

Digital Temperature Controller

DX 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 instruction 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 properties damage

⚠ DANGER

Do not touch or connect the input/output terminals because they may cause electric shock.

⚠ WARNING

- If the product is used with methods other than specified by the manufacturer, then it may lead to injury or property damage.
- Please install an appropriate protective circuit on the outside if malfunction or an incorrect operation may be a cause of leading to a serious accident.
- Since this product does not have the power switch or a fuse, please install those separately on the outside. (Power rating: 250V 0.5A)
- To prevent damage or failure of this product, please supply the rated power voltage.
- To prevent electric shock or equipment failure, please do not turn

⚠ CAUTION

- The contents of the instruction manual are subjective to change without prior notice.
- Please make sure that the specification is the same as what you have ordered.
- Please make sure that the product is not damaged during shipping.
- Please use this product in a place where the ambient operating temperature is 0 ~ 50 °C (40 °C max, closely installed) and the ambient operating humidity is 35 ~ 85 % R.H (without condensation).
- Please use this product in a place where corrosive gas (such as harmful gas, ammonia, etc.) and flammable gas do not occur.
- Please use this product in a place where there is no direct vibration and a large physical impact on the product.
- Please use this product in a place where there is no water, oil, chemicals, steam, dust, salt, iron or others.
- Please do not wipe this product with organic solvents such as alcohol, benzene and others. (Please use mild detergent)
- Please avoid places where excessive amounts of inductive interference and electrostatic and magnetic noise occur.
- Please avoid places where heat accumulation occurs due to direct sunlight or radiant heat.
- Please use this product in a place where the elevation is below 2,000 m.
- Please make sure to inspect the product if exposed to water since there is a possibility of electric leakage or a risk of fire.
- For thermocouple (TC) input, please use a prescribed compensation lead wire. (There is a temperature error if a general lead is used.)
- For resistance temperature detector (RTD) input, please use a small resistance of lead wires and the 3 lead wires should have the same resistance. (There is a temperature error if the 3 lead wires do not have the same resistance.)
- Please put the input signal wire away from the power lines and load lines to avoid the effect of inductive noise.
- The input signal wires and output signal wires should be separated from each other. If it is not possible, please use shielded wires for the input signal wires.
- For thermocouple (TC), please use ungrounded sensors. (There is a possibility of malfunction of product by electric leakage if a grounded sensor is used.)
- If there is a lot of noise from the power line, installing an insulated transformer or a noise filter is recommended. The noise filter should be grounded on the panel and the lead wire between the output of the noise filter and the power terminal of the instrument should be as short as possible.

Suffix code

Model	Code	Description
DX	□ □ □ □ □ □ □ □	Digital temperature controller
Dimension	2	48(W) × 96(H) mm
	3	96(W) × 48(H) mm
	4	48(W) × 48(H) mm
	7	72(W) × 72(H) mm
	9	96(W) × 96(H) mm
Input	K	K thermocouple
	J	J thermocouple
	R	R thermocouple
	D	RTD: KPt 100 Ω
	P	RTD: Pt 100 Ω
	V	1 - 5 V d.c.
	C	4 - 20 mA d.c.
Control output	M	Relay contact output
	C	Current output (4 - 20 mA d.c.)
	S	S.S.R. (voltage pulse output, 12 V d.c.)
Alarm output	S	Alarm output: 1 contact (model: DX4)
	W	Alarm output: 2 contacts(all model except DX4)
Option	A	Retransmission output (4 - 20 mA d.c.)
	N	None (no retransmission output for DX4, DX7)
Control operation	*1	R Reverse operation control(heating control) / Direct operation control(cooling control)
	A	100 - 240 V a.c.
Power supply	D	24 V d.c./a.c.

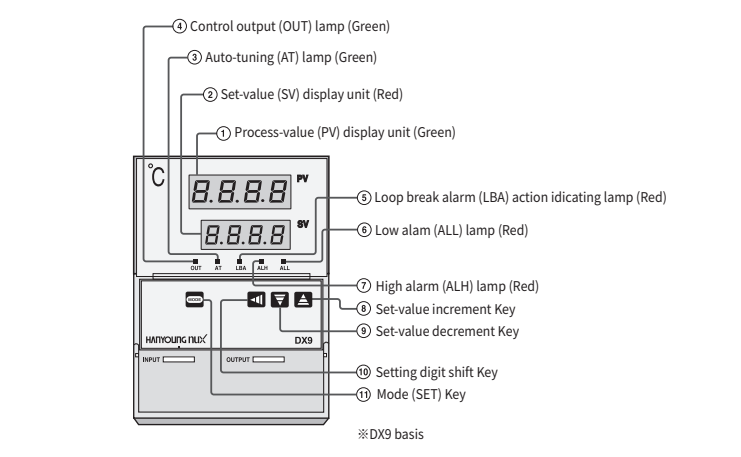
*1: The control operation can be changed in the parameter, SL9, and the default is "reverse operation control (0)".

Specification

Power supply voltage		100 ~ 240 V a.c. (±10 %), 50/60 Hz, 24 V d.c./a.c.
Power consumption		4.5 W max
Input	Type	Refer to input table
	Sampling cycle	250 ms
	Indication accuracy	± 0.5 % (refer to input type table)
	Allowable voltage	20 V d.c. for 1 minute
	Reference junction compensation accuracy	±3.5°C (0 ~ 50 °C)
Operation after input break		Up Scale
Control output	Relay	NO: 5 A 250 V a.c., 5 A 30 V d.c. (resistive load), NC: 3 A 250 V a.c., 1A 30 V d.c. (resistive load) Switching Life : 100 thousand times (without load)
	Voltage output	ON voltage: 12 V d.c. min, OFF voltage: 0.1 V d.c. max, Load resistance 600 Ω min
	Current output	range: 3.2 ~ 20.8 mA, Accuracy: ± 0.2 mA, Load resistance 600Ω max
Retransmission output		range: 3.2 ~ 20.8 mA, Accuracy: ± 0.2 mA, Load resistance 600Ω max
Alarm output		5 A 250 V a.c., 5 A 30 V d.c. (resistive load), Switching Life: 100 thousand times (without load)
Control	method	ON/OFF, PID control
	Output operation	Reverse operation, Direct operation
	Anti-reset windup	Auto(A=0), 0.1 ~ 100%
Insulation resistance		20 MΩ min (primary terminal - secondary terminal)
Dielectric strength		2,300 V a.c., for 1 minute (primary terminal - secondary terminal)
ing ment	Temper. & humidity	0 ~ 50°C, 35 ~ 85% R.H (with no condensation)
	Environment	Refer to safety information



Part name and functions



Operation

PV/SV display and SV setting modes

Process value (PV) display unit	Set-value (SV) display unit	Description
Process value (PV)	Set-value (SV)	Displays process-value. Set-value (SV) can be set ※1

※1: Set-value (SV) is a control target, It is settable within the input range.

Normal setting mode

※ Press the **MODE** key continuously for 3 sec.

Process value (PV) display unit	Name	Description
*1 ALH	High alarm (ALH)	Displays high alarm set-value.
*1 ALL	Low alarm(ALL)	Displays low alarm set-value.
P	Proportional band (P)	Set when proportional control is performed. Control becomes ON/OFF action with P set to "0".
A	Anti-reset windup (ARW)	Prevents overshoot and/or undershoot caused by integral action effect. It operates automatically (AUTO) if ARW is set to "0".
I	Integral time (I)	Eliminates offset occurring in proportional control. Integral action is OFF with this action set to "0".
d	Derivative time (D)	Prevents ripples by predicting output change thereby improving control stability. Derivative action is OFF with this action set to "0".
LbA	Control loop break alarm (LBA)	Indicates control loop break alarm setting. LBA is off if "0" is set.
C	Proportioning cycle (C)	Displays control output cycle (sec.).
HYS	Hysteresis (HYS)	Displays hysteresis of set-value for main output. (ON/OFF control)
*2 F-r	Full scale limit	This limits the maximum of retransmission output.
*3 U-r	Under scale limit	This limits the minimum of retransmission output.
LoC	Set data lock (LOC)	Turns the set data lock ON/OFF

*1 ALH and ALL are initialized if SL3 is changed.

*2 or *3 is an option. (The parameters are not shown if retransmission output is unavailable)
(The retransmission output option is not available for DX4, DX7.)

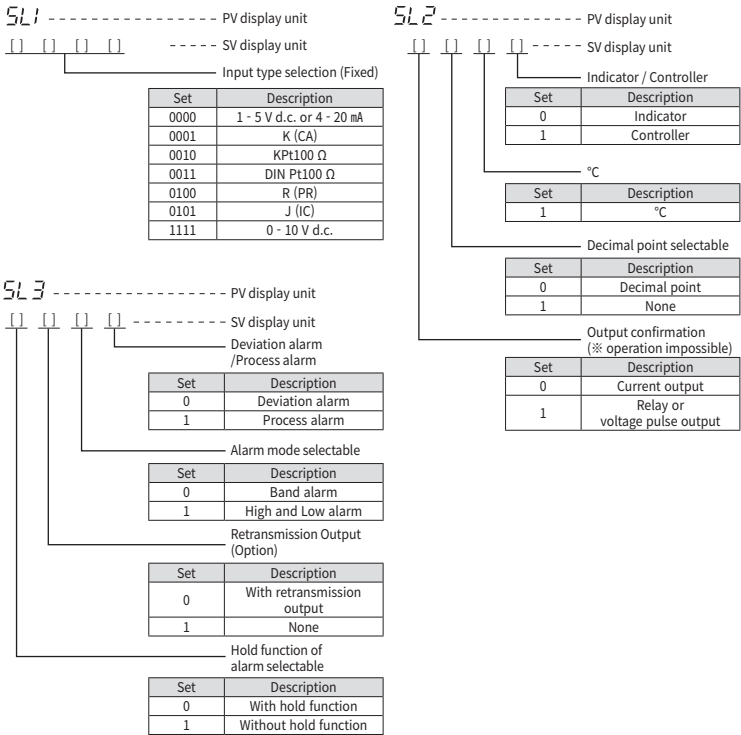
Initial set mode

(1) Press **MODE** key and **SET** key simultaneously for 3 seconds to enter the setting mode.

(2) Press **MODE** key for 3 seconds to enter the PV / SV setting mode.

⚠ Caution

The value in the parameter SL1 (input selection) cannot be changed. The SL1 is set according to the suffix code when ordering a product.



※ ALH & ALL will be initialized if you change the deviation alarm or process alarm at the SL3

PV display unit	Description	SV display unit (Setting range)	Remark
SL4	Decimal point position selection	0 ~ 4	If you want 000.0, set 0002 on SV display unit.
SL5	Input correction	-100 ~ 100 % of FS	
SL6	Hysteresis of high alarm (ALH)	0 ~ 10 % of FS	
SL7	Max. value of temperature setting range	Within input range	Refer to input type table
SL8	Min. value of temperature setting range	Within input range	Refer to input type table
SL9	Control operation direction	0, 1	0 : Reverse operation 1 : Direct operation
SL10	Hysteresis of low alarm (ALL)	0 ~ 10 % of FS	
SL11	Input filter	0 ~ 100 second	
SL12	Max. input scale setting	9999	Only for voltage input
SL13	Min. input scale setting	-1999	Only for voltage input
SL14	Delay time of high alarm (ALH)	0 ~ 100 second	
SL15	Delay time of low alarm (ALL)	0 ~ 100 second	

※ For DCV input, if SL12 and SL13 are changed, the parameters related to temperature are initialize

Main functions

Control loop break alarm (LBA) function

(1) Setting procedure

Usually set the set-value of the LBA to a value of twice the integral time (I). The LBA can also be set by the auto-tuning (AT) function. In this case, the set-value is automatically set to a value of twice the integral time (I).

(2) Description of operation

LBA function starts to measure the time from the moment when the control output becomes 0% or 100%, and it detects the variation of the process value in LBA setting time and then it determines that LBA is ON or OFF by the variation.

- ① The LBA is ON if the process value is not increasing more than 2 °C within the LBA set-vale when the control output is 100%. (In direct operation, the LBA is ON if the process value is not decreasing more than 2 °C.)
- ② The LBA is ON if the process value is not decreasing more than 2 °C within the LBA set-vale when the control output is 0%. (In direct operation, the LBA is ON if the process value is not increasing more than 2 °C.)

(3) Causes of action

The LBA is activated under the following conditions.

- ① Controlled object trouble : Heater break, no power supply, incorrect wiring, etc.
 - ② Sensor trouble : Sensor disconnected, shorted, etc.
 - ③ Actuator trouble : Burnt relay contact, incorrect wiring, relay contact not closed, etc.
 - ④ Output circuit trouble : Burnt internal relay contact, relay contact not open or closed, etc.
 - ⑤ Input circuit trouble : The process-value does not change even if input changes, etc.
- * If causes of the above trouble cannot be identified, check the control system.

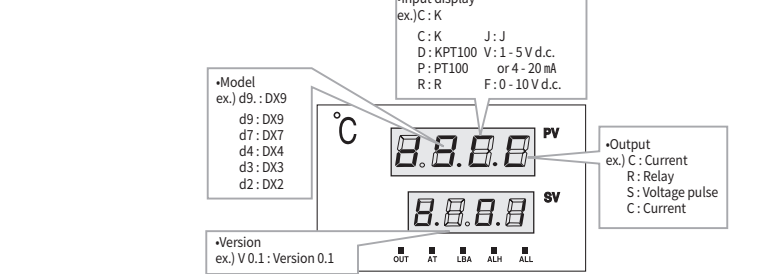
(4) Cautions for control loop break alarm (LBA) function

- ① The LBA function is activated only when the control output is 0 % or 100 %. Therefore, the time from trouble occurrence till the activation of the LBA function equals the time of when the control output becomes 0 % or 100 % plus the LBA setting time.
- ② No LBA function is activated while the auto-tuning (AT) function is activated.
- ③ The LBA function is influenced by disturbances
- ④ If LBA setting time is too short or does not match the controlled object, the LBA may be turned ON/OFF or not be turned ON. In such case, set the setting time of LBA to be slightly longer.

Alarm function

		※ Each alarm operation can be set as shown below. (▲: Set-value (SV) △: Alarm set-value)	
Deviation alarm	High & Low alarm	ON OFF ON Low ALL ▲ ALH High	This alarm setting is that the alarm is activated if a few °C is higher or low than setvalue. For example, if the set-value of the temperature is 200 °C and a system is designed to have that the high alarm (ALH) is activated when the process value is 205 °C and the low alarm is activated when the process value is 190 °C then set the high alarm (ALH) 5 °C, and set the low alarm (ALL) 10 °C. If the set-value is changed to 300 °C, the high alarm is activated at 305 °C and the low alarm is activated at 290 °C.
	Band alarm	OFF ON OFF Low ▲ ALL ▲ ALH High	
Process alarm	High & Low alarm	ON OFF ON Low ALL ▲ ALH High	Note) Regardless of the set-value, the high or low alarm is activated at the alarm set- value. ※ For the band alarm, the relay of the low alarm (ALL) is not activated but the relay of the high alarm (ALH) is activated.
	Band alarm	OFF ON OFF Low ▲ ALL ▲ ALH High	

Model information after power on



Control operation direction

Set a control operation at the SL9.

- ① 0: Reverse operation for heating control
- ② 1: Direct operation for cooling control

Input scale

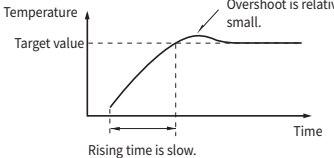
Set a range of input voltage for DCV input. For instance, SL1 = 0000 (1-5 V d.c.) input, SL12 = 100.0, SL13 = 0.0 will be displayed as below.

Input Voltage	1 V	3 V	5 V
Display	0.0	50.0	100.0

Anti reset wind-up

Set the anti reset wind-up with "A" parameter.

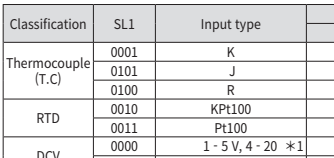
- ① Control in case of A = Auto (0)



Rising time is slow.

※ If "A" is too small, large overshoot or undershoot occurs. Set the value the same as the proportional value.

- ② In case of a set value for temperature on "A" parameter.



Rising time is fast.

Input type

Classification	SL1	Input type	Range		※ Accuracy: ± 0.5 % of FS *1: ± 1 % of FS
			1°C (SL2 : X1XX)	0.1°C (SL2 : X0XX)	
Thermocouple (T.C)	0001	K	- 50 ~ 1300 °C	-50.0 ~ 999.9 °C	
	0101	J	- 50 ~ 600 °C	-50.0 ~ 600.0 °C	
	0100	R	0 ~ 1700 °C	0.0 ~ 999.9 °C	
RTD	0010	KPt100	- 199 ~ 500 °C	-199.0 ~ 500.0 °C	
	0011	Pt100	- 199 ~ 640 °C	-199.0 ~ 640.0 °C	
	0000	1 - 5 V, 4 - 20 *1	- 1999 ~ 9999	-199.0 ~ 999.9 °C	
DCV	1111	0 - 10 V *1	- 1999 ~ 9999	-199.0 ~ 999.9 °C	
				Decimal point is set by SL4	

(Unit: mm)

Classification	Type	DX2	DX3	DX4	DX7	DX9
Product dimensions	W	48.0	96.0	48.0	72.0	96.0
	H	96.0	48.0	48.0	72.0	96.0
	H2	89.8	44.5	44.5	67.0	89.8
	L	100.0	100.0	99.5	100.0	100.0
	D	89.0	88.0	90.5	89.0	89.0
	D1	12.0	12.0	10.0	12.0	12.0
Panel cutout	W1	75.0	120.0	60.0	82.0	120.0
	H1	120.0	75.0	60.0	100.0	120.0
	A *1)	45.0	91.0	45.0	68.0	90.0
	B *1)	91.0	45.0	45.0	68.0	91.0

*1) +0.5 mm tolerance applied

Connections

