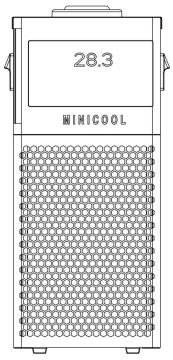
RIGID HVAC CO., LTD

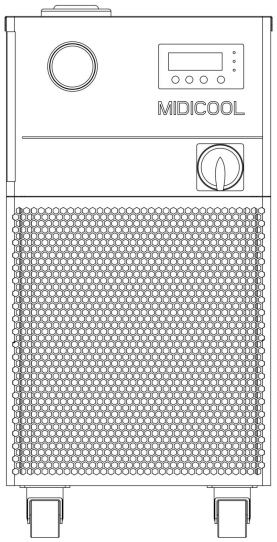
Cooling Specialist

Countertop Recirculating Cooler

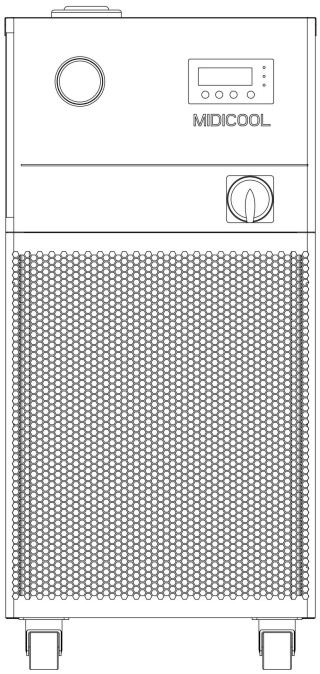
User Manual



·MINI Series·



·MIDI Series·



·MIDI Series·

Contents：

Safety Instructions:

Warning Symbol:

 Caution	 Highly flammable material	 Low Temperature Hazard
 Beware of Electric Shock	 Risk of hand crushing	 Biological Hazard
 Explosive Atmosphere	 High temperature hazard	 Read and follow the instructions carefully.

Alert Level:

Danger	Indicates a hazardous situation that could result in serious injury or death!
Warning	Indicates a hazardous situation that could result in serious injury or death!
Caution	Indicates a hazardous situation that could result in potential injury!
Attention	Indicates a situation that could result in damage to equipment!

Regarding the Use of This Manual:

- Before initial operation of this equipment, carefully read these safety instructions and follow the usage guidelines for accessories.
- This manual is an integral part of the product. Keep it in a safe place for future reference.
- When transferring the equipment to a third party, this manual must be provided along with the device.

Intended Use of the Equipment:

This equipment is intended for indoor use only, specifically for temperature control and circulation of liquid media in laboratory settings.

Use only recommended bath fluids; avoid acidic or corrosive bath fluids.

Operator Requirements:

Operation and maintenance must be performed only by trained professionals.

Repairs may be conducted only by qualified electrical engineers. Strictly adhere to the repair manual's specifications.

Disclaimer:

The following circumstances may compromise the equipment's protective features, and the user shall bear full responsibility for any resulting property damage or personal injury.

Failure to use and operate the equipment in accordance with the operating manual.

Use of the equipment for purposes other than its intended application.

Operation of the equipment with accessories or consumables not recommended by our company.

Maintenance or repair performed by personnel not authorized by our company.

Unauthorized disassembly or modification of the equipment by the user.

Usage Restrictions:

ATEX Directive (2014/34/EU) Notice

- Do not operate this equipment in rooms containing explosive substances.
- Do not use this equipment to process explosive substances or highly flammable materials.
- Do not use this equipment to process substances that generate explosive gases.

Operator Protection:

WARNING! Damaged equipment or power cords pose an electric shock hazard!

- Only operate the equipment when both the device and power cord are in perfect condition!
- Only operate the equipment after it has been properly installed!
- In case of danger, immediately disconnect the equipment's power supply (e.g., using a laboratory emergency switch)! The equipment switch does not completely cut off the power supply!
- Always disconnect the power supply before installing, replacing accessories, or parts.
- Always disconnect the power supply before cleaning, maintaining, or moving the instrument.

WARNING! Lethal voltage inside the equipment!

Contact with high-voltage components may cause electric shock; electric shock can result in cardiac injury and respiratory paralysis.

- Ensure the equipment housing is sealed and undamaged.
- Do not disassemble the equipment housing.
- Ensure no liquids enter the interior of the equipment.
- The equipment may only be disassembled and serviced by the manufacturer or a manufacturer-authorized service facility.

WARNING! Improper power supply causes danger!

- Use only grounded outlets and power sources.

WARNING! Chemically or mechanically damaged accessories pose a risk of injury!

- Avoid subjecting the equipment and accessories to mechanical damage.
- Inspect the equipment and accessories for damage before each use. Replace immediately if damaged.

WARNING! Infectious fluids and pathogenic bacteria can harm your health!

- When handling infectious fluids and pathogenic bacteria, comply with national regulations, your laboratory's biosafety level, and the manufacturer's safety instructions.
- When handling bacteria or biological materials classified as Risk Level II or higher, adhere to relevant regulations such as the Laboratory Biosafety Manual.(Source: World Health Organization, Laboratory Biosafety Manual)

WARNING! Improper use of bath solutions may harm your health!

- Use only bath solutions that meet safety, health, and equipment requirements. Be aware that bath solutions may pose chemical hazards; observe all safety warnings for bath solutions.
- Depending on the bath solution used and the type of operation, toxic or flammable vapors may be present; ensure adequate ventilation.
- Do not use any bath solution that may cause hazardous reactions during operation.

Caution! Using incorrect accessories and spare parts may create safety hazards. The use of non-manufacturer-recommended accessories and spare parts may compromise the safety, proper functioning, and accuracy of the equipment. Damage resulting from the use of non-manufacturer-recommended accessories and spare parts or incorrect operation of the equipment is not covered under the manufacturer's warranty.

- Please use accessories and genuine spare parts recommended by our company.
- Please use the original power cord.

Caution! Equipment is heavy. Handle with care.

- Before moving the equipment, drain all bath fluid from the interior.
- Use the equipment's designated handles when moving it.
- When placing the equipment, be careful not to trap your hands.

Caution! Refrigerant is flammable!

- Refrigerant is flammable. Do not use hard objects to defrost or de-ice the refrigeration or circulation system.
- Ensure the refrigeration cycle system remains intact.
- Only authorized manufacturers may service the refrigeration cycle system.

Caution! High Temperature Hazard!

- During high-temperature operation, the equipment housing, outer surfaces, and connecting pipes may exceed 70°C. Risk of severe burns!
- Never touch the heater during high-temperature operation.
- Beware of severe burns from high-temperature steam or hot water exiting the cooling coil outlet.
- Beware of delayed boiling hazards!
- When changing bath fluid, completely drain residual fluid from the entire system (including hoses and external equipment). To drain residual fluid, open the pump inlet and outlet plugs and fitting nuts, then blow compressed air through the inlet and outlet ports.

Caution! Low Temperature Hazard!

- During low-temperature operation, certain housing parts and connecting fittings may exceed -30°C. Avoid contact to prevent frostbite!

Equipment Protection:

Attention! Install equipment correctly!

- Place equipment on a spacious, level, clean, dry, non-slip, and fire-resistant surface.
- Position equipment in a well-ventilated area and keep ventilation openings unobstructed.

Caution! Impact or movement of the equipment during operation may cause damage!

- Do not move or impact the equipment while it is running.

Caution! Improper use of bath fluid may damage the equipment!

- Use only non-acidic and non-corrosive bath fluids.
- The bath fluid viscosity at the minimum operating temperature should be 50 mm^2/s or lower.
- Untreated tap water is not recommended for use as bath fluid. Use high-purity water (ion-exchanged) or distilled water with 1 g of sodium carbonate per liter added to reduce corrosivity.
- Do not use the following bath solutions:

- Untreated tap water
- Acidic or alkaline liquids
- Solutions containing halides: chlorides, fluorides, bromides, iodides, or sulfides
- Bleach (sodium hypochlorite)
- Solutions of chromate or chromium salts
- Glycerin
- Ferrous solutions.

Caution! Improper handling and storage may damage the equipment!

- Do not transport or drain the equipment while it is in a high-temperature or low-temperature state. Check the bath fluid temperature when draining the cooling bath fluid from the equipment.
- Drain the bath fluid from the equipment's bath tank before moving it.
- Drain the bath fluid when the equipment is not in use for an extended period.

Caution! Monitor liquid level!

- Do not operate the instrument when liquid is insufficient! Check liquid level regularly!
- Monitor the required liquid level in the bath, especially during high-temperature operation!
- When using water as a high-temperature heating medium, evaporation of water vapor causes significant loss of the medium.

User Obligations and Responsibilities:

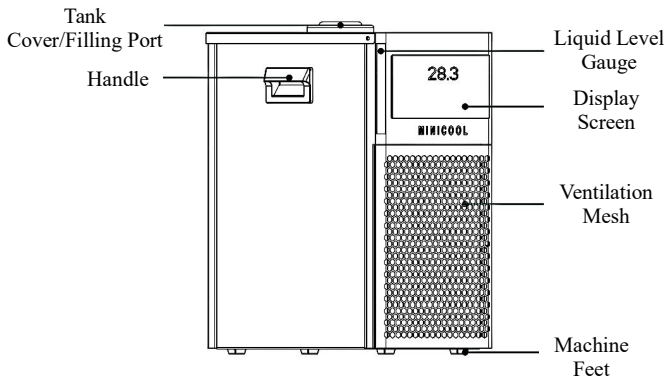
- The user must keep this manual in a safe place and readily accessible for reference.
- Only trained professionals may operate and maintain the equipment.
- Operators must thoroughly read and understand this manual before using the equipment.
- The user must verify that the installation location and environment comply with all relevant regulations.
- The equipment's auxiliary systems must be safe and reliable.
- Systems designed by the user must be safe.
- The equipment manufacturer assumes no responsibility for system safety. The user is solely responsible for ensuring the safety of the associated systems.

Disposal:

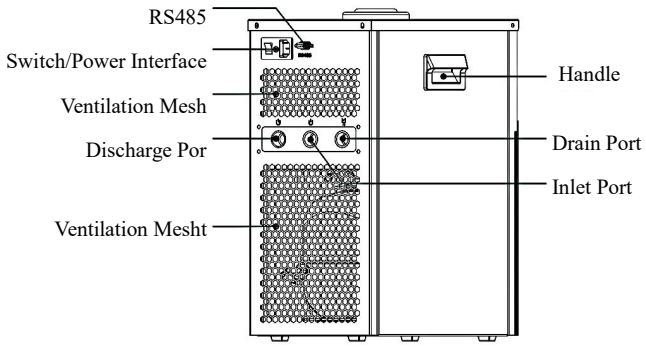
- Disposal of the equipment, packaging, consumables, and optional accessories must comply with local government regulations and laws. For questions regarding disposal, contact your local waste disposal authority.

Equipment Overview and Installation:

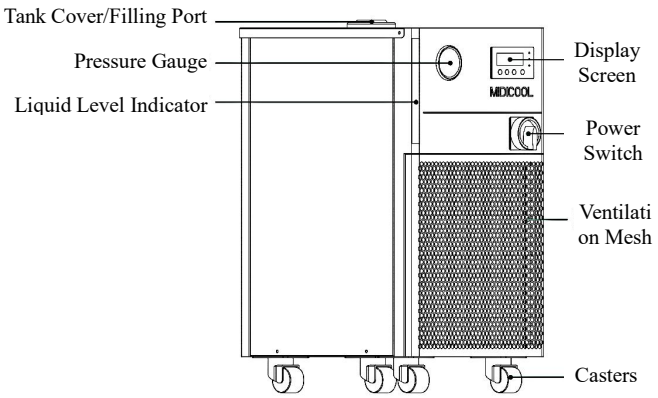
MINI/MIDI Series Cryogenic Cooling Circulators



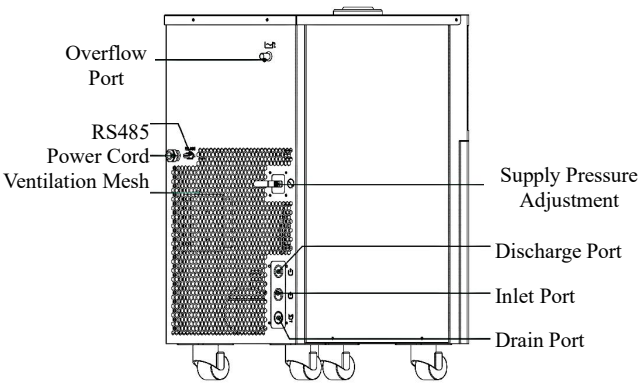
MINI Series Cryogenic Cooling Circulator (Front View)



MINI Series Cryogenic Cooling Circulator (Rear View)



MIDI Series Cryogenic Cooling Circulator (Front View)



MIDI Series Cryogenic Cooling Circulator (Rear View)

Note:

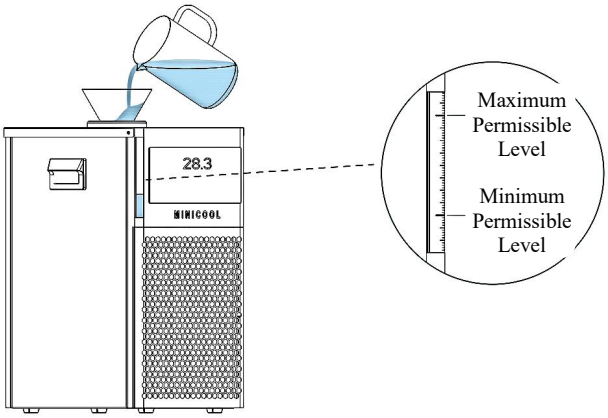
- The rear configuration of MINI/MIDI Series Low-Temperature Cooling Circulating Pumps varies slightly by model. Some models feature a circuit breaker with the power cord integrated into the unit, while others use a three-in-one socket with a separate power cord.

Equipment Installation Requirements:

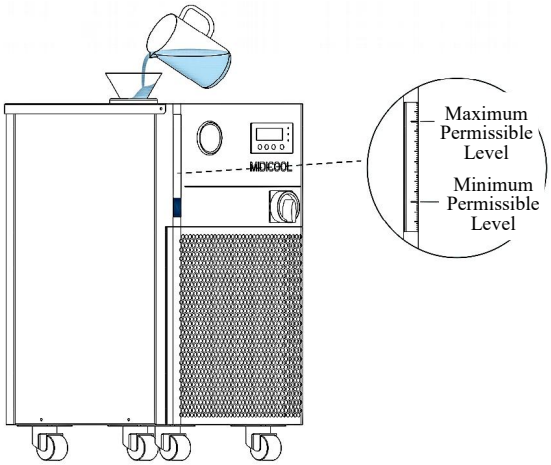
- Place the instrument on a level, clean, and fireproof surface.
- Do not place the equipment directly near heat sources (e.g., heating devices, drying ovens).
- Avoid direct sunlight exposure.
- Ensure adequate air circulation. Maintain a minimum clearance of 30cm around all ventilation openings.
- Verify the equipment's power supply is properly grounded and operational.
- Ambient temperature range: +5°C to +30°C; Relative humidity: <80%.
- Do not place containers holding liquids on the equipment to prevent liquid ingress into the housing, which may cause fire or electric shock!
- Do not disassemble the equipment without authorization to avoid personal injury or damage to the equipment.

Adding Bath Fluid:

- Remove the cap from the filling port and add the appropriate circulating bath fluid to the device's bath tank (a funnel may be used for adding fluid).



MINI Series Fluid Addition Demonstration



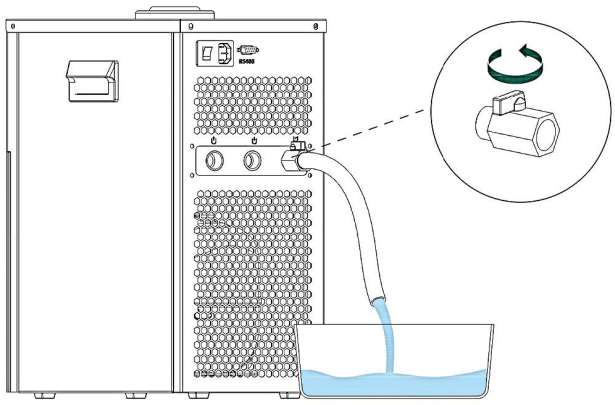
MIDI Series Fluid Addition Demonstration

Caution!

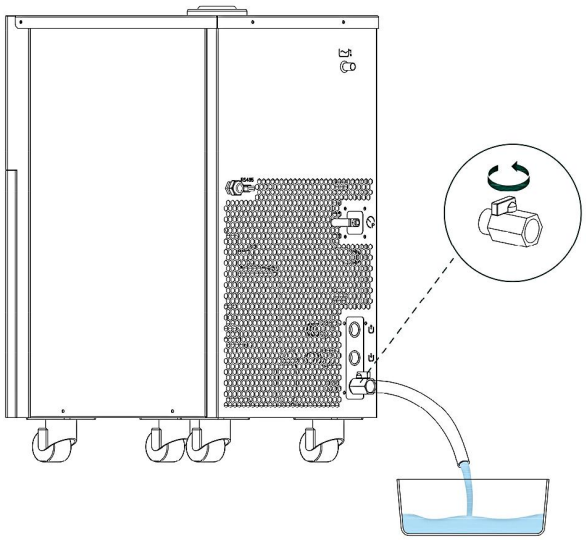
Before adding bath fluid, check and ensure the drain port is securely plugged with the cap.

Draining the Bath Tank:

When the machine is not in use for an extended period or when changing the bath solution, the bath tank must be drained. Prepare a sufficiently large container for collecting the solution. Pull out the drain tube, remove the plug, and drain the solution into the container. (To facilitate draining residual solution into the collection container, we recommend installing a drain hose on the drain port.)



MINI Series Drain Demonstration



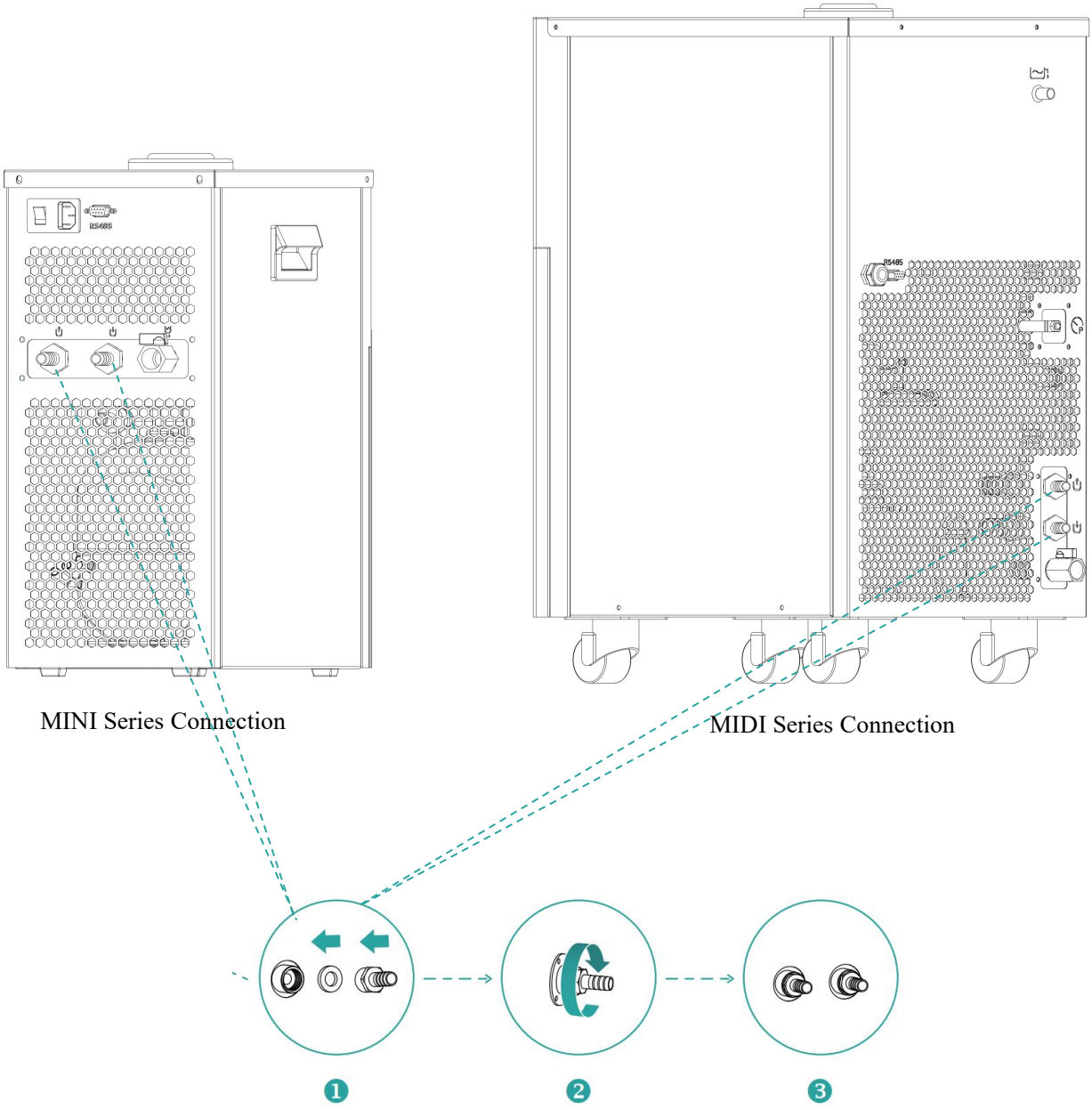
MIDI Series Drain Demonstration

Caution!

Never drain the bath tub when it is cold to prevent frostbite!

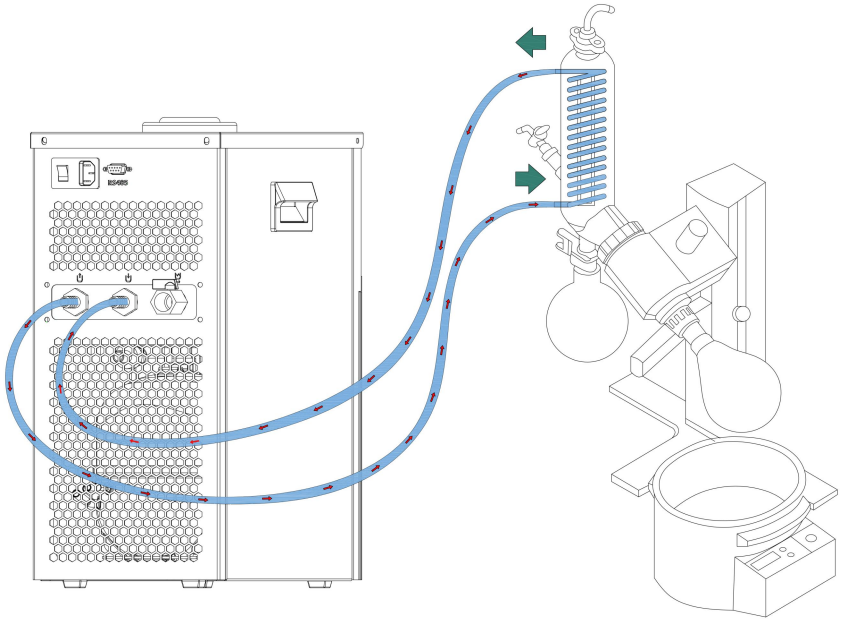
Equipment Connection Procedure:

- First insert the PTFE gasket into the heat transfer medium inlet/outlet. Then screw in the tower adapter and tighten it with a wrench.

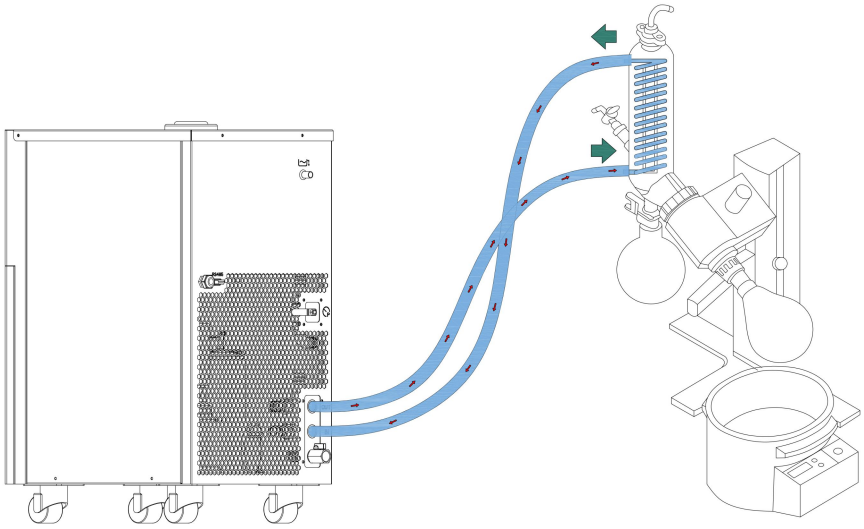


Connecting External Sealed Equipment:

- Use hoses to connect external sealed systems requiring temperature control to the bath fluid outlet and inlet ports at the rear of the device.



MINI Series Connection to Rotating Evaporator

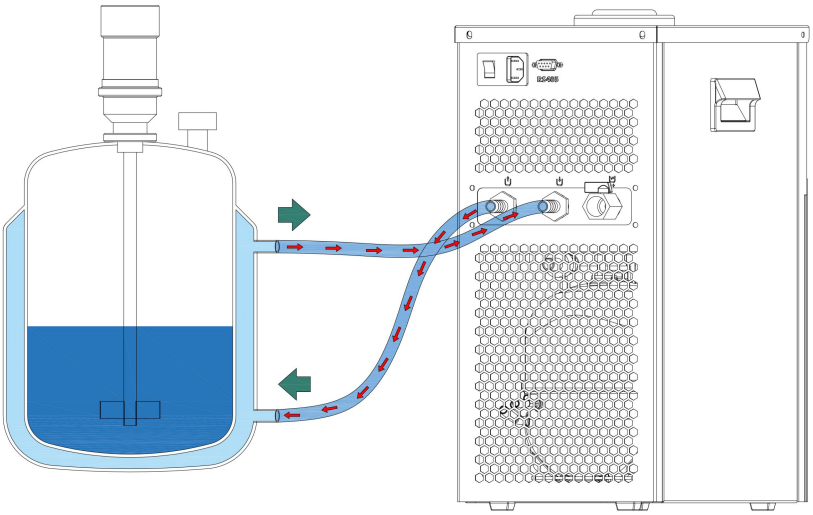


MIDI Series Connection to Rotating Evaporator

Caution!

When supplying cooling fluid to a rotating evaporator, it is generally recommended to use a “bottom-in, top-out” cooling water flow configure-ation (varies depending on the cooling tube type) to ensure optimal cooling performance!

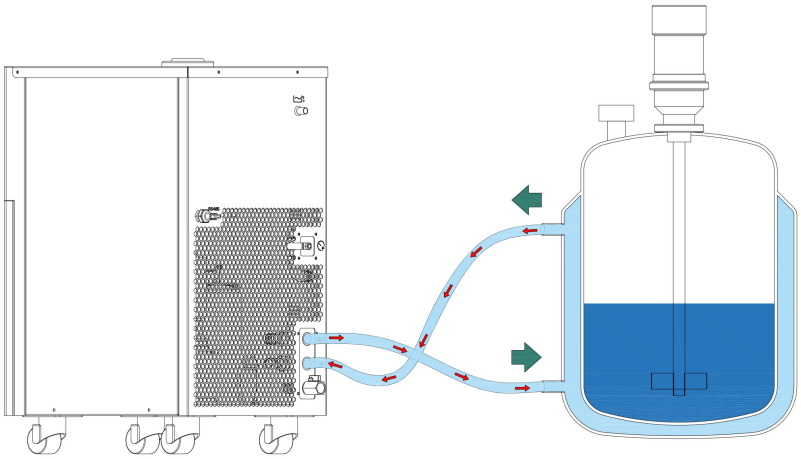
To prevent inlet/outlet tubing from slipping off, sec-ure it with clamps on the heat transfer medium inlet/outlet fitings!



MINI Series Reactor Connection Example

Caution!

- When the device provides a temperature-controlled bath for a reactor, the bath fluid must follow the “bottom inlet, top outlet” principle!
- To prevent inlet/outlet tubing from slipping off, secure it with clamps to the inlet/outlet fittings of the heat transfer medium!



MIDI Series Reactor Connection Example

Power Connection:

WARNING! Improper power supply causes danger!

- Use only grounded outlets and power sources.

MINI Series Touchscreen Overview:

MINI Series Touchscreen:

Function Key Descriptions:

Indicator Light	Symbol	Function	Button Action
Set Indicator Light	Set	Enter parameter settings mode	Press and hold for 3 seconds
Up Key	灯光	Switch between menus and parameters	Press to activate
		Adjust menus and parameters	Press to activate
		Turn lights on or off (in main interface)	Press to activate
Down Key		Upload parameters to copy card	Press and hold for 3 seconds
		Adjust menus and parameters	Press to activate
		Download parameters from copy card	Press and hold for 3 seconds
Power Switch		Start device	Press to activate
Unlock Key	3 秒 解锁	Standby mode auto-locks to prevent accidental activation; unlock operation	Press and hold for 3 seconds
Circulation Pump Switch		Manually switch circulation pump	Press to activate

Setting Operation (Example: Start Temperature 2°C, Stop Temperature 8°C):
Set Stop Temperature: In the normal interface, press and hold “ ” for over 3 seconds to display the set temperature. At this point, press the “灯光” or “ ” keys to adjust the stop temperature value to 2.0° C. The stop temperature value range is between C4 and C5.
Set Start-up Temperature: Start-up Temperature = Stop-down Temperature + Cooling Hysteresis. In the main interface, press “Set” to display Po. Press “Set” again to display “0”. Use the “灯光” or “ ” keys to adjust the display to 55. Press “Set” to display C1. Press “Set” to enter the parameter menu, then use the “灯光” or “ ” keys to adjust to 6.0° C.
Shutdown temperature = st value Startup temperature = st + C1 value

System Menu Settings:
During normal operation, press “Set” to enter the system settings menu. Press the “灯光” or “ ” key to cycle through parameter codes to Po. Press ‘Set’ to display 0. Then press the “灯光” or “ ” key to adjust the display to 55. Click “Set” to enter the administrator menu, where basic parameters C1-F6 can be adjusted. While in system menu settings, pressing the “Power” button or remaining idle for 30 seconds will save modified parameter values and exit the system menu. If an error occurs during parameter saving, the temperature display will show “Err” and return to normal display after 5 seconds.

Parameter Menu:

User Parameter Menu:

Prompt	Description	Setting Range	Initial value	Notes
St	Temperature Setpoint	Lower Temperature Limit ~ Upper Temperature Limit	5℃	
Po	Administrator Menu Password	-99~99 (Password: 55, cannot be changed)	55	
C1	Refrigeration Hysteresis	0.5℃~9.9℃	4.0℃	
C2	Minimum Compressor Start Interval	0~60min	5	Minimum time interval before restarting the compressor after shutdown
C3	Liquid Temperature Sensor Calibration	-10.0℃~10.0℃	0.0	
C4	Lower Temperature Limit	-40℃~温度设置值	-18℃	
C5	Upper Temperature Limit	温度设置值~85℃	10℃	
Adr	Communication Address	0~246	0	

Any adjustment to parameters may alter control effectiveness. If no button operation is performed within one minute, the system will automatically return to the home page. During this period, any parameter changes may affect control outcomes (if no button is pressed within one minute, the system will automatically return to the home page. At this point, some function settings may not have been updated).

Function Code:

Data List

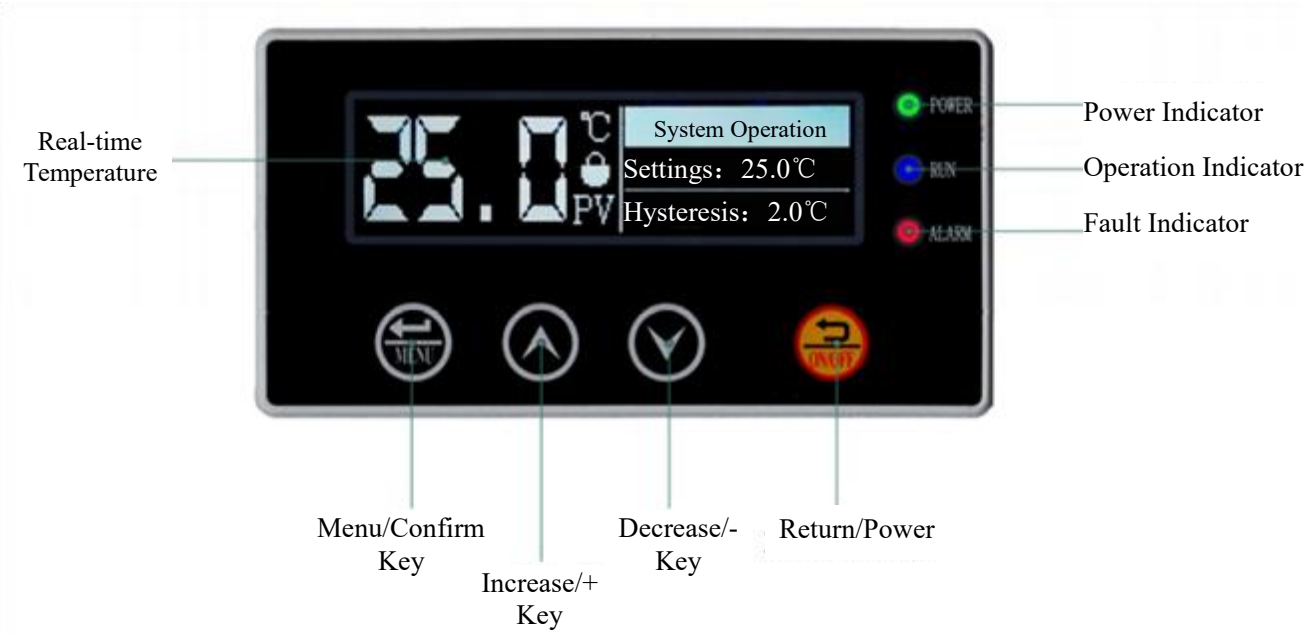
Address	Parameters	Register Meaning	Range	Default	Unit	Resolution
0x0000	ST	Temperature Setpoint	C4~C5	4.0	℃	0.1/bit
0x0001	/	Liquid Temperature	-50°C~99°C	/	℃	1℃/0.1℃
0x0007	/	Power-On Status	0~1 0: Off 1: On	/	/	/
0x0008	/	Lock Status	0~1 0: Unlocked 1: Locked	/	/	/
0x0009	/	Light Status	0~1 0: Closed 1: Open	/	/	/
0x000A	/	Circulation Pump Status	0~1 0: Closed 1: Open	/	/	/
0x001A	/	Reserved	/	/	/	/
0x001B	PO	Administrator Menu Password	-99~99	55	/	1/bit
0x001C	C1	Refrigeration Hysteresis	0.5°C~9.9°C	4.0	℃	0.1/bit
0x001D	C2	Minimum Compressor Start Interval	0~60 minutes	5	minute	1/bit
0x001E	C3	Liquid Temperature Sensor Calibration	-10.0°C~10.0°C	0.0	℃	0.1/bit
0x001F	C4	Lower Limit of Temperature Setpoint	-50°C~Temperature Setpoint	-10	℃	0.1/bit
0x0020	C5	Upper Limit of Temperature Setpoint	Temperature Setpoint~85°C	10	℃	0.1/bit

Write control commands

Address	Parameters	Register Meaning	Range	Default	Unit	Resolution
0x0000	ST	Temperature Setpoint	C4~C5	4.0	℃	0.1/bit
0x0001	PO	Administrator Menu Password	-99~99	55	/	1/bit
0x0002	C1	Refrigeration Hysteresis	0.5°C~9.9°C	4.0	℃	0.1/bit
0x0003	C2	Minimum Compressor Start Interval	0~60 minute	5	minute	1/bit
0x0004	C3	Cabinet Temperature Sensor Calibration	-10.0℃~10.0℃	0.0	℃	0.1/bit
0x0005	C4	Lower Temperature Setpoint Limit	-50℃ ~ setpoint temperature	-10	℃	0.1/bit
0x0006	C5	Upper Temperature Setpoint Limit	setpoint temperature~85℃	10	℃	0.1/bit

Introduction to the MIDI Series Control Panels:

MIDI Series Touchscreens:



Power Operation:

When the system powers on, the power indicator illuminates. Press the “Power” key to turn the system on or off. Press the ‘Power’ key to turn on the system when it is off. Press the “Power” key to turn off the system when it is on.

Parameter Settings:

Press the “Menu” key on the main interface to enter the main menu. Use the “Up” and “Down” keys to select submenus. Press “Menu” to enter a submenu, and press “Power” to return to the previous menu level. Within a submenu, use the “Up” and ‘Down’ keys to adjust parameter values. Press “Menu” to save settings. If no key is pressed for 10 seconds during setup, the system automatically returns to the main interface.

*Administrator Password: 359

User Parameter List:

Prompt	Description	Setting Range	Default Value	Notes
1	Setpoint Temperature	-20.0~70.0℃	25℃	
2	Setpoint Hysteresis	0.1~8.0	2	
3	Follow-Up Temperature Difference	-30.0~30.0	0	
4	Power-Up Operation Mode	0-3	2	1: Standby on Power-Up 2: Power-On 3: Power-Up Memory
5	Upper Temperature Alarm Limit	25.0~80.0	50	
6	Lower Temperature Alarm Limit	-25.0~20.0℃	5	

System Parameters:

Prompt	Description	Setting Range	Default	Notes
33	Local Address	1~125	1	
34	Backlight Delay	0~3000S	60S	
35	Key Lock Delay	0~300S	30	
36	Display Contrast	5~255	130	
37	Language Selection	Chinese/English	0	0: Chinese 1: English

Function Codes:

Hardware uses 485 half-duplex communication; software protocol adopts MODBUS-RTU.

Start bit: 1 bit, Data bits: 8 bits, Stop bit: 1 bit, No parity bit. Baud rate: 9.6 kb/s.

This device acts as a slave unit (address configurable, default 1). Does not actively transmit data. Only receives and responds to data sent by the master unit.

Function Code (Decimal)	Parameter Address (Decimal)	Description		Value Range	Remarks	Attribute
01	0	Output Switching Signal	Bit0: Alarm			R
			Bit1: Pump			
			Bit2: Compressor			
			Bit3: Heating Valve			
			Bit4: Multi-purpose Output			
02	0	Input Switching Signal	Bit0: Flow Switch			R
			Bit1: Multi-purpose input			
03/06/16	15	Restore Factory Settings		1	*1	W
	25	System Status	0x01: Standby			R/W
			0x02: Power On			
			0x03: Fault			R
	29	Fault Code	0: Normal, No Fault			R
			1: Ambient Temperature Sensor Fault			
			2: Media Temperature Sensor Fault			
			8: Power Supply Fault			
			9: Power Supply Reverse Phase Protection			
			10: Liquid Level Protection			
			13: Flow Protection			
			16: Pump Overload			
			17: Low Flow Limit Protection			
			18: Compressor Overload			
			33: System Operation Abnormal			
			45: High Temperature Alarm			
			54: Low Temperature Alarm			
	30	System Operating Time	Unsigned Integer		*1	R
	34	Compressor Run Time	Unsigned Integer		*1	R
	37	Unit Address		1~125	*1	R/W
	47	Setpoint Temperature		-20.0~70.0	*10	
	48	Setpoint Hysteresis		0.1~8.0	*10	
	49	Follow-Up Temperature Difference		-30.0~30.0	*10	
	50	Power-on/off Mode		0~2	*1	
	51	Upper Temperature Alarm Limit		25.0~80.0	*10	
	52	Lower Temperature Alarm Limit		-25.0~20.0	*10	
	53	Lower Flow Protection Limit		0.0~90.0	*10	

03/06/16	54	Flow Switch Type		0~2	*1	R/W
	55	Alarm Output Type		0~1	*1	
	56	Flow Detection Delay		0~300	*1	
	57	Compressor Frequency Start Delay		10~600	*1	
	58	System Start/Stop Mode		0~2	*1	
	59	Pump Start/Stop Mode		0~1	*1	
	60	Pump Start/Stop During Fault		0~1	*1	
	61	DI1 Input Function		0~4	*1	
	62	DI1 Switch Type		0~2	*1	
	63	DO1 Output Function		0~2	*1	

Any adjustment to parameters may alter control performance. If no button operation is performed within one minute, the system will automatically return to the home screen. During this period, any parameter changes may affect control performance (if no button is pressed within one minute, the system will automatically return to the home screen. At this point, some function settings may not have been updated).

Precautions and Daily Maintenance:

Precautions:

- The heat transfer fluid level must not fall below the pump body, heating tubes, and the “L” area of the liquid level sight glass. Top up the fluid promptly if the level is too low.
- When operating below the dew point temperature for extended periods, be aware that condensation mixing into the heat transfer fluid may prevent further temperature reduction.
- After replacing the bath fluid, verify the fluid level is appropriate. When switching to a different type of bath fluid, completely drain the bath tank and all connecting tubes.
- After use, ensure all switches are in the off position, unplug the power cord, drain all liquid from the tank, and wipe dry any moisture.
- Continuous operation of the instrument should not exceed 72 hours.

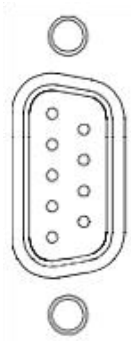
Instrument Maintenance:

- Before inspecting or maintaining the equipment, always turn off the instrument and disconnect the power supply!
- Inspect Power Cord: Check the power cord for damage or cracking. If deterioration is detected, cease use immediately and contact our company to replace the power cord.
- Inspect Hoses and Connectors: Visually inspect hoses and connectors for wear. Replace any showing signs of aging promptly. Generally, it is recommended to inspect connecting hoses and connectors every 6 months and replace any aged or worn hoses.
- Inspect and clean the heat dissipation grille: Wipe the heat dissipation grille clean with a damp cloth. Remove the air intake cover of the device's heat sink, take out the filter, and clean dust from its surface using tap water or a vacuum cleaner. Depending on the operating environment, it is generally recommended to clean the device's heat dissipation grille and air intake every 2 to 4 weeks.
- Check and replace bath fluid:

When using water as bath fluid, it is generally recommended to replace the bath fluid every 1 to 2 weeks.
When using ethanol and ethylene glycol as bath fluid, it is generally recommended to replace the bath fluid every 3 months.
When using thermal oil as bath fluid, it is generally recommended to replace the bath fluid every 6 months to 1 year.

Device Interfaces and Communication Protocol:

Communication	RS485		
Type	DATA-	DATA+	GND
DB9 Pin	1	2	5
Communication Distance	Theoretical Distance ≤1200m Recommended ≤400~1000m		
Protocol	Standard ModBus-RTU		



RS485 Communication Protocol:
Communication Configuration:
Baud Rate: 9600
Parity: even
Data bits: 8
Stop bits: 1
Command Syntax:

- A single space (0x20) separates each command from its subsequent parameters, and each parameter from the next.
- Each command is immediately followed by a carriage return (0x0d and 0x0a, with no space between them).

Note:
RS485 is an optional feature.