Model No.
FCTA30101
FCTA60101
FCTW30101
FCTW60101
FCTW90101

FerroCool Thermostat Operation Manual

Please read this operation manual carefully and keep it properly

Preface

Thank you very much for purchasing Ferrcool Thermostat. (herein referred to as the “product”). This manual describes the operation of the product. Please use this manual for efficient and long use of this unit. Be sure to read this manual efficiently for your deep understanding of overview and safety of this unit before installation or carrying out the relevant operations of this unit. Especially, you need to follow the instructions about ”Danger”, “Warning” and “Caution”.

Caution

This product is provided with “Warning” labels and “Caution” labels to inform the operator of hazards related to the product. Check the contents and position of all labels before starting the work.

⚠ WARNING

The product shall be handled only by trained personnel only. Transportation, installation and maintenance including dangerous work shall be done by persons who have full knowledge and experience on the product and the system. Cover panels of the product shall be opened only by qualified service technicians or qualified personnel.

⚠ WARNING

Read all warning and caution labels carefully and keep them in mind. Do not peel off or rub alert warning and caution labels. Confirm locations of alert warning and caution labels.

⚠ WARNING

This product can not be used for the device related to food.

⚠ WARNING

If abnormal conditions, such as abnormal noise or smoke, or water leakage appeared, take the following actions:

1、Shut down power.

2、Stop water radiating water supply

3、Contact an authorized Ferrotec dealer for repair

Packaged items

No.	Item	Qty.
1	Product	1
2	Power supply cable	1
3	Mounting bracket	4
4	Operation Manual	1

History

Version	Abstract	Date
Z	First edition	2022.12.31

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Abbreviation(The order of ABC)	Meaning
AC	Alternating Current
AT	Auto Tuning
Chap.	Chapter
EPDM	Ethylene Propylene Diene Monomer
ERR	Error
IEC	International Electrotechnical Commission
LCD	Liquid Crystal Display
PFR	Power Failure Resume
PID	Proportional,Integral,Differentiate
RXD	Received Data
SUS	Special Use Stainless steel
Temp	Temperature
TXD	Transmitted Data
WRN	Warning

1 Introduction

The definition and construction of operation manual are described below.

1.1 Scope and general description of use

The operation manual applies to operation method of FerroTec – brand Thermostat. Thermostat is air-to-liquid heat exchanger to be used to control the temperature(e.g. detectors in anX-Ray system).It aims easier understanding of operational and Installation information of the Thermostat. Before any operation and Installation of this unit, be sure to read this operation manual carefully and understand the contents well. This unit is Class1 equipment with regard to the type of protection for electric shock.

1.2 Operation by external communication

The content which can be communicated is as follows.
1)Setting and reading of target temperature
2)Reading of the value detected by temperature sensor
3)Reading of warning status
4)Setting and reading of off-setvalue
For operation by communication,it is necessary to order "Communication Specifications".

<Contact>
If you have any questions or are unclear about any of the content of this manual,please contact the following department.

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Hangzhou Dahe Thermo-Magnetics Co., Ltd
Address: 668# Binkang Rd.,Binjiang District, Hangzhou, China
TEL: +86-0571-86696188
Zip Code: 310053
http://www.ferrotec.com

1.3 Contents of operation manual

1)Chap.1 Introduction

The definition and use of operation manual are described.

2)Chap.2 Safety Instructions

Safety instruction,cautionnote,danger and warning,warning labe land caution label and safety interlock used in this unit are described.

3)Chap.3 Installation Precautions

The precautions for setting up and mounting this unit are described.

4)Chap.4 Unit Overview

Describes the outlook of this unit and operation overview.

5)Chap.5 Names and Functions of Components

The description and function of the parts in this unit are mentioned.

6)Chap.6 Specifications

The specifications of this unit are described.

7)Chap.7 Preparation for Operation

The precautions for operation of this unit are described by each part.

8)Chap.8 Operation

The method for operation of this unit is explained.

9)Chap.9 Alarm

The alarms,which arise in this unit,are explained.

10)Chap.10 Appendix

The signal of connectors and the method for calculating dew points are described.

2 Safety Instructions

2.1 Before using the Thermostat

This chapter is dedicated for your safety during interaction with the product. The product is operated at high voltage. Therefore, not only those who operate the unit, but those who are in charge of service and who work nearby the product should read carefully and thoroughly understand descriptions related to safety in this manual before starting the work.

2.1.1 Safety training

This manual is not a general manual for safety and hygiene education that safety and hygiene tutors are supposed to conduct. Anyone working with or near the product should be fully trained in recognition of the danger inherent to the product and the related safety countermeasures. A manager is responsible for strict compliance to the safety standard in whole system,but individual person in charge of operation and maintenance should take responsibility for the daily work and should consider the safety of the working location and environment.Operators and maintenance personnel responsible should ensure the safety of workshops and their environment before starting work. Training concerning the product should take place after the sufficient training on safety. The training must not be carried without consideration to safety.

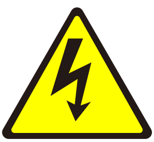
2.1.2 Identification of “Danger”，“Warning”，“Caution” and “Note”

The notifications given in this operation manual aim to assure the safe and correct operation of the product to prevent injury of operatorsor damage to the product. The notifications are grouped into four categories,“Danger”,“Warning”,“Caution”, and“Note”,which indicate the severity of the hazard and damage and also the degree of emergency. All notifications contain critical matter on safety,so they shall be carefully observed.DANGER,WARNING,CAUTION and NOTE signs are in order according to severity (DANGER> WARNING>CAUTION>NOTE).

List2-1 Division of DANGER,WARNING,CAUTION,and NOTE

	These paragraphs highlight hazards that would cause serious or even fatal injuries to workers if handled improperly or important instructions are ignored.
	These paragraphs highlights hazards that might cause serious injuries to workers if the appropriate procedure is not carried out or warnings are ignored.
	These paragraphs highlights hazards that might cause serious injuries to workers or might damage the unit, installed devices or products if the appropriate procedure is not carried out or cautions are ignored.
NOTE	These paragraphs highlight knowledge which is recommended to be known to avoid mistakes that likely to happen during operation. Also anything that might damage the unit or performance of product for checking is described.

List2-2 Meaning of symbols

Symbols	IEC/ISO standard	Meaning
	IEC 348	Attention,consult accompanying documents
	ISO3864 No.B.3.6	Caution,risk of electric shock

2.2 “Warning” label and “Caution” label

This product is provided with “Warning” labels and “Caution” labels to inform the operator of hazards related to the product. Check the contents and position of all labels before starting the work.

⚠ WARNING

The product shall be handled only by trained personnel only. Transportation, installation and maintenance including dangerous work shall be done by persons who have full knowledge and experience on the product and the system. Cover panels of the product shall be opened only by qualified service technicians or qualified personnel.

⚠ WARNING

Read all warning and caution labels carefully and keep them in mind. Do not peel off or rub alert warning and caution labels. Confirm locations of alert warning and caution labels.

⚠ WARNING

This product can not be used for the device related to food.

⚠ WARNING

If abnormal conditions, such as abnormal noise or smoke, or water leakage appeared,take the following actions:

1) Shut down power.
2) Stop water radiating water supply.
3) Contact an authorized Ferrotec dealer for repair.

2.2.1 The position of attached “Warning” label and “Caution” label

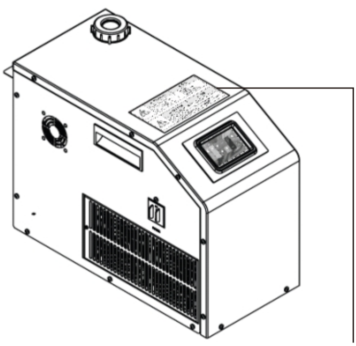


Fig.2-1 The position of attaching “Warning” label and “Caution” label

Fig.2-2:Air-cooled Detail of “Warning” and “Caution” label

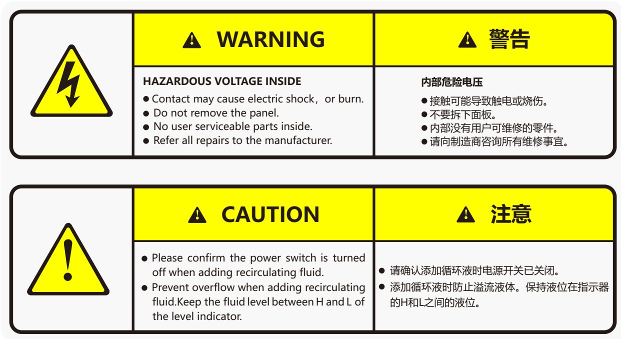


Fig.2-2:Water-cooled Detail of “Warning” and “Caution” label

2.3 Precautions for running(safety interlock)

This is a function to protect personnel, to restrict operation, that may cause damage to the product or facility, and to remove dangers related to safety. This unit has several interlock functions, which activate when dangerous operation or condition occurs to stop operation and make it safe. See“2.3.1 Interlock list”for contained function.

⚠ DANGER

During operation or maintenance of the product, do not disable the interlock function of any device. Otherwise unexpected personnel injury or damage to the product may occur.

⚠ DANGER

When turning on/off the power observe the procedure. Otherwise unexpected malfunction or danger may occur. When maintaining, cleaning or in case of emergency, turn off the power source.After identifying a problem be sure to check the cause and take necessary countermeasuresbefore turning on the power.

⚠ CAUTION

When the power supply is restarted after turned off once, keep time interval at least1sec. The restart of supply within that interval may break the unit.

⚠ CAUTION

Please do not use the device which generates the electromagnetic radiation such as cellular phones beside the unit. There is a possibility that the unit mis-operates.

2.3.1 Interlock list

List2-3 Safety interlock list (Part1)

No.	Description	Part	Qty	Location	Cause
1	Overheat in Heat Exchanger	Thermostat	2	Heat Exchanger	Detects abnormal heat in heat exchanger.
2	Overheat in Heat Sink	Level sensor	1	Heat sink	Detects overheat in Heat Sink.
3	Low circulating fluid level	Controller internal circuit	1	Reservoir	Detects lowering of circulating fluid level in reservoir.
4	Detection of break-age of temp .sensor	Controller internal circuit	1	Temperature sensor	Detects breakage and short circuit of temp. sensor and cables.
5	Excessive temp. increase	Controller internal circuit	1	-	Detects temp. input value not less than 70℃
6	Excessive temp. decrease	Controller internal circuit	1	-	Detects temp. input value not more than 3℃.
7	TEC open circuit	Controller TEC circuit	1	TEC	The thermo-module TEC circuit disconnected
8	TEC short circuit	Controller TEC circuit	1	TEC	The thermo-module TEC circuit short-circuited

List2-4 Safety interlock list(Part2)

No.	Description	Condition of unit	Indication	How to reset
1	Overheat in Heat Exchanger	Shuts off power supply to the Heat exchanger, Pump and Fan.	Error indication on display. (ERROR01)	Restart power supply
2	Overheat in Heat Sink	Shuts off power supply to the Heat exchanger, Pump and Fan.	Error indication on display. (ERROR01)	Restart power supply
3	Low circulating fluid level	Shuts off power supply to the Heat exchanger, Pump and Fan.	Error indication on display. (ERROR07)	Restart power supply
4	Detection of bre-akage of temp. sensor	Shuts off power supply to the Heat exchanger, Pump and Fan.	Error indication on display. (ERROR09)	Restart power supply
5	Excessive temp. decrease	Shuts off power supply to the Heat exchanger, Pump and Fan.	Error indication on display. (ERROR11)	Restart power supply
6	Excessive temp. decrease	Shuts off power supply to the Heat exchanger, Pump and Fan.	Error indication on display. (ERROR11)	Restart power supply
7	TEC open circuit	Shuts off power supply to the Heat exchanger, Pump and Fan.	Error indication on display. (ERROR03)	Restart power supply
8	TEC short circuit	Shuts off power supply to the Heat exchanger, Pump and Fan.	Error indication on display. (ERROR04)	Restart power supply

2.4 Disposing of product

Contact an industrial waste disposal company for disposal of the product. To minimize the risk, drain the fluid from the product when it is scrapped. If the fluid is left inside, an accident and damage can result during transportation.

3 Caution on Installation

⚠ WARNING

Pay special attention to the safety of all personnel when installing and transporting the product.

⚠ CAUTION

The product is heavy, be careful when installing or moving the product.

⚠ CAUTION

Only trained personnel can perform work such as installation, transportation and maintenance of the product.

3.1 Environment

The product shall be installed in an environment that meets the following requirements.

1)Where the product is not exposed to water,oil or any chemical spills.

2)Where the product is installed horizontally in astable position.

3)Where the product is installed without interfere the suction and discharge port.

4)Where the product is not exposed to corrosive or flammable gas.(The unit is not explosion proof.)

5)Where the ambient temperature range is between 10 to 35℃ and the relative humidity range is between 35 to 80%. No dew condensation is allowed on the unit. Information about due condensation is shown on“10.2 Calculation of DewPoint”.

6)Where the product is not exposed to noise sources (such as dischargeing equipment, large relay and thyristor).

7)Where the there is enough space between power supply cable and communication cable of the product and power cables of other equipments.

8)Where the product is not exposed to strong electrical or magnetic emissions.

9)Where the power supply and ground connections can be made correctly.

10)Where the product is not exposed to materials such as silicone,which may generate harmful gas.

11)Where the product is not outdoors or in a place with the direct sunshine or heat radiation.

12)The product is placed at an altitude below 2000 meters.

3.2 Installation

If the air inlet of Thermostat and the outlet opening is not enough, the cooling capacity decreases due to the rise of the ambient temperature,decrease of the radiating air flow.Install Thermo-con following condition.Moreover,when the exhaust duct is necessary,prepare it by customer.

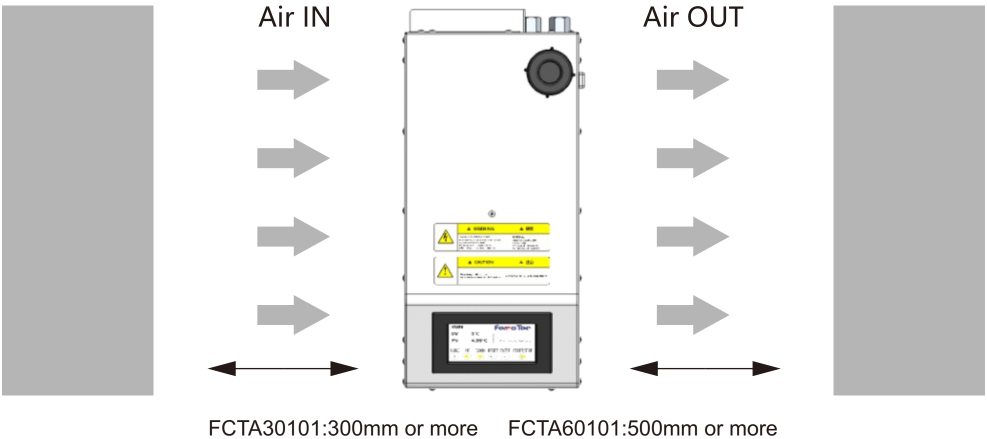


Fig.3-1Installation environment

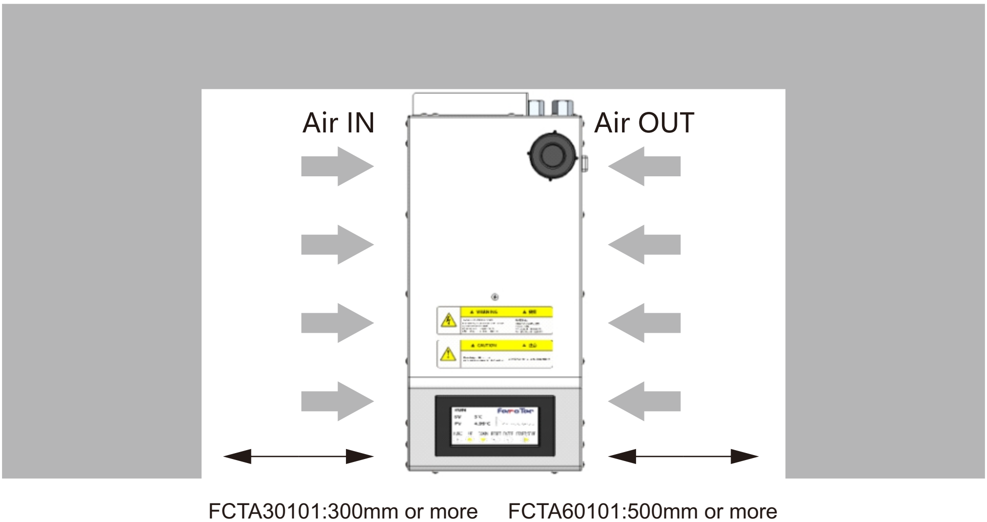


Fig.3-2 Installation environment (when the back side has been blocked)

The product should be mounted as follows.
1) Use the foot attached to the product for mounting.
2) Then tighten the M4 screw into the hole.

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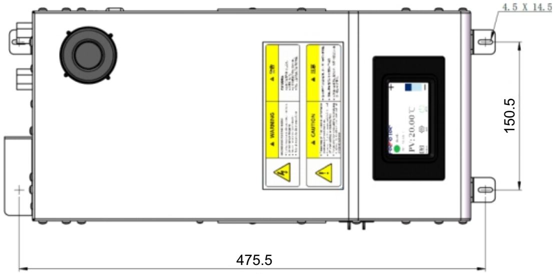

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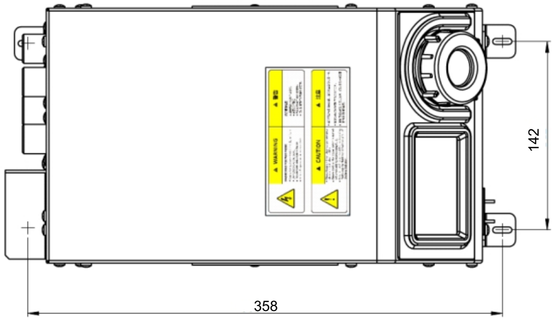

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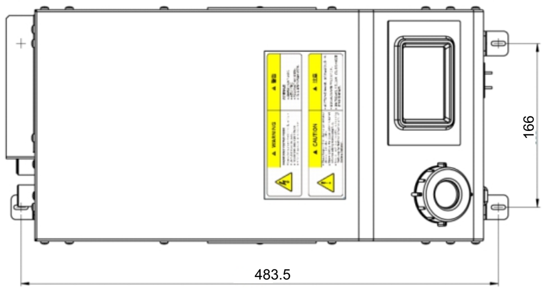

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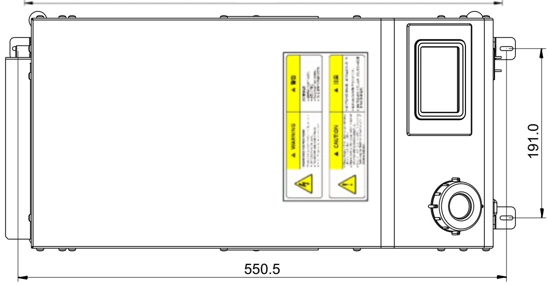


Fig3-3 Mounting

⚠ CAUTION

Be sure to correctly tighten all screws the required torque.

3.3 Piping

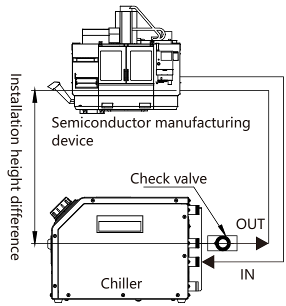
1) Ensure the flow rate of the circulating fluid is as high as possible to maintain the temperature stability.Therefore,the length of the external piping should be minimized and internal diameter should be as large as possible. Piping must have sufficient strength for the maximum discharge pressure of the circulating circuit.

2)Likewise if a tube is bent or multiple elbow f ittings are used, the piping resistance will increase and the flow rate will decrease.If the flow rate falls,the temperature stability will decrease.

3)If installing a tank externally,only a sealed tank should be used.Do not use an open tank.

⚠ CAUTION

Ensure that the INLET and OUTLET for circulating fluid is connected correctly. If any valves are used ensure that they do not restrict the flow , otherwise low flow my cause an alarm.



⚠ CAUTION

Use water that satisfies the quality standards shown below for radiating water. If other liquids are used, the product could be damaged and leak fluid, resulting in electrical shock or earth leakage.

	Item	Standard value
Quality item	pH(25℃)	6.5 to 8.2
	Electric conductivity (25oC) (µS/cm)	100 to 800
	Chloride ion (mgCl-/L)	200 or less
	Sulphate ion (mgSO 42-/L)	200 or less
	Acid consumption (pH4.8) (mgCaCO3/L)	100 or less
	Total hardness (mgCaCO3/L)	200 or less
	Calcium hardness (mgCaCO3/L)	150 or less
	Ion silica (mgSiO2/L)	50 or less
	Iron (mgFe/L)	1.0 or less
	Copper (mgCu/L)	0.3 or less
	Sulphide ion (mgS2-/L)	None detected
	Ammonium ion (mgNH 4+/L)	1.0 or less
	Residual chlorine (mgCl/L)	0.3 or less
	Free carbon (mgCO2/L)	4.0 or less

List 3-1 Quality standard for fresh water (tap water)

4 Unit Overview

4.1 Method of identifying model

FC T A/W 30X 0 1 – 3 1 01 – ☐

- FC — FTH Chiller
- T — T: TEC
- A/W — W: Water-cooled; A: Air-cooled; C: Chemical fluid
- 30X — Cooling capacity: 30 * 10^1=300W
- 0 — Product type:
  - 0: Standard
  - 1: Front water outlet
  - 2: Integrated built-in use
  - 3: Split type
  - 4: Rack mount type
- 1 — Serial number
- 3 — Power supply:
  - 1: 220V 50Hz
  - 2: 200V~240V 50/60Hz
  - 3: 100V~240V 50/60Hz
  - 4: 380V 50Hz 3φ
  - 5: 208V 50/60Hz 3φ
- 1 — Power cable/plug:
  - 1: Chinese standard
  - 2: European standard
  - 3: American standard
  - 4: Aviation plug
  - 5:Japanese standard
- 01 — Customization: 01: Standard; requirements Different
- ☐ — Accessories

4.2 Manufacturing years method of display

SERIAL NO. 2022 0001

Mfg.year
2022
2023

Serial No.
0001
0002
……

4.3 Model No.label

A model No. label is attached to the unit in the position shown below.

Model No. label

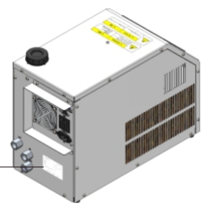


Fig.4-1Position of Model No.label

Fig.4-2Legend of Model No. label

4.4 Appearance

The appearance and the outline dimensions are as shown below.

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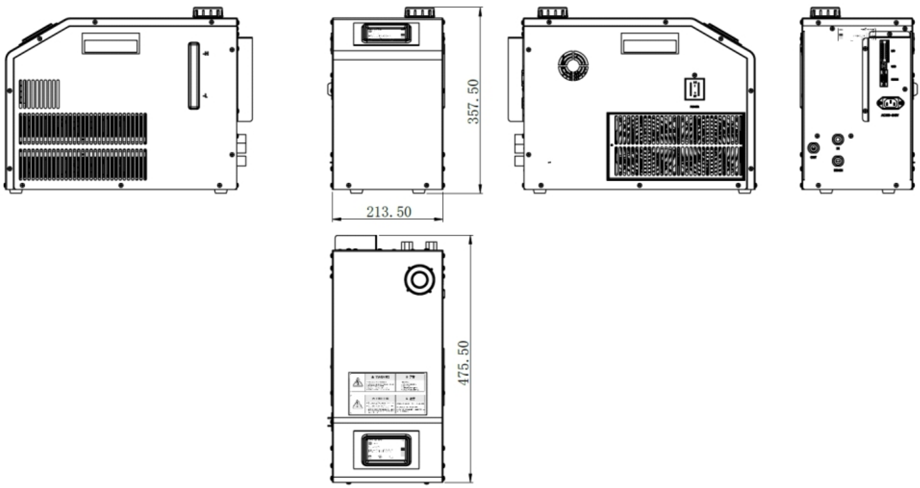

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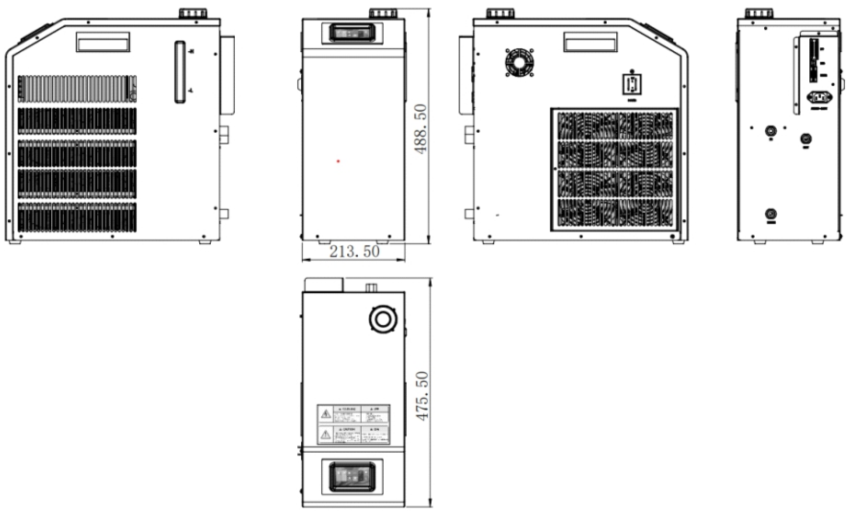

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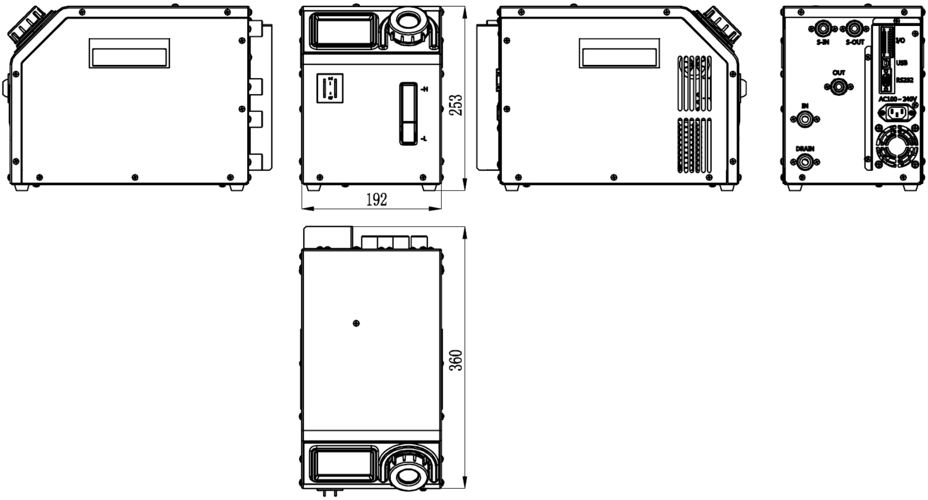

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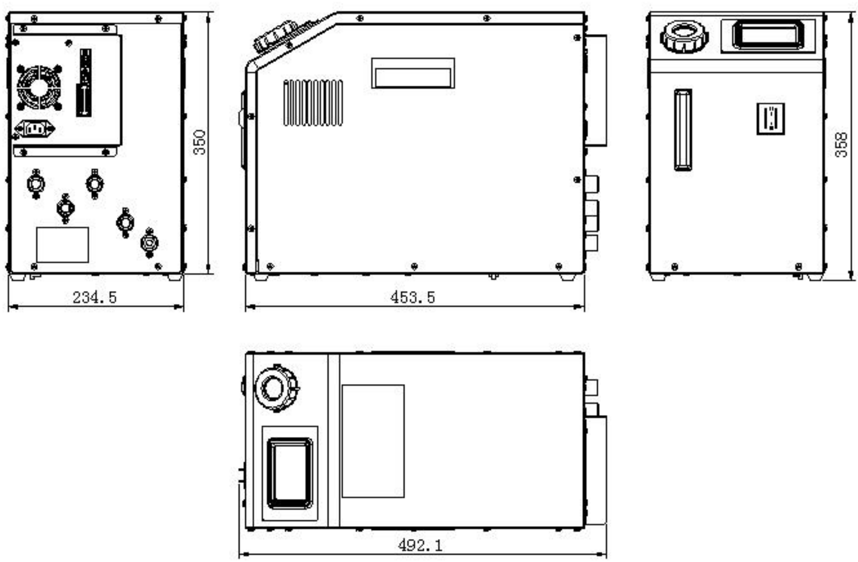

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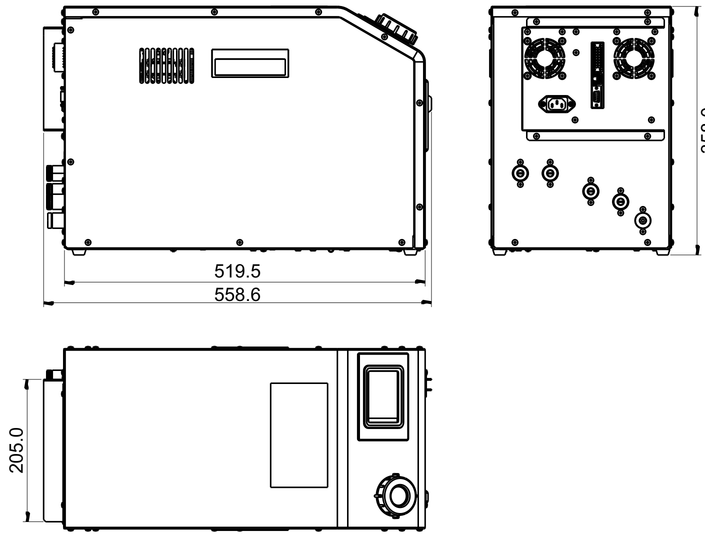


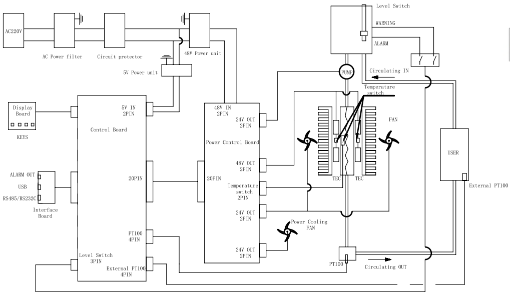
Fig.4-3Out side drawings of FerroCool Thermostat

4.5 Outline of operation

The unit is operated as explained below.

4.5.1 Electrical diagram

Air-cooled



Water-cooled

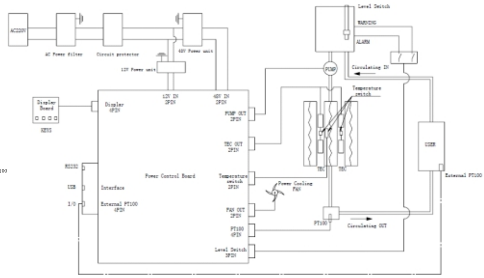
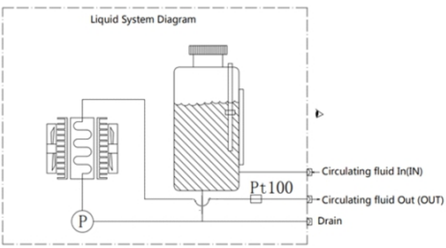


Fig.4-4Electrical diagram

4.5.2 Mechanical system

The unit is equipped with circulating fluid as shown below.

Air-cooled



Water-cooled

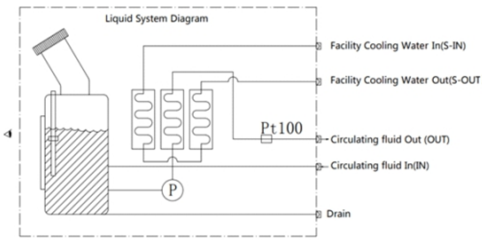


Fig.4-5Circulating fluid circuit

4.6 Functions

4.6.1 Offset function

This function controls the temperature slide by an offset value from set point temperature. The range of offset is -9.99 to 9.99°C. When the circulating fluid is carried to the target object, a certain deviation occurs between the temperature before the object and the setting temperature of the product due to the influence of ambient temperature on the piping. In this case, if the deviation is input as the offset value, the temperature of circulating fluid just before the object can match with setting value. Internal sensor value for alarm does not include the offset value.

4.6.2 Learning control function

This function lets the product measure the temperature of circulating fluid flowing before temperature target object by an external temperature sensor and adjusts the offset function automatically to the set value at a certain sampling interval. The external temperature sensor needs to be prepared separately by thecustomer. Professional software is required.

4.6.3 External tune control function

This function makes the temperature of circulating fluid consistent to the external (ambient) temperature all the times. This function lets the product measure the temperature from a temperature sensor mounted in the customer preferred location, then it adjusts the temperature of the fluid automatically to the temperature detected by the sensor. The separate temperature sensor needs to be prepared separately by the customer.Professional software is required.

4.6.4 Temperature sensor fine control function

This is a function to finely control the measurement temperature of the control sensor within the range of -9.99 to 9.99°C separate from offset function. Control sensor can be corrected by inputting difference (calibration value) between temperature of standard and that of control sensor. Professional software is required
Internal sensor value for alarm includes the fine control value.
Professional software is required.
Internal sensor value for alarm = Internal sensor value – Fine control value

4.6.5 Setting value memory function

This function backs up all the manually set values to nonvolatile memory. Even if the power is turned off the set values are saved and will be restored at power on.

4.6.6 Upper/Lower Temperature Limit Alarm Function

This function raises an alarm when temperature of the circulating fluid is out of allowable upper and lower range. When the alarm is raised, WRN is indicated on LCD. If circulating fluid temperature returns to within allowable upper/ lower range, this alarm is automatically canceled. The allowable upper and lower range of temperature can be set between 0.1 °Cand 10°C.

5 Names and Functions of Components

The parts included into the unit have description and function individually.

5.1 Sideview

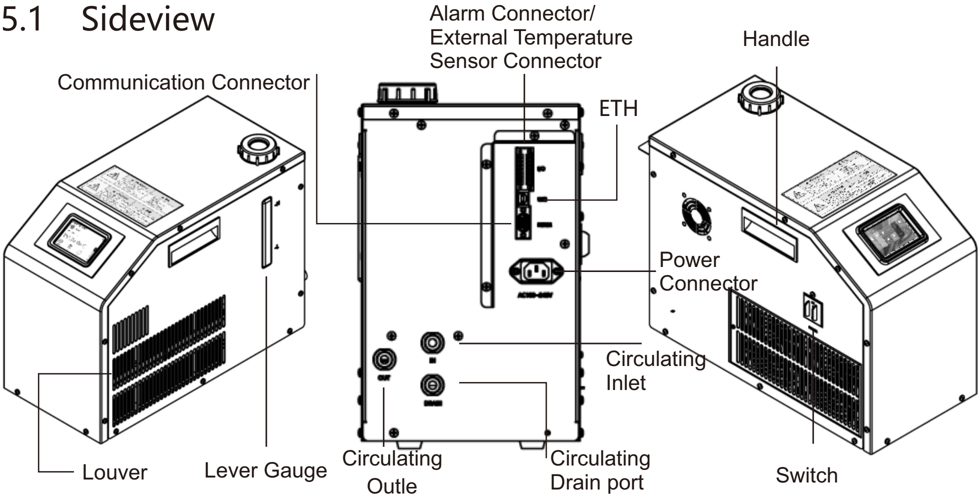


Fig.5-1 FCTA30101/FCTA60101

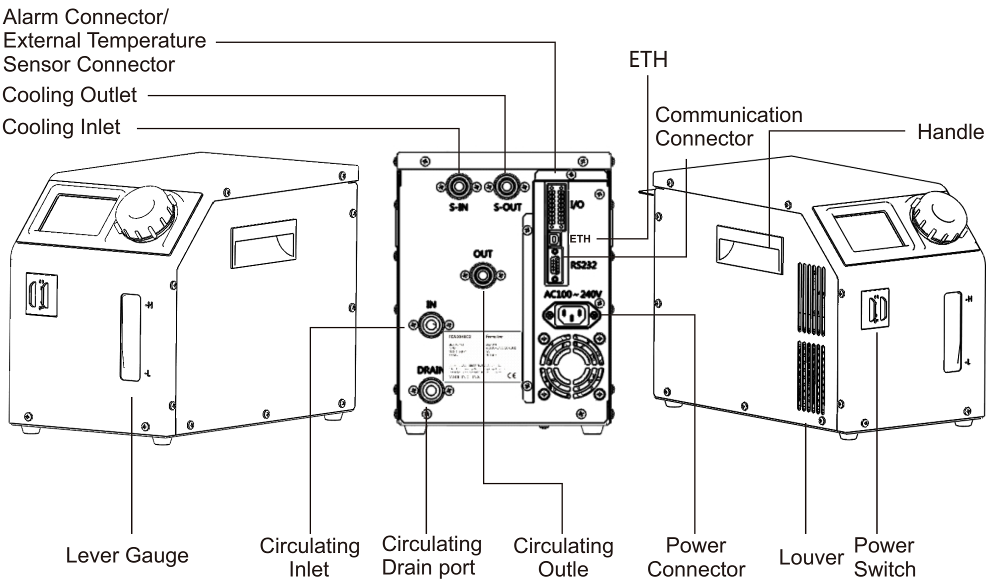


Fig.5-1 FCTW30101

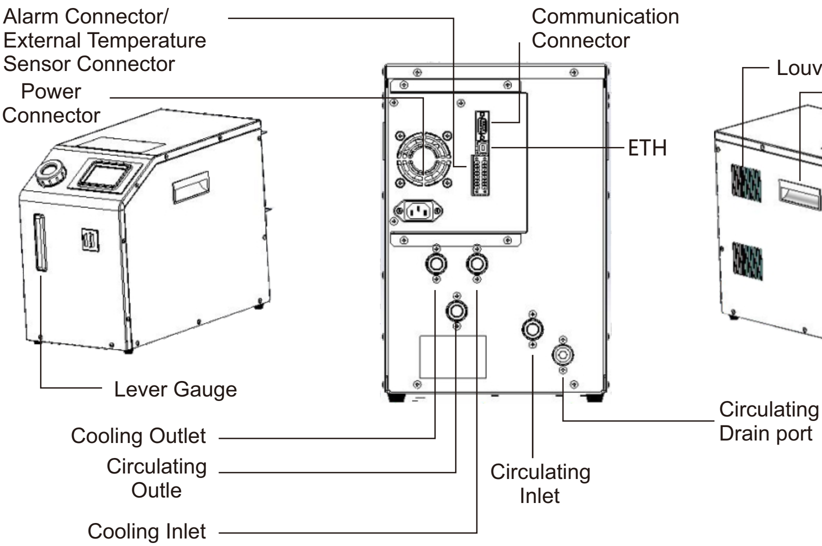


Fig.5-1 FCTW60101

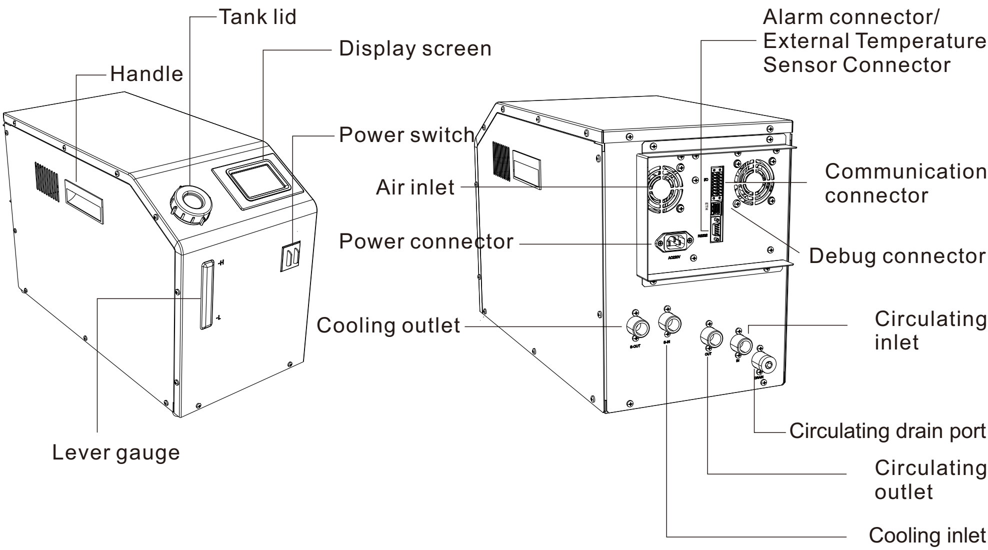


Fig.5-1 FCTW90101

5.1.1 Air Filter

Air Filter

The Thermostat adopts air-cooled heat exchanger not to allow dust to enter easily inside. However, should the dust be allowed and attached on the filter, the filter may become unable to function properly. To prevent this, the filter should be taken out by removal of screws and cleaned periodically.

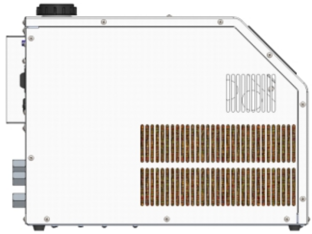


Fig.5-2 Air Filter

⚠ CAUTION

Please keep air filter clean as performance decreases with dust build up. We will recommend the removal of dust once every three months. Please remove dust with the cleaner,do not use water to clean.

5.2 Top view

The parts attached to the top of Thermostat have description and function individually as shown below.

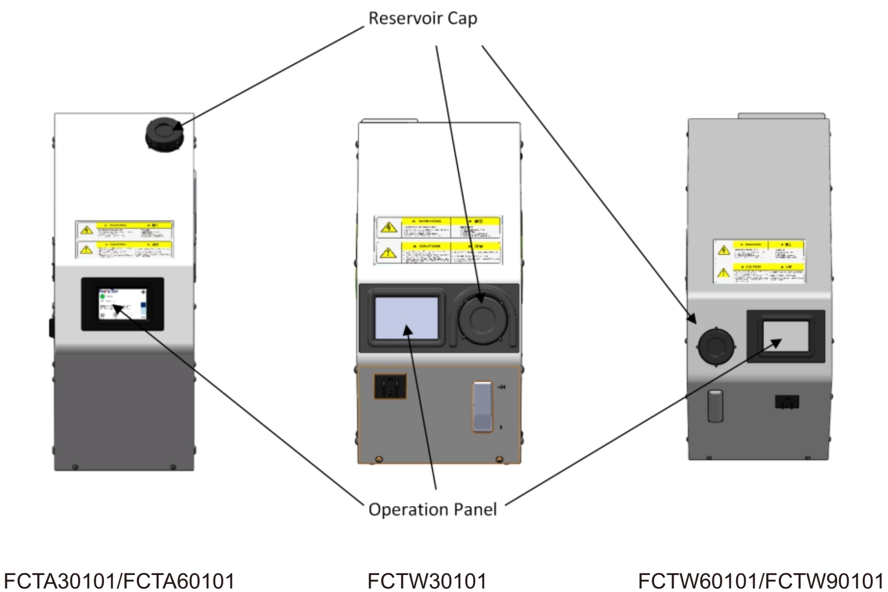


Fig.5-3 Top view

5.2.1 Operation panel/Display

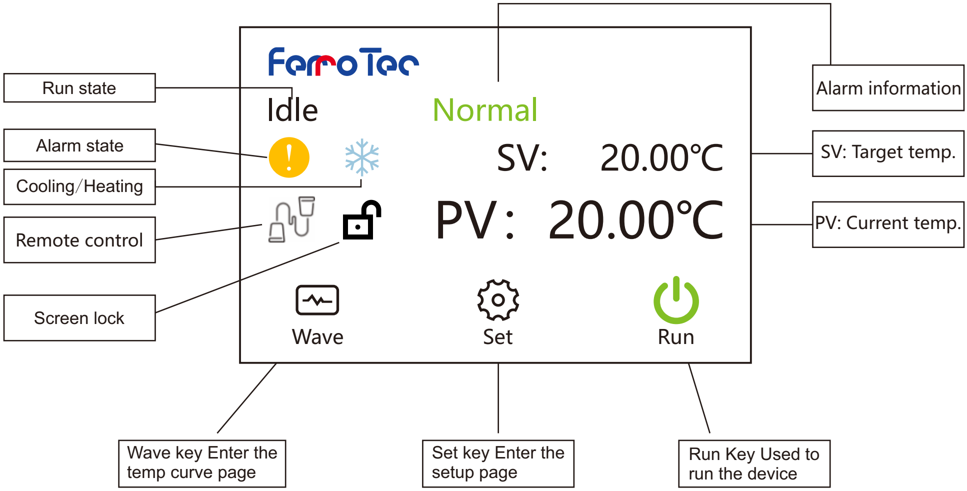
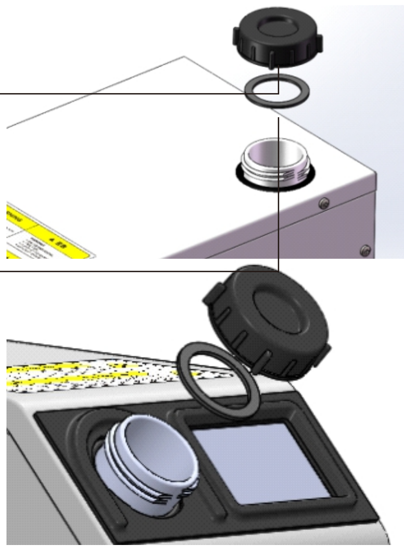


Fig.5-4 Operation panel/Display

5.2.2 Reservoir Cap



Reservoir Cap

Removed to supply circulating fluid before operation. Replace cap before starting operation. Counter-clockwise to open Clockwise to close.

Gasket (Included)

Between the reservoir cap and reservoir for sealing. Under a circumstance where a tank get negative pressure, remove the gasket after confirming that the circulating fluid will not f low back when the product stopped.

Fig.5-5Reservoir Cap

6 Specifications

6.1 Specification table

The specif ications of the Thermostat is as shown below.

List 6-1 Specifications

Item	Spec.	
Model No.	FCTA30101	FCTA60101
Cooling method	Thermoelectric device(thermo-module)	
Radiating method	Forced air cooling	
Control method	Automatic cooling/heating PID control	
Ambient temperature/humidity	10~35℃,35~80%RH	
Circulatingfluid	DI Water	
Operating temperature range	10.0~60.0℃	10.0~60.0℃
Cooling capacity	320W（25℃）	600W（25℃）
Heating capacity	780W（25℃）	900W（25℃）
Temperature stability	±0.05℃	
Pump	Magnetic drive pump 22L/min,11m lift	Magnetic drive pump 19L/min,20m lift
Tank capacity	Approx,3.0L	
Piping port size	IN/OUT Rc3/8 Drain Rc3/8（with piug）	
Wetted parts material	Stainless steel 304,EPDM,PE,ABS	
Power supply	Single-phase 100 to 240 VAC 50/60Hz	
Over current protector	13.5 A	
Current consumption	6A(100V)~2.2A(240V)	9.5A(100V)~3.9A(240V)
Commuications	I/O、ETH、RS232、RS485	
Acoustic noise	60dBA	75dBA
Weight	Approx 18.0KG	Approx 27.2KG
Accessories	Power cable	
Safety standards	EN60204-1 CE marking	

Item		Spec.	
Model No.		FCTW30101	FCTW60101
Cooling method		Thermoelectric device(thermo-module)	
Radiating method		Water cooling	
Control method		Automatic cooling/heating PID control	
Ambient temperature/humidity		10~35℃,35~80%RH	
Circulating fluid		DI Water	
Operating temperature range		10.0~60.0℃	
Cooling capacity		320W（25℃）	600W（25℃）
Heating capacity		680W（25℃）	900W（25℃）
Temperature stability		±0.05℃	
Circulating fluid system	Pump	Magnetic drive pump 22L/min,11m lift	Magnetic drive pump 19L/min,20m lift ※1
	Tank capacity	Approx,1.2L	Approx,3.0L
	Piping port size	IN/OUT Rc3/8 Drain Rc3/8（with piug)	
	Wetted parts material	SUS304,EPDM,PE,ABS	
Facility water system	Temperature range	10~35℃	
	Pressure range	≤1MPa	
	Required flow rate	3-7L/min	7-15L/min
	Piping port size	Rc3/8	
	Wetted parts material	Aluminum，Stainless steel 304, EPDM, PE	
Power supply		Single-phase 100 to 240 VAC 50/60Hz	
Over current protector		13.5 A	
Current consumption		4.8A(100V)~2.0A(240V)	7.5A(100V)~3.2A(240V)
Commuications		I/O、ETH、RS232、RS485	
Acoustic noise		45dBA	
Weight		Approx 10.5KG	Approx 21.5KG
Accessories		Power cable	
Safety standards		EN60204-1 CE marking	

※1 19L/min, 30m lift pump can be selected, and the equipment size will also change after selection.

Item		Spec.
Model No.		FCTW90101
Cooling method		Thermoelectric device(thermo-module)
Radiating method		Water cooling
Control method		Automatic cooling/heating PID control
Ambient temperature/humidity		10~35℃,35~80%RH
Circulating fluid		DI Water
Operating temperature range		10.0~60.0℃
Cooling capacity		900W (25℃)
Heating capacity		1200W (25℃)
Temperature stability		±0.05℃
Circulating fluid system	Pump	Magnetic drive pump 19L/min，20m lift
	Tank capacity	Approx,3.0L
	Piping port size	IN/OUT Rc3/8 Drain Rc3/8 (with piug)
	Wetted parts material	SUS304,EPDM,PE,ABS
Facility water system	Temperature range	10~35℃
	Pressure range	≤1MPa
	Required flow rate	7-15L/min
	Piping port size	Rc3/8
	Wetted parts material	Aluminum，Stainless steel 304, EPDM, PE
Power supply		Single-phase 200 to 240 VAC 50/60Hz
Over current protector		13.5 A
Current consumption		5.5A(200V)-4.6A(240V)
Commuications		I/O、ETH、RS232、RS485
Acoustic noise		45dBA
Weight		Approx 27KG
Accessories		Power cable
Safety standards		EN60204-1 CE marking

6.2 Performance chart

Value on performance chartis not guaranteed value but representative value. The value used for consideration should not be the very limit for the safety.

FCTA30101

1)Cooling capacity

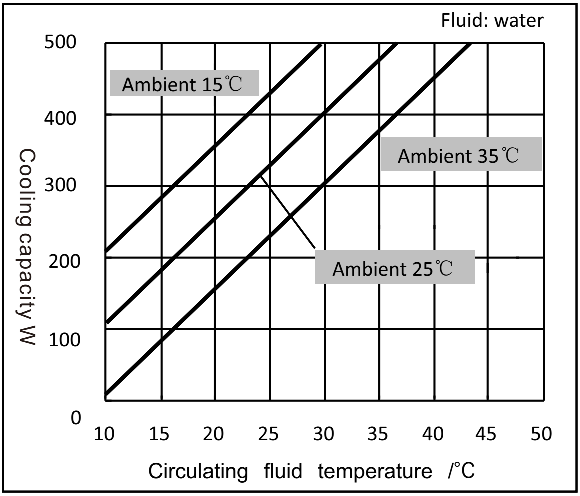


Fig.6-1 Cooling capacity

2)Heating capacity

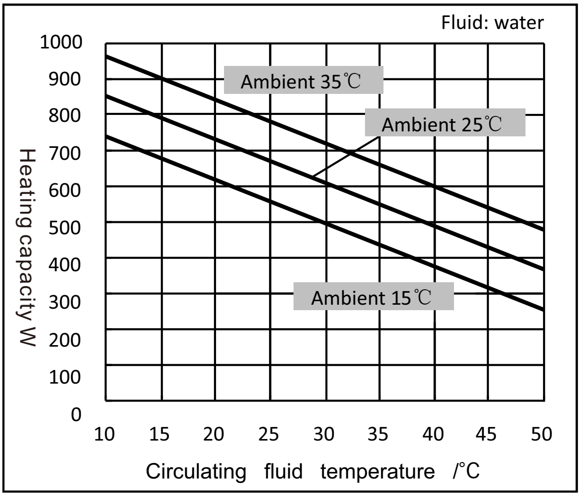


Fig.6-2 Heating capacity

FCTA60101

1)Cooling capacity

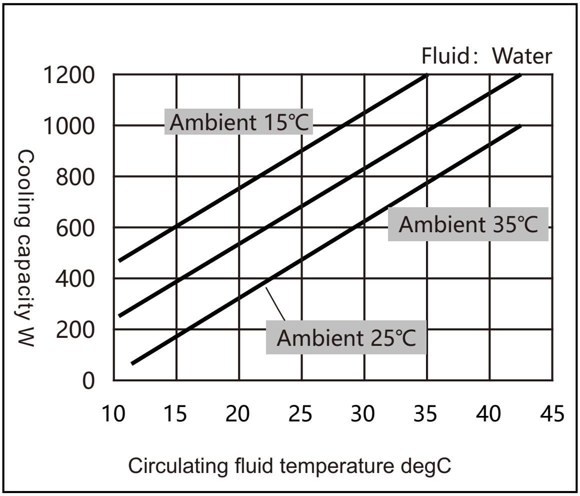


Fig.6-3 Cooling capacity

2)Heating capacity

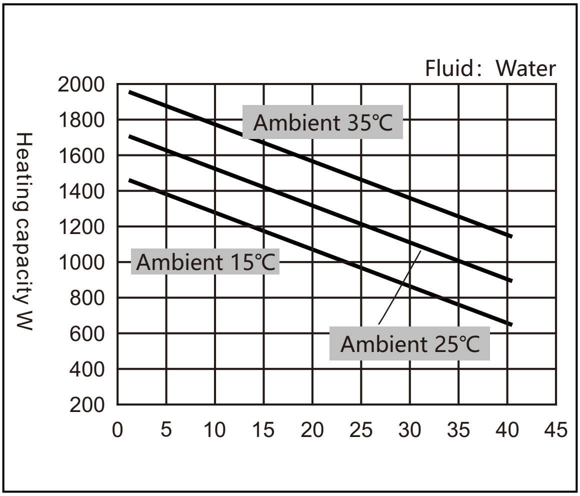


Fig.6-4 Heating capacity

FCTW30101

1)Cooling capacity

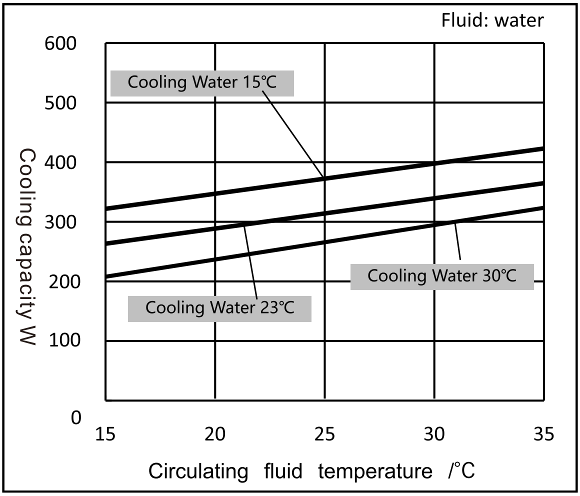


Fig.6-5 Cooling capacity

2)Heating capacity

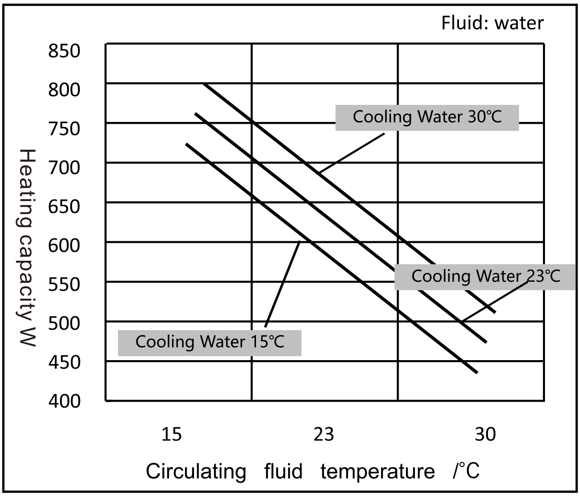


Fig.6-6 Heating capacity

FCTW60101

1)Cooling capacity

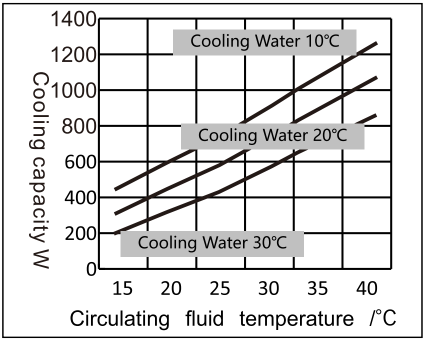


Fig.6-7 Cooling capacity

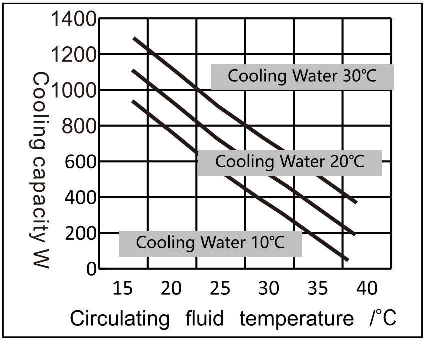


Fig.6-8 Heating capacity

2)Pump capacity

The pressure on Y axis stands for discharge pressure of circulating fluid from FerroCool Thermostst.

FCTA30101/FCTW30101

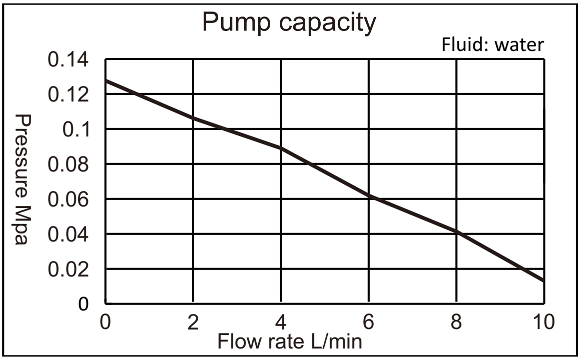


Fig.6-9 Pump capacity

FCTW60101/FCTA60101

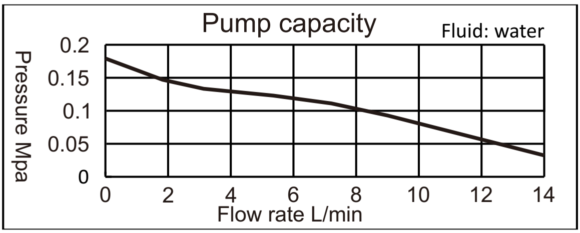


Fig.6-10 Pump capacity

FCTW90101

1)Cooling capacity

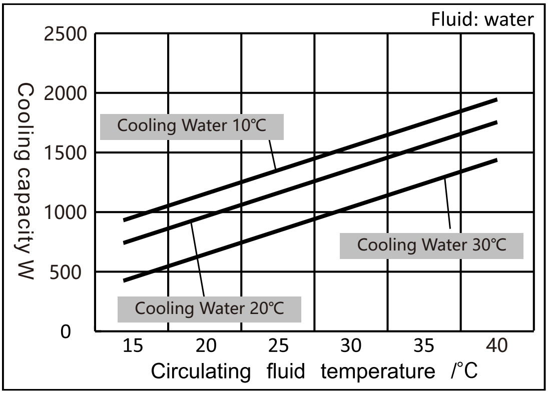


Fig.6-11 Cooling capacity

2)Heating capacity

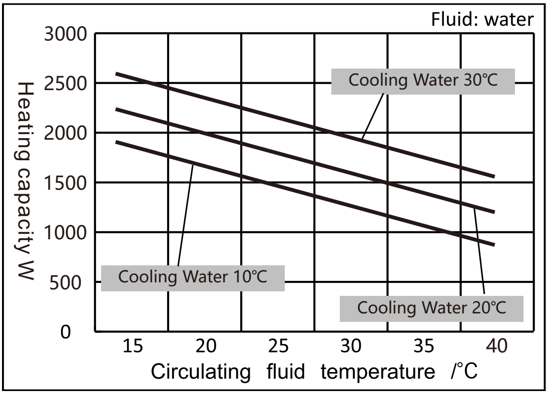


Fig.6-12 Heating capacity

3)Pump capacity

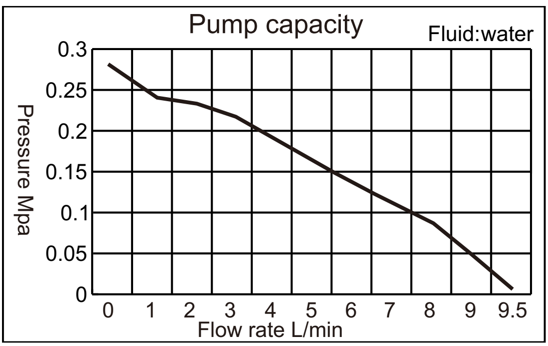
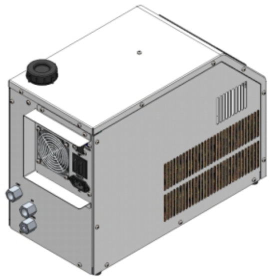


Fig.6-13 泵性能

7 Preparation for Operation

7.1 Preparation for circulating fluid



The piping for circulating fluid is connected as below.

1.The piping for circulating fluid is located at the rear side face.

2.The same fittings are used for IN and OUT of the circulating fluid.

The fitting which can mate them needs to be prepared separately. When the fitting is connected, be sure to hold the fitting (block) mounted at Ferro Cool. with spanner,etc.

Thread size of fitting for circulating fluid:

FCTA30101、FCTA60101：Rc3/8

FCTW30101、FCTW60101、FCTW90101：Rc3/8

A plug is mounted on DRAIN port for circulating fluid. When the piping for drain is connected, remove this plug before hand.

Drain the circulating fluid before performing any maintenance.

FCTA30101、FCTA60101：Rc3/8

FCTW30101、FCTW60101、FCTW90101：Rc3/8

⚠ CAUTION

Fluid other than water is not to be used as circulating fluid. Using such a fluid might lead to fluid leakage and damage of the pump.

⚠ CAUTION

If a tank released to atmosphere is mounted outside, minimize the piping resistance at RETURN of circulating fluid. If the piping resistance is high, the causing the built-in reservoir of FerroCool Thermostst. can have negative pressure resulting in deformation and crack.The built-in reservoir of FerroCool Thermostst. is made of Plastic and must not be subject to negative pressure larger than -0.02MPa.

⚠ CAUTION

Once the plug is removed from the drain port, the leakage from it is not guaranteed. Therefore, seal it with PTFE seal tape etc. and ensure there is no leakage from it before operation.

7.2 Power supply

The power supply shall be connected with attached power supply cable.

Confirm the power supply at factory has enough capacity and the voltage is within specified value beforehand (with reference to electrical specifications of the power supply). This unit is provided with the power supply cable. The power supply cable shall be connected properly in accordance with Chapter 10 “Power Supply Cable”.

AC100-240V,50/60Hz Single phase

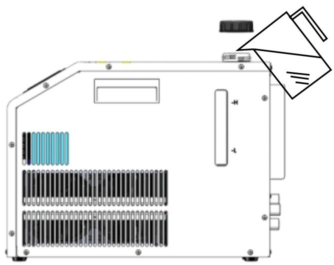
Electric specifications of the power supply

7.3 Grounding

Be sure to provide the grounding. Use medical plug with protection earth when the unit is used for medical equipment. PE line of the power supply cable is available for grounding. Do not hold the ground in common with the ones for equipment which generates strong electromagnetic noise or high frequency.

7.4 Supply circulating fluid and drain

<Supply circulating fluid>



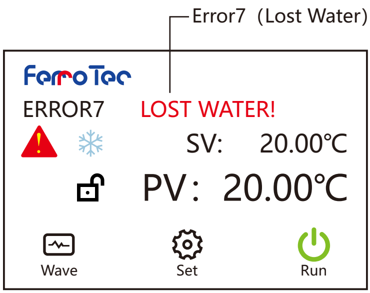
1. Confirm the power switch is turned off.

2.Take off the reservoir cap of the product.

3.Fill the circulating fluid for the reservoir. The inlet of the reservoir is not so large and there is a possibility of spillage of circulating fluid. Pay attention when filling the circulating fluid. Stop the filling once the level of fluid reaches “H” level.

4. Turn on the power switch to fill the piping ping with the fluid.

5. When the piping is filled with the circulating fluid, the level of the reservoir lowers and Lost Water arises accordingly. Then, turn off the power again.



6.Repeat the step from 3 to 6 until error7 (Low Water) doesn’t appear anymore. T h e n , replace the cap on the reservoir and tighten it securely.

7. Keep the fluid level between H and L of the level indicator.

8.Water pressure during normal operation becomes under 0.1 MPa.

<Drain circulating fluid>

1.Drain circulating fluid from the drain port. Open the reservoir cap would be helpful for draining.

2.To drain from the piping, blow the air (0.1MPa, about 1 minute) from Fluid IN to Fluid OUT. Tighten the tank lid and drain port while blowing.

⚠ DANGER

Never touch the switch with wet hands to avoid electrical shock.

⚠ CAUTION

Operation of the pump with the plenty of air left in the piping for prolonged period may cause the pump to break. Exhaust the air enough from the piping before starting operation of the pump. Take enough care not to spill the feed water over the case when supplying water to the reservoir. When it is spilt by mistake, wipe it off immediately and supply the power after it dries. If this procedure is neglected, it may cause break down of the equipment. Do not perform operation under the condition which lowers the flow rate significantly, such as closing the valve. Otherwise, the temperature might be beyond control.

⚠ CAUTION

If the fluid with low conductivity such as DI water is used as circulating fluid, it causes static electricity due to friction and damages the temperature sensor and other electric components of this unit.Take a measure to minimize static electricity from circulating fluid.

⚠ CAUTION

If the power switch is turned on without circulating fluid, the pump is damaged.

⚠ CAUTION

The product is damaged when driving for along term with the temperature staggered periodically after reaching the target temperature. Please set the PID value again .

7.5 Check·Repair

The following checks shall be performed before operation.

7.5.1 Daily check

1) Indication of display panel : Check temperature condition and confirm whether or not the alarm occurs.

2) Filter : Confirm there is not attachment of the dust on the filter at suction port. A lot of attachment may impair performance. We will recommend the removal of dust once every three months.

3) Check if the circulating fluid is dirty. Dirty circulating fluid may result in worse capacity or shorter product life. If water is used as the circulating fluid, algae and bacteria will be generated and dirty the circulating fluid. Therefore, replace the circulating fluid regularly (once a month as a guide).

4) Confirm there is no leakage of circulating fluid or no bending or crush of the piping of circulating fluid.

5) Confirm there is no abnormal sound or smell or abnormal heating of the case.

⚠ CAUTION

Remove the dust attached to a fiter by vacuum cleaner to prevent degrading of performance. There commended interval of removal is once per 3 months. Do not use water or boiled water since it leads to generation of rust at a frame.

⚠ CAUTION

If the thermostat is operated with bacteria and algae present, its cooling capacity or the capacity of the pump may deteriorate. Replace all circulating fluid regularly according to the conditions of water quality (once a month as a guide).

7.5.2 Check after seismic vibration and impact

1)Piping: Confirm there is no defect including disconnection in piping.

2) Electrical wiring: Confirm there is disconnection of the connector from the cable.

3) Mounting condition: If the Thermostat is mounted for operation, confirm the Thermo-con is mounted securely.

4) Circulating fluid: Confirm there is no leakage.

5) Others: Confirm there is no abnormal sound or smell or abnormal heating of the case.

7.5.3 Repair and maintenance

The repair and maintenance services of this unit are performed only at our factory. The service requiring a trip regardless of inside and outside of China is not provided. Also, when this unit is returned for these purposes, drain the fluid from Ferro Cool. Additionally, it is recommended to prepare spare units to minimize downtime due to those repair and maintenance services.

⚠ WARNING

Drain the fluid from Thermostat when it is returned for the repair and maintenance service. If the f luid is left inside, an accident and damage can result during transportation.

⚠ CAUTION

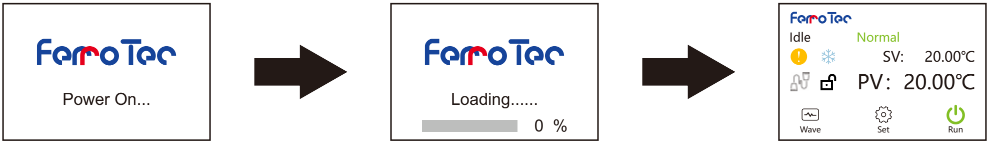
After washing with DI water,return the product when the fluid was other than water. The acceptance might be refused according to the state of the product.

8 Operation

This chapter describes the detailed information on how to operate.

8.1 Condition after power up

When power is turned on, Ferrotec logo is indicated on display panel for approx. 1 sec,then go to the home page.

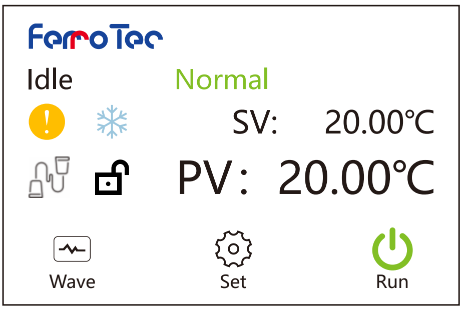


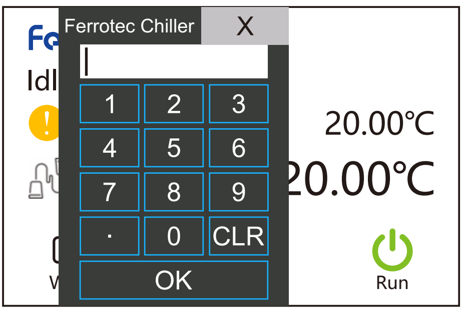
⚠ CAUTION

Please do not use devices that generate electromagnetic radiation such as cellular phones near the product. There is a possibility that the product malf-unctions.

8.2 How to operate

8.2.1 Home page





1.[Run] key Short press the key to switch between “run” and “stop”

2.[Set] key Enter the setup page.

3.[Wave] key Enter the alarm page.

4.[ ] key Lock screen status indicator

When the screen is locked, hold down the icon to unlock the screen. The screen lock function is set on the parameter setup page. If the remote port lock screen is used, you can unlock only the remote port.

5.[ ] key Remote control status

When the remote control is started, the on key on the screen fails, and you need to stop the device from the machine, please remove the remote control from the parameter setting page first. In case of emergency, please forcibly turn off the power

6.[/] Device status display

a) Warning!!!: Alarm warning, but it can working.

b) Error!!!:Alarm, Stop.

7.[/]Heating/Cooling status display

a) Heating state

b) Cooling state

8.2.2 Setup page

1.P/I/D parameters: PID each parameter range from 0 to 5000.

2.High Limit: Max. temp. setting allowed by the device; Range from 30 to 60℃.

3.Heat offset: Temp. compensation; Range from 0 to 10, the unit is ℃, the maximum deviation can be set to 10℃.

4.Shutdown Delay: Set pump delay stop time after shutdown; Range from 0 to 1000 seconds.

5.Sleep Time Setting screen lock time; Range from 0 to 1000 seconds.

6.Rrady Limit: Allowed temp. range; Range from 0 to 10℃, the unit is ℃.

7.Ready time: Set the time to reach the allowed range; Range from 0 to 60 minutes.

8.Power: Limit the percentage of maximum power input; Range from 0 to 100%.

9.Baud Rate: Set the baud rate for communication with host computer.

10.Address: Setting correspondence address. Range from 1 to 128.

11.PT100(0:in/1:out): The setting is controlled by internal PT100 or external PT100.

12.REMOTE(0:OFF 1:ON): Set remote control.

13.Auto Lock(0:OFF 1:ON): Set the lock screen. After the screen is locked, the device status cannot be changed on the main screen

14.PFR: Power Failure Resume. It can record the working state of abnormal power failure when opening, and automatically recover after power-on.

15.Anti Freeze: Anti-freezing function. When the equipment is placed in a low-temperature environment standby, if the water drops to 5℃, the machine will automatically run the pump.

16.PID Auto-Tuning: It is used to start PID automatic adjustment in PID self-tuning mode. (See HELP page)

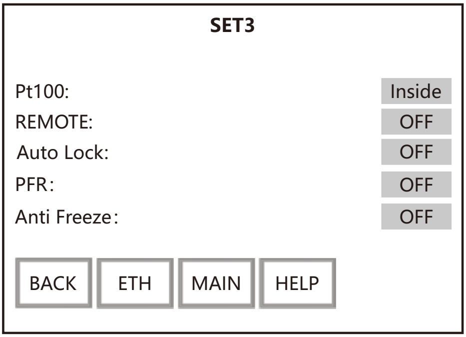
17.RESET ALL SET: Restore factory settings. (See HELP page)

SET1	
P rate (0~5000):	100
I rate (0~5000):	5
D rate (0~5000):	2500
High limit(30~60℃) :	60
Heat offset (0~1000 (0.01℃)) : +	0.00
Shutdown delay (0~1000s)	10
MAIN NEXT	

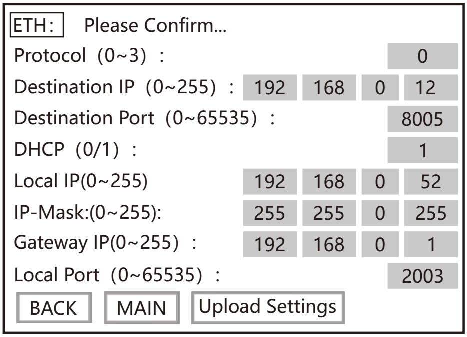
SET1

SET2	
Sleep Time (Sec):	0
Ready Limit(0~10℃) :	0.00
Ready Time (Minutes):	2500
Power (0~100%) :	60
Baud Rate:	10
Address (1~128)	1
BACK NEXT MAIN	

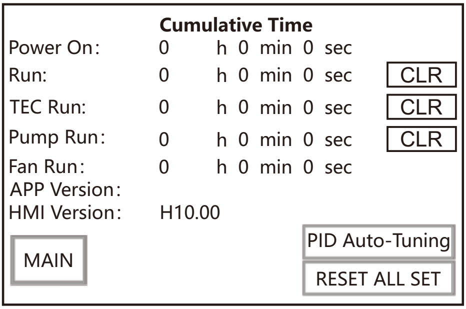
SET2



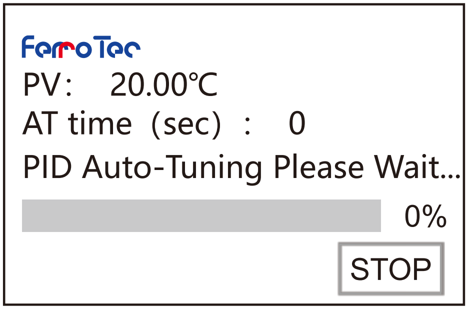
SET3



ETH Setting interface



Help Interface



At Interface

Protocol: Thermostat communication protocol, mode options.See the following table for definitions

Protocol Value	Mode	Details
0	TCP CLIENT	In the TCP CLIENT mode, after the Thermostat is powered on, it will actively connect to TCP The SERVER can control the Thermostat after the connection is established.
1	TCP SERVER	In the TCP SERVER mode, after the module is powered on, it will listen whether there is a client request connection on the local port. After the connection is established, it can control the Thermostat. This mode only supports one client.
2	UDP SERVER	In the UDP SERVER mode, this mode sends and receives commands according to the set parameters to control and monitor the Thermostat. In this mode, the network parameters that the module needs to configure include: local IP, subnet mask, default gateway, local port, destination IP, Destination port.
3	UDP CLIENT	In the UDP CLIENT mode, this mode sends and receives commands according to the set parameters to control and monitor the Thermostat. In this mode, the network parameters that the module needs to configure include: local IP, subnet mask, default gateway, local port, destination IP, and destination port.

Destination IP: Set destination IP
Destination Port: Set Destination Port
DHCP: Set the DHCP switch. To turn it off, you need to manually set the local IP, subnet mask and gateway address.
Local IP : Local IP
IP-Mask: Subnet mask
Gateway IP : Gateway IP
Local Port: Local Port
At interface: Display the current actual temperature, AT time and progress, and automatically jump to the main interface after completion.

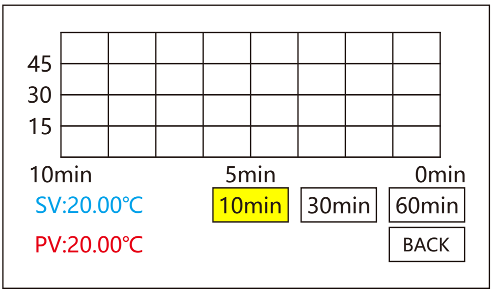
Alarm log page:
Press the alarm icon area on the home page to enter, and 8 logs will be displayed circularly, with No. 1 being the latest alarm. Press CLR at the bottom to clear all records.

8.2.3 Parameter setting method

1.Click on the gray area of the corresponding parameter to bring up the numerical input window.

2.Enter the numerical value and click OK to confirm.

8.2.4 Temperature curve page



Temperature curve table

You can select the display duration 10 minutes or 30 minutes or 60 minutes.

9 Alarm

This chapter explains the various alarms that the product has.

9.1 Alarm indication

When the alarm occurs, there will be an alarm prompt sound, and the status bar will display the alarm and alarm information, as shown in Fig.9-1, In the main interface, press

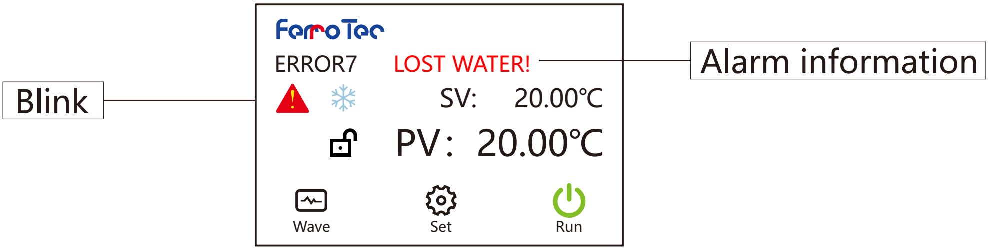


Fig.9-1 Alarm indication on the home page

NOTE

The inputted data memorized after the power supply is turned off. The writing can be done up to 1 million times.

9.2 Alarm code list

The alarm has individual code sent from controller as listed below.

List9-2 Alarm code list

Code	Description	Status	May reason	Repair method
ERROR1	TEC TOO HOT	Stop	TEC Cold surface overtemperature	Removal of possible cause and restart the power supplyIn this case if the alarm can't be reset by above manner, repair is req-uired.
ERROR2	PUMP FAN ERROR	Stop	The fan or the pump overload or disconn-ection	Removal of possible cause and restart the power supplyIn this case if the alarm can't be reset by above manner, repair is req-uired.
ERROR3	TEC OPEN	Stop	TEC open a way	Removal of possible cause and restart the power supplyIn this case if the alarm can't be reset by above manner, repair is req-uired.
ERROR4	TEC SHORT CIRCUIT	Stop	TEC Short	Removal of possible cause and restart the power supplyIn this case if the alarm can't be reset by above manner, repair is req-uired.
ERROR5	PCBA TOO HOT	Stop	High temperature of main board	Removal of possible cause and restart the power supplyIn this case if the alarm can't be reset by above manner, repair is req-uired.
ERROR6	PCBA ERROR	Stop	Power board failure	Removal of possible cause and restart the power supplyIn this case if the alarm can't be reset by above manner, repair is req-uired.
ERROR7	LOST WATER	Stop	The fluid level below the cut-off level	Add water and reset autom-atically In this case if the ala-rm can' t be reset by above manner, repair is required.
ERROR8	POWER ERROR	Stop	Power supply error	Removal of possible cause and restart the power supplyIn this case if the alarm can't be reset by above manner, repair is req-uired.
ERROR9	PT100 ERROR	Stop	Pt100 Abnormal sensor	Removal of possible cause and restart the power supplyIn this case if the alarm can't be reset by above manner, repair is req-uired.
ERROR11	TEMP OUT OF LIMIT	Stop	Temperature overrun	Removal of possible cause and restart the power supplyIn this case if the alarm can't be reset by above manner, repair is req-uired.

9.3、 Alarm code list

List9-3 Alarm code list

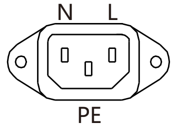
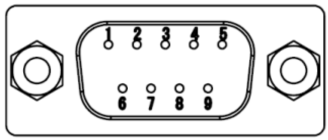
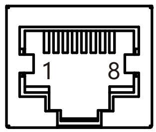
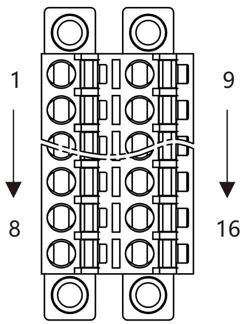
Code	Description	Status	May reason	Repair method
WARN-ING10	READY WARNING	Continue	Temperature regul-ation time exceeds the set time warning	Automatic reset after the temperature reaches the set range.
WARN-ING14	LOW WATER	Continue	Low level warning	Automatic reset by ad-ding water. In this case, if the alarm cannot be reset by the above me-thod, maintenance is re-quired

10 Appendix

The signal and shape of each connector and the method to calculate dew point are explained below.

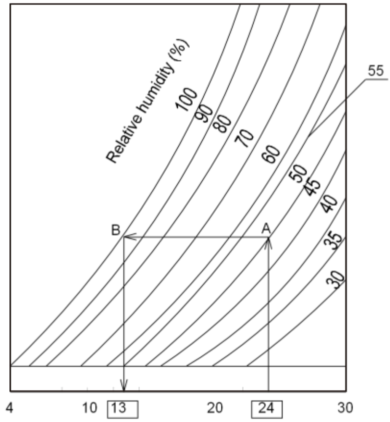
10.1 Signal and style of connectors

The signal and style of each connector attached to the Thermo-con are as shown on the table below.

Description	No.	Signal	Style and Part No.
Power supply connector (IEC60320)	N	AC100-240V	
	L	AC100-240V	
	E	PE	
Rs232 connector (D-sub9)	1	NC	
	2	RXD	
	3	TXD	
	4	NC	
	5	GND	
	6-9	NC	
ETH connector (RJ45)	1-2	TX+/TX-	
	3、6	RX+/RX-	
	4-5	n/c	
	7-8	n/c	
Communication connector Alarm Output connector External temperature sensor connector	1	PT100+	
	2	PT100+	
	3	PT100-	
	4	PT100-	
	5、6	NC	
	7	485A+	
	8	485A-	
	9	IO-LOCK（External locked port)	
	10	IO-REMOTE(Remote control port)	
	11	NC	
	12	GND	
	13	OUT-1N(Running status relay output)	
	14	OUT-1C(Running status relay output)	
	15	OUT-2N(Alarm relay output)	
	16	OUT-2C(Alarm relay output)	

List10-1 Signal and style of connectors

10.2 Calculation of dew point (from psychometric chart)



Temperature (deg.C)

Fig.10-1 Moisture air diagram

1) Measure the ambient temperature and relative humidity.

2) Plot the ambient temperature on the horizontal axis (Ex. 24 ℃), and then draw a perpendicular line.

3) Find the intersection (A) of the curve, which is equal to relative humidity (Ex. 50%).

4) Draw a line from point (A) parallel to horizontal axis, and find the intersection (B) of the curve for 100% relative humidity.

5) Draw a perpendicular line from the intersection at point (B) down to the horizontal axis and read the Dew Point Temperature. (13℃ in this case.)

* Therefore, moisture in the air starts to condensate when the air temperature becomes lower than this temperature.

10.3 Power Supply Cable

List10-2 Power Supply Cable

Description	Specifications
Power Supply Cable	RatingVoltage:250V RatingCurrent:10A

⚠ CAUTION

Do not use the included power supply cable for any purposes other than connection to this product.

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