

Operation Manual Installation · Operation

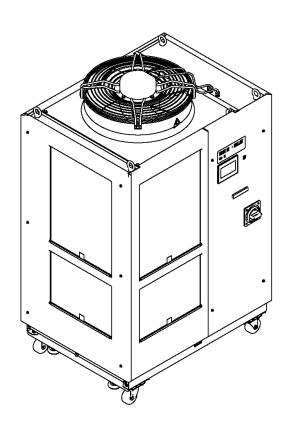
Original Instructions

Thermo Chiller HRL Series

HRL100-A*-40

HRL200-A*-40

HRL300-A*-40



Keep this manual available whenever necessary

To the users

Thank you for purchasing SMC's Thermo chiller (hereinafter referred to as the "product").

For safety and long life of the product, be sure to read this operation manual (hereinafter referred to as the "manual") and clearly understand the contents.

- Be sure to read and follow all instructions noted with "Warning" or "Caution" in this manual.
- This manual is intended to explain the installation and operation of the product. Only people who understand the basic operation of the product through this manual or who perform installation and operation of or have basic knowledge about industrial machines are allowed to work on the product.
- This manual and other documents attached to the product do not constitute a contract, and will not affect any existing agreements or commitments.
- It is strictly prohibited to copy this manual entirely or partially for the use by a third party without prior permission from SMC.

Note: This manual is subject to possible change without prior notice.

Contents

Chapter	1 Safety Instructions	1-1
1.1 B	EFORE USING THE PRODUCT	1-1
1.2 R	EADING THE MANUAL	1-1
1.3 H	AZARDS	1-2
1.3.1	Level of hazards	1-2
1.3.2	Definition of "Serious injury" and "Minor injury"	1-2
1.4 PF	RODUCT LABEL	1-3
1.5 SA	AFETY MEASURES	1-4
1.5.1	Safety instructions for use	1-4
1.5.2	Personal protective equipment	1-4
1.6 En	MERGENCY MEASURES	1-5
1.7 W	ASTE DISPOSAL	
1.7.1	Disposal of refrigerant and compressor oil	1-5
1.7.2	Disposal of product	1-5
1.7.3	Battery	1-6
1.8 SA	AFETY DATA SHEET (SDS)	1-6
Chapter	2 Name and Function of Parts	2-1
-	ODEL NUMBER OF PRODUCT	
	AME AND FUNCTION OF PARTS	
2.2.1		
2.3 Fu	JNCTION OF PARTS	
Chapter		
-	RANSPORT	
3.1.1	Transportation using forklift and hanging	
3.1.2	Transportation using casters	
3.2 IN	STALLATION	3-4
3.2.1	Environment	3-4
3.2.2	Location	3-6
3.2.3	Installation and maintenance space	3-7
3.3 IN	STALLATION	3-8
3.3.1	Installation	3-8
3.3.2	Electrical wiring	3-10
3.3.3	Preparation and wiring of power supply cable	3-12
3.3.4	Contact input/output communicatin wiring	3-17
3.3.5	Wiring of Run/Stop signal input	3-21
3.3.6	Wiring of contact output signal	3-23
3.3.7	Wiring of analog output signal	3-24
3.3.8	RS-485 communication wiring	3-24
3.3.9	RS-232C communication wiring	3-26
3.4 Pı	PING	3-28
■ Inst	tallation of particle filter	3-30

■ Installation of particle filter element	
■ How to connect to the circulating fluid outlet	3-34
■ How to connect to the drain port	3-34
3.5 CIRCULATING FLUID SUPPLY	3-36
Chapter 4 Starting the Product	4-1
4.1 BEFORE STARTING	4-1
4.2 PREPARATION FOR START	4-2
4.2.1 Power supply	4-2
4.2.2 Operation screen (home screen)	4-3
4.3 PREPARATION OF CIRCULATING FLUID SUPPLY TO USER'S EQUIPMENT	4-4
4.4 OPERATION START AND STOP	4-6
4.4.1 Setting of circulating fluid temperature	4-6
4.4.2 Setting of pump operation mode	4-7
4.4.3 Starting the Product	
4.4.4 Stopping the product	
4.5 CHECK ITEMS DURING STARTUP	
4.6 ADJUSTMENT OF CIRCULATING FLUID FLOW RATE	
Chapter 5 Display and Setting of Various Functions	5-1
5.1 Basic Operation	
5.1.1 Touch panel	5-1
5.1.2 Basic operating instructions	5-2
5.2 FLOW CHART OF OPERATION SCREEN	
5.2.1 Flow Chart of Operation Screen	
5.3 LIST OF FUNCTIONS	
5.4 DESCRIPTION OF SCREEN	
5.4.1 Home screen	
*1 In the case of option D1 "CH1 with electrical conductivity control", it will display	
•Menu key	
Display and setting of date and time	5-9
Operating condition display	5-9
Current circulating fluid temperature [PV]	5-10
·Circulating fluid set temperature [SP]	5-10
Circulating fluid discharge pressure [Press PV]	5-11
Circulating fluid flow rate [Flow PV]	5-11
Circulating fluid flow rate [DI PV]	5-11
Independent pump operation [Pump]	5-12
Operation mode [MODE]	
RUN/STOP display	
•Run/stop operation	
5.4.2 Menu	
5.4.3 Status screen	
5.4.4 Information screen	
	5-17

•Alarm name	5-17
Alarm log record	5-18
Display of alarm/maintenance reminder	5-19
5.4.5 Check operation time screen and maintenance reminder	5-20
·Setting the usage time of DI filter	5-22
Setting of the usage time of dustproof filter	5-22
5.4.6 Software version screen	5-23
5.4.7 CH1 setting screen	5-23
Temperature rise/drop alarm (AL10/AL11)	
•TEMP READY alarm (AL12) of TEMP READY function	
Offset (TEMP OFFSET) function	
Pump operation mode	
Discharge pressure alarm (AL18/AL19/AL20)	5-33
Electric conductivity and alarm setting (AL28)	5-35
5.4.8 CH2 setting screen	
Temperature rise/drop alarm (AL14/AL15) setting	
•TEMP READY alarm (AL16) and TEMP READY function	5-38
Offset (TEMP OFFSET) function	
Pump operation mode	5-41
Discharge pressure alarm (AL21/AL23/AL24/AL26)	5-42
Electric conductivity and alarm setting (AL27)	5-43
5.4.9 Function setting screen	
 KEY-LOCK, START-UP operating method, ANTI-FREEZING and WARMING-UP 	
Continuing pump operation	
·Ambient temperature alarm (AL35) and maintenance alarm (AL36)	
•TEMP OUT signal	5-51
Data reset	
5.4.10 Communication setting screen	
 Setting for communication error (AL34)/contact input signal detection (AL30 and AL31) 	
Serial communication setting	
•Setting of analog output signal	
Setting of contact input signal form	
Setting of contact output signal 1 to 3	
Setting of contact output signal 4 to 6	
5.4.11 Temperature waveform screen	
Chapter 6 Alarm Notification and Troubleshooting	
6.1 ALARM NOTIFICATION	
6.2 OPERATION OF THIS PRODUCT WHEN AN ALARM OCCURS	
6.3 TROUBLESHOOTING	
6.4 OTHER ERRORS	
Chapter 7 Control Inspection and Cleaning	

7.2 INSPECTION AND CLEANING 7-2 7.2.1 Daily check 7-2 7.2.2 Monthly check 7-2 7.2.3 Inspection every 3 months 7-4 7.3 OPERATION STOP FOR AN EXTENDED PERIOD OF TIME 7-5 7.3.1 Discharge of the circulating fluid 7-5 7.4 REPLACEMENT OF CONSUMBLES 7-8 7.4.1 Replacing Particle Filters 7-8 7.4.2 Replacing the DI filter 7-8 7.4.3 Consumables 7-11 Chapter 8 Documents 8-1 8.1 SPECIFICATIONS 8-1 8.1.1 HRL100/200/300-A*-40 8-1 8.1.2 Refrigerant with GWP reference 8-2 8.1.3 Communication specifications 8-2 8.2 DIMENSIONS 8-3 8.2.1 HRL100-A*-40 8-3 8.2.2 HRL200-A*-40 8-4 8.2.3 FLOW DIAGRAM 8-6 8.3 FLOW DIAGRAM 8-6 8.4 COOLING CAPACITY 8-7 8.4.1 HRL100-A*-40 CH1 8-7 8.4.2 HRL200-A*-40 CH1 8-7 8.5.1 HRL100-A*-40 CH1 8-8 8.5.2 HRL200-A*-40 CH1 8-8 8.5.3 HRL300-A*-40 CH1 8-9	7.1	QUALITY CONTROL OF CIRCULATING FLUID AND FACILITY WATER	7-1
7.2.2 Monthly check	7.2	INSPECTION AND CLEANING	7-2
7.2.3 Inspection every 3 months	7.2.	1 Daily check	7-2
7.3 OPERATION STOP FOR AN EXTENDED PERIOD OF TIME	7.2.	2 Monthly check	7-3
7.3.1 Discharge of the circulating fluid	7.2.	3 Inspection every 3 months	7-4
7.4 REPLACEMENT OF CONSUMABLES 7-8 7.4.1 Replacing Particle Filters 7-8 7.4.2 Replacing the DI filter 7-8 7.4.3 Consumables 7-11 Chapter 8 Documents 8-1 8.1 SPECIFICATIONS 8-1 8.1.1 HRL100/200/300-A*-40 8-1 8.1.2 Refrigerant with GWP reference 8-2 8.1.3 Communication specifications 8-2 8.2 DIMENSIONS 8-3 8.2.1 HRL100-A*-40 8-3 8.2.2 HRL200-A*-40 8-4 8.3 FLOW DIAGRAM 8-5 8.3.1 HRL**-A*-40-* 8-6 8.4 COOLING CAPACITY 8-7 8.4.1 HRL100-A*-40 CH1 8-7 8.4.2 HRL200-A*-40 CH1 8-7 8.4.3 HRL300-A*-40 CH1 8-7 8.4.4 HRL100/200/300-A*-40 CH2 8-8 8.5 PUMP CAPACITY 8-9 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-9 8.5.4 HRL**-A*-40 CH2 8-8 8.5 PUMP CAPACITY 8-9 8.5.1 HRL300-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 <td>7.3</td> <td>OPERATION STOP FOR AN EXTENDED PERIOD OF TIME</td> <td>7-5</td>	7.3	OPERATION STOP FOR AN EXTENDED PERIOD OF TIME	7-5
7.4.1 Replacing Particle Filters. 7-8 7.4.2 Replacing the DI filter 7-8 7.4.3 Consumables. 7-11 Chapter 8 Documents 8-1 8.1 SPECIFICATIONS 8-1 8.1.1 HRL100/200/300-A*-40 8-1 8.1.2 Refrigerant with GWP reference 8-2 8.1.3 Communication specifications 8-2 8.2 DIMENSIONS 8-3 8.2.1 HRL100-A*-40 8-3 8.2.2 HRL200-A*-40 8-4 8.2.3 HRL300-A*-40 8-5 8.3 FLOW DIAGRAM 8-6 8.3.1 HRL***-A*-40-* 8-6 8.4 COOLING CAPACITY 8-7 8.4.1 HRL100-A*-40 CH1 8-7 8.4.2 HRL200-A*-40 CH1 8-8 8.5 PUMP CAPACITY 8-8 8.5.1 HRL100-A*-40 CH1 8-8 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-9 8.5.4 HRL***-A*-40 CH1 8-9 8.5.5 HRL300-A*-40 CH1 8-9 8.5.4 HRL***-A*-40 CH2 8-10 8.6 Types of HAZARD LABELS 8-11 8.6.1 Positions of danger warning label 8-12	7.3.	1 Discharge of the circulating fluid	7-5
7.4.2 Replacing the DI filter 7-8 7.4.3 Consumables 7-11 Chapter 8 Documents 8-1 8.1 SPECIFICATIONS 8-1 8.1.1 HRL100/200/300-A*-40 8-1 8.1.2 Refrigerant with GWP reference 8-2 8.1.3 Communication specifications 8-2 8.2 DIMENSIONS 8-3 8.2.1 HRL100-A*-40 8-3 8.2.2 HRL200-A*-40 8-4 8.2.3 HRL300-A*-40 8-5 8.3 FLOW DIAGRAM 8-6 8.3.1 HRL***-A*-40-* 8-6 8.4 COOLING CAPACITY 8-7 8.4.1 HRL100-A*-40 CH1 8-7 8.4.2 HRL200-A*-40 CH1 8-8 8.4.3 HRL300-A*-40 CH1 8-8 8.5 PUMP CAPACITY 8-8 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-9 8.5.1 HRL300-A*-40 CH1 8-9 8.5.2 H	7.4	REPLACEMENT OF CONSUMABLES	7-8
7.4.3 Consumables 7-11 Chapter 8 Documents 8-1 8.1 SPECIFICATIONS 8-1 8.1.1 HRL100/200/300-A*-40 8-1 8.1.2 Refrigerant with GWP reference 8-2 8.1.3 Communication specifications 8-2 8.2 DIMENSIONS 8-3 8.2.1 HRL100-A*-40 8-3 8.2.2 HRL200-A*-40 8-4 8.3 FLOW DIAGRAM 8-6 8.3.1 HRL***-A*-40-* 8-6 8.4 COOLING CAPACITY 8-7 8.4.1 HRL100-A*-40 CH1 8-7 8.4.2 HRL200-A*-40 CH1 8-7 8.4.3 HRL300-A*-40 CH1 8-8 8.4.4 HRL100/200/300-A*-40 CH2 8-8 8.5 PUMP CAPACITY 8-9 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-9 8.5.4 HRL***-A*-40 CH2 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.6 Types of Hazard Labels 8-11 8.6.1 Positions of danger warning label 8-12	7.4.	1 Replacing Particle Filters	7-8
Chapter 8 Documents 8-1 8.1 SPECIFICATIONS 8-1 8.1.1 HRL100/200/300-A*-40 8-1 8.1.2 Refrigerant with GWP reference 8-2 8.1.3 Communication specifications 8-2 8.2 DIMENSIONS 8-3 8.2.1 HRL100-A*-40 8-3 8.2.2 HRL200-A*-40 8-4 8.3 FLOW DIAGRAM 8-6 8.3.1 HRL***-A*-40-* 8-6 8.4 COOLING CAPACITY 8-7 8.4.1 HRL100-A*-40 CH1 8-7 8.4.2 HRL200-A*-40 CH1 8-7 8.4.3 HRL300-A*-40 CH1 8-8 8.4.4 HRL100/200/300-A*-40 CH2 8-8 8.5 PUMP CAPACITY 8-9 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-9 8.5.4 HRL***-A*-40 CH2 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.6 Types of Hazard Labels 8-11 8.6.1 Positions of danger warning label 8-12	7.4.	2 Replacing the DI filter	7-8
8.1 SPECIFICATIONS 8-1 8.1.1 HRL100/200/300-A*-40 8-1 8.1.2 Refrigerant with GWP reference 8-2 8.1.3 Communication specifications 8-2 8.2 DIMENSIONS 8-3 8.2.1 HRL100-A*-40 8-3 8.2.2 HRL200-A*-40 8-4 8.2.3 HRL300-A*-40 8-5 8.3 FLOW DIAGRAM 8-6 8.4.1 HRL***-A*-40-* 8-6 8.4.2 HRL200-A*-40 CH1 8-7 8.4.2 HRL200-A*-40 CH1 8-7 8.4.3 HRL300-A*-40 CH1 8-8 8.5 PUMP CAPACITY 8-8 8.5.1 HRL100/200/300-A*-40 CH2 8-8 8.5 PUMP CAPACITY 8-9 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-9 8.5.4 HRL***-A*-40 CH2 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.5.5 HRL***-A*-40 CH2 8-10 8.6.6	7.4.	3 Consumables	7-11
8.1 SPECIFICATIONS 8-1 8.1.1 HRL100/200/300-A*-40 8-1 8.1.2 Refrigerant with GWP reference 8-2 8.1.3 Communication specifications 8-2 8.2 DIMENSIONS 8-3 8.2.1 HRL100-A*-40 8-3 8.2.2 HRL200-A*-40 8-4 8.2.3 HRL300-A*-40 8-5 8.3 FLOW DIAGRAM 8-6 8.3.1 HRL***-A*-40-* 8-6 8.4 COOLING CAPACITY 8-7 8.4.1 HRL100-A*-40 CH1 8-7 8.4.2 HRL200-A*-40 CH1 8-8 8.4.4 HRL100/200/300-A*-40 CH2 8-8 8.5 PUMP CAPACITY 8-9 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-9 8.5.4 HRL***-A*-40 CH2 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.5.5 HRL***-A*-40 CH2 8-10 8.6	Chapt	er 8 Documents	8-1
8.1.2 Refrigerant with GWP reference 8-2 8.1.3 Communication specifications 8-2 8.2 DIMENSIONS 8-3 8.2.1 HRL100-A*-40 8-3 8.2.2 HRL200-A*-40 8-4 8.2.3 HRL300-A*-40 8-5 8.3 FLOW DIAGRAM 8-6 8.3.1 HRL***-A*-40-* 8-6 8.4 COOLING CAPACITY 8-7 8.4.1 HRL100-A*-40 CH1 8-7 8.4.2 HRL200-A*-40 CH1 8-7 8.4.3 HRL300-A*-40 CH1 8-8 8.5 PUMP CAPACITY 8-8 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-9 8.5.4 HRL***-A*-40 CH2 8-10 8.6 TYPES OF HAZARD LABELS 8-11 8.6.1 Positions of danger warning label 8-12	-		8-1
8.1.3 Communication specifications 8-2 8.2 DIMENSIONS 8-3 8.2.1 HRL100-A*-40 8-3 8.2.2 HRL200-A*-40 8-4 8.2.3 HRL300-A*-40 8-5 8.3 FLOW DIAGRAM 8-6 8.3.1 HRL***-A*-40-* 8-6 8.4 COOLING CAPACITY 8-7 8.4.1 HRL100-A*-40 CH1 8-7 8.4.2 HRL200-A*-40 CH1 8-7 8.4.3 HRL300-A*-40 CH1 8-8 8.5 PUMP CAPACITY 8-8 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-9 8.5.4 HRL***-A*-40 CH2 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.6 TYPES OF HAZARD LABELS	8.1.	1 HRL100/200/300-A*-40	8-1
8.2 DIMENSIONS 8-3 8.2.1 HRL100-A*-40 8-3 8.2.2 HRL200-A*-40 8-4 8.2.3 HRL300-A*-40 8-5 8.3 FLOW DIAGRAM 8-6 8.3.1 HRL***-A*-40-* 8-6 8.4 COOLING CAPACITY 8-7 8.4.1 HRL100-A*-40 CH1 8-7 8.4.2 HRL200-A*-40 CH1 8-7 8.4.3 HRL300-A*-40 CH1 8-8 8.5 PUMP CAPACITY 8-8 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-9 8.5.4 HRL***-A*-40 CH2 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.6 Types of Hazard Labels 8-11 8.6.1 Positions of danger warning label 8-12	8.1.	2 Refrigerant with GWP reference	8-2
8.2.1 HRL100-A*-40 8-3 8.2.2 HRL200-A*-40 8-4 8.2.3 HRL300-A*-40 8-5 8.3 FLOW DIAGRAM 8-6 8.3.1 HRL***-A*-40-* 8-6 8.4 COOLING CAPACITY 8-7 8.4.1 HRL100-A*-40 CH1 8-7 8.4.2 HRL200-A*-40 CH1 8-8 8.4.3 HRL300-A*-40 CH2 8-8 8.4.4 HRL100/200/300-A*-40 CH2 8-8 8.5 PUMP CAPACITY 8-9 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-10 8.5.4 HRL***-A*-A*-40 CH2 8-10 8.6 TYPES OF HAZARD LABELS 8-11 8.6.1 Positions of danger warning label 8-12	8.1.	3 Communication specifications	8-2
8.2.2 HRL200-A*-40 8-4 8.2.3 HRL300-A*-40 8-5 8.3 FLOW DIAGRAM 8-6 8.3.1 HRL***-A*-40-* 8-6 8.4 COOLING CAPACITY 8-7 8.4.1 HRL100-A*-40 CH1 8-7 8.4.2 HRL200-A*-40 CH1 8-8 8.4.3 HRL300-A*-40 CH2 8-8 8.5 PUMP CAPACITY 8-8 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.6 TYPES OF HAZARD LABELS 8-11 8.6.1 Positions of danger warning label 8-12	8.2	DIMENSIONS	8-3
8.2.3 HRL300-A*-40 8-5 8.3 FLOW DIAGRAM 8-6 8.3.1 HRL***-A*-40-* 8-6 8.4 COOLING CAPACITY 8-7 8.4.1 HRL100-A*-40 CH1 8-7 8.4.2 HRL200-A*-40 CH1 8-8 8.4.3 HRL300-A*-40 CH1 8-8 8.4.4 HRL100/200/300-A*-40 CH2 8-8 8.5 PUMP CAPACITY 8-9 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.6 TYPES OF HAZARD LABELS 8-11 8.6.1 Positions of danger warning label 8-12	8.2.	1 HRL100-A*-40	8-3
8.3 FLOW DIAGRAM 8-6 8.3.1 HRL***-A*-40-* 8-6 8.4 COOLING CAPACITY 8-7 8.4.1 HRL100-A*-40 CH1 8-7 8.4.2 HRL200-A*-40 CH1 8-8 8.4.3 HRL300-A*-40 CH2 8-8 8.4.4 HRL100/200/300-A*-40 CH2 8-8 8.5 PUMP CAPACITY 8-9 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.6 TYPES OF HAZARD LABELS 8-11 8.6.1 Positions of danger warning label 8-12	8.2.	2 HRL200-A*-40	8-4
8.3.1 HRL***-A*-40-* 8-6 8.4 COOLING CAPACITY 8-7 8.4.1 HRL100-A*-40 CH1 8-7 8.4.2 HRL200-A*-40 CH1 8-8 8.4.3 HRL300-A*-40 CH2 8-8 8.5 PUMP CAPACITY 8-9 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.6 Types of Hazard Labels 8-11 8.6.1 Positions of danger warning label 8-12	8.2.	3 HRL300-A*-40	8-5
8.4 COOLING CAPACITY 8-7 8.4.1 HRL100-A*-40 CH1 8-7 8.4.2 HRL200-A*-40 CH1 8-8 8.4.3 HRL300-A*-40 CH2 8-8 8.5 PUMP CAPACITY 8-9 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.6 TYPES OF HAZARD LABELS 8-11 8.6.1 Positions of danger warning label 8-12	8.3	FLOW DIAGRAM	8-6
8.4.1 HRL100-A*-40 CH1 8-7 8.4.2 HRL200-A*-40 CH1 8-7 8.4.3 HRL300-A*-40 CH1 8-8 8.4.4 HRL100/200/300-A*-40 CH2 8-8 8.5 PUMP CAPACITY 8-9 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.6.1 Positions of danger warning label 8-11	8.3.	1 HRL***-A*-40-*	8-6
8.4.2 HRL200-A*-40 CH1 8-7 8.4.3 HRL300-A*-40 CH1 8-8 8.4.4 HRL100/200/300-A*-40 CH2 8-8 8.5 PUMP CAPACITY 8-9 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.6 TYPES OF HAZARD LABELS 8-11 8.6.1 Positions of danger warning label 8-12	8.4	COOLING CAPACITY	8-7
8.4.3 HRL300-A*-40 CH1 8-8 8.4.4 HRL100/200/300-A*-40 CH2 8-8 8.5 PUMP CAPACITY 8-9 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.6 TYPES OF HAZARD LABELS 8-11 8.6.1 Positions of danger warning label 8-12	8.4.	1 HRL100-A*-40 CH1	8-7
8.4.3 HRL300-A*-40 CH1 8-8 8.4.4 HRL100/200/300-A*-40 CH2 8-8 8.5 PUMP CAPACITY 8-9 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.6 TYPES OF HAZARD LABELS 8-11 8.6.1 Positions of danger warning label 8-12	8.4.	2 HRL200-A*-40 CH1	8-7
8.4.4 HRL100/200/300-A*-40 CH2 8-8 8.5 PUMP CAPACITY 8-9 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.6 TYPES OF HAZARD LABELS 8-11 8.6.1 Positions of danger warning label 8-12	8.4.		
8.5 PUMP CAPACITY 8-9 8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.6 TYPES OF HAZARD LABELS 8-11 8.6.1 Positions of danger warning label 8-12			
8.5.1 HRL100-A*-40 CH1 8-9 8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.6 TYPES OF HAZARD LABELS 8-11 8.6.1 Positions of danger warning label 8-12	_		
8.5.2 HRL200-A*-40 CH1 8-9 8.5.3 HRL300-A*-40 CH1 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.6 TYPES OF HAZARD LABELS 8-11 8.6.1 Positions of danger warning label 8-12			
8.5.3 HRL300-A*-40 CH1 8-10 8.5.4 HRL***-A*-40 CH2 8-10 8.6 TYPES OF HAZARD LABELS 8-11 8.6.1 Positions of danger warning label 8-12			
8.5.4 HRL***-A*-40 CH2 8-10 8.6 TYPES OF HAZARD LABELS 8-11 8.6.1 Positions of danger warning label 8-12			
8.6 Types of Hazard Labels			
8.6.1 Positions of danger warning label			
			_
0.1 OTARDANDO0-13			
8.8 DAILY CHECK SHEETHECK SHEET8-14	_		
Chapter 9 Product Warranty9-1			

Chapter 1 Safety Instructions



Before using the product, be sure to read and understand all the important actions highlighted in this manual.

1.1 Before Using the Product

- This chapter is intended to specifically describe the safety related issues for handling the product. Read this before handling the product.
- The product is a cooling device using circulating fluid. SMC does not take any responsibility for any problems that may arise from using the product for other purposes.
- This product is not designed for a clean room. It generates dust from the internal components such as pump and fan motor.
- 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.
- All personnel who work with or around the product should read and understand the safety related information in this manual carefully before starting work.
- The safety manager is responsible for strictly observing safety standards, but responsibility in respect to safety standards during daily work resides with each individual operator and maintenance personnel.
- 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.
- This manual must be kept available to operators whenever necessary.

1.2 Reading the Manual

This manual contains symbols to help identify important actions when installing, operating or maintaining the product.



This sign indicates actions that must be followed.



This sign indicates prohibited actions.

1.3 Hazards

1.3.1 Level of hazards

The instructions given in this manual aim to assure the safe and correct operation of the product, and to prevent injury of operators or damage to the product. These instructions are grouped into three categories, Danger, Warning and Caution, which indicate the level of hazard, damage and also the degree of emergency. All safety critical information should be carefully observed at all times.

"DANGER", "WARNING" and "CAUTION" signs are in order according to severity (DANGER> WARNING> CAUTION).

A DANGER

"DANGER": Hazard that WILL cause serious personal injury or death during operation.

WARNING

"WARNING": Hazard that MAY cause serious personal injury or death during operation.

A CAUTION

"CAUTION": Hazard that MAY cause minor personal injury.

CAUTION

"CAUTION without exclamation symbol": Hazard that MAY cause damage or failure of the product, facility, devices, etc.

1.3.2 Definition of "Serious injury" and "Minor injury"

■ "Serious injury"

This term describes injuries that result in after effects including loss of eyesight, burns, electric shock, fracture, poisoning, etc. and requires long-term treatment or hospitalization.

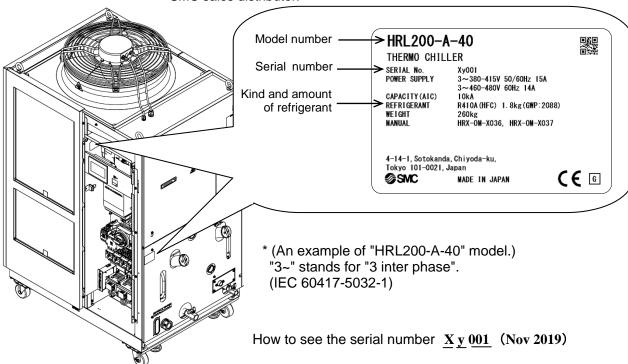
"Minor injury"

This term describes injuries that do not need long-term treatment or hospitalization. (Others excluded from "Serious injury".)

1.3 Hazards HRL Series

1.4 Product 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.



X		R			001	
Year	Symbol	Remarks	Month	Symbol	Remarks	Serial no.
2019 2020 2021	X y Z	Repeated from A to Z in alphabetical order	1 2 3	o P Q	Repeated from O to Z in alphabetical order, with O for January and Z for December	_

Fig. 1-1 Position of the product label

HRL Series 1.4 Product Label

1.5 Safety Measures

1.5.1 Safety instructions for use

WARNING



Follow the instructions below when using the product. Failure to follow the instructions may cause an accident and injury.

- Read and understand this manual carefully before using the product.
- Before starting maintenance of the product, be sure to lock out and tag out the breaker of the user's power supply.
- If operating the product during maintenance, be sure to inform all workers nearby.
- Use only the correct tools and procedure when installing or maintaining the product.
- Use personal protective equipment where specified ("1.5.2 Personal protective equipment").
- Check all parts and screws are fitted correctly and securely after maintenance.
- Avoid working in a drunken or sick condition, which might cause an accident.
- Do not remove the panels except for the cases permitted in this manual.
- Do not remove the panels during operation.
 Do not handle this product by any means other than specified in this Operation Manual; this can result in damage to the product or fire.

1.5.2 Personal protective equipment

This manual specifies personal protective equipment for each work.

Transport, Installing and Uninstalling

A CAUTION



Always use safety shoes, gloves and head protection when transporting, installing or uninstalling the product.

■ Handling of circulating fluid

A CAUTION



Always use safety shoes, gloves, mask, apron and eye protection when handling the circulating fluid.

Operation

A CAUTION



Always use safety shoes and gloves when operating the product.

1.5 Safety Measures HRL Series

1.6 Emergency Measures

When emergency conditions such as natural disaster, fire, earthquake and injury occur, shut off the breaker of the user's power supply that supplies power to the product.

▲ WARNING



Even when the power supply swtich is turned off, some of the internal circuits are still energized, unless the user's power supply is shut off. Be sure to shut off the breaker of the user's power supply.

1.7 Waste Disposal

1.7.1 Disposal of refrigerant and compressor oil

The product uses hydro fluorocarbon type refrigerant (HFC) and compressor oil. Comply with the laws and regulations in each country for the disposal of refrigerant and compressor oil. The type and quantity of refrigerant is described on the "1.4 Product Label".

If these fluids need to be recovered, read and understand the instructions below carefully. If there is any unclear point, contact an SMC's sales distributor.

▲ WARNING



- Only maintenance personnel or qualified people are allowed to open the cover panels of the product.
- Do not mix the compressor oil with domestic waste for disposal. Also, the disposal of the waste must only be conducted by specific facilities that are permitted for that purpose.

A WARNING



- Comply with the laws and regulations in each country for the disposal of refrigerant and compressor oil.
- The release of refrigerant in to the atmosphere is banned by law. Recover it with specific equipment and dispose of it correctly.
- Only people who have sufficient knowledge and experience about the product and its accessories are allowed to recover the refrigerant and compressor oil.

1.7.2 Disposal of product

The disposal of the product must be handled by a specialized industrial waste disposal agency in accordance with local laws and regulations.

HRL Series 1.6 Emergency Measures

1.7.3 Battery

A battery is used in the touch panel of this product. Please inform this to the disposal agency when you dispose this product.

Battery type: GT11-50BAT

System: Manganese Dioxide-Li/Organic Electrolyte

Nominal Voltage: 3V

Nominal Capacity: 550 mAh

Nominal Discharge Current: 0.2 mA

Weight: 6.8 g

Dimension: 24.5 mm × 5.0mm

The lifetime of it is approximately about 5 years, and the touch panel makes "MT07/ Low Battery" Maintenance notice when the battery needs to be replaced.

1.8 Safety Data Sheet (SDS)

If the safety data sheets of chemicals used in this product are needed, contact an SMC's sales distributor.

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

1.8 Safety Data Sheet (SDS)

HRL Series

Chapter 2 Name and Function of Parts

2.1 Model Number of Product

The product can be ordered with the model number configured as shown below.

The product needs to be handled in different ways depending on the part number. Refer to "1.4 Product Label" and check the part number of the product.

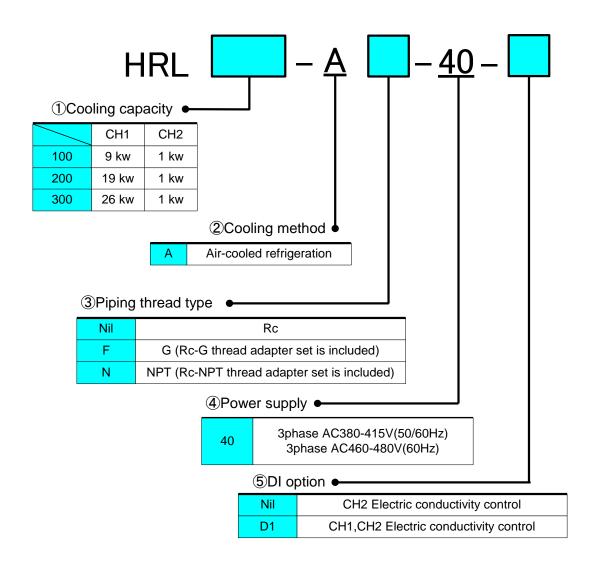


Fig. 2-1 Product model number

HRL Series 2.1 Model Number of Product

2.2 Name and Function of Parts

2.2.1 HRL***-A*-40 (Air cooled type)

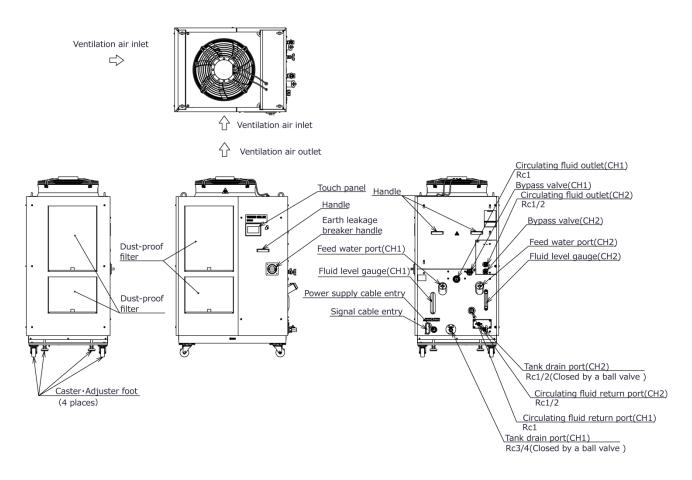


Fig. 2-2 Names of the parts (This drawing shows "HRL200-A-40".)

2.2 Name and Function of Parts HRL Series

	Table 2.2-1 Accessory list					
(1)	Operation Manual	2 pcs. (English 1 pc. /Japanese 1 pc.)				
(2)	Particle filter set (for CH1) *1	1 set				
(3)	Particle filter set (for CH2) *1	1 set				
(4)	For HRL***-AF-** G thread adapter set	1 set				
(4)	For HRL***-AN-** NPT thread adapter set	1 set				
(5)	Anchor brackets *2	2 pcs.				
(6)	DI Filter	1 pcs				

^{*1} When "F" or "N" piping thread type is selected, the particle filter connection is "G thread" or "NPT thread".

^{*2} The anchor brackets are used for fixation with the skid when this product is packed. The anchor bolts are not attached. The bolts (M8) used for fixing to the skid are not anchor bolts. Refer to "3.3.1 Installation" when using anchor bolt fixing bracket.

2.3 Function of Parts

The function of parts is as follows.

Table 2.3-1 Function of parts

Name	Function				
Touch panel	Runs and stops the product and performs settings such as the				
Todon paner	circulating fluid temperature.				
Fluid level gauge	Indicates the circulating fluid level of the tank. Confirm the level is				
- raid io roi gauge	between HIGH and LOW. For details, refer to "3.5 Circulating Fluid Supply".				
Product label	Shows the product information such as model number and serial number. For details, refer to "1.4 Product Label".				
Circulating fluid	The circulating fluid flows out from the outlet port.				
outlet port (CH1)	For laser source.				
Circulating fluid	The circulating fluid flows out from the outlet port.				
outlet port (CH2)	For optical systems.				
Circulating fluid					
return port (CH1)	The circulating fluid returns to the return port.				
Circulating fluid	The circulating hald retains to the retain port.				
return port (CH2)					
Tank drain port (CH1)	This drain port to drain the circulating fluid out of the tank.				
Tank drain port (CH2)	·				
5	Inserted to prevent that the dust and contamination are clung				
Dust-proof filter	on the air cooled condensers directly. Clean the filter				
	periodically. For details, refer to "7.2.2 Monthly check". Insert the power cable to the power cable entry and connect it				
Power cable entry	to the power terminal. For details, refer to "3.3.2 Electrical wiring"				
Power terminal	and "3.3.3 Preparation and wiring of power supply cable".				
	Insert the signal cable to the signal cable entry and connect it to				
Signal cable entry	the signal connectors. For details, refer to "3.3.5 Wiring of Run/Stop signal				
	input", "3.3.6 Wiring of contact output signal", "3.3.7 Wiring of analog output				
	signal", "3.3.8 RS-485 communication wiring",				
Signal connecors	"3.3.9 RS-232C communication wiring" or the Operation				
	Manual Communication Function.				
Earth leakage breaker	Shuts off the power supply to the internal equipment of the product.				
/ Breaker handle	(Parts energized remained in the product.)				
	Refer to "3.3.2 Electrical wiring" for the earth leakage breaker.				
Feed water port (CH1)	Supply circulating fluid to the tank.				
Feed water port (CH2)	,				

2.3 Function of Parts HRL Series

Chapter 3 Transport and Setting Up

WARNING



- Only persons who have sufficient knowledge and experience about the product and system are allowed to transport and set up the product.
- Especially pay attention to personal safety.

3.1 Transport

The product is heavy and has potential danger at transport. Also, to prevent damage and breakage of the product, be sure to follow the instructions shown below for transport.

▲ WARNING



When moving the product by a forklift, insert the fork into the right positions referring to 3.1.1 Transportation using forklift and hanging-Moving by forklift and slinging should be done by persons who have the licenses.

WARNING



- Be sure to use all the four eye bolts when slinging the product.
- The slant angle of each rope should be 60 degrees or less.

CAUTION



Never lay the product on its side.

The compressor oil will leak in to the refrigerant piping, which may cause early failure of the compressor.

CAUTION



Drain the residual fluid from the piping as much as possible to prevent any spillage.

CAUTION



 When the product is carried by using a forklift, make sure that the fork does not damage the cover panel or piping port.

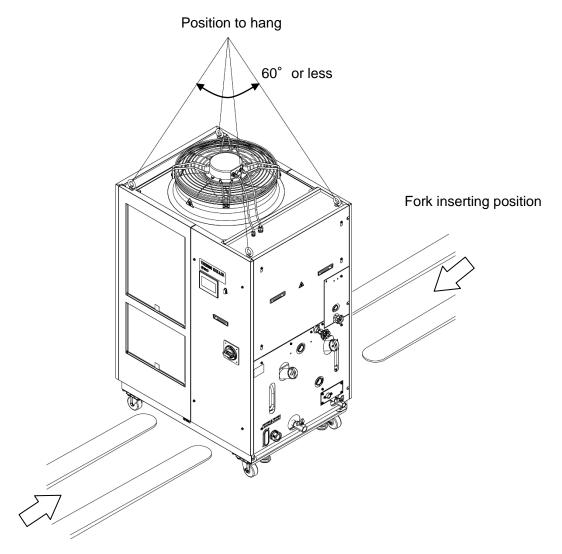
HRL Series 3.1 Transport

3.1.1 Transportation using forklift and hanging

WARNING



This is a heavy product. (Refer to Table 3.1-1 Weight of the product) Moving by forklift and slinging should be done by persons who have the licenses.



Fork inserting position

Fig. 3-1 Fork inserting and hanging position (This drawing shows "HRL200-A-40".)

Table 3.1-1 Weight of the product

Table 3.1-1 Weight of the product				
Model	Weight kg			
HRL100-A-40	Approx.240			
HRL200-A-40	Approx.260			
HRL300-A-40	Approx.330			

3.1 Transport HRL Series

3.1.2 Transportation using casters

▲ WARNING



This is a heavy product. (Refer to Table 3.1-1 Weight of the product). Moving the product by casters should be done by 2 persons or more.

CAUTION



Raise the adjuster feet and push the corners of the product when moving the product using the casters.

Do not hold the piping connections or handles of the panels when moving by casters, or it may cause damage to the product..

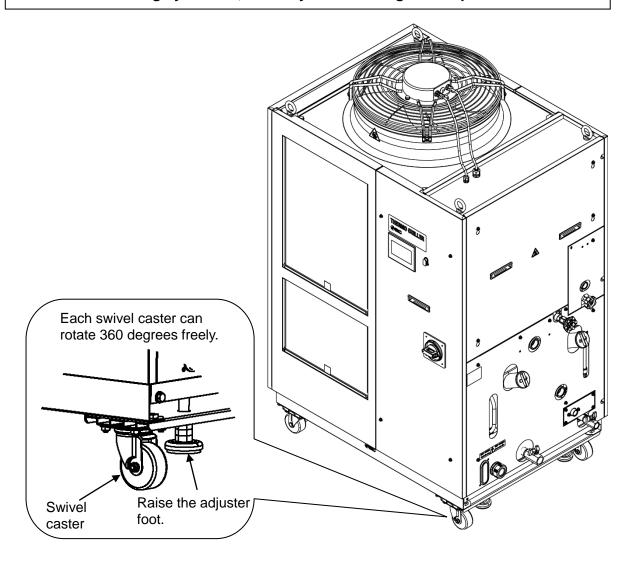


Fig. 3-2 Transportation using casters

HRL Series 3.1 Transport

3.2 Installation

WARNING



 Do not set up the product in places possibly exposed to leakage of flammable gas. Should any flammable gas stay around the product, the product may cause a fire.

A CAUTION



- Keep the product upright on a rigid and flat floor which can resist the weight of the product, and take measures to prevent the product from tipping over. Improper installation may cause water leakage, tipping, damage of the product or injure the operator.
- Keep the ambient temperature of the product between 2 to 45°C. Operation out of this ambient temperature range may cause a malfunction of the product. Operating the product in an environment temperature of 45 °C may reduce the heat discharging efficiency of the heat exchanger and the safety device may function, resulting in the product operation stoppage.
- The installer/end user is responsible for carrying out an acoustic noise risk assessment on the equipment after installation and taking appropriate measures as required.

3.2.1 Environment

The product must not be operated, installed, stored or transported in the following conditions. Potential malfunction or damage to the product may occur if these instructions are disregarded.

This product is not designed for clean room usage. The pump and ventilating fan inside the product generate particles.

- Location that is outside.
- Location that is exposed to steam, salt water or oil.
- Location that is exposed to dust or powder material.
- Location that is exposed to corrosive gas, organic solvent, chemical solution, or flammable gas. (The product is not explosion-proof.)
- Location where the ambient temperature is out of the following range: During transportation or storage: -15 to 50°C (No water or circulating fluid in the piping.)
 - During operation: 2 to 45°C
- Location where condensation forms on the inside electrical parts.
- Location that is exposed to direct sunlight or heat radiation
- Location that is near heat sources and poor in ventilation.
- Location that is subjected to abrupt changes in temperature.
- Location that is subjected to strong electromagnetic noise (intense electric field, intense magnetic field, or surges).
- Location that is subjected to static electricity, or conditions where static electricity can discharge to the product.
- Location that is subjected to strong high frequencies raditation.
- Location that is subjected to potential lightening srtike.
- Location at altitude of 3000m or higher (except during product storage and transport).
 Refer to next page for details.
- Location where the product is affected by strong vibrations or impacts.
- Condition that applies external force or weight causing the product to be damaged.
- Location without adequate space for maintenance as required.
- For the product installation or operation in accordance with UL standards, see below.

■ Thermo-chiller installation in high altitude of 1000 meters or more

Because of lower air density, the heat radiation efficiencies of the devices in the product will be lower in the location at altitude of 1000m or higher. For this reason, the maximum ambient temperature for the thermo-chiller operation and the cooling capacity will be reduced.

For product installation at a place of high altitude of 1000 meters or more, select a thermo-chiller of the applicable capacity referring to the table below.

- Max. ambient temp.: Use the product in lower ambient temperature than the described value at each altitude.
- 2. Cooling capacity correction coefficient: Coefficient to calculate the cooling capacity at each altitude.

For the product operation at an altitude of 1800 meters, the cooling capacity at an altitude of 1800 meters = "8.4 Cooling Capacity" x 0.8.

Altitude [m]	1. Max. ambient temp. [°C]	2. Cooling capacity correction coefficient
Less than 1000m	45	1.00
1000 m or more - Less than 1500 m	42	0.85
1500m or more - Less than 2000m	38	0.80
2000m or more - Less than 2500m	35	0.75
2500m or more - Less than 3000m	32	0.70

Installation/Operation in accordance with the UL standard

The product cannot be used in the environment shown below:

- Environment at an altitude of 2000 meters or more
- Environment at a pollution degree of 3 or more

HRL Series 3.2 Installation

3.2.2 Location

CAUTION



 Do not install in a location which can be subjected to any of the conditions in "3.2.1 Environment".

CAUTION



Radiates heat from the air vent of the cooling fan. If the product is operated with insufficient air ventilation the internal temperature can exceed 45°C, which can cause and affect the performance and life of the product. To prevent this ensure that suitable ventilation is available (see below).

Installation of multiple products

Keep sufficient space between products so that the air vented from one product will not be taken in by other products.

Installation at indoor site

1. For a facility having a large installation area (that can vent the air naturally):

Make an air outlet on a wall at a high level and air inlet on a wall at a low level, to allow for adequate airflow.

2. For a facility having a small installation area (that can not vent the air naturally):

Make a forced air exhaust vent on a wall at a high level and an air inlet on a wall at a low level.

3. Using duct to exhaust the air:

In case the indoor site cannot accept the exhausted air from the product or/and is air conditioned, ventilate by installing a duct on the outlet ventilation of the product. Do not fasten the duct on the outlet ventilation of the product directly. Have the space at least the duct's diameter apart. Use a fan for the duct that considered the ventilation resistance of the duct.

Table 3.2-1 Amount of radiation and required ventilation

		Required ventilation amount (m³/min)			
Model	Heat radiation (kW)	Differential temp. of 3 °C between inside and outside of installation	Differential temp. of 6 °C between inside and outside of installation		
		area	area		
HRL100-A*-40	Approx.18	305	155		
HRL200-A*-40	Approx.35	590	295		
HRL300-A*-40	Approx.45	760	380		

Installation environment specifications

Sound noise:HRL100-A*-40:75 dB(A)

HRL200-A*-40: 75 dB(A)

HRL300-A*-40: 71 dB(A)
* Front 1m, height 1m, rated condition

3.2 Installation HRL Series

3-6

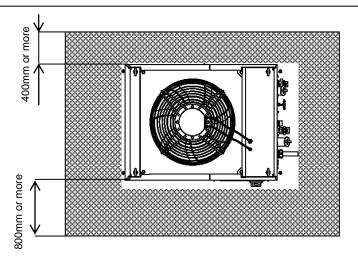
3.2.3 Installation and maintenance space

It is recommended to keep the space around the product shown in Fig. 3-3.

A CAUTION



Have an enough space for the ventilation for the product. Otherwise it may cause a lack of cooling capacity or/and stoppage of the product. Ensure there is enough space for maintenance.



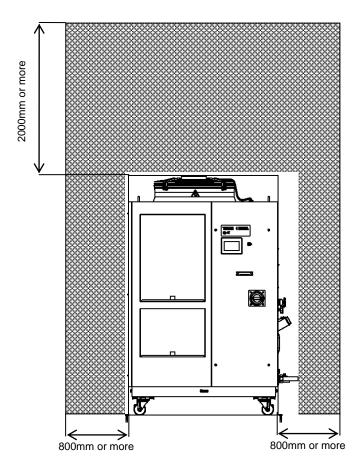


Fig. 3-3 Installation space (This drawing shows "HRL200-A-20".)

HRL Series 3.2 Installation

3.3 Installation

3.3.1 Installation

A CAUTION



Install the product on a vibration free level floor.

Prepare the M10 anchor bolts that are suitable for the material of the floor that the product will be installed on. Drive the anchor bolts in at least two places on the left and right sides of the product (four places in total). Refer to "8.2 Dimensions" for the dimensions for the position of the anchor bolts.

Use a bracket

- **1.** Install this product according to the anchor bolts installed on the level floor.
- **2.** Fasten the nuts to the anchor bolts.
- **3.** Make sure that there is no looseness on all the anchor bolts and nuts.

[Tips]

SMC Foundations bolt set "IDF-AB500" (SUS M10x50) is applicable. Please order separately.

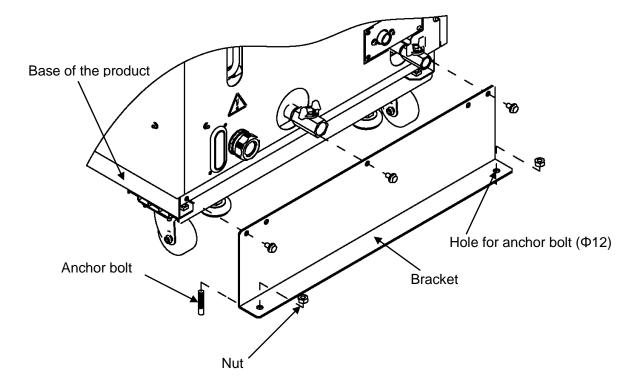


Fig. 3-4 Installation procedures

Use the adjuster foot

A CAUTION



Install the product on a vibration free level floor. be sure to use the adjuster foot to install on the floor. The adjuster foot is not earthquake-proof. If necessary make an earthquake-resistant measure on the customer side.

- **1.** Install the product on a level floor.
- **2.** Lower the adjuster to the level floor to fix the product in place.

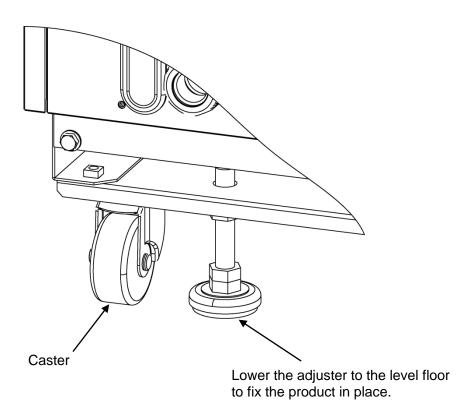


Fig. 3-5 Installation by adjuster foot

HRL Series 3.3 Installation

3.3.2 Electrical wiring

▲ WARNING

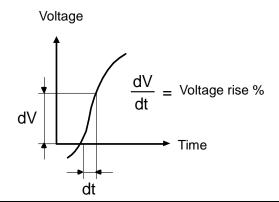


- Do not modify the internal electrical wiring of the product. Incorrect wiring may cause electric shock or fire. Also, modifying the internal wiring will void the product's warranty.
- NEVER connect the ground to water line, gas pipe or lightning conductor.

MARNING



- The installation of electrical equipment and wiring work should be performed only by personnel with sufficient knowledge and experience.
- Be sure to shut off the user's power supply. Wiring with the product energized is strictly prohibited.
- The wiring must be conducted using cables complying with "Table 3.3-1" and firmly secured to the product to prevent the external force of cables being applied to the terminals. Incomplete wiring, or improper securing of wiring, may cause electrical shock or excessive heat and fire.
- Ensure a stable power supply with no voltage surges.
- Ensure that an earth leakage breaker is used in the power supply of the product. See "Table 3.3-1".
- Use a power supply suitable for the specifications of the product. Use a power supply of over voltage category 3 (IEC60664-1).
- Be sure to connect the ground connection.
- Ensure that a lock out facility is availble on the power supply.
- Each product must have its own separate earth leakage breaker.
 Otherwise there can be a risk of electric shock or fire.
- Ensure that no harmonics are superimposed at power supply.
 (Do not use inverter, etc.)
- Supply a steady power supply which is not affected by surges or distortion. In particular, if the voltage rate of increase (dv/dt) at zero crossing exceeds 40V/200µsec, it may cause malfunction.



^{*:} For the product operation in the UL compliant conditions, please refer to "Installation/Operation in accordance with the UL standard" in the next page.

■ Power supply specifications, power supply cable and earth leakage breaker

Prepare the power supply shown in the following table. For the connection between the product and power supply, use the power supply cable and earth leakage breaker shown below. An earth leakage breaker must be mounted to a position where the breaker is easily accessible and close to the thermo-chiller.

Table 3.3-1 Power supply	cable and earth leakage breaker ((Recommended)

		-			Earth leakage breaker			
Model	Power block supply voltage diameter Recommended crimp some terminal		Cable Specifications *1	Breaker size (A)	Sensitivity of leakage current			
						(mA)		
HRL100-A*-40	3-phase 380 to 415V AC (50Hz/60Hz) 3-phase 460 to 480V AC(60Hz)		Defe	4 cores x AWG10 (4 cores x 5.5 mm ²)	20			
HRL200-A*-40		380 to 415V AC	380 to 415V AC (50Hz/60Hz)	ME	R5.5-5	*including ground	30	00
HRL300-A*-40		M5	R8-5	4 cores x AWG8 (4 cores x 8 mm²) *including ground	40	30		

^{*1} Cable specifications are the examples when using the product at a continuous allowable operating temperature of 70 °C, with an operating voltage of 600 V and two kinds of plastic insulated wires at an ambient temperature of 30 °C. Please select the proper size cables according to the actual condition.

Installation/operation in accordance with the UL standard

For the product operation in the UL compliant conditions, the conditions shown below must be satisfied:

- Use power supply of overvoltage category 2 (transient overvoltage 2500 V or less)
- Bending radius of the power supply cable must be 38.1 mm or more.
- *1 When using a power supply in the overvoltage category 3, take measures such as mounting an isolation transformer between the product and the power supply or keep the transient overvoltage of the power supply to 2500 V or less by using a varistor, etc.

■ Installation/operation in accordance with the UL standard

For the product operation in the UL compliant conditions, the conditions shown below must be satisfied:

- Use power supply of overvoltage category 2 (transient overvoltage 2500 V or less)
- Bending radius of the power supply cable must be 38.1 mm or more.

HRL Series 3.3 Installation

^{*1} When using a power supply in the overvoltage category 3, take measures such as mounting an isolation transformer between the product and the power supply or keep the transient overvoltage of the power supply to 2500 V or less by using a varistor, etc.

3.3.3 Preparation and wiring of power supply cable

WARNING



- The electrical facilities should be installed and wired in accordance with local laws and regulations of each country and by a person who has knowledge and experience.
- Check the power supply. Operation with voltages, capacities and frequencies other than the specified values can cause fire and electric shock.
- Wire with an applicable cable size and terminal. Forcibly mounting with an unsuitably size cable may result in heat generation or fire.

▲ WARNING



Be sure to lock out and tag out the breaker of the facility power supply (customer power supply facility) before wiring.

▲ WARNING



Be sure to connect the power supply cable from the product side first, and then connect the breaker of the facility power supply (the user's machine power supply).

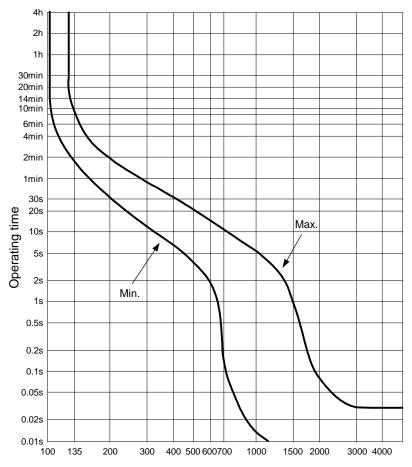
A CAUTION



 When the panel is removed or mounted, be sure to wear protective shoes and gloves to prevent injury with the edge of the panel.

CAUTION

A breaker that has the operating characteristic below is installed. Please use a breaker that has the same or longer operating time as/than this for the customer side (upstream side). If it has a shorter operating time, there is a possibility of accidental breaker trip due to the internal motors' inrush currents of this product.



Current (% for breaker capacity)

Operating characteristics of the breaker

HRL Series 3.3 Installation

Preparation for operation

1. Remove four screws to remove the front panel for the electrical unit.

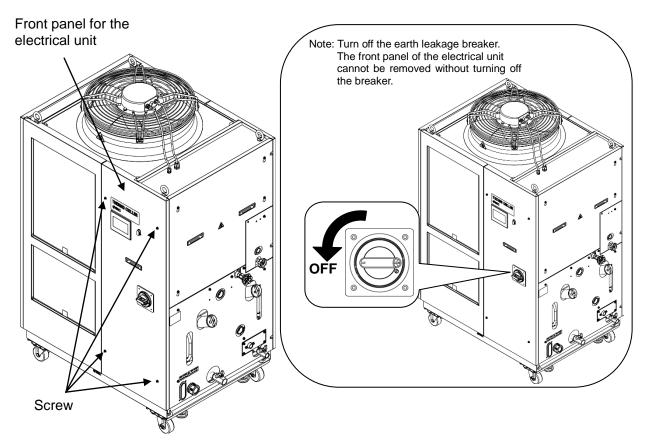


Fig. 3-6 Remove the front panel for the electrical unit

2. Hold the handle and pull up the front panel of the electrical unit, and remove it.

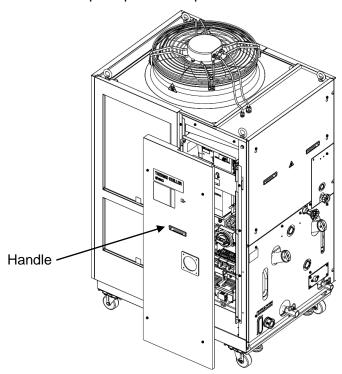


Fig. 3-7 Remove the front panel for the electrical unit

3. Loosen the power cable outlet cap and insert the power cable.

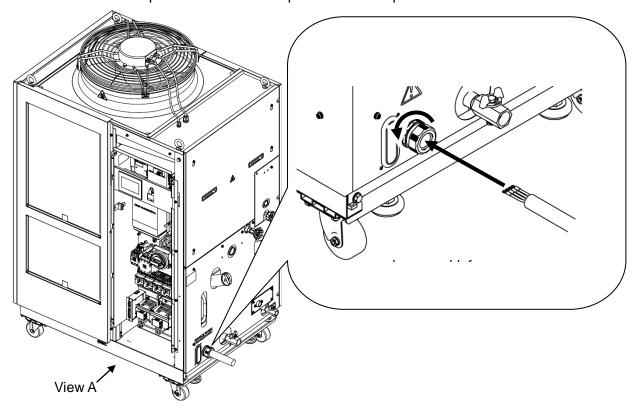


Fig. 3-8 Wiring of power supply cable

HRL Series 3.3 Installation

4. Connect the power supply cable and the ground cable as shown in the figure below.

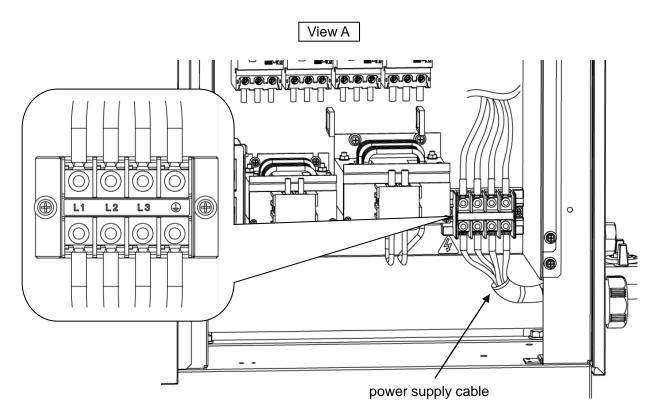


Fig. 3-9 Wiring of power supply cable

^{*} Connect an over current protection to the power cable connected to the equipment to avoid hazard.

3.3.4 Contact input/output communicatin wiring

A WARNING



Be sure to lock out and tag out the breaker of the facility power supply (the user's machine power supply) before wiring.

CAUTION

- Use the connector that are specified.
- The capacity of the output contact of the product is limited. If the capacity is not large enough, install a relay, etc. (to allow for larger capacity). Also, ensure that the input current of the relay is small enough in relation to the contact capacity of the product.

The product has a contact input/output communication function as shown below. Connect cables referring to the applicable chapter for each function.

- Run/Stop input (Refer to "3.3.5 Wiring of Run/Stop signal input")
- Contact output signal(Refer to "3.3.6 Wiring of contact output signal")
- Analog output signal (Refer to "3.3.7 Wiring of analog output signal")

Use the signal cable described below for wiring of each function.

■ Contact Input/Output communication connector

The following connectors are used for this product as a contact input / output signal connector. Please prepare suitable mating connector cable.

Table 3.3-2 Contact input/output communication connector

Connector specification (this product side)

Dsub 25 pin female (socket) type

HRL Series 3.3 Installation

Table 3.3-3 Contact input/output/ analog output communication specification

Item		Specification		
Contact input signal1,2,3	Insulation system	Optocoupler		
	Rated input voltage	DC24V	· Run/Stop signal	
	Operating voltage range	DC21.6V to 26.4V	External switch signal Operation mode request signal	
	Rated input current	5mA TYP	(Contact input 3 fixed)	
	Input impedance	4.7kΩ		
Contact output signal 1,2,3,4,5,6	Rated load voltage	AC48V or less / DC30V or less	Cinnel of an austin a status	
	Maximum load current	AC/DC 800mA or less *1	 Signal of operating status Alarm signal TEMP READY signal etc *2 	
	Minimum load current	DC5V 10mA		
Analog output signal 1,2	Output voltage range	0V to +10V		
	Maximum output current	10mA	_	
	Maximum accuracy	±0.4%F.S. or less		
DC24V output voltage		DC24V±10% 200mA MAX *1 (It can not be used for inductive load.)		

^{*1:}The total load current must be 800 mA or less. To use the power of the device, the total load current must be 200 mA or less.

^{*2:}Refer to "3.3.6 Wiring of contact output signal"

Table 3.3-4 Contact input/output communicatin /Analog output pin number

	Table 5.5-4 Contact input/output confindincatin /Arialog output pin number				
PIN No.	Application	Division	Default setting		
1	DC24V output	Output	_		
2	2 DC24V input		_		
3	Contact input signal 1	Input	Run/Stop *1		
4	Contact input signal 3	Input	Operation mode request signal (fix)*2		
5	Contact output signal 6	Output	OFF*1		
6	Contact output signal 1	Output	Run status signal [N.O type](fix)*2		
7	Contact output signal 3	Output	Operation continuation[WRN]alarm signal [N.C. type](fix)*2		
8	Contact output signal 5	Output	OFF *1		
9	None	_	Do not connect. *3		
10	Analog output signal 2	Output	CH2 Electric conductivity *1		
11	Analog output signal 1	Output	CH2 Circulating fluid temperature *1		
12	None	_	Do not connect. *3		
13	None	_	Do not connect. *3		
14	24 COM output (Common of contact input signal)	Output	-		
15	Common of contact output signal 1, 2, 3, 4, 5	Output	-		
16	Contact input signal 2	Input	External switch signal *1		
17	None	_	Do not connect. *3		
18	Common of contact output signal 6	Output	-		
19	Contact output signal 2	Output	Operation stop [FLT] alarm signal [N.C. type](fix)*2		
20	Contact output signal 4	Output	OFF *1		
21	None	_	Do not connect. *3		
22	Common of contact output signal 2	Output	_		
23	Common of contact output signal 1	Output	_		
24	None	_	Do not connect. *3		
25	None	_	Do not connect. *3		

^{*1 :} It is possible to change the setting.

HRL Series 3.3 Installation

^{*2 :} You can not change the setting("N.O type / N.C. type" can be changed).

^{*3 :} Do not connect any wire

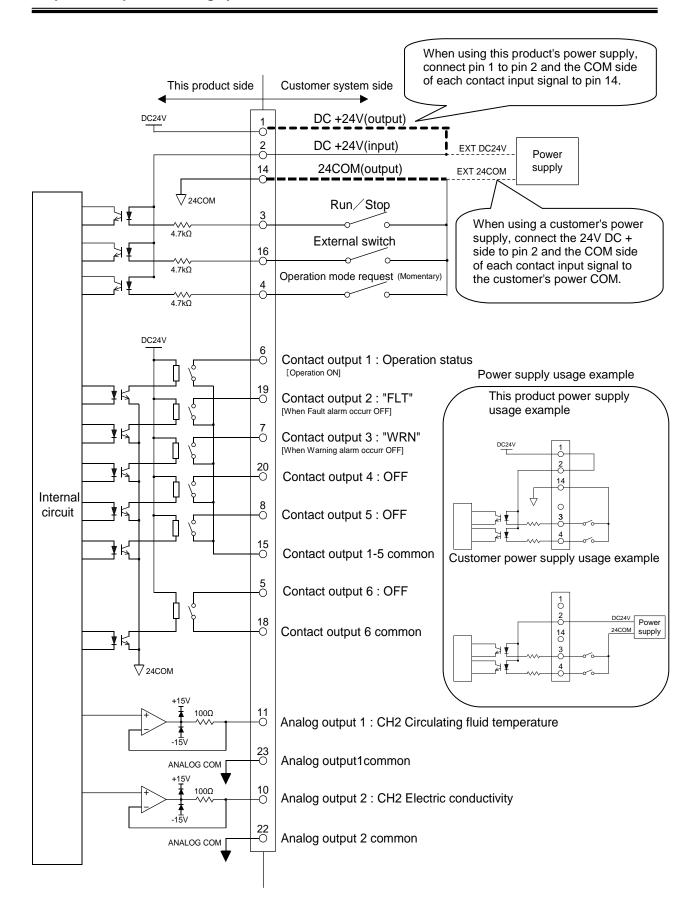


Fig. 3-10 Circuit diagram

3.3.5 Wiring of Run/Stop signal input

This product can be remotely controlled by the contact signal. This chapter illustrates examples of wiring.

To enable Run / Stop signal input, set the operation mode to "DIO mode" after wiring. (Refer to "5.4.1 Home screen Operation mode").

[Tips]

This product has three input signals. Two of them can be customized depending on the customer's application.

1. Prepare the switch (power supply voltage: 24 VDC, contact capacity: 35 mA or more, minimum load current: 5mA) and suitable connector cable.

HRL Series 3.3 Installation

2. Wire the contact input / output signal connector as follows and connect it to this product. (This wiring is an example.)

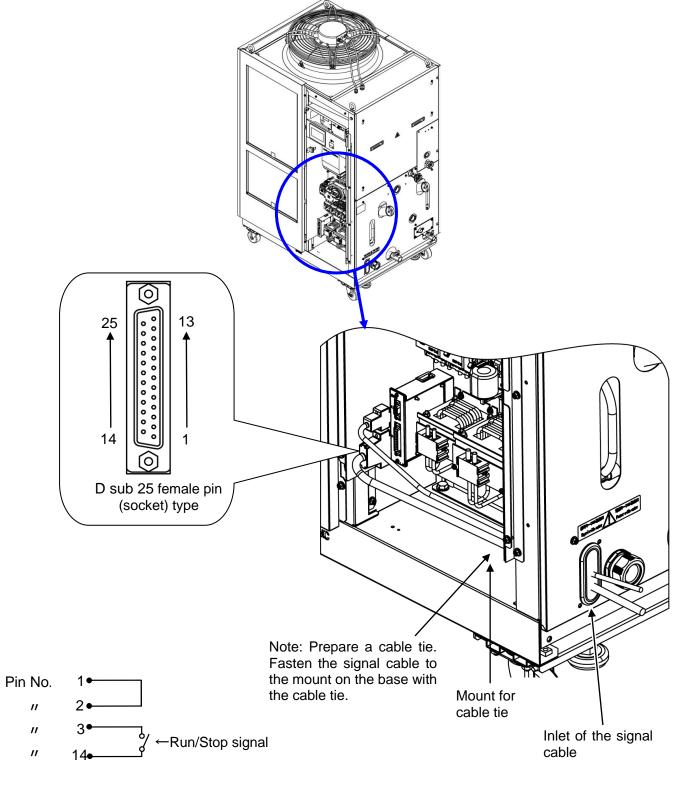


Fig. 3-11 Wiring of Run/Stop signal input and remote signal input (Example)

3.3 Installation HRL Series

3.3.6 Wiring of contact output signal

Contact output signals are the signals that output the status of this product. Contact specification of each signal output is shown below.

WARNING



Be sure to turn OFF the breaker of the facility power supply (the user's machine power supply) before wiring.

Contact specification of each signal output is shown below.

Table 3.3-5 Contact signal output at the factory setting

Contact output	Content of the signal (Default setting)	Operation		
Contact output signal 1	Operation status signal	N.O.	During operation:Contact closed During operation stop:Contact open With power supply cutoff:Contact open	
Contact output signal 2	Operation stop [FLT] alarm signal	N.C	While alarm being generated:Contact open While alarm being generated:Contact closed With power supply shut off:Contact open	
Contact output signal 3	Operation continuation[WRN] alarm signal	N.C	While alarm being generated:Contact open While alarm being generated:Contact closed With power supply shut off:Contact open	
Contact output signal 4,5,6	OFF	_	_	

[Tips]

This product has six output signals. Three of them can be customized to user's application

Signals shown below can be output. Refer to "5.4.10 Communication setting screen".

- DIO MODE signal output
- ·Alarm signal output
- ·Maintenance remainder signal output
- ·CH1 TEMP READY signal output
- ·CH2 TEMP READY signal output
- TEMP OUT signal output
- START-UP setting signal output
- ·ANTI-FREEZING setting signal output
- •WARMING- UP setting signal output
- Operation mode request signal status
- ·Selected alarm signal output
- ·Selected maintenance signal output

HRL Series 3.3 Installation

3.3.7 Wiring of analog output signal

This product can output analog signals

▲ WARNING



Be sure to turn OFF the breaker of the facility power supply (the user's machine power supply) before wiring.

The contents of the analog output signal and the factory settings are as follows. The signal content can be selected from four types. Refer to "5.4.10 Communication setting screen"

Table 3.3-6 Analog output signal

No.	Signal item	Output voltage	Default setting
1	CH2 circulating fluid temperature	0.0 to 100.0 °C:0.00 to 10.00V	Analog output 1
2	CH2 electric conductivity	0.1 to 50.0µS/cm:0.02 to 10.00V	Analog output 2
3	CH1 circulating fluid temperature	0.0 to 100.0 °C:0.00 to 10.00V	_
4	CH1 electric conductivity	0.1 to 50.0µS/cm:0.02 to 10.00V	_

3.3.8 RS-485 communication wiring

This product can operate the following by serial communication RS-485.

- -Control of Run/Stop
- -Circulating fluid temperature setting
- -Circulating fluid temperature reading
- -Operation status reading
- -Alarm condition reading

Refer to Operation Manual Communication Function for more details.

RS-485 communication connector

The following connector is used for this product as a connector for RS-485 communication. Please prepare suitable mating connector.

Table 3.3-7 RS-485 communication connector

Connector specification (this product side)

Dsub 9 pin female (socket) type

3.3 Installation HRL Series

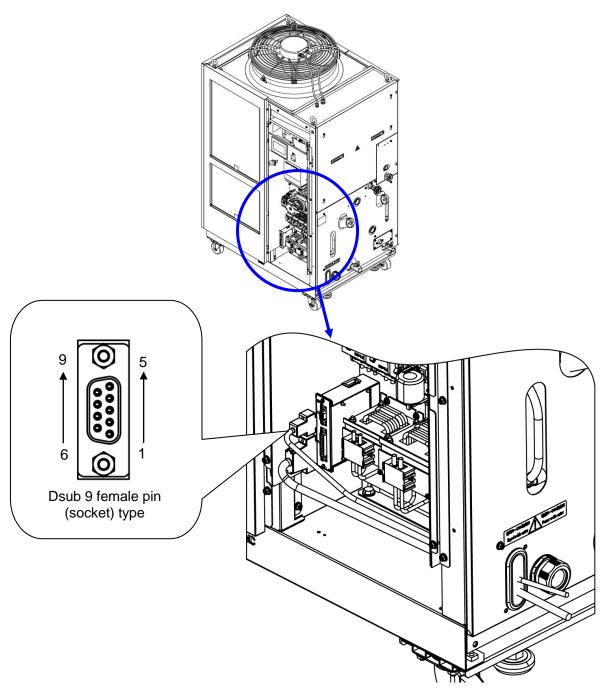


Fig. 3-12 RS-485 communication wiring

Wiring of interface communication cable

▲ WARNING



Be sure to turn OFF the breaker of the facility power supply (the user's machine power supply) before wiring.

Connecting to PC

RS-485 cannot be directly connected to a normal PC. Use a RS-232C/RS485 converter which is available on the market.

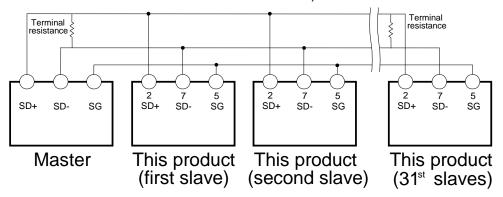
HRL Series 3.3 Installation

Be sure to follow the wiring procedure shown below for connecting multiple thermo-chillers.

Configuration of connection

One thermo-chiller for one host computer, or multiple thermo-chillers for one host computer.

(31 thermo-chillers can be connected at maximum.)



Do not connect any wire to other PIN numbers.

[Tips]

Both ends of the communication connection (the end nodes) need to be connected to the host computer.

If the terminating resistor is required, please be connected by the customer.

3.3.9 RS-232C communication wiring

This product can operate the following by serial communication RS-232C.

- -Control of Run/Stop
- -Circulating fluid temperature setting
- -Circulating fluid temperature reading
- -Operation status reading
- -Alarm condition reading

Refer to Operation Manual Communication Function for more details.

■ RS-232C communication connector

The following connector is used for this product as RS-232C communication connector. Please prepare suitable mating connector.

Table 3.3-8 communication connector

Connector specification (this product side)

Dsub 9 pin female (socket) type

3.3 Installation HRL Series

■ Wiring of communication cable

WARNING

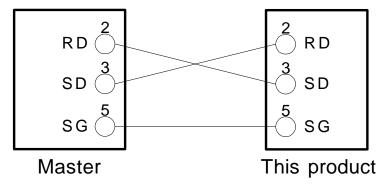


Be sure to turn OFF the breaker of the facility power supply (the user's machine power supply) before wiring.

Be sure to wire as shown in the figure below.

Configuration

One thermo-chiller for one master.



Do not connect any wire to other PIN numbers.

Fig. 3-13 Connection of RS-232C

HRL Series 3.3 Installation

3.4 Piping

A CAUTION



- Connect piping firmly. Incorrect piping might cause leakage of supplied or drained fluid and wet surrounding area and facility.
- Use caution not to allow dust and foreign matter to enter the water circuit, etc. during connection of piping.
- Securely connect the piping at the piping port with specific wrench when tightening.
- Incorrect piping can burst in service.
- Use non-corrosive material for fluid contact parts of circulating fluid and/or facility water. 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.
- Do not generate a rapid change of pressure by water hammer, etc.
 Internal parts of the product and/or the piping may be damaged.
- It is recommended to use heat insulation to reduce the heat radiation and absorption to/from customer's piping.

A CAUTION



Be sure to wear protective shoes and gloves to prevent injury with the edge of the panel.

3.4 Piping HRL Series

■ Piping port size

Table 3.4-1 Piping port size

CH No.	Description		Port size	Recommended tightening torque	Recommended piping specifications
	Circulating fluid	Chiller side	1" union	178 to 185N·m	_
	outlet port	Filter side Rc1 *1		36 to 38N•m	1.0MPa
CH1	<u> </u>	T IIIOT OIGO	1101 *1	00 10 0011 111	or more
Citi	Circulating fluid return port		Rc1 *2	36 to 38N•m	1.0MPa
				30 to 3014 111	or more
	Tank drain port		Rc3/4 *2	28 to 30N·m	_
	Circulating fluid	Chiller side	1/2" union	64 to 70N•m	_
	outlet port	Filter side	Rc1/2 *1	20 to 25N•m	0.8MPa
CH2	odilot port	Tiller side		20 to 2511 111	or more
	Circulating fluid return port		Rc1/2 *2	20 to 25N•m	0.8MPa
				20 10 2514-111	or more
	Tank drain port		Rc1/2 *2	20 to 25N·m	_

^{*1 :} When the piping thread type "F (G thread)" or "N (NPT thread)" is selected, it becomes "G thread " or "NPT thread ".

[Tips]

<For HRL***-AN-**>

A set of thread adapters that converts the connections from Rc to NPT is enclosed as an accessory. For NPT thread, be sure to use this adapter.

<For HRL***-AF-**>

A set of thread adapters that converts the connections from Rc to G is enclosed as an accessory. For G thread, be sure to use this adapter.

HRL Series 3.4 Piping

^{*2 :} When the piping screw type "F (G thread)" or "N (NPT thread)" is selected, a conversion joint is included.

■ Installation of particle filter

Attach the accessory particle filter. Be sure to install it.

1. Wrap seal tape around the nipple (1") of the CH1 particle filter set, and connect the union (1") to the CH1 circulating fluid outlet.

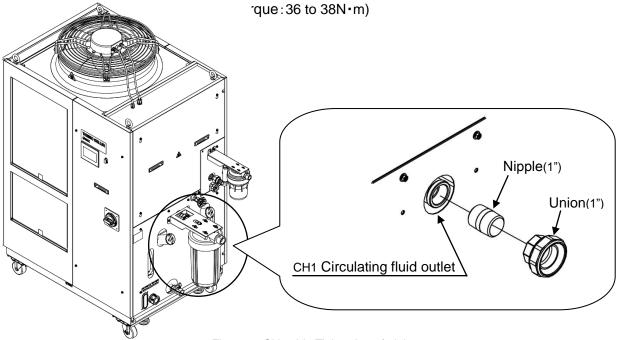


Fig. 3-14 CH1 side Tightening of piping

Attach the CH1 particle filter. Insert the gasket (1") and install it. (Recommended tightening torque: 178 to 185N·m)

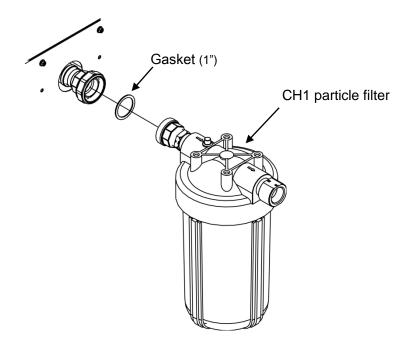


Fig. 3-15 CH1 side Installation of particle filter

3.4 Piping HRL Series

3. Attach the CH1 filter bracket.

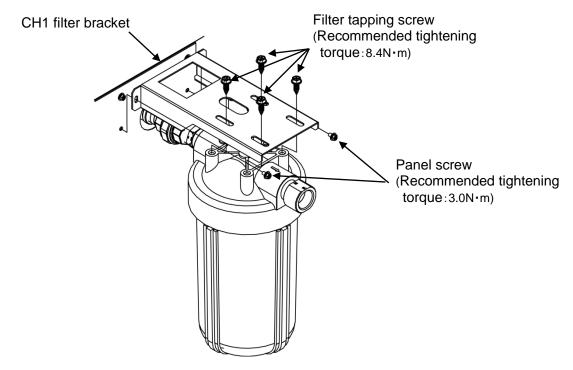
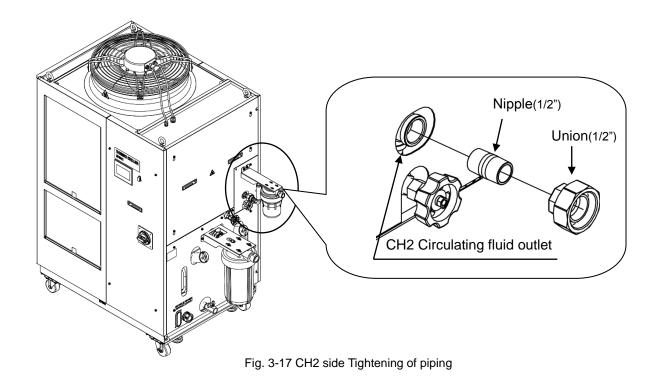


Fig. 3-16 CH1 side Installation of filter bracket.

4. Wrap seal tape around the nipple (1/2") of the CH2 particle filter set, and connect the union (1/2") to the CH2 circulating fluid outlet. (Recommended tightening torque: 20 to 25N·m)



HRL Series 3.4 Piping

5. Attach the CH2 particle filter. Insert the gasket (1/2") and install it. (Recommended tightening torque: 64 to 70N·m)

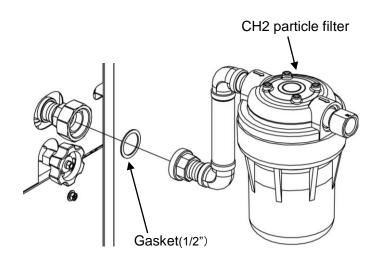


Fig. 3-18 CH2 side Installation of particle filter

6. Attach the CH2 filter bracket.

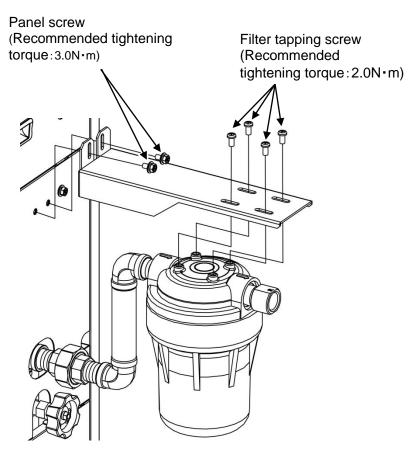


Fig. 3-19 CH2 side Installation of filter bracket.

3.4 Piping HRL Series

■ Installation of particle filter element

1. Remove the filter case using the maintenance handle.

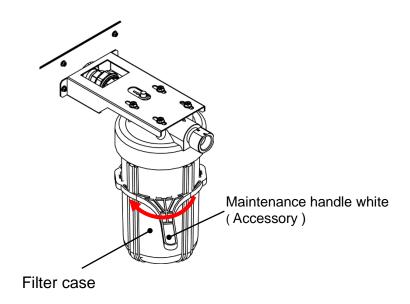


Fig. 3-20 CH1 particle filter case removal

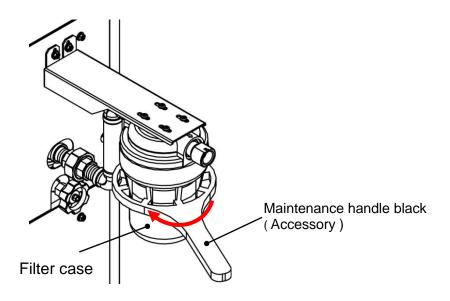


Fig. 3-21 CH2 particle filter case removal

2. Insert the element and mount the filter case.

HRL Series 3.4 Piping

■ How to connect to the circulating fluid outlet

When piping the circulating fluid outlet, hold the filter outlet side fitting of the circulating fluid outlet with a wrench not to rotate it.

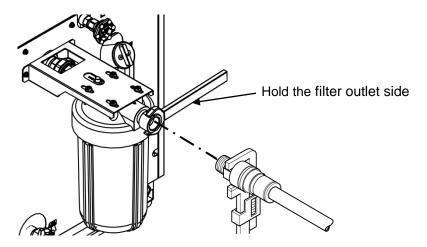


Fig. 3-22 Hold the filter outlet side

A CAUTION



Without holding the filter side fitting of the circulating fluid outlet with a wrench, the fitting may rotate and it may cause a fluid leakage and/or malfunction of the product. Be sure to hold the filter side fitting.

■ How to connect to the drain port

When piping the drain port, hold the ball valve of the drain port with a wrench not to rotate it.

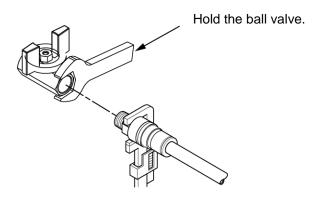


Fig. 3-23 Connection to the drain port

A CAUTION



Without holding the ball valve of the drain port with a wrench, the ball valve may rotate and it may cause a fluid leakage and/or malfunction of the product. Be sure to hold the ball valve of the drain port.

3.4 Piping HRL Series

■ Recommended piping circuit

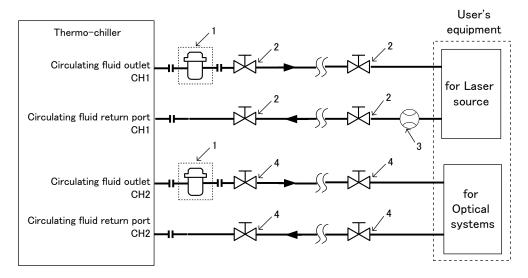


Fig. 3-24 Recommended piping circuit

No.	Description	Size
1	Particle filter (Accessory)	filtration accuracy :5µm
2	Valve	1"
3	Flow meter	Prepere a flow meter with an appropriate flow range.
4	Valve	1/2"

■ Mounting of DI filter

At delivery, "Temporary piping for DI filter" is connected. Install the DI filter (accessory) according to "7.4.2 Replacing the DI filter".

HRL Series 3.4 Piping

3.5 Circulating Fluid Supply

- **1.** Ensure that the power source and the power supply of the product is turned off.
- 2. Check the drain port is valve to prevent the supplied circulating fluid from draining out.
- **3.** Open the circulating fluid supply port by turning it counterclockwise, and fill the circulating fluid within the range from LOW to HIGH shown on the level gauge. Use tap water which satisfies the water quality standard shown in Table 7.1-1, or a DI water (pure water). When deionized water is used, the conductivity should be 1.0 μS/cm or higher (Electrical resistivity: 1 MΩ·cm or lower).

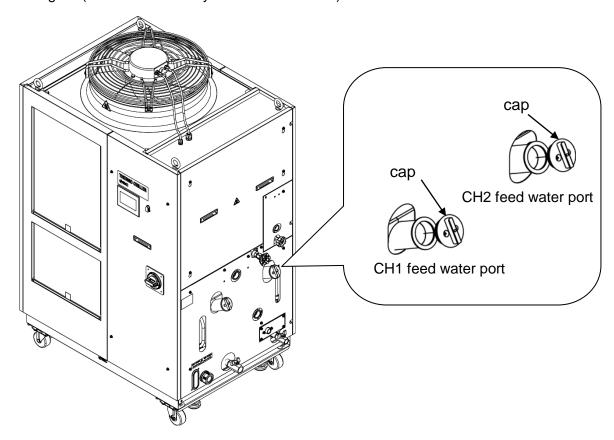


Fig. 3-25 Supplying the fluid to the supply fill port

3.5 Circulating Fluid Supply

HRL Series

CAUTION



- When tap water is used, refer to "7.1 Quality Control of Circulating Fluid and Facility Water".
- When deionized water is used, the conductivity should be 1.0 μ S/cm or higher (Electrical resistivity: 1 M Ω ·cm or lower).

CAUTION



• Confirm that the fluid level is between "HIGH" and "LOW" level of the fluid level gauge.

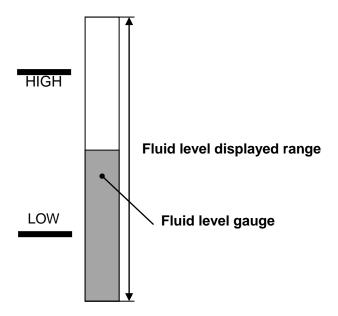


Fig. 3-26 Fluid level gauge

Open the supply port cap and put the circulating fluid within the display range of "HIGH" and "LOW".

3.5 Circulating Fluid Supply

HRL Series

Chapter 4 Starting the Product

CAUTION



Only people who have sufficient knowledge and experience about the product and its accessories are allowed to start and stop the product.

4.1 Before Starting

Check the following points before starting the product.

- Installation state
 - Check that the product is installed horizontally.
 - Check that there are no heavy objects on the product, and the external piping is not applying excessive force to the product.
- Connection of cables
 - Check that the power, ground and I/O signal cables (to be supplied by user) are correctly connected.
- Circulating fluid piping
 - Check that the circulating fluid piping is correctly connected to the inlet and outlet.
- Fluid level gauge
 - Confirm that the fluid level is between "HIGH" and "LOW" levels of the fluid level gauge.

HRL Series 4.1 Before Starting

4.2 Preparation for Start

4.2.1 Power supply

Turn ON the facility power supply breaker.

Turn ON the breaker handle.

If the product is powered on properly, the touch panel of the product operates as follows.

• The startup screen first appears on the touch panel and then switches to the operation screen (home screen).

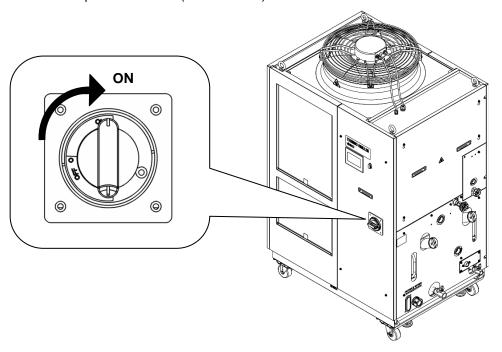


Fig. 4-1 Position of the breaker handle(the figure shows HRL200-A-40)



Fig.4-2 Startup screen

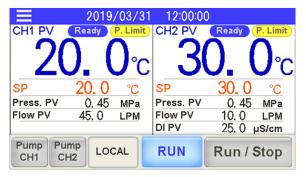


Fig.4-3 Operation screen (home screen)

4.2 Preparation for Start HRL Series

4.2.2 Operation screen (home screen)

Items displayed on the home screen are listed in Table 4.2-1 Items displayed on the home screen.

Refer to Chapter 5 Display and Setting of Various Functions for details.

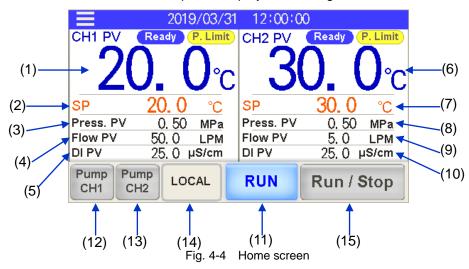


Table 4.2-1 Items displayed on the home screen

No.	Classification	CH number	ltem	Explanation
(1)			Circulating fluid temperature	It indicates the current temperature.
(2)			Circulating fluid set temperature	It indicates the set temperature.
(3)		CH1	Circulating fluid Discharge pressure	It indicates the discharge pressure.
(4)		GIII	Circulating fluid flow rate	It indicates the fluid flow rate. This value is not measured by a flow meter. It should be used as a reference value (rough indication). It includes the flow rate in the bypass circuit.
(5)	S		Circulating fluid electric conductivity	It indicates the electric conductivity. *1
(6)	Displayed value		Circulating fluid temperature	It indicates the current temperature.
(7)			Circulating fluid set temperature	It indicates the set temperature.
(8)		CH2	Circulating fluid discharge pressure	It indicates the discharge pressure.
(9)			Circulating fluid flow rate	t indicates the flow rate measured by a flow meter. It does not include the flow rate in the bypass circuit.
(10)			Circulating fluid electric conductivity	It indicates the electric conductivity.
(11)		Common	Operating condition display	It indicates the run and stop status of the product.
(12)		CH1	Independent pump operation	CH1 pump operates independently while the button is pressed.
(13)		CH2	Independent pump operation	CH2 pump operates independently while the button is pressed.
(14)	Button	Common	Operatrion mode	To select a operatrion mode from the touch panel (LOCAL mode), contact input (DIO mode) or serial communication (SERIAL mode).
(15)		Common	Run/Stop	To run/stop the product.

^{*1} When option D1 "CH1 Electric conductivity control" is purchased, a numerical value is displayed.

HRL Series 4.2 Preparation for Start

4.3 Preparation of Circulating Fluid Supply to User's Equipment

Circulating fluid is supplied only inside the product at the time of installation of the thermo-chiller. If the operation is started under this condition, the product circulating fluid is supplied to user's device and the piping. This lowers the fluid level of the product so additional fluid must be supplied. Follow the instructions below to supply additional fluid.

1. Touch [Pump |] button or [Pump |] button on the touch panel.

Pump operates independently while pressing the [Pump CH1 Pump CH2] button.

[Pump CH1 CH2] button (blue) lights up during independent pump operation. The circulating fluid is then supplied to user's device and the piping to bleed the air inside the piping.

[Tips]

Independent pump operation is carried out at the following pump rotations: 50% for CH1 and 45% for CH2 (minimum rotation). The product does not operate at maximum rotation.

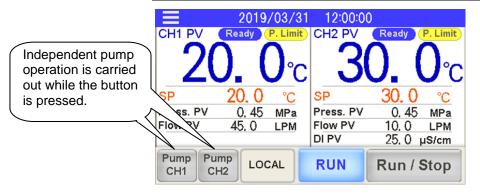


Fig.4-5 Pump independent operation

If the fluid level in the tank drops, an alarm is activated and "AL02 CH1 Low Level WRN" or "AL04 CH2 Low Level WRN" is displayed on the screen.

2. Supply circulating fluid in the range between HIGH and LOW to turn off the alarm.

After supplying the circulating fluid, press [Alarm Reset] button to turn off the alarm.

The displayed alarm will be turned off.



Fig. 4-6 Turning off the low tank fluid level alarm

Touch [(menu key)]to display the menu.

When [Home] button is pressed, the home screen will be displayed.

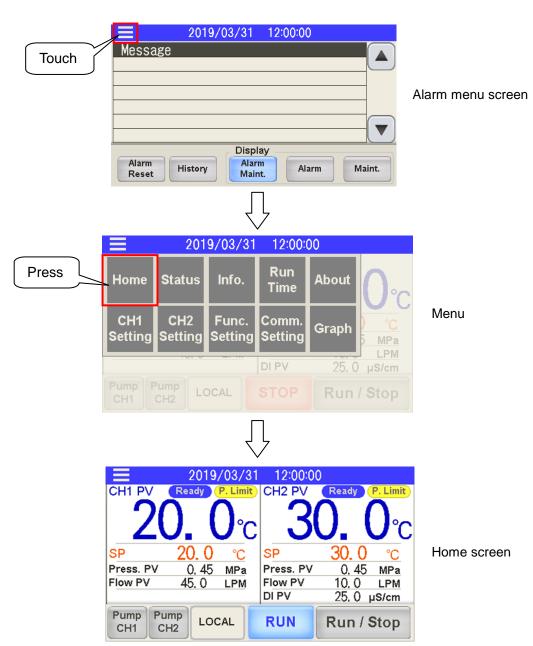


Fig. 4-7 Screen change from alarm menu to home screen

4. Repeat the procedures 1–3 until the fluid level of the product stops dropping.

[Tips]

While the low tank fluid level alarm (AL02/AL04) is still on (without turning off the alarm), the home screen can be displayed to carry out independent pump operation. If the fluid level continues to drop, the alarm "AL01 CH1 LOW level FLT" or "AL03 CH2 LOW level FLT" is activated.

4.4 Operation Start and Stop

4.4.1 Setting of circulating fluid temperature

Press the [SP] value on the touch panel (home screen) to display numeric keys to set the circulating fluid set temperature. Enter the set temperature for CH1 and CH2.

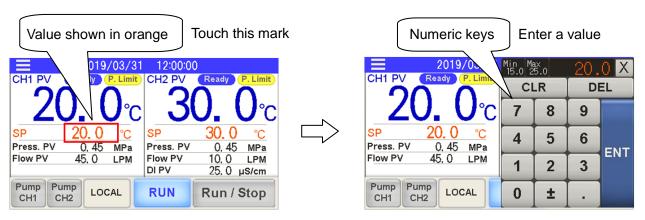


Fig. 4-8 Setting of CH1 circulating fluid temperature

4.4 Operation Start and Stop HRL Series

4.4.2 Setting of pump operation mode

Pump operation mode is set in the pressure control mode by default. Refer to "Pump operation mode" (P.5-31) for setting.

[By default] Pressure control mode

 CH1: The pump output (rotation) is controlled to maintain the circulating fluid discharge pressure at below.

HRL100: 0.43MPa、HRL200: 0.45MPa、HRL300: 0.45MPa

 CH2: The pump output (rotation) is controlled to maintain the circulating fluid discharge pressure at 0.45 MPa.

4.4.3 Starting the Product

CAUTION



- Allow at least 5 minutes before restarting the product.
- Operation and suspension frequency should not exceed 10 times per day.
 Frequently switching between operation and suspension may result in the malfunction of the refrigeration circuit.

When the alarm is activated, refer to "Chapter 6 Alarm Notification and Troubleshooting" to turn off the applicable alarm.

1. Press [Run / Stop] button on the home screen.

CH1 and CH2 will start operation.

The operating condition display switches from [STOP] to [RUN] and flashes during the operation preparation.

The display turns on [RUN] when it starts operating.

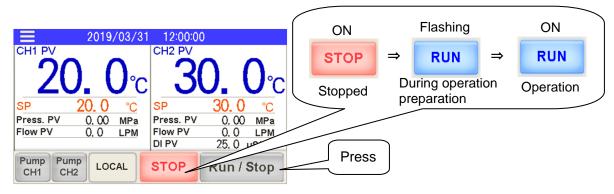


Fig.4-9 Starting the product

CAUTION

When the alarm is activated, refer to "Chapter 6 Alarm Notification and Troubleshooting".

2. Ensure that the circulating fluid flow is at least the minimum required flow rate of applicable types.

4.4.4 Stopping the product

1. Press [Run / Stop] button on the home screen. CH1 and CH2 stop running. The operating condition display switches from [RUN] to [STOP] and flashes during the stop preparation period.] display turns on when it has stops running. Flashing ON ON 2019/03/31 12:00:00 RUN STOP STOP P. Limit CH2 PV **During stop** Operation Stopped opreparation SP 0.45 MPa 45.0 LPM 0. 45 10. 0 Press. PV Press. PV MPa Flow PV Flow PV LPM DI PV **Press** Pump LOCAL RUN-Run / Stop

Fig. 4-10 Stopping the product

2. Please turn OFF the breaker. The touch panel turns off.

CAUTION



Except in case of an emergency, do not turn OFF the breaker before the thermo-chiller operation will completely stop. It will cause damage to the product.

4.4 Operation Start and Stop

HRL Series

4.5 Check Items during Startup

Check the following items after starting the product.

MARNING



If abnormality is detected, press [Run / Stop] key and turn OFF the facility power supply (power supply of the user's equipment) breaker.

- Confirm that there is leakage from the piping.
- Confirm that no circulating fluid is discharged from the tank drain port.
- Confirm that the circulating fluid pressure is within the specification range.
- The fluid level is within the range.

4.6 Adjustment of Circulating Fluid Flow Rate

If the circulating fluid flow rate is smaller than the minimum required, the product may fail to maintain performance, making it impossible for the compressor to operate. Refer to Figure 3-17 to find the recommended piping circuit fluid flow rate for adjustment, and adjust the manual valve while monitoring the pressure and flow rate of the user's equipment to achieve the required pressure or flow rate.

[Tips]

Refer to "8.1 Specifications" for the minimum required flow rate.

Chapter 5 Display and Setting of Various Functions

WARNING

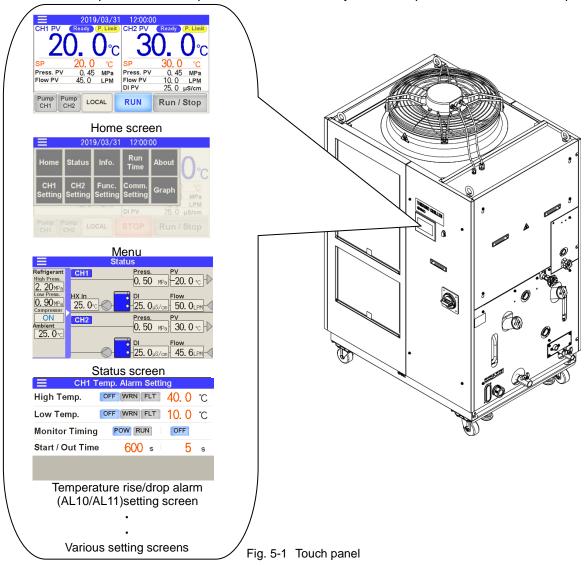


Thoroughly read and understand this manual before changing settings.

5.1 Basic Operation

5.1.1 Touch panel

The basic operations of the product are controlled by the touch panel on the front of the product.



CAUTION



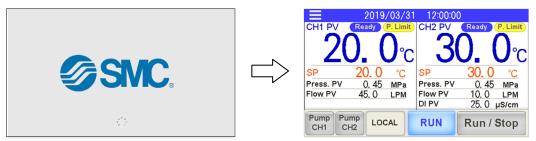
Be sure to operate the touch panel only with your fingers. Operating the panel with a sharp pointed screwdriver or ballpoint pen damages the panel.

HRL Series 5.1 Basic Operation

5.1.2 Basic operating instructions

Basic operating instructions for the touch panel of the product are described below.

1. After turning on the power, the startup screen appears on the display and changes to the home screen.

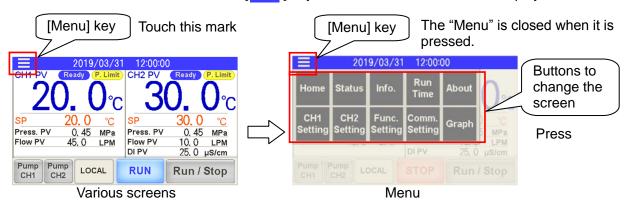


Startup the software

Home screen

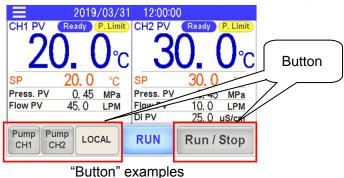
2. Settings and screen display can be reviewed after the home screen changes to the respective screen. The menu is displayed when [=] (menu key) located upper left on the screen is touched. Go to the respective screen from the menu to check the settings and screen display content.

Essentially use [] key to change the screen. [] key is located on every screen. The menu is closed when [] key is touched while the menu is displayed.



3. Press a button for example to carry out "Run/Stop," "Selection of function" or "Change the screen.

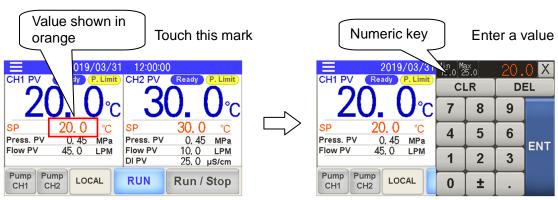
Any button-shaped section on the screen can be pressed to operate it.



5.1 Basic Operation HRL Series

5-2

4. Touch the value in orange to display numeric keys to enter a value. Enter a set value.



Example of an orange "Value"

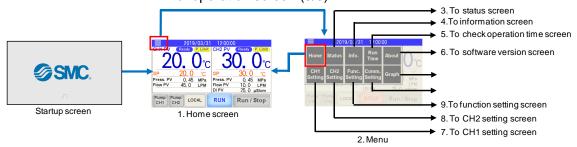
Example of numeric keys

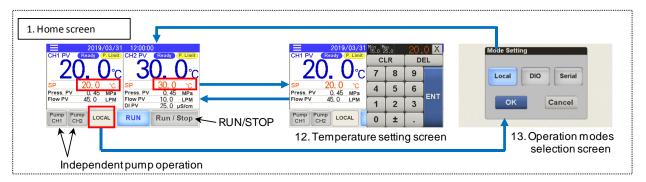
HRL Series 5.1 Basic Operation

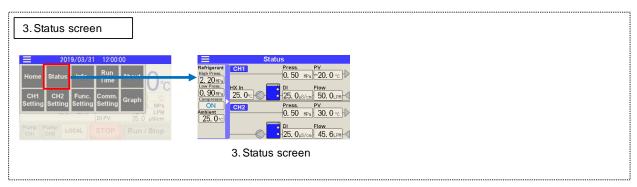
5.2 Flow Chart of Operation Screen

5.2.1 Flow Chart of Operation Screen

Flow chart of operation screens (touch panels) of the product are shown in from Fig.5-2 Flow chart of operation screen (1/3) to Fig.5-4 Flow chart of operation screen (3/3).







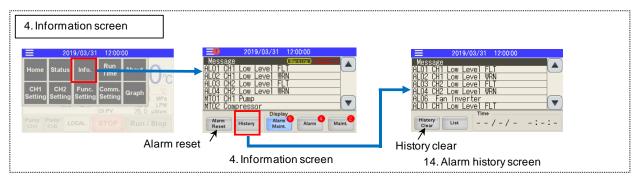


Fig.5-2 Flow chart of operation screen (1/3)

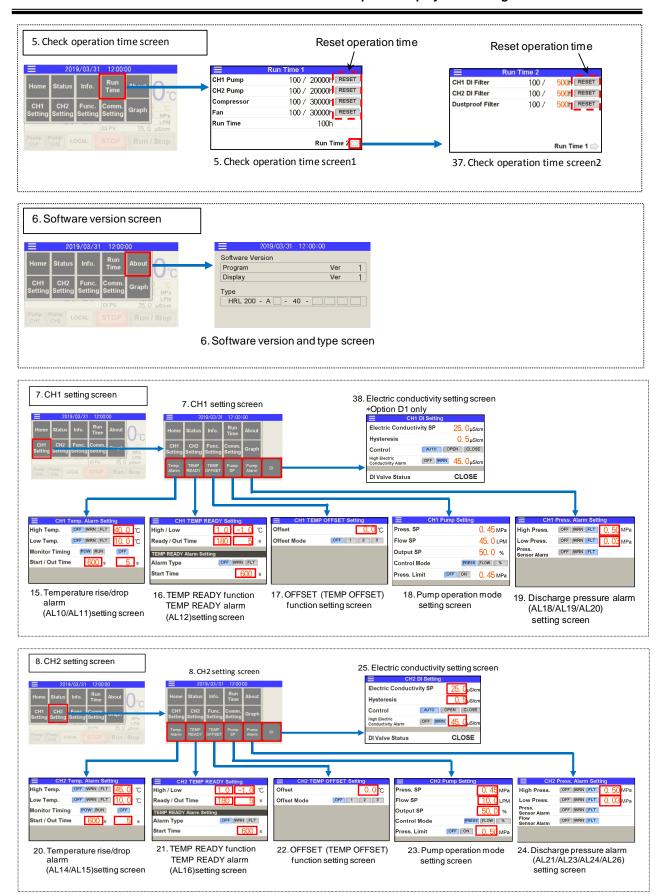


Fig.5-3 Flow chart of operation screen (2/3)

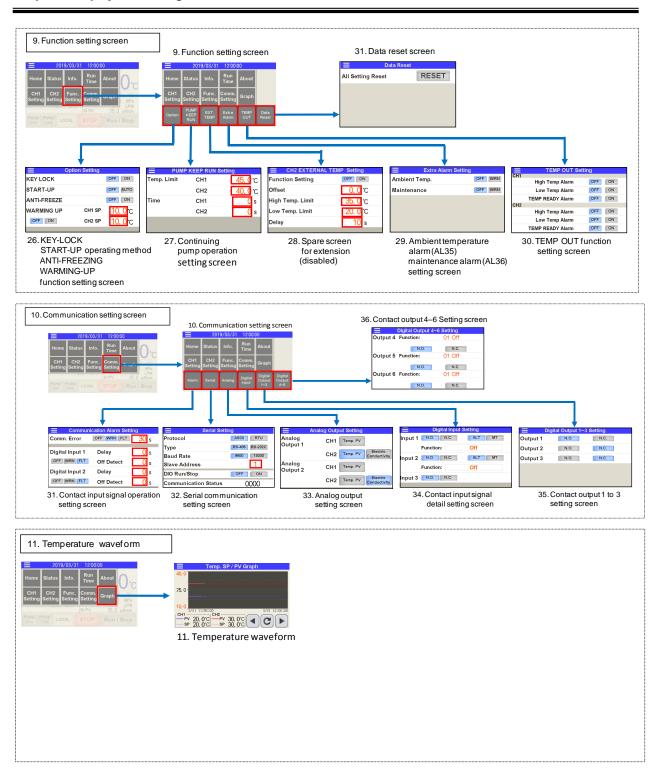


Fig. 5-4 Flow chart of operation screen (3/3)

5.3 List of Functions

Function of the product can be set as shown in Table 5.3-1 List of functions.

Table 5.3-1 List of functions

No.	Classification	Function	Outline	Reference page
		Temperature setting	Allows change of the set circulating fluid temperature.	
		Temperature display	Displays the circulating fluid temperature.	
		Pressure display	Displays the circulating fluid discharge pressure.	
			Displays the circulating fluid flow rate.	
			A rough indication of the flow rate of [CH1]. It includes the	
		Flow rate display	bypass circuit.	
1	Home screen		The flowmeter value of [CH2]. It does not include the bypass	Chapter
			circuit.	5.4.1
		Run/Stop	Run/stop the product.	
		Pump independent operation	Independently operates the pump of CH1 or CH2.	
			Displays the operation mode.	
		Operation mode selection	·Selects the operation from touch panel or communication.	
		Operating condition display	Displays the operating status.	
2	Menu	Menu display	Selects a menu for various settings.	Chapter
				5.4.2 Chapter
3	Status screen	Sensor value display	Displays the sensor value of the product.	5.4.3
			Displays an alarm name when the alarm goes off.	3.4.3
			Displays a maintenance reminder.	Chapter
4	Information screen	Alarm/maintenance display	Displays previously activated alarms.	5.4.4
			Following operation times can be checked:	
			The operation time can be reset.	O
			·Pump	
5	Check operation time screen	Check operation time	·Compressor	Chapter
		Reset operation time	·Fan	5.4.5
			·Time of use of DI filter	
			·Time of use of dustproof filter	
6	Software version screen	Display of software version	Software version can be checked.	Chapter
	Contware version sereem	. ,		5.4.6
		Temperature rise/drop alarm	Sets the temperature rise/drop alarm (AL10/AL11).	
		TEMP READY function	Sets TEMP READY signal and alarm (AL12).	
_	0.14	TEMP OFFSET	Sets the offset mode.	Chapter
7	CH1 setting screen	Pump operation mode	Sets the pump operation mode and set value.	5.4.7
		Discharge pressure rise/drop alarm	Sets the pump discharge pressure rise/drop alarm (AL19/AL20)	
		Electric conductivity	and discharge pressure sensor failure (AL18). Sets the electric conductivity. *1	
		Temperature rise/drop alarm	Sets the temperature rise/drop alarm (AL14/AL15).	
		TEMP READY function	Sets TEMP READY signal and alarm (AL14/AL15).	
		TEMP OFFSET	Sets the offset mode.	
		Pump operation mode	Sets the pump operation mode and set value.	Chapter
8	CH2 setting screen	1 amp operation mode	Sets the pump discharge pressure rise/drop alarm (AL23/AL24)	5.4.8
		Discharge pressure rise/drop alarm	and discharge pressure sensor failure/flow rate sensor failure	
		Districting procedure mestarep arann	(AL21/AL26).	
		Electric conductivity	Sets the electric conductivity.	
		,	Prevents operations other than "run/stop", "change screen" and	
		KEY LOCK	"alarm reset".	
		START-UP	Selects the operating method to turn on the power.	
		ANTI-FREEZE	Sets the anti-freezing operation.	
		WARMING UP	Sets the warming up.	
9	Function setting screen	PUMP KEEP RUN	Sets the pump continuing operation function.	Chapter
9	i anonon setting screen	Ambient temperature alarm	Selects the enabling/disableing of ambient temperature alarm	5.4.9
		, and one temperature diami	(AL35).	
		Maintenance alarm	Sets the assignment of "maintenance reminder" as an alarm	
			signal (AL36).	-
		TEMP OUT function setting	Sets TEMP OUT function.	
		Data reset	Resets set values to default settings.	
l		Communication alarm	Sets the communication error (AL34) and contact input 1 and 2	Chapter 5.4.10
		Carial communication	signal detection (AL30/AL31).	
10	Communication setting screen	Serial communication	Sets RS-232C and RS-485.	
	_	Analogue output	Sets the contact input signal	5.4.10
		Contact input signal Contact output signal	Sets the contact input signal. Sets the contact output signal.	1
L	1	Contact output signal	poto the contact output signal.	

^{*1} Only for Option D1 "CH1 with electric conductivity control".

HRL Series 5.3 List of Functions

5.4 Description of Screen

5.4.1 Home screen

Items displayed on the home screen and setting items are shown in Table 5.4-1 List of check items in inspection monitor menu.

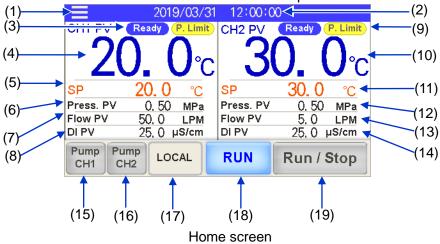


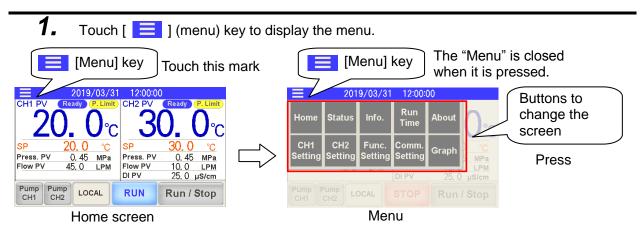
Table 5.4-1 List of check items in inspection monitor menu

No.	CH number	ltem	Explanation	Reference page
(1)		Menu key	Touch the key to display the menu.	P.5-9
	Common	·	Displays the date and time.	
(2)		Date and time display	Press the numeric section to set the date and time.	P.5-9
(0)			Displays TEMP READY status.	
(3)		Operating condition display	Displays the control status of the circulating fluid temperature.	P.5-9
(4)		Current circulating fluid temperature	Displays the current temperature of circulating fluid.	P.5-10
(E)			It indicates the set temperature.	P.5-10
(5)		Circulating fluid set temperature	Press the numeric section to change the set temperature.	P.5-10
(6)	CH1	Circulating fluid discharge pressure	It indicates the discharge pressure.	P.5-11
			It indicates the fluid flow rate. This value is not	
(7)		Circulating fluid flow rate	measured by a flowmeter. It should be used as	
(1)			a reference value (rough indication).	P.5-11
			It includes the flow rate in the bypass circuit.	
(8)		Circulating fluid electrical conductivity	It indicates the electrical conductivity. *1	
(0)		Operating condition display	Displays TEMP READY status.	P.5-9
(9)		Sperating condition display	Displays the control status of the circulating fluid pressure.	F.5-9
(10)		Current circulating fluid temperature	Displays the circulating fluid temperature.	P.5-10
(11)		Circulating fluid set temperature	It indicates the set temperature.	P.5-10
(11)	11) CH2		Press the numeric section to change the set temperature.	P.5-10
(12)		Circulating fluid discharge pressure	It indicates the discharge pressure.	P.5-11
(42)		Circulating fluid flow rate	It indicates the flow rate measured by a flowmeter.	P.5-11
(13)	(13)	Circulating fluid flow rate	It does not include the flow rate in the bypass circuit.	P.5-11
(14)		Circulating fluid electrical conductivity	It indicates the electrical conductivity.	P.5-11
(15)	CH1	Independent pump operation	CH1 pump operates independently while the button is pressed.	P.5-12
(16)	CH2	Independent pump operation	CH2 pump operates independently while the button is pressed.	P.5-12
			To select a operation mode from the touch panel	
(17)		Operation mode	(Local mode), contact input (mode)	P.5-12
(17)	Common	Operation mode	(mode), comdet input (mode)	F.0-12
	Common		or serial communication (SERIAL mode).	
(18)		Operating condition display	It indicates the run and stop status of the product.	P.5-12
(19)		Run/Stop	To run/stop the product.	P.5-13

^{*1} In the case of option D1 "CH1 with electrical conductivity control", it will display.

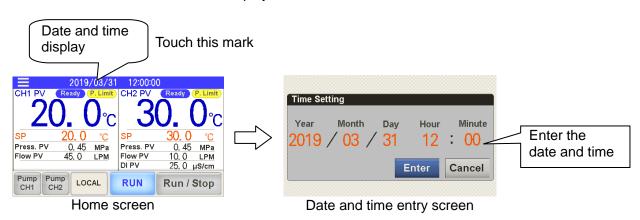
5.4 Description of Screen HRL Series





[·]Display and setting of date and time

2. Touch the date and time display to set the date and time.



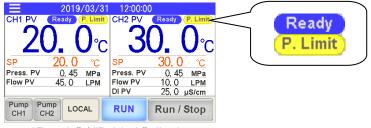
Operating condition display

3. Display "TEMP READY status" and "PRESS LIMIT status" of CH1 and CH2.

Display [Ready] if the current temperature is within a certain range.

(Refer to About TEMP READY function (P.5–27) for "TEMP READY function".) Display [P. Limit] if the circulating fluid discharge pressure has reached the pressure limit value.

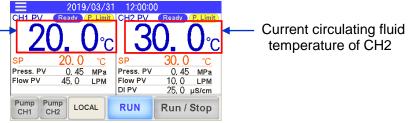
(Refer to About control function of circulating fluid discharge pressure (P.5-32) for details of "PRESS LIMIT".)



"Ready" / "P. Limit" display

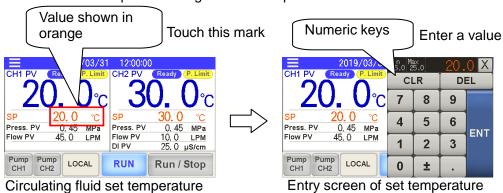
- Current circulating fluid temperature [PV]
 - **4.** Display the current circulating fluid temperature of CH1 and CH2.

Current circulating fluid temperature of CH1



Current circulating fluid temperature

- Circulating fluid set temperature [SP]
 - **5.** Display the circulating fluid set temperature of CH1 and CH2. Touch the numeric part to change the set temperature.



The set temperature ranges of CH1 and CH2 are as follows:

The set temperature of CH2 will be higher than CH1. The set temperature of CH2 must not be set lower than that of CH1.

Item	CH1	CH2	
Setting range	5°C to 35°C	10°C to 40°C *	*CH2 set temperature ≧CH1set
By default	20°C	25°C	temperature

[Tips]

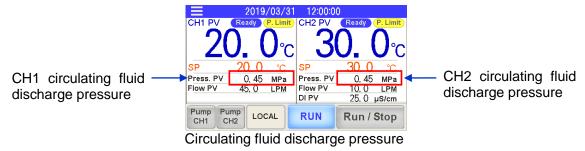
Sample set temperature:

- To change from CH1SP: 25°C and CH2SP: 30°C status, to CH2SP: 15°C, first set CH1SP to 15°C and then CH2SP to 15°C. If CH2SP is set to 15°C before setting CH1SP to 15°C, then the following message appears: Please set CH1SP first.
- Likewise, if a temperature higher than that of CH2SP is entered when setting CH1SP, then the following message appears: Please set CH2SP first in this case.

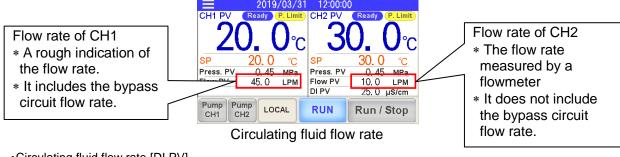


Set temperature error

- Circulating fluid discharge pressure [Press PV]
 - **6.** Display the circulating fluid discharge pressure of CH1 and CH2.

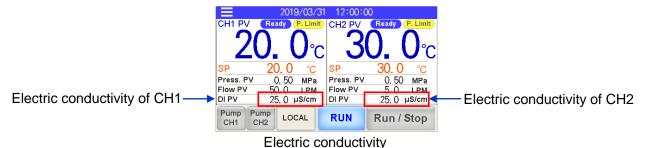


- Circulating fluid flow rate [Flow PV]
 - **7.** Display the circulating fluid flow rate of CH1 and CH2.
 - * A rough indication including the bypass circuit is shown for the flow rate of CH1.
 - * The flow rate measured by a flowmeter is shown for CH2. The bypass circuit is not included.



·Circulating fluid flow rate [DI PV]

8. Display the electric conductivity of CH1,CH2. In the case of option D1 "CH1 with electrical conductivity control", it will display.

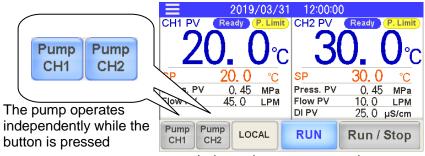


HRL Series 5.4 Description of Screen

5-11

Independent pump operation [Pump]

9. The pump operates independently while [Pump |] or [Pump |] button is pressed.



Operation mode [MODE]

Independent pump operation

10. Display the current run mode.

Set the operation mode.

[LOCAL]mode is set by default.

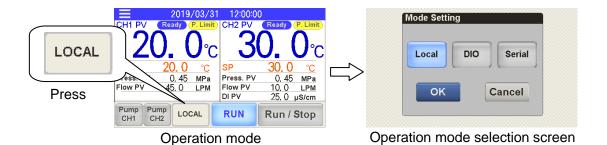
Operation mode can be selected from the following three modes:

- [LOCAL] mode: The operation is performed by the touch panel.
- [DIO] mode: The operation is performed by contact input signal.

(Refer to "5.4.10 Communication setting screen" for the setting of contact input signal.)

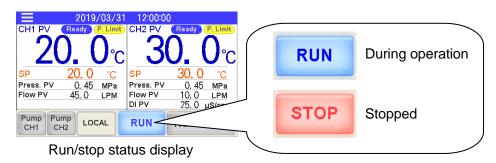
• [SERIAL]mode: The operation is performed by the serial communication RS-232C/RS-485.

(Refer to "5.4.10 Communication setting screen" for serial communication.)



RUN/STOP display

11. Indicates whether the product is running or has stopped running.

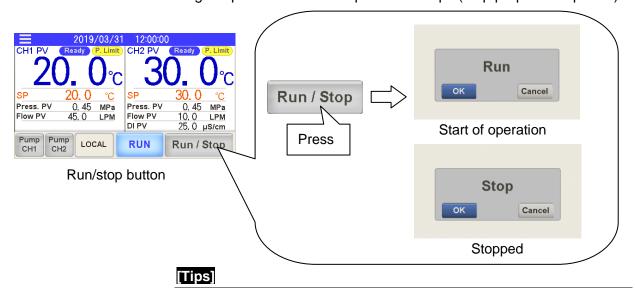


Run/stop operation

12. Run/Stop the product. Press [Run/Stop] button when the product has stopped running to display "Operation check screen". Press [OK] button to start operation. The "Operating condition display" described in 11 flashes to indicate the period before operation starts (operation preparation period).

Press [Run / Stop] button when the product is running to display "Stop check screen".

Press [OK] button to stop the operation. "Operating condition display" described in 11 flashes during the period before the operations stops (stop preparation period)



- If [Run / Stop] button is pressed when "Run/Stop (FLT)" alarm is activated, the "Cannot Run" message appears.
 Please turn off the alarm. Refer to "Chapter 6 Alarm Notification and Troubleshooting" for turning off the alarm.
- If the "Operation mode" is set to anything other than "LOCAL", a "Switch to the local mode" message appears. Set the running mode to the "LOCAL" mode.



Cannot run because of the fault alarm

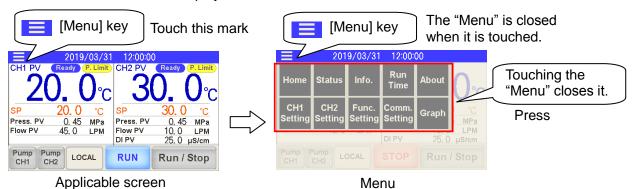


Switch to the local mode

5.4.2 Menu

[] (menu) key is located upper left on the applicable screen. Touch [] key to display the menu. Go to the applicable setting screen from the menu.

The menu is closed when [] key is touched while the menu is displayed.



5.4.3 Status screen

Press [Status] button on the menu to display "Status" screen.

The screen display of the "Status" screen is shown in Table 5.4-2 Screen display of status screen.

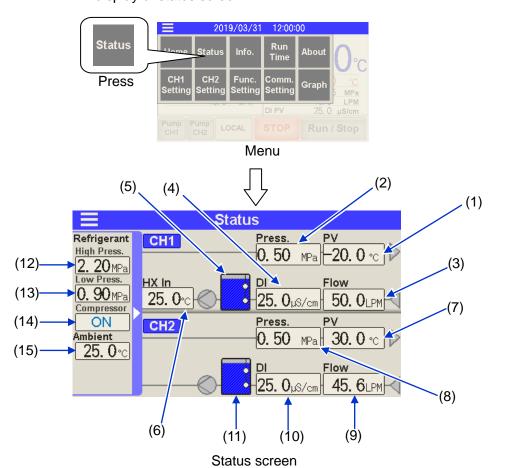


Table 5.4-2 Screen display of status screen

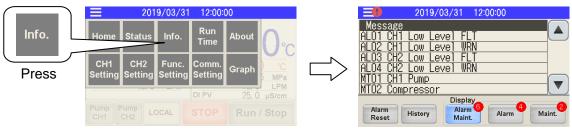
No	СН		isplay of status screen	
No.	number	Item	Explanation	
(1)		Current circulating fluid	Displays the current temperature of the circulating fluid outlet port.	
(5)		temperature Circulating fluid discharge	Displays the circulating fluid	
(2)		pressure	discharge pressure.	
4-3			Displays the circulating fluid flow rate.	
(3)		Circulating fluid flow rate	*A rough indication of the flow rate.	
			*It includes the bypass circuit. Displays the electrical conductivity of the	
(4)		Electrical conductivity	circulating fluid. *1	
	CH1		Indicates the tank fluid level with three levels: "Sufficient," "Low," or "Insufficient."	
(5)		Tank fluid level	"Sufficient" "Low" "Insufficient" Blue Yellow Red	
(6)		Heat exchanger inlet temperature	Displays the inlet temperature of the heat exchanger for the circulating fluid.	
(7)		Current circulating fluid temperature	Displays the current temperature of the circulating fluid outlet port.	
(8)		Circulating fluid discharge pressure	Displays the circulating fluid discharge pressure.	
(9)		Circulating fluid flow rate	Displays the circulating fluid flow rate. *The value is measured by a flowmeter. *The bypass circuit is not included.	
(10)	CH2	Electrical conductivity	Displays the electrical conductivity of the circulating fluid.	
			Indicates the tank fluid level with three levels: "Sufficient," "Low," or "Insufficient."	
(11)		Tank fluid level	"Sufficient" "Low" "Insufficient" Blue Yellow Red	
(12)		Pressure gauge on high-pressure side of compressor circuit	Displays the pressure gauge on high-pressure side of refrigerant circuit.	
(13)	Common	Pressure gauge on low-pressure side of the compressor circuit	Displays the pressure gauge on low-pressure side of the refrigerant circuit.	
(14)		Compressor output	Displays the compressor output.	
(15)		Ambient temperature	Displays the ambient temperature of the product.	

^{*1} In the case of option D1 "CH1 with electrical conductivity control", to display the value.

5.4.4 Information screen

Information screen is displayed when [Info.] button on the menu is pressed. The "Information" screen has the following functions:

- •To show the content of currently activated "Alarms".
- Displays the content of currently issued "Maintenance reminders".
 (Refer to "5.4.5 Check operation time screen and maintenance reminder" for details.)
- •To reset an alarm. (An alarm cannot be reset without first eliminating the cause.) Refer to "Chapter 6 Alarm Notification and Troubleshooting" for details.)
- •To display previously activated alarms (alarm history).



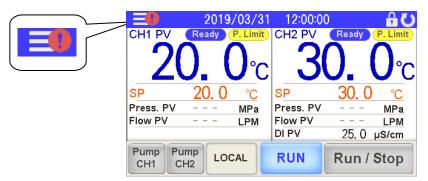
Menu

Information screen



If an "Alarm" is activated when the product is operating, the screen automatically switches to the "Information".

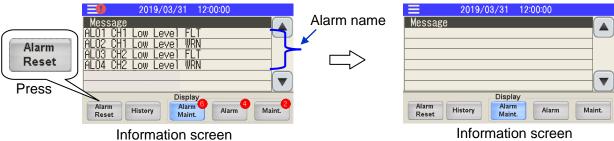
However, if the "Maintenance reminder" is issued, the screen will not switch. [] is displayed upper right on the screen if an "Alarm" is activated or a "Maintenance reminder" is issued.



Display when an "Alarm" is activated or "Maintenance reminder" is issued

· Alarm reset

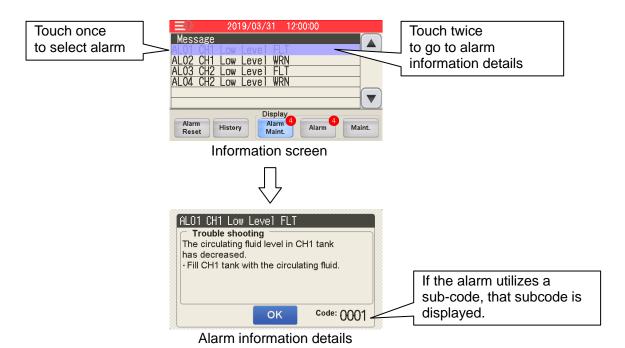
1. Alarm Reset After eliminating the cause of the alarm, press [button to cancel the alarm. When the alarm is turned off, alarm names disappear from the "Information" screen.



Information screen

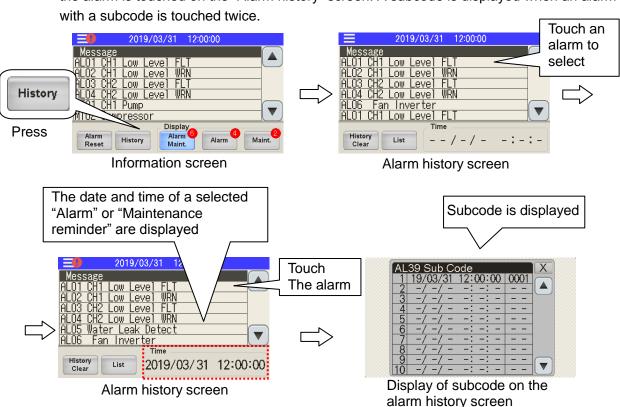
· Alarm name

2. Touch the "Alarm" or "Maintenance reminder" on the "Information" screen to display details of the alarm. Touching alarm one time displays the alarm information. Touching alarm twice displays alarm information details. If the alarm utilizes a sub-code, this is displayed in the alarm information details.



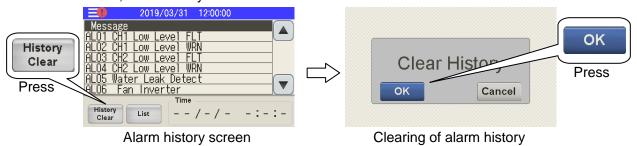
· Alarm log record

3. Previously activated "Alarm contents" are displayed if [History] button is pressed. A maximum of 300 records can be displayed. The date and time of an alarm are displayed if the alarm is touched on the "Alarm history" screen. A subcode is displayed when an alarm with a subcode is touched twice.

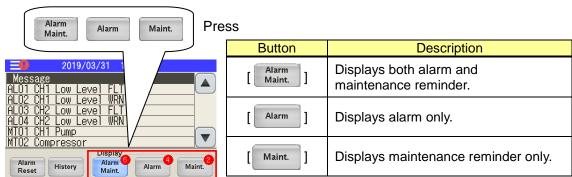


Cleaning of alarm history

4. All "Alarm" records are cleared if the "History Clear" button is pressed. However, the currently activated alarm is not cleared.



- Display of alarm/maintenance reminder
 - **5.** The "Alarm" and "Maintenance reminder" on the "Information" screen can each be individually displayed.



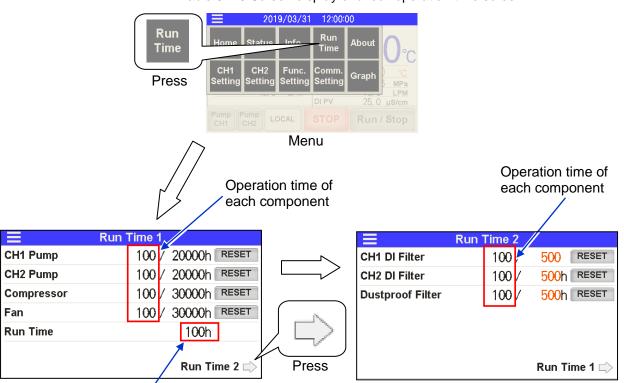
Information screen

By default: It is set to "Alarm Maint."

5.4.5 Check operation time screen and maintenance reminder

The "Check operation time" screen is displayed if [Run Time] button on the menu is pressed.

Screen display and function of the "Check operation time" screen are shown in Table 5.4-3 Screen display of check operation time screen.



Operation time of the product

Check operation time screen 1

Check operation time screen 2

	Table 5.4-3 Screen display of check operation time screen				
No.	Indication	Item/replacement cycle	Explanation		
		Operating time	Displays the operating time for CH1 pump.		
1	Pump CH1	20000hour	Displays the recommended replacement		
		2000011001	cycle for CH1 pump.		
		Operating time	Displays the operating time for CH2 pump.		
2	Pump CH2	20000hour	Displays the recommended replacement		
			cycle for CH2 pump.		
		Operating time	Displays the operating time for compressor.		
3	Compressor	30000hour	Displays the recommended replacement		
			cycle for a compressor.		
		Operating time	Displays the operating time of a fan.		
4	Fan	30000hour	Displays the recommended replacement		
			cycle for a fan.		
	CH1 DI Filter	Operating time	Displays the usage time of a DI filter.		
5	*1	1 to 9999hour	The "Maintenance reminder" is issued if the usage		
	. 1	By default: 500 hour	time has reached the hours specified by the user.		
		Usage time	Displays the usage time of a DI filter.		
6	CH2 DI Filter	1 to 9999hour	The "Maintenance reminder" is issued if the usage		
		By default: 500 hour	time has reached the hours specified by the user.		
	Dustproof	Usage time	Displays the usage time of a dustproof filter.		
7	Filter	1 to 9999hour	The "Maintenance reminder" is issued if the usage		
		By default: 500 hour	time has reached the hours specified by the user.		
8	Run Time	Operating time	Displays the operation time of a chiller.		
9	Reset	[RESET] button	The operation time is reset to "0 hour" when		
			[RESET] button is pressed.		

Table 5.4-3. Screen display of check operation time screen

■ About "Maintenance reminder" function

- "Maintenance reminder" is displayed on the "Information" screen if a product part in use has reached its recommended replacement cycle.
- "Maintenance reminder" is always issued if a part of the product has reached the recommended replacement cycle.
- A "Maintenance reminder" signal can be output by contact signal and by serial communication.
- (Refer to "5.4.10 Communication setting screen" for details.)
- •A "Maintenance reminder" signal can be output as "The AL36: Maintenance alarm". (Refer to "5.4.9 Function setting screen Ambient temperature alarm [AL35] and Maintenance Alarm [AL36]".)

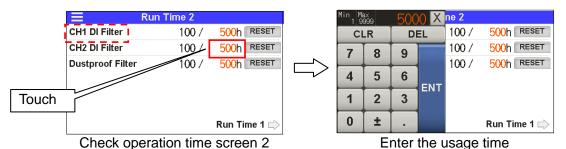
^{*1} In the case of option D1 "CH1 with electrical conductivity control", to display the value.

- ·Setting the usage time of DI filter
 - 1. The replacement period (usage time) for a DI filter can be set.

 "Maintenance reminder" is always issued when the filter reaches the specified time.

 Touch the numeric section of DI filter to set the time of use.

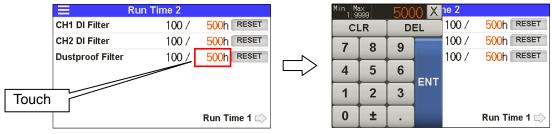
 Setting range: 1 to 9999 hours (by default: 500 hours)



! In the case of option D1 "CH1 with electrical conductivity control", it can be set.

- ·Setting of the usage time of dustproof filter
 - 2. The replacement period (usage time) for a dustproof filter can be set. "Maintenance reminder" is always issued when the filter reaches the specified time. Touch the numeric section of a dustproof filter to set the usage time.

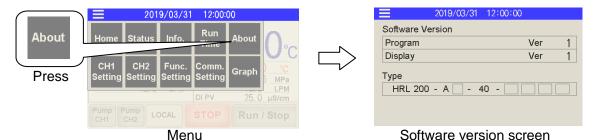
 Setting range: 1 to 9999 hours (by default: 500 hours)



Check operation time screen 2 Enter the usage time

5.4.6 Software version screen

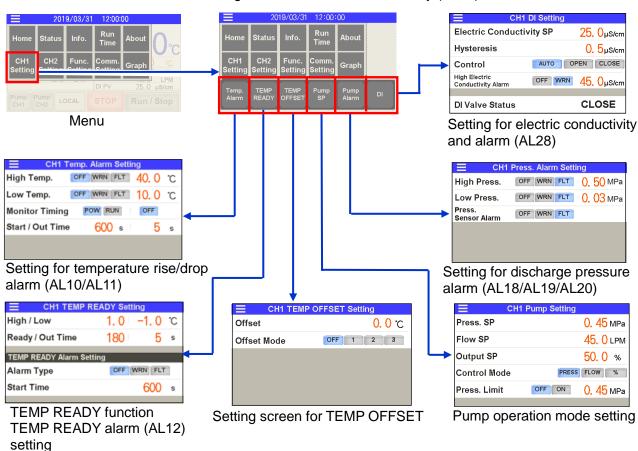
"Software version" screen is displayed if [] button on the menu is pressed. The software number and version number are displayed.



5.4.7 CH1 setting screen

A screen for shifting to the following setting screens is displayed if [setting] button on the menu is pressed.

- Setting screen for temperature rise/drop alarm (AL10/AL11)
- Setting screen for TEMP READY alarm (AL12) of TEMP READY function
- Setting screen for TEMP OFFSET
- Setting screen for pump operation mode
- Setting screen for discharge pressure alarm (AL18/AL19/AL20)
- Setting screen for electric conductivity (AL28)



Temperature rise/drop alarm (AL10/AL11)

An alarm can be activated when the current temperature of circulating fluid rises/drops outside of the setting range.

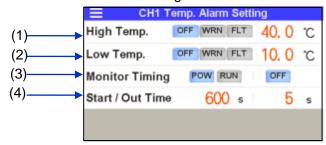
This function is OFF (deactivated) by default.

The following two types of alarm can be set on the "Temperature rise/drop alarm setting" screen:

- AL10: Alarm for CH1 circulating fluid temperature rise/drop—the alarm activates if the temperature rises above the set temperature.
- AL11: Alarm for CH1 circulating fluid temperature drop—the alarm activates if the temperature drops below the set temperature.

Following settings can also be selected: Refer to Table 5.4-4 Settings of AL10/AL11.

- Operation of the product at the time of alarm
- · Conditions to start alarm monitoring
- · Start time for alarm monitoring



Setting for temperature rise/drop alarm (AL10/AL11)

Table 5.4-4 Settings of AL10/AL11

No.	Indication	Item	Setting and selection		Setting range
		AL10 : CH1	OFF *	Disabled	
(1)	(1) High Temp.	Circulating fluid	WRN	Operation continues during the alarm	5 to 55°C *45°C
		temperature rise	FLT	Operation stops during alarm	
		AL11 : CH1	OFF *	Disabled	
(2)	(2) Low Circ	Circulating fluid	WRN	Operation continues during the alarm	1 to 35°C *5°C
		temperature drop	FLT	Operation stops during alarm	
			POW *	Continuous monitoring (monitoring continues even when the operation is stopped)	_
(3)	Monitor Timing	Alarm monitoring conditions	RUN	Monitoring continues only during operation. If [RUN] is selected, [OFF] or [AUTO] should be selected. Refer to About alarm monitoring timing (P.5–25) for details.	_
	Start/	No monitoring	[Start Time]	Alarm monitoring starts when the set time has passed after the start of operation.	0 to 9999sec *600sec
(4)	Out Time	No monitoring time/out time	[Out Time]	The alarm is activated when the set time has passed after the temperature rises/drops out of the alarm setting range.	0 to 600sec *5sec

^{*} By default.

5.4 Description of Screen HRL Series

5-24

■ About alarm monitoring timing

If [RUN] is selected as (3) "Monitor Timing" alarm monitoring condition, [OFF] and [AUTO] can be additionally selected. [AUTO] is a function to start alarm monitoring when the circulating fluid temperature rises/drops within the alarm setting temperature range in the time period specified by (4) "Start Time" (no monitoring time). Specific alarm monitoring timing is shown in Figure 5-5 Alarm monitoring timing.

[Example of setting]

- Circulating fluid SP: 20°C
- (1) "High Temp." CH1 circulating fluid temperature rise (AL10): 22°C
- (2) "Low Temp." CH1 circulating fluid temperature drop (AL11): 18°C
- (3) "Monitor Timing" Alarm monitoring conditions: [RUN] and [AUTO]
- (4) "Start Time" No monitoring time: 1200 sec / "Out Time": 600 sec

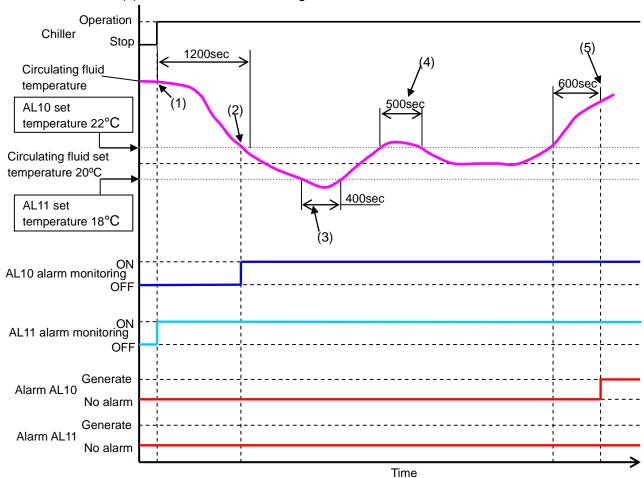


Fig. 5-5 Alarm monitoring timing

- Status (1): Start operation of the chiller. Monitoring of "AL11" starts since the temperature is 18°C or higher which is the value set for "AL11."
- Status (2): Monitoring of "AL10" starts since the temperature falls below 22°C, which is the value set for "AL10."
- Status (3): No alarm is activated since the temperature returns to the range within "Out Time" 600 seconds even though it is below 18°C, which is the value set for "AL11."
- Status (4): No alarm is activated since the temperature returns to the range within "Out Time" 600 seconds even though it is above 22°C, which is the value set for "AL10."
- Status (5): "AL10" is activated 600 seconds after the temperature rises above 22°C, which is the value set for "AL10."

•TEMP READY alarm (AL12) of TEMP READY function

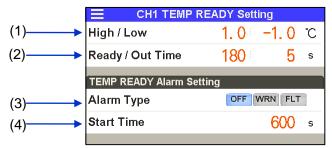
2. "TEMP READY" signal can be output by signal contact and serial communication if the circulating fluid temperature is within the range set for the time and temperature. "TEMP READY" signal cannot be "Disabled".

[Ready] is displayed on the "Home" screen if "TEMP READY" conditions are met. (Refer to 5.4.1 Home screen Operation condition display)

The alarm "AL12: TEMP READY alarm" can be output if the temperature does not meet the TEMP READY conditions. This function is OFF (deactivated) by default.

It can be set on "TEMP READY function setting" screen.

Refer to Table 5.4-5 TEMP READY signal setting and ■ About TEMP READY function (P.5–27) for details.



TEMP READY signal (AL12) setting

Table 5.4-5 TEMP READY signal setting

No.	Indication	Item		etting and selection	Setting range
INO.	mulcation	пеш	36		Jetting range
(1) High/	Upper/lower temperature	[High]	Sets the upper temperature limit for circulating fluid SP.	+0.1 °C to +10.0 °C * +1.0 °C	
(1)	Low	limit	[Low]	Sets the lower temperature limit for circulating fluid SP.	-0.1 °C to -10.0 °C * -1.0 °C
	Ready/	Stable	[Ready Time]	"TEMP READY" signal is output when the set time has passed after the circulating fluid temperature rises/drops within the range of (1) "Upper/Lower temperature limit."	10sec to 9999sec * 180sec
(2)	(2) Ready/ temperature time/out time		[Out Time]	"TEMP READY" is cleared when the set time has passed after the circulating fluid temperature rises/drops outside the range of (1) "Upper/Lower temperature limit" in the "TEMP READY" condition.	0sec to 600sec * 5sec
			OFF *	Disabled	_
(3)	Alarm Type		WRN	Operation continues during the alarm Operation stops	_
			121	during alarm	_
(4)	Start Time	Start time of AL12 alarm monitoring	[Start Time]	Monitoring of "AL12: TEMP READY alarm" starts when the set time has passed after the start of operation.	0sec to 9999sec * 600sec

^{*} By default.

■ About TEMP READY function

The operation chart of "TEMP READY" signal is shown in Fig. 4-2 TEMP READY signal chart.

[Example of setting]

- (1) "High" Upper temperature limit: +2°C and "Low" Lower temperature limit: -2°C
- (2) "Ready Time" Stable temperature time: 300 sec and "Out Time" extra temperature time: 200 sec
- (3) "Alarm Type" Alarm operation (AL12): "WRN"
- (4) "Start Time" Start time of alarm monitoring (AL12): 1000 sec

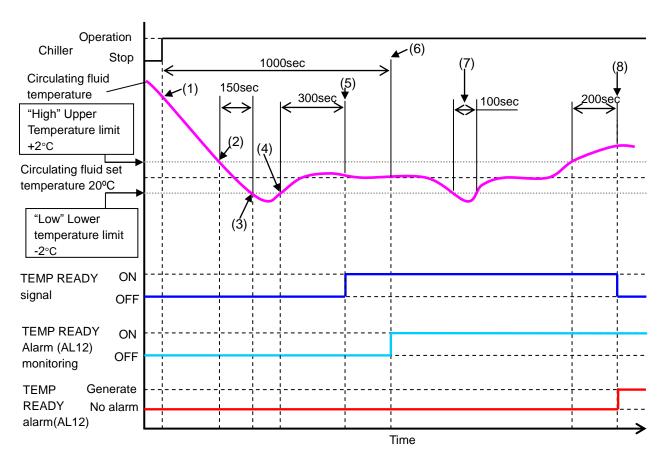


Fig. 5-6 TEMP READY signal chart

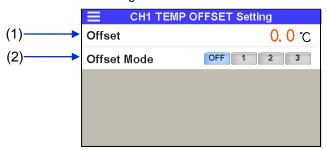
- Status (1): Start operation of the chiller.
- Status (2): The temperature is in the "High/Low" range, but no "TEMP READY" signal is generated since "Ready Time" is set at 300 sec at this point.
- Status (3): The 300 sec count for "Ready Time" is reset since the temperature is now outside of the "Low" range.
- Status (4): The 300 sec count for "Ready Time" starts since the temperature is now within the "High/Low" range.
- Status (5): "TEMP READY" signal is generated at this point since the temperature remains in the "High/Low" range for 300 sec of "Ready Time."

 Monitoring of "TEMP READY alarm (AL12)" does not start since "Start Time" is set at 1000 sec.
- Status (6): Monitoring of "TEMP READY alarm (AL12)" starts at this point where 1000 sec of "Start Time" has elapsed.
- Status (7): "TEMP READY" signal output continues since the temperature is now back within the "Out Time" range of 200 sec even though it was temporarily outside the "Low" range.
- Status (8): "TEMP READY" signal turns OFF when 200 sec has passed after the temperature rises above the "High" range. "TEMP READY alarm (AL12)" is simultaneously activated.

Offset (TEMP OFFSET) function

3. The circulating fluid temperature can be offset. Refer to ■ About offset function (P.5–29) for details

This function can be set on "Offset setting" screen. Refer to Table 5.4-6 Offset setting for details.



Offset setting

Table 5.4-6 Offset setting

No.	Indication	Item	Explanation	Setting range
(1)	Offset Temp.	Offset temperature	Sets offset temperature.	-20.0 °C to +20.0 °C [By default] 0.0 °C
(2)	Offset Mode	Offset mode	Selects the offset mode. [OFF] Disabled [1] MODE 1 [2] MODE 2 [3] MODE 3	OFF / 1 / 2 / 3 [By default] OFF

■ About offset function

This function controls the circulating fluid discharge temperature with offset.

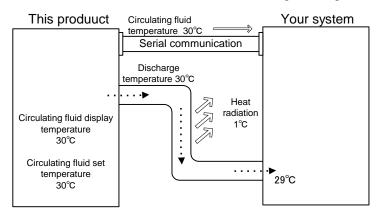
Temperature offset may occur between the thermo-chiller and the customer's device depending on the installation environment. To correct the temperature offset, three types of offset functions are available (MODE1 to 3). The default setting of this function is "OFF".

[When communication is used]

The circulating fluid temperature sent by serial communication is the circulating fluid temperature which is displayed on the thermo-chiller (the circulating fluid temperature after offset).

Example of temperature offset

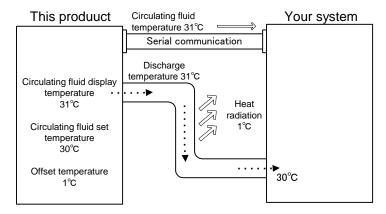
The discharge temperature of the circulating fluid is 30°C, but the fluid temperature in the customer's device is 29°C because of heat radiation during sending of the fluid.



MODE	Explanation
MODE1	Control the temperature so that the discharge temperature of the circulating fluid is circulating fluid set temperature + offset temperature. Circulating fluid temperature indicates the circulating fluid discharge temperature.
MODE2	Control the temperature so that the discharge temperature of the circulating fluid is circulating fluid set temperature. Circulating fluid temperature indicates the circulating fluid discharge temperature + offset temperature.
MODE3	Control the temperature so that the discharge temperature of the circulating fluid is circulating fluid set temperature + offset temperature. Circulating fluid temperature indicates the circulating fluid discharge temperature - offset temperature.
OFF	Control the temperature so that the discharge temperature of the circulating fluid is circulating fluid temperature set value.

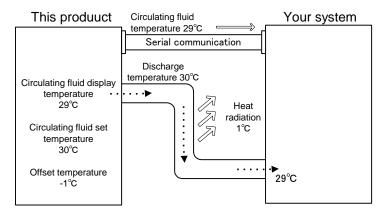
■ Example of MODE 1

When the offset temperature is 1°C, the thermo-chiller controls the temperature at 31°C (circulating fluid set temperature + offset temperature.) Even if the discharge temperature is 31°C, the circulating fluid temperature is 30°C at the customer's device because of 1°C of heat radiation during sending of the fluid. Circualting fluid display temperature and communication data is 31°C.



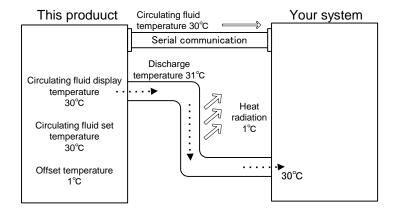
■ Example of MODE 2

When the offset temperature is -1°C, circulating fluid display temperature and the communication data is 29°C (circulating fluid discharge temperature + offset temperature), and matches the circulating fluid temperature at the customer's device.



■ Example of MODE 3

When the offset temperature is 1°C, the thermo-chiller controls the temperature at 31°C (circulating fluid set temperature + offset temperature) Even if the discharge temperature is 31°C, the circulating fluid temperature is 30°C at the customer's device because of 1°C of heat radiation during sending of the fluid. The circulating fluid display temperature and the communication data is 30°C (circulating fluid discharge temp. - offset temp.), and matches the circulating fluid temperature at the customer's device.



Pump operation mode

4. Pump operation mode can be set up.

Pump operation mode can be selected from the following three modes:

 Pressure control mode—Operates to maintain the circulating fluid discharge pressure at the set pressure. This mode is set by default.

The pressure might not rise to the set pressure if the piping resistance in the user's device and piping is too small.

Flow control mode———Operates to maintain the circulating fluid flow rate at the set flow rate. (However, CH1 flow rate serves as a rough indication.)

The flow rate might not reach the set flow rate if the piping resistance in the user's device and piping is too large.

Pump output setting mode—Operates to maintain the pump output (rotation) at the set output.

■About the control function of circulating fluid discharge pressure

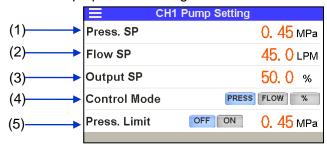
This is a function to control the pump output to maintain the circulating fluid discharge pressure within the set pressure.

This function is "Disabled" by default. If this function is "Enabled", the control pressure set by this function gets priority over the pressure, flow rate and output set by the pump operation mode

[P. Limit] is displayed on the upper screen when the pump discharge pressure is controlled during operation.

(Refer to 5.4.1 Operation condition display on home screen.)

This can be set on "Pump operation mode setting" screen. Refer to Table 5.4-7 Pump operation settings for details.



Pump operation mode setting

Table 5.4-7 Pump operation mode setting

No.	Indication	Item	Explanation	Se	etting range
		Cat the management	(4) The manner are artists in controlled to	HRL100	0.10 to 0.50 MPa *0.43 MPa
(1)	(1) Press.SP	Set the pressure while in pressure control mode	(4) The pump operation is controlled to maintain the set pressure when "Control mode" (operation mode) is set [PRESS].	HRL200	0.10 to 0.55 MPa *0.45 MPa
		control mode	J. Victorial of the control of the c	HRL300	0.10 to 0.68 MPa *0.45 MPa
				HRL100	20.0 to 120.0 LPM *45.0 LPM
(2)	(2) Flow SP	Set flow rate in the flow rate control mode	(4) The pump operation is controlled to maintain the set pressure when "Control mode" (operation mode) is set [FLOW].	HRL200	25.0 to 130.0 LPM *45.0 LPM
			, , , , , ,	HRL300	40.0 to 180.0 LPM *125.0 LPM
(2)	Output CD	Set the output in the output setting mode	(4) The pump operation is controlled to maintain the set output (rotation) when	HRL100	50.0 to 100.0%
(3)	Output SP		"Control mode" (operation mode) is set to	HRL200	*50.0%
			[%].	HRL300	
			Selects the pump operation mode		
(4)	Control Mode	Selection of pump	PRESS * Pressure control mode	-	_
(-)	Control Mode	operation mode	Flow rate control mode		_
			Pump output setting mode		
		D	Selects enabling/disabling of the pressure control.	HRL100	0.10 to 0.68 MPa *0.45 MPa
(5)	Press.Limit	Pressure setting for pressure control function	OFF * Function disabled	HRL200	0.10 to 0.68 MPa *0.50 MPa
			ON Function enabled	HRL300	0.10 to 0.68 MPa *0.50 MPa

^{*} By default

- **5.** An alarm can be activated when the circulating fluid discharge pressure rises/drops outside the setting range. This function is set to " [FLT] (stop) at the time of alarm" by default. The following two alarms can be set on "Discharge pressure alarm setting" screen:
 - AL19: Alarm for CH1 circulating fluid discharge pressure rise—this alarm activates when the pressure rises above the set pressure.
 - AL20: Alarm for CH1 circulating fluid discharge pressure drop—this alarm activates when the pressure drops below the set pressure.

Following settings can also be selected:

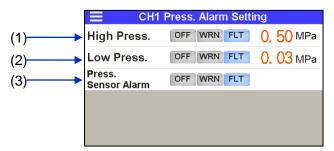
Selection of product operation when an alarm occurs

The alarm "AL18: CH1 failure of circulating fluid discharge pressure sensor" activates when a failure is detected in the circulating fluid discharge pressure sensor. This allows selecting the product operation when the alarm "AL18" is activated.

This function is set to "Operation stops at time of alarm" by default.

If the operation at the time of the alarm "AL18" is set to become [OFF] (disabled) or [WRN] (operation continues at time of alarm), the pump operation mode switches to the "Pump output setting mode" (50% output) to continue operation when a pressure sensor failure is detected.

Discharge pressure alarm (AL18/AL19/AL20)



Setting of discharge pressure alarm (AL18/AL19/AL20)

Table 5.4-8 Settings for AL18/AL19/AL20

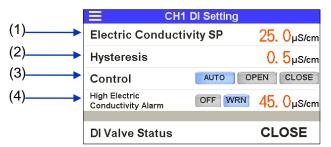
No.	Indication	Item		etting and selection	Setting range
		AL19 : CH1	OFF	Disabled	
(1)	High Press.	Circulating fluid discharge	WRN	Operation continues during the alarm	0.03 to 0.68MPa *0.50MPa
	1 1033.	pressure rise	FLT *	Operation stops during alarm	*0.50Wi a
		AL20 : CH1	OFF	Disabled	
(2)	Low Press.	Circulating fluid discharge	WRN	Operation continues during the alarm	0.03 to 0.68MPa *0.03MPa
		pressure drop	FLT *	Operation stops during alarm	
	_	AL18: Failure	OFF	Disabled	
(3)	Press. Sensor	of circulating fluid discharge	WRN	Operation continues during the alarm	_
	Alarm	pressure sensor	FLT *	Operation stops during alarm	

^{*} By default

- · Electric conductivity and alarm setting (AL28)
 - **6.** Entering value settings for electrical conductivity of circulating fluid and hysteresis causes circulating fluid to flow from the solenoid valve through to the DI filter to control the electrical conductivity.
 - *Only in the case of option D1 "CH1 with electrical conductivity control", it can be set.

The following items can be set on "Electrical conductivity and alarm (AL28) setting" screen:

- Target electric conductivity value
- · Electric conductivity hysteresis
- Setting of solenoid valve operation during the operation of the product: "Control"/"Normally open"/"Normally closed".
- "Enabling"/"Disabling" of "AL28: CH2 electric conductivity increase" alarm function



Electric conductivity and alarm (AL28) setting

Table 5.4-9 Settings of electric conductivity (AL28)

No.	Indication	Item		Explanation	Setting range
(1)	Electric Conductivity SP	Target electric conductivity value	Sets a target electric conductivity value.		0.5 to 45.0µS/cm *25.0µS/cm
(2)	Hysteresis	Electric conductivity hysteresis	Refer to ■ Ab	Sets an electric conductivity hysteresis. Refer to ■ About electric conductivity control (P.5–44) for details.	
(3)	Control	Solenoid valve operating method	AUTO *	Controls the solenoid valve to achieve the target value. Normally open (remains open when product is stopped)	_
(4)	High Electric Conductivity Alarm	AL28: Setting of CH1 electrical conductivity increase alarm	"AL28" activates when electrical conductivity increases above the set value. This sets the setting value and operation when an alarm occurs. "AL28" automatically turns off the alarm when the electrical conductivity falls below the set value. OFF Disabled WRN * Operation continues during the alarm		0.4 to 46.0µS/cm *45.0µS/cm

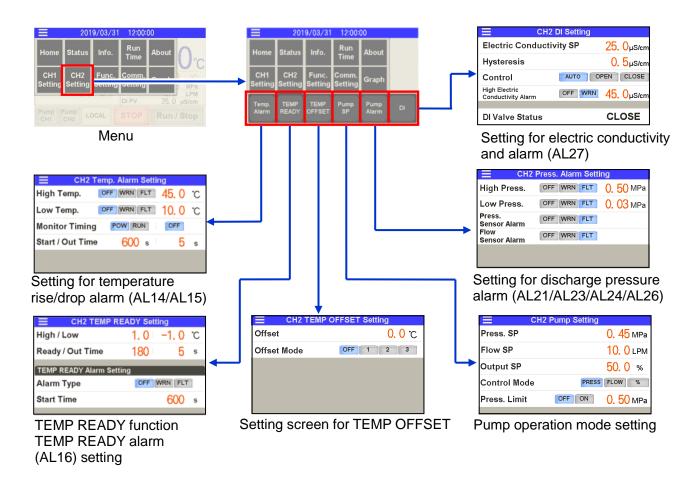
^{*}By default

For more information on electric conductivity control, refer to "■ Electrical conductivity" (P.5-44).

5.4.8 CH2 setting screen

A screen for shifting to the following setting screens is displayed if [CH2 | Setting |] button on the menu is pressed.

- Setting screen for circulating fluid temperature rise/drop alarm (AL14/AL15)
- Setting screen for TEMP READY alarm (AL16) of TEMP READY function
- Setting screen for TEMP OFFSET
- Setting screen for pump operation mode
- Setting screen for discharge pressure alarm (AL21/AL23/AL24/AL26)
- Setting screen for electric conductivity (AL27)



Temperature rise/drop alarm (AL14/AL15) setting

1. An alarm can be activated when the current temperature of circulating fluid rises/drops outside of the setting range.

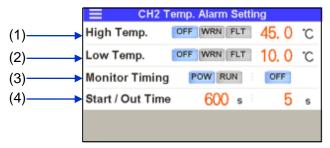
This function is OFF (deactivated) by default.

The following two types of alarm can be set on the "Temperature rise/drop alarm setting" screen:

- AL14: Alarm for CH2 circulating fluid temperature rise—this alarm activates when the temperature rises above the set temperature.
- AL15: Alarm for CH2 circulating fluid temperature drop—this alarm activates when the temperature drops below the set temperature.

Following settings can also be selected: Refer to Table 5.4-10 Settings of AL14/AL15 for details.

- Operation of the product at the time of alarm
- · Conditions to start alarm monitoring
- · Start time for alarm monitoring



Temperature rise/drop alarm (AL14/AL15) setting

Table 5.4-10	Settings of	AL 14/AL 15
--------------	-------------	-------------

No.	Indication	Item		Setting and selection	Setting range
(1)	High Temp.	AL14 : CH2 Circulating fluid temperature rise	OFF * WRN	Disabled Operation continues during the alarm Operation stops during alarm	10 to 50 °C *45 °C
(2)	Low Temp.	AL15 : CH2 Circulating fluid temperature drop	OFF * WRN	Disabled Operation continues during the alarm Operation stops during alarm	1 to 40 °C *5°C
(3)	Monitor Timing	Alarm monitoring conditions	POW *	Continuous monitoring (monitoring continues even when the operation stops) Monitoring continues only during operation. If [RUN] is selected, [OFF] or [AUTO] should be selected. Refer to About alarm monitoring timing (P.5–25) for details.	_
	Start/	No monitoring	[Start Time]	Alarm monitoring starts when the set time has passed after start of operation.	0 to 9999sec *600sec
(4)	Out Time	time/extra time	[Out Time]	The alarm is activated when the set time has passed after the temperature rises/drops out of the alarm setting range.	0 to 600sec *5sec

^{*} By default.

2. "TEMP READY" signal can be output by signal contact and serial communication if the circulating fluid temperature is within the range set for the time and temperature.

"TEMP READY" signal cannot be "Disabled".

[Ready] is displayed on the "home" screen if "TEMP READY" conditions are met. (Refer to 5.4.1 Home screen Operating condition display.)

If the TEMP READY conditions are not met, alarm can be activated as "AL16 : TEMP READY alarm". This function is OFF (deactivated) by default.

It can be set on "TEMP READY function setting" screen.

Refer to Table 5.4-11 TEMP READY signal setting and ■ About TEMP READY function (P.5–27) for details.

[•]TEMP READY alarm (AL16) and TEMP READY function



TEMP READY signal (AL16) setting

Table 5.4-11 TEMP READY signal setting

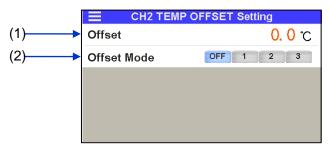
No.	Indication	Item	S S	Setting and selection		
(1)	High/ Low	Upper/lower temperature limit	[High]	Set the temperature range of the circulating fluid SP.	+0.1 °C to +10.0 °C * +1.0 °C	
(1)			[Low]	Set the temperature range of the circulating fluid SP.	-0.1 °C to -10.0 °C * -1.0 °C	
	Ready/ Out Time	Stable temperature time/extra time	[Ready]	"TEMP READY" signal is output when the set time has passed after the circulating fluid temperature rises/drops within the range of (1) "Upper/Lower temperature limit."	10sec to 9999sec * 180sec	
(2)			[Out Time]	"TEMP READY" is cleared when the set time has passed after the circulating fluid temperature rises/drops outside the range of (1) "Upper/Lower temperature limit" in the "TEMP READY" condition.	Osec to 600sec * 5sec	
			OFF *	Disabled	-	
(3)	Alarm Type	AL16 alarm operation	WRN	Operation continues during the alarm	_	
			FLT	Operation stops during alarm	_	
(4)	Start Time	Start time for AL16 alarm monitoring	[Start Time]	Monitoring of "AL16: TEMP READY alarm" starts when the set time has passed after the start of operation.	0sec to 9999sec * 600sec	

^{*} By default

Offset (TEMP OFFSET) function

3. The circulating fluid temperature can be offset. Refer to ■ About offset function (P.5–29) for details.

This function can be set on "Offset setting" screen. Refer to Table 5.4-12 Offset setting for details.



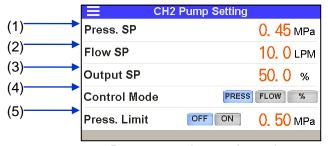
Offset setting

Table 5.4-12 Offset setting

No.	Indication	Item	Explanation	Setting range
(1)	Offset Temp.	Offset temperature	Sets offset temperature.	-20.0 °C to +20.0°C [By default] 0.0°C
(2)	Offset Mode	Offset mode	Selects the offset mode. [OFF] Disabled [1] MODE 1 [2] MODE 2 [3] MODE 3	OFF / 1 / 2 / 3 [By default] OFF

·Pump operation mode

4. Pump operation mode can be set up. Setting method is the same as "CH1 pump operation mode." Refer to "CH1 pump operation mode" (P.5–32). Setting range and default settings are shown in Table 5.4-13 Pump operation mode setting.



Pump operation mode setting

Table 5.4-13 Pump operation mode setting

No.	Indication	Item	Explanation	Setting range
(1)	Press.SP	Set the pressure while in pressure control mode	(4) The pump operation is controlled to maintain the set pressure when "control mode" (operation mode) is set to [PRESS].	0.10 to 0.49 MPa *0.45 MPa
(2)	Flow SP	Set flow rate in the flow rate control mode	(4) The pump operation is controlled to maintain the set flow rate when "control mode" (operation mode) is set to [FLOW].	2.0 to 10.0 LPM *10.0 LPM
(3)	Output SP	Set the output in the output setting mode	(4) The pump operation is controlled to maintain the set output (rotation) when "control mode" (operation mode) is set to [%].	45.0 to 100.0% *45.0%
(4)	Control Mode	Selection of pump operation mode	Selects the pump operation mode PRESS * Pressure control mode FLOW Flow rate control mode Set output mode	
(5)	PressLimit	Pressure setting for pressure control function	Selects enabling/disabling of the pressure control. OFF * Function disabled ON Function enabled	0.10 to 0.50 MPa *0.50 MPa

^{*}By default

Discharge pressure alarm (AL21/AL23/AL24/AL26)

5. An alarm can be activated when the circulating fluid discharge pressure rises/drops outside the setting range.

This function is set to "[FLT] (stop) at the time of alarm" by default.

The following two alarms can be set on "Discharge pressure alarm setting" screen:

- AL23: Alarm for CH2 circulating fluid discharge pressure rise—the alarm activates if the
 pressure rises above the set pressure.
- AL24: Alarm for CH2 circulating fluid discharge pressure drop—the alarm activates if the pressure drops below the set pressure.

Following settings can also be selected.

· Selection of product operation when an alarm occurs

"AL21: CH2 failure in circulating fluid discharge pressure sensor" is activated if a failure is detected in the circulating fluid discharge pressure sensor. The product operation at the time of alarm "AL21" can be selected.

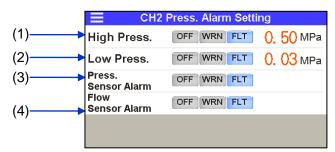
This function is set to "[FLT] (stop) at the time of alarm" by default.

If the operation at the time of the alarm "AL21" is set to be [OFF] (disabled) or [WRN](operation continues at the time of alarm), the pump operation mode switches to the "pump output setting mode" (45% output) to continue operation when a failure is detected in the circulating fluid discharge pressure sensor.

Alarm "AL26: CH2 failure of circulating fluid flow sensor" is activated if failure is detected in the circulating fluid flow sensor. The product operation at the time of alarm "AL26" can be selected.

This function is set to "Operation stops at time of alarm" by default.

If the operation at the time of the alarm "AL26" is set to be [OFF] (disabled) or [WRN](operation continues at the time of alarm), the pump operation mode switches to "Pump output setting mode" (45% output) to continue operation when a failure is detected in circulating fluid discharge pressure flow sensor.



Discharge pressure alarm (AL21/AL23/AL24/AL26)

	Table 5.4-14 Settings of AL21/AL23/AL24/AL26						
No.	Indication	Item	Setting and selection		Setting range		
	High Press.	AL23 : CH2 Circulating fluid discharge pressure rise	OFF	Disabled			
(1)			WRN	Operation continues during the alarm	0.03 to 0.50MPa *0.50MPa		
			FLT *	Operation stops during alarm			
		AL24 : CH2	OFF	Disabled			
(2)	Low Press.	Circulating fluid discharge pressure drop	WRN	Operation continues during the alarm	0.03 to 0.50MPa *0.03MPa		
			FLT *	Operation stops during alarm			
	Press. Sensor Alarm	Sensor fluid discharge	OFF	Disabled			
(3)			WRN	Operation continues during the alarm	_		
			FLT *	Operation stops during alarm			
(4)	Flow Sensor Alarm	Sensor circulating fluid	OFF	Disabled			
			WRN	Operation continues during the alarm	_		
		Alarm failure	FLT *	Operation stops during alarm			

*By default

6. Entering value settings for electrical conductivity of circulating fluid and hysteresis causes circulating fluid to flow from the solenoid valve through to the DI filter to control the electrical conductivity.

The following items can be set on "Electrical conductivity and alarm (AL27) setting" screen:

- Target electric conductivity value
- Electric conductivity hysteresis
- Setting of solenoid valve operation during the operation of the product: "Control"/"Normally open"/"Normally closed".
- "Enabling"/"Disabling" of "AL27: CH2 electric conductivity increase" alarm function



Electric conductivity and alarm (AL27) setting

[•]Electric conductivity and alarm setting (AL27)

Table 5.4-15	Settings	of electric	conductivity	/ (AL27)

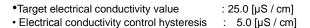
No.	Indication	Item	J	Setting range	
(1)	Electric Conductivity SP	Target electric conductivity value	Sets a target e	0.5 to 45.0µS/cm *25.0µS/cm	
(2)	Hysteresis	Electric conductivity hysteresis	Sets an electric conductivity hysteresis. Refer to ■ About electric conductivity control (P.5–44) for details.		0.1 to 10.0µS/cm *0.5µS/cm
(3)	Control	Solenoid valve operating method	OPEN	Controls the solenoid valve to achieve the target value. Normally open (remains open when product is stopped) Normally close	
(4)	High Electric Conductivity Alarm	AL27: Setting of CH2 electrical conductivity increase alarm	"AL27" activates when electrical conductivity increases above the set value. This sets the setting value and operation when an alarm occurs. "AL27" automatically turns off the alarm when the electrical conductivity falls below the set value. OFF Disabled Operation continues during the alarm		0.4 to 46.0μS/cm *45.0μS/cm

^{*}By default

■ About electric conductivity

An example of control of electrical conductivity control is shown in Figure 5-7 Example of electrical conductivity control.

Example operation of electric conductivity control



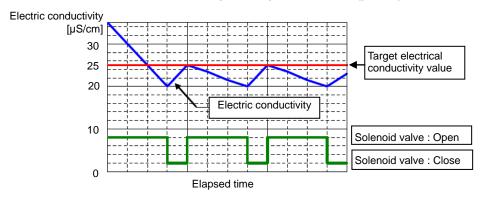
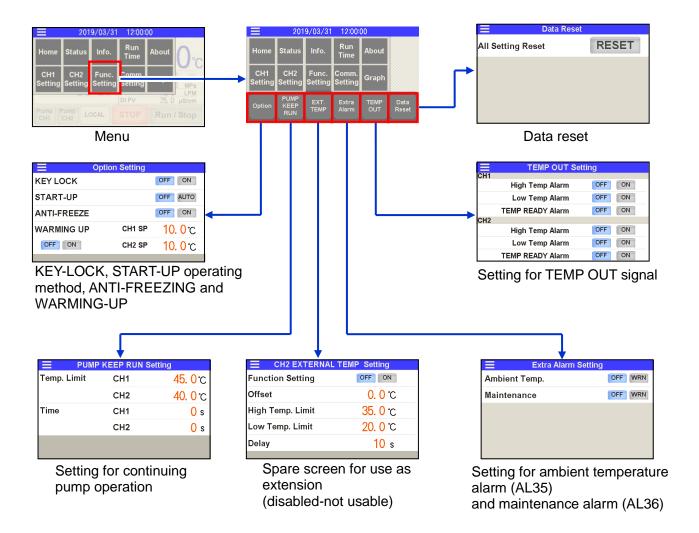


Fig.5-7 Example of electrical conductivity control

5.4.9 Function setting screen

A screen for shifting to the following setting screens is displayed if Func. [Setting] button on the menu is pressed.

- Setting screen of KEY-LOCK/START-UP operating method/ANTI-FREEZING/WARMING-UP
- Setting screen for continuing pump operation
- Setting screen for ambient temperature alarm (AL35) and maintenance alarm (AL36)
- Setting screen for TEMP OUT signal
- Setting screen for data reset



•KEY-LOCK, START-UP operating method, ANTI-FREEZING and WARMING-UP

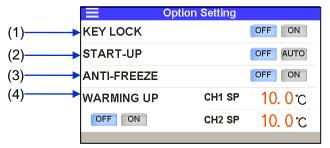
1. Following settings can be made on this product:

- KEY-LOCK———— prevents all operations other than "Run/Stop," "Change screen" and "Alarm reset."
- START-UP operation setting— a function to restore back to the state prior to power shutdown, after the power supply is restored, when power supply had been cut off due to a power outage.
- ANTI-FREEZING—— a function to prevent freezing of circulating fluid when the operation was stopped during winter time by automatic operation and by heating the circulating fluid with heat generated by pump. Pump automatic running and stopping is repeated to prevent freezing by maintaining circulating fluid temperature at 3°C to 5°C.
 - Pump automatically starts operating if the circulating fluid temperature drops below 3°C.
 - Circulating fluid is heated by the pump power generated by pump operation. When the circulating fluid temperature reaches 5°C or higher, the pump will stop operating automatically.
- WARMING-UP-
- a function to maintain the circulating fluid at the warming-up setting temperature when operation is stopped during winter time or at night by conducting automatic operation and heating the circulating fluid with heat generated by the pump.
- Pump automatically continues operating until the circulating fluid temperature rises up to +2°C, which is the warming-up setting temperature.
- Pump automatically stops operating when the circulating fluid temperature rises up to +2°C which is the warming-up setting temperature.
- Pump automatically restarts operation when the circulating fluid temperature drops to -2°C which is the warming-up set temperature.

A CAUTION



- The "ANTI-FREEZING" and "WARMING-UP" functions operate when the power supply is ON and the product operation is stopped.
- Fully open the valve or manual by-pass valve that was installed by the user to let the circulating fluid circulate when the pump operation automatically starts.



Setting of KEY-LOCK, START-UP operation, ANTI-FREEZING and WARMING-UP

Table 5.4-16	Settings of key-lo	ock, startup operation, anti-freezing and v	varming-up
Indication	Item	Explanation	Setting

No.	Indication	Item		Explanation	Setting range
(1)	(1) KEY LOCK	Key-lock	OFF *	Disabled	_
(1)	KET LOCK	Key-lock	ON	Enabled	_
(2)	START-UP	Startup	OFF *	Disabled	_
(2)	START-UP	operation	ON	Enabled	
(2)	ANTI-FREEZE	ZE Anti-freezing	OFF *	Disabled	_
(3)	ANTIFREEZE		ON	Enabled	
			OFF *	Disabled	_
		G UP Warming-up	ON	Enabled	_
(4)	WARMING UP		CH1 SP	CH1 set temperature	5.0 to 35.0 °C *5.0 °C
			CH2 SP	CH2 set temperature	10.0 to 40.0 °C *10.0 °C

^{*}By default

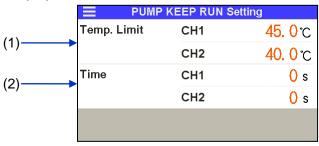
2. Continuing pump operation can be set.

Refer to ■ About continuous pump operation function (P.5–48) for this function.

This function is set to "Disabled" by default.

Following items can be set on "Continuous pump operation" setting screen:

- Pump operation sustainable temperature
- Pump operation sustainable time



Setting for continuous pump operation

Table 5.4-17 Settings for continuous pump operation

No.	Indication	Item	Explanation		Setting range
(1)	Pump operation CH1 "Continuous pump operation" ends when the temperature		5.0 to 50.0 °C *45.0 °C		
(1) Temp. Limit	sustainable temperature CH2	CH2	reaches the set temperature.	10.0 to 45.0 °C *40.0 °C	
(2)	Time	Pump operation sustainable	CH1	"Continuous pump operation" ends when the set time has elapsed. Set time: 0 sec—this function is	0 to 9999sec *0sec
		time	CH2	"Disabled"	

^{*}By default

Continuing pump operation

■ About continuous pump operation function

This function allows just the pump to continue operating after some alarms are activated. Alarms that allow continuous pump operation are shown in Table 5.4-18 Alarms that allow continuous pump operation (1/2) and Table 5.4-19 Alarms that allow continuous pump operation (2/2).

"Continuous pump operation" ends if any one of the following conditions is met, and the product stops operating:

- (1) After activation of the alarm, the temperature has reached the "Pump operation sustainable temperature" from the temperature at which pump-only operation starts.
- (2) After activation of the alarm, the time reached the "Pump operation sustainable time" starting from the time at which pump-only-operation started.

Table 5.4-18 Alarms that allow continuous pump operation (1/2)

Table 5.4-18 Alarms that allow continuous pump operation (1/2)						
Alarm		Alarms that allow continuous				
No.	Alarm name		pump op	eration		
INU.		Operation	CH1	CH2		
AL01	CH1 Low Level FLT	[FLT]	×	0		
AL02	CH1 Low Level WRN	[WRN]	-	-		
AL03	CH2 Low Level FLT	[FLT]	0	×		
AL04	CH2 Low Level WRN	[WRN]	-	-		
AL06	Fan Inverter	[FLT]	0	0		
AL09	CH1 Hgih Temp. FLT	[FLT]	×	0		
A1 40	CH1 Hgih Temp.	[OFF]* / [WRN]	-	-		
AL10	Orri rigin remp.	[FLT]	0	0		
A1 11	CH1 Low Temp.	[OFF]* / [WRN]	_	-		
AL11	CHI LOW TEMP.	[FLT]	0	0		
AL12	CH1 TEMP READY ALARM	[OFF]*/[WRN]	-	-		
AL1Z	OTT TEIVII INCADT ACAINI	[FLT]	0	0		
AL13	CH2 High Temp. FLT	[FLT]	0	×		
AL14	CH2 High Temp.	[OFF]* / [WRN]	-	-		
AL14		[FLT]	0	0		
AL15	CH2 Low Temp.	[OFF]* / [WRN]	-	_		
ALIO		[FLT]	0	0		
AL16	CH2 TEMP READY ALARM	[OFF]* / [WRN]	_	-		
ALIO	OHZ TEIVII INCAD I ACAINI	[FLT]	0	0		
AL17	CH1 HX In High Temp. FLT	[FLT]	×	0		
AL18	CH1 Press. Sensor	[OFF] / [WRN]	-	-		
ALIO	O.11 1 1033. OO11301	[FLT]*	×	0		
AL19	CH1 High Press.	[OFF] / [WRN]	_	_		
ALIS	OTT Thight 1033.	[FLT]*	×	0		
AL20	CH1 Low Press.	[OFF] / [WRN]	-	-		
ALZU	0.11 Low 1 1000.	[FLT]*	0	0		
AL21	CH2 Press. Sensor	[OFF]/[WRN]	_	_		
ALZI	0112 1 1033. 0011301	[FLT] *	0	×		
AL22	CH2 High Press. Error	[FLT]	0	×		

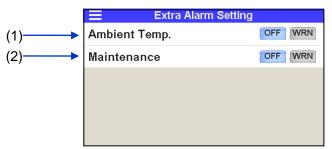
Table 5.4-19 Alarms that allow continuous pump operation (2/2)

Alarm	Table 5.4-19 Alarms that a	Alarms that allo			
No.	Alarm name		pump operation		
		Operation	CH1	CH2	
AL23	CH2 High Press.	[OFF] / [WRN]	_	_	
ALZS	0112 1 light 1 1000.	[FLT]*	0	×	
AL24	CH2 Low Press.	[OFF] / [WRN]	_	-	
ALZ4	GHZ LOW Fress.	[FLT]*	0	0	
AL25	CH2 Low Press. Error	[FLT]	0	×	
AL26	CH2 Flow Sensor	[OFF] / [WRN]	_	-	
ALZO	CHZ HOW Serisor	[FLT]*	0	0	
AL27	CH2 High Electric conductivity	[OFF] / [WRN]*	-	-	
AL28	CH1 High Electric conductivity (Option D1 only)	[OFF] / [WRN]*	-	-	
AL30	Digital input 1	[OFF] / [WRN]	_	-	
AL30	Digital Input 1	[FLT]*	0	0	
AL31	Digital input 2	[OFF] / [WRN]	_	-	
ALST	Digital Input 2	[FLT] *	0	0	
AL34	Communication	[OFF] / [WRN]*	-	-	
AL34	Communication	[FLT]	0	0	
AL35	Ambient Temp.	[OFF]* / [WRN]	-	-	
AL36	Maintenance	[OFF]* / [WRN]	-	-	
AL37	Refrigeration Circuit	[FLT]	0	0	
AL38	Sensor	[FLT]	×	×	
AL39	Controller	[FLT]	×	×	
AL40	Compressor Inverter	[FLT]	0	0	
AL41	Compressor Inverter Comm.	[FLT]	0	0	
AL42	CH1 Pump Inverter	[FLT]	×	0	
AL43	CH1 Pump Inverter Comm.	[FLT]	×	×	
AL44	CH2 Pump Inverter	[FLT]	0	×	
AL45	CH2 Pump Inverter Comm.	[FLT]	×	×	

^{*} Default setting.

^{• &}quot;FLT": Operation stops when alarm occurs; "WRN": operation continues when alarm occurs; "OFF": alarm is disabled.

- •Ambient temperature alarm (AL35) and maintenance alarm (AL36)
 - **3.** Following alarms can be set for this product:
 - AL35: Ambient temperature alarm— the alarm "AL35" activates when the ambient temperature value of the product rises/drops out of the range between 2°C and 45°C.
 This function is set to "OFF" (disabled) by
 - default.
 - AL36: Maintenance alarm—— "Maintenance reminder" can be assigned to alarm "AL36" as an alarm signal.
 This function is set to "Disabled" by default.



Setting for ambient temperature alarm (AL35) and maintenance alarm (AL36)

Table 5.4-20 Settings for ambient temperature alarm (AL35) and maintenance alarm (AL36)

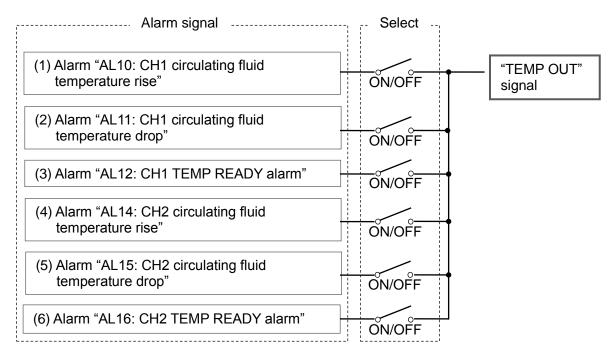
No.	Indication	Item	E	xplanation	Remarks
	Ambient	AL35: Ambient	OFF *	Disabled	The alarm activates when the ambient temperature
(1) Temp.		temperature alarm	WRN	Operation continues during the alarm	sensor is outside of the range between 2°C and 45°C.
		AL36:	OFF *	Disabled	If "WRN" is selected, the alarm "AL36" activates
(2) Maintenar	Maintenance	Maintenance alarm	WRN	Operation continues during the alarm	when "Maintenance reminder" is issued.

*By default

•TEMP OUT signal

4. Set "TEMP OUT" signal.

"TEMP OUT" signal has a function to make an arbitrary selection from the following six alarm signals to output a "TEMP OUT" signal from a contact or serial communication. This function is set to "OFF" (disabled) by default.



TEMP OUT signal output chart

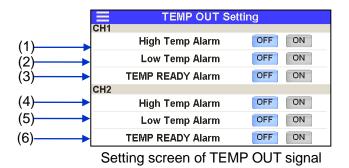


Table 5.4-21 Se	ettings for	TEMP (OUT s	ignal
-----------------	-------------	--------	-------	-------

No.	Indication		Explanation	Setting	
(1)		High Temp.	Alarm "AL10: CH1 circulating fluid temperature rise"	OFF *	Disabled
		7.10.111	tomporatare nee	ON	Enabled
(2)	CH1	Low Temp.	Alarm "AL11: CH1 circulating fluid	OFF *	Disabled
(2)	0111	Alarm	temperature drop"	ON	Enabled
(3)		TEMP READY	Alarm "AL12: CH1 TEMP READY alarm"	OFF *	Disabled
(0)	(0)	Alarm	, adm , te i z i diam , te i z i diam ,	ON	Enabled
(4)		High Temp.	Alarm "AL14: CH2 circulating fluid	OFF *	Disabled
(4)		Alarm	temperature rise"	ON	Enabled
(5)	CH2	Low Temp.	Alarm "AL15: CH2 circulating fluid	OFF *	Disabled
(3)	(6)	Alarm	temperature drop"	ON	Enabled
(6)		TEMP READY	Alarm "AL16: CH2 TEMP READY alarm"	OFF *	Disabled
(0)		Alarm	AIAIIII ALTU. CITZ TEIVIF NEADT AIAIIII	ON	Enabled

^{*} By default

5. Reset the product settings to the default settings.
The settings can be reset on "Data reset" setting screen.
"Date and time," "Operation time" and "Alarm history" are not reset.



Data reset setting screen

Table 5.4-22 Data reset setting

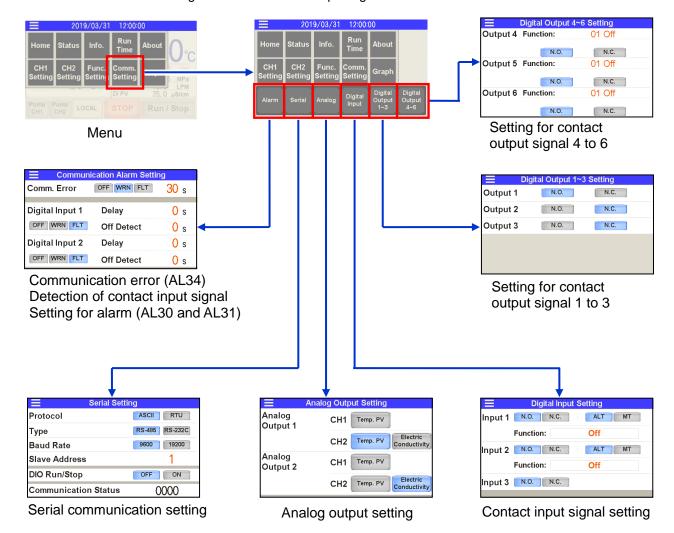
No.	Indication	Item	Explanation		
(1)	All Setting Reset	Data reset	RESET	Set values are reset to default settings.	

Data reset

5.4.10 Communication setting screen

A screen for shifting to the following setting screens is displayed if [setting] button on the menu is pressed.

- Setting screen for communication error (AL34) and contact input signal detection alarm (AL30 and AL31)
- Setting screen for serial communication
- Setting screen for analog output
- Setting screen for contact input signal form
- Setting screen for contact output signal 1 to 3
- Setting screen for contact output signal 4 to 6



- •Setting for communication error (AL34)/contact input signal detection (AL30 and AL31)
 - **1.** Set communication error (AL34) and contact input signal detection.
 - Communication error (AL34)
 The alarm "AL34: communication error" is activated if no request message from the host computer arrives within the wait time during use of serial communication.

Operation at the time of alarm and message waiting time can be set.

Detection of contact input signal (AL30 and AL31)

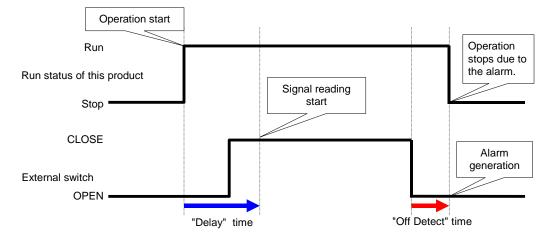
The product has two contact inputs available to detect the contact input signal. This allows reading and monitoring the contact signal from an external switch. If abnormality is detected in an external switch, this can activate an alarm. Options to select "Continuous monitoring" or "Monitoring during operation" are available. Also, the detection start time after the start of operation and the detection end time can be set.

- If the signal of "Contact input 1" is detected: the alarm "AL30: Detection of contact input 1 signal" is activated.
- If the signal of "Contact input 2" is detected: the alarm "AL31: Detection of contact input 2 signal" is activated.
- "Delay" time: sets the start time to detect the contact input signal after the start of operation.
- "Off detect" time: sets the time between the detection of the contact input OFF signal and the activation of the alarm.

Table 5.4-23 Monitoring method for contact input signal
"Delay" time Monitoring method

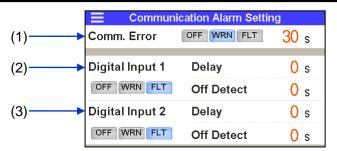
Osec Continuous monitoring

1 to 300sec Monitoring during operation



"Delay" time and "Off detect" time

This function is set to "Disabled" by default. Refer to "Setting of contact input signal form" (P.5–57) for details. Contact input signal can be used to perform the "Run/Stop" of the product. Refer to "Setting of contact input signal form" (P.5–57) for the setting method.



Communication error, detection of contact input signal and operation setting

Table 5.4-24 Communication error, detection of contact input signal and operation setting

No.	Indication	Item	Setting	and selection	Setting range	
			OFF	Disabled		
(1) Comm. Error	Alarm "AL34: Communication error"	WRN *	Operation continues during the alarm	Waiting time	30 to 600sec *30sec	
			FLT	Operation stops during alarm		
			OFF Disabled		Delay	0 to 300sec *0sec
(0)	(2) Digital Input 1	Alarm "AL30: Detection of contact input 1 signal"		Operation	Off Detect	10300
(2)			[WRN]	continues during the alarm		0 to 10sec
			FLT *	Operation stops during alarm		*0sec
				Disabled	Delay	0 to 300sec
(3) Digital Input 2	Alarm "AL31:		Operation	,	*0sec	
	Detection of contact input 2 signal"	WRN	continues during the alarm		0 to10sec *0sec	
		FLT *	Operation stops during alarm	Off Detect		

^{*} By default

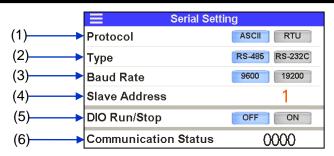
2. Set serial communication.

The following operations can be performed by the serial communication RS-232C/RS-485:

- To run/stop the product
- To change the set value of circulating fluid temperature
- To readout the circulating fluid temperature, pressure, flow rate and electrical conductivity (CH2)
- To readout the status of respective parts of the product (e.g., operation status and content of alarm)

This section describes the operation of the "Serial communication setting" screen. Refer to "Communication Function" of Operation Manual for details such as for communication messages.

[·]Serial communication setting



Serial communication setting

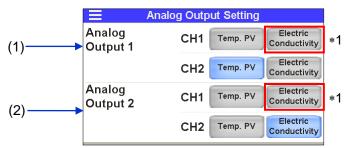
Table 5.4-25 Setting of serial communication

No.	Indication	Item		ection and display
(1)	Protocol	Communication format	ASCII *1	ASCII code
(1)	1 1010001	Communication format	RTU	Binary data
(2)	Tyroo	Standard	RS-485 *1	EIA RS-485
(2)	Туре	Standard	RS-232C	EIA RS-232C
(2)	Dovid Data	Communication on and	9600	9600 bps
(3)	Baud Rate	Communication speed	19200 *1	19200 bps
(4)	Slave Address	Slave address	1 to 32 1 *1	Select from 1 to 32
(5)	DIO Run/Stop *2	"Run/stop" by contact input	OFF *1	Disabled
(3)	DIO Kun/Stop *2	Transcop by contact input	ON	Enabled
(6)	Communication Status	Communication status	0000	Displays the communication status

^{*1} By default

^{*2 &}quot;Run/stop" operation of the product is carried out by the contact input signal, and by reading/writing the "Change in set value of circulating fluid temperature" and "Operation status" by serial communication.

- Setting of analog output signal
 - **3.** The product has two analog outputs. The following signals can be output as analog signals:
 - Analog output signal 1— "CH1 circulating fluid temperature" or "Electric conductivity
 *1", "CH2 circulating fluid temperature" or "Electric conductivity".
 - Analog output signal 2— "CH1 circulating fluid temperature" or "Electric conductivity
 *1", "CH2 circulating fluid temperature" or "Electric conductivity".



Setting of analog output signal

*1 In the case of option D1 "CH1 with electrical conductivity control", it can be set.

Table 5.4-26 Setting of analog output signal

No.	Indication	Item		ction and display	Output	
				CH1 Temp. PV	CH1 circulating fluid temperature	0°C-100°C: 0-10 V
(1)	Analog	Angles autout simal 1	CH1 Electric *2		0.1-50.0 μ S/cm: 0.02-10.0 V	
	(1) Output 1	Analog output signal 1	CH2 Temp. PV *1	CH2 circulating fluid temperature	0°C-100°C: 0-10 V	
			CH2 Electric Conductivity	CH2 electric conductivity	0.1-50.0 μ S/cm: 0.02-10.0 V	
		Analog output signal 2	CH1 Temp. PV	CH1 circulating fluid temperature	0°C-100°C: 0-10 V	
(2)	Analog		CH1 Electric *2	CH1 electric conductivity	0.1-50.0 μ S/cm: 0.02-10.0 V	
(2)	Output 2		CH2 Temp. PV	CH2 circulating fluid temperature	0°C-100°C: 0-10 V	
			CH2 Electric *1	CH2 electric conductivity	0.1-50.0 μ S/cm: 0.02-10.0 V	

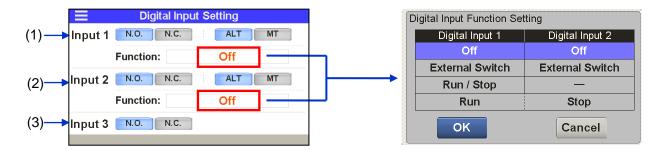
^{*1:} By default.

·Setting of contact input signal form

- **4.** The type and form of contact input signal are set. Following items can be set for contact input signal 1 and 2:
 - Contact type···selects [N.O.] (A contact) or [N.C.] (B contact)
 - Signal form····selects [ALT] (alternate) or [MT] (momentary)
 - Signal type····selects "OFF" (disabled), "External switch" (external switch signal) or "Run/Stop" (run/stop) signal.

^{*2:}

"Operation mode" can be switched from "Local mode/Serial mode" to "DIO mode" by inputting a contact signal in contact input 3. Refer to the "Communication Function" of Operation Manual for details.



Setting of contact input signal form

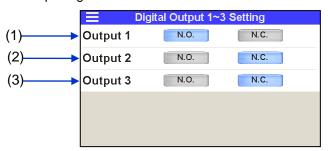
Table 5.4-27 Setting of contact input signal form

No.	Indication	Item		Setting	and selection	
				N.O. *1	A contact (normally open)	
			type	N.C.	B contact (normally closed)	
(1)	Input 1	Contact input	Signal	ALT *1	Alternate	
(1)	Input 1	signal 1	form	MT	Momentary	
				[Off]	Disabled	
			Signal	[External Switch]	External switch signal	
			type	[Run/Stop] *1	Run/stop signal	
				[Run] *2	Run signal	
		out 2 Contact input signal 2	Contact	N.O. *1	A contact (normally open)	
			type	N.C.	B contact (normally closed)	
(0)			Signal	ALT *1	Alternate	
(2)	Input 2		form	MT	Momentary	
				[Off]	Disabled	
			Signal	[External Switch] *1	External switch signal	
			type	[Run/Stop]	Run/stop signal	
				[Stop] *2	Stop signal	
(2)	Innut 0	Contact input	Contact	N.O. *1	A contact (normally open)	
(3)	input 3	Input 3 signal 3 *3	type	N.C.	B contact (normally closed)	

- *1 : By default.
- *2 : This setting assigns "Run" signal to "Contact input 1" and "Stop" signal to "Contact input 2".
- *3: The signal form of contact input 3 is "Momentary".

- Setting of contact output signal 1 to 3
 - **5.** Set contact output signal 1 to 3. Contact output signal is continuously output.

 The signal type of contact output signal 1 to 3 is fixed. Contact output signal 4 to 6 can be used to change the signal type. The contact type of the following contact output signals can be set:
 - Contact output signal 1 "Operation status" selects "N.O." (A contact) or "N.C." (B contact).
 - · Contact output signal 2 "FLT alarm" ————selects "N.O." (A contact) or "N.C." (B contact).
 - · Contact output signal 3 "WRN alarm" ———selects "N.O." (A contact) or "N.C." (B contact).



Setting of contact output signal 1 to 3

Table 5.4-28 Setting of contact output signal 1 to 3

No.	Indication	li	Item		g and selection
(1)	Output 1	Contact output	Operation status	N.O. *	A contact (normally open)
(1)	1 7 1 3 1 6 31 177 31 17 1	signal 1	signal	N.C.	B contact (normally closed)
(2)	Output 2	Contact output	Operation stop (FLT) alarm status	N.O.	A contact (normally open)
(2)	(2) Output 2 signal 2	signal 2	signal	N.C. *	B contact (normally closed)
(3)	Output 2	Contact output	Continuous operation "WRN"	N.O.	A contact (normally open)
(3)	(3) Output 3	signal 3	alarm status signal	N.C. *	B contact (normally closed)

^{*} By default

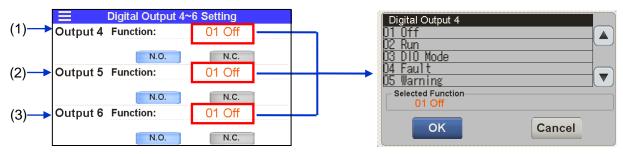
Set contact output signal 4 to 6. Contact output signal is continuously output.

A "Signal type" for contact output signal 4 to 6 can be selected by the customer. Refer to "5.4-30 Signal type for contact output signals 4 to 6."

Select the "Contact type" and "Signal type" for contact output signals 4 to 6.

- Contact output signal 4—selects "Signal type" and "N.O." (A contact) or "N.C." (B contact).
- Contact output signal 5—selects "Signal type" and "N.O." (A contact) or "N.C." (B contact).
- Contact output signal 6—selects "Signal type" and "N.O." (A contact) or "N.C." (B contact).

[·]Setting of contact output signal 4 to 6



Setting of contact output signal 4 to 6

Selection of signal type

Table 5.4-29 Setting of contact output signal 4 to 6

No.	Indication	Item	Signal type		Contact type
(4)	Output 4 Contact output			N.O. *	A contact (normally open)
(1)	Function	signal 4	Select from "Table 5.4-29 Signal type for contact output signal 4 to 6" * [OFF]	N.C.	B contact (normally closed)
(2)	Output 5	Contact output		N.O. *	A contact (normally open)
(2)	Function	signal 5		N.C.	B contact (normally closed)
(2)	Output 6	Contact output		N.O. *	A contact (normally open)
(3) Function	•		N.C.	B contact (normally closed)	

^{*}By default

Table 5.4-30 Signal type for contact output signal 4 to 6

No.	Indication	Item	Contact type	Explanation		
1	Off	Disableing	N.O.	Normally open		
1	Oli	Disableing	N.C.	Normally closed		
	Dim	Operation status signal	N.O.	Operation : closed		
2	Run	Operation status signal	N.C.	Stop : closed		
	DIO Mada	DIO mada signal	N.O.	DIO mode : closed		
3	DIO Mode	DIO mode signal	N.C.	DIO mode : open		
4	Foult	Operation stop "FLT" alarm	N.O.	the time of alarm : closed		
4	Fault	status signal	N.C.	the time of alarm : open		
5	Morning	Continuing operation "WRN"	N.O.	the time of alarm : closed		
5	Warning	alarm status signal	N.C.	the time of alarm : open		
6	Alarm	alarm status signal	N.O.	the time of alarm : closed		
0	Alailli	alarm status signal	N.C.	the time of alarm : open		
7	Maintenance	maintenance reminder	N.O.	Maintenance reminders occurred : closed		
_ ′	Mantenance	status signal	N.C.	Maintenance reminders occurred : open		
8	CH1 TEMP READY	CH1 TEMP READY signal	N.O.	TEMP READY status : closed		
0	CHI TEWP READT	CH1 TEMP READY signal	N.C.	TEMP READY status : open		
9	CH3 TEMP DE ADV	CH2 TEMP READY signal	N.O.	TEMP READY status : closed		
9	CH2 TEMP READY	CH2 TEMP READY signal	N.C.	TEMP READY status : open		
10	TEMP OUT	TEMP OUT signal	N.O.	TEMP READY status : closed		
10	TEMP OUT	TEMP OUT signal	N.C.	TEMP READY status : open		
11	EXTERNAL TEMP	None	I	_		
12	START UP	Startup setting	N.O.	Enabled : closed		
12	START OF	status signal	N.C.	Enabled : open		
13	ANTI-FREEZING	Anti-freezing setting	N.O.	Enabled : closed		
13	ANTI-I NELZING	status signal	N.C.	Enabled : open		
14	WARMING UP	Warming up setting	N.O.	Enabled : closed		
14	WARIVIING OF	status signal	N.C.	Enabled : open		
15	Digital Input 1	Pass through signal of the	N.O.	Output the input signal as it is		
15	Digital Input 1	contact input signal 1	N.C.	Reverse output of the input signal		
16	Digital Input 2	Pass through signal of the	N.O.	Output the input signal as it is		
10	Digital Input 2	contact input signal 2	N.C.	Reverse output of the input signal		
17	Mode Request Input	Mode request input signal(DIO) (Pass through signal of the	N.O.	Output the input signal as it is		
17	Mode Nequest Input	contact input signal 3)	N.C.	Reverse output of the input signal		
		Selected alarm status signal	N.O.	Selected alarm occurrence : closed		
18	Select Alarm	Ociocica diami status signal	N.C.	Selected alarm occurrence : open		
		Refer to "Table 5.4-31 List of alarr	n selection" for			
		Matarasasasas	N.O.	Selected maintenance		
		Maintenance reminders		reminders occurred : closed Selected maintenance		
19	Select Maintenance	status signal	N.C.	reminders occurred : open		
		About selectable maintenance rer	minders			
		Refer to "Table 5.4-32 List of maintenance reminders".				

Table 5.4-31 List of alarm selection

Alarm No.	Indication	Explanation
AL01	CH1 Low Level FLT	CH1 abnormal low tank fluid level
AL02	CH1 Low Level WRN	CH1 low tank fluid level
AL03	CH2 Low Level FLT	CH2 abnormal low tank fluid level
AL04	CH2 Low Level WRN	CH2 low tank fluid level
AL06	Fan Inverter	Fan failure
AL09	CH1 High Temp. FLT	CH1 abnormal rise of circulating fluid temperature
AL10	CH1 High Temp.	CH1 circulating fluid temperature rise
AL11	CH1 Low Temp.	CH1 circulating fluid temperature drop
AL12	CH1 TEMP READY Alarm	CH1 TEMP READY alarm
AL13	CH2 High Temp. FLT	CH2 abnormal rise in circulating fluid temperature
AL14	CH2 High Temp.	CH2 circulating fluid temperature rise
AL15	CH2 Low Temp.	CH2 circulating fluid temperature drop
AL16	CH2 TEMP READY Alarm	CH2 TEMP READY alarm
AL17	CH1 HX In High Temp. FLT	CH1 abnormal rise in heat exchanger inlet temperature
AL18	CH1 Press. Sensor	CH1 failure of circulating fluid discharge pressure sensor
AL19	CH1 High Press.	CH1 circulating fluid discharge pressure rise
AL20	CH1 Low Press.	CH1 circulating fluid discharge pressure drop
AL21	CH2 Press. Sensor	CH2 failure of circulating fluid discharge pressure sensor
AL22	CH2 High Press. Error	CH2 abnormal rise in circulating fluid discharge pressure
AL23	CH2 High Press.	CH2 circulating fluid discharge pressure rise
AL24	CH2 Low Press.	CH2 circulating fluid discharge pressure drop
AL25	CH2 Low Press. Error	CH2 abnormal drop in circulating fluid discharge pressure
AL26	CH2 Flow Sensor	CH2 failure of circulating fluid discharge flow sensor
AL27	CH2 High Electric Conductivity	CH2 electric conductivity increase
AL28	CH1 High Electric Conductivity	CH1 electric conductivity increase(Option D1 only)
AL30	Digital Input 1	Contact input 1 signal detection
AL31	Digital Input 2	Contact input 2 signal detection
AL34	Communication	Communication error
AL35	Ambient Temp.	Outside of the ambient temperature range
AL36	Maintenance	Maintenance alarm
AL37	Refrigeration Circuit	Compressor circuit failure
AL38	Sensor	Sensor failure
AL39	Controller	Controller failure
AL40	Compressor Inverter	Compressor inverter error
AL41	Compressor Inverter Comm.	Compressor inverter communication error
AL42	CH1 Pump Inverter	CH1 pump inverter error
AL43	CH1 Pump Inverter Comm.	CH1 pump inverter communication error
AL44	CH2 Pump Inverter	CH2 pump inverter error
AL45	CH2 Pump Inverter Comm.	CH2 pump inverter communication error

^{*}Refer to Chapter 6 Alarm Notification and Troubleshooting.

Table 5.4-32 List of maintenance reminders

Maintenance No.	Indication	Explanation
MT01	CH1 Pump	CH1 pump maintenance
MT02	Compressor	Compressor maintenance
MT03	Fan	Fan maintenance
MT04	Dustproof Filter	Dust-proof filter maintenance
MT05	CH2 DI Filter	CH2 DI filter maintenance
MT06	CH2 Pump	CH2 pump maintenance
MT07	Low Battery	Battery maintenance
MT08	CH1 Pressure Sensor	Maintenance for CH1 circulating fluid
		discharge pressure sensor
MT09	CH2 Pressure Sensor	Maintenance for CH2 circulating fluid
	011211000010 0011001	discharge pressure sensor
MT10	CH2 Flow Sensor	Maintenance for CH2 circulating fluid
IVITIO	CHZ Flow Sensor	flow sensor
MT11	CH1 DI Filter	CH1 DI filter maintenance (Option D1 only)

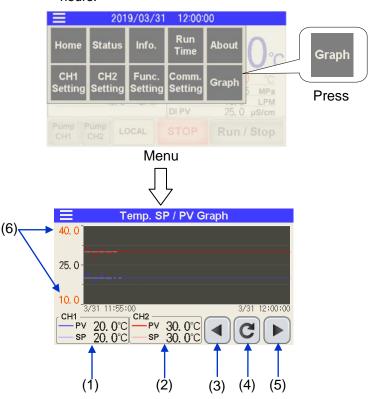
^{*} Refer to "5.4.5 Check operation time screen and maintenance reminder" for "Maintenance reminder".

5.4.11 Temperature waveform screen

Press [Graph] button on the menu to display "Temperature waveform" screen.

The "Temperature waveform" screen has following functions:

- Displays "CH1 circulating fluid temperature waveform". The sampling cycles are 1 sec. each.
- Displays "CH2 circulating fluid temperature waveform". The sampling cycles are 1 sec. each.
- "Temperature waveform" can be displayed up to approximately last 9 hours.



Temperature waveform screen

Table 5.4-33 Temperature waveform screen

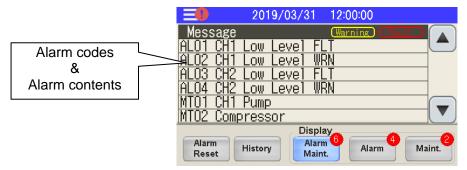
No.	Iten	n	Function	Explanation
(4)	PV temperatur		CH1 circulating fluid temperature	Displays the current circulating fluid temperature of CH1.
(1)	CH1	SP	CH1 set circulating fluid temperature	Displays the set circulating fluid temperature of CH1.
(2)	CH2	PV	CH2 circulating fluid temperature	Displays the current circulating fluid temperature of CH2.
(2)	СП2	SP	CH2 set circulating fluid temperature	Displays the set circulating fluid temperature of CH2.
(3)	(3) Button		Time scroll	Press the button to shift the time axis to the past. This can be displayed up to approximately the last 9 hours.
(4)	В	utton	Update of temperature waveform	Press "Time scroll" button to stop updating the temperature waveform. Press this button to update the temperature waveform. * Collection of temperature data can continue even while the update of temperature waveform is stopped, by pressing "Time scroll" button.
(5)	▶ Bu	utton	Time scroll	Press this button to shift the time axis forward.
(6)	Temperaturange	ire	Change of temperature range	A value can be entered to change the temperature range for temperature waveform.

Chapter 6 Alarm Notification and Troubleshooting

6.1 Alarm Notification

The product makes notification in the order shown below when any alarm is generated.

- The screen automatically moves to the "Information" screen and displays alarm codes and alarm contents.
 (Refer to "5.4.4 Information screen" for the operation method of "Information" screen.)
- Contact signal of the contact input/output communication is output.
- It is possible to read the alarm status using serial communication.
 Refer to the Operation Manual Communication Function for more details.



Information screen

6.2 Operation of this product when an alarm occurs

When an alarm occurs, this product operates in two ways depending on the content of the alarm.

- Operation continuation alarm: When an alarm occurs, this product continues to operate. The alarm content will display "WRN".
- Operation stop alarm: When an alarm occurs, this product stops.
 The alarm content will display "FLT".

There is an alarm content that allows you to select the action when an alarm occurs. There are also alarm contents that can disable (turn off) the alarm function. Refer to "Table 6.3-1 and 6.3-2 Alarm codes and troubleshooting".

HRL Series 6.1 Alarm Notification

6.3 Troubleshooting

6.3.1 Alarm contents, causes, and troubleshooting

Troubleshooting method varies depending on which alarm has been generated. Refer to "Table 6.3-1 and 6.3-2 Alarm codes and troubleshooting".

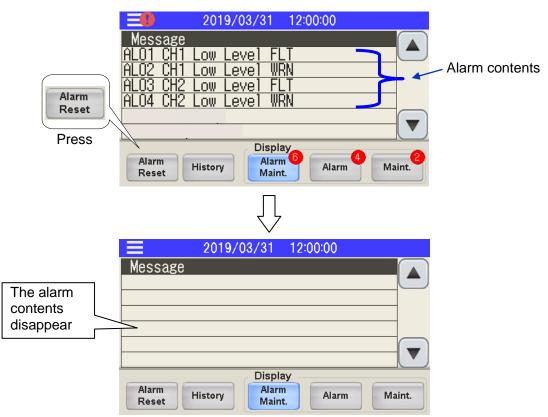
Instructions to reset the alarms after eliminating the causes of the alarms explained below.

 Check the alarm contents displayed on the "Information" screen and remove the cause. Alarms can not be canceled except this screen.

The alarm can be reset by serial communication.

Refer to the Operation Manual Communication Function for more details.

- [Alarm Reset]Press the button
- The alarm is reset.
 Confirm that the alarm content on the "Information" screen has disappeared. The alarm signal of contact output and serial communication turns off.



Alarm cancellation method

6.3 Troubleshooting HRL Series

Table 6.3-1 Alarm codes and troubleshooting (1/2)

Alarm	Alarm content	Defa	ult setting	Cause/Countermeasure
code	Sub code	Operation	Threshold	(Please reset the alarm after eliminating the cause.)
AL01	CH1 Low Level FLT	FLT	_	The circulating fluid level of CH1 has decreased.
AL02	CH1 Low Level WRN	WRN	_	Refilling circulating fluid.
AL03	CH2 Low Level FLT	FLT	_	The circulating fluid level of CH2 has decreased.
AL04	CH2 Low Level WRN	WRN	_	Refilling circulating fluid.
AL06	Fan Inverter	FLT	-	Check that there is no abnormality with the power supply system (e.g. ground fault, short-circuit, voltage fluctuation, abnormal interphase voltage, open phase, surge).
AL09	CH1 Hgih Temp. FLT	FLT	55°C	Check that the ambient temperature, and heat load satisfy the specifications,
AL10	CH1 Hgih Temp.	OFF *1	45°C *3	and that the circulating fluid flow rate is more than the minimum flow rate. Please review the setting value.
AL11	CH1 Low Temp.	OFF *1	5°C *3	Check the effect of ambient temperature. Please review the setting value.
AL12	CH1 TEMP READY ALARM	OFF *1	+1/-1°C *3	There may be causes such as large load fluctuation and flow rate fluctuation. Please review the setting value.
AL13	CH2 High Temp. FLT	FLT	50°C	Check that the ambient temperature, and heat load satisfy the specifications, and that the circulating fluid flow rate is more
AL14	CH2 High Temp.	OFF *1	45°C *3	than the minimum flow rate. • Please review the setting value.
AL15	CH2 Low Temp.	OFF *1	5°C *3	Check the effect of ambient temperature. Please review the setting value.
AL16	CH2 TEMP READY ALARM	OFF *1	+1/-1°C *3	There may be causes such as large load fluctuation and flow rate fluctuation. Please review the setting value.
AL17	CH1 HX In High Temp. FLT	FLT	60°C	Check that the circulating fluid flow rate is more than the minimum flow rate. Check that the heat load is within the specified range.
AL18	CH1 Press. Sensor	FLT *1	-	Short-circuit or broken wire of the pressure sensor. Ask for the service.
AL19	CH1 High Press.	FLT *1	0.50MPa *3	Check that there is no bending, collapse, or clogging with the external piping. Check that there is no clogging of the particle filter.
AL20	CH1 Low Press.	FLT *1	0.03MPa *3	Restart the thermo-chiller and check if the pump runs.
AL21	CH2 Press. Sensor	FLT *1	_	Short-circuit or broken wire of the pressure sensor. Ask for the service.
AL22	CH2 High Press. Error	FLT	0.50MPa	Check that there is no bending, collapse, or clogging with the external piping.
AL23	CH2 High Press.	FLT *1	0.50MPa *3	Check that there is no clogging of the particle filter.
AL24	CH2 Low Press.	FLT *1	0.03MPa *3	Restart the thermo-chiller and check if the pump runs.
AL25	CH2 Low Press. Error	FLT	0.03MPa	(Check the flow rate display value.)
AL26	CH2 Flow Sensor	FLT *1	_	Short-circuit or broken wire of the flow rate sensor. Ask for the service.
AL27	CH2 High Electric conductivity	WRN *2		Replace CH2 DI filter.
AL28 *4	CH1 High Electric conductivity	WRN *2	45.0µS/cm *3	Replace CH1 DI filter.
AL30 AL31	Digital input 1 Digital input 2	FLT *1		Contact input has been detected.
AL34	Communication	WRN *1	_	No request message from the host computer. Try to send the request message again.
AL35	Ambient Temp.	OFF *2	2°C/45°C	Check the environment.
ALJO	ransion romp.	O11 *Z	2 0/40-0	oncox the onvitoriment.

HRL Series 6.3 Troubleshooting

Table 6.3-2 Alarm codes and troubleshooting (2/2)

Alarm	Alarm content	Alarm content Default setting		Cause/Countermeasure	
code	Sub code	Operation	Threshold	(Please reset the alarm after eliminating the cause.)	
	Maintenance		_		
	1 CH1 Pump maintenance		20,000h	-	
	2 Compressor maintenance		30.000h		
	3 Fan maintenance	-	30,000h	1	
	4 Dust-proof filter maintenance	-	500h *3	1	
	5 CH2 DI filter maintenance		500h *3	-	
	6 CH2 Pump maintenance	-	20,000h		
AL36	7 Battery maintenance	OFF *2	20,00011	"Maintenance reminder" occurred.	
	8 Maintenance of CH1 circulating fluid	-		Please maintain the corresponding part.	
	discharge pressure sensor				
	9 Maintenance of CH2 circulating fluid	1	Abnormal		
	discharge pressure sensor		occurrence		
	10 Maintenance of CH2				
	circulating fluid flow sensor				
	11 CH1 DI filter maintenance *4		500h *3		
	Refrigeration Circuit		_		
	1 High compressor intake temp.		60°C		
	2 Low compressor intake temp.		0°C	Refrigerant circuit failed.	
	3 Super heat temp.		0°C	• Check that the ambient temperature,	
	5 Refrigeration circuit high press. rise		_	heat load satisfy the specifications.	
AL37	6 Refrigeration circuit high press. drop	FLT	_	· Check that the circulating fluid flow rate	
	8 Refrigeration circuit low press. drop		_	is more than the minimum flow rate.	
	9 Refrigeration circuit low press. rise		_	• Ask for the service.	
	11 Compressor running failure		_	1	
	12 Compressor discharge temp. rise		_		
	Sensor		_		
	1 CH1 Circulating fluid temp. sensor		_	1	
	2 CH1 Heat exchanger inlet temp. sensor		_	1	
	3 Compressor discharge temp. sensor		_		
	4 Compressor intake temp. sensor		_		
	5 CH2 Heat exchanger outlet temp. sensor		_	Short-circuit or broken wire of the sensor.	
AL38	6 Ambient temp. sensor	FLT	_	Ask for the service.	
	9 Refrigeration circuit high press. sensor		_		
	10 Refrigeration circuit low press. sensor		_	1	
	12 CH2 DI sensor		_		
	13 CH2 Circulating fluid temp. sensor		_		
	15 CH1 DI sensor *4	1		1	
	Controller		_		
	1 EEPROM error	1		-	
	2 Internal communication error		_	Controller failed.	
AL39	3 FRAM error	FLT	_	Shut off the power to this product and restart it.	
	5 Ref. memory error	1		If it does not return to normal, ask for service.	
	6 Cir. memory error	1	_	-	
AL40	Compressor Inverter	FLT			
AL41	Compressor Inverter Comm.	FLT		Check that there is no abnormality with	
AL42	CH1 Pump Inverter	FLT		the power supply system (e.g. ground fault,	
AL43	CH1 Pump Inverter Comm.	FLT		short-circuit, voltage fluctuation, abnormal	
AL44	CH2 Pump Inverter	FLT		interphase voltage, open phase, surge).	
/\LTT	CH2 Pump Inverter Comm.	FLT			

^{*1 :} Selectable from "OFF" / "WRN" / "FLT" *2 : Selectable from "OFF" / "WRN"

6.3 Troubleshooting HRL Series

^{*3 :} The setting value can be changed.

^{*4 :} In the case of option D1 "CH1 with electrical conductivity control", it can be set.

6.4 Other Errors

■ How to check other errors

Possible causes and countermeasures for failures with no alarm code display are shown in "Table6.4-1".

Table 6.4-1 Possible causes and countermeasures for failures without alarm code

Content of failure	Possible cause	Countermeasure
	The breaker of the user's power supply or/and the optional breaker is/are not turned ON.	Turn ON the breaker.
	Breaker of this product is broken	Replace the breaker.
Touch panel displays nothing.	No power supply. (e.g. Breaker(s) in the power supplying route has not been turned ON.)	Supply the power.
	The breaker for the user's facility or the optional breaker has tripped due to short-circuit or leakage of electricity.	Repair the short-circuited part or the electricity leaking part.
	The DC power supply has failed.	Replace the DC power.
The product does not operate after pressing the [Run/Stop] button.	Communication setting has been turned ON.	Check the setting of the operation mode.

HRL Series 6.4 Other Errors

6.4 Other Errors HRL Series

Chapter 7 Control, Inspection and Cleaning

7.1 Quality Control of Circulating Fluid and Facility Water

WARNING



Use specified fluids only. If other fluids are used, they may damage the product, causing fluid leakage, or result in hazards such as electric shock or leakage of electricity.

When using clear water (tap water), ensure that it satisfies the water quality criteria shown in the table below.

If the water quality standards are not met, clogging or leakage in the facility water piping, or other problems such as refrigerant leakage, etc., may result.

Table 7.1-1 Quality criteria for clean water (tap water)

	lt a ma		Crite	erion
	Item	Unit	Circulating fluid	Facility water
	pH (at 25 °C)	_	6.0 to 8.0	6.5 to 8.2
	Electric conductance (at 25 °C)	[µS/cm]	100 to 300	100 to 800
	Chloride ion	[mg/L]	50 or less	200 or less
Standard	Sulphate ion	[mg/L]	50 or less	200 or less
item	Acid consumption (at pH 4.8)	[mg/L]	50 or less	100 or less
	Total hardness	[mg/L]	70 or less	200 or less
	Calcium hardness	[mg/L]	50 or less	150 or less
	Ionic silica	[mg/L]	30 or less	50 or less
	Iron	[mg/L]	0.3 or less	1.0 or less
	Copper	[mg/L]	0.1 or less	0.3 or less
Referential	Sulfide ion	[mg/L]	Should not be	Should not be
item	Sullide Ion	[IIIg/L]	detected any	detected any
	Ammonium ion	[mg/L]	0.1 or less	1.0 or less
	Residual chlorine	[mg/L]	0.3 or less	0.3 or less
	Free carbon dioxide	[mg/L]	4.0 or less	4.0 or less

 $^{*\ \} Quoted\ from\ the\ standard\ "JRA-GL-02-1994",\ The\ Japan\ Refrigeration\ and\ Air\ Conditioning\ Industry\ Association.$

CAUTION



Replace the circulating fluid and/or the facility water if any problems are found in the regular check. Even if no problems are found, some of the water in the tank evaporates and impurity concentration in the circulating fluid increases. Replace the circulating fluid on the tank once in every 3 months. Refer to the section "7.2 Inspection and Cleaning" for regular inspection.

7.2 Inspection and Cleaning

▲ WARNING



- Do not perform key operation or setting of this equipment with wet hands. Do not touch the electrical parts such as the power supply plug. It may cause an electric shock.
- Do not splash water directly on the product or do not wash with water. It might cause electric shock, fire, or etc.
- Do not touch the fins directly when cleaning the dust-proof filter. It may cause injury.

WARNING



- Shut off the power supply to this product before performing cleaning, maintenance or inspection, or it may cause electric shock, injury, burn, or etc.
- When the panel has been removed for the purpose of inspection or cleaning, mount the panel after the work is completed. If the product is operated with the panel removed or open, it may cause injury or electric shock.

7.2.1 Daily check

Check the items listed below. If any abnormality is found, stop the operation of the product and turn the power supply OFF, and ask for service.

Table 7.2-1 Daily check items

Iable 7.2-1 Daily check items			
Item		Contents of check	
Installation condition	Check the installation condition of the product.	-Check that there is no heavy object on the product or excessive force appying to the pipingTemperature should be within the specification range of the productMake sure the ventilation grille is not obstructed. (For air-cooled type)	
Fluid leakage	Check the connected parts of the piping.	Check that there is no fluid leakage from the connected parts of the piping.	
Amount of circulating fluid	Check the liquid level indicator.	Fluid level should be between "HIGH" and "LOW" levels of the fluid level meter.	
touch panel	Check the indications on the display.	The display on the screen is clear.	
Circulating fluid temperature	Check on the touch panel.	There should be no problem for operation.	
Circulating fluid discharge pressure	Check on the touch panel.	There should be no problem for operation.	
Circulating fluid flow rate	Check on the touch panel.	There should be no problem for operation. If flow rate has become smaller, check for any clogged of the particle filters.	
Operating condition	Check the operating condition of the product	-There should be no abnormality with noise, vibration, smell, or generation of smoke That the alarm has not occurred	

7.2 Inspection and Cleaning HRL Series

7.2.2 Monthly check

Table 7.2-2 Contents of monthly check

Item	Contents of check	
Ventilating condition	Clean the ventilating	Make sure the ventilating grilles are not clogged
(air cooled type)	grilles.	with dust, etc.

Cleaning of air ventilation port (Air cooled type.)

CAUTION



If the fins of the air-cooled condenser become clogged with dust or debris, heat radiation performance declines. This will result in the reduction of cooling performance, and may stop the operation because the safety device is triggered.

Clean the dust-proof filters with a long bristled brush or by air blow to prevent the fins from being deformed or damaged.

■ Removal of the dust-proof filter

- **1.** The dust-proof filters are installed on the front and left sides of the product.
- They can be removed as shown in the drawing below.
 Care should be taken not to deform or scratch the air cooled condenser (fins) while removing the filters.

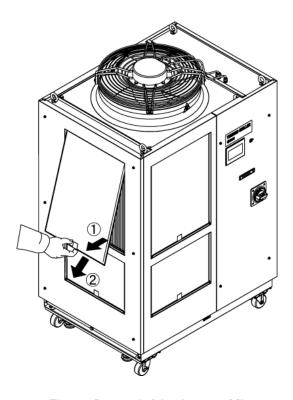
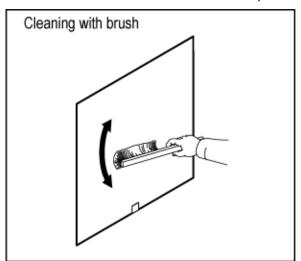


Fig. 7-1 Removal of the dust-proof filter

Cleaning of dust-proof filter

Clean the dust-proof filters with a long bristled brush or by air blow.



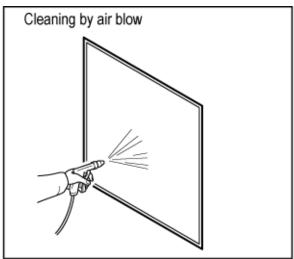


Fig. 7-2 Cleaning of the dust-proof filter

Mounting of dust-proof filters

Reassemble the filters in the reverse order to the removing procedure.

7.2.3 Inspection every 3 months

Table 7.2-3 Contents of every 3 months check

Item	Contents of check	
Power supply	Check the power supply voltage.	Make sure the supply voltage is within the specification range.
Circulating fluid	Replace the circulating fluid (clean water) periodically.	 Ensure that the water has not been contaminated and that there is no algae growth. Circulating water inside the tank must be clean and there must not be foreign matter inside. Use clean water or pure water. The water quality must be within the range shown in Table 7.1-1 Quality criteria for clean water (tap water). * It is recommended to replace the circulating fluid every 3 months when periodic maintenance is performed.

Replacement of circulating fluid

- Replace the circulating fluid with new clean fluid periodically, or it may get algae or decompose.
- Circulating fluid to be supplied in the tank should satisfy the water quality specified in "Table 7.1-1 Quality criteria for clean water (tap water)".
- If the particle filter element is dirty, replace the element. (Refer to "7.4.1 Replacing Particle Filter".)

7.2 Inspection and Cleaning HRL Series

7.3 Operation Stop for an Extended Period of Time

If there is a concern that the product will not be operated for an extended period of time or there is a possibility of freezing in the winter time, take the measures according to the instructions shown below.

- **1.** Turn OFF the earth leakage breaker of the user's power supply. Turn off the power supply breaker of this product.
- **2.** Discharge all the circulating fluid completely from the thermo-chiller. Refer to "7.3.1 Discharge of the circulating fluid" for the method of drain the circulating fluid from the product.
- **3.** After discharging the circulating fluid, cover the product with a sheet (to be prepared by user) before storing the product.

7.3.1 Discharge of the circulating fluid

WARNING



- Before discharging the circulating fluid, stop the user's equipment and release the residual pressure.
- Be sure to wear protective shoes and gloves to prevent injury with the edge of the panel.
- **1** Turn OFF the breaker of the user's power supply.
- **2.** Open the supply port cap.
- 3. Open the ball valve of the tank drain port to drain the circulating fluid.

4. Remove the particle filter element.

1) Use the maintenance handle, remove the filter case.

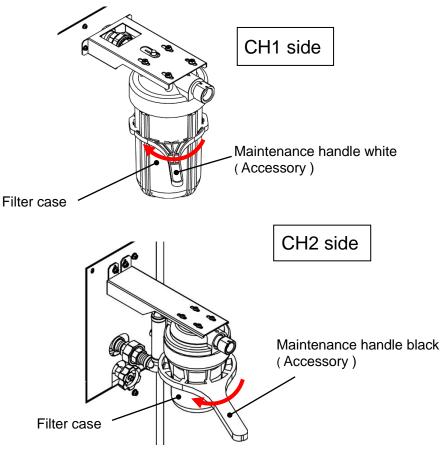


Fig. 7-3 Particle filter removal

- 2) Drain the circulating fluid in the filter case and take out the element. When reusing the removed element, dry it and store it separately.
- 3) Attach the filter case by hand tighten.



A CAUTION



- Mounting of the case should be performed by hand-tighten. When the case is tightened excessively by tools or handle, the case might crack or be damaged.
- Make sure that the case is held manually by hand when removing and mounting the case. If the case is dropped, it may result in cracking or breakage.

- **5.** Remove the DI filter.
 - Remove the maintenance panel and remove the DI filter.
 (Refer to "7.4.2 Replacing the DI filter".) Store the removed DI filter separately.
 - 2) Install the DI filter temporary piping that was installed at the time of delivery.

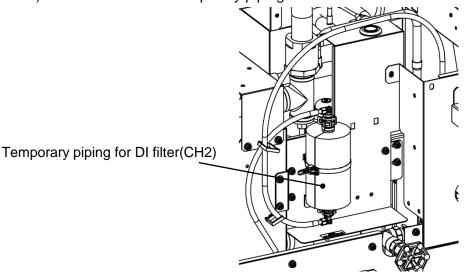


Fig. 7-4 Temporary pipe installation for DI filter

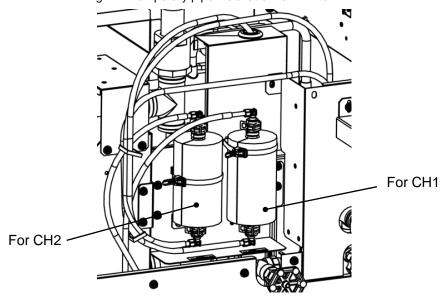


Fig. 7-5 Temporary pipe installation for DI filter(For option D1)

- **6.** After confirming that the circulating fluid has been sufficiently discharged from the product, customer's facilities and piping, perform an air purge (pressure less than 0.1 MPa, about 1 minute) from the circulating fluid outlet of the product.
 - Purge both CH1 and CH2, Circulating fluid is drained from the drain port.
- 7. Close the ball valve after draining the circulating fluid.
- **8.** Close the supply port cap.

7.4 Replacement of consumables

▲ WARNING



- Before discharging the circulating fluid, stop the user's equipment and release the residual pressure.
- Be sure to wear protective shoes and gloves to prevent injury with the edge of the panel.

7.4.1 Replacing Particle Filters

To replacing the element of the particle filter, it is necessary to discharge the circulating fluid.

Remove the filter case and replace the element according to steps 1 to 4 of "7.3.1 Discharge of the circulating fluid".

7.4.2 Replacing the DI filter

Connect DI filter inside this product. In the delivery state, "Temporary piping for DI filter" is connected. Install the attached "DI filter" according to the following procedure.

- 1. Turn off the earth leakage breaker of this product.
- **2.** Remove the maintenance panel. Loosen the 4 fixing screws. Also, remove the 2 fixing screws.

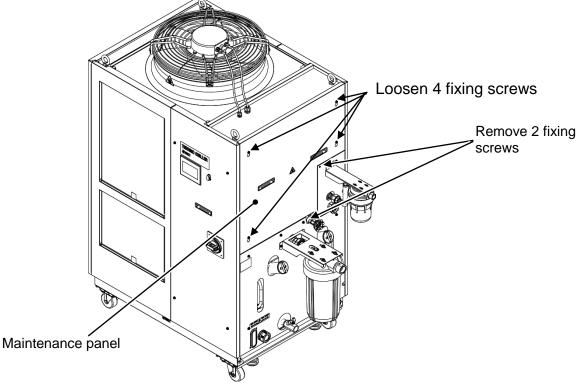
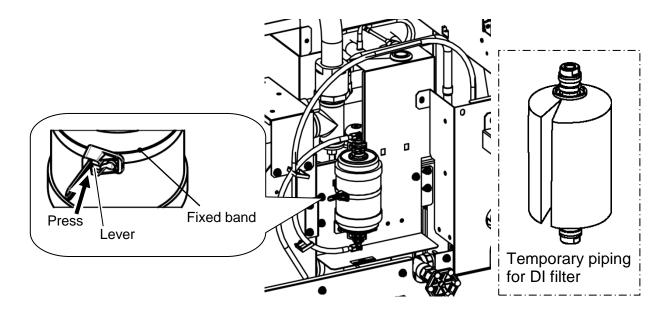


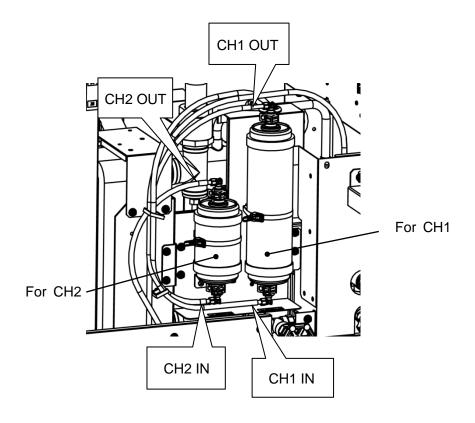
Fig. 7-6 Maintenance panel removal

3. Remove DI filter fixed band by pushing lever on the band.

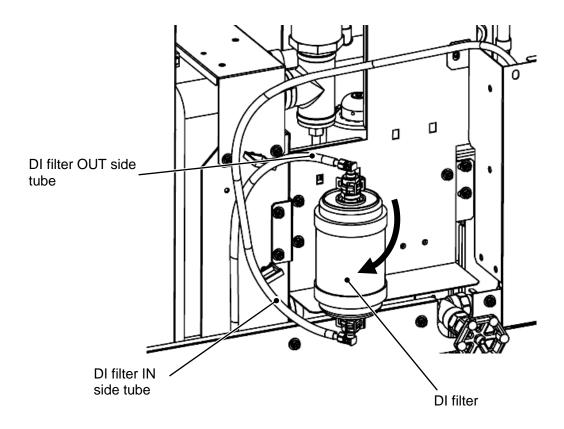
(The temporary piping for DI filter is connected at the time of delivery. "Temporary piping for DI filter" is used for long term storage of this product. Please keep it in a safe place.)



■ For option D1 "CH1 with electrical conductivity control" In the case of option D1, DI filters are located as shown in the figure below.

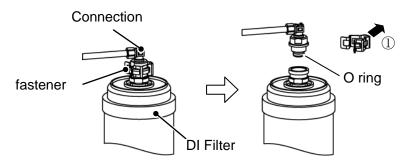


4. Pull out the DI filter to the front. The DI filter has been connected to the tube. Please allow excessive force is not applied to the tube.



5. The connection fitting of the DI filter and the tube is connected by a fastener. O ring is used for the connection fitting. After removing the fastener, remove the connection fitting. Be careful not to apply force to the tube at this time. Also, please be careful not to damage the Oring.

Both the IN side and the OUT side have the same shape. Remove the connection fitting onboth sides and remove the DI filter.



- 6. Install the DI filter in the reverse order of removal. The DI filter has no flow direction. The DI filter IN-side tube on the lower side of the DI filter, please connect the DI filter OUT-side tube on the upper side. If connected reversely, the air in the DI filter will not escape, The DI filter function may not work properly.
- **7.** Secure the DI filter in a fixed band.
- 8. Install the maintenance panel. (Recommended tightening torque:3.0N·m)

7.4.3 Consumables

Table 7.4-1 Consumables

Part number	Name	Qty.	Remarks
HRS-S0213	Dust-proof filter (Lower)	1 pc.	HRL200-A: 2 pcs. are used per unit
HRS-S0214	Dust-proof filter (Upper)	1 pc.	HRL100/200-A: 2 pcs. are used per unit
HRS-S0185	Dust-proof filter	1 pc.	HRL300-A: 4 pcs. are used per unit
HRS-PF006	Particle filter element	1 pc.	Common to each model: For CH1
EJ202S-005X11	Particle filter element	1 pc.	Common to each model: For CH2
HRR-DF001	DI filter replacement cartridge	1 pc.	Common to each model: For CH2
HRR-DF002	DI filter replacement cartridge	1 pc.	Common to each model: For CH1 (Option D1 only)

Chapter 8 Documents

8.1 Specifications

8.1.1 HRL100/200/300-A*-40

Table 8.1-1 Specifications

				HRL100-A*-40 HRL200-A*-40 HRL300-A*-40						
Model			CH1	CH2	CH1	CH2	CH1	CH2		
Cooling meth	od				0111	U.I.2	Air-cooled r	_	U	, 0
Refrigerant					R410A(HFC)					
Quantity of refrigerant kg			1.4 1.8 2.5							
Control metho					PID control					
Ambient temp	perature			°C			2 to			
	Circulatin	g fluid				CH2 : C	ear water *1, D Dear water *1,	DI water (pur	e water)	
		erature range		°C			CH1:5 to 35/			
		apacity*2		kW	9 1.5	1 *8	19	1 *8	26	1 *8
	Heating c	capacity*3		kW	1.5	1	4.0	1	6.0	1
Temperature stability *4 Rated flow rate		°C			CH1 : CH2 :	±0.5	1			
	Pump capacity Maximum flow rate Maximum lifting height Settable pressure range *5		L/min	45 (0.43MPa)	45 10 45 10 125 10 (0.43MPa) (0.45MPa) (0.45MPa) (0.45MPa) (0.45MPa) (0.45MPa)					
			L/min	120	16 *12	130	16 *12	180	16 *12	
			m	50	49	55	49	68	49	
			MPa	0.10 to	0.10 to	0.10 to	0.10 to	0.10 to	0.10 to	
Circulating fluid Minimum operating flow rate *6 system Tank capacity				. , .	0.50	0.49	0.55	0.49	0.68	0.49
		w rate *6	L/min	20 42	2	25 42	2	40	2	
l · F	-			<u> </u>	42	7		7	60	7
	, .	(With valve)		•			buil	t-ın		
	setting ra			μS/ cm	0.5 to 45 *9	0.5 to 45	0.5 to 45 *9	0.5 to 45	0.5 to 45 *9	0.5 to 45
	Particle fi (Accesso	Iter filtration a	ccuracy	μm	5	5	5	5	5	5
		g fluid outlet, g fluid return	port				c1 (Symbol F:			
	Ollodiatil	ig ilala rotairi	Port				4 (Symbol F:			
	Tank drai	n port					2 (Symbol F:			
	Wetted m	Wetted material			Brass EPDM CH2 : Stainle	CH1 : Stainless steel, Copper (Brazing filler metal for the heat exchanger) *10, Brass *10,Bronze *10,Fluoropolymer,PP,PBT,POM,PU,PC,PVC, EPDM,NBR, Ion-exchange resin *9 CH2 : Stainless, Alumina ceramic, Carbon, Fluoropolymer,PP,PBT,POM,PU, PVC,PPS,AS,PS,EPDM,NBR, Ion-exchange resin 3-phase 380 to 415VAC(50/60Hz)				
Power supply Allowable voltage 'range' Allowable voltage range ran			range ±10%(N -phase 460 to	o continuous 480VAC(60H Max. voltage	voltage fluctu lz) less than 500'	,				
Electrical system	Applicabl	e earth	Rated current	Α	2	0	3	0	4	0
,	leakage b	leakage breaker	Sensitivity current	mA		30				
	Rated operating current *4		Α	8.	8.5 15 19		9			
	Rated po	Rated nower consumption *4		kW (kVA)	5.6 (, ,	9.4 (10.2)	12.3 (
Noise level (F	ront: 1m, h	eight: 1m) *4		dB(A)	7		7		7	
Accessories						`	Particle filter Particle filter	set for CH1	nglish 1, Japar of M8 bolts) *7	nese 1)
Weight (in the	dry state) *	×11		kg		x.240	Appro		Appro	x.330
	ary oraco)	• •		···9	, , , , ,		, wppio		, ippio	

HRL Series 8.1 Specifications

Chapter 8 Documents

- *1 Use fluid for circulating fluid that conforms to:
 - Clean water: Water Quality Standards of the Japan Refrigeration and Air Conditioning Industrial Association (JRA GL-02-1994)
- *2 (1) Facility water temperature:32°C,(2) Circulating fluid: Clean water, (3) Circulating fluid temperature: CH1 20°C /CH2 25°C, (4) Circulating fluid flow rate: Rated flow rate, (5) Power supply: 400 VAC
- *3 (1) Facility water temperature:32°C,(2) Circulating fluid: Clean water, (3) Circulating fluid flow rate: Rated flow rate,(4)Power supply: 400 VAC
- *4 (1) Facility water temperature:32°C,(2) Circulating fluid: Clean water, (3) Circulating fluid temperature: CH1 20°C /CH2 25°C,
 - (4) Load: Refer to the specified cooling capacity, (5) Circulating fluid flow rate: Rated flow rate, (6) Power supply: 400 VAC,
 - (7) Piping length: Minimum
- *5 With the pressure control mode that controls the pressure automatically with the inverter. If the pressure control mode is not necessary, use the flow control function or the pump output setting function.
- *6 Required flow rate to maintain the cooling capacity. When the flow rate is lower than the rated flow, use a by-pass piping set.
- *7 The anchor brackets (including M8 bolt x 6pcs.) are used for fixation with the skid when this product is packed. The anchor bolts are not attached.
- *8 Up to 1.5kW. However, when 1.5kW heat load is applied, the colling capacity of CH1 will decrease by 0.5kW.
- *9 Option D1 "with electrical conductivity control function" only
- *10 In the case of option D1 " with electrical conductivity control function", it is not included.
- *11 The weight will increase by 1kg when option D1 "with electrical conductivity control" is selected.
- *12 The usable flow rate range is varied depending on the Pump control mode. Refer to Pump capacity curve (Fig.8-12) for details.

8.1.2 Refrigerant with GWP reference

Table 8.1-2 Refrigerant with GWP reference

	Global Warming	Potential (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

Note:

- 1. This product is hermetically sealed and contains fluorinated greenhouse gases.
- 2. See specification table for refrigerant used in the product.

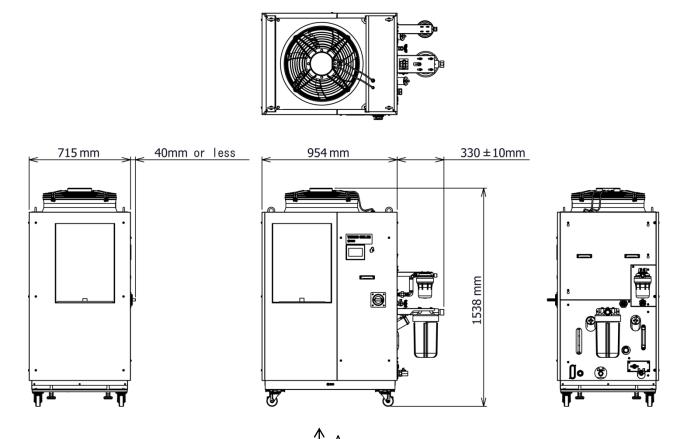
8.1.3 Communication specifications

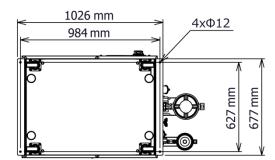
- For contact input/output communicatins, refer to 3.3.4 Contact input/output communicatin wiring
- For serial communication specifications, refer to Operation Manual Communication Function, HRX-OM-W069.

8.1 Specifications HRL Series

8.2 Dimensions

8.2.1 HRL100-A*-40



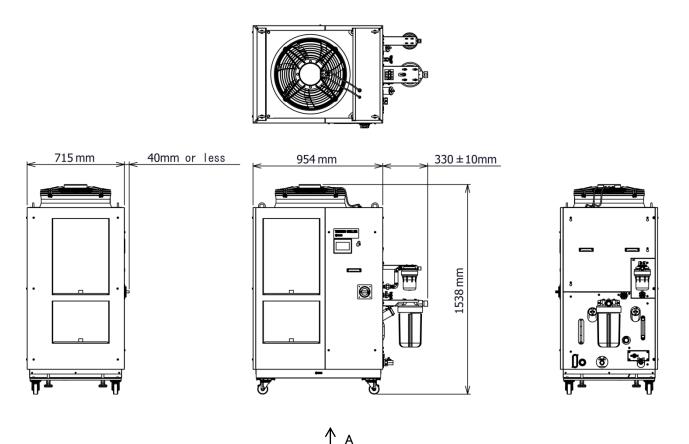


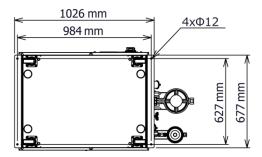
Dimensions for the positions of the anchor bolts (View A)

Fig. 8-1 Dimensions

HRL Series 8.2 Dimensions

8.2.2 HRL200-A*-40



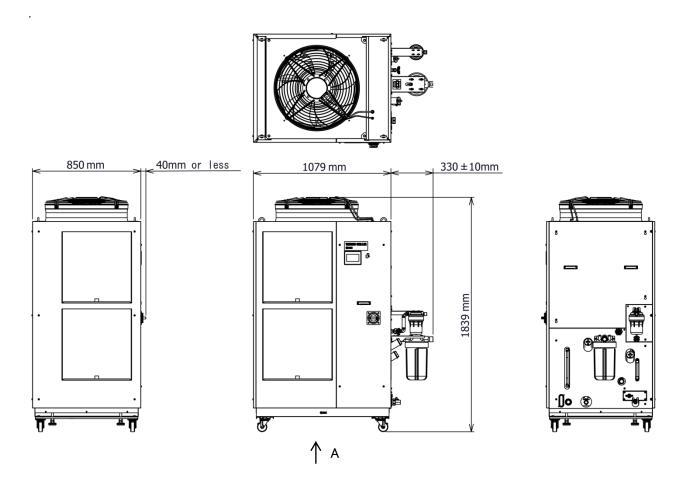


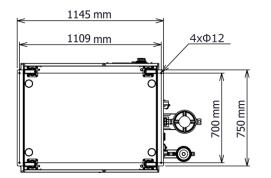
Dimensions for the positions of the anchor bolts (View A)

Fig. 8-2 Dimensions

8.2 Dimensions HRL Series

8.2.3 HRL300-A*-40





Dimensions for the positions of the anchor bolts (View A)

Fig. 8-3 Dimensions

HRL Series 8.2 Dimensions

8.3 Flow Diagram

8.3.1 HRL***-A*-40-*

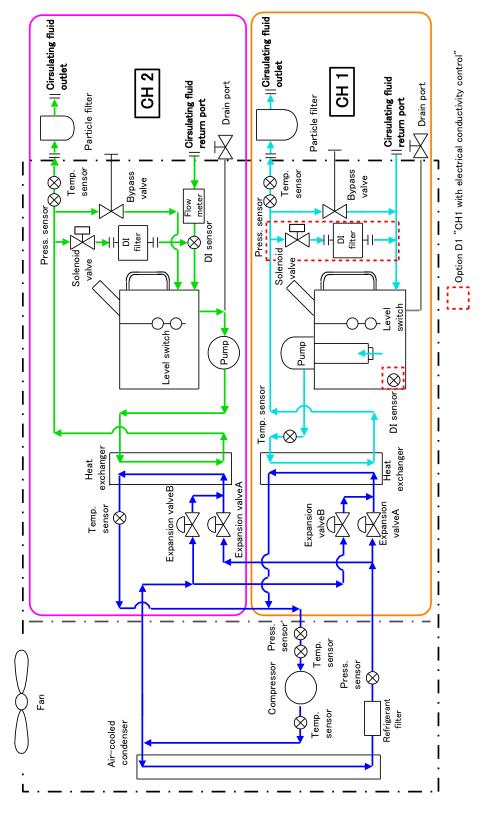
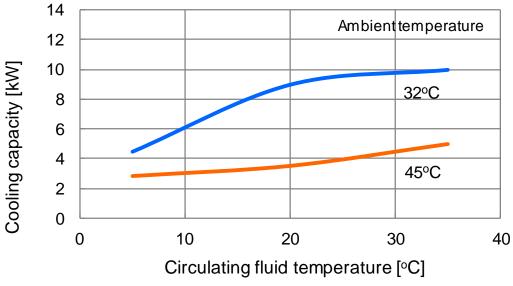


Fig. 8-4 Flow Diagram (HRL***-A*-40)

8.3 Flow Diagram HRL Series

8.4 Cooling Capacity

8.4.1 HRL100-A*-40 CH1



*This is the cooling capacity of the CH1 side when 1 kW heat load is applied to the CH2 side.

Fig. 8-5 Cooling Capacity (HRL100-A*-40)

8.4.2 HRL200-A*-40 CH1

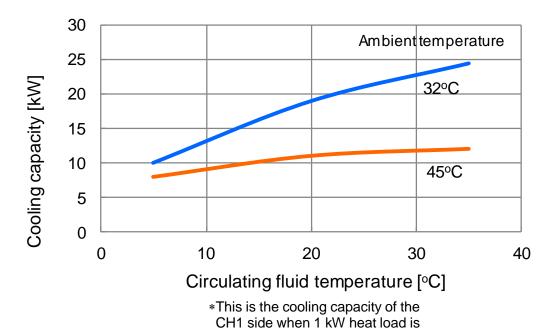
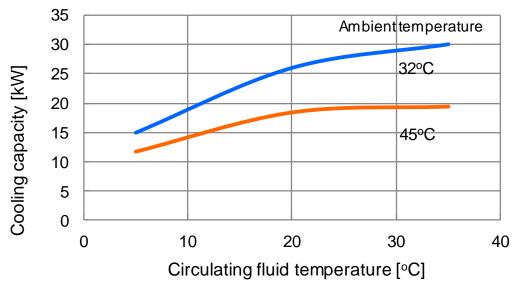


Fig. 8-6 Cooling Capacity (HRL200-A*-40)

applied to the CH2 side.

HRL Series 8.4 Cooling Capacity

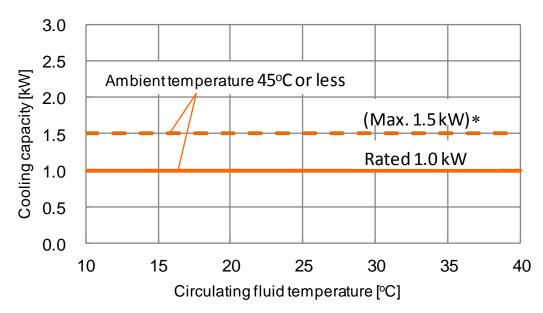
8.4.3 HRL300-A*-40 CH1



*This is the cooling capacity of the CH1 side when 1 kW heat load is applied to the CH2 side.

Fig. 8-7 Cooling Capacity (HRL300-A*-40)

8.4.4 HRL100/200/300-A*-40 CH2



*Up to 1.5kW.However,when 1.5kW heat load is applied,the cooling capacity of CH1 will decrease by 0.5kW.

Fig. 8-8 Cooling Capacity (HRL100/200/300-A*-40)

8.4 Cooling Capacity

HRL Series

8.5 Pump Capacity

8.5.1 HRL100-A*-40 CH1

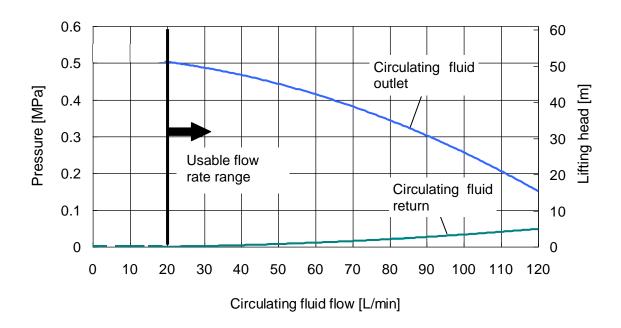


Fig. 8-9 Pump capacity(HRL100-A*-40 CH1)

8.5.2 HRL200-A*-40 CH1

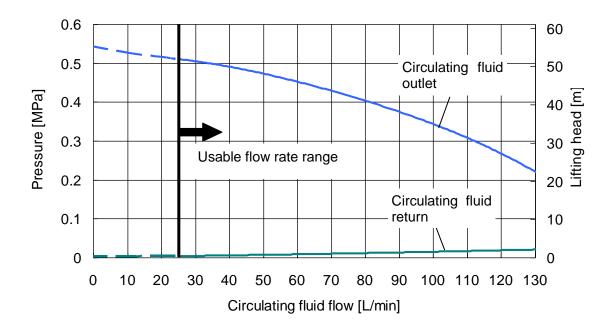


Fig. 8-10 Pump capacity(HRL200-A*-40 CH1)

HRL Series 8.5 Pump Capacity

8.5.3 HRL300-A*-40 CH1

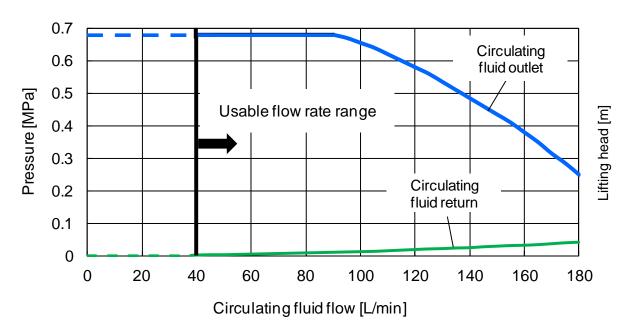


Fig. 8-11 Pump capacity(HRL300-A*-40 CH1)

8.5.4 HRL***-A*-40 CH2

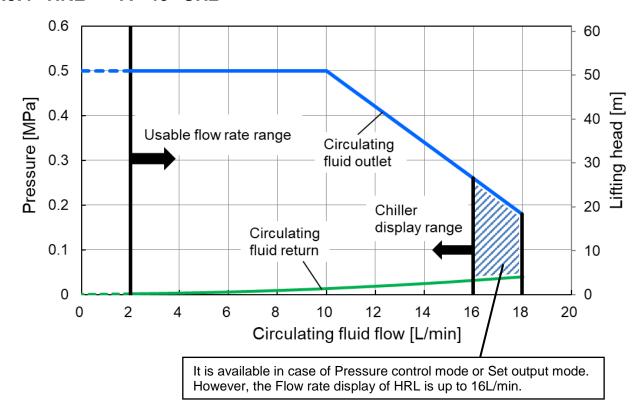


Fig. 8-12 Pump capacity(HRL100/200/300-A*-40 CH2)

8.5 Pump Capacity HRL Series

8.6 Types of Hazard Labels

To ensure the safety of the operators, potential hazards are classified and marked with warning labels.

Read this section before starting any work on the product.

■ Electric shock warning

A WARNING



This symbol stands for danger of electric shock.

The product has some uncovered terminals applied with high voltage inside.

- Do NOT operate the product without the cover panels mounted.
- Do NOT work on the parts inside the product unless you have been trained for the product service.
- Do NOT work inside this product unless you have been trained to do so.
- High temperature warning

WARNING



This symbol stands for danger of burns.

The product has surfaces that can reach high temperatures during operation. Even after the power is turned off, there can still be residual heat in the product., which causes burns.

- Do NOT operate the product without cover panels fitted.
- Do NOT start working on the parts inside the product until the temperature has decreased sufficiently.
- Rotating objects warning (Air-cooled type only)

WARNING



This symbol stands for a danger of your fingers/hand being cut or getting caught by the rotating objects.

 The product contains a cooling fan that rotates during operation of the product (for air-cooled type).

The fan may stop and restart intermittently during operation. Do NOT operate the product without the cover panels mounted.

Warning related to those other than shown above

WARNING



This symbol stands for a multiplex danger.

Electric shock: The product has some uncovered terminals applied with high voltage.

Rotary fan: This product has a rotating object inside the cover panel. <Water-cooled refrigerated type>

High pressure inside: This product contains high pressure liquid in the piping and the tank.

- Do not operate the product without the cover panels mounted.

8.6.1 Positions of danger warning label

Confirm the positions of the danger warning labels on the product to show the potential danger before starting operation.

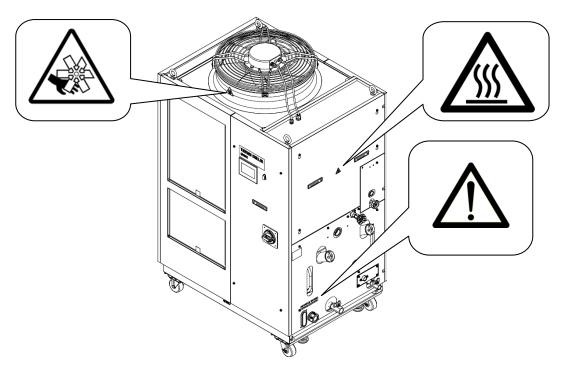


Fig. 8-13 Positions of danger warning label

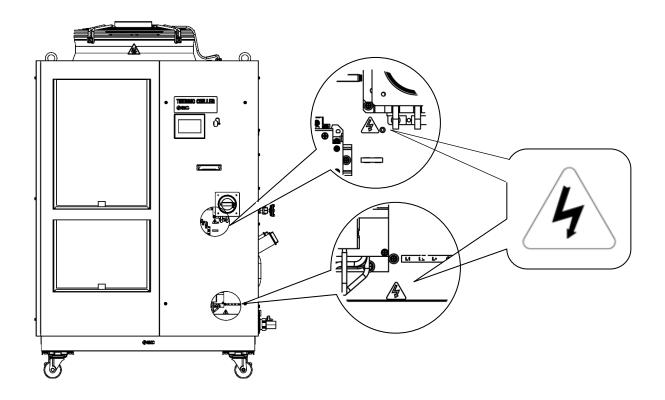


Fig. 8-14 Positions of danger warning label

8.6 Types of Hazard Labels HRL Series

8.7 Standards

This product complies with the standards shown below.

Table 8.7-1 Standards

	Standard	
CE Mark	EMC Directive Machinery Directive	2014/30/EU 2006/42/EC

HRL Series 8.7 Standards

Model no. Mfg. code

SWC, Thermo-chiller Daily Check Sheet

For information about how to perform daily checks of the thermo chiller, refer to section "7.2.1 Daily check" of the operation manual. Check and record the condition at start right after setting up.

			Setting up conditions	nditions	Fluid leakage	Liquid level	T do lo		Circulating fluid	ng fluid		Operation conditions	
Date	Performed by	당	Temperature	Humidity	Present/	Low/High display	panel	Temperature	Flow rate	Discharge press.	Electric conductivity	Abnormality occurrence	Result
			೦ೢ	%	Notpresent	In a range ∕ Out of range	conditions	ွ	L/min	MPa	µS/cm	Present/Not present	
o los		CH1											
iiiiiai valde		СН2											
		CH1											
		СН2											
		CH1											
		СН2											
		CH1											
		СН2											
		CH1											
		СН2											
		CH1											
		СН2											
		CH1											
		СН2											

Chapter 9 Product Warranty

Period

The warranty period of the product is 1 year in service or 1.5 years after the product is delivered whichever comes first.

2. Scope

For any failure reported within the warranty period which is clearly SMC's responsibility, replacement parts will be provided. In that case, removed parts shall become the property of SMC.

This guarantee applies only to SMC's product independently, and not to any other damage incurred due to the failure of the product.

3. Contents

- SMC guarantees that the product will operate normally if it is installed under maintenance and control in accordance with the Operation Manual, and operated under the conditions specified in the catalog or contracted separately.
- SMC guarantees that the product does not have any defects in components, materials or assembly.
- 3. SMC guarantees that the product complies with the outline dimensions provided.
- 4. The following situations are out of scope of this warranty.
 - (1) The product was incorrectly installed or connected with other equipment.
 - (2) The product was under insufficient maintenance and control or incorrectly handled.
 - (3) The product was operated outside of the specifications.
 - (4) The product was modified or altered in construction.
 - (5) The failure was a secondary failure of the product caused by the failure of equipment connected to the product.
 - (6) The failure was caused by a natural disaster such as an earthquake, typhoon, or flood, or by an accident or fire.
 - (7) The failure was caused by operation different from that shown in the Operation Manual or outside of the specifications.
 - (8) The checks and maintenance specified (daily checks and regular checks) were not performed.
 - (9) The failure was caused by the use of circulating fluid or facility water other than those specified.
 - (10) The failure occurred naturally over time (such as discoloration of a painted or plated face).
 - (11) The failure does not affect the functioning of the product (such as new sounds, noises and vibrations)
 - (12) The failure was due to the "Installation Environment" specified in the Operation Manual.
 - (13) The failure was caused by the customer disregarding "6. Request to Customers".

Agreement

If there is any doubt about anything specified in "2. Scope" and "3. Contents", it shall be resolved by agreement between the customer and SMC.

5. Disclaimer

- (1) Expenses for daily and regular checks
- (2) Expenses for repairs performed by other companies
- (3) Expenses for transfer, installation and removal of the product
- (4) Expenses for replacement of parts other than those in this product, or for the supply of liquids
- (5) Inconvenience and loss due to product failure (such as telephone bills, compensation for workplace closure, and commercial losses)
- (6) Expenses and compensation not covered in "2. Scope".

HRL Series Product Warranty

6. Request to Customers

Proper use and maintenance are essential to assure safe use of this product. Be sure to satisfy the following preconditions. Please note that SMC may refuse to carry out warranted repair if these preconditions have been disregarded.

- (1) Use the product following the instructions for handling described in the Operation Manual.
- (2) Perform checks and maintenance (daily checks and regular checks) specified in the Operation Manual and Maintenance Manual.
- (3) Record the check and maintenance results on the daily check sheet attached to the Operation Manual and Maintenance Manual.

7. Request for Warranted Repair

For warranted repair, please contact the supplier you purchased this product from.

Warranted repair shall be on a request basis.

Repair shall be provided free of charge in accordance with the warranty period, preconditions and terms defined above. Therefore, a fee will be charged for any repairs if a failure is detected after the end of the warranty period.

Product Warranty HRL Series

Revision history	
Revision A: [Jul.2020]	

SMC Corporation

4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021 JAPAN Tel: + 81 3 5207 8249 Fax: +81 3 5298 5362 URL https://www.smcworld.com