

SAMURAI SERIES
AIR COOLED WATER CHILLERS
SCREW TYPE
RCME-(40-70)AH1 / RCME-(080-210)/(2-3)AH1



English

Specifications in this manual are subject to change without notice in order that HITACHI may bring the latest innovations to their customers. Whilst every effort is made to ensure that all specifications are correct, printing errors are beyond Hitachi's control; Hitachi cannot be held responsible for these errors.

Español

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

A pesar de que se hacen todos los esfuerzos posibles para asegurarse de que las especificaciones sean correctas, los errores de impresión están fuera del control de HITACHI, a quien no se hará responsable de ellos.

Deutsch

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

Sämtliche Anstrengungen wurden unternommen, um sicherzustellen, dass alle technischen Informationen ohne Fehler veröffentlicht worden sind. Für Druckfehler kann HITACHI jedoch keine Verantwortung übernehmen, da sie außerhalb ihrer Kontrolle liegen.

Français

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

Bien que tous les efforts sont faits pour assurer l'exactitude des caractéristiques, les erreurs d'impression sont hors du contrôle de HITACHI qui ne pourrait en être tenu responsable.

Italiano

Le specifiche di questo manuale sono soggette a modifica senza preavviso affinché HITACHI possa offrire ai propri clienti le ultime novità. Sebbene sia stata posta la massima cura nel garantire la correttezza dei dati, HITACHI non è responsabile per eventuali errori di stampa che esulano dal proprio controllo.

Русский

Технические характеристики, содержащиеся в данном руководстве, могут быть изменены HITACHI без предварительного уведомления, по причине постоянного внедрения последних инноваций. Несмотря на то, что мы принимаем все возможные меры для актуализации технических данных, при публикации возможны ошибки, которые HITACHI не может контролировать, и за которые не несет ответственности.

Português

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

Apesar de serem feitos todos os esforços para assegurar que todas as especificações apresentadas são correctas, quaisquer erros de impressão estão fora do controlo da HITACHI, que não pode ser responsabilizada por estes erros eventuais.

Dansk

Specifikationer i denne vejledning kan ændres uden varsel, for at HITACHI kan bringe de nyeste innovationer ud til kunderne.

På trods af alle anstrengelser for at sikre at alle specifikationer er korrekte, har Hitachi ikke kontrol over trykfejl, og Hitachi kan ikke holdes ansvarlig herfor.

Nederlands

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

Iedere poging wordt ondernomen om te zorgen dat alle specificaties juist zijn. Voorkomende drukfouten kunnen echter niet door Hitachi worden gecontroleerd, waardoor Hitachi niet aansprakelijk kan worden gesteld voor deze fouten.

Svenska

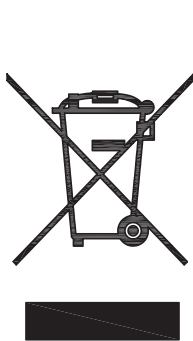
Specifikationerna i den här handboken kan ändras utan föregående meddelande för att HITACHI ska kunna leverera de senaste innovationerna till kunderna.

Vi på Hitachi gör allt vi kan för att se till att alla specifikationer stämmer, men vi har ingen kontroll över tryckfel och kan därför inte hållas ansvariga för den typen av fel.

Ελληνικά

Οι προδιαγραφές του εγχειριδίου μπορούν να αλλάξουν χωρίς προειδοποίηση, προκειμένου η HITACHI να παρέχει τις τελευταίες καινοτομίες στους πελάτες της.

Αν και έχει γίνει κάθε προσπάθεια προκειμένου να εξασφαλιστεί ότι οι προδιαγραφές είναι σωστές, η Hitachi δεν μπορεί να ελέγξει τα τυπογραφικά λάθη και, ως εκ τούτου, δεν φέρει καμία ευθύνη για αυτά τα λάθη.



ATTENTION

This product and the batteries contained on it shall not be mixed with general house waste at the end of its life. They shall be retired according to the appropriated local or national regulations in a environmentally correct way in order to be treated at a specialized treatment facility for re-use, recycling and recovery. If a chemical symbol is printed beneath the symbol, it means that the battery contains heavy metal above a certain concentration.

If a chemical symbol is printed beneath the symbol, it means that the battery contains heavy metal above a certain concentration. Possible chemical symbols are: - Pb: Lead (>0,004%) - Hg: Mercury (>0,0005%) Cd : Cadmium (>0,002%).



ATENCIÓN

Este producto y las baterías incluidas en el mismo no deben eliminarse con la basura doméstica al final de su vida útil. Deberán desecharse conforme a la normativa nacional o local correspondiente de manera respetuosa con el medioambiente a fin de que se traten posteriormente en instalaciones de tratamiento especializadas para su reutilización, reciclaje o recuperación. Si un símbolo químico está impreso debajo del símbolo, quiere decir que la batería contiene metales pesados por encima de una determinada concentración.

Si un símbolo químico está impreso debajo del símbolo, quiere decir que la batería contiene metales pesados por encima de una determinada concentración. Los posibles símbolos químicos son: - Pb: Plomo (>0,004%) - Hg: Mercurio (>0,0005%) - Cd : Cadmio (>0,002%).



ACHTUNG

Dieses Produkt und die darin enthaltenen Batterien dürfen am Ende ihrer Lebensdauer nicht in den normalen Hausmüll gelangen. Sie müssen entsprechend den örtlichen und nationalen Vorschriften umweltfreundlich entsorgt werden, um in einer speziellen Wiederverwertungs-, Recycling- und Rückgewinnungsanlage einer Sonderbehandlung unterzogen zu werden. Wenn ein chemisches Symbol unterhalb des Symbols gedruckt ist, so ist dies ein Hinweis darauf, dass die Batterie eine über einem gewissen Wert liegende Schwermetallkonzentration aufweist.

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ATTENTION

En fin de vie, ce produit et les batteries qu'il contient ne doivent pas être jetés avec les ordures ménagères. Il faut s'en débarrasser conformément à la réglementation locale ou nationale en vigueur, d'une manière respectueuse pour l'environnement, afin qu'ils soient envoyés dans un centre de traitement spécifique pour être réutilisés, recyclés et récupérés. La présence d'un symbole chimique imprimé sous le symbole indique que la pile contient des métaux lourds au-delà d'une certaine concentration.

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AVVISO

Questo prodotto e le batterie in esso contenute non deve essere smaltito con i rifiuti generici di casa quando arriva alla fine del ciclo vitale. Deve invece essere ritirato seguendo le relative normative nazionali o locali in modo corretto per l'ambiente per essere gestito con un trattamento specializzato per la sua riutilizzazione, riciclo e recupero. Se nella parte inferiore del simbolo è impresso un simbolo chimico, significa che le batterie contengono metallo pesante al di sopra di una certa concentrazione.

Se nella parte inferiore del simbolo è impresso un simbolo chimico, significa che le batterie contengono metallo pesante al di sopra di una certa concentrazione. I simboli chimici possibili sono: - Pb: Piombo (>0,004%) - Hg: Mercurio (>0,0005%) Cd : Cadmio (>0,002%).



ВНИМАНИЕ

Данное изделие, и содержащиеся в нем батареи, не должны утилизироваться вместе с обычными отходами после завершения их срока службы. В соответствии с местными и национальными нормами по защите окружающей среды, они должны быть отвезены в специальный сборный пункт для соответствующей обработки, восстановления и повторного использования. Химический знак, расположенный под символом, означает, что батарея устройства содержит тяжелые металлы повышенной концентрации.

Химический знак, расположенный под символом, означает, что батарея устройства содержит тяжелые металлы повышенной концентрации. Возможными химическими знаками являются: - Pb: Свинец (>0,004%) - Hg: Меркурий (>0,0005%) Cd : Кадмий (>0,002%).



ATENÇÃO

Este produto e as baterias nele contidas não devem ser misturadas com lixo doméstico geral no fim da respectiva vida útil. Devem ser tratados de acordo com as regulamentações locais ou nacionais apropriadas, de uma forma que não seja nociva para o ambiente, em instalações especiais para reutilização, reciclagem e recuperação. Se existir um símbolo químico impresso abaixo do símbolo, isto significa que a bateria contém metais pesados acima de uma determinada concentração.

Se existir um símbolo químico impresso abaixo do símbolo, isto significa que a bateria contém metais pesados acima de uma determinada concentração. Os símbolos químicos que podem aparecer impressos são: - Pb: Chumbo (> 0,004%) - Hg: Mercúrio (> 0,0005%) Cd: Cádmio (> 0,002%).



BEMÆRK

Produktet og dets batterier må ikke blandes sammen med almindeligt husholdningsaffald ved slutningen af dets levetid. De skal bortskaffes i henhold til de relevante lokale eller nationale miljømæssige bestemmelser, så de kan blive behandlet på korrekt vis på en specialiseret genbrugsstation – til genbrug eller genindvinding. Hvis der er trykt et kemisk symbol under symbolet, betyder det, at batteriet indeholder tungmetaller ud over en bestemt koncentration.

Hvis der er trykt et kemisk symbol under symbolet, betyder det, at batteriet indeholder tungmetaller ud over en bestemt koncentration. De kemiske symboler kan være: - Pb: Bly (>0,004 %) - Hg: Kviksølv (>0,0005 %) Cd : Kadmium (>0,002 %)



ATTENTIE

Dit product en de batterijen erin mogen niet bij het normale huisvuil worden afgevoerd. Deze moeten volgens de toepasselijke gemeentelijke of landelijke regels op een milieuverantwoorde wijze worden verwerkt en in een speciale verwerkingsinstallatie worden gereedgemaakt voor hergebruik, recycling en herstel. Als onder het recyclesymbool een chemisch symbool is gedrukt, betekent dit dat de batterij een zwaar metaal boven een bepaalde concentratie bevat.

Als onder het recyclesymbool een chemisch symbool is gedrukt, betekent dit dat de batterij een zwaar metaal boven een bepaalde concentratie bevat. Mogelijke chemische symbolen zijn: - Pb: Lead (>0,004%) - Hg: Mercury (>0,0005%) Cd : Cadmium (>0,002%).



OBS!

Den här produkten och batterierna den innehåller ska inte blandas med vanligt hushållsavfall när den är förbrukad. De ska sorteras enligt lokala eller nationella bestämmelser på ett miljövänligt sätt, så att de kan tas om hand vid en för syftet anpassad anläggning för återanvändning och återvinning. Om det finns en kemisk beteckning under symbolen betyder det att batteriet innehåller tungmetaller över en viss mängd.

Om det finns en kemisk beteckning under symbolen betyder det att batteriet innehåller tungmetaller över en viss mängd. Möjliga kemiska beteckningar är: – Pb: bly (>0,004 %) – Hg: kvicksilver (>0,0005 %) Cd : kadmium (>0,002 %).



ΠΡΟΣΟΧΗ

Στο τέλος της διάρκειας ζωής τους, το συγκεκριμένο προϊόν και οι μπαταρίες που εμπεριέχονται δεν πρέπει να αναμιχθούν με τα οικιακά απορρίμματα. Πρέπει να αποσύρονται σύμφωνα με τους κατάλληλους τοπικούς ή εθνικούς κανονισμούς με τρόπο σωστό για το περιβάλλον ώστε να υποστούν επεξεργασία σε ειδική εγκατάσταση για εκ νέου χρήση, ανακύκλωση και αποκατάσταση. Εάν υπάρχει χημικό σύμβολο τυπωμένο κάτω από το σύμβολο σημαίνει ότι η μπαταρία περιέχει βαρύ μέταλλο σε μεγάλη συγκέντρωση.

Εάν υπάρχει χημικό σύμβολο τυπωμένο κάτω από το σύμβολο σημαίνει ότι η μπαταρία περιέχει βαρύ μέταλλο σε μεγάλη συγκέντρωση. Πιθανά χημικά σύμβολα είναι τα ακόλουθα: - Pb : Μόλυβδος (>0,004%) - Hg: Υδράργυρος (>0,0005%) Cd : Κάδμιο (>0,002%).

English

From 4th July 2007 and following Regulation EC N° 842/2006 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 R134a into the atmosphere: R134a is fluorinated greenhouse gas covered by the Kyoto protocol global warming potential (GWP) R134a: = 1300.

Español

Desde el 4 de Julio de 2007 y en base al Reglamento CE N° 842/2006 sobre determinados gases fluorados 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 R134a en la atmósfera: R134a es un gas fluorado cubierto por el protocolo de Kyoto con un potencial de calentamiento global (GWP): = 1300.

Deutsch

Ab 4. Juli 2007 und folgende Verordnung EG Nr. 842/2006 Bestimmte fluorierte Treibhausgase, auf dem Schild, das sich am Gerät befindet, muss die Gesamtkältemittelmenge verzeichnet sein, die bei der Installation eingefüllt wird.

Lassen die R134a nicht in die Luft entweichen: R134a ist fluoriert treibhausgas, durch das Kyoto-protokoll erfasst ist. Sie besitzen folgendes treibhauspotential (GWP) R134a: = 1300.

Francais

Du 4 Juillet 2007 et en fonction de la Réglementation CE N° 842/2006 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 R134a se répandre dans l'atmosphère: le R134a est un gaz fluoré à effet de serre, couvert par le protocole de Kyoto avec un potentiel de réchauffement global (PRG) R134a: = 1300.

Italiano

Dal 4 Luglio 2007 e in base alla Normativa EC N° 842/2006 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 R134a nell'atmosfera: R134a è un gas fluorurati ad effetto serra che in base al protocollo di Kyoto presentano un potenziale riscaldamento globale (GWP) R134a: = 1300.

Русский

Постановление EC N° 842/2006 о некоторых фторсодержащих парниковых газах от 4 июля 2007 г. требует указать количество хладагента, содержащегося в агрегате, на специальной этикетке, которая наклеивается на корпус аппарата.

Запрещено выпускать R134a в атмосферу: R134a - это фторосодержащий парниковый газ, на который распространяется действие Киотского протокола. Потенциал глобального потепления (ПГП) R134a = 1300.

Português

A partir de 4 de Julho de 2007 e em conformidade com a Regulamentação da UE N° 842/2006 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 R134a para a atmosfera: o R134a é um gas fluorado com efeito de estufa abrangido pelo potencial de aquecimento global (GWP) do protocolo de Quioto: = 1300.

Dansk

Fra d. 4. Juli 2007 og i henhold til Rådets forordning (EF) nr. 842/2006 om visse fluorholdige drivhusgasser, skal installationens samlede mængde kølevæske fremgå af etiketten, der er klæbet fast på enheden.

Slip ikke R134a ud i atmosfæren: R134a er fluorholdig drivhus-gas, der er omfattet af Kyoto-protokollens globale opvarmningspotentiale (GWP) R410A/R407C: = 1300.

Nederlands

Vanaf 4 Juli 2007 en conform richtlijn EC N° 842/2006 voor bepaalde fluorbroeikasgassen, dient u de tabel in te vullen op de unit met het totale koelmiddelvolume in de installatie.

Laat geen R134a ontsnappen in de atmosfeer: R134a is een fluorbroeikasgas dat vallen onder het protocol van Kyoto inzake klimaatverandering global warming potential (GWP) R134a: = 1300.

Svenska

Från och med 4 Juli 2007 och enligt reglering EC N° 842/2006 om vissa fluorhaltiga växthusgaser, måste etiketten som sitter på enheten fyllas i med sammanlagd mängd kylmedium som fyllts på under installationen.

Släpp inte ut R134a i atmosfären: R134a är fluorerad växthus-gas som omfattas av Kyotoprotokollet om global uppvärmnings-potential (GWP) R134a: = 1300.

Ελληνικά

Από τις 4 Ιουλίου 2007 και σύμφωνα με τον Κανονισμό 842/2006/ΕΚ για για ορισμένα φθοριούχα αέρια θερμοκηπίου, είναι υποχρεωτική η συμπλήρωση της επισήμανσης που επισυνάπτεται στη μονάδα με το συνολικό ποσό ψυκτικού που εισήχθη κατά την εγκατάσταση.

Μην απελευθερώνετε R134a στην ατμόσφαιρα τα R134a είναι φθοριούχα αέριο καλύπτονται από το Πρωτόκολλο του Κιότο με δυναμικό θέρμανσης του πλανήτη (GWP) R134a: = 1300.

THIS EQUIPMENT CONTAINS
FLUORINATED GREENHOUSE
GASES COVERED BY THE
KYOTO PROTOCOL



DO NOT VENT R134a
INTO THE ATMOSPHERE
GWP: 1300

EN	English	Original version
ES	Español	Versión traducida
DE	Deutsch	Übersetzte Version
FR	Français	Version traduite
IT	Italiano	Versione tradotta
RU	Русский	Переведенная версия
PT	Português	Versão traduzida
DA	Dansk	Oversat version
NL	Nederlands	Vertaalde versie
SV	Svenska	Översatt version
EL	Ελληνικά	Μεταφρασμένη έκδοση

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1. General information

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1.1 General notes

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If you have any questions, contact your service contractor of HITACHI.

Check and make sure that the explanations of each part of this Technical Catalogue correspond to your water chiller model.

Refer to the models codification to confirm the main characteristics of your system.

Signal words (DANGER, WARNING and CAUTION) are used to identify levels of hazard seriousness. Definitions for identifying hazard levels are provided below with their respective signal words.

It is assumed that this unit will be operated and serviced by English speaking people. If this is not the case, the customer should add safety, caution and operating signs in the native language of the personal.

This water chiller has been designed for the following temperature. Operate the water chiller within this range:

	Temperature (°C)	
	Maximum	Minimum
Ambient temperature	+46	-15
Chilled Water Outlet Outlet Temperature	+15 (+30)*	+5
*In case of high water outlet temperature option		

1.2 Safety and applied symbols

During normal 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 jeopardise the safety of those in the surrounding area or that put the unit itself at risk will be clearly indicated in this manual.

To indicate these situations, a series of special symbols will be 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 and physical wellbeing.*
- *Not taking these instructions into account could lead to serious, very serious or even fatal injuries to you and others in the proximity of the unit.*
- *Hazards or unsafe practices which could result severe personal injury or death.*

In the texts following the danger symbol you can also find information on safe procedures during unit installation.



CAUTION

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

In the texts following the caution symbol you can also find information on safe procedures during unit installation.



NOTE

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

1.3 Product guide

1.3.1 Classification of water chiller models

◆ Basic modules

Unit type (Modular water chiller): RCM						
	E = Made in Europe					
		Position-separating hyphen (fixed)				
			Capacity (HP): 40, 50, 60, 70			
				A = Air cooled		
					H = R134a refrigerant	
						Series 1
RCM	E	—	XX	A	H	1

◆ Factory built modules combinations

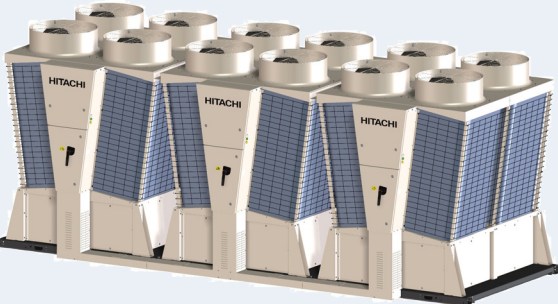
Unit type (Modular water chiller): RCM								
	E = Made in Europe							
		Position-separating hyphen (fixed)						
			Total capacity (HP): 080, 090, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210					
				Position-separating slash (fixed)				
					N° of modules: 2, 3			
						A = Air cooled		
							H = R134a refrigerant	
								Series 1
RCM	E	—	XXX	/	X	A	H	1

1.3.2 Product guide: Water chillers

◆ **Basic modules**

❄️	
3N~ 400V 50Hz	
	
Unit	Code
RCME-40AH1	8E041341
RCME-50AH1	8E051341
RCME-60AH1	8E061341
RCME-70AH1	8E071341

◆ **Factory built modules combinations**

❄️			
3N~ 400V 50Hz			
			
Modules of 2 units	Code	Modules of 3 units	Code
RCME-080/2AH1	8E080201		
RCME-090/2AH1	8E090201		
RCME-100/2AH1	8E100201		
RCME-110/2AH1	8E110201		
RCME-120/2AH1	8E120201		
RCME-130/2AH1	8E130201		
RCME-140/2AH1	8E140201		
		RCME-150/3AH1	8E150301
		RCME-160/3AH1	8E160301
		RCME-170/3AH1	8E170301
		RCME-180/3AH1	8E180301
		RCME-190/3AH1	8E190301
		RCME-200/3AH1	8E200301
		RCME-210/3AH1	8E210301

2. General data

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2.1 General Data

2.1.1 Hitachi Air-Cooled Water Chiller units RCME-(40-70)AH1

Model			RCME-40AH1	RCME-50AH1	RCME-60AH1	RCME-70AH1
Electrical power supply		-	3N~ 400V 50Hz			
Cooling capacity		kW	100	125	150	175
Total power input		kW	27.2	35.6	47.0	54.5
EER		-	3.68	3.51	3.19	3.21
ESEER		-	4.54	4.34	4.25	4.28
Cooling Capacity ①		kW	99.7	124.7	149.7	174.6
Input Power ①		kW	27.5	35.9	47.3	54.9
EER ①		-	3.63	3.47	3.16	3.18
ESEER ①		-	4.39	4.21	4.14	4.15
Outer dimension	Height	mm	2450			
	Width	mm	2230			
	Depth	mm	2000			
Cabinet colour		-	Natural Grey T (textured)			
Shipping weight		kg	1325	1360	1425	1450
Operating weight		kg	1340	1380	1460	1480
Compressor	Type	-	HITACHI Semi-Hermetic Screw Type			
	Model	-	G30ASF-Z	G40ASF-Z	G50ASF-Z	G50ASF-Z
	Quantity	-	1			
	Oil Heater	W	150			
	Capacity control	-	Continuous Capacity Control			
	Working range	%	25~100			
Water side heat exchanger		-	Braze Plate Type			
Air Side Heat Exchanger		-	Multi-Pass Cross Finned Tube (Cu/Al)			
Fan Motor	Type	-	Direct-Driven propeller fan (EC motor)			
	Quantity	-	4			
Refrigerant type		-	R134a			
Flow control		-	Electronic Expansion Valve			
Number of circuits		-	1			
Nominal water flow		m³/h	17.2	21.5	25.8	30.1
Pressure drop		kPa	15.9	15.5	14.7	19.5
Permissible water pressure max.		MPa	1.0			
Water flow range	Min.	m³/h	10.8	13.4	16.1	18.8
	Max.	m³/h	24.6	30.7	36.9	43.0
Minimum internal system water volume		m³	0.36	0.45	0.54	0.63
Water pipe connection	Size and type	-	2.1/2" Victaulic			
	Quantity	-	1 × Inlet , 1 × Outlet			
Control system		-	HITACHI Micro-Processor Control			
Chilled water outlet temperature		°C	+5 ~ +15			
Condenser air inlet temperature		°C	-15 ~ +46			
Sound power level		dB(A)	89	91	93	94
Sound pressure level		dB(A)	73	78	80	81



NOTE

- Data are based on the following conditions: Chilled Water Inlet / Outlet Temperature : 12 / 7°C. Condenser Inlet Air Temperature : 35°C. Data do not include the pump input.
- ① Data are with pump input included (according to the European Standard EN 14511).
- All data are related to High Efficiency mode.
- Sound Pressure Level: Sound pressure measured to 1.5m height and 1m from control panel.

2.1.2 Hitachi Air-Cooled Water Chiller units RCME-(080-140)/2AH1 (2 modules factory built)

Model			RCME-080/2AH1	RCME-090/2AH1	RCME-100/2AH1	RCME-110/2AH1	RCME-120/2AH1	RCME-130/2AH1	RCME-140/2AH1
Electrical power supply		-	3N~ 400V 50Hz						
Cooling capacity		kW	200	225	250	275	300	325	350
Total power input		kW	54.4	62.8	71.2	82.6	94.0	101	109
EER		-	3.68	3.58	3.51	3.33	3.19	3.20	3.21
ESEER		-	4.90	4.85	4.68	4.71	4.57	4.60	4.59
Cooling Capacity ❶		kW	199.5	224.4	249.4	274.4	299.3	324.2	349.1
Input Power ❶		kW	54.9	63.4	71.8	83.3	94.7	102.3	109.9
EER ❶		-	3.63	3.54	3.47	3.30	3.16	3.17	3.18
ESEER ❶		-	4.76	4.72	4.56	4.60	4.46	4.49	4.48
Outer dimension	Height	mm	2450						
	Width	mm	2250						
	Depth	mm	4000						
Cabinet colour		-	Natural Grey T (textured)						
Shipping weight		kg	2750	2785	2820	2885	2950	2975	3000
Operating weight		kg	2780	2820	2860	2940	3020	3040	3060
Compressor	Type	-	HITACHI Semi-Hermetic Screw Type						
	Model	-	G30ASF-Z	G30 / G40ASF-Z	G40ASF-Z	G40 / G50ASF-Z	G50ASF-Z		
	Quantity	-	2	1 / 1	2	1 / 1	2		
	Oil Heater	W	2 x 150						
	Capacity control	-	Continuous Capacity Control						
	Working range	%	25~100						
Water side heat exchanger		-	Brazing Plate Type						
Air Side Heat Exchanger		-	Multi-Pass Cross Finned Tube (Cu/Al)						
Fan Motor	Type	-	Direct-Driven propeller fan (EC motor)						
	Quantity	-	8						
Refrigerant type		-	R134a						
Flow control		-	Electronic Expansion Valve						
Number of circuits		-	2						
Nominal water flow		m³/h	34.4	38.7	43.0	47.3	51.6	55.9	60.2
Pressure drop		kPa	15.9	15.7	15.5	15.1	14.7	17.1	19.5
Permissible water pressure max.		MPa	1.0						
Water flow range	Min.	m³/h	21.5	24.2	26.9	29.6	32.3	34.9	37.6
	Max.	m³/h	49.1	55.3	61.4	67.6	73.7	79.9	86.0
Minimum internal system water volume		m³	0.72	0.81	0.90	0.99	1.08	1.18	1.27
Water pipe connection	Size and type	-	2.1/2" Victaulic						
	Quantity	-	2 × Inlet , 2 × Outlet						
Control system		-	HITACHI Micro-Processor Control						
Chilled water outlet temperature		°C	+5 ~ +15						
Condenser air inlet temperature		°C	-15 ~ +46						
Sound power level		dB(A)	92	93	94	95	96	96	97
Sound pressure level		dB(A)	76	79	81	82	83	83	84


NOTE

- Data are base on the follwing conditions: Chilled Water Inlet / Outlet Temperature : 12 / 7°C. Condenser Inlet Air Temperature : 35°C. Data do not include the pump input.
- ①Data are with pump input included (according to the European Standard EN 14511).
- All data are related to High Efficiency mode.
- Sound Pressure Level: Sound pressure measured to 1.5m height and 1m from control panel.

2.1.3 Hitachi Air-Cooled Water Chiller units RCME-(150-210)/3AH1 (3 modules factory built)

Model			RCME-150/3AH1	RCME-160/3AH1	RCME-170/3AH1	RCME-180/3AH1	RCME-190/3AH1	RCME-200/3AH1	RCME-210/3AH1
Electrical power supply		-	3N~ 400V 50Hz						
Cooling capacity		kW	375	400	425	450	475	500	525
Total power input		kW	107	118	130	141	148	156	163
EER		-	3.51	3.38	3.28	3.19	3.20	3.21	3.21
ESEER		-	4.89	4.83	4.76	4.65	4.66	4.70	4.68
Cooling Capacity ❶		kW	374.1	399.1	424.0	449.0	473.9	498.8	523.7
Input Power ❶		kW	107.8	119.2	130.6	142.0	149.6	157.2	164.8
EER ❶		-	3.47	3.35	3.25	3.16	3.17	3.17	3.18
ESEER ❶		-	4.79	4.75	4.68	4.58	4.57	4.61	4.59
Outer dimension	Height	mm	2450						
	Width	mm	2250						
	Depth	mm	6000						
Cabinet colour		-	Natural Grey T (textured)						
Shipping weight		kg	4260	4325	4390	4455	4480	4505	4530
Operating weight		kg	4320	4400	4480	4560	4580	4600	4620
Compressor	Type	-	HITACHI Semi-Hermetic Screw Type						
	Model	-	G40ASF-Z	G40 / G50ASF-Z	G40 / G50ASF-Z	G50ASF-Z			
	Quantity	-	3	2 / 1	1 / 2	3			
	Oil Heater	W	3 x 150						
	Capacity control	-	Continuous Capacity Control						
	Working range	%	25~100						
Water side heat exchanger		-	Brazing Plate Type						
Air Side Heat Exchanger		-	Multi-Pass Cross Finned Tube (Cu/Al)						
Fan Motor	Type	-	Direct-Driven propeller fan (EC motor)						
	Quantity	-	12						
Refrigerant type		-	R134a						
Flow control		-	Electronic Expansion Valve						
Number of circuits		-	3						
Nominal water flow		m³/h	64.5	68.8	73.1	77.4	81.7	86.0	90.3
Pressure drop		kPa	15.5	15.2	15.0	14.7	16.3	17.9	19.5
Permissible water pressure max.		MPa	1.0						
Water flow range	Min.	m³/h	40.3	43.0	45.7	48.4	51.1	53.8	56.4
	Max.	m³/h	92.1	98.3	104.4	110.6	116.7	122.9	129.0
Minimum internal system water volume		m³	1.36	1.45	1.54	1.63	1.72	1.81	1.90
Water pipe connection	Size and type	-	2.1/2" Victaulic						
	Quantity	-	3 × Inlet , 3 × Outlet						
Control system		-	HITACHI Micro-Processor Control						
Chilled water outlet temperature		°C	+5 ~ +15						
Condenser air inlet temperature		°C	-15 ~ +46						
Sound power level		dB(A)	95	96	97	97	98	98	98
Sound pressure level		dB(A)	83	83	84	85	85	85	86


NOTE

- Data are base on the follwing conditions: Chilled Water Inlet / Outlet Temperature : 12 / 7°C. Condenser Inlet Air Temperature : 35°C. Data do not include the pump input.
- ①Data are with pump input included (according to the European Standard EN 14511).
- All data are related to High Efficiency mode.
- Sound Pressure Level: Sound pressure measured to 1.5m height and 1m from control panel.

2.2 Sound Data

Model	Sound Power level (dB)								Overall (dBA)
	Frequency Band (Hz)								
	63	125	250	500	1000	2000	4000	8000	
RCME-40AH1	91	87	84	87	86	78	62	54	89
RCME-50AH1	101	92	88	87	88	78	65	57	91
RCME-60AH1	103	94	90	89	90	80	67	59	93
RCME-70AH1	104	95	91	90	91	81	68	60	94
RCME-080/2AH1	94	90	87	90	89	81	65	57	92
RCME-090/2AH1	101	93	90	90	90	81	67	59	93
RCME-100/2AH1	104	95	91	90	91	81	68	60	94
RCME-110/2AH1	105	96	92	91	93	82	69	61	95
RCME-120/2AH1	106	97	93	92	93	83	70	62	96
RCME-130/2AH1	106	98	94	92	94	84	71	62	96
RCME-140/2AH1	107	98	94	93	94	84	71	63	97
RCME-150/3AH1	105	97	93	92	93	83	70	61	95
RCME-160/3AH1	106	98	94	92	94	84	71	62	96
RCME-170/3AH1	107	98	94	93	95	84	71	63	97
RCME-180/3AH1	107	99	95	94	95	85	72	63	97
RCME-190/3AH1	108	99	95	94	96	85	72	64	98
RCME-200/3AH1	108	100	96	94	96	85	73	64	98
RCME-210/3AH1	108	100	96	95	96	86	73	64	98



NOTE

- For LOW NOISE option the values of the tables are reduce in -3dB.
- For SUPER LOW NOISE option the values of the tables are reduce in -5bB.

Model	Sound Pressure level at 1m (dB)								Overall (dBA)
	Frequency Band (Hz)								
	63	125	250	500	1000	2000	4000	8000	
RCME-40AH1	67	67	68	69	71	61	45	36	73
RCME-50AH1	82	78	75	74	76	64	50	42	78
RCME-60AH1	84	80	77	76	78	66	52	44	80
RCME-70AH1	85	81	78	77	79	67	53	45	81
RCME-080/2AH1	70	70	71	72	74	64	48	39	76
RCME-090/2AH1	82	79	76	75	77	65	52	43	79
RCME-100/2AH1	85	81	78	77	79	67	53	45	81
RCME-110/2AH1	86	83	79	78	80	68	55	46	82
RCME-120/2AH1	87	83	80	79	81	69	55	47	83
RCME-130/2AH1	87	84	80	79	81	69	56	47	83
RCME-140/2AH1	88	84	81	80	82	70	56	48	84
RCME-150/3AH1	87	83	79	78	81	68	55	47	83
RCME-160/3AH1	87	84	80	79	81	69	56	47	83
RCME-170/3AH1	88	85	81	80	82	70	57	48	84
RCME-180/3AH1	89	85	81	80	83	70	57	49	85
RCME-190/3AH1	89	86	82	81	83	71	58	49	85
RCME-200/3AH1	89	86	82	81	83	71	58	49	85
RCME-210/3AH1	90	86	82	81	84	71	58	50	86



NOTE

- For LOW NOISE option the values of the tables are reduce in -3dB.
- For SUPER LOW NOISE option the values of the tables are reduce in -5bB.

Model	Sound Pressure level at 10m (dB)								Overall (dBA)
	Frequency Band (Hz)								
	63	125	250	500	1000	2000	4000	8000	
RCME-40AH1	63	59	56	59	58	50	34	26	61
RCME-50AH1	73	64	60	59	60	50	37	29	63
RCME-60AH1	75	66	62	61	62	52	39	31	65
RCME-70AH1	76	67	63	62	63	53	40	32	66
RCME-080/2AH1	66	62	59	62	61	53	37	29	64
RCME-090/2AH1	73	65	62	62	62	53	39	31	65
RCME-100/2AH1	76	67	63	62	63	53	40	32	66
RCME-110/2AH1	77	68	64	63	65	54	41	33	67
RCME-120/2AH1	78	69	65	64	65	55	42	34	68
RCME-130/2AH1	78	70	66	64	66	56	43	34	68
RCME-140/2AH1	79	70	66	65	66	56	43	35	69
RCME-150/3AH1	77	69	65	64	65	55	42	33	67
RCME-160/3AH1	78	70	66	64	66	56	43	34	68
RCME-170/3AH1	79	70	66	65	67	56	43	35	69
RCME-180/3AH1	79	71	67	66	67	57	44	35	69
RCME-190/3AH1	80	71	67	66	68	57	44	36	70
RCME-200/3AH1	80	72	68	66	68	57	45	36	70
RCME-210/3AH1	80	72	68	67	68	58	45	36	70

**NOTE**

- For LOW NOISE option the values of the tables are reduce in -3dB.
- For SUPER LOW NOISE option the values of the tables are reduce in -5bB.

Model	Sound Pressure level at 30m (dB)								Overall (dBA)
	Frequency Band (Hz)								
	63	125	250	500	1000	2000	4000	8000	
RCME-40AH1	53	49	46	50	49	40	25	17	52
RCME-50AH1	63	55	51	49	51	40	28	19	53
RCME-60AH1	65	57	53	51	53	42	30	21	55
RCME-70AH1	66	58	54	52	54	43	31	22	56
RCME-080/2AH1	56	52	49	53	52	43	28	20	55
RCME-090/2AH1	64	56	52	52	53	43	29	21	55
RCME-100/2AH1	66	58	54	52	54	43	31	22	56
RCME-110/2AH1	67	59	55	53	55	45	32	23	57
RCME-120/2AH1	68	60	56	54	56	45	33	24	58
RCME-130/2AH1	69	60	56	55	56	46	33	25	59
RCME-140/2AH1	69	61	57	55	57	46	34	25	59
RCME-150/3AH1	68	59	55	54	56	45	32	24	58
RCME-160/3AH1	69	60	56	55	56	46	33	25	59
RCME-170/3AH1	69	61	57	55	57	47	34	25	59
RCME-180/3AH1	70	61	57	56	58	47	34	26	60
RCME-190/3AH1	70	62	58	56	58	48	35	26	60
RCME-200/3AH1	71	62	58	57	58	48	35	27	61
RCME-210/3AH1	71	62	58	57	59	48	35	27	61

**NOTE**

- For LOW NOISE option the values of the tables are reduce in -3dB.
- For SUPER LOW NOISE option the values of the tables are reduce in -5bB.

2.3 Water Chillers options and accessories

2.3.1 Included functions

Specifications		Remarks
General	Low Ambient Fan Control (-15°C)	
	Current Limiter	
Control System	Star-Delta starting	For compressors
	Main Isolator Switch	
	LCD touch panel	
	Local/Remote Changeover Switch	
	Individual Alarm	By Alarm Code
	Compressor Operation Hour Meter	Display on LCD
	Pressure Sensor (High and Low)	
	Pump Freeze Protection Operation	Pump ON/OFF Operation
	Pump Operation Circuit	Pump ON/OFF Contact
	Non Voltage Contact for Remote indication	Pump, Operation, Alarm
	DC24V External Control	Level or pulse
	Short Period Power OFF Protection	
	Power Failure Recover Control	
	2 Different Temperatures Setting	
	Remote Control (Field Supplied) socket	AC 230V
	Electrical Power estimation	Display on LCD
	% of instantaneous load	Display on LCD
	Numbered Cables	
	Power source terminals	AC 230V
	Output ON/OFF Signal for Free Cooling	
	Output ON/OFF Signal for Fan operation	Snow Protection
	Output Signal for Forcing Compressor Load	
Air Condenser	Coil Guard Nets	
	Coated Aluminium Fin	
Refrigeration Cycle	Independent Circuit	
	Compressor Safety Valve	
	Pressure Display (High and Low)	Display on Operation Panel
	Leak Detection	
Water system	10 bar Water Pressure	
	Lower panels enclosure	

2.3.2 Options



NOTE

Options (on order) are factory built. They shall be ordered together with the Chiller unit.

Specifications		Remarks
General	Low Noise add-on	
	Super Low Noise add-on	
	Factory built modules connection	up to 3 modules
High Water Temp.	Outlet temperature 15 ~ 30°C (High1)	
Compressor	Compressor Enclosure	Included in "Low Noise" and "Super Low Noise" options
Control System	Compressor Circuit Breaker Protector	
	Fan Circuit Breaker Protector	
	Power Meter (Factory installed)	Factory installed
Air Condenser	Heavy Corrosion Air Heat Exchangers	
Refrigeration Cycle	Insulation Suction Pipe	Low pressure side
	Discharge Valve	
	Suction Valve	
	Compressor Dual Safety Valve	
Water Cooler	Water Cooler Heater	
Water system	Differential Water Pressure Switch	
	Differential Water Pressure Gauge	
	Stainless Steel Water Pipe	AISI 304. Included in "high Water Outlet Temp." option
	Common Water Pipe	available as accessory only (not factory built)
	Pump kit (single and double)	
Others	Wooden Crate	
	Electric box at opposite side	
	Power cable routing	
	EBOX Lower Safety Cover	Only for single modules
	Wood Base	Only for single modules
	Heavy Corrosion	
	Witness Test	



NOTE

Incompatibilities: Stainless Steel Water Pipe Option + Common Water Pipe Accessory

2.3.3 Accessories

Description	Specifications	Code	Remarks (number of accessories)
CHL-WFS-01	Water Flow Switch	8E500001	40 - 210 HP: 1
CHL-WST-01	Water Strainer 2.1/2"	8E500002	40-70HP: 1 ; 080-140: 2 ; 150-210HP: 3
CHL-WST-04	Water Strainer 5"	8E500005	080-210HP: 1; only if Common water pipe option is assembled
CHL-CWP-03	Common Water Pipe L-R	8E500024	080-140: 1
CHL-CWP-04	Common Water Pipe -M-	8E500025	150-210HP: 1 + 1
CHL-AVR-01	Antivibration Rubber Mat	8E500008	40-70HP: 1 ; 080-140: 2 ; 150-210HP: 3
CHL-AVS-02	Antivibration Spring System	8E500026	40-70HP (only): 1
CHL-FLA-01	Water Flange Connection 2.1/2"	8E500011	40-70HP: 1 ; 080-140: 2 ; 150-210HP: 3
CHL-MBS-01	Modbus BMS Gateway	8E500012	all: 1
CHL-PMM-01	Power Meter (200A)	8E500016	40-70HP: 1
CHL-PMM-02	Power Meter (400A)	8E500017	080-140: 1
CHL-PMM-03	Power Meter (1000A)	8E500018	150-210HP: 1



NOTE

Accessories are field installed. They shall be ordered separately.

2.4 Components data

2.4.1 Compressor

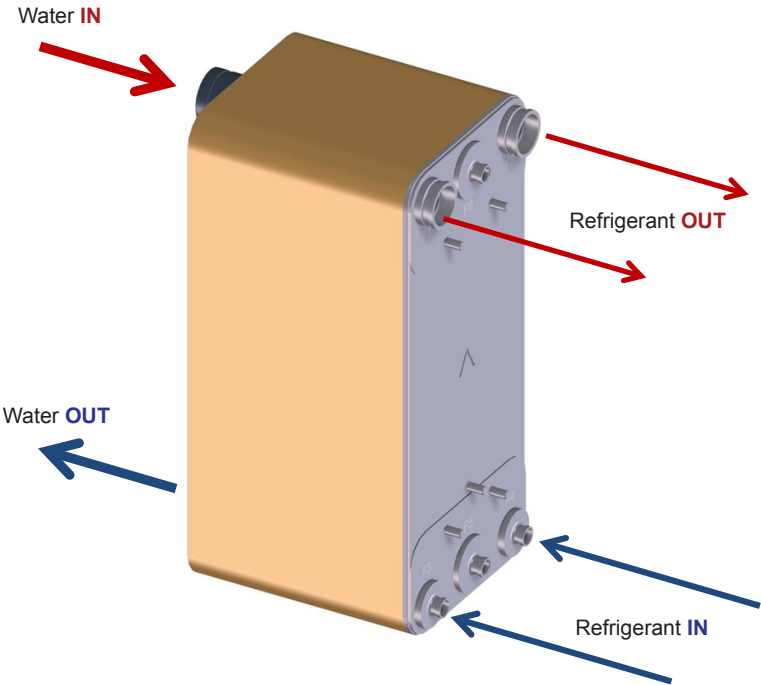
Model			G30ASF-Z	G40ASF-Z	G50ASF-Z
Type			HITACHI semi-hermetic screw type		
	Revolution	rpm	2880		
	Displacement	m³/h	4	211.7	272.0
	Capacity Control	%	25 ~ 100		
Pneumatic Pressure					
	High Side	MPa	2.02		
	Low Side	MPa	2.02		
Motor	Type		Special Squirrel Cage Three-Phase Motor		
	Starting Method		Star-Delta Starting		
	Nominal Output	kW	22	30	37
	Poles		2		
	Insulation		E		
Oil	Name		JX Nippon Oil & Energy, Ze-GLES RB 68		
	Charge	Litre	6		
Net Weight		kg	420	440	485

2.4.2 Condenser and Condenser Fan

Model RCME-AH1				40	50	60	70
Air Heat Exchanger	Type			Multi-Pass Cross Finned tube			
	Piping	Material		Copper Tube			
		Outer Diameter	mm	7.00			
		Rows		3			
	Fin	Pitch		1.70			
		Material		Aluminium			
	Quantity			4			
	Maximum Operating Pressure		MPa	4.15			
Fan	Fan	Type		Direct-Driven Propeller Fan			
		Quantity		4			
		Outer diameter		710			
		Revolution		780	855	900	900
		Air Flow	m³/min	830	910	960	960
	Motor	Type		Drip-proof type enclosure			
				DC			
		Poles		8			
		Quantity		4			
		Nominal Output	kW	1.2			
		Starting Method		Direct-On-Line Starting			

2.4.3 Water Cooler

			Brazen plate heat exchanger type		
			A	B	C
Dimensions	Height (H)	mm	4	4	4
	Width (W)	mm	4	4	4
	Depth (D)	mm	208	265	332
Maximum Permissible Pressure	Refrigerant Side	MPa	3.1	3.1	3.1
	Water Side	MPa	2.8	2.8	2.8
Internal Volume	Refrigerant Side	Litre	16.3	21.1	26.8
	Water Side	Litre	17.3	22.3	28.2
Material			AISI316		
Net weight (without water)			68	83	101



Model RCME-AH1	Brazen plate heat exchanger type
RCME-40AH1	A
RCME-50AH1	B
RCME-60AH1	C
RCME-70AH1	

2.5 Typical on-site module combinations

2.5.1 General Data

◆ 4 Modules

Model			4 x RCME-40AH1	4 x RCME-50AH1	4 x RCME-60AH1	4 x RCME-70AH1
Power supply		-	3N~ 400V 50Hz			
Cooling capacity		kW	400	500	600	700
Total power input		kW	109	142	188	218
EER		-	3.68	3.51	3.19	3.21
ESEER		-	5.06	4.83	4.65	4.67
Cooling Capacity ①		kW	398.9	498.8	598.7	698.2
Input Power ①		kW	109.9	143.7	189.3	219.8
EER ①		-	3.63	3.47	3.16	3.18
ESEER ①		-	4.93	4.72	4.55	4.57
Dimensions	Height	mm	2450			
	Width	mm	2230			
	Depth	mm	8000			
Cabinet colour		-	Natural Grey T (textured)			
Operating weight		kg	5360	5520	5840	5920
Compressor	Type	-	HITACHI Semi-Hermetic Screw Type			
	Model	-	G30ASF-Z	G40ASF-Z	G50ASF-Z	G50ASF-Z
	Quantity	-	4			
	Oil Heater	W	4 x 150			
	Capacity control	-	Continuous Capacity Control			
	Working range	%	25 ~ 100			
Water side heat exchanger		-	Brazing Plate Type			
Air Side Heat Exchanger		-	Multi-Pass Cross Finned Tube (Cu/Al)			
Fan Motor	Type	-	Direct-Driven propeller fan (EC motor)			
	Quantity	-	16			
Refrigerant type		-	R134a			
Flow control		-	Electronic Expansion Valve			
Number of circuits		-	4			
Nominal water flow		m³/h	68,8	86,0	103,2	120,4
Pressure drop		kPa	15,9	15,5	14,7	19,5
Permissible water pressure max.		MPa	1.0			
Water flow range	Min.	m³/h	43,0	53,8	64,5	75,3
	Max.	m³/h	98,3	122,9	147,4	172,0
Minimum internal system water volume		m³	1,45	1,81	2,17	2,53
Water pipe connection	Size and type	-	2.1/2" Victaulic			
	Quantity	-	4 × Inlet , 4 × Outlet			
Control system		-	HITACHI Micro-Processor Control			
Chilled water outlet temperature		°C	+5 ~ +15			
Condenser air inlet temperature		°C	-15 ~ +46			
Sound power level		dB(A)	95	97	99	100
Sound pressure level		dB(A)	79	84	86	87



NOTE

- Chilled Water Inlet / Outlet Temperature : 12 / 7°C
- Condenser Inlet Air Temperature : 35°C
- Sound Pressure Level: Sound pressure measured to 1.5m height and 1m from control panel.

◆ 5 Modules

Model			5 x RCME-40AH1	5 x RCME-50AH1	5 x RCME-60AH1	5 x RCME-70AH1
Power supply		-	3N~ 400V 50Hz			
Cooling capacity		kW	500	625	750	875
Total power input		kW	136	178	235	272
EER		-	3,68	3,51	3,19	3,21
ESEER		-	5,12	4,89	4,69	4,72
Cooling Capacity ①		kW	498,7	623,5	748,3	872,8
Input Power ①		kW	137,3	179,6	236,7	274,7
EER ①		-	3,63	3,47	3,16	3,18
ESEER ①		-	5,01	4,79	4,60	4,61
Dimensions	Height	mm	2450			
	Width	mm	2230			
	Depth	mm	10000			
Cabinet colour		-	Natural Grey T (textured)			
Operating weight		kg	6700	6900	7300	7400
Compressor	Type	-	HITACHI Semi-Hermetic Screw Type			
	Model	-	G30ASF-Z	G40ASF-Z	G50ASF-Z	G50ASF-Z
	Quantity	-	5			
	Oil Heater	W	5 x 150			
	Capacity control	-	Continuous Capacity Control			
	Working range	%	25 ~ 100			
Water side heat exchanger		-	Brazing Plate Type			
Air Side Heat Exchanger		-	Multi-Pass Cross Finned Tube (Cu/Al)			
Fan Motor	Type	-	Direct-Driven propeller fan (EC motor)			
	Quantity	-	20			
Refrigerant type		-	R134a			
Flow control		-	Electronic Expansion Valve			
Number of circuits		-	5			
Nominal water flow		m³/h	86,0	107,5	129,0	150,5
Pressure drop		kPa	15,9	15,5	14,7	19,5
Permissible water pressure max.		MPa	1.0			
Water flow range	Min.	m³/h	53,8	67,2	80,6	94,1
	Max.	m³/h	122,9	153,6	184,3	215,0
Minimum internal system water volume		m³	1,81	2,26	2,71	3,16
Water pipe connection	Size and type	-	2.1/2" Victaulic			
	Quantity	-	5 × Inlet , 5 × Outlet			
Control system		-	HITACHI Micro-Processor Control			
Chilled water outlet temperature		°C	+5 ~ +15			
Condenser air inlet temperature		°C	-15 ~ +46			
Sound power level		dB(A)	96	98	100	101
Sound pressure level		dB(A)	80	85	87	88



NOTE

- Chilled Water Inlet / Outlet Temperature : 12 / 7°C
- Condenser Inlet Air Temperature : 35°C
- Sound Pressure Level: Sound pressure measured to 1.5m height and 1m from control panel.

◆ 6 Modules

Model			6 x RCME-40AH1	6 x RCME-50AH1	6 x RCME-60AH1	6 x RCME-70AH1
Power supply		-	3N~ 400V 50Hz			
Cooling capacity		kW	600	750	900	1050
Total power input		kW	163	214	282	327
EER		-	3,68	3,51	3,19	3,21
ESEER		-	5,12	4,89	4,67	4,69
Cooling Capacity ①		kW	598,4	748,2	898,0	1047,3
Input Power ①		kW	164,8	215,5	284,0	329,7
EER ①		-	3,63	3,47	3,16	3,18
ESEER ①		-	5,01	4,79	4,58	4,59
Dimensions	Height	mm	2450			
	Width	mm	2230			
	Depth	mm	12000			
Cabinet colour		-	Natural Grey T (textured)			
Operating weight		kg	8040	8280	8760	8880
Compressor	Type	-	HITACHI Semi-Hermetic Screw Type			
	Model	-	G30ASF-Z	G40ASF-Z	G50ASF-Z	G50ASF-Z
	Quantity	-	6			
	Oil Heater	W	6 x 150			
	Capacity control	-	Continuous Capacity Control			
	Working range	%	25 ~ 100			
Water side heat exchanger		-	Brazing Plate Type			
Air Side Heat Exchanger		-	Multi-Pass Cross Finned Tube (Cu/Al)			
Fan Motor	Type	-	Direct-Driven propeller fan (EC motor)			
	Quantity	-	24			
Refrigerant type		-	R134a			
Flow control		-	Electronic Expansion Valve			
Number of circuits		-	6			
Nominal water flow		m³/h	103,2	129,0	154,8	180,6
Pressure drop		kPa	15,9	15,5	14,7	19,5
Permissible water pressure max.		MPa	1.0			
Water flow range	Min.	m³/h	64,5	80,6	96,8	112,9
	Max.	m³/h	147,4	184,3	221,1	258,0
Minimum internal system water volume		m³	2,17	2,71	3,25	3,80
Water pipe connection	Size and type	-	2.1/2" Victaulic			
	Quantity	-	6 × Inlet , 6 × Outlet			
Control system		-	HITACHI Micro-Processor Control			
Chilled water outlet temperature		°C	+5 ~ +15			
Condenser air inlet temperature		°C	-15 ~ +46			
Sound power level		dB(A)	97	98	100	101
Sound pressure level		dB(A)	81	86	88	89



NOTE

- Chilled Water Inlet / Outlet Temperature : 12 / 7°C
- Condenser Inlet Air Temperature : 35°C
- Sound Pressure Level: Sound pressure measured to 1.5m height and 1m from control panel.

◆ 7 Modules

Model			7 x RCME-40AH1	7 x RCME-50AH1	7 x RCME-60AH1	7 x RCME-70AH1
Power supply		-	3N~ 400V 50Hz			
Cooling capacity		kW	700	875	1050	1225
Total power input		kW	190	249	329	381
EER		-	3,68	3,51	3,19	3,21
ESEER		-	5,12	4,89	4,68	4,71
Cooling Capacity ①		kW	698,1	872,9	1047,7	1221,9
Input Power ①		kW	192,2	251,4	331,3	384,6
EER ①		-	3,63	3,47	3,16	3,18
ESEER ①		-	4,99	4,78	4,59	4,61
Dimensions	Height	mm	2450			
	Width	mm	2230			
	Depth	mm	14000			
Cabinet colour		-	Natural Grey T (textured)			
Operating weight		kg	9380	9660	10220	10360
Compressor	Type	-	HITACHI Semi-Hermetic Screw Type			
	Model	-	G30ASF-Z	G40ASF-Z	G50ASF-Z	G50ASF-Z
	Quantity	-	7			
	Oil Heater	W	7 x 150			
	Capacity control	-	Continuous Capacity Control			
	Working range	%	25 ~ 100			
Water side heat exchanger		-	Brazing Plate Type			
Air Side Heat Exchanger		-	Multi-Pass Cross Finned Tube (Cu/Al)			
Fan Motor	Type	-	Direct-Driven propeller fan (EC motor)			
	Quantity	-	28			
Refrigerant type		-	R134a			
Flow control		-	Electronic Expansion Valve			
Number of circuits		-	7			
Nominal water flow		m³/h	120,4	150,5	180,6	210,7
Pressure drop		kPa	15,9	15,5	14,7	19,5
Permissible water pressure max.		MPa	1.0			
Water flow range	Min.	m³/h	75,3	94,1	112,9	131,7
	Max.	m³/h	172,0	215,0	258,0	301,0
Minimum internal system water volume		m³	2,53	3,16	3,80	4,43
Water pipe connection	Size and type	-	2.1/2" Victaulic			
	Quantity	-	7 × Inlet , 7 × Outlet			
Control system		-	HITACHI Micro-Processor Control			
Chilled water outlet temperature		°C	+5 ~ +15			
Condenser air inlet temperature		°C	-15 ~ +46			
Sound power level		dB(A)	98	99	101	102
Sound pressure level		dB(A)	81	86	88	89



NOTE

- Chilled Water Inlet / Outlet Temperature : 12 / 7°C
- Condenser Inlet Air Temperature : 35°C
- Sound Pressure Level: Sound pressure measured to 1.5m height and 1m from control panel.

◆ 8 Modules

Model			8 x RCME-40AH1	8 x RCME-50AH1	8 x RCME-60AH1	8 x RCME-70AH1
Power supply		-	3N~ 400V 50Hz			
Cooling capacity		kW	800	1000	1200	1400
Total power input		kW	218	285	376	436
EER		-	3,68	3,51	3,19	3,21
ESEER		-	5,13	4,90	4,69	4,72
Cooling Capacity ①		kW	797,9	997,6	1197,3	1396,4
Input Power ①		kW	219,7	287,4	378,7	439,5
EER ①		-	3,63	3,47	3,16	3,18
ESEER ①		-	5,02	4,80	4,61	4,62
Dimensions	Height	mm	2450			
	Width	mm	2230			
	Depth	mm	16000			
Cabinet colour		-	Natural Grey T (textured)			
Operating weight		kg	10720	11040	11680	11840
Compressor	Type	-	HITACHI Semi-Hermetic Screw Type			
	Model	-	G30ASF-Z	G40ASF-Z	G50ASF-Z	G50ASF-Z
	Quantity	-	8			
	Oil Heater	W	8 x 150			
	Capacity control	-	Continuous Capacity Control			
	Working range	%	25 ~ 100			
Water side heat exchanger		-	Brazing Plate Type			
Air Side Heat Exchanger		-	Multi-Pass Cross Finned Tube (Cu/Al)			
Fan Motor	Type	-	Direct-Driven propeller fan (EC motor)			
	Quantity	-	32			
Refrigerant type		-	R134a			
Flow control		-	Electronic Expansion Valve			
Number of circuits		-	8			
Nominal water flow		m³/h	137,6	172,0	206,4	240,8
Pressure drop		kPa	15,9	15,5	14,7	19,5
Permissible water pressure max.		MPa	1.0			
Water flow range	Min.	m³/h	86,0	107,5	129,0	150,5
	Max.	m³/h	196,6	245,7	294,9	344,0
Minimum internal system water volume		m³	2,89	3,62	4,34	5,06
Water pipe connection	Size and type	-	2.1/2" Victaulic			
	Quantity	-	8 × Inlet , 8 × Outlet			
Control system		-	HITACHI Micro-Processor Control			
Chilled water outlet temperature		°C	+5 ~ +15			
Condenser air inlet temperature		°C	-15 ~ +46			
Sound power level		dB(A)	98	100	102	103
Sound pressure level		dB(A)	82	87	89	90



NOTE

- Chilled Water Inlet / Outlet Temperature : 12 / 7°C
- Condenser Inlet Air Temperature : 35°C
- Sound Pressure Level: Sound pressure measured to 1.5m height and 1m from control panel.

2.5.2 Sound Data

Combination	Sound Power level (dB)								Overall (dBA)
	Frequency Band (Hz)								
	63	125	250	500	1000	2000	4000	8000	
4 x RCME-40AH1	97	93	90	93	92	84	69	60	95
4 x RCME-50AH1	107	98	94	93	94	84	71	63	97
4 x RCME-60AH1	109	100	96	95	96	86	73	65	99
4 x RCME-70AH1	110	101	97	96	97	87	74	66	100
5 x RCME-40AH1	98	94	91	94	93	85	69	61	96
5 x RCME-50AH1	108	99	95	94	95	85	72	64	98
5 x RCME-60AH1	110	101	97	96	97	87	74	66	100
5 x RCME-70AH1	111	102	98	97	98	88	75	67	101
6 x RCME-40AH1	99	94	91	95	94	86	70	62	97
6 x RCME-50AH1	108	100	96	95	96	86	73	64	98
6 x RCME-60AH1	110	102	98	97	98	88	75	66	100
6 x RCME-70AH1	111	103	99	98	99	89	76	67	101
7 x RCME-40AH1	99	95	92	96	95	86	71	63	98
7 x RCME-50AH1	109	101	97	95	97	86	74	65	99
7 x RCME-60AH1	111	103	99	97	99	88	76	67	101
7 x RCME-70AH1	112	104	100	98	100	89	77	68	102
8 x RCME-40AH1	100	96	93	96	95	87	72	63	98
8 x RCME-50AH1	110	101	97	96	97	87	74	66	100
8 x RCME-60AH1	112	103	99	98	99	89	76	68	102
8 x RCME-70AH1	113	104	100	99	100	90	77	69	103

Combination	Sound Pressure level at 1m (dB)								Overall (dBA)
	Frequency Band (Hz)								
	63	125	250	500	1000	2000	4000	8000	
4 x RCME-40AH1	73	73	74	75	77	67	51	42	79
4 x RCME-50AH1	88	84	81	80	82	70	56	48	84
4 x RCME-60AH1	90	86	83	82	84	72	58	50	86
4 x RCME-70AH1	91	87	84	83	85	73	59	51	87
5 x RCME-40AH1	74	74	75	76	78	68	52	43	80
5 x RCME-50AH1	89	85	82	81	83	71	57	49	85
5 x RCME-60AH1	91	87	84	83	85	73	59	51	87
5 x RCME-70AH1	92	88	85	84	86	74	60	52	88
6 x RCME-40AH1	75	75	76	76	79	69	53	44	81
6 x RCME-50AH1	90	86	82	81	84	71	58	50	86
6 x RCME-60AH1	92	88	84	83	86	73	60	52	88
6 x RCME-70AH1	93	89	85	84	87	74	61	53	89
7 x RCME-40AH1	76	76	77	77	79	69	54	44	81
7 x RCME-50AH1	90	87	83	82	84	72	59	50	86
7 x RCME-60AH1	92	89	85	84	86	74	61	52	88
7 x RCME-70AH1	93	90	86	85	87	75	62	53	89
8 x RCME-40AH1	76	76	77	78	80	70	54	45	82
8 x RCME-50AH1	91	88	84	83	85	73	59	51	87
8 x RCME-60AH1	93	90	86	85	87	75	61	53	89
8 x RCME-70AH1	94	91	87	86	88	76	62	54	90

Combination	Sound Pressure level at 10m (dB)								Overall (dBA)
	Frequency Band (Hz)								
	63	125	250	500	1000	2000	4000	8000	
4 x RCME-40AH1	69	65	62	65	64	56	41	32	67
4 x RCME-50AH1	79	70	66	65	66	56	43	35	69
4 x RCME-60AH1	81	72	68	67	68	58	45	37	71
4 x RCME-70AH1	82	73	69	68	69	59	46	38	72
5 x RCME-40AH1	70	66	63	66	65	57	41	33	68
5 x RCME-50AH1	80	71	67	66	67	57	44	36	70
5 x RCME-60AH1	82	73	69	68	69	59	46	38	72
5 x RCME-70AH1	83	74	70	69	70	60	47	39	73
6 x RCME-40AH1	71	66	63	67	66	58	42	34	69
6 x RCME-50AH1	80	72	68	67	68	58	45	36	70
6 x RCME-60AH1	82	74	70	69	70	60	47	38	72
6 x RCME-70AH1	83	75	71	70	71	61	48	39	73
7 x RCME-40AH1	71	67	64	68	67	58	43	35	70
7 x RCME-50AH1	81	73	69	67	69	58	46	37	71
7 x RCME-60AH1	83	75	71	69	71	60	48	39	73
7 x RCME-70AH1	84	76	72	70	72	61	49	40	74
8 x RCME-40AH1	72	68	65	68	67	59	44	35	70
8 x RCME-50AH1	82	73	69	68	69	59	46	38	72
8 x RCME-60AH1	84	75	71	70	71	61	48	40	74
8 x RCME-70AH1	85	76	72	71	72	62	49	41	75

Combination	Sound Pressure level at 30m (dB)								Overall (dBA)
	Frequency Band (Hz)								
	63	125	250	500	1000	2000	4000	8000	
4 x RCME-40AH1	59	55	52	56	55	47	31	23	58
4 x RCME-50AH1	69	61	57	55	57	46	34	25	59
4 x RCME-60AH1	71	63	59	57	59	48	36	27	61
4 x RCME-70AH1	72	64	60	58	60	49	37	28	62
5 x RCME-40AH1	60	56	53	57	56	47	32	24	59
5 x RCME-50AH1	70	62	58	56	58	47	35	26	60
5 x RCME-60AH1	72	64	60	58	60	49	37	28	62
5 x RCME-70AH1	73	65	61	59	61	50	38	29	63
6 x RCME-40AH1	61	57	54	57	57	48	33	24	59
6 x RCME-50AH1	71	62	58	57	59	48	35	27	61
6 x RCME-60AH1	73	64	60	59	61	50	37	29	63
6 x RCME-70AH1	74	65	61	60	62	51	38	30	64
7 x RCME-40AH1	62	57	54	58	57	49	33	25	60
7 x RCME-50AH1	72	63	59	58	59	49	36	28	62
7 x RCME-60AH1	74	65	61	60	61	51	38	30	64
7 x RCME-70AH1	75	66	62	61	62	52	39	31	65
8 x RCME-40AH1	62	58	55	59	58	50	34	26	61
8 x RCME-50AH1	72	64	60	58	60	50	37	28	62
8 x RCME-60AH1	74	66	62	60	62	52	39	30	64
8 x RCME-70AH1	75	67	63	61	63	53	40	31	65

2.6 Electrical Data

◆ Factory built

Model	Unit main power			Applicable instantaneous voltage (V)		Rated conditions				Condenser fan motor		Maximum unit (for power supply installation sizing)			
						Compressor motor									
							COOL								
	STC*1 (A)	RNC (A)	MC (A)	IPT (kW)	RNC (A)	IPT (kW)	Current (A)	STC*2 (A)	IPT (kW)						
	Ph	(V)	(Hz)	Maximum	Minimum										
RCME-40AH1	3N~	400	50	440	360	138	41.9	56.6	24.7	7.8	2.5	71.6	138	38.6	
RCME-50AH1	3N~	400	50	440	360	170	56.2	75.9	33.1	7.8	2.5	90.9	170	49.5	
RCME-60AH1	3N~	400	50	440	360	222	73.8	99.7	44.5	7.8	2.5	115	222	64.9	
RCME-70AH1	3N~	400	50	440	360	222	86.3	116	52.0	7.8	2.5	131	222	75.0	
RCME-080/2AH1	3N~	400	50	440	360	138	83.9	113	49.4	15.5	5	143	210	76.4	
RCME-090/2AH1	3N~	400	50	440	360	138/170	98.1	133	57.8	15.5	5	163	242	87.7	
RCME-100/2AH1	3N~	400	50	440	360	170	112	152	66.2	15.5	5	182	261	99.0	
RCME-110/2AH1	3N~	400	50	440	360	170/222	130	176	77.6	15.5	5	206	313	114	
RCME-120/2AH1	3N~	400	50	440	360	222	148	199	89.0	15.5	5	229	336	130	
RCME-130/2AH1	3N~	400	50	440	360	222	160	216	96.0	15.5	5	246	353	140	
RCME-140/2AH1	3N~	400	50	440	360	222	173	233	104.0	15.5	5	263	353	150	
RCME-150/3AH1	3N~	400	50	440	360	170	169	228	99.5	23.3	7.5	273	352	149	
RCME-160/3AH1	3N~	400	50	440	360	170/222	186	251	110.5	23.3	7.5	296	404	164	
RCME-170/3AH1	3N~	400	50	440	360	170/222	204	275	122.5	23.3	7.5	320	427	179	
RCME-180/3AH1	3N~	400	50	440	360	222	221	299	133.5	23.3	7.5	344	451	195	
RCME-190/3AH1	3N~	400	50	440	360	222	234	316	140.5	23.3	7.5	361	468	205	
RCME-200/3AH1	3N~	400	50	440	360	222	246	333	148.5	23.3	7.5	378	485	215	
RCME-210/3AH1	3N~	400	50	440	360	222	259	349	155.5	23.3	7.5	394	485	225	

STC: Starting Current (A) RNC: Running Current (A) MC: Maximum Current IPT: Input (kW) Ph: Number of phases



NOTE

- This data is based on the following conditions:
Chilled Water Inlet/Outlet Temperature: 12/7°C. Ambient Temperature: 35°C.
- The "Maximum Unit Current" shown in the above table is the maximum total unit running current at the following conditions: Supply Voltage: 90% of the rated voltage. Unit Capacity: 100% at max. operating conditions.
- The power supply cables must be sized to cover this maximum current value.
- Starting Current (*1. *2) means as follows.
*1: Starting Current of the first Compressor
*2: Maximum Starting Current of the unit when the last Compressor starts (Max. current for the running compressors + STC for the last compressor to start operation).
- Compressor motor is star-delta starting.

◆ On-site module combination

Model	Unit main power			Applicable instantaneous voltage (V)		Rated conditions				Condenser fan motor		Maximum unit (for power supply installation sizing)			
						Compressor motor									
							COOL								
	STC*1 (A)	RNC (A)	MC (A)	IPT (kW)	RNC (A)	IPT (kW)	Current (A)	STC*2 (A)	IPT (kW)						
Ph	(V)	(Hz)	Maximum	Minimum											
4 x RCME-40AH1	3N~	400	50	440	360	138	168	226	98.8	31.1	10.0	286	353	154	
4 x RCME-50AH1	3N~	400	50	440	360	170	225	304	132	31.1	10.0	364	443	198	
4 x RCME-60AH1	3N~	400	50	440	360	222	295	399	178	31.1	10.0	459	566	260	
4 x RCME-70AH1	3N~	400	50	440	360	222	345	466	208	31.1	10.0	526	616	300	
5 x RCME-40AH1	3N~	400	50	440	360	138	210	283	124	38.8	12.5	358	424	193	
5 x RCME-50AH1	3N~	400	50	440	360	170	281	379	166	38.8	12.5	454	534	248	
5 x RCME-60AH1	3N~	400	50	440	360	222	369	498	223	38.8	12.5	573	680	325	
5 x RCME-70AH1	3N~	400	50	440	360	222	431	582	260	38.8	12.5	657	748	375	
6 x RCME-40AH1	3N~	400	50	440	360	138	252	340	148	46.6	15.0	430	496	231	
6 x RCME-50AH1	3N~	400	50	440	360	170	337	455	199	46.6	15.0	454	624	297	
6 x RCME-60AH1	3N~	400	50	440	360	222	443	598	267	46.6	15.0	573	795	389	
6 x RCME-70AH1	3N~	400	50	440	360	222	518	699	312	46.6	15.0	657	879	450	
7 x RCME-40AH1	3N~	400	50	440	360	138	294	396	173	54.3	17.5	501	568	270	
7 x RCME-50AH1	3N~	400	50	440	360	170	393	531	232	54.3	17.5	636	715	347	
7 x RCME-60AH1	3N~	400	50	440	360	222	517	698	312	54.3	17.5	803	910	454	
7 x RCME-70AH1	3N~	400	50	440	360	222	604	815	364	54.3	17.5	920	1011	525	
8 x RCME-40AH1	3N~	400	50	440	360	138	336	453	198	62.1	20.0	573	639	309	
8 x RCME-50AH1	3N~	400	50	440	360	170	450	607	265	62.1	20.0	727	806	396	
8 x RCME-60AH1	3N~	400	50	440	360	222	591	797	356	62.1	20.0	917	1024	519	
8 x RCME-70AH1	3N~	400	50	440	360	222	690	932	416	62.1	20.0	1052	1142	600	

STC: Starting Current (A) RNC: Running Current (A) MC: Maximum Current IPT: Input (kW) Ph: Number of phases



NOTE

- This data is based on the following conditions:
Chilled Water Inlet/Outlet Temperature: 12/7°C. Ambient Temperature: 35°C.
- The "Maximum Unit Current" shown in the above table is the maximum total unit running current at the following conditions: Supply Voltage: 90% of the rated voltage. Unit Capacity: 100% at max. operating conditions.
- The power supply cables must be sized to cover this maximum current value.
- Starting Current (*1.*2) means as follows.
*1: Starting Current of the first Compressor
*2: Maximum Starting Current of the unit when the last Compressor starts (Max. current for the running compressors + STC for the last compressor to start operation).
- Compressor motor is star-delta starting.

◆ Recommended values for the circuit breaker, earth leakage breaker, cables and bus bar

Model	CB (EF)	ELB - Is	Cable	Bus Bar	Cable
	4 poles	4 poles	Recommended		Maximum
	(A)	(mA)	(mm ²)	(mm*mm)	(mm ²)
RCME-40AH1	125	100	50	-	-
RCME-50AH1	125	100	50	-	-
RCME-60AH1	160	100	70	-	-
RCME-70AH1	160	100	70	-	-
RCME-080/2AH1	200	100	70	-	-
RCME-090/2AH1	200	100	70	-	-
RCME-100/2AH1	250	100	95	-	-
RCME-110/2AH1	250	100	95	-	-
RCME-120/2AH1	300	100	95	-	-
RCME-130/2AH1	300	100	95	-	-
RCME-140/2AH1	350	100	120	20x10 (*)	-
RCME-150/3AH1	350	100	120	20x10 (*)	-
RCME-160/3AH1	350	100	120	20x10 (*)	-
RCME-170/3AH1	400	100	150	30x10 (*)	-
RCME-180/3AH1	400	100	150	30x10 (*)	-
RCME-190/3AH1	630	100	240	30x10 (*)	-
RCME-200/3AH1	630	100	240	30x10 (*)	-
RCME-210/3AH1	630	100	240	30x10 (*)	-
4 x RCME-40AH1	125 (each module)	100	50 (each module)	-	120 (each module)
4 x RCME-50AH1	125 (each module)	100	50 (each module)	-	120 (each module)
4 x RCME-60AH1	160 (each module)	100	70 (each module)	-	120 (each module)
4 x RCME-70AH1	160 (each module)	100	70 (each module)	-	120 (each module)
5 x RCME-40AH1	125 (each module)	100	50 (each module)	-	120 (each module)
5 x RCME-50AH1	125 (each module)	100	50 (each module)	-	120 (each module)
5 x RCME-60AH1	160 (each module)	100	70 (each module)	-	120 (each module)
5 x RCME-70AH1	160 (each module)	100	70 (each module)	-	120 (each module)
6 x RCME-40AH1	125 (each module)	100	50 (each module)	-	120 (each module)
6 x RCME-50AH1	125 (each module)	100	50 (each module)	-	120 (each module)
6 x RCME-60AH1	160 (each module)	100	70 (each module)	-	120 (each module)
6 x RCME-70AH1	160 (each module)	100	70 (each module)	-	120 (each module)
7 x RCME-40AH1	125 (each module)	100	50 (each module)	-	120 (each module)
7 x RCME-50AH1	125 (each module)	100	50 (each module)	-	120 (each module)
7 x RCME-60AH1	160 (each module)	100	70 (each module)	-	120 (each module)
7 x RCME-70AH1	160 (each module)	100	70 (each module)	-	120 (each module)
8 x RCME-40AH1	125 (each module)	100	50 (each module)	-	120 (each module)
8 x RCME-50AH1	125 (each module)	100	50 (each module)	-	120 (each module)
8 x RCME-60AH1	160 (each module)	100	70 (each module)	-	120 (each module)
8 x RCME-70AH1	160 (each module)	100	70 (each module)	-	120 (each module)


NOTE

- (*): Provide additional insulation ($\geq 500V$) in all the bus bars to avoid electric archs between circuits.
- The indicated values are the recommended values considering installation type described previously. In any case, follow local or national regulations.
- Recommended cables and bus bars are selected considering CB tripping value. Proposed CB tripping values are fixed standard rated values available on the market. If using variable CB which allows an accurate tripping value setting (based on maximum unit current and maximum starting current in electrical data) then, lower cable or bus bars sizes could be selected.
- Depending on the installations type, cable trays, maximum allowed temperature and other factors, different cables or bus bar types and sizes could apply.

3. Working range

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3.1 Working Range

◆ Air-Cooled Water Chiller units RCME-AH1

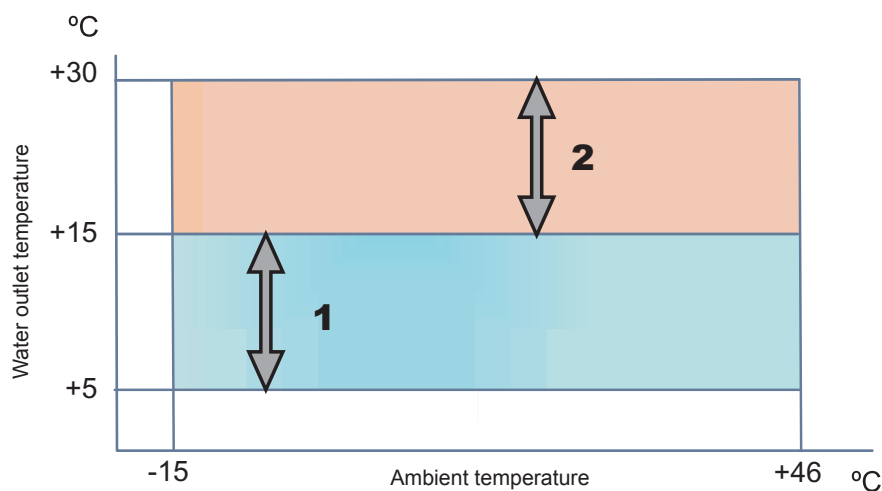
Item		Description
Power Supply	Working Voltage	90%~110% of Rated Voltage
	Voltage Imbalance	Within $\pm 3\%$ Deviation from Each Voltage at Compressor Terminals
	Starting Voltage	Higher than 85% of Rated Voltage
Ambient Temperature		-15 ~ +46°C
Water Outlet Temperature		+5 ~ +15°C
Maximum Permissible Water Pressure		1.0 MPa
Humidity		$\leq 50\%$ (40 °C) (1)
Altitude		≤ 1000 m (1)

(1) Minimum working range requirements according to EN60204-1. In case of different working range conditions, ask conformity to HITACHI Distributor.)

◆ High water outlet temperature

Water outlet temperature range is:

- 1 Standard : +5°C ~ +15°C
- 2 High water temperature option : +15°C ~ +30°C



3.2 Chiller Pressure drop calculation

Formula: $CPD = \alpha * CFR^{\beta}$

CPD: Chiller Pressure Drop (kPa)

CRF: Chilled water flow rate (m³/h)

	α	β
40 HP	0.0950	1.8008
50 HP	0.0607	1.8063
60 HP	0.0405	1.8141
70 HP	0.0405	1.8141

In case of more than 1 module, the total pressure drop of the unit will be the average of the pressure drop of the modules

Example

3x50HP + 1x60HP

	CRF (m ³ /h)	α	β	CPD (kPa)
In case of 50 HP	21.5	0.0607	1.8063	$0.0607 * 21.5^{1.8063} = 15.5$
In case of 60 HP	25.8	0.0405	1.8141	$0.0405 * 25.8^{1.8141} = 14.7$
Total pressure drop:	$\frac{(3 \times 15.5) + (1 \times 14.7)}{4}$			= 15.3 kPa

3.3 Ethylene Glycol Application

◆ Low Ambient Application

Under the condition where the ambient temperature is low in winter, there is a case where the unit and piping will become damaged by freezing during the shutdown periods.

To prevent freezing, it is effective to operate the pump. This Chiller has the pump ON/OFF operation control to avoid freezing. This control becomes available by connecting Pump Operation circuit. (See "6.3 Wiring Diagram").

Additionally, in a case where measures such as water raining are difficult, utilise antifreeze mixture of ethylene glycol.

Below table shows the ethylene glycol percentage suggested for the different temperature values.

The table also shows the correction factors, since unit with antifreeze mixture have a slight different performance compared with no glycol.

Example:

- Cooling Capacity with ethylene glycol = $K_c \times$ Cooling Capacity without ethylene glycol
- Input Power, Flow Rate and Pressure Drop is calculated in the same way as Cooling Capacity

(Water Outlet Temperature: +5 ~ +15°C)

Minimum Ambient Temperature	°C	-3	-7	-13	-22
Required Ethylene Glycol Percentage	wt%	10	20	30	40
Cooling Capacity Correction Factor	K_c	0.99	0.98	0.97	0.96
Input Power Correction Factor	K_i	1.00	0.99	0.99	0.98
Flow Rate Correction Factor	K_f	1.00	1.01	1.04	1.08
Pressure Drop Correction Factor	K_p	1.04	1.11	1.18	1.29

4. Drawings

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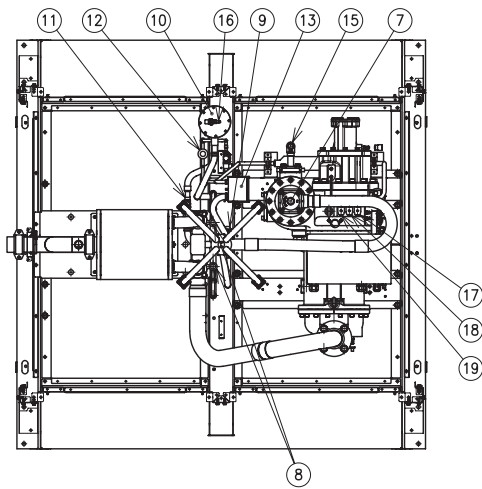
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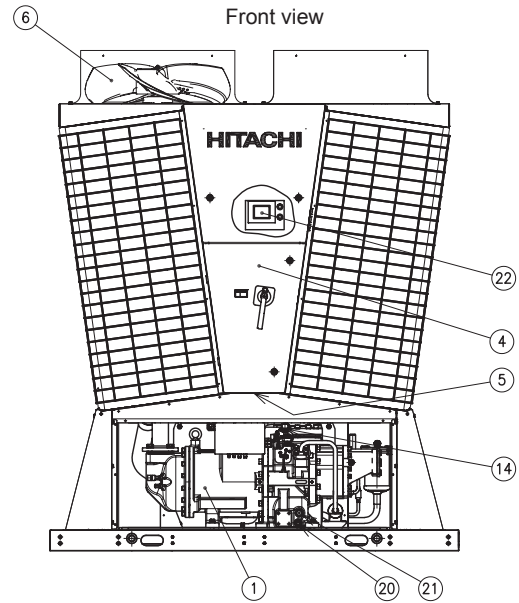


4.1 Structure drawing

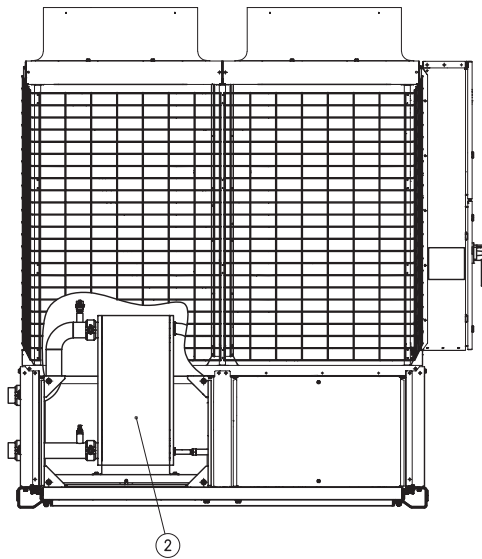
Lower part view



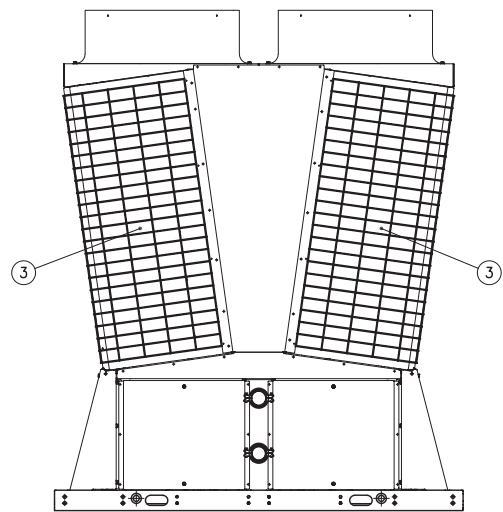
Front view



Right side view



Rear view



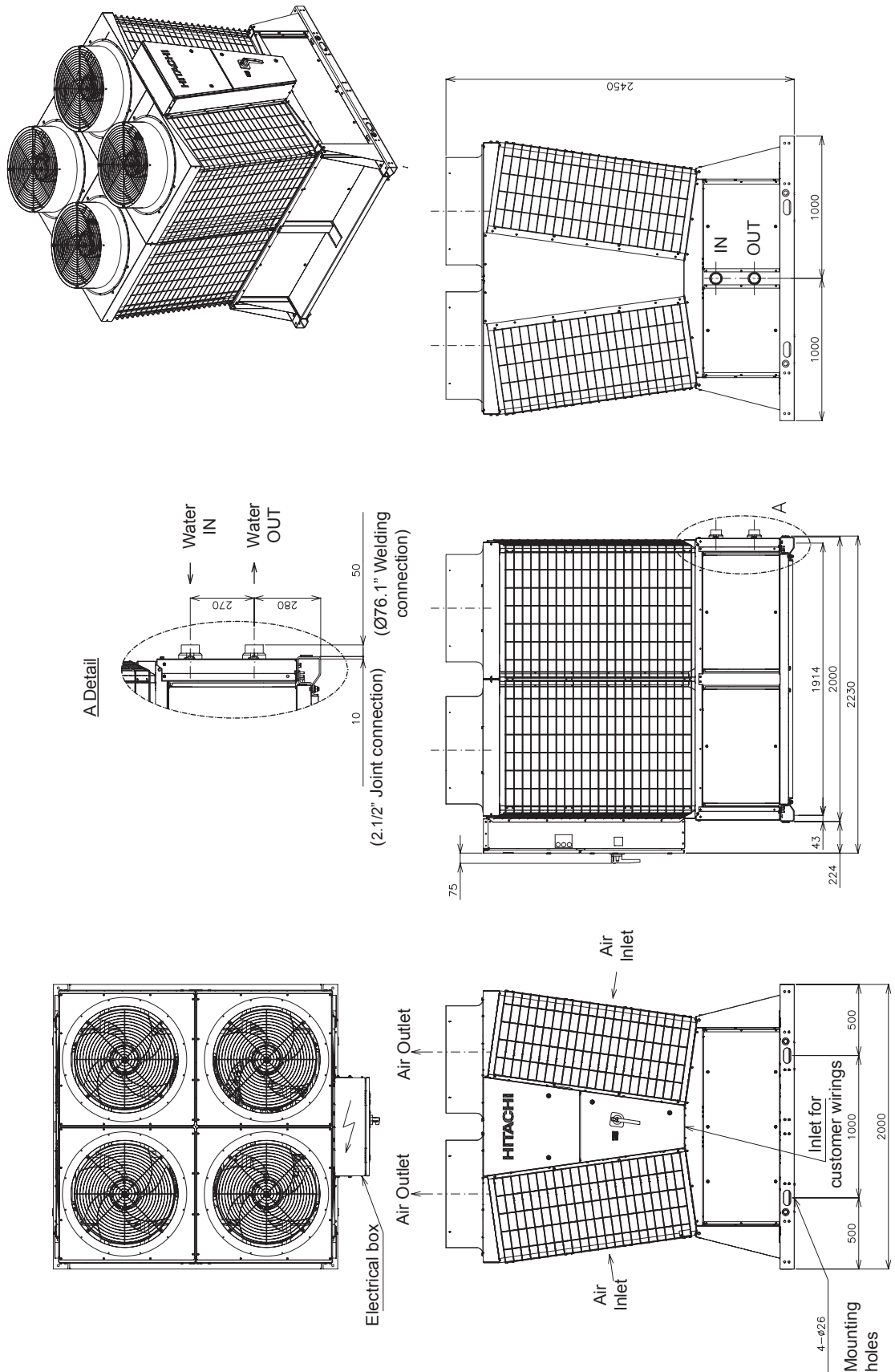
XEKS1642

No.	Name
1	Compressor
2	Water side heat exchanger
3	Air side heat exchanger (x4)
4	Electrical box
5	Power wiring supply
6	Fan (x4)
7	Check valve
8	Electronic expansion valve (x2)
9	Liquid line stop valve
10	Filter drier
11	Liquid sight glass

No.	Name
12	Electronic expansion valve (70HP only)
13	Economizer (70HP only)
14	High pressure switch
15	Pressure relief valve
16	Service valve (x3)
17	Compressor solenoid valve A
18	Compressor solenoid valve B
19	Compressor solenoid valve C
20	Compressor oil heater
21	Compressor oil sight glass
22	Operation switch

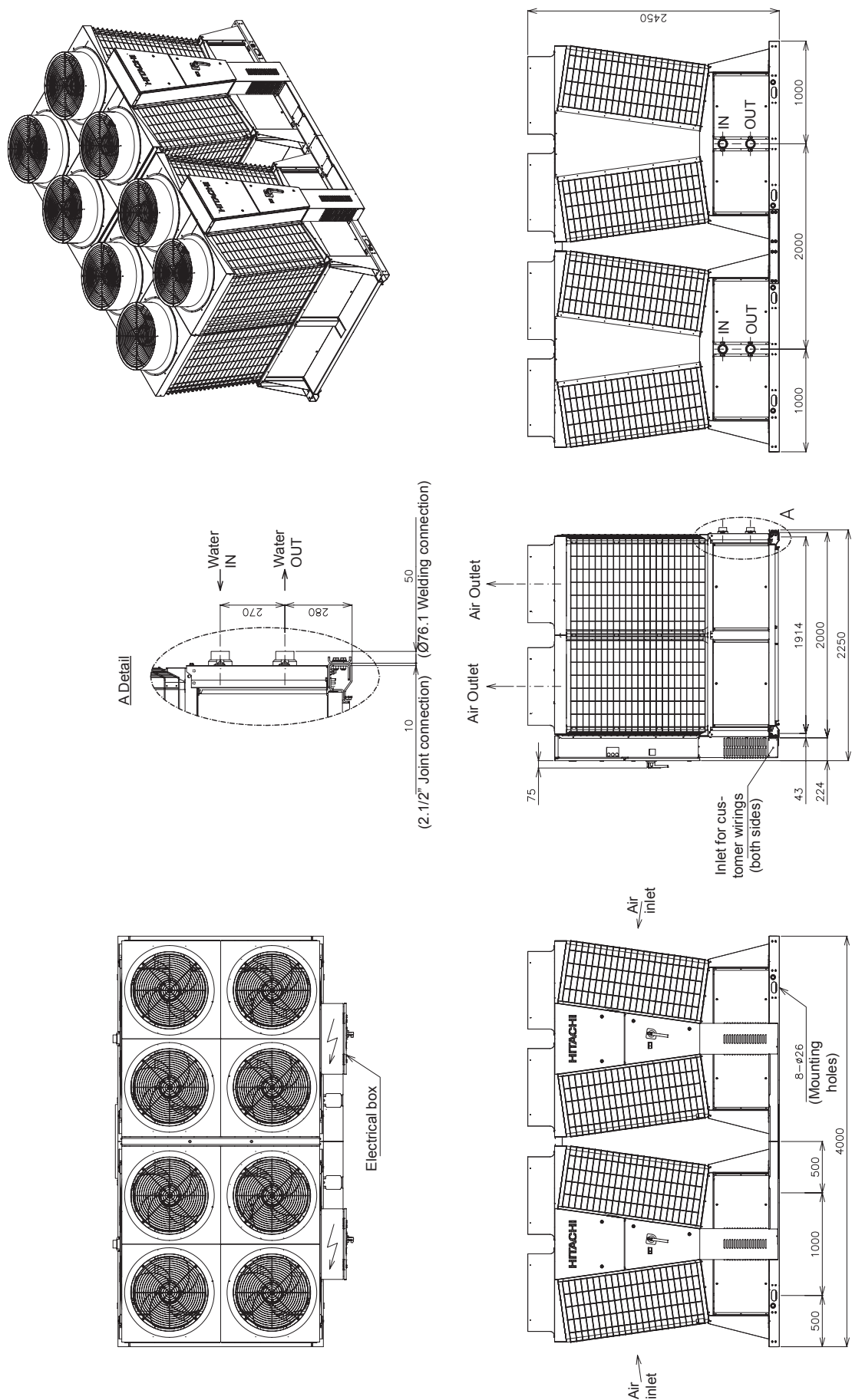
4.2 Dimensional Drawing

4.2.1 RCME-AH1 1 module

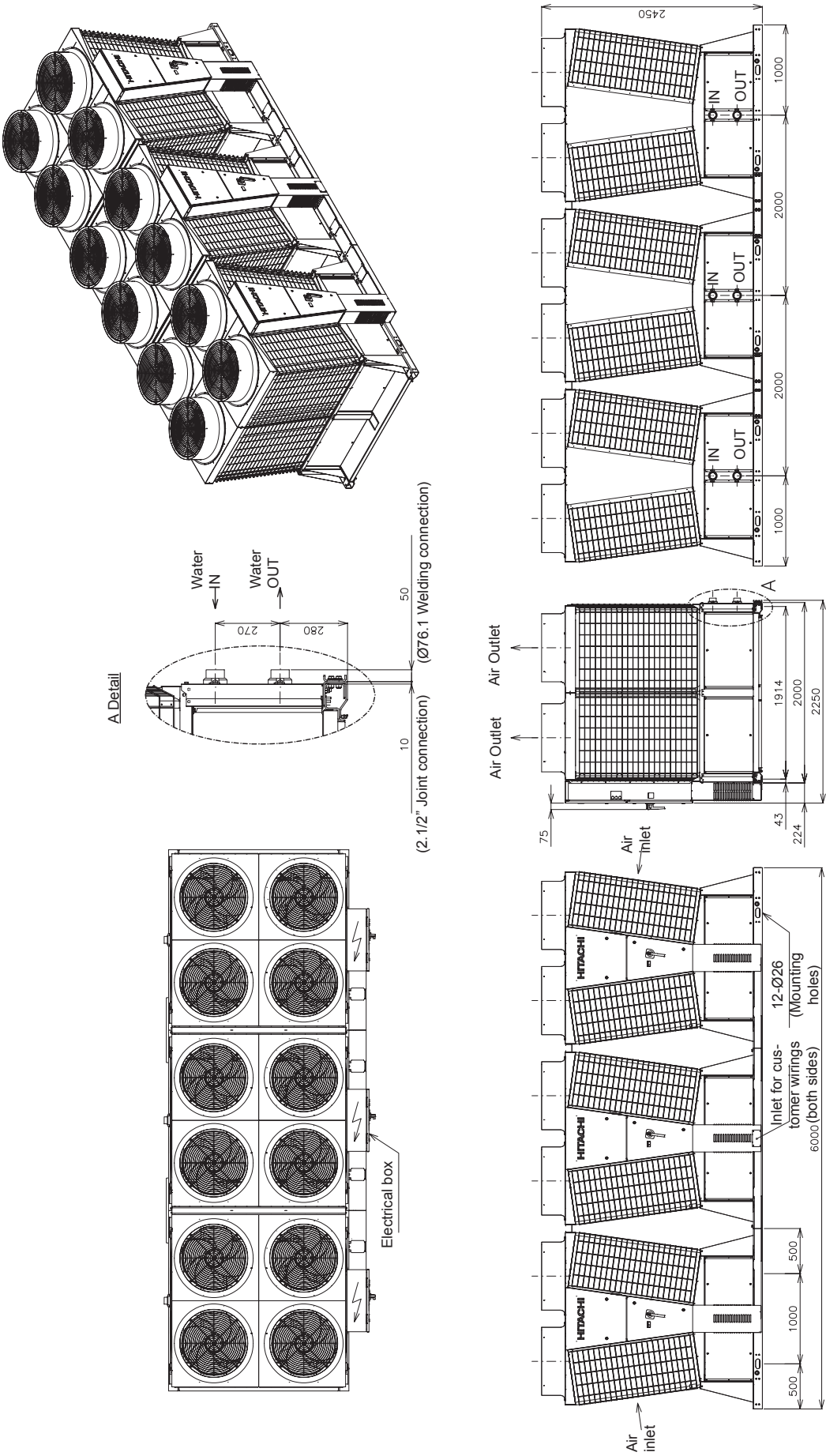


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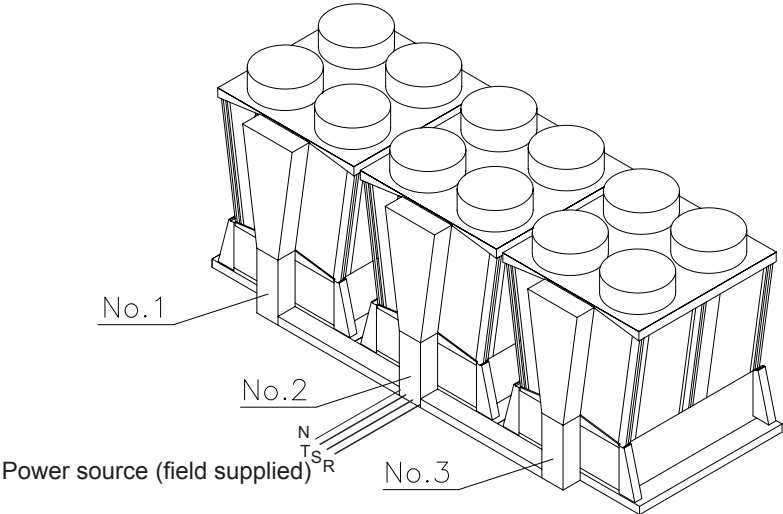
4.2.2 RCME-AH1 2 module



4.2.3 RCME-AH1 3 module



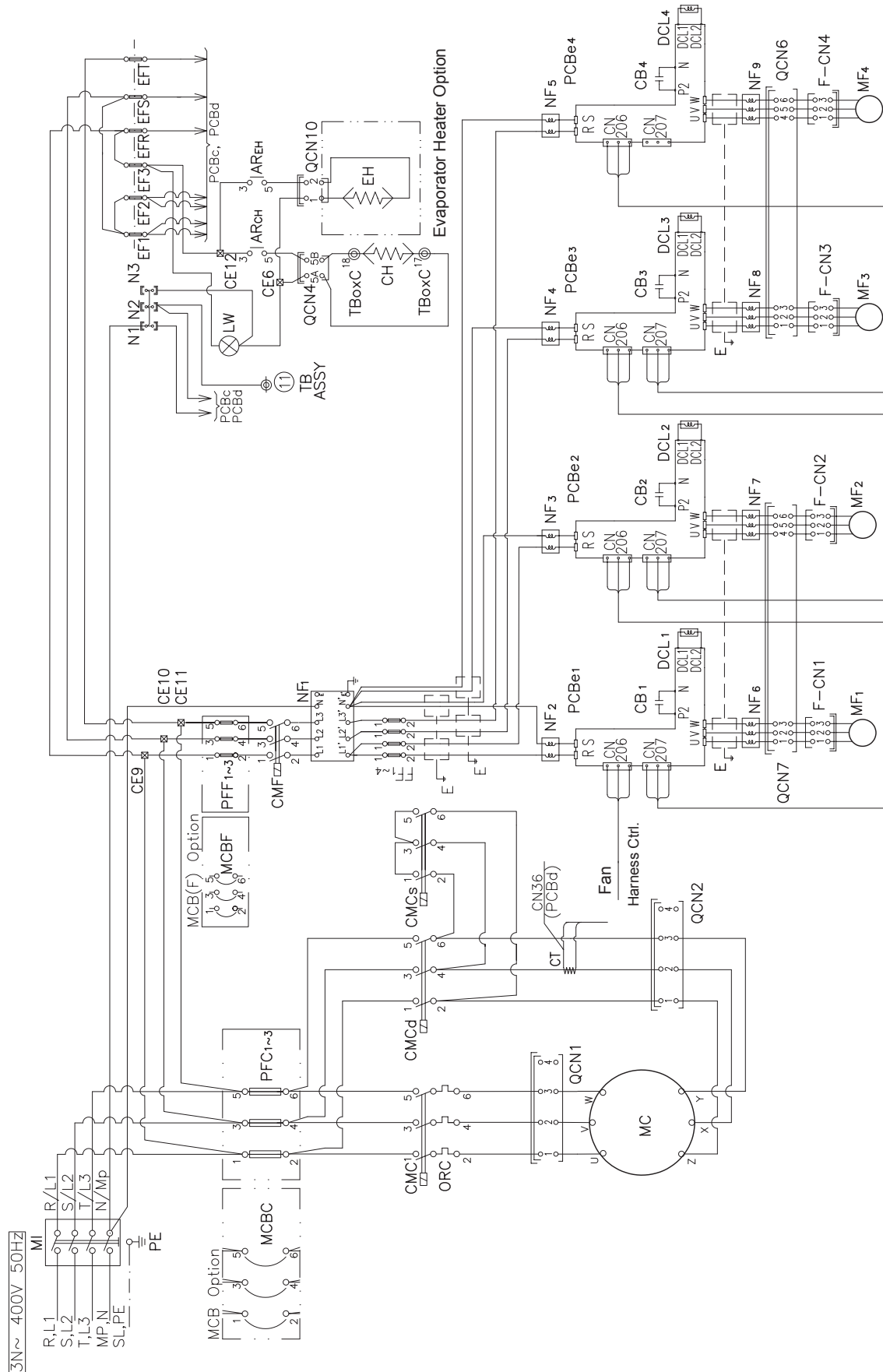
4.2.4 Modules location



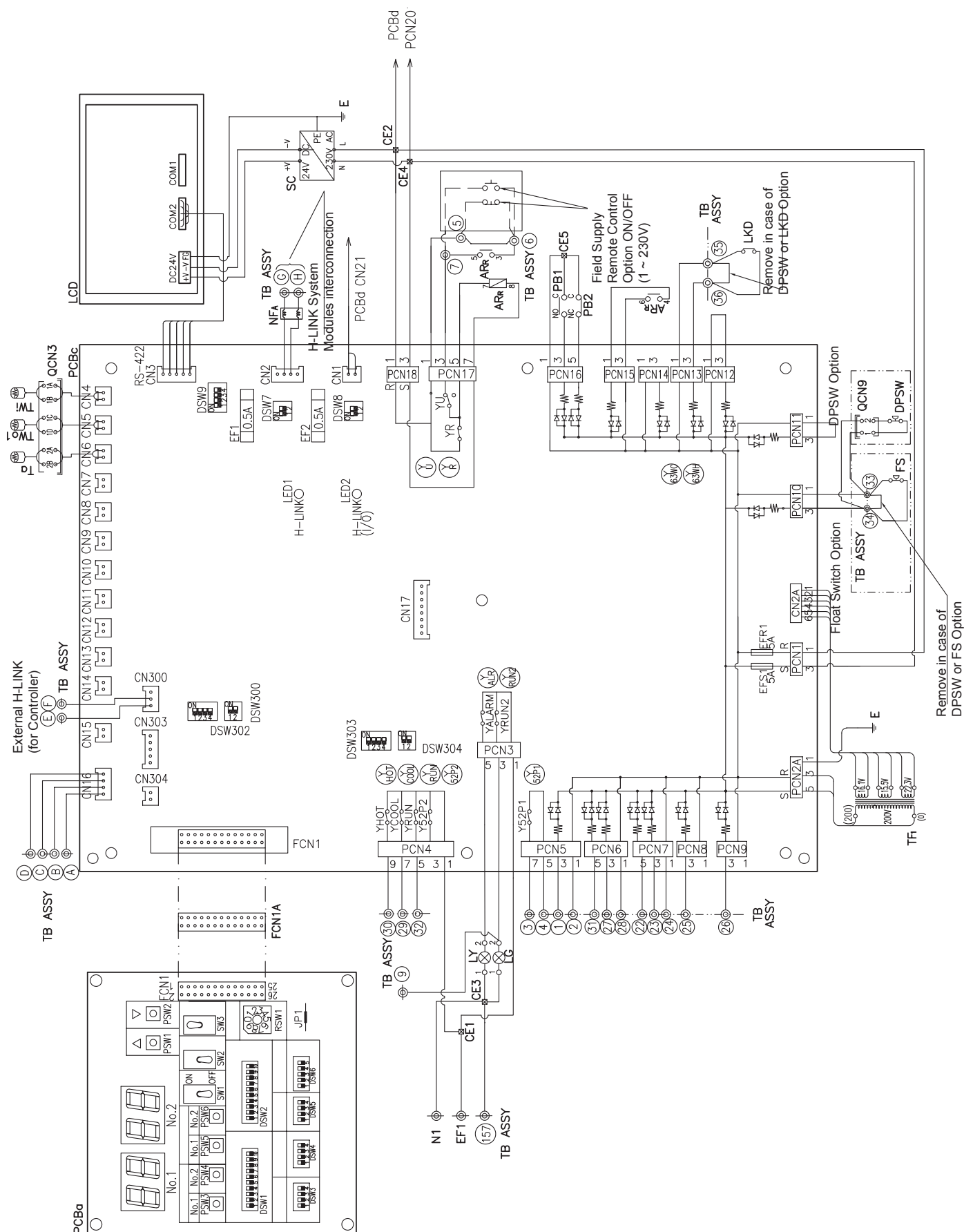
		No. 1	No. 2	No. 3
2 - modules	RCME-080/2AH1	RCME-40AH1	RCME-40AH1	
	RCME-090/2AH1	RCME-40AH1	RCME-50AH1	
	RCME-100/2AH1	RCME-50AH1	RCME-50AH1	
	RCME-110/2AH1	RCME-50AH1	RCME-60AH1	
	RCME-120/2AH1	RCME-60AH1	RCME-60AH1	
	RCME-130/2AH1	RCME-60AH1	RCME-70AH1	
	RCME-140/2AH1	RCME-70AH1	RCME-70AH1	
3 - modules	RCME-150/3AH1	RCME-50AH1	RCME-50AH1	RCME-50AH1
	RCME-160/3AH1	RCME-50AH1	RCME-50AH1	RCME-60AH1
	RCME-170/3AH1	RCME-50AH1	RCME-60AH1	RCME-60AH1
	RCME-180/3AH1	RCME-60AH1	RCME-60AH1	RCME-60AH1
	RCME-190/3AH1	RCME-60AH1	RCME-60AH1	RCME-70AH1
	RCME-200/3AH1	RCME-60AH1	RCME-70AH1	RCME-70AH1
	RCME-210/3AH1	RCME-70AH1	RCME-70AH1	RCME-70AH1

4.3 Wiring Diagram

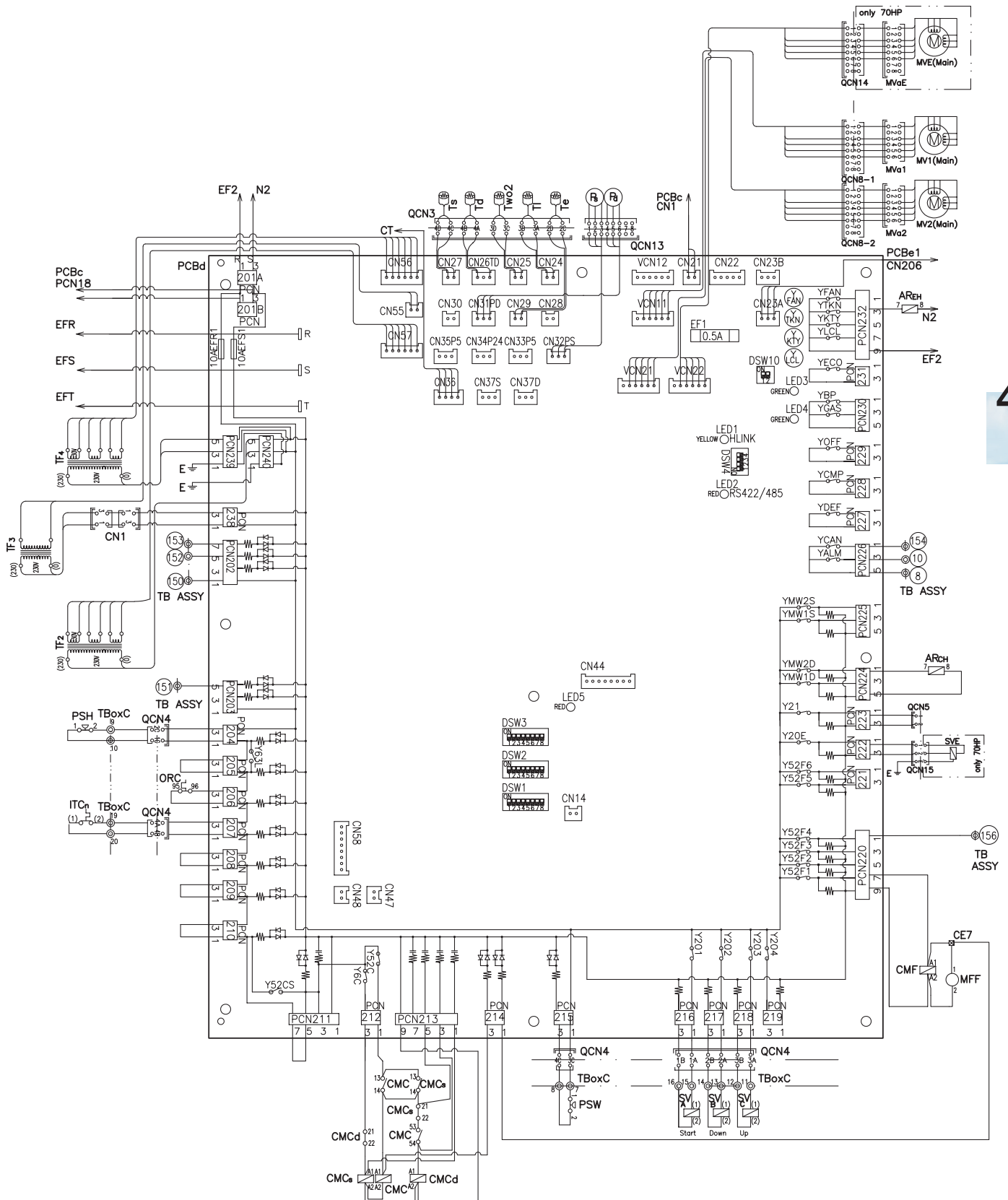
4.3.1 Power circuit for RCME-AH1



4



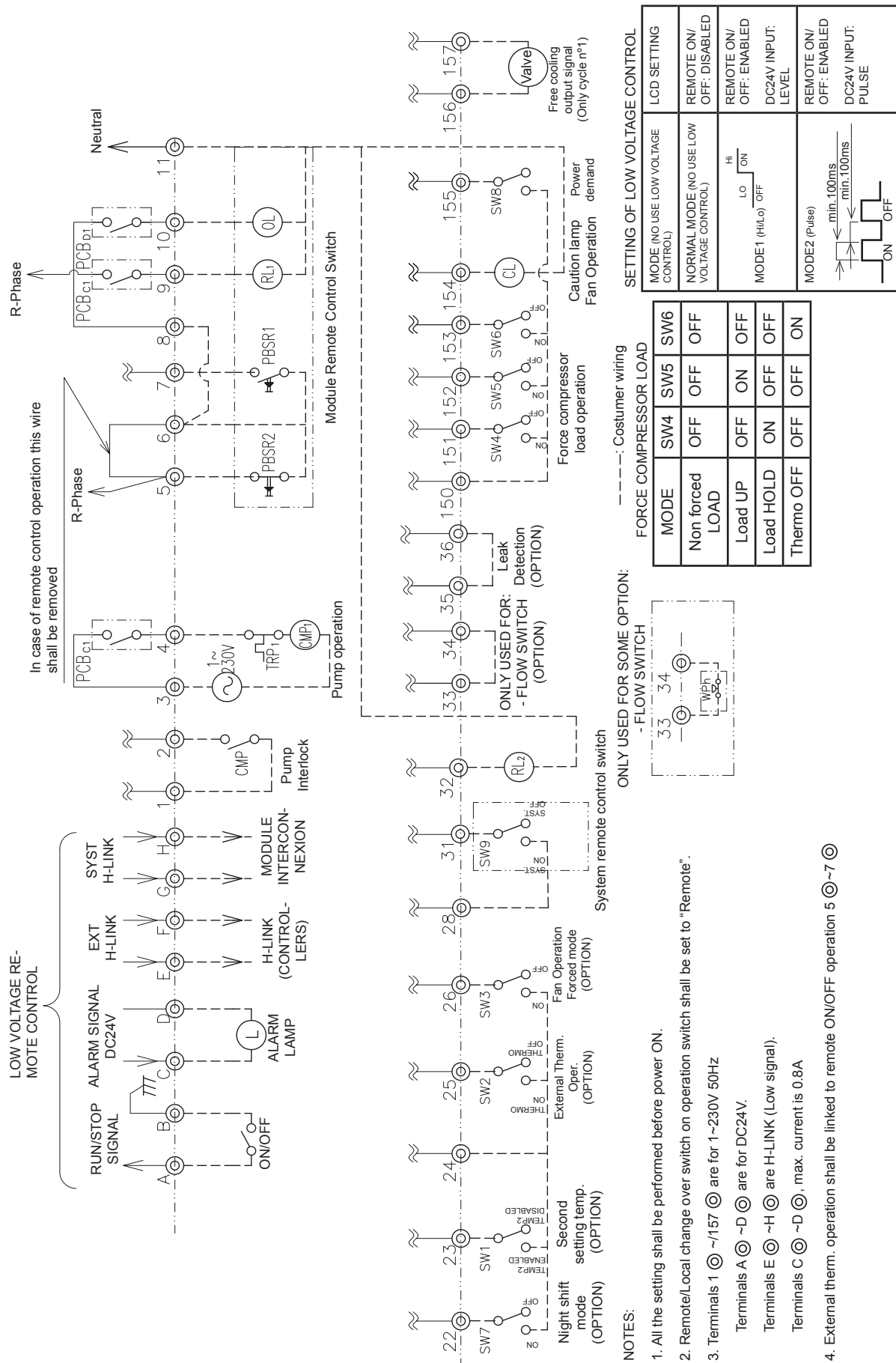
4.3.3 I/O Circuit for RCME-AH1



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4.3.4 Customer wiring of control circuit for RCME-AH1

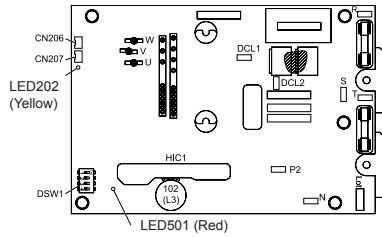


4.3.5 Parts list

Mark	Name
AR _{R,EH,CH}	Auxiliary relays: Remote ctrl., compr. & evap. heaters
CB _{1~4}	Fan capacitor
CE _{1~13}	Connectors
CH	Crankcase heater on compressor
CL	Pilot lamp for caution signal (from fans)
CMC	Direct contactor motor compressor
CMC _{d,s}	Delta/Star contactor motor compressor
CMF	Contactor motor fan
CMP ₁	Contactor for pump
CMP _{1,2}	Contactors for pumps (Optional)
CN _{1,2}	Connector
CT	Current transformer (Sensor)
CT _{r,s,t}	Current transformer (Optional)
DCL _{1~4}	Fan reactor
DPSW	Differential water pressure switch (Optional)
E	Earth connection point
EF _{1~3,R,S,T}	Electric fuse (6A)
EH	Electric heater on cooler (Optional)
EHP	Electric heater for pump circuit
F-CN _{1~4}	Fan connectors
FF _{1~4}	Fan fuses (DC or AC fans) 20A
FS	Flow switch (Optional)
H-LINK _{EXT.}	PCB for controller
H-LINK _{SYS.}	PCB for modules interconnection
ITC	Internal thermostat on compressor
LCD	Liquid cristal display
LG	Green lamp compressor operation indicator
LKD	Leak detection (Optional)
LW	White lamp power supply indicator
LY	Yellow lamp alarm indicator
MC	Motor compressor
MCBC	Magnetic circuit breaker for compressor (Optional)
MCBF	Magnetic circuit breaker for fans (Optional)
MCBP _{1~2}	Magnetic circuit breaker for pumps (Optional)
MF _{1~4}	Motor fan (DC)
MFF	Motor fan inside electrical box
MI	Main interruptor (Switch)

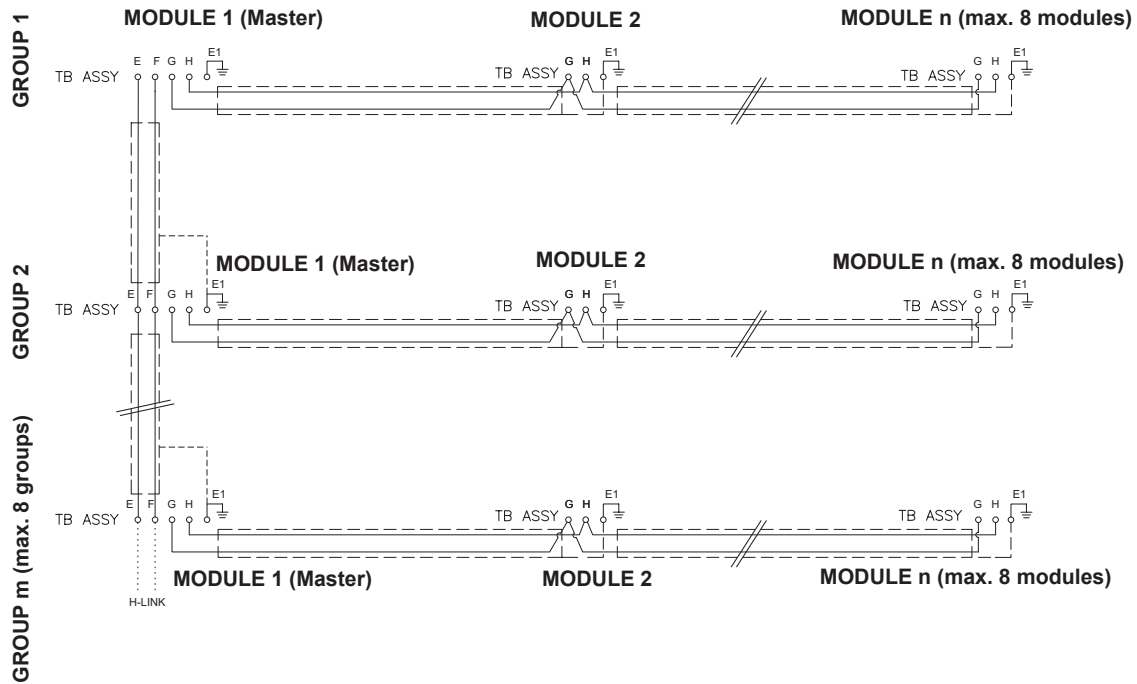
Mark	Name
MP _{1,2}	Motor pumps (Optional)
MV _{a1,a2,aE}	Exp. valve connector
MV _{1,2,E}	Electronic exp.valve main and economizer
N _{1,2,3}	Neutral terminals
NF _{2~11,A}	Ring cores noise filters
NF ₁	Noise filter PCB
OL	Pilot lamp for remote indication (alarm)
ORC	Overcurrent relay compressor
PBSR1	Push button switch for starting (REMOTE)
PBSR2	Push button switch for stoppage (REMOTE)
PCB _{a,c,d}	Printed circuit board (setting, main, cycle)
PB _{1,2}	Push button for local ON/OFF (White/Black)
PCBe _{1~4}	Fan module PCB
Pd / Ps	Discharge / Suction pressure sensor
PE	Unit connection point to installation earth line
PFC _{1~3}	Protection fuse for compressor
PFF _{1~3}	Protection fuse for fan
PM	Power meter (Optional)
PSH	High pressure switch
PSW	Pressure switch for economizer
QCN _{1~15}	Quick connector
RL _{1~2}	Pilot lamp for remote indication (unit operation)
SB _{1,2}	Pump switches buttons (Optional)
SC	Source converter AC/DC
SVE	Solenoid valve for economizer
SW _{1~8}	Switch
T _a	Thermistors ambient
TB ASSY	Terminal board assy
TBoxC	Terminal board on compressor terminal box
T _e	Thermistor before expansion valve
TF _{1~4}	Transformer
T _l	Liquid thermistor
TRP ₁	Thermal relay for pump
Ts, Td	Suction / Discharge thermistor
T _{wi}	Thermistor water inlet
T _{wo1}	Thermistors water outlet
T _{wo2}	Water temperature in evaporator backside
WP _h	Water pressure switch, water flow switch

4.3.6 Diagram of fan module PCB



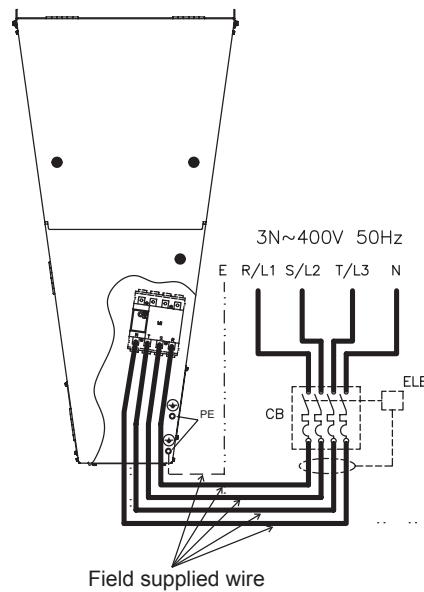
Part name	Content of functions
LED501 (Red)	Fan controller power indication. Normal condition: activated. Abnormal condition: not activated.
LED202 (Yellow)	Microcomputer status indication. Normal condition: activated. Abnormal condition: not activated.

4.3.7 Wiring diagram for H-LINK communication



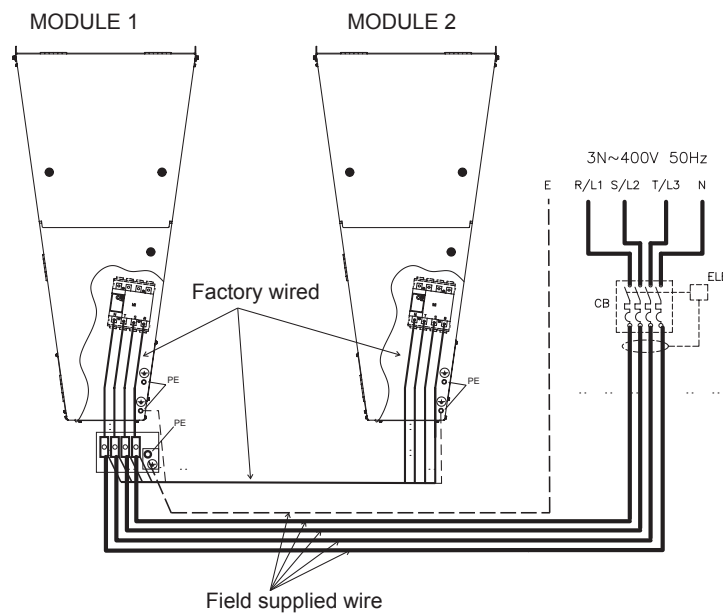
4.3.8 Wiring diagram for Power circuit

◆ Individual module



◆ Factory built modules

2 modules



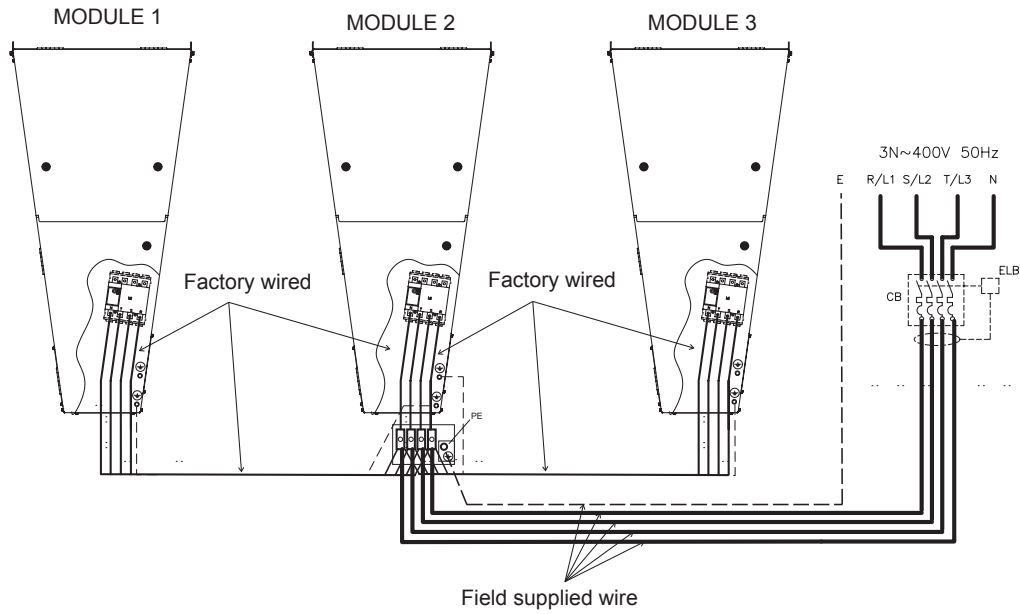
CAUTION

Power line connections thought Module 1 only.

NOTE

- Select the size of the field supplied cables according to the total combined requirements of the water chiller modules. 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. Make sure that they comply with national and regional electrical codes.
- H-LINK communication wire is factory wired.

3 modules



CAUTION

Power line connections thought Module 2 only.



NOTE

- Select the size of the field supplied cables according to the total combined requirements of the water chiller modules. 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. Make sure that they comply with national and regional electrical codes.
- H-LINK communication wire is factory wired.

◆ On-site module combinations

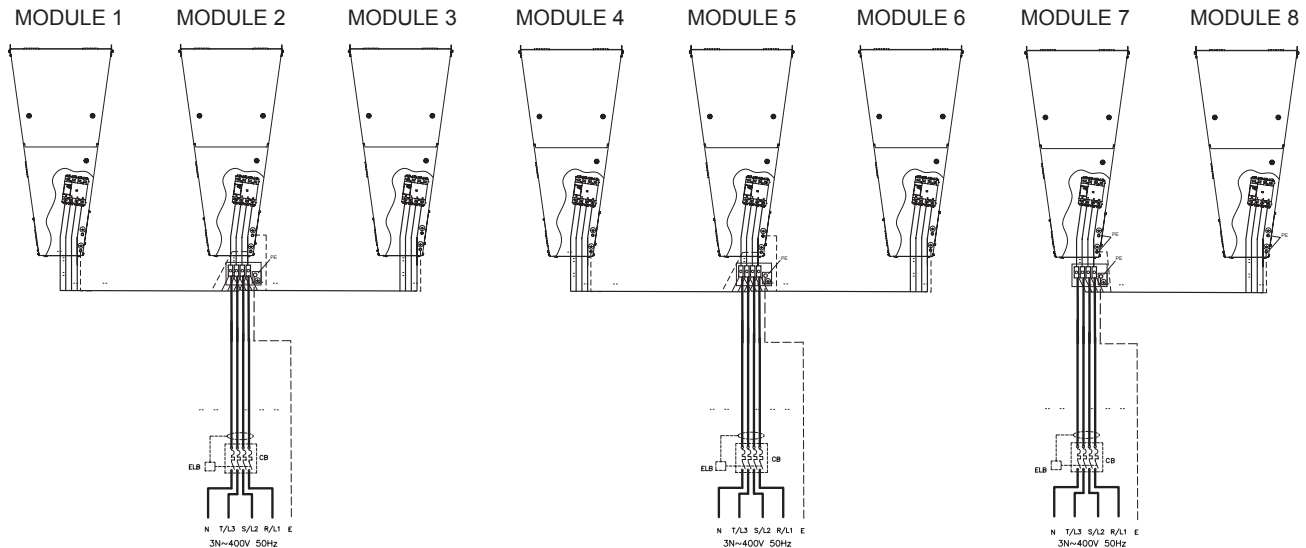
The power line for on-site combinations can be connected either:

1 Individually (recommended)

Each module is supplied with its own power line (follow “Individual module” diagram)

2 Between modules (interconnections)

To minimize power cable sizing it is advisable to feed up to a maximum of 3 modules from 1 power source cable as illustrated below (as an example for a combination with of 8 modules):



4

Hitachi provides a specific connection kit for this purpose as an option.

Power cable routing is available as an option.

Please refer to the diagrams in “Factory built modules” for proper connection examples and their restrictions.



NOTE

- Select the size of the field supplied cables according to the total combined requirements of the water chiller modules. 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. Make sure that they comply with national and regional electrical codes.
- Follow the H-Link connection according to the contents of chapter “Wiring diagram for H-LINK communication”.

5. Refrigerant cycle diagram

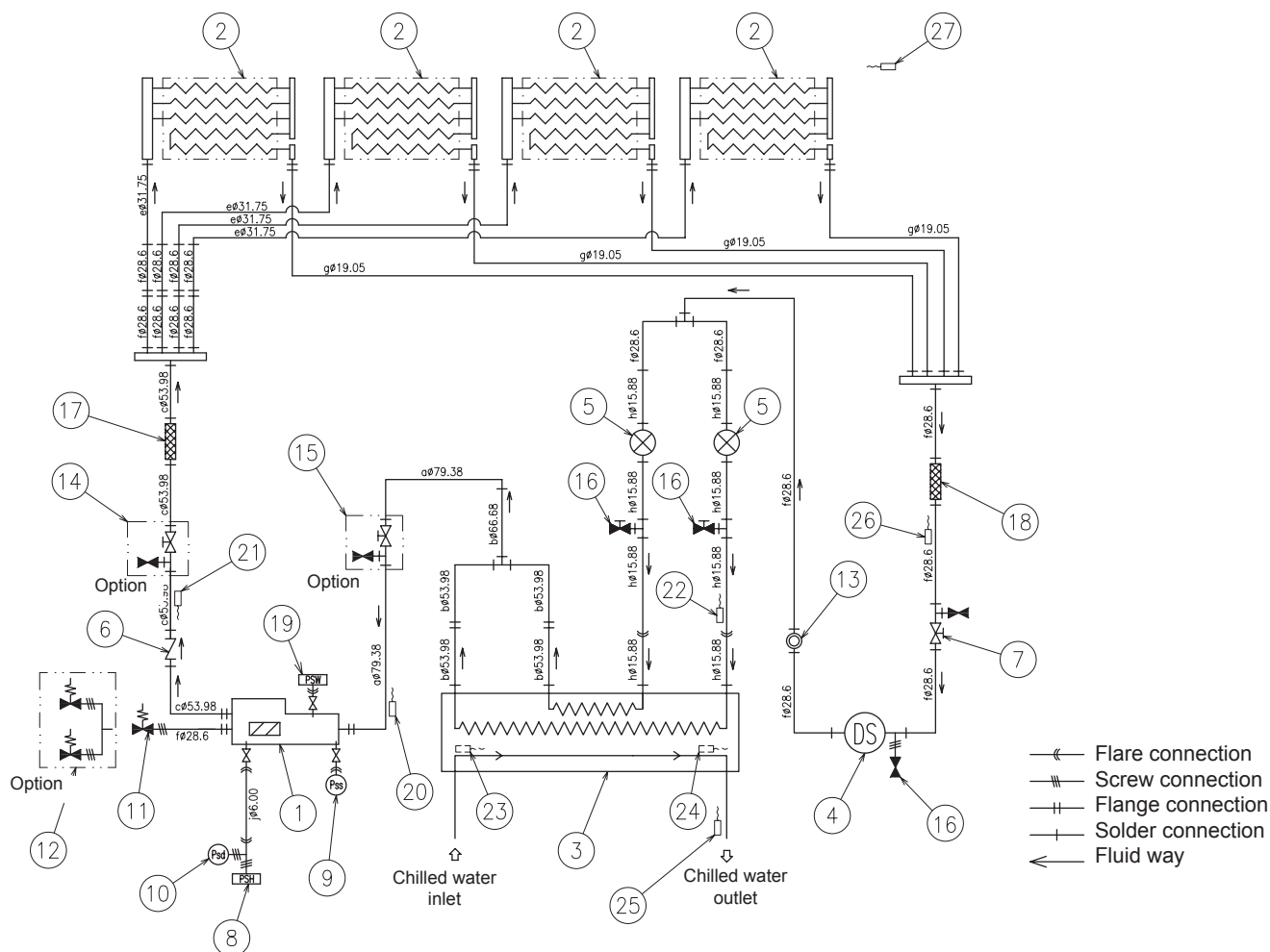
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5.1 Refrigerant cycle diagram for RCME-(40-60)AH1 50

5.2 Refrigerant cycle diagram for RCME-70AH1 with economiser..... 51



5.1 Refrigerant cycle diagram for RCME-(40-60)AH1

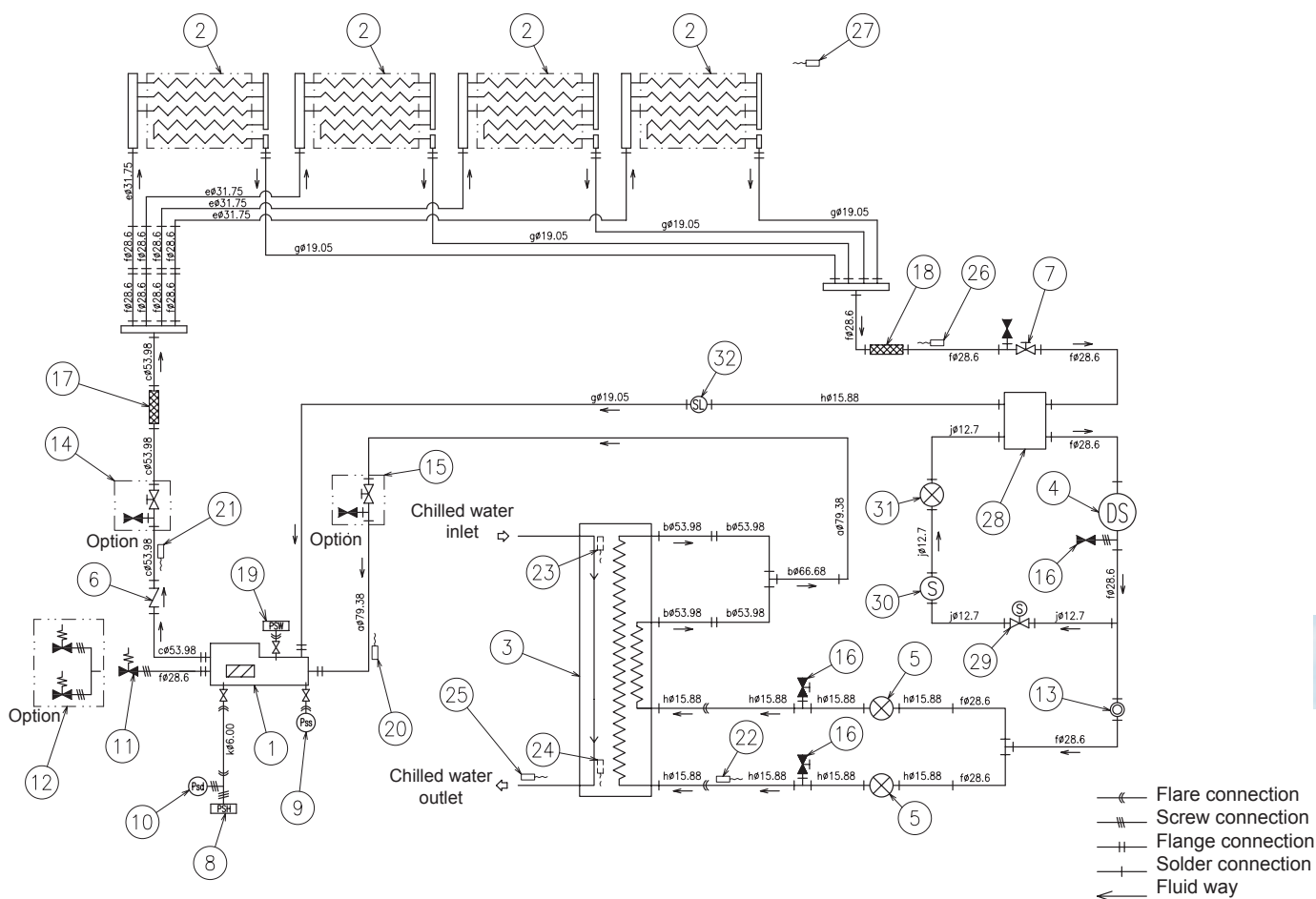


XEKS1612

Nr.	Name
1	Compressor
2	Air-Cooled Condenser (x4)
3	Water Cooler
4	Filter Drier
5	Electronic Expansion Valve (x4)
6	Check Valve
7	Stop Valve (with check joint)
8	High Pressure Switch
9	Pressure Sensor (Low)
10	Pressure Sensor (High)
11	Pressure Relief Valve
12	Dual safety valve (option)
13	Sight Glass
14	Stop Valve (D-valve Option)

Nr.	Name
15	Stop Valve (S-valve Option)
16	Stop Valve (x3)
17	Antivibration hose (for discharge line)
18	Antivibration hose (for liquid line)
19	Pressure Switch
20	Thermistor (Suction, THM _s)
21	Thermistor (Discharge, THM _d)
22	Thermistor (Evaporation, THM _{i2})
23	Thermistor (Cooler water inlet, THM _{wi})
24	Thermistor (Cooler water outlet, THM _{wo2})
25	Thermistor (Cooler water outlet, THM _{wo})
26	Thermistor (Liquid, THM _l)
27	Thermistor (Ambient, THM _a)

5.2 Refrigerant cycle diagram for RCME-70AH1 with economiser



XEKS1613

Nr.	Name
1	Compressor
2	Air-Cooled Condenser (x4)
3	Water Cooler
4	Filter Drier
5	Electronic Expansion Valve (x2)
6	Check Valve
7	Stop Valve (with check joint)
8	High Pressure Switch
9	Pressure Sensor (Low)
10	Pressure Sensor (High)
11	Pressure Relief Valve
12	Dual safety valve (option)
13	Sight Glass
14	Stop Valve (D-valve Option)
15	Stop Valve (S-valve Option)

Nr.	Name
16	Stop Valve (x3)
17	Antivibration hose (for discharge line)
18	Antivibration hose (for liquid line)
19	Pressure Switch
20	Thermistor (Suction, THM_s)
21	Thermistor (Discharge, THM_d)
22	Thermistor (Evaporation, THM_{e2})
23	Thermistor (Cooler water inlet, THM_{wi})
24	Thermistor (Cooler water outlet, THM_{wo2})
25	Thermistor (Cooler water outlet, THM_{wo})
26	Thermistor (Liquid, THM_l)
27	Thermistor (Ambient, THM_a)
28	Economiser
29	Solenoid valve
30	Strainer
31	Electronic Expansion valve (for Economiser)
32	Silencer

6 . Preparation initial check

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6.1 Initial check

◆ Prerequisite information

Measure and architectural information regarding installation location.

◆ Installation Location

Confirm that the final installation location is provided with convenient piping and wiring work. Strong water runoff should be avoided.

This unit must be installed in a restricted area not accessible to the general public. Install the unit on a roof or in an area where people, except service engineer, can not touch the unit.

Install the unit with sufficient clearance around it for operation and maintenance. Install the unit where good ventilation is available.

Do not install the unit where is a high level of oil mist, salty air or sulphurous atmosphere.

Install the unit as far as practical (being at least 3 meters) from electromagnetic wave radiator (such as medical equipment).

◆ Installation Space

Check for obstacles which restrict condenser air flow or hamper maintenance work in the space specified in next point "[6.3 Placing the unit](#)".

◆ Foundation

Check to ensure that the foundation is flat, level and sufficiently strong, taking into account the maximum foundation gradient (see next point "[6.3 Placing the unit](#)") and the unit weight balance. Confirm elevation provision for the unit on a solid base with an iron frame or concrete curbs.

In order to obtain proper clearance beneath the unit for either rooftop or on the ground installation, where foundation bolts should be sunk into concrete. Additionally, for on the ground installation, provide a gravel or concrete space around the condenser air intake in order to avoid airflow obstruction due to grass or other vegetation.

◆ Reception of Unit

Check to ensure that the unit has been transported without damage. File a damage claim with the transportation companies if mishandling due to transportation company negligence is suspected.

6.2 Transportation

Transport the products as close to the installation location as practical before unpacking is accomplished.

Secure the route to the final installation location by confirming the dimensions (Refer to the "[2. General data](#)"Chapter).



DANGER

- *If leakage is detected, stop the unit and contact the installer or service shop. Do not use a naked fire near the refrigerant gas. If a naked fire is utilised near the refrigerant gas, refrigerant is turned into a harmful phosgene compound.*
- *This unit is operated with refrigerant R134a, which is non-flammable and non-poisonous. However, refrigerant itself is heavier than the atmosphere so that a floor is covered with refrigerant gas if refrigerant is leaked. Therefore, keep good ventilation to avoid choke during servicing.*



CAUTION

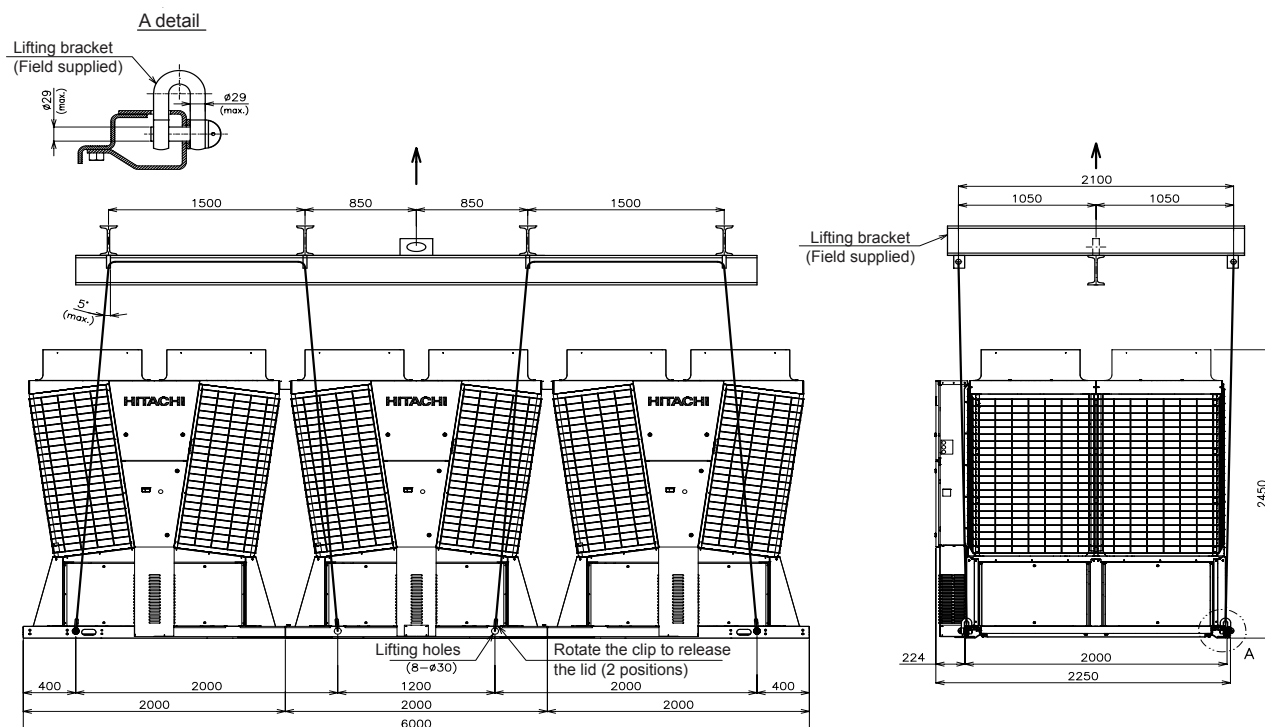
- *Check to ensure that valves are correctly opened. If not opened, serious damage will occur to the compressor due to an abnormal high pressure.*
- *This unit controls air flow for condenser during low ambient temperature.*
- *Due to this control, avoid the strong wind hits the unit directly. In such a case, put buffer plate around the unit (field supplied)*

6.2.1 Transportation by Rigging

Hook wire cables and apply field-supplied spreader bars on the top of the unit (see figure below) to prevent the unit panels from damage due to cable scratches. The unit should remain in an upright position even during rigging. The wire cable to rig the unit shall be three times stronger than the unit weight. Check to ensure that the rigging bolts are tightly fixed to the unit. The weight of the unit is indicated on the unit label.

Rigging shall be performed by the instruction drawing attached to the unit.

(Here the example of 3 modules unit is shown).



XEKS1635



DANGER

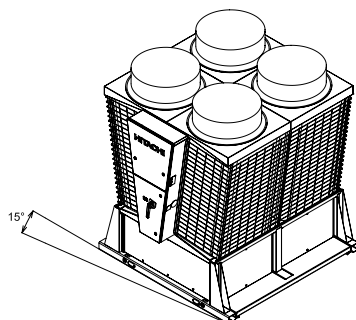
- Do not stand below the unit when rigging.
- Do not put any foreign material into the unit and check to ensure that none exists before the installation and test run. Otherwise a fire or failure will occur.



CAUTION

- Follow strictly the lifting method shown by the drawing attached to the unit.
- For safety reasons ensure that the outdoor unit is lifted smoothly and does not lean.
- To avoid damage, place a soft protection material (like a piece of cloth) between the wires and the unit

6.2.2 Declining the unit during transportation



DANGER

Do not decline the unit more than an angle of 15° as shown in the figure during transportation. If declined more than an angle of 15°, the unit may fall down.

6.3 Placing the unit

◆ Tools and Instruments

Pincers, wrenches, facilities to transport and place the unit.

◆ Unpacking

Remove the plastic bag (cut it if necessary)

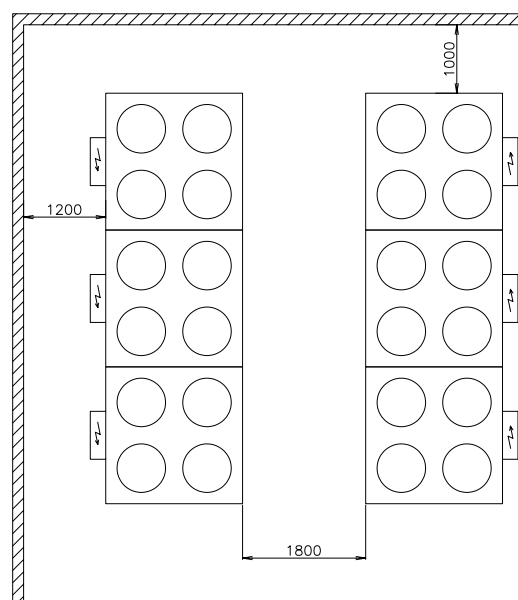
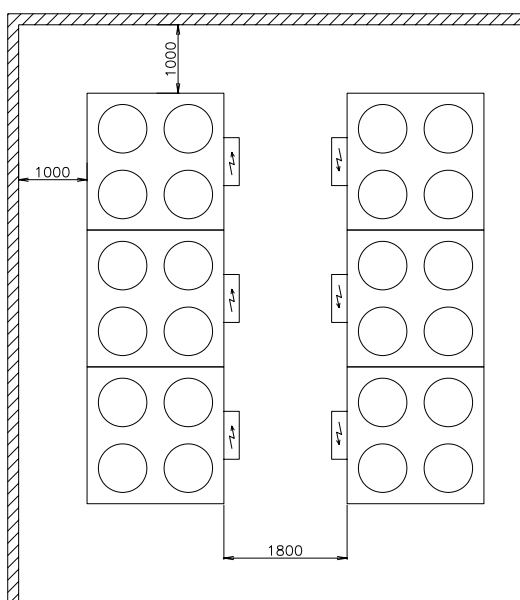
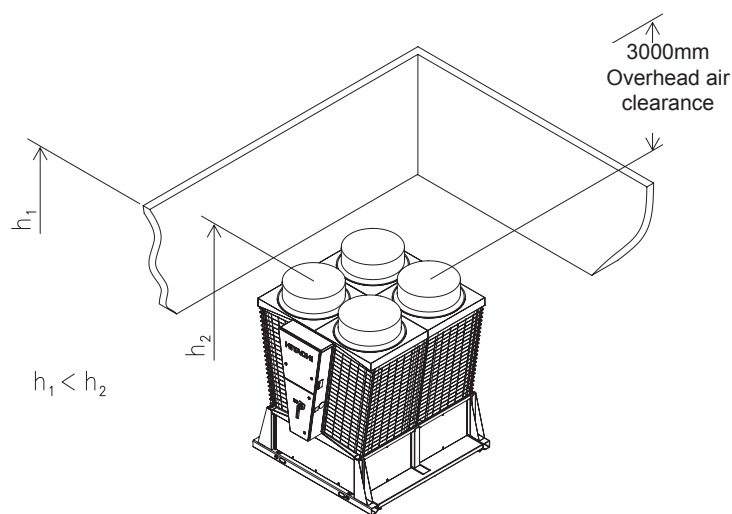
◆ Placing

Make sure to arrange for the adequate equipment and human resources to place the unit on the foundation.

Keep clearance between the units of more than 1800mm, and avoid obstacles that may hamper air intake, when installing more than one unit together.

Install the unit in the shade or not exposed to direct sunshine or direct radiation from high temperature heat source.

Do not install the unit in a space where a seasonal wind directly blows to the chiller fans.

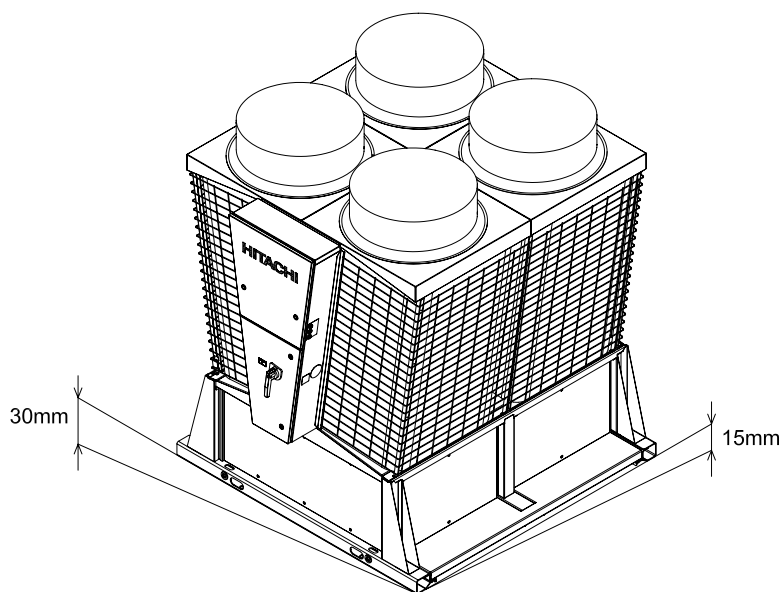


NOTE

- The height of the wall shall be smaller than that of the unit cabinet.
- When the unit is installed at a location where the unit is encircled with walls and obstruction of free Air circulation is suspected, consultation with HITACHI regarding the operation space is recommended.

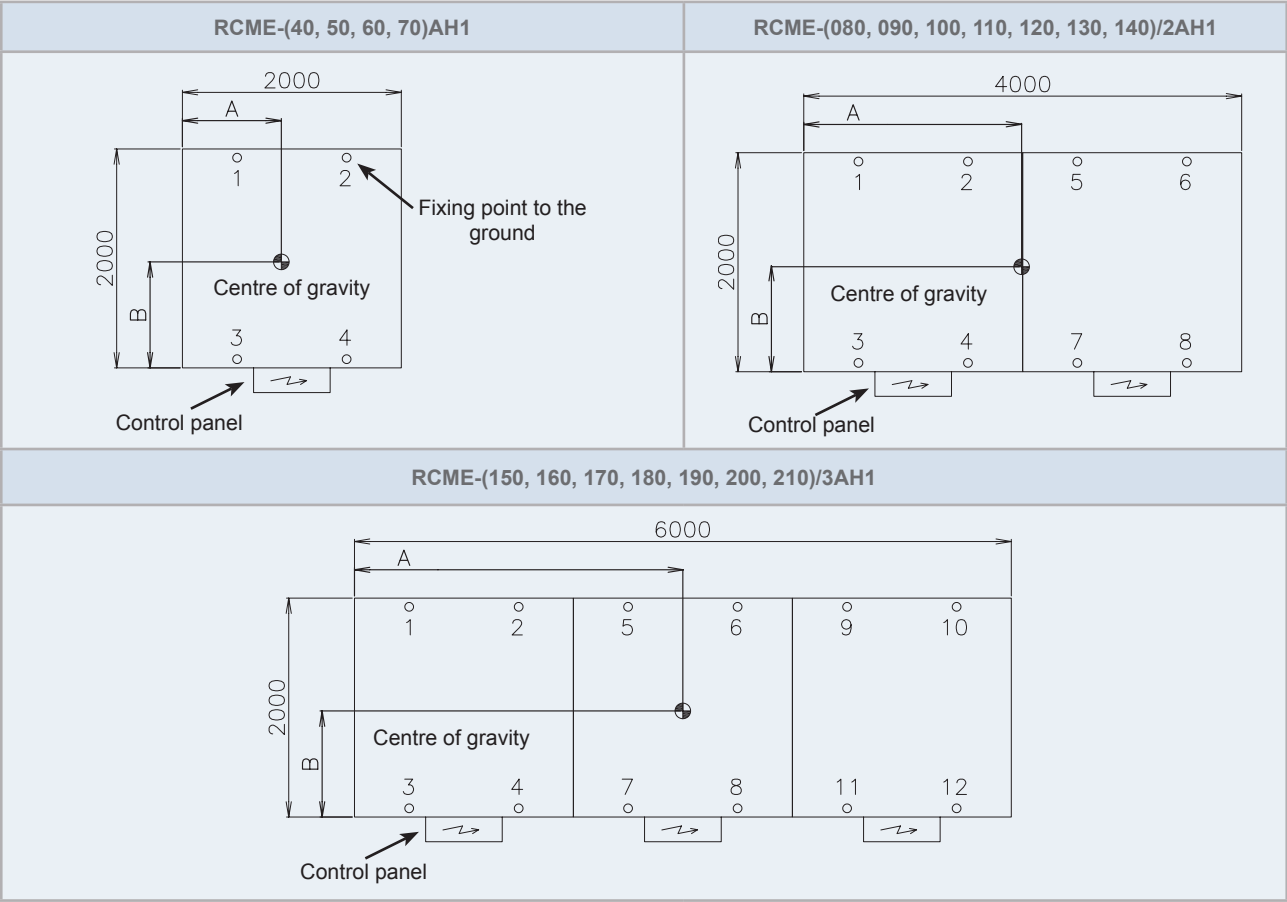
◆ Maximum Foundation Gradient

The unit should be installed in an upright position within the gradient shown in next figure.



6.4 Gravity centre

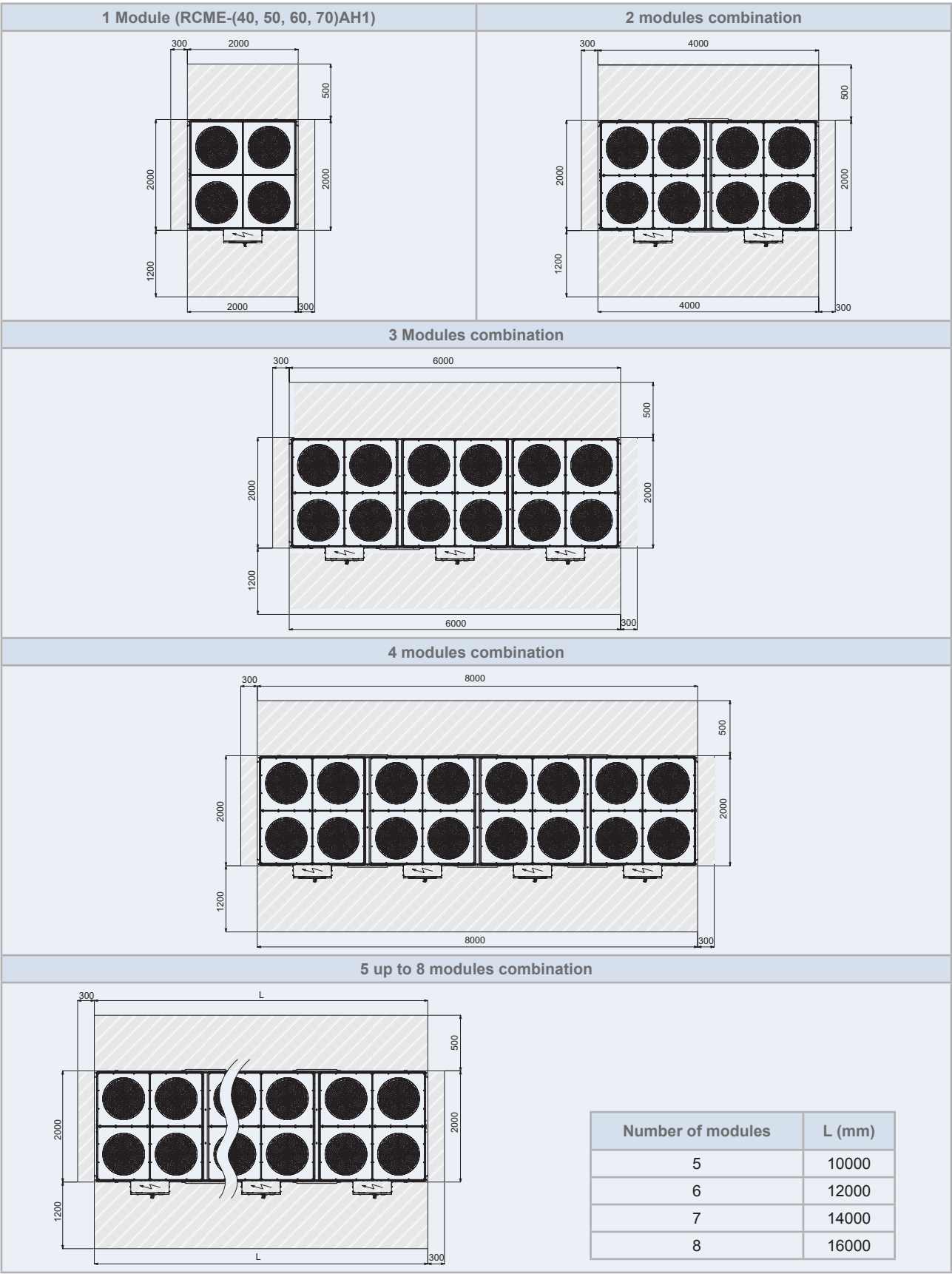
When hanging the unit ensure the balance of the unit, check safety and lift it up smoothly. Do not remove any packing materials and hang the unit under packing conditions.



Model	Operating Weight	Location of Centre of Gravity (mm)	
	(kg)	Dimension A	Dimension B
RCME-40AH1	1340	1000	1000
RCME-50AH1	1380	1000	1000
RCME-60AH1	1460	1000	1000
RCME-70AH1	1480	1000	1000
RCME-080/2AH1	2780	2000	1000
RCME-090/2AH1	2820	2014	1000
RCME-100/2AH1	2860	2000	1000
RCME-110/2AH1	2940	2027	1000
RCME-120/2AH1	3020	2000	1000
RCME-130/2AH1	3040	2007	1000
RCME-140/2AH1	3060	2000	1000
RCME-150/3AH1	4320	3000	1000
RCME-160/3AH1	4400	3036	1000
RCME-170/3AH1	4480	3036	1000
RCME-180/3AH1	4560	3000	1000
RCME-190/3AH1	4580	3009	1000
RCME-200/3AH1	4600	3009	1000
RCME-210/3AH1	4620	3000	1000

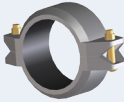
Model	Weight Distribution (kg)											
	Location											
	1	2	3	4	5	6	7	8	9	10	11	12
RCME-40AH1	335	335	335	335	-	-	-	-	-	-	-	-
RCME-50AH1	345	345	345	345	-	-	-	-	-	-	-	-
RCME-60AH1	365	365	365	365	-	-	-	-	-	-	-	-
RCME-70AH1	370	370	370	370	-	-	-	-	-	-	-	-
RCME-080/2AH1	290	405	290	405	405	290	405	290	-	-	-	-
RCME-090/2AH1	290	405	290	405	420	295	420	295	-	-	-	-
RCME-100/2AH1	295	420	295	420	420	295	420	295	-	-	-	-
RCME-110/2AH1	295	420	295	420	440	315	440	315	-	-	-	-
RCME-120/2AH1	315	440	315	440	440	315	440	315	-	-	-	-
RCME-130/2AH1	315	440	315	440	445	320	445	320	-	-	-	-
RCME-140/2AH1	320	445	320	445	445	320	445	320	-	-	-	-
RCME-150/3AH1	295	435	295	435	350	350	350	350	435	295	435	295
RCME-160/3AH1	295	440	295	440	350	350	350	350	460	305	460	305
RCME-170/3AH1	300	440	300	440	370	365	370	365	460	305	460	305
RCME-180/3AH1	310	460	310	460	370	370	370	370	460	310	460	310
RCME-190/3AH1	310	460	310	460	375	375	375	375	460	310	460	310
RCME-200/3AH1	310	465	310	465	375	375	375	375	465	310	465	310
RCME-210/3AH1	315	465	315	465	375	375	375	375	465	315	465	315

6.5 Service space



6.6 Factory-supplied components

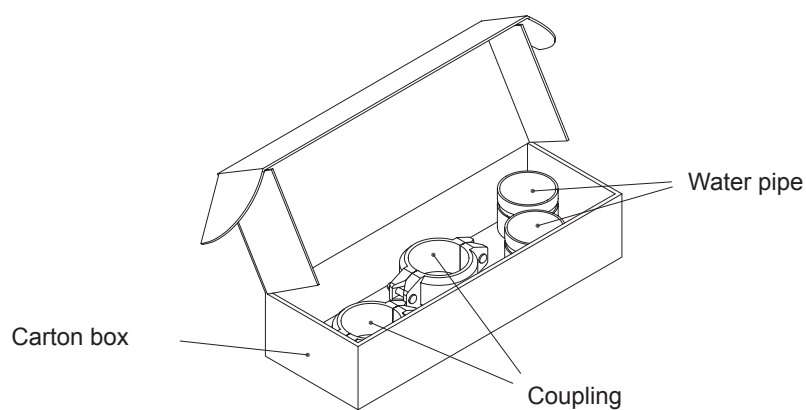
Make sure that the following accessories are packaged with the unit.

Accessory	Image	Qty.
Water pipe (*)		2
Coupling (*)		2
Installation and operation manual		1
Declaration of conformity	-	1



NOTE

- If any of these accessories are not packed with the unit or any damage to the unit is detected, please contact your dealer.
- (*) These accessories are supplied in a carton box inside the module:



7. Installation

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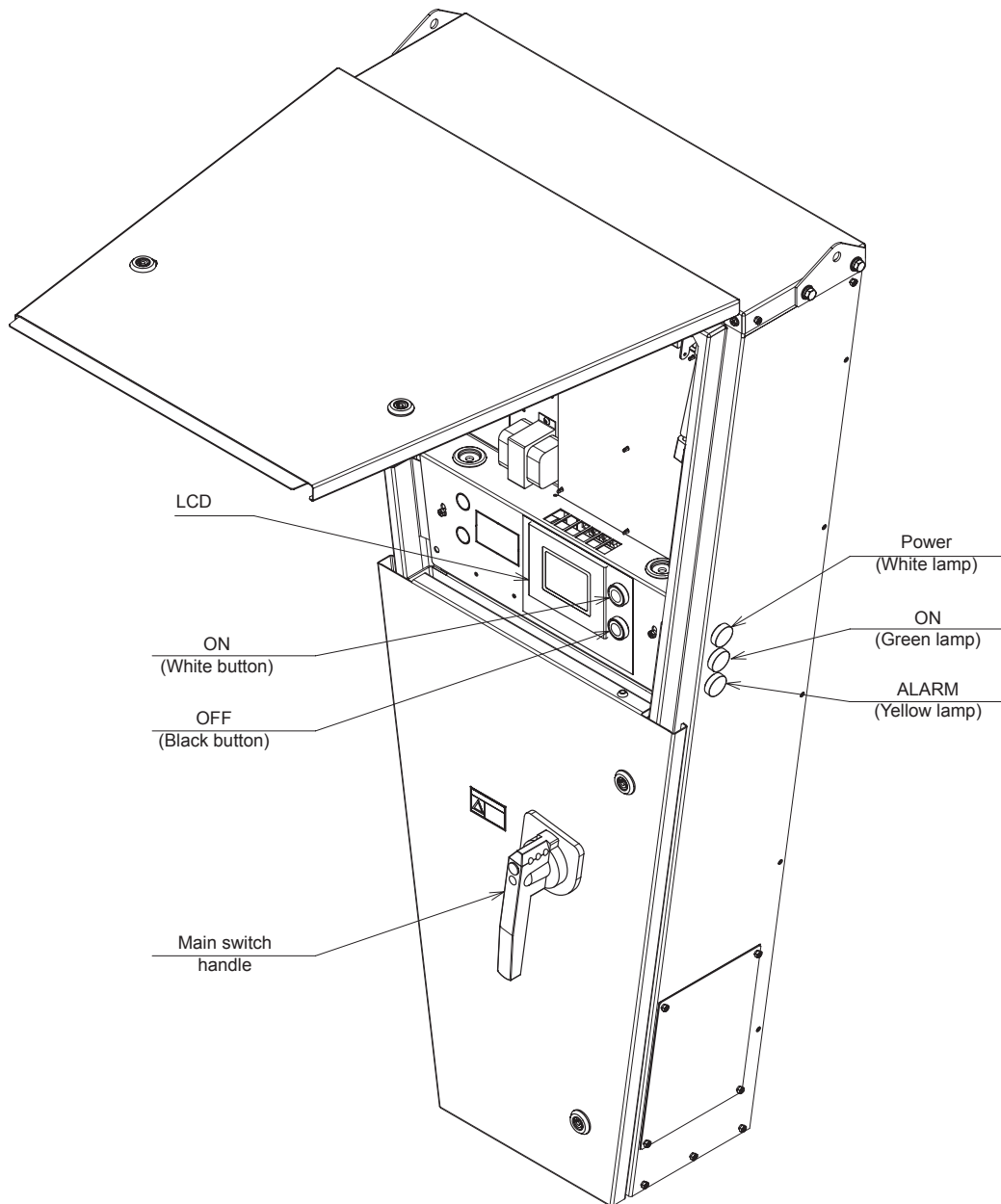
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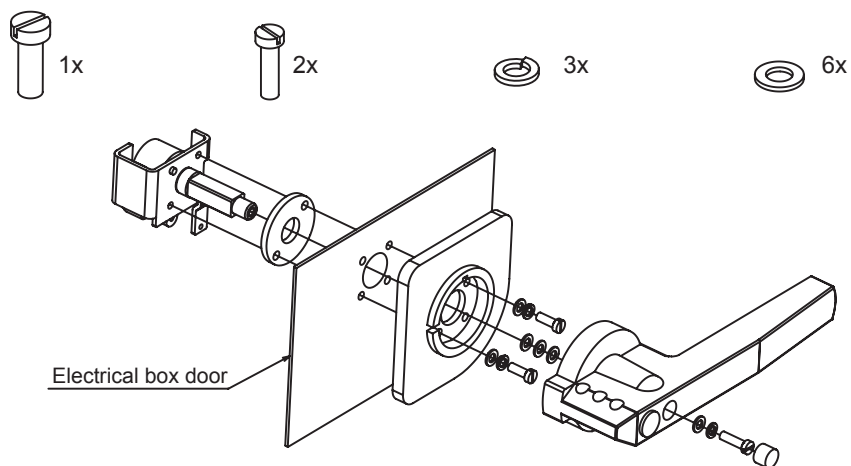
 7.9.1 Installation Work Check List 74



7.1 Electrical box



7.1.1 Handle installation



7.2 Electrical Wiring



DANGER

- *This unit must be installed in a restricted area not accessible to the general public.*
- *Before obtaining access to terminals, all supply circuits must be disconnected. Switch OFF main switch (M.I) for any work inside electrical box.*
- *Keep electrical box cover closed 2 min. after switching power off (to discharge the capacitors). Do not switch power ON before connecting the earth protection conductor to "PE" terminal (residual leakage current).*
- *It is recommended that the main switch be locked in the "OFF" position, to prevent against accidental supply of power during equipment servicing.*



NOTE

Electrical connection must be done by professional installers.

◆ Tools and Instruments

One set of wiring tools and electrical tester (clamp meter)

◆ General check

- 1 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. Make sure that they comply with national and regional electrical codes.
- 2 Check to ensure that the power supply voltage is within +/-10% of the rated voltage.
- 3 Check to ensure that power supply has an impedance low enough to warranty not reduce the starting voltage more than 85% of the rated voltage.
- 4 Check to ensure that the ground wire is connected.
- 5 Check that power terminals L1, L2, L3 and N (R, S, T and N) are correctly connected to the MI terminals. Check terminals tightening and correct phase connection.
- 6 Connect a fuse or a circuit breaker of specified capacity.



NOTE

Check and test to ensure that if there is more than one source of power supply, that all are turned OFF.



CAUTION

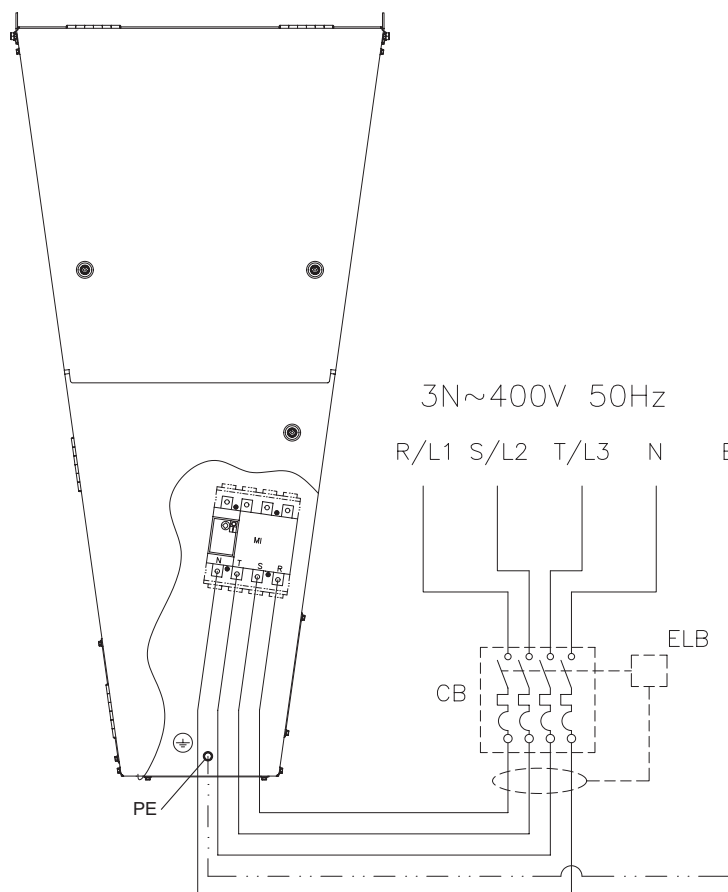
- *Check to ensure that screws for terminal block are tightly tightened.*
- *Check to ensure that the fans have stopped before electrical wiring work or periodical check is performed.*
- *Protect the wires, electrical parts, from rats or other small animals. If not protected, rats may damage unprotected parts, and at the worst, a fire will occur.*
- *Electrical wiring must comply with national and local codes. Contact your local authority in regards to standards, rules, regulations, etc.*



DANGER

- *Do not connect or 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.*

7.2.1 Electrical wiring connection



CB – Thermal and Magnetic Circuit Breaker (according to EN 60947-4 or updated version). C Type for Motor protection trip curve. Fixed Breaking Capacity according the recommended CB values and make sure that they comply with national and regional electrical codes.

EF – Alternatively, Electric Fuses (according to EN 60269-2 or updated version) could be used instead of CB. Use recommended EF values and make sure that they comply with national and regional electrical codes.

ELB – Earth Leakage Breaker (according to EN 62423 or updated version) and based on TN-S earth protection system. Fixed Earth Leakage Breaker Capacity according the recommended ELB values and make sure that they comply with national and regional electrical codes.



NOTE

For other earth protection systems check regulations for the most proper ELB value.

Maximum allowed electric leakage current according to the following table (RMS at 50Hz).

ELB must be A Class. “si” super-immunized earth leakage protection without tripping delay (no S type)

Earth protection system should not have a total resistance higher than 100Ω The maximum trip time for 300 mA should be 0.3s. Earth resistance should be improved if ELB trip time at 0.3s is not ensured.

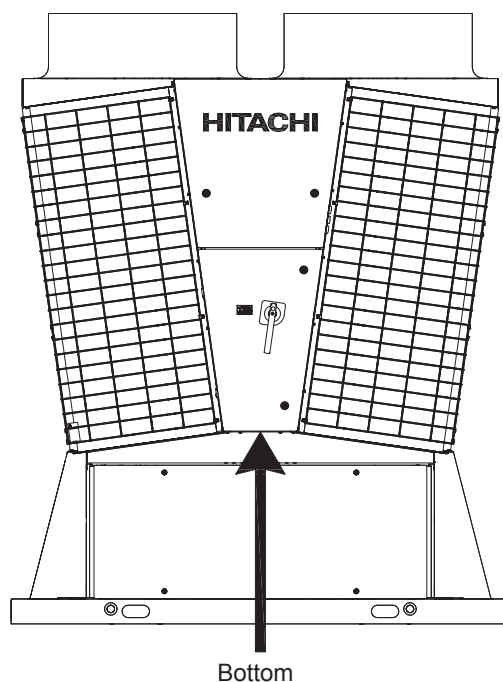


NOTE

See the Electrical Wiring and Wiring Diagrams on chapter "4. Drawings".

7.2.2 Customer electrical connection

Follow the procedure below for the installation of electrical connection in the case of individual modules. Connection is possible through the bottom plate of the electrical box.

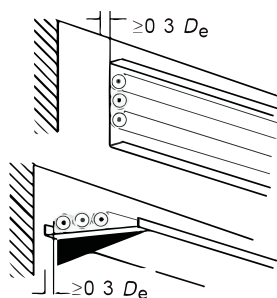


- 1 Unscrew and remove the bottom plate.
- 2 Drill a hole or holes with the appropriate diameter for the cables to be used, and attach cable glands or any other sealant system.
- 3 Route the cables through the cable glands.
- 4 Put the plate back on place and tight the screws.
- 5 Attach the end of each cable to the corresponding terminal board inside the electrical box.
- 6 Make sure that any gap in the plate is tightly sealed.

◆ Cable sizes

Cable sizes: Copper with XLPE insulation according to IEC 60364-2-52 considering the following installation type:

3 single core loaded cable in a perforated tray and laid in flat formation. (Table A.52-12, method F-6)



Bus Bar: Non insulated copper bus bars according to EN 13601. Considering max temperature of 65°C on the bar.



NOTE

See chapter "Electrical Data" for recommended values for the circuit breaker, earth leakage breaker, cable sizes and bus bar

7.2.3 Control Wiring

Connect the interlock wiring and control wiring between the unit terminals and the magnetic switches for the water pumps, according to the wiring diagram shown in section *Customer Wiring of Control Circuit* in chapter *Drawings* or in the wiring label. The main connection terminal N is required.

◆ Available functions

Connect according to the wiring diagram shown in section *"4.3.4 Customer wiring of control circuit for RCME-AH1"Customer Wiring of Control Circuit* in chapter *"4. Drawings"* or the wiring label.

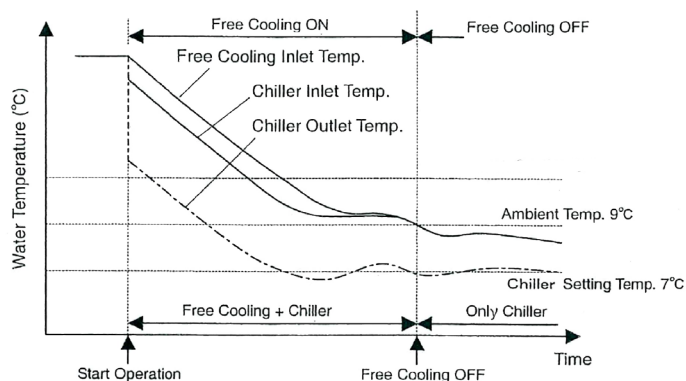
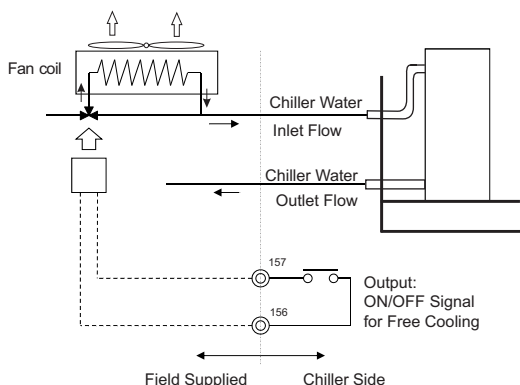
Low signals (<50V)

- Remote control signal– terminals A~D (24 VDC)
 - To operate, set SW2 "Remote" and select DC24 input pulse or level.
 - A-B input is intended for single module operation only, and does not allow control of a group consisting of several modules (master/slave group).
 - C-D output of master unit informs of system alarm. Slave unit informs of module alarm only.
- Remote control by Hitachi controllers or gateways (External H-LINK) – terminals E,F.
 - Set SW2 "Remote" and DSW5 pin 4 ON , DSW6 pin 1 ON (on PCBa)
- Module interconnections - Terminals G,H.
 - Communication between modules in same group (Master/Slave group), with each of them operating as a single chiller.
- Pump interlock signal - terminal 1-2
 - Module waits for pump confirmation signal before enabling module start. $P_{U}-P_{U}$ is displayed in 7-segment.
 - When the switch is opened during module operation $S_{P}-S_{P}$ is displayed in 7-segment.
 - Pump interlock has to be closed in all modules which are a part of the (Master/Slave) group.

230 V signals

- Pump Operation output - terminal 3-4
 - For High Efficiency mode, using multiple pumps, connect each pump to its own module.
 - ♦ Set LCD in Gr. CTRL Setting menu, "Pump Operation" option as "Unit" and both Unit Inc.and Dec. Wait Time = 3 min.
 - For Standard mode, using one system pump, connect the pump output to the Master unit only.
 - ♦ Set LCD in Gr. CTRL Setting menu, "Pump Operation" option as "Unit" and both Unit Inc.and Dec. Wait Time = 0 min.
- Remote control – terminals 5~11
 - Terminal 5-6, STOP (Normally closed, push to open and stop).
 - Terminal 6-7, RUN (Normally open, push to close and run).
 - Input is intended for single module operation only, and does not allow control of a Master/Slave group.
 - In case of remote control operation, cut the jumper in terminal 5-6.
 - Terminal 9-11, Running output for the module. In master module, running output for the system (green lamp on E-Box)
 - Terminal 10-11, Alarm output for the module (yellow lamp on E-Box)
- Night shift mode operation Option – terminals 22, 24
 - For master/slave groups, use the master input only
- 2nd setting temperature activation – terminals 23, 24
 - It is necessary to stop the module in order to make changes
 - For master/slave groups, use the master input only
- External thermostat Option (Ice storage) – terminals 25, 24.
 - Compressor running at 100% load, water setting temperature is ignored (used only as a thermo off safety limit).
 - This input applies for individual modules only.
- Fan Operation activation Option – terminals 26,24
 - For master/slave groups, use the master input only
- System remote control switch - terminal 28-31.
 - Control signal to turn all modules on and off
 - For master/slave groups, use the master input only; slave modules receive operation orders though H-Link

- Water Protection Switch Option (Flow Switch Options or DPSW) – terminals 33, 34.
 - When circuit is opened during operation alarm $\overline{EE}$ - $\overline{EE}$ is displayed in the 7-segment.
 - Flow switch/DPSW has to be closed in every module of the group. When using just one Flow switch in multi module units, this input flow swicht signal should be linked to all modules.
- Leak detection (optional) - terminal 35-36.
 - Leak detection signal stop de module.
 - When using just one leak detection device in multi module units, this input signal (leak detection) should be linked to all modules.
- Force Compressor Load Option (thermo off, hold, load up) – terminals 150~153
- Fan Operation Caution – terminals 11-154.
 - This output is for individual module.
 - 1 fan abnormality: caution for fan is output
 - 2 fan abnormality: module alarm
- Free Cooling Option – terminals 156, 157.
 - ON condition: Inlet water temperature > Ambient Temp + 2 °C, OFF
 - OFF condition: Inlet water temperature < Ambient Temp



NOTE

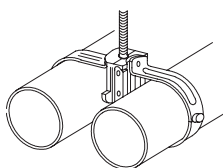
See section "4.3.4 Customer wiring of control circuit for RCME-AH1" in chapter "4. Drawings" and "8. Control system".

7.3 Water Piping

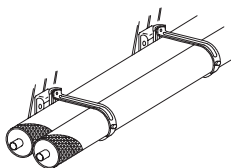
◆ When Piping Connections are performed

- 1 Connect all pipes as close as possible to the unit, so that disconnection can be easily performed when required.
- 2 It is recommended for the piping of the chilled water inlet and outlet that flexible joints be utilised, so that vibration will not transmit.
- 3 Whenever permissible, sluice valves should be utilised for water piping, in order to minimise flow resistance and to maintain sufficient water flow.
- 4 Proper inspection should be performed to check for leaking parts inside and outside the system, by completely opening the chilled water inlet and outlet valves to the water cooler. Additionally, equip valves to the inlet and outlet piping. Equip an air purge cock on the inlet piping and a drain cock on the outlet piping. The cock handle should be removed so that the cock can not be opened under normal circumstances. If this cock is opened during operation, trouble will occur due to water blow-off.
- 5 Sufficiently perform insulation to keep the chilled water piping cool and to prevent sweating of the piping.
- 6 Under the condition where the ambient temperature is low in winter, there is a case where equipment and piping will become damaged during the shutdown periods at night, because the water in the pump or piping will be frozen. To prevent freezing of the water, it is effective to operate the pumps. HITACHI Chiller has the pump ON/OFF operation control (see wiring diagram) water from piping. Additionally, in a case where measures such as water draining are difficult, utilise antifreeze mixture of ethylene glycol type or propylene glycol type.
- 7 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. Some examples for suspension method are shown below.

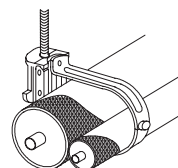
For suspending heavies



For piping along the wall



For instant installation work



- 8 The common water pipes (Inlet/Outlet) are field supplied or can be requested (as option) to be factory assembled. It is not necessary to install any sensor in these common pipes for standard models. Number of connections for models for factory assembled modules are:

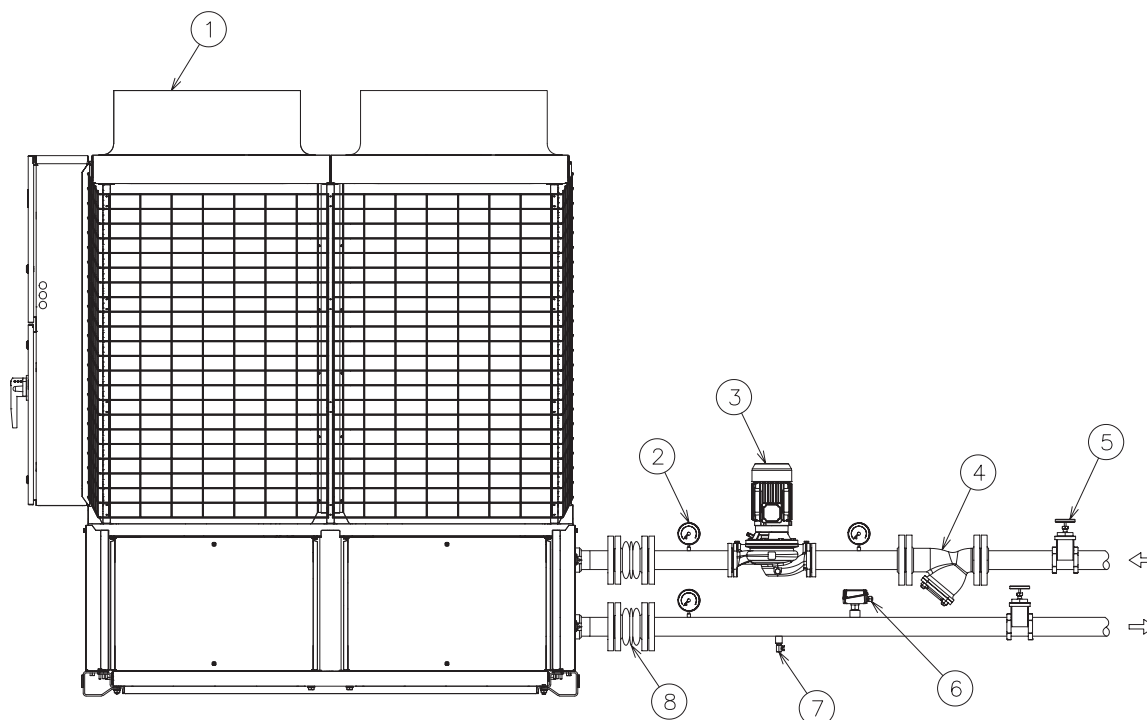
Models	Water Inlet	Water Outlet
1 module	1	1
2 modules	2	2
3 modules	3	3



CAUTION

- *Cleaning of Plate Heat Exchangers shall be performed by specialists. Please contact your contractor or dealer of HITACHI.*
- *Clean the Water Strainer periodically according to its clogging degree.*
- *It is strongly recommended to clean the Plate Heat Exchanger at the same time the Water Strainer is cleaned.*

7.4 Field typical installation example



- | | | |
|------------------|---|--------------------------------|
| ① Chiller unit | ④ Strainer (20 mesh water strainer
Ø1.5 mm hole size (metal type)) | ⑥ Flow switch (accessory) |
| ② Manometer (x3) | ⑤ Shut-off valve (x2) | ⑦ Drain valve |
| ③ Pump | | ⑧ Pipe vibration absorber (x2) |



NOTE

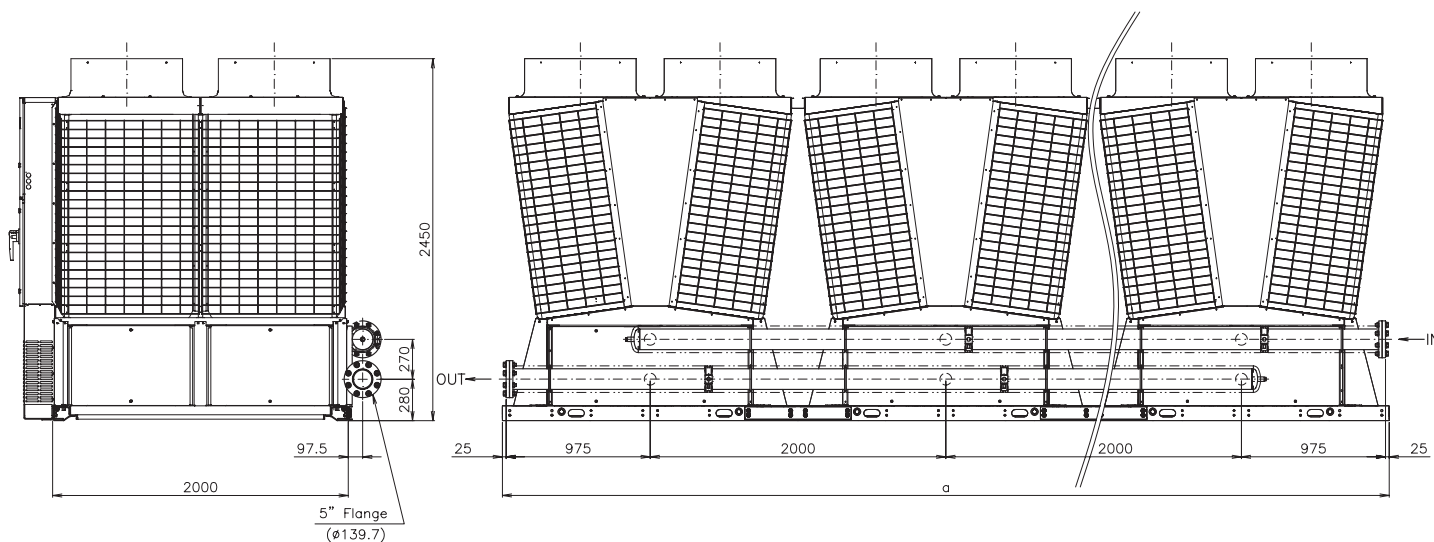
Water strainer is prepared as option.

7.5 Typical Common Water Piping (Field installation)

The Common Water Pipe Distributor collects water from each inlet and outlet, providing a single water inlet and outlet connections, as shown in the drawing below.

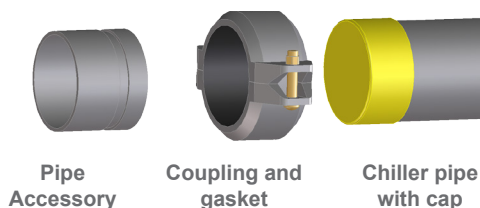
It is available as an option.

The Common Water Pipe Distributor is pre assembled and integrated into the Chiller unit as a factory fitted option (see chapter ["2.3 Water Chillers options and accessories"](#)).

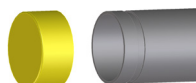


7.6 Water connection

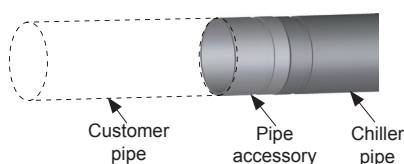
Victaulic joints are used for water inlet and outlet connections.



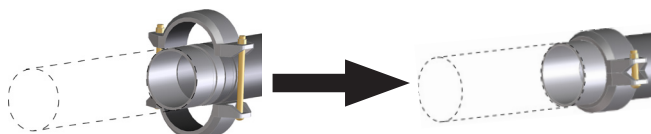
1 Remove the cap from the chiller pipe.



2 Weld the pipe accessory to the water supply pipe, and join the pipes together.



3 Attach the rubber ring and fix the coupling.



4 Check whether there is any leakage.



NOTE

See section "11.19 Installations works of Victaulic joints" in chapter "11. Maintenance"

7.7 Minimum internal system water volume

To ensure the cooling operation at least 5 minutes without interruption, the internal chilled water volume in the piping system should be greater than the minimum volume shown below.

MODEL	Minimum internal system water volume (m ³)
RCME-40AH1	0.36
RCME-50AH1	0.45
RCME-60AH1	0.54
RCME-70AH1	0.63
RCME-080/2AH1	0.72
RCME-090/2AH1	0.81

MODEL	Minimum internal system water volume (m ³)
RCME-100/2AH1	0.90
RCME-110/2AH1	0.99
RCME-120/2AH1	1.08
RCME-130/2AH1	1.18
RCME-140/2AH1	1.27
RCME-150/3AH1	1.36

MODEL	Minimum internal system water volume (m ³)
RCME-160/3AH1	1.45
RCME-170/3AH1	1.54
RCME-180/3AH1	1.63
RCME-190/3AH1	1.72
RCME-200/3AH1	1.81
RCME-210/3AH1	1.90



NOTE

- Minimum internal system water volume written above is for standard ON/OFF differential.
- In case of changing ON/OFF differential, minimum internal water volume changes as following percentage.

Inlet ON/OFF Differential (set in the LCD menu)	4°C	3°C	2°C	1°C
Minimum Internal Water Volume	50%	67%	100%	200%

- To prevent frequent ON/OFF for no load or extremely low load operation, system internal water volume shall be more than above table.
- ON/OFF cycles shall be maximum 6 times per hour. (minimum 5 minutes operation and minimum 5 minutes thermostat OFF)

7.8 Water Control



CAUTION

- When industrial water is applied for chilled water and condenser water, industrial water rarely causes deposits of scales or other foreign substances on equipment. However, well water or river water may in most cases contain suspended solid matter, organic matter, and scales in great quantities. Therefore, such water should be subjected to filtration or softening treatment with chemicals before application as chilled water.
- It is also necessary to analyse the quality of water by checking pH, electrical conductivity, ammonia ion content, sulphur content, and others, and to utilise industrial water only if problem is encountered through these checks.

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 ⁻ /l)	Less than 50	Less than 50	●	
Sulphur Acid Ion (mg SO ₄ ²⁻ /l)	Less than 50	Less than 50	●	
The Amount of Acid Consumption (pH 4.8) (mg CaCO ₃ /l)	Less than 50	Less than 50		●
Total Hardness (mg CaCO ₃ /l)	Less than 70	Less than 70		●
Calcium Hardness (mg CaCO ₃ /l)	Less than 50	Less than 50		●
Silica L (mg SiO ₂ /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 ²⁻ /l)	It shall not be detected.		●	
Ammonium Ion (mg NH ₄ ⁺ /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 ₂ /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.

7.9 Installation final check

Inspect the installation work according to all documents and drawings.

7.9.1 Installation Work Check List

1 Is the unit solidly mounted and levelled?

2 Is the installation location adequate?

☐ Space for Condenser Air Flow

☐ Space for Maintenance Work

☐ Noise and Vibration

☐ Sunshine and Rainfall

☐ Appearance

3 Is the water piping system adequate?

☐ Tube Size

☐ Water Drain

☐ Length

☐ Water Control

☐ Flexible Joint

☐ Air Purge

☐ Insulation

☐ Pressure Control

☐ Strainer

☐ Common Pipes

4 Is the electrical wiring system adequate?

☐ Wire size

☐ Tightened connections

☐ Switch size

☐ Operation control devices

☐ Fuse size

☐ Safety devices

☐ Voltage and Hz

☐ Interlock

5 Have the R, S and T phases of the water Chiller correctly been connected to the R, S and T phases of the main power source?

6 Are the stop valves for the condenser liquid line and water valve open?

7 Have the packing glands and the cap nuts for the stop valves been tightened?

8 Is BMS connected correctly and operate as decided?

8. Control system

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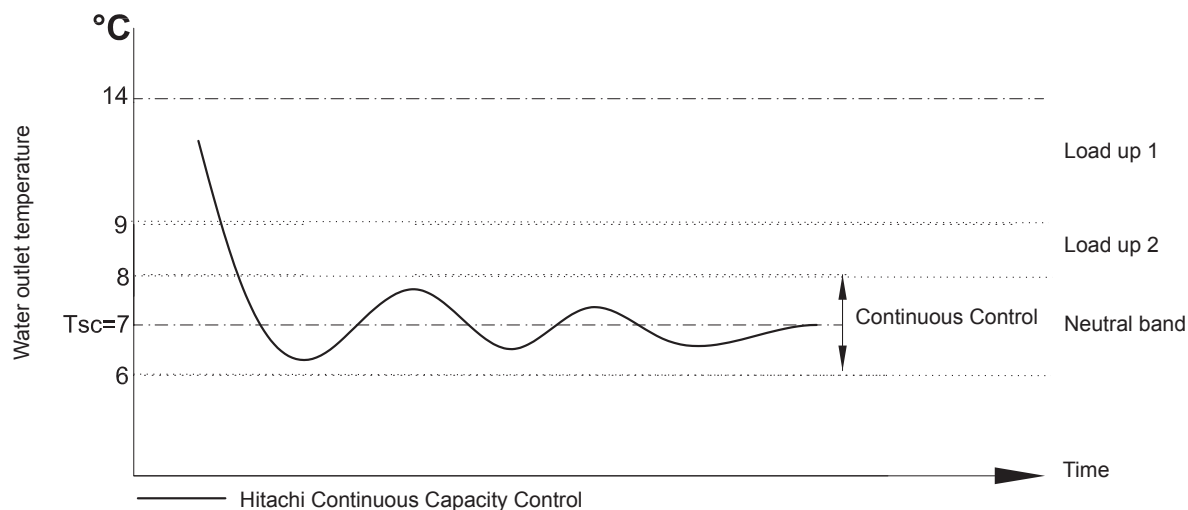
8.1 General notes

Electrical Operation Controls of HITACHI Water Chillers are as follows.

8.1.1 Capacity Control

All models are equipped with an unloading system for each compressor, in order to adjust the cooling capacity and to provide precise temperature control for the chilled water, coupled with electronic thermostats.

Electrical Operation Controls advanced HITACHI Water Chillers are as follows.

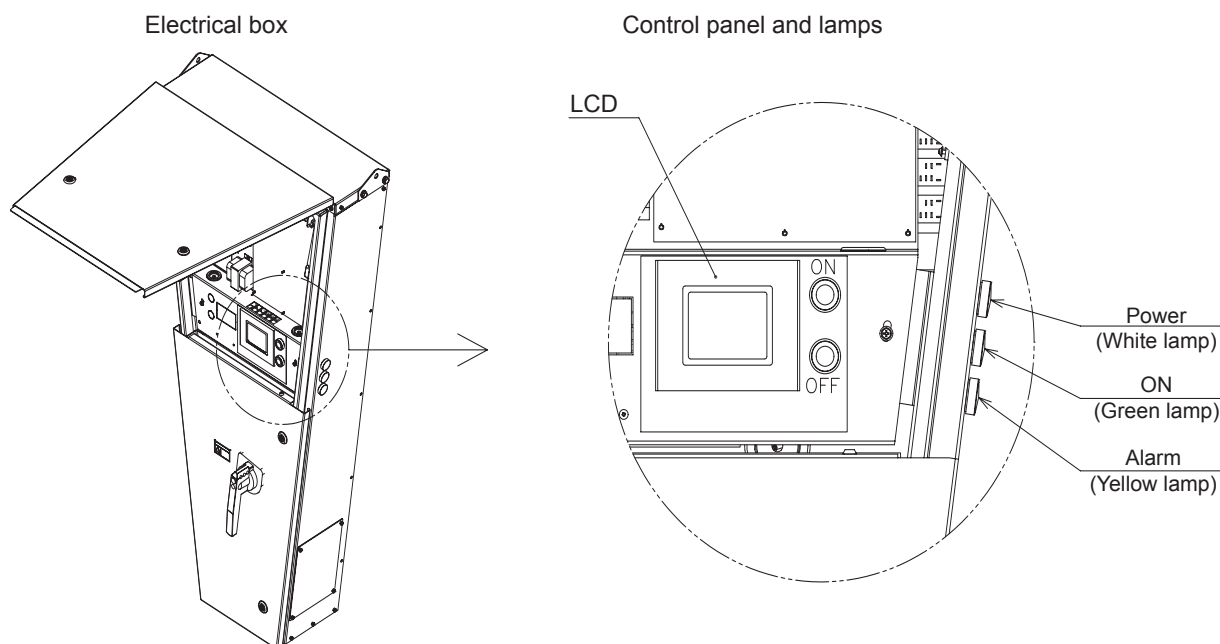


Check Water Control Configuration parameters on point [Control Adjustment](#) in this chapter.

8.1.2 Control Panel

◆ Operation buttons and lamps

ON switch, OFF switch, Power Supply Lamp, Operation Lamp, Alarm Lamp, Operation/Alarm Indicator for each refrigerant cycle and check switch are mounted in the Control Panel. The Control Panel is located at a position where easy access is available.



8.2 PCB (Printed Circuit Board) control adjustment

8.2.1 Control Structure

◆ Printed Circuit Board

A micro-processor, relays and electronic components are mounted on the Printed Circuit Board. Increased reliability is assured due to the elimination of mechanical parts and wires. This board contains various functions by applying micro-processor as follows:

- **Screw Compressor Cycling Protection Circuit.**
The electronic timer of the screw compressor cycling protection (ccp) connected in the compressor control circuit delays the screw compressor restarting period for approximately 30 seconds.
- **Electronic Expansion Valves and Variable Fan Speed Control.**
This series include electronic expansion valves control and variable fan speed motor for better performance and efficiency.
- **Electronic Thermostat Circuit.**
The electronic thermostat senses chilled water outlet temperature, and operate capacity control solenoid valves of HITACHI screw compressor.
- **Screw Compressor Reversing Protection Circuit.**
This circuit is composed of a reverse-phase protection device, preventing reverse operation of the screw compressor, because the screw compressor definitely cannot be operated in the wrong direction due to the misconnection of the main power phases.
- **Restart after Power-Failure.**
In case that a power failure shorter than 2 seconds occurs, compressor can be restarted automatically within 3 minutes after power supply.

◆ Switch Position Table

SWITCH POSITION	
ON 	ON
OFF 	
ON 	OFF
OFF 	

8.2.2 Unit Factory Settings

Table 1

MODEL	STANDARD SETTING PCB _a						
	DSW 1	DSW 2	DSW 3	DSW 4	DSW 5	DSW 6	RSW 1
RCME-40AH1	ON          		Module No.1: (Master unit)				
RCME-50AH1	ON          		ON   			ON    	   
RCME-60AH1	ON          	ON          	ON   	ON   	ON   		
RCME-70AH1	ON          		ON   	ON   			
RCME-080~140/2AH1	According to individual module capacity		Module No.3 (Slave 2):			ON    	   
RCME-150~210/3AH1			ON   				   

Table 2

MODEL	PCBe DSW1	STANDARD SETTING PCBe
RCME-40AH1 RCME-50AH1 RCME-60AH1 RCME-70AH1	PCBe 1	
	PCBe 2	
	PCBe 3	
	PCBe 4	

Table 3

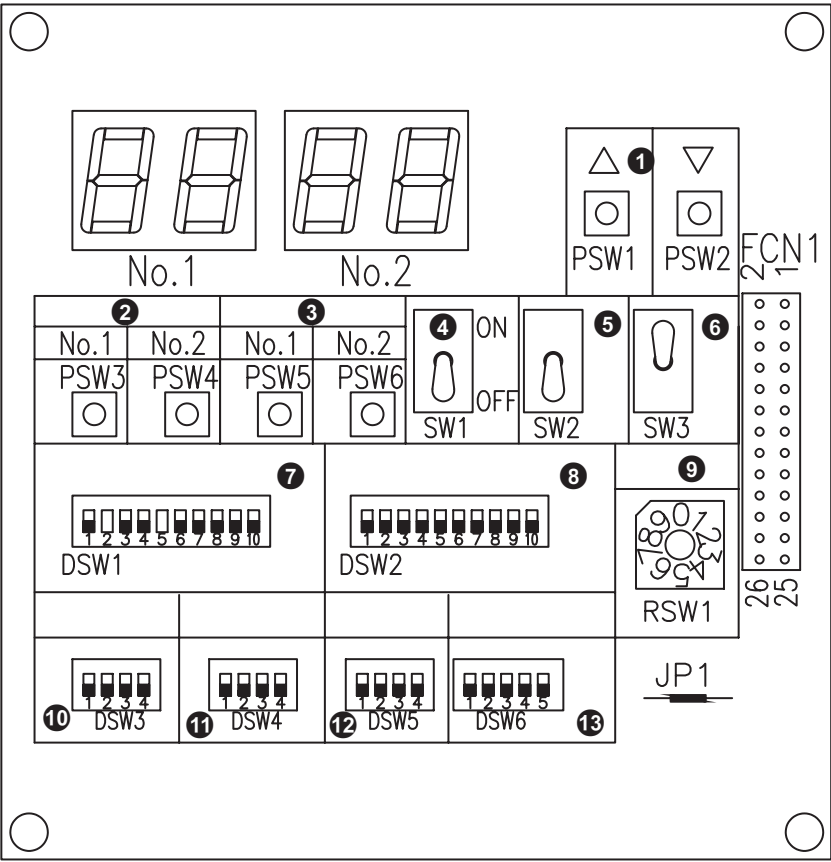
MODEL	STANDARD SETTING PCBc						
	DSW7	DSW8	DSW9	DSW 300	DSW 302	DSW 303	DSW 304
RCME-40AH1	 End resistance cancellation						
RCME-50AH1							
RCME-60AH1							
RCME-70AH1							
RCME-080~210/ nAH1	 Master						
	 Slave						

Table 4

MODEL	STANDARD SETTING PCBd				
	DSW1	DSW2	DSW3	DSW 4	DSW 10
RCME-40AH1					
RCME-50AH1					
RCME-60AH1					
RCME-70AH1					
RCME-080~210/ nAH1					

8.2.3 Unit Configuration Details

PCBa Settings



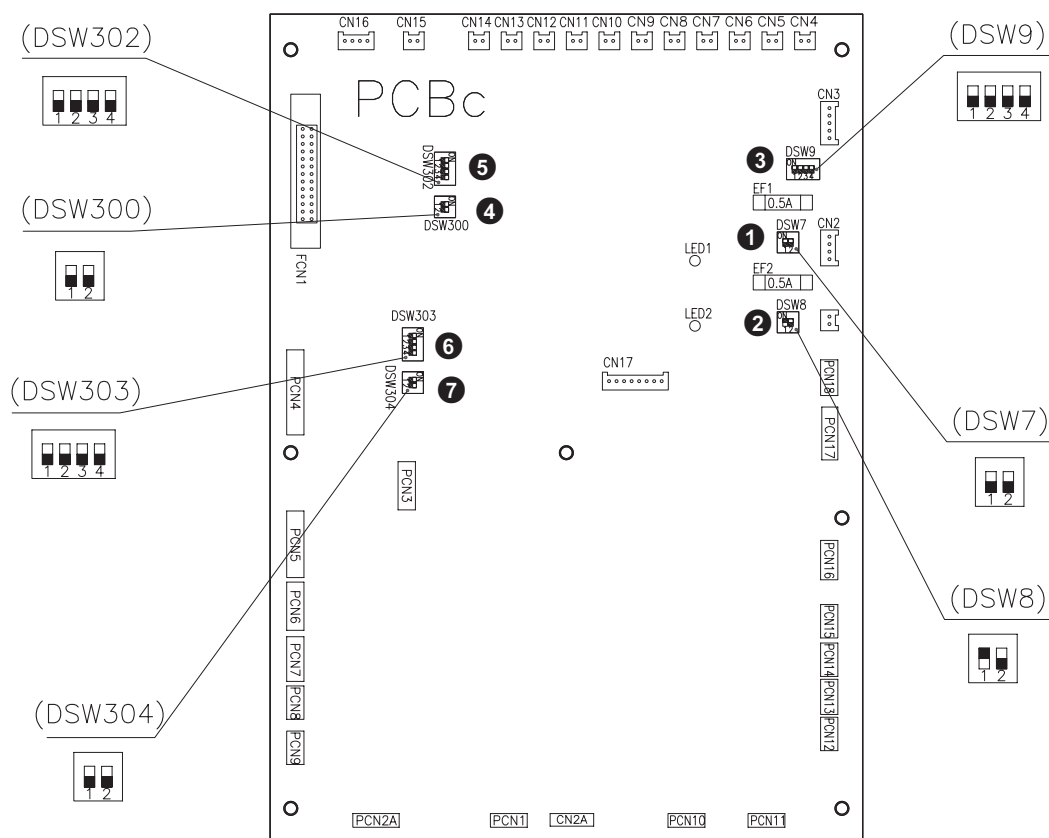
(*) This picture don't show factory setting

N°	Dip Switch	Description
1	High cut check   PSW1 PSW2	Not available
2	High cut check   PSW3 PSW4	PSW3: Fan stop for High Pressure cut checking PSW4: Not available
3	Manual defrost   PSW5 PSW6	Manual defrost. Not available
4	Pump operation  ON OFF SW1	Manual Pump Operation Standard: OFF
5	Local/Remote changeover switch  LOCAL REMOTE SW2	Local/Remote Control: - Standard: Remote - Local: This mode allows unit ON/OFF from buttons in electrical box.  NOTE OFF function is available in both modes.
6	Cool/Heat changeover switch  COOL HEAT SW3	Cooling Mode: Standard Heating Mode: Not available

N°	Dip Switch	Description													
7	Manual set A ON 12345678910 DSW1 (This picture is an example of RCME-40AH1)	1 Cycle 1 disabled	1 Cycle 1 enabled												
		2~4 Not available (DSW1 pin 2, 3, 4: All OFF)													
		5 6 7 European Models													
		Capacity code													
		<table><tr><th>Pin</th><th>Capacity (HP)</th></tr><tr><td> 8 9 </td><td>40</td></tr><tr><td> 8 9 </td><td>50</td></tr><tr><td> 8 9 </td><td>60</td></tr><tr><td> 8 9 </td><td>70</td></tr><tr><td> 8 9 </td><td>Reserved</td></tr></table>		Pin	Capacity (HP)	8 9	40	8 9	50	8 9	60	8 9	70	8 9	Reserved
		Pin	Capacity (HP)												
8 9	40														
8 9	50														
8 9	60														
8 9	70														
8 9	Reserved														
10 Individual thermistor (Always off)	10 Not available (Common Thermistor)														
8	Manual set B ON 12345678910 DSW2	1 Cooling only models	1 Not available												
		2 Screw Compressor	2 Not available												
		3 Air-cooled	3 Not available												
		4 Not available	4 European voltage												
		5 Reserved	5 Not available												
		6 General air conditioning	6 Not available												
		7 Main refrigerant (R134a)	7 Not available												
		8 Inverter fan	8 Not available												
		9 10 (DSW2 pin 9 and 10: All ON) (Continuous Capacity Control)													
		9	Master RSW1	Number of modules connected.											
NOTE: To set in all units with the total number of modules. For individual modules set to 0.															

N°	Dip Switch	Description																				
10	Manual set C ON 1234 DSW3	H-Link Module address <table><tr><th>Pin</th><th>Address</th><th>Pin</th><th>Address</th></tr><tr><td> 123 </td><td>Master</td><td> 123 </td><td>Slave 4</td></tr><tr><td> 123 </td><td>Slave 1</td><td> 123 </td><td>Slave 5</td></tr><tr><td> 123 </td><td>Slave 2</td><td> 123 </td><td>Slave 6</td></tr><tr><td> 123 </td><td>Slave 3</td><td> 123 </td><td>Slave 7</td></tr></table>	Pin	Address	Pin	Address	123	Master	123	Slave 4	123	Slave 1	123	Slave 5	123	Slave 2	123	Slave 6	123	Slave 3	123	Slave 7
		Pin	Address	Pin	Address																	
		123	Master	123	Slave 4																	
123	Slave 1	123	Slave 5																			
123	Slave 2	123	Slave 6																			
123	Slave 3	123	Slave 7																			
4 Common power source mode	4 Not available																					
11	Optional Function B: ON 1234 DSW4	Not available																				
	12	Optional Function C: ON 1234 DSW5	1 Status recovery after power failure disabled	1 Status recovery after power failure enabled																		
2 Standard			2 Not available																			
3 Standard			3 Not available																			
4 Standard			4 Remote control by H-LINK (To apply with optional H-LINK control devices)																			
13	Optional Function D: ON 12345 DSW6	12 Single Module Control (RCME-(40/50/60/70)AH1)																				
		12 Multiple Module Control (factory setting for RCME-(080-210)/nAH1))																				
		12 Not available																				
		12 Not available																				
		3 Not available	3 Standard																			
		45 Enable connection to 1 PCBd																				

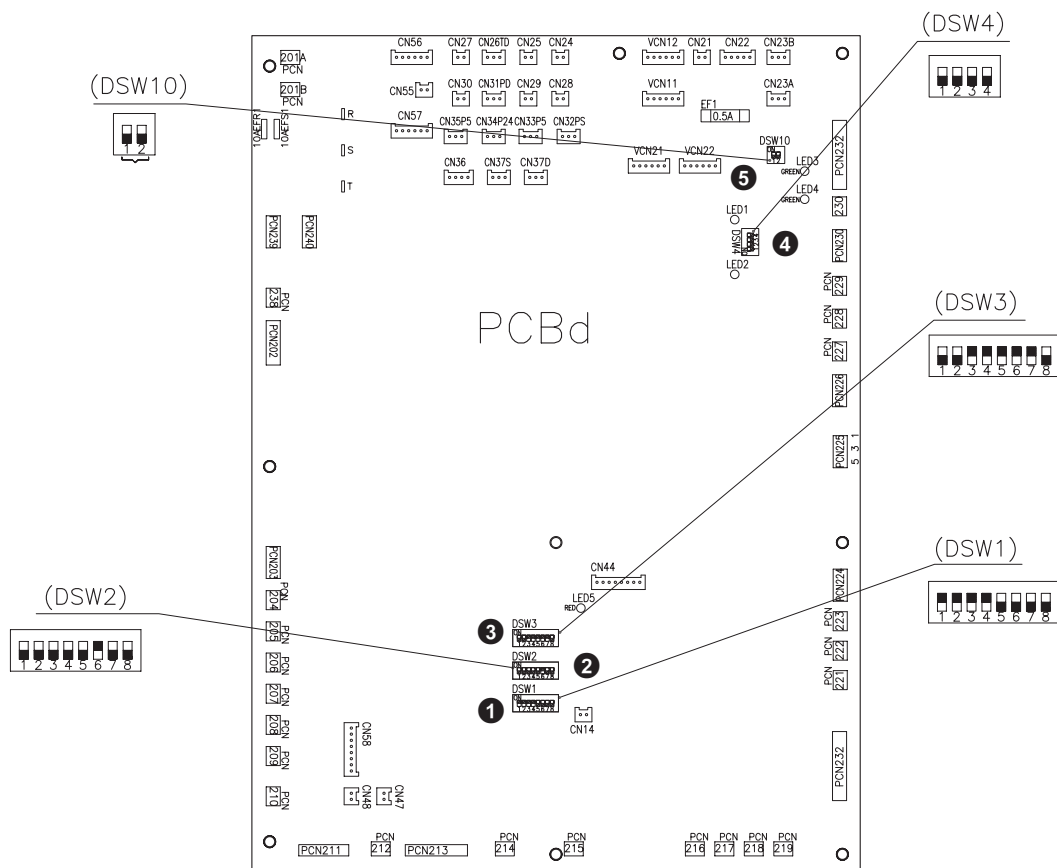
PCBc Settings



N°	Dip Switch	Description	
1	Internal H-Link terminal set DSW7	H-Link end resistance OFF for Single or Slave Modules	H-Link end resistance ON for Master Module
		Fuse enable (Standard)	H-Link fuse short-circuit
2	PCBd COMM DSW8	H-Link end resistance OFF	H-Link end resistance ON (Standard)
		Fuse enable (Standard)	H-Link fuse short-circuit
3	 DSW9	Without end resistance 1	Not available
		Without end resistance 2	Not available
		3~4 Not available (always OFF)	
4	External H-Link terminal set DSW300	H-Link end resistance OFF (Standard)	H-Link end resistance ON NOTE Switch ON, only 1 Master (just one chiller) when using H-LINK devices.
		Fuse enable (Standard)	H-Link fuse short-circuit
5	 DSW302	Not available	

N°	Dip Switch	Description			
6	H-Link Group Address ON 1234 DSW303	Pin	Address	Pin	Address
		1234	Group 1	1234	Group 5
		1234	Group 2	1234	Group 6
		1234	Group 3	1234	Group 7
		1234	Group 4	1234	Group 8
7	ON 12 DSW304	Not available			

PCBd Settings



N°	Dip Switch	Description	
①	 DSW1	1~8 Disable DC Fan 1-4	1~8 Enable DC Fan 1-4
②	 DSW2	1 2 I/O PCB Address 5 6 Other settings not available 7~8 Other settings not available (DSW2 pin 7 and 8: All OFF)	
③	 DSW3	1 2 VCN 11 3 4 VCN 12 5 6 VCN 21 7 8 VCN 22	VCN 11 Type : 1 2 Type 3 VCN 12 Type : 3 4 Type 4 VCN 21 Type : 5 6 Type 3 VCN 22 Type : 7 8 Type 2
④	 DSW4	1 Without end resistance 1 2 Without end resistance 2 3~4 Not available (always OFF)	1 Not available 2 Not available
⑤	PCBd COMM DSW10	1 H-Link end resistance OFF (Standard) 2 Fuse enable (Standard)	1 H-Link end resistance ON 2 H-Link fuse short-circuit

PCB_{En} Settings
n: number of PCB

Diagram of the PCB layout showing various components and their locations. The components are labeled as follows: CN206, CN207, LED202 (Yellow), DSW1, W, V, U, DCL1, DCL2, S, T, R, P2, N, HIC1, 102 (L3), LED501 (Red).

N°	Dip Switch	Description										
1	ON 1 2 3 4 DSW1	Address settings <table border="1"><thead><tr><th>Pin</th><th>PCBe DSW1</th></tr></thead><tbody><tr><td> ON 1 2 3 4 </td><td>PCBe 1</td></tr><tr><td> ON 1 2 3 4 </td><td>PCBe 2</td></tr><tr><td> ON 1 2 3 4 </td><td>PCBe 3</td></tr><tr><td> ON 1 2 3 4 </td><td>PCBe 4</td></tr></tbody></table>	Pin	PCBe DSW1	ON 1 2 3 4	PCBe 1	ON 1 2 3 4	PCBe 2	ON 1 2 3 4	PCBe 3	ON 1 2 3 4	PCBe 4
Pin	PCBe DSW1											
ON 1 2 3 4	PCBe 1											
ON 1 2 3 4	PCBe 2											
ON 1 2 3 4	PCBe 3											
ON 1 2 3 4	PCBe 4											

8.3 Oil Heater control

Heater ON conditions:

During compressors Stop and discharge gas temperature < 50°C

Heater OFF conditions:

During compressor operation and discharge gas temperature ≤ 55°C

8.4 LCD (Liquid Control Display) control adjustment

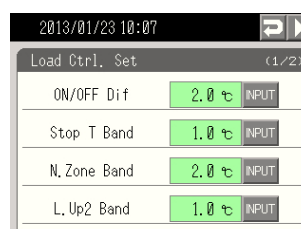
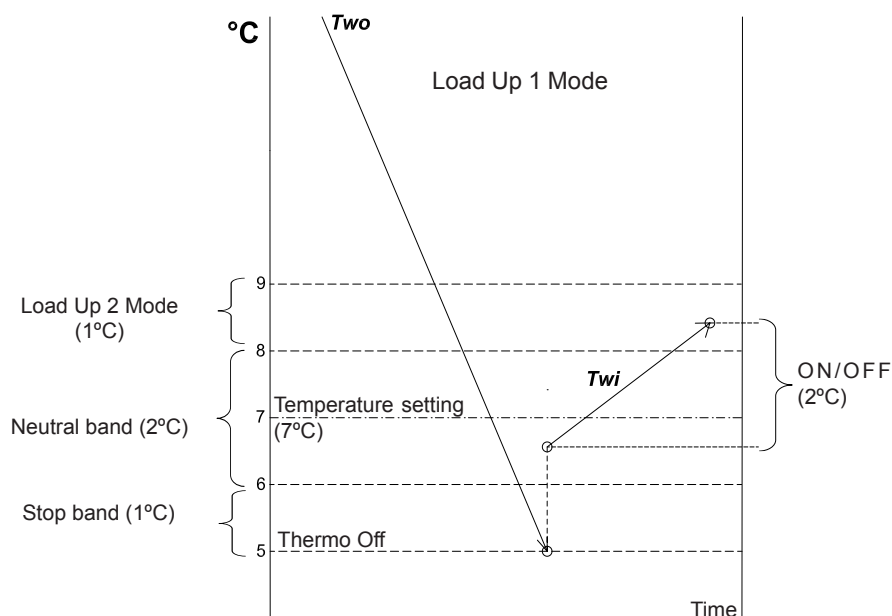
Operation and configuration unit data can be checked in LCD

8.4.1 LCD standard setting

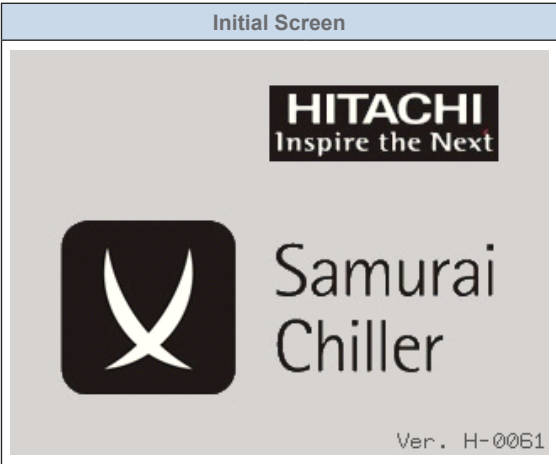
Compressor parameters		Value
Compressor starting delay		30 sec.
CT sensor protections time		30 sec.
CT sensor current (A)	40 HP	71
	50 HP	90
	60 HP	109
	70 HP	109

Pump parameters	Value
Periodic pump OP.	Disable
Pump OP. in ON/OFF cont.	ON
Pump feed back waiting time	Unlimited
	1 min

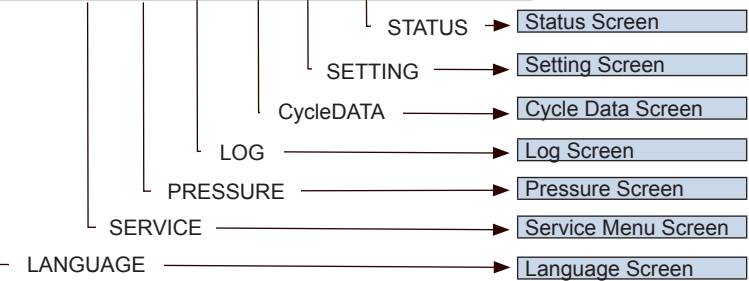
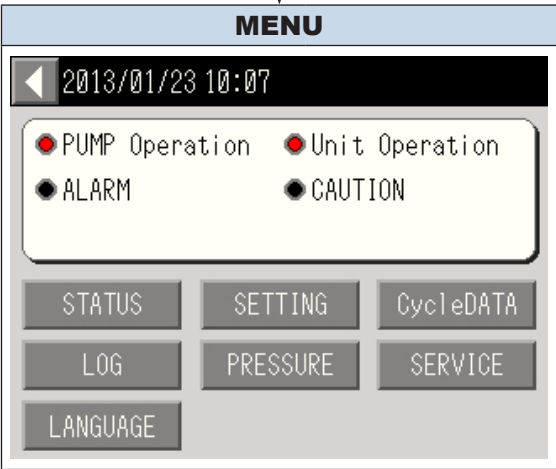
◆ Water control setup



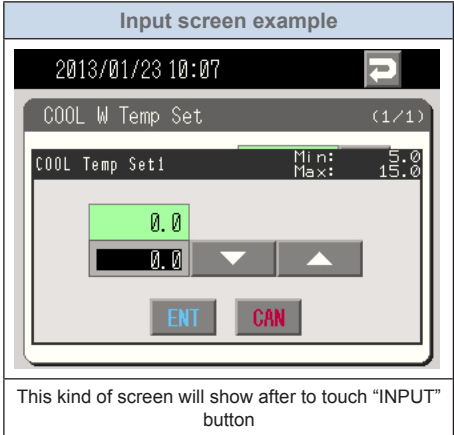
8.4.2 LCD display for individual module.



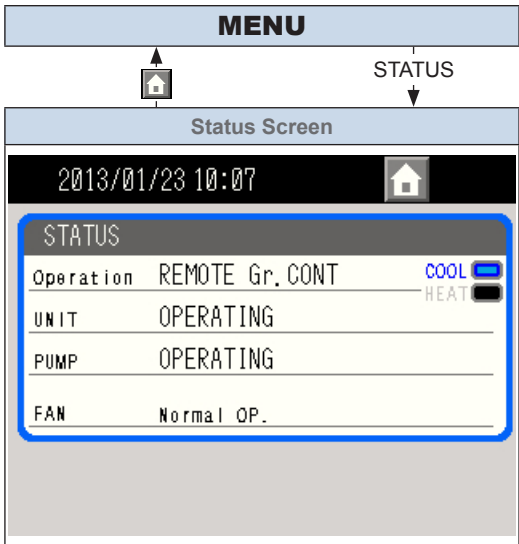
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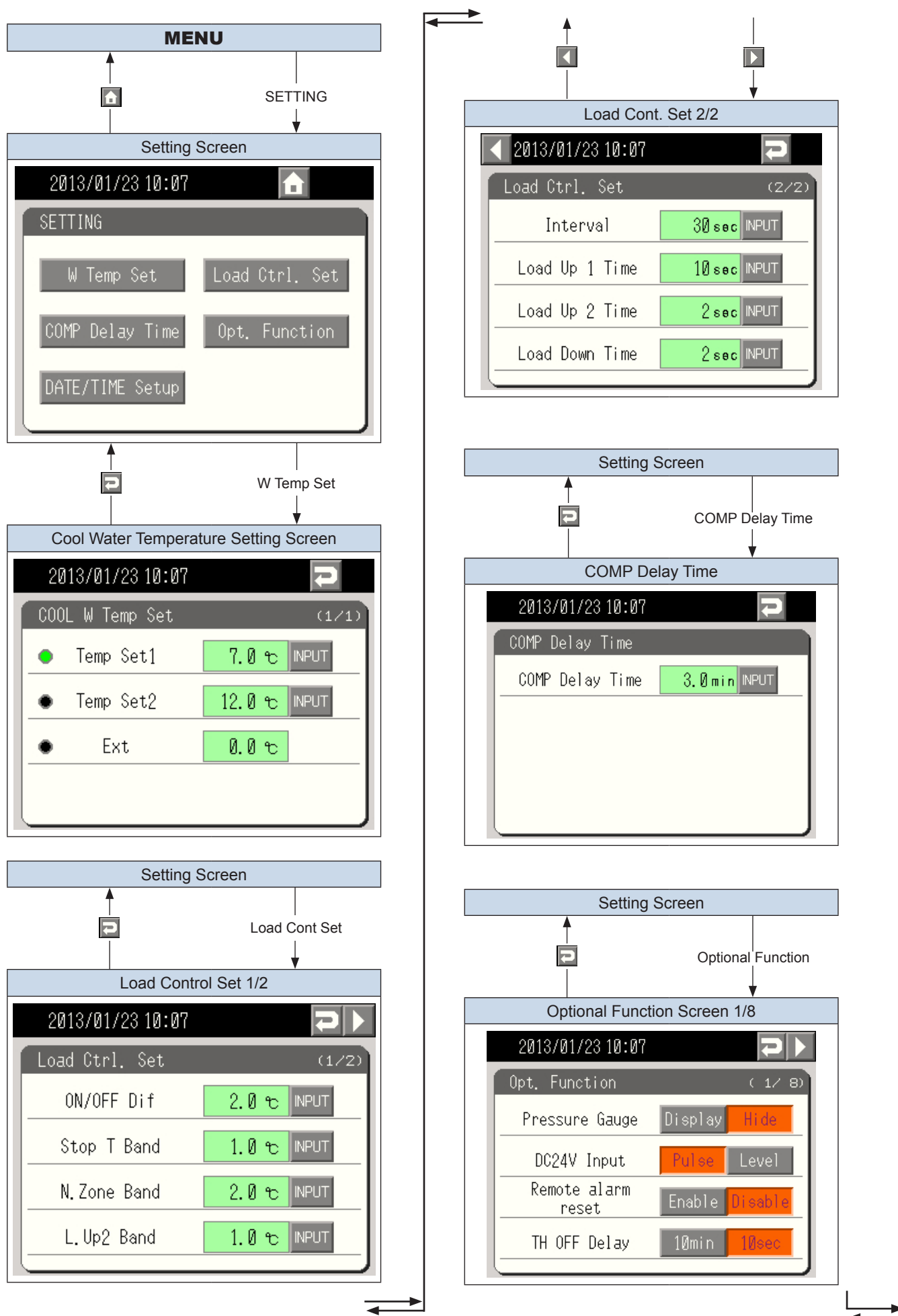


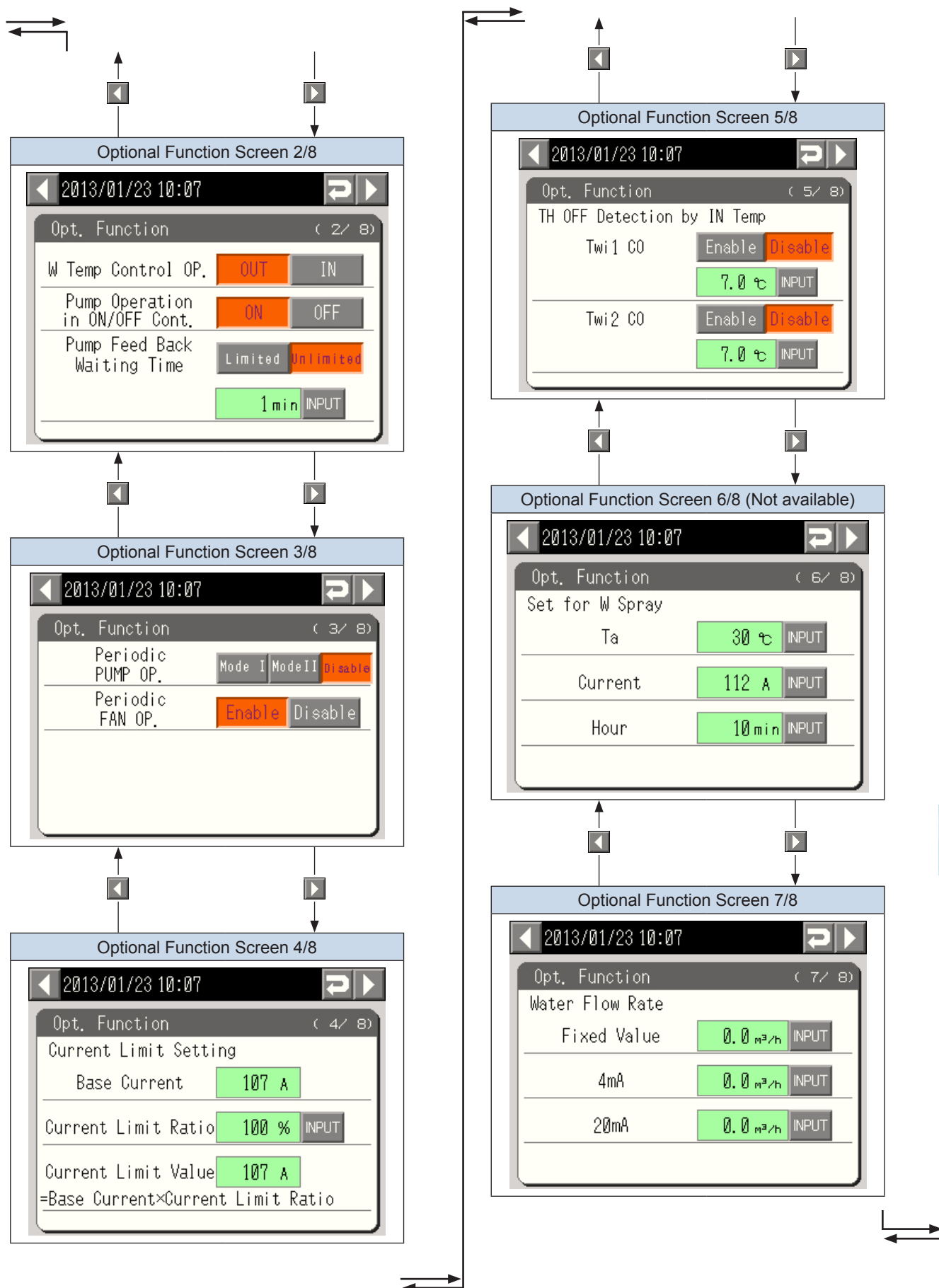
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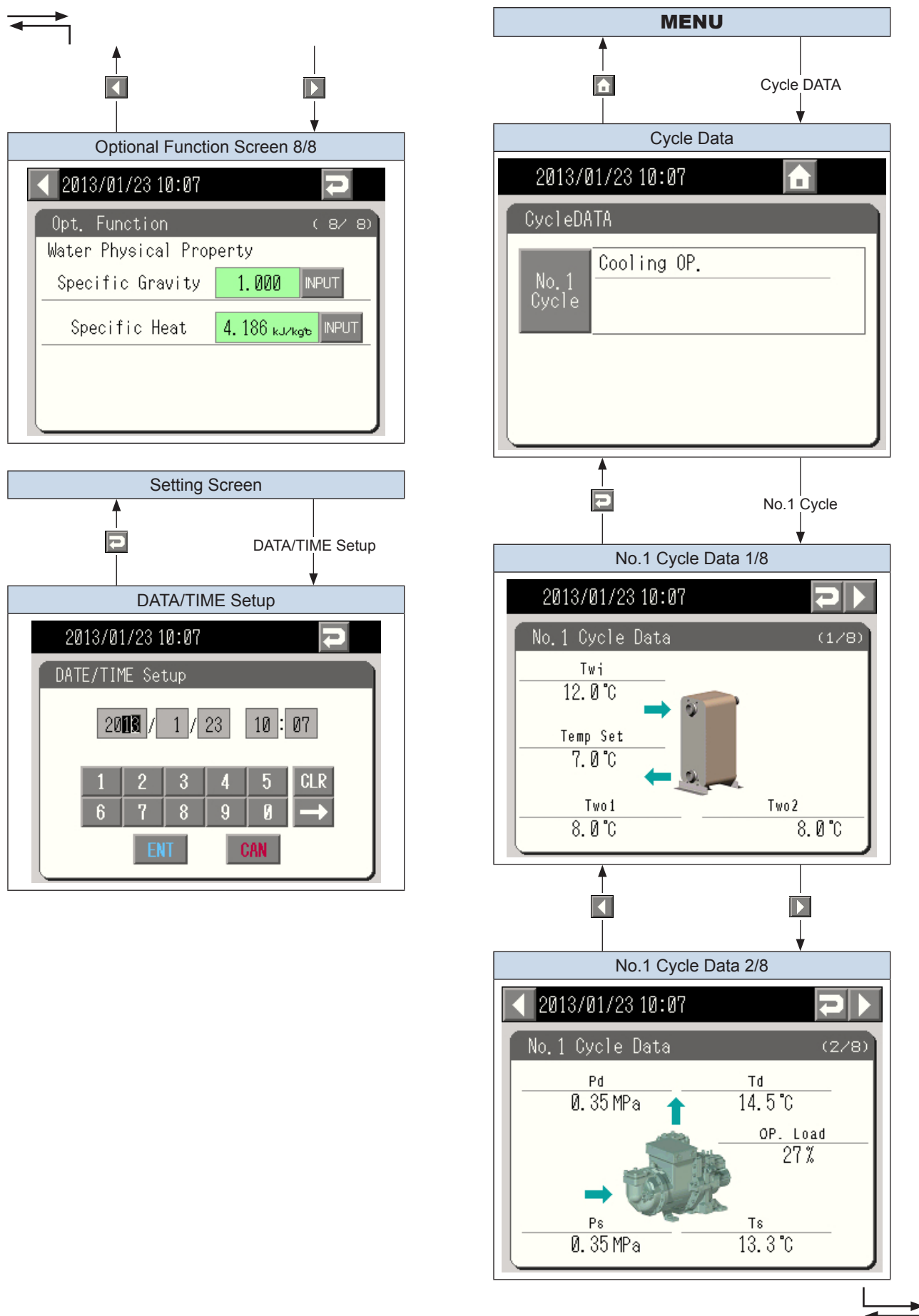


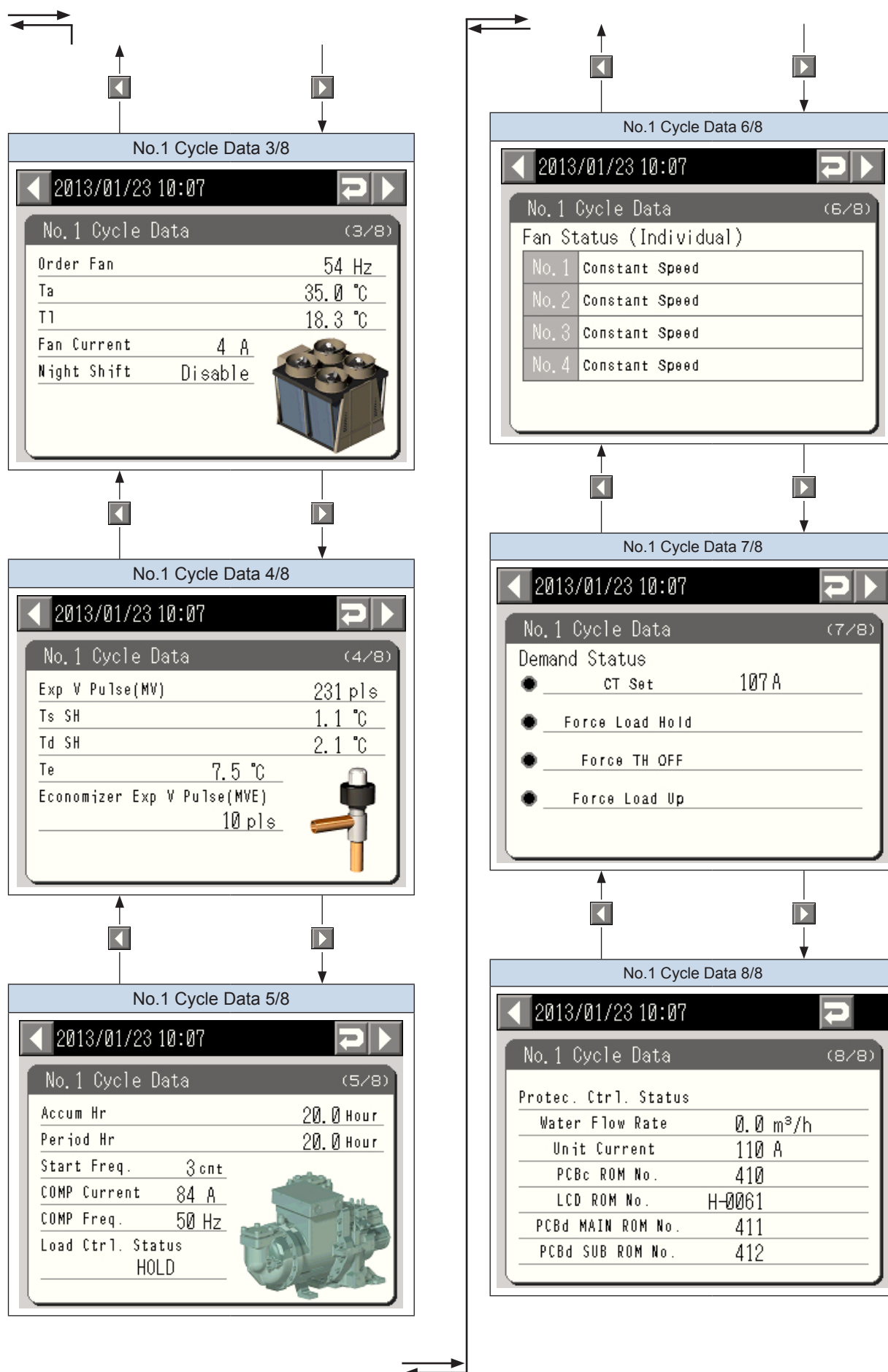
Pictogram description	
	Back to main menu
	Go back
	Next screen
	Previous Screen

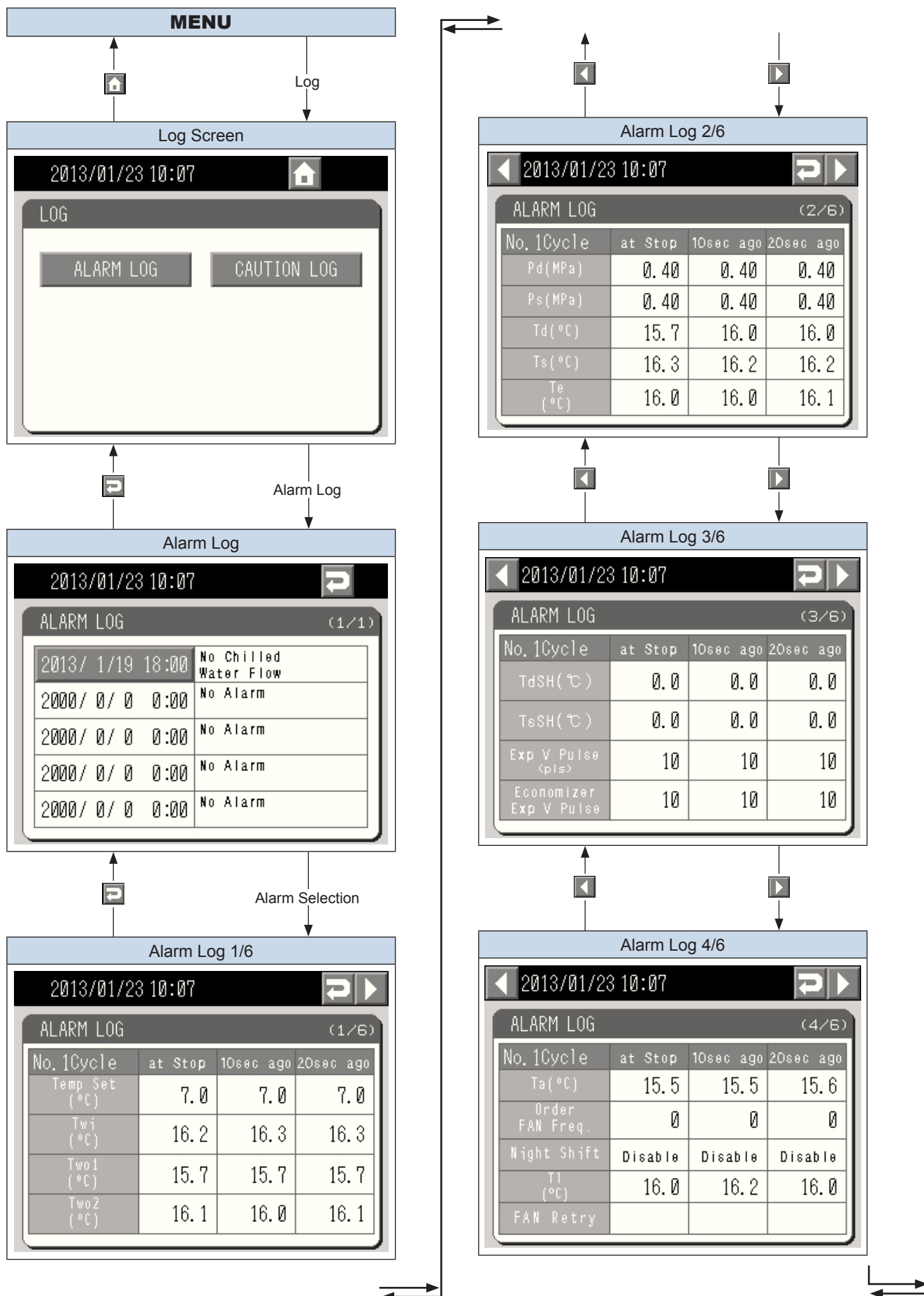


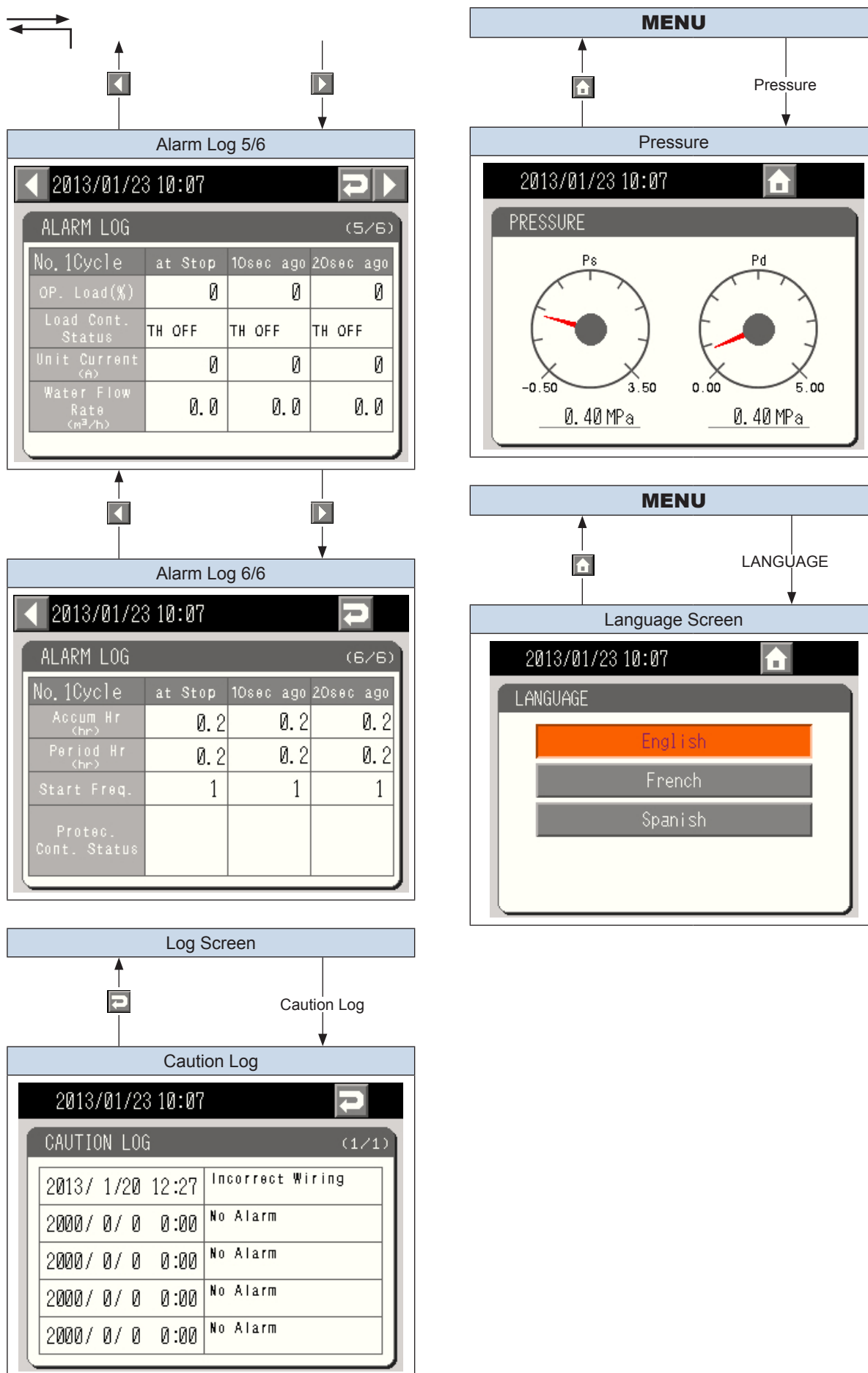




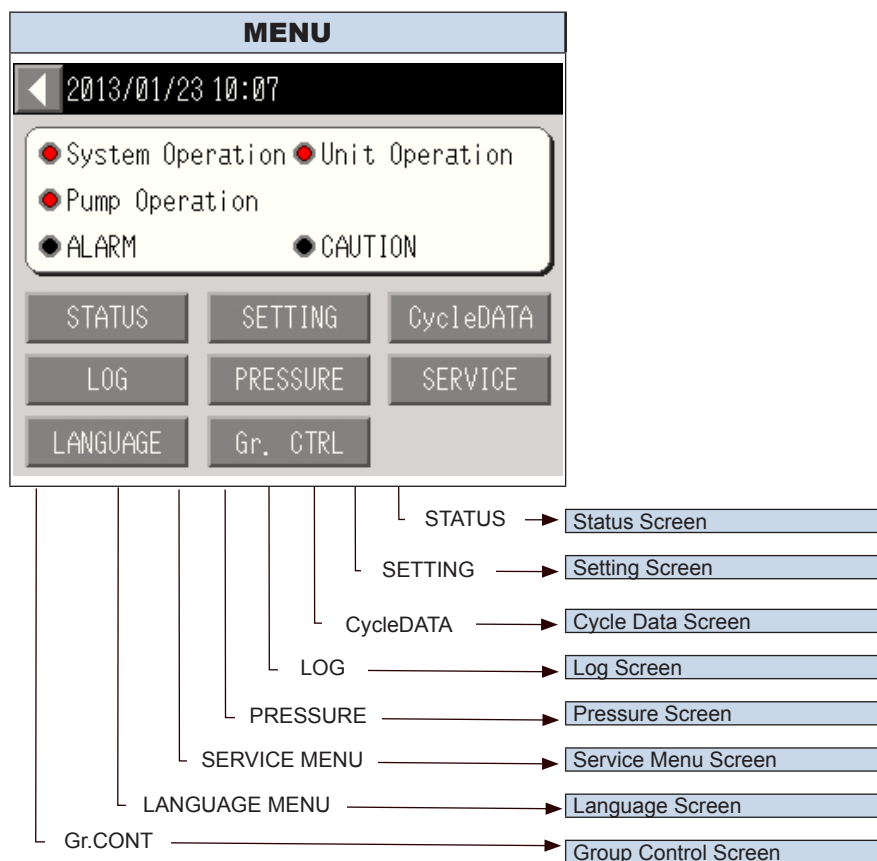






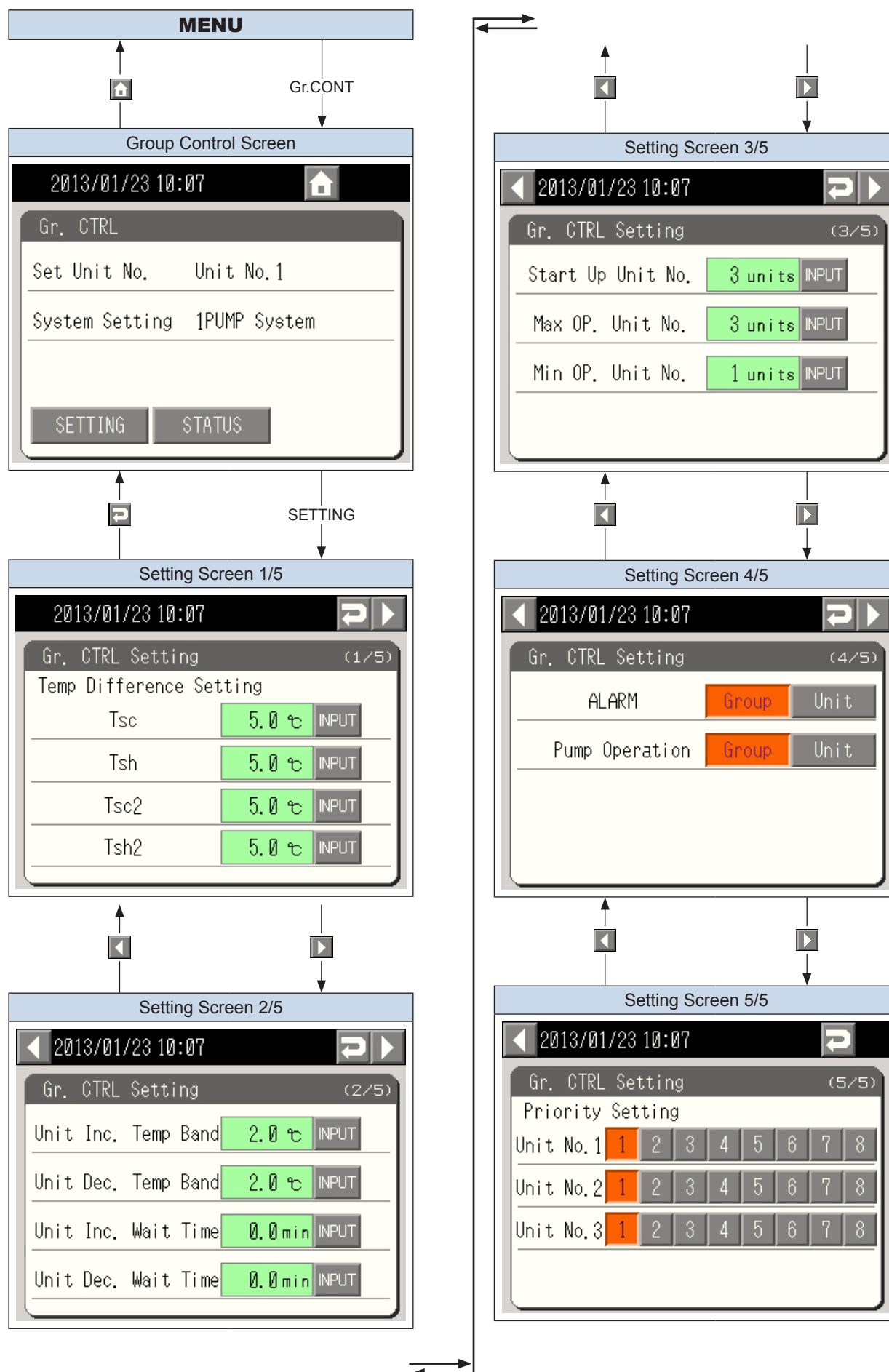


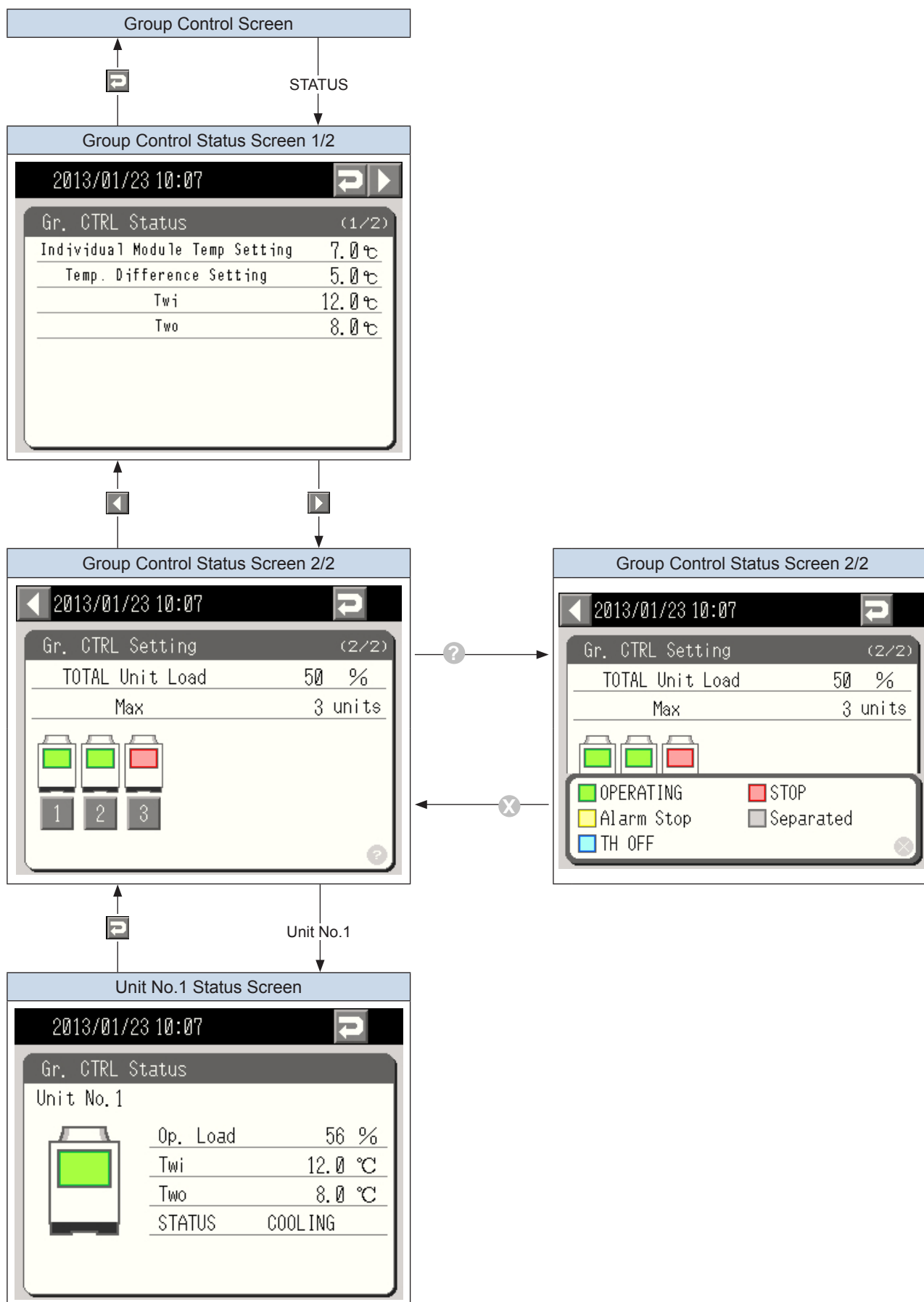
8.4.3 LCD display for 2 or more modules connected. Group Control option is enabled



NOTE

Some values cannot be edit during operation, stop the modules to be able to change.





9. Self-Inspection Functions

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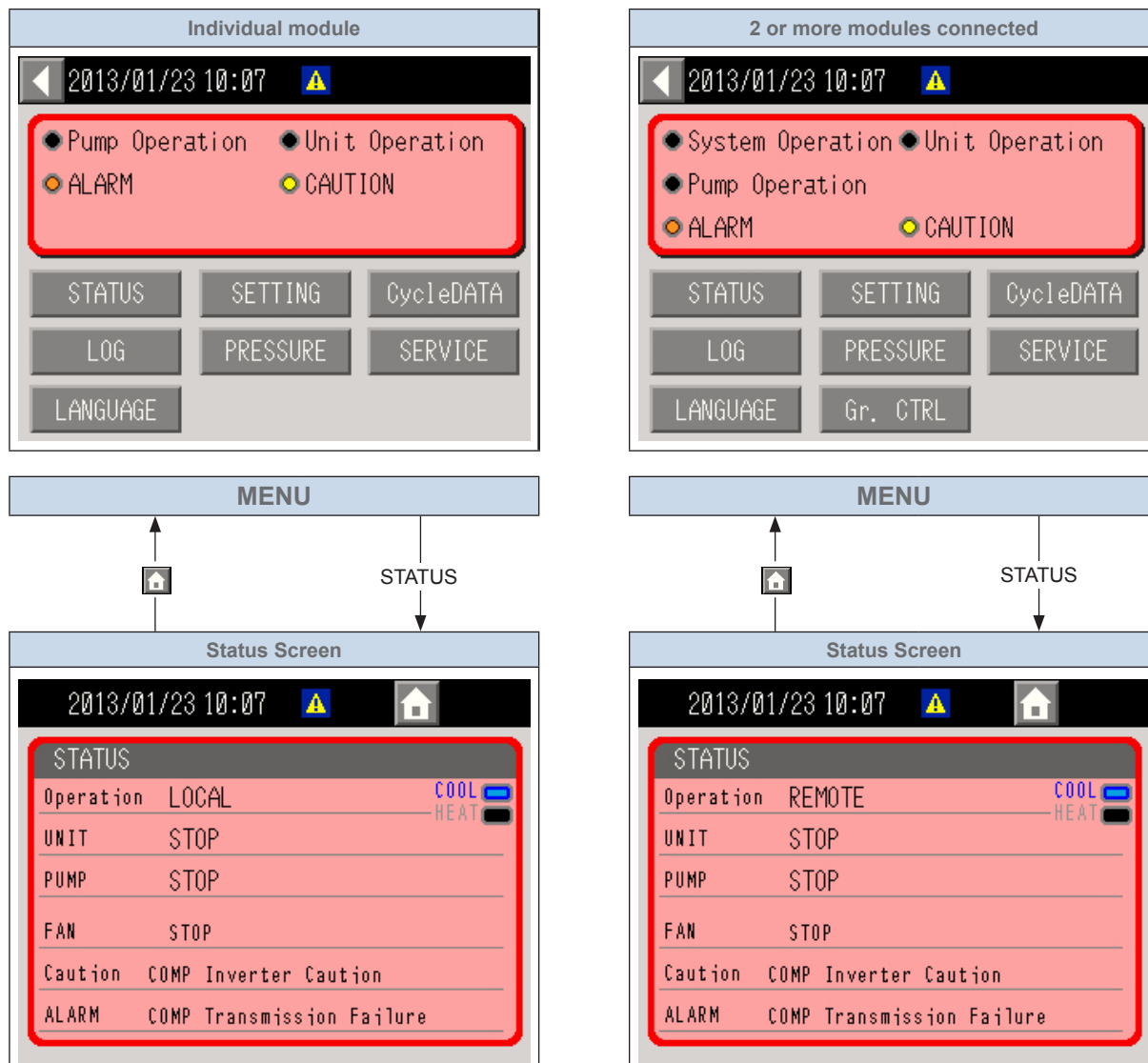
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9.1 Alarm Indication

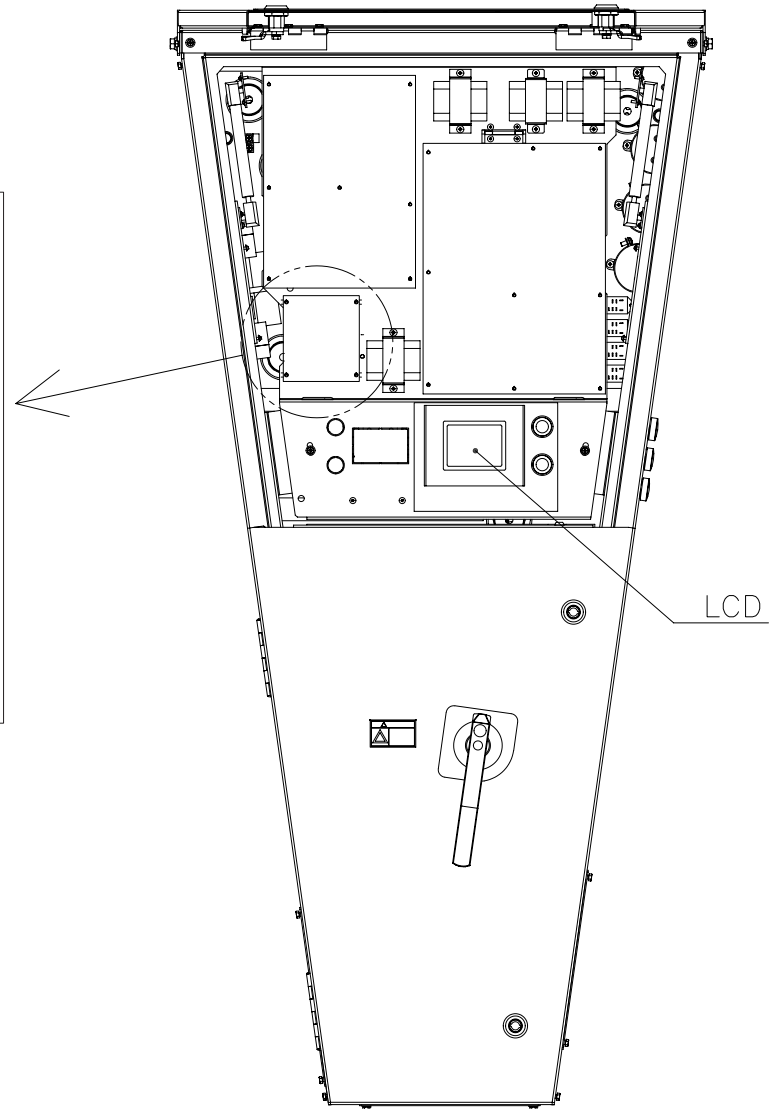
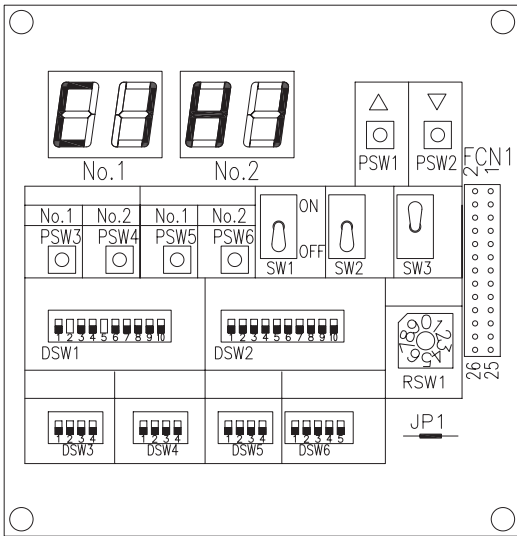
◆ LCD

If the unit is operated under abnormal conditions, an alarm code (refer to the table below) is indicated on the LCD Alarms Screens. The "Alarm" lamp will be lighted and LCD Screen is lighted in red.



◆ **7-Segment display**

7-Segment on PCBa shows the Alarm code as follows:



9.2 Alarm list

Status Indication		Content
7-segment	LCD Screen (n : module number)	
	High Pressure Switch	Activation of high pressure switch
	Excessively High Pd	Discharge pressure (Pd) becomes higher than 1.92Mpa
	Low Ps Protection Control	Excessively low pressure
	Low Ps Protection Control	Activation of low pressure protection control
	Activation of FAN Internal TH	Activation of fan internal thermostat (Option)
	COMP Over Current	Activation of thermal relay for compressor or Malfunction of auxiliary relay ARn
	Excessively High Td	Activation of discharge gas thermistor
	Activation of Comp Internal TH	Activation of compressor internal thermostat
	Excessively Low Cooler IN Temp	Excess low temperature of cooler inlet refrigerant. Refrigerant undercharge detection
	Excessively Low Ts	Activation of suction gas thermistor
	Failure of Te THM (CN29)	Cooler inlet THM abnormality (CN29)
	Failure of Td THM (CN26)	Cooler Discharge gas THM abnormality (CN26)
	Failure of TI THM (CN24)	High Pressure Switch (CN24)
	Failure of Two2 THM (CN25)	Outlet rear side THM abnormality (CN25)
	Failure of Ts THM (CN27)	Suction gas THM abnormality (CN27)
	Failure of Pd Sensor (CN31)	Discharge pressure sensor abnormality (CN31)
	Failure of Ps Sensor (CN32)	Suction pressure sensor abnormality (CN32)
	Failure of CT sensor	Current sensor abnormality (CN36)
	FAN Number Setting	Incorrect DSW setting of fan number
	FAN Over Current	Fan overcurrent relay
	I/O Internal TransM Failure	I/O internal transmission
	CPU-I/O PCB TransM Failure	PCBs connection abnormality or incorrect DSW setting
	Failure of Start Circuit	Failure of auxiliary relay for starting
	Failure of Power Supply Phase	Phase abnormally (reverse/open phase)
	Failure of Twi THM (CN4)	Water inlet temperature thermistor abnormality (CN4)
 	Failure of Two1 THM (CN5)	Water outlet temperature thermistor abnormality (CN5)
 	Alarm of Freeze Protection	Activation of freeze protection control
 	Excessively High Water Temp	n/a (only shown in Heat Pump models)
	Failure of Ta THM (CN6)	Failure of ambient temperature thermistor (Open / Short) (CN6)

Status Indication		Content
7-segment	LCD Screen (n : module number)	
<i>2C-2C</i>	Failure of System W 1 THM(CN13)	Water supply header temperature thermistor
<i>2d-2d</i>	Failure of System W 2 THM(CN14)	Water return header temperature thermistor
<i>5P-5P</i>	PUMP Transmission Failure	No feedback signal from water pump
<i>40-40</i>	Incorrect setting Incorrect Operation /(**) Incorrect Setting of Gr. Control Incorrect wiring	Incorrect DSW setting Incorrect operation (switch during operation) Incorrect DSW setting Wrong transmission wiring (between modules/group)
<i>PU-PU</i> Flickering	Excessively High Water Temperature	Excessively High inlet Water Temperature
<i>F 1-11</i> <i>14(*)</i>	No.n FAN Short Circuit Detection	Fan Earth Detection. Ground.
<i>F 1-21</i> <i>24(*)</i>	No.n FAN Error No.n FAN Over Current Alarm No.n FAN Fin Temp High Alarm.	Fan error detection Fan overcurrent Fan fin temperature increase
<i>F 1-41</i> <i>44(*)</i>	No.n FAN Transmission Error	Fan transmission abnormality
<i>F 1-51</i> <i>54(*)</i>	No.n FAN Low Voltage Alarm No.n FAN High Voltage Alarm	Fan undervoltage Fan overvoltage
<i>F 1-81</i> <i>84(*)</i>	No.n FAN Current Sensor Error	Abnormality in current detection circuit
<i>6E-6E</i>	No Chilled Water Flow	Cold water suspension
<i>6C-6C</i>	No Condenser Water Flow	Insufficient volume of water.
<i>F 1-P7</i>	All Fans Abnormal Retry	All fans simultaneously stopped
<i>F 1-P8</i>	Fan Low Voltage Retry Fan High Voltage Retry FAN Transmission Failure Retry	Undervoltage / Overvoltage / Transmission abnormality

(*) The right 7-segments display indicates the fan number (1, 2, 3 or 4)

(**) /Remote>Local

/Local>Remote

/Cool>Heat

/Heat>Cool

/Remote OP.

/Local OP.

/Group Control

9.3 Cautions list

This function addresses issues which are not a failure serious enough for an alarm-stop, but are stored to an external output and alarm history as an alarm as well as to warn the customer. Also, in case of a caution, the following activation

- Display warning mark in the LCD Screen (caution are not shown in the 7-segments display).
- Store the details in the warning history is applied.

No.	Name of warning	Content
1	Abnormality of each sensor	Sensor Abnormality
2	Based on Pump operation Over-increase of water temperature	Control to Prevent Water Over-temperature
3	Freeze Protection	Freeze Protection
4	Number of Compressor Run/Stop	COMP Run/Stop Frequency
5	Failure of 1 Fan	Fan Inverter Abnormality
6	Compressor Overhaul Period Approaching	Overhaul Period
7	CPU-I/O Transmission	CPU-I/O Transmission
8	Transmission of Control of Number of Units	Transmission of Control of Number of Units
9	Incorrect Setting of Control of Number of Units	Incorrect Setting of Control of Number of Units
10	Insufficient Number of Operating Units	Insufficient Number of Operating Units

9.4 Retry control list

Status Indication		Content
7-segment	LCD Screen	
C 1-P6	Ps Retry	Retry due to Suction Pressure Decrease
C 1-P6	Ps Retry	Retry due to Suction Pressure abnormality
C 1-P6	Cooler Inlet Retry	Retry due to Cooler Inlet Refrigerant Temperature Decrease
C 1-P6	Ts Retry	Retry due to Suction Refrigerant Temperature Decrease
C 1-P5	Td Retry	Retry due to Discharge Refrigerant Temperature Over-Increase
C 1-P5	49C Retry	Retry due to Internal Thermo Activation
C 1-P2	Pd Retry	Retry due to Discharge Pressure Over-Increase
C 1-PP	52C Retry	Retry due to 52C Release

9.5 Protection list

Activation Status Display		Priority	Protection Control Name
7-Segment	LCD Screen		
U1-P3	Current Limited	1	Overcurrent Protection
U1-P0	Differential Pressure Limited	2	Differential Pressure Protection
U1-P6	Outlet Water Temperature Limited	3	Outlet Water Temperature Decrease Prevention
U1-P2	Discharge Pressure Over-Increase Limited	4	Discharge Pressure Over-increase Prevention
U1-P6	Suction Pressure Decrease Limited	5	Suction Pressure Decrease Prevention
U1-P6	Cooler Refrigerant Temperature Limited	6	Cooler Inlet Refrigerant Temperature Decrease Prevention
U1-P5	During frost formation limitation	7 (*)	Heating frost formations limitation
U1-P6	Compressor coil temperature over-increase prevention	8 (*)	Compressor coil temperature over-increase prevention
U1-P7	During cycle standardization	9 (*)	Cycle standardization control

(*) for continuous control models

9.6 Normal Indication

Status Indication	Content
7-segment	
C1-BB	Power Supply, After Stoppage
C1-Co	Cooling Operation
C1-oF	Stoppage by Thermo-OFF
PU-PU	- Waiting for pump interlock signal - Inlet water temp. - Outlet water temp. > 2°C - Waiting for start, depending on the timer settings of the module starting up immediately before. (*)
C1-Ct	Activation of Current Limiter
C1-E0	Initializing Electronic Expansion Valve

(*) The 7-segment display of a given module changes its indication to PU-PU when the module which is starting up immediately before it shows C1-oF on its 7-segment. The length of PU-PU display in a given module may vary depending on the timer settings of the module starting up immediately before it.

This means that when the indication in the 7-segment display of a given unit becomes C1-oF, the 7-segment display of the unit appointed to start up next by means of the master/slave control shows PU-PU.

10. Test run

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10.1 Previous starting check

Before starting, see chapter [Installation](#)



CAUTION

- Check to ensure that valves are correctly opened. If not opened, serious damage will occur to the compressor due to an abnormally high pressure.
- Switch On the main power switch, and energise the oil heater for 12 hours before start-up, to sufficiently warm the oil.



DANGER

- **Never operate the unit without all covers and guards assembled. It could provide access to unit parts with risk of trap, burn or electric shock.**
- **Due to safety reasons, it is recommended to operate the unit remotely with the doors of the electrical box closed. Switch OFF main switch (MI) for any work inside electrical box. Keep electrical box cover closed 2 min. after switching power off (to discharge the capacitors).**

◆ Tools and instruments

- High Pressure Compound Gauge. Low Pressure Compound Gauge. Electrical Tester and General Tools.
- Remove the foreign particles and substances from the water piping, without going through the water coolers and clearing the water strainer filter before running. Check to ensure that no foreign particle and substance exists in the water piping

10.1.1 Cabinet

1 External as well as internal	• Confirm that there has been no damage caused during transportation or by installation works, externally as well as internally. • Remove and clean any dust and foreign bodies, etc. • Check each screw and washer to see if they are loose, and use a driver or a spanner to tighten them if necessary. • Confirm visually that there is no peeling at the thermal and acoustic insulation materials, tapes and attached labels.
2 Air-side heat exchanger	• Confirm visually the state of dust adhered to the fins. In case there is excessive dirt, clean with a fin cleaner.
3 Fan part	• Make the fan rotate slightly with the hands or a stick, and check the following. Pay attention to any rattle or abnormal noise while conducting the inspection. • Abnormalities and deformations at the fan or the fan protective net • Smooth rotation of the fan • Looseness of screws (in particular, inspect any looseness in the fixation of the shaft and the propeller fan)

10.1.2 Refrigerant system

1 Cycle in general	• Check each screw to see if they are loose, and use a driver or a spanner to tighten them if necessary. • Use a foaming agent or a leak tester (for R134a) to check gas leakage, and pay special attention to flange, screw hole and flare parts.
2 Compressor	• Confirm visually that there is no gas leakage or bleeding from flanges, etc.
3 Fusible plug	• Confirm visually that there are no abnormal bulges in the fusible plug.
4 Stop valve of refrigerant liquid line	• Confirm that the stop valve of refrigerant liquid line at the outlet side of the air-side heat exchanger is fully open.



NOTE

- When checking refrigerant leakage, please do not use general household detergents with uncertain substances as a foaming agent.

10.1.3 Electrical system

1 CB / Fuse	Confirm visually that the capacity and size of CB is the suitable or a fuse with a suitable capacity is inserted.
2 Electrical equipment	- Check the looseness of each screw of attached parts as well of wiring connection parts, using a driver. - It is necessary to conduct this inspection with scrupulous care, since looseness in the attachment of wiring connection parts would generate heat by resistance in contact, leading to damage of the equipment. - Confirm that the insulation resistance value of the electrical device circuit exceeds DC500V, and that total insulation value exceeds 1MΩ. - In case that the value is lower than 1MΩ, it means that there is a failure of the insulation of the electrical equipment, and operation shall not be conducted.
3 For compressor Motor	Conduct a check of insulation failure. Do not conduct operation in case that total insulation value at DC500V is lower than 1MΩ.
4 Fan Motor	Conduct a check of insulation failure. Do not conduct operation in case that total insulation value at DC500V is lower than 1MΩ.
5 Internal wiring	- Confirm touching directly with the hand that there is no disconnected or loose wiring. - Confirm that coating insulation parts are not damaged. While doing so, please pay attention not to touch with wet hands, or to directly touch with the hand parts of the unit that might be hot or the edge of metal plates.
6 Local wiring	- Confirm that earth wiring is correctly installed, and use a tester to check that it is not disconnected. - Confirm that R, S, T phases are correctly connected, using a reverse phase detector. - Confirm the capacity of local wiring. If wiring capacity is insufficient, heat will be generated when screws are loose, and voltage drop will become large.
7 Electronic Expansion Valve	Confirm that the convex part of the coil of the electronic expansion valve fits into the concave part of the main unit of the electronic expansion valve.
8 LCD Device	- Confirm that it is easy to see and that no display is lacking. - Confirm that the date and time are set up correctly in calendar and timer.

10.1.4 Water cycle

1 Water quality control	- Conduct a water-quality test. - See “11.20 Water quality control” for the reference values.
2 Water pipe	- In case that there is no (locally supplied) strainer attached next to the chiller unit, then attach the simple strainer (supplied with the product as an accessory). - In case that the attachment method of the cold water circulation pump is bad, cold water pipes are long, and fixation is not reliable, there is the risk to produce abnormal noise or vibration. Inspect and confirm carefully, paying special attention to noise and vibrations. - There is the following method for confirmation: - Open the inlet and outlet cold water valves, and run water into plate heat exchanger and cold water pipes. - Remove the air in the water pipes from the air extraction plug or the automatic air extraction valve, while operating the cold water circulation pump. - Keep the cold water circulation pump operating for a while and confirm that there is no water leakage, abnormal noise or vibration. - Remove the simple strainer (supplied with the product as an accessory). - Perform the extraction of air from the pump and insertion of water into the pumps in the entire system. - Perform the check for water leakage points in the entire system. Please take into account that uneven clamping or the trapping of foreign bodies may cause water leakage in Victaulic joint connections. - Confirm that the valve is open. The diagram illustrates a valve assembly on a pipe. A circular valve handle is shown with 'OPEN' and 'CLOSE' markings. An arrow points to the handle with the label 'VALVE OPEN'. Below the handle, a label 'OPEN/CLOSE STATE' points to a small circular indicator that shows 'OPEN'. To the left of the valve, a label 'OPEN/CLOSE DIRECTION' points to the handle's rotation. To the right of the valve, a label 'TYPE OF FLUID FLUX DIRECTION' points to an arrow labeled 'WATER' indicating flow direction. - Confirm that a locally supplied strainer (mesh equivalent) is attached to the cold (hot) water inlet/outlet pipes next to the chiller unit. Also, when conducting the inspection at the beginning of the season, check if there are dirt or foreign bodies in the strainer, and remove them in case that it was clogged.
3 Water temperature	There is no impediment to exceed the limits of water temperature for continued usage, given that it is for a short time. However, depending on facilities such as water tanks, there are cases in which the operation of the chiller unit may be hindered when exceeding usage limits for more than 30 minutes at a time.

10.2 Check before test run

- Please turn on the power source switch 12 hours before starting operation. It is necessary to supply electricity to the oil heater.
- Confirm that water leak testing and extraction of air have been performed on water piping. Also confirm the existence of water leakage.
- Confirm that the stop valve of refrigerant liquid is fully open.
- Confirm that power supply voltage is within $\pm 10\%$ of the rated voltage. Also confirm that the unbalance between voltage phases remains within $\pm 2\%$.
- Ensure that all covers and guards are correctly assembled.
- Open the water inlet and outlet valves.
- After assuring that all control switches have been cut OFF, switch on the handle on the electric box to supply electrical power (white lamp at the right side of the electrical panel is ON).
- Start the cycle operation locally, by pressing white ON button on the panel, or remotely by the provided actuator (green lamp at the right side of the electrical panel is ON).
- Compressor will start to run approximately 3 minutes after switch ON (if desired, check setting configuration to increase compressor starting delay. Chapter [Controller Adjustment](#)).
- Ensure that the displayed data in LCD are within the working range (consult to the HITACHI technical service).
- Set the desired water temperature on LCD.

10.3 Start test run operation



NOTE

- *A loud sound occurs when this compressor is stopped after the normal operation. However, this sound indicates no abnormalities and stops within a few seconds by the activation of the check valve. This sound is due to the reverse rotation of the screw rotors, resulting from the pressure difference between the discharge and the suction pressure.*
- *Each compressor may show the different values of running current due to individual capacity control for each compressor. This is not abnormal.*

When installation is completed, perform test run according to the following procedure, and hand over the system to the customer. Perform test run regarding the units one by one in order, and confirm that the electrical wiring and the water piping are correctly connected.

Do not operate the system until all the safety notes have been cleared:

Test run should be performed as follows:

- 1 Fully open the liquid line stop valve on chiller.
- 2 Check that compressor fuses are not blown. Check that also fuses protecting power fans and control circuit are not blown.
- 3 Check correct phase connection. Each rotation direction of two rotors in the compressor is fixed so that a reversal phase protection device is equipped. However, the rotation direction should be checked as follows: Confirm that phases R/L1, S/L2 and T/L3 are correctly connected. If not, the compressors do not start due to the activation of the reverse phase protection in chiller control. Switch off electrical power into the power supply cables and exchange two of the three phases on the Main Switch terminals at the field connection side of the unit.
- 4 Switch on Main Switch (MI) to electrical power supply.
- 5 Switch on the field-supplied water pump. Check the correct pump operation.
- 6 Check to ensure that the chilled water flows sufficiently.
- 7 Operate other auxiliary equipment such as fan coil units and air handling units and check they operate properly.
- 8 Compressor oil should be heated before compressor starting. Keep 12h compressor crankcase heater operating before compressor starting every time after long time of chiller power off.
- 9 Set the desired water temperature on the LCD.
- 10 Depress the "ON" push button. The condenser fans will start to operate and the compressor will be started. (The minimum and standard starting delay time is 3 minutes, for more delay check chapter [Controller Adjustment](#)).
- 11 Check the rotation direction of the condenser fans.
- 12 Check to ensure that the water temperature control works properly.
- 13 Check to ensure that the control and protection devices work properly.

14 Confirmation of standard operation pressure

Stop operation once, and startup again after 3 minutes have passed. Operate the compressor for approximately 15 minutes, and confirm that the displayed values of low and high pressure are correct.

15 Gas leakage check

confirm that there is no gas leakage.

Test run can be also performed without compressor operation as follows:

- 1 Ensure that the Main Switch is OFF.
- 2 Remove the compressor fuses (PFC)
- 3 Follow the previous Test Run procedure except point 9. In order to operate the unit without compressor, push both ON and OFF buttons at the same time for 3 seconds.

10.4 Resumption of test run

After confirming all the items of test run from the beginning to the end, please restart operation and inspect the confirmation items for test run in the following table:

Item	Check point	Criteria and instructions	Notes
Operation Operation register	1 Voltage	Instant voltage upon compressor startup ... Higher than (Rated voltage -15%) Operation voltage ... (Within rated voltage ±10%) Voltage phase unbalance ... Within 2% In case that it is inevitable, it can also be within 3%.	Voltage unbalance alters greatly the current value of each phase.
	2 High pressure	See chapter “10.10 Normal operating pressure (cooling operation)”	
	3 Low pressure		
	4 Suction air (Outdoor) Dry bulb temperature Wet bulb temperature		
	5 Cold water inlet temperature		
	6 Cold water outlet temperature		
	7 Activation temperature of the cold water thermostat	Confirm activation temperature by changing setting temperature.	
	8 Compressor start/stop frequency	Less than 6 times per hour, with operation time longer than 5 minutes Confirm.	
Refrigerant System Cycle in general Compressor	1 Are there any abnormal vibrations or points of contact in pipes and capillaries, etc.?	Confirm visually.	Special attention is required in intermediate periods
	2 State of frost formation on compressor	Confirm that frost formation is not abnormally excessive.	
Electrical system Electrical equipment	1 Is electrical equipment (relays, etc.) operating correctly?	Unreliable operation such as howling, sparking or chattering confirm that these do not occur.	
	2 Is the operation time of timers correct?		
Water cycle pump	1 Is there any abnormality in discharge water pressure or operation noise?		When it is necessary to adjust the quantity of water, please adjust it at the discharge side of the pump.
	2 Is there clogging in the strainer?	Is there dirt or any foreign body clogging the strainer? Inspect again (for the locally installed strainer).	
	3 Detachment of simple strainer from the cold (hot) water inlet part	The strainer supplied with the product as an accessory is a simple strainer with a small mesh surface, intended to capture the dirt and foreign bodies between the locally installed strainer and the product. Please remove it after letting water pass trough before the test run.	

10.4.1 Inspection of the high pressure inspection device

To confirm the activation of the high pressure switch:

Operation Mode	Switch on the setting PCB (SW2=LOCAL / SW3=COLD)
Check Operation	Press PSW3

- When pressing the Pressure cut check switch, the fan is forced to stop, and high pressure increases.
- This activate the high pressure interruption device (Alarm stop).
- After confirmation, please release the alarm by stopping the operation of the chiller together with the recovery operation of the high pressure interruption device.

10.4.2 Inspection of the low pressure inspection device

- Activate operation by means of local operation settings, and put the chiller unit into operation.
- When pressing the following switch on the setting PCB during chiller unit operation, the expansion valve becomes fully open, and low pressure decreases.
- This activates the low pressure interruption device.

Operation Mode	Switch on the setting PCB (SW2=LOCAL / SW3=COLD)
Cooling Operation	Long press of PSW5 button during 10 seconds

Condition for the activation of low pressure interruption device:

Immediate activation when the low pressure pressure sensor detects a pressure of 0.01MPa

10.4.3 Thermostat

It is difficult to inspect the accuracy of operation of a local thermostat, but the following procedure allows a rough confirmation.

- Set the settings of the thermostat to high temperature side, and those for water to low temperature side.
- Read the setting temperature of the thermostat at the time of stopping the compressor, and compare it with the actual measurement of inlet temperature.

10.4.4 Inspection of refrigerant leakage

Tightening may become loose during transportation. Please perform a leakage check of at least 10~15 seconds for each point.

10.5 Stop the unit

Compressors operation is switch off by pressing black button "OFF" inside the electrical panel.



NOTE

- OFF function is always available in both, local and remote control mode.
- Switch OFF the main power source when the unit is shut down for a long time period.

10.6 Performance

Specific installation conditions (load, location, ambient temperature, water, etc...) could require adjusting the water temperature control in order to optimise the chiller performance. (See water system control setting on Chapter [Controller Adjustment](#)).

10.7 Alarms and cautions

In case of abnormal chiller performance check alarms or caution indications on LCD.

When some alarms occur yellow lamp is ON and LCD is red colored. Check troubleshooting for details in Chapter [Troubleshooting](#).

10.8 Periodical checking

- 1 Check the power supply
- 2 Check abnormal sound or vibrations
- 3 Check that the unit amperage is within the range by any ammeter in the LCD
- 4 Check that water circuit parameters are within the range
- 5 Check that refrigerant circuit parameters are within the range.

10.9 Instructions after Test Run

When the test run is completed, please instruct customers about operation and periodic maintenance methods before leaving the unit, by using this manual. A special attention is required to the following caution:

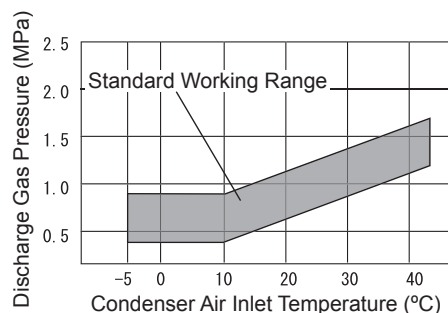
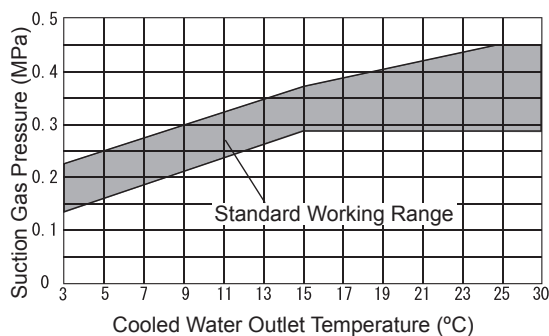


CAUTION

- *Do not cut off the power source switch during the operating season. When the power source switch is cut off, the oil heater for screw compressor is not energised, and the compressor might be damaged due to oil foaming at starting.*
- *When the operation season starts after long disconnection of the power source switch, please turn on the power source switch 12 hours before starting operation.*

10.10 Normal operating pressure (cooling operation)

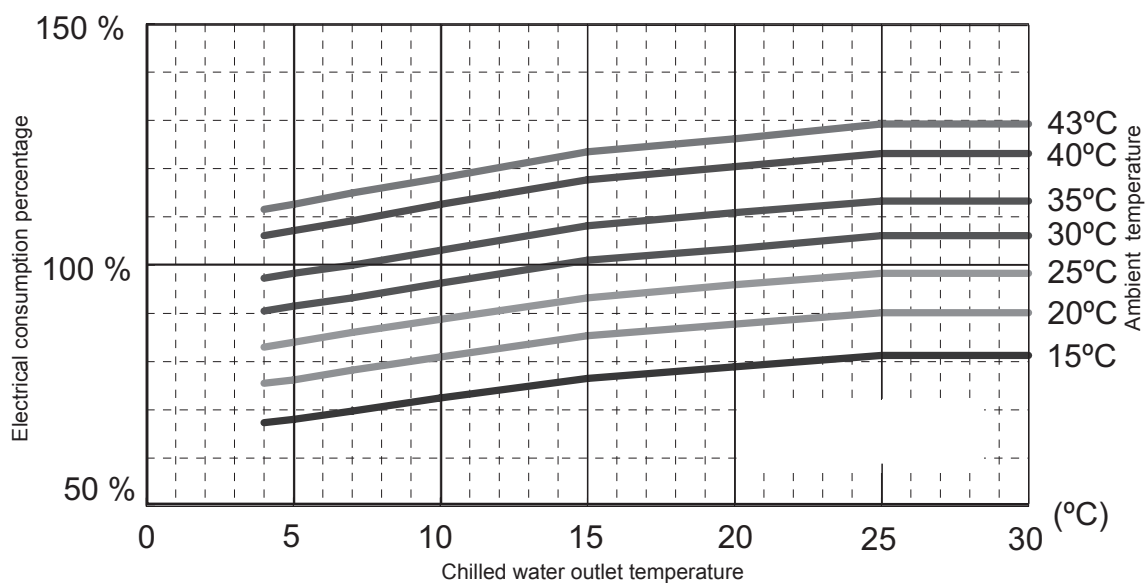
Check to ensure that Chiller is operating within the working range as shown below, after at least 15 minutes operation.



Conditions:

-Compressor: 100% Load

10.11 Electrical consumption percentage



NOTE

Inlet air temperature at dry bulb of the air side heat exchanger 35°C. Cold water temperature 12°C. cold water outlet temperature 7°C.

10.12 Guidance when handing over

When handing the chiller unit over after completion of test run, provide the customer with sufficient explanations from the instruction manual, regarding the essentials of operation and the method of periodical maintenance. Also, please provide particular explanation and guidance on the following items.

- 1 Supply of electricity to the oil heater
Please do not turn power OFF during normal operation, in order to allow supply of electricity to the oil heater. Also, in case of resuming operation after having turned power OFF for a long time, please turn the power supply ON 12 hours before starting operation. The oil heater has the purpose to prevent bad lubrication inside the compressor upon startup, which could cause damage to the bearing or rotor.
- 2 About extraction of water from the pipes
In case of stopping operation of the chiller unit for a long time, please extract the water from inside the pipes of the chiller unit. Please use the water extraction plug and the air extraction plug attached to the cold (hot) water pipes for extraction of water from the chiller unit.
- 3 Freeze protection for winter
During winter, or when outdoor temperature is low, water inside the pump or cold water pipes may freeze when the product is stopped during the night, causing damage to the machinery or the pipes. Please make sure to apply a proper insulation to the pump and water pipes, in order to prevent freezing.
Furthermore, this product has a function to operate the cold (hot) water circulation pump automatically in case that the outdoor temperature decreases while it is stopped. Please do not turn the power supply switch OFF during the season. In case that it is absolutely necessary to turn the power source switch OFF, please extract the water from inside the chiller unit first.
- 4 In the extraordinary event of a fire
 - Please turn all power sources OFF.
 - For extinction, please use a fire extinguisher for oil fire or a fire extinguisher for electrical fire.
- 5 This is not a failure.
 - A noise like that of water flowing can be heard for a while during operation or after stop. This is the noise of refrigerant flowing inside the pipes, and is not a failure.
 - The compressor does not operate, even if operation switch is in operation state, and the thermostat for detection of cold (hot) water temperature is activated. This is not a failure. Compressor starts operation upon thermostat recovery.
 - The rotor inside the compressor sounds as if it was counter-rotating when the compressor stops. This is caused by a temporary reverse flow of refrigerant inside the pipes, and is not a failure.
- 6 In case of refrigerant leakage
The refrigerant used in this chiller unit is a non-flammable, non-toxic, odourless safe refrigerant, but it may still release harmful gases in contact with fire. Also, since the specific weight of this refrigerant is higher than that of the air, there is the risk that it covers the floor and causes suffocation in the extraordinary event of a leakage. Therefore, in case that there is a refrigerant leakage, or in case that irritation is felt on eyes or throat, then stop operation, turn off any fire (turn off stoves, etc.), ventilate the room well and then contact your distributor or a Hitachi customer service centre.
- 7 About operation control, etc.

The instruction manual supplied with the product contains information about common usage method. Operation control may have changed in case that special modifications have been applied by request of the customer. Please instruct the customer to contact the distributor or a Hitachi customer service centre for enquiries regarding methods of usage not included in the instruction manual.

- 8 To ensure a safe use
In order to ensure a safe use, please provide the customer with sufficient explanations about the contents of "To ensure a safe use" on the instruction manual bundled together with the chiller unit as well as those of "Safety summary" on the installation and operation manual, and instruct the customer to read them thoroughly.
 - Safety and applied symbols chapter (12) describe how important notes are identify. BE SURE to follow them as they are important safety information.
 - Please make sure to store the instruction manual at a place where it can be consulted by the end user at any time.

11. Maintenance

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11.1 General notes

The unit should be periodically inspected according to the same items as those described in the paragraph titled [Test Running](#). In order to ensure dependable performance and long life operation, the following additional items should be given for particular attention.



DANGER

- *Do not remove neither unit covers neither guards without disconnecting the power supply.*
- *If a fire accidentally occurs, turn OFF the main switch and use an extinguisher for an oil fire and an electric fire.*
- *Do not operate the unit near flammable gases such as lacquer, paint oil, etc. to avoid a fire or an explosion.*
- *Turn OFF the main switch when electrical box covers are removed for setting the temperature. Do not operate the unit without fixing panels.*
- *Turn OFF main switch (MI) for any work inside electrical box.*
- *Keep electrical box cover closed 2 min. after switching power off (to discharge the capacitors)*



CAUTION

- *Perform periodical maintenance according to the [Instructions](#) to maintain the unit in a good condition.*
- *Do not touch the parts at the discharge gas side by hand, since the pipes at the discharge side are heated by refrigerant and the temperature becomes higher than 100 °C.*
- *Do not utilise this unit for cooling or heating of drinking water or food. Comply with local codes and regulations.*
- *Turn OFF all the main switches if refrigerant leakage or chilled water leakage occurs. Also, if the unit can not be stopped by the control switch, turn OFF all the switches for power source.*

11.2 Components

◆ Compressor

The semi-hermetic screw compressor requires periodic maintenance, including replacement of parts. Contact with your Hitachi dealer for receive proper instructions.

◆ Air-cooled Condenser

Inspect the condenser and remove any accumulated dirt from the coil, at regular intervals. Other obstacles such as growing grass and pieces of paper, which might restrict Air flow, should also be removed.

◆ Electrical Equipment

Always pay careful attention to working voltage, amperage and phase balance. Check for faulty contact caused by loosened terminal connections, oxidised contacts, foreign matter, and others.

◆ Control and Protective Devices

Do not readjust the settings in the field unless the setting is maintained at the point other than the point listed in the table on [Components Data](#) chapter.

11.3 Lubrication

◆ Compressor

The compressors are charged at the factory with the correct oil listed on the compressor nameplate. It is not necessary to add oil, if the refrigerant cycle remains sealed.

◆ Fan Motor

Bearing of all fan motors are pre-lubricated. Lubrication is not required.

11.4 Deposit

Lime and other minerals in the chilled water tend to deposit on surfaces of plates over a long period of operation. As deposits of these minerals increase, excessive lower operation pressure is detected, indicating evidence of deposits on the water cooler.



CAUTION

- *Cleaning of Plate type Heat Exchangers shall be performed by specialists. Please contact your contractor or dealer of HITACHI.*
- *Clean the Water Strainer periodically according to its clogging degree.*
- *It is strongly recommended to clean the Plate Heat Exchanger at the same time the Water Strainer is cleaned.*



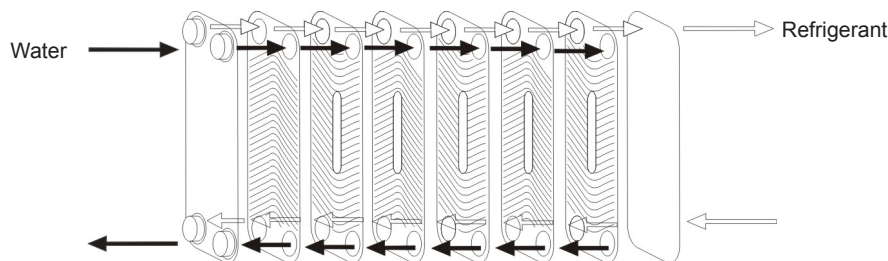
DANGER

- ***This product is equipped with Plate type Heat Exchangers, which are very sensitive of clogging and therefore they could get frozen unless special care is taken.***
- ***For that reason it is recommended to follow accurately the next caution about normal cleaning method. For further details, please contact your HITACHI installer.***



CAUTION

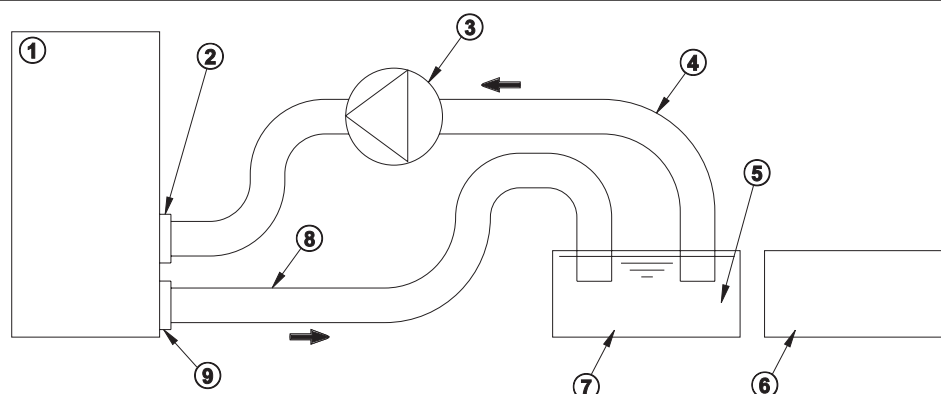
- *Correctly select cleaning agent depending on scales in the plate type heat exchangers. The cleaning chemicals are different depending on fouling degree.*
- *This plate type heat exchanger is made of stainless steel. Do not use a cleaning agent containing hydrochloric acid or fluorine compound. If used, the heat exchanger will be damaged, resulting in refrigerant leakage.*
- *After cleaning with cleaning agent, clean inside of water piping including the heat exchangers by using clean water. Perform water treatment (preventive treatment) in order to prevent the water circuit from corrosion or re-adhering of scales after cleaning.*
- *In the case that a cleaning agent is used, adjust concentration of the cleaning agent, cleaning period and temperature according to the scale degree.*



- *In the case that acid cleaning is performed, neutralisation treatment is required after cleaning. Treatment for neutralisation fluid should be performed by a waste fluid contractors.*

The cleaning agent and neutralising agent have erosiveness and stimulativeness against eyes, skin, mucous membrane etc. Therefore use protection tools (protection glasses, protection gloves, protection shoes, protection cloth, protection mask, etc.) in order not to absorb or touch these agents during this cleaning work.

11.5 Cleaning Method



Nr.	Name	Nr.	Name
1	Chiller Unit	6	Waste Fluid Tank
2	Chilled Water / Inlet Piping	7	Cleaning Water Tank
3	Acid-resistant Type Water Pump	8	Hose
4	Hose	9	Chilled Water / Outlet Piping
5	Diluted Cleaning Fluid		

- 1 Installation of Cleaning Circuit
 - Stop the water Chiller unit.
 - Stop the circulating water pump.
 - Disconnect the connections at the chilled water inlet and install a circulating water circuit by using an acid-resistant type water pump.
- 2 Check of Circulating Circuit
 - Pour water in the cleaning tank and operate the acid-resistant type water pump.
 - Check to ensure that no water leakage exists.
 - Check to ensure that the water hose is firmly fixed.
 - Check to ensure that the cleaning agent will not damage equipment near the water Chiller even if bubbles occur and touch them.
 - Check to ensure that good ventilation is available.
 - Check to ensure that no abnormal sound occurs.
- 3 Cleaning Work
 - Discharge water in the water circuit of the air conditioning system.
 - Supply diluted cleaning fluid from the cleaning water tank by operating the acid-resistant pump.
 - Circulate the cleaning fluid for an appropriate period of time (the operating time should be determined according to the type of cleaning agent, concentration and fouling degree).
- 4 Waste Fluid
 - Stop the acid-resistant pump.
 - Put the waste fluid into the waste fluid tank.
 - Supply water into the cleaning tank and operate the pump for water cleaning.
 - Put the cleaning water into the waste fluid tank as same as the waste fluid.
 - Measure pH degree by using a pH test sheet and neutralise the waste fluid by gradually adding neutralising agent.
 - After neutralisation ask a waste fluid treatment contractors to handle it.

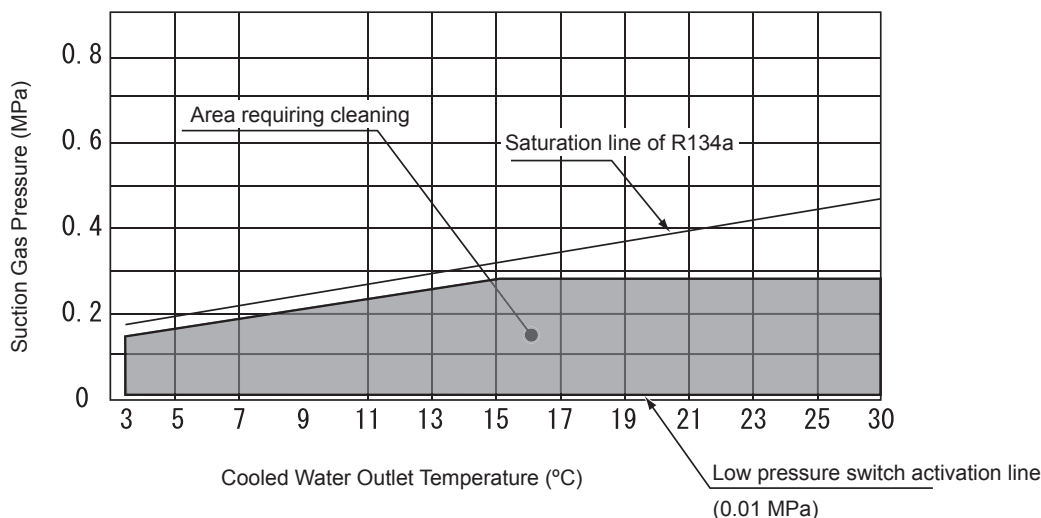
5 Neutralisation Treatment in the Water Piping

- Put water into the cleaning tank.
- Operate the acid-resistant pump after Air-purging.
- Measure the pH degree and gradually add neutralising agent until the pH reaches pH = 7.
- Operate the pump for a specified period of time for neutralisation.
- Discharge the used water.
- Operate the circulating pump and clean the circuit with water until no fouling fluid is observed.

6 Re-starting

Reconnect the water piping as they were so that the water Chiller can operate.

After cleaning, perform water treatment (preventive treatment) in order to prevent the water circuit from corrosion.



11.6 Winter Shutdown

When shutting down the unit for winter, clean the inside and outside of the cabinet, and dry the unit. Pump down the refrigerant to the condenser and close the liquid outlet stop valves. This unit should be covered during shutdown, in order to protect it from dust and environmental conditions. Be sure to tighten the packing glands and the cap nuts of the valves.

Remove the drain plug and drain all residual water from the water cooler piping systems, as such water may freeze during the cold season. It is very helpful to supply brine (anti-freezer) to the piping systems.

11.7 Spring Start-Up

After any extended shutdown period, prepare the unit for operation as follows.

- 1 Thoroughly inspect and clean the unit.
- 2 Clean the water piping lines and the strainer. Inspect the pump and other auxiliary equipment in the piping line.
- 3 Tighten all wiring connections and access panel.



CAUTION

When the main switch for this unit has been at the OFF position for an extended period of time, it should be switched ON at least 12 hours before start-up, so that oil in the compressor discharge casing may be warmed enough, to prevent oil foaming by the oil heater during start-up.

11.8 Part Replacement

Replacement of parts should be undertaken by ordering from the HITACHI Spare Parts List.



CAUTION

Do not replace with spare parts which are not the equivalent.

11.9 Refrigeration Cycle

◆ Strainer

Check for clogging each time when the refrigeration cycle is opened.

◆ Refrigerant Charge

Inspect the refrigerant charge of the system by checking the discharge and suction pressures. Perform a leakage test, if any leakage is suspected, and always perform such a test after a refrigeration cycle component is replaced. When refrigerant charge is required, follow the following instructions given for two cases:

1 When Refrigerant Gas Completely Leaked.

Before charging the entire cycle must be completely evacuated and dehydrated. A gauge manifold or equivalent piping preparation shown in the next page is recommended as a convenient procedure regarding both charging and evacuation.

Fully open all the stop valves.

Connect the evacuation line to the check joints of the high and the low pressure sides.

Completely evacuate the entire cycle with a vacuum pump.

Charge refrigerant to the refrigeration cycle by weighing the charging cylinder. The proper refrigerant charge is listed on the nameplate.

When charging by weight is stopped due to high ambient temperature, close the valve and operate the unit after circulating the chilled water through the water cooler and installing a jumper on the low pressure switch, if required.

2 When Only Additional Refrigerant is Required.

Connect a gauge manifold to check joint of low pressure side, and connect a charge cylinder to gauge manifold.

Operate the unit after circulating the chilled water and install a jumper on the low pressure switch, if required. Repeat the following procedure until pressure becomes proper.

Charge the gas refrigerant a little slowly into refrigeration cycle from check joint for low pressure.

Check the pressure after refrigeration cycle becomes stable.



CAUTION

- *Do not charge OXYGEN, ACETYLENE or other flammable and poisonous gases into the refrigeration cycle when performing a leakage test or an airtight test. These types of gases are extremely dangerous, because explosion can occur. It is recommended that compressed air or nitrogen is charged for these types of tests.*
- *Mineral deposits on water cooler plates act as thermal insulators, and also act as resistance against water flow, causing a decrease of the water flow running through them, and resulting in a decreasing of the cooling capacity. Deposits on the plates should be inspected at regular intervals. Experience with the water Chiller will dictate accurate inspection intervals.*
- *These deposits should be removed by circulating diluted acid through the water passes after the water has been drained. As water in different localities contains different minerals, different acids are required, depending upon the thickness of the deposits.*
- *Compressor operating hours are indicated in the LCD panel. In the case that the total operation time reaches 40,000 hours or 3 years pass after installation, exchange the bearings of the compressor. For details, refer to the Service Handbook for HITACHI Screw Compressors.*

11.10 Compressor Removal

◆ When Removing the Compressor

Remove the compressor while completing the following procedures.

- 1 Collect all refrigerant into a condenser before this work.
- 2 Circulate the chilled water sufficiently through the water cooler, and operate the water Chiller for 10 minutes, and check to ensure that the oil level is maintained at a stable condition.
- 3 Stop the water Chiller and completely close the liquid stop valve.
- 4 Operate the water Chiller after circulating water through the water cooler.
- 5 Stop the water Chiller when the low pressure reaches at approximately 0.05 MPa. Do not operate at a pressure lower than 0.05 MPa. If operated, it will cause a damage to the compressor.
- 6 Wait for several minutes. If the low pressure increases up to 0.45 to 0.5 MPa, repeat the above procedures 5 and 6 four or five times.
- 7 Turn OFF the power supply of the unit and wait 15 min until hot parts become cool.
- 8 After these works above, almost all refrigerant can be collected in the condenser.
- 9 Recover the rest of refrigerant from the water cooler and the compressor.
- 10 Remove the front cover (E-box side) turning the locks (x6) 1/4 and unscrew the 6 screws, 3 on the right side of the cover and 3 on the left side.
- 11 Remove the bolts on the discharge and suction flanges of the compressor.
- 12 Remove all the wiring of the compressor.
- 13 Remove the bolts fixing the compressor.
- 14 Remove the compressor.
- 15 After completing the operation, perform vacuum again and charge refrigerant (check Vacuuming Procedure and Additional refrigerant insertions chapters).



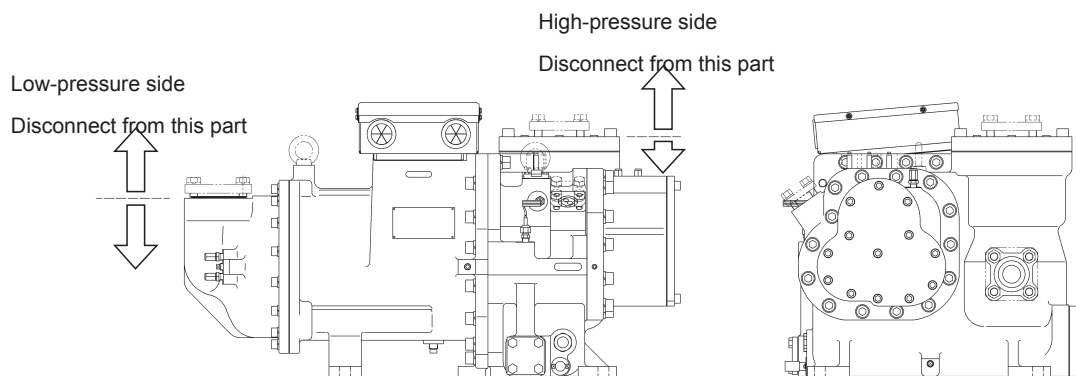
CAUTION

Compressor is heavy, two persons and a portable crane or similar is required.

11.10.1 Overhaul work

Perform the work according to "Semi-hermetic Hitachi Screw Compressor Manual"

When compressor is removed from refrigeration cycle, high pressure part should be separated between projecting part flange of compressor and upper cover of oil separator. Do not be separated between check valve and projecting part flange of compressor, or collected refrigerant is ejected.



11.11 Vacuuming Procedure

Although refrigerant is collected to airside heat exchanger by the above collection operation, it is necessary to be vacuumed due to that refrigerant cycle of low pressure side pipe and of water side heat exchanger are open.

Vacuum should be performed in the stop valve nr. 16 in refrigerant cycle diagram, in 2 positions, one closed to the filter drier and one between the expansion valve water cooler.

◆ Vacuuming procedure is shown in the following.

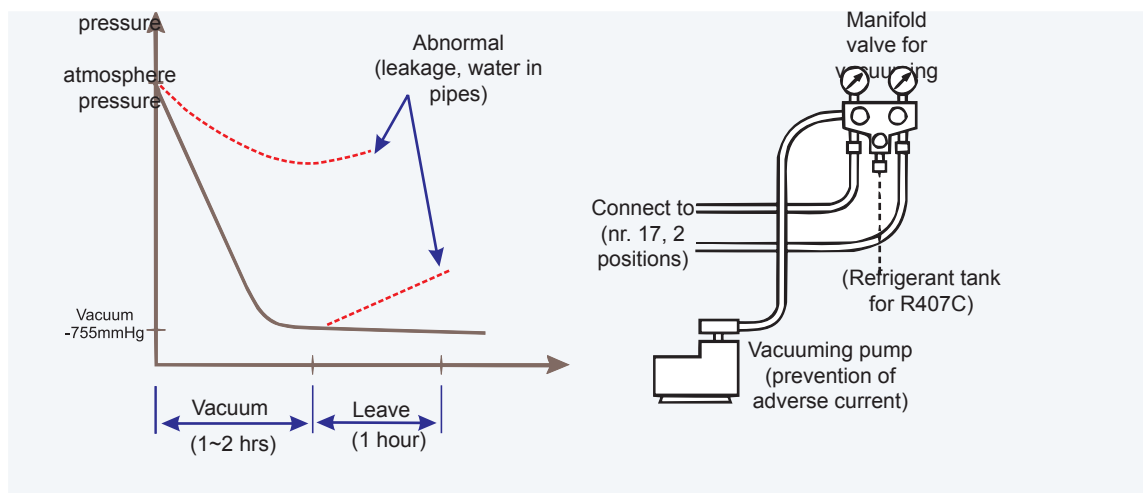
Manifold valve, vacuuming pump and vacuuming gauge for R134a are connected.

Operate vacuuming pump for at least 1~2 hours until vacuum grade be below -755mmHg (5Torr).



CAUTION

If vacuum grade is not decreased to -755mmHg in 1 hour, confirm if there is no leakage or if water is not in the pipes, and then keep vacuuming other 1 hour.



◆ Confirmation of vacuum

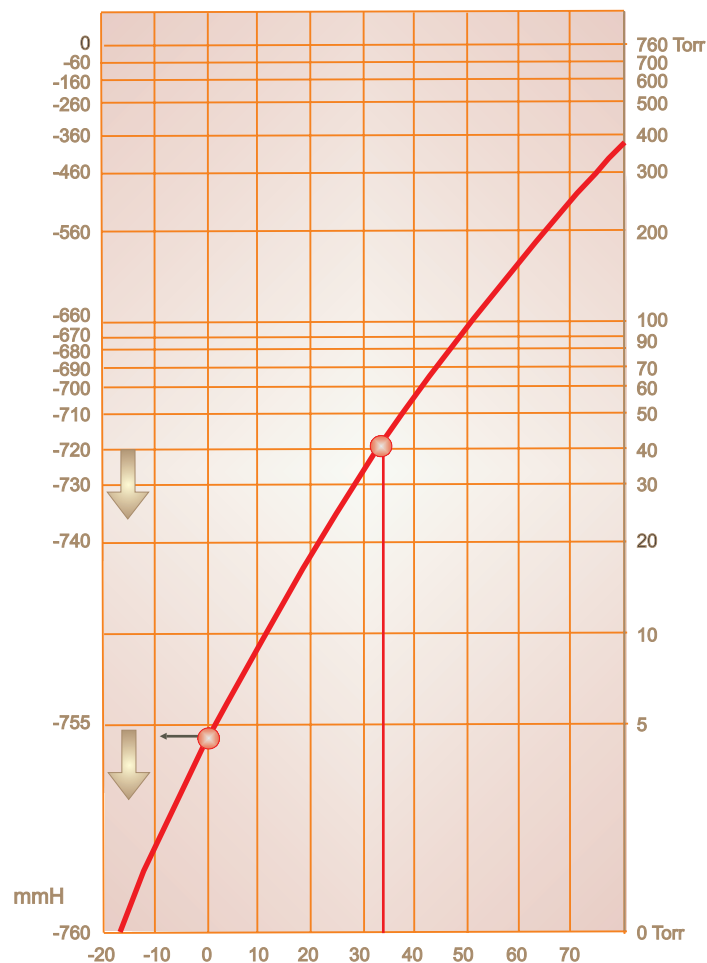
Vacuum gauge should be used to measure a target vacuum, however, it is impossible to read the vacuum gauge installed in the manifold very accurately. It is recommended to use a digital vacuum measure device, available in the market.

◆ Water evaporation

In atmosphere pressure, water boils at 100°C , however, each time a pressure in pipes reaches to a vacuum state, water boils at lower temperature than 100°C .

The lower this temperature is, the more water evaporates and vacuum drying is kept.

If there is a possibility of dew condensation, vacuum (vacuuming time) should be controlled more strictly since water does not evaporate easily and it is difficult to know the degree of dew condensation. It is desirable to control the vacuum grade as a $-755\sim-758\text{ mmHg}$ (5~2 Torr).



◆ Leave

After finishing vacuuming, manifold valve is closed and vacuum pump is stopped, and then leave it for 1 hour to confirm if a pressure measured by vacuum gauge is not increased.

- 1 This process should be performed since air can be leaked due to the negative pressure although air leakage is not confirmed in air tight test.
- 2 In case of increasing pressure, it is possible that there is a slight leakage in some positions. Perform air tight test again, and perform vacuum drying again after repaired.

11.12 Additional refrigerant insertion

According to the refrigerant characteristics, the followings should be taken into account.

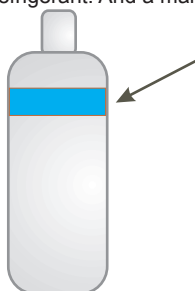
- Refrigerant should be added in liquid state not in gas state.
- Confirm if the tanks are specialised for R134a.
- The valves or hose for charge should be specialised for R134a.

◆ Confirmation of tank

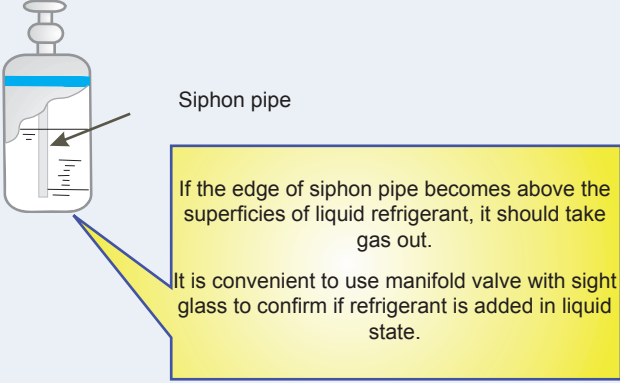
- 1 Painting color is different from types of refrigerant. And a mark stamped in inspection also serves for the confirmation of refrigerant.

Painting color:

R134a: Blue



- 2 The refrigerant tank has two specifications as shown in the below. In any case, liquid refrigerant should be added.

The same structure as conventional tank. <no siphon pipe>	Tank specialized for R407C <with siphon pipe...Label attached>
	
Do not add refrigerant while being stand	It is possible to add refrigerant while being stand

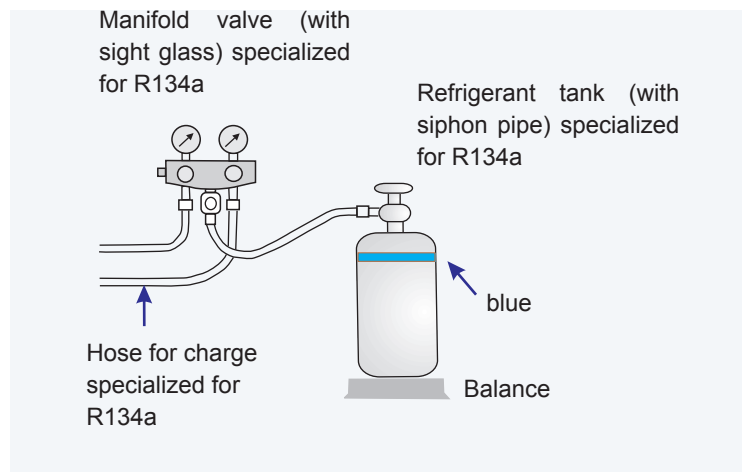


NOTE

Specification of connection screw for R134a is UNF7/16

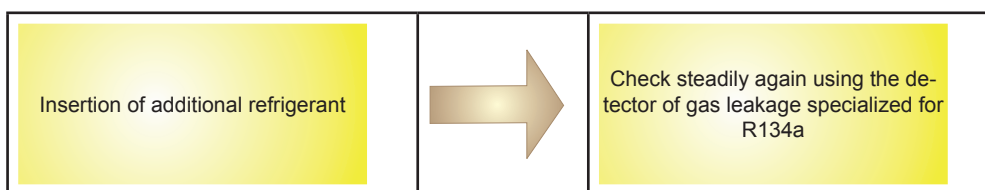
◆ Procedure for refrigerant insertion

Refrigerant charge should be performed in the stop valve nr. 17 in refrigerant cycle located before filter drier (nr 5 in the refrigerant cycle diagram)



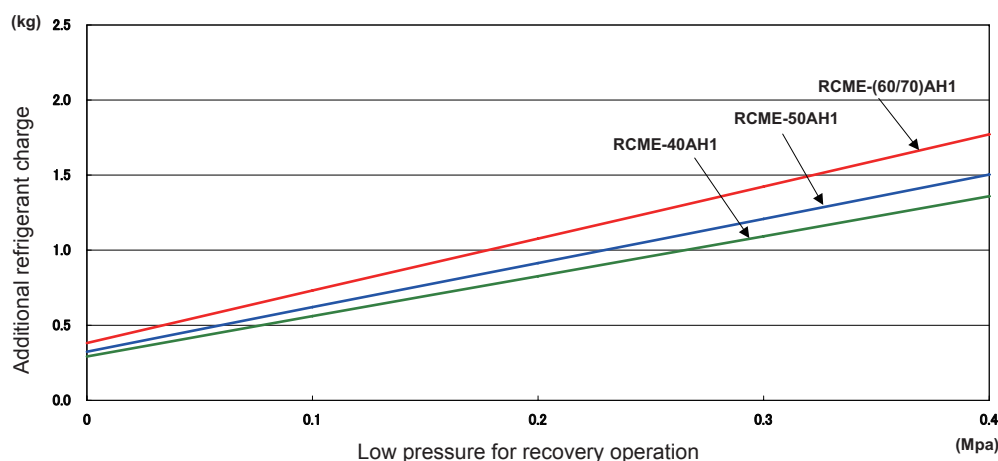
- 1 After vacuuming, additional refrigerant should be inserted in liquid state with stop valve of liquid side and gas side close. (Confirm the volume by the balance) In principal, collected refrigerant from water side heat exchanger to outside of refrigeration cycle by collection device is measured to determine the volume. If it is impossible to measure it, use the following figure to determine the volume, confirming the balance pressure after collection operation.
- 2 If it is impossible to add regulated volume due to the lower ambient temperature, compressor is operated in cooling mode and liquid refrigerant should be added from stop valve for refrigerant insertion. Then, regulated volume is added with the liquid side stop valve (high pressure side) open a little bit.

◆ Check of leakage position



CAUTION

Check for refrigerant leakage should be performed steadily. The refrigerant used in this unit is incombustible, non-toxic and odourless safe one. However, toxic gas is produced when leaked refrigerant is exposed to fire. And oxygen will be lacked due to that refrigerant, its gravity is higher than air, is spread in the floor.



CAUTION

Over-Charging and insufficient refrigerant charge may cause an damage at the compressor and alarm will show, please charge the suitability amount of refrigerant by weighing always refrigerant.

11.13 Caution at Replacement of Expansion Valve

The replacement of expansion valve can be performed by collecting the refrigerant to air side heat exchanger

Electronic expansion valve is used in this product, and its opening is almost closed (10 pulse) at compressor stop. Therefore, when removing the welding of expansion valve, it is important not to remain the refrigerant between liquid outlet valve of air side heat exchange and expansion valve.



CAUTION

There will be a clearance between control value and actual value of expansion valve opening, therefore, zero point adjustment (re-input of power source) should be realized.

11.14 Safety and protection control

The safety and protective devices are equipped with the unit to ensure dependable and long life operation.

Their functions should be carefully noted, and field adjustment is not recommended, if the setting is maintained at the point listed in the table.

◆ Compressor protection

- 1 Fuse and thermal relay equipped in the control box cut out each compressor operation when the current to the compressor exceeds the setting
- 2 The internal thermostat embedded in the motor winding cuts out each operation, when the temperature exceeds the setting
- 3 The oil heater in the compressor prevents from oil foaming during cold starting. This heater warms the oil, while the compressor is stopped

◆ Refrigeration Cycle

- 1 The high pressure switch and low pressure control protect against excessive discharge pressure and exceedingly low suction pressure. The switch and control cut out compressor operation when discharge pressure or suction pressure is abnormal.
- 2 The pressure relief valve is equipped on compressor discharge side. When high pressure exceeds the setting, gas refrigerant will be discharged to prevent abnormal high pressure

◆ Condenser Fan Motor Protection

Fuse and internal thermostat are equipped.

The internal thermostat embedded in fan motor winding cut out fan operation and compressor operation, when the temperature of the motor winding exceeds the setting

◆ Water Cooler

Pump interlock, freeze protection thermostat, low pressure control and suction gas thermostat can protect water cooler against water cooler freezing

Safety and protection device		Model RCME-AH1			
		40	50	60	70
For Compressor					
High Pressure Switch	MPa	Manual Reset, Non-Adjustable			
Cut - Out		2,02			
Low Pressure Control	MPa	Electronic Control			
Cut - Out		0,01			
Internal Thermostat for Compressor	°C	Manual Reset, Non-Adjustable			
Cut - Out		115			
Cut - In		93			
Compressor Motor		400V / 50Hz			
Fuse	A	(3 Fuses for Each Compressor)			
		100	100	125	125
Thermal Relay	A	(One Three-Phase Set for Each Compressor Motor)			
		48	55	65	65
Oil Heater	W	(One Heater for Each Compressor Motor)			
Capacity		150			
Discharge Gas Temperature Control	°C	(One for Each Circuit)			
Cut - Out		140			
CCP Timer		Non-Adjustable (One Timer for Each Compressor Motor)			
Setting Timer	s	30			
Star - Delta	s	5			
Unloading During Starting	s	10			
For Control Circuit					
Fuse	A	6			
For Refrigerant Circuit					
Pressure Relief Valve		(One for Each Circuit)			
Setting Pressure	MPa	2,25			
Freeze Protection Control		(One for Each Water Cooler)			
Cut - Out	°C	1			
Fan Motor		400V / 50Hz			
Fuse	A	(3 Fuses for Each Circuit)			
		20			
Fuse	A	(One Fuse for Each Fan)			
		12,5			



CAUTION

- **Periodical Maintenance**
Perform periodical maintenance according to the "INSTRUCTIONS" to maintain the unit in a good condition.
- **Fire**
If a fire accidentally occurs, turn OFF the main switch and use an extinguisher for an oil fire and electric fire.
- **Flammable Gases**
Do not operate the unit near the flammable gases such as lacquer, paint, oil, etc. to avoid a fire or an explosion.
- **Service Panels and Electrical Box Cover**
*Turn OFF the main switch when service panels or electrical box covers are removed for setting the temperature.
Do not operate the unit without fixing panels.*
- **Heated Pipe**
Do not touch the parts at discharge gas side by hand, since the pipes at the discharge side are heated by refrigerant and temperature becomes higher than 100°C.
- **Use**
Do not utilise this unit for cooling of drinking water or food. Comply with local codes and regulations.
- **Failure**
Turn OFF all the main switches if refrigerant leakage or chilled water leakage occurs. Also, if the unit can not be stopped by the control switch, turn OFF all the switches for power source.
- **Activation of Safety Device**
*In the case that one of safety devices is activated and unit is stopped, remove the cause of the stoppage and restart the unit. The protection devices are utilised to protect the unit from an abnormal operation.
Therefore, if one of safety devices is activated, remove the cause by referring the [Troubleshooting](#) in the [Instruction](#) or call the local agency.*
- **CB or Fuse**
Utilise a CB or fuse with specified capacity. Do not use a steel wire or a copper wire instead of a CB or fuse. If an incorrect wire is utilised, a serious accident such as a fire will occur.
- **Safety Devices**
Do not make a short-circuit at the protection line. If a short-circuit is made, a serious accident will occur.
- **Setting of Safety devices**
*Do not change the setting of safety devices, if changed, a serious accident will occur.
Do not touch any electrical parts except for the operation switches during the operation.
Do not press the button on the magnetic switch. If pressed, serious accident will occur.*



NOTE

For normal operating pressure see "[10.10 Normal operating pressure \(cooling operation\)](#)" in chapter "[10. Test run](#)".

11.15 Test Running And Maintenance Record

MODEL:	RCME	MFG. NO.		
	COMPRESSOR	MFG. NO.		
CUSTOMER NAME AND ADDRESS	DATE			

Is there adequate water flow for the water cooler?

Has all water piping been checked for leakage?

Has the unit been operated for at least twenty minutes?

Check Ambient Temperature:

°C

Check Chilled Water Temperature:

Inlet °C

Outlet °C

Check Water Flow:

m³/h

Check Suction Line Temperature and Superheat:

Suction Line Temperature	°C	°C	°C	°C
Superheat	deg	deg	deg	deg

Check Pressure:

Discharge Pressure	MPa	MPa	MPa	MPa
Suction Pressure	MPa	MPa	MPa	MPa

Check Running Current:

A	A	A	A
---	---	---	---

Check Voltage for System:

R-S, S-T, T-R=

V
 V
 V

Has the unit been checked for refrigerant leakage?

Is the unit clean inside and outside?

Are all cabinet panels free from rattling?

Model:

Date:

Weather:

Time of Operation : Start,

Stop. (Operation hour:
)

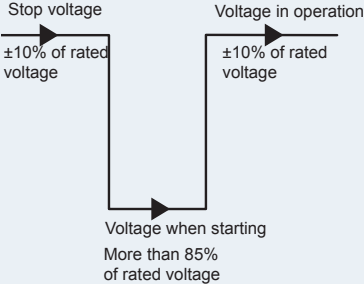
	Sampling Time					
	Compressor Number					
	Term					
Ambient Temperature	DB	°C				
	WB	°C				
Compressor	High Pressure	MPa				
	Low Pressure	MPa				
	Voltage	V				
	Current	A				
Chiller Water Temperature	Inlet	°C				
	Outlet	°C				
Current for Chilled Water Pump		A				
NOTES:						

11.17 Table of maintenance criteria

The following items are the criteria for maintenance.

Check Item		Inspection frequency (interval)						Criteria (Action)	Notes
		Every day	Month	Season	Year	2 years	40000 hours		
1. General									
Noise		○						There shall be no abnormal noises like howling.	Shall be judged from a position of about 1m from the front of the product.
Vibration		○						There shall be no abnormal vibration in visual appreciation.	
2. External panel of Electrical Box									
External panel as well as interior	○ Dirt	○						Clean with a cloth.	
	○ Rust	○						Repair with rustproof coating.	
	○ Backlash	○						Retighten screws.	
	○ Peeling of insulation	○						Attach with adhesive.	
Drain pan as well as bottom plate	○ Water leak		○					Clean drain pan, drainage outlet and drain pipes.	
	○ Rust	○						Repair with rustproof coating.	
3. Refrigerant System									
Cycle in general	○ Refrigerant leak			○				There shall be no refrigerant leakage, checking each machinery and piping connection with a leakage detector. Leakage inside water-side Heat Exchanger shall be confirmed by inspecting the air emitted from the water inlet/outlet side. At this time, water shall be extracted.	A foaming agent or leak tester shall be used for leakage detection.
	○ Piping Capillary, Tube			○				It shall be confirmed visually that there are no points of vibration and resonance.	
Compressor	○ Noise	○						There shall be no abnormal noises in auditory appreciation at startup, during operation or when stopping.	
	○ Oil leakage and bleeding	○						There shall be no oil leakage or bleeding from the flanges of discharge container, etc.	
	○ Oil level gauge	○						Oil level shall be confirmed visually.	
	○ Insulation resistance			○				It shall be 1MΩ or greater, with a DC500V Megger tester.	
	○ Oil heater			○				It shall be powered on while Compressor is stopped.	
	○ Deterioration of anti-vibration rubber			○				It shall always keep elasticity in tactile appreciation.	
	○ Periodical inspection					○		Replacement of refrigerant oil and inspection of each part shall be conducted.	
	○ Major overhaul						○	Compressor shall be overhauled.	

Check Item		Inspection frequency (interval)						Criteria (Action)	Notes
		Every day	Month	Season	Year	2 years	40000 hours		
Air-side Heat Exchanger	○ Clogging of fins			○				In case that the fins are clogged, they shall be sprayed with hot water (under 40°C) and cleaned.	
Water-side Heat Exchanger	○ Cleaning			○				It shall be cleaned regularly.	Please take into account that the frequency of cleaning shall be determined by the results of examination of water quality and by working time.
	○ Volume and temperature of water	○						They shall be adjusted to allow standard operation pressure.	
	○ Extraction of water			○				The water of the water-side Heat Exchanger shall be extracted during intermediate periods or when it is not to be used for a long period.	The water of the cold (hot) water pipes shall be also extracted.
	○ Water quality		○					It shall be conform to criteria.	
Electronic Expansion Valve	○ Activation			○				Since zero point reset is performed automatically, immediately after power ON, the activation of the expansion valve shall be confirmed in tactile appreciation.	It has a light batting sensation.
Solenoid Valve	○ Activation			○				The opening and closing of the valve shall be smooth.	
Check Valve	○ Activation			○				The activation of the valve shall be smooth.	
Stop Valve	○ Activation			○				The opening and closing of the valve shall be smooth.	
Strainer	○ Clogging			○				Differential pressure (temperature difference) shall be of the same level before and after.	
Related to containers (Accumulator, etc.)	○ Corrosion			○				No abnormal corrosion shall be appreciated visually.	
High pressure switch	○ Activation				○			It shall activate reliably with the values of Table 3-2 (page 40).	
Safety Valve	○ Activation				○			It shall activate reliably with the operating points. Operating points shall follow "6. Specifications of the product".	
Compound Gauge	○ Declared value				○			Inspection shall be conducted comparing with the basic pressure gauge,	In the case of specifications with a compound gauge

Check Item		Inspection frequency (interval)						Criteria (Action)	Notes
		Every-day	Month	Season	Year	2 years	40000 hours		
4. Electrical system									
Electricity in general	Power supply voltage	○						Power supply voltage shall be as in the figure below. 	
	Insulation resistance			○				For each machinery, it shall be 1MΩ or greater, with a DC500V Megger tester.	Except for Inverter part
	Electrical wiring			○				There shall be no loosening of terminals or damage to wire coating.	
	Earth Wire			○				It shall be correctly attached.	
	Fuse			○				- Check whether capacity is correct. - Check whether there is any deformation or change of colour.	
Electrical equipment	Electrical equipment in general			○				- There shall be no remarkable accumulations of foreign bodies. - There shall be no accumulation of dust, etc.	
	Electromagnetic switch			○				No howling or sparking shall occur upon repeatedly switching the contactor ON/OFF.	An interval of at least 3 minutes or more shall be left between each ON/OFF repetition.
	Electromagnetic contactor			○				There shall be no abnormalities in external appearance.	
	Auxiliary relay			○				Activation shall be smooth.	
	PCB			○				It shall activate following setting values.	It shall activate with the temperature of setting values.
	LCD Device	○						- Is any indication lacking or is it difficult to see? → Shall be confirmed visually. - Are the date and time correct? → Shall be confirmed visually.	Charge the batteries first, if the icon warning of low remaining battery is indicated, or if the date does not appear correctly. (The Chiller Unit shall be powered ON) In case that this does not solve the problem, please replace the LCD device itself.
	Electrolytic capacitor (Fan module)			○				There shall be no leakage or deformation.	
	Pressure Sensor · Thermistor			○				- Resistance shall be regular · There shall be no discolouration. - The value displayed in the Segment shall be appropriate.	
	Control Switch (Remote Control Switch)			○				Activation shall be smooth.	
	Transformer			○				There shall be no abnormalities in external appearance.	

Check Item		Inspection frequency (interval)						Criteria (Action)	Notes
		Ever-day	Month	Season	Year	2 years	40000 hours		
5. Fan									
Fan	○ Noise · Vibration	○						It shall rotate with a good balance and little vibration.	
Fan Motor	○ Noise · Vibration	○						There shall be no abnormalities in auditive, visual and tactile appreciation.	
	○ Insulation resistance			○				It shall be 1MΩ or greater, with a DC500V Megger tester.	
6. Water cycle									
Strainer	○ Clogging			○				Clean	
Water pipe	○ Water leak · Air entrainment			○				There shall be no abnormalities in auditive and visual appreciation	

11.18 Maintenance inspection criteria of Screw Compressor

It is necessary to conduct periodical inspection and servicing in order to maintain the performance and reliability of Screw Compressors. Maintenance inspection criteria of Screw Compressors are shown in the following table. Please follow these criteria when performing maintenance inspections.

Since the degradation of refrigerant oil in particular has an important effect on the performance and life span of the Screw Compressor, it shall be replaced regardless of the contents of the table below in case that discolouration or dirt are found out during an inspection.

Class	Time or period		Item to perform
	Compressor operation time	Period passed	
Routine inspection	—	Every day	Record of operating conditions (Pressure, temperature, voltage, current value, accumulated time, special remarks, etc.)
Periodical inspection	—	Every 2 years	Replacement of refrigerant oil and inspection of each part(Note 1) (Please inspect each part when replacing refrigerant oil, and replace parts in which abnormalities are found)
Major over-haul	Every 40000 hours	(Every 5 years(Note 2))	Overhaul of the Compressor
Notes	1) Please follow the Compressor servicing manual when inspecting the Compressor. 2) Please carry out a Compressor overhaul every 40000 hours. However, in case that a periodical inspection is not performed every 2 years, then perform overhaul every 5 years, even if 40000 hours of operation are not reached.		

NOTE

The "times and periods" listed above are the recommended times for inspection and servicing, and are different from warranty periods. Please consult your warranty certificate, as some repairs may incur in a cost even during the 1-year warranty period.

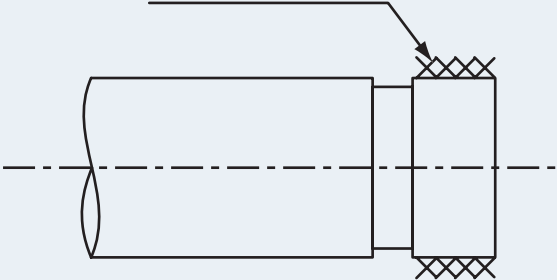
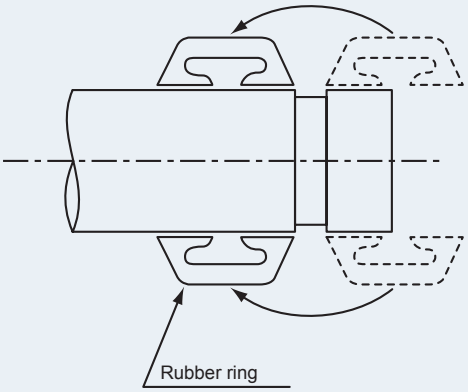
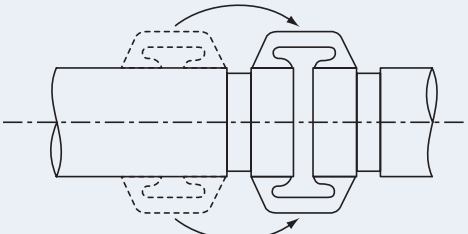
11.19 Installations works of Victaulic joints

This product uses Victaulic joints for the connection of water-side Heat Exchanger (Plate-type Heat Exchanger) with the water pipes. Please follow the handling instructions procedure detailed below when attaching and removing Victaulic joints as a part of the maintenance of the water-side Heat Exchanger.

i NOTE

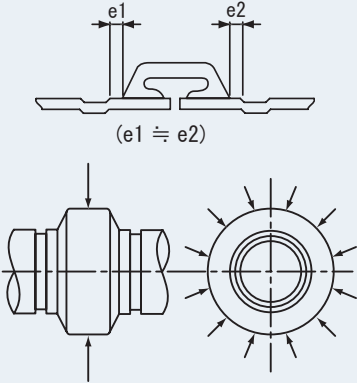
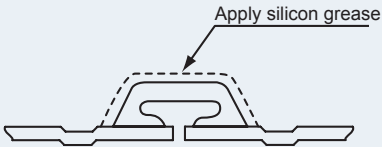
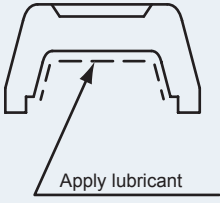
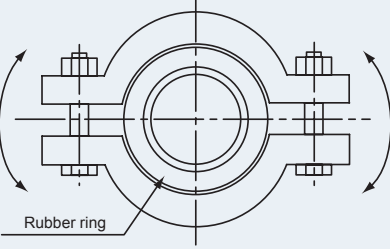
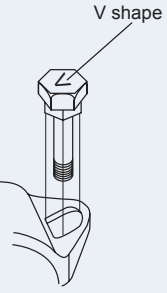
In case of not conducting the works following this procedure, accidents such as decannulation and water leakage might occur.

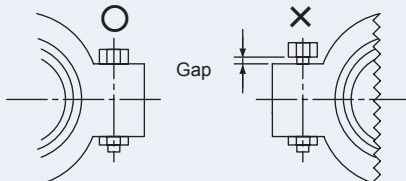
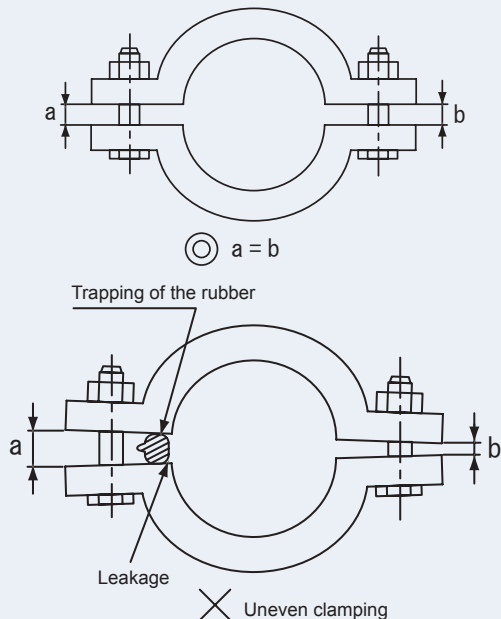
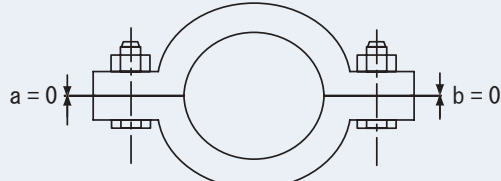
11.19.1 Handling instructions procedure for roll group and cut group type

Procedure	Work	Main points	Important points
1	Attachment of the rubber ring	1 Apply a lubricant to the pipe end before installing the rubber ring into the pipe. Apply to this part  2 Insert the rubber ring from the pipe end, and attach it beneath the groove.  Rubber ring	Use silicon grease or a dedicated smoothness spray as a lubricant. Please be careful not to damage the rubber ring. In particular scratches to the sealed surface could become a cause of water leakage. Please attach it with your hands instead of using a tool.
2	Expansion of pipe	1 After aligning the tube cores, return the rubber ring to the sealed surface. 	Please do it with your hands, instead of using tools which could damage the rubber ring or the pipe end.

i NOTE

- The contents of this table apply in the case of satisfactory operation conditions, where a complete operation log is being recorded.
- Please conduct the inspection of the Compressor following the instructions in the Compressor inspection manual.
- In case that the period for performance of activation tests of safety and protection devices designated by the prefecture is shorter, please follow the instructions.

Procedure	Work	Main points	Important points
2	Expansion of pipe	2 Set the rubber ring so as it comes to the centre, and hit it with a wooden mallet or your hands to adopt it to the pipe surface.  3 Apply a lubricant to the outer surface of the rubber ring, in order to prevent trapping of the rubber. 	Please be careful not to use a tool such as a hammer, which could easily damage the rubber. This work is of particular importance, so please check the state of application thoroughly.
3	Setting of the housing	1 Please apply lubricant to the inner side of the housing.  2 Cover the housing in parallel, put the carriage of the bolt (structure to prevent joint turning) into the bolt house of the housing and tack temporarily.  a. The carriage of the bolt becomes aligned with the bolt hole of the housing when inserting bolt with the V shape of the bolt head facing the centre of the housing. 	At this time, when the nuts for the bolts of both sides are only a bit inserted, as shown in the figure on the left, please turn the housing 2 or 3 times before tightening the bolts, in order to avoid problems with the setting of the rubber ring, such as rubber clamping.

Procedure	Work	Main points	Important points
3	Setting of the housing	b. Please set the bolts and the housing so as there is no gap left between them.  3 Bolts shall be tightened alternatively, so as the gap at a. and b. becomes the same. Uneven clamping ($a > b$) may cause trapping of the rubber, as shown in the figure, which may be a cause of leakage and breakage of the rubber.  4 Assembly is completed when the gap of both a and b is "0" (metal touch). There is no change to airtightness, even if trying to tighten the bolts more than that. Please take into account that bolts may break if they are tightened too much.  i NOTE Coupling bolts torque (N.m): 40~60	In case that it is difficult to tighten a bolt, please loosen the bolt once, remove the housing and reconfirm that the rubber ring is correctly set. In case that the joint does not become "0" (metal touch) no matter how much the bolt is tightened, please restart the assembly from the beginning, as there is an abnormality.

11.20 Water quality control

Cooling air conditioning equipment uses water as a heat source to carry out their function (cooling water) or as a medium to use heat (cold (hot) water). For this reason, it is essential to perform an accurate selection and control of water properties, with particular attention given to water chemistry, in order to keep the performance of cooling air conditioning equipment and to prevent the occurrence of trouble.

When there is a failure of the Heat Exchanger, depending on the degree of severity it could be beyond repair, suspend the functions of the device or require a large amount of money for repair. Therefore, it is essential to implement a comprehensive selection of cold (hot) water and cooling water, together with maintenance control, already from the stage of planning installation of the equipment.

The explanations below describe the water quality control of cold (hot) water and cooling water. It is very important to maintain these criteria duly at all times, in order to avoid unexpected situations.

Water quality control also requires specialized knowledge; in case of using chemicals for water treatment, the formulation may be different depending on the maker, and therefore it is suggested to consult with a maker specialized in water treatment.

11.20.1 About the used water

Please take into account that the types of source water intended for use with this product are tap water (water supply), industrial water and underground water, and any other type of water (such as pure water) cannot be used with the standard product.

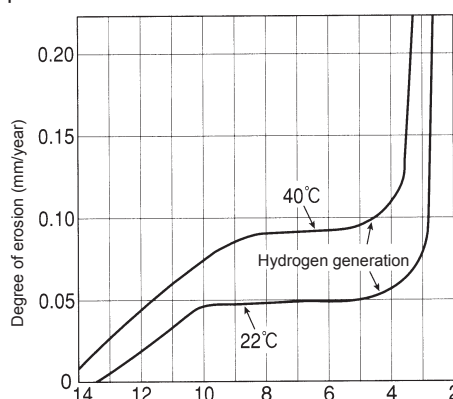
11.20.2 About water quality criteria

Conduct a water-quality test. See “11.20 Water quality control” for the reference values). Please observe these criteria for water quality control, as cooling water system, cold water system and hot water system have each their basic values. Also, please understand that the observation of these criteria is a prerequisite for the validity of the product warranty.

◆ Explanation of each of the main items of water quality control

1 pH (Concentration of hydrogen ions)

pH is used as a scale to determine the acidity or neutrality, as well as the alkalinity of water. But it is also a very important factor used in many other fields related to water quality control and the cycle of water, such as to determine the taste, corrosivity, purification effect in water treatment and sterilizing effect in chlorine treatment, formation of deposits, solubility of scales, and other chemical and biological analysis. As an example, the relation between the pH value and the corrosion of iron is shown below.



Relation between the corrosion of mild steel and the pH of water

2 Electrical conductivity

The measurement of electrical conductivity is useful to know the approximate characteristics of water. The values are almost fixed depending on the type and quantity of salts dissolved in the water. The water with higher electrical conductivity contains more substances that may cause corrosion and formation of scales, which in general is not desirable.

3 Chloride ions

Chloride ions are corrosive, and corrosion may occur if there is a large quantity of chloride ions, even if pH value is in a region less favourable to corrosion. Also, chloride ions are not oxidizing, but they can penetrate into metals in the presence of oxidants and dissolved oxygen.

4 Sulphate ions

Besides being a main cause of corrosion, sulphate ions are an indicator of the generation of scales. Problems such as “red water” may occur easily if the concentration of sulphate ions is high, even in general tap water.

5 Acid consumption (pH4.8) = Alkalinity

It indicates the whole quantity of hydroxides, carbonates and bicarbonates present in the water.

It is used as a base for calculation of saturation index and for the estimation of tendency to prevent the formation of scales, “red water” and corrosion.

6 Whole hardness, calcium hardness

The amount of calcium ions as well as magnesium ions present in the water is expressed in the corresponding mg/l of calcium carbonate.

Also, the hardness due to calcium ions is known as calcium hardness. It may be a cause of scale trouble in connection with temperature, pH, and conductivity.

7 Ionic silica

It indicates the silica dissolved in water. If the amount of substances that cause metallic corrosion (such as Fe or Zn) present in the water increases, they create chemical compounds with the silica and make the separation of scales easier.

8 Iron

Iron may be present in the water in the form of bicarbonate, chloride, sulphate, hydroxide, iron bacteria and organic iron salt, and it may be a cause for “red water” or scale trouble.

9 Copper

It is eluted from the copper tubes of the system very frequently. Copper may be a promoting factor for corrosion of galvanized steel pipe or iron pipe.

10 Sulphide ions

It indicates the sulphides dissolved in the water. Sulphides decompose when the pH decreases, releasing hydrogen sulphide (H₂S). Please take into account that even an extremely small quantity may cause an intense corrosion of copper, iron and many metallic materials.

11 Ammonium ions

If there is ammonia present in the water, copper and ammonia react creating complex salts, which may induce corrosion advancing the elution of copper. The amount of ammonia present in the water which is required for the creation of complex salts with copper depends on the balance of the $\text{NH}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NH}_4^+ + \text{OH}^-$ relation. It is essential to take into account that the amount of ammonia increases with a rise of the pH value of water, thus increasing the danger of corrosion.

12 Residual chlorine

The residual chlorine in water that has been treated with chlorine, such as tap-water, may be a cause for corrosion of copper and other materials.

13 Free carbon dioxide

It indicates the amount of carbon dioxide gas present in the water. In relation with pH, it may be a cause for corrosion of iron or penetration into concrete.

14 Stability index (Ryznar Stability Index(RSI))

The proposed stability index (RSI) is a linear scale indicating the corrosivity of water and the tendency to formation of scales, which is calculated with the following formula.

$$\text{RSI} = (9.3 + A + B - C - D) \times 2 - E$$

RSI less than 6: Tendency to formation of scales

RSI between 6 and 7: Stable area

RSI more than 7: Tendency to corrosion

A: Dissolved substances index = 0.1 (Electrical conductivity between 5~50mS/m), 0.2 (Electrical conductivity between 50~150mS/m)

B: Temperature index <Chiller cold water> = 2.4, <Chiller hot water> = 1.6

C: Calcium hardness index = $\log(\text{Calcium hardness}) - 0.4$

D: Acid consumption (pH4.8) index = $\log[\text{Acid consumption (pH4.8)}]$

E: pH value

15 Dissolved oxygen

It indicates the amount of oxygen gas dissolved in the water. It is the most important element that accelerates the chemical reaction known as corrosion.

With respect to the corrosion of steel, a quantity of dissolved oxygen of about 5~15 (ml/l) causes the largest tendency to corrosion, while tendency to corrosion becomes smaller with values higher or lower than these.



NOTE

About acid consumption, whole hardness and calcium hardness

While scale damage occurs easily when these values are high on the one side, on the other hand corrosion damage occurs easily when these values are low. The guidelines on Table 4-2 of the next page only determine the upper limit values, assuming the danger of scale damage and the possibility to judge the tendency to corrosion by other means. Therefore, in case that there are no concerns about scale damage, maintaining these values on the upper side allows to improve resistance to corrosion. Concretely, in the case of cold water and hot water systems, if RSI is in the range of 6~7.5 (no concern of scale damage), operation with the following values provides better resistance to corrosion.

Acid consumption (pH4.8)(mgCaCO₃/l) = 50~100

Whole hardness(mgCaCO₃/l) = 50~200



NOTE

The guidelines on Table 4-2 of the next page only determine the circulating water in the circulation system of refrigeration system, and in the other cases stability index of 6.0~7.0 shall be kept.

11.21 Important notes for handling of R134a

11.21.1 Refrigerant

The refrigerant used is an HFC-type refrigerant with an ozone depletion potential of "zero". In case of mixing with another type of refrigerant, the properties of the refrigerant would change, becoming a cause for failure of the equipment. Also, due to differences in their properties, please take the following points into account during handling.

- Please confirm that the refrigerant cylinder is a specific one for R134a.
- Please make sure to conduct the charge with the settings of the refrigerant cylinder (charge cylinder) as liquid.
- Please use a manifold valve and a charge hose suitable for R134a refrigerant.

11.21.2 Refrigerant Oil

The refrigerant oil used is Ze-GLES RB68, made by JX Nippon Oil & Energy Corporation, which has an excellent compatibility with R134a. Since no other type of refrigerant oil can be used, please make sure that no other type of refrigerant oil is being mixed in during service and maintenance. Also, since hygroscopic properties are equivalent to those of UX300 refrigerant oil used until now, the same humidity control is applied as before. (Since both FREOL UX300 and RB68 refrigerant oils are ester refrigerant oils, the time of exposition to the atmosphere should be as short as possible)

11.21.3 Recovery of refrigerant

Please recover the refrigerant from the air-side heat exchanger when performing an overhaul inspection of the compressor, or a parts inspection. However, when replacing or repairing the air-side heat exchanger, or its valves and plugs, it is not possible to recover the refrigerant into the air-side heat exchanger and other high pressure parts. In such cases, it is necessary to use a refrigerant recovery device to recover the refrigerant inside the cooling cycle.

- 1 Fully open the liquid outlet valve ⑥ of the air-side heat exchanger.
- 2 Make enough refrigeration water flow, and operate the Chiller Unit. (In the case of air-cooled heat pump systems, operate in cooling mode)
- 3 Stop the operation of the Chiller Unit when the pressure at low pressure side descends until about 0.05MPa. Do not operate at all with a pressure lower than 0.01MPa at the low pressure side.
Operation in such a condition may be a cause of compressor failure.
- 4 When the pressure at the low pressure side ascends until 0.2~0.3MPa after a few minutes have passed, operate the Chiller Unit again and repeat steps (2) and (3) some 4~5 times.
- 5 This allows to bring most of the refrigerant inside the cooling cycle into the air-side heat exchanger and the high pressure pipes between ⑥ and ⑦.
- 6 Use a refrigerant recovery device to recover the refrigerant remaining into the low pressure side pipes and inside the water refrigerator, which cannot be recovered into the air-side heat exchanger, from stop valve ⑩.



NOTE

Refer to "7. Refrigerant cycle diagram" chapter to view the mentioned references

11.22 Operation inspection items

11.22.1 Method for water quality control

1 Water-quality test of circulating water

- a. 1st time: All the items in water quality criteria in the previous table shall be inspected before test run.
- b. 2nd time: pH and electrical conductivity shall be measured in the first week after test run. All items shall be inspected in case of recognizing an abnormality.
- c. 3rd time: All the items shall be inspected in the first month after operation.
- d. Further inspections: These are to be determined based on the understanding of the tendencies in variation of water quality obtained from the inspection results up to the 3rd time. Even in case that no abnormalities are found as a result of the tests, please group the units according to region or to the water vein system, and conduct pH and conductivity tests once per month, and a complete inspection of all the items in water quality criteria every 6 months.

2 Procedure when water quality is abnormal

In case that an abnormality in water quality is detected as a result of periodical inspections, it is necessary to take an action such as those shown below, according to the circumstances.

- a. Replace water with fresh one or force blow. (Once a week ~ Once per month).
- b. Perform water treatment with corrosion preventing agents or scale restraining agents.

3 Other control items

In order to maintain an optimal water quality, it is essential to take the installation place into account. Please consider and control the following items.

◆ Before installation

Items for consideration and control	Response procedure
1 Installation place a. Considerations about the installation place of the Chiller Unit b. Is there any abnormal drainage from the boiler, freezer or other equipment penetrating into the cold (hot) water system?	1 Request a chemical analysis of water from a maker of water treatments, and in case of a negative result either change the source of water, or determine the adequate water treatment upon consultation with the maker.
2 System a. Considerations about the materials of the heat exchanger, the pipes, the tank, the valves and other parts of the Chiller unit b. Prohibition to expose the return pipes of the tank to the atmosphere. c. Considerations about the temperature, quantity of flow, pressure and minimum water volume of the cold (hot) water system of the Chiller Unit.	1 Take into account that corrosion may concentrate in one place due to differences in the materials of the cold (hot) water system. (Corrosion due to poor treatment of concrete-made tanks may occur in some cases) 2 Exposure of tank return pipes to the atmosphere may promote corrosion, and therefore they shall contain water only. 3 Control to maintain the usage range of the cold (hot) water system of the Chiller Unit. (Refer to the materials such as the instruction manual)
3 Used water a. Considerations of specifications in case of brine. b. Considerations of specifications in case of special waters such as pure water.	1 Select a brine suitable for Hitachi Chiller Units. See the Hitachi technical handbook "Instructions for use of brine" for the specifications. 2 Special waters such as pure water cannot be used with the standard model, so please consider a system using an indirect heat exchanger.

◆ After operation

Items for consideration and control	Response procedure
1 Confirmation of the existence of leakage in pump, valves, pipes, etc.	1 Application of countermeasure in leakage points.
2 Control of temperature, quantity of flow, pressure and minimum water volume of the cold (hot) water system of the Chiller Unit.	2 Control to maintain the usage range of the cold (hot) water system of the Chiller Unit. (Refer to materials such as the instruction manual) (Once/day)

11.23 Operation inspection items

Check Item			Description of inspection	Results (Write numerical value or mark with a circle)
Conditions of the installation	1	Inspection of the periphery of the Chiller Unit	Remove any obstacles	Good / Not good
	2	Pressure, quality and quantity of flow of cold (hot) water	Inspect while letting water flow	Good / Not good
	3	Cold (hot) water pipes		Good / Not good
Servicing	4	Inspection of screws and bolts	Retighten places that might have been loosened.	Retightened / Not retightened
	5	Retighten electrical wiring terminals	All parts shall be retightened.	Retightened / Not retightened
	6	Leakage of each water pipe	Shall be confirmed letting water flow.	No / Yes
	7	Dirt of the air-side heat exchanger	Clean with hot water (40°C).	Done / Not done
	8	Clogging of drain pipe	Shall be confirmed letting water flow.	No / Yes
	9	Maintenance and cleaning of the inside and the outside of the electrical box		Done / Not done
	10	Compressor	Inspect valves, joints, flare parts, brazed parts, etc.	Good /Not good
	11	Air-side Heat Exchanger		Good /Not good
	12	Water-side Heat Exchanger		Good /Not good
	13	Expansion Valve		Good /Not good
	14	4-way valve (only for air-cooled heat pump systems)		Good /Not good
	15	Solenoid Valve		Good /Not good
	16	Check Valve		Good /Not good
	17	Strainer		Good /Not good
	18	Piping · Capillary tubes		Good /Not good
	19	High Pressure Switch		Good /Not good
	20	Maintenance and cleaning of the inside and the outside of the unit		Performed / Not performed
Operation	21	Voltage between phases of Compressor	Shall be higher than 90% of the rated voltage.	Good /Not good
	22	Vibration and noise	Inspect compressor, fan, piping,etc.	No abnormal noises / Abnormal noises
	23	Adjustment of operation and automatic operation mechanism	Inspect activation of run, stop and thermostat.	Good /Not good
	24	High Pressure Switch	Inspect setting value and operating point.	Good /Not good
	25	Pilot lamp		Good /Not good
	26	4-way valve (only for air-cooled heat pump systems)	Inspect the switchover of cooling and heating.	Good /Not good
	27	Solenoid Valve		Good /Not good
	28	Guidance on operation method		Done / Not done
	29	Cold (hot) water inlet temperature		_____ °C
	30	Cold (hot) water outlet temperature		_____ °C
	31	Inlet temperature of the dry bulb (wet bulb) of the air-side heat exchanger		_____ °C (____ °C)
	32	Water flow at the water-side heat exchange		_____ m ³ /h
	33	Discharge Pressure		_____ MPa
	34	Suction Pressure		_____ MPa
	35	Running voltage		_____ V
	36	Operation Current		_____ A

Item (*) ^{(*)6}	Cooling water system (*) ⁽⁴⁾			Cold water system		Hot water system (*) ⁽³⁾			Tendency (*) ⁽²⁾		
	Circulation system		Once-through	Circulating water [Less than 20°C]	Make-up water	Low medium temperature water system	High medium temperature water system	Corrosion	Formation of scales		
	Circulating water	Make-up water	Circulating water			Make-up water					
Standard items	pH (25°C)	6.5~8.2	6.0~8.0	6.8~8.0	6.8~8.0	7.0~8.0	7.0~8.0	7.0~8.0	○	○	
	Electrical conductivity (mS/m) (25°C) {μS/cm} (25°C) (*) ⁽¹⁾	Less than 80 {Less than 800}	Less than 30 {Less than 300}	Less than 40 {Less than 400}	Less than 30 {Less than 300}	Less than 30 {Less than 300}	Less than 30 {Less than 300}	Less than 30 {Less than 300}	○	○	
	Chloride ions (mgCl/l)	Less than 200	Less than 50	Less than 50	Less than 50	Less than 50	Less than 50	Less than 30	○		
	Sulphate ions (mgSO ₄ ² /l)	Less than 200	Less than 50	Less than 50	Less than 50	Less than 50	Less than 50	Less than 30	○		
	Acid consumption (pH4.8) (mgCaCO ₃ /l)	Less than 100	Less than 50	Less than 50	Less than 50	Less than 50	Less than 50	Less than 50		○	
	Whole hardness (mgCaCO ₃ /l)	Less than 200	Less than 70	Less than 70	Less than 70	Less than 70	Less than 70	Less than 70		○	
	Calcium hardness (mgCaCO ₃ /l)	Less than 150	Less than 50	Less than 50	Less than 50	Less than 50	Less than 50	Less than 50		○	
	Ionic silica (mgSiO ₂ /l)	Less than 50	Less than 30	Less than 30	Less than 30	Less than 30	Less than 30	Less than 30		○	
	Iron (mgFe/l)	Less than 1.0	Less than 0.3	Less than 1.0	Less than 1.0	Less than 0.3	Less than 1.0	Less than 1.0	Less than 0.3	○	○
	Copper (mgCu/l)	Less than 0.3	Less than 0.1	Less than 1.0	Less than 1.0	Less than 0.1	Less than 1.0	Less than 1.0	Less than 0.1	○	
Reference items	Sulfide ions (mgS ²⁻ /l)	Shall be undetectable	Shall be undetectable	Shall be undetectable	Shall be undetectable	Shall be undetectable	Shall be undetectable	Shall be undetectable	○		
	Ammonium ions (mgNH ₄ ⁺ /l)	Less than 1.0	Less than 0.1	Less than 1.0	Less than 0.1	Less than 0.3	Less than 0.1	Less than 0.1	○		
	Residual chlorine (mgCl/l)	Less than 0.3	Less than 0.3	Less than 0.3	Less than 0.3	Less than 0.3	Less than 0.1	Less than 0.1	○		
Reference items	Free carbon dioxide (mgCO ₂ /l)	Less than 4.0	Less than 4.0	Less than 4.0	Less than 4.0	Less than 0.4	Less than 4.0	Less than 0.4	○		
	Stability index	6.0~7.0	—	—	—	—	—	—	○	○	

i NOTE

- (*)1) The names of the items, and the definition of their terms as well as their units are based on JIS K 0101. Also, the units and values inside { } brackets correspond to the original units, and have been included for reference.
- (*)2) The ○ mark inside the column indicates a factor related to the tendency to corrosion or the formation of scales.
- (*)3) Corrosion becomes considerable in general when temperatures are high (higher than 40°C), and in particular in the case of direct contact with water of steel material that has no protective coating, it is desirable to apply active anti-corrosion countermeasures such as the addition of anticorrosives or deaeration treatment, etc.
- (*)4) In the case of cooling water systems using a direct vent type cooling tower, circulating water of the close circuit and its make-up water shall belong to the hot water system, while spraying water and its make-up water shall belong to the cold water system, each with its water quality criteria.
- (*)5) The types of source water intended for supply to this product are tap water (water supply), industrial water and underground water, with pure water, grey water and water subject to softening treatment being excluded.
- (*)6) The above 15 items indicate the representative factors for corrosion and scale damage.

APPENDIX : Chart 1-A Inspection and Maintenance Guideline on Main Parts of Chiller Unit

This chart provides the guideline of periodical inspection items, period (inspection cycle) and part replacement under general system operation conditions. Regarding to the preventive maintenance, the inspection frequency is shown as the "Inspection cycle." Also, the predictive period of "Cleaning and adjustment" or "Part replacement and repairing" to be required according to the periodical inspection results is shown as the "Maintenance cycle." In order to prevent the deterioration of parts and the degradation of their performance, the following estimates and defines the operation time or service period of the inspected parts until they reach the wear-out failure region. They may vary depending on the applicable system devices. For the concrete inspection and maintenance points and cycles, refer to the technical documents and materials of each product.

Explanation of symbols

Inspection period

Clean or adjust the system based on the inspection results

Repair or replace parts if their failure is found by inspection

Replace the (consumable) parts periodically

Part category	Part name		Periodic inspection					Preventive maintenance		Remarks																	
	Part name	Inspection points	Inspection method	Criteria (Rough indication)	Maintenance points	Inspection cycle		Maintenance cycle			Elapsed years (2)																
						Every year	Inspection schedule	Operate Hours	Operate Years		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
Refrigerant circuit	Expansion valve	Compressor	Noise and vibration during startup, operation and shutdown. Oil level, oil leakage, and oil heater. Measurement of insulation resistance. Deterioration of rubber pad. Looseness of terminals and contact of wirings. Intermediate inspection and disassembly inspection.	Visual, auditory, and tactile inspection. Visual and tactile inspection of oil level gauge and joints. 500VDC megger Rubber deformation and elasticity (tactile inspection). Retightening and visual inspection. Compressor operation time.	Abnormal noise and vibration shall not exist. Check the oil level. No leakage shall occur. The compressor shall be warmed when stopped. Shall be 1M ohms or more. The anti-vibration function shall be normal. A looseness or a contact shall not exist. Inspection and maintenance standard of the product shall be met.	Overhaul or replace the parts if abnormal. Replace the oil, retighten fasteners, and repair or replace electric wirings. Replace it if insulation resistance is below 1M ohms. Replace if deterioration or hardening has occurred. Retighten fasteners, or correct the wiring path. Check for a noise, vibration and oil leakage, and replace parts (bearings and others).	Every year	Hermetic compressor: 20,000 hours Semi-hermetic compressor: Depends on the product standard.		Random failure															Wear-out failure		
			Temperature type	Heat up the feeler bulb.	Replace it if pressure and temperature do not change. Replace if locked.																						
			Electronic system	Auditory and tactile inspection. Gas detector, visual inspection. Visual inspection.	Operational noise and temperature change shall occur. Abnormal resonance, noise, and corrosion shall not exist. Abnormal resonance and contact wear shall not exist.																						
			Pipings in unit	500VDC megger Visual and auditory inspection.	Shall be 1M ohms or more. Abnormal noise and vibration shall not exist.																						
			Solenoid valves, 4-way valves and others	A change of noise and pressure.	No pressure increase.																						
	Refrigerant system		Check valves	Check the valve operation and its gas leakage.	Opening and closing operations, gas detector.	The valve shall open and close smoothly, and no gas shall leak.	Replace if the valve does not open or close or if the gas leaks.	Before the cooling or heating season	20,000-Hr	Random failure															Wear-out failure		
			Stop valves	Clogging.	Differential pressure before and after strainer (Temperature difference).	Pressure difference before and after dryer (due to clogging). The strainer shall not be damaged.	Replace the dryer if the moisture content is large or the dryer is clogged.																				
			Strainer	Check for a clogging and water amount (with the indicator).	Comparative examination with the standard pressure gauge.	The indication of standard pressure gauge shall be within the acceptance range.	Replace if the indication exceeds the limit.																				
			Dryer	Corrosion of receiver, accumulator, oil separator and others.	Visual inspection.	Abnormal corrosion shall not exist.	Repair and repaint the corroded areas.																				
			Pressure, coupling, and hydraulic gauges	Operating pressure, gas leakage, and insulation resistance.	Pressure gauge	Shall operate at the preset value.	Readjust or replace if the operating pressure exceeds the limit.			Random failure															Random failure		
Protective equipment (Security equipment)		Containers	Operating pressure, gas leakage, and insulation resistance.	Pressure gauge	Shall operate at the pressure specified by local regulations.	Readjust or replace if the operating pressure exceeds the limit.		25,000-Hr	Random failure															Random failure			
		Pressure cut-off devices	Check the operating pressure.	Pressure gauge	Shall operate at the pressure specified by local regulations.	Readjust or replace if the operating pressure exceeds the limit.			Random failure															Random failure			
		Safety valves	Appearance check (for swelling of fusible alloy).	Visual inspection.	The fusible alloy shall be at the normal position.	Replace if the alloy swells abnormally and the gas leaks.			Random failure															Random failure			
Heat exchanger		Air heat exchanger	Check for a clogging by foreign materials and for a damage. Leakage of gas.	Visual inspection, and cleaning. Gas detector	A clogging or damage shall not exist. The gas shall not leak.	Clean the air inlet if it is clogged. Repair or replace if the gas leaks.		See right	Random failure															Random failure			
		Water heat exchanger	Water flow amount and temperature. Leakage of gas. Water drainage.	Thermometer, flowmeter, and differential pressure gauge detector Gas detector In the heat exchanger and piping.	Shall be within the range of use of the product. No leakage shall be detected. Shall be installed.	Valve adjustment, and adjustment of operation settings Repair or replace if the gas leaks. Add the water drainage and valves.			Random failure															Random failure			

Note (1): Random failure is an accidental failure that may occur within the service life of parts and equipment. This failure may occur before progress of abrasion. It is hard to estimate when the failure occurs and it is also hard to establish the technical measures. At present, we can take measures based on the statistics of system handling.

Note (2): The elapsed years in the chart is determined based on the typical system operation such as 10 operation hours per day and 2,500 operation hours per year under normal operating conditions (without frequent system startup and shutdown). As this value varies depending on the system operation conditions, check it at the time of maintenance contract.

Note (3):  estimates the time when the wear-out failure begins and the failure rate increases according to the elapsed time

Note (4): Depends on the quality standard of refrigerant, cooling and heating water, and makeup water.

APPENDIX : Chart 1-B Inspection and Maintenance Guideline on Main Parts of Chiller Unit

This chart provides the guideline of periodical inspection items, period (inspection cycle) and part replacement under general system operation conditions. Regarding to the preventive maintenance, the inspection frequency is shown as the "inspection cycle." Also, the predictive period of "Cleaning and adjustment" or "Part replacement and repairing" to be required according to the periodical inspection results is shown as the "Maintenance cycle." In order to prevent the deterioration of parts and the degradation of their performance, the following estimates and defines the operation time or service period of the inspected parts until they reach the wear-out failure region. They may vary depending on the applicable system devices. For the concrete inspection and maintenance points and cycles, refer to the technical documents and materials of each product.

Explanation of symbols

Inspection period

Clean or adjust the system based on the inspection results

Repair or replace parts if their failure is found by inspection

Replace the (consumable) parts periodically

Part Category	Part name		Periodic inspection					Preventive maintenance															Remarks						
	Part name	Inspection points	Inspection method	Criteria (Rough indication)	Maintenance points	Inspection cycle Every year	Inspection schedule	Operate Hours	Operate Years	Elapsed years (2)																			
										1	2	3	4	5	6	7	8	9	10	11	12	13		14	15				
Electric and electro-nic parts	Fan motor	✗Noise and vibration during startup, operation and shutdown. ✗Measurement of insulation resistance.	✓/visual and auditory inspection. 500VDC megger	✗Abnormal noise shall not be generated. ✗Shall be 1M ohms or more.	✗Replace it if the bearing noise is large. ✗Replace if insulation has deteriorated.			20,000Hr																					
	Cooling fan for electric, electronic parts	✗Insulation resistance, and generation of abnormal noise.	500VDC megger ✗Auditory inspection.	✗Shall be 1M ohms or more. ✗Abnormal noise shall not be heard.	✗Shall be less than 1M ohms. ✗Replace if the fan locks.																								Wear-out failure
	Breakers (including FFBs and ELBs)	✗Appearance and operation check. ✗Poor contact.	✓/visual inspection.	✗No dirt, poor contact, deformation or discoloration shall exist. ✗An operation failure shall not occur.	✗Replace if an operation failure, deformation, or discoloration has occurred.																								
	Thermostat	✗Operation check.	Check the unit operation.	✗Shall operate as specified by technical documents of the product.	✗Replace or adjust (calibrate) it.																								Wear-out failure
	Oil heater	✗Is conductive when the compressor is shut down? ✗Measure the insulation resistance of oil heater.	✗A multimeter or an ammeter 500VDC megger ✓/visual inspection.	✗The heater shall be conductive and warmed when compressor is shut down. ✗Shall be 1M ohms or more, and abnormality shall not be found.	✗Repair the electric wiring, or replace the oil heater if heater wiring is repaired. ✗Replace if less than 1M ohms.				8 years																				Consuma-ble parts
	Fuses	✗Appearance check.	✓/visual inspection.	✗No deformation and discoloration shall exist.	✗Replace the fuse if blown.																								Consuma-ble parts
	Control box (including inverter, circuit boards, and sequencer)	✗Check the insulation resistance of the circuit. ✗Visually check the adhesion of foreign material to circuit boards. ✗Check for loose terminals and connectors. ✗Self-inspection mode, and appearance check.	500VDC megger (except for circuit boards) ✓/visual inspection. ✗Driver and visual inspection.	✗Foreign materials shall not accumulate excessively. ✗The connections shall not loose. ✗Abnormal indication and fluid leakage shall not occur.	✗Clean with a brush, and replace if defective. ✗Tighten if loose, and plug in again. ✗Replace if defective.			25,000Hr																					Wear-out failure
	Electrolytic capacitor	✗Appearance check of (electrolytic) capacitor.	Capacitance meter 500VDC megger	✗Fluid leakage and deformation shall not occur.	✗Replace if fluid leaks.																								
	General-purpose inverter	✗Appearance check of (electrolytic) capacitor.	✓/visual inspection.	✗Fluid leakage and deformation shall not occur.	✗Replace if fluid leaks.																								Consuma-ble parts
	Smoothing capacitor	✗Measurement of capacitance and insulation resistance.	Capacitance meter 500VDC megger	✗Shall be above the specified capacity.	✗Replace the parts periodically.																								
	Cooling fan	✗Insulation resistance, and generation of abnormal noise.	500VDC megger ✓/visual and auditory inspection.	✗Shall be 1M ohms or more, and abnormal noise shall not be heard.	✗Replace if the fan locks.																								Consuma-ble parts
Mechanical and manufactured components	Pressure sensor and thermistor	✗Open or short circuit, and appearance check.	✗Multimeter ✓/visual inspection.	✗Shall be at the specified resistance. No discoloration shall occur.	✗Replace if circuit is open or short.																								
	Switching power supply	✗Measurement of output voltage.	✗Multimeter	✗The output voltage shall be within the specified range.	✗Replace if the voltage is abnormal.																							Wear-out failure	
	Propeller fan	✗Visually check for a runout or disbalance due to foreign material insertion.	✓/visual inspection.	✗Excessive runout and foreign material insertion shall not occur.	✗Replace if excessive runout or disbalance occurs.																							Wear-out failure	
	Drain pan	✗Check for clogging and for abnormal flow of drain water. ✗Check for peeling or float of paint films.	✓/visual inspection.	✗Water drainage shall be normal. ✗Excessive rusting or holes due to rust shall not exist.	✗Clean the drain pan, and check its inclination. ✗Replace the drain pan if the paint fails to repair.																								
	Frame, baseplates, guards and others	✗Check for rusts and peeling of insulating materials. ✗Check for peeling or float of paint films.	✓/visual inspection.	✗Excessive rusts shall not exist, and the insulating materials shall not be damaged.	✗Repair and adhere the insulating materials if peeled off. ✗Repair painting																							Parts to be cleaned	

Note (1): Random failure is an accidental failure that may occur within the service life of parts and equipment. This failure may occur before progress of abrasion. It is hard to estimate when the failure occurs and it is also hard to establish the technical measures. At present, we can take measures based on the statistics of system handling.

Note (2): The elapsed years in the chart is determined based on the typical system operation such as 10 operation hours per day and 2,500 operation hours per year under normal operating conditions (without frequent system startup and shutdown). As this value varies depending on the system operation conditions, check it at the time of maintenance contract.

Note (3):  estimates the time when the wear-out failure begins and the failure rate increases according to the elapsed time

Note (4): Depends on the quality standard of refrigerant, cooling and heating water, and makeup water.

APPENDIX : Chart 1-C Inspection and Maintenance Guideline on Main Parts of Chiller Unit

This chart provides the guideline of periodical inspection items, period (inspection cycle) and part replacement under general system operation conditions. Regarding to the preventive maintenance, the inspection frequency is shown as the "inspection cycle." Also, the predictive period of "Cleaning and adjustment" or "Part replacement and repairing" to be required according to the periodical inspection results is shown as the "Maintenance cycle." In order to prevent the deterioration of parts and the degradation of their performance, the following estimates and defines the operation time or service period of the inspected parts until they reach the wear-out failure region. They may vary depending on the applicable system devices. For the concrete inspection and maintenance points and cycles, refer to the technical documents and materials of each product.

Explanation of symbols	
Inspection period	
Clean or adjust the system based on the inspection results	
Repair or replace parts if their failure is found by inspection	
Replace the (consumable) parts periodically	

Part Category	Part name	Periodic inspection				Preventive maintenance																			Remarks																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
		Inspection points	Inspection method	Criteria (Rough indication)	Maintenance points	Inspection cycle		Inspection schedule	Maintenance cycle		Elapsed years (2)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
						Every year			Operate Hours	Operate Years	1	2	3	4	5	6	7	8	9	10	11	12	13	14		15																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
Hydraulic circuit	Remote control switch	•Check the remote control by switching the controller. •Looseness of terminals and contact of wirings.	•Visual inspection. •Driver and visual inspection.	•The indication and operation shall be normal as operated. •A looseness or a contact shall not exist.	•Replace if the control or display specified by the controller fails. •Relighten if loose, and plug in again.			25,000Hr				Random failure															Wear-out failure																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
	Central control unit	•Check the remote control by switching the controller. •Looseness of terminals and contact of wirings. •Measurement of insulation resistance.	•Visual inspection. •Driver and visual inspection. •500VDC megger	•The indication and operation shall be normal as operated. •A looseness or a contact shall not exist. •Shall be 1M ohms or more.	•Relighten if loose, and plug in again. •Replace if less than 1M ohms.		Before the cooling or heating season		10 years			Random failure															Wear-out failure																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
	Water outage protection device (Flow switch)	•Check the remote control by switching the controller. •Check for a water leakage. •Measurement of insulation resistance.	•Visual inspection. •500VDC megger	•The indication and operation shall be normal as operated. •No water shall leak. •Shall be 1M ohms or more.	•Replace if abnormal.					5 years		Random failure		Random failure															Wear-out failure																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
	Phase shifting, capacitor and integration four meter, and ammeter	•Measurement of insulation resistance.	•500VDC megger	•Shall be 1M ohms or more.	•Replace if below 1M ohms or if abnormal.					8 years		Random failure		Random failure															Wear-out failure																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
	Strainer	•Shall not be clogged with foreign materials.	•Visual inspection.	•No dirt or clogging shall exist.	•Cleaning.					10 years		Random failure		Random failure															Parts to be cleaned																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
	Water piping	•Water leakage. •Air insertion.	•Visual inspection. •Auditory inspection. •Opening of air release valve	•No water shall leak. •Noise due to air insertion shall not exist.	•Relightening and repair. •Release the air, or adjust or replace the air release valve.					5 years		Random failure		Random failure																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	Flow control valve	•Temperature difference between water inlet and outlet (Nomal flow rate). •Noise and vibration during startup, operation and shutdown. •Measurement of insulation resistance. •Looseness of terminals and contact of wirings. •Check for a water leakage. •Cleaning and inspection of strainer.	•Visual, auditory, and tactile inspection. •500VDC megger •Driver and visual inspection. •Visual inspection.	•Abnormal noise and vibration shall not exist. •Shall be 1M ohms or more. •A looseness or a contact shall not exist. •No water shall leak •Shall not be clogged by foreign materials.	•Replace if abnormal. •Replace if less than 1M ohms. •Relighten fasteners, or correct the wiring path.		Before the cooling or heating season		5 years		Random failure		Wear-out failure																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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Note (1): Random failure is an accidental failure that may occur within the service life of parts and equipment. This failure may occur before progress of abrasion. It is hard to estimate when the failure occurs and it is also hard to establish the technical measures. At present, we can take measures based on the statistics of system handling.

Note (2): The elapsed years in the chart is determined based on the typical system operation such as 10 operation hours per day and 2,500 operation hours per year under normal operating conditions (without frequent system startup and shutdown). As this value varies depending on the system operation conditions, check it at the time of maintenance contract.

Note (3):  estimates the time when the wear-out failure begins and the failure rate increases according to the elapsed time

Note (4): Depends on the quality standard of refrigerant, cooling and heating water, and makeup water.

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