CP-UM-5556E

SDC23M/24M
Single Loop Controller
User's Manual
for Installation

Thank you for purchasing the SDC23M/24M.
Before operating this product described in this user's manual, please take note of the following points regarding safety.
Be sure to keep this manual nearby for handy reference.

RESTRICTIONS ON USE

This product has been designed, developed and manufactured for general-purpose application in machinery and equipment.
Accordingly, when used in applications outlined below, special care should be taken to implement a fail-safe and/or redundant design concept as well as a periodic maintenance program.

- Safety devices for plant worker protection
- Start/stop control devices for transportation and material handling machines
- Aeronautical/aerospace machines
- Control devices for nuclear reactors

Never use this product in applications where human safety may be put at risk.

NOTICE

Be sure that the user receives this manual before the product is used.

Copying or duplicating this user's manual in part or in whole is forbidden. The information and specifications in this manual are subject to change without notice.

Considerable effort has been made to ensure that this manual is free from inaccuracies and omissions. If you should find an error or omission, please contact Yamatake Corporation.

In no event is Yamatake Corporation liable to anyone for any indirect, special or consequential damages as a result of using this product.

This manual explains the handling precautions, mounting, wiring, PV range type, list of parameters and main specifications only. These manuals also contain information on using various functions. Please read if necessary.

SDC23M/24M Single Loop Controller User's Manual for Installation & Configuration CP-SP-1285E.

UNPACKING

Check the following items when removing the SDC23M/24M from its package:

Name	Part No.	Q'ty	Remarks
Mounting Bracket	81409654-001	2	
User's Manual	CP-UM-5556E	1	This manual
	CP-UM-5556C	1	Chinese manual

SAFETY PRECAUTIONS

⚠ WARNING Warnings are indicated when mishandling this product might result in death or serious injury to the user.

⚠ CAUTION Cautions are indicated when mishandling this product might result in minor injury to the user, or only physical damage to this product.

⚠ WARNING

- Note that incorrect wiring of the SDC23M/24M can damage the SDC23M/24M and lead to other hazards.
  Check that the SDC23M/24M has been correctly wired before turning the power ON.
- Before wiring, or removing/mounting the SDC23M/24M, be sure to turn the power OFF.
  Failure to do so might cause electric shock or faulty operation.
- Do not touch electrically charged parts such as the power terminals. Doing so might cause electric shock.
- Do not disassemble the SDC23M/24M.
  Doing so might cause electric shock or faulty operation.

⚠ CAUTION

- Use the SDC23M/24M within the operating ranges recommended in the specifications (temperature, humidity, voltage, vibration, shock, mounting direction, atmosphere, etc.).
  Failure to do so might cause fire or faulty operation.
- Do not block ventilation holes.
  Doing so might cause fire or faulty operation.
- Wire the SDC23M/24M properly according to predetermined standards. Also wire the SDC23M/24M using specified power leads according to recognized installation methods.
  Failure to do so might cause electric shock, fire or faulty operation.
- Do not allow lead clippings, chips or water to enter the controller case.
  Doing so might cause fire or faulty operation.
- Firmly tighten the terminal screws at the torque listed in the specifications. Insufficient tightening of terminal screws might cause electric shock or fire.
- Do not use unused terminals on the SDC23M/24M as relay terminals.
  Doing so might cause electric shock, fire or faulty operation.
- We recommend attaching the terminal cover (sold separately) after wiring the SDC23M/24M.
  Failure to do so might cause electric shock.
- Use the relays within the recommended service life.
  Failure to do so might cause fire or faulty operation.
- Use Yamatake Corporation's "SURGENON" if there is the risk of power surges caused by lightning.
  Doing so might cause fire or faulty operation.
- Do not operate the keys with a propelling pencil or sharp-tipped object. Doing so might cause faulty operation.

Mounting

■ Location

Install the controller in the following locations:

- Common mode voltages for I/O except power supply and relay contact output: The voltage to ground is 33Vr.m.s max., 46.7V peak max., and 70Vdc max.
- Not high or low temperature / humidity.
- Free from sulfide gas or corrosive gas.
- Less dust or soot.
- Appropriately processed locations to prevent direct sunlight, wind or rain.
- Less mechanical vibration and shock.
- Not close to the high voltage line, welding machine or electrical noise generating source.
- The minimum 15 meters away from the high voltage ignition device for a boiler.
- Less effect by the magnetic field.
- No flammable liquid or gas.

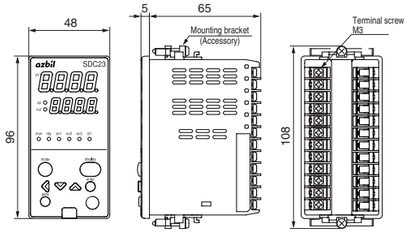
■ Mounting Procedure

- The mounting must be horizontal within 10 degrees tilted in back side lowering or within 10 degrees tilted in back side rising.
- The mounting panel should be used with a thickness of 9 mm or less of firm board.

■ External Dimensions

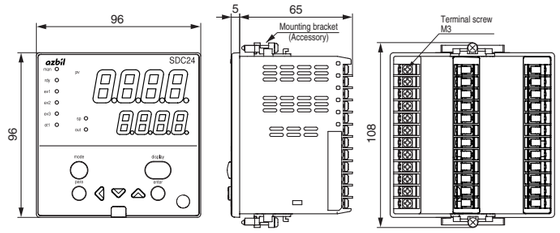
- **C23M**

unit: mm



- **C24M**

unit: mm



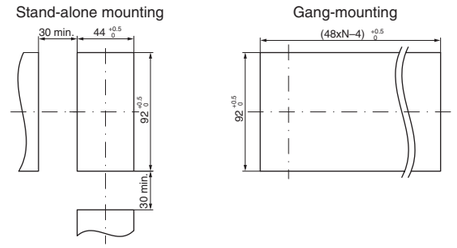
! Handling Precautions

- To fasten this controller onto the panel, tighten a mounting bracket screws, and turn one more half turn when there is no play between the bracket and panel. Excessively tightening the screws may deform the controller case.

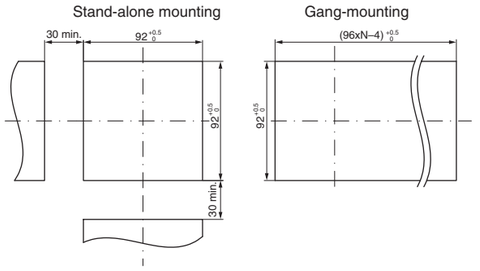
■ Panel Cutout Dimensions

unit: mm

- **C23M**



- **C24M**



! Handling Precautions

- When three or more units are gang-mounted horizontally, the maximum allowable ambient temperature is 40°C.

Wiring

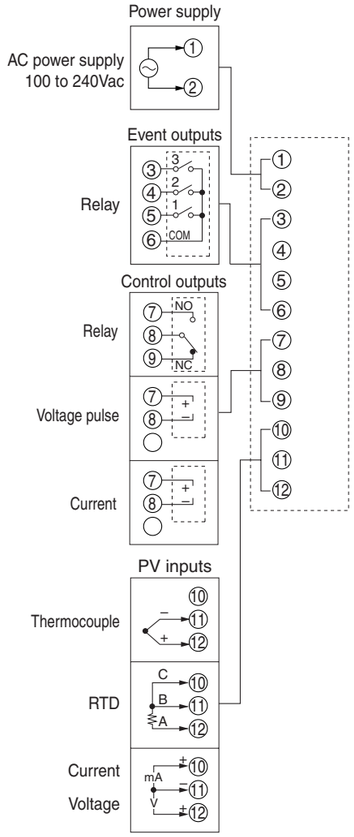
Be sure to provide a switch within operator reach for shutting OFF the main power supply to the controller in the main supply wiring.
Also, in case of AC power supply models, the main supply wiring also requires a time-lagged type (T) fuse (rated current: 0.5A, rated voltage: 250 V). (IEC127)
The following table shows the meaning of the symbols in the terminal wiring label on the controller side:

Symbols	Meaning
~	AC power supply
⚠	Caution, fear of electric shock
⚠	Caution

! Handling Precautions

- Before wiring the SDC23M/24M, verify the controller's model No. and terminal Nos. written on the label on the side of the body. Inspect all wiring once wiring work for the SDC23M/24M has been completed.
- Use M3 crimp-type terminal lugs for wiring to terminal.
- Provide a distance of at least 50cm between I/O lead wires or communications lead wires and power lead wires. Also, do not pass these lead wires through the same piping or wiring duct.
- Be careful not to allow any crimp-type terminal lugs to touch adjacent terminals.
- Regarding a device or equipment which is connected to this controller, use a model to which the basic insulation meeting with the power supply voltage and the maximum operating voltage of the I/O units is provided.
- The controller requires maximum 5 seconds to start up once the power is turned ON.
  The controller can be used once it has started up. However, it is recommended to allow a warm-up time of at least 30 minutes to attain the specified accuracy.

● Connection of C23M/24M

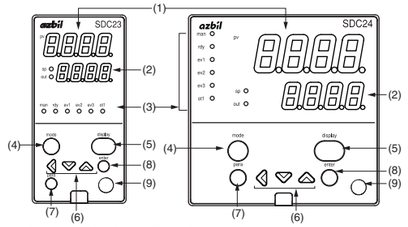


● I/O isolation

Items surrounded by solid lines are insulated from other signals.
Availability of input or output is based on a model number.

Power supply		Control output
PV input	Internal circuit	Event output 1
Loader communication		Event output 2
		Event output 3

Part names and functions



(1) Upper display: Displays PV values (present temperature, etc.) or setup items.

(2) Lower display: Displays SP values (set temperature, etc.) and other parameter values. When the lower display shows the SP value, the "sp" lamp lights up. When the display shows the manipulated variable (MV), the "out" lamp lights up.

(3) Mode indicator
- man: Lights when MANUAL (manual mode).
- rdy: Lights when READY (control stop).
- ev1 to ev3: Lights when event relays are ON.
- ot1: Lights when the control output is ON.

(4) [mode] key: The operation which has been set beforehand can be done by pushing the key for 1s or more.

(5) [display] key: Used to change the display contents in the operation display mode. Display is returned from bank setup display to operation display.

(6) < , ∨ , ∧ key: Used for incrementing numeric values and performing arithmetic shift operations.

(7) [para] key: Switches the display.

(8) [enter] key: Used to set the setup values at the start of change and during the change.

(9) Loader connector: Connects to a personal computer by using a dedicated cable supplied with the Smart Loader Package.

PV range table

● When "S" on the PV input type

C01 Set value	Input type	Range	
1	K	-200 to +1200°C	-300 to +2200°F
2	K	0 to 1200°C	0 to 2200°F
3	K	0.0 to 800.0°C	0 to 1500°F
4	K	0.0 to 600.0°C	0 to 1100°F
5	K	0.0 to 400.0°C	0 to 700°F
6	K	-200.0 to +400.0°C	-300 to +700°F
9	J	0 to 800°C	0 to 1500°F
10	J	0. to 600°C	0 to 1100°F
11	J	-200 to +400°C	-300 to +700°F
13	E	0 to 600°C	0 to 1100°F
14	T	-200.0 to +400.0°C	-300 to +700°F
15	R	0 to 1600°C	0 to 3000°F
16	S	0 to 1600°C	0 to 3000°F
17	B	0 to 1800°C	0 to 3300°F
18	N	0 to 1300°C	0 to 2300°F
19	PLII	0 to 1300°C	0 to 2300°F
20	WRe5-26	0 to 1400°C	0 to 2400°F
21	WRe5-26	0 to 2300°C	0 to 4200°F

C01 Set value	Input type	Range	
41	Pt100	-200 to +500°C	-300 to +900°F
43	Pt100	-200 to +200°C	-300 to +400°F
45	Pt100	-100 to +300°C	-150 to +500°F
51	Pt100	-50.0 to +200.0°C	-50 to +400°F
53	Pt100	-50.0 to +100.0°C	-50 to +200°F
63	Pt100	0.0 to 200.0°C	0 to 400°F
67	Pt100	0 to 500°C	0 to 900°F

[!] Handling Precautions

· The accuracy is ±0.5%FS±1 digit, and ±1.0%FS±1 digit for a negative area of the thermocouple.
The accuracy varies according to the range:
The accuracy of the No.17 (sensor type B) is ±5.0%FS for a range of 260°C or less, ±1.0%FS for 260 to 800°C.
The PV values under 20°C are not shown.

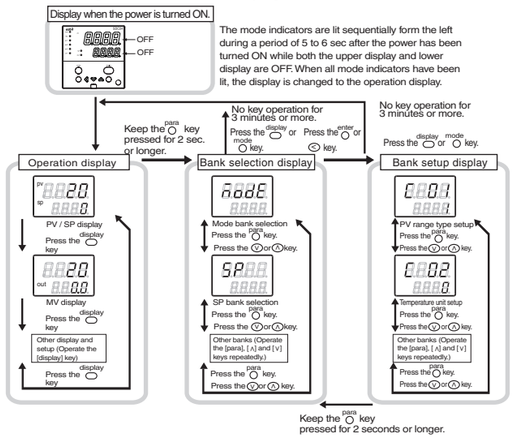
· The ranges with a decimal point show digits after the decimal point.

● When "L" on the PV input type

C01 Set value	Input type	Range
84	0 to 1V	The scaling and the decimal point position can be changed variably in a range of -1999 to +9999.
86	1 to 5V	
87	0 to 5V	
88	0 to 10V	
89	0 to 20mA	
90	4 to 20mA	

Key operation and setting

The following shows the flow of key operation:



The display and setup status shown above are examples for explanation. Therefore, some displays or settings are not shown actually according to the model and/or setup contents. After the setup bank (SEUP) is selected in the Bank selection display, C01 is shown in the Bank setup display.

There are the standard type and special type in the data setup method. Here, the method is explained in the standard type.

● Setting example of the PV range type

If the mode bank (mode) is selected, use the [∨] [∧] keys to move to the setup bank (SEUP), and then press the [enter] key. Next, press the [∨] [∧] keys as necessary to display C01 on the upper display.
Move the digit or increase/decrease the numeric value by pressing the [<] [∨] [∧] keys.
When the [enter] key is pressed at the desired numeric value, the flashing will stop and the data will be set.

● Setting example of the SP1

If the mode bank (mode) is selected, use the [∨] [∧] keys to move to the setup bank (SP), and then press the [enter] key. Next, press the [∨] [∧] keys as necessary to display SP-1 on the upper display.
When the [enter] key is pressed, the numerical value on the lower display will start to flash.
Move the digit or increase/decrease the numeric value by pressing the [<] [∨] [∧] keys.
When the [enter] key is pressed at the desired numeric value, the flashing will stop and the data will be set.

Alarm code table

This table shows the alarm display and measures for the abnormal operation of this controller.

Alarm code	Failure name	Cause	Corrective action
AL01	PV input failure (over range)	Sensor line break, incorrect wiring, incorrect PV range type setting	Checking wiring or reset PV range type.
AL02	PV input failure (under range)	Sensor line break, incorrect wiring, incorrect PV range type setting	
AL03	CJ failure	Terminal temperature is faulty (thermocouple).	Checking the ambient temperature.
	PV input failure	Sensor line break, incorrect wiring (RTD)	Checking wiring.
AL70	A/D conversion failure	Defective A/D converter	Replace unit.
AL95	Parameter failure	• Power turned OFF during fixing data • Data corrupted due to noise, etc.	Re-start the system. Reset data or replace unit. (AL95/97: setting data, AL96/98: tuning data) Replace unit.
AL96	Adjustment data failure	• Power turned OFF during fixing data • Data corrupted due to noise, etc.	
AL97	Parameter failure (RAM area)	Data corrupted due to noise, etc.	
AL98	Adjustment data failure (RAM area)	Data corrupted due to noise,etc.	
AL99	ROM failure	ROM (memory) error	Re-start the system. Replace unit.

Maintenance

Cleaning : When wiping out the SDC23M/24M, use the soft and dried cloth.

Parts replacement: Do not replace the parts.

Fuse replacement: When replacing the fuse for the power supply wires, make sure that the replacement fuse complies with all applicable safety standards.
Standard IEC127, Cutoff Speed Delayed operation type (T), Rated Voltage 250V, Rated Current 0.5A

Model selection table

Basic model No.	Mounting	Control output	PV input	Power supply	Option 1	Option 2	Additions 1	Additions 2	Additions Specifications	Specifications
C23M										48 x 96 size model
C24M										96 x 96 size model
	T									Panel mounting type
		R0								Relay contact output
		V0								Voltage pulse output
		C0								Current output
			S							Thermocouple/Resistance temperature detector
			L							DC voltage/DC current input
				A						AC model
					1					Event relay output: 3 points
						0				–
							0			No additional treatment
								0		No additional treatment
									M001	Step operation model

Specifications

● PV input

Thermocouple: K,J,E,T,R,S,B,N (JIS C1602-1995)
PL II (Engelhard Industries Data (ITS90))
WRe5-26 (ASTM E988-96(Reapproved 2002))

Resistance temperature detector (RTD):
Pt100 (JIS C1604-1997)

DC voltage: 0 to 1V, 1 to 5V, 0 to 5V, 0 to 10V
DC current: 0 to 20mA, 4 to 20mA
Sampling cycle: 300ms
Indication accuracy: ±0.5%FS±1digit,
±1.0%FS±1digit for a negative area of the thermocouple (at ambient temperature 23±3°C)
±2 (rightmost digit) when decimal point is displayed.

Thermocouple input
- Input bias current: +0.2 μA (flows from terminal A.)
- Operation at input break: Up scale +AL01
- Thermocouple or compensating wire: φ 0.3 to 0.65mm

Resistance temperature detector input
- Input bias current: Approx. +1mA (flows from terminal A.)
- Burnout indication: RTD burnout or A-wire burnout ••••• Up scale AL01
  B-wire burnout or C-wire burnout ••••• Up scale AL01, AL03
  2 or more wires burnout ••••• Up scale AL01, AL03
- Allowable wiring resistance: Range No.51 to 63 10 Ω or less, Other ranges 85 Ω or less
- Effect of wiring resistance: ±0.05 %FS/Ω or less

DC voltage input
- Input impedance: 1 MΩ or more
- Input bias current: 0 to 1 V range 1 μA (flows to the A terminal)
  0 to 5 V, 1 to 5 V range 3.5μA (flows to the A terminal)
  0 to 10V range 7 μA (flows to the A terminal)
- Burnout indication: Down scale +AL02
  However, the burnout cannot be detected in a range of 0 to 10 V.

DC current input
- Input impedance: 100 Ω or less
- Burnout indication: Down scale + AL02
  However, the burnout cannot be detected in a range of 0 to 20 mA.
- Allowable input current: 25 mA or less
  If the input exceeds this value, alarm AL01 occurs and the circuit is disconnected. If the input decreases to within specifications, the circuit is automatically restored. The circuit is also disconnected when the instrument power is OFF.

● Control output

• Relay output
- Contact rating: NO side 250 Vac/30 Vdc, 3A (resistive load)
  NC side 250 Vac/30 Vdc, 1 A (resistive load)
- Life: NO side Min. 50,000 operations
  NC side Min. 100,000 operations
- Min. switching specifications: 5V, 100 mA
- Min. open time / close times: 250 ms

• Voltage pulse output (for SSR drive)
- Open circuit voltage: 19 Vdc±15 %
- Internal resistance: 82 Ω ± 0.5 %
- Allowable current: Max. 24 mAdc
- Min OFF time / ON time: 1 ms when the time proportional cycle time is less than 10 s.
  250 ms when the time proportional cycle time is more than 10 s.

• Current output
- Output type: 0 to 20 mAdc or 4 to 20 mAdc
- Allowable load resistance: 600 Ω or less
- Output accuracy: ±0.3 %FS (at ambient temperature 23±3 °C)
  ±1 %FS at 0 to 1 mA

● Event relay outputs (ev1 to ev3)

- Output rating: 250 Vac/30 Vdc 2 A (resistive load)
- Life: 100,000 operations or more
- Min. switching specifications: 5 V, 10 mA (reference value)

● Environmental condition

• Operating conditions
- Ambient temperature: 0 to 50 °C (Gang-mounting: 0 to 40 °C)
- Ambient humidity: 10 to 90 %RH (without condensation)
- Rated power supply voltage: 100 to 240 Vac, 50/60 Hz
- Power supply voltage range: 85 to 264 Vac, 50/60±2 Hz

• Transport conditions
- Ambient temperature: -20 to +70 °C
- Ambient humidity: 10 to 95 %RH (without condensation)

● Other specifications

- Power consumption: 9 VA or less
- Non-detected failure time: 20 ms or less
- Inrush current at power ON: 20 A or less
- Altitude: 2000 m or less
- Mass: C23M 48 x 96 Approx.160 g (with mounting bracket)
  C24M 96 x 96 Approx.210 g (with mounting bracket)
- Terminal screw tightening torque: 0.4 to 0.6 N·m or less
- Applicable standards: EN61010-1, EN61326-1(approval pending)
- Over-voltage category: Category II (IEC60364-4-443, IEC60664-1)
- Allowable pollution degree: Pollution degree 2
- Recommended cables: For thermocouples:
  Connect thermocouple wires to the terminals directly. When a thermocouple is connected to terminal block, or wiring distance is long, connect the wire via a shielded compensating lead wire.
  For input/output other than thermocouples:
  Use a JCS 4364 instrument cable or equivalent. If electromagnetic induction noise is comparatively low, a shielded multiconductor microphone cord (MVVS) may be used.

Accessories and optional parts

Name	Model No.
Mounting bracket	81409654-001 (Accessory)
Hard cover	81446915-001 (for C23M) 81446916-001 (for C24M)
Soft cover	81441121-001 (for C23M) 81441122-001 (for C24M)
Terminal cover	81446912-001 (for C23M) 81446913-001 (for C24M)
Smart loader package	SLP-C35C50 (C15M, C23M, C24M common)

SDC23M/24M List of Parameters

[List of Operation Displays]

■ Operation Displays

Display	Item	Contents	Initial value	User level
Upper display: PV Lower display: SP	SP (Target value)	SP low limit (C07) to SP high limit (C08)	0	0
LSP1 (Display example) Lower display: LSP	LSP No. (1st digit: Value at the right end digit)	1 to LSP system group (C30)	1	0
Upper display: PV Lower display: MV	MV (Manipulated Variable)	–10.0 to +110.0% Setting is disabled in AUTO mode. (Numeric value does not flash.) Setting is enabled in MANUAL mode. (Numeric value flashes.)	—	0
HEAt	Heat MV (Manipulated Variable)	Setting is disabled –10.0 to +110.0%	—	0
Cool	Cool MV (Manipulated Variable)		—	0
Upper display: PV At1 (Display example)	AT progress display (1st digit = Numeric value at right end digit)	Setting is disabled. Except for 0: During execution of AT (Value is decreased.) 0: Completion of AT	—	0
E1	Internal event 1 main setting	Setting range is different depending on the internal event operation type. –1999 to +9999U: Except below. 0 to 9999U: Setting value is an absolute value. –199.9 to +999.9%: For MV.	0	0
E1.Sb	Internal event 1 sub-setting		0	0
t1. . . (Display example)	Timer remaining time 1	Setting is disabled. Upper display: The distinction by ON delay or OFF delay is displayed at the side location of [t1.]. Lower display: Displayed by the unit (either one of 0.1s, s, or min) based on the internal event 1 delay time unit (E1. the 3rd digit of C3).	—	0
E2	Internal event 2 main setting	Setting range is different depending on the internal event operation type. –1999 to +9999U: Except below. 0 to 9999U: Setting value is an absolute value. –199.9 to +999.9%: For MV.	0	0
E2.Sb	Internal event 2 sub-setting		0	0
t2. . . (Display example)	Timer remaining time 2	Setting is disabled. Upper display: The distinction by ON delay or OFF delay is displayed at the side location of [t2.]. Lower display: Displayed by the unit (either one of 0.1s, s, or min) based on the internal event 2 delay time unit (E2. the 3rd digit of C3).	—	0
E3	Internal event 3 main setting	Setting range is different depending on the internal event operation type. –1999 to +9999U: Except below. 0 to 9999U: Setting value is an absolute value. –199.9 to +999.9%: For MV.	0	0
E3.Sb	Internal event 3 sub-setting		0	0
t3. . . (Display example)	Timer remaining time 3	Setting is disabled. Upper display: The distinction by ON delay or OFF delay is displayed at the side location of [t3.]. Lower display: Displayed by the unit (either one of 0.1s, s, or min) based on the internal event 3 delay time unit(E3. the 3rd digit of C3).	—	0

[List of Parameter Setting Displays]

■ Mode bank
Bank selection: ModE

Display	Item	Contents	Initial value	User level
A--M	AUTO/MANUAL mode selection	AUto : AUTO mode MAn : MANUAL mode	AUTO	0
r---r	RUN/READY mode selection	rUn : RUN mode rdY : READY mode	RUN	0
At	AT Stop/Start selection	At oF : AT Stop At on : AT Start	AT Stop	0
do.Lt	Release all DO latches	Lt on : Latch continue Lt oF : Latch release	Latch continue	0
C.dI1	Communication DI 1	dI oF : OFF dI on : ON	OFF	0

■ SP bank
Bank selection: SP

Display	Item	Contents	Initial value	User level
SP-1 to SP-4	SP of LSP1 group to SP of LSP4 group *1	SP low limit (C07) to SP high limit (C08)	0	0
Pid. 1 to Pid. 8	PID group No. (for LSP1 to 8) *2	1 to 8	1	1
rAP. 1 to rAP. 8	Ramp (for LSP1 to 8) *2	0 to 9999 (The decimal point position is determined by the PV decimal point position and the SP ramp unit.)	0	1
tiM. 1 to tiM. 8	Time (for LSP1 to 8) *2	0.0 to 999.9 (when step operation time unit is 0.1s.) 0 to 9999 (when step operation time unit is 1s or 1min.)	0	1

*1 LSP1 to 8 for step operation models.

*2 Selectable only for step operation models.

User level details 0: Display in basic/standard/high function,
1: Display in standard/high function,
2: Display in high function.

Initial value may vary depending on model No.

■ Event bank
Bank selection: Ev

Display	Item	Contents	Initial value	User level
E1 to E5	Internal event 1 to 5 *, main setting	–1999 to +9999 The decimal point position varies by meeting the internal event operation type.	0	0
E1.Sb to E5.Sb	Internal event 1 to 5 *, sub-setting	0 to 9999 for some operation type.	0	0
E1.HY to E5.HY	Internal event 1 to 5 *, hysteresis	0 to 9999 The decimal point position varies by meeting the internal event operation type.	5	0
E1.on to E5.on	Internal event 1 to 5 *, ON delay	0.0 to 999.9 (For the delay time unit 0.1s)	0	2
E1.oF to E5.oF	Internal event 1 to 5 *, OFF delay	0 to 9999 (Except for the delay time unit 0.1s)	0	2

* Internal event 1 to 8 for step operation models.

■ PID bank
Bank selection: Pid

Display	Item	Contents	Initial value	User level
P-1	Proportional band *	0.1 to 999.9%	5.0	0
I-1	Integration time *	0 to 9999s or 0.0 to 999.9s (0: No integral control action)	120	0
d-1	Derivative time *	0 to 9999s or 0.0 to 999.9s (0: No derivative control action)	30	0
rE-1	Manual reset *	–10.0 to +110.0%	50.0	0
oL-1	MV low limit *	–10.0 to +110.0%	0.0	1
oH-1	MV high limit *	–10.0 to +110.0%	100.0	1
P-1C	Cool-side proportional band *	0.1 to 999.9%	5.0	0
I-1C	Cool-side integration time *	0 to 9999s or 0.0 to 999.9s (0: No integral control action)	120	0
d-1C	Cool-side derivative time *	0 to 9999s or 0.0 to 999.9s (0: No derivative control action)	30	0
oL1C	Cool-side MV low limit *	–10.0 to +110.0%	0.0	1
oH1C	Cool-side MV high limit *	–10.0 to +110.0%	100.0	1

* PID1 to 8 for step operation models

■ Parameter bank
Bank selection: PArA

Display	Item	Contents	Initial value	User level
CtrL	Control method	0: ON/OFF control 1: PID fixed	0 or 1	0
AtL oL	MV low limit at AT	–10.0 to +110.0%	0.0	0
AtL oH	MV high limit at AT	–10.0 to +110.0%	100.0	0
diFF	ON/OFF control differential	0 to 9999U	5	0
oFFS	ON/OFF control operating point offset	–1999 to 9999U	0	2
FL	PV filter	0.0 to 120.0s	0.0	0
rR	PV ratio	0.001 to 9.999	1.000	1
bi	PV bias	–1999 to +9999U	0	0
CYU	Time proportional cycle unit 1	0: 1s unit 1: 0.5s fixed (Cycle time is disabled.) 2: 0.2s fixed (Cycle time is disabled.) 3: 0.1s fixed (Cycle time is disabled.)	0	2
CY	Time proportional cycle1	5 to 120s *1 1 to 120s *2	10 or 2	0
CYU2	Time proportional cycle unit 1	0: 1s unit 1: 0.5s fixed (Cycle time is disabled.) 2: 0.2s fixed (Cycle time is disabled.) 3: 0.1s fixed (Cycle time is disabled.)	0	2
CY2	Time proportional cycle1	5 to 120s *1 1 to 120s *2	10	0
tP.tY	Time proportional operation type	0: Controllability aiming type 1: Actuator life aiming type (Only one ON/OFF operation within time proportional cycle time)	0 or 1	2
SPU	SP ramp-up	0.0 to 999.9U (0.0: No ramp)	0.0	2
SPd	SP ramp-down		0.0	2

*1 When the output includes the relay output.

*2 When the output does not include the relay output.

■ Extension tuning bank
Bank selection: Et

Display	Item	Contents	Initial value	User level
AtE tY	AT type	0: Normal (Standard control characteristcis) 1: Immediate response (Control characteristcis immediately responding to the external disturbance.) 2: Stable (Control characteristics with less up/down function of PV)	1	0
AtE-P	AT proportional band tuning factor	0.00 to 99.99	1.00	2
AtE-I	AT integration time tuning factor	0.00 to 99.99	1.00	2
AtE-d	AT derivative time tuning factor	0.00 to 99.99	1.00	2

■ Zone bank (Step operation model only)
Bank selection: ZonE

Display	Item	Contents	Initial value	User level	Remarks
Zn-1	Zone1	–1999 to +9999U	9999U	2	Displayed when the zone PID operation is used (C24≠0).
Zn-2	Zone2		9999U	2	
Zn-3	Zone3		9999U	2	
Zn-4	Zone4		9999U	2	
Zn-5	Zone5		9999U	2	
Zn-6	Zone6		9999U	2	
Zn-7	Zone7		9999U	2	
Zn.dF	Zone hysteresis	0 to 9999	5U	2	

[List of Setup Setting Displays]

■ Setup bank
Bank selection: SEUP

Display	Item	Contents	Initial value	User level
C01	PV input range type	When the PV input model is thermocouple or RTD, Thermocouple: 1 to 6, 9 to 11, 13 to 21 Resistance temperature detector: 41, 43, 45, 51, 53, 63, 67	2	0
		When the PV input model is DC voltage or DC current, DC voltage/current: 81, 86 to 90	88	
C02	Temperature unit	0: Centigrade (°C) 1: Fahrenheit (°F)	0	0
C03	Cold junction compensation (T/C)	0: Cold junction compensation is performed. (Internal) 1: Cold junction compensation is not performed. (External)	0	2
C04	Decimal point position	0: No decimal point 1: One digit after decimal point 2: Two digits after decimal point 3: Three digits after decimal point (Select '0' or '1' for the thermocouple/RTD range with decimal point)	0	0
C05	PV range low limit	When the PV input model is thermocouple or RTD, the setting is disabled although range low limit is displayed.	0	0
		–1999 to +9999U when the PV input model is DC voltage or DC current.	0	
C06	PV range high limit	When the PV input model is thermocouple or RTD, the setting is disabled although range high limit is displayed.	1200	0
		–1999 to +9999U when the PV input model is DC voltage or DC current.	1000	
C07	SP low limit	PV input range low limit to PV input range high limit	PV input range low limit	1
C08	SP high limit		PV input range high limit	1
C09	Square root extraction dropout	0.0 to 100.0% (0.0: No square root extraction)	0.0	2
C14	Control action (direct/reverse)	0: Heat control (reverse action) 1: Cool control (direct action)	0	0
C15	Selection of MV at PV alarm occurrence	0: Control operation is continued. 1: MV at PV alarm occurrence is outputted.	0	2
C16	MV at PV alarm occurrence	–10.0 to +110.0%	0.0	2
C17	MV at READY (at heat-side for heat/cool control)	–10.0 to +110.0%	0.0	1
C18	MV at READY (at cool-side)	–10.0 to +110.0%	0.0	1
C19	Operation at MANUAL change	0: Bump-less 1: Preset	0	1
C20	Preset MANUAL value	–10.0 to +110.0% (Used even at MANUAL mode when power is ON.)	0.0 or 50.0	1
C21	PID operation initialization function selection	0: Automatic 1: Not initialized 2: Initialized (when SP value different from current value is inputted.)	0	2
C22	PID operation	-10.0 to +110.0%	0.0 or 50.0	2
C24	Zone PID action selection *1	0: Disabled 1: Selection by SP 2: Selection by PV	0	2
C26	Heat/cool control selection	0: Disabled. 1: Enabled.	0	0
C27	Heal/cool selection	0: Normal 1: Energy saving	0	1
C28	Dead zone	–100.0 to +100.0%	0.0	0
C29	Heal/cool control selection point	–10.0 to +110.0%	50.0	2
C30	LSP setting system *2	1 to 4	1 or 8	0
C31	SP ramp type *1	0: Standard 1: Multi-ramp 2: Step operation. Step is stopped when power is re-supplied. (READY) 3: Step operation. Step is recovered when power is re-supplied.	2	2
C32	SP ramp unit	0: 0.1U/s 1: 0.1U/min 2: 0.1U/h	1	2
C33	Step operation time unit *1	0: 0.1s 1: 1s (Displayed in min.s in console.) 2: 1min (Displayed in h.min in console.)	0	2
C34	Step operation PV start *1	0: Disabled. 1: Enabled.	0	2
C35	Step operation loop *1	0: Stop (Not looped.) 1: Looped. 2: Final step continued. (Not looped.)	0	2
C42	Control output 1 range	Current output: 1: 4 to 2mA 2: 0 to 20mA	1	0
C43	Control output 1 type	0: MV 1: Heat MV (for heat/cool control) 2: Cool MV (for heat/cool control) 3: PV 4: PV before ratio bias filter 5: SP 6: Deviation (PV-SP) 7: CT1 current value 8: CT2 current value 9: MFB (Invalid on SDC25/26) 10: SP+MV 11: PV+MV	0	0
C44	Control output 1 scaling low limit	–1999 to +9999 (The decimal point position and unit may vary depending on the control output 1 type.)	0.0	0
C45	Control output 1 scaling high limit		100.0	0
C46	Control output 1 MV scalable bandwidth	0 to 9999 (Available when control output 1 type is 10 or 11.)	200	0
C71	Key operation mode/type	0: Standard type 1: Special type	0	2
C72	Mode key function	0: Invalid 1: AUTO/MANUAL selection 2: RUN/READY selection 3: AT Stop/Start 4: LSP group selection 5: Release of all DO latches 6: Invalid 7: Communication DI1 selection 8: Invalid	1	0
C73	Mode display setup	Whether the mode bank setup display is enabled or disabled is determined by the sum of the following weighting: Bit 0: AUTO/MANUAL display 0: Disabled, +1: Enabled Bit 1: RUN/READY display 0: Disabled, +2: Enabled Bit 2: LSP/RSP display 0: Disabled, +4: Enabled Bit 3: AT stop/start display 0: Disabled, +8: Enabled Bit 4: DO latch release 0: Disabled, +16: Enabled Bit 5: Communication DI1 ON/OFF display 0: Disabled, +32: Enabled Other invalid setup: 0, +64, +128	255	1
C74	PV/SP value display setup	Whether the basic display is enabled or disabled is determined by the sum of the following weighting: Bit 0: PV display 0: Disabled, +1: Enabled Bit 1: SP display 0: Disabled, +2: Enabled Bit 2: LSP group No. display 0: Disabled, +4: Enabled Other invalid setup: 0, +8	15	1
C75	MV display setup	Whether the basic display is enabled or disabled is determined by the sum of the following weighting: Bit 0: MV display 0: Disabled, +1: Enabled Bit 1: Heat MV/cool MV display 0: Disabled, +2: Enabled Bit 2: MFB display 0: Disabled, +4: Enabled Bit 3: AT progress display 0: Disabled, +8: Enabled	15	1
C76	Event setting value display setup	0: In the operation display mode, the internal event setting value is not displayed. 1: In the operation display mode, the internal event 1 setting value is displayed. 2: In the operation display mode, the internal event 1 to 2 setting value is displayed. 3: In the operation display mode, the internal event 1 to 3 setting value is displayed.	0	1
C77	Event remaining time display setup	0: In the operation display mode, the ON/OFF delay remaining time of the internal event is not displayed. 1: In the operation display mode, the ON/OFF delay remaining time of the internal event 1 is displayed. 2: In the operation display mode, the ON/OFF delay remaining time of the internal event 1 to 2 is displayed. 3: In the operation display mode, the ON/OFF delay remaining time of the internal event 1 to 3 is displayed.	0	1
C79	User level	0: Basic configuration 1: Standard configuration 2: High function configuration	1	0
C80	LED monitor	0: Disabled 1: Disabled 2: Disabled 3: Disabled 4: Flashing at READY	0	2

*1 Selectable only for step operation models.

*2 LSP1 to 8 for step operation models.

(continued on back page)

■ Event assignment bank
Bank selection: EvCF

Display	Item	Contents	Initial value	User level
E1.C1 to E5.C1	Operation type of internal event 1 to 5 Configuration 1 Operation type *	0: No event 1: PV high limit 2: PV low limit 3: PV high/low limit 4: Deviation high limit 5: Deviation low limit 6: Deviation high/low limit 7: Deviation high limit (Final SP reference) 8: Deviation low limit (Final SP reference) 9: Deviation high/low limit (Final SP reference) 10: SP high limit 11: SP low limit 12: SP high/low limit 13: MV high limit 14: MV low limit 15: MV high/low limit 16: No event 17: No event 18: No event 19: No event 20: Loop diagnosis 1 21: Loop diagnosis 2 22: Loop diagnosis 3 23: Alarm (status) 24: READY (status) 25: MANUAL (status) 26: No event 27: During AT execution (status) 28: During SP ramp (status) 29: Control direct action (status) 30: No event 31: No event 32: Timer (status) 33: No event	0	0
E1.C2 to E5.C2	Internal event 1 to 5 Configuration 2 *	Digits are called as 1st digit, 2nd digit, 3rd digit and 4th digit from the right end digit.	0000	0
	1st digit: Direct /Reverse	0: Direct 1: Reverse	0	
	2nd digit: Stand-by	0: None 1: Standby 2: Standby + Standby at SP change	0	
	3rd digit: EVENT state at READY	0: Continue 1: Forced OFF	0	
	4th digit: Undefined	0	0	
E1.C3 to E5.C3	Internal event 1 to 5 Configuration 3 *	Digits are called as 1st digit, 2nd digit, 3rd digit and 4th digit from the right end digit.	0000	2
	1st digit: Alarm OR	0: No event 1: Alarm direct + OR operation 2: Alarm direct + AND operation 3: Alarm reverse + OR operation 4: Alarm reverse + AND operation	0	
	2nd digit: Special OFF	0: As normal execution 1: Event OFF at the event setting value (main)=0	0	
	3rd digit: Delay time unit	0: 0.1s 1: 1s 2: 1min	0	
	4th digit: Undefined	0	0	

* Internal event 1 to 8 for step operation models.

■ DI assignment bank
Bank selection: di

Display	Item	Contents	Initial value	User level
di1.1 to di3.1	Internal contact 1 to 3 Operation type	0: No function 1: LSP group selection (0/+1) 2: LSP group selection (0/+2) 3: LSP group selection (0/+4) 4: PID group selection (0/+1) * 5: PID group selection (0/+2) * 6: PID group selection (0/+4) * 7: RUN/READY selection 8: AUTO/MANUAL selection 9: Invalid 10: AT Stop/Start 11: Invalid 12: Control action direct/reverse selection (As per setting/opposite operation of setting) 13: SP ramp Enabled/Disabled 14: PV Hold (No-hold/Hold) 15: PV maximum value hold (No-hold/Hold) 16: PV minimum value hold (No-hold/Hold) 17: Timer Stop/Start 18: Release of all DO latches (Continue/Release) 19: Advance * 20: Step hold *	0	0
di1.2 to di3.2	Internal contact 1 to 3 Input bit operation	0: Disabled. (Input of default) 1: Function 1 ((A and B) or (C and D)) 2: Function 2 ((A or B) and (C or D)) 3: Function 3 (A or B or C or D) 4: Function 4 (A and B and C and D)	0	2

* Selectable only for step operation models.

Display	Item	Contents	Initial value	User level
di1.3 to di3.3	Internal contact 1 to 5 Input assignment A	0: Normally open (OFF, 0) 1: Normally close (ON, 1) 2 to 9: Undefined 10: Internal event 1 11: Internal event 2 12: Internal event 3	2 to 5 or 0	2
di1.4 to di3.4	Internal contact 1 to 5 Input assignment B	13: Internal event 4 14: Internal event 5 15: Internal event 6 * 16: Internal event 7 * 17: Internal event 8 * 18: Communication DI1 19: Communication DI2	0	2
di1.5 to di3.5	Internal contact 1 to 5 Input assignment C	20: Communication DI3 21: Communication DI4 22: MANUAL mode 23: READY mode 24: Undefined 25: During AT execution 26: During SP ramp	0	2
di1.6 to di3.6	Internal contact 1 to 5 Input assignment D	27: Undefined 28: Alarm is enabled. 29: PV alarm is enabled. 30: Undefined 31: Mode key function selection status 32: Event output 1 status 33: Control output 1 status	0	2
di1.7 to di3.7	Internal contact 1 to 5 Polarity A to D	Digits are called as 1st digit, 2nd digit, 3rd digit and 4th digit from the right end digit.	0000	2
	1st digit: Polarity A (Polarity of input assignment A)	0: Direct 1: Reverse	0	
	2nd digit: Polarity B (Polarity of input assignment B)		0	
	3rd digit: Polarity C (Polarity of input assignment C)		0	
	4th digit: Polarity D (Polarity of input assignment D)		0	
di1.8 to di3.8	Internal contact 1 to 5 Polarity	0: Direct 1: Reverse	0	2
di1.9 to di3.9	Internal contact 1 to 5 Internal event No.assignment	0: Every internal event 1 to 5: Internal event number	0	2

■ DO assignment bank
Bank selection: do

Display	Item	Contents	Initial value	User level
ot1.1 Ev1.1 to Ev3.1	Control output 1, event output 1 to 3 Operation type	0: Input of default 1: MV1 (ON/OFF control output, time proportional output, heat-side proportional output of heat/cool control) 2: MV2 (cool-side proportional output of heat/cool control) 3: Function 1 ((A and B) or (C and D)) 4: Function 2 ((A or B) and (C or D)) 5: Function 3 (A or B or C or D) 6: Function 4 (A and B and C and D)	0	2
ot1.2 Ev1.2 to Ev3.2	Control output 1, event output 1 to 3 Output assignment A	0: Normally open (OFF, 0) 1: Normally close (ON, 1) 2: Internal event 1 3: Internal event 2 4: Internal event 3 5: Internal event 4 6: Internal event 5 7: Internal event 6 * 8: Internal event 7 * 9: Internal event 8 * 10 to 13: Undefined 14: MV1 15: MV2 16 to 25: Undefined 26: Internal contact 1 27: Internal contact 2 28: Internal contact 3 29 to 33: Undefined	14 to 15 or 2 to 4	2
ot1.3 Ev1.3 to Ev3.3	Control output 1, event output 1 to 3 Output assignment B	34: Communication DI1 35: Communication DI2 36: Communication DI3 37: Communication DI4 38: MANUAL mode 39: READY mode 40: Undefined 41: During AT execution	0	2
ot1.4 Ev1.4 to Ev3.4	Control output 1, event output 1 to 3 Output assignment C	42: During SP ramp 43: Undefined 44: Alarm is enabled. 45: PV alarm is enabled. 46: Undefined 47: Mode key function selection status 48: Event output 1 status 49: Control output 1 status	0	2
ot1.5 Ev1.5 to Ev3.5	Control output 1, event output 1 to 3 Output assignment D			
ot1.6 Ev1.6 to Ev3.6	Control output 1, event output 1 to 3 Polarity A to D	Digits are called as 1st digit, 2nd digit, 3rd digit and 4th digit from the right end digit.	0000	2
	1st digit: Polarity A	0: Direct 1: Reverse	0	
	2nd digit: Polarity B		0	
	3rd digit: Polarity C		0	
	4th digit: Polarity D		0	
ot1.7 Ev1.7 to Ev3.7	Control output 1, event output 1 to 3 Polarity	0: Direct 1: Reverse	0	2
ot1.8 Ev1.8 to Ev3.8	Control output 1, event output 1 to 3 Latch	0: Disabled 1: Enabled (Latch at ON) 2: Enabled (Latch at OFF, except at the time of initialization after power ON)	0	2

* Selectable only for step operation models.

■ User function bank
Bank selection: UF

Display	Item	Contents	Initial value	User level
UF-1	User function definition 1	This is the display in upper display. The setup exception is as follows: ----: Yet to be registered. P-_: Proportional band of the PID group in use I-_: Integration time of the PID group in use d-_: Derivative time of the PID group in use rE-_: Manual reset of the PID group in use oL-_: MV low limit of the PID group in use oH-_: MV high limit of the PID group in use P-_C: Cool-side proportional band of the PID group in use I-_C: Cool-side integration time of the PID group in use d-_C: Cool-side derivative time of the PID group in use oL_C: Cool-side MV low limit of the PID group in use oH_C: Cool-side of MV high limit of the PID group in use	----	1
UF-2	User function definition 2		----	1
UF-3	User function definition 3		----	1
UF-4	User function definition 4		----	1
UF-5	User function definition 5		----	1
UF-6	User function definition 6		----	1
UF-7	User function definition 7		----	1
UF-8	User function definition 8		----	1

■ Lock bank
Bank selection: LoC

Display	Item	Contents	Initial value	User level
LoC	Key lock	0: All settings are enabled. 1: Mode, event, operation display, SP, UF, lock, manual MV, and mode key can be set. 2: Operation display, SP, UF, lock, manual MV, and mode key can be set. 3: UF, lock, manual MV, and mode key can be set.	0	0
L.LoC	Loader lock	0: Loader communication read/write is enabled. 1: Loader communication read/write is disabled.	0	2
PASS	Password display	0 to 15 5: Password 1A to 2B display	0	0
PS1A	Password 1A	0000 to FFFF (hexadecimal value)	0000	0
PS2A	Password 2A	0000 to FFFF (hexadecimal value)	0000	0
PS1b	Password 1B	0000 to FFFF (hexadecimal value)	0000	0
PS2b	Password 2B	0000 to FFFF (hexadecimal value)	0000	0

■ Instrument information bank
Bank selection: id

Display	Item	Contents	Initial value	User level
id01	ROM ID	4 fixed	—	2
id02	ROM version 1	XX. XX (2 digits after decimal point)	—	2
id03	ROM version 2	XX. XX (2 digits after decimal point)	—	2
id04	SLP support Information		—	2
id05	EST support version		—	2
id06	Manufacturing date code (year)	Year - 2000. Ex.: “8” means the year 2008.	—	2
id07	Manufacturing date code (month, day)	Month + Day ÷ 100. Ex.: “12.01” means the 1st day of December	—	2
id08	Serial No.		—	2

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