# User's Manual

Models UT350 / UT320 **Digital Indicating Controllers** User's Manual Installation



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YOKOGAWA 🔶

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This manual describes installation, wiring, and other tasks required to make the controller ready for operation.

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#### Introduction

Thank you for purchasing the UT350/UT320 digital indicating controller.

The controller is shipped from the factory with 3 hardcopy user's manuals (A2 size) and 1 user's manual on CD-ROM. The 3 user's manuals in hardcopy format describe the operating procedures required for basic use. It is recommended that you refer to these user's manuals to understand [1] installation, [2] initial settings, and [3] operating procedures of the controller. The CD-ROM contains an User's Manual (Reference) with descriptions of various functions and setting ranges that can be set as necessary.

Moreover, the use of an optional parameter setting tool (model: LL100-E10) allows you to easily perform settings and adjustments with a PC.

#### ■ How to Use the Manuals

Purpose	Manual Title	Description	Media
Setup	Installation	Describes the tasks (installation, wiring, and others) required to make the controller ready for operations.	A2-size paper, back and front
Basic operation	Initial Settings	Describes examples of setting PV input types, control output types, and alarm types. Making settings described herein allows you to carry out basic control.	A2-size paper, front
Operating procedures and troubleshooting	Operations	Describes key operation sequences. For operation control through external contact inputs, see the back of Installation User's Manual.	A2-size paper, back
Brief operation and setpoint recording	Parameters	Contains the parameter map used as a guideline for setting parameters and lists of parameters for recording User Settings.	A2-size paper, back and front
Detailed description of functions	User's Manual (Reference)	Describes functions more advanced than those explained in the 3 hardcopy user's manuals.	CD-ROM

# 1. Safety Precautions

The following symbol is indicated on the controller to ensure safe use

#### CAUTION

This symbol on the controller indicates that the operator must refer to an explanation in the user's manual in order to avoid the risk of injury or death of personnel or damage to the instrument. The manual describes how the operator should exercise special care to avoid electric shock or other dangers that may result in injury or loss of life.

The following symbols are used in the hardcopy user's manuals and in the user's manual supplied on the CD-ROM.

#### NOTE

Indicates that operating the hardware or software in a particular manner may damage it or result in a system failure.

## IMPORTANT

Draws attention to information that is essential for understanding the operation and/or features of the controller.

#### 2. Model and Suffix Codes

Before using the controller, check that the model and suffix codes match your order.

			-		
Model	Suffix Code		Description		
UT350			Digital indicating controller (provided with retransmission output and 15 V		
UT320			DC loop power supply as standard)		
	-0		Standard type		
Type -2			Heating/cooling type		
	-3	-3 Standard type (with 24 V DC loop power supply)			
		0	None		
Optional functions		1	With communication, heater burnout alarm		
		2	With heater burnout alarm		

Check that the following items are provided:

- Digital indicating controller (of ordered model): · Brackets (mounting hardware): .
- Unit label:
- User's Manuals: 3 (A2 size)
- User's Manual (Reference) (CD-ROM version): ....



# NOTE



- (2) mechanical vibrations are minimal,
- (3) corrosive gas is minimal, (4) temperature can be maintained at about 23°C and the fluctuation is minimal
- (5) no direct radiant heat is present, (6) no magnetic disturbances are caused.
- (7) no wind blows against the terminal board (reference junction compensation
- element) (8) no water is splashed,

(9) no flammable materials are around,

Never place the controller directly on flammable items or equipment.

If the controller has to be installed close to flammable items or equipment, be sure to provide shielding panels all around the controller, at least 150mm away from every side; the panels should be made of either 1.43mm-thick metal-plated steel plates or 1.6mm-thick uncoated steel plates.

<u>م</u> NOTE

Never touch the opening at the bottom of the case. It is to be used in the factory at shipping

#### Installation Position

Install the controller at an angle within 30° from horizontal Front panel with the front panel facing upward. Do not install it facing of controller downward. The position of right and left sides should be horizontal



150mm

150mm

150mr

#### External Dimensions and Panel Cutout Dimensions



UT320



(25)

145 min

92<sup>+0.8</sup>

General installation

92









Unit: mm

Small bracket



Power







For UT













ontrolle







# CAUTION

Turn off the power to the controller before installing it on the panel because there is a possibility of electric shock



#### 4. How to Connect Wires

#### CAUTION

- 1) Before carrying out wiring, turn off the power to the controller and check that the cables to be connected are not alive with a tester or the like because there is a possibility of electric shock.
- 2) Wiring must be carried out by personnel who have basic electrical knowledge and practical experience.

#### NOTE

- 1) Provide power from a single-phase instrument power supply. If there is a lot of noise in the power line, insert an insulating transformer into the primary side of the line and use a line filter (recommended part: ZAC2205-00U from TDK) on the secondary side.
- As a countermeasures against noise, do not place the primary and secondary power cables close to each other. 2) For thermocouple input, use shielded compensating lead wires for wiring. For RTD input, use shielded wires that have low conductor resistance and cause no significant differences in resistance between the three wires. The cables to be used for wiring, terminal specifications, and recommended parts are as shown below.
- 3) Control output relays may be replaced. However, because they have a life of 100,000 times that of the resistance load, use auxiliary relays to turn on/off a load.
- 4) The use of inductance (L) loads such as auxiliary relays, motors and solenoid valves causes malfunction or relay failure; always insert a CR filter for use with alternating current or a diode for use with direct current, as a spark-removal surge suppression circuit, into the line in parallel with the load.
- 5) When there is possibility of being struck by external lightening surge, use the arrester to protect the instrument.

#### Cable Specifications and Recommended Cables

Purpose	Name and Manufacturer
supply, grounding, relay contact outputs	600 V PVC insulated wires, JIS C 3307, 0.9 to 2.0 mm <sup>2</sup>
nocouple	Shielded compensating lead wires, JIS C 1610, X-D-C-C (See Yokogawa Electric's GS 6B1U1-E.)
	Shielded wires (three conductors), UL2482 (Hitachi Cable)
aignala	Shielded wiree

#### Terminal Covers (Optional parts)

get Model	Part Number	Sales Unit
T350	T9115YD	1
T320	T9115YE	1

1. Before attaching the terminal cover, bend the side with the groove inward as shown in Fig. A. Be careful not to bend it backwards. This not only marks it harder to attach the cover but will also weaken its hold.

2. Fit the holes on the top and bottom of the terminal cover the projections on the brackets (Fig. B) and lock in place. The figure right shows the attachment of a terminal cover to UT controller.



- **PV Input Signals**
- Number of inputs: 1 (terminals (1)-(2)-(3)) Input type: Universal input system. The input type can be selected with the software Sampling period: 250 ms
- Burnout detection: Functions at TC, RTD, standard signal (0.4 to 2 V or 1 to 5 V) Upscale, downscale, and off can be specified. For standard signal, burnout is determined to have occurred
- if it is 0.1 V or less Input bias current: 0.05 µA (for TC or RTD b-terminal)
- Measurement current (RTD): About 0.13 mA Input resistance:  $1 \ M\Omega$  or more for thermocouple or mV input About 1 M $\Omega$  for DC voltage input
- Allowable signal source resistance: 250  $\Omega$  or less for thermocouple or mV input Effects of signal source resistance: 0.1  $\mu V/\Omega$  or less
- $2 \text{ k}\Omega$  or less for DC voltage input Effects of signal source resistance: About 0.01%/100  $\Omega$  Allowable wiring resistance: for RTD input Maximum 150  $\Omega$ /wire: Conductor resistance between three wires should be equal
- However, 10  $\Omega$ /wire for a maximum range of -150.0 to 150.0°C. Wire resistance effect:  $\pm 0.1^{\circ}C/10 \Omega$ • Allowable input voltage: ±10 V DC for thermocouple, mV, or
- RTD input
- ±20 V DC for DC voltage input Noise rejection ratio: 40 dB (50/60 Hz) or more in normal mode
- 120 dB (50/60 Hz) or more in common mode Reference junction compensation error:  $\pm 1.0^{\circ}$ C (15 to 35°C)
- $\pm 1.5^{\circ}$ C (0 to  $15^{\circ}$ C, 35 to  $50^{\circ}$ C) Applicable standards: JIS, IEC, DIN (ITS-90) for thermocouples and RTD

#### Loop Power Supply

plies power to a two-wi (15 V DC: terminals (4)-(5); 24 V DC: terminals (2)-(2)) A resistor (10 to 250  $\Omega$ ) connected between the controller and transmitter converts a current signal into a voltage signal, which is then read via the PV input terminal. Supply voltage: 14.5 to 18.0 V DC, max. 21 mA (provided with a protection circuit against a field short-circuit); 21.6 to 28.0 V DC, max, 30 mA (only for models with 24 V DC loop power supply)

When using the 24 V DC loop power supply of the UT320. keep the operating ambient temperature between 0°C and  $40^{\circ}C$ 

#### Retransmission Output

- Either PV, target setpoint, or control output is output. Either the retransmission output or the loop power supply can be used with terminals 4-5.
- Number of outputs: 1 (terminals (4-(5))
- Output signal: 4-20 mA DC
- Load resistance: 600 Ω or less + Output accuracy:  $\pm 0.3\%$  of span under standard operating conditions (23 ±2°C, 55 ±10% RH, power frequency of 50/60 Hz)

#### Control Output

- em, The output type can be selected output sys with the software.
- Current output (Standard type: terminals 6-7); Heating side: terminals 16-10; Cooling side: terminals (4-15)

Number of outputs	1 or 2 (two for heating/cooling type), switched between a voltage pulse output and current output.
Output signal	4-20 mA DC
Load resistance	600 $\Omega$ or less
Output accuracy	± 0.3% of span under standard operating conditions (23 ± 2 °C, 55 ±10% RH, power frequency of 50/60 Hz)

• Voltage pulse output (Standard type: terminals 16-17); Heating side: terminals (6-17); Cooling side: terminals (4-15)

Number of outputs	1 or 2 (two for heating/cooling type), switched between a voltage pulse output and current output.
Output signal	On-voltage = 12 V or more (load resistance: 600 $\Omega$ or more) Off-voltage = 0.1 V DC or less
Resolution	10 ms

• Relay contact output (Standard type: terminals ①-②-③; Heating side: terminals (1)-(2)-(3); Cooling side: terminals (4)-(7))

Number of outputs	1 or 2 (two for heating/cooling type)
Output signal	Three terminals (NC, NO, and common) / Two terminals
Contact rating	Terminals ① - ② - ③: 250 V AC or 30 V DC, 3 A (resistance load) Terminals ④-⑦: 240 V AC or 30 V DC, 1A (resistance load)
Resolution	10 ms

#### Contact Inputs

Fold the cover in the direction

Fit the cover hold

over the protrusion

on the mounting bracket

of the arrow

Figure A

Figure B

- · Purpose: Selection between target setpoints or Auto/Man modes, or for other purposes
- Number of inputs: 2 • Input type: Non-voltage contact or transistor open collector input
- Input contact rating: 12 V DC, 10 mA or more
- · On/off determination: For non-voltage contact input, contact
- resistance of 1 k $\Omega$  or less is determined as "on" and contact resistance of 20 k $\Omega$  or more as "off." For transistor open collector input, input voltage of 2 V or less is determined as "on" and leakage current must not
- exceed 100 µA when "off." Minimum status detection hold time: About 1 second

#### Contact Outputs

#### • Purpose: Alarm output, FAIL output, and others

- Number of outputs: 3
- Relay contact rating: 240 V AC/1 A or 30 V DC/1 A ; 1a (COM terminal is common), (FAIL output ; 1b)

#### Display Specifications

- PV displ UT350: 4-digit, 7-segment red LED display, character
- height of 20 mm UT320: 4-digit, 7-segment red LED display, character
- height of 12 mm
- · Setpoint display: 4-digit, 7-segment red LED display, character height of 9.3 mm (for both UT350 and UT320)
- Status indicating lamps: LEDs

#### Safety and EMC Standards

- Safety: Compliant with IEC1010-1: 1990 and EN61010-1: 1992 Approved by CSA1010 CSA1010 installation category (overvoltage category) : CATII (IEC1010-1)
  - Approved by UL508
- EMC standards: Complies with EN61326 The instrument continues to operate at a measuring accuracy of within  $\pm 20\%$  of the range during tests.
- Construction, Installation, and Wiring
- struction: Only the front panel is dust-proof and drip-proo (protection class IP55) For side-by-side close installation the controller loses its
- dust-proof and drip-proof protection. · Material: ABS resin and polycarbonate
- · Case color: Black
- · Weight: About 1 kg or less Dimensions
  - UT350 96 (W)  $\times$  96 (H)  $\times$  100 (depth from panel face)
- UT320 48 (W)  $\times$  96 (H)  $\times$  100 (depth from panel face)
- Installation: Panel-mounting type. With top and bottom mounting hardware (1 each)
- Panel cutout dimensions
- UT350  $92^{+0.8}_{0}$  (W) ×  $92^{+0.8}_{0}$  (H) mm
- $UT320 45^{+0.6} (W) \times 92^{+0.8} (H) mm$ Installation position: Up to 30° upward facing
- (not designed for facing downward) • Wiring: M3.5 screw terminals (for signal wiring and power/ ground wiring as well)

#### Power Supply Specifications

- Power supply: Rated voltage of 100 to 240 V AC (±10%), 50/60 Hz
- Power consumption: Max. 20 VA (8.0 W max.) Internal fuse rating: 250 V AC, 1.6A time-lug fuse
- · Data backup: Non-volatile memory (can be written to up to 100.000 times)
- Withstanding voltage Between primary terminals\* and secondary terminals\*
- At least 1500 V AC for 1 minute (Note) Between primary terminals\* and grounding term
- At least 1500 V AC for 1 minute (Note) Between grounding terminal and secondary terminals At least 1500 V AC for 1 minute
- Between secondary terminals\*\*
- At least 500 V AC for 1 minute \* Primary terminals indicate power terminals and relay

Signal Isolations

internal circuit.

internal circuit.

and internal circuit.

and internal circuit.

**Environmental Conditions** 

Temperature change rate: 10°C/h or less

internal circuit.

Normal operating condition

close installation)

UT320 is used.

less

Magnetic field: 400 A/m or less

Shock: 147 m/s<sup>2</sup> or less, 11 ms

Temperature: -25 to 70°C

range)

whichever is larger

· Transportation and storage conditions

Temperature change rate: 20°C/h or less

Effects of changes in operating conditions

of F.S./°C, whichever is larger

- output terminals
- \*\* Secondary terminals indicate analog I/O signal, voltage pulse output, and contact input termina
- Note: The withstanding voltage is specified as 2300 V AC per minute to provide a margin of safety. • Insulation resistance: 20 M $\Omega$  or more at 500 V DC between
- power terminals and grounding terminal - Grounding: Class 3 grounding (grounding resistance of 100  $\Omega$
- or less)

• PV input terminals: Isolated from other input/output terminals.

15 V DC loop power supply terminals: Not isolated from 4-20

from other input/output terminals and internal circuit.

DC loop power supply terminals, 4-20 mA analog output

terminals and voltage pulse control output terminals, other

retransmission): Not isolated between 4-20 mA outputs nor

from 15 V DC loop power supply and voltage pulse control

mA outputs and 15 V DC loop power supply. Isolated from other input/output terminals and internal circuit.

output terminals and from other input/output terminals and

output. Isolated from other input/output terminals and

Relay contact control output terminals: Isolated between contact

· Contact input terminals: Not isolated between contact input terminals and from communication terminals. Isolated from

other input/output terminals and internal circuit. · Relay contact alarm output terminals: Not isolated between

output terminals and internal circuit. • RS-485 communication terminals: Not isolated from contact

relay contact alarm outputs. Isolated from other input/

· Power terminals: Isolated from other input/output terminals and

· Grounding terminals: Isolated from other input/output terminals

Ambient temperature: 0 to 50°C (40°C or less for side-by-side

The operating ambient temperature range is between 0°C

and 40°C when the 24 V DC loop power supply of the

Ambient humidity: 20 to 90% RH (no condensation allowed)

Continuous vibration at 5 to 14 Hz: Full amplitude of 1.2 mm or

Continuous vibration at 14 to 150 Hz; 4.9 m/s<sup>2</sup> or less

Warm-up time: 30 minutes or more after power on

Humidity: 5 to 95% RH (no condensation allowed)

- Effects from changes in ambient temperature

Short-period vibration: 14.7 m/s<sup>2</sup>, 15 seconds or less

Installation height: Height above sea level of 2000 m or less

- On voltage or thermocouple input,  $\pm 1 \ \mu V / ^{\circ}C$  or  $\pm 0.01 \%$ 

- On RTD input,  $\pm 0.05^{\circ}$ C /°C (ambient temperature) or less - On analog output, ±0.05% of F.S./°C or less

- Effects from power supply fluctuation (within rated voltage

- On analog output,  $\pm 0.05\%$  of F.S./ 10 V or less

- On analog input,  $\pm 1~\mu V/10$  V or  $\pm 0.01\%$  of F.S./10 V,

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input terminals. Isolated from other input/output terminals

• Voltage pulse control output terminals: Not isolated from 4-20

• 24 V DC loop power supply terminals: Isolated from the 15 V

mA analog output and voltage pulse control output. Isolated

Not isolated from the internal circuit.

I/O terminals and the internal circuitry.

• 4-20 mA analog output terminals (for control output and

NOTE

Do not use unassigned terminals as relay terminals.





OT=4 (factory-set default) OT=5 OT=6 OT=7 OT=8 OT=9 OT=10 OT=11 Heating side: Relay output Heating side: Voltage pulse output Heating side: Current output Heating side: Relay output Heating side: Voltage pulse output Heating side: Current output Heating side: Relay output Heating side: Voltage pulse output Heating side: Current output (terminals (6) and (7)) (terminals (6) and (7)) (terminals), (2) and (3) (terminals (6) and (7)) (terminals (6) and (7)) terminals(),(2) and (3) (terminals (6) and (7)) (terminals (1), (2) and (3) (terminals @and 🕅) Cooling side: Relay output Cooling side: Relay output Cooling side: Relay output Cooling side: Voltage pulse output | Cooling side: Voltage pulse output | Cooling side: Voltage pulse output | Cooling side: Current output Cooling side: Current output Cooling side: Current output (terminals (4) and (7)) (terminals (4) and (7)) (terminals (4) and (7)) (terminals (4) and (5)) (terminals (1) and (5) (terminals (1) and (5)) (terminals (1) and (5) (terminals (1) and (5)) (terminals (4) and (5))

The control output types, "relay output" and "voltage pulse output" shown in the table above refer to those of time proportional control. To change the type to a relay output for on-off control, select "Relay Terminals" and change the setpoint of the proportional band to "0."

The control

∎ UT

# ■ UT320 Standard Type (Model UT320-0 or UT320-3) or Heating/Cooling type(Model UT320-2)

·					See In	itial Settings User's	Manual . Signals with the Controller
Relay contact output	Note: Select this option fr	om	*	Wiring can only be carried	for more	e information.	* When receiving 4-20 mA DC current signals,
	* Time proportional PID	DO 405 commination		out for controllers with 24 V DC loop power supply		RTD Input	
	relay contact output is configured at factory	KS-485 communication	* Wiring can only be carried out for controllers with	24 V DC loop	12+-		
	before shipment.	23 SDB(+)	communication functions. Maximum baud rate: 9600 bps	power supply	13(-)+		250 Ω 4-20mA
Contact rating: 250 V AC, 3	A	24 SDA(-)			۲ <sup>C</sup>	13 B ·	
30 V DC, 3 A	(resistance load)			21.6-28.0VDC (30 mA DC max.)		mV/V input	Note: Connecting a 250 $\Omega$ resistor to the terminals is
Alarm o	output						optional. Model: X010-250-2 (resistor with M3.5 crimp-on terminal
Alarm-1 output		26 RDA(-) ←					lugs)
		27 SG					
							Installation category (overvoltage category): If (IEC 1010-1)
Alarm-3 output							1
Common						Retransmission output	* PV retransmission is configured at factory before shipment.
Relay contact rating: 240	V AC, 1 A						
Derma errente	A			Control output		4-20 mA DC	
Power supply	CAUTION Before carrying out wiring, turn	off the power		Current / voltage No	te:Select this option from the OT		Load resistance: 600 $\Omega$ or less
	to the controller and check that connected are not alive with a t	cables to be ester or the like			parameter.	15 V DC loop power supply	* If 15 V DC loop power supply is used,
	because there is a possibility of	f electric shock.		16 + 4-20 mA DC, voltage pulse			retransmission output cannot be used.
				17 - (12 V)		14 (+) 14.5-18.0VDC (21 mA DC max)	
Allowable range: 100 to 240 (free volta)	0 V AC (±10%) age)						
50/60 Hz	shared	* DIS is a setup pa Changing DIS se	arameter. etpoint allows you to change the	e function of external contact input	. 🖌		
This wiring is only possible for a control	Heater current detection input	14.0. 818	When DIO 4 (5 )	Correspondence between paran	neter DIS and extern	al contact input functi	
with a heater burnou	t	No function	2.SP when DI1=ON	Hides the LOCK parameter when DI1=0	N. When switching targe	t 2.SP when DI1=ON	
alarm.			1.SP when DI1=OFF	Shows the LOCK parameter when DI1=0	DFF. 1.SP2.SP3.SP4.SP	1.SP when DI1=OFF	
		No function	MAN when DI2=OFF	No function	DI2 OFF OFF ON ON	RUN when DI2=OF	
		M Common	Common	Common	Common	Common	
OT is a setup param	neter. You can change th	ne settings of the parar	meter OT to change the cont	rol output type.			contact rating: 12 V DC, 10 mA or more
See Initial Setting	gs User's Manual , for	more information.	-			Note: External Conta If the power is turn	act Input red on when the external contact input is OFF,
OT=0 (factory-se	Corr	OT=1	arameter OT and the control o	utput types	)T=3	off will be continue	ed. (except for RUN/STOP)
Time proportiona	al control	Time proportional control	Current outp	out On-o	off control		
320 Heating/0	Cooling Type	(Model UT32	20-2□)		PV input	* Not configured at fact	tory before shipment
e control output			*1	Mining and the second sect	i i iipat	See Initial Setting	is User's Manual, Signals with the Controller
* Time propo	ortional PID relay contact		RS-485 communication	Wiring can only be carried out		for more information.	* When receiving 4-20 mA DC current signal
	-			or controllers with communication	TC	input RTD in	set the PV input type to 1-5 V DC (setpoint
before ship	onfigured at factory		[23]SDB(+) →	functions. Maximum baud rate: 9600 bps	TCi	nput RTD ir	set the PV input type to 1-5 V DC (setpoint
-0 0 Available if	onfigured at factory oment. 4, 7 or 10 is set in the O	T	23 SDB(+)	functions. Maximum baud rate: 9600 bps		input RTD ir	set the PV input type to 1-5 V DC (setpoint
-0 Available if (Control Ou	onfigured at factory oment. 4, 7 or 10 is set in the O utput Type) setup parame	T eter.	$\begin{array}{c} 1\\ 23\\ \text{SDB}(+) \longrightarrow \end{array}$	functions. Maximum baud rate: 9600 bps		nput RTD ir	set the PV input type to 1-5 V DC (setpoint
Output is cc     before ship     * Available if     (Control Output     50 V AC, 3 A     0 V DC, 3 A (resistance load)	onfigured at factory oment. 4, 7 or 10 is set in the O utput Type) setup parame	T eter.	$\begin{array}{c} 1 \\ 23 \text{ sdb}(+) \longrightarrow \\ 24 \text{ sda}(-) \longrightarrow \\ 25 \text{ rdb}(+) \longleftarrow \\ \end{array}$	functions. Maximum baud rate: 9600 bps		Input         RTD in           11         A           12         b           13         B	set the PV input type to 1-5 V DC (setpoint
OULPUT IS CC before ship Available if (Control Ou V DC, 3 A V DC, 3 A (resistance load) t/cooling-side control (	onfigured at factory ment. 4, 7 or 10 is set in the O utput Type) setup parame	T eter. ing-side control output	$\begin{array}{c} 1 \\ 23 \text{ sdb}(+) \longrightarrow \\ 24 \text{ sdA}(-) \longrightarrow \\ 25 \text{ rdb}(+) \longleftarrow \\ 26 \text{ rdA}(-) \longleftarrow \end{array}$	functions. Maximum baud rate: 9600 bps		nput RTD ir 11 A 12 b 13 B mV/V i	nput       set the PV input type to 1-5 V DC (setpoint         12       250 Ω 4-20mA         13       13         nput       Note: Connecting a 250 Ω resistor to the termina optional.
OULDUT IS CC before ship Available if (Control Ou OV AC, 3 A V DC, 3 A (resistance load) t/cooling-side control of 1 output	Dutput Sutput	T eter. ing-side control output ed if 4, 5 or 6 is set in Control Output	$\begin{array}{c} 23 \text{ sdB(+)} \longrightarrow \\ 24 \text{ sdA(-)} \longrightarrow \\ 25 \text{ rdB(+)} \longleftarrow \\ 26 \text{ rdA(-)} \longleftarrow \\ 27 \text{ sg} \end{array}$	for controllers with communication functions. Maximum baud rate: 9600 bps		Input         RTD in           11         A           12         b           13         B           mV/V i         12	nput       set the PV input type to 1-5 V DC (setpoint         12+       250 Ω 4-20mA         13-       13-         Note: Connecting a 250 Ω resistor to the termina optional.         Model: X010-250-2 (resistor with M3.5 crimp-on lugs)
OULPUT IS CC before ship Available if (Control Ou OV AC, 3 A V DC, 3 A (resistance load) t/cooling-side control cc 1 output	onfigured at factory       4, 7 or 10 is set in the O'       utput Type) setup parame       output       Note: The cool       is selected       the OT (( Type) setup parame	T eter. ing-side control output ed if 4, 5 or 6 is set in Control Output tup parameter. a cuttui to pot	$\begin{array}{c} 23 \text{ sdB}(+) \longrightarrow \\ 24 \text{ sdA}(-) \longrightarrow \\ 25 \text{ sdB}(+) \longleftarrow \\ 26 \text{ sdA}(-) \longleftarrow \\ 27 \text{ sg} \longrightarrow \\ 7 \text$	for controllers with communication functions. Maximum baud rate: 9600 bps		nput         RTD ir           11         -           12         -           13         B           mV/V i         -           12         +           13         -	nput       set the PV input type to 1-5 V DC (setpoint         12 +       250 Ω 4-20mA         13 -       13 -         Note: Connecting a 250 Ω resistor to the termina optional.         Model: X010-250-2 (resistor with M3.5 crimp-on lugs)         ▲ NOTE
Output is cc before ship * Available if (Control Ou • • • • • • • • • • • • • • • • •	onfigured at factory         4, 7 or 10 is set in the O         utput Type) setup parame         output         Output         UT	T eter. ing-side control output ad if 4, 5 or 6 is set in Control Output tup parameter. m-3 output is not . The controller is	$ \begin{array}{c}                                     $	Maximum baud rate: 9600 bps		nput RTD ir 11 A 12 b 13 B mV/V i 12 + 13 -	nput       set the PV input type to 1-5 V DC (setpoint         12       12         250 Ω       4-20mA         13       13         Note: Connecting a 250 Ω resistor to the termina optional. Model: X010-250-2 (resistor with M3.5 crimp-on lugs)         Model: X010-250-2 (resistor with M3.5 crimp-on lugs)         Installation category (overvoltage category): II (IEC1010-1)
OULPUT IS CC before ship Available if (Control Ou (Control Ou	Note: The cool is selected the OT (0 is set in the O utput Type) setup parame butput UT OT Type) se The alarn available factory-s control o	T eter. ing-side control output ed if 4, 5 or 6 is set in Control Output tup parameter. m-3 output is not . The controller is et to the cooling-side utput (time proportional	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Maximum baud rate: 9600 bps		nput         RTD ir           11         -           12         -           13         B           mV/V i         -           12         -           13         -           -         -           -         -           -         -           -         -           -         -           -         -           -         -           -         -           -         -           -         -	nput       set the PV input type to 1-5 V DC (setpoint         12       12         13       13         Note: Connecting a 250 Ω resistor to the termina optional.         Model: X010-250-2 (resistor with M3.5 crimp-on lugs)         Installation category (overvoltage category): II (IEC1010-1)         smission is configured at factory before shipment.
OULPUT IS CC before ship * Available if (Control Ou v DC, 3 A v DC, 3 A v DC, 3 A (resistance load) t/cooling-side control CC 1 output 3 output side control AL1 6 4 3 output side control COM 7 *	Note: The cool is selected the OT (UT) (UT) (UT) (UT) (UT) (UT) (UT) (UT)	T eter. edif 4, 5 or 6 is set in Control Output tup parameter. m-3 output is not . The controller is et to the cooling-side utput (time proportional / contact output).	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	)		nput     RTD ir       11     11       12     12       13     mV/V i       12     12       13     -       13     -       Retransmissi	nput       Image: Set the PV input type to 1-5 V DC (setpoint
Output is cc before ship Available if (Control Ou (Control Ou (	Duringured at factory         4, 7 or 10 is set in the O'         utput Type) setup parameter         Dutput         Note: The cool         is select         the OT         UT         UT         UT         Image: Select select         Image: Select select select         Image: Select select select select         Image: Select selec	T eter. ing-side control output ad if 4, 5 or 6 is set in Control Output tup parameter. n-3 output is not . The controller is et to the cooling-side utput (time proportional <i>r</i> contact output).	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Maximum baud rate: 9600 bps		nput     RTD ir       11     A       12     b       13     B       mV/V i       12       13       * PV retrans       Retransmissi	nput       set the PV input type to 1-5 V DC (setpoint         12       12         13       250 Ω 4-20mA         Note: Connecting a 250 Ω resistor to the termina optional. Model: X010-250-2 (resistor with M3.5 crimp-on lugs)         Installation category (overvoltage category): II (IEC1010-1)         smission is configured at factory before shipment.         ion output         15 V DC loop power supply
Output is cc before ship * Available if (Control Ou V DC, 3 A V DC, 3 A V DC, 3 A (resistance load) t/cooling-side control cc 1 output 3 output side control (Note) rmon ating: 240 V AC, 1 A 30 V DC, 1 A (resist NOT CONTERPORT (Note) COMTERPORT AL2 5 	Note: The cool is selected the OT (( Type) setup parame Note: The cool is selected the OT (( Type) setup rhe alarr available factory-s control o PID relay	T eter. ad if 4, 5 or 6 is set in Control Output tup parameter. m-3 output is not . The controller is et to the cooling-side utput (time proportional y contact output).	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	)		nput     RTD ir       11     11       12     12       13     mV/V i       12     12       13     -       13     -       13     -       13     -       14     +	nput       set the PV input type to 1-5 V DC (setpoint         12       12         250 Ω       4-20mA         Note: Connecting a 250 Ω resistor to the termina optional.         Model: X010-250-2 (resistor with M3.5 crimp-on lugs)         Installation category (overvoltage category): II (IEC1010-1)         smission is configured at factory before shipment.         ion output       15 V DC loop power supply         14       (14.5-18.0/DCC)         (21 mA DC max.)
Output is cc before ship Available if (Control Ou v Ac, 3 A V DC, 3 A (resistance load) V(cooling-side control of 1 output 3 output side control (Note) mon cOM 7 + ming: 240 ∨ AC, 1 A 30 ∨ DC, 1 A (resist	A, 7 or 10 is set in the O utput Type) setup parameters butput UT UT VT A A, 7 or 10 is set in the O is setup parameters Note: The cool is selecter the OT (i Type) se The alarr available factory-s control o PID relay	T eter. ing-side control output ad if 4, 5 or 6 is set in Control Output tup parameter. 3 output is not The controller is et to the cooling-side utput (time proportional / contact output).	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Heating-side control Current / voltace	TC i 12++ 13-+ 13-+ 14 13 -+ 14 14 14 14 14 14 14 14 14 14	nput RTD ir 11 A 12 b 13 B mV/V i 12 + 13 - * PV retrans Retransmissi 9,	nput       set the PV input type to 1-5 V DC (setpoint         12       250 Ω 4-20mA         13       13         Note: Connecting a 250 Ω resistor to the termina optional. Model: X010-250-2 (resistor with M3.5 crimp-on lugs)         Installation category (overvoltage category): II (IEC1010-1)         smission is configured at factory before shipment.         ion output       15 V DC loop power supply         14       14.5-18.0VDC         (21 mA DC         15       (21 mA DC max.)
Output is CC before ship before ship * Available if (Control Output * All 1 6 • AL2 5 • All 3 4 * Available if (Control Output * All 1 6 • All 2 5 • All 3 4 * Available if (Control Output * All 1 6 • All 2 5 • All 3 4 * Available if (Control Output * All 1 6 • All 3 4 • All 1 6 •	A, 7 or 10 is set in the O utput Type) setup parameters output UT UT UT UT UT UT UT UT UT V Note: The cool is selected the OT (( Type) setup setup parameters the OC (( Type) setup available factory-s control o PID relay ance load)	T eter. ing-side control output ed if 4, 5 or 6 is set in Control Output tup parameter. m-3 output is not . The controller is et to the cooling-side utput (time proportional / contact output).	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Heating-side control	Available if 5, 6, 8, 110 r 12 is set in th (Control Output The	PV retrans PV retrans P, e OT Dep	nput       set the PV input type to 1-5 V DC (setpoint         12       12         13       250 Ω 4-20mA         Note: Connecting a 250 Ω resistor to the termina optional. Model: X010-250-2 (resistor with M3.5 crimp-on lugs)         MOTE         Installation category (overvoltage category): II (IEC1010-1)         smission is configured at factory before shipment.         ion output       15 V DC loop power supply         14       14.5-18.0VDC (21 mA DC max.)         ontrol output       15 V DC loop power supply
Output is cc before ship Available if (Control Ou 30 ∨ AC, 3 A ) ∨ DC, 3 A (resistance load) tr/cooling-side control of -1 output -2 output -3 output -3 output -3 output -1 output -2 output -1 output -2 output -1 output -1 output -1 output -2 output -3 output -3 output -3 output -3 output -1 output -1 output -1 output -2 output -1 output -2 output -3 output -3 output -3 output -1 output -1 output -1 output -2 output -1 output -1 output -2 output -1 output -2 output -1 output -2 output -3 output -3 output -2 output -1 output -2 output -3 output -2 output -3 output -2 output -3 output -2 output -2 output -3 output -2 output	A 7 or 10 is set in the O utput Type) setup parameters butput UT VUT VUT VUT VUT VUT VUT VUT VUT VUT	T eter. ing-side control output ed if 4, 5 or 6 is set in Control Output tup parameter. m-3 output is not . The controller is et to the cooling-side utput (time proportional / contact output).	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Heating-side control	A output * Available if 5, 6, 8, 11 or 12 is set in th (Control Output Ty setup parameter.	nput         RTD ir           11         11           12         12           13         mV/V i           12         12           13         -           13         -           13         -           12         -           13         -           12         -           13         -           13         -           9, e OT pe)         -           1         -           -         -	nput       set the PV input type to 1-5 V DC (setpoint         12       250 Ω 4-20mA         13       13         Note: Connecting a 250 Ω resistor to the termina optional. Model: X010-250-2 (resistor with M3.5 crimp-on lugs)         Installation category (overvoltage category): II (IEC1010-1)         smission is configured at factory before shipment.         ion output       15 V DC loop power supply         (14)       (21 mA DC max.)         ontrol output       * If 15 V DC loop power supply is used, retransmission output cannot be used.
Output is cC before ship Available if (Control Ou 50 V AC, 3 A 0 V DC, 3 A (resistance load) t/cooling-side control of -1 output -2 output -3 output -3 output -3 output -1 (Note) mmon -1 ating: 240 V AC, 1 A 30 V DC, 1 A (resist pply upply • 8 • 9 10	A, 7 or 10 is set in the O utput Type) setup parameters output UT VT VT VT VT VT VT VT VT VT VT VT VT VT	T eter. ing-side control output ad if 4, 5 or 6 is set in Control Output tup parameter. m-3 output is not . The controller is et to the cooling-side utput (time proportional <i>y</i> contact output).	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Heating-side control	A output * Available if 5, 6, 8, 11 or 12 is set in th (Control Output Ty) setup parameter.	nput RTD ir 11  A 12  b 13  B mV/V  i 12  b 13  B mV/V  i 12 13 12 13 12 12 13 12 13 12 12 13 12 12 13 12 13 12 12 13 12 13 12 13 12 13 12 13 12 13 12 13 13 14 14 14 15 15 14 12	nput       set the PV input type to 1-5 V DC (setpoint         12       12         13       13         Note: Connecting a 250 Ω resistor to the termina optional. Model: X010-250-2 (resistor with M3.5 crimp-on lugs)         NOTE         Installation category (overvoltage category): II (IEC1010-1)         smission is configured at factory before shipment.         ion output       15 V DC loop power supply         14       14.5-18.0VDC         15       0         installation category (overvoltage category): II (IEC1010-1)         smission is configured at factory before shipment.         ion output       15 V DC loop power supply         if       15         istal.ation category       15         installation category (overvoltage category): II (IEC1010-1)         smission is configured at factory before shipment.         ion output       15 V DC loop power supply         istal.ation category       istal.ation category         installation category       istal.ation category         ima DC,       15 V DC loop power supply         ima DC,       * The retransmission output cannot be used.
Output is CC before ship * Available if (Control Ou * Available if * Available if * Available if * Available if (Control Ou * All 1 6 * All 2 5 * All 3 4 * Output * Soutput *	A, 7 or 10 is set in the O utput Type) setup parameters butput UT Note: The cool is selecter the OT (( Type) setup setup parameters is selecter the OT (( Type) se The alar available factory-s control o PID relay ance load) N Dut wiring, tum off the power and check that cables to be ot alive with a tester or the like a possibility of electric shock.	T eter. ing-side control output ed if 4, 5 or 6 is set in Control Output tup parameter. m-3 output is not . The controller is et to the cooling-side utput (time proportional y contact output).	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Heating-side control Heating-side contro Current / voltage pulse output 16(+)	Available if 5, 6, 8, 11 or 12 is set in th (Control Output Ty) setup parameter.	nput         RTD ir           11         11           12         12           13         8           mV/V i         12           12         12           13         -           13         -           13         -           13         -           13         -           12         +           13         -           13         -           13         -           13         -           13         -           13         -           14         +           15         -           14         +           14         +           15         -	nput       if 12 + 250 Ω 4-20mA         nput       if 2         if 12 + 250 Ω 4-20mA         if 2       if 2         if 3       if 2         if 4       if 3         if 4       if 4         if 4       if 4         if 5       if 5         if 5       if 5         if 5       if 15         if 15       if 15
Output is CC before ship * Available if (Control Ou * 50 V AC, 3 A 0 V DC, 3 A (resistance load) ut/cooling-side control of +1 output +2 output +3 output pside control 4L2 5 + 3 output pside control AL3 4 + it (Note) mmon COM 7 • mmon Com 7 • for carrying to the control of before carrying connected are m because there is 50/60 Hz shared	A, 7 or 10 is set in the O utput Type) setup parameters output UT UT UT UT UT UT UT UT UT U	T eter. ing-side control output ad if 4, 5 or 6 is set in Control Output tup parameter. 3 output is not The controller is et to the cooling-side utput (time proportional v contact output).	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Heating-side control	A vailable if 5, 6, 8, 11 or 12 is set in th (Control Output Ty setup parameter.	nput         RTD ir           11         11           12         12           13         12           13         12           12         12           13         12           12         13           12         12           13         12           13         12           12         13           12         13           13         12           13         12           13         12           13         12           13         12           13         12           13         12           13         12           13         12           13         12           13         12           14         4           15         volta           15         volta	nput       set the PV input type to 1-5 V DC (setpoint         nput       12+20mA         13-       Note: Connecting a 250 Ω resistor to the termina optional. Model: X010-250-2 (resistor with M3.5 crimp-on lugs)         NOTE       Installation category (overvoltage category): II (IEC1010-1)         semission is configured at factory before shipment.       in output         15 V DC loop power supply       14+14.5-18.0VDC         15-2       (21 mA DC max.))         ontrol output       * If 15 V DC loop power supply is used, retransmission output cannot be used.         * The retransmission output and 15 V DC loop power supply are not available if the cooling-side control output is set to "current output" and "voltage pulse output."
Output is of before ship * Available if (Control Ou * 50 V AC, 3 A 10 V DC, 3 A (resistance load) ut/cooling-side control of 1-1 output h-2 output h-3 output p-3 output p-3 output y-3 output	A, 7 or 10 is set in the O utput Type) setup parameters butput UT VT VT VT VT VT VT VT VT VT VT VT VT VT	T eter. ing-side control output ad if 4, 5 or 6 is set in Control Output tup parameter. The controller is et to the cooling-side utput (time proportional / contact output). a setup parameter. ing DIS setpoint allows v	$\begin{array}{c} 1 \\ 23 \\ 24 \\ \text{SDB(+)} \\ 24 \\ \text{SDA(-)} \\ 25 \\ \text{RDA(-)} \\ 26 \\ \text{RDA(-)} \\ 27 \\ \text{SG} \\ 1 \\ 21 \\ 1 \\ 2 \\ 22 \\ 12 \\ 3 \\ 22 \\ 13 \\ 22 \\ 13 \\ 24 \\ 14 \\ 5 \\ 25 \\ 15 \\ 6 \\ 26 \\ 16 \\ 7 \\ 27 \\ 17 \\ 8 \\ 28 \\ 18 \\ 9 \\ 29 \\ 10 \\ 30 \\ 20 \\ 10 \\ 30 \\ 20 \\ 10 \\ 30 \\ 20 \\ 10 \\ 30 \\ 20 \\ 10 \\ 30 \\ 20 \\ 10 \\ 30 \\ 20 \\ 10 \\ 30 \\ 20 \\ 10 \\ 30 \\ 20 \\ 10 \\ 30 \\ 20 \\ 10 \\ 30 \\ 20 \\ 10 \\ 30 \\ 20 \\ 10 \\ 30 \\ 20 \\ 10 \\ 10 \\ 30 \\ 20 \\ 10 \\ 10 \\ 30 \\ 20 \\ 10 \\ 10 \\ 30 \\ 20 \\ 10 \\ 10 \\ 30 \\ 20 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 1$	Heating-side control Heating-side contro Heating-side contro	I output * Available if 5, 6, 8, 11 or 12 is set in th (Control Output Ty) setup parameter.	nput         RTD ir           11         11           12         12           13         12           13         12           13         12           13         12           13         12           13         12           13         12           13         12           14         13           15         12           15         12           14         4-20           15         12           14         4-20           15         12	nput       set the PV input type to 1-5 V DC (setpoint         nput       12+20mA         13       13         Note: Connecting a 250 Ω resistor to the termina optional. Model: X010-250-2 (resistor with M3.5 crimp-on lugs)         Note: Connecting a 250 Ω resistor to the termina optional. Model: X010-250-2 (resistor with M3.5 crimp-on lugs)         Installation category (overvoltage category): II (IEC1010-1)         smission is configured at factory before shipment.         ion output       15 V DC loop power supply         imA DC, (12 V)       * If 15 V DC loop power supply is used, retransmission output cannot be used.         * The retransmission output and 15 V DC loop power supply are not available if the cooling-side control output is set to "current output" and "voltage pulse output."
Output is cc before ship * Available if (Control Output 50 V AC, 3 A 0 V DC, 3 A (resistance load) ±/cooling-side control of +1 output +2 output +2 output +3 output +3 output +3 output +3 output +3 output +3 output +3 output +3 output +3 output +10 0 COM 7 + mmon COM 7 + 100 0 C, 1 A 30 V DC, 1 A 30 V DC, 1 A (resist pely upply ↓ + 10 ± (Note) + 10 ± (100 to 240 V AC (±10%) (free voltage) 50/60 Hz shared sonly possible Heal	A, 7 or 10 is set in the O utput Type) setup parameters output Dutput UT UT UT UT UT UT UT UT UT U	T eter. ing-side control output ed if 4, 5 or 6 is set in Control Output tup parameter. n-3 output is not . The controller is et to the cooling-side utput (time proportional / contact output).	23       SDB(+)       1         24       SDA(-)       1         25       RDA(-)       1         26       RDA(-)       1         27       SG       1         1       21       11         22       12       12         3       23       13         4       25       15         6       26       16         7       27       17         8       28       18         9       29       19         10       30       20         10       30       20         10       30       20         10       30       20         10       30       20         10       30       20         10       30       20         10       30       20         11       10       30         12       10       30         13       13         14       15         15       16         16       28         17       30         18       19         19	Heating-side contro Heating-side contro Heating-side contro Pulse output 16++20 mA DC, voltage pulse 1712 V) ternal contact input.	TC i 12++ 13-+	nput RTD ir 11 A 12 b 13 B mV/V i 12 + 13 - * PV retran: Retransmissi 4.20 14 + 4.20 15 - tope) functions	nput       iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii
OULPUT IS CC before ship before ship * Available if (Control OU • • • • • • • • • • • • • • • • •	A, 7 or 10 is set in the O utput Type) setup parameters output UT VIT VIT VIT VIT VIT VIT VIT VIT VIT VI	T eter. ing-side control output ad if 4, 5 or 6 is set in Control Output tup parameter. 	$\begin{array}{c c} & & & \\ & & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & &$	Heating-side control Heating-side control Heating-side contro Current / voltage pulse output 16 4-20 mA DC, voltage pulse 17 - ternal contact input. ternal contact input. ce between parameter DIS and e hen DIS=2 When DI1-ON When switchin	I output         * Available if 5, 6, 8, 11 or 12 is set in th (Control Output Ty) setup parameter.         external contact input         S=3       When DIS= graget         graget       2,SP when DII	nput RTD ir 11  A 12  b 12  b 13  B mV/V i 12  + 13  - 12  + 13  - 13  - 14  + 4.20 15  - 14  + 14  - 15  - 14  + 15  - 14  + 15  - 14  + 15  - 14  + 15  - 14  + 15  - 14  + 15  - 14  + 14  - 15  - 14  + 14  - 14  -	nput       set the PV input type to 1-5 V DC (setpoint         input       il2         il2       il2         il2 <t< td=""></t<>
Output is CC before ship Available if (Control Ou So VAC, 3 A 0 V DC, 3 A (resistance load) at/cooling-side control of -1 output -2 output -3 output ride control t (Note) mmon rating: 240 V AC, 1 A 30 V DC, 1 A (resist mon rating: 240 V AC, 1 A 30 V DC, 1 A (resist pply upply + 8 -100 t 100 to 240 V AC (±10%) (free voltage) 50/60 Hz shared S only possible ler with a nout alarm.     Control of -1 output -1 output -1 output -1 output -1 output -1 output -1 output -2 output -1 output	A, 7 or 10 is set in the O utput Type) setup parameters output UT Vitro	T eter. ing-side control output ad if 4, 5 or 6 is set in Control Output tup parameter. 	rou to change the function of ext $23 \text{ sd}(-) \rightarrow +$ $24 \text{ sd}(-) \rightarrow +$ $25 \text{ Rd}(-) \rightarrow +$ $26 \text{ Rd}(-) \rightarrow +$ 27  sg 4  (1) 22  (2) 4  (2) 4  (2) 6  (26) 7  (27) 6  (26) 7  (27) 6  (26) 7  (27) 7  (27) 10  (29) 10  (20) 10  (20)	Heating-side contro Heating-side contro Heating-side contro Heating-side contro Current / voltage pulse output 16 + 4-20 mA DC, voltage pulse 17 - 112 V) ternal contact input. ce between parameter DIS and ce hen DIS=2 When DIS parameter when DI1=OF. parameter when DI1=OF.	I output         * Available if 5, 6, 8, 11 or 12 is set in th (Control Output Tyr) setup parameter.         external contact input         Saa         Understand         2.SP when DI15         9 target         2.SP when DI11         1.SP when DI11         1.SP when DI11	nput         RTD ir           11         11           12         12           13         mV/V i           12         12           13         mV/V i           12         12           13         -           13         -           13         -           12         +           13         -           13         -           13         -           12         +           13         -           12         +           13         -           12         +           13         -           13         -           13         -           13         -           9         e OT           0e         0T           0col         -           14         +           4         -           00T         -           00T         -           00T         -           00T         -	set the PV input type to 1-5 V DC (setpoint if the cooling-side control output and DC, ge pulse (12 V) and DC, ge pulse (12 V) and DC, ge pulse (12 V) and DC, ge pulse (12 V) and C, and C, and C, and C, box (12 V) and C, and C,
Output is competence of the shared     Source of the shared	A, 7 or 10 is set in the O utput Type) setup parameters output UT UT UT UT UT UT UT UT UT V Note: The cool is selected the OT (( Type) se The alarr available factory-s control o PID relay and check that cables to be ot alive with a tester or the like a possibility of electric shock. * DIS is Chang ter current ection input T 29 CT1 No fu	T eter. ing-side control output ad if 4, 5 or 6 is set in Control Output tup parameter. m-3 output is not . The controller is et to the cooling-side utput (time proportional / contact output). a setup parameter. ging DIS setpoint allows y DIS=OFF When DIS=1 (Fi nction 2.SP whe nction AUTO wh MAN whe	23 SDB(+)       1         24 SDA(-)       1         25 RDB(+)       26 RDA(-)         26 RDA(-)       27         27       SG         20       12         1       21         1       21         1       21         1       21         1       22         1       22         1       23         1       23         1       23         1       21         1       21         1       22         1       23         1       23         1       23         1       23         1       24         1       25         1       5         26       16         1       27         1       12         1       28         1       18         9       29         10       30         20       19         10       30         20       10         30       20         10       30	Heating-side control Heating-side control Heating-side control Heating-side control Current / voltage pulse output 16 + 4-20 mA DC, voltage pulse 17 - (12 V) ternal contact input. parameter when DI1=OFF. parameter when DI1=OFF. parameter when DI1=OFF. parameter when DI1=OFF.	I output         * Available if 5, 6, 8, 11 or 12 is set in th (Control Output Tyl) setup parameter.         sexternal contact input         S=3       When DIS=         g target 10.4: 11.SP when DI1         STOP when DI2         STOP when DI2         NON	nput         RTD ir           11         11           12         12           13         12           13         12           13         12           13         12           13         12           12         13           12         14           13         12           14         15           15         15           14         4.20           15         15           14         4.20           15         0           14         4.20           15         0           14         4.20           15         0           11         19           0         0           0         0           0         0           0         0           0         0           0         0	nput       set the PV input type to 1-5 V DC (setpoint         nput       12+20mA         13-       Note: Connecting a 250 Ω resistor to the termina optional.         Model: X010-250-2 (resistor with M3.5 crimp-on lugs)         Installation category (overvoltage category): II (IEC1010-1)         smission is configured at factory before shipment.         ion output       15 V DC loop power supply         if 15 V DC loop power supply is used, retransmission output and 15 V DC loop power supply are not available if the cooling-side control output.         * The retransmission output and 15 V DC loop power supply are not available if the cooling-side control output.         * The retransmission output and 15 V DC loop power supply are not available if the cooling-side control output.         * The retransmission output and "voltage pulse output."
Output is cc before ship * Available if (Control Output * Available if (Control Output v DC, 3 A (resistance load) //cooling-side control of output ide control AL3 4 * 4 output ide control AL3 4 * 7 mon COM 7 * 10 poly * 8 * 10 100 to 240 V AC, 1 A 30 V DC, 1 A (resist resist ply * 8 * 10 i00 to 240 V AC (±10%) free voltage) i0/60 Hz shared output alarm. Control output ing: 240 V AC, 1 A 30 V DC, 1 A (resist connected are no because there is i0/60 Hz shared output alarm.	A, 7 or 10 is set in the O utput Type) setup parameters output UT Note: The cool is selecter the OT (U Type) set The alarr available factory-s control o PID relay ance load) N N * DIS is Chang ter current ection input * DIS is Chang ter current ago com ter current ection input * DIS is Chang ter current ago com to fu No fu No fu Com	T eter. ing-side control output ad if 4, 5 or 6 is set in Control Output tup parameter. The controller is et to the cooling-side utput (time proportional / contact output). a setup parameter. jing DIS setpoint allows y DIS=OFF When DIS=1 (Fe nction 2.SP whe nction 1.SP whe nction AUTO wh MAN whe mon Com	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Image: state of the provided state	I output         * Available if 5, 6, 8, 11 or 12 is set in th (Control Output Ty) setup parameter.         sexternal contact input         S=3       When DIS=         g larget 2.SP when DI1         SF4SP FF NN       STOP when DI2         SNON       RUN when DI2=         On       Common	nput         RTD ir           11         11           12         12           13         12           13         12           13         12           12         12           13         12           12         12           13         12           12         12           13         12           12         13           12         14           14         4-20           15         1           0         15           15         0           15         0           15         0           15         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0      <	nput       set the PV input type to 1-5 V DC (setpoint         nput       12 + 20mA         nput       13 - 1200 M resistor to the termina optional. Model: X010-250-2 (resistor with M3.5 crimp-on lugs)         Note: Connecting a 250 Ω resistor to the termina optional. Model: X010-250-2 (resistor with M3.5 crimp-on lugs)         Installation category (overvoltage category): II (IEC1010-1)         smission is configured at factory before shipment.         ion output       15 V DC loop power supply is used, retransmission output cannot be used.         * The retransmission output and 15 V DC loop power supply are not available if the cooling-side control output; "         * The retransmission output and 15 V DC loop power supply are not available if the cooling-side control output;"         * The retransmission output and 15 V DC loop power supply are not available if the cooling-side control output;"         * The retransmission output and 15 V DC loop power supply are not available if the cooling-side control output;"         * The retransmission output and 15 V DC loop power is turned on whe the external contact input is C the mode (SP.no or A/M) exis before the power is turned of the continued. (except for RUI STOP)
VAC, 3 A / DC, 3 A (resistance load) / Cooling-side control of output AL1 6 - 0 output AL1 6 - 0 output AL2 5 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0	A, 7 or 10 is set in the O utput Type) setup parameter output Dutput UT UT UT UT UT UT UT V Note: The cool is select the OT (( Type) se The alarr available factory-s control o PID relay ance load) N V V V V V V V V V V V V	T eter. ing-side control output ed if 4, 5 or 6 is set in Control Output tup parameter. m-3 output is not . The controller is et to the cooling-side utput (time proportional / contact output). a setup parameter. jing DIS setpoint allows y DIS=OFF When DIS=1 (Fr nction 2.SP whe 1.SP whe nction AUTO wh MAN whe mon Corr	1       23       SDB(+)       1         24       SDA(-)       1       1         25       RDA(-)       1       26         26       RDA(-)       1       1         27       SG       1       1         4       22       12       1         4       22       12       1         4       23       13       13         4       25       15       15         6       26       16       16         7       27       17       16         8       28       18       19         9       29       19       19         10       30       20       19         10       30       20       19         10       30       20       19         10       30       20       19         10       30       20       19         10       30       20       19         10       30       20       10         10       20FF       Now       Now sthe LOCK         10       10       10       10       10	Image: second state of the second state of the second state stat	I output         * Available if 5, 6, 8, 11 or 12 is set in th (Control Output Tyr) setup parameter.         sexternal contact input         Same parameter         2.SP when DIS=         g target         STOP when DIZ=         NNON         RUN when DIZ=         On	nput         RTD ir           11         11           12         12           13         12           13         12           13         12           12         13           12         13           12         12           13         12           12         13           12         12           13         12           13         12           14         4.20           15         15           0         15           0         15           0         0           14         4.20           15         0           15         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0	nput       set the PV input type to 1-5 V DC (setpoint         nput       12+20mA         nput       13-000 resistor to the termina optional. Model: X010-250-2 (resistor with M3.5 crimp-on lugs)         Note:       Installation category (overvoltage category): II (IEC1010-1)         smission is configured at factory before shipment.       int 15 V DC loop power supply         ion output       15 V DC loop power supply         if 15 V DC loop power supply       retransmission output cannot be used.         * The retransmission output and 15 V DC loop power supply are not available if the cooling-side control output is set to "current output" and "voltage pulse output."         x       +5V         if +5V       DI1         u       +5V         u       +5V         u       10         u       u         x       Transistor contact         u       the power is turned on whe the external contact input is C the mode (SP.no or A/M) exis before the power is turned of the continued. (except for RUI STOP)         c, 10 mA or more       C, 10 mA or more
OULPUT IS CC before ship Available if (Control OU V DC, 3 A V DC, 3 A V DC, 3 A (resistance load) t/cooling-side control of 1 output 3 output side control (Note) nmon COM 7 + 10 10 2 output 3 output 3 output 3 output 100 v AC, 1 A 3 ou V DC, 1 A (resist poly ply 100 v 240 V AC, 1 A 30 V DC, 1 A (resist poly 100 to 240 V AC (±10%) (free voltage) 50/60 Hz shared s only possible ller with a nout alarm. up parameter. ange the settings of th Settings User's Ma	A, 7 or 10 is set in the O utput Type) setup parameter output Type) setup parameter output Type) setup parameter output Type) setup parameter note: The cool is selecter the OT (i Type) se The alarr available factory-s control o PID relay ance load) N www.ing. turn off the power and check that cables to be ot alive with a tester or the like a possibility of electric shock. * DIS is Chang ter current action input 29 CT1 29 CT1 30 Com * DIS is Chang Com No fu No fu No fu Com	T eter. ing-side control output ad if 4, 5 or 6 is set in Control Output tup parameter. 	Image: space of the system       Image: space of the system       Image: space of the system         Image: space of the system       Image: space of the system       Image: space of the system         Image: space of the system       Image: space of the system       Image: space of the system         Image: space of the system       Image: space of the system       Image: space of the system       Image: space of the system         Image: space of the system       Image: space of the system       Image: space of the system       Image: space of the system         Image: space of the system       Image: space of the system       Image: space of the system       Image: space of the system         Image: space of the system       Image: space of the system       Image: space of the system       Image: space of the system         Image: space of the system       Image: space of the system       Image: space of the system       Image: space of the system         Image: space of the system       Image: space of the system       Image: space of the system       Image: space of the system         Image: space of the system       Image: space of the system       Image: space of the system       Image: space of the system         Image: space of the system       Image: space of the system       Image: space of the system       Image: space of the system       Image: space of the system         Image: space of the system	Heating-side control Heating-side control Heating-side control Heating-side control Current / voltage pulse output 16 + 4-20 mA DC, voltage pulse 17 - (12 V) + ternal contact input. parameter when DI1=OKF, parameter when DI1=OKF, ternal contact input. DI OFF ON C DI2 OFF OK C Common Common	I output         * Available if 5, 6, 8, 11 or 12 is set in th (Control Output Tyl setup parameter.         * Stermal contact input         Sexternal contact input         Sexternal contact input         Sing target         2.SP when DI1         STOP when DI2         NON         Common         Common         Power Supply Wiring	nput RTD ir 11 A 12 b 13 B mV/V i 12 + 13 C Retransmissi 4 0 Cooling-side c 14 + 15 C Cooling-side c Cooling-s	set the PV input type to 1-5 V DC (setpoint 12 12 12 12 12 12 12 12 12 12
Couput is constructed as a solution of the solution of th	A, 7 or 10 is set in the O utput Type) setup parameter output butput Dutput Dutput Dutput Note: The cool is selecter the OT (C Type) setup parameter The alarra available factory-s control o PID relay * DIS is Chang ter current and check that cables to be ot alive with a tester or the like a possibility of electric shock. * DIS is Chang ter current add check that cables to be ot alive with a tester or the like a possibility of electric shock. * DIS is Chang ter current add check that cables to be ot alive with a tester or the like a possibility of electric shock. * DIS is Chang ter current add check that cables to be ot alive with a tester or the like a possibility of electric shock. * DIS is Chang ter current add check that cables to be ot alive with a tester or the like a possibility of electric shock. * DIS is Chang ter current add check that cables to be ot alive with a tester or the like a possibility of electric shock.	T eter. ing-side control output ad if 4, 5 or 6 is set in Control Output tup parameter. The controller is et to the cooling-side utput (time proportional / contact output). a setup parameter. ing DIS setpoint allows y DIS=OFF When DIS=1 (Figure nction 2.SP when nction 1.SP when nction AUTO wh MAN whe mon Corr ge the control output ty ion.	23 sdb(+)       1         24 sda(-)       1         25 kdb(-)       1         26 kda(-)       1         27 sc       1         28 kda(-)       1         29 kda(-)       1         20 kda(-)       1         21 sda(-)       1         22 kda(-)       1         29 kda(-)       1         20 kda(-)       1         21 kda(-)       1         22 kda(-)       1         23 kda(-)       1         20 kda(-)       1         21 kda(-)       1         22 kda(-)       1         23 kda(-)       1         24 kda(-)       1         20 kda(-)       1         22 kda(-)       1         31 kda(-)       1         32 kda(-)       1         33 kda(-)       1         34 kda(-)       1         35 kda(-)       1         36 kda(-)       1         37 kda(-)       1         38 kda(-)       1         39 kda(-)       1         30 kda(-)       1         30 kda(-)       1         30 kda	Image: second state of the second state	I output         * Available if 5, 6, 8, 11 or 12 is set in th (Control Output Ty) setup parameter.         sexternal contact input         S=3       When DIS=         g larget 2.SP when DI1         STOP when DI2         SM DN       RUN when DI2=         On       Common         Power Supply Wiring	nput RTD ir 11 11 12 12 13 mV/V i 12 13 mV/V i 12 + 13 mV/V i 12 + 13 mV/V i 12 + 13 mV/V i 12 + 13 - mV/V i 12 + 13 - mV/V i 13 - mV/V i 12 + - - - - - - - - - - - - -	put       set the PV input type to 1-5 V DC (setpoint         nput       12+250.2 (resistor to the termina optional.         Model: X010-250.2 (resistor with M3.5 crimp-on lugs)         Model: X010-250.2 (resistor with M3.5 crimp-on lugs)         smission is configured at factory before shipment.         in output       15 V DC loop power supply         introl output       * If 15 V DC loop power supply         introl output       * If 15 V DC loop power supply         introl output       * The retransmission output cannot be used.         * The retransmission output and 15 V DC loop power supply is used, retransmission output and 15 V DC loop power supply are not available if the cooling-side control output is set to "current output" and "voltage pulse output."         Image: the power is turned on whe the external contact input if the power is turned on whe the external contact input is set to "current output" and "voltage pulse output."         Image: transmission output       Note: External Contact input if the power is turned on whe the external contact input is set to "current output" and "voltage pulse output."         Image: transmission output       If the power is turned on whe the external contact input is set to "current output" and "voltage pulse output."         Image: transmission output       If the power is turned on the external contact input is set to "current output" and "voltage pulse output."         Image: transmission output       If the power is turned on the external contact input is set to "controlers with 2
	A, 7 or 10 is set in the O utput Type) setup parameter butput utput Type) setup parameter butput utputputp	T eter. ing-side control output ad if 4, 5 or 6 is set in Control Output tup parameter. m-3 output is not . The controller is et to the cooling-side utput (time proportional / contact output). a setup parameter. jing DIS setpoint allows y DIS=OFF When DIS=1 (Fe nction 2.SP when nction AUTO wh MAN whe mon Corr ge the control output ty ion. cooling-side output types OT=6 Heating side: Current output	1       23       SDB(+)       1         1       24       SDA(-)       1         1       25       RDA(-)       1         25       RDA(-)       1       1         1       21       11       1         2       22       12       12         3       23       13       13         4       25       15       16         6       26       16       17         8       28       18       19         9       29       19       19         10       30       20       17         8       28       18       19         9       29       19       19         10       30       20       10         30       20       10       30       20         10       30       20       10       30       20         110       30       20       10       30       20         10       101=0F       Shows the LOCK in not not not not not not not not not no	Image: second control of the synthesis of the synthe synthesis of the synthesis of the synthe	I output         * Available if 5, 6, 8, 11 or 12 is set in th (Control Output Tyr) setup parameter.         * Sternal contact input         Sate of the setup parameter.         * Sternal contact input         Sate of the setup parameter.         * Sternal contact input         Sate of the setup parameter.         * Sternal contact input         Sate of the setup parameter.         * Stop when DIS=         Input         Stop when DIS=         Stop	nput RTD ir IIIA IIIIA IIII	put       set the PV input type to 1-5 V DC (setpoint         input       iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii
	A, 7 or 10 is set in the O utput Type) setup parameter output UT Note: The cool is selecter the OT (in Type) setup parameter output UT The alarr available factory-s control o PID relay ance load) N wt wiring, turn off the power and check that cables to be ot alive with a tester or the like a possibility of electric shock. * DIS is Chang ter current cetton input 29 cT1 Von fur 29 cT1 0 fur com ter parameter OT to chang ter OT and heating-side/c OT=5 g side: Voltage pulse output (terminals @and @) g side: Relay output	T eter. ing-side control output ad if 4, 5 or 6 is set in Control Output tup parameter. 	$\begin{array}{c} \begin{array}{c} 23 \text{ sDB}(+) & & \\ 24 \text{ sDA}(-) & & \\ 25 \text{ sDB}(+) & & \\ 26 \text{ RDA}(-) & & \\ 27 \text{ sG} & & \\ 28 \text{ (1)} & & \\ 29 \text{ (2)} & & \\ 29 \text{ (1)} & & \\ 3 \text{ (2)} & & \\ 4 \text{ (2)} & & \\ 14 \text{ (3)} & & \\ 28 \text{ (1)} & & \\ 9 \text{ (2)} & & \\ 16 \text{ (1)} & & \\ 6 \text{ (2)} & & \\ 6 \text{ (2)} & & \\ 16 \text{ (1)} & & \\ 6 \text{ (2)} & & \\ 16 \text{ (1)} & & \\ 8 \text{ (2)} & & \\ 19 \text{ (2)} & & \\ 10 \text{ (3)} & & \\ 29 \text{ (1)} & & \\ 30 \text{ (2)} & & \\ 19 \text{ (2)} & & \\ 10 \text{ (3)} & & \\ 29 \text{ (2)} & & \\ 19 \text{ (2)} & & \\ 10 \text{ (3)} & & \\ 29 \text{ (2)} & & \\ 19 \text{ (2)} & & \\ 10 \text{ (3)} & & \\ 29 \text{ (2)} & & \\ 19 \text{ (2)} & & \\ 10 \text{ (3)} & & \\ 29 \text{ (2)} & & \\ 10 \text{ (3)} & & \\ 29 \text{ (2)} & & \\ 10 \text{ (3)} & & \\ 29 \text{ (2)} & & \\ 10 \text{ (3)} & & \\ 29 \text{ (2)} & & \\ 10 \text{ (3)} & & \\ 29 \text{ (2)} & & \\ 10 \text{ (3)} & & \\ 29 \text{ (3)} & & \\ 10 \text{ (3)} & & \\ 29 \text{ (3)} & & \\ 10 \text{ (3)} & & \\ 29 \text{ (3)} & & \\ 10 \text{ (3)} & & \\ 29 \text{ (3)} & & \\ 10 \text{ (3)} & & \\ 29 \text{ (3)} & & \\ 10 \text{ (3)} & & \\ 29 \text{ (3)} & & \\ 10 \text{ (3)} & & \\ 29 \text{ (3)} & & \\ 10 \text{ (3)} & & \\ 29 \text{ (3)} & & \\ 10 \text{ (4)} & & \\ 10 \text{ (5)} &$	Image: second control of the secon	I output         * Available if 5, 6, 8, 11 or 12 is set in the (Control Output Tyl) setup parameter.         external contact input         Sa       When DIS=         g target       2.SP when DII         1.SP when DII       STOP when DI2         STOP when DI2       STOP when DI2         on       Common         Power Supply Wiring       1         External resistor 1000       1000	nput RTD ir IIIA IIIIA IIIA	put       set the PV input type to 1-5 V DC (setpoint         nput       12+25014-20mA         nput       13-1000         nput       13-1000         Note: Connecting a 250 Ω resistor to the termine optional. Model: X010-250-2 (resistor with M3.5 crimp-on lugs)         Installation category (overvoltage category): II (IEC1010-1)         smission is configured at factory before shipment.         ion output       15 V DC loop power supply         imA DC       14+5V and the control output         * If 15 V DC loop power supply is used, retransmission output cannot be used.         * The retransmission output and 15 V DC loop power supply are not available if the cooling-side control output is set to "current output" and "voltage pulse output."         A       +5V         Image to the power is turned on whe the external contact input is the mode (SP.no or A/M) exis before the power is turned of the continued. (except for RUI STOP)         c, 10 mA or more       * Wiring can only be carried out for controllers with 24 V DC loop power supply.         c. 10 mA or more       24 V DC Power Supply Wiring to Two-wire Sensor
	A, 7 or 10 is set in the O utput Type) setup parameter output Dutput Vitro The cool is selecter the OT (U Type) setup parameter Note: The cool is selecter the OT (U Type) setup parameter available factory-s control o PID relay ance load) N * DIS is Chang ter current section input * DIS is Chang ter current section input * DIS is Chang ter current section input * DIS is Chang ter current section input (terminals (Sand (?)) ng side: Relay output (terminals (Sand (?)) re parameter OT to chan- mut (terminals (Sand (?)) re current section (?)	T eter. ing-side control output ad if 4, 5 or 6 is set in Control Output tup parameter. The controller is et to the cooling-side utput (time proportional / contact output). a setup parameter. ing DIS setpoint allows y DIS=OFF When DIS=1 (Fig nction 2.SP when nction 1.SP when nction AUTO wh MAN whe mon Corr ge the control output ty ion. cooling-side output types OT=6 Heating side: Current output (terminals@and() Cooling side: Relay output (terminals@and()	1       23       SDB(+)       1         1       24       SDA(-)       1         1       25       RDA(-)       1         1       26       RDA(-)       1         1       21       11         1       21       11         1       21       11         1       21       11         1       22       12         1       23       13         1       24       14         1       25       15         6       26       16         7       27       17         8       28       18         9       29       19         10       30       20         10       30       20         10       30       20         10       30       20         11       00       30       20         10       30       20       11         10       10       30       20         10       10       30       20         10       10       10       10         10       10	Image: state of the provided state	I output         * Available if 5, 6, 8, 11 or 12 is set in th (Control Output Ty) setup parameter.         sexternal contact input         S=3       When DIS=         g larget 2.SP when DI1         STOP when DI2         SNON         RUN when DI2=         On         Common         Power Supply Wiring         External resistor 1000 (Note)	nput RTD ir 11 11 12 13 mV/V i 12 13 mV/V i 12 12 13 mV/V i 12 12 12 12 12 12 12 12 12 12	put       set the PV input type to 1-5 V DC (setpoint         nput       12+200 A         nput       14+200 A         nput       14+200 A         nput       15 V DC loop power supply is used, retransmission output cannot be used.         * The retransmission output cannot be used.         * The retransmission output and 15 V DC loop power supply are not available if the cooling-side control output is set to "current output" and "voltage pulse output."         note:       10+200 A         note:       2+5V         DI       10+10+10+10+10 <t< td=""></t<>
	A, 7 or 10 is set in the O utput Type) setup parameter output putputput putputput putputput putputput putputput putputput putputputput putputputput putputputputput putputputputput putputputputputputputputput putputputputputputputputputputputputputp	T eter. ing-side control output ad if 4, 5 or 6 is set in Control Output tup parameter. 	1       23       SDB(+)       1         1       24       SDA(-)       1         1       25       RDA(-)       1         26       RDA(-)       1       1         1       21       11       1         2       22       12       12         3       23       13       13         4       25       15       16         6       26       16       17         8       28       18       19         9       29       19       10         30       20       10       30         9       29       19       10         30       29       19       10         30       20       10       30       20         10       30       20       10       30       20         10       30       20       10       30       20         10       10-OFF       Shows the LOCK       No       No         10       10-OFF       No       No       No         10       10-OFF       No       No       No         10       10	Image: second state of the second state	I output         * Available if 5, 6, 8, 11 or 12 is set in th (Control Output Tyr) setup parameter.         external contact input         Sa         When DIS=         g target:         2.SP when DI1         1.SP when DI2         NON         RUN when DI2         On         Common         Power Supply Wiring         External resistor 1000         (Note)         1.1	nput RTD ir RTD ir 11 A 12 b 13 B mV/V i 12 + 13 C Retransmissi 4 14 + 9, e OT pe) functions 4 UT Cooling-side c 14 + 4-20 15 - Cooling-side c 14 + 4-20 15 - Contac Cooling-side c 14 + 4-20 15 - Contac Cooling-side c 14 + 4-20 15 - Contac Conta	put       set the PV input type to 1-5 V DC (setpoint         nput       if i
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output is competences     output is com	A, 7 or 10 is set in the O utput Type) setup parameter output Dut	T eter. ing-side control output 2d if 4, 5 or 6 is set in Control Output tup parameter. m-3 output is not . The controller is et to the cooling-side utput (time proportional / contact output). a setup parameter. ing DIS setpoint allows y US=OFF When DIS=1 (Fi nction 2.SP when nction 1.SP when nction AUTO wh MAN whe mon Corr ge the control output ty ion. xooling-side output types OT=6 Heating side: Current output (terminals@and) Cooling side: Relay output (terminals@and) Cooling side: Current output (terminals@and) Cooling side: Current output (terminals@and) Cooling side: Current output (terminals@and) Cooling side: Current output (terminals@and) OT=12 Heating side: Current output (terminals@and) Cooling side: Current output (terminals@and) OT=12 Heating side: Current output (terminals@and) Cooling side: Sourcent output (terminals@and) Cooling side: Current outp	$\begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} 23 \text{ sd}(+) & \rightarrow \\ 24 \text{ sd}(-) & \rightarrow \\ 25 \text{ Rd}(+) & \leftarrow \\ 26 \text{ Rd}(-) & \leftarrow \\ 27 \text{ sg} \end{array} \end{array}$	Maximum baud rate: 9600 bps Heating-side contro Heating-side contro	I output         * Available if 5, 6, 8, 11 or 12 is set in th (Control Output Ty) setup parameter.         sexternal contact input         Same and the setup parameter.         Same	nput RTD ir RTD ir R	set the PV input type to 1-5 V DC (setpoint input set the PV input type to 1-5 V DC (setpoint input input input input Note: Connecting a 250 Ω resistor to the termina optional. Model: X012-250-2 (resistor with M3.5 crimp-on lugs) mabor intralation category (overvolage category): II (EC1010-1) straisation category (overvolage category): II (EC1010-1) straisation is configured at factory before shipment. inn ADC if V DC loop power supply int ADC if V DC loop power supply if the colling-side control output is set to "current output" and "voltage pulse output." Note: External Contact Input if the cooling-side control output is set to "current output" and "voltage pulse output." Note: External Contact Input if the cooling-side control output is Set to "current output" and "voltage pulse output." Note: External Contact Input if the cooling-side control output is Set to "current output" and "voltage pulse output." Note: External Contact Input if the cooling-side control output is Set to "current output" and "voltage pulse output." Note: External Contact Input if the cooling-side control output is Set to "current output" and "voltage pulse output." Note: External Contact Input if the cooling-side control output is Set to "current output" and "voltage pulse output." Note: External Contact Input if the cooling-side control output is Set to "current output" and "voltage pulse output."

To change the type to a relay output for on-off control, select "Relay Terminals" and change the setpoint of the proportional band to "0."

Note: Connecting a 100  $\Omega$  resistor to the terminals is optional. Model: X010-100-2 (resistor with M3.5 crimp-on terminal lugs) Note: Connecting a 250  $\Omega$  resistor to the terminals is optional.

Model: X010-250-2 (resistor with M3.5 crimp-on terminal lugs)

IM 05D01D02-01E (2)

# User's Models UT350 / UT320 Digital Indicating Controllers User's Manual IM 05D01D02-02E Initial Settings YOKOGAWA

Yokogawa M&C Corporation

This manual describes examples of setting PV input types, control output types, and alarm types. Carrying out settings described herein allows you to perform basic control. Refer to examples of various settings to understand how to set parameters required. Refer to "1. Parameter Map" in **Parameters User's Manual** for an easy to understand explanation of setting various parameters. If you cannot remember how to carry out an operation during setting, press the **Transport** key for more than 3 seconds. This brings you to the display (operating display) that appears at power-on.

Contents

- 1. Names and Functions of Front Panel Parts
- 2. Setting PV Input Type (Setting First at Power-on)
- 3. Changing PV Input Type
- 4. Setting Control Output Type
- Changing Alarm Type
   Description of Multiple Setpoints and PID



## 

The controller automatically returns to the display at the time of power-on (i.e., operating display) if no key is operated for at least one minute.

Although only figures of the UT350 front panel are cited in "2. Setting PV Input Type (Setting First at Power-on)," and thereafter, the UT320 is identical to the UT350 in terms of front panel operation.

■ Setting of Main Parameters at the Factory before Shipment

Item	Factory-set defaults for standard type controllers	Factory-set defaults for heating/cooling type controllers		
Control output	Time proportional PID	Heating side: Time proportional PID relay output (variable)		
	relay output (variable)	Cooling side: Time proportional PID relay output (variable)		
Control action	Reverse action (variable)	Not specified		
PID parameter	P = 5.0%, I = 240 seconds, D = 60 seconds.			
Alarm output		Alarm-1: PV high limit, Alarm-2: PV low limit, Alarm-3: PV high limit		

# 2. Setting PV Input Type (Setting First at Power-on)

controlled

800°C

Maximum value of

PV input range (RH)

Parameters to be set for temperature input

 PV input type (IN): Set according to a sensor
 Maximum value of PV input range (RH): Set the maximum value of the range to be controlled.

 Minimum value of PV input range (RL): Set the minimum value of the range to be controlled.

NOTE

Minimum value of PV input range (RL)



0.0m<sup>3</sup>/h

Minimum value of

ameters to be set for voltage input

PV input scale

PV input scale (SL) PV input scale (SH

50.0m<sup>3</sup>/h

Maximum value o

PV input type (III): Set according to an input signal Maximum value of PV input range (RH): Set the maximum value of an input signal. Minimum value of PV input range (RL): Set the minimum value of an input signal. Position of PV input decimal point (SDP): Set the position of the decimal point for PV input display

Maximum value of PV input scale (SH): Set the maximum value of the scale to be controlled. Minimum value of PV input scale (SL): Set the minimum value of the scale to be controlled.

Set a range to

1 be controlle



The following operating procedure describes an example of setting the controller to a K-type thermocouple (-199.9°C to

#### Instrument Input Range Codes

T S

	Select the unit from the UNIT parameter.						
Input	Туре	Instrument Input Range Code	Instrument Input Range	Measurement Accuracy			
Unspecified	1	OFF	Set the data item PV Ir	Input Type "IN" to the OFF option to leave the PV input			
		1	-200 to 1370°C				
	ĸ	2	-300 to 2500°F -199.9 to 999.9°C				
	IX	<u>ک</u>	0 to 2300°F	+0.1% of instrument range +1 digit for temperatures			
		3	-199.9 to 999.9°F	equal to or higher than 0°C			
	J	4	-199.9 to 999.9°C -300 to 2300°F	$\pm 0.2\%$ of instrument range $\pm 1$ digit for temperatures below 0°C			
	_	5	-199.9 to 400.0°C -300 to 750°F				
	T	6	0.0 to 400.0°C -199 9 to 750 0°F				
	в	7	0 to 1800°C 32 to 3300°F	$\pm 0.15\%$ of instrument range $\pm 1$ digit for temperatures equal to or higher than 400°C $\pm 5\%$ of instrument range $\pm 1$ digit for temperatures below 400°C			
	s	8	0 to 1700°C 32 to 3100°F				
Thermocouple	R	9	0 to 1700°C 32 to 3100°F	$\pm$ 0.15% of instrument range $\pm$ 1 digit			
	N	10	-200 to 1300°C -300 to 2400°F	$\pm 0.1\%$ of instrument range $\pm 1$ digit $\pm 0.25\%$ of instrument range $\pm 1$ digit for temperatures below 0°C			
	E	11	-199.9 to 999.9°C -300 to 1800°F				
	L(DIN)	12	-199.9 to 900.0°C -300 to 1300°F	±0.1% of instrument range ±1 digit for temperatures equal to or higher than 0°C			
		13	-199.9 to 400.0°C -300 to 750°F	$\pm 0.2\%$ of instrument range $\pm 1$ digit for temperatures below 0°C			
		14	0.0 to 400.0°C -199.9 to 750.0°F				
	w	15	0 to 2300°C 32 to 4200°F	$\pm$ 0.2% of instrument range $\pm$ 1 digit			
	Platinel 2	16	0 to 1390°C 32 to 2500°F	±0.1% of instrument range ±1 digit			
	PR20-40	17	0 to 1900°C 32 to 3400°F	$\pm 0.5\%$ of instrument range $\pm 1$ digit for temperatures equal to or higher than 800°C No guarantee of accuracy for temperatures below 800°			
	W97Re3- W75Re25	18	0 to 2000°C 32 to 3600°F	$\pm 0.2\%$ of instrument range $\pm 1$ digit			
	IDHOC	30	-199.9 to 500.0°C -199.9 to 999.9°F	$\pm$ 0.1% of instrument range $\pm$ 1 digit (Note1) (Note2)			
	JPTIOU	31	-150.0 to 150.0°C -199.9 to 300.0°F	±0.2% of instrument range ±1 digit (Note1)			
RTD		35	-199.9 to 850.0°C -300 to 1560°F				
	Pt100	36	-199.9 to 500.0°C -199.9 to 999.9°F	±0.1% of instrument range ±1 digit (Note1) (Note2)			
		37	-150.0 to 150.0°C -199.9 to 300.0°F	$\pm$ 0.2% of instrument range $\pm$ 1 digit (Note1)			
Standard	0.4 to 2 V	40	0.400 to 2.000 V				
signal	1 to 5 V	41	1.000 to 5.000 V	+0.1% of instrument range +1 digit			
	0 to 2 V	50	0.000 to 2.000 V	The read-out range can be scaled between -1999 and			
DC voltage	0 to 10 V	51	0.00 to 10.00 V	9999.			
	-10 to 20 mV	55	-10.00 to 20.00 mV				
		30	0.0 10 100.0 MV	1			

Blinks during

change.

\* Performance in the standard operationg condition (at 23±2°C, 55±10%RH, and 50/60Hz power frequency)

Note1: The accuracy is  $\pm 0.3^{\circ}$ C of instrument range  $\pm 1$  digit for a temperature range from  $0^{\circ}$ C to  $100^{\circ}$ C.

Note2: The accuracy is  $\pm 0.5^{\circ}$ C of instrument range  $\pm 1$  digit for a temperature range from  $-100^{\circ}$ C to  $200^{\circ}$ C. \* To receive a 4-20 mA DC signal, select a standard signal of 1 to 5 V DC and connect it to a  $250\Omega$  resistor. This resistor is optional.

Model: X010-250-2 (resistor with M3.5 crimp-on terminal lugs)

#### NOTE

 $\triangle$ 

The controller may automatically initialize the registered operating parameter setpoints if any change is made to the data item PV Input Type (IN), Maximum Value of PV Input Range (RH), Minimum Value of PV Input Range (RL), PV Input Decimal Point Position (SDP), Maximum Value of PV Input Scale (SH) or Minimum Value of PV Input Scale (SL). After a change has been made to any of these data items, be sure to verify the registered operating parameter setpoints to ensure that they are correct. If any data item has been changed to its default, set it to a required value.



# 4. Setting Control Output Type







#### 6. Description of Multiple Setpoints and PID

The UT350/UT320 controllers have a maximum of four target setpoint (SP) parameters and has PID for each of these setpoints. The following shows the correspondence between the target setpoint numbers (SP.NO), target setpoints (SP), and PID parameters.

For example, if you have set "2" to the target setpoint number (SP.NO), the control parameters available are target setpoint (2.SP), proportional band (heating-side proportional band) (2.P), integral time (heating-side integral time) (2.I), derivative time (heating-side derivative time) (2.D), cooling-side proportional band (2.Pc), cooling-side integral time (2.Ic), and cooling-side derivative time (2.Dc).

To use multiple target setpoints, see the table below to check the corresponding parameters.

Target setpoint	Target	PID parameter						
number (SP.NO)	setpoint (SP)	Proportional band (heating-side proportional band)	Integral time (heating-side integral time)	Derivative time (heating-side derivative time)	Cooling-side proportional band	Cooling-side integral time	Cooling-side derivative time	
SP.NO=1	1.SP	1.P	1.1	1.D	1.Pc	1.lc	1.Dc	
SP.NO=2	2.SP	2.P	2.1	2.D	2.Pc	2.lc	2.Dc	
SP.NO=3	3.SP	3.P	3.1	3.D	3.Pc	3.lc	3.Dc	
SP.NO=4	4.SP	4.P	4.1	4.D	4.Pc	4.lc	4.Dc	

#### NEW User's Models UT350 / UT320 Pl d **Digital Indicating Controllers** Manual sp<u>nEnU</u> **User's Manual** Operations Ze da IM 05D01D02-02E 2nd Edition: Jul 1, 2001 YOKOGAWA

Yokogawa M&C Corporation

This manual describes key entries for operating the controller. For operations using external contact inputs, see "6. Terminal Wiring Diagrams" in Installation User's Manual . If you cannot remember how to carry out an operation during setting, press the vertice that 3 seconds. This brings you to the display (operating display) that appears at power-on.

Contents

- 1. Setting Target Setpoint (SP) 2. Performing/Canceling Auto-tuning
- 3. Setting PID Manually
- 4. Setting Alarm Setpoints
- 5. Selecting Target Setpoint Numbers (SP.NO)
- 6. Switching between Run and Stop Switching between AUTO and MAN
- 8. Manipulating the Control Output in Manual Operation 9. Troubleshooting

# NOTE

Do not use the instrument generating strong magnetic field such as radio equipment and the like near the controller. This may cause the fluctuation of the PV value.

#### 1. Setting Target Setpoint (SP)

The following operating procedure describes an example of setting 120.0 to a target setpoint. In automatic operation, the controller starts control using set target setpoints.





# 2. Performing/Canceling Auto-tuning

Auto-tuning should be carried out after setting a target setpoint (SP). Make sure the controller is in automatic operation mode (AUTO) and in running state (RUN) before carrying out auto-tuning. See "7. Switching between AUTO and MAN." to change to AUTO and "6. Switching between RUN and STOP," to change to RUN.

#### NOTE

When on-off control is being used, auto-tuning cannot be carried out. Moreover, do not perform auto-tuning when

- contolling any of following processes. Control processes with quick response such as flow control or pressure control
- Processes where even temporary output on/off results in inconvenience
- Processes where a large output change at control element results in inconvenience
- Processes where variations in PV may exceed an allowable range, adversely affecting product quality Press the or key to display the required setpoint. Tuning for 1.SP is AT = 1. Bring the operating display into view (display appears at power on). Displays PV 268 Blinks during Displays change. target setpoint MAN lamp OFF. To cancel auto-tuning, set AT = OFF 2. Press the The key for more than 3 seconds to call up the menu "OP.PA". Press the wey once to register the setpoint This starts auto-tuning.) If the *L* key is pressed when AT = OFF, auto-tuning will be cancelled. In this case, PID contains the value existing before auto-tuning. Displays menu "OP.PA". oPPR 6. During auto-tuning, the panel indications become as shown below. 3. Press the key five times to display the Displays parameter \_\_\_\_"AT".\_\_\_ 485 MAN lamp sp 1200 blinks. st de Auto-tuning is complete when the MAN lamp goes off.

# 3. Setting PID Manually

If you know the values to be set or if suitable PID constants cannot be obtained by auto-tuning, follow the procedure below











#### 5. Selecting Target Setpoint Numbers (SP.NO)

The following operating procedure describes an example of changing a target setpoint number (SP.NO) from 1 to 2.

## NOTE

If a target setpoint number has been switched using contact input, when the contact input is on, that number cannot be selected by keystroke When using target setpoint ramp setting function, PV tracking works if the target setpoint number is switched.



#### 6. Switching between Run and Stop Switching between the RUN and STOP states can be performed only using external contact input.

# NOTE

When the controller is shipped from the factory, it is configured so that switching between the RUN and STOP states cannot be performed. To make the switching possible, configure the DIS setup parameter as "DIS = 4".



When the controller is stopped, input and outputs are as follows: PV input Displays PV. Control output Preset output value (factory-set default: 0%)

Alarm output ON in the event of an alarm When the controller is stopped, control output relay is "STOP.

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	•	
	ч	
	<b>.</b>	
•		

increas

increase.

Is the instrument defective Totally inoperable

Check wiring on the power supply terminals.

voltage.

#### 7. Switching between AUTO and MAN

#### NOTE

M

If AUTO and MAN have been switched using contact input, when the contact input is ON, switching between AUTO and MAN cannot be achieved by keystroke.



#### 8. Manipulating the Control Output in Manual Operation

#### NOTE

output.

Control output cannot be changed if the controller is stopped. In this case, the preset output value (setup parameter PO) will be output.

A control output value is linked with a display value changed using the 💌 or 🖾 key. Note that the control output changes as displayed without requiring the key.



# Manipulating the Control Output during Heating/Cooling Control

Either of the following two displays appears when the mode is switched to MAN during heating/cooling control.

Heating-side OUT display Cooling-side OUT display 268 268 Cooling-side leating-side Symbol "H" Symbol "C" output output represents the represents the \_ % heating-side cooling-side 

 Controller behavior and control output manipulation when the dead band is positive The following is an example when the DB parameter is set at 12.4%.

If you hold down the  $\bigtriangledown$  key with the heating-side output under manipulation (i.e., cooling-side output C = 0.0%), the heating-side output (H =) decreases. Consequently, both the heating-side and cooling-side outputs change to 0.0%. If you keep the 😇 key held down longer, you enter the state of manipulating the cooling-side output, and its value begins to

\_output.\_\_

Inversely, if you hold down the 🖾 key with the cooling-side output under manipulation (i.e., heating-side output H = 0.0%), the cooling-side output ( $\overline{C}$  =) decreases. Consequently, both the heating-side and cooling-side outputs go to 0.0%. If you keep the A key held down longer, you enter the state of manipulating the heating-side output, and its value begins to



# roubleshooting

#### Troubleshooting Flow

If the operating display does not appear after turning on the controller's power, follow the measures in the procedure below. If a problem appears complicated, contact our sales representative.





Take note of the parameter settings when asking the vendor for repair.

#### Errors at Power On

The following table shows errors that may be detected by the fault diagnosis function when the power is turned on.

Error indication (on PV display unit)	Description of error	PV	Control output	Alarm output	Retransmission output	Communi- cation	Remedy
<i>E [] [] []</i> (E000)	Faulty RAM	Nana			00/ 07 000	Ctopped	
EIII /(E001)	Faulty ROM	None	0% or less	OFF	0% of less	Stopped	Foulty
£002 (E002)	System data error		0%		0%		Contact us
PV decimal point blinks.	Faulty calibration value	Normal action (out of accuracy)	Normal action (out of accuracy)	Normal action (out of accuracy)	Normal action (out of accuracy)	Normal action	for repair.
E400 (E400)	Parameter error	0%	Preset value output	OFF	0%		Check and set the parameters, as they have been set to the limited values.

#### Possible Errors during Operation

The following shows possible errors occurring during operations

Error indication Description PV Contro Alarm Retransmis- Commu-Remedy (on PV display output output sion output nication of erro unit) Displays "RJC" RJC error Norma Normal Normal Normal Faulty with RJC=OFF and PV action action action Contact us for repair action ternatel PV value blinks. EEPROM Normal action Norma Normal Normal Normal Faulty action action action action Contact us for repair *E 300* (E300) A/DC error 105% Preset Normal Normal Normal value action action action output b.o UE (B.OUT) PV burnout Dependent on the BSL Preset Normal Normal Normal Check wires and parameter Up-scale: 105% value action action action sensor Down-scale: -5% output ggr (OVER) or Excessive PV -5% or 105% Normal Check process. Normal Normal Normal Out of -5 to action action action action 105% E200 (E200) Auto-tuning Normal action Norma Normal Normal Normal Check process. Press action action action action any key to erase error (Time-out) indication. SP decimal Faulty Normal action Normal Normal Normal Normal Check wires and action point blinks. communiaction action action communication parameter (on setpoint cation line and make resetting. display unit) Recovery at normal receip All indications off Runaway (due None 0% or less OFF 0% or Faulty if power off/on does Stopped to defective or OFF not reset start the unit. Contact us for repair power or All indications off Power off None 0% OFF 0% Stopped Check for abnormal power

## ■ If a Power Failure Occurs during Operation

Momentary power failures shorter than 20 ms

The controller is not affected at all and continues normal operation.

Power failures of 20 ms or longer

• The alarm function of the controller continues to work normally. (Alarms with the stand-by feature temporarily return to their stand-by state, however.)

· Setting parameters that have already been configured retain their settings. Auto-tuning is cancelled.

• After recovery from a power failure, control action resumes in the same mode as the one before the occurrence of the power failure. The control output begins with the preset output value.

#### Troubleshooting When the Controller Fails to Operate Correctly

If your control tasks are not successful, check the preset parameters and controller wiring before concluding the controller to be defective. The following show some examples of troubleshooting you should refer to in order to avoid the possibility of other problems.

The controller does not show the correct measured input (PV).

• The UT350/UT320 controllers have a universal input.

The type of PV input can be set/changed using the parameter "IN". At this point, the controller must be wired correctly according to the selected type of PV input. Check the wiring first if the controller fails to show the correct PV. To do this, refer to Initial Settings User's Manual

With the parameters "RH", "RL", "SDP", "SH" and "SL", it is possible to scale the input signal and change its number of decimal places. Also check that these parameters are configured correctly.

• The controller does not provide any control output or the control output does not

change at all.

• The UT350/UT320 controllers have a universal output. The type of control output can be set/changed using the parameter "OT"

At this point, the controller must be wired correctly according to the selected type of control output. Check the wiring first if the controller provides no control output. To do this, refer to "6. Terminal Wiring Diagrams," in Installation User's Manual

With the parameters "OH" and "OL", it is possible to set/change the high and low limits of control output. The control output may not change at all, however, because of restrictions on these parameters. Also check the restrictions on these parameters

• The control output can only be changed when the controller is in the MAN mode. If the MAN lamp is off (i.e., the controller is in the AUTO mode), you cannot change the control output using key

#### • The control output does not change soon after the target setpoint SP has been changed.

• If this happens, check the setpoint of the parameter "C.MD". In cases where fixed-point control is selected as the PID control mode (C.MD = 1), tracking based on the I-term works to prevent the control output from changing suddenly even if the target setpoint SP is varied.

The control output therefore may appear to be working incorrectly at first; however it gradually adapts itself to the new target setpoint



# 2. Lists of Parameters

Parameters relating to PV or setpoints should all be set For example, use temperature values to define target se alarm setpoints for temperature input.

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
<b>L L</b> (LL)	LL communication interface selection	OFF: Communication is carried out via the RS485 communication terminals. ON: Communication is carried out via the light-loader adapter.	with communication : OFF without communication : ON		_
<b>A 1</b> (A1)	Alarm 1-setpoint	PV alarm / SP alarm: -100.0 to 100.0% of PV input range Deviation alarm: -100.0 to 100.0% of PV input	PV high limit/SP high limit alarm: 100.0% of PV input range Deviation alarm: 0.0% of PV		_
<b>A</b> 2	Alarm 2-setpoint	range span Output alarm: -5.0 to 105.0% An alarm common to the 1.SP to 4.SP parameters.	input range span Other PV/SP low limit alarm: 0.0% of PV input range		_
<b>A</b> 3	Alarm 3-setpoint		Output high limit alarm: 100.0% Output low limit alarm: 0.0%		_
<b>AL</b>	Auto-tuning	OFF: No auto-tuning 1: Auto-tuning for 1.SP 2: Auto-tuning for 2.SP – 3: Auto-tuning for 3.SP 4: Auto-tuning for 4.SP AUTO: Performs auto-tuning to all groups 1 to 4.	OFF		_
<b>5</b> [ <sub>(SC)</sub>	"Super" function	OFF: Disable 1: Overshoot suppressing function Suppresses overshoots generated by abrupt cha in the target setpoint or by disturbances. 2: Hunting suppressing function (Stable mode) Suitable to stabilize the state of control when the varies greatly, or the target setpoint is changed. Enables to answer the wider characteristic changed compared with Response mode. 3: Hunting suppressing function (Response mode) B: Hunting suppressing function (Response mode). 3: Hunting suppressing function (SC) 2 or 3 in PID con "SUPER" function 2 or 3 is not available in the for 1) ON/OFF control 2) P control (control for proportional band only) 3) PD control (control for proportional band and def 4) Heating/cooling control	OFF Ioad ges he of trol or PI control. Ilowing control: rivative item only)		Ref.2.1(5) Ref.2.1(6)
<u>-                                    </u>	Target setpoint	Do not use hunting suppressing function when cont with response such as flow or pressure control. 0: Uses target setpoint via communication	rol processes		
(SP.NO)	number selection	1: Selects target setpoint 1 (1.SP). 2: Selects target setpoint 2 (2.SP). 3: Selects target setpoint 3 (3.SP). 4: Selects target setpoint 4 (4.SP).			Ref.4.1(1)
	PID parameter display number	MENU: Move to FL parameter display 1Gr to 4Gr: Display of each PID parameter	MENU		
<b>FL</b>	PV input filter	OFF, 1 to 120 second. Used when the PV input fluctuates.	OFF		
<b>b5</b>	PV input bias	-100.0% to 100.0% of PV input range span	0.0% of PV input range span		Ref.1.1(1)
	Setpoint ramp-up-rate	OFF 0.0% + 1 digit of PV input range span	OFF		
	Setpoint ramp-down- rate	Set runit is range rate time unit /TML	OFF		Ref.4.1(4)
	Output high limit Heating-side output high limit (in heating/cooling control) Output low limit Cooling-side output high limit	-5.0 to 105.0% Heating-side limiter in heating/cooling control: 0.0 to 105.0% (OL < OH) -5.0 to 105.0% Cooling-side limiter in heating/cooling control: 0.0 to	100% Heating/cooling control: 100.0% 0.0% Heating/cooling control:		Ref.2.1(3)
(OL) H (H)	(in neating/cooling control) ON/OFF control hysteresis Heating-side/cooling-side ON/OFF control hysteresis (in heating/cooling control)	In OV/OFF control: 0.0 to 100.0% of PV input range span In heating/cooling control: 0.0 to 10.0%	ON/OFF control: 0.5% of PV input range span Heating/cooling control: 0.5%		_
	Direct/reverse action switching	0: reverse action, 1: direct action Control output 100% Reverse action - 0% Direct action + Deviation (PV, Se)	0		Ref.2.1(1)
НЬ Г	Heater burnout current setpoint 1	OFF, or 1 to 50 A	OFF		
(HB1) <b>Hb2</b> (HB2)	Heater burnout current setpoint 2				
<b><i>H</i></b> <sup>(HC1)</sup>	Heater burnout current measurement 1	These are not setpoints.	The current value of the heater burnout detector is shown on the display of		Ref.3.3(5)
<b>H[2</b> (HC2)	Heater burnout current measurement 2		the HC1 or HC2 parameter.		
orb <sub>(ORB)</sub>	ON/OFF rate detection band	0.0 to 100.0% of PV input range span	1.0% of PV input range span		
	ON/OFF rate high limit	ORL + 1 digit to 105.0%	100.0%		Defe
	ON/OFF rate low limit	-5.0% to ORH - 1 digit	0.0%		кет.3.3(4)
	ON/OFF rate	This is not a setpoint.	The moving average (for 5 cycle times) of the control output is shown.		
(1.SP)	Target setpoint-1	0.0 to 100.0% of PV input range However, between target setpoint limiter lower limit (SPL) and upper limit (SPH).	0.0% of PV input range		
<b>2.5P</b>	Target setpoint-2				
<b>3.5</b> <i>P</i>	Target setpoint-3				Ref.4.1(1)
<u>45</u> P	Target setpoint-4				

# PID-related Parameters

The following parameters are displayed when "1Gr" is set to PID parameter display number (PID). In this case, the corresponding (target setpoint-1). To set PID corresponding to target setpoint 2 to 4, set "2Gr", "3Gr", or "4Gr" to PID. The relevant parameters will then be display

Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
(1.P)	Proportional band/Heating- side proportional band (in heating/cooling control)	0.1 to 999.9% In heating/cooling control: 0.0 to 999.9% (heating-side ON/OFF control applies when 0.0)	5.0%		
(1.l)	Integral time Heating-side integral time (in heating/cooling control)	OFF, 1 to 6000 second	240 second		
<b>Id</b> (1.D)	Derivative time Heating-side derivative time (in heating/cooling control)	OFF, 1 to 6000 second	60 second		
(1.MR)	Manual reset	-5.0 to 105.0% (enabled when integral time "1.1" is OFF) The manual reset value equals the output value when $PV = SP$ is true. For example, if the manual reset value is 50%, the output value is 50% when $PV = SP$	50.0%		Ref.4.1(1
<b>(1.Pc)</b>	Cooling-side proportional band	0.0 to 999.9% (Cooling-side ON/OFF control applies when 0.0)	5.0%		
	Cooling-side integral time	OFF, 1 to 6000 second	240 second		

in real numbers. etpoints and	* The "User S * The "Target Version) wh	Setting" column in the ta Item in CD-ROM" colu ich describes items in r	able below is provided for mn in the table below prov more detail and items that	the customer to rides references are not contain	o record setpoints. s from User's Manual (R ed in this manual.	eference) (CD-ROM
ng Target Item in CD-ROM		Cooling-side derivative time	OFF, 1 to 6000 second		60 second	
-	(1.DB)	Deadband	-100.0 to 50.0% In heating/cooling control, a both of the heating- and co are presented, or none of th can be set.	a reagion where oling-side outputs nem is presented,	3.0%	Ref.4.1(1)
	Ic P	Zone PID reference	0.0 to 100.0% of PV input r	ange.	100% value of	
	(1.RP)	a below for recording set	points when two sets or more	of PID paramet	ers are used	
-	Parameter	n=2 n=3 n=	=4		ers are used.	
-	n.P n.l					
	n.D n.MR					
	n.Pc n.lc					
Ref.2.1(5)	n.Dc n.DB					
Ref.2.1(6)	n.RP	None N	one			
	(RDV)	Reference deviation	OFF, 0.0 to100.0% of PV input to Used to select PID constants ac the setpoint. The 4th group of P the controller fails to keep track	ange span cording to a deviation ID constants is used of the deviation.	n from when	Ref.4.1(1)
	■ Auto-tu	ning	<b> </b>	Interv	al of auto-tuning	Auto-tuning is
Ref.4.1(1)	Auto-tuning is a automatically me	function with which the easures the process char	controller acteristics	$\bigcap$	$\bigcap$	3rd peak arrives.
	to automatically s function does no	set the optimum PID consist of work when the control	tants. This Setpoint			
	the "Limit Cycle	e Method." As shown in controller temporarily c	the figure PV input value	-/ \	$\int$	
Ref.1.1(1)	control output in calculates the op	a step-waveform manne timum proportional band	r. Then, it Control output	Off [	Off	PID control based on
	gral time (I) and ing response to s	derivative time (D) from set them in their respective the Limit (OU) and	the result- ve param-		he configured the control	PID constants determined by auto-tuning
Ref.4.1(4)	between the outp	put's high and low limits	during auto-tuning.	meters are alread	ly configured, the control	output turns on and off onl
	<ul> <li>Auto-tur</li> </ul>	ning Using Zone	PID (see "■ PID ?	Switching (	(Zone PID)" later	in this manual)
Pof 2 1/2)	Setting of AT Parameter	Auto-tuned Setpoin	t	Remarks		
Rel.2.1(3)	OFF 1	- The setpoints when aut	Auto-tuning is turned o o- Determines the values	ff (disabled). of 1.P, 1.I and 1.	D parameters by auto-tunin	g.
	2 3	tuning is started	Determines the values Determines the values	of 2.P, 2.I and 2. of 3.P, 3.I and 3.	D parameters by auto-tunin D parameters by auto-tunin	g. g.
	4 AUTO	Median value of each z	Determines the values one Determines the values	of 4.P, 4.I and 4. of all PID parame	D parameters by auto-tunin eters in use by auto-tuning.	g.
	The AT parameter	width	4 in the table above are dene	ndent on how m	any zones have been set	For example, if you have se
Ref.2.1(1)	two zones, you c	an use AT parameter sett	ings 1 and 2. Likewise, if yo	ou have set three	zones, you can use AT par	rameter settings 1, 2 and 3.
	■ Hystere	esis (for Target	Setpoints (On-C	Off Control	) and Alarm Se	tpoints)
	chattering.	e set in on-off control set	points and alarm setpoints as	well. With the r	iysteresis settings, it is pos	sible to prevent relays from
		<ul> <li>When hysteresis</li> </ul>	is set in a target setpoint	When Example of A	hysteresis is set in an alarn f hysteresis set in PV high limit a	n setpoint Iarm
Ref.3.3(5)		Output Point of on-o (Target se	off action etpoint)	Output	Point of on-off action (Alarm setpoint)	
-		On -	Hysteresis	On -		
		Off	<b>_</b>	Off -	Hysteresis	
		:	PV value		: PV value	<b>→</b>
D=( 2.2(4)	Target !	Setnoint Ramr	Setting Function	n		
Rel.3.3(4)	Use this function	to prevent the target set	point from changing suddenl	y. The ramp sett	ing function works when:	
	[1] the target set [2] the target set	point is changed (examp	le: change in "1.SP" from 10 1 (example: switch from "1.S	0°C to 150°C); P" to "3 SP"):		
	[3] the power is [4] a change is r	turned on or the controlle nade from manual operat	er is recovered from power fa- tion to automatic operation; (	ailure;		
-	[5] a change is n	nade from the STOP stat	e to the RUN state.		1.SP	2.SP
Ref.4.1(1)	If the target setp after switching,	the controller operates	smaller than the target set according to the settings o	point 2.SP=640° f the f the	C	
	target setpoint be ing, the controlle	fore switching is greater the er operates according to t	an the target setpoint after sw the settings of the Setpoint P	itch- amp	temperature difference	70°C/min
	Down (DNR) an right shows an ex	d Ramp Time Unit (TM) xample when the Target S	J) parameters. The figure of Setpoint Number (SP.NO) pa	n the <sup>1.SP=500°</sup> ram-	2-minute ir	temperature change
<u> </u>	eter is switched. respectively. Thu 1 SP and 2 SP -	The 1.SP and 2.SP param us, there is a temperature parameters. This example	eters are set to 500°C and 64 difference of 140°C betwee e shows how the temperature	0°C, n the re is	Switching from 1.SP to 2.SP p	e rise arameter
target setpoint is 1.SP	changed by as m example, the UP	uch as this temperature d R parameter is 70°C and	ifference over a period of tw the TMU parameter is 1 mir	o minutes. In this		n setting function DV teching and
ed.	■ PID Sw	vitchina (Zone	PID)		in case of the above conditions	p setting iuriculon, PV tracking works [2] to [5].
g Target Item in CD-ROM	Using a zone PII	D, you can automatically	, switch between groups of PII	O constants accor	ding to the temperature zo	ne. You can set a maximur
	Setting Method:	ure zoiles.	Maximum val	ue of PV		
]	[1] Set the Zone "ON".	PID Selection (ZON) pa	rameter to input range	e (RH) Setpo	int	Zone 3: Operated with 3rd group of
	[2] Define a refe When using	erence point. two zones, define only re	eference point 1 (2.RF	point 2		Zone 2:
-	(1.KP) betwee the PV input When using	t range. three zones, define refere	Reference (1.RF	point 1	PV input value	PID constants Zone 1:

Note: Set the maximum and minimum values, as close as possible to those of the actual range to be controlled, in the Maximum Value of PV Input Range (RH) and Minimum Value of PV Input Range (RL) parameters. Otherwise, the controller may fail to determine the optimum values when autotuning is carried out.

input range (RL)

2 (1.RP and 2.RP) in the same way as noted above. Minimum value of PV

#### Setup Parameters

> Operated with 1st group of

-- J PID constants

#### • Control Function-related Parameters

Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
SPH (SPH)	Target setpoint limiter upper limit	0.0 to 100.0% of PV input range where, SPL < SPH Places a limit on the range within which the target setpoint is changed.	100.0% of PV input range		_
SPL (SPL)	Target setpoint limiter lower limit		0.0% of PV input range		_
	Alarm-1 type	OFF, 1 to 25, 28 to 31 1: PV high limit (energized, no stand-by action) 2: PV low limit (energized, no stand-by action)	1		
<b>AL2</b>	Alarm-2 type	3: Deviation high limit (energized, no stand-by action) 4: Deviation low limit (energized, no stand-by action) 5: Deviation high limit (de-energized, no stand-by action) 6: Deviation low limit (de-energized no stand-ty action)	2		Ref.3.3(4)
	Alarm-3 type	These Alarm Type parameters are common to the parameters 1.SP to 4.SP. See "List of Alarm Types" on the back for other alarm types.	1		
<b>HY</b> 1)	Alarm-1 hysteresis	0.0 to 100.0% of PV input range span Output alarm: 0.0 to 100.0% Hysteresis for PV high limit alarm Point of	0.5% of PV input range span Output alarm:		
<b>HY2</b> (HY2)	Alarm-2 hysteresis	Output on-off action (Alarm setpoint) On	0.5%		Ref.3.3(2)
<b>HY3</b>	Alarm-3 hysteresis	Off			
<b>ď<u></u> '' (DY1)</b>	Alarm-1 delay timer	An alarm is output when the delay timer expires after the alarm setpoint is reached. 0.00 to 99.59 (min, sec.) (enabled when alarm-1 type "AL1" is 1 to 20 or 28 to 31) Alarm setpoint Alarm output	0.00		_
	Alarm-2 delay timer Alarm-3 delay timer	0.00 to 99.59 (min, sec.) (enabled when alarm-2 type "AL2" is 1 to 20 or 28 to 31) 0.00 to 99.59 (min, sec.) (enabled when alarm-3 type			
	Control output cycle time	"AL3" is 1 to 20 or 28 to 31)	30 second		
	Heating-side control output cycle time (in heating/cooling control)				Ref.3.3(4)
	output cycle time		SU SECOLIO		_
	Preset output/Heating-side preset output (in heating/cooling control)	-5.0 to 105.0% In heating/cooling control: Heating side 0.0 to 105.0% In Stop mode, fixed control output can be generated.	0.0%		Ref.2.1(8)
Poc	output	In Stop mode, cooling-side fixed control output can be generated.	0.0%		
	PID control mode	U: Standard PID control (with output bump at SP change) 1: Fixed point control (without output bump at SP change) Choose "fixed point control" when controlling pressure or flow rate.	0		Ref.2.1(2)
	Zone PID selection	OFF: SP selection ON: Zone PID	ON		Ref.4.1(2)
<b>Ar</b>	Anti-reset windup (Excess integration prevention)	AUTO (0), 50.0 to 200.0% Used when the control output travels up to 100% or down to 0% and stays at this point. The larger SP, the sconer PID computation (integral computation) stops.	AUTO		Ref.2.1(4)
L	Ramp-rate time unit	0: hour, 1: minute Time unit of setpoint ramp-up (UPR) and setpoint	0		Ref.4.1(4)
	setting	ramp-down (DNR)			
P.SL (P.SL)	Protocol selection	ramp-down (DNR)  0: PC link communication  1: PC link communication (with sum check)  2: Ladder communication  3: Coordinated master station  7: MODBUS (ASCII)  8: MODBUS (RTU)  10: Coordinated slave station (loop-1 mode)  11: Coordinated slave station (loop-2 mode)	0		
(TMU) P.S.L (P.S.L)	setting Protocol selection Baud rate	ramp-down (DNR)  0: PC link communication  1: PC link communication (with sum check)  2: Ladder communication  3: Coordinated master station  7: MODBUS (ASCII)  4: Coordinated slave station (loop-1 mode)  11: Coordinated slave station (loop-2 mode)  0: 600, 1: 1200, 2: 2400, 3: 4800, 4: 9600 (bps)	4		
(TMU) P.SL (P.SL) (P.SL) (BPS) (BPS) (PRI)	setting Protocol selection Baud rate Parity	ramp-down (DNR)  0: PC link communication  1: PC link communication (with sum check)  2: Ladder communication  3: Coordinated master station  7: MODBUS (ASCII)  10: Coordinated slave station (loop-1 mode)  11: Coordinated slave station (loop-2 mode)  0: 600, 1: 1200, 2: 2400, 3: 4800, 4: 9600 (bps)  0: None  1: Even  2: Odd	0 4 1		communi- cation
(TMU) P.SL (P.SL) (P.SL) (P.SL) (PRI) SLP (STP)	setting Protocol selection Baud rate Parity Stop bit	ramp-down (DNR)  0: PC link communication 1: PC link communication (with sum check) 2: Ladder communication 3: Coordinated master station 4: Coordinated slave station 7: MODBUS (ASCII) 10: Coordinated slave station (loop-1 mode) 11: Coordinated slave station (loop-2 mode) 0: 600, 1: 1200, 2: 2400, 3: 4800, 4: 9600 (bps)  0: None 1: Even 2: Odd 1, 2	0 4 1 1		communi- cation function
(TMU) P.SL (P.SL) (P.SL) BPS (BPS) BPS (BPS) (BPS) (BPS) BC (PRI) SLP (STP) GLN	setting Protocol selection Baud rate Parity Stop bit Data length	ramp-down (DNR)  0: PC link communication 1: PC link communication (with sum check) 2: Ladder communication 3: Coordinated master station 4: Coordinated slave station 7: MODBUS (ASCII) 8: MODBUS (RTU) 10: Coordinated slave station (loop-1 mode) 11: Coordinated slave station (loop-2 mode) 0: 600, 1: 1200, 2: 2400, 3: 4800, 4: 9600 (bps)  0: None 1: Even 2: Odd 1, 2  7, 8: Fixed at 7, when the P.SL parameter is set to MODBUS (ASCII). Fixed at 8, when the P.SL parameter is set to MODBUS (ASCII). Fixed at 8, when the P.SL parameter is set to MODBUS (ASCII). Fixed at 8, when the P.SL parameter is set to MODBUS (RTU) or Ladder Communication.	0 4 1 8		communi- cation function
(TMU) P.SL (P.SL) (	setting Protocol selection Baud rate Parity Stop bit Data length Address	ramp-down (DNR)  0: PC link communication  1: PC link communication (with sum check)  2: Ladder communication  3: Coordinated master station  4: Coordinated slave station  7: MODBUS (ASCII)  8: MODBUS (RTU)  10: Coordinated slave station (loop-1 mode)  11: Coordinated slave station (loop-2 mode)  0: 600, 1: 1200, 2: 2400, 3: 4800, 4: 9600 (bps)  0: None  1: Even  2: Odd  1, 2  7, 8: Fixed at 7, when the P.SL parameter is set to MODBUS (ASCII). Fixed at 8, when the P.SL parameter is set to MO	0 4 1 1 8 1		communi- cation function

<ul> <li>Input-/Output-related</li> </ul>	Parameters
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Parameter Symbol	Name of Parameter	Setting Range and Description	Initial Value	User Setting	Target Item in CD-ROM
i n	PV input type (PV INPUT terminals) ① - ① - ① to?terminals	OFF, 1 to 18, 30, 31, 35 to 37, 40, 41, 50, 51, 55, 56 See Instrument Input Range Codes in <i>Initial Settings</i> User's Manual.	OFF		_
	PV input unit	°C: degree Celsius °F: Fahrenheit (This parameter is not shown for voltage input.)	°C		_
r H (RH)	Max. value of PV input range	Set the PV input range, however RL < RH -Temperature input Set the range of temperature that is actually controlled.	Max. value of instrument input range		_
rl <sub>(RL)</sub>	Min. value of PV input range	<ul> <li>Voltage input</li> <li>Set the range of a voltage signal that is applied.</li> <li>The scale across which the voltage signal is actually controlled should be set using the parameters Maximum Value of PV Input</li> <li>Scale (SH) and Minimum Value of PV Input Scale (SL).</li> </ul>	Min. value of instrument input range		_
SdP (SDP)	PV input decimal point position (displayed at voltage input)	0 to 3 Set the position of the decimal point of voltage-mode PV input. 0: No decimal place 1: One decimal place 2, 3: Two, three decimal places	1		_
<b>5</b> <i>H</i> <sub>(SH)</sub>	Max. value of PV input scale (displayed at voltage input)	-1999 to 9999, however SL < SH Set the read-out scale of voltage-mode PV input.	100.0		_
<b>5</b> <i>L</i> <sub>(SL)</sub>	Min. value of PV input scale (displayed at voltage input)		0.0		_
	Presence/absence of PV input reference junction compensation	OFF, ON	ON		_
<b>bS</b> L	Selection of PV input burnout action	OFF 1: Up scale 2: Down scale	1		_
<b>ос</b> (от)	Control output type	0         Time proportional PID relay contact output (terminals①-②-③)           1         Time proportional PID voltage pulse output (terminals⑥-⑦)           2         Current output (terminals⑥-⑦)           3         ON/OFF control relay contact output (terminals①-②-③)	0		_

Continued				
<b>ос</b> (от)	Control output type	The following 4 to 12 are displayed only for heating/ cooling type controllers.         4       Heating-side relay output (terminals ①- ② - ③), cooling-side relay output (terminals ④ - ⑦)         5       Heating-side pulse output (terminals ⑥ - ⑦), cooling-side relay output (terminals ⑥ - ⑦), cooling-side relay output (terminals ④ - ⑦)	Heating/cooling type: 4	
		<ul> <li>6 Heating-side current output (terminals (g)- (7)), cooling-side relay output (terminals ④ - (7))</li> <li>7 Heating-side relay output (terminals ① - ② - ③), cooling-side pulse output (terminals (④ - ⑤)</li> </ul>		
		<ul> <li>8 Heating-side pulse output (terminals (6)-(7)), cooling-side pulse output (terminals (3)-(5))</li> <li>9 Heating-side current output (terminals (6)-(7)), cooling-side pulse output (terminals (4)-(5))</li> <li>10 Heating-side pulse output (terminals (4)-(5))</li> </ul>		
		10       Heating-side relay output (terminals (1)-(2)-(3)), cooling-side current output (terminals (3)-(5))         11       Heating-side pulse output (terminals (3)-(5)), cooling-side current output (terminals (3)-(5)), cooling-side current output (terminals (3)-(5))         10       Heating-side pulse output (terminals (3)-(3)), cooling-side current output (terminals (3)-(3)-(3)), cooling-side current output (te		
_		12       Heating-side current output (terminals (b) - (f)),         cooling-side current output (terminals (b) - (c)),		
r <b>EL</b> (RET)	Retransmission output type	OFF: Does not work. 1: PV, 2: SP, 3: OUT, 4: Loop power supply for sensor (15 V) In position proportional control, a valve opening signal (0 to 100%) is transmitted if setpoint "3" is selected. In heating/cooling control, an output value before allocation to heating and cooling control (0 to 10%) is transmitted if setpoint "3" is selected (0 to 50%: Cooling-side output; 50 to 100%: Heating-side output).	1	Ref.2.2(1
<b>г<u>Е</u>Н</b> <sub>(RTH)</sub>	Max. value of retransmission output scale	RET=1, 2: RTL + 1 digit to 100.0% of PV input range RET=3: RTL + 1 digit to 100.0%	100.0% of PV input range	
r <b>ĽĽ</b>	Min. value of retransmission output scale	RET=1, 2: 0.0% of PV input range to RTH - 1 digit RET=3: 0.0% to RTH - 1 digit	0.0% of PV input range	
di S	DI function selection	OFF         Disables the external contact input.           1         D11: 2.SP (on)/1.SP (off), D12: AUTO (on)/MAN (off)           2         D11: Hides (on)/shows (off) the LOCK setup parameter. D12: Unused.           3         See the table below.	1	Ref.3.1(1)
		4 DI1: 2.SP (on)/1.SP (off), DI2: STOP (on)/RUN (off)		

 $\bigcirc$  SP Selection when DIS = 3 is set DI1 DI2 1 SP OFF OFF

	011	0.1
2.SP	ON	OFF
3.SP	OFF	ON
4.SP	ON	ON

(C.S1) (C.S2) (C.S2) (C.S3)	SELECT display-1 registration SELECT display-2 registration SELECT display-3 registration	OFF, 201 to 1015 Select the desired parameter from among the operating and setup parameters, then register the number (D register No.) accompanying that parameter. For example, registering "231" for C.S1 allows you to change alarm-1 setpoint in operating display. Numbers for registering alarm SP parameter for operating display: Alarm-1 setpoint: 231 Alarm-2 setpoint: 232 Alarm-3 setpoint: 233	OFF	Ref.6.1(1)
<b>[.54</b> (C.S4)	SELECT display-4 registration	See User's Manual (Reference) (CD-ROM).		
<b>Ι <u>ο</u>ΓΥ΄</b>	Key lock	<ul> <li>OFF: No key lock</li> <li>1: Change to any parameter prohibited Prohibits any operating parameter or setup parameter from being changed.</li> <li>The setpoint of the LOCK parameter itself can be changed, however.</li> <li>2: Change to and display of operating parameters, prohibited Turns off the display for setting operating parameters, thus prohibiting any change to the parameter settings.</li> <li>(Hold down the SET/ENT key for more than 3 seconds to show the password check display.)</li> <li>3: Disables the A/M key on the instrument's front panel.</li> </ul>	OFF	Ref.7.1(2)
Pud (PWD)	Password setting	0: Password not set 1 to 9999	0	Ref.7.1(1)

#### Useful Operating Displays (SELECT Display)

Registering frequently changed parameters in the SELECT display after ordinary operating displays will allow you to change settings easily. A maximum of four displays can be registered. Useful operating display (SELECT display)

Setting method:

(Reference) (CD-ROM version).





Heating/Cooling Control (for a Heating/Cooling Controller Only)

In heating/cooling control, the controller outputs the result of computation after splitting it into heating-purpose and cooling-purpose signals. In addition, the controller can perform PID control or on-off control on the heating and cooling sides separately. When performing on-off control, set the proportional band to "0".

- The controller splits the result of computation (0 to 100%) into heating-side and cooling-side signals, as described below.
- 0% to 50% of the computation result is presented as a 0% to 100% cooling-side
- 50% to 100% of the computation result is presented as a 0% to 100% heating-side output.

Heating/cooling control provides two methods in which either none of the heating- and or both of the h outputs are p presented, as shown in the following figures.





Keep the ratio of the heating-side proportional band (P) to the cooling-side proportional band (Pc) equal to or below 5.
If neither the heating side nor the cooling side is performing on-off control, setting the integral time (I or Ic) of one side to "0" results in the Integral Time parameters of both sides being set to "OFF", ia pia-

irrespective of the integral time setting of the other side.

#### Cycle Time

A cycle time can only be set if the type of control output is time proportional PID relay output or time proportional voltage pulse output.

A cycle time refers to one period consisting of on- and off-state time lengths. The ratio of the on-state time to the off-state time differs according to the value of the control output. The figure on the right shows on-to-off time ratios of the control output when the cycle time is set to 10 seconds. Setting a shorter cycle time allows the controller to perform elaborate control at short time intervals. This significantly reduces the on- and off-state times, however it shortens the service life of a relay.

0 Ο PID computation Manual MV output 0% to 100% 🗲 Heating/cooling computation 0% to 50% \_\_\_\_\_50% to 100% Cooling-side output limiter Heating-side output limiter Cooling-side MV Heating-side MV output 0% to 100% output 0% to 100%

munication

Relay's Behavior when Cycle Time = 10 sec For 50% of Control Output

Cvcle time



Cycle time

IM 05D01D02-03E (2)