

Operation Manual

Original Instructions

Thermo-Chiller

HRZ002-WS-F	HRZ002-W1S-F	HRZ002-W2S-F
HRZ004-WS-F	HRZ004-W1S-F	HRZ004-W2S-F
HRZ008-WS-F	HRZ008-W1S-F	HRZ008-W2S-F
HRZ008-L-F	HRZ008-L1-F	
HRZ010-WS-F	HRZ010-W1S-F	HRZ010-W2S-F



CE

Save This Manual Carefully for Use at Any Time

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To the Customers

Thank you for purchasing our THERMO CHILLER HRZ Series (hereinafter called "This system").

For the long-term, safe use of this system, be sure to read and understand this manual thoroughly before performing operation of this system.

- Warnings and precautions defined in this manual shall be observed.
- This manual provides the explanations of the installation and operation of this system. Only those who have thorough understanding of the fundamental operating procedure or have basic knowledge and skills of handling industrial equipment for the installation and operation of this system are qualified to perform installation and operation.
- The contents of this manual and related documents supplied with this system shall be neither regarded as a provision of the contract nor utilized to correct or modify the existing agreements, commitments and relations.
- Copying, duplicating or transferring any part of or whole contents of this manual without the prior written consent of SMC Corporation is strictly prohibited.
- The Service Manual is supplied in addition to this manual and provides the explanations of the inspection, troubleshooting, and in-depth remedies of this system. The Service Manual is intended for service personnel that completed service training SMC provides. Only those who fall under the above condition are allowed to perform maintenance and repair of this system with the use of the Service Manual.

Note: The contents of this manual are subject to change without

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Chapter 1 Safety



Be sure to read and understand the important precautions defined in this manual thoroughly prior to system use.

1.1 Before Using this System

- This "Safety" chapter describes the safety-related items that users should be aware of upon handling this system.
- This system, which is operated under high voltage, is outfitted with the parts that cause a rise or drop in temperature and rotating parts when it is in action. All personnel who work with or around this system are required to thoroughly read and understand the safety-related items in this manual prior to working with or around this system.
- This manual is not intended to be used as a manual for comprehensive safety and hygiene education. Such a manual should be provided by a safety training manager.
- The product is operated at high voltage and contains components which become hot and rotate. If a component needs to be replaced or repaired, contact a specialized vendor for parts and service.
- A safety manager is responsible for observing safety standards. Operators and maintainers, however, are to have individual responsibilies for complying with the safety standard in his/her daily work.
- Operators and maintainers must individually take account of safety and assure a proper working area and working environment.
- The relevant personnel must receive proper safety education prior to work training on this system. Otherwise, personnel may be exposed to hazards. Never conduct work training without giving proper consideration to safety.
- Do not use the materials that rust or corrode for the circulating fluid and facility water circuits. Using the materials that tend to rust or corrode may cause clogs or/and leakages of the circulating fluid and facility water circuits. In case of using these kind of materials, consider and carry out some prevention against the rusting or corrosion on the customer side.
- Save this manual at a designated place for reference when necessary.

1.2 Danger, Warning, and Caution Used in This Manual

1.2.1 Hazard Levels

This system is designed with its first priority being the safety of workers and the prevention of system damage. This manual classifies the risks into the following three categories according to the severity and level of the hazard; Danger, Warning, and Caution. Read the statements carefully, thoroughly understand them before operating this system.

DANGER, WARNING and CAUTION signs are in order according to hazard severity (DANGER > WARNING > CAUTION). See below for the details.

A DANGER

"DANGER" denotes that there is an imminent hazard which will cause serious personal injury or death during operation.

"WARNING" denotes that there is a hazard which may cause serious personal injury or death during operation.

"CAUTION" denotes that there is a hazard which may cause minor personal injury during operation.

CAUTION

"CAUTION" without an exclamation symbol denotes that there is a hazard which may cause damage or failure of this system, facility, or devices.

[Tips]

Tips are provided when there is information personnel are required to be aware of for system operation and maintenance. If the task carries useful information, the relevant tips are given as well.

1.2.2 Definitions of "Serious injury" and "Minor injury"

"Serious injury"

This term describes injuries such as loss of eyesight, wound, burns, frostbite, electric shock, fracture, and toxication that leave aftereffects, and/or injury requiring hospitalization and/or prolonged staying in a hospital.

"Minor injury"

This term describes injuries that do not require hospitalization or prolonged staying in a hospital (injuries other than "serious injuries" described above).

1.2.3 Symbols

This manual provides the following symbols in addition to "Danger", "Warning", and "Caution" to present the warning details in easy-to-understand manner.

Symbol of electrical hazard



Symbol of heat hazard



Symbol of low temperature hazard



This symbol warns you of potential frostbite.

Symbol of "Don'ts"



This symbol denotes "Don't" item which you must not do in operation of this system.

Symbol of "Required Action"



1.3 Hazard Warning Label

The hazard warning labels are applied to the sections of this system where potential hazards are present during system operation and maintenance.

The hazard warning labels are in appropriate sizes and colors to get attention of the operator. They contain symbols in addition to the descriptions of warnings.

1.3.1 Type of hazard warning label

The hazard warning labels affixed on this system are listed below.

Labels of high voltage hazard



Labels of hot/cold surface hazard



1.3.2 Location of hazard warning label



High voltage hazard

label.



■ Hot/cold surface hazard



Figure 1-8 Hot/Cold Surface Hazard

1.4 Location of Model Label

Information about the product, such as Serial No. and Model No. can be found on the product label. This information is needed when contacting an SMC sales distributor.



Figure 1-9 Location of Model Label

1.5 Safety Measures

1.5.1 Safety Precautions

While this system is protected by various safety measures including the safety interlocks, the following basic safety precautions should be observed to assure further safe operations.



Follow the following instructions upon operation of this system. Failure to follow the instructions can lead to personal injury or hazardous accidents.

- Read and understand this manual thoroughly before operation of this system.
- Before operating the system during maintenance, inform all personnel who are working in the vicinity of the system to alert them of your action.
- Use appropriate tools and follow proper procedures.
- See "1.5.4 Protective equipment" on page1-12 to wear protective equipment properly.
- Refer to your safety manual for emergency evacuation.
- Use assistance to carry object over 20 kg.
- Check that all parts and screws are returned to the pre-work conditions at the end of work.
- Do not work when intoxicated or feeling ill. Accidents may occur if disregarded.
- Do not remove a panel unless permitted in this manual.
- Do not handle this product by any means other than specified in this Operation Manual.

1.5.2 Safety Interlock system

Safety Interlock system

The function of the safety interlock system is not only protect personnel by restricting operation that may cause damage to this system or the facility around it but also eliminate the danger relating to safety. This system is outfitted with several interlock functions that are activated when improper operation or hazardous conditions occur. System operation shall be terminated when a safety interlock is activated.

An alarm message is displayed on the LCD screen when a safety interlock is activated. See "Chapter 6 Error Message and Troubleshooting" on page 6-1 for details on the alarms and remedies or see section "Troubleshooting" in a separate volume of the "Service Manual".

Front panel

System repair may require the removal of the front panel. The breaker handle operation is available only with the front panel attached.



Figure 1-10 Front Panel

1.5.3 Lockout/Tagout

Summary

Lockout in this system disables the main breaker operation to prevent electric shocks.

Tagout, to be placed on a locked out main breaker, to prevent improper breaker operation (ON) conducted by other personnel.

See "■ Lockout procedure" in the following pages for practical lockout/tagout.



Figure 1-11 Lockout/Tagout



Lockout procedure

A WARNING



All service personnel must observe the restrictions applied during lockout and are required to perform lockout in accordance with this procedure. No service personnel is allowed to start, energize, or use the locked out system.

1. Turn the breaker handle to 'OFF O'.



Figure 1-12 Breaker Handle at 'OFF O'

- **2.** Turn the breaker handle to 'RESET'.
 - Hold the breaker handle with hand. The handle turns back to 'OFF O' if released.
- **3.** Push the lock pushing part of the breaker handle, and turn the breaker handle to 'OFF O'.
 - The lock mechanism part is to remain opened.



Figure 1-13 Breaker Handle at 'RESET'



Figure 1-14 Pushing of Lock Mechanism Part

4. Lock the lock mechanism part with the padlock.



Figure 1-15 Breaker Lock

Releasing lockout

- **1.** Remove the padlock from the lock mechanism part.
- **2.** Turn the breaker handle to 'RESET'.

The lock mechanism part is closed.

 \bullet The handle turns back to 'OFF O' if released.

1.5.4 Protective equipment

This manual defines protective equipment according to work type.

WARNING

Wear proper protective equipment as shown below, according to work type.



Read and understand the relevant operation manual thoroughly prior to use of protective equipment.

- For system transportation, installation and removal
 - Protective footwear

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- For handling circulating fluid
 - Protective footwear
 - Protective apron
- For system operation
 - Protective footwear

- Protective gloves
- Protective gloves
- Protective goggles
- Protective mask

• Hard hat

• Protective gloves

1.6 Emergency Measures 1.6.1 Emergency off [EMO] switch

Press the red emergency off [EMO] switch on the front of the system only if the need to shut off the power arises due to emergency such as natural disaster, fire, earthquake or personal injury.

The emergency off [EMO] switch is a large, red mushroom-shaped push button labeled with 'EMO' on it. The system comes to a halt if this button is pressed.

When press the emergency off [EMO] switch, the control power for this system is shut off to bring the system to a stop. The main breaker of this system, however, is designed not to trip, which enables the motor circuit to remain partially energized. "8.1.6Communication specification" in Chapter 8 Appendix on page 8-16 to view the circuit diagram and see how the EMO switch is interconnected to the system.

Restart of this system is enabled only when this button is reset manually.

Location of emergency off [EMO] switch



Figure 1-16 Location of Emergency Off [EMO] Switch

Reset of emergency off [EMO] switch

WARNING



No automatic recovery is applied to the emergency off [EMO] switch. Always eliminate the cause of activating the EMO before resetting. Potential serious accidents may occur if disregarded.

- **1.** Before restarting, always make sure that the cause of the emergency off condition (The reason why the EMO switch was activated) has been eliminated from the power supplies, the system and peripheral equipment.
- **2.** With the cause completely eliminated, turn the emergency off [EMO] switch clockwise to reset.

The EMO button returns to its original position.







When the system is in remote mode, the remote mode is retained despite the power outage. Thus the system operation is to resume as the start signal is issued from your system.

WARNING

3. The screen then changes from the "Model Indication screen" to "Status screen 1" as power is being restored to the system.

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1.7 Waste Disposal

1.7.1 Disposal of refrigerant and compressor oil

HFC- refrigerant and compressor oil are present in this system. When recovering the refrigerant or compressor oil, the precautions provided below should thoroughly be read and understood in advance. If you have any questions or concerns, contact the system supplier.



Only service personnel or those who are qualified are allowed to open the panel of this system.

WARNING

A WARNING

Do not dispose of the compressor oil as domestic garbage. Incineration is permitted only at an authorized incinerator.

A WARNING



Disposal of the compressor oil must be in accordance with regulations and rules of local authorities.

A WARNING

The release of refrigerant into the air is prohibited by law. Recover the refrigerant with the "refrigerant recovery system", and request the specialized waste disposal agency for disposal of the recovered refrigerant.

A WARNING



Only personnel with proper licensing, who have adequate knowledge and experiences with not only this system but associated equipment are allowed to implement the recovery of the refrigerant and compressor oil.

[Tips]

For the type and quantity of the refrigerant, See "Location of Model Label" on page 1-7.

1.7.2 Circulating fluid disposal

As to the disposal of a circulating fluid (ethylene glycol solution, fluorinated fluid), consign the specialized industrial waste disposal agency with the contents detailed.

1.7.3 System disposal

As to the disposal of this system, consign the specialized industrial waste disposal agency in accordance with local laws and regulations.

1.7.4 Label

Label described below which is attached to the top panel of product is that required by Japanese law, and the content of this label is applicable in Japan only.



Contents of description of this label is shown as follows.

Fluorocarbon Collection and Destruction Law in Japan

This product uses Fluorocarbon (HFC) as a refrigerant.

1. It is strictly forbidden to emit Fluorocarbon to the atomosphere.

2. When disposing this product, Fluorocarbon must be collected in an appropriate manner.

3. This kind of Fluorocarbon and the amount used in this product is printed on the name label.

1.8 Material Safety Data Sheet (SDS)

Any chemicals used by the user must be accompanied by an SDS.



[About Contents]

- Contents documented here are based on references, information and data available so far. Information given regarding physical/chemical properties, hazard and toxicity here gives no guarantee.
- Also, be noted that cautions are for normal handling. Carry out sufficient safety, hygiene, and environmental measures for special handling.
- Note the items described as "no documentation" mean our study on those items is not completed yet.

1.8.1 Galden[®] HT135

SAFETY DATA SHEET

GALDEN® HT135

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SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

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1.2 Relevant identified uses of the substance or mixture and uses advised against

Uses of the Substance/Mixture

- Trade name

- Heat transfer medium
- For industrial use only.

1.3 Details of the supplier of the safety data sheet

Company

SOLVAY SPECIALTY POLYMERS JAPAN K.K. 7TH FL,ATAGO GREEN HILLS MORI TOWER ATAGO 2-5-1, MINATO-KU 105-6207, TOKYO JAPAN Tel: +81-3-54254300 / 4330 Fax: +81-3-54254321

E-mail address

sds.solvay@solvay.com

1.4 Emergency telephone number

+81 345 789 341 [Carechem 24]

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification (JIS Z 7252) and Hazard communication (JIS Z 7253) based on GHS.

- Not classified as hazardous product according to JIS Z 7252.

2.2 Label elements

Classification (JIS Z 7252) and Hazard communication (JIS Z 7253) based on GHS.

- No GHS labelling required according to JIS Z 7253.

2.3 Other hazards which do not result in classification

- Thermal decomposition can lead to release of toxic and corrosive gases.

SECTION 3: Composition/information on ingredients

3.1 Substance

- Chemical nature

Perfluorinated polyethers





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Information on Components and Impurities

Chemical Name	CAS-No.	Number on official gazette	Concentration [%]
Perfluorinated polyether	****	****	> 99.9

3.2 Mixture

- Not applicable, this product is a substance.

SECTION 4: First aid measures

4.1 Description of first aid measures

In case of inhalation

- Move to fresh air in case of accidental inhalation of fumes from overheating or combustion.
- Oxygen or artificial respiration if needed.

In case of skin contact

- Wash off with soap and water.

In case of eye contact

- Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
- If eye irritation persists, consult a specialist.

In case of ingestion

- Drink 1 or 2 glasses of water.
- Do NOT induce vomiting.
- If symptoms persist, call a physician.

4.2 Most important symptoms and effects, both acute and delayed

In case of inhalation

- Effects
- No known effect.

In case of skin contact

- Effects
 - Effects of skin contacts may include:
 Redness

In case of eye contact

Effects

- Contact with eyes may cause irritation.
- Redness

In case of ingestion

Symptoms

- Ingestion may provoke the following symptoms:
- Nausea
 Vomiting
- Diarrhoea

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician

- None

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SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

- Water
- powder
- Foam
- Dry chemical
- Carbon dioxide (CO2)

Unsuitable extinguishing media

- None

5.2 Special hazards arising from the substance or mixture

- The product is not flammable.
- Not explosive
- In case of fire hazardous decomposition products may be produced such as: Gaseous hydrogen fluoride (HF), Fluorophosgene

5.3 Advice for firefighters

Special protective equipment for firefighters

- Wear self-contained breathing apparatus and protective suit.
- When intervention in close proximity wear acid resistant over suit.

Further information

- Evacuate personnel to safe areas.
- Approach from upwind.
- Protect intervention team with a water spray as they approach the fire.
- Keep containers and surroundings cool with water spray.
- Keep product and empty container away from heat and sources of ignition.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel

- Prevent further leakage or spillage if safe to do so.

Advice for emergency responders

- Ensure adequate ventilation.
- Material can create slippery conditions.
- Sweep up to prevent slipping hazard.
- Keep away from open flames, hot surfaces and sources of ignition.

6.2 Environmental precautions

- Should not be released into the environment.
- Do not flush into surface water or sanitary sewer system.

6.3 Methods and materials for containment and cleaning up

- Soak up with inert absorbent material.
- Suitable material for picking up.
- Dry sand
- Earth
- Shovel into suitable container for disposal.

6.4 Reference to other sections

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- Refer to protective measures listed in sections 7 and 8.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

- Ensure adequate ventilation.
- Use personal protective equipment.
- Keep away from heat and sources of ignition.
- To avoid thermal decomposition, do not overheat.
- Take measures to prevent the build up of electrostatic charge. Clean and dry piping circuits and equipment before any operations.
- Ensure all equipment is electrically grounded before beginning transfer operations.

Hygiene measures

- Ensure that eyewash stations and safety showers are close to the workstation location.
- When using do not eat, drink or smoke.
- Wash hands before breaks and at the end of workday.
 - Handle in accordance with good industrial hygiene and safety practice.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/Storage conditions

- Keep away from heat and sources of ignition.
- Keep in properly labelled containers. Keep away from combustible material.
- Keep away from incompatible products
- Provide tight electrical equipment well protected against corrosion.
- Refer to protective measures listed in sections 7 and 8.

Packaging material

- Suitable material
- Plastic materials.
- glass

7.3 Specific end use(s)

- Contact your supplier for additional information

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

- We are not aware of any national exposure limit.

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Threshold limit values of by-products from thermal decomposition:

Components with official national occupational exposure limits

Components	Value type	Value	Basis
hydrogen fluoride	ACL	0.5 ppm	Japan. Administrative Control Levels

Components with other national occupational exposure limits

Components	Value type	Value	Basis
hydrogen fluoride	OEL-C	3 ppm 2.5 mg/m3	Japan. The Japan Society for Occupational Health. Recommendation of Occupational Exposure Limits

Components with other occupational exposure limits

Components	Value type	Value	Basis
hydrogen fluoride	TWA	0.5 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Denner of o	l 	I
	Expressed as	:Fluorine	
		-	
hydrogen fluoride	С	2 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Danger of c	taneous absorption	1
	Expressed as	:Fluorine	
	-	1	
carbonyl difluoride	TWA	2 ppm	USA. ACGIH Threshold Limit Values (TLV)
carbonyl difluoride	STEL	5 ppm	USA. ACGIH Threshold Limit Values (TLV)

Biological Exposure Indices

Components	Value type	Value	Basis
hydrogen fluoride	BEI	2 mg/l Fluoride Urine Prior to shift (16 hours after exposure ceases)	ACGIH - Biological Exposure Indices (BEI)
hydrogen fluoride	BEI	3 mg/l Fluoride Urine End of shift (As soon as possible after exposure ceases)	ACGIH - Biological Exposure Indices (BEI)

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8.2 Exposure controls

Control measures

Engineering measures

- Provide local ventilation appropriate to the product decomposition risk (see section 10).
- Refer to protective measures listed in sections 7 and 8.
- Apply technical measures to comply with the occupational exposure limits.
- Individual protection measures

Respiratory protection
In case of decomposition (see section 10), use an air breathing apparatus with face mask.
Use only respiratory protection that conforms to international/ national standards.

Hand protection

Wear protective gloves.

- Suitable material
- Nitrile rubber
- PVC
- Neoprene gloves
- butyl-rubber
- Take note of the information given by the producer concerning permeability and break through times, and of special workplace conditions (mechanical strain, duration of contact).

Eye protection

Tightly fitting safety goggles

Skin and body protection Wear work overall and safety shoes.

Hygiene measures

- Ensure that eyewash stations and safety showers are close to the workstation location.
- When using do not eat, drink or smoke.
- Wash hands before breaks and at the end of workday.
- Handle in accordance with good industrial hygiene and safety practice.

Environmental exposure controls

Dispose of rinse water in accordance with local and national regulations.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance	Physical state:	liquid
	Colour:	colourless
<u>Odour</u>	odourless	
Odour Threshold	no data available	
<u>рН</u>	no data available	
Melting point/range	Not applicable	
Boiling point/boiling range	135 °C	
Flash point	The product is no	ot flammable.
Evaporation rate (Butylacetate = 1)	no data available	
Flammability (liquids)	The product is no	ot flammable.
Flammability/Explosive limit	no data available	

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Auto-ignition temperature	no data available		
Vapour pressure	ca. 7.73 hPa		
Vapour density	no data available		
Density	1.72 g/cm3 (25 °C)		
Solubility	Water solubility : insoluble		
	Solubility in other solvents: Fluorinated solvents : insoluble		
Partition coefficient: n-octanol/wate	r no data available		
Thermal decomposition	> 290 °C		
Viscosity	Viscosity, dynamic: ca. 1.72 mPa.s		
Explosive properties	Not explosive		
Oxidizing properties	Not considered as oxidizing		
9.2 Other information			
Molecular weight	610 Da Polymer Molar Mass		
SECTION 10: Stability and reactivity			

10.1 Reactivity

- No dangerous reaction known under conditions of normal use.

10.2 Chemical stability

- Stable under recommended storage conditions.
- Metals promote and lower decomposition temperature

10.3 Possibility of hazardous reactions

- No dangerous reaction known under conditions of normal use.

10.4 Conditions to avoid

- -Avoid to use in presence of high voltage electric arc and in absence of oxygen.
- Keep away from flames. -
- To avoid thermal decomposition, do not overheat. _

10.5 Incompatible materials

- Alkali metals
- Lewis acids (Friedel-Crafts) above 100°C
- Aluminum and magnesium in powder form above 200°C

10.6 Hazardous decomposition products

- Gaseous hydrogen fluoride (HF).Fluorophosgene

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SECTION 11: Toxicological information	
11.1 Information on toxicological effects	
Acute toxicity	
Acute oral toxicity	
	LD50 : > 15,000 mg/kg - Rat , male and female Method: OECD Test Guideline 401
	Test substance: Molecular weight ~ 650
	Not classified as hazardous for acute oral toxicity according to GHS.
Acute inhalation toxicity	
	LC50 - 4 h (vapour): > 66.6 mg/l - Rat, male and female
	Test substance: Molecular weight ~ 650
	Not classified as hazardous for acute inhalation toxicity according to GHS.
Acute dermal toxicity	no observed effect
	LD50 : > 5,000 mg/kg - Rat , male and female
	Method: OECD Test Guideline 402 Test substance: Molecular weight ~ 650
	Not classified as hazardous for acute dermal toxicity according to GHS.
A auto taviaitu / athan nautos af	No effect observed at this dose or concentration
administration)	no data avaliable
Skin corrosion/irritation	
	Rabbit
	Not classified as initiating to skin Method: OECD Test Guideline 404
	Test substance: Molecular weight ~ 650
	2 Weeks - Rabbit No skin intitation
	Method: Repeated dermal application test.
	Test substance: Molecular weight ~ 650
Serious eye damage/eye irritation	
	Rabbit
	Not classified as irritating to eyes
	Test substance: Molecular weight ~ 650
	Unpublished internal reports
Respiratory or skin sensitisation	
	Buehler Test - Guinea pig
	Method: OECD Test Guideline 406
	Test substance: Molecular weight ~ 650
	onpublished internal reports

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Mutagenicity			
Genotoxicity in vitro			
	Ames test with and without metabolic activation		
	negative Method: OECD Test Guideline 471 Test substance: Molecular weight ~ 650 Chromosome aberration test in vitro with and without metabolic activation		
	negative Method: OECD Test Guideline 473 Test substance: Molecular weight ~ 650		
Genotoxicity in vivo			
	In vivo micronucleus test - Rat male		
	Oral Method: OECD Test Guideline 474		
	Test substance: Molecular weight ~ 650		
	negative		
Carcinogenicity	no data available		
Toxicity for reproduction and develop	ment_		
Toxicity to reproduction/Fertility Developmental Toxicity/Teratogenici	no data available ty no data available		
STOT			
STOT - single exposure	The substance or minimum is not allocated as an affic target arran to visant, single		
	exposure according to GHS criteria.		
STOT - repeated exposure	no data available		
CMR effects			
Mutagenicity	The product is considered to be non-mutagenic based on an overall assessment of the data from animal and/or in vitro testing.		
Aspiration toxicity	no data available		
Further information	Description of possible hazardous to health effects is based on experience and/or toxicological characteristics of several components. Thermal decomposition can lead to release of toxic and corrosive gases. The exposure to decomposition products causes severe irritation of eyes, skin and mucous membranes.		

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SECTION 12: Ecological information			
12.1 Toxicity			
Aquatic Compartment			
Acute toxicity to fish			
	By analogy No toxicity at the limit of solubility		
Acute toxicity to daphnia and other aq	uatic invertebrates.		
	By analogy No toxicity at the limit of solubility		
12.2 Persistence and degradability			
Degradability assessment			
	The product is not considered to be rapidly degradable in the environment		
12.3 Bioaccumulative potential	no data available		
12.4 Mobility in soil	no data available		
12.5 Results of PBT and vPvB assessment	ent no data available		
12.6 Other adverse effects	no data available		
Ecotoxicity assessment			
Acute aquatic toxicity	No toxicity at the limit of solubility		
Remarks	Ecological injuries are not known or expected under normal use		
Nonana	Loogical injunes are not known of expected and chornal ase.		
SECTION 13: Disposal considerations			
13.1 Waste treatment methods			
Product Disposal			
Can be incinerated, when in cor The incinerator must be equipped Dispose of in accordance with let	npliance with local regulations. ed with a system for the neutralisation or recovery of HF. ocal regulations.		
Advice on cleaning and disposal of pa	ckaging		
- Empty containers can be landfil	led, when in accordance with the local regulations.		
SECTION 14: Transport information			
not regulated			
International transport regulations			
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IMDG not regulated

IATA not regulated

Note: The above regulatory prescriptions are those valid on the date of publication of this sheet. Given the possible evolution of transport regulations for hazardous materials, it would be advisable to check their validity with your sales office.

SECTION	15: Re	gulatory	inforn	nation
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15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

ISHL Substances Subject to be Notified Names	Not relevant
Poisonous and Deleterious Substances Control Law	Not relevant
Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof	Not relevant

Notification status

Inventory Information	Status
United States TSCA Inventory	- Listed on Inventory
Canadian Domestic Substances List (DSL)	- Listed on Inventory
Australia Inventory of Chemical Substances (AICS)	- Listed on Inventory
Korea. Korean Existing Chemicals Inventory (KECI)	- Listed on Inventory
China. Inventory of Existing Chemical Substances in China (IECSC)	- Listed on Inventory
Japan. ISHL - Inventory of Chemical Substances	- Listed on Inventory
Japan. CSCL - Inventory of Existing and New Chemical Substances	- Listed on Inventory
Philippines Inventory of Chemicals and Chemical Substances (PICCS)	- Listed on Inventory
New Zealand. Inventory of Chemical Substances	- Listed on Inventory
Taiwan. Chemical Substance Inventory (TCSI)	- Listed on Inventory
EU. European Registration, Evaluation, Authorisation and Restriction of Chemical (REACH)	 If product is purchased from Solvay in Europe it is in compliance with REACH, if not please contact the supplier.

SECTION 16: Other information

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Key or legend to abbreviations and acronyms used in the safety data sheet

ACL Administrative Control level
 C Celling limit
 OEL-C Occupational Exposure Limit-Ceiling
 STEL Short-term exposure limit
 TWA 8-hour, time-weighted average

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. Such information is only given as a guidance to help the user handle, use, process, store, transport, dispose and release the product in satisfactory safety conditions and is not to be considered as a warranty or quality specification. It should be used in conjunction with technical sheets but do not replace them. Thus, the information only relates to the designated specific product and may not be applicable if such product is used in combination with other materials or in any other manufacturing process, unless otherwise specifically indicated. It does not release the user from ensuring he is in conformity with all regulations linked to its activity.

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1.8.2 Fluorinert[™] FC-3283

3MTM FluorinertTM Electronic Liquid FC-3283 09/06/16



Safety Data Sheet

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Document Group:	06-4521-8	Version Number:	31.04
Issue Date:	09/06/16	Supercedes Date:	10/13/15

SECTION 1: Identification

1.1. Product identifier

3M[™] Fluorinert[™] Electronic Liquid FC-3283

Product Identification Numbers

98-0212-2908-7, 98-0212-4878-0, 98-0212-4879-8, 98-0212-4880-6, HB-0042-0654-4, ZF-0002-1344-5, ZF-0002-1345-2, ZF-0002-1356-9

1.2. Recommended use and restrictions on use

Recommended use

For Industrial Use Only. Not Intended for Use as a Medical Device or Drug., Testing Fluid or Heat Transfer Fluid for Electronics

Restrictions on use

Fluorinert[™] Electronic Liquids are used in a wide variety of applications, including but not limited to precision cleaning of medical devices and as lubricant deposition solvents for medical devices. When the product is used for applications where the finished device is implanted into the human body, no residual Fluorinert solvent may remain on the parts. It is highly recommended that the supporting test results and protocol be cited during FDA registration.

3M Electronics Markets Materials Division (EMMD) will not knowingly sample, support, or sell its products for incorporation in medical and pharmaceutical products and applications in which the 3M product will be temporarily or permanently implanted into humans or animals. The customer is responsible for evaluating and determining that a 3M EMMD product is suitable and appropriate for its particular use and intended application. The conditions of evaluation, selection, and use of a 3M product can vary widely and affect the use and intended application of a 3M product. Because many of these conditions are uniquely within the user's knowledge and control, it is essential that the user evaluate and determine whether the 3M product is suitable and appropriate for a particular use and intended application, and complies with all local applicable laws, regulations, standards, and guidance.

1.3. Supplier's details

MANUFACTU	RER:
DIVISION:	
ADDRESS:	
Telephone:	

3M Electronics Materials Solutions Division 3M Center, St. Paul, MN 55144-1000, USA 1-888-3M HELPS (1-888-364-3577)

1.4. Emergency telephone number 1-800-364-3577 or (651) 737-6501 (24 hours)

SECTION 2: Hazard identification

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3MTM FluorinertTM Electronic Liquid FC-3283 09/06/16

2.1. Hazard classification

Not classified as hazardous according to OSHA Hazard Communication Standard, 29 CFR 1910.1200.

2.2. Label elements Signal word Not applicable.

Symbols Not applicable.

Pictograms Not applicable.

2.3. Hazards not otherwise classified None.

SECTION 3: Composition/information on ingredients

Ingredient	C.A.S. No.	% by Wt
Perfluoro compounds (primarily compounds with 9	86508-42-1	100
carbons)		

SECTION 4: First aid measures

4.1. Description of first aid measures

Inhalation:

No need for first aid is anticipated.

Skin Contact:

Wash with soap and water. If signs/symptoms develop, get medical attention.

Eye Contact:

Flush with large amounts of water. Remove contact lenses if easy to do. Continue rinsing. If signs/symptoms persist, get medical attention.

If Swallowed:

Rinse mouth. If you feel unwell, get medical attention.

4.2. Most important symptoms and effects, both acute and delayed

See Section 11.1. Information on toxicological effects.

4.3. Indication of any immediate medical attention and special treatment required Not applicable

SECTION 5: Fire-fighting measures

5.1. Suitable extinguishing media

Material will not burn. Use a fire fighting agent suitable for the surrounding fire.

5.2. Special hazards arising from the substance or mixture

Exposure to extreme heat can give rise to thermal decomposition.

Page 2 of 9
Hazardous Decomposition or By-Products

<u>Substance</u> Carbon monoxide Carbon dioxide <u>Condition</u> During Combustion During Combustion

5.3. Special protective actions for fire-fighters

When fire fighting conditions are severe and total thermal decomposition of the product is possible, wear full protective clothing, including helmet, self-contained, positive pressure or pressure demand breathing apparatus, bunker coat and pants, bands around arms, waist and legs, face mask, and protective covering for exposed areas of the head.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Evacuate area. Ventilate the area with fresh air. For large spill, or spills in confined spaces, provide mechanical ventilation to disperse or exhaust vapors, in accordance with good industrial hygiene practice. Refer to other sections of this SDS for information regarding physical and health hazards, respiratory protection, ventilation, and personal protective equipment.

6.2. Environmental precautions

Avoid release to the environment. For larger spills, cover drains and build dikes to prevent entry into sewer systems or bodies of water.

6.3. Methods and material for containment and cleaning up

Contain spill. Working from around the edges of the spill inward, cover with bentonite, vermiculite, or commercially available inorganic absorbent material. Mix in sufficient absorbent until it appears dry. Remember, adding an absorbent material does not remove a physical, health, or environmental hazard. Collect as much of the spilled material as possible. Place in a closed container approved for transportation by appropriate authorities. Clean up residue with an appropriate solvent selected by a qualified and authorized person. Ventilate the area with fresh air. Read and follow safety precautions on the solvent label and SDS. Seal the container. Dispose of collected material as possible.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Do not breathe thermal decomposition products. Avoid skin contact with hot material. For industrial or professional use only. Store work clothes separately from other clothing, food and tobacco products. Do not eat, drink or smoke when using this product. Wash thoroughly after handling. No smoking: Smoking while using this product can result in contamination of the tobacco and/or smoke and lead to the formation of hazardous decomposition products.

7.2. Conditions for safe storage including any incompatibilities

Store away from heat.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Occupational exposure limits

No occupational exposure limit values exist for any of the components listed in Section 3 of this SDS.

8.2. Exposure controls

8.2.1. Engineering controls Provide appropriate local exhaust when product is heated.

8.2.2. Personal protective equipment (PPE)

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Eye/face protection None required.

Skin/hand protection

Select and use gloves and/or protective clothing approved to relevant local standards to prevent skin contact based on the results of an exposure assessment. Selection should be based on use factors such as exposure levels, concentration of the substance or mixture, frequency and duration, physical challenges such as temperature extremes, and other use conditions. Consult with your glove and/or protective clothing manufacturer for selection of appropriate compatible gloves/protective clothing. Note: Nitrile gloves may be worn over polymer laminate gloves to improve dexterity. Gloves made from the following material(s) are recommended: Polymer laminate

Respiratory protection

During heating:

Use a positive pressure supplied-air respirator if there is a potential for over exposure from an uncontrolled release, exposure levels are not known, or under any other circumstances where air-purifying respirators may not provide adequate protection.

Thermal hazards

Wear heat insulating gloves when handling hot material to prevent thermal burns.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

in inter and on ousie physical and chemical	properties
General Physical Form:	Liquid
Specific Physical Form:	Liquid
Odor, Color, Grade:	Colorless, odorless liquid.
Odor threshold	No Data Available
pH	Not Applicable
Melting point	Not Applicable
Boiling Point	123 - 133 °C
Flash Point	No flash point
Evaporation rate	< 1 [Ref Std: BUOAC=1]
Flammability (solid, gas)	Not Applicable
Flammable Limits(LEL)	None detected
Flammable Limits(UEL)	None detected
Vapor Pressure	14 mmHg [@ 23 °C]
Vapor Density	18 [@ 23 °C] [Ref Std: AIR=1]
Density	1.8 g/ml
Specific Gravity	1.8 [Ref Std: WATER=1]
Solubility in Water	Nil
Solubility- non-water	No Data Available
Partition coefficient: n-octanol/ water	No Data Available
Autoignition temperature	No Data Available
Decomposition temperature	Not Applicable
Viscosity	0.7 centistoke [@ 25 °C]
Molecular weight	No Data Available
Volatile Organic Compounds	[Details: Exempt]
Percent volatile	100 %
VOC Less H2O & Exempt Solvents	[Details: Exempt]

SECTION 10: Stability and reactivity

10.1. Reactivity

This material may be reactive with certain agents under certain conditions - see the remaining headings in this section.

10.2. Chemical stability Stable.

10.3. Possibility of hazardous reactions Hazardous polymerization will not occur.

10.4. Conditions to avoid Heat

10.5. Incompatible materials Finely divided active metals Alkali and alkaline earth metals

10.6. Hazardous decomposition products <u>Substance</u>

Hydrogen Fluoride Perfluoroisobutylene (PFIB) <u>Condition</u> At Elevated Temperatures - greater than 200 °C At Elevated Temperatures - greater than 200 °C

Refer to section 5.2 for hazardous decomposition products during combustion.

If the product is exposed to extreme condition of heat from misuse or equipment failure, toxic decomposition products that include hydrogen fluoride and perfluoroisobutylene can occur.

SECTION 11: Toxicological information

The information below may not be consistent with the material classification in Section 2 if specific ingredient classifications are mandated by a competent authority. In addition, toxicological data on ingredients may not be reflected in the material classification and/or the signs and symptoms of exposure, because an ingredient may be present below the threshold for labeling, an ingredient may not be available for exposure, or the data may not be relevant to the material as a whole.

11.1. Information on Toxicological effects

Signs and Symptoms of Exposure

Based on test data and/or information on the components, this material may produce the following health effects:

Inhalation:

No known health effects.

Skin Contact:

Contact with the skin during product use is not expected to result in significant irritation.

Eye Contact:

Contact with the eyes during product use is not expected to result in significant irritation.

Ingestion: May be harmful if swallowed.

Additional Information:

A Material Toxicity Summary Sheet (MTSS) has been developed for this product. Please contact the address listed on the first

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page of this MSDS to obtain a copy of the MTSS for this product.

Toxicological Data

If a component is disclosed in section 3 but does not appear in a table below, either no data are available for that endpoint or the data are not sufficient for classification.

Acute Toxicity

Name	Route	Species	Value
Perfluoro compounds (primarily compounds with 9 carbons)	Dermal		LD50 estimated to be > 5,000 mg/kg
Perfluoro compounds (primarily compounds with 9 carbons)	Inhalation-	Rat	LC50 > 41 mg/l
	Vapor (4		
	hours)		
Perfluoro compounds (primarily compounds with 9 carbons)	Ingestion	Rat	LD50 > 5,000 mg/kg
ATE = acute toxicity estimate			

Skin Corrosion/Irritation

Name	Species	Value
Perfluoro compounds (primarily compounds with 9 carbons)	Rabbit	No significant irritation

Serious Eye Damage/Irritation

	Name	Species	Value
Ľ	Perfluoro compounds (primarily compounds with 9 carbons)	Rabbit	No significant irritation

Skin Sensitization

For the component/components, either no data are currently available or the data are not sufficient for classification.

Respiratory Sensitization

For the component/components, either no data are currently available or the data are not sufficient for classification.

Germ Cell Mutagenicity

	Name	Route	Value
[Perfluoro compounds (primarily compounds with 9 carbons)	In Vitro	Not mutagenic

Carcinogenicity

For the component/components, either no data are currently available or the data are not sufficient for classification.

Reproductive Toxicity

Reproductive and/or Developmental Effects

For the component/components, either no data are currently available or the data are not sufficient for classification.

Target Organ(s)

Specific Target Organ Toxicity - single exposure

For the component/components, either no data are currently available or the data are not sufficient for classification.

Specific Target Organ Toxicity - repeated exposure

Name	Route	Target Organ(s)	Value	Species	Test Result	Exposure
						Duration
Perfluoro compounds	Inhalation	heart endocrine	All data are negative	Rat	NOAEL	13 weeks
(primarily compounds with		system bone, teeth,	_		49,821 ppm	
9 carbons)		nails, and/or hair				
		hematopoietic				
		system liver				
		immune system				
		nervous system				

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		eyes kidney and/or bladder respiratory system				
Perfluoro compounds (primarily compounds with 9 carbons)	Ingestion	heart endocrine system hematopoietic system liver nervous system kidney and/or bladder respiratory system	All data are negative	Rat	NOAEL 2,000 mg/kg/day	28 days

Aspiration Hazard

For the component/components, either no data are currently available or the data are not sufficient for classification.

Please contact the address or phone number listed on the first page of the SDS for additional toxicological information on this material and/or its components.

SECTION 12: Ecological information

Ecotoxicological information

Please contact the address or phone number listed on the first page of the SDS for additional ecotoxicological information on this material and/or its components.

Chemical fate information

Please contact the address or phone number listed on the first page of the SDS for additional chemical fate information on this material and/or its components.

SECTION 13: Disposal considerations

13.1. Disposal methods

Dispose of contents/ container in accordance with the local/regional/national/international regulations.

Dispose of waste product in a permitted industrial waste facility. Combustion products will include HF. Facility must be capable of handling halogenated materials.

Empty drums/barrels/containers used for transporting and handling hazardous chemicals (chemical substances/mixtures/preparations classified as Hazardous as per applicable regulations) shall be considered, stored, treated & disposed of as hazardous wastes unless otherwise defined by applicable waste regulations. Consult with the respective regulating authorities to determine the available treatment and disposal facilities.

EPA Hazardous Waste Number (RCRA): Not regulated

SECTION 14: Transport Information

Not regulated per U.S. DOT, IATA or IMO.

These transportation classifications are provided as a customer service. As the shipper YOU remain responsible for complying with all applicable laws and regulations, including proper transportation classification and packaging. 3M transportation classifications are based on product formulation, packaging, 3M policies and 3M understanding of applicable current regulations. 3M does not guarantee the accuracy of this classification information. This information applies only to transportation classification and not the packaging, labeling, or marking requirements. The original 3M package is certified for U.S. ground shipment only. If you are shipping by air or ocean, the package may not meet applicable regulatory requirements.

SECTION 15: Regulatory information

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15.1. US Federal Regulations Contact 3M for more information.

311/312 Hazard Categories:

Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No Immediate Hazard - Yes Delayed Hazard - No

15.2. State Regulations

Contact 3M for more information.

15.3. Chemical Inventories

The components of this material are in compliance with the provisions of Australia National Industrial Chemical Notification and Assessment Scheme (NICNAS). Certain restrictions may apply. Contact the selling division for additional information.

The components of this product are in compliance with the new substance notification requirements of CEPA.

The components of this material are in compliance with the China "Measures on Environmental Management of New Chemical Substance". Certain restrictions may apply. Contact the selling division for additional information.

The components of this material are in compliance with the provisions of Philippines RA 6969 requirements. Certain restrictions may apply. Contact the selling division for additional information.

The components of this product are in compliance with the chemical notification requirements of TSCA.

Contact 3M for more information.

15.4. International Regulations

Contact 3M for more information.

This SDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SECTION 16: Other information

NFPA Hazard Classification Health: 3 Flammability: 0 Instability: 0 Special Hazards: None

National Fire Protection Association (NFPA) hazard ratings are designed for use by emergency response personnel to address the hazards that are presented by short-term, acute exposure to a material under conditions of fire, spill, or similar emergencies. Hazard ratings are primarily based on the inherent physical and toxic properties of the material but also include the toxic properties of combustion or decomposition products that are known to be generated in significant quantities.

HMIS Hazard Classification

Health: 0 Flammability: 0 Physical Hazard: 0 Personal Protection: X - See PPE section.

Hazardous Material Identification System (HMIS® IV) hazard ratings are designed to inform employees of chemical hazards in the workplace. These ratings are based on the inherent properties of the material under expected conditions of normal use and are not intended for use in emergency situations. HMIS® IV ratings are to be used with a fully implemented HMIS® IV program. HMIS® is a registered mark of the American Coatings Association (ACA).

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Reason for Reissue

Conversion to GHS format SDS.

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1.8.3 Galden[®] HT200

SAFETY DATA SHEET

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SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

GALDEN® HT200

1.2 Relevant identified uses of the substance or mixture and uses advised against

Uses of the Substance/Mixture

- Trade name

- Heat transfer medium
- For industrial use only.

1.3 Details of the supplier of the safety data sheet

Company

SOLVAY SPECIALTY POLYMERS JAPAN K.K. 7TH FL,ATAGO GREEN HILLS MORI TOWER ATAGO 2-5-1, MINATO-KU 105-6207, TOKYO JAPAN Tel: +81-3-54254300 / 4330 Fax: +81-3-54254321

E-mail address

sds.solvay@solvay.com

1.4 Emergency telephone number

+81 345 789 341 [Carechem 24]

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification (JIS Z 7252) and Hazard communication (JIS Z 7253) based on GHS.

- Not classified as hazardous product according to JIS Z 7252.

2.2 Label elements

Classification (JIS Z 7252) and Hazard communication (JIS Z 7253) based on GHS.

- No GHS labelling required according to JIS Z 7253.

2.3 Other hazards which do not result in classification

- Thermal decomposition can lead to release of toxic and corrosive gases.

SECTION 3: Composition/information on ingredients

3.1 Substance

- Chemical nature

Perfluorinated polyethers

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Information on Components and Impurities

Chemical Name	CAS-No.	Number on official gazette	Concentration [%]
Perfluorinated polyether	****	****	> 99.9

3.2 Mixture

- Not applicable, this product is a substance.

SECTION 4: First aid measures

4.1 Description of first aid measures

In case of inhalation

- Move to fresh air in case of accidental inhalation of fumes from overheating or combustion.
- Oxygen or artificial respiration if needed.

In case of skin contact

- Wash off with soap and water.

In case of eye contact

- Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
- If eye irritation persists, consult a specialist.

In case of ingestion

- Drink 1 or 2 glasses of water.
- Do NOT induce vomiting.
- If symptoms persist, call a physician.

4.2 Most important symptoms and effects, both acute and delayed

In case of inhalation

Effects

No known effect.

In case of skin contact

- Effects
 - Effects of skin contacts may include:
 Redness

In case of eye contact

Effects

- Contact with eyes may cause irritation.
- Redness

In case of ingestion

Symptoms

- Ingestion may provoke the following symptoms:
- Nausea
- Vomiting
- Diarrhoea

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician

- None

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SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

- Water
- powder
- Foam
- Dry chemical
- Carbon dioxide (CO2)

Unsuitable extinguishing media

- None

5.2 Special hazards arising from the substance or mixture

- The product is not flammable.
- Not explosive
- In case of fire hazardous decomposition products may be produced such as: Gaseous hydrogen fluoride (HF), Fluorophosgene

5.3 Advice for firefighters

Special protective equipment for firefighters

- Wear self-contained breathing apparatus and protective suit.
- When intervention in close proximity wear acid resistant over suit.

Further information

- Evacuate personnel to safe areas.
- Approach from upwind.
- Protect intervention team with a water spray as they approach the fire.
- Keep containers and surroundings cool with water spray.
- Keep product and empty container away from heat and sources of ignition.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel

- Prevent further leakage or spillage if safe to do so.

Advice for emergency responders

- Ensure adequate ventilation.
- Material can create slippery conditions.
- Sweep up to prevent slipping hazard.
- Keep away from open flames, hot surfaces and sources of ignition.

6.2 Environmental precautions

- Should not be released into the environment.
- Do not flush into surface water or sanitary sewer system.

6.3 Methods and materials for containment and cleaning up

- Soak up with inert absorbent material.
- Suitable material for picking up.
- Dry sand
- Earth
- Shovel into suitable container for disposal.

6.4 Reference to other sections

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Refer to protective measures listed in sections 7 and 8.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

- Ensure adequate ventilation.
- Use personal protective equipment. _
- Keep away from heat and sources of ignition.
- To avoid thermal decomposition, do not overheat.
- Take measures to prevent the build up of electrostatic charge.
- Clean and dry piping circuits and equipment before any operations.
- Ensure all equipment is electrically grounded before beginning transfer operations.

Hygiene measures

- Ensure that eyewash stations and safety showers are close to the workstation location. -
- When using do not eat, drink or smoke.
- Wash hands before breaks and at the end of workday. _
- Handle in accordance with good industrial hygiene and safety practice. -

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/Storage conditions

- Keep away from heat and sources of ignition.
- Keep in properly labelled containers. Keep away from combustible material
- Keep away from incompatible products
- Provide tight electrical equipment well protected against corrosion.
- Refer to protective measures listed in sections 7 and 8.

Packaging material

- Suitable material
- polyethylene containers

7.3 Specific end use(s)

- Contact your supplier for additional information

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

We are not aware of any national exposure limit.

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Threshold limit values of by-products from thermal decomposition:

Components with official national occupational exposure limits

Components	Value type	Value	Basis
hydrogen fluoride	ACL	0.5 ppm	Japan. Administrative Control Levels

Components with other national occupational exposure limits

Components	Value type	Value	Basis
hydrogen fluoride	OEL-C	3 ppm	Japan. The Japan Society for Occupational
		2.5 mg/m3	Health. Recommendation of Occupational
			Exposure Limits

Components with other occupational exposure limits

Components	Value type	Value	Basis
hydrogen fluoride	TWA	0.5 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Danger of cu	itaneous absorption	
	Expressed as	:Fluorine	
hydrogen fluoride	С	2 ppm	USA_ACGIH Threshold Limit Values (TLV)
nyarogen naenae	Ŭ	~ pp	
	Danger of cu Expressed as	Itaneous absorption ;Fluorine	
		1	
carbonyl difluoride	TWA	2 ppm	USA. ACGIH Threshold Limit Values (TLV)
carbonyl difluoride	STEL	5 ppm	USA. ACGIH Threshold Limit Values (TLV)
4			1

Biological Exposure Indices

Components	Value type	Value	Basis
hydrogen fluoride	BEI	2 mg/l Fluoride Urine Prior to shift (16 hours after exposure ceases)	ACGIH - Biological Exposure Indices (BEI)
hydrogen fluoride	BEI	3 mg/l Fluoride Urine End of shift (As soon as possible after exposure ceases)	ACGIH - Biological Exposure Indices (BEI)

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8.2 Exposure controls

Control measures

Engineering measures

- Provide local ventilation appropriate to the product decomposition risk (see section 10).
- Refer to protective measures listed in sections 7 and 8.
- Apply technical measures to comply with the occupational exposure limits.

Individual protection measures

- Respiratory protection

 In case of decomposition (see section 10), use an air breathing apparatus with face mask.
 Use only respiratory protection that conforms to international/ national standards.
- Hand protection
- Wear protective gloves.
- Suitable material
- Nitrile rubber
- PVC
- Neoprene gloves -
- butyl-rubber
- Take note of the information given by the producer concerning permeability and break through times, and of special workplace conditions (mechanical strain, duration of contact).

Eye protection

Tightly fitting safety goggles

Skin and body protection

Wear work overall and safety shoes.

Hygiene measures

- Ensure that eyewash stations and safety showers are close to the workstation location.
- _ When using do not eat, drink or smoke.
- Wash hands before breaks and at the end of workday. _
- Handle in accordance with good industrial hygiene and safety practice.
- Environmental exposure controls

Dispose of rinse water in accordance with local and national regulations.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance	Physical state:	liquid
	<u>Colour</u> :	colourless
<u>Odour</u>	odourless	
Odour Threshold	no data available	
<u>рН</u>	no data available	
Melting point/range	Not applicable	
Boiling point/boiling range	200 °C	
Flash point	The product is no	ot flammable.
Evaporation rate (Butylacetate = 1)	no data available	
Flammability (liquids)	The product is no	ot flammable.
Flammability/Explosive limit	no data available	

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Auto-ignition temperature	no data available		
Vapour pressure	0.27 hPa		
Vapour density	no data available		
Density	1.79 g/cm3		
<u>Solubility</u>	<u>Water solubility :</u> insoluble		
	Solubility in other solvents: Fluorinated solvents : soluble		
Partition coefficient: n-octanol/wate	r no data available		
Thermal decomposition	> 290 °C		
Viscosity	Viscosity, dynamic : ca. 4.3 mPa.s		
Explosive properties	Not explosive		
Oxidizing properties	Not considered as oxidizing		
9.2 Other information			
Molecular weight	870 Da Polymer Molar Mass		

SECTION 10: Stability and reactivity

10.1 Reactivity

- No dangerous reaction known under conditions of normal use.

10.2 Chemical stability

- Stable under recommended storage conditions.
- _ Metals promote and lower decomposition temperature

10.3 Possibility of hazardous reactions

- No dangerous reaction known under conditions of normal use.

10.4 Conditions to avoid

- Avoid to use in presence of high voltage electric arc and in absence of oxygen. -
- Keep away from flames. To avoid thermal decomposition, do not overheat. _

10.5 Incompatible materials

- Alkali metals -
- Lewis acids (Friedel-Crafts) above 100°C _
- Aluminum and magnesium in powder form above 200°C -

10.6 Hazardous decomposition products

- Gaseous hydrogen fluoride (HF).Fluorophosgene

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SECTION 11: Toxicological informati	on	
11.1 Information on toxicological effects		
Acute toxicity		
Acute oral toxicity Acute inhalation toxicity Acute dermal toxicity	LD50 : > 15,000 mg/kg - Rat , male and female Method: OECD Test Guideline 401 Test substance: Molecular weight ~ 650 Not classified as hazardous for acute oral toxicity according to GHS. No effect observed at this dose or concentration LC50 - 4 h (vapour) : > 66.6 mg/l - Rat , male and female Method: OECD Test Guideline 403 Test substance: Molecular weight ~ 650 Not classified as hazardous for acute inhalation toxicity according to GHS. no observed effect LD50 : > 5,000 mg/kg - Rat , male and female Method: OECD Test Guideline 402 Test substance: Molecular weight ~ 650 Not classified as hazardous for acute dermal toxicity according to GHS. No effect observed at this dose or concentration no data available	
administration)		
Skin corrosion/irritation	Rabbit Not classified as irritating to skin Method: OECD Test Guideline 404 Test substance: Molecular weight ~ 650 2 Weeks - Rabbit No skin irritation Method: Repeated dermal application test. Test substance: Molecular weight ~ 650	
Serious eye damage/eye irritation	Debbi	
	Naboli Not classified as irritating to eyes Method: OECD Test Guideline 405 Test substance: Molecular weight ~ 650 Unpublished internal reports	
<u>Respiratory or skin sensitisation</u>	Buehler Test - Guinea pig Does not cause skin sensitisation. Method: OECD Test Guideline 406 Test substance: Molecular weight ~ 650 Unpublished internal reports	

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Mutagenicity		
Genotoxicity in vitro		
	Ames test with and without metabolic activation	
	negative Method: OECD Test Guideline 471 Test substance: Molecular weight ~ 650 Chromosome aberration test in vitro with and without metabolic activation	
	negative Method: OECD Test Guideline 473 Test substance: Molecular weight ~ 650	
Genotoxicity in vivo	In vivo micronucleus test - Rat	
	male	
	Method: OECD Test Guideline 474 Test substance: Molecular weight ~ 650	
	negative	
Carcinogenicity	no data available	
Toxicity for reproduction and develop	<u>ment</u>	
Toxicity to reproduction/Fertility Developmental Toxicity/Teratogenici	no data available ty no data available	
STOT		
STOT - single exposure		
	The substance or mixture is not classified as specific target organ toxicant, single exposure according to GHS criteria.	
STOT - repeated exposure	no data available	
CMR effects		
Mutagenicity	The product is considered to be non-mutagenic based on an overall assessment of the data from animal and/or in vitro testing	
A		
Aspiration toxicity	no data available	
Further information	Description of possible hazardous to health effects is based on experience and/or toxicological characteristics of several components. Thermal decomposition can lead to release of toxic and corrosive gases. The exposure to decomposition products causes severe irritation of eyes, skin and mucous membranes.	

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SECTION 12: Ecological information		
12.1 Toxicity		
•		
Aquatic Compartment		
Addle toxicity to itsi	By analogy No toxicity at the limit of solubility	
Acute toxicity to daphnia and other aqu	uatic invertebrates. By analogy No toxicity at the limit of solubility	
12.2 Persistence and degradability		
Degradability assessment	The product is not considered to be rapidly degradable in the environment	
12.3 Bioaccumulative potential	no data available	
12.4 Mobility in soil	no data available	
12.5 Results of PBT and vPvB assessment	no data available	
12.6 Other adverse effects	no data available	
Ecotoxicity assessment		
Acute aquatic toxicity	No toxicity at the limit of solubility	
Remarks	Ecological injuries are not known or expected under normal use.	
SECTION 13: Disposal considerations		
13.1 Waste treatment methods		
Product Disposal		
 Can be incinerated, when in compliance with local regulations. The incinerator must be equipped with a system for the neutralisation or recovery of HF. Dispose of in accordance with local regulations. 		
Advice on cleaning and disposal of page	ckaging	
- Empty containers can be landfill	ed, when in accordance with the local regulations.	
SECTION 14: Transport information		
Local regulation		
not regulated		
International transport regulations		
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1.8 Material Safety Data Sheet (SDS)

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IMDG not regulated

IATA not regulated

Note: The above regulatory prescriptions are those valid on the date of publication of this sheet. Given the possible evolution of transport regulations for hazardous materials, it would be advisable to check their validity with your sales office.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

ISHL Substances Subject to be Notified Names	Not relevant
Poisonous and Deleterious Substances Control Law	Not relevant
Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof	Not relevant

Notification status

Inventory Information	Status
United States TSCA Inventory	- Listed on Inventory
Canadian Domestic Substances List (DSL)	- Listed on Inventory
Australia Inventory of Chemical Substances (AICS)	- Listed on Inventory
Korea. Korean Existing Chemicals Inventory (KECI)	- Listed on Inventory
China. Inventory of Existing Chemical Substances in China (IECSC)	- Listed on Inventory
Japan. ISHL - Inventory of Chemical Substances	- Listed on Inventory
Japan. CSCL - Inventory of Existing and New Chemical Substances	- Listed on Inventory
Philippines Inventory of Chemicals and Chemical Substances (PICCS)	- Listed on Inventory
New Zealand. Inventory of Chemical Substances	- Listed on Inventory
Taiwan. Chemical Substance Inventory (TCSI)	- Listed on Inventory
EU. European Registration, Evaluation, Authorisation and Restriction of Chemical (REACH)	 If product is purchased from Solvay in Europe it is in compliance with REACH, if not please contact the supplier.

SECTION 16: Other information

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Key or legend to abbreviations and acronyms used in the safety data sheet

-	ACL	Administrative Control level
-	С	Ceiling limit
	OEL-C	Occupational Exposure Limit-Ceiling
	STEL	Short-term exposure limit
	TWA	8-hour, time-weighted average

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. Such information is only given as a guidance to help the user handle, use, process, store, transport, dispose and release the product in satisfactory safety conditions and is not to be considered as a warranty or quality specification. It should be used in conjunction with technical sheets but do not replace them. Thus, the information only relates to the designated specific product and may not be applicable if such product is used in combination with other materials or in any other manufacturing process, unless otherwise specifically indicated. It does not release the user from ensuring he is in conformity with all regulations linked to its activity.

P01000018311 Version : 1.09 / JP (EN) www.solvay.com





1.8.4 Fluorinert[™] FC-40

3MTM FluorinertTM Electronic Liquid FC-40 09/16/16



Safety Data Sheet

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Document Group:	10-3783-7	Version Number:	55.00
Issue Date:	09/16/16	Supercedes Date:	09/06/16

SECTION 1: Identification

Product identifier
 3M[™] Fluorinert[™] Electronic Liquid FC-40

Product Identification Numbers 98-0204-0901-1, 98-0212-4881-4, 98-0212-4907-7

1.2. Recommended use and restrictions on use

Recommended use

For industrial use only. Not intended for use as a medical device or drug. Not for sale in Japan. Restrictions on use

Fluorinert[™] Electronic Liquids are used in a wide variety of applications, including but not limited to precision cleaning of medical devices and as lubricant deposition solvents for medical devices. When the product is used for applications where the finished device is implanted into the human body, no residual Fluorinert solvent may remain on the parts. It is highly recommended that the supporting test results and protocol be cited during FDA registration.

3M Electronics Markets Materials Division (EMMD) will not knowingly sample, support, or sell its products for incorporation in medical and pharmaceutical products and applications in which the 3M product will be temporarily or permanently implanted into humans or animals. The customer is responsible for evaluating and determining that a 3M EMMD product is suitable and appropriate for its particular use and intended application. The conditions of evaluation, selection, and use of a 3M product can vary widely and affect the use and intended application of a 3M product. Because many of these conditions are uniquely within the user's knowledge and control, it is essential that the user evaluate and determine whether the 3M product is suitable and appropriate for a particular use and intended application, and complies with all local applicable laws, regulations, standards, and guidance.

1.3. Supplier's details	
MANUFACTURER:	3M
DIVISION:	Electronics Materials Solutions Division
ADDRESS:	3M Center, St. Paul, MN 55144-1000, USA
Telephone:	1-888-3M HELPS (1-888-364-3577)

1.4. Emergency telephone number 1-800-364-3577 or (651) 737-6501 (24 hours)

SECTION 2: Hazard identification

2.1. Hazard classification

Page 1 of 8

Not classified as hazardous according to OSHA Hazard Communication Standard, 29 CFR 1910.1200.

2.2. Label elements Signal word Not applicable.

Symbols Not applicable.

Pictograms Not applicable.

2.3. Hazards not otherwise classified None.

SECTION 3: Composition/information on ingredients

PERFLUORO COMPOUNDS, C5-18 86508-42-1 100	Ingredient	C.A.S. No.	% by Wt
	PERFLUORO COMPOUNDS, C5-18	86508-42-1	100

SECTION 4: First aid measures

4.1. Description of first aid measures

Inhalation:

No need for first aid is anticipated.

Skin Contact:

Wash with soap and water. If signs/symptoms develop, get medical attention.

Eye Contact:

Flush with large amounts of water. Remove contact lenses if easy to do. Continue rinsing. If signs/symptoms persist, get medical attention.

If Swallowed:

No need for first aid is anticipated.

4.2. Most important symptoms and effects, both acute and delayed See Section 11.1. Information on toxicological effects.

4.3. Indication of any immediate medical attention and special treatment required Not applicable

SECTION 5: Fire-fighting measures

5.1. Suitable extinguishing media

Non-combustible. Use a fire fighting agent suitable for surrounding fire.

5.2. Special hazards arising from the substance or mixture Exposure to extreme heat can give rise to thermal decomposition.

Hazardous Decomposition or By-Products

<u>Substance</u> Carbon monoxide Condition During Combustion

Page 2 of 8

Carbon dioxide

During Combustion

5.3. Special protective actions for fire-fighters

When fire fighting conditions are severe and total thermal decomposition of the product is possible, wear full protective clothing, including helmet, self-contained, positive pressure or pressure demand breathing apparatus, bunker coat and pants, bands around arms, waist and legs, face mask, and protective covering for exposed areas of the head.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Ventilate the area with fresh air. For large spill, or spills in confined spaces, provide mechanical ventilation to disperse or exhaust vapors, in accordance with good industrial hygiene practice.

6.2. Environmental precautions

Avoid release to the environment. For larger spills, cover drains and build dikes to prevent entry into sewer systems or bodies of water.

6.3. Methods and material for containment and cleaning up

Contain spill. Working from around the edges of the spill inward, cover with bentonite, vermiculite, or commercially available inorganic absorbent material. Mix in sufficient absorbent until it appears dry. Collect as much of the spilled material as possible. Place in a closed container approved for transportation by appropriate authorities. Clean up residue with an appropriate solvent selected by a qualified and authorized person. Ventilate the area with fresh air. Read and follow safety precautions on the solvent label and SDS. Seal the container. Dispose of collected material as soon as possible.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Do not breathe thermal decomposition products. Avoid skin contact with hot material. For industrial or professional use only. Store work clothes separately from other clothing, food and tobacco products. No smoking: Smoking while using this product can result in contamination of the tobacco and/or smoke and lead to the formation of hazardous decomposition products.

7.2. Conditions for safe storage including any incompatibilities Store away from heat.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Occupational exposure limits No occupational exposure limit values exist for any of the components listed in Section 3 of this SDS.

8.2. Exposure controls

8.2.1. Engineering controls Provide appropriate local exhaust when product is heated.

8.2.2. Personal protective equipment (PPE)

Eye/face protection None required.

Skin/hand protection

No chemical protective gloves are required.

Respiratory protection

Use a positive pressure supplied-air respirator if there is a potential for over exposure from an uncontrolled release, exposure levels are not known, or under any other circumstances where air-purifying respirators may not provide adequate protection. During heating:

Use a positive pressure supplied-air respirator if there is a potential for over exposure from an uncontrolled release, exposure levels are not known, or under any other circumstances where air-purifying respirators may not provide adequate protection.

Thermal hazards

Wear heat insulating gloves when handling hot material to prevent thermal burns.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

General Physical Form:	Liquid
Specific Physical Form:	Liquid
Odor, Color, Grade:	Colorless, odorless liquid.
Odor threshold	No Data Available
pH	Not Applicable
Melting point	Not Applicable
Boiling Point	158 - 173 °C
Flash Point	No flash point
Evaporation rate	< 1 [Ref Std: BUOAC=1]
Flammability (solid, gas)	Not Applicable
Flammable Limits(LEL)	None detected
Flammable Limits(UEL)	None detected
Vapor Pressure	3 mmHg [@ 25 °C]
Vapor Density	22.5 [@ 25 °C] [Ref Std: AIR=1]
Density	1.9 g/ml
Specific Gravity	1.9 [Ref Std: WATER=1]
Solubility in Water	Nil
Solubility- non-water	No Data Available
Partition coefficient: n-octanol/ water	No Data Available
Autoignition temperature	No Data Available
Decomposition temperature	No Data Available
Viscosity	2 centistoke [@ 25 °C]
Molecular weight	No Data Available
Volatile Organic Compounds	[Details: Exempt]
Percent volatile	100 %
VOC Less H2O & Exempt Solvents	[Details: Exempt]

SECTION 10: Stability and reactivity

10.1. Reactivity

This material may be reactive with certain agents under certain conditions - see the remaining headings in this section.

10.2. Chemical stability Stable.

10.3. Possibility of hazardous reactions Hazardous polymerization will not occur.

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10.4. Conditions to avoid Heat

10.5. Incompatible materials Finely divided active metals Alkali and alkaline earth metals

10.6. Hazardous decomposition products <u>Substance</u> Hydrogen Fluoride Perfluoroisobutylene (PFIB)

Condition At Elevated Temperatures - greater than 200 °C At Elevated Temperatures - greater than 200 °C

Refer to section 5.2 for hazardous decomposition products during combustion.

If the product is exposed to extreme condition of heat from misuse or equipment failure, toxic decomposition products that include hydrogen fluoride and perfluoroisobutylene can occur.

SECTION 11: Toxicological information

The information below may not be consistent with the material classification in Section 2 if specific ingredient classifications are mandated by a competent authority. In addition, toxicological data on ingredients may not be reflected in the material classification and/or the signs and symptoms of exposure, because an ingredient may be present below the threshold for labeling, an ingredient may not be available for exposure, or the data may not be relevant to the material as a whole.

11.1. Information on Toxicological effects

Signs and Symptoms of Exposure

Based on test data and/or information on the components, this material may produce the following health effects:

Inhalation:

No health effects are expected.

Skin Contact:

Contact with the skin during product use is not expected to result in significant irritation.

Eye Contact:

Contact with the eyes during product use is not expected to result in significant irritation.

Ingestion:

No known health effects.

Toxicological Data

If a component is disclosed in section 3 but does not appear in a table below, either no data are available for that endpoint or the data are not sufficient for classification.

Acute Toxicity

Name	Route	Species	Value
PERFLUORO COMPOUNDS, C5-18	Dermal		LD50 estimated to be > 5,000 mg/kg
PERFLUORO COMPOUNDS, C5-18	Inhalation- Vapor (4 hours)	Rat	LC50 > 41 mg/l
PERFLUORO COMPOUNDS, C5-18	Ingestion	Rat	LD50 > 5,000 mg/kg

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ATE = acute toxicity estimate

Name	Species	Value			
PERFLUORO COMPOUNDS, C5-18	Rabbit	No significant irritation			
Serious Eve Damage/Irritation					
Serious Eve Damage/Irritation					
Serious Eye Damage/Irritation	Species	Value			
Serious Eye Damage/Irritation Name	Species	Value			

Skin Sensitization

For the component/components, either no data are currently available or the data are not sufficient for classification.

Respiratory Sensitization

For the component/components, either no data are currently available or the data are not sufficient for classification.

Germ Cell Mutagenicity

Name	Route	Value
PERFLUORO COMPOUNDS, C5-18	In Vitro	Not mutagenic

Carcinogenicity

For the component/components, either no data are currently available or the data are not sufficient for classification.

Reproductive Toxicity

Reproductive and/or Developmental Effects

For the component/components, either no data are currently available or the data are not sufficient for classification.

Target Organ(s)

Specific Target Organ Toxicity - single exposure

Specific Target Organ Toxicity - repeated exposure

For the component/components, either no data are currently available or the data are not sufficient for classification.

Name	Route	Target Organ(s)	Value	Species	Test Result	Exposure Duration
PERFLUORO COMPOUNDS, C5-18	Inhalation	heart endocrine system bone, teeth, nails, and/or hair hematopoietic system liver immune system eyes kidney and/or bladder respiratory system	All data are negative	Rat	NOAEL 49,821 ppm	13 weeks
PERFLUORO COMPOUNDS, C5-18	Ingestion	heart endocrine system hematopoietic system liver nervous system kidney and/or bladder respiratory system	All data are negative	Rat	NOAEL 2,000 mg/kg/day	28 days

Aspiration Hazard

For the component/components, either no data are currently available or the data are not sufficient for classification.

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Please contact the address or phone number listed on the first page of the SDS for additional toxicological information on this material and/or its components.

SECTION 12: Ecological information

Ecotoxicological information

Please contact the address or phone number listed on the first page of the SDS for additional ecotoxicological information on this material and/or its components.

Chemical fate information

Please contact the address or phone number listed on the first page of the SDS for additional chemical fate information on this material and/or its components.

SECTION 13: Disposal considerations

13.1. Disposal methods

Dispose of contents/ container in accordance with the local/regional/national/international regulations.

Dispose of waste product in a permitted industrial waste facility. Combustion products will include HF. Facility must be capable of handling halogenated materials.

Empty and clean product containers may be disposed as non-hazardous waste. Consult your specific regulations and service providers to determine available options and requirements.

EPA Hazardous Waste Number (RCRA): Not regulated

SECTION 14: Transport Information

For Transport Information, please visit http://3M.com/Transportinfo or call 1-800-364-3577 or 651-737-6501.

SECTION 15: Regulatory information

15.1. US Federal Regulations

Contact 3M for more information.

311/312 Hazard Categories:

Fire Hazard - No Pressure Hazard - Yes Reactivity Hazard - No Immediate Hazard - No Delayed Hazard - No

15.2. State Regulations

Contact 3M for more information.

15.3. Chemical Inventories

The components of this material are in compliance with the provisions of Australia National Industrial Chemical Notification and Assessment Scheme (NICNAS). Certain restrictions may apply. Contact the selling division for additional information.

The components of this product are in compliance with the new substance notification requirements of CEPA.

The components of this material are in compliance with the China "Measures on Environmental Management of New Chemical Substance". Certain restrictions may apply. Contact the selling division for additional information.

The components of this material are in compliance with the provisions of the Korean Toxic Chemical Control Law. Certain

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restrictions may apply. Contact the selling division for additional information.

The components of this material are in compliance with the provisions of Philippines RA 6969 requirements. Certain restrictions may apply. Contact the selling division for additional information.

The components of this product are in compliance with the chemical notification requirements of TSCA.

Contact 3M for more information.

15.4. International Regulations Contact 3M for more information.

Contact Sivi for more information

This SDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SECTION 16: Other information

NFPA Hazard Classification Health: 3 Flammability: 0 Instability: 0 Special Hazards: None

National Fire Protection Association (NFPA) hazard ratings are designed for use by emergency response personnel to address the hazards that are presented by short-term, acute exposure to a material under conditions of fire, spill, or similar emergencies. Hazard ratings are primarily based on the inherent physical and toxic properties of the material but also include the toxic properties of combustion or decomposition products that are known to be generated in significant quantities.

HMIS Hazard Classification

Health: 0 Flammability: 0 Physical Hazard: 0 Personal Protection: X - See PPE section.

Hazardous Material Identification System (HMIS® IV) hazard ratings are designed to inform employees of chemical hazards in the workplace. These ratings are based on the inherent properties of the material under expected conditions of normal use and are not intended for use in emergency situations. HMIS® IV ratings are to be used with a fully implemented HMIS® IV program. HMIS® is a registered mark of the American Coatings Association (ACA).

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1.8.5 Ethylene glycol aqueous solution 60%

ETHYLENE GLYCOL, 60% Aqueous Solution 1/6

SAFETY DATA SHEET

INITIAL DATE	13 Oct. 2006
REVISION DATE	17 Sep. 2015
REVISION No.	4

SECTION 1: [CHEMICAL PRODUCT AND COMPANY IDENTIFICATION]			
SDS No.	: SWB-0990-08E		
PRODUCT NAME	ETHYLENE GLYCOL, 60% Aqueous Solution		
PRODUCT NUMBER	: HRZ-BR001		
MANUFACTURER	: SHOWA WATER INDUSTRIES CO. LTD.		
ADDRESS	: 764 Washinosu, Yorocho, Yorogun, Gifu, 503-1261 JAPAN		
DEPT. IN CHARGE	: QUALITY ASSURANCE DEPARTMENT		
TELEPHONE	: 81-584-32-3105		
FAX	: 81-584-32-3107		

SECTION 2: [HAZARDS IDENTIFICATION]

MOST IMPORTANT HAZARDS

HEALTH HAZARDS; Harmful if swallowed. The product is irritating to the eyes and respiratory tract. The product may cause effects on the kidneys and central nervous system. This may result in renal failure and brain injury. Exposure could cause lowering of consciousness.

ENVIRONMENTAL EFFECTS ; Harmful to aquatic organisms.

PHYSICAL & CHEMICAL DANGERS ; Non-flammable.

SPECIAL HAZARDS : Causes damage to organs. Causes mild skin irritation and eye irritation. OVERVIEW OF EMERGENCY EXPECTED : Gives off irritating or toxic gases on combustion.

GHS CLASSIFICATION:

	Serious eye damage / Eye irritation	; Category 2B
	Specific target organ systemic toxicity (Single exposure)	; Category 1 *1)
	Specific target organ systemic toxicity (Repeated exposure)	; Category 1 *2)
Hazardous to the aquatic environment (acute)		; Category 3
	*1) central nervous system, kidney, heart, respira	tory organs
	*2) central nervous system, heart, respiratory org	ans
	%Classification according to Japanese Industrial Standard (JI	SZ 7252:2014)」.
	%Hazards which are not indicated in above summary are	[Not classified], [Not applicable] or

[Classification not possible].

GHS LABEL ELEMENTS :

PICTOGRAM;



SIGNAL WORD ; Danger

HAZARD STATEMENT :

Causes eye irritation.

Causes damage to organs (central nervous system, kidneys, heart, respiratory organs). Causes damage to organs (central nervous system, heart, respiratory organs) through prolonged or

ETHYLENE GLYCOL, 60% Aqueous Solution 2/6

repeated exposure.
Harmful to aquatic life.
PRECAUTIONARY STATEMENT :
A SAFETY MEASURE ;
Wash hands thoroughly after handling.
Do not breathe mist/vapours.
Do not eat, drink or smoke when using this product.
Avoid release to the environment.
FIRST-AID MEASURES;
IF IN EYES : Rinse cautiously with water for several minutes. Remove contact lenses, if present and
easy to do. Continue rinsing. If eye irritation persists, get medical advice/attention.
If eye irritation persists, get medical advice/attention.
IF EXPOSED OR CONCERNED : Get medical advice/attention.
Get medical advice/attention if you feel unwell.
STORAGE;
Keep locked up.
DISPOSAL;
Dispose of contents/container in accordance with local/regional/national/international regulations.

SECTION 3: [COMPOSITION / INFORMATION ON INGREDIENTS]

Chemical Name	Concentration (mass%)	CAS No.	MITI No. *3)	EINECS
ETHYLENE GLYCOL	59~61	107-21-1	2-230	203-473-3
WATER	39~41	7732-18-5	_	231-791-2

 $\pm 3)$ MITI No. ; Japanese Ministry of International Trade and Industry registration number

SECTION 4 :	FIRST AID MEASURES	
-------------	--------------------	--

INHALATION	: If large amounts of mist/vapours has been inhaled, immediately remove the exposed person to fresh air and keep quiet. Get medical advice/attention if you feel unwell.
SKIN CONTACT	Remove contaminated clothes. Rinse skin with plenty of water and then wash skin with
	soap. Consult a doctor if there is a change in appearance or if there is pain.
EYE CONTACT	Firstly, rinse with plenty of water for at least 15 minutes (remove contact lenses if easily
	possible), then refer for medical advice/attention.
INGESTION	Rinse mouth with water and drink plenty of water. Induce vomiting. Immediately take
	a medical advice/attention. Never give anything by mouth to an unconscious person.
THE EXPECTED	ACUTE AND TARDIVE SYMPTON : No information about product.
♦ ETHYLENE GI	YCOL
Inhalation	Cough. Dizziness. Headache.
Skin	: Dry skin.
Eyes	Redness. Pain.
Ingestion	: Abdominal pain. Dullness. Nausea. Unconsciousness. Vomiting.
THE MOST IMPO	RTANT SYMPTOMS AND EFFECTS : No information.
PROTECTION FO	OR FIRSTAIDS : Use of suitable protective equipment.
SPECIAL NOTES	FOR DOCTORS : No information.

SECTION 5: [FIRE-FIGHTING MEASURES]
SUITABLE EXTINGUISHING MEDIA :
Not flammable. But may cause flammability due to heating.
Water spray, Carbon dioxide, Foam, Dry chemical, Dry sand, etc
UNSUITABLE EXTINGUISHING MEDIA No information.
SPECIFIC HAZARDS WITH REGARD TO FIRE-FIGHTING :
This product may give off irritating or toxic gases in a fire.
SPECIFIC METHODS OF FIRE-FIGHTING :
Prohibit the entrance except the person concerned.
Move container from fire area if it can be done without risk.
Keep fire exposed containers cool by spraying with water.
The fire-fighting should be performed from the windward side, with suitable respiratory protective
device, if necessary.
PROTECTION FOR FIREFIGHTERS:
Fighters should wear protective clothing, respirator, rubber boots and fireproof clothing.
SECTION 6 : [ACCIDENTAL RELEASE MEASURES]
PERSONAL PRECAUTIONS/PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES :
Rope off the leakage place to prohibit the entry of person.
Wear appropriate personal protective equipments (Refer to section 8) when clean-up working, and
avoid contact.
Work from the windward side.
In the case of indoor, open the windows/doors and ventilate it enough.
ENVIRONMENTAL PRECAUTIONS :
Take precautions to minimize effect on environment. Particularly ensure that the product is not
directly discharged to the ground or to the water drainage gutters, rivers or lakes.
METHODS FOR CLEANING UP :
Collect by absorbing into dry sand, waste or other materials.
In case of large spills, to prevent effluent with sandbags, and recovered as much as possible by using
pumps.
Return spilled liquid to a sealable container and move to a safe location.
Wash away with plenty of water.
Dispose of contaminated waste material in accordance with relevant regulations.
PREVENTION OF SECONDARY HAZARDS :
Immediately remove all ignition sources. (No open flames, no sparks and no smoking.)
SECTION 7: [HANDLING AND STORAGE]
HANDLING :
TECHNICAL MEASURES ; Use personal protective equipments as required. See section 8.
LOCAL EXHAUST VENTILATION / GENERAL VENTILATION ;
Install local exhaust ventilation and general ventilation system. See section 8.
PRECAUTIONS FOR SAFE HANDLING;
Handle in a well-ventilated place. Reseal container after each use.
Handle it carefully not to be scattered.
Wash hands, face, mouth and eyes thoroughly after handling.
Do not eat, drink, or smoke during work.

ETHYLENE GLYCOL, 60% Aqueous Solution 3/6

EVASION OF THE CONTACT ; Refer to section 10.

STORAGE : STORAGE CONDITIONS ; Protect from sunlight. Store Storage facilities should be b Keep away from strong oxid Keep out of reach of childrer CONTAINER MATERIAL ; Keep container tightly close	in a well-ventilated place. Keep cool. built by a fireproof construction. ants, strong bases and strong acids. h and store locked up. d. Use containers without breakage, corrosion and leakage.
SECTION 8: [EXPOSURE 0	CONTROLS / PERSONAL PROTECTION]
MANAGEMENT CONCENTRAT	ION : No information.
OCCUPATIONAL EXPOSURE L	IMITS : No information.
< Reference EQUIPMENT MEASURES :	e value> Ethylene glycol (aerosol only) ; Ceiling 100mg/m³ · ACGIH(2011)
When handling in the factor	y, install local exhaust ventilation and general ventilation system.
Take measures to prevent	t the build-up of electrostatic charge, and ensuring all facilities are
electrically grounded/earthe	d.
Install eye washers and safe clearly.	ety showers in worksites where the product is handled, and display them
PROTECTIVE EQUIPMENTS :	
RESPIRATORY PROTECT	ION ; Respiratory protection mask if necessary.
HAND PROTECTION	; Impervious protective gloves.
	(Nitrile gloves, Neoprene gloves, etc.)
EYE PROTECTION	; Safety glasses with side-shields, Goggles, Face protection.
SKIN PROTECTION	; Protective clothing, Safety boots, Safety helmets.
HYGIENE MEASURES : Wash	hands thoroughly after handling.
Take o	ff contaminated clothing and wash before reuse.
SECTION 9: [PHYSICAL A	ND CHEMICAL PROPERTIES]
APPEARANCE : Colorless	liquid.
ODOR : Little	
pH : 5.5~7.5	
FLASH POINT : None.	
DENSITY : $1,070 \sim 1$,	090 kg/m ³ (20°C)
SOLUBILITY (water) : Miscible.	
SECTION 10: (STABILITY	AND REACTIVITY]
CHEMICAL STABILITY : Stab	le at the normal temperature.
POSSIBILITY OF HAZARDOUS	REACTIONS :
No d	angerous reaction known under conditions of normal use.
CONDITIONS TO AVOID : High	a temperature and direct sunlight.
MATERIALS TO AVOID Strop	ng oxidants, strong acids and strong bases.
HAZARDOUS DECOMPOSITIO	N PRODUCTS : May give off irritating or toxic gases on heating.
SECTION 11: TOXICOLOG	GICAL INFORMATION
◆PRODUCT	
No information.	

vo mormation.

♦ ETHYLENE GLYCOL

ACUTE TOXICITY (oral) $\ : \$ Based on the rat LD50 (oral route) of 4,000 \sim 10,200mg/kg. SKIN CORROSION / IRRITATION :

Based on the description in the report on rabbit and guinea pig skin irritation tests : "mild dermal irritation in rabbits and guinea pigs."

SERIOUS EYE DAMAGE / EYE IRRITATION :

Based on the description in the report on rabbit eye irritation tests : Short term exposure to ethylene glycol (liquid or vapour) causes conjunctival irritation with no permanent damage to the cornea.

SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) :

Based on the human evidence including : "consciousness disorder, convulsions and stupor (after 34 days of accidental ingestion) ; an increase in urea nitrogen, creatinine and uric acid concentrations (blood examination) ; albuminuria, hematuria and nephropathy (urine examination) ; degeneration of convoluted tubules (renal biopsy) ; mild pulmonary congestion," "acute effects are observed in four stages : effects on the central nervous system (after $0.5 \sim 12$ hours of exposure) ; effects on the heart-lung system (after $12 \sim 36$ hours of exposure) ; nephropathy in specimens surviving from Stage 1 and 2 (exposure to ethylene glycol) ; degeneration of the central nervous system".

SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE):

Based on human evidence including "loss of consciousness and nystagmus," "mild headache and backache, upper respiratory tract irritation", and the evidence from animal studies including "inflammatory degeneration of the lung and heart".

SECTION 12: [ECOLOGICAL INFORMATION]

♦PRODUCT

No information. ◆ETHYLENE GLYCOL ECOTOXICITY : Harmful to aquatic life. Fishes (Rainbow trout); 96-hour LC50=47mg/L PERSISTENCE / DEGRADABILITY : Readily biodegradable. BIOACCUMULATION : No information. MOBILITY IN THE SOIL : No information. HAZARDOUS TO THE OZONE LAYER : Can not be classified because the substance is not listed in the Annex to the Montreal Protocol.

SECTION 13: [DISPOSAL CONSIDERATIONS]

RESIDUES:

Disposal methods must be in compliance with all regulations.

This product or used the waste must be entrusted with processing in industrial waste disposer. CONTAMINATED CONTAINER AND PACKAGING :

Discard container after using up the contents.

Dispose of the container in accordance with local/regional/national/international regulations.

SECTION 14: [TRANSPORT INFORMATION]
UN NO. (NAME AND DESCRIPTION) : Not applicable.
UN HAZARD CLASS : Not applicable.
UN PACK GROUP : Not applicable.
SPECIFIC PRECAUTIONARY TRANSPORT MEASURES AND CONDITIONS :
When transporting, protect from direct sunlight and take on cargo without breakage of container and

leakage. Follow all regulations in your country.

ETHYLENE GLYCOL, 60% Aqueous Solution 6/6

	SECTION 15:	REGULATORY INFORMATION
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TSCA : All components listed.

SECTION 16: [OTHER INFORMATION]

This information is based upon technical information (Japanese Safety Data Sheet) believed to be reliable. But hazard identification and toxicological information are not comprehensive. So be careful enough about handling.

The data on this sheet relates only to the specific product designated herein. Manufacturer assumes no legal responsibility for the use of these data.

1.8.6 Refrigerant R410A

SAFETY DATA SHEET



Genetron® AZ-20 (R-410A)

00000009881

Version 1.0 0 Issuing date 02/27/2012

Revision Date 02/27/2012

Print Date 01/30/2014

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

Product information

Trade name	1	Genetron® AZ-20 (R-410A)
Number		00000009881
Recommended use of the chemical and restrictions on use	:	Refrigerant
Company	3	Honeywell Japan Inc. New Pier Takeshiba South Tower 20F, 1-16-1 Minato-ku 1050022 Tokyo, 13 JP
For further information, please contact:	1	800-522-8001 +1-973-455-6300 (Monday-Friday, 9:00am-5:00pm)
In case of emergency call		Medical: 1-800-498-5701 or +1-651-523-0309 Transportation: 1-800-424-9300 or +1-703-527-3887 In Japan: +(81)-345209637 (24 hours/day, 7 days/week)

2. HAZARDS IDENTIFICATION

Classification of the substance or mixture Classification of the : Gases under pressure, Liquefied gas substance or mixture Specific target organ toxicity - single exposure, Category 3

GHS Label elements, including precautionary statements

Symbol(s)	
Signal word	: Warning
Hazard statements	: Contains gas under pressure; may explode if heated. May cause drowsiness and dizziness.
Precautionary statements	: Prevention: Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray. Use only outdoors or in a well-ventilated area. Response: IF INHALED: Remove victim to fresh air and keep at rest in a
	1/12

Genetron®	AZ-20 (R-41	0A)				
000000098	000009881					
Version 1.0 0	Issuing date 02/2	7/2012	Revision Date 02/27/2012	Print Date 01/30/2014		
		position comfortable for breathing. Call a POISON CENTER or doctor/ physicia				
		Storage: Store in a well-ventilated place. Keep container tightly closed. Store locked up. Protect from sunlight. Store in a well-ventilated place. Disposal: Dispose of contents/ container to an approved waste disposal plant.				
Other hazard result in clas	ds which do not sification	: Caus reali May May May May	ses asphyxiation in high concentra ze that he/she is suffocating. cause cardiac arrhythmia. cause frostbite. irritate skin. irritate eyes.	ations. The victim will not		

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature : Si	ubstance	
Chemical Name	CAS-No.	Concentration
Pentafluoroethane Pentafluoroethane	354-33-6	50.00 %
Difluoromethane Difluoromethane	75-10-5	50.00 %

4. FIRST AID MEASURES

Inhalation	 Move to fresh air. If breathing is irregular or stopped, administer artificial respiration. Use oxygen as required, provided a qualified operator is present. Call a physician. Do not give drugs from adrenaline-ephedrine group.
Skin contact	: After contact with skin, wash immediately with plenty of water. If there is evidence of frostbite, bathe (do not rub) with lukewarm (not hot) water. If water is not available, cover with a clean, soft cloth or similar covering. If symptoms persist, call a physician.
Eye contact	 Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In case of frostbite water should be lukewarm, not hot. 2/12

Genetron® AZ-20 (R-410A)

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	lf syn	nptoms persist, call a physician.	
Ingestion	: Unlike As th Do no Call a	ely route of exposure. is product is a gas, refer to the inh ot induce vomiting without medica a physician immediately.	nalation section. I advice.
Notes to physician	: Beca cated with s support contro Treat	use of the possible disturbances of holamine drugs, such as epinephi special caution and only in situation ort. Treatment of overexposure shol of symptoms and the clinical co frost-bitten areas as needed.	of cardiac rhythm, rine, should be used ons of emergency life hould be directed at the inditions.
5. FIREFIGHTING MEASURES			
Suitable extinguishing media	: The p Use v carbo Use e circur	product is not flammable. water spray, alcohol-resistant foan on dioxide. extinguishing measures that are a mstances and the surrounding env	n, dry chemical or ppropriate to local vironment.
Specific hazards during firefighting	: Conte This (atmost press Conta Cool Do no cours Vapo reduc In cas produ Hydro Carbo Carbo Carbo	ents under pressure. product is not flammable at ambie spheric pressure. ever, this material can ignite when sure and exposed to strong ignition ainer may rupture on heating. closed containers exposed to fire of allow run-off from fire fighting to tes. urs are heavier than air and can c cing oxygen available for breathing se of fire hazardous decompositio uced such as: ogen halides ogen fluoride on monoxide on dioxide (CO2) onyl halides	ent temperatures and mixed with air under n sources. with water spray. e enter drains or water cause suffocation by g. n products may be
Special protective equipment for firefighters	: In the Wear No ur	event of fire and/or explosion do self-contained breathing apparate	not breathe fumes. us and protective suit.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions,	: Immediately evacuate personnel to safe areas.
protective equipment and	Keep people away from and upwind of spill/leak.
emergency procedures	Wear personal protective equipment. Unprotected persons
Genetron® AZ-20 (R-410A) 00000009881 Version 1.0 0 Revision Date 02/27/2012 Print Date 01/30/2014 Issuing date 02/27/2012 must be kept away. Remove all sources of ignition. Avoid skin contact with leaking liquid (danger of frostbite). Ventilate the area. After release, disperses into the air. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Avoid accumulation of vapours in low areas. Unprotected personnel should not return until air has been tested and determined safe. Ensure that the oxygen content is >= 19.5%. : Prevent further leakage or spillage if safe to do so. Environmental precautions The product evaporates readily. Methods and materials for : Ventilate the area. containment and cleaning up

7. HANDLING AND STORAGE

Handling

Precautions for safe handling	:	Handle with care. Avoid inhalation of vapour or mist. Do not get in eyes, on skin, or on clothing. Wear personal protective equipment. Use only in well-ventilated areas. Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C. Follow all standard safety precautions for handling and use of compressed gas cylinders. Use authorized cylinders only. Protect cylinders from physical damage. Do not puncture or drop cylinders, expose them to open flame or excessive heat. Do not pierce or burn, even after use. Do not spray on a naked flame or any incandescent material. Do not remove screw cap until immediately ready for use. Always replace cap after use.
Advice on protection against fire and explosion	8	The product is not flammable. Can form a combustible mixture with air at pressures above atmospheric pressure.
Storage		
Conditions for safe storage, including any incompatibilities	ŧ	Pressurized container: protect from sunlight and do not expose to temperatures exceeding 50 °C. Do not pierce or burn, even after use. Keep containers tightly closed in a dry, cool and well- ventilated place. Storage rooms must be properly ventilated. Ensure adequate ventilation, especially in confined areas.
		4/12

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Protect cylinders from physical damage. Store away from incompatible substances.

Advice on common storage

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters-

1

Components	CAS- No.	Value	Control parameters	Update	Basis
Difluorometha ne Difluorometha ne	75-10-5	TWA : time weighted average	(1,000 ppm)	1994	Limit established by Honeywell International Inc.

	TWA : time weighted average	2,200 mg/m3 (1,000 ppm)	2007	US. Workplace Environmental Exposure Level (WEEL) Guides
--	-----------------------------------	----------------------------	------	---

Pentafluoroet hane Pentafluoroet hane	354-33-6	TWA : time weighted average	(1,000 ppm)	Limit established by Honeywell International Inc.
--	----------	-----------------------------------	-------------	---

	TWA : time weighted average	4,900 mg/m3 (1,000 ppm)	2007	US. Workplace Environmental Exposure Level (WEEL) Guides
--	-----------------------------------	----------------------------	------	---

Appropriate engineering controls

General room ventilation is adequate for storage and handling. Perform filling operations only at stations with exhaust ventilation facilities.

Individual protection measures, such as personal protective equipment

Respiratory protection	 In case of insufficient ventilation, wear suitable respiratory equipment. Wear a positive-pressure supplied-air respirator. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. For rescue and maintenance work in storage tanks use self- contained breathing apparatus.
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Hand protectio	n : Le In Pi N Pi	eather gloves case of contact through splashing: rotective gloves eoprene gloves olyvinyl alcohol or nitrile- butyl-rubbe	rgloves
Eye protection	: W Si If G	'ear as appropriate: afety glasses with side-shields splashes are likely to occur, wear: oggles or face shield, giving complet	e protection to eyes
Skin and body	protection : A W	void skin contact with leaking liquid (/ear cold insulating gloves/ face shiel	danger of frostbite). d/ eye protection.
Hygiene meas	ures : H pr E A R K	andle in accordance with good indus actice. nsure adequate ventilation, especiall void contact with skin, eyes and cloth emove and wash contaminated cloth eep working clothes separately.	trial hygiene and safety y in confined areas. ning. ing before re-use.
Protective mea	isures : D A E th	o not breathe vapour. void contact with skin, eyes and cloth nsure that eyewash stations and safe e workstation location.	ning. aty showers are close to

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state	: Liquefied gas
Colour	: colourless
Odour	: weak
рН	: Note: neutral
Boiling point/boiling range	: -48.5 °C
Flash point	: Note: not applicable
Evaporation rate	: > 1 Method: Compared to CCl4.
lower flammability limit	: Note: None
upper flammability limit	: Note: None

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Vapour pressure	: 14,8 at 21	44 hPa 1 °C(70.0 °F)	
	33,7 at 54	98 hPa .4 °C(129.9 °F)	
Vapour density	: 3 Note:	(Air = 1.0)	
Density	: 1.08	g/cm3 at 21.1 °C	
Water solubility	: 1.5 g	J/I	
Partition coefficient: n- octanol/water	: log P Test	ow: 1.48 substance: Ethane, pentafluoro- (HFC-125)
	log P Test	ow: 0.21 substance: Difluoromethane (HFC	2-32)
Ignition temperature	: > 750) °C	
Decomposition temperature	: > 250) °C	
Ozone depletion potential (ODP)	: 0		
0. STABILITY AND REACTIVIT	Y		
Ob		1	

Chemical stability	. Stable under normal conditions.
	Hazardous polymerisation does not occur.
	Stable under normal conditions.
Possibility of hazardous reactions	: Hazardous polymerisation does not occur.
Conditions to avoid	 Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C. Decomposes under high temperature. Some risk may be expected of corrosive and toxic decomposition products. Can form a combustible mixture with air at pressures above atmospheric pressure.
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Genetron® AZ-20 (R-410A) 00000009881 Version 1.0 0 Issuing date 02/27/2012 Revision Date 02/27/2012 Print Date 01/30/2014 Do not mix with oxygen or air above atmospheric pressure. Incompatible materials to : Finely divided aluminium avoid Potassium Calcium Powdered metals Aluminium Magnesium Zinc Hazardous decomposition : In case of fire hazardous decomposition products may be produced such as: products Hydrogen fluoride Carbonyl halides Carbon monoxide Carbon dioxide (CO2)

11. TOXICOLOGICAL INFORMATION

Acute inhalation toxicity Pentafluoroethane	: > 769000 ppm Exposure time: 4 h Species: rat
Difluoromethane	: LC50: > 520000 ppm Exposure time: 4 h Species: rat
Sensitisation Pentafluoroethane	: Cardiac sensitization Species: dogs Note: No-observed-effect level 75 000 ppm Lowest observable effect level 100 000 ppm
Difluoromethane	: Cardiac sensitization Species: dogs Note: No-observed-effect level >350 000 ppm
Repeated dose toxicity Pentafluoroethane	: Species: rat Application Route: Inhalation Exposure time: (4 Weeks) NOEL: 50000 ppm Subchronic toxicity
Difluoromethane	: Species: rat

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ersion 1.0 0 Issuing date (2/27/2012	Revision Date 02/27/2012	Print Date 01/30/2014
	Appli Expo NOE Subc	cation Route: Inhalation sure time: (90 d) L: 50000 ppm hronic toxicity	
Germ cell mutagenicity	· Test	Method: Ames test	
remandoroemane	Resu	It: negative	
Difluoromethane	: Test Resu	Method: Ames test It: negative	
	: Cell t Resu	ype: Human lymphocytes Ilt: negative	
	: Cell t Resu	ype: Chinese Hamster Ovary Cell It: negative	ls
	: Cell t	ype: Human lymphocytes	
	Resu Meth	ilt: negative od: Mutagenicity (in vitro mammal	lian cytogenetic test)
	: Test Resu	Method: Chromosome aberration It: negative	test in vitro
Germ cell mutagenicity Difluoromethane	: Spec Cell t Meth Resu	ies: mouse ype: Bone marrow od: Mutagenicity (micronucleus te ilt: negative	est)
Teratogenicity	0.01227-074		
Pentafluoroethane	: Spec Appli	ies: rabbit cation Route: Inhalation exposure	
	NOA	EL,Teratog: 50,000 ppm	
	NOA	EL, Maternal: 50,000 ppm Did not show teratogenic effects	in animal experiments.
	Spec	ies: rat	
	Appli	cation Route: Inhalation exposure	
	NOA	EL,Maternal: 50,000 ppm	
	Note	Did not show teratogenic effects	in animal experiments.
Difluoromethane	: Spec	ies: rat	
	Dose Note:	: NOEL - 50,000 ppm Did not show teratogenic effects	in animal experiments.
	Spec	ies: rabbit	
	Dose	NOEL - 50,000 ppm	in onlegal suggestments
	Note	Did not snow teratogenic effects	in animai experiments.
		9/12	

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Further in Acute toxic	formation ity	: Vapo reduc the lic	urs are heavier than air and can o ing oxygen available for breathin quid may cause frostbite. May cau	cause suffocation by g. Rapid evaporation of use cardiac arrhythmia.
12. ECOLOGIC	AL INFORMAT	ION		
Biodegrada Pentafluoro	ability pethane	: Resu Value Metho	It: Not readily biodegradable. 1: 5 % od: OECD 301 D	
Difluoromethane : Not		: Note:	Minimal	
Other adv	erse effects			
Additional information	ecological I	: We h effect	ave no quantitative data concerni s of this product.	ing the ecological
13. DISPOSAL	CONSIDERATI	ONS		
Disposal m	ethods	: In acc	cordance with local and national r	equiations.

14. TRANSPORT INFORMATION

IATA	
UN/ID No.	: UN 3163
Description of the goods	: Liquefied gas, n.o.s. (Pentafluoroethane, Difluoromethane)
Class	: 2.2
Labels	: 2.2
Packing instruction (cargo aircraft)	: 200
Packing instruction (passenger aircraft)	: 200
IMDG	
UN/ID No.	: UN 3163
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Version 1.0 0	Issuing date 02	2/27/2	012	Revision Date 02/27/2012	Print Date 01/30/2014
Description of the goods		:	LIQU (PEN	DMETHANE)	
Class		-	2.2		- 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999
Labels		1	2.2		
EmS Numb	er 1	1	F-C		
EmS Numb	er 2	:	S-V		
Marine pollu	utant	:	no		

15. REGULATORY INFORMATION

National regulatory information

High Pressure Gas Law JP HPG	:	Gases
Vessel Safety Law Japan JP VSL	*	Gases
Aviation Law Japan JP AVL	:	Gases

Other international regulations

Notification status 1907/2006 (EU)		his mixture contains only ingredients which have been ubject to a pre-registration according to Regulation (EC) No. 907/2006 (REACH).		
US. Toxic Substances Control Act	**	On TSCA Inventory		
Australia. Industrial Chemical (Notification and Assessment) Act		On the inventory, or in compliance with the inventory		
Canada. Canadian Environmental Protection Act (CEPA). Domestic Substances List (DSL). (Can. Gaz. Part II, Vol. 144)	:	All components of this product are on the Canadian DSL list.		
Japan. Kashin-Hou Law List	•	On the inventory, or in compliance with the inventory		
Korea. Existing Chemicals Inventory (KECI)	*	On the inventory, or in compliance with the inventory		
Philippines. The Toxic Substances and Hazardous and Nuclear Waste Control	:	On the inventory, or in compliance with the inventory		
		11/12		

Version 1.0 0	Issuing date 02/2	27/2012	Revision Date 02/27/2012	Print Date 01/30/2014
Act				
China. Inve Chemical S	ntory of Existing Substances	: On th	e inventory, or in compliance with	the inventory
NZIOC - N	ew Zealand	: On th	e inventory, or in compliance with	the inventory

16. OTHER INFORMATION

	HMIS III	NFPA
Health hazard	: 1	2
Flammability	: 1	1
Physical Hazard	: 0	
Instability	:	0

Further information

none

1.8.7 Refrigerant R448A

Honeywell Solstice® N40 Refrigerant (R-448A)

000000017419

Version 4.0	Revision Date 18.08.2020	Supersedes 3

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier			
Product name	3	Honeywell Solstice® N40 Refr	igerant (R-448A)
SDS-number	;	00000017419	
Type of product	:	Mixture	
Remarks		SDS according to Art. 31 of Re	egulation (EC) 1907/2006.
1.2. Relevant identified	uses	of the substance or mixture ar	nd uses advised against
Use of the Substance/Mixture	3 7	Refrigerant	
Uses advised against	:	none	
1.3. Details of the suppl	ier of	the safety data sheet	
Company	4	Honeywell Fluorine Products Europe B.V. Stationsplein Zuid-West 961 1117 CE Schiphol-Oost Netherlands	Honeywell International, Inc. 115 Tabor Road Morris Plains, NJ 07950-2546 USA
Telephone	1	+32 16 391 211	
Telefax	;		
For further information, please contact:	:	PMTEU Product Stewardship: SafetvDataSheet@Honevwell.	com
1.4. Emergency telepho	ne nu	mber	
Emergency telephone number	đ	+1-703-527-3887 (ChemTrec- +1-303-389-1414 (Medical)	Transport)
Country based Poison Control Center	÷	see chapter 15.1	

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

REGULATION (EC) No 1272/2008

Gases under pressure Liquefied gas H280 Contains gas under pressure; may explode if heated.

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Honeywell Solstice® I 000000017419	N4() Refrigerant	(R-448A)	
Version 4.0		Revision Date	18.08.2020	Supersedes 3
2.2. Label elements REGULATION (EC) No 1272 Hazard pictograms	2/20	08		
Signal word	2.4	Warning		
Hazard statements	ः	H280	Contains gas under p explode if heated.	ressure; may
Precautionary statements	13	P410 + P403	Protect from sunlight. ventilated place.	Store in a well-

2.3. Other hazards

High vapour concentrations can cause headaches, dizziness, drowsiness, and nausea, and may lead to unconsciousness. May cause cardiac arrhythmia.

SECTION 3: Composition/information on ingredients

3.1. Substance

Not applicable

3.2. Mixture

Chemical name	CAS-No. Index-No. REACH Registration Number EC-No.	Classification 1272/2008	Concentration	Remarks
Difluoromethane	75-10-5 01-2119471312-47 200-839-4	Flam. Gas 18; H221 Press. Gas ; H280	26 %	1*
Pentafluoroethane	354-33-6 01-2119485636-25 206-557-8	Press. Gas ; H280	26 %	1*
Norflurane	811-97-2 01-2119459374-33 212-377-0	Press. Gas ; H280	21 %	12
2,3,3,3-Tetrafluoroprop-1-ene	754-12-1 01-0000019665-61 468-710-7	Press. Gas Liquefied gas; H260 Flam. Gas 1B; H221	20 %	15

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1-ene

Version 4.0	Revision Date 18.08	3.2020	Supersedes 3

1* - For specific concentration limits see Annexes of 1272/2008

01-0000019758-54

471-480-0

Remaining components of this product are non-hazardous and/or are present at concentrations below reportable limits.

Press. Gas ; H280

11

7 %

Occupational Exposure Limit(s), if available, are listed in Section 8. For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

trans-1,3,3,3-Tetrafluoroprop- 29118-24-9

4.1 Description of first aid measures

General advice:

First aider needs to protect himself. Move out of dangerous area. Take off all contaminated clothing immediately.

Inhalation:

Remove to fresh air. Artificial respiration and/or oxygen may be necessary. Call a physician immediately.

Skin contact:

Rapid evaporation of the liquid may cause frostbite. In case of contact with liquid, thaw frosted parts with water, then remove clothing carefully. Wash with plenty of water Consult a physician. Take off contaminated clothing and shoes immediately. Wash contaminated clothing before re-use.

Eye contact:

Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

Ingestion:

Ingestion is unlikely because of the physical properties and is not expected to be hazardous. As this product is a gas, refer to the inhalation section.

4.2. Most important symptoms and effects, both acute and delayed

No data available

4.3. Indication of any immediate medical attention and special treatment needed

Do not give adrenaline or similar drugs.

See Section 11 for more detailed information on health effects and symptoms.

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Revision Date 18.08.2020

Supersedes 3

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media: The product is not flammable. Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Extinguishing media which shall not be used for safety reasons: High volume water jet

5.2. Special hazards arising from the substance or mixture

No data available

5.3. Advice for firefighters

Wear full protective clothing and self-contained breathing apparatus. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. In the event of fire, cool tanks with water spray.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Immediately contact emergency personnel. Wear personal protective equipment. Unprotected persons must be kept away. Ensure adequate ventilation. In case of insufficient ventilation wear suitable respiratory equipment. Ensure that the oxygen content is >= 19.5%.

6.2. Environmental precautions

Prevent further leakage or spillage if safe to do so. The product evaporates readily.

6.3. Methods and materials for containment and cleaning up

Ventilate the area.

6.4. Reference to other sections

For personal protection see section 8.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Advice on safe handling:

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Version 4.0

Revision Date 18.08.2020

Supersedes 3

Open drum carefully as content may be under pressure. The product should only be used in areas from which all naked lights and other sources of ignition have been excluded. Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C. Do not pierce or burn, even after use. Do not spray on a naked flame or any incandescent material. Do not use in areas without adequate ventilation. Contaminated equipment (brushes, rags) must be cleaned immediately with water.

Advice on protection against fire and explosion:

The product is not flammable. Can form a combustible mixture with air at pressures above atmospheric pressure.

Hygiene measures:

Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation, especially in confined areas. Avoid contact with skin, eyes and clothing. Remove and wash contaminated clothing before re-use. Keep working clothes separately.

7.2. Conditions for safe storage, including any incompatibilities

Further information on storage conditions:

Store in original container. Keep away from direct sunlight. Keep containers tightly closed in a cool, well-ventilated place.

7.3. Specific end use(s)

no additional data available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Occupational exposure limits:

Components	Basis / Value type	Value / Form of exposure	Exceeding Factor	Remarks
Difluoromethane	HONEYWELL TWA	2.200 mg/m3 1.000 ppm		We are not aware of any national exposure limit.
Pentafluoroethane	HONEYWELL TWA	1.000 ppm		We are not aware of any national exposure limit.
Norflurane	HONEYWELL	1.000 ppm		
Norflurane	EH40 WEL TWA	4.240 mg/m3 1.000 ppm		

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2.3.3.3-Tetrafluoroprop-1-ene	WEEL TWA	500 ppm	
2,3,3,3-Tetrafluoroprop-1-ene	HONEYWELL TWA	500 ppm	
trans-1,3,3,3-Tetrafluoroprop-1-ene	HONEYWELL TWA	800 ppm	We are not aware of any national exposure limit.

TWA - Time weighted average

DNEL/ PNEC-Values

Component	End- use/impact	Exposure duration	Value	Exposure routes	Remarks
Difluoromethane	Workers / Long-term systemic effects		7035 mg/m3	Inhalation	
Difluoromethane	Consumers / Long-term systemic effects		750 mg/m3	Inhalation	
Pentafluoroethane	Workers / Long-term systemic effects		16444 mg/m3	Inhalation	
Pentafluoroethane	Consumers / Long-term systemic effects		1753 mg/m3	Inhalation	
Norflurane	Workers / Long-term systemic effects		13936 mg/m3	Inhalation	
Norflurane	Consumers / Long-term systemic effects		2476 mg/m3	Inhalation	
2.3.3.3-Tetrafluoroprop-1- ene	Workers / Long-term systemic effects		950 mg/m3	Inhalation	
2,3,3,3-Tetrafluoroprop-1- ene	Consumers / Long-term systemic effects		113,1 mg/m3	Inhalation	2
2,3,3,3-Tetrafluoroprop-1- ene	Consumers / Acute systemic effects		186400 mg/m3	Inhalation	

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Supersedes 3

trans-1,3,3,3- Tetrafluoroprop-1-ene	Workers / Long-term systemic effects	3902 mg/m3	Inhalation	
trans-1,3,3,3- Tetrafluoroprop-1-ene	Consumers / Long-term systemic effects	830 mg/m3	Inhalation	

Component	Environmental compartment / Value	Remarks Assessment factor: 1000	
Difluoromethane	Fresh water: 0,142 mg/l		
Difluoromethane	Fresh water sediment: 0,534 mg/kg dw		
Pentafluoroethane	Fresh water: 0,1 mg/l	Assessment factor: 1000	
Pentafluoroethane	Fresh water sediment: 0.6 mg/kg dw	1	
Norflurane	Fresh water: 0,1 mg/l	Assessment factor: 1000	
Norflurane	Marine water: 0,01 mg/l	Assessment factor: 10000	
Norflurane	Fresh water sediment: 0,75 mg/kg	Assessment factor: 100	
Norflurane	Sewage treatment plant: 73 mg/l		
2,3,3,3-Tetrafluoroprop-1-ene	Fresh water: 0,1 mg/l		
2,3,3,3-Tetrafluoroprop-1-ene	Marine water: 0,01 mg/l		
2,3.3.3-Tetrafluoroprop-1-ene	Fresh water sediment: 1,77 mg/kg	1	
2,3,3,3-Tetrafluoroprop-1-ene	Marine sediment: 0,178 mg/kg		
2,3,3,3-Tetrafluoroprop-1-ene	Soil: 1,54 mg/kg	1	
trans-1,3,3,3-Tetrafluoroprop-1-ene	Fresh water: 0,1 mg/l	Assessment factor: 1000	

8.2. Exposure controls

Occupational exposure controls

The Personal Protective Equipment must be in accordance with EN standards:respirator EN 136, 140, 149; safety glasses EN 166; protective suit: EN 340, 463, 468, 943-1, 943-2; gloves EN 374, 511;

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safety shoes EN-ISO	20345.	
Personal protective	equipment	
Respiratory protectio	n:	
In case of insufficient	ventilation wear suitable respiratory equipment.	
Seli-contained breat	ing apparatus (EN 155)	
Hand protection:		
Protective gloves aga	ainst cold	
(EN 511)		
Gloves must be inspe	ected prior to use.	
Replace when worn.		
Eve protection:		
Safety glasses with s	ide-shields conforming to EN166	
Face-shield		
Skin and body protect	tion	

Handle in accordance with local environmental regulations and good industrial practices.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Form	10	Liquefied gas
Colour		clear colourless
Odour		slight ether-like
Melting point/range	3	No data available
Boiling point/boiling range	10	-45,939,8 °C
Flash point		Not applicable
Auto-ignition temperature	ŝ	628 °C
Vapour pressure		1.120 kPa at 21,1 °C
Vapour pressure	2	2.588 kPa Page 8 / 15

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		at 54,4 °C
Density	13	1,11 g/cm3
pН	ţ.	neutral
Water solubility	\$1) \$1)	No data available
Partition coefficient: n- octanol/water	:	No data available
Relative vapour density	ŧ	2,98 (Air = 1.0)

9.2 Other Information

no additional data available

SECTION 10: Stability and reactivity

10.1. Reactivity

Stable under normal conditions. Hazardous polymerisation does not occur.

10.2. Chemical stability

No data available

10.3. Possibility of hazardous reactions

No data available

10.4. Conditions to avoid

Heating will cause pressure rise with risk of bursting Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C. Do not pierce or burn, even after use. Do not spray on a naked flame or any incandescent material.

10.5. Incompatible materials

oxidising substances Possible incompatibility with alkali sensitive materials. Powdered metals

10.6. Hazardous decomposition products

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Halogenated compounds Hydrogen fluoride Carbonyl halides Carbon oxides

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute oral toxicity: Not applicable

Acute dermal toxicity: No data available

Acute inhalation toxicity: LC50 Species: Rat Value: > 520000 ppm Exposure time: 4 h Test substance: Difluoromethane (HFC-32)

LC50 Species: Rat Value: > 769000 ppm Exposure time: 4 h Test substance: Ethane, pentafluoro- (HFC-125)

LC50 Species: Rat Value: > 500000 ppm Exposure time: 4 h Test substance: 1,1,1,2-tetrafluoroethane (HFC-134a)

LC50 Species: Rat Value: > 400000 ppm Exposure time: 4 h Test substance: 2,3,3,3-Tetrafluoroprop-1-ene

Skin irritation: No data available

Eye irritation: No data available

Respiratory or skin sensitisation: No data available

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Aspiration hazard: No data available

Other information: May cause cardiac arrhythmia. Difluoromethane. (HFC-32): Cardiac sensitisation threshold (dog): 350000 ppm. Ethane, pentafluoro- (HFC-125): Cardiac sensitisation threshold (dog): 75000 ppm. 1,1,2-tetrafluoroethane (HFC-134a): Cardiac sensitisation threshold (dog): 80000 ppm.

SECTION 12: Ecological information

12.1. Toxicity

Toxicity to fish: LC50 Species: Cyprinus carpio (Carp) Value: > 197 mg/l Exposure time: 96 h Test substance: 2,3,3,3-Tetrafluoroprop-1-ene

Toxicity to aquatic plants: EC50 Species: Scenedesmus capricornutum (fresh water algae) Value: > 100 mg/l Test substance: 2,3,3,3-Tetrafluoroprop-1-ene

Toxicity to aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Value: > 83 mg/l Exposure time: 48 h Test substance: 2,3,3,3-Tetrafluoroprop-1-ene

12.2. Persistence and degradability

Biodegradability: Result: Not readily biodegradable. Test substance: 2,3,3,3-Tetrafluoroprop-1-ene

Biodegradability: Biodegradation: 5 % Result: Not readily biodegradable. Test substance: Ethane, pentafluoro- (HFC-125)

12.3. Bioaccumulative potential

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No data available

12.4. Mobility in soil

No data available

12.5. Results of PBT and vPvB assessment

No data available

12.6. Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Product: Dispose according to legal requirements.

Packaging: Legal requirements are to be considered in regard of reuse or disposal of used packaging materials

Further information: Provisions relating to waste: EC Directive 2006/12/EC; 2008/98/EEC Regulation No. 1013/2006

For personal protection see section 8.

SECTION 14: Transport information

ADR/RID

55	3163
8	LIQUEFIED GAS, N.O.S. (PENTAFLUOROETHANE, DIFLUOROMETHANE, 1,1,1,2- TETRAFLUOROETHANE)
- 21	2
-	2A
	20
1	2.2
	no
- 53	3163
÷	Liquefied gas, n.o.s.

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Class		(Pentafluoroethane, Difluoromethane, 1,1,1,2- Tetrafluoroethane) 2.2	
Hazard Labels	÷	2.2	
IMDG			
UN Number	1	3163	
Description of the goods	1	LIQUEFIED GAS, N.O.S. (PENTAFLUOROETHANE, DIFLUOROMETHAN	NE, 1,1,1,2-

	TETRAFLUOROETHANE)
Class	: 2.2
Hazard Labels	: 2.2
EmS Number	: F-C, S-V
Marine pollutant	: no

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Poison Control Center

Country	Phone Number	Country
Austria	+4314064343	Liechtenstein
Belgium	070 245245	Lithuania
Bulgaria	(+)35929154233	Luxembourg
Croatia	(+3851)23-48-342	Maita
Cyprus	+357 2240 5611	Netherlands
Czech Republic	+420224919293; +420224915402	Norway
Denmark	82121212	Poland
Estonia	16662; (+372)6269390	Portugal
Finland	9471977	Romania
France	+33(0)145425959	Slovakia (NTIC)
Greece	+30 210 779 3777	Slovenia
Hungary	(+36-80)201-199	Spain
Iceland	5432222	Sweden
Ireland	+353(1)8092166	Switzeriand
Italy	0382 24444	United Kingdom
Germany	Berlin : 030/19240	
	Bonn : 0228/19240	

Country	Phone Number
Liechtenstein	+41 442515151
Lithuania	+370532362052
Luxembourg	070245245; (+352)80002-5500
Malta	+356 2395 2000
Netherlands	030-2748888
Norway	22591300
Poland	+48 42 25 38 400
Portugal	808250143
Romania	+40 21 318 3606
Slovakia (NTIC)	+421 2 54 774 166
Slovenia	+386 1 400 6051
Spain	+34915620420
Sweden	112 (begår Giftinformation);+46104566786
Switzerland	145
United Kingdom	(+44) 844 892 0111

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	Erfurt : 0361/730730
	Freiburg : 0761/19240
	Göttingen : 0551/19240
	Homburg : 06841/19240
	Mainz : 06131/19240
	Munich : 089/19240
Latvia	+37167042473

Other inventory information

US. Toxic Substances Control Act On TSCA Inventory

Australia. Industrial Chemical (Notification and Assessment) Act On the inventory, or in compliance with the inventory

Canada. Canadian Environmental Protection Act (CEPA). Domestic Substances List (DSL) All components of this product are on the Canadian DSL

Japan, Kashin-Hou Law List On the inventory, or in compliance with the inventory

Korea. Existing Chemicals Inventory (KECI) On the inventory, or in compliance with the inventory

Philippines. The Toxic Substances and Hazardous and Nuclear Waste Control Act Not in compliance with the inventory

China. Inventory of Existing Chemical Substances (IECSC) On the inventory, or in compliance with the inventory

New Zealand. Inventory of Chemicals (NZIoC), as published by ERMA New Zealand On the inventory, or in compliance with the inventory

15.2 Chemical safety assessment

A Chemical Safety Assessment has not been carried out.

SECTION 16: Other information

Text of H-statements referred to under heading 3						
Difluoromethane	· H221	Flammable gas				

Difluoromethane

H221 H280 Page 14 / 15 Flammable gas. Contains gas under pressure; may explode

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		if heated.
Pentafluoroethane	: H280	Contains gas under pressure; may explode if heated.
Norflurane	: H280	Contains gas under pressure; may explode if heated.
2,3,3,3-Tetrafluoroprop-1-ene	: H221 H280	Flammable gas. Contains gas under pressure; may explode if heated.
trans-1,3,3,3-Tetrafluoroprop-1- ene	: H280	Contains gas under pressure; may explode if heated.

Further information

All directives and regulations refer to amended versions.

Vertical lines in the left hand margin indicate a relevant amendment from the previous version.

Abbreviations: EC European Community CAS Chemical Abstracts Service DNEL Derived no effect level PNEC Predicted no effect level vPvB Very persistent and very biaccumulative substance PBT Persistent, bioaccmulative und toxic substance

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. Final determination of suitability of any material is the sole responsibility of the user.

This information should not constitute a guarantee for any specific product properties.

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Chapter 2 Name of Each Section 2.1 Name of Each Section (1)

HRZ***-WS-F HRZ***-W1S-F HRZ***-W2S-F



Figure 2-1 Name of Each Section (1)

[Tips]

The front casters (2 pcs.) have built-in brakes. The disengagement of the brakes is required when transporting the system.



Chapter 3 Transporting and Installation

WARNING



Proper procedure must be followed when using this system. Exercise caution to assure personnel safety during the installation, operation, maintenance, and inspection of the system.

WARNING

Only personnel, who have adequate knowledge and experiences with not only this system but associated equipment are allowed to perform transport, installation, and maintenance involving potential hazardous task.

3.1 Transporting

This system is heavy, which poses potential danger at transportation. When transporting this system, the following safety precautions should be observed to prevent system damage and breakdown.

WARNING

For transporting with the forklift, be sure to insert the fork into a designated position, referring to "3.1.1 Transporting with forklift" on page 3-2.

CAUTION



Do not set this system on its side during transportation. Oil in the compressor drains into the refrigerant pipe, which causes lubricant shortages leading to damage to the compressor.

CAUTION



Drain the remaining fluid out of the pipe as much as possible. The remaining fluid may spill if disregarded.

CAUTION



Exercise caution not to damage the panel and piping with the forklift when transporting the system.

3.1.1 Transporting with forklift

WARNING

- Do not set this system on its side for transportation. Potential damage to this system carrying danger of personnel injury if disregarded.
 Do not incert the fork from the back on well on front
 - Do not insert the fork from the back as well as front.

Δ





Figure 3-1 Transport with Forklift

3.1.2 Transporting with caster



This system is heavy, which requires assistance for this work.

Exercise caution and look out for sloped surfaces such as ramps, etc.



A CAUTION

A WARNING

Do not grab piping on the back of this system or panel handles when transporting with the casters.

Potential damage to piping and panels may occur if disregarded.

3.2 Installation

A WARNING

System installation should be kept from areas with the potential of flammable gas leak. Ignition may occur if leaked gas is collected around the system.

WARNING



This system is NOT designed for outside use. Potential electric shock, fire and system damage may occur if exposed to rain, water and dust.

A CAUTION



This system is to be installed on a level floor that can withstand the weight of this system. Potential water leak and personal injury due to system tipping over may occur if disregarded.

3.2.1 Installation conditions

System installation is not allowed outside or in the conditions described below. Potential system malfunction and damage may occur if disregarded.

Clean room specifications are not applied to this unit. The pump and ventilating fan installed in this unit generate particles.

- Location that is exposed to water vapor, salt water, and oil
- Location that is exposed to dust and powder
- Location that is exposed to corrosive gas, solvent, and flammable gas
- Location that is exposed to direct sun light or radiant heat
- Location where ambient temperature is out of the following range:

In operation 10 to 35 deg C

- In storage 0 to 50 deg C(with no water or circulating fluid in piping)
- Location where relative humidity is out of the following range:
 - In operation 30 to 70%
 - In storage 15 to 85%
- Location that is subjected to abrupt changes in temperature
- Location that is subjected to intense electromagnetic noise (intense electric field, intense magnetic field, or surges)
- Location that is subjected to static electricity, or condition that discharges static electricity to the system
- Location that is subjected to strong high frequencies
- Location that is subjected to potential lightning damage
- Location with altitudes of 1000m or higher
- Location that is affected by strong vibrations or impacts
- Condition that applies external force or weight causing the system deformation
- Condition with no adequate space for maintenance as required in the installation site.

3.2.2 Installation location and maintenance work area

This system does not have ventilating hole on the both right and left sides. Although this can be installed directlycontacting to walls or devices, installation with maintenance space is recommended. (See "Figure3-2)



Figure 3-2 Recommended Installation Location

To save space, this system can be installed to allow access only in front and back for daily operation and inspection. For maintenance and repair work, additional access space is required for the left and right side of the system. We recommend a separate repair area, without taking space from installation site, to accommodate the needed extra space.



Figure 3-3 Installation Location

3.3 Procedure for Installation

CAUTION

- Anti-seismic bracket is an optional part (except for HRZ008-L-F, HRZ008-L1-F), which is required for the installation of this system (HRZ-TK002).
- Preparation of anchor bolts suitable for floor material is your responsibility. M8-anchor bolts (8 pcs.) are required for HRZ008-L-F and HRZ008-L1-F, and M12-anchor bolts (4 pcs.) for other models. See "Appendix 8.6 Anchor Bolt Mounting Position" on page 8-27.

3.3.1 Installation

- System installation should be on a vibration-free stable level plane.
- See "Appendix 8.2 Outer Dimensions" in Chapter 8 on page 8-20 for the dimensions of this system.

3.3.2 Procedure for system securing (1)

HRZ***-WS-F HRZ***-W1S-F HRZ***-W2S-F

1. Transfer this system to the installation site.

2. Lock the brakes on casters (2 pcs. on the front).

3. Using a13-mm open end wrench, attach the anti-seismic brackets to the front and back.

CAUTION

Drain pan port is assigned to the bottom on the back of this system. Exercise caution not to damage the dain pan port when attaching the anti-seismic bracket.





3.3.3 Procedure for system securing (2) HRZ008-L-F HRZ008-L1-F

Adjust and secure the adjustable feet of this system to secure the anti-seismic bracket.

1. Transfer this system to the installation site.

2. Adjust the adjustable foot with a 24-mm open end wrench.

- Level the system (using a leveler) by adjusting the adjustable feet.
- All adjustable feet (4 pcs.) must touch the floor completely.
- Casters need not be touching the floor.
- **3.** Attach the anti-seismic bracket to the adjustable foot, and tighten the nut (upper) of the adjustable foot to lock it.



Figure 3-5 Anti-seismic Bracket Attachment

4. Secure the anti-seismic bracket with the anchor bolts. Repeat precedures for additional brackets.

3.3.4 Wiring installation

WARNING Δ



Power cable

The power cables are to be prepared under your responsibility, referring to the following table.

Table 3-1	Power Cable and Main Breaker (This System)	
-----------	--	--

	ltem		HRZ002-WS-F HRZ002-W1S-F HRZ002-W2S-F	HRZ004-WS-F HRZ004-W1S-F HRZ004-W2S-F HRZ008-WS-F HRZ008-W1S-F HRZ008-W2S-F	HRZ008-L-F HRZ008-L1-F	HRZ010-WS-F HRZ010-W1S-F HRZ010-W2S-F	
a)	Size (recommended)		10AWG×4-conductor	10AWG×4-conductor	4AWG×4-conductor	10AWG×4-conductor	
able	Crimp contact	Breaker	R5.5-5	R5.5-5	R22-8	R5.5-8	
erc	(recommended)	Earth bar	R5.5-8	R5.5-8	R22-8	R5.5-8	
Mo	Torque	Breaker	2.5N•m (1.84 ft-lbf)	2.5N•m (1.84 ft-lbf)	6N•m (4.43 ft-lbf)	6N•m (4.43 ft-lbf)	
ш	(recommended)	Earth bar	12.5N•m (9.22 ft-lbf)	12.5N•m (9.22 ft-lbf)	12.5N•m (9.22 ft-lbf)	12.5N•m (9.22 ft-lbf)	
Main breaker (This System)		System)	20A	30A	60A	30A	

Communication connector

The communication connectors are to be prepared under your responsibility, referring to the following table.

Table 3-2	Communication	Connector
-----------	---------------	-----------

Connector	Type (for your system)			
Contact signal (P1 connector)	D-Sub 25-pin (male)			
Serial RS-485 (P2 connector)	D-Sub 9-pin (male)			

Selection of the breaker for the customer's equipment (primary side)

CAUTION This product is equipped with the breaker which has different operating characteristics depending on each model. For the customer's equipment (primary side), use the breaker whose operating time is equal to or longer than the breaker of this product. If the breaker with shorter operating time is connected, the customer's equipment could be cut off du eto the inrush current of the motor of this product.

HRZ002-WS-F HRZ004-WS-F HRZ008-WS-F	HRZ002-W1S-F HR HRZ004-W1S-F HR HRZ008-W1S-F HR	8Z002-W2S-F 8Z004-W2S-F 8Z008-W2S-F	HR701	N-WS-F	HR7010-	W15-F	HR7010.	W2S-F
4h 2h 1h 30min 20min 14min 14min 2min 1min 30s 20s 10s 5s 2a 15 0.5s 0.2s 0.1s 0.05s 0.02s 0.01s		Operating time	HRZ010	MIN	HRZ010-	W1S-F	HRZ010	



Operating time



HRZ008-L-F HRZ008-L1-F

Current (% to the capacity of the main breaker of this product)

Figure 3-8 Breaker operating characteristics curve
3.3.5 **Procedures for wiring installation**



1. Turn OFF the power breaker on customer side (primary side), and then use the assigned procedures to peform lockout/tagout.

[Tips]

Connection of the power cable with this system must be established first. Do not connect the cable with the factory side at this point.

- **2.** Turn OFF the main breaker of this system.
- **3.** Undo the screws (2 pcs.) to remove the front panel.

Be sure to use a Phillips screwdriver.

4. Undo the screws (2 pcs.) or press claw to remove the breaker cover.

Be sure to use a Phillips screwdriver.



Figure 3-9 Main Breaker OFF and Removal of Front Panel/Breaker Cover

[Tips]

Make sure the breaker is at the 'OFF' position. Otherwise, the removal of the front panel is not possible.

5. Loosen the cap at power cable access (strain relief) and insert the power cable.



Figure 3-10 Power cable insertion

CAUTION



Correct phase rotation is required when attach the power cable to the breaker terminal.

CAUTION

0

Do not drop a screw or washer in the electrical unit when attaching the breaker cover and terminal. Do not leave it in the unit if dropped in. Potential failure may occur if the power is turned ON without removing it.

[Tips]

See "Table 3-1 Power Cable and Main Breaker (This System)" on page 3-8 for the recommended cable size and crimp contact.

6. Connect the power cables to the breaker terminal.

Be sure to use a Phillips screwdriver. See Table 3-1 on Page 3-8 for recommended torque.

7. Connect the grounding terminal (M8) of the power cable to the earth bar.

Be sure to use a 13-mm open end wrench. Recommended torque: 12.5 N•m (9.22 ft-lbf)



Figure 3-11 Connection of Power Cable and Grounding Terminal

[Tips]

See "Table 3-1 Power Cable and Main Breaker (This System)" on page 3-8 for torque value.

8. Attach the breaker cover to the breaker.

9. Attach the front panel.

10.Connect the power cable to the power breaker on customer side (primary side).

11.Connect the communication cables with P1 and P2.



Figure 3-12 Signal line mounting

3.3.6 Installation of circulating fluid and facility water piping

A CAUTION		
• Regarding the circulating fluid and facility water pipings, consider carefully the suitability for operating pressure, temperature circulating fluid and facility water. If the operating performance is not sufficient, the pipings may burst during operation. Also, the use of corrosive materials such as aluminum or iron for fluid contact parts, such as piping, may not only lead to clogging or leakage in the circulating fluid and facility water circuits but also refrigerant leakage and other unexpected problems. provide protection against corrosion when you use the product.		
 Always insulate external circulating piping. Potential insufficient cooling performance due to heat absorption from the pipe surface and potential insufficient heating performance caused by thermal radiation if disregarded. When using fluorinated liquid as the circulating fluid, do not use pipe tape. Liquid leakage may occur around the pipe tape. for sealant, we recommend that 		
 you use the following sealant:SMC Part No., HRZ-S0003 (Silicone sealant) Use clean pipes and pipe fittings, free of particles, oil and moisture. Apply air blow to the parts before using. The presence of particles, oil or moisture in the circulating fluid circuit causes insufficient cooling, system failure attributed to moisture freeze when entering the system, or foaming of the circulating fluid in the tank. 		
• The total capacity of circulating fluid required by external piping should remain under the capacity of the sub tank. Potential problem of tank overflow, when pump stop, may occur if disregarded. See "Appendix 8.1.1 System specification" in Chapter 8 for the capacity of the sub tank.		
 Be sure to choose a circulating fluid pipe capable of letting the fluid flow at rated flow rate or better. See "Pump performance" defined in "Appendix 8.1.1 System specification" for the flow rate rating. 		
 Have a drip pan available incase of a fluid leak. Do not return the circulating fluid to the unit by installing a pump in the user system. 		
 Make sure of the locations of ports for the circulating fluid supply, return, facility water inlet, outlet and their corresponding connections are correct. Secure the piping connector section with a pipe wrench, and provide proper tightening to the pipe. See Figure on page 3-13. 		
 Do not give an impact when the piping connector section is fixed or tightened. It may damage the piping or cause leakage. The flow rate of the facility water is automatically adjusted depending on using conditions. The facility water outlet temperature can be up to 60 deg.C 		

Pipe diameter

Pipe	Diameter	Recommended torque (Material: SS* vs SS)
Facility water inlet	Rc1/2	28 to 30N•m (20.7 to 22.1ft-lbf)
Facility water outlet	Rc1/2	28 to 30N•m (20.7 to 22.1ft-lbf)
Circulating fluid supply	Rc3/4	28 to 30N•m (20.7 to 22.1ft-lbf)
Circulating fluid return	Rc3/4	28 to 30N•m (20.7 to 22.1ft-lbf)
Main tank drain port	Rc3/8 (with valve)	Piping not necessary
Sub tank drain port	Rc3/8 (with valve)	Piping not necessary
Drain pan port	Rc3/8	Piping not necessary

Procedure for piping installation

Secure the pipe coupling section with a pipe wrench, and provide proper tightening to the pipe.



Figure 3-13 Pipe Tightening

Recommended piping installation



Figure 3-14 Recommended Piping Installation

No.	Name	Size	Material
1	Valve	Rc3/4	Stainless steel
2	Y-strainer (100µm)	Rc3/4	Stainless steel
3	Valve	Rc1/2	Stainless steel
4	Y-strainer (5µm)	Rc1/2	Stainless steel

Table 3-4	Recommended	Pipe
	rtooonnonaoa	

CAUTION

No thermal insulator is assigned to facility water circuit. In order to avoid dew condensation of facility water circuit, retain the facility water temperature inside the range in Table 3-5 correspond to installation conditions. Otherwise please insulate the facility water piping by customer.

Installation conditions		Facility water
Ambient Relative		temperature
temperature(deg C)	humidity(%)	range(deg C)
	70	29 to 30
	60	27 to 30
35	50	24 to 30
	40	20 to 30
	30	15 to 30
	70	24 to 30
	60	22 to 30
30	50	19 to 30
	40	15 to 30
	30	11 to 30
	70	20 to 30
	60	17 to 30
25	50	14 to 30
	40	11 to 30
	30	10 to 30
	70	15 to 30
	60	13 to 30
20	50	
	40	10 to 30
	30	
	70	
	60	
15	50	10 to 30
	40	
	30	
	70	
	60	ļ
10	50	10 to 30
	40	
	30	

Table 3-5	Facility water temperature range

Chapter 4 System Startup and Shutdown

CAUTION



Only personnel, who have adequate knowledge of and experiences with not only this system but associated equipment, are allowed to implement system startup and shutdown.

4.1 Pre-check

Check the following items prior to starting up the system.

4.1.1 Installation condition

- Make sure that the system is installed in a horizontal position.
- No heavy object is placed on this system. This system should not be applied with an undue force such as caused by piping installation.
- Re-check the items defined in "3.2 Installation" on page 3-3.

4.1.2 Cable connection

Make sure proper connection of the power cable, ground, and communication cables.

4.1.3 Installation of circulating fluid and facility water piping

Make sure that circulating fluid and facility water piping are installed properly.

4.1.4 Operating signal from your system

Make sure that no remote signal is being issued from your system. System startup takes effect upon power-ON if this system receives a remote signal and it is in remote mode.

4.1.5 Check emergency off [EMO] switch

Make sure of the location of the emergency off [EMO] switch before operating the system. See section 1.6.1 "Emergency off [EMO] switch" in Chapter 1 "Safety" for details.

4.2 Opening of Facility water Valve

CAUTION



Check that the facility water complies with not only the water quality standard defined in section 7.1 "Water Quality Management" on page 7-1 but the requirements provided in "8.1.1 System specification" in Chapter 8 Appendix on page 8-1.

Open the facility water valve for water supply.

[Tips]

This system is outfitted with a water regulating valve inside. Facility water may not flow upon system startup which is normal.

4.3 Supply of Circulating Fluid

CAUTION



Circulating fluids to use vary with system models. See section 8.1.1 "System specification" in Chapter 8 for the designated circulating fluid for a specific model.



Figure 4-1 Circulating Fluid Fill Port and Circulating Fluid Level Gauge

4.3.1 Preparation of circulating fluid

■ When the circulating fluid is a 60% ethylene glycol aqueous solution

Always check the concentration of the circulating fluid.

CAUTION

- Low concentration EG in the circulating fluid may cause system failure due to it being frozen in the system.
- High concentration EG in the circulating fluid may cause circulating pump overload, which triggers "Return Low Flow FLT".
- Potential cooling error may occur if the circulating fluid varies in concentration.

When the circulating fluid is a fluorinated fluid

CAUTION

Make sure of no oil, moisture, and other foreign materials contaminate the circulating fluid. Potential cooling error or system failure, due to contaminant freezes internally, may occur if disregarded.

When the circulating fluid is water

CAUTION

Attention should be taken on water quality. Ensure water quality is within specified range, and other foreign materials contaminate the circulating fluid. Potential cooling error or system failure, due to contaminant freezes internally, may occur if disregarded.

4.3.2 Supply of circulating fluid

Remove the circulating fluid fill cap, and fill the circulating fluid until it reaches its specified level.

The circulating fluid specified level is a range between "HIGH" and "LOW" in Figure 4-1.

Be sure to tighten the cap until it clicks after fluid supply.

If the circulating fluid is supplied over the specified level, follow the procedure provided in section 7.3.1 "Draining of circulating fluid out of tank" on page 7-4 to drain excess fluid until it reaches the specified level.

[Tips]

Level between "HIGH" and "LOW" represent liquid level in normal running condition. Immediately as you start filling up the chiller, the internal transferring pump start pumping fluid from the Sub Tank into the Main Tank. Thus the fluid level in the level gauge will start to drop.

During initial priming of the external piping, addition fluid is needed. See section 8.1.1 "System specification" on page 8-1 for Sub Tank and Main Tank capacity.

A WARNING



Circulating fluid must be supplied to be in the range between "HIGH" and "LOW". Potential overflow of hot circulating fluid may occur due to excessive volume.

Total fluid volume use to fill up the system including initial priming should not exceed combined volume of Sub Tank and Main Tank. If level is below the "LOW" mark, this system will trigger an alarm.





When supplying the circulating fluid, make sure that the fluid inside this system has dropped to room temperature for the prevention of burns.



To prevent moisture, which is formed by condensation of a flowed air, from finding its way into the tank, ensure the circulating fluid at room temperature when supplying the fluid.

Be sure to tighten the cap until it clicks after fluid supply. Potential circulating fluid vaporization or moisture intrusion due to condensation of flowed air may occur if disregarded.

4.4 Requirement for System Startup

4.4.1 Turning ON power

1. Make sure that the main breaker for this system is OFF, and release lockout/tagout of the power breaker on customer side (primary side). Then, turn ON the power.

2. Turn ON the main breaker of this system.

The "Model Indication screen" and "System Information screen" are displayed in sequence on the LCD screen. The screen will change to the "Status screen 1" in approx. 20 seconds, and the system is ready to run.

[Tips]

It is normal if the "System Information screen" is not displayed. See section 5.3.33 "System Information screen" in "Chapter 5 System Operation" on page 5-36 for details.



Figure 4-2 Main Breaker at 'ON'

WARNING



Press the emergency off [EMO] switch immediately upon ocurrence of abnormal conditions. Be sure to turn OFF the main breaker afterwards.

4.4.2 Circulating fluid temperature setting

From the "Setting screen" on the LCD screen, set the circulating fluid at any temperature. See section 5.4 "Examples of System Operation" in "Chapter 5 System Operation" on page 5-37 for operating procedure.

[Tips]

See section 8.1.1 "System specification" in "Chapter 8 Appendix" on page 8-1 for the setting range of circulating fluid temperature.

4.5 System Startup and Shutdown

4.5.1 System startup

Press the [START/STOP] key on the operation display panel.

The [RUN] lamp on the operation display panel comes on, and the "System Information screen" is flashing. The screen then change to the "Status screen 1", which initiates system operation.

[Tips]

It is normal if the "System Information screen" is not displayed. See section 5.3.33 "System Information screen" in "Chapter 5 System Operation" on page 5-36 for details.

4.5.2 System shutdown

Press the [START/STOP] key on the operation display panel.

The "System Information screen" is flashing on the LCD screen, and the [RUN] lamp comes on. The compressor comes to a halt approx, 20 seconds after circulating pump stop for protection of the compressor. The screen is returned to the "Setting screen 1", which prompts the [RUN] lamp to go out.

[Tips]

See section 5.3.33 "System Information screen" in "Chapter 5 System Operation" on page 5-36 for details on the System Information screen.

A CAUTION

Internal equipment may remain at elevated or lowered in temperature immediately after system shutdown. Potential burns or frostbite may happen if your skin comes in contact with these surfaces. Further work is allowed only when the system reaches room temperature.

CAUTION

Emergency off [EMO] switch and main breaker (OFF) should not be used for system shutdown unless it is an emergency.



Chapter 5 System Operation 5.1 Operation Display Panel

Use the operation display panel located in front of the system for the basic operations.





CAUTION

Be sure to use your fingers only to operate the Operation Display Panel. Using sharp object will damage the panel.





Figure 5-2 Flow Chart of Operation Screen

[Tips]

- 1. After the menu screen, pressing the [SEL] key can make the screen return to the previous page.
- 2. For the items which are set numerically can be set by minimum unit of displayed value.
- 3. The contents displayed on the screen may change depending on the options or settings. Please refer to the description page of each screen.

Screen	Descriptions	Reference	
Model Indication screen	Displays the model and revision No. of this system.	Page 5-4	
Status screen 1 to 4	Displays the operating condition of this system.	Page 5-5 to 5-8	
Alarm Display screen	The alarm number and alarm message are displayed in the event of an error in this system. Not displayed if no error.	Page 5-9	
Menu screen	Allows setting screen selection	Page 5-9	
Setting screen	Allows switching to "Control Setting screen", "Alarm Setting screen" and "Initial Setting screen".	Page 5-10	
Control screen 1, 2, 3-1, 3-2	Allows the setting of pump frequency, pressure or flow rate by pump inverter.	Page 5-11 to 5-15	
Alarm Setting screen 1 to 3	Allows the setting of set values for the alarm of temperature and flow rate.	Page 5-16 to 5-18	
Initial Setting screen 1 to 8	Allows the setting of set values.	Page 5-19 to 5-26	
Mode Selection screen	Allows communication mode selection.	Page 5-27	
Maintenance screen 1 to 8	Not used during system operation. Not allowed to use unless otherwise specified.	Page 5-28 to 5-35	
System Information screen	Displays the status of system startup and shutdown.	Page 5-36	

Table 5-1	Descriptions	s of Operation	Screens

5.3 Operation Screen







Figure 5-3 Model Indication Screen

The "Model Indication screen" is displayed upon power-ON of this system. This screen remains ON for approx. 5 seconds and is automatically switched to the "Status screen 1". The "Alarm Display screen" is displayed if error occurs in this system.

Table 5-2	Model Indication screen

No.	Item	Descriptions
1	-	System model
2	-	System revision No.

5.3.2 Status screen 1

P P V	2 3 . 6 ℃ ◀ 1
IP SP	2 5. 0 ℃ ← 2
FLOW	2 0 . 0 L P M ◄ 3
SS	0. 50MPa ◀ 4
	-





Table 5-3 Status screen 1

No.	Item	Descriptions
1		Discharge temperature of the circulating fluid
I		(A value derived according to the offset ^{*1} if applied)
2	TEMP SP	Set value of circulating fluid discharge temperature
3	RTN FLOW	Return flow rate of the circulating fluid
4	PRESS	Discharge pressure of the circulating fluid

[Tips]

See "Appendix 8.4 Offset Function" in Chapter 8 on page 8-23 for details on offset (*1).

Unit of RTN FLOW and PRESS can be selected on "Initial Setting screen 1". See "5.3.16 Initial Setting screen 1" (page 5-19) for details.

5.3.3 Status screen 2





Figure 5-5 Status screen 2

Tahle	5-4	Status	screen	2
Iavie	J-4	Status	SCIECII	2

No.	Item	Descriptions
1	TEMP PV	Discharge temperature of the circulating fluid
2	TEMP SP	Set circulating fluid temperature
3	< <temp ready="">></temp>	Displays the BAND/READY [Displayed when set value conditions are satisfied] ^{*1}
4	TEMP BAND	Set value of BAND range ^{*1}

[Tips]

See "Appendix 8.5 BAND/READ" in Chapter 8 on page 8-26 on offset features (*1).

5.3.4 Status screen 3



Figure 5-6 Status screen 3

Table 5-5	Status screen 3
Table 5-5	Status screen s

No.	Item	Descriptions
1	OFFSET	The current offset mode ^{*1}
2	OFFSET	Set offset ^{*1}

[Tips]

See "Appendix 8.4 Offset Function" in Chapter 8 on page 8-23 on offset features (*1).

5.3.5 Status screen 4





Figure 5-7 Status screen 4

Table 5-0	Status	screen 4
10010 0		0010011 1

No.	Item	Descriptions
1	DIPV	Circulating fluid electric resistivity.
2	DI SP	Set value of circulating fluid electric resistivity.
3	DIACC	Accumulated time that the solenoid valve in DI circuit is activated.
4	DISV	Open/close status of solenoid valve in DI circuit.

[Tips]

It is displayed only if the DI Control Kit (optional) is provided.

5.3.6 Alarm Display screen



Figure 5-8 Alarm Display screen

In the event of an error in this system, the current screen is switched to the "Alarm Display screen" to display the relevant alarm code, and message.

The "Alarm Display screen" is displayed only if an error is raised.

See section 6.2 "Troubleshooting" in "Chapter 6 Error Message and Troubleshooting" on page 6-2 for alarm numbers and messages.

5.3.7 Menu screen





Table 5-7 Menu screen	
-----------------------	--

No.	Item	Descriptions
1	SETTING	Switches to the "Setting screen" with the press of the [ENT]
	0211110	key.
2	REMOTE MODE	Switches to the "Mode Selection screen" with the press of
		the [ENT] key.
3	MAINTENANCE	Switches to the "Initial Setting screen 1" with the press of
		the [ENT] key.

[Tips]

 $[\blacktriangle]$ or $[\blacktriangledown]$ key is used for selecting "Item."

5.3.8 Setting screen







Table 5-8 Setting screen

No.	ltem	Descriptions
1	CONTROL SET	Switches to the "Control Setting screen 1" with the press of the [ENT] key.
2	ALARM SET	Switches to the "Alarm Setting screen 1" with the press of the [ENT] key.
3	INITIAL SET	Switches to the "Initial Setting screen 1" with the press of the [ENT] key.

[Tips]

[▲] or [▼] key is used for selecting "Item."

5.3.9 Control Setting screen 1

This screen is displayed if the PUMP IV is set to PRESS or FLOW on the Initial Setting screen 3. If PUMP IV is set to FREQ, this screen is not displayed and 5.3.11 Control Setting screen 3-1 (page 5-14) is displayed.





Figure 5-11	Control Setting screen 1
-------------	--------------------------

No.	ltem	Descriptions	Setting Range	Factory Default
1	TEMP SP	Allows the setting of circulating fluid discharge temperature.	HRZ002-WS/W1S-F : -10.0 to 90.0 deg C HRZ004/008/010-WS/W1S- F : -20.0 to 90.0 deg C HRZ***-W2S-F : 10.0 to 60.0 deg C HRZ008-L/L1-F : -20.0 to 40.0 deg C	25.0 deg C
2	OFFSET	Allows the setting of OFFSET value ^{*1}	-20.0 to 20.0 deg C	0.0 deg C
3	PUMP SP	Allows the setting of circulating fluid flow rate. (When PUMP IV on "Initial Setting screen 3" is set to FLOW.)	HRZ***-WS/W1S/W2S-F : 10.0 to 40.0LPM/2.6~10.6GPM HRZ008-L-F : 15.0 to 40.0LPM/4.0~10.6GPM HRZ008-L1-F : 10.0 to 40.0LPM/2.6~10.6GPM	HRZ***-WS/W1S/W2S-F : 20.0LPM/5.3GPM HRZ008-L-F : 30.0LPM/7.9GPM HRZ008-L1-F : 20.0LPM/5.3GPM
		Allows the setting of circulating fluid discharge pressure. (When PUMP IV on "Initial Setting srceen 3" is set to PRESS.)	0.10 to 1.00MPa 15~145PSI	0.10MPa 15PSI

Table 5-9 Control Setting screen 1

[Tips]

In the case of using Offset Function, select any one of MODE 1 to 3 on No.3 of "Initial Setting screen 1". See "Chapter 8 8.4 Offset Function" (page 8-23) for details.(*1).

 $[\blacktriangle]$ or $[\blacktriangledown]$ key is used for selecting "Item." And pressing [ENT] key enabling changing the set point.

Unit of PUMP SP can be selected on "Initial Setting screen 1". See "5.3.16 Initial Setting screen 1" (page 5-19) for details.

5.3.10 Control Setting screen 2



Figure 5-12 Control Setting screen 2

Tahla	5-10	Control	Setting	screen '	2
Table	5-10	CONTINU	Seung	Screen	2

No.	ltem	Descriptions	Setting Range	Factory Default
1	DI SP	Allows the setting of circulating fluid electric resistivity.	0.0 to 2.0MΩ	0.5MΩ
2	DI HYS	Allows the setting of hysteresis for circulating fluid electric resistivity. (See Figure about hysteresis.)	0.0 to 0.9MΩ	0.3ΜΩ



Figure 5-13 DI Hysteresis setting (DI HYS)

[Tips]

It is displayed only if the DI Control Kit (optional) is provided.

 $[\blacktriangle]$ or $[\blacktriangledown]$ key is used for selecting "Item." and move to the other Control Setting screens. And pressing [ENT] key enabling changing the set point.

5.3.11 Control Setting screen 3-1

This screen is displayed if the PUMP IV is set to FREQ on the Initial Setting screen 3.

If PUMP IV is set to PRESS or FLOW, this screen will not be displayed and 5.3.9 Control Setting screen 1 (page 5-11) will be displayed.





Figure 5-14 Control Setting screen3-1

No.	ltem	Descriptions	Setting Range	Factory Default
1			HRZ002-WS/W1S-F :	
			-10.0 to 90.0 deg C	
			HRZ004/008/010-	
	TEMP SP	Allows the setting of circulating fluid discharge temperature.	WS/W1S-F :	
			-20.0 to 90.0 deg C	25.0 deg C
			HRZ***-W2S-F :	
			10.0 to 60.0 deg C	
			HRZ008-L/L1-F :	
			-20.0 to 40.0 deg C	
2	OFFSET	Allows the setting of OFFSET value ^{* 1}	-20.0 to 20.0 deg C	0.0 deg C
3	PUMP SP	Switched to the "Control Setting screen 3- 2".(Pump frequency setting screen.)	-	-

Table 5-11 Control Setting screen3-1

[Tips]

In the case of using Offset Function, select any one of MODE 1 to 3 on No.3 of "Initial Setting screen 1". See "Chapter 8 8.4Offset Function" (page 8-23) for details (*1).

 $[\blacktriangle]$ or $[\lor]$ key is used for selecting "Item." And pressing [ENT] key enabling to change the set point of TEMP SP and OFFSET.

5.3.12 Control Setting screen 3-2

< PUMP FI	REQ SET>	
RTN FLOV	N 8. OLPM ┥	<u> </u>
PRESS	0. 05 MP a ┥	2
FREQ	15.0Hz 🗲	<u> </u>



Figure 5-15 Control Setting screen 3-2

Table 5-12	Control	Setting	screen	3-2

No.	Item	Descriptions	Setting Range	Factory Default
1	RTN FLOW	Return flow rate of circulating fluid.	-	-
2	PRESS	Discharge pressure of circulating fluid.	-	-
		Allows the setting of pump frequency.		
3	FREQ	("Control Setting screen 3-2" is displayedonly if PUMP IV on "Initial Setting screen 3" is set to FREQ.)	15.0 to 60.0Hz	15.0Hz

[Tips]

.

Pressing [ENT] key enabling to change the set point of FREQ.

Unit of RTN FLOW and PRESS can be selected on "Initial Setting screen 1". See "5.3.16 Initial Setting screen 1"(page 5-19) for details.

5.3.13 Alarm Setting screen 1





Figure 5-16 Alarm Setting screen 1

Table 5-13 Alarm Setting screen 7	Table 5-13	Alarm Setting screen 1	1
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No.	ltem	Descriptions	Setting Range	Factory Default
1	HI TEMP	Allows the setting of temperature to generate "11:Reservoir High Temp. WRN". Alarm is raised when circulating fluid temperature exceeds the set value.	HRZ002-WS/W1S-F : -10.0 to 93.0 deg C HRZ004/008/010- WS/W1S-F : -20.0 to 93.0 deg C HRZ***-W2S-F : 10.0 to 63.0 deg C HRZ008-L/L1-F : -20.0 to 45 deg C	HRZ***-WS/W1S-F: 93.0 deg C HRZ***-W2S-F: 63.0 deg C HRZ008-L/L1-F: 45.0 deg C
2	LO TEMP	Allows the setting of temperature to generate "32:Reservoir Low Temp. WRN". Alarm is raised when circulating fluid temperature falls below the set value.	HRZ002-WS/W1S-F : -15.0 to 90.0 deg C HRZ004/008/010- WS/W1S-F : -25.0 to 90.0 deg C HRZ***-W2S-F : 5.0 to 60.0 deg C HRZ008-L/L1-F : -25.0 to 40.0 deg C	HRZ002-WS/W1S-F : -15.0°C HRZ004/008/010- WS/W1S-F : -25.0°C HRZ***-W2S-F : 5.0°C HRZ008-L/L1-F : -25.0°C

[Tips]

[▲] or [▼] key is used for selecting "Item" and move to other Alarm Setting screens. And pressing the [ENT] key enabling to change the set value.

5.3.14 Alarm Setting screen 2

< ALARM SET > t
LO FLOW WRN ON
LO FLOW 8.0LPM
2



Figure 5-17 Alarm Setting screen2

Table 5-14	Alarm Setting screen 2)
	7 during obloon 2	-

No.	ltem	Descriptions	Setting Range	Factory Default
1	lo flow WRN	Allows the setting of "13:Return Low Flow WRN" (valid:ON/invalid: OFF). Alarm is not raised if invalid:OFF is selected.	OFF,ON	ON
2	LO FLOW	Allows the setting of flow rate to generate "13:Return Low Flow WRN". Alarm is raised when circulating fluid flow rate falls below the set value.	HRZ***-WS/W1S/W2S-F : 8.0 to 40.0LPM 2.1~10.6GPM HRZ008-L/L-F : 15.0~40.0LPM 4.0~10.6GPM HRZ008-L1-F : 8.0~40.0LPM 2.1~10.6GPM	HRZ***-WS/W1S/W2S-F : 8.0LPM 2.1GPM HRZ008-L/L-F : 15.0LPM 4.0GPM HRZ008-L1-F : 8.0LPM 2.1GPM

[Tips]

[▲] or [▼] key is used for selecting "Item" and move to other Alarm Setting screens. And pressing the [ENT] key enabling to change the set value.

5.3.15 Alarm Setting screen 3





Figure 5-18 Alarm Setting screen 3

Table 5-15 Alarm Setting screen 3

No.	ltem	Descriptions	Setting Range	Factory Default
1	LOW DI	Allows the setting of DI value to generate "24:DI Low Level WRN". Alarm is raised when DI value falls below the set value. Alarm is cancelled if the set value is 0.	0.0 to 2.0MΩ	0.0ΜΩ

[Tips]

It is displayed only if the DI Control Kit (optional) is provided.

[▲] or [▼] key is used for selecting "Item" and move to other Alarm Setting screens. And pressing the [ENT] key enabling to change the set value.

5.3.16 Initial Setting screen 1





Figure 5-19 Initial Setting screen 1

Toble 5 16	Initial	Sotting	aaraan	1
1able 5-16	Initial	Settina	screen	

No.	Item	Descriptions	Setting Range	Factory Default
1	FLOW UNIT	Allows the selection of the unit of flow rate.	LPM,GPM	LPM
2	PRESS UNIT	Allows the selection of the unit of pressure.	MPa,PSI	MPa
3	OFFSET	Allows the selection of Offset MODE.	MODE1 to 3,OFF	OFF

[Tips]

 $[\blacktriangle]$ or $[\triangledown]$ key is used for selecting "Item" and move to other Initial Setting screens. And pressing the [ENT] key enabling to select the setting.

5.3.17 Initial Setting screen 2





Figure 5-20 Initial Setting screen 2

Table	5-17	Initial	Setting	screen	2
Tubic	0-17	muai	ocung	3010011	~

No.	Item	Descriptions	Setting Range	Factory Default
1	REM.SD.WRITE	Store the TEMP SP and FLOW SP value with serial communication. TEMP SP and FLOW SP will be set to stored value after re-turn ON the main breaker.	OFF,ON	ON
2	REM.COM.ERR	Allows the selection of system condition when serial communication error occurs (WRN : Stop, FLT : Continued).	WRN,FLT	WRN
3	DEVICE ADRS ^{*1}	Allows the setting of the device address for serial communication.	1 to 32CH	1

[Tips]

 $[\blacktriangle]$ or $[\blacktriangledown]$ key is used for selecting "Item" and move to other Initial Setting screens. And pressing the [ENT] key enabling to select the setting.

*1 For HRZ010-W*S-F and HRZ008-L*-F,"SLAVE ADRS" is displayed.

5.3.18 Initial Setting screen 3





Figure 5-21 Initial Setting screen 3

-	- 10		o		~
lable	5-18	Initial	Setting	screen	3

No.	Item	Descriptions	Setting Range	Factory Default
1	PUMP IV	Allows the selection of the controlled object for pump operation. FREQ : Pump frequency control. FLOW : Circulating fluid Flow rate control. PRESS : Pump discharge pressure control.	FREQ FLOW PRESS	FLOW
2	P.LIMIT FUNC.	Allows the setting of pump discharge pressure upper limit function (Valid : ON, Invalid : OFF).	OFF,ON	OFF
3	P.LIMIT	Allows the setting of pump discharge pressure upper limit value. This function enables the pump discharge pressure not to exceed the upper limit value to protect your system.	0.10 to 1.00MPa 15~145PSI	1.00MPa 145PSI

[Tips]

[▲] or [▼] key is used for selecting "Item" and move to other Initial Setting screens. And pressing the [ENT] key enabling to select the setting or set value.

5.3.19 Initial Setting screen 4





Figure 5-22 Initial Setting screen 4

Table	5-19	Initial	Setting	screen	4
Tuble	0-10	muai	ocuing	3010011	-

No.	ltem	Descriptions	Setting Range	Factory Default
1	PURGE STOP	Allows the selection of automatic collection stop mode.		
		AUTO: Collection operation stops automatically when cllection finished normally.	AUTO,TIME	AUTO
		TIME : Collection continues for the setting time.		
2	PURGE TIME	When "AUTO" mode, allows the setting for the time to raise "TIME OUT". When "TIME" mode, allows the setting of the time to continue collection operation.	1 to 600sec	300s

[Tips]

It is displayed only if the Circulating Fluid Automatic Collector (optional) is provided.

[▲] or [▼] key is used for selecting "Item" and move to other Initial Setting screens. And pressing the [ENT] key enabling to select the setting.
5.3.20 Initial Setting screen 5





Figure 5-23 Initial Setting screen 5

No.	ltem	Descriptions	Setting Range	Factory Default
1	KEY IN BUZZ	Allows the setting of buzzer during key input (Valid : ON, Invalid : OFF).	OFF,ON	ON
2	ALARM BUZZ	Allows the setting of alarm buzzer (Valid : ON, Invalid : OFF).	OFF,ON	ON
3	SETTINGLOCK	Allow the selection of "SETTINGLOCK" function. This function enables to restrict the input from operation display panel to prevent from unintended change of setting value from operaiton touch panel. · ALL : · When communication mode is "LOCAL", only following operations are possible. · START/STOP. · Setting of "SETTINGLOCK" function. · When communication mode is "DIO/SEREMOTE", only following operations are possible. · Setting of "SETTINGLOCK" function. · When communication mode is "DIO/SEREMOTE", only following operations are possible. · Setting of "SETTINGLOCK" function. · REM : · When communication mode is "LOCAL", normal operation is possible. · When communication mode is "DIO/SER REMOTE", only following operations are possible. · Setting of communication mode. · Setting of communication mode. · Setting of "SETTINGLOCK" function.	OFF REM ALL	OFF

Table 5-20 Initial Setting screen 5

[Tips]

 $[\blacktriangle]$ or $[\blacktriangledown]$ key is used for selecting "Item" and move to other Initial Setting screens. And pressing the [ENT] key enabling to select the setting.

5.3.21 Initial Setting screen 6



Figure 5-24 Initial Setting screen 6

Table 5-21 In	itial Setting	screen 6
---------------	---------------	----------

No.	ltem	Descriptions	Setting Range	Factory Default
1	TEMP BAND	Allows the setting of band range to TEMP PV.	1.0 to 99.9 deg C	1.0 deg C
2	READY TIME	Allows the setting of time from when TEMP PV reaches the BAND range to when "TEMP READY" is displayed on operation display panel and Ready signal is output.	1 to 999s	60s

[Tips]

[▲] or [▼] key is used for selecting "Item" and move to other Initial Setting screens. And pressing the [ENT] key enabling to select the set value.

5.3.22 Initial Setting screen 7



Figure 5-25 Initial Setting screen 7

Table	5-22	Initial	Settina	screen 7
10010	~	maan	ooung	00100111

No.	Item	Descriptions	Setting Range	Factory Default
1	OUT	Allows the selection of alarm signals for contact signal.(See"Chapter 8 8.1.7 Alarm signal selection"(page 8-19) for details.)	N/A ALARM01 to 32	N/A
2	E_OUT	Allows the selection either TEMP READY or AUTO PURGE signal.(Output for pin No. 8 of "Chapter 8 8.1.6Communication specification Table 8-7 Contact Signal "(page 8-16). See communication specification for details.	N/A TEMP READY ^{*1} AUTO PURGE	N/A

[Tips]

See "Chapter 8 8.5 BAND/READY function"(page 8-26) for TEMP BAND, READY TIME (*1).

[▲] or [▼] key is used for selecting "Item" and move to other Initial Setting screens. And pressing the [ENT] key enabling to select the setting or set value.

5.3.23 Initial Setting screen 8





Figure 5-26 Initial Setting screen 8

No.	ltem	Descriptions	Setting Range	Factory Default
1	CUSTOM DIO	Allows the setting for DIO signal customize (valid:ON/invalid:OFF). See "Communication Specifications" for details.	OFF,ON	OFF

[Tips]

Press the [ENT] key to make the setting changeable. Select the operation mode with the $[\blacktriangle]$ or $[\blacktriangledown]$ key.

5.3.24 Mode Selection screen



Figure 5-27 Mode Selection screen

Table	5-24	Mode	Selection screen
lane	J-24	INDUE	Selection Scieen

No.	ltem	Descriptions	Setting Range	Factory Default
1	MODE	Allows the selection of communication mode. LOCAL : System start/stop and TEMP SP value setting are available only from the operation display panel. DIO REMOTE : System start/stop is allowed only through contact signal. When Analog Communication option is provided, TEMP SP value setting is available through analog signal. SER REMOTE : System start/stop and TEMP SP value setting are available only through serial RS-485 communication. DNET REMOTE ^{*1} : System start/stop and TEMP SP value setting are available only through Device Net communication.	LOCAL DIO REMOTE SER REMOTE DNET REMOTE ^{*1}	LOCAL

[Tips]

It is displayed only if the Device Net Communication (optional) is provided (*1).

 $[\blacktriangle]$ or $[\blacktriangledown]$ key is used for selecting "Item" And pressing the [ENT] key enabling to select the setting.

5.3.25 Maintenance screen 1



Figure 5-28 Maintenance screen 1

Table 5-25 Maintenance screen 1

No.	Item	Descriptions
1	VALVE OPEN	Switches to the "Maintenance Item screen 3" with the press of the [ENT] key.
2	ALARM HISTORY	Switches to the "Maintenance Item screen 4" with the press of the [ENT] key.
3	RUNNING DATA	Switches to the "Maintenance Item screen 5" with the press of the [ENT] key.

[Tips]

[▲] or [▼] key is used for selecting "Item" and move to other Maintenance screens. And pressing the [ENT] key enabling to change the setting or set value.

5.3.26 Maintenance screen 2



Figure 5-29 Maintenance screen 2

Table 5-26 Maintenance screen 2

No.	Item	Descriptions
1	MONITOR	Switches to the "Maintenance Item screen 6" with the press of the [ENT] key.
2	AUTO PURGE ^{*1}	Switches to the "Maintenance Item screen 7" with the press of the [ENT] key.
3	DI ACC RESET*2	Switches to the "Maintenance Item screen 8" with the press of the [ENT] key.

[Tips]

It is displayed only if the Circulating Fluid Automatic Collector (optional) is provided (*1).

It is displayed only if the DI Control Kit (optional) is provided (*2).

 $[\blacktriangle]$ or $[\nabla]$ key is used for selecting "Item." and move to other Maintenance screens. And pressing the [ENT] key enabling to change the setting or set value.

5.3.27 Maintenance screen 3





Figure 5-30 Maintenance screen 3

Table 5-27 Maintenance screen 3

No.	Item	Descriptions
1	VALVE	The solenoid valve for DI circuit is opened forcefully. The solenoid valve for DI circuit is closed forcefully.
[Tips]		

It is displayed only if the DI Control Kit (optional) is provided.

For other options, "N/A" is displayed on the screen.

If you move the screen from "Maintenance screen 3",

The forced operation of the solenoid valve will be canceled.

5.3.28 Maintenance screen 4



Figure 5-31 Maintenance screen 4

No.	ltem	Descriptions
1	ALARM HIST	Data recording stores up to 150 pieces of alarm history data. If there are 150 or more pieces of data, the alarm history data is to be deleted in order of longest stores.

5.3.29 Maintenance screen 5







Table 5-29 Maintenance screen 5

No.	ltem	Descriptions
1	RUN CNT	Number of times of operation on the system.
2	DRV TIME	Operating time on the system.
3	DISV CNT ^{*1}	Number of times that the solenoid valve for DI circuit is activated.

[Tips]

*1 It is displayed only if the DI Control Kit (optional) is provided.

For other options, "N/A" is displayed on the screen.

If you move the screen from "Maintenance screen 3",

The forced operation of the solenoid valve will be canceled.

5.3.30 Maintenance screen 6





Figure 5-33 Maintenance screen 6

No.	Item	Descriptions
1	RTN TEMP	Return temperature of circulating fluid.
2	HI PRESS	High pressure of refrigerant circuit.
3	LOW PRESS	Low pressure of refrigerant circuit.





Figure 5-34 Maintenance screen 7

When MSG is "READY", Start/Stop of circulating fluid automatic collection is available.

No.	Item	Descriptions		
	MSG	Indicates the status of circulating fluid automatic collection.		
		READY : Ready to collect.		
		PURGE START : During collection.		
1		FINISH : Collection finished normally.		
I		TIME OUT : Collecting time exceeds setting value.		
		IN RUNNING : This system during operation.		
		ALARM : Alarm raised to this system.		
		TEMP OUT : Circulating fluid temp. is out of range for starting collection.		
2	PURGE TIME	Setting value of PURGE TIME.		
		Start/Stop circulating fluid automatic collection.		
	PURGE MODE	After pressing [ENT] key, pressing either [\blacktriangle] or [\blacktriangle] key to select		
3		Start/Stop. Then automatic collection Start/Stop is available after pressing [ENT] key to fix the setting.		
		START : Start collection.		
		STOP : Stop collection.		

Table 5-31 Maintenance screen 7

[Tips]

It is displayed only if the Circulating Fluid Automatic Collector (optional) is provided.

5.3.32 Maintenance screen 8





Figure 5-35 Maintenance screen 8

Table 5-32 Maintenance screen 8	

No.	Item	Descriptions	
1	DIACC	Accumulated time that the solenoid valve for DI circuit is activated.	
2	DATA RESET?	Allows to reset DI ACC. After pressing [ENT] key, pressing either [▲] or [▲] key to select Yes/No. Then Reset/Not reset DI ACC after pressing [ENT] key to fix the setting. Yes : Reset DI ACC. No : Not reset DI ACC.	

[Tips]

It is displayed only if the DI Control Kit (optional) is provided.

5.3.33 System Information screen



Figure 5-36 System Information screen

The "System Information screen", as shown above, may be displayed upon system Start/Stop.

Table 5-33 System Information screen					
No.	Item	em Descriptions			
	INITIALIZE MODE (CONTROL VALVE) (RESERVOIR)	Operation preparation mode after turn-On the main breaker. System operation is disabled if this message is displayed. CONTROL VALVE : Positioning of the electronic expansion valve is performed. RESERVOIR : The circulating fluid flows in this system through the internal pump.			
1	Pump Up Mode Running Start	If your piping is supplied with an insufficient amount of thecirculating fluid at system startup, the circulating pump in this system activated (repeating ON/OFF) to replenish piping with the circulating fluid. Continuous operation is initiated once piping is replenished with the fluid.			
	CPRSR Down Mode. Running Stop	Compressor operation remains for applox. 20 seconds after circulating pump stop for the protection of the compressor at the time of system shutdown.			

5.4 Examples of System Operation

5.4.1 Example 1: Circulating fluid set temperature is changed from 20.0 deg C to 34.1 deg C.



Figure 5-37 Change of Set Temperature from 20 deg C to 34.1 deg C

1. Press the [SEL] key to display the "Menu screen".

- < M E N U >
- 1. SETTING
- 2. REMOTE MODE
- 3. MAINTENANCE

Figure 5-38 Menu screen

With the use of the arrow keys ([▲], [▼]), move the cursor to "1. SETTING" and press the [ENT] key.

The "Setting screen" is displayed.

< SETTING>
1. CONTROL SET
2. ALARM SET
3. INITIAL SET

Figure 5-39 Setting screen

3. With the use of the arrow keys ([▲], [▼]), move the cursor to "1. CONTROL SET" and press the [ENT]] key. The "Control Setting screen 1" is displayed.
CONTROL TEMP SP
OFFSET
PUMP SP 2

	51	2	υ.	0 C
off f s e	ΕT		0.	0°C
PUMP	S P	20.	0 L	ΡM

Figure 5-40 Control setting screen1

S E T >

0 0

1

 0°

4.

Press the [ENT] key. < C O N T R O L The cursor is now appear on the current value for ТЕМР S P TEMP SP, which enables change of the OFFSET temperature set value. PUMP S P Figure 5-41 Control Setting screen 1 : Cursor Display

5. Use the arrow keys $([\blacktriangle], [\blacktriangledown], [\blacktriangleright])$ to change the temperature to 34.1 deg C.

 $[\blacktriangle]$ key: Used to add one value on which the cursor is placed.

 $[\mathbf{\nabla}]$ key: Used to subtract one value on which the cursor is placed.

[] key: Used to move the cursor to the right.

< CON	ITROL	SET> ↓
ТЕМР	S P	34. ℃
OFFSE	ЕΤ	0. 0℃
PUMP	SΡ	20.0LPM

S E T >

20.0°C

20.0LPM

0.0°C

1

Figure 5-42 Control Setting screen 1 : Change of set value

6. Press the [SEL] key to display the "Menu screen 1".

<control set=""></control>	¥
TEMP SP 34.	1 °C
OFFSET 0.	0°C
PUMP SP 20.0L	ΡМ

Figure 5-43 Control Setting screen 1 : Setting Confirmation

5.4.2 Example 2: Communication mode is switched from "LOCAL" to "SER REMOTE".



Figure 5-44 Switching of communication mode from "LOCAL" to "SER REMOTE"

1. Press the [SEL] key to display the "Menu screen".

- < M E N U >
- 1. SETTING
- 2. REMOTE MODE
- 3. MAINTENANCE

Figure 5-45 Menu screen

MODE : LOCAL

REM

<

MODE

< REMOTE MODE >

With the use of the arrow keys ([▲], [▼]), move the cursor to "2. REMOTE MODE" and press the [ENT] key.

The "Mode Selection screen" is displayed.
Figure 5-46 Mode Selection screen

3. Press the [ENT] key

The name of current mode "LOCAL" flashes and enable to switch the setting.

Figure 5-47 Mode Selection screen

ODE

>

4. Use the arrow keys ([▲], [▼]),to select "SER REMOTE". A Constant of the set of the

Figure 5-48 Mode Selection screen

5. Press the [ENT]key.

5.4.3 Example 3: PUMP IV is switched from "FLOW" to "FREQ".





1. Press the [SEL] key to display the "Menu screen".

<MENU> 1. SETTING 2. REMOTE MODE 3. MAINTENANCE

Figure 5-50 Menu screen

With the use of the arrow keys ([▲],
[▼]), move the cursor to "1.SETTING" and press the [ENT] key.

The "Setting screen" is displayed.

< SETTING>
1. CONTROL SET
2. ALARM SET
3. INITIAL SET

Figure 5-51 Setting screen

< INITIAL SET> \ddagger

UNIT

UNIT

FLOW

PRESS

OFFSET

With the use of the arrow keys([▲],
[▼]),move the cursor to "3.INITIAL SET" and press the [ENT] key.

The "Initial setting screen 1" is displayed.

Figure 5-52 Initial Setting screen 1

4. With the use of the arrow keys([▲],[▼]), Move the cursor to "Initial Setting screen 3".

< I N I T I A	AL SET> ↓
PUMP IV	FLOW
P. LIMIT	FUNC. OFF
P. LIMIT	1. 0 0 M P a

Figure 5-53 Initial Setting screen 3

LPM

MP a

OF F

5.	With the use of the arrow keys([▲],[▼]), move the cursor to "PUMP IV" and press the [ENT]key. The name of current setting "FLOW" flashes and enable to switch the setting.	<pre><initial set="">↓↓ PUMP IV</initial></pre>
		Figure 5-54 Initial Setting screen 3
6.	With the use of the arrow keys([▲],[▼]), to select "FREQ"	<pre><initial iv<="" pump="" set→↓↓="" th=""></initial></pre>
7		

7. Press the [ENT] key.

Chapter 6 Error Message and Troubleshooting

6.1 Error Message

The following are to be performed in the event of an error in this system.

- The "ALARM" lamp comes on.
- Alarm buzzer comes on.
- The "Alarm Display screen" is displayed on the LCD screen.
- Error signal is issued through external communication. (See section 8.1.6 "Communication specification" in Chapter 8 Appendix for details.) on page 8-16
- This system is brought to a stop forcefully according to error types.





6.2 Troubleshooting

The procedure for error recovery varies with alarm types.

• Alarm Code.01 to 21,24,25,28,29,32:

Eliminate the error cause. Press the [RESET] key on the operation display panel or power cycle the main breaker to enable error recovery to take effect.

*Alarm code 02 and 16 are alarms only for HRZ008-L/L1-F.

*Alarm code 28 is an alarm only for HRZ010-W*S-F.

• Alarm Code.22:

Eliminate the error cause, and power cycle the main breaker to enable error recovery to take effect.

- Alarm Code.23: Automatic error recovery is implemented upon elimination of the error.
- Alarm Code.24:

This is an alarm for accessories (optional).

No alarm of this type is issued if the system is outfitted with no accessories.

Table 6-1	Troubleshooting	(1/3)	١
	rioubleanooung	(1/0)	1

Code	Error message	System condition	Cause	Remedies
01	Water Leak Detect FLT	Stop	The fluid is pooled at the base of this system.	Check for fluid leak.
02	Incorrect Phase Error FLT	Stop	The power phase rotation is wrong.	Check that a proper connection is established between the power cable and main breaker of this system.
03	RFGT High Press FLT	Stop	The pressure of the refirigerant circuit exceeded the specified value. <specified value=""> HRZ***-WS/W1S/W2S-F: 3.0MPa HRZ008-L/L1-F:2.4MPa</specified>	Check that facility water is being supplied to this system.
04	CPRSR Overheat FLT	Stop	The temperature in the compressor was excessive. <specified value=""> HRZ***-WS/W1S/W2S-F: 110 deg C HRZ008-L/L1-F:110 deg C</specified>	Check that facility water is being supplied to this system.
05	Reservoir Low Level FLT	Stop	An insufficient amount of the circulating fluid is observed in the tank.	Replenish the circulating fluid.
06	06 Reservoir Low Level WRN Continued Continued An insufficient amount of the circulating fluid is observed in the tank		An insufficient amount of the circulating fluid is observed in the tank.	Replenish the circulating fluid.
07	07 Reservoir High Level WRN Continued An excessive circulating tank		An excessive amount of the circulating fluid is observed in the tank.	Drain the circulating fluid.
08	Temp. Fuse Cutout Stop The circulating fluid tank was raised in temperature. FLT Stop Geg C Geg C		Check the load specification. Replacement of the thermal fuse is required. Call the supplier for service.	
09 Reservoir High Temp. FLT Stop The temperature of the cir fluid exceeded the specified <specified value=""> HRZ***-WS/W1S-F : 95 HRZ***-W2S-F : 65 deg HRZ008-L/L1-F : 50 deg</specified>		The temperature of the circulating fluid exceeded the specified value. <specified value=""> HRZ***-WS/W1S-F : 95 deg C HRZ***-W2S-F : 65 deg C HRZ008-L/L1-F : 50 deg C</specified>	Check the load specification.	

Table 6-1 Troubleshooting (2/3)				
Code	Error message	System condition	Cause	Remedies
10	Return High Temp WRN	Continued	The temperature of the circulating fluid exceeded the specified value. <specified value=""> HRZ***-WS-F : 110 deg C HRZ***-W1S-F:100 deg C HRZ***-W2S-F:80 deg C HRZ008-L/L1-F :60 deg C</specified>	Check the circulating fluid flow rate, load specification.
11	Reservoir High Temp. WRN	Intersteller 1.05 deg CThe temperature of the circulating fluid exceeded your set value. <setting range=""> HRZ002-WS/W1S-F : -10.0 to 93.0 deg C HRZ004/008/010-WS/W1S-F : -20.0 to 93.0 deg C HRZ008-L/L1-F : -20.0 to 63.0 deg C HRZ008-L/L1-F : -20.0 to 45.0 deg C <factory default=""> HRZ***-WS/W1S-F :93.0 deg C HRZ***-W2S-F :63.0 deg C HRZ008-L/L1-F :45.0 deg C</factory></setting>		Reset the setting temperature.
12	Return Low Flow FLT	Stop	The flow rate of the circulating fluid falls below specified value. <specified value=""> 6L/min</specified>	 Check that the external value is opened. Prepare a thicker external pipe or install bypass piping.
13	Return Low Flow WRN	Continued	The flow rate of the circulating fluid falls below your set value. <specified value=""> HRZ***-WS/W1S/W2S-F : 8.0~40.0L/min (2.1~10.6GPM) HRZ008-L-F : 15.0~40.0L/min (4.0~10.6GPM) HRZ008-L1-F : 8.0~40.0L/min (2.1~10.6GPM) <factory default=""> HRZ***-WS/W1S/W2S-F : 8.0L/min (2.1GPM) HRZ008-L-F : 15.0L/min (4.0GPM) HRZ008-L1-F : 8.0L/min (2.1GPM)</factory></specified>	Reset the setting flow rate.
16	CPRSR Breaker Trip FLT	Stop	The breaker for the compressor power line was tripped.	Check that the power supply to this system is compliant with the specification.
19	FAN Motor Stop WRN	Continued	The ventilating fan came to a stop.	Check that the air vent on the back of the system is not blocked off.
20	Internal Pump Time Out WRN	Continued	The internal pump was under conditions of continuous operation over a specified time. <specified time="">10min</specified>	Check for fluid leak from circulating fluid piping in your system.
21	Controller Error FLT	Stop	An error was detected in the control system.	Contact the system supplier for request of inspection and repair.

HRX-OM-X010 Chapter 6 Error Message and Troubleshooting

 Table 6-1
 Troubleshooting (3/3)

Code	le Error message		System condition	Cause	Remedies
22	Memory Data Error FLT		Stop	An error was detected in data stored in the controller of this system.	 Re-turn ON the main breaker to recover from the error. Contact the system supplier for request of inspection and repair.
	Communica	0001	Continued	An interruption of serial communication occurred in this system.	•Contact the system supplier for request of inspection and repair.
23	-tion Error	8000	Continued	An interruption of serial communication occurred between this system and your system.	• Check for disconnection of the communication connector from this system.
24 DI Low Level WRN		WRN	Continued	The DI level of the re-circulating liquid lowered than the your set value (Optional). <setting range=""> $0.0 \text{ to } 2.0 \text{ M} \Omega$ <factory default=""> $0.0 \text{ M} \Omega$</factory></setting>	 Lower the setting for resistivity. Replacement of the DI filter is required
25	Pump Inverter FLT	r Error	Stop	An error was detected in the inverter for circulating pump.	Contact the system supplier for request of inspection and repair.
28	CPRSR INV Error FLT		Stop	An error was detected in the inverter for compressor.	Contact the system supplier for request of inspection and repair.
29	RFGT Low Press FLT		Stop	The refrigerant pressure falls below the specified value. <specified value=""> 0.1MPa</specified>	Contact the system supplier for request of inspection and repair.
32 Reservoir Low Temp. WRN		Continued	The temperature of the circulating fluid falls your set value. <setting range=""> HRZ002-WS/W1S-F: -15.0 to 90.0 deg C HRZ004/008/010-WS/W1S-F: -25.0 to 90.0 deg C HRZ***-W2S-F: 5.0 to 60.0 deg C HRZ008-L/L1-F: -25.0 to 40.0 deg C <factory default=""> HRZ002-WS/W1S-F: -15.0 deg C HRZ004/008/010-WS/W1S-F: -25.0 deg C HRZ***-W2S-F: 5.0 deg C HRZ008-L/L1-F: -25.0 deg C</factory></setting>	Reset the setting temperature.	

Chapter 7 System Maintenance

7.1 Water Quality Management

A CAUTION

Only designated circulating fluid is permitted to use for this system. Potential system failure and fluid leak may occur if disregarded, which results in electric shock, ground fault, and freeze. Be sure to use fresh water (tap water) compliant with water quality standards in the table below for ethylene glycol aqueous solution and facility water.

Table 7-1 Water Quality Standards for Fresh Water (Tap Water)				
	Substance	Facility water	Circulating water	
	Substance	spec.	spec.	
	pH (25 deg C)	6.5 to 8.2	6.0 to 8.0	
	Electrical conductivity (25 deg C)			
	(μs/cm)	100 to 800	0.5 to 300	
	*Circulating fluid 1 to 500			
	Chloride ion (mgCl-/L)	Max. 200	Max.50	
	Sulfate ion (mgSO ₄ ²⁻ /L)	Max.200	Max.50	
	Acid consumption (pH4.8)	Max 100	Max 50	
	(mgCaCO ₃ /L)	Wax. 100	IVIAX.50	
Standarda	Total hardness (mgCaCO ₃ /L)	Max.200	Max.70	
Standards	Calcium hardness (mgCaCO ₃ /L)	Max.150	Max.50	
	lonic silica (mgSiO ₂ /L)	Max.50	Max.30	
	Iron (mgFe/L)	Max.1.0	Max.0.3	
	Copper (mgCu/L)	Max.0.3	Max.0.1	
	Sulfide ion (mgS ²⁻ /L)	Not be detected		
	Ammonium ion (mgNH₄⁺/L)	Max.1.0	Max.0.1	
	Residual chlorine (mgCl/L)	Max.0.3	Max.0.3	
	Free carbon dioxide (mgCO ₂ /L)	Max.4.0	Max.4.0	
	Filtering (µm)	Ma	IX.5	

According to the Water quality guideline for refrigeration air-conditioning equipment: JRA-GL-02-1994

CAUTION



If the periodic inspection finds a nonconforming substance in the facility water, clean the facility water circuit and recheck the quality of the facility water.

7.2 Inspection and Cleaning

WARNING

- Δ Do not touch any electrical parts with wet hands. •
 - Keep wet hands away from electrical parts. Potential electric shock can occur if disregarded.
 - Keep this system from water. Potential electric shock or fire can occur if disregarded.

A WARNING

If the inspection and cleaning require the removal of the panel, be sure to re-attach the panel upon completion. Potential personal injury or electric shock may occur if operated with the panel opened or removed.

Daily inspection 7.2.1

Inspection item	Inspection method				
Installation	Check of the condition of	No heavy object is placed on this system. This system should not be subjected to external force.			
condition	system installation	Temperature and humidity fall within the specified range.			
Fluid leak	Check of the piping connector section	No leak of facility water and circulating fluid from the piping connector section			
Fluid level	Reading of the level of the circulating fluid	Level falls within the circulating fluid specified level between "High" and "Low".			
Operation	Display check	Clarity of letters and numbers on the LCD display should be assured.			
display panel	Function check	[RUN] lamp is ON.			
Circulating fluid Confirm the reading on the LCD screen		Temperature should be within setpoint.			
Refrigerant pressure	Reading of the refrigerant pressure gauge	Value of "HI PRESS" in "Maintenance screen 6 (page 5-33)" should be in the following range. HRZ010-W*S-F : 0.5 to 2.5 MPa HRZ008-L/L1-F : 0.5 to 2.0 MPa			
Discharge pressure of circulating fluid	Confirm the reading on the LCD screen	Reading should not have deviated much from last inspection.			
Circulating fluid flow rate	Confirm the reading on the LCD screen	Reading should not have deviated much from last inspection.			
Operating condition	Operating condition check	No abnormal noise, vibration, odor and smoke			
Facility water	Check of the facility water	Temperature, flow rate and pressure fall within the specified range.			
Circulating fluid supply port cap	Check by providing manual tightening	No looseness			

Table 7-2 Daily Inspection

7.2.2 Quarterly inspection



Quarterly inspection requires an advance lockout/tagout of this system. See section 1.5.3 "Lockout/Tagout" in "Chapter 1 Safety" for details on page 1-10.

WARNING

Inspection item	Inspection method
	Circulating fluid is to be drained for check. Fluid should be free of particles, moisture ^{*1} and foreign substances.
Circulating fluid	For ethylene glycol solution, confirm that the concentration falls within the specified range.
	Recommended to replace the water.
Facility water	Facility water quality should fall within the standards specified.
Ventilation hole and electrical parts	No particles and dust should be present.

Table 7.3 Quarterly Increation

CAUTION



7.3 Storage

The following should be performed for system long-term storage.

- **1.** Drain the circulating fluid. See section 7.3.1 "Draining of circulating fluid out of tank" for details on page 7-4.
- **2.** Drain the facility water. See section 7.3.2 "Draining of facility water" for details on page 7-5.
- **3.** Cover the system with a plastic sheet for storage.

7.3.1 Draining of circulating fluid out of tank

- Use the clean container for circulating fluid recovery. Reuse of the recovered circulating fluid with contaminated will cause insufficient cooling and system failure
- Be sure to wait until the circulating fluid obtains room temperature for its draining. Potential burns and dew intrusion may occur if disregarded.
- **1.** Prepare the container for circulating fluid recovery at the back of this system.



- **3.** Remove the cap of the circulating fluid fill port.
- **4.** Open the values of the main and sub tank drain ports to drain the circulating fluid.
- **5.** Apply air purge from the the circulating fluid return to push the circulating fluid remaining in the heat exchange back in the tank and drain it.

	CAUTION
2	If the recovered circulating fluid is contaminated by foreign substances, completely remove them. Do not reuse comtaminated fluid. Potential insufficient cooling, system failure and froth in the circulating fluid may occur if disregarded.
	CAUTION



Recovered circulating fluid must be sealed in a container to prevent contamination from moisture or foreign substances. Stored in a cool, dark place. Keep it from flame. **6.** Upon completion of fluid draining, close the valves of the main and sub tank drain ports.





Main tank drain port

7.3.2 Draining of facility water



Be sure to drain the facility water only when it is at room temperature. Trapped fluid inside the system can still be hot. Potential burns can occur if disregarded.

CAUTION

Λ

Place the drain pan underneath the piping connections on the rear of this system.
 A 7L-capacity or bigger drain pan is required.



- **2.** Remove facility water piping.
 - Remove the joints such as unions if present.

3. Drain the facility water using the facility water inlet port.

7.4 Periodic Replacement Parts

Replacement of consumables listed in the following table is recommended. Contact the system supplier for request of part replacement.

Part	Recommended replacement cycle		
Internal pump	Every 3 yrs		
Circulating pump	Every 3 yrs		
Ventilating fan	Every 3 yrs		
Inverter Coolong Fan	Every 3 yrs		

Table 7-4 Periodic Replacement Part List

* Note: A replacement cycle may vary with your usage condition.

^{7.4} Periodic Replacement Parts

Chapter 8 Appendix

8.1 Specification

8.1.1 System specification

Specification for fluorinated fluid (wide temperature)

Table 8-1 Specification for Fluorinated Fluid (wide temperature)

Model			HRZ002-WS-F	HRZ004-WS-F	HRZ008-WS-F	HRZ010-WS-F
Cooling method			Water cooled refrigerant			
Cooling capacity ^{*1} (50Hz/60Hz)		2.0	4.0	8.0	10.0	
Operating temperature	e range	deg C	-10 to 90		-20 to 90	
Temperature stability		deg C		±0	.1 ^{*2}	
			Galden [®] H [®] Galden [®] H [®]	T135 ^{*3} Fluorinert [™] F T200 ^{*3} Fluorinert [™] F	C-3283 ^{*3} (-20 to 40 c C-40 ^{*3} (20 to 90 deg	deg C) C)
Circulating fluid				(No intrusion c	f foreign body)	
Refrigerant				R410A(HFC,	GWP2088) ^{*11}	
Quantity of refrigerant		kg	1.5			
Pump capacity*4	⁵ ump capacity ^{*4} MPa		0.65 (At 20L/min) 0.72 (At 20L/min) (104[PSIG] At 5.3 [gal/min]) [gal/min])			0.72 (At 20L/min) (104[PSIG] At 5.3 [gal/min])
Main Tank capacity ^{*5}		L	Approx.15 (4 [gal])			
Sub Tank capacity *6		L		Approx.16	i (4.2 [gal])	
Circulating fluid port				Rc	3/4	
Facility water		deg C /MPa		10 to 30 / 0.3 to 0.7	7 (45 to 100 [PSIG])	
Facility water	ated condition ^{*9}	L/min	4	7	14	15
required flow rate co	mp. changing ndition ^{*10}	L/IIIII	10	12	15	15
Facility water port				Rc	1/2	
Power supply	3-phase 50/60Hz AC200/200 to 208V±10%)%		
Breaker size		А	20 30			
Dimensions*7		mm	W380×D870×H950 (W14.96xD34.25xH37.40[inch])			
Weight ^{*8}		kg	165 (364 [lbs])			
Communication			Serial RS-485 (Dsub-9pin) , Contact signal (Dsub-25pin)			

*1: The capacity is derived under the conditions that the circulating fluid temp is 20 deg C, the facility water temp. is 25 deg C and that the circulating fluid flow rate is obtained at a specified flow rate of pump capacity.

*2: This is a system output temperature, with flow rate defined in pump capacity secured, when stabilized with no disturbance. Its upper limit may be violated if an insufficient amount of the circulating fluid is present or a disturbance to flow rate is observed. *3: Galden[®] is a registered trademark of Solvay Solexis, and Fluorinert[™] is a trademark of U.S. 3M.

*4: The capacity is derived at the Outlet of this system when the circulating fluid temp. is at 20 deg C and maximum frequency operation by inverter.

*5: This is a minimum amount of the fluid for operation of the Thermo Chiller outfitted with internal piping and heat exchanger in this system. Circulating fluid temp.: 20deg C

*6: This is an auxiliary space with a main tank capacity excluded. Available for circulating fluid recovery from external piping and backup supply.

*7: This is the dimensions of panels, which is derived without protrusions such as a breaker handle.

*8: This is the mass of the system when it contains no circulating fluid.

*9: The required flow rate when the cooling capacity load is applied under the condition in *1.

*10.Temporarily required flow rate when set temperature is changed under the facility water temp.25 deg C.

*11: The value of IPCC (Intergovernmental Panel on Climate Change) Forth Assignment Report : Climate Change 2007 (AR4).

Specification for ethylene glycol solution (wide temperature)

Model			HRZ002-W1S-F	HRZ004-W1S-F	HRZ008-W1S-F	HRZ010-W1S-F
Cooling method			Water cooled refrigerant			
Cooling capacity ^{*1} (50Hz/60Hz)		kW	2.0	4.0	8.0	10.0
Operating temperature range		deg C	-10 to 90 -20 to 90			
Temperature stability deg C		±0.1 ^{*2}				
Circulating fluid			Ethylene glycol aqueous solution 60%*3			
			(No intrusion of foreign body)			
Refrigerant			R410A(HFC,GWP2088) ^{*11}			
Quantity of refrigerant		kg	1.5			
Pump capacity ^{*4}		MPa	0.40 (At 20L/min) (58 [PSIG] At 5.3 [gal/min])			
Main Tank capacity ^{*5}		L	Approx.15 (4 [gal])			
Sub Tank capacity *6		L	Approx.16 (4.2 [gal])			
Circulating fluid port			Rc 3/4			
Facility water		deg C /MPa	10 to 30 / 0.3 to 0.7 (45 to 100 [PSIG])			
Facility water required flow rate	Rated condition ^{*9}	– L/min	4	6	14	15
	Temp. changing condition *10		10	12	15	15
Facility water port			Rc 1/2			
Power supply			3-phase 50/60Hz AC200/200 to 208V±10%			
Breaker size		А	20 30			
Dimensions ^{*7} mm		mm	W380×D870×H950 (W14.96xD34.25xH37.40[inch])			
Weight ^{*8}		kg	165 (364 [lbs])			
Communication			Serial RS-485 (Dsub-9pin) , Contact signal (Dsub-25pin)			

 Table 8-2
 Specification for ethylene glycol solution (wide temperature)

*1: The capacity is derived under the conditions that the circulating fluid temp is 20 deg C, the facility water temp. is 25 deg C and that the circulating fluid flow rate is obtained at a specified flow rate of pump capacity.

*2: This is a system output temperature, with flow rate defined in pump capacity secured, when stabilized with no disturbance. Its upper limit may be violated if an insufficient amount of the circulating fluid is present or a disturbance to flow rate is observed. *3: Pure ethylene glycol needs dilution with fresh water before use.

Ethylene glycol with additives such as preservatives is NOT available. It not only deteriorates the performance, but also lead to cause failure.

*4: The capacity is derived at the Outlet of this system when the circulating fluid temp. is at 20 deg C and maximum frequency operation by inverter.

*5: This is a minimum amount of the fluid for operation of the Thermo Chiller outfitted with internal piping and heat exchanger in this system. Circulating fluid temp.: 20 deg C

*6: This is an auxiliary space with a main tank capacity excluded. Available for circulating fluid recovery from external piping and backup supply.

*7: This is the dimensions of panels, which is derived without protrusions such as a breaker handle.

*8: This is the mass of the system when it contains no circulating fluid.

*9: The required flow rate when the cooling capacity load is applied under the condition in *1.

*10:Temporarily required flow rate when set temperature is changed under the facility water temp.25 deg C.

*11: The value of IPCC (Intergovernmental Panel on Climate Change) Forth Assignment Report : Climate Change 2007 (AR4).

HRZ002-W2S-F HRZ008-W2S-F Model HRZ004-W2S-F HRZ010-W2S-F Cooling method Water cooled refrigerant Cooling capacity*1 2.0 kW 4.0 80 10.0 (50Hz/60Hz) Operating temperature range deg C 10 to 60 ±0.1*2 Temperature stability deg C Pure water / DI water*3 Circulating fluid (No intrusion of foreign body) R410A(HFC,GWP2088)*11 Refrigerant Quantity of refrigerant 15 kg 0.38 (At 20L/min) Pump capacity*4 MPa (55 [PSIG] At 5.3 [gal/min]) Main Tank capacity*5 L Approx.15 (4 [gal]) Sub Tank capacity *6 L Approx.16 (4.2 [gal]) Circulating fluid port Rc 3/4 deg C Facility water 10 to 30 / 0.3 to 0.7 (45 to 100 [PSIG]) /MPa Rated condition*9 4 7 15 14 Facility water L/min required flow rate Temp. changing 10 15 12 15 condition *10 Facility water port Rc 1/2 50/60Hz AC200/200 to 208V±10% Power supply 3-phase Breaker size А 20 30 W380×D870×H950 Dimensions*7 mm (W14.96xD34.25xH37.40[inch]) Weight*8 165 (364 [lbs]) kg Communication Serial RS-485 (Dsub-9pin), Contact signal (Dsub-25pin)

Specification for water (wide temperature)

Table 8-3 Specification for water (wide temperature)

*1: The capacity is derived under the conditions that the circulating fluid temp is 20 deg C, the facility water temp. is 25 deg C and that the circulating fluid flow rate is obtained at a specified flow rate of pump capacity.

*2: This is a system output temperature, with flow rate defined in pump capacity secured, when stabilized with no disturbance. Its upper limit may be violated if an insufficient amount of the circulating fluid is present or a disturbance to flow rate is observed.

*3: Water quality of The Japan Refrigeration and Air Conditioning Industry Association (JRA GL-02-1994/Recirculating fluid of Cooling water system) shall be satisfied (See "7.1 Water Quality Management')

Additives such as preservative is NOT available. It not only deteriorates the performance, but also lead to cause failure. *4: The capacity is derived at the Outlet of this system when the circulating fluid temp. is at 20 deg C and maximum frequency operation by inverter.

*5: This is a minimum amount of the fluid for operation of the Thermo Chiller outfitted with internal piping and heat exchanger in this system. Circulating fluid temp.: 20 deg C

*6: This is an auxiliary space with a main tank capacity excluded. Available for circulating fluid recovery from external piping and backup supply.

*7: This is the dimensions of panels, which is derived without protrusions such as a breaker handle.

*8: This is the mass of the system when it contains no circulating fluid.

*9: The required flow rate when the cooling capacity load is applied under the condition in *1.

*10:Temporarily required flow rate when set temperature is changed under the facility water temp.25 deg C.

*11: The value of IPCC (Intergovernmental Panel on Climate Change) Forth Assignment Report : Climate Change 2007 (AR4).

Specification for fluorinated fluid (low temperature)

Table 8-4 Specification for Fluorinated Fluid (Low Temperature)

Model		HRZ008-L-F		
Cooling method		Water cooled refrigerant		
Cooling capacity ^{*1} (50Hz/60Hz)	kW	8.0 (At -10 deg C)		
Operating temperature range	deg C	-20 to 40		
Temperature stability	deg C	±0.1*2		
Circulation fluid		Galden [®] HT135 ^{*3} Fluorinert [™] FC-3283 ^{*3}		
Circulating tiuld		(No intrusion of foreign body)		
Refrigerant		R448A(HFC/HFO,GWP1387)*10		
Quantity of refrigerant	kg	2		
Pump capacity ^{*4} (50Hz/60Hz)	MPa	Max.0.95(At 30l/min) (138 [PSIG] At 8 [gal/min]) with flow control function by VFD		
Main Tank capacity ^{*5}	L	Approx.22 (5.8 [gal])		
Sub Tank capacity ^{*6}	L	Approx.17 (4.5 [gal])		
Circulating fluid port		Rc 3/4		
Facility water	deg C /MPa	10 to 25 / 0.3 to 0.7 (45 to 100 [PSIG])		
Required flow of facility water ^{*9} (50Hz/60Hz)	L/min	18 / 23 (4.8 / 6.0 [gal/min])		
Facility water port		Rc 1/2		
Power supply		3-phase 50/60Hz AC200/200 to 208V±10%		
Main breaker size	А	60		
Dimensions*7	mm	W415×D1080×H1075 (W16.34xD42.52xH42.32 [inch])		
Weight *8	kg	236 (520 [lbs])		
Communication		Serial RS-485 (Dsub-9nin) Contact signal (Dsub-25nin)		

*1: The capacity is derived under the conditions that the facility water temp. is 25 deg C and that the circulating fluid

flow rate is obtained at a specified flow rate of pump capacity. Applied to 50 / 60Hz. *2: This is a system output temperature, with flow rate defined in pump capacity secured, when stabilized with no disturbance. Its upper limit may be violated if an insufficient amount of the circulating fluid is present or a disturbance to flow rate is observed.

*3: Galden[®] is a registered trademark of Solvay Solexis, and Fluorinert [™] is a trademark of U.S. 3M. *4: The capacity is derived at the Outlet of this system when the circulating fluid temp. is at 20 deg C.

*5: This is a minimum amount of the fluid for operation of the Thermo Chiller outfitted with internal piping and heat exchanger in this system. Circulating fluid temp.: 20 deg C

*6: This is an auxiliary space with a main tank capacity excluded. Available for circulating fluid recovery from external piping and backup supply.

*7: This is the dimensions of panels, which is derived without protrusions such as a breaker handle.

*8: This is the mass of the system when it contains no circulating fluid.*9: Facility water temp. is 25 deg C. There is required flow when adding load described on cooling capacity.

*10: The value of IPCC (Intergovernmental Panel on Climate Change) Forth Assignment Report : Climate Change 2007 (AR4).

Specification for ethylene glycol solution (low temperature)

Model		HRZ008-L1-F	
Cooling method		Water cooled refrigerant	
Cooling capacity ^{*1} (50Hz/60Hz)	kW	8.0 (At -10 deg C)	
Operating temperature range	deg C	-20 to 40	
Temperature stability	deg C	±0.1*2	
		Ethylene glycol solution 60%*3	
		(No intrusion of foreign body)	
Refrigerant		R448A(HFC/HFO,GWP1387)*10	
Quantity of refrigerant	kg	2	
Pump capacity ^{*4} (50Hz/60Hz)	MPa	Max.0.40 (At 20L/min) (58 [PSIG] At 5.3 [gal/min]) with flow control function by VFD	
Main Tank capacity ^{*5}	L	Approx.22 (5.8 [gal])	
Sub Tank capacity *6	L	Approx.17 (4.5 [gal])	
Circulating fluid port		Rc 3/4	
Facility water	deg C /MPa	10 to 25 / 0.3 to 0.7 (45 to 100 [PSIG])	
Required flow of facility water ^{*9} (50Hz/60Hz)	L/min	18 / 23 (4.8 / 6.0 [gal/min])	
Facility water port		Rc 1/2	
Power supply		3-phase 50/60Hz AC200/200 to 208V±10%	
Main breaker size	А	60	
Dimensions*7	mm	W415×D1080×H1075 (W16.34xD42.52xH42.32 [inch])	
Weight ^{*8}	kg	236 (520 [lbs])	
Communication	1	Serial RS-485 (Dsub-9pin) . Contact signal (Dsub-25pin)	

Table 8-5 Specification for Ethylene Glycol Aqueous Solution (Low Temperature)

I
 *1: The capacity is derived under the conditions that the facility water temp. is 25 deg C and that the circulating fluid flow rate is obtained at a specified flow rate of pump capacity. Applied to 50 / 60Hz.

*2: This is a system output temperature, with flow rate defined in pump capacity secured, when stabilized with no disturbance. Its upper limit may be violated if an insufficient amount of the circulating fluid is present or a disturbance to flow rate is observed.

*3: Pure ethylene glycol needs dilution with fresh water before use.

Ethylene glycol with additives such as preservatives is NOT available.

*4: The capacity is derived at the Outlet of this system when the circulating fluid temp. is at 20 deg C.

*5: This is a minimum amount of the fluid for operation of the Thermo Chiller outfitted with internal piping and heat exchanger in this system. Circulating fluid temp.: 20 deg C

*6: This is an auxiliary space with a main tank capacity excluded. Available for circulating fluid recovery from external piping and backup supply.

*7: This is the dimensions of panels, which is derived without protrusions such as a breaker handle.

*8: This is the mass of the system when it contains no circulating fluid.

*9: Facility water temp. is 25 deg C. There is required flow when adding load described on cooling capacity.

*10: The value of IPCC (Intergovernmental Panel on Climate Change) Forth Assignment Report : Climate Change 2007 (AR4).

8.1.2 Cooling capacity



Fluid : Fluorinated Fluid

*Common to 50/60Hz



*Common to 50/60Hz


Circulating fluid setting temp. [deg.C]

Figure 8-3 Cooling capacity (HRZ***-W2S-F) *Common to 50/60Hz





Fluid : Ethylene glycol solution 60% Flow rate : Rated flow Facility water temp. : 25deg. C



Fig. 8-5 Cooling capacity (HRZ008-L1-F) *Common to 50/60Hz

8.1.3 Heating capacity



Fig. 8-6 Heating capacity (HRZ***-WS-F) *When pump inverter is operating at frequency of 60Hz (maximum).







HRZ008-L-F

Circulating Fluid: Fluorinated Fluid Flow rate : Rated flow







Fig. 8-10 Heating capacity (HRZ008-L1-F) * When pump inverter is operating at frequency of 60Hz (maximum).

8.1.4 Pump Performance Curve



Figure 8-11 Pump Performance Curve (HRZ***-WS-F) When circulating fluid flow rate lowers 6L/min (1.6G/min), an alarm will occur and operation can't be performed.

HRZ***-W1S-F

Circulating Fluid: Ethylene glycol solution 60% Operating Temperature: 20 deg.C At maximum frequency operation by inverter



Figure 8-12 Pump Performance Curve (HRZ***-W1S-F) When circulating fluid flow rate lowers 6L/min (1.6G/min), an alarm will occur and operation can't be performed.



Figure 8-13 Pump Performance Curve (HRZ***-W2S-F) When circulating fluid flow rate lowers 6L/min (1.6G/min), an alarm will occur and operation can't be performed.



Circulating Fluid: Fluorinated Fluid Operating Temperature: 20 deg C At maximum frequency operation by inverter



 $\label{eq:Fig. 8-14} Fig. \ 8-14 \quad Pump \ Performance \ Curve\ (\ HRZ008-L-F\) \\ When \ circulating\ fluid\ flow\ rate\ lowers\ 6L/min\ (1.6G/min), an \ alarm\ will\ occur\ and\ operation\ can't\ be\ performed.$

HRZ008-L1-F

Circulating Fluid: Ethylene glycol solution 60% Operating Temperature: 20 deg C At maximum frequency operation by inverter



 $\label{eq:Fig. 8-15} Fig. \ 8-15 \ \ Pump \ Performance \ Curve \ (\ HRZ008-L1-F \) \\ When \ circulating fluid flow rate lowers \ 6L/min \ (1.6G/min), an alarm will occur and operation \ can't be performed.$

8.1.5 Refrigerant with GWP reference

	Table 8-6 Refrigerant with GWF	P reference
	Global Warming Pot	ential (GWP)
Refrigerant	Regulation (EU) No 517/2014 (Based on the IPCC AR4)	Revised Fluorocarbons Recovery and Destruction Law (Japanese law)
R134a	1,430	1,430
R404A	3,922	3,920
R407C	1,774	1,770
R410A	2,088	2,090
R448A	1,387	1,387

Note:

1. This product is hermetically sealed and contains fluorinated greenhouse gases.

2. See specification table for refrigerant used in the product.

8.1.6 Communication specification

This section provides the general outline of communications utilized in this system.

For detail specification, we provide a separate system manual "Communication Specification", which is available through your local distributor.

Contact signal

	Tabl	<u>e 8-7 Conta</u>	act Signal	
	Item		Specificati	on
Co	nnector No.		P1	
Connector	type (this system)	Г)-sub25P female conne	ctor(M2 6x0 45)
Connocio			Photocoun	
	Rated input voltage			
Input signal				06 41/
input signal	Deted input ourrept			0.4 V
	Rated input current			-
	Input Impedance		4.7KΩ	D 0001/
Contact output	Rated load voltage		Max. AC48V / Mai	x. DC30V
signal			Max. AC/DC 8	00mA
(Other than Pin	Max. load current	(Pin No.	15 is common to output	signals. Total used load
No. 5-18)			current should be at or	below 800mA)
Contact output	Rated load voltage		Max. AC48V / Ma	x. DC30V
signai (Pin No. 5-18)	Max. load current		AC/DC 800mA (resis	stance load)
Contact output	Rated load voltage		Max. AC48V / Ma	x. DC30V
sıgnal (EMO signal)	Max. load current	AC/[DC 800mA (resistance l	oad, inductive load)
Analog input	Input voltage range		-10 to +10	V
	Input impedance		1MΩ	
Signal	Input accuracy		±0.2% F.S. o	r less
	Output voltage range		-10 to +10	V
Analog output	Max. output current		10mA	
signa -	Output accuracy		±0.2% F.S. o	r less
Circuit block diagram	The product Your system	Pin No VO 1 Output 2 Intput 14 Output 3 Intput 16 Intput 4 Intput 17 Intput 6 Output 19 Output 20 Output 15 Intput 15 Intput 16 Output 17 Output 19 Output 11 Output 12 Output 13 Output 13 Output	Time Standard specification DC+24V output Input signal COM 24COM Run/Stop signal - AUTO PURGE signal ¹¹ - Run status signal Warning signal Warning signal Fault signal Remote signal TEMP READY signal AUTO PURGE status signal Output signal COM Alarm signal Temp.PV Analog Output ¹² [-100 to 100deg C:-10 to 10V] DI PV Analog Output ¹³ [0 to 20 MΩ:0 to 10V] Temp.SP Analog Input ¹³ [-100 to 100 deg C:-10 to 10V]	EM CUSTOM DIO DC+24V output Input signal COM 24COM Run/Stop signal 1 Run/Stop signal 2 DIO REMOTE signal 2 DIO REMOTE signal 1 AUTO PURGE signal ¹¹ DIO REMOTE signal 2 OUT1 OUT2 OUT3 OUT4 OUT5 Output signal COM OUT6 Temp.PV Analog Output ^{*2} [-100 to 100deg C:-10 to 10V] DI PV Analog Output ^{*3} [0 to 20 MΩ:0 to 10V] Temp.SP Analog Input ^{*3} [-100 to 100 deg C:-10 to 10V]
	EMO CIRCUIT 0 13 25	25 Output	ENVO signal	EIVIO signal

*1: The recovery signal can be input only when the circulating fluid automatic collection function (optional) is used, and it does not serve as the DIO REMOTE signal.
*2 :Valid if Analog Communication (optional) is provided.
*3 :Valid if DI Control Kit (optional) is provided.

■ Serial RS-485

1	Table 8-8 Serial RS-485
Item	Specification
Connector No.	P2
Connector type (this system)	D-sub9P female connector
Standard	EIA RS485
Protocol	Modicon Modbus
Circuit block diagram	This system Your system

^{8.1} Specification

8.1.7 Alarm signal selection

User can designate one alarm signal for contact signal. See section 5.3.22 Initial Setting screen 7 "page 5-25" for signal selecting.

The following table presents the setting-alarm relationship. The alarm signal is turned OFF if the designated alarm detected. (Alarm signal is ON if no alarm is detected.)

Setting	Alarm	Alarm
N/A	Alarm signal remains ON (closed) under normal circumstances.	-
ALARM01	Water Leak Detect FLT	01
ALARM03	RFGT High Press FLT	03
ALARM04	CPRSR Overheat FLT	04
ALARM05	Reservoir Low Level FLT	05
ALARM06	Reservoir Low Level WRN	06
ALARM07	Reservoir High Level WRN	07
ALARM08	Temp. Fuse Cutout FLT	08
ALARM09	Reservoir High Temp. FLT	09
ALARM10	Return High Temp·WRN	10
ALARM11	Reservoir High Temp. WRN	11
ALARM12	Return Low Flow FLT	12
ALARM13	Return Low Flow WRN	13
ALARM19	FAN Motor Stop WRN	19
ALARM20	Internal Pump Time Out WRN	20
ALARM21	Controller Error FLT	21
ALARM22	Memory Data Error FLT	22
ALARM23	Communication Error	23
ALARM24 ^{*1}	DI Low Level WRN	24
ALARM25	Pump Inverter Error FLT	25
ALARM28 ^{*2}	CPRSR Inverter Error FLT	28
ALARM29	RFGT Low Press FLT	29
ALARM32	Reservoir Low Temp.WRN	32

Table 8-9Alarm signal selection

• Example

With parameter "OUT" on the Initial Setting screen set to "Alarm1", alarm "Water Leak Detect FLT" is detected, the alarm contact signal is switched to OFF (open).

*1 : Alarm 24 is alarm assigned to accessories (optional).

2 : Alarm 28 is not assigned for HRZ008-L-F, the alarm signal always remains ON (closed).

8.2 Outer Dimensions

8.2.1 Part 1



8.3 Flow Chart 8.3.1 Part 1



HRZ***-WS-F HRZ***-W1S-F HRZ***-W2S-F

Figure 8-18 Flow Chart

8.3.2 Part 2



HRZ008-L-F HRZ008-L1-F

Figure 8-19 Flow Chart

8.4 Offset Function

Potential deviations in temperature between this system and your system may be concerned depending on the installation environment. The offset function falling into three types (MODE1 to 3) is assigned to calibrate deviations in temperature. See the following descriptions for the offset function. See section 5.3.16"Initial Setting screen 1"page5-19" for setting.

TEMP PV value, which is displayed on the Status screen, is output as circulating fluid temperature data in terms of communication.

When MODE1 is selected

This mode is used to exercise temperature control to allow the discharge temperature of the circulating fluid to be "TEMP SP value + OFFSET value". TEMP PV value denotes the discharge temperature of the circulating fluid.

E.g.: TEMP SP value: +20 deg C, OFFSET value: +2 deg C → Circulating fluid discharge temp.: +22 deg C, TEMP PV: +22 deg C

• When MODE2 is selected

This mode is used to exercise temperature control to allow the discharge temperature of the circulating fluid to be "TEMP SP value". TEMP PV value denotes "Circulating fluid discharge temp. value + OFFSET value".

E.g.: TEMP SP value: +20 deg C, OFFSET value: +2 deg C → Circulating fluid discharge temp.: +20 deg C, TEMP PV: +22 deg C

• When MODE3 is selected

This mode is used to exercise temperature control to allow the discharge temperature of the circulating fluid to be "TEMP SP value + OFFSET value". TEMP PV value denotes "Circulating fluid discharge temp. value - OFFSET value".

E.g.: TEMP SP value: +20 deg C, OFFSET value: +2 deg C → Circulating fluid discharge temp.: +20 deg C, TEMP PV: +20 deg C

When OFF is selected

If no mode is selected, temperature control is conducted to allow the discharge temperature of the circulating fluid to be "TEMP SP value".

8.4.1 Example of offset function

When the discharge temperature of the circulating fluid is at 30deg C, heat is dissipated by 1deg C to allow the circulating fluid in your system to be 29deg C. Under the above condition, the following process is to be performed with the utilization of MODEs 1 to 3.



Figure 8-20 Example of Offset Function

When MODE1 is selected

This mode enables this system to exercise temperature control to obtain 31deg C (TEMP SP value +OFFSET value), with OFFSET value set at 1deg C. Once the discharge temperature of the circulating fluid becomes 31deg C, 1deg C-thermal dissipation is assured to allow the circulating fluid in your system to be 30deg C. TEMP SP value is obtained for your system.

Note that "31deg C" is recorded in TEMP PV and communication data.



Figure 8-21 When MODE1 is selected

When MODE2 is selected

With OFFSET value set at -1deg C, TEMP PV and communication data express "29deg C" (circulating fluid discharge temp. value + OFFSET value) that agrees with the temperature of the circulating fluid in your system.



Figure 8-22 When MODE2 is selected

When MODE3 is selected

This mode enables this system to exercise temperature control to obtain 31deg C (TEMP SP value +OFFSET value), with OFFSET value set at 1deg C. Once the discharge temperature of the circulating fluid becomes 31deg C, 1deg C-thermal dissipation is assured to allow the circulating fluid in your system to be 30deg C. TEMP SP value is obtained for your system. TEMP PV and communication data also express "30deg C" (circulating fluid discharge temp. value - OFFSET value) that agrees with the temperature of the circulating fluid in your system.



Figure 8-23 When MODE3 is selected

8.5 BAND/READY function

Sets BAND to TEMP SP value, and notifies TEMP PV value reaches within BAND range by the operation display panel or the communication. See section "Chapter 5 System Operation 5.3.21 Initial Setting screen 6" on page 5-24, for the procedure of the setting.

• When the setting is ON

Allows the setting of the BAND and REDY TIME. Allows the setting of the communication output.



Figure 8-24 BAND/READY function

• Examples of Setting

TEMP SP : 20deg C

BAND: 2deg C

READY TIME : 60sec.

"TEMP READY" is displayed on the operation display panel 60-sec. after TEMP PV value becomes 18 deg C to start output by communication. Necessary condition is that TEMP PV value after 60-sec. is 20+/-2.0 deg C or less. See "5.3.4 Status screen 3" on page 5-7 for the details of display position.

• When the setting is OFF

BAND/READY function becomes invalid.

8.6 Anchor Bolt Mounting Position 8.6.1 Part 1

HRZ***-WS-F HRZ***-W1S-F HRZ***-W2S-F

Lock the brakes on casters (2 pcs. on the front), and attach the anti-seismic bracket (optional: HRZ-TK002) to secure this system.







8.6.2 Part 2

HRZ008-L-F HRZ008-L1-F

Adjust and secure the adjuster foot of this system to secure the anti-seismic bracket.

Anti-seismic bracket is an accessory, which is required for the installation of this system. It is your responsibility to prepare anchor bolts suitable for your floor material. M8-anchor bolts (8 pcs.) are required.



Figure 8-26 Anchor Bolt Mounting Position

8.7 Compliance

This system	conforms	to the	following	standards.
-------------	----------	--------	-----------	------------

	EMC Directive	2014/30/EU
	Machinery	2006/42/50
CE Marking	Directive	2000/42/EC
	RoHS	2011/65/51
	Directive	2011/05/EU
SEMI	S2,S8,F47	
UL	E229305 / UL19	995

Table 8-10 Compliance

To confirm daily i	inspectic	on item c	n the The	irmo Ch	iller, See "Tat	vle 7-2 D)aily Insp	section" in '	"7.2.1 Dail	y inspection" of	"Chapter 7.		ΣØ	lodel: erial Nc	 		
		Installation	Leak	age	Fluid Level	Operation di panel	isplay	Circulating fluid temp.	Refrigerant press.	Circulating fluid outlet press.	Circulating fluid flowrate	Operating condition		Facility w	ater	Circulating fluid supply port cap	
Your name	Date T _€	∋mp. Humid	ty Orcutating fluid	Cooling water								Error	Temp.	Flowrate	IN press.	Looseness	Judgment
		° °	Yes/No	Yes/No	IN/OUT of range	Display	unction	ů	МРа	МРа	L/min	Yes/No	ů	L/min	MPa	Yes/No	
After installation (initial value)																	
												_					
		<u> </u>															

Chapter 8 Appendix

8-30

Chapter 9 Product Warranty

1. Warranty

If a failure is observed in our Thermo Chiller, repair shall be provided in accordance with the warranty period and preconditions defined below at SMC's option.

Repair involves the inspection and/or replacement and/or modification of a defective part. Removed parts shall become the possession of SMC.

2. Warranty period

The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whicherer is first.

3. Warranty exemption

SMC's liability under this warranty shall not be available for the following troubles and damages.

- (1) Troubles or damage caused by the neglect of our designated inspection (daily inspection, periodic inspection).
- (2) Troubles or damages caused by mishandling such as using improper operating procedure and using with our specifications violated.
- (3) Troubles or damages caused by unauthorized modification.
- (4) Troubles or damages caused by the use of a not-designated circulating fluid and facility water.
- (5) Troubles or damages caused by wearing out such as fading on the coated or plated surface.
- (6) Sensory phenomena that are considered no effect on the functions (such as noise, vibration).
- (7) Troubles or damages caused by natural disaster such as earthquake, typhoon, water, inevitable events and fire.
- (8) Troubles or damages occurred under the installation conditions defined in the Operation Manual.
- (9) Troubles or damages that are not compliant with the "5. Warranty preconditions".

4. Escape clause

- (1) Expenses of daily inspection and periodic inspection.
- (2) Expenses of repair consigned with neither SMC nor our authorized service station.
- (3) Expenses of transport, installation, and removal of this system.
- (4) Expenses of removal of non-genuine parts and replenishment of non-genuine fluids.
- (5) Unavailability and loss due to this system being disabled. (such as telephone bill, leave compensation, commercial loss)
- (6) Expenses and compensation for terms other than provided in "1. Warranty".

5. Warranty precondition

Proper use and inspection of this system is required to assure safe use of this system. System warranty shall satisfy the following preconditions. Please take note that warranted repair shall not be available if these preconditions are disregarded.

- (1) System operation shall be conducted by following operating procedure defined in the Operation Manual.
- (2) Daily and periodic inspections designated in the Operation Manual shall be made as scheduled.
- (3) Inspection record shall be entered in the Daily Inspection Sheet provided in the Operation Manual.

6. Request for warranted repair

As to warranted repair, please contact the supplier you purchased this system from for service. Warranted repair shall be on request basis.

Unrequited repair shall be provided in accordance with the warranty period, preconditions and terms defined above. Therefore, the repair service shall be available on a chargeable basis if a failure is detected after the warranty period.



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