Module type temperature controller

ML-D series

INSTRUCTION MANUAL

Thank you for purchasing Hanyoung Nux products. Please read the instruction manual carefully before using this product, and use the product correctly. Also, please keep this manual where you can view it any time.

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Safety information

Please read the safety information carefully before the use, and use the product correctly. The alerts declared in the manual are classified into Danger, Warning and Caution according to their importance

⚠ DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury
⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor injury or property damage

⚠ WARNING

- If the user uses the product with methods other than specified by the manufacturer, it may occur serious injuries or property damages.
- If you are concerned about serious accident due to the malfunction of products, please install safety circuit outside.
- To prevent from the electric shock and the product's malfunction, install and assemble it after turning off the power.
- To protect from electric shock and malfunction of the device, do not turn Power "ON" until all wiring is finished. Also, check-out if the wiring is correct before turning power "ON" for this product.

⚠ CAUTION

■ Safety
- For the safety and protection of the product and the system connected to it, please follow the manual and use it.
- We do not have responsibility for all the damages caused by using the products without following the introductions in the manual or careless use of it.
- For the safety and protection of the product and the system connected to it, you must install a separate circuit outside the product when you are required.
- Do not dissemble, repair and remodel it as you pleases. It may cause electric shock, fire and malfunction.
- Do not give a shock to the product. It may cause damage and malfunction of the product.
- We do not have responsibility and guarantee about the product for any of the contents other than the terms of our company's quality assurance.
- When a user or others are harmed by the defection which is unexpected by our company or natural disaster while using the product, we do not have any responsibility for the loss or indirect damage.

■ Installation
- Use it after installing the product on panel since there is a risk of electric shock.
- Do not block radiators of the product. It may cause malfunction of the product.
- Do not install it in following places :

· The place for contacting the part while people are unconscious.
· A place where there is a direct electric vibration or shock.
· A place where there is a corrosive gas or a combustional gas.
· A place where there is a high temperature change.
· A place where the temperature is extremely high or low.
· A place where there is a direct sunlight.
· A place where there is a high impact of electromagnetic waves.
· A place where there is a high humidity.
· A place where there are products that are highly flammable in case of fire.
· A place where there is a lot of dust and salt.

■ Wiring
- Wire it after all the powers of the instruments are shut off.
- It works at 24Vd.c. When using a power other than the rating, it may cause an electric shock and fire.
- When connecting many of ML Series to make one module, connect a power to only one unit.
- When connecting to 24Vd.c. power, use it in accordance with the rating after calculating total consumption of electric power. Using a power supply of lower capacity than the total consumption of electric power of the module may cause malfunction of the product.
- Do not work with wet hand. It may cause electric shock.
- For installation and way of use, use the manual and follow it.
- Refer to the installation method for the content and about the connection. Never connect to gas pipe, telephone wire, and lighting rod. It may cause explosion and fire.
- Do not supply power before finishing the connections among the parts of this product.
- There is a possibility of electric shock while applying electric current. So, do not come in contacts with any parts.
- For I/O signal line, wire it after separating the instrument's power line and load line to prevent the impact of induction noise.
- For instrument's power, wire it to avoid a noise impact from the power. We recommend to use noise filter if it is easy to get impact of the noise.
- For connected module's power supply, supply it to only one module. Power is supplied among all connected modules.
- For power, select the product in accordance with inrush current when the connected module's consumption voltage and Power are ON.

■ Loder cable
- Be sure to use the cable supplied by the manufacture. Connecting another cable such as a general USB cable may cause malfunction.

Product configuration

Please check if the following items are included.

Main body	4 parts of 6 pin terminal	1 part of 5 pin terminal	RS232C communication cable(option)	Instruction Manual
				

Suffix code

■ ML-D2H

Model	Code			Content
ML-D	□	□	□	Modular type temperature controller
Channels	2			2 Channels
Function		H		Heating & Cooling control (simultaneous), HBA (Heater break alarm)
Output-type			MM	OUT1 : Relay / OUT2 : Relay
			SM	OUT1 : SSR / OUT2 : Relay
			SS	OUT1 : SSR / OUT2 : SSR
			CM	OUT1 : 4-20mA d.c. / OUT2 : Relay
			CS	OUT1 : 4-20mA d.c. / OUT2 : SSR
			CC	OUT1 : 4-20mA d.c. / OUT2 : 4-20mA d.c.

■ ML-D4

Model	Code		Content
ML-D	□	□	Modular type temperature controller
Channels	4		4 Channels
Output-type		M	Relay
		S	SSR (12Vd.c.)
		C	SCR (4-20mA d.c.)

Specification

■ Specification

Display range	±0.3% of Input range, ±1 Digit
Insulation resistance	Over 500Vd.c. 20 MΩ (Between power supply and input part)
Dielectric strength	750Va.c. (Between power supply and input part)

■ Input

Thermocouple	K, J, E, T, R, B, S, L, N, U, W, PL2	Each channel selected by INP parameter
RTD	Pt100 Ω, KPt100 Ω	
DC voltage	0-100mV d.c., 1-5Vd.c., 0-10Vd.c.	
Sampling period	50 ms	
Input display resolution	Generally below input range's decimal point	
Input impedance	Thermocouple and voltage power input : over 1 MΩ	
Allowable signal source resistance	About 0.2 uV/Ω	
Allowable wiring resistance	Thermoresistance (below 10Ω. but, the resistance of 3 wires should be the same)	
Allowable input voltage	within -2~5Vd.c.(Thermocouple, RTD), within -5~12Vd.c.	
Input compensation	±100% of Input range.	
Reference junction compensation accuracy	±1.5 ℃ (0 ~ 50 ℃)	
Burn-Out Detection	Up scale	

■ Output

Control output (ML-D)	RELAY	1a contact
		250Va.c. 3A, 30Vd.c. 3A
	SSR	About 12Vd.c. or more (Resistive load min 600Ω). About 25mA d.c when disconnection.
		Time resolution: Control cycle 0.1% or 10ms whichever is bigger.
	SCR	4-20mA d.c. (Load resistance: lower than 600Ω)
		Accuracy : ±0.1 % of FS (4-20mA d.c. range)

■ Control function

Control method	ML-D2H	PID (Heating/Cooling simultaneous control) / 2 DOF PID (Single control) / ON-OFF control
	ML-D4	2-DOF PID / ON-OFF control
Control operation		Selectable between reverse operation (heating) / Direct operation (cooling) (By DR parameter setting)
Proportional band		0 ~ 100 % of FS
Integral time		0 ~ 3,600 seconds
Derivative time		0 ~ 3,600 seconds
Cycle time		1 ~ 100 seconds
ON/OFF control		It is possible to set up when proportional band is 0
Manual reset		It is possible to set up manual reset when integral time is 0 second
Alarm setting range		0 ~ 100% of input range (Absolute alarm), ±100 % of input range (Deviation alarm)
Alarm hysteresis		By EVHY parameter setting
Alarm type		By EVTY parameter setting (18 types)
Heater Break Alarm	ML-D2H	Applicable in ON/OFF control, time proportional control output (Detection is not possible when output ON/OFF time is less than 0.2 seconds.) Measuring current: 1~5Aa.c. (resolution: 0.5Aa.c. ± 5 % of FS ± 1 Digit) CT model name for Heater break alarm: CT-50N

■ RS232 Communication

Communication protocol	RS-232 EIA standard
Max. communication range	15 m
Communication speed	9600 bps
Start bit	1 bit
Data length	8 bit
Parity bit	Even
Stop bit	1 bit
Supported protocol	PC-Link

■ RS485 Communication

Communication protocol	RS-485 EIA standard / 2 wires half duplex
Number of maximum connection	31 units
Max. communication range	1200 m
Communication process	No process
Communication speed	9600, 19200, 38400, 57600, 76800 bps [Initial value : 9600]
Start bit	1 bit
Data length	7, 8 bits [Initial value : 8]
Parity bit	None, Odd, Even [Initial value : Even]
Stop bit	1, 2 bits [Initial value : 1]
Response time	Receiving processing time + (response time X 10 ms)
Supported protocol	PC-Link , PC-Link with SUM, Modbus ASCII/RTU [Initial value : PC-Link]

■ Power supply specification

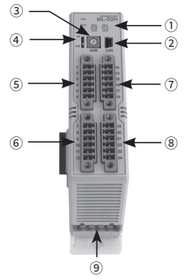
Power voltage		24Vd.c.
Voltage regulation		±10 % of power voltage.
Consumption voltage	Below 3W	ML-E
	Below 5W	ML-D4M, ML-D2HMM
	Below 7W	ML-D4S, ML-D4C, ML-D2HSM, ML-D2HSS
Ambient temperature		0 ~ 50 ℃
Ambient humidity		35 ~ 85 % RH (But, not dew condensation)
System requirements		Not in a poisonous gas, not in a magnetic filed or in a place where dust is present.
Storage temperature		-25 ~ 65 ℃
Weight(g)		Approx. 220 (Excludes the packing box)

Part names

■ ML-D2H

No	Name	Function
①	LED status display	Power, Communication, Event, Control output display LED
②	Loader Jack	RS232 communication part
③	Unit address switch	RS485 communication address setting switch (0~15)
④	Unit expansion address switch	RS485 communication expansion address setting switch (0/+16)
⑤	CH 1 Part	Temperature input and CT input part
⑥		OUT1: Heating control output part OUT2: Cooling control output part
⑦	CH 2 Part	Temperature input and CT input part
⑧		OUT1: Heating control output part OUT2: Cooling control output part
⑨	Power and communication part	RS485 communication and 24 Vd.c. input part

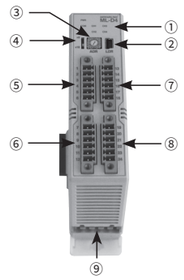
※ When unit expansion address switch is located at +16 and unit address switch is located at 1 then, RS485 communication address is set up like 1+16=17.



■ ML-D4

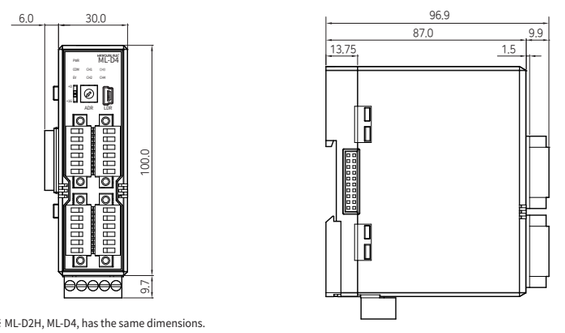
No	Name	Function
①	LED status display	Power, Communication, Event, Control output display LED
②	Loader Jack	RS232 communication part
③	Unit address switch	RS485 communication address setting switch (0~15)
④	Unit expansion address switch	RS485 communication expansion address setting switch (0/+16)
⑤	CH 1 Part	Temperature input and contact output part
⑥	CH 2 Part	
⑦	CH 3 Part	
⑧	CH 4 Part	
⑨	Power and communication part	RS485 communication and 24 Vd.c. input part

※ When unit expansion address switch is located at +16 and unit address switch is located at 1 then, RS485 communication address is set up like 1+16=17.



Dimension

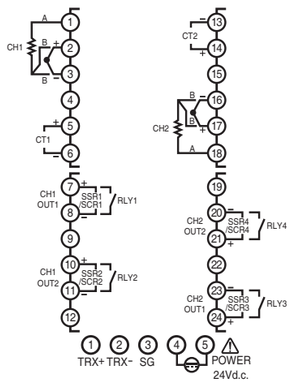
[unit : mm]



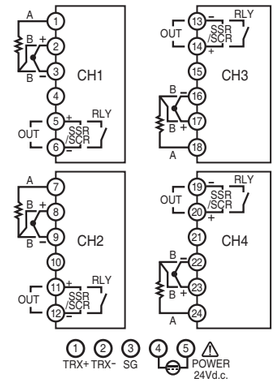
※ ML-D2H, ML-D4, has the same dimensions.

Connection diagram

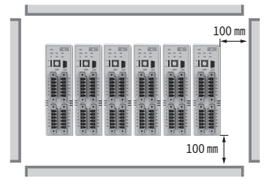
■ ML-D2H



■ ML-D4

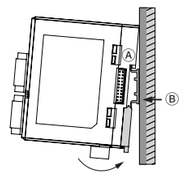


Installation

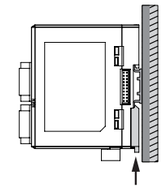


- Leave over 100mm space in consideration of ambient temperature and communication parts' connector when installing and separating module's main body.

■ Installation by DIN Rail



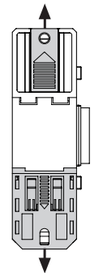
① Hang a hook (A) of the upper back of the module to the Din Rail and install it like (B) by pressing.



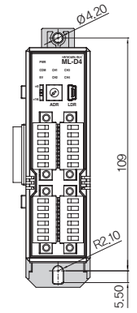
② Push mounting bracket up and check if it is hanged properly.

■ Installation by screws

① Please check the hole dimensions when installing.



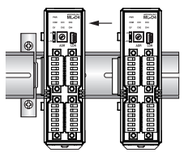
② Push upper hook and lower hook on the bottom of the module to the outside.



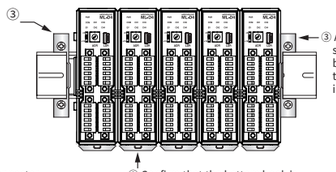
③ Fix it with M3 screw.

■ Installation method of Module

For ML series, it is possible to connect maximum 32 units (including ML-E).
When installing module, install them straight in a vertical orientation.



① Accessing the communication connector by pushing the module aside.



② Confirm that the bottom hook is locked properly by pressing.

③ Attach stoppers at both ends of the module in the rail.

■ Power and communication connection

When making one module by connecting many ML series, apply power line and communication line to only one unit.
When making maximum 32 modules, the maximum necessary power capacity is 224 W (32units X 7W)
(Refer to the Power Specification)

<Correct use example>

<Invalid use example>

※ For further information, please visit our homepage(www.hynux.com) and refer to the user's manual.