

8.3.2.2 ADDITIONAL INFORMATION

 **DANGER**

- ***Do not pour water into the unit. These products are equipped with electrical parts. If the electrical components are in contact with water, a serious electrical shock will take place.***
- ***Do not touch or adjust safety devices inside the unit. If these devices are touched or adjusted, a serious accident can take place.***
- ***Do not open the service cover or access inside the unit with-out disconnecting the main power supply.***
- ***In case of fire Turn OFF the main switch, put out the fire at once and contact your service contractor.***
- ***Disconnect the appliance from its power source during service and when replacing parts.***
- ***It must be ensured that the heat pump cannot operate accidentally without water neither with air inside hydraulic system.***
- ***Check that the earth wire is securely connected. If the unit is not properly earthed, it may lead to electric shock. Do not connect the earth wire to gas piping, water piping, lighting conductor or earth wire of a telephone.***
- ***Fix the cables securely. External forces on the terminals could lead to a fire.***
- ***Use an ELB (earth leakage breaker, with an actuation time of 0.1s or less). In the event of a fault, there is danger of an electric shock or a fire if it is not used.***
- ***Do not charge oxygen, acetylene or other flammable and poisonous gases into the refrigerant cycle when performing a leakage test or an air-tightness test. These types of gases are extremely dangerous and can cause an explosion.***
- ***Do not install the unit in the following places, otherwise, it may lead to a fire, deformation, corrosion or failure.***
  - *Places where oil (including machinery oil) splashes.*
  - *Places where flammable gas may generate or flow.*
  - *Places where there is splashing water.*
  - *Places where sulfide gas drifts such as in hot spring.*
  - *Places where strong wind with high salinity blows such as coast regions, or places with an atmosphere of acidity or alkalinity.*
- ***Do not install the unit in the place where silicon gas drifts. If the silicon gas attaches to the surface of heat exchanger, the fin surface repels water. As a result, drain water splashes outside of the drain pan and splashed water runs inside of electrical box. In the end, water leakage or electrical devices failure may occur.***

- **Means for disconnection from the supply mains, which have a contact separation in all poles that provide full disconnection under overvoltage category III conditions, must be incorporated in the fixed wiring in accordance with the wiring rules.**
- **The appliance shall be installed in accordance with national wiring regulations.**
- **The installation and service of this product shall be carried out by professional personnel, who have been trained and certified by national training organizations that are accredited to teach the relevant national competency standards that may be set in legislation.**
- **Mechanical connectors used indoors shall comply with ISO 14903. When mechanical connectors are reused indoors, sealing parts shall be renewed. When flared joints are reused indoors, the flare part shall be re-fabricated.**
- **Reusable mechanical connectors and flared joints are not allowed indoors.**
- **Disconnect the appliance from its power source during service and when replacing parts.**

### CAUTION

- Do not use any sprays such as insecticide, lacquer, hair spray or other flammable gases within approximately 1 meter from the system.
- If circuit breaker or fuse is often activated, stop the system and contact your service contractor.
- Do not make service or inspections tasks by yourself. This work must be performed by qualified service person.
- Do not put any foreign material (sticks, etc..) inside the units. These units have high speed rotating fans and it is dangerous when any object touches them.
- Refrigerant leakage can cause difficulty with breathing due to insufficient air.
- Installation and service engineering must comply with local standards, laws and regulations. The standards (British Standard, BS4434) may be applicable if local regulations are not available.
- This air to water heat pump has been designed for standard water heating for human beings only. Do not use this for other functions that are not included in the wired controller.
- Do not install the unit in the place where the breeze directly catches the animals and plants. It could adversely affect the animals and plants.
- Pay attention to the following points when the unit is installed in hospital or other facilities where there are strong electromagnetic waves from medical equipment.
  - Do not install the unit where the electromagnetic wave is directly radiated to the electrical box, wiring, wired controller and adapter.
  - At least 3 meters from strong electromagnetic wave radiators, such as radio equipment.

- If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
- This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.

### NOTE

- It is recommended to ventilate the room every 3 or 4 hours.
- The air conditioner may not work properly in the following cases.
  - The power supplied by the power transformer is less than or equal to the electric power of the air conditioner.
  - The large power-consuming equipment is too close to the power supply wiring of the air conditioner, large surge voltage may be inducted in the power supply wiring of the air conditioner.



### 8.3.3 IMPORTANT NOTICE

- **PLEASE READ THE MANUAL CAREFULLY BEFORE STARTING WORK ON THE INSTALLATION OF THE SYSTEM.** Failure to observe the instructions for installation, use and operation described in this documentation may result in operating failure including potentially serious faults, or even the destruction of the system.
- Verify, in accordance with the manuals which appear in the outdoor and indoor unit, that all the information required for the correct installation of the system is included. If this is not the case, contact your distributor.
- Hisense pursues a policy of continuing improvement in design and performance of products. The right is therefore reserved to vary specifications without notice.
- Hisense cannot anticipate every possible circumstance that might involve a potential hazard.
- Check and make sure that the explanations of each part of this manual correspond to your air to water heat pump model.
- Refer to the models codification to confirm the main characteristics of your system.
- Signal words (DANGER, CAUTION and NOTE) are used to identify levels of hazard seriousness. Definitions for identifying hazard levels are provided in initial pages of this document.
- This unit is exclusively for air to water systems. It can not be used with indoor units in air to air systems.

#### DANGER



*Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.*

- **The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).**
- **Do not pierce or burn.**
- **Be aware that the R32 refrigerants does not contain an odour.**

#### DANGER

*Pressure Vessel and Safety Device: This heat pump is equipped with a high pressure vessel under PED (Pressure Equipment Directive). The pressure vessel has been designed and tested before shipment according to PED.*

*Also, in order to prevent the system from an abnormal pressure, a high pressure switch, which needs no field adjustment, is utilized in the refrigeration system.*

*Therefore, this heat pump is protected from abnormal pressures. However, if abnormally high pressure is applied to the refrigeration cycle including the high pressure vessel(s), it will result in serious injury or death due to explosion of the pressure vessel.*

*Do not apply a pressure higher than the maximum allowable pressure (refer to nameplate) to the system, by modifying or changing the high pressure switch.*

- **Start-up and Operation:** Check to ensure that all the stop valves are fully opened and no obstacle exists at the inlet/outlet sides before start-up and during the operation.
- **Maintenance:** Periodically check the high pressure side pressure. If the pressure is higher than the maximum allowable pressure, stop the system and clean the heat exchanger or remove the cause.

**8.3.4 TRANSPORTATION AND HANDLING**

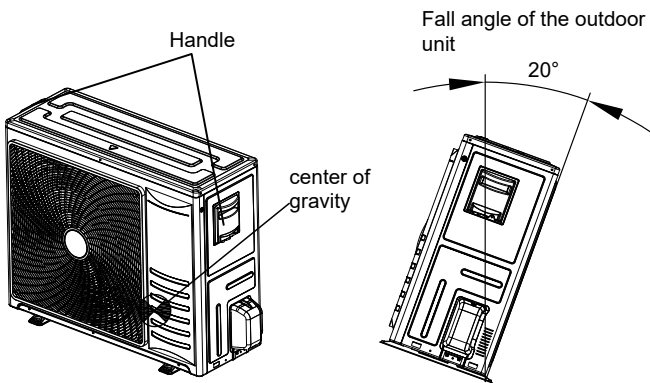
Transport the product as close to the installation location as possible before unpacking.

**⚠ CAUTION**

- Do not step on or put any materials on the product.
- Do not put any foreign material into the outdoor unit and check to ensure that none exists in the outdoor unit before the installation and test run. Otherwise, a fire or failure, etc. may occur.

When manually lifting the unit using the handles, pay attention to the following points.

- To prevent the unit from overturning, pay attention to the center of gravity as shown in the below figure.
- Two or more personnel should be used to move the unit.



**8.3.5 BEFORE OPERATION**

**⚠ CAUTION**

- When the system is started after a shut-off longer than approximately 3 months, it is recommended to check the system by your service contractor.
- Make sure that the outdoor unit is not covered with snow or ice. If covered, remove it by using hot water (approximately 50°C). If the water temperature is higher than 50°C, it will cause damage to plastic parts.

**8.3.5.1 LINE-UP OF OUTDOOR UNITS**

Capacity	44(2.0HP)	60(2.5HP)	80(3.0HP)
Model	AHW-044HCDS1	AHW-060HCDS1	AHW-080HCDS1

**8.3.5.2 FACTORY-SUPPLIED UNIT COMPONENTS**

Check to ensure that the following accessories are packed with the outdoor unit.

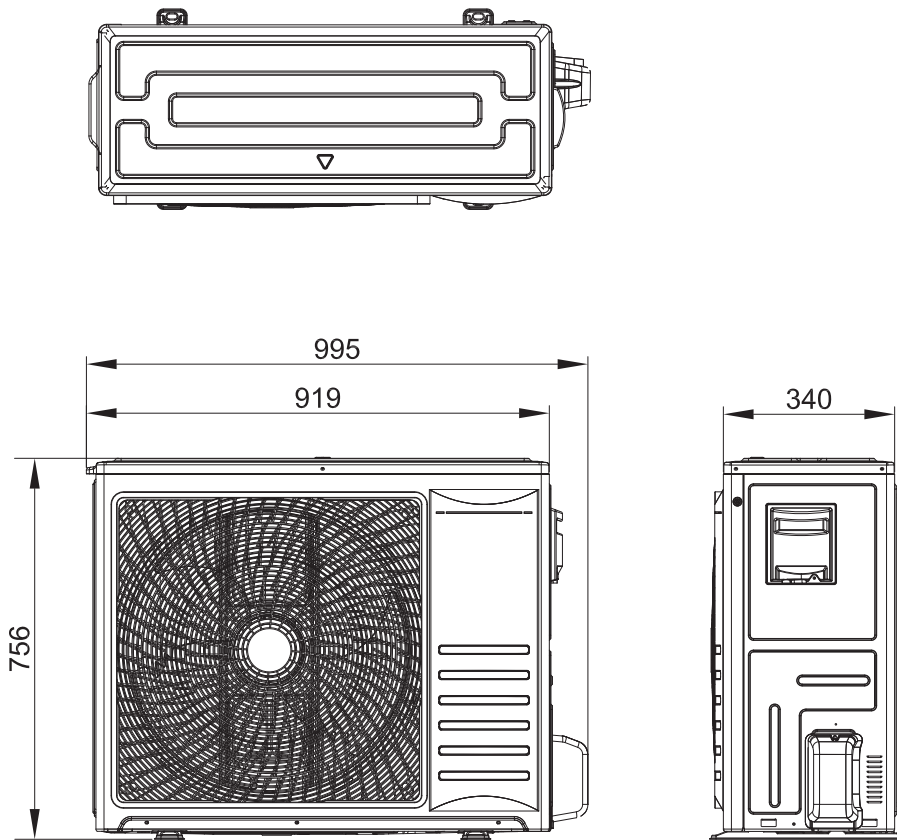
Accessory	Image	Qty.	Purpose
Instruction manual		1	Basic instructions for the installation of the device
Drain nozzle		1	For water discharge when necessary
Flare Nut	$\phi 6.35$	1	Piping connection for liquid stop valve
	$\phi 12.7$	1	Piping connection for gas stop valve

**i NOTE**

- The previous accessories are supplied inside the unit.
- If any of these accessories are not packed with the unit or any damage to the unit is detected, please contact your dealer.

8.3.6 GENERAL DIMENSIONS

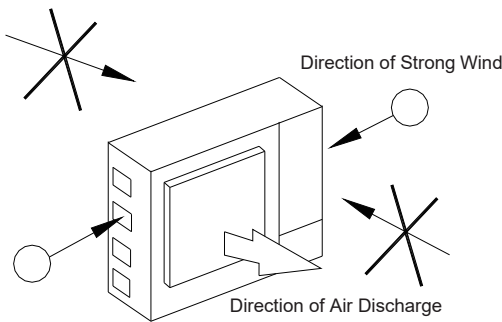
Unit: mm



8.3.7 UNIT INSTALLATION

**CAUTION**

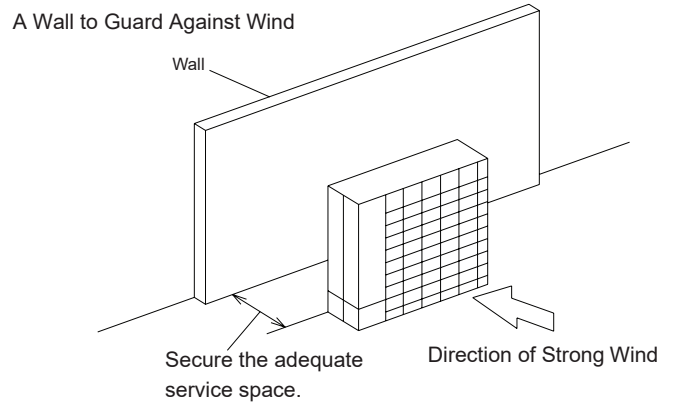
- Install the unit in the shade or not exposed to direct sunshine or direct radiation from high temperature heat source.
- Make sure that the foundation is flat and sufficiently strong.
- This unit has aluminum fin with sharp edges. Pay attention to the fin to avoid injury. Install the unit in a restricted area not accessible by the general public.
- When installing the outdoor unit in snow-covered areas, mount the field-supplied hoods at the discharge side of the outdoor unit and the inlet side of the heat exchanger.
- Do not install the unit in a space where a seasonal wind directly blows to the outdoor heat exchanger or a wind from a building space directly blows to the outdoor fan.



- In case of installation in the open spaces unavoidably where there is no buildings or surrounding structures, install near the wall to avoid facing the wind directly. Ensure that the service space should be secured.

**DANGER**

- Install the unit with sufficient clearance around it for operation and maintenance. Install the unit where good ventilation is available.
- For cleaning, use nonflammable and nontoxic cleaning liquid. Use of inflammable agent should cause explosion or fire.
- Work with sufficient ventilation, for working in an enclosed space should cause oxygen deficiency. Toxic gas should be produced when cleaning agent is heated to high temperature by e.g., being exposed to fire.
- Install the unit in a location where noise emitted by the unit does not disturb neighbours.
- Cleaning liquid shall be collected after cleaning.
- Pay attention not to clamp cables when attaching the service cover to avoid electric shock or fire.

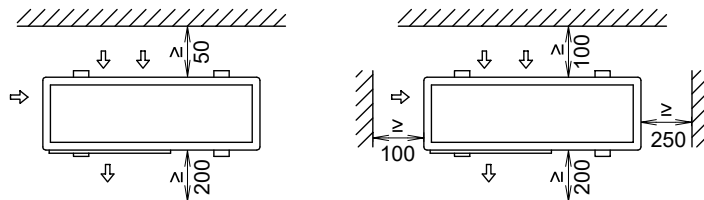


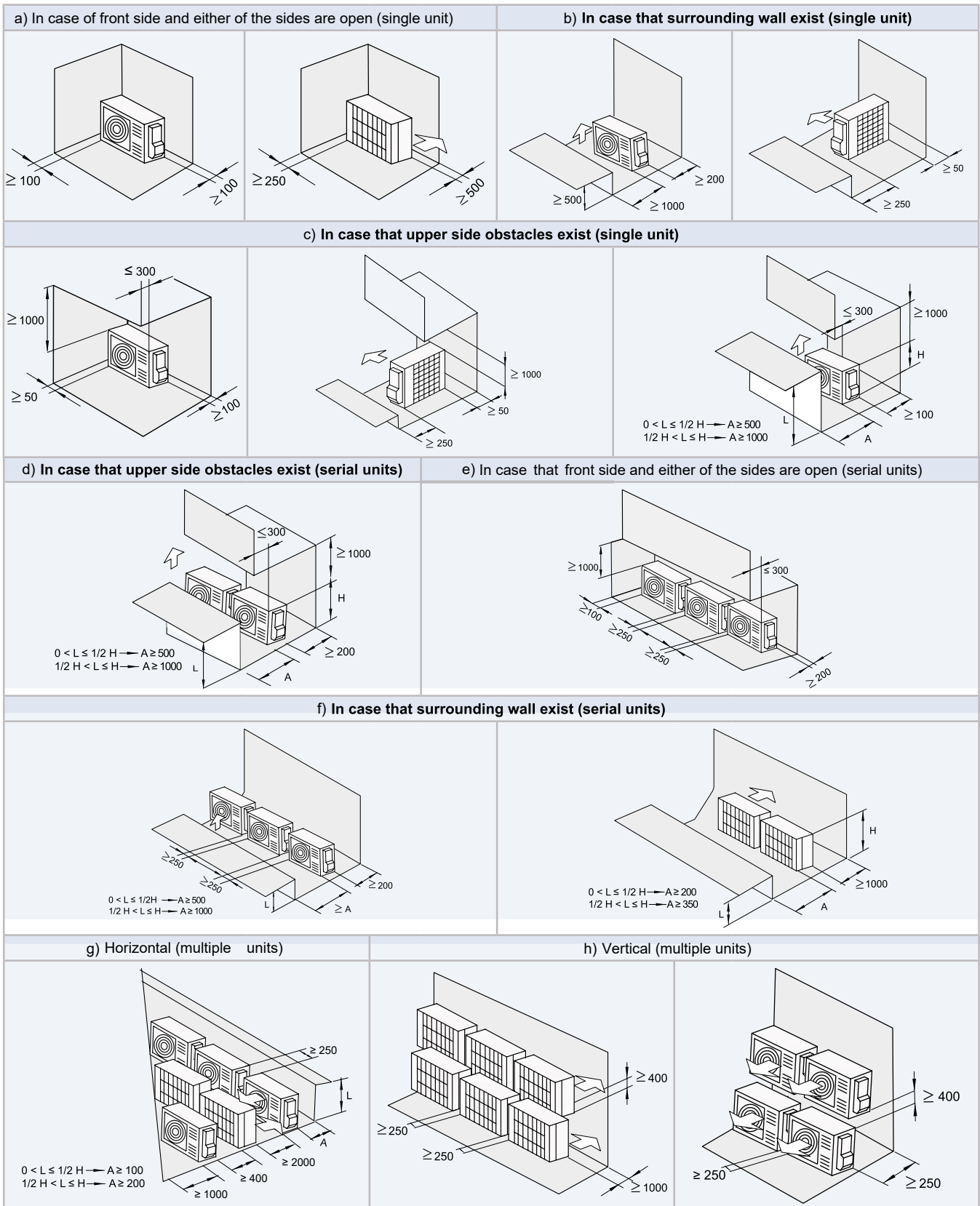
NOTE:

If the extreme strong wind blows directly against the air discharge portion, the fan may rotate reversely and be damaged.

8.3.7.1 INSTALLATION SPACE

(Unit: mm)



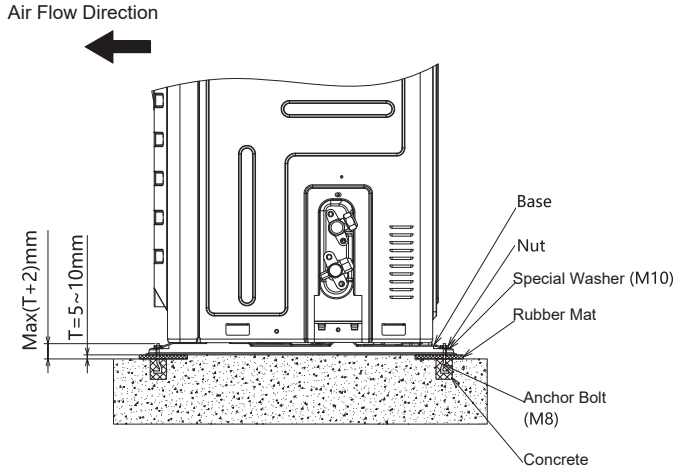


**i NOTE**

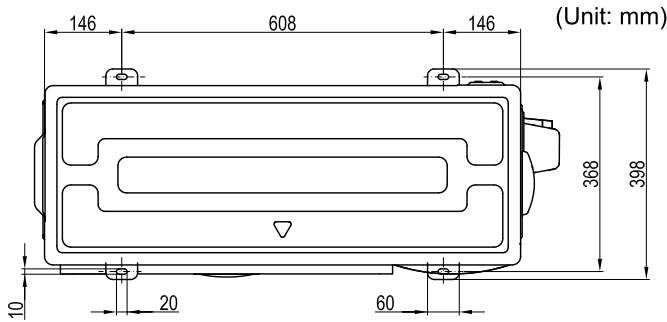
- If L is greater than H, install the outdoor unit on the foundation, so that H is greater than or equal to L. H: Outdoor unit height + foundation height.
- Do not stack more than two units in height.
- In all cases, short circuit of air flow is not allowed.

8.3.7.2 INSTALLATION PLACE PROVISION

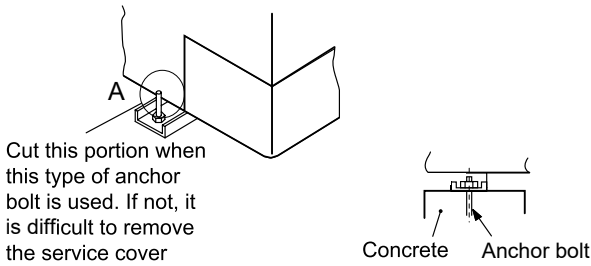
- Secure the outdoor unit with the anchor bolts.



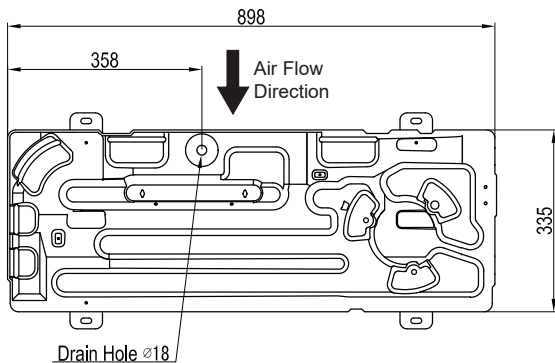
- Fix the outdoor unit to the anchor bolts by field-supplied special washer.
- When installing the outdoor unit, fix the unit by anchor bolts. Regarding the location of fixing holes



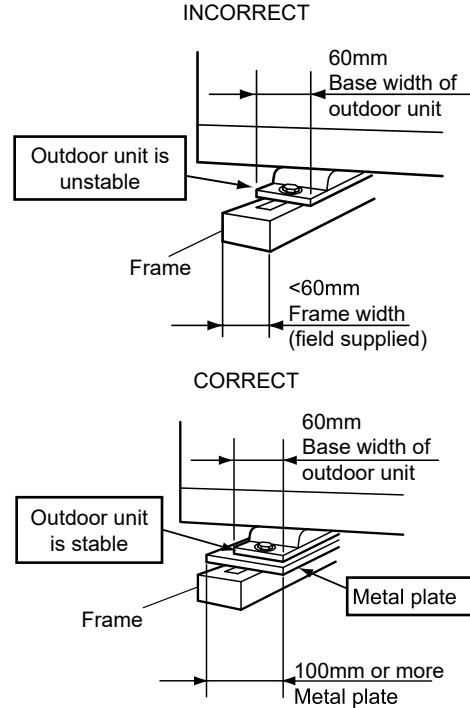
- Example of fixing outdoor unit by anchor bolts.



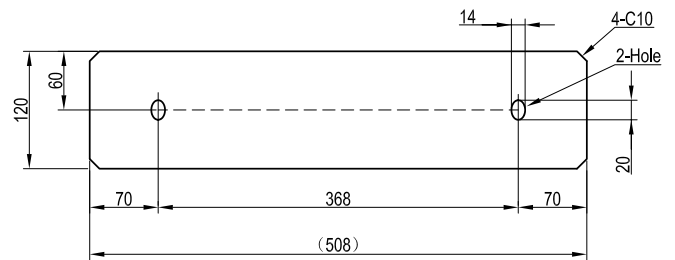
- When installing the unit on a roof or a veranda, drain water may turn to ice in a cold morning. Therefore, avoid draining in an area where people often use because it is slippery. In case of installing in such a place, provide the additional drainage around the foundation.



- The whole of the base of the outdoor unit should be installed on a foundation. When using vibration-proof mat, it should also be positioned in the same way. When installing the outdoor unit on a field-supplied frame, use metal plates to adjust the frame width for stable installation as shown in figure.



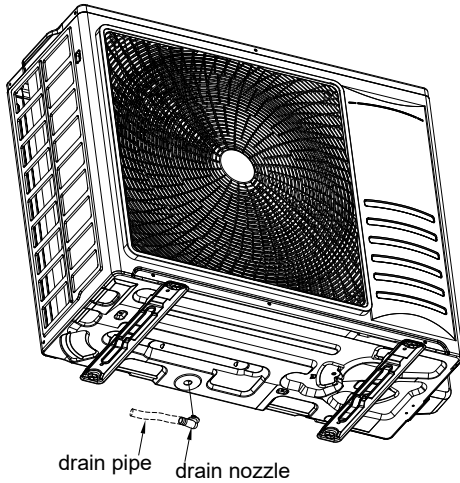
- Recommended metal plate size (field-supplied)
- Material: Hot-rolled mild steel plate (SPHC)
  - Plate thickness: 4.5T



8.3.7.3 DRAIN PIPING

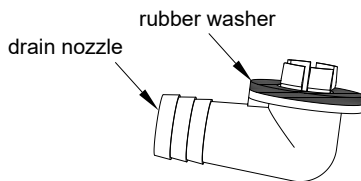
When the base of the outdoor unit is temporarily utilized as a drain receiver and the drain water in it is discharged, one drain nozzle is needed.

The drain nozzle should be inserted into the base of the outdoor unit up to the extruded portion.



**i** NOTE

- The drain nozzle is factory-supplied with a rubber washer.



- A drain pipe(inner diameter:15mm) should be field-supplied.
- Do not use this drain nozzle in a cold area, because the drain water may freeze.
- Please install the drain nozzle before the refrigerant piping work.

8.3.8 REFRIGERANT PIPING WORK

**!** CAUTION

Make sure that refrigerant piping installation complies with the legislation EN378 and local legislation.

8.3.8.1 PIPING MATERIALS

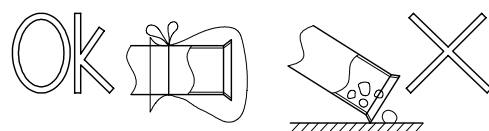
1. Prepare field-supplied copper pipes.
2. Select the piping size with the correct thickness and correct material which have sufficient pressure strength.
3. Select clean copper pipes. Make sure there is no dust and moisture inside. Blow the inside of the pipes with oxygen free nitrogen to remove any dust and foreign materials before connecting pipes.

**i** NOTE

- A system with no moisture or oil contamination will give maximum performance and lifecycle compared to that of a poorly prepared system. Take particular care to ensure all copper piping is clean and dry internally.

**!** CAUTION

- All external piping shall be selected in size and dimension avoiding any mechanical strength due to contraction or expansion, vibration or refrigerant pulsation.
- All the piping shall be protected against any environmental effect like water freezing, corrosion, etc. When flexible pipe is used, precautions shall be taken against mechanical damages, excessive stresses by torsion or any other.
- Flare nut connections shall be accessible for maintenance purposes.
- Ensure that refrigerant piping is earthed prior to units interconnection and in case of additional refrigerant charging is required.
- Cap the end of the pipe when pipe is to be inserted through a hole.
- Do not put pipes on the ground directly without a cap or vinyl tape at the end of the pipe.



- If piping installation is not completed until next day or over a longer period of time, braze off the ends of the piping and charge with oxygen free nitrogen through a Schrader valve type access fitting to prevent moisture and particle contamination.

**!** CAUTION

- Do not use insulation material that contains NH3 because it can damage copper pipe material and can be a source of future leakage.
- Completely insulate both refrigerant gas piping and liquid piping between the indoor unit and the outdoor unit. If not insulated, dew will occur on the piping surface.



## 8.3.8.2 PIPING SIZE

- Outdoor unit

Stop valve(mm)	
Gas Pipe	Liquid Pipe
Φ12.7	Φ6.35

- Indoor unit

Model	Gas Pipe(mm)	Liquid Pipe(mm)
044(2.0HP)	Φ12.70	Φ6.35
060(2.5HP)		
080(3.0HP)	Φ15.88	

- The pipe between outdoor unit and indoor unit

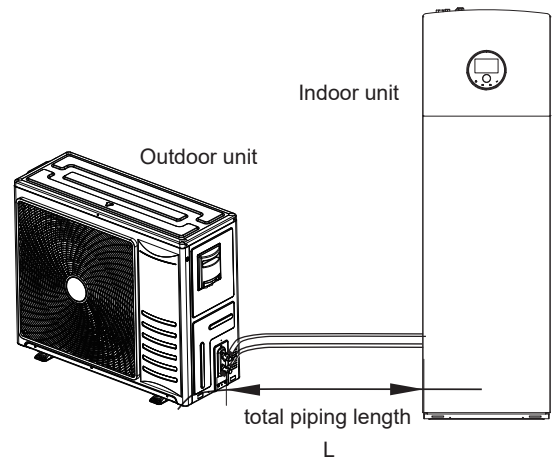
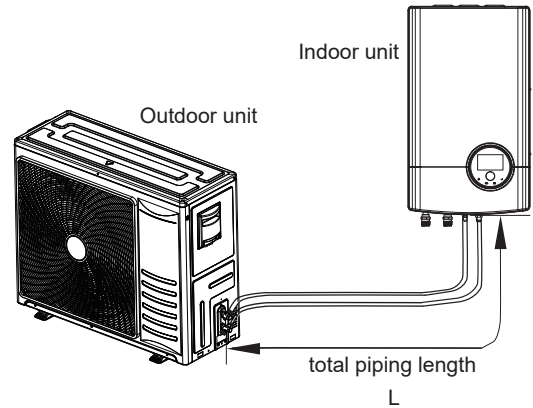
Capacity	Total Piping length L(m)	Gas pipe(mm)	Liquid pipe(mm)
44 (2.0HP)	5 ≤ L < 10	Φ12.7	Φ9.53
	10 ≤ L ≤ 40		Φ6.35
60 (2.5HP)	5 ≤ L < 10	Φ12.7	Φ9.53
	10 ≤ L ≤ 40		Φ6.35
80 (3.0HP)	5 ≤ L < 10	Φ15.88	Φ9.53
	10 ≤ L ≤ 45		Φ6.35

**i** NOTE

- The piping sizes between the outdoor unit and indoor unit vary according to different piping length. The pipe adapters(factory-supplied) are required.

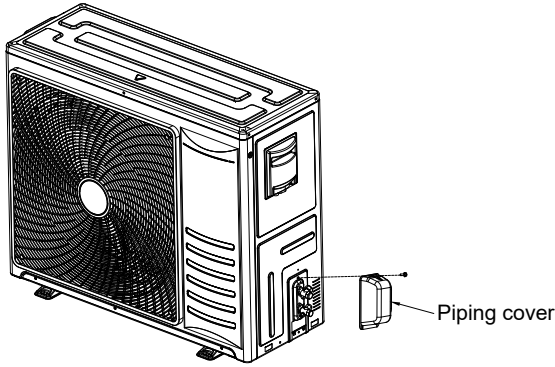
Capacity	Total Piping length L(m)	Outdoor unit	
		Gas pipe(mm)	Liquid pipe(mm)
44 (2.0HP)	5 ≤ L < 10	-	Φ6.35 → Φ9.53
	10 ≤ L ≤ 40		-
60 (2.5HP)	5 ≤ L < 10	-	Φ6.35 → Φ9.53
	10 ≤ L ≤ 40		-
80 (3.0HP)	5 ≤ L < 10	Φ12.7 → Φ15.88	Φ6.35 → Φ9.53
	10 ≤ L ≤ 45		-

Capacity	Total Piping length L(m)	Indoor unit	
		Gas pipe(mm)	Liquid pipe(mm)
44 (2.0HP)	5 ≤ L < 10	Φ15.88 → Φ12.7	-
	10 ≤ L ≤ 40		Φ9.53 → Φ6.35
60 (2.5HP)	5 ≤ L < 10	Φ15.88 → Φ12.7	-
	10 ≤ L ≤ 40		Φ9.53 → Φ6.35
80 (3.0HP)	5 ≤ L < 10	-	-
	10 ≤ L ≤ 45		Φ9.53 → Φ6.35

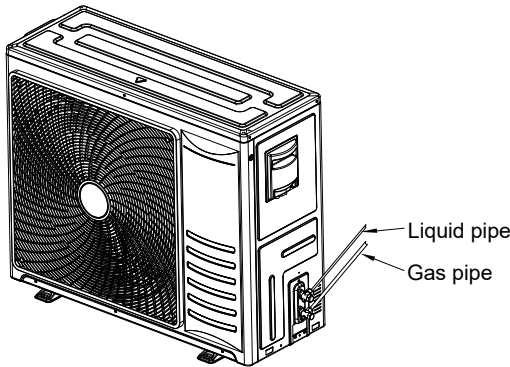


8.3.8.3 PIPING CONNECTION

1. Take the piping cover away from the unit.



2. Connect the indoor unit and the outdoor unit with field-supplied refrigerant piping. Suspend the refrigerant piping at certain points and prevent the refrigerant piping from touching the weak part of the building such as wall, ceiling, etc. (If touched, abnormal sound may occur due to the vibration of the piping. Pay special attention in case of short piping length)



3. Apply the oil thinly at the seat surface of the flare nuts(\*) and pipes before tightening. Refrigerant oil is field-supplied.
  4. The stop valves should be performed according to the following section.
  5. Use a pipe bender for pipe bending work when connecting pipes.
  6. Install the piping cover back in order to prevent rainwater from entering the unit.
- (\*) The factory-supplied flare nuts are used to connect the gas and the liquid stop valves.

**i** NOTE

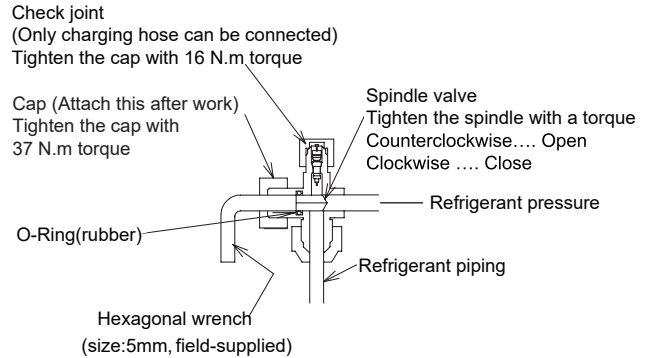
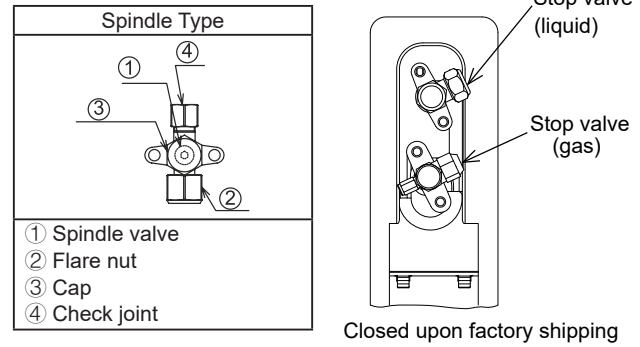
- If the flare nut is tightened too hard, the flare nut may crack after a long time and cause refrigerant leakage.
- Tightening Torque for flare nuts:

Piping size (mm)	Tightening Torque (N.m)
Φ6.35	14~18
Φ9.53	34~42
Φ12.7	50~62
Φ15.88	63~77

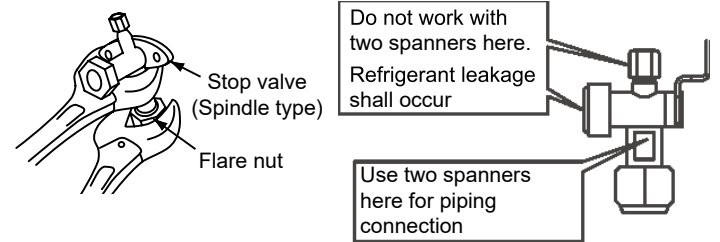
**!** CAUTION

- Check to ensure that the stop valves are completely closed before connecting.

8.2.8.3.1 OUTDOOR UNIT STOP VALVE



Stop valve (gas/liquid)	Tightening Torque (N.m)		
	①	③	④
	7-9	33-42	14-18



**!** CAUTION

- At the test run, fully open the spindle of the stop valves. If not fully opened, the outdoor unit will be damaged.
- Do not apply an abnormal big force to the spindle valve at the end of the opening.

8.2.8.3.2 BRAZING WORK

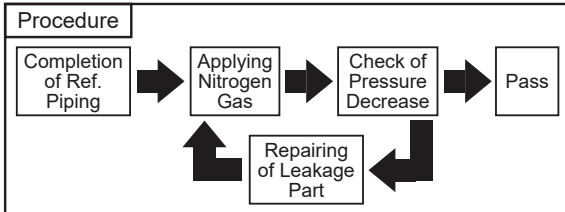
**!** CAUTION

- Use nitrogen gas for blowing during pipe brazing. If oxygen, acetylene or fluorocarbon gas is used, it will cause an explosion or poisonous gas.
- A lot of oxidation film will occur inside of tubes if no nitrogen gas blowing is performed during brazing work. This film will be flecked off after operation and will circulate in the cycle, resulting in clogged expansion valves, etc. This will cause bad influence to the compressor.
- Use a reducer valve when nitrogen gas blowing is performed during brazing. The gas pressure should be maintained within 0.03 to 0.05MPa. If an excessively high pressure is applied to a pipe, it will cause an explosion.

## Installation

### 8.3.8.4 AIR-TIGHTNESS TEST

1. Connect the manifold gauge using charging hoses with a nitrogen cylinder to the check joint of the gas stop valve. Apply nitrogen gas pressure of 4.15MPa.
2. Check for any gas leakage at the flare nut connections, or brazed parts by gas leak detector or foaming agent.
3. After the air-tightness test, release nitrogen gas.

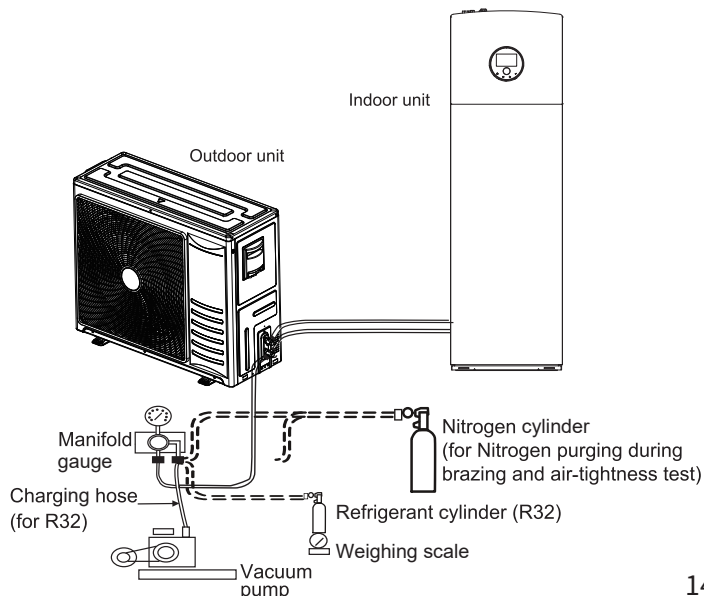
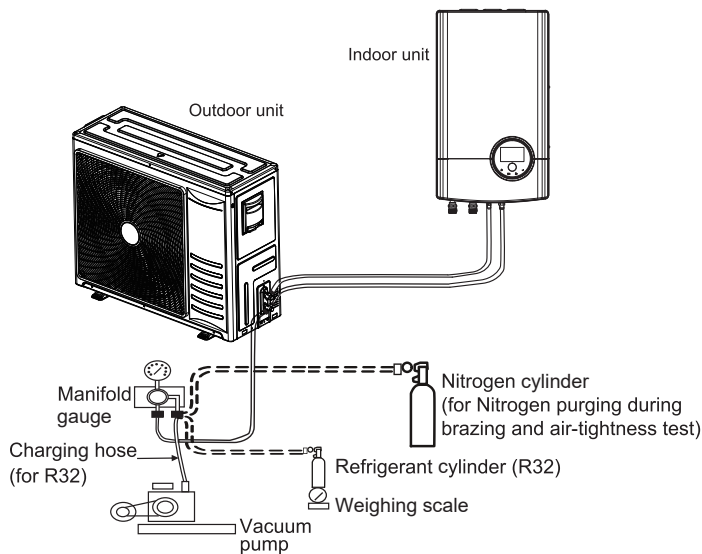


#### **i** NOTE

- Do not open the stop valves during the air-tightness test.

### 8.3.8.5 VACUUM PUMPING AND REFRIGERANT CHARGE

1. Connect the manifold gauge using charging hoses with a vacuum pump to the check joint of the gas stop valve.
2. Continue vacuum pumping work until the pressure reaches -0.1MPa or lower for one to two hours.



3. After vacuum pumping work, stop the manifold gauge's valve, stop the vacuum pump and leave it for one hour. Check to ensure that the pressure in the manifold gauge does not increase.
4. Fully open the gas stop valve and liquid stop valve.
5. Add refrigerant according to the piping diameter and piping length in the field connecting.
6. Check for any gas leakage by gas leak detector or foaming agent. Use the foaming agent which does not generate NH<sub>3</sub> by chemical reaction.

#### **i** NOTE

- When the spindle cap for stop valve is removed, the gas accumulated at O-ring or screws is released and may make sound. This phenomenon is NOT a gas leakage.
- This unit is only for the refrigerant R32. The manifold gauge and the charging hose should be exclusive use for R32.
- If vacuum degree of -0.1MPa is not available, it may be because of gas leakage or entering moisture. Check for any gas leakage once again. If no leakage exists, operate the vacuum pump for more than one to two hours.

### 8.3.8.6 REFRIGERANT CHARGING QUANTITY

In case of the total piping length(L) is more than the charge-less piping length, the additional refrigerant quantity should be charged according to the table below:

Capacity		44 (2.0HP)	60 (2.5HP)	80 (3.0HP)
Factory Charge	kg	1.23		1.26
Charge-less piping length(L <sub>0</sub> )	m	15		15
Additional charge for piping length (L-L <sub>0</sub> )	g/m	20		30
Minimum piping length(L <sub>min</sub> )	m	5		
Maximum piping length(L <sub>max</sub> )	m	40		45
Maximum total refrigerant charge(*)	kg	1.73		2.16
Maximum height difference between outdoor unit and indoor unit				
Outdoor unit is higher than indoor unit"	m	30		
Indoor unit is higher than outdoor unit	m	20		

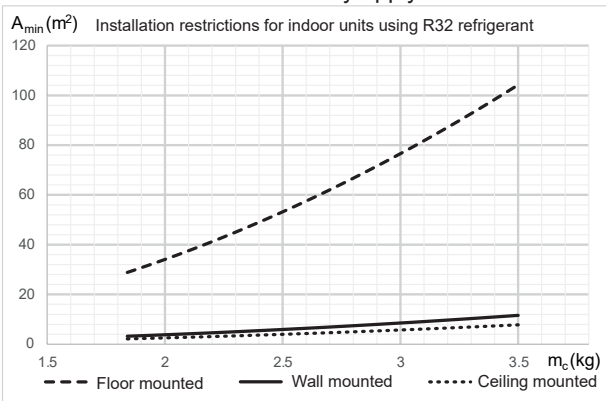
\*In case of total refrigerant amount  $\geq 1.84$  kg, there are an additional minimum floor area requirements(more details in the following section).

#### **!** CAUTION

- When charging refrigerant, accurately measure refrigerant to be charged.
- Overcharging or undercharging of refrigerant can cause compressor trouble.

8.2.8.6.1 MINIMUM FLOOR AREA REQUIREMENTS

- The following chart and table shows the minimum floor area ( $A_{min}$ ) required for the installation of an indoor unit from a refrigerant system containing a certain refrigerant charge ( $m_c$ ) of R32 (A2L refrigerant), and supposing a total room height not lower than 2.2 m. (According to IEC 60335-2-40:2018 and EN 378-1:2016).
- For  $m_c < 1.84$  kg, IEC 60335-2-40:2018 and EN 378-1:2016 do not establish any minimum floor area restriction. In that case check local regulations to ensure that no hard restrictions may apply.



$$A_{min} = (m_c / (2.5 * LFL^{(5/4)} * h_0))^2 \quad (EQU.1)$$

- $A_{min}$ : Minimum installation area of an Indoor unit for a given refrigerant charge  $m_c$  (kg) and considering the installation height  $h_0$  (m<sup>2</sup>).
- $h_0$ : Installation height of the bottom side of the indoor unit + distance from the indoor unit bottom side to the lowest part for which a refrigerant leak may release to the indoor area.
- $m_c$ : total system refrigerant charge that could be released to the indoor area in case of undetected refrigerant leak.
- LFL: Lower Flammability Limit for R32, 0.307 kg/m<sup>3</sup> as established by EN 378-1:2016 and ISO 817.

Minimum floor area for equipment installed inside			
$m_c$ (kg)	$A_{min}$ (m <sup>2</sup> )	$A_{min}$ (m <sup>2</sup> )	$A_{min}$ (m <sup>2</sup> )
	Floor mounted	Wall mounted	Ceiling mounted
1.84	28.81	3.20	2.14
1.9	30.72	3.41	2.29
2.0	34.04	3.78	2.53
2.1	37.53	4.17	2.79
2.2	41.19	4.58	3.06
2.3	45.02	5.00	3.35
2.4	49.02	5.45	3.65
2.5	53.19	5.91	3.96
2.6	57.53	6.39	4.28
2.7	62.04	6.89	4.61
2.8	66.72	7.41	4.96
2.9	71.58	7.95	5.32
3.0	76.6	8.51	5.70
3.1	81.79	9.09	6.08
3.2	87.15	9.68	6.48
3.3	92.68	10.30	6.89
3.4	98.39	10.93	7.32
3.5	104.26	11.58	7.75

- The  $A_{min}$  in the table above is calculated according to the formula (EQU.1) under the following conditions:
  - Floor mounted:  $h_0 = 0.6$  m
  - Wall mounted:  $h_0 = 1.8$  m
  - Ceiling mounted:  $h_0 = 2.2$  m
- For safety, the  $A_{min}$  must be calculated according to the actual installation by professionals.

**CAUTION**

- Do not charge OXYGEN, ACETYLENE, or other flammable and poisonous gases into the refrigerant because an explosion can occur. It is recommended that oxygen free nitrogen be charged for these types of tests cycle when performing a leakage test or an air-tightness test. These types of gases are extremely dangerous.
- Check for refrigerant leakage in detail. If a large refrigerant leakage occurred, it would cause difficulty with breathing or harmful gases would occur if a fire were being used in the room.

**NOTE**

- Fill in the label attached to the unit with the amount of refrigerant charged and Tonnes of CO<sub>2</sub> equivalent of fluorinated greenhouse gases contained on the installation.

**NOTE**

- This equipment Contains fluorinated greenhouse gases.
- Refrigerant: R32 , global warming potential (GWP) value :675.
- Weight (kg) of Refrigerant charged before shipment: Reference to the nameplate [ ] ① kg.
- Weight (kg) of Refrigerant charged additionally on site: Reference to the manual [ ] ② kg.
- Weight (kg) of Refrigerant charged totally: ③=(①+②), [ ] kg.
- Tonnes of CO<sub>2</sub> equivalent of fluorinated greenhouse gases contained :③×675/1000, [ ] tCO<sub>2</sub>eq.

**DANGER**

- Only use R32 as refrigerant. Other substances may cause explosions and accidents.
- R32 is fluorinated greenhouse gases. Its global warming potential (GWP) value is 675. Do NOT vent these gases into the atmosphere.
- Tonnes of CO<sub>2</sub> equivalent of fluorinated greenhouse gases contained is calculated by GWP value of the refrigerant × Total refrigerant charge [kg] / 1000 in the label.

8.3.8.7 CAUTION OF THE PRESSURE BY CHECK JOINT

When the pressure is measured, use the check joint of the gas stop valve.

At that time, connect the pressure gauge according to the following table because of high pressure side and low pressure side changes by operation mode.

Check joint of the gas stop valve:

Cooling operation	Heating operation
Low pressure	High pressure

**NOTE**

Be careful that refrigerant and oil do not splash to the electrical parts at removing the charge hoses.

## 8.3.9 ELECTRICAL WIRING

### 8.3.9.1 GENERAL CHECK

- Make sure that the following conditions related to power supply installation are satisfied.
  - Ensure that the power supply voltage is within  $\pm 10\%$  of the rated voltage and the earth wire is connected.
  - Check cable capacity.
  - The impedance of the power supply line is low enough to avoid any voltage drop of more than 15% of the rated voltage.



#### DANGER

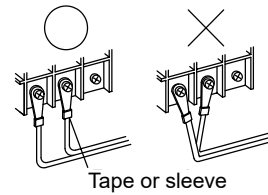
- Do not adjust any wiring or connections unless the main power switch is OFF.
- Check that the earth wire is securely connected, tagged and locked in accordance with national and local codes.
- When using more than one power source, check and ensure that all of them are turned OFF before operating the unit.
- Avoid wiring installation in contact with the refrigerant pipes, water pipes, edges of plates and electrical components inside the unit to prevent damage, which may cause electric shock or short circuit.



#### CAUTION

- Check to ensure that screws for terminal board are tightly tightened.
- Check to ensure that the outdoor fan have stopped before electrical wiring work or periodical check is performed.
- Protect the wires, drain pipe, electrical parts, from rats or other small animals. If not protected, rats may damage unprotected parts, and at the worst, a fire will occur.
- Wrap the accessory packing around the wires, and plug the wiring connection hole with the seal material to protect the product from any condensed water and insects.
- Tightly secure the wires with the cord clamp inside the unit.
- Lead the wires through the knockout hole to the wiring cover when using conduit.
- Electrical wiring must comply with national and local codes. Contact your local authority in regards to standards, rules, regulations, etc.
- Check that the earth wire is securely connected.
- Connect a fuse of specified capacity.
- Turn OFF the main power switch to the indoor unit and the outdoor unit and wait for more than 10 minutes before electrical wiring work or a periodical check is performed.
- Use a dedicated power circuit for the unit. Do not use a power circuit shared with the outdoor unit or any other appliance.
- Make sure that all wiring and protection devices are properly selected, connected, identified and fixe to the corresponding terminals of the unit, specially the protection (earth) and power wiring, taking into account the applicable national and local regulations. Establish proper earthing; Incomplete earthing may cause electrical shock.

- Keep a distance between each wiring terminal and attach insulation tape or sleeve as shown in the figure.



- Check to ensure that the electrical resistance is more than  $1 M\Omega$ , by measuring the resistance between ground and the terminal of the electrical parts. If not, do not operate the system until the electrical leakage is found and repaired.

### 8.3.9.2 COMMON WIRING

- Use shielded twisted pair wire (more than  $0.75 \text{ mm}^2$ ) for transmission wiring between outdoor unit and indoor unit.
- Use 2-core wire for the transmission cable (Do not use wire with more than 3 cores).
- Use shielded twisted pair cable for transmission wiring to protect the units from noise obstacle at length of less than 300 m and size complied with local code.
- H-NET shielded twisted pair cable must be grounded in the outdoor unit side.

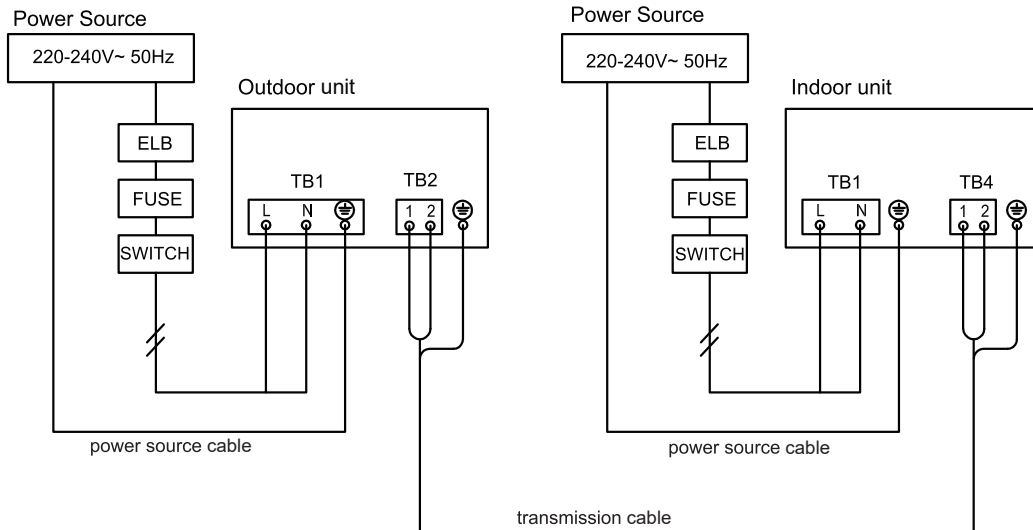


#### CAUTION

- Pay attention to the connection of the transmission wires. Incorrect connection may cause the failure of printed circuit board.
- Check to ensure that the field-supplied electrical components (mains power switches, circuit breakers, wires, connectors and wire terminals) have been properly selected according to the electrical data indicated in this chapter and they comply with national and local codes. If it is necessary, contact with your local authority in regards to standards, rules, regulations, etc.



The electrical wiring connection between the outdoor unit and the indoor unit is shown in figure below:

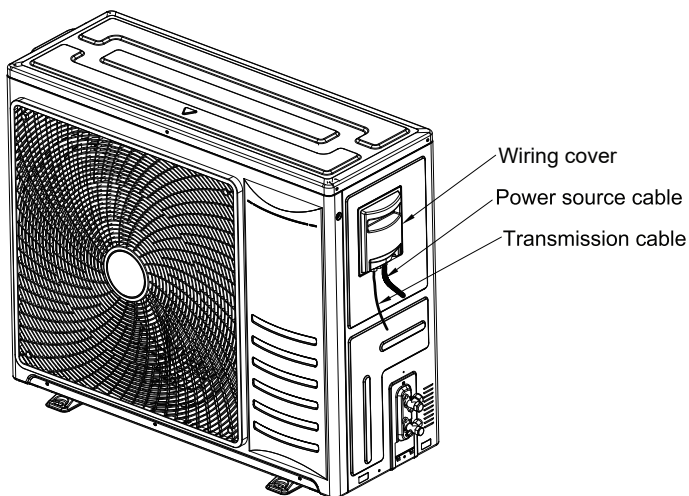


Shielded twisted pair cable 0.75mm<sup>2</sup> x 2.  
 This cable dose not need any polarity.  
 Do not apply an excessively high voltage to this cable (Rated Voltage:5V).

**8.3.9.3 ELECTRICAL WIRING CONNECTION FOR OUTDOOR UNITS**

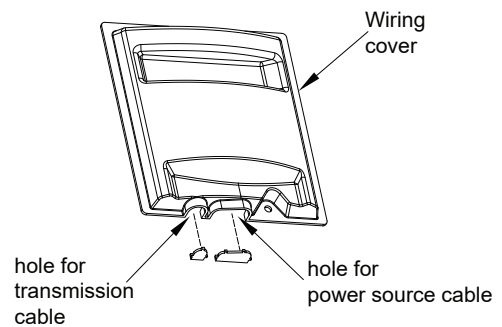
The electrical wiring connection for the outdoor unit is shown in the figure below:

- External view:



**i NOTE**

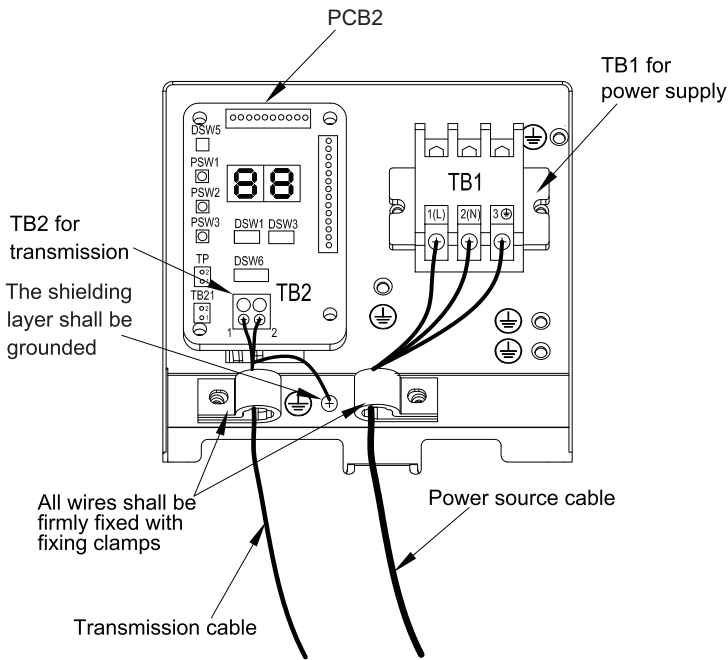
- Knock out the holes of the wiring cover before wiring connection.



**! CAUTION**

- The wiring cover must be installed back after the wiring connection work, and make sure it is firmly fixed. Otherwise, the water or dust may enter, and cause an electric shock.

- Inner view:



**i NOTE**

- All wires shall be firmly fixed with fixing clamps, and ensure that each wire is reliably grounded.

**! CAUTION**

- Do not connect the power source cable to the TB2. If connected, the printed circuit board will be damaged.

8.3.9.4 WIRING SIZE AND MAIN SWITCH PROTECTION

Recommended minimum sizes for field-supplied wires and select the main switches according to the table below:

Capacity	Power supply	Power source cable size	Transmission cable size	MC (A)	CB (A)	ELB (n° poles/A/mA)
		EN60335-1	EN60335-1			
44(2.0HP)	220-240V~ 50Hz	2.5 mm <sup>2</sup>	0.75 mm <sup>2</sup>	9.8	16	2/16/30
60(2.5HP)		2.5 mm <sup>2</sup>		12.0	16	2/16/30
80(3.0HP)		4.0 mm <sup>2</sup>		16.8	20	2/20/30

**i NOTE**

- ELB: earth leakage breaker; CB: circuit breaker; MC: maximum current.
- Follow local codes and regulations when selecting field wires, circuit breakers and earth leakage breakers.
- Use the wires which are not lighter than the ordinary polychloroprene sheathed flexible cord (code designation 60245 IEC 57).

**! CAUTION**

- Ensure specifically that there is an earth leakage breaker (ELB) installed for the units (outdoor unit).
- If the installation is already equipped with an earth leakage breaker (ELB), ensure that its rated current is large enough to hold the current of the units (outdoor unit).

**i NOTE**

- Electric fuses can be used instead of magnetic circuit breakers (CB). In that case, select fuses with similar rated values as the CB.
- The earth leakage breaker (ELB) mentioned in this manual is also commonly known as residual current device (RCD) or residual current circuit breaker (RCCB).
- The circuit breakers (CB) are also known as thermal-magnetic circuit breakers or just magnetic circuit breakers (MCB).



**i** NOTE

- Where power supply cable is connected through junction box in series, be sure to determine the total current and choose wires based on the table below.

Selection according to EN 60335-1.

Current i (A)	Wire size (mm <sup>2</sup> )
$i \leq 6$	2.5
$6 < i \leq 10$	2.5
$10 < i \leq 16$	2.5
$16 < i \leq 25$	4
$25 < i \leq 32$	6
$32 < i \leq 40$	10
$40 < i \leq 63$	16
$63 < i$	※1

※1: In the case that current exceeds 63A, do not connect cables in series.

- As a minimum, the chosen wires shall not be lighter than the polychloroprene sheathed flexible cord (code designation 60245 IEC 57).
- The wiring specifications for weak-current communication circuit shall not be lower than that for RVV(S)P shielded wires or equivalent, and the shielding layer shall be grounded.
- A switch that can ensure all-pole disconnection shall be installed between power supply and air conditioning unit in such a manner that the contact spacing shall not be less than 3 mm.
- Once the power cord is damaged, the dealer or the professionals from designated maintenance department must be contacted in a timely manner for repair and replacement.
- For the installation of power cord, the ground wire must be longer than the current-carrying conductor.

8.3.9.5 SETTING OF DIP SWITCHES

**i** NOTE

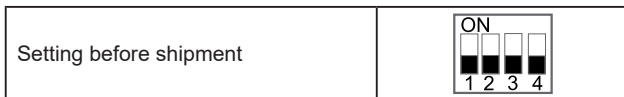
- The mark “■” indicates the dip switches positions.
- No mark “■” indicates pin position is not affected.
- The figures show the settings before shipment or after selection.
- “Not used” means that the pin must not be changed. A malfunction might occur if changed.

**!** CAUTION

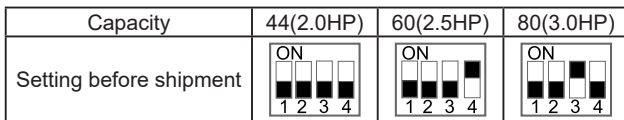
Before setting dip switches, first turn the power supply OFF and then set the position of dip switches. If the switches are set without turning the power supply OFF, the contents of the setting are invalid.

8.2.9.5.1 DIP Switch Setting of PCB2

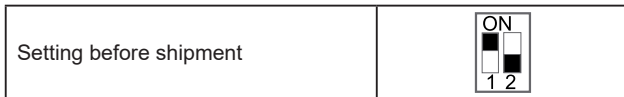
- (1) DSW1: Unit model setting  
No setting is required.



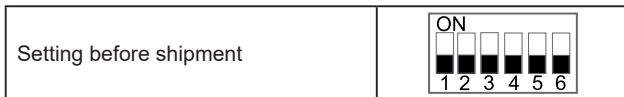
- (2) DSW3: Capacity setting  
No setting is required.



- (3) DSW5: End resistance setting  
No setting is required.



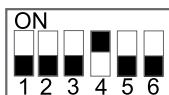
- (4) DSW6: Refrigeration system No. setting  
Setting is required. Use binary encoding method.



Max No.63 are available to set when all the equipment are connected to corresponding H-NET.

**i** NOTE

- Binary encoding method for Refrigeration system No.:  
 Refrigeration system No. =  $\sum \text{the value of the pin} \times 2^{(\text{pin number}-1)}$  the value of the pin: the value is equal to 1 when the pin is set as ON, otherwise the value is equal to 0.  
 Pin number: the figure below the pin, marked as 1~6.  
 Ex.) Set refrigeration system No. as 8.



Calculation in binary:  $8 = 0 \times 2^{(1-1)} + 0 \times 2^{(2-1)} + 0 \times 2^{(3-1)} + 1 \times 2^{(4-1)} + 0 \times 2^{(5-1)} + 0 \times 2^{(6-1)}$

8.3.10 TEST RUN

When installation is completed, perform test run according to the wired remote controller’s manual, and hand over the system to the customer.

**!** CAUTION

Do not operate the system until all the check points have been cleared:

- Check to ensure that the electrical resistance is more than 1 MΩ, by measuring the resistance between ground and the terminal of the electrical parts. If not, do not operate the system until the electrical leakage is found and repaired. Do not impress the voltage on the terminals for transmission 1 and 2.
- Check to ensure that the stop valves of the outdoor unit are fully opened, and then start the system.
- Pay attention to the following items while the system is running:
  - Do not touch any of the parts by hand at the discharge gas side, since the compressor chamber and the pipes at the discharge side are heated higher than 90°C.
  - DO NOT PUSH THE BUTTON OF THE MAGNETIC SWITCH(ES), it will cause a serious accident.
  - Do not touch any electrical components within 10 minutes after turning OFF the main switch.
  - Confirm that the gas line stop valve and the liquid line stop valve are fully open.
  - Confirm that the leakage of the refrigerant does not exist. The flare nuts are sometimes loosened by vibration during transportation.
  - Check that the refrigerant piping and the electrical wiring conform to the same system.
  - Confirm that the dip switch settings on the printed circuit board of the indoor unit and the outdoor unit are correct.
  - Check whether or not the electrical wirings of the indoor unit and the outdoor unit are connected properly.

8.3.11 MAIN SAFETY DEVICES

◆ Compressor protection

High pressure switch:

This switch cuts out the operation of the compressor when the discharge pressure exceeds the setting.

◆ Fan motor protection

When the thermistor temperature is reached to the setting, motor output is decreased.

Otherwise, when the temperature becomes lower, limitation is cancelled.

Capacity		44(2.0HP)	60(2.5HP)	80(3.0HP)
For compressor				
Pressure switches	-	Automatic Reset, Non-Adjustable		
High	Cut Out	MPa	4.4±0.15	
	Cut-In	MPa	3.4±0.2	
Low	Cut Out	MPa	0.05±0.03	
	Cut-In	MPa	0.15±0.03	
Fuse on Main Circuit 220-240V ~ 50Hz	A	30		
CCP Timer	-	Non-Adjustable		
Setting Time	min.	3		
For condenser fan motor	-	Automatic Reset, Non-Adjustable		
Internal Thermostat	-			

## 8.3.12 TECHNICAL PARAMETERS

Technical parameters							
Outdoor unit:	AHW-044HCDS1			Indoor unit:	AHM-044HCDSAA		
Outdoor side heat exchanger of air conditioner/heat pump: air							
Indoor side heat exchanger of air conditioner/heat pump: water							
Type: compressor driven vapour compression							
Driver of compressor: electric motor							
Indication if the heater is equipped with a supplementary heater: yes							
Parameters shall be declared for the average heating season							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
Heating							
Parameters shall be declared for:				Low temperature application			
Indoor heat exchanger:				Variable outlet			
Rated heating capacity	$P_{rated,h}$	4.44	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	197	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature $T_j$				Declared coefficient of performance/Average season, at indoor temperature 20 °C and outdoor temperature $T_j$			
$T_j = -7^\circ\text{C}$	$P_{dh}$	3.9	kW	$T_j = -7^\circ\text{C}$	$COP_d$	3.29	—
$T_j = 2^\circ\text{C}$	$P_{dh}$	2.4	kW	$T_j = 2^\circ\text{C}$	$COP_d$	4.80	—
$T_j = 7^\circ\text{C}$	$P_{dh}$	1.7	kW	$T_j = 7^\circ\text{C}$	$COP_d$	6.44	—
$T_j = 12^\circ\text{C}$	$P_{dh}$	2.2	kW	$T_j = 12^\circ\text{C}$	$COP_d$	9.92	—
$T_j = \text{bivalent temperature}$	$P_{dh}$	3.9	kW	$T_j = \text{bivalent temperature}$	$COP_d$	3.29	—
$T_j = \text{operating limit}$	$P_{dh}$	4.3	kW	$T_j = \text{operating limit}$	$COP_d$	2.62	—
Bivalent temperature				Operating limit temperature			
heating/Average	$T_{biv}$	-7	°C	heating/Average	$T_{ol}$	-10	°C
heating/Warmer	$T_{biv}$	—	°C	heating/Warmer	$T_{ol}$	—	°C
heating/Colder	$T_{biv}$	—	°C	heating/Colder	$T_{ol}$	—	°C
Degradation co-efficient	$C_d$	0.9					
Power consumption in modes other than 'active mode'							
Off mode	$P_{OFF}$	0.010	kW	Standby mode	$P_{SB}$	0.010	kW
Thermostat-off mode(heating)	$P_{TO}$	0.011	kW	Crankcase heater mode	$P_{CK}$	0.001	kW
Supplementary heater							
Supplementary capacity	$P_{SUP}$	0.102	kW	Type of energy input	Electric		
Other items							
Capacity control		Variable		Air flow rate, outdoor		2700	$\text{m}^3/\text{h}$
Reference annual heating demand	$Q_H$	9119	kWh	Sound power level, indoor/outdoor measured	LWA	42/61	dB(A)
Annual energy consumption	$Q_{HE}$	1824	kWh	Global warming potential	GWP	675	$\text{kgCO}_2 \text{ eq.}$
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						

## Technical parameters

Outdoor unit:	AHW-044HCDS1	Indoor unit:	AHM-044HCDSAA				
Outdoor side heat exchanger of air conditioner/heat pump: air							
Indoor side heat exchanger of air conditioner/heat pump: water							
Type: compressor driven vapour compression							
Driver of compressor: electric motor							
Indication if the heater is equipped with a supplementary heater: yes							
Parameters shall be declared for the average heating season							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
Heating							
Parameters shall be declared for:				Medium temperature application			
Indoor heat exchanger:				Variable outlet			
Rated heating capacity	$P_{rated,h}$	3.87	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	126	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature $T_j$				Declared coefficient of performance/Average season, at indoor temperature 20 °C and outdoor temperature $T_j$			
$T_j = -7^\circ\text{C}$	$P_{dh}$	3.4	kW	$T_j = -7^\circ\text{C}$	COPd	1.97	—
$T_j = 2^\circ\text{C}$	$P_{dh}$	2.1	kW	$T_j = 2^\circ\text{C}$	COPd	3.22	—
$T_j = 7^\circ\text{C}$	$P_{dh}$	1.4	kW	$T_j = 7^\circ\text{C}$	COPd	3.97	—
$T_j = 12^\circ\text{C}$	$P_{dh}$	2.0	kW	$T_j = 12^\circ\text{C}$	COPd	7.24	—
$T_j = \text{bivalent temperature}$	$P_{dh}$	3.4	kW	$T_j = \text{bivalent temperature}$	COPd	1.97	—
$T_j = \text{operating limit}$	$P_{dh}$	3.5	kW	$T_j = \text{operating limit}$	COPd	1.68	—
Bivalent temperature				Operating limit temperature			
heating/Average	$T_{biv}$	-7	°C	heating/Average	$T_{ol}$	-10	°C
heating/Warmer	$T_{biv}$	—	°C	heating/Warmer	$T_{ol}$	—	°C
heating/Colder	$T_{biv}$	—	°C	heating/Colder	$T_{ol}$	—	°C
Degradation co-efficient	$C_d$	0.9					
Power consumption in modes other than 'active mode'							
Off mode	$P_{OFF}$	0.010	kW	Standby mode	$P_{SB}$	0.010	kW
Thermostat-off mode(heating)	$P_{TO}$	0.011	kW	Crankcase heater mode	$P_{CK}$	0.001	kW
Supplementary heater							
Supplementary capacity	$P_{SUP}$	0.303	kW	Type of energy input	Electric		
Other items							
Capacity control		Variable		Air flow rate, outdoor		2700	$\text{m}^3/\text{h}$
Reference annual heating demand	$Q_H$	7944	kWh	Sound power level, indoor/outdoor measured	LWA	42/61	dB(A)
Annual energy consumption	$Q_{HE}$	2457	kWh	Global warming potential	GWP	675	$\text{kgCO}_2 \text{ eq.}$
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						

## Technical parameters

Outdoor unit:	AHW-060HCDS1	Indoor unit:	AHM-060HCDSAA				
Outdoor side heat exchanger of air conditioner/heat pump: air							
Indoor side heat exchanger of air conditioner/heat pump: water							
Type: compressor driven vapour compression							
Driver of compressor: electric motor							
Indication if the heater is equipped with a supplementary heater: yes							
Parameters shall be declared for the average heating season							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
Heating							
Parameters shall be declared for:				Low temperature application			
Indoor heat exchanger:				Variable outlet			
Rated heating capacity	$P_{rated,h}$	6.10	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	194	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature $T_j$				Declared coefficient of performance/Average season, at indoor temperature 20 °C and outdoor temperature $T_j$			
$T_j = -7^\circ\text{C}$	$P_{dh}$	5.4	kW	$T_j = -7^\circ\text{C}$	COPd	3.13	—
$T_j = 2^\circ\text{C}$	$P_{dh}$	3.3	kW	$T_j = 2^\circ\text{C}$	COPd	4.67	—
$T_j = 7^\circ\text{C}$	$P_{dh}$	2.0	kW	$T_j = 7^\circ\text{C}$	COPd	6.63	—
$T_j = 12^\circ\text{C}$	$P_{dh}$	2.2	kW	$T_j = 12^\circ\text{C}$	COPd	9.92	—
$T_j = \text{bivalent temperature}$	$P_{dh}$	5.4	kW	$T_j = \text{bivalent temperature}$	COPd	3.13	—
$T_j = \text{operating limit}$	$P_{dh}$	5.3	kW	$T_j = \text{operating limit}$	COPd	2.66	—
Bivalent temperature				Operating limit temperature			
heating/Average	$T_{biv}$	-7	°C	heating/Average	$T_{ol}$	-10	°C
heating/Warmer	$T_{biv}$	—	°C	heating/Warmer	$T_{ol}$	—	°C
heating/Colder	$T_{biv}$	—	°C	heating/Colder	$T_{ol}$	—	°C
Degradation co-efficient	$C_d$	0.9					
Power consumption in modes other than 'active mode'							
Off mode	$P_{OFF}$	0.010	kW	Standby mode	$P_{SB}$	0.010	kW
Thermostat-off mode(heating)	$P_{TO}$	0.011	kW	Crankcase heater mode	$P_{CK}$	0.001	kW
Supplementary heater							
Supplementary capacity	$P_{SUP}$	0.729	kW	Type of energy input	Electric		
Other items							
Capacity control		Variable		Air flow rate, outdoor		2700	m <sup>3</sup> /h
Reference annual heating demand	$Q_H$	12507	kWh	Sound power level , indoor/ outdoor measured	LWA	42/62	dB(A)
Annual energy consumption	$Q_{HE}$	2539	kWh	Global warming potential	GWP	675	kgCO <sub>2</sub> eq.
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						

## Technical parameters

Outdoor unit:	AHW-060HCDS1	Indoor unit:	AHM-060HCDSAA				
Outdoor side heat exchanger of air conditioner/heat pump: air							
Indoor side heat exchanger of air conditioner/heat pump: water							
Type: compressor driven vapour compression							
Driver of compressor: electric motor							
Indication if the heater is equipped with a supplementary heater: yes							
Parameters shall be declared for the average heating season							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
Heating							
Parameters shall be declared for:				Medium temperature application			
Indoor heat exchanger:				Variable outlet			
Rated heating capacity	$P_{rated,h}$	5.37	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	130	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature $T_j$				Declared coefficient of performance/Average season, at indoor temperature 20 °C and outdoor temperature $T_j$			
$T_j = -7^\circ\text{C}$	$P_{dh}$	4.7	kW	$T_j = -7^\circ\text{C}$	$COP_d$	2.04	—
$T_j = 2^\circ\text{C}$	$P_{dh}$	3.0	kW	$T_j = 2^\circ\text{C}$	$COP_d$	3.21	—
$T_j = 7^\circ\text{C}$	$P_{dh}$	2.0	kW	$T_j = 7^\circ\text{C}$	$COP_d$	4.34	—
$T_j = 12^\circ\text{C}$	$P_{dh}$	2.0	kW	$T_j = 12^\circ\text{C}$	$COP_d$	7.24	—
$T_j = \text{bivalent temperature}$	$P_{dh}$	4.7	kW	$T_j = \text{bivalent temperature}$	$COP_d$	2.04	—
$T_j = \text{operating limit}$	$P_{dh}$	4.5	kW	$T_j = \text{operating limit}$	$COP_d$	1.75	—
Bivalent temperature				Operating limit temperature			
heating/Average	$T_{biv}$	-7	°C	heating/Average	$T_{ol}$	-10	°C
heating/Warmer	$T_{biv}$	—	°C	heating/Warmer	$T_{ol}$	—	°C
heating/Colder	$T_{biv}$	—	°C	heating/Colder	$T_{ol}$	—	°C
Degradation co-efficient	$C_d$	0.9					
Power consumption in modes other than 'active mode'							
Off mode	$P_{OFF}$	0.010	kW	Standby mode	$P_{SB}$	0.010	kW
Thermostat-off mode(heating)	$P_{TO}$	0.011	kW	Crankcase heater mode	$P_{CK}$	0.001	kW
Supplementary heater							
Supplementary capacity	$P_{SUP}$	0.805	kW	Type of energy input	Electric		
Other items							
Capacity control		Variable		Air flow rate, outdoor		2700	m <sup>3</sup> /h
Reference annual heating demand	$Q_H$	11032	kWh	Sound power level , indoor/ outdoor measured	LWA	42/62	dB(A)
Annual energy consumption	$Q_{HE}$	3312	kWh	Global warming potential	GWP	675	kgCO <sub>2</sub> eq.
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						



## Technical parameters

Outdoor unit:	AHW-080HCDS1	Indoor unit:	AHM-080HCDSAA				
Outdoor side heat exchanger of air conditioner/heat pump: air							
Indoor side heat exchanger of air conditioner/heat pump: water							
Type: compressor driven vapour compression							
Driver of compressor: electric motor							
Indication if the heater is equipped with a supplementary heater: yes							
Parameters shall be declared for the average heating season							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
Heating							
Parameters shall be declared for:				Low temperature application			
Indoor heat exchanger:				Variable outlet			
Rated heating capacity	$P_{rated,h}$	6.50	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	194	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature $T_j$				Declared coefficient of performance/Average season, at indoor temperature 20 °C and outdoor temperature $T_j$			
$T_j = -7^\circ\text{C}$	$P_{dh}$	5.8	kW	$T_j = -7^\circ\text{C}$	$COP_d$	3.14	—
$T_j = 2^\circ\text{C}$	$P_{dh}$	3.5	kW	$T_j = 2^\circ\text{C}$	$COP_d$	4.84	—
$T_j = 7^\circ\text{C}$	$P_{dh}$	2.3	kW	$T_j = 7^\circ\text{C}$	$COP_d$	5.98	—
$T_j = 12^\circ\text{C}$	$P_{dh}$	2.0	kW	$T_j = 12^\circ\text{C}$	$COP_d$	9.67	—
$T_j = \text{bivalent temperature}$	$P_{dh}$	5.8	kW	$T_j = \text{bivalent temperature}$	$COP_d$	3.14	—
$T_j = \text{operating limit}$	$P_{dh}$	6.2	kW	$T_j = \text{operating limit}$	$COP_d$	2.66	—
Bivalent temperature				Operating limit temperature			
heating/Average	$T_{biv}$	-7	°C	heating/Average	$T_{ol}$	-10	°C
heating/Warmer	$T_{biv}$	—	°C	heating/Warmer	$T_{ol}$	—	°C
heating/Colder	$T_{biv}$	—	°C	heating/Colder	$T_{ol}$	—	°C
Degradation co-efficient	$C_d$	0.9					
Power consumption in modes other than 'active mode'							
Off mode	$P_{OFF}$	0.010	kW	Standby mode	$P_{SB}$	0.010	kW
Thermostat-off mode(heating)	$P_{TO}$	0.011	kW	Crankcase heater mode	$P_{CK}$	0.001	kW
Supplementary heater							
Supplementary capacity	$P_{SUP}$	0.343	kW	Type of energy input	Electric		
Other items							
Capacity control		Variable		Air flow rate, outdoor		2700	$\text{m}^3/\text{h}$
Reference annual heating demand	$Q_H$	13441	kWh	Sound power level , indoor/ outdoor measured	LWA	42/64	dB(A)
Annual energy consumption	$Q_{HE}$	2732	kWh	Global warming potential	GWP	675	$\text{kgCO}_2 \text{ eq.}$
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						

## Technical parameters

Outdoor unit:	AHW-080HCDS1	Indoor unit:	AHM-080HCDSAA				
Outdoor side heat exchanger of air conditioner/heat pump: air							
Indoor side heat exchanger of air conditioner/heat pump: water							
Type: compressor driven vapour compression							
Driver of compressor: electric motor							
Indication if the heater is equipped with a supplementary heater: yes							
Parameters shall be declared for the average heating season							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
Heating							
Parameters shall be declared for:				Medium temperature application			
Indoor heat exchanger:				Variable outlet			
Rated heating capacity	$P_{rated,h}$	5.90	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	134	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature $T_j$				Declared coefficient of performance/Average season, at indoor temperature 20 °C and outdoor temperature $T_j$			
$T_j = -7^\circ\text{C}$	$P_{dh}$	5.2	kW	$T_j = -7^\circ\text{C}$	$COP_d$	1.85	—
$T_j = 2^\circ\text{C}$	$P_{dh}$	3.2	kW	$T_j = 2^\circ\text{C}$	$COP_d$	3.40	—
$T_j = 7^\circ\text{C}$	$P_{dh}$	2.1	kW	$T_j = 7^\circ\text{C}$	$COP_d$	4.50	—
$T_j = 12^\circ\text{C}$	$P_{dh}$	2.1	kW	$T_j = 12^\circ\text{C}$	$COP_d$	7.71	—
$T_j = \text{bivalent temperature}$	$P_{dh}$	5.2	kW	$T_j = \text{bivalent temperature}$	$COP_d$	1.85	—
$T_j = \text{operating limit}$	$P_{dh}$	5.7	kW	$T_j = \text{operating limit}$	$COP_d$	1.54	—
Bivalent temperature				Operating limit temperature			
heating/Average	$T_{biv}$	-7	°C	heating/Average	$T_{ol}$	-10	°C
heating/Warmer	$T_{biv}$	—	°C	heating/Warmer	$T_{ol}$	—	°C
heating/Colder	$T_{biv}$	—	°C	heating/Colder	$T_{ol}$	—	°C
Degradation co-efficient	$C_d$	0.9					
Power consumption in modes other than 'active mode'							
Off mode	$P_{OFF}$	0.010	kW	Standby mode	$P_{SB}$	0.010	kW
Thermostat-off mode(heating)	$P_{TO}$	0.011	kW	Crankcase heater mode	$P_{CK}$	0.001	kW
Supplementary heater							
Supplementary capacity	$P_{SUP}$	0.179	kW	Type of energy input	Electric		
Other items							
Capacity control		Variable		Air flow rate, outdoor		2700	m <sup>3</sup> /h
Reference annual heating demand	$Q_H$	12081	kWh	Sound power level, indoor/outdoor measured	LWA	42/64	dB(A)
Annual energy consumption	$Q_{HE}$	3536	kWh	Global warming potential	GWP	675	kgCO <sub>2</sub> eq.
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						

**8.4 Installation of Hi-Therma Monobloc**

**8.4.1 GENERAL INFORMATION**

**8.4.1.1 GENERAL NOTES**

- This manual gives a common description and information for this heat pump air conditioner which you operate as well for other models.
- This manual should be considered as a permanent part of the heat pump air conditioning equipment and should remain with the air conditioning equipment.
- No part of this publication may be reproduced, copied, filed or transmitted in any shape or form without the permission of Hisense.
- Within the policy of continuous improvement of its products, Hisense reserves the right to make changes at any time without prior notification and without being compelled to introducing them into products previously sold. This document may therefore have been subject to amendments during the life of the product.
- As a result, some of the images or data used to illustrate this document may not refer to specific models. No claims will be accepted based on the data, illustrations and descriptions included in this manual.
- This heat pump air conditioner has been designed for the following ambient temperatures. Please operate the air conditioner within the ranges.

Temperature

		Min.	Max.
Outdoor ambient	Space heating	-25°C DB	35°C DB
	Domestic hot water (DHW)	-25°C DB	40°C DB
	Space cooling	5°C DB	46°C DB
Water outlet	Space heating	15°C	60°C
	Space cooling	5°C	22°C
Domestic hot water (DHW)		30°C	55°C (75°C*)
Water pressure		1 bar	3 bar

DB: Dry Bulb

\*: When there is an electric heater mounted in the DHW tank, the setting temperature can reach 75°C.

- Upon receiving this product, inspect it for any shipping damage. Claims for damage, either apparent or concealed, in a written form, should be filed immediately with the shipping company.
- Check the model number, electrical characteristics (power supply, voltage and frequency) and accessories to determine if they are correct.
- The standard utilization of the unit shall be explained in these instructions. Therefore, the utilization of the unit other than those indicated in these instructions is not recommended. Please contact your local agent, as the occasion arises.
- If you have any questions, please contact your dealer or designated service center of Hisense.

**8.4.1.2 GENERAL SAFETY**

- **Notice: Servicing shall be performed only as recommended by the manufacturer.**
- **Qualification of workers**  
Warning: Every working procedure that affects safety means shall only be carried out by competent persons. Examples for such working procedures are:
  - breaking into the refrigerating circuit.
  - opening of sealed components.
  - opening of ventilated enclosures.
- **Information on servicing**
  - Prior to beginning work on systems, safety checks are necessary to ensure that the risk of ignition is minimized. - Work shall be undertaken under a controlled procedure so as to minimized the risk of flammable gas or vapor being present while the work is being performed.
  - Work in confined spaces shall be avoided. The area around the workspace shall be sectioned off. Ensure that the conditions within the area have been made safe by control of flammable material.
- **Checking for presence of refrigerant**
  - The area shall be checked with an appropriate refrigerant detector prior to and during work. The leak detection equipment should be suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe.
- **Presence of fire extinguisher**
  - If any hot work is to be conducted, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO<sub>2</sub> fire extinguisher adjacent to the charging area.
- **No ignition sources**
  - All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed.
- **Ventilated area**
  - Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.
- **Checks to the refrigeration equipment**
  - where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer's technical department for assistance. The following checks shall be applied to installations.
  - The charge size is in accordance with the room size within which the refrigerant containing parts are installed.

- The ventilation machinery and outlets are operating adequately and are not obstructed.
- If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant.
- Marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected.
- Refrigeration pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.
- **Checks to electrical devices**
  - Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment, so that all parties are advised.
  - Initial safety checks shall include:
    - (1) that capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking;
    - (2) that no live electrical components and wiring are exposed while charging, recovering or purging the system;
    - (3) that there is continuity of earth bonding.
- **Repairs to sealed components**
  - During repairs to sealed components, all electrical supplies shall be disconnected prior to any removal of sealed covers, etc. If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.
  - Ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected, including damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.
  - Ensure that the apparatus is mounted securely.
  - Ensure that seals or sealing materials have not degraded to the point that they no longer serve the purpose of preventing the ingress of flammable atmospheres. Replacement parts shall be in accordance with the manufacturer's specifications.
- **Repair to intrinsically safe components**
  - Do not apply any permanent inductive or capacitance loads to the circuit without ensuring that this will not exceed the permissible voltage and current permitted for the equipment in use.
- Intrinsically safe components are the only types that can be worked on while live in the presence of a flammable atmosphere.
- Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.
- **Cabling**
  - Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.
- **Detection of flammable refrigerants**
  - Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.
- **Leak detection methods**
  - Electronic leak detectors may be used to detect refrigerant leaks but the sensitivity may not be adequate, or may need re-calibration for the flammable refrigerants.
  - Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed.
  - The use of detergents containing chlorine shall be avoided.
  - If a leak is suspected, all naked flames shall be removed/extinguished.
  - If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. Oxygen free nitrogen (OFN) shall then be purged through the system both before and during the brazing process.
- **Removal and evacuation**
  - The refrigerant charge shall be recovered into the correct recovery cylinders and the system shall be "flushed" with OFN to render the unit safe. This process may need to be repeated several times.
  - Compressed air or oxygen shall not be used for purging refrigerant systems.
  - Flushing shall be achieved by breaking the vacuum in the system with OFN and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system. When the final OFN charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. This operation is absolutely vital if brazing operations on the pipework are to take place.
  - The outlet for the vacuum pump is not close to any ignition sources and that ventilation is available.

- **Charging procedures**

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimise the amount of refrigerant contained in them.
- Cylinders shall be kept upright.
- Ensure that the refrigeration system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigeration system.
- Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

- **Decommissioning**

- Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail.
- Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of reclaimed refrigerant.
- Electrical power must be available before the task is commenced.
- Become familiar with the equipment and its operation.
- Isolate system electrically.
- Before attempting the procedure, ensure that:
  - (1) mechanical handling equipment is available, if required, for handling refrigerant cylinders;
  - (2) all personal protective equipment is available and being used correctly;
  - (3) the recovery process is supervised at all times by a competent person;
  - (4) recovery equipment and cylinders conform to the appropriate standards.
- Pump down refrigerant system, if possible.
- If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
- Make sure that cylinder is situated on the scales before recovery takes place.
- Start the recovery machine and operate in accordance with manufacturer's instructions.
- Do not overfill cylinders. (No more than 80 % volume liquid charge).
- Do not exceed the maximum working pressure of the cylinder, even temporarily.
- When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.

- Recovered refrigerant shall not be charged into another refrigeration system unless it has been cleaned and checked.

- **Labelling**

- Equipment shall be labelled stating that it has been de-commissioned and emptied of refrigerant. The label shall be dated and signed.
- Ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.

- **Recovery**

- When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed.
- Ensure that the correct number of cylinders for holding the total system charge are available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i.e. special cylinders for the recovery of refrigerant).
- Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.
- The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of all appropriate refrigerants.
- A set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release.
- The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant waste transfer note arranged.
- Do not mix refrigerants in recovery units and especially not in cylinders.
- If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant.
- The evacuation process shall be carried out prior to returning the compressor to the suppliers.
- Only electric heating to the compressor body shall be employed to accelerate this process.
- When oil is drained from a system, it shall be carried out safely.



8.4.2 SAFETY

8.4.2.1 APPLIED SYMBOLS

- During normal heat pump system design work or unit installation, greater attention must be paid in certain situations requiring particular care in order to avoid damage to the unit, the installation or the building or property.
- Situations that pose a risk to the safety of those in the surrounding area or to the unit itself are clearly indicated in this manual.
- Signal words (DANGER , CAUTION and NOTE) are used to identify levels of hazard seriousness. Pay close attention to these symbols and to the messages following them, as your safety and that of others depends on it.

 **DANGER**

- **The text following this symbol contains information and instructions relating directly to your safety.**
- **Not taking these instructions into account could lead to serious, very serious or even fatal injuries to you and others.**

 **CAUTION**

- The text following this symbol contains information and instructions relating directly to your safety.
- Not taking these instructions into account could lead to minor injuries to you and others.
- Not taking these instructions into account could lead to unit damage.

 **NOTE**

- The text following this symbol contains information and instructions that may be use or that require a more thorough explanation.
- Instructions regarding inspections to be made on unit parts or systems may also be included.






Caution, risk of fire!

**This appliance is filled with R32, an odourless low burning velocity refrigerant. If the refrigerant is leaked, there is a possibility of ignition if it enters in contact with an external ignitions source.**

**RISK OF EXPLOSION**

The compressor must be stopped before removing the refrigerant pipes. All service valves must be fully closed after pumping down operation.

Symbol	Explanation
	Before installation, read the installation and operation manual, and the wiring instruction sheet.
	Before performing maintenance and service tasks, read the service manual.
	For more information, see the Technical, Installation and Service Handbook.

8.4.2.2 ADDITIONAL INFORMATION ABOUT SAFETY

 **DANGER**

- **DO NOT CONNECT THE POWER SUPPLY TO THE UNIT PRIOR TO FILLING THE SPACE HEATING CIRCUIT (AND DHW CIRCUIT IF IT WERE THE CASE) WITH WATER AND CHECKING WATER PRESSURE AND THE TOTAL ABSENCE OF ANY WATER LEAKAGE.**
- Do not pour water into the unit. These products are equipped with electrical parts. If the electrical components are in contact with water, a serious electrical shock will take place.
- Do not touch or adjust safety devices inside the unit. If these devices are touched or adjusted, a serious accident can take place.
- Do not open the service cover or access inside the unit without disconnecting the main power supply.
- In case of fire, Turn OFF the main switch, put out the fire at once and contact your service contractor.
- Disconnect the appliance from its power source during service and when replacing parts.
- It must be ensured that the heat pump cannot operate accidentally without water neither with air inside hydraulic system.
- Check that the earth wire is securely connected. If the unit is not properly earthed, it may lead to electric shock.
- Do not connect the earth wire to gas piping, water piping, lighting conductor or earth wire of a telephone.
- Fix the cables securely. External forces on the terminals could lead to a fire.
- Use an ELB (earth leakage breaker, with an actuation time of 0.1s or less). In the event of a fault, there is danger of an electric shock or a fire if it is not used.
- Do not charge oxygen, acetylene or other flammable and poisonous gases into the refrigerant cycle when performing a leakage test or an air-tightness test. These types of gases are extremely dangerous and can cause an explosion.
- Do not install the unit in the following places, otherwise, it may lead to a fire, deformation, corrosion or failure.
  - Places where oil (including machinery oil) splashes.
  - Places where flammable gas may generate or flow.
  - Places where there is splashing water.
  - Places where sulfide gas drifts such as in hot spring.
  - Places where strong wind with high salinity blows such as coast regions, or places with an atmosphere of acidity or alkalinity.
- Do not install the unit in the place where silicon gas drifts. If the silicon gas attaches to the surface of heat exchanger, the fin surface repels water. As a result, drain water splashes outside of the drain pan and splashed water runs inside of electrical box. In the end, water leakage or electrical devices failure may occur.
- Means for disconnection from the supply mains, which have a contact separation in all poles that provide full disconnection under overvoltage category III conditions, must be incorporated in the fixed wiring in accordance with the wiring rules.
- The appliance shall be installed in accordance with national wiring regulations.
- The installation and service of this product shall be carried out by professional personnel, who have been trained and certified by national training organizations that are accredited to teach the relevant national competency standards that may be set in legislation.

## CAUTION

- Do not use any sprays such as insecticide, lacquer, hair spray or other flammable gases within approximately 1 meter from the system.
- If circuit breaker or fuse is often activated, stop the system and contact your service contractor.
- Do not put any foreign material (sticks, etc...) inside the units. These units have high speed rotating fans and it is dangerous when any object touches them.
- Do not let any foreign body into the water inlet and outlet unit.
- Refrigerant leakage can cause difficulty with breathing due to insufficient air.
- Installation and service engineering must comply with local standards, laws and regulations. The standards (British Standard, BS4434) may be applicable if local regulations are not available.
- This air to water heat pump has been designed for standard water heating for human beings only. Do not use this for other functions that are not included in the controller.
- Do not install the unit in the place where the breeze directly catches the animals and plants. It could adversely affect the animals and plants.
- Pay attention to the following points when the unit is installed in hospital or other facilities where there are strong electromagnetic waves from medical equipment.
  - Do not install the unit where the electromagnetic wave is directly radiated to the electrical box, wiring, controller and adapter.
  - At least 3 meters from strong electromagnetic wave radiators, such as radio equipment.
- If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
- Without reading the installation manual, do not carry out water piping connection and wiring connection.
- Check whether the earth wire connection is correct and firm.
- Connect to the fuse of specified capacity.
- The appliance is not to be used by children or person with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.

## NOTE

It is recommended to ventilate the room every 3 or 4 hours.

The air conditioner may not work properly in the following cases.

- The power supplied by the power transformer is less than or equal to the electric power of the air conditioner.
- The large power-consuming equipment is too close to the power supply wiring of the air conditioner, large surge voltage may be inducted in the power supply wiring of the air conditioner.

## 8.4.3 IMPORTANT NOTICE

### 8.4.3.1 INFORMATION

- **PLEASE READ THE MANUAL CAREFULLY BEFORE STARTING WORK ON THE INSTALLATION OF THE SYSTEM.** Failure to observe the instructions for installation, use and operation described in this documentation may result in operating failure including potentially serious faults, or even the destruction of the system.
- Verify, in accordance with the manuals which appear in the unit, that all the information required for the correct installation of the system is included. If this is not the case, contact your distributor.
- HISENSE cannot anticipate every possible circumstance that might involve a potential hazard.
- The operation modes of these units are controlled by the master controller.
- This unit has not been designed for industrial processes, and is used as heat pump limited to the scope of the controller. For use in other applications, please contact your HISENSE dealer or service contractor.
- Keep the water temperature of the system above the freezing temperature.
- Check and make sure that the explanations of each part of this manual correspond to your air to water heat pump model.
- Refer to the models codification to confirm the main characteristics of your system.

## DANGER

**Pressure Vessel and Safety Device:** This heat pump is equipped with a high pressure vessel under PED (Pressure Equipment Directive). The pressure vessel has been designed and tested before shipment according to PED. Also, in order to prevent the system from an abnormal pressure, a high pressure switch, which needs no field adjustment, is utilized in the refrigeration system. Therefore, this heat pump is protected from abnormal pressures. However, if abnormally high pressure is applied to the refrigeration cycle including the high pressure vessel(s), it will result in serious injury or death due to explosion of the pressure vessel. Do not apply a pressure higher than the following pressure to the system, by modifying or changing the high pressure switch.

## DANGER



Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

- The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).
- Do not pierce or burn.
- Be aware that the R32 refrigerants does not contain an odour.



**Start-up and Operation:** Check to ensure that all the stop valves are fully opened and no obstacle exists at the inlet/outlet sides before start-up and during the operation.

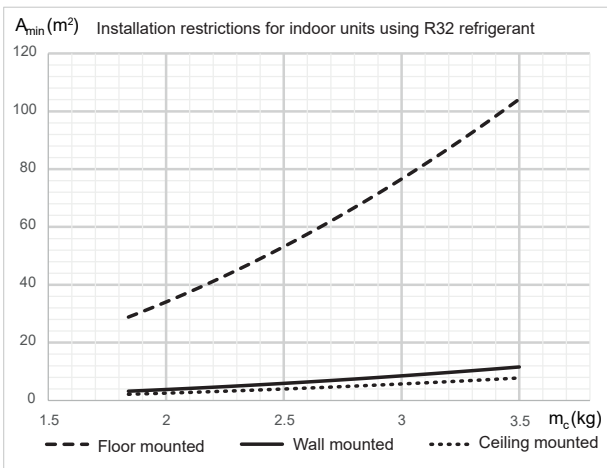
**Maintenance:** Periodically check the high pressure side pressure. If the pressure is higher than the maximum allowable pressure, stop the system and clean the heat exchanger or remove the cause.

**Maximum allowable pressure :** refer to nameplate.

8.4.3.2 MINIMUM FLOOR AREA REQUIREMENTS

- The following chart and table shows the minimum floor area ( $A_{min}$ ) required for the installation of an indoor unit from a refrigerant system containing a certain refrigerant charge ( $m_c$ ) of R32 (A2L refrigerant), and supposing a total room height not lower than 2.2 m. (According to IEC 60335-2-40:2018 and EN 378-1:2016).
- For  $m_c < 1.84$  kg, IEC 60335-2-40:2018 and EN 378-1:2016 do not establish any minimum floor area restriction. In that case check local regulations to ensure that no hard restrictions may apply.

Minimum floor area for equipment installed inside			
$m_c$ (kg)	$A_{min}$ (m <sup>2</sup> )	$A_{min}$ (m <sup>2</sup> )	$A_{min}$ (m <sup>2</sup> )
	Floor mounted	Wall mounted	Ceiling mounted
1.84	28.81	3.20	2.14
1.9	30.72	3.41	2.29
2.0	34.04	3.78	2.53
2.1	37.53	4.17	2.79
2.2	41.19	4.58	3.06
2.3	45.02	5.00	3.35
2.4	49.02	5.45	3.65
2.5	53.19	5.91	3.96
2.6	57.53	6.39	4.28
2.7	62.04	6.89	4.61
2.8	66.72	7.41	4.96
2.9	71.58	7.95	5.32
3.0	76.6	8.51	5.70
3.1	81.79	9.09	6.08
3.2	87.15	9.68	6.48
3.3	92.68	10.30	6.89
3.4	98.39	10.93	7.32
3.5	104.26	11.58	7.75



$$A_{min} = (m_c / (2.5 * LFL^{(5/4)} * h_0)^{1/2}) \quad (EQU.1)$$

- $A_{min}$ : Minimum installation area of an Indoor unit for a given refrigerant charge  $m_c$  (kg) and considering the installation height  $h_0$  (m<sup>2</sup>).
- $h_0$ : Installation height of the bottom side of the indoor unit + distance from the indoor unit bottom side to the lowest part for which a refrigerant leak may release to the indoor area.
- $m_c$ : total system refrigerant charge that could be released to the indoor area in case of undetected refrigerant leak.
- LFL: Lower Flammability Limit for R32, 0.307 kg/m<sup>3</sup> as established by EN 378-1: 2016 and ISO 817.
- The  $A_{min}$  in the table above is calculated according to the formula (EQU.1) under the following conditions:
  - Floor mounted:  $h_0 = 0.6$  m
  - Wall mounted:  $h_0 = 1.8$  m
  - Ceiling mounted:  $h_0 = 2.2$  m
- For safety, the  $A_{min}$  must be calculated according to the actual installation by professionals.

**CAUTION**

- Do not charge OXYGEN, ACETYLENE, or other flammable and poisonous gases into the refrigerant because an explosion can occur. It is recommended that oxygen free nitrogen be charged for these types of tests cycle when performing a leakage test or an air-tightness test. These types of gases are extremely dangerous.
- Check for refrigerant leakage in detail. If a large refrigerant leakage occurred, it would cause difficulty with breathing or harmful gases would occur if a fire were being used in the room.

**NOTE**

- Fill in the label attached to the unit with the amount of refrigerant charged and Tonnes of CO<sub>2</sub> equivalent of fluorinated greenhouse gases contained on the installation.

**NOTE**

- This equipment Contains fluorinated greenhouse gases.
- Refrigerant: R32 , global warming potential (GWP) value :675.
- Weight (kg) of Refrigerant charged before shipment: Reference to the nameplate [ ] ① kg.
- Weight (kg) of Refrigerant charged additionally on site: Reference to the manual [ ] ② kg.
- Weight (kg) of Refrigerant charged totally: ③=(①+②), [ ] kg.
- Tonnes of CO<sub>2</sub> equivalent of fluorinated greenhouse gases contained :③×675/1000, [ ] tCO<sub>2</sub>eq.

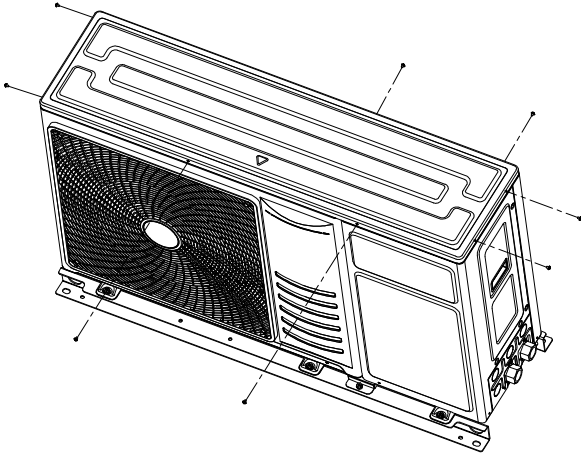
**DANGER**

- Only use R32 as refrigerant. Other substances may cause explosions and accidents.
- R32 is fluorinated greenhouse gases. Its global warming potential (GWP) value is 675. Do NOT vent these gases into the atmosphere.
- Tonnes of CO<sub>2</sub> equivalent of fluorinated greenhouse gases contained is calculated by GWP value of the refrigerant × Total refrigerant charge [kg] / 1000 in the label.
- Mass of charged refrigerant: refer to chapter 8.3.8.1.

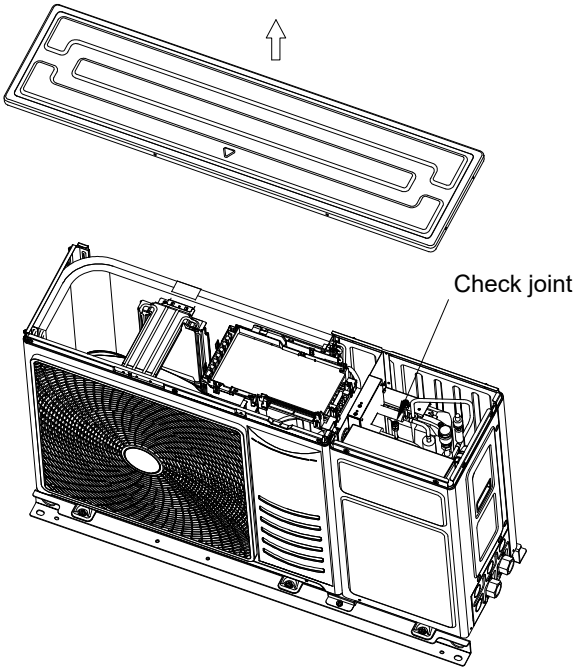
8.4.3.3 CAUTION OF THE PRESSURE BY CHECK JOINT

When the pressure is measured, use the check joint inside the unit, as shown below.

Step1: Remove the screws(8 pc) around the top cover.



Step2: Remove the top cover.



Step3: Connect the pressure gauge to the check joint according to the following table because of high pressure side and low pressure side changes by operation mode.

Check joint:

Cooling operation	Heating operation
Low pressure	High pressure

**i** NOTE

Be careful that refrigerant and oil do not splash to the electrical parts at removing the charge hoses.

8.4.4 TRANSPORTATION AND HANDLING

8.4.4.1 TRANSPORTATION

Transport the product as close to the installation location as possible before unpacking.

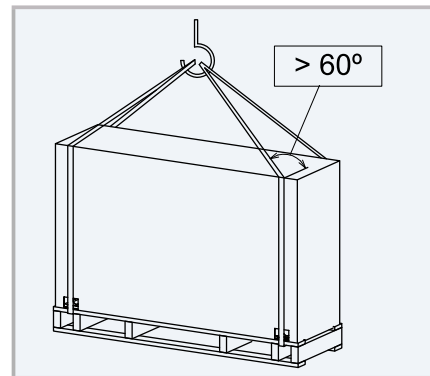
**!** CAUTION

- Do not step on or put any materials on the product.
- Apply two lifting wires onto the unit when lifting it by crane.

8.4.4.2 HANDLING

**!** CAUTION

- Do not step on or put any materials on the product.
- Do not put any foreign material into the unit and check to ensure that none exists in the unit before the installation and test run. Otherwise, a fire or failure, etc. may occur.
- When hanging the unit, ensure a balance of the unit, check safety and lift it up smoothly.
- Do not remove any packing materials.
- Hang the unit under packing condition with two ropes.
- For safety reasons ensure that the unit is lifted smoothly and does not lean.
- Two or more personnel should be used to move the unit.



8.4.5 BEFORE OPERATION

**CAUTION**

- When the system is started after a shut-off longer that approximately 3 months, it is recommended to check the system by your service contractor.
- Turn OFF the main switch when the system is to be stopped for a long period of time: If the main switch is not turned OFF, electricity will be used, because the oil heater is always energised during compressor stopping.
- Make sure that the unit is not covered with snow or ice. If covered, remove it by using hot water (approximately 50°C). If the water temperature is higher than 50°C, it will cause damage to plastic parts.

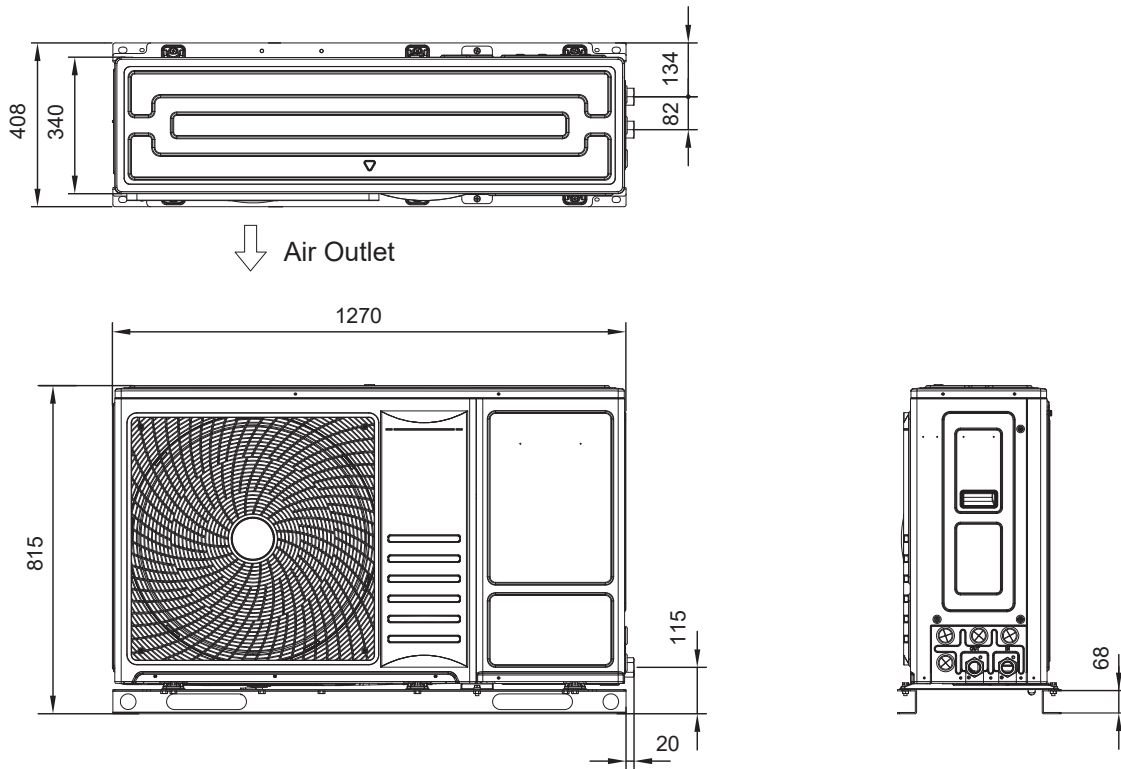
**NOTE**

- The accessories shown in the table are supplied inside the unit.
- If any of these accessories are not packed with the unit or any damage to the unit is detected, please contact your dealer.

Accessory	Image	Qty.	Remarks
Instruction manual		1	Basic instructions for the installation of the device.
Rubber ring		4	For electrical wiring connection.
Shut-off valve (G1")		1	Connect at the water outlet , for connecting/ disconnecting water pipe.
Shut-off valve with filter (G1")		1	Connect at the water inlet, for connecting/ disconnecting water pipe, and filtering impurities in water.
Drain nozzle		2	For water discharge when necessary.
Gasket		6	Six gaskets for each connections between the unit and shut-off valves (inlet/outlet)
Controller		1	Used for device operation.

8.4.6 GENERAL DIMENSIONS

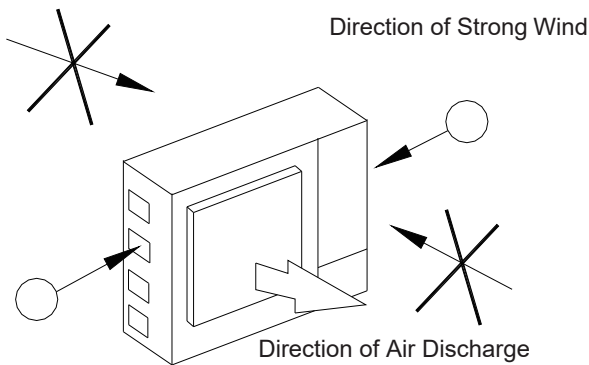
(Units: mm)



8.4.7 UNIT INSTALLATION

**CAUTION**

- Transport the products as close to the installation location as possible before unpacking.
- Do not put any material on the products.
- When installing more than one units together, keep clearance between the units of more than 500 mm, and avoid obstacles that should hamper air intake.
- Install the unit in the shade or not exposed to direct sunshine or direct radiation from high temperature heat source.
- Make sure that the foundation is flat and sufficiently strong.
- This unit has aluminum fin with sharp edges. Pay attention to the fin to avoid injury. Install the unit in a restricted area not accessible by the general public.
- When installing the unit in snow-covered areas, mount the field-supplied hoods at the discharge side of the unit and the inlet side of the heat exchanger.
- Do not install the unit in a space where a seasonal wind directly blows to the heat exchanger or a wind from a building space directly blows to the fan.

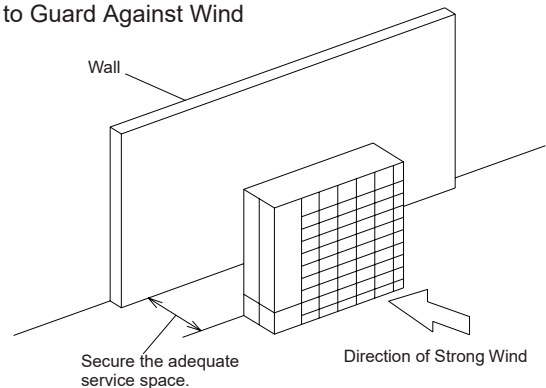


- In case of installation in the open spaces unavoidably where there is no buildings or surrounding structures, install near the wall to avoid facing the wind directly. Ensure that the service space should be secured.

**DANGER**

- Install the unit with sufficient clearance around it for operation and maintenance as shown in the next figures. Install the unit where good ventilation is available.
- Do not install the unit where there is a high level of oil mist, salty air or sulphurous atmosphere.
- Install the unit as far as possible (being at least 3 meters) from electromagnetic wave radiator (such as medical equipment).
- For cleaning, use nonflammable and nontoxic cleaning liquid. Use of inflammable agent should cause explosion or fire.
- Work with sufficient ventilation, for working in an enclosed space should cause oxygen deficiency. Toxic gas should be produced when cleaning agent is heated to high temperature by e.g., being exposed to fire.
- Install the unit in a location where noise emitted by the unit does not disturb neighbours.
- Cleaning liquid shall be collected after cleaning.
- Pay attention not to clamp cables when attaching the service cover to avoid electric shock or fire

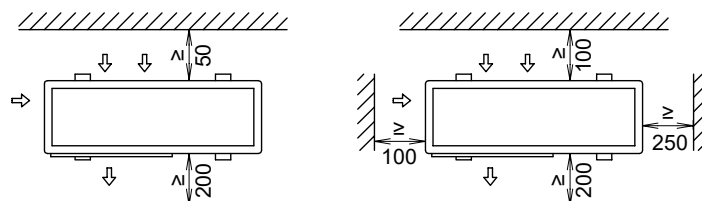
A Wall to Guard Against Wind

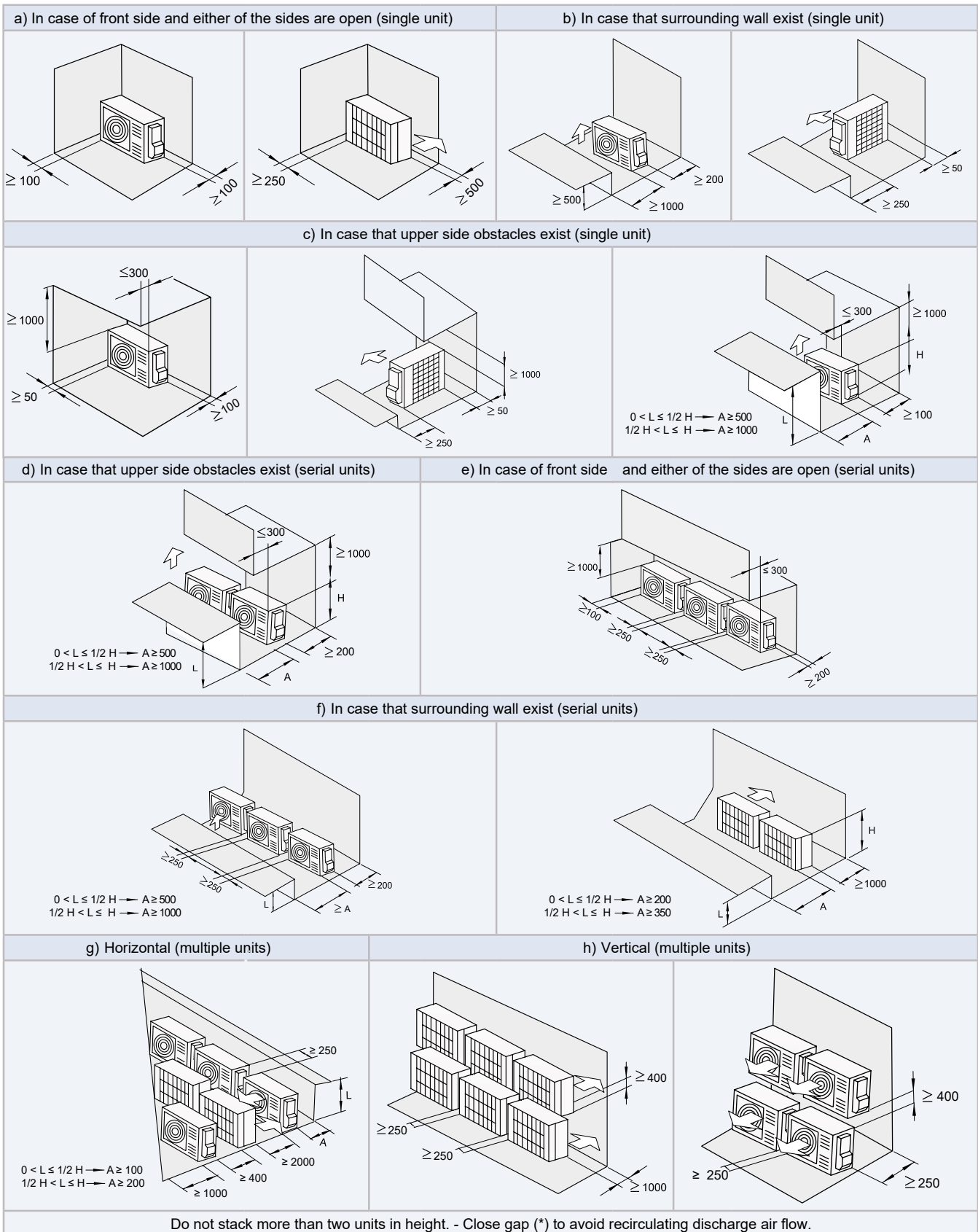


NOTE:  
If the extreme strong wind blows directly against the air discharge portion, the fan may rotate reversely and be damaged.

8.4.7.1 INSTALLATION SPACE

(Units: mm)





**i** NOTE

- If L is greater than H, install the outdoor unit on the foundation, so that H is greater than or equal to L. H: Outdoor unit height + foundation height.
- Do not stack more than two units in height.
- In all cases, short circuit of air flow is not allowed.

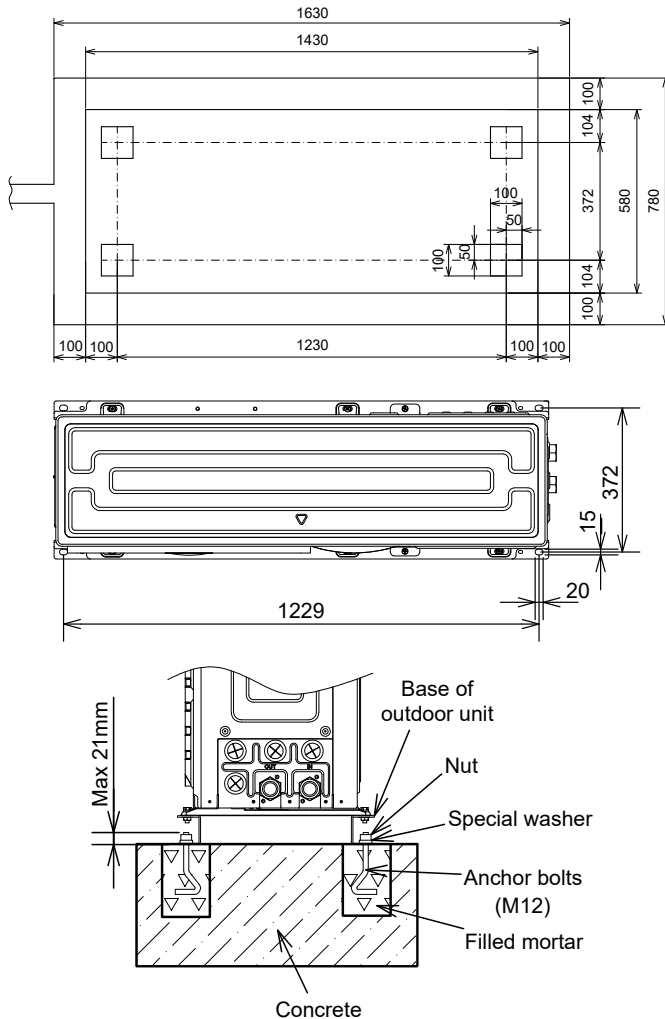


## 8.4.7.2 INSTALLATION PLACE PROVISION

### ◆ Concrete foundation

- Foundation shall be on a level surface and it is recommended to be 100-300 mm higher than ground level.
- Use M12 anchor bolts to fix the unit to the foundation (Foundation bolts, nuts and washers are not included, and must be field supplied)
- Drain water might turn into ice on cold weather areas. Therefore, when installing the unit on a roof or a veranda, avoid the draining on a public area since it may become slippery.

(Unit: mm)



- The unit is low-vibration model, but consider using some floor reinforcement or anti-vibration mat/rubber when vibration should occur due to weakness of attached surface.
- The foundation shall be unified with the floor slab in order to ensure strength against a fall or for when the unit has to be moved.
- Drain water and rainwater are discharged from the bottom of the unit when in operation as well as when stopped.
- Choose a location with good drainage or place a water drain as shown in the drawing.
- Make the foundation flat and waterproof, as a water leakage may appear in case of, for instance, rain.

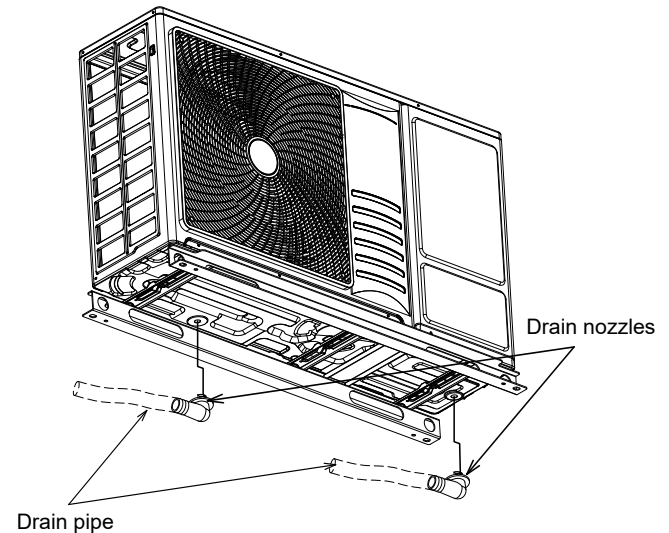
### ⚠ CAUTION

Pay attention to the following for installation:

- Installation shall ensure that unit will not incline, vibrate, make noise or fall down by a blast of wind or in an earthquake. Calculate quake-resistance strength to ensure that installation is strong enough against falling. Fix the unit with wires (field-supplied) when installing in a location without walls or windbreak and likely exposed to a blast of wind.
- Apply vibration-proof material where necessary.
- To prevent unit damage or personal injury caused by electric leakage in case of rainstorm and flood, the minimum installation height of the outdoor unit should be more than 100mm above the possible maximum accumulated water height.

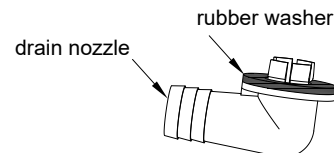
### 8.4.7.3 DRAIN PIPING

When the base of the unit is temporarily utilized as a drain receiver and the drain water in it is discharged, two drain nozzles are needed to install on the bottom of the machine refer to the figure below. If necessary, link a separate drain pipe for each drain nozzle.



### i NOTE

- The drain nozzles are factory-supplied.



- The drain pipes (inner diameter:15mm) should be field-supplied.
- Do not use this drain nozzle set in a cold area, because the drain water may freeze.
- This drain boss is not sufficient to collect all the drain water. If collecting drain water is completely required, provide a drain-pan that is bigger than the unit base and install it under the unit with drainage.

8.4.7.4 WATER PIPING

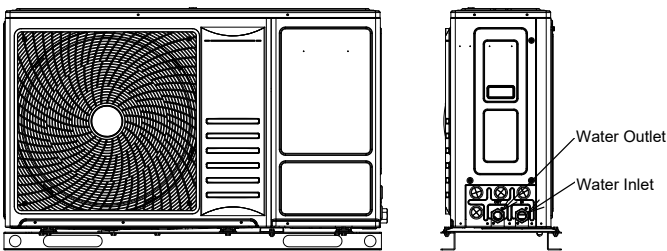
8.3.7.4.1 GENERAL NOTES BEFORE PERFORMING PIPING WORK

- It is advisable to insulate the water pipes, joints and connections in order to avoid heat loss and dew condensation on the surface of the pipes or accidental injuries due to excessive heat on piping surfaces.
- It is recommended to use flexible joints for the water piping inlet and outlet in order to avoid vibration transmission.
- Water circuit must be performed and inspected by a licensed technician and must comply with all relevant European and national regulations.
- Proper water pipe inspection should be performed after piping work to assure there is no water leakage in the space heating circuit.

8.3.7.4.2 WATER PIPING CONNECTION

(1) Piping location and connection size

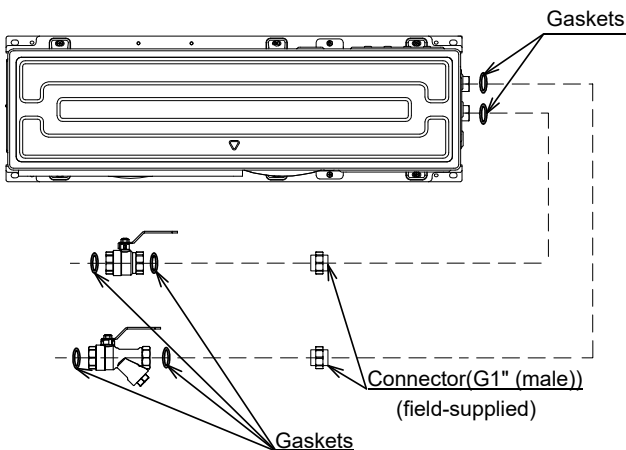
The unit is factory supplied with two unions to be connected to the water inlet/outlet pipe. Refer to the figure detailing the location of the water pipes location and connection sizes.



Description	Connection size
Water Inlet	G1" (female)
Water Outlet	G1" (female)

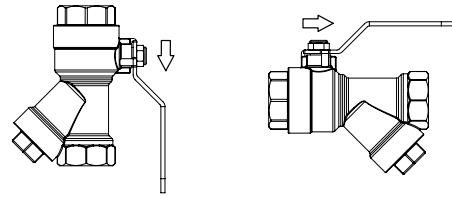
(2) Install shut-off valves

A shut-off valve and a shut-off valve with filter are provided with the unit. For convenience of repair and maintenance, install the shut-off valve with filter on water inlet pipe and the shut-off valve on water outlet pipe of the unit as follow.



**i** NOTE

The shut-off valve with filter must be installed at water inlet of the unit, and water flow direction and installation direction must be confirmed as follow. The gasket in accessories can be installed at the two connections of shut-off valve and shut-off valve with filter.



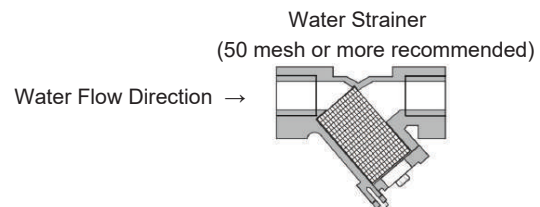
**!** CAUTION

- Rubber gasket must be mounted (accompanied with the unit), otherwise water leakage may be caused.
- Note the location of ball valve, and the direction of ball valve and drain valve, which are essential to maintenance.
- Do NOT use excessive force when connecting the field piping and make sure the piping is aligned properly.
- Deformation of the piping can cause malfunctioning of the unit.
- Screw up ball valves and other pipeline connections by using two wrenches.

(3) Additional water strainer

**!** CAUTION

- Provide a 50 mesh or more water strainer at the water inlet side of water piping. Otherwise, damage to the plate heat exchanger may occur. In the plate heat exchanger, water flows through a narrow space between the plates. Therefore, there is a possibility that freezing or corrosion may occur if foreign particles or dust clog the flow of water between the plates.
- This is not required when cooling mode is not used.



- The water piping connection needs to be completed after flushing the water system

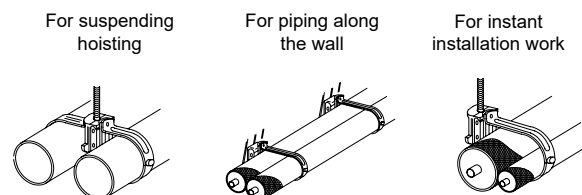
8.3.7.4.3 SUSPENSION OF WATER PIPING

Suspend the water piping at certain points and prevent the water piping from being in direct contact with the building: walls, ceilings, etc...

If there is direct contact between pipes, abnormal sound may occur due to the vibration of the piping. Pay special attention in cases of short piping lengths.

Do not fix the water pipes directly with the metal fittings (piping may expand and contract).

Some examples for suspension method are shown below.





8.4.8 REFRIGERANT CIRCUIT

8.4.8.1 REFRIGERANT CHARGE

This appliance is filled with R32, an odourless flammable refrigerant gas with low burning velocity (A2L class pursuant to ISO 817), and is factory charged in the unit.

Refrigerant charge before shipment ( W0 (kg) )

Model	W0 (kg)
044(2.0HP)	1.17
080(3.0HP)	1.21

8.4.8.2 PRECAUTIONS IN THE EVENT OF REFRIGERANT LEAKS

If the refrigerant is leaked, there is a possibility of ignition if it is in contact with an external ignition source.

Make sure that unit installation comply with applicable legislation in each country.

The installers and those responsible for drafting the specifications are obliged to comply with local safety codes and regulations in the case of refrigerant leakage.

**CAUTION**

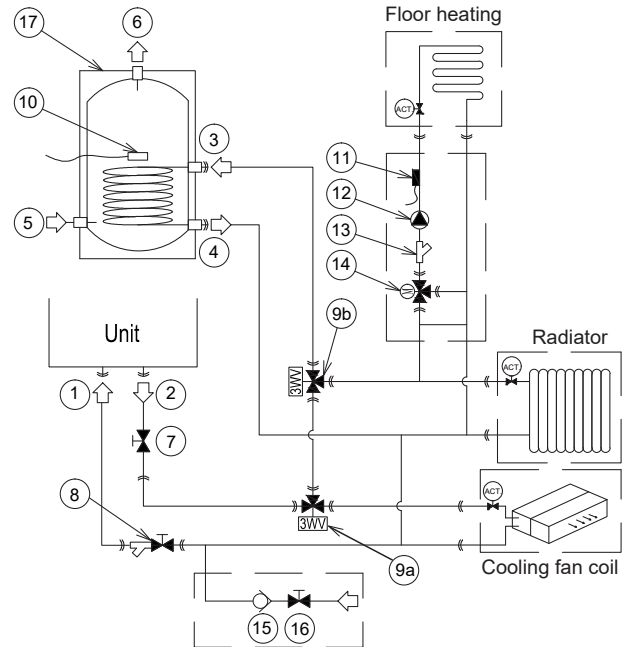
- Do not charge OXYGEN, ACETYLENE, or other flammable and poisonous gases into the refrigerant because an explosion can occur. It is recommended that oxygen free nitrogen be charged for these types of tests cycle when performing a leakage test or an airtightness test. These types of gases are extremely dangerous.
- Insulate the unions and flare-nuts at the piping connection part completely
- Insulate the piping completely, if not, it will cause a decrease of performance or sweating on the surface of the pipe.
- Charge refrigerant correctly. Overcharging or insufficient charging could cause a compressor failure.
- Check for refrigerant leakage in detail. If a large refrigerant leakage occurred, it would cause difficulty with breathing or harmful gases would occur if a fire was being used in the room.

8.4.9 SPACE HEATING AND DHW

8.4.9.1 ADDITIONAL HYDRAULIC NECESSARY ELEMENTS

**DANGER**

Do not connect the power supply to the unit prior to filling the space heating circuit (and DHW circuit if it were the case) with water and checking water pressure and the total absence of any water leakage.



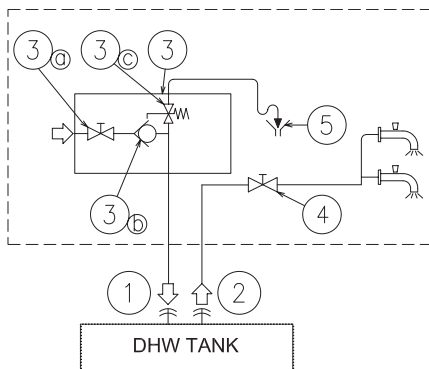
Nature	No.	Part name
Piping connections	1	Water inlet of the unit
	2	Water outlet of the unit
	3	DHW tank inner coil inlet
	4	DHW tank inner coil outlet
	5	Water inlet (DHW)
	6	Water outlet (DHW)
Factory supplied	7	Shut-off valve
	8	Shut-off valve with filter
Optional accessories	9	9a 3WV Cooling
		9b 3WV DHW
	10	Thermistor ( for DHW)
Field supplied	11	Thermistor ( for Space heating)
	12	Water pump
	13	Filter
	14	Mixing valve
	15	Check valve
	16	Shut-off valve
	17	Domestic hot water tank

As an installation example of space heating / cooling and Domestic hot water (DHW), the following hydraulic elements are necessary to correctly perform the space heating / cooling and DHW water circuit:

- The factory supplied shut-off valve (7) need to be installed at water outlet of the unit, and shut-off valve with filter (8) need to be installed horizontally at water inlet of the unit.

- A water check valve (15) with a shut-off valve (16) must be connected to the water filling point when filling the water circuit. The check valve acts as a safety device to protect the installation.
- A domestic hot water tank (17) has to be installed in combination with the space heating / cooling.
- 3-way valves (9) must be connected at one point of the water outlet pipe of the installation, used to divert the water circulation for specific functions. As shown in example, connect straight through of 3-way valve to DHW tank inner coil.
- DHW thermistor (10) must be installed to reach the inner wall of the DHW tank and keep in good contact with it. Space heating thermistor (10) must be installed on the metal tube close to space heating, and keep in good contact with it.
- Mixing valve (14) is recommended to use ESBE ARA661, which operation mode is 3-point SPDT. If mixing valve of other brands or models are used, the operation mode must be 3-point SPDT, and power supply must be 220-240V ~ 50Hz. The rotation time can be set in the master controller.

Additionally, the following elements are required for the DHW circuit:



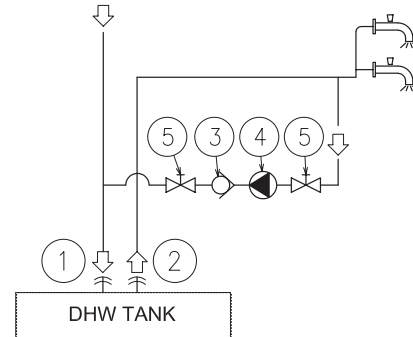
Nature	No.	Part name	
Piping connections	1	Supplementary water inlet of DHW tank	
	2	DHW tank outlet	
Field supplied	3	Pressure and temperature relief valve	
		3a	Shut-off valve
		3b	Water check valve
	3c	Safety valve	
	4	Shut-off valve	
5	Draining		

- A Shut-off valve (field supplied):  
The shut-off valve (4) must be connected after the DHW tank outlet (2) in order to make easier any maintenance work.
- A Security water valve (Field-supplied):  
This accessory (3) is a pressure and temperature relief valve that must be installed as near as possible to the Supplementary water inlet of DHW tank (1). It should ensure a correct draining (5) for the discharge valve of this valve. This security water valve should provide the following:
  - Pressure protection
  - Non-return function
  - Shut-off valve
  - Filling
  - Draining

**i NOTE**

The discharge pipe should always be open to the atmosphere, free of frost and in continuous slope to the down side in case that water leakage exists.

In case of a recirculation circuit for the DHW circuit, the following elements are required:



Nature	No.	Part name
Piping connections	1	Supplementary water inlet of DHW tank
	2	DHW tank outlet
Field supplied	3	Water check valve
	4	Water pump
	5	Shut-off valve

- **A Recirculation water pump (field supplied):** This water pump (3) will help to correctly recirculate the hot water to the DHW inlet.
- **A Water check valve (field supplied):**  
This accessory (3) is connected after the recirculation water pump (4) in order to ensure the nonreturn of water.
- **Two Shut-off valves (field supplied) (5):**  
One before the recirculation water pump (4) and other after the water check valve accessory (3).

**! CAUTION**

The water check valve shall be confirmed installed in the correct direction. Otherwise, serious damages may occur in the DHW tank.

8.4.9.2 REQUIREMENTS AND RECOMMENDATIONS FOR HYDRAULIC CIRCUIT

8.3.9.2.1 REQUIREMENTS FOR ANTI-FREEZING

- When the unit is stopped during shut-off periods and the ambient temperature is very low, the water inside the pipes and the circulating pump may freeze, thus damaging the pipes and the water pump. In these cases, the installer shall ensure that the water temperature inside the pipes does not fall below the freezing point. In order to prevent this, the unit has a self-protection mechanism which should be activated (refer to “10.6.1 DIP Switch Setting of PCB1”).
- Even if the unit is stopped, the water pump may run under some circumstances, i.e, when the anti-freezing function is triggered.
- Keep the unit power on and water system unblocked to prevent water freezing, otherwise an alarm may occur.
- If the water system is blocked, an alarm of water flow will occur to stop the whole system.
- If machine is stopped for a long period of time in winter, drain out water in circuit and water pipes to prevent freezing.
- The anti-freezing protection is effective better with Auxiliary electric heater connected. It is advisable to install the Auxiliary electric heater for those models in which these are not supplied but optional.
- However, in case of a power failure or unit failure, these functions cannot guarantee protection.

**Do one of the following to protect the water circuit against freezing:**

- Add glycol to the water.  
Glycol lowers the freezing point of the water.
- Install freeze protection valves.  
Freeze protection valves drain the water from the system before it can freeze.

**1 Freeze protection by glycol**

**About freeze protection by glycol**

Adding glycol to the water lowers the freezing point of water.

**CAUTION**

- Ethylene glycol is toxic.
- Due to the presence of glycol, corrosion of the system is possible. Uninhibited glycol will turn acidic under the influence of oxygen. This process is accelerated by the presence of copper and high temperatures. The acidic uninhibited glycol attacks metal surfaces and forms galvanic corrosion cells that cause severe damage to the system. Therefore it is important that:
  - The water treatment is correctly executed by a qualified water specialist,
  - A glycol with corrosion inhibitors is selected to counteract acids formed by the oxidation of glycols,
  - No automotive glycol is used because their corrosion inhibitors have a limited lifetime and contain silicates which can foul or plug the system.
  - Galvanized pipes are NOT used in glycol systems since the presence may lead to the precipitation of certain components in the glycol's corrosion inhibitor.

**NOTE**

Glycol absorbs water from its environment. Therefore do NOT add glycol that has been exposed to air. Leaving the cap off the glycol container causes the concentration of water to increase. The glycol concentration is then lower than assumed. As a result, the hydraulic components might freeze up after all. Take preventive actions to ensure a minimal exposure of the glycol to air.

• **Types of glycol**

The types of glycol that can be used depend on whether the system contains a domestic hot water tank:

If...	Then...
The system contains a domestic hot water tank	Only use propylene glycol <sup>(a)</sup>
The system does NOT contain a domestic hot water tank	You can use either propylene glycol(a) or ethylene glycol

<sup>(a)</sup> Propylene glycol, including the necessary inhibitors, classified as Category III according to EN1717.

• **Required concentration of glycol**

The required concentration of glycol depends on the lowest expected outdoor temperature, and on whether you want to protect the system from bursting or from freezing. To prevent the system from freezing, more glycol is required.

Add glycol according to the table below.

Lowest expected outdoor temperature	Prevent from bursting	Prevent from freezing
-5°C	10%	15%
-10°C	15%	25%
-15°C	20%	35%
-20°C	25%	—
-25°C	30%	—
-30°C	35%	—

1) Protection against bursting: the glycol will prevent the piping from bursting, but NOT the liquid inside the piping from freezing.

2) Protection against freezing: the glycol will prevent the liquid inside the piping from freezing.

**NOTE**

- The required concentration might differ depending on the type of glycol. ALWAYS compare the requirements from the table above with the specifications provided by the glycol manufacturer. If necessary, meet the requirements set by the glycol manufacturer.
- The added concentration of glycol should NEVER exceed 35%. It is advisable to use a mixture with antifreeze glycol (ethylene or propylene at a concentration between 10% and 30%).
- If glycol is added to the water, do NOT install freeze protection valves. Possible consequence: Glycol leaking out of the freeze protection valves.
- If the concentration ratio of glycol can ensure the normal operation of the unit (the solution freezing temperature is lower than the ambient temperature -5°C), cancel Anti-freezing function (refer to “10.6.1 DIP Switch Setting of PCB1”) to reduce the energy consumption.
- Unit performance may be reduced when operating with glycol, depending on the percentage of glycol used, since glycol is denser than water.

## 2 Freeze protection by freeze protection valves

### About freeze protection by glycol

When no glycol is added to the water, you can use freeze protection valves to drain the water from the system before it can freeze.

- Install freeze protection valves (field supply) at all lowest points of the field piping.
- Normally closed valves (located indoors near the piping entry/exit points) can prevent that all water from indoor piping is drained when the freeze protection valves open.

### **i** NOTE

When freeze protection valves are installed, set the minimum cooling setpoint (default =7°C) at least 3°C higher than the maximum opening temperature of the freeze protection valve. If lower, freeze protection valves can open during cooling operation.

#### 8.3.9.2.2 MINIMUM REQUIRED WATER VOLUME

The following part shows the minimum water volume in the system for product protection (anti-hunting) and temperature drop at defrosting.

- Minimum required water volume in each single water circuit of DHW / SWP for product protection (anti-hunting).  
Water volume in each single water circuit of DHW / SWP need be greater than 20L.
- Minimum required water volume in single water circuit of space cooling for product protection (anti-hunting).  
The following table shows the minimum water volume needed in single water circuit of space cooling.

Model	044(2.0HP)	080(3.0HP)
Minimum required water volume	30L	45L

- Minimum required water volume during defrosting.  
The following table shows the minimum water volume needed in single water circuit of space heating in case of safe defrosting.

Lowest possible operation water temperature in single water circuit of space heating	044(2.0HP)	080(3.0HP)
≥25°C	61L	61L
20-25°C	99L	99L
15-20°C	158L	158L
10-15°C	198L	198L

### **i** NOTE

- The values shown on the table are based on theoretical installation conditions. And the value can be different depending on each specific installation.
- To calculate minimum water volume the internal water volume of the unit is NOT included.
- Consult with local technical engineer under the special occasions where operation water temperature in single water circuit of space heating is lower than 20°C.

#### 8.3.9.2.3 MINIMUM REQUIRED WATER FLOW

Check that the water pump of the water circuit works within the pump operating range and that the water flow is over the unit minimum value.

Model	min. water flow(L/min)
044(2.0HP)	8.3
080(3.0HP)	10.0

#### 8.3.9.2.4 REQUIREMENTS AND RECOMMENDATIONS FOR HYDRAULIC CIRCUIT

- An additional special water filter is highly recommended to be installed on the space heating (field installation), in order to remove possible particles remaining from brazing which cannot be removed by the field supplied shut-off valve with filter.
- Put insulation on the pipes in order to avoid heat losses.
- Whenever possible, sluice valves should be installed for water piping, in order to minimize flow resistance and to maintain sufficient water flow.
- Ensure that the installation complies with applicable legislation in terms of piping connection and materials, hygienic measures, testing and the possible required use of some specific components like thermostatic mixing valves.
- The maximum water pressure is 3 bar (nominal opening pressure of the safety valve). Provide adequate reduction pressure device in the water circuit to ensure that the maximum pressure is NOT exceeded.
- The water pressure can be read on master controller, detected by the water pressure sensor located at inlet of plate heat exchanger. If water pressure exceeded 3 bar, the water pressure displayed on master controller would flash.
- Ensure that the drain pipes connected to the safety valve and to the air purge valve are properly driven to avoid water being in contact with unit components.
- Make sure that all field supplied components installed in the piping circuit can withstand the water pressure and the water temperature range in which the unit can operate. The units are conceived for exclusive use in a closed water circulation.
- The internal air pressure of the expansion vessel will be adapted to the water volume of the final installation (factory supplied with 1 bar of internal air pressure).
- Drain taps must be provided at all low points of the installation to permit complete drainage of the circuit during servicing.
- The maximum piping length depends on the maximum pressure availability in the water outlet pipe. Please check the pump curves.
- The unit is equipped with an air purge valve (factory supplied) at the highest location of the unit. If this location is not the highest of the water installation, air might be trapped inside the water pipes, which could cause system malfunction. In that case additional air purge valves (field supplied) should be installed to ensure no air enters the water circuit.
- For heating floor system, the air should be purged by mean of an external pump and an open circuit to avoid air bags.

8.4.9.3 WATER FILLING

- (1) Check that a water check valve (field supplied) with a shutoff valve (field supplied) is connected to the water filling point (water inlet connection) for filling the hydraulic circuit (see “8.3.9.1 Additional hydraulic necessary elements”).
- (2) Make sure all the valves are open (water inlet/outlet shut-off valves and the rest of valves of the water circuit installation components).
- (3) Ensure that the air purge valve of the unit is open when installation (turn the screw cap of air purge valve twice at least).
- (4) Check that the drain pipes connected to the safety valve (keep the outlet of drain pipes located in the drain pan) are correctly connected to the general draining system. The safety valve is later used as an air purging device during the water filling procedure.
- (5) Fill the water circuit with water until the pressure displayed on the controller reaches  $2.0 \pm 0.2$  bar. During all the operation conditions, the normal pressure range of water circuit is 1 ~ 2.5 bar.

**i** NOTE

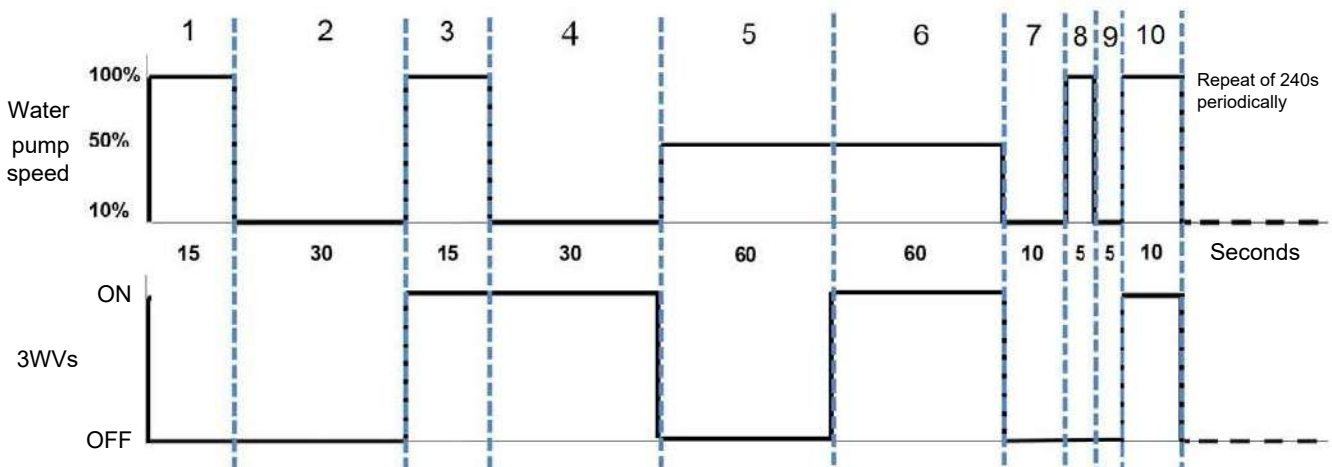
While the system is being filled with water, it is highly recommended to operate the safety valve manually so as to help with the air purging procedure.

- (6) Remove as much air from inside the water circuit as possible through the air purge valve and other air vents in the installation (fan coils, radiators...).
- (7) There are two methods to start the air purge procedure:
  - a. Using the master controller to start air purge. (Refer to the master controller manual)
  - b. Using DSW4-1 of the PCB1:  
 DSW4-1 ON: Start air purge  
 DSW4-1 OFF: Stop air purge

- (8) If a little quantity of air is still remaining in the water circuit, it will be removed by the automatic air purge valve of the unit during the first hours of operation. Once the air in the installation has been removed, a reduction of water pressure in the circuit is very likely to occur. Therefore, additional water should be filled by booster pump until water pressure returns to approximate 2.0 bar.

**i** NOTE

- The unit is equipped with an automatic air purge valve (factory supplied) at the highest location of the unit. Anyway, if there are higher points in the water installation, air might be trapped inside water pipes, which could cause system malfunction. In that case, additional air purge valves (field supplied) should be installed to ensure no air enters into the water circuit. The air purge valve should be located at points which are easily accessible for servicing.
- The water pressure indicated on the master controller may vary depending on the water temperature (the higher temperature, the higher pressure). Nevertheless, it must remain above 1 bar in order to prevent air from entering the circuit.
- Fill in the circuit with tap water. The water in the heating installation must comply with EN directive 98/83 EC. Non-sanitary controlled water is not recommended (for example, water from wells, rivers, lakes, etc.) .
- The maximum water pressure is 3 bar (nominal opening pressure of the safety valve). Provide adequate reduction pressure device in the water circuit to ensure that the maximum pressure is NOT exceeded.
- For heating floor system, air should be purged by means of an external pump and an open circuit to prevent the formation of air pockets.
- Check carefully for leaks in the water circuit, connections and circuit elements.
- During water filling, it is necessary to ensure that water enters the unit from the water inlet to ensure that all water passes through the shut-off valve with filter to filter impurities, otherwise it may block the components inside the unit.



**i** NOTE

- The unit will stop for at least 6 min before starting next air purge cycle.



(9) Check Water Volume:

- The unit has a built-in 8L expansion vessel, and default initial pressure is 1 bar. To ensure the unit works normally, the initial pressure of expansion vessel should be adjusted according to the circulated water volume.
- Use water volume checklist below to decide whether initial pressure of expansion vessel needs to be adjusted.
- Use water volume checklist to confirm the total volume of water in installation system is below the allowed maximum water volume.
- Installation height difference: height difference between highest point of water circulation and the unit. If the unit is mounted at the highest point, above all water pipes, the installation height is deemed to be 0 m.
- Calculate initial pressure of expansion vessel. Decide initial pressure (Pg) according to the maximum installation height difference (H), seen below:

$$P_g = H/10 + 0.3$$

Unit: H (m), P<sub>g</sub> (bar)

- The process of calculating allowed maximum water volume in whole circulation is:
  - Calculate maximum water volume corresponding to initial pressure P<sub>g</sub> by using maximum water volume curve as shown below.
  - Confirm the total maximum water volume in water circulation is smaller than above value. Otherwise, the expansion vessel in the unit is smaller for system.

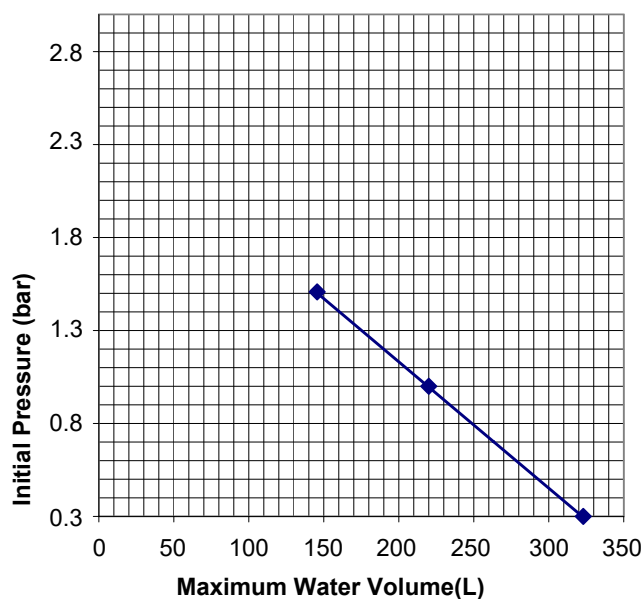
**i** NOTE

- 0.3 bar is the minimum initial pressure and 1.5 bar is the maximum initial pressure of expansion vessel set outside the factory.
- When initial pressure in expansion vessel is set as 0.3 bar at minimum, the water quantity required by system is higher than the limit value, it may be considered replacing expansion vessel with bigger volume.

**Water Volume Checklist**

	Installation height difference (a)	Water Volume	
		≤220L	>220L
Safety Valve (3 bar)	≤7m	No need to adjust initial pressure of expansion vessel	Things need to do : Must reduce initial pressure. Calculate it based on the section "Check water volume". Ensure water volume is lower than allowed maximum water volume (using the figures below).
	>7m	Things need to do : Must increase initial pressure. Calculate it based on the section "Check water volume". Ensure water volume is lower than allowed maximum water volume (using the figures below).	The expansion vessel is too small to install. (It needs proper expansion vessel or use safety valve with high activated pressure that is supplied from local place)

**Maximum Water Volume Curve Graph**



8.4.9.4 DHW TANK SELECTION AND INSTALLATION

**i** NOTE

- This DHW tank is designed for heat pump type heating system. DHW shall be selected according to the requirements in this instruction and on-site use requirements.
- If the selection, installation and wiring are not carried out according to the requirements in this instruction, we would not be responsible for the problems caused by the DHW tank.
- Hot water may cause serious burns. Test water temperature with hands. Use after the water is mixed till proper temperature.
- Connecting of water pipe with tap water pipe should be operated by qualified staff using proper piping material according to local regulations and standards.
- When the high domestic hot water temperature can be a potential risk for human injuries, a mixing valve (field supplied) shall be installed at the hot water outlet connection of the DHW tank. This mixing valve shall secure that the hot water temperature at the hot water tap never rise above a set maximum value. This maximum allowable hot water temperature shall be selected according to the applicable legislation.

8.3.9.4.1 DHW TANK SELECTION

When selecting a tank for DHW operation, take into consideration the following points:

- The volume of the tank has to meet with the daily consumption in order to avoid stagnation of water.
- Fresh water must circulate inside the DHW tank water circuit in order to avoid stagnation of water.
- Fresh water must circulate inside the DHW tank water circuit at least one time per day during the first days after the installation has been performed. Additionally, flush the system with fresh water when there is no consumption of DHW during long periods of time.
- Try to avoid long runs of water piping between the tank and the DHW installation in order to decrease possible temperature losses.
- If the domestic cold water entry pressure is higher than the equipment's design pressure, a adequate pressure reducer must be installed to ensure that the maximum pressure is NOT exceeded.

**1 Storage capacity**

The storage capacity of the DHW tank depends on the daily water demand and the combination method. The daily water demand is estimated with the following calculation formula for consumption:

$$D_i(T) = D_i(60^\circ\text{C}) \times (60 - T_i / T - T_i)$$

Where:

$D_i(T)$ : Water demand at T temperature

$D_i(60^\circ\text{C})$ : Domestic hot water demand at 60 °C

T: Temperature of the DHW tank

$T_i$ : Temperature of the inlet cold water

- Calculation of  $D_i(60^\circ\text{C})$ :

The standard consumption, expressed in daily litres per person and determined by technical installation regulations of each country, is used to calculate the domestic hot water demand at 60 °C,  $D_i(60^\circ\text{C})$ . This quantity is then multiplied by the expected number of users of the installation. In the

following example, the domestic hot water demand at 60°C has been considered as 30 litres per person, in a detached house with 4 residents.

- Calculation of T:

The temperature of the DHW tank refers to the temperature of the accumulated water inside the tank, prior to operation. This temperature is usually between 45°C and 65°C. It has been considered as 45°C in this example.

- Calculation of  $T_i$ :

The temperature of the inlet cold water refers to the temperature of the water being supplied to the tank. Since this temperature is usually between 10°C and 15°C, it has been considered as 12°C in this example.

- Example:

$$D_i(T) = 30 \times 4 \times (60 - 12 / 45 - 12) = 174.5 \text{ litres/day}$$

$$174.5 \times 2(*) = 349 \text{ litres/day approximate demand of hot water}$$

**i** NOTE

(\*) *It is recommended to multiply the calculated consumption by two, in case that the installation is in a detached house. This is done to ensure a steady supply of hot water. In the case of a multifamily installation, it is not necessary to increase the forecast of hot water demand, given the lower simultaneity factor.*

**2 Coil Face Area**

The coil face area is a key parameter for DHW tank. To improve the heating efficiency, the coil face area should be adjusted according to the capacity.

The coil face area should be no less than the values listed in the table below.

Storage Capacity(L)	100	150	200	250	300
Coil Face Area(m <sup>2</sup> )	1.5	1.5	1.8	1.8	2.0

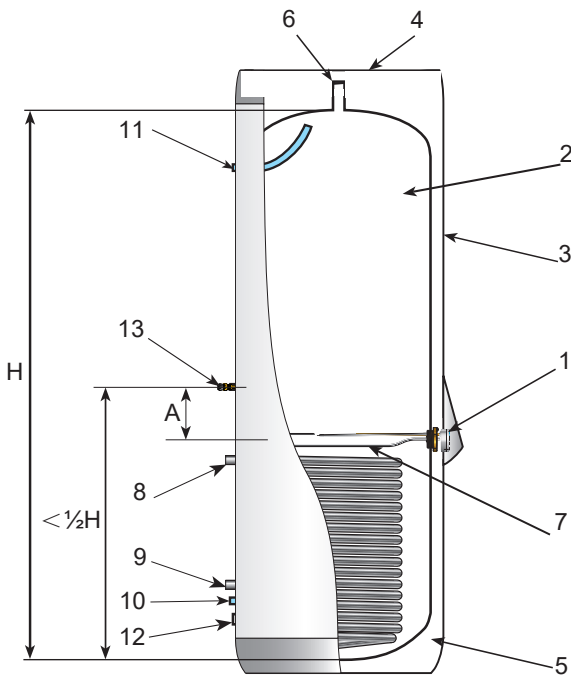
**i** NOTE

*Smaller coil face area will lead to worse heating efficiency. In that condition, the heat pump will start and stop frequently which causes more time and more power consumption to heat up the DHW tank.*



3 Structural Drawings

The typical structure of the DHW tank is shown as below (only for example):



Ref.	Name
1	Control panel
2	Storage tank
3	External covering
4	Top covering
5	Thermal insulation
6	Temperature pressure valve connection port
7	DHW electric heater
8	DHW tank inner coil inlet
9	DHW tank inner coil outlet
10	DHW tank water inlet
11	DHW tank water outlet
12	Drainage outlet
13	Thermistor for DHW

For different storage capacity, the structural design of the DHW tank may be different. The parameters of the typical structure shown in the left are recommended as follows:

Ref.	Recommended value(mm)*
A	Min.150

\* Please check and adjust according to the actual situation.

**i** NOTE

- (1) Thermistor for DHW
  - ① The DHW tank including the thermistor, the DHW electric heater and the DHW tank inner coil must be designed and installed in accordance with the local regulation.
  - ② The position of the thermistor is very important. The reasonable position will help to ensure the detection accuracy of the DHW temperature. It is related to the operation of the heat pump.
- (2) DHW electric heater
  - ① The electric heater is necessary to heat up the DHW tank in the following conditions:
    - Supplement the heat pump to heat up the DHW tank when the heating capacity of the heat pump is insufficient in low ambient temperature.
    - Heat up the DHW tank when the operating conditions exceed the limitation, see details in Section "8.3.1 GENERAL INFORMATION".
  - ② The capacity of the DHW electric heater is related to the storage capacity of the DHW tank, and should be selected according to the following demand.
    - Larger capacity of the DHW electric heater is beneficial to heat up the DHW tank, but will consume more power, while smaller capacity of the electric heater will cost more time to heat up the DHW tank.

**!** CAUTION

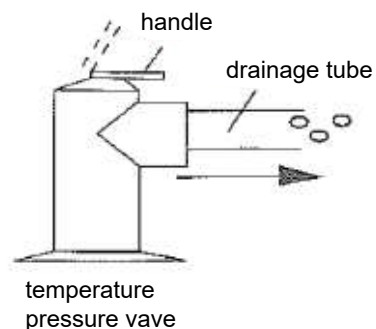
- The temperature pressure valve and the temperature protection device (covered by the control panel) must be installed according to local regulation and performed by qualified professionals referring to Section "8.3.9.4.2 Safety device".

8.3.9.4.2 SAFETY DEVICE

1 Temperature pressure valve

A temperature pressure valve which fit with local national requirements should be installed together with DHW tank to avoid the excessive higher temperature and pressure.

- Temperature pressure valve must be tightly connected with drainage pipe. Drainage pipe must be connected as shown below and introduced to building down corner (The water temperature in drainage pipe may be high, note burns).
- Temperature pressure valve in DHW tank can not be connected for other purposes.
- Check temperature pressure valve once half a year. When checking, open temperature pressure valve handle (seen below), temperature pressure valve will smoothly drain water out. The water temperature may be high, note burns. Reset after it is errorless. If drainage fails, contact local dealer for repair.
- Temperature pressure valve and its drainage pipe must keep smooth and not blocked.



**⚠ CAUTION**

- If DHW tank is not used for more than 2 weeks, a certain amount of hydrogen will gather in DHW tank. It is recommended to open temperature pressure valve handle or water outlet faucet for several minutes to release hydrogen. However, do not open hot water faucet in dishcleaning machine and washing machine, etc. When hydrogen is released, do not make open flame or operate other electrical apparatus. When gas is released, releasing sound will be heard.
- Temperature pressure valve is used to prevent too high temperature in DHW tank (higher than 94°C, recommended) and water pressure (higher than 0.85MPa, recommended).

**2 Temperature protection switch**

- When using the DHW electric heater, an Auto Restore Temperature Protection Switch (THe2) has to be installed to prevent the DHW temperature from being heated uncontrollable. When DHW temperature exceeds the protection value, the temperature protection switch opens, and auto restores when DHW temperature reduces below the protection value. The protection value can be selected according to temperature requirement of DHW. The recommended protection value is 80°C.
- Temperature Protection Switch / Temperature fuse (THe1) is connected in the DHW electric heater power supply circuit, which can directly cut off the power supply of DHW electric heater when DHW temperature exceeds the protection value. The recommended protection value is 90°C.
- The detail wiring diagram of DHW tank is shown in section “8.3.10.3.3 Wiring of DHW electric heater”.

**⚠ CAUTION**

- Do not install DHW electric heater without temperature protection device.
- Electrical box cover must be opened by qualified electrician.
- Power off before open electrical box cover.

8.3.9.4.3 DHW TANK INSTALLATION

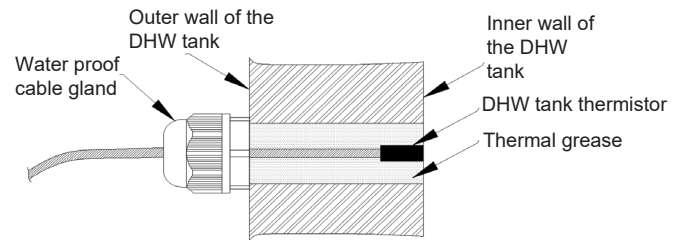
**i NOTE**

- Recommend installing this equipment to balcony or outdoor at temperature from 0 °C to 43 °C.
- DHW tank is mounted near floor drain to connect temperature pressure valve drainage pipe.
- Do not install DHW tank in place with corrosive gas.
- Installation location is free from frosting.
- Installation location must bear weight of DHW tank containing water.
- Ensure dimension of water pipe is above 1 inch (recommend DN40 water pipe), provide enough volume to pipeline and reduced resistance in pipeline system.
- DHW tank is located in a place that is convenient for repair and ensure electrical box is open.
- No accumulated water around installation location.
- Arrange filter at water inlet pipe, preventing domestic water contaminated by impurities.
- Ensure DHW tank is full of water before energizing.

**Install DHW tank**

- (1) Check DHW tank for complete accessories.
- (2) When mounted on ground, ensure the bottom of DHW tank is flat and vertically. If mounted in bath room where water exists, recommend installing on a foundation higher than ground, preventing the bottom being soaked by water.

- (3) To ensure the measurement accuracy, the DHW tank thermistor should be coated with thermal grease. The water proof cable gland (field supplied) is recommended to secure the sensor firmly. The DHW tank sensor must be installed to reach the inner wall of the DHW tank and keep in good contact with it.



**⚠ CAUTION**

- DHW tank supplies hot water from tap water. Domestic hot water is only used when tap water is connected.
- For safety, do not add ethylene glycol into water circulation. If added, water will be contaminated when heat exchanger coil leaks.
- When water hardness is more than 250-300 ppm, recommend using softened water to reduce DHW tank scale.
- softened water to reduce DHW tank scale. Immediately flush DHW tank with fresh water after installation. Flush once every day in first five days of installation.
- Try to avoid long runs of water piping between the tank and the DHW installation in order to decrease possible temperature losses. If the domestic cold water entry pressure is higher than the DHW tank’s design pressure, a pressure reducer must be fitted.
- After used for a while (depend on local water quality and use frequency), clean DHW tank and remove scales.
  - a. Power off and close water inlet valve.
  - b. Open water outlet valve and drainage valve to empty DHW tank.

**⚠ CAUTION**

When scales are removed, temperature in DHW tank may be a little high, it should prevent burns or drainage equipment damaged.

- c. Close drainage valve after cleaning several minutes with water inlet valve opened. Ensure effluent water is closed after DHW tank is full of water. Power on and get back to work.
- Always check DHW tank and its surroundings has accumulated water or not. If leak, contact local dealer.

## 8.4.9.5 WATER CONTROL

It is necessary to analyse the quality of water by checking pH, electrical conductivity, ammonia ion content, sulphur content, and others. The following is the recommended standard water quality.

Item	Chilled water system		Tendency (1)	
	Circulating water (20°C less than)	Supply water	Corrosion	Deposits of scales
Standard Quality pH (25 °C)	6.8 ~ 8.0	6.8 ~ 8.0	•	•
Electrical Conductivity (mS/m) (25 °C) {μS/cm} (25 °C) <sup>(2)</sup>	Less than 40 Less than 400	Less than 30 Less than 300	•	•
Chlorine Ion (mg Cl <sup>-</sup> /l)	Less than 50	Less than 50	•	
Sulphur Acid Ion (mg H <sub>4</sub> SO <sub>4</sub> <sup>-</sup> /l)	Less than 50	Less than 50	•	
The amount of Acid consumption (pH 4.8) (mg CaCO <sub>3</sub> /l)	Less than 50	Less than 50		•
Total Hardness (mg CaCO <sub>3</sub> /l)	Less than 70	Less than 70		•
Calcium Hardness (mg CaCO <sub>3</sub> /l)	Less than 50	Less than 50		•
Silica L (mg SiO <sub>2</sub> /l)	Less than 30	Less than 30		•
Reference Quality Total Iron (mg Fe/l)	Less than 1.0	Less than 0.3	•	•
Total Copper (mg Cu/l)	Less than 1.0	Less than 0.1	•	
Sulphur Ion (mg S <sup>2-</sup> /l)	It shall not be detected		•	
Ammonium Ion (mg NH <sub>4</sub> <sup>+</sup> /l)	Less than 1.0	Less than 0.1	•	
Remaining Chlorine (mg Cl/l)	Less than 0.3	Less than 0.3	•	
Floating Carbonic Acid (mg CO <sub>2</sub> /l)	Less than 4.0	Less than 4.0	•	
Index of Stability	6.8 ~ 8.0	-	•	•

 **NOTE**

- (1) The mark “•” in the table means the factor concerned with the tendency of corrosion or deposits of scales.
- (2) The value showed in “{ }” are for reference only according to the former unit.

## 8.4.10 ELECTRICAL AND CONTROL SETTINGS

### 8.4.10.1 GENERAL CHECK

- (1) Ensure all electrical apparatus used on site (power switch, circuit breaker, lead, conduit and terminal board) are selected according to technical manual and national electrician standard. Wiring must be made according to national specification.
- (2) Check voltage is within rated voltage  $\pm 10\%$ . In case of low voltage, system will not start. In case of high voltage, electrical parts will be burnt out.
- (3) Confirm earth wire is connected.

Use wires which are not lighter than the polychloroprene sheathed flexible cord (code designation 60245 IEC 57).  
Power supply for unit (TB1 terminal)

Model	Power supply	Operation mode	Power supply cables EN60335-1	Transmitting EN60335-1	CB (A)	ELB (n° of poles/A/mA)
AHZ- 044HCDS1	220-240V~50Hz	—	3 x 2.5 mm <sup>2</sup>	2 x 0.75 mm <sup>2</sup>	16	2/16/30
		With DHW tank heater	3 x 4.0 mm <sup>2</sup>		32	2/32/30
AHZ- 080HCDS1		—	3 x 4.0 mm <sup>2</sup>		20	2/20/30
		With DHW tank heater	3 x 6.0 mm <sup>2</sup>		40	2/40/30

Power supply for auxiliary electric heater (TB5 terminal)

Model	Power supply	Operation mode	Power supply cables EN60335-1	Transmitting EN60335-1	CB (A)	ELB (n° of poles/A/mA)
AHZ- 044HCDS1	220-240V~50Hz	—	3 x 2.5 mm <sup>2</sup>	2 x 0.75 mm <sup>2</sup>	16	2/16/30
		With DHW tank heater	3 x 4.0 mm <sup>2</sup>		32	2/32/30
AHZ- 080HCDS1		—	3 x 4.0 mm <sup>2</sup>		20	2/20/30
		With DHW tank heater	3 x 6.0 mm <sup>2</sup>		40	2/40/30

CB: Air circuit breaker; ELB: Earth leakage breaker.

### CAUTION

- Turn OFF the main power switch of the unit and wait for more than 10 minutes before electrical wiring work or a periodical check is performed.
- The data corresponding to DHW electric heater is calculated in combination with the domestic hot water tank with 3kW DHW electric heater. The DHW electric heater whose power is equal or lower than 3kW, can be driven directly by indoor unit. As for the DHW electric heater which power is over 3kW, the unit can only provide control signal.
- The data corresponding to auxiliary electric heater is calculated as 3kW power.

### NOTE

- (1) Field wiring shall be in conformity to local laws and regulations, and all wiring operations must be performed by qualified professionals.
- (2) Refer to relevant standards for Above-noted power supply cables size.
- (3) Where power supply cable is connected through junction box in series, be sure to determine the total current and choose wires based on the table below. Selection according to EN 60335-1.

Current i (A)	Wire size (mm <sup>2</sup> )
$i \leq 6$	2.5
$6 < i \leq 10$	2.5
$10 < i \leq 16$	2.5
$16 < i \leq 25$	4
$25 < i \leq 32$	6
$32 < i \leq 40$	10
$40 < i \leq 63$	16
$63 < i$	※1

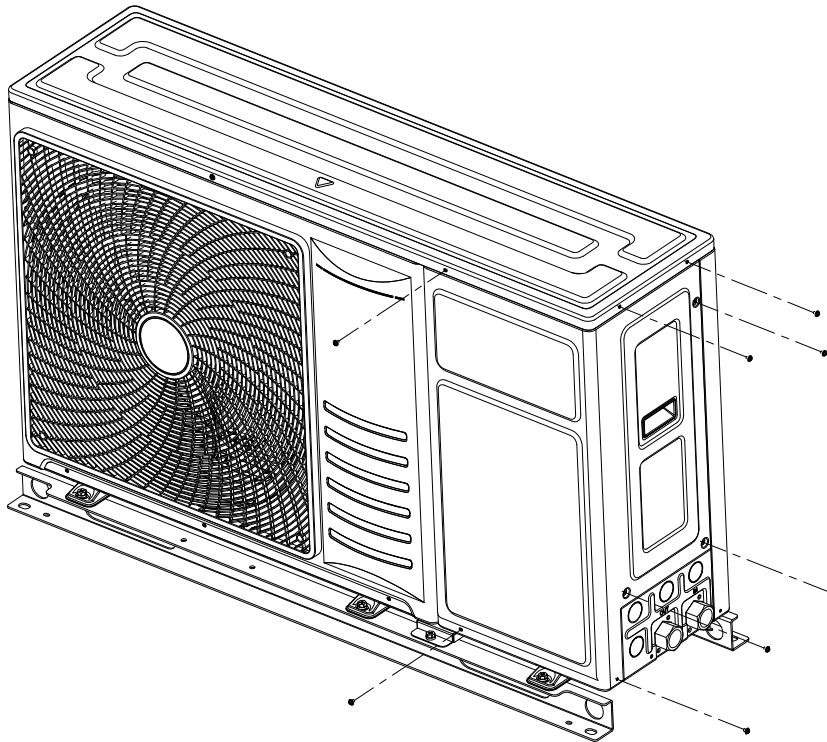
※ 1: In the case that current exceeds 60A, do not connect cables in series.

- (4) As a minimum, the chosen wires shall not be lighter than the polychloroprene sheathed flexible cord (code designation 60245 IEC 57).
- (5) The wiring specifications for weak current transmission circuit shall not be lower than that for RVV(S)P shielded wires or equivalent, and the shielding layer shall be grounded.
- (6) A switch that can ensure all-pole disconnection shall be installed between power supply and air conditioning unit in such a manner that the contact spacing shall not be less than 3 mm.
- (7) Once the power cord is damaged, the dealer or the professionals from designated maintenance department must be contacted in a timely manner for repair and replacement.
- (8) For the installation of power cord, the earth wire must be longer than the current-carrying conductor.

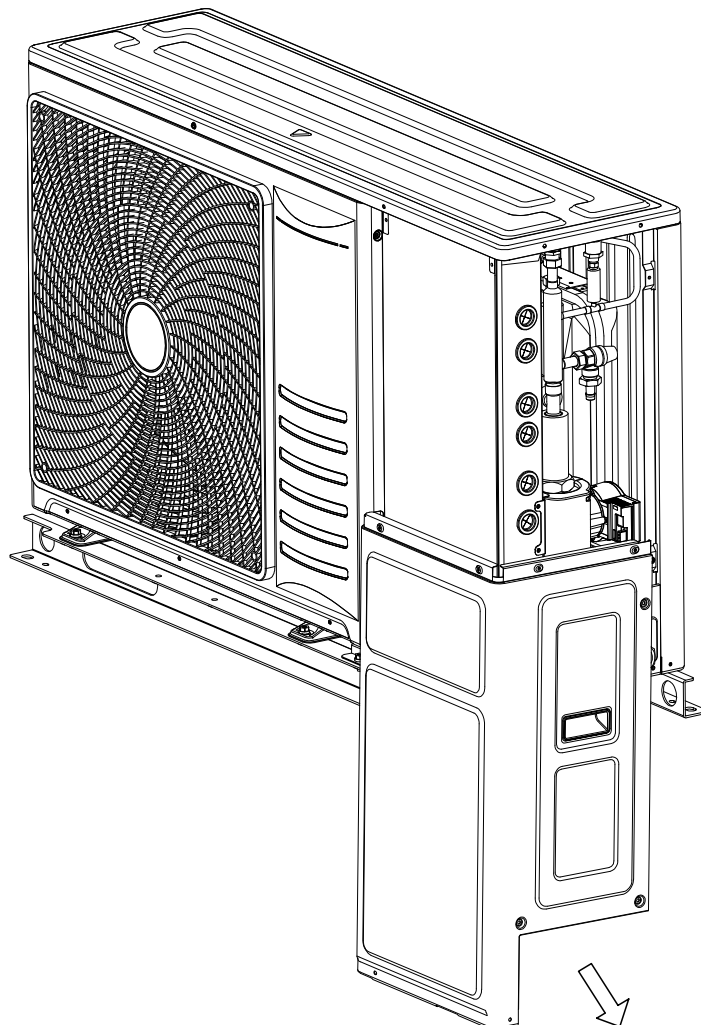
### 8.4.10.2 ELECTRICAL WIRING CONNECTION FOR OUTDOOR UNITS

The electrical wiring connection for the unit is shown as follow.

Step1: Remove the screws (8pc) around the service cover.

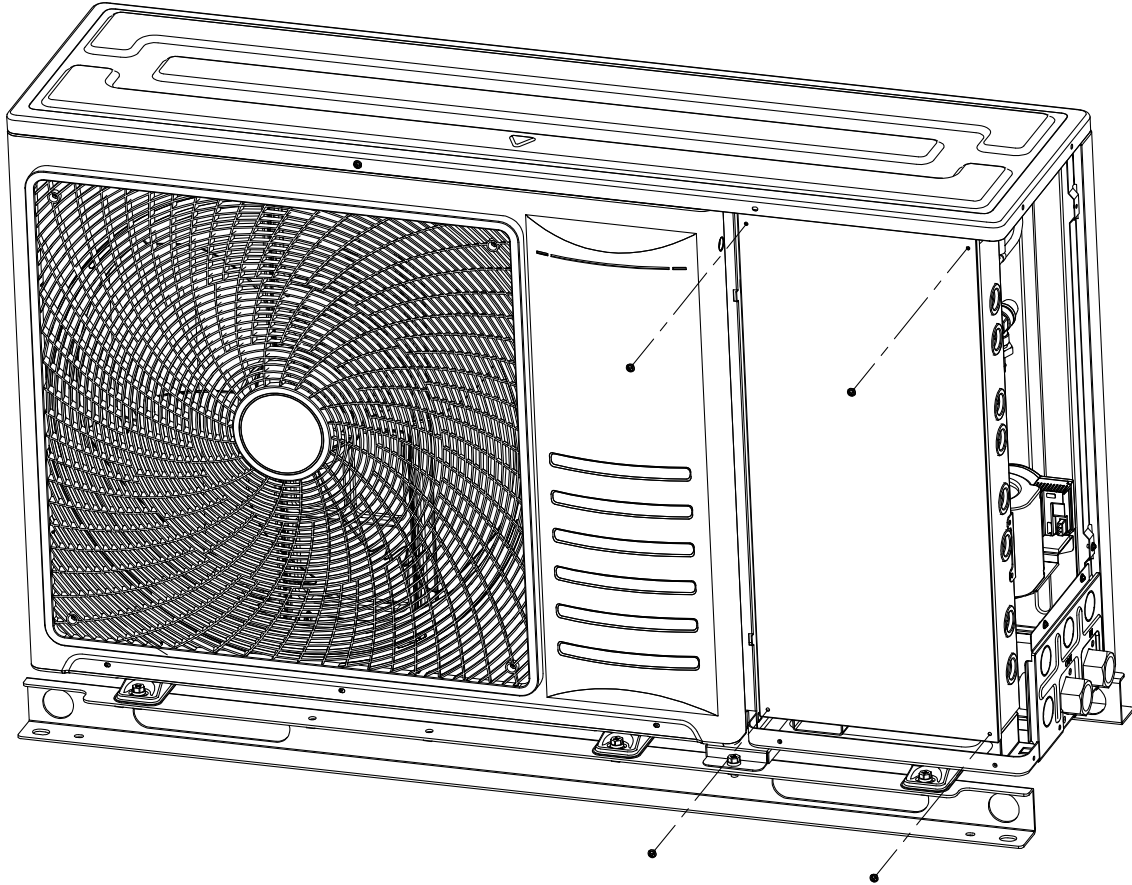


Step2: Remove the service cover.

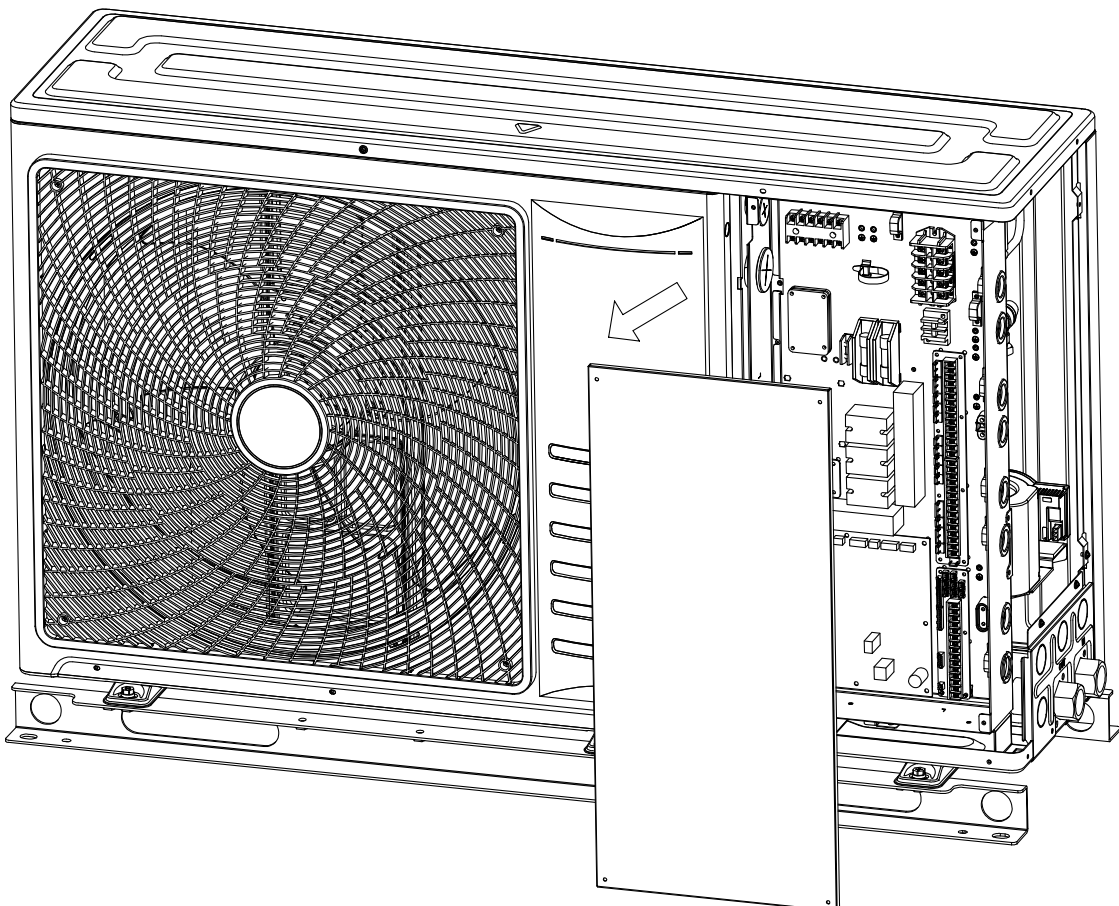




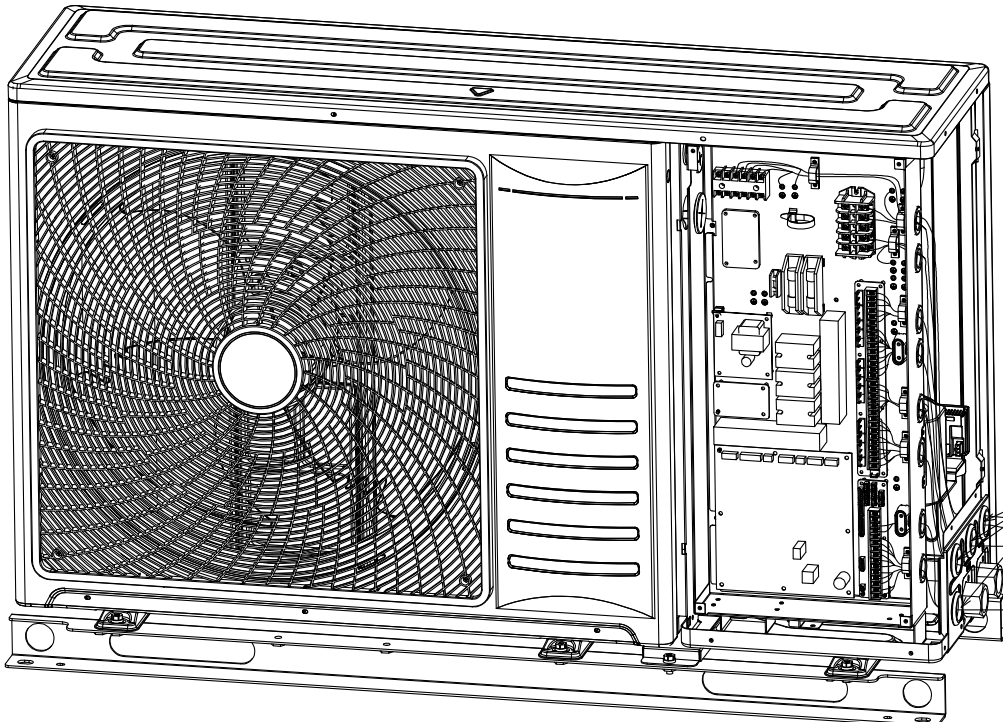
Step3: Remove the screws (4pc) around the electrical box cover.



Step4: Remove the electrical box cover.



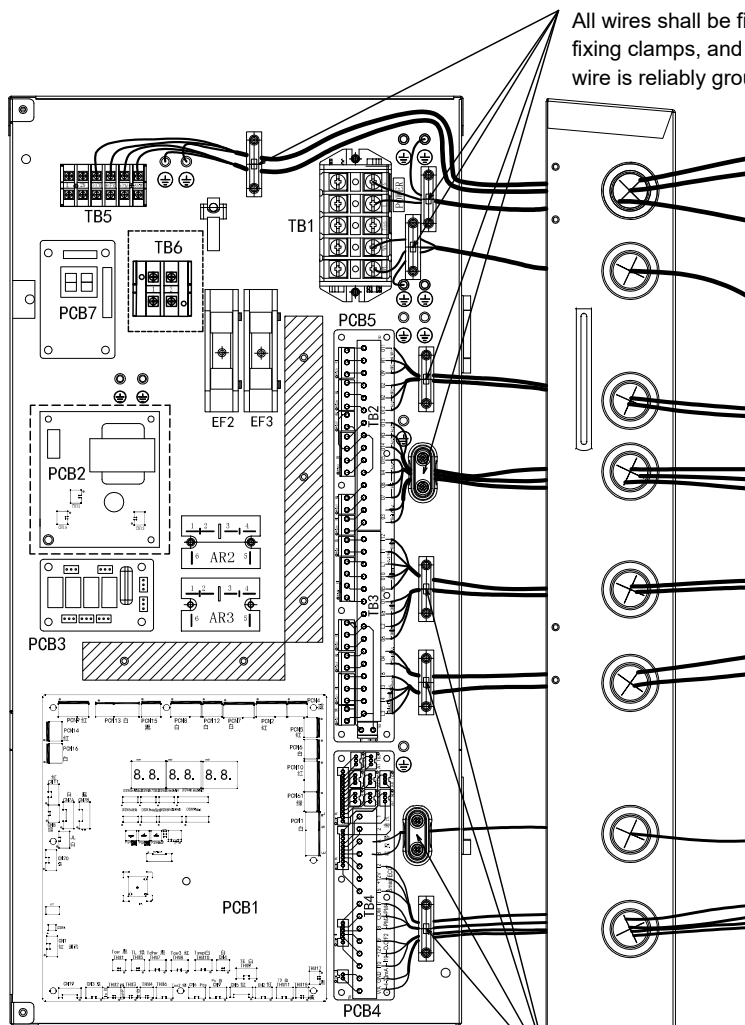
Step5: Carry out wiring work as required.



**i** NOTE

Knock out the holes on the sheet metal as required and put on the rubber rings provided by the factory before wiring connection.

The more detailed wiring connection is shown in the figure below:



All wires shall be firmly fixed with fixing clamps, and ensure that each wire is reliably grounded.

**i** NOTE

Only the structural layout is displayed, the actual assembly of the unit shall prevail.

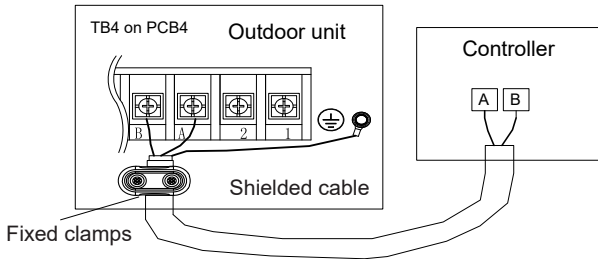
All wires shall be firmly fixed with fixing clamps, and ensure that each wire is reliably grounded.



8.4.10.3 TERMINAL BOARD CONNECTIONS

8.3.10.3.1 WIRING OF UNIT AND CONTROLLER

- The transmission is wired to terminals A-B.
- The H-NET wiring system requires only two transmission cables that connect the unit and the controller.
- The shielding layer shall be grounded.



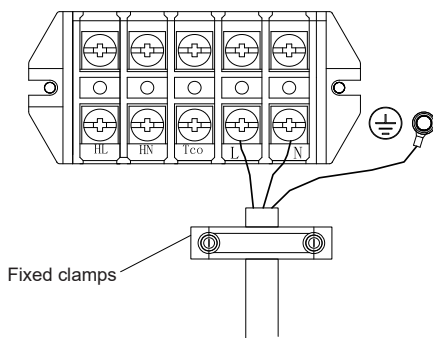
- Use twisted pair cables (0.75 mm<sup>2</sup>) for transmission wiring between the unit and controller. The wiring must consist of 2-core wires (Do not use wire with more than 3 cores).
- Use shielded wires for transmission wiring to protect the units from noise interference, with a length of less than 300 m and a size in compliance with local codes. Connect the shielding layer to ground.
- In the event that a conduit tube for field-wiring is not used, fix rubber bushes to the panel with adhesive.

**CAUTION**

Ensure that the transmission wiring is not wrongly connected to any live part that could damage the PCB.

8.3.10.3.2 WIRING OF MAIN POWER SUPPLY

The main power supply connection is wired to the terminal board (TB1) as follows:



- TB: Terminal board
- CB: Air circuit breaker
- ELB: Earth leakage breaker
- //— : Power supply cables
- : Transmission cables
- ☆ : Field supplied, not contained in the unit

**CAUTION**

- Connect power line and earth wire to the harness.
- Check and ensure live line and null line of terminal boards in power supply are correctly linked.

If connected inversely, some parts may be damaged.

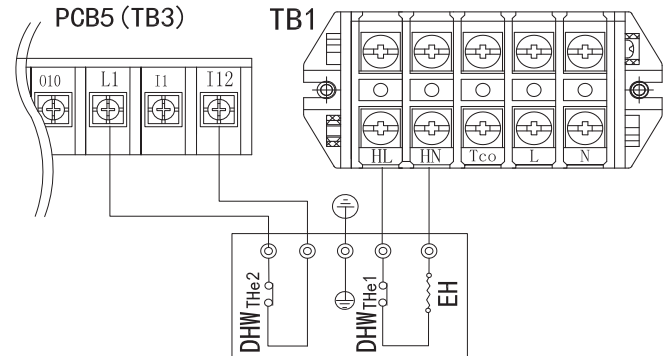
8.3.10.3.3 WIRING OF DHW ELECTRIC HEATER

**CAUTION**

The electric heater of the DHW tank needs to meet the relevant requirements of local laws and regulations. It is necessary to protect it through a temperature fuse and a temperature protection switch.

**1 Electric heater power ≤ 3 kW.**

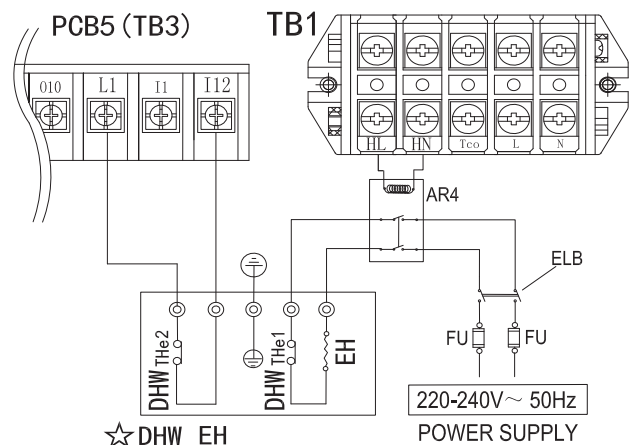
Power line connection should give concern to live line and null line, and be grounded strictly.



☆ DHW EH

**2 Electric heater power >3 kW.**

When the capacity of the electric heater is greater than 3 kW, the terminal HL/HN only provides control signals to control the ON/OFF of the AC contactor.



☆ DHW EH

POWER SUPPLY

Codes	Indications	Recommended parameters
DHW EH	DHW electric heater assembly	
EH	Electric heater	
The1	Temperature protection switch / Temperature fuse Connected in the DHW electric heater power supply circuit, directly cut off the power supply of DHW electric heater when DHW temperature exceeds the protection value.	Protection value 90°C
The2	Temperature protection switch (Auto restore) When DHW temperature exceeds the protection value, the temperature protection switch open, and auto restore when DHW temperature reduce below the protection value. The unit can detect this temperature protection switch is open and cuts off the power supply DHW electric heater.	Protection value 80°C
AR4	AC contactor (repeater)	Selection according to EH (DHW) specifications
FU	Fuse	

**CAUTION**

Electrical wiring must be performed by professional technician according to national regulations.

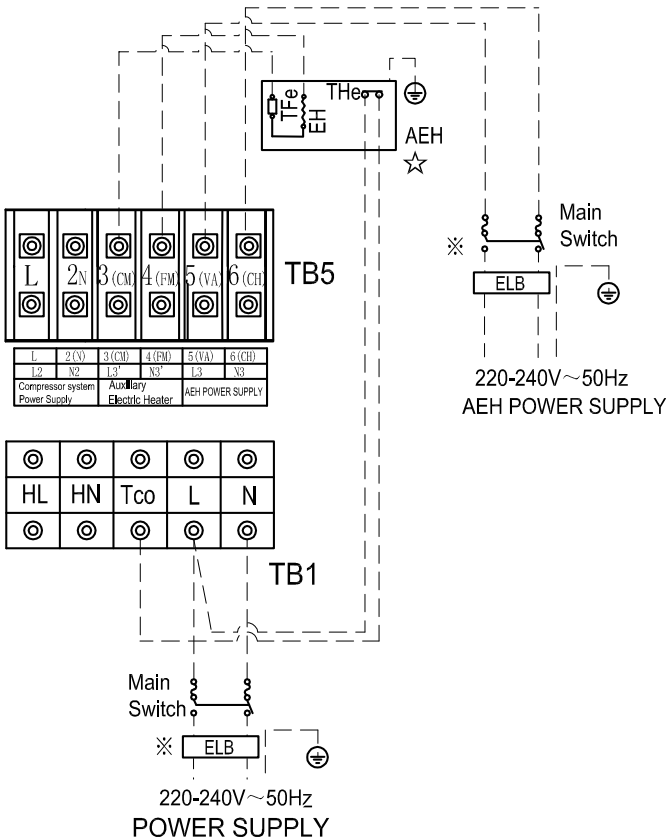
- Correctly mount cable water proof head and electrical box cover, preventing short circuit caused by water intruding into electrical box.
- Thermistor of DHW tank is weak current signal, preventing mixed with strong current signal.
- The DHW tank must have temperature protection devices recommended in this section to ensure the power supply of DHW electric heater can be cut off in time when the DHW temperature is too high.

8.3.10.3.4 WIRING OF AUXILIARY ELECTRIC HEATER

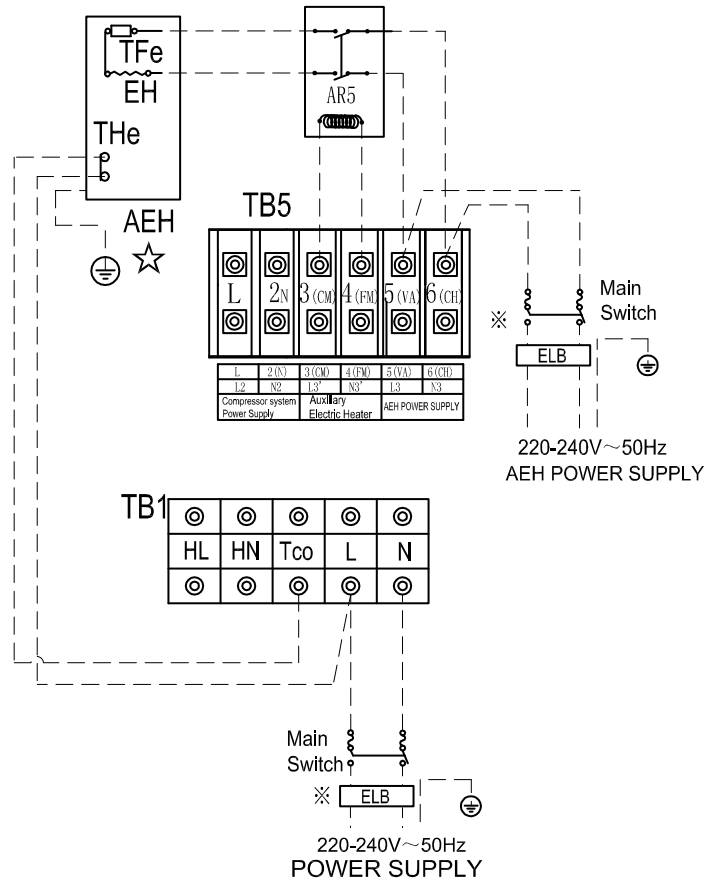
**CAUTION**

The auxiliary electric heater needs to meet the relevant requirements of local laws and regulations. It is necessary to protect it through a temperature fuse and a temperature protection switch.

**1 Electric heater power ≤ 3 kW.**



**2 Electric heater power >3 kW.**



**CAUTION**

When the power of the electric heater is greater than 3kW, the terminal 3(CM)/4(FM) only provides control signals to control the on and off of the AC contactor.

Codes	Indications	Recommended parameters
AEH	Auxiliary electric heater assembly	
EH	Auxiliary electric heater	
TFe	Temperature fuse or Temperature control switch	Protection value 90°C
The	Temperature control switch	Protection value 75°C
AR5	AC contactor (repeater)	Selection according to EH specifications
FU	Fuse	

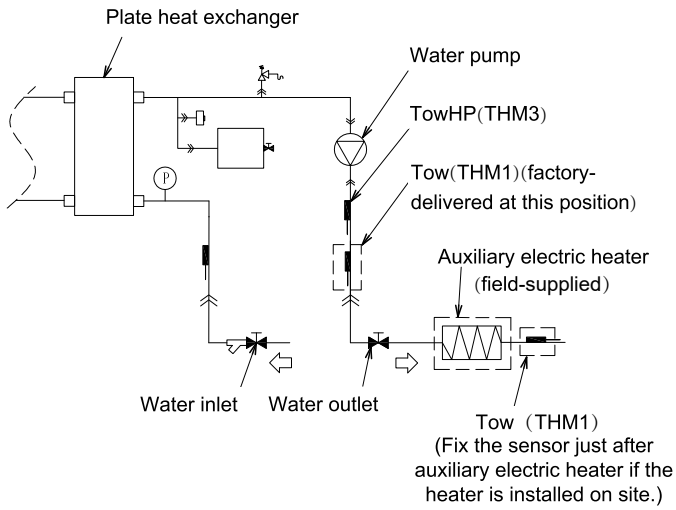
**CAUTION**

Electrical wiring must be performed by professional technician according to national regulations.

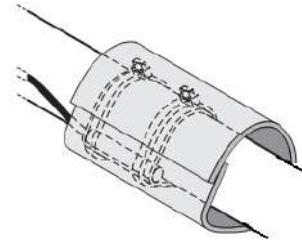
- Correctly mount cable water proof head and electrical box cover, preventing short circuit caused by water intruding into electrical box.
- The auxiliary electric heater must have temperature protection devices recommended in this section to ensure the power supply of auxiliary electric heater can be cut off in time when the auxiliary electric heater temperature is too high.

**CAUTION**

Remove the factory-delivered sensor of Tow from original position and fix the sensor just after auxiliary electric heater if the heater is installed on site, as shown in the figure below.



4. Insulate the sensor with the insulation sheet (field-supplied).

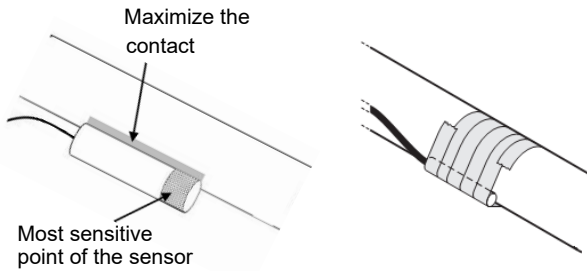


**NOTE**

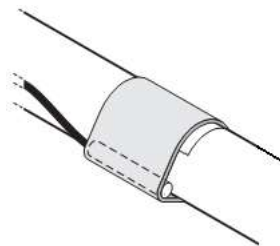
In case that the sensor supplied with unit is not long enough, please make sure that the length extension is properly done avoiding the sensing distortion and that the joint is properly insulated and waterproof to avoid any electrical failure.

Fixing the sensor

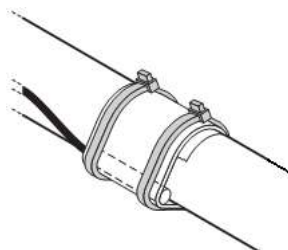
1. Fix the sensor with insulating aluminum tape (field-supplied) in order to ensure a good heat transference. Make good contact between sensor and pipe.



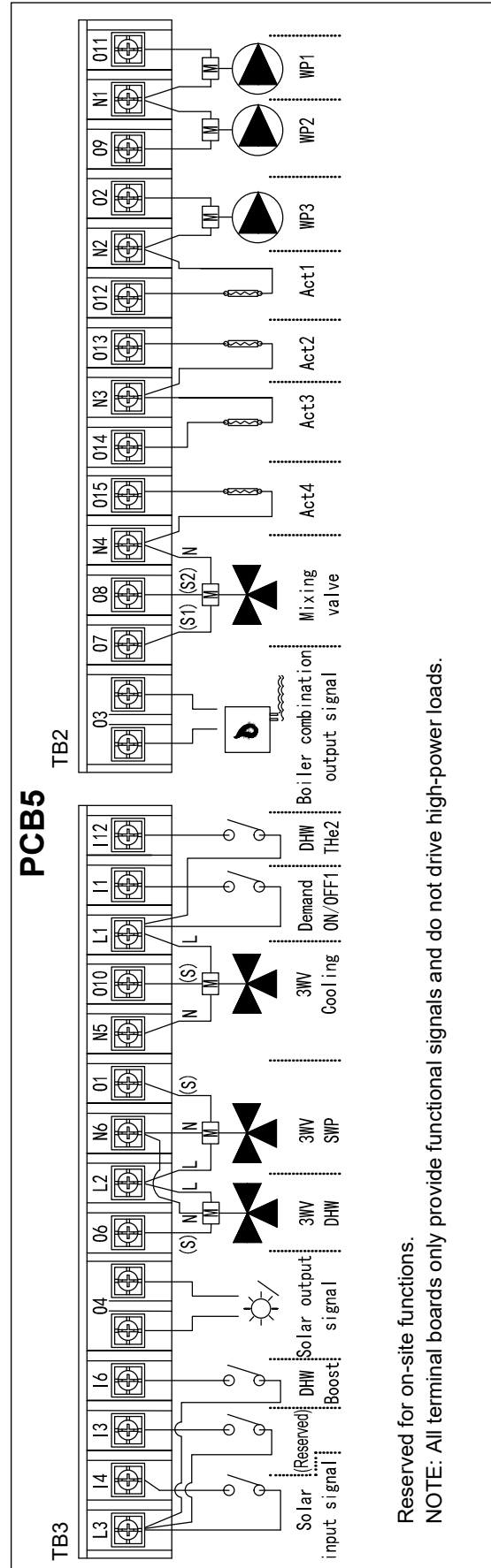
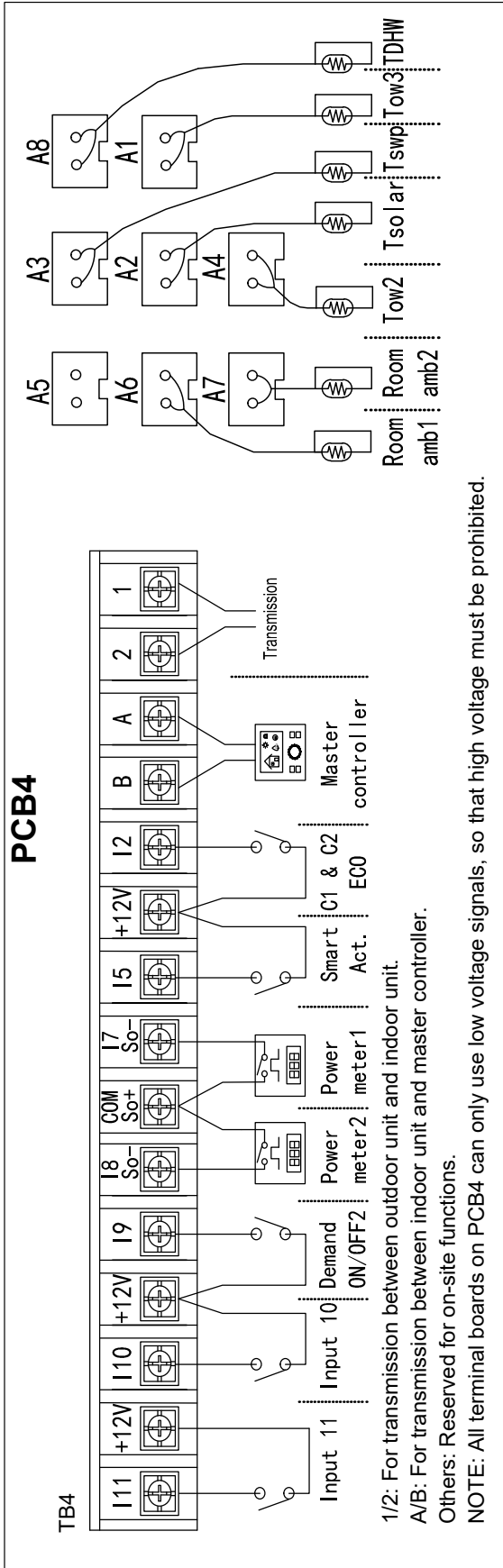
2. Put the insulating tape (field-supplied) around the sensor in order to avoid loosening of the sensor after some years.



3. Fasten the sensor with 2 cord clamps (field-supplied).



8.4.10.4 OPTIONAL INDOOR UNIT WIRING (ACCESSORIES)



**NOTE**

Inputs and outputs printed on the board are the setting before shipment options. By means of the master controller, some other inputs and output functions can be configured and used.

**Input - Setting before shipment**

Mark	Description	Default settings	Available input codes	Terminals	Specification
I1	Input 1	i - 08 (Demand ON/OFF 1)	i - 00~17 (Except i - 07/12)	I1, L1 on TB3	Closed/Open 220-240V ~ 50/60Hz
I2	Input 2	i - 13 (Cycle 1 and 2 ECO mode)	i - 00~17 (Except i - 07/12)	I2, +12V on TB4	Closed/Open 12V DC
I3	Input 3	i - 00 (No function)	i - 00~17 (Except i - 07/12)	I3, L3 on TB3	Closed/Open 220-240V ~ 50/60Hz
I4	Input 4	i - 04 (Solar in)	i - 00~17 (Except i - 07/12)	I4, L3 on TB3	Closed/Open 220-240V ~ 50/60Hz
I5	Input 5	i - 02 (Smart Act.)	i - 00~17 (Except i - 07/12)	I5, +12V on TB4	Closed/Open 12V DC
I6	Input 6	i - 06 (DHW Boost)	i - 00~17 (Except i - 07/12)	I6, L3 on TB3	Closed/Open 220-240V ~ 50/60Hz
I7	Input 7	i - 07 (Power meter 1)	i - 00~17	I7, COM on TB4	Closed/Open 12V DC
I8	Input 8	i - 12 (Power meter 2)	i - 00~17	I8, COM on TB4	Closed/Open 12V DC
I9	Input 9	i - 09 (Demand ON/OFF 2)	i - 00~17 (Except i - 07/12)	I9, +12V on TB4	Closed/Open 12V DC
I10	Input 10	i - 00 (No function)	i - 00~17 (Except i - 07/12)	I10, +12V on TB4	Closed/Open 12V DC
I11	Input 11	i - 00 (No function)	i - 00~17 (Except i - 07/12)	I11, +12V on TB4	Closed/Open 12V DC

**Input - All input codes descriptions:**

Input codes	Mark	Description
i - 00	No Function	-
i - 02	Smart Act./ SG Ready Input 1	This function must be used to stop or limit the heat pump and Auxiliary electric heater when restricted by Electric company. It allows an external Smart switch device to switch off or reduce consumption of the heat pump and Auxiliary electric heater during time of peak electricity demand. In case of using Smart Grid application, this input is used as a digital input 1 and allows four different operating modes.
i - 03	Swimming pool Demand ON/OFF	Optional input signal can be configured as function of "Swimming pool Demand ON/OFF" to operate SWP. Switch ON/OFF of SWP can also be controlled by master controller. Closed: Start SWP operation (Switch ON and Demand ON) Open: Stop SWP operation (Switch OFF and Demand OFF).
i - 04	Solar in	In case of combining Unit with solar panels, this input is used as a feedback for solar station ready operation. Closed: Solar in ON to trigger solar pump operation ON Open: Solar in OFF to trigger solar pump operation OFF.
i - 05	Forced Heating/Cooling	Heating/cooling can be changed by an input of an external contact signal. Heating/cooling can also be changed over by master controller. Closed: Heating mode Open: Cooling mode.
i - 06	DHW Boost	With this function enabled, it is possible to request a heating up of the DHW when user requires an instantaneous delivery of DHW. Triggering input signal can also Switch ON DHW.
i - 07	Power meter 1	Input used as kW/h pulse count for Energy data recording, used to count energy data or the total energy data.
i - 08	Demand ON/OFF 1	Optional input signal can be configured as function of "Demand ON/OFF 1" or "Demand ON/OFF 2" and selected as room thermostat. Closed: Corresponding room thermostat Switch ON and Thermo ON. Open: Corresponding room thermostat Switch OFF and Thermo OFF. Corresponding room thermostat can also be Switch ON/OFF by Rooms function on Master controller.
i - 09	Demand ON/OFF 2	

Input codes	Mark	Description
i - 10	Forced heating	Forced Heating mode by input of contact signal, Heating can also be changed over by master controller. Closed: Forced Heating mode Open: No action.
i - 11	Forced cooling	Forced Cooling mode by input of contact signal, Cooling can also be changed over by master controller. Closed: Forced Cooling mode Open : No action.
i - 12	Power meter 2	Input used as kW/h pulse count for Energy data recording, used to count energy data or the total energy data.
i - 13	Cycle 1 and 2 ECO mode	Cycle 1 and Cycle 2 Water ECO offset. Current water temperature setting is reduced or increased by the indicated parameter in space heating mode or space cooling mode. Closed: Cycle 1 and Cycle 2 Water ECO offset enabled Open: Cycle 1 and Cycle 2 Water ECO offset disabled.
i - 14	Cycle 1 ECO mode	Cycle 1 Water ECO offset. Current water temperature setting is reduced or increased by the indicated parameter in space heating mode or space cooling mode. Closed: Cycle 1 Water ECO offset enabled Open: Cycle 1 Water ECO offset disabled.
i - 15	Cycle 2 ECO mode	Cycle 2 Water ECO offset. Current water temperature setting is reduced or increased by the indicated parameter in space heating mode or space cooling mode. Closed: Cycle 2 Water ECO offset enabled Open: Cycle 2 Water ECO offset disabled.
i - 16	Force OFF	Force OFF the unit include Water Cycle 1, Water Cycle 2, DHW and SWP. Switch ON/OFF of different function can also be controlled by master controller. Closed: Forced OFF the unit include Water Cycle 1, Water Cycle 2, DHW and SWP. Open: No action.
i - 17	SG Ready Input 2	In case of using Smart Grid application, this input is used as a digital input 2 and allows four different operating modes.

 **CAUTION**

*Functions i - 05(Forced Heating/Cooling) /Functions i - 10(Forced heating)/Functions i - 11(Forced cooling) cannot be used at the same time.*

Output - Setting before shipment

Mark	Description	Default settings	Available output codes	Terminals		Specification
O1	Output 1	o - 01 (3WV SWP)	o - 00 ~ 29 (Except o - 02/08/17/21)	Power supply	L2, N6 on TB3	ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
				Signal line	O1 on TB3	
O2	Output 2	o - 02 (WP3)	o - 00 ~ 29 (Except o - 17)	O2, N2 on TB2		ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
O3	Output 3	o - 03 (Boiler combination)	o - 00 ~ 29 (Except o - 02/08/17/21)	O3 on TB2		Free voltage Max. 1.0A
O4	Output 4	o - 04 (Solar out)	o - 00 ~ 29 (Except o - 02/08/17/21)	O4 on TB3		Free voltage Max. 1.0A
O5	Output 5	o - 17 (DHW Electric Heater)	o - 00 ~ 29	HL, HN on TB1		ON/OFF 220-240V ~ 50/60Hz Max. 15A
O6	Output 6	o - 18 (3WV DHW)	o - 00 ~ 29 (Except o - 02/08/17/21)	Power supply	L2, N6 on TB3	ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
				Signal line	O6 on TB3	
O7	Output 7	o - 19 (Mixing valve Close)	o - 00 ~ 29 (Except o - 02/08/17/21)	O7, N4 on TB2		ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
O8	Output 8	o - 20 (Mixing valve Open)	o - 00 ~ 29 (Except o - 02/08/17/21)	O8, N4 on TB2		ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
O9	Output 9	o - 21 (WP2)	o - 00 ~ 29 (Except o - 17)	O9, N1 on TB2		ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
O10	Output 10	o - 22 (3WV Cooling)	o - 00 ~ 29 (Except o - 02/08/17/21)	Power supply	L1, N5 on TB3	ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
				Signal line	O10 on TB3	
O11	Output 11	o - 08 (WP1)	o - 00 ~ 29 (Except o - 17)	O11, N1 on TB2		ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
O12	Output 12	o - 23 (Act1)	o - 00 ~ 29 (Except o - 02/08/17/21)	O12, N2 on TB2		ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
O13	Output 13	o - 24 (Act2)	o - 00 ~ 29 (Except o - 02/08/17/21)	O13, N3 on TB2		ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
O14	Output 14	o - 25 (Act3)	o - 00 ~ 29 (Except o - 02/08/17/21)	O14, N3 on TB2		ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
O15	Output 15	o - 26 (Act4)	o - 00 ~ 29 (Except o - 02/08/17/21)	O15, N4 on TB2		ON/OFF 220-240V ~ 50/60Hz Max. 1.0A



**Output - All output codes descriptions:**

Output codes	Mark	Description
o - 00	No Function	-
o - 01	3WV SWP	In case of combining Unit with swimming pool, this output is used to drive 3-way valve diverting to the swimming pool heat exchanger. Output ON signal when swimming pool function is operating.
o - 02	WP3	In case of combining Unit with hydraulic separator, this output is used to drive relay of water pump 3.
o - 03	Boiler combination	In case of combining Unit with boiler, this output is used to Start/Stop it.
o - 04	Solar out	In case of combining Unit with solar panel, this output is used to drive relay of solar pump.
o - 05	Alarm signal	Output ON signal when an Alarm Code is existence.
o - 06	SWP signal	Output ON signal in case that Swimming pool function is demand ON.
o - 07	Cooling signal	Output ON signal in case that Space Cooling is Thermo-ON.
o - 08	WP1	In case of the pipeline connected to the unit is long leading to low water flow rate, this output is used to drive relay of a extra WP1 that can be cascaded with inside EC WP1 to offer additional hydraulic head. The extra WP1 works equally with inside EC WP1.
o - 09	Heating signal	Output ON signal in case that Space Heating is Thermo-ON.
o - 10	DHW signal	Output ON signal in case that DHW is demand ON or DHW Electric Heater is ON.
o - 11	Solar overheat	Output ON signal in case that solar panels overheat protection is activated.
o - 12	Defrost	Output ON signal in case that the outdoor unit is defrosting.
o - 13	DHW re-circulation pump	Output ON signal to drive relay of a re-circulation pump in case of re-circulation pump is available for DHW tank.
o - 14	Heater relay 1	Copy ON/OFF signal of Auxiliary electric heater output terminal 1.
o - 15	Heater relay 2	Copy ON/OFF signal of Auxiliary electric heater output terminal 2.
o - 16	c1 water ON/OFF	Output ON signal in case that Water Cycle1 switch ON.
o - 17	DHW Electric Heater	Output ON signal in case the DHW Electric Heater is Enabled and meet the ON conditions.
o - 18	3WV DHW	In case of combining Unit with DHW, this output is used to drive 3-way valve diverting to the sanitary tank inner coil. Output ON signal when DHW function is operating.
o - 19	Mixing valve Close	Mixing valve has two operation terminals of closing valve and opening valve. Optional output signal need be configured as function of "Mixing valve Close" and "Mixing valve Open" to drive mixing valve.
o - 20	Mixing valve Open	
o - 21	WP2	When Water Cycle 2 is available Optional Output signal need be configured to drive relay of water pump 2.
o - 22	3WV Cooling	In case of combining Unit with cooling fan coil, this output is used to drive 3-way valve diverting to cooling fan coil. Output ON signal when space cooling is operating.
o - 23	Act1	Room actuators, output ON signal in case the corresponding Room Thermostat is Thermo ON (heating and cooling). And also meet follow condition Room actuators also Output ON: ① Air purge ② Anti-freezing ③ Screed Drying ④ Retry operation due to anti freezing (alarm-76 , d1-31, d1-03) ⑤ Outdoor Unit defrost without Room Thermostat Thermo ON ⑥ Overrun after requiring OFF
o - 24	Act2	
o - 25	Act3	
o - 26	Act4	
o - 27	Act5	
o - 28	Act6	
o - 29	Act7	

**Auxiliary sensor - Setting before shipment**

Mark	Description	Default settings	Available auxiliary sensor codes
A1	Auxsensor 1	a - 01 (Tow3)	a - 00 ~ 13
A2	Auxsensor 2	a - 03 (Tsolar)	a - 00 ~ 13
A3	Auxsensor 3	a - 02 (Tswp)	a - 00 ~ 13
A4	Auxsensor 4	a - 05 (Tow2)	a - 00 ~ 13
A5	Auxsensor 5	a - 00 (No Function)	a - 00 ~ 13
A6	Auxsensor 6	a - 07 (Room_amb1)	a - 00 ~ 13
A7	Auxsensor 7	a - 08 (Room_amb2)	a - 00 ~ 13

**Auxiliary sensor codes - All Auxiliary sensor codes descriptions:**

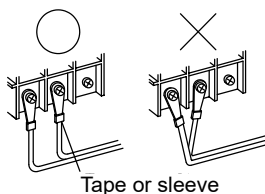
Auxiliary sensor codes	Mark	Description
a - 00	No Function	-
a - 01	Tow3	This sensor is used in case to combine Unit with hydraulic separator to detect Hot water temperature detection of hydraulic separator .
a - 02	Tswp	In case of combining Unit with swimming pool, this sensor is used to detect swimming pool water temperature.
a - 03	Tsolar	In case of combining Unit with solar panels, this sensor is used to Detect Hot water temperature of solar panels .
a - 04	Ta_ao	Optional Second Outdoor Ambient Temperature sensor accessory can be connected to the Auxiliary sensor in case that the heat pump is located in a non-suitable position for this measurement.
a - 05	Tow2	When Water Cycle 2 is available, auxiliary sensor need be configured as function of "Tow2" to detect outlet water temperature of Water Cycle 2.
a - 06	duty	Used to detect duty signal when duty signal control is Enabled, the duty signal type can be 0-10V, 0-5V or 10-20mA.
a - 07	Room_amb1	Rooms function on master controller is selected as room thermostat, and in this scenario, auxiliary sensor can be configured as function of "Room_amb1-7", and can be selected as room temperature detection of specific room.
a - 08	Room_amb2	
a - 09	Room_amb3	
a - 10	Room_amb4	
a - 11	Room_amb5	
a - 12	Room_amb6	
a - 13	Room_amb7	

## **⚠ DANGER**

- Do not connect the power supply to the unit prior to filling the space heating circuit (and DHW circuit if it were the case) with water and checking water pressure and the total absence of any water leakage.
- Do not connect or adjust any wiring or connections unless the main power switch is OFF.
- When using more than one power source, check and ensure that all of them are turned OFF before operating the unit.
- Avoid wiring installation in contact with the refrigerant pipes, water pipes, edges of plates and electrical components inside the unit to prevent damage, which may cause electric shock or short circuit.

## **⚠ CAUTION**

- Turn OFF the main power switch to the unit and wait for more than 10 minutes before electrical wiring work or a periodical check is performed.
- Check to ensure that the outdoor fan have stopped before electrical wiring work or a periodical check is performed.
- Use a dedicated power circuit for the unit. Do not use a power circuit shared with the unit or any other appliance.
- Make sure that all wiring and protection devices are properly selected, connected, identified and fixed to the corresponding terminals of the unit, specially the protection (earth) and power wiring, taking into account the applicable national and local regulations. Establish proper earthing; Incomplete earthing may cause electrical shock.
- Protect the unit against the entry of small animals (like rodents) which could damage the drain pipe and any internal wire or any other electrical part, leading to electric shock or short-circuit.
- Keep a distance between each wiring terminal and attach insulation tape or sleeve as shown in the figure.



- Tightly secure the power source wiring using the cord clamp inside the unit.
- Check to ensure that the electrical resistance is more than 1 megohm, by measuring the resistance between ground and the terminal of the electrical parts. If not, do not operate the system until the electrical leakage is found and repaired.
- The DHW heater is an accessory which is field-supplied. When the DHW heater is being installed, the power supply cables must be reselected according to the actual load current.

### 8.4.10.5 WIRING SIZE AND MINIMUM REQUIREMENTS OF THE PROTECTION DEVICES

- (1) Connect the power supply wires and the earth wire to the terminal board in the electrical control box refer to chapter 8.3.10.2.
- (2) Do not wire in front of the fixing screw of the service panel.  
If do, the screw can not be removed.
- (3) Use shielded twist pair for controller.

## **⚠ CAUTION**

- The tightening torque of each screw shall be as follows.
 

M4:	1.0 to 1.3 N·m
M5:	2.0 to 2.5 N·m
M6:	4.0 to 5.0 N·m
M8:	9.0 to 11.0 N·m
M10:	18.0 to 23.0 N·m

Keep the above tightening torque when wiring work.

## **⚠ CAUTION**

- Ensure specifically that there is an Earth Leakage Breaker (ELB) installed for the units.
- If the installation is already equipped with an Earth Leakage Breaker (ELB), ensure that its rated current is large enough to hold the current of the units.

## **i NOTE**

- Electric fuses can be used instead of magnetic Circuit Breakers (CB). In that case, select fuses with similar rated values as the CB.
- The Earth Leakage Breaker (ELB) mentioned on this manual is also commonly known as Residual Current Device (RCD) or Residual Current Circuit Breaker (RCCB).
- The Circuit Breakers (CB) are also known as Thermal-Magnetic Circuit Breakers or just Magnetic Circuit Breakers (MCB).
- Total wiring length for controller can be extended up to 500m. If total wiring length less than 30m, it is possible to use the normal wiring (0.3mm<sup>2</sup>) except shielded twist pair.

8.4.10.6 SETTING OF DIP SWITCHES

**i** NOTE

- The mark “■” indicates the dip switches positions.
- No mark “■” indicates pin position is not affected.
- The figures show the settings before shipment or after selection.
- “Not used” means that the pin must not be changed. A malfunction might occur if changed.

**!** CAUTION

Before setting dip switches, first turn the power supply OFF and then set the position of dip switches. If the switches are set without turning the power supply OFF, the contents of the setting are invalid.

8.3.10.6.1 DIP Switch Setting of PCB1

- (1) DSW1: Unit model setting  
No setting is required.

Setting before shipment	
-------------------------	--

- (2) DSW2: Unit capacity setting  
No setting is required.

Setting before shipment	<b>044(2.0HP)</b>	<b>080(3.0HP)</b>

- (3) DSW3: Additional setting

Setting before shipment	
ON: Cancel 70 alarm (Water pressure abnormality)	
Antifreeze settings ON: Whole water cycle does antifreeze. OFF: Only primary cycle does antifreeze.	

- (4) DSW4: Additional setting

Setting before shipment	
Water pump forced ON	
Auxiliary electric heater forced OFF	
ON: Antifreeze setting is enabled OFF: Antifreeze setting is disabled	

Water pump mode when Thermo OFF ON: Operate periodically OFF: Operate constantly	
Manual emergency setting ON: Manual emergency enabled OFF: Manual emergency disabled	
DHW electric heater allowance setting ON: DHW electric heater forced OFF cancelling OFF: DHW electric heater forced OFF	
DHW 3-way valve forced ON	
Air purge start	

- (5) DSW5: Additional setting

Setting before shipment	
ON: Cancel 75/78 alarm (Water pump abnormalities)	
ON: WP3 operates in space cooling mode.	
ON: Cancel Alarm of Thermistor Tow2.	

- (6) DSW6: Fuse reset

Setting before shipment	
-------------------------	--

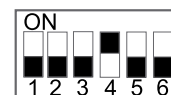
- (7) DSW7: Not used

Setting before shipment	
-------------------------	--

- (8) DSW8: Refrigeration system No. setting Setting is required. Use binary encoding method.

Setting before shipment	
-------------------------	--

Max No.63 are available to set when all the equipment are connected to corresponding central control system. Ex.) Set refrigeration system no. as 8.



- (9) DSW9: Water module No. setting  
No setting is required.

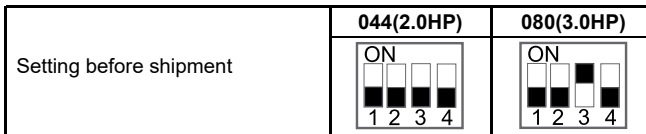
Setting before shipment	
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8.3.10.6.2 DIP Switch Setting of PCB7

- (1) DSW1: Unit model setting  
No setting is required.



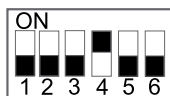
- (2) DSW3: Unit capacity setting  
No setting is required.



- (3) DSW6: Refrigeration system No. setting  
Setting is required. Use binary encoding method.



Max No.63 are available to set when all the equipment are connected to corresponding H-NET.  
Ex.) Set refrigeration system no. as 8.



8.4.11 TEST RUN

**i** NOTE

NEVER operate the unit without careful inspection.

8.4.11.1 CHECKLIST BEFORE TEST RUN

Do NOT operate the system before the following checks are OK:

You have read the complete installation instructions of the unit and master controller carefully.	<input type="checkbox"/>
The unit is properly mounted.	<input type="checkbox"/>
The following field wiring has been carried out according to this document and the applicable legislation: <ul style="list-style-type: none"> <li>▪ Between the local power supply and the unit <input type="checkbox"/></li> <li>▪ Between the unit and the valves (if applicable) <input type="checkbox"/></li> <li>▪ Between the unit and the room thermostat (if applicable) <input type="checkbox"/></li> <li>▪ Between the unit and the DHW tank (if applicable) <input type="checkbox"/></li> </ul>	<input type="checkbox"/>
The system is properly earthed and the earth terminals are tightened.	<input type="checkbox"/>
The fuses or locally installed protection devices are installed according to this document, and have NOT been bypassed.	<input type="checkbox"/>
The power supply voltage matches the voltage on the Nameplate of the unit.	<input type="checkbox"/>
There are NO loose connections or damaged electrical components in the electrical box.	<input type="checkbox"/>
There are NO damaged components or squeezed pipes on the inside of the units.	<input type="checkbox"/>
Only for DHW tank with electric heater: Temperature protection switch (Auto restore) has been already wired. <input type="checkbox"/> Temperature protection switch / Temperature fuse has been already wired.	<input type="checkbox"/>
There are NO refrigerant leaks.	<input type="checkbox"/>
The water pipes are thermally insulated.	<input type="checkbox"/>
There is NO water leakage inside the unit.	<input type="checkbox"/>
The shut-off valves are properly installed and fully open.	<input type="checkbox"/>
The air purge valve is open (at least 2 turns).	<input type="checkbox"/>
The safety valve purges water when open.	<input type="checkbox"/>
The minimum water volume is guaranteed in all conditions. See section 8.3.9.2.	<input type="checkbox"/>
The DHW tank is filled completely.	<input type="checkbox"/>

**⚠ CAUTION**

- The unit starts only when all check points are cleared up.
- Pay attention when system is running:
  - (A) Do not touch any parts of discharge pipelines, because the discharge temperature of compressor can be more than 90°C.
  - (B) Do not press AC contactor button, otherwise serious accident may be caused.
- Do not touch any electrical components within 10 minutes after main power supply is cut off.

8.4.11.2 CHECKLIST DURING TEST RUN

The minimum flow rate during electric heater/defrost operation is guaranteed in all conditions. See section "8.3.9.2 Requirements and recommendations for hydraulic circuit".	<input type="checkbox"/>
To perform an air purge.	<input type="checkbox"/>
To perform a test run.	<input type="checkbox"/>
To perform an actuator test run.	<input type="checkbox"/>
Underfloor screed drying function The underfloor screed drying function is started (if necessary).	<input type="checkbox"/>

 CAUTION

- When performing test run of floor heating, higher temperature in indoor unit (up to 55°C) will damage floors due to expansion and contraction. Recommend it is within 30 minutes.
- Use the controller to start test run (refer to the manual of master controller).
- It is normal that after indoor unit is energized, it may directly enter anti-freezing running mode, and water pump automatically runs if outdoor temperature is very low.

8.4.11.3 CHECK THE MINIMUM FLOW RATE

1	Check the hydraulic configuration to find out which space heating loops can be closed by mechanical, electronic, or other valves.	—
2	Close all space heating loops that can be closed.	—
3	Start the pump test run . See setting of DSW4-8 in section "8.3.10.6.1 DIP Switch Setting of PCB1" .	—
4	Read out the flow rate and modify the bypass valve setting to reach the minimum required flow rate + 2L/min.	—

**8.4.12 MAIN SAFETY DEVICES**

◆ **Compressor protection**

High pressure switch:

This switch cuts out the operation of the compressor when the discharge pressure exceeds the setting.

◆ **Fan motor protection**

When the thermistor temperature is reached to the setting, motor output is decreased. The other way, when the temperature becomes lower, limitation is cancelled.

Model				44(2.0HP)	60(2.5HP)
For compressor					
Pressure switches		-		Automatic Reset, Non-Adjustable (each one for each compressor)	
High	Cut Out	MPa		4.4±0.15	
	Cut-In	MPa		3.4±0.2	
Low for control	Cut Out	MPa		0.05±0.03	
	Cut-In	MPa		0.15±0.03	
Fuse		-		30A (Inside PCB6)	
220-240V ~ 50Hz		A			
CCP Timer		-		Non-Adjustable	
Setting Time		min.		3	
For condenser fan motor					
Internal Thermostat		-		Automatic Reset, Non-Adjustable (each one for each motor)	
For Control Circuit					
Fuse on Main Circuit of Indoor part		-		10A (Inside PCB1)	
220-240V ~ 50Hz		A			
Fuse on DHW Electric Heater		-		20	
220-240V ~ 50Hz		A			
Fuse on Auxiliary Electric Heater		-		20	
220-240V ~ 50Hz		A			



8.4.13 TECHNICAL PARAMETERS

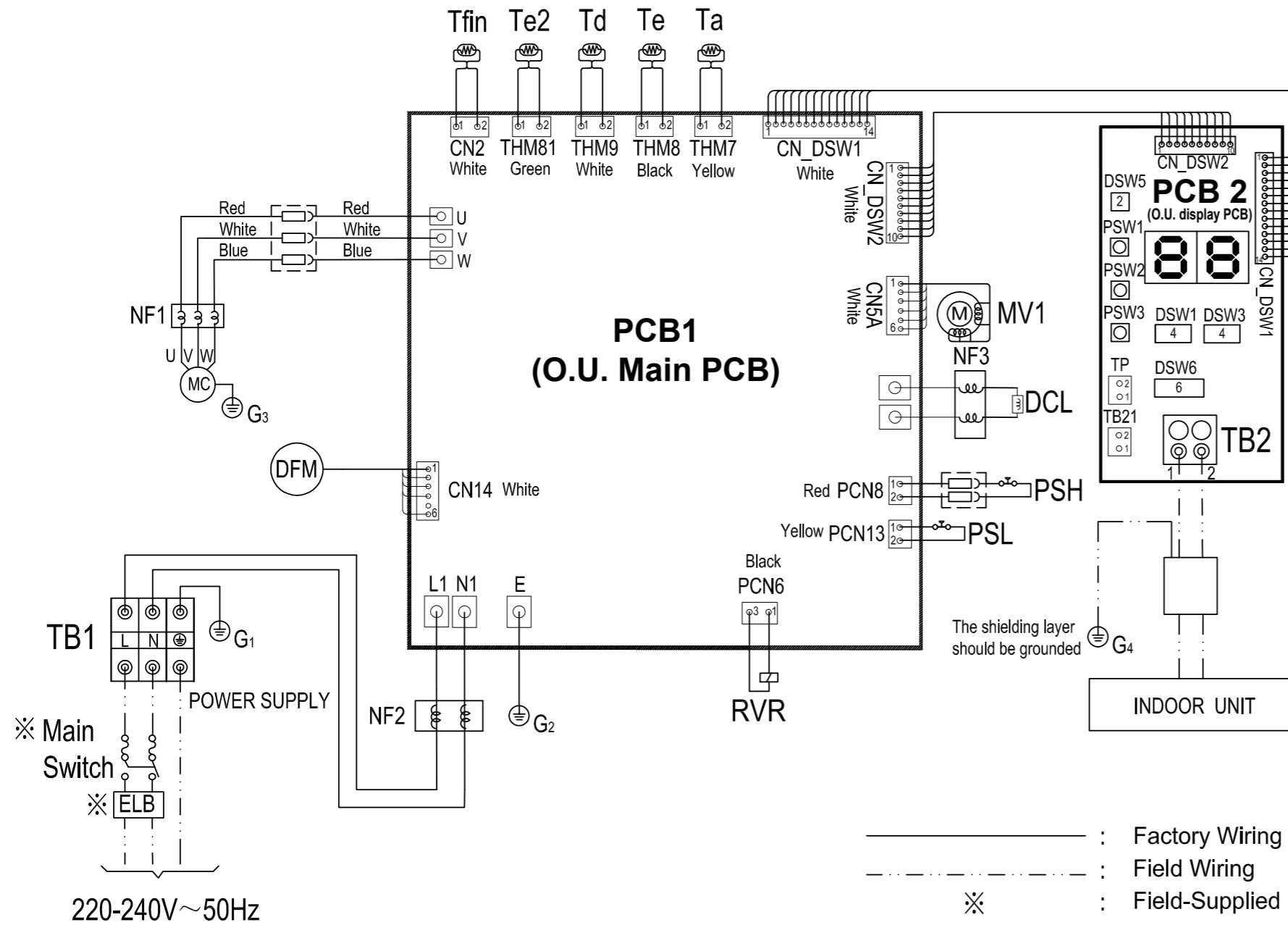
Outdoor unit:	AHW-044HCDS1	Indoor unit:	/				
Outdoor side heat exchanger of air conditioner/heat pump: air							
Indoor side heat exchanger of air conditioner/heat pump: water							
Type: compressor driven vapour compression							
Driver of compressor: electric motor							
Indication if the heater is equipped with a supplementary heater: no							
Parameters shall be declared for the average heating season							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
Heating							
Parameters shall be declared for:				Low temperature application			
Indoor heat exchanger:				Variable outlet			
Rated heating capacity	$P_{rated,h}$	4.61	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	204	%
Declared heating capacity for part load at indoor temperature 20°C and outdoor temperature $T_j$				Declared coefficient of performance (*)/Average season, at indoor temperature 20°C and outdoor temperature $T_j$			
$T_j = -7^\circ\text{C}$	$P_{dh}$	4.05	kW	$T_j = -7^\circ\text{C}$	COPd	3.26	—
$T_j = 2^\circ\text{C}$	$P_{dh}$	2.48	kW	$T_j = 2^\circ\text{C}$	COPd	5.02	—
$T_j = 7^\circ\text{C}$	$P_{dh}$	1.67	kW	$T_j = 7^\circ\text{C}$	COPd	6.70	—
$T_j = 12^\circ\text{C}$	$P_{dh}$	1.14	kW	$T_j = 12^\circ\text{C}$	COPd	8.74	—
$T_j = \text{bivalent temperature}$	$P_{dh}$	4.05	kW	$T_j = \text{bivalent temperature}$	COPd	3.26	—
$T_j = \text{operating limit}$	$P_{dh}$	4.56	kW	$T_j = \text{operating limit}$	COPd	2.68	—
Bivalent temperature				Operating limit temperature			
heating/Average	$T_{biv}$	-7	°C	heating/Average	$T_{ol}$	-10	°C
heating/Warmer	$T_{biv}$	—	°C	heating/Warmer	$T_{ol}$	—	°C
heating/Colder	$T_{biv}$	—	°C	heating/Colder	$T_{ol}$	—	°C
Degradation co-efficient	$C_d$	0.9					
Power consumption in modes other than 'active mode'							
Off mode	$P_{OFF}$	0.007	kW	Standby mode	PSB	0.007	kW
Thermostat-off mode(heating)	$P_{TO}$	0.008	kW	Crankcase heater mode	PCK	0.000	kW
Supplementary heater							
Supplementary capacity	$P_{SUP}$	0.021	kW	Type of energy input	Electric		
Other items							
Capacity control	Variable			Air flow rate, outdoor		2700	m <sup>3</sup> /h
Reference annual heating demand	$Q_H$	9465	kWh	Sound power level , outdoor measured	LWA	61	dB(A)
Annual energy consumption	$Q_{HE}$	1830	kWh	Global warming potential	GWP	675	kgCO <sub>2</sub> eq.
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						

Outdoor unit:	AHW-044HCDS1	Indoor unit:	/				
Outdoor side heat exchanger of air conditioner/heat pump: air							
Indoor side heat exchanger of air conditioner/heat pump: water							
Type: compressor driven vapour compression							
Driver of compressor: electric motor							
Indication if the heater is equipped with a supplementary heater: no							
Parameters shall be declared for the average heating season							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
Heating							
Parameters shall be declared for:				Medium temperature application			
Indoor heat exchanger:				Variable outlet			
Rated heating capacity	$P_{rated,h}$	4.09	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	136	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature $T_j$				Declared coefficient of performance (*)/Average season, at indoor temperature 20 °C and outdoor temperature $T_j$			
$T_j = -7^\circ\text{C}$	$P_{dh}$	3.60	kW	$T_j = -7^\circ\text{C}$	$COP_d$	2.08	—
$T_j = 2^\circ\text{C}$	$P_{dh}$	2.26	kW	$T_j = 2^\circ\text{C}$	$COP_d$	3.44	—
$T_j = 7^\circ\text{C}$	$P_{dh}$	1.49	kW	$T_j = 7^\circ\text{C}$	$COP_d$	4.33	—
$T_j = 12^\circ\text{C}$	$P_{dh}$	1.02	kW	$T_j = 12^\circ\text{C}$	$COP_d$	6.66	—
$T_j = \text{bivalent temperature}$	$P_{dh}$	3.60	kW	$T_j = \text{bivalent temperature}$	$COP_d$	2.08	—
$T_j = \text{operating limit}$	$P_{dh}$	3.59	kW	$T_j = \text{operating limit}$	$COP_d$	1.77	—
Bivalent temperature				Operating limit temperature			
heating/Average	$T_{biv}$	-7	°C	heating/Average	$T_{ol}$	-10	°C
heating/Warmer	$T_{biv}$	—	°C	heating/Warmer	$T_{ol}$	—	°C
heating/Colder	$T_{biv}$	—	°C	heating/Colder	$T_{ol}$	—	°C
Degradation co-efficient	$C_d$	0.9					
Power consumption in modes other than 'active mode'							
Off mode	$P_{OFF}$	0.007	kW	Standby mode	$P_{SB}$	0.007	kW
Thermostat-off mode(heating)	$P_{TO}$	0.008	kW	Crankcase heater mode	$P_{CK}$	0.000	kW
Supplementary heater							
Supplementary capacity	$P_{SUP}$	0.483	kW	Type of energy input	Electric		
Other items							
Capacity control	Variable			Air flow rate, outdoor		2700	$\text{m}^3/\text{h}$
Reference annual heating demand	$Q_H$	8412	kWh	Sound power level , outdoor measured	LWA	61	dB(A)
Annual energy consumption	$Q_{HE}$	2425	kWh	Global warming potential	GWP	675	$\text{kgCO}_2 \text{ eq.}$
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						

Outdoor unit:	AHZ-080HCDS1			Indoor unit:	/		
Outdoor side heat exchanger of air conditioner/heat pump: air							
Indoor side heat exchanger of air conditioner/heat pump: water							
Type: compressor driven vapour compression							
Driver of compressor: electric motor							
Indication if the heater is equipped with a supplementary heater: no							
Parameters shall be declared for the average heating season							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
Heating							
Parameters shall be declared for:				Low temperature application			
Indoor heat exchanger:				Variable outlet			
Rated heating capacity	$P_{rated,h}$	6.52	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	197	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature $T_j$				Declared coefficient of performance (*)/Average season, at indoor temperature 20 °C and outdoor temperature $T_j$			
$T_j = -7^\circ\text{C}$	$P_{dh}$	5.74	kW	$T_j = -7^\circ\text{C}$	$COP_d$	3.09	—
$T_j = 2^\circ\text{C}$	$P_{dh}$	3.47	kW	$T_j = 2^\circ\text{C}$	$COP_d$	4.76	—
$T_j = 7^\circ\text{C}$	$P_{dh}$	2.44	kW	$T_j = 7^\circ\text{C}$	$COP_d$	6.65	—
$T_j = 12^\circ\text{C}$	$P_{dh}$	1.48	kW	$T_j = 12^\circ\text{C}$	$COP_d$	9.58	—
$T_j = \text{bivalent temperature}$	$P_{dh}$	5.74	kW	$T_j = \text{bivalent temperature}$	$COP_d$	3.09	—
$T_j = \text{operating limit}$	$P_{dh}$	6.14	kW	$T_j = \text{operating limit}$	$COP_d$	2.84	—
Bivalent temperature				Operating limit temperature			
heating/Average	$T_{biv}$	-7	°C	heating/Average	$T_{ol}$	-10	°C
heating/Warmer	$T_{biv}$	—	°C	heating/Warmer	$T_{ol}$	—	°C
heating/Colder	$T_{biv}$	—	°C	heating/Colder	$T_{ol}$	—	°C
Degradation co-efficient	$C_d$	0.9					
Power consumption in modes other than 'active mode'							
Off mode	$P_{OFF}$	0.010	kW	Standby mode	$P_{SB}$	0.010	kW
Thermostat-off mode(heating)	$P_{TO}$	0.011	kW	Crankcase heater mode	$P_{CK}$	0.000	kW
Supplementary heater							
Supplementary capacity	$P_{SUP}$	0.349	kW	Type of energy input	Electric		
Other items							
Capacity control	Variable			Air flow rate, outdoor		2700	$\text{m}^3/\text{h}$
Reference annual heating demand	$Q_H$	13406	kWh	Sound power level , outdoor measured	LWA	64	dB(A)
Annual energy consumption	$Q_{HE}$	2680	kWh	Global warming potential	GWP	675	$\text{kgCO}_2 \text{ eq.}$
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						

Outdoor unit:	AHZ-080HCDS1			Indoor unit:	/		
Outdoor side heat exchanger of air conditioner/heat pump: air							
Indoor side heat exchanger of air conditioner/heat pump: water							
Type: compressor driven vapour compression							
Driver of compressor: electric motor							
Indication if the heater is equipped with a supplementary heater: no							
Parameters shall be declared for the average heating season							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
Heating							
Parameters shall be declared for:				Medium temperature application			
Indoor heat exchanger:				Variable outlet			
Rated heating capacity	$P_{rated,h}$	6.07	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	137	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature $T_j$				Declared coefficient of performance (*)/Average season, at indoor temperature 20 °C and outdoor temperature $T_j$			
$T_j = -7^\circ\text{C}$	$P_{dh}$	5.34	kW	$T_j = -7^\circ\text{C}$	$COP_d$	2.18	—
$T_j = 2^\circ\text{C}$	$P_{dh}$	3.11	kW	$T_j = 2^\circ\text{C}$	$COP_d$	3.41	—
$T_j = 7^\circ\text{C}$	$P_{dh}$	2.09	kW	$T_j = 7^\circ\text{C}$	$COP_d$	4.36	—
$T_j = 12^\circ\text{C}$	$P_{dh}$	1.23	kW	$T_j = 12^\circ\text{C}$	$COP_d$	6.52	—
$T_j = \text{bivalent temperature}$	$P_{dh}$	5.34	kW	$T_j = \text{bivalent temperature}$	$COP_d$	2.18	—
$T_j = \text{operating limit}$	$P_{dh}$	5.81	kW	$T_j = \text{operating limit}$	$COP_d$	1.72	—
Bivalent temperature				Operating limit temperature			
heating/Average	$T_{biv}$	-7	°C	heating/Average	$T_{ol}$	-10	°C
heating/Warmer	$T_{biv}$	—	°C	heating/Warmer	$T_{ol}$	—	°C
heating/Colder	$T_{biv}$	—	°C	heating/Colder	$T_{ol}$	—	°C
Degradation co-efficient	$C_d$	0.9					
Power consumption in modes other than 'active mode'							
Off mode	$P_{OFF}$	0.010	kW	Standby mode	$PSB$	0.010	kW
Thermostat-off mode(heating)	$P_{TO}$	0.011	kW	Crankcase heater mode	$PCK$	0.011	kW
Supplementary heater							
Supplementary capacity	$P_{SUP}$	0.227	kW	Type of energy input	Electric		
Other items							
Capacity control	Variable			Air flow rate, outdoor		2700	$\text{m}^3/\text{h}$
Reference annual heating demand	$Q_H$	12471	kWh	Sound power level , outdoor measured	$LWA$	64	dB(A)
Annual energy consumption	$Q_{HE}$	3574	kWh	Global warming potential	$GWP$	675	$\text{kgCO}_2 \text{ eq.}$
Contact details	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd No. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, China						

# Electric Wiring Diagram



Mark	Name
TB <sub>1,2</sub>	Terminal Board
PCB <sub>1,2</sub>	Printed Circuit Board
DCL	Reactor
MC	Motor for Compressor
DFM	DC Fan Motor
MV1	Micro-Computer Control Expansion Valve
NF <sub>1,2,3</sub>	Magnet ring for Noise Filter
PSH	High Pressure Switch
PSL	Low Pressure Switch
THM <sub>7,8,9,81</sub>	Thermistor
G <sub>1-4</sub>	Earth
○	Terminals
RVR	Reversing Valve Relay
CN,PCN	Connector
Tfin	Thermistor for Fin
ELB	Earth Leakage Breaker
PSW <sub>1,2,3</sub>	Push Switch on PCB2
DSW <sub>1,3,5,6</sub>	Dip Switch on PCB2

**WARNING**  
 Do not connect the power source line to the PCB2. The PCB2 is for the low voltage or communication line. If connected, the printed circuit board will be damaged.

**WARNING**  
 High voltage danger!  
 Turn OFF the main power switch to the indoor unit and the outdoor unit and wait for more than 10 minutes before electrical wiring work or a periodical check is performed.

DSW settings (before shipment)

DSW1(Unit model setting) No setting is required.	DSW3(Capacity Setting) No setting is required.			DSW5(End-Res.)	DSW6(Ref.Cycle No.Setting)
ON OFF	44 (2.0 HP) ON OFF	60 (2.5 HP) ON OFF	80 (3.0 Hp) ON OFF	ON OFF	ON OFF Ref.Cycle No.Setting 0~63

The mark of ■ indicates the position of dip switchies.

Note:  
 1. All the field wiring and equipment must comply with local codes.

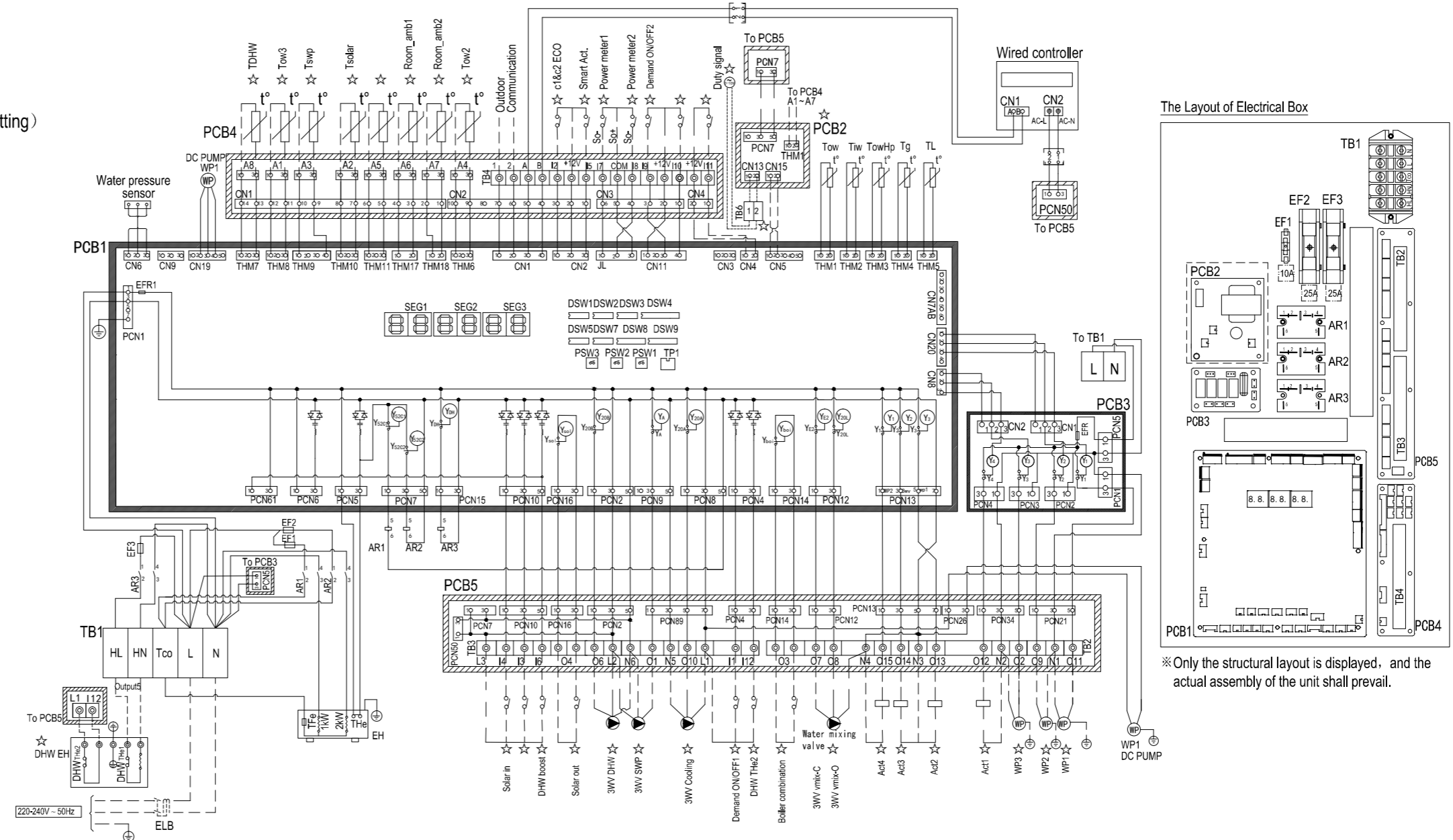
# ELECTRICAL WIRING DIAGRAM

**Warning** Electrical operation and regular inspection are not allowed until 10 minutes after the main power supply is cut off

- : Factory Wiring
- - - : Field Wiring
- ELB : Leakage Protector
- ☆ : Optional Parts
- (Output/Input/Auxsensor factory setting)
- ⊕ : Earth Mark

**Note:**  
1.All the field wiring and equipment must comply with local codes.

Mark	Name
AR	Relay
CN.THA.JL	Connector
PCN	Connector
PCB	Printed Circuit Board
TB	Terminal
EH	Electric heater of water module
TFe	The fuse inside electric heater
THe	The thermostat of electric heater
DHW EH	Electric heater of DHW tank
DHW <sub>THe</sub>	The thermostat of DHW Electric heater
EFR	Fuse(PCB)
EF	Fuse
DSW	Dip Switch
3W <sub>DHW</sub>	3 Way Valve for DHW
3W <sub>SWP</sub>	3 Way Valve for Swimming Pool
3W <sub>Cooling</sub>	3 Way Valve for Cooling
3W <sub>Vmix</sub>	3 Way Valve for Mixing Valve
WP	Water Pump
Act	Electrothermal actuator
Y	Relay(PCB)
ECO	ECO Operation
Smart	Smart Operation
Solar in	Solar operation input signal
Solar out	Solar operation output signal
Boiler out	Boiler operation output signal
Tiw	Inlet water thermistor
Tow	Outlet water thermistor
TowHp	Outlet HP water thermistor
Tg	Gas pipe thermistor
TL	Liquid pipe thermistor
TDHW	DHW water thermistor
Tow2	C2 outlet water thermistor
Tswp	Swimming Pool water thermistor
Tsolar	Solar thermistor
Tow3	Hydraulic separator thermistor



**DIP Switch Settings of PCB1** ■ Indicates the position of DIP Switch

<p>(1)DSW1: Unit model setting No setting is required.</p> <p>Split</p>	<p>(4)DSW4: Additional setting</p> <p>Setting before shipment</p> <p>Water pump forced ON</p> <p>Auxiliary electric heater forced OFF</p> <p>ON:Anti-freezing enabled OFF:Anti-freezing disabled</p> <p>Water pump mode when Thermo OFF</p> <p>ON:Operate periodically OFF:Operate constantly</p> <p>Manual emergency setting</p> <p>ON:Manual emergency enabled OFF:Manual emergency disabled</p> <p>DHW electric heater allowance setting</p> <p>ON:DHW electric heater cancel forced OFF OFF:DHW electric heater forced OFF</p>	<p>DHW 3-way valve forced ON</p> <p>Start air purge</p> <p>(5)DSW5: Additional setting</p> <p>setting before shipment</p> <p>ON:Cancel 75/78 a1arm(Water pump abnormalities)</p> <p>ON:WP3 operates in space cooling mode.</p> <p>ON:Cancel Alarm of Thermistor Tow2</p> <p>(6)DSW6: Fuse reset</p> <p>Setting before shipment</p>	<p>(7)DSW7: Not used</p> <p>Setting before shipment</p> <p>(8)DSW8: Refrigeration system No.setting Setting is required. Use binary encoding method.Before shipment are all OFF.</p> <p>Max.No.63 are available to set when all the equipment are connected to corresponding Central Control System. EX: Set refrigeration system no. as 8.</p> <p>(9)DSW9: Indoor unit No.setting No setting is required.</p>
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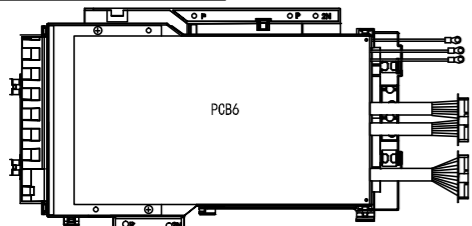


Mark	Name	Mark	Name
AR	Relay	Tow	Outlet water thermistor
CN,THMA,JL	Connector	TowHp	Outlet HP water thermistor
PCN	Connector	Tg	Gas pipe thermistor
PCB	Printed Circuit Board	TL	Liquid pipe thermistor
TB	Terminal	TDHW	DHW water thermistor
AEH	Auxiliary electric heater	Tow2	C2 outlet water thermistor
TFe	The temperature fuse of electric heater	Tswp	Swimming Pool water thermistor
THE	The thermostat of electric heater	Tsolar	Solar thermistor
DHW EH	Electric heater of DHW Tank	Tow3	Hydraulic separator thermistor
DHW <sub>mix</sub>	The thermostat of DHW Electric heater	DCL	Reactor
EFR	Fuse(PCB)	MC	Motor for Compressor
EF	Fuse	DFM	DC Fan Motor
DSW	Dip Switch	MV	Micro-Computer Control Expansion Valve
3WV <sub>DHW</sub>	3 Way Valve for DHW	NF	Magnet ring for Noise Filter
3WV <sub>SWP</sub>	3 Way Valve for Swimming Pool	PSH	High Pressure Switch
3WV <sub>Cooling</sub>	3 Way Valve for Cooling	PSL	Low Pressure Switch
3WV <sub>Mix</sub>	3 Way Valve for Mixing Valve	RVR	Reversing Valve Relay
WP	Water Pump	Tfin	Thermistor for Fin
Act	Electrothermal actuator		
Y	Relay(PCB)		
ECO	ECO Operation		
Smart	Smart Operation		
Solar in	Solar operation input signal		
Solar out	Solar operation output signal		
Boiler out	Boiler operation output signal		
Tiw	Inlet water thermistor		

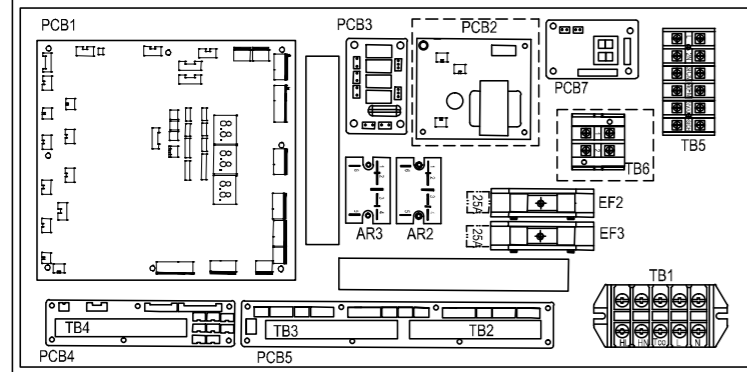
Note:

1.All the field wiring and equipment must comply with local codes.

The Layout of Electrical Box 1



The Layout of Electrical Box 2



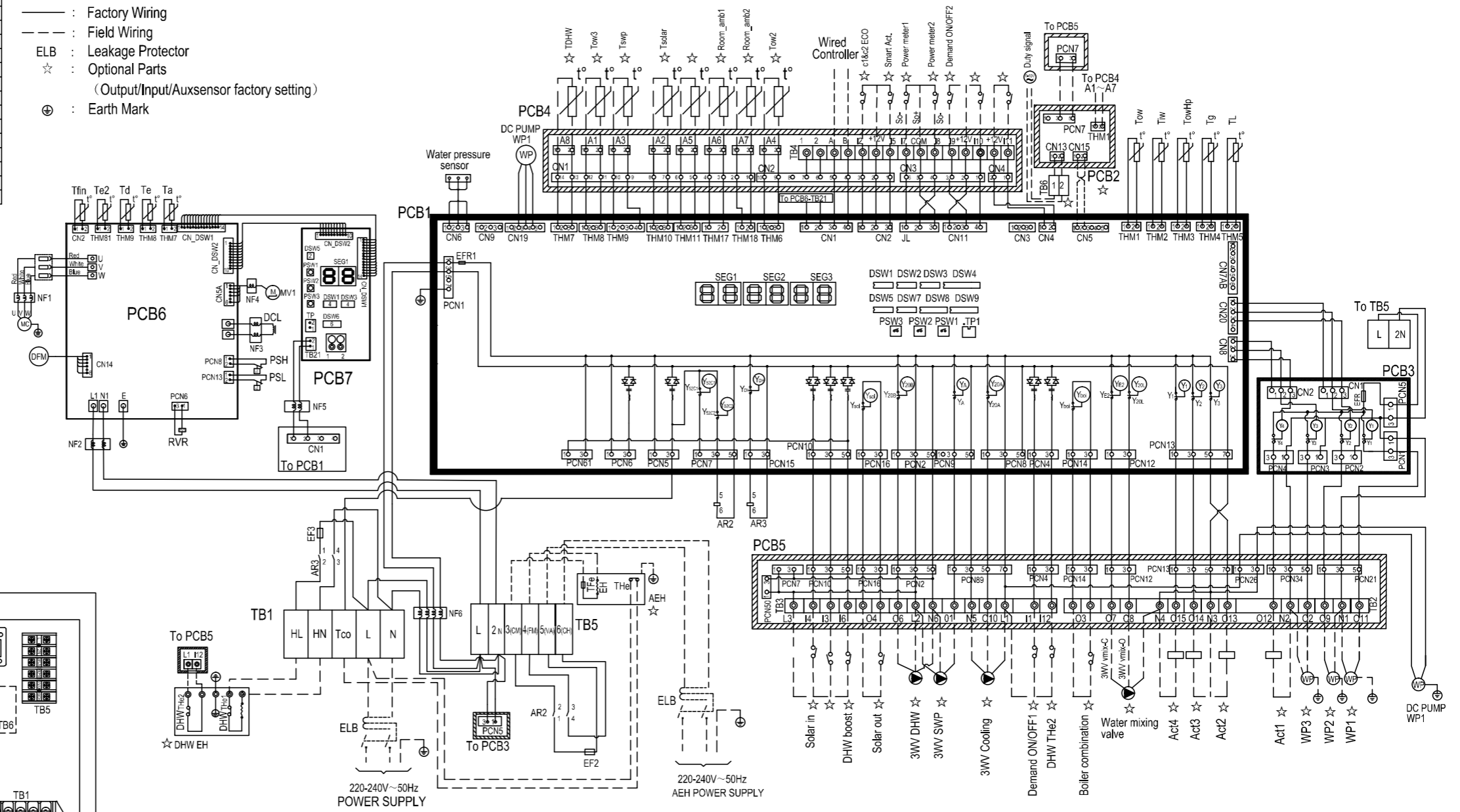
Only the structural layout is displayed, and the actual assembly of the unit shall prevail.

DIP Switch Settings of PCB7(before shipment) ■ Indicates the position of DIP Switch

DSW1(Unit model setting) No setting is required.	DSW3(Capacity Setting) No setting is required.		DSW5(End-Res.)	DSW6(Ref.Cycle No.Setting)
ON OFF	44 (2.0 HP) ON OFF	80 (3.0 HP) ON OFF	ON OFF	ON OFF Ref.Cycle No.Setting 0-63

**Warning** Electrical operation and regular inspection are not allowed until 10 minutes after the main power supply is cut off

- : Factory Wiring
- - - : Field Wiring
- ELB : Leakage Protector
- ☆ : Optional Parts (Output/Input/Auxsensor factory setting)
- ⊕ : Earth Mark



DIP Switch Settings of PCB1 ■ Indicates the position of DIP Switch

(1)DSW1: Unit model setting No setting is required. Monobloc	(4)DSW4: Additional setting Setting before shipment	DHW 3-way valve forced ON	(7)DSW7: Not used
(2)DSW2: Unit capacity setting No setting is required. 44 (2.0 HP) 80 (3.0 HP)	Water pump forced ON	Start air purge	Setting before shipment
(3)DSW3: Additional setting Setting before shipment	Auxiliary electric heater forced OFF	(5)DSW5: Additional setting	(8)DSW8: Refrigeration system No.setting Setting is required. Use binary encoding method.Before shipment are all OFF.
ON:Cancel 70 alarm(Water pressure abnormality)	ON:Anti-freezing enabled OFF:Anti-freezing disabled	Setting before shipment	Max.No.63 are available to set when all the equipment are connected to corresponding Central Control System. EX: Set refrigeration system no. as 8.
Anti-freezing settings ON:Whole water cycle does anti-freezing. OFF:Only primary cycle does anti-freezing.	Water pump mode when Thermo OFF ON:Operate periodically OFF:Operate constantly	ON:Cancel I75/78 alarm(Water pump abnormalities)	(9)DSW9: Indoor unit No.setting No setting is required.
	Manual emergency setting ON:Manual emergency enabled OFF:Manual emergency disabled	ON:WP3 operates in space cooling mode.	Setting before shipment
	DHW electric heater allowance setting ON:DHW electric heater cancel forced OFF OFF:DHW electric heater forced OFF	ON:Cancel Alarm of Thermistor Tow2	
		(6)DSW6: Fuse reset	
		Setting before shipment	



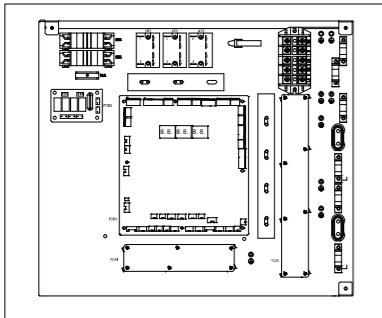
# ELECTRICAL WIRING DIAGRAM

- : Factory Wiring
- - - : Field Wiring
- ELB : Leakage Protector
- ☆ : Optional Parts  
(Output/Input/Auxsensor factory setting)
- ⊕ : Earth Mark

Note:  
1.All the field wiring and equipment must comply with local codes.

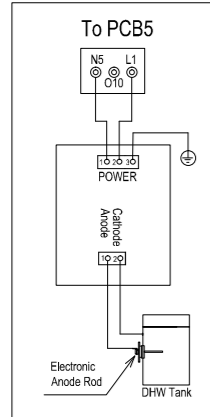
Mark	Name	Mark	Name
AR	Relay	Act	Electrothermal actuator
CN,THA,JL	Connector	Y	Relay(PCB)
PCN	Connector	ECO	ECO Operation
PCB	Printed Circuit Board	Smart	Smart Operation
TB	Terminal	Solar in	Solar operation input signal
EH	Electric heater of water module	Solar out	Solar operation output signal
TFe	The fuse inside electric heater	Boiler out	Boiler operation output signal
THe	The thermostat of electric heater	Tiw	Inlet water thermistor
DHW EH	Electric heater of DHW tank	Tow	Outlet water thermistor
DHW The	The thermostat of DHW Electric heater	TowHp	Outlet HP water thermistor
EFR	Fuse(PCB)	Tg	Gas pipe thermistor
EF	Fuse	TL	Liquid pipe thermistor
DSW	Dip Switch	TDHW	DHW water thermistor
3WVDHW	3 Way Valve for DHW	Tow2	C2 outlet water thermistor
3WVSWP	3 Way Valve for Swimming Pool	Tswp	Swimming Pool water thermistor
3WVcooling	3 Way Valve for Cooling	Tsolar	Solar thermistor
3WVmix	3 Way Valve for Mixing Valve	Tow3	Hydraulic separator thermistor
WP	Water Pump	TCO	Manual reset temperature limiter

## The Layout of Electrical Box

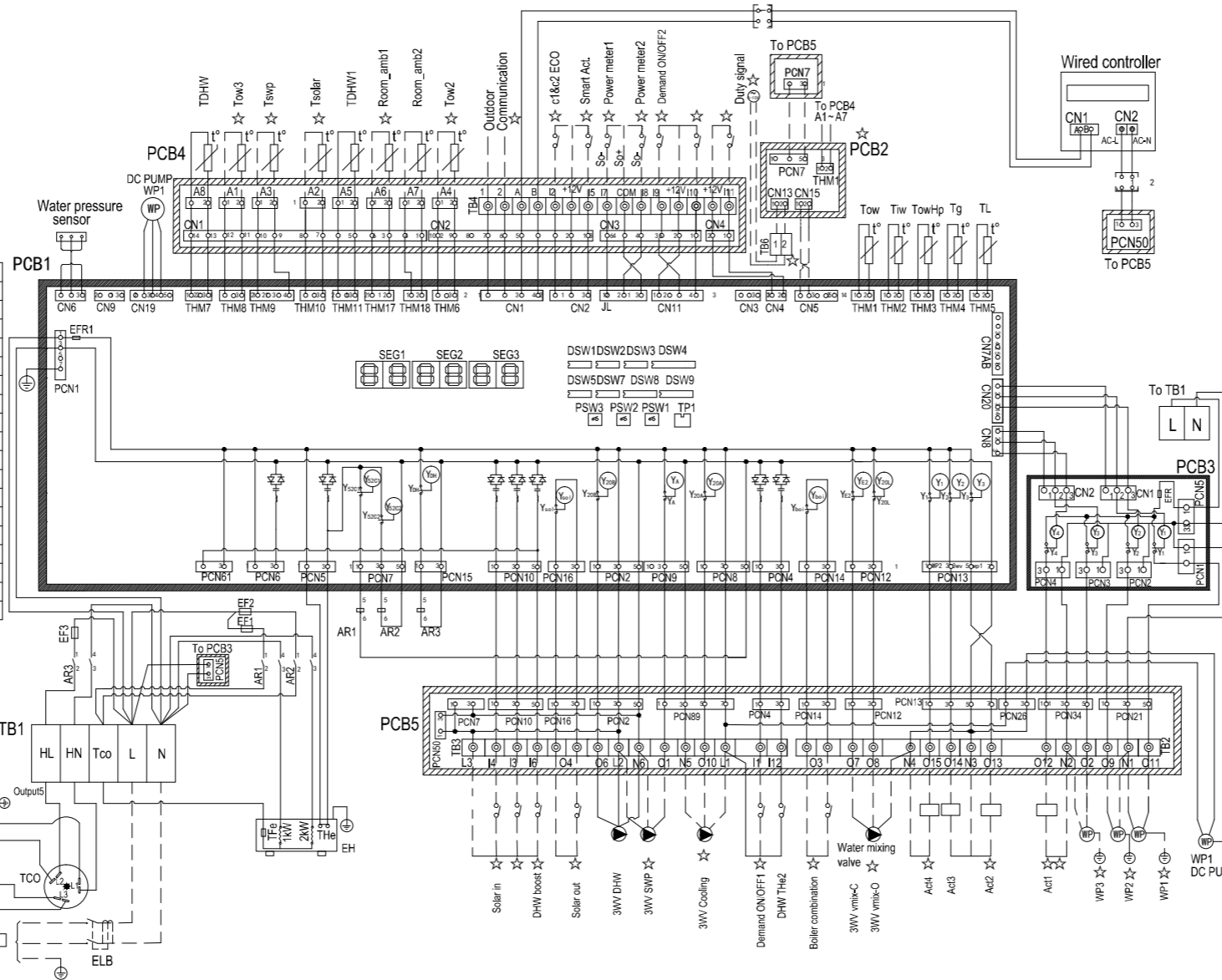


※ Only the structural layout is displayed, and the actual assembly of the unit shall prevail.

## Electronic Anode Wiring Diagram



**Warning** Electrical operation and regular inspection are not allowed until 10 minutes after the main power supply is cut off

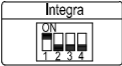


## Alarm Code Table

Alarm Code	Category	Content of Abnormality	Leading Cause
02	Outdoor unit	Activation of Protection Device (High Pressure Switch)	Activation of PSH (Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing).
03	Outdoor/ Indoor unit	Abnormal transmission between the Indoor unit and the Outdoor unit	Incorrect Wiring, Loose Terminals, Disconnect Wire, Blowout of Fuse, Outdoor or Indoor Unit Power OFF.
04	Outdoor unit	Abnormal transmission between Outdoor Unit main PCB and Inverter	O.U.main PCB and Inverter Transmission Failure (Loose Connector, Wire Breaking, Blowout of Fuse).
06	Outdoor unit	Abnormal Inverter Voltage	Outdoor Voltage Drop, Insufficient Power Capacity.
07	Outdoor unit	Decrease in Discharge Gas Superheat	Excessive Refrigerant Charge, Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Opened Position (Disconnect Connector).
08	Outdoor unit	Increase in Discharge Gas Temperature	Insufficient Refrigerant Charge, Pipe Clogging Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Closed Position (Disconnect Connector).
11	Indoor unit	Inlet Water Thermistor (Tiw) Abnormality	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit.
12	Indoor unit	Outlet Water Thermistor (Tow) Abnormality	
13	Indoor unit	Liquid Refrigerant Pipe Thermistor (TL) Abnormality	
14	Indoor unit	Gas Refrigerant Pipe Thermistor (Tg) Abnormality	
16	Indoor unit	DHW Thermistor (TDHW) Abnormality	
17	Indoor unit	Outlet HP Water Thermistor (TowHP) Abnormality	
18	Indoor unit	Water Pressure Sensor (Pw) Abnormality	
22	Outdoor unit	Outdoor unit Ambient Thermistor (Ta)	
23	Outdoor unit	Compressor Discharge Gas Thermistor (Td)	
24	Outdoor unit	Heat Exchanger Liquid Pipe Thermistor (Te)	
25	Outdoor unit	Heat Exchanger Liquid Pipe Thermistor 2 (Te2)	
31	Outdoor unit	Incorrect Capacity Setting of Outdoor Unit and Indoor Unit	Incorrect Capacity Setting of Outdoor Unit and Indoor Unit.
35	Outdoor unit	Incorrect Setting of Indoor Unit No.	Incorrect Setting of Indoor Unit No.
43	Outdoor unit	Activation of Low Compression Ratio Protection Device	Defective Compression (Failure of Compressor of Inverter, Loose Power Supply Connection).
47	Outdoor unit	Activation of Low Pressure Decrease Protection Device (Vacuum Operation Protection)	Insufficient Refrigerant, Refrigerant Piping, Clogging, Expansion Valve Locking at close Position (Loose Connector).
48	Outdoor unit	Activation of Inverter Overcurrent Protection Device	Overload Operation, Compressor Failure.
51	Outdoor unit	Abnormal Inverter Current Sensor	Current Sensor Failure.
53	Outdoor unit	Inverter Error Signal Detection	Error Signal Detection (IPM Error, Step-Out Detection, PFC hardware Error).
54	Outdoor unit	Abnormality of Inverter Fin Temperature	Abnormal Inverter Fin Thermistor, Inverter fin thermistor protection activation.
55	Outdoor unit	Inverter Failure	O.U. main PCB Failure or flow is detected abnormality in the hydraulic cycle.
57	Outdoor unit	Activation of Fan Controller Protection	Abnormal speed of Fan-motor.
70	Indoor unit	Water Pressure Alarm	Water pressure is detected abnormality in the hydraulic cycle.
71	Indoor unit	Protection Thermostat of DHW Electric Heater Activation	High temperature is detected in DHW Electric Heater.
72	Indoor unit	Protection Thermostat of Auxiliary Electric Heater Activation	High temperature is detected in Auxiliary Electric Heater.
74	Indoor unit	Overheating Protection for water cycle 2	Water Cycle 2 supply temperature > Target temperature + offset lasting for 10mins.
75	Indoor unit	Water Pump (WP1) malfunction	Water Pump (WP1) output PWM is detected abnormality.
76	Indoor unit	Freeze Protection Stop by indoor unit temperature thermistors	Water temperature or refrigerant temperature is too low and trigger freezing protection.
78	Indoor unit	Hydraulic flow abnormality alarm (WP1)	Water flow is detected abnormality in the hydraulic cycle.
80	Indoor unit	Transmission failure between unit and Master Controller	No Transmission for a continuous period of 5 minutes between Unit and Master Controller, failed wiring (breaking, wiring error, etc.).
A1	Indoor unit	Auxiliary sensor Abnormality (Tow3)	Loose, disconnected, broken or short-circuited connector. Or the condition of Hydraulic Separator is Enabled but Tow3 has not been set in all the Auxiliary sensors (A1-A7).
A2	Indoor unit	Auxiliary sensor Abnormality (Tswp)	Loose, disconnected, broken or short-circuited connector. Or the condition of Swimming pool is Enabled but Tow2 has not been set in all the Auxiliary sensors (A1-A7).
A3	Indoor unit	Auxiliary sensor Abnormality (Tsolar)	Loose, disconnected, broken or short-circuited connector. Or the condition of Solar function need to be set as the solar sensor but Tsolar has not been set in all the Auxiliary sensors (A1-A7).
A4	Indoor unit	Auxiliary sensor Abnormality (Tow2)	Loose, disconnected, broken or short-circuited connector. Or the condition of Cycle 2 is Enabled but Tow2 has not been set in all the Auxiliary sensors (A1-A7).
A5	Indoor unit	Auxiliary sensor Abnormality (Room_amb1...7)	Loose, disconnected, broken or short-circuited connector.
F1	Indoor unit	Alarm sent by Outdoor unit (Outdoor unit alarm 21-29)	-
F2	Indoor unit	Alarm sent by Outdoor unit (Outdoor unit alarm except 21-29 and EE)	-
F3	Indoor unit	Alarm sent by Outdoor unit (Outdoor unit alarm EE)	-
H2	Wired Remote Controller and Master Controller	Wired Remote Controller and Master Controller transmission alarm	Wired Remote Controller is configured as room thermostat but no Wired Remote Controller is detected.
EE	Outdoor unit	Compressor Protection Alarm (It can not be reset from Master Controller)	This alarm code appears when the following alarms* occurs three times within 6 hours. *02, 07, 08, 43 to 45, 47

## DIP Switch Settings of PCB1

(1)DSW1: Unit model setting  
No setting is required.



(2)DSW2: Unit capacity setting  
No setting is required.

Setting before shipment

ON:Cancel 70 alarm(Water pressure abnormality)

Anti-freezing settings  
ON:Whole water cycle does anti-freezing.  
OFF:Only primary cycle does anti-freezing.

(4)DSW4: Additional setting

Setting before shipment	
Water pump forced ON	
Auxiliary electric heater forced OFF	
ON:Anti-freezing enabled OFF:Anti-freezing disabled	
Water pump mode when Thermo OFF ON: Operate periodically OFF: Operate constantly	
Manual emergency setting ON: Manual emergency enabled OFF: Manual emergency disabled	
DHW electric heater allowance setting ON: DHW electric heater cancel forced OFF OFF: DHW electric heater forced OFF	

DHW 3-way valve forced ON

Start air purge

(5)DSW5: Additional setting

Setting before shipment

(6)DSW6: Fuse reset

Setting before shipment

(7)DSW7: Not used

Setting before shipment

(8)DSW8: Refrigeration system No.setting  
Setting is required.  
Use binary encoding method. Before shipment are all OFF.

Max No.63 are available to set when all the equipment are connected to corresponding Central Control System.  
EX: Set Refrigeration system no. as 8.

(9)DSW9: Indoor unit No.setting  
No setting is required.

Setting before shipment

10. Control function

10.1 Basic function introduction

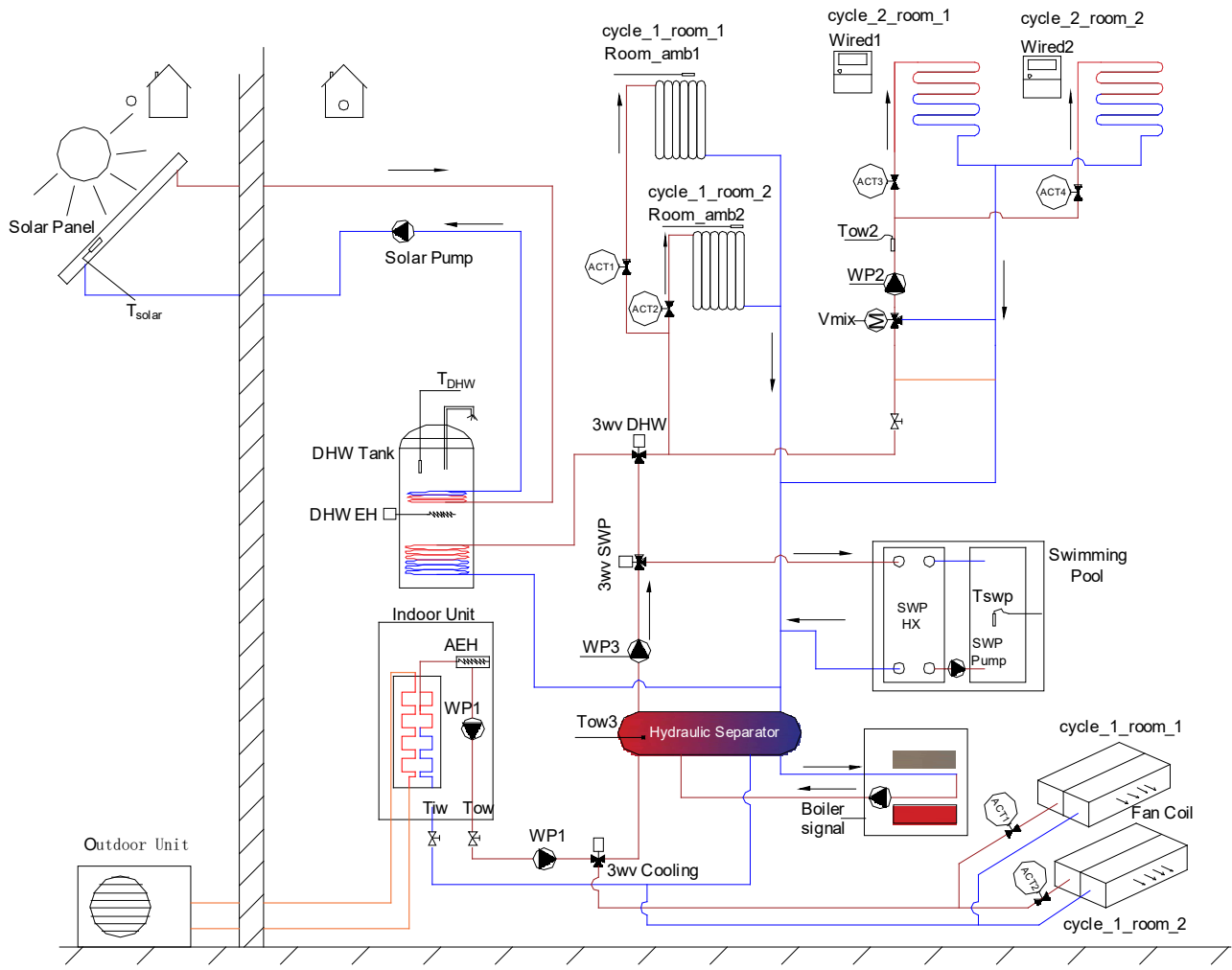
There are four main functions that can be set on the master controller interface and incorporated into the heat pump and water circulation.

The configuration of this option should be done through the master controller.

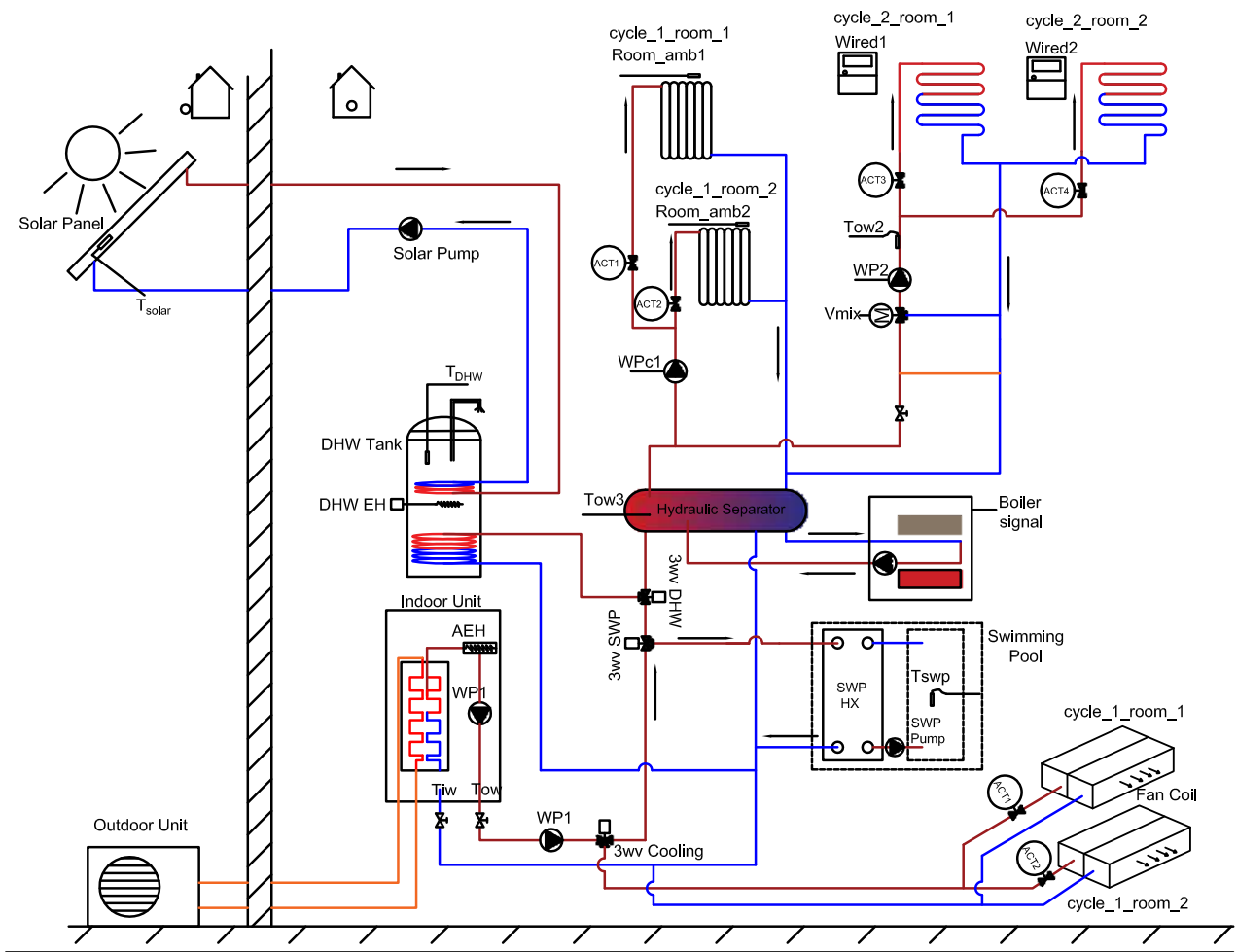
Configuration → Complementary Heating → Boiler

Mark	Description	Default Value	Range	Steps	Units
PDS	Point of DHW & SWP	Before Hydr S	Before Hydr S / After Hydr S	-	-

(1) Point of 3-way valve for DHW and 3-way valve for swimming pool is after hydraulic separator. [Point of DHW & SWP] set as [After Hydr S]. It is possible to use boiler to heat up DHW and SWP referring to 10.6.3 and 10.6.4. WP3 offers total hydraulic head for all water circulation of DHW/SWP/Space Heating.

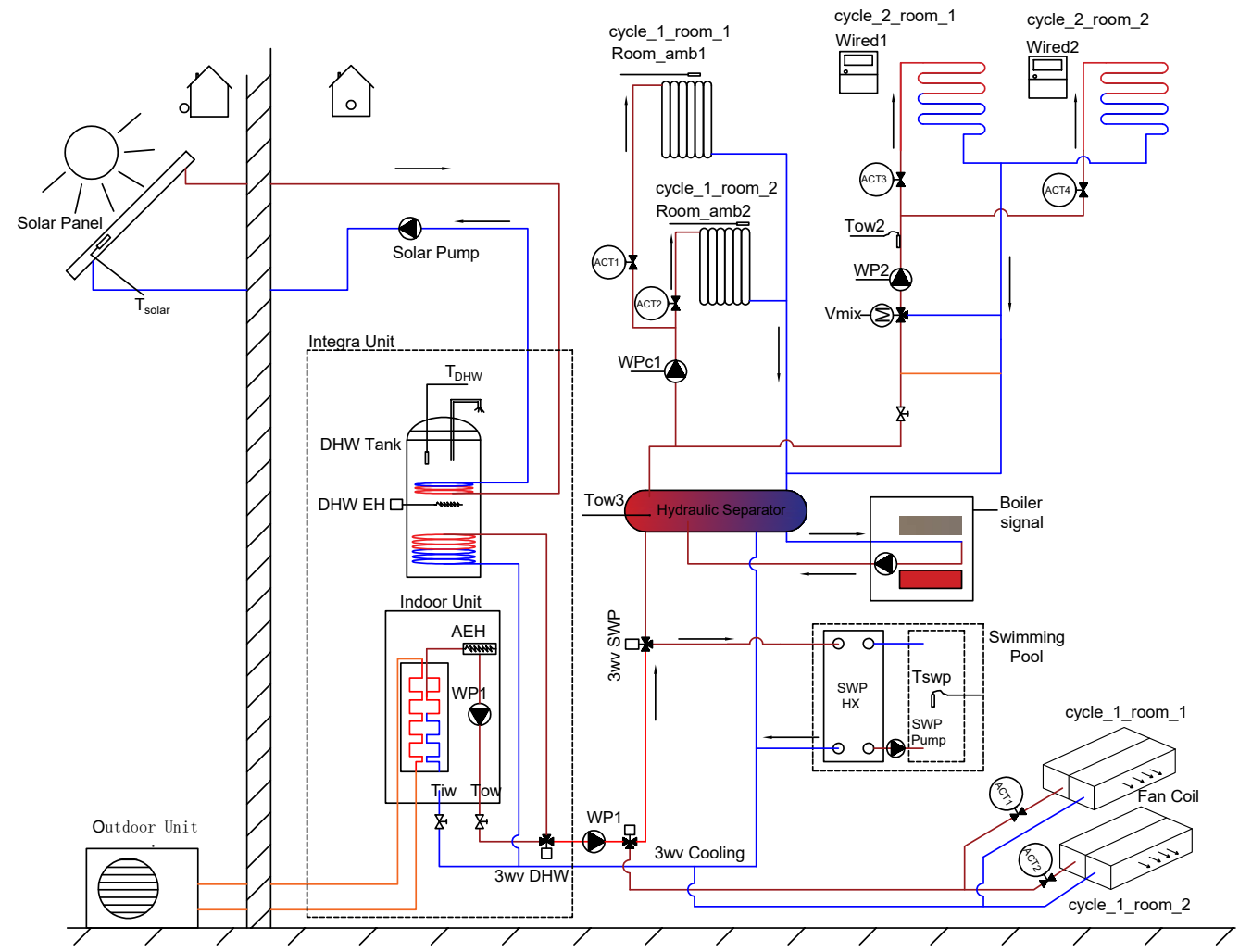


(2) Point of 3-way valve for DHW and 3-way valve for swimming pool is after hydraulic separator. [Point of DHW & SWP] set as [Before Hydr S]. WPC1 and WP2 offer hydraulic head for Water Cycle 1 and Water Cycle 2 separately. It is possible to use storage heat capacity in hydraulic separator to heat up Water Cycle 1 and Water Cycle 2 during heat pump DHW operation referring to 10.8.



## Control function

(3) For Integra Unit with DHW tank combination, [Point of DHW & SWP] is [Before Hydr S] as default setting. The extra WP1 must be installed at beginning of water circulation just after 3WV DHW to offer total hydraulic head for all water circulation of SWP/Space Heating/ Space Cooling.



Mark	Description
AEH	Auxiliary electric heater in water circulation
DHW EH	DHW Electric Heater in DHW tank
WP1	Water Pump1 between plate exchanger and hydraulic separator /installation
WP2	Water Pump2 used only on Water Cycle 2
WPc1	Water Pump c1 used only on Water Cycle 1
WP3	Water Pump3 from hydraulic separator to the distribution circuit
Vmix	mixing valve to achieve a second temperature control on Water Cycle 2
3WV Cooling	3-way valve for cooling diverting to cooling fan coils
3WV DHW	3-way valve for DHW diverting to the sanitary DHW tank inner coil
3WV SWP	3-way valve for swimming pool diverting to the swimming pool heat exchanger
ACT1- ACT7	room actuator to achieve room temperature control
Cycle_1_room1...4	Room thermostat1...4 set on Water Cycle 1
Cycle_2_room1...4	Room thermostat1...4 set on Water Cycle 2
Room_amb1...7	Room temperature detected by auxiliary sensor
wired1...2	wired room controller1...2
Tiw	Measured inlet water temperature
Tow	Measured outlet water temperature
Tow2	Water Cycle 2 outlet water temperature
Tow3	Hot water temperature detection of hydraulic separator
TDHW	DHW water temperature of DHW tank
Tswp	Measured swimming pool water temperature
Tsolar	Measured Hot water temperature of solar panels

### NOTE

1. Automatic Bypass Valve or equivalent Bypass replacement should be fitted after the pump in water circulation to prevent pump pressure from climbing significantly and ensure adequate flow.

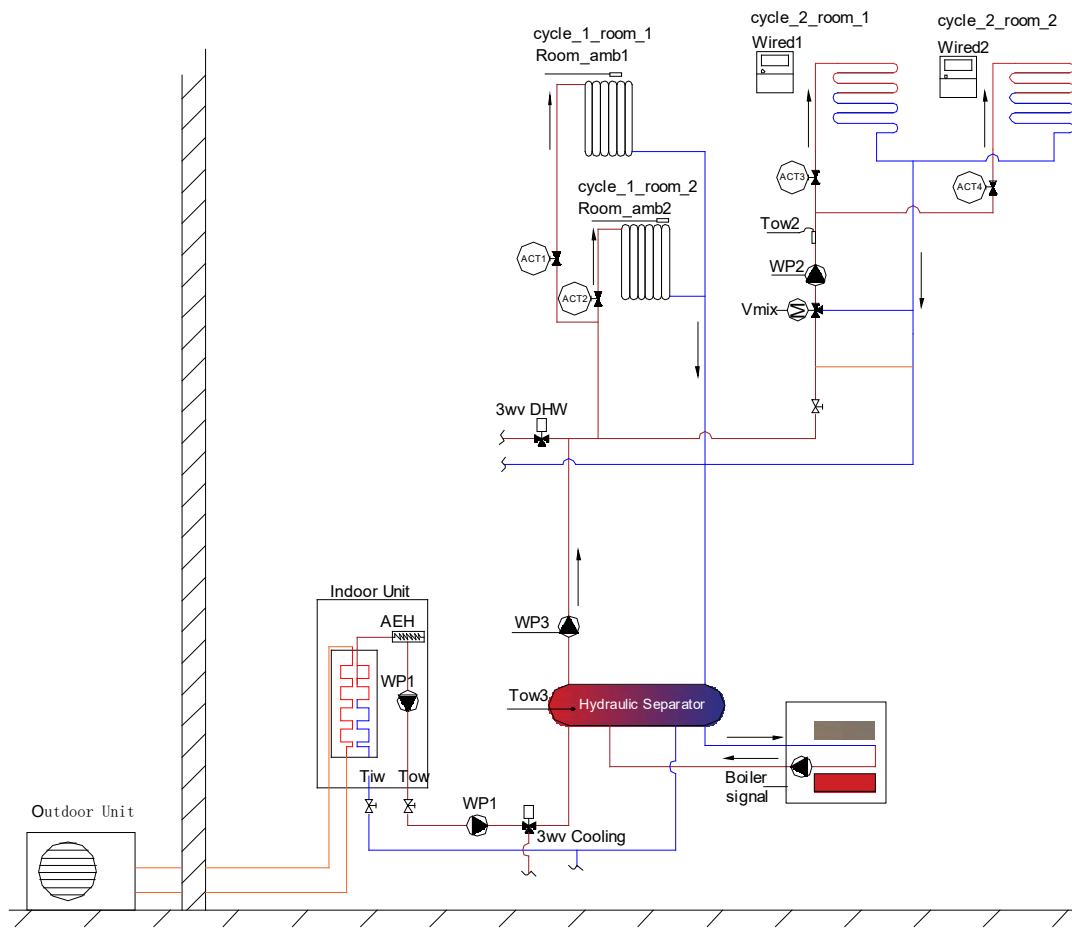
10.1.1 Main function

(1) Space heating and Water Cycle

- Water Cycle 1 and Water Cycle 2

Space heating is operated by Water Cycle 1 or combination of Water Cycle 1 and Water Cycle 2. The unit is connectable to only one cycle demand (Water Cycle 1), either high temperature (i.e., radiator or fan coils) or low temperature (radiant floor).

Water Cycle 1 will be direct (high temperature for radiator or fan coils operation) and Water Cycle 2 will be a mixing cycle in order to have a second temperature control using mixing valve (low temperature for floor heating operation). Additionally, a motorized valve need be added in order to close direct cycle when not in use. The floor heating loops (Cycle 2) require a lower temperature than with radiator or fan coils (Cycle 1). To get these 2 water temperature levels, a mixing station is required. This mixing station is controlled using the indoor unit by means of a mixing valve and additional water sensor.



- Room thermostat

There are max. 4 room thermostats that can be incorporated to each Water Cycle (Cycle 1 and Cycle 2). The room thermostats can be Rooms function on Master controller, Slave room controller or Demand ON/OFF1/2 by input signal. And each room thermostat will control Switch ON/OFF and Thermo ON/OFF of each room based on individual operation (ON/OFF / setting temperature / room temperature) and need an actuator to achieve room temperature control.

- Room thermostat & Water Cycle

- ① If any one of room thermostats on the specific Water Cycle (Cycle 1 or Cycle 2) is Switch ON and Thermo ON, The corresponding Water Cycle will be Switch ON and Thermo ON. Then the heat pump and other heat source will be operated to meet demand.
- ② If all room thermostats on the specific Water Cycle (Cycle 1 or Cycle 2) is Switch OFF and Thermo OFF, The corresponding Water Cycle will either be Switch OFF / Thermo OFF or not depending on setting.
- ③ Room thermostats condition (setting temperature and room temperature) on the specific Water Cycle (Cycle 1 or Cycle 2) can offset setting outlet water temperature of the corresponding Water Cycle depending on setting.
- ④ Water Cycle (Cycle 1 or Cycle 2) can also operate independently without Room thermostats by request of water outlet temperature (the difference of setting outlet water temperature and current water outlet temperature on specific Water Cycle). The corresponding Water Cycle will be Thermo ON when setting outlet water temperature is not met. Then the heat pump and other heat source will be operated to meet demand. Oppositely the corresponding Water Cycle will be Thermo OFF.

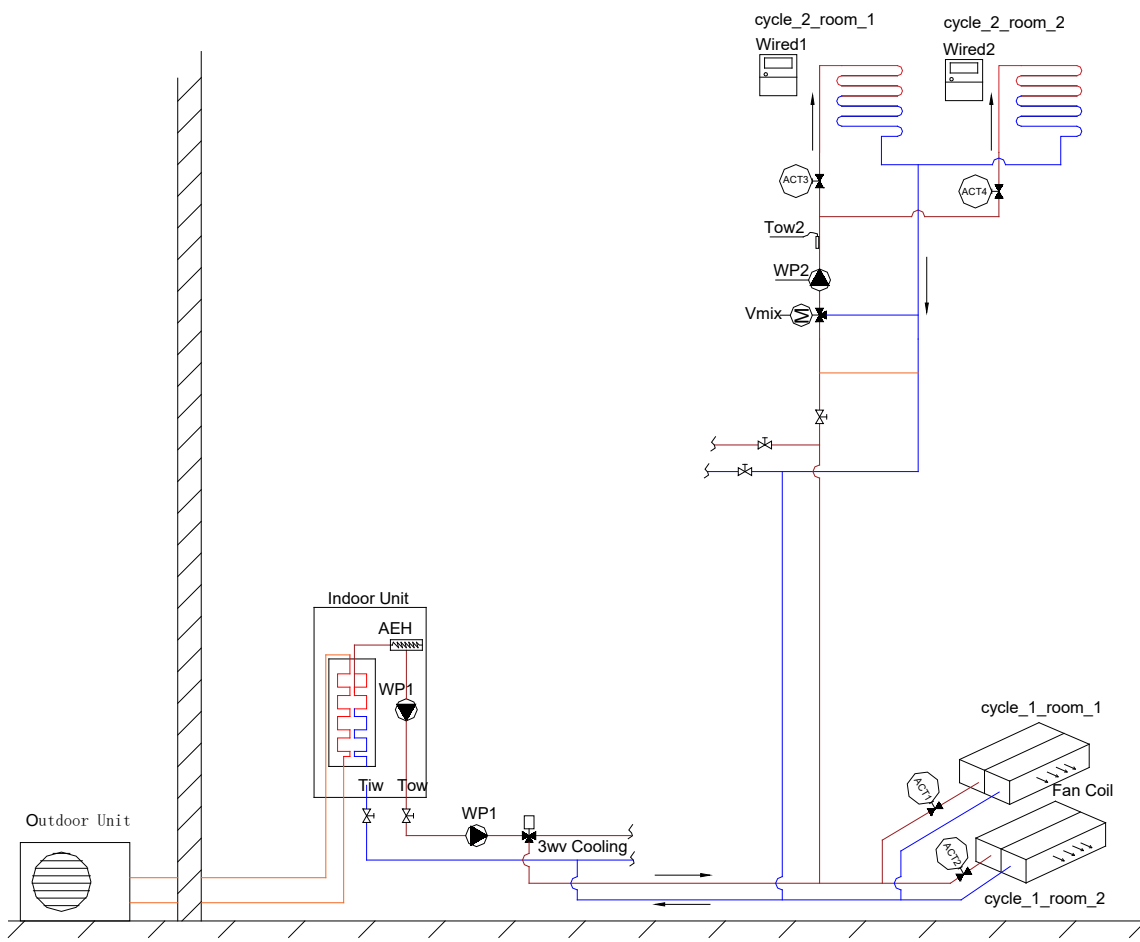
- ⑤ Water Cycle (Cycle 1 or Cycle 2) can also operate by combination of request of water outlet temperature and Room thermostats, that means the corresponding Water Cycle will be Switch ON and Thermo ON by request of water outlet temperature or Room thermostats on the corresponding Water Cycle. Oppositely the Water Cycle will be Thermo OFF when request of water outlet temperature and Room thermostats Thermo ON all disappear.

(2) Space cooling and Water Cycle

- Water Cycle 1 and Water Cycle 2

Space cooling is also operated by the same Water Cycle 1 or combination of Water Cycle 1 and Water Cycle 2. The unit is connectable to only one cycle demand (Cycle 1).

The unit is also able to connect to 2 different Water Cycles (Cycle 1 and Cycle 2), Water Cycle 1 will be direct to the cooling water outlet and Water Cycle 2 will be a mixing cycle in order to have a second temperature control using mixing valve (different cooling water outlet temperature). Additionally, a motorized valve can be added in order to close direct cycle when not in use. To get these 2 water temperature levels, a mixing station is required. This mixing station is controlled using the indoor unit by means of a mixing valve and additional water sensor.



NOTE:

1. Shut-off valve can be fitted to separate cooling water circulation and heat water circulation (DHW operation) if Space cooling and DHW is possible to operate simultaneously referring to 10.1.2.

- Room thermostat

There are max. 4 room thermostats that can be incorporated to each Water Cycle (Cycle 1 and Cycle 2). The room thermostats can be Rooms function on master controller, Slave room controller or Demand ON/OFF1/2 by input signal. And each room thermostat will control Switch ON/OFF and Thermo ON/OFF of each room based on individual operation (ON/OFF / setting temperature / room temperature) and each room need an actuator to achieve room temperature control.

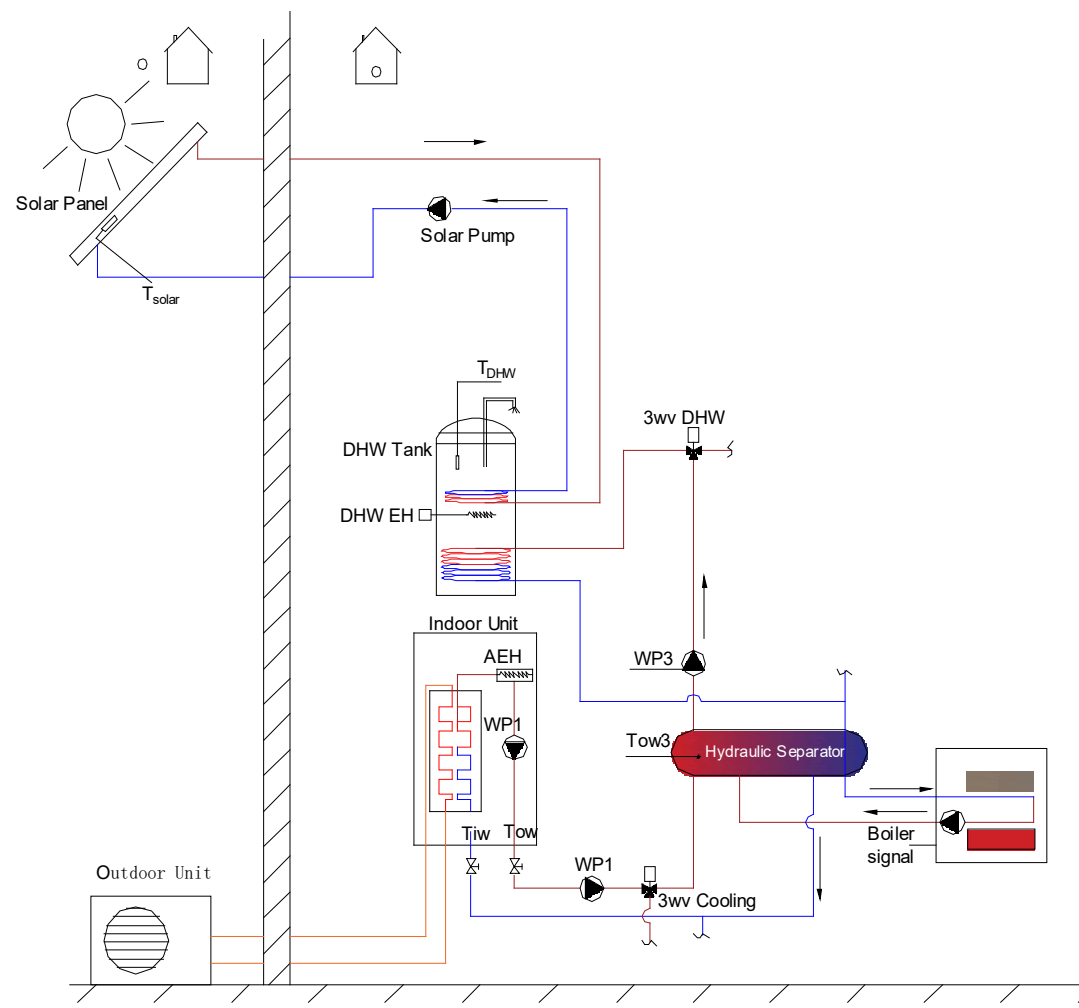
- Room thermostat & Water Cycle

- ① If any one of room thermostats on the specific Water Cycle (Cycle 1 or Cycle 2) is Switch ON and Thermo ON, The corresponding Water Cycle will be Switch ON and Thermo ON. Then the heat pump will be operated to meet demand.
- ② If all room thermostats on the specific Water Cycle (Cycle 1 or Cycle 2) is Switch OFF and Thermo OFF, The corresponding Water Cycle will either be Switch OFF / Thermo OFF or not depending on setting .

- ③ Room thermostats condition (setting temperature and Room temperature) on the specific WaterCycle (Cycle 1 or Cycle 2) can offset setting outlet water temperature of the corresponding Water Cycle. depending on setting.
- ④ Water Cycle (Cycle 1 or Cycle 2) can also operate independently without Room thermostats by request of water outlet temperature (the difference of setting outlet water temperature and current water outlet temperature on specific Water Cycle) . The corresponding Water Cycle will be Thermo ON when setting outlet water temperature is not met. Then the heat pump will be operated to meet demand. Oppositely the corresponding Water Cycle will be Thermo OFF.
- ⑤ Water Cycle (Cycle 1 or Cycle 2) can also operate by combination of request of water outlet temperature and Room thermostats, that means the corresponding Water Cycle will be Switch ON and Thermo ON by request of water outlet temperature or Room thermostats on the corresponding Water Cycle. Oppositely the Water Cycle will be Thermo OFF when request of water outlet temperature and Room thermostats Thermo ON all disappear.

(3) Domestic Hot Water (DHW)

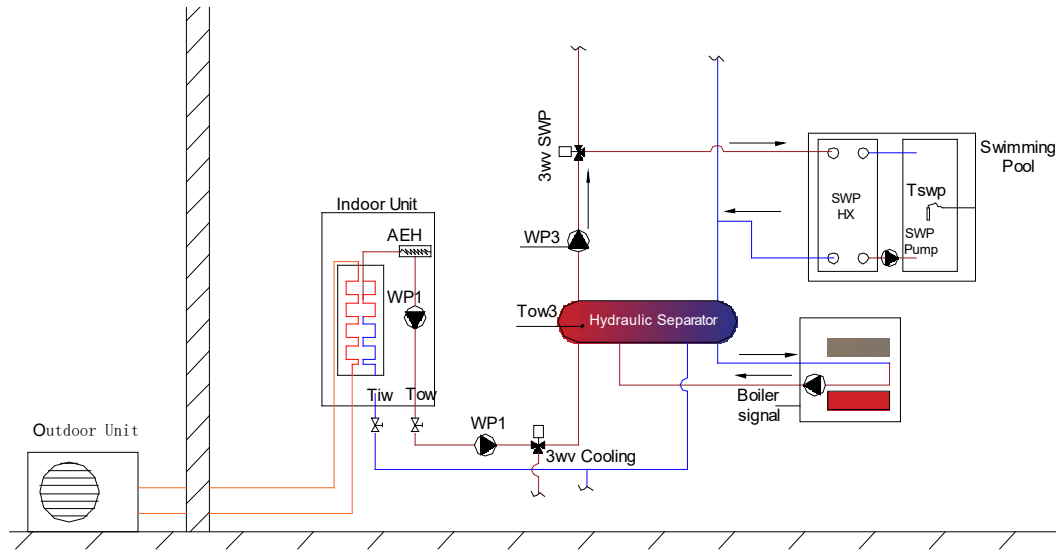
In addition, the unit can be combined with sanitary tank to delivery DHW. When DHW operation is required, the 3-way valve for DHW changes its normal position diverting to the sanitary tank inner coil, allowing to heat the tank water temperature. DHW can be heated up by heat pump / DHW Electric Heater / boiler / solar panel depending on heat source availability and setting.





(4) Swimming pool (SWP)

In addition, the unit can be combined with swimming pool. When the swimming pool operation is required, the 3-way valve for the swimming pool changes its normal position diverting to the swimming pool heat exchanger, allowing to heat the swimming pool water to a comfortable value. Swimming pool can be heated up by heat pump / Auxiliary electric heater / boiler depending on heat source availability and setting.



10.1.2 Alternate function operation with priority

The heat pump system can be configured with various combinations of the four main functions. For example, space heating/cooling and DHW is configured as available function. And different function of space heating/cooling/DHW/SWP and their combinations can be switched on altogether through master controller interface. Usually heat pump can only operate one function at the same time. So, all the available function will operate alternately with different priority depending on setting. When specific function operates the corresponding 3-way valve will divert to specific water circuit. For example, when DHW operation is required, the 3-way valve for DHW changes its normal position diverting to the sanitary tank inner coil, allowing to heat the tank water.

10.1.2.1 3WVs operation

3WVs are used to switch to specific function operation.  
3WVs operation as following.

Operation mode	3WV DHW	3WV Cooling	3WV SWP
Defrost by DHW *1	ON	OFF	OFF
Defrost by Space heating *2	OFF	OFF	OFF
Air purge *3	On and OFF periodically		
Seizure protection *4	On and OFF periodically		
Space heating operation	OFF	OFF	OFF
Space cooling operation	OFF	ON	OFF
DHW operation	ON	OFF	OFF
SWP operation	OFF	OFF	ON
"Space cooling operation and DHW operation simultaneously *5"	ON	ON	OFF
"Space cooling operation and SWP operation simultaneously *6"	OFF	ON	ON

NOTE:

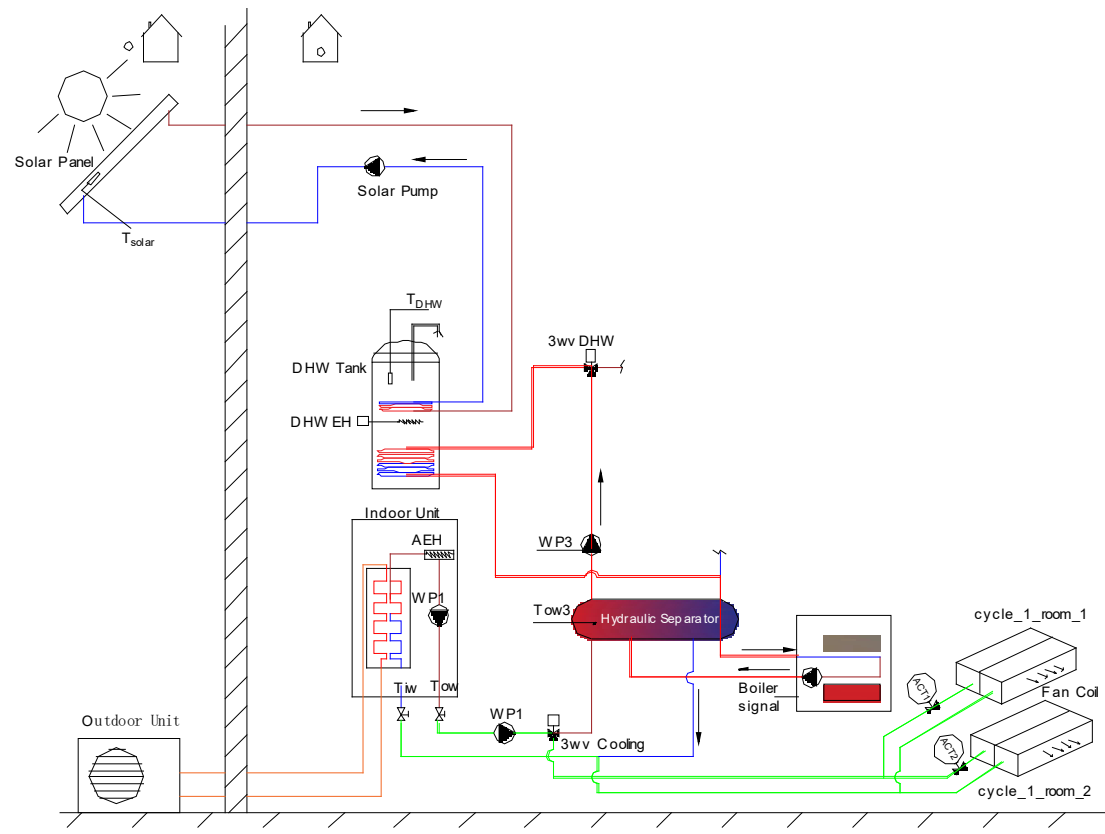
\*1. refer to 10.9.2.

\*2. refer to 10.9.2.

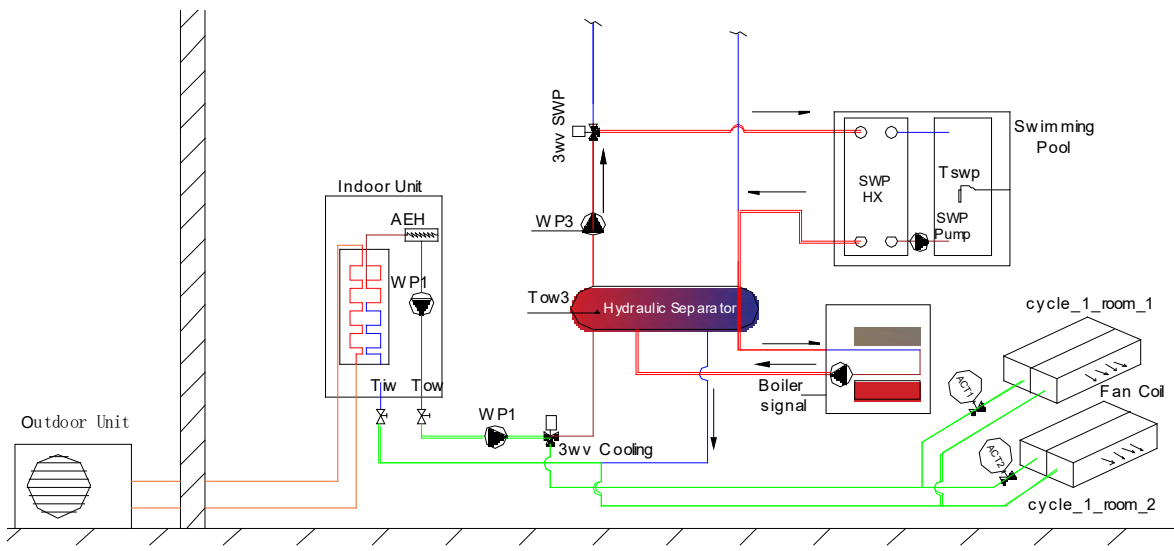
\*3. refer to 10.8.5.

\*4. refer to 10.8.6.

\*5.It is possible to operate Space cooling (heat pump and water pump1) and DHW (water pump3 or boiler) simultaneously when hydraulic separator is available (refer to 10.2.5), [DSW5-2] set as [OFF] and [Point of DHW & SWP] set as [After Hydr S] (refer to 10.1) , in this situation cooling water circulation will not pass through hydraulic separator.



\*6. It is possible to operate the 3-way valve for the swimming pool to separate cooling water circulation and heating water circulation when hydraulic separator is available (refer to 10.2.5), [DSW5-2] set as [OFF] and [Point of DHW & SWP] set as [After Hydr S] (refer to 10.1), in this situation cooling water circulation will not pass through hydraulic separator.



## 10.1.2.2 Operation priority

All the available function will operate alternately with different priority depending on setting. Usually heat pump can operate alternately between 2 functions.

## 10.1.2.2.1 Alternate operation between DHW and Space heating/cooling

DHW priority can be set through different ways.

## (1) DHW schedule priority

Heat pump will have priority to heat up DHW at [Starting Time 1/2/3/4] with [Setting temperature ON Starting Time 1/2/3/4] of DHW.

To valid the function of DHW schedule priority set [Status] as [Enabled].

The configuration of this option should be done through the master controller.

Configuration →Auxiliary Function →DHW- Schedule Priority.

Mark	Description	Default Value	Range	Steps	Units
	Status	Disabled	Disabled/Enabled	-	-
	Starting Time 1	3:00	Disabled-0:00~24:00	0:10	Time
TDHWS_time1	Setting temperature ON Starting Time 1	50	40-A	1	°C
	Starting Time 2	12:00	Disabled-0:00~24:00	0:10	Time
TDHWS_time2	Setting temperature ON Starting Time 2	50	40-A		°C
	Starting Time 3	16:00	Disabled-0:00~24:00	0:10	Time
TDHWS_time3	Setting temperature ON Starting Time 3	50	40-A		°C
	Starting Time 4	20:00	Disabled-0:00~24:00	0:10	Time
TDHWS_time4	Setting temperature ON Starting Time 4	50	40-A		°C

Note:

1. When DHW Electric Heater is available ([DHW\_hts] set as [Enabled] , refer to 10.3.3), A=75°C.
2. When Boiler is available and DHW by Boiler is enabled ([HS] set as [HP+Heater+Boiler] or [HP+Heater+Boiler] and[DHW\_B] set as [Enabled] , refer to 10.6.3), A=60°C.
3. circumstance except 1 and 2, A=55°C.

## (2) Time priority

- Set max. DHW operation time with heat pump as [HP ON Max. Time] to limit the max. period time of DHW operation shift.

Note:

1. Max. DHW operation time of [HP ON Max. Time] will be add extra 70 minutes to heat up DHW in one period time of DHW operation shift When DHW schedule priority is activated at specific setting Starting Time, DHW boost is activated (referring to 10.3.6), or DHW Anti-legionella is activated (referring to 10.3.5).

The configuration of this option should be done through the master controller.

Configuration →DHW

Mark	Description	Default Value	Range	Steps	Units
DHW_HP_tmax	HP ON Max. Time	60	20~250~unlimited	1	min

- Set Min. space heating/cooling operation time with heat pump as [Min. time Space heating/cooling] to ensure adequate space heating/cooling operation time in one period time of space heating/cooling operation shift.

Note:

1. Min. space heating/cooling operation time of [Space\_HP\_tmin] will be limited to 20 minutes to accelerate shift of DHW operation When DHW schedule priority is activated at specific setting Starting Time, DHW boost is activated (referring to 10.3.6), or DHW Anti-legionella is activated (referring to 10.3.5).

The configuration of this option should be done through the master controller.

Configuration →Heat Pump→ Heat Pump Priority

Mark	Description	Default Value	Range	Steps	Units
Space_HP_tmin	Min. time Space heating/cooling	60	20-240	1	min

(3) DHW set temperature priority

Set Hysteresis between DHW set temperature and DHW temperature as [DHW Setting Temperature Differential Temp] to start DHW operation shift.

Note:

1. Hysteresis between DHW set temperature and DHW temperature as [DHWS\_shift\_diff] will be limited to accelerateshift of DHW operation When DHW schedule priority is activated at specific setting Starting Time, DHW boost is activated (referring to 10.3.6), or DHW Anti-legionella is activated (referring to 10.3.5).

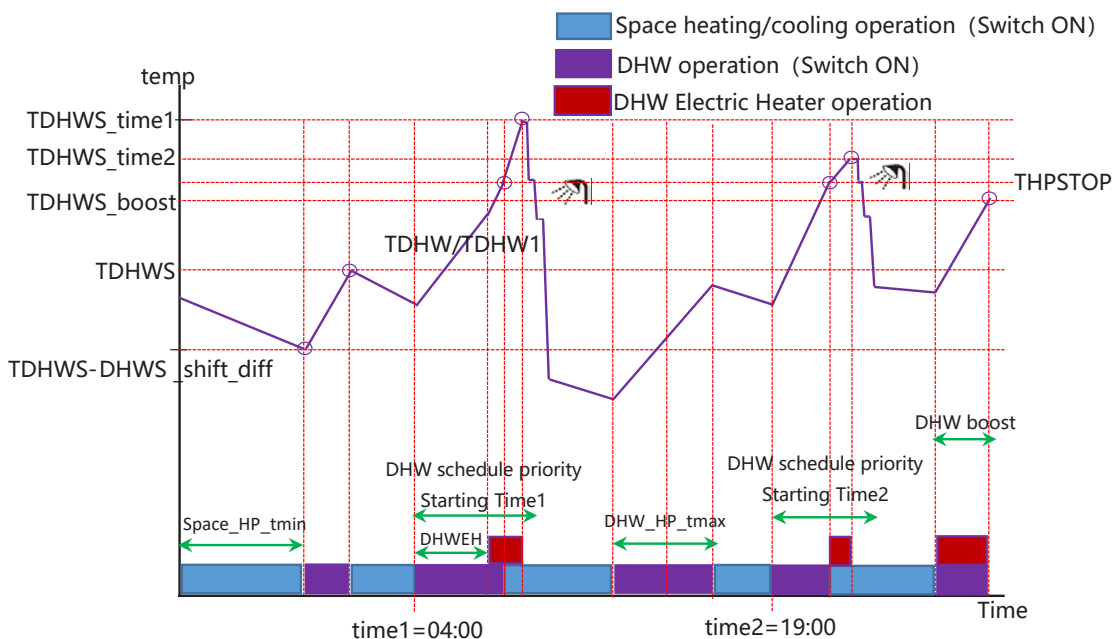
The configuration of this option should be done through the master controller.

Configuration →Heat Pump→ Heat Pump Priority

Mark	Description	Default Value	Range	Steps	Units
DHWS_shift_diff	DHW Setting Temperature Differential Temp	10	6-20	1	°C

Alternate operation between Space heating/cooling and DHW.

- Meet all following conditions to start DHW operation shift (DHW Switch ON).
  - (1)  $TDHW \leq TDHWS - DHWS\_shift\_diff$  or  $TDHW1 \leq TDHWS - DHWS\_shift\_diff$  if TDHW1 is valid.
  - (2) Period time of space heating/cooling operation shift is more than [Space\_HP\_tmin] or space heating/cooling has no demand.
- Meet one of following conditions to start space heating/cooling operation shift (space heating/coolingSwitch ON).
  - (1) TDHW is met and TDHW1 is met if TDHW1 is valid.
  - (2) Max temperature of THPSTOP is reached. (THPSTOP refers to 10.3.4).
  - (3) Period time of DHW operation shift is more than [DHW\_HP\_tmax].



Note:

1. [DHWEH] refers to 10.3.4 and DHW boost refers to 10.3.6.
2. Heat pump will keep cooling operation without shifting to DHW operation when Average outdoor ambient temperature is more than 38°C - 40°C, that is out of heat pump heating operation range. DHW is met by DHW Electrical Heater (referring to 10.3.4 (4)) or boiler (10.6.3 (7)), and keep complementary heat source is available at that time.

#### 10.1.2.2.2 Alternate operation between SWP and Space heating/cooling

- Meet all following conditions to start SWP operation shift (SWP Switch ON).
  - (4)  $T_{swp} \leq T_{swps}-1$  [°C] or demand request by Optional input signal of [Swimming pool Demand ON/OFF] (refer to 10.4.2).
  - (5) Period time of space heating/cooling operation shift is more than 60 minutes or space heating/cooling has no demand.
- Meet one of following conditions to start space heating/cooling operation shift (space heating/cooling Switch ON).
  - (1)  $T_{swp}$  is met or demand request disappears by Optional input signal of [Swimming pool Demand ON/OFF] (refer to 10.4.2).
  - (2) Period time of SWP operation shift is more than 120 minutes.

#### 10.1.2.2.3 Alternate operation between SWP and DHW

- Meet all following conditions to start SWP operation shift (SWP Switch ON).
  - (1)  $T_{swp} \leq T_{swps}-1$  [°C] or demand request by Optional input signal of [Swimming pool Demand ON/OFF] (refer to 10.4.2).
  - (2) Period time of DHW operation shift is more than 60 minutes or DHW has no demand.
- Meet one of following conditions to start DHW operation shift (DHW Switch ON).
  - (1)  $T_{swp}$  is met or demand request disappears by Optional input signal of [Swimming pool Demand ON/OFF] (refer to 10.4.2).
  - (2) Period time of SWP operation shift is more than 120 minutes.

#### 10.1.2.2.4 Alternate operation between SWP / DHW / Space heating/cooling

All the available function will operate alternately with different priority depending on setting. Usually heat pump can operate alternately between 2 functions. Operation can refer to followings when the three functions all switch on.

- (1) When demand of one function is met, Heat pump can operate alternately between the other 2 functions according to 10.1.2.1.1 / 10.1.2.1.2 / 10.1.2.1.3. For example, Heat pump can operate alternately between DHW and space cooling according to 10.1.2.1.1 when setting SWP temperature [ $T_{swp}$ ] is met.
- (2) When demand of SWP / DHW / Space heating/cooling are all requested. The heat pump can operate alternately between the first one of 2 functions according to 10.1.2.1.2, and then the Heat pump can operate alternately between the second one of 2 functions according to 10.1.2.1.3.

Note:

1. It is not recommended to switch on all the three functions of SWP / DHW / Space heating/cooling at the same time.
2. When one function is urgent to use, it is recommended to switch off the other functions to focus the capacity of the heat pump.

### 10.1.3 Heat source

Basically, Heat pump produces capacity for space heating / space cooling / domestic hot water / swimming pool by transforming renewable energy from the outside air into heat. Air to water heat pumps extract the free energy present in the air, which is efficient to heat a home up to a comfortable temperature.

#### 10.1.3.1 Available heat source

Besides heat pump several other complementary heat sources can be incorporated in the heat pump system to offer complementary heat to extend the application.

(1) Auxiliary electric heater

It can be used as complementary heat source for space heating and swimming pool.

(2) DHW electric heater

It can be used as complementary heat source for DHW.

(3) solar panel

It can be used as complementary heat source for DHW.

(4) gas boiler

It can be used as complementary heat source for space heating / DHW / swimming pool.

The decision as to how to operate complementary heat sources is based on ambient temperature and heat source selection as below.

The configuration of this option should be done through the master controller.

Configuration → Complementary Heating → Heating Source

Mark	Description	Default Value	Range	Steps	Units
HS	Heating Source	Only HP	HP only / HP + Heater / HP + Boiler / HP + Heater + Boiler	-	-

Refer to 10.5 and 10.6 for details.

#### 10.1.3.2 Emergency operation

In the event of outdoor unit failure, the required heating can be provided by complementary heat sources such as Auxiliary electric heater/ DHW electric heater / boiler / solar panel / gas boiler. The unit can operate to offer heating capacity intentionally as emergency operation for space heating / DHW / SWP without outdoor unit function.

Note:

1. [Point of DHW & SWP] should set as [After Hydr S] to use boiler to heat up DHW/SWP during Emergency operation and [HP Block]. Refer to 10.1. and 10.9.5.

The configuration of this option should be done through the master controller.

Configuration → Auxiliary Function → Emergency Operation

Mark	Description	Default Value	Range	Steps	Units
Emergency_Mode	Emergency Operation Mode	Manual	Manual/Automatic	-	-
Emergency_SH	Emergency Space heating Status	Disabled	Disabled/Enabled	-	-
Emergency_DHW	Emergency DHW Status	Disabled	Disabled/Enabled		
Emergency_SWP	Emergency Swimming pool Status	Disabled	Disabled/Enabled		

(1) [Emergency Operation Mode]

- Manual mode: Emergency operation is performed by dip-switch setting.

DSW4-4: ON → Emergency Operation enabled

DSW4-4: OFF → Emergency Operation disabled

- Automatic mode: Emergency operation is performed when alarm occurs in the outdoor unit or indoor unit that is forbidding outdoor unit from function.

NOTE:

1. Alarm code will display on the status bar of master controller interface when alarm occurs. Do not reset alarm code that will make Automatic Emergency operation disabled.

(2) [Emergency Space heating Status]: Enable or disable emergency operation for space heating.

(3) [Emergency DHW Status]: Enable or disable emergency operation for DHW.

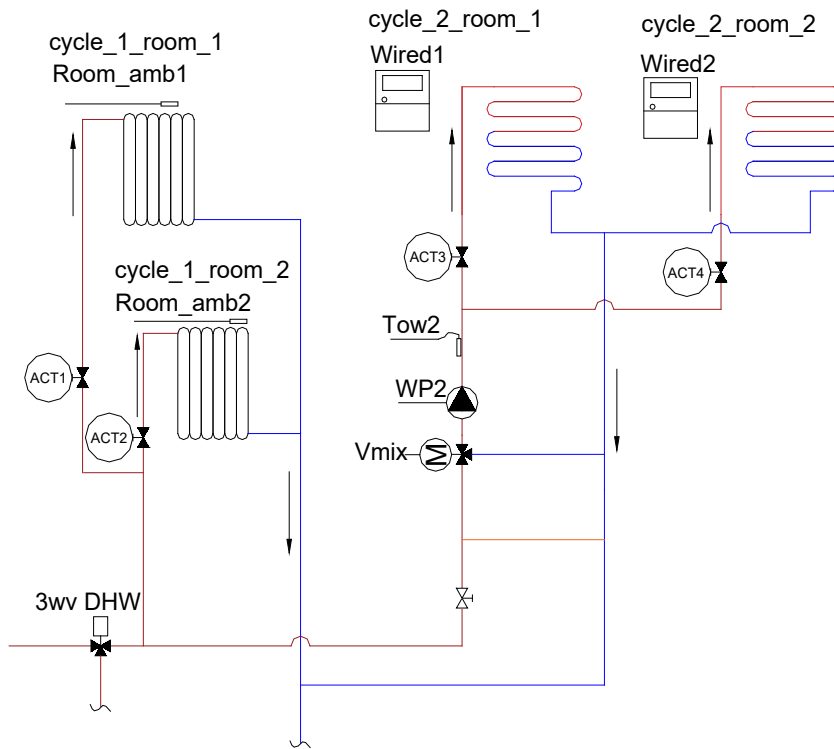
(4) [Emergency Swimming pool Status]: Enable or disable emergency operation for SWP.

10.2 Space heating/cooling

Space heating is operated by Water Cycle 1 or combination of Water Cycle 1 and Water Cycle 2. Space heating is demanded by request of water outlet temperature and Room thermostats on Water Cycle 1 / Water Cycle 2.

10.2.1 Room thermostat

There are max. 4 room thermostats that can be incorporated to each Water Cycle (Cycle 1 and Cycle 2). The room thermostats can be Rooms function on Master controller, room controller or Demand ON/OFF/1/2 by input signal. And each room thermostat will control Switch ON/OFF and Thermo ON/OFF of each room based on individual operation (ON/OFF / setting temperature / room temperature) and need an actuator to achieve room temperature control.



The configuration of this option should be done through the master controller

Configuration →Room thermostat→Cycle1.

Configuration →Room thermostat→Cycle2.

Mark	Cycle_1_room_i Cycle_2_room_i	Room thermostat & temp.		Room actuator		
		selection	Range	selection	Range	
			NONE		NONE	-
	Cycle_1_room_i		Room_amb1 *1		Act1 *4	
	Cycle_2_room_i		Room_amb2 *1		Act2 *4	
			Room_amb3 *1		Act3 *4	
			Room_amb4 *1		Act4 *4	
			Room_amb5 *1		Act5 *4	
			Room_amb6 *1		Act6 *4	
			Room_amb7 *1		Act7 *4	
			Slave_Wired1.Sensor *2			
			Slave_Wired2.Sensor *2			
			Demand ON/OFF1 *3			
			Demand ON/OFF2 *3			



NOTE:

\*1. Rooms function on Master controller is selected as room thermostat. And in this scenario auxiliary sensor on PCB1 of indoor unit can be configured as function of [Room\_amb1...7] and be selected as Room temperature detection. Refer to 10.10.3.

\*2. Slave\_Wired1 room controller can be selected as room thermostat and Room temperature detection.

\*3. Optional input signal can be configured as function of [Demand ON/OFF1...2] and selected as room thermostat.

\*4. Optional Output signal can be configured as function of [Act1...7] and be selected as Room actuator. refer to 10.10.

5. After changing Configuration of Room thermostat on the master controller, it needs to be powered off and on again to take effect.

#### 10.2.1.1 Room Thermo ON/OFF

Room Thermo ON/OFF is different depending on Room thermostat.

(1) Room Thermo ON/OFF by setting room temperature and Room temperature detection

- Heating

-Thermo ON

$Tr\_Room \leq Ts\_Room^{\circ}C$

-Thermo OFF

$Tr\_Room \geq Ts\_Room+2$

- Cooling

-Thermo ON

$Tr\_Room \geq Ts\_Room+2^{\circ}C$

-Thermo OFF

$Tr\_Room < Ts\_Room$

Tr\_Room: detected room temperature.

Ts\_Room: setting room temperature.

(2) Room Thermo ON/OFF by Demand ON/OFF1/2

- Heating and cooling

-Thermo ON

When a closed signal is active

-Thermo OFF

When an Open signal is active

Refer to 10.10.1.

#### 10.2.1.2 ECO operation

- Cooling

Ts\_Room is limited above 26°C when ECO operation is active.

- Heating

Ts\_Room is limited below 22°C when ECO operation is active.

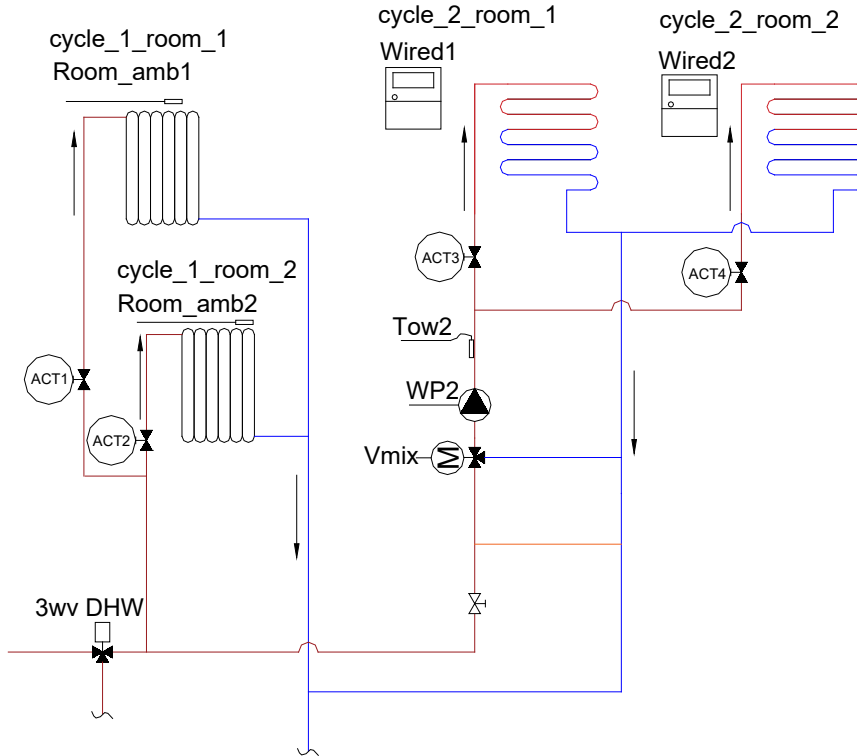
ECO operation refers to manual of controller.

10.2.2 Water Cycle for space heating

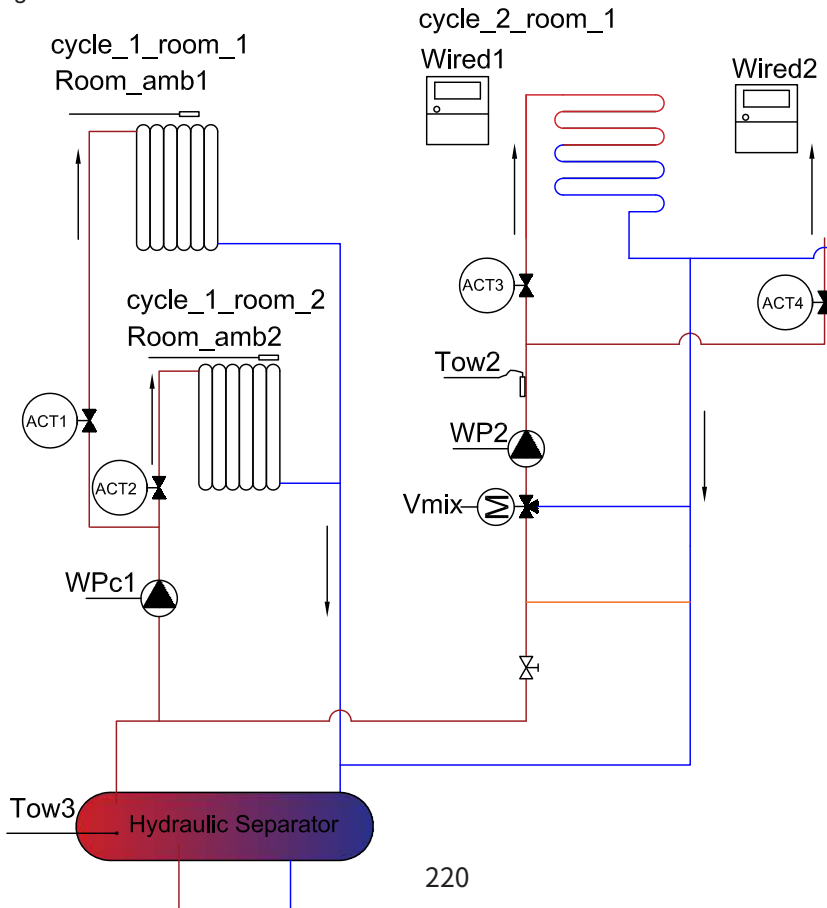
Space heating is operated by Water Cycle 1 or combination of Water Cycle 1 and Water Cycle 2.

Cycle 1 will be direct (high temperature for radiator or fan coils operation) and Cycle 2 will be a mixing cycle in order to have a second temperature control using mixing valve (low temperature for floor heating operation). Additionally, a motorized valve can be added in order to close direct cycle when not in use. The floor heating loops (Cycle 2) require a lower temperature than with radiator or fan coils (Cycle 1). To get these 2 water temperature levels, a mixing station is required. This mixing station is controlled using the indoor unit by means of a mixing valve / additional pump (WP2) /additional water sensor (Tow2).

Without WPc1 referring to 10.1:



With WPc1 referring to 10.1:



NOTE:

- ① When Cycle 2 is available Auxiliary sensor on PCB1 of indoor unit need be configured as function of [Tow2] . Refer to 10.10.3.
- ② When Cycle 2 is available Optional Output signal need be configured as function of [WP2]. This Output signal can be used as relay signal to wp2. Refer to 10.10.2.
- ③ When Cycle 1 is available Optional Output signal need be configured as function of [WPC1]. This Output signal can be used as relay signal to WPC1. Refer to 10.10.2.

The configuration of Water Cycle 1 and Water Cycle 2 availability should be done through the master controller

Configuration → Space heating → Cycle 1

Mark	Description	Default Value	Range	Steps	Units
Cycle 1_ Status	Status	Enabled	Disabled /Enabled	-	-

Configuration → Space heating → Cycle 2

Mark	Description	Default Value	Range	Steps	Units
Cycle 2_ Status	Status	Disabled	Disabled /Enabled	-	-

#### 10.2.2.1 Set target outlet water temperature

Each of the 2 Water Cycles will have an independent target outlet water temperature. And Target outlet water temperature is combination of Water Cycle set-point and compensation of Water ECO offset / Room thermostat.

(1) Heating Water Cycle set-point can be define as follows:

Ttwo\_c1 \_water\_p as Water Cycle 1.

Ttwo\_c2 \_water\_p as Water Cycle 2.

There are three ways to set Water Cycle set-point as follows:

- Fixed, refer to 1.2.2.1.1 (1)
- OTC point, refer to 1.2.2.1.1 (2)
- OTC Gradient, refer to 1.2.2.1.1 (3)

(2) Heating Compensation of Water ECO offset defined as following, refer to 1.2.2.1.2

c1\_wate\_h\_Ecoofs as Water Cycle 1.

c2\_wate\_h\_Ecoofs as Water Cycle 2.

*NOTE: Compensation of Water ECO offset is valid when the function is active.*

(3) Heating Compensation of Room thermostat defined as following, refer to 1.2.2.1.3

Compenh\_c1 as Water Cycle 1.

Compenh\_c2 as Water Cycle 2.

*NOTE: Compensation of Room thermostat is valid when the function is active.*

(4) Heating Target outlet water temperature defined as

Ttwo\_Cycle 1 as Water Cycle 1.

Ttwo\_Cycle 2 as Water Cycle 2.

Heating Target outlet water temperature is combination of Water Cycle set-point and compensation of Water ECO offset / Room thermostat.

$Ttwo\_Cycle\ 1 = Ttwo\_c1\_water\_p + Compenh\_c1 - c1\_wate\_h\_Ecoofs$

$Ttwo\_Cycle\ 2 = Ttwo\_c2\_water\_p + Compenh\_c2 - c2\_wate\_h\_Ecoofs$

*NOTE: Compenh\_c1 and Compenh\_c2 is forced as 0 when water Calculation Regulation Mode set as [Fix].*

(5) Heating Target outlet water temperature is regulated as following scope

$c1\_wate\_h\_min \leq Ttwo\_Cycle\ 1 \leq c1\_wate\_h\_max$

$c2\_wate\_h\_min \leq Ttwo\_Cycle\ 2 \leq c2\_wate\_h\_max$

The configuration of this option should be done through the master controller

Configuration → Space heating → Cycle 1 → Working range

Mark	Description	Default Value	Range	Steps	Units
c1_wate_h_max	Max. Water Supply Temp	55	35~65	1	°C
c1_wate_h_min	Min. water Supply Temp	20	20~34	1	°C

Configuration → Space heating → Cycle 1

Mark	Description	Default Value	Range	Steps	Units
c1_wate_t	type of heat emitters	radiator	Radiators/Floor Heating/Fan coils		

Configuration → Space heating → Cycle 2 → Working range

Mark	Description	Default Value	Range	Steps	Units
c2_wate_h_max	Max. Water Supply Temp	50	35~55	1	°C
c2_wate_h_min	Min. water Supply Temp	20	20~34	1	°C

Configuration → Space heating → Cycle 2

Mark	Description	Default Value	Range	Steps	Units
c2_wate_t	type of heat emitters	Underfloor heating	Radiators/Floor Heating/Fan coils		

NOTE:

1. It is the installer's responsibility to make sure no unwanted situation occurs (for example: water temperature setting too high into floor heating).
2. When only Cycle 1 is heating, Cycle 2 will be fed with water at temperature equal to the target water of Cycle 1.
3. Water Cycle 2 is matched with low water temperature application et. Floor heating with low Target outlet water temperature and Water Cycle 1 is matched with high water temperature application et. radiator with high Target outlet water temperature.

#### 10.2.2.1.1 Water temperature set-point

Water Cycle set-point can be set as follows:

The configuration of this option should be done through the master controller

Configuration → Space heating → Cycle 1

Mark	Description	Default Value	Range	Steps	Units
Cycle 1	Water Regulation Mode	Fixed	Fixed OTC point OTC Gradient	-	-

Configuration → Space heating → Cycle 2

Mark	Description	Default Value	Range	Steps	Units
Cycle 2	Water Regulation Mode	Fixed	Fixed OTC point OTC Gradient	-	-

##### (1) Fixed

Setting outlet water temperature is a fixed temperature set by the user on master controller. Refer to master controller manual.

The configuration of this option should be done through the master controller

Main Interface → Space heating → Cycle 1

Mark	Description	Default Value	Range	Steps	Units
Ttwo_c1_water_p	Cycle 1 water temperature set-point	40	c1_wate_h_min ~ c1_wate_h_max	1	°C

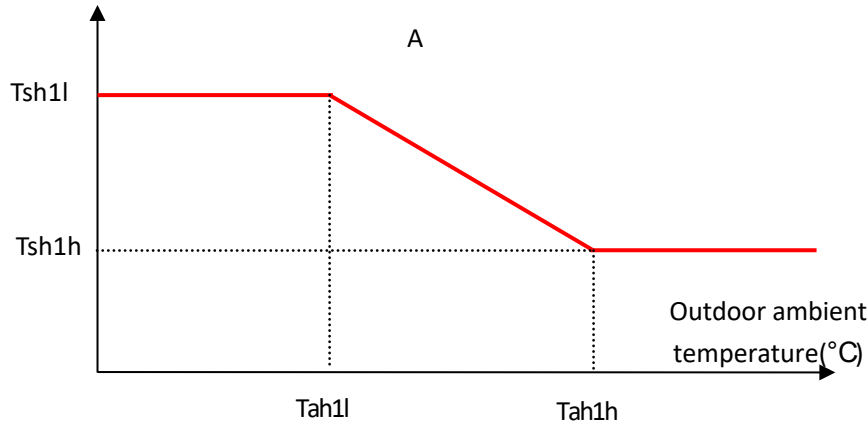
Main Interface → Space heating → Cycle 2

Mark	Description	Default Value	Range	Steps	Units
Ttwo_c2_water_p	Cycle 2 water temperature set-point	40	c1_wate_h_min ~ c1_wate_h_max	1	°C

(2) OTC point

Water target is selected by an Outside Temperature Compensated (OTC) control that is defined by 4 different points to create a line representing the function that the air to water heat pump will use to give the temperature setting according to the current ambient temperature. OTC Points system will use average outdoor ambient temperature in order to get the water temperature set-point. Water set-point will be determined using the following rule:

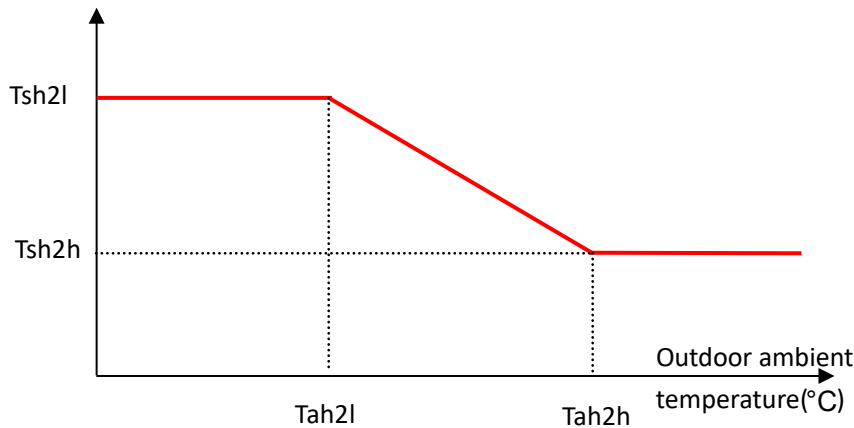
① Water temperature set point of Water Cycle 1: Ttwo\_c1\_water\_p as following



The configuration of this option should be done through the master controller  
 Configuration → Space heating → Cycle 1 → Water Regulation Mode → OTC point

Mark	Description	Default Value	Range	Steps	Units
Tah1l	low ambient temperature	-20	-20~5	1	°C
Tah1h	High ambient temperature	20	6~25	1	°C
Tsh1l	Water temperature at low ambient temperature	44*	35~c1_wate_h_max	1	°C
Tsh1h	Water temperature at high ambient temperature	25*	c1_wate_h_min~34	1	°C

② Water temperature set point of Water Cycle 2: Ttwo\_c2\_water\_p as following



The configuration of this option should be done through the master controller  
 Configuration → Space heating → Cycle 2 → Water Regulation Mode → OTC point

Mark	Description	Default Value	Range	Steps	Units
Tah2l	low ambient temperature	-20	-20~5	1	°C
Tah2h	High ambient temperature	20	6~25	1	°C
Tsh2l	Water temperature at low ambient temperature	44*	35~c2_wate_h_max	1	°C
Tsh2h	Water temperature at high ambient temperature	25*	c2_wate_h_min~34	1	°C

NOTE:

1. Average Outdoor Ambient Temperature (2 hours) is used to calculate set-point.

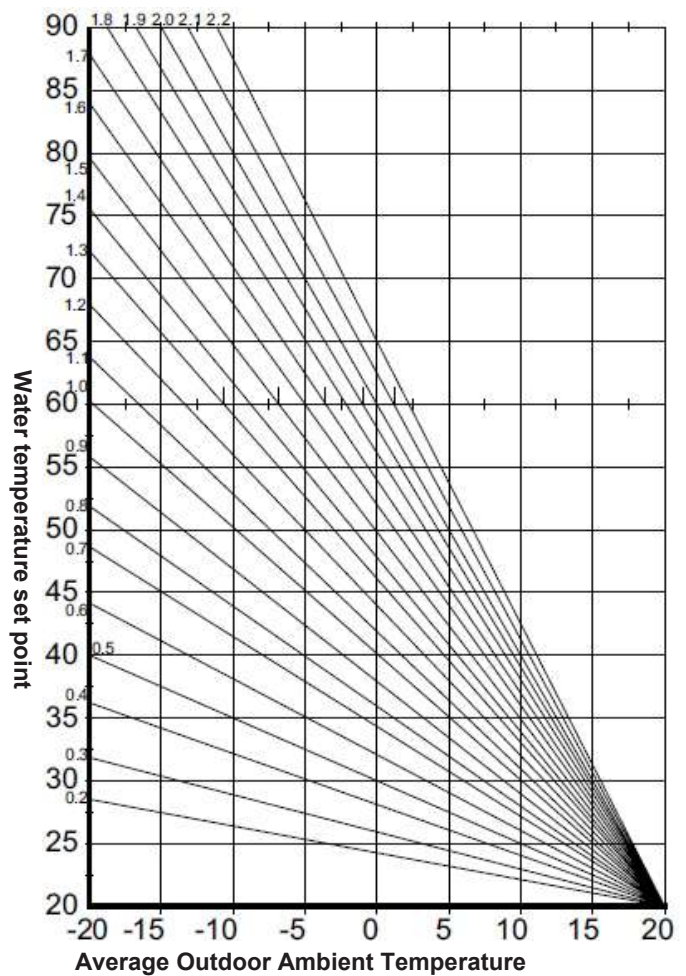
(3) OTC Gradient

Water target is selected by an Outside Temperature compensated (OTC) control that is defined by a different gradient of the curve. The initial point of the curve is always 20°C-20°C (water outlet target 20°C at outdoor ambient temperature of 20°C). User can edit the gradient variable.

The gradient of the heating curve describes the relation between the change in water outlet target and the change in outside temperature.

- ① Water temperature set point of Water Cycle 1: Ttwo\_c1\_water\_p as following
- ② Water temperature set point of Water Cycle 2: Ttwo\_c2\_water\_p as following

Gradient Curve	Ttwo_c1_water_p Ttwo_c2_water_p
0.2	-0.2×Ta+24
0.3	-0.3×Ta+26
0.4	-0.4×Ta+28
0.5	-0.5×Ta+30
0.6	-0.6×Ta+32
0.7	-0.7×Ta+34
0.8	-0.8×Ta+36
0.9	-0.9×Ta+38
1	-1.0×Ta+40
1.1	-1.1×Ta+42
1.2	-1.2×Ta+44
1.3	-1.3×Ta+46
1.4	-1.4×Ta+48
1.5	-1.5×Ta+50
1.6	-1.6×Ta+52
1.7	-1.7×Ta+54
1.8	-1.8×Ta+56
1.9	-1.9×Ta+58
2	-2.0×Ta+60
2.1	-2.1×Ta+62
2.2	-2.2×Ta+64



NOTE:

- 1. Ta: Average Outdoor Ambient Temperature (2 hours) is used to calculate set-point.

The configuration of this option should be done through the master controller

Configuration → Space heating → Cycle 1 → Water Regulation Mode → OTC Gradient

Mark	Description	Default Value	Range	Steps	Units
Cycle 1	Gradient Curve	0.6	0.2~2.2	0.1	—

Configuration → Space heating → Cycle 2 → Water Regulation Mode → OTC Gradient

Mark	Description	Default Value	Range	Steps	Units
Cycle 2	Gradient Curve	0.6	0.2~2.2	0.1	—

NOTE:

- 1. Average Outdoor Ambient Temperature (2 hours) is used to calculate set-point.

## 10.2.2.1.2 Water ECO offset

- Function

Use a reduced offset for water temperature setting. By using this function, current water temperature setting is reduced by the indicated parameter.

The configuration of this option should be done through the master controller

Configuration → Space heating → Cycle 1

Mark	Description	Default Value	Range	Steps	Units
c1_wate_Eco	water Eco	Disabled	Disabled/Enabled		
c1_wate_h_Ecoofs	Eco offset	2	-10~10	1	°C

Configuration → Space heating → Cycle 2

Mark	Description	Default Value	Range	Steps	Units
c2_wate_Eco	water Eco	Disabled	Disabled/Enabled		
c2_wate_h_Ecoofs	Eco offset	2	-10~10	1	°C

- Function activation

ECO offset function is active for each Cycle by different options:

- (1) [water Eco] of specific Cycle on Configuration set as [Enabled]
- (2) Optional input signal can be configured as function of Cycle 1 ECO mode / Cycle 2 ECO mode / Cycle 1 and 2 ECO mode and close the corresponding input terminal. refer to 10.10.1.
- (3) [water Eco] of specific Water Cycle from interface of Water Cycle on master controller is pushed ON.

## 10.2.2.1.3 Compensation from Room thermostat

There are max. 4 room thermostats that can be incorporated to each Water Cycle (Cycle 1 and Cycle 2). Compensate water temperature setting by room temperatures and room temperature settings on the specific Cycles (Cycle 1 & 2) to operate space heating/cooling efficiently.

This function is available with the following possible combinations:

- Rooms function on Master controller is selected as room thermostat. Optional Auxiliary sensor on PCB1 of indoor unit can be configured as function of Room\_amb1...7 and be selected as Room temperature detection. Refer to 10.10.
- Slave\_Wired room controller can be selected as room thermostat.

When Room compensation is enabled, the calculated set point is adjusted according on the difference between the room temperature and room setting temperature. The amount of room influence can be adjusted by the room temperature compensation factor setting.

To increase or decrease the amount of room compensation, the room compensation factor should be adjusted.

## (1) Cycle 1

The configuration of this option should be done through the master controller

Configuration → Space heating → Cycle 1 → Room temperature Compensation

Mark	Description	Default Value	Range	Steps	Units
Rfacth_c1	Compensation factor	2	OFF-1-5	1	°C
Maxfacth_c1	Max Compensation value	10	0~10	1	°C
Minfacth_c1	Min Compensation value	-10	-10~0	1	°C

Compenh\_c1 = Rfacth\_c1 × Maximum difference of room setting temperature and room temperature for

Thermo On Rooms on Cycle 1

Minfacth\_c1 ≤ Compenh\_c1 ≤ Maxfacth\_c1



(2) Cycle 2

The configuration of this option should be done through the master controller.

Configuration → Space heating → Cycle 1→Room temperature Compensation

Mark	Description	Default Value	Range	Steps	Units
Rfacth_c2	Compensation factor	2	OFF-1-5	1	°C
Maxfacth_c2	Max Compensation value	10	0~10	1	°C
Minfacth_c2	Min Compensation value	-10	-10~0	1	°C

Compenh\_c2= Rfacth\_c2 × Maximum difference of room setting temperature and room temperature for Thermo On Rooms on Cycle 2

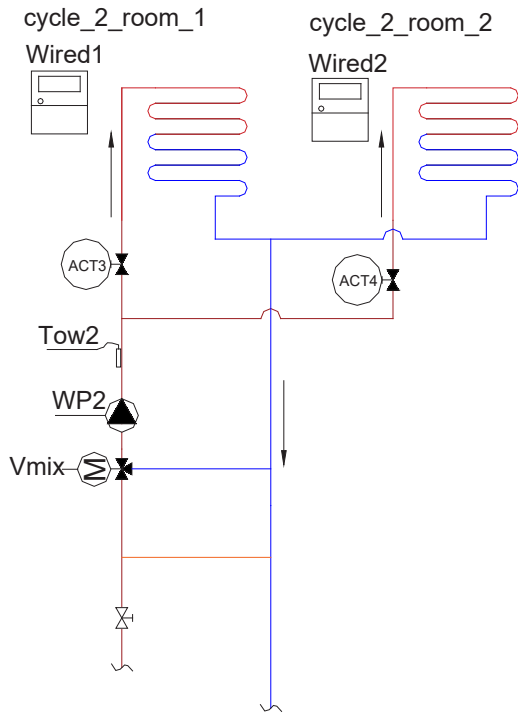
Minfacth\_c2 ≤ Compenh\_c2 ≤ Maxfacth\_c2

NOTE:

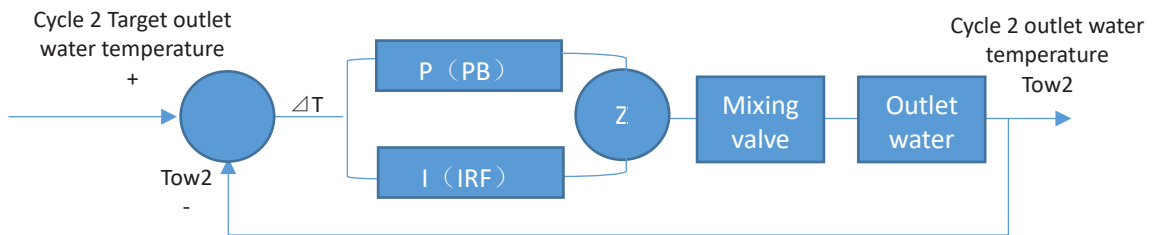
1. [Compensation factor] on Configuration set as [OFF] to inactive room thermostat compensation.
2. Use room thermostat compensation to increase target outlet water temperature dynamically according to room heating load with relative low set-point.

10.2.2.2 Second water temperature control

The mixing valve is controlled to maintain the second heating supply temperature at the second heating target outlet water temperature. The mixing valve position is calculated with a proportional integral action (P+I) control algorithm based on the difference between the heating target outlet water temperature and the heating supply temperature.



Cycle 2 mixing valve position



Where:

- PB: Proportional band of mixing valve.
- IRF: Integral reet factor of mixing valve.
- RTV: running time factor of mixing valve.

The configuration of this option should be done through the master controller.

Configuration → Space heating → Cycle 2→Mixing valve

Mark	Description	Default Value	Range	Steps	Units
RTV	Rotation time	140	10-500s	10s	s
PB	Proportion Factor	6	0-20	0.2	%/°C
IRF	Integral Factor	2.5	0-20	0.1	%/°C.min
	Overheat protection offset	6	OFF, 3-10	1	°C

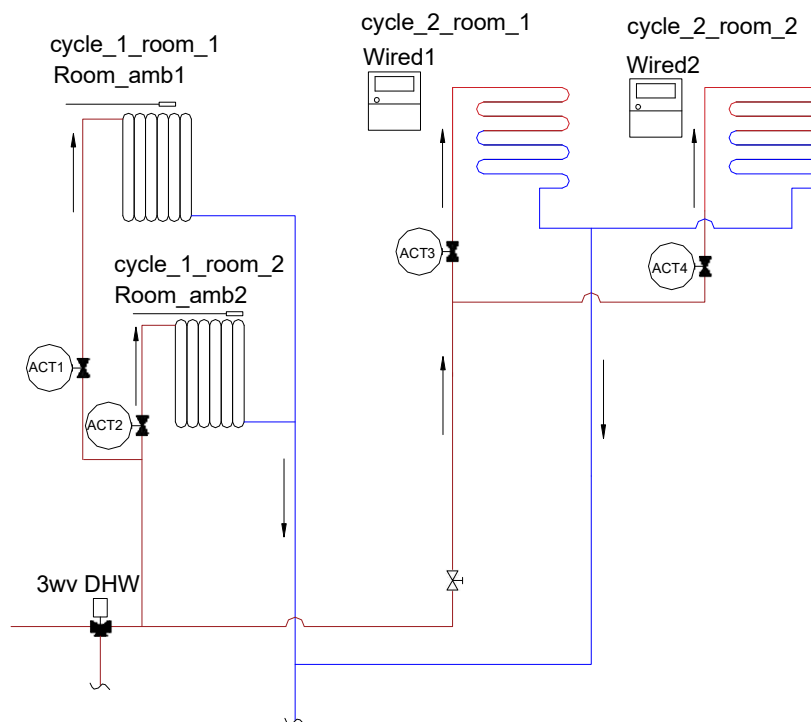
NOTE:

- Mixing valve is field-supplied and Configuration should be adjusted based on the selected Mixing valve and operation confirmation.
- [Overheat protection offset] is used in case of a mixing valve malfunction (i.e.: blocked). The protection has no effect in case it is set to OFF. Overheat in Water Cycle 2 may cause alarm 73 if Overheat protection is set .
- Mixing valve has 2 operation terminals of closing valve and opening valve. Optional output signal need be configured as function of [Mixing valve Close] and [Mixing valve Open] and wire the Mixing valve based on the Configuration. Refer to 10.10.
- ESBE ARA661 is recommended as Mixing valve and bypass pipe before Mixing valve should be tuned to balance water circulation. Bypass pipe before Mixing valve can be skipped if equivalent Bypass replacement is fitted.

Space heating is operated by Water Cycle 1 or combination of Water Cycle 1 and Water Cycle 2. And There are max. 4 room thermostats that can be incorporated to each Water Cycle (Cycle 1 and Cycle 2). It is possible to create Cycle 2 without Second water temperature control (no Mixing valve/WP2/Tow2) to just manage room thermostats and zone control.

NOTE:

- Set [DSW5-3] as [ON] to cancel sensor alarm of [Tow2].
- Set water temperature for Cycle 1 equally to Cycle 2.
- Set [Overheat protection offset] as [OFF]. Overheat in Water Cycle 2 may cause alarm 73 if Overheat protection is set.



## 10.2.2.3 Thermo ON/OFF and capacity control

Space heating is operated by Water Cycle 1 or combination of Water Cycle 1 and Water Cycle 2. Space heating is demanded by request of water outlet temperature on Water Cycle 1 / Water Cycle 2 and Room thermostats.

There are 3 different ways to Thermo ON/OFF Space heating operation (heat pump and other heat resources running and stopping).

The configuration of this option should be done through the master controller.

Configuration →Heat Pump →Water Pump Configuration

Mark	Description	Default Value	Range	Steps	Units
Off_mode(heating)	WP ECO Mode Operation (heating)	ON	ON/OFF	-	-

(1) Thermo ON/OFF by room thermostats when [Off\_mode(heating) ] is set as [OFF].

In this situation, Water Cycle (Cycle 1 or Cycle 2) only operate with Room thermostats.

- Space heating is Thermo ON

If any one of room thermostats on the specific Water Cycle (Cycle 1 or Cycle 2) is Switch ON and Thermo ON, The corresponding Water Cycle will be Switch ON and Thermo ON. Then the heat pump and other heat source will be operated to meet demand. The heat pump and other heat source will be operated to achieve the Maximum value of Target outlet water temperature.

- Maximum value of Target outlet water temperature= [Ttwo\_Cycle 1] if only room thermostats on Water Cycle1 is Thermo ON.
- Maximum value of Target outlet water temperature= [Ttwo\_Cycle 2] if only room thermostats on Water Cycle2 is Thermo ON.
- Maximum value of Target outlet water temperature = Maximum value of [Ttwo\_Cycle 1] and [Ttwo\_Cycle 2] if room thermostats on both Water Cycle1 and Water Cycle2 is Thermo ON.

- Space heating is Thermo OFF

If all of room thermostats on both Water Cycle (Cycle 1 or Cycle 2) is Thermo OFF. Then the heat pump and other heat source will stop operating.

(2) Thermo ON/OFF by request of water outlet temperature on Water Cycle 1 and Water Cycle 2 when [Off\_mode(heating)] is set as [ON] and no room thermostats is available.

In this situation, Water Cycle (Cycle 1 or Cycle 2) can operate independently without Room thermostats by request of water outlet temperature.

- Space heating is Thermo ON when any of the following conditions is fulfilled.

- [Tow] ≤ [Ttwo\_Cycle 1] -3°C (Cycle 1 Thermo ON).
- [Tow] ≤ [Ttwo\_Cycle 2] -3°C (Cycle 2 Thermo ON).

Then the heat pump and other heat source will be operated to meet demand. The heat pump and other heat source will be operated to achieve the Maximum value of Target outlet water temperature.

- Space heating is Thermo OFF when all of the following conditions is fulfilled.

- [Tow] ≥ [Ttwo\_Cycle 1] +4°C (Cycle 1 Thermo OFF)
- [Tow] ≥ [Ttwo\_Cycle 1] +4°C (Cycle 1 Thermo OFF)

Then the heat pump and other heat source will stop operating.

(1) Thermo ON/OFF by combination of room thermostats and request of water outlet temperature on Water Cycle 1 and Water Cycle 2 when [ Off\_mode(heating) ] is set as [ON] and room thermostats is available.

In this situation, Water Cycle (Cycle 1 or Cycle 2) can also operate by combination of request of water outlet temperature and Room thermostats, that means Space heating will be Thermo ON by request of water outlet temperature or Room thermostats. Oppositely the Water Cycle will be Thermo OFF when request of water outlet temperature and Room thermostats Thermo ON all disappear.

- Space heating is Thermo ON

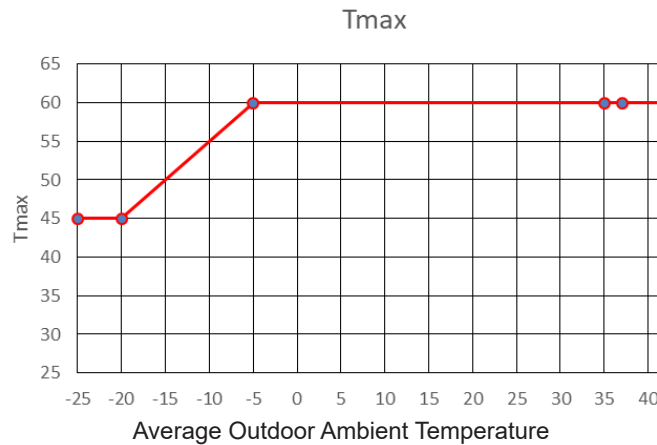
Room thermostats in situation (1) or Request of water outlet temperature in situation (2) Thermo ON.

- Space heating is Thermo OFF

Room thermostats in situation (1) and Request of water outlet temperature in situation (2) all Thermo OFF.

NOTE:

1. [Tow]: Measured outlet water temperature  
 [Tiw]: Measured inlet water temperature  
 [Ttwo\_Cycle 1]: heating Water Cycle1 Target outlet water temperature refers to 10.2.2.1.  
 [Ttwo\_Cycle 2]: heating Water Cycle2 Target outlet water temperature refers to 10.2.2.1.
2. Space heating can be Thermo ON only when measured outlet water temperature [Tow] is lower than Tmax.
3. Space heating will be forced Thermo OFF when measured outlet water temperature [Tow] is more than [Tmax + 3°C].
4. Tmax is Maximum outlet water temperature related outdoor ambient temperature that Heat pump can reach.



5. Water Cycle and room thermostats have following operation interaction

- ① If any one of room thermostats on the specific Water Cycle (Cycle 1 or Cycle 2) is Switch ON, then the corresponding Water Cycle will be Switch ON.
- ② If the specific Water Cycle (Cycle 1 or Cycle 2) is Switch OFF, then all of room thermostats on the corresponding Water Cycle will be forced Switch OFF.
- ③ If all of room thermostats on the specific Water Cycle (Cycle 1 or Cycle 2) is Switch OFF and [Off mode(heating) ] is set as [OFF], then the corresponding Water Cycle will be forced Switch OFF in heating mode.

10.2.2.4 Heating Auto ON/OFF

When outside temperature rises, it is not necessary to keep the heat pump in heating mode. The system switches the heat to OFF when the average outdoor temperature of 24 hours rises above the Switch-OFF Temperature.

The configuration of this option should be done through the master controller.

Configuration → Space heating → Heating Auto ON/OFF.

Mark	Description	Default Value	Range	Steps	Units
Auto Heat	Status	Disabled	Disabled /Enabled	-	-
	Heating Auto temperature	24	18-26	1	°C

[Status] of [Auto Heat] can also be set through the master controller [favourite] button.

Mark	Description	Default Value	Range	Steps	Units
[favourite] button	Auto Heat	OFF	OFF/ON	-	-

Function:

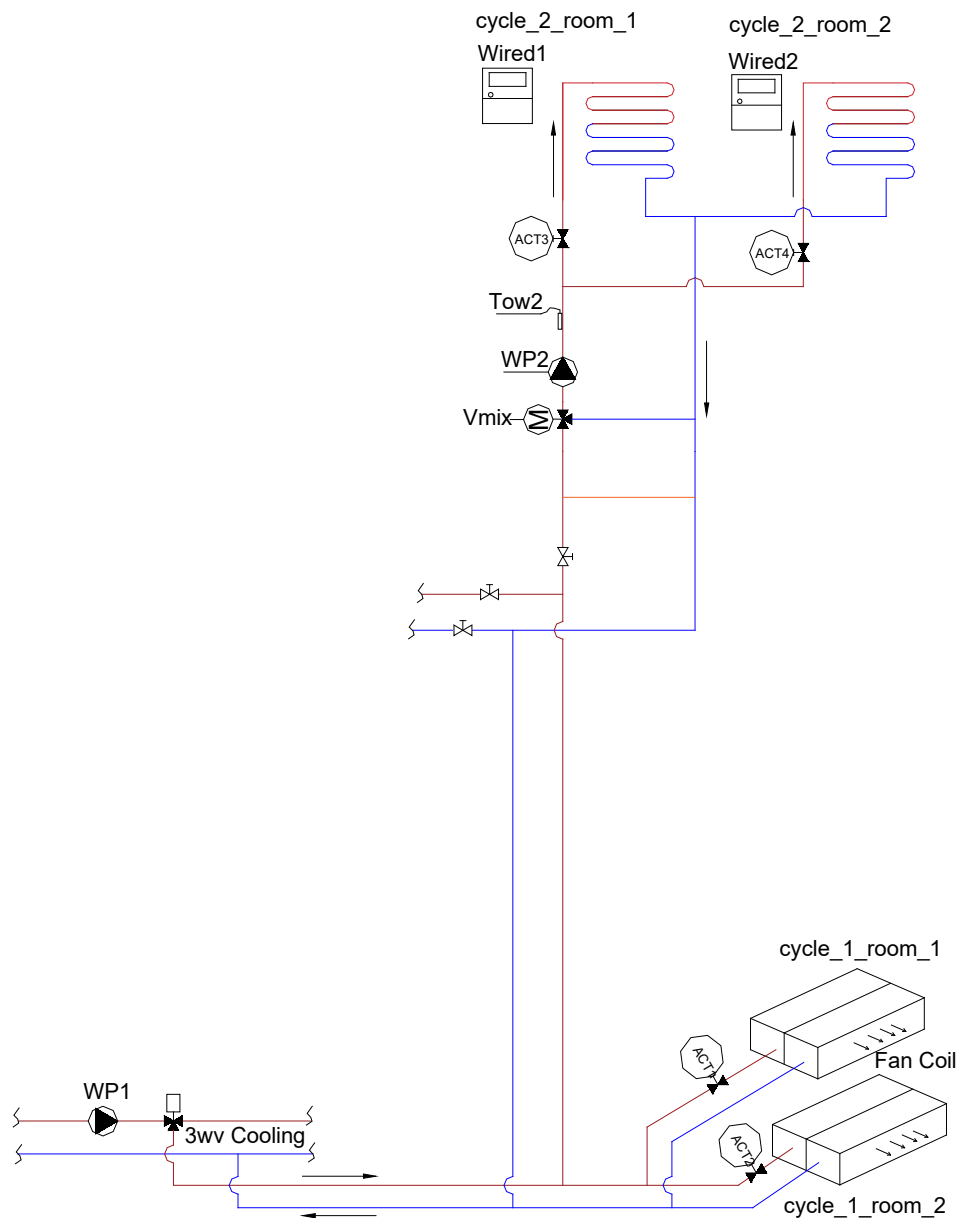
- ① Space heating will be forced Thermo OFF when [Status] of [Auto Heat] is enabled and the average outdoor temperature of 24 hours is more than [Heating Auto temperature] + 1°C.
- ② Forced Thermo OFF will be canceled when [Status] of [Auto Heat] is disabled Or the average outdoor temperature of 24 hours is lower than [Heating Auto temperature] - 1°C.

### 10.2.3 Water Cycle for space cooling

In addition, the unit can be combined with fan coils to delivery space cooling. When space cooling operation is required, the 3-way valve for cooling changes its normal position diverting to the fan coils, allowing to delivery cooling capacity.

Space cooling is operated by Water Cycle 1 or combination of Water Cycle 1 and Water Cycle 2.

Cycle 1 will be direct (low temperature for fan coils operation (5~12°C)) and Cycle 2 will be a mixing cycle in order to have a second temperature control using mixing valve (medium temperature for floor refreshing operation (16~21°C)). Additionally, a motorized valve can be added in order to close direct cycle when not in use . To get these 2 water temperature levels, a mixing station is required. This mixing station is controlled using the indoor unit by means of a mixing valve / additional pump (WP2) /additional water sensor (Tow2).



#### NOTE:

1. When space cooling is available Optional Output signal need be configured as function of [3WV cooling] to drive 3-way valve for space cooling.
2. When Cycle 2 is available Auxiliary sensor on PCB1 of indoor unit need be configured as function of [Tow2] . Refer to 10.10.
3. When Cycle 2 is available Optional Output signal need be configured as function of [WP2]. This Output signal can be used as relay signal to wp2. Refer to 10.10.

The configuration of this option should be done through the master controller

Configuration → Space cooling → Cycle 1

Mark	Description	Default Value	Range	Steps	Units
Cycle 1_Status	Status	Enabled	Disabled /Enabled	-	-

Configuration → Space cooling → Cycle 2

Mark	Description	Default Value	Range	Steps	Units
Cycle 2_Status	Status	Disabled	Disabled /Enabled	-	-

### 10.2.3.1 Set target outlet water temperature

Each of the 2 Water Cycles will have an independent target outlet water temperature. And Target outlet water temperature is combination of Water Cycle set-point and compensation of Water ECO offset / Room thermostat.

(1) Cooling Water Cycle set-point can be define as follows:

Ttwo\_c1\_water\_c\_p as Water Cycle 1.

Ttwo\_c2\_water\_c\_p as Water Cycle 2.

There are 2 ways to set Water Cycle set-point as follows:

- Fixed, refer to 1.2.3.1.1 (1)
- OTC point, refer to 1.2.3.1.1 (2)

(2) Cooling Compensation of Water ECO offset defined as following, refer to 1.2.3.1.2

c1\_wate\_c\_Ecoofs as Water Cycle 1.

c2\_wate\_c\_Ecoofs as Water Cycle 2.

*NOTE: Compensation of Water ECO offset is valid when the function is active.*

(3) Cooling Compensation of Room thermostat defined as following, refer to 1.2.3.1.3

Compenc\_c1 as Water Cycle 1.

Compenc\_c2 as Water Cycle 2.

*NOTE: Compensation of Room thermostat is valid when the function is active.*

(4) Cooling Target outlet water temperature defined as

Ttwo\_Cycle 1\_c as Water Cycle 1.

Ttwo\_Cycle 2\_c as Water Cycle 2.

Cooling Target outlet water temperature is combination of Water Cycle set-point and compensation of Water ECO offset and Room thermostat.

$Ttwo\_Cycle\ 1\_c = Ttwo\_c1\_water\_c\_p - Compenc\_c1 + c1\_wate\_c\_Ecoofs$

$Ttwo\_Cycle\ 2\_c = Ttwo\_c2\_water\_c\_p - Compenc\_c2 + c2\_wate\_c\_Ecoofs$

*NOTE: Compenh\_c1 and Compenh\_c2 is forced as 0 when water Calculation Regulation Mode set as [ Fix ].*

(5) Cooling Target outlet water temperature is regulated as following scope

$c1\_wate\_c\_min \leq Ttwo\_Cycle\ 1\_c \leq c1\_wate\_c\_max$

$c2\_wate\_c\_min \leq Ttwo\_Cycle\ 1\_c \leq c2\_wate\_c\_max$

The configuration of this option should be done through the master controller

Configuration → Space cooling → Cycle 1 → Working range

Mark	Description	Default Value	Range	Steps	Units
c1_wate_c_max	Max. Water Supply Temp	22	19~22	1	°C
c1_wate_c_min	Min. water Supply Temp	12	5~18	1	°C

Configuration → Space cooling → Cycle 2 → Working range

Mark	Description	Default Value	Range	Steps	Units
c2_wate_c_max	Max. Water Supply Temp	22	19~22	1	°C
c2_wate_c_min	Min. water Supply Temp	12	5~18	1	°C

NOTE:

1. It is the installer's responsibility to make sure no unwanted situation occurs (for example: water temperature setting too low into Refreshing floor installation).
2. In case of Radiator and Refreshing floor installation, Radiators valve should be closed and disabled by user and the system only works for refreshing floor.

10.2.3.1.1 Water temperature set-point

Water Cycle set-point can be set as follows:

The configuration of this option should be done through the master controller

Configuration → Space cooling→Cycle 1

Mark	Description	Default Value	Range	Steps	Units
Cycle 1	Water Regulation Mode	Fixed OTC point	Fixed	-	-

Configuration → Space cooling→Cycle 2

Mark	Description	Default Value	Range	Steps	Units
Cycle 2	Water Regulation Mode	Fixed OTC point	Fixed	-	-

(1) Fixed

Setting outlet water temperature is a fixed temperature set by the user on master controller . Refer to master controller manual.

The configuration of this option should be done through the master controller.

Main Interface → Space cooling→Cycle 1

Mark	Description	Default Value	Range	Steps	Units
Ttwo_c1_water_c_p	Cycle 1 water temperature set-point	12	c1_wate_c_min~ c1_wate_c_max	1	°C

Main Interface → Space cooling→Cycle 2

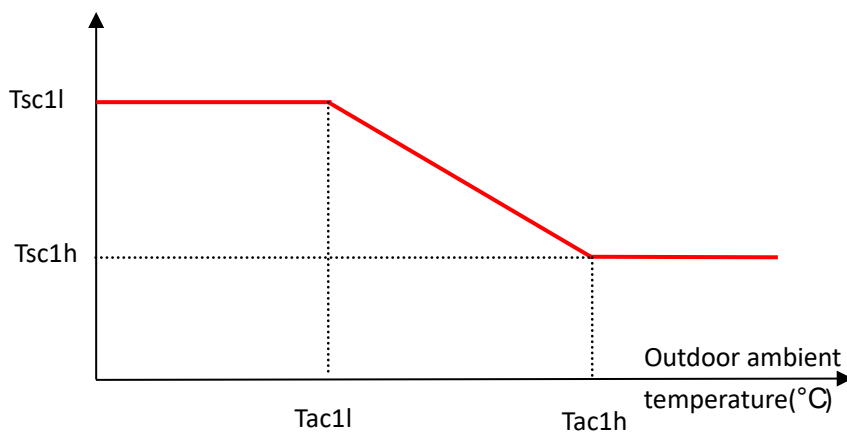
Mark	Description	Default Value	Range	Steps	Units
Ttwo_c2_water_c_p	Cycle 2 water temperature set-point	12	c2_wate_c_min~ c2_wate_c_max	1	°C

(2) OTC point

The weather-dependent set-point defines the parameters for weather-dependent operation of the unit. When weather-dependent operation is active the water temperature is determined automatically depending on the outdoor temperature: higher outdoor temperatures will result in colder water and vice versa.

OTC Points system will use average outdoor ambient temperature in order to get the water temperature set-point. Water set-point will be determined using the following rule.

- ① Water temperature set point of Water Cycle 1: Ttwo\_c1\_water\_c\_p as following



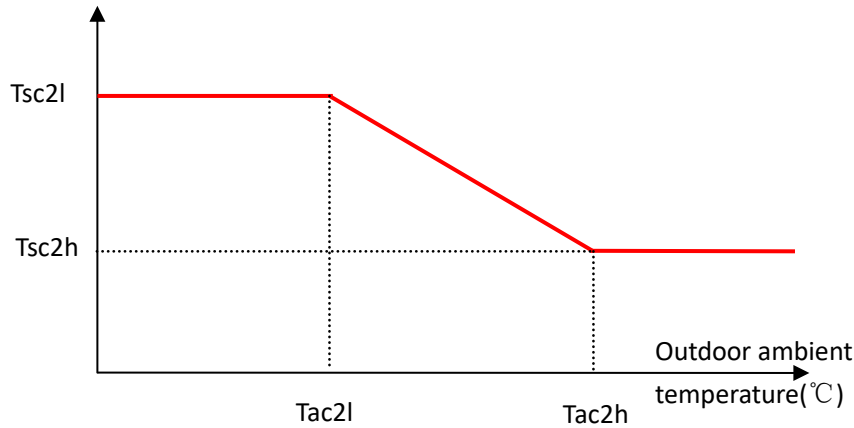
The configuration of this option should be done through the master controller



Configuration → Space cooling → Cycle 1 → Water Regulation Mode → OTC point

Mark	Description	Default Value	Range	Steps	Units
Tac1l	low ambient temperature	23	17~30	1	°C
Tac1h	High ambient temperature	32	31~43	1	°C
Tsc1l	Water temperature at low ambient temperature	22	17~c1_wate_c_max	1	°C
Tsc1h	Water temperature at high ambient temperature	16	c1_wate_c_min~16	1	°C

① Water temperature set point of Water Cycle 2: Ttwo\_c2\_water\_c\_p as following



The configuration of this option should be done through the master controller

Configuration → Space cooling → Cycle 1 → Water Regulation Mode → OTC point

Mark	Description	Default Value	Range	Steps	Units
Tac2l	low ambient temperature	23	17~30	1	°C
Tac2h	High ambient temperature	32	31~43	1	°C
Tsc2l	Water temperature at low ambient temperature	22	17~c2_wate_c_max	1	°C
Tsc2h	Water temperature at high ambient temperature	16	c2_wate_c_min~16	1	°C

NOTE:

1. Average Outdoor Ambient Temperature (2 hours) is used to calculate set-point.

### 10.2.3.1.2 Water ECO offset

- Function

Use a reduced offset for water temperature setting. By using this function, current water temperature setting is reduced by the indicated parameter.

The configuration of this option should be done through the master controller

Configuration → Space cooling → Cycle 1

Mark	Description	Default Value	Range	Steps	Units
c1_wate_Eco	water Eco	Disabled	Disabled/Enabled		
c1_wate_c_Ecoofs	Eco offset	1	-5~5	1	°C

Configuration → Space cooling → Cycle 2

Mark	Description	Default Value	Range	Steps	Units
c2_wate_Eco	water Eco	Disabled	Disabled/Enabled		
c2_wate_c_Ecoofs	Eco offset	1	-5~5	1	°C

- Function activation

ECO offset function is active for each cycle by different options:

- (1) [water Eco] on Configuration set as [Enable]
- (2) Optional input signal can be configured as function of Cycle 1 ECO mode / Cycle 2 ECO mode / Cycle 1 and 2 ECO mode and the corresponding input terminal is closed. refer to 10.10.1.
- (3) [water Eco] of specific Water Cycle from interface of Water Cycle on master controller is pushed ON

10.2.3.1.3 Compensation from Room thermostat

There are max. 4 room thermostats that can be incorporated to each Water Cycle (Cycle 1 and Cycle 2). Compensate water temperature setting by room temperatures and room setting temperature on the specific cycles (Cycle 1 & 2) to operate space cooling/cooling efficiently.

This function is available with the following possible combinations:

- Rooms function on Master controller is selected as room thermostat. Optional Auxiliary sensor on PCB1 of indoor unit can be configured as function of Room\_amb1...7 and be selected as Room temperature detection. Refer to 10.10.
- Slave\_Wired room controller can be selected as room thermostat.

When Room compensation is enabled, the calculated set point is adjusted according on the difference between the Room temperature and room setting temperature. The amount of room influence can be adjusted by the Room temperature compensation factor setting.

To increase or decrease the amount of room compensation, the room compensation factor should be adjusted.

(1) Cycle 1

The configuration of this option should be done through the master controller

Configuration → Space cooling→ Cycle 1→Room temperature Compensation

Mark	Description	Default Value	Range	Steps	Units
Rfactc_c1	Compensation factor	OFF	OFF-1-5	1	°C
Maxfactc_c1	Max Compensation value	5	0~5	1	°C
Minfactc_c1	Min Compensation value	-5	-5~0	1	°C

Compenc\_c1= Rfactc\_c1 × Maximum difference of room temperature and room setting temperature for Thermo ON Rooms on Cycle 1

$$\text{Minfactc\_c1} \leq \text{Compenc\_c1} \leq \text{Maxfactc\_c1}$$

(2) Cycle 2

The configuration of this option should be done through the master controller

Configuration → Space cooling→ Cycle 2→Room temperature Compensation

Mark	Description	Default Value	Range	Steps	Units
Rfactc_c2	Compensation factor	OFF	OFF-1-5	1	°C
Maxfactc_c2	Max Compensation value	5	0~5	1	°C
Minfactc_c2	Min Compensation value	-5	-5~0	1	°C

Compenc\_c2= Rfactc\_c2 × Maximum difference of room temperature and room setting temperature for Thermo ON Rooms on Cycle 2

$$\text{Minfactc\_c2} \leq \text{Compenc\_c2} \leq \text{Maxfactc\_c2}$$

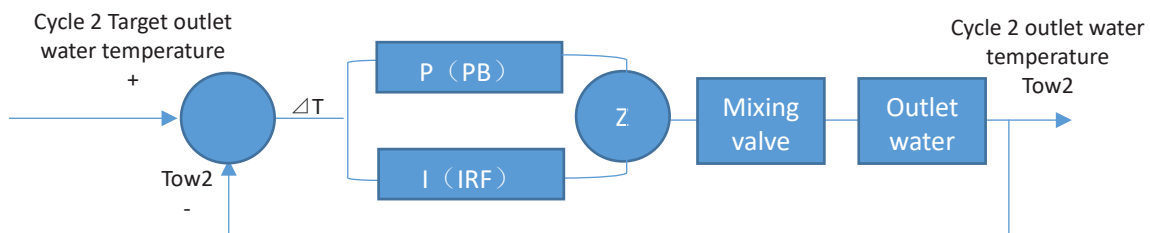
NOTE:

1. [Compensation factor] on Configuration set as [OFF] to inactive room thermostat compensation.
2. Use room thermostat compensation to decrease target outlet water temperature dynamically according to room cooling load with relative high set-point.

10.2.3.2 Second water temperature control

The mixing valve is controlled to maintain the second cooling supply temperature at the second cooling target outlet water temperature. The mixing valve position is calculated with a proportional integral action (P+I) control algorithm based on the difference between the cooling target outlet water temperature and the cooling supply temperature.

Cycle 2 mixing valve position



Where:

PB: Proportional band of mixing valve.

IRF: Integral reet factor of mixing valve.

RTV: running time factor of mixing valve.

The configuration of this option should be done through the master controller.

Configuration → Space cooling → Cycle 2 → Mixing valve

Mark	Description	Default Value	Range	Steps	Units
RTV	Rotation time	140	10-500s	10s	s
PB	Proportion Factor	6	0-20	0.2	%/°C
IRF	Integral Factor	2.5	0-20	0.1	%/°C.min
	Overheat protection offset	6	OFF, 3-10	1	°C

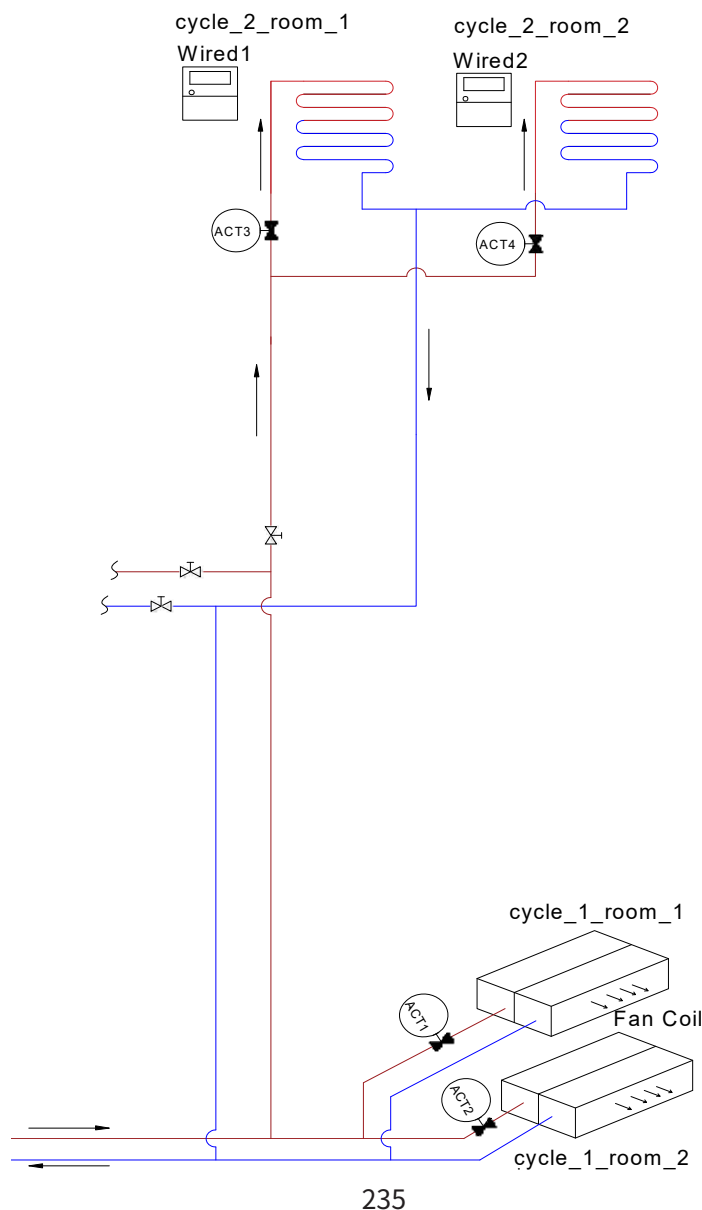
NOTE:

1. *Mixing valve is field-supplied and Configuration should be adjusted based on the selected Mixing valve and operation confirmation.*
2. *[Overheat protection offset] is not available in cooling operation.*
3. *Mixing valve has 2 operation terminals of closing valve and opening valve. Optional output signal need be configured as function of [Mixing valve Close] and [Mixing valve Open] and wire the Mixing valve based on the Configuration. Refer to 10.10.*
4. *ESBE ARA661 is recommended as Mixing valve and bypass pipe before Mixing valve should be tuned to balance water circulation. Bypass pipe before Mixing valve can be skipped if equivalent Bypass replacement is fitted.*

Space cooling is operated by Water Cycle 1 or combination of Water Cycle 1 and Water Cycle 2. And There are max. 4 room thermostats that can be incorporated to each Water Cycle (Cycle 1 and Cycle 2). It is possible to create Cycle 2 without Second water temperature control (no Mixing valve/WP2/Tow2) to just manage room thermostats and zone control.

NOTE:

1. *Set [DSW5-3] as [ON ] to cancel sensor alarm of [Tow2].*
2. *Set water temperature for Cycle 1 equally to Cycle 2.*



## 10.2.3.3 Thermo ON/OFF and capacity control

Space cooling is operated by Water Cycle 1 or combination of Water Cycle 1 and Water Cycle 2. Space cooling is demanded by request of water outlet temperature on Water Cycle 1 / Water Cycle 2 and Room thermostats.

There are 3 different ways to Thermo ON/OFF Space cooling operation (heat pump running and stopping).

The configuration of this option should be done through the master controller.

Configuration →Heat Pump →Water Pump Configuration

Mark	Description	Default Value	Range	Steps	Units
Off_mode(cooling)	WP ECO Mode Operation (cooling)	OFF	ON/OFF	-	-

(1) Thermo ON/OFF by room thermostats when [Off\_mode(cooling) ] is set as [OFF].

In this situation, Water Cycle (Cycle 1 or Cycle 2) only operate with Room thermostats.

- Space cooling is Thermo ON

If any one of room thermostats on the specific Water Cycle (Cycle 1 or Cycle 2) is Switch ON and Thermo ON, The corresponding Water Cycle will be Switch ON and Thermo ON. Then the heat pump will be operated to meet demand. The heat pump will be operated to achieve the Minimum value of Target outlet water temperature.

- Minimum value of Target outlet water temperature= [Ttwo\_Cycle 1\_c] if only room thermostats on Water Cycle1 is Thermo ON.
- Minimum value of Target outlet water temperature= [Ttwo\_Cycle 2\_c] if only room thermostats on Water Cycle2 is Thermo ON.
- Minimum value of Target outlet water temperature = Minimum value of [Ttwo\_Cycle 1\_c] and [Ttwo\_Cycle 2\_c] if room thermostats on both Water Cycle1 and Water Cycle2 is Thermo ON.

- Space cooling is Thermo OFF

If all of room thermostats on both Water Cycle (Cycle 1 or Cycle 2) is Thermo OFF. Then the heat pump will stop operating.

(2) Thermo ON/OFF by request of water outlet temperature on Water Cycle 1 and Water Cycle 2 when [Off\_mode(cooling)] is set as [ON] and no room thermostats is available .

In this situation ,Water Cycle (Cycle 1 or Cycle 2) can operate independently without Room thermostats by request of water outlet temperature.

- Space cooling is Thermo ON when any of the following conditions is fulfilled.
  - [Tow] ≥ [Ttwo\_Cycle 1\_c] and [Tiw] ≥ [Ttwo\_Cycle 1\_c] +5°C (Cycle 1 Thermo ON).
  - [Tow] ≥ [Ttwo\_Cycle 2\_c] and [Tiw] ≥ [Ttwo\_Cycle 2\_c] +5°C (Cycle 2 Thermo ON).

Then the heat pump will be operated to meet demand. The heat pump will be operated to achieve the Minimum value of Target outlet water temperature.

- Space cooling is Thermo OFF when all of the following conditions is fulfilled.
  - [Tow] ≤ [Ttwo\_Cycle 1\_c] -4°C or [Tow] ≤ 3°C (Cycle 1 Thermo OFF).
  - [Tow] ≤ [Ttwo\_Cycle 2\_c] -4°C or [Tow] ≤ 3°C (Cycle 2 Thermo OFF).

Then the heat pump will stop operating.

(3) Thermo ON/OFF by combination of room thermostats and request of water outlet temperature on Water Cycle 1 and Water Cycle 2 when [ Off\_mode(cooling) ] is set as [ON] and room thermostats is available.

In this situation, Water Cycle (Cycle 1 or Cycle 2) can also operate by combination of request of water outlet temperature and Room thermostats, that means Space cooling will be Thermo ON by request of water outlet temperature or Room thermostats. Oppositely the Water Cycle will be Thermo OFF when request of water outlet temperature and Room thermostats Thermo ON all disappear.

- Space cooling is Thermo ON

Room thermostats in situation (1) or Request of water outlet temperature in situation (2) Thermo ON.

- Space cooling is Thermo OFF

Room thermostats in situation (1) and Request of water outlet temperature in situation (2) all Thermo OFF.

NOTE:

1. [Tow]:Measured outlet water temperature

[Tiw]:Measured inlet water temperature

[Ttwo\_Cycle 1\_c : cooling Water Cycle1 Target outlet water temperature

[Ttwo\_Cycle 2\_c] : cooling Water Cycle2 Target outlet water temperature

2. Water Cycle and room thermostats have following operation interaction.

- ① If any one of room thermostats on the specific Water Cycle (Cycle 1 or Cycle 2) is Switch ON, then the corresponding Water Cycle will be Switch ON.
- ② If the specific Water Cycle (Cycle 1 or Cycle 2) is Switch OFF, then all of room thermostats on the corresponding Water Cycle will be forced Switch OFF.
- ③ If all of room thermostats on the specific Water Cycle (Cycle 1 or Cycle 2) is Switch OFF and [Off\_mode(cooling) ] is set as [OFF], then the corresponding Water Cycle will be forced Switch OFF in cooling mode.

#### 10.2.4 Auto HEAT/COOL

The end-user set the desired operation mode on the controller: Heating, Cooling or Automatic. When Automatic is selected, the change of the operation mode is based on averaged outdoor temperature. As long the outdoor temperature changes, the system changes to match the system requirements. If outdoor temperature drops, the operation mode switches to heating, and vice versa.

Space mode should be done through the master controller interface.

Main Interface → Space mode

Mark	Description	Default Value	Range	Steps	Units
	Space mode	-	Heat/Cool/Auto		

The configuration of this option should be done through the master controller.

Configuration → Auto Heat/Cool

Mark	Description	Default Value	Range	Steps	Units
Hoff	Switch to Space heating	22	10-23	1	°C
Coff	Switch to Space Cooling	25	24-35	1	°C

Space heating and space cooling will be decided as following When Space mode set [Auto]

- ① Space heating will be set when the average outdoor temperature of 24 hours is lower than [Hoff].
- ② Space cooling will be set when the average outdoor temperature of 24 hours is more than [Coff].

#### 10.2.5 Hydraulic separator

In some installations, water pump of the unit is not sized for big heating installations (small water pump). In those cases, a hydraulic separator or buffer tank, as a extra water pump, has to be used to ensure a proper water pump dimensioning.

The boiler is configured with the heat pump. A hydraulic separator or buffer tank has to be used to ensure a proper hydraulic balancing. Additional water pump [WP3] and water sensor [Tow3] is needed for the boiler combination control.

Some installations need a big buffer tank in combination with an auxiliary heating system (boiler, pellets, solar panels, etc.). In those cases, the control of the water temperature can be done by an external temperature sensor (Tow3) to heat the water of that tank.

For example, the system works for only one zone application.

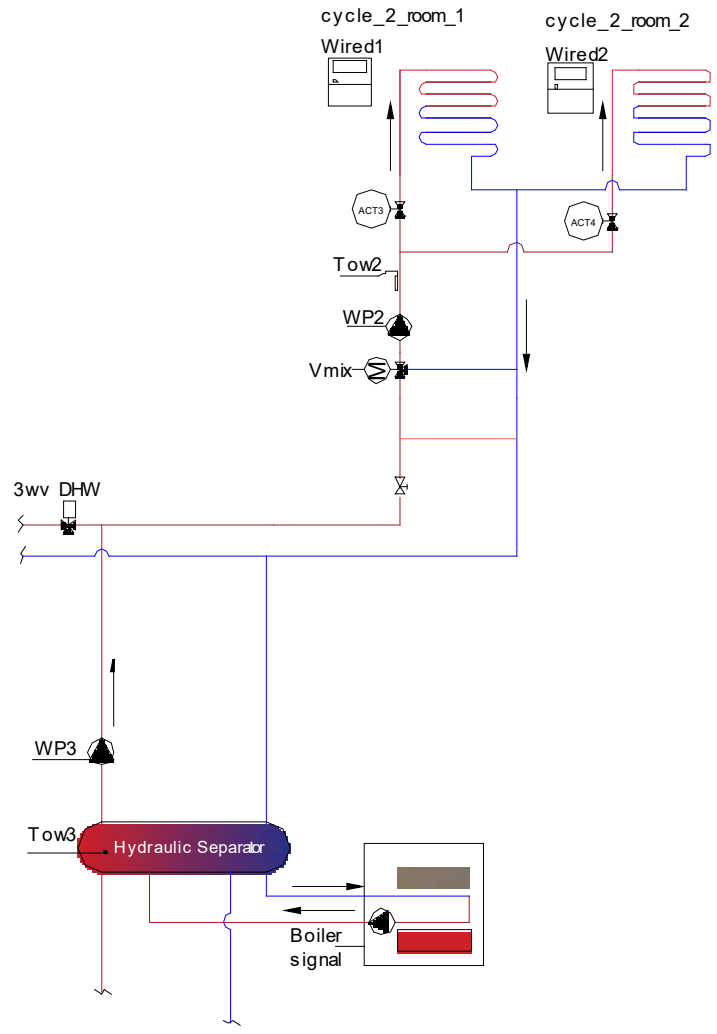
Using the buffer tank in combination with a boiler, Cycle 1 is working as Cycle 2 in a mixing loop. With this system, the configuration of the Unit controller is like for 2 Cycles:

Cycle 1: Buffer tank working as Cycle 1

Cycle 2: Mixing circuit for space heating

NOTE:

1. Settings for Cycle 1 must be always higher than for Cycle 2.
2. Room thermostats must be incorporated only to Water Cycle 2. And [ Off\_mode(heating)] is set as [ON].
3. Cycle 1 only works as a buffer tank.



The configuration of this option should be done through the master controller.

Configuration →Complementary Heating →Boiler

Mark	Description	Default Value	Range	Steps	Units
hsb	Hydraulic Separator Status	Disabled	Disabled / Enabled		

NOTE :

1. When hydraulic separator is Enabled ,Auxiliary sensor on PCB1 of indoor unit must be configured as function of [Tow3] and water sensor [Tow3] must be embedded in hot water side of hydraulic separator to detect hot water temperature from the hydraulic separator. Refer to 10.10.
2. When hydraulic separator is Enabled, Optional Output signal need be configured as function of [WP3 ],and Additional water pump [WP3] must be activated by [WP3 ] Output signal. This Output signal can be used as relay signal to wp3. Refer to10.10.
3. When hydraulic separator is Enabled and water sensor (Tow3) is available, Tow3 is used to achieve Thermo ON/OFF and capacity control (referring to 10.2.2.3 and 10.2.3.3) instead of [Tow].
4. Hydraulic separator is not recommended with big water volume (less than 25L) when DHW is combined in the system, that will cause less efficiency and additional heating time to heat up DHW tank.

### 10.3 DHW

In addition, the unit can be combined with sanitary tank to delivery DHW. When DHW operation with heat pump is required, the 3-way valve for DHW changes its normal position diverting to the sanitary tank inner coil, allowing to heat the tank water temperature.

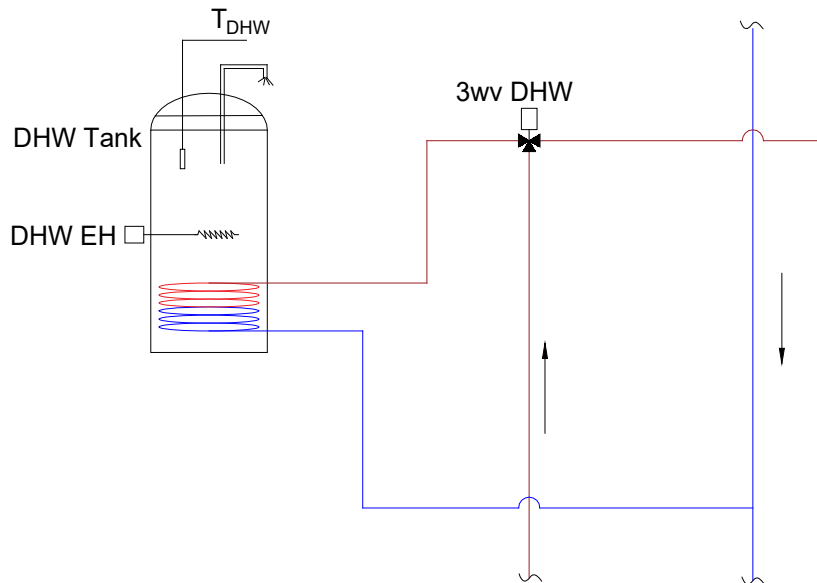
DHW operation should be enabled from the master controller.

DHW can be heated up by heat pump / DHW Electric Heater / boiler / solar panel depending on heat source availability and setting.

The configuration of DHW availability should be done through the master controller.

Configuration →DHW

Mark	Description	Default Value	Range	Steps	Units
DHW_hts	Status	Enabled	Disabled /Enabled	-	-



#### NOTE:

1. When DHW is available DHW sensor of [TDHW] on PCB1 of indoor unit must be added to detect DHW water temperature.
2. DHW sensor of [TDHW] must be embedded in hot water side of DHW tank to detect hot water temperature. DHW sensor of [TDHW] must be installed above DHW Electric Heater and inner coil to detect hottest water temperature during DHW heat pump or DHW Electric Heater operation.
3. Auxiliary DHW sensor of [TDHW1] is optional to detect water temperature in the DHW tank of lower side, which can help to manage DHW operation with heat pump. When Auxiliary DHW sensor of [TDHW1] is choosed, Auxiliary sensor on PCB1 of indoor unit must be configured as function of [TDHW1] referring to 10.10.3. Auxiliary DHW sensor of [TDHW1] need be installed on the metal surface of tank at the top part of inner coil and be well insulated to detect hottest water temperature during DHW heat pump operation. When Auxiliary DHW sensor of [TDHW1] is configured and installed, Auxiliary DHW sensor of [TDHW1] will be involved to manage DHW operation with heat pump, otherwise only DHW sensor of [TDHW] is used to manage DHW operation.
4. When DHW is available Optional Output signal need be configured as function of [3WV DHW] to drive 3-way valve for DHW.
5. Inner coil surface area is critical to heat up DHW with heat pump. Inadequate coil surface area will cause less efficiency, additional heating time, and stoppage of heat pump.



### 10.3.1 DHW setting temperature

DHW setting temperature should be done through the master controller interface.

Main Interface → DHW

Mark	Description	Default Value	Range	Steps	Units
TDHWS	DHW Setting temperature		40- TDHWS_max	1	°C

In order to prevent high hot water in the tank an additional function of [Max. Setting Temp] is added:

The configuration of this option should be done through the master controller.

Configuration →DHW

Mark	Description	Default Value	Range	Steps	Units
TDHWS_max	Max. Setting Temp	55	40-A	1	°C

NOTE :

1. When DHW Electric Heater is available ([DHW\_hts] set as [Enabled] , refer to 10.3.3), A=75°C.
2. When Boiler is available and DHW by Boiler is enabled ([HS] set as [HP+Heater+Boiler] or [HP+Heater+Boiler] and [DHW\_B] set as [Enable] , refer to 10.6.3), A=60°C.
3. Circumstance except 1 and 2 , A=55°C.
4. In case of heating up the DHW tank with an outdoor ambient temperature lower than -5°C and without using the DHW electrical heater, the setting temperature should not exceed the maximum value in the specified continuous working range.

### 10.3.2 DHW operation with heat pump

When DHW operation with heat pump is required, the 3-way valve for DHW changes its normal position diverting to the sanitary tank inner coil, allowing to heat the tank water temperature.

The configuration of this option should be done through the master controller.

Configuration →DHW

Mark	Description	Default Value	Range	Steps	Units
DHW_HP_mode	Control	Powerful	Powerful / Efficient		
DHW_HP_diff	HP ON Differential Temp	5	1-10	1	°C
DHW_HP_tmax	HP ON Max. Time	60	20~250~unlimited	1	min
DHW_HP_cycle	HP ON interval	1	0-24	1	hour

- (1) Heat pump can heat up DHW with 2 different control modes: [Powerful] and [Efficient].
- [Powerful]: This is fast way to heat DHW. Target outlet water temperature of DHW operation is 30°C higher than the tank temperature.
  - [Efficient] :The efficient way to heat DHW. Target outlet water temperature of DHW operation 15°C higher than the tank temperature.
- (2) [DHW\_HP\_diff]: Hysteresis for the start of DHW heating operation with Heat pump.
- (3) [DHW\_HP\_tmax]: Maximum time that DHW will be heat up by heat pump, after that time heat pump stops operating by this function and DHW is still heated by DHW Electric Heater when it is enabled, until other conditions request stoppage. This function is invalid when [DHW\_HP\_tmax] is set [unlimited].
- (4) [DHW\_HP\_cycle]: the minimum time between 2 heat pump cycles of DHW operation, after that time heat pump will be able to operate again to heat up DHW when heat pump is stopped by the function of [DHW\_HP\_tmax].

### 10.3.3 DHW operation with DHW Electric Heater

DHW Electric Heater (DHW EH) is on-site accessory to deliver additional heating capacity during cold outdoor temperatures. The electrical heater can also be used for emergency operation in case of outdoor unit malfunction.

NOTE:

1. For DHW Electric Heater Optional Output signal need be configured as function of [DHW Electric Heater] to drive relay. The power supply of DHW Electric Heater connects to terminals HL-HN and build-in Safety thermostat of DHW Electric Heater connects to terminals L1-I12 (DHW The2).

The configuration of this option should be done through the master controller.

Configuration →DHW→ DHW Electrical Heater

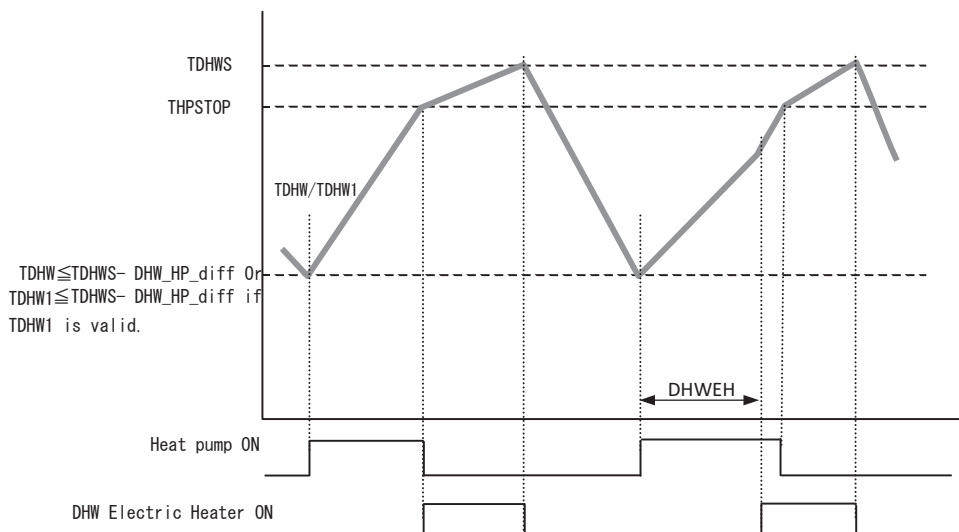
Mark	Description	Default Value	Range	Steps	Units
DHW_hts	Status	Disabled	Disabled /Enabled		
DHW_ht_mode	mode	Standard	Standard/ H.Demand		
DHWEH	Waiting Time	45	0~250~unlimited	1	min
DHW_ht_diff	ON Differential Temp	6	1-10	1	°C

- (1) DHW Electric Heater is activated when [DHW\_hts] is set as [Enabled].
- (2) DHW Electric Heater can be forced off if DSW4-3: OFF. Forcing off DHW electric heater by DSW4-3: OFF is invalid when DHW Emergency operation (referring to 10.1.3.2), DHW Boost operation (referring to 10.3.6), DHW Anti-legionella operation (referring to 10.3.5) or HP Block operation (referring to 10.9.5). The heater is forced off with factory setting. Set DSW4-3: ON to cancel forcing off through the Dip switch on PCB1.
- (3) DHW Electric Heater can heat up DHW on 2 different modes: [Standard] and [H.Demand].
  - Standard: DHW will be heat up by heat pump prior to DHW Electric Heater when water temperature in the tank [TDHW] / [TDHW1 if TDHW1 is valid] is low enough to start up the heat pump. Then DHW Electric Heater will start to heated up DHW when water temperature in the tank is too high to run the heat pump. This is an efficient way to use energy.
  - High Demand: DHW Electric Heater operation starts if water temperature in the tank [TDHW] and DHW setting temperature [TDHWS] difference is larger than differential temperature [DHW\_ht\_diff]. DHW can be heated up using the heater, heat pump, or a combination of both without priority. This is fast way to heat up DHW.
- (4) [DHWEH]: DHW Electric heater waiting time, after that time heat pump heats up DHW and Heat Pump cannot give enough capacity it will be necessary to start Heater in order to supply additional capacity. Then DHW Electric Heater starts. [DHWEH] only available when [DHW\_ht\_mode] is set as [Standard].
- (5) [DHW\_ht\_diff]: Hysteresis for the start of DHW heating operation with DHW Electric Heater.

### 10.3.4 DHW operation by heat pump and Heater

- (1) [DHW\_ht\_mode] is set [Standard]

DHW is heated up by heat pump and DHW Electric Heater sequentially When [DHW\_ht\_mode] is set [Standard]. Low temperature part of DHW is heated up by heat pump until max temperature of THPSTOP or DHW Electric heater waiting time[DHWEH], and then the remain high temperature part of DHW is done by DHW Electric Heater.





NOTE:

1. *Tow/Tow3 should be lower than 55°C to start heat pump.*

(4) DHW Electric Heater operates during Space heating/cooling.

When heat pump shift to Space heating/cooling operation at the time that DHW schedule priority is activated (referring to 10.1.2.1.1) and DHW setting temperature (TDHWS) is not met, it is possible that heat pump does not have enough capacity to heat up DHW in this DHW operation shift. So DHW Electric Heater can start to offer additional capacity.

• DHW Electric Heater will start if:

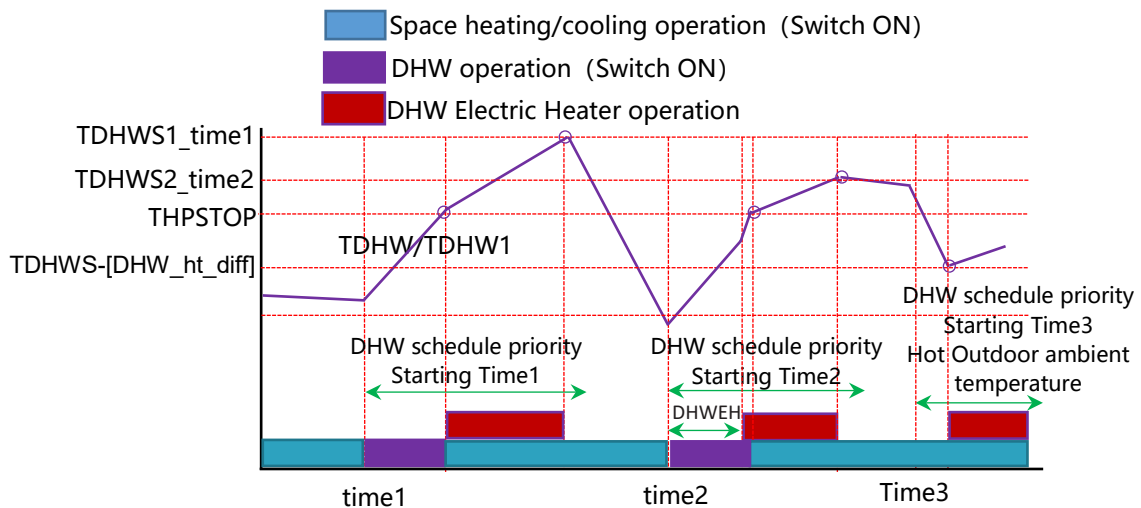
- ① Heat pump shift to Space heating/cooling operation form DHW operation referring to 10.1.2.1.1.
- ② Current DHW temperature (TDHW) is lower than DHW setting temperature (TDHWS) -2 °C.
- ③ DHW schedule priority is activated at specific setting Starting Time referring to 10.1.2.1.1 (1).

Or

- ① Heat pump is Space cooling operation.
- ② Average outdoor ambient temperature is more than 38°C-40°C , that is out of heat pump heatingoperation range.
- ③ Current DHW temperature (TDHW) is lower than DHW setting temperature (TDHWS) - [DHW\_ht\_diff] °C.
- ④ DHW schedule priority is activated at specific setting Starting Time referring to 10.1.2.1.1 (1).

• DHW Electric Heater will stop if:

DHW setting temperature (TDHWS) is met or Auxiliary electric heater starts.



### 10.3.5 DHW Anti-legionella protection

In order to help prevent against Legionella in the domestic hot water system, the DHW set point can be raised to a higher than normal temperature. The Legionella protection only makes sense if there is a DHW electric heater to raise the DHW temperature to this high temperature.

Heat pump and DHW Electric Heater will work at mode of [H.Demand] to achieve quick heating up.

DHW Anti-legionella can be activated by manual ON or weekly timer.

- DHW Anti-legionella can be activated by manual ON through the master controller interface of DHW.

The operation of this function should be done through the master controller interface of DHW.

Mark	Description	Default Value	Range	Steps	Units
	DHW Antilegionella	OFF	OFF/ON	-	-

NOTE:

- 1. *DHW Anti-legionella manual ON through the master controller interface of DHW will be forced off after specific time (about 80minutes).*

- DHW Anti-legionella can also be activated by weekly timer.

The configuration of this option should be done through the master controller.

Configuration → Auxiliary Function → DHW-Anti Legionella

Mark	Description	Default Value	Range	Steps	Units
Anti_Legionella_Status	Status	Disabled	Disabled/Enabled	—	—
Anti_Legionella_Oplnt	Operation day	Sunday	Daily/Mon~Sun	—	day
Anti_Legionella_StTim	Starting Time	01:00	(00:00~23:50)	00:10	time
TDHWS_Anti_Legionella	Setting temperature	A	40~A*	5	°C
Anti_Legionella_Keep	Duration Time	10	10~60	5	min

NOTE:

1. When DHW Electric Heater is available ([DHW\_hts] set as [Enabled] , referring to 10.3.3), A=75°C. Otherwise A=60°C.

- ① Status: defines whether the Anti Legionella function is turned Disabled or Enabled.
- ② Operation Day: day of the week at which DHW Anti-legionella will work.
- ③ Starting time: time of the day at which DHW Anti-legionella will work.
- ④ Setting temperature: high water temperature of tank to be reached.
- ⑤ Duration Time: time period defining how long the set point temperature should be maintained.

NOTE:

1. If DHW electric heater is unavailable and Anti-legionella Setting temperature is too high, DHW will be heated up to the max temperature by heat pump.
2. DHW electric heater will work as mode of [H.Demand] and confine of [DHW\_ht\_diff] =1°C to achieve high temperature quickly. Forcing off DHW electric heater by DSW43: OFF is invalid during DHW Anti-legionella operation.

### 10.3.6 DHW Boost

It is possible to request a one-time heating up of DHW temperature up to DHW Boost temperature setting. This can be useful when spontaneous DHW Demand for one day.

Heat pump and DHW Electric Heater will work at mode of [H.Demand] to achieve quick heating up.

The configuration of this option should be done through the master controller.

Configuration → Auxiliary Function → DHW-Boost

Mark	Description	Default Value	Range	Steps	Units
DHW_Boost	Trigger type	Push	Disabled/Push/Open/Closed	—	—
TDHWS_Boost	Setting temperature	A	40~A*	5	°C

NOTE:

1. When DHW Electric Heater is available ([DHW\_hts] set as [Enabled] , refer to 10.3.3), A=75°C.
2. When Boiler is available and DHW by Boiler is enabled ([HS] set as [HP+Heater+Boiler] or [HP+Heater+Boiler] and [DHW\_B] set as [Enabled] , refer to 10.6.3), A=60°C.
3. circumstance except 1 and 2, A=55°C.

To start a DHW Boost operation, users have 2 options:

- DHW Boost can be activated by manual ON through the master controller [favourite] button or interface of DHW when [Trigger type] is set as [Push].

The operation of this function should be done through the master controller [favourite] button or interface of DHW.

Mark	Description	Default Value	Range	Steps	Units
master controller [favourite] button or interface of DHW	DHW Boost		OFF/ON	-	-

- DHW Boost can also be activated by Optional input signal of DHW Boost when [Trigger type] is set as [Open] or [Closed].

Optional input signal can be configured as function of [DHW Boost], refer to 10.10.1.

Closing corresponding input terminal will activate DHW Boost if [Trigger type] is set as [Closed].

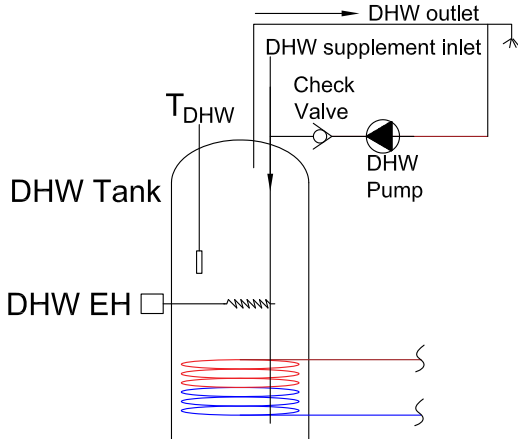
Opening corresponding input terminal will activate DHW Boost if [Trigger type] is set as [Open].

NOTE:

1. If DHW electric heater is unavailable and DHW Boost Setting temperature is too high, DHW will be heated up to the max temperature by heat pump.
2. DHW electric heater will work as mode of [H.Demand] and confine of [DHW\_ht\_diff] ≤ 3°C to achieve setting temperature quickly(referring to 10.3.3). Forcing off DHW electric heater by DSW4-3: OFF is invalid during DHW Boost operation.

10.3.7 DHW Recirculation pump

Output signal to drive relay of a re-circulation pump in case of re-circulation pump is available for DHW tank. By using this output, user can heat all the water inside DHW system when heating DHW by Heat Pump. This output can also be used with Legionella and timer function.



NOTE:

1. When DHW Recirculation pump is available Optional Output signal need be configured as function of [DHW re-circulation pump] to drive relay of a re-circulation pump.

The configuration of this option should be done through the master controller.

Configuration →Auxiliary Function →DHW Pump

Mark	Description	Default Value	Range	Steps	Units
DHW_recirp	DHW Pump	Disabled	Disabled Demand Anti-Legionella Timer Timer+ Demand Timer+ Anti-Legionella Timer+ Demand+ Anti-Legionella	-	-

- (1) [DHW\_recirp] set as [Disabled] to invalid DHW Recirculation pump function.
- (2) [DHW\_recirp] set as [Demand]  
Output ON signal in case that DHW is demand ON or DHW Electric Heater is ON.
- (3) [DHW\_recirp] set as [Anti-Legionella]  
Output ON signal in case that DHW Anti-legionella protection is operated.  
DHW Recirculation pump can be used to circulate DHW outlet water to offer instant hot water at the tap.

Configuration →Auxiliary Function →DHW Pump

Mark	Description	Default Value	Range	Steps	Units
DHW_recirp_t	Running Time	8	5-60	1	Min

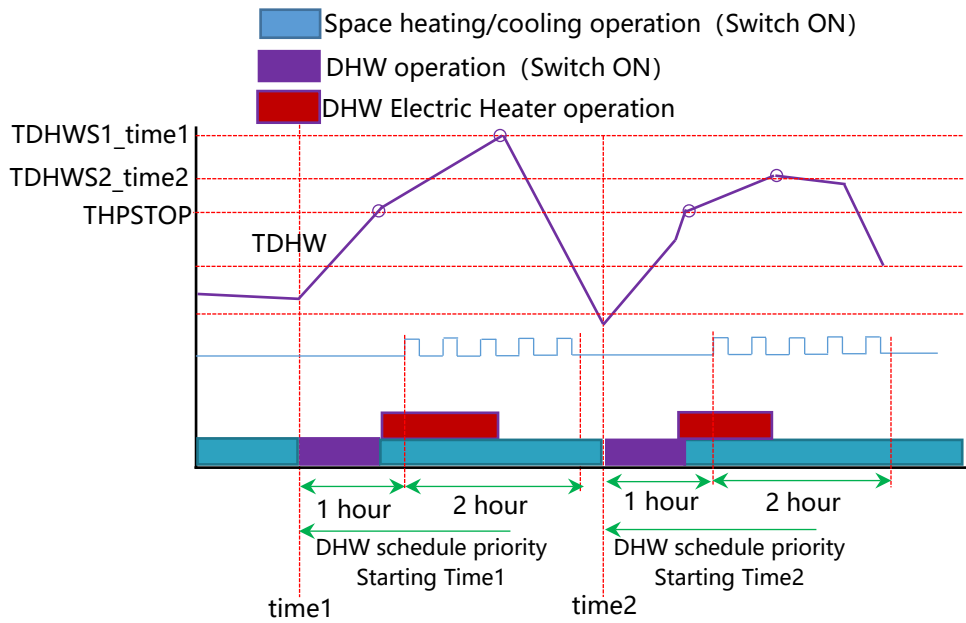
The operation of DHW Pump can be done through the master controller [favourite] button.

Mark	Description	Default Value	Range	Steps	Units
Master controller [favourite] button	DHW Pump		ON/OFF	-	-

- DHW Pump will run for [DHW\_recirp\_t] of Running Time after Push ON through the master controller [favourite] button of DHW Pump .
- DHW Pump will stop automatically after [DHW\_recirp\_t] of Running Time.

- (4) [DHW\_recirp] set as [Timer]

Output ON/OFF signal periodically (ON 4min and OFF 8min) one hour later after DHW schedule priority is activated at [Starting Time 1/2/3/4] and This Output will last 2 hours. Refer to 10.1.2.1.1.



- (5) [DHW\_recirp] set as [Timer+ Demand]  
Output ON signal in case that conditions of (2) or (4) are met.
- (6) [DHW\_recirp] set as [Timer+ Anti-Legionella]  
Output ON signal in case that conditions of (3) or (4) are met.
- (7) [DHW\_recirp] set as [Timer+ Demand+ Anti-Legionella]  
Output ON signal in case that conditions of (2) , (3) or (4) are met.

**10.3.8 DHW Electric Heater during Emergency operation**

DHW Electric Heater Operation during Emergency operation  
 DHW Electric Heater Operation during Emergency operation (referring to 10.1.3.2) as following:  
 1.Forcing off DHW electric heater by DSW4-3:OFF is invalid when DHW Emergency operation.  
 2.DHW Electric Heater will work at mode of [H.Demand] (referring to 10.3.4) .



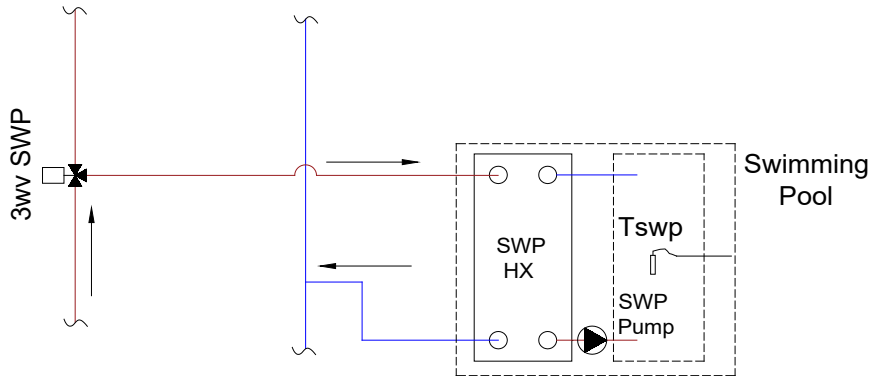
### 10.4 Swimming pool

In addition, the unit can be combined with swimming pool. When the swimming pool operation is required, the 3-way valve for the swimming pool changes its normal position diverting to the swimming pool heat exchanger, allowing to heat the swimming pool water temperature to a comfortable value.

The configuration of swimming pool availability should be done through the master controller.

Configuration →Swimming Pool

Mark	Description	Default Value	Range	Steps	Units
Swimming Pool status	Status	Disabled	Disabled /Enabled	-	-



NOTE:

1. When swimming pool is available Auxiliary sensor on PCB1 of indoor unit need be configured as function of [Tswp] to detect swimming pool water temperature. Refer to 10.10.
2. When swimming pool is available Optional Output signal need be configured as function of [3WV SWP] to drive 3-way valve for the swimming pool.
3. Optional Output signal can be configured as function of [SWP signal] to drive relay of SWP pump. Refer to 10.10.

#### 10.4.1 SWP setting temperature

The operation of this function should be done through the master controller interface of SWP.

Mark	Description	Default Value	Range	Steps	Units
Tswps	SWP setting temperature		24-33	1	°C

#### 10.4.2 SWP Demand ON/OFF and capacity control

There are 2 ways to demand SWP operation:

- (1) SWP operation is demanded by request of SWP temperature (the difference of SWP setting temperature and current SWP temperature).
  - SWP operation will start if:  
Current SWP temperature[Tswp] is lower than SWP setting temperature[Tswps] -1°C
  - SWP operation will stop if:  
Current SWP temperature[Tswp] is higher than SWP setting temperature[Tswps] +2°C
- (2) SWP operation is demanded by request of Optional input signal of [Swimming pool Demand ON/OFF].
  - SWP operation will start if:  
The corresponding input terminal of [Swimming pool Demand ON/OFF] is closed.
  - SWP operation will stop if:  
The corresponding input terminal of [Swimming pool Demand ON/OFF] is open.

NOTE:

1. Optional input signal can be configured as function of [Swimming pool Demand ON/OFF] to operate SWP. Refer to 10.10.1.
2. When Optional input signal is be configured as function of [Swimming pool Demand ON/OFF], SWP operation is demanded by request of Optional input signal of [Swimming pool Demand ON/OFF] instead of by request of SWP temperature.

When SWP operation is demanded ON the heat pump will be operated to achieve the Target outlet water temperature of SWP to heat up SWP water.

Target outlet water temperature of SWP =Current SWP temperature+ Offset Temperature [Tswpos].

The configuration of this option should be done through the master controller.

Configuration →Swimming Pool

Mark	Description	Default Value	Range	Steps	Units
Tswpos	Offset Temperature	30	15-40	1	°C

### 10.5 Auxiliary electric heater

Auxiliary electric heater (AEH) is used as additional heating capacity during cold outdoor temperature. The electrical heater can also be used for emergency operation in case of outdoor unit malfunction.

For Split unit Auxiliary electric heater is factory-delivered. It is 3-step heater with capacity of 1kW/2kW/3kW.

For Monobloc unit is on-site accessory. It offers 3-step heater connection with max. capacity of 3kW.

Steps	Split	Monobloc	Output Terminal
	capacity	capacity	
1	1kW (factory-delivered)	-	Terminal1
2	2kW (factory-delivered)	on-site accessory max. capacity of 3kW	Terminal2
3	3kW (factory-delivered)	on-site accessory max. capacity of 3kW	Terminal1+ Terminal2

NOTE:

1. For Monobloc unit The power supply of Auxiliary electric heater and build-in Safety thermostat of Auxiliary electric heater connection refers to electrical diagram and installation manual. Max capacity of heater is 3kW.

Auxiliary electric heater can offer additional heating capacity during space heating operation / SWP operation / defrosting depending on setting. It will always be disabled in any other mode (DHW, and Cooling mode).

Auxiliary electric Heater will only operate when Auxiliary electric Heater is selected as heat source ([Heating Source] is set to [HP + Heater] or [HP + Heater + Boiler] ). In the case of [HP only] or [Heater + Boiler] it will never operate.

The configuration of this option should be done through the master controller.

Configuration →Complementary Heating →Heating Source

Mark	Description	Default Value	Range	Steps	Units
HS	Heating Source	Only HP	HP only / HP + Heater / HP + Boiler / HP + Heater + Boiler	—	—

#### 10.5.1 PI control method

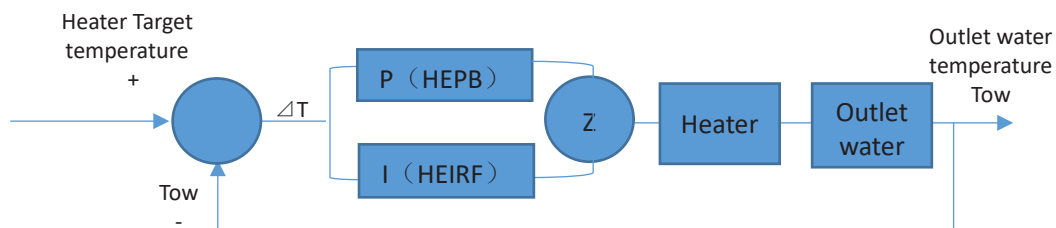
The desired heating supplied by Auxiliary electric Heater is determined by the Load factor, which is calculated by a P+I function ranging from 0 to 100%. Actual heater output will be translated from percentage to a 3 step output using hysteresis system.

(1) Heater Target temperature

Heater operation is controlled by the heater target temperature.

(2) Heater load factor

Load Factor determines the desired heating supplied by heater. Load factor is calculated by a P+I function ranging from 0 to 100%.



Where:

HEPB: Proportional band of electric heater.

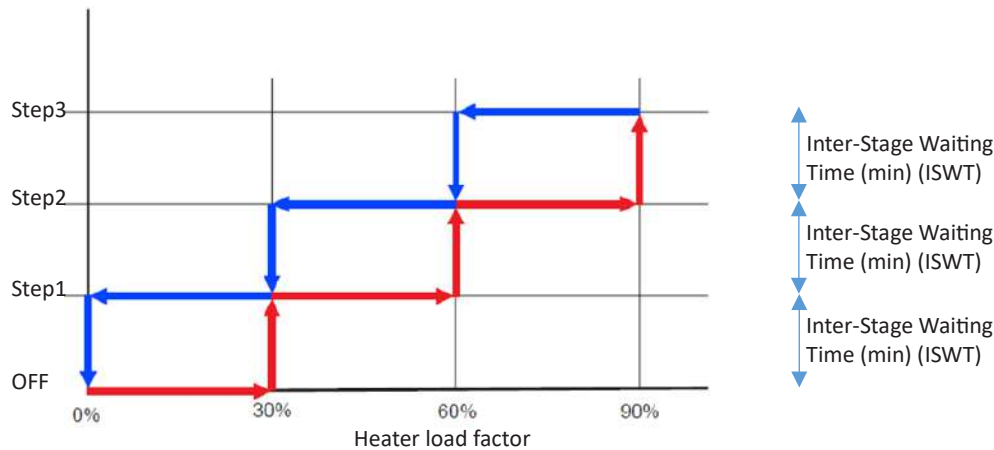
HEIRF: Integral reset factor of electric heater.

The configuration of this option should be done through the master controller.

Configuration →Complementary Heating →Electrical Heater.

Mark	Description	Default Value	Range	Steps	Units
HEPB	Proportion Factor	2.0	0-20	0.2	%/°C
HEIRF	Integral Factor	1.0	0-20	0.1	%/°C.min
ISWT	Minimum time of steps	5	0-10	1	min
TDHWS_Anti_Legionella	Setting temperature	A	40~A*	5	°C

(3) Actual heater output will be translated from percentage to a 3 step output using hysteresis system.



Step increase conditions

Step increases from 0 (heater OFF) to 1 when Load factor is higher than 30%

Step increases from 1 to 2 when Load factor is higher than 60%

Step increases from 2 to 3 when Load factor is higher than 90%

Step decrease conditions

Step decreases from 3 to 2 when Load factor is lower than 60%

Step decreases from 2 to 1 when Load factor is lower than 30%

Step decreases from 1 to 0 (heater OFF) when Load factor is 0%

Normal operation will require a maximum increase or decrease of 1 step.

(4) Heater inter-stage steps control.

After each step changes, further step changes are prohibited during the Inter-Stage Waiting Time (min) (ISWT) to avoid hunting.

10.5.2 Heater Operation during space heating

NOTE:

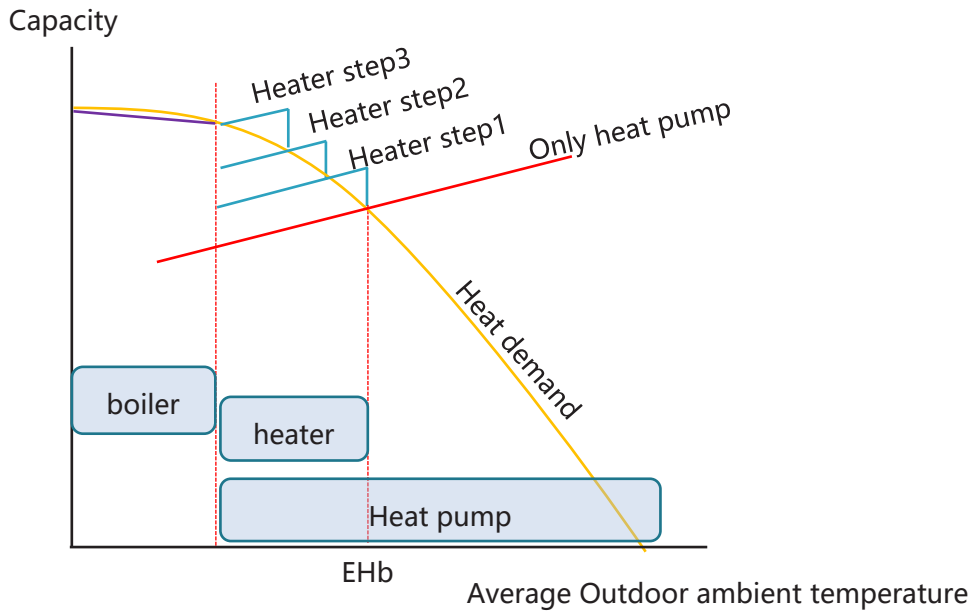
- Auxiliary Electric Heater can be forced off if DSW4-7: ON. Forcing off Auxiliary electric heater by DSW4-7:ON is invalid when space heating Emergency operation (referring to 10.1.3.2) . The heater is forced off factory setting. Set DSW4 PIN7: OFF to cancel forcing off through the Dip switch on PCB1.

The configuration of this option should be done through the master controller.

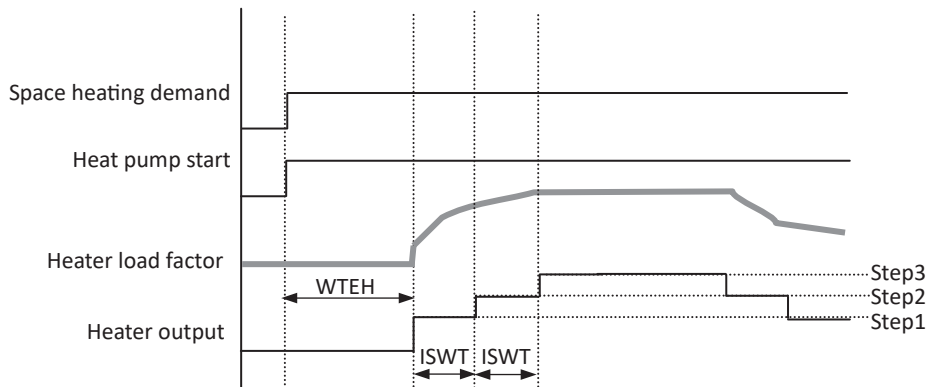
Configuration →Complementary Heating →Electrical Heater

Mark	Description	Default Value	Range	Steps	Units
Hdif	Supply Setting Compensation	4	0~20	1	°C
EHb	Bivalent Point	0	-20~20	1	°C
WTEH	Waiting time	30	5~90	5	min

(1) Heater will only be enabled when Average Outdoor Ambient Temperature < [Bivalent Point ]. The decision as to how to operate will be made considering ambient temperature.



(2) Electric Heater is only allowed to operate when more than [Waiting Time] has passed since Heat Pump started.



(3) Heater Target temperature.

$$\text{Heater Target temperature} = \text{Maximum value of Target outlet water temperature} - [\text{Hdif}] \text{ } ^\circ\text{C}$$

Maximum value of Target outlet water temperature refer to 10.2.2.3.

(4) Heater load factor and Actual heater output refer to 10.5.1.

(5) Heater Operation during space heating Emergency operation.

Heater Operation during Emergency operation (referring to 10.1.3.2) as following:

- ① Forcing off Auxiliary electric heater by DSW4-7:ON is invalid when space heating Emergency operation.
- ② Auxiliary Electric Heater will operate with Heater Target temperature equaling Maximum value of Target outlet water temperature and without requirement of [Bivalent Point ] & [Waiting Time] to offer immediate heating capacity during Emergency operation.

### 10.5.3 Initial Start-up at Low outdoor ambient temperatures.

During commissioning and when water temperature is very low, it is important for water to be heated gradually. In those conditions, additional function should be used for starting at low water temperature conditions:

Space Heating at lower water temperatures (lower than 15°C) and lower outdoor ambient temperatures (lower than 7°C) can damage the heat pump when defrosting.

As a result, heating up to 15°C when outdoor temperature is lower than 7°C is performed by the Auxiliary Electrical Heater.

NOTE:

1. Forcing off Auxiliary electric heater by DSW4-7:ON is invalid when Initial Start-up at Low outdoor ambient temperatures.
2. This function is only valid when Auxiliary electric Heater is selected as heat source ([Heating Source] is set to [HP + Heater] or [HP + Heater + Boiler] ).

### 10.5.4 Heater Operation during SWP

NOTE:

1. Auxiliary Electric Heater can be forced off if DSW4-7:ON. Forcing off Auxiliary electric heater by DSW4-7:ON is invalid when SWP Emergency operation (referring to 10.1.3.2) . The heater is forced off factory setting. Set DSW4-7: OFF to cancel forcing off through the Dip switch on PCB1.

The configuration of this option should be done through the master controller.

Configuration →Complementary Heating →Electrical Heater

Mark	Description	Default Value	Range	Steps	Units
SWP_EH1	Swimming Pool by Electrical Heater	Disabled	Disabled / Enabled		

(1) Heater will only be enabled when all following conditions meet.

- ① [SWP\_EH1] set as Enabled.
- ② Average Outdoor Ambient Temperature > Heat pump upper heating operation range (38°C-40°C) , that is out of heat pump heating operation range.

(2) Heater Target temperature

Heater Target temperature= Target outlet water temperature of SWP- [Hdif] °C

Target outlet water temperature of SWP refer to 10.4.2.

(3) Heater load factor and Actual heater output refer to 10.5.1.

(4) Heater Operation during SWP Emergency operation.

Heater Operation during Emergency operation (referring to 10.1.3.2) as following:

- ① Forcing off Auxiliary electric heater by DSW4-7:ON is invalid when SWP Emergency operation.
- ② Auxiliary Electric Heater will operate with Heater Target temperature equaling Target outlet water temperature of SWP and without requirement of Average Outdoor Ambient Temperature range to offer immediate heating capacity during Emergency operation.
- ③ Heater will only be enabled during Emergency operation when [SWP\_EH1] set as Enabled.

### 10.5.5 Heater Operation during defrosting

NOTE:

1. Forcing off Auxiliary electric heater by DSW4-7:ON is invalid when defrosting.

The configuration of this option should be done through the master controller.

Configuration →Auxiliary Function →Defrost

Mark	Description	Default Value	Range	Steps	Units
Defrost_EH1	Defrost by Electrical heater	Disabled	Disabled /Enabled	-	-

(1) Actual heater output will be step 3 during defrosting when all following conditions meet

- ① [Defrost by Electrical heater] set as Enabled.
- ② Measured inlet water temperature [Tiw] < 25°C.

10.6 Boiler combination

Boiler can be used as additional heating capacity or replacement heating capacity during cold outdoor temperatures. Boiler can also be used for emergency operation in case of outdoor unit malfunction. Boiler can offer additional heating capacity during space heating / DHW / swimming pool depending on setting.

Boiler and Heater can never work at the same time. The decision as to how to operate is based on ambient temperature and heat source selection as below.

Boiler will only operate when Boiler is selected as heat source ([Heating Source] is set to [HP + Boiler] or [HP + Heater + Boiler] ).

The configuration of this option should be done through the master controller.

Configuration →Complementary Heating →Heating Source

Mark	Description	Default Value	Range	Steps	Units
Defrost_EH1	Defrost by Electrical heater	Disabled	Disabled /Enabled	-	-

NOTE:

1. Hydraulic separator and water sensor [Tow3] must be available to use boiler (referring to 10.2.5).
2. Optional Output signal can be configured as function of [boiler combination] and be used to activate boiler with the dry contact (referring to 10.10.2) .
3. Hot water temperature detection sensor [Tow3] of the hydraulic separator must avoid to be installed too closely to the outlet pipe of boiler.
4. Keep distance between outlet pipe of boiler and outlet pipe of the hydraulic separator.

10.6.1 PI control method

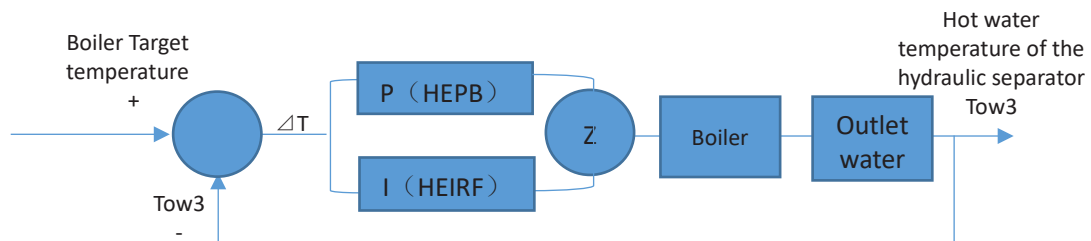
The desired heating supplied by Boiler is determined by the Load factor, which is calculated by a P+I function ranging from 0 to 100%. Actual Boiler output will be translated from percentage to ON/OFF output.

(1) Boiler Target temperature

Boiler operation is controlled by the Boiler target temperature.

(2) Boiler load factor

Load Factor determines the desired heating supplied by Boiler. Load factor is calculated by a P+I function ranging from 0 to 100%.



Where:

HEPB: Proportional band of Boiler.

HEIRF: Integral reset factor of Boiler.

The configuration of this option should be done through the master controller.

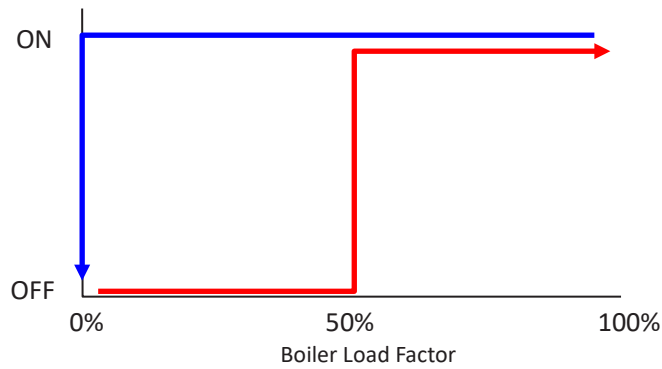
Configuration →Complementary Heating →Electrical Heater

Mark	Description	Default Value	Range	Steps	Units
HEPB	Proportion Factor	2.0	0-20	0.2	%/°C
HEIRF	Integral Factor	1.0	0-20	0.1	%/°C.min

NOTE:

1. [HEPB] and [HEIRF] use the same parameters as Electrical Heater (referring to 10.5.1) .

(3) Actual Boiler output will be translated from percentage to a ON/OFF output using hysteresis system.



- Boiler ON conditions  
Load factor is higher than 50% and Hot water temperature [Tow3] of the hydraulic separator less than Boiler Target temperature -1°C.
- Boiler OFF conditions  
Load factor is 0% or Hot water temperature [Tow3] of the hydraulic separator more than Boiler Target +4 °C.

**10.6.2 Boiler Operation during space heating**

The configuration of this option should be done through the master controller.

Configuration →Complementary Heating →Boiler

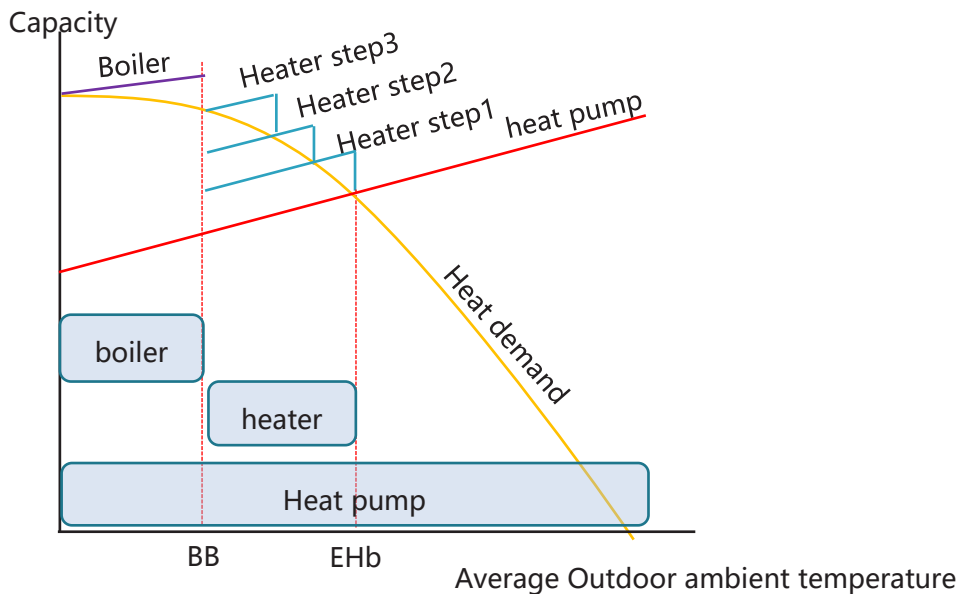
Mark	Description	Default Value	Range	Steps	Units
B_mode	Combination mode	Parallel	Parallel/Alternative	—	—
BB	Bivalent Point	-10	-20~20	1	°C
kscob	Supply Setting Offset	4	0~10	1	°C
WTBO	Waiting Time	30	5~90	5	min

(1) Boiler will only be enabled when Average Outdoor Ambient Temperature < [Bivalent Point ]. The decision as to how to operate will be made considering ambient temperature.

(2) Boiler can work on 2 different modes: [Parallel] and [Alternative].

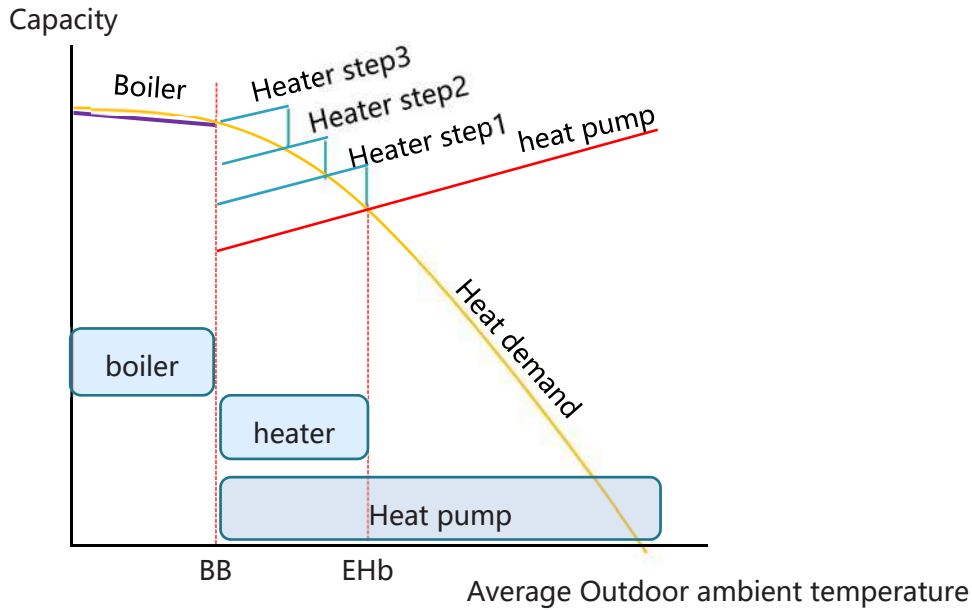
- [Parallel]

Boiler works as complementary source and Boiler / heat pump work together to supply heat during cold outdoor temperatures.

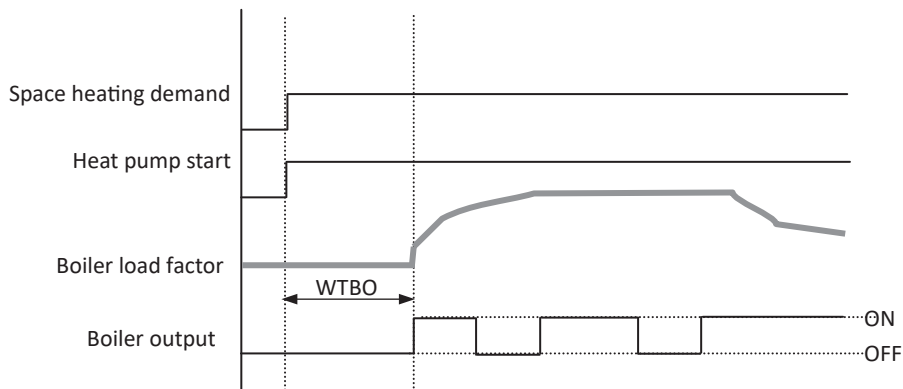




- [Alternative]  
Boiler works as replacement source and heat pump stop working due to low efficiency during cold outdoor temperatures. Boiler supplies all heat capacity.



(3) Boiler is only allowed to operate when more than [Waiting Time] has passed since Heat Pump starts.



NOTE:

1. [Waiting Time] is only available when Boiler working modes set as [Parallel].
2. DO NOT set boiler outlet water temperature too high that will make boiler start and stop frequently.

(4) Boiler Target temperature

- Boiler working mode set as [Parallel]  
Boiler Target temperature=Maximum value of Target outlet water temperature- [kscob] °C
- Boiler working mode set as [Alternative]  
Boiler Target temperature=Maximum value of Target outlet water temperature °C  
Maximum value of Target outlet water temperature, refer to 10.2.2.3.

(5) Boiler actual output refers to 10.6.1.

(6) Boiler Operation during special operation

Boiler Operation during space heating Emergency operation (referring to 10.1.3.2) , HP Block operation (referring to 10.9.5), and Initial Start-up at Low outdoor ambient temperatures (referring to 10.5.3) as following:

Boiler will work on mode of [Alternative] without requirement of [Bivalent Point] to offer immediate heating capacity.

### 10.6.3 Boiler Operation during DHW

The configuration of this option should be done through the master controller.

Configuration → Complementary Heating → Boiler

Mark	Description	Default Value	Range	Steps	Units
DHW_B	DHW by Boiler	Disabled	Disabled / Enabled		

It is possible to use boiler to heat up DHW when [DHW\_B] set as [Enabled]. And [Point of DHW & SWP] should set as [After Hydr S] to use boiler to heat up DHW. Refer to 10.1.

- (1) Boiler will only be enabled when Average Outdoor Ambient Temperature < [Bivalent Point]. The decision as to how to operate will be made considering ambient temperature.

[Bivalent Point] refers to 10.6.2.

- (2) Boiler can work on 2 different modes: [Parallel] and [Alternative].

[Parallel] and [Alternative] refers to 10.6.2.

- [Parallel]

Boiler works as complementary source and Boiler / heat pump work together to heat up DHW during cold outdoor temperatures.

NOTE:

1. Boiler is allowed to work on mode of [Parallel] only when DHW Electric Heater is inactivated ([DHW\_hts] set as [Disabled], referring to 10.3.3).

- [Alternative]

Boiler works as replacement source and heat pump stop working due to low efficiency during cold outdoor temperatures. Boiler supplies all heat capacity.

NOTE:

1. Boiler works without requirement of [DHW\_B] when work mode set as [Alternative].

- (3) Boiler is only allowed to operate when more than [Waiting Time] has passed since Heat Pump starts.

[Waiting Time] refers to 10.6.2.

[Waiting Time] refers to 10.6.2.

NOTE:

1. [Waiting Time] is only available when Boiler working modes set as [Parallel].
2. DO NOT set boiler outlet water temperature too high that will make boiler start and stop frequently.

- (4) Boiler Target temperature.

- Boiler working mode set as [Parallel]

Boiler Target temperature equals [Tmax].

[Tmax] refers to 10.2.2.3.

- Boiler working mode set as [Alternative]

Boiler Target temperature varies 60-65 °C.

- (5) Boiler actual output refers to 10.6.1.

- (6) Boiler Operation during special operation.

Boiler Operation during DHW Emergency operation (referring to 10.1.3.2), HP Block operation (referring to 10.9.5), and high outdoor ambient temperature as following:

Boiler will work on mode of [Alternative] without requirement of [Bivalent Point] to offer immediate heating capacity.

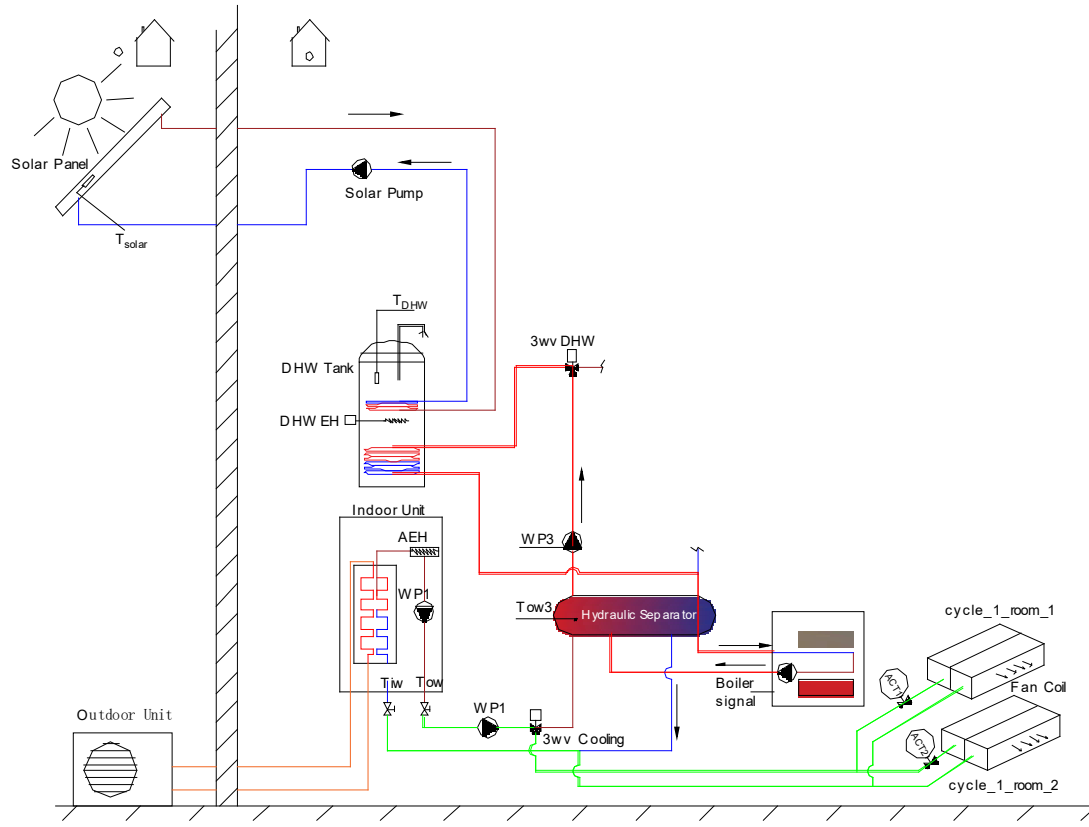
NOTE:

1. DHW Electric Heater has priority to supply DHW heating during special operation (6).
2. Boiler is allowed to work during DHW Emergency operation only when DHW Electric Heater is inactivated ([DHW\_hts] set as [Disabled], referring to 10.3.3) or DHW Electric Heater is inactivated during DHW Emergency operation ([Emergency\_DHW] set as [Disabled], referring to 10.1.3.2).
3. Boiler works during DHW Emergency operation without requirement of [DHW\_B].
4. Boiler works When average outdoor ambient temperature is more than 38°C-40°C, that is out of heat pump heating operation range, and DHW Electric Heater is inactivated ([DHW\_hts] set as [Disabled], referring to 10.3.3).

(7) Boiler Operation during Space cooling.

It is possible to operate Space cooling (heat pump and WP1) and DHW (WP3 or boiler) simultaneously when hydraulic separator is available (refer to 10.2.5), [DSW5-2] set as [OFF ] and [Point of DHW & SWP] set as [After Hydr S] (refer to 10.1), in this situation cooling water circulation will not pass through hydraulic separator.

Boiler can works to meet DHW demand When average outdoor ambient temperature is more than 38°C-40°C , that is out of heat pump heating operation range , and DHW Electric Heater is inactivated ([DHW\_hts] set as [Disabled] , referring to 10.3.3) .



- Boiler ON conditions  
Water temperature in the tank [TDHW] is less than [TDHWS]- [DHW\_ht\_diff] °C and Hot water temperature [Tow3] of the hydraulic separator is less than Boiler Target temperature -5°C.  
[DHW\_ht\_diff] refers to 10.3.3.
- Boiler OFF conditions  
[TDHW] is higher than [TDHWS] or [Tow3] is higher than Boiler Target +5 °C.

10.6.4 Boiler Operation during SWP

The configuration of this option should be done through the master controller.

Configuration →Complementary Heating →Boiler

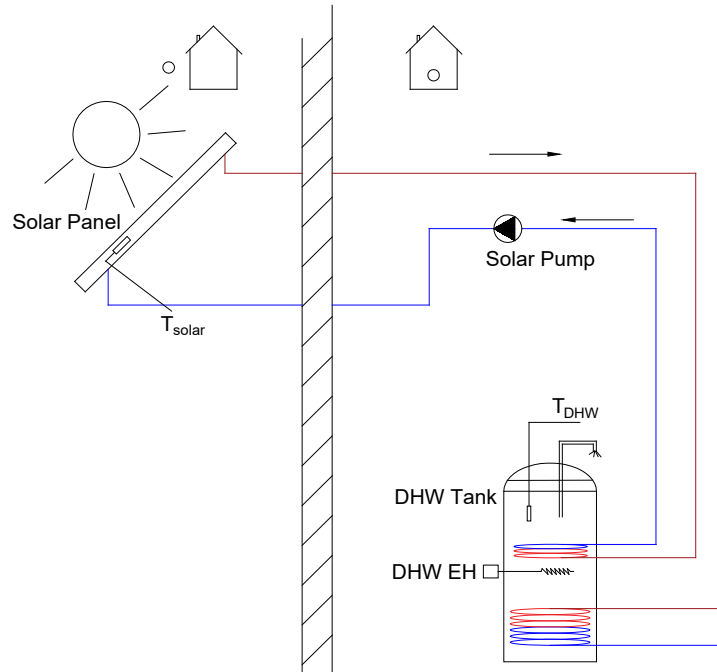
Mark	Description	Default Value	Range	Steps	Units
SWP_B	Swimming Pool by Bolier	Disabled	Disabled / Enabled		

It is possible to use boiler to heat up SWP when [SWP\_B] set as [Enabled]. And [Point of DHW & SWP] should set as [After Hydr S] to use boiler to heat up SWP. Refer to 10.1.

- (1) Boiler will only be enabled when average outdoor ambient temperature is more than 38°C-40°C , that is out of heat pump heating operation range.
- (2) Boiler Target temperature  
Boiler Target temperature equals Target outlet water temperature of SWP- [kscob] °C.  
Target outlet water temperature of SWP refers to 10.4.2.
- (3) Boiler actual output refers to 10.6.1.
- (4) Boiler Operation during special operation.  
Boiler Operation during SWP Emergency operation (referring to 10.1.3.2) and HP Block operation (referring to 10.9.5) as following.  
Boiler will work to offer immediate heating capacity. And Boiler Target temperature varies 60-65°C.

10.7 Solar combination

The solar combination will enable to heat up domestic water by means of the sun whenever the sun is available. The solar panels gather heat from the sun. when it is ready, the solar pump begins operating in order to transfer the heat to the domestic hot water tank's heat exchanger.



NOTE:

1. When solar combination is available Optional Output signal need be configured as function of [Solar out] to drive relay of the solar pump (referring to 10.10.2) .

The configuration of this option should be done through the master controller.

Configuration → Complementary Heating → Solar

Mark	Description	Default Value	Range	Steps	Units
Solar_s	Status	Disabled	Disabled Input solar sensor	-	-
Solar_min_T	Solar Min. Time	5	5~240	5	min
Solar_max_T	Solar Max. Time	OFF	off, 35~240	5	min
Solar_ΔTDHW_c	ΔTDHW	3	1~10	1	°C
Solar_ΔT_c	ΔT connection	10	1~30	1	°C
Solar_ΔT_disc	ΔT disconnection	5	1~Solar_ΔT_c	1	°C
Tsolar_DHWS	DHW Max. Temp	60	30~90	1	°C
Tsolar_min	Panel Min. Temp	15	1~60	1	°C
Tsolar_overheat	Panel Overheat Temp	80	80~120	1	°C
Tsolar_antiFreezing	Panel antiFreezing Temp	4	-20~10	1	°C

### 10.7.1 Control function

There are 2 ways to trigger solar pump operation to transfer the heat to the domestic hot water tank's heat exchanger.

#### (1) [Solar\_s] set as [Input]

Trigger solar pump operation to transfer the heat to the domestic hot water tank's heat exchanger by input signal of [Solar in].

- Solar pump ON when all of the following conditions are met.
  - ① Time of [Solar\_min\_T] has passed since Solar pump OFF.
  - ② Water temperature in the domestic hot water tank [TDHW] less than [Tsolar\_DHWS]- [Solar\_ΔTDHW\_c] °C.
  - ③ Input signal of [Solar in] is closed.
- Solar pump OFF when any of the following conditions is fulfilled.
  - ① Time of [Solar\_max\_T] has passed since Solar pump ON if [Solar\_max\_T] is not set as [OFF].
  - ② [TDHW] is higher than [Tsolar\_DHWS].
  - ③ Input signal of [Solar in] is open.

NOTE:

1. When [Solar\_s] set as [Input] Optional input signal need be configured as function of [Solar in]. Refer to 10.10.1.

#### (2) [Solar\_s] set as [solar sensor]

Trigger solar pump operation to transfer the heat to the domestic hot water tank's heat exchanger by detecting hot water temperature of solar panels [Tsolar].

The solar panels gather heat from the sun. When detecting hot water temperature of solar panels [Tsolar] rises above the water temperature in the domestic hot water tank [TDHW], the solar pump operation to transfer the heat to the domestic hot water tank's heat exchanger.

- Solar pump ON when all of the following conditions are met.
  - ① Time of [Solar\_min\_T] has passed since Solar pump OFF.
  - ② [TDHW] less than [Tsolar\_DHWS]- [Solar\_ΔTDHW\_c].
  - ③ [Tsolar] is higher than [TDHW] + [Solar\_ΔT\_c].
  - ④ [Tsolar] is higher than [Tsolar\_min].
- Solar pump OFF when any of the following conditions is fulfilled.
  - ① Time of [Solar\_max\_T] has passed since Solar pump ON if [Solar\_max\_T] is not set as [OFF].
  - ② [TDHW] is higher than [Tsolar\_DHWS].
  - ③ [Tsolar] is less than [TDHW] + [Solar\_ΔT\_disc].
  - ④ [Tsolar] is less than [Tsolar\_min]-2 °C.

NOTE:

1. When [Solar\_s] set as [solar sensor] Auxiliary sensor on PCB1 of indoor unit need be configured as function of [Tsolar] to detect hot water temperature of solar panels. Refer to 10.10.
2. Hot water temperature sensor of solar panels [Tsolar] should be installed whereabouts to detect stable hot water temperature of solar panels.

### 10.7.2 Solar panels overheat protection

The solar panels gather heat from the sun. when hot water temperature of solar panels [Tsolar] is too high , the solar pump begins operating in order to transfer the heat to the domestic hot water tank's heat exchanger or other heat emitting device.

Optional Output signal can be configured as function of [Solar overheat] and output on signal to drive device when solar panels overheat protection is activated. Refer to 10.10.2.

- Solar pump ON and Optional Output signal of [Solar overheat] ON when following conditions are met.
  - ① [Tsolar] is higher than [Tsolar\_overheat].
- Solar pump OFF and Optional Output signal of [Solar overheat] OFF when following conditions are met.
  - ① [Tsolar] is less than [Tsolar\_overheat]-5 °C

NOTE:

1. Overheat protection is available when [Solar\_s] set as [solar sensor].

### 10.7.3 Solar panels antiFreezing protection

The solar panels may be frozen in the winter. It is necessary to circulate hot water to the solar panels to prevent them from being frozen. When hot water temperature of solar panels [Tsolar] is too low, the solar pump begins operating in order to transfer the heat to the solar panels through heat exchanger.

- Solar pump ON when all of the following conditions are met.
  - ① [Tsolar] is less than [Tsolar\_antiFreezing]-2 °C.
  - ② [TDHW] is higher than [Tsolar] +6 °C.
- Solar pump OFF when any of the following conditions is fulfilled.
  - ① [Tsolar] is higher than [Tsolar\_antiFreezing].
  - ② [TDHW] is less than [Tsolar] +2 °C.

**NOTE:**

1. *Overheat protection is available when [Solar\_s] set as [solar sensor].*

10.8 Water pump control

Depending on system configuration WP1/WP2/WP3 work in the water circulation as following.

Water pump	Description
WP1	This Water pump is present inside the unit. It is responsible of water recirculation between plate exchanger and hydraulic separator /installation. A extra WP1 can be cascaded with inside EC WP1 to offer additional hydraulic head. The extra WP1 works equally with inside EC WP1. The extra WP1 must be installed at beginning of water circulation to offer total hydraulic head for all water circulation of DHW/ SWP/Space Heating/ Space Cooling. (* For Integra Unit, the extra WP1 must be installed at beginning of water circulation just after DHW to offer total hydraulic head for all water circulation of SWP/Space Heating/ Space Cooling.)
WP2	Water Pump used only in case a secondary Water Cycle for space heating or space cooling is used. It ensures water circulation at Water Cycle 2.
WP3	Water Pump used in case that an hydraulic separator is used. It ensures water circulation from hydraulic separator to the distribution circuit.

NOTE:

1. Optional Output signal can be configured as function of [WP1] and be used to drive relay of extra WP1 (referring to 10.10.2) .
2. Optional Output signal can be configured as function of [WP2] and be used to drive relay of WP2. (referring to 10.10.2) .
3. Optional Output signal can be configured as function of [WP3] and be used to drive relay of WP3. (referring to 10.10.2) .

10.8.1 Water pump control during space heating/cooling

10.8.1.1 WP1/WP3 control

10.8.1.1.1 Hydraulic separator is Enabled

WP1 and WP3 need to work together to deliver water circulation When hydraulic separator is Enabled ([hsb] set as [Enabled]).

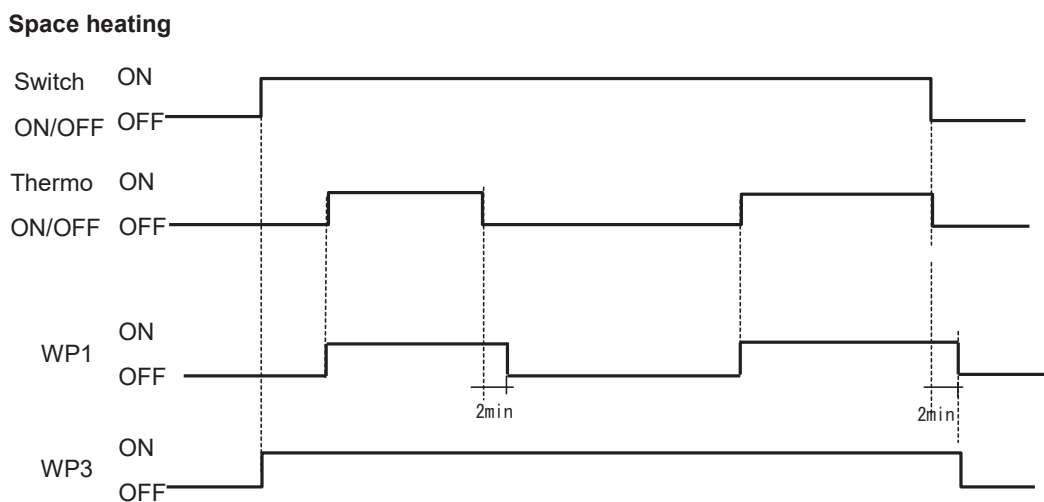
(1) [Off\_mode(heating)] is set as [ON] (Space heating/cooling Thermo ON/OFF by request of water outlet temperature on Water Cycle 1 and Water Cycle 2).

Pumps control can be set to Standard or Economic mode. This configuration is set using DSW4 PIN5.

When PIN is OFF, pump is in Standard operation, pump is always in operation when space heating or cooling is enabled (Switch ON), so in case of disable space heating or cooling (Switch OFF), pump stops operation.

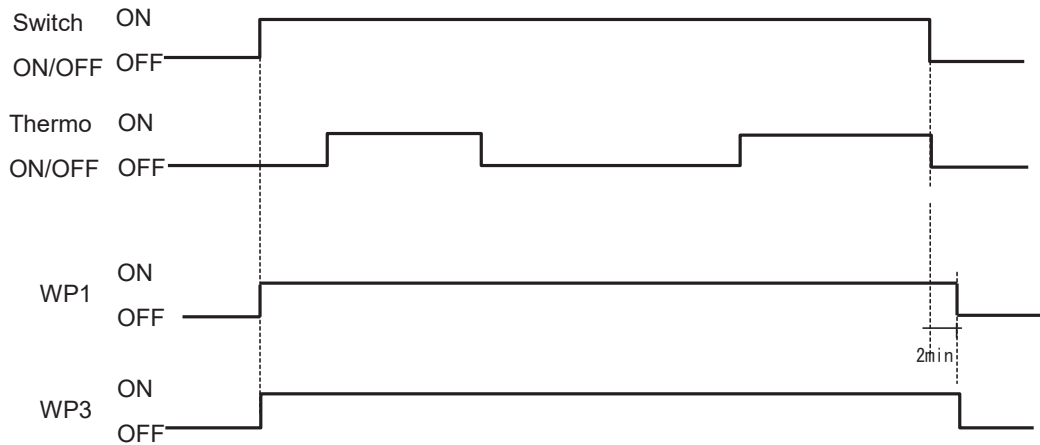
When PIN is ON, pump is in Economic operation. This allows the pump to work periodically when space heating or cooling is Thermo OFF (Demand OFF for space heating and cooling).

- When DSW4-5 is OFF, pump of WP1/WP3 is in Standard operation, water pump works as shown in the graphic below:



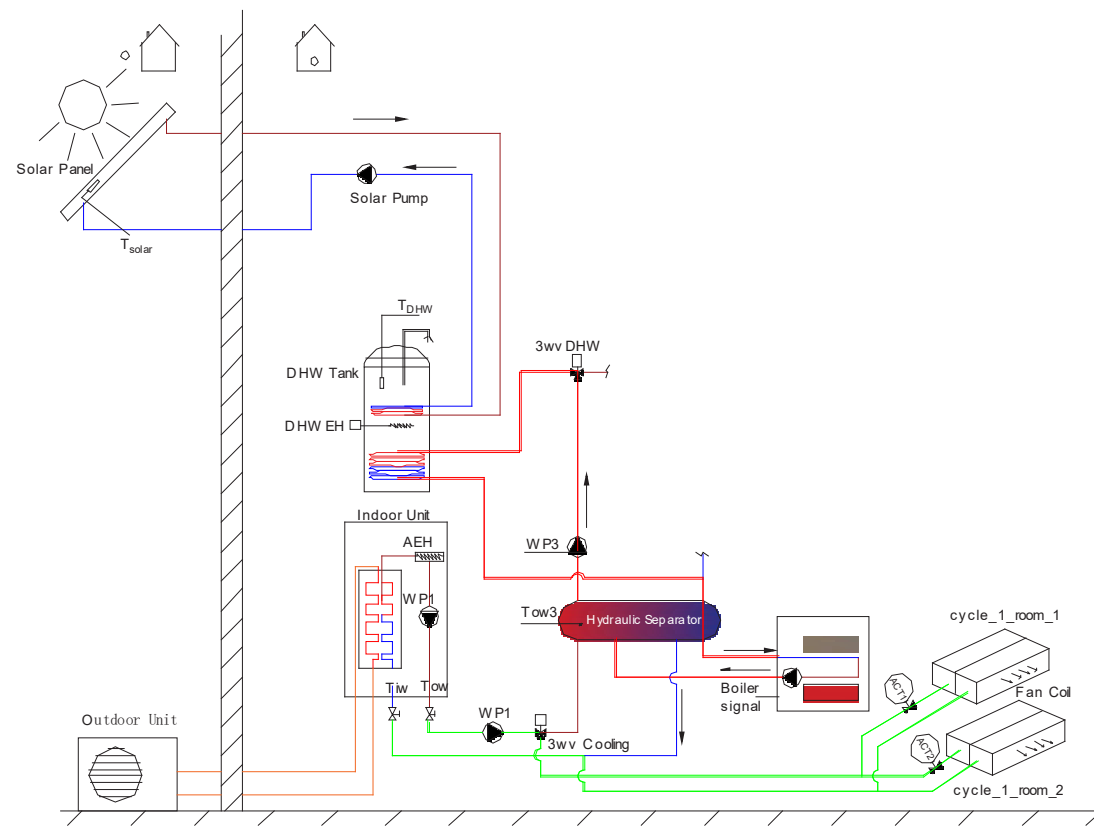


Space cooling



NOTE:

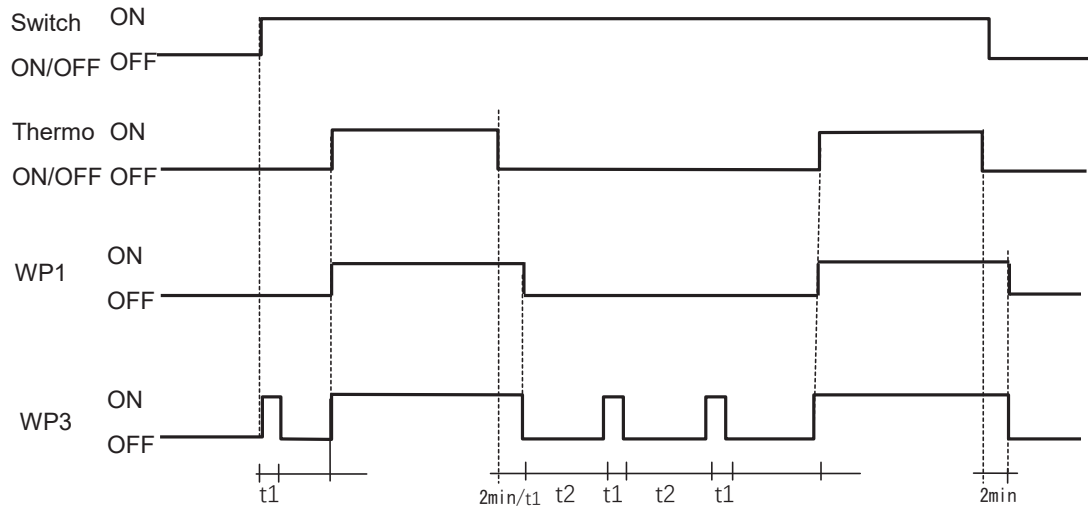
1. WP3 is always OFF during space cooling when DSW5-2 is OFF, in this situation cooling water circulation will not pass through hydraulic separator.



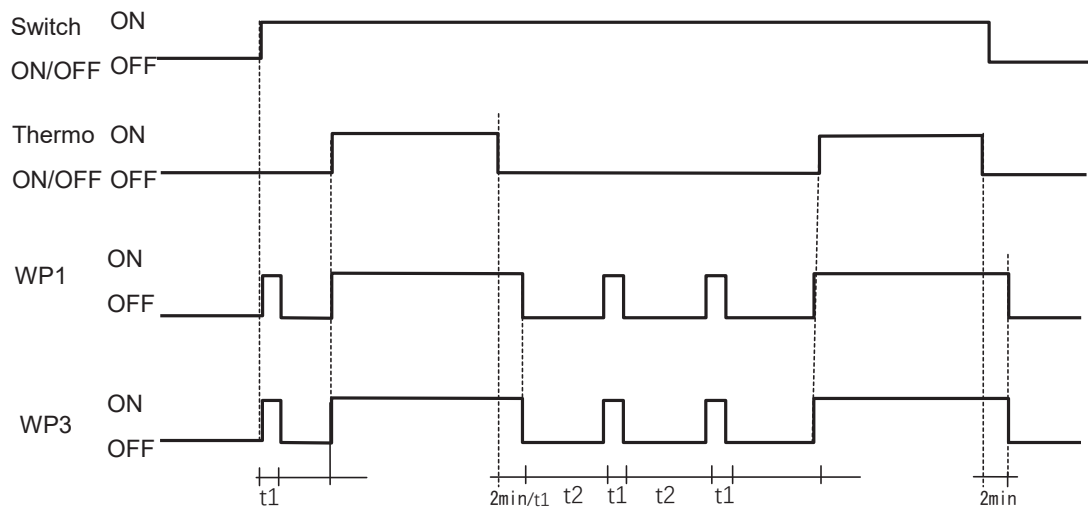
2. WP1 and WP3 has 2 minutes or more of overrun after requiring OFF depending on outlet water temperature.
3. WP1 is always OFF when Boiler works as replacement source and heat pump stop working in Emergency operation (referring to 10.1.3.2), HP Block operation (referring to 10.9.5) or Boiler working mode of [Alternative] (referring to 10.6).

- When DSW4-5 is ON, pump of WP1/WP3 is in Economic mode, water pump works as shown in the graphic below:

**Space heating**



**Space cooling**



The configuration of this option should be done through the master controller.

Configuration → Heat pump → Water pump configuration,

Mark	Description	Default Value	Range	Steps	Units
tPumpOFF	Min. ON Time	40	0-120	10	min
tPumpON	Min. OFF Time	10	0-20	2	min

t1= tPumpON

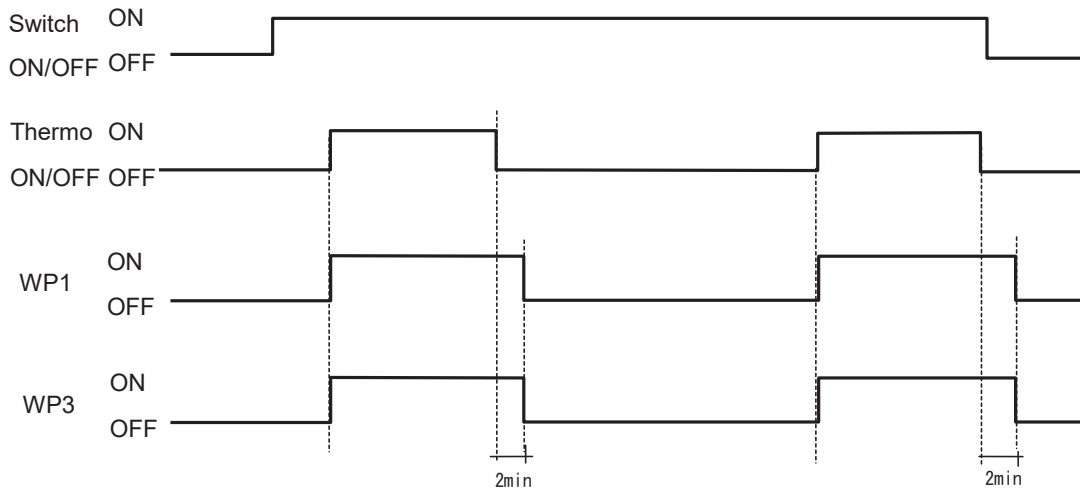
t2= tPumpOFF

## NOTE:

1. WP3 is always OFF during space cooling when DSW5-2 is OFF, in this situation cooling water circulation will not pass through hydraulic separator.
2. WP1 and WP3 has 2 minutes or more of overrun after requiring OFF depending on outlet water temperature.
3. WP1 is always OFF when Boiler works as replacement source and heat pump stop working in Emergency operation (referring to 10.1.3.2), HP Block operation (referring to 10.9.5) or Boiler working mode of [Alternative] (referring to 10.6.).

(2) [Off\_mode(heating)] is set as [OFF] (Space heating/cooling Thermo ON/OFF by room thermostats)

Water pump of WP1/WP3 works as shown in the graphic below:



## NOTE:

1. WP3 is always OFF during space cooling when DSW5-2 is OFF, in this situation cooling water circulation will not pass through hydraulic separator.
2. WP1 and WP3 has 2 minutes or more of overrun after requiring OFF depending on outlet water temperature.
3. WP1 is always OFF when Boiler works as replacement source and heat pump stop working in Emergency operation (referring to 10.1.3.2), HP Block operation (referring to 10.9.5) or Boiler working mode of [Alternative] (referring to 10.6.).

## 10.8.1.1.2 Hydraulic separator is Disabled

Only WP1 work to deliver water circulation When hydraulic separator is Disabled ([hsb] set as [Disabled]).

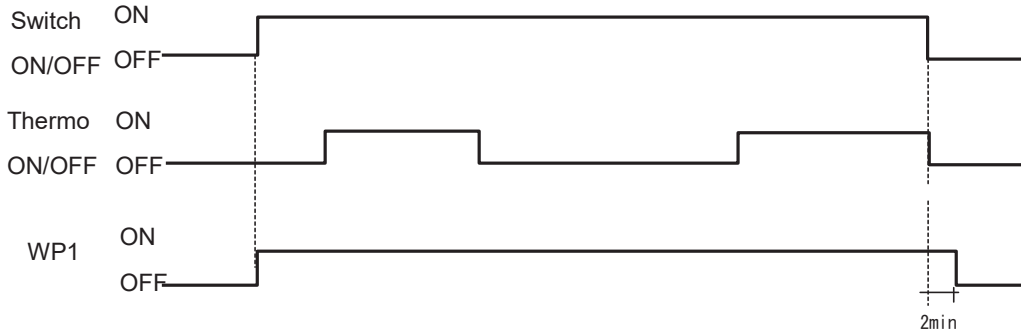
- (1) [Off\_mode(heating)] is set as [ON] (Space heating/cooling Thermo ON/OFF by request of water outlet temperature on Water Cycle 1 and Water Cycle 2).

Pumps control can be set to Standard or Economic mode. This configuration is set using DSW4 PIN5.

When PIN is OFF, pump is in Standard operation, pump is always in operation when space heating or cooling is enabled (Switch ON), so in case of disable space heating or cooling (Switch OFF), pump stops operation.

When PIN is ON, pump is in Economic operation. This allows the pump to stop when space heating or cooling is Thermo OFF (Demand OFF for space heating and cooling).

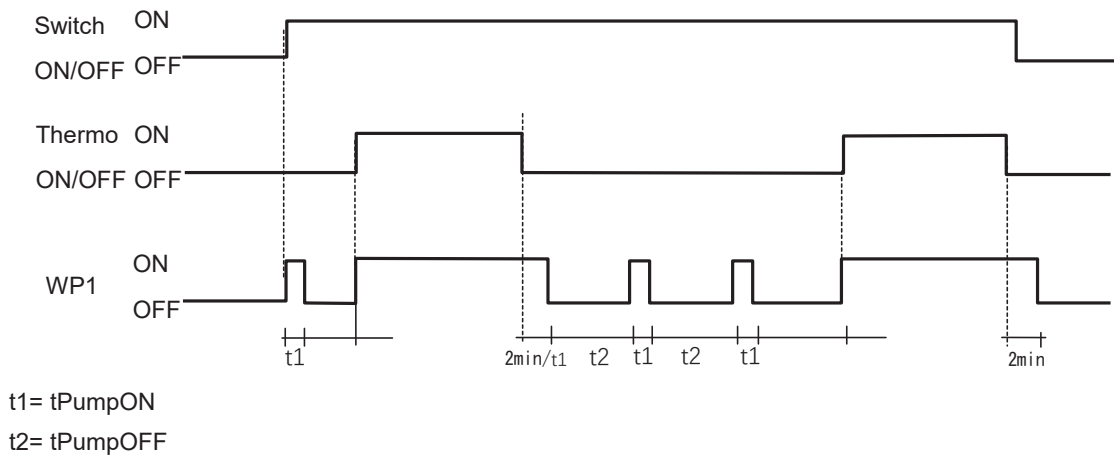
- When DSW4-5 is OFF, WP1 is in Standard operation, water pump works as shown in the graphic below:



NOTE:

- WP1 has 2 minutes or more of overrun after requiring OFF depending on outlet water temperature.

- When DSW4-5 is ON, WP1 is in Economic mode, water pump works as shown in the graphic below:

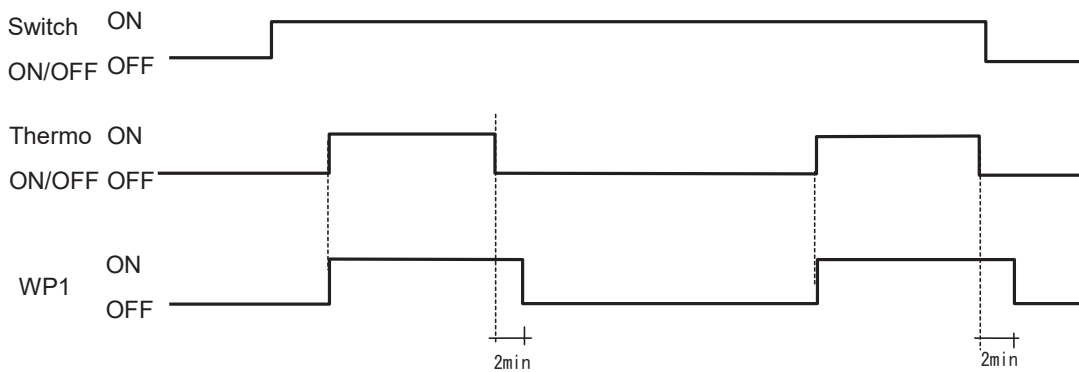


NOTE:

- WP1 has 2 minutes or more of overrun after requiring OFF depending on outlet water temperature.

(2) [Off\_mode(heating)] is set as [OFF] (Space heating/cooling Thermo ON/OFF by room thermostats)

WP1 works as shown in the graphic below:



NOTE:

- WP1 has 2 minutes or more of overrun after requiring OFF depending on outlet water temperature.

10.8.1.2 WP2 control

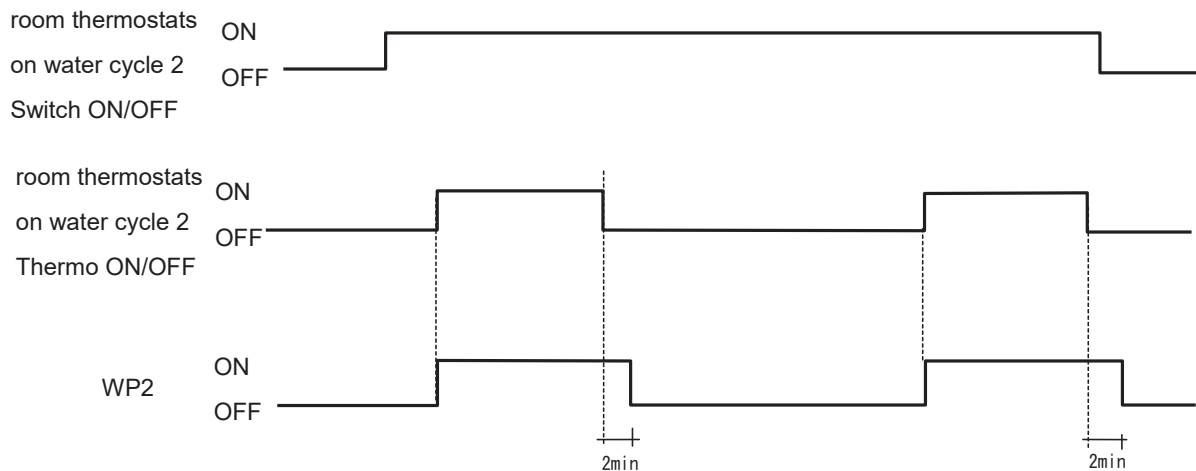
WP2 is used only in case a secondary Water Cycle for space heating or space cooling is used. It ensures water circulation at Water Cycle 2. The mixing station is controlled using the indoor unit by means of a mixing valve / additional pump (WP2)/ additional water sensor (Tow2).

The configuration of this option should be done through the master controller.

Configuration →Heat pump→Water pump configuration

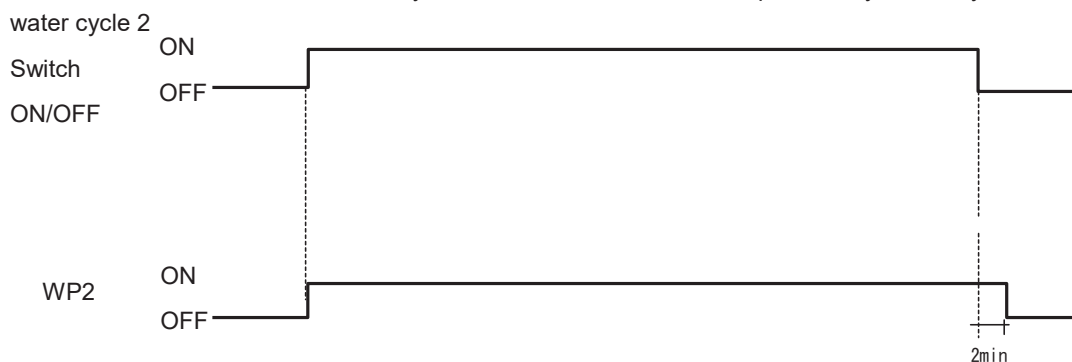
Mark	Description	Default Value	Range	Steps	Units
Cool_WP2	Cooling operation for WP2	Disabled	Disabled / Enabled	-	-

(1) Any room thermostat is available on Water Cycle 2, then WP2 is demanded operation by room thermostats on Water Cycle 2.



NOTE:

1. WP2 is always OFF during space cooling when [Cool\_WP2] is [Disabled], in this situation cooling water circulation will not pass through Water Cycle 2.
  2. WP2 has 2 minutes or more of overrun after requiring OFF depending on outlet water temperature.
  3. WP2 will continue running to use storage heat capacity in hydraulic separator to heat up Water Cycle 2 during heat pump DHW operation when Any room thermostat on Cycle 2 is Thermo ON and [Point of DHW & SWP] set as [Before Hydr S] which means Point of 3-way valve for DHW and 3-way valve for swimming pool is before hydraulic separator. Refer to 10.1.
  4. WP2 will stop running during heat pump DHW operation if [Point of DHW & SWP] set as [After Hydr S] which means Point of 3-way valve for DHW and 3-way valve for swimming pool is after hydraulic separator. Refer to 10.1.
- (2) None room thermostat is available on Water Cycle 2, then WP2 is demanded operation by Water Cycle 2.



NOTE:

1. WP2 is always OFF during space cooling when [Cool\_WP2] is [Disabled], in this situation cooling water circulation will not pass through Water Cycle 2.
2. WP2 has 2 minutes or more of overrun after requiring OFF depending on outlet water temperature.
3. WP2 will continue running to use storage heat capacity in hydraulic separator to heat up Water Cycle 2 during heat pump DHW operation when Cycle 2 is Switch ON and [Point of DHW & SWP] set as [Before Hydr S] which means Point of 3-way valve for DHW and 3-way valve for swimming pool is before hydraulic separator. Refer to 10.1.
4. WP2 will stop running during heat pump DHW operation if [Point of DHW & SWP] set as [After Hydr S] which means Point of 3-way valve for DHW and 3-way valve for swimming pool is after hydraulic separator. Refer to 10.1.

10.8.1.3 WPc1 control

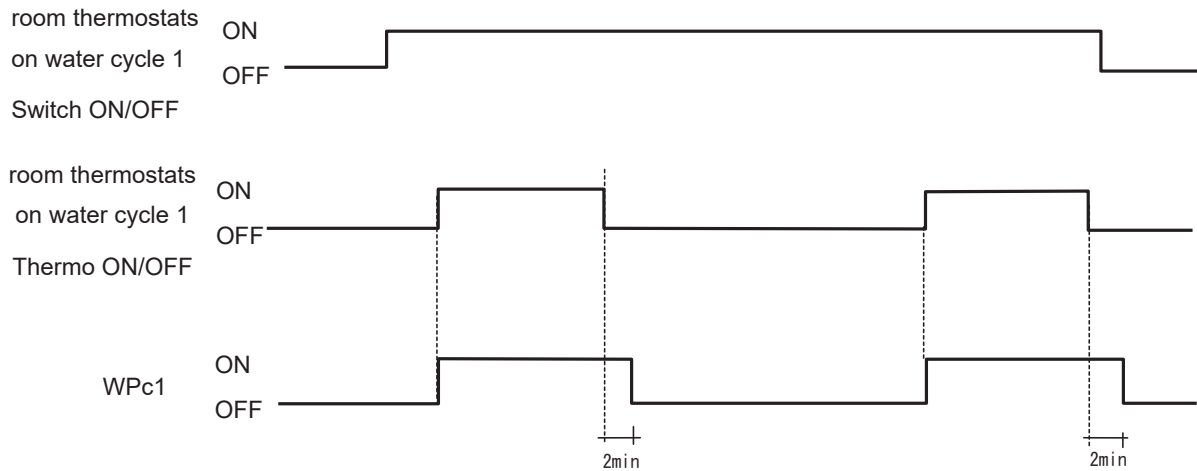
WPc1 is used only in case Water Cycle 1 is available. It ensures water circulation at Water Cycle 1. Refer to 10.1.

The configuration of this option should be done through the master controller.

Configuration →Heat pump→Water pump configuration

Mark	Description	Default Value	Range	Steps	Units
Cool_WP2	Cooling operation for WP2	Disabled	Disabled / Enabled	-	-

(1) Any room thermostat is available on Water Cycle 1, then WPc1 is demanded operation by room thermostats on Water Cycle 1.



NOTE:

1. WPc1 is always OFF during space cooling when [Cool\_WP2] is [Disabled], in this situation cooling water circulation will not pass through Water Cycle 1.
2. WPc1 has 2 minutes or more of overrun after requiring OFF depending on outlet water temperature.
3. WPc1 will continue running to use storage heat capacity in hydraulic separator to heat up Water Cycle 1 during heat pump DHW operation when Any room thermostat on Cycle 1 is Thermo ON and [Point of DHW & SWP] set as [Before Hydr S] which means Point of 3-way valve for DHW and 3-way valve for swimming pool is before hydraulic separator. Refer to 10.1.
4. WPc1 will stop running during heat pump DHW operation if [Point of DHW & SWP] set as [After Hydr S] which means Point of 3-way valve for DHW and 3-way valve for swimming pool is after hydraulic separator. Refer to 10.1.

(2) None room thermostat is available on Water Cycle 1, then WPc1 is demanded operation by Water Cycle 1.



NOTE:

1. WPc1 is always OFF during space cooling when [Cool\_WPc1] is [Disabled], in this situation cooling water circulation will not pass through Water Cycle 1.
2. WPc1 has 2 minutes or more of overrun after requiring OFF depending on outlet water temperature.
3. WPc1 will continue running to use storage heat capacity in hydraulic separator to heat up Water Cycle 2 during heat pump DHW operation when Cycle 1 is Switch ON and [Point of DHW & SWP] set as [Before Hydr S] which means Point of 3-way valve for DHW and 3-way valve for swimming pool is before hydraulic separator. Refer to 10.1.
4. WPc1 will stop running during heat pump DHW operation if [Point of DHW & SWP] set as [After Hydr S] which means Point of 3-way valve for DHW and 3-way valve for swimming pool is after hydraulic separator. Refer to 10.1.

10.8.2 Water pump control during DHW and SWP

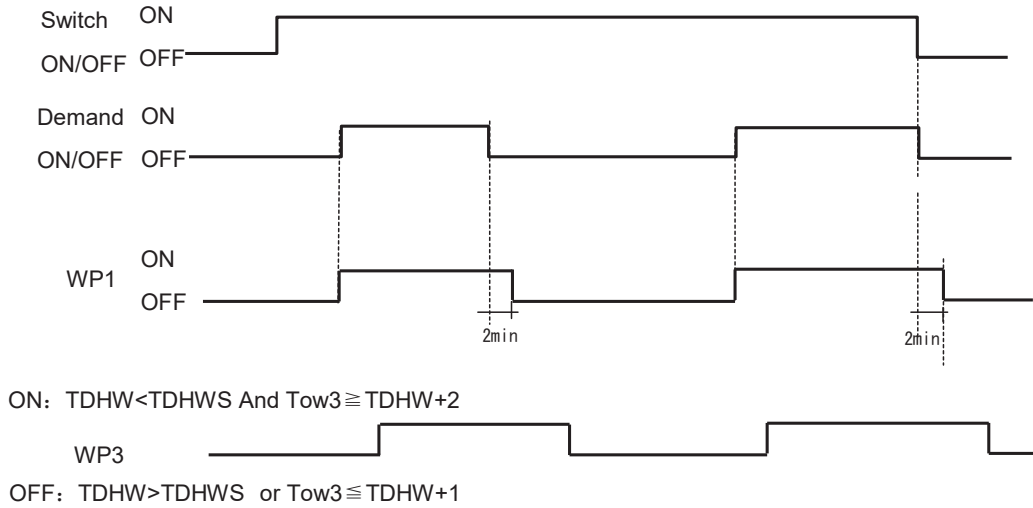
10.8.2.1 Hydraulic separator is Enabled

WP1 and WP3 need to work together to deliver water circulation When hydraulic separator is Enabled ([hsb] set as [Enabled]).

Water pump of WP1/WP3 works as shown in the graphic below:

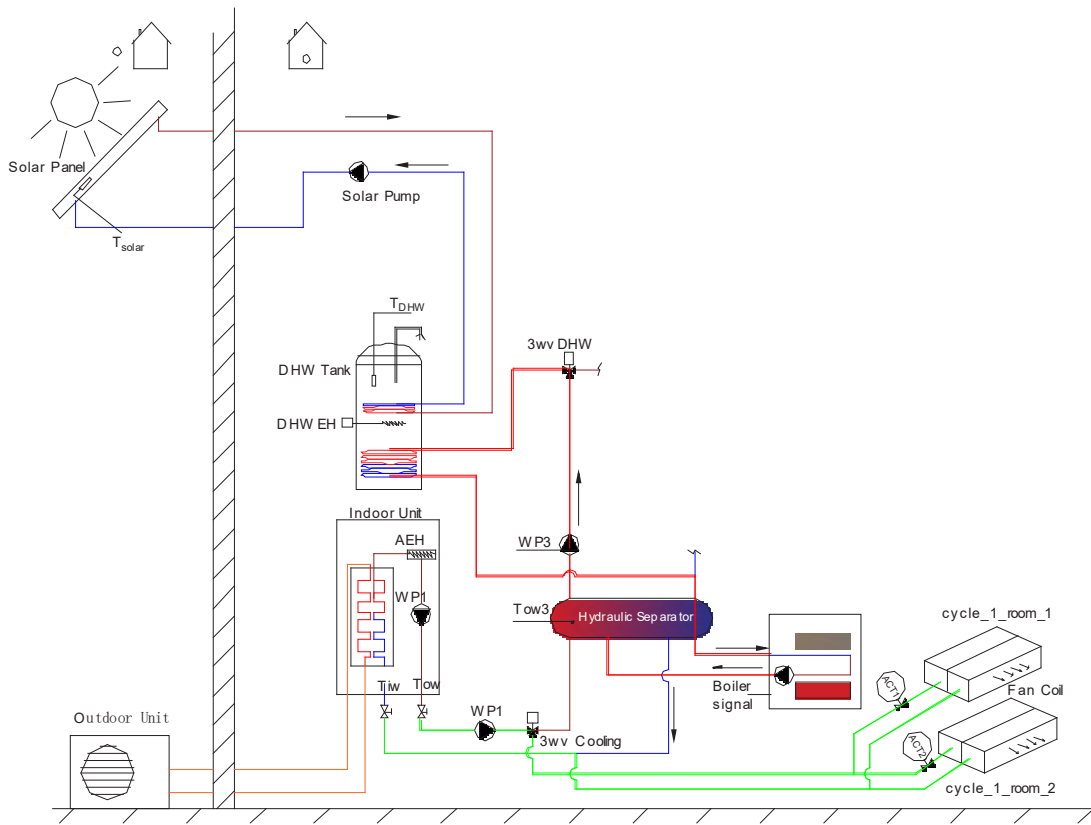
[Point of DHW & SWP] should set as [After Hydr S] which means Point of 3-way valve for DHW and 3-way valve for swimming pool is after hydraulic separator. Refer to 10.1.

DHW operation



NOTE:

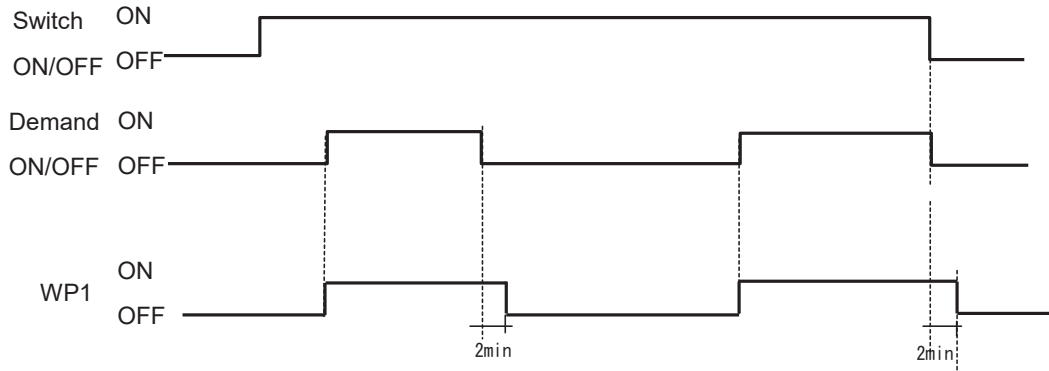
- It is possible to operate Space cooling (heat pump and WP1) and DHW (WP3 or boiler) simultaneously when hydraulic separator is available (refer to 10.2.5), [DSW5-2] set as [OFF] and [Point of DHW & SWP] set as [After Hydr S] (refer to 10.1), in this situation cooling water circulation will not pass through hydraulic separator. Boiler can work to meet DHW demand, refer to 10.6.3 (7). In this situation WP1 works in space cooling referring to 10.8.1.1.1. And WP3 works referring to DHW operation chart.



- WP1 is always OFF when Boiler works as replacement source and heat pump stop working in Emergency operation (referring to 10.1.3.2), HP Block operation (referring to 10.9.5) or Boiler working mode of [Alternative] (referring to 10.6.).



**SWP operation**



ON:

- ①  $T_{swp} < T_{swps}$  And  $T_{ow3} \geq T_{swp} + 2$
- ② Optional input terminal of [Swimming pool Demand ON/OFF] is closed.



OFF:

- ①  $T_{swp} > T_{swps}$  or  $T_{ow3} \leq T_{swp} + 1$
- ② Optional input terminal of [Swimming pool Demand ON/OFF] is open.

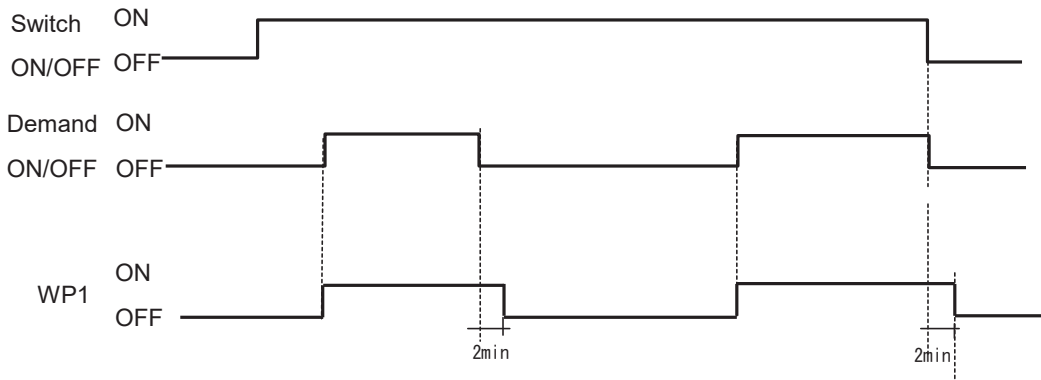
NOTE:

- 1. WP1 and WP3 has 2 minutes or more of overrun after requiring OFF depending on outlet water temperature.
- 2. WP1 is always OFF when Boiler works as replacement source and heat pump stop working in Emergency operation (referring to 10.1.3.2), HP Block operation (referring to 10.9.5) or Boiler working mode of [Alternative] (referring to 10.6.).

**10.8.2.2 Hydraulic separator is Disabled**

Only WP1 work to deliver water circulation When hydraulic separator is Disabled ([hsb] set as [Disabled]). WP1 works as shown in the graphic below:

**DHW operation or SWP operation**



NOTE:

- 1. WP1 has 2 minutes or more of overrun after requiring OFF depending on outlet water temperature.

10.8.3 EC WP1 speed control

Inside EC WP1 can be controlled by PWM input signal (EC Water Pump).

The configuration of this option should be done through the master controller.

Configuration →Heat pump→Water pump configuration

Mark	Description	Default Value	Range	Steps	Units
Pump_mode	Operation Speed Mode	Fix	Fix/ΔT	1	°C
Space_speed	Space speed (heating and cooling)	100%	50-100%	5	%
DHW_speed	DHW speed	100%	50-100%	5	%
SWP_speed	SWP Speed	100%	50-100%	5	%

(1) Speed of Inside EC WP1 can be controlled by PWM input signal (EC Water Pump) in 2 optional modes:

- Fixed speed selected by installer when [Pump\_mode] set as [Fix].
- Variable speed by Water Inlet and Water Outlet temperature when [Pump\_mode] set as [ΔT].

NOTE:

1. Variable speed is valid only during space heating/cooling operation. DHW operation and SWP operation always works as Fixed speed.

(2) When EC WP1 works as [Fix] of [Pump\_mode], Fixed speed value of WP1\_speed is set by [Space\_speed] during space heating/cooling operation, [DHW\_speed] during DHW operation and [SWP\_speed] during SWP operation.

- Set Fixed speed value and PWM input signal

WP1_speed Space_speed DHW_speed SWP_speed %	model					
	44(2.0HP)		60(2.5HP)		80(3.0HP)	
	PWM_in %		PWM_in %		PWM_in %	
	space cooling	space heating	space cooling	space heating	space cooling	space heating
50	18	60	18	55	14	50
55	18	54	18	50	14	45
60	18	49	18	45	14	41
65	18	43	18	40	14	36
70	18	37	18	35	14	31
75	18	32	18	30	14	27
80	18	26	18	25	14	22
85	15	21	15	20	14	18
90	11	15	11	15	11	13
95	8	10	8	10	8	9
100	5	5	5	5	5	5

(3) When EC WP1 works as [ΔT] of [Pump\_mode], Speed of WP1 is controlled by PWM input signal to achieve target value of Water Inlet and Water Outlet temperature difference.

- space heating operation  
5%≤PWM\_in (n) ≤60%

Maximum value of Target outlet water temperature (refer to 10.2.2.3)	Target value of Water Inlet and Water Outlet temperature difference
55- 60°C	8 °C
45 -55°C	7 °C
25-45°C	5 °C
less than 25°C	3 °C

- space cooling operation  
5%≤PWM\_in (n) ≤18%  
Target value of Water Inlet and Water Outlet temperature difference sets as 5 °C.

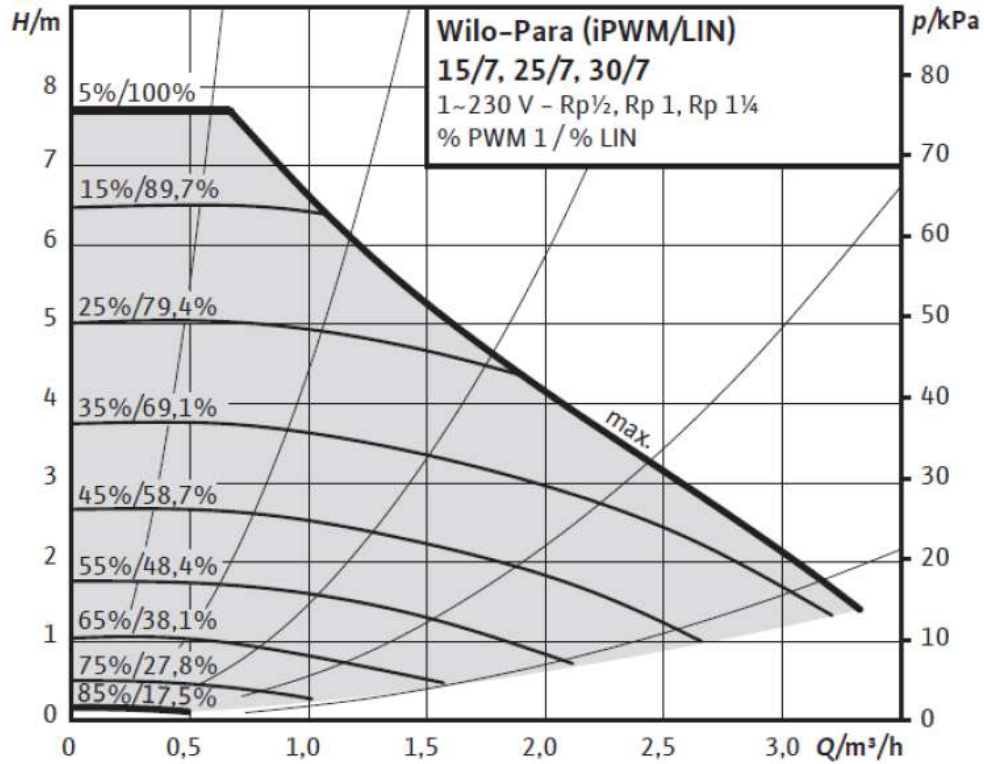
(4) EC WP1 PWM input signal (%).

- PWM input signal

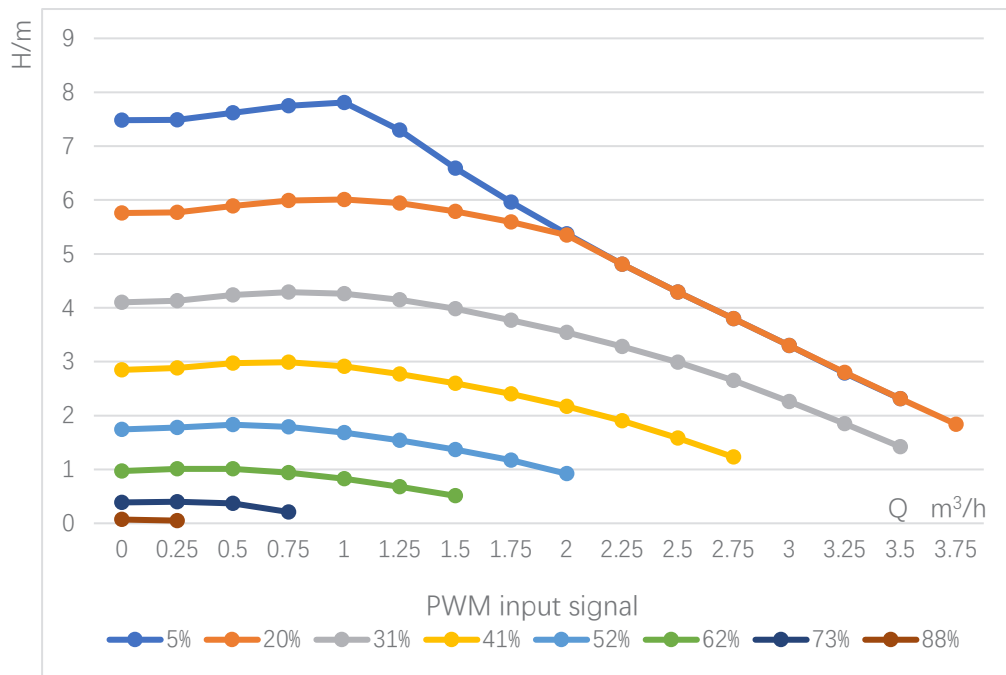
PWM input signal (%) [n-P] in 7-segments	Pump Action
<5	The pump runs at maximum speed.
5 - 60	The pump speed decreases linearly from maximum to minimum.
100	Standby.

- EC WP1 Hydraulic operational area with PWM input signal

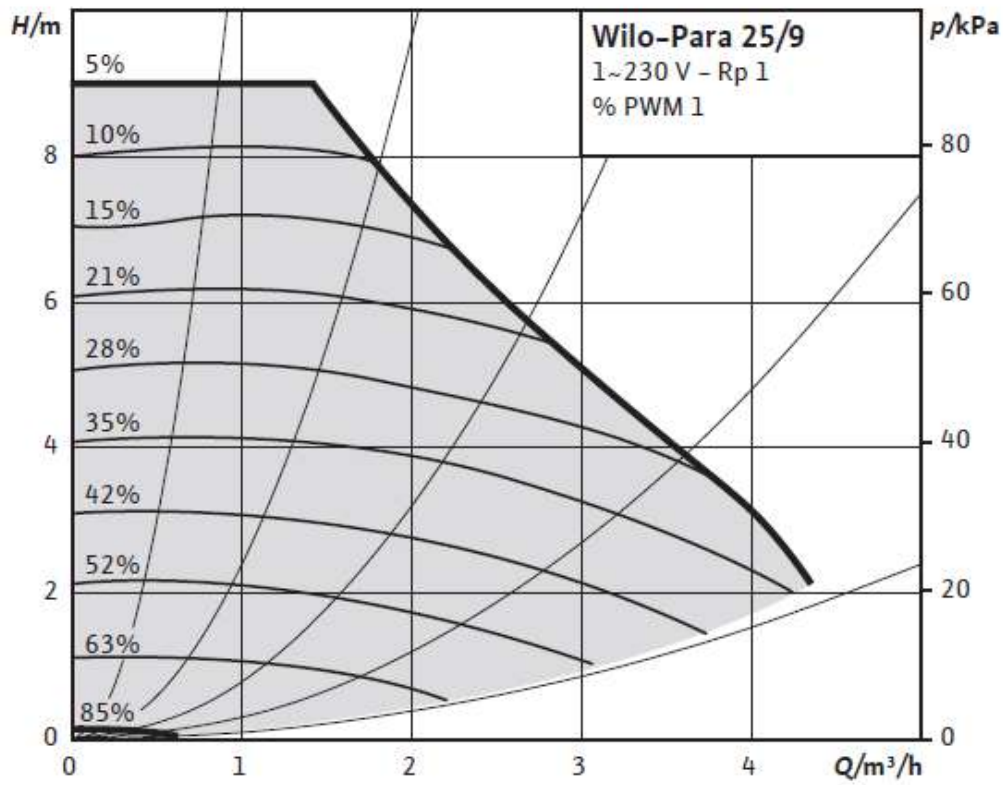
Split Unit with Wilo Pump:



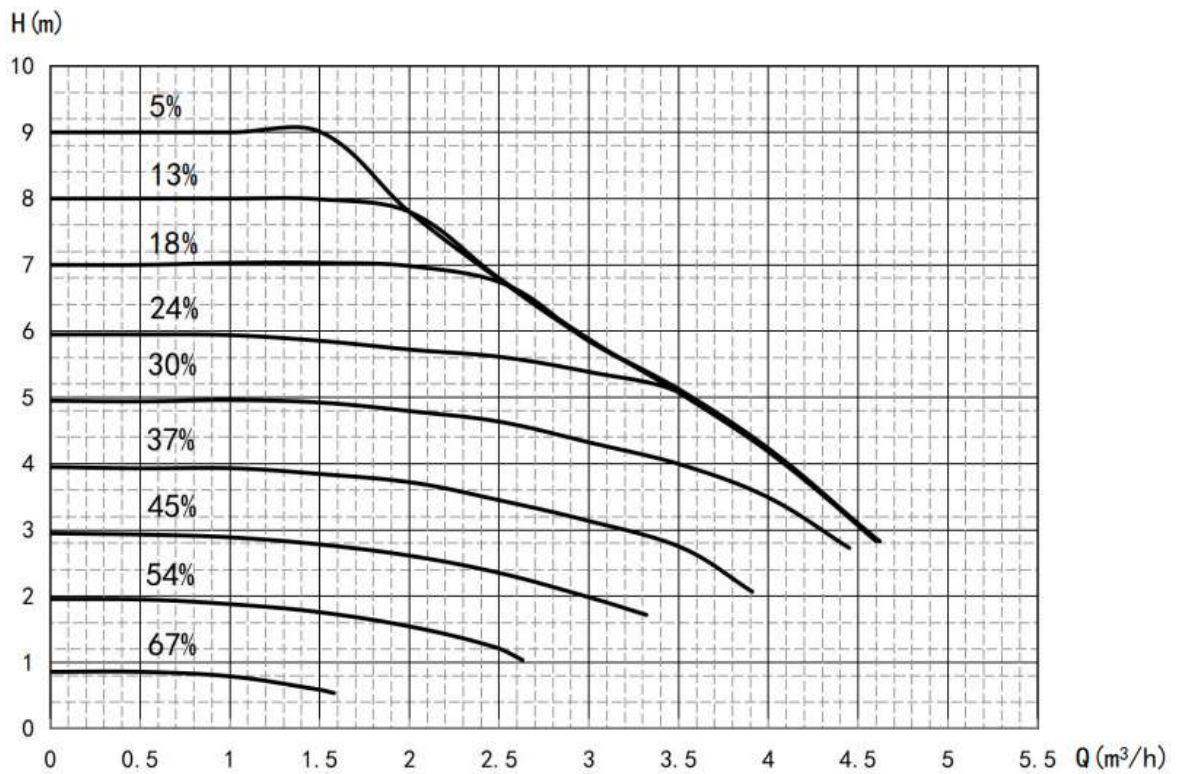
Split Unit with GRUNDFOS pump:



Monobloc Unit with Wilo pump:



Monobloc Unit and Integra Unit with SHIMGE pump:



### 10.8.4 EC WP1 Water flow feedback

Water flow can be feedbacked by PWM output signal of Inside EC WP1 to monitor and estimate capacity.

PWM output signal for Wilo and SHIMGE:

PWM output signal (%) [o-P] in 7-segments	Pump Status	Potential causes
0	Pump PWM interface damaged	iPWM interface in short circuit
2	Standby, pump is ready to run	
5-75	Pump is running normally, flow information is supplied	
80	Abnormal running mode: Pump is running but not at optimal performance	Undervoltage 160/170-194 V Self-thermal protection mode
85	Abnormal function mode Pump has stopped	Undervoltage <160/170 V Overvoltage >250 V Unexpected external flow
90	Abnormal function mode Pump has stopped but still functional Check the installation setup and the pump	Failure on another component than pump Debris in the installation Bad temperature setup
95	The pump has stopped due to permanent failure	Pump blocked Electric module out of order
100	Problem of PWM connection	PWM interface in open circuit

PWM output signal for GRUNDFOS:

PWM output signal (%) [o-P] in 7-segments	Pump Status	Potential causes
0	Pump PWM interface damaged	iPWM interface in short circuit
95	Standby, pump is ready to run	
0-70	Pump is running normally, flow information is supplied	
75	Abnormal running mode: Pump is running but not at optimal performance	Undervoltage 160/170-194 V Self-thermal protection mode
80	Abnormal function mode Pump has stopped	Undervoltage <160/170 V Overvoltage >250 V Unexpected external flow
85	Abnormal function mode Pump has stopped	Phase failure protection or overload short-circuit protection.
90	Abnormal function mode Pump has stopped	Failure on another component than pump Debris in the installation Bad temperature setup
100	Problem of iPWM connection	PWM interface in open circuit

### 10.8.5 Anti Freezing

If water temperature is 5°C or lower in winter, and unit remains OFF, operate the water pump to protect the unit and pipes installation from freezing. This control is released when the water outlet temperature becomes 7°C or higher.

Set DSW4-6 ON to activate Anti Freezing. Anti Freezing is activated factory setting. Set DSW4-6: OFF to cancel Anti Freezing through the Dip switch on PCB1.

NOTE:

1. *Do not cancel Anti Freezing if ambient temperature around water circulation may be low to cause freezing damage.*  
There are 3 ways to do Anti Freezing.
  - ① Run WP1/WP2/WP3 and Room actuator to circulate warm water to do Anti Freezing when ambient temperature and water temperature is low to cause frozen damage possibly.
  - ② Run water pump and Auxiliary electric heater to do Anti Freezing when ambient temperature and water temperature is low continually after pump operation.
  - ③ Run water pump and heat pump to do Anti Freezing when ambient temperature and water temperature is low continually after Auxiliary electric heater operation.

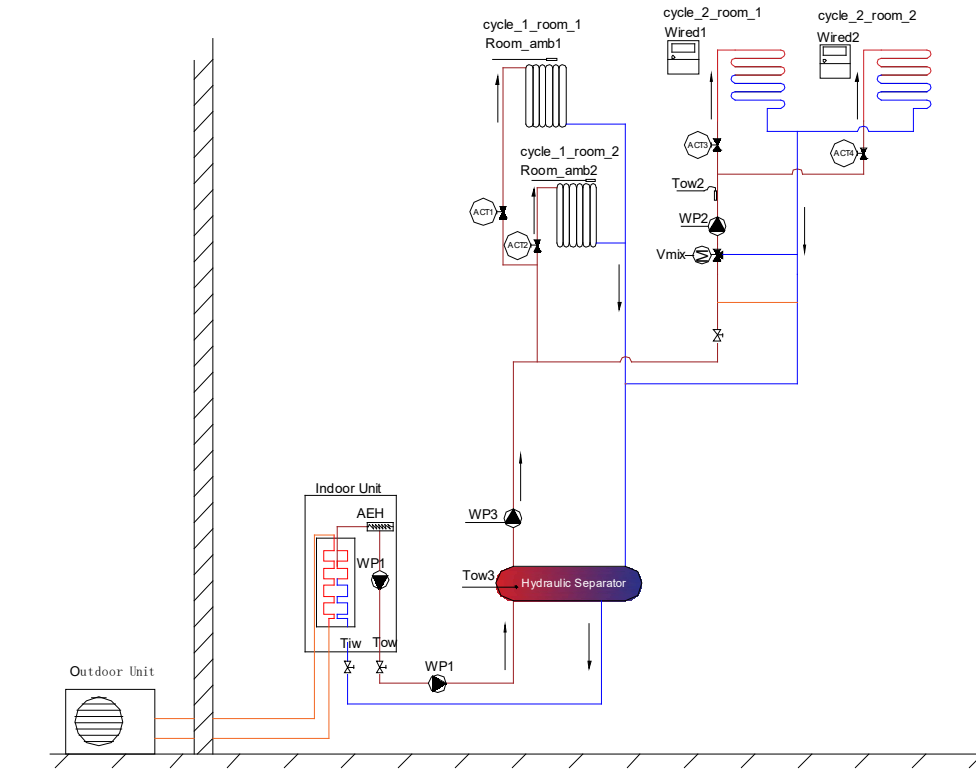
NOTE:

1. *Water temperature may drop to 3°C before the unit begins to heat up water intentionally by Auxiliary electric heater or heat pump.*

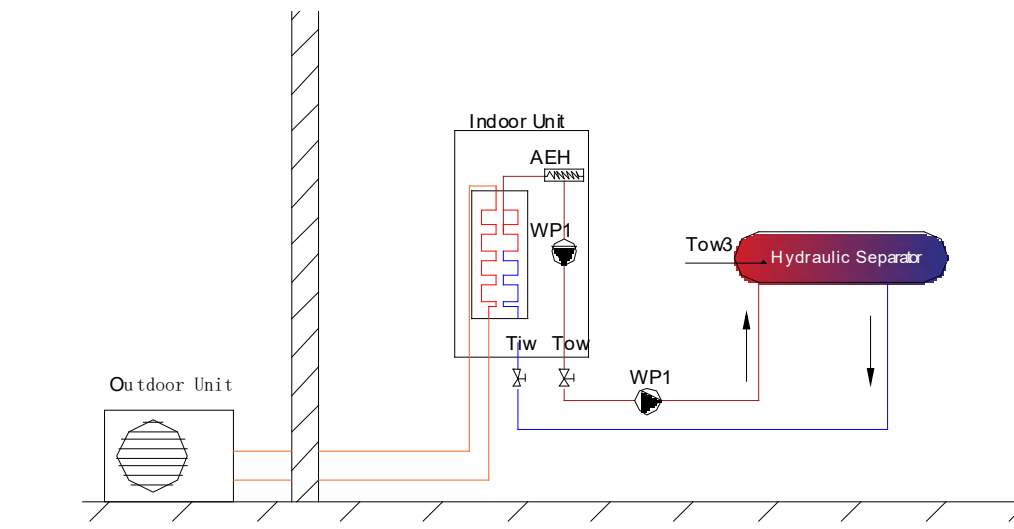
There 2 ways to do water circulation when Auxiliary electric heater or heat pump is operated to do Anti Freezing.

- Circulate whole Water Cycle to keep all system warm when DSW3-4 is ON.

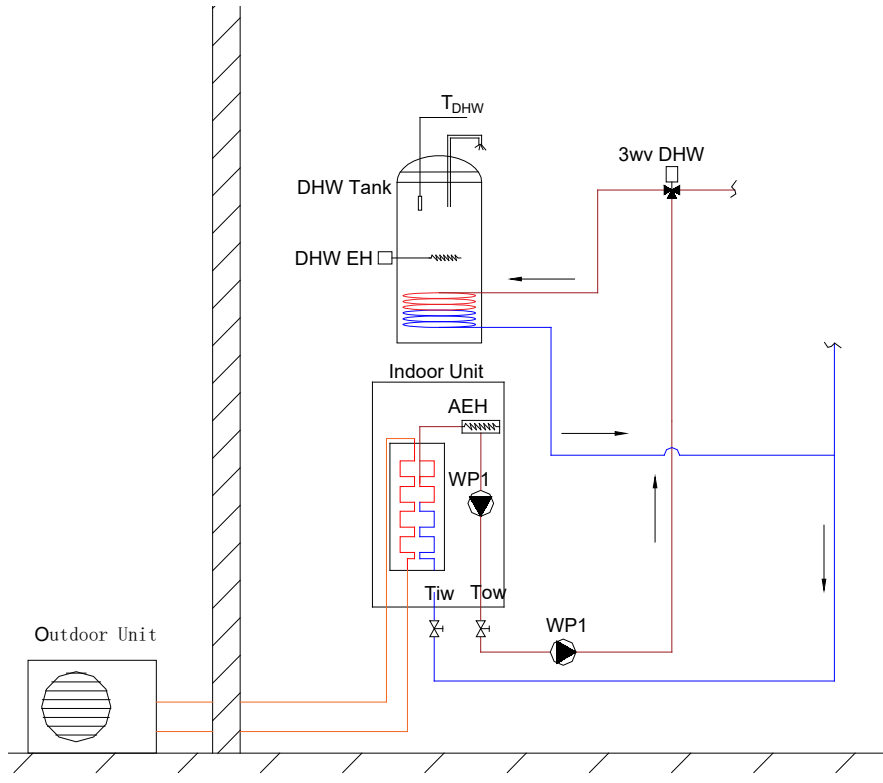
Run WP1/WP2/WP3 , Room actuator and mixing valve to circulate whole Water Cycle.



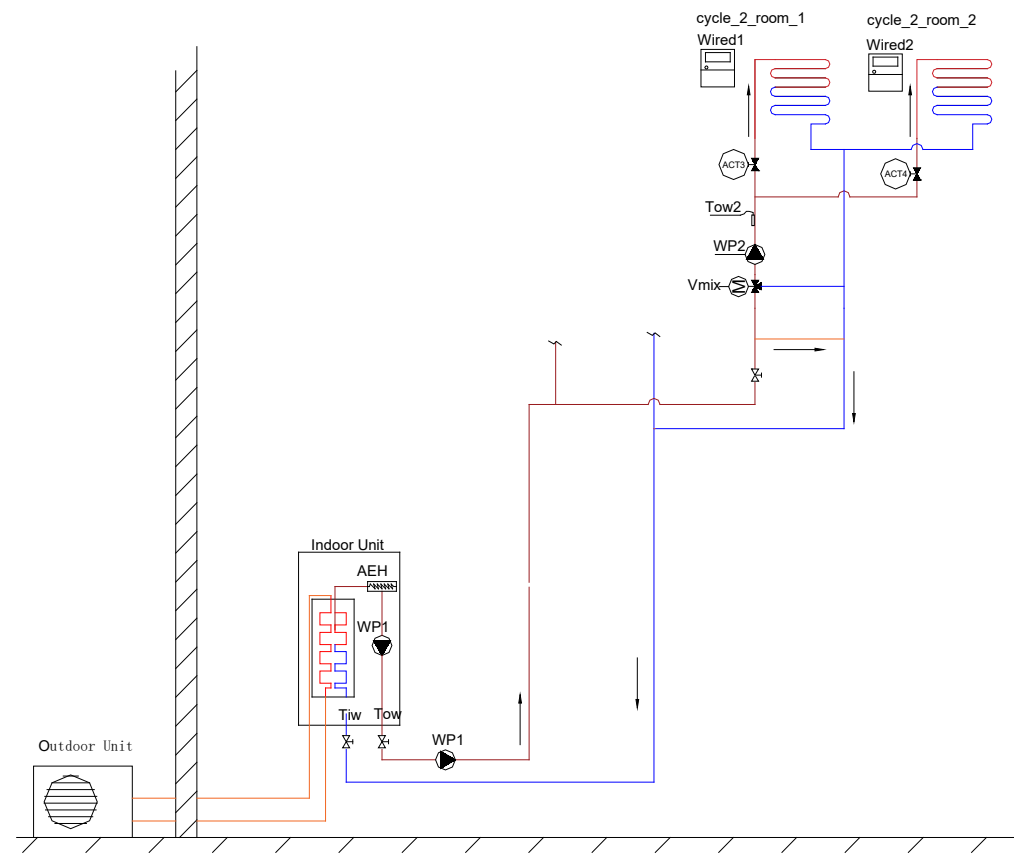
- Circulate only primary Water Cycle to save power consumption when DSW3-4 is OFF.  
Run only WP1 to circulate only primary Water Cycle.  
When Hydraulic separator is available



When 3WV DHW is available



When Bypass is available





NOTE:

1. DSW3-4 ON is factory setting. Recommend DSW3-4 ON to circulate whole Water Cycle, for example no 3WV DHW or hydraulic separator is available. Make sure water circulation and Anti Freezing is fine if DSW3-4 set OFF.
2. Keep the unit power on and water circuit unblocked to do Anti Freezing in the winter.
3. Auxiliary electric heater(on-site accessory) is recommended to fit to water circuit to do Anti Freezing in the winter for monobloc unit.

10.8.6 Air purge

When commissioning and installing the unit, it is very important to remove all air in the water circuit. When the air purge function is running, the pump operates to remove air in the water circuit. By air purge mode the unit change automatically the pump speed and the position of the 3-way valve.

The configuration of this option should be done through the master controller.

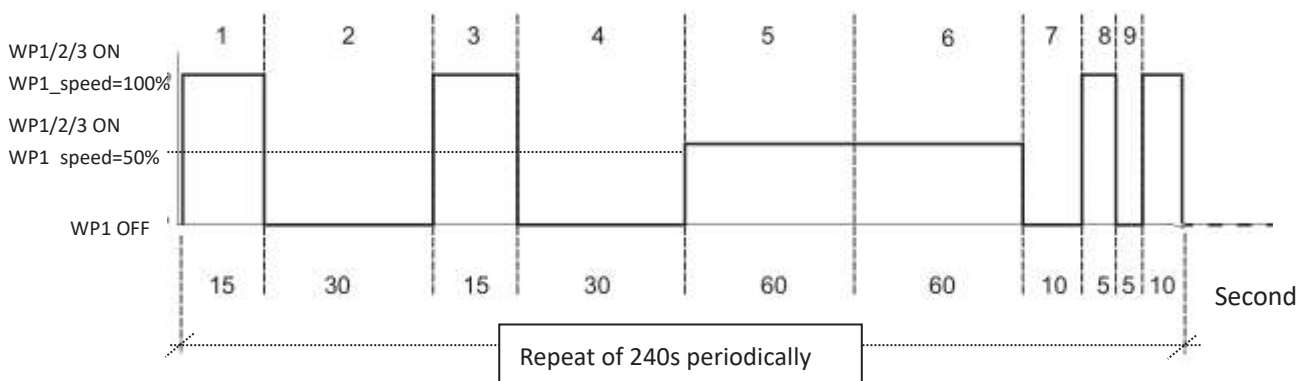
Configuration →Auxiliary Function →Air purge.

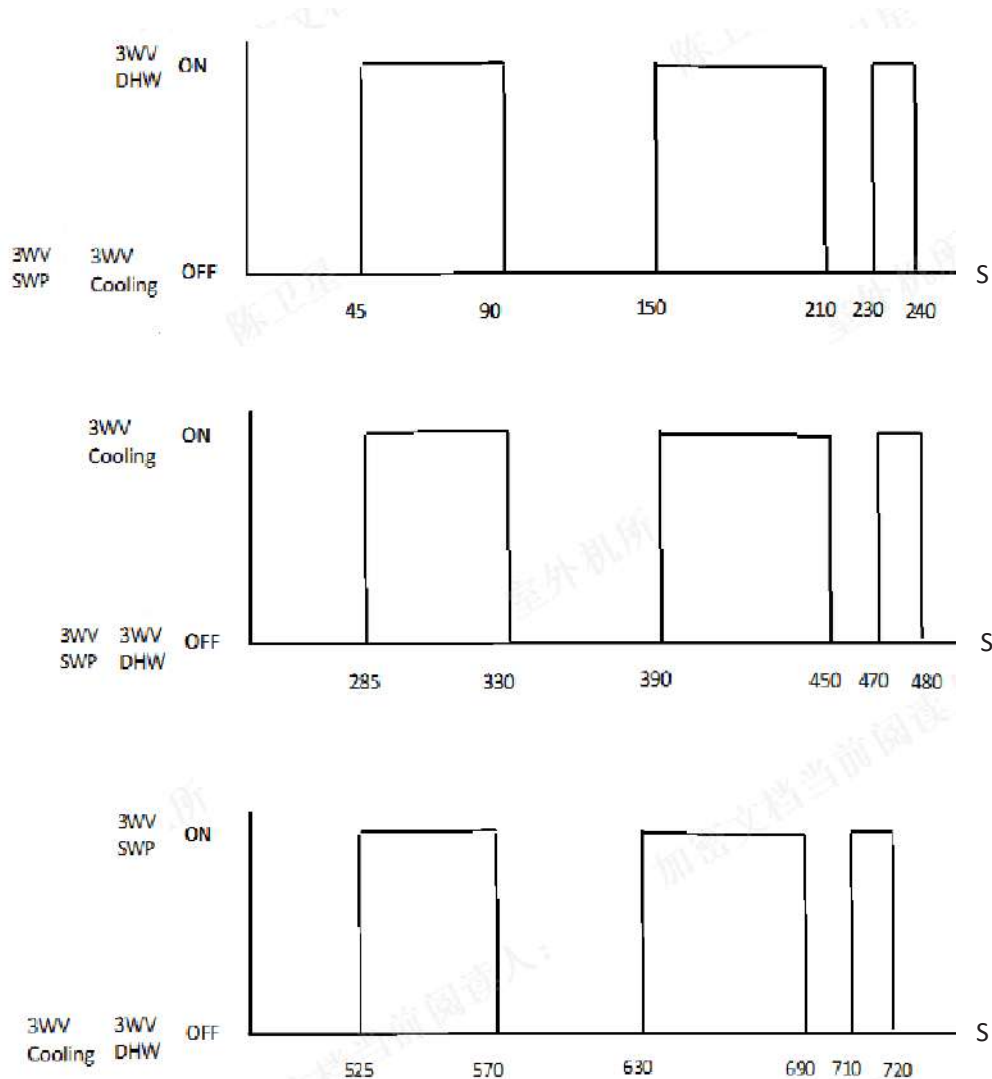
Mark	Description	Default Value	Range	Steps	Units
Air purge	Start/stop air purge	stop air purge	Start/stop air purge	-	-
Air purge_T	Operation time	20	20-30	10	min

NOTE:

1. Air purge stops automatically after time of [ Air purge\_T].

To Start air purge WP1/WP2/WP3 and 3-way valves will operate according to following procedure.





### 10.8.7 Seizure protection

The pump seizure protection function prevents sticking of components due to long periods of inactivity, by running the components during a short period every week. Mixing valves will also have action.

The configuration of this option should be done through the master controller.

Configuration →Auxiliary Function →Seizure Protection

Mark	Description	Default Value	Range	Steps	Units
Seizure	Status	Disabled	Disabled/Enabled	-	-
Seizure_Oplnt	Operation Day	Saturday	Monday~Sunday	-	-Day
Seizure_StTim	Start Time	0:00	0:00~23:50	0:10	Time

NOTE:

1. Seizure protection stops automatically after 1min operation.

WP1/WP2/WP3 and 3-way valves will operate according to following procedure when Seizure protection is activated.

procedure	WP1/WP2/WP3	3WV DHW	3WV Cooling	3WV SWP	running time
①	WP1/2/3 ON WP1_speed=50%	off	off	off	0-15s
②		on	off	off	15-30s
③		off	on	off	30-45s
④		off	off	on	45-60s

### 10.9 Optional functions

#### 10.9.1 Screed Drying

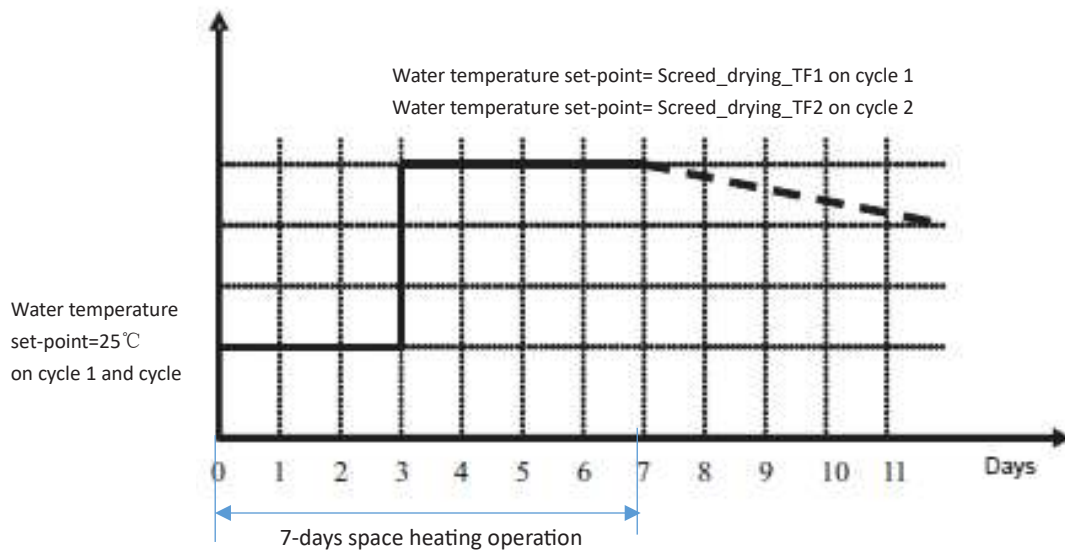
Unit has a special optional function exclusively used for the process of drying screed that has been newly applied to floor heating systems. This process is based on EN1264 part 4. The water temperature set-point follows a predetermined schedule upon activation of the floor screed drying function. Upon completion of the above sequence, the controller returns to normal operation. Water Cycle 1 and Water Cycle 2 are forced to ON and mode is forced to heating.

The configuration of this option should be done through the master controller.

Configuration →Auxiliary Function →Screed Drying

Mark	Description	Default Value	Range	Steps	Units
Screed_drying_TF1	Cycle 1 setting water temperature	55	25-55	1	°C
Screed_drying_TF2	Cycle 2 setting water temperature	55	25-55	1	°C
Screed_drying_start	Start Screed drying	—	—		

The unit will has 7-days space heating operation according to following procedure.



NOTE:

1. Force Water Regulation Mode as [Fix] to maintain stable outlet water temperature when Screed Drying is activated.
2. Force [Off\_mode(heating)] as [ON] to maintain stable outlet water temperature when Screed Drying is activated.
3. Set Screed\_drying\_TF1/ Screed\_drying\_TF2 higher than 26°C to operate specific Water Cycle when Screed Drying is activated, otherwise specific Water Cycle will keep OFF.

### 10.9.2 Defrost by DHW and electric heater

This function allows to perform defrost operation by DHW tank instead of by space heating water circuit.

The configuration of this option should be done through the master controller.

Configuration →Auxiliary Function →Defrost

Mark	Description	Default Value	Range	Steps	Units
Defrost_Space	Defrost By Space Heating	Disabled	Disabled /Enabled	-	-
Defrost_DHW	Defrost By DHW	Disabled	Disabled /Enabled		
Defrost_EH1	Defrost By Electrical Heater	Disabled	Disabled /Enabled	-	-

Usually Unit will perform defrost by space heating whenever [Defrost\_Space] is set.

Perform defrost by DHW is permitted when all following conditions are met.

- ① [Defrost\_DHW] set as [Enabled].
- ② TDHW is greater than 35 °C and Tow3 is greater than 25 °C if Hydraulic separator is available.

It is also possible to operate Auxiliary electric heater to accelerate defrost and prevent plate heat exchanger from freezing during defrost.

Operate Auxiliary electric heater during defrost when all following conditions are met.

- ① [Defrost\_EH1] set as [Enabled].
- ② Tiw is less than 25 °C.

### 10.9.3 Second Outdoor Ambient Temperature

Optional Second Outdoor Ambient Temperature sensor accessory can be connected to the Auxiliary sensor on PCB1 in case that the heat pump is located in a non-suitable position for this measurement.

Water Cycle set-point and other applications will be determined by this Second Outdoor Ambient Temperature when sensor is configured and plugged.

NOTE:

1. When Second Outdoor Ambient Temperature is available Auxiliary sensor on PCB1 of indoor unit need be configured as function of [Ta\_ao] to detect Second Outdoor Ambient Temperature. Refer to 10.10.

### 10.9.4 Energy configuration

An ESTIMATION of capacity can be checked due to usage of inlet water temperature, outlet Water temperature, feedback water flow level, output of Auxiliary electric heater and output of DHW Electric Heater.

An ESTIMATION of power consumption can be checked with 2 measuring ways.

- ① Use estimated power consumption feedbacked from outdoor unit invert, output of Auxiliary electric heater and output of DHW Electric Heater.
  - ② Use power meter device to measure real power consumption. It can be done connecting an external power meter. The number of pulses of the power meter is a variable that must be set through the master controller. Use Only one power meter Or 2 separated power meter to measure real power consumption depending on setting.
- Use Only one power meter device for the whole installation (Indoor Unit + Outdoor unit).
  - Use 2 separated power meter devices: One for the Outdoor Unit and another one for the Indoor Unit. Power consumption is combination of power meter1 and power meter2.

ESTIMATION of capacity and power consumption will be presented by space heating, space cooling, DHW, SWP or their total.

NOTE:

1. Capacity and power consumption is estimated.
2. Capacity and power consumption is based on Auxiliary electric heater with 3-step of 1kW/2kW/3kW if Auxiliary electric heater is configured.

The configuration of this option should be done through the master controller.

Configuration →Auxiliary Function →Energy Configuration

Mark	Description	Default Value	Range	Steps	Units
Capcon	Capacity configuration	Disabled	Disabled / Enabled	-	-
Power_meter_s	Power Meter status	Disabled	Disabled/Enabled	-	-
DHW_ht2_cap	Capacity of DHW ELE. heater	3	Disabled~1~6	0.2	kW
Power_meter1_p	Power Meter 1	Disabled	Disabled 0.1 1 10 100 1000	-	pulse/kWh
Power_meter2_p	Power Meter 1	Disabled	Disabled 0.1 1 10 100 1000	-	pulse/kWh

- (1) Set [Capcon] as [Enabled] to activate ESTIMATION of capacity and power consumption.
- (2) Set [Power\_meter\_s] as [Enabled] to use power meter device to measure real power consumption. Otherwise, power consumption is estimated by feedbacked power consumption from outdoor unit invert, output of Auxiliary electric heater and output of DHW Electric Heater. The estimated power consumption value may differ from the actual power consumption.
- (3) Set [Power\_meter1\_p] and [Power\_meter2\_p] to match number of pulses of the power meter.

NOTE:

1. Optional input signal can be configured as function of [Power meter 1] and [Power meter 2] to measure pulses of the power meter.

### 10.9.5 Smart function

Use Optional input signal to trigger specific action such as limiting heat pump operation to save energy.

The configuration of this option should be done through the master controller.

Configuration →Auxiliary Function →Smart Function

Mark	Description	Default Value	Range	Steps	Units
Esmart_s	Status	Disabled	Disabled/Enabled	-	-
Esmart_m	Smart Action	HP Block	HP Block HP Limited (A) SG. Grid Ready DHW Block DHW Only	-	-
Esmart_t	Function triggering Type	Closed	Closed /Open	-	-
Esmart_boiler	Start Boiler	Disabled	Disabled / Enabled	-	-
Esmart_ht2	Start DHW Heater	Disabled	Disabled / Enabled	-	-
Esmart_A	Current Limitation	60	40-100	10	%

- (1) Set [Esmart\_s] as [Enabled] to activate Smart Function.
  - (2) Set [Esmart\_m] to choose Smart Action when Smart Function is triggered.
- [HP Block]: Heat Pump and Auxiliary electric heater is forbidden in any condition (Space Heating, Cooling, DHW, Swimming pool) when signal is active.

NOTE:

1. Heat Pump and Auxiliary electric heater is allowed during Anti Freezing operation when [HP Block] is activated .
2. Boiler is only complementary heat source for space heating and SWP since Heat Pump and Auxiliary electric heater is forbidden during [HP Block] . Make sure complementary heat source is available for space heating and SWP during [HP Block].

- [HP Limited (A)]: Current consumption is limited to percentage value of [Esmart\_A] of full range when signal is active. Current data is based on Outdoor unit real current (A) given by compressor.
- [DHW Block]: DHW Operation is forbidden when signal is active. Space Heating/Cooling, Swimming pool is allowed normally.
- [DHW only]: Space Heating/Cooling, Swimming pool is forbidden except DHW when signal is active. DHW operation is allowed normally.
- [SG. Grid Ready]: The control technology by integrating the individual heat pump allows in a smart grid by using 2 digital inputs establishing an unidirectional connection and allowed for four different operation modes:

item	SG Ready Input 1	SG Ready Input 2	Action	Description
1	Open	Open	Standard HP mode	SG is not activated
2	Closed	Open	HP Block	Run as [HP Block]
3	Open	Closed	Low price mode	Following forced action ① Space Heating: Increase Water temperature setting by +5°C ② DHW: Increase DHW setting Temperature by + 7°C ③ [Ehb] ≥ -2 [°C], [WTEH] ≤ 80 [min], [H dif] ≤ 4 [°C] forced for Auxiliary electric heater ④ [DHWEH] ≤ 60 [min], [DHW_ht_diff] ≤ 6 [°C] forced for DHW electric heater
4	Closed	Closed	Overcapacity mode	Following forced action ① Space Heating: Increase Water temperature setting to [c1_wate_h_max] ② DHW: Increase DHW setting Temperature to 70°C ③ [Ehb] ≥ 6 [°C], [WTEH] ≤ 30 [min], [H dif] ≤ 1 [°C] forced for Auxiliary electric heater ④ [DHW_ht_diff] ≤ 4 [°C], [DHW_ht_mode] = [H.Demand] forced for DHW electric heater

NOTE:

1. Optional input signal can be configured as function of [Smart Act./SG Ready Input 1] and [SG Ready Input 2] to response smart grid.

(3) Set [Esmart\_t] to choose Type of triggering signal.

NOTE:

1. Optional input signal can be configured as function of [Smart Act./SG Ready Input 1] to trigger Smart Function.

(4) Set [Esmart\_boiler] as [Enabled] to allow boiler operation to offer complementary heat capacity for DHW during [HP Block]

(5) Set [Esmart\_ht2] as [Enabled] to allow DHW electric heater operation to offer complementary heat capacity for DHW during [HP Block].

NOTE:

1. DHW electric heater and boiler both can be complementary heat source for DHW during [HP Block]. DHW electric heater has priority to operate DHW during [HP Block] when both DHW electric heater and boiler are available. Make sure one complementary heat source at least is available for DHW during [HP Block].

2. [Point of DHW & SWP] should set as [After Hydr S] to use boiler to heat up DHW during [HP Block]. Refer to 10.1.

10.9.6 Duty Control

Duty signal (0-10V, 0-5V or 4-20mA) can be used to adjust setting temperature of Water Cycle 1, Water Cycle 2, DHW or SWP.

The configuration of this option should be done through the master controller.

Configuration → Auxiliary Function → Demand Control (duty)

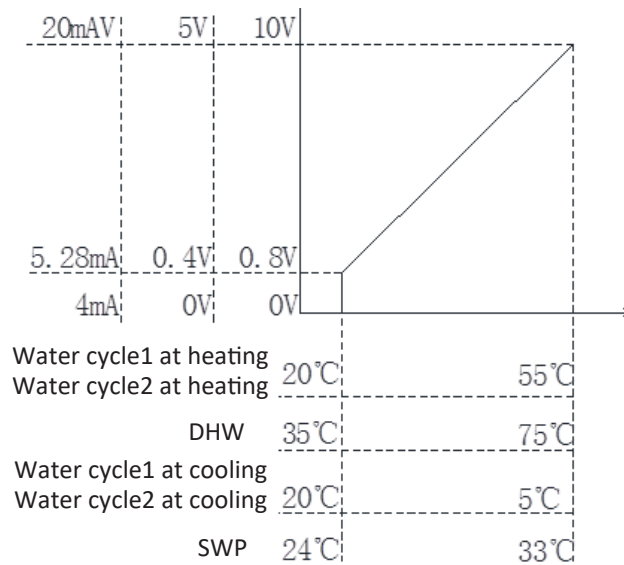
Mark	Description	Default Value	Range	Steps	Units
duty_s	Status	Disabled	Disabled/Enabled	-	-
duty_m	Signal Type	0-10V	0-10V 0-5V 4-20mA	-	-
duty_f	Setting function	DHW	DHW cycle1 cycle2 SWP	-	-

NOTE:

1. Auxiliary sensor on PCB1 of indoor unit need be configured as function of [duty] to detect duty signal. Refer to 10.10.

- (1) Set [duty\_s] as [Enabled] to activate Duty Control Function.
- (2) Set [duty\_m] to choose Signal Type when Duty Control Function is activated.
- (3) Set [duty\_f] to choose specific function to adjust setting temperature when Duty Control Function is activated.

Setting temperature of specific function is adjusted according to duty signal as following.





### 10.9.7 Night Shift

Night shift function reduces compressor load and fan speed in order to reduce environmental noise, preferably at night. When Night shift function is active, the capacity of the unit is reduced to the percentage defined as [night\_shift\_demand].

NOTE:

1. Make sure unit has enough capacity during Night shift.

There are 2 ways to activate Night shift function.

- Night shift function can be set through the master controller.

Configuration →Auxiliary Function →Night shift.

Mark	Description	Default Value	Range	Steps	Units
night_shift_s	Status	Disabled	Disabled / Enabled	-	-
night_shift_demand	Capacity Limitation	75	40-100	1	%
night_shift_StTim1	Starting time	20:00	0:00~24:00	0:10	Time
night_shift_StTim2	Stopping time	08:00	0:00~24:00	0:10	Time

- Night shift function can also be set through the master controller [favourite] button.

Mark	Description	Default Value	Range	Steps	Units
[favourite] button	Night Mode	OFF	OFF/ON	-	-

### 10.9.8 Quiet Mode

Quiet Mode function reduces compressor load and fan speed in order to reduce environmental noise. When Quiet Mode function is active, Outdoor unit will run at quiet mode of [dB] as 1.

Quiet Mode function is set through the master controller [favourite] button.

Mark	Description	Default Value	Range	Steps	Units
[favourite] button	Quiet Mode	OFF	OFF/ON	-	-

## 10.10 Input /Output /Auxiliary sensors

NOTE:

1. After changing the input settings, output settings and auxiliary sensor settings on the master controller, it needs to be powered off and on again to take effect.

### 10.10.1 Input

The unit offers 11 optional input ports that can be configured as different function.

The configuration of this option should be done through the master controller.

Configuration → I/O → Inputs

Mark	Description	Default Value	Range	Terminals ON board	Terminals ON PCB1	Specification ON board
i1	Input 1	08 (Demand ON/OFF1)	00~17 (except 07, 12)	I1, L1 on TB3	PCN4-1	Closed/Open 220-240V ~ 50/60Hz
i2	Input 2	13 (Cycle 1 and 2 ECO mode)	00~17 (except 07, 12)	I2, +12V on TB4	CN2-1	Closed/Open 12V DC
i3	Input 3	00 (No Function)	00~17 (except 07, 12)	I3, L3 on TB3	PCN10-3	Closed/Open 220-240V ~ 50/60Hz
i4	Input 4	04 (Solar in)	00~17 (except 07, 12)	I4, L3 on TB3	PCN10-1	Closed/Open 220-240V ~ 50/60Hz
i5	Input 5	02 (Smart Act.)	00~17 (except 07, 12)	I5, +12V on TB4	CN2-3	Closed/Open 12V DC
i6	Input 6	06 (DHW boost)	00~17 (except 07, 12)	I6, L3 on TB3	PCN10-5	Closed/Open 220-240V ~ 50/60Hz
i7	Input 7	07 (Power meter 1)	00~17	I7, COM on TB4	JL-1	Closed/Open 12V DC
i8	Input 8	12 (Power meter2)	00~17	I8, COM on TB4	JL-2	Closed/Open 12V DC
i9	Input 9	09 (Demand ON/OFF2)	00~17 (except 07, 12)	I9, +12V on TB4	CN11-3	Closed/Open 12V DC
i10	Input 10	00 (No Function)	00~17 (except 07, 12)	I10, +12V on TB4	CN11-4	Closed/Open 12V DC
i11	Input 11	00 (No Function)	00~17 (except 07, 12)	I11, +12V on TB4	CN11-4	Closed/Open 12V DC

Optional function can be configured.

Input codes	Mark	Description
00	No Function	-
02	Smart Act./ SG Ready Input 1	This function must be used to stop or limit the heat pump and Auxiliary electric heater when restricted by Electric company. It allows an external Smart switch device to switch off or reduce consumption of the heat pump and Auxiliary electric heater during time of peak electricity demand. In case of using Smart Grid application, this input is used as a digital input 1 and allows four different operating modes.
03	Swimming pool Demand ON/OFF	Optional input signal can be configured as function of ""Swimming pool Demand ON/OFF"" to operate SWP. Switch ON/OFF of SWP can also be controlled by master controller. Closed: Start SWP operation (Switch ON and Demand ON) Open: Stop SWP operation (Switch OFF and Demand OFF)
04	Solar in	In case of combining Unit with solar panels, this input is used as a feedback for solar station ready operation. Closed: Solar in ON to trigger solar pump operation ON Open: Solar in OFF to trigger solar pump operation OFF
05	Forced Heating/ Cooling	Heating/cooling can be changed by an input of an external contact signal. Heating/cooling can also be changed over by master controller. Closed: Heating mode Open: Cooling mode
06	DHW Boost	With this function enabled, it is possible to request a heating up of the DHW when user requires an instantaneous delivery of DHW. Triggering input signal can also Switch ON DHW.
07	Power meter 1	Input used as kW/h pulse count for Energy data recording, used to count energy data or the total energy data.
08	Demand ON/OFF 1	Optional input signal can be configured as function of "Demand ON/OFF 1" or "Demand ON/OFF 2" and selected as room thermostat.

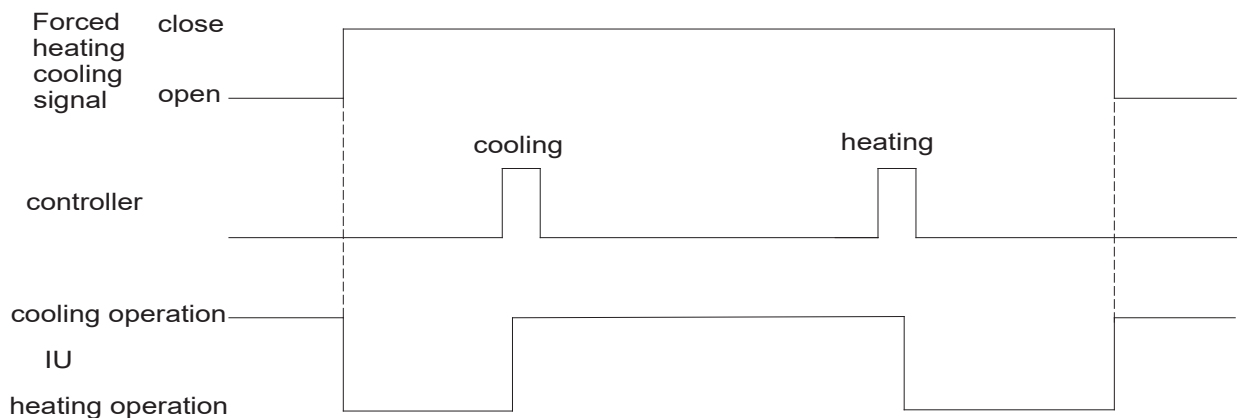
09	Demand ON/OFF 2	Closed: Corresponding room thermostat Switch ON and Thermo ON. Open: Corresponding room thermostat Switch OFF and Thermo OFF. Corresponding room thermostat can also be Switch ON/OFF by Rooms function on Master controller.
10	Forced heating	Forced Heating mode by input of contact signal, Heating can also be changed over by master controller. Closed: Forced Heating mode Open: No action
11	Forced cooling	Forced Cooling mode by input of contact signal, Cooling can also be changed over by master controller. Closed: Forced Cooling mode Open : No action
12	Power meter 2	Input used as kW/h pulse count for Energy data recording, used to count energy data or the total energy data.
13	Cycle 1 and 2 ECO mode	Cycle 1 and Cycle 2 Water ECO offset. Current water temperature setting is reduced or increased by the indicated parameter in space heating mode or space cooling mode. Closed: Cycle 1 and Cycle 2 Water ECO offset enabled Open: Cycle 1 and Cycle 2 Water ECO offset disabled
14	Cycle 1 ECO mode	Cycle 1 Water ECO offset. Current water temperature setting is reduced or increased by the indicated parameter in space heating mode or space cooling mode. Closed: Cycle 1 Water ECO offset enabled Open: Cycle 1 Water ECO offset disabled
15	Cycle 2 ECO mode	Cycle 2 Water ECO offset. Current water temperature setting is reduced or increased by the indicated parameter in space heating mode or space cooling mode. Closed: Cycle 2 Water ECO offset enabled Open: Cycle 2 Water ECO offset disabled
16	Force OFF	Force OFF the unit include Water Cycle 1, Water Cycle 2, DHW and SWP. Switch ON/OFF of different function can also be controlled by master controller. Closed: Forced OFF the unit include Water Cycle 1, Water Cycle 2, DHW and SWP. Open: No action
17	SG Ready Input 2	In case of using Smart Grid application, this input is used as a digital input 2 and allows four different operating modes.

NOTE:

1. Function of 05 (Forced Heating/Cooling)/ Function of 10 (Forced heating)/ Function of 11 (Forced cooling) cannot be used simultaneously.

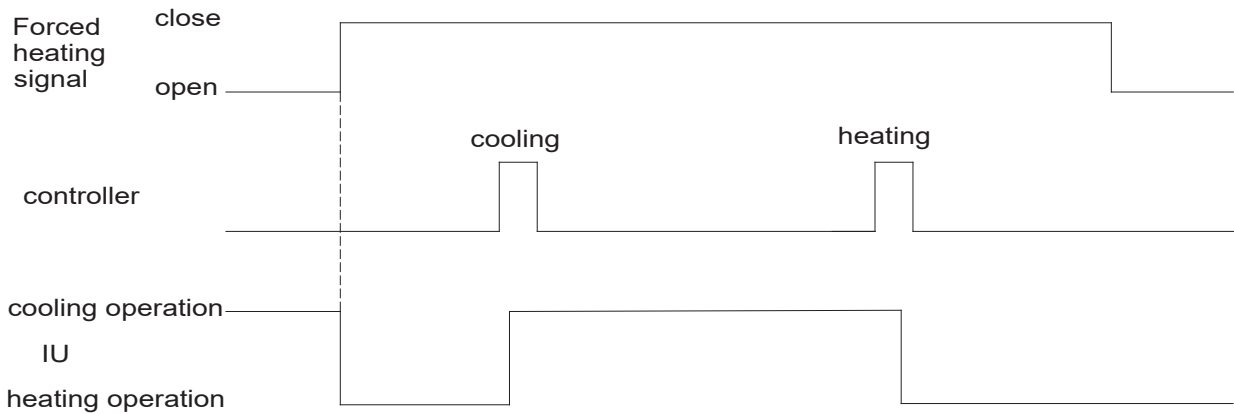
(1) Forced Heating/cooling

Heating/cooling can be changed by an input of an external contact signal. Heating/cooling can also be changed over by controller.



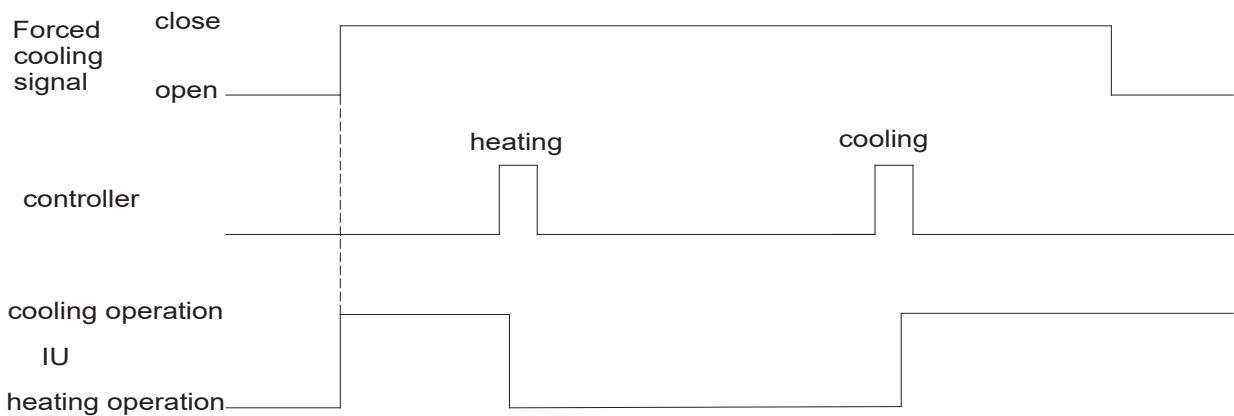
(2) Forced heating

Forced Heating mode can be changed by an input of an external contact signal. Heating/cooling can also be changed over by controller.



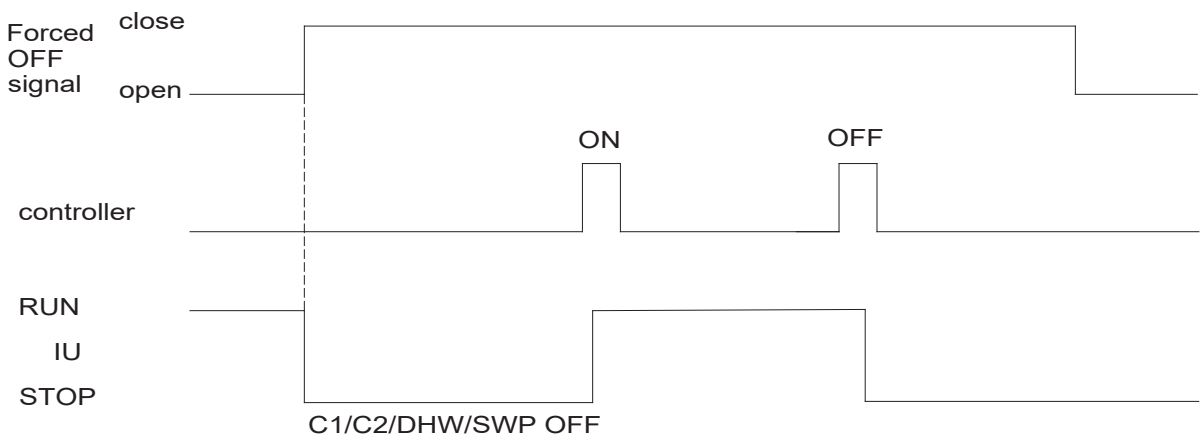
(3) Forced cooling

Forced Cooling mode can be changed by an input of an external contact signal. Heating/cooling can also be changed over by controller.



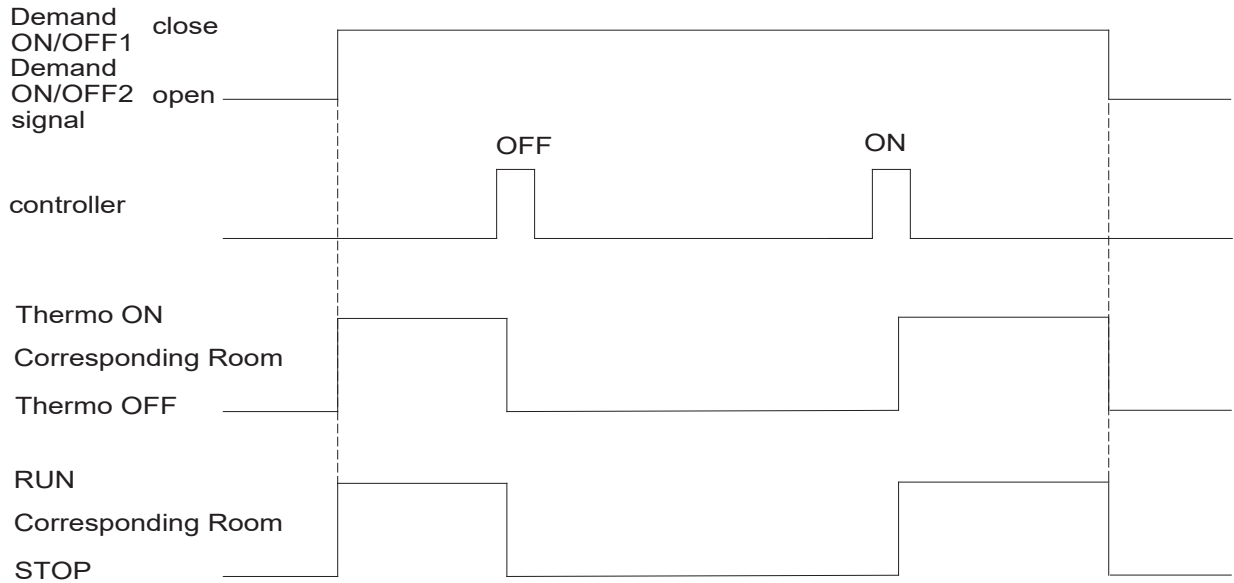
(4) Force OFF

Force OFF the unit include Water Cycle 1, Water Cycle 2, DHW and SWP. Switch ON/OFF of different function can also be controlled by master controller.



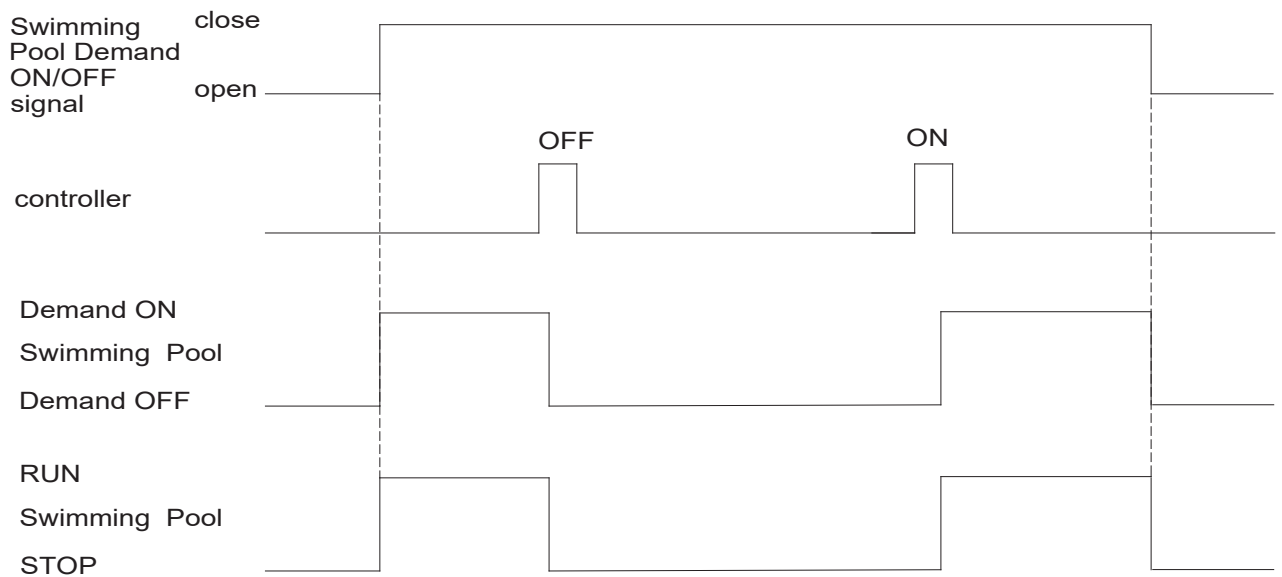
(5) Demand ON/OFF1 and Demand ON/OFF2

Switch ON/OFF and Thermo ON/OFF of Corresponding room is controlled by an input of an external contact signal. Corresponding room thermostat can also be Switch ON/OFF by Rooms function on Master controller.



(6) Swimming pool Demand ON/OFF

Switch ON/OFF and Demand ON/OFF of SWP is controlled by an input of an external contact signal. SWP can also be Switch ON/OFF by Master controller.

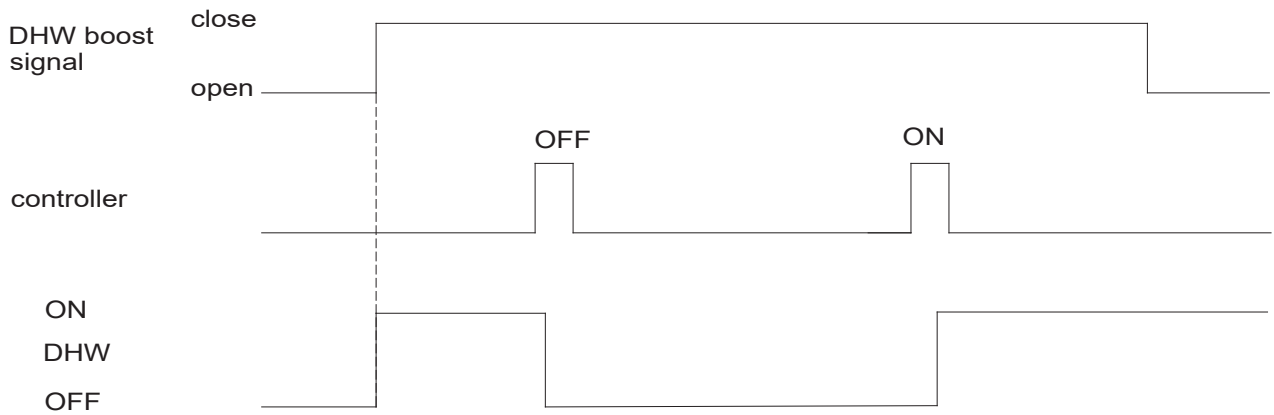


(7) DHW Boost

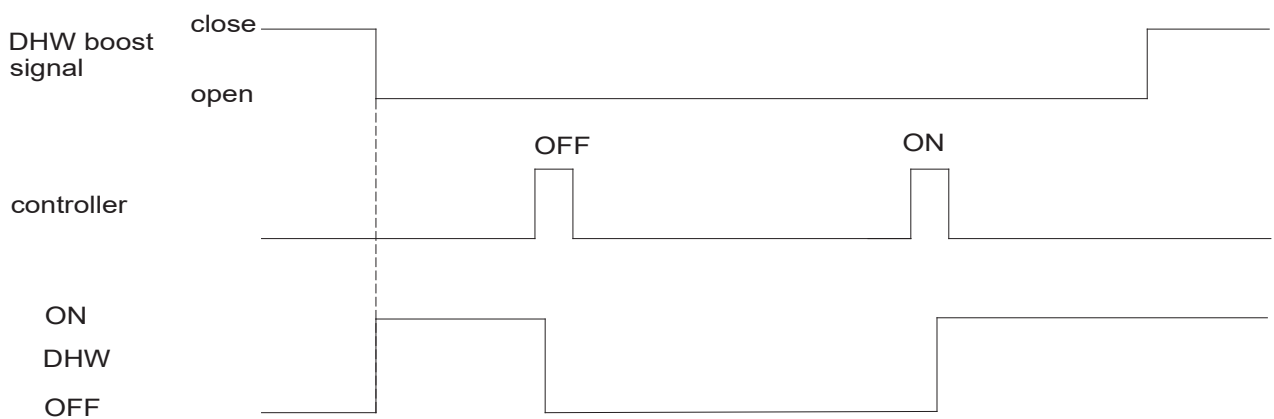
An input of an external contact signal of DHW Boost can be used to Switch ON of DHW. DHW can also be Switch ON/OFF by Master controller.

Valid signal is depending on setting [Trigger type] of DHW Boost referring to 10.3.6.

- Set [Trigger type] as [Closed]



- Set [Trigger type] as [Open]



10.10.2 Output

The unit offers 15 optional output ports that can be configured as different function.

The configuration of this option should be done through the master controller.

Configuration → I/O → Outputs

Mark	Description	Default Value	Range	Terminals ON board		Terminal s ON PCB1	Specification ON board
				Power supply	L2, N6 on TB3		
o1	Output 1	01 (3WV SWP)	0~29 (except 17,02,21,08)	Signal line	O1 on TB3	PCN9-3	ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
o2	Output 2	02 (WP3)	0~30 (except 17)	O2, N2 on TB2		CN8-2	ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
o3	Output 3	03 (Boiler combination)	0~29 (except 17,02,21,08)	O3 on TB2		PCN14- 1	Free voltage
o4	Output 4	04 (Solar out)	0~29 (except 17,02,21,08)	O4 on TB3		PCN16- 1	Free voltage
o5	Output 5	17 (DHW Electric Heater)	0~30	HL, HN on TB1		PCN15- 1	ON/OFF 220-240V ~ 50/60Hz Max. 13A
o6	Output 6	18 (3WV DHW)	0~29 (except 17,02,21,08)	Power supply	L2, N6 on TB3	PCN2-1	ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
				Signal line	O6 on TB3		
o7	Output 7	19 (Mixing valve Close)	0~29 (except 17,02,21,08)	O7, N4 on TB2		PCN12- 1	ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
o8	Output 8	20 (Mixing valve Open)	0~29 (except 17,02,21,08)	O8, N4 on TB2		PCN12- 3	ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
o9	Output 9	21 (WP2)	0~30(except 17)	O9, N1 on TB2		CN20-3	ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
o10	Output 10	22 (3WV Cooling)	0~29 (except 17,02,21,08)	Power supply	L1, N5 on TB3	PCN8-1	ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
				Signal line	O10 on TB3		
o11	Output 11	08 (WP1)	0~30 (except 17)	O11, N1 on TB2		CN20-2	ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
o12	Output 12	23 (Act1)	0~29 (except 17,02,21,08)	O12, N2 on TB2		CN8-3	ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
o13	Output 13	24 (Act2)	0~29 (except 17,02,21,08)	O13, N3 on TB2		PCN13-5	ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
o14	Output 14	25 (Act3)	0~29 (except 17,02,21,08)	O14, N3 on TB2		PCN13-3	ON/OFF 220-240V ~ 50/60Hz Max. 1.0A
o15	Output 15	26 (Act4)	0~29 (except 17,02,21,08)	O15, N4 on TB2		PCN13-1	ON/OFF 220-240V ~ 50/60Hz Max. 1.0A



Optional function can be configured.

Output code	Mark	Description
00	No Function	-
01	3WV SWP	In case of combining Unit with swimming pool, this output is used to drive 3-way valve diverting to the swimming pool heat exchanger. Output ON signal when swimming pool function is operating.
02	WP3	In case of combining Unit with hydraulic separator, this output is used to drive relay of water pump 3.
03	Boiler combination	In case of combining Unit with boiler, this output is used to Start/Stop it.
04	Solar out	In case of combining Unit with solar panel, this output is used to drive relay of solar pump.
05	Alarm signal	Output ON signal when an Alarm Code is existence.
06	SWP signal	Output ON signal in case that Swimming pool function is demand ON.
07	Cooling signal	Output ON signal in case that Space Cooling is Thermo-ON.
08	WP1	In case of the pipeline connected to the unit is long leading to low water flow rate, this output is used to drive relay of a extra WP1 that can be cascaded with inside EC WP1 to offer additional hydraulic head. The extra WP1 works equally with inside EC WP1. For Integra Unit, extra WP1 stops when 3WV DHW is ON diverting water circulation to the sanitary tank inner coil, referring 10.1(3).
09	Heating signal	Output ON signal in case that Space Heating is Thermo-ON.
10	DHW signal	Output ON signal in case that DHW is demand ON or DHW Electric Heater is ON.
11	Solar overheat	Output ON signal in case that solar panels overheat protection is activated.
12	Defrost	Output ON signal in case that the outdoor unit is defrosting.
13	DHW re-circulation pump	Output ON signal to drive relay of a re-circulation pump in case of re-circulation pump is available for DHW tank.
14	Heater relay 1	Copy ON/OFF signal of Auxiliary electric heater output terminal 1.
15	Heater relay 2	Copy ON/OFF signal of Auxiliary electric heater output terminal 2.
16	c1 water ON/OFF	Output ON signal in case that Water Cycle1 switch ON.
17	DHW Electric Heater	Output ON signal in case the DHW Electric Heater is Enabled and meet the ON conditions.
18	3WV DHW	In case of combining Unit with DHW, this output is used to drive 3-way valve diverting to the sanitary tank inner coil. Output ON signal when DHW function is operating.
19	Mixing valve Close	Mixing valve has 2 operation terminals of closing valve and opening valve. Optional output signal need be configured as function of "Mixing valve Close" and "Mixing valve Open" to drive mixing valve.
20	Mixing valve Open	
21	WP2	When Water Cycle 2 is available Optional Output signal need be configured to drive relay of water pump 2.
22	3WV Cooling	In case of combining Unit with cooling fan coil, this output is used to drive 3-way valve diverting to cooling fan coil. Output ON signal when space cooling is operating.
23	Act1	Room actuators, output ON signal in case the corresponding Room Thermostat is Thermo ON (heating and cooling). And also meet follow condition Room actuators also Output ON: ① Air purge ② Anti freezing ③ Screed Drying ④ Retry operation due to anti freezing (alarm-76 , d1-31, d1-03) ⑤ Outdoor Unit defrost without Room Thermostat Thermo ON ⑥ Overrun after requiring OFF
24	Act2	
25	Act3	
26	Act4	
27	Act5	
28	Act6	
29	Act7	
30	WPc1	WPc1 is used only in case Water Cycle 1 is available. Optional Output signal need be configured to drive relay of water pump c1. It ensures water circulation at Water Cycle 1.

## 10.10.3 Auxiliary sensors

The unit offers 7 Auxiliary sensors that can be configured as different function.

The configuration of this option should be done through the master controller.

Configuration → I/O → Auxiliary sensors.

Mark	Description	Default Value	Terminals ON board	Terminals ON board	Terminal s ON PCB1	Specification ON board
As1	Auxsensor1	01 (Tow3)	00~14	A1 On PCB4	THM8	-
As2	Auxsensor2	03 (Tsolar)	00~14	A2 On PCB4	THM10	-
As3	Auxsensor3	02 Tswp	00~14	A3 On PCB4	THM9	-
As4	Auxsensor4	05 (Tow2)	00~14	A4 On PCB4	THM6	-
As5	Auxsensor5	14 (TDHW1)	00~14	A5 On PCB4	THM11	-
As6	Auxsensor6	07 (Room_amb1)	00~14	A6 On PCB4	THM17	-
As7	Auxsensor7	08 (Room_amb2)	00~14	A7 On PCB4	THM18	-

Optional function can be configured.

Auxiliary sensor code	Mark	Description
00	No Function	-
01	Tow3	This sensor is used in case to combine Unit with hydraulic separator to detect Hot water temperature detection of hydraulic separator.
02	Tswp	In case of combining Unit with swimming pool, this sensor is used to detect swimming pool water temperature.
03	Tsolar	In case of combining Unit with solar panels, this sensor is used to Detect Hot water temperature of solar panels.
04	Ta_ao	Optional Second Outdoor Ambient Temperature sensor accessory can be connected to the Auxiliary sensor in case that the heat pump is located in a non-suitable position for this measurement.
05	Tow2	When Water Cycle 2 is available, auxiliary sensor need be configured as function of "Tow2" to detect outlet water temperature of Water Cycle 2.
06	duty	Used to detect duty signal when duty signal control is Enabled, the duty signal type can be 0- 10V, 0-5V or 10-20mA.
07	Room_amb1	Rooms function on master controller is selected as room thermostat, and in this scenario, auxiliary sensor can be configured as function of "Room_amb1...7", and can be selected as room temperature detection of specific room.
08	Room_amb2	
09	Room_amb3	
10	Room_amb4	
11	Room_amb5	
12	Room_amb6	
13	Room_amb7	
14	TDHW1	Auxiliary temperature sensor to detect water temperature in the DHW tank of lower side.

## 10.11 Test Run

### 10.11.1 Actuator test run

Purpose of the actuator test run is to confirm the operation of the different output signals (e.g., when you select Pump, a test run of the pump will start).

Select [Actuator\_test\_Output] of output ports and [Actuator\_test\_T] of run time to start output ON signal.

The configuration of this option should be done through the master controller.

Configuration →Actuator test run.

Mark	Description	Default Value	Range	Steps	Units
Actuator_test	Start/stop	stop	Start/stop	-	-
Actuator_test_T	run time	5	5-20	5	min
Actuator_test_Output	output test run signal	Output15	Output1- Output15	-	-

NOTE:

1. Make sure that all air is purged before executing the test run. Also avoid disturbances in the water circuit during the test run.
2. Be careful to run actuator test of output signal of DHW Electric Heater. DO NOT CAUSE OVERHEAT.
3. Stop the unit before executing the test run.
4. Actuator test run will stop automatically after [run time].

### 10.11.2 Unit test run

Select run time, mode and function to start unit test run.

The configuration of this option should be done through the master controller.

Configuration →Actuator test run.

Mark	Description	Default Value	Range	Steps	Units
	Start/stop	stop	Start/stop	-	-
	run time	5	20-120	5	min
	mode	heating	cooling/heating		
	function	C1	C1/C2/DHW/swimming pool	-	-

NOTE:

1. Make sure that all air is purged before executing the test run. Also avoid disturbances in the water circuit during the test run.
2. Make sure that minimum water volume is guaranteed in all conditions.
3. Check all electrical, refrigerant and water circuit installation carefully before unit test run.
4. Make sure the minimum required flow rate is reached.

## 11. Control configuration for OU

## 11.1 Control Logic

No.		Item	Details
1	Cooling Operation	Comp.Frequency Control	Quasi PI Control: (1) Difference between indoor outlet water temperature and target outlet water temperature (2) Amount of temperature difference change.
		O.U. Electronic Exp. Valve Control	Quasi PI Control: To determine the O.U. electronic expansion valve opening so as to keep the temperature at the top of compressor at an optimum level.
		O.U. Fan Control	To control the fan steps so that hight pressure is within a stable temperature range.
		Reversing Valve Control	Reversing Valve: ON
2	Heating Operation	Comp.Frequency Control	Quasi PI Control: (1) Difference between indoor outlet water temperature and target outlet water temperature (2) Amount of temperature difference change.
		O.U. Electronic Exp. Valve Control	Quasi PI Control: To determine the O.U. electronic expansion valve opening so as to keep the temperature at the top of compressor at an optimum level.
		O.U. Fan Control	The fan steps are dependent on Ta in the beginning. After to control the fan steps so that hight and low pressure are within a stable temperature range and Te is within a stable temperature range.
		Reversing Valve Control	Reversing Valve: OFF
3	Defrost Operation	Comp.Frequency Control	Fixed compressor frequency
		O.U. Electronic Exp. Valve Control	To determine the O.U. electronic expansion valve opening depending on the discharge temperature of the compressor , hight pressure and defrost time.
		O.U. Fan Control	To stop the outdoor fan.
		Reversing Valve Control	Reversing Valve: ON

## 11.2 Defrost Operation

< Defrost Operation >

The following defrost operations, "Standard Defrost", "Forced Defrost" and "Manual Defrost" are available.

(1) Standard Defrost

This operation starts according to the outdoor temperature, the outdoor evaporating temperature and the operating time.

(2) Forced Defrost

This operation starts when the indoor unit repeats Thermo-ON/OFF\* operation and therefore cannot start the "Standard Defrost."

(3) Manual Defrost

This operation starts when the push switch "PSW1" on the outdoor unit PCB is pressed for more than 3 seconds during maintenance, etc. (This function cannot be used when the pressure and the outdoor evaporating temperature is high or at the beginning of the operation.)

NOTE:

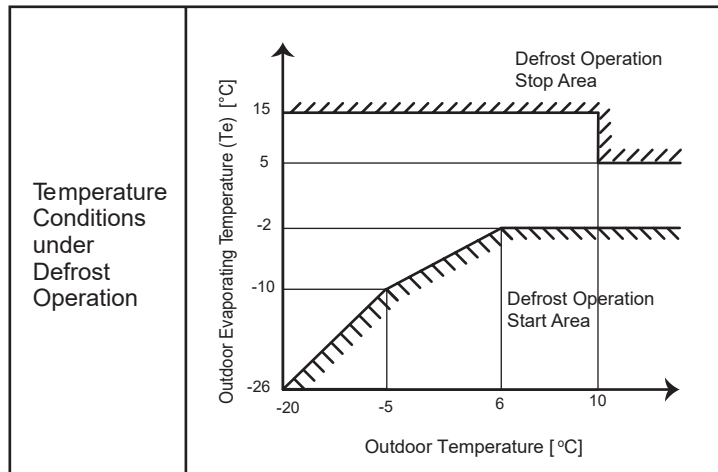
Do not repeatedly use "Manual Defrost" frequently.

\* Thermo-ON: The outdoor unit and some indoor units are running.

Thermo-OFF: The outdoor unit and some indoor units stay on, but don't run.

## < Condition for Starting Defrost Operation >

- (1) Standard Defrost
  - (a) Temperature Condition



- (b) Condition of Operating Time for Defrost Operation Start

The defrost operation starts when the temperature condition shown in “(a) Temperature Condition” is met after a heating operation of 40 to 120 minutes. The heating operation time is determined by estimating the amount of frost on the heat exchanger.

- (2) Forced Defrost
  - The “Forced Defrost” starts when all the following conditions are met.
    - (a) The reversing valve is “OFF” for more than 120 minutes.
    - (b) The outdoor temperature is 10 °C or lower.
    - (c) The accumulated heating operation time is more than 60 minutes.  
(The accumulated time is reset when the operation is stopped or the defrost operation is performed.)
    - (d) The compressor is operated continuously for more than 90 seconds.
    - (e) The outdoor evaporating temperature is lower than 5°C and the high pressure is lower than 3.3MPa or pressure ratio is more than 8.5 or difference between outlet water temperature and inlet water temperature of plate heat exchanger is lower than 2°C right before the operation starts.

## < Condition for Completing Defrost Operation >

The defrost operation stops when any of the following conditions is met.

- (1) The outdoor evaporating temperature reaches 25°C within 2 minutes after the defrost operation starts.
- (2) The outdoor evaporating temperature reaches 20°C (the outdoor temperature < 10°C) after a lapse of 2 minutes or more from the defrost operation start.
- (3) The outdoor evaporating temperature reaches 5°C (the outdoor temperature > 10°C) after a lapse of 2 minutes or more from the defrost operation start.
- (4) The temperature at the top of the compressor reaches 132°C.
- (5) The high pressure reaches 3.3MPa within 20 seconds after the defrost operation starts.
- (6) The high pressure reaches 3.1MPa after a lapse of 2 minutes or more from the defrost operation start.
- (7) More than 9 minutes have passed from the defrost operation start.

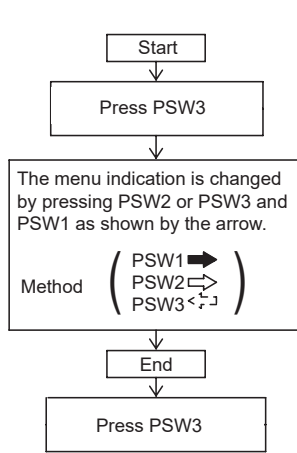
### NOTE:

The defrost operation does not start immediately even if the above conditions are met, because these conditions may be met temporarily depending on the refrigerant system variability.

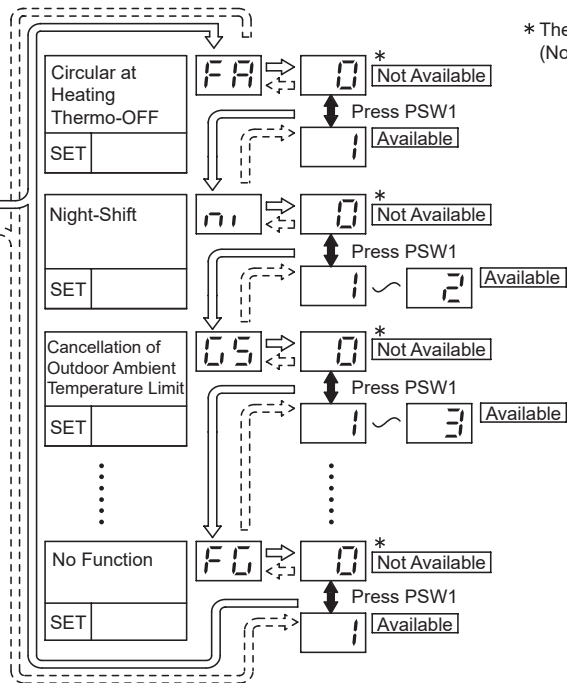
The defrost operations start when these conditions are met continuously for a certain period of time.

### 11.3 Function Setting

The function setting should be performed during the outdoor unit stoppage. This setting is not available during other Setting.



**NOTES:**  
 1. Record the function No. of each setting when setting the optional function. The example is for setting 1.



\* The setting before shipment is "0" (Not Available).

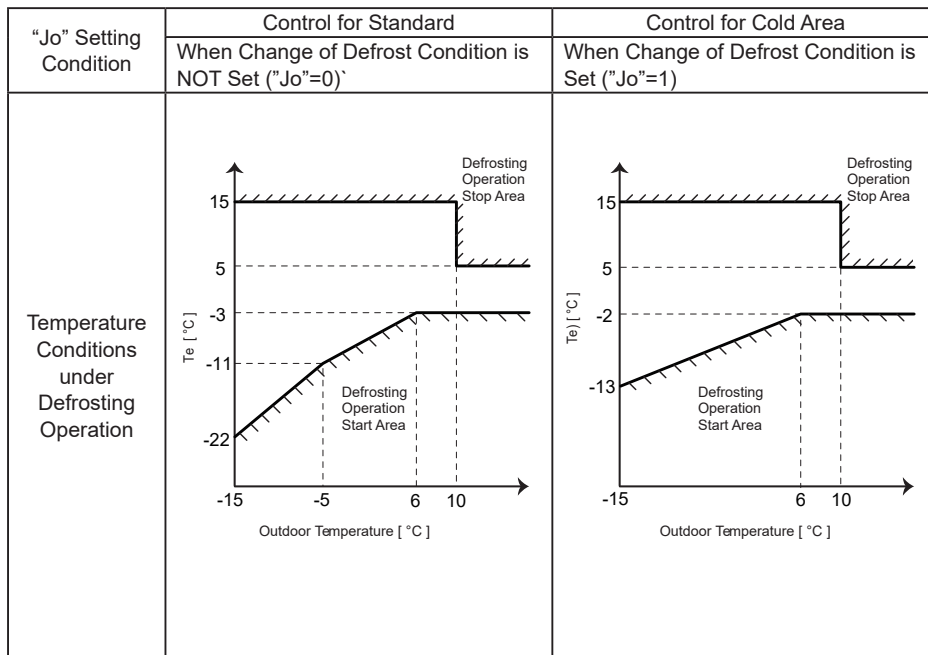


## 11.3.1 Function Setting Item

No.	Setting Item	7-Segment Display		Contents
		Item	No.	
1	Circulator Function at Heating Thermo-OFF	FA	00	No setting
			01	No function
2	Night Shift (Low Noise)	Ni	00	No setting
			01	No function
3	Cancellation of Outdoor Ambient Temperature Limit for Heating	GH	00	No setting
			01	No function
4	Cancellation of Outdoor Ambient Temperature Limit for cooling	GC	00	No setting
			01	No function
5	Defrost for Cold Area (Change of Defrost Condition)	Jo	00	No setting
			01	Condition 2 of defrost operation for cold area
6	SLo (IU Fan Speed) Defrost Setting	bJ	00	No setting
			01	No function
7	Cancellation of Hot Start	HT	00	No setting (Hot start control is available)
			01	Cancellation of hot start
8	Priority Capacity Mode for Cooling	cU	00	No setting
			01	Adjust the compressor speed to improve the cooling capacity
9	Priority Capacity Mode for Heating	hU	00	No setting
			01	Adjust the compressor speed to improve the heating capacity
10	Energy Saving Mode for Cooling	SC	00	No setting
			01	No function
11	Energy Saving Mode for Heating	SH	00	No setting
			01	No function
12	Low Noise Setting	dB	00	No setting
			01	No function
13	Demand Function Setting	dE	00	No setting
			01	No function
14	Wave Function Setting	UE	00	No setting
			01	No function
15	Low Outlet Temperature Protection In Cooling Mode1	Fb	00	No setting
			01	01: No Function
16	Low Outlet Temperature Protection In Cooling Mode2	Fc	00	No setting
			01	No function
17	Superheat of Exchanger Setting	E1	00	No setting
			01	No function
18	Capacity Setting	Co	00	No setting
			01	Test setting
19	Oil Heater Function	F1	00	No setting
			01	Oil Heater setting is effective
20	No function	F2~F5	00	No setting
			01	No function

**11.3.2 Change of Defrost Condition (Function Setting “Jo”)**

Press “PSW1” and select the setting condition “0” or “1” for Change of Defrost Condition “ Jo ”. This function changes the defrost condition as shown below.



**11.3.3 Priority Capacity Mode for Cooling (Function Setting “cU”)**

If the cooling capacity seems insufficient during the normal operation, press “PSW1” and select the setting condition “0” to “1” Priority Capacity Mode Setting “ cU ”. By setting this function, the target frequency of the compressor is set higher only for cooling operation.

Outdoor Unit Capacity (HP)	Priority Capacity Mode for Cooling is not set cU=0	Maximum Frequency (Hz)	Priority Capacity Mode for Cooling is not set cU=1	Maximum Frequency (Hz)
044(2.0HP)		75		90
060(2.5HP)		75		90
080(3.0HP)		75		90

NOTE:

The upper limit frequency of the compressor can NOT be changed by Priority Capacity Mode Setting.

**11.3.4 Priority Capacity Mode for Heating (Function Setting “hU”)**

If the heating capacity seems insufficient during the normal operation, press “PSW1” and select the settin condition “0” or “1” at the Compressor Frequency Control Target Value for Heating “ hU ”. By setting this function, the target frequency of the compressor is set higher only for heating operation.

Outdoor Unit Capacity (HP)	Priority Capacity Mode for Heating is not set hU=0 Maximum Frequency(Hz)					Priority Capacity Mode for Heating is not set hU=1 Maximum Frequency (Hz)
	Outdoor Temperature	Ta< -15°C	-15°C≤Ta<12°C	12°C≤Ta<24°C	24°C≤Ta	
044(2.0HP)	/	75	80	75	70	95
060(2.5HP)	/	90	95	85	75	95
080(3.0HP)	/	95	95	85	80	95

NOTES:

Increase rates are approximate, these may change slightly depending on the outdoor unit model.

11.3.5 Quiet Mode

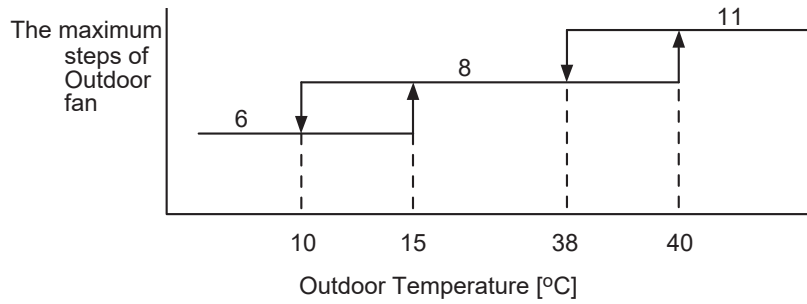
Outdoor unit receives Quiet Mode enabled signal from Master Controller to reduce the unit sound noise(Refer to the Section 10.9.8 “Quiet Mode”).

NOTES:

1. By setting this function, the compressor frequency and the outdoor fan motor rotation frequency are forcibly reduced and so the outdoor unit capacity decreases and the unit operation range is limited.
2. Reduction rates are approximate, these may change slightly depending on the outdoor unit model.

11.3.5.1 Quiet Mode is enabled (Cooling operation)

(1) Outdoor Fan



(2) Frequency Range

Outdoor Unit Capacity	Maximum Frequency(Hz)
044(2.0HP)	40
060(2.5HP)	42
080(3.0HP)	47

(3) Sound pressure noise and Capacity ratio

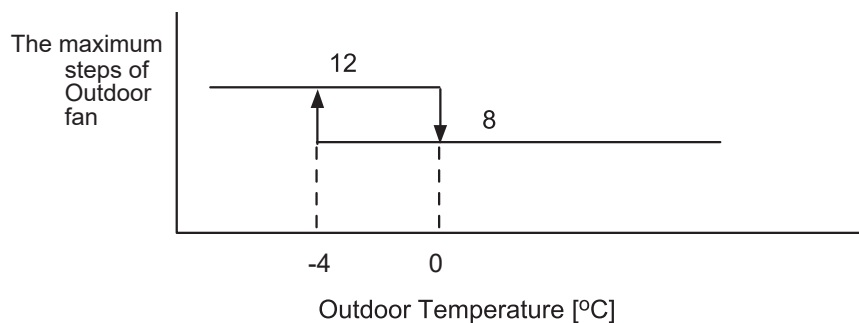
When Quiet Mode is enabled, the sound pressure noise and capacity ratio as follows.

Outdoor Unit Capacity	Sound Pressure Noise (dB)	Capacity ratio
044(2.0HP)	39	65%
060(2.5HP)	42	60%
080(3.0HP)	43	75%

11.3.5.2 Quiet Mode is enabled (Heating operation)

(1) Outdoor Fan

When Quiet Mode is enabled, the maximum steps of outdoor unit as follows.



(2) Frequency Range

When Quiet Mode is enabled, the maximum Frequency of outdoor unit as follows.

Outdoor Temperature \ Outdoor Unit Capacity	Maximum Frequency(Hz)			
	Ta < -15°C	-15°C ≤ Ta < 12°C	12°C ≤ Ta < 24°C	24°C ≤ Ta
044(2.0HP)	45	30	45	40
060(2.5HP)	55	40	60	45
080(3.0HP)	60	40	60	40

(3) Sound pressure noise and Capacity ratio

When Quiet Mode is enabled, the sound pressure noise and capacity ratio as follows.

Outdoor Unit Capacity	Sound Pressure Noise (dB)	Capacity ratio
044(2.0HP)	39	60%
060(2.5HP)	42	60%
080(3.0HP)	43	60%

11.3.6 Night Shift Mode

Outdoor unit receives Night Shift enabled signal from Master Controller to reduce the unit sound noise(Refer to the Section 10.9.7 "Night Shift").

NOTE:

By setting this function ,the compressor frequency and the outdoor fan motor rotation frequency are forcibly reduced and so the outdoor unit capacity decreases.

11.3.6.1 Night Shift Mode is enabled (Cooling operation)

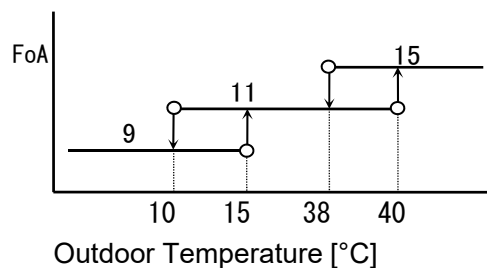
(1) Outdoor Fan

The max step of outdoor fan Fomax:

$$Fomax = \text{night\_shift\_demand}/100 * FoA \text{ (Fomax} \geq 6\text{steps)}$$

Note: FoA: See the figure below.

night\_shift\_demand Refer to the Section 10.9.7.



(2) Frequency Range

When Night Shift Mode is enabled, the maximum Frequency of outdoor unit as follows.

Night_shift_demand(%) \ Outdoor Unit Capacity	Maximum Frequency(Hz)						
	40	50	60	70	80	90	100
044(2.0HP)	20	26	36	45	55	64	73
060(2.5HP)	20	26	36	45	55	64	73
080(3.0HP)	30	37	45	52	60	67	75

(3) Sound pressure noise and Capacity ratio

When Night Shift Mode is enabled, the sound pressure noise and capacity ratio as follows.

Night_shift_demand(%)	Sound Pressure Noise(dB)		
	044(2.0HP)	060(2.5HP)	080(3.0HP)
40	35	38	39
50	38	38	39
60	41	41	42
70	43	43	45
80	45	45	46
90	46	46	48
100	47	47	48

11.3.6.2 Night Shift Mode is enabled (Heating operation)

(1) Outdoor Fan

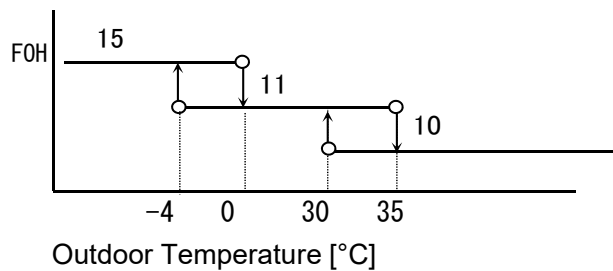
The max step of outdoor fan Fomax:

$$Fomax = \text{night\_shift\_demand}/100 * FoH \text{ (Fomax} \geq 6\text{steps)}$$

FoH: See the figure below

Note: FoA: See the figure below.

night\_shift\_demand Refer to the Section 10.9.7.



(2) Frequency Range

When Night Shift Mode is enabled, the maximum Frequency of outdoor unit as follows.

Night_shift_demand(%)	Maximum Frequency(Hz)						
	40	50	60	70	80	90	100
Outdoor Unit Capacity							
044(2.0HP)	20	30	40	50	60	70	80
060(2.5HP)	27	39	51	63	75	86	95
080(3.0HP)	38	47	57	66	76	85	95

(3) Sound pressure noise and Capacity ratio

When Night Shift Mode is enabled, the sound pressure noise and capacity ratio as follows.

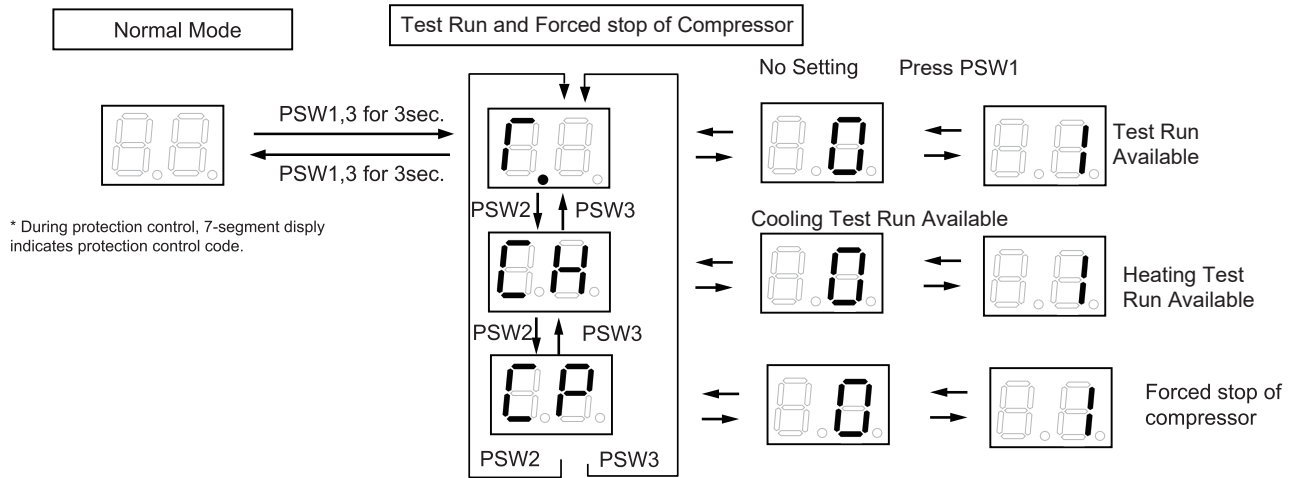
Night_shift_demand(%)	Sound Pressure Noise(dB)		
	044(2.0HP)	060(2.5HP)	080(3.0HP)
40	35	38	39
50	40	42	43
60	41	43	44
70	43	46	47
80	45	48	48
90	47	48	50
100	47	48	50

11.3.7 Test run

Test run setting should be performed during the outdoor unit stoppage and normal mode. This setting is not available during other Setting.

To start the Test Run: Press PSW1 and PSW3 for 3 seconds .

To cancel the Test Run: Press PSW1 and PSW3 for 3 seconds.



Note:

1. In case of alarm, T. is replaced by alarm code.
2. The control of Test Run operation is the same as normal operation control.
3. When Test Run is not required, do not forget to exit the Test Run, set T. to 0 or press PSW1 and PSW3.

**SERVICE**



## 1. Troubleshooting

### 1.1 Initial Troubleshooting

#### 1.1.1 Checking of Electrical Wiring and Power Supply

Check the following items for any abnormality in the activation of the system.

No.	Check Situation	Check Method
1	Is any power supply breaker or fuse blown?	Check the voltage (secondary side) of the breaker and also check the continuity of the fuse by a tester.
2	Is voltage at the secondary side of the transformer correct?	Disconnect at the secondary side of the transformer and measure voltage by a tester.
3	Is wiring firmly secured and correctly connected?	<p>Check that the following wiring connection on O.U./I.U. printed circuit boards (PCBs) is not loosened.</p> <ul style="list-style-type: none"> <li>• The connection for thermistors</li> <li>• The connection for the wired controller cable</li> <li>• The connection for communication cable</li> <li>• Each connection for power supply line</li> </ul> <p>Check that the wiring connection on O.U./I.U. PCBs is not loose or misconnected on the site according to the "Electrical Wiring Diagram" of the Engineering Manual.</p>

**NOTE:**

If the fuse(s) on an I.U. PCB blows out, diagnose the cause of overcurrent and recover the fuse(s).

In addition, check the power supply of optional parts because the fuse may blow out because of the power supply failure.

#### 1.1.2 Checking of Rotary Switch and DIP Switch Settings

The following diagram indicates the factory settings of DSWs on PCBs in the indoor and outdoor units.

Hi-therma Split O.U. refer to 8.2.9.5 SETTING OF DIP SWITCHES.

Hi-therma Split I.U. refer to 8.1.9.5 SETTING OF DIP SWITCHES ON PCB1.

Hi-therma Monobloc refer to 8.3.10.6 SETTING OF DIP SWITCHES.

### 1.1.3 Power supply failure to the indoor unit and the master controller

- The light band of the master controller is not displayed.
- Not operated

If the fuses are blown out or a breaker is activated, investigate the cause of the overcurrent and take the necessary action.

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Power failure or power is not ON		Measure the voltage by means of the voltmeter	Supply the power
Blown out fuse or activation of the breaker at the power source	Short circuit supplied between the wires	Check for any uncovered part of the wires	Remove the cause of the short circuit and replace the fuse
	Short circuit of the wires to earth	Measure the insulation resistance	Remove the cause of the short circuit and replace the fuse
Blown out fuse at the control circuit	Short circuit supplied between the wires	Check for any uncovered part of the wires	Remove the cause of the short circuit and replace the fuse
	Short circuit of the control circuit to earth	Measure the insulation resistance	Remove the cause of the short circuit and replace the fuse
Disconnected cable of the master controller		Connect the cable	Replace the cable or repair the cable
Insufficient contacting at the connectors of the master controller	Insufficient connection or incorrect connection of the indoor unit PCB in the master controller	Check the connectors	Correctly connect the connector
Failure of the master controller		Check the master controller by means of the self-check mode	Replace the master controller if it failed*
Failure of PCB	Unconnected wires to PCB	Check the connectors	Correctly connect the wires
	Failure of PCB		Replace PCB if it failed
Incorrect wiring connection		Take action according to the procedure explained in "Electrical Wiring" chapter.	

\* Master Controller of Hi-Therma Split units requires separate power supply (PCN 50 on I.U. PCB5, 220~240 V~ 50 Hz) and Master Controller of Hi-Therma Monobloc units does not require separate power supply.

### 1.1.4 Checking by means of the 7-segment display

#### Simple checking procedure by means of the 7-segment display

1. Turn on the indoor unit connected to the outdoor unit.
2. Turn on the outdoor unit.
3. Auto-addressing starts.

During the auto-addressing, the following items can be checked by means of the 7-segment display of the outdoor unit.

- Disconnection of the power supply to the Indoor Unit.
- Disconnection of the operating line between the outdoor and the indoor units.

- **Normal case:**

The 7-segment display of the outdoor unit is not indicated.

- **Abnormal case:**

If there is something wrong, the 7-segment display of the outdoor unit displays the following indications:

O.U.

Cause	Indication	Remarks
A. The indoor unit is not supplied with power.	00	Continues to flash after 30 seconds.
B. Disconnection of the operating line between the outdoor units.	00	Continues to flash after 30 seconds.

I.U.

During the auto-addressing, the following items can be checked by means of the 7-segment display of the indoor unit.

Items	Indication	Remarks
Transmission between indoor and outdoor unit has been successfully connected	0000000	Enter normal operation display on I.U. PCB1.
Transmission failure between indoor and outdoor unit	0000000	ROM Number of Indoor unit. Outdoor unit power off or disconnection of the operating line between the outdoor and the indoor units.
Transmission failure between indoor and outdoor unit and Switch ON any functions on master controller	00	Continues to flash after 40 seconds.

1.1.5 Abnormal operation of the devices

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
No defrost operation mode is available during the heating process or the defrost operation continues	Failure of thermistor for outdoor evaporating temperature (Te) and Te2 during heating	Failure of thermistor	Replace or correctly connect when it is abnormal	
		Disconnected wire of thermistor or wrong installation position for Te and Te2.		
	Failure of 4-way reversing valve	Disconnected 4-way reversing valve coil	Measure the resistance of coil	Replace the 4-way reversing valve
		Incorrect activation of 4-way reversing valve	Enforced power supply	
	Disconnected control wires between indoor unit and outdoor unit		Check the connectors	Correctly connect the wiring
	Failure of the PCB of the indoor unit	Disconnected wiring to PCB	Check the connectors	Correctly connect the wiring
		Failure of PCB	Check PCB by means of the self-check mode	Replace PCB when the check mode is not available
	Failure of the PCB of the indoor unit	Disconnected wiring to PCB	Check the connectors	Correctly connect the wiring
Failure of the PCB		Check PCB by means of the self-check mode	Replace if PCB fails	
Insufficient cooling process	Indoor cool load is higher than the cooling capacity		Calculate the cool load	Use a bigger unit
	Excessively low suction pressure	Gas leakage or shortage of refrigerant	Measure superheat	Correctly charge the refrigerant after repairing the gas leakage
		Excessively small diameter tube or long piping	Measure and check the field-supplied pipes	Use the correct pipes
		Incorrect activation of the check valve of the outdoor unit	Check whether or not the temperature difference before/after the check valve	Replace the check valve of the outdoor unit
		Failure or malfunction of the expansion valve	Check for clogging	Remove the clogging
			Check the connection cord and the connector	Replace the connector
			Is there an operation sound from the coil?	Replace the coil
			Is the thermistor on the compressor normal?	Replace the thermistor
		Is the thermistor installed correctly on compressor?	Correctly install the thermistor	
	Clogged strainer in the outdoor unit; clogging at the low pressure piping	Check the temperature difference at the inlet and the outlet of the strainer	Replace the strainer in the outdoor unit	
Clogging at the low pressure piping	Check the temperature difference	Remove the clogging		

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Insufficient cooling process	Excessively high discharge pressure	Insufficient air flow at the outdoor unit heat exchanger	Clogging of the outdoor unit heat exchanger?	Remove the clogging
			Obstacles at the inlet or the outlet of the outdoor unit heat exchanger	Remove the obstacles
			Is the service area for the outdoor unit sufficient?	Secure the service area
			Correct fan speed?	Replace the fan motor
		Excessively high air temperature to the outdoor unit heat exchanger	Short-circuited air to the outdoor unit?	Remove the cause of the short-circuited air
			Any other heat load near the outdoor unit?	Remove the heat source
		Excessively charged refrigerant	Expansion valve opening	Correctly charge the refrigerant
		Non-condensated gas in cycle	Check each temperature and each pressure	Charge the refrigerant after the vacuum pumping
		Clogging of the discharge piping	Check for clogging	Remove the clogging
		Failure or malfunction of the expansion valve	Check for clogging	Remove the clogging
	Check the connection cord and the connector		Replace the connector	
	Is there an operation sound from the coil?		Replace the coil	
	Is the thermistor on the compressor normal?		Replace the thermistor	
	Is the thermistor installed correctly on the compressor?		Correctly install the thermistor	
	Malfunction or internal leakage of the 4-way reversing valve		Check the temperature difference at the inlet and the outlet of the 4-way reversing valve	Replace the 4-way reversing valve
	Excessively low suction pressure	Malfunction or internal leakage of the 4-way reversing valve	Check the temperature difference between the inlet and the outlet of 4-way reversing valve	Replace the 4-way reversing valve
	Discharge temperature of the outdoor unit is unstable		Check the expansion valve of the outdoor unit	Replace the failed expansion valve of the outdoor unit

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Insufficient heating process	Indoor heat load is greater than the heating capacity		Calculate the heat load	Replace the unit with a bigger unit
	Excessively low suction pressure	Gas leakage or insufficient refrigerant charge	Measure superheat	Correctly charge the refrigerant after the gas leakage check and repairing
		Excessively small diameter or long piping	Measure the field supplied piping	Use the specified pipes
		Failure or malfunction of the expansion valve	Check for clogging	Remove the clogging
			Check the connection cord and the connector	Replace the connector
			Is there an operation sound from the coil?	Replace the coil
			Is the thermistor on the compressor normal?	Replace the thermistor
			Is the thermistor installed correctly on compressor?	Correctly install the thermistor
			Clogging of O.U. strainer	Check the temperature difference between the inlet and the outlet of strainer
		Clogging of suction piping	Check the temperature difference of each part	Remove the clogging
		Insufficient air flow through the outdoor unit heat exchanger	Is the outdoor unit heat exchanger clogged?	Remove the clogging
			Are there any obstacles at the inlet or the outlet of outdoor unit?	Remove the obstacles
			Is the service area for the outdoor unit sufficient?	Secure a sufficient service area
			Check the speed of the outdoor unit fan	Replace the fan motor
		Excessively low air temperature through the outdoor unit heat exchanger	Check for any short-circuited air to the outdoor unit	Remove the cause of the short-circuited air
	Defrosting is insufficiently completed	Check the thermistor for the defrost operation	Replace the thermistor for the defrost operation	
	Excessively high discharge pressure	Excessively charged refrigerant	Check the refrigerant quantity	Correctly charge the refrigerant
		Non-condensate gas in refrigerant cycle	Check the refrigerant quantity	Recharge the refrigerant after the vacuum pumping
		Clogging of the discharge pressure piping	Check for clogging	Remove the clogging
	Malfunction or internal leakage of the 4-way reversing valve		Check the temperature difference at the inlet and the outlet of the 4-way reversing valve	Replace the 4-way reversing valve
	Malfunction of the check valve of the outdoor unit		Check the temperature difference at the inlet and the outlet of the check valve	Replace the check valve
	Excessively high suction pressure	Malfunction or internal leakage of 4-way reversing valve	Check the temperature difference at the inlet and the outlet of the 4-way reversing valve	Replace the 4-way reversing valve
Discharge temperature of the indoor unit is unstable		Check the expansion valve of the outdoor unit	Replace the failed expansion valve of the outdoor unit	

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Cooling or heating process with an abnormal sound	Foreign particles inside of the fan casing		Visually inspect it	Remove the foreign particles
	Outdoor unit propeller fan is hitting the shroud		Visually inspect it	Adjust the position of the propeller fan
	Abnormal sound from the compressor	Faulty Installation	Check that each part is tightly fixed	Tightly fix each part
		Wear or breakage of the internal compressor parts	Abnormal sound from the inside of the compressor	Replace the compressor
	Abnormal vibration of the cabinets		Check the surface of the contacts	Replace the magnetic switch
Outdoor fan does not operate when the compressor operates	Obstacle at the outdoor fan		Check the obstacles	Remove the obstacles
	Watching condition for the operation process		Heating process: 4-way reversing valve off, Cooling process: 4-way reversing valve on Wait for the switching of the 4-way reversing valve	Cooling process: If the 4-way reversing valve does not switch, check for insufficient refrigerant



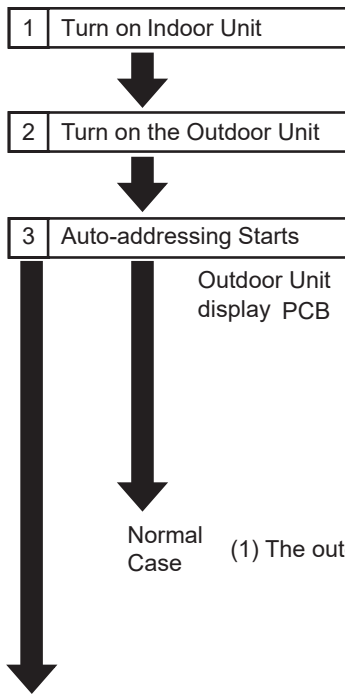
1.2 Troubleshooting Procedure

1.2.1 Checking of Using 7-Segment Display

The 7 segment at the indoor unit PCB1 will show the alarms from the indoor unit.

The 7 segment at the outdoor unit display PCB shows the alarms from the outdoor unit.

1.2.1.1 Checking of Using 7-Segment Display(O.U.)



During auto-addressing, the following items can be checked using the outdoor unit's 7-segment on display PCB.

- (1) Disconnection of power supply to the indoor unit.
- (2) Reverse connection of the operating line between the outdoor and indoor unit.  
In this case, "03" appears after 30 seconds.
- (3) Duplication of indoor unit number. See Alarm Code 35.

Normal Case (1) The outdoor unit's on-board 7-segment on display PCB is not indicated.

Abnormal Case

(2) The outdoor unit's on-board 7-segment LED display indicates the followings if there is something wrong.

(A) Alarm code will be displayed on the 7-segment when alarm is received from indoor unit in normal mode.  
As for the following alarm codes, however, alarm code will be displayed on the 7-segment when alarm is detected by outdoor unit itself.  
Alarm Code "03" (Abnormal Transmission between Indoor Unit and Outdoor Unit)  
Alarm Code "35" (Incorrect Indoor and Outdoor Unit No. Setting)

(B) The following 7-segment is displayed and flashed every 0.5 seconds.

SEG1

Alarm Code

(C) SEG1 is as follows.

7-Segment Display	Dotted Indication	Remarks
<p>&lt;In Case of Unit Alarm Code "01"&gt;</p> <p>SEG1: Alarm Code</p> <div style="text-align: center;"> <p>SEG1</p> <p>Alarm Code</p> </div>	<div style="text-align: center;"> <p>SEG1</p> <p>Dotted Indication</p> </div>	<p>The Degeneration Control is not Activated is shown without dotted indication. The Degeneration Control is Activated is shown with dotted indication.</p>

**! WARNING**

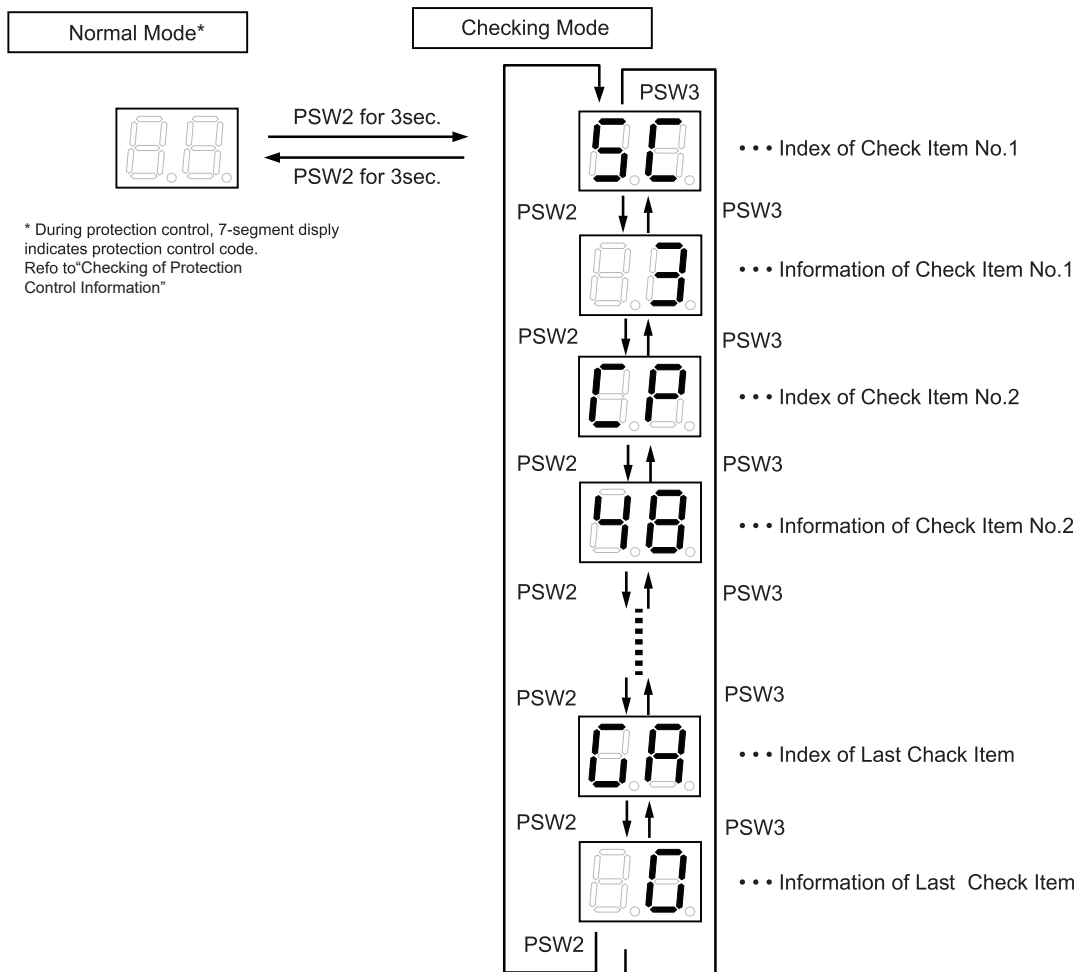
Only an authorized person can check using this method.

- Before Checking
  - (1) Turn ON the main power supply. Wait for more than 20 seconds to start checking.
  - (2) Checking Items
    - \* Expansion Valve Opening
    - \* Temperature Readings from Thermistors
  - (3) Check the locations of 7-segment and push switches.
  - (4) High voltage is applied to the main PCB and electrical parts. Never touch electrical parts and wires without appropriate personal protective equipment (PPE) when checking.

4 | Checking Using 7-Segment Display

You can check the operating conditions and each part of the refrigerant system temperature condition by 7-segment display (SEG1) on the outdoor unit display PCB and push switches (PSW).

- To start the checking mode: Press PSW2 for 3 seconds
- To move the checking item forward: Press PSW2
- To move the checking item backward: Press PSW3
- To cancel the checking mode: Press PSW2 for 3 seconds



Details of 7-Segment Display

Check No.	Item	Indication Data	
		Index	Contents
01	Input/Output State of Outdoor Micro-Computer	50	Outdoor chip output state, this show the status of relays on display PCB.
02	Total Capacity of Operating Indoor Unit	88	0 ~ 999 Refer to "(1) Indoor Unit Capacity Table"
03	Inverter Order Frequency to Compressor	88	0~115 [Hz]
04	Number to Running Compressor	00	0~1 [pc]
05	Outdoor Fan Step	88	0~15 [step]
06	Outdoor Electronic Expansion Valve Opening	88	0~100 [%]
07	High Pressure (Discharge Pressure)	88	-0.55 ~ 5.52 [MPa]
08	Low Pressure (Suction Pressure)	88	-0.22 ~ 2.21 [MPa]
09	Discharge Temperature (at the Discharge Pipe near the Compressor)	88	1 ~ 142 [°C] Indication of Sensor Open Circuit: 255 °C Indication of Sensor Short Circuit: 0 °C
10	Liquid Pipe Temperature (Te) (at Outdoor Unit Heat Exchanger)	88	-46 ~ 80 [°C] Indication of Sensor Open Circuit: 127 °C Indication of Sensor Short Circuit: -127 °C
11	Ambient Air Temperature	88	-46 ~ 80 [°C] Indication of Sensor Open Circuit: 127 °C Indication of Sensor Short Circuit: -127 °C
12	Suction Temperature at the Suction Pipe near the Compressor	88	-46 ~ 80 [°C] Indication of Sensor Open Circuit: 127 °C Indication of Sensor Short Circuit: -127 °C
13	Inverter Primary Current	88	0~255 [A]
14	Indoor Electronic Expansion Valve Opening	88 ↑ 88	IE and 00 automatic changing 0~100 [%]
15	Liquid Pipe Temperature of Indoor Unit	88 ↑ 88	TL and 00 automatic changing -62 ~ 127 [°C]
16	Gas Pipe Temperature of Indoor Unit	88 ↑ 88	TG and 00 automatic changing -62 ~ 127 [°C]
17	Inlet Water Temperature of Indoor Unit	88 ↑ 88	TI and 00 automatic changing -62 ~ 127 [°C]
18	Outlet Water Temperature of Indoor Unit	88 ↑ 88	To and 00 automatic changing -62 ~ 127 [°C]
19	Capacity of Outdoor Unit	88 ↑ 88	CR and 00 automatic changing 0 ~ 999 Refer to "(1) Indoor Unit Capacity Table"
20	Cause Code of I.U. or O.U. Stoppage	88 ↑ 88	d1 and 00 automatic changing 0 ~ 99 Refer to "(2) Cause Code of I.U. or O.U. Stoppage"
21	The Degeneration Control of Pressure Ratio Decrease Protection	2.8	2.8 :The Degeneration Control is not Activated 2.8 :The Degeneration Control is Activated
22	The Degeneration Control of High Pressure Increase Protection	2.3	2.3 :The Degeneration Control is not Activated 2.3 :The Degeneration Control is Activated
23	The Degeneration Control of Inverter Temp. Increase Protection	2.4	2.4 :The Degeneration Control is not Activated 2.4 :The Degeneration Control is Activated
24	The Degeneration Control of Discharge Temp. Increase Protection	2.5	2.5 :The Degeneration Control is not Activated 2.5 :The Degeneration Control is Activated
25	The Degeneration Control of TdSH Decrease Protection TdSH: Superheat of Discharge Gas	2.6	2.6 :The Degeneration Control is not Activated 2.6 :The Degeneration Control is Activated
26	The Degeneration Control of Overcurrent Protection	2.7	2.7 :The Degeneration Control is not Activated 2.7 :The Degeneration Control is Activated

Check No.	Item	Indication Data	
		Index	Contents
27	Accumulated Operating Time of Compressor	00	0~9999(× 10 hours) If it exceeds 9999, it is displayed as: .0
28	Accumulated Operating Time of Compressor(Restorable)	00	0~9999(× 10 hours)
29	Outdoor Unit Alarm Code	00	0~99 Refer to "(3) Alarm Code Table"
30	Cause Code of Inverter Stoppage	00	0~16 Refer to "(4) Cause Code of Inverter Stoppage"
31	Abnormal Data Record (No.1~No.15)	00 00 00 ~ 00	No. 1 Abnormal Data Record(Latest) ~ No. 15 Abnormal Data Record *Refer to "(5) Abnormal Data Record"
32	Total Capacity of Indoor Unit Connected	00	0~9999 1: Refer to "(1) Indoor Unit Capacity Table"
33	Connected Indoor Unit Number	00	0~64 (Pc)
34	Refrigerant System Address	00	0~63

### (1) Indoor Unit Capacity Table

Indication	Capacity	Horsepower
	(kW)	(HP)
16	4.4	2.0
20	6.0	2.5
24	8.0	3.0

### (2) Cause Code of I.U. or O.U. Stoppage

Refer to 1.2.3. cause Code of I.U. or O.U. Stoppage

1. The cause code of indoor unit stoppage is not always "02" (Alarm) during stoppage by the abnormality. If the unit is under Thermo-OFF by other cause of stoppage before "02" (Alarm) occurs, the previous cause code of indoor unit stoppage remains.
2. When the communication between the indoor unit and the outdoor unit is disconnected for 3 minutes, the indoor micro-computer will be reset. Accordingly when the alarm code "03" (Communication Failure between Indoor Unit and Outdoor Unit) occurs, the cause code of indoor unit stoppage may be indicated "05".

## (3) Alarm Code

Code	Category	Content of Abnormality	Leading Cause
02	Outdoor Unit	Activation of Protection Device (High Pressure Switch)	Activation of PSH (Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing)
03	Transmission	Abnormality between Indoor and Outdoor	Incorrect Wiring, Loose Terminals, Disconnect Wire, Blowout of Fuse, Outdoor Unit Power OFF
04		Abnormality between O.U. main PCB and Inverter	O.U. main PCB and Inverter Transmission Failure (Loose Connector, Wire Breaking, Blowout of Fuse)
06	Voltage	Abnormal Inverter Voltage	Outdoor Voltage Drop, Insufficient Power Capacity
07	Cycle	Decrease in Discharge Gas Superheat	Excessive Refrigerant Charge, Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Opened Position (Disconnect Connector)
08		Increase in Discharge Gas Temperature	Insufficient Refrigerant Charge, Pipe Clogging Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Closed Position (Disconnect Connector)
22	Sensor on Outdoor Unit	Outdoor Unit Ambient Thermistor(Ta)	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit
23		Compressor Discharge Gas Thermistor (Td)	
24		Heat Exchanger Liquid Pipe Thermistor (Te)	
25		Heat Exchanger Liquid Pipe Thermistor 2 (Te2)	
31	System	Incorrect Capacity Setting of Outdoor Unit and Indoor Unit/water module	Excessive or Insufficient Indoor Unit / Total Capacity Code
38		Abnormality of Picking up Circuit for Protection in Outdoor Unit	Failure of Protection Detecting Device (Incorrect Wiring of O.U. main PCB)
43	Protection Device	Activation of Low Compression Ratio Protection Device	Defective Compression (Failure of Compressor of Inverter, Loose Power Supply Connection)
47		Activation of Low Pressure Decrease Protection Device (Vacuum Operation Protection)	Insufficient Refrigerant, Refrigerant Piping, Clogging, Expansion Valve Locking at Open Position (Loose Connector)
48		Activation of Inverter Overcurrent Protection Device	Overload Operation, Compressor Failure
51	Sensor	Abnormal Inverter Current Sensor	Current Sensor Failure
53	Inverter	Inverter Error Signal Detection	Error Signal Detection (IPM Error, Step-Out Detection, PFC hardware Error)
54		Abnormality of Inverter Fin Temperature	Abnormal Inverter Fin Thermistor, Inverter fin thermistor protection activation
55		Inverter Failure	O.U. main PCB Failure
57	Fan Controller	Activation of Fan Controller Protection	Abnormal speed of Fan-motor
EE	Compressor	Compressor Protection Alarm (It can not be reset from remote controller)	This alarm code appears when the following alarms* occurs three times within 6 hours. *02, 07, 08, 43 to 45, 47

(4) Cause Code of Inverter Stoppage (iTC)

iTC	Stoppage Cause	Corresponding cause Code of I.U. or O.U. Stoppage	Remark	
			Indication during Retry	Alarm Code
88	IPM Error	88	88	99
82	Instantaneous Overcurrent	88	88	88
83	Inverter Fin Thermistor Protection Activation	88	88	99
85	Inverter Voltage Decrease	88	88	88
86	Overvoltage	88	88	88
88	abnormal fault of sampling circuit	88	88	98
83	Open Phase Detection	88	88	99
88	Protection Device activation (PSH)	88	88	88
28	Step-Out Detection	88	88	99
22	EERPOM Error or Abnormal of Key Parameters of Compressor and PFC	88	88	99
23	Abnormal PFC Hardware	88	88	99
25	Abnormal Communication	88	-	-
26	Power overload	88	-	-
28	Abnormal Speed of DC Fan	88	88	98
80	Instantaneous Overcurrent of PFC	88	-	-
80	Instantaneous Overvoltage PFC Generatrix	88	-	-
32	Abnormal TFIN Sensor	88	88	98
33	Abnormal Chip Check	88	88	99
36	Abnormal AC Voltage	88	-	-
	Undefined Function	88	-	-



Cause Code of Inverter Stoppage (ITC)		
Stoppage Cause	Cause Code of Inverter Stoppage (ITC)	Cause of failure
IPM Error	1	The instantaneous current of the compressor output is too large, triggering the hardware protection.
Instantaneous Overcurrent	2	The compressor outputs overcurrent, and software protection is triggered when the effective value is greater than 13A.
		The compressor outputs instantaneous overcurrent, and software protection is triggered when the peak value is greater than 22A.
Inverter Fin Thermistor Protection Activation	3	The IPM temperature is too high, check whether the IPM is in good contact with the fin.
Inverter Voltage Decrease	5	The DC bus voltage is too low, check the input power voltage.
Overvoltage	6	The DC bus voltage is too high, check the input power voltage.
Abnormal fault of sampling circuit	8	The O.U. main PCB PFC sampling circuit is damaged, and O.U. main PCB needs to be replaced.
Open Phase Detection	13	There is no current or leakage of current in one phase of the three-phase output of the compressor. Please check 1. Whether the wiring of the compressor is correct; 2. Whether one phase of the compressor is open circuit; 3. Whether there is major leakage current between the compressor winding and Ground.
Protection Device activation (PSH)	18	High pressure switch circuit triggers protection, please check 1. Check whether the wiring of the high pressure switch is correct; 2. The high pressure is too high, causing the pressure switch to be activated; 3. The state of the high pressure switch is abnormal.
Step-Out Detection	21	The demagnetization of the compressor causes the compressor to step out. Please confirm whether the compressor is normal.
		The actual rotating speed of the compressor does not match the target speed of the inverter, please confirm whether the compressor is normal.

Cause Code of Inverter Stoppage (ITC)		
Stoppage Cause	Cause Code of Inverter Stoppage (ITC)	Cause of failure
EERPOM Error or Abnormal of Key Parameters of Compressor and PFC	22	The inverter EEPROM software parameters are faulty, please re-write the software or replace the PCB.
		The inverter software parameters are faulty, please re- write the software or replace the PCB.
Abnormal PFC Hardware	23	PFC hardware overcurrent protection.
Abnormal Communication	25	Abnormal communication between the inverter and the master control.
Power overload	26	Compressor output power overload protection.
Abnormal Speed of DC Fan	28	DC fan abnormal speed protection, please check: 1. Whether the wiring of the DC fan is correct; 2. Whether the DC fan is working, and whether there are foreign objects that prevent it from running; 3. If the DC fan does not work, try to replace the motor.
Instantaneous Overcurrent of PFC	30	When the whole unit inputs overcurrent and the effective value is greater than 17.5A, the software protection will be triggered.
		PFC instantaneous overcurrent, software protection is triggered when the peak value is greater than 40A.
Instantaneous Overvoltage PFC Generatrix	31	PFC DC bus instantaneous overvoltage fault.
Abnormal TFIN Sensor	32	The TFIN sensor is faulty, please check 1. TFIN sensor wiring status; 2. Whether the TFIN sensor is faulty, whether there is an open circuit or a short circuit.
Abnormal Chip Check	33	Please confirm that the software is correct.
Abnormal AC Voltage	36	The AC input voltage is too high, please check whether the input voltage of the whole unit is normal.
		The AC input voltage is too low, please check whether the input voltage of the whole unit is normal.

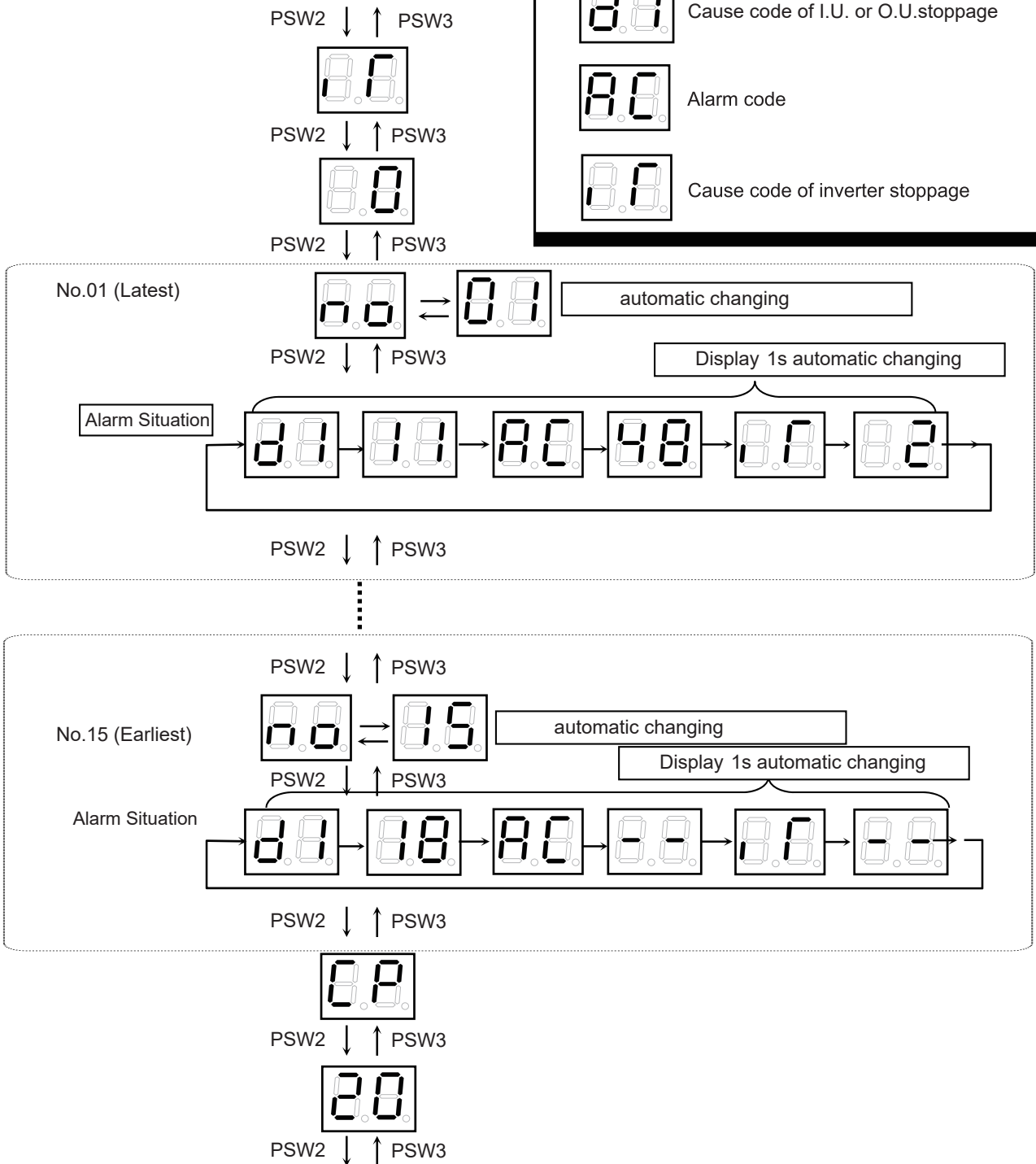
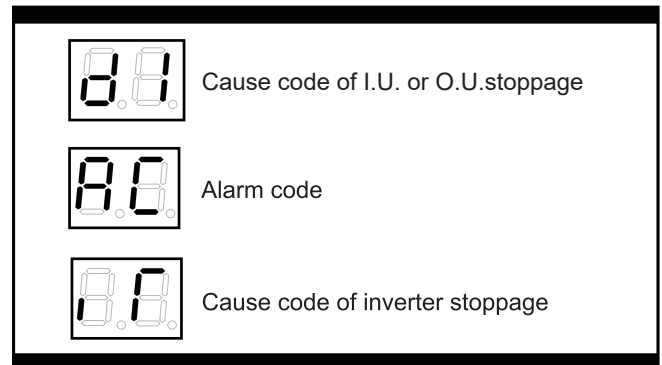
(5) Abnormal Data Record

“Abnormal Data Record”(No.01 ~ No.15) in checking item can record recent abnormal stoppages.

(The maximum number of recordable is 15. No. 01 is the latest one.)

In case of abnormal stoppage in following table, accumulated operation time when abnormal happened, alarm code/cause code of stoppage, and cause code of inverter stoppage are recorded.

Indication



NOTE:

\* All History will be erased by pressing PSW1 for 5 seconds when Abnormal Data Record is displayed.



Indication	Protection Control	Remark
P1	Pressure Ratio Protection Control	To control the compressor frequency for prevention of operation with high/low pressure ratio.
P2	High Pressure Increase Protection Control	To control the compressor frequency for prevention of high pressure increase.
P3	Inverter Current Protection Control	To control the compressor frequency for prevention of inverter current increase in the outdoor unit during operation.
P4	Inverter Fin Temperature Increase Protection Control	To control the compressor frequency for prevention of inverter fin temperature increase. The inverter fin temperature is detected at the O.U. main PCB.
P5	Discharge Temperature Increase Protection Control	To control the compressor frequency for prevention of discharge gas temperature increase during operation.
P6	Low pressure Decrease Protection Control	To control the compressor frequency for prevention of low pressure decrease.
P9	High Pressure Decrease Protection Control	To control the compressor frequency for prevention of high pressure decrease, which would interrupt smooth refrigerant distribution to indoor unit with different height and oil supply to the compressor.
PA	Demand Current Control	To control the compressor frequency for fixing the inverter primary current around the set value (40~100% of rated current).
Pd	Low Pressure Increase Protection Control	To control the compressor frequency for prevention of low pressure increase.

1.2.1.2 Checking of Using 7-Segment Display (I.U.)

(1) Normal Operation Display

	Segment Display		
	SEG1	SEG2	SEG3
Initial Display	00	1F	2F
Space heating Thermo OFF/ Cycle 1 Thermo OFF/Cycle 2 Thermo OFF	10	1F	2F
Space heating Thermo ON / Cycle 1 Thermo ON/ Cycle 2 Thermo OFF	11	16	2F
Space heating Thermo ON / Cycle 1 Thermo OFF / Cycle 2 Thermo ON	11	1F	26
Space heating Thermo ON/ Cycle 1 Thermo ON/ Cycle 2 Thermo ON	11	16	26
Space cooling Thermo OFF/ Cycle 1 Thermo OFF / Cycle 2 Thermo OFF	20	1F	2F
Space cooling Thermo ON / Cycle 1 Thermo ON / Cycle 2 Thermo OFF	22	16	2F
Space cooling Thermo ON/ Cycle 1 Thermo OFF/ Cycle 2 Thermo ON	22	1F	26
Space cooling Thermo ON / Cycle 1 Thermo ON / Cycle 2 Thermo ON	22	16	26
DHW Thermo OFF	40	1F	2F
DHW Thermo ON	44	1F	2F
Swimming pool Thermo OFF	80	1F	2F
Swimming pool Thermo ON	88	1F	2F

## (2) Checking by 7-Segment Display

### **! WARNING**

Only an authorized person can check using this method.

- Before Checking
  - (1) Turn ON the main power supply. Wait for more than 20 seconds to start checking.
  - (2) Checking Items
    - \* Parameters of I.U.
    - \* Operation Status
    - \* Configuration of Inputs and Outputs, and Operation Status
  - (3) Check the locations of 7-segment and push switches.
  - (4) High voltage is applied to the I.U. PCB1 and electrical parts. Never touch electrical parts and wires without appropriate personal protective equipment (PPE) when checking.

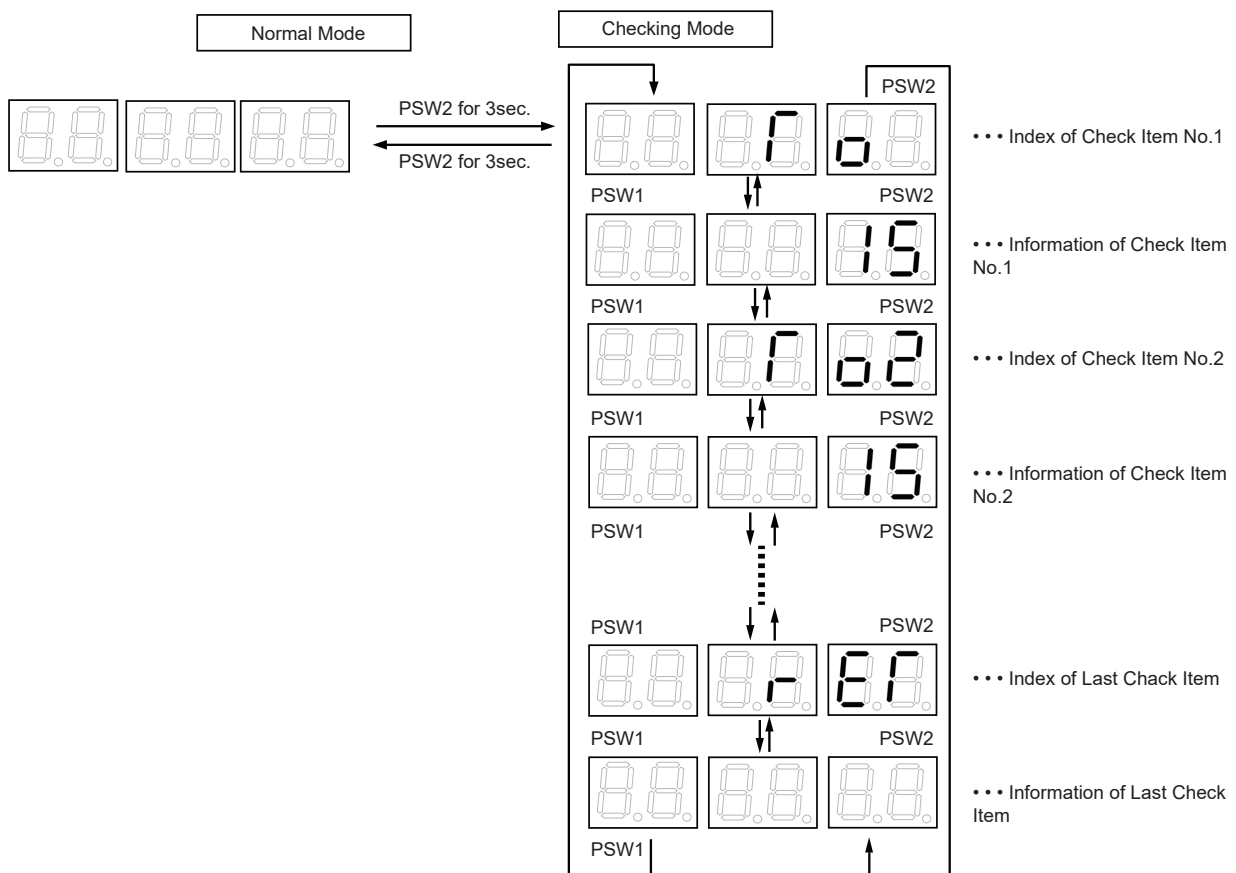
You can check the operating conditions by 7-segment display (SEG1,2,3,4,5,6) on the indoor unit PCB and push switches (PSW).

To start the checking mode: Press PSW2 for 3 seconds

To move the checking item forward: Press PSW2

To move the checking item backward: Press PSW1

To cancel the checking mode: Press PSW2 for 3 seconds



(1) Operation Parameters

Check No.	Item	Indication	Indication Data	
			Indication	Contents
1	Outlet Water Thermistor (Tow)	000000	000000	-30~105[°C] Indication of Sensor Open Circuit: 127 °C Indication of Sensor Short Circuit: -127 °C
2	Water Cycle 2 Outlet Water Temperature (Tow2)	000000	000000	-30~105[°C] Indication of Sensor Open Circuit: 127 °C Indication of Sensor Short Circuit: -127 °C
3	Hot Water Temperature Detection of Hydraulic Separator (Tow3)	000000	000000	-30~105[°C] Indication of Sensor Open Circuit: 127 °C Indication of Sensor Short Circuit: -127 °C
4	Inlet Water Thermistor (Tiw)	000000	000000	-30~105[°C] Indication of Sensor Open Circuit: 127 °C Indication of Sensor Short Circuit: -73°C
5	Outlet HP Water Thermistor (TowHP)	000000	000000	-30~105[°C] Indication of Sensor Open Circuit: 127 °C Indication of Sensor Short Circuit: -73°C
6	Gas Refrigerant Pipe Thermistor (Tg)	000000	000000	-30~105[°C] Indication of Sensor Open Circuit: 127 °C Indication of Sensor Short Circuit: -127°C
7	Liquid Refrigerant Pipe Thermistor (TL)	000000	000000	-30~105[°C] Indication of Sensor Open Circuit: 127 °C Indication of Sensor Short Circuit: -127°C
8	Indoor Unit Expansion Valve Opening (Reserved)	000000	000000	0-100% Display 0 if the Unit do not have an Expansion Valve
9	Heating Load Factor of Auxiliary Electric Heater	000000	000000	0-100% Display 0 if the Auxiliary Electric Heater is Set Disabled or Not Running
10	Heating Load Factor of Boiler	000000	000000	0-100% Display 0 if the Boiler is Set Disabled or Not Running
11	DHW Water Temperature	000000	000000	-30~105[°C] Indication of Sensor Open Circuit: 127 °C Indication of Sensor Short Circuit: -127°C
12	Swimming Pool Water Temperature	000000	000000	-30~105[°C] Indication of Sensor Open Circuit: 127 °C Indication of Sensor Short Circuit: -127°C
13	Average Outdoor Ambient Temperature (2 hours)	000000	000000	Received from outdoor unit, Calculated by indoor unit
14	Average Outdoor Ambient Temperature (24 hours)	000000	000000	Received from outdoor unit, Calculated by indoor unit
15	Second Outdoor Ambient Temperature	000000	000000	-30~105[°C] Indication of Sensor Open Circuit: 127 °C Indication of Sensor Short Circuit: -127°C
16	Average Second Outdoor Ambient Temperature in 2 hours	000000	000000	Calculated by indoor unit
17	Average Second Outdoor Ambient Temperature in 24 hours	000000	000000	Calculated by indoor unit
18	Target Outlet Water Temperature of Space heating	000000	000000	Calculated by Setting temperature of Cycle 1 and Cycle 2 in heating mode
19	Target Outlet Water Temperature of Space cooling	000000	000000	Calculated by Setting temperature of Cycle 1 and Cycle 2 in cooling mode
20	Target Outlet Water Temperature of DHW	000000	000000	Calculated by DHW temperature and offset temperature
21	Target Outlet Water Temperature of Swimming Pool	000000	000000	Calculated by Setting temperature of Swimming pool and offset temperature
22	Hot Water Temperature of Solar Panels	000000	000000	-30~105[°C] Indication of Sensor Open Circuit: 127 °C Indication of Sensor Short Circuit: -127°C
23	Target High Pressure (Reserved)	000000	000000	-
24	Target Evaporating Temperature (Reserved)	000000	000000	-
25	iPWM_in of WP1	000000	000000	5-95% 5% is the maximum running speed of WP1
26	iPWM_out of WP1	000000	000000	0: iPWM interface is short circuit 2: Stand-by, pump is ready to run 5-75: Pump is running normally, flow information is supplied 80/85/90/95: WP1 Abnormality, refer to 75 Alarm 100: iPWM interface is open circuit
27	Water Flow Rate	000000	000000	Calculated by iPWM_out of WP1 (L/h)
28	Water Pressure	000000	000000	0~9[bar] Indication of Sensor Open Circuit: 10.1bar Indication of Sensor Short Circuit: -1.1bar
29	Calculation of Fd	000000	000000	Used to control the frequency of Compressor (%)
30	High Pressure (Discharge Pressure)	000000	000000	Received from outdoor unit [MPa]
31	Low Pressure (Suction Pressure)	000000	000000	Received from outdoor unit [MPa]
32	Evaporating Temperature (at Outdoor Unit Heat Exchanger)	000000	000000	Received from outdoor unit [°C]
33	Discharge Temperature (at the Discharge Pipe near the Compressor)	000000	000000	Received from outdoor unit [°C]
34	Inverter Order Frequency to Compressor	000000	000000	Received from outdoor unit [Hz]
35	Inverter Primary Current	000000	000000	Received from outdoor unit [A]
36	Outdoor Unit Expansion Valve Opening	000000	000000	Received from outdoor unit [%]
37	Outdoor Unit Capacity	000000	000000	Received from outdoor unit 044/060 display: 2 (HP) 080 display: 3(HP)
38	Rom Number (Indoor Unit)	000000	000000	-

(2) Operation Status

Check No.	Item	Indication	Indication Data	
			Initial Indication	Contents
39	Mixing Valve Operation Status	000000	000000	Zero Reset: 000000
				Zero Control: 000000
				Mixing Valve Open: 000000~000000
				Mixing Valve Close: 000000~000000
				No action and indicate current opening
40	Terminal 1 of Auxiliary electric heater	000000	000000	on/off: 000000 / 000000
41	Terminal 2 of Auxiliary electric heater	000000	000000	on/off: 000000 / 000000
42	WP1 Operation Status	000000	000000	on/off: 000000 / 000000
43	Emergency Status	000000	000000	on/off: 000000 / 000000
44	Water Pump Anti Freezing Status 1	000000	000000	on/off: 000000 / 000000
45	Water Pump Anti Freezing Status 2 (Reserved)	000000	000000	on/off: 000000 / 000000
46	Auxiliary Electric Heater Anti Freezing Status	000000	000000	on/off: 000000 / 000000
47	Heat Pump Anti Freezing Status	000000	000000	on/off: 000000 / 000000
48	Anti-legionella Status	000000	000000	on/off: 000000 / 000000
49	DHW Boost Status	000000	000000	on/off: 000000 / 000000
50	Defrost by Spaceheating	000000	000000	on/off: 000000 / 000000
51	Defrost by DHW	000000	000000	on/off: 000000 / 000000
52	DHW Schedule Priority Current Status	000000	000000	Starting Time1 running 000000
				Starting Time2 running 000000
				Starting Time3 running 000000
				Starting Time4 running 000000
				No Schedule running 000000
53	Oil Return Status	000000	000000	on/off: 000000 / 000000



(3) Room Informations

Check No.	Item	Indication	Indication Data	
			Initial Indication	Contents
54	Room 1 in Cycle 1	000000		Room temperature Room setting temperature Each data is displayed for 1s cycled Room Thermo ON/OFF
55	Room 2 in Cycle 1	000002		Room temperature Room setting temperature Each data is displayed for 1s cycled Room Thermo ON/OFF
56	Room 3 in Cycle 1	000003		Room temperature Room setting temperature Each data is displayed for 1s cycled Room Thermo ON/OFF
57	Room 4 in Cycle 1	000004		Room temperature Room setting temperature Each data is displayed for 1s cycled Room Thermo ON/OFF
58	Room 1 in Cycle 2	000200		Room temperature Room setting temperature Each data is displayed for 1s cycled Room Thermo ON/OFF
59	Room 2 in Cycle 2	000202		Room temperature Room setting temperature Each data is displayed for 1s cycled Room Thermo ON/OFF
60	Room 3 in Cycle 2	000203		Room temperature Room setting temperature Each data is displayed for 1s cycled Room Thermo ON/OFF
61	Room 4 in Cycle 2	000204		Room temperature Room setting temperature Each data is displayed for 1s cycled Room Thermo ON/OFF

(4) Inputs / Outputs

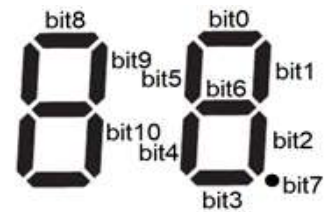
Check No.	Item	Indication	Indication Data	
			Contents	
62	Output 1	00000001	Configuration: Output code+ on/oFF	
63	Output 2	00000002	Configuration: Output code+ on/oFF	
64	Output 3	00000003	Configuration: Output code+ on/oFF	
65	Output 4	00000004	Configuration: Output code+ on/oFF	
66	Output 5	00000005	Configuration: Output code+ on/oFF	
67	Output 6	00000006	Configuration: Output code+ on/oFF	
68	Output 7	00000007	Configuration: Output code+ on/oFF	
69	Output 8	00000008	Configuration: Output code+ on/oFF	
70	Output 9	00000009	Configuration: Output code+ on/oFF	
71	Output 10	00000000	Configuration: Output code+ on/oFF	
72	Output 11	00000000	Configuration: Output code+ on/oFF	
73	Output 12	00000002	Configuration: Output code+ on/oFF	
74	Output 13	00000003	Configuration: Output code+ on/oFF	
75	Output 14	00000004	Configuration: Output code+ on/oFF	
76	Output 15	00000005	Configuration: Output code+ on/oFF	
77	Input 1	00000000	Configuration: Input code+ on/oFF	
78	Input 2	00000002	Configuration: Input code+ on/oFF	
79	Input 3	00000003	Configuration: Input code+ on/oFF	
80	Input 4	00000004	Configuration: Input code+ on/oFF	
81	Input 5	00000005	Configuration: Input code+ on/oFF	
82	Input 6	00000006	Configuration: Input code+ on/oFF	
83	Input 7	00000007	Configuration: Input code+ on/oFF	
84	Input 8	00000008	Configuration: Input code+ on/oFF	
85	Input 9	00000009	Configuration: Input code+ on/oFF	
86	Input 10	00000000	Configuration: Input code+ on/oFF	
87	Input 11	00000000	Configuration: Input code+ on/oFF	

(5) Capacity and power consumption statistics

Check No.	Item	Indication	Indication Data	
			Indication	Contents
88	Auxiliary Electric Heater Step	0000P02	000000	0/1/2/3 Steps of Auxiliary Electric Heater
89	DHW Electric Heater Status	0000P03	000000	0: OFF 1: ON
90	Power Consumption of Space heating	0000P08	000020	Unit: 0.1kWh. Statistics of capacity and power consumption within half an hour, and updated every half an hour. Each update covers the last data and does not accumulate.
91	Power Consumption of Space cooling	0000P02	000020	
92	Power Consumption of DHW	0000P04	000020	
93	Power Consumption of Swimming pool	0000P08	000020	
94	Capacity of Space heating	0000C08	000020	
95	Capacity of Space cooling	0000C02	000020	
96	Capacity of DHW	0000C04	000020	
97	Capacity of Swimming pool	0000C08	000020	

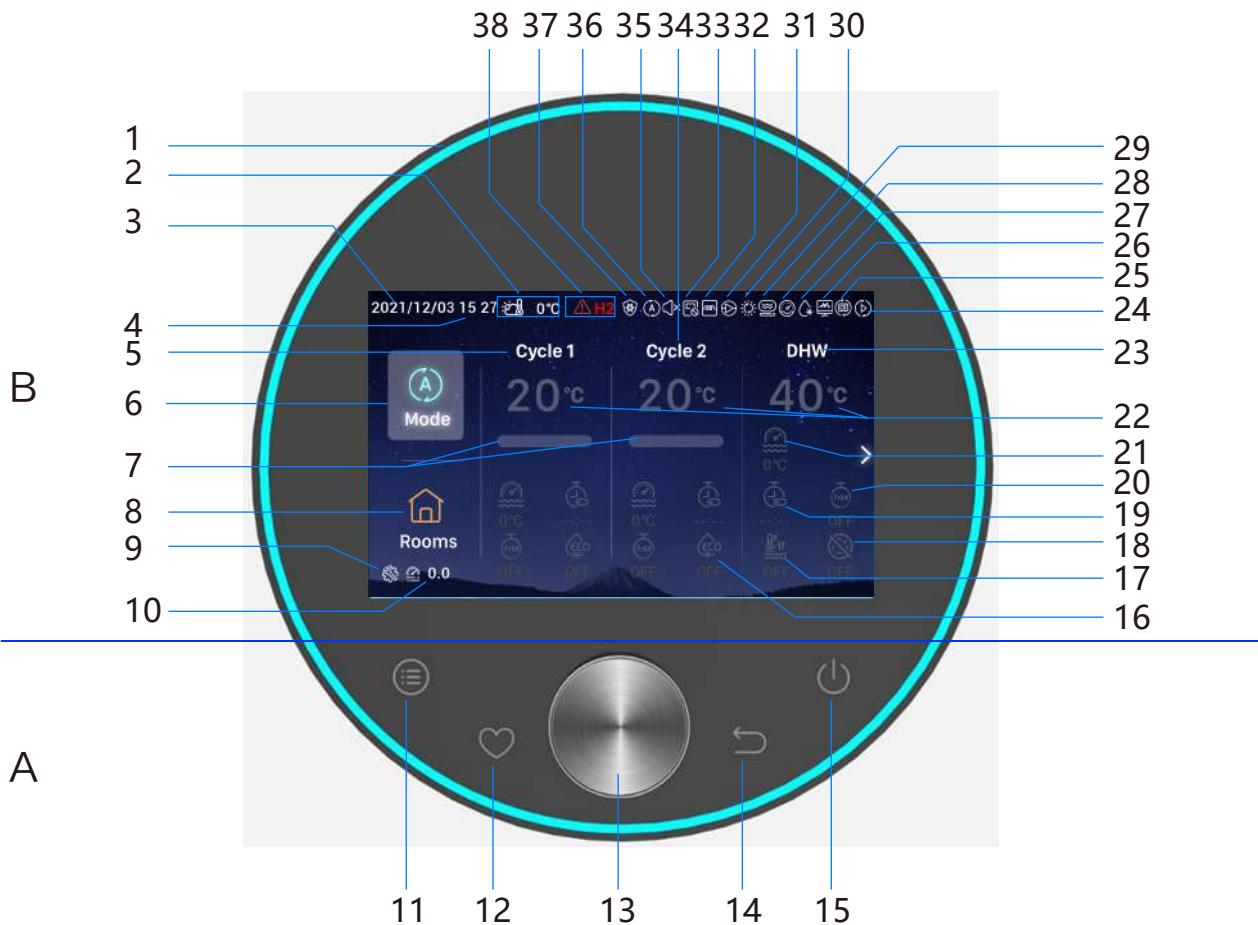
(6) Alarm Codes and Retry Codes

Check No.	Item	Indication Data	
		Index	Contents
1	Sensor Alarms	000500	Bit0: 11
			Bit1: 12
			Bit2: 13
			Bit3: 14
			Bit4: 16
			Bit5: 17
			Bit6: 18
2	Auxiliary Sensor Alarms	000005	Bit0: A1
			Bit1: A2
			Bit2: A3
			Bit3: A4
			Bit4: A5
3	System Alarms	000595	Bit0: 71
			Bit1: 72
			Bit2: 76
			Bit3: 70
			Bit4: 74
			Bit5: 75
4	Transmission Alarms	000000	Bit0: 80
			Bit1: 03
5	Cause code of I.U. or O.U. Stoppage	000000	Bit0: d1-03
			Bit1: d1-06
			Bit2: d1-31
			Bit3: d1-70
			Bit4: d1-07
			Bit5: d1-74
			Bit6: d1-75
			Bit7: d1-78
			Bit8: d1-01
			Bit9: d1-02



1.2.2 Checking of Master Controller

1.2.2.1 Checking of Master Controller (Hi-Therma Split)




● A Touch Buttons

- 11 Menu: Tap to enter menu interface
- 12 Favourite: Quick access to frequently used functions
- 13 Mechanical Rotary Knob: Rotate to adjust value or to scroll the pages, pressing indicates confirmation
- 14 Return: Short press to return to the previous step, and long press for more than 3 seconds to dismiss the alarm
- 15 On/off: Tap to switch ON or OFF
- 11+12 Installation and Service Mode Combination Button: Press and hold for more than 3 seconds to enter/exit Installation and Service Mode
- 11+14 Initialization Combination Button: Press and hold for more than 3 seconds to perform initialization

● B Display

- |   |  |   |
|---|--|---|
| 1 Light Band                                | 17 DHW Boost                           | 28 Compressor Operation Display(reserved)         |
| 2 Outdoor Ambient Temperature Display       | 18 DHW-Anti Legionella                 | 29 Boiler Operation Display                       |
| 3 Date Display                              | 19 Simple Timer                        | 30 Solar Operation Display                        |
| 4 Time Display                              | 20 Weekly Timer                        | 31 Water Pump Operation Display                   |
| 5 Cycle1 Setting Display                    | 21 Current Water Temperature           | 32 Water Module Electric Heater Operation Display |
| 6 Mode                                      | 22 Water Temperature Setting           | 33 Centralized Control Operation Display          |
| 7 Water Temperature Attainment Rate Display | 23 DHW Setting Display                 | 34 Cycle2 Setting Display                         |
| 8 Rooms                                     | 24 Test Run Operation Display          | 35 Quiet Operation Display                        |
| 9 Installation Service Mode Display         | 25 Auto Operation Display(reserved)    | 36 Operation Mode Display                         |
| 10 Water Pressure Display                   | 26 Energy Monitoring Operation Display | 37 Anti Freezing Operation Display                |
| 16 ECO                                      | 27 Defrost Operation Display           | 38 Alarm and Alarm Code                           |

Operation Data

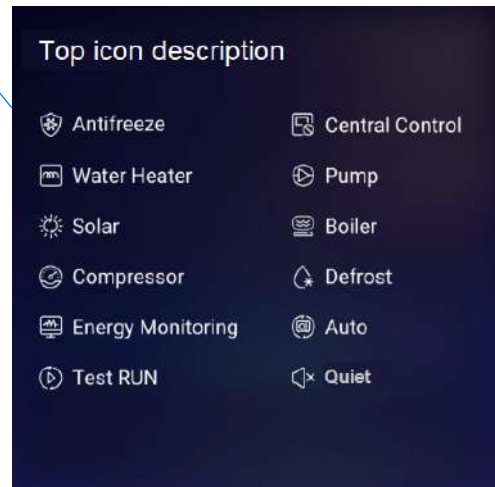


① Rotate the mechanical knob to select Operation Data (Operation Data is highlighted);  
② Press the mechanical knob to enter the Operation Data menu and rotate the mechanical knob to display the contents of the Operation Data.  
③ Under the Operation Data menu, press to return to the Menu interface.

1.2.2.2 Checking of Controller (Hi-Therma Monobloc)



18-29:

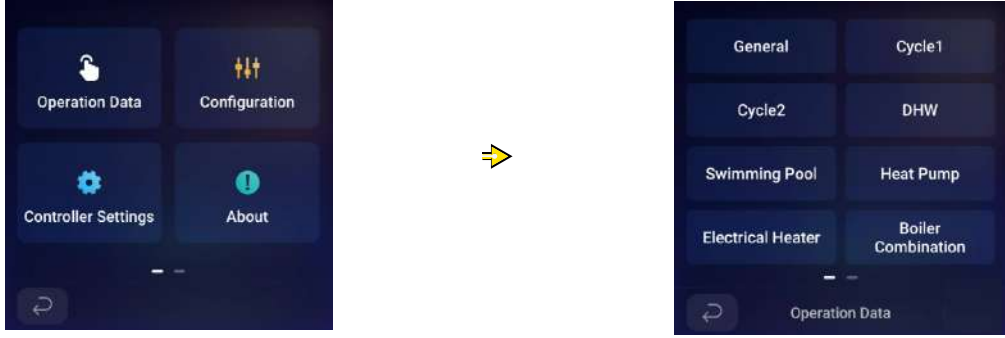




● A Button

The mechanical button at the bottom of the controller body:  
 Long press for 3 seconds to shut down the unit;  
 Long press for 10 seconds to initialize the system configuration;  
 When alarming, short press the mechanical button to reset the alarm.

● B Display

- |   |                              |   |
|---|------------------------------|---|
| 1 LED                                       | 12 Simple Timer              | 18 Anti Freezing Operation Display                |
| 2 Outdoor Ambient Temperature Display       | 13 Weekly Timer              | 19 Water Module Electric Heater Operation Display |
| 3 Date Display                              | 14 Current Water Temperature | 20 Solar Operation Display                        |
| 4 Time Display                              | 15 Water Temperature Setting | 21 Compressor Operation Display(reserved)         |
| 5 Cycle1 Setting Display                    | 16 Favourite                 | 22 Energy Monitoring Operation Display            |
| 6 Mode                                      | 17 Menu                      | 23 Test Run Operation Display                     |
| 7 Water Temperature Attainment Rate Display |                              | 24 Centralized Control Operation Display          |
| 8 Rooms                                     |                              | 25 Water Pump Operation Display                   |
| 9 Installation Service Mode Display         |                              | 26 Boiler Operation Display                       |
| 10 Water Pressure Display                   |                              | 27 Defrost Operation Display                      |
| 11 ECO                                      |                              | 28 Auto Operation Display(reserved)               |
|   |                              | 29 Quiet Operation Display                        |

Operation Data	 <p>The diagram illustrates the navigation process. On the left, the main menu is shown with four options: Operation Data (with a hand icon), Configuration (with a lightning bolt icon), Controller Settings (with a gear icon), and About (with an exclamation mark icon). A yellow arrow points to the right, where the Operation Data sub-menu is displayed. This sub-menu contains eight options: General, Cycle1, Cycle2, DHW, Swimming Pool, Heat Pump, Electrical Heater, and Boiler Combination. A back arrow is visible at the bottom left of the sub-menu.</p>
	<ol style="list-style-type: none"><li>① Press the  icon to select Operation Data;</li><li>② Enter the Operation Data menu to display the contents of the Operation Data.</li><li>③ Under the Operation Data menu, press  to return to the Menu interface.</li></ol>

Operation Data

General	Operation Status Cool DHW Heat SWP Alarm	Mark
	Water Inlet Temperature	Tiw
	Water Outlet Temperature	Tow
	Outdoor Ambient Temperature	Ta
	Outdoor Ambient AVG Temperature	Ta-ao
Cycle 1	Operation	-
	ECO	-
	Current Water Temperature	Tow/Tow3
	Water Setting Temperature	-
Cycle 2	Operation	-
	Current Water Temperature	Tow2
	Water Setting Temperature	-
	Mixing Valve Position	-
DHW	Operation	-
	Current Water Temperature	TDHW
	Setting Temperature	TDHWS
	ELE.Heater Status	-
	ELE.Heater Operation	-
	Anti-Legionella Status	-
Swimming Pool	Operation	-
	Current Temperature	Tswp
	Setting Temperature	Tswps
*Heat Pump	*Water Outlet PHEX Temperature	TowHP
	*Water Flow Level	-
	*Water Pump Speed	-
	*IDU Gas Temperature	Tg
	*IDU Liquid Temperature	TL
	*Disch. Temperature	Td
	*Evap. Liquid Temperature	Te
	*EVI	-
	*EVO	-
	*Comp.Frequency Defrosting	-
	*Cause code of Stoppage	-
*Comp. Current	-	
Electric Heater	Operation	-
	Load Factor	-
	Step	-
Boiler Combination	Operation	-
Solar Combination	Operation	-
	Sol. Panel Temperature	Tsolar
*Auxiliary Sensor Setting	*Auxsensor 1~*Auxsensor 7	-
*Output Setting	*Output 1~*Output 15	-
*Input Setting	*Input 1~*Input 11	-
Energy Data	Year/Month/Day	-
	Space Heating/Space Cooling/ DHW/Swimming Pool	-
	Input/Capacity	-
Alarm History	-	-

\*: Only displayed in the Installation and Service Mode.



## 1.2.3 Troubleshooting by Alarm Code

Alarm Code	Category	Cause Code of Stoppage	Detail of Abnormality	Main Factors
02	Outdoor unit	-	Activation of Protection Device (High Pressure Switch)	Activation of PSH (Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing)
03	Outdoor/Indoor unit	d1-05/d1-06	Abnormal transmission between the indoor unit and the outdoor unit	Incorrect Wiring, Loose Terminals, Disconnect Wire, Blowout of Fuse, Outdoor or Indoor Unit Power OFF
04	Outdoor unit	d1-05	Abnormal Transmitting between Outdoor Unit main PCB and Inverter	O.U. main PCB and Inverter Transmission Failure (Loose Connector, Wire Breaking, Blowout of Fuse)
06	Outdoor unit	d1-18	Abnormal Inverter Voltage	Outdoor Voltage Drop, Insufficient Power Capacity
07	Outdoor unit	d1-16	Decrease in Discharge Gas Superheat	Excessive Refrigerant Charge, Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Opened Position (Disconnect Connector)
08	Outdoor unit	d1-15	Increase in Discharge Gas Temperature	Insufficient Refrigerant Charge, Pipe Clogging Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Closed Position (Disconnect Connector)
11	Indoor unit	d1-02	Inlet Water Thermistor(Tiw) Abnormality	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit
12	Indoor unit	d1-02	Outlet Water Thermistor(Tow) Abnormality	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit
13	Indoor unit	d1-02	Liquid Refrigerant Pipe Thermistor(TL) Abnormality	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit
14	Indoor unit	d1-02	Gas Refrigerant Pipe Thermistor(Tg) Abnormality	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit
16	Indoor unit	d1-02	DHW Thermistor(TDHW) Abnormality	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit
17	Indoor unit	d1-02	Outlet HP Water Thermistor(TowHP) Abnormality	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit
18	Indoor unit	d1-02	Water Pressure Sensor(Pw) Abnormality	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit
22	Outdoor unit	-	Outdoor Unit Ambient Thermistor(Ta)	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit
23	Outdoor unit	-	Compressor Discharge Gas Thermistor (Td)	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit
24	Outdoor unit	-	Heat Exchanger Liquid Pipe Thermistor (Te)	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit
25	Outdoor unit	-	Heat Exchanger Liquid Pipe Thermistor 2 (Te2)	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit
31	Outdoor unit	-	Incorrect Capacity Setting of Outdoor Unit and Indoor Unit	Incorrect Capacity Setting of Outdoor Unit and Indoor Unit
35	Outdoor unit	-	Incorrect Setting of Indoor Unit No.	Incorrect Setting of Indoor Unit No.
43	Outdoor unit	d1-11	Activation of Low Compression Ratio Protection Device	Defective Compression (Failure of Compressor of Inverter, Loose Power Supply Connection)
47	Outdoor unit	d1-15	Activation of Low Pressure Decrease Protection Device (Vacuum Operation Protection)	Insufficient Refrigerant, Refrigerant Piping, Clogging, Expansion Valve Locking at close Position (Loose Connector)
48	Outdoor unit	d1-17	Activation of Inverter Overcurrent Protection Device	Overload Operation, Compressor Failure
51	Outdoor unit	d1-17	Abnormal Inverter Current Sensor	Current Sensor Failure
53	Outdoor unit	d1-17	Inverter Error Signal Detection	Error Signal Detection (IPM Error, Step-Out Detection, PFC hardware Error)
54	Outdoor unit	d1-17	Abnormality of Inverter Fin Temperature	Abnormal Inverter Fin Thermistor, Inverter fin thermistor protection activation
55	Outdoor unit	d1-18	Inverter Failure	O.U. main PCB Failure
57	Outdoor unit	d1-18	Activation of Fan Controller Protection	Abnormal speed of Fan-motor

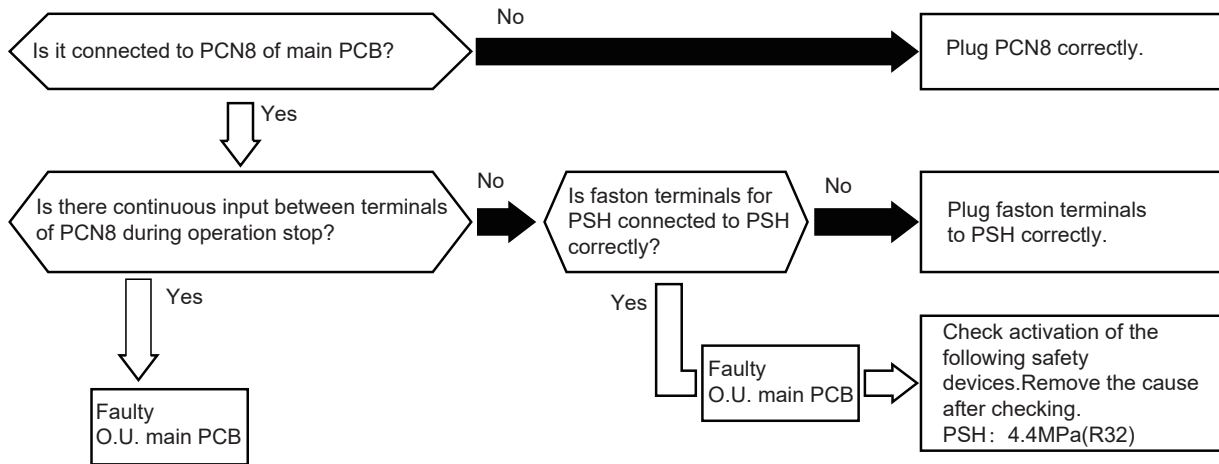
Alarm Code	Category	Cause Code of Stoppage	Detail of Abnormality	Main Factors
70	Indoor unit	d1-70	Water Pressure Alarm	Water pressure is detected abnormality in the hydraulic cycle
71	Indoor unit	d1-02	Protection Thermostat of DHW Electric Heater Activation	High temperature is detected in DHW Electric Heater
72	Indoor unit	d1-02	Protection Thermostat of Auxiliary Electric Heater Activation	High temperature is detected in Auxiliary Electric Heater
74	Indoor unit	d1-74	Overheating protection for water Cycle 2	Water Cycle 2 supply temperature > Target temperature + offset lasting for 10mins.
75	Indoor unit	d1-75	Water Pump (WP1) malfunction	Water Pump (WP1) output iPWM is detected abnormality
76	Indoor unit	d1-31	Freeze Protection Stop by indoor unit temperature thermistors	Water temperature or refrigerant temperature is too low and trigger freezing protection
78	Indoor unit	d1-78	Hydraulic flow abnormality alarm (WP1)	Water flow is detected abnormality in the hydraulic cycle
80	Indoor unit	d1-02	Transmission failure between unit and Master Controller	No Transmission for a continuous period of 5 minutes between Unit and Master Controller. failed wiring (breaking, wiring error, etc.)
-	Indoor unit	d1-03	Freeze protection	Space Cooling is on and Outlet HP Water Thermistor(TowHP) $\leq 3^{\circ}\text{C}$ lasting for 100s or Inlet Water Thermistor(Tiw) $\leq 5^{\circ}\text{C}$ lasting for 100s.
-	Indoor unit	d1-07	Stoppage of Cooling Operation due to Low Outdoor Air Temperature	Space Cooling is on and Outdoor Ambient Temperature in 30mins or Second Outdoor Ambient Temperature in 30mins is equal or lower to $5^{\circ}\text{C}$ .
A1	Indoor unit	d1-02	Auxiliary sensor Abnormality (Tow3)	Loose, disconnected, broken or short-circuited connector. Or the condition of Hydraulic Sparator is Enabled but Tow3 has not been set in all the Auxiliary sensors (A1-A7).
A2	Indoor unit	d1-02	Auxiliary sensor Abnormality (Tswp)	Loose, disconnected, broken or short-circuited connector. Or the condition of Swimming pool is Enabled but Tow2 has not been set in all the Auxiliary sensors (A1-A7).
A3	Indoor unit	d1-02	Auxiliary sensor Abnormality (Tsolar)	Loose, disconnected, broken or short-circuited connector. Or the condition of Solar function need to be set as the solar sensor but Tsolar has not been set in all the Auxiliary sensors (A1-A7).
A4	Indoor unit	d1-02	Auxiliary sensor Abnormality (Tow2)	Loose, disconnected, broken or short-circuited connector. Or the condition of Cycle 2 is Enabled but Tow2 has not been set in all the Auxiliary sensors (A1-A7).
A5	Indoor unit	d1-02	Auxiliary sensor Abnormality (Room_amb1...7)	Loose, disconnected, broken or short-circuited connector.
F1	Indoor unit	d1-02	Alarm sent by Outdoor unit (Outdoor unit alarm 21-29)	-
F2	Indoor unit	d1-02	Alarm sent by Outdoor unit (Outdoor unit alarm except 21-29 and EE)	-
F3	Indoor unit	d1-02	Alarm sent by Outdoor unit (Outdoor unit alarm EE)	-
H2	Wired Remote Controller and Master Controller	-	Wired Remote Controller and Master Controller transmission alarm	Wired Remote Controller is configured as room thermostat but no Wired Remote Controller is detected.
EE	Outdoor unit	-	Compressor Protection Alarm (It can not be reset from Master Controller)	This alarm code appears when the following alarms* occurs three times within 6 hours. *02, 07, 08, 43 to 45, 47

1.2.3.1 Troubleshooting by Alarm Code (O.U.)

Alarm Code	02	Activation of the safety device (high pressure switch) in the outdoor unit
------------	----	--

Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.

★ PSH is activated 6 times in one hour the alarm occurs.

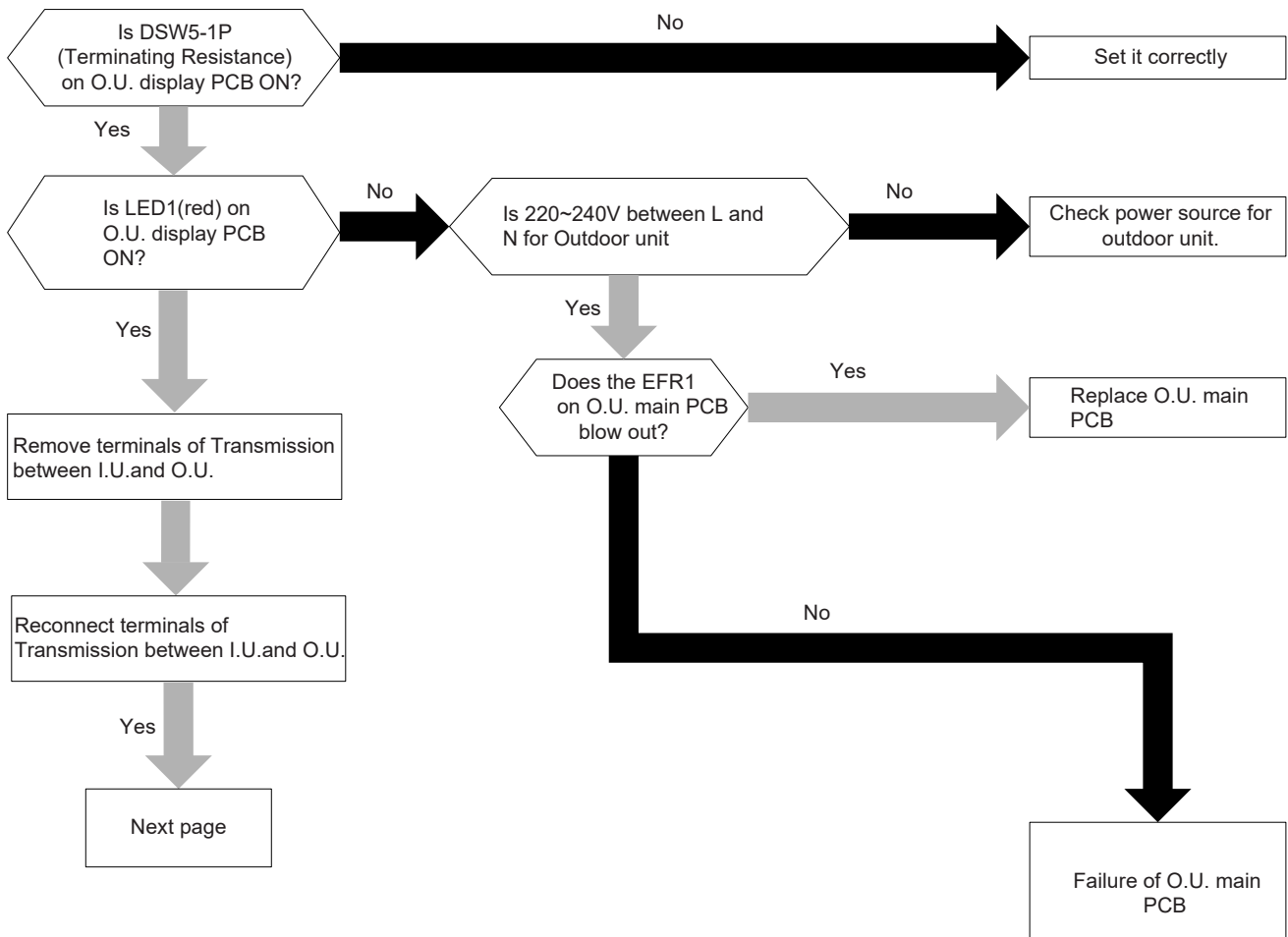


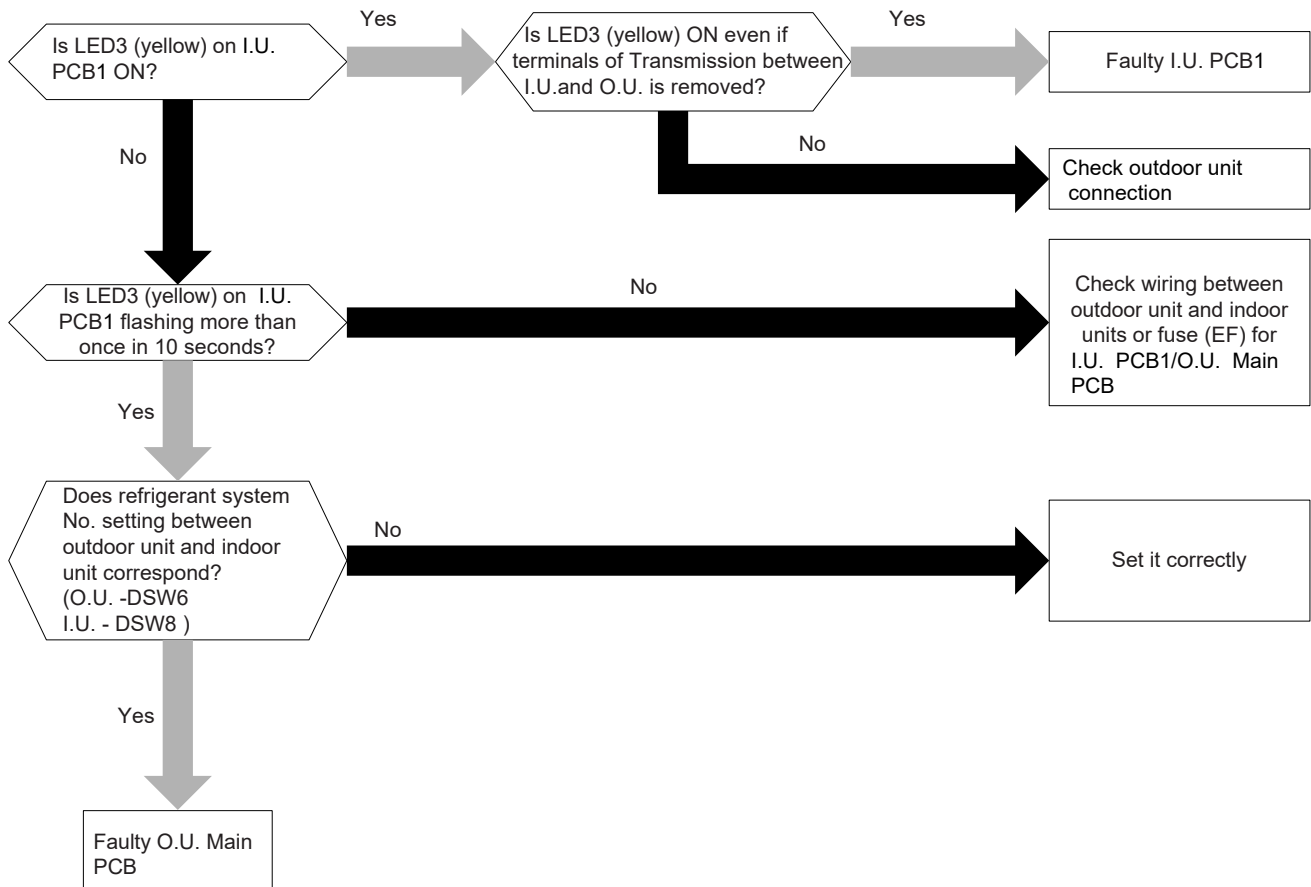
Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)	
Activation of the high-pressure switch due to the excessively high discharge pressure (PSH)	Outdoor Unit: Insufficient Air Flow to the Heat Exchanger (Outdoor Heat Exchanger during the Cooling Process) Indoor Unit: Insufficient Water Flow to the Heat Exchanger Indoor Heat Exchanger (during the Heating Process)	Check the heat exchanger for dust or for clogging	Remove the dust or the clogging	
		Check the air filter for dust	Remove the dust	
		Check for any obstacles at the inlet or the outlet of the heat exchanger	Remove the obstacles	
		Check the service area	Secure service area	
		Check the speed (Outdoor Fan: Cooling)	Replace the fan motor if faulty	
		Check the speed of the water pump	Replace the water pump if faulty	
	Expansion valve malfunction or abnormality	Disconnected	Fix the looseness or reconnect the connector	
		Fully closed and locked	Replace the expansion valve	
		Check the operation sound of the coil	Replace the coil	
		Check the Discharge Gas thermistor	Replace the thermistor	
		Check the fastening of the thermistor	Re-fasten the thermistor	
	Excessively High Water Temperature in the indoor unit	Calculate the heat load	Reduce the heat load or use a bigger unit	
		Check minimum water flow	Provide good circulation	
		Check for collapse in water cycle	Remove the short-circuited	
		Check for other heat source	Stop the heat source	
	Faulty High-Pressure Switch	Faulty Pressure Switch	Measure the discharge pressure. Check the continuity after the decrease of the pressure	Replace the pressure switch if faulty
		Insufficient Contacting	Measure the resistance by means of a tester	Fix the looseness. Replace the connector
		Incorrect Connection	Check the connections	Repair the connections
	Overcharged refrigerant		Check the cycle operation temp.	Charge the refrigerant correctly
	Mixture of the non-condensate gas in the refrigerant cycle		Check the air temp. and the pressure	Recharge the refrigerant after the vacuum pumping
Clogging of the discharge piping		Check for clogging	Remove the clogging	
Liquid line stop valve or gas line stop valve is not in operation		Check the stop valves	Fully Open the stop valves	

Alarm Code	03	Abnormal Transmitting between Indoor and Outdoor Units
------------	----	--

Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.

- ★ This alarm is displayed when abnormal transmission between O.U. and I.U. is maintained for three minutes after the normal transmission. Also, abnormal transmission between O.U. and I.U. is maintained for 30 seconds after the micro-computer is automatically reset.
- ★ The alarm is displayed when the abnormal transmission is maintained for 30 seconds from the starting of the outdoor unit.
- ★ Investigate the cause of the overcurrent and take the necessary action when the fuses are blown out or the breaker for the outdoor unit is activated.

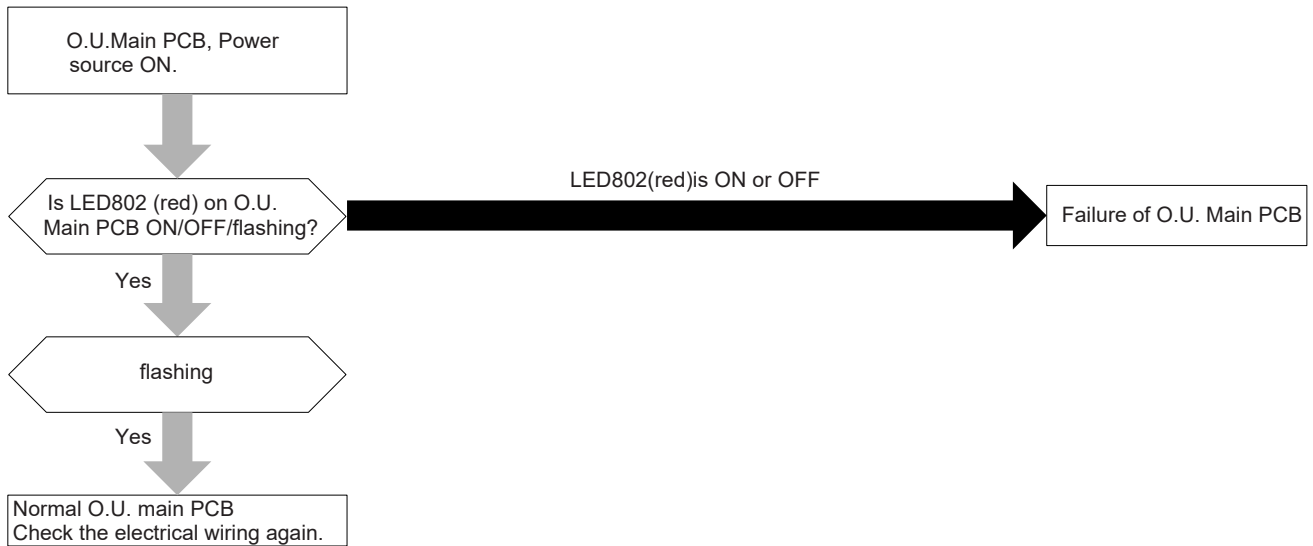




Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
Power failure or power is not ON		Measure the voltage by tester.	Supply power.
Melted Fuse for Power Supply or Activation of Breaker (Outdoor Unit )	Short Circuit between Wires	Check for breakage of insulation.	Remove cause of short circuit. Replace fuse on I.U. PCB1 or O.U.main PCB if faulty.
	Short Circuited Wire to Ground	Measure insulation resistance.	Remove cause of short circuit. Replace fuse on I.U. PCB1 or O.U.main PCB if faulty.
	Faulty Comp. Motor	Measure resistance between wires and insulation resistance.	Replace O.U. main PCB.
	Faulty Outdoor Unit Fan Motor	Measure resistance between wires and insulation resistance.	Replace outdoor unit fan motor and fuse. Replace O.U. PCB if faulty.
Melted Fuse on PCB (Outdoor Unit)	Short Circuit between Wires	Check for breakage of insulation.	Remove cause of short circuit.
	Short Circuit (to Ground)	Measure insulation resistance.	Remove cause of short circuit .
	Faulty Electrical Coil Resistance for Comp. Motor	Measure resistance of coil.	Replace Compressor wiring or Compressor refer to 1.3.4.
	Failure of Outdoor Unit Fan Motor	Measure resistance between wires and insulation resistance.	Replace fan motor refer to 1.3.4.
Incorrect Power Supply	Circuit of O.U. main PCB	Measure O.U. main PCB output.	Replace electrical box
Disconnected Wires Insufficient Contacting or Incorrect Connection	Between Outdoor Unit and Indoor Unit	Check continuity of wires.	Replacing wires, repairing and tightening screws.
	Power Supply Wiring for Outdoor Unit	Check for looseness of connection screws. Check terminal Nos.	Correctly connect wires.
Faulty PCB(Outdoor Unit,Indoor Unit)	Disconnected Wires to Check connection I.U.PCB1/O.U. main PCB	Check connections.	Correctly connect wires.
	Faulty I.U.PCB1/O.U. main PCB		Replace it if faulty.
Incorrect Wiring	Disconnected Wire Insufficient Contacting	Check continuity and looseness of connection screws.	Replacing Wires, Repairing and Tightening Screws
	Incorrect Wiring	Check terminal	Correctly connect wires.

Alarm Code	04	Abnormal Transmitting between Outdoor Unit main PCB and Inverter
------------	----	--

- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- ★ This alarm code is indicated when abnormality continues for 30 seconds after normal transmitting between the outdoor unit PCB and Inverter, and also abnormality continues for 30 seconds after the microcomputer is automatically reset. The alarm is indicated when the abnormal transmitting continues for 30 seconds from starting of the outdoor unit.

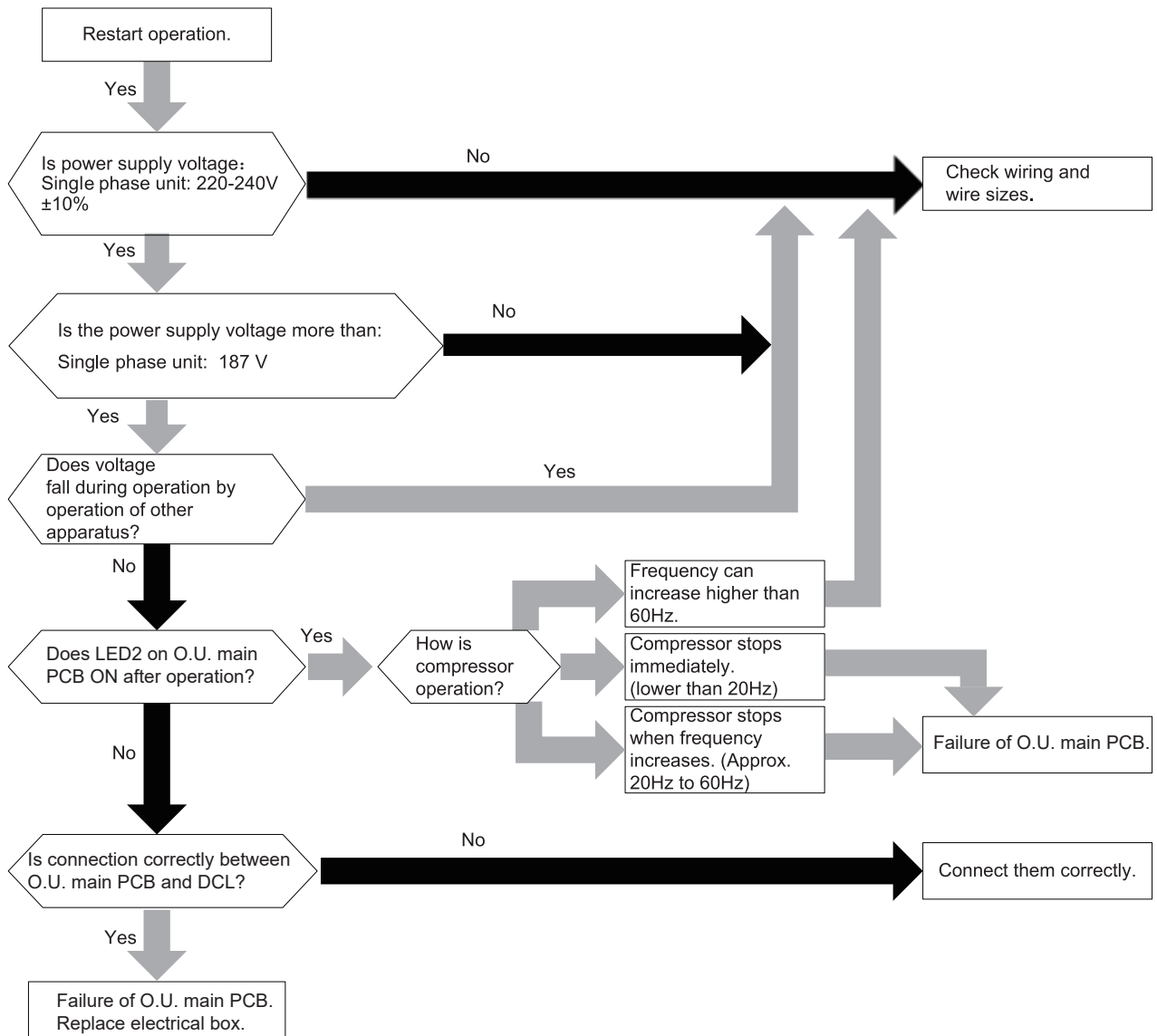




Phenomenon	Cause	Check Item	Action(Turn OFF Main Switch)
Disconnected Wires, Insufficient Contacting or Incorrect Connection	Power Supply Wiring for Outdoor Unit	Check continuity of wires. Check for looseness of connection screws. Check connection No.	Replacing wires, repairing, tightening screws and incorrect wiring.
Faulty O.U. main PCB	Disconnected Wires to O.U. main PCB	Check connections.	Repair wiring connections.
	Faulty O.U. main PCB		Replace electrical box if faulty.
Faulty Electrical Components Power Fuse, Resistance	Melted Power Fuse	Check conductivity of power fuse, power transistor, diode module.	Replace power fuse and power transistor,
	Disconnected Incoming Current Limit Resistance	Check resistance of incoming current limit resistance.	Replace incoming current limit resistance.
Incorrect Wiring	Disconnected Wire Insufficient Contacting	Check continuity and looseness of connection screws.	Replacing Wires, Repairing and Tightening Screws
	Incorrect Wiring	Check terminal Nos.	Correctly connect wires.

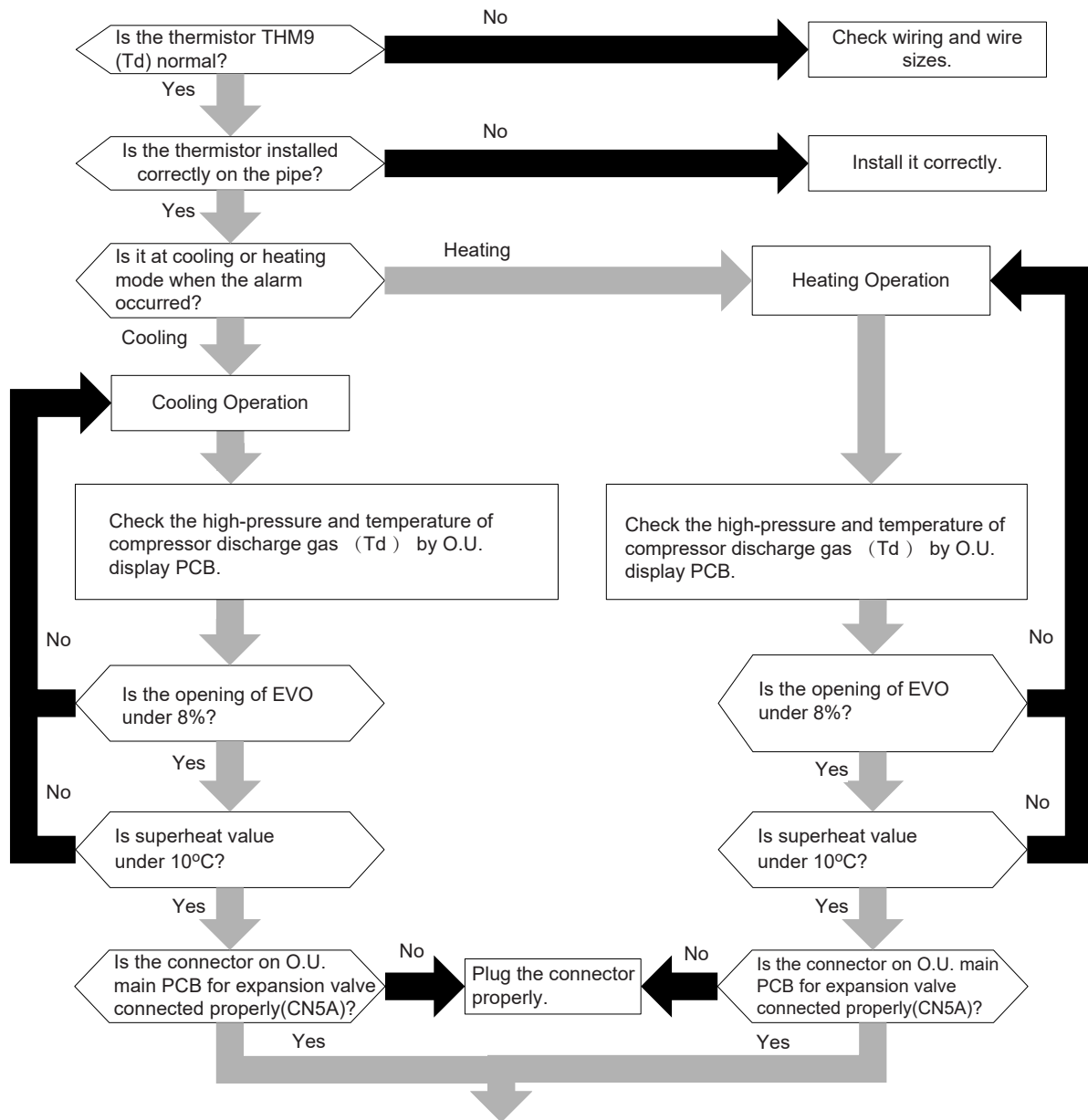
Alarm Code	06	<b>Abnormal Inverter Voltage</b> (Insufficient Inverter Voltage or Overvoltage)
------------	----	--

- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- ★ When either insufficient voltage or overvoltage is detected on the inverter three times in 30 minutes, the operation stops and this alarm code is displayed. If this occurs less than three times in 30 minutes, the operation is automatically retried.

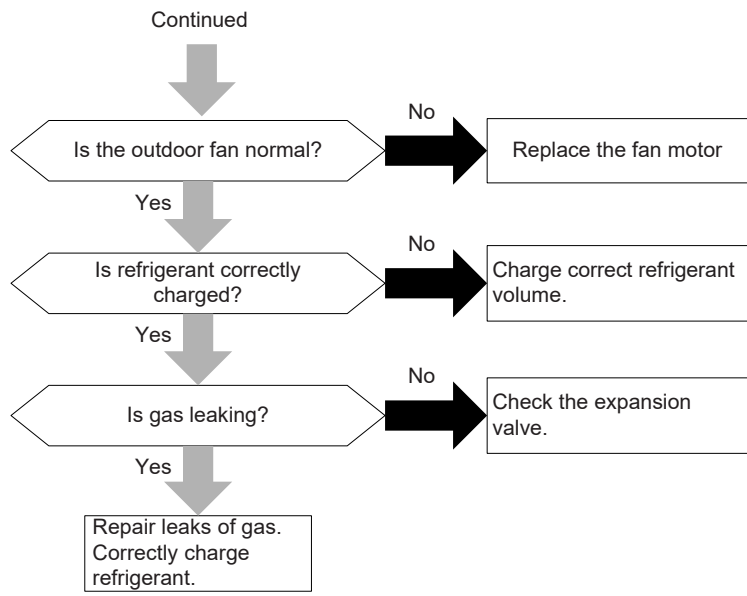


Alarm Code <b>07</b>	<b>Decrease in Discharge Gas Superheat</b>
----------------------	--

- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- ★ If the temperature of compressor discharge gas (Td) is below the estimated condensing temperature for 30 minutes during operation, the compressor stops and then the operation is automatically retried after three minutes. If this occurs again twice in the next 120 minutes, this alarm code is displayed.
- ★ This alarm code is displayed when an abnormality cannot be detected by the step-out detection, caused by locking of compressor shaft.



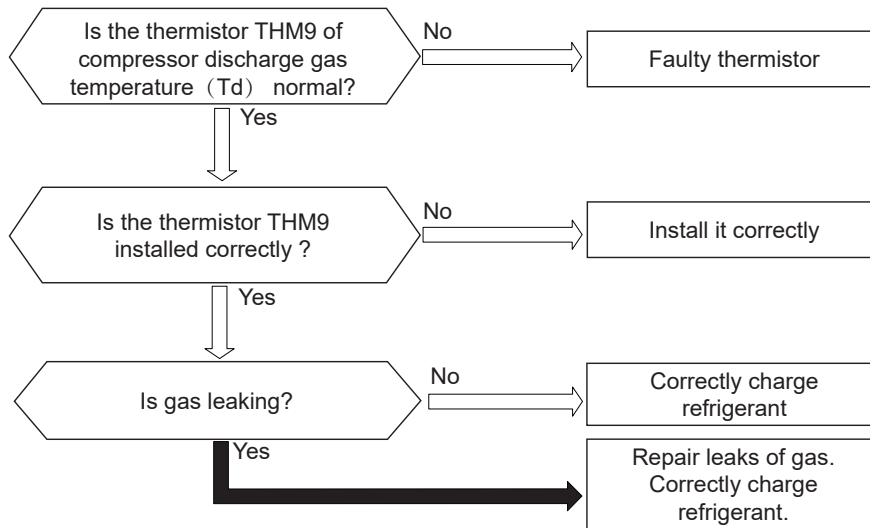
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Phenomenon	Cause	Check Item	Action(Turn OFF Main Switch)	
Decrease of Discharge Gas Superheat	Ref. Cycle is Different from the Electrical System	Check ref. cycle and the electrical system.	Repair wiring.	
	Overcharged Refrigerant	Check pressures.	Correctly charge Overcharged Refrigerant refrigerant.	
	Faulty Expansion Valve	Check expansion valve.	Replace expansion valve if faulty.	
	Faulty O.U. main PCB	Fault	Check operation.	Replace electrical box if faulty.
		Disconnected Wires for Expansion Valve	Check connections.	Repair wiring connections.
	Faulty Discharge Gas Thermistor	Fault	Check resistance of thermistor.	Replace thermistor if faulty.
Incorrect Mounting		Check mounting state.	Correctly mount thermistor.	
	Incorrect Connection	Check connections.	Remove looseness, replace connector or repair connections.	

Alarm Code	08	Increase in Discharge Gas Temperature of Compressor
------------	----	---

- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- ★ When either of the following conditions occurs, retry operation is performed. However, if it occurs again twice times in the next 60 minutes, this alarm code is displayed;
  - The temperature of the thermistor on the top of the compressor is kept higher than 120°C for 10 minutes.
  - The temperature of the thermistor on the top of the compressor is kept higher than 130°C for 5 seconds.

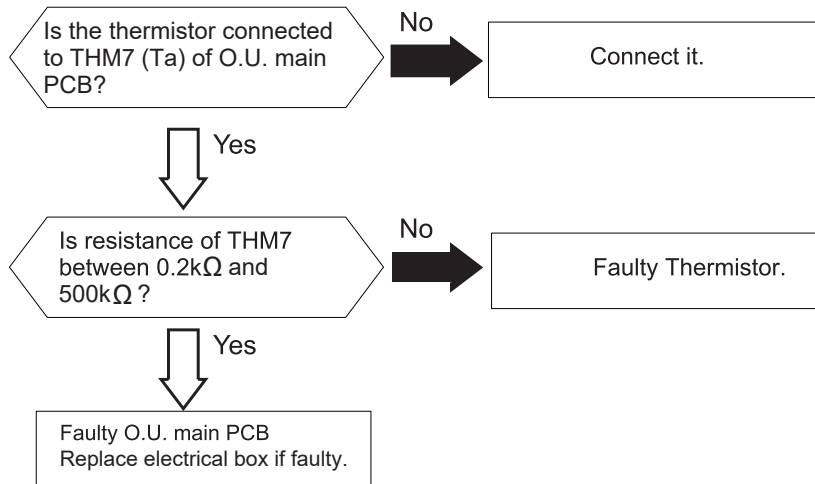


Phenomenon	Cause		Check Item	Action(Turn OFF Main Switch)
Excessively High Discharge Gas Temperature	Undercharge of Refrigerant		Check pressures and EVO	Correctly charge Undercharge of refrigerant.
	Faulty Expansion Valve		Check expansion valve.	Replace expansion valve if faulty.
	Faulty O.U. main PCB	Fault	Check operation.	Replace electrical box if faulty.
		Disconnected Wires for Expansion Valve	Check connections.	Repair wiring connections.
	Faulty Discharge Gas Thermistor	Fault	Check resistance of thermistor.	Replace thermistor if faulty.
		Incorrect Mounting of Thermistor	Check mounting state.	Correctly mount thermistor.
Incorrect Wiring		Check connections.	Remove looseness, replace connectors or repair connections.	

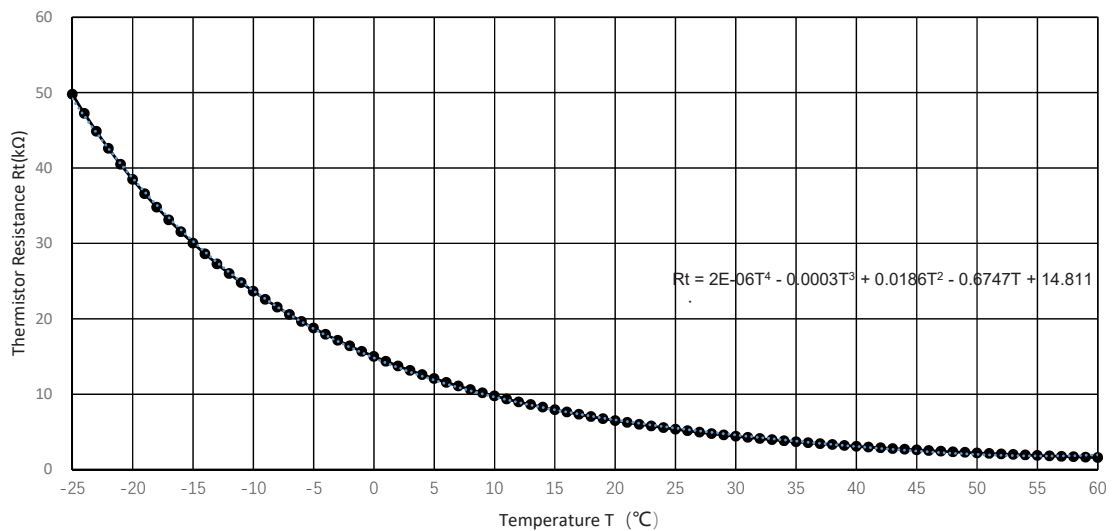
Alarm Code	22	Abnormality of Thermistor for Outdoor Unit Ambient (Ta)
------------	----	---

- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- ★ This alarm code is indicated when a short circuit (less than 0.2kΩ) or disconnection (more than 500kΩ) of the thermistor is detected during the operation.

O.U. main PCB: Outdoor Unit main PCB



Thermistor Characteristics Ta, Te and Te2

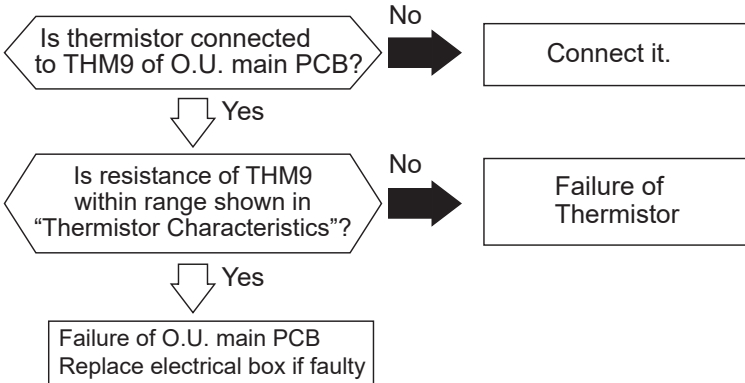


Phenomenon	Cause	Check Item	Action(Turn OFF Main Switch)
Faulty Thermistor for Outdoor Unit Ambient	Fault	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to O.U. main PCB.	Repair wiring and connections.
Faulty O.U. main PCB		Replace O.U. main PCB and check operation.	Replace O.U. main PCB if faulty.

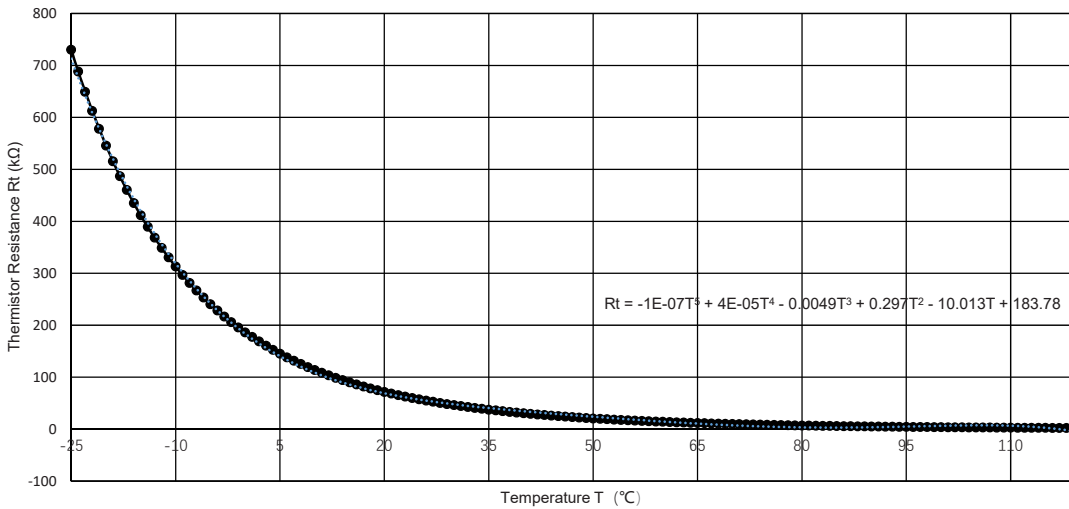
Alarm Code	23	Abnormality of Thermistor for Compressor Discharge Gas Temperature(Td)
------------	----	--

- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- ★ This alarm code is indicated when a short circuit (less than 0.9kΩ) for a second or disconnection (more than 5946kΩ) of the thermistor is detected during the operation.

O.U. main PCB: Outdoor Unit main PCB



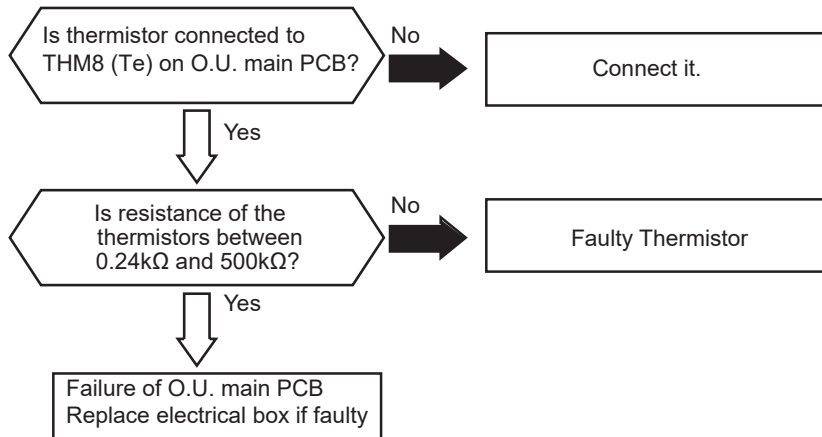
Thermistor Characteristics (Td)



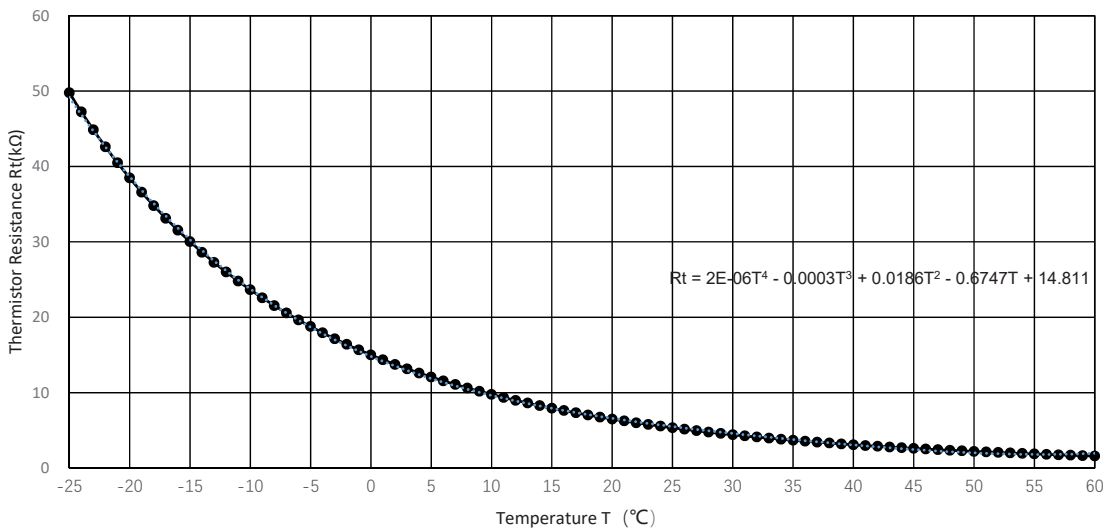
Phenomenon	Cause	Check Item	Action(Turn OFF Main Switch)
Faulty Compressor Discharge Gas Thermistor(Td)	Fault	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to O.U. main PCB.	Repair wiring and connections.
Faulty O.U. main PCB			Replace O.U. main PCB if faulty.

Alarm Code	24	Abnormality of Thermistor of heat exchanger Liquid Pipe (Te)
------------	----	--

- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- ★ This alarm code is displayed when a short circuit (0.24kΩ or less) or disconnection (500kΩ or more) of the thermistor is detected during heating or cooling operation.



Thermistor Characteristics Ta,Te and Te2

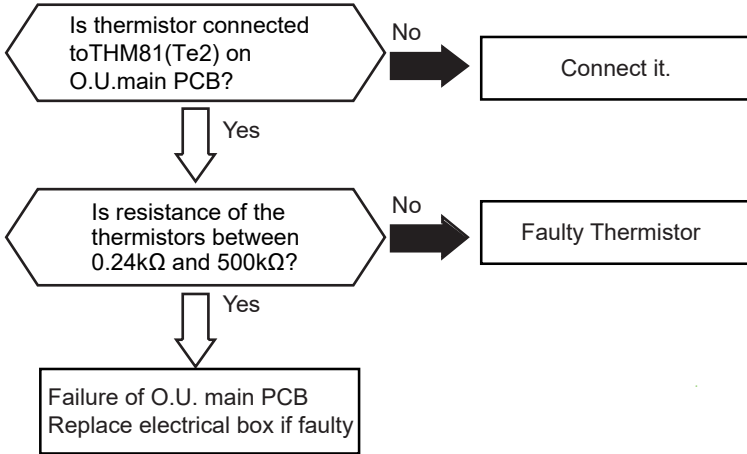


Phenomenon	Cause	Check Item	Action(Turn OFF Main Switch)
Faulty Thermistor for Heat Exchanger Liquid Pipe(Te)	Fault	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to O.U. main PCB.	Repair wiring and connections.
Faulty O.U. main PCB		Replace O.U. main PCB and check operation.	Replace O.U. main PCB if faulty.



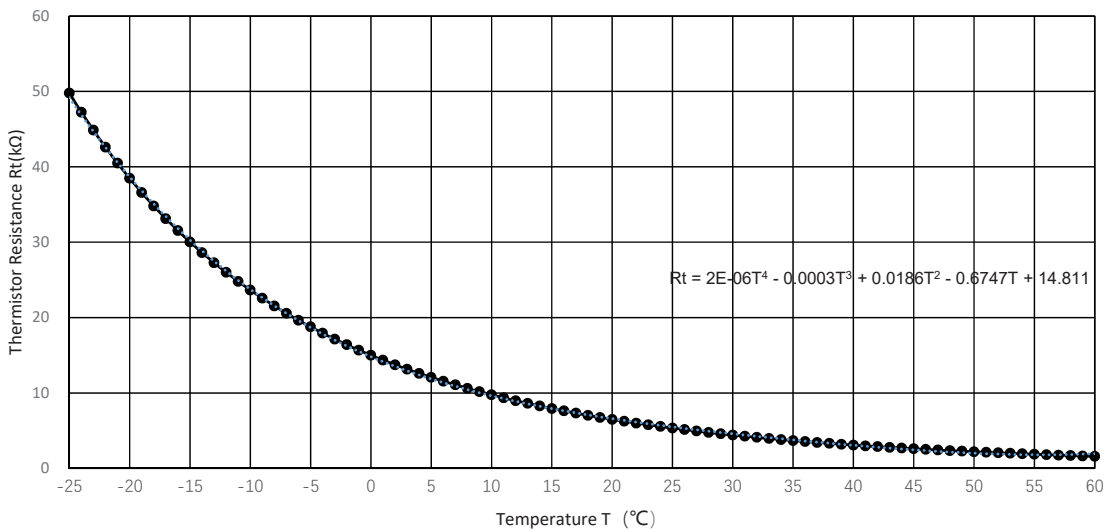
Alarm Code	25	Abnormality of Thermistor of heat exchanger Liquid Pipe (Te2)
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- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- ★ This alarm code is displayed when a short circuit (0.24kΩ or less) or disconnection (500kΩ or more) of the thermistor is detected during heating or cooling operation.



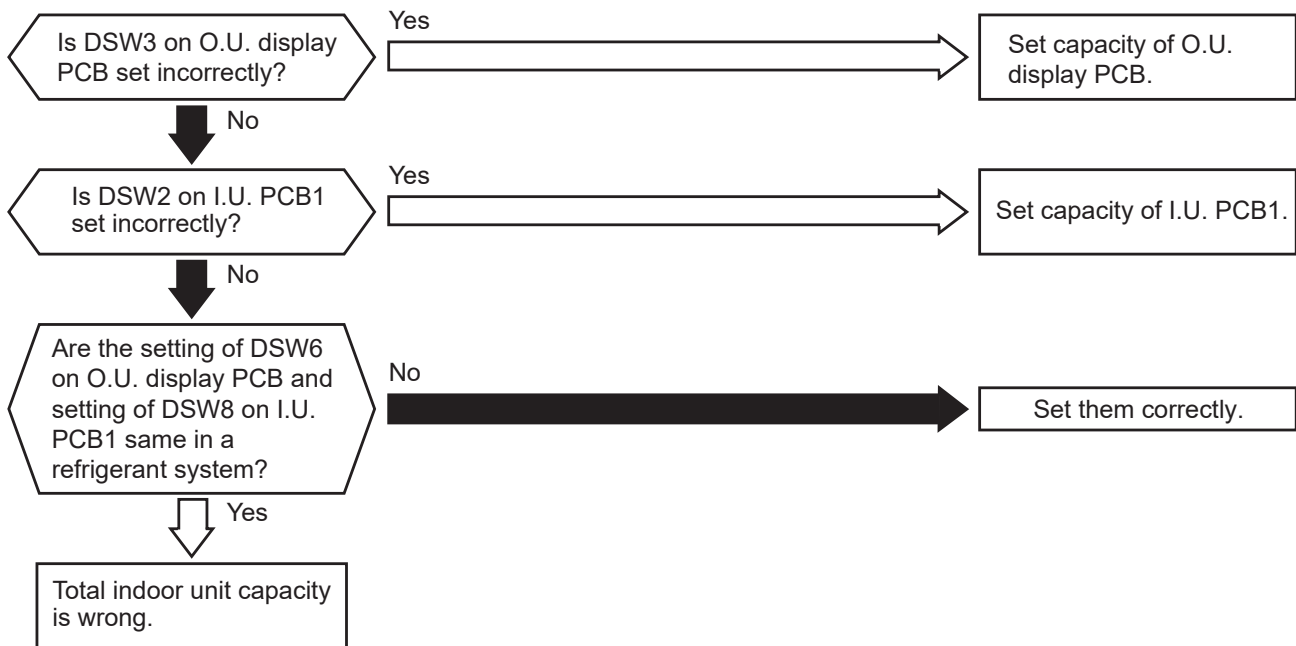
Phenomenon	Cause	Check Item	Action(Turn OFF Main Switch)
Faulty Thermistor for Heat Exchanger Liquid Pipe(Te2)	Fault	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to O.U. main PCB.	Repair wiring and connections.
Faulty O.U. main PCB		Replace O.U. main PCB and check operation.	Replace electrical box if faulty.

Thermistor Characteristics Ta,Te and Te2



Alarm Code	31	Incorrect Capacity Setting of Indoor Unit and Outdoor Unit
------------	----	--

- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- ★ This alarm code is indicated when the capacity setting dip switch, DSW3 on the O.U. display PCB is not set (all the settings from #1 to #4 are OFF) or set incorrectly.
- ★ This alarm code is indicated when the total indoor unit capacity is smaller than 50% or greater than 135% of the combined outdoor unit capacity.



Phenomenon	Cause	Check Item	Action(Turn OFF Main Switch)
Incorrect Capacity Setting of Indoor Unit		Check capacity setting on I.U. PCB1.	Correctly set DIP switch, DSW2.
Incorrect Capacity Setting of Outdoor Unit		Check capacity setting on O.U. display PCB.	Correctly set DIP switch, DSW3.
Refrigeration Cycle Setting of Outdoor Unit and Indoor Unit is Different		Check refrigeration cycle setting on O.U. display PCB and I.U. PCB1.	Set them correctly.
Indoor Unit Capacity Connected to the Outdoor Unit is Beyond Permissible Range		Check outdoor unit model by calculating indoor unit capacity.	Ensure that total indoor unit capacity is from 50% to 135%.

Alarm Code	35	Incorrect Indoor Unit No. Setting
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- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
  - ★ This alarm code is displayed when the duration of automatic addressing of indoor unit exceeds 5 minutes after power-on of outdoor unit.
  - ★ This alarm code is displayed when the number of connected indoor units exceeds the maximum allowed.
  - ★ This alarm code is displayed when refrigerant system No. set by DSW6 on O.U. display PCB in the same H-NET.

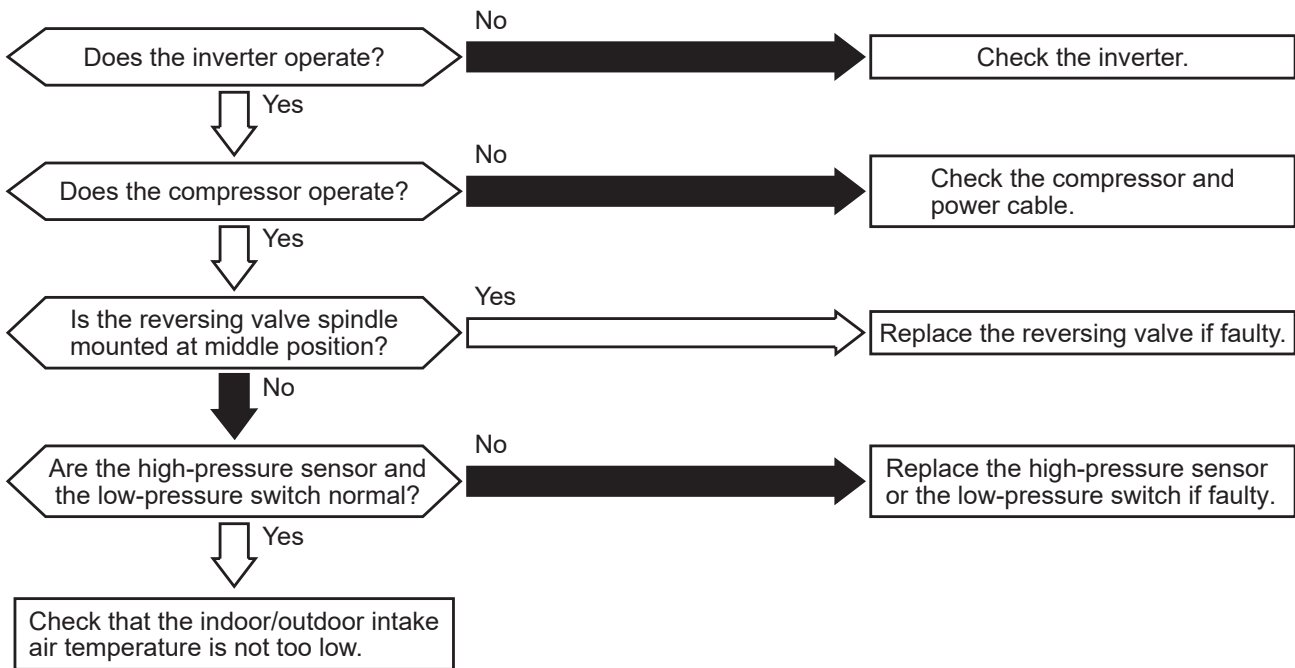
**NOTE:**

- In the case of H-NET system, this alarm code may be displayed when DSW6 (for refrigerant system No. setting) on the O.U. display PCB and DSW8 (for refrigerant system No. setting) on the indoor unit PCB1 are not set correctly. In this case, turn OFF the power supply and set them correctly, and turn ON the power supply again.

Alarm Code	43	Activation of Low Compression Ratio Protection Device
------------	----	---

- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- ★ If the pressure ratio  $\epsilon^{*1}$  is less than 1.0 for 1 minute or less than 1.5 for 5 minute, the compressor stops. The operation automatically restarts after three minutes. If this occurs again twice in the next 60 minutes, this alarm code is displayed.
- \*1) Pressure Ratio  $\epsilon = (Pd[MPa] + 0.1)/(Ps[MPa] + 0.06)$  )  
 Pd: high pressure (discharge pressure)  
 Ps: low pressure (suction pressure)

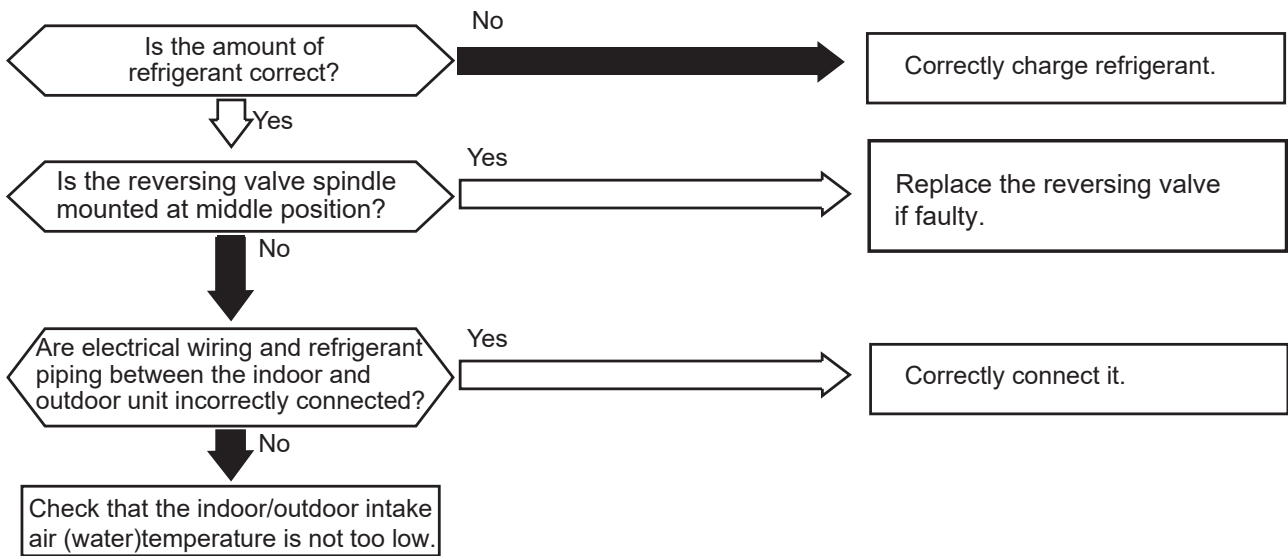
O.U. PCB: Outdoor Unit PCB



Phenomenon	Cause	Check Item	Action(Turn OFF Main Switch)
Excessively Low Compression Ratio	Inverter is not Functioning	Check inverter.	Repair faulty part.
	Compressor is not Operating	Check compressor.	Replace comp. if faulty.
	Valve Stoppage at Middle Position of Reversing Valve	Measure suction pipe temp. of reversing valve.	Replace reversing valve if faulty.
	Excessively Low Indoor Intake Air Temperature	Check indoor unit and outdoor unit air temp. thermistor.	Replace thermistor if faulty.

Alarm Code	46	Activation of High Pressure Decrease Protection Device
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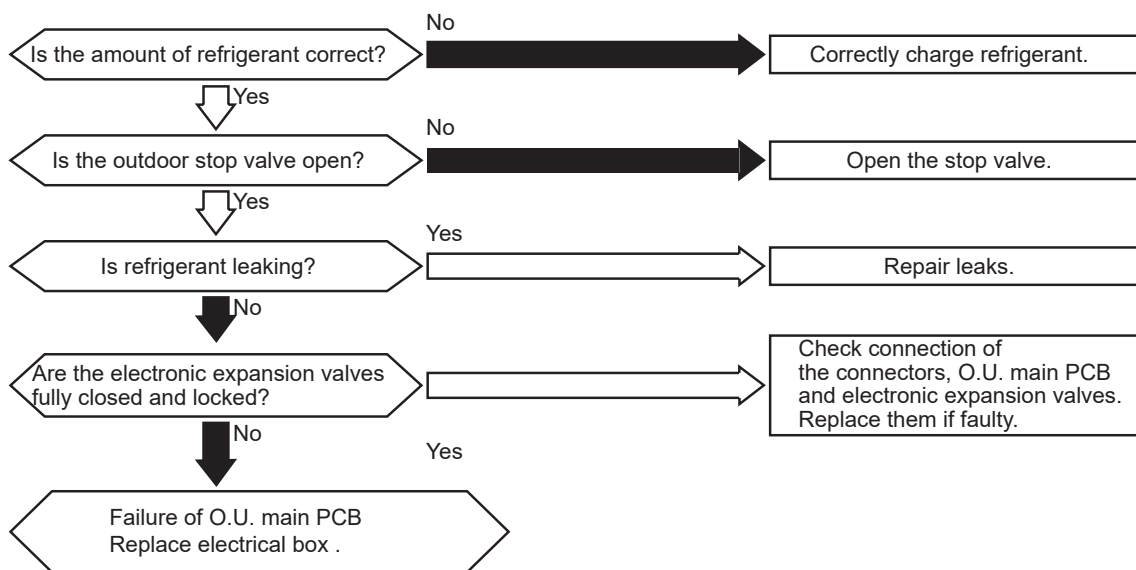
- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- ★ When the discharge pressure (Pd) continues to be lower than 1.0MPa for 30 minutes or continues to be lower than 0.3MPa for 4 minutes, the compressors stop and then retry the operation after 3 minutes. This alarm code is indicated when this occurs once more within the next 35 minutes.



Phenomenon	Cause	Check Item	Action(Turn OFF Main Switch)
Excessively Low Discharge Pressure	Shortage of Ref.	Check charged ref. volume or check for leakage	Repair leakage and correctly charge.
	Valve Stoppage at Middle Position of Reversing Valve	Measure suction pipe temp. of reversing valve.	Replace reversing valve if faulty.
	Incorrect Connection between Indoor Unit and Outdoor Unit	Check the wiring	Correctly connect them.
	Excessively Low Indoor/ outdoor Intake Air(water) Temperature	Check indoor unit and outdoor unit temperature thermistor.	Replace thermistor if faulty.

Alarm Code	47	Activation of Low Pressure Decrease Protection Switch (Vacuum Operation Protection)
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- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- ★ This alarm code is indicated when a suction pressure (Ps) is lower than 0.09MPa and the same condition occurs twice or more within one hour.
- ★ This alarm code is indicated when low pressure switch(PSL) is activated and the same condition occurs three times or more within 80minutes.

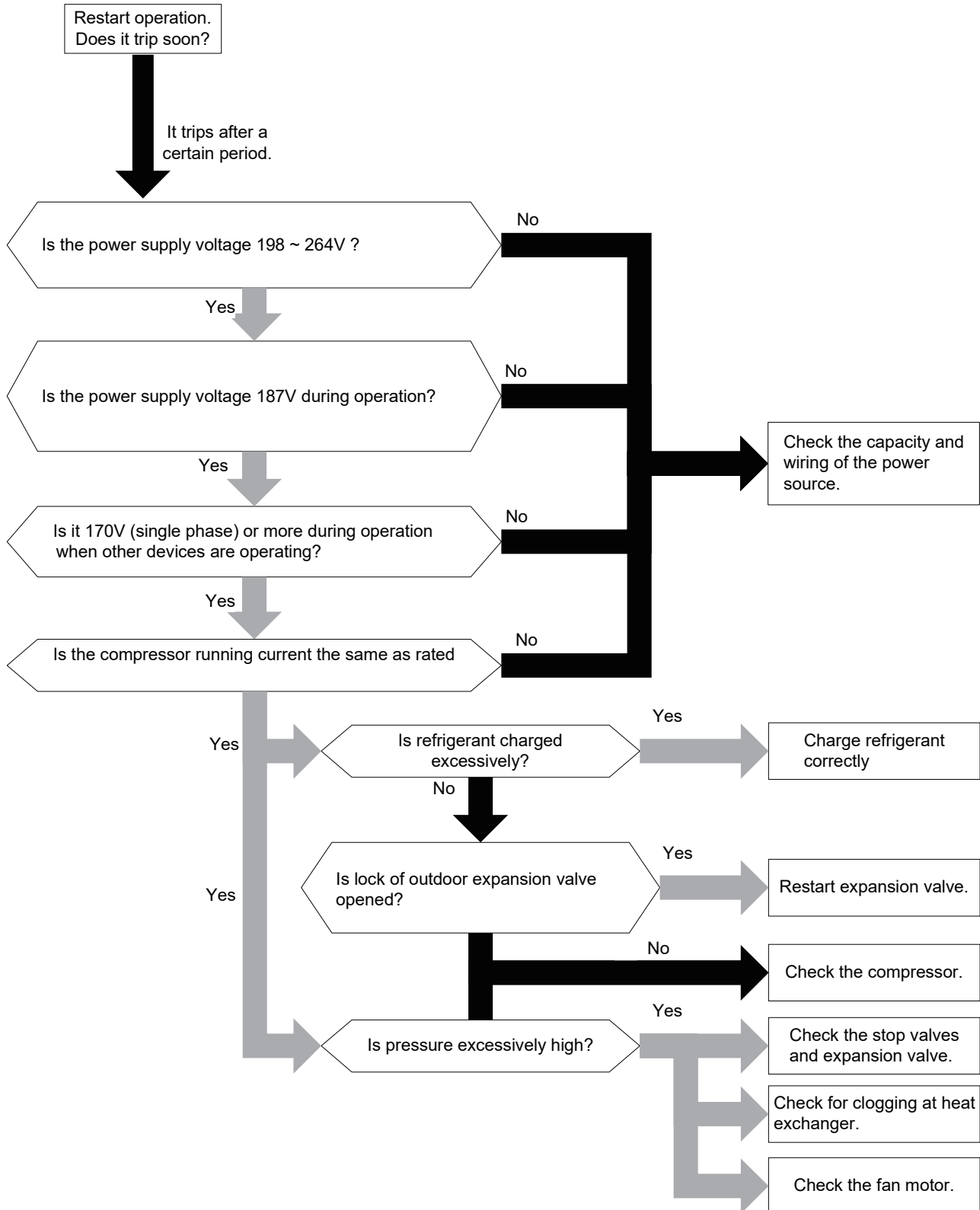


Phenomenon	Cause		Check Item	Action(Turn OFF Main Switch)
Excessively Low Suction Pressure (in Vacuum)	Shortage of Ref.		Check charged ref. volume or check for leakage.	Repair leakage and correctly charge.
	Closed Stop Valve		Check stop valve.	Open stop valve.
	Incorrect Connection between Indoor Unit and Outdoor Unit		Check electrical system and ref. cycle.	Correctly connect between indoor unit and outdoor unit.
	Locked Expansion Valve with Fully Closed		Check connector for O.U. main PCB.	Repair connector for O.U. main PCB1 or expansion valve. Replace it if faulty.
	Closed Expansion Valve by Disconnecting Td Thermistor		Check Td thermistors for compressors and measure Td thermistor resistance.	Repair or replace Td thermistor.
Internal Thermostat for Outdoor Fan is Activated in Heating Operation	Faulty Outdoor Fan Motor		Measure coil resistance and insulation resistance	Replace outdoor fan motor if faulty.
	Faulty Internal Thermostat	Fault	Check for conduction after temperature of outdoor fan motor is decreased.	Replace outdoor fan motor.
		Incorrect Contact	Measure resistance by tester.	Remove looseness and replace connector.
		Incorrect Contact	Check connection.	Connect it correctly.

Alarm Code	48	Activation of Inverter Overcurrent Protection Device (2)
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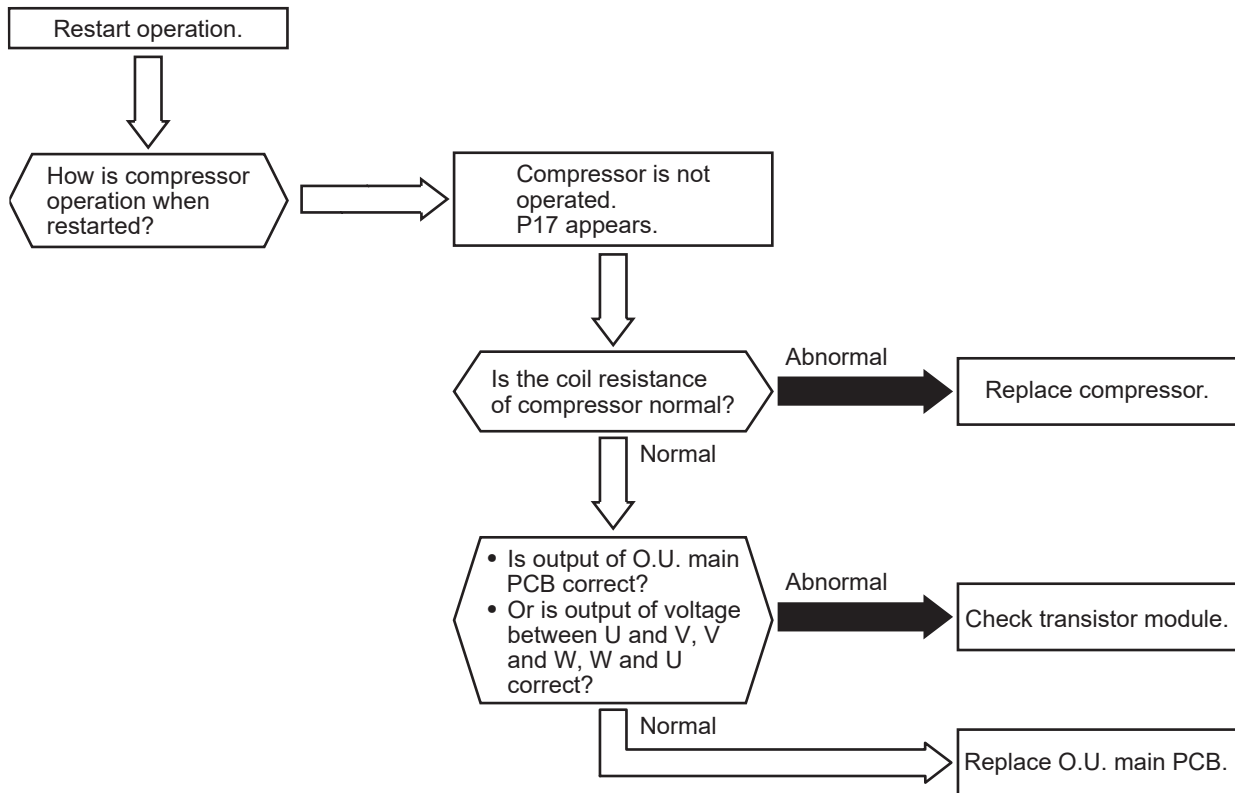
- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.

★ If instantaneous overcurrent (Cause code of inverter stoppage = 2) occurs on inverter , the compressor stops. The operation automatically restarts after three minutes. If this occurs again five times in the next 30 minutes, this alarm code is displayed.



Alarm Code	51	Abnormality of Current Sensor
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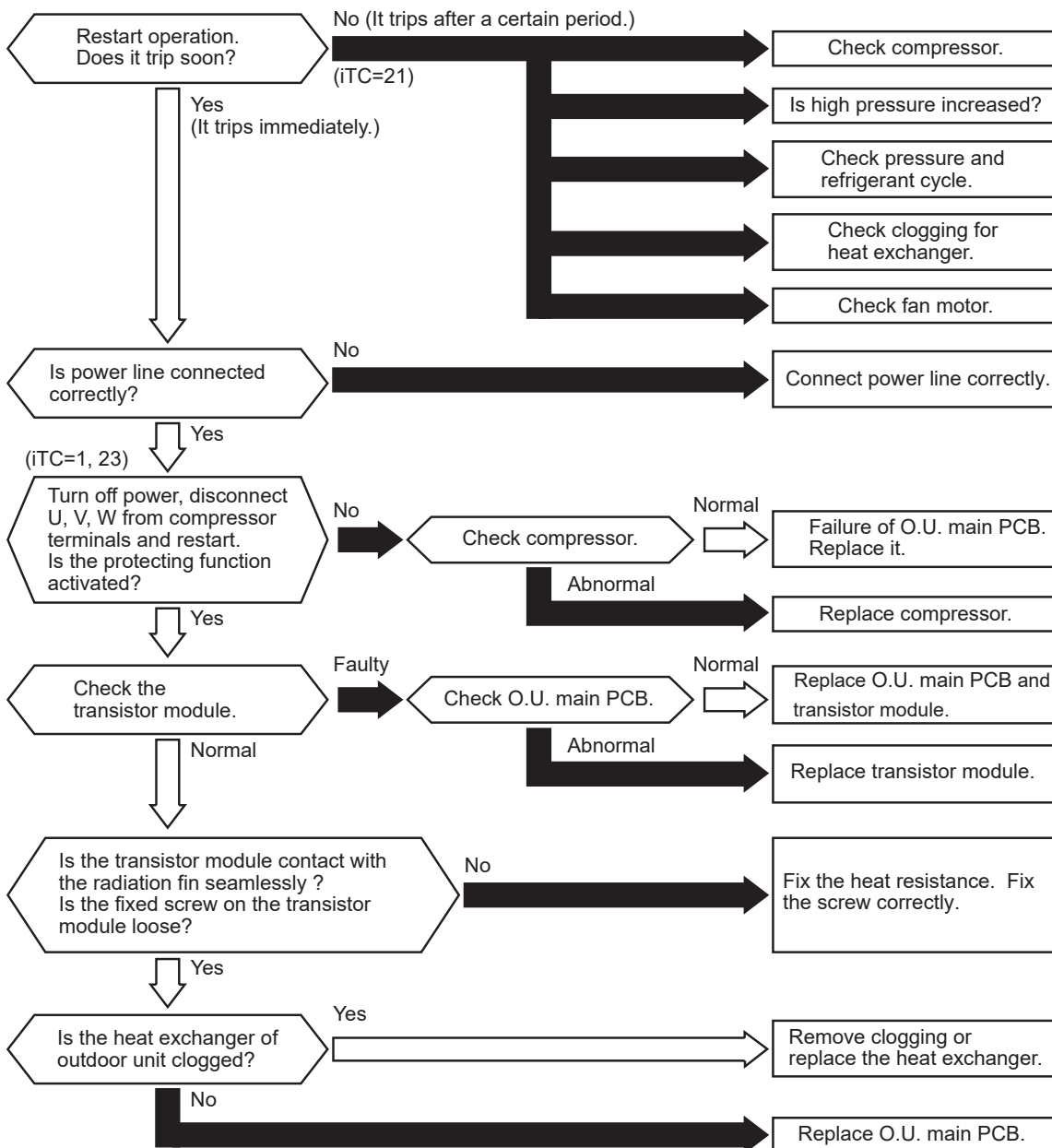
- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- ★ If abnormal fault of sampling circuit (Cause code of inverter stoppage = 8) occurs on inverter , the compressor stops. The operation automatically restarts after three minutes. If this occurs again 2 times in the next 30 minutes, this alarm code is displayed.





Alarm Code	53	Inverter Error Signal Detection
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- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- ★ If the following abnormality is detected on inverter , the compressor stops. The operation automatically restarts after three minutes. If this occurs again 6 times in the next 30 minutes, this alarm code is displayed.
  - ① IPM Error(Cause code of inverter stoppage = 1)
  - ② Step-Out Detection(Cause code of inverter stoppage = 21)
  - ③ Abnormal PFC Hardware(Cause code of inverter stoppage = 23).

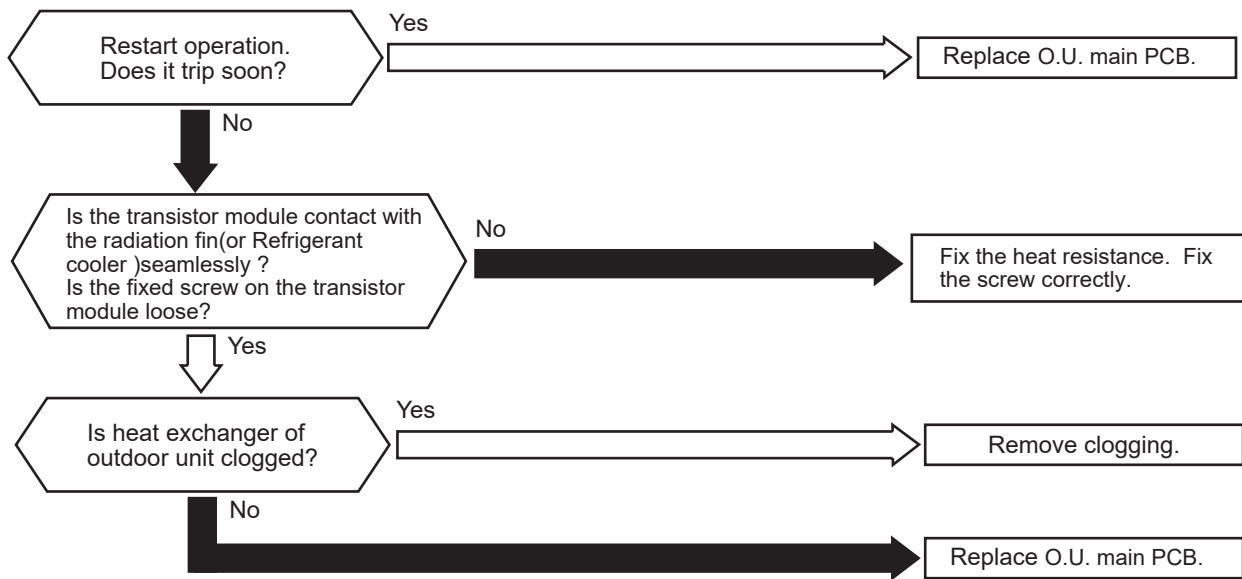


Alarm Code	54	Abnormality of Inverter Fin Temperature
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- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- ★ When the following condition occurs three times in 30 minutes, the operation stops and this alarm code is displayed. If this occurs less than three times in 30 minutes, the operation automatically restarts.

Condition of Activation:

- ① Inverter fin thermistor protection activation (Cause code of inverter stoppage = 3) .The temperature of inverter fin exceeds 75°C.
- ② TFin sensor Error (Cause code of inverter stoppage = 32) the temperature sensor is open or broken.



Alarm Code	55	Inverter Failure
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- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.

★ This alarm code is indicated when the following phenomenon occurs three times in 30 minutes.  
(Retry operation is performed for the first two times.)

Condition of Activation:

- ① When there is no current in one phase of the compressor, or the current between phases is unbalanced, the compressor phase failure (Cause code of inverter stoppage = 13).
- ② EERPOM Error or Abnormal of Key Parameters of Compressor and PFC (Cause code of inverter stoppage = 22)
- ③ Abnormal Chip Check(Cause code of inverter stoppage = 33)

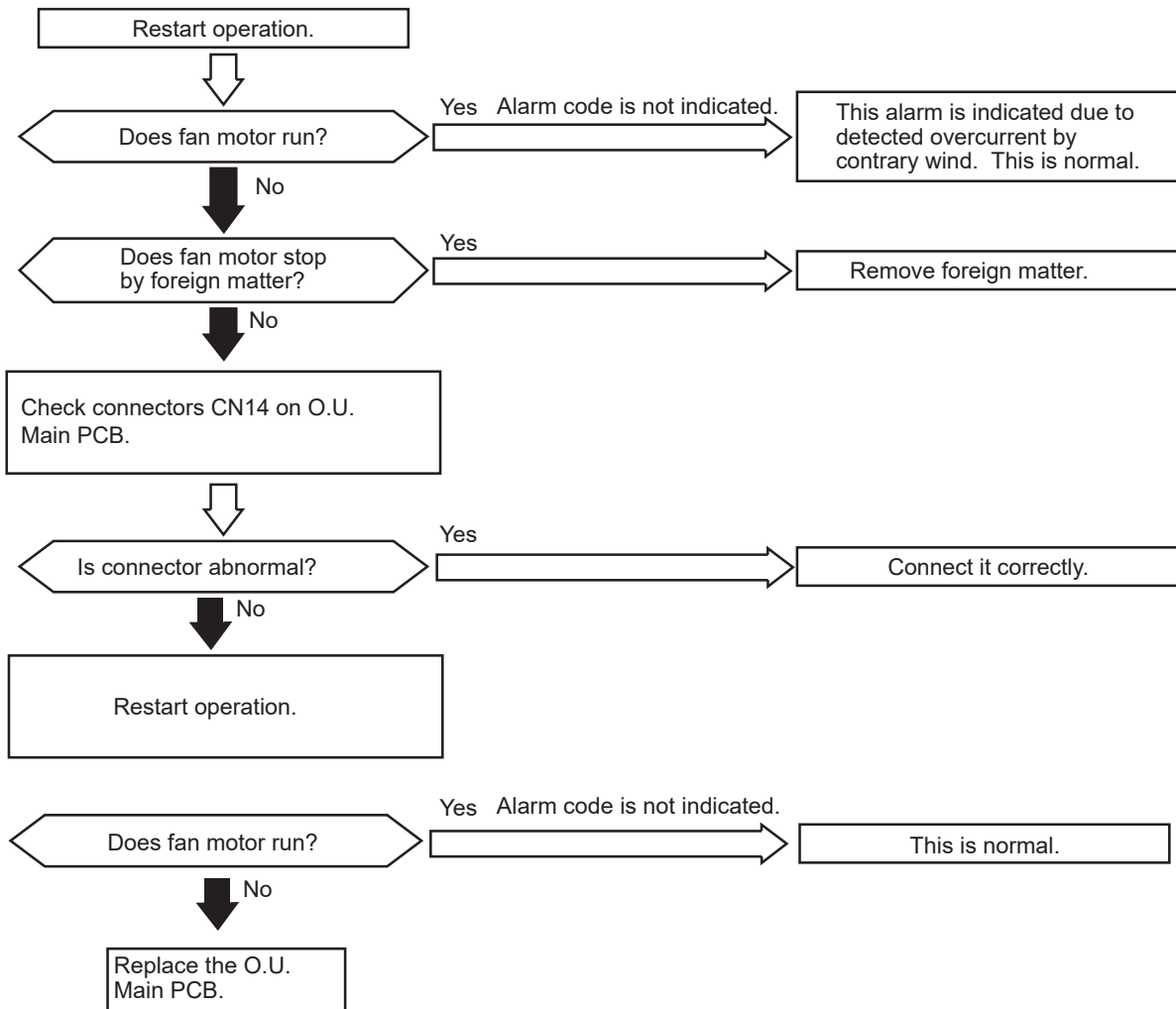


Alarm Code	57	Abnormality of Fan Motor
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- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- ★ When the following condition occurs three times in 30 minutes, the operation stops and this alarm code is displayed.  
If this occurs less than three times in 30 minutes, the operation automatically restarts.

Condition of Activation:

(1) Abnormal speed of Fan-motor detection (Cause code of inverter stoppage = 28)



Alarm Code	<b>EE</b>	Compressor Protection
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- ★ This alarm code appears when one of the following alarms occurs three times within 6 hours, which may result in serious compressor damages, if the outdoor unit is continuously operated without removing the cause.

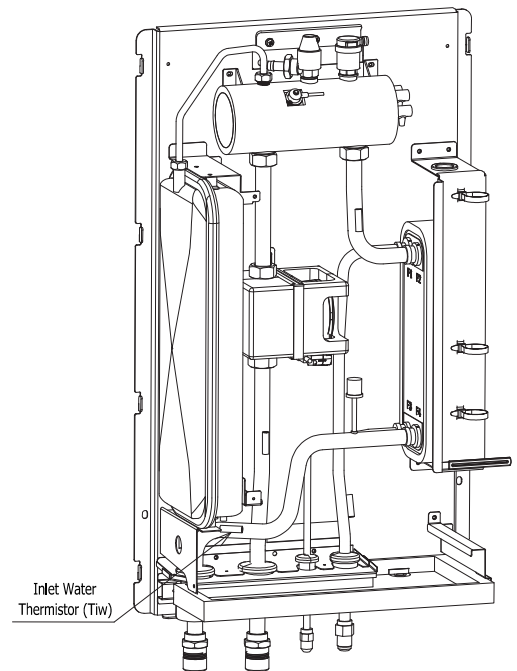
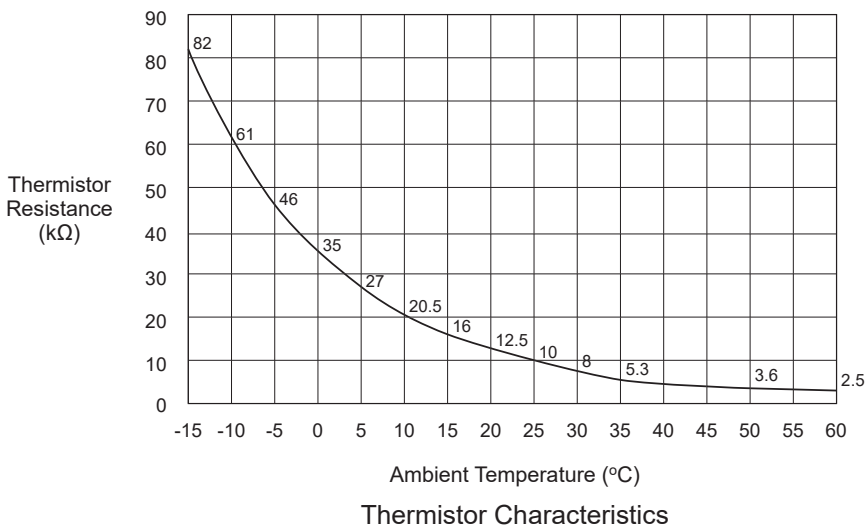
Alarm Code	Content of Abnormality
02	Activation of Protection Device (High Pressure Switch) in Outdoor Unit
07	Decrease in Discharge Gas Superheat
08	Excessively High Discharge Gas Temperature at Top of Compressor
43	Activation of Pressure Ratio Decrease Protection
44	Activation of Low Pressure Increase Protection
45	Activation of High Pressure Increase Protection Device
47	Activation of Low Pressure Decrease Protection

These alarms are able to be checked by the CHECK Mode. Follow the action indicated in each alarm chart. These alarms are cleared only by turning OFF the main power supply to the system. Do not restart the operation without taking any necessary action, since there is a possibility of causing serious damages to the compressors.

## 1.2.3.2 Troubleshooting of Alarm Code (I.U.)

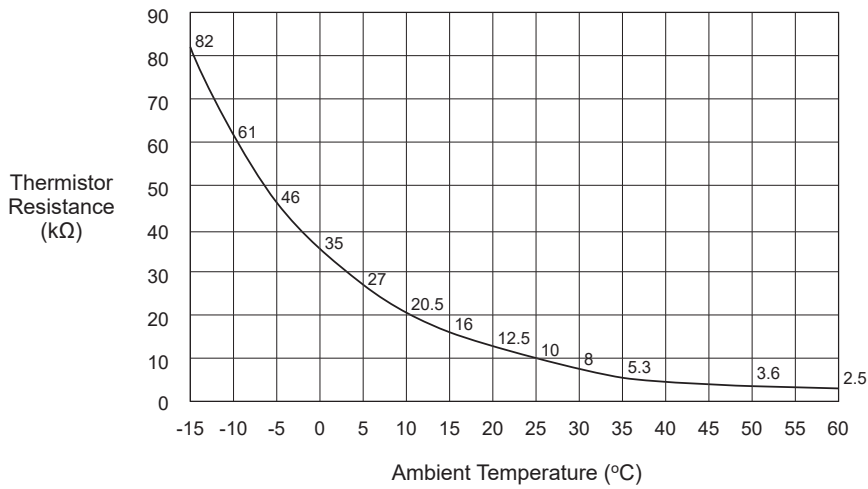
Alarm code	<b>11</b>	Inlet Water thermistor (Tiw) abnormality
------------	-----------	--

- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- This alarm code is indicated when a short circuit (less than 0.24kΩ) or disconnection (more than 840kΩ) of the thermistor is detected during the heating or cooling operation. The operation is automatically restarted when the malfunction is removed.
- Reset the unit to release the alarm.

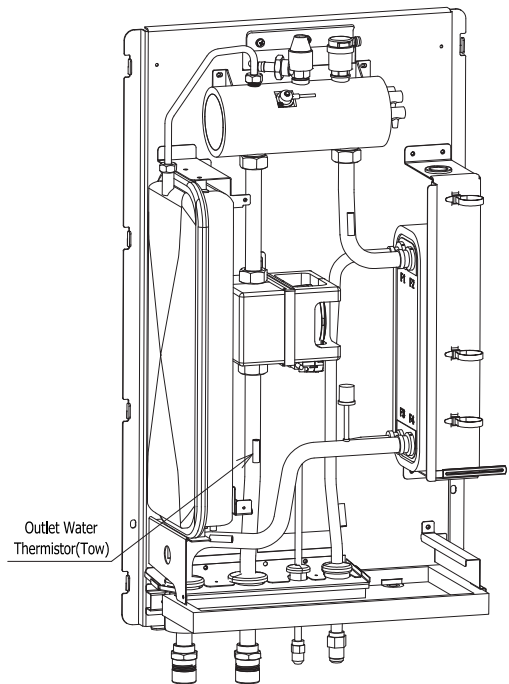


Alarm code	<b>12</b>	Outlet Water Thermistor (Tow) abnormality
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- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- This alarm code is indicated when a short circuit (less than 0.24kΩ) or disconnection (more than 840kΩ) of the thermistor is detected during the heating or cooling operation. The operation is automatically restarted when the malfunction is removed.
- Reset the unit to release the alarm.

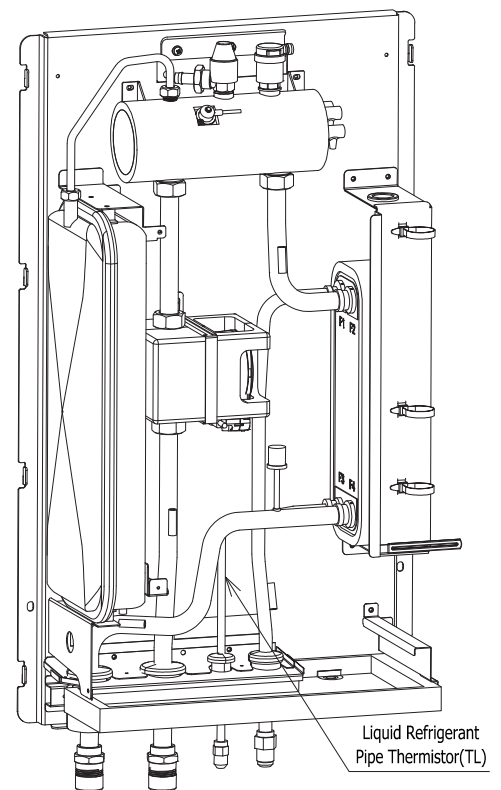
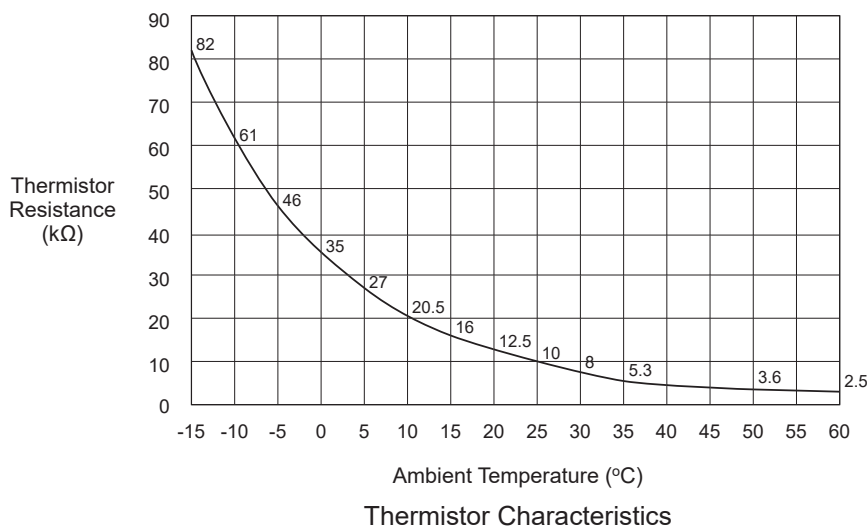


Thermistor Characteristics



Alarm code	13	Liquid Refrigerant Pipe Thermistor(TL) abnormality
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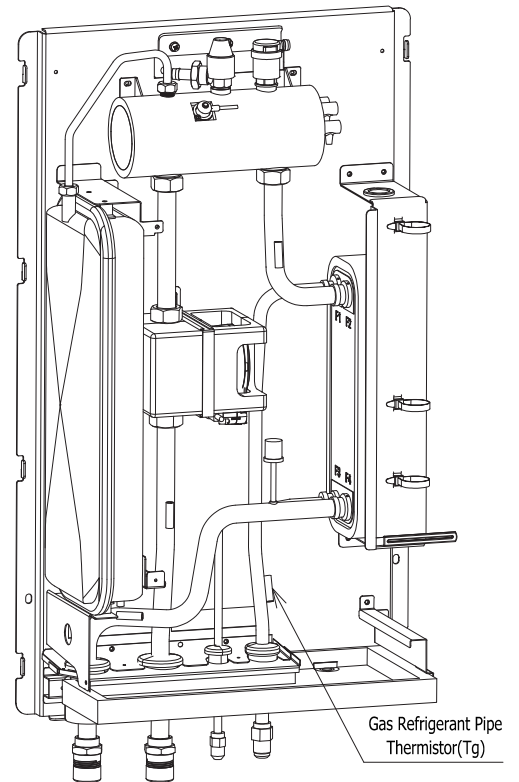
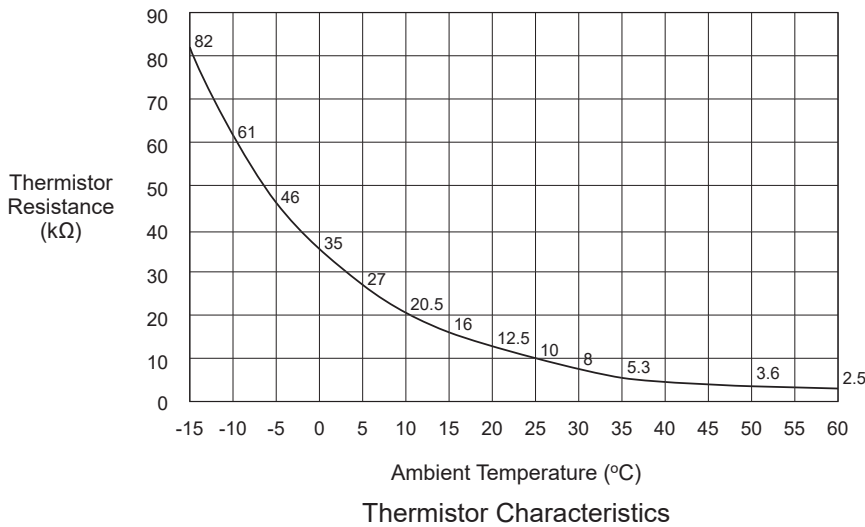
- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- This alarm code is indicated when a short circuit (less than 0.24kΩ) or disconnection (more than 840kΩ) of the thermistor is detected during the heating or cooling operation. The operation is automatically restarted when the malfunction is removed.
- Reset the unit to release the alarm.





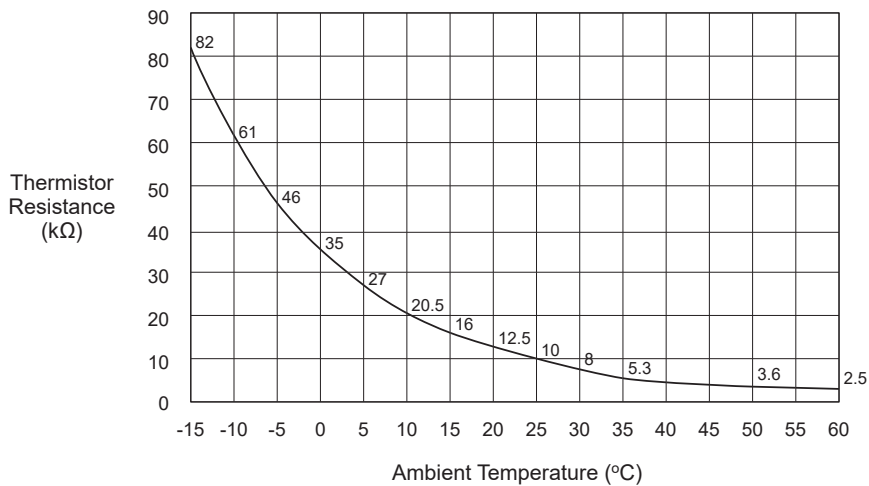
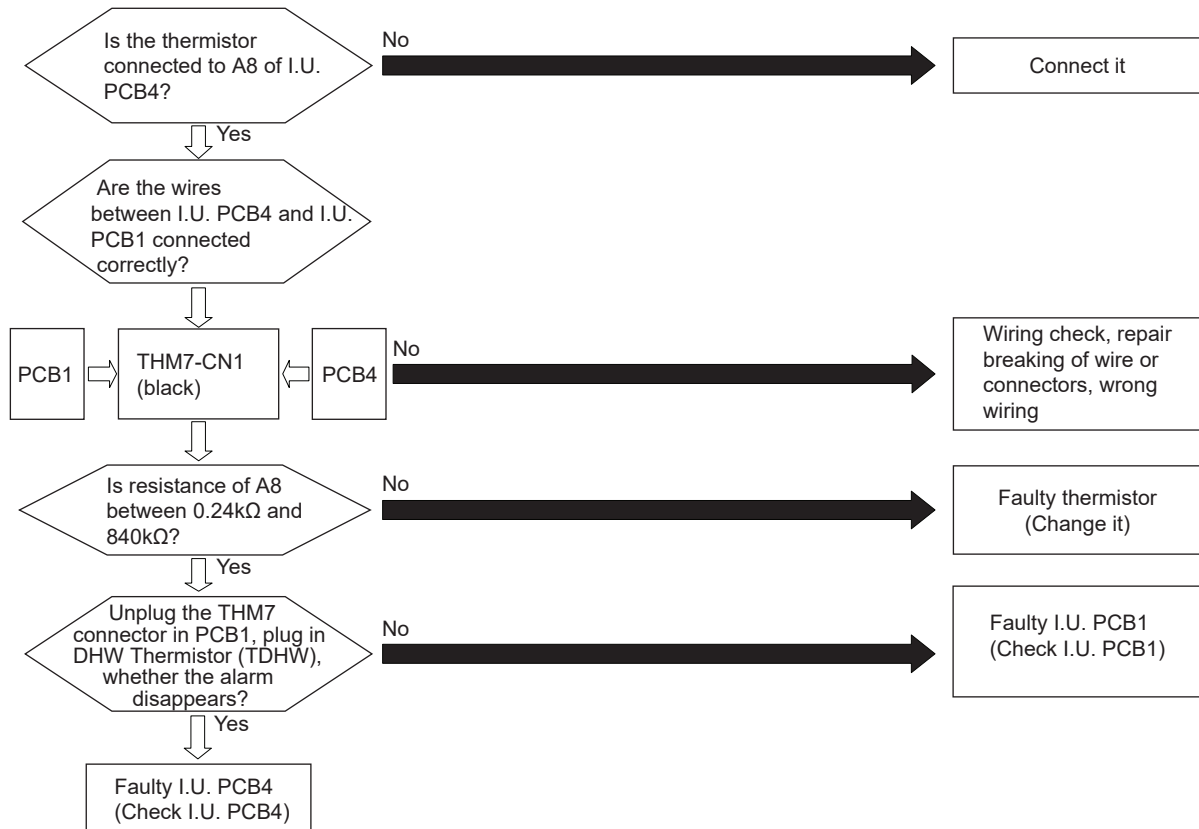
Alarm code	<b>14</b>	Gas Refrigerant Pipe Thermistor(Tg) abnormality
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- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- This alarm code is indicated when a short circuit (less than 0.24kΩ) or disconnection (more than 840kΩ) of the thermistor is detected during the heating or cooling operation. The operation is automatically restarted when the malfunction is removed.
- Reset the unit to release the alarm.



Alarm code	<b>16</b>	DHW Thermistor(TDHW) abnormality
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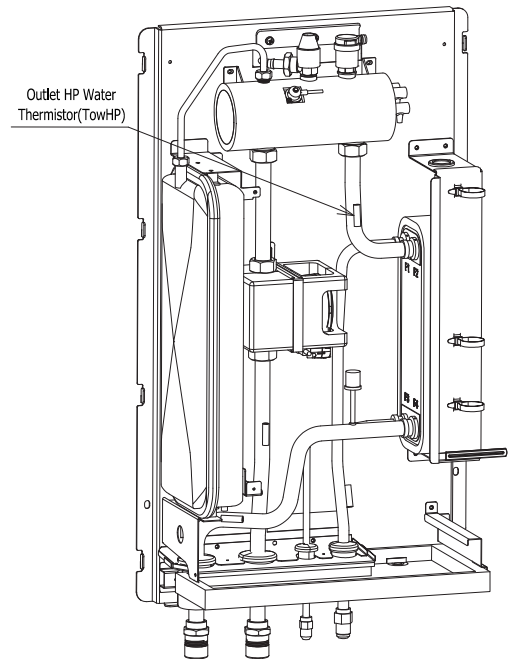
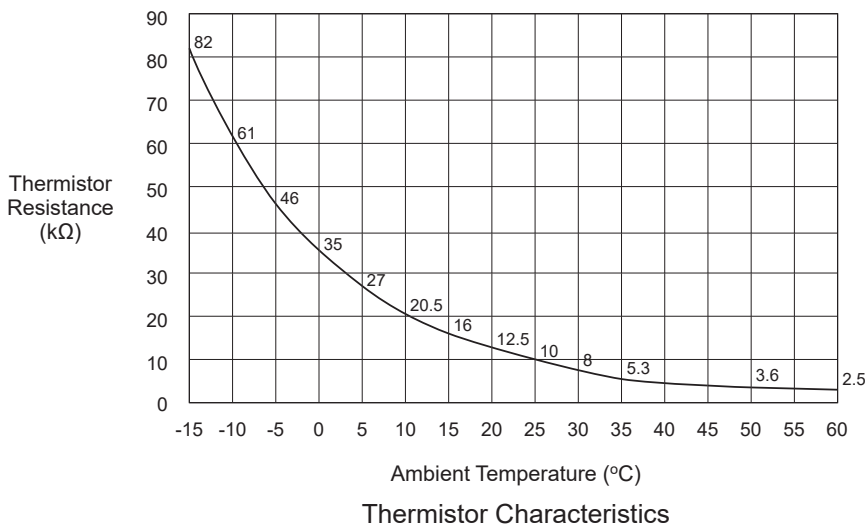
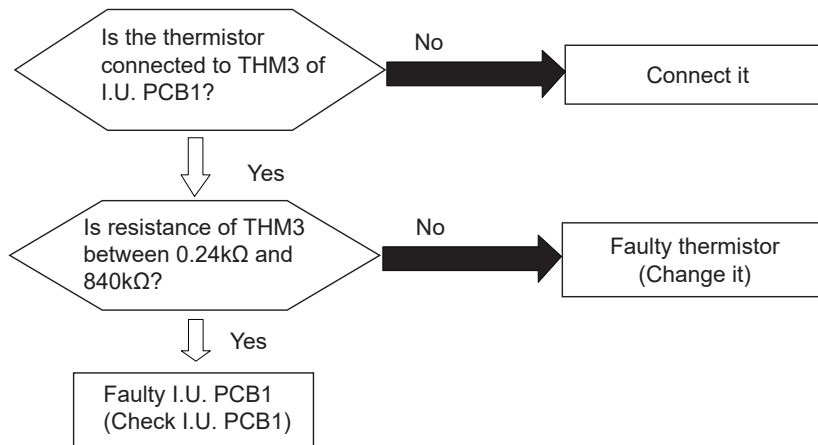
- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- This alarm code is indicated when a short circuit (less than 0.24kΩ) or disconnection (more than 840kΩ) of the thermistor is detected during the heating or cooling operation. The operation is automatically restarted when the malfunction is removed.
- Reset the unit to release the alarm.



Thermistor Characteristics

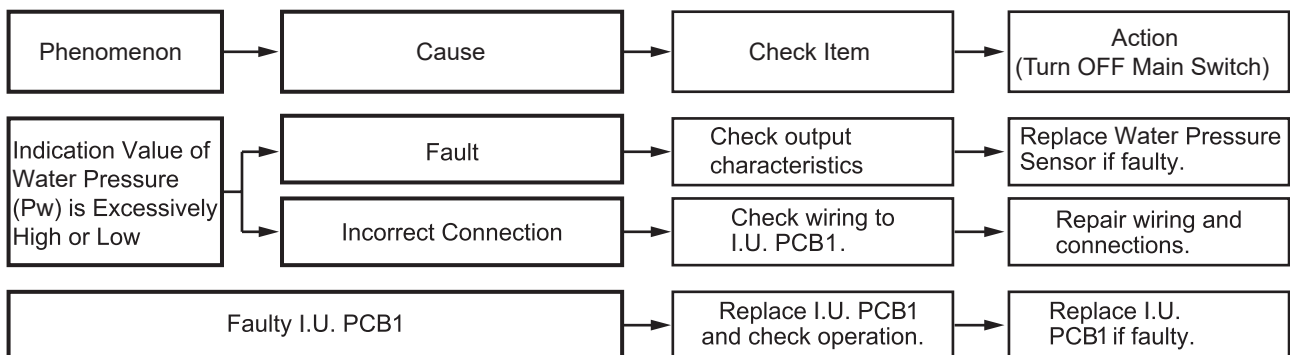
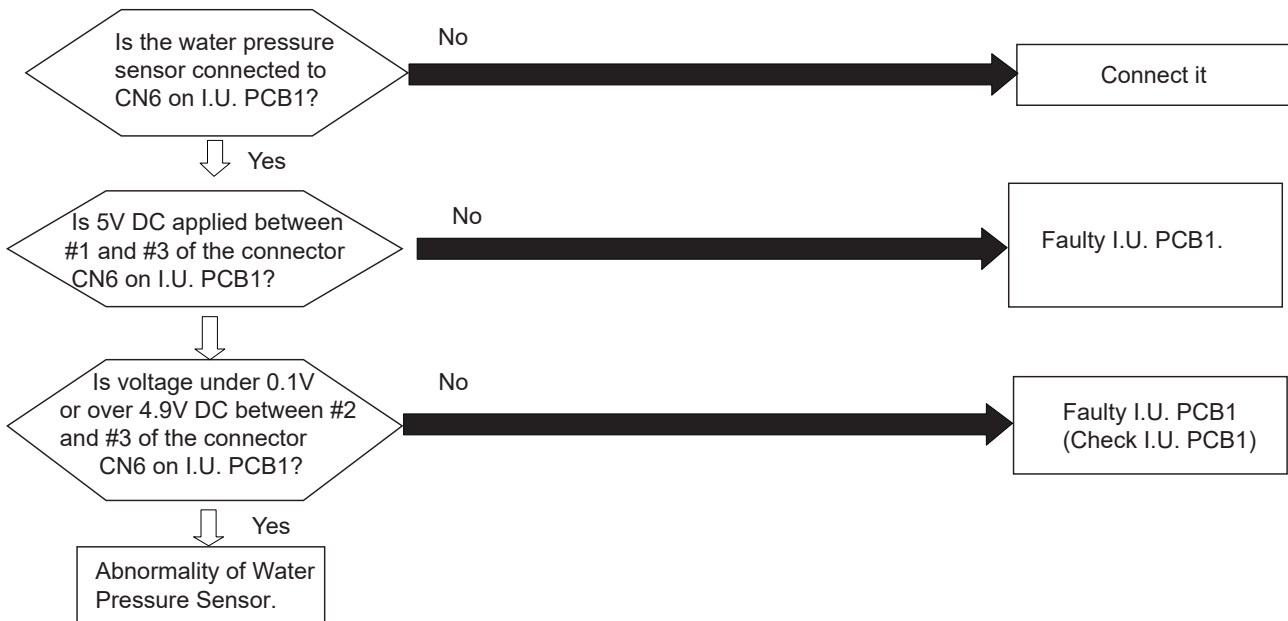
Alarm code	<b>17</b>	Outlet HP Water Thermistor(TowHP) abnormality
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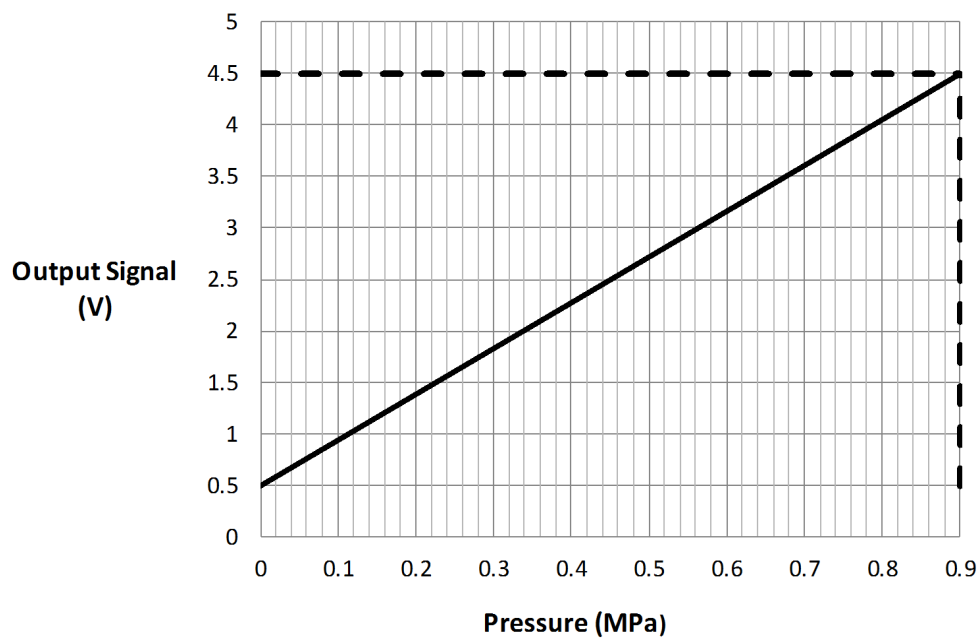
- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- This alarm code is indicated when a short circuit (less than 0.24kΩ) or disconnection (more than 840kΩ) of the thermistor is detected during the heating or cooling operation. The operation is automatically restarted when the malfunction is removed.
- Reset the unit to release the alarm.



Alarm code	<b>18</b>	Water Pressure Sensor(Pw) Abnormality
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- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- This alarm code is indicated when the pressure sensor voltage decreases to 0.1V or less or increases to 4.9V or more during running.
- Reset the unit to release the alarm.



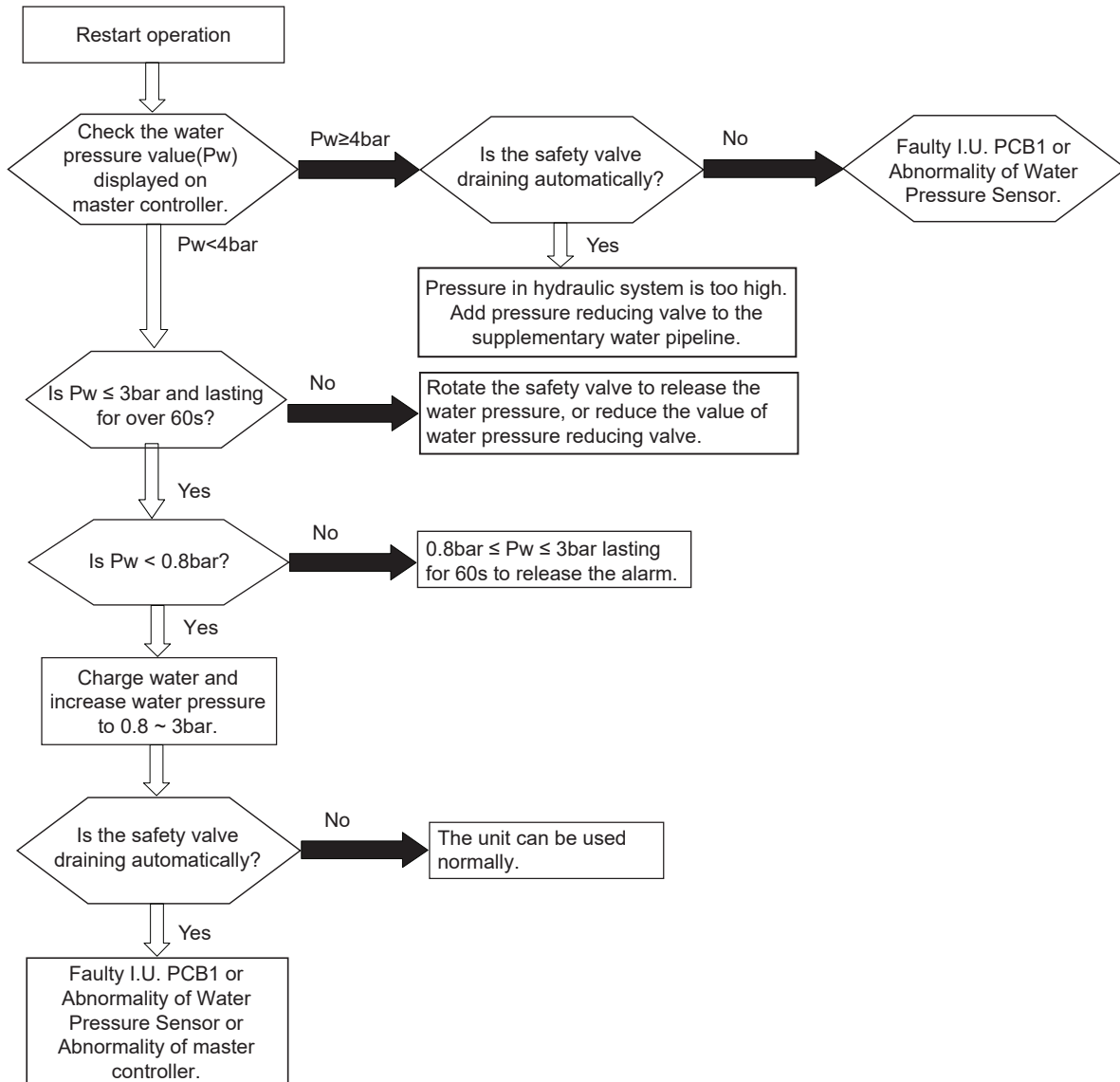
**TRANSFER FUNCTION**

$$V_{out} = 4.4444 \cdot P_g + 0.5 \quad \text{OR} \quad V_{out} = V_{in} \cdot (0.8889 \cdot P_g + 0.1)$$

$P_g$  = MPa (GAUGE)

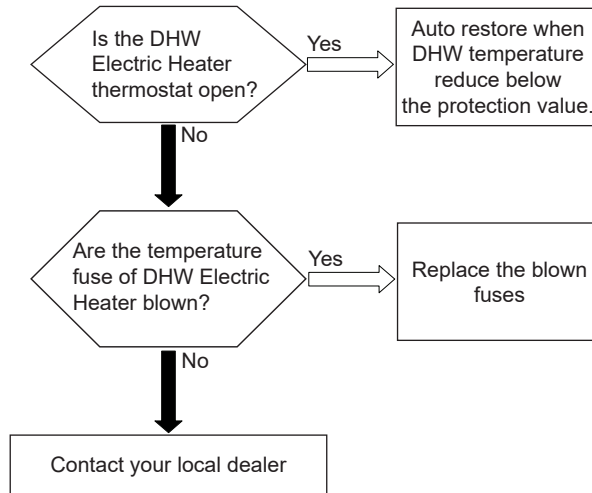
Alarm code	<b>70</b>	Water pressure alarm
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- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- This alarm is displayed when there is a low water pressure( $P_w < 0.3\text{bar}$ ) or high water pressure( $P_w \geq 4\text{bar}$ ) abnormality in the hydraulic system for 3 min and the same condition occurs three times or more within 60 minutes.  
Note: The detection is invalid when DSW3-3 ON.
- Reset the unit to release the alarm.



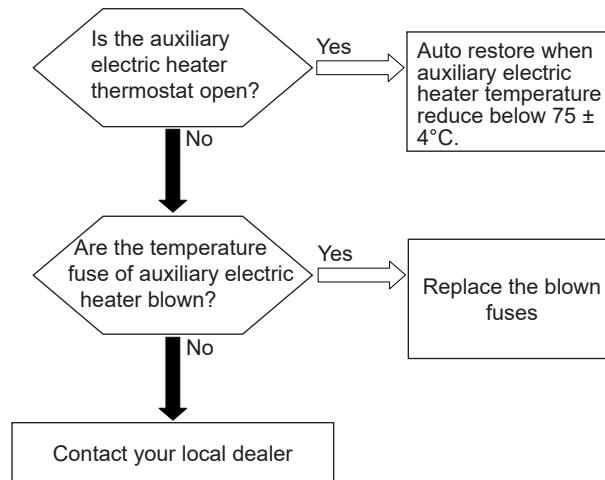
Alarm code	<b>71</b>	Protection Thermostat of DHW Electric Heater activation
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- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- This alarm is displayed when the temperature inside the DHW tank exceeds the safety temperature and protection thermostat is activated (field supplied).
- Reset the unit to release the alarm.



Alarm code	<b>72</b>	Protection Thermostat of Auxiliary Electric Heater Activation
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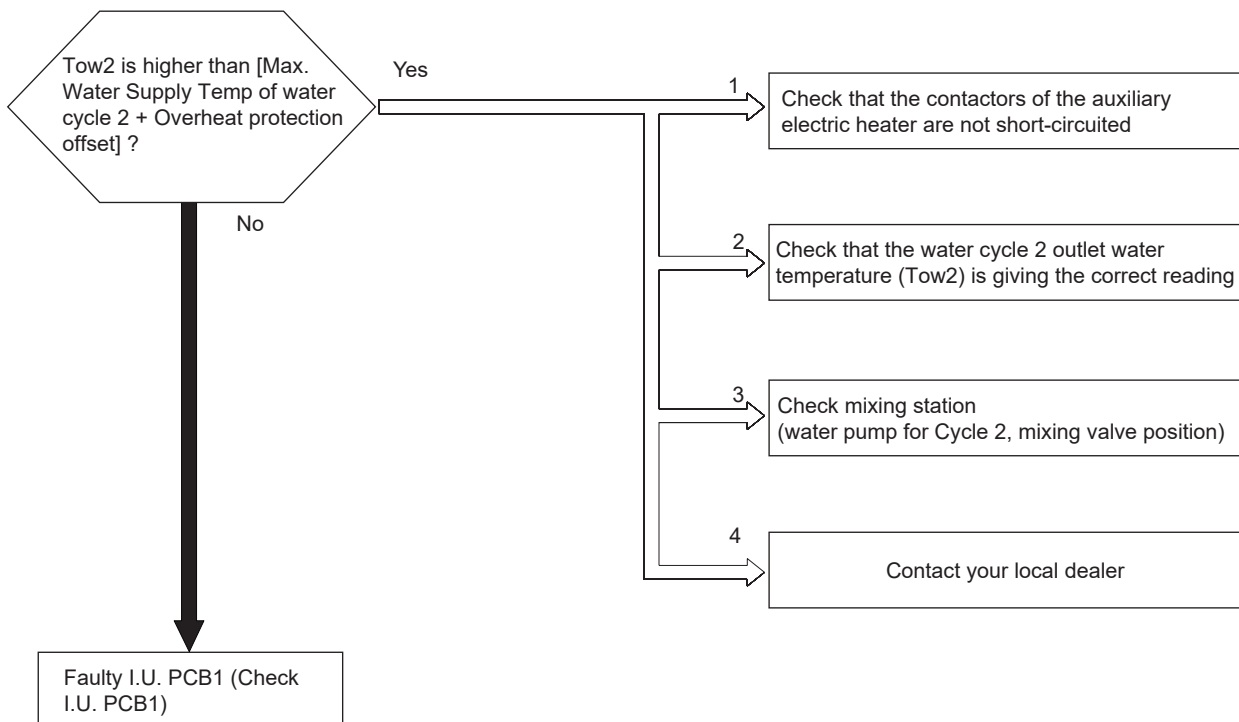
- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- This alarm is displayed when the temperature inside the auxiliary electric heater exceeds the safety temperature and protection thermostat is activated.
- Reset the unit to release the alarm.





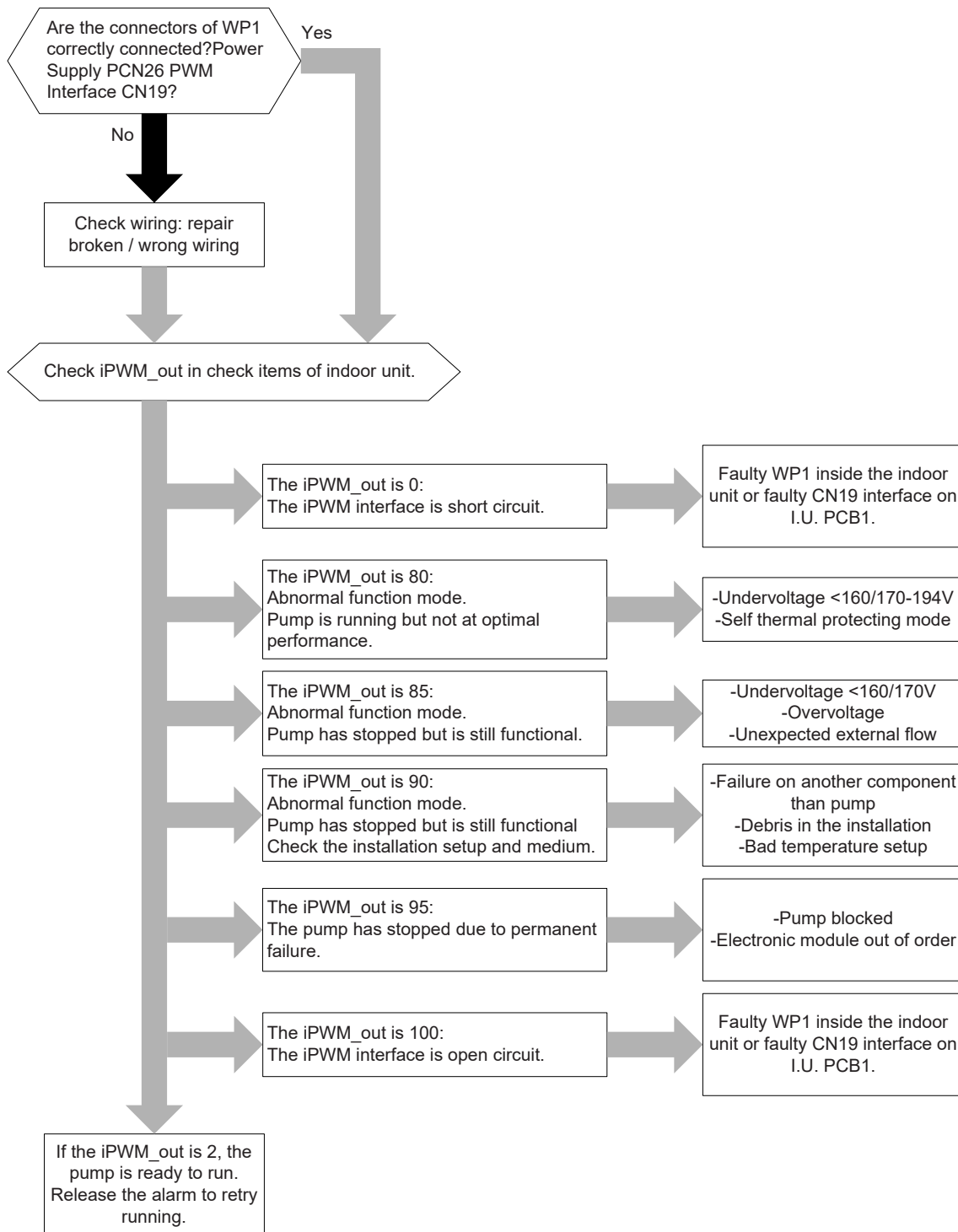
Alarm code	<b>74</b>	Mixing overheating limit protection for mixed circuit (Only if cycle 2 is enabled)
------------	-----------	--

- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- This alarm code is displayed when outlet water temperature of water cycle 2 (Tow2) is too high as following and the same condition occurs three times or more within 60 minutes.
  - (1) None of [OFF] is set by [Overheat protection offset].
  - (2) Detecting Tow2 is higher than [Max. Water Supply Temp of water cycle 2 + Overheat protection offset] for 10 minutes. referring to 10.2.2.2 Second water temperature control.
- Reset the unit to release the alarm.



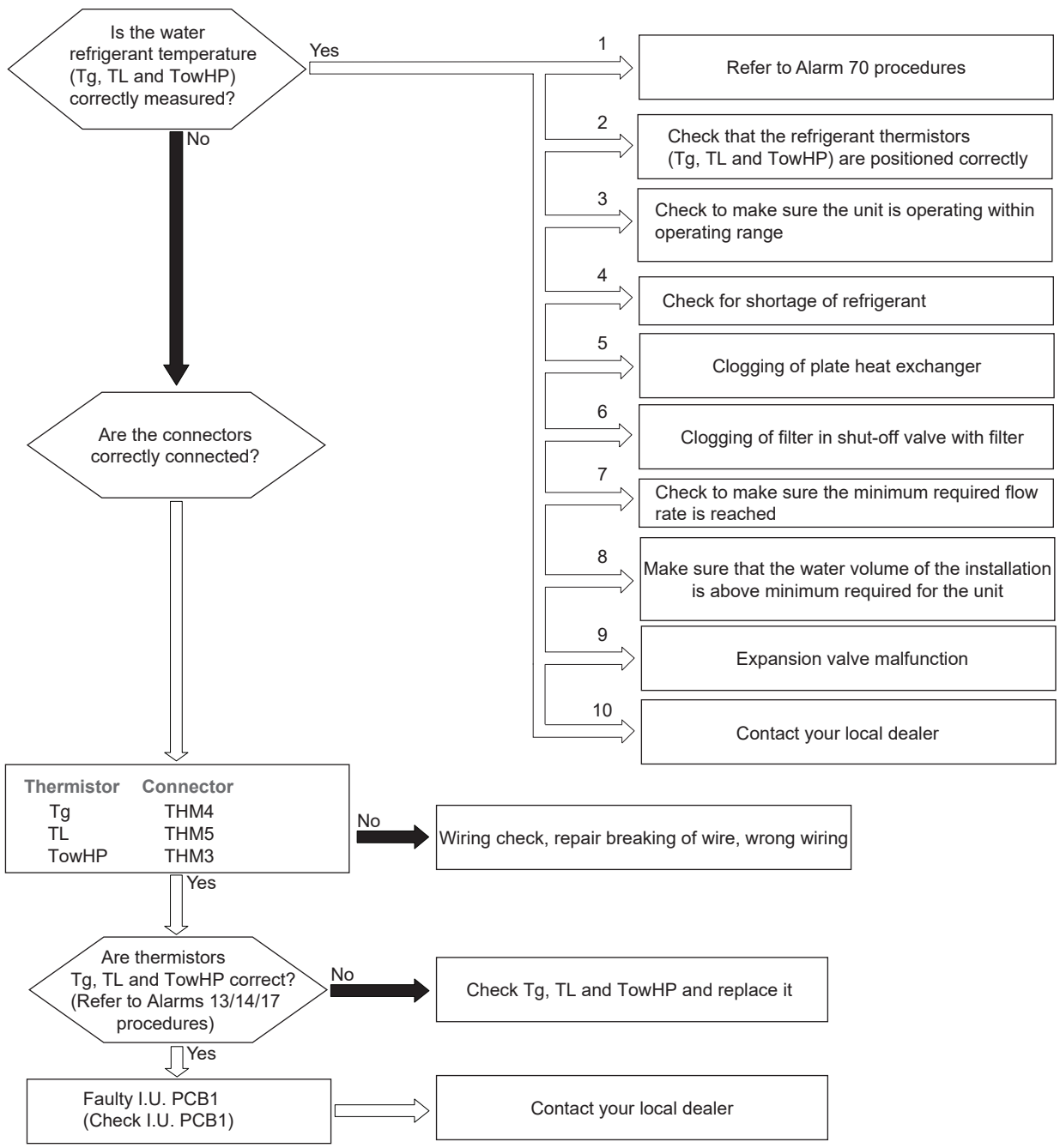
Alarm code	<b>75</b>	Water Pump (WP1) malfunction
------------	-----------	------------------------------

- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- This alarm is displayed when iPWM output of WP1 are 0 or 80-100% lasting for 120s and the same condition occurs three times or more within 60 minutes. referring to 10.8.4 EC WP1 Water flow feedback.  
Note: The detection is invalid when DSW5-1 ON.
- Reset the unit to release the alarm.



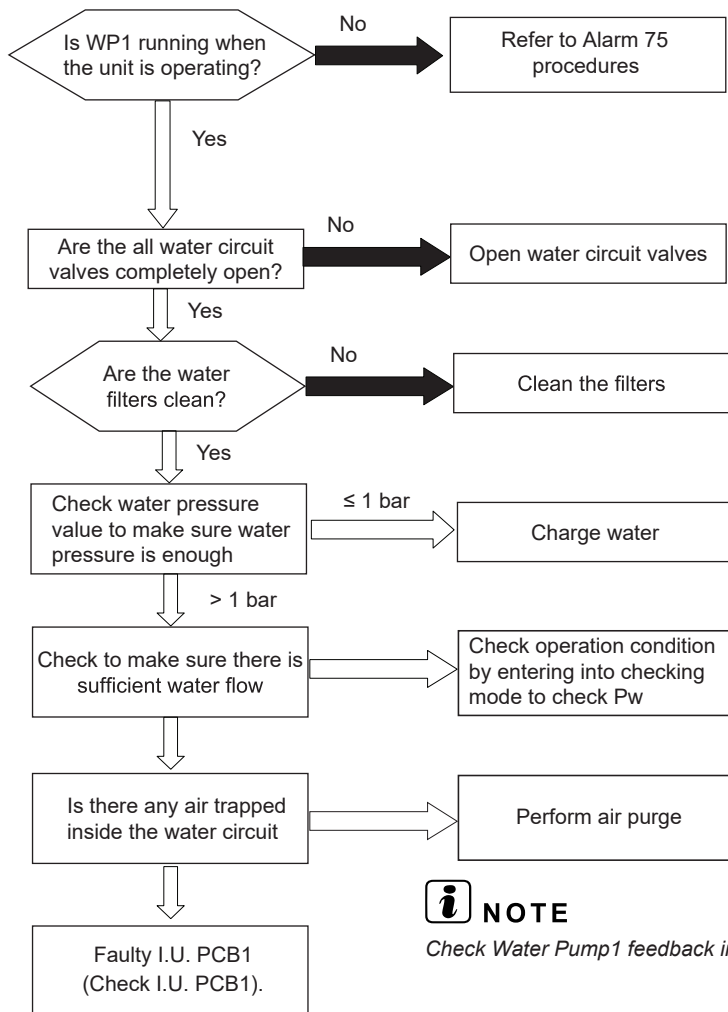
Alarm code	<b>76</b>	Freeze Protection Stop by indoor unit temperature thermistors
------------	-----------	---

- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- This alarm code is displayed when the following conditions are detected and the same condition occurs three times or more within 3 hours
  - Condition 1:  $TL + TowHP \leq 4[^\circ C]$  and  $TL \leq 1[^\circ C]$  lasting for 180s, during defrosting.
  - Condition 2: Meet any of following conditions during cooling operation:
    - (1)  $TL + TowHP \leq 4[^\circ C]$  and  $TL \leq 1[^\circ C]$  lasting for 180s.
    - (2)  $[TL \leq -4^\circ C$  and  $Tg \leq 8^\circ C]$  or  $[Tg \leq 1^\circ C]$  lasting for 240s.
    - (3)  $[TL \leq -16^\circ C$  and  $Tg \leq 8^\circ C]$  or  $[Tg \leq -1^\circ C]$  lasting for 60s.
- Reset the unit to release the alarm.



Alarm code	<b>78</b>	Hydraulic flow rate abnormality alarm (WP1)
------------	-----------	---

- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- This alarm is displayed when there is a low flow rate abnormality in the hydraulic system as following and the same condition occurs three times or more within 60 minutes.  
Note: The detection is invalid when DSW5-1 ON.
- Reset the unit to release the alarm.

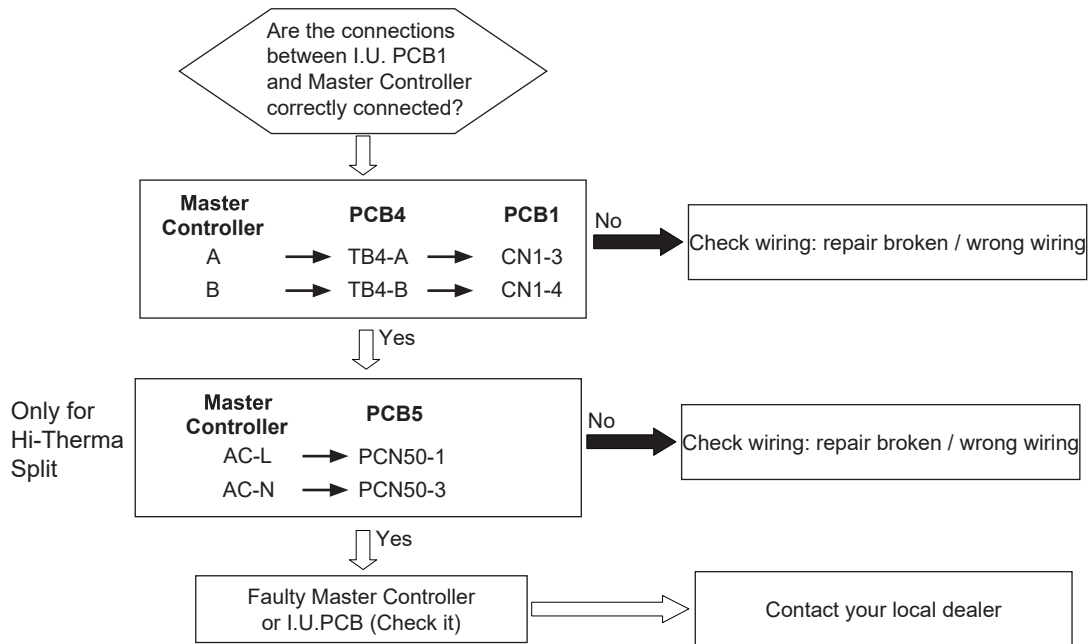


**i NOTE**

Check Water Pump1 feedback in "Alarm Code 75".

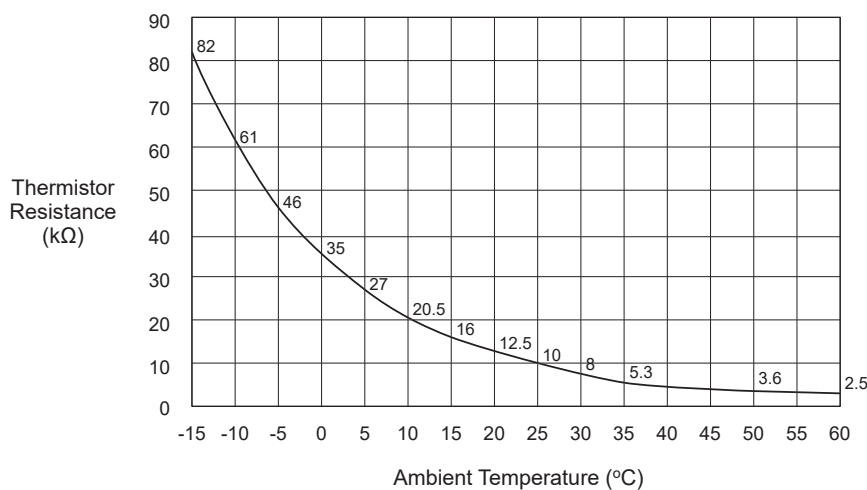
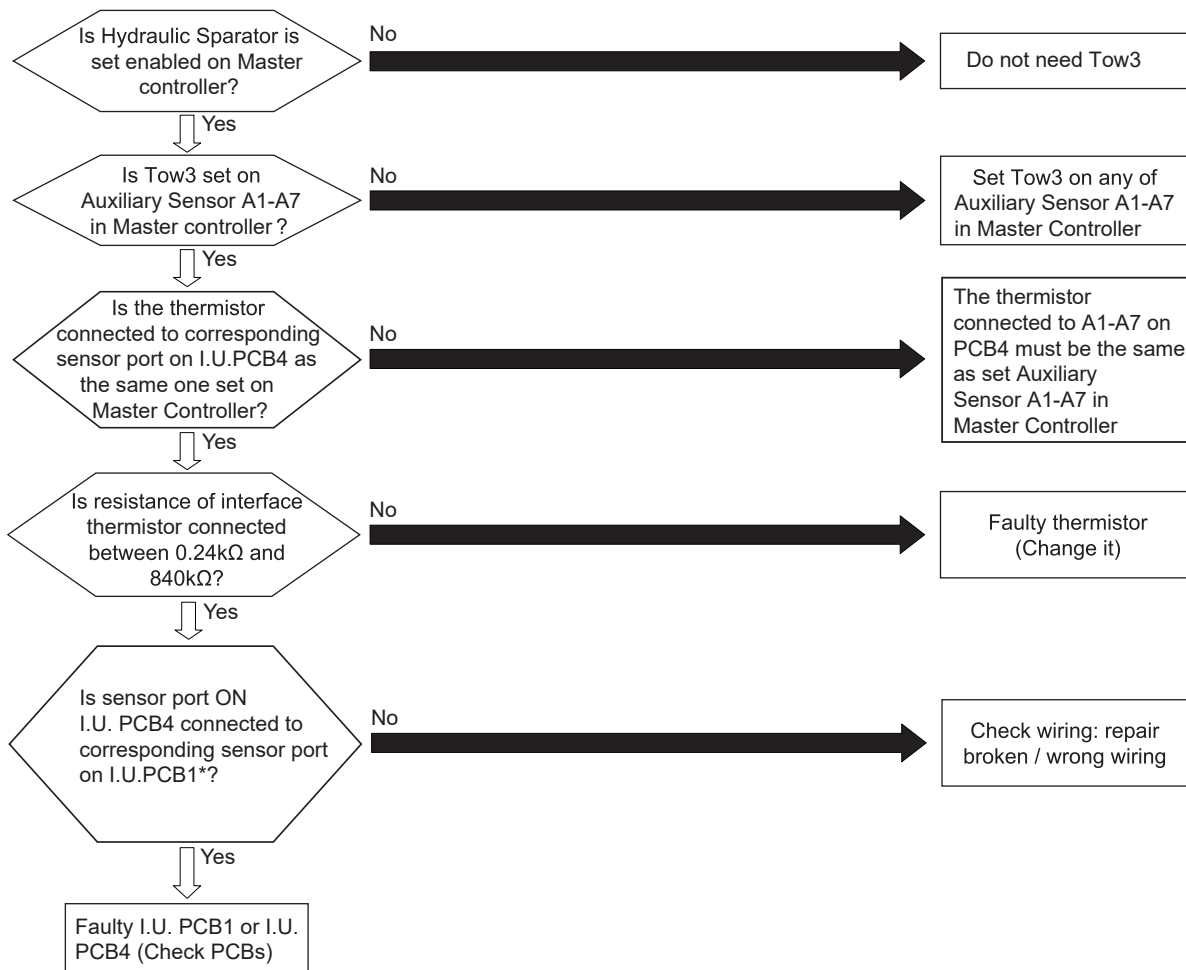
Alarm code	<b>80</b>	Transmission failure between Indoor unit and Master Controller
------------	-----------	--

- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- Alarm code is displayed when there is no communication between indoor unit PCB1 and the Master Controller for 5 minutes.
- Reset the unit to release the alarm.



Alarm code	<b>A1</b>	Auxiliary sensor Abnormality (Tow3)
------------	-----------	-------------------------------------

- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- This alarm code is indicated when a short circuit (less than 0.24kΩ) or disconnection (more than 840kΩ) of the thermistor is detected during the heating or cooling operation. The operation is automatically restarted when the malfunction is removed.
- Reset the unit to release the alarm.



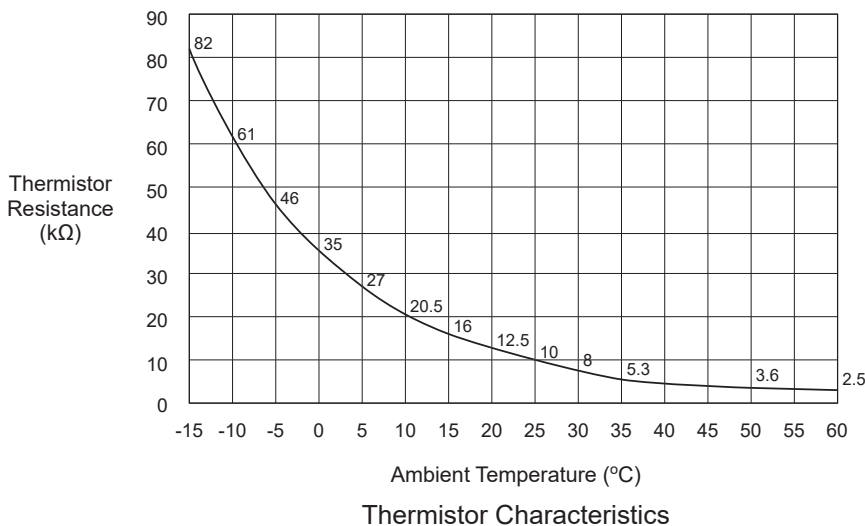
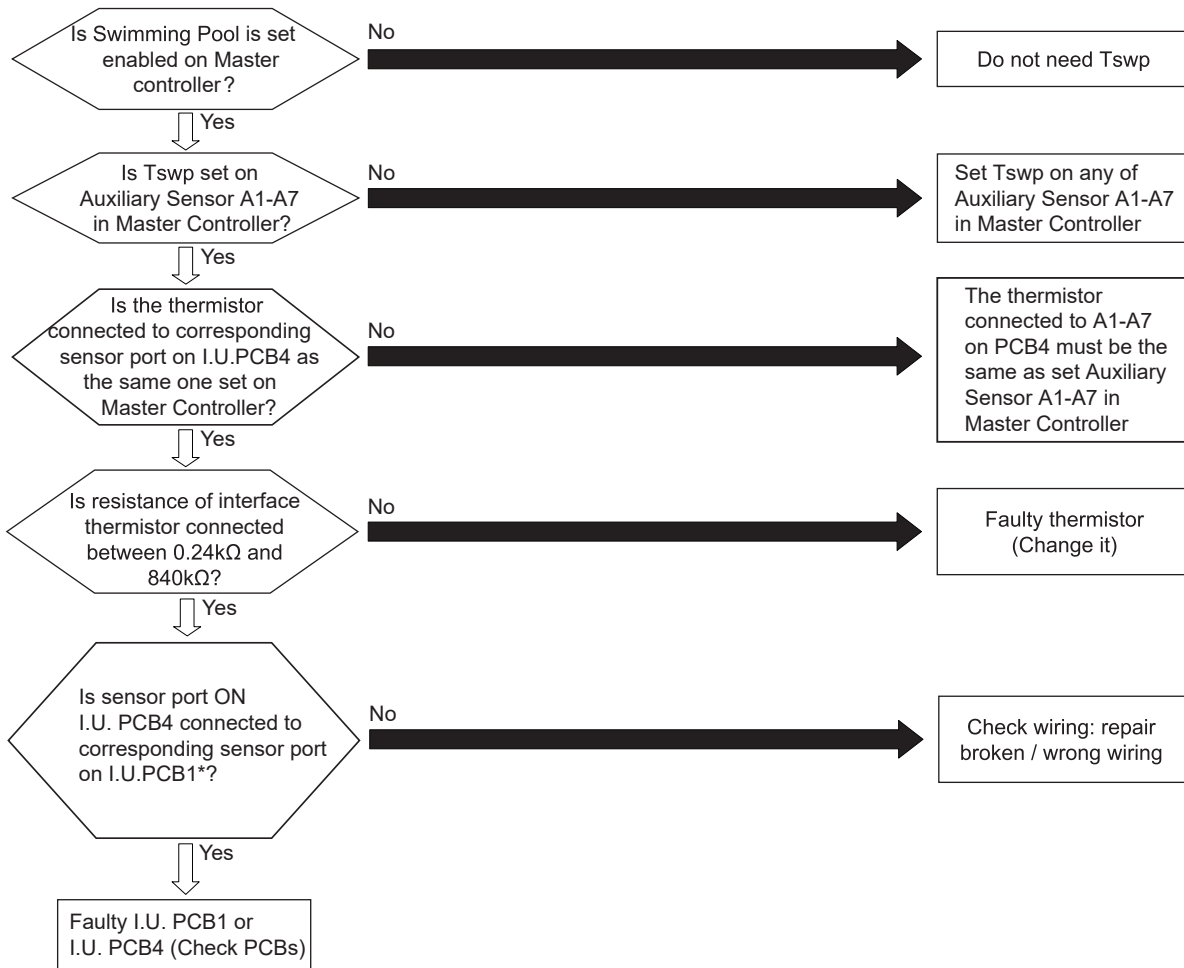
Thermistor Characteristics

\*I.U. PCB4 connected to corresponding sensor port on I.U.PCB1

I.U. PCN4	I.U.PCN4	I.U.PCB1
A1	CN1-12	THM8
	CN1-11	
A2	CN1-8	THM10
	CN1-7	
A3	CN1-10	THM9
	CN1-9	
A4	CN2-10	THM6
	CN2-9	
A5	CN1-6	THM11
	CN1-5	
A6	CN1-4	THM17
	CN1-3	
A7	CN1-2	THM18
	CN1-1	

Alarm code	<b>A2</b>	Auxiliary sensor Abnormality (Tswp)
------------	-----------	-------------------------------------

- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- This alarm code is indicated when a short circuit (less than 0.24kΩ) or disconnection (more than 840kΩ) of the thermistor is detected during the heating or cooling operation. The operation is automatically restarted when the malfunction is removed.
- Reset the unit to release the alarm.

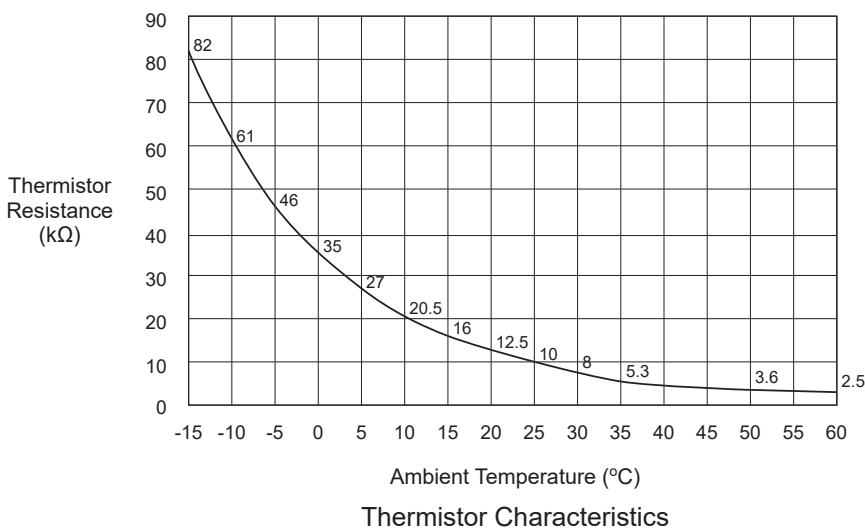
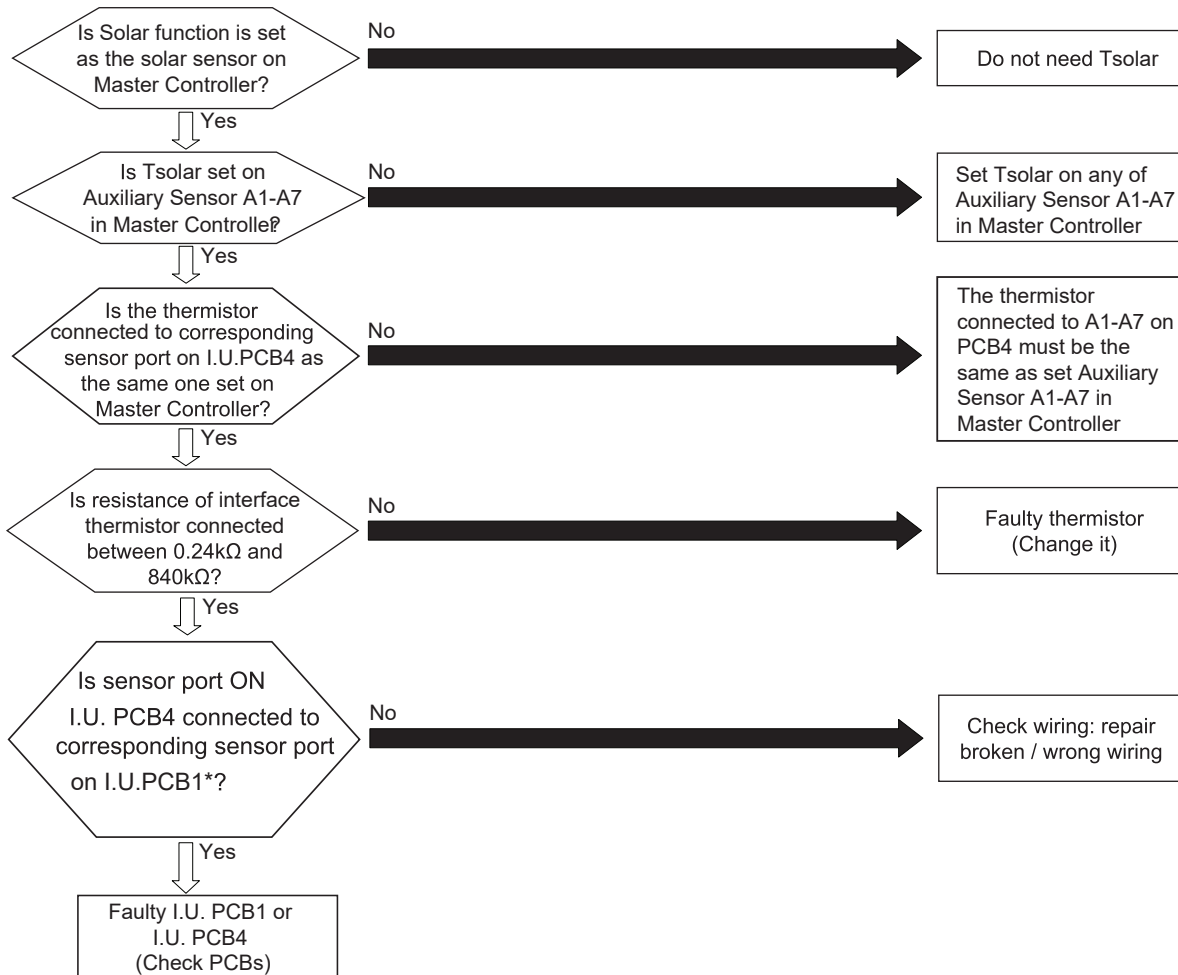


\*I.U. PCB4 connected to corresponding sensor port on I.U.PCB1

I.U. PCN4	I.U.PCN4	I.U.PCB1
A1	CN1-12	THM8
	CN1-11	
A2	CN1-8	THM10
	CN1-7	
A3	CN1-10	THM9
	CN1-9	
A4	CN2-10	THM6
	CN2-9	
A5	CN1-6	THM11
	CN1-5	
A6	CN1-4	THM17
	CN1-3	
A7	CN1-2	THM18
	CN1-1	

Alarm code	<b>A3</b>	Auxiliary sensor Abnormality (Tsolar)
------------	-----------	---------------------------------------

- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- This alarm code is indicated when a short circuit (less than 0.24kΩ) or disconnection (more than 840kΩ) of the thermistor is detected during the heating or cooling operation. The operation is automatically restarted when the malfunction is removed.
- Reset the unit to release the alarm.



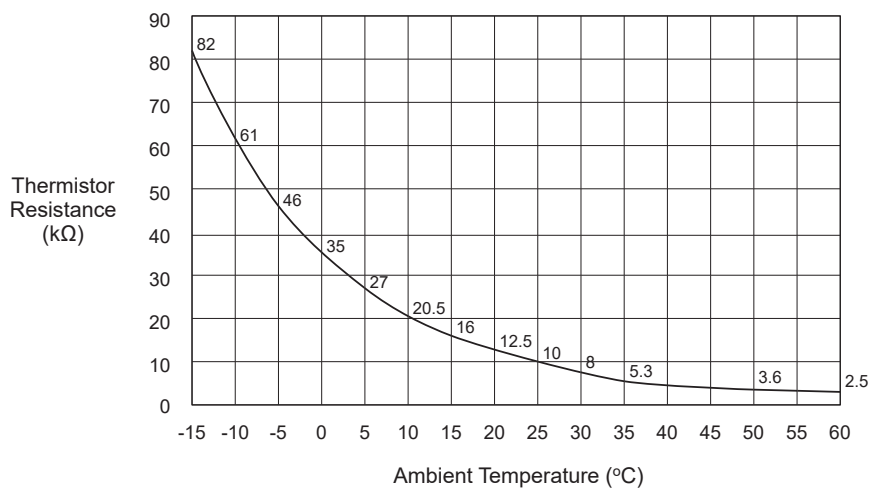
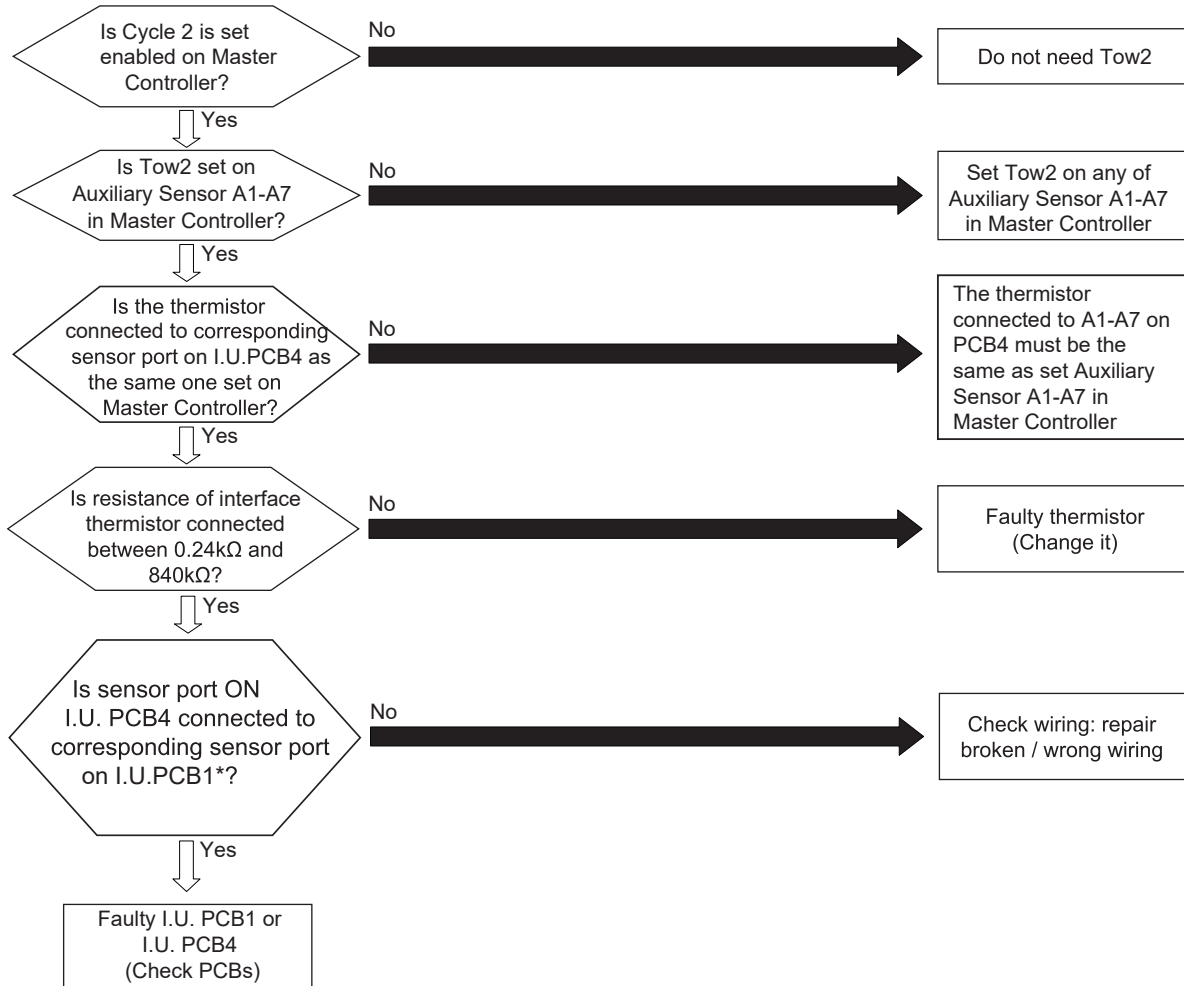
\*I.U. PCB4 connected to corresponding sensor port on I.U.PCB1

I.U. PCN4	I.U.PCN4	I.U.PCB1
A1	CN1-12	THM8
	CN1-11	
A2	CN1-8	THM10
	CN1-7	
A3	CN1-10	THM9
	CN1-9	
A4	CN2-10	THM6
	CN2-9	
A5	CN1-6	THM11
	CN1-5	
A6	CN1-4	THM17
	CN1-3	
A7	CN1-2	THM18
	CN1-1	



Alarm code	A4	Auxiliary sensor Abnormality (Tow2)
------------	----	-------------------------------------

- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- This alarm code is indicated when a short circuit (less than 0.24kΩ) or disconnection (more than 840kΩ) of the thermistor is detected during the heating or cooling operation. The operation is automatically restarted when the malfunction is removed.
- Reset the unit to release the alarm.



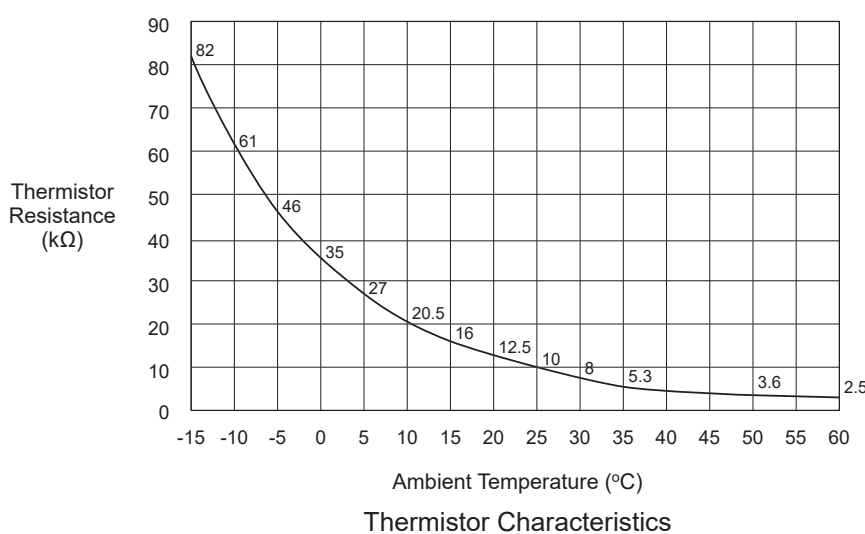
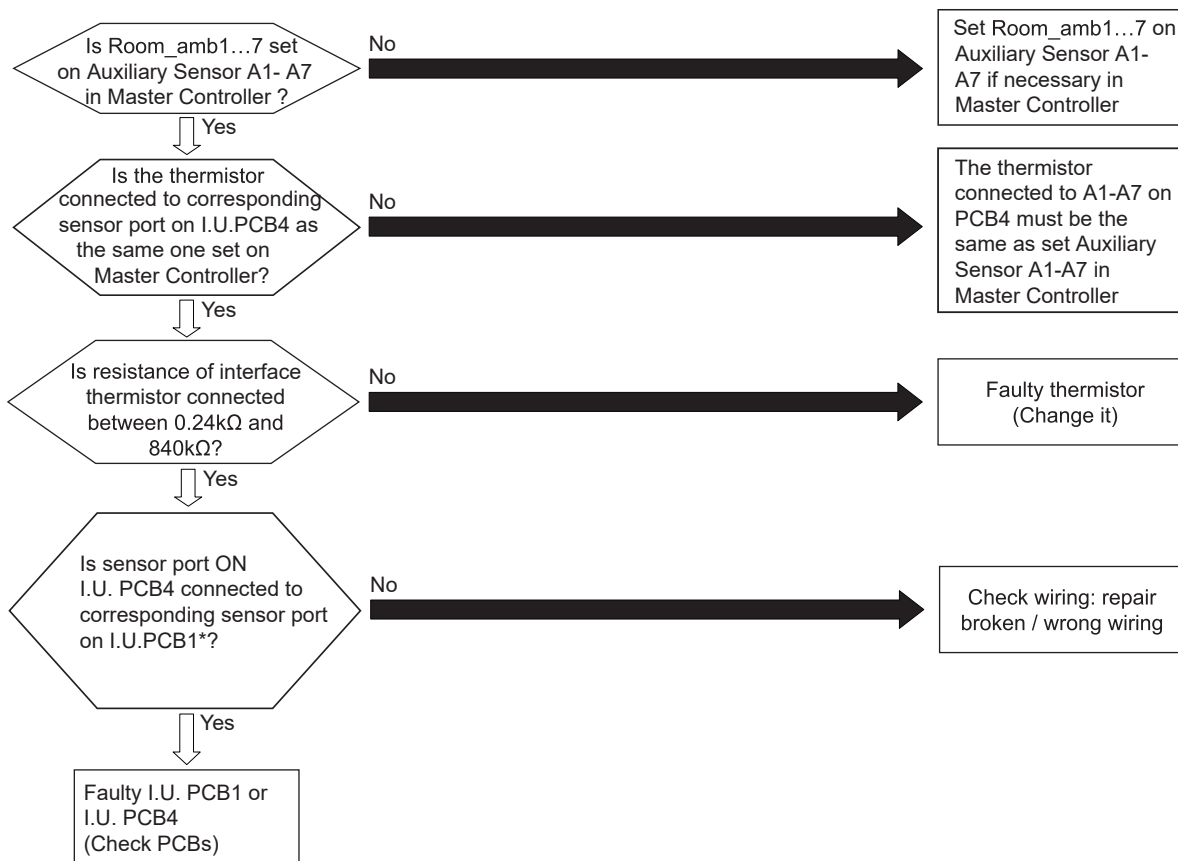
Thermistor Characteristics

\*I.U. PCB4 connected to corresponding sensor port on I.U.PCB1

I.U. PCN4	I.U.PCN4	I.U.PCB1
A1	CN1-12	THM8
	CN1-11	
A2	CN1-8	THM10
	CN1-7	
A3	CN1-10	THM9
	CN1-9	
A4	CN2-10	THM6
	CN2-9	
A5	CN1-6	THM11
	CN1-5	
A6	CN1-4	THM17
	CN1-3	
A7	CN1-2	THM18
	CN1-1	

Alarm code	A5	Auxiliary sensor Abnormality (Room_amb1...7)
------------	----	--

- Alarm code is displayed on the master controller/ the 7-segment of O.U. display PCB / the 7-segment of I.U. PCB1.
- This alarm code is indicated when a short circuit (less than 0.24kΩ) or disconnection (more than 840kΩ) of the thermistor is detected during the heating or cooling operation. The operation is automatically restarted when the malfunction is removed.
- Reset the unit to release the alarm.



\*I.U. PCB4 connected to corresponding sensor port on I.U.PCB1

I.U. PCN4	I.U.PCN4	I.U.PCB1
A1	CN1-12	THM8
	CN1-11	
A2	CN1-8	THM10
	CN1-7	
A3	CN1-10	THM9
	CN1-9	
A4	CN2-10	THM6
	CN2-9	
A5	CN1-6	THM11
	CN1-5	
A6	CN1-4	THM17
	CN1-3	
A7	CN1-2	THM18
	CN1-1	

Alarm code	<b>F1</b>	Alarm sent by Outdoor unit (Outdoor unit alarm 21-29).
------------	-----------	--

- Alarm code is displayed on the master controller / the 7-segment of I.U. PCB1.
- Reset the unit to release the alarm.

Alarm code	<b>F2</b>	Alarm sent by Outdoor unit (Outdoor unit alarm except 21-29 and EE).
------------	-----------	--

- Alarm code is displayed on the master controller / the 7-segment of I.U. PCB1.
- Reset the unit to release the alarm.

Alarm code	<b>F3</b>	Alarm sent by Outdoor unit (Outdoor unit alarm EE).
------------	-----------	---

- Alarm code is displayed on the master controller / the 7-segment of I.U. PCB1.
- Reset the unit to release the alarm.

Alarm code	<b>H2</b>	Wired Remote Controller and Master Controller transmission alarm.
------------	-----------	---

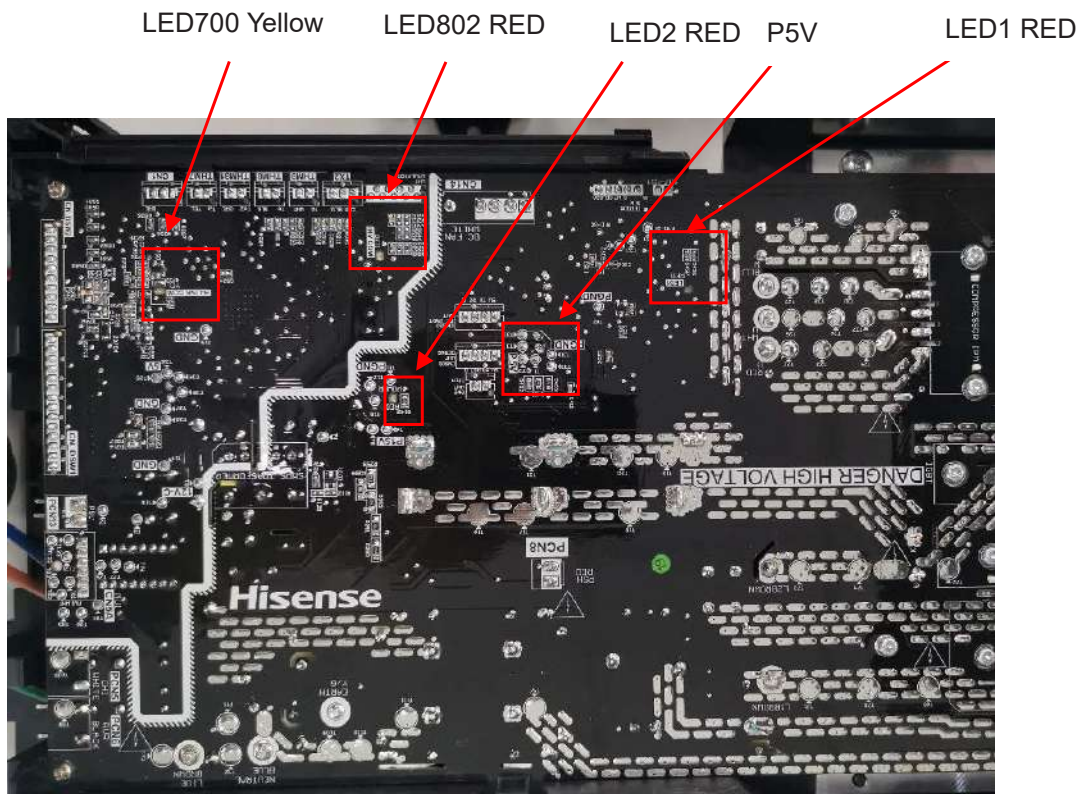
- This alarm is displayed only on Master Controller.
- Wired Remote Controller is configured as room thermostat but no Wired Remote Controller is detected.
- Reset the unit to release the alarm.

1.3 Checking procedure for main parts

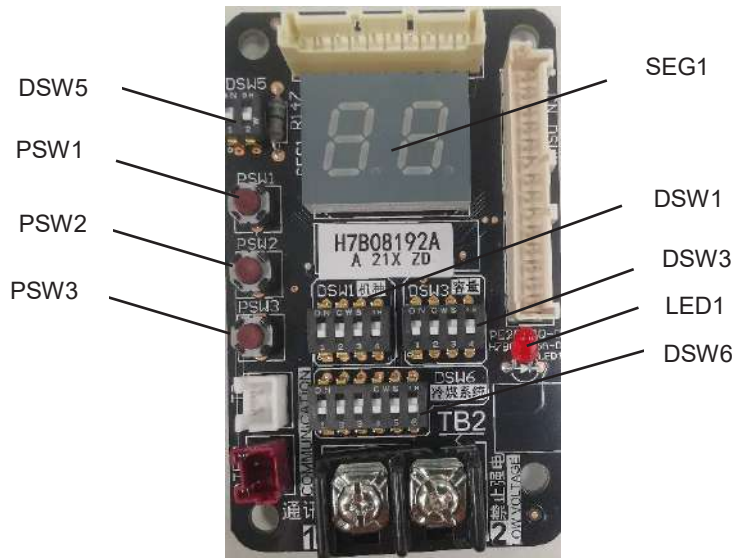
1.3.1 Functions of RSW; DSWs and LEDs

1.3.1.1 Functions of RSW; DSWs and LEDs (O.U.)

Part Name	Contents	
LEDs	LED1	Running status indicator of inverter on O.U. main PCB
	LED1	Power Supply Indication for O.U. display PCB
	LED2	Power Supply Indication for O.U. main PCB
	LED700	This LED700 indicates the transmission state between the outdoor unit and indoor unit
	LED802	This LED802 indicates the inverter transmission status
SEG	SEG1	Indicate alarm code and check parameters
DSWs	DSW1	No setting is required
	DSW3	Capacity setting
	DSW5	End resistance setting
	DSW6	Refrigeration system No. setting
PSWs	PSW1	Manual defrost operation switch. The defrost option is manually available under the forced defrost area
	PSW2	Available optional function. Setting can be selected using the 7-segment display
	PSW3	



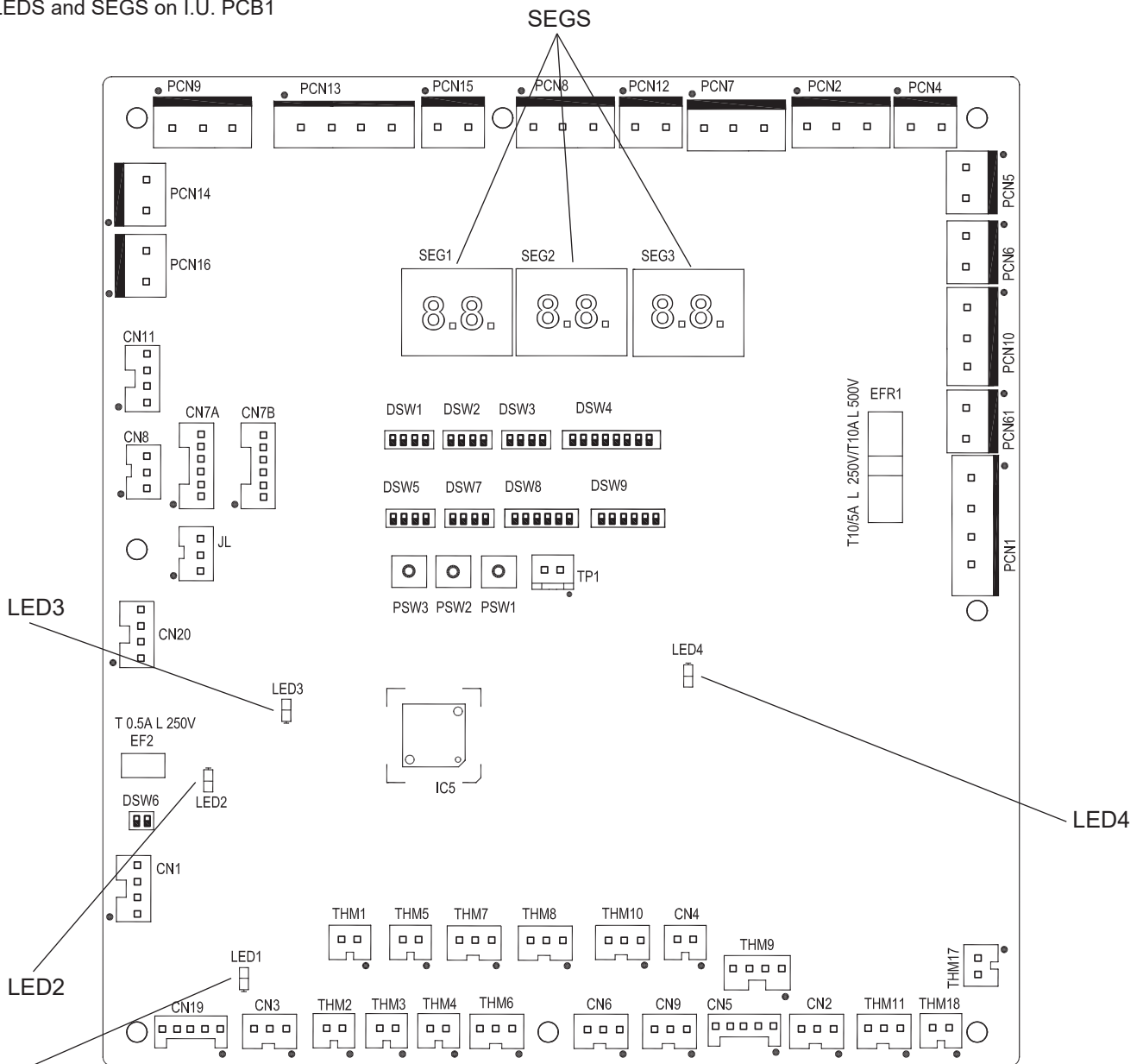
O.U. main PCB



O.U. Display PCB

1.3.1.2 Functions of RSW; DSWs and LEDs (IU)

LEDS and SEGS on I.U. PCB1



I.U. PCB1

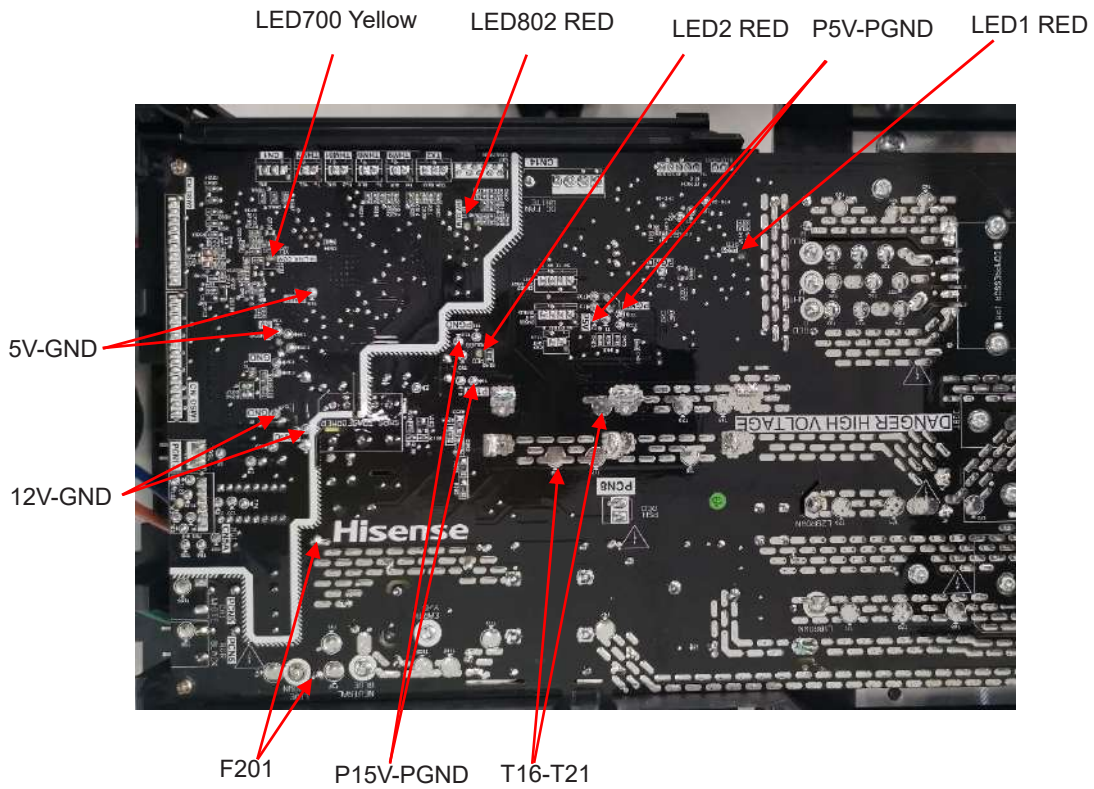
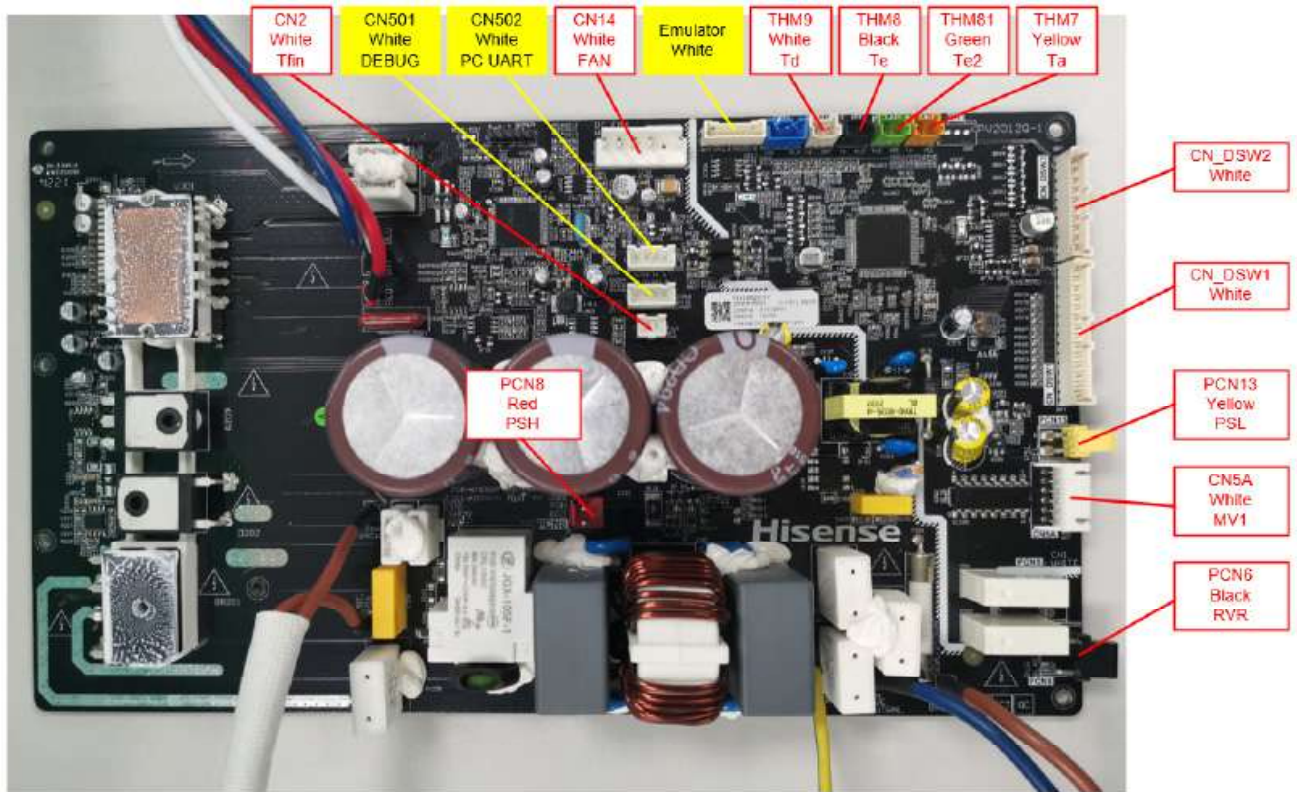
Part Name		Contents
LEDs	LED1	Not used (Green)
	LED2	This LED indicates the transmission status between the indoor unit and the master controller(Yellow)
	LED3	This LED indicates the transmission status between the indoor unit and the outdoor unit(Yellow)
	LED4	Power source for the I.U. PCB1(Red)
SEGs	SEG1-3	Indicate alarm code and check parameters
DSWs	DSW1	Unit model setting
	DSW2	Unit capacity setting
	DSW3	Additional setting
	DSW4	Additional setting
	DSW5	Additional setting
	DSW6	Fuse reset
	DSW7	Not used
	DSW8	Refrigeration system No. setting
	DSW9	Indoor unit No. setting
PSWs	PSW1	Check mode
	PSW2	Check mode
	PSW3	Check mode

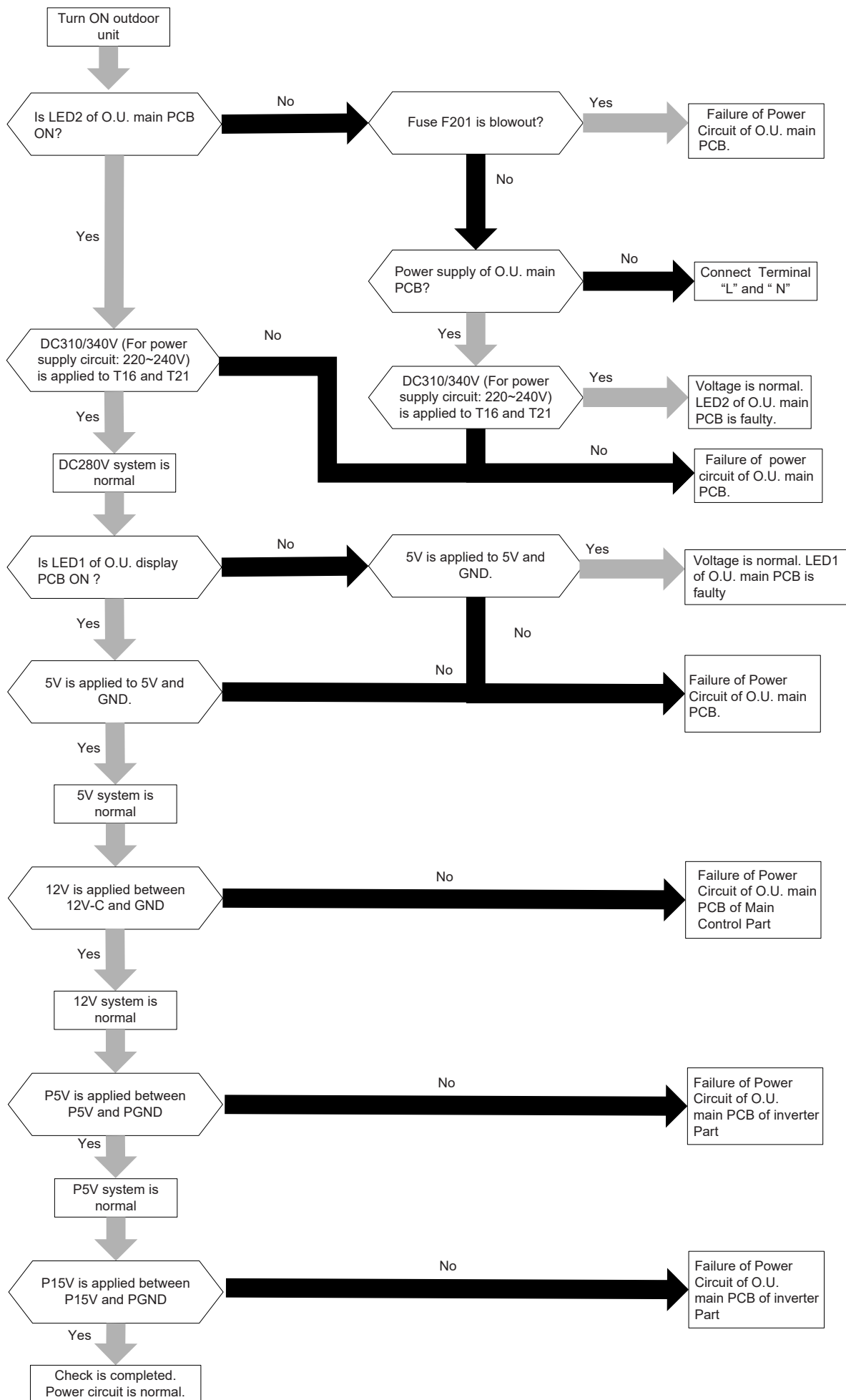


1.3.2 Checking of PCB and LEDs

1.3.2.1 Checking of O.U. main PCB

Outdoor unit main PCB check procedure







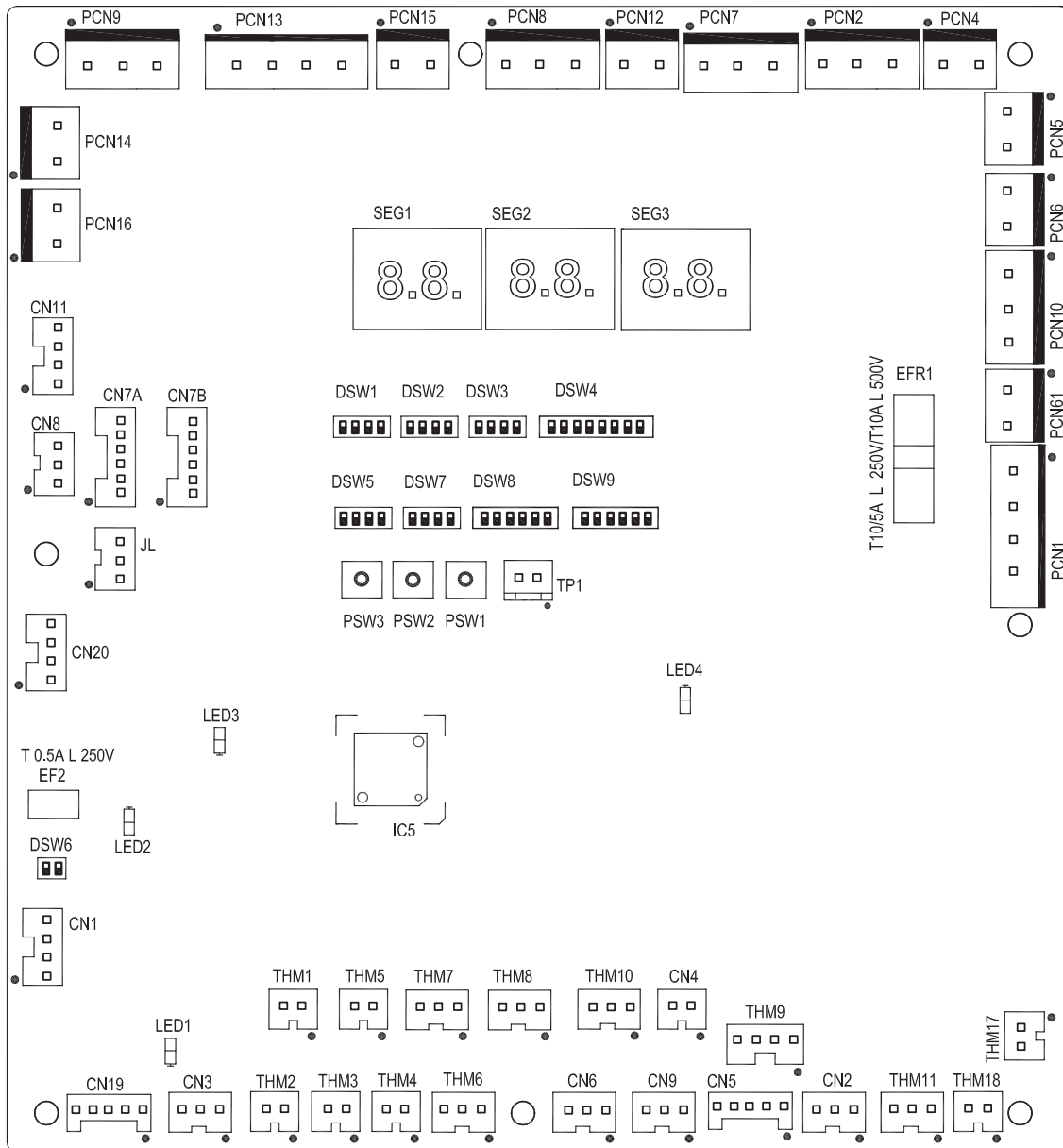
Checking of LED1 of O.U. main PCB for inverter

LED1 is the inverter running status indicator, which indicates the inverter running status and alarm information through flashing status.

- (1) LED1 flashes slowly when the inverter is standby, or running with a small current.
- (2) LED1 is on continuously when the inverter is running with high current and the PFC is operating.
- (3) LED1 will perform fast flash and slow flash alternately when the inverter stops and alarm occurs.

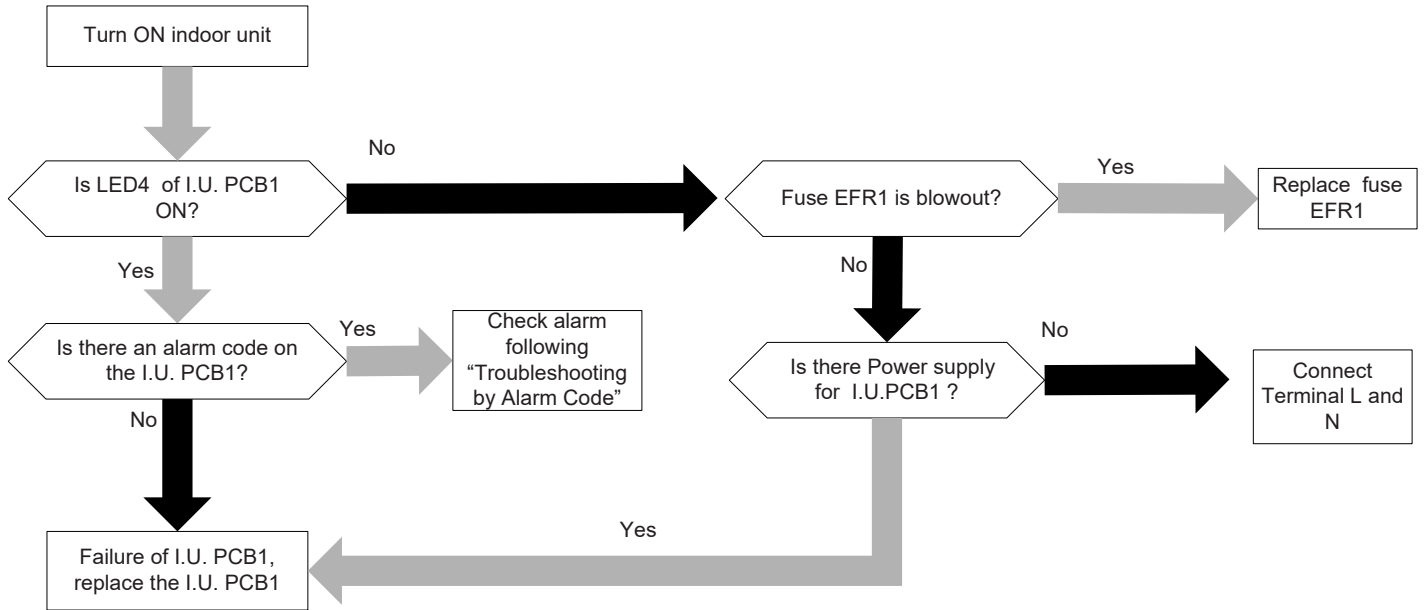
1.3.2.2 Checking of I.U.PCB1

Indoor unit PCB1 check procedure



Connector No.	Pin No.	Description	Default function
PCN1	PCN1-1	Power supply-L phase	-
	PCN1-3	Power supply-N phase	-
	PCN1-7	Earth	-
PCN10	PCN10-1	Input 4	Solar in
	PCN10-3	Input 3	-
	PCN10-5	Input 6	DHW boost
PCN61	PCN61	Not used	-
PCN4	PCN4-1	Input 1	Demand ON/OFF 1
	PCN4-3	Input 12	DHW THe2
PCN6	PCN6	Not used	-
PCN5	PCN5-1	L phase	-
	PCN5-3	Auxiliary E-heater thermostat	-
PCN7	PCN7-1	Auxiliary electric heater	Terminal1
	PCN7-3	Auxiliary electric heater	Terminal2
	PCN7-5	N phase	-
PCN2	PCN2-1	Output 6	3WV DHW
	PCN2-3	L phase	-
	PCN2-5	N phase	-
PCN12	PCN12-1	Output 7	Mixing valve Close
	PCN12-3	Output 8	Mixing valve Open
PCN8	PCN8-1	Output 10	3WV Cooling
	PCN8-3	L phase	-
	PCN8-5	N phase	-
PCN15	PCN15-1	DHW electric heater	-
	PCN15-3	N phase	-
PCN13	PCN13-1	Output 15	Act4
	PCN13-3	Output 14	Act3
	PCN13-5	Output 13	Act2
	PCN13-7	N phase	-
PCN9	PCN9-1	Not used	-
	PCN9-3	Output 1	3WV SWP
	PCN9-5	N phase	-
PCN16	PCN16-1	Output 4	Solar out
	PCN16-3		
PCN14	PCN14-1	Output 3	Boiler combination
	PCN14-3		
CN7A	CN7A	Not used	-
CN7B	CN7B	Not used	-
CN8	CN8-1	DC 13V	-
	CN8-2	Output 2	WP3
	CN8-3	Output 12	Act1
CN1	CN1-1	Communication with outdoor unit	-
	CN1-2		
	CN1-3	Communication with controller	-
	CN1-4		
CN19	CN19-1	DC 13V	-
	CN19-2	GND	-
	CN19-3	DC PUMP Feedback signal	-
	CN19-4	DC PUMP Control signal	-
	CN19-5	Not used	-
CN3	—	Not used	-

Connector No.	Pin No.	Description	Default function
THM1	THM1	Tow	-
THM2	THM2	Tiw	-
THM3	THM3	TowHP	-
THM4	THM4	Tg	-
THM5	THM5	TL	-
THM6	THM6	Auxsensor 4	Tow2
THM7	THM7	Auxsensor 8	TDHW
THM8	THM8	Auxsensor 1	Tow3
THM9	THM9	Auxsensor 3	Tswp
THM10	THM10	Auxsensor 2	Tsolar
THM11	THM11	Auxsensor 5	-
THM17	THM17	Auxsensor 6	Room_amb1
THM18	THM18	Auxsensor 7	Room_amb2
CN6	CN6	Pdw	-
CN4	CN4	Input 11	-
CN2	CN2-1	Input 2	c1&c2&ECO
	CN2-2	DC 13V	-
	CN2-3	Input 5	Smart Act.
CN5	CN5-1	DC 13V	-
	CN5-2	GND	-
	CN5-3	Not used	-
	CN5-4	Not used	-
	CN5-5	Not used	-
CN11	CN11-1	DC 13V	-
	CN11-2	Not used	-
	CN11-3	Input 9	Demand ON/OFF 2
	CN11-4	Input 10	Not used
JL	JL-1	Input 7	Power meter 1
	JL-2	Input 8	Power meter 2
	JL-3	DC 13V	-
CN9	CN9	Not used	-
CN20	CN20-1	DC 13V	-
	CN20-2	Output 11	WP1
	CN20-3	Output 9	WP2
	CN20-4	Not used	-
Emulator	—	Not used	-
TP1	—	Not used	-
CN9	—	Not used	-
EFR1	EFR1	Fuse for main control board	-

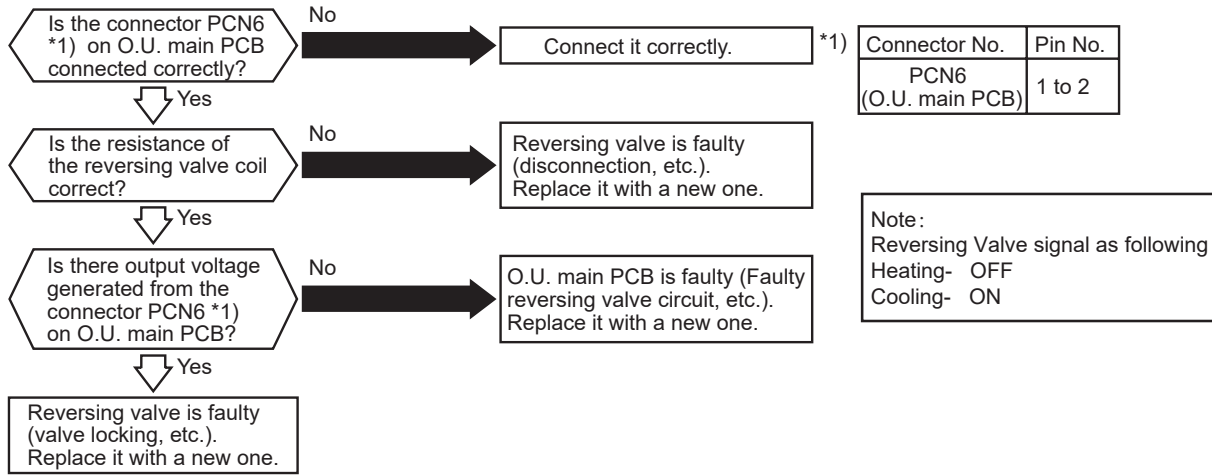


1.3.3 Checking of Electrical Coil Resistance for each Electrical Components

Parts	Type	Resistance	Unit models
Reversing Valve Coil	SHF-4-10L3	2kΩ at 20°C	044(2.0HP)/060(2.5HP)/080(3.0HP)
Electronic expansion valve coil	UVK-18D03	46Ω at 20°C	044(2.0HP)/060(2.5HP)
	UKV-25D525	46Ω at 20°C	080(3.0HP)
Compressor	WHP06840GUKQA8JT6	1.354Ω at 20°C	044(2.0HP)/060(2.5HP)
	SVB200FCNMC-L	1.21Ω at 20°C	080(3.0HP)

### 1.3.4 Checking of Reversing Valve

If outdoor unit does not start the heating operation or defrosting operation, there may be a malfunction of the reversing valve. The troubleshooting is indicated below.



### 1.3.5 Checking of DC Fan motor

When O.U. main PCB is faulty and Alarm 57 appears, the fan motor may also be damaged. To prevent O.U. main PCB damage which may result from operation combined with a faulty fan motor, check also if the fan motor is not damaged when O.U. main PCB is replaced.

Procedure in case of error diagnosis.

- (1) Remove fan motor connectors for DC fan motor from the O.U. main PCB(CN14) and turn the fan motor shaft by hand.

**Normal:** The fan motor shaft turns smoothly.

**Faulty:** No continuous rotary torque movement felt when turning the motor by hand. This occurs because the internal magnet of the fan motor breaks the movement when the internal electronic circuit of the fan motor has a short-circuit fault.

- (2) Measure the fan motor resistance:

- a . Disconnect the connector of DC fan motor from O.U. main PCB.
- b . Connect the black test lead wire to the pin terminal of black wiring for the connector of DC fan motor.
- c . Connect the red test lead wire to each measuring pin terminal for the connector of DC fan motor.

Wiring Color for Measurement (Normal Value)			
Red-Black	White-Black	Yellow-Black	Blue-Black
2.6MΩ or greater	about 28kΩ	about 188kΩ	25MΩ or greater

NOTE:

If the wires are connected other way around the resistance can not be measured correctly.

It is normal when the resistance is the same or closed as the normal values in the table up.

It is abnormal if the resistance is completely different from the normal values in the table up.

(Open fault: infinity; Short-circuit fault: several Ω to several kΩ)

The condition of open fault and short-circuit fault in the electronic circuit of DC fan motor can be checked if the value shows abnormality.

2. Servicing

2.1 Hi-Therma Split system - Outdoor unit (AHW-044/060/080HCDS1)

Safety Introduction

**⚠ DANGER**

DO NOT TOUCH THE ELECTRICAL COMPONENTS WHILE LEDS on O.U. MAIN PCB or LED1 on O.U. DISPLAY PCB ARE ON, TO AVOID ELECTRICAL SHOCK.

WAIT UNTIL ALL LEDS TURN OFF.

**⚠ DANGER**

- Before performing any of the service operations described in this chapter turn all the main switches off and the place security lockers or convenient warning indicators in order to prevent them from turning on accidentally.
- In case of blocked or stucked parts use appropriated tools and eventually lubricants to release them.
- In case of sharped edged parts as covers use security gloves to avoid getting injured.
- When performing brazing work besides security gloves it is must to wear convenient eye protection.
- Check and be sure that all LEDS on the O.U. main PCB or display PCB are OFF for all electrical maintenance.

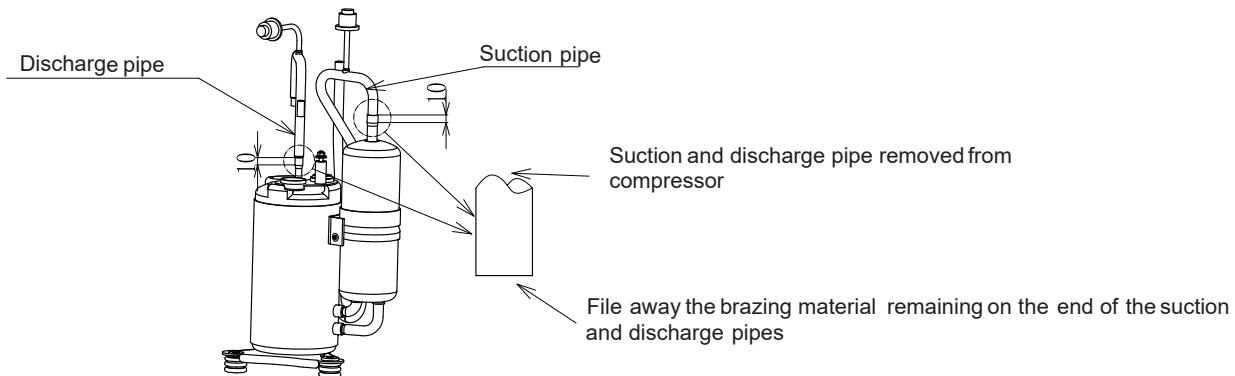
**i NOTE**

- All compressors are connected by brazing. Check to ensure whether there are flammable things around or not when using a burner for pipe connections if not oil existing pipe inside may ignite.
- Do not expose the refrigerant cycle to the atmosphere for a long period in order to avoid mixing the water and foreign particles into the refrigerant cycle. After removing compressor replace it quickly. If exposed for a long period seal the suction pipe and discharge pipe.
- Remove the cap for the compressor just before replacing the compressor. Before mounting the compressor seal the suction pipe and discharge pipe with a tape to protect the compressor from foreign particles. Remove the tape at pipe connection.
- Caution for Replacement of Compressor

Remove the suction pipe and the discharge pipe from the compressor. Isolate the wires and electrical components to protect them from the burner flame when brazing the connection pipes.

When replacing the compressor, the brazed material used for connecting the compressor and refrigerant pipes can drop into the pipes and get sucked into the compressor, causing a compressor failure. To avoid this, take the following points into account when replacing the compressor:

- File away brazing material remaining on the end of the refrigerant pipes.
- Insert the pipes fully in to prevent brazing material from entering them.
- Refer to the table for the recommended amount of brazing material. If using more brazing material than the recommended amount, it may drop into the pipes.



**⚠ CAUTION**

When brazing the pipes, prevent oxidized scale formation by nitrogen substitution.

Thickness of brazing material	Piping diameter (refrigerant cycle side) (mm)						
	Ø6.35	Ø9.53	Ø6.35	Ø12.7	Ø15.88	Ø19.05	Ø22.2
Ø1.6mm	25	30	35	35	75	100	110
Ø2.0mm	15	15	10	20	45	55	70
Ø2.4mm	10	10	15	15	30	35	45

Follow the procedure below to remove main parts and components. For mounting follow the reverse procedure of removal. Do not expose the refrigerant cycle to the atmosphere for a long period to avoid moisture or dust entering into the cycle. Be sure to replace parts immediately after removing. Seal the refrigerant cycle when left unattached for a long period.

**2.1.1 Removing the pipe cover**

1 Remove pipe cover downward after removing 1 screw.

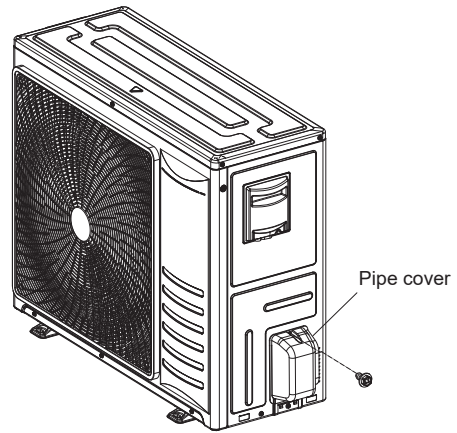


Fig.2.1

**2.1.2 Removing the front cover and upper cover**

1. Remove the pipe cover following “2.1.1 Removing the pipe cover”
2. Remove 5 fixing screws on the top and remove the upper cover, as is shown in Fig.2.2.
3. To remove the front cover, remove 6 fixing screws at the front, 2 left nails and 1 right nail, as is shown in Fig.2.3.

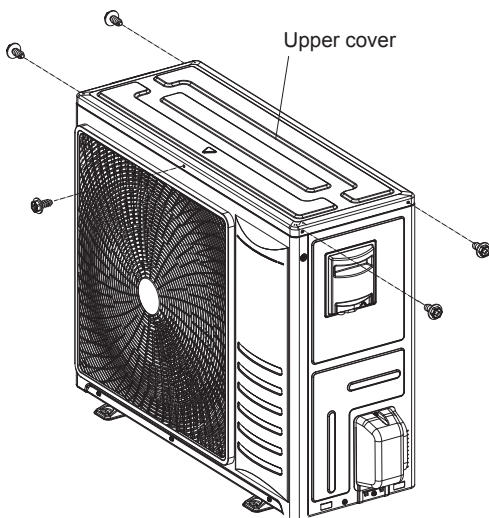


Fig.2.2

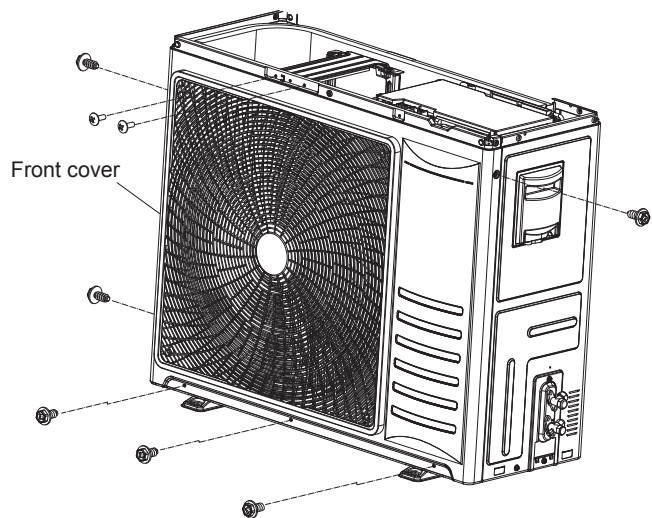


Fig.2.3

**2.1.3 Removing the Side cover and Side Electrical box cover**

1. Remove the pipe cover following “2.1.1 Removing the pipe cover”
2. Remove the front cover and upper cover following “2.1.2 Removing the front cover and upper cover”
3. Remove the side electrical box cover and side electrical box components, and remove the right side cover components, as is shown in Fig.2.4.

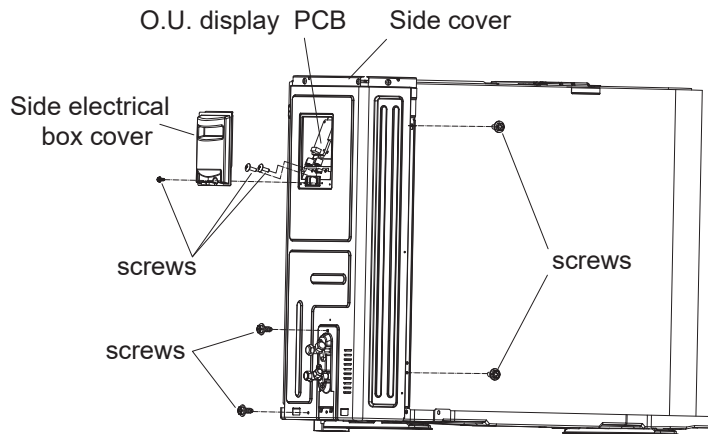


Fig.2.4

**2.1.4 Removing the Propeller fan**

1. Remove the pipe cover following “2.1.1 Removing the pipe cover”
2. Remove the front cover and upper cover following “2.1.2 Removing the front cover and upper cover”
3. To remove the propeller fan remove the cap nut which fixes the propeller fan onto the motor shaft, as is shown in Fig.2.5.

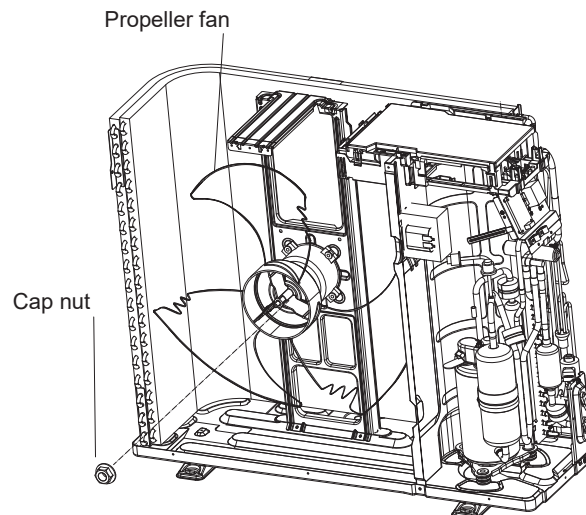


Fig.2.5

**i NOTE**

- Use a puller when the propeller fan and fan motor shaft are fixed too tightly.
- The cap nut is left thread. For removal turn to the reverse direction to the propeller fan.
- Assembling the propeller fan: Insert the skidding protection part of the fan boss matching with the motor shaft notch; tighten the nut after the shaft screw fully comes out. (Tightening Torque 3.0 Nm).



### 2.1.5 Removing the outdoor fan motor

1. Remove the pipe cover following "2.1.1 Removing the pipe cover".
2. Remove the front cover and upper cover following "2.1.2 Removing the front cover and upper cover".
3. Remove the Propeller fan following "2.1.4 Removing the Propeller fan".
4. Remove the fan motor connector (CN14) inserted into the O.U. main PCB in the electrical box.
5. Remove 4 screws which fix the motor as is shown in Fig.2.6.

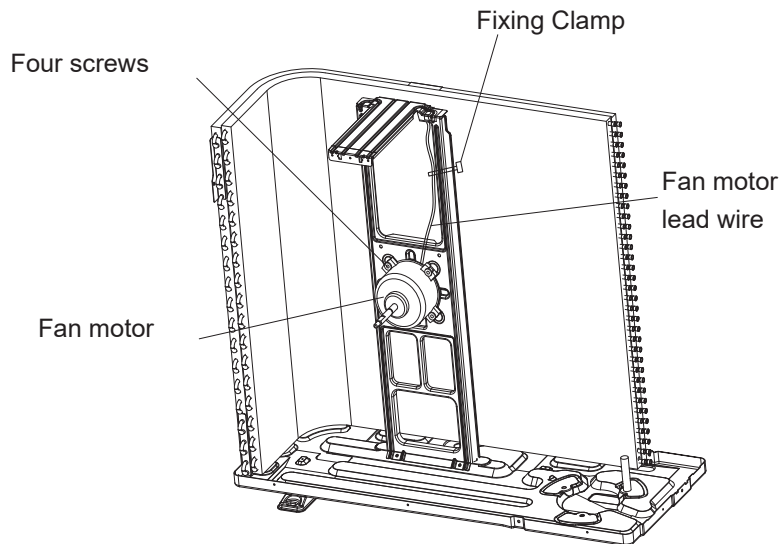


Fig.2.6

#### **i** NOTE

- Be sure to place the lead wire outlet downward when assembling the motor.
- Fix the motor lead wire onto the motor clamp using a cord band as before to avoid obstructing the propeller fan.
- Connect the motor lead wire to O.U. main PCB. (Insert into the connector (CN14) on the O.U. main PCB).

2.1.6 Removing the compressor

**i** NOTE

- Do not expose the refrigerant cycle to the atmosphere for a long period to avoid moisture or dust into the cycle. Be sure to replace the compressor immediately after removing. Seal to the suction and discharge pipes when the refrigerant cycle is left unattached for a prolonged time.
- Remove the cap of new compressor right before the replacement. Before mounting the compressor seal the suction and discharge pipes with a tape to protect the compressor from dust. Remove the tape at pipe connection.
- To connect wiring at reassembling ensure that the compressor terminal numbers and wiring mark band codes are matched. Incorrect wiring numbers may result in inverse rotation and damage the compressor.

1. Remove the pipe cover following “2.1.1 Removing the pipe cover”.
2. Remove the front cover and upper cover following “2.1.2 Removing the front cover and upper cover”.
3. Remove the Side cover and Electrical box cover following “2.1.3 Removing the Side cover and Electrical box box cover”.
4. Open the soundproof cover wrapped around the compressor and remove the terminal box cover of the compressor body. Disconnect the compressor wires in the terminal box and remove the thermistor on top of the compressor, as is shown in Fig.2.7.

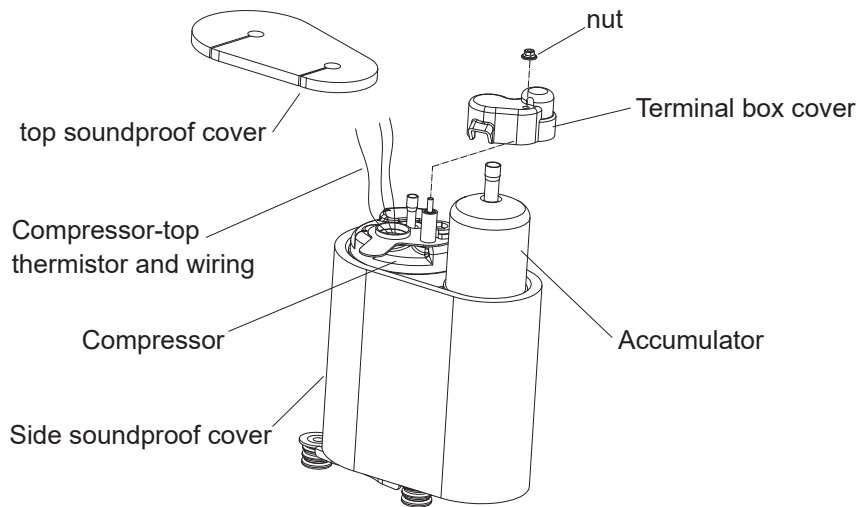


Fig.2.7

**!** CAUTION

Check the wiring color and layout when disconnecting. Connecting wires in wrong order at reassembling may result in compressor damage.

5. Remove the suction and discharge pipes from the compressor.  
Be sure to separate the blazing burner flame sufficiently from the wires and electrical components around the brazed part in order to avoid burning.

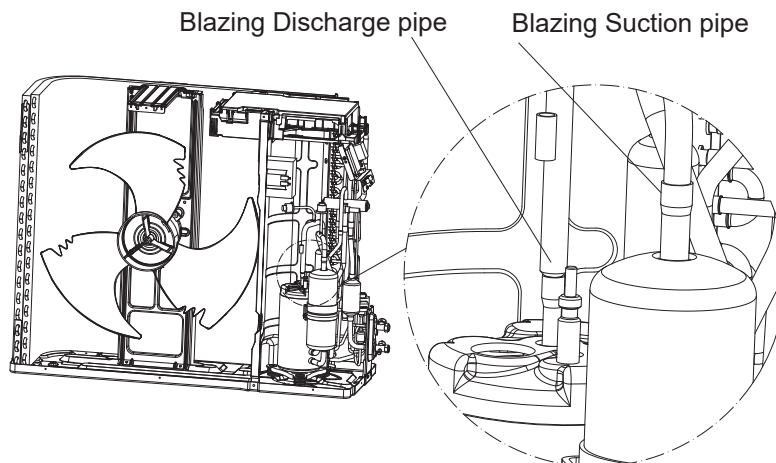


Fig.2.8

6. Remove push nuts 1 and 2 which fixes the compressor. Lift the compressor and remove from the unit body. (3 in the figure does not have a push nut).
7. Check if the Faston terminal has any abnormality when replacing the compressor. (Ensure the pull out force greater than 20 N). If the Faston terminal is identified faulty replace to a new one.

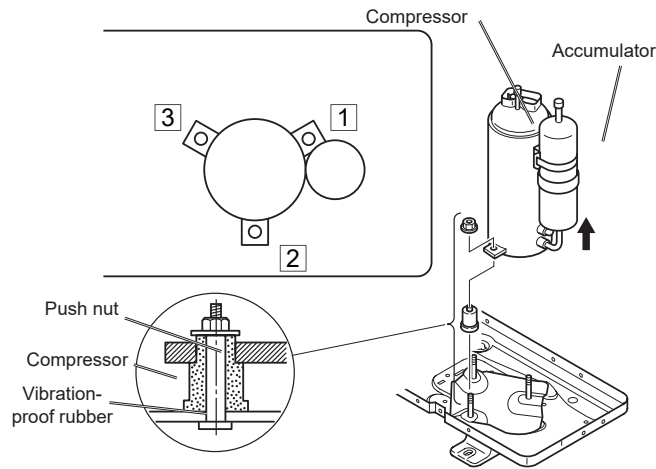


Fig.2.9

**2.1.7 Removing the high pressure switch and low pressure switch**

1. Remove the pipe cover following “2.1.1 Removing the pipe cover”.
2. Remove the front cover and upper cover following “2.1.2 Removing the front cover and upper cover”.
3. Remove the Side cover and Electrical box cover following “2.1.3 Removing the Side cover and Electrical box cover”.
4. Remove PCN8 the high pressure switch terminal and PCN13 the low pressure switch terminal.
5. Remove the high pressure switch and the low pressure switch from the brazed part of discharge piping.

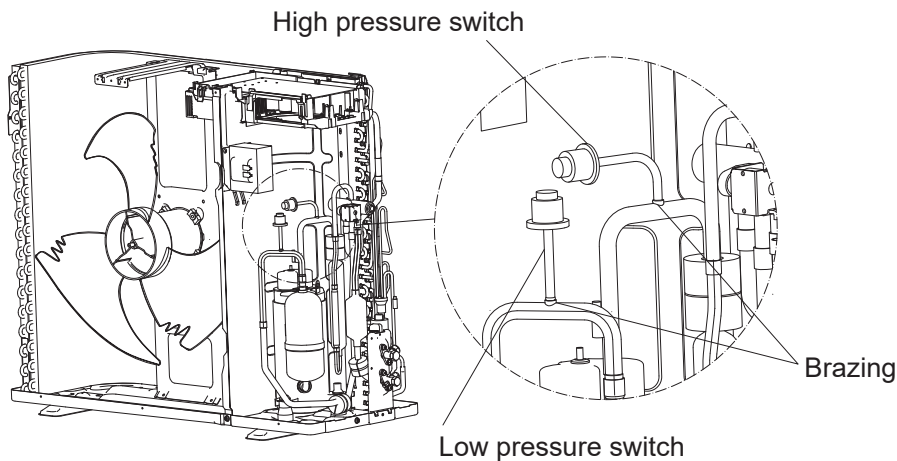


Fig.2.10

### 2.1.8 Removing the 4-way reversing valve and coil

1. Remove the pipe cover following "2.1.1 Removing the pipe cover".
2. Remove the front cover and upper cover following "2.1.2 Removing the front cover and upper cover".
3. Remove the Side cover and Electrical box cover following "2.1.3 Removing the Side cover and Electrical box cover".
4. Disconnect the PCN6 connector on the O.U. main PCB of the electrical box.
5. Remove 1 fixing screw to remove the 4-way reversing valve coil.
6. After removing the four brazing points as shown in the figure, the 4-way reversing valve can be removed.

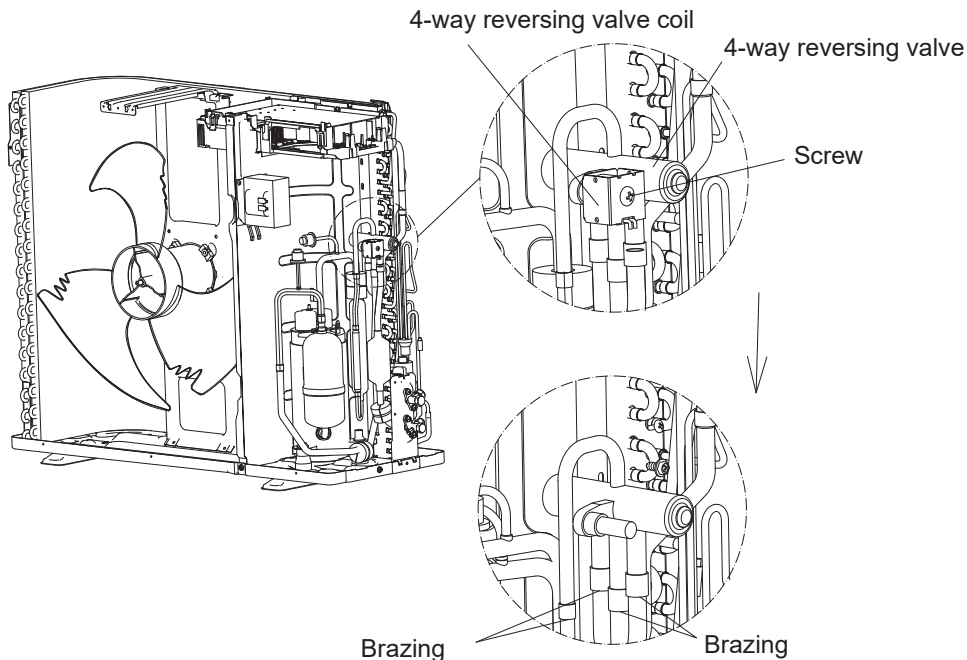


Fig.2.11

### 2.1.9 Removing the electronic expansion valve coil

1. Remove the pipe cover following "2.1.1 Removing the pipe cover".
2. Remove the front cover and upper cover following "2.1.2 Removing the front cover and upper cover".
3. Remove the Side cover and Electrical box cover following "2.1.3 Removing the Side cover and Electrical box cover".
4. Remove the CN5A connector on the O.U. main PCB of the electrical box.
5. Hold and disconnect the coil of the expansion valve. The expansion valve coil is equipped with a lock mechanism. Ensure that the coil is locked when replacing, as is shown below.
6. To remove the electronic expansion valve, the electronic expansion valve coil needs to be removed first. After the coil is removed, disconnect the two brazing points of the electronic expansion valve. Protect the electronic expansion valve to avoid being burned by flames during the brazing process.
7. When removing the electronic expansion valve coil, it is necessary to rotate and pull out the coil at the same time, and separate the groove from the fixation protrusion. When installing the electronic expansion valve coil, it is necessary to push the electronic expansion valve coil onto the electronic expansion valve body, and rotate the coil to fix the groove with the fixation protrusion at the same time, the sound of the groove and the fixation protrusion mesh will be heard.

#### CAUTION

The electronic expansion valve will malfunction if the coil does not fix firmly with the valve body by the groove and the fixation protrusion.

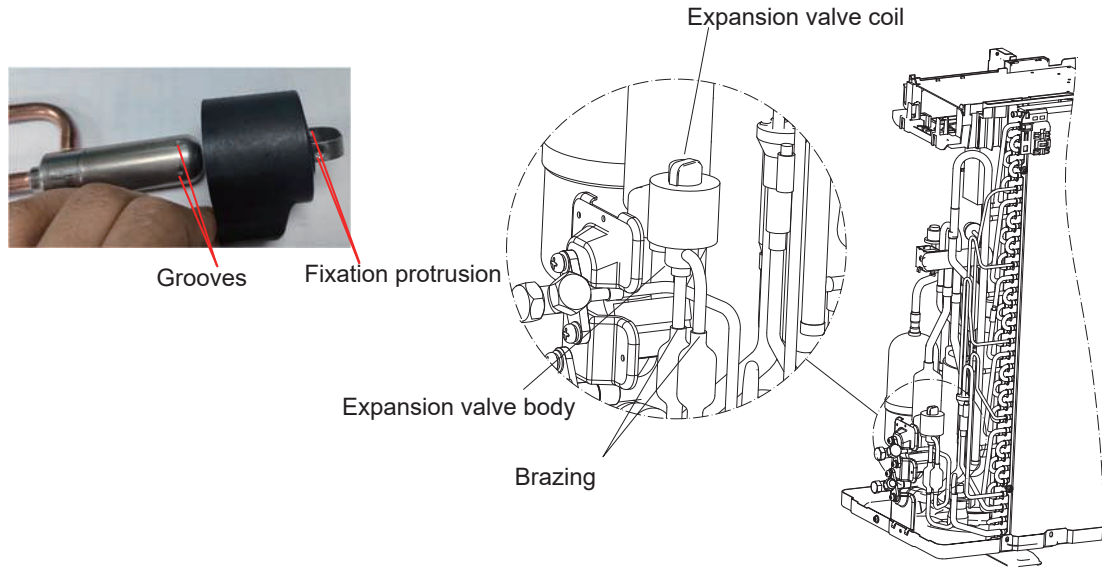


Fig.2.12

**2.1.10 Removing the electrical box**

1. Remove the upper cover following "2.1.2 Removing the front cover and upper cover".
2. Remove the side electrical box cover following "2.1.3 Removing the Side cover and Side Electrical box cover".
3. Remove 4 screws which fix the electrical box.

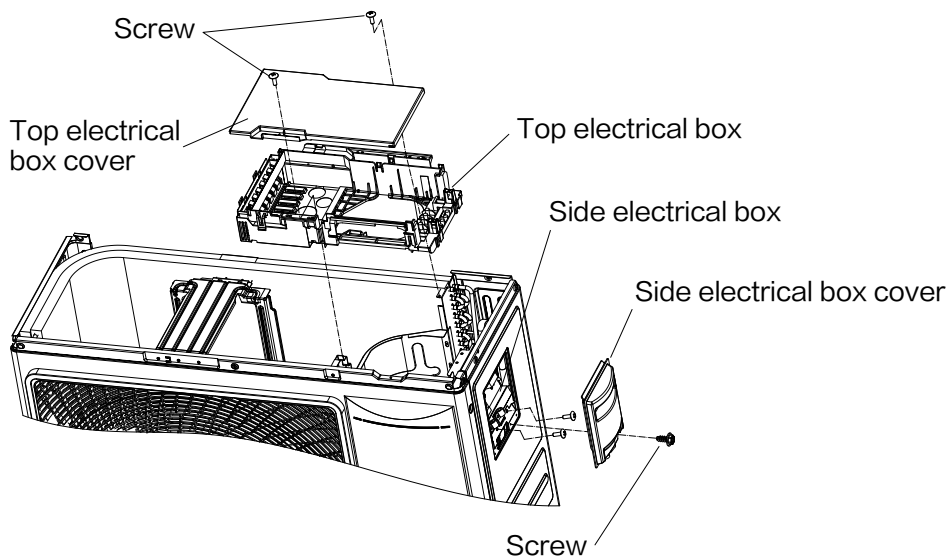


Fig.2.13

### 2.1.11 Removing Display PCB

1. Remove 1 fixing screw and remove the terminal cover.
2. Disconnect all the wiring connected to the O.U. display PCB.
3. Hold the upper part of 4 holders with long nose pliers and remove the O.U. display PCB.

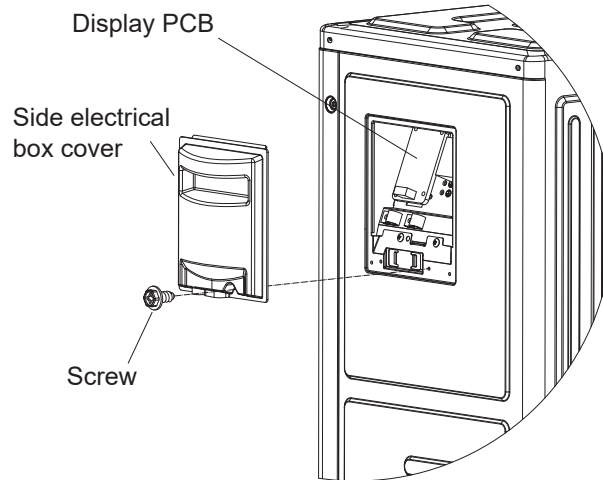


Fig.2.14 O.U. display PCB



#### NOTE

- *DO NOT touch electrical components on the O.U. display PCB. Pay attention not to bend or apply much force onto O.U. display PCB in order to avoid O.U. display PCB failure.*
- To connect wiring at reassembling ensure that the terminal numbers and wiring mark band codes are matched. Incorrect wiring may result in malfunction or damage of electrical components.
- Different dip switch setting shall be applied for each model when the electrical box is replaced.
- Pay attention not to clamp any wiring between plates or electrical components when closing electrical box cover or front cover at reassembling.



**2.1.12 Replacing O.U. main PCB**

1. Remove the front cover and upper cover following “2.1.2 Removing the front cover and upper cover”.
2. Remove the side electrical box cover following “2.1.3 Removing the Side cover and Side Electrical box cover”.
3. Remove the electrical box as shown following “2.1.10 Removing the electrical box”.

Remove all terminals from the O.U. main PCB and disconnect the PFC inductor terminals, compressor terminals, the input power cable, and the earth terminals.

All terminals are located as shown below, and the terminals which need to be inserted and disconnected during the replacement are marked in red.

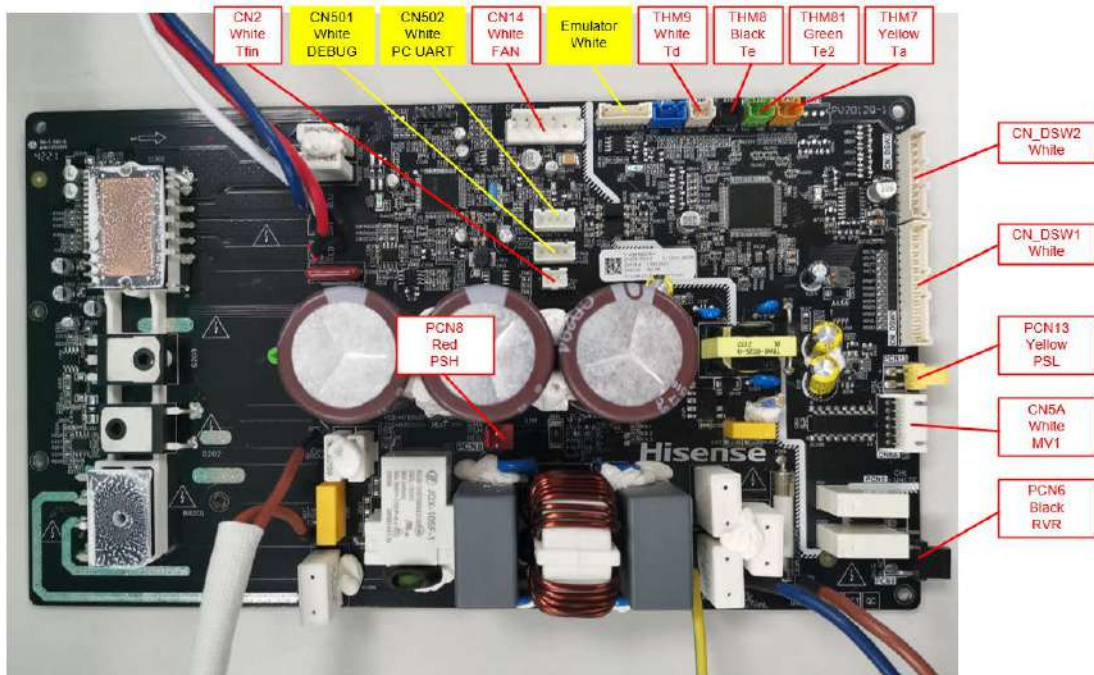


Fig.2.15 O.U. main PCB

Note: When removing the PFC inductor terminals, the wiring harness terminals have their own latches which can be removed after pressing the pick on the terminals. Do not pull out forcibly, otherwise it may cause damages to the PFC inductor terminal.

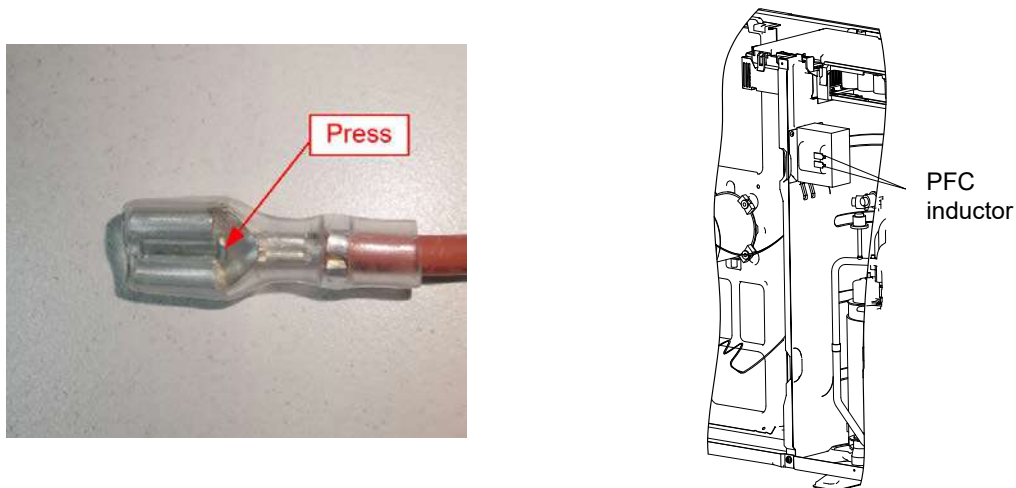


Fig.2.16 PFC inductor

Remove the 11 fixing screws (see Fig.2.17 for the location of the screws) of the PCB, then the PCB and Fin are separated from electrical box.

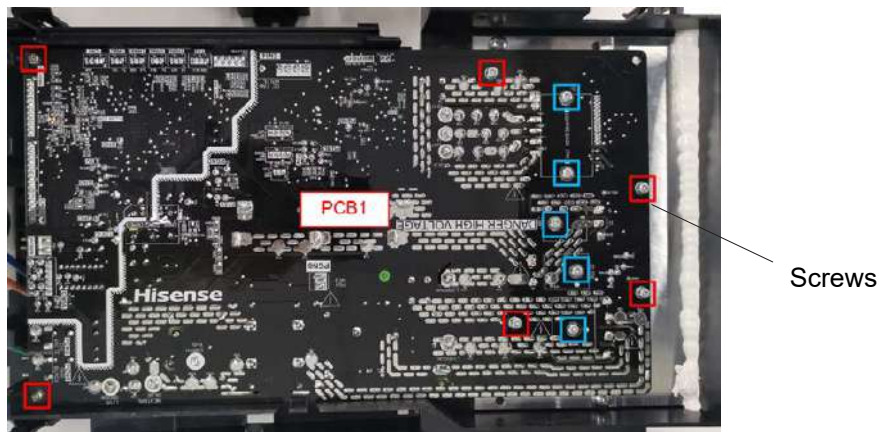
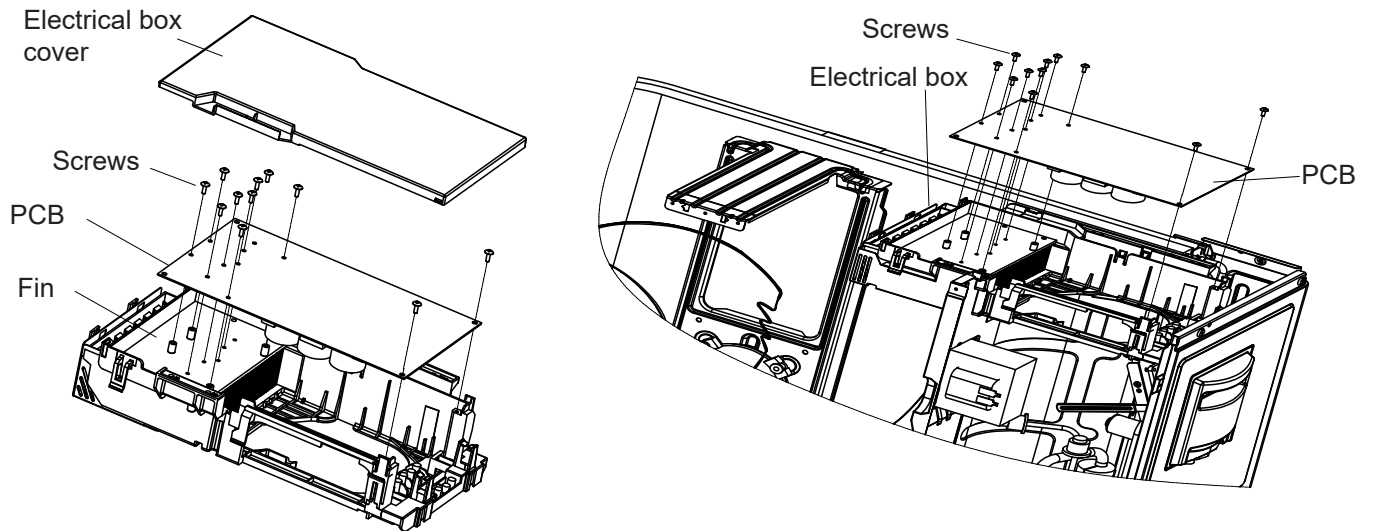


Fig.2.17 Replacing PCB and Fin

Note:

1. Because of the silicone seal between fin and electrical box, it is not recommended to remove the fin when replacing PCB as it is generally sufficient to replace PCB only. If the fin is also removed, be sure to apply a silicone seal to the original location or there is a risk of water intruding into the PCB and causing short circuit.
2. The outdoor unit electrical box assembly are used as maintenance spare parts, and can be replaced as a whole during maintenance.



3. Service spare parts are supplied as electrical box assembly and contain electrical box, Fin, PCB, power terminal block, CN\_DSW1/2 wiring.
4. For PCB installation method, follow the reverse procedure of removal. Note that the wiring terminals cannot be inserted and connected incorrectly.
5. The screws marked in blue need to be tightened with a torque of 0.4-0.5N·m and if not tightened firmly or missed, the PCB may be damaged during operation.



Fig.2.18 Electrical box assembly

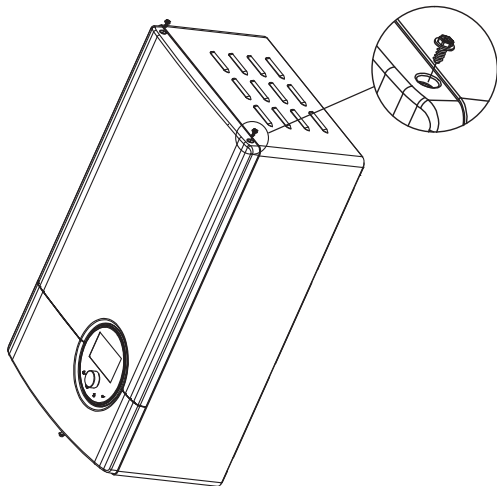
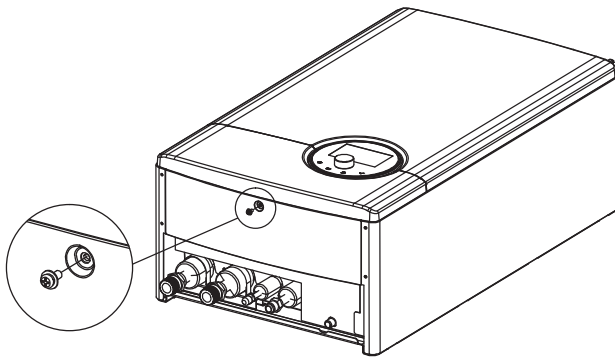
**2.2 Hi-Therma Split system - Indoor unit (AHM-044/060/080HCDSAA)**

**2.2.1 Removing the front panel**

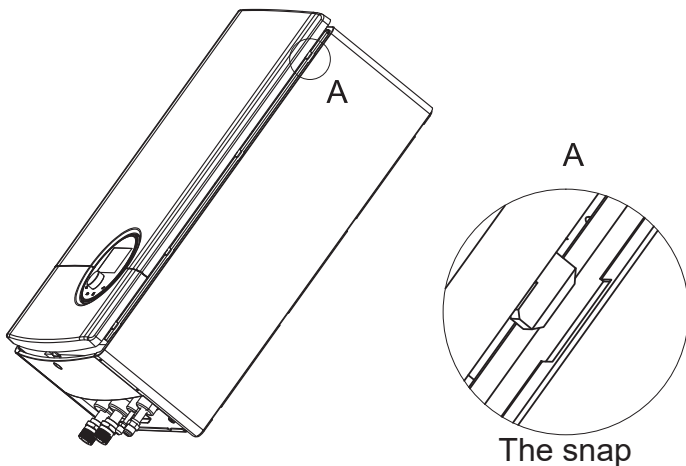
**i NOTE**

The indoor unit front panel needs to be removed for any task inside the indoor unit.

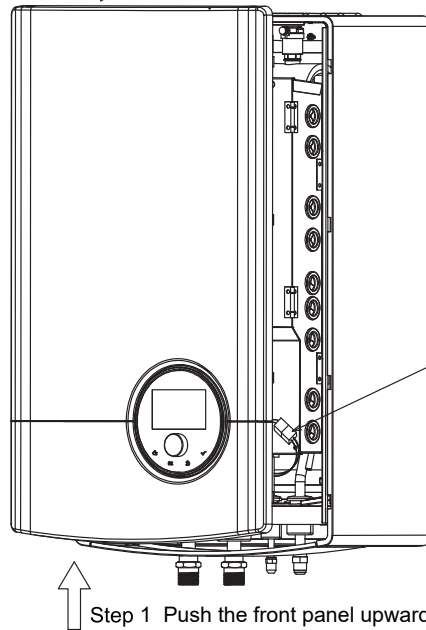
1. Unscrew 1 screw at the bottom of the indoor unit and 2 screws on the top of unit.



2. Remove the front panel.



- Step 2 Push the front panel forward, disengage the snap, and front panel can be removed.



- Step 3 Pay attention to the wire connected master controller and electrical box. Do not pull the wire, otherwise may cause the breakage. Unplug the terminal to release the front panel.

**⚠ CAUTION**

- Take care with the LCD display of the master controller while removing the front panel.
- Be careful not to drop the front panel during operation.
- Take care when removing front panel, the parts inside the unit could be hot.

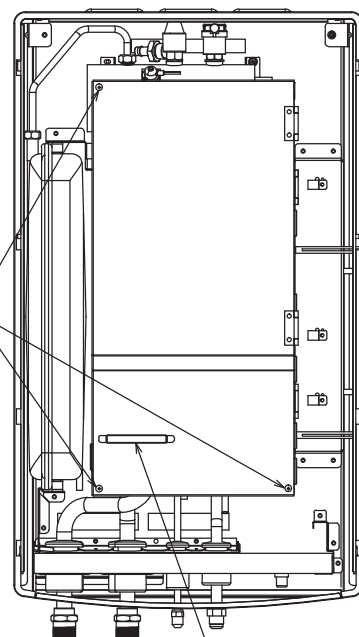
**2.2.2 Opening the electrical box**

Remove the front panel following "2.2.1 Removing the front panel".

**⚠ DANGER**

- Disconnect the unit from the power supply before touching any of the parts in order to avoid an electric shock.

- Step 1 Unscrew the 3 screws.

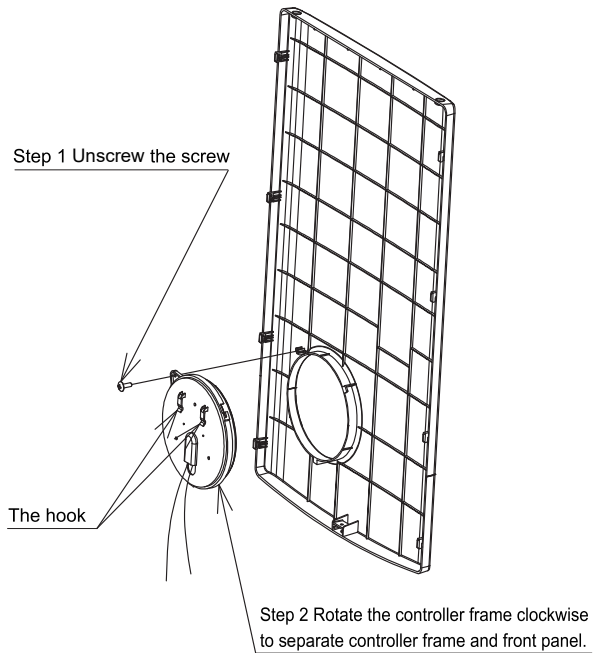
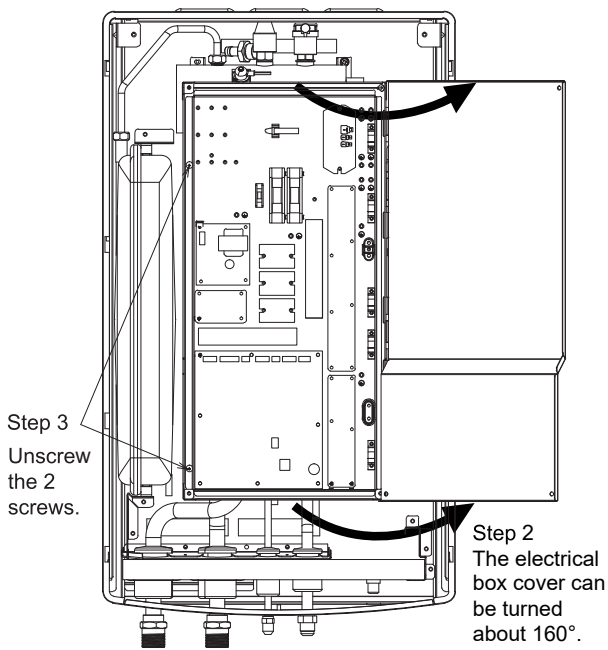


\*Handle on electrical box cover can be used to hang the master controller.

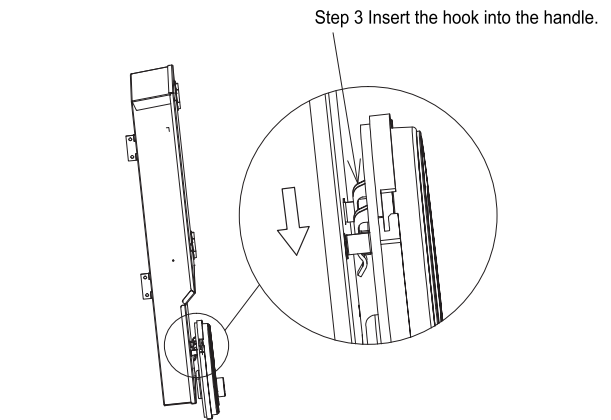
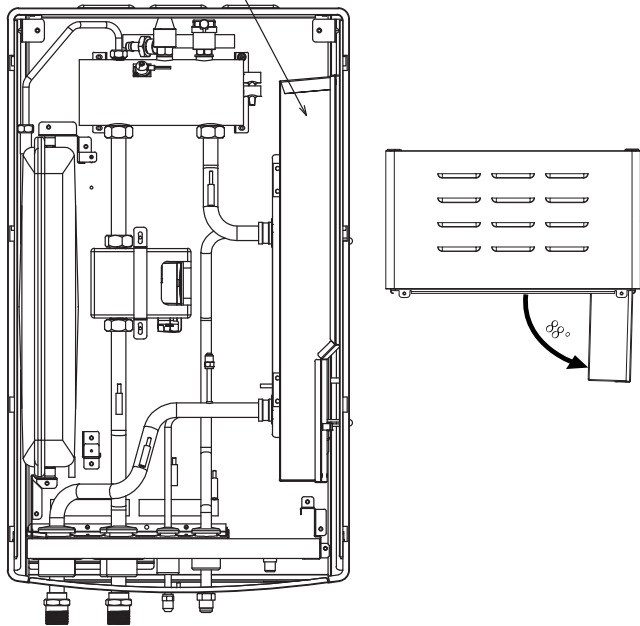
2.2.3 Hanging the master controller

**i** NOTE

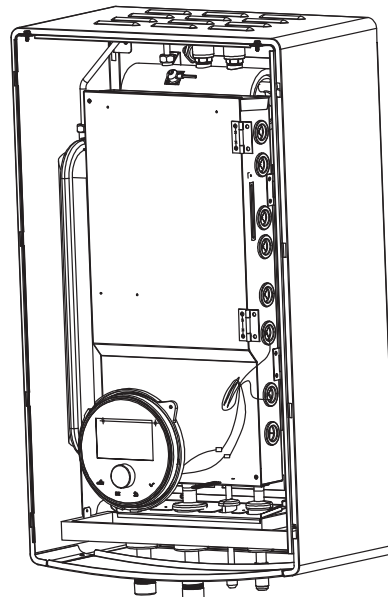
The master controller can be hung on the handle of the electrical box cover.



Step 4 The electrical box can be turned about 88°.



Step 4 Complete hanging.



**⚠ CAUTION**

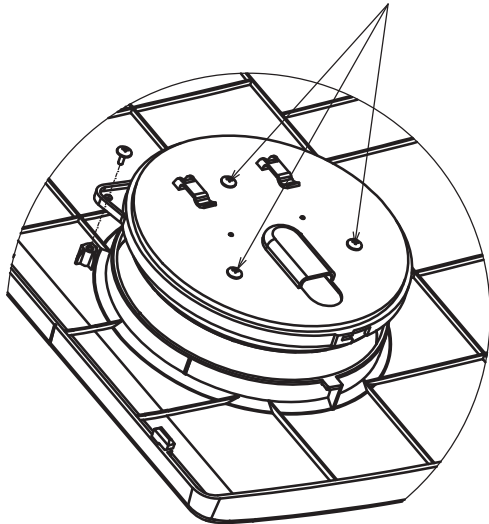
Take care with the electrical box components in order to avoid damaging.

2.2.4 Disassembling the Master Controller

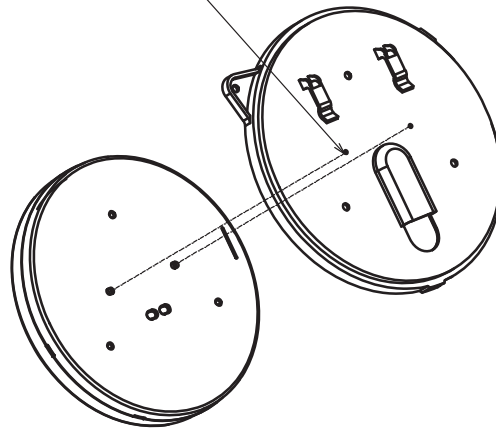
**CAUTION**

- Please pay attention to protect the LCD display of the Master Controller when removing.
- Please prevent the Master Controller from falling and damaging during operation.

Remove the three screws to separate the controller from the mounting plate.



Note: Insert the positioning column into the hole on the back of the controller at the position indicated during installation



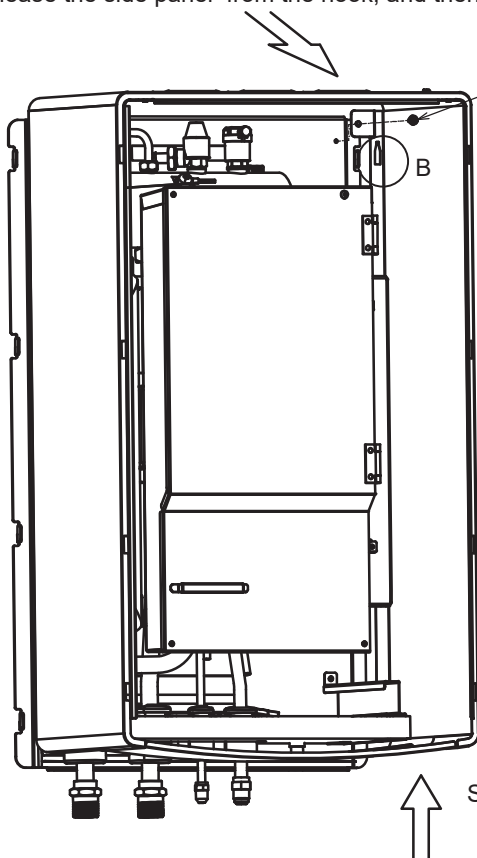
2.2.5 Removing the side panel

Remove the front panel following “2.2.1 Removing the front panel”.

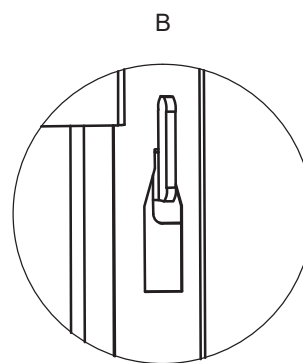
**DANGER**

The side panel is heavy, please operate it with at least two people to avoid falling and hurting .

Step 3: Push the side panel assembly forward in the direction shown by the arrow to release the side panel from the hook, and then remove the side panel assembly.



Step 1: Remove the two screws (one on the left and one on the right).



The Snap

Step 2: Push up the side panel assembly in the direction shown by the arrow.

Step 4: Reverse operation to install the upper side panel assembly

**2.2.6 Removing the water system components**

**⚠ DANGER**

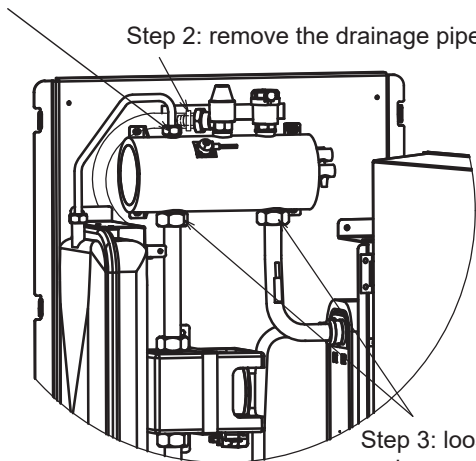
- The following operations need to cut off the water system and drain the water in the machine.
- Follow-up operations can be performed after completely disconnecting the power supply.

**i NOTE**

1. Remove the front panel following “2.2.1 Removing the front panel”.
2. Remove the side panel following “2.2.5 Removing the side panel”.
3. Opening the electrical box following “2.2.2 Opening the electrical box”.

**2.2.6.1 Removing the Auxiliary Electric Heater components**

Step 1: loosen the nut with a tool in a counterclockwise direction to separate the water pipe from the Auxiliary Electric Heater.

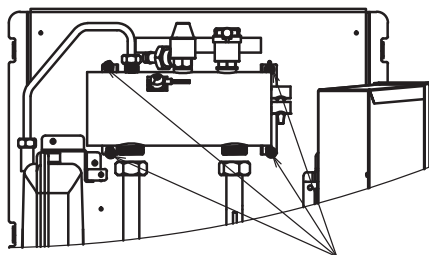


Step 2: remove the drainage pipe tie and remove the drainage pipe.

Step 3: loosen the two nuts in a counter clockwise direction and remove the drain pipe.

**⚠ CAUTION**

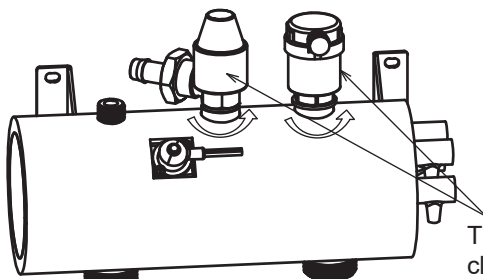
- When disassembling the nut, pay attention not to damage the thread and place the gasket, otherwise it will lead to poor sealing and water leakage.
- Pay attention to the protection of the piping after removal to prevent foreign matter from entering the pipe, which will cause the pipeline to block badly.



Step 4: Remove the 4 screws to remove the Auxiliary Electric Heater.

Step 5: reverse operation can realize the installation of Auxiliary Electric Heater.

**2.2.6.2 Removing the Safety Valve and Air Purge Valve**

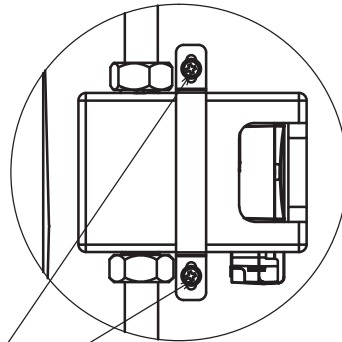
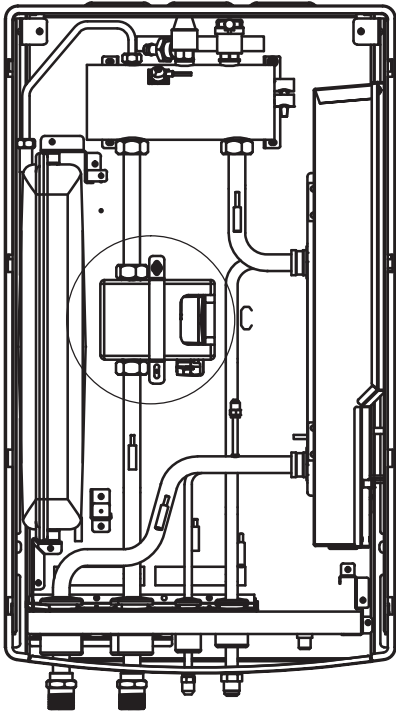


The safety valve and air purge valve can be removed by counter clockwise rotation and installed in place by reverse operation.

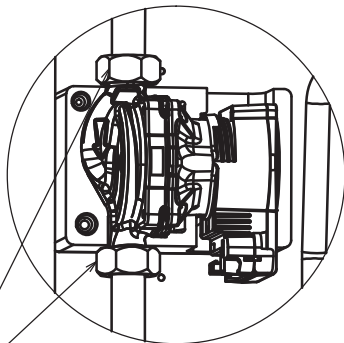
**⚠ CAUTION**

Unless necessary, do not disassemble the safety valve and exhaust valve at will.

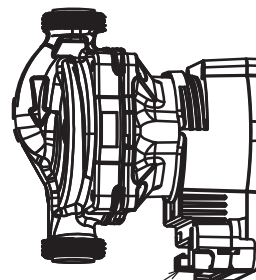
2.2.6.3 Removing the Water Pump



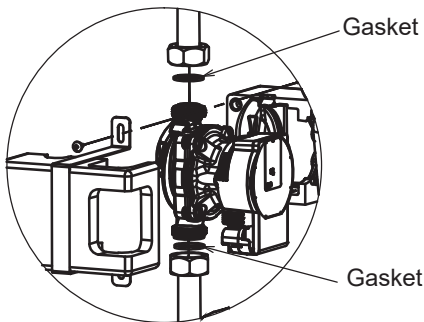
Step 1: loosen two nuts in counter clockwise direction with tools, remove the retaining plate and upper foam parts.



Step 2: loosen the two nuts counter clockwise to separate the water pipe from the water pump and the water pump.



Step 3: the position indicated is the plug-in place of the water pump power supply line and signal line, and the pluggable terminal is used to remove the power supply line and signal line.

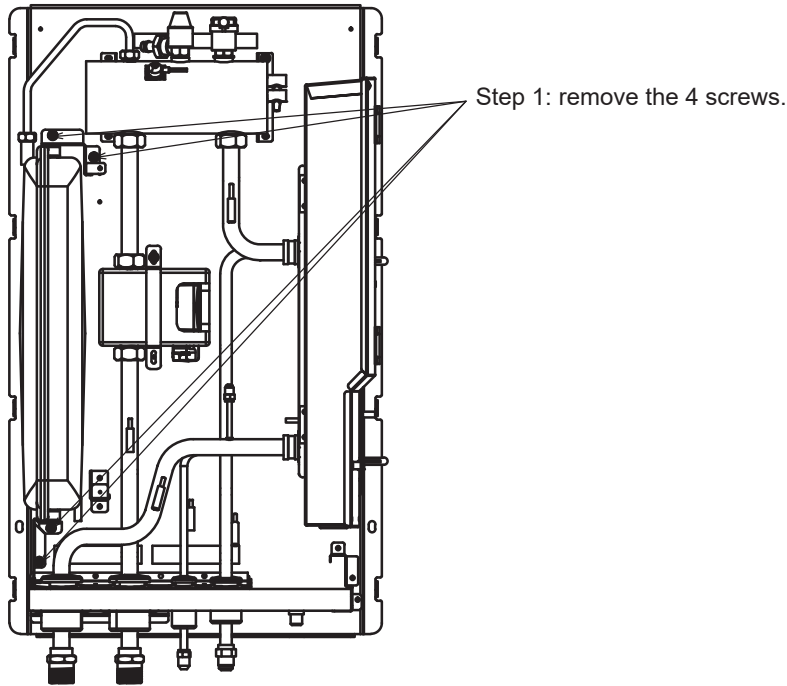


Step 4: Install the water pump and operate in the reverse direction.

**CAUTION**

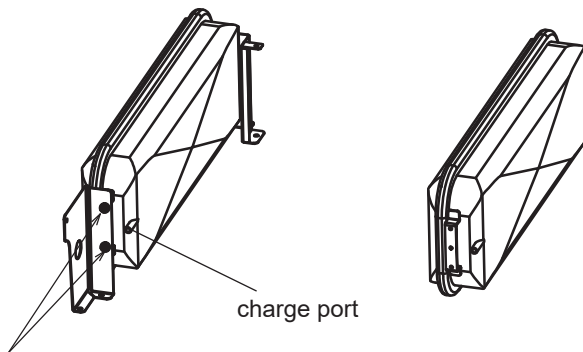
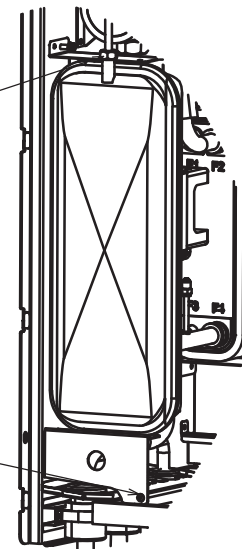
- Pay attention to the installation of gasket during disassembly and assembly, otherwise the pipe may leak.
- The pump is heavy to prevent injury from falling.
- Pay attention to the protection of the removed pipeline. If foreign matters enter, the pipeline will be blocked.

2.2.6.4 Removing the Expansion Vessel



Step 2: loosen the nut in the counter clockwise direction to separate the piping from the expansion vessel.

Step 3: loosen the screws to remove the expansion vessel and fixing plate.



Step 4: Remove the bolts and remove the connecting plate.

Step 5: Install the expansion vessel in the reverse direction.

**CAUTION**

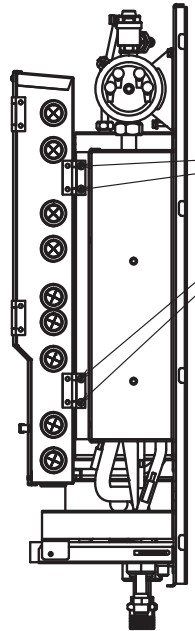
- The parts are heavy, so pay attention to support during disassembly to prevent falling and hurting people.

2.2.6.5 Removing the plate heat exchanger assembly

**i** NOTE

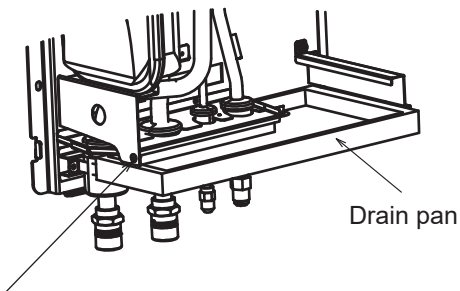
To remove the plate heat exchanger assembly, first remove the electrical box, drain pan and deflector. Refer to the following steps.

2.2.6.5.1 Removing the electrical box assembly

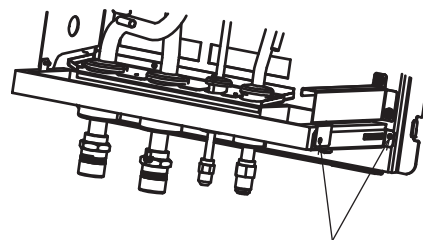


Remove the four screws to separate the electrical box assembly from the machine.

2.2.6.5.2 Removing the drain pan

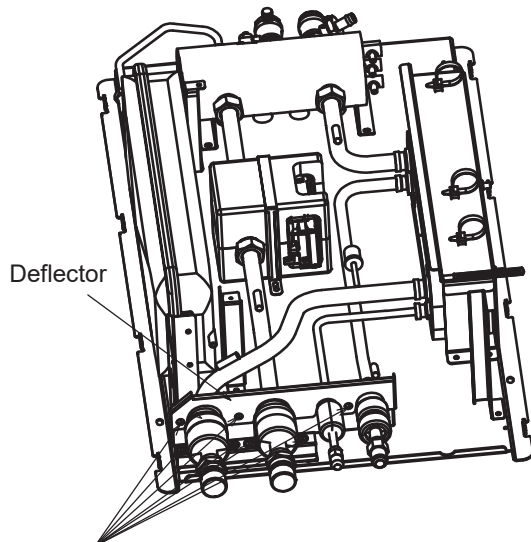


Step 1: Remove the screw on the left side of the drain pan.

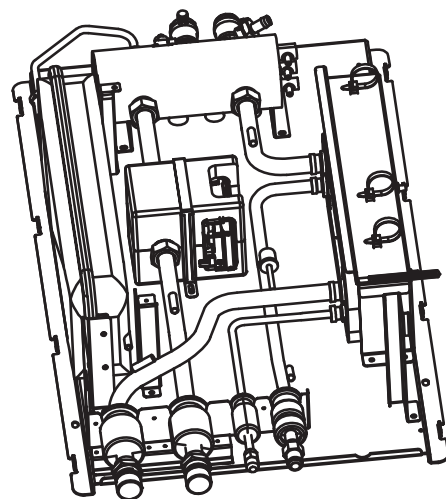


Step 2: Remove the drain pan after removing the two screws.

2.2.6.5.3 Removing the deflector and fixing clamp

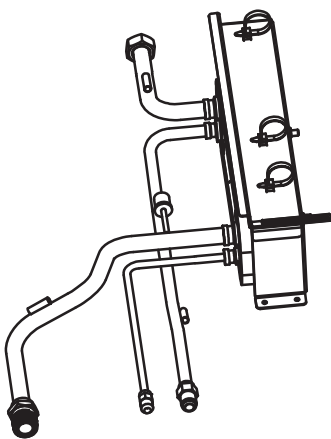
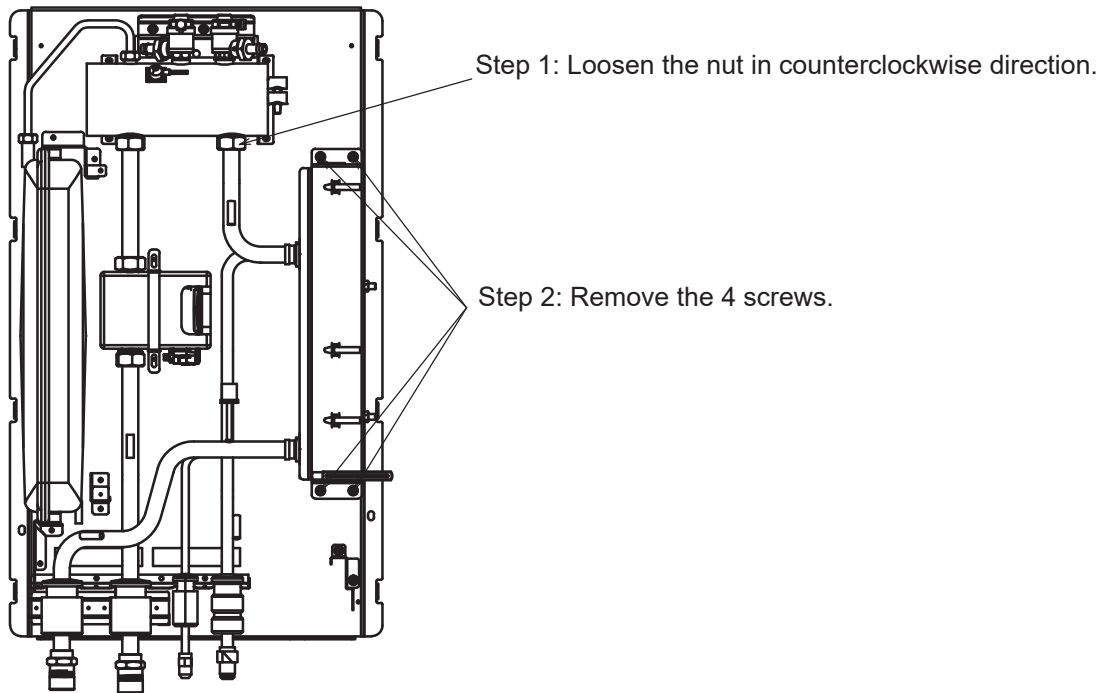


Remove the 7 screws to remove the deflector.

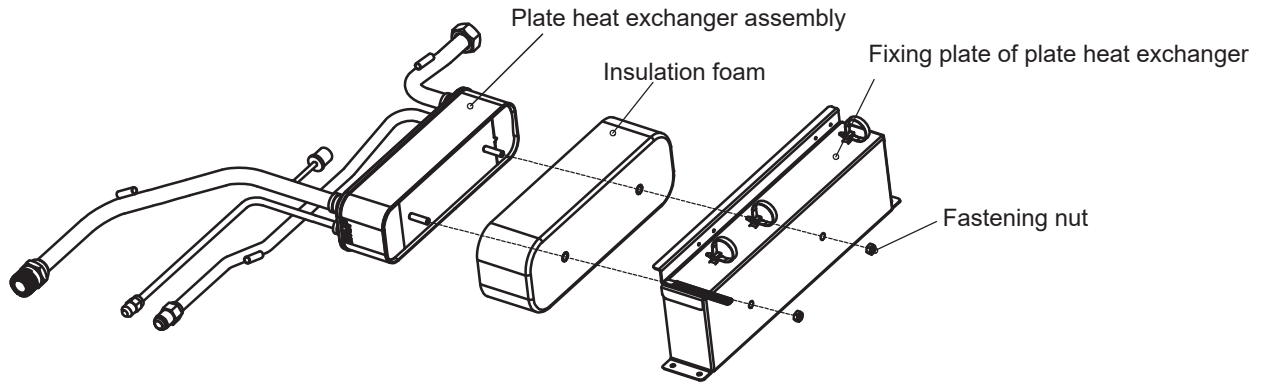




2.2.6.5.4 Removing the plate heat exchanger assembly

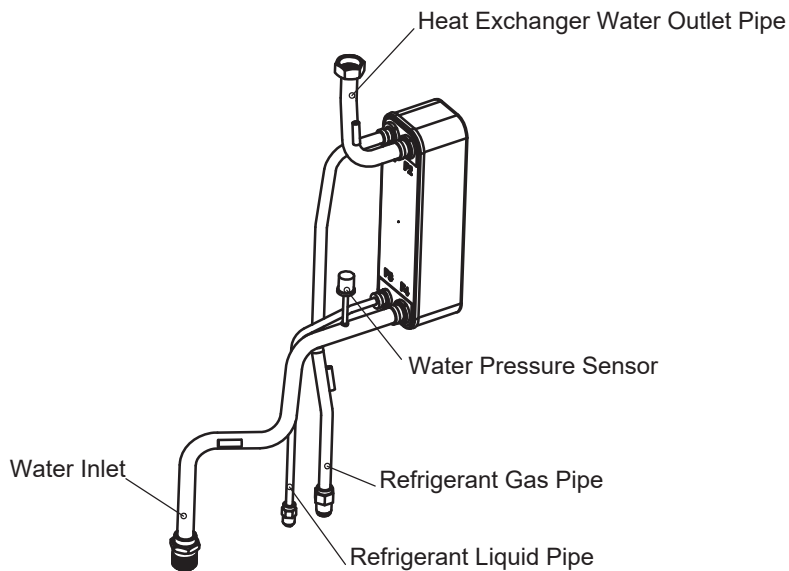


Step 3: After completing the above steps, the plate heat exchanger assembly as shown in the figure can be removed.



Step 4: As shown above, remove the 2 fastening nuts and remove the plate heat exchanger fixing plate, insulation foam and plate heat exchanger assembly.

Step 5: The installation of heat exchanger components can be realized according to the above reverse steps.



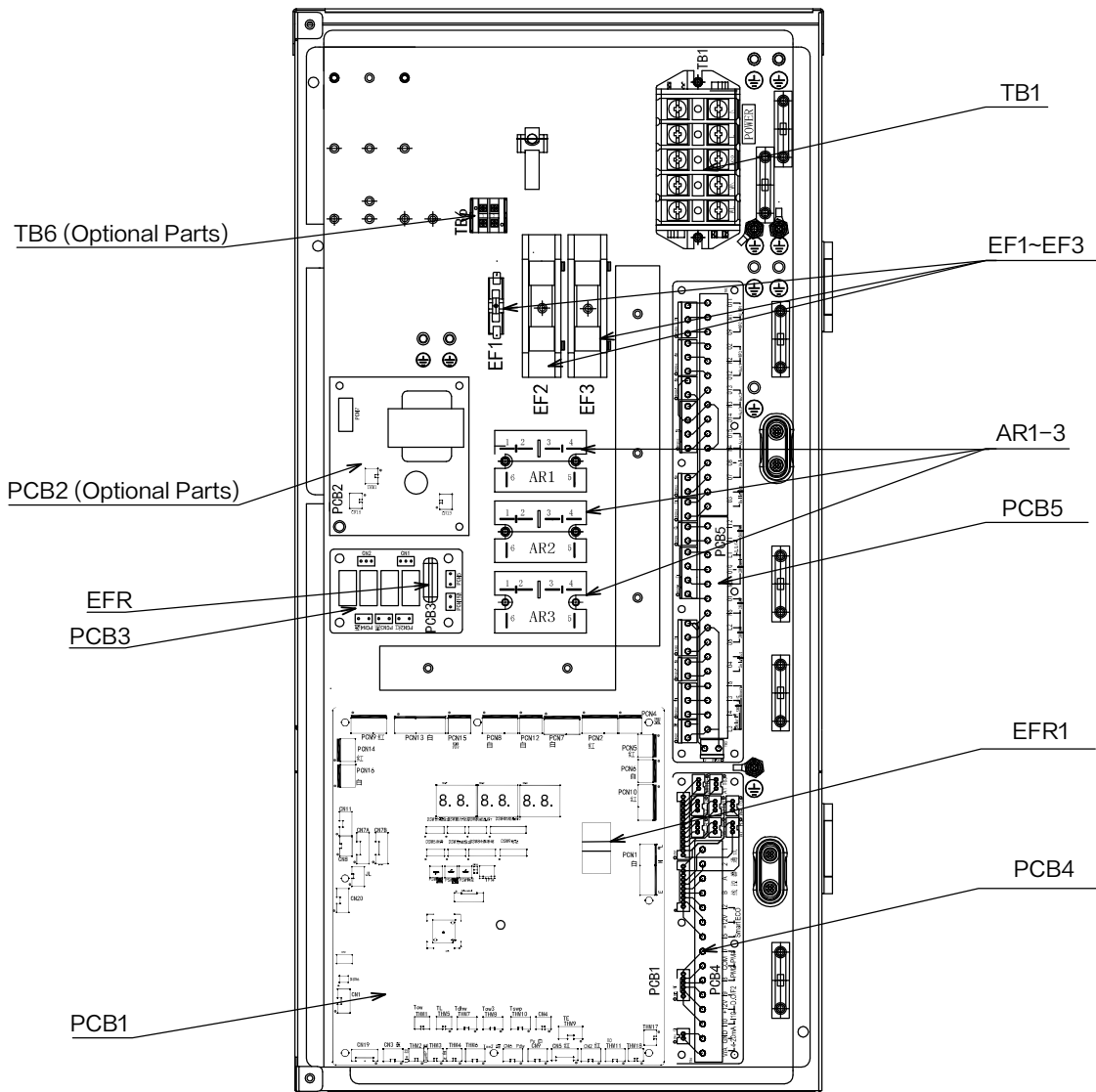
**i NOTE**

- The above piping is brazed with the plate heat exchanger. If it is to be removed, the welding process is required.
- The water pressure sensor and water inlet pipe are also brazed. If they need to be replaced, they need to be welded.

**! CAUTION**

- During the operation of the above procedures, pay attention to protect the threads at the connecting end of the piping to avoid damage leading to poor connection.
- Please seal and protect the end of the piping to avoid pipe blockage caused by foreign matters.

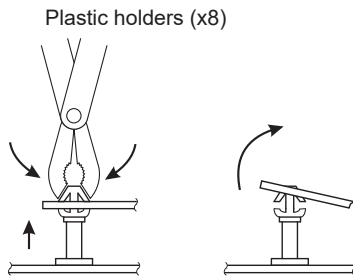
2.2.7 Removing the Electrical Components



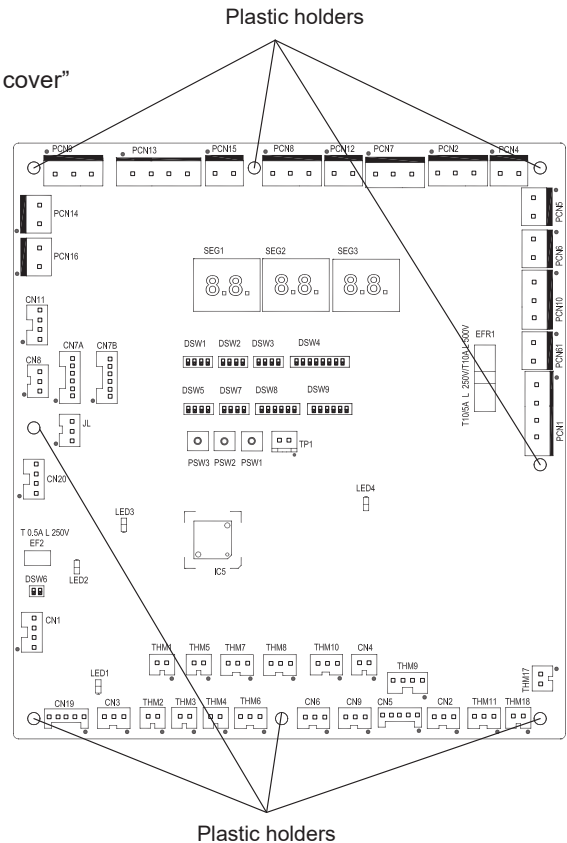
## 2.2.7.1 Removing the PCB1

To Remove the PCB1, the following operations should be done:

- Remove the front cover, as explained in “2.2.1 Removing the front cover”
  1. Remove all the connectors connected to the PCB1.
  2. Remove the plastic holders that fix the PCB1 to the E-Box.



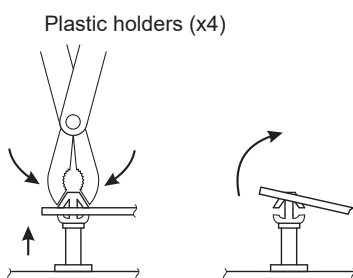
3. Remove the PCB1. If necessary, replace the PCB1 with a new one proceeding in reverse way than disassembling.



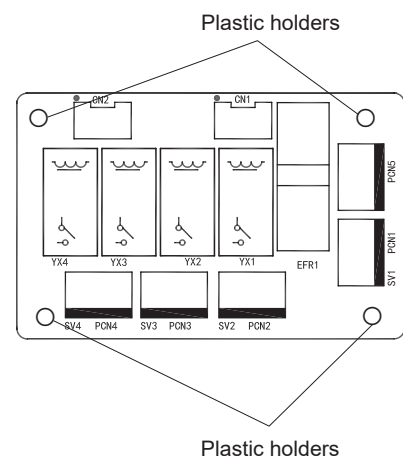
## 2.2.7.2 Removing the PCB3

To Remove the PCB3, the following operations should be done:

- Remove the front cover, as explained in “2.2.1 Removing the front cover”
  1. Remove all the connectors connected to the PCB3.
  2. Remove the plastic holders that fix the PCB3 to the E-Box.



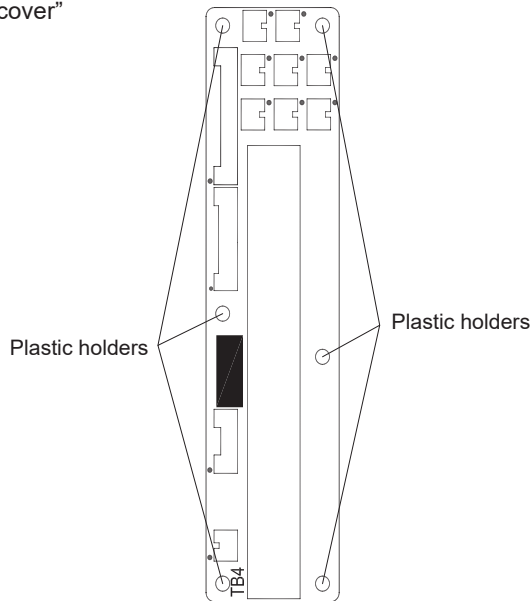
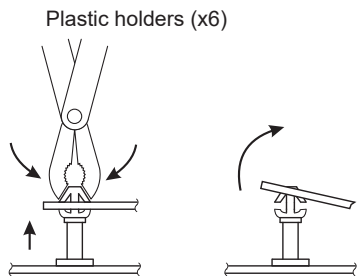
3. Remove the PCB3. If necessary, replace the PCB3 with a new one proceeding in reverse way than disassembling.



**2.2.7.3 Removing the PCB4**

To Remove the PCB4, the following operations should be done:

- Remove the front cover, as explained in “2.2.1 Removing the front cover”
  1. Remove all the connectors connected to the PCB4.
  2. Remove the plastic holders that fix the PCB4 to the E-Box.

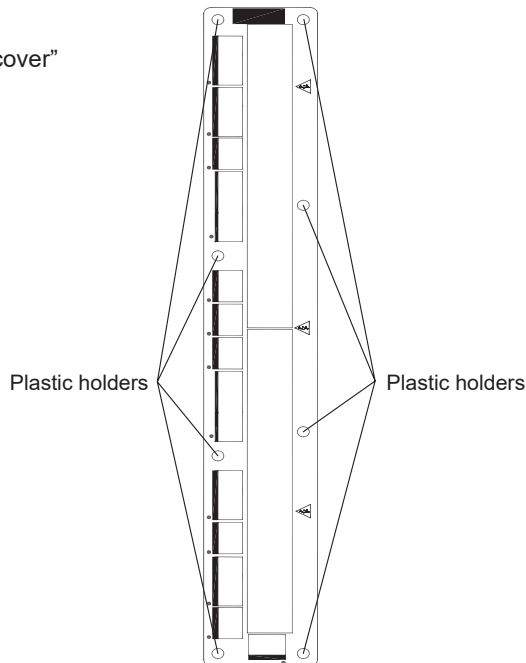
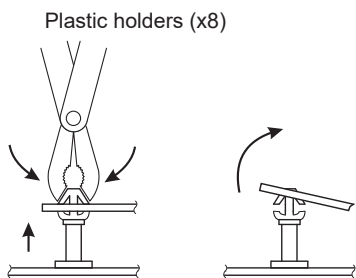


3. Remove the PCB4. If necessary, replace the PCB4 with a new one proceeding in reverse way than disassembling.

**2.2.7.4 Removing the PCB5**

To Remove the PCB5, the following operations should be done:

- Remove the front cover, as explained in “2.2.1 Removing the front cover”
  1. Remove all the connectors connected to the PCB5.
  2. Remove the plastic holders that fix the PCB5 to the E-Box.



3. Remove the PCB5. If necessary, replace the PCB5 with a new one proceeding in reverse way than disassembling.

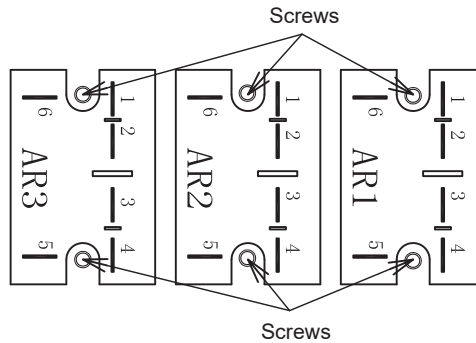
## 2.2.7.5 Removing the relays (AR1~3)

- Remove the front cover as explained in chapter “2.2.1 Removing the front cover”
- Open the Electrical box cover as explained in chapter “2.2.2 Opening the Electrical box” Then,
  - Identify the abnormal relay. Once detected, disconnect the cables.

### NOTE

Take note of the connections on the Relays. Check the wiring diagram for any doubt. Any incorrect connection may damage the unit.

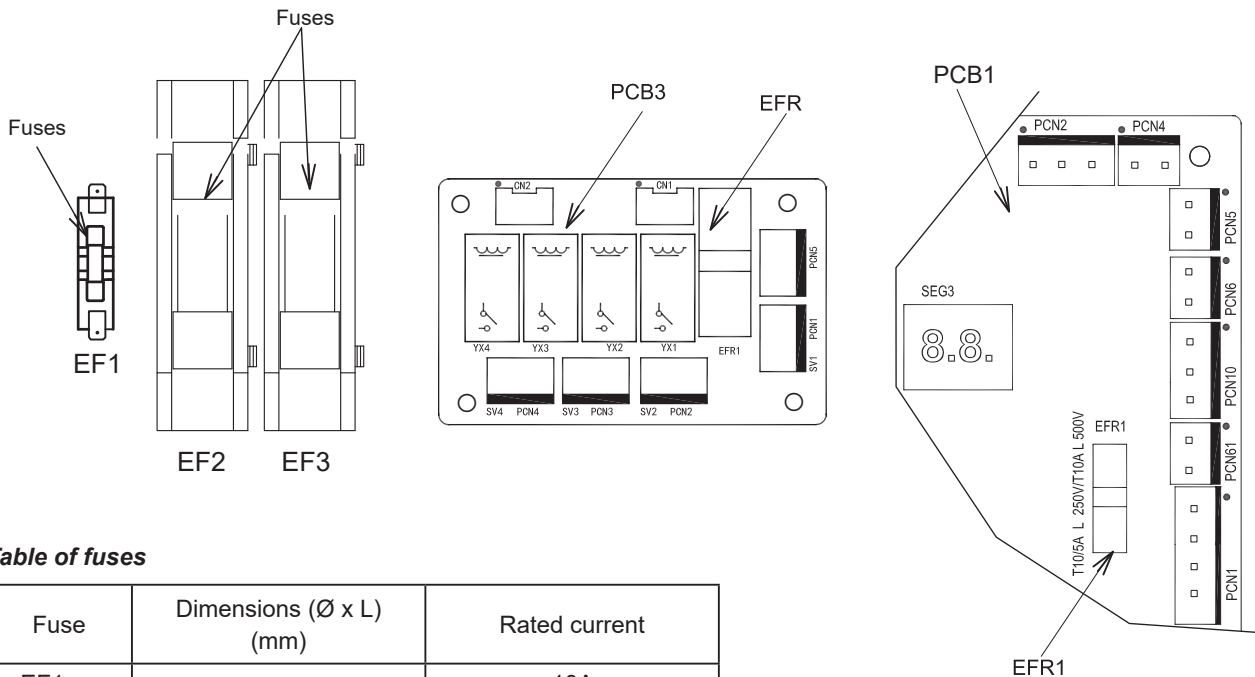
- Remove the screws attaching the relay to the Electrical box.



## 2.2.7.6 Replacement of fuses (EF1~3, EFR, EFR1)

- Remove the front cover as explained in chapter “2.2.1 Removing the front cover”.
- Open the Electrical box cover as explained in chapter “2.2.2 Opening the Electrical box”.

  - Once the broken fuse is detected, pull it from its placement.

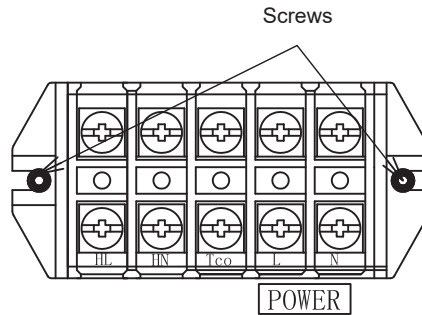


**Table of fuses**

Fuse	Dimensions (Ø x L) (mm)	Rated current
EF1	5.2 x 20	10A
EFR		10A
EFR1		10A
EF3	10.3 x 38	25A
EF4		25A

### 2.2.7.7 Removing the terminal board (TB1)

- Remove the front cover as explained in “2.2.1 Removing the front cover”
- Open the Electrical Box as explained in “2.2.2 Opening the Electrical Box”
  1. Remove all the cables connected to the terminal board.
  2. Remove the screws fixing the Terminal board to the E-Box.



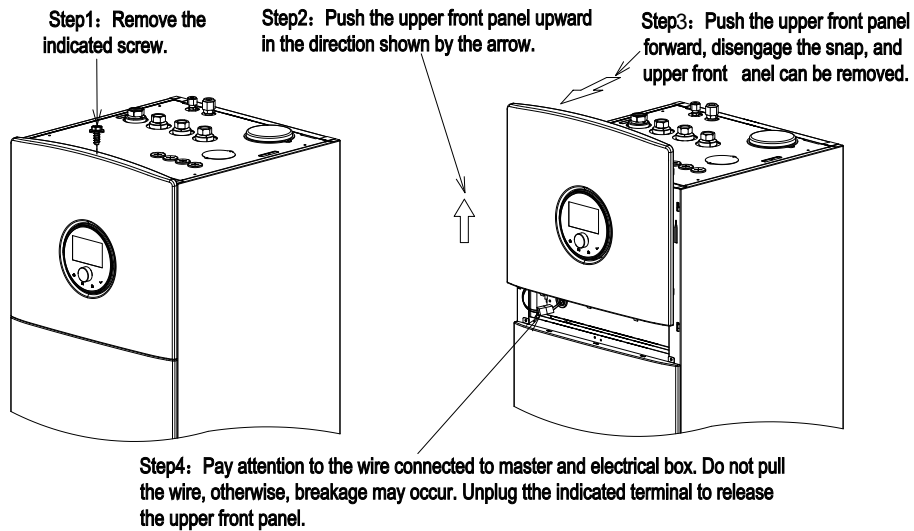
2.3 Hi-Therma Integra system - Indoor unit (AHS-044/060/080HCDSAA-23)

2.3.1 Removing the upper front panel

**i** NOTE

The indoor unit front panel needs to be removed for any task inside the indoor unit.

1) Remove the upper front panel as is shown in the figure below.



2) To reassemble a new upper front panel, proceed in a reverse way than disassembling.

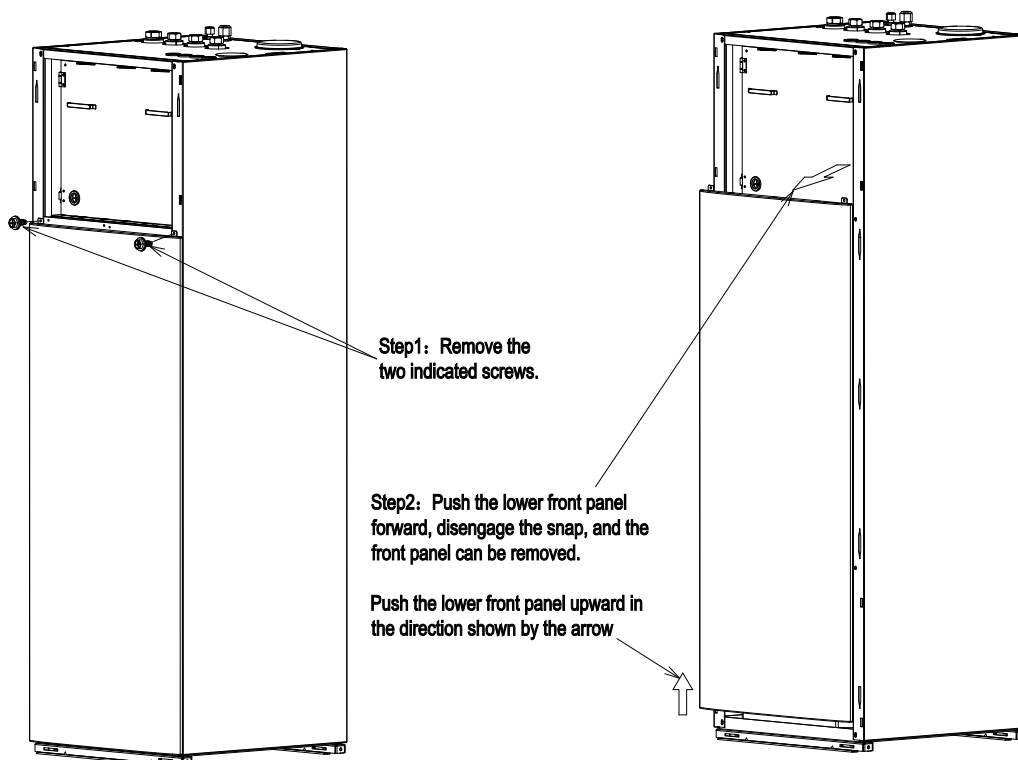
**!** CAUTION

- Take care with the LCD display of the master controller while removing the front panel.
- Be careful not to drop the front panel during operation.
- Take care when removing front panel, the parts inside the unit could be hot.

2.3.2 Removing the lower front panel

1) Remove the upper front panel as explained in “2.3.1 Removing the upper front panel”.

2) Remove the lower front panel as is shown in the figure below.



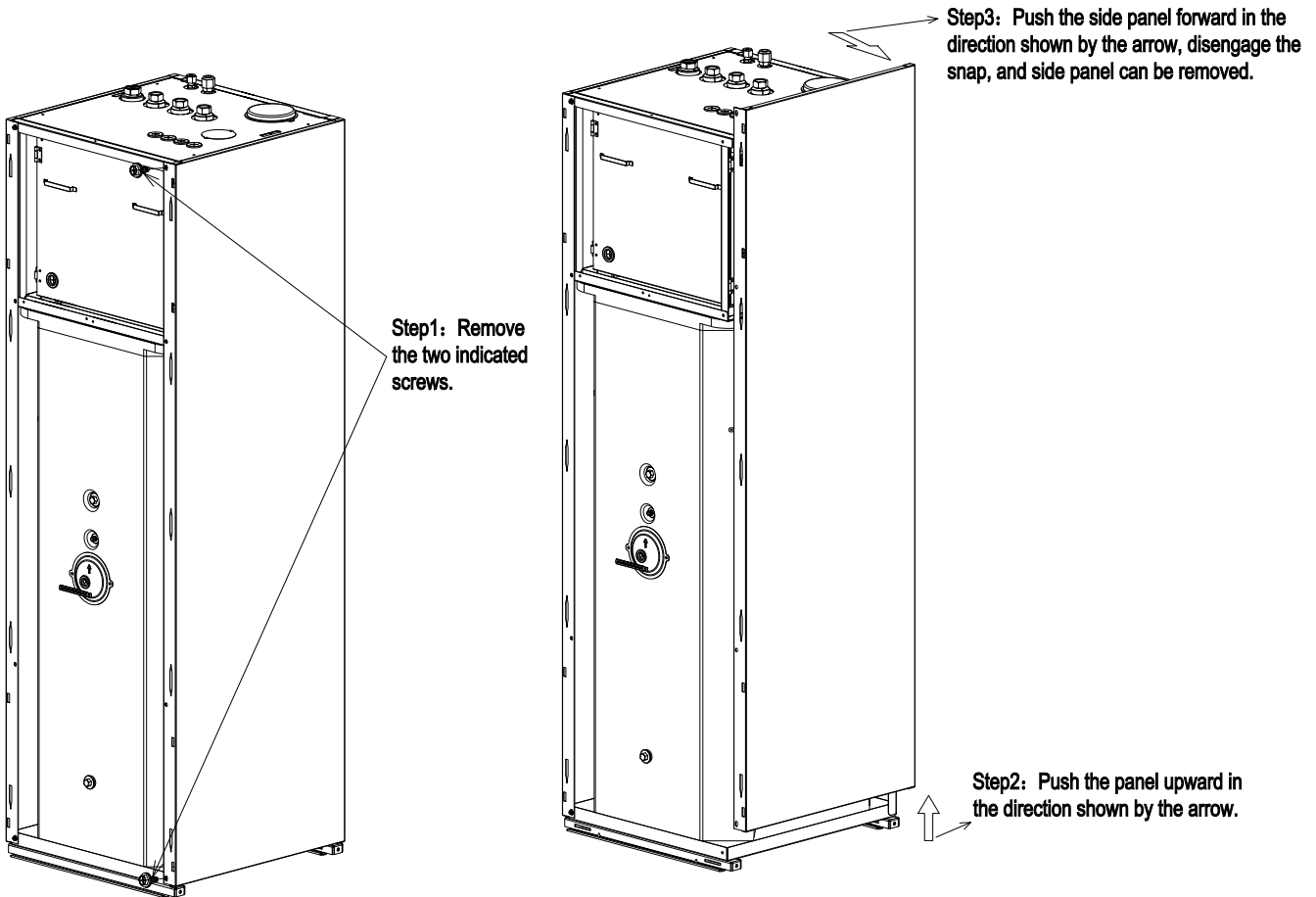
3) To reassemble a new lower front panel, proceed in a reverse way than disassembling.



### 2.3.3 Removing the side panel

The steps for removing the left side panel are the same.

- 1) Remove the upper front panel as explained in "2.3.1 Removing the upper front panel".
- 2) Remove the lower front panel as explained in "2.3.2 Removing the lower front panel".
- 3) Remove the right or left side panel as is shown in the figure below.



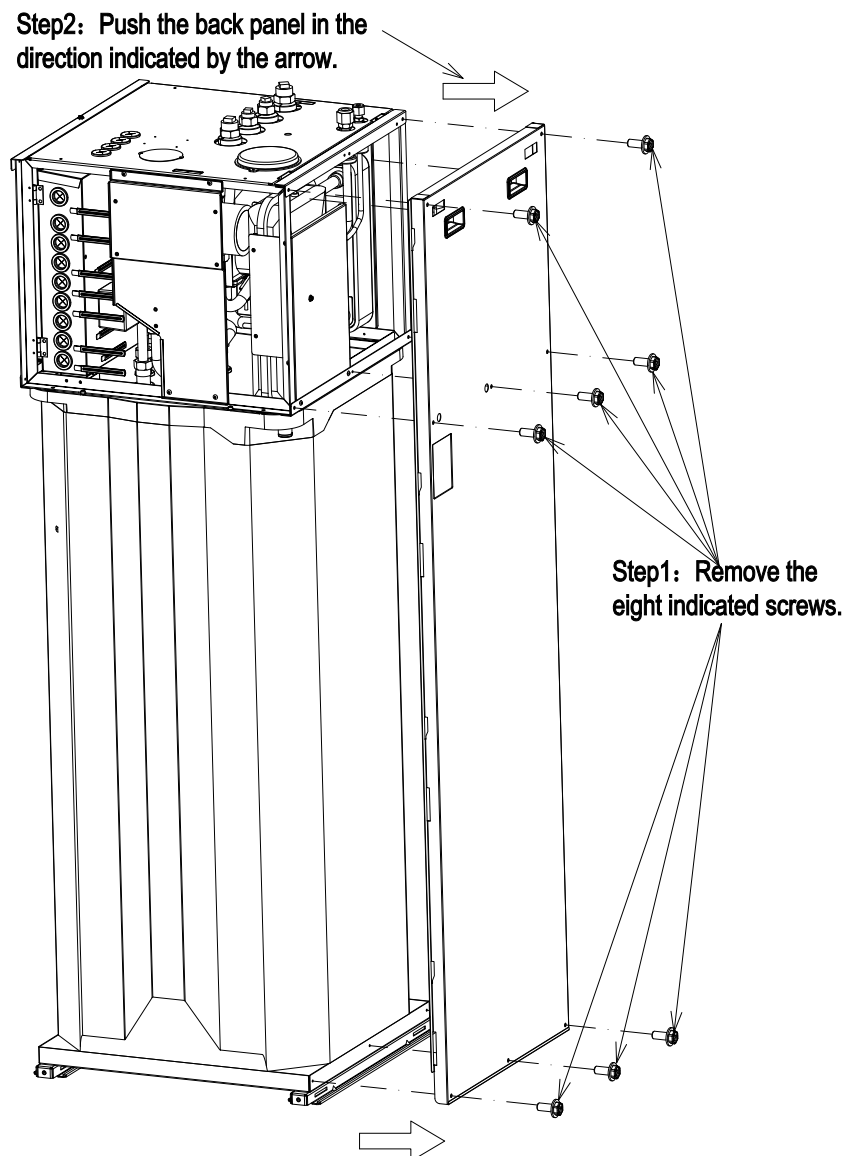
- 4) To reassemble a new right or left side panel, proceed in a reverse way than disassembling.

#### DANGER

The side panel is heavy, please operate it with at least two people to avoid falling and hurting .

### 2.3.4 Removing the back panel

- 1) Remove the upper front panel as explained in "2.3.1 Removing the upper front panel".
- 2) Remove the lower front panel as explained in "2.3.2 Removing the lower front panel".
- 3) Remove the side panels as explained in "2.3.3 Removing the side panels".
- 4) Remove the back panel as is shown in the figure below.



- 5) To reassemble a new back panel, proceed in a reverse way than disassembling.

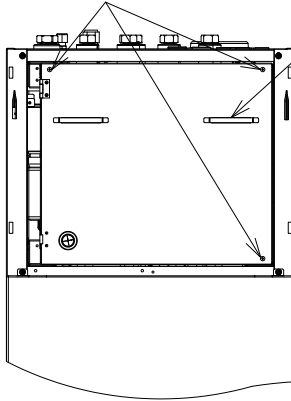
**2.3.5 Opening the electrical box**

**⚠ DANGER**

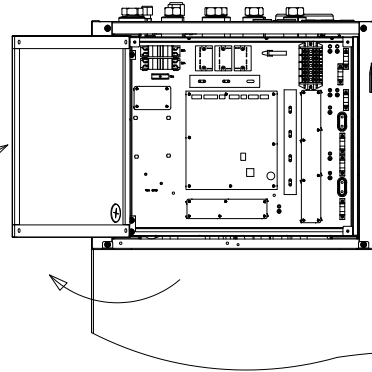
*Disconnect the unit from the power supply before touching any of the parts in order to avoid an electric shock.*

- 1) Remove the upper front panel as explained in “2.3.1 Removing the upper front panel”.
- 2) Open the electrical box cover as shown in the figure below. The electrical box can be turned about 93° counterclockwise.

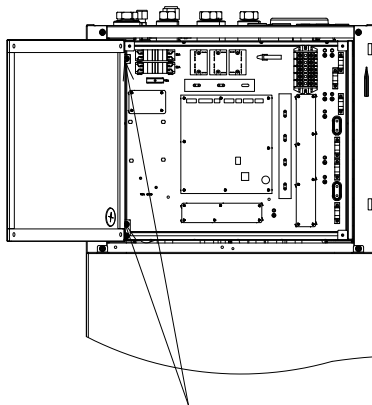
**Step1 : Remove the 3 screws.**



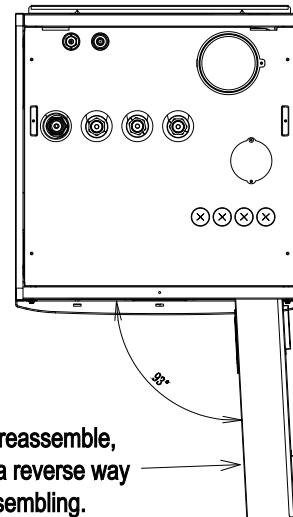
**Step2: Hold the indicated handle and pull left to open the electrical box cover.**



**Step3: The electrical box cover can be opened about 120°.**



**Step4: As shown in removing the electrical box, after removing the electrical box cover, remove the 3 screws inside.**



**Step5: To reassemble, proceed in a reverse way than disassembling.**

**⚠ CAUTION**

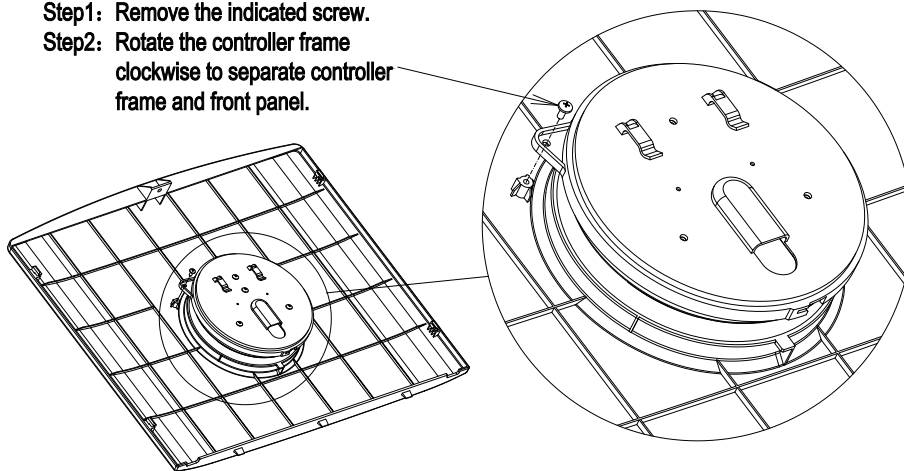
*Take care with the electrical box components in order to avoid damaging.*

2.3.6 Hanging the master controller

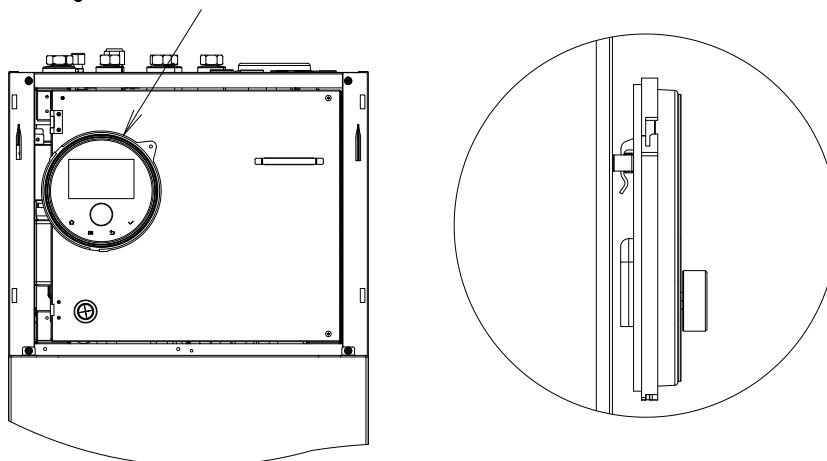
**i** NOTE

The master controller can be hung on the handle of the electrical box cover.

- Step1: Remove the indicated screw.
- Step2: Rotate the controller frame clockwise to separate controller frame and front panel.



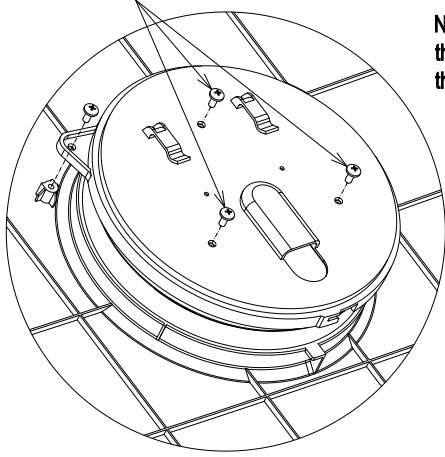
- Step3: As shown in the figure, the master controller can be hung on the handle of the electrical box cover.



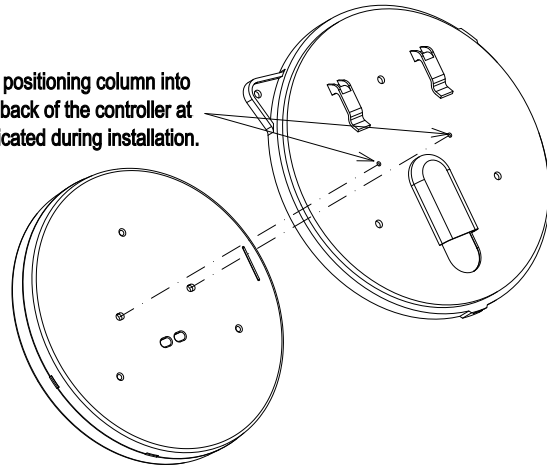
**2.3.7 Disassembling the Master Controller****⚠ CAUTION**

- Please pay attention to protect the LCD display of the Master Controller when removing.
- Please prevent the Master Controller from falling and damaging during operation.

Remove the indicated three screws to separate the controller and the mounting plate.



Note: Insert the positioning column into the hole on the back of the controller at the position indicated during installation.



2.3.8 Removing the water system components

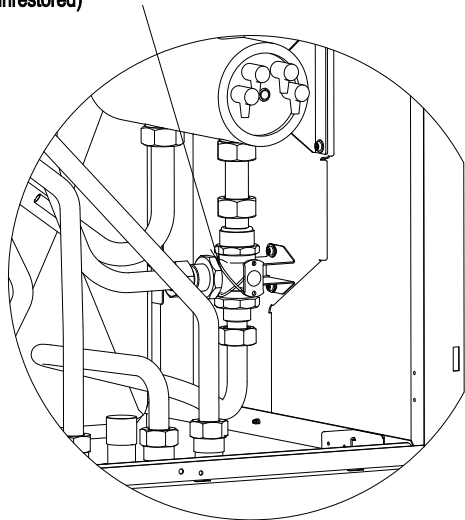
**⚠ DANGER**

- The following operations need to cut off the water system and drain the water in the machine.
- Follow-up operations can be performed after completely disconnecting the power supply.

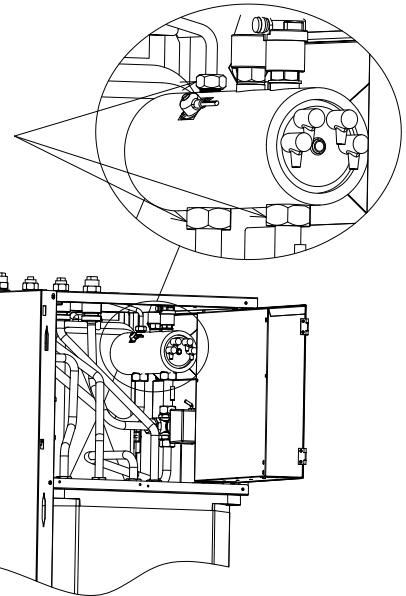
2.3.8.1 Removing the Auxiliary Electric Heater components

- 1) Remove the upper front panel as explained in “2.3.1 Removing the upper front panel”.
- 2) Remove the lower front panel as explained in “2.3.2 Removing the lower front panel”.
- 3) Remove the right side panel as explained in “2.3.3 Removing the side panel”.
- 4) Rotate the electrical box by 93° as explained in “2.3.5 Opening the electrical box”.
- 5) Remove the auxiliary electric heater as is shown in the figure below.

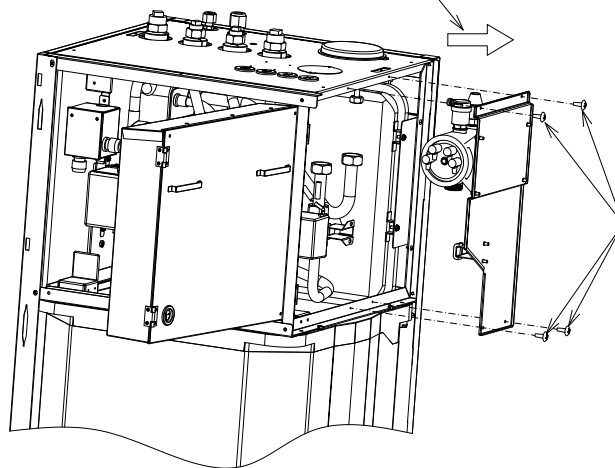
Step1: Cut the wire tie fixed to the 3-way valve  
(During reassembly, the wire tie can be left unrestored)



Step2: Remove the three nuts

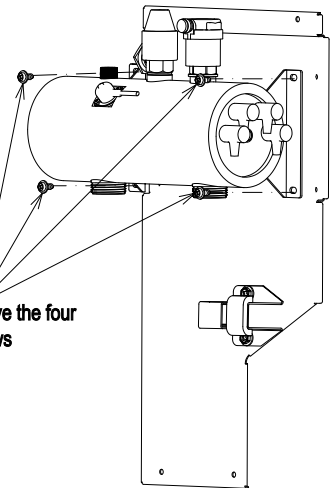


Step4: Pull the electric heater assembly to the right



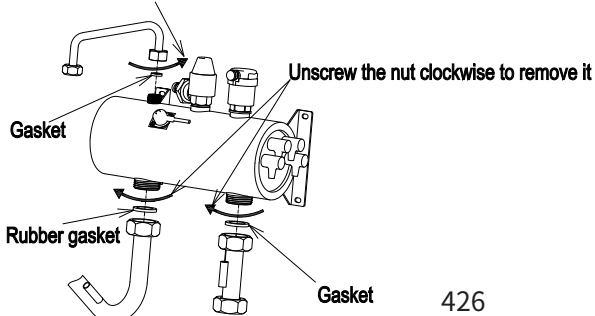
Step3: Remove the four indicated screws

Step5: Remove the four indicated screws



Details and notes on removing and reassembling water pipe nuts

Unscrew the nut counterclockwise to remove it

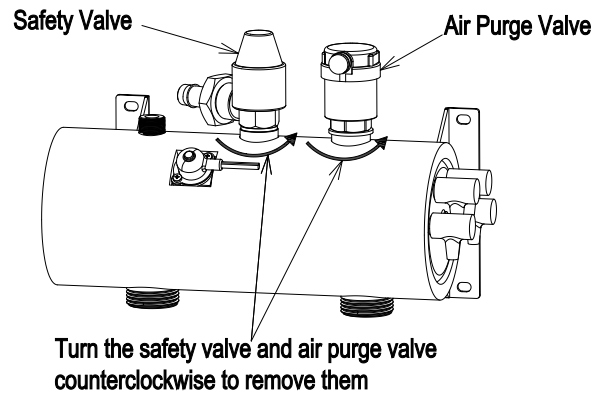


6) To reassemble a new auxiliary electric heater, proceed in a reverse way than disassembling..

**⚠ CAUTION**

- At the connection of water pipe nut and electric heater pipe nozzle, a rubber gasket needs to be installed to prevent water leakage.
- When removing the electric heater, be careful not to damage the gasket. If damaged, it needs to be replaced with a new one;
- Proceed in a reverse way to reassemble the electric heater, and check whether there is water leakage after reassembly.
- For the 3-way reversing valve's cord clamp which has been cut off, it is not necessary to recover it.

### 2.3.8.2 Removing the Safety Valve and Air Purge Valve



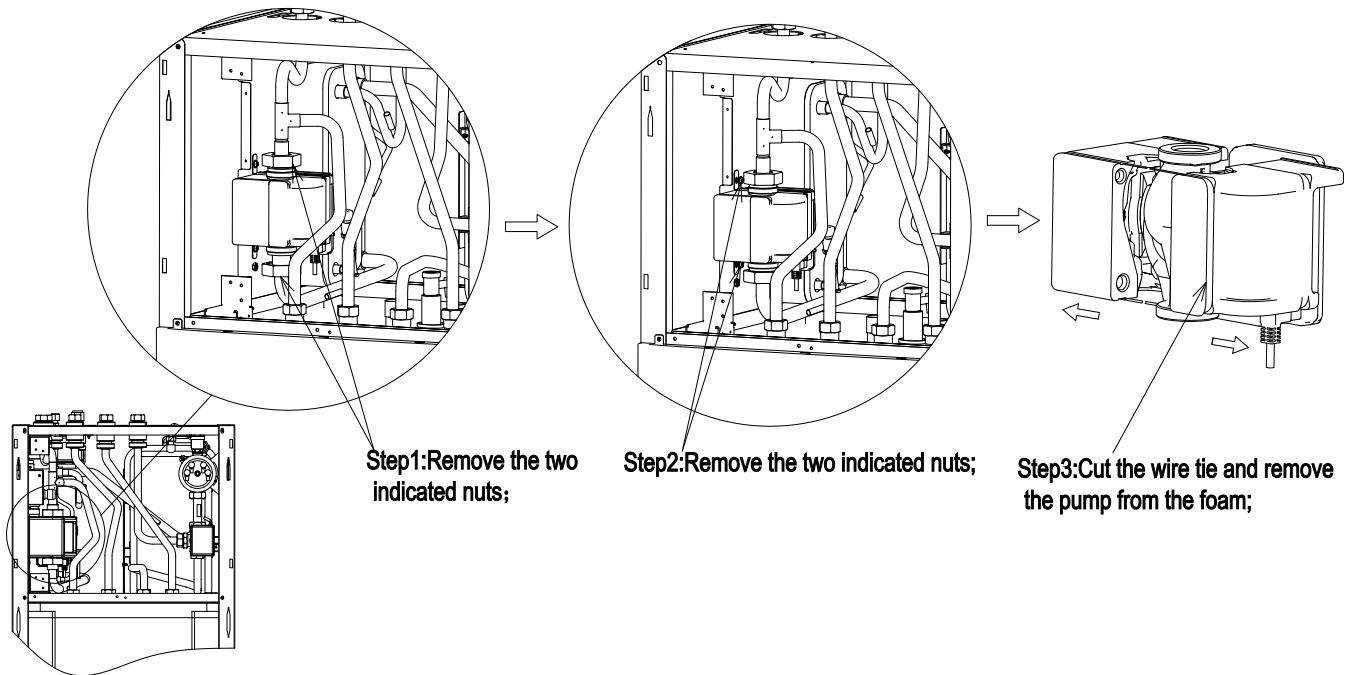
To reassemble a new safety valve and a new exhaust valve, proceed in a reverse way than disassembling..

**⚠ CAUTION**

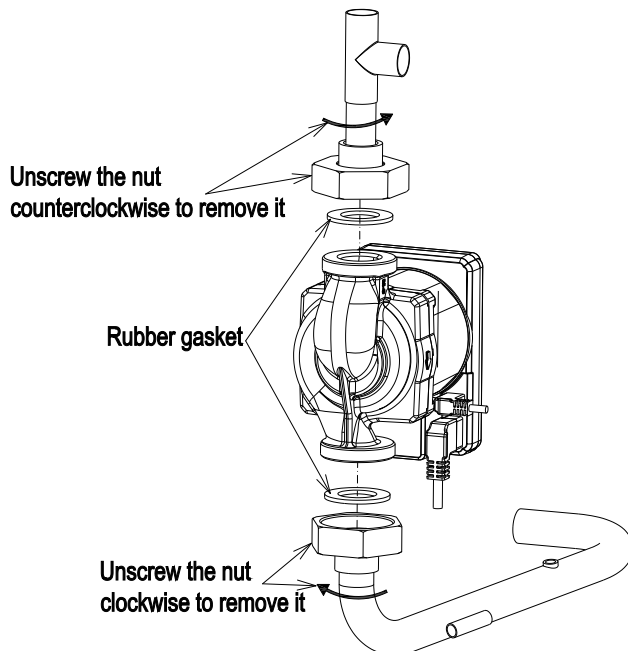
After the installation of the new safety valve and exhaust valve, ensure to conduct the air tightness test.

2.3.8.3 Removing the Water Pump

- 1) Remove the upper front panel as explained in “2.3.1 Removing the upper front panel”.
- 2) Rotate the electrical box by 93° as explained in “2.3.5 Opening the electrical box”.
- 3) Remove the water pump as is shown in the figure below.



Details of removing and reassembling the water pump nuts and rubber gaskets



- 4) To reassemble a new water pump, proceed in a reverse way than disassembling.

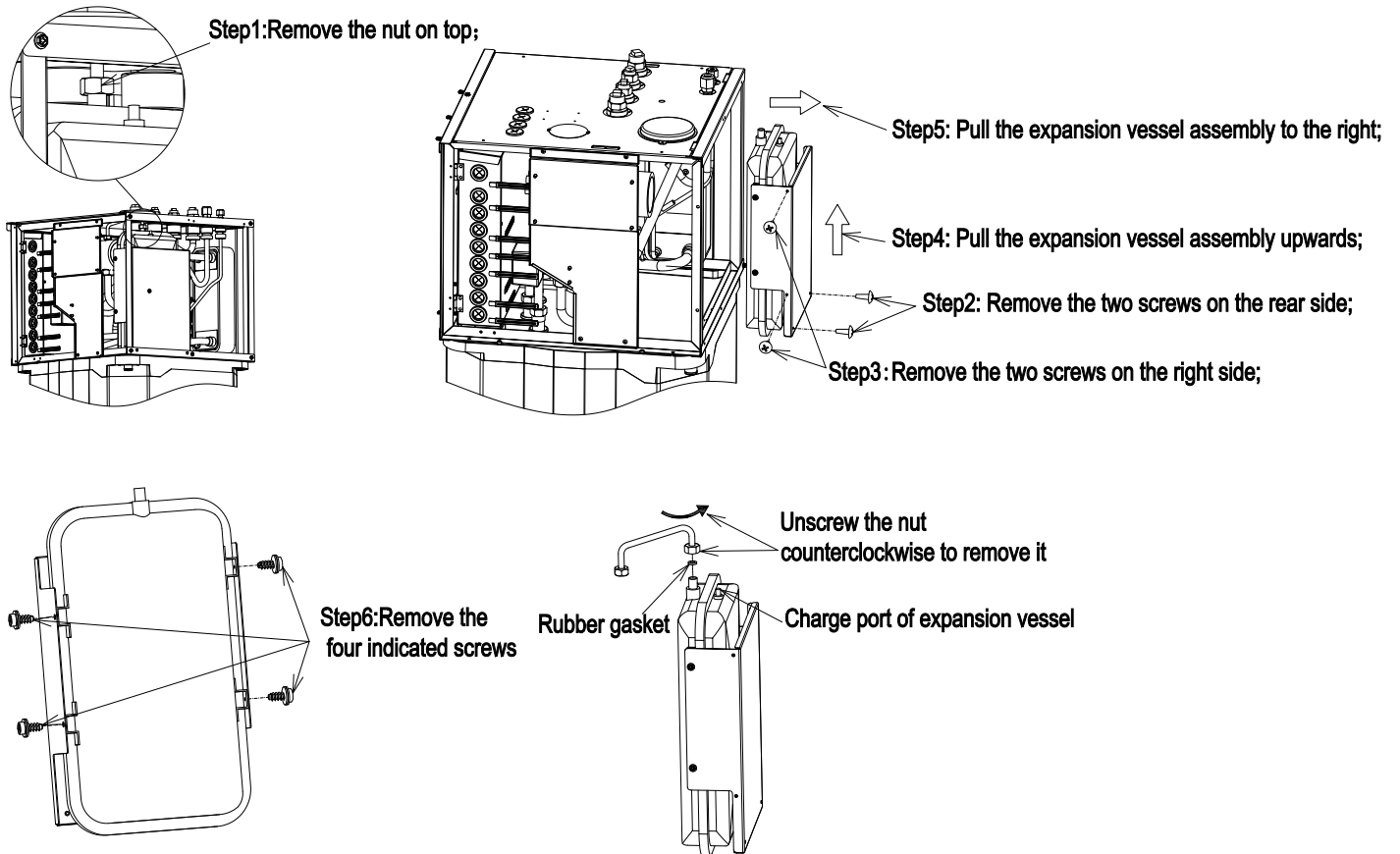
**CAUTION**

- At the connection of water pipe nut and water pump pipe nozzle, a rubber gasket needs to be installed to prevent water leakage.
- When removing the water pump, be careful not to damage the gasket. If damaged, it needs to be replaced with a new one;
- Proceed in a reverse way to reassemble a new water pump, and check whether there is water leakage after reassembly.



**2.3.8.4 Removing the Expansion Vessel**

- 1) Remove the upper front panel as explained in “2.3.1 Removing the upper front panel”.
- 2) Remove the lower front panel as explained in “2.3.2 Removing the lower front panel”.
- 3) Remove the right and left side panels as explained in “2.3.3 Removing the side panel”.
- 4) Remove the back panel as explained in “2.3.4 Removing the back panel”.
- 5) Remove the expansion vessel as is shown in the figure below.



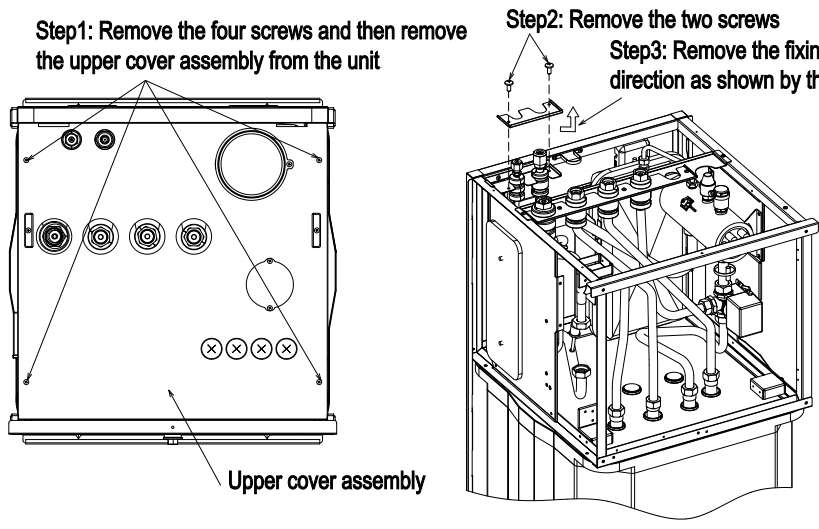
6) To reassemble a new expansion vessel, proceed in a reverse way than disassembling.

**⚠ CAUTION**

- At the connection of water pipe nut and expansion vessel pipe nozzle, a rubber gasket needs to be installed to prevent water leakage.
- When removing the expansion vessel, be careful not to damage the gasket. If damaged, it needs to be replaced with a new one;
- Proceed in a reverse way to reassemble a new expansion vessel, and check whether there is water leakage after reassembly.

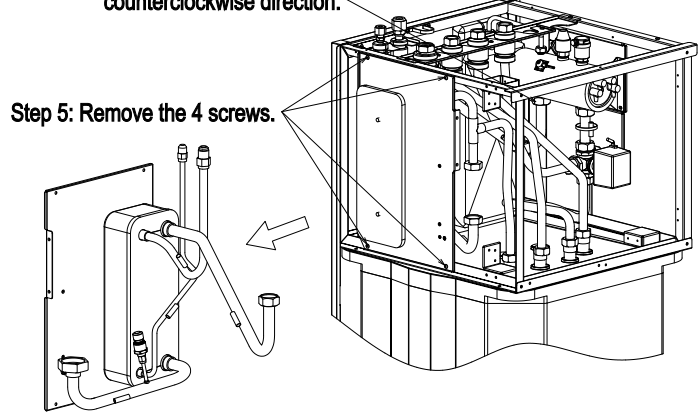
2.3.8.5 Removing the plate heat exchanger assembly

- 1) Remove the upper front panel as explained in “2.3.1 Removing the upper front panel”.
- 2) Remove the lower front panel as explained in “2.3.2 Removing the lower front panel”.
- 3) Remove the left side panel as explained in “2.3.3 Removing the side panel”.
- 4) Rotate the electrical box by 93° in a counterclockwise direction as explained in “2.3.5 Opening the electrical box”.
- 5) Remove the plate heat exchanger as is shown in the figure below.

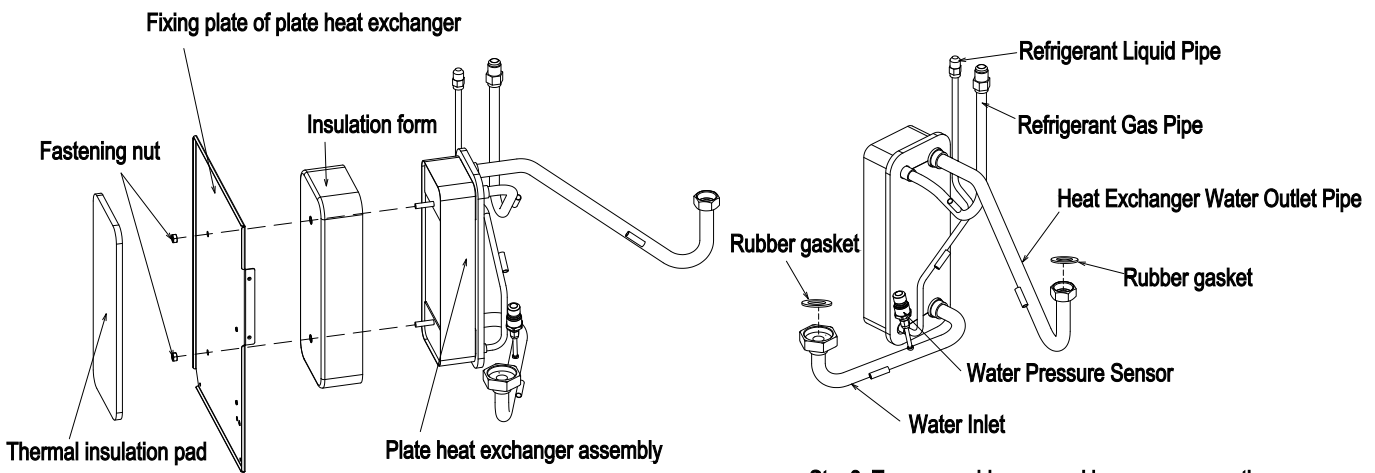


**Step3: Remove the fixing plate in the direction as shown by the arrow**

**Step 4: Loosen the nut in counterclockwise direction.**



**Step 6: After completing the above steps, the plate heat exchanger assembly as shown in the figure can be removed.**



**Step 7: As shown above, remove the thermal insulation pad, remove the 2 fastening nuts and remove the plate heat exchanger fixing plate, insulation form and plate heat exchanger assembly.**

**Step8: To reassemble, proceed in a reverse way than disassembling.**

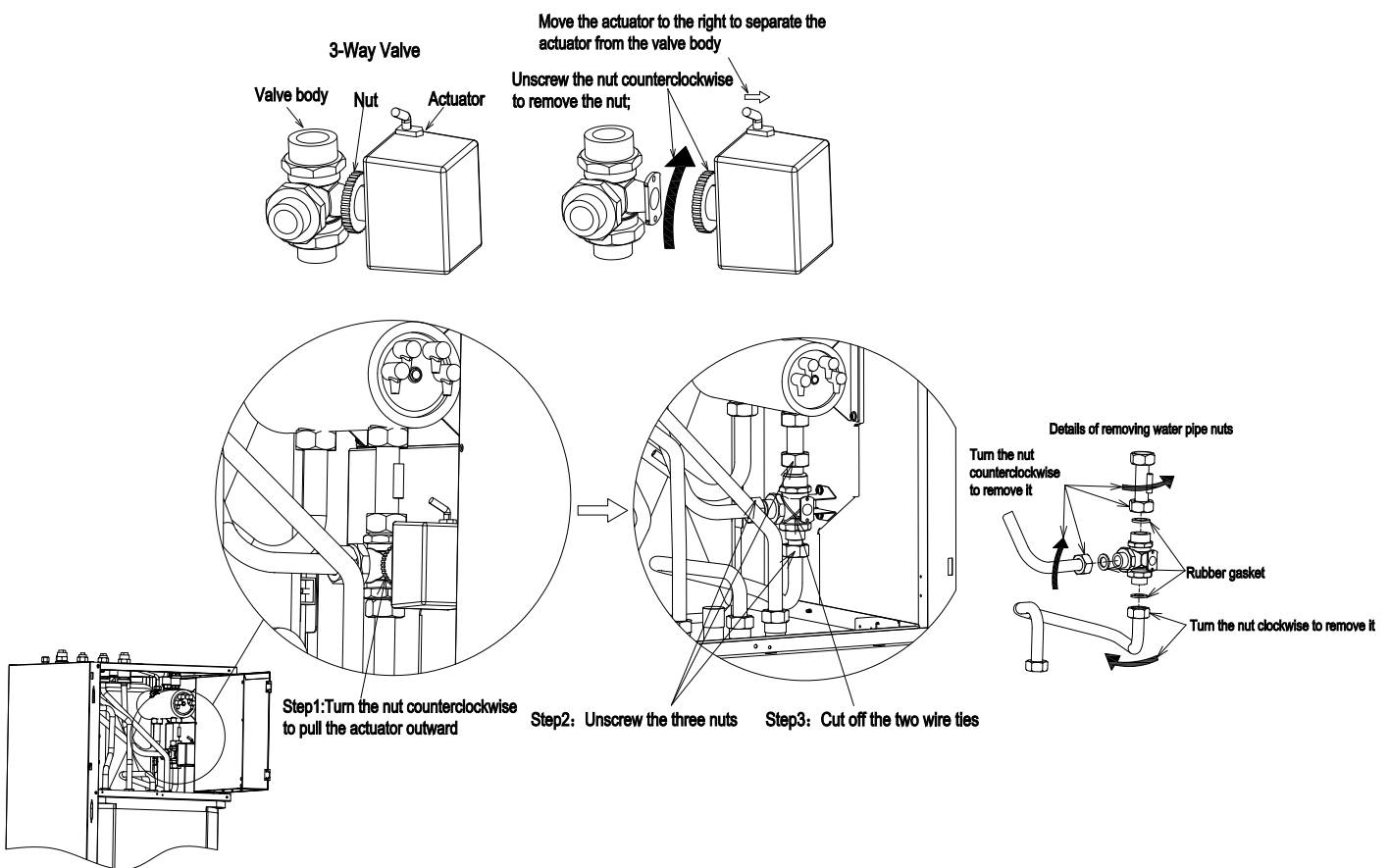
6) To reassemble a new plate heat exchanger, proceed in a reverse way than disassembling..

**CAUTION**

- At the connection of water pipe nut and plate heat exchanger, and at the connection of water pipe nut and water pipe nozzle, a rubber gasket needs to be installed to prevent water leakage.
- When removing the plate heat exchanger, be careful not to damage the gasket. If damaged, it needs to be replaced with a new one;
- Proceed in a reverse way to reassemble a new plate heat exchanger, and check whether there is water leakage after reassembly.

**2.3.8.6 Removing the 3-Way Reversing Valve**

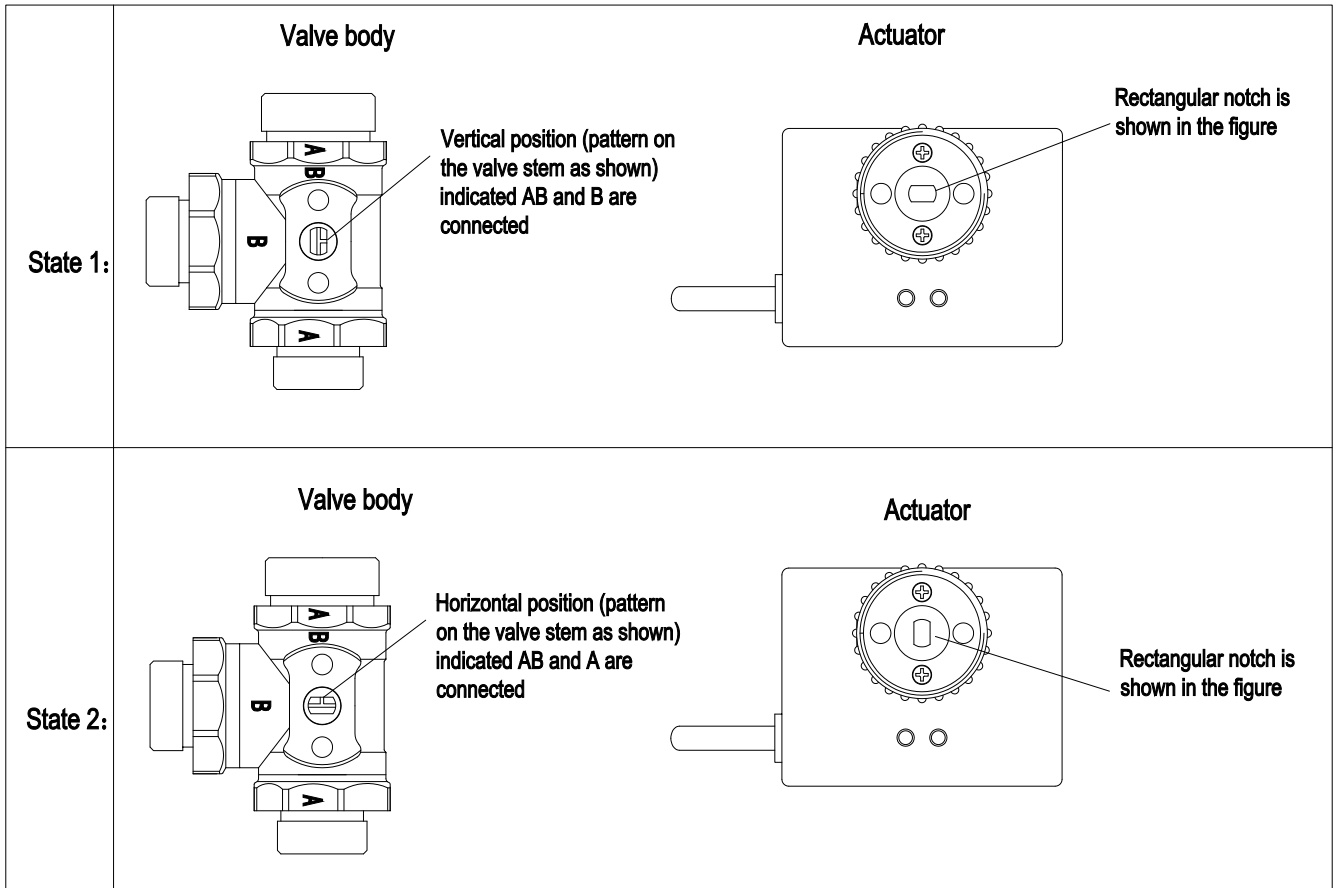
The 3-way valve consists of two parts: the valve body and the actuator. The valve body is brass, the actuator is the electrical part, and a threaded connection is adopted between the two parts. Turn the nut counterclockwise to complete the disassembly (as shown in the figure below).



- 1) Remove the upper front panel as explained in “2.3.1 Removing the upper front panel”.
- 2) Rotate the electrical box by 93° as explained in “2.3.5 Opening the electrical box”.
- 3) Remove the 3-way reversing valve as is shown in the figure below. If it is only the actuator that is damaged, it suffices to complete “Step1”. If the valve body is damaged, all steps need to be completed..
- 4) To reassemble a new reversing valve, proceed in a reverse way than disassembling.
  - ① If only the actuator is damaged, replace the actuator after completing “Step1”;
  - ② If the valve body is damaged, proceed in a reverse way than disassembling to replace a new reversing valve.

When replacing the reversing valve, please note that the valve body spool can only be in the two states shown in the figure below, and no other states can occur. If the spool is in a different state, it will cause control abnormality.

Using wrenches and so on, the spool of the valve body can be turned. When installing, ensure that the valve body spool matches with the rectangular notch of the actuator.



**⚠ CAUTION**

- At the connection of water pipe nut and valve body, a rubber gasket needs to be installed to prevent water leakage.
- When removing the valve body, be careful not to damage the gasket. If damaged, it needs to be replaced with a new one;
- Proceed in a reverse way to reassemble, and check whether there is water leakage after reassembly.
- The cord clamp used to bundle the valve body needs to be cut during the disassembly process. When reassembling in a reverse way than disassembling, it is no longer necessary to bundle the cord clamp.

## 2.3.9 Removing the Thermostat

### 2.3.9.1 Resetting the Thermostat

When the water temperature in the DHW tank exceeds  $85\pm 5$  °C, the thermostat is activated, the power of the DHW tank electric heater is disconnected and the heating is stopped.

After the thermostat is reset, the electric heater can resume normal operation.

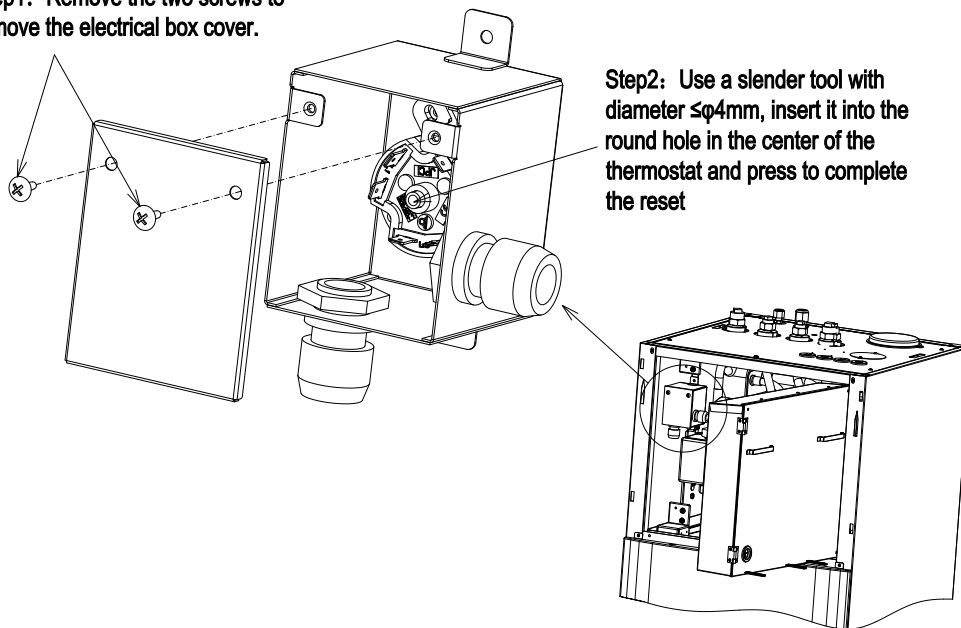
After the thermostat is disconnected, it needs to be reset manually.

Only after the temperature of the thermostat sensor head drops to 45 °C, it can be manually reset.

The steps for manually resetting the thermostat are:

- 1) Remove the upper front panel as explained in “2.3.1 Removing the upper front panel”.
- 2) Rotate the electrical box by 93° as explained in “2.3.5 Opening the electrical box”.
- 3) Reset the thermostat as is shown in the figure below.

**Step1: Remove the two screws to remove the electrical box cover.**

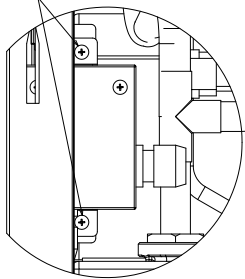


**Step2: Use a slender tool with diameter  $\leq \phi 4$ mm, insert it into the round hole in the center of the thermostat and press to complete the reset**

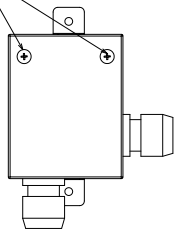
2.3.9.2 Removing the Thermostat

- 1) Remove the upper front panel as explained in “2.3.1 Removing the upper front panel”.
- 2) Remove the lower front panel as explained in “2.3.2 Removing the lower front panel”.
- 3) Rotate the electrical box by 93° as explained in “2.3.5 Opening the electrical box”.
- 4) Remove the thermostat as is shown in the figure below.

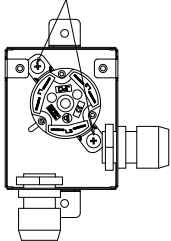
**Step1:** Unscrew the two indicated screws to remove the thermostat assembly.



**Step2:** Unscrew the two indicated screws to remove the thermostat box cover

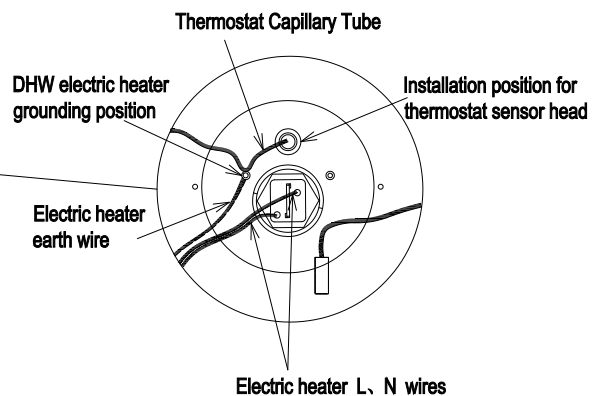
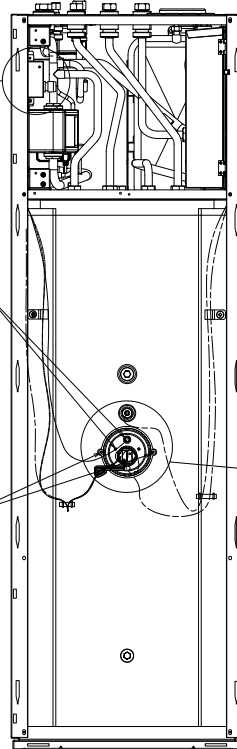


**Step3:** Unscrew the two indicated screws to remove the thermostat.



**Step6:** Cut off the fixing clamp for capillary tube to pull the bulb out from the blind pipe.

**Step5:** Unscrew the two indicated screws to remove the electrical box cover



**Step4:** Remove the 6 wiring on the thermostat. Pay attention to record the state before the removal of the wiring, after the new thermostat is assembled, restore the 6 wiring to the initial state.

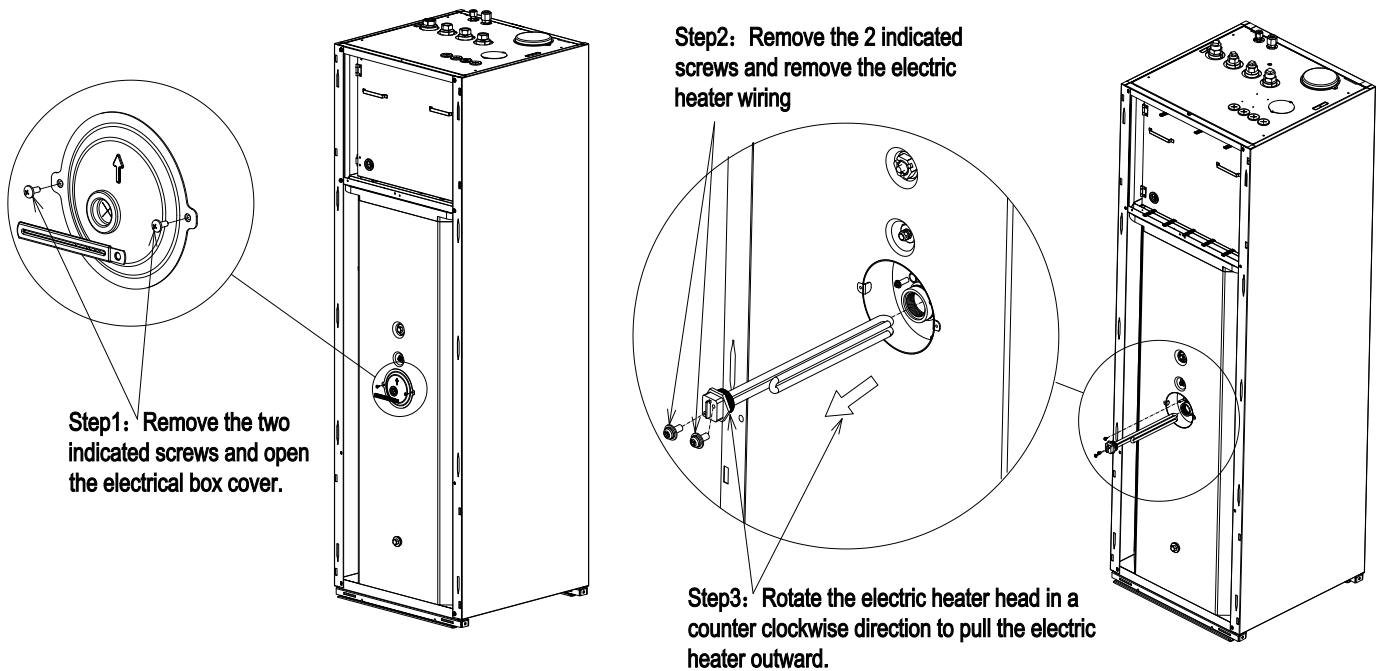
5) To reassemble a new thermostat, proceed in a reverse way than disassembling.

**CAUTION**

- When reassembling in a reverse way than disassembling, the thermostat sensor head shall be inserted into the bottom of the blind pipe, otherwise it may cause abnormal temperature control. The capillary tube needs to be fixed on the earthing bolts of the electric heater with cord clamps to avoid loosening;
- The 6 wirings of the thermostat shall be restored to the state before disassembly.
- Do not press or fold the copper pipe when disassembling and installing the thermostat, and abnormal operation will lead to thermostat failure.

### 2.3.10 Removing the DHW Electric Heater

- 1) Remove the upper front panel as explained in “2.3.1 Removing the upper front panel”.
- 2) Remove the lower front panel as explained in “2.3.2 Removing the lower front panel”.
- 3) Remove the DHW electric heater as is shown in the figure below.



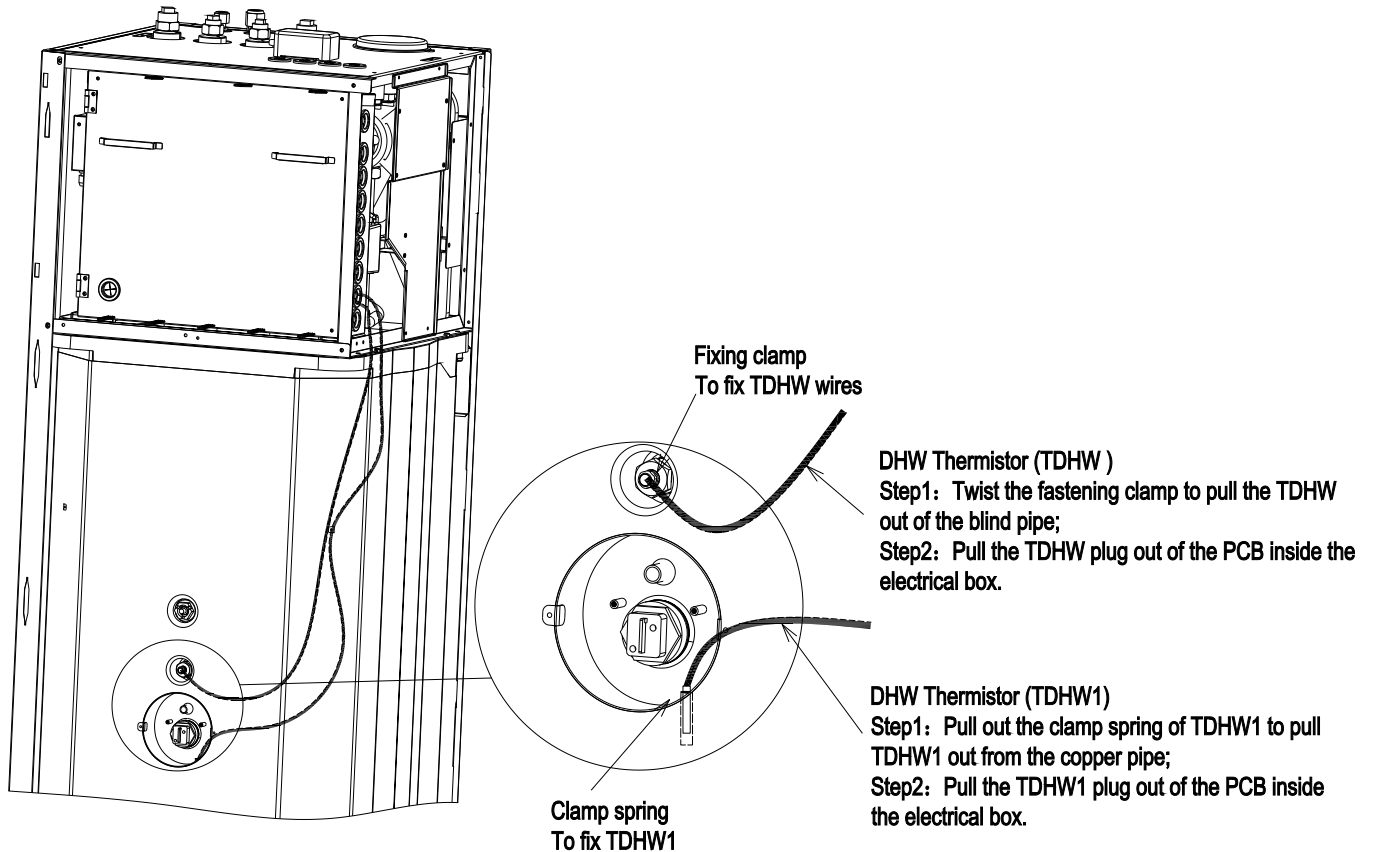
- 4) To reassemble a new DHW electric heater, proceed in a reverse way than disassembling.

### CAUTION

- The above operations shall be conducted only when the power is completely cut off.
- The DHW electric heater comes with a rubber gasket, when the new electric heater is reassembled, it needs to be tightened firmly, and ensure to conduct air tightness test after installation

### 2.3.11 Removing the DHW Thermistors

- 1) Remove the upper front panel as explained in “2.3.1 Removing the upper front panel”.
- 2) Remove the lower front panel as explained in “2.3.2 Removing the lower front panel”.
- 3) Rotate the electrical box by 93° as explained in “2.3.5 Opening the electrical box”.
- 4) Remove the DHW electric heater cover as explained in “2.3.10 Removing the DHW electric heater”.
- 5) Remove the DHW thermistors (TDHW and TDHW 1) as is shown in the figure below.



- 6) To reassemble a new DHW thermistor, proceed in a reverse way than disassembling.

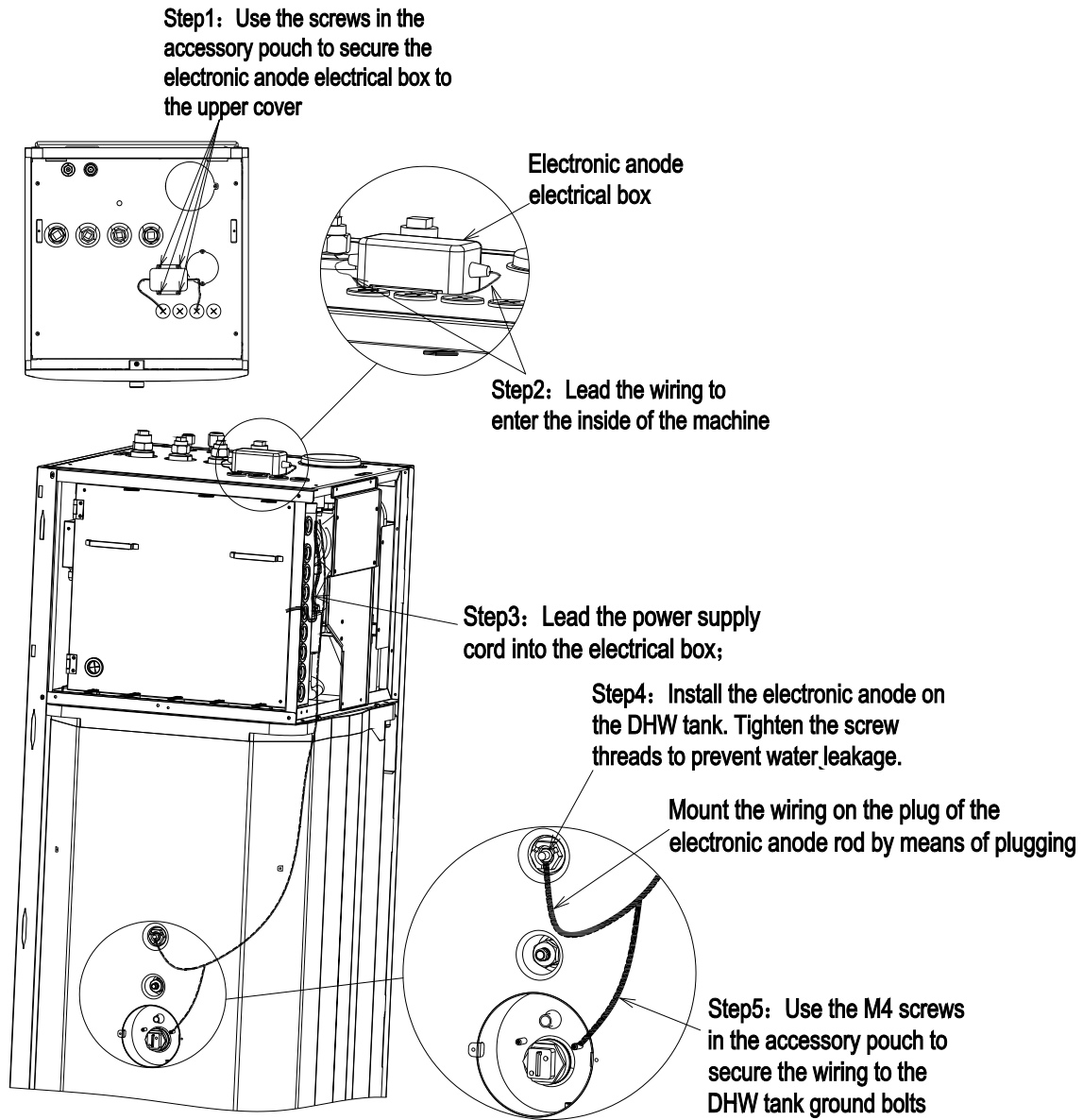
### **⚠ CAUTION**

- The above operations shall be conducted only when the power is completely cut off.
- TDHW needs to be inserted into the deepest part of the blind pipe, and the wiring should be fixed with cord clamp to avoid inaccurate installation position and coming off of the TDHW, resulting in abnormal water temperature control;
- TDHW1 needs to be firmly fixed with clamp spring, and TDHW1 shall be in close contact with the inner part of the DHW tank to prevent TDHW1 from being installed unstably and coming out, resulting in abnormal water temperature control;
- TDHW PCB terminal is marked as “TDHW”, TDHW1 PCB terminal is marked as “A5”. If the terminals are connected incorrectly, it will cause abnormal water temperature control.

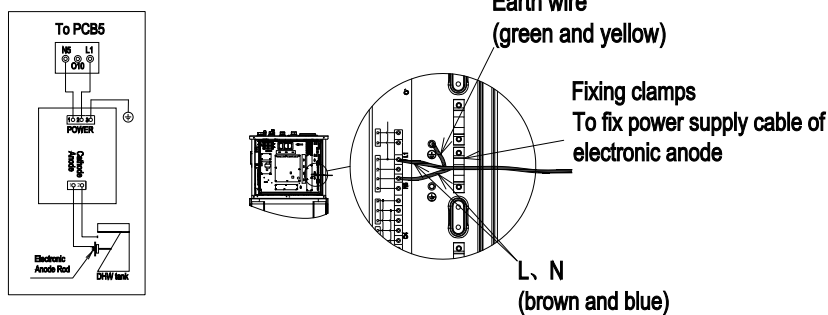


**2.3.12 Installing the Electronic Anode (Optional Part)**

- 1) Remove the upper front panel as explained in “2.3.1 Removing the upper front panel”.
- 2) Remove the lower front panel as explained in “2.3.2 Removing the lower front panel”.
- 3) Rotate the electrical box by 93° as explained in “2.3.5 Opening the electrical box”.
- 4) Install the electronic anode as is shown in the figure below.



**Electronic Anode Wiring Diagram**



5) The wiring connection inside the electrical box is shown as below:

**⚠ CAUTION**

- Before the wiring enters the electrical box, it is necessary to bundle the return trap;
- After the wiring enters the electrical box, fix the wiring firmly with cord clamps.

2.4 Hi-Therma Monobloc System (AHZ-044/080HCDS1)

Safety Introduction

**⚠ DANGER**

DO NOT TOUCH THE ELECTRICAL COMPONENTS WHILE LEDS on O.U. MAIN PCB or LED1 on O.U. DISPLAY PCB ARE ON, TO AVOID ELECTRICAL SHOCK.

WAIT UNTIL ALL LEDS TURN OFF.

**⚠ DANGER**

- Before performing any of the service operations described in this chapter turn all the main switches off and the place security lockers or convenient warning indicators in order to prevent them from turning on accidentally.
- In case of blocked or stuck parts use appropriate tools and eventually lubricants to release them.
- In case of sharped edged parts as covers use security gloves to avoid getting injured.
- When performing brazing work besides security gloves it is must to wear convenient eye protection.
- Check and be sure that all LEDS on the O.U. main PCB or display PCB are OFF for all electrical maintenance.

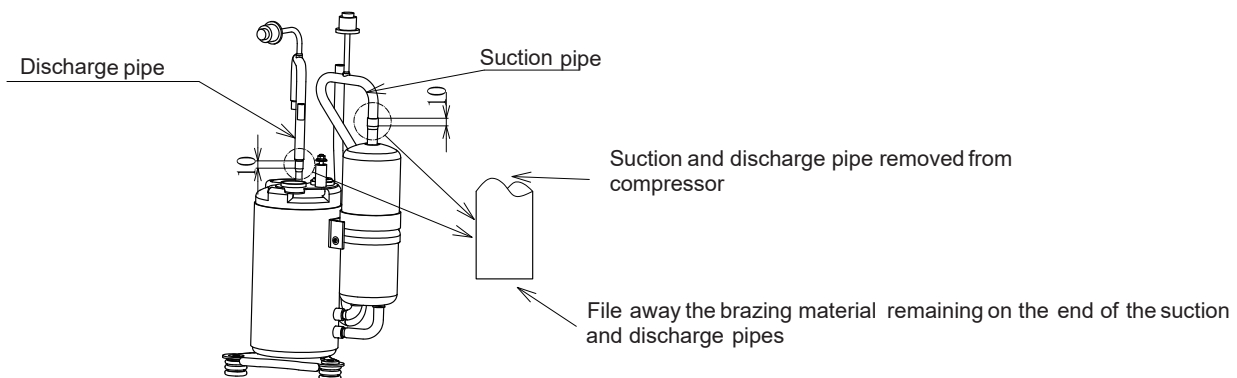
**i NOTE**

- All compressors are connected by brazing. Check to ensure whether there are flammable things around or not when using a burner for pipe connections if not oil existing pipe inside may ignite.
- Do not expose the refrigerant cycle to the atmosphere for a long period in order to avoid mixing the water and foreign particles into the refrigerant cycle. After removing compressor replace it quickly. If exposed for a long period seal the suction pipe and discharge pipe.
- Remove the cap for the compressor just before replacing the compressor. Before mounting the compressor seal the suction pipe and discharge pipe with a tape to protect the compressor from foreign particles. Remove the tape at pipe connection.
- Caution for Replacement of Compressor

Remove the suction pipe and the discharge pipe from the compressor. Isolate the wires and electrical components to protect them from the burner flame when brazing the connection pipes.

When replacing the compressor, the brazed material used for connecting the compressor and refrigerant pipes can drop into the pipes and get sucked into the compressor, causing a compressor failure. To avoid this, take the following points into account when replacing the compressor:

- File away brazing material remaining on the end of the refrigerant pipes.
- Insert the pipes fully in to prevent brazing material from entering them.
- Refer to the table for the recommended amount of brazing material. If using more brazing material than the recommended amount, it may drop into the pipes.



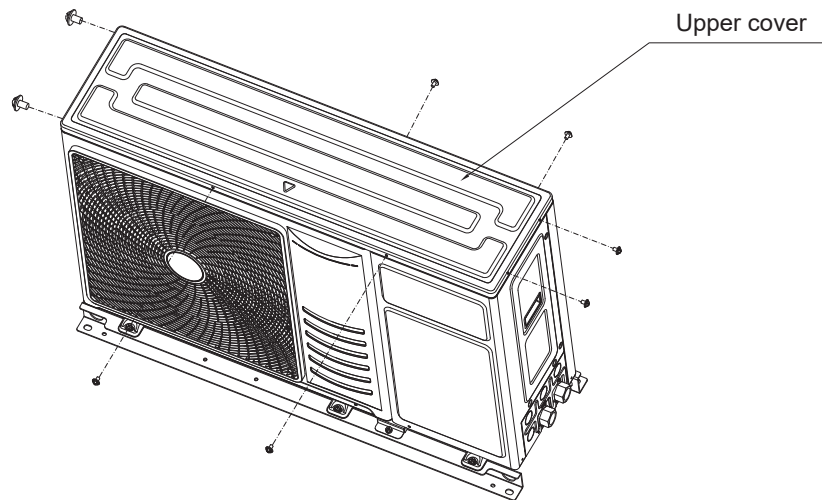
**⚠ CAUTION**

When brazing the pipes, prevent oxidized scale formation by nitrogen substitution.

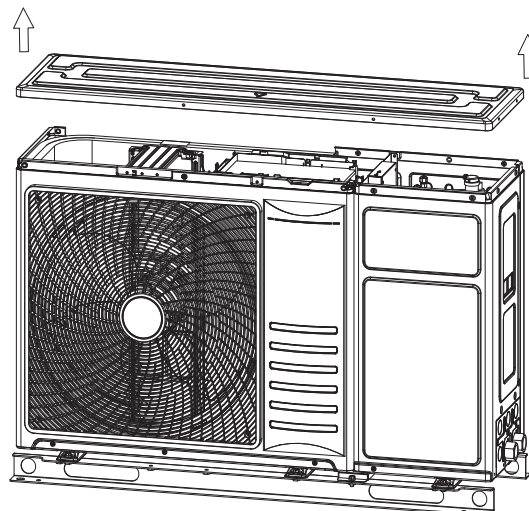
Thickness of brazing material	Piping diameter (refrigerant cycle side) (mm)						
	Ø6.35	Ø9.53	Ø6.35	Ø12.7	Ø15.88	Ø19.05	Ø22.2
Ø1.6mm	25	30	35	35	75	100	110
Ø2.0mm	15	15	10	20	45	55	70
Ø2.4mm	10	10	15	15	30	35	45

**2.4.1 Removing the Covers****2.4.1.1 Removing the Upper cover**

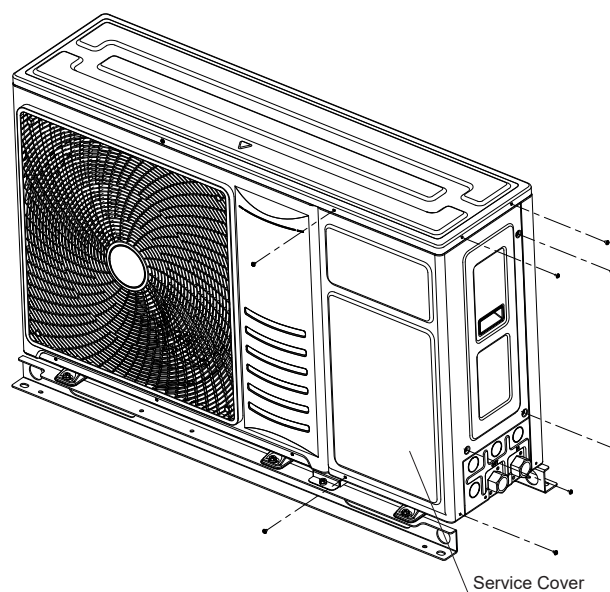
1. Remove the 8 screws fixing the Upper cover.



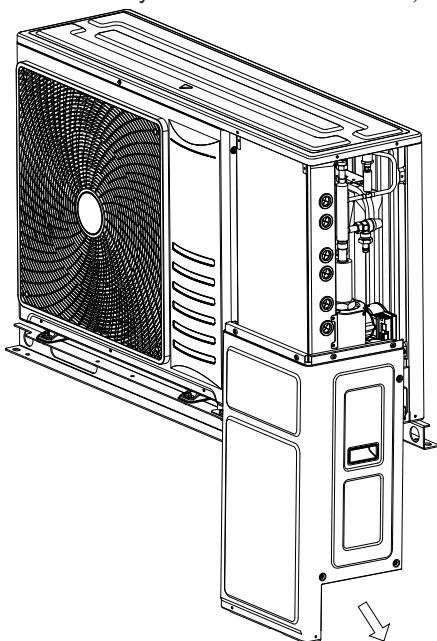
2. Pull the Upper cover upwards and remove it.

**2.4.1.2 Removing the Service Cover**

1. Remove the 8 screws fixing the service cover.



2. Pull the service cover in the direction shown by the arrow and remove it;

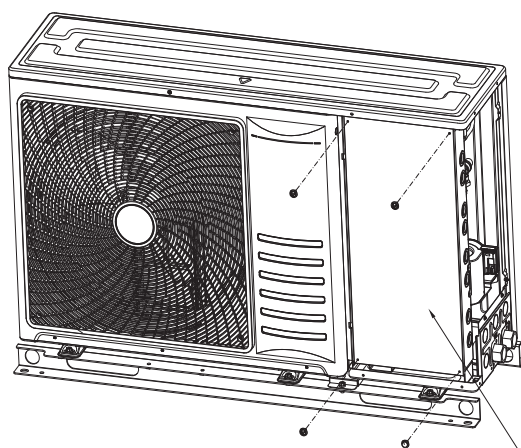


### 2.4.1.3 Removing the Electrical Box Cover on the Indoor Part

- Remove the service cover as explained in “2.3.1.2 Removing the Service cover”

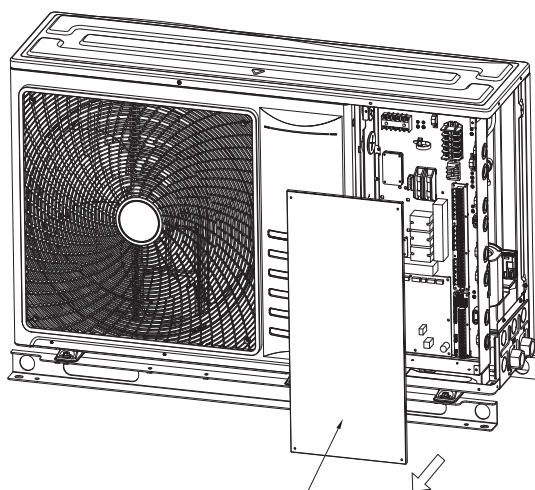
Then,

1. Remove the 4 screws fixing the electrical box cover.



Electrical box cover

2. Pull the electrical box cover in the direction shown by the arrow and remove it.

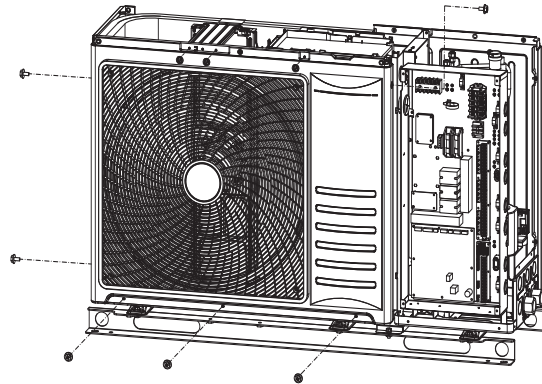


Electrical box cover

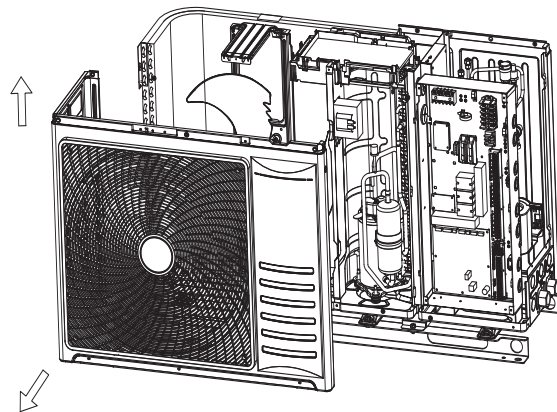
**2.4.1.4 Removing the Front Cover**

- Remove the Upper cover as explained in “2.3.1.1 Removing the Upper cover”
  - Remove the service cover, as explained in “2.3.1.2 Removing the Service cover”
  - Remove the electrical box cover, as explained in “2.3.1.3 Removing the Electrical box cover”
- then,

1. Remove the 4 screws fixing the electrical box cover.



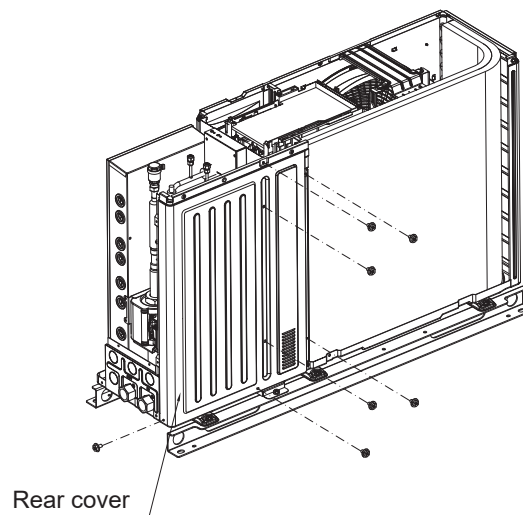
2. Pull up the front cover first, then pull back and remove it.



**2.4.1.5 Removing the Rear Cover**

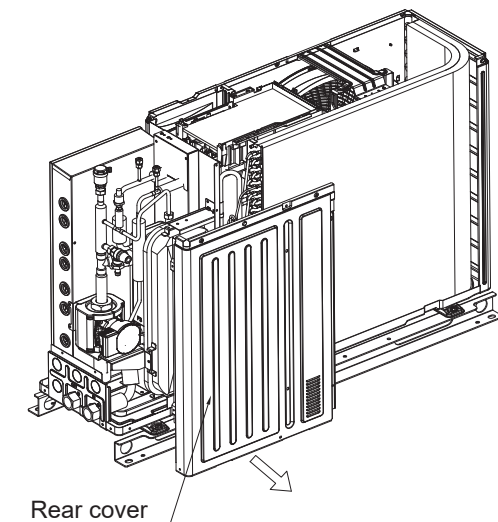
- Remove the Upper cover, as explained in “2.3.1.1 Removing the Upper cover”
  - Remove the Service cover, as explained in “2.3.1.2 Removing the Service cover”
- Then,

1. Remove the 7 screws fixing the Rear cover





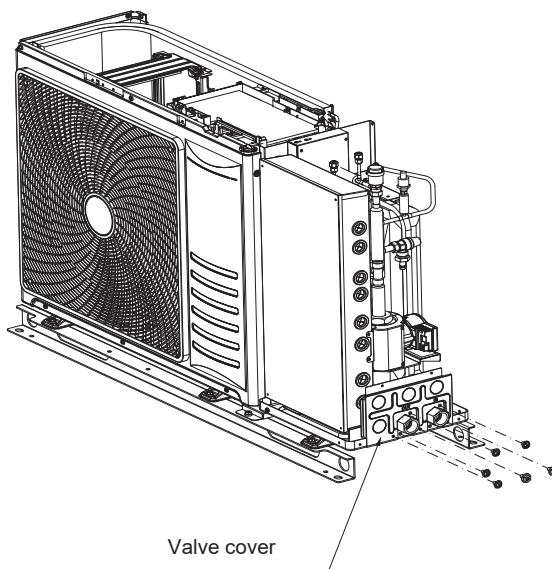
2. Pull the Rear cover backwards and remove it



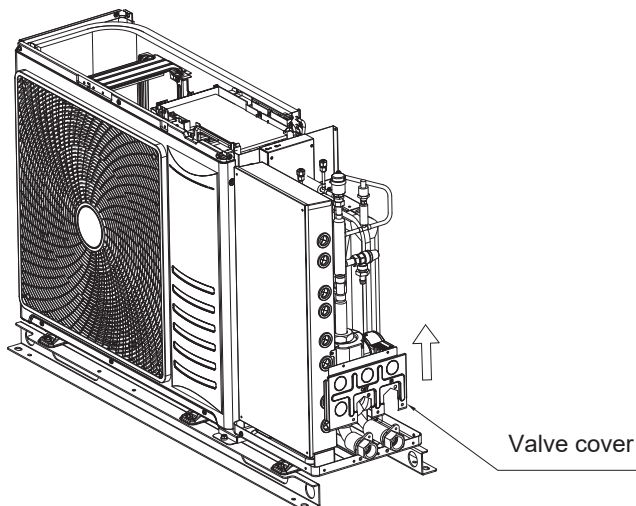
### 2.4.1.6 Removing the Valve Cover

- Remove the service cover, as explained in "2.3.1.2 Removing the Service cover"
  - Remove the rear cover, as explained in "2.3.1.5 Removing the Rear cover"
- Then,

1. Remove the 6 screws fixing the Valve cover

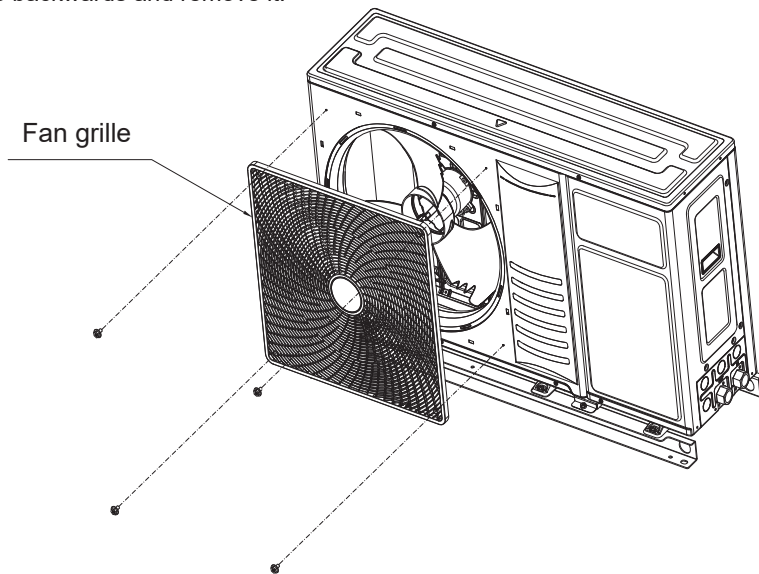


2. Pull the Valve cover upwards and remove it.



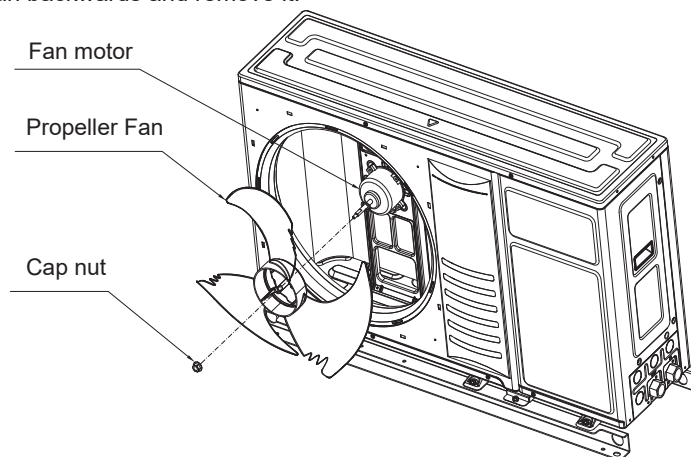
### 2.4.2 Removing the Fan Grille

1. Remove the 4 screws fixing the Fan grille.
2. Pull the fan grille backwards and remove it.



### 2.4.3 Removing the Propeller Fan

1. Remove the Fan grille, as explained in “2.3.2 Removing the Fan grille”.
2. Remove the cap nut fixing the propeller fan to the fan shaft.
3. Pull the propeller fan backwards and remove it.

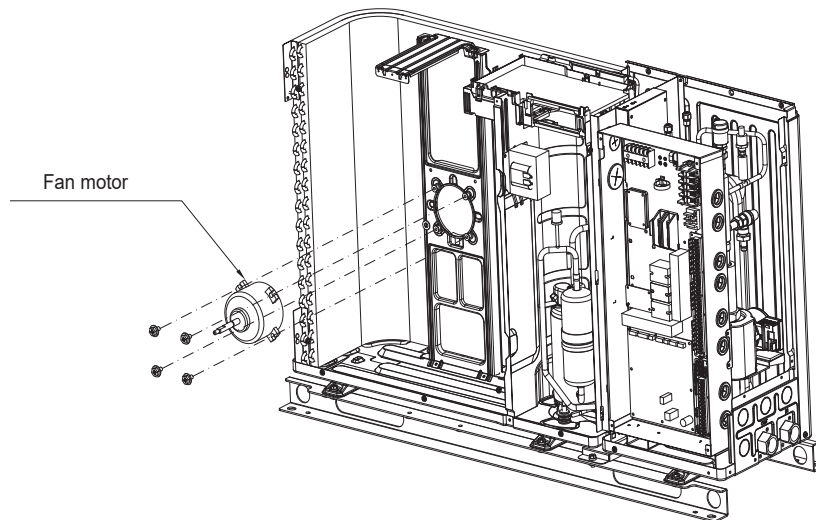


### 2.4.4 Removing the Fan Motor

- Remove the Upper cover, as explained in “2.3.1.1 Removing the Upper cover”
  - Remove the service cover, as explained in “2.3.1.2 Removing the Service cover”
  - Remove the electrical box cover, as explained in “2.3.1.3 Removing the electrical box cover”
  - Remove the front cover, as explained in “2.3.1.4 Removing the Front cover”
  - Remove the propeller fan, as explained in “2.3.3 Removing the Propeller fan”
- Then,
1. Disconnect the CN14 connector from the O.U. main PCB.
  2. Remove the wiring from the clamps where it is fixed.
  3. Unscrew the screws fixing the fan motor from its support.
  4. Remove the fan motor.

#### **i** NOTE

- Be sure to place the lead wire outlet downward when assembling the motor.
- Fix the motor lead wire onto the motor clamp using a cord band as before to avoid obstructing the propeller fan.
- Connect the motor lead wire to O.U. main PCB. (Insert into the connector (CN14) on the O.U. main PCB).



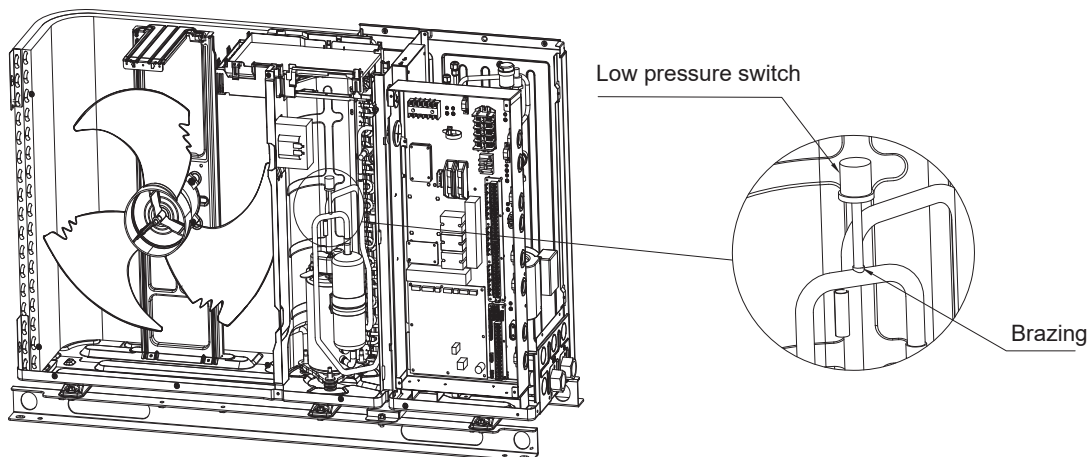
## 2.4.5 Removing the Refrigerant Components

### 2.4.5.1 Removing the Low Pressure Switch (PSL)

- Remove the Upper cover, as explained in “2.3.1.1 Removing the Upper cover”
- Remove the service cover, as explained in “2.3.1.2 Removing the Service cover”
- Remove the electrical box cover, as explained in “2.3.1.3 Removing the Electrical box cover”
- Remove the front cover, as explained in “2.3.1.4 Removing the Front cover”

Then,

1. Collect the refrigerant from the check joint.
2. Disconnect the PCN13 connector from the O.U. main PCB.
3. Remove the Low pressure switch with a blow torch.



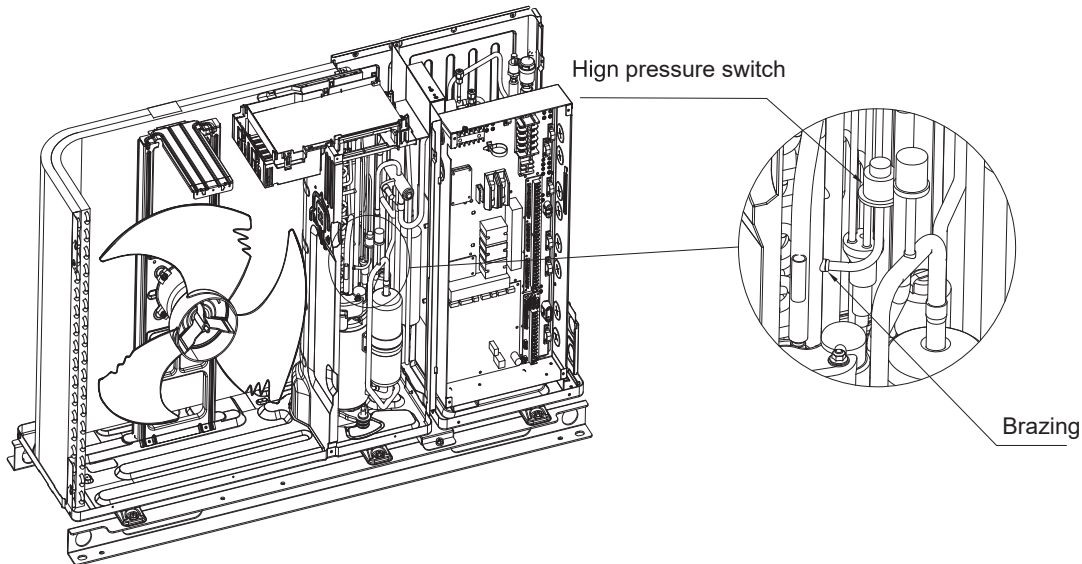


**2.4.5.2 Removing the High Pressure Switch (PSH)**

- Remove the Upper cover, as explained in “2.3.1.1 Removing the Upper cover”
- Remove the service cover, as explained in “2.3.1.2 Removing the Service cover”
- Remove the electrical box cover, as explained in “2.3.1.3 Removing the Electrical box cover”
- Remove the front cover, as explained in “2.3.1.4 Removing the Front cover”

Then,

1. Collect the refrigerant from the check joint.
2. Disconnect the PCN8 connector from the O.U. main PCB.
3. Remove the wiring from the clamps where it is fixed.
4. Remove the High pressure switch with a blow torch.

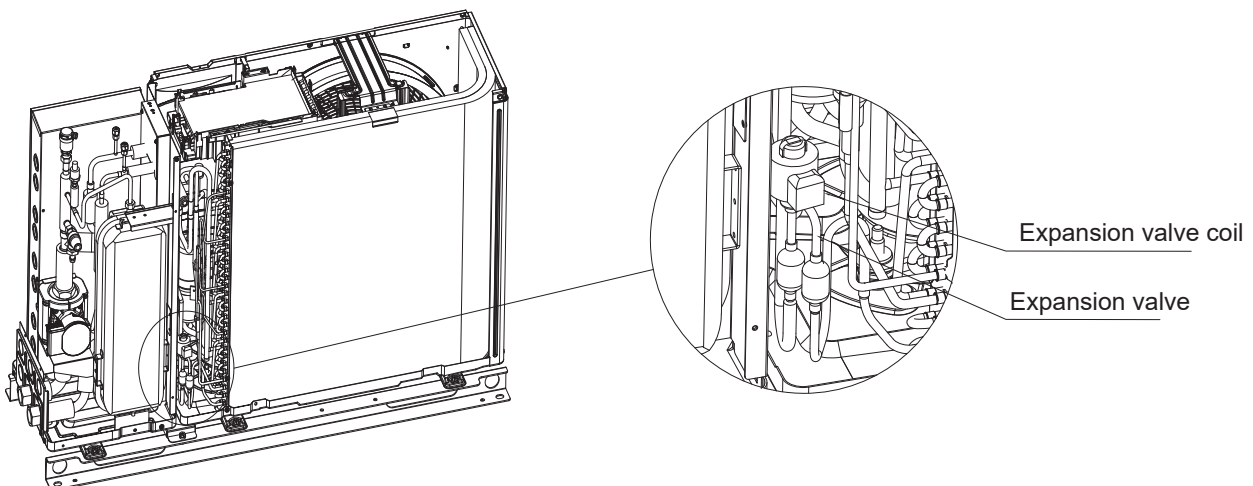


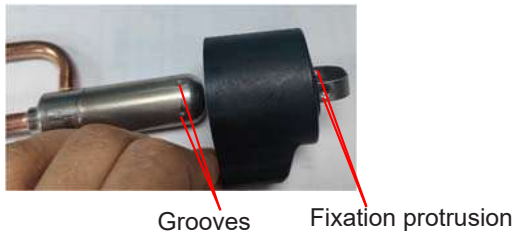
**2.4.5.3 Removing the Expansion Valve and Coil**

- Remove the Upper cover, as explained in “2.3.1.1 Removing the Upper cover”
- Remove the Service cover, as explained in “2.3.1.2 Removing the Service cover”
- Remove the Rear cover, as explained in “2.3.5 Removing the Rear cover”

Then,

1. Disconnect the CN5A connector at the O.U. main PCB.
2. Hold and disconnect the coil of the expansion valve. The expansion valve coil is equipped with a lock mechanism. Ensure that the coil is locked when replacing.
3. When removing the electronic expansion valve coil, it is necessary to rotate and pull out the coil at the same time, and separate the groove from the fixation protrusion. When installing the electronic expansion valve coil, it is necessary to push the electronic expansion valve coil onto the electronic expansion valve body, and rotate the coil to fix the groove with the fixation protrusion at the same time, the sound of the groove and the fixation protrusion mesh will be heard.





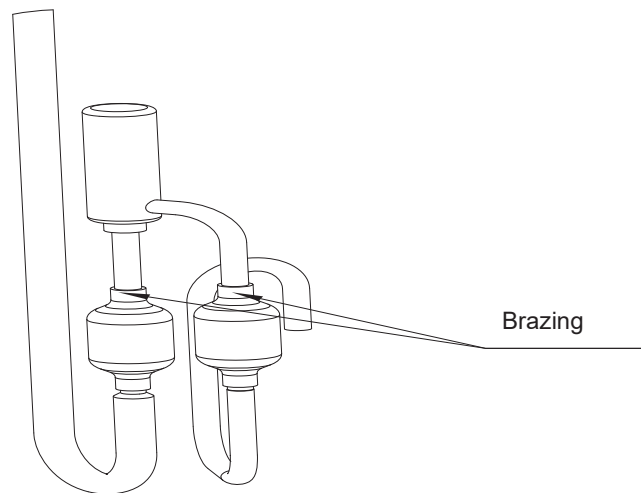
**⚠ CAUTION**

The electronic expansion valve will malfunction if the coil does not fix firmly with the valve body by the groove and the fixation protrusion.

- Once the Expansion valve coil has been removed, remove the brazing as shown in the figure using a blowtorch.

**⚠ CAUTION**

Protect the connecting wires and pipe insulation from the brazing flame.

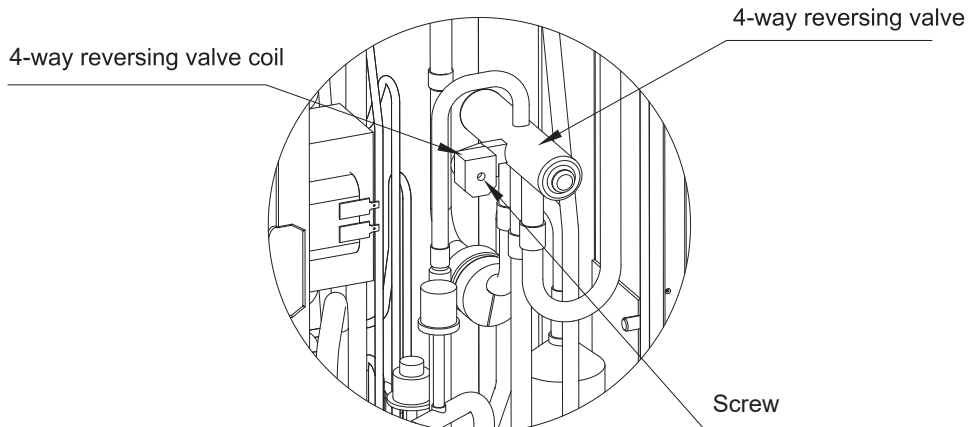


**2.4.5.4 Removing the 4-way Reversing Valve Coil**

- Remove the Upper cover as explained in “2.3.1.1 Removing the Upper cover”
- Remove the service cover, as explained in “2.3.1.2 Removing the Service cover”
- Remove the electrical box cover, as explained in “2.3.1.3 Removing the electrical box cover”
- Remove the Front cover, as explained in “2.3.1.4 Removing the Front cover”

Then,

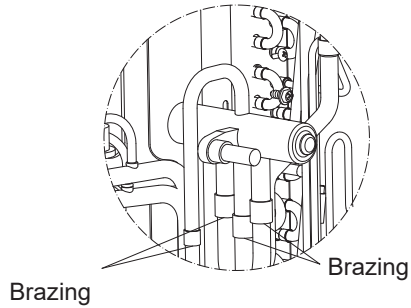
- Remove the Screw that fixes the coil to the 4-way reversing valve.
- Disconnect the PCN6 connector on the O.U. main PCB of the electrical box.
- Remove the cable from the clamps.
- Remove the 4-way reversing valve coil.



#### 2.4.5.5 Removing the 4-way reversing valve

- Remove the Upper cover as explained in “2.3.1.1 Removing the Upper cover”
- Remove the Service cover, as explained in “2.3.1.2 Removing the Service cover”
- Remove the electrical box cover, as explained in “2.3.1.3 Removing the electrical box cover”
- Remove the Front cover, as explained in” 2.3.1.4 Removing the Front cover”

Once the 4-way reversing valve coil has been removed, remove the brazing as shown in the figure using a blowtorch and previously cooling the pipe side with wet cloth in order to avoid brazing material entering the expansion valve.



#### CAUTION

Protect the connecting wires and pipe insulation from the brazing flame.

## 2.4.6 Removing Cycle and Hydraulic Components

### DANGER

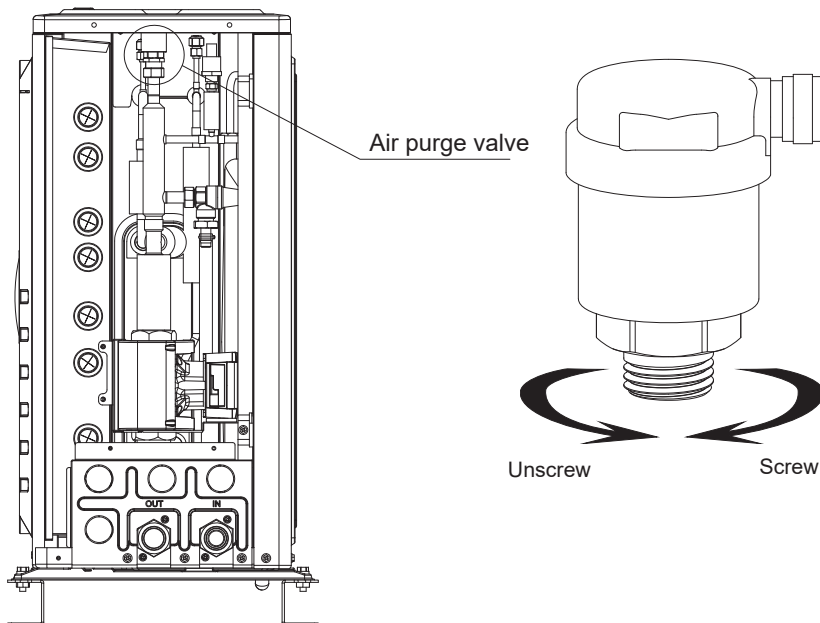
- The following operations need to cut off the water system and drain the water in the machine.
- Follow-up operations can be performed after completely disconnecting the power supply.

### CAUTION

- When disassembling the nut, pay attention not to damage the thread and place the sealing ring, otherwise it will lead to poor sealing and water leakage.
- Pay attention to the protection of the piping after removal to prevent foreign matter from entering the pipe, which will cause the pipeline to block badly.

### 2.4.6.1 Removing the Air Purge Valve

- Remove the service cover, as explained in “2.3.1.2 Removing the Service cover”  
Then,
  1. Drain the water circuit of the unit.
  2. Unscrew the Air purge valve. Pay attention to protect the gasket.
  3. Replace the Air purge valve for a new one.

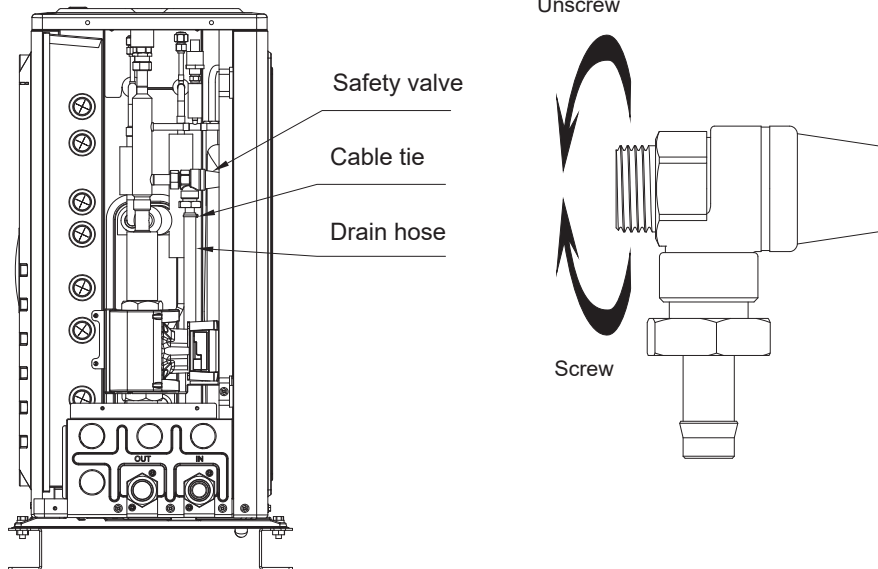


### 2.4.6.2 Removing the Safety Valve

- Remove the service cover, as explained in “2.3.1.2 Removing the Service cover”

Then,

1. Drain the water circuit of the unit.
2. Remove the cable tie fixing the drain hose.
3. Unscrew the Safety valve. Pay attention to protect the gasket.
4. Replace the Safety valve for a new one if needed.
5. To reassemble the Safety valve, proceed in reverse way than disassembling.



### CAUTION

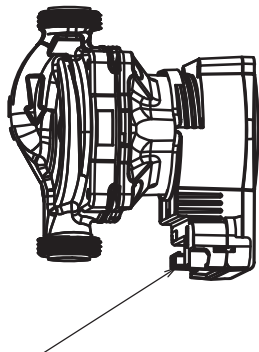
*Unless necessary, do not disassemble the safety valve and exhaust valve at will.*

### 2.4.6.3 Removing the Water Pump

- Remove the Upper cover, as explained in “2.3.1.1 Removing the Upper cover”
- Remove the service cover, as explained in “2.3.1.2 Removing the Service cover”
- Remove the electrical box cover, as explained in “2.3.1.3 Removing the Electrical box cover”
- Remove the Rear cover, as explained in “2.3.1.5 Removing the Rear cover”
- Remove the Valve cover, as explained in “2.3.1.6 Removing the Valve cover”

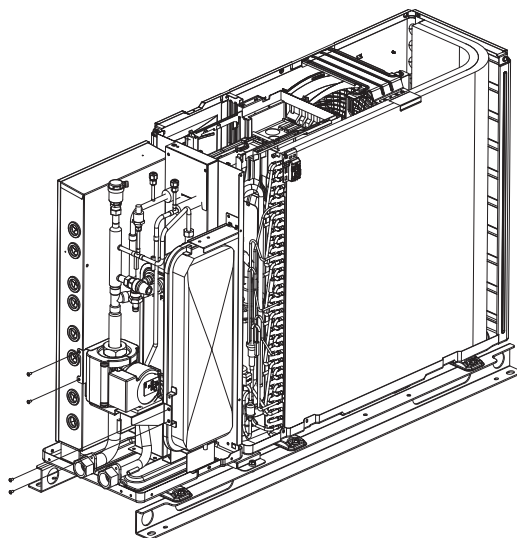
Then,

1. Drain the water circuit of the unit.

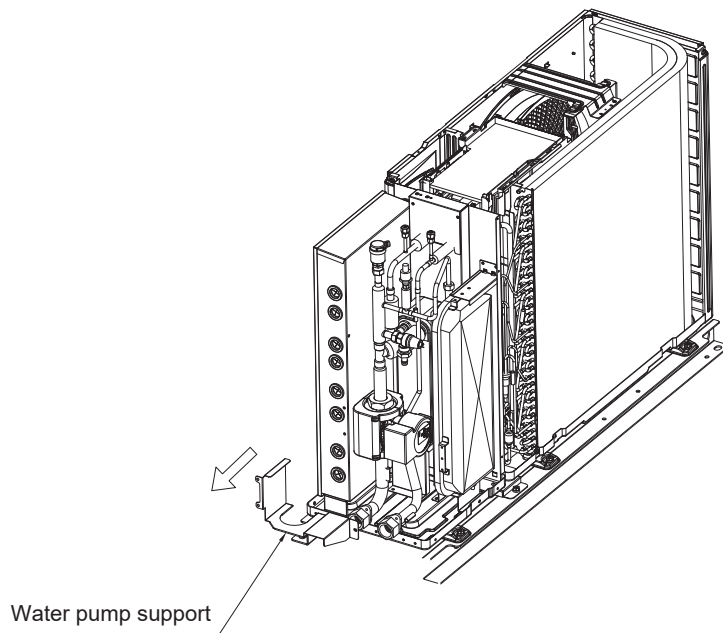


2. The position indicated is the plug-in place of the water pump power supply line and signal line, and the pluggable terminal is used to remove the power supply line and signal line.

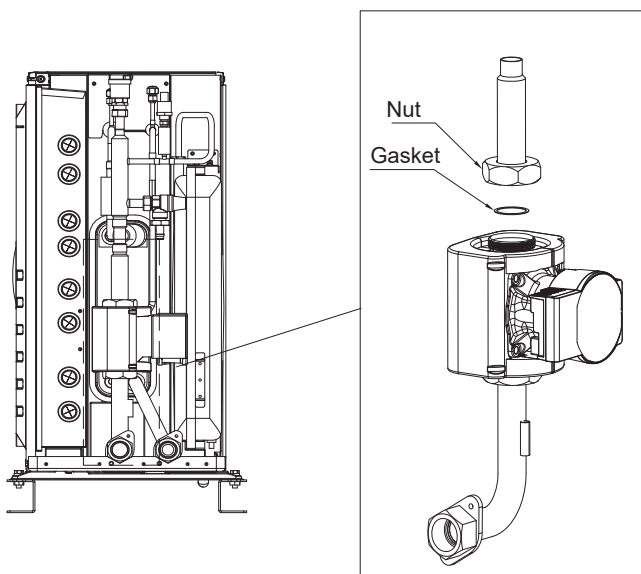
3. Remove the 4 screws fixing the water pump support.



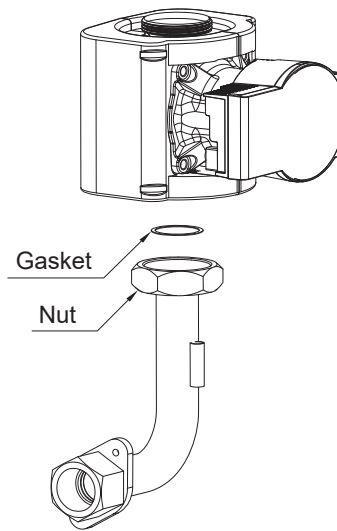
4. Remove the 4 screws fixing the water pump support.



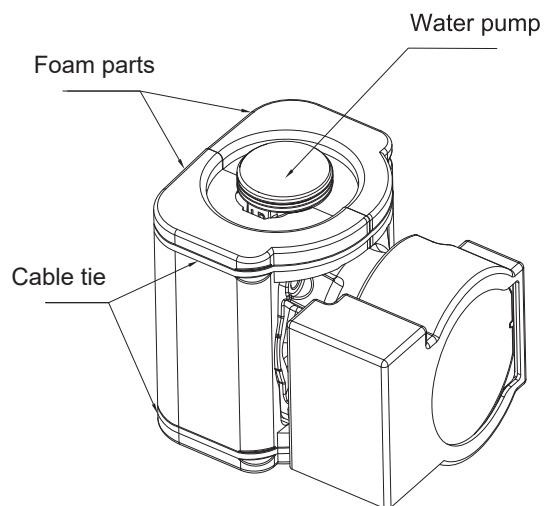
5. Remove the wiring from the clamps where it is fixed.
6. Loosen the upper nut of the water pump with tools in counterclockwise direction, and remove the water pump assembly.



7. Loosen the nut under the water pump with tools in a counterclockwise direction to separate the water pump from the water pipe.

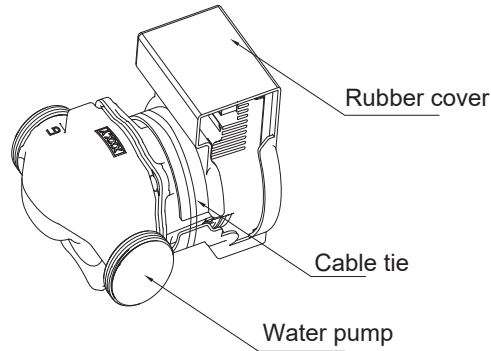


8. Cut two cable ties and separate the foam parts from the water pump;





9. Cut a cable tie and separate the rubber cover from the water pump;



### CAUTION

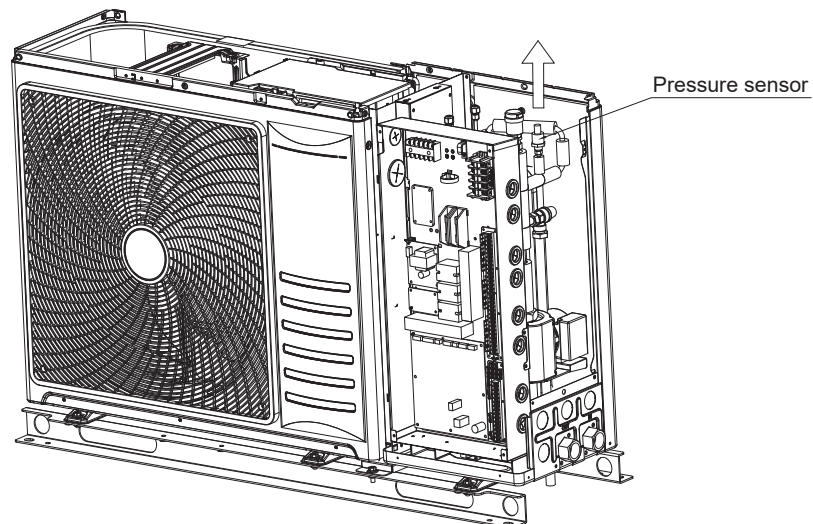
- Pay attention to the installation of gasket during disassembly and assembly, otherwise the pipe may leak.
- The pump is heavy, be careful to prevent injury from falling.
- Pay attention to the protection of the removed pipeline. If foreign matters enter, the pipeline will be blocked.

#### 2.4.6.4 Removing the Pressure Sensor (Water Cycle)

- Remove the Upper cover, as explained in "2.3.1.1 Removing the Upper cover"
- Remove the Service cover, as explained in "2.3.1.2 Removing the Service cover"
- Remove the electrical box cover, as explained in "2.3.1.3 Removing the electrical box cover"

Then,

1. Disconnect the CN6 connector at the I.U. PCB1.
2. Remove the cable from the clamps.
3. Loosen the pressure sensor with tools in a counterclockwise direction to separate pressure sensor from the pipe.
4. Replace the Pressure sensor for a new one.

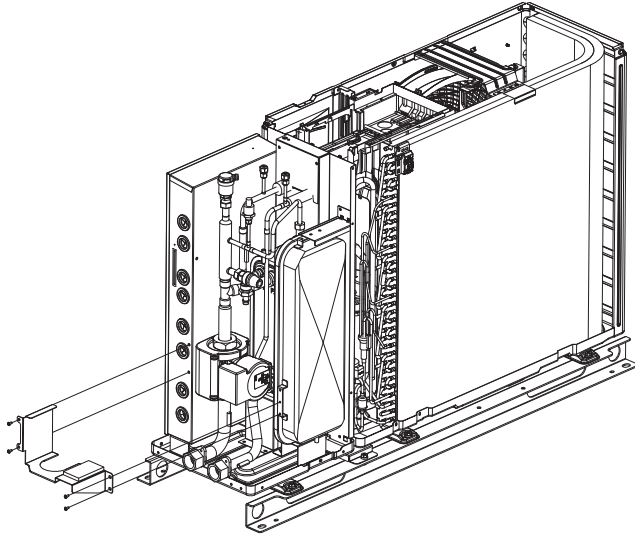


### 2.4.6.5 Removing the Expansion Vessel

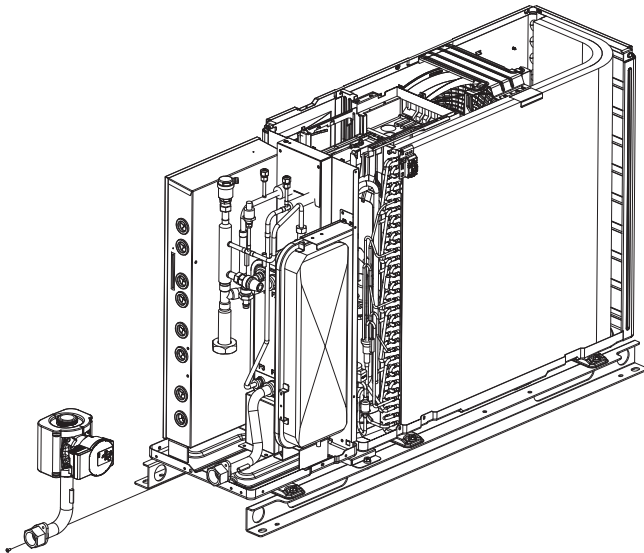
- Remove the Upper cover, as explained in “2.3.1.1 Removing the Upper cover”
- Remove the service cover, as explained in “2.3.1. 2 Removing the Service cover”
- Remove the electrical box cover, as explained in “2.3.1.3 Removing the electrical box cover”
- Remove the Rear cover, as explained in “2.3.1.5 Removing the Rear cover”
- Remove the Valve cover, as explained in “2.3.1.6 Removing the Valve cover”
- Remove the Water pump, as explained in “2.3.6.5 Removing the Water pump”

Then,

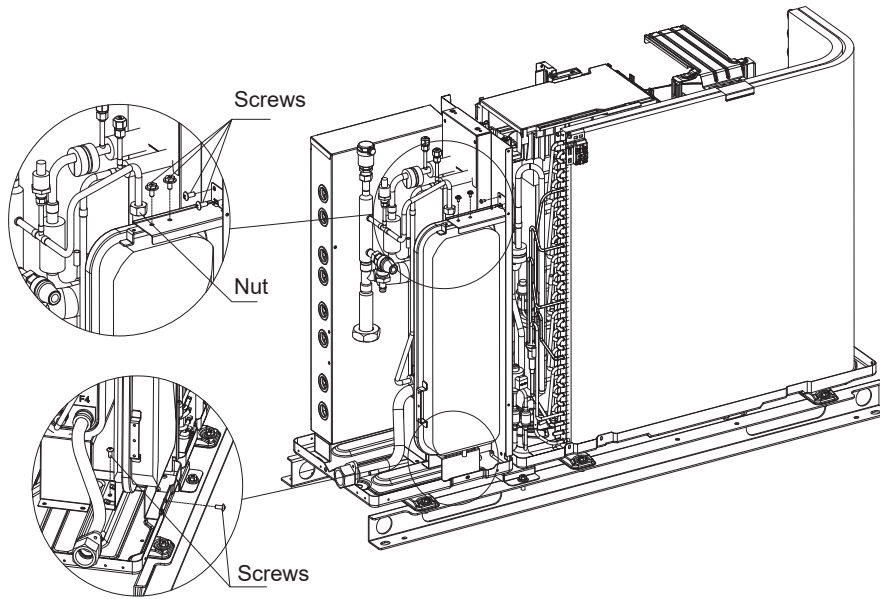
1. Remove water pump support



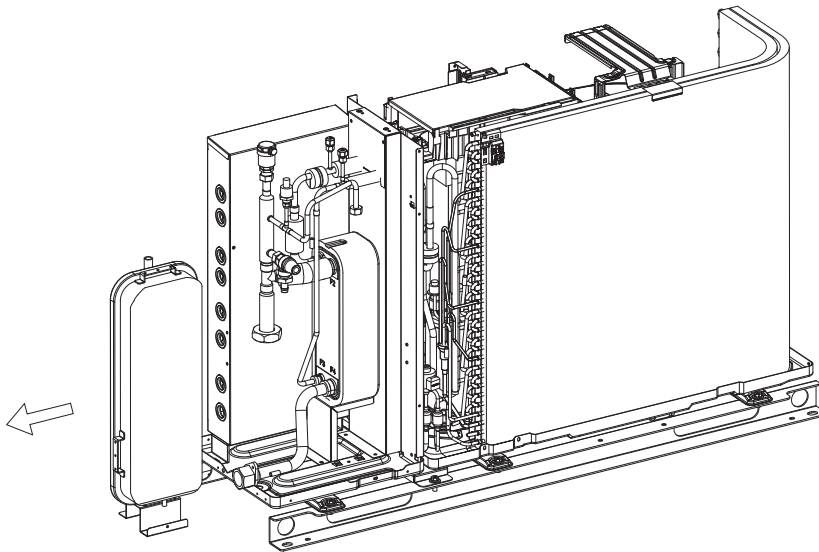
2. Remove water pump assembly, as is shown in the figure below:



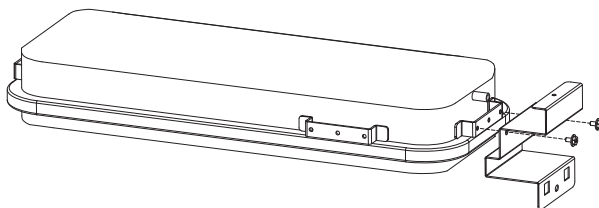
3. Remove the fixing plate and 4 fixing screws at the top of the expansion vessel, remove the 2 fixing screws at the bottom of the expansion vessel, and loosen the Hexagon nuts on the top of the expansion vessel. Pay attention to protect the gasket.



4. Remove the expansion vessel assembly.



5. Remove the expansion vessel.



## 2.4.6.6 Removing the Compressor

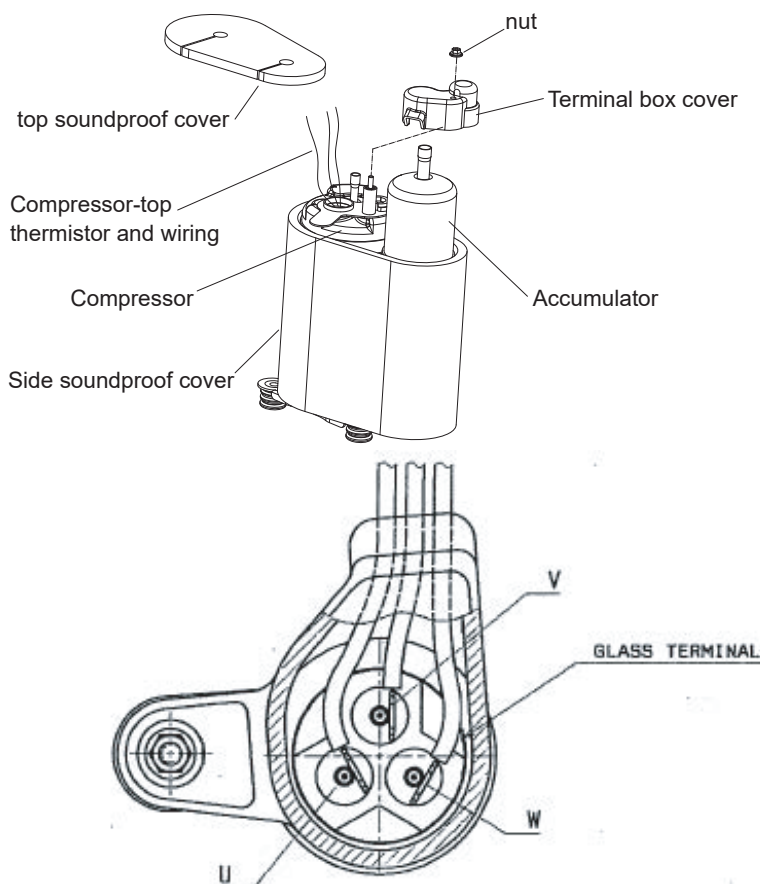
### NOTE

- The compressor is connected by brazing. Check to ensure whether there are flammable things around or not when using a burner for pipe connections. Otherwise, oil existing pipe inside may ignite.
- Do not expose the refrigerant cycle to the atmosphere for a long period to avoid moisture or dust into the cycle. Be sure to replace the compressor immediately after removing. Seal to the suction and discharge pipes when the refrigerant cycle is left unattached for a prolonged time.
- Remove the cap of new compressor right before the replacement. Before assembling the compressor, seal the suction and discharge pipes with a tape to protect the compressor from foreign particles. Remove the tape at pipe connection.
- To connect wiring at reassembling ensure that the compressor terminal numbers and wiring mark band codes are matched. Incorrect wiring numbers may result in reverse rotation and damage the compressor.

### CAUTION

Flammable objects. Fire risk. All compressor pipes must be brazed to be connected to the refrigerant circuit. Ensure that all the surrounding is free of flammable objects and liquids when performing piping brazing work.

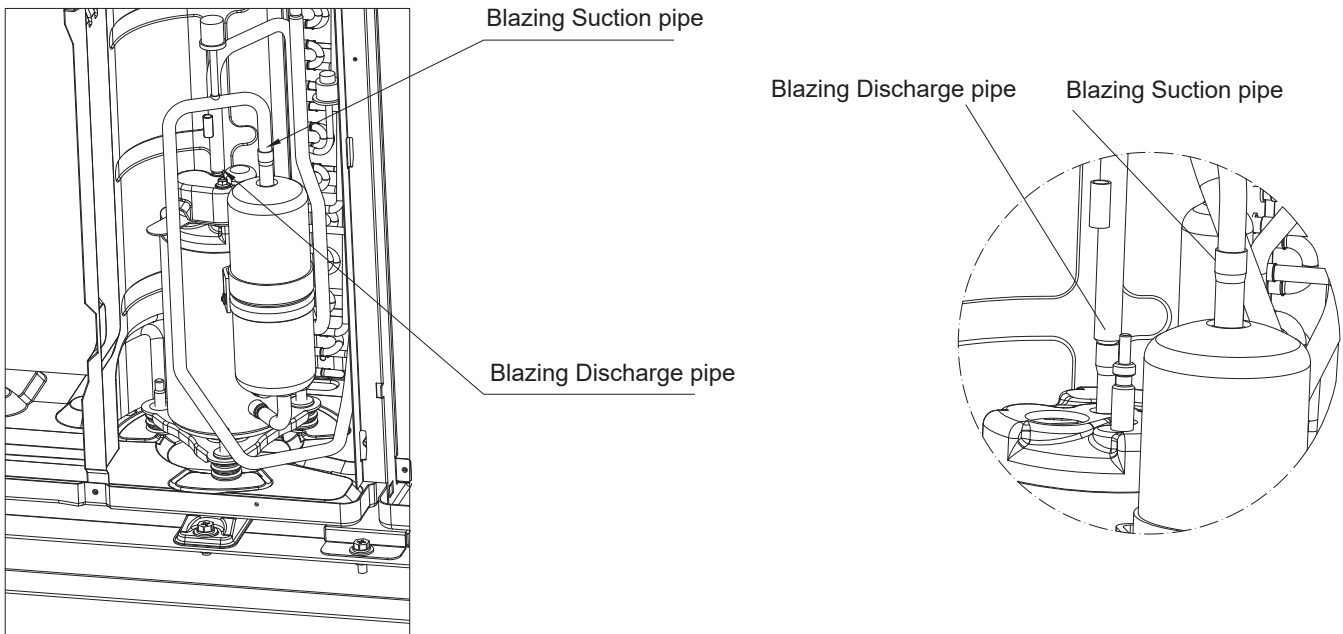
- Remove the upper cover, as explained in “2.3.1.1 Removing the Upper cover”
  - Remove the service cover, as explained in “2.3.1.2 Removing the Service cover”
  - Remove the electrical box cover, as explained in “2.3.1.3 Removing the Electrical box cover”
  - Remove the front cover, as explained in “2.3.1.4 Removing the Front cover”
  - Remove the rear cover, as explained in “2.3.1.5 Removing the Rear cover”
1. Collect the refrigerant from the check joint at the piping.
  2. Open the soundproof cover wrapped around the compressor and remove the terminal box cover of the compressor body. Disconnect the compressor wires in the terminal box.



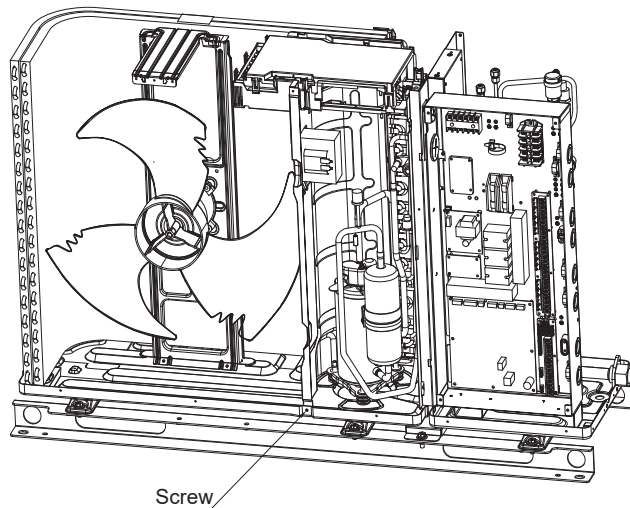
### CAUTION

Check the wiring color and layout when disconnecting. Connecting wires in wrong order at reassembling may result in compressor damage.

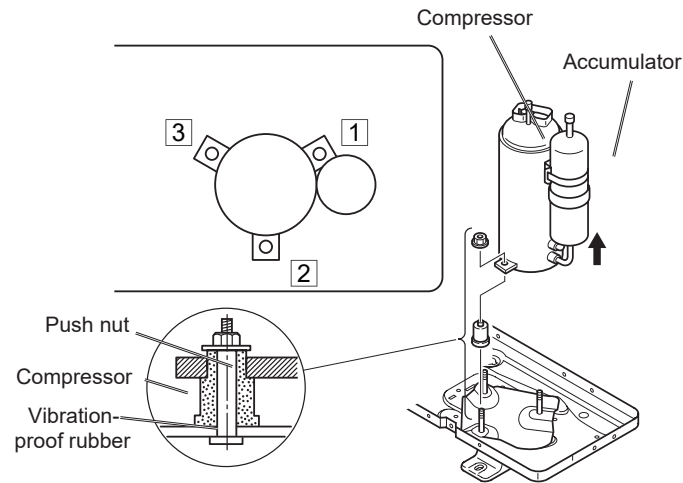
3. Remove the suction and discharge pipes from the compressor.  
Be sure to separate the blazing burner flame sufficiently from the wires and electrical components around the brazed part in order to avoid burning.



4. In case that more space is necessary to take out the compressor, remove the screw of the metal sheet.



5. Remove push nuts which fix the compressor with One-way ratchet wrench. Lift the compressor and remove from the unit body.
6. Check if the Faston terminal has any abnormality when replacing the compressor.(Ensure the pull-out force is greater than 20 N). If the Faston terminal is identified faulty, replace to a new one.

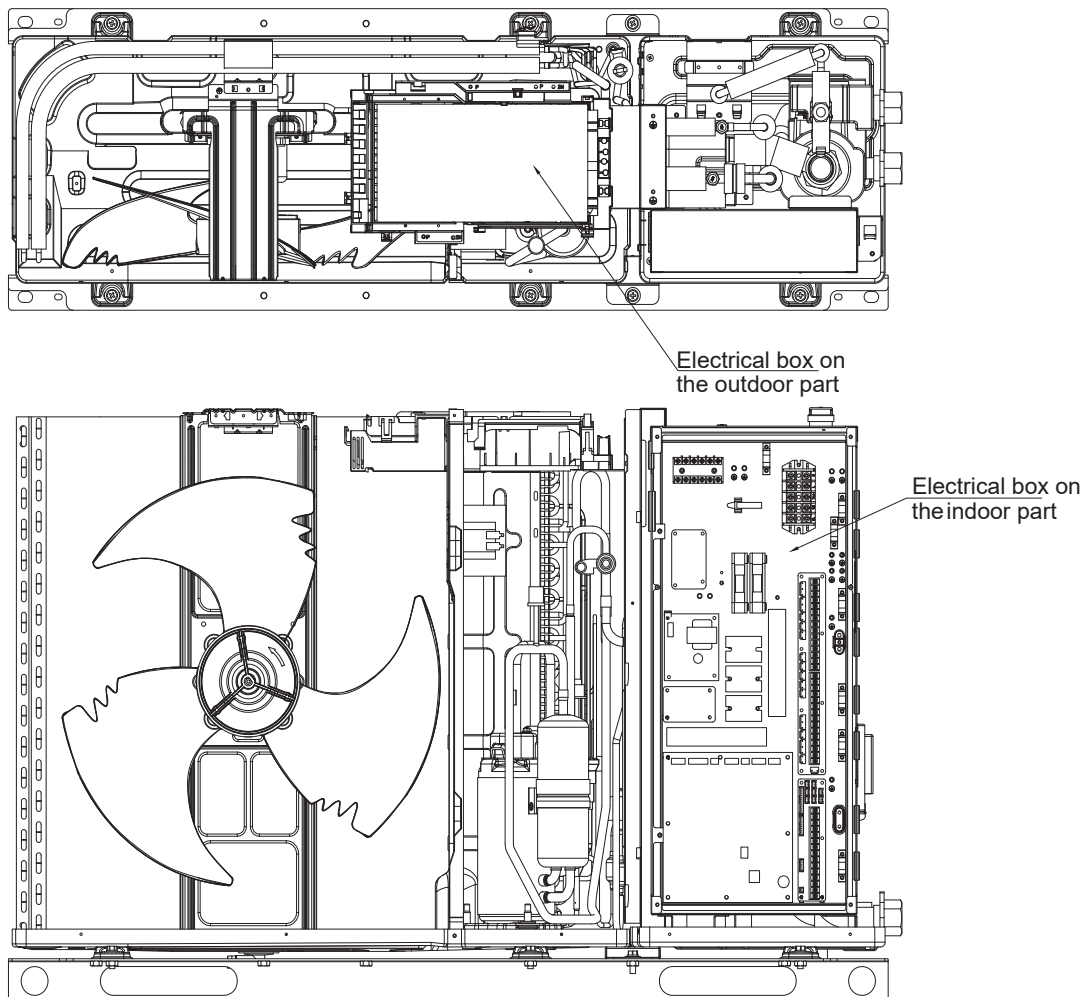


### 2.4.7 Removing the Electrical Components

**i** NOTE

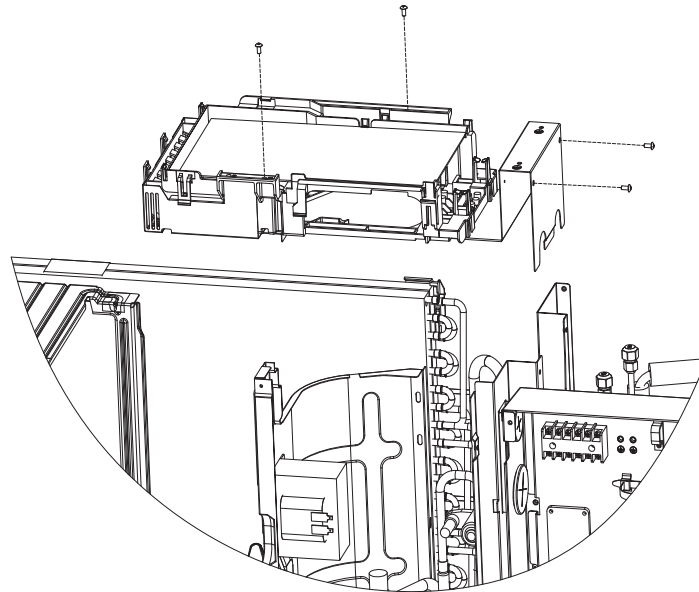
- DO NOT touch electrical components on the PCB. Pay attention not to bend or apply much force onto PCB in order to avoid PCB failure.
- To connect wiring at reassembling ensure that the terminal numbers and wiring mark band codes are matched. Incorrect wiring may result in malfunction or damage of electrical components.
- Different dip switch setting shall be applied for each model when the electrical box is replaced; Refer to chapter "Troubleshooting".
- Pay attention not to clamp any wiring between plates or electrical components when closing electrical box cover or front cover at reassembling.

#### 2.4.7.1 Location of electrical components

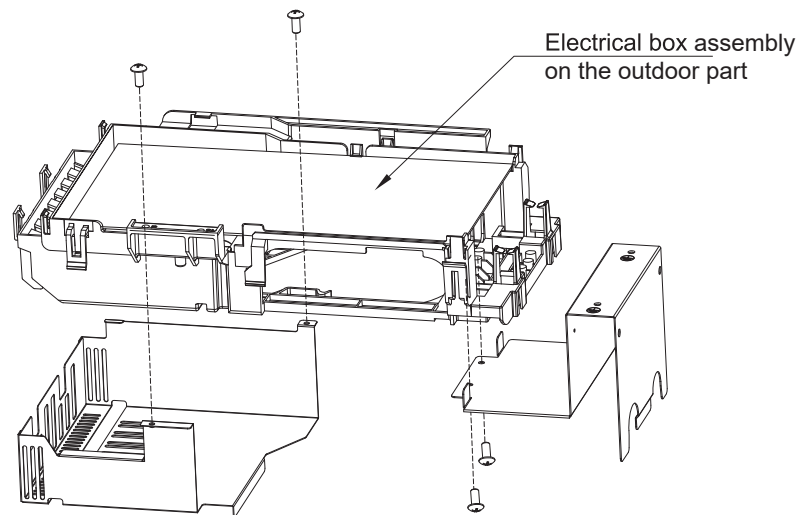


2.4.7.2 Removing the Electrical Box Assembly on Outdoor Part

1. Disconnect all the wiring connected to the outdoor part electrical box.
2. As shown in the figure below, remove the 4 screws securing the outdoor part electrical box, and then remove the outdoor part electrical box assembly



3. As shown in the figure below, remove the 4 screws securing the sheet metal, and then remove the 2 sheet metal pieces. The outdoor unit electrical box assembly are used as maintenance spare parts, and can be replaced as a whole during maintenance.





## 2.4.7.3 Replacing O.U. main PCB

- Remove the Upper cover, as explained in "2.3.1.1 Removing the Upper cover"
  - Remove the Service cover, as explained in "2.3.1.2 Removing the Service cover"
  - Remove the electrical box cover, as explained in "2.3.1.3 Removing the electrical box cover on indoor part"
  - Remove the front cover, as explained in "2.3.1.4 Removing the front cover"
  - Remove the electrical box assembly, as explained in "2.3.7.2 Removing the Electrical Box Assembly on Outdoor Part"
- Remove all terminals from the O.U. main PCB and disconnect the PFC inductor terminals, compressor terminals, the input power cable, and the earth terminals.

All terminals are located as shown below, and the terminals which need to be inserted and disconnected during the replacement are marked in red.

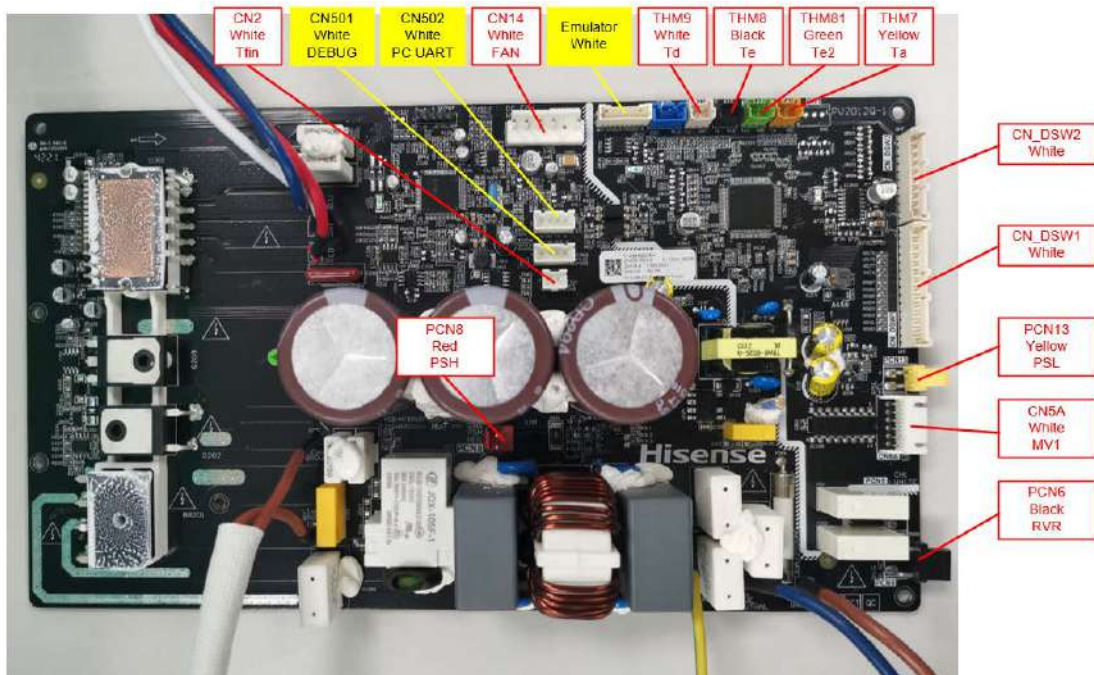


Fig.2.19 O.U. main PCB

Note: When removing the PFC inductor terminals, the wiring harness terminals have their own latches which can be removed after pressing the pick on the terminals. Do not pull out forcibly, otherwise it may cause damages to the PFC inductor terminal.

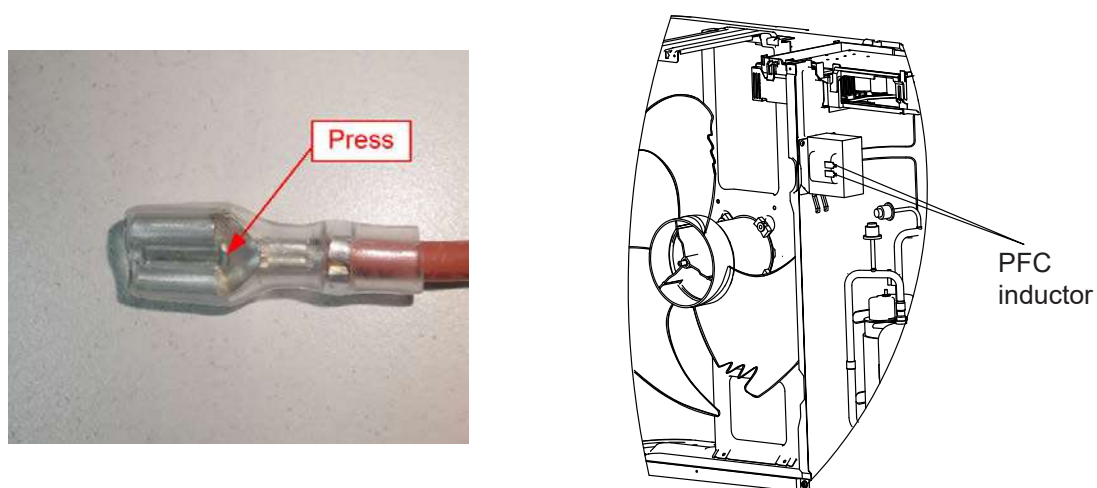


Fig.2.20 PFC inductor

Remove the 11 fixing screws (see Fig.2.21 for the location of the screws) of the PCB, then the PCB and Fin are separated from electrical box.



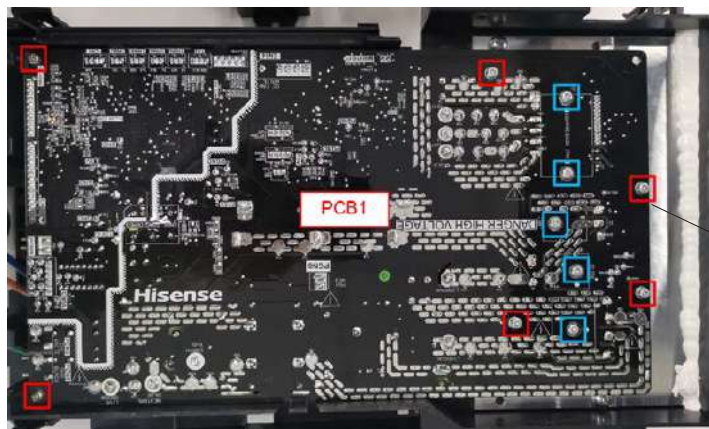
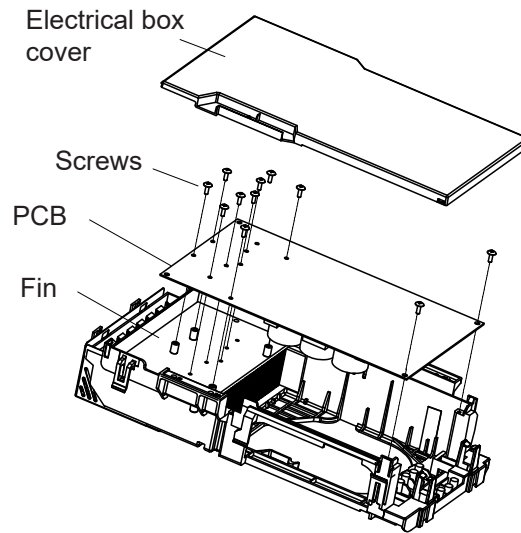


Fig.2.21 Replacing PCB and Fin

Note:

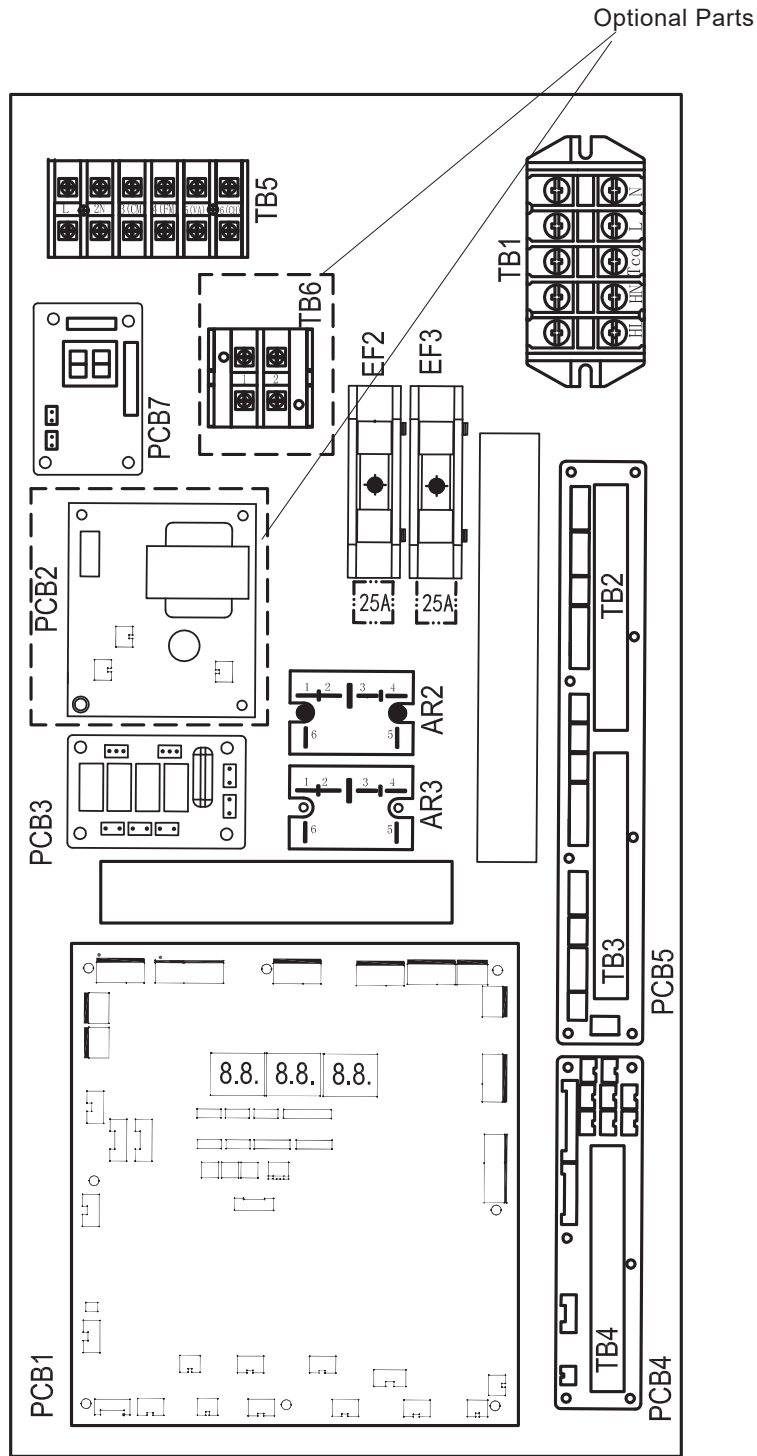
1. Because of the silicone seal between fin and electrical box, it is not recommended to remove the fin when replacing PCB as it is generally sufficient to replace PCB only. If the fin is also removed, be sure to apply a silicone seal to the original location or there is a risk of water intruding into the PCB and causing short circuit.
2. The outdoor unit electrical box assembly are used as maintenance spare parts, and can be replaced as a whole during maintenance.

3. Service spare parts are supplied as electrical box assembly and contain electrical box, Fin, PCB, power terminal block, CN\_DSW1/2 wiring.
4. For PCB installation method, follow the reverse procedure of removal. Note that the wiring terminals cannot be inserted and connected incorrectly.
5. The screws marked in blue need to be tightened with a torque of 0.4-0.5N·m and if not tightened firmly or missed, the PCB may be damaged during operation.



Fig.2.22 Electrical box assembly

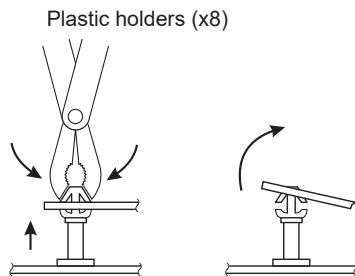
2.4.7.4 Removing the Electrical Box Assembly on Indoor Part



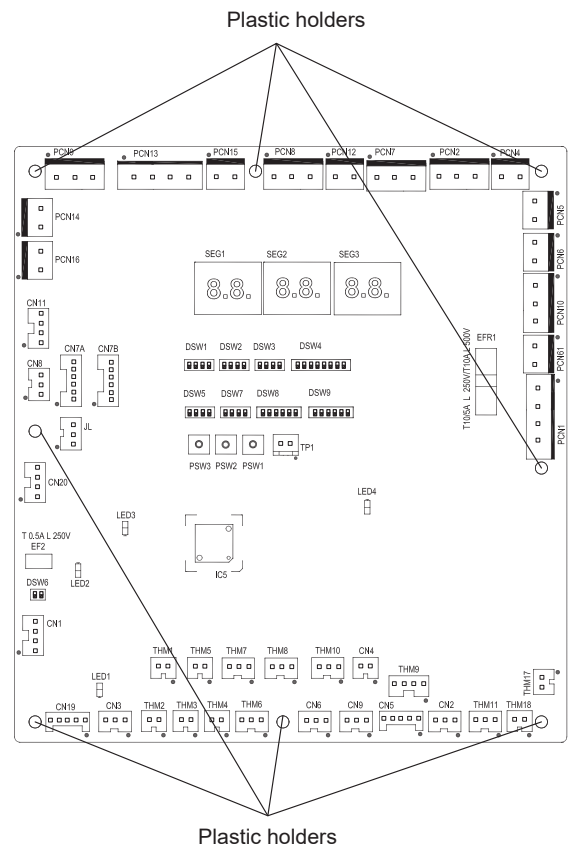
## 2.4.7.4.1 Removing the PCB1

To Remove the PCB1, the following operations should be done:

- Remove the service cover, as explained in “2.3.1.2 Removing the service cover”
- Remove the electrical box cover, as explained in “2.3.1.3 Removing the electrical box cover”
  1. Remove all the connectors connected to the PCB1.
  2. Remove the plastic holders that fix the PCB1 to the E-Box.



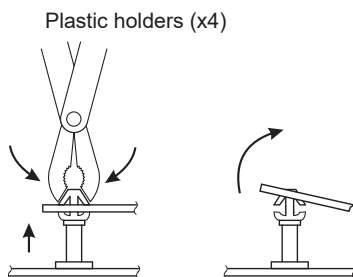
3. Remove the PCB1. If necessary, replace the PCB1 with a new one proceeding in reverse way than disassembling.



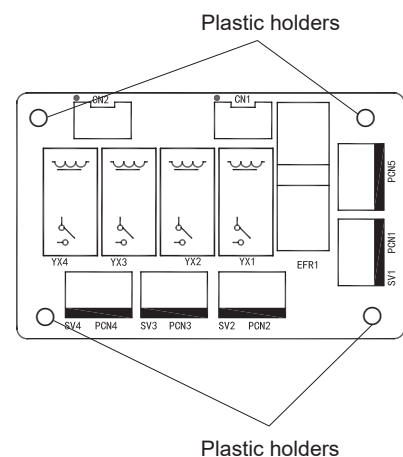
## 2.4.7.4.2 Removing the PCB3

To Remove the PCB3, the following operations should be done:

- Remove the service cover, as explained in “2.3.1.2 Removing the Service cover”
- Remove the electrical box cover, as explained in “2.3.1.3 Removing the electrical box cover”
  1. Remove all the connectors connected to the PCB3.
  2. Remove the plastic holders that fix the PCB3 to the E-Box.



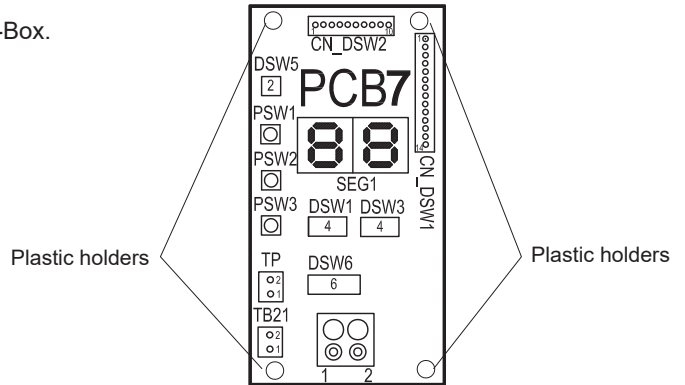
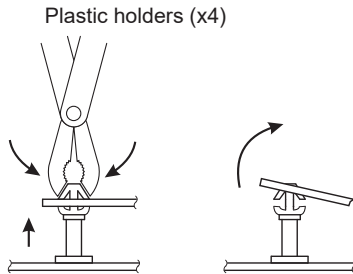
3. Remove the PCB3. If necessary, replace the PCB3 with a new one proceeding in reverse way than disassembling.



2.4.7.4.3 Removing the PCB7

To Remove the PCB7, the following operations should be done:

- Remove the service cover, as explained in “2.3.1.1 Removing the Service cover”
- Remove the electrical box cover, as explained in “2.3.1.3 Removing the electrical box cover”
  1. Remove all the connectors connected to the PCB7.
  2. Remove the plastic holders that fix the PCB7 to the E-Box.

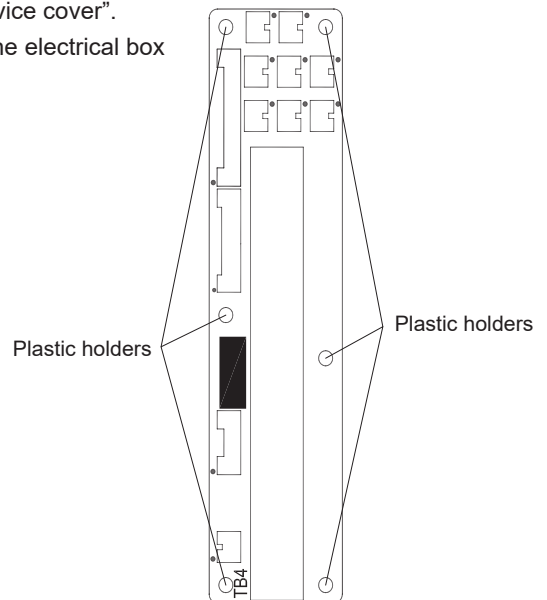
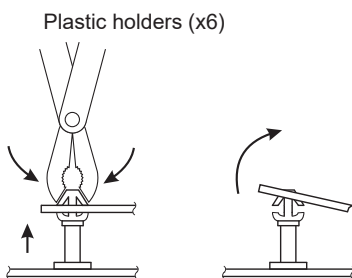


3. Remove the PCB7. If necessary, replace the PCB7 with a new one proceeding in reverse way than disassembling.

2.4.7.4.4 Removing the PCB4

To Remove the PCB4, the following operations should be done:

- Remove the service cover, as explained in “2.3.1.2 Removing the service cover”.
- Remove the electrical box cover, as explained in “2.3.1.3 Removing the electrical box cover”
  1. Remove all the connectors connected to the PCB4.
  2. Remove the plastic holders that fix the PCB4 to the E-Box.



3. Remove the PCB4. If necessary, replace the PCB4 with a new one proceeding in reverse way than disassembling.

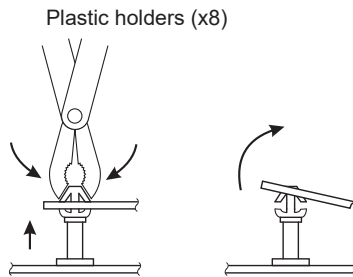
## 2.4.7.4.5. Removing the PCB5

To Remove the PCB5, the following operations should be done:

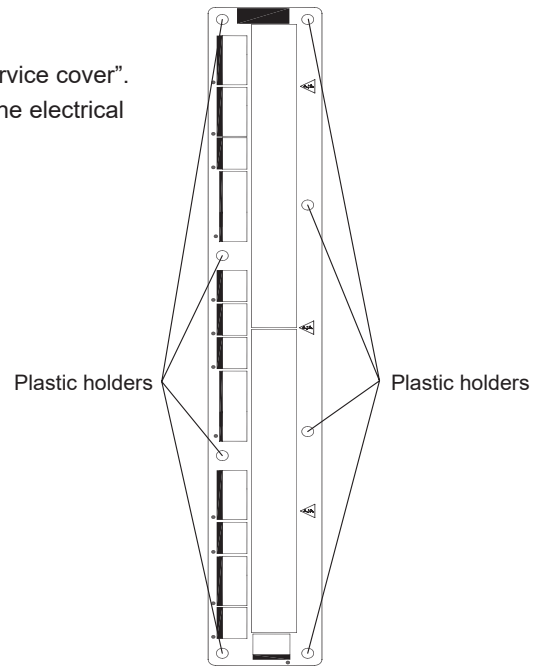
- Remove the Service cover, as explained in “2.3.1.2 Removing the Service cover”.
- Remove the electrical box cover, as explained in “2.3.1.3 Removing the electrical box cover”,

Then

1. Remove all the connectors connected to the PCB5
2. Remove the plastic holders that fix the PCB5 to the E-Box



3. Remove the PCB5. If necessary, replace the PCB5 with a new one proceeding in reverse way than disassembling.



## 2.4.7.4.6 Removing the relays (AR2~3)

- Remove the service cover as explained in chapter “2.3.1.2 Removing the service cover”
- Remove the Electrical box cover as explained in chapter “2.3.1.3 Removing the Electrical box cover”

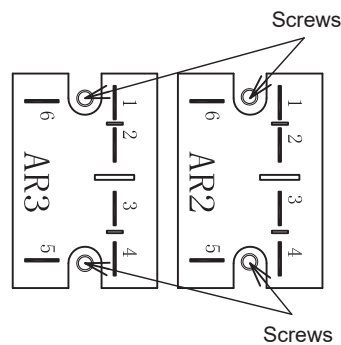
Then,

1. Identify the abnormal relay. Once detected, disconnect the cables.

### NOTE

Take note of the connections on the Relays. Check the wiring diagram for any doubt. Any incorrect connection may damage the unit.

2. Remove the screws attaching the relay to the Electrical box.



2.4.7.4.7 Replacement of the fuses (EF2~3,EFR,EFR1)

- Remove the service cover as explained in chapter “2.3.1.2 Removing the Service cover”
- Remove the electrical box cover as explained in chapter “2.3.1.3 Removing the Electrical box cover”.
  1. Once the broken fuse is detected, pull it from its placement.

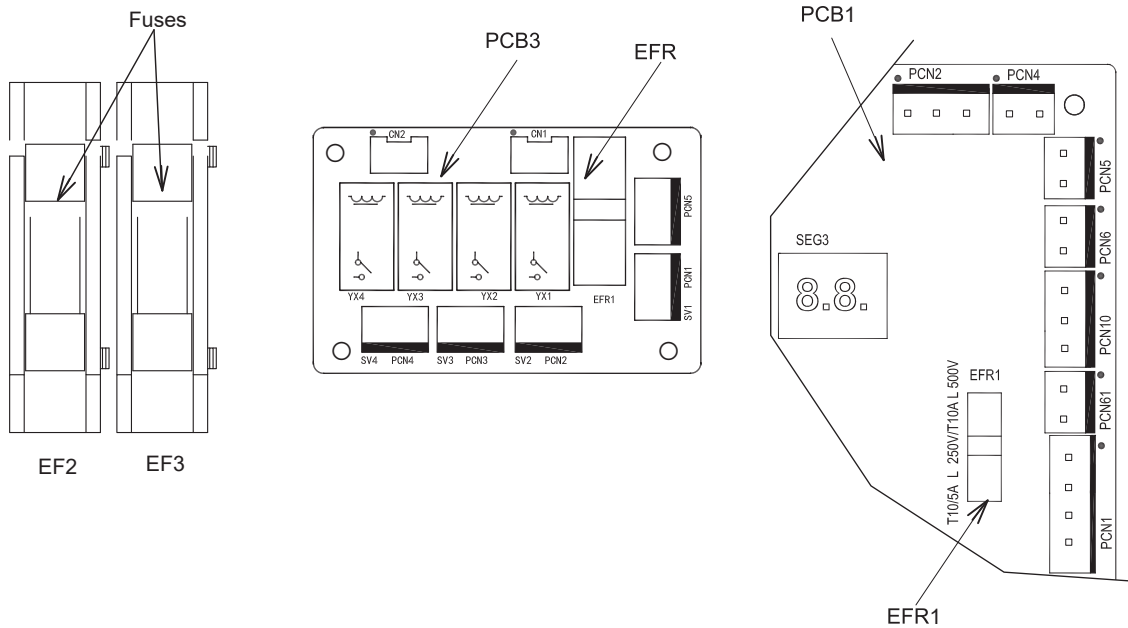
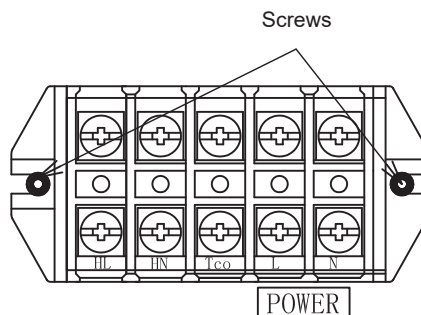


Table of fuses

Fuse	Dimensions (Ø x L) (mm)	Rated current
EFR	5.2 x 20	10A
EFR1		10A
EF3	10.3 x 38	25A
EF4		25A

2.4.7.4.8 Removing the terminal board (TB1)

- Remove the service cover as explained in “2.3.1.2 Removing the service cover”
- Remove the Electrical box cover, as explained in “2.3.1.3 Removing the Electrical Box cover”
  1. Remove all the cables connected to the terminal board.
  2. Remove the screws fixing the Terminal board to the E-Box.



### 2.4.7.4.9. Removing the terminal board (TB5)

- Remove the Service cover as explained in “2.3.1.2 Removing the service cover”
- Remove the Electrical box cover, as explained in “2.3.1.3 Removing the Electrical box cover”
  1. Remove all the cables connected to the terminal board.
  2. Remove the screws fixing the Terminal board to the E-Box.

