

PUMA/B is a control module, which forms the core of PUM series. Each control module, 30mm wide, is equipped with PID control function for maximum 4 channels, 8 points of CT input/output, and high-speed RS-485 port. By connecting with PUM event input/output modules, it realizes a compact and high-performance system.



FEATURES

I. High-level control functions for various applications

1. Process value input, control output:
max. 4 points (4 channels independent control)
(Process value input: Insulation between channel,
All input/output and power supply: Insulation)
2. CT input: max. 8 points
One unit can detect three phase heater break for 4 channels
3. High-speed sampling: 200ms
4. Input measurement accuracy: $\pm 0.3\%$ FS
5. Types of control output can be selected by 2 channels
(Relay contact/SSR drive/current linear output)
6. Analog re-transmission output function can be assigned to current output
7. ON/OFF control, PID control Fuzzy PID control, and Heat/Cool control

II. User-friendly structure and functions

1. Lateral connection : Max.16 units (64 channels) + event input/output module 16 units = total 32 units
Simple wiring for power supply and communication
2. Detachable structure: Terminal block, main unit, and the base part
→ Easy wiring with detachable terminal block
→ Main units exchangeable without re-wiring
3. Status LED for each control channel
→ Easy to detect error channel
4. Smart loader communication: Connect one module and all connected modules are able to communicate using a loader software.

III. Large scale system using high speed RS-485

1. Modbus RTU protocol for large volume communication
2. High-speed communication: Maximum 115.2kbps
3. Highly-efficient communication: Parameters dispersed on the address map are re-allocated to contiguous address

IV. Various functions to realize high-performance system

1. Alarm function (output from event I/O module)
2. Power distribution function (with event I/O module):
Power ratio can be set to multiple point output by input/control calculation value of one channel
3. Operation mode control by digital input (with event I/O module): Run/Standby, etc.
4. Remote operation using input, and re-transmission output using output of connected analog input/output module (other stations)

SYSTEM SPECIFICATION

1. **Product type:** Multi-loop module type temperature controller
2. **Module type**
 - 1) Analog module: Total maximum 16 units
 - a) Control module (4 loop/unit)
 - b) Extended input/output (analog) module
- Analog input/output module
(Input/output 4 points/unit)
- Analog input module (Input 4 points/unit)
- Analog output module (output 4 points/unit)
 - 2) Extended input/output (digital) module:
Maximum 16 units
- Event input/output module
(Input/output ; 8 points/unit)
 - 3) Enhanced communication module: 1 unit
3. **Connecting method:**
Lateral connecting with connectors
- For power supply and RS-485 communication, any one of connected modules is required to be connected.
4. **No. of loop, input/output**
 - 1) Control loop: Max. 64
 - 2) No.of input/output: DI 128 points / DO 128 points

CONTROL MODULE SPECIFICATION

1. General specification

- (1) **Power supply:** 24V DC $\pm 10\%$
- (2) **Power consumption:** Max. 3.2 W (135 mA)
[when 24V DC is applied]
- (3) **Insulation resistance:** 20M Ω or more (500V DC)
- (4) **Withstand voltage:**

Power supply \leftrightarrow all terminals	1000V AC 1 min.
Relay contact \leftrightarrow all terminals	1500V AC 1 min.
Others	500V AC 1 min.
- (5) **Applied standards:**
UL, C-UL, CE marking, RoHS directive
[Pending for UL, C-UL marking]

2. Input

2.1 Process value input

- (1) **No. of input:** 2 or 4 points (1 point/channel)
- (2) **Input setting:** Input code selection
- (3) **Input signal:** See table 1
Select from group I or II depending on the model code.
(setting can be done by channel within group)
[Group I] a) Thermocouple
b) Resistance bulb (3 wire)
[Group II] c) DC voltage, current
- (4) **Measurement range and input type:** See table 1
- (5) **Measurement accuracy (Ta = 23°C)**
a) Thermocouple: $\pm 0.3\%FS \pm 1\text{digit} \pm 1^\circ C$
or $\pm 3^\circ C$ whichever is greater
*Unless;
B thermocouple 0 to 500°C: $\pm 5\%FS \pm 1\text{digit} \pm 1^\circ C$
R thermocouple 0 to 500°C: $\pm 1\%FS \pm 1\text{digit} \pm 1^\circ C$
T thermocouple -200 to 0°C: $\pm 0.5\%FS \pm 1\text{digit} \pm 1^\circ C$
b) Resistance bulb input: $\pm 0.3\%FS \pm 1\text{digit}$ or $\pm 1^\circ C$
whichever is greater
c) Voltage / Current input: $\pm 0.3\%FS \pm 1\text{digit}$
- (6) **Resolution:** See table 1
- (7) **Temperature fluctuation:** $\pm 0.3\%FS/10^\circ C$
- (8) **Input sampling cycle:** 200ms
- (9) **Input impedance**
Thermocouple: 1M Ω or more
Current input: 250 Ω
Voltage input: approx. 1M Ω
- (10) **Influence of signal source resistance**
Thermocouple: $\pm 0.3\%FS \pm 1\text{digit} / 100\Omega$
Voltage input: $\pm 0.3\%FS \pm 1\text{digit} / 500\Omega$
- (11) **Allowable wiring resistance**
Resistance bulb: 10 Ω or less (per wire)
- (12) **Allowable input voltage**
DC voltage input: within $\pm 15V$
Current input: within $\pm 25mA$
Thermocouple/resistance bulb: within $\pm 5V$
- (13) **Noise rejection ratio**
Normal mode: 30dB or more (50/60Hz)
Common mode: 120dB or more (50/60Hz)
between process value input and earth, power supply, output 220V AC, 50/60Hz
- (14) **Input compensation**
a) User adjustment: zero point, span point $\pm 50\%FS$
b) PV shift: $\pm 10\%FS$
c) First order lag filter: 0.0 to 120.0 sec.
- (15) **Overrange, underrange:**
Out of range of -5 to 105%FS
(Accuracy cannot be ensured for -5 to 0, 100 to 105%FS)
- (16) **Insulation:** Functional insulation between channels, and with any other input/output

2.2 Heater break detector (CT) input

- (1) **No. of input:** 4 or 8 points (2 points/loop)
- (2) **Input type:** Single-phase type CT /point
1 to 30A: CTL-6-S-H
20 to 50A: CTL-12-S36-8
- (3) **Current detection accuracy:**
Input value $\pm 10\%$ or $\pm 2A$, whichever is greater
- (4) **Time required for detection**
- ON detection: 800ms or more
- OFF detection: 2 sec. or more

(5) Connection method:

Connector for heater break detector
[on the front of module]

- (6) **Insulation:** No insulation between channels
No insulation with communication port (RS-485, loader)
Functional insulation with any other input/output

3. Output

3.1 Control output

- (1) **No. of output:** 2 points (1 point/loop) or 4 points (2 points/loop)
- (2) **Control output behaviour:**
Heat (reverse action) or cool (direct action), or heat/cool (control output 2 points/loop required)
- (3) **Output type:** Selected from a) to d) (by 2 channels)
- a) Relay contact output
- Proportional cycle: 1 to 150 sec.
- Contact structure: SPST contact
- Contact capacity: 220V AC/30V DC, 3A (resistance load) 220V AC/30V DC, 1A (inductive load)
- Min. switching current: 100mA (24V DC)
- Mechanical life: 20,000,000 switching or more (100/min.)
- Electric life: 100,000 switching or more (rated load)
- Insulation: Basic insulation with any other input/output
- b) SSR/SSC drive output
- Proportional cycle: 1 to 150 sec.
- Minimum resolution: 5ms
- ON voltage: 10V DC (8 to 12V DC)
- OFF voltage: 0.5V DC or less
- Max. current: 20mA DC (per point)
- Load resistance: 500 Ω or more
- Insulation: No insulation with any other output (excluding relay output)
Functional insulation with others than those above
- c) Current output (4 to 20mA DC, 0 to 20mA DC)
- Actual output range: 0mA to 20.6mA DC
- Accuracy: $\pm 0.3\%FS$
(less than 1mA : $\pm 5\%FS$)
- Linearity: $\pm 0.3\%FS$
(less than 1mA : $\pm 5\%FS$)
- Resolution: 5,000 or more
- Ripple current: P-P 0.3mA or less
- Load resistance: 300 Ω or less
- Insulation: No insulation with any other output (excluding relay output)
Functional insulation with others than those above
- (4) **Optional functions:**
Output limit, Soft start, power distribution, Output shutdown, output scaling (for current output only)

3.2 Analog re-transmission output

- (1) **No. of output:** 2 points (OUT3, OUT4 applied)
- (2) **Output type:** Current output (4 to 20mA DC, 0 to 20mA DC)
- (3) **Option:** Output scaling

4. Communication function

4.1 RS-485 interface

- (1) **Communication standards:** RS-485 compatible
- (2) **No. of port:** 1 port
- (3) **Communication, synchro method:**
Two-wire, half-duplex, asynchronous cycle
- (4) **Communication speed:** 9.6k, 19.2k, 38.4k, 115.2kbps
- (5) **Communication distance:** 1km (38.4kbps or less),
250m (115.2kbps)
- (6) **Recommended cable:** KPEV-SB 0.5sq-equivalent
- (7) **No. of connectable units:**
33 units (master and slave)
(32 units if any modules other than PUM series are included in slaves.)
- (8) **Data format:** Data bit; 8, parity; even / odd / none
- (9) **Protocol:** Modbus RTU compatible
- (10) **Insulation:** No insulation with loader communication port, CT input
Functional insulation with any other input/output

4.2 Loader communication (RS-232C) interface

- (1) **Communication standards:** RS-232C compatible
- (2) **No. of port:** 1 port
- (3) **Communication, synchro method:**
Half-duplex, asynchronous cycle
- (4) **Communication speed:** 19.2kbps (fixed)
- (5) **Data format:** Data bit 8, no parity
- (6) **Protocol:** Modbus RTU compatible
- (7) **Connection method:**
2.5 diameter mini-plug/jack
[on the front of the module]
(Common cable with PXG, PXH)
- (8) **Insulation:** No insulation with RS-485, CT input
Functional insulation with any other input/output

5. Control functions

5.1 Control methods

- (1) **PID control (including FUZZY PID control)**
 - PID constant: Set by auto tuning
- (2) **PID 2 (Heat/cool) control (including FUZZY PID control)**
 - PID constant: Set by auto tuning

5.2 Control parameter

- Proportional band (P):
0.0 to 999.9%, P=0: 2 position control ON
- Integration time (I):
0 sec to 3200 sec. I=0: Integration OFF
- Derivation time (D):
0.0 to 999.9 sec. D=0: Derivation OFF
- Control cycle: 200ms

5.3 Control mode

- (1) **Mode type:** Auto / Manual / Remote
- (2) **Mode switching:**
Auto ↔ Manual: balanceless / bumpless transfer
Auto/Manual ↔ Remote: balance/bumpless transfer
Auto/Manual ↔ Remote: balance/bumpless transfer

5.4 Digital input function

(1) Operation control by digital input:

Run/Standby switch, Auto/Manual switch, Local/Remote switch, Start auto tuning, Ramp SV ON/OFF, Ramp SV HOLD, DO latch release, Start timer, Output shut-down

(2) Input method: Input using event input/output module

6. Alarm function

6.1 Alarm function

- (1) **No. of alarm set-points:** 5 points / control channel
- (2) **Alarm type:** PV value(Lower/upper limit, absolute/deviation value, range)
Loop burnout alarm, Error alarm, etc.
(Non-excitation, delay, latch, timer function also available)
- (3) **Alarm output:** Data output via communication or output from event input / output module

6.2 Heater break alarm

- (1) **No. of alarm set-points:**
4 or 8 points (2 points/control channel)
- (2) **Alarm type:** Detect when output ON (break detection)
Detect when output OFF (leakage current detection)
(setting can be done separately by point)
- (3) **Heater current alarm**
Detectable current range: 2A to 50A
Detected current resolution: 0.1A
Setting resolution: 0.1A
Operation dead band: 0.0 to 50.0A
- (4) **Alarm output:** Data output via communication or output from event input/output module

7 Display configuration

7.1 Display

- (1) **Display:** Status display LED
(2 colors × 6 points)
- (2) **Display contents:**
RUN/FAULT, RS-485 TX/RX, OUT/ERR by loop (4 loops) (Functions are assigned to LED of each channel)

7.2 Setting device

- (1) **Setting device:** Rotary SW × 1
- (2) **Set contents:** RS-485 Station No.
(Station No.= setting value + 1)

8. Power outage

- (1) **Impact of power outage:**
Outage of 2ms or less ; no impact
- (2) **Operation after power outage:**
Start from the first step (cold start)
- (3) **Memory backup:**
Nonvolatile memory (EEPROM)
No. of update ; 100,000

9. Self diagnosis

Diagnosis method:

Program error monitoring by watch dog timer

10. Structure**(1) Installation method:**

DIN rail mounting or mounting with M3 screws inside a cabinet

(2) Dimensions: 30 (W) × 100 (H) × 85 (D) mm
(excluding terminal cover and projected part)

(3) Weight: Approx. 200 g

(4) Extrenal terminal

- Process value input/control output:
Detachable terminal block
(M3 screw × 20 terminals)
- Power supply connection:
Terminal block on the base part
(M3 screw × 2 terminals)
Power is supplied via side connectors in case of lateral connecting. (Max. 33 units)
- RS-485 communication connection:
Terminal block on the base part
(M3 screw × 3 terminals)
RS-485 communication is connected via side connectors in case of lateral connecting.
- CT input: Special connectors (8 pin × 2 pcs.)
[on the front of the module]
- Loader communication port:
2.5 diameter mini-plug/jack
[on the front of the module]

(5) Case material: Polyphenylene oxide
(flame retardant grade : UL94V-0 equivalent)

(6) Case color: Case ; red
Terminal, base part ; black

(7) Protection

- Body: IP20 grade protection
(ventilation slits on the top and the bottom of the body)
- Terminal: IP00 grade protection, terminal cover is available as an option

11. Normal operating condition

(1) Ambient temperature*: -10 to 50°C

* "Ambient temperature" is the temperature underneath the controller inside the equipment or the cabinet where the controller is installed.

(2) Ambient humidity:
90% RH or less (non condensing)

(3) Vibration: 10 to 70Hz, 9.8m/s² (1G) or less

(4) Warmup time: 30 min. or more

12. Transporting, storage condition (packing condition)

(1) Storage temperature: -20 to 60°C

(2) Ambient humidity: 90%RH or less (no condensing)

(3) Vibration: 10 to 70Hz, 9.8m/s² (1G) or less

(4) Shock: 294m/s² (30G) or less

13. Packing list

Temperature controller: 1unit
Instruction manual: 1 copy
250Ω resistance: 0 or 2 or 4 pcs.
(For no. points of voltage/current input selected)

14. Loader software**(1) Distribution medium:**

Free download from Fuji Electric Systems HP (<http://www.fic-net.jp/eng/index.html>)

(2) Recommended operating environment

PC: DOS/V (PC-AT compatible)
OS: Windows XP (operation confirmed in Japanese / English)
RAM: 256M bytes or more
Free space on the hardware: 500M bytes or more
Display resolution: 1024 × 768 or over
Serial interface: RS-232C 1 port
(without RS-232C, USB serial converter cable required)

(3) Connection with PUM

Via loader interface on the front face of the module (special cable available from Fuji is required) or via RS-485

CODE SYMBOLS

[Control module (4 channels)]

Digit	Description	1	2	3	4	5	6	7	8	9	10	11	12	13
4	< Module type > 4ch control module	P	U	M					1	-	0		0	0
5	< Input type > Thermocouple / resistance bulb [all channels] Voltage / current [all channels] Thermocouple / resistance bulb [ch 1, 2], voltage / current [ch3, 4]				A									
6	< OUT1, 2 output type > Relay output SSR drive output Current output						T	A						
7	< OUT3, 4 output type > Relay output SSR drive output Current output							A	C	E				
10	< Operation Manual > Japanese English											A	B	
11	< Option 1 > Not fitted CT input (8 points)												Y	C

[Control module (2 channels)]

Digit	Description	1	2	3	4	5	6	7	8	9	10	11	12	13
4	< Module type > 2ch control module	P	U	M					1	-	0		0	0
5	< Input type > Thermocouple / resistance bulb [all channels] Voltage / current [all channels]				B									
6	< OUT1, 2 output type > Relay output SSR drive output Current output						T	A						
7	< OUT3, 4 output type > Not fitted Relay output SSR drive output Current output													
10	< Operation Manual > Japanese English											A	B	
11	< Option 1 > Not fitted CT input (4 points)												Y	C

[Accessories]

Digit	Description	1	2	3	4	5	6	7	8
6	RS-485 terminating resistance	P	U	M	Z	*			
7	DIN rail mounting end plate						A	0	1
8	Side connecting terminal cover (right & left 1 set)						A	0	2
	Front face screw terminal cover						A	0	3
	Loader connecting cable (RS-232C)						A	0	4
	CT input terminal cable (for 4 points) [l=1m]						L	0	1
	CT input terminal cable (for 4 points) [l=3m]						C	0	1
	CT input terminal cable (for 4 points) [l=5m]						C	0	3
	CT for 1 to 30A (CTL6-S-H)						C	0	5
	CT for 2 to 50A (CTL12-S36-8)						C	T	1
							C	T	2

[Table 1] Input type and standard nput range

Input type	Input code	Measurement range		Min. measurement unit		
		[°C]	[°F]	[°C]	[°F]	
Resistance bulb (IEC)	Pt100Ω	2	0 to 150	32 to 302	0.1	0.1
		3	-150 to 300	-238 to 572	0.1	0.1
		4	-150 to 850	-238 to 1562	0.1	1
Thermocouple	J	5	0 to 400	32 to 752	0.1	0.1
		6	0 to 800	32 to 1472	0.1	1
	K	7	0 to 400	32 to 752	0.1	0.1
		8	0 to 800	32 to 1472	0.1	1
		9	0 to 1200	32 to 2192	1	1
	R	10	0 to 1600	32 to 2912	1	1
	B	11	0 to 1800	32 to 3272	1	1
	S	12	0 to 1600	32 to 2912	1	1
	T	13	-199 to 400	-326 to 752	0.1	1
	E	14	-199 to 800	-326 to 1472	0.1	1
	N	18	0 to 1300	32 to 2372	1	1
PL-II	19	0 to 1300	32 to 2372	1	1	
DC voltage *	DC0-5V	21	-1999 to 9999 (scaling range)		-	-
	DC1-5V	22				
	DC0-10V	23				
	DC2-10V	24				

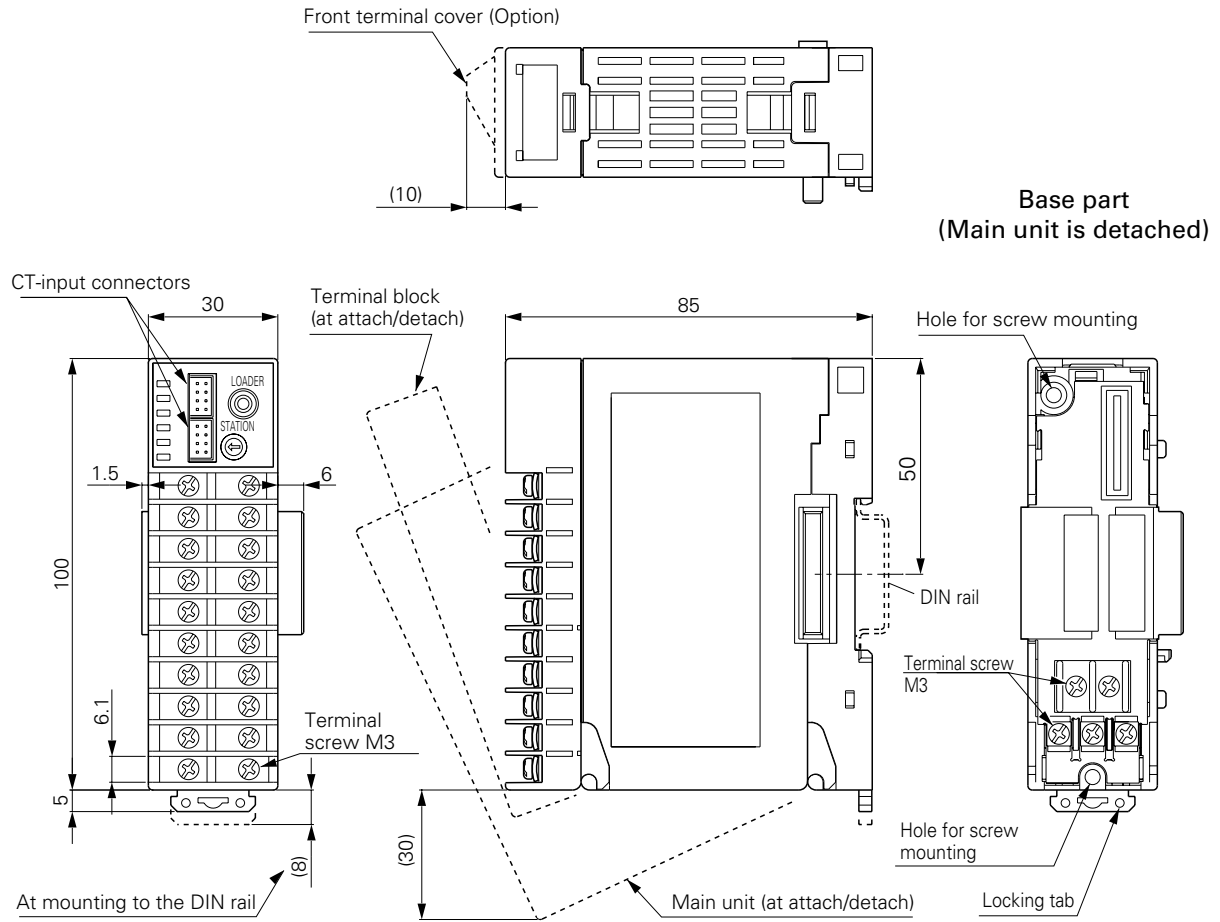
* In case of currenet input, attach I/V unit which comes with the controller to the voltage input terminal.

[Table 2] Insulation block diagram

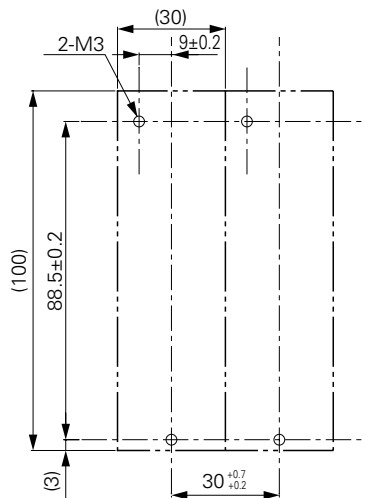
Power	PV1
Loader communication port	PV2
RS-485 communication port	PV3
CT Input (CT1A, B - CT4A,B)	PV4
OUT1 (relay contact output)	OUT1 (SSR drive, current)
OUT2 (relay contact output)	OUT2 (SSR drive, current)
OUT3 (relay contact output)	OUT3 (SSR drive, current)
OUT4 (relay contact output)	OUT4 (SSR drive, current)

- Basic insulation (1500V AC)
- == Functional insulation (1000V AC)
- Functional insulation (500V AC)

OUTLINE DIAGRAM (Unit : mm)

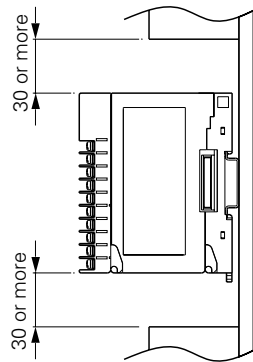


Dimensions for screw mounting



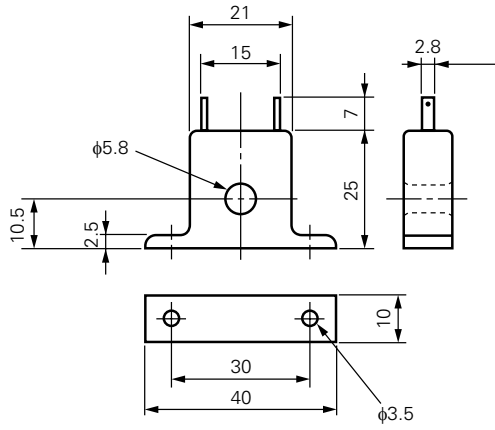
Notice at the installation

Please keep the distance of 30mm from this instrument to radiate.
[50mm is recommended]

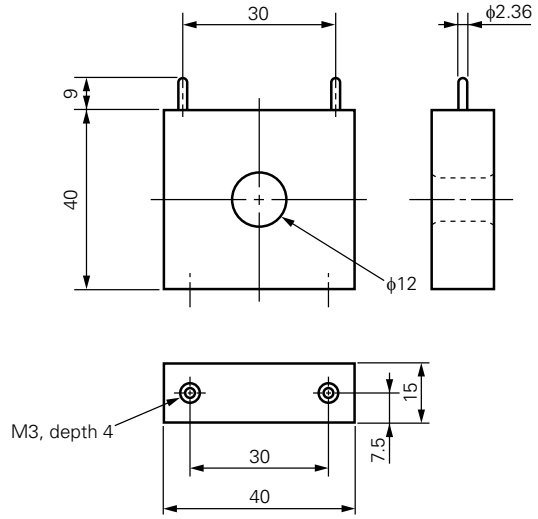


Heater current detector (CT)

Specification : 1 to 30 A
Type : CTL-6-S-H



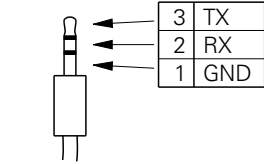
Specification : 20 to 50 A
Type : CTL-12-S36-8



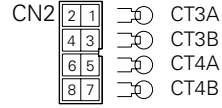
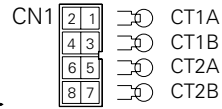
TERMINAL CONNECTION DIAGRAM

CT input connector

Loader interface plug (RS-232C)



φ2.5 3-pole miniature plug



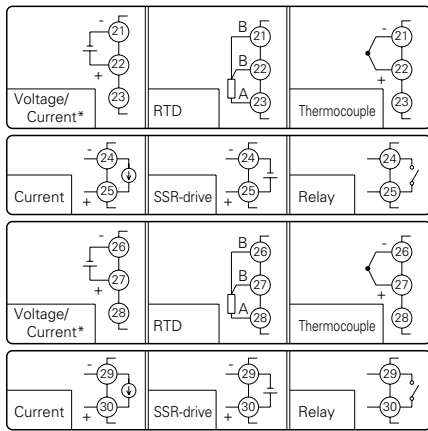
* No. 2, 4, 6 and 8 pins of CN1 and CN2 are connected in the instruments.

* CN2 is not available for model PUMB.

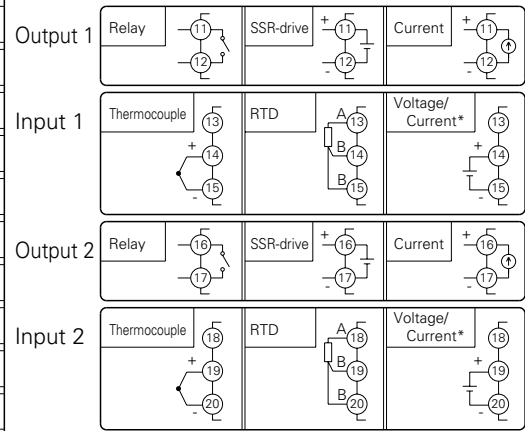
CT input cable connection table

Pin No.	Cable distinction color	
	Cover color	Dot color
1	Yellow	Red
2		Black
3	White	Red
4		Black
5	Light-gray	Red
6		Black
7	Orange	Red
8		Black

* Input 3 and Input 4 are not available for model PUMB.

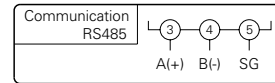
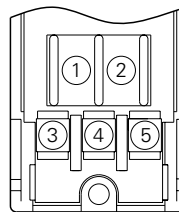


* In case of current input, attach I/V unit which comes with the controller to the voltage input terminal.



* In case of current input, attach I/V unit which comes with the controller to the voltage input terminal.

Base part



Operation parameter

Parameter (name)	Read/write date setting range	Depends on input range	Factory default	Register No.			
				Ch 1	Ch 2	Ch 3	Ch 4
SV value	0 to 100%FS	yes	0	40001	40002	40003	40004
MV value	-3.0 to 103.0%		-	40005	40006	40007	40008
Manual mode switch	0: Auto 1: Manual		0 (Auto)	40013	40014	40015	40016
Run/Standby switch	0: Run 1: Standby		0 (Run)	40017	40018	40019	40020
Remote mode switch	0: Local 1: Remote		0 (Local)	40009	40010	40011	40012
Auto-tuning RUN command	0: Stop/End 1: Normal type 2: Low PV type		0 (End)	41005	42005	43005	44005
Digital output latch release command	0: OFF 1: Release latch		0 (OFF)	41031	42031	43031	44031
ALM1 set value 1	-100 to 100%FS		2.5%FS	41033	42033	43033	44033
ALM1 set value 2	-100 to 100%FS		2.5%FS	41034	42034	43034	44034
ALM2 set value 1	-100 to 100%FS		2.5%FS	41041	42041	43041	44041
ALM2 set value 2	-100 to 100%FS		2.5%FS	41042	42042	43042	44042
ALM3 set value 1	-100 to 100%FS		2.5%FS	41049	42049	43049	44049
ALM3 set value 2	-100 to 100%FS		2.5%FS	41050	42050	43050	44050
ALM4 set value 1	-100 to 100%FS		2.5%FS	41057	42057	43057	44057
ALM4 set value 2	-100 to 100%FS		2.5%FS	41058	42058	43058	44058
ALM5 set value 1	-100 to 100%FS		2.5%FS	41065	42065	43065	44065
ALM5 set value 2	-100 to 100%FS		2.5%FS	41066	42066	43066	44066

Control (PID) parameter

Parameter (name)	Read/write date setting range	Depends on input range	Factory default	Register No.			
				Ch 1	Ch 2	Ch 3	Ch 4
Proportional band [P]	0.0 to 999.9%		5.0	41102	42102	43102	44102
Integration time [I]	0 to 3200sec		240	41103	42103	43103	44103
Derivation time [D]	0.0 to 999.9sec		60.0	41104	42104	43104	44104
ON/OFF control hysteresis	0 to 50%FS	yes	1°C	41105	42105	43105	44105
Cooling proportional band coefficient [cool]	0.0 to 100.0		1.0	41106	42106	43106	44106
Dead band	-50.0 to 50.0%		0.0	41107	42107	43107	44107
Output convergence value	-100.0 to 100.0%		0.0	41108	42108	43108	44108
Anti-reset windup [ARW]	0 to 100%FS	yes	100%FS	41109	42109	43109	44109
Direct/Reverse action setting [MV1/MV2]	0: Reverse/None 1: Direct/None 2: Reverse/Direct 3: Direct/Reverse 4: Reverse/Reverse 5: Direct/Direct		0 (Reverse/None)	41110	42110	43110	44110
SV Lower Limits	0 to 100%FS	yes	0%FS	41218	42218	43218	44218
SV Upper Limits	0 to 100%FS	yes	100%FS	41219	42219	43219	44219
MV1 Lower Limits	-3.0 to 103.0%		-3.0	41255	42255	43255	44255
MV1 Upper Limits	-3.0 to 103.0%		103.0	41256	42256	43256	44256
MV2 Lower Limits	-3.0 to 103.0%		-3.0	41257	42257	43257	44257
MV2 Upper Limits	-3.0 to 103.0%		103.0	41258	42258	43258	44258
Output limiter type setting	0 to 15 [See appendix A]		0	41259	42259	43259	44259

Setup parameter

Parameter (name)	Read/write data setting range	Depends on input range	Factory default	Register No.			
				Ch 1	Ch 2	Ch 3	Ch 4
PV input type	0: Not selectable 1: Not selectable 2: Pt100 (0 to 150°C) 3: Pt100 (-150 to 300°C) 4: Pt100 (-150 to 850°C) 5: J (0 to 400°C) 6: J (0 to 800°C) 7: K (0 to 400°C) 8: K (0 to 800°C) 9: K (0 to 1200°C) 10: R (0 to 1600°C) 11: B (0 to 1800°C) 12: S (0 to 1600°C) 13: T (-199 to 400°C) 14: E (-199 to 800°C) 18: N (0 to 1300°C) 19: PL-2 (0 to 1300°C) 21: Voltage (0 to 5V DC) 22: Voltage (1 to 5V DC) 23: Voltage (0 to 10V DC) 24: Voltage (2 to 10V DC)		7 (TC/Pt input) 22 (Voltage input)	40151	40152	40153	40154
PV input scale lower	-1999 to 9999		0 (TC/Pt input) 0.0 (Voltage input)	41212	42212	43212	44212
PV input scale upper	-1999 to 9999		400 (TC/Pt input) 100.0 (Voltage input)	41213	42213	43213	44213
Decimal place	0: No decimal point 1: One decimal point 2: Two decimal point		0 (TC/Pt input) 1 (Voltage input)	41214	42214	43214	44214
Temperature Unit	0: °C 1: °F		0 (°C)	41215	42215	43215	44215
PV input shift	-10 to 10%FS	yes	0	41216	42216	43216	44216
SV value shift	-50 to 50%FS	yes	0	41217	42217	43217	44217
PV input filter	0.0 to 120.0sec		0	41220	42220	43220	44220
PV display zero adjustment	-50 to 50%FS	yes	0	41221	42221	43221	44221
PV display span adjustment	-50 to 50%FS	yes	0	41222	42222	43222	44222
Cold junction compensation	0: OFF 1: ON		1 (ON)	41223	42223	43223	44223
RSV zero adjustment	-50 to 50%FS	yes	0	41225	42225	43225	44225
RSV span adjustment	-50 to 50%FS	yes	0	41226	42226	43226	44226
RSV input master Station No.	0 to 255		0	41532	42532	43532	44532
RSV input master Ch. No.	1 to 4		(each Ch. No.)	41533	42533	43533	44533
FAULT MV1 set value	-3.0 to 103.0%		-3.0	41260	42260	43260	44260
FAULT MV2 set value	-3.0 to 103.0%		-3.0	41261	42261	43261	44261
Softstart MV1 value	-3.0 to 103.0%		103.0	41262	42262	43262	44262
Softstart MV2 value	-3.0 to 103.0%		103.0	41263	42263	43263	44263
Softstart time	0 to 99hr.59min.		0	41264	42264	43264	44264
Standby MV1 value	-3.0 to 103.0%		-3.0	41268	42268	43268	44268
Standby MV2 value	-3.0 to 103.0%		-3.0	41269	42269	43269	44269
Standby mode setting	0: ALM=OFF 1: ALM=ON		0	41270	42270	43270	44270
Linkage operation master Station No.	0 to 255		0	41536	42536	43536	44536
Linkage operation master Ch. No.	1 to 4		(each Ch. No.)	41537	42537	43537	44537

System parameter

Parameter (name)	Read/write date setting range	Depends on input range	Factory default	Register No.			
				Ch 1	Ch 2	Ch 3	Ch 4
Current output range	4: 0 - 20mA DC 5: 4 - 20mA DC		5 (4-20mA DC)	40166	40167	40168	40169
Output type	0: PV of own station 1: SV of own station 2: DV of own station 3: MV1 of own station 4: MV2 of own station 5: PV of other stations 6: SV of other stations 7: MV of other stations		3 (MV1 of own Station)	40171	40177	40183	40190
Output proportion cycle	1 to 120sec.		2(SSR)/30(Relay)	40176	40182	40188	40194
Output master Station No.	0 to 255		0	40172	40178	40184	40190
Output master Ch. No.	1 to 4		(each Ch. No.)	40173	40179	40185	40191
Output scaling span	-100.0 to 100.0%		100.0	40174	40180	40186	40192
Output scaling base	-100.0 to 100.0%		0.0	40175	40181	40187	40193
Output shutdown	0 to 15 (bit data : 0000 to 1111) bit 0: Output 1 shutdown bit 1: Output 2 shutdown bit 2: Output 3 shutdown bit 3: Output 4 shutdown		0 (bit data 0000)	40201			
DI-1 function select	0: No function 1: Run/Standby switch 2: Auto/Manual switch 3: Local/Remote switch 4, 5: No function 6: Start AT (Normal type) 7: Start AT (Low PV type) 8, 9: No function 10: Ramp SV ON/OFF 11: Ramp SV HOLD 12-16: No function 17: Latch release (all) 18: Latch release (DO1) 19: Latch release (DO2) 20: Latch release (DO3) 21: Latch release (DO4) 22: Latch release (DO5) 23-25: No function 26: Start timer (DO1) 27: Start timer (DO2) 28: Start timer (DO3) 29: Start timer (DO4) 30: Start timer (DO5) 31-48: No function 49: Output 1 shutdown 50: Output 2 shutdown 51: Output 3 shutdown 52: Output 4 shutdown		0	41013	42013	43013	44013
DI-2 function select	0 to 52		0	41014	42014	43014	44014
DI-3 function select	0 to 52		0	41015	42015	43015	44015
DI-4 function select	0 to 52		0	41016	42016	43016	44016
DI-5 function select	0 to 52		0	41017	42017	43017	44017
DI-6 function select	0 to 52		0	41018	42018	43018	44018
DI-7 function select	0 to 52		0	41019	42019	43019	44019
DI-8 function select	0 to 52		0	41020	42020	43020	44020
DI-9 function select	0 to 52		0	41021	42021	43021	44021
DI-10 function select	0 to 52		0	41022	42022	43022	44022
DI-11 function select	0 to 52		0	41023	42023	43023	44023
DI-12 function select	0 to 52		0	41024	42024	43024	44024
DI-13 function select	0 to 52		0	41025	42025	43025	44025
DI-14 function select	0 to 52		0	41026	42026	43026	44026
DI-15 function select	0 to 52		0	41027	42027	43027	44027
DI-16 function select	0 to 52		0	41028	42028	43028	44028
DI master Station No. setting	0 to 255		0	41011	42011	43011	44011
DO1 output event type setting	0 to 102 [See appendix B]		0	41032	42032	43032	44032
DO1 option function setting	0 to 15 (bit data : 0000 to 1111) bit 0: Alarm latch function bit 1: Error input alarm function bit 2: Non-excitation output function bit 3: Hold reset function		0 (bit data 0000)	41036	42036	43036	44036
DO2 output event type setting	0 to 102 [See appendix B]		0	41040	42040	43040	44040
DO2 option function setting	0 to 15 (bit data : 0000 to 1111) bit 0: Alarm latch function bit 1: Error input alarm function bit 2: Non-excitation output function bit 3: Hold reset function		0 (bit data 0000)	41044	42044	43044	44044
DO3 output event type setting	0 to 102 [See appendix B]		0	41048	42048	43048	44048

System parameter

Parameter (name)	Read/write date setting range	Depends on input range	Factory default	Registor No.			
				Ch 1	Ch 2	Ch 3	Ch 4
DO3 option function setting	0 to 15 (bit data : 0000 to 1111) bit 0: Alarm latch function bit 1: Error input alarm function bit 2: Non-excitation output function bit 3: Hold reset function		0 (bit data 0000)	41052	42052	43052	44052
DO4 output event type setting	0 to 102 [See appendix B]		0	41056	42056	43056	44056
DO4 option function setting	0 to 15 (bit data : 0000 to 1111) bit 0: Alarm latch function bit 1: Error input alarm function bit 2: Non-excitation output function bit 3: Hold reset function		0 (bit data 0000)	41060	42060	43060	44060
DO5 output event type setting	0 to 102 [See appendix B]		0	41064	42064	43064	44064
DO5 option function setting	0 to 15 (bit data : 0000 to 1111) bit 0: Alarm latch function bit 1: Error input alarm function bit 2: Non-excitation output function bit 3: Hold reset function		0 (bit data 0000)	41068	42068	43068	44068
Ramp SV ON/OFF	0: OFF 1: ON		0 (OFF)	41299	42299	43299	44299
Ramp SV - decline	0 to 100%FS	yes	0	41300	42300	43300	44300
Ramp SV - incline	0 to 100%FS	yes	0	41301	42301	43301	44301
Ramp SV - slope time units	0: Slope deg/hr. 1: Slope deg/min.		0 (Slope deg/hr.)	41302	42302	43302	44302
Control algorithm	0: PID 1: FUZZY PID 2: PID against open-loop		0 (PID)	41291	42291	43291	44291
ON/OFF hysteresis setting	0: OFF 1: ON		1 (ON)	41292	42292	43292	44292
Mode at startup	0: Auto mode 1: Manual mode 2: Remote mode 3: Standby mode		0 (Auto mode)	41304	42304	43304	44304

Alarm parameter

Parameter (name)	Read/write date setting range	Depends on input range	Factory default	Registor No.			
				Ch 1	Ch 2	Ch 3	Ch 4
ALM1 hysteresis	0 to 50%FS	yes	0.25%FS	41035	42035	43035	44035
ALM1 delay time	0 to 99min.59sec. or 0 to 99hr.59min.		0	41037	42037	43037	44037
ALM1 delay time units	0: sec. 1: min.		0 (sec.)	41038	42038	43038	44038
ALM2 hysteresis	0 to 50%FS	yes	0.25%FS	41043	42043	43043	44043
ALM2 delay time	0 to 99min.59sec. or 0 to 99hr.59min.		0	41045	42045	43045	44045
ALM2 delay time units	0: sec. 1: min.		0 (sec.)	41046	42046	43046	44046
ALM3 hysteresis	0 to 50%FS	yes	0.25%FS	41051	42051	43051	44051
ALM3 delay time	0 to 99min.59sec. or 0 to 99hr.59min.		0	41053	42053	43053	44053
ALM3 delay time units	0: sec. 1: min.		0 (sec.)	41054	42054	43054	44054
ALM4 hysteresis	0 to 50%FS	yes	0.25%FS	41059	42059	43059	44059
ALM4 delay time	0 to 99min.59sec. or 0 to 99hr.59min.		0	41061	42061	43061	44061
ALM4 delay time units	0: sec. 1: min.		0 (sec.)	41062	42062	43062	44062
ALM5 hysteresis	0 to 50%FS	yes	0.25%FS	41067	42067	43067	44067
ALM5 delay time	0 to 99min.59sec. or 0 to 99hr.59min.		0	41069	42069	43069	44069
ALM5 delay time units	0: sec. 1: min.		0 (sec.)	41070	42070	43070	44070
Object Ch. No. for interchannel ALM1	1 to 4		(each Ch. No.)	41039	42039	43039	44039
Object Ch. No. for interchannel ALM2	1 to 4		(each Ch. No.)	41047	42047	43047	44047
Object Ch. No. for interchannel ALM3	1 to 4		(each Ch. No.)	41055	42055	43055	44055
Object Ch. No. for interchannel ALM4	1 to 4		(each Ch. No.)	41063	42063	43063	44063
Object Ch. No. for interchannel ALM5	1 to 4		(each Ch. No.)	41071	42071	43071	44071
CT[A] HB alarm set value	0.0 to 50.0A		0	41072	42072	43072	44072
CT[A] HB alarm hysteresis	0.0 to 50.0A		0.5	41073	42073	43073	44073
CT[A] Load short-circuit alarm set value	0.0 to 50.0A		0	41074	42074	43074	44074
CT[A] Load short-circuit alarm hysteresis	0.0 to 50.0A		0.5	41075	42075	43075	44075
CT[B] HB alarm set value	0.0 to 50.0A		0	41076	42076	43076	44076
CT[B] HB alarm hysteresis	0.0 to 50.0A		0.5	41077	42077	43077	44077
CT[B] Load short-circuit alarm set value	0.0 to 50.0A		0	41078	42078	43078	44078
CT[B] Load short-circuit alarm hysteresis	0.0 to 50.0A		0.5	41079	42079	43079	44079
Loop break detection time	0 to 9999sec		0 (detection OFF)	41080	42080	43080	44080
Loop break detection band	0 to 100%FS	yes	10°C	41081	42081	43081	44081

Communication parameter

Parameter (name)	Read/write data setting range	Depends on input range	Factory default	Register No.			
				Ch 1	Ch 2	Ch 3	Ch 4
RS-485 Parity setting	0: NONE 1: ODD 2: EVEN		0 (NONE)	40111			
RS-485 Communication speed	0: 9.6kbps 1: 19.2kbps 2: 38.4kbps 3: Forbidden 4: 115.2kbps		1 (9.6kbps)	40115			
RS-485 Communication permission	0: Read only 1: Read/Write		1 (R/W)	40114			
RS-485 Response interval time	0 to 25 (x20ms)		0	40113			
Enhanced communication module (PUMC) connection	0: PUMC not connected (RS485 Enable) 1: PUMC connected (RS485 Disable)		0 (PUMC not connected)	40116			
Master/slave setting in connected modules	0: Master 1: Slave		1 (Slave)	40117			
User address 01	30000 to 49999		30002 (PV1)	40301			
User address 02	30000 to 49999		30002 (PV1)	40302			
User address 03	30000 to 49999		30002 (PV1)	40303			
User address 04	30000 to 49999		30002 (PV1)	40304			
User address 05	30000 to 49999		30002 (PV1)	40305			
User address 06	30000 to 49999		30002 (PV1)	40306			
User address 07	30000 to 49999		30002 (PV1)	40307			
User address 08	30000 to 49999		30002 (PV1)	40308			
User address 09	30000 to 49999		30002 (PV1)	40309			
User address 10	30000 to 49999		30002 (PV1)	40310			
User address 11	30000 to 49999		30002 (PV1)	40311			
User address 12	30000 to 49999		30002 (PV1)	40312			
User address 13	30000 to 49999		30002 (PV1)	40313			
User address 14	30000 to 49999		30002 (PV1)	40314			
User address 15	30000 to 49999		30002 (PV1)	40315			
User address 16	30000 to 49999		30002 (PV1)	40316			
User address 17	30000 to 49999		30002 (PV1)	40317			
User address 18	30000 to 49999		30002 (PV1)	40318			
User address 19	30000 to 49999		30002 (PV1)	40319			
User address 20	30000 to 49999		30002 (PV1)	40320			
User address 21	30000 to 49999		30002 (PV1)	40321			
User address 22	30000 to 49999		30002 (PV1)	40322			
User address 23	30000 to 49999		30002 (PV1)	40323			
User address 24	30000 to 49999		30002 (PV1)	40324			
User address 25	30000 to 49999		30002 (PV1)	40325			
User address 26	30000 to 49999		30002 (PV1)	40326			
User address 27	30000 to 49999		30002 (PV1)	40327			
User address 28	30000 to 49999		30002 (PV1)	40328			
User address 29	30000 to 49999		30002 (PV1)	40329			
User address 30	30000 to 49999		30002 (PV1)	40330			
User address 31	30000 to 49999		30002 (PV1)	40331			
User address 32	30000 to 49999		30002 (PV1)	40332			
User data 01	Depends on "User address 01"		-	45001			
User data 02	Depends on "User address 02"		-	45002			
User data 03	Depends on "User address 03"		-	45003			
User data 04	Depends on "User address 04"		-	45004			
User data 05	Depends on "User address 05"		-	45005			
User data 06	Depends on "User address 06"		-	45006			
User data 07	Depends on "User address 07"		-	45007			
User data 08	Depends on "User address 08"		-	45008			
User data 09	Depends on "User address 09"		-	45009			
User data 10	Depends on "User address 10"		-	45010			
User data 11	Depends on "User address 11"		-	45011			
User data 12	Depends on "User address 12"		-	45012			
User data 13	Depends on "User address 13"		-	45013			
User data 14	Depends on "User address 14"		-	45014			
User data 15	Depends on "User address 15"		-	45015			
User data 16	Depends on "User address 16"		-	45016			
User data 17	Depends on "User address 17"		-	45017			
User data 18	Depends on "User address 18"		-	45018			
User data 19	Depends on "User address 19"		-	45019			
User data 20	Depends on "User address 20"		-	45020			
User data 21	Depends on "User address 21"		-	45021			
User data 22	Depends on "User address 22"		-	45022			
User data 23	Depends on "User address 23"		-	45023			
User data 24	Depends on "User address 24"		-	45024			
User data 25	Depends on "User address 25"		-	45025			
User data 26	Depends on "User address 26"		-	45026			
User data 27	Depends on "User address 27"		-	45027			
User data 28	Depends on "User address 28"		-	45028			
User data 29	Depends on "User address 29"		-	45029			
User data 30	Depends on "User address 30"		-	45030			
User data 31	Depends on "User address 31"		-	45031			
User data 32	Depends on "User address 32"		-	45032			

Configuration parameter

Parameter (name)	Read/write date setting range	Depends on input range	Factory default	Register No.			
				Ch 1	Ch 2	Ch 3	Ch 4
Control when input burnout is detected	0: Stop control 1: Continue control		0 (Stop Control)	41407	42407	43407	44407
LED2 Lamp Allocation	0 to 255		1	40222			
LED3 Lamp Allocation	0 to 255		12	40223			
LED4 Lamp Allocation	0 to 255		13	40224			
LED5 Lamp Allocation	0 to 255		14	40225			
LED6 Lamp Allocation	0 to 255		15	40226			
Reset main unit	0: RUN 1: Reset main unit		0 (RUN)	40101			

Monitor parameter

Parameter (name)	Read/write date setting range	Depends on input range	Factory default	Register No.			
				Ch 1	Ch 2	Ch 3	Ch 4
System time	0 to 65535		-	30001			
Measurement value (PV)	-5 to 105%FS		-	30002	30003	30004	30005
Set value (SV)	0 to 100%FS		-	30006	30007	30008	30009
DV	-105 to 105%FS		-	30010	30011	30012	30013
Output value (MV1)	-3.0 to 103.0%		-	30014	30016	30018	30020
Output value (MV2)	-3.0 to 103.0%		-	30015	30017	30019	30021
Remote SV (RSV)	0 to 100%FS		-	30022	30023	30024	30025
Remote mode switch	0: Local 1: Remote		-	30030	30031	30032	30033
Heater current[A]	0.0 to 50.0A		-	30071	30073	30075	30077
Heater current[B]	0.0 to 50.0A		-	30072	30074	30076	30078
Leak current[A]	0.0 to 50.0A		-	30081	30083	30085	30087
Leak current[B]	0.0 to 50.0A		-	30082	30084	30086	30088
Error source display	0000 to FFFF		-	31008	32008	33008	34008
Alarm 1-5 status	0000 to 001F		-	31007	32007	33007	34007
Event input status	0000 to FFFF		-	31061	32061	33061	34061
Remaining time on timer 1	0 to 99min.59sec. or 0 to 99hr.59min.		-	31011	32011	33011	34011
Remaining time on timer 2	0 to 99min.59sec. or 0 to 99hr.59min.		-	31012	32012	33012	34012
Remaining time on timer 3	0 to 99min.59sec. or 0 to 99hr.59min.		-	31013	32013	33013	34013
Remaining time on timer 4	0 to 99min.59sec. or 0 to 99hr.59min.		-	31014	32014	33014	34014
Remaining time on timer 5	0 to 99min.59sec. or 0 to 99hr.59min.		-	31015	32015	33015	34015
Output value	0 to 99min.59sec. or 0 to 99hr.59min.		-	30120	30121	30122	30123
Communication permission	0: Read only 1: Read/Write		-	30062			

[Appendix A] Output limiter type setting

Read/write date setting range
0: 103% / -3% , 103% / -3%
1: Limit / -3% , 103% / -3%
2: 103% / Limit , 103% / -3%
3: Limit / Limit , 103% / -3%
4: 103% / -3% , Limit / -3%
5: Limit / -3% , Limit / -3%
6: 103% / Limit , Limit / -3%
7: Limit / Limit , Limit / -3%
8: 103% / -3% , 103% / Limit
9: Limit / -3% , 103% / Limit
10: 103% / Limit , 103% / Limit
11: Limit / Limit , 103% / Limit
12: 103% / -3% , Limit / Limit
13: Limit / -3% , Limit / Limit
14: 103% / Limit , Limit / Limit
15: Limit / Limit , Limit / Limit

[Appendix B] DO output event type setting

Read/write date setting range		
0: None	35: MV1 (heat) upper limit	70: No function
1: Upper limit absolute	36: MV1(heat) lower limit	71: During Auto-tuning
2: Lower limit absolute	37: MV1(heat) upper/lower limit	72: Direct Operation
3: Upper limit absolute(w/ hold)	38: MV2(cool) upper limit	73: Standby mode operating
4: Lower limit absolute(w/ hold)	39: MV2(cool) lower limit	74: Manual mode operating
5: Upper limit deviation	40: MV2(cool) upper/lower limit	75: Remote SV operating
6: Lower limit deviation	41: Interchannel upper limit deviation	76: During ramp SV
7: Upper/lower limit deviation	42: Interchannel lower limit deviation	77: No function
8: Upper limit deviation(w/ hold)	43: Interchannel upper/lower limit deviation	78: No function
9: Lower limit deviation(w/ hold)	44: Interchannel upper limit deviation(w/ hold)	79: No function
10: Upper/lower limit deviation(w/ hold)	45: Interchannel lower limit deviation(w/ hold)	80: No function
11: Range upper/lower limit deviation	46: Interchannel upper/lower limit deviation(w/ hold)	81: No function
12: No function	47: No function	82: No function
13: No function	48: No function	83: No function
14: No function	49: No function	84: No function
15: No function	50: No function	85: No function
16: Upper/lower limit absolute	51: No function	86: No function
17: Upper/lower limit deviation	52: Delay ON timer	87: No function
18: Upper limit absolute, lower limit deviation	53: Delay OFF timer	88: No function
19: Upper limit deviation, lower limit absolute	54: Delay ON/OFF timer	89: No function
20: Upper/lower limit absolute(w/ hold)	55: No function	90: No function
21: Upper/lower limit deviation(w/ hold)	56: No function	91: No function
22: Upper limit absolute, lower limit deviation(w/ hold)	57: No function	92: No function
23: Upper limit deviation, lower limit absolute(w/ hold)	58: No function	93: No function
24: Range upper/lower limit absolute	59: No function	94: No function
25: Range upper/lower limit deviation	60: No function	95: No function
26: Range upper limit absolute, lower limit deviation	61: Loop break alarm	96: No function
27: Range upper limit deviation, lower limit absolute	62: No function	97: No function
28: Range upper/lower limit absolute(w/ hold)	63: No function	98: No function
29: Range upper/lower limit deviation(w/ hold)	64: HB alarm1	99: No function
30: Range upper limit absolute, lower limit deviation	65: HB alarm2	100: No function
31: Range upper limit deviation, lower limit absolute	66: HB alarm 1 OR 2	101: No function
32: SV upper limit	67: Load short-circuit alarm1	102: No function
33: SV lower limit	68: Load short-circuit alarm2	
34: SV upper/lower limit	69: Load short-circuit alarm 1 OR 2	

 Caution on Safety

*Before using this product, be sure to read its instruction manual in advance.

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