No. CP-SP-1448E

Single Loop Controller

Model C1M

User's Manual

for Installation and Configuration



Thank you for purchasing your Azbil Corporation product.

This manual contains information for ensuring the safe and correct use of the product.

Those designing or maintaining equipment that uses this product should first read and understand this manual. This manual contains information not only for installation, but also for maintenance, troubleshooting, etc. Be sure to keep it nearby for handy reference.

Azbil Corporation

Getting Up to Speed with model C1M

The quick reference guide on pages D-1 to D-8 summarizes key operations, parameters, and settings, and gives concrete operation examples using illustrations.

Try looking at these pages first, and then read the main text for details.

A separate color version of the quick guide printed on dirt-resistant paper is available for convenient use on the work site (document No. CP-SP-1450E).

Contact the azbil Group or a distributor for details.

NOTICE

Please make sure that this manual is available to the user of the product.

Unauthorized duplication of 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 complete and accurate, but if you should find an omission or error, please contact us.

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

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Modbus[™] is a trademark and the property of Schneider Electric SE, its subsidiaries and affiliated companies.

Safety Requirements



To reduce the risk of an electric shock resulting in personal injury, follow all safety notices in this document.

This symbol warns the user of a potential shock hazard.

Use of this product in a manner not specified by the manufacturer will impair its built-in safety features.

Do not replace any component except as specified by the manufacturer.

All wiring work must comply with local regulations and be carried out by authorized and experienced personnel.

Make sure to provide a cutoff switch for the power to this device within reach of the operator.

When wiring the power for AC power models, install a time-lag (T) fuse (rated current 0.5 A, rated voltage 250 V). (IEC 60127)

• Device Ratings

Voltage:	100 to 240 V AC (operating voltage: 85 to 264 V AC)
Frequency:	50/60 Hz
Power consumption:	8 VA max.

• Operating Environment

Do not operate this device in the presence of flammable liquids or vapors. Operation in such environments is a safety hazard.

Operating temperature:	-10 to +55 °C
Operating humidity:	10 to 85 % RH (without condensation)
Vibration:	0 to 5 m/s ² (10 to 60 Hz)
Overvoltage category:	II (IEC 60364-4-443, IEC 60664-1)
Pollution degree:	2
Installation location:	indoors
Elevation:	2000 m max.

Device Installation

This product should be installed in a panel to protect the operator from accidental contact with the rear terminals.

Common mode voltage of all I/O except for supply power and relay contact outputs: voltage to ground of 30 V_{rms} max., 42.4 V peak max., and 60 V DC max.

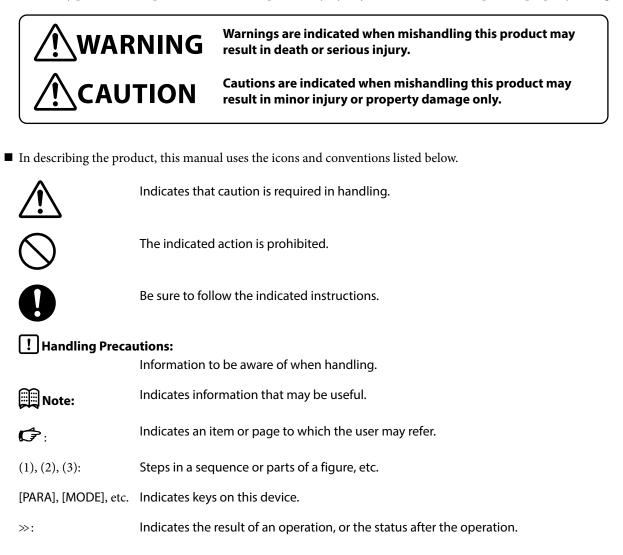
Standards compliance

EN 61010-1, EN 61326-1 (for use in industrial locations)

During EMC testing, the reading or output may fluctuate by ± 10 % FS (for MFB: ± 30 % FS).

Conventions Used in This Manual

■ The safety precautions explained below aim to prevent injury to you and others, and to prevent property damage.



• Numeric value and character display on LCD

0	1	Ē.	2	3	4	
5	6		7	8	9	

Numeric values: The 7-segment LCD expresses numeric values as follows:

Alphabetical characters: The 7-segment LCD expresses alphabetical characters shown below. There are some alphabetical characters which are not displayed on the LED.

А		В	С	D	E	
а	0	b	с	d	е	
F		G	Н	Ι	J	
f	□ □	g	h	i	j	
к		L	М	Ν	0	
k		I	m	n	0	
Ρ		Q	R	S	Т	
р	, o	q	r	s	t	
U		۷	Y	Z	-	
u		v	у	z		

! Handling Precautions:

• As shown above, the following are shown in the same way: the number 2 and the letter Z, the number 5 and the letter S, and the number 9 and the letter Q.

Safety Precautions

To prevent electrical shock, this device must be installed in a location that is only accessible to people with appropriate knowledge about electrical safety. Install this device inside a control panel that cannot be opened without the use of a key or tool.

Do not use this device in an environment with conductive contamination, or with dry non-conductive contamination which can become conductive due to condensation, etc. Otherwise, problems such as tracking phenomena may damage parts, resulting in fire.

Be sure to use the fuse described in the specifications for the power wiring of this device. Otherwise, tracking phenomena or parts failure due to other factors may cause fire.

Be sure to check that the device has been correctly wired before turning on the power. Incorrect wiring of this device may cause device failure and also lead to a dangerous accident.

Before removing, mounting, or wiring this device, be sure to turn off the power to this device and all connected devices. After wiring this device, attach the separately sold terminal cover (model No. 84515888-001). Otherwise, there is a danger of electric shock.



Do not disassemble this device. There is a danger of electric shock or device failure.

Do not touch live parts such as the power terminals. There is a danger of electric shock.



Use this device within the operating ranges given in the specifications (for temperature, humidity, voltage, vibration, shock, mounting direction, atmosphere, etc.). Otherwise, there is a danger of fire or device failure.
Do not block the ventilation holes. There is a danger of fire or device failure.
Wire this device correctly in compliance with applicable standards, and use the power source and installation methods specified in this user's manual. Otherwise, there is a danger of fire, electric shock, or device failure.
Do not allow wire clippings, metal shavings, water, etc., to enter the case of this device. There is a danger of fire or device failure.
Firmly tighten the terminal screws to the torque listed in the specifications. Insufficient tightening may result in fire or electric shock.
Do not use unused terminals as relay terminals. There is a danger of fire, electric shock, or device failure.
Use the relays within the recommended service life. Otherwise, there is a danger of fire or device failure.
Use an appropriate overcurrent protection device (fuse, circuit breaker, etc.) with a sufficient breaking capacity for lines to which the relays of this device are connected to protect the circuits. Otherwise, there is a danger of fire or device failure.

	there is a risk of a power surge caused by lightning, use a surge absorber (surge protector). therwise, there is a danger of fire or device failure.
	o not operate the keys with a sharp object (such as a mechanical pencil tip, etc.). Doing so an cause device failure.
	o remove dirt from this device, wipe it with a soft dry cloth. ever use an organic solvent such as paint thinner or benzene, or a detergent.
//\	o not use this device in wet places or with wet hands. here is a danger of electric shock.
	o not use the current transformer input for measurement in a place that falls into neasurement category II, III, or IV. There is a danger of fire, electric shock, or device failure.

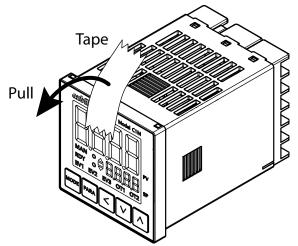
Before Using This Device

There is a film over the console on the front of this device to protect the surface.

After the installation and wiring work is completed, stick a piece of tape on the corner of the console and pull it in the direction indicated by the arrow below to remove the protective film.

! Handling Precautions:

• Removing the protective film with your fingernail may cause scratches on the console.



The Role of This Manual

There are five different manuals related to model C1M Single Loop Controller (hereafter "this device"). Read them as necessary for your specific requirements.

If you do not have a manual you require, please contact us or one of our dealers.

Alternatively, you can download the necessary manuals from http://www.azbil.com.



Single Loop Controller Model C1M User's Manual for Installation and Configuration Document No. CP-SP-1448E

This manual.

This manual describes the hardware and all functions of this device. Personnel in charge of the design, manufacture, operation, or maintenance of equipment that incorporates this device, or those in charge of communication software for equipment that uses this device's communication functions, should read this manual thoroughly.

This manual also describes the installation, wiring, connections for communication, functions and settings of this device, operating procedures, communication with a master station (PC, etc.), communication addresses, troubleshooting, and detailed specifications.



Single Loop Controller Model C1M User's Manual

Document No. CP-UM-5964JEC

This manual is supplied with the product. It has descriptions in Japanese, English, and Chinese. Personnel in charge of the design or manufacture of equipment that incorporates this device should read this manual thoroughly. This manual covers safety precautions, installation, wiring, main specifications, and parameters of this device. For further information about operation, refer to the user's manual for installation and configuration.



Quick Reference Guide for Model C1M

Document No. CP-SP-1450E

For those using this device for the first time or for operators on the work site, this guide serves as a reference when specifying parameters.

Key operations, menu flowcharts and parameter settings are described with color illustrations.



Smart Loader Package Model SLP-C1F Installation Manual

Document No. CP-UM-5986JEC

This manual is supplied with the product. It has descriptions in Japanese, English, and Chinese. Personnel in charge of the design or manufacture of equipment that incorporates this device should read this manual thoroughly. This manual covers safety precautions, installation, wiring, main specifications, and parameters of this device. For further information about operation, refer to the user's manual on detailed functions.



User's Manual for Detailed Functions of Smart Loader Package Model SLP-C1F for Single Loop Controller Model C1A/C1M

Document No. CP-SP-1463E

This manual is supplied with Smart Loader Package model SLP-C1F.

This manual describes the software used on a PC to configure model C1M. Those designing or setting up equipment that uses model C1M should read this manual. The manual describes installation of the software into a PC, operation of the PC, various functions, and setup procedures.

Organization of This User's Manual

This manual is organized as shown below.

Quick Refer	ence Guide	
		Parameters, settings, and concrete operation examples with illustrations.
		For quick understanding of this device, read this section first.
Chapter 1.	Overview	
		This product's applications, features, model selection, and part names and their functions. The terms introduced in this chapter are used in the subsequent descriptions, so make sure to understand them.
Chapter 2.	Outline of Func	tions
		Overview of functions and operations.
Chapter 3.	Installation	
		Operating environment, installation procedures, necessary tools.
Chapter 4.	Wiring	
		Wiring procedures and precautions, and connection examples.
Chapter 5.	Functions	
		Detailed description of functions.
Chapter 6.	Displayed Item	s and Settings
		Displayed items and settings.
Chapter 7.	CPL Communic	ation Function
		Communication with a host device (PC, PLC, etc.) using Azbil's standard CPL communication and RS-485.
Chapter 8.	Modbus Comm	unication Function
		Communication with a host device (PC, PLC, etc.) using Modbus communication and RS-485.
Chapter 9.	PLC Link Comm	unication Function
		Communication with a PLC using RS-485 without the need for special programs.
Chapter 10.	List of Commun	ication Data
		A list of communication data in the memory of this device.
Chapter 11.	Maintenance ar	nd Troubleshooting
		Maintenance, inspection, and troubleshooting.
Chapter 12.	Calibration and	Inspection
		Calibration to maintain accuracy for safe operation.
Chapter 13.	Disposal	
		Disposal of this device when it is no longer used.
Chapter 14.	Specifications	
		General specifications, performance specifications, and optional parts.

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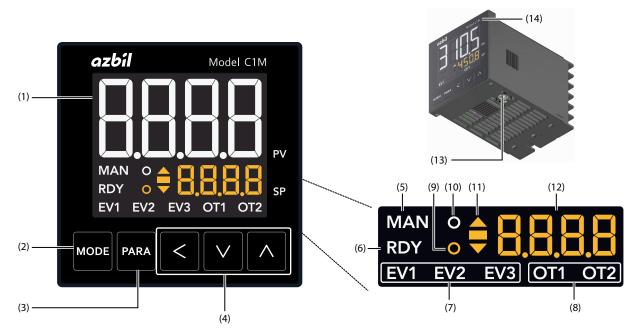
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Quick Reference Guide for Model C1M

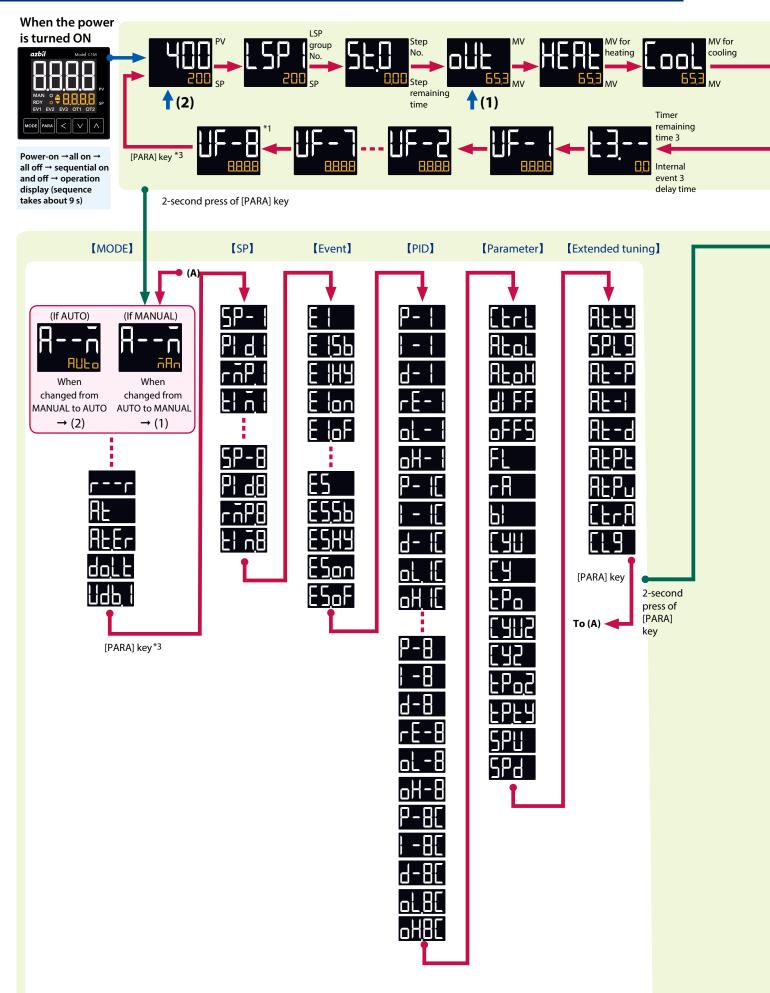
This guide offers a summary of key operations, parameter flowcharts, and settings, for convenient reference at the operation site This guide is made for repeated use. Dirt wipes off easily and even notes written with an oil-based felt-tip pen can be removed with an eraser.

If more detailed information on model C1M is needed, refer to the user's manual for installation and configuration (CP-SP-1448E). The most convenient way to configure the C1M is with the Smart Loader Package (model No. SLP-C1FJA_). Please contact the azbil Group or a distributor for more information.

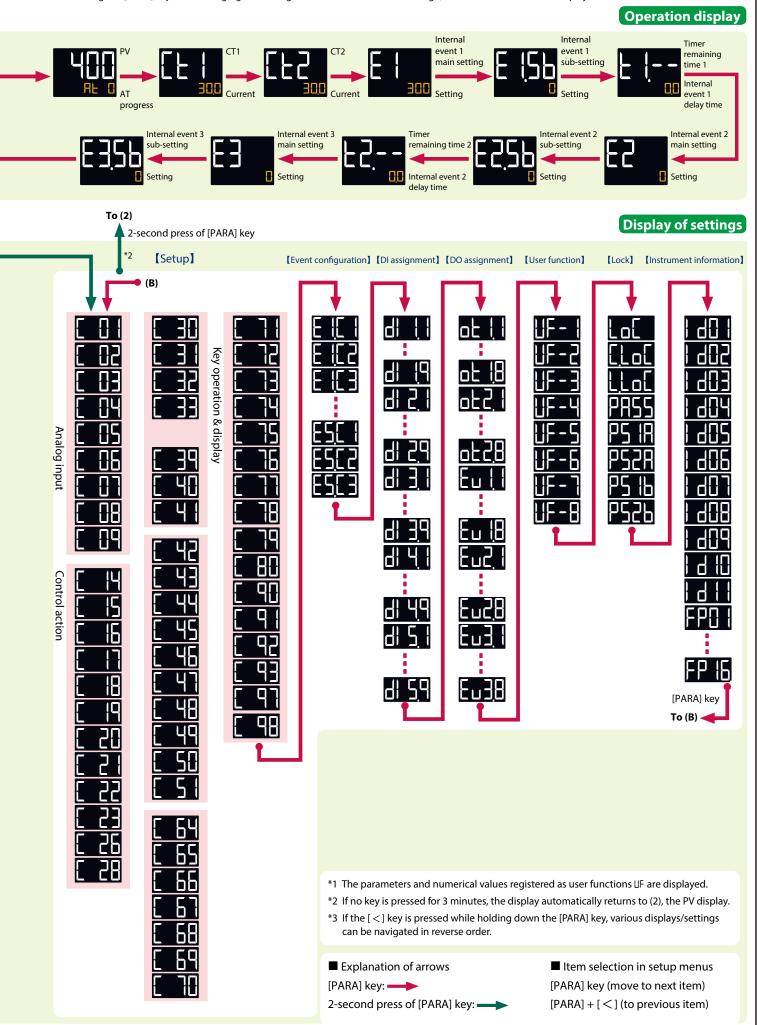


(1)	Upper display	Shows PV (present temperature, etc.) or items that can be set.
(2)	[MODE] key	Pressing this button shows the operation display. If it is held down for 1 second or longer, the preset operation (initial setting: AUTO/MANUAL selection) can be executed.
(3)	[PARA] key	Switches the display.
(4)	$[<],[\vee],$ and $[\wedge]$ keys	Used for incrementing/decrementing numeric values and performing arithmetic shift operations.
(5)	MAN mode indicator	Lights up in MANUAL mode.
(6)	RDY mode indicator	Lights up in READY (control stop) mode.
(7)	Event indicator	Lights up when the corresponding event output is ON.
(8)	Control output indicator	Lights up when the corresponding control output is ON.
(9)	Status indicator	Lights up according to the setting of the status indicator. (Default: Not used)
(10)	AT indicator	Flashes during AT execution.
(11)	Slope display unit	Shows the operation status during a step operation.
(12)	Lower display	Shows SP (set temperature, etc.) and other settings.
(13)	Loader connector	Connected to the PC using the USB loader cable included with the Smart Loader Package.
(14)	Protective film	Protects the surface. Please remove the protective film before use.

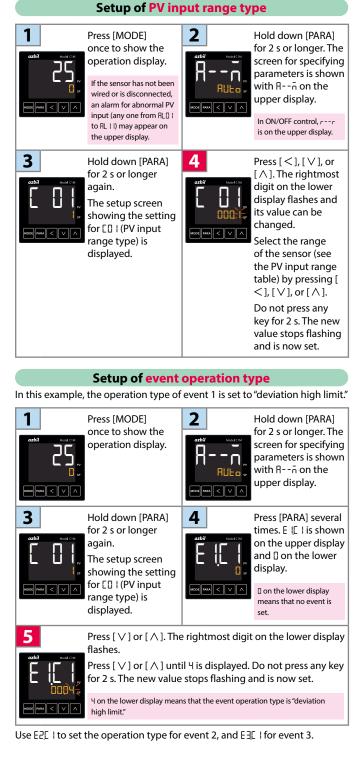
Flowchart of Key Operations and Displays



○ Some items are not displayed depending on the availability of optional functions, model number, display setup ([]] to []] and user level ([]]. ○ Pressing the [PARA] key while changing the setting of an item will cancel the change, and the next item will be displayed.



Operation Examples



 Red letters
 : Initial setup procedure

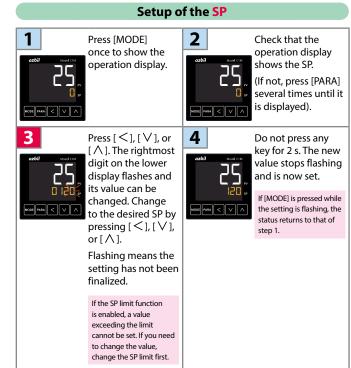
 Blue letters
 : Procedure during operation

 Execution of auto tuning (AT)

AT forces ON/OFF of the MV a number of times (a limit cycle) to calculate PID values. Check that this operation does not create any problems for the associated equipment before executing AT.

1 Press [MODE] once to show the operation display.	2 Hold down [PARA] for 2 s or longer. The screen for specifying parameters is shown with Rn on the upper display.
3 Press [PARA] twice. RL is shown on the upper display and RL _□ F on the lower display.	4 Press [∨] or [∧]. RŁoF flashes. The display flashes only in RUN and AUTO modes, and only if there is no PV
www. < V ∧ If the control method is ON/OFF control and if bit 3 (AT stop/start display) of [] (mode display setup) is "0" (disabled), the parameter and setting are not displayed.	input error. Also, if "AT stop/start" is set as the DI assignment, the display does not flash and the setting cannot be changed using the keys.
5 Press [∧] once. Rtpn flashes on the lower display.	6 Do not press any key for 2 s. RLpn stops flashing and AT begins.
€HLon, www.mansiev	→ Cheon → During AT, the AT indicator flashes and repeatedly.
	When AT and the calculation of PID constants are done, the indicator turns off.

During the AT process, if the mode is changed to READY or MANUAL, if PV input is faulty, or if a power failure occurs, AT stops automatically without changing the PID constants. AT can also be stopped by changing the setting from $R_{L_{DT}}$ to $R_{L_{DT}}F$ (return to step 3 above).



For highlighted steps (e.g., 4), the following precaution applies: • If keys are locked, the setting does not flash and cannot be changed. To change the setting, cancel the key lock first.

		•				
R	UN/READY mode select	lion		Setup of e	vent value	
once	s [MODE] e to show the ration display.	upper display.		Press [MODE] once to show the operation display.		Hold down [PARA] for 2 s or longer. The screen for specifying parameters is shown with $\Pi - \overline{n}$ on the upper display.
the u and a show display the u and a show disp	s [PARA] once. · is shown on upper display rdY or rUn is wn on the lower lay. current mode is ated by rUn (RUN) or READY). s [∨] or [∧] to ct rUn or rdY. 6	is on the upper display. Press [∨] or [∧]. The lower display flashes. If "RUN/READY selection" is set as the DI assignment, the display does not flash and the mode cannot be changed using the keys. Do not press any key for 2 s. The new value stops flashing		Press [PARA] several times. E is shown on the upper display and [] on the lower display. [] on the lower display means that the event main setting is "0."	4	Press [<], [\lor], or [\land]. The rightmost digit on the lower display flashes and its value can be changed. Change to the desired event setting by pressing [<], [\lor], or [\land]. Flashing means the setting has not been finalized.
				and is now set. If [MODE] is pressed while t step 1.	he setting is flashing,	the status returns to that of
	Setup of PID values		Use E2 to speci	• ify the setting for event	t 2, and E∃ for e	vent 3.
once	s [MODE] e to show the ration display.	upper display.		To proceed to hysteresis setup, press [√] twice or press [∧] several times. E [HY is shown on the upper display		Press [<], [\lor], or [\land]. The rightmost digit on the lower display flashes and its value can be changed.
sever	s [PARA] portional band) own on the er display and present setting own on the er display.	Change to the desired P value by		and 5 on the lower display. 5 on the lower display means that the hysteresis setting is "5."		Change to the desired hysteresis setting by pressing $[<], [\lor], or [\land].$ Do not press any key for 2 s. The new value stops flashing and is now set.
is ON parar	e control method //OFF control, the meter and setting not displayed.	pressing [<], [\lor], or [\land]. Flashing means the setting has not been finalized. The setting range of the	Use E2H4 to spi	ecify the hysteresis sett	ing for event 2,	and E∃H∃ for event 3.
	not press any key for 2 s. The ne	proportional band is from 0.1 to 999.9 %. w value stops flashing				
azbil Model CIM	is now set. ODE] is pressed while the setting is flashin 1.	g, the status returns to that of				
Use - for specifying	g the integral time (0–9999 s) a	nd d- I for the				

Use | - | for specifying the integral time (0–9999 s) and d- | for the derivative time (0–9999 s).

Parameters

Display Left: upper display Right: lower display				Initial value	Setting
	Value (SP)	SP (target value) S	P low limit to SP high limit	0	
1 SP (+1	LSP		to LSP system group (max. 8)	1	
SE - *1	Step remaining time	Step No., step remaining time N S	Not applicable step No. indicates whether the process is ramp-up, ramp-down, or soak.	-	
oUt	Value		10.0 to +110.0 % Setting is enabled in MANUAL mode (value flashiing)	•	
HERE	Value	Heat MV (Manipulated Variable) N	Not applicable.	-	
Cool	Value	Cool MV (Manipulated Variable)	10.0 to +110.0 %	-	
Value (PV)	RE 1*1	AT progress display (the last digit) N	Not applicable.	-	
EE I	Value	CT current value 1 N	Not applicable.		
CF5	Value	CT current value 2 N	Not applicable.		
EI	Value	Internal Event 1 main setting -	1999 to +9999 U or 0 to 9999 U	0	
E (Sb	Value	Internal Event 1 sub-setting		0	
E *1	Value		Not applicable. Jpper display: ON delay / OFF delay distinction is displayed.	-	
E5	Value	Internal Event 2 main setting S	ame as Internal Event 1 main setting	0	
E256	Value	Internal Event 2 sub-setting S	Same as Internal Event 1 sub-setting	0	
£2 *1	Value	Timer remaining time 2 S	Same as Timer remaining time 1	-	
E 3	Value	Internal Event 3 main setting S	Same as Internal Event 1 main setting	0	
E 356	Value	Internal Event 3 sub-setting S	Same as Internal Event 1 sub-setting	0	
£3 *1	Value	Timer remaining time 3 S	Same as Timer remaining time 1		

Parameter settings

Display	Item	Contents	Initial value	Setting
Rñ	AUTO/MANUAL	RUEs: AUTO mode nRn: MANUAL mode	AUTO	
rr	RUN/READY	rUn: RUN mode rdy: READY mode	RUN	
AF	AT execution/stop instructions	REaF: AT stop REan: AT execution	AT stop	
AFEr	Auto tuning error	EngF: Normal Engn: Abnormal	Normal	
dalit	Release all DO latchs	Lbon: Latch continue LboF: Latch release	Latch continue	
Udb, I	User-defined bit	dbpF: OFF_dbpn: ON	OFF	

SP [SP bank]

Display	Item	Contents	Initial value	Setting
SP- 1~ SP-8	SP (for LSP1 to 8)	SP low limit to SP high limit	0	
P1 d, 1 ~ P1 dB	PID group number (for LSP1 to 8)	1 to 8	1	
nñP, I ~ nñPB	Ramp (for LSP1 to 8)	0 to 9999	0	
El ñ, l∼ El ñB	Soak time (for LSP1 to 8)	0.0 to 999.9 or 0 to 9999	0	

Eu [Event bank]

Display		ltem	Contents	Initial value	Setting
E I~ES		Internal Event 1 to 5 main setting	-1999 to +9999 U or 0 to 9999 U*	0	
E (Sb ~ ESSb		Internal Event 1 to 5 sub-setting		0	
E 1H9 ~ ESH9		Internal Event 1 to 5 hysteresis	0 to 9999*	5	
E lon ~ ESon	•	Internal Event 1 to 5 ON delay time	0.0 to 999.9 or 0 to 9999	0	
E IoF ~ ESoF	•	Internal Event 1 to 5 OFF delay time		0	

of decimal places changes according to the operation type of the internal event.

PI [PID bank]

Display		Item	Contents	Initial value	Setting
P- 1~ P-8		Proportional band (1 to 8)	0.1 to 999.9 %	5.0	
1 - 1 ~ 1 -8		Integration time (1 to 8)	0 to 9999 s (No integral control action when set at "0")*	120	
d-1~d-8		Derivative time (1 to 8)	0 to 9999 s (No derivative control action when set at "0")*	30	
rE-1~rE-8		Manual reset (1 to 8)	-10.0 to +110.0 %	50.0	
oL - 1 ~ oL - 8	•	MV low limit (1 to 8)	-10.0 to +110.0 %	0.0	
oH- I ~ oH-8	٠	MV high limit (1 to 8)	-10.0 to +110.0 %	100.0	
P- IC ~ P-BC		Cool-side proportional band (1 to 8)	0.1 to 999.9 %	5.0	
1 - IC ~ I -BC		Cool-side integration time (1 to 8)	0 to 9999 s (No integral control action when set at "0")*	120	
d- IC ~ d-8C		Cool-side derivative time (1 to 8)	0 to 9999 s (No derivative control action when set at "0")*	30	
ol., IC ~ ol.,8C	•	Cool-side MV low limit (1 to 8)	-10.0 to +110.0 %	0.0	
oH, IC ~ oHBC	٠	Cool-side MV high limit (1 to 8)	-10.0 to +110.0 %	100.0	

PR-B [Parameter bank]

	Display		Item	Contents	Initial value	Setting
	EbrL		Control method	0: ON/OFF control 1: Fixed PID	0 or 1	
Q	Ab,oL		MV low limit at AT	-10.0 to +110.0 %	0.0	
Control	RE,oH		MV high limit at AT	-10.0 to +110.0 %	100.0	
<u></u>	di FF		ON/OFF control differential	0 to 9999 U	5	
	oFFS	•	ON/OFF control operating point offset	-1999 to +9999 U	0	
	FL		PV filter	0.0 to 120.0 s	0.0	
٧	rЯ	•	PV ratio	0.001 to 9.999	1.000	
	Ы		PV bias	-1999 to +9999 U	0	
	C 4U	•	Time proportional cycle unit 1	0: Unit of 1 s 1: Fixed at 0.5 s 2: Fixed at 0.25 s 3: Fixed at 0.1 s	0	
	ГЧ	-	The second se		10	
	19		Time proportional cycle 1	5 to 120 s or 1 to 120 s (5 to 120 s when output includes relay output)	10 or 2	
Time proportional outpu	ΕPo		Time proportional minimum ON/OFF time 1	Set value: 0 If either one of the conditions below is true, 250 ms applies. Otherwise, 1 ms applies. • MVI is set for relay output or event output in DO assignment. • Time proportional cycle is 10 s or longer. <u>Set value: 1-255</u> If MVI is set for relay output or event output in DO assignment. 1-49:50 ms applies. 50-250: The set value applies.	0	
portio	C 405	•	Time proportional cycle unit 2	0: Unit of 1 s 1: Fixed at 0.5 s 2: Fixed at 0.25 s 3: Fixed at 0.1 s	0	
nal out	C.R5		Time proportional cycle 2	5 to 120 s or 1 to 120 s (5 to 120 s when output includes relay output)	10 or 2	
utput	EPa2		Time proportional minimum ON/OFF time 2	Set subure.0 If either one of the conditions below is true, 250 ms applies. Otherwise, 1 ms applies. WW2 is set for relay output or event output in DO assignment. - Time proportional cycle is 10 s or longer. Set value: 1-250 If MV2 is set for relay output or event output in DO assignment, 1-49:50 ms applies. 50-250: The set value applies.	0	
	EPES	•	Time proportional cycle mode	0: Controllability aiming type 1: Operation end service life aiming type (Only ON/OFF operation within Time proportional cycle)	0 or 1	
SP	SPU	•	SP up ramp (U/min)	0.0 to 999.9 U (No ramp when set at 0.0 U)	0.0	
52	SPd	•	SP down ramp (U/min)		0.0	

U (unit): The smallest unit of an industrial quantity (°C, Pa, L/min, etc.) of a PV range

(Extended tuning bank)

Display	Т	Item	Contents	Initial value	Setting
AFFA		AT type	0: Normal 1: Immediate response 2: Stable*	1	
SPL9	•	SP lag constant	0.0 to 999.9	0.0	
AF-b	•	AT Proportional Band adjust	0.00 to 99.99	1.00	
AF-I	•	AT Integral time adjust	0.00 to 99.99	1.00	
AE-d	•	AT Derivative time adjust	0.00 to 99.99	1.00	
REPE	•	Type of MV switching point at AT	0: Default (2/3 of initial PV and SP) 1: SP 2: PV	0	
REPu	•	MV switching point PV in AT	-1999 to +9999 U	0	
Сыся	•	Control algorithm	0: PID (Conventional PID) 1: Ra-PID (High-performance PID)	0	
CL9	•	Cooling Gain	-10.0 to +110.0 %	30.0	

* Normal = standard control characteristics, immediate response = control with quick response to external disturbance, stable = control with less PV fluctuation

: Essential parameters for PV measurement and control

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Control actio

SP

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- : Basic parameters
- : Required when using optional functions

Setup bank, etc., settings

EUP	ľ	Setup bank]			
Display		Item	Contents	Initial value	Setting
0.01		PV input range type For details, refer to the PV Input Range Table		Depends	
				on the model	
C 05		Temperature unit	0: Centigrade (°C) 1: Fahrenheit (°F)	0	
E 03	٠	Reference junction compensation (Cold junction compensation)	0: Performed (internal) 1: Not performed (external)	0	
E 84		Decimal point position	0: No decimal point 1 to 3: 1 to 3 digits below decimal point	0	
C 05		PV range low limit	When the PV input type is DC voltage/DC current,	0	
C 06 C 07	•	PV range high limit SP low limit	-1999 to +9999 U PV input range low limit to PV input range high limit	1000	
C 08	•	SP high limit		•	
C 09	•	PV square root extraction dropout	0.0 to 100.0 $\%$ (PV square root extraction is not performed when set at 0.0.)	0.0	
EN		Control action (Direct/Reverse)	0: Heat control (Reverse action) 1: Cool control (Direct action)	0	
C 15	٠	Output operation at PV alarm	0: Control calculation is continued. 1: Output at PV alarm is output.	0	
C 16		Output at PV alarm	-10.0 to +110.0 %	0.0	
E 17 E 18		Output at READY (Heat) Output at READY (Cool)	-10.0 to +110.0 % -10.0 to +110.0 %	0.0	
E 19	•	Output operation at changing AUTO/ MANUAL	0: Bumpless transfer 1: Preset	0	
C 20	•	Preset MANUAL value	-10.0 to +110.0 %	0.0 or 50.0	
F 21	•	Initial output type (mode) of PID control	0: Auto 1: Not initialized 2: Initialized	0	
C 55	٠	Initial output of PID control	-10.0 to +110.0 %	0.0 or 50.0	
E 23	•	Integral time and derivative time decimal		0	
6 26		point position Heat/Cool control	2: XX.XX 3: X.XXX 0: Not used 1: Individual PID 2: Common PID	0	
62.3		Heat/Cool control dead zone	-100.0 to +100.0 %	0.0	
08 3 0 3 1		LSP system group SP ramp type	1 to 4 0: Standard 1: Multi-ramp	1	
			 Step operation: When the power is turned ON again, the step operation is stopped (READY) Step operation: When the power is turned ON again, the 		
C 32	•	SP ramp unit	step operation is reset 0: 0.1 U/s 1: 0.1 U/min 2: 0.1 U/h	1	
E 33		STEP time unit	0: 0.1 s 1: 1 s 2: 1 min	2	
E 34 E 35	+	STEP PV start STEP loop	0: None 1: Up start 2: Down start 0: Stop 1: Loop 2: Final step continued	0	
C 36	Π	CT1 operation type	0: Heater burnout detection	0	
C 31	H	CT1 output	1: Current value measurement 0 to 1: Control output 1 to 2	0	
C 38	\square	CT1 measurement wait time	2 to 4: Event output 1 to 3 30 to 300 ms	30	
E 39		CT2 operation type	Same as CT1	0	
C 40 C 41	\vdash	CT2 output CT2 measurement wait time	Same as CT1 Same as CT1	0	
C 42		Control output 1 range	1:4 to 20 mA 2:0 to 20 mA	1	
C 43		Control output 1 type	0: MV 1: Heat MV 2: Cool MV 3: PV 4: PV before ratio, bias, and filter	0	
			5: SP 6: Deviation 7: CT1 current value 8: CT2 current value 9: Invalid 10: SP+MV		
E 44		Control output 1 scaling low limit	11: PV+MV -1999 to +9999 U	0.0	
C 45		Control output 1 scaling high limit	-1333 (0 +3333 0	100.0	
С 46 С 41		Control output 1 MV scaling bandwidth Control output 2 range	0 to 9999 (Valid when control output 1 type is 10 or 11) Same as control output 1	200	
C 48		Control output 2 type	Same as control output 1	3	
C 49 C 50	\square	Control output 2 scaling low limit Control output 2 scaling high limit	Same as control output 1 Same as control output 1	0	
C 51		Control output 2 MV scaling bandwidth	Same as control output 1	200	
C 64		Communication type	0: CPL 1: Modbus/ASCII 2: Modbus/RTU 3: PLC-Link communication	0	
C 65 C 66		Station address Transmission speed (bps)	0 to 127 (Communication is disabled when set at "0".) 0:4800 1:9600 2: 19200 3: 38400	0	
C 61		Data format (Data length)	0:7 bits 1:8 bits	1	
C 68 C 69	\vdash	Data format (Parity) Data format (Stop bit)	0: Even parity 1: Odd parity 2: None parity 0: 1 bit 1: 2 bits	0	
C 10	•	Communication minimum response time	1 to 250 ms	3	
E 11 E 12	-	Key operation type [MODE] key function	0: Standard type 1: Special type 0: Invalid 1: AUTO/MANUAL selection	0	
			2: RUN/READY selection 3: AT execution/stop instructions 4: LSP group selection 5: Release all DO latches		
C 13	•	MODE display setup	6: Invalid 7: User-defined bit 1 selection 8: Invalid Bit 0: AUTO/MANUAL display (Enabled: +1)	255	
		(Sum of the weighting)	Bit 1: RUN/READY display (Enabled: +2) Bit 2: Invalid		
			Bit 3: AT Stop/Start display (Enabled: +8)		
			Bit 4: Release all DO latches display (Enabled: +16) Bit 5: User-defined bit 1 ON/OFF display (Enabled: +32)		
E 74	•	PV/SP display setup	Bit 6 to 7: Invalid Bit 0: PV display (Enabled: +1)	15	
		(Sum of the weighting)	Bit 1: SP display (Enabled: +2) Bit 2: LSP group number display (Enabled: +4)		
F 15	-	MV display onto:	Bit 3 to 7: Invalid		
LÔ	•	MV display setup (Sum of the weighting)	Bit 0: MV display (Enabled: +1) Bit 1: Heat MV/cool MV display (Enabled: +2)	15	
			Bit 2: Invalid Bit 3: AT progress display (Enabled: +8)		
C 76	•	EV display setup	Bit 4 to 7: Invalid 0: Not displayed	0	
		(Operation display)	1: Set value of Internal event 1 is displayed 2: Set values of Internal event 1 to 2 are displayed	-	
	L		3: Set values of Internal event 1 to 3 are displayed		
C 11	•	Event remaining time display setup (Operation display)	0: Not displayed 1: Internal event 1 is displayed	0	
			2: Internal event 1 to 2 is displayed 3: Internal event 1 to 3 is displayed		
E 18	•	CT input current value display setup (Operation display)	0: Not displayed 1: CT1 current value is displayed	1	
			2: CT1 to 2 current values are displayed		
E 79		User level	0: Simple configuration 1: Standard configuration	0	
C 80		Status indicator	2: Advanced configuration		
1 80		Status indicator	0: Not used 1: Flashing while data is sending through RS-485	0	
			communication. 2: Flashing while data is receiving through RS-485		
			communication. 3: Logical OR of all DI statuses		
			4: Invalid (OFF)		
C 90		Number of CT1 turns	0: 800 turns 1 to 40: CT turns divided by 100	8	
E 91	٠	CT1 number of power wire passes	0: 1 time 1 to 6: Number of times	1	
C 92	•	Number of CT2 turns	0: 800 turns 1 to 40: CT turns divided by 100	8	
E 93 E 91	•	CT2 number of power wire passes	Same as CT1 number of power wire passes 0: -10 %FS	1	
6.71		PV input failure (under range) type	1:-5 mV (This setting is applicable if C01 (PV input range type)	U	
			is set for sensor type B (No.17) or PR40-20 (No. 23))		
C 98	\square	Sampling period	1:50 ms 2:100 ms 3:300 ms 4:500 ms	1	

Display		Item	Contents	Initial	Catting
,		item	Contents	value	Setting
IC I ~ ESE I		Internal event 1 to 5 Configuration 1	See "Event types."	0	
(C2~ESC2		Internal event 1 to 5 Configuration 2	"1st digit" (2nd, etc.) means the first digit (etc.) from the right.		
		1st digit: Direct/Reverse	0: Direct 1: Reverse	0	
		2nd digit: Standby	0: None 1: Standby 2: Standby + Standby at SP change	0]
		3rd digit: EVENT state at READY	0: Continue 1: Forced OFF	0	1
		4th digit: Undefined	0	0	
(C 3 ~ ESC 3	•	Internal event 1 to 5 Configuration 3	"1st digit" (2nd, etc.) means the first digit (etc.) from the right.		
		1st digit: Alarm OR	0: None 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 usual 1: When the event set value (main setting) is 0, the event is "OFF".	0	
		3rd digit: Delay time unit	0: 0.1 s 1: 1 s 2: 1 min	0	1
		4th digit: Undefined	0	0	1
41) [DI assignment bank]		
Display		Item	Contents	Initial value	Setting
2 : LSP group. 3 : LSP group. 4 : PID group. 5 : PID group. 7 : RINNREAD 8 : AUTO/MAN 9 : Imaid 10 11 : Irvaid 12 13 : SP Ramp. 14 : PV Hold 15 : FV Maim 16 : FV Maim 17 : Timer 50 18 : Relassol:			15: PV Maximum value hold 16: PV Minimum value hold 17: Timer Stop/Start 18: Release/continue all DO latches		
			19: Advance 20: SP Step Hold		
1 12 ~ di 52	•	Internal contact 1 to 5 Input bit operation		0	
	•	Internal contact 1 to 5 Input bit operation Internal contact 1 to 5 Input assignment A	0: Not used (Default input) 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: Normally open (normally off = 0) 1: Normally closed (normally off = 1) 2: D13 : D12 4 to 9: Invalid	0	
l (3 ~ di 53		Internal contact 1 to 5 Input assignment	0: Not used (Default input) 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) 4: Function 4 (A and B and C and D) 0: Normally copen (normally off = 0) 1: Normally coped (normally on = 1)		
I I2 ~ dI 52 I I2 ~ dI 53 I I7 ~ dI 55	•	Internal contact 1 to 5 Input assignment A Internal contact 1 to 5 Input assignment	0: Not used (Default input) 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) and (C or D)) 4: Function 4 (A and B and C and D) 0: Normally coped (normally or n = 0) 1: Normally coped (normally on = 1) 2: Dil 3: Dl2 4 to 9: Invalid 10 to 14: Internal event 1 to 5 15 to 17: Invalid 18 to 21: User-defined bit 1 to 4 25: MAVUAL 25: RADY 24: Invalid 25: MAVUAL 25: RADY 24: Invalid 25: MAVUAL 25: RADY 24: Invalid 25: MAVUAL 25: MAV 24: Invalid 25: MAVUAL 25: MAV 24: Invalid 26: Mal Jarm 27: Invalid	0, 2-5	
i (3 ~ di 53 i (4 ~ di 54	•	Internal contact 1 to 5 Input assignment A Internal contact 1 to 5 Input assignment B Internal contact 1 to 5 Input assignment	0: Not used (Default input) 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: Normally open (normally off = 0) 1: Normally closed (normally off = 0) 2: D1 3: D12 4 to 0 s invalid 10 to 14: internal event 1 to 5 15 to 17: invalid 18 to 21: User-defined bit 1 to 4 2:: MAVLAL 23: READY 24: Invalid 25: Aft (Auto-Tuning) 26: During SP ramp 27: Invalid 28: All alarm	0, 2-5	
(3 ~ d) 53 (4 ~ d) 54 (5 ~ d) 55 (6 ~ d) 56	•	Internal contact 1 to 5 Input assignment A Internal contact 1 to 5 Input assignment B Internal contact 1 to 5 Input assignment C Internal contact 1 to 5 Input assignment	0: Not used (Default input) 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: Normally obsen (normally off = 0) 1: Normally closed (normally off = 0) 1: Normally closed (normally off = 1) 2: D1 3: D12 4 to 9: Invalid 10 to 14: Internal event 1 to 5 15 to 17: Invalid 18 to 21: User-defined bit 1 to 4 2: MAVUAL 23: READY 24: Invalid 25: AT (Auto-Tuning) 26: During 5P ramp 27: Invalid 28: All alarm 29: PV alarm 30: Invalid 31: MODEJ key status 32: Event output 1 terminal status	0, 2-5	
() ~ a) 53 () ~ a) 54 () ~ a) 54 () ~ a) 55 () ~ a) 56	•	Internal contact 1 to 5 Input assignment A Internal contact 1 to 5 Input assignment B Internal contact 1 to 5 Input assignment C Internal contact 1 to 5 Input assignment D	0: Not used (Default input) 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) C: Normally obset (normally off = 0) 1: Normally obset (normally off = 0) 2: D1 of 1: International event 1 to 5 1: St 1: Normall 3: Normall 3: (MODE) key status 3: Cirvaidl 3: Off Output 1 terminal status 3: Control output 1 terminal status 3: Obset C	0, 2-5	
() ~ a) 53 () ~ a) 54 () ~ a) 54 () ~ a) 55 () ~ a) 56	•	Internal contact 1 to 5 Input assignment A Internal contact 1 to 5 Input assignment B Internal contact 1 to 5 Input assignment C Internal contact 1 to 5 Input assignment D	0: Not used (Default input) 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: Normally copen (normally off = 0) 1: Normally code (normally on = 1) 2: D1 3: D12 4 to 9: Invalid 10 to 14: Internal event 1 to 5 15 to 17: Invalid 18 to 21: User-defined bit 1 to 4 25: MAULd 25: RACHY 24: Invalid 25: Al (Auto-Tuning) 26: During SP ramp 27: Invalid 28: Al Jaarm 29: PV Jaarm 30: Invalid 31: (MODE] key status 32: Cornto Jouth 1 terminal status 33: Cornto Jouth 1 terminal status 33: Cornto Jouth 1 terminal status	0, 2-5	
(3 ~ d) 53 (4 ~ d) 54 (5 ~ d) 55 (6 ~ d) 56	•	Internal contact 1 to 5 Input assignment A Internal contact 1 to 5 Input assignment B Internal contact 1 to 5 Input assignment C Internal contact 1 to 5 Input assignment D Internal contact 1 to 5 Polarity A to D Ist digit: Polarity A	0: Not used (Default input) 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) C: Normally obset (normally off = 0) 1: Normally obset (normally off = 0) 2: D1 of 1: International event 1 to 5 1: St 1: Normall 3: Normall 3: (MODE) key status 3: Cirvaidl 3: Off Output 1 terminal status 3: Control output 1 terminal status 3: Obset C	0, 2-5	
() ~ a) 53 () ~ a) 54 () ~ a) 54 () ~ a) 55 () ~ a) 56	•	Internal contact 1 to 5 Input assignment A Internal contact 1 to 5 Input assignment B Internal contact 1 to 5 Input assignment C Internal contact 1 to 5 Polarity A to D Ist digit: Polarity A 2nd digit: Polarity B 3rd digit: Polarity C	0: Not used (Default input) 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) C: Normally obset (normally off = 0) 1: Normally obset (normally off = 0) 2: D1 of 1: International event 1 to 5 1: St 1: Normall 3: Normall 3: (MODE) key status 3: Cirvaidl 3: Off Output 1 terminal status 3: Control output 1 terminal status 3: Obset C	0, 2-5	
i (3 ~ di 53 i (4 ~ di 54 i (5 ~ di 55	•	Internal contact 1 to 5 Input assignment A Internal contact 1 to 5 Input assignment B Internal contact 1 to 5 Input assignment C Internal contact 1 to 5 Input assignment D Internal contact 1 to 5 Polarity A to D 1st digit: Polarity A 2nd digit: Polarity B	0: Not used (Default input) 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) C: Normally obset (normally off = 0) 1: Normally obset (normally off = 0) 2: D1 of 1: International event 1 to 5 1: St 1: Normall 3: Normall 3: (MODE) key status 3: Cirvaidl 3: Off Output 1 terminal status 3: Control output 1 terminal status 3: Obset C	0, 2-5	

do [DO assignment bank]

Display		Item	Contents	Initial value	Setting
ok (1~ ok2) Eu (1~ Eu3)	•	Control output 1 to 2, event output 1 to 3 Operation type	0: Default output 1: MV ON/OFF status 1 2: MV ON/OFF status 2 3 to 6: Function 1 to 4	0	
ob (2 ~ ob22 Eu (2 ~ Eu32	•	Control output 1 to 2, event output 1 to 3 Output assignment A	0: Normally open (normally off = 0) 1: Normally closed (normally on = 1) 2 to 6: Internal Event 1 to 5	2–4, 14, 15	
ob (3 ~ ob23 Eu (3 ~ Eu33	•	Control output 1 to 2, event output 1 to 3 Output assignment B	7 to 13: Invalid 14: MV ON/OFF status 1 15: MV ON/OFF status 2 16,17: Invalid 18: D11 19: D12 20 to 25: Invalid	0	
ob (4 ~ ob24 Eu (4 ~ Eu34	•	Control output 1 to 2, event output 1 to 3 Output assignment C	26 to 30: Internal contact 1 to 5 31 to 33: Invalid 34 to 37: User-defined bit 1 to 4 38: MANUAL 39: READY 40: Invalid 41: AT (Auto-Tuning) 42: During SP ramp 43: Invalid 44: Alarm	0	
ot (5 ~ ot25 Eu (5 ~ Eu35	•	Control output 1 to 2, event output 1 to 3 Output assignment D	45: PV alarm 46: Invalid 47: [MODE] key status 48: Event output 1 terminal status 49: Control output 1 terminal status	0	
ot 16 ~ ot26 Eu 16 ~ Eu36	•	Control output 1 to 2, event output 1 to 3 Polarity A to D	"1st digit" (2nd, etc.) means the first digit (etc.) from the right.		
		1st digit: Polarity A	0: Direct	0	
		2nd digit: Polarity B	1: Reverse	0	
		3rd digit: Polarity C	_	0	
		4the digit: Polarity D		0	
ob (1~ob21 Eu (1~Eu31	•	Control output 1 to 2, event output 1 to 3 Polarity	0: Direct 1: Reverse	0	
ob 18 ~ ob 28 Eu 18 ~ Eu 38	•	Control output 1 to 2, event output 1 to 3 Latch	0: None 1: Latch (Latch at ON) 2: Latch (Latch at OFF except for initialization at power ON)	0	
UF	ľ	User function bank]		
Display		Item	Contents	Initial value	Setting
UF- 1 ~ UF-8	•	User function 1 to 8	-	-	

LoE	【Lock bank】
Display	Item

	-				
Display LoC		Item	Contents	Initial value	Setting
		Keylock	C: All settings can be specified. 1: Mode, event, operation display, SP, UF, lock, manual MV, and (MODE) key operation can be specified. 2: Operation display, SP, UF, lock, manual MV, and (MODE) key operation can be specified. 3: UF, lock, manual MV, and (MODE) key operation can be specified.		
C)L oC	•	Communication lock	0: Unlocked 1: Locked	0	
LLoC	٠	Loader lock	0: Unlocked 1: Locked	0	
PRSS		Password display	0 to 15 (5: Password 1A to 2B display)	0	
PS IA		Password 1A	0000 to FFFF (hex)	0000	
PS2R		Password 2A	0000 to FFFF (hex)	0000	
PS Ib		Password 1B	0000 to FFFF (hex)	0000	
P526		Password 2B	0000 to FFFF (hex)	0000	

[Instrument information bank]

Display		Item	Contents	Initial value	Setting
1901	•	ROM ID	16: Fixed	Not Applicable	
1 905	•	ROM Version 1		Not Applicable	
E09 1	•	ROM Version 2		Not Applicable	
1 904	•	Loader information		Not Applicable	
1 405	•	EST information		Not Applicable	
1 406	•	Manufacturing date code (year)	Subtract 2000 from the year. Example: "21" means the year 2021.	Not Applicable	
1 40 1	•	Manufacturing date code (month, day)	Month + day divided by 100. Example: "12.01" means the 1st day of December.	Not Applicable	
1 408	•	Serial No.		Not Applicable	
1 908 1	•	Model No.		Not Applicable	
1 4 10	•	Model Information		Not Applicable	
1911	•	Production site code		Not Applicable	
FPD I FP 16	•	Advanced function password 1 to 16	0000 to FFFF (hex)	0000	

! Precautions for setup

• The type of automatic tuning can be changed by RELY (AT type) in the extended tuning bank. Specify the setting in accordance with the control characteristics.

Memo

Changing the user level

The user level can be selected from three options with [$\Partial P$. The number of available displays and settings decreases in the order: advanced \rightarrow standard \rightarrow simple. All items are displayed when advanced configuration is selected.

Press [MODE] once to show the operation display, and then hold down [PARA] for 2 s or longer. The screen for specifying parameters is shown with Rn or rr on the upper display.	2 Hold down [PARA] for 2 s or longer again. [] is shown on the upper display.
3 Press [PARA] several times to change to τη (user level). τη (user level).	 Press [<], [∨], or [∧]. The lower display flashes. Change to the desired setting by pressing [∨] or [∧]. C simple (initial value) Standard Advanced

PV input range table

	(Thermocouple)				
[] I Setting	Sensor type	Range (Celsius)	Range (Fahrenheit)		
1	К	-200 to +1200 °C	-300 to +2200 °F		
2	К	0 to 1200 °C	0 to 2200 °F		
3	К	0.0 to 800.0 °C	0 to 1500 °F		
4	К	0.0 to 600.0 °C	0 to 1100 °F		
5	К	0.0 to 400.0 °C	0.0 to 700.0 °F		
6	К	-200.0 to +400.0 °C	-300 to +700 °F		
9	J	0.0 to 800.0 °C	0 to 1500 °F		
10	J	0.0 to 600.0 °C	0 to 1100 °F		
11	J	-200.0 to +400.0 °C	-300 to +700 °F		
13	E	0.0 to 600.0 °C	0 to 1100 °F		
14	Т	-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	В	0 to 1800 °C	0 to 3300 °F		
18	N	0 to 1300 °C	0 to 2300 °F		
19	PL II	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		
23	PR40-20	0 to 1900 °C	0 to 3400 °F		
24	DIN U	-200.0 to +400.0 °C	-300 to +700 °F		
25	DIN L	-100.0 to +800.0 °C	-150 to +1500 °F		

(RTD)					
ED I Setting	Sensor type		Range Celsius)	Range (Fahrenheit)	
41	Pt100	-200	to +500 °C	-300 to +900 °F	
42	JPt100	-200	to +500 °C	-300 to +900 °F	
43	Pt100	-200	to +200 °C	-300 to +400 °F	
44	JPt100	-200	to +200 °C	-300 to +400 °F	
45	Pt100	-100.0	to +300.0 °C	-150 to +500 °F	
46	JPt100	-100.0	to +300.0 °C	-150 to +500 °F	
51	Pt100	-50.0	to +200.0 °C	-50.0 to +400.0 °F	
52	JPt100	-50.0	to +200.0 °C	-50.0 to +400.0 °F	
53	Pt100	-50.0	to +100.0 °C	-50.0 to +200.0 °F	
54	JPt100	-50.0	to +100.0 °C	-50.0 to +200.0 °F	
63	Pt100	0.01	to 200.0 °C	0.0 to 400.0 °F	
64	JPt100	0.01	to 200.0 °C	0.0 to 400.0 °F	
67	Pt100	0.01	to 500.0 °C	0.0 to 900.0 °F	
68	JPt100	0.01	to 500.0 °C	0.0 to 900.0 °F	
	DC vo	ltag	e / DC c	urrent]	
CO 1	Senso	or		Pango	
Setting	type			Range	
84	0 to 1 V			range is -1999	
86	1 to 5	V		ne number of	
87	0 to 5	V	decimal pla	ces is changeable.	
88	0 to 10	v			

.

: Initial value

Alarm codes

89

90

0 to 20 mA

4 to 20 mA

	Alarm code*1	Description	Cause	Corrective action	
	ALC I	PV input error	Sensor burnout, incorrect wiring	Check the wiring.	
		(over range)	Incorrect settings for PV range type, etc.	Check the PV range type (C01) and other settings.	
	8L 02	PV input error	Sensor burnout, incorrect wiring	Check the wiring.	
	(under range) Incorrect settings for PV range type, etc.		Check the PV range type (C01) and other settings.		
Input errors	ALD3	Reference junction compensation (cold junction compensation) error	Measurement range error in terminal temperature at reference junction compensation	Make sure that the ambient temperature is within the specifications of this product.	
errors		RTD input error	Sensor burnout, incorrect wiring	Check the wiring.	
	AL II	Current transformer (CT) input error (over range)*2	Current input exceeding the high limit of the display range	Use a current transformer with a number of turns that matches the display range. Check the number of CT turns and the setting. Check the setting and the number of times the power wire passes through the CT.	
			Incorrect wiring	Check the wiring.	
	AL 10	A/D conversion error	A/D conversion unit failure	Turn the power off and then on	
	RL 74	Nonvolatile memory error	Temporary communication error,	again. If the alarm is triggered when the	
	AL 80	Nonvolatile memory not initialized	corruption of data written, or failure of this device	power is turned on again, replace the device.	
	ALB I	Setting value area error*3			
	AL 82	Adjustment value area error*3			
	AL 83	Internal system error			
Inst	AL BY	Setting value initialization error		Turn the power off and then on again.	
Instrument errors	AL 95	Setting value error		If the alarm is triggered after turning the power on again, the problem can be corrected with the following procedure: - initialize the set point - Write the setting again If this procedure does not correct the problem, replace the device.	
	Al 96	Adjustment value error		Turn the power off and then on again. If the alarm is triggered after turning the power on again, the problem can be corrected with the following procedure: • Restore the adjusted value ⁴⁴ If this procedure does not correct the problem, replace the device.	

*1 Multiple alarms may occur at the same time. If the corrective action for one of the alarms says that the device should be replaced, it should be replaced.

*2 The error occurred because of CT input 1, 2, or both.

*3 This error may occur when updating the firmware.

*4 If the area in memory for restoring the adjustment value has been corrupted, the value cannot be restored.

Operation type	Setting	Direct action •: ON/OFF changes at the value O: ON/OFF changes when the value is exceeded	Reverse action •: ON/OFF changes at the value ·: ON/OFF changes when the value is exceeded
No event	0	Always OFF	Always OFF
PV high limit	1	→ HYS ON Main setting PV →	ON HYS Main setting PV
PV low limit	2	ON HYS Main setting PV	HYS ON Main setting
PV hogh/low limit	3	ON HYS HYS ON Main setting* Sub-setting* PV	HYS ON HYS Main setting* Sub-setting* PV →
Deviation high limit	4	SP+Main setting PV →	ON HYS SP+Main setting
Deviation low limit	5	ON HYS SP+Main setting PV	HYS ON SP+Main setting PV
Deviation high/low limit	6	ON HYS ON Main Sub- setting Sp setting	Main Sub- setting SP PV
Deviation high limit (Final SP reference)	7	HYS ON SP+Main setting PV	ON HYS SP+Main setting PV →
Deviation low limit (Final SP reference)	8	ON HYS SP+Main setting PV	SP+Main setting
Deviation high/low limit (Final SP reference)	9	ON HYS ON Main Sub- setting SP setting	HYS ON HYS Main Sub- setting Sp setting PV-
Heater 1 burnout/ Overcurrent	16	ON HYS ON Main setting* Sub-setting* CT1 when output is ON OFF before measuring CT1 current	HYS ON HYS Main setting* Sub-setting* CT1 when output is ON→ OFF before measuring CT1 current
Heater 1 shortcircuit	17	HYS ON Main setting CT1 when output is OFF → OFF before measuring CT1 current	ON HYS Main setting CT1 when output is OFF OFF before measuring CT1 current
Heater 2	18	ON HYS HYS ON	HYS ON HYS

ON HYS HYS ON Main setting* Sub-setting* HÝS ON HÝS Main setting* Sub-setting* CT2 when output is ON --CT2 when output is ON ---OFF before measuring CT2 current OFF before measuring CT2 current HYS ON ON HYS 19 Main setting CT2 when output is OFF — Main setting CT2 when output is OFF ---OFF before measuring CT2 current OFF before measuring CT2 current 23 ON if there is an alarm, OFF if there is an alarm, otherwise OFF otherwise ON

Setting

20

21

22 24

15

: Initial value

burnout/ Overcurrent

Heater 2

Alarm (status)

shortcircuit

 If the main setting is greater than the sub-setting, operations are performed with the settings automatically swapped.

Event types other than the above

Operation	Operation			
Туре	Setting		Type	
SP high limit	10		MV high/low limit	
SP low limit	11		Loop diagnosis 1	
SP high/low limit	12		Loop diagnosis 2	
MV high limit	13		Loop diagnosis 3	
MV low limit	14		READY (status)	

Operation	
Туре	Setting
MANUAL (status)	25
AT in execution (status)	27
During SP ramp	28
Control action (status)	29
Timer (status)	32

Event types

Chapter 1. Overview

1-1 Overview

This is a compact controller ($48 \times 48 \text{ mm mask}$) with the features below.

- LED display for excellent visibility
- Easy setting by [MODE], [PARA], and digit-change keys on the front panel.
- Input type: thermocouples (K, J, E, T, R, S, B, N, PLII, WRe5-26, PR40-20, DIN U, DIN L), resistance temperature detectors (Pt100, JPt100), current signals (4–20 or 0–20 mA DC), voltage signals (0–1, 1–5, 0–5, or 0–10 V DC).
- Control output type: relay, voltage pulse, current. These signals are assigned to control outputs 1 and 2 according to the model No. that the customer orders.
- Heating and cooling control using control output 2 and event relays
- ON/OFF control and PID control
- According to the specified model number, the 3 event outputs, 2 event outputs with independent contacts, 2 CT inputs, 2 digital inputs, and RS-485 communication can be combined.
- Loader connector as a standard feature
- Smart Loader Package model SLP-C1F can be used for easy reading and writing of parameters by connecting the included USB loader cable. With the SLP-C1F, the user can specify settings in a table format, operate this device, and monitor the control situation on the trend screen. There is no need to create programs for communicating with a host device.
- This product is compliant with the IEC Directive and is CE-marked (compliant with EN 61010-1, EN 61326-1 standards)

Model Selection Table

asic model No.	Installation		ntrol put	PV input	Power	Opt	ions	Add'l	proc.	Speci	fications		
000	4	6	6	Ø	8	90		0	2 Ø	Digits			
C 1 M			•			•	v	W	UUUUUUU	Basic model No.			
Т									Screw terminal block				
	-									Control output 1	Control output 2		
		R	0							Relay output (C.O. contacts)	None		
		V	0							Voltage pulse output (for SSR drive)	No		
		V	с							Voltage pulse output (for SSR drive)	Current output		
		V	V							Voltage pulse output (for SSR drive)	Voltage pulse output (for SSR drive)		
		С	0							Current output	None		
		C	С							Current output	Current output		
				Т						Thermocouple input (K, WRe5/26, PR40/20, DIN			
				R						RTD input (Pt100, JPt100))		
				L						DC voltage/current (0–1 V, 1–5 V, 0–5 V, 0–10 4–20 mA DC)	↓ V DC; 0–20 mA DC,		
					A					AC power supply (100-2	240 V)		
						0	0			None			
						0	1			3 event relay outputs			
						0	2			3 event relay outputs, 2 current transformer in	puts, 2 digital inputs		
					0	3			3 event relay outputs, 2 current transformer in	puts, RS-485 comm.			
						0	4			2 event relay outputs (in	dependent contacts)		
						0	5			2 event relay outputs (in 2 current transformer in			
						0	6			2 event relay outputs (in 2 current transformer in			
						0	9			RS-485 communication			
								0		None			
								D		With inspection report			
								Y		With traceability certific	ate		
									0	None			
									Α	UL-compatible model (a	vailable soon)		
									F	UL compatible model Fahrenheit temperature soon)	supportted (available		

Model selection of this device is shown below.

Accessories

Name	Qty.	Notes				
Mounting bracket	1	When replacing, use model 84515488-001.				
Gasket	1	When replacing, use model 84515487-001.				
User's manual	1	Document No. CP-UM-5964JEC				

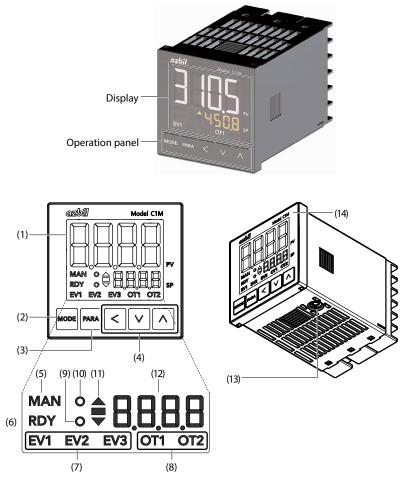
Optional parts

Name	Model No.	Notes
Mounting bracket	84515488-001	For maintenance (qty.: 1)
Gasket	84515487-001	For maintenance (qty. 20)
Dedicated hard cover	84515988-001	
Dedicated terminal cover	84515888-001	
L-shaped plug adapter	81441057-001	
Current transformer	QN206A*	800 turns, hole diameter: 5.8 mm
	QN212A*	800 turns, hole diameter: 12 mm
Smart Loader Package	SLP-C1FJA0	With USB loader cable
	SLP-C1FJA1	Without USB loader cable
USB loader cable	81441177-001	

* Not UL-certified

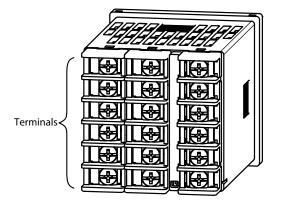
1-2 Names and Functions of Parts

Model C1M and its console



Shows PV (present temperature, etc.) or items that can be set. (1) Upper display: (2) [MODE] key: Shows the operation display. If it is held down for 1 second or longer, the preset operation (initial setting: AUTO/MANUAL selection) can be executed. (3) [PARA] key: Switches the display. Used for incrementing/decrementing numeric values and shifting between digits of a (4) [<], [∨], and [∧] keys: number. (5) MAN mode indicator: Lights up in MANUAL mode. (6) RDY mode indicator: Lights up in READY (control stop) mode. (7) Event indicator: Lights up when the corresponding event relay output is ON. (8) Control output indicator: Lights up when the corresponding control output is ON. Lights up according to the setting of the status indicator (by default, not used). (9) Status indicator: (10) AT indicator: Flashes during AT execution. (11) Slope display Shows the operation status during a step operation. (12) Lower display: Shows the SP (set temperature, etc.) or other settings. Connected to the PC using the USB loader cable included with the Smart Loader Package. (13) Loader connector: (14) Protective film: Protects the surface. Remove the protective film before use.

Terminals



Terminals: Used to connect the power, inputs, outputs, etc.

M3 screws are used. For terminal connections, use crimp terminal lugs compatible with M3 screws.

The tightening torque of the terminal screws is 0.6 ± 0.1 N·m.

Chapter 2. Outline of Functions

Other Analog PV Input output ΡV Control outputs 1-2 Control processing (ON/OFF control, PID control) processing processing (current output) Internal contacts Digital inputs 1-2 processing Control outputs 1-2 (relay output, voltage pulse output) Internal event Digital CT processing CT inputs 1-2 output processing processing Event outputs 1-3 Other (relay output) Other

2-1 Input/Output Configuration

• PV input

The range and the sensor used for the PV input can be selected. Selectable options vary depending on the PV input type (T: thermocouple, R: resistance temperature detector, L: DC voltage/current) specified by the model number (digit **⑦**).

Control output
 If R (relay output) or V (voltage pulse output) is specified by the model number (digits ③ and ④), ON/OFF control output or time proportional output can be selected. For time proportional output, the time proportional cycle can be specified. If C (current output) is specified by the model number (digits ④ and ④), continuous output (analog output) is available, and scaling of the output can be set. For models with two control outputs, heating and cooling control can be used and is simple to set up.

 Event output
 For models with optional event outputs (digits ④ and ④), the alarm or control mode set for the event operation type is output as digital output (DO).

 Digital input
 For models with optional digital inputs (digits ④ and ④), the functions specified by DI assignment can be switched.

• Current transformer input

For models with optional current transformer inputs (digits 0 and 0), the heater burnout alarm can be output from the event output terminals.

2-2 Key Operation

Various displays and settings can be called up to the console using keys.

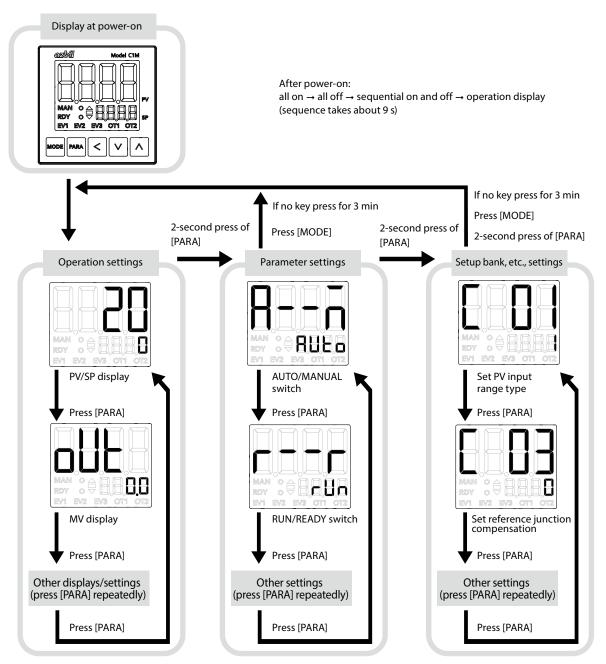
There are two key operation modes, standard and special, which can be selected in the setup bank.

Display transitions and use of keys in each mode are shown below.

Standard mode

If [] | (key operation mode) in the setup bank is set to 0, the keys operate in standard mode. In this mode, items that can be set are displayed in the order shown below.

Operation settings		Mode		Setup	
SP	5-95	AUTO/MANUAL	5-11	PV input range type	5-2
LSP No.	5-34	RUN/READY	5-11		152
Step No., step remaining time	5-38	AT stop/start selection	5-12	PV input failure (under range) type	15-9
MV	5-96	Release all DO latches	5-13	Sampling cycle	6-2
Heat MV	5-96	User-defined bit 1	5-13] 0 2
Cool MV	5-96			Event configuration	
AT progress	5-96	SP		Internal event configuration 1	5-6
CT1 current	5-98	LSP group 1 SP	5-33	Internal event configuration 2	5-6
CT2 current	5-98	PID group number (for LSP 1)	6-4]] (
Internal event 1 main setting	5-65	;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;		Internal event 5 configuration 2	15-6
Internal event 1 sub-setting	5-65	Ramp (for LSP 8)	5-44	Internal event 5 configuration 3	5-6
Timer remaining time 1	5-97	Soak time (for LSP 8)	5-44] - (
Internal event 2 main setting	5-65			DI assignment	
Internal event 2 sub-setting	5-65	Event		Internal contact 1 operation type	5-4
Timer remaining time 2	5-97	Internal event 1 main setting	5-65	Internal contact 1 Input bit operation	5-5
Internal event 3 main setting	5-65	Internal event 1 sub-setting	5-65]]]
Internal event 3 sub-setting	5-65	Internal event 1 hysteresis	5-65	Internal contact 5 polarity	15-5
Timer remaining time 3	5-97			Internal contact 5 internal event No. assignment	
		Internal event 5 ON delay time	5-66		100
User function (enabled)		Internal event 5 OFF delay time	5-66	DO assignment	
User function 1	5-99			Control output 1 operation type	5-7
User function 2	5-99	PID		Control output 1 output assignment A	5-7
User function 3	5-99	Proportional band 1	5-21		
User function 4	5-99	Integral time 1	5-21	Event output 3 polarity	15-7
User function 5	5-99	Derivative time 1	5-21	Event output 3 latch	5-7
User function 6	5-99	Manual reset 1	5-21	Ì	
User function 7	5-99			User function	
	_	Cool-side MV low limit 8	5-21	User function 1	5-9
		Cool-side MV high limit 8	5-21	User function 2	5-9
	I				
		Parameter		User function 7	15-9
		Control method	5-16	User function 8	5-9
		MV low limit at AT	5-24		_
		MV high limit at AT	5-24	Lock	
		ON/OFF control differential	5-20	Key lock	5-1
	1			Communication lock	5-
		SP up ramp	5-36		-
		SP down ramp	5-36	Password 1B	5-
	1			Password 2B	5-
		Extended tuning			-
		AT type	5-24	Instrument information	
		SP lag constant	5-27	ROM ID	6-4
ote: The number on the right of				ROM version 1	6-4
the setting items indicate		Control algorithm	6-18		
		Cooling gain	6-18	Advanced function password 15	6-4
page that gives the expla					1 ()-4



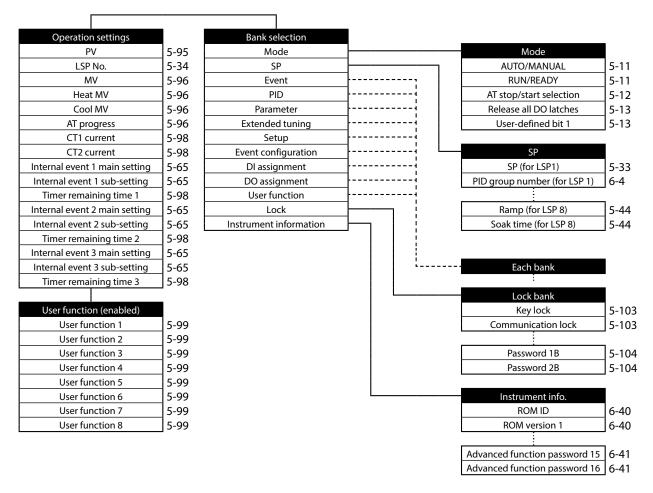
The displays and settings shown in this figure are illustrative examples. They may differ depending on the model and settings.

! Handling Precautions

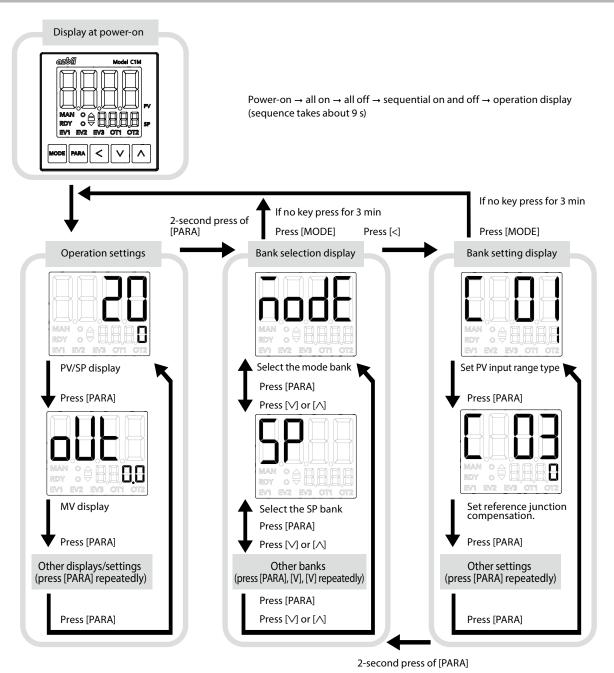
- 6-1 Operation Settings (p. 6-1)
 - 6-2 Parameter Settings (p. 6-3)
 - 6-3 Setup Bank, etc., Settings (p. 6-19)
 - (for details on operation settings, parameter settings, and setup bank settings, etc.)
- If [<] is pressed while holding down [PARA], various displays/settings can be navigated in reverse order. However, the keys can be used together this way only for a maximum of 2 seconds.

Special mode

If [] (key operation mode) in the setup bank is set to 1, the keys operate in special mode. In this mode, items that can be set are displayed in the order shown below.



Note: In the diagram above, the hyphenated number on the right of the items is the page number that gives an explanation of the item.



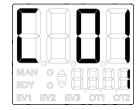
The display and setting shown in this figure are examples for explanation. They may differ depending on the model and settings.

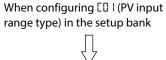
! Handling Precautions

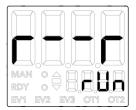
- 🗭 6-1 Operation Settings (p. 6-1)
 - 6-2 Parameter Settings (p. 6-3)
 - 6-3 Setup Bank, etc., Settings (p. 6-19)
 - (for details on operation settings, bank selection, items in banks) The sections above describe the banks to which the settings belong.
- When operation settings and other items are displayed, if [<] is pressed while holding down [PARA], various displays/settings can be navigated in reverse order. However, the keys can be used together this way only for a maximum of 2 seconds.

How to set data

Press [PARA] until the desired item is displayed.
 Display transitions and the use of [PARA] are described on pages 2-3 and 2-5.







When switching between RUN and READY by the r--r parameter

- (2) Press [<], [\lor], or [\land].
 - If the lower display shows numbers, the value in the 1st digit will start flashing (blinking). If it shows characters, they will all start flashing. For numbers, the flashing digit can be shifted and the flashing value can be incremented/decremented using [<], [v], and [^].</p>

For characters, the entire flashing expression can be changed using $[\lor]$ and $[\land]$.



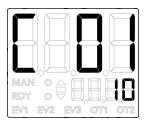


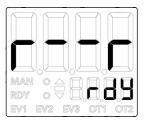
าปก is flashing

flashing

(3) Release the key and wait.

» The new value stops flashing after 2 seconds and is now set.





! Handling Precautions

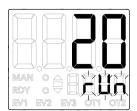
- If a value does not flash after [<], [∨], or [∧] is pressed, the value cannot be changed.
 - For example, if the RUN/READY selection is set in the DI assignment bank, the device keys cannot be used to switch between RUN and READY.
- If pressing [v] does not change the flashing value, press [A], and vice versa.
- If [PARA] is pressed while the display is flashing, this device shows the next item without making any changes. If [MODE] is pressed while the display is flashing, this device shows the operation display without making any changes.
- The manipulated value (MV) displayed in MANUAL mode continues flashing even if you release the key. In this case, the flashing value is being output as the MV.

Using the [MODE] key

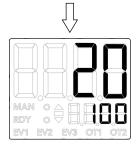
When the operation display is shown, press [MODE] for 1 second or longer to execute the switch that is set by [72] ([MODE] key function) in the setup bank.

The figures on the right show an example of pressing [MODE] when [72 is set to 2 (RUN/ READY selection).

- (1) If [MODE] is pressed when the PV and SP are displayed in READY mode, the lower display shows run flashing.
- (2) If [MODE] is held down for 1 second or longer, the mode will switch from READY to RUN, and run stops flashing.
- (3) When you release [MODE], the operation display is shown again.







! Handling Precautions

- If []2 ([MODE] key function) in the setup bank is set to 0 (invalid), or if the specified switching operation is disabled, switching using [MODE] is not possible.
- If you press [MODE] when the screen for specifying settings (parameters, setup items, etc.) is displayed, this device shows the operation display, but continuing to press [MODE] will not change the setting. In this case, release [MODE] temporarily and then press it again.

User level

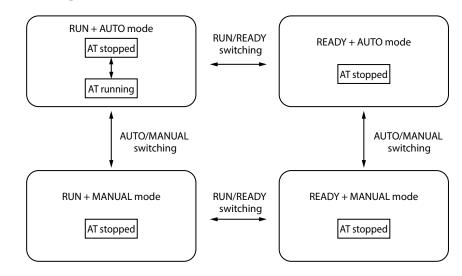
The user level can be selected from three options (simple, standard, advanced) with [79 (user level) in the setup bank.

Chapter 6. Displayed Items and Settings (for items that are displayed according to the user level)

! Handling Precautions

• If the user level is changed, the displayed items will change but settings that have been made will remain valid. For example, if you set the user level to 2 (standard configuration) or 3 (advanced configuration) in order to configure advanced functions and then return the setting to 1 (simple configuration), the settings available for 2 and 3 will not be displayed, but the new settings will apply to the advanced functions.

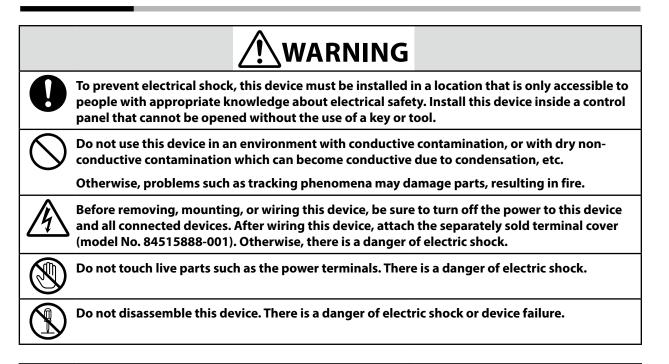
2-3 Operation Modes



The transitions between operation modes are shown below.

- RUN: The process is being controlled.
- READY: The process is not being controlled.
- AUTO: Automatic operation (this device automatically determines the MV)
- MANUAL: Manual operation (the user can change the MV manually)
- AT: Auto tuning (this device automatically sets the PID constants by generating limit cycles)

Chapter 3. Installation



WARNING



Use this device within the operating ranges given in the specifications (for temperature, humidity, voltage, vibration, shock, mounting direction, atmosphere, etc.). Otherwise, there is a danger of fire or device failure.



Do not block the ventilation holes. There is a danger of fire or device failure.



Do not allow wire clippings, metal shavings, water, etc., to enter the case of this device. There is a danger of fire or device failure.

Installation location

Install this device as specified in Operating conditions (p. 14-5) and in a location that meets the following criteria:

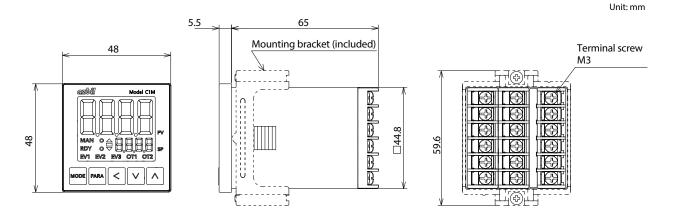
- Common mode voltage of all I/O except for the supply power and relay contact outputs: voltage to ground of 30 V_{RMS} max., 42.4 V peak max., and 60 V DC max.
- Neither high nor low temperature/humidity
- No sulfide gas or other corrosive gases
- Little dust or soot
- Protected from direct sunlight, wind, and rain
- Little mechanical vibration or shock
- Not close to high voltage lines, welding machines, or other sources of electrical noise
- At least 15 meters away from the high voltage ignition device for a boiler, etc.
- No strong magnetic fields
- No flammable liquids or gases
- Indoors

Mounting precautions

Pay attention to the following when mounting this device:

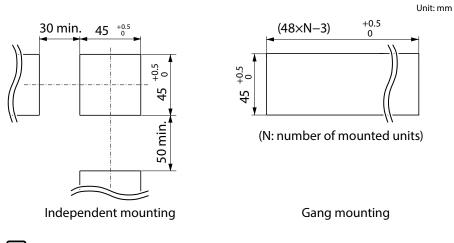
- Do not block the ventilation holes.
- When using fans or cooling equipment, make sure the air does not directly blow on this device.
- Mount this device horizontally with the back not raised or lowered more than 10°.
- Use a rigid panel whose thickness is no more than 8 mm.
- Do not tighten screws too tightly because the case may be deformed.

External dimensions



Panel cutout dimensions

For a panel-mounted model, open a hole in the panel as shown below.



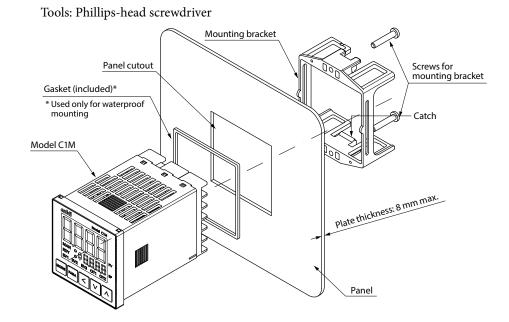
! Handling Precautions

- The maximum allowable ambient temperature for gang-mounted products: 50 °C (two units), 45 °C (three or more units)
- When waterproofing and dust proofing are required, mount the units individually. If units are gang mounted, waterproofing and dust proofing performance cannot be maintained.
- Leave a space of at least 50 mm above and below this device.

Mounting method

- Mount this device horizontally with the back not raised or lowered more than 10°.
- Use a rigid panel whose thickness is no more than 8 mm.

Waterproof mounting



- (1) Place the gasket on the terminal side of this device and slide it to the back of the console.
- (2) Insert this device from the front of the panel.
- (3) Attach the mounting bracket from behind the panel.
- (4) Push the mounting bracket onto the panel until the catches of the bracket are fully engaged with the grooves in this device.
- (5) Tighten the screws at the top and bottom of the bracket.

Handling Precautions

- To secure the bracket to the panel, tighten the screws of the supplied mounting bracket until the bracket can no longer move, and then further tighten each screw by only half a turn. Excessive tightening of the screws may deform the case.
- If units are gang mounted, waterproofing and dust proofing performance cannot be maintained.

Standard mounting

For normal mounting (not waterproof/dustproof), skip step 1 of the above procedure and use step 2 and the rest of the procedure.

! Handling Precautions

• To secure the bracket to the panel, tighten the screws of the supplied mounting bracket until the bracket can no longer move, and then further tighten each screw by only half a turn. Excessive tightening of the screws may deform the case.

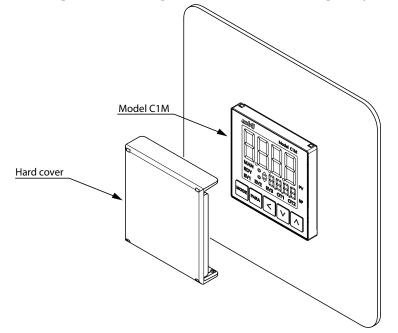
• Attaching the hard cover

The separately sold hard cover can be attached to the console.

It is useful for preventing accidental changing of the settings and to protect a device that is installed in a poor installation environment. The display can be viewed with the cover on.

To use the keys, remove the cover.

Items required: hard cover, part No. 84515988-001 (sold separately)



- (1) Mount the C1M in a panel as shown in the figure above.
- (2) Set the two protrusions on the top of the hard cover into the two dents on the top of the C1M.
- (3) Push the bottom of the hard cover onto the C1M until it clicks into place.

Chapter 4. Wiring

4-1 Wiring

WARNING

To prevent electrical shock, this device must be installed in a location that is only accessible to people with appropriate knowledge about electrical safety. Install this device inside a control panel that cannot be opened without the use of a key or tool.

Do not use this device in an environment with conductive contamination, or with dry nonconductive contamination which can become conductive due to condensation, etc. Otherwise, problems such as tracking phenomena may damage parts, resulting in fire.



Be sure to use the fuse described in the specifications for the power wiring of this device. Otherwise, tracking phenomena or parts failure due to other factors may cause fire.



Be sure to check that the device has been correctly wired before turning on the power. Incorrect wiring of this device may cause device failure and also lead to a dangerous accident.



Before removing, mounting, or wiring this device, be sure to turn off the power to this device and all connected devices. After wiring this device, attach the separately sold terminal cover (model No. 84515888-001). Otherwise, there is a danger of electric shock.



Do not touch live parts such as the power terminals. There is a danger of electric shock.



Wire this device correctly in compliance with applicable standards, and use the power source and installation methods specified in this user's manual. Otherwise, there is a danger of fire, electric shock, or device failure.

Do not allow wire clippings, metal shavings, water, etc., to enter the case of this device. There is a danger of fire or device failure.



Firmly tighten the terminal screws to the torque listed in the specifications. Insufficient tightening may result in fire or electric shock.



Do not use unused terminals as relay terminals. There is a danger of fire, electric shock, or device failure.



Use the relays within the recommended service life. Otherwise, there is a danger of fire or device failure.

Use an appropriate overcurrent protection device (fuse, circuit breaker, etc.) with a sufficient breaking capacity for lines to which the relays of this device are connected to protect the circuits. Otherwise, there is a danger of fire or device failure.



If there is a risk of a power surge caused by lightning, use a surge absorber (surge protector). Otherwise, there is a danger of fire or device failure.

Symbols used in the terminal wiring label

The following table shows the meaning of the symbols used in the terminal wiring label on the side of the device.

Symbol	Description
~	AC
A	Caution: risk of electrical shock
	Caution: risk of device failure, electric shock, or fire due to wrong wiring Check the wiring and the wiring diagram.

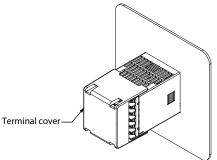
Wiring precautions

Pay attention to the following when wiring this device.

- Before wiring this device, verify its model No. and terminal Nos., which are written on the wiring diagram on the side of the device.
- Wire the power lines separately from input/output signal lines.
 Keep them at least 50 cm away from each other.
 Do not pass these two types of wiring through the same conduit or wiring duct.
- Do not use any terminals as relay terminals.
- Fasten to the correct tightening torque.
- To separately turn the power supply of this device on and off in instrumentation where current signals are input to multiple devices (including this device) connected in series, use the separately sold resistor (model No. 81401325) and set the range type to voltage.
- Connect a terminating resistor (120 Ω) to both ends of the RS-485 transmission line.

However, if terminal resistance is not specified for other devices connected to the same transmission line, do not connect the resistor. If they do specify a resistor, use the highest resistance value specified, at least 120 Ω .

- Make sure that devices and equipment connected to this device have reinforced insulation or double insulation suitable for their operating voltage and for this device's power.
- Attach the cover after wiring work.

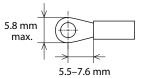


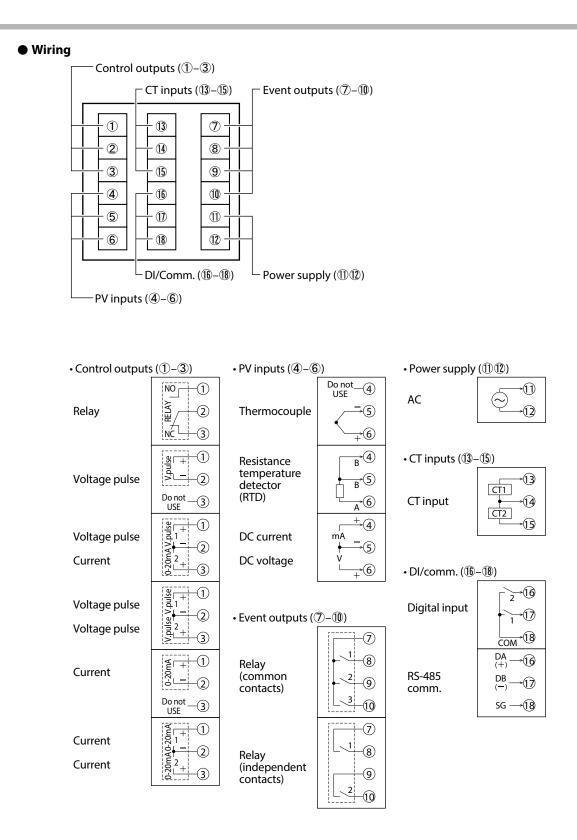
- Remove the protective film from the LCD before use.
- Use 16-22 AWG cables.
- Be careful not to allow crimp terminals to touch adjacent terminals.



- Connect no more than two crimp terminal lugs to the same terminal screw. Bend the crimp terminal lugs in advance.
- Use crimp terminal lugs compatible with M3 screws. Recommended crimp terminal lug:

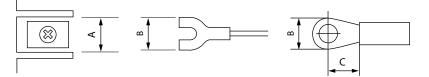
V1.25-MS3, manufactured by J.S.T. Mfg. Co., Ltd.





• Recommended crimp terminal lugs

Use crimp terminal lugs compatible with M3 screws.

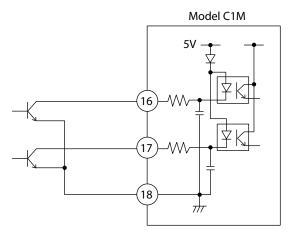


Mounting method	Compatible screw	Terminal dimensions (mm)		Compatible wire size	J.S.T. Mfg. Co., Ltd. Model No. (reference)	
		Α	В	С		
C1MT (for panel	М3	6.1	5.8 max.	5.5–7.6	0.3–1.2 mm ² 22–16 AWG	V1.25-MS3 (round terminals)
mounting)						V1.25 B3A (Y terminals)

! Handling Precautions

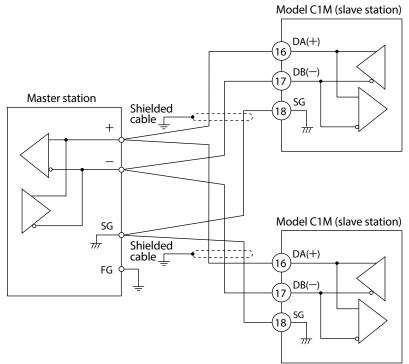
- If this device is installed where there is considerable vibration or shock, be sure to use round crimp terminal lugs to prevent wires from coming off the terminals.
- Be careful not to allow crimp terminal lugs to touch adjacent terminals.

Connecting open collector outputs to digital inputs



RS-485 communication connections

• If the system includes 3-wire devices only



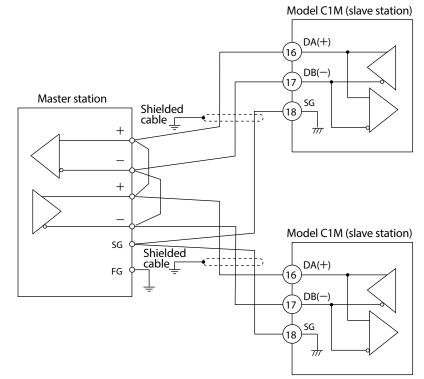
Important

Terminating resistor

- Connect a terminating resistor (120 Ω , 1/2 W or more recommended) to both ends of the RS-485 transmission line.
- However, if terminal resistance is not specified for other devices connected to the same transmission line, do not connect the resistor. If they do specify a resistor, use the highest resistance value specified, at least 120 Ω .

! Handling Precautions

- Do not connect DA (+) to DB (-). Doing so might damage this device.
- Ground only one end of the shielded cable.
- Be sure to connect the signal ground (SG) terminals to each other. Otherwise, communication may be unreliable.



• If the system includes 5-wire devices only

Important

Terminating resistor

- Connect a terminating resistor (120 Ω , 1/2 W or more recommended) to both ends of the RS-485 transmission line.
- However, if terminal resistance is not specified for other devices connected to the same transmission line, do not connect the resistor. If they do specify a resistor, use the highest resistance value specified, at least 120 Ω .

! Handling Precautions

- Do not short DA (+) and DB (-). Doing so might damage this device.
- Ground only one end of the shielded cable.
- Be sure to connect the signal ground (SG) terminals to each other. Otherwise, communication may be unreliable.

Connecting solid state relays (SSR)

To drive the SSR, controllers with voltage pulse outputs must be used. Specify a model No. that includes "V0," "VC," or "VV" (codes for control output).

An SSR can be roughly categorized as either a constant-current SSR or a resistance SSR. The following describes how to connect each type.

Constant-current SSR

Check the following specifications of your SSR and the specification of the voltage pulse output of the C1M.

- Input current (maximum): If it is below the maximum current allowed for the voltage pulse output, the SSRs can be connected in parallel.
- Operating voltage: Check that the voltage between the voltage pulse output terminals is within the specified range.

1. Azbil's PGM10N or PGM10F

This example shows the calculation for the connection of this device and the PGM10N015.

For connection with other models, check the specifications of the model.

• Input current:

Since the input current is 10 mA or less, up to two units ($10 \text{ mA} \times 2 = 20 \text{ mA} < 24 \text{ mA}$ [maximum allowable current]) can be connected in parallel.

• Operating voltage:

The input voltage of the SSR is 3.5 to 30 V. Therefore, the voltage between the terminals is within the specified range.

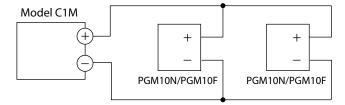
Voltage between terminals (two PGM10N units)

= Voltage when open – Internal resistance × Total drive current

= 19 V DC ±15 % – 18 Ω ±0.5 % \times 20 mA

≈16 to 21 V

Connection diagram



Number of connectable units

SSR	Connection	V0/VC model	VV model
PGM10N	Parallel	2 units max.	4 units max.*
PGM10F	Parallel	2 units max.	4 units max.*

* Two units per output

2. Omron's G3PA, G3PE-__B, G3NA

• Input current:

Since the input current is 7 mA or less, up to three units (7 mA \times 3 = 21 mA < 24 mA [maximum allowable current]) can be connected in parallel.

• Operating voltage:

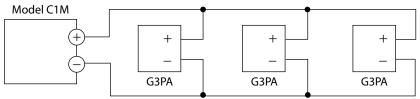
The rated voltage is 5–24 V DC or 12–24 V DC. Therefore, the voltage between the terminals is within the specified range.

Voltage between terminals (three G3PA units)

- = Voltage when open Internal resistance × Total drive current
- = 19 V DC $\pm 15 \% 18 \Omega \pm 0.5 \% \times 21 \text{ mA}$

 ≈ 16 to 21 V

Connection diagram



Number of connectable units

SSR	Connection	V0/VC model	VV model
G3PA	Parallel	3 units max.	6 units max.*
G3PEB	Parallel	3 units max.	6 units max.*
G3NA	Parallel	3 units max.	6 units max.*

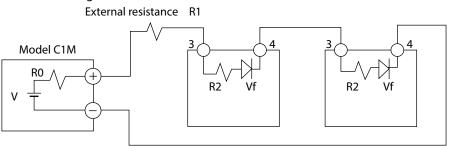
* Three units per output

Resistance SSR

Connect an external resistor in series as needed so that the voltage between the input terminals of the SSR is within the specified range.

Example: when connecting two SSRs

Connection diagram



When connecting n units of the SSR, the voltage between the terminals of the SSR can be calculated by the expression below:

 $((V \times R2) + Vf \times (R0 + R1)) \div (R0 + R1 + n \times R2)$

When n = 2 and external resistance $R1 = 680 \Omega$, the result is:

V: 19 V \pm 15 % R0: 18 $\Omega \pm$ 0.5 % R1: 680 Ω R2: 260 Ω Vf: 1.1 V

Voltage between terminals

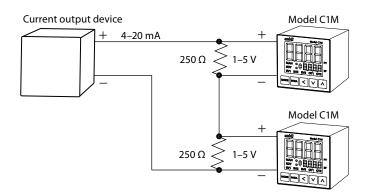
 $= ((19 \times 260) + 1.1 \times (18 + 680)) \div (18 + 680 + 2 \times 260)$ $\approx 4.7 \text{ V}$

If the input voltage range of the SSR is 3–6 V, it can operate.

Connecting a current output device

When the power of this device is turned off, its current input circuit is disconnected.

When connecting a current output device to multiple C1M units whose power can be turned on and off individually, use the separately sold resistor (81401325) and specify a voltage input range.



Noise suppression measures

Use a single-phase instrument power supply to minimize the effect of electrical noise on this device.

If there is a large amount of electrical noise from the power supply, use an isolation transformer and a line filter.

(Azbil's line filter model No.: 81442557-001)

Use a CR filter for quick-rising noise.

(Azbil's CR filter model No.: 81446365-001)

! Handling Precautions

• If anti-noise measures are taken, do not bundle primary and secondary power lines of the isolation transformer together, and do not put them in the same conduit or duct.

4-2 Cables

For thermocouple input, connect the unshielded wires of the thermocouple to the PV input terminals. If a thermocouple with a terminal block is used, or if the wiring distance is long, use compensating lead wires for connection with the terminals of this device.

Use shielded compensating lead wires.

• For inputs and outputs other than thermocouples, use JCS 4364 cables for lowpower instruments or the equivalent (generally called twisted shielded cable for instrumentation use).

The following cables are recommended.

Fujikura	ujikura Dia Cable Ltd.		IPEV-S-0.9 mm ² ×1P
		3 cores	ITEV-S-0.9 mm ² ×1T
Sumide	n HST Cable Co., Ltd.	2 cores	JKPEV-S-0.9 mm ² ×1P

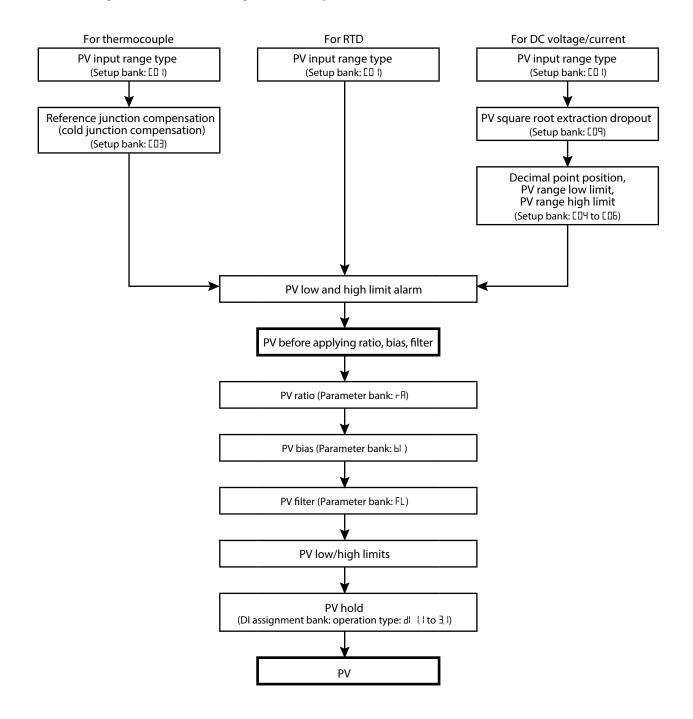
Note: The model No. of the recommended cable may change without notice, so please contact the manufacturer.

• If there is relatively little electromagnetic induction noise, shielded multi-core microphone cables (MVVS) can be used.

Chapter 5. Functions

5-1 PV Input

The following is a functional block diagram for PV input.



PV input range type

For thermocouple and resistance temperature detector, the sensor type and the temperature range can be selected.

For DC voltage and DC current, the signal type can be selected.

ltem (bank)	Display	Description	Initial value	User level
PV input range type (setup bank)	[[] [See the PV input range table.	Differs depending on the PV input type* specified by the model No.	Simple, standard, advanced

* For T (thermocouple) = 1, for R (RTD) = 41, for L (DC voltage/current) = 88

• PV input range table (thermocouple)

[[] setting	Sensor type	Rar	nge ((Celsius)* ¹		EDЧ display* ²	ED4 setting range	[]] UY initial value ^{*3}
1	К	-200	to	+1200	°C	-	(Fixed)	0
2	К	0	to	1200	°C	-	(Fixed)	0
3	К	0.0	to	800.0	°C	\checkmark	0–1	0
4	К	0.0	to	600.0	°C	\checkmark	0–1	0
5	К	0.0	to	400.0	°C	\checkmark	0–1	0
6	К	-200.0	to	+400.0	°C	\checkmark	0–1	0
9	J	0.0	to	800.0	°C	~	0–1	0
10	J	0.0	to	600.0	°C	✓	0–1	0
11	J	-200.0	to	+400.0	°C	~	0–1	0
13	E	0.0	to	600.0	°C	~	0–1	0
14	Т	-200.0	to	+400.0	°C	\checkmark	0–1	0
15	R*4	0	to	1600	°C	-	(Fixed)	0
16	S*4	0	to	1600	°C	-	(Fixed)	0
17	B*5	0	to	1800	°C	-	(Fixed)	0
18	Ν	0	to	1300	°C	-	(Fixed)	0
19	PLII	0	to	1300	°C	-	(Fixed)	0
20	WRe5-26	0	to	1400	°C	-	(Fixed)	0
21	WRe5-26	0	to	2300	°C	-	(Fixed)	0
23	PR40-20*6	0	to	1900	°C	-	(Fixed)	0
24	DIN U	-200.0	to	+400.0	°C	\checkmark	0–1	0
25	DIN L	-100.0	to	+800.0	°C	\checkmark	0–1	0

*1. If the display range is exceeded, this device continues displaying the maximum or minimum value that can be displayed.

*2. [04 is the setting of the decimal point position of the PV.

*3. $\Box \Box \forall$ is reset to the initial value when $\Box \downarrow$ is changed.

*4. <u>Accuracy</u> Below 200 °C: ±9 °C

*5. <u>Accuracy</u> Below 260 °C: ±80 °C (reference value), 260 °C to below 600 °C: ±12 ° C, 600 °C to below 1000 °C: ±6 °C, 1000 °C or more: ±4.5 °C. Temperatures below 20 °C are not displayed.

*6. <u>Accuracy</u> Below 400 °C: not specified, 400 °C to below 1100 °C: ±40 °C, 1100 °C or more: ±12 °C.

[] setting	Sensor type	Rang	e (Fal	hrenheit)* ¹		E04 display*2	ED4 setting range	EDY initial value ^{*3}
1	К	-300	to	+2200	°F	-	(Fixed)	0
2	К	0	to	2200	°F	-	(Fixed)	0
3	К	0	to	1500	°F	-	(Fixed)	0
4	К	0	to	1100	°F	-	(Fixed)	0
5	К	0.0	to	700.0	°F	\checkmark	0–1	0
6	К	-300	to	+700	°F	-	(Fixed)	0
9	J	0	to	1500	°F	-	(Fixed)	0
10	J	0	to	1100	°F	-	(Fixed)	0
11	J	-300	to	+700	°F	-	(Fixed)	0
13	E	0	to	1100	°F	-	(Fixed)	0
14	Т	-300	to	+700	°F	-	(Fixed)	0
15	R*4	0	to	3000	°F	-	(Fixed)	0
16	S*4	0	to	3000	°F	-	(Fixed)	0
17	B* ⁵	0	to	3300	°F	-	(Fixed)	0
18	Ν	0	to	2300	°F	-	(Fixed)	0
19	PLII	0	to	2300	°F	-	(Fixed)	0
20	WRe5-26	0	to	2400	°F	-	(Fixed)	0
21	WRe5-26	0	to	4200	°F	-	(Fixed)	0
23	PR40-20*6	0	to	3400	°F	-	(Fixed)	0
24	DIN U	-300	to	+700	°F	-	(Fixed)	0
25	DIN L	-150	to	+1500	°F	-	(Fixed)	0

*1. If the display range is exceeded, this device continues displaying the maximum or minimum value that can be displayed.

 $*2.\,\ensuremath{\mathbb{E}}\xspace{0.1ex}$ is the setting of the decimal point position of the PV.

*3. $\ensuremath{\square}\xspace$ 43. $\ensuremath{\square}\xspace$ 4 is changed.

*4. Accuracy Below 200 °C: ±9 °C

*5. <u>Accuracy</u> Below 260 °C: ±80 °C (reference value), 260 °C to below 600 °C: ±12 ° C, 600 °C to below 1000 °C: ±6 °C, 1000 °C or more: ±4.5 °C. Temperatures below 20 °C are not displayed.

*6. <u>Accuracy</u> Below 400 °C: not specified, 400 °C to below 1100 °C: ±40 °C, 1100 °C or more: ±12 °C.

• PV input range table (RTD)

ED I setting	Sensor type	Rai	nge (C	elsius)* ¹		ED4 display* ²	ED4 setting range	[[]4 initial value ^{*3}
41	Pt100	-200	to	+500	°C	-	(Fixed)	0
42	JPt100	-200	to	+500	°C	-	(Fixed)	0
43	Pt100	-200	to	+200	°C	-	(Fixed)	0
44	JPt100	-200	to	+200	°C	-	(Fixed)	0
45	Pt100	-100.0	to	+300.0	°C	\checkmark	0–1	0
46	JPt100	-100.0	to	+300.0	°C	\checkmark	0–1	0
51	Pt100	-50.0	to	+200.0	°C	\checkmark	0–1	1
52	JPt100	-50.0	to	+200.0	°C	\checkmark	0–1	1
53	Pt100	-50.0	to	+100.0	°C	\checkmark	0–1	1
54	JPt100	-50.0	to	+100.0	°C	\checkmark	0–1	1
63	Pt100	0.0	to	200.0	°C	\checkmark	0–1	1
64	JPt100	0.0	to	200.0	°C	\checkmark	0–1	1
67	Pt100	0.0	to	500.0	°C	\checkmark	0–1	0
68	JPt100	0.0	to	500.0	°C	\checkmark	0–1	0

*1. If the display range is exceeded, this device continues displaying the maximum or minimum value that can be displayed.

*2. [[]4 is the setting of the decimal point position of the PV.

*3. [D4] is reset to the initial value when [D] is changed.

[[] setting	Sensor type	Range (Fahrenheit)* ¹				ED4 display* ²	۲۵۹ setting range	[04 initial value ^{*3}
41	Pt100	-300	to	+900	°F	-	(Fixed)	0
42	JPt100	-300	to	+900	°F	-	(Fixed)	0
43	Pt100	-300	to	+400	°F	-	(Fixed)	0
44	JPt100	-300	to	+400	°F	-	(Fixed)	0
45	Pt100	-150	to	+500	°F	-	(Fixed)	0
46	JPt100	-150	to	+500	°F	-	(Fixed)	0
51	Pt100	-50.0	to	+400.0	°F	\checkmark	0–1	0
52	JPt100	-50.0	to	+400.0	°F	\checkmark	0–1	0
53	Pt100	-50.0	to	+200.0	°F	\checkmark	0–1	0
54	JPt100	-50.0	to	+200.0	°F	\checkmark	0–1	0
63	Pt100	0.0	to	400.0	°F	\checkmark	0–1	0
64	JPt100	0.0	to	400.0	°F	\checkmark	0–1	0
67	Pt100	0.0	to	900.0	°F	\checkmark	0–1	0
68	JPt100	0.0	to	900.0	°F	\checkmark	0–1	0

*1. If the display range is exceeded, this device continues displaying the maximum or minimum value that can be displayed.

*2. [[]4 is the setting of the decimal point position of the PV.

*3. [D4] is reset to the initial value when [D] is changed.

• PV input range table (DC voltage/current)

ED I setting	Sensor type	Range ^{*1}	ED4 display* ²	۲۵۹ setting range	EO4 initial value ^{*2}
84	0–1 V	The scaling range is –1999 to	\checkmark	0–3	0
86	1–5 V	+9999.	\checkmark	0–3	0
87	0–5 V		\checkmark	0–3	0
88	0–10 V		\checkmark	0–3	0
89	0–20 mA		\checkmark	0–3	0
90	4–20 mA		\checkmark	0–3	0

*1. If the display range is exceeded, this device continues displaying the maximum or minimum value that can be displayed.

*2. [[]4 is the setting of the decimal point position of the PV.

*3. [04 is not reset to the initial value when [0] is changed.

Handling Precautions

- When the range No. is set, the initial setting for the PV decimal point position and the range that are shown in the tables above apply. PV decimal point position (p. 5-7) (for details on PV decimal point position)
- Be sure to specify the correct setting for [] | according to the sensor type and range. Otherwise, abnormal output may occur due to a large error in temperature.
- Chapter 14. Specifications (for the accuracy of each PV input range type)

Temperature unit

When the PV input range type is thermocouple or RTD, the temperature unit can be selected.

ltem (bank)	Display	Description	Initial value	User level
Temperature unit (Setup bank)	50 3	0: Celsius (°C) 1: Fahrenheit (°F)	0	Simple, standard, advanced

• When the PV input range type is thermocouple or RTD, the display and setting can be configured.

Reference junction compensation (cold junction compensation)

If the PV input type is thermocouple, either one of the options below can be selected:

- This device does reference junction compensation (cold junction compensation).
- This device does not do reference junction compensation (cold junction compensation) because an external cold junction compensation device (ice bath, etc.) is used.

ltem (bank)		Display	Description	Initial value	User level
Reference junction compensation (cold junction compensation)	E	03	0: Internal compensation (by this device) 1: External compensation (by another	0	Advanced
(setup bank)			device)		

PV square root extraction dropout

If the PV input type is DC voltage/current, a dropout value can be set so that the result of the PV square root extraction used to convert the pressure (differential pressure) into the flow becomes "0."

Item (bank)	Display	Description	Initial value	User level
PV square root extraction dropout (setup bank)	09	0.0 %: PV square root extraction is not performed. 0.1 to 100.0 %	0.0 %	Advanced

- If the PV input type is DC voltage/current, this item is displayed and the setting can be changed.
- Details of PV square root extraction

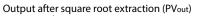
The calculation input in % and the calculation result in % are expressed as $PV_{\rm in}$ and $PV_{\rm out},$ respectively.

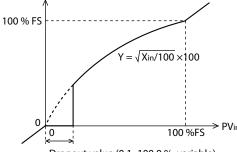
If the PV input is greater than or equal to the PV square root extraction dropout value and is less than 100.0 %, the calculation formula will be:

$$PV_{out} = \sqrt{PV_{in} / 100} \times 100$$

If the PV input is more than 0.0 % and is smaller than the PV square root extraction dropout value, $PV_{out} = 0.0$ %.

If the PV input is 0.0 % or less, or 100.0 % or more, the PV square root is not extracted, so $PV_{out} = PV_{in}$.





Dropout value (0.1–100.0 %, variable)

PV decimal point position

If the PV input type is DC voltage/current, or if some thermocouple or RTD range types are selected, the decimal point position of the PV input can be specified.

ltem (bank)	Display	Description	Initial value	User level
PV decimal point position (setup bank)	[04	 0: No decimal point 1: 1 digit after the decimal point 2: 2 digits after the decimal point 3: 3 digits after the decimal point 	0	Simple, standard, advanced

! Handling Precautions

- This setting also applies to other parameters, including those listed below.
 - ۰SP
 - SP low limit / high limit
 - SP up ramp / down ramp
 - PV range low limit / high limit
 - · Event setting and continuous output setting related to PV
 - · Event setting and continuous output setting related to SP
 - Event settings and continuous output settings related to deviation (absolute deviation)
 - · ON/OFF control differential
 - · ON/OFF control operating point offset
 - \cdot MV switching point PV in AT

Note

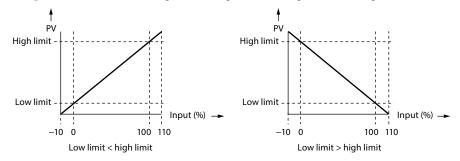
• C PV input range type (p. 5-2) (for whether this item is displayed for a certain [] | setting. The setting range and initial value also vary depending on the setting.)

PV range low/high limit

If the PV input type is DC voltage/current, scaling of the PV input can be specified.

ltem (bank)	Dis	splay	Description	Initial value	User level
PV range low limit (setup bank)	E (35	If the PV input type is DC voltage/current: -1999 to +9999 (no decimal point) -199.9 to +999.9 (1 digit after the decimal point)	0	Simple, standard, advanced
PV range high limit (setup bank)	Ε (]6	 -19.99 to +99.99 (2 digits after the decimal point) -1.999 to +9.999 (3 digits after the decimal point) If the PV input type is thermocouple or RTD: the low and high limits of the specified PV input range 	1000	

- If the PV input type is thermocouple or RTD, this item is displayed but the setting cannot be changed.
- If the PV input type is DC voltage/current, this item is displayed and the setting can be changed. The following figures show the relationship between the PV input and the PV according to the range low and high limit settings.



PV ratio and PV bias

The PV ratio and PV bias can be set to compensate the PV.

Item (bank)	Display	Description	Initial value	User level
PV ratio (parameter bank)	гЯ	0.001 to 9.999	1.000	Standard, advanced
PV bias (parameter bank)	61	–1999 to +9999 U	0 U	Simple, standard, advanced

• Details of PV ratio/bias calculation

When the input is PV_{in} , the result is PV_{out} , the PV ratio is RA, and the PV bias BI, the formula will be:

$$PV_{out} = (PV_{in} \times RA) + BI$$

■ PV low limit alarm threshold

ltem (bank)	Display	Description	Initial value	User level
PV input failure (under range) type (setup bank)	[97	0: –10 % FS 1: –5 mV (valid only when [] (PV input range type) is set to 17 or 23.)	0	Simple, standard, advanced

This setting is valid when $[\Box | (PV input range type) is set to 17 (sensor type: B) or 23 (sensor type: PR40-20). If 1 (<math>-5 \text{ mV}$) is set, the PV low limit alarm is not triggered when the sensor is connected normally.

The PV low limit alarm is triggered if the sensor is connected in the wrong direction. PV limiting and PV low/high limit alarm (p. 5-10) (for the lowest PV that can be displayed)

PV filter

The PV filter is a first-order lag filter used if the PV fluctuates sharply and repeatedly out of control or if it flutters due to noise, etc. The larger the setting is, the less frequently the PV changes.

Under normal circumstances, keep the filter at its initial value of 0.0.

ltem (bank)	Display	Description	Initial value	User level
PV filter	E!	0.0: No filter	0.0 s	Simple,
(parameter bank)		0.1 to 120.0 s		standard, advanced

 $OUT = OUT_{LAST} + (IN - OUT_{LAST}) / (T/T_s + 1)$

IN:	Input to the filter	T:	Filter setting (s)
OUT:	Current filter calculation output	Ts:	Sampling cycle
OUT _{LAST} :	Previous filter calculation output		(select from 0.05, 01, 0.3, 0.5 s)

PV hold

If the PV display is fluctuating, the display can be held steady in one of three ways by assigning "PV hold," "PV max. hold," or "PV min. hold" to a digital input (DI).

PV hold:

The PV at a certain time is displayed and not updated.

PV max. hold:

The maximum PV is displayed.

The maximum PV is updated only if a new PV is greater than the displayed value.

PV min. hold:

The minimum PV is displayed.

The minimum PV is updated only if a new PV is smaller than the displayed value.

When the PV from a certain time, the maximum PV, or the minimum PV is being displayed, the PV on the upper display flashes (blinks).

PV limiting and PV low/high limit alarm

The PV low and high limits are specified for each PV input range No. In principle, -10 % FS is the low limit and +110 % FS is the high limit of the PV.

C Operation when a PV input error occurs (p. 11-4)

The PV is limited to falling within the range.

If the PV before the PV ratio, PV bias, and PV filter are applied is greater than the PV high limit, a PV high limit alarm (RLO !) is generated. If it is less than the PV low limit, a PV low limit alarm (RLO?) is generated.

! Handling Precautions

• If the temperature unit is Fahrenheit, the PV low limit for ranges 41–44 is –235 °F.

A PV low limit alarm (RLD2) is generated between -300 and -235 °F, which is within the PV range.

To control a process below -235 °F, set the output operation at PV alarm ([15) to "0" (continue the control calculation) or set the temperature unit ([12] to "0" (Celsius (°C)).

Note that if the output operation at PV alarm ([L]) is set to "0" (continue the control calculation), control will continue also when an abnormality such as a PV high limit alarm ($[RL \square]$) occurs.

PV range No.	Range	PV low limit	PV high limit
41, 42	-300 to +900 °F	–235 °F	+1020 °F
43, 44	-300 to +400 °F	–235 °F	+470 °F

5-2 Mode

The user can switch AUTO/MANUAL modes and RUN/READY modes, stop or start the AT (auto tuning), release all DO (digital output) latches, and turn on or off user-defined bit 1.

AUTO/MANUAL mode

ltem (bank)	Display	Description	Initial value	User level
AUTO/MANUAL (mode bank)	8ā	RUE០(0): AUTO mode ភិកិក(1): MANUAL mode	AUto	Simple, standard, advanced

- After a switch between AUTO and MANUAL modes, the display returns to the operation display.
- If the operation type of any of internal contacts 1 to 5 is set to AUTO/MANUAL, R--n (AUTO/MANUAL) is displayed but the setting cannot be changed with the keys.
- If ELL (control method) is set to 0 (ON/OFF control), AUTO mode will apply. R--n (AUTO/MANUAL) is not displayed and the setting cannot be changed with the keys.
- If "Bit 0: AUTO/MANUAL display" of [7] (mode display setup) is set to 0 (disabled), R--n (AUTO/MANUAL) is not displayed and the setting cannot be changed with the keys.

RUN/READY mode

RUN and READY	modes can	be switched.
1.01. 41.4 1(1).10 1	mo avo van	

ltem (bank)	Display	Description	Initial value	User level
RUN/READY (mode bank)	гг	֊Աո(0): RUN mode ֊ժԿ(1): READY mode	ւլս	Simple, standard, advanced

- If the operation type of any of internal contacts 1 to 5 is set to RUN/READY, r--r (RUN/READY) is displayed but the setting cannot be changed with the keys.
- If "Bit 1: RUN/READY display" of [73 (mode display setup) is set to 0 (disabled), r--r (RUN/READY) is not displayed and the setting cannot be changed with the keys.

AT (automatic tuning) stop/start

AT can be started or stopped.

Item (bank)	Display	Description	Initial value	User level
AT (Auto-Tuning) stop/start (mode bank)	AF	RE_F(0): AT stop RE_n(1): AT start	RŁ _o F	Simple, standard, advanced

- AT stops in MANUAL or READY mode.
- If a PV high limit error (RLO I) or PV low limit error (RLO2) occurs, AT stops.
- If the operation type of any of internal contacts 1 to 5 is set to AT stop/start, RE (AT stop/start) is displayed but the setting cannot be changed with the keys.
- If ELrL (control method) is set to 0 (ON/OFF control), RE (AT stop/start) is not displayed and the setting cannot be changed with the keys. If ELrL (control method) is changed to 0 (ON/OFF control) while AT is running, AT stops.
- If "Bit 3: AT stop/start display" of []] (mode display setup) is set to 0 (disabled), RE (AT stop/start) is not displayed and the setting cannot be changed with the keys.

AT (automatic tuning) (p. 5-24), 5-4 AT (Automatic Tuning) Function (p. 5-28) (for details on AT)

AT error

AT status can be monitored, and if it ends abnormally, the error can be cleared by this setting.

ltem (bank)	Display	Description	Initial value	User level
Auto tuning error (mode bank)	<u>AF</u> L	EroF(0): Normal Eron(1): Abnormal	EroF	Simple, standard, advanced

- After executing the AT start operation, if AT does not start, or if it stops without changing the PID constants, REEr (auto tuning error) will be set to Eron (abnormal).
- The error can be reset to Er_F (normal) by any of the following operations.
 - Change the setting of REEr (auto tuning error) to EroF (normal).
 - Try executing AT again until it ends normally.
 - Turn the power off and then back on.
- C AT (automatic tuning) (p. 5-24), 5-4 AT (Automatic Tuning) Function (p. 5-28) (for details on AT)

Release all DO (digital output) latches

Whether to release all DO (digital output) latches can be set.

ltem (bank)	Display	Description	Initial value	User level
Release all DO (digital output) latches (mode bank)	do <u>l</u> t	LEon(0): Latch continue LEoF(1): Latch release	Lt <u>o</u> n	Simple, standard, advanced

- If the operation type of any of internal contacts 1 to 5 is set to 18 (release/ continue all DO latches), doLt (release all DO latches) is displayed but the setting cannot be changed with the keys.
- If "Bit 4: release all DO latches display" of [7] (mode display setup) is set to 0 (disabled), dolt (release all DO latches) is not displayed and the setting cannot be changed with the keys.

User-defined bit 1

User-defined bit 1 can be turned on or off.

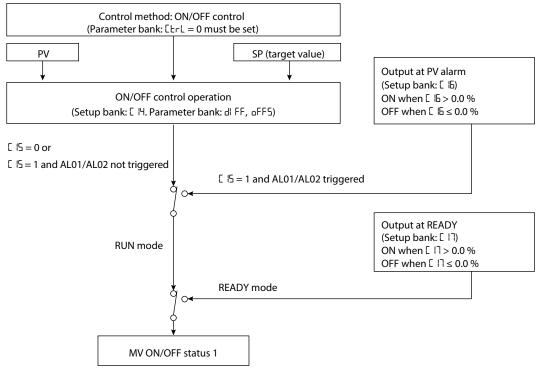
ltem (bank)	Display	Description	Initial value	User level
User-defined bit 1 (mode bank)	Udb, I	dboF(0): User defined bit 1 is OFF. dbon(1): User defined bit 1 is ON.	dboF	Simple, standard, advanced

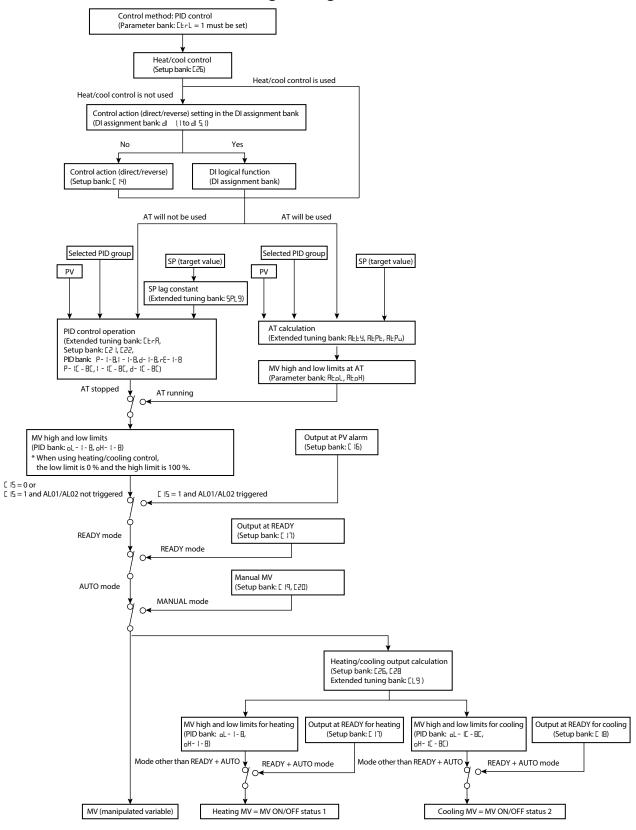
- There are four user-defined bits, 1 to 4, but only user-defined bit 1 can be turned on or off using the keys.
- A function (operation) can be set for user-defined bit 1 in the DI assignment bank.
- If "Bit 5: user-defined bit 1 ON/OFF display" of [7] (mode display setup) is set to 0 (disabled), Udb ! (user-defined bit 1) is not displayed and the setting cannot be changed.

5-3 Control

Functional block diagrams for control (ON/OFF control, PID control, Ra-PID control, heating/cooling control, etc.) are shown below.

ON/OFF control





■ PID control, Ra-PID control, heating/cooling control

Control method

There are two control methods.

ltem (bank)	Display	Description	Initial value	User level
Control method (parameter bank)	Etrl	0: ON/OFF control 1: PID control	0 or 1	Simple, standard, advanced

• If relay (R0) is selected for control output by the model No., the initial value is 0. For other models, the initial value is 1.

Control action and heating/cooling control

Direct/reverse of the control action and whether to use the heating/cooling control can be selected.

ltem (bank)	Display	Description	Initial value	User level
Control action (direct/reverse) (setup bank)	[4	0: Heating control (reverse action) 1: Cooling control (direct action)	0	Simple, standard, advanced
Heat/cool control (setup bank)	6 26	0: Not used 1: Use (individual PID) 2: Use (shared PID)	0	Simple, standard, advanced

- If EtrL (control method) is set to 1 (PID control), E2E (heat/cool control) is displayed and the setting can be changed.
- If E25 (heat/cool control) is set to 0 (not used), E 14 (control action) is displayed and the setting can be changed.
- If E25 (heat/cool control) is set to 0 (not used), E20 (preset MANUAL value) and E22 (initial output of PID control) will change to 0.0.
- If the setting of E26 (heat/cool control) is changed from 0 (not used) to another setting, E20 (preset MANUAL value) will change to 50.0 and E22 (initial output of PID control) will change to 50.0.
- If E25 (heat/cool control) is set to 2 (use (shared PID)), REpL (MV low limit at AT) will change to 50.0 and REpH (MV high limit at AT) will be 100.0.
- If E25 (heat/cool control) is changed from 2 (use (shared PID)) to another setting, REpL (MV low limit at AT) will change to 0.0 and REpH (MV high limit at AT) will be 100.0.
- Reverse action (heating control) is a control that reduces (or turns off) the MV when the PV increases.
 Direct action (cooling control) is a control that increases (or turns on) the MV when the PV increases.

Special control output

The control output when the PV is abnormal and when the device is in READY mode and can be specified.

ltem (bank)	Display	Description	Initial value	User level
Output operation at PV alarm (setup bank)	E 15	0: Continue the control calculation 1: Output the value set for "Output at PV alarm"	0	Advanced
Output at PV alarm (setup bank)	E 16	-10.0 to +110.0 %	0.0 %	Advanced
Output at READY (Heat) (setup bank)	[]	-10.0 to +110.0 %	0.0 %	Standard, advanced
Output at READY (Cool) (setup bank)	C 18	-10.0 to +110.0 %	0.0 %	Standard, advanced

- If ELL (control method) is set to 1 (PID control) and E2E (heat/cool control) is set to 1 or 2, E IE (output at READY (Cool)) is displayed and the setting can be changed.
- When the PV is abnormal, RLO | or $\mathsf{RLO2}$ occurs.

Operation when switched to MANUAL mode

The control output when the mode is switched from AUTO to MANUAL can be set.

ltem (bank)	Display	Description	Initial value	User level
Output operation at changing AUTO/MANUAL (setup bank)	[9	0: Bumpless transfer 1: Preset	0	Standard, advanced
Preset MANUAL value (setup bank)	05]	-10.0 to +110.0 %	0.0 or 50.0 %	Standard, advanced

- If \Box [9 (output operation at changing AUTO/MANUAL) is set to 0 (bumpless transfer), the MV when switched from AUTO to MANUAL is retained. If 1 (preset) is set, the MV is changed to the value set by \Box (preset MANUAL value) when the mode is switched from AUTO to MANUAL.
- If ELrL (control method) is set to 1 (PID control), [19 (output operation at changing AUTO/MANUAL) and [20] (preset MANUAL value) are displayed and the settings can be changed.
- The initial value of [20 (preset MANUAL value) is 0.0 when [25 (heat/cool control) is set to 0 (not used), and 50.0 when the setting is 1 or 2 (use).

! Handling Precautions

• If the mode is MANUAL at power ON, the MV will be the value set by [20 (preset MANUAL value).

■ Initial output type (mode) of PID control

Item (bank)	Display	Description	Initial value	User level
Initial output type (mode) of PID control	15]	0: Automatic 1: Not initialized	0	Advanced
(setup bank)		2: Initialize (if a new SP is set)		

- If EtrL (control method) is set to 1 (PID control), this item is displayed and the setting can be changed.
- When PID groups are switched according to a change in the SP or the SP group, the MV may be stuck at the low or high limit, and the PV may not change or may overshoot. PID control initialization is useful in preventing these problems.
- If 0 (automatic) is set:

When the SP value is changed or SP groups are switched, whether the PID control must be initialized or not is determined automatically, and it is initialized only when necessary.

• If 1 (not initialized) is set:

PID control is not initialized when the SP is changed or SP groups are switched. This setting is useful if the continuity of the MV is important when the SP is changed or SP groups are switched.

• If 2 (initialize) is set:

PID control is always initialized when the SP is changed or SP groups are switched. This setting is useful if it is important that, when the SP is changed or SP groups are switched, the MV increases or decreases quickly according to the relationship between the PV and SP.

Initial output of PID control

ltem (bank)	Display	Description	Initial value	User level
Initial output of PID control	ר ככ	-10.0 to +110.0 %	0.0 or 50.0 %	Advanced
(setup bank)	<u> L L L</u>			

- If [LrL (control method) is set to "1" (PID control), this item is displayed and the setting can be changed.
- This value is used for PID control immediately after the operation mode is changed from READY to RUN, or after RUN mode is activated when the power is turned on. This value greatly affects the MV when the mode is switched.
- If the setting for [26 (heat/cool control) is changed, the value will be reset automatically. If it is changed to 1 or 2 (use), 50.0 % will apply. If it is changed to 0 (not used), 0.0 % will apply.

Integral time and derivative time decimal point position

ltem (bank)	Display	Description	Initial value	User level
Integral time and derivative time decimal point position (setup bank)	E 23	0: No decimal point 1: 1 digit after the decimal point 2: 2 digits after the decimal point 3: 3 digits after the decimal point	0	Advanced

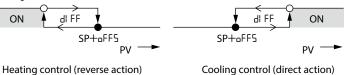
- If EtrL (control method) is set to 1 (PID control), this item is displayed and the setting can be changed.
- If 0 is set, the integral time and derivative time settings will be from 0 to 9999 s.
- If 1 is set, the integral time and derivative time settings will be from 0.0 to 999.9 s.

ON/OFF control

The settings	related to	ON/OFF	control	can be	specified
The settings	Telateu ti	JON/OFT	control	Call De	: specified.

ltem (bank)	Display	Description	Initial value	User level
ON/OFF control differential (parameter bank)	di FF	0 to 9999 U	5 U	Simple, standard, advanced
ON/OFF control operating point offset (parameter bank)	oFFS	–1999 to +9999 U	0 U	Advanced

- If EtrL (control method) is set to 0 (ON/OFF control), dl FF (ON/OFF control differential) and oFF5 (ON/OFF control operating point offset) are displayed and the settings can be changed.
- The operation of ON/OFF control is shown below.



The meaning of the symbols in the diagram:

•: ON/OFF changes at the value

 $\bigcirc: \mathsf{ON}/\mathsf{OFF}$ changes when the value is exceeded

• Example of how to use the ON/OFF control differential and the ON/OFF control operating point offset:

In heating control with SP = 200 °C, if you want to turn off the output when the temperature is 205 °C or higher and turn on the output when the temperature falls below 190 °C, set the differential to 15 °C and the offset to 5 °C. In cooling control with SP = 10 °C, if you want to turn off the output when the temperature is 5 °C or lower and turn on the output when the temperature is above 10 °C, set the differential to 5 °C and the offset to -5 °C.

! Handling Precautions

 dl FF (ON/OFF control differential) and pF5 (ON/OFF control operating point offset) should be set so that the output is turned on or off within the PV range. PV input range type (p. 5-2) (for details on the PV range)

PID control

The settings	related [•]	to PID	control	can be	specified
The settings	related		control	can be	specificu.

ltem (bank)	Display	Description	Initial value	User level
Proportional band		0.1 to 999.9 %	5.0 %	Simple,
(PID bank)				standard, advanced
Integration time		0 to 9999 U	120 s	uavancea
(PID bank)		(0 = no integral operation)		
Derivative time		0 to 9999 U	30 s	
(PID bank)		(0 = no derivative operation)		
Manual reset	rE-	-10.0 to +110.0 %	50.0 %	
(PID bank)				
MV low limit		-10.0 to +110.0 %	0.0 %	Standard,
(PID bank)	ol-i			advanced
MV high limit		-10.0 to +110.0 %	100.0 %	
(PID bank)	0H- 1			
Cool-side proportional band	P- 1	0.1 to 999.9 %	5.0 %	Simple,
(PID bank)				standard, - advanced
Cool-side integration time	- [0 to 9999 U	120 s	
(PID bank)		(0 = no integral operation)		
Cool-side derivative time		0 to 9999 U	30 s	
(PID bank)		(0 = no derivative operation)		
Cool-side MV low limit		-10.0 to +110.0 %	0.0 %	Standard,
(PID bank)	ol IC			advanced
Cool-side MV high limit		-10.0 to +110.0 %	100.0 %]
(PID bank)				

- If EtrL (control method) is set to "1" (PID control), this item is displayed and the setting can be changed.
- The abbreviations for "Cool-side proportional band," "Cool-side integration time," and "Cool-side derivative time" are displayed and the settings can be changed if [26 (heat/cool control) is set to 1 (use (individual PID)).
- The abbreviations for "Cool-side MV low limit" and "Cool-side MV high limit" are displayed and the settings can be changed if [26 (heat/cool control) is set to 1 or 2 (use).
- In heating/cooling control, if "integration time" (| |) or "cool-side integration time" (| |E) is 0 seconds, no integration is performed. Manual reset (rE- |) is used for both heating and cooling.
- rE- | (manual reset) is displayed if the integration time setting for either heating or cooling is "0."
- If the integration time for either heating or cooling is 0 seconds, both integration times are processed as 0 seconds.
- If the MV low limit is greater than the MV high limit, the low limit and the high limit are automatically interchanged.

• PID control operation initialization

PID control operation is initialized when:

- PID control starts after RUN + MANUAL modes are switched to RUN + AUTO modes
- PID control starts after READY + AUTO modes are switched to RUN + AUTO modes
- PID control starts after the value set for "Output at PV alarm" is output
- PID control starts after AT ends normally
- PID control starts after AT ends abnormally
- The settings below are changed in RUN + AUTO modes:
 - Control method Heat/cool control Control operation Sampling cycle Control algorithm
- PID control is initialized according to the setting for "Initial output type (mode) of PID control" ([2 !) in RUN + AUTO modes

Heating/cooling control

The dead zone and cooling gain can be set for heating/cooling control.

ltem (bank)	Display	Description	Initial value	User level
Heat/Cool control dead zone (setup bank)	85 3	-100.0 to +100.0 %	0.0 %	Simple, standard, advanced
Cooling gain	EL9	-10.0 to +110.0 %	30.0 %	Advanced

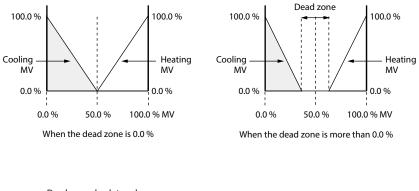
Heating/cooling control operations are as follows.

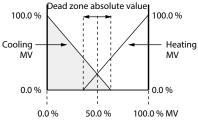
- [28 (heat/cool control dead zone) is displayed and the setting can be changed if [26 (heat/cool control) is set to 1 or 2 (use).
- If E26 (heat/cool control) is set to 1 (use (individual PID)), heating PID values apply when the MV is 50 % or more, and cooling PID values apply when the MV is less than 50 %.
- [L9 (cooling gain) is displayed and the setting can be changed if [26 (heat/cool control) is set to 2 (use (shared PID)).
- Set [L9 (cooling gain) to a higher value to boost the cooling capability, and set it to a lower value to decrease the cooling capability.

📖 Note

Heating/cooling output

If [25 (heat/cool control) is set to 1 (use (individual PID)), the heating and cooling MVs shown in the figures below are output in accordance with the setting for "Heat/cool control dead zone."





When the dead zone is less than 0.0 %

The figure below shows the relationship between the MV low limit, MV high limit, cooling MV low limit, and cooling MV high limit.

MV low limit \leq heating MV \leq MV high limit

Cooling MV low limit \leq cooling MV \leq cooling MV high limit

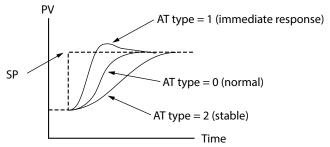
AT (automatic tuning)

	The following s	ettings can be specified for AT.		
ltem (bank)	Display	Description	Initial value	User level
MV low limit at AT (parameter bank)	AF ^{or}	-10.0 to +110.0 %	0.0 %	Simple, standard, advanced
MV high limit at AT (parameter bank)	RE _{.0} H	-10.0 to +110.0 %	100.0 %	advanced
AT type (extended tuning bank)	AFFA	0: Normal (regular control characteristics) 1: Immediate response (to disturbance) 2: Stable (minimal PV fluctuation)	1	
AT proportional band adjust (extended tuning bank)	AF-b	0.00 to 99.99	1.00	Advanced
AT integral time adjust (extended tuning bank)	AF - I	0.00 to 99.99	1.00	
AT derivative time adjust (extended tuning bank)	86-98	0.00 to 99.99	1.00	
Type of MV switching point at AT	AFbF	0: Default (2/3 of the deviation of the initial PV from the initial SP)	0	
(extended tuning bank)		1: SP 2: PV		
MV switching point PV in AT	RLPu	–1999 to +9999 U	0	

- If EtrL (control method) is set to "1" (PID control), this item is displayed and the setting can be changed.
- The MV when AT is executed can be limited by "MV low limit at AT" (REoL) / "MV high limit at AT" (REoH).
 - If E26 (heat/cool control) is set to 0 (not used), the MV is limited by both "MV low limit at AT" (ALoL) / "MV high limit at AT" (ALoH) and by "MV low limit" (oL- 1) / "MV high limit" (oH- 1) for the PID constants.
 - If [25 (heat/cool control) is set to 1 or 2 (use),
 - The MV is limited by "MV low limit at AT" (<code>REoL</code>) / "MV high limit at AT" (<code>REoH</code>).
 - The heating MV is limited by "MV low limit" (oL | to θ) / "MV high limit" (oH- | to θ).
 - The cooling MV is limited by "cool-side MV low limit" (aL IE to BE) / "cool-side MV high limit" (aH IE to BE).
- "AT type" (FEEY) is used to calculate the PID constants that are appropriate for the control characteristics of the equipment by AT.

1 (immediate response): adjustment for speed-oriented applications, such as a process where the PV directly reflects heating by a heater.

2 (stable): adjustment for stability-oriented applications, such as a process where the PV indirectly reflects heating by a heater.



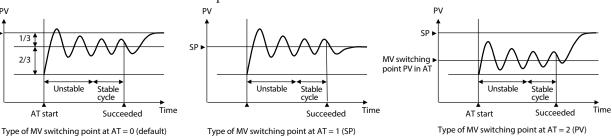
The following graph illustrates the differences in control results using PID constants calculated with each AT type.

Difference in PV change when SP is changed

• "AT proportional band adjust" (AL-P), "AT integral time adjust" (AL-I), "AT derivative time adjust" (RE-d):

The PID constants calculated with AT are multiplied by these factors before being written to the PID constant settings. Note that values within the setting range of the PID constants will be written.

- "Type of MV switching point at AT" is a setting for changing the MV switching point during AT.
 - 0 (default): A new MV applies when the PV passes the two-thirds point in the amount of PV deviation from the SP at the start of AT.
 - 1 (SP): A new MV applies when the PV passes the SP at the start of AT.
 - 2 (PV): A new MV applies when the PV passes the setting for "MV switching point PV in AT."



🗒 Note

ΡV

SP

• If you want to execute AT only for heating PID constants when [26 (heat/ cool control) is set to 1 (use (individual PID)), the settings should satisfy: 50.0 % < MV low limit at AT (REoL) < MV high limit at AT (REoH)

If you want to execute AT only for cooling PID constants, the settings should satisfy:

MV low limit at AT (RLoL) < MV high limit at AT (RLoH) < 50.0 %

AT (automatic tuning) stop/start (p. 5-12) 5-4 AT (Automatic Tuning) Function (p. 5-28) (for details on AT)

! Handling Precautions

- If E26 (heat/cool control) is set to 2 (use (shared PID), execute AT with settings that satisfy:
 - 50.0 % < MV low limit at AT (RŁoŁ) < MV high limit at AT (RŁoH)
- If you change a setting such as PV input range type or linear scaling low/high limit while AT is running, AT may not end. Do not change any settings other than RE (AT stop/start selection) while AT is running.
- If you want to execute AT only for heating PID constants when E26 (heat/ cool control) is set to 1 (use (individual PID), the settings should satisfy: 50.0 % < MV low limit at AT (REpL) < MV high limit at AT (REpH)
- If you want to execute AT only for cooling PID constants when E26 (heat/ cool control) is set to 1 (use (individual PID), the settings should satisfy: MV low limit at AT (REpL) < MV high limit at AT (REpH) < 50.0 %

Ra-PID

Ra-PID (RationaLOOP control function) reduces instability when the response to disturbance is improved by the high-precision control logic. The following settings are available.

ltem (bank)	Display	Description	Initial value	User level
Control algorithm		0: PID (conventional PID)	0	Standard,
(extended tuning bank)		1: Ra-PID (high-performance PID)		advanced

• If [LrL (control method) is set to "1" (PID control), this item is displayed and the setting can be changed.

SP lag

The SP lag is a filter function to prevent sudden changes in the SP used in control operations when the SP changes. Use the setting below for SP lag.

ltem (bank)	Display	Description	Initial value	User level
SP lag constant	כסי ס	0.0 to 999.9	0.0	Advanced
(extended tuning bank)		(0.0 = no effect)		

- If [LrL (control method) is set to "1" (PID control), this item is displayed and the setting can be changed.
- The function of 5PL9 (SP lag constant): If 0.0 is set: The SP lag function has no effect. If 0.1 or more is set: The larger the constant, the smaller the amount of MV change when the SP is changed, and the more strongly overshoot is suppressed.
- When the SP changes, the initial output value of the filter function that is input to the PID control operation is reset as follows.
 - Reset to the SP when PID control starts after RUN + MANUAL modes are switched to RUN + AUTO modes
 - Reset to the PV when PID control starts after READY + AUTO modes are switched to RUN + AUTO modes
 - Reset to the PV when PID control starts after the value set for "Output at PV alarm" is output
 - Reset to the SP when PID control starts after AT ends normally
 - Reset to the PV when PID control starts after AT ends abnormally
 - Reset to the PV if the settings below are changed in RUN + AUTO modes:
 - Control method Heat/cool control Control operation Sampling cycle Control algorithm
 - Reset to the PV if PID control is initialized according to the setting for "Initial output type (mode) of PID control" ([2 |) in RUN + AUTO modes

5-4 AT (Automatic Tuning) Function

Use the AT function if:

- You want to set [LrL (control method) to 1 (PID control) and set PID constants automatically.
- The rise of PV is slow or the overshoot is large.

AT function is available if [LrL (control method) is set to 1 (PID control).

How to start AT

- (1) Check that the PV input and the actuators (heater power, etc.) are ready for control.
- (2) Check that the RDY mode indicator is off, which indicates that the device is in RUN mode. If the RDY mode indicator is on and the device is in READY mode, change the mode to RUN.
- (3) Check that the MAN mode indicator is off, which indicates that the device is in AUTO mode. If the MAN mode indicator is on and the device is in MANUAL mode, change the mode to AUTO.
- (4) Set RE (AT stop/start) in the mode bank to RE no (AT start).

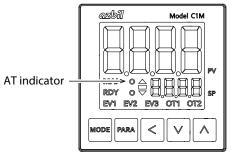
How to stop AT

AT ends automatically. To stop AT while it is running, set $\exists E (AT \text{ stop/start})$ in the mode bank to $\exists E_DF$ (AT stop).

AT can also be stopped by changing the mode to READY or MANUAL.

Display while AT is running

During AT, the AT indicator flashes. When AT and the calculation of PID constants are done, the AT indicator turns off.



• Operation while AT is running

During AT, PID constants are calculated using limit cycles.

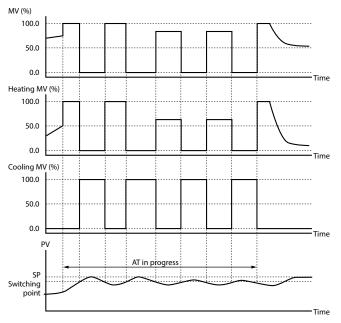
- A limit cycle operation is performed using the MV switching point specified by "Type of MV switching point at AT"
 During AT, two values are output repeatedly. One of the values is "MV low limit" (oL 1 to B) or "MV low limit at AT"(REoL), whichever is greater, and the other is "MV high limit" (oH 1 to B) or "MV high limit at AT" (REoH), whichever is smaller.
- (2) When the limit cycle has stabilized, the PID constants are changed, and AT ends.

If [26 (heat/cool control) is set to 1 (use (individual PID)), AT is executed using both heating and cooling MVs.

In the first half, the MV changes to its low and high limits. In the second half, it changes within a relatively narrow range.

If [26 (heat/cool control) is set to 2 (use (shared PID)), AT is executed using only heating MV.

The figures below illustrates AT with the following settings: L2E (heat/cool control) = 1 (use (individual PID), heating/cooling control dead zone = 0.0 %, MV low limit = 0.0 %, MV high limit = 100.0 %



Handling Precautions

- Before starting AT, check that the PV input and the actuators (heater power, etc.) are ready for control.
- If ELFL (control method) is set to 0 (ON/OFF control), AT cannot start. Change the control method setting to 1 (PID control).
- Conditions for starting AT:
 - The device is in RUN and AUTO modes.
 - No PV input error has occurred.
 - The setting for "MV switching point PV in AT" is within the PV input range.
 AT (automatic tuning) (p. 5-24) (for "Type of MV switching point at AT")
 PV input range type (p. 5-2) (for the PV input range)
- If any of the following is detected during AT, AT will stop without changing the PID constants:
 - Switch to READY mode
 - Switch to MANUAL mode
 - \cdot PV error
 - Change in the setting of "control method," "heat/cool control," "control operation" (only when "heat/cool control" is set to 0 (not used)), "sampling cycle," and "control algorithm"
 - Change in the setting of "MV low limit" (aL 1 to 8), "MV low limit at AT" (ALaL), "MV high limit" (aH - 1 to 8), or "MV high limit at AT" (ALaH) that would prevent change in the two-value output during AT
- For forcible termination of AT by RE (AT stop/start selection) in the mode bank or by the internal contacts to which the function to stop/start AT is assigned, see the section below:

5-7 Digital Input (DI) / Internal Contacts (p. 5-47)

If AT is forced to stop, $R \vdash E_{r}$ (auto tuning error) is set to $E_{r,on}$ (abnormal). $R \vdash E_{r}$ (auto tuning error) can be reset to $E_{r,o}F$ (normal)) by any of the following operations.

- Change the setting of REEr (auto tuning error) to $E_{ro}F$ (normal).
- Try executing AT again until it ends normally.
- Turn the power off and then back on.
- If E2E (Heat/cool control) is set to 2 (Use (shared PID)), specify "MV low limit at AT" (RE_0L) / "MV high limit at AT" (RE_0H) and "MV low limit" (oL 1 to B) / "MV high limit" (oH 1 to B) so that both values that are output to the MV are 50 % or more.
- If [26 (heat/cool control) is set to 1 (use (individual PID)),
 - The MV is limited by "MV low limit at AT" (REoL) / "MV high limit at AT" (REoH).
 - The heating MV is limited by "MV low limit" ($_{o}L$ 1 to B) / "MV high limit" ($_{o}H$ 1 to B) for the PID constants.
 - The cooling MV is limited by "cool-side MV low limit" (aL IE to BE) / "cool-side MV high limit" (aH IE to BE).

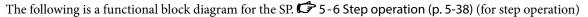
• If the two values are close, the PV may not change even if the MV has changed during AT.

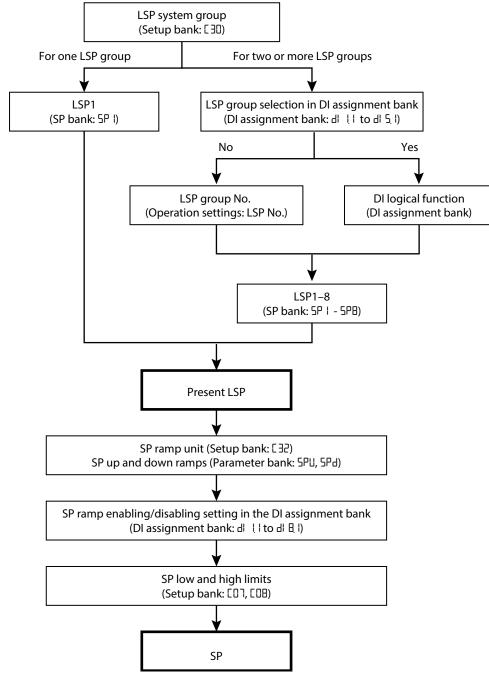
In this case, AT may not end. If this happens, stop AT manually, reset the MV low and high limits, and then start AT again.

- The number of limit cycles from the start to the end of AT and how long the AT takes differ depending on the process being controlled.
- If AT always fails, instead of using it, set the PID constants manually.
- The progress of AT can be checked on the operation display.
 Operation settings (p. 6-1)
- If E26 (heat/cool control) is set to 0 (not used) or 2 (use (shared PID)), a value indicating the progress of AT is displayed. It starts with 4 and is decremented to 0, which means that AT is complete.
 If E26 (heat/cool control) is set to 1 (use (individual PID)), AT starts at 7, decreases by increments of 1, and finishes at 0.
 The AT progress value indicates the number of steps remaining until AT ends.
 It does not indicate the time until AT ends.
- Depending on the process being controlled, it may not be possible to obtain suitable PID constants. In such a case, set the PID constants manually.
- Do not change any settings other than $\mathsf{R}\mathsf{E}\,$ (AT stop/start selection) while AT is running.

AT (automatic tuning) stop/start (p. 5-12), AT (automatic tuning) (p. 5-24) (for details on AT)

5-5 SP





📖 Note

• A local set point (LSP) is a set point stored in this device. A set point given by an external analog input is called a remote set point (RSP). This device does not provide an RSP function.

Specifying the SP using operation settings

The SP for the LSP group (LSP1 to 8) that is being used can be specified.

During an SP ramp, the SP that is displayed will be different from the LSP group SP, but when the setting is being changed using the keys, the value specified for the LSP group will be displayed.

ltem (bank)	Display	Description	Initial value	User level
SP (operation settings)	PV is shown on the upper display.	SP low limit to high limit	0 U	Simple, standard, advanced

• If "Bit 1: SP display" of [74 (PV/SP display setup) is set to 1 (enabled), this item is displayed and the setting can be changed.

Number of LSP groups

The number of LSP groups to be used can be specified.

ltem (bank)	Display	Description	Initial value	User level
LSP system group (setup bank)	06]	1 to 8	1	Simple, standard, advanced

LSP1 to 8

ltem (bank)	Display	Description	Initial value	User level
SP (SP bank)	SP-1 SP-2 SP-3 SP-4 SP-5 SP-6 SP-7 SP-8	SP low limit to high limit	0U	Simple, standard, advanced

• SPs for as many LSP groups as are specified by [30 (LSP system group) are displayed for setting.

LSP group No.

The LSP group to display can be selected.

ltem (bank)	Display	Description	Initial value	User level
LSP No. (operation settings)	LSP	The rightmost digit shows the number. From 1 to the number set for "LSP system group"	1	Simple, standard, advanced

- This item is displayed if E3D (LSP system group) is set to 2 or more and "Bit 2: LSP group No. display" of E74 (PV/SP display setup) is set to 1 (enabled).
- If this item is displayed and if LSP group selection is not specified in DI assignment, the setting can be changed.

Specifying LSP group selection by DI assignment

In the DI assignment bank, LSP group selection can be set for internal contacts 1 to 5.

ltem (bank)	Display	Description	Initial value	User level
DI assignment Internal contact 1 to 5	4 1	0: No function 1: LSP group selection (0/+1)	0	Advanced Standard,
Operation type (DI assignment bank)	<u>ן 7 וף</u>	2: LSP group selection (0/+2) 3: LSP group selection (0/+4)	0	advanced
		4–20: other functions	0	_
			0	

• Details of LSP group selection by internal contact

The LSP group No. set by ON/OFF of internal contacts is shown below.

LSP group selection (0/+1)	OFF: 0	ON: 1
LSP group selection (0/+2)	OFF: 0	ON: 2
LSP group selection (0/+4)	OFF: 0	ON: 4

The LSP group No. is determined by adding 1 to the sum of the LSP group selection values set by ON/OFF of internal contacts.

For example, if the sum of the values set by internal contacts 1 to 3 is 1, the LSP group No. will be 2.

• If the number of LSP groups is 1, this item can be displayed and the setting can be changed, but LSP group selection by DI assignment is invalid.

SP ramp unit

ltem (bank)	Display	Description	Initial value	User level
SP ramp unit (setup bank)	5E 3	0: 0.1 U/s 1: 0.1 U/min	1	Advanced
		2: 0.1 U/h		

• 0.1 U means that the setting displayed has one more decimal place than the number of decimal places set by "PV decimal point position."

Examples

For a thermocouple input with a range of -200 to +200 °C: 0.1 U = 0.1 °C

For a DC voltage input with a range of 0.0 to 100.0: 0.1 U = 0.01

SP up ramp / down ramp (p. 5-36) (for the relationship between PV input ranges with a decimal point and the setting for "PV decimal point position")

! Handling Precautions

• For a DC voltage input or DC current input with the 3-decimal place setting, 0.1 U = 0.0001.

However, regarding the SP up ramp and SP down ramp settings, all four values displayed on this device indicate values after the decimal point, because this device can display only four digits.

SP up ramp / down ramp

SP up ramp a	and down ramp	can be specified.
--------------	---------------	-------------------

ltem (bank)	Display	Description	Initial value	User level
SP up ramp	50!!	0.0 U : No ramp	0.0 U	Advanced
(parameter bank)		0.1 to 999.9 U		
SP down ramp	ςρკ	(Select the time unit of ramp by "SP ramp	0.0 U	
(parameter bank)	ע יע	unit.")		

- If the initial value 0.0 U is set, the SP ramp function does not operate. Therefore, if the up ramp is set to 0.1 U or more and the down ramp is set to 0.0 U, the SP ramp function operates when the SP is increasing but does not operate when the SP is decreasing. It is also possible to set the SP ramp function to operate only when the SP is decreasing.
- The setting for these items has one more decimal place than that of the displayed PV. For a linear input with the 3-decimal place setting, all four digits that are displayed are after the decimal point. The time unit of the ramp can be selected from per second, per minute, and per hour by E32 (SP ramp unit).

Example of the relationship between PV input ranges with a decimal point and the setting for "PV decimal point position":

[] (PV input range type)	[[낵 (PV decimal point position)	5만년 (SP up ramp)	5만년 (SP down ramp)
2 (0 to 1200 °C)	(Fixed)	0.0 to 999.9	0.0 to 999.9
3 (0.0 to 800.0 °C)	0 (no decimal point)	0.0 to 999.9	0.0 to 999.9
	1 (1 digit after the decimal point)	0.00 to 99.99	0.00 to 99.99
88 (0 to 10 V)	0 (no decimal point)	0.0 to 999.9	0.0 to 999.9
	1 (1 digit after the decimal point)	0.00 to 99.99	0.00 to 99.99
	2 (2 digits after the decimal point)	0.000 to 9.999	0.000 to 9.999
	3 (3 digit after the decimal point)	0.0000 to 0.9999	0.0000 to 0.9999

- The ramp starts with the present PV when:
 - The power is turned on.
 - READY + AUTO modes are switched to RUN + AUTO modes.
 - RUN + MANUAL modes are switched to RUN + AUTO modes.

SP low/high limit

The SP low/high limit can be set in order to limit the range of the SP.

ltem (bank)	Display	Description	Initial value	User level
SP low limit (setup bank)	רם כ	(PV range low limit to PV range high limit)	PV range low limit	Standard, advanced
SP high limit (setup bank)	C 08	(PV range low limit to PV range high limit)	PV range high limit	Standard, advanced

! Handling Precautions

• If the setting for [] | (PV input range type) is changed, the SP low/high limit will be reset (excluding linear ranges)

Enabling/disabling SP ramp by DI assignment

In the DI assignment bank, the function to enable or disable the SP ramp can be set for internal contacts 1 to 5.

ltem (bank)	Display	Description	Initial value	User level
DI assignment Internal contact 1 to 5	41 11	0: No function	0	Simple, standard,
Operation type	4151	13: Enabling/disabling SP ramp 1–12, 14–20: other functions	0	advanced
(DI assignment bank)	dl <u>3</u> l		0	
			0	
			0	

• Details of SP ramp enabling/disabling by internal contacts SP ramp is enabled or disabled by ON/OFF of internal contacts as shown below.

OFF: SP ramp enabled, ON: SP ramp disabled

Assign SP ramp enabling/disabling to only one internal contact.

• If the SP ramp is disabled while it is running, SP ramping stops and the SP at that time will be the final SP.

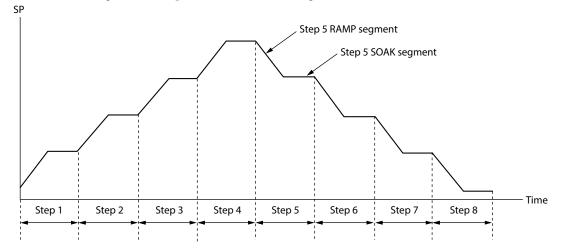
5-6 Step operation

Using up to eight SP groups, a step operation where the SP changes as shown in the figure below can be executed.

Configure a step operation by specifying the LSP, ramp, and time of each step. The PID group No. to use in each step can also be set.

In each step, the segment where the SP is changing is called the RAMP, and the segment where the SP does not change is the SOAK.

The RAMP and SOAK segments in step 5 are indicated in the figure below.



! Handling Precautions

• A step operation can run in RUN mode. If the mode is changed to READY, step operation stops at the beginning of step 1.

Number of LSP groups

The number of steps in one step operation can be specified by this setting.

Item (bank)	Display	Description	Initial value	User level
LSP system group (setup bank)	C 30	1 to 8	1	Simple, standard, advanced

SP ramp type

Whether to execute a step operation can be set.

What happens when the power is turned off and back on during a step operation can also be specified with this item. \$\mathcal{C}^{+}\$ 5-6 Step operation (p. 5-38) (for step operation)

ltem (bank)		Disp	ay	Description	Initial value	User level
SP ramp type	ŗ	コ	!	0: Standard	0	Advanced
(setup bank)	╵┗	لــ	I	1: Multi-ramp		
				2: Step operation enabled: Step operation does not resume when the power is turned back on (shifts to READY)		
				3: Step operation enabled: Step operation resumes when the power is turned back on		

- Set 2 or 3 to enable step operations.
- 2: If a power failure occurs during a step operation (in RUN mode), when the power is turned back on, the step operation does not resume (this device enters READY mode) and the SP returns to its value at the beginning of the step operation.
- 3: If a power failure occurs during a step operation (in RUN mode), when the power is turned back on, the step operation resumes from the step that was being processed when the power failure occurred. However, operation cannot restart at exactly the same point of time and SP as when the power failure occurred. The step operation resumes as follows.

If a power failure occurs during a SOAK, the operation will resume from the beginning of the SOAK. If a power failure occurs during a RAMP and there was no PV alarm (RLD I/RLD2), the operation will resume with an SP that is the same as the PV in that RAMP. If a power failure occurs during a RAMP and there was a PV alarm (RLD I/RLD2), the operation will resume with the SOAK that follows that RAMP.

! Handling Precautions

- Operation of the C1M with setting 3 (step operation enabled: the operation resumes when the power is turned back on) differs from the setting 3 operation of Azil's DCP digital program controllers (DCP31/32, DCP551/552). With the DCP, operation restarts at the point of time in the RAMP or SOAK that was in progress when the power failure occurred, and with the SP at that time. With the C1M, operation restarts from the beginning of the RAMP or SOAK that was in progress.
- If setting 3 is used, pay attention to the number of times data is written to EEPROM (nonvolatile memory). During a step operation in RUN mode, every time a RAMP or SOAK segment starts, data is written to EEPROM. If step operations are repeated with 10-minute or shorter RAMP/SOAK time, the service life of writing to EEPROM (about 100,000 times) will be exceeded within 2 years.
- If [] (SP ramp type) is set to 0 (standard) or 1 (multi-ramp) and if this device is in RUN mode, when the setting is changed to 2 or 3 (step operation enabled), this device automatically enters READY mode.

SP ramp unit

The unit of the ramp's slope in a step operation can be specified.

Item (bank)	Display	Description	Initial value	User level
SP ramp unit (setup bank)	5E 3	0: 0.1 U/s 1: 0.1 U/min	1	Advanced
		2: 0.1 U/h		

• 0.1 U means that the setting displayed has one more decimal place than the number of decimal places set by "PV decimal point position."

Examples

For a thermocouple input with a range of -200 to +200 °C: 0.1 U = 0.1 °C

For DC voltage input with a range of 0.0 to 100.0: 0.1 U = 0.01

! Handling Precautions

• For DC voltage input or DC current input with the 3-decimal place setting, 0.1 U = 0.0001.

However, regarding the SP up and down settings, all four digits that are displayed are after the decimal point because this device can display only four digits.

STEP time unit

The time unit of a SOAK segment in a step operation can be specified.

ltem (bank)	Display	Description	Initial value	User level
STEP time unit (setup bank)	E 33	0: 0.1 s 1: 1 s (the operation display shows Min, 5)	0	Advanced
		2: 1 min (the operation display shows H. 히 n)		

- 0: The unit of the soak time setting in the SP bank will be 0.1 s.
- 1: The unit of the soak time setting in the SP bank will be seconds. The time remaining in the step is displayed in the format MM.SS (minutes.seconds).
- 2: The unit of the soak time setting in the SP bank will be minutes. The time remaining in the step is displayed in the format HH.MM (hours.minutes).

! Handling Precautions

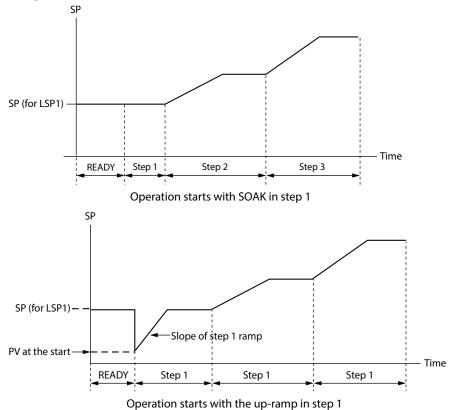
- The time remaining in the step is displayed in the unit set by "STEP time unit," regardless of whether the process is in RAMP or SOAK.
- If 1 is set, and the time remaining in the step is more than 99 minutes 59 seconds, 99.99 will be displayed.
- If 2 is set, and the time remaining in the step is more than 99 hours 59 minutes, 99.99 will be displayed.

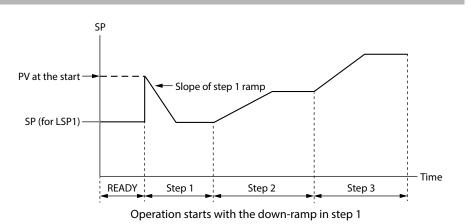
STEP PV start

Whether to start a step operation with the PV and the type of PV start when it is used can be specified.

ltem (bank)	Display	Description	Initial value	User level
STEP PV start	r Ju	0: No	0	Advanced
(setup bank)		1: Up start		
		2: Down start		

- 0: The step operation starts with SOAK in step 1.
- 1: If the PV is smaller than the SP for LSP 1, the step operation starts with the up-ramp of step 1 using an SP that is the same as the PV. If the PV is equal to or greater than the SP for LSP 1, the step operation starts with the SOAK of step 1.
- 2: If the PV is greater than the SP for LSP 1, the step operation starts with the down-ramp of step 1 using an SP that is the same as the PV. If the PV is equal to or smaller than the SP for LSP 1, the step operation starts with the SOAK of step 1.





STEP loop

The operation when a step operation ends (loop back, etc.) can be specified.

ltem (bank)	Display	Description	Initial value	User level
STEP loop (setup bank)	[35	0: Operation stops (no loop-back)1: Loops back2: Continues SOAK with the final step's SP (no loop-back)	0	Advanced

- 0: This device enters READY mode when the SOAK of the final step ends.
- 1: When the SOAK of the final step ends, step operation is repeated starting with the RAMP in step 1. In this RAMP, regardless of the setting of [34 (STEP PV start), the SP of the final step ramps up to the SP for LSP 1. There is no limit on the number of loops. Therefore, looping will continue until the operation mode is switched to READY.
- 2: When the SOAK of the final step ends, SOAK continues at the SP of the final step until the operation mode is switched to READY.

■ Step operation: LSP, PID group No., ramp, soak time

How to change the SP during a step operation and PID group No. can be specified.

ltem (bank)	Display	Description	Initial value	User level
LSP (step 1) (SP bank)	5P-	SP low limit (ርዐገ) to SP high limit (ርዐፀ)	0	Simple, standard, advanced
PID group No. (step 1) (SP bank)	Pl d l	1 to 8	1	Standard, advanced
Ramp (step 1) (SP bank)	rōP. l	0.0 U : No ramp 0.1 to 999.9 U (Select the time unit of the ramp by "SP ramp unit.")	0.0	
Soak time (step 1) (SP bank)	۲١٦	0.0 to 999.9 s (when "STEP time unit" = 0.1 s) 0 to 9999 s (when "STEP time unit" = 1 s) 0 to 9999 min (when "STEP time unit" = 1 min)	0.0	
LSP (step 2) (SP bank)	SP-2	Same as step 1	0	Simple, standard, advanced
PID group No. (step 2) (SP bank)	PI 42		1	Standard, advanced
Ramp (step 2) (SP bank)	rñP <u>2</u>	_	0.0	
Soak time (step 2) (SP bank)			0.0	
LSP (step 3) (SP bank)	SP-3	Same as step 1	0	Simple, standard, advanced
PID group No. (step 3) (SP bank)	Pl d <u>3</u>	_	1	Standard, advanced
Ramp (step 3) (SP bank)	rñP <u>3</u>		0.0	
Soak time (step 3) (SP bank)	F1 <u>v</u> 3		0.0	
LSP (step 4) (SP bank)	SP-4	Same as step 1	0	Simple, standard, advanced
PID group No. (step 4) (SP bank)	만성		1	Standard, advanced
Ramp (step 4) (SP bank)	┍╖┍╝		0.0	
Soak time (step 4) (SP bank)	比교		0.0	

ltem (bank)	Display	Description	Initial value	User level
LSP (step 5) (SP bank)	SP-S	Same as step 1	0	Simple, standard, advanced
PID group No. (step 5) (SP bank)	Pl d <u>S</u>		1	Standard, advanced
Ramp (step 5) (SP bank)	r ñP <u>.</u> S	_	0.0	
Soak time (step 5) (SP bank)			0.0	
LSP (step 6) (SP bank)	SP-6	Same as step 1	0	Simple, standard, advanced
PID group No. (step 6) (SP bank)	PI <u>4</u> 6		1	Standard, advanced
Ramp (step 6) (SP bank)	rāP <u>6</u>		0.0	
Soak time (step 6) (SP bank)	<u>۲۱ ה</u> 6		0.0	
LSP (step 7) (SP bank)	5P-7	Same as step 1	0	Simple, standard, advanced
PID group No. (step 7) (SP bank)	민신기		1	Standard, advanced
Ramp (step 7) (SP bank)	rāP]		0.0	
Soak time (step 7) (SP bank)			0.0	
LSP (step 8) (SP bank)	SP-8	Same as step 1	0	Simple, standard, advanced
PID group No. (step 8) (SP bank)	PI 4 <u>8</u>		1	Standard, advanced
Ramp (step 8) (SP bank)	rāP <u>8</u>		0.0	
Soak time (step 8) (SP bank)	비교		0.0	

- Steps for as many LSP groups as are specified by [][(LSP system group) are displayed for setting.
- "PID group No." is not displayed and the setting cannot be changed if ON/OFF control is enabled or if "PID group selection" is set as the "Operation type" of any of internal contacts 1 to 5.
- 0.1 U in "ramp" means that the setting displayed has one more decimal place than the number of decimal places set by "PV decimal point position."
- If set to 0.0 U, the RAMP is skipped and the next SOAK begins. If the LSP of two consecutive steps is the same, the RAMP is skipped and the next SOAK begins.
- If "soak time" is set to 0.0 or 0, the SOAK is skipped and the next RAMP begins.

Internal contacts: operation type

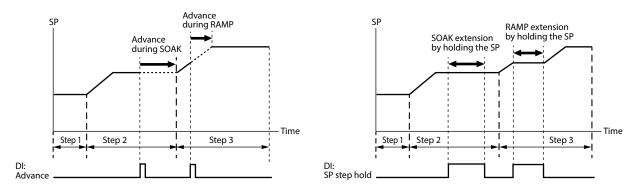
Among the internal contact operation types, the following are related to step operation.

Note

• 🕼 5 - 7 Digital Input (DI) / Internal Contacts (p. 5-47) (for functions of internal contacts)

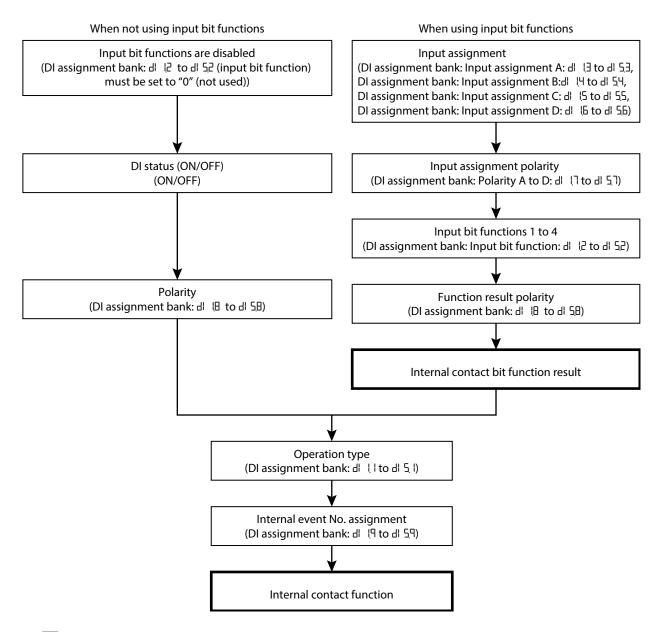
ltem (bank)	Display	Description	Initial value	User level
Internal contact 1 operation type	d [0 to 20 0: No function	0	Simple, standard,
(DI assignment bank)		7: RUN/READY		advanced
Internal contact 2 operation type	9151	19: Advance	0	
(DI assignment bank)		20: SP step hold		
Internal contact 3 operation type	4) <u>5</u> ((1–6 and 8–18 are not directly related to step operation.)	0	
(DI assignment bank)				
Internal contact 4 operation type	립면		0	
(DI assignment bank)				
Internal contact 5 operation type	dl <u>5</u> l		0	
(DI assignment bank)				

- 7: The operation mode changes to READY when the internal contact turns ON. The mode changes to RUN when the internal contact turns OFF.
- 19: If the internal contact turns ON in RUN mode during the SOAK, the next RAMP starts from the beginning. If it turns ON during the RAMP, the next SOAK starts from the beginning. This is called advance operation.
 If an advance operation is executed during the SOAK of the last step, the operation specified by [35] (STEP loop) applies: switching to READY mode, looping back to the beginning of the RAMP in step 1, or continuing to SOAK.
- 20: If the internal contact turns ON in RUN mode, the progress of the step stops (the SP of the step is held steady). If an advance operation is executed in this state, the process will jump to the beginning of the next RAMP or SOAK and its SP is also held.



5-7 Digital Input (DI) / Internal Contacts

The following is a functional block diagram for digital input (DI) and internal contacts.



! Handling Precautions

• There are 5 internal contacts, 1 to 5. The number of digital inputs (0, 1, or 2) can be selected by specifying the appropriate model No. For models with 2 digital inputs, the operation of these inputs is assigned to internal contacts 1 and 2 when the product is shipped.

Operation type

The operation by internal contacts can be specified.

ltem (bank)	Display	Description	Initial value	User level
Internal contact 1 operation type (DI assignment bank)	qı fi	0 to 20 See the table below for the functions that can be set by these settings.	0	Simple, standard, advanced
Internal contact 2 operation type (DI assignment bank)	qı 5'ı		0	
Internal contact 3 operation type (DI assignment bank)	41 <u>3</u> 1		0	
Internal contact 4 operation type (DI assignment bank)	비식비		0	
Internal contact 5 operation type (DI assignment bank)	dl <u>5</u> l		0	

! Handling Precautions

- For operation types 1 to 3 (LSP group selection), the LSP group number is determined by adding 1 to the sum of the weights (+1, +2, +4) of the internal contacts that are ON. However, if the number exceeds the setting for E 3D (LSP system group), the value set for C30 will be set as the LSP group selection.
- For operation types 4 to 6 (PID group selection), the PID group number is determined by adding 1 to the sum of the weights (+1, 2, 4) of the internal contacts that are ON. However, if the number exceeds 8, PID group 8 is selected.
- Do not set 14 (PV hold), 15 (PV max. hold), and 16 (PV min. hold) at the same time.
- For operation types other than 0 (no function) and 1 to 3 (LSP group selection), do not set the same operation for multiple internal contacts.
- When using heating/cooling control, do not set 12 (control action (direct/ reverse)).
- If 17 (timer stop/start) is set, specify an internal event No. by "Internal event No. assignment."

Settings	Functions	Operation when OFF	Operation when ON	
0	No function	None	None	
1	LSP group selection (0/+1)	LSP number: +0	LSP number: +1	
2	LSP group selection (0/+2)	LSP number: +0	LSP number: +2	
3	LSP group selection (0/+4)	LSP number: +0	LSP number: +4	
4	PID group selection (0/+1)	PID number: +0	PID number: +1	
5	PID group selection (0/+2)	PID number: +0	PID number: +2	
6	PID group selection (0/+4)	PID number: +0	PID number: +4	
7	RUN/READY*1	RUN	READY	
8	AUTO/MANUAL	AUTO	MANUAL	
9	No function	None	None	
10	AT (automatic tuning) stop/start*2	Stops AT.	Starts AT.	
11	No function	None	None	
12	Control action (direct/reverse)	Operates as configured.	Reversed operation	
13	SP ramp enabling/disabling	Enables SP ramp.	Disables SP ramp.	
14	PV hold	Holds the value.	Do not hold the value.	
15	PV max. hold	Holds the value.	Do not hold the value.	
16	PV min. hold	Holds the value.	Do not hold the value.	
17	Timer stop/start	Stops the timer.	Starts the timer.	
18	Release all DO latches	Continues latches if any.	Release latches.	
19	Advance ^{*3}	Continues step operation.	Proceeds to the next soak or ramp.	
20	SP step hold	Continues step operation.	SP step hold	

The functions that can be assigned by $\mathsf{d} !$ settings and the operations are shown below.

*1. During a step operation, the OFF to ON edge and the ON to OFF edge are used.

*2. The OFF to ON edge and the ON to OFF edge are used.

*3. The OFF to ON edge is used.

Internal event No. assignment

If the operation type is set to "timer stop/start," specify an internal event No. by this item.

ltem (bank)	Display	Description	Initial value	User level
Internal contact 1	4) (9	0: All internal events	0	Advanced
Internal event No. assignment		1 to 5: Internal event No.		
(DI assignment bank)				
Internal contact 2 Internal event No. assignment	41 2.9		0	
(DI assignment bank)				
Internal contact 3			0	
Internal event No. assignment	9 <u>5</u> 16			
(DI assignment bank)				
Internal contact 4			0	
Internal event No. assignment	심식의			
(DI assignment bank)				
Internal contact 5	dl <u>5</u> 9		0	
Internal event No. assignment				
(DI assignment bank)				

• This item is displayed and the setting can be changed if the internal contact's operation type is set to timer stop/start.

Input bit functions

There are four types of input bit functions. With this item, the function to use can be selected or all functions can be disabled.

Item (bank)	Display	Description	Initial value	User level
Internal contact 1 input bit function (DI assignment bank)	dl (2	0: Not used (use the default input) 1: Function 1, (A and B) or (C and D) - 2: Function 2, (A or B) and (C or D)	0	Advanced
Internal contact 2 input bit function (DI assignment bank)	41 22	3: Function 3, (A or B or C or D) 4: Function 4, (A and B and C and D)	0	
Internal contact 3 input bit function (DI assignment bank)	91 35		0	
Internal contact 4 input bit function (DI assignment bank)	41 42		0	
Internal contact 5 input bit function (DI assignment bank)	dl 5 <u>2</u>		0	

• If 0 is set, input bit functions are not used and the default input is used. The default input for each internal contact:

Internal contact 1: Digital input (DI) 1 Internal contact 2: Digital input (DI) 2 Internal contact 3: OFF state Internal contact 4: OFF state Internal contact 5: OFF state

• An input bit function is a combination of logical functions (AND, OR) for each of the internal contacts 1 to 5. Functions 1 to 4 have different combinations of logical functions. The following explains each logical function:

AND function	OR function
OFF and OFF = OFF	OFF or OFF = OFF
ON and OFF = OFF	ON or OFF = ON
ON and ON = ON	ON or ON = ON

- OFF may be expressed by contact open (OPEN) or the number 0.
- ON may be expressed by contact closed (CLOSE) or the number 1.

Input assignment

The four inputs (A, B, C, D) used for input bit functions can be selected.

ltem (bank)	Display	Description	Initial value	User level
Internal contact 1 input assignment A		0: Normally open (normally off = 0)	2	Advanced
(DI assignment bank)	61 13	1: Normally closed (normally on = 1)		
Internal contact 1 input assignment B	0 01	2: DI1	0	
(DI assignment bank)	4 14			
Internal contact 1 input assignment C		3: DI2	0	
(DI assignment bank)	dl <u>IS</u>	4 to 9: Undefined		
Internal contact 1 input assignment D	dl 15	10: Internal event 1	0	
(DI assignment bank)	<u>di 15</u>	11: Internal event 2		-
Internal contact 2 input assignment A	61 2 3		3	
(DI assignment bank)	dl 2 <u>.</u> 3	12: Internal event 3		-
Internal contact 2 input assignment B	41 24	13: Internal event 4	0	
(DI assignment bank)		14: Internal event 5		-
Internal contact 2 input assignment C	dl 25	15 to 17: Undefined	0	
(DI assignment bank)	לו ל.ש	18: User-defined bit 1		-
Internal contact 2 input assignment D	41 26		0	
(DI assignment bank)		19: User-defined bit 2		-
Internal contact 3 input assignment A	EE 16	20: User-defined bit 3	4	
(DI assignment bank)		21: User-defined bit 4		-
Internal contact 3 input assignment B	4134	22: MANUAL mode	0	
(DI assignment bank)		23: READY mode		-
Internal contact 3 input assignment C	dl 35		0	
(DI assignment bank)		24: Undefined		-
Internal contact 3 input assignment D	dl 36	25: AT	0	
(DI assignment bank)		26: During SP ramp		-
Internal contact 4 input assignment A	41 43	27: Undefined	0	
(DI assignment bank)				-
Internal contact 4 input assignment B	심 식식	28: All alarm	0	
(DI assignment bank)		29: PV alarm		-
Internal contact 4 input assignment C	41 45	30: Undefined	0	
(DI assignment bank)	•—	31: [MODE] key status		-
Internal contact 4 input assignment D	dl 4 <u>6</u>	32: Event output 1 terminal status	0	
(DI assignment bank)		-		-
Internal contact 5 input assignment A	dl <u>5</u> .3	33: Control output 1 terminal status	0	
(DI assignment bank)		4		-
Internal contact 5 input assignment B	454		0	
(DI assignment bank)	-	4		-
Internal contact 5 input assignment C	dl <u>5</u> 5		0	
(DI assignment bank)		4		-
Internal contact 5 input assignment D	dl <u>5</u> 6		0	
(DI assignment bank)				

This item is displayed and the setting can be changed if input bit functions 1 to 4 is set for the internal contact.

Input assignment polarity

Whether to reverse the data assigned to the four inputs (A, B, C, D) used for input bit functions can be specified.

ltem (bank)	Display	Description	Initial value	User level
Internal contact 1 polarity	רו וך	"1st digit" (2nd, etc.) means the first digit	0000	Advanced
(Dl assignment bank)		(etc.) <u>from the right</u> .		
Internal contact 2 polarity A to D		1st digit: Polarity of input assignment A	0000	
(DI assignment bank)	91 5 1	2nd digit: Polarity of input assignment B		
Internal contact 3 polarity A to D	4137	3rd digit: Polarity of input assignment C	0000	
(DI assignment bank)	ובוס	4th digit: Polarity of input assignment D		
Internal contact 4 polarity A to D	김 Ч구	0: Direct	0000	
(DI assignment bank)	ורום	1: Reverse		
Internal contact 5 polarity A to D	4157		0000	1
(DI assignment bank)	ובום			

• This item is displayed and the setting can be changed if input bit functions 1 to 4 is set for the internal contact.

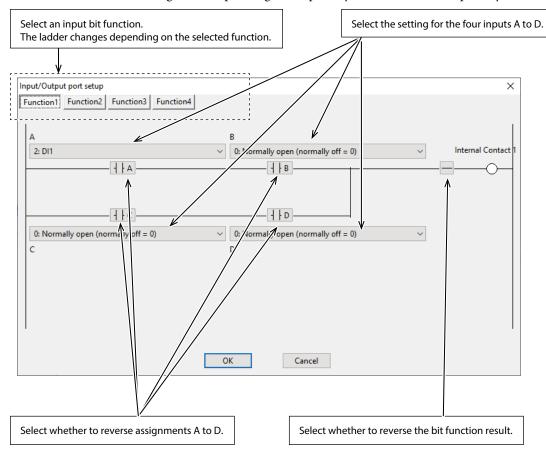
Function result polarity

Whether to reverse the results of input bit functions 1 to 4 can be specified.

ltem (bank)	Display	Description	Initial value	User level
Internal contact 1 polarity	41 18	0: Direct	0	Advanced
(DI assignment bank)		1: Reverse		
Internal contact 2 polarity	92.19		0	
(DI assignment bank)				
Internal contact 3 polarity	dl 38		0	
(DI assignment bank)		_		
Internal contact 4 polarity	A! 48		0	
(DI assignment bank)	עי יט			
Internal contact 5 polarity	ם וב		0	
(DI assignment bank)				

DI assignment by Smart Loader Package model SLP-C1F

When specifying the settings in the DI assignment bank using Smart Loader Package model SLP-C1F, select [Edit] \rightarrow [Input/Output port setup] from the input menu. This will display a screen for easy setup of the input bit function type, input assignment, input assignment polarity, and function result polarity.



! Handling Precautions

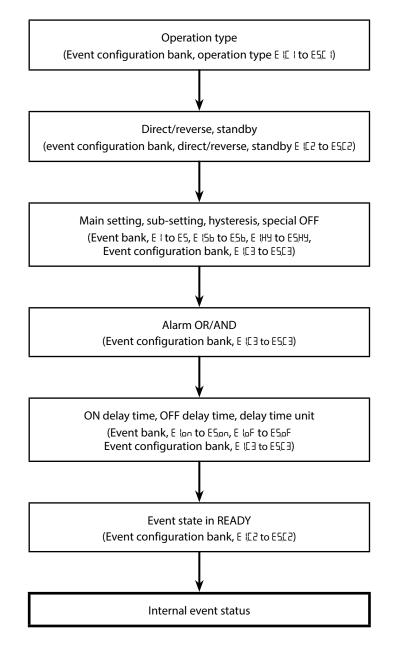
- In addition to selecting from the menu, you can also open the [Input/ Output port setup] screen by the following operations.
 - Click the I/O port setting icon
 - Right-click an input bit function setting
 - Press Ctrl + P

5-8 Internal Events

The result of internal event processing can be output as control outputs or event outputs via the digital output (DO) processing circuit.

Chapter 2. Outline of Functions (p. 2-1) (for details)

The following is a functional block diagram for internal events.



! Handling Precautions

There are 5 internal events numbered 1 to 5. The number of event outputs (0–3) can be selected by specifying the appropriate model No. When the product is shipped, the operation results of internal events 1 to 3 are set to be output from event output terminals 1 to 3. To use the operation results of internal events 4 to 5, specify the settings in the DO assignment bank.

Operation

The operation of internal events is shown below. Operation differs depending on the type of operation, direct/reverse setting, event main setting, event sub-setting, hysteresis settings, etc.

Note

• For the meaning of U (unit), see the terminology list in the Appendix.

Operation type	Setting	Direct action •: ON/OFF changes at the value O: ON/OFF changes when the value is exceeded	Reverse action •: ON/OFF changes at the value O: ON/OFF changes when the value is exceeded
No event	0	Always OFF	Always OFF
PV high limit	1	HYS ON Main setting PV	ON HYS Main setting PV
PV low limit	2	ON HYS Main setting PV	HYS ON Main setting PV
PV high and low limits	3	ON HYS ON Main setting ^{*1} Sub-setting ^{*1} PV	HYS ON HYS Main setting ^{*1} Sub-setting ^{*1} PV
Deviation high limit	4	SP+Main setting PV-	ON HYS SP+Main setting PV-
Deviation low limit	5	ON HYS SP+Main setting PV	HYS ON SP+Main setting PV
Deviation high and low limits	6	ON HYS HYS ON Main setting Sub-setting SP PV	HYS ON HYS Main setting Sub-setting
Deviation high limit (final SP reference)	7	SP+Main setting PV	ON HYS SP+Main setting PV-
		When not during an SP ramp: same as the direct action of the deviation high limit. During an SP ramp: the operation is different in that the final SP is used instead of the present SP.	When not during an SP ramp: same as the reverse action of the deviation high limit. During an SP ramp: the operation is different in that the final SP is used instead of the present SP.
Deviation low limit (Final SP reference)	8	ON HYS SP+Main setting PV	HYS ON SP+Main setting PV
		of the deviation low limit. During an SP ramp: the operation is different in that the final SP is used instead of the present SP.	of the deviation low limit. During an SP ramp: the operation is different in that the final SP is used instead of the present SP.

Operation type	Setting	Direct action •: ON/OFF changes at the value O: ON/OFF changes when the value is exceeded	Reverse action •: ON/OFF changes at the value O: ON/OFF changes when the value is exceeded
Deviation high and low limits (Final SP reference)	9	ON HYS ON	HYS ON HYS Main setting Sub-setting
(indisi reference)		Main setting ' Sub-setting ' PV SP PV When not during an SP ramp: same as the direct action of the deviation high and low limits. During an SP ramp: the operation is different in that the final SP is used instead of the present SP.	SP PV \rightarrow When not during an SP ramp: same as the reverse action of the deviation high and low limits. During an SP ramp: the operation is different in that the final SP is used instead of the present SP.
SP high limit	10	HYS ON Main setting	ON HYS Main setting SP
SP low limit	11	ON HYS Main setting SP	HYS ON Main setting SP
SP high and low limits	12	ON HYS ON Main setting ^{*1} Sub-setting ^{*1} SP	HYS ON HYS Main setting ^{*1} Sub-setting ^{*1} SP
MV high limit	13	HYS ON Main setting MV	ON HYS Main setting MV
MV low limit	14	ON HYS Main setting MV	HYS ON Main setting MV
MV high and low limits	15	ON HYS ON Main setting ^{*1} Sub-setting ^{*1} MV	HYS ON HYS Main setting ^{*1} Sub-setting ^{*1} MV
Heater 1 burnout/ overcurrent ^{*2}	16	ON HYS ON Main setting ^{*1} Sub-setting ^{*1} CT1 when output is ON OFF before measuring CT1 current	Main setting ^{*1} Sub-setting ^{*1} CT1 when output is ON OFF before measuring CT1 current
Heater 1 short circuit ^{*2}	17	HYS ON Main setting CT1 when output is OFF OFF before measuring CT1 current	ON HYS Main setting CT1 when output is OFF OFF before measuring CT1 current
Heater 2 burnout/ overcurrent* ²	18	ON HYS ON Main setting ^{*1} Sub-setting ^{*1} CT2 when output is ON OFF before measuring CT2 current	Main setting ^{*1} Sub-setting ^{*1} CT2 when output is ON OFF before measuring CT2 current
Heater 2 short circuit ^{*2}	19	HYS ON Main setting CT2 when output is OFF → OFF before measuring CT2 current	ON HYS Main setting CT2 when output is OFF — OFF before measuring CT2 current

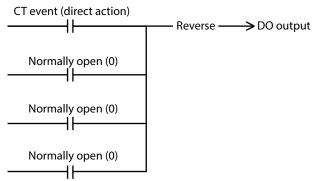
*1. If the main setting is greater than the sub-setting, operations are performed with the settings automatically swapped.

Operation type	Setting	Direct action	Reverse action					
Loop diagnosis 1	20	Turns on if the PV does not change according to	the increase or decrease of the MV.					
		Use this setting to detect a failure of the actuate	or, etc.					
		Settings						
		Main setting: MV						
		• Sub-setting: PV						
		ON delay time: diagnosis time						
		Operation specifications						
		Turns ON if the PV set for the sub-setting (condition 1) is not reached within the diagnosis time (ON delay time)(condition 3) even though the MV greater than the main setting is retained (condition 2).						
		To set the ON delay time, the user level ([79)	should be set to "Advanced configuration."					
		The ON delay time is set to 0.0 s when the pr						
		For heating control						
		PV Sub- setting cond. 1	PV Sub- setting					
		Area meeting cond. 2 Mu Main setting Cond. 3 Time -	Area meeting cond. 2 Mu Main					
		EV ON delay time EV ON If cond. 1 & 2 are met, ON delay starts	EV ON Time If cond. 1 & 2 are met, ON delay starts					

*2. If the event type is burnout/overcurrent or short circuit of heater 1 or 2, there is no event detection from the time the power is turned on until the CT input current is measured for the first time. During this period, the internal event output is OFF regardless of the direct/reverse setting for the event. To prevent a reverse-acting event's output from turning OFF at power-on, set as follows.

Example of settings

Select the direct action for the event of burnout/overcurrent or short circuit of heater 1/2, and set the output operation polarity of the terminal (event terminal or control output terminal) that outputs the event to "reverse" in the DO assignment bank.



Operation type	Setting	Direct action	Reverse action			
Loop diagnosis 2	21	Turns on when the PV does not change accordi	ng to the increase or decrease of the MV.			
		Use this setting to detect a failure of the actuate	or, etc.			
		Settings				
		Main setting: MV				
		 Sub-setting: the amount of the change in transition value set for the main setting 	the PV from the time when the MV exceeds the			
		ON delay time: diagnosis time				
		 Operation specifications 				
		Turns ON if the PV does not reach the value obtained by adding (subtractin setting value to the PV when the MV exceeds the main setting (condition 1) diagnosis time (ON delay time)(condition 3) even though an MV greater that setting is retained (condition 2).				
		• Note				
		To set the ON delay time, the user level ([19)	should be set to "advanced configuration."			
		The ON delay time is set to 0.0 s when the pr	oduct is shipped.			
		For heating control	For cooling control			
		Reference (if 0 or more)	Reference			
		MV Main	MV Main			
		If cond. 1 & 2 are met, ON delay starts	If cond. 1 & 2 are met, ON delay starts			

Operation type	Setting	Direct action	Reverse action						
Loop diagnosis 3	22	Turns on when the PV does not change according to the increase or decrease of the MV.							
		Use this setting to detect a failure of the actuator, etc.							
		• Settings							
		 Main setting: the amount of a change in th high limit (100 %) or the low limit (0 %) 	ne PV from the time when the MV reaches the						
		Sub-setting: the absolute value of deviation	on (PV–SP) that will turn off the event						
		• ON delay time: diagnosis time							
		OFF delay time: time from power-on to eve	ent OFF						
		 Operation specifications 							
		In a direct operation of heating control, the e	vent turns ON if:						
		 The amount of PV increase after the diagn reaches the high limit is smaller than the n 	osis time (ON delay time) elapses after the MV nain setting.						
		 The amount of PV decrease after the diagr reaches the low limit is smaller than the m 	nosis time (ON delay time) elapses after the MV ain setting.						
		In a reverse operation of cooling control, the	-						
			 The amount of PV decrease after the diagr reaches the high limit is smaller than the n 	nosis time (ON delay time) elapses after the MV nain setting.					
				osis time (ON delay time) elapses after the MV					
			conditions above, and if any of these conditions						
		 The absolute value of deviation (PV–SP) is However, after the absolute value of devia OFF if the absolute value of deviation beco subtracting the hysteresis from the sub-se 	tion exceeds the sub-setting, the event turns ones smaller than the value obtained by						
		The time from the start of operation after	power-on is less than the OFF delay time						
		● Note							
		To set the ON and OFF delay times, the user I configuration."	level (८ ७९) should be set to "advanced						
		The ON and OFF delay times are set to 0.0 s v	when the product is shipped.						
		For heating control	For cooling control						
		Reference PV PV	Main setting PV (if 0 or more)						
		Reference PV Main setting (if 0 or more) Main setting (if 0 or more)	Reference PV Reference PV Reference PV Reference PV						
		High Iimit Area meeting cond. 2	MV High - limit Area meeting cond.2						
		Low limit Cond.3 ON delay time	Low						
			ON delay time						
		EV	EV Time →						

Operation type	Setting	Direct action	Reverse action
Alarm	23	ON when an alarm (alarm code RLD to RL96) occurs, OFF otherwise	OFF when an alarm (alarm code RLD to RL96) occurs, ON otherwise
(status) READY	24	ON in READY mode	OFF in READY mode
	27		
(status)	25	OFF in RUN mode	ON in RUN mode
MANUAL	25	ON in MANUAL mode	OFF in MANUAL mode
(status)		OFF in AUTO mode	ON in AUTO mode
nvalid	26	Always OFF	Always ON
AT in execution	27	ON when AT is running	OFF when AT is running
(status)		OFF when AT stopped	ON when AT stopped
During SP ramp	28	ON during SP ramp	OFF during SP ramp
		OFF when there is no SP ramp or it is completed	ON when there is no SP ramp or it is completed
Control action	29	ON during direct action (cooling)	OFF during direct action (cooling)
(status)		OFF during reverse action (heating)	ON during reverse action (heating)
nvalid	30	Always OFF	Always ON
nvalid	31	Always OFF	Always ON
limer	32	The direct and reverse action settings are disab	led for timer events.
		OFF to ON	nk. ges from OFF to ON after the DI changes from ges from ON to OFF after the DI changes from N delay time or longer. OFF delay time or longer.
		ON delay time	OFF delay time
		Internal event	ON
			Time 🗕
		Note	
		To set the ON and OFF delay times, the user configuration."	level ([79) should be set to "advanced
		The ON and OFF delay times are set to 0.0 s	when the product is shipped.
		"Internal event No. assignment" in the DI ass is shipped. With this setting, a timer can be s single internal contact (DI).	ignment bank is set to 0 when the product started or stopped for all internal events by a
		If the setting is changed to 1 or more, a time internal event by one internal contact (DI).	er can be started or stopped for one specified

Operation type

The operation type can be set for internal events.

ltem (bank)		Displ	ау	Description	Initial value	User level
Internal event 1 configuration 1 Operation type	Ε	ΪĽ		0: No event 1: PV high limit	0	Simple, standard,
(event configuration bank)				2: PV low limit		advanced
				3: PV high and low limits		
				4: Deviation high limit		
Internal event 2 configuration 1	- ·		1	5: Deviation low limit	0	
Operation type	ב נ][i	6: Deviation high and low limits		
(Event configuration bank)				7: Deviation high limit (final SP reference)		
				8: Deviation low limit (final SP reference)		
				9: Deviation high and low limits (final SP		
Internal event 3 configuration 1	- ·		1	- reference)	0	
Operation type	E :	ЗС	i	10: SP high limit		
(event configuration bank)				11: SP low limit		
				12: SP high and low limits		
				13: MV high limit		
Internal event 4 configuration 1	– 1			- 14: MV low limit	0	
Operation type	Ľ'	ΗĒ	i	15: MV high and low limits	-	
(event configuration bank)				16: Heater 1 burnout/overcurrent		
(event configuration bank)				17: Heater1 short circuit		
				18: Heater 2 burnout/overcurrent		
Internal event 5 configuration 1				19: Heater 2 short circuit	0	
-	E	5.	ł	20: Loop diagnosis 1	U	
Operation type		•		21: Loop diagnosis 2		
(event configuration bank)				22: Loop diagnosis 3		
				23: Alarm (status)		
				24: READY (status)		
				25: MANUAL (status)		
				26: Invalid		
				27: AT in execution (status)		
				28: During SP ramp (status)		
				29: Control direct action (status)		
				30: Invalid		
				31: Invalid		
				32: Timer (status)		
				33: Invalid		

Direct/reverse, standby, and READY mode operation

Direct/reverse, standby, and READY mode operation that is associated with operation type can be set.

ltem (bank)	Display	Description	Initial value	User level
Internal event 1 configuration 2	5113	"1st digit" (2nd, etc.) means the first digit (etc.) <u>from the right</u> .	0000	Simple, standard,
(event configuration bank)		1st digit: Direct/reverse setting		advanced
Internal event 2 configuration 2	5323	0: Direct	0000	
(event configuration bank)	└└└└	1: Reverse		
Internal event 3 configuration 2	כסרס	2nd digit: Standby setting 0: None	0000	
(event configuration bank)	EJE3	1: Standby		
Internal event 4 configuration 2	EHEH	2: Standby + standby when the SP is changed	0000	
(event configuration bank)	ר אָר א	3rd digit: Event state in READY mode		
Internal event 5 configuration 2	FSFS	0: Continues 1: Forced OFF	0000	
(event configuration bank)	└╶ᆚ└╴┛	4th digit: Undefined		
		0: Undefined		

- If internal event configuration 1 operation type is set to 0 (no event), internal event configuration 2 (direct/reverse, standby, event state in READY mode) is not displayed.
- 🕞 For the operation of internal events according to the direct/reverse setting, see Operation (p.5-56 to 5-61.)

! Handling Precautions

- The standby function makes it possible to have an event not turn ON even if the ON conditions (before reversing) are satisfied after this device's power has just been turned ON or when the mode is switched from READY to RUN. The event will turn ON after the OFF conditions are satisfied if the ON conditions are satisfied again.
- "Standby + standby when the SP is changed" is a function that reactivates the standby function when the SP or LSP group No. is changed, in addition to the regular standby function operation. However, if the same SP is written or if the SP does not change after a change of LSP group No., this device will not enter standby mode.

	RE	ADY	When changed fr	om READY to RUN
Event status in READY mode	0: Continues	1: Forced OFF	0: Continues	1: Forced OFF
Standby setting				
0: None	Normal operation	OFF	Normal operation	Normal operation
1: Standby	OFF	OFF	OFF (standby status)	OFF (standby status)
2: Standby + standby when the SP is changed	OFF	OFF	OFF (standby status)	OFF (standby status)

Alarm OR, special OFF, delay time unit

Alarm OR, special OFF, and delay time unit associated with operation type can be set.

ltem (bank)	Display	Description	Initial value	User level
Internal event 1 configuration 3 (event configuration bank)	E (C3	"1st digit" (2nd, etc.) means the first digit (etc.) <u>from the right</u> . 1st digit: Alarm OR setting 0: None	0000	Advanced
Internal event 2 configuration 3 (event configuration bank)	E <u>7</u> 53	1: Alarm direct + OR operation 2: Alarm direct + AND operation 3: Alarm reverse + OR operation	0000	
Internal event 3 configuration 3 (event configuration bank)	E <u>3</u> E 3	4: Alarm reverse + AND operation 2nd digit: Special OFF setting 0: No special OFF 1: If the main setting for the event is	0000	
Internal event 4 configuration 3 (event configuration bank)	E4[3	0, the event is OFF. 3rd digit: Delay time unit setting 0: 0.1 s 1: 1 s	0000	
Internal event 5 configuration 3 (event configuration bank)	E <u>5,</u> E 3	2: 1 min 4th digit: Undefined 0: Undefined	0000	

• If internal event configuration 1 operation type is set to 0 (no event), internal event configuration 3 (alarm OR, special OFF, delay time unit) is not displayed.

The relationship between the alarm OR setting, alarm occurrence, and internal event ON/OFF is shown below.

Alarm OR setting	Alarm occurrence	Internal event status before alarm OR processing	Internal event status after alarm OR processing
None	No	OFF	OFF
	No	ON	ON
	Yes	OFF	OFF
	Yes	ON	ON
Alarm direct + OR	No	OFF	OFF
operation	No	ON	ON
	Yes	OFF	ON
	Yes	ON	ON
Alarm direct + AND	No	OFF	OFF
operation	No	ON	OFF
	Yes	OFF	OFF
	Yes	ON	ON
Alarm reverse + OR	No	OFF	ON
operation	No	ON	ON
	Yes	OFF	OFF
	Yes	ON	ON
Alarm reverse + AND	No	OFF	OFF
operation	No	ON	ON
	Yes	OFF	OFF
	Yes	ON	OFF

■ Main setting, sub-setting, hysteresis

The main setting, sub-setting, and hysteresis associated with operation type can be set.

ltem (bank)	Display	Description	Initial value	User level
Internal event 1 main setting	El	-1999 to +9999	0	Simple,
(event bank)		The number of decimal places in the PV changes according to the operation type.		standard, advanced
		For some operation types, the range is 0–9999.		
Internal event 1 sub-setting	E (56	-1999 to +9999	0	
(event bank)		The number of decimal places in the PV changes according to the operation type.		
		For some operation types, the range is 0–9999.		
Internal event 1 hysteresis	Е (НУ	0 to 9999	5	
(event bank)	L ÚJ]	The number of decimal places in the PV changes according to the operation type.		
Internal event 2 main setting	62	Same as internal event 1 main setting	0	
(event bank)				
Internal event 2 sub-setting	62,56	Same as internal event 1 sub-setting	0	
(event bank)				
Internal event 2 hysteresis	E5'HA	Same as internal event 1 hysteresis	5	
(event bank)				
Internal event 3 main setting (event bank)	EB	Same as internal event 1 main setting	0	
Internal event 3 sub-setting (event bank)	E <u>3</u> ,56	Same as internal event 1 sub-setting	0	
Internal event 3 hysteresis (event bank)	EBHY	Same as internal event 1 hysteresis	5	
Internal event 4 main setting (event bank)	EH	Same as internal event 1 main setting	0	
Internal event 4 sub-setting	ЕЧБЬ	Same as internal event 1 sub-setting	0	
(event bank) Internal event 4 hysteresis		Same as internal event 1 hysteresis	5	-
(event bank)	EAHA		ر	
Internal event 5 main setting		Same as internal event 1 main setting	0	-
(event bank)	ES			
Internal event 5 sub-setting		Same as internal event 1 sub-setting	0	-
(event bank)	E5.56			
Internal event 5 hysteresis	ESHY	Same as internal event 1 hysteresis	5	1
(event bank)				

• If internal event configuration 1 operation type is set to 0 (no event), internal event main setting, sub-setting, and hysteresis are not displayed.

• CF For the operation of internal events according to the main setting, sub-setting, and hysteresis, see Operation (p.5-56 to 5-61.)

ON delay time, OFF delay time

ON delay is a function that delays the timing at which the internal event status is changed from OFF to ON.

OFF delay is a function that delays the timing at which the internal event status is changed from ON to OFF.

Note that, if the operation type is set to 20 (loop diagnosis 1), 21 (loop diagnosis 2), 22 (loop diagnosis 3), or 32 (timer), it operates as a different function.

Item (bank)	Display	Description	Initial value	User level
Internal event 1 ON delay	ГІ	0.0 to 999.9 s	0.0 s	Advanced
time	E lon	(when "delay time unit" = 0.1 s)	or 0 s	
(event bank)		0 to 9999 s		
		(when "delay time unit" = something other than 0.1 s)		
Internal event 1 OFF delay		0.0 to 999.9 s	0.0 s	
time	E loF	(when "delay time unit" = 0.1 s)	or 0 s	
(event bank)		0 to 9999 s		
		(when "delay time unit" = something other than 0.1 s)		
Internal event 2 ON delay		0.0 to 999.9 s	0.0 s	
time	EGou	(when "delay time unit" = 0.1 s)	or 0 s	
(event bank)		0 to 9999 s		
		(when "delay time unit" = something other than 0.1 s)		
Internal event 2 OFF delay	E2.oF	0.0 to 999.9 s	0.0 s	
time		(when "delay time unit" = 0.1 s)	or 0 s	
(event bank)		0 to 9999 s		
		(when "delay time unit" = something other than 0.1 s)		
Internal event 3 ON delay		0.0 to 999.9 s	0.0 s	
time	E <u>J</u> on	(when "delay time unit" = 0.1 s)	or 0 s	
(event bank)		0 to 9999 s		
		(when "delay time unit" = something other than 0.1 s)		
Internal event 3 OFF delay	EBoF	0.0 to 999.9 s	0.0 s	
time		(when "delay time unit" = 0.1 s)	or 0 s	
(event bank)		0 to 9999 s		
		(when "delay time unit" = something other than 0.1 s)		
Internal event 4 ON delay	EYon	0.0 to 999.9 s	0.0 s	
time		(when "delay time unit" = 0.1 s)	or 0 s	
(event bank)		0 to 9999 s		
		(when "delay time unit" = something other than 0.1 s)		
Internal event 4 OFF delay	EYoF	0.0 to 999.9 s	0.0 s	
time		(when "delay time unit" = 0.1 s)	or 0 s	
(event bank)		0 to 9999 s		
		(when "delay time unit" = something other than 0.1 s)		

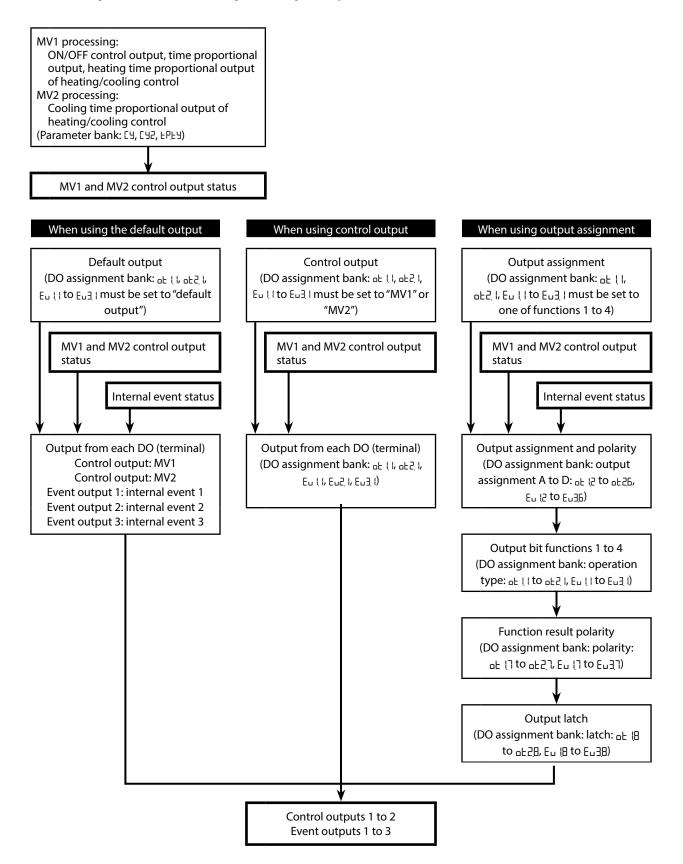
The ON delay time and OFF delay time can be specified by the parameters below.

ltem (bank)	Display	Description	Initial value	User level
Internal event 5 ON delay	ГГ	0.0 to 999.9 s	0.0 s	Advanced
time	חסבן	(when "delay time unit" = 0.1 s)	or 0 s	
(event bank)		0 to 9999 s		
		(when "delay time unit" = something other than 0.1 s)		
Internal event 5 OFF delay	гг г	0.0 to 999.9 s	0.0 s	
time	ESoF	(when "delay time unit" = 0.1 s)	or 0 s	
(event bank)		0 to 9999 s		
		(when "delay time unit" = something other than 0.1 s)		

• If internal event configuration 1 operation type is set to 0 (no event), internal event ON delay time and OFF delay time are not displayed.

5-9 Digital Output (DO)

The following is a functional block diagram for digital output (DO).



MV1/MV2 processing

The time proportional cycle and time proportional cycle mode for MV1 and MV2 can be specified.

ltem (bank)	Display	Description	Initial value	User level
Time proportional cycle 1 (for MV1) (parameter bank)	[4	5 to 120 s (when the output includes the relay output)	10 or 2 s	Simple, standard, advanced
Time proportional cycle 2 (for MV2) (parameter bank)	675	1 to 120 s (when the output does not include the relay output)	10 or 2 s	
Time proportional cycle mode (parameter bank)	£P <u></u> £y	0: Priority on controllability 1: Priority on actuator service life (only one ON/OFF operation in a time proportional cycle)	0 or 1	Advanced
Time proportional minimum ON/OFF time 1 (for MV1) (parameter bank)	٤Po	0 to 250 ms	0	Advanced
Time proportional minimum ON/OFF time 2 (for MV2) (parameter bank)	Fbo5	0 to 250 ms	0	Advanced

- MV1: ON/OFF control output, time proportional output, heating time proportional output of heating/cooling control MV2: Cooling time proportional output of heating/cooling control
- In the DO assignment bank, if MV1 is connected to any of relay control output, voltage pulse control output, or event output, time proportional cycle 1 ([4]) is displayed and the setting can be changed.
- If heating/cooling control is used and, in the DO assignment bank, if MV2 is connected to any of relay control output, voltage pulse control output, or event output, time proportional cycle 2 (EY2) is displayed and the setting can be changed.
- The initial value of time proportional cycle 1 (EY) is 2 if the control output 1 is a voltage pulse output, and 10 otherwise.
- The initial value of time proportional cycle 2 ([42) is 2 if the control output 2 is a voltage pulse output, and 10 otherwise.
- The time proportional cycle mode (LPLY) setting is valid for both MV1 and MV2 time proportional outputs.
- If MV1 is connected to the relay control output or event output in the DO assignment bank and if time proportional cycle 1 (EY) is set to shorter than 5 s, 5 s applies.
- If MV2 is connected to the relay control output or event output in the DO assignment bank and if time proportional cycle 2 ([42) is set to shorter than 5 s, 5 s applies.

- The minimum ON/OFF time is the minimum time to maintain the output status after switching the output ON/OFF. Until this time elapses, the output status is maintained even if the time to switch ON/OFF comes.
- If time proportional minimum ON/OFF time 1 = 0: If MV1 is connected to the relay control output or event output in the DO assignment bank, or if time proportional cycle 1 is 10 s or longer, 250 ms applies. Otherwise, 1 ms applies.
- If time proportional minimum ON/OFF time 1 = 1-250: If MV1 is connected to the relay control output or event output in the DO assignment bank, and if the setting is 1-49, 50 ms applies. If the setting is 50-250, the set value applies.
- If time proportional minimum ON/OFF time 2 = 0: If MV2 is connected to the relay control output or event output in the DO assignment bank, or if time proportional cycle 2 is 10 s or longer, 250 ms applies. Otherwise, 1 ms applies.
- If time proportional minimum ON/OFF time 2 = 1-250: If MV2 is connected to the relay control output or event output in the DO assignment bank, and if the setting is 1-49, 50 ms applies. If the setting is 50-250, the set value applies.

! Handling Precautions

• The shorter the time proportional cycle, the better the controllability. However, when specifying the settings, please take the electrical service life of the relay into consideration.

Operation type

The operation type of control outputs 1–2 and event outputs 1–3 can be specified in the DO assignment bank.

ltem (bank)	Display	Description	Initial value	User level
Control output 1 operation type		0: Default output	0	Advanced
(DO bank)	οείι	1: MV1		
Control output 2 operation type	oF51	2: MV2	0	
(DO bank)		3: Function 1, (A and B) or (C and D)		
Event output 1 operation type		4: Function 2, (A or B) and (C or D)	0	
(DO bank)				
Event output 2 operation type		5: Function 3, (A or B or C or D)	0	
(DO bank)	Eu2, I	6: Function 4, (A and B and C and D)		
Event output 3 operation type			0	
(DO bank)	בטקן			

- If relay output or voltage pulse output is set as the control output by the model No., the operation type setting of control outputs 1-2 (ob 11 to ob 21) is displayed and can be changed.
- If a model with event relay outputs is used, the operation type setting of event outputs 1-3 (Eu [] to Eu H) is displayed and can be changed.
- MV1: ON/OFF control output, time proportional output, heating time proportional output of heating/cooling control MV2: Cooling time proportional output of heating/cooling control
- When set to 0 (default output), the following will be output:

Control output 1: MV1 control output status Control output 2: MV2 control output status Event output 1: Internal event 1 processing result Event output 2: Internal event 2 processing result Event output 3: Internal event 3 processing result

• An output bit function is a combination of logical functions (AND, OR) for each of the control outputs and event outputs. Functions 1 to 4 have different combinations of logical operations. The following explains each logical function:

OR function
OFF or OFF = OFF
OFF or ON = ON
ON or OFF = ON
ON or ON = ON

Output assignment

The four inputs (A, B, C, D) used for output bit functions can be selected.

ltem (bank)	Display	Description	Initial value	User level
Control output 1 output assignment A	1 1 7	0: Normally open (normally off $=$ 0)	14	Advanced
(DO assignment bank)	of 13	1: Normally closed (normally on = 1)		
Control output 1 output assignment B		2: Internal event 1	0	
(DO assignment bank)	ot (J	3: Internal event 2		
Control output 1 output assignment C	1 11 1	4: Internal event 3	0	
(DO assignment bank)	of (4			
Control output 1 output assignment D		5: Internal event 4	0	
(DO assignment bank)	ot 15	6: Internal event 5		
Control output 2 output assignment A		7 to 13: Undefined	15	
(DO assignment bank)	of 55	14: MV ON/OFF status 1		
Control output 2 output assignment B	_L]]	15: MV ON/OFF status 2	0	
(DO assignment bank)	of 5'3	16 to 17: Undefined		
Control output 2 output assignment C	_L]U	18: DI1	0	
(DO assignment bank)	o£2 <u>.</u> 4	19: DI2		
Control output 2 output assignment D	o£2,5	20 to 25: Undefined	0	
(DO assignment bank)		26: Internal contact 1		
Event output 1 output assignment A	Eu (2	27: Internal contact 2	2	
(DO assignment bank)				
Event output 1 output assignment B	Eu (3	28: Internal contact 3	0	
(DO assignment bank)		29: Internal contact 4		
Event output 1 output assignment C	Eu !4	30: Internal contact 5	0	
(DO assignment bank)		31 to 33: Undefined		
Event output 1 output assignment D	Eu !S	34: User-defined bit 1	0	
(DO assignment bank)		35: User-defined bit 2		
Event output 2 output assignment A	Eu2 <u>2</u>	36: User-defined bit 3	3	
(DO assignment bank)		37: User-defined bit 4		
Event output 2 output assignment B	Eu23	38: MANUAL mode	0	
(DO assignment bank)		39: READY mode		
Event output 2 output assignment C	EuZY		0	
(DO assignment bank)		40: Undefined		
Event output 2 output assignment D	Eu2S	41: AT (Auto-Tuning)	0	
(DO assignment bank)		42: During SP ramp		
Event output 3 output assignment A	Eu <u>3</u> 2	43: Undefined	4	
(DO assignment bank)		44: Alarm (RL0 to RL96)		
Event output 3 output assignment B	Eu33	45: PV alarm (RL0 to RL03)	0	
(DO assignment bank)		46: Undefined		
Event output 3 output assignment C	Ευ∃Ϋ	47: [MODE] key status	0	
(DO assignment bank)		48: Event output 1 terminal status		
Event output 3 output assignment D	Eu3S	49: Control output 1 terminal status	0	
(DO assignment bank)				

- If relay output or voltage pulse output is set as the control output by the model No. and if one of functions 1 to 4 is set for the operation type of control outputs 1-2 (at 1 to at 2 1), the output assignment A-D setting of control outputs 1-2 (at 12 to at 25) is displayed and can be changed.
- If a model with event relay outputs is used and if one of functions 1 to 4 is set for the operation type of event outputs 1-3 (Eu | | to Eu] |), the output assignment A-D setting of event outputs 1-3 (Eu |2 to Eu]5) is displayed and can be changed.

Output assignment polarity

Whether to reverse the data assigned to the four inputs (A, B, C, D) used for output bit functions can be specified.

ltem (bank)	Display	Description	Initial value	User level
Control output 1 polarity A to D	ot 16	"1st digit" (2nd, etc.) means the first digit	0000	Advanced
(DO assignment bank)		(etc.) <u>from the right</u> .		
Control output 2 polarity A to D		1st digit: Polarity of output assignment A	0000	
(DO assignment bank)	of 5 <u>'</u> 2	2nd digit: Polarity of output assignment B		
Event output 1 polarity A to D	Eu 16	3rd digit: Polarity of output assignment C	0000	
(DO assignment bank)		4th digit: Polarity of output assignment D		
Event output 2 polarity A to D	ר חר		0000	
(DO assignment bank)	Eu2 <u>,</u> 6	0: Direct		
Event output 3 polarity A to D	ב שב	1: Reverse	0000	
(DO assignment bank)	CUJO			

- If relay output or voltage pulse output is set as the control output by the model No. and if one of functions 1 to 4 is set for the operation type of control outputs 1-2 (at 1 to at 2 l), the polarity A-D setting of control outputs 1-2 (at 15 to at 25) is displayed and can be changed.
- If a model with event relay outputs is used and if one of functions 1 to 4 is set for the operation type of event outputs 1–3 (Eu | + to Eu∃ +), the polarity A–D setting of event outputs 1–3 (Eu | 5 to Eu∃6) is displayed and can be changed.

! Handling Precautions

- Depending on the conditions, the output relay may turn on and off quickly and repeatedly. To prevent this, observe the following:
 - If 49 (control output 1 terminal status) is set for any of control output 1 output assignments A to D (at 12 to at 15), do not set 1 (reverse) as the output assignment polarity for the same letter.
- If 48 (event output 1 terminal status) is set for any of event output 1 output assignments A to D (Eu 12 to Eu 15), do not set 1 (reverse) as the output assignment polarity for the same letter.

Function result polarity

Whether to reverse the results of output bit functions 1 to 4 can be specified.

ltem (bank)	Display	Description	Initial value	User level
Control output 1 polarity		0: Direct	0	Advanced
(DO assignment bank)	of (1	1: Reverse		
Control output 2 polarity			0	
(DO assignment bank)	סבל ו			
Event output 1 polarity			0	
(DO assignment bank)	Eu (7			
Event output 2 polarity	רב ב		0	
(DO assignment bank)	Eud 1			
Event output 3 polarity	רב ב		0	
(DO assignment bank)	Eu <u>3</u> 7			

- If relay output or voltage pulse output is set as the control output by the model No. and if one of functions 1 to 4 is set for the operation type of control outputs 1-2 (at 1 to at 2 1), the polarity setting of control outputs 1-2 (at 1 to at 2 1) is displayed and can be changed.
- If a model with event relay outputs is used and if one of functions 1 to 4 is set for the operation type of event outputs 1-3 (Eu | 1 to Eu = 1), the polarity setting of event outputs 1-3 (Eu | 1 to Eu = 1) is displayed and can be changed.

Latch

ltem (bank)	Display	Description	Initial value	User level
Control output 1 latch		0: Do not latch	0	Advanced
(DO assignment bank)	o£ 1,8	1: Latch when ON		
Control output 2 latch	_L]0	2: Latch when OFF (except for initialization	0	
(DO assignment bank)	0230	at power-on)		
Event output 1 latch	C. 10		0	
(DO assignment bank)	Eu 18			
Event output 2 latch	C 20		0	
(DO assignment bank)	Eu2 <u>8</u>			
Event output 3 latch	F.,38		0	
(DO assignment bank)				

Whether to latch the output when it is ON or OFF can be specified.

- If relay output or voltage pulse output is set as the control output by the model No. and if one of functions 1 to 4 is set for the operation type of control outputs 1-2 (at 1 to at 2 1), the latch operation setting of control outputs 1-2 (at 18 to at 28) is displayed and can be changed.
- If a model with event relay outputs is used and if one of functions 1 to 4 is set for the operation type of event outputs 1–3 (Eu | | to Eu∃ |), the latch operation setting of event outputs 1–3 (Eu ||∃ to Eu∃B) is displayed and can be changed.

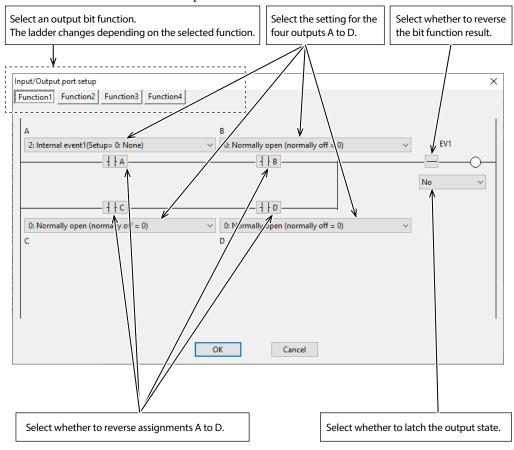
• To release the latches, do any of the following operations: turn the power off and then back on, set "release all DO latches" (doLL) to LLoF (latch release) using the keys or communication, or change the above latch setting in the DO assignment bank to 0 (do not latch).



• When output assignments A–D are set to "14" (MV ON/OFF status 1) or "15" (MV ON/OFF status 2), [Latch] can be set to "1" (latch when ON) or "2" (latch when OFF) only if the ROM version is 1.01 or later.

DO assignment by Smart Loader Package model SLP-C1F

When specifying the settings in the DO assignment bank using Smart Loader Package model SLP-C1F, select [Edit] \rightarrow [Input/Output port setup] from the input menu. This will display a screen for easy setup of the output bit function type, output assignment, output assignment polarity, function result polarity, and whether to latch the output.



Handling Precautions

- In addition to selecting from the menu, you can also open the [Input/ Output port setup] screen by the following operations.
 - Click the I/O port setting icon
 - Right-click an output bit function setting
 - Press Ctrl + P

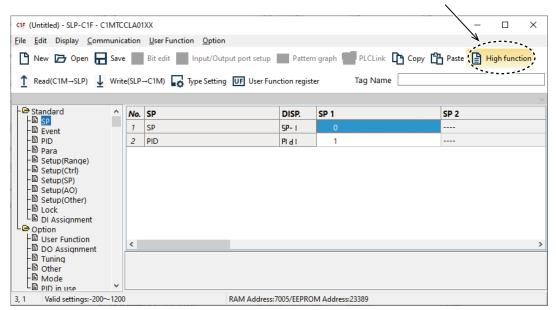
5-10 Application Examples

This section gives examples of applications that use the assignment function of this device.

Applications using the assignment function

This section gives examples of settings using Smart Loader Package model SLP-C1F.

To use the assignment function, set the user level to "Advanced (High function)" first.



• Example 1: Output OR of heater burnout and PV high limit alarm

Overview: Set the PV high limit for internal event 1. Set heater burnout for internal event 2. Output the OR of the above outputs to the EV1 relay.

- (1) Select [Event] under [Standard] and set [1: PV high limit] for [Internal event 1].
- (2) In the same manner, set [16: Heater 1 burnout/overcurrent] for [Internal event 2].

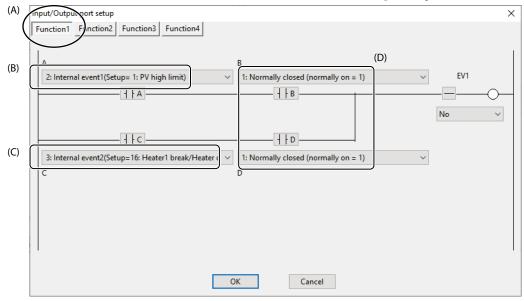
(3) Select [DO Assignment] under [Option], right-click the operation type field of [EV1], and select [Input/Output port setup].

CIF (Untitled) - SLP-C1F - C1MTCCL	A01XX				-	- 🗆	×
File Edit Display Communicati	ion L	Iser Function Option					
↑ Read(C1M→SLP) ↓ Write(S	_	it edit 🔛 Input/Output port s			PLCLink 🚹 Copy 🐴 Paste 🗎 High function		
0: Default(Internal event 1)	No.	DO Assignment	DISP.	EV1	EV2	EV3	^
-B SP -B Event	1	Туре	Eu (I	0: De	ault(Internal event 1) 0: Default(internal event 2)	0: De	efault(
- 🖹 PID	2	Output assign A	Eu 12		Input/Output port setup		
- 🖹 Para - 🖹 Setup(Range)	3	Output assign B	Eu (3		0: Default(Internal event 1)		
- Setup(Ctrl)	4	Output assign C	Eu (4		1: MV1 (ON/OFF, Time proportional output 1, HEAT)		
- Setup(SP)	5	Output assign D	Eu (5		2: MV2 (Time proportional output 2,COOL)		
- Setup(AO)	6	Polarity A	Eu (6		3: Operation 1, (A and B) or (C and D)		
- Lock	7	Polarity B	Eu 16		4: Operation 2, (A or B) and (C or D)		
LB DI Assignment	8	Polarity C	Eu 16		5: Operation 3, (A or B or C or D)		
- ← Option - □ User Function	9	Polarity D	Eu 16		6: Operation 4, (A and B and C and D)		~
DO Assignment	<			-			>
- 🖹 Tuning - 🖹 Other							
- 🖹 Mode							
5. 1 Valid settings:0~6		DAMAN	dress:5623/EEPROM	Address	2007		
5, 1 Valid settings:0~0		KAIVI Ad	aress: 3023/EEPROIM	Address:	2007		

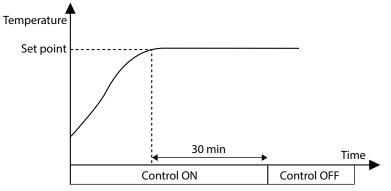
(4) On the [Input/Output port setup] screen, configure the settings as shown below.

(A) Select [Function 1] to output the OR of two operations.

- (B) Select [Internal event 1 (setting = 1: PV high limit)] for output assignment A.
- (C) In the same manner, select [Internal event 2 (setting = 16: heater 1 burnout/overcurrent] for output assignment C.
- (D) Select [Normally closed (normally on = 1)] for output assignments B and D.







• Explanation

Timer start condition: AND of the external switch (DI1) and the target temperature (internal event 2: deviation high limit)

Timer ON delay time: the desired amount of time between the time when the set point is reached and when operation stops automatically

The mode (RUN/READY) changes depending on the combination of the DI1 status and timer ON/OFF.

Status	Control OFF	Operation started, timer counting	Time elapsed, operation stopped
DI1	OFF	ON	ON
Timer (internal EV2)	OFF	OFF	ON
Internal contact 2 status	ON	OFF	ON
Mode	READY	RUN	READY

• Sample settings

• Event

Event	Display	Internal event 1	Internal event 2
Operation type	E_ <u></u> []	32: Timer	4: Deviation high limit
Direct/reverse	E _ [[2		0: Direct
Standby	E _ <u>C</u> 2		0: No standby
Event state in READY	E _ [C2	0: Continues	0: Continues
Alarm OR	E_ <u>C</u> 3	0: None	0: None
Special OFF	E_ <u>C</u> 3		0: No special OFF
Delay time unit	E_ <u></u> [3	2: 1 min	0: 0.1 s
Event main setting (low limit)	E		0
Event sub-setting (high limit)	Е _ ,5Ь		
Hysteresis	Е_,НУ		5
ON delay time	Eon	30	0
OFF delay time	EoF	0	0

_: Internal event No.

• DI assignment

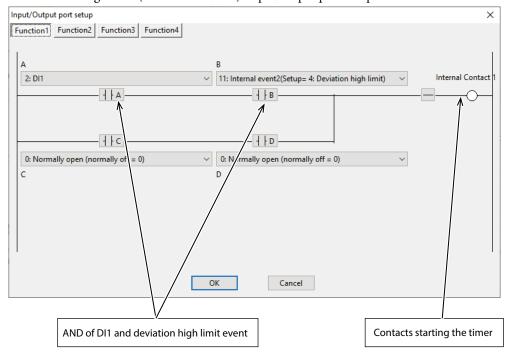
DI assignment	Display	Internal contact 1	Internal contact 2
Operation type	dl I	17: Timer stop/start	7: RUN/READY
Input bit function	dl2	1: Function 1, (A and B) or (C and D)	1: Function 1, (A and B) or (C and D)
Input assignment A	E lb	2: DI1	2: DI1
Input assignment B	dIЧ	11: Internal event 2 (setting = 4: Deviation high limit)	10: Internal event 1 (setting = 32: Timer (status))
Input assignment C	dl _ <u>.</u> 5	0: Normally open (normally OFF = 0)	0: Normally open (normally OFF = 0)
Input assignment D	dl6	0: Normally open (normally OFF = 0)	0: Normally open (normally OFF = 0)
Polarity A	٦ ال	0: Direct	0: Direct
Polarity B	٦ ال	0: Direct	1: Reverse
Polarity C	٦ ال	0: Direct	0: Direct
Polarity D	٦ ال	0: Direct	0: Direct
Polarity	dl _ <u>.8</u>	0: Direct	1: Reverse
Internal event No. assignment	dl9	1	

_: Internal contact No.

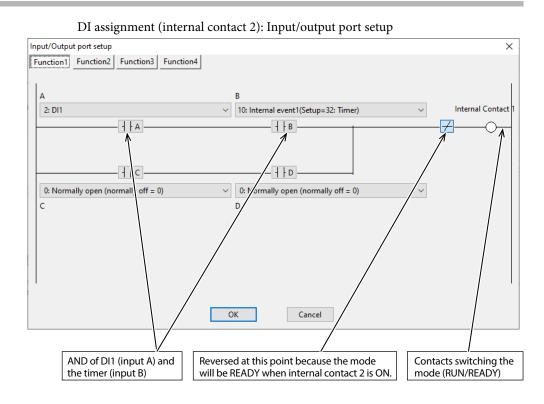
• Key points for configuration

Timer start condition: AND of DI1 and the target temperature (internal event 2: deviation high limit)

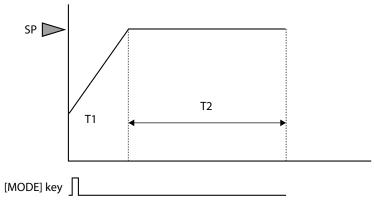
Condition for RUN/ READY mode switching: AND of DI (input A) and the timer (input B). However, because the mode will be READY when the internal contacts are ON, the function result is reversed at the final stage of the internal contact 2 processing.



DI assignment (internal contact 1): Input/output port setup



• Example 3: Simple operation



• Explanation

When [MODE] is pressed, this device enters RUN mode and the PV starts to change.

The SP increases (or decreases) according to the ramp setting.

When the final SP is reached and the PV is within a certain range, the timer starts counting. After T2 hours, this device enters READY mode.

• Sample settings

• Event

Event	Display	Internal event 1	Internal event 2
Operation type	E _ <u>C</u> I	9: Deviation high and low limits (final SP reference)	32: Timer (status)
Direct/Reverse	E _ <u>C</u> 2	1: Reverse	
Standby	E _ [2	0: No standby	
Event state in READY	E _ <u>C</u> 2	1: Forced OFF	0: Continues
Alarm OR	E_ <u>C</u> 3	0: None	0: None
Special OFF	E_ <u></u> [3	0: No special OFF	
Delay time unit	E_ <u></u> [3	0: 0.1 s	0: 0.1 s
Event main setting (low limit)	E _	3	
Event sub-setting (high limit)	Е _ ,56	3	
Hysteresis	Е_, НУ	9999	
ON delay	Eon	2	15
OFF delay	EoF	0	0

_: Internal event No.

• DI assignment

DI assignment	Display	Internal contact 1	Internal contact 2
Operation type	dl I	7: RUN/READY	17: Timer stop/start
Input bit function	dl2	1: Function 1, (A and B) or (C and D)	1: Function 1, (A and B) or (C and D)
Input assignment A	E Ib	18: User-defined bit 1	10: Internal event 1 (setting = 9: Deviation high and low limits (final SP reference))
Input assignment B	dl4	11: Internal event 2 (setting = 32: Timer (status))	26: During SP ramp
Input assignment C	dl5	0: Normally open (normally OFF = 0)	18: User-defined bit 1
Input assignment D	dl <u>_ 6</u>	0: Normally open (normally OFF = 0)	11: Internal event 2 (setting = 32: Timer (status))
Polarity A	٦ ال	0: Direct	0: Direct
Polarity B	٦ ال	1: Reverse	1: Reverse
Polarity C	۲ ال	0: Direct	0: Direct
Polarity D	٦ ال	0: Direct	0: Direct
Polarity	dl _ <u>8</u>	1: Reverse	0: Direct
Internal event No. assignment	d!9		2

_: Internal contact No.

• Other

[72 ([MODE] key function): 7 (user-defined bit 1 switching)

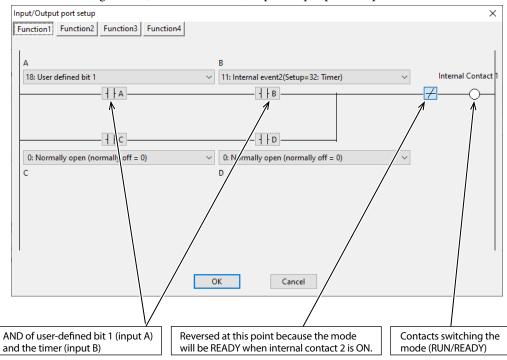
SP up ramp and down ramp: any

• Key points for configuration

The internal event 1 is a substitute for the guaranteed soak.

Therefore, set the hysteresis of event 1 to "9999" so that the event will not turn OFF even if the PV fluctuates after it is turned ON.



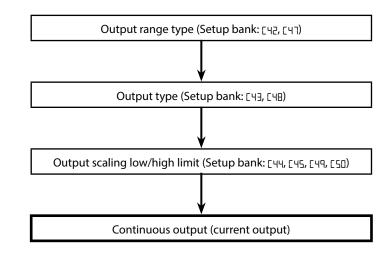


nput/Output port setup Function1 Function2 Function		:
A 10: Internal event1(Setup= 9: Dev	riation high and low 🗸 26: During SP ramp	✓ Ir ternal Contac
	4 B	
18: User defined bit 1	11: Internal event2(Setup=32: Timer)	\sim
c	OK Cancel	

DI assignment (internal contact 2): Input/output port setup

Guaranteed soak conditions (RAMP has ended and the SP is within the deviation of the final SP)

5-11 Continuous output



The following is a functional block diagram for continuous output.

Output range

The output range can be set for the current output.

Item (bank)	Display	Description	Initial value	User level
Control output 1 range (setup bank)	6 42	1: 4 to 20 mA 2: 0 to 20 mA	1	Simple, standard, advanced
Control output 2 range (setup bank)	[4]		1	auvanceu

• These items are displayed and the settings can be changed if current output is set as the control output.

Output type

The type of current output can be set.

ltem (bank)		Display	Description	Initial value	User level
Control output 1 type (setup bank)	E	43	0: MV 1: Heating MV (for heating/cooling control) 2: Cooling MV (for heating/cooling control) 3: PV	0	Simple, standard, advanced
Control output 2 type (setup bank)	E	48	4: PV (before applying ratio, bias, filter) 5: SP 6: Deviation (PV – SP) 7: CT1 current 8: CT2 current 9: Invalid 10: SP+MV 11: PV+MV	3	

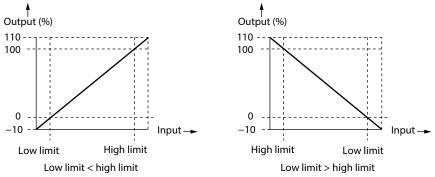
- These items are displayed and the settings can be changed if current output is set as the control output.
- The MV scaling width is used for calculation of SP + MV and PV + MV.
 MV scaling width (p. 5-88) (for details)

Output scaling low/high limit

Output scaling low and high limits can be set for the current output.

ltem (bank)		Display	Description	Initial value	User level
Control output 1 scaling low limit	ŗ	цц	-1999 to +9999	0.0	Simple,
(setup bank)			The number of decimal places changes		standard, advanced
Control output 1 scaling high limit	Г	ЦΕ	according to the output type.	100.0	auvanceu
(setup bank)	L	בר	Either of the following units is used		
Control output 2 scaling low limit	Г	ųą	depending on the output type.	0	
(setup bank)	Ĺ	77	Output type = $0-2$: % (of the MV)		
Control output 2 scaling high limit	Г	гп	Output type = $3-6$: same as the PV (°C, etc.)	1000	
(setup bank)	Ĺ	טכ	Output type = 7–8: A (current)		

- These items are displayed and the settings can be changed if current output is set as the control output.
- The relationship between the output type and the output based on the output scaling low and high limit settings is shown in the figure below.



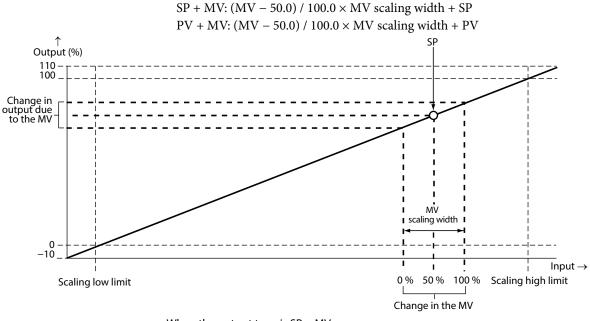
However, in the 0–20 mA range the output is 0–110 %.

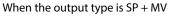
MV scaling width

If the output type is set to either SP + MV or PV + MV, the output can be made continuous by adding the change in the MV to the SP or PV.

Item (bank)	Display	Description	Initial value	User level
Control output 1 MV scaling width (setup bank)	E 46	0 to 9999 The number of decimal places and the unit are the same as the PV.	200	Simple, standard,
Control output 2 MV scaling width (setup bank)	[5]		200	advanced

- These items are displayed and the settings can be changed if the output type of control output 1 or 2 is set to SP + MV or PV + MV.
- The value calculated by the following expression is output according to the output scaling low and high limit settings.





! Handling Precautions

• This function is used when the continuous output from the C1M is connected to the remote SP (RSP) input of another controller for the purpose of cascade control in which the C1M operates as the master and another controller operates as a slave. Set the width of the RSP that changes in conjunction with the change in the MV (0–100 %) of the C1M as the MV scaling width.

5-12 Current Transformer (CT) Input

There are two types of current values input from the CT input terminals.

- Current when output ON: Used for heater burnout/overcurrent events. It can be displayed as CT current.
- Current when output OFF: Used for heater short-circuit events. It cannot be displayed.

If [] or [] (CT operation type) is set to 0 (heater burnout detection):

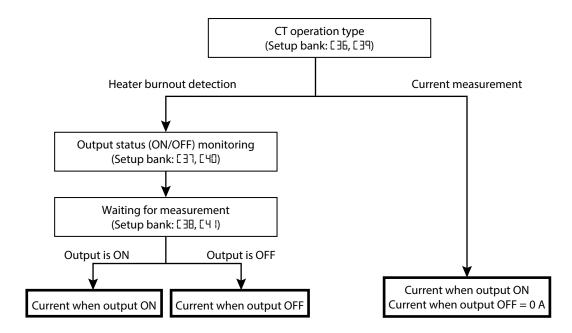
Current when output ON: The CT current measured when the output specified by "CT output" is ON

Current when output OFF: The CT current measured when the output specified by "CT output" is OFF

If [35 or [39 (CT operation type) is set to 1 (current measurement):

Current when output ON: The CT current measured regardless of whether the output is ON or OFF Current when output OFF: Always 0.0 A

The following is a functional block diagram for CT input.



Handling Precautions

• The current when the output is ON is used if the operation type of the internal event is set to heater burnout/overcurrent. The current when the output is OFF is used if the operation type of the internal event is set to heater short.

CT operation type

Different operations can be set for CT inputs 1 and 2.

ltem (bank)	Display	Description	Initial value	User level
CT1 operation type (setup bank)	6 36	0: Heater burnout detection 1: Current measurement	0	Simple, standard, advanced
CT2 operation type (setup bank)	PE]		0	auvanceu

- These items are displayed and the settings can be changed if a model with two CT inputs is used.
- If current measurement is selected, the current when the output is ON is updated regardless of the ON/OFF status of the output, and the current when the output is OFF is always 0.0 A.

CT output

When the CT operation type is heater burnout detection, an output whose ON/OFF is monitored can be specified.

ltem (bank)	Display	Description	Initial value	User level
CT1 output (setup bank)	[]]	0: Control output 1 1: Control output 2	0	Simple, standard, advanced
CT2 output	г чп	2: Event output 1	0	auvanceu
(setup bank)		3: Event output 2		
		4: Event output 3		

• These items are displayed and the settings can be changed if a model with two CT inputs is used and the CT operation type is set to heater burnout detection.

CT measurement wait time

When the CT operation type is heater burnout detection, the time from the change in the output ON/OFF status to the start of the current measurement can be set.

ltem (bank)	Display	Description	Initial value	User level
CT1 measurement wait time (setup bank)	C 38	30 to 300 ms	30 ms	Simple, standard, advanced
CT2 measurement wait time (setup bank)	[4]		30 ms	auvanceu

- These items are displayed and the settings can be changed if a model with two CT inputs is used and the CT operation type is set to heater burnout detection.
- Current measurement starts when the measurement waiting time elapses after the change in the ON/OFF status of the monitored output, and it ends when 100 ms elapses.

■ Number of CT turns / number of CT power wire passes

Different settings can be specified for CT inputs 1 and 2.

ltem (bank)	Display	Description	Initial value	User level
Number of CT1 turns	г оп	0: 800	8	Advanced
(setup bank)	[9[]	1–40: CT turns divided by 100		
Number of CT1 power wire passes	гоі	0: 1	1	
(setup bank)		1–6: The set value		
Number of CT2 turns	59 3	0: 800	8	
(setup bank)		1–40: CT turns divided by 100		
Number of CT2 power wire passes		0: 1	1	
(setup bank)		1–6: The set value		

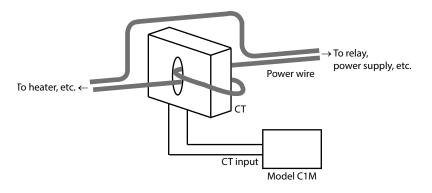
- These items are displayed and the settings can be changed if a model with two CT inputs is used.
- For the number of turns, set the number of turns of the CT connected to this device divided by 100.

For example, if the number of CT turns is 400, set 4. Note that, if 0 is set, 800 turns apply (same result as when 8 is set).

• The optional CTs, models QN206A and QN212A, have 800 turns, so set 8 for them. For the number of power wire passes, set the number of times that the power wire passes through the hole in the CT.

For example, if the power wire passes through the hole of the CT twice as shown below, set 2.

Note that, if 0 is set, 1 applies (same result as when 1 is set).



! Handling Precautions

- Make sure that the current does not exceed the high limit of the CT input that can be displayed. Exceeding the high limit may cause malfunction.
- If this device detects a current exceeding the high limit of the CT input that can be displayed, a CT input error alarm (RL | |) will be generated. However, if the current is so large that a malfunction occurs, the CT input error alarm will not be generated.
- The display range and the current measurement range of the CT input vary depending on the number of turns and power wire passes of the CT. Make sure to specify settings that match the number of turns and power wire passes of the connected CT.

The display range and the current measurement range are calculated using the expression below.

(The calculation by this device has a margin of error of 0.1 A or less.) Display range low limit (A) = 0.0

Display range high limit (A) = Number of turns \div (16 \times number of power wire passes) \times 1.4

Current measurement range low limit (A) = Number of turns \div (2000 \times number of power wire passes)

Current measurement range high limit (A) = Number of turns \div (16 \times number of power wire passes)

The table below shows an example of the display range and the current measurement range determined by the number of turns and power wire passes of the CT. The current measurement range is shown in parentheses.

Number of turns Number of power wire passes	100	400	800	1600	4000
1	0.0 to 8.7 A	0.0 to 35.0 A	0.0 to 70.0 A	0.0 to 140.0 A	0.0 to 350.0 A
	(0.1 to 6.2 A)	(0.2 to 25.0 A)	(0.4 to 50.0 A)	(0.8 to 100.0 A)	(2.0 to 250.0 A)
2	0.0 to 4.3 A	0.0 to 17.5 A	0.0 to 35.0 A	0.0 to 70.0 A	0.0 to 175.0 A
	(0.1 to 3.1 A)	(0.1 to 12.5 A)	(0.2 to 25.0 A)	(0.4 to 50.0 A)	(1.0 to 125.0 A)
6	0.0 to 1.4 A	0.0 to 5.8 A	0.0 to 11.6 A	0.0 to 23.3 A	0.0 to 58.3 A
	(0.1 to 1.0 A)	(0.1 to 4.1 A)	(0.1 to 8.3 A)	(0.2 to 16.6 A)	(0.4 to 41.6 A)

5-13 Display on the Console and Key Operation

What is displayed on the console and the use of the keys can be customized.

Key operation mode

There are two key operation modes, standard and special, which can be selected by the setting below.

ltem (bank)	Display	Description	Initial value	User level
Key operation mode		0: Standard	0	Advanced
(setup bank)		1: Special		

C 2 - 2 Key Operation (p. 2-2) (for details about the two modes)

[MODE] key function

The switching operation of the [MODE] key can be selected. Switching occurs when the key is pressed for 1 second or longer while the operation display is shown.

ltem (bank)	Display	Description	Initial value	User level
[MODE] key function (setup bank)	5 72	0: Invalid 1: AUTO/MANUAL selection 2: RUN/READY selection 3: AT stop/start 4: LSP group selection 5: Release all DO latches 6: Invalid 7: User-defined bit 1 8: Invalid	1	Simple, standard, advanced

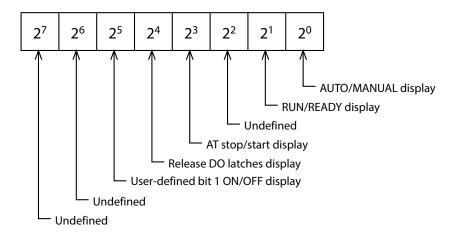
! Handling Precautions

- If ELFL (control method) is set to 0 (ON/OFF control), the AUTO/MANUAL selection setting is invalid.
- If ELFL (control method) is set to 0 (ON/OFF control), or if the PV high/low limit alarm is triggered, the AT stop/start setting is invalid.
- If E 30 (LSP system group) is set to 1, the LSP group selection setting is invalid.

Mode display setup

Whether to display the mode settings in the mode bank can be selected.

ltem (bank)	Display	Description	Initial value	User level
Mode display setup (setup bank)	E 73	Whether to display the settings in the mode bank is determined by the sum of the weights shown below.	255	Standard, advanced
		Bit 0: AUTO/MANUAL display No: 0, Yes: +1		
		Bit 1: RUN/READY display No: 0, Yes: +2		
		Bit 3: AT stop/start display No: 0, Yes: +8		
		Bit 4: DO latch release display No: 0, Yes: +16		
		Bit 5: User-defined bit 1 ON/OFF display No: 0, Yes: +32		
		Invalid settings: 0, +4, +64, +128		



• If Smart Loader Package model SLP-C1F is used, the setting for [73 (mode display setting) can be specified not only by a numerical value but also by bit input.

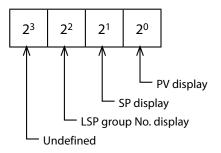
! Handling Precautions

- Even if AUTO/MANUAL display is enabled, if EtrL (control method) is set to 0 (ON/OFF control), the AUTO/MANUAL selection setting is not displayed.
- Even if AT stop/start display is enabled, if ELrL (control method) is set to 0 (ON/OFF control), the AT stop/start setting is not displayed.

■ PV/SP display setup

Whether to show PV- and SP-related settings on the operation display can be selected.

ltem (bank)	Display		Description	Initial value	User level
PV/SP display setup (setup bank)	E	74	Whether to show the following items on the operation display is determined by the sum of the weights shown below. Bit 0: PV No: 0. Yes: +1 Bit 1: SP No: 0. Yes: +2 Bit 2: LSP group No. No: 0. Yes: +4 Invalid settings: 0, +8	15	Standard, advanced



• If Smart Loader Package model SLP-C1F is used, the setting for [74 (PV/SP display setup) can be specified not only by a numerical value but also by bit input.

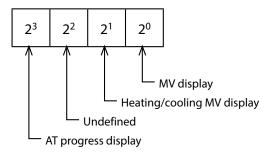
! Handling Precautions

• Even if LSP group No. display is enabled, if [30 (LSP system group) is set to 1, LSP group numbers are not displayed.

MV display setup

Whether to show MV-related settings on the operation display can be selected.

ltem (bank)	Display	Description	Initial value	User level
MV display setup (setup bank)	E 75	Whether to show the following items on the operation display is determined by the sum of the weights shown below. Bit 0: MV No: 0. Yes: +1 Bit 1: Heating MV / cooling MV No: 0. Yes: +2	15	Standard, advanced
		Bit 3: AT progress No: 0. Yes: +8 Invalid settings: 0, +4		



• If Smart Loader Package model SLP-C1F is used, the setting for [75 (MV display setup) can be specified not only by a numerical value but also by bit input.

! Handling Precautions

- Even if heating/cooling MV display is enabled, if E26 (heat/cool control) is set to 0 (not used), the heating/cooling MV is not displayed.
- Even if AT progress display is enabled, the progress is not displayed when AT is not running.

Event display setup

Whether to show the main- and sub-settings of internal events 1–3 on the operation display can be selected.

ltem (bank)	Display	Description	Initial value	User level
EV display setup (setup bank)	E 76	0: Do not show internal event settings on the operation display	0	Standard, advanced
		1: Show internal event 1 settings on the operation display		
		2: Show internal event 1–2 settings on the operation display		
		3: Show internal event 1–3 settings on the operation display		

Handling Precautions

- Even if internal event settings are set to be displayed, they are not displayed if an internal event operation type that does not require mainand sub-settings is specified.
- The main- and sub-settings of internal events 4–5 cannot be displayed on the operation display.

Event remaining time display setup

Whether to show the ON/OFF delay remaining time of internal events 1–3 on the operation display can be selected.

ltem (bank)	Display	Description	Initial value	User level
Event remaining time display setup (setup bank)	[]]	 0: Do not show the ON/OFF delay remaining time of internal events on the operation display 1: Show the ON/OFF delay remaining time of internal event 1 on the operation display 2: Show the ON/OFF delay remaining time of internal events 1–2 on the operation display 3: Show the ON/OFF delay remaining time of internal events 1–3 on the operation display 	0	Standard, advanced

! Handling Precautions

- The ON/OFF delay remaining time of an internal event whose operation type is set to "23" or higher can be shown on the operation display by specifying [Event remaining time display setup] only if the ROM version is 1.01 or later. With ROM version 1.00, do not change the initial value of [Event remaining time display setup].
- Even if the internal event remaining time is set to be displayed, it is not displayed if an internal event operation type that does not require display of the remaining time is specified.
- The remaining time of internal events 4–5 cannot be displayed on the operation display.

CT input current display setup

Whether to show the CT current on the operation display can be selected.

ltem (bank)	Display		Description	Initial value	User level
CT input current display setup (setup bank)	E	78	0: Do not show the CT current on the operation display	1	Standard, advanced
			1: Show the CT1 current on the operation display		
			2: Show the CT1 and CT2 currents on the operation display		

• This item is displayed and the setting can be changed if a model with two CT inputs is used.

User level

What is displayed on the console can be restricted by specifying the user level. The higher the setting, the more displayed items.

ltem (bank)	Display	Description	Initial value	User level
User level (setup bank)	[79	0: Simple 1: Standard 2: Advanced	0	Simple, standard, advanced

Status indicator

The function of the status indicator can be selected.

ltem (bank)	Display	Description	Initial value	User level
Status indicator (setup bank)	C 80	0: Not used (always off) 1: Blinks when sending RS-485 communication data 2: Blinks when receiving RS-485 communication data 3: OR (logical sum) of all DI states 4: Always OFF	0	Advanced

User-defined function

Up to eight more settings selected from various settings can be displayed as userdefined functions 1–8 on the operation display.

ltem (bank)	Display	Description	Initial value	User level
User function 1		Displayed characters are defined for each item. The		Standard,
(user function bank)		following are special cases.		advanced
User function 2	UF-2			
(user function bank)		: Unregistered		
User function 3	!!F	P: Proportional band of the PID in use		
(user function bank)		: Integral time of the PID in use		
User function 4	!!E_4	d: Derivative time of the PID in use		
(user function bank)		E: Manual reset of the PID in use		
User function 5	!!F - S	□: MV low limit of the PID in use		
(user function bank)		GH: MV high limit of the PID in use		
User function 6	!!F-F	-		
(user function bank)		P[: Proportional band for cooling of the PID in use		
User function 7		<pre>+E: Integral time for cooling of the PID in use</pre>		
(user function bank)		d[: Derivative time for cooling of the PID in use		
User function 8		<code>LE</code> : MV low limit for cooling of the PID in use		
(user function bank)		BH_E: MV high limit for cooling of the PID in use		

- Only the settings that can be displayed can be registered.
 (Example: Manual reset of the PID constants can be registered when integral time = 0)
- Items cannot be registered from the console using the parameter number displayed on the setup screen of Smart Loader Package model SLP-C1F.
- To select a parameter, use the keys as follows.
 - [<]: Displays the first parameter in the next bank.
 - $[\lor]$: Displays the next parameter.
 - $[\wedge]$: Displays the previous parameter.

Handling Precautions

• The user level required for user-defined functions 1–8 to be shown on the operation display is "advanced."

• Specifying user-defined functions

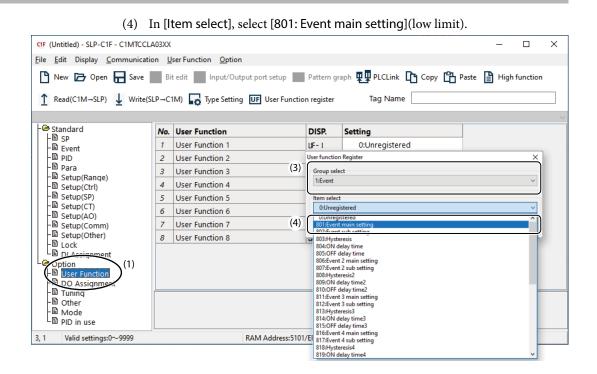
This section gives examples of settings using Smart Loader Package model SLP-C1F. Up to eight user-defined functions (parameters) can be assigned to the [PARA] key. Set frequently used functions to make the operation of this device easier. In the example below, the main setting of event 1 is set for UF1.

1. Specifying from the user-defined function screen

To use this function, set the user level to "Standard" or "Advanced (High function)" first.

CIF (Untitled	l) - SLP-C1F - C1I	MTC	CLA01	XX					
<u>F</u> ile <u>E</u> dit	Display <u>C</u> omm	unic	ation	User Function Option					
New New	🕒 New 🗁 Open 🕁 Save 📰 Bit edit 🔄 Input/Output port setup 📰 Pattern graph 💷 PLCLink 📭 Copy 🖺 Paste 🗎 High function								
1 Read(C1M→SLP) 🛓	Write	e(SLP-	→C1M) 🙀 Type Setting UF User Fund	ction registe	er Tag Name			
- 🗠 Standa	rd	^	No.	SP	DISP.	SP 1	SP 2		
-₿ <mark>SP</mark> -₿ Ever	nt		1	SP	5P- 1	0			
- 🖹 PID			2	PID	Pidi	1			
- Para									
-⊜ Setu	ip(Range) ip(Ctrl)								
-🖹 Setu	ip(SP)								
- 🖹 Setu									
- Setu - Loc	ıp(Other)								
	c ssignment								
L 🗠 Option	1								
	r Function		<					>	
-≌ DO -≌ Tun	Assignment		-					-	
-⊜ Tun -⊜ Oth									
-B Mo									
L🖹 PID	in use	۷							
3, 1 Val	id settings:-200~	1200		RAM Address:7	005/EEPRO	M Address:23389			

- (1) Select [User Function] under [Option].
- (2) Select any of user-defined functions 1–8.
 - » The [User Function register] dialog box is displayed.
- (3) In [Group select], select [1: Event].



2. If you find a parameter to set for a user-defined function during configuration

In this case, use the procedure below.

- (1) Place the cursor on the parameter you want to register.
- (2) Click the [User Function Register] icon.

» The [User Function register] dialog box is displayed.

(3) Click the radio button for the UF No. to which the parameter should be registered, and then click [Register].

 \gg The parameter is now registered.

		The parameter is i		loter e un		
CIF (Untitled) - SLP-C1F - C1MTCCL	A02XX				-	
<u>Eile E</u> dit Display <u>C</u> ommunicati	on <u>U</u>	ser Function Option				
		t edit Input/C (2): port setup IM) 😱 Type Settin UF User Fu		·	Paste 📄 High function	
- Standard	No.	Event	DISP.	Internal Event 1	Internal Event 2	Internal Ev 1
- 🖹 SP - 🗎 Event	1	Operation type	E5C 1	1: PV high limit	2: PV low limit	0: None
- E PID	2	Direct/Reverse	E5C5	0: Direct	0: Direct	
-B Para	3	Stand-by	E5C5	0: None	0: None	
- 🖹 Setup(Range) - 🖹 Setup(Ctrl)	4	EVENT state at READY	E5253	0: EVENT continued at Ready	0: EVENT continued at Ready	
- Setup(SP)	5	Controller alarm OR	E323	0: None	0: None	
- Setup(CT) Betup(AO)	6	Special OFF setup	E323	0: Normal	0: Normal (1)	
- Setup(Other)	7	Delay unit	E2C3	0: 0.1s	0.0.13	
- Lock	8	Event main setting	E5	0	0	
L □ DI Assignment → Option	9	Event sub setting	E256		C	
B User Function	<					>
- DO Assignment - Tuning - Other - Mode						
4, 8 Valid settings:-1999~9999		RAM Address	:7506/EEPROM	Address:23890		
		User function Register	Diesse celect th	e number to register]	

(3)	[Event 2 main setting] Please select the number to register.									
(3)	<u>2</u> :UF2	0:Unregistered								
	<u>3</u> :UF3	0:Unregistered								
	○ <u>4</u> :UF4	0:Unregistered								
	<u>5</u> :UF5	0:Unregistered								
	O <u>6</u> :UF6	0:Unregistered								
	○ <u>7</u> :UF7	0:Unregistered								
	○ <u>8</u> :UF8	0:Unregistered								
		Registe	Cancel							

Rote

• The registered parameters can be checked by selecting [User function] under [Option].

Key lock, communication lock, loader lock

With various lock functions, changing the settings and communication can be prohibited.

ltem (bank)	Display	Description	Initial value	User level
Key lock (lock bank)		0: All settings can be specified.01: Mode, event, operation display, SP, UF, lock, manual MV, and [MODE] key operation can be specified.22: Operation display, SP, UF, lock, manual MV, and [MODE] key operation can be 		Simple, standard, advanced
		3: UF, lock, manual MV, and [MODE] key operation can be specified.		
Communication lock	ELoE	0: Unlocked	0	Advanced
(lock bank)		1: Locked		
Loader lock	!!~Г	0: Unlocked	0	Advanced
(lock bank)		1: Locked		

• If you set a password in addition to the key lock, only the items whose settings can be changed using the keys (shown in the table above) are displayed.

The parameters shown below can be read and written even if communication lock or loader lock is enabled.

Bank	Parameter		
Setup	PV decimal point position		
Mode	AUTO/MANUAL mode selection		
	RUN/READY mode selection		
	AT stop/start selection		
	Release all DO latches		
Operation	PV		
settings	SP (target value)		
	LSP No.		
	MV (Manipulated Variable)		
	Heat MV (Manipulated Variable)		
	Cool MV (Manipulated Variable)		
	AT progress		
	Current transformer (CT) input 1 current		
	Current transformer (CT) input 2 current		
	Timer remaining time 1		
	Timer remaining time 2		
	Timer remaining time 3		
	Timer remaining time 4		
	Timer remaining time 5		
	Step No.*		
	Step remaining time		
	Step remaining time (second)		
	LSP in use		
	PV before applying ratio, bias, filter		
Status	Input alarm status		

* If the step operation is stopped (READY mode), the step operation No. will be 0.

Password

If a password is set (password lock), key-locked items whose settings cannot be changed using the keys will not be displayed.

ltem (bank)	Display	Description	Initial value	User level
Password display (lock bank)	PRSS	0 to 15 5: Displays passwords 1A to 2B	0 (0 is set at power-on)	Simple, standard, advanced
Password 1A (lock bank)	PS IR	0000 to FFFF (hex)	0000	
Password 2A (lock bank)	PS2R	0000 to FFFF (hex)	0000	
Password 1B (lock bank)	P5 Ib	0000 to FFFF (hex)	0000	
Password 2B (lock bank)	PS2b	0000 to FFFF (hex)	0000	

- P5 IR (password 1A) and P52R (password 2A) are displayed and the settings can be changed if PR55 (password display) is set to 5 and the two sets of passwords (1A and 1B, 2A and 2B) match.
- P5 lb (password 1B) and P52b (password 2B) are displayed and the settings can be changed if PR55 (password display) is set to 5.
- The value set for P5 IA (password 1A) is automatically set for P5 Ib (password 1B).
- The value set for P52A (password 2A) is automatically set for P52b (password 2B).

! Handling Precautions

- The password function can be used only if the ROM version is 1.01 or later. With ROM version 1.00, do not change the initial value of [Password 1A/2A/1B/2B].
- Before setting passwords 1A to 2B, decide on two hexadecimal numbers that will be the passwords, and make a note so that you will remember them.
- PR55 is provided to prevent accidental changing of passwords by restricting the display conditions of passwords 1A to 2B.
- If you set a value for passwords 1A and 2A and then set a different value for passwords 1B and 2B, passwords 1A and 2A will no longer be displayed, and the settings for key lock, communication lock, and loader lock cannot be changed. This is called a password locked state.
- Settings that cannot be changed due to key lock cannot be displayed in the password locked state.
- If the password lock cannot be reset, initialize settings from the [Calibration and checking] screen of Smart Loader Package model SLP-C1F. In this case, any settings configured by the user will also be initialized (lost).

Chapter 6. Displayed Items and Settings

6-1 Operation Settings

Meaning of user level settings

0: Simple configuration, 1: Standard configuration, 2: Advanced configuration

Operation settings

Display	ltem	Description	lnitial value	User level	Notes
Upper display: PV Lower display: SP	SP (target value)	SP low limit (E01) to SP high limit (E08)	0	0	Whether to display can be selected by the PV/SP value display setting ([기식).
LSP 1	LSP No. (the last digit)	From 1 to the number set for LSP system group (E3D, max. = 8)	1	0	Displayed if LSP system group ([30]) is set to 2 or more. The lower display shows the LSP for the LSP group.
					Whether to display can be selected by the PV/SP value display setting (ር 기식).
(display example) Lower display: Step remaining	Step No., step remaining time	Setting cannot be changed The upper display indicates the step No. (1–8) to the right of 5 [⊥] and tells whether the process is ramp-up, ramp-down, or soak. The lower display shows the remaining	-	0	The time remaining in the step is displayed in the unit set by STEP time unit ([3]) regardless of whether the current process is ramp or soak. If the unit is 1 s: min.s
time		time for the soak or ramp.			If the unit is 1 min: h.min
oUE	MV (Manipulated Variable)	 -10.0 to +110.0 % Setting cannot be changed in AUTO mode (the setting does not blink) Setting can be changed in MANUAL 	-	0	In ON/OFF control ($ErL = 0$), 100.0 is displayed when ON and 0.0 is displayed when OFF. Whether to display can be selected by the MV display
		mode (the setting blinks)			setting (E ٦5).
HERF	Heat MV (Manipulated Variable)	Setting cannot be changed	-	0	Displayed if heat/cool control is used ($E2E \neq 0$).
Cool	Cool MV (Manipulated Variable)	Setting cannot be changed	-	0	Whether to display can be selected by the MV display setting ([75).
Upper display: PV	AT progress (the last digit*)	Setting cannot be changed x to 1: AT is running (the value decrements) 0: AT is complete	-	0	Displayed if AT is running (display continues even after AT ends). Whether to display can be selected by the MV display setting (L 75).
[[]	Current transformer (CT) input 1 current	Setting cannot be changed	-	0	Displayed if a model with two CT inputs is used.
٢٢٦	Current transformer (CT) input 2 current	Setting cannot be changed	-	0	Whether to display can be selected by the CT display setting ([78).
El	Internal event 1 main setting	The range of settings differs depending on the operation type of the internal event.	0	0	The settings required for the internal event type are displayed.
E <u>1</u> 56	Internal event 1 sub-setting	0 to 9999 U: An absolute value is set -199.9 to + 999.9 %: MV -1999 to +9999 U: Other than the above	0	0	Whether to display can be selected by the event display setting (C76).

Display	ltem	Description	lnitial value	User level	Notes
F	Timer remaining time 1	Setting cannot be changed The rightmost digit shows ^Г for ON delay and L for OFF delay.	-	0	Whether to display can be selected by the timer remaining time display setting (ברך).
E2	Internal event 2 main setting	The range of settings differs depending on the operation type of the internal event.	0	0	The settings required for the internal event type are displayed.
E2 <u>.</u> 56	Internal event 2 sub-setting	0 to 9999 U: An absolute value is set -199.9 to + 999.9 %: MV -1999 to +9999 U: Other than the above	0	0	Whether to display can be selected by the event display setting (ር ገሬ).
F5	Timer remaining time 2	Setting cannot be changed The rightmost digit shows ^Г for ON delay and L for OFF delay.	-	0	Whether to display can be selected by the timer remaining time display setting (ברך).
EB	Internal event 3 main setting	The range of settings differs depending on the operation type of the internal event.	0	0	The settings required for the internal event type are displayed.
E <u>3</u> 56	Internal event 3 sub-setting	0 to 9999 U: An absolute value is set -199.9 to + 999.9 %: MV -1999 to +9999 U: Other than the above	0	0	Whether to display can be selected by the event display setting ([76).
F3	Timer remaining time 3	Setting cannot be changed The rightmost digit shows ^Г for ON delay and L for OFF delay.	-	0	Whether to display can be selected by the timer remaining time display setting (ברך).

* The rightmost digit

6-2 Parameter Settings

Meaning of user level settings

0: Simple configuration, 1: Standard configuration, 2: Advanced configuration

Mode bank

Bank selection: hodE

Display	ltem	Description	Initial value	User level	Notes
87	AUTO/MANUAL mode selection	RUEם: AUTO mode កំអ៊ក: MANUAL mode	AUTO	0	Displayed if the control method is PID control (EtrL = 1). Whether to display can be selected by the mode display setting ([7]).
	RUN/READY mode selection	ר לה: RUN mode ר לש: READY mode	RUN	0	Whether to display can be selected by the mode display setting ([기∃).
AF	AT start/stop selection	REoF: AT stop REon: AT start	AT stop	0	Displayed if the control method is PID control ($ELrL = 1$). Whether to display can be selected by the mode display setting (Γ 73).
AFEr	Auto tuning error	EroF: Normal Eron: Abnormal	Normal	0	Displayed if the control method is PID control (ELrL = 1). Whether to display can be selected by the mode display setting ([73]).
dolt	Release all DO latches	LEon: Latch continue LEoF: Latch release	Latch continue	0	All DOs for control outputs (relay, voltage pulse) and event outputs can be unlatched. Whether to display can be selected by the mode display setting ([73]).
Udb, I	User-defined bit 1	dboF: OFF dbon: ON	OFF	0	Whether to display can be selected by the mode display setting ([]].

SP bank

Bank selection: SP

Display	ltem	Description	lnitial value	User level	Notes
5P- (SP (for LSP1)	SP low limit (E0٦) to SP high limit (E08)	0	0	
PI d I	PID group No. (for LSP1)	1 to 8	1	1	Displayed for PID control ([ErL = 1)
	Ramp (for LSP1)	0 to 9999 (The decimal point position is determined by the decimal point position of the PV and the SP ramp unit ([3]).)	0	1	Displayed if SP ramp type (E I) is set to 1 or more.
比교	Soak time (for LSP1)	0.0 to 999.9 (when STEP time unit = 0.1 s) 0 to 9999 (when STEP time unit = 1 s or 1 min)	0	1	Displayed if SP ramp type ([3]) is set to 2 or more.
SP-2	SP (for LSP2)	Same as LSP group 1	0	0	Displayed if LSP system group ([30) is set to 2 or more and the conditions for LSP1 described
PI 42	PID group No. (for LSP2)		1	1	above are met.
	Ramp (for LSP2)		0	1	
	Soak time (for LSP2)		0	1	
SP-3	SP (for LSP3)	Same as LSP group 1	0	0	Displayed if LSP system group ([30) is set to 3 or more and the conditions for LSP1 described
PI d.3	PID group No. (for LSP3)		1	1	above are met.
rñP <u>3</u>	Ramp (for LSP3)		0	1	
	Soak time (for LSP3)		0	1	
SP-4	SP (for LSP4)	Same as LSP group 1	0	0	Displayed if LSP system group ([30) is set to 4 or more and the conditions for LSP1 described
PI dy	PID group No. (for LSP4)		1	1	above are met.
┍╖┍	Ramp (for LSP4)		0	1	
比교	Soak time (for LSP4)		0	1	

Display	Item	Description	Initial value	User level	Notes
SP-S	SP (for LSP5)	Same as LSP group 1	0	0	Displayed if LSP system group ([30) is set to 5 or more and the conditions for LSP1 described
PI d <u>5</u>	PID group No. (for LSP5)		1	1	above are met.
rñP <u>S</u>	Ramp (for LSP5)		0	1	
	Soak time (for LSP5)		0	1	
5P-6	SP (for LSP6)	Same as LSP group 1	0	0	Displayed if LSP system group ([30) is set to 6 or more and the conditions for LSP1 described
PI d <u>6</u>	PID group No. (for LSP6)		1	1	above are met.
rñP <u>6</u>	Ramp (for LSP6)		0	1	
비교	Soak time (for LSP6)		0	1	
5P-7	SP (for LSP7)	Same as LSP group 1	0	0	Displayed if LSP system group ([30) is set to 7 or more and the conditions for LSP1 described
만성	PID group No. (for LSP7)		1	1	above are met.
	Ramp (for LSP7)		0	1	
	Soak time (for LSP7)		0	1	
SP-8	SP (for LSP8)	Same as LSP group 1	0	0	Displayed if LSP system group ([30) is set to 8 or more and the conditions for LSP1 described
PI d.8	PID group No. (for LSP8)		1	1	above are met.
rñP <u>.</u> 8	Ramp (for LSP8)		0	1	
El ñ8	Soak time (for LSP8)		0	1	

T

Event bank

Bank selection: E_{u}

Display	ltem	Description	lnitial value	User level	Notes
El	Internal event 1 main setting	–1999 to +9999 The number of decimal places changes	0	0	The settings required for the internal event 1 operation type (E IC I) are displayed.
E <u>(</u> 56	Internal event 1 sub-setting	according to the operation type of the internal event. For some operation types, the range is 0	0	0	
Е (НУ	Internal event 1 hysteresis	to 9999. 0 to 9999 The number of decimal places changes according to the operation type of the internal event.	5	0	
E lon	Internal event 1 ON delay time	0.0 to 999.9 (when delay time unit = 0.1 s) 0 to 9999 (when delay time unit =	0	2	
E loF	Internal event 1 OFF delay time	something other than 0.1 s)	0	2	
53	Internal event 2 main setting	Same as internal event 1	0	0	The settings required for the internal event 2 operation type (E2L I) are displayed.
Е2 <u></u> 5Ь	Internal event 2 sub-setting		0	0	
E5HA	Internal event 2 hysteresis		5	0	
E2 <u>on</u>	Internal event 2 ON delay time		0	2	
65°2	Internal event 2 OFF delay time		0	2	
63	Internal event 3 main setting	Same as internal event 1	0	0	The settings required for the internal event 3 operation type (F3C II) are displayed
E <u>3</u> 56	Internal event 3 sub-setting		0	0	. (E∃[I) are displayed.
ЕЭ́НУ	Internal event 3 hysteresis		5	0	
E <u>J</u> on	Internal event 3 ON delay time		0	2	
EBoF	Internal event 3 OFF delay time		0	2	

Display	ltem	Description	lnitial value	User level	Notes
EY	Internal event 4 main setting	Same as internal event 1	0	0	The settings required for the internal event 4 operation type (E4C 1) are displayed.
ЕЧ.5Ь	Internal event 4 sub-setting		0	0	
ЕЧНУ	Internal event 4 hysteresis		5	0	
EYon	Internal event 4 ON delay time		0	2	
EYoF	Internal event 4 OFF delay time		0	2	
ES	Internal event 5 main setting	Same as internal event 1	0	0	The settings required for the internal event 5 operation type (ESC I) are displayed.
E5 <u>5</u> 56	Internal event 5 sub-setting		0	0	
ЕҔНУ	Internal event 5 hysteresis	·	5	0	
E <u>S</u> on	Internal event 5 ON delay time		0	2	
ESoF	Internal event 5 OFF delay time		0	2	

PID bank

Bank selection: $\mathsf{P}\mathsf{I} \mathrel{d}$

Display	ltem	Description	Initial value	User level	Notes
P- {	Proportional band (PID group 1)	0.1 to 999.9 %	5.0	0	Displayed if the control method is PID control ($ErL = 1$).
-	Integration time (PID group 1)	0 to 9999 (0 = no integral operation) (The decimal point position is determined by "Integral time and derivative time decimal point position" ([23])).	120	0	
d-	Derivative time (PID group 1)	0 to 9999 (0 = no derivative operation) (The decimal point position is determined by "Integral time and derivative time decimal point position" ([23])).	30	0	
-E-1	Manual reset (PID group 1)	-10.0 % to +110.0 %	50.0	0	Displayed if the control method is PID control (EtrL = 1) and if integration time (I - I) of the PID group = 0.
oL - 1	MV low limit (PID group 1)	-10.0 % to +110.0 %	0.0	1	Displayed if either of the set of conditions below is met
oH- 1	MV high limit (PID group 1)	-10.0 % to +110.0 %	100.0	1	 The control method is PID control (ELrL = 1), individual PID heating/cooling control is not used (E2E ≠ 1), and the integration time (I - I) of the PID group = 0 The control method is PID control (ELrL = 1), individual PID heating/cooling control is used (E2E = 1), and the integration time (I - I) or the integration time for cooling of the PID group (I - IE) = 0
P- 1[Cool-side proportional band (PID group 1)	0.1 to 999.9 %	5.0	0	Displayed if the control method is PID control (Etrt = 1) and individual PID heating/cooling
- IC	Cool-side integration time (PID group 1)	0 to 9999 (The decimal point position is determined by "Integral time and derivative time decimal point position" ([23])).	120	0	control is used (E2E = 1)
9- IC	Cool-side derivative time (PID group 1)	0 to 9999 (The decimal point position is determined by "Integral time and derivative time decimal point position" ([2])).	30	0	
ol. IC	Cool-side MV low limit (PID group 1)	-10.0 % to +110.0 %	0.0	1	
oų IC	Cool-side MV high limit (PID group 1)	-10.0 % to +110.0 %	100.0	1	

Display	Item	Description	Initial value	User level	Notes
P-2	Proportional band (PID group 2)	Same as PID group 1	5.0	0	Same as PID group 1
1 - 5	Integration time (PID group 2)		120	0	
d-5	Derivative time (PID group 2)		30	0	
rE-3	Manual reset (PID group 2)		50.0	0	
oL-2	MV low limit (PID group 2)		0.0	1	
S-Ho	MV high limit (PID group 2)		100.0	1	
P-5C	Cool-side proportional band (PID group 2)		5.0	0	
1 - 50	Cool-side integration time (PID group 2)		120	0	
д-5С	Cool-side derivative time (PID group 2)		30	0	
oL.2C	Cool-side MV low limit (PID group 2)		0.0	1	
0H,2E	Cool-side MV high limit (PID group 2)		100.0	1	

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Display	ltem	Description	Initial value	User level	Notes
P-3	Proportional band (PID group 3)	Same as PID group 1	5.0	0	Same as PID group 1
-]	Integration time (PID group 3)		120	0	
d-3	Derivative time (PID group 3)		30	0	
rE-3	Manual reset (PID group 3)		50.0	0	
oL-3	MV low limit (PID group 3)		0.0	1	
E-Ho	MV high limit (PID group 3)		100.0	1	
P-3C	Cool-side proportional band (PID group 3)		5.0	0	
] -][Cool-side integration time (PID group 3)		120	0	
JE-P	Cool-side derivative time (PID group 3)		30	0	
oL <u>.</u> 3C	Cool-side MV low limit (PID group 3)		0.0	1	
oH <u></u> 3E	Cool-side MV high limit (PID group 3)		100.0	1	

Display	ltem	Description	lnitial value	User level	Notes
P-4	Proportional band (PID group 4)	Same as PID group 1	5.0	0	Same as PID group 1
-4	Integration time (PID group 4)		120	0	
6-4	Derivative time (PID group 4)		30	0	
۲-3-	Manual reset (PID group 4)		50.0	0	
02-4	MV low limit (PID group 4)		0.0	1	
0H-4	MV high limit (PID group 4)		100.0	1	
P-4[Cool-side proportional band (PID group 4)		5.0	0	
-4[Cool-side integration time (PID group 4)		120	0	
d-4[Cool-side derivative time (PID group 4)		30	0	
oL.4C	Cool-side MV low limit (PID group 4)		0.0	1	
oH,4C	Cool-side MV high limit (PID group 4)		100.0	1	

Display	ltem	Description	Initial value	User level	Notes
P-S	Proportional band (PID group 5)	Same as PID group 1	5.0	0	Same as PID group 1
1-5	Integration time (PID group 5)		120	0	
d-5	Derivative time (PID group 5)		30	0	
rE-5	Manual reset (PID group 5)		50.0	0	
oL-5	MV low limit (PID group 5)		0.0	1	
oH-S	MV high limit (PID group 5)		100.0	1	
P-5[Cool-side proportional band (PID group 5)		5.0	0	
1 -5[Cool-side integration time (PID group 5)		120	0	
d-5C	Cool-side derivative time (PID group 5)		30	0	
oL.SC	Cool-side MV low limit (PID group 5)		0.0	1	
oHSE	Cool-side MV high limit (PID group 5)		100.0	1	

Display	ltem	Description	Initial value	User level	Notes
P-6	Proportional band (PID group 6)	Same as PID group 1	5.0	0	Same as PID group 1
1 - 5	Integration time (PID group 6)		120	0	
d-6	Derivative time (PID group 6)		30	0	
rE-6	Manual reset (PID group 6)		50.0	0	
oL-6	MV low limit (PID group 6)		0.0	1	
oH-6	MV high limit (PID group 6)		100.0	1	
P-60	Cool-side proportional band (PID group 6)		5.0	0	
1 -60	Cool-side integration time (PID group 6)		120	0	
d-6C	Cool-side derivative time (PID group 6)		30	0	
oL <u>6</u> C	Cool-side MV low limit (PID group 6)		0.0	1	
oH,6C	Cool-side MV high limit (PID group 6)		100.0	1	

Display	ltem	Description	Initial value	User level	Notes
P-7	Proportional band (PID group 7)	Same as PID group 1	5.0	0	Same as PID group 1
-]	Integration time (PID group 7)		120	0	
d-7	Derivative time (PID group 7)		30	0	
rE-]	Manual reset (PID group 7)		50.0	0	
oL-7	MV low limit (PID group 7)		0.0	1	
C-Ha	MV high limit (PID group 7)		100.0	1	
ף-ק	Cool-side proportional band (PID group 7)		5.0	0	
- 7[Cool-side integration time (PID group 7)		120	0	
d-7C	Cool-side derivative time (PID group 7)		30	0	
oL.7C	Cool-side MV low limit (PID group 7)		0.0	1	
οΗͺϽϹ	Cool-side MV high limit (PID group 7)		100.0	1	

Display	Item	Description	Initial value	User level	Notes
P-8	Proportional band (PID group 8)	Same as PID group 1	5.0	0	Same as PID group 1
-8	Integration time (PID group 8)		120	0	
d-8	Derivative time (PID group 8)		30	0	
rE-8	Manual reset (PID group 8)		50.0	0	
oL-8	MV low limit (PID group 8)		0.0	1	
oH-8	MV high limit (PID group 8)		100.0	1	
P-80	Cool-side proportional band (PID group 8)		5.0	0	
1 -80	Cool-side integration time (PID group 8)		120	0	
d-8C	Cool-side derivative time (PID group 8)		30	0	
oL,8C	Cool-side MV low limit (PID group 8)		0.0	1	
oH,8C	Cool-side MV high limit (PID group 8)		100.0	1	

Parameter bank

Bank selection: PR-R

Display	ltem	Description	lnitial value	User level	Notes
[Errl	Control method	0: ON/OFF control 1: PID control	0 or 1	0	The initial value is 0 if control output 1 is a relay output, and 1 otherwise.
AF ^o r	MV low limit at AT	-10.0 to +110.0 %	0.0	0	Displayed if the control method is PID control ($ELrL = 1$).
AF ^o A	MV high limit at AT	-10.0 to +110.0 %	100.0	0	
dl FF	ON/OFF control differential	0 to 9999 U	5	0	Displayed if the control method is ON/OFF control ($ErL = 0$).
oFFS	ON/OFF control operating point offset	–1999 to +9999 U	0	2	
FL	PV filter	0.0 to 120.0 s	0.0	0	
гЯ	PV ratio	0.001 to 9.999	1.000	1	
61	PV bias	-1999 to +9999 U	0	0	
[40	Time proportional cycle unit 1	0: 1 s 1: Always 0.5 s*1 2: Always 0.25 s*1 3: Always 0.1 s*1	0	2	Displayed if the conditions to display time proportional cycle 1 ([Y]) are met and the output does not include a relay output.
69	Time proportional cycle 1	5 to 120 s (when the output includes a relay output) 1 to 120 s (when the output does not include a relay output)	10 or 2	0	Displayed if MV1 (time proportional output, or time proportional output for heating in heating/cooling control) is set for relay control output, voltage pulse control output, or event output in DO assignment. The initial value is 2 if control output 1 is a voltage pulse
٤Po	Time proportional minimum ON/OFF time 1	Set value: 0 If either one of the conditions below is true, 250 ms applies. Otherwise, 1 ms applies. • MV1 is set for relay control output or event output in DO assignment. • Time proportional cycle 1 is 10 s or longer. Set value: 1–250 ms If MV1 is set for relay control output or event output in DO assignment, 1–49: 50 ms applies. 50–250: The set value applies.	0	2	output, and 10 otherwise. Same as time proportional cycle1 ([၂)
2023	Time proportional cycle unit 2	0: 1 s 1: Always 0.5 s* ² 2: Always 0.25 s* ² 3: Always 0.1 s* ²	0	2	Displayed if the conditions to display time proportional cycle 2 ([42]) are met and the output does not include a relay output.

Display	ltem	Description	Initial	User	Notes
		p	value	level	
543	Time proportional cycle 2	5 to 120 s (when the output includes a relay output) 1 to 120 s (when the output does not include a relay output)	10 or 2	0	Displayed if heating/cooling control is used ($[25 \neq 0]$) and MV2 (time proportional output for cooling in heating/cooling control) is set for relay control output, voltage pulse control output, or event output in DO assignment. The initial value is 2 if control output 2 is a voltage pulse output, and 10 otherwise.
5093	Time proportional minimum ON/OFF time 2	 <u>Set value: 0</u> If either one of the conditions below is true, 250 ms applies. Otherwise, 1 ms applies. MV2 is set for relay control output or event output in DO assignment. Time proportional cycle 2 is 10 s or longer. <u>Set value: 1–250 ms</u> If MV2 is set for relay control output or event output in DO assignment, 1–49: 50 ms applies. 50–250: The set value applies. 	0	2	Same as time proportional cycle 2 ([냉ਟ]
ЕЪГА	Time proportional cycle mode	0: Priority on controllability 1: Priority on actuator service life (only one ON/OFF operation in a time proportional cycle)	0 or 1	2	The initial value is 1 if control output 1 is a relay output, and 0 otherwise.
SPU	SP up ramp	0.0 to 999.9 U (0.0 U: no ramp)	0.0	2	Select the time unit of the ramp by SP ramp unit (E32).
SPd	SP down ramp		0.0	2	

*1. The setting cannot be specified for time proportional cycle 1 ([IJ).

*2. The setting cannot be specified for time proportional cycle 2 ([12]).

■ Extended tuning bank Bank selection: Eb

Display	ltem	Description	lnitial value	User level	Notes
AFFA	AT type	0: Normal (regular control characteristics) 1: Immediate response (to disturbance) 2: Stable (minimal PV fluctuation)	1	0	Displayed if the control method is PID control ($EtrL = 1$).
SPL9	SP lag constant	0.0 to 999.9	0.0	2	
RE-P	AT proportional band adjust	0.00 to 99.99	1.00	2	
RE-1	AT integral time adjust	0.00 to 99.99	1.00	2	
RF-9	AT derivative time adjust	0.00 to 99.99	1.00	2	
REPE	Type of MV switching point at AT	0: Default (2/3 of the deviation of the initial PV from the initial SP) 1: SP 2: PV	0	2	Displayed if the control method is PID control (EErL = 1).
REPu	MV switching point PV in AT	–1999 to + 9999 U	0	2	Displayed if the control method is PID control ($ErL = 1$) and type of MV switching point at AT ($REPE$) is set to 2 (PV).
[<u></u> [[]	Control algorithm	0: PID (conventional PID) 1: Ra-PID (high-performance PID)	0	1	Displayed if the control method is PID control ($E_{L} = 1$).
[19	Cooling Gain	–10.0 to +110.0 %	30.0	2	Displayed if the control method is PID control (EtrL = 1) and shared PID heating/cooling control is used (E23 = 2).

6-3 Setup Bank, etc., Settings

Meaning of user level settings

0: Simple configuration, 1: Standard configuration, 2: Advanced configuration

Setup bank

Bank selection: SEUP

	Display	ltem	Description	lnitial value	User level	Notes
Ε		PV input range type	For thermocouple: 1–6, 9–11, 13–21, 23–25 For RTD: 41–46, 51–54, 63, 64, 67, 68	1	0	PV input range type (p. 5-2) (for details)
			For DC voltage/current: 84, 86–90	88		
E	03	Reference junction compensation (cold junction compensation)	0: Internal compensation (by this device) 1: External compensation (by another device)	0	2	Displayed if a thermocouple range is set for PV input range type.
Ε	04	PV Decimal point position	0: No decimal point 1: 1 digit after the decimal point 2: 2 digits after the decimal point 3: 3 digits after the decimal point	0	0	If a DC voltage/current range is set for PV input range type or if a thermocouple or RTD range with a decimal point is selected.
E	05	PV range low limit	If a thermocouple or RTD range is set for PV input range type (E1 I),the low limit of the specified PV input range is displayed but the setting cannot be changed. If the PV input type is DC voltage/	- 0	0	
			current: -1999 to +9999			
E	06	PV range high limit	If a thermocouple or RTD range is set for PV input range type ([]),the high limit of the specified PV input range is displayed but the setting cannot be changed.	-	0	
			If the PV input type is DC voltage/ current: –1999 to +9999	1000		
E	٢۵	SP low limit	PV range low limit to PV range high limit	-	1	
E	80	SP high limit		-	1	
E	09	PV square root extraction dropout	0.0 to 100.0 % (0.0 = no square root extraction)	0.0	2	Displayed if the PV input type is DC voltage/current.
Ε	4	Control action (direct/reverse)	0: Heating control (reverse action) 1: Cooling control (direct action)	0	0	Displayed if the control method is ON/OFF control ($[LrL = 0)$ or if heating/cooling control is not used ($[2b = 0)$.
E	15	Output operation at PV alarm	0: Continue the control calculation 1: Output the value set for "Output at PV alarm"	0	2	
E	16	Output at PV alarm	-10.0 to +110.0 %	0.0	2	
E	17	Output at READY (Heat)	-10.0 to +110.0 %	0.0	1	

<u> </u>			[
	Display	ltem	Description	lnitial value	User level	Notes
٢	18	Output at READY (Cool)	-10.0 to +110.0 %	0.0	1	Displayed if the control method is PID control ($ELrL = 1$) and heating/cooling control is used ($E2E \neq 0$).
Ε	19	Output operation at changing AUTO/ MANUAL	0: Bumpless transfer 1: Preset	0	1	Displayed if the control method is PID control (EtrL = 1). If the mode is MANUAL at
E	20	Preset MANUAL value	-10.0 to +110.0 %	0.0 or 50.0	1	power-on, the MV will be the value set by preset MANUAL value (E20).
E	51	Initial output type (mode) of PID control	0: Automatic 1: Not initialized 2: Initialize (if a new SP is set)	0	2	
E	22	Initial output of PID control	-10.0 to +110.0 %	0.0 or 50.0	2	
Ľ	53	Integral time and derivative time decimal point position	0: No decimal point 1: 1 digit after the decimal point 2: 2 digits after the decimal point 3: 3 digits after the decimal point	0	2	Displayed if the control method is PID control ([ErL = 1).
	32	Heat/cool control	0: Not used 1: Use (individual PID) 2: Use (shared PID)	0	0	Displayed if the control method is PID control ($[ErL = 1)$ and the sum of control outputs and event relay outputs is 2 or more. Control action and heating/ cooling control (p. 5-16) (for details)
E	28	Heat/Cool control dead zone	-100.0 to +100.0 %	0.0	0	Displayed if heat/cool control is used ($E2E \neq 0$).
E	30	LSP system group	1 to 8	1	0	
Ľ	31	SP ramp type	 0: Standard 1: Multi-ramp 2: Step operation enabled: Step operation does not resume when the power is turned back on (shifts to READY) 3: Step operation enabled: Step operation resumes when the power is turned back on 			
E	35	SP ramp unit	0: 0.1 U/s 1: 0.1 U/min 2: 0.1 U/h			

	Display	Item	Description	Initial	User	Notes
				value	level	
E	33	STEP time unit	0: 0.1 s 1: 1 s (displayed as min.s on the console) 2: 1 min (displayed as h.min on the console)			
E	34	STEP PV start	0: No 1: Up start 2: Down start			
E	35	STEP loop	0: Operation stops (no loop-back) 1: Loops back 2: Continues SOAK with the final step's SP (no loop-back)			
E	36	CT1 operation type	0: Heater burnout detection 1: Current measurement	0	0	Displayed if a model with two CT inputs is used.
Ľ	31	CT1 output	0: Control output 1 1: Control output 2 2: Event output 1 3: Event output 2 4: Event output 3	0	0	Displayed if a model with two CT inputs is used and CT1 operation type is set to heater burnout detection ($\Box \exists b = 0$).
Ε	38	CT1 measurement wait time	30 to 300 ms	30	0	
E	75	CT2 operation type	0: Heater burnout detection 1: Current measurement	0	0	Displayed if a model with two CT inputs is used.
E	40	CT2 output	0: Control output 1 1: Control output 2 2: Event output 1 3: Event output 2 4: Event output 3	0	0	Displayed if a model with two CT inputs is used and CT2 operation type is set to heater burnout detection ($E \exists 9 = 0$).
E	41	CT2 measurement wait time	30 to 300 ms	30	0	
E	42	Control output 1 range	1: 4–20 mA 2: 0–20 mA	1	0	Displayed if current output is set as control output 1 by the model No.
E	43	Control output 1 type	0: MV 1: Heating MV (for heating/cooling control) 2: Cooling MV (for heating/cooling control) 3: PV 4: PV (before applying ratio, bias, filter) 5: SP 6: Deviation 7: CT1 current 8: CT2 current 9: Invalid 10: SP+MV	0	0	The decimal point position of scaling low and high limits If "Control output 1 type" is set to MV or CT: 1 digit after the decimal point PV or SP: the same as the PV decimal point position The unit for scaling low and high limits If "Control output 1 type" is set to MV: % PV or SP: the same as the PV unit CT: A (current)
E	ЧЧ	Control output 1 scaling low limit	11: PV+MV –1999 to +9999 The decimal point position and unit vary	0.0	0	
Ε	45	Control output 1 scaling high limit	depending on the setting for "control output 1 type" ([4]).	100.0	0	

		1	[r	1	
	Display	ltem	Description	Initial value	User level	Notes
٢	46	Control output 1 MV scaling width	0 to 9999 The decimal point position and unit are the same as those of the PV.	200	0	Displayed if control output 1 is set to current output by the model No. and if control output 1 type is set to SP+MV or PV+MV.
Ε	47	Control output 2 range	1: 4–20 mA 2: 0–20 mA	1	0	Displayed if current output is set as control output 2 by the model No.
Ε	48	Control output 2 type	0: MV 1: Heating MV (for heating/cooling control) 2: Cooling MV (for heating/cooling control) 3: PV 4: PV (before applying ratio, bias, filter) 5: SP 6: Deviation 7: CT1 current 8: CT2 current 9: Invalid 10: SP+MV 11: PV+MV	3	0	The decimal point position and unit of scaling low and hight limits are the same as those of control output 1.
E	49	Control output 2 scaling low limit	 –1999 to +9999 The decimal point position and unit vary depending on the setting for control 	0	0	
Γ	50	Control output 2 scaling high limit	output 2 type (E4B).	1000	0	
Ľ	51	Control output 2 MV scaling width	0 to 9999 The decimal point position and unit are the same as those of the PV.	200	0	Displayed if current output is set as control output 2 by the model No. and if "control output 2 type" is set to SP+MV or PV+MV.
E	64	Communication type	0: CPL 1: Modbus™/ASCII 2: Modbus/RTU 3: PLC link	0	0	Displayed if a model with RS-485 is used.
Γ	65	Station address	1 to 127 (0: no communication)	0	0	
٢	66	Transmission speed	0: 4800 bps 1: 9600 bps 2: 19200 bps 3: 38400 bps	2	0	
Γ	67	Data format (data length)	0: 7 bits 1: 8 bits	1	0	
E	68	Data format (parity)	0: Even parity 1: Odd parity 2: No parity	0	0	
Ε	69	Data format (stop bit)	0: 1 bit 1: 2 bits	0	0	
E	70	Communication minimum response time	1 to 250 ms	3	2	
E	71	Key operation mode	0: Standard 1: Special	0	2	

	Display	ltem	Description	Initial	User	Notes
				value	level	
E	72	[MODE] key function	1: AUTO/MANUAL mode selection 2: RUN/READY mode selection 3: AT stop/start 4: LSP group selection 5: Release all DO latches 6: Invalid 7: User-defined bit 1 8: Invalid	1	0	
	13	Mode display setup	Whether to display the settings in the mode bank is determined by the sum of the weights shown below.	255	1	
			Bit 0: AUTO/MANUAL display No: 0. Yes: +1 Bit 1: RUN/READY display No: 0. Yes: +2 Bit 3: AT stop/start display No: 0. Yes: +8 Bit 4: DO latch release display No: 0. Yes: +16 Bit 5: User-defined bit 1 ON/OFF display No: 0. Yes: +32 Bits 6–7: Invalid			
	74	PV/SP display setup	Whether to show the following items on the operation display is determined by the sum of the weights shown below. Bit 0: PV No: 0. Yes: +1 Bit 1: SP No: 0. Yes: +2 Bit 2: LSP group No. No: 0. Yes: +4 Bits 3-7: Invalid	15	1	
	75	MV display setup	Whether to show the following items on the operation display is determined by the sum of the weights shown below. Bit 0: MV No: 0. Yes: +1 Bit 1: Heating MV / cooling MV No: 0. Yes: +2 Bit 2: Invalid Bit 3: AT progress No: 0. Yes: +8 Bits 4–7: Invalid	15	1	
Ľ	76	EV display setup	 0: Do not show internal event settings on the operation display 1: Show internal event 1 settings on the operation display 2: Show internal event 1–2 settings on the operation display 3: Show internal event 1–3 settings on the operation display 	0	1	

			2			
	Display	ltem	Description	lnitial value	User level	Notes
	רך	Event remaining time display setup	 0: Do not show the ON/OFF delay remaining time of internal events on the operation display 1: Show the ON/OFF delay remaining time of internal event 1 on the operation display 2: Show the ON/OFF delay remaining time of internal events 1–2 on the operation display 3: Show the ON/OFF delay remaining time of internal events 1–3 on the operation display 	0	1	
Ľ	18	CT input current display setup	 0: Do not show the CT current on the operation display 1: Show the CT1 current on the operation display 2: Show the CT1 and CT2 currents on the operation display 	1	1	
Ε	79	User level	0: Simple configuration 1: Standard configuration 2: Advanced configuration	0	0	
Ľ	80	Status indicator	0: Not used (always off) 1: Blinks when sending RS-485 communication data 2: Blinks when receiving RS-485 communication data 3: OR (logical sum) of all DI states 4: Always OFF	0	2	
E	90	Number of CT1 turns	0: 800 1-40: CT turns divided by 100	8	2	Displayed if a model with two CT inputs is used.
E	91	Number of CT1 power wire passes	0: 1 1–6: The set value	1	2	
Γ	92	Number of CT2 turns	0: 800 1–40: CT turns divided by 100	8	2	
Ε	93	Number of CT2 power wire passes	0: 1 1–6: The set value	1	2	
Ε	97	PV input failure (under range) type	0: –10 % FS 1: –5 mV (valid only when [] !(PV input range type) is set to 17 or 23.)	0	0	
Γ	98	Sampling cycle	1: 50 ms 2: 100 ms 3: 300 ms 4: 500 ms	1	2	

■ Event configuration bank Bank selection: EuEF

Dis	splay	ltem	Description	lnitial value	User level	Notes
Ε ((Internal event 1 conf. 1 operation type	0: No event 1: PV high limit 2: PV low limit 3: PV high and low limits 4: Deviation high limit 5: Deviation low limit 6: Deviation high and low limits 7: Deviation high limit (final SP reference) 8: Deviation low limit (final SP reference) 9: Deviation high and low limits (final SP reference) 10: SP high limit 11: SP low limit 12: SP high and low limits 13: MV high limit 14: MV low limit 15: MV high and low limits 16: Heater 1 burnout/overcurrent 17: Heater 1 short circuit 18: Heater 2 burnout/overcurrent 19: Heater 2 short circuit 20: Loop diagnosis 1 21: Loop diagnosis 2 22: Loop diagnosis 3 23: Alarm (status) 24: READY (status) 25: MANUAL (status) 26: Invalid 27: AT in execution (status) 28: During SP ramp (status) 29: Control direct action (status) 30: Invalid 31: Invalid 32: Timer (status) 33: Invalid	0	0	
E !!	53	Internal event 1 conf. 2 1st digit: Direct/reverse	"1st digit" (2nd, etc.) means the first digit (etc.) <u>from the right</u> . 0: Direct 1: Reverse	0	0	
		2nd digit: Standby	0: None 1: Standby 2: Standby + standby when the SP is changed	0		
		3rd digit: Event state in READY mode	0: Continues 1: Forced OFF	0		
		4th digit: Undefined	0	0		

	1	1	1		1
Display	ltem	Description	lnitial value	User level	Notes
E ![[]	Internal event 1 conf. 3	"1st digit" (2nd, etc.) means the first digit (etc.) <u>from the right</u> .		2	
	1st digit: Alarm OR	0: None 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: No special OFF 1: If the main setting for the event is 0, the event is OFF.	0		
	3rd digit: Delay time unit	0: 0.1 s 1: 1 s 2: 1 min	0		
	4th digit: Undefined	0	0		
1 253	Internal event 2 conf. 1 operation type	Same as internal event 1 configuration 1	0	0	
6525	Internal event 2 conf. 2 1st digit: Direct/reverse 2nd digit: Standby 3rd digit: Event state in READY mode 4th digit: Undefined		0000	0	
E <u>7</u> 53	Internal event 2 conf. 3 1st digit: Alarm OR 2nd digit: Special OFF 3rd digit: Delay time unit 4th digit: Undefined	Same as internal event 1 configuration 3	0000	2	
E <u>3</u> C	Internal event 3 conf. 1 operation type	Same as internal event 1 configuration 1	0	0	
E 3ïC S	Internal event 3 conf. 2 1st digit: Direct/reverse 2nd digit: Standby 3rd digit: Event state in READY mode 4th digit: Undefined	Same as internal event 1 configuration 2	0000	0	
E JC 3	Internal event 3 conf. 3 1st digit: Alarm OR 2nd digit: Special OFF 3rd digit: Delay time unit 4th digit: Undefined	Same as internal event 1 configuration 3	0000	2	

Display	ltem	Description	Initial	User	Notes
EHCI	Internal event 4 conf. 1 operation type	Same as internal event 1 configuration 1	value 0	level 0	
E4ïC5	Internal event 4 conf. 2 1st digit: Direct/reverse 2nd digit: Standby 3rd digit: Event state in READY mode 4th digit: Undefined	Same as internal event 1 configuration 2	0000	0	
E4[] 3	Internal event 4 conf. 3 1st digit: Alarm OR 2nd digit: Special OFF 3rd digit: Delay time unit 4th digit: Undefined	Same as internal event 1 configuration 3	0000	2	
ES <u>C</u> I	Internal event 5 conf. 1 operation type	Same as internal event 1 configuration 1	0	0	
E5 <u>.</u> C2	Internal event 5 conf. 2 1st digit: Direct/reverse 2nd digit: Standby 3rd digit: Event state in READY mode 4th digit: Undefined	Same as internal event 1 configuration 2	0000	0	
E <u>5,</u> C3	Internal event 5 conf. 3 1st digit: Alarm OR 2nd digit: Special OFF 3rd digit: Delay time unit 4th digit: Undefined	Same as internal event 1 configuration 3	0000	2	

DI assignment bank Bank selection: d

Dis	splay	ltem	Description	lnitial value	User level	Notes
dl	ļļ	Internal contact 1 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/+4) 7: RUN/READY selection 8: AUTO/MANUAL selection 9: Invalid 10: AT stop/start 11: Invalid 12: Control operation (direct/reverse) (Operates as configured / reversed operation) 13: SP ramp enabling/disabling 14: PV hold (disabled/enabled) 15: PV max. hold (disabled/enabled) 16: PV min. hold (disabled/enabled) 17: Timer stop/start 18: Release/continue all DO latches 19: Advance (disabled/enabled) 20: SP step hold (disabled/enabled)	0	0	
dl	ΪŻ	Internal contact 1 input bit function	0: Not used (use the default input) 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	If a model with digital inputs is used, if 0 (not used) is selected, internal contact 1 reflects the state of digital input 1.

	:	ltaur	Description	1		Nata
	isplay	ltem	Description	Initial value	User level	Notes
dI	[]	Internal contact 1 input assignment A	0: Normally open (normally off = 0) 1: Normally closed (normally on = 1) 2: Dl1 3: Dl2 4 to 9: Invalid 10: Internal event 1 11: Internal event 2	2	2	Displayed if internal contact 1 input bit function is set to one of functions 1–4 (dl $\lg \neq 0$).
dl	ĮΥ	Internal contact 1 input assignment B	12: Internal event 2 12: Internal event 3 13: Internal event 4 14: Internal event 5 15 to 17: Invalid 18: User-defined bit 1 19: User-defined bit 2	0	2	
비	ί <u>ς</u>	Internal contact 1 input assignment C	19: User-defined bit 220: User-defined bit 321: User-defined bit 422: MANUAL23: READY24: Invalid25: AT (Auto-Tuning)26: During SP ramp27: Invalid28: Alarm29: PV alarm30: Invalid31: [MODE] key status32: Event output 1 terminal status33: Control output 1 terminal status	0	2	
dl	16	Internal contact 1 input assignment D		0	2	
dl	[]	Internal contact 1 polarity A to D 1st digit: Polarity A (polarity of input assignment A)	"1st digit" (2nd, etc.) means the first digit (etc.) <u>from the right</u> . 0: Direct 1: Reverse	0	2	Displayed if internal contact 1 input bit function is set to one of functions 1–4 (d! $\downarrow 2 \neq 0$).
		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		
d	ί <u>8</u>	Internal contact 1 polarity	0: Direct 1: Reverse	0	2	
립	19	Internal contact 1 internal event No. assignment	0: All internal events 1 to 5: Internal event No.	0	2	Displayed if internal contact 1 operation type is set to timer stop/start (dl l = 17).
dl	5.1	Internal contact 2 operation type	Same as internal contact 1 operation type 0 to 20	0	0	
dl	2,2	Internal contact 2 input bit function	Same as internal contact 1 input bit function 0: Not used (use the default input) 1-4: Functions 1-4	0	2	If a model with digital inputs is used, if 0 (not used) is selected, internal contact 2 reflects the state of digital input 2.

Display	ltem	Description	Initial value	User level	Notes
dl 2,3	Internal contact 2 input assignment A	Same as internal contact 1 input assignment A to D	3	2	Displayed if internal contact 2 input bit function is set to one of functions 1–4 (dl 22 \neq 0).
41 2,4	Internal contact 2 input assignment B	0 to 33	0	2	Tunctions $1-4$ (a) $EE \neq 0$).
dl 2 <u>5</u>	Internal contact 2 input assignment C		0	2	
92 16	Internal contact 2 input assignment D		0	2	
61.5.1	Internal contact 2 polarity A to D	"1st digit" (2nd, etc.) means the first digit (etc.) <u>from the right</u> .		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		
91 <u>5</u> 8	Internal contact 2 polarity	0: Direct 1: Reverse	0	2	
P <u>.</u> 5 Ib	Internal contact 2 internal event No. assignment	0: All internal events 1 to 5: Internal event No.	0	2	Displayed if internal contact 2 operation type is set to timer stop/start (dl 2 l = 17).
41 <u>3</u> 1	Internal contact 3 operation type	Same as internal contact 1 operation type 0 to 20	0	0	
91 <u>3</u> 5	Internal contact 3 input bit function	Same as internal contact 1 input bit function	0	2	
		0: Not used 1-4: Functions 1-4			

Di	splay	ltem	Description	Initial value	User level	Notes
dl	33	Internal contact 3 input assignment A	Same as internal contact 1 input assignment A to D	4	2	Displayed if internal contact 3 input bit function is set to one of functions 1–4 (dl $\exists z \neq 0$).
dl	<u>]</u> 4	Internal contact 3 input assignment B	0 to 33	0	2	
비	35	Internal contact 3 input assignment C		0	2	
dl	3.6	Internal contact 3 input assignment D		0	2	
 	15	Internal contact 3 polarity A to D	"1st digit" (2nd, etc.) means the first digit (etc.) <u>from the right</u> .		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		
비	3.8	Internal contact 3 polarity	0: Direct 1: Reverse	0	2	
dl	<u>9</u> 9	Internal contact 3 internal event No. assignment	0: All internal events 1 to 5: Internal event No.	0	2	Displayed if internal contact 3 operation type is set to timer stop/start (dl $\exists l = 17$).
비	41	Internal contact 4 operation type	Same as internal contact 1 operation type	0	0	
		Internal contact 4	0 to 20 Same as internal contact 1 input bit	0	2	
	ЧĊ	input bit function	function 0: Not used			
			0: Not used 1-4: Functions 1-4			

D	isplay	ltem	Description	lnitial value	User level	Notes
비	ЧЭ	Internal contact 4 input assignment A	Same as internal contact 1 input assignment A to D	3	2	Displayed if internal contact 4 input bit function is set to one of functions 1–4 (dl 22 ≠ 0).
dl	ЧЧ	Internal contact 4 input assignment B	0 to 33	0	2	
비	ЧS	Internal contact 4 input assignment C		0	2	
비	4,5	Internal contact 4 input assignment D		0	2	
	47	Internal contact 4 polarity A to D	"1st digit" (2nd, etc.) means the first digit (etc.) <u>from the right</u> .		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		
dl	48	Internal contact 4 polarity	0: Direct 1: Reverse	0	2	
비	49	Internal contact 4 internal event No. assignment	0: All internal events 1 to 5: Internal event No.	0	2	Displayed if internal contact 4 operation type is set to timer stop/start (dl 2 l = 17).
립	5,1	Internal contact 5 operation type	Same as internal contact 1 operation type 0 to 20	0	0	
비	5,2	Internal contact 5 input bit function	Same as internal contact 1 input bit function	0	2	
			0: Not used 1-4: Functions 1-4			

Display	ltem	Description	Initial value	User level	Notes
di <u>5</u> 3	Internal contact 5 input assignment A	Same as internal contact 1 input assignment A to D	3	2	Displayed if internal contact 5 input bit function is set to one of functions 1–4 (dł 22 ≠ 0).
<u> </u>	Internal contact 5 input assignment B	0 to 33	0	2	
dl <u>5</u> 5	Internal contact 5 input assignment C		0	2	
di 5 <u>6</u>	Internal contact 5 input assignment D		0	2	
dl <u>5</u> 7	Internal contact 5 polarity A to D	"1st digit" (2nd, etc.) means the first digit (etc.) <u>from the right</u> .		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		
dl 5 <u>8</u>	Internal contact 5 polarity	0: Direct 1: Reverse	0	2	
4) <u>5</u> 9	Internal contact 5 internal event No. assignment	0: All internal events 1 to 5: Internal event No.	0	2	Displayed if internal contact 5 operation type is set to timer stop/start (dl 2 l = 17).

DO assignment bank Bank selection: do

Dis	play	ltem	Description	Initial value	User level	Notes
ot	[]	Control output 1 operation type	 0: Default output 1: MV ON/OFF status 1 (ON/OFF control output, time proportional output, heating time proportional output of heating/cooling control) 2: MV ON/OFF status 2 (cooling time proportional output of heating/cooling control 3: Function 1, (A and B) or (C and D) 4: Function 2, (A or B) and (C or D) 5: Function 4, (A and B and C and D) 	0	2	Displayed if control output 1 is set to relay output or voltage pulse output by the model No. For control output 1, the default output is MV1.
ot	5	Control output 1 output assignment A	0: Normally open (normally off = 0) 1: Normally closed (normally on = 1) 2: Internal event 1 3: Internal event 2 4: Internal event 3 5: Internal event 4 6: Internal event 5 7 to 13: Invalid	14	2	Displayed if relay output or voltage pulse output is set as control output 1 by the model No. and control output 1 operation type is set to one of functions $1-4$ (at $ 1>2$).
ot	[]	Control output 1 output assignment B	14: MV ON/OFF status 1 15: MV ON/OFF status 2 16 to 17: Invalid 18: DI1 19: DI2 20 to 25: Invalid 26: Internal contact 1 27: Internal contact 2	0	2	
ot	ίΗ	Control output 1 output assignment C 28: Internal contact 3 29: Internal contact 4 30: Internal contact 5 31 to 33: Undefined 34: User-defined bit 1 35: User-defined bit 2 36: User-defined bit 3 37: User-defined bit 4		0	2	
ot	lΩ	Control output 1 output assignment D	 38: MANUAL 39: READY 40: Invalid 41: AT (Auto-Tuning) 42: During SP ramp 43: Invalid 44: Alarm 45: PV alarm 46: Invalid 47: [MODE] key status 48: Event output 1 terminal status 49: Control output 1 terminal status 	0	2	

Display	ltem	Description	Initial value	User level	Notes
ot (6	Control output 1 polarity A to D 1st digit: Polarity A 2nd digit: Polarity B	"1st digit" (2nd, etc.) means the first digit (etc.) <u>from the right</u> . 0: Direct 1: Reverse	0	2	Displayed if relay output or voltage pulse output is set as control output 1 by the model No. and control output 1 operation type is set to one of
	3rd digit: Polarity C 4th digit: Polarity D	-		-	functions $1-4$ (at $ > 2$).
o£ (7	Control output 1 polarity	0: Direct 1: Reverse	0	2	
ot 1,8	Control output 1 latch	0: Do not latch 1: Latch when ON 2: Latch when OFF (except for initialization at power-on)	0	2	
o£2,1	Control output 2 operation type	Same as control output 1 operation type 0: Default output 1: MV1 2: MV2 3-6: Functions 1-4	0	2	Displayed if voltage pulse output is set as control output 2 by the model No. For control output 2, the default output is MV2.
o£2 <u>2</u>	Control output 2 output assignment A	Same as control output 1 output assignment A to D	15	2	Displayed if voltage pulse output is set as control output 2 by the model No. and control
o£23	Control output 2 output assignment B	0 to 49	0	2	output 2 operation type is set to one of functions $1-4$ ($\underline{a} \ge 1 > 2$).
ot 2.4	Control output 2 output assignment C		0	2	
o£ 2,5	Control output 2 output assignment D		0	2	
o£2 <u>6</u>	Control output 2 polarity A to D	"1st digit" (2nd, etc.) means the first digit (etc.) <u>from the right</u> .		2	
	1st digit: Polarity A	0: Direct	0	-	
	2nd digit: Polarity B	1: Reverse	0	-	
	3rd digit: Polarity C		0	-	
o£2,7	4th digit: Polarity D Control output 2 polarity	0: Direct 1: Reverse		2	
o£2 <u>8</u>	Control output 2 latch	0: Do not latch 1: Latch when ON 2: Latch when OFF (except for initialization at power-on)	0 2		
Eull	Event output 1 operation type	Same as control output 1 operation type 0: Default output 1: MV1 2: MV2 3-6: Functions 1-4	0	2	Displayed if a model with event output 1 is used. For event output 1, the default output is internal event 1.

Display	ltem	Description	lnitial value	User level	Notes
Eu 1,2	Event output 1 output assignment A	Same as control output 1 output assignment A to D	2	2	Displayed if event output 1 is selected by the model No. and event output 1 operation type
Eu (3	Event output 1 output assignment B	0 to 49		2	is set to one of functions $1-4$ (Eu > 2).
Eu !4	Event output 1 output assignment C		0	2	
Eu !S	Event output 1 output assignment D		0	2	
Eu !6	Event output 1 polarity A to D	"1st digit" (2nd, etc.) means the first digit (etc.) <u>from the right</u> .		2	
	1st digit: Polarity A	0: Direct	0		
	2nd digit: Polarity B	1: Reverse	0		
	3rd digit: Polarity C		0		
	4th digit: Polarity D		0		
Eu (7	Event output 1 polarity	0: Direct 1: Reverse	0	2	
Eu 1,8	Event output 1 latch	0: Do not latch 1: Latch when ON 2: Latch when OFF (except for initialization at power-on)	0	2	
Eu2, I	Event output 2 operation type	Same as control output 1 operation type 0: Default output 1: MV1 2: MV2 3-6: Functions 1-4	0	2	Displayed if a model with event output 2 is used. For event output 2, the default output is internal event 2.
Eu <u>2</u> 2	Event output 2 output assignment A	Same as control output 1 output assignment A to D	3	2	Displayed if event output 2 is selected by the model No. and event output 2 operation type
ΕυΖΞ	Event output 2 output assignment B	0 to 49	0	2	is set to one of functions $1-4$ (Eu2 $l > 2$).
ΕυΖΫ	Event output 2 output assignment C		0	2	
ΕυΖ.ς	Event output 2 output assignment D		0	2	
Eu2 <u>,</u> 6	Event output 2 polarity A to D	"1st digit" (2nd, etc.) means the first digit (etc.) <u>from the right</u> .		2	
	1st digit: Polarity A	0: Direct	0		
	2nd digit: Polarity B	1: Reverse	0		
	3rd digit: Polarity C		0	ł	
4th digit: Polarity D			0		
E <u>u2</u> 7	Event output 2 0: Direct polarity 1: Reverse		0	2	
Eu2B Event output 2 latch		0: Do not latch 1: Latch when ON 2: Latch when OFF (except for initialization at power-on)	0	2	

Display	ltem	Description	lnitial value	User level	Notes
Eu <u>3</u> I	Event output 3 operation type	Same as control output 1 operation type 0: Default output 1: MV1 2: MV2 3-6: Functions 1-4	Displayed if a model with event output 3 is used. For event output 3, the default output is internal event 3.		
Eu <u>3</u> 2	Event output 3 output assignment A	Same as control output 1 output assignment A to D	4	2	Displayed if event output 3 is selected by the model No. and event output 3 operation type
Eu <u>3</u> 3	Event output 3 output assignment B	0 to 49	0	2	is set to one of functions $1-4$ (Eu $\exists l > 2$).
Eu <u>3</u> 4	Event output 3 output assignment C		0	2	
Eu <u>3</u> 5	Event output 3 output assignment D		0	2	
Eu <u>3</u> 6	Event output 3 polarity A to D	"1st digit" (2nd, etc.) means the first digit (etc.) <u>from the right</u> .		2	
	1st digit: Polarity A	0: Direct	0		
	2nd digit: Polarity B	1: Reverse	0		
	3rd digit: Polarity C		0		
	4th digit: Polarity D		0		
ΕυΞ٦	Event output 3 polarity	0: Direct 1: Reverse	0	2	
8 <u>,</u> 5u3	Event output 3 latch	0: Do not latch 1: Latch when ON 2: Latch when OFF (except for initialization at power-on)	0	2	

■ User function bank Bank selection: UF

Display	ltem	Description	lnitial value	User level	Notes	
∐F-	User function 1	Displayed characters are defined for each item. The following are special cases.		1	Only the settings that can be displayed can be registered. (For example, manual reset of the	
UF-2	User function 2	: Unregistered P: Proportional band of the PID in		1	PID constants can be registered when integral time = 0)	
UF-3	User function 3	unction 3 use	I: Integral time of the PID in use	1	Registered settings are added to the end of the list of settings that are shown on the operation	
UF-4	User function 4		□L: MV low limit of the PID in use		1	display.
UF-5	User function 5			1		
UF-6	User function 6		in use			
UF-7	□L_E: MV low limit for cooling of the PID			1		
UF-8	User function 8	□H_L: MV high limit for cooling of the PID in use		1		

Lock bank

Bank selection: LoC

Display	ltem	Description	lnitial value	User level	Notes
ιοί	Key lock	 0: All settings can be specified. 1: Mode, event, operation display, SP, UF, lock, manual MV, and [MODE] key operation can be specified. 2: Operation display, SP, UF, lock, manual MV, and [MODE] key operation can be specified. 3: UF, lock, manual MV, and [MODE] key operation can be specified. 	0	0	The setting can be specified if the two sets of passwords (1A and 1B, 2A and 2B) match. The [MODE] key operation, MV in MANUAL mode, key lock, password display, and passwords 1A to 2B can be specified when any value from 0 to 3 is set for key lock (LoE).
[Lo[Communication lock	0: Unlocked 1: Locked	0	2	
LLoC	Loader lock	0: Unlocked 1: Locked	0	2	
PRSS	Password display	0 to 15 5: Displays passwords 1A to 2B	0	0	Reset to 0 each time the power is turned on.
P5 18	Password 1A	0000 to FFFF (hex)	0000	0	The setting can be specified if password display (PR55) is set to 5 and the two sets of passwords
P52R	Password 2A	0000 to FFFF (hex)	0000	0	(1A and 1B, 2A and 2B) match.
P5 16	Password 1B	0000 to FFFF (hex)	0000	0	Displayed if password display (PR55) is set to 5.
P526	Password 2B	0000 to FFFF (hex)	0000	0	

■ Instrument information bank Bank selection: d

Display	Item	Description	lnitial value	User level	Notes
1 90 1	ROM ID	RL YRYS 16	-	2	ROM firmware identification Setting cannot be changed
1 905	ROM version 1		-	2	
1 903	ROM version 2		-	2	
1 404	Loader information		-	2	
1 405	EST Information		-	2	
1 406	Manufacturing date code (year)	Year – 2000 Example: Year 2021 is "21"	-	2	Date of manufacture and serial No. Setting cannot be changed
1 90 1	Manufacturing date code (month, day)	Month + (day ÷ 100) Example: Dec. 1 is "12.01."	-	2	
806 1	Serial No.		-	2	
1 409	Model No.		-	2	Product identification code Setting cannot be changed
1 4 10	Model information		-	2	
1161	Production site code		-	2	
FPO (Advanced function password 1	0000 to FFFF (hex)	0000	2	
FP02	Advanced function password 2	0000 to FFFF (hex)	0000	2	
FP03	Advanced function password 3	0000 to FFFF (hex)	0000	2	
FP04	Advanced function password 4	0000 to FFFF (hex)	0000	2	
FP05	Advanced function password 5	0000 to FFFF (hex)	0000	2	
FP06	Advanced function password 6	0000 to FFFF (hex)	0000	2	
FP07	Advanced function password 7	0000 to FFFF (hex)	0000	2	
FP08	Advanced function password 8	0000 to FFFF (hex)	0000	2	
FP09	Advanced function password 9	0000 to FFFF (hex)	0000	2	

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Disp	olay	Item	Description	lnitial value	User level	Notes
FP	Advanced function password 10 0000 to FFFF (hex)		0000 to FFFF (hex)	0000	2	
F٢	Advanced function 0000 to FFFF (hex) password 11 0000 to FFFF (hex)		0000 to FFFF (hex)	0000	2	
F٢	FP I2 Advanced function password 12		0000 to FFFF (hex)	0000	2	
FP	13	Advanced function password 13	0000 to FFFF (hex)	0000	2	
F٢	 4	Advanced function password 14	0000 to FFFF (hex)	0000	2	
F٢	PIS Advanced function password 15 0000 to FFFF (hex)		0000 to FFFF (hex)	0000	2	
F٢	Advanced function 0 password 16 0		0000 to FFFF (hex)	0000	2	

Chapter 7. CPL Communication Function

7-1 Overview of Communications

If a model with RS-485 communication is used, this device can communicate with a PC, PLC, or other host device using a program created by the user.

CPL (Controller Peripheral Link: Azbil Corporation's host communication protocol) or MODBUS can be selected as the communication protocol. This chapter describes CPL communications.

Features

The features of the C1M's communication functions are as follows:

- Up to 31 C1M units can be connected to a single master station (host device).
- Almost all of the parameter data of this device can be communicated.
 Chapter 10. List of Communication Data
- Random access commands are available. Two or more parameters at separated addresses can be read or written by a single command.

Configuration

The settings shown below must be specified for CPL communication.

They can be displayed and configured if a model with RS-485 communication is used.

ltem	Display		Description	lnitial value	User level
Communication type	ΕΕ	54	0: CPL 1: Modbus/ASCII 2: Modbus/RTU 3: PLC link	0	Simple, standard, advanced
Station address	ΕΕ	5	0: No communication 1 to 127	0	
Transmission speed	ΕΕ	6	0: 4800 bps 1: 9600 bps 2: 19200 bps 3: 38400 bps	2	
Data format (data length)	ΕΕ	57	0: 7 bits 1: 8 bits	1	
Data format (parity)	ΕΕ	6	0: Even parity 1: Odd parity 2: No parity	0	
Data format (stop bit)	ΕΕ	59	0: 1 bits 1: 2 bits	0	
Communication minimum response time	[-		1 to 250 ms	3	Advanced

! Handling Precautions:

• The settings can be configured using the keys on this device or Smart Loader Package model SLP-C1F. RS-485 communications cannot be used for configuration.

Communication procedure

The communication procedure is as follows.

- (1) The host device (master station) sends an instruction message to one C1M unit (slave station).
- (2) The slave station receives the instruction message and performs read or write processing according to the content of the message.
- (3) The slave station sends a response message appropriate for the type of processing.
- (4) The master station receives the response message.

! Handling Precautions:

 Sending data using several protocols intermixed (CPL, Modbus/ASCII, Modbus/RTU, PLC link) to the same RS-485 transmission line is not allowed.

7-2 Message Structure

Message structure

The following shows the message structure.

Messages are broadly classified into two layers: the data link layer and the application layer.

• Data link layer

This layer contains the basic information required for communications such as the destination of the communication message and the check information of the message.

Application layer

Data is read and written in this layer. The content of the layer varies according to the purpose of the message.

A message consists of (1) to (8) below.

The command (details sent from the master station) and the response (details returned from the slave station) are stored in the application layer.

02 h	58H		03H	0DH 0AH			
STX	Х		ETX	CR LF			
(1) (2) (3)	(4)	(5)	(6) (7) (8)			
Data link layer		Application layer	Data link layer				
		1 frame					
(1) STX (start of message)		(5) Instruction message = 6	command,	response			
(2) Station address		message = response					
(3) Sub-address		(6) ETX (end of command/response)					
(4) Device ID code		(7) Checksum					
		(8) Delimiter (end of message)					

Data link layer

Overview

The data link layer is of a fixed length. The position of each data item and the number of its characters are already decided. Note, however, that the data positions of the data link layer from ETX onwards shift according to the number of characters in the application layer.

Response start conditions

- This device sends a response message only when all the message components in the data link layer of the instruction message are correct. If even one of these is incorrect, no response message is sent, and the device stands by for reception of STX.
- The maximum number of word addresses that can be accessed by one frame is 32.

List of data link layer data definitions

The following list shows the definitions for data in the data link layer.

Data name	Character code	Number of characters	Meaning of data
STX	02 h	1	Start of message
Station address	0 to 7FH are expressed as hexadecimal character codes.	2	Identification of device to communicate with
Sub-address	00 (30H, 30H)	2	No function
Device ID code	X (58H) or x (78H)	1	Device type
ETX	03H	1	End position of the application layer
Checksum	00H to FFH are expressed as 2-digit hexadecimal character codes.	2	Checksum of message
Delimiter	CR (0DH), LF (0AH)	2	End of message

• Description of data items

• STX (02H)

When STX is received, this device interprets it as the start of a command message. No matter what has been received previously, upon receiving STX, this device begins processing a new message. In this way, if an instruction message contains an error due to electromagnetic noise, etc., this device can respond to the next proper message (a resent message, etc.) from the master station.

• Station address

This device creates a response message only to instruction messages that mention its station address. A station address is expressed as a 2-digit hexadecimal character code in a message.

This device returns a response message that includes its own station address. The station address can be specified by E65 (station address). Note that, if the station address is set to 0 (30H 30H), this device does not respond even if the station addresses match.

• Sub-address

Set the sub-address to 00 (30H 30H), because this device does not use sub-addresses.

However, this device will return a response message that includes a received subaddress.

• Device ID code

X (58H) or x (78H) can be used. This code is determined for each product series, and other codes cannot be selected. This device returns a response message that includes the received device ID code. X (58H) is used as the default, and x (78H) is used to distinguish the message from the resend message.

• ETX

ETX indicates the end of the application layer.

• Checksum

This value is for checking whether something abnormal (e.g., electromagnetic noise) has caused the message content to change during transmission.

The checksum is expressed as a 2-digit hexadecimal character code.

- How to calculate a checksum
 - (1) Add the character codes in the message from STX through ETX in single byte units.
 - (2) Take two's complement of the low-order one byte of the sum.
 - (3) Convert the obtained two's complement to a two-byte ASCII code.

The following is a sample checksum calculation:

Sample message

STX:02H

- 0: 30H (1st byte of the station address)
- 1: 31H (2nd byte of the station address)
- 0: 30H (1st byte of the sub-address)
- 0: 30H (2nd byte of the sub-address)
- X: 58H (device ID code)
- R: 52H (1st byte of the command)
- S: 53H (2nd byte of the command)

(omitted)

ETX : 03H

- Add the character codes in the message from STX through ETX in single byte units. The addition calculation in single byte units is as follows:
 02H + 30H + 31H + 30H + 58H + 52H + 53H + ... + 03H The result of this calculation is 376H.
- (2) The low-order byte of the sum, 376H, is 76H. The two's complement of 76H is 8AH.
- (3) Convert the obtained 8AH to a two-byte ASCII code.

The result is:

8: 38H

A: 41H

The two bytes, 8 (38H) and A (41H), are the checksum.

• Delimiter (CR/LF)

This indicates the end of the message. Immediately after LF is received, the device enters a state allowed to process the received message.

Application layer

The table below shows the configuration of the application layer.

ltem	Description				
Command	RS (read decimal format data from consecutive addresses)				
	WS (write decimal format data to consecutive addresses)				
	RD (read hexadecimal format data from consecutive addresses)				
	WD (write hexadecimal format data to consecutive addresses)				
	RU (read hexadecimal format data from random addresses)				
	WU (write hexadecimal format data to random addresses)				
Data delimiter	RS and WS commands: "," (comma)				
	Other commands: None				
Word address	RS and WS commands: decimal value and "W" (e.g., 501W)				
	Other commands: hexadecimal value (e.g., 01F5)				
Number of data	RS and WS commands: decimal value (e.g., 1)				
records to read	Other commands: hexadecimal value (e.g., 0001)				
Data	RS and WS commands: decimal value (ex.: 100)				
	Other commands: hexadecimal value (e.g., 0064)				

7-3 Description of Commands

Continuous data read command (RS command)

This command reads data from consecutive addresses in one message.

Instruction message

This is a command—in one message—to read data from consecutive word addresses starting from the specified address. The figure below shows the structure of the application layer of a "read" instruction message.

R	S	,	9	1	0	1	W	,	1
(*	1)	(2)		(3)				(2)	(4)
			Арр	Application layer					

(1) Continuous data read command

(2) Data delimiter

(3) Starting word address

(4) Read data count

Response message

If an instruction message is received successfully, a response message appropriate for the command is returned.

The figure below shows the structure of the application layer of a response message for a read command.

• Normal termination (reading of single data record)

0	0	,			
(1)	(2)	(3	3)	

Normal termination (reading of multiple data records)

0 0	,		,		,	
(1)	(2)	(3)	(2)	(4)	(2)	(5)

Abnormal termination



A termination code indicating an error is entered in place of XX.

C⁷7-6 List of Termination Codes (p. 7-15) (for details about termination codes)

- (1) Termination code
- (2) Data delimiter
- (3) Read data 1
- (4) Read data 2 to (n-1)
- (5) Read data n

Maximum read data count per message

Continuous data write command (WS command)

This command writes data to consecutive addresses.

• Instruction message

The figure below shows the structure of the application layer of a "write" instruction message.

W S	,	1 5	0	1	W	,	1	,	6	5
(1)	(2)		(3)			(2)	(4)	(2)	(5	5)

(1) Write command

(2) Data delimiter

(3) Starting word address

(4) Write data (1st word)

(5) Write data (2nd word)

Response message

The figure below shows the structure of the application layer of a response message for a write command.

Normal termination



• Abnormal termination or warning



A termination code indicating an error is entered in place of XX.

C 7-6 List of Termination Codes (p. 7-15) (for details about termination codes)

(1) Termination code

Maximum write data count per message

Fixed-length continuous data read command (RD command)

This command reads continuous data in two-byte units. This command is suitable for handling data in ladder programs sent by PLC communications as the data is of a fixed length.

The starting word address is expressed as four hexadecimal digits. The data count is expressed as four digits, and data is expressed as four \times n (n is a positive integer) hexadecimal digits.

Instruction message

The read starting word address (four hexadecimal digits) and the read data count (four hexadecimal digits) are sent.

R D		
(1)	(2)	(3)

(1) Fixed-length continuous data read command

(2) Starting word address

(3) Read data count

Response message

If the command is processed successfully, a termination code indicating success (two decimal digits) is returned with the specified number of read data records (four hexadecimal digits × read data count). If there was an error, a termination code indicating error (two decimal digits) is returned without appending the data that was read.

• Normal termination (reading of single data record)

0 0	
(1)	(2)

· Normal termination (reading of multiple data records)

0	0			77				
(1)	(2)		(3)		(4	4)	

Abnormal termination



A termination code indicating an error is entered in place of XX.

C⁷ 7-6 List of Termination Codes (p. 7-15) (for details about termination



(1) Termination code

- (2) Read data 1
- (3) Read data 2 to (n-1)
- (4) Read data n

Maximum read data count per message

Fixed-length continuous data write command (WD command)

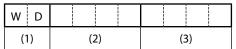
This command writes continuous data in two-byte units. This command is suitable for handling data in ladder programs sent by PLC communications as the data is of a fixed length.

The starting word address is expressed as four hexadecimal digits. Data is expressed as four \times n (n is a positive integer) hexadecimal digits.

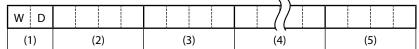
Instruction message

The write starting word address (four hexadecimal digits) and data to be written (four \times n hexadecimal digits) is sent.

Writing of one data record



· Writing of multiple data records



(1) Fixed-length continuous data write command

(2) Starting word address

(3) Write data 1

(4) Write data 2 to (n-1)

(5) Write data n

Response message

If data is written, a termination code indicating success (two decimal digits) is returned. If only part of the data is written, a termination code indicating warning (two decimal digits) is returned. If none of the data is written, a termination code indicating error (two decimal digits) is returned.

Normal termination



Abnormal termination or warning



A termination code indicating an error is entered in place of XX.

7-6 List of Termination Codes (p. 7-15) (for details about termination

(1) Termination code

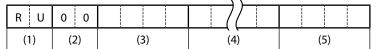
Maximum write data count per message

Fixed-length random data read command (RU command)

This command reads random (non-consecutive) data in two-byte units.

Instruction message

The word address (four hexadecimal digits) of the data to be read is sent in the specified order.



(1) Fixed-length random data read command

(2) Sub-command: fixed to "00"

(3) Word address 1

(4) Word address 2 to (n-1)

(5) Word address n

Response message

If the command is processed successfully, a termination code indicating success (two decimal digits) is returned with the specified number of read data records (four hexadecimal digits × read data count). If there was an error, a termination code indicating error (two decimal digits) is returned without appending the data that was read.

Normal termination

0 0			
(1)	(2)	(3)	(4)

Abnormal termination

A termination code indicating an error is entered in place of XX.

X Х 7-6 List of Termination Codes (p. 7-15) (for details about termination (1) codes)

(1) Termination code

(2) Read data 1

(3) Read data 2 to (n-1)(4) Read data n

Maximum read data count per message

Fixed-length random data write command (WU command)

This command writes data to random (non-consecutive) addresses in two-byte units. Data is expressed in four hexadecimal digits.

Instruction message

Data is sent for the specified write data count with the data address (four hexadecimal digits) of the data to be written and the data (four hexadecimal digits) as a pair.

ΨU	0 0				
(1)	(2)	(3)	(4)	(5)	(6)

(1) Fixed-length random data write command

(2) Sub-command: fixed to "00"

(3) Word address 1

(4) Write data 1

- (5) Word address n
- (6) Write data n

Response message

If data is written, a termination code indicating success (two decimal digits) is returned. If only part of the data is written, a termination code indicating warning (two decimal digits) is returned. If none of the data is written, a termination code indicating error (two decimal digits) is returned.

Normal termination



Abnormal termination or warning



A termination code indicating an error is entered in place of XX.

7-6 List of Termination Codes (p. 7-15) (for details about termination codes)

(1) Termination code

Maximum write data count per message

7-4 Definition of Word Addresses

RAM and EEPROM areas of data addresses

Word addresses are categorized as follows:

Word address (Hexadecimal)	Name	Notes
273W to 14859W (0111 to 3A0B)	RAM access word address	Reading and writing of these addresses are both performed on RAM. Since writing is not performed to EEPROM, the value returns to that stored in EEPROM when the power is turned off and back on.
16657W to 31243W (4111 to 7A0B)	EEPROM access word address	Writing is performed to both RAM and EEPROM, but reading is performed only on RAM. Since writing is also performed to EEPROM, the value does not change even when the power is turned off and back on.

! Handling Precautions:

• The number of EEPROM erase/write cycles is limited (about 100,000 cycles). Accordingly, it is recommended that very frequently written parameters be written to RAM, which does not have a limitation on cycles. Note, however, that the data written to the RAM area is overwritten with the EEPROM area data when the power is turned on.

Write data range

If the value to be written is outside the range specified for the parameter, the value is not written and a termination code indicating error is returned.

Write conditions

A termination code indicating an error is also returned if the conditions for writing are not satisfied.

7-5 Numerical Representation in the Application Layer

The specifications of numerical representation are decimal variable-length (zero suppress) for RS and WS commands and hexadecimal fixed-length for RD, WD, RU and WU commands. Details are as follows:

RS and WS commands

ltem	Specifications	Error handling
Unnecessary space	Cannot be appended.	The message processing is aborted and a termination
Unnecessary zero	Cannot be appended.	code indicating error is returned in a response
Numerical value = zero	Cannot be omitted. Be sure to use "0."	message.
Other unnecessary characters	Numerical values may be prefixed with a "-" expressing a negative number. Any other characters cannot be appended. The "+" sign must not be appended to indicate positive numerical values.	
Range of available numerical values	 -32768 to +32767 Values outside this range are not allowed. 	

■ RD, WD, RU, and WU commands

ltem	Specifications	Error handling
Unnecessary space	Cannot be appended.	The message processing is aborted and a termination
Unnecessary zero	Cannot be appended.	code indicating error is returned in a response
Numerical value = zero	Cannot be omitted. Be sure to use "0000."	message.
Other unnecessary characters	Cannot be appended.	
Range of available numerical values	0000H to FFFFH	

7-6 List of Termination Codes

If an error occurred in the application layer, a termination code indicating error is returned in a response message.

Termination code	Description	Process	Example
00	Normal termination	All the processing has completed successfully.	
99	Undefined command	Only the termination code is	AA,1001W,1
	Other errors	returned. The message is not processed.	RX03E80001
10	Numerical value conversion error	Processing is aborted when a	RS,1001W,100000
	• A numerical value of 7 digits or more	conversion error or a range error has occurred.	RS,01001W,1
	• A figure other than 0 of which the leading		RS,+1001W,1
	digit is 0	(Processing is performed until just before the abnormality	WS,10?1W,1
	• The conversion result is 65535 or greater,	occurs)	RD03E9000>
	or -65536 or smaller.		RU0103E9
	 Other obvious illegal representation of an integer 		
22	The value of read data is outside the	The high limit or low limit	
	specified range.	value is read from the corresponding word address,	
	• The decimal point position is changed	and the subsequent processing	
	and the value becomes –32769 or smaller, or 32768 or larger.	continues.	
	The value of written data is outside the	Processing is continued	(Example: Specified range
	specified range.	excluding the relevant word	for 5001W is 0 to 1)
		address.	(Processing aborted)
			WS,5001W,3000
			WD13890BB8
			WU0013890BB8
23	Writing disabled due to instrument set	Processing is continued	
	value conditions, instrument external	excluding the relevant word	
	conditions, etc.	address.	
	Writing/reading disabled because communications/loader locked	Only the termination code is returned. The message is not	
	communications/loader locked	processed.	
40	Read/write word count error	Only the termination code is	RS,1001W,100
		returned. The message is not processed.	RD03E90064
41	Word address out of the range	Only the termination code is	RS,100000W,1
	• Out of the range between 256 and 65534	returned. The message is not	RD03G90001
	_	processed.	RU00\$3E903EA
			WS,03E9W,1
			WD0XXX0001
			WU00o3E90001
42	The value of written data is outside the	Processing is performed up to	WS,2101W,100,XXX
12	specified range.	the relevant word address. The	WC 2101W 100000
	specified lange.	succeeding processing is not	WS,2101W,100000

Termination code	Description	Process	Example
83	 Any of the following alarms has occurred: AL74: Nonvolatile memory error AL80: Nonvolatile memory not initialized AL81: Setting value area error AL82: Adjustment value area error AL83: Internal system error AL84: Setting value initialization error AL95: Setting value error AL96: Adjustment value error 	Only the termination code is returned. The message is not processed.	

7-7 Reception and Transmission Timing

Time specifications for instruction and response messages

The cautions below are required with regard to the timing of command message transmission from the master station and response message transmission from the slave station (this device).

• Response monitoring time

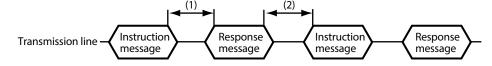
The maximum response time from the end of the instruction message transmission by the master station until when the master station receives a response message from this device is two seconds ((1) in the figure below).

So, the response monitoring time should be set to two seconds.

Generally, when a response time-out occurs, the instruction message is resent.

Transmission start time

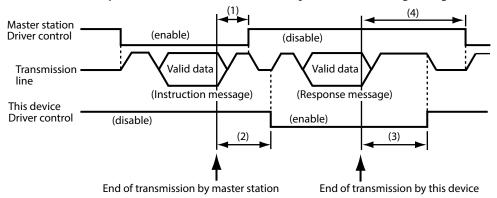
A wait time of 10ms is required before the master station starts to transmit the next instruction message (to the same slave station or a different slave station) after the end of receiving response message ((2) in the figure below).



- End of transmission by master station Transmission start time of this device = 2000 ms max.
- (2) End of transmission by this device Transmission start time of master station = 10 ms min.

RS-485 driver control timing specifications

When the transmission/reception on the RS-485 3-wire system is directly controlled by the master station, care should be paid to the following timing:



- (1) End of transmission by master station Driver disable time = $500 \mu s$ max.
- (2) End of reception by this device Driver enable time = Response time-out setting ([]]) or longer
- (3) End of transmission by this device Driver disable time = 10 ms max.
- (4) End of reception by master station Driver enable time = 10 ms min.

7-8 Precautions for Creating Communication Programs for the Master Station

Keep the following points in mind when creating a communication program.

- This device takes a maximum of two seconds before it sends a response. Therefore, specify the response monitoring time to two seconds.
- Resend the message if there is no response within two seconds. Set a communications error to occur if there is no response even after two retries.
- Be sure to resend as described above, because sometimes a message is not transmitted correctly for some reason such as electrical noise during communication.

Note

• If "X" and "x" device ID codes are alternated when a message is resent by the master station, it will be easy to identify whether the received message is a response to the previous instruction or to the current one.

Communication program example

A sample program is installed in the folder in which Smart Loader Package SLP-C1F has been installed.

In the default setting, the directory is C:\Program Files(x86)\SLP\SLPC1\Samples\cpl.cpp.

This program is written in C++.

The sample program is for your reference only, and there is no guarantee that all functions will work properly.

! Handling Precautions:

- Azbil Corporation will not be liable for any loss or damage caused by applying this sample program.
- Before executing the sample program

Check the settings for communication type, station address, transmission speed and data format of the instrument.

Compiling

The following is an example of compiling with Visual Studio 2019.

After launching x86 Native Tools Command Prompt for VS 2019 from the start menu, compile using the cl command.

Example of execution results

C:\Sample>cl cpl.cpp
Microsoft(R) C/C++ Optimizing Compiler Version 19.29.30133 for x86
Copyright (C) Microsoft Corporation. All rights reserved.
cpl.cpp
Microsoft (R) Incremental Linker Version 14.29.30133.0
Copyright (C) Microsoft Corporation. All rights reserved.
/out:cpl.exe
cpl.obj

• Running the sample program

This program reads and writes data using COM port 1. When executed, the application layers of the instruction and response messages communicated are displayed.

command:RS,14356W,2
result:00,0,0
command:WS,14357W,2
result:00
, ,

Example of execution results

• Processing of the sample program

- Setup for communication Call open () and initialize the RS-232C port.
- Executing commands Set a desired character string in "command" and call AppCPL().

Chapter 8. Modbus Communication Function

8-1 Overview of Communications

If a model with RS-485 communication is used, this device can communicate with a PC, PLC or other host device using a program created by the user.

CPL (Controller Peripheral Link: Azbil Corporation's host communication protocol) or MODBUS can be selected as the communication protocol. This chapter describes MODBUS communications.

Features

Key features of the C1M's communication functions are as follows:

- Up to 31 C1M units can be connected to a single master station (host device).
- Almost all of the parameter data of this device can be communicated.
 Chapter 10. List of Communication Data

! Handling Precautions:

- In MODBUS communications, the data address of this device that is set in the host device may be reduced by 1 in a communication message during transmission. Be sure to understand the specifications of the host device before using this device.
 - Example: If the data address is set to 1001 in the host device, it will be 1000 in a communication message during transmission.

Configuration

The settings shown below must be specified for Modbus communication.

ltem	Display		Description	lnitial value	User level
Communication type	C 64		0: CPL 1: Modbus/ASCII 2: Modbus/RTU 3: PLC link	0	Simple, standard, advanced
Station address	E 8	55	0: No communication 1 to 127	0	
Transmission speed	ission speed		0: 4800 bps 1: 9600 bps 2: 19200 bps 3: 38400 bps	2	
Data format (data length)	[67		0: 7 bits 1: 8 bits	1	
Data format (parity)	C 68		0: Even parity 1: Odd parity 2: No parity	0	
Data format (stop bit)	[]	59	0: 1 bit 1: 2 bits	0	
Communication minimum response time			1 to 250 ms	3	Advanced

- These items can be displayed and configured if a model with RS-485 communication is used.
- When the communication type is set to MODBUS/RTU, the operation is fixed to 8-bit data regardless of the data format (data length) setting.

Handling Precautions:

• The settings can be configured using the keys on this device or using Smart Loader Package model SLP-C1F. RS-485 communications cannot be used for configuration.

Communication procedure

The communication procedure is as follows.

- (1) The host device (master station) sends an instruction message to one C1M unit (slave station).
- (2) The slave station receives the instruction message and performs read or write processing according to the content of the message.
- (3) The slave station sends a response message appropriate for the type of processing.
- (4) The master station receives the response message.

Handling Precautions:

 Sending data using several protocols intermixed (CPL, Modbus/ASCII, Modbus/RTU, PLC link) to the same RS-485 transmission line is not allowed.

8-2 Message Structure

Message Structure

The following shows the message structure.

All messages are expressed in hexadecimal.

Modbus/ASCII

All messages are written in hexadecimal ASCII codes (each slot below represents one character).

A MODBUS/ASCII message consists of (1) to (5) below.

The command (details sent from the master station) and the response (details returned from the slave station) are stored in (3).

3AH								0DH	0AH
:								CR	LF
(1)	(2)		(3)		(4	4)	(5	5)
				1 frame					

(1) Start of message (colon, expressed with ASCII code 3AH)

(2) Station address (2 bytes)

(3) Instruction message, response message

(4) Checksum (LRC) (2 bytes)

(5) Delimiter (end of message)

Colon (3AH)

When a colon (3AH) is received, this device interprets it as the start of a command message.

No matter what has been received previously, upon receiving a colon, this device begins processing a new message.

In this way, if an instruction message contains an error due to electromagnetic noise, etc., this device can respond to the next proper message (a resent message, etc.) from the master station.

• Station address

This device creates a response message only to instruction messages that mention its station address. A station address is expressed as a 2-digit hexadecimal character code in a message.

This device returns a response message that includes its own station address.

The station address can be specified by E65 (station address). Note that, if the station address is set to 0 (30H 30H), this device does not respond even if the station addresses match.

• Checksum (LRC)

This value is for checking whether something abnormal (e.g., electromagnetic noise) has caused the message content to change during transmission. The checksum is expressed as a 2-digit hexadecimal character code. The procedure for calculating the checksum is as follows.

- Add from the start of the station address to immediately before the checksum. Note that the values to be added are not the ASCII character values in the instruction message but the one-byte binary data converted from two ASCII characters.
- (2) Take the two's complement of the sum.
- (3) Convert the low-order one byte of the sum to a 2-digit hexadecimal character code.

The following is a sample checksum calculation:

Sample message

- :: 3AH (start of the message)
- 0: 30H (1st byte of the station address)
- A: 41H (2nd byte of the station address)
- 0: 30H (1st byte of the read command)
- 3: 33H (2nd byte of the read command)
- 0: 30H (1st byte of the starting word address)
- 3: 33H (2nd byte of the starting word address)
- E: 45H (3rd byte of the starting word address)
- 9: 39H (4th byte of the starting word address)
- 0: 30H (1st byte of the read count)
- 0: 30H (2nd byte of the read count)
- 0: 30H (3rd byte of the read count)
- 2: 32H (4th byte of the read count)
- (1) Add from the start of the station address to immediately before the checksum. The addition calculation is as follows:
 0AH + 03H + 03H + E9H + 00H + 02H
 The result is FBH.
- (2) The low-order byte of FBH is FBH. It remains unchanged. The two's complement of FBH is 05H.
- (3) Convert the obtained 05H to a two-byte ASCII code. The result is:
 - 0: 30H
 - 5: 35H

The two bytes, 0 (30H) and 5 (35H), are the checksum.

• Delimiter (CR/LF)

This indicates the end of the message. Immediately after LF is received, the device enters a state allowed to process the received message.

Modbus/RTU

All messages use binary data (each slot below represents one byte).

A Modbus RTU message consists of (1) to (3) below.

The command (details sent from the master station) and the response (details returned from the slave station) are stored in (2).

(1)								(3	3)			
	1 frame											

(1) Station address (1 byte)

(2) Instruction message, response message

(3) Checksum (2 bytes)

Station address

This device creates a response message only to instruction messages that mention its station address. A station address is expressed in one byte in a message.

This device returns a response message that includes its own station address.

The station address can be specified by C65 (station address). Note that, if the station address is set to 0, this device does not respond even if the station addresses match.

• Checksum (CRC)

This value is for checking whether something abnormal (e.g., electromagnetic noise) has caused the message content to change during transmission. The check sum is expressed in two bytes.

The procedure for calculating the checksum (CRC) is as follows.

```
/* CRC calculation */
/* Input unsigned char length:
                                       Number of bytes sent */
/*
         unsigned char * top:
                                      Sent data start pointer */
/* Output unsigned short CRC:
                                       CRC calculation result */
unsigned short crc16 (unsigned char length, unsigned char *top)
{
         unsigned short CRC= 0xffff;
         unsigned short next;
         unsigned short carry;
         unsigned short n;
         unsigned char crcl;
         while (length--) {
                   next = (unsigned short)*top;
                   CRC ^= next;
                   for (n = 0; n < 8; n++) {
                             carry = CRC & 1;
                             CRC >>= 1;
                             if (carry) {
                                       CRC ^= 0xA001;
                             }
                   }
                   top++;
         }
         crcl = (CRC & 0xff00)>>8;
         CRC <<= 8;
         CRC \mid = crcl;
         return CRC;
}
```

• Determining the end of one frame

The message end (end of 1 frame) is determined when the period of time during which no character is received exceeds the time specified for the transmission speed. If the next character is not received by the timeout time shown below, the frame is determined to have ended.

Note that the timeout time has a fluctuation of ± 1 ms.

Set transmission speed (bps)	Timeout time
4800	9 ms or more
9600	5 ms or more
19200	3 ms or more
38400	2 ms or more

Command types

Command (send message) types supported by this device are as follows.

Command type	Desc	Conformance class	
	ASCII	RTU	
Read multiple data records	03 (2 bytes)	03H (1 byte)	0
Write multiple data records	10 (2 bytes)	10H (1 byte)	0
Write 1 data record	06 (2 bytes)	06H (1 byte)	1*

* This device does not support class 1 commands other than the writing of one data record.

Number of data records

The number of data records that can be read or written using a one-frame message is shown below.

Command type	Descr	iption
(function code)	ASCII	RTU
Read command	1 to 64	1 to 64
Write command	1 to 64	1 to 64
1 data record write command	1	1

Other specifications

If there is an error in a response message, one of the exception codes shown below is added after the function code.

Error type	Excepti	ion code	Description
	ASCII	RTU	
Illegal function code	01 (2 bytes)	01H (1 byte)	Function code not supported by this device
			The value is outside the specified range from –32767 to +32768.
Illegal data address	02 (2 bytes)	02H (1 byte)	An included data address cannot be read or written.
Device failure	04 (2 bytes)	04H (1 byte)	Any of the following alarms has occurred:
			· AL74: Nonvolatile memory error
			 AL80: Nonvolatile memory not initialized
			\cdot AL81: Setting value area error
			· AL82: Adjustment value area error
			· AL83: Internal system error
			· AL84: Setting value initialization error
			· AL95: Setting value error
			· AL96: Adjustment value error
Illegal data	03 (2 bytes)	03H (1 byte)	Error other than the above

8-3 Description of Commands

Read command (03H)

Instruction message

This is a command—in one message—to read data from consecutive word addresses starting from the specified address. The following is a sample "read" instruction message.

Modbus/ASCII

3AH	30H	41H	30H	33H	30H	33H	45H	39H	30H	30H	30H	32H	30H	35H	0DH	0AH
:	0	А	0	3	0	3	Е	9	0	0	0	2	0	5	CR	LF
(1)	(2) (3) (4) (5) (6) (7)											')				
(1) S	(1) Start of the message (5) Read data count															
(2) S	tatio	n ad	dress	5					(6) C	heck	sum	(LRC	<u>)</u>			
(3) Read command (03H) (7) Delimiter																
(4) S	tartir	ng w	ord a	addre	ess											

Modbus/RTU

0AH	03H	03H	E9H	00H	02 h	14H	C0H
(1)	(2)	(3	3)	(4	1)	(5	5)
(1) S [.]	tatio	n ad	dress	5			
(2) R	ead o	comr	mano	d (03	H)		
(3) S	tartir	ng w	ord a	ddre	ess		
(4) R	ead o	data	cour	nt			
(5) C	heck	sum	(CRC])			

• Response message

If an instruction message is received successfully, a response message appropriate for the command is returned.

The following is a sample response message for a read command.

Modbus/ASCII

Normal termination

3AH	30H	41H	30H	33H	30H	34H	30H	33H	30H	31H	30H	30H	30H	33H	45H	38H	0DH	0AH
:	0	А	0	3	0	4	0	3	0	1	0	0	0	3	E	8	CR	LF
(1)	(2	2)	(3	3)	(4	4)	(5) (6) (7) (8)									3)		
(1) S ⁻	tart o	of the	e me	ssag	e			(5) Read data 1										
(2) Station address (6) I										(6) Read data 2								
(3) Read command (03H)									(7) C	heck	sum	(LRC])					
(4) Read data count $ imes$ 2								(8) Delimiter										

• Abnormal termination

	зан	30H	41H	38H	34H	30H	31H	37H	31H	0DH	0AH	
		0	А	8	4	0	1	7	1	CR	LF	
Ī	(1)	(1) (2)		(3	3)	(4	1)	(!	5)	(6)		

(1) Start of the message

(2) Station address

(3) Error flag (Since undefined "04" was sent as a command with an instruction message, the most significant bit was turned ON and "84" was returned.)

(4) Termination code indicating error (CP Page 8-8)

(5) Checksum (LRC)

(6) Delimiter

Modbus/RTU

Normal example

0AH	03H	04H	03H)1H	00H 03H	51H 76H
(1)	(2)	(3)	(4)	(5)	(6)
(1) S	tatio	n ad	dress			
(2) R	ead o	comr	nand	(03	H)	
(3) R	ead o	data	count	t x 2	2 (bytes)	
(4) R	ead o	data	1			
(5) R	ead	data	2			
(6) C	heck	sum	(CRC)		

Abnormal termination

0AH	84H	01H	F3H	02 h
(1)	(2)	(3)	(4	1)

(1) Station address

- (2) Error flag (Since undefined "04H" was sent as a command with an instruction message, the most significant bit was turned ON and "84H" was returned.)
- (3) Termination code indicating error (CP Page 8-8)

(4) Checksum (CRC)

Write command (10H) Instruction message

This is a command—in one message—to write data to consecutive word addresses starting from the specified address. The following is a sample "write" instruction message.

Example: 01A0H and 0E53H are written to two consecutive word addresses starting from 1501W (05DDH).

3AH	30H	31F	I 31F	130F	130H	35H	44H	44H	30H	30H	30H	32H	30H	34H	30H	31H	41H	30H	30H	45H	35H	33H	30H	35H	0DH	0AH
:	: 0 1 1 0 0 5 D D 0 0 0 2								0	4	0	1	А	0	0	Е	5	3	0	5	CR	LF				
(1)	(1) (2) (3) (4) (5)									(6	5)		(]	7)			(8	3)		(9	9)	(1	0)			
	(1) Start of the message														(7) W	Vrite	data	1								
	(2) Station address										(8) Write data 2															
							(3)	Write	e cor	nma	nd (1	10H)		(9) Checksum (LRC)												
	(4) Starting word address												(10)	Delir	niter											
	(5) Write data count																									
	(6) Write data count $\times 2$																									

Modbus/ASCII

Modbus/RTU

													_		
	01H	10H	05H	DDH	00H	02 h	04H	01H	AOH	0EH	53H	45H B9H			
	(1)	(2)	(3	3)	(4	1)	(5)	(6)	7	7	(8)	l		
(1) Station address (5) Write data count ×												count ×2	2		
	(2) W	/rite	comr	mand	(10	H)	(6) Write data 1								
	(3) S [.]	tartir	ng wo	ord a	ddre	SS		((7) W	/rite (data	2			
(4) Write data count (8) Checksum (CRG										(CRC)					

• Response message

If an instruction message is received successfully, a response message appropriate for the command is returned.

The following is a sample response message for a write command.

Modbus/ASCII

ЗАН	30H	31H	31H	30H	30H	35H	44H	44H	30H	30H	30H	32H	30H	42H	0DH	0AH
:	0	1	1	0	0	5	D	D	0	0	0	2	0	В	CR	LF
(1) (2) (3) (4) (5)										5)		(6	5)	(7	')	
(1) Start of the message (5) Write data count																
(2) S	tatio	n ad	dres	5					(6) C	heck	ksum	(LRC	_)			
(3) Write command (10H) (7) Delimiter																
(4) S	tartir	ng w	ord a	addre	ess											

Мос	lbus	/RTU										
01H	H 10H 05H DDH 00H 02 h D1H											
(1) (2) (3) (4) (5)												
(1) Station address												
(2) W	/rite	comma	nd	(10	H)							
(3) W	/rite	starting	w	ord a	addr	ess						
(4) W	(4) Write data count											
(5) Checksum (CRC)												

🛱 Note

• The format of a response message for abnormal termination is the same as that of the read command.

One data record write command (06H)

Instruction message

This is a command to write one data record to the specified address. The following is a sample write instruction message.

Example: 01A0H is written to word address 1501W (05DDH).

Modbus/ASCII

ЗАН	30H	31H	30H	36H	30H	35H	44H	44H	30H	31H	41H	30H	37H	36H	0DH	0AH
:	0	1	0	6	0	5	D	D	0	1	Α	0	7	6	CR	LF
(1)	(2	2)	(3	3)		(4	4)			(5	5)		(6	5)	(7	')
(1) S	tart c	of the	e me	essage (5) Write data												
(2) S	tatio	n ad	dress	5	(6) Checksum (LRC)											
(3) W	/rite	com	man	d (06	H)				(7) D	elim	iter					
(4) Word address																

Modbus/RTU

01H	06H	05HDDH	01H A0H	18H D4H	
(1)	(2)	(3)	(4)	(5)	
(1) S ¹	tatio	n address			
(2) W	/rite	command	(06H)		
(3) Word address					
(4) Write data					
(5) Checksum (CRC)					

• Response message

The format of a response message for normal termination is the same as that of the instruction message.

Note

• The format of a response message for abnormal termination is the same as that of the read command.

8-4 Specifications Common with CPL Communication Function

Definition of word addresses

🕼 7-4 Definition of Word Addresses (p. 7-13)

Numerical representation

The specifications of numerical representation are the same as the following:

C→ 7 - 5 Numerical Representation in the Application Layer RD, WD, RU, and WU commands (p. 7-14)

■ Specifications of RS-485 driver control timing

7-7 Reception and Transmission Timing (p. 7-17)

Chapter 9. PLC Link Communication Function

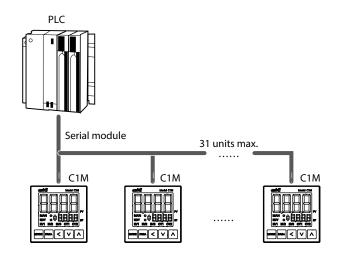
9-1 Overview

If a model with RS-485 communication is used, this device can directly communicate with a PLC using the PLC link communication function.

With this function, data retained by a PLC can be written to this device and vice versa.

The PLC link communication function can use the C1A and C1M at the same time if conditions such as the communication protocol and communication speed are met.

Sample connection



Supported PLC protocol

- Mitsubishi QnA-compatible 3C frame format 4
- Omron FINS
- General-purpose Modbus/RTU

Supported PLCs (typical models)

• Mitsubishi

MELSEC iQ-R/iQ-F/L series (Mitsubishi QnA-compatible 3C format 4 protocol)

MELSEC Q series (Mitsubishi QnA-compatible 3C format 4 protocol)

• Omron

CS/CJ/CP series (FINS protocol)

NJ/NX series (FINS protocol)

• Keyence

KV Nano series (Modbus/RTU protocol)

• Siemens

S7-1200 series (Modbus/RTU protocol)

Modbus/RTU device

General-purpose Modbus/RTU device (Modbus/RTU protocol)

Specifications

- Number of connected PLC units = 1
- Number of connected C1M units = 31
- Communication data count: 64 (PLC \rightarrow C1M), 64 (C1M \rightarrow PLC)

Precautions for the PLC link communication function

- When the PLC link communication function is used, RS-485 communication with the host device cannot be used.
- Do not connect anything other than the C1M and one PLC unit to the RS-485 communication line.
- Set the C1M addresses from 1 to the maximum number of connected C1M units. The maximum number of connected C1M units can be selected from 8 (default), 16, 24, and 31.
- The PLC's device ID and the C1M's station address must be different.
- Do not use 255 or 254 as the device ID of the PLC.
- New settings will apply after the power of the device is turned off and back on. If you have changed the settings, turn the power off and back on.
- Use the required number of consecutive registers on the PLC.
- Different protocols cannot be used at the same time.

9-2 Data Transmission

PLC link communication is a function for transferring data between the PLC and this controller. There are two transfer types: "Cyclic data transfer" and "Triggered data transfer."

The type of transfer can be set in the PLC link settings of the SLP-C1F Smart Loader Package.

The upper limits for the number of transfer processes and number of sheets are shown below.

Function	Maximum No. of sheets	Maximum No. of processes in 1 sheet	Total maximum No. of sheets for the function	Total maximum No. of processes for the function
Cyclic data transfer	4 sheets	64 lines	4 sheets	64 lines
Triggered data transfer	4 sheets	64 lines		

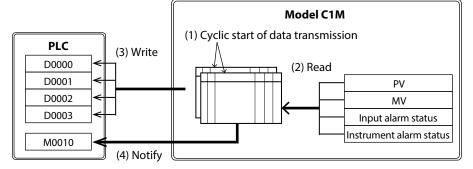
• Cyclic data transfer

Data from the controller can be transferred to the PLC periodically. Data can also be transferred from the host device to the controller.

Major applications:

- Saving controller data to the PLC
- Monitoring controller data by the PLC for device management

The controller transfers data periodically as follows.



- (1) The controller starts cyclic data transfer according to the configuration sheets.
- (2) Data is read from the controller.
- (3) The read data is written to the PLC.
- (4) When transfer of the data specified for the sheet is complete, a completion notification is written.

! Handling Precautions

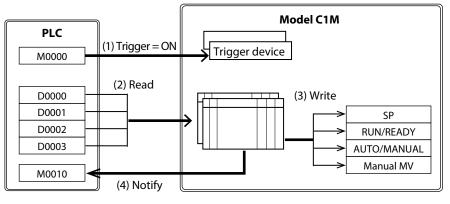
- The normal memory area and RAM area are available for the data written from the PLC to the C1M.
 - Chapter 10. List of Communication Data (for details)

Triggered data transfer

Data from the controller is transferred to the PLC when the trigger device is detected turning from OFF to ON. Data can also be transferred from the PLC to the controller.

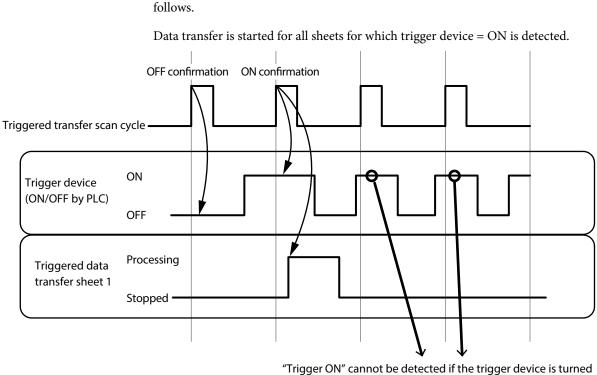
Major applications:

- Changing the controller settings (SP, PID, etc.) from the PLC
- Changing the controller operations (RUN/READY mode selection, etc.) from the PLC



The controller executes triggered data transfer as follows.

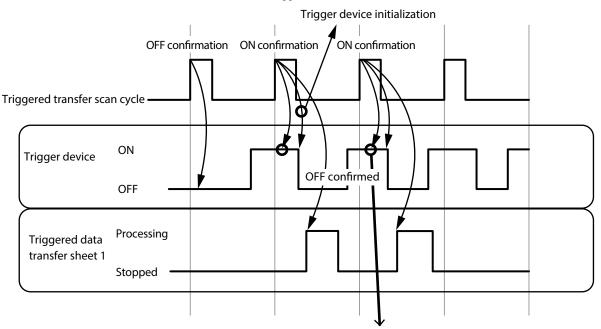
- (1) The controller reads the trigger device in order to monitor the trigger device turning from OFF to ON. When the trigger device is turned on, triggered data transfer starts.
- (2) Data is read from the PLC.
- (3) The read data is written to the controller.
- (4) When transfer of the data specified for the sheet is complete, a completion notification is written.



The triggered transfer scan cycle and triggered data transfer operations are as follows.

"Trigger ON" cannot be detected if the trigger device is turned on and off by PLC on a cycle shorter than the scan cycle.

When the [Trigger device initialization] setting is [Yes], the trigger device is turned off immediately after the trigger is detected. If the trigger device is turned off by the trigger device initialization function, its status is the same as when the C1M confirms that the trigger device is off. Therefore if the trigger device is turned on, it is detected in the next trigger device scan.



When the trigger device is turned off by the trigger device initialization function, the next trigger will be detected.

Usable devices

The address ranges of the devices (data) usable with each model are as follows.

• C1M controller (this device)

Various monitoring data and parameters can be selected in the PLC link settings in the SLP-C1F Smart Loader Package. Frequently used data and addresses can be entered directly.

See the following table for the addresses of frequently used data.

Name	R/W	Address		
		Decimal	Hex	
Representative alarm	R/-	14336	3800	
DO state	R/-	14337	3801	
DI state	R/-	14338	3802	
Loop PV	R/-	14356	3814	
Loop SP	R/-	14357	3815	
MV	R/-	14358	3816	
CT1 current when output ON	R/-	14418	3852	
CT2 current when output ON	R/-	14419	3853	
Heat MV	R/-	14420	3854	
Cool MV	R/-	14421	3855	
LSP group selection	R/W	14592	3900	
LSP in use	R/W	14593	3901	
Manual MV	R/W	14594	3902	
RUN/READY	R/W	14595	3903	
AUTO/MANUAL	R/W	14596	3904	
AT stop/start selection	R/W	14597	3905	
P(Proportional Band) in use	R/W	14848	3A00	
l(Integral time) in use	R/W	14849	3A01	
D(Derivative time) in use	R/W	14850	3A02	
Manual Reset in use	R/W	14851	3A03	
Output low limit in use	R/W	14852	3A04	
Output high limit in use	R/W	14853	3A05	
P(Proportional Band)(Cool) in use	R/W	14854	3A06	
l(Integral time)(Cool) in use	R/W	14855	3A07	
D(Derivative time)(Cool) in use	R/W	14856	3A08	
Output low limit(Cool) in use	R/W	14858	3A0A	
Output high limit(Cool) in use	R/W	14859	3A0B	

R/- Can be read from the C1M and written to the PLC.

R/W Can be read from the C1M and written to the PLC and written from the PLC to the C1M.

Device type		Addres	ss range
Input relay	X000000	to	X7FFFFF
Output relay	Y000000	to	Y7FFFF
Internal relay	M000000	to	M999999
Special relay	SM00000	to	SM99999
Link special relay	SB00000	to	SB7FFFF
Edge relay	V000000	to	V999999
Latch relay	L000000	to	L999999
Link relay	B000000	to	B7FFFF
Annunciator	F000000	to	F999999
Timer (contact)	TS00000	to	TS99999
Timer (coil)	TC00000	to	TC99999
Retentive timer (contact)	SS00000	to	SS99999
Retentive timer (coil)	SC00000	to	SC99999
Counter (contact)	CS00000	to	CS99999
Counter (coil)	CC00000	to	CC99999
Data register	D000000	to	D999999
Link register	W000000	to	W7FFFFF
Index register	Z000000	to	Z999999
File register (R)	R000000	to	R999999
File register (ZR)	ZR00000	to	ZR7FFFF
File register (ZR)(decimal)	ZR00000	to	ZR99999
Special register	SD00000	to	SD99999
Link special register	SW00000	to	SW7FFFF
Timer current value	TN00000	to	TN99999
Retentive timer current value	SN00000	to	SN99999
Counter current value	CN00000	to	CN99999

• Mitsubishi Electric MELSEC iQ-R/iQ-F/L series (Mitsubishi QnA-compatible 3C format 4 protocol)

Note: The range of available addresses varies depending on the specifications and settings of the CPU unit.

Device type		Address	range
Input relay	X000000	to	X7FFFFF
Output relay	Y000000	to	Y7FFFFF
Internal relay	M000000	to	M999999
Special relay	SM00000	to	SM99999
Link special relay	SB00000	to	SB7FFFF
Edge relay	V000000	to	V999999
Latch relay	L000000	to	L999999
Link relay	B000000	to	B7FFFF
Annunciator	F000000	to	F999999
Timer (contact)	TS00000	to	TS99999
Timer (coil)	TC00000	to	TC99999
Retentive timer (contact)	SS00000	to	SS99999
Retentive timer (coil)	SC00000	to	SC99999
Counter (contact)	CS00000	to	CS99999
Counter (coil)	CC00000	to	CC99999
Data register	D000000	to	D999999
Link register	W000000	to	W7FFFFF
Index register	Z000000	to	Z999999
File register (R)	R000000	to	R999999
File register	ZR00000	to	ZR7FFFF
Special register	SD00000	to	SD99999
Link special register	SW00000	to	SW7FFFF
Timer current value	TN00000	to	TN99999
Retentive timer current value	SN00000	to	SN99999
Counter current value	CN00000	to	CN99999

Mitsubishi Electric MELSEC Q series (Mitsubishi QnA-compatible 3C format 4 protocol)

Note: The range of available addresses varies depending on the specifications and settings of the CPU unit.

• Omron CS/CJ/CP series (Omron FINS protocol)

• Omron NJ/NX series (Omron FINS protocol)

Device type	A	ddres	s range
Channel I/O bit	0000.00	to	6143.15
Internal auxiliary relay bit	W0000.00	to	W0511.15
Retaining relay bit	H0000.00	to	H1535.15
Special auxiliary relay bit	A0000.00	to	A1471.15
Timer (up flag)	Т00000	to	T04095
Counter (up flag)	C00000	to	C04095
Channel I/O	00000	to	06143
Timer (current value)	TN00000	to	TN04095
Counter (current value)	CN00000	to	CN04095
Data memory	D00000	to	D32767
Extended data memory bank 0	E0_00000	to	E0_32767
Extended data memory bank 1	E1_00000	to	E1_32767
Extended data memory bank 2	E2_00000	to	E2_32767
Extended data memory bank 3	E3_00000	to	E3_32767
Extended data memory bank 4	E4_00000	to	E4_32767
Extended data memory bank 5	E5_00000	to	E5_32767
Extended data memory bank 6	E6_00000	to	E6_32767
Extended data memory bank 7	E7_00000	to	E7_32767
Extended data memory bank 8	E8_00000	to	E8_32767
Extended data memory bank 9	E9_00000	to	E9_32767
Extended data memory bank A	EA_00000	to	EA_32767
Extended data memory bank B	EB_00000	to	EB_32767
Extended data memory bank C	EC_00000	to	EC_32767
Extended data memory bank D	ED_00000	to	ED_32767
Extended data memory bank E	EE_00000	to	EE_32767
Extended data memory bank F	EF_00000	to	EF_32767
Extended data memory bank 10	E10_00000	to	E10_32767
Extended data memory bank 11	E11_00000	to	E11_32767
Extended data memory bank 12	E12_00000	to	E12_32767
Extended data memory bank 13	E13_00000	to	E13_32767
Extended data memory bank 14	E14_00000	to	E14_32767
Extended data memory bank 15	E15_00000	to	E15_32767
Extended data memory bank 16	E16_00000	to	E16_32767
Extended data memory bank 17	E17_00000	to	E17_32767
Extended data memory bank 18	E18_00000	to	E18_32767
Extended data memory current	E00000	to	E32767

Note: The range of available addresses varies depending on the specifications and settings of the CPU unit.

- Keyence KV nano series (Modbus/RTU protocol)
- Siemens S7-1200 series (Modbus/RTU protocol)
- General-purpose Modbus/RTU device (Modbus/RTU protocol)

Device type	Address range		
Coil	000001 to 065536		
Input relay	100001 to 165536		
Input register	300001 to 365536		
Retaining register	400001 to 465536		

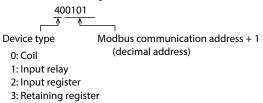
Change the Modbus address used by the SLP in accordance with the address expression used for the connected Modbus device.

Device type	Modbu	s communication	protocol	SLP-C1F
	Function code		Address range	Address range
	For reading	For writing		
Coil	1 (0x01)	15 (0x0F)	0000	000001
			0001	000002
			to	to
			FFFF	065536
Input relay	2 (0x02)	-	0000	100001
			0001	100002
			to	to
			FFFF	165536
Input register	4 (0x04)	-	0000	300001
			0001	300002
			to	to
			FFFF	365536
Retaining	3 (0x03)	16 (0x10)	0000	400001
register			0001	400002
			_	to
			FFFF	465536

The address expression in the Modbus protocol and the SLP is as follows.

In the Modbus communication protocol, a function number is added to an address in order to indicate the device type. In the SLP, the type is expressed by the value (0, 1, 3, 4) at the beginning of an address.

Also, the address used by the loader is the Modbus protocol address + 1, as shown in the above example of "000001" to "065536."



! Handling Precautions

• When connecting to a Keyence KV PLC, set SendDelayTime to 100 ms or longer. If a time shorter than 100 ms is set, faulty communication may result.

Completion notification data

When transfer of data within a sheet is completed during cyclic data transfer and triggered data transfer, completion notification data is written. The contents of the completion notification data are as follows.

Туре	Code	Description
Communication succeeded	0	Normal response
Timeout	1	Timeout occurred in communication between the PLC and the C1M
C1M error	2	An error occurred with the C1M.
PLC error	3	An abnormal code is included in the reply data from the PLC.

9-3 PLC Link Setup

To set up PLC link communication, use the SLP-C1F Smart Loader Package.

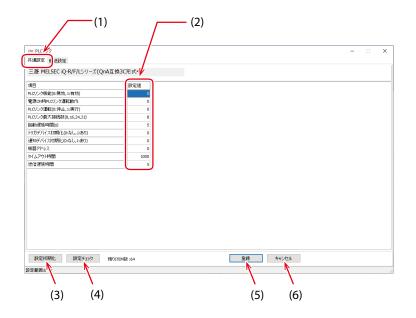
Open the setup screen of the SLP-C1F and click the [PLC Link] button to open the [PLC Link] window.

The method of setup is described below, illustrated by the SLP-C1F screen.

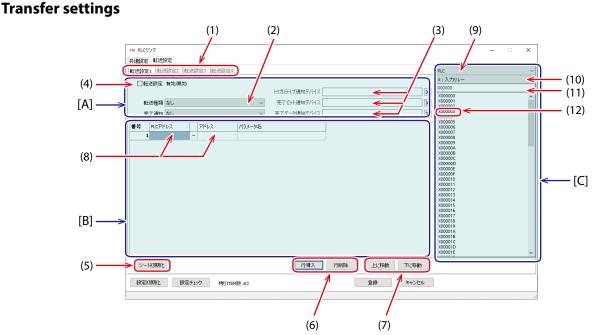
! Handling Precautions

• To use PLC link communication, set CPL/MODBUS to 3 (PLC link communication) in the Setup (communication) Bank.

Common settings



- (1) Select the [Common] tab to configure the PLC connection settings common to transfer 1 to 4.
- (2) Enter a value for each item.
- (3) Click the [Initial PLC Link] button to initialize (clear) the PLC link setup screen.
- (4) Click the [Check] button to check that all the transfer setting addresses have been defined.
- (5) Click the [Register] button to enable the configured PLC link settings. Note that registration only rewrites the settings in the PC memory. After registration, the settings must be written, along with other parameters, to the controller or be saved in a PC file.
- (6) Click the [Cancel] button to discard the configured PLC link settings.



Transfer settings

(1) Select a tab from the [Transfer 1] to [Transfer 4] tabs.

• Section [A]	Transfer operation settings
	(2) After selecting a tab, first select [Transfer type].
	(3) Drag and drop an address in section [C] to [Trigger device/Live notification device], [Completion notification bit], and [Completion notification data].
	(4) You can enable or disable the settings using the [Transfer: Enabled/Disabled] checkbox. Text on disabled tabs is grayed out.
• Section [B]	Transfer data settings
	(5) [Clear sheet] initializes the sheet for each transfer setting.
	(6) The number of lines can be increased or decreased with [Ins] and [Del]. One line corresponds to one item. Up to 64 items can be specified in total for transfer 1 to transfer 4 combined. [Remaining items] is displayed at the bottom of the screen.
	(7) Other lines can be selected by using [Up] and [Down].
	(8) Set [PLC address] and [Address] by dragging and dropping an address in section [C]. Also, you can enter a decimal address into [Address] directly from the keyboard.
• Section [C]	Address list
	(9) Select a device (PLC or C1M).
	(10) Select a data type.
	(11) Enter the first address in the list.
	(12) An address can be selected from the list and dragged and dropped to sections

[A] and [B].

Transfer setting examples

• Cyclic data transfer (PLC \rightarrow C1M)

Used for writing parameters from the PLC to the C1M consecutively.

In this example, data at D0000100 to D0000103 are transferred to the C1M periodically.

• Transfer operation settings

Transfer type:	Cyclic data transfer (PLC \rightarrow C1M)
Live notification device:	M000100
Completion notification bit:	M000010
Completion notification data	: D000010

📖 Note

- 0 and 1 are written alternately to the live notification device periodically.
- If [Notification device initialization] on the [Common] tab is set to 0 (enabled), 0 is written to the device specified by [Completion notification bit] immediately before the data transfer.
- After the data transfer, 1 is written to the completion notification bit.
- If the data transfer is successful, 0 is written to the device specified by [Completion notification data]. If there is an error in the transfer, a value other than 0 is written to the device.

• Transfer data settings

 $D000100 \rightarrow SP$ (target value)

 $D000101 \rightarrow P$ (Proportional Band)

 $D000102 \rightarrow I$ (Integral time)

 $D000103 \rightarrow D$ (Derivative time)

! Handling Precautions

• Use RAM write addresses when transferring (writing) data to the C1M periodically.

転送数定1 転送数定2 転送数定3 転送数定4 □回転送数定 有効無効 転送後援 (周期デー列転送(NLC→) ~ 売了)参加 なし ~					完了的	ブ通知デバイス トト通知デバイス	M000010		×	C1M よ(使)データ (R-]14336:代表アラーム (R-]14337:DO状題 (R-]14356:DV状題 (R-]14356:PV (R-]14357:SP(目標価) (R-]14355:MV(提作量)	~ ~	
番号 1 2 3	PLC7% 2			14357 14848 14849	パラメータ名 SP(目標値) カレンド比例得 カレント使分配	(力の表水(則) (間(力の表水(則)					iR14418:CTI出力の映着 R14418:CTI出力の映着 R14418:CTI出力の映着 R14418:CTIL力の映着 R14418:CTIL力の映着 R14418:CTIL力の映着 R14518:CTILのいた R14518:C	
シート酸定物	▶\$刀期化	設定チェ		持りITEM			行挿入	行削除	上(2移動	下に移動	1	

• Cyclic data transfer (C1M \rightarrow PLC)

Used for monitoring the C1M data on the PLC.

In this example, C1M data is transferred to addresses D000200 to D000201.

• Transfer operation settings

Transfer type:	Cyclic data transfer (C1M \rightarrow PLC)
Live notification device:	M000101
Completion notification bit:	M000011
Completion notification data:	D000011

📖 Note

- 0 and 1 are written alternately to the live notification device periodically.
- If [Notification device initialization] on the [Common] tab is set to 0 (enabled), 0 is written to the device specified by [Completion notification bit] immediately before the data transfer.
- After the data transfer, 1 is written to the completion notification bit.
- If the data transfer is successful, 0 is written to the device specified by [Completion notification data]. If there is an error in the transfer, a value other than 0 is written to the device.

• Transfer data settings

 $PV \rightarrow D000200$

SP (target value) \rightarrow D000201

CIA PLCUS	19									- 0	×
共連設定	転送設定										
転送設定:	転送設定2	転送	改定3 転送設定4						C1M		~
「「「「「「」」	経設定 有効/無	効							よく使うデータ		~
					トリガ/ライブ通知デバイス	M000101		×	[R-]14336:代表アラーム [R-]14337:DO状態		
₽ZÌ	き種類 周期デー	夕転送	t(→PLC)	~	完了ビット通知デバイス	M000011		×	[R-]14338: DI状態 [R-]14356: PV		
完	7通知 なし			~	完了デーダ通知デバイス	M000011		×	[R-]14357: SP(目標值) [R-]14358: MV(操作量)		
番号	PLCアドレス		アドレス	パラメータ名		1			[R-]14418: CT1 出力ON [R-]14419: CT2 出力ON	き電流	
	D000200			1100 040		_			[R-]14420:加熱MV(操作 [R-]14421:冷却MV(操作	量) 量)	
2	D000201	←	1435	7 SP(目標值)					(RW)14592: LSP組選択 (RW)14593: 使用中のLS (RW)14594: マニュアル提	P値	
									[RV] 14355、RUN READY [RV] 14356、AT(P()) たほり (RV] 14365 (AT(P())) たほり (RV] 14365 (AT(P())) たほり (RV] 14355 (AT()) とたい (RV] 14355 (AT()) とたい (RV] 14355 (AT()) とう (RV] 14555 (AT()) とう (RV] 14555 (AT()) とう (RV] 14555 (AT()) とう (RV] 14555 (AT()) (AT()) (AT()) (RV] 14555 (AT()) (AT()) (AT()) (AT()) (RV] 14555 (AT()) (AT()) (AT()) (AT()) (AT())) (RV] 14555 (AT()) (AT()) (AT())) (RV] 14555 (AT()) (AT()) (AT()) (AT())) (RV] 1455 (AT()) (AT())	JALモード切り 対切り加熱側の 帯間間の加熱側の 部時間間の加熱側の 部分して、 部分して、 一部の の に、 で に で に の に の に の に の に の に の に の い の い の い の い の い の い の い の い た の い の た の い の た の い の た で た の た つ た の た の た の の た の た の た の た の た の た の た の た の た の た の た の た の た た た た の た た た た た た た た た た た た た)替え りりりり (例) (例) (例)
シート	初期化				行挿入	行削除	上に移動	下に移動			
設定初	期化	ĝ定チョ	ック 残りITE	M鼓:54			登録	和心也儿			

\bullet Triggered data transfer (PLC \rightarrow C1M)

Used for writing parameters from the PLC to the C1M at a time determined by the PLC.

This example shows the transfer of M000016 and M000017 to the C1M mode setting when M000050 changes from OFF to ON.

• Transfer operation settings

Transfer type:	Triggered data transfer (PLC \rightarrow C1M)
Trigger device:	M000050
Completion notification bit:	M000060

Completion notification data: D000050

📖 Note

- If [Trigger device initialization] on the [Common] tab is set to 0 (enabled), 0 is written to the trigger device when a trigger is detected.
- If [Notification device initialization] on the [Common] tab is set to 0 (enabled), 0 is written to the device specified by [Completion notification bit] when a trigger is detected.
- After the data transfer, 1 is written to the completion notification bit.
- If the data transfer is successful, 0 is written to the device specified by [Completion notification data]. If there is an error in the transfer, a value other than 0 is written to the device.

• Transfer data settings

M000016 \rightarrow RUN/READY mode selection

M000017 \rightarrow LSP in use

CIF PLCL		a										- 🗆 X
Transfer 1	l Tra	nsfer 2	Trans	fer3	Transfer4							C1M v
Tr.	ansfer: E fer type	Trigger t Enable dress 16	transfe → →	CIM RUN, LSP i	+C1M) address READY mode a use	Trigger (Comple to	notification device tion notification bit n notification data	M000060		x x x	Prequently used data Amm summary Do tatus Amm Summary Do tatus Py Py SP Bitaget value) AMV Current transformer (C1) input 1 current treat MV Corrent transformer (C1) input 2 current treat MV Kall more (C) input 2 current treat MV/MEADV mode selection AT top/tart selection AT top/tart selection AT top/tart selection AT top/tart selection D Derivative time(Son) D D Derivative time(Son) D D D D D D D D D D D D D D D D D D D
	In	15		el	Up	Dov	vn					
Remain	ing item	ns :62	Regist	er	Cancel	Check						

• Triggered data transfer (C1M \rightarrow PLC)

Used for writing C1M data to the PLC when a C1M event occurs.

This example shows the transfer of C1M data to D0000070 and D0000071 when the [Alarm summary] setting of the C1M changes to a value other than 0.

• Transfer operation settings

Transfer type:	Triggered data transfer (C1M \rightarrow PLC)
Trigger device:	Alarm summary
Completion notification bit:	M000051

Completion notification data: D000051

Note

- If [Notification device initialization] on the [Common] tab is set to 0 (enabled), 0 is written to the trigger device when a trigger is detected.
- If [Notification device initialization] on the [Common] tab is set to 0 (enabled), 0 is written to the device specified by [Completion notification bit] when a trigger is detected.
- After the data transfer, "1" is written to the completion notification bit.
- If the data transfer is successful, 0 is written to the device specified by [Completion notification data]. If there is an error in the transfer, a value other than 0 is written to the device.

• Transfer data settings

Representative alarm \rightarrow D000070

 $PV \rightarrow D000071$

CM PLCリング 共通設定 転送設定: 転送	 ドレガライブ追加デバイス [た表アラーム] アビット追加デバイス [M000051] アデーの追加デバイス [000051] X 	X C1M よび他ジータ マン よび他ジータ マン
● PLCアドレス アドレス パラメータ名 1 0000070 ← 14335 代表アラーム 2 000071 ← 14355 PV		10:1419:71 ことろつめ装置の 10:1422:21話が以後計画) 10:1422:21話が以後計画) 10:1422:21話が以後計画) 10:1422:21話がした。 10:1422:21話がした。 10:1422:21話がした。 10:1422:21話がした。 10:1425:2152:2152 10:1425:2152:2152 10:1425:2152:2152 10:1425:2152:2152 10:1425:2152:2152 10:1425:2152:2152 10:1425:2152:2152 10:1425:2152:2152 10:1425:2152:2152 10:1425:2152:2152 10:1425:2152:2152 10:1425:2
シートや加期化 設定チェック 残f)ITTEM数: 54	行操入 行操脉 上に移動 下に移動 登録 キャンセル	

9-4 List of PLC Link Settings

The PLC link settings include common settings, transfer settings, and data settings.

Common settings

ltem	Settings	Initial value	Notes
PLC Link Function	0: Disabled	0	
	1: Enabled		
PLC Link Operation at Power On	 0: PLC link operation stops when the power is turned on. 1: PLC link operation is executed when the power is turned on. 	0	The setting is valid only if [PLC Link Function] is set to 1.
PLC Link Operation	0: Stop 1: Execute	0	The setting is valid only if [PLC Link Function] is set to 1.
Max. No. of units connected by PLC link	8, 16, 24, 31	8	
Startup delay time	0–60 s	5	
Trigger device initialization	0: No	0	
	1: Yes		
Notification device initialization	0: No	0	
	1: Yes		
Station address	0–127	0	The address of the PLC to communicate with
TimeOut	0–32000 ms	1000	
Send Delay Time	0–1000 ms	5	

! Handling Precautions

• To use PLC link communication, set E64 (CPL/MODBUS) to "3" (PLC link communication) and configure the above settings on the PLC link screen of the SLP-C1F in advance.

Transfer settings

ltem	Settings	Initial value	Notes
Transfer: Enabled/Disabled	Unchecked: Disabled	Unchecked	
	Checked: Enabled		
Transfer type	Cyclic data transfer (PLC \rightarrow C1M)	None	
	Cyclic data transfer (C1M \rightarrow PLC)		
	Triggered data transfer (PLC \rightarrow C1M)		
	Triggered data transfer (C1M \rightarrow PLC)		
Trigger device address	When trigger device is PLC	Not set	For triggered data transfer
	See the list of address ranges for the PLC device type.		
	Usable devices (p. 9-6)		
	When trigger device is the C1M		
	Selectable from the C1M monitor data and parameters.		
Live notification device address	See the list of address ranges for the PLC device type.	Not set	For cyclic data transfer
	Usable devices (p. 9-6)		
Completion notification bit address	See the list of address ranges for the PLC device type.	Not set	
	Usable devices (p. 9-6)		
Completion notification data address	See the list of address ranges for the PLC device type.	Not set	
	Usable devices (p. 9-6)		

Transfer sheets 1 to 4 can be set independently.

Data settings

Transfer sheets 1 to 4 can be set independently. Up to 64 data items can be specified in total for all sheets combined. The settings for each data item are shown in the table below.

ltem	Settings	Initial value	Notes
PLC address	See the list of address ranges for the PLC device type.	Not set	
C1M address	Selectable from the C1M monitor data and parameters.	Not set	

Chapter 10. List of Communication Data

List of communication data

The symbols in the RAM/EEPROM Read/Write columns are as follows.

No symbol: Possible

- \Box : Possible depending on the conditions
- \triangle : Possible but data is invalid
- ×: Not possible

Note: Reading the EEPROM address, like reading the RAM address, reads data from RAM.

Decimal point information

-:	No decimal point
1 to 3:	The value indicates the decimal point position (for communication, original value is
	multiplied by 10, 100, or 1000)
P:	Varies depending on the PV input range
C:	Varies depending on the integral time and derivative time decimal point position
S:	Varies depending on various conditions

RS/WS commands for CPL communication use a decimal word address followed by "W." RD/WD/RU/WU commands for CPL communication use a hexadecimal word address. Modbus communication commands use a hexadecimal word address.

Bank	Item	RAM a	ddress	EEPROM	address	RA	٨M	EEPI	ROM	Decimal	Notes
		Decimal	Hexa- decimal	Decimal	Hexa- decimal	Read	Write	Read	Write	point	
Instru-	ROM ID	273	0111	16657	4111		×		×	-	"16" for model C1M
ment	ROM version 1	274	0112	16658	4112		×		×	2	
informa-	ROM version 2	275	0113	16659	4113		×		×	2	
tion	Loader information	276	0114	16660	4114		×		×	-	
	EST Information	277	0115	16661	4115		×		×	-	
	Manufacturing date code (year)	278	0116	16662	4116		×		×	-	Year – 2000 Example: Year 2021 is "21"
	Manufacturing date code (month, day)	279	0117	16663	4117		×		×	2	Month + (day ÷ 100) Example: Dec. 1 is "12.01."
	Serial No.	280	0118	16664	4118		×		×	-	
	Advanced function password 1	5021	139D	21405	539D					-	
	Advanced function password 2	5022	139E	21406	539E					-	
	Advanced function password 3	5023	139F	21407	539F					-	
	Advanced function password 4	5024	13A0	21408	53A0					-	
	Advanced function password 5	5025	13A1	21409	53A1					_	
	Advanced function password 6	5026	13A2	21410	53A2					_	
	Advanced function password 7	5027	13A3	21411	53A3					-	
	Advanced function password 8	5028	13A4	21412	53A4					-	
	Advanced function password 9	5029	13A5	21413	53A5					-	
	Advanced function password 10	5030	13A6	21414	53A6					-	
	Advanced function password 11	5031	13A7	21415	53A7					-	
	Advanced function password 12	5032	13A8	21416	53A8					-	
	Advanced function password 13	5033	13A9	21417	53A9					-	
	Advanced function password 14	5034	13AA	21418	53AA					-	
	Advanced function password 15	5035	13AB	21419	53AB					_	
	Advanced function password 16	5036	13AC	21420	53AC					-	

Bank	ltem	RAM a	ddress	FFPROM	address	R/	٩M	FFP	ROM	Decimal	Notes
Dalik	i i i i i i i i i i i i i i i i i i i	Decimal	Hexa-	Decimal	Hexa-		Write		-	point	NULES
		Deemina	decimal	Decima	decimal	licaa		licuu			
Lock	Key lock	5001	1389	21385	5389		1			_	
	Communication lock	5002	138A	21386	538A		×		×	-	When communication is
											locked, an error response is sent.
	Loader lock	5003	138B	21387	538B		×		×	_	
	Password display	5004	138C	21388	538C				×	_	*1
	Password 1A	-	-	_	-	×	×	×	×	_	Passwords can't be read/
											written by comm. or loader
	Password 2A	_	-	_	_	×	×	×	×	-	Same as above.
	Password 1B	-	-	-	-	×	×	×	×	-	Same as above.
	Password 2B	-	-	-	-	×	×	×	×	-	Same as above.
User	User function 1	5101	13ED	21485	53ED					-	
Function	User function 2	5102	13EE	21486	53EE					_	
	User function 3	5103	13EF	21487	53EF					-	
	User function 4	5104	13F0	21488	53F0					-	
	User function 5	5105	13F1	21489	53F1					-	
	User function 6	5106	13F2	21490	53F2					-	
	User function 7	5107	13F3	21491	53F3					-	
	User function 8	5108	13F4	21492	53F4					-	
Setup	PV input range type	5201	1451	21585	5451					-	
	Reference junction compensation (cold junction compensation)	5203	1453	21587	5453					-	
	PV Decimal point position	5204	1454	21588	5454					-	
	PV range low limit	5205	1455	21589	5455					Р	
	PV range high limit	5206	1456	21590	5456					Р	
	SP low limit	5207	1457	21591	5457					Р	
	SP high limit	5208	1458	21592	5458					Р	
	PV square root extraction dropout	5209	1459	21593	5459					1	
	(Reserved for future use.)	5210	145A	21594	545A	\triangle	×		×	-	
	(Reserved for future use.)	5211	145B	21595	545B	\triangle	×	\triangle	×	Р	
	(Reserved for future use.)	5212	145C	21596	545C		×		×	Р	
	(Reserved for future use.)	5213	145D	21597	545D	\triangle	×		×	-	
	Control action (direct/reverse)	5214	145E	21598	545E					-	
	Output operation at PV alarm	5215	145F	21599	545F					-	
	Output at PV alarm	5216	1460	21600	5460					1	
	Output at READY (Heat)	5217	1461	21601	5461					1	
	Output at READY (Cool)	5218	1462	21602	5462					1	
	Output operation at changing AUTO/ MANUAL	5219	1463	21603	5463					-	
	Preset MANUAL value	5220	1464	21604	5464					1	
	Initial output type (mode) of PID control		1465	21605	5465					_	
	Initial output of PID control	5222	1466	21606	5466					1	
	Integral time and derivative time deci- mal point position	5223	1467	21607	5467					-	
	(Reserved for future use.)	5224	1468	21608	5468	Δ	×	Δ	×	_	
	(Reserved for future use.)	5225	1469	21609	5469	\triangle	×		×	_	
	Heat/cool control	5226	146A	21610	546A					_	
	(Reserved for future use.)	5227	146B	21611	546B	Δ	×		×	_	
	Heat/Cool control dead zone	5228	146C	21612	546C					1	
	(Reserved for future use.)	5229	146D	21612	546D	Δ	×	Δ	×	1	
	LSP system group	5230	146E	21613	546E		<u> </u>			_	
	SP ramp type	5231	146F	21615	546F					_	
	SP ramp unit	5232	1470	21616	5470					_	

*1. The value read is always 0.

Bank	Item	RAM a	ddress	EEPROM	address	RA	M	EEPF	ROM	Decimal	Notes
		Decimal	Hexa-	Decimal	Hexa-	Read	Write	Read	Write	point	
			decimal		decimal						<u> </u>
etup	STEP time unit	5233	1471	21617	5471					_	
	STEP PV start	5234	1472	21618	5472					-	
	STEP loop	5235	1473	21619	5473					-	
	CT1 operation type	5236	1474	21620	5474					_	
	CT1 output	5237	1475	21621	5475					-	
	CT1 measurement wait time	5238	1476	21622	5476					-	
	CT2 operation type	5239	1477	21623	5477					-	
	CT2 output	5240	1478	21624	5478					-	
	CT2 measurement wait time	5241	1479	21625	5479					-	
	Control output 1 range	5242	147A	21626	547A					-	
	Control output 1 type	5243	147B	21627	547B					-	
	Control output 1 scaling low limit	5244	147C	21628	547C					S	
	Control output 1 scaling high limit	5245	147D	21629	547D					S	
	Control output 1 MV scaling width	5246	147E	21630	547E					Р	
	Control output 2 range	5247	147F	21631	547F					-	
	Control output 2 type	5248	1480	21632	5480					-	
	Control output 2 scaling low limit	5249	1481	21633	5481					S	
	Control output 2 scaling high limit	5250	1482	21634	5482					S	
	Control output 2 MV scaling width	5251	1483	21635	5483					Р	
	(Reserved for future use.)	5252	1484	21636	5484		×	Δ	×	-	
	(Reserved for future use.)	5253	1485	21637	5485		×		×	-	
	(Reserved for future use.)	5254	1486	21638	5486		×		×	S	
	(Reserved for future use.)	5255	1487	21639	5487		×		×	S	
	(Reserved for future use.)	5256	1488	21640	5488		×		×	_	
	(Reserved for future use.)	5257	1489	21641	5489		×	Δ	×		
	(Reserved for future use.)	5258	148A	21642	548A		×	Δ	×	1	
	(Reserved for future use.)	5259	148B	21643	548B		×	Δ	×		
	(Reserved for future use.)	5260	148C	21644	548C		×		×		
	(Reserved for future use.)	5261	148D	21645	548D		×		×		
	, ,						×		×		
	(Reserved for future use.)	5262	148E	21646	548E		×		×		
	(Reserved for future use.)	5263	148F	21647	548F	Δ		Δ		1	
	Communications type	5264	1490	21648	5490		×		X	-	
	Station address	5265	1491	21649	5491		×		×	-	
	Transmission speed (bps)	5266	1492	21650	5492		×		×	_	
	Data format (data length)	5267	1493	21651	5493		×		×	-	
	Data format (parity)	5268	1494	21652	5494		×		×	_	
	Data format (stop bit)	5269	1495	21653	5495		×		×	-	
	Communication minimum response time	5270	1496	21654	5496		×		×	-	
		5271	1407	21655	E 407						
	Key operation mode	5271	1497	21655	5497					_	
	[MODE] key function	5272	1498	21656	5498						
	Mode display setup	5273	1499	21657	5499						
	PV/SP display setup	5274	149A	21658	549A					-	
	MV display setup	5275	149B	21659	549B					-	
	EV display setup	5276	149C	21660	549C					_	
	Event remaining time display setup	5277	149D	21661	549D						
	CT input current display setup	5278	149E	21662	549E					-	
	User level	5279	149F	21663	549F					_	
	Status indicator	5280	14A0	21664	54A0		<u> </u>			-	
	(Reserved for future use.)	5281	14A1	21665	54A1		Δ	Δ	Δ	-	
	(Reserved for future use.)	5282	14A2	21666	54A2			Δ	\triangle	_	
	(Reserved for future use.)	5283	14A3	21667	54A3			\triangle	\triangle	_	
	(Reserved for future use.)	5284	14A4	21668	54A4	\triangle		\triangle	\triangle	-	

Bank	ltem	RAM a	ddress	EEPRON	address	RA	٨M	EEPI	ROM	Decimal	Notes
		Decimal	Hexa- decimal	Decimal	Hexa- decimal		Write		r —	point	
Setup	(Reserved for future use.)	5285	14A5	21669	54A5	Δ		Δ	Δ	_	
	(Reserved for future use.)	5286	14A6	21670	54A6			\triangle		_	
	(Reserved for future use.)	5287	14A7	21671	54A7		\triangle	\triangle	\triangle	_	
	(Reserved for future use.)	5288	14A8	21672	54A8		\triangle	\triangle	×	_	
	(Reserved for future use.)	5289	14A9	21673	54A9		×	\triangle	×	_	
	Number of CT1 turns	5290	14AA	21674	54AA					_	
	Number of CT1 power wire passes	5291	14AB	21675	54AB					_	
	Number of CT2 turns	5292	14AC	21676	54AC					_	
	Number of CT2 power wire passes	5293	14AD	21677	54AD					_	
	PV input failure (under range) type	5297	14B1	21681	54B1					_	
	Sampling cycle	5298	14B2	21682	54B2					_	
DI assign-	Internal contact 1 operation type	5401	1519	21785	5519					_	
nent	Internal contact 1 input bit function	5402	151A	21786	551A					_	
	Internal contact 1 input assignment A	5403	151A	21787	551R						
	Internal contact 1 input assignment B	5404	151C	21788	551C						
	Internal contact 1 input assignment C	5405	151C	21789	551D						
	Internal contact 1 input assignment D	5406	151E	21709	551E						
	Internal contact 1 polarity A	5407	151E	21791	551E					_	
	Internal contact 1 polarity R	5408	1520	21792	5520					_	
	Internal contact 1 polarity D	5409	1520	21793	5520					_	
	Internal contact 1 polarity D	5410	1522	21794	5522					_	
	Internal contact 1 polarity	5411	1522	21795	5523					_	
	Internal contact 1 internal event No.	5412	1525	21795	5524					_	
	assignment	5412	1524	21790	5524						
	Internal contact 2 operation type	5413	1525	21797	5525					-	
	Internal contact 2 input bit function	5414	1526	21798	5526					-	
	Internal contact 2 input assignment A	5415	1527	21799	5527	İ				-	
	Internal contact 2 input assignment B	5416	1528	21800	5528	İ.				-	
	Internal contact 2 input assignment C	5417	1529	21801	5529	İ.				_	
	Internal contact 2 input assignment D	5418	152A	21802	552A					-	
	Internal contact 2 polarity A	5419	152B	21803	552B					_	
	Internal contact 2 polarity B	5420	152C	21804	552C					-	
	Internal contact 2 polarity C	5421	152D	21805	552D					-	
	Internal contact 2 polarity D	5422	152E	21806	552E					-	
	Internal contact 2 polarity	5423	152F	21807	552F					-	
	Internal contact 2 internal event No. assignment	5424	1530	21808	5530					-	
	Internal contact 3 operation type	5425	1531	21809	5531					-	
	Internal contact 3 input bit function	5426	1532	21810	5532					-	
	Internal contact 3 input assignment A	5427	1533	21811	5533					-	
	Internal contact 3 input assignment B	5428	1534	21812	5534					-	
	Internal contact 3 input assignment C	5429	1535	21813	5535					-	
	Internal contact 3 input assignment D	5430	1536	21814	5536					_	
	Internal contact 3 polarity A	5431	1537	21815	5537					-	
	Internal contact 3 polarity B	5432	1538	21816	5538					-	
	Internal contact 3 polarity C	5433	1539	21817	5539					-	
	Internal contact 3 polarity D	5434	153A	21818	553A					-	
	Internal contact 3 polarity	5435	153B	21819	553B					-	
	Internal contact 3 internal event No. assignment	5436	153C	21820	553C					-	
	Internal contact 4 operation type	5437	153D	21821	553D					_	
	Internal contact 4 input bit function	5438	153E	21822	553E	1			İ	-	
	Internal contact 4 input assignment A	5439	153F	21823	553F	1				_	

Bank	Item	RAM a	ddress	EEPROM	address	RA	M	EEPF	ROM	Decimal	Notes
		Decimal	Hexa-	Decimal	Hexa-	Read	Write	Read	Write	point	
			decimal	ļ	decimal						
DI assign-	Internal contact 4 input assignment B	5440	1540	21824	5540					-	
nent	Internal contact 4 input assignment C	5441	1541	21825	5541					-	
	Internal contact 4 input assignment D	5442	1542	21826	5542					-	
	Internal contact 4 polarity A	5443	1543	21827	5543					-	
	Internal contact 4 polarity B	5444	1544	21828	5544					-	
	Internal contact 4 polarity C	5445	1545	21829	5545					-	
	Internal contact 4 polarity D	5446	1546	21830	5546					-	
	Internal contact 4 polarity	5447	1547	21831	5547					-	
	Internal contact 4 internal event No. assignment	5448	1548	21832	5548					-	
	Internal contact 5 operation type	5449	1549	21833	5549					-	
	Internal contact 5 input bit function	5450	154A	21834	554A					-	
	Internal contact 5 input assignment A	5451	154B	21835	554B					-	
	Internal contact 5 input assignment B	5452	154C	21836	554C					-	
	Internal contact 5 input assignment C	5453	154D	21837	554D					-	
	Internal contact 5 input assignment D	5454	154E	21838	554E					-	
	Internal contact 5 polarity A	5455	154F	21839	554F					-	
	Internal contact 5 polarity B	5456	1550	21840	5550					-	
	Internal contact 5 polarity C	5457	1551	21841	5551					-	
	Internal contact 5 polarity D	5458	1552	21842	5552					-	
	Internal contact 5 polarity	5459	1553	21843	5553					-	
	Internal contact 5 internal event No. assignment	5460	1554	21844	5554					-	
DO assign-	Control output 1 operation type	5601	15E1	21985	55E1					-	
ment	Control output 1 output assignment A	5602	15E2	21986	55E2					-	
	Control output 1 output assignment B	5603	15E3	21987	55E3					_	
	Control output 1 output assignment C	5604	15E4	21988	55E4					_	
	Control output 1 output assignment D	5605	15E5	21989	55E5					-	
	Control output 1 polarity A	5606	15E6	21990	55E6					-	
	Control output 1 polarity B	5607	15E7	21991	55E7					-	
	Control output 1 polarity C	5608	15E8	21992	55E8					-	
	Control output 1 polarity D	5609	15E9	21993	55E9					_	
	Control output 1 polarity	5610	15EA	21994	55EA					-	
	Control output 1 latch	5611	15EB	21995	55EB					-	
	Control output 2 operation type	5612	15EC	21996	55EC					_	
	Control output 2 output assignment A	5613	15ED	21997	55ED					-	
	Control output 2 output assignment B	5614	15EE	21998	55EE					_	
	Control output 2 output assignment C	5615	15EF	21999	55EF					-	
	Control output 2 output assignment D	5616	15F0	22000	55F0						
	Control output 2 polarity A	5617	15F1	22001	55F1					_	
	Control output 2 polarity B Control output 2 polarity C	5618	15F2	22002 22003	55F2 55F3					-	
	Control output 2 polarity C	5619 5620	15F3 15F4	22003	55F4					-	
	Control output 2 polarity	5621	15F5	22004	55F5					_	
	Control output 2 polarity	5622	15F6	22005	55F6					_	
	Event output 1 operation type	5623	15F7	22000	55F7						
	Event output 1 output assignment A	5624	15F8	22007	55F8						
	Event output 1 output assignment B	5625	15F9	22000	55F9						
	Event output 1 output assignment C	5626	15FA	22005	55FA					_	
	Event output 1 output assignment D	5627	15FB	22010	55FB					_	
	Event output 1 polarity A	5628	15FC	22012	55FC					_	
	Event output 1 polarity B	5629	15FD	22013	55FD					_	
	Event output 1 polarity C	5630	15FE	22014	55FE					_	
	Event output 1 polarity D	5631	15FF	22015	55FF					_	

ment Event ou Event o	Item nt output 1 polarity nt output 1 latch nt output 2 operation type nt output 2 output assignment A	Decimal	ddress Hexa-	EEPROM Decimal	Hexa-	RA	Write	EEPF		Decimal	Notes
ment Event ou Event o	nt output 1 latch nt output 2 operation type nt output 2 output assignment A			Decimal						point	1
ment Event ou Event o	nt output 1 latch nt output 2 operation type nt output 2 output assignment A	5622	decimal		decimal	пеац	write	пеаа	vvrite	Point	
ment Event ou Event o	nt output 1 latch nt output 2 operation type nt output 2 output assignment A	5632	1600	22016	5600					_	
Event of Event nt output 2 operation type nt output 2 output assignment A	5633	1601	22017	5601					_		
Event of Event nt output 2 output assignment A	5634	1602	22017	5602							
Event of Event	5635	1602	22010	5603							
Event ou Event nt output 2 output assignment B	5636	1603	22019	5604					_		
Event of Event of Internal										_	
Event ou Event nt output 2 output assignment C	5637	1605	22021	5605					-		
Event ou Event nt output 2 output assignment D	5638	1606	22022	5606					-		
Event ou Event ou Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal	nt output 2 polarity A	5639	1607	22023	5607					-	
Event ou Event ou Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal	nt output 2 polarity B	5640	1608	22024	5608					-	
Event ou Event ou Internal	nt output 2 polarity C	5641	1609	22025	5609					-	
Event ou Event ou Internal	nt output 2 polarity D	5642	160A	22026	560A					-	
Event ou Event ou Internal	nt output 2 polarity	5643	160B	22027	560B					-	
Event ou Event ou Internal	nt output 2 latch	5644	160C	22028	560C					-	
Event or Event or Internal	nt output 3 operation type	5645	160D	22029	560D					_	
Event ou Event ou Internal	nt output 3 output assignment A	5646	160E	22030	560E					-	
Event of Event of Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal	nt output 3 output assignment B	5647	160F	22031	560F					-	
Event of Event of Event of Event of Event of Event of Event of Event of Event of Internal	nt output 3 output assignment C	5648	1610	22032	5610					_	
Event of Event of Event of Event of Event of Event of Event of Internal	nt output 3 output assignment D	5649	1611	22033	5611					-	
Event of Event of Event of Event of Event of Internal tion Internal	nt output 3 polarity A	5650	1612	22034	5612					-	
Event or Event or Event or configura- tion Internal (Reserve Internal	nt output 3 polarity B	5651	1613	22035	5613					-	
Event or Event of Event of Event of Internal	nt output 3 polarity C	5652	1614	22036	5614					-	
Event ou Event Internal configura- tion Internal Internal (Reserve Internal Internal Internal (Reserve Internal	nt output 3 polarity D	5653	1615	22037	5615					-	
Event Internal configura- tion Internal (Reserve Internal	nt output 3 polarity	5654	1616	22038	5616					-	
configura- tion Internal Internal (Reserve Internal Inte	nt output 3 latch	5655	1617	22039	5617					_	
configura- tion Internal Internal (Reserve Internal Inte	rnal event 1 operation type	5801	16A9	22185	56A9					-	
tion Internal Internal (Reserve Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal Internal	rnal event 1 direct/reverse	5802	16AA	22186	56AA					_	
Internal (Reserve Internal Internal (Reserve Internal Internal Internal (Reserve Internal Internal Internal Internal Internal Internal	rnal event 1 standby	5803	16AB	22187	56AB					_	
Internal Internal (Reserve Internal Internal Internal (Reserve Internal Internal Internal Internal Internal	rnal event 1 event state at READY	5804	16AC	22188	56AC					_	
Internal Internal (Reserve Internal Internal Internal (Reserve Internal Internal Internal Internal	erved for future use.)	5805	16AD	22189	56AD		\triangle	\triangle	Δ	_	
Internal (Reserve Internal Internal Internal (Reserve Internal Internal Internal Internal	rnal event 1 alarm OR	5806	16AE	22190	56AE					_	
Internal (Reserve Internal Internal Internal (Reserve Internal Internal Internal Internal	rnal event 1 special OFF setup	5807	16AF	22191	56AF					_	
(Reserve Internal Internal Internal (Reserve Internal Internal Internal	rnal event 1 delay time unit	5808	16B0	22192	56B0					_	
Internal Internal Internal (Reserve Internal Internal Internal	served for future use.)	5809	16B1	22193	56B1	\triangle	\triangle	\triangle	Δ	_	
Internal Internal (Reserve Internal Internal Internal	rnal event 2 operation type	5810	16B2	22194	56B2					_	
Internal Internal (Reserve Internal Internal Internal	rnal event 2 direct/reverse	5811	16B3	22195	56B3					_	
Internal (Reserve Internal Internal Internal	rnal event 2 standby	5812	16B4	22196	56B4					_	
(Reserve Internal Internal Internal	rnal event 2 event state at READY	5813	16B5	22190	56B5					_	
Internal Internal Internal	served for future use.)	5814	16B5	22198	56B6	Δ	Δ	Δ	Δ	_	
Internal Internal	rnal event 2 alarm OR	5815	16B7	22190	56B7					_	
Internal	rnal event 2 special OFF setup	5816	16B8	22200	56B8					_	
	rnal event 2 delay time unit	5817	16B9	22200	56B9					_	
(neselve	served for future use.)	5818	16BA	22201	56BA	Δ	Δ	Δ	Δ	_	
Internal	rnal event 3 operation type	5819	16BB	22202	56BB		<u> </u>			_	
	rnal event 3 direct/reverse	5820	16BC	22203	56BC					_	
	rnal event 3 standby	5820	16BD	22204	56BD					_	
	rnal event 3 event state at READY	5822	16BD	22205	56BE					_	
	served for future use.)	5823	16BF	22200	56BF	Δ	Δ	Δ	Δ	_	
	ernal event 3 alarm OR	5824	16C0	22207	56C0					_	
	rnal event 3 special OFF setup	5825	16C1	22209	56C1					-	
	rnal event 3 delay time unit	5826	16C2	22210	56C2		_	~		-	
	served for future use.)	5827	16C3	22211	56C3	Δ	Δ	Δ	Δ	-	
	much as south A and south at	5828	16C4	22212	56C4					-	
Internal	rnal event 4 operation type rnal event 4 direct/reverse	5829	16C5	22213	56C5					-	

Bank	Item	RAM a	ddress	EEPROM	address	RA	M	EEPF	ROM	Decimal	Notes
		Decimal	Hexa-	Decimal	Hexa-	-	Write	Read	Write	point	
		Decima	decimal	Decima	decimal	neuu		neuu	mile		
Event	Internal event 4 event state at READY	5831	16C7	22215	56C7					_	
configura-	(Reserved for future use.)	5832	16C8	22216	56C8			Δ		_	
tion	Internal event 4 alarm OR	5833	16C9	22217	56C9					_	
	Internal event 4 special OFF setup	5834	16CA	22218	56CA					_	
	Internal event 4 delay time unit	5835	16CB	22219	56CB					_	
	(Reserved for future use.)	5836	16CC	22220	56CC					_	
	Internal event 5 operation type	5837	16CD	22221	56CD					_	
	Internal event 5 direct/reverse	5838	16CE	22222	56CE					_	
	Internal event 5 standby	5839	16CF	22223	56CF					_	
	Internal event 5 event state at READY	5840	16D0	22224	56D0					_	
	(Reserved for future use.)	5841	16D1	22225	56D1					_	
	Internal event 5 alarm OR	5842	16D2	22226	56D2					_	
	Internal event 5 special OFF setup	5843	16D3	22227	56D3					_	
	Internal event 5 delay time unit	5844	16D4	22228	56D4					_	
	(Reserved for future use.)	5845	16D5	22229	56D5					_	
Parameter	Control method	6001	1771	22385	5771					_	
	MV low limit at AT	6002	1772	22386	5772					1	
	MV high limit at AT	6003	1773	22387	5773					1	
	ON/OFF control differential	6004	1774	22388	5774					Р	
	ON/OFF control operating point offset	6005	1775	22389	5775					Р	
	PV filter	6006	1776	22390	5776					1	
	PV ratio	6007	1777	22390	5777					3	
	PV bias	6008	1778	22392	5778					 P	
	(Reserved for future use.)	6009	1779	22392	5779			Δ	Δ	1	
	(Reserved for future use.)	6010	177A	22393	577A			Δ	\triangle	3	
	(Reserved for future use.)	6010	177A	22394	577B				\triangle	P	
	Time proportional cycle unit 1	6012	177C	22395	577C						
	, ,	6012	177D	22390	577D					_	
	Time proportional cycle 1 Time proportional cycle unit 2	6013	177E	22397	577E						
		6014	177E	22390	577F						
	Time proportional cycle 2 TP operation type	6015	1776	22399	5780						
	(Reserved for future use.)	6017	1780	22400	5780			Δ	Δ	- 1	
	· · · · · · · · · · · · · · · · · · ·	6018	1782	22401	5782					S	
	SP up ramp	6018	1783	22402	5783					S	
	SP down ramp (Reserved for future use.)	6020	1783	22403	5785			Δ	Δ	P	
	,			-						٢	
	Time Proportional Min. ON/OFF Time 1	6021	1785	22405	5785					_	
SP	Time Proportional Min. ON/OFF Time 2 (Reserved for future use.)	6022	1786	22406	5786		×		×		
36		7001	1B59	23385	5B59					٢	
	(Reserved for future use.)	7002	1B5A	23386	5B5A						
	(Reserved for future use.)	7003	1B5B	23387	5B5B			\triangle		S	
	(Reserved for future use.)	7004	1B5C	23388	5B5C	Δ		Δ	Δ	S	Como os DAM
	LSP1	7005	1B5D	23389	5B5D					Р	Same as RAM address 13312 (decimal).
	PID group number (for LSP1)	7006	1B5E	23390	5B5E					-	
	Ramp (for LSP1)	7007	1B5F	23391	5B5F					S	
	Soak time (for LSP1)	7008	1B60	23392	5B60					S	
	LSP2	7009	1B61	23393	5B61					Р	Same as RAM address 13313 (decimal).
	PID group number (for LSP2)	7010	1B62	23394	5B62				L	_	
	Ramp (for LSP2)	7011	1B63	23395	5B63					S	
	Soak time (for LSP2)	7012	1B64	23396	5B64					S	
	LSP3	7013	1B65	23397	5B65					Р	Same as RAM address 13314 (decimal).
	PID group number (for LSP3)	7014	1B66	23398	5B66						
	Ramp (for LSP3)	7015	1B67	23399	5B67					S	

Bank	ltem	RAM a	ddress	EEPROM	address	RA	M	EEPF	ROM	Decimal	Notes
		Decimal	Hexa-	Decimal	Hexa-	Read	Write	Read	Write	point	
			decimal		decimal						
P	Soak time (for LSP3)	7016	1B68	23400	5B68					S	
	LSP4	7017	1B69	23401	5B69					Р	Same as RAM address
											13315 (decimal).
	PID group number (for LSP4)	7018	1B6A	23402	5B6A					-	
	Ramp (for LSP4)	7019	1B6B	23403	5B6B					S	
	Soak time (for LSP4)	7020	1B6C	23404	5B6C					S	
	LSP5	7021	1B6D	23405	5B6D					Р	Same as RAM address 13316 (decimal).
	PID group number (for LSP5)	7022	1B6E	23406	5B6E					-	
	Ramp (for LSP5)	7023	1B6F	23407	5B6F					S	
	Soak time (for LSP5)	7024	1B70	23408	5B70					S	
	LSP6	7025	1871	23409	5B71					Р	Same as RAM address 13317 (decimal).
	PID group number (for LSP6)	7026	1B72	23410	5B72					-	
	Ramp (for LSP6)	7027	1B73	23411	5B73					S	
	Soak time (for LSP6)	7028	1B74	23412	5B74					S	
	LSP7	7029	1B75	23413	5B75					Р	Same as RAM address 13318 (decimal).
	PID group number (for LSP7)	7030	1B76	23414	5B76					_	
	Ramp (for LSP7)	7031	1B77	23415	5B77					S	
	Soak time (for LSP7)	7032	1B78	23416	5B78					S	
	LSP8	7033	1B79	23417	5B79					Р	Same as RAM address 13319 (decimal).
	PID group number (for LSP8)	7034	1B7A	23418	5B7A					-	
	Ramp (for LSP8)	7035	1B7B	23419	5B7B					S	
	Soak time (for LSP8)	7036	1B7C	23420	5B7C					S	
Event	Internal event 1 main setting	7501	1D4D	23885	5D4D					S	Same as RAM address 13056 (decimal).
	Internal event 1 sub-setting	7502	1D4E	23886	5D4E					S	Same as RAM address 13057 (decimal).
	Internal event 1 hysteresis	7503	1D4F	23887	5D4F					S	
	Internal event 1 ON delay time	7504	1D50	23888	5D50					S	
	Internal event 1 OFF delay time	7505	1D51	23889	5D51					S	
	Internal event 2 main setting	7506	1D52	23890	5D52						Same as RAM address 13058 (decimal).
	Internal event 2 sub-setting	7507	1D53	23891	5D53					S	Same as RAM address 13059 (decimal).
	Internal event 2 hysteresis	7508	1D54	23892	5D54					S	
	Internal event 2 ON delay time	7509	1D55	23893	5D55					S	
	Internal event 2 OFF delay time	7510	1D56	23894	5D56					S	
	Internal event 3 main setting	7511	1D57	23895	5D57			L		S	Same as RAM address 13060 (decimal).
	Internal event 3 sub-setting	7512	1D58	23896	5D58			L		S	Same as RAM address 13061 (decimal).
	Internal event 3 hysteresis	7513	1D59	23897	5D59					S	
	Internal event 3 ON delay time	7514	1D5A	23898	5D5A					S	
	Internal event 3 OFF delay time	7515	1D5B	23899	5D5R					S	
	Internal event 4 main setting	7516	1D5D	23900	5D50			L		S	Same as RAM address 13062 (decimal).
	Internal event 4 sub-setting	7517	1D5D	23901	5D5D			L		S	Same as RAM address 13063 (decimal).
	Internal event 4 hysteresis	7518	1D5E	23902	5D5E					S	
	Internal event 4 ON delay time	7519	1D5F	23903	5D5E					S	
	Internal event 4 OFF delay time	7520	1D60	23903	5D60					S	

Bank	ltem	RAM a	ddress	EEPRON	address	RA	M	EEPI	ROM	Decimal	Notes
		Decimal	Hexa- decimal	Decimal	Hexa- decimal	Read	Write	Read	Write	point	
Event	Internal event 5 main setting	7521	1D61	23905	5D61					S	Same as RAM address 13064 (decimal).
	Internal event 5 sub-setting	7522	1D62	23906	5D62					S	Same as RAM address 13065 (decimal).
	Internal event 5 hysteresis	7523	1D63	23907	5D63					S	
	Internal event 5 ON delay time	7524	1D64	23908	5D64					S	
	Internal event 5 OFF delay time	7525	1D65	23909	5D65					S	
Extended	AT type	8501	2135	24885	6135					-	
tuning	(Reserved for future use.)	8502	2136	24886	6136	\triangle	×		×	-	
	(Reserved for future use.)	8503	2137	24887	6137	\triangle	×		×	-	
	SP lag constant	8504	2138	24888	6138					1	
	(Reserved for future use.)	8505	2139	24889	6139	Δ	×		×	-	
	AT proportional band adjust	8506	213A	24890	613A					2	
	AT integral time adjust	8507	213B	24891	613B					2	
	AT derivative time adjust	8508	213C	24892	613C					2	
	MV Switching Point Type for AT	8541	215D	24925	615D					-	
	MV Switching Point PV for AT	8542	215E	24926	615E					Р	
	Control algorithm	8509	213D	24893	613D					_	
	Cooling Gain	6071	17B7	22455	57B7					1	
	(Reserved for future use.)	8510	213E	24894	613E		×		×	_	
	(Reserved for future use.)	8511	213F	24895	613F		×		×	_	
	(Reserved for future use.)	8512	2140	24896	6140		×		×	_	
	(Reserved for future use.)	8513	2141	24897	6141		×		×	_	
	(Reserved for future use.)	8514	2142	24898	6142		×		×	_	
	(Reserved for future use.)	8515	2143	24899	6143	\triangle	×		×	2	
	(Reserved for future use.)	8516	2145	24900	6144		×		×	2	
	(Reserved for future use.)	8517	2144	24900	6145		X		×	2	
	(Reserved for future use.)	8518	2145	24901	6146		×		×	_	
Mode	AUTO/MANUAL	9001	2140	24902	6329					_	Same as RAM address
Mode		9001	2329	23363	0329					_	14596 (decimal). Writable when not assigned to a DI, etc.
	RUN/READY	9002	232A	25386	632A					_	Same as RAM address 14595 (decimal). Writable when not assigned to a Dl.
	(Reserved for future use.)	9003	232B	25387	632B		×		×	-	Same as RAM address 14598 (decimal).
	AT start/stop selection	9004	232C	25388	632C					_	Same as RAM address 14597 (decimal). Writable when not assigned to a DI, etc.
	Auto tuning error	9126	23A6	25510	63A6					_	
	Release all DO latches	9005	232D	25389	632D					-	Writable when not assigned to a DI.

Bank	ltem	RAM a	ddress	EEPROM	address	RA	١M	EEP	ROM	Decimal	Notes
		Decimal	Hexa-	Decimal	Hexa-	Read	Write	Read	Write	point	
o		0101	decimal	25.405	decimal		×		×		C DAMA LL
Operation	PV	9101	238D	25485	638D				×	P	Same as RAM address
settings		0102	2205	25.406	6205					Р	14356 (decimal).
	SP (target value)	9102	238E	25486	638E					· ·	⁻²
	LSP group selection	9103	238F	25487	638F					-	Same as RAM address 14592 (decimal).
											Writable when not as-
											signed to a DI.*3
	(Reserved for future use.)	9104	2390	25488	6390		×		×	-	
	MV (Manipulated Variable)	9105	2391	25489	6391					1	Same as RAM address
											14594 (decimal).
											Writable in manual mod
	Heat MV (Manipulated Variable)	9106	2392	25490	6392		×		×	1	Same as RAM address
											14420 (decimal).
	Cool MV (Manipulated Variable)	9107	2393	25491	6393		×		×	1	Same as RAM address
		_					ļ				14421 (decimal).
	(Reserved for future use.)	9108	2394	25492	6394		×		×	1	Same as RAM address
											14417 (decimal).
	AT progress	9109	2395	25493	6395		×		×	-	C
	CT1 current	9110	2396	25494	6396		×		×	1	Same as RAM address
	CT2 current	9111	2397	25495	6397		×		×	1	14418 (decimal). Same as RAM address
		9111	2397	25495	0397					'	14419 (decimal).
	Timer remaining time 1	9112	2398	25496	6398		×		×	S	interio (decimal).
	Timer remaining time 2	9113	2399	25497	6399		×		×	S	
	Timer remaining time 3	9114	239A	25498	639A		×		×	S	
	Timer remaining time 4	9115	239B	25499	639B		×		×	S	
	Timer remaining time 5	9116	239C	25500	639C	İ	×		×	S	
	(Reserved for future use.)	9117	239D	25501	639D		×		×	S	
	(Reserved for future use.)	9118	239E	25502	639E		×		×	S	
	(Reserved for future use.)	9119	239F	25503	639F		×		×	S	
	Step No.	9120	23A0	25504	63A0		×		×	S	
	Step remaining time	9121	23A1	25505	63A1		×		×	S	
	Step remaining time (second)	9122	23A2	25506	63A2		×		×	S	
	LSP in use	9123	23A3	25507	63A3					Р	Same as RAM address
		_									14593 (decimal).*2
	PV (before ratio,bias,filter)	9124	23A4	25508	63A4		×	L	×	Р	
	(Reserved for future use.)	9125	23A5	25509	63A5	\triangle	×	\triangle	×	Р	

*2. If a value is read immediately after writing it to an SP or LSP that is in use, the value may not have changed yet. Values are updated after the sampling cycle time ends.

*3. If an SP or LSP that is in use is read immediately after writing the value to the LSP group selection, the value may not have changed yet. Values are updated after the sampling cycle time ends.

Bank	ltem	RAM a	ddress	EEPROM	address	RA	٩M	EEP	ROM	Decima	Notes
		Decimal	Hexa- decimal	Decimal	Hexa- decimal		Write	Read	Write	point	
Status	Input alarm status	9201	23F1	25585	63F1		×		×	_	Bit 0: RL 0 / (PV input error (over range)) Bit 1: RL 02 (PV input error (under range)) Bit 2: RL 03 (Reference junction compensation error (thermocouple) / PV input error (RTD)) Bits 3–9: Undefined Bit 10: RL // (CT input error (over range)) Bits 11–15: Undefined
	Instrument alarm status	9202	23F2	25586	63F2		×		×		Bit 0: RL ?!4 (Nonvolatile memory error) Bit 1: Undefined Bit 2: RL ?!? (A/D conversion error) Bit 3: RL ?!? (A/D conversion error) Bit 3: RL ?!? (A/D conversion error) Bit 3: RL ?!? (A/D conversion error) Bit 4: RL ?!? (Adjustment value error) Bit 5: RL ?! (Adjustment value area error) Bit 6: RL ?!? (Adjustment value area error) Bit 7: Undefined Bit 8: RL ?!? (Internal system error) Bit 9: RL ?!? (Setting value initialization error) Bits 10–11: Undefined Bit 12: RL ?!? (Nonvolatile memory not initialized) Bits 13–15: Undefined Bits 13–15: Undefined
	Internal event / internal contact func- tion status	9203	23F3	25587	63F3		×		×	_	Bits 0–4: Internal events 1–5 Bits 5–7: Undefined Bits 8-10: Internal contacts 1-3 Bits 11–15: Undefined

Bank	Item	RAM a	ddress	EEPROM	address	RA	M	EEPF	ROM	Decimal	Notes
		Decimal	Hexa- decimal	Decimal	Hexa- decimal	Read	Write	Read	Write	point	
Status	Control status	9204	23F4	25588	63F4		×		×	-	Bit 0: MANUAL mode 0: AUTO 1: MANUAL Bit 1: READY mode 0: RUN mode
											1: READY mode 1: READY mode Bit 2: Undefined Bit 3: AT is in progress Bits 4–5: Undefined Bit 6: During SP ramp Bit 7: SP ramp-up is in progres Bit 8: SP ramp-down is in progress Bits 9–12: Undefined Bit 13:
											Heating PID is in use* Bit 14: Cooling PID is in use* Bit 15: Undefined
	DO state	9205	23F5	25589	63F5		×		×	_	Same as RAM address 14337 (decimal). Bit 0: Control output 1 Bit 1: Control output 2 Bit 2: Event output 1 Bit 3: Event output 2 Bit 4: Event output 3 Bits 5–15: Undefined
	DI state	9206	23F6	25590	63F6		×		×	-	Same as RAM address 14338 (decimal). Bit 0: Dl1 Bit 1: Dl2 Bit 3: Undefined
	User-defined bit	9207	23F7	25591	63F7					-	Bit 0:User-defined bit 1 Bit 1:User-defined bit 2 Bit 2:User-defined bit 3 Bit 3:User-defined bit 4
	User-defined bit 1	9208	23F8	25592	63F8					-	
	User-defined bit 2	9209	23F9	25593	63F9					-	
	User-defined bit 3	9210	23FA	25594	63FA					-	
	User-defined bit 4	9211	23FB	25595	63FB					_	
Гад	Tag 1	9301	2455	25685	6455					_	Cannot be displayed or s on the console
	Tag 2	9302	2456	25686	6456					-	Same as above.
	Tag 3	9303	2457	25687	6457					-	Same as above.
	Tag 4	9304	2458	25688	6458					-	Same as above.
	Tag 5	9305	2459	25689	6459					-	Same as above.
	Tag 6	9306	245A	25690	645A					-	Same as above.
	Tag 7	9307	245B	25691	645B					-	Same as above.
	Tag 8	9308	245C	25692	645C					-	Same as above.
	Tag 9	9309	245D	25693	645D					_	Same as above.
	Tag 10	9310	245E	25694	645E					-	Same as above.
	Tag 11	9311	245F	25695	645F					_	Same as above.
	Tag 12	9312	2460	25696	6460					-	Same as above.
	Tag 13	9313	2461	25697	6461					_	Same as above.
	Tag 14	9314	2462	25698	6462	1				-	Same as above.
	Tag 15	9315	2463	25699	6463					_	Same as above.
	Tag 16	9316	2464	25700	6464					_	Same as above.

* Valid only if $\overset{\neg}{_{L}}\overset{\neg}{_{L}}\overset{\Box}{_{L}}$ (heat/cool control) is set to 1 (use (individual PID))

Bank	ltem	RAM a	ddress	EEPROM	address	RA	M	EEPI	ROM	Decimal	Notes
		Decimal	Hexa-	Decimal	Hexa-	Read	Write	Read	Write	point	
			decimal		decimal						
PID	Proportional band 1	12288	3000	28672	7000					1	
	Integration time 1	12289	3001	28673	7001					С	
	Derivative time 1	12290	3002	28674	7002					С	
	Manual reset 1	12291	3003	28675	7003					1	
	MV low limit 1	12292	3004	28676	7004					1	
	MV high limit 1	12293	3005	28677	7005					1	
	Cool-side proportional band 1	12336	3030	28720	7030					1	
	Cool-side integration time 1	12337	3031	28721	7031					С	
	Cool-side derivative time 1	12338	3032	28722	7032					С	
	(Reserved for future use.)	12339	3033	28723	7033	Δ	Δ	Δ	Δ	1	
	Cool-side MV low limit 1	12340	3034	28724	7034					1	
	Cool-side MV high limit 1	12341	3035	28725	7035					1	
	Proportional band 2	12294	3006	28678	7006					1	
	Integral time 2	12295	3007	28679	7007					C	
	Derivative time 2	12296	3008	28680	7008					C	
	Manual reset 2	12297	3009	28681	7009					1	
	MV low limit 2	12298	300A	28682	700A					1	
	MV high limit 2	12290	300A	28683	700A					1	
	Cool-side proportional band 2	12299	3036	28726	7036					1	
	Cool-side integration time 2	12342	3037	28720	7037					C	
	Cool-side derivative time 2	12343	3038	28728	7037					C	
	(Reserved for future use.)	12344	3038	28729	7038			Δ	Δ	1 1	
	Cool-side MV low limit 2									1	
		12346	303A 303B	28730 28731	703A 703B						
	Cool-side MV high limit 2	12347	303B	28684						1	
	Proportional band 3	12300	300C	28685	700C 700D					C	
	Integral time 3	12301	300D	28686	700D					C C	
	Derivative time 3	12302	300E		700E						
	Manual reset 3	12303		28687						1	
	MV low limit 3	12304	3010	28688	7010					1	
	MV high limit 3	12305	3011	28689	7011					1	
	Cool-side proportional band 3	12348	303C	28732	703C					1	
	Cool-side integration time 3	12349	303D	28733	703D					C	
	Cool-side derivative time 3	12350	303E	28734	703E					C	
	(Reserved for future use.)	12351	303F	28735	703F				\triangle	1	
	Cool-side MV low limit 3	12352	3040	28736	7040					1	
	Cool-side MV high limit 3	12353	3041	28737	7041					1	
	Proportional band 4	12306	3012	28690	7012					1	
	Integral time 4	12307	3013	28691	7013					С	
	Derivative time 4	12308	3014	28692	7014					С	
	Manual reset 4	12309	3015	28693	7015					1	
	MV low limit 4	12310	3016	28694	7016					1	
	MV high limit 4	12311	3017	28695	7017					1	
	Cool-side proportional band 4	12354	3042	28738	7042					1	
	Cool-side integration time 4	12355	3043	28739	7043					С	
	Cool-side derivative time 4	12356	3044	28740	7044					С	
	(Reserved for future use.)	12357	3045	28741	7045		\triangle		Δ	1	
	Cool-side MV low limit 4	12358	3046	28742	7046					1	
	Cool-side MV high limit 4	12359	3047	28743	7047					1	
	Proportional band 5	12312	3018	28696	7018					1	
	Integral time 5	12313	3019	28697	7019					С	
	Derivative time 5	12314	301A	28698	701A					С	
	Manual reset 5	12315	301B	28699	701B					1	
	MV low limit 5	12316	301C	28700	701C					1	
	MV high limit 5	12317	301D	28701	701D					1	
	Cool-side proportional band 5	12360	3048	28744	7048					1	
	Cool-side integration time 5	12361	3049	28745	7049					С	
	Cool-side derivative time 5	12362	304A	28746	704A					С	
	(Reserved for future use.)	12363	304B	28747	704B		\triangle	Δ	\triangle	1	

Bank	Item	RAM a	ddress	EEPRON	address	RA	M	EEP	ROM	Decimal point	Notes
		Decimal	Hexa- decimal	Decimal	Hexa- decimal	Read	Write	Read	Write		
PID	Cool-side MV low limit 5	12364	304C	28748	704C					1	
	Cool-side MV high limit 5	12365	304D	28749	704D					1	
	Proportional band 6	12318	301E	28702	701E					1	
	Integral time 6	12319	301E	28703	701E					C	
	Derivative time 6	12320	3020	28704	7020					C	
	Manual reset 6	12321	3021	28705	7021					1	
	MV low limit 6	12322	3022	28706	7022					1	
	MV high limit 6	12323	3023	28707	7023					1	
	Cool-side proportional band 6	12366	304E	28750	704E					1	
	Cool-side integration time 6	12367	304F	28751	704F					C	
	Cool-side derivative time 6	12368	3050	28752	7050					C	
	(Reserved for future use.)	12369	3051	28753	7051					1	
	Cool-side MV low limit 6	12370	3052	28754	7052					1	
	Cool-side MV high limit 6	12370	3053	28755	7052					1	
	Proportional band 7	12371	3033	28708	7033					1	
	Integration time 7	12324	3024	28708	7024					C	
	Derivative time 7	12323	3025	28710	7025	<u> </u>				C	
	Manual reset 7	12320	3020	28710	7020					1	
	Manual reset 7	12327	3027	28711	7027					1	
	MV high limit 7	12328	3028	28712	7028					1	
			3029							1	
	Cool-side proportional band 7	12372	3054	28756 28757	7054 7055					C	
	Cool-side integration time 7	12373								C	
	Cool-side derivative time 7	12374	3056	28758	7056			_			
	(Reserved for future use.)	12375	3057	28759	7057			Δ		1	
	Cool-side MV low limit 7	12376	3058	28760	7058					1	
	Cool-side MV high limit 7	12377	3059	28761	7059					1	
	Proportional band 8	12330	302A	28714	702A					1	
	Integration time 8	12331	302B	28715	702B					C	
	Derivative time 8	12332	302C	28716	702C					С	
	Manual reset 8	12333	302D	28717	702D					1	
	MV low limit 8	12334	302E	28718	702E					1	
	MV high limit 8	12335	302F	28719	702F					1	
	Cool-side proportional band 8	12378	305A	28762	705A					1	
	Cool-side integration time 8	12379	305B	28763	705B					С	
	Cool-side derivative time 8	12380	305C	28764	705C					С	
	(Reserved for future use.)	12381	305D	28765	705D	Δ		Δ	Δ	1	
	Cool-side MV low limit 8	12382	305E	28766	705E					1	
	Cool-side MV high limit 8	12383	305F	28767	705F					1	
vent	Internal event 1 main setting	13056	3300	29440	7300					S	
	Internal event 1 sub-setting	13057	3301	29441	7301					S	
	Internal event 2 main setting	13058	3302	29442	7302					S	
	Internal event 2 sub-setting	13059	3303	29443	7303					S	
	Internal event 3 main setting	13060	3304	29444	7304					S	
	Internal event 3 sub-setting	13061	3305	29445	7305	L				S	
	Internal event 4 main setting	13062	3306	29446	7306		<u> </u>			S	
	Internal event 4 sub-setting	13063	3307	29447	7307					S	
	Internal event 5 main setting	13064	3308	29448	7308					S	
	Internal event 5 sub-setting	13065	3309	29449	7309					S	
SP	LSP1	13312	3400	29696	7400					Р	
	LSP2	13313	3401	29697	7401					Р	
	LSP3	13314	3402	29698	7402					Р	
	LSP4	13315	3403	29699	7403					Р	
	LSP5	13316	3404	29700	7404					Р	
	LSP6	13317	3405	29701	7405					Р	
	LSP7	13318	3406	29702	7406					Р	
	LSP8	13319	3407	29703	7407					Р	

Bank	ltem	RAM a	RAM address		EEPROM address		RAM		EEPROM		Notes
		Decimal	Hexa-	Decimal	Hexa-	Read	Write	Read	Write	point	
			decimal		decimal						
Instru- ment status 1	Representative alarm	14336	3800	30720	7800		×		×	_	Bit 0: PV error Bit 1: Undefined Bit 2: CT error (AL11) Bits 3–7: Undefined Bit 8: Initialization error (AL80/83/84) Bits 9–11: Undefined Bit 12: A/D conversion error (AL70) Bit 13: Setting value error (AL81/95) Bit 14: Adjustment value error (AL82/96)
	DO state	14337	3801	30721	7801		×		×	-	Bit 15: Undefined Same as RAM address 920: (decimal).
	DI state	14338	3802	30722	7802		×		×	-	Same as RAM address 9206 (decimal).
Instru-	RUN/READY	14352	3810	30736	7810		×		×	_	
ment	AUTO/MANUAL	14353	3811	30737	7811		×		×	_	
status 2	AT start/stop selection	14354	3812	30738	7812		×		×	_	
	(Reserved for future use.)	14355	3813	30739	7813		×		×	-	
	PV	14356	3814	30740	7814		×		×	Р	
	SP (target value)	14357	3815	30741	7815		×		×	Р	
	MV (Manipulated Variable)	14358	3816	30742	7816		×		×	1	
Instru- ment	(Reserved for future use.)	14416	3850	30800	7850		×		×	Р	Same as RAM address 700 [°] (decimal).
status 3	(Reserved for future use.)	14417	3851	30801	7851		×	Δ	×	1	Same as RAM address 910 (decimal).
	CT1 current	14418	3852	30802	7852		×		×	1	Same as RAM address 911 (decimal).
	CT2 current	14419	3853	30803	7853		×		×	1	Same as RAM address 911 (decimal).
	Heat MV (Manipulated Variable)	14420	3854	30804	7854		×		×	1	Same as RAM address 910 (decimal).
	Cool MV (Manipulated Variable)	14421	3855	30805	7855		×		×	1	Same as RAM address 910 (decimal).

Bank	ltem	RAM a	ddress	EEPROM address		RAM		EEPROM		Decimal	Notes
		Decimal	Hexa- decimal	Decimal	Hexa- decimal	Read	Write	Read	Write	point	nt
Operation	LSP group selection	14592	3900	30976	7900					-	Writable when not assigned to a Dl. Same as RAM address 9103 (decimal).
	LSP in use	14593	3901	30977	7901					Р	Same as RAM address 9123 (decimal).
	Manual MV	14594	3902	30978	7902					1	Writable in manual mode Same as RAM address 9105 (decimal).
	RUN/READY	14595	3903	30979	7903					-	Writable when not assigned to a Dl. Same as RAM address 9002 (decimal).
	AUTO/MANUAL	14596	3904	30980	7904					_	Writable when not assigned to a DI, etc. Same as RAM address 9001 (decimal).
	AT start/stop selection	14597	3905	30981	7905					-	Writable when not assigned to a DI, etc. Same as RAM address 9004 (decimal).
	(Reserved for future use.)	14598	3906	30982	7906		×	Δ	×	-	Same as RAM address 9003 (decimal).
PID group	Proportional band	14848	3A00	31232	7A00					1	
in use	Integration time	14849	3A01	31233	7A01					С	
	Derivative time	14850	3A02	31234	7A02					С	
	Manual reset	14851	3A03	31235	7A03					1	
	MV low limit	14852	3A04	31236	7A04					1	
	MV high limit	14853	3A05	31237	7A05					1	
	Cool-side proportional band	14854	3A06	31238	7A06					1	
	Cool-side integration time	14855	3A07	31239	7A07					С	
	Cool-side derivative time	14856	3A08	31240	7A08					С	
	(Reserved for future use.)	14857	3A09	31241	7A09		\triangle	Δ	\triangle	1	
	Cool-side MV low limit	14858	3A0A	31242	7A0A					1	
	Cool-side MV high limit	14859	3A0B	31243	7A0B					1	

Chapter 11. Maintenance and Troubleshooting

To remove dirt from this device, wipe it with a soft dry cloth.

Never use an organic solvent such as paint thinner or benzene, or a detergent.

Do not use this device in wet places or with wet hands.

There is a danger of electric shock.

Maintenance

Cleaning

To remove dirt from this device, wipe it with a soft dry cloth.

Never use an organic solvent such as thinner or benzene.

• Parts replacement

Do not replace any parts of this unit.

Fuse replacement

When replacing the fuse connected to the electric wiring, always use the specified standard fuse.

Standards compliance: IEC 60127

Speed: time-lag (T)

Rated voltage: 250 V AC

Rated current: 0.5 A

Alarm codes and countermeasures

This section describes the alarm codes that are displayed if this device has errors, and also describes countermeasures. If any of the following abnormalities occur in the instrument, the control function of this device will stop.

	Alarm code ^{*1}	Description	Cause	Corrective action
	ALO I	PV input error (over	Sensor burnout, incorrect wiring	Check the wiring.
		range)	Incorrect settings for PV range type, etc.	Check the PV range type (C01) and other settings.
	RLO2	PV input error (under	Sensor burnout, incorrect wiring	Check the wiring.
		range)	Incorrect settings for PV range type, etc.	Check the PV range type (C01) and other settings.
Input error	ALO3	Reference junction compensation (cold junction compensation) error	Measurement range error in terminal temperature at reference junction compensation	Make sure that the ambient temperature is within the specifications of this product.
rror		RTD input error	Sensor burnout, incorrect wiring	Check the wiring.
	AL II	CT input error (over range) ^{*2}	Current input exceeding the high limit of the display range	Use a current transformer with a number of turns that matches the display range.
				Check the number of CT turns and the setting.
				Check the setting and the number of times the power wire passes through the CT.
			Incorrect wiring	Check the wiring.
	RL 10	A/D conversion error	A/D conversion unit failure	Turn the power off and then on again.
	RL 74	Nonvolatile memory error	Temporary communication error, corruption of data written, or	If the alarm is triggered when the power is turned on again, replace the device.
	AL80	Nonvolatile memory not initialized	failure of this device	tumed on again, replace the device.
	ALB I	Setting value area error*3		
	8L82	Adjustment value area error ^{*3}		
	AL83	Internal system error		
_	ALBY	Setting value initialization error		Turn the power off and then on again.
Instrument e	AL95	Setting value error		If the alarm is triggered after turning the power on again, the problem can be corrected with the following procedure:
				Initialize the set point
rrors				Write the setting again
				If this procedure does not correct the problem, replace the device.
	AL96	Adjustment value error		Turn the power off and then on again.
				If the alarm is triggered after turning the power on again, the problem can be corrected with the following procedure:
				 Restore the adjusted value^{*4}
				If this procedure does not correct the problem, replace the device.

- *1. Multiple alarms may occur at the same time. If the corrective action for one of the alarms says that the device should be replaced, it should be replaced.
- *2. The error occurred because of CT input 1, 2, or both.
- *3. This error may occur when updating the firmware.

÷

*4. If the area in memory for restoring the adjustment value has been corrupted, the value cannot be restored.

Operation when a PV input error occurs

If a PV input error occurs, this device will operate as follows.

Control output: Whether to continue operation can be specified.

Other operations: Operation continues.

If the PV input is abnormal, this device displays the alarm codes and values shown in the tables below. What is displayed varies depending on the sensor type.

Thermocouple

Error	Range No.	Indication	Alarm code
Sensor burnout		Upscale (110 % FS)	ALC I
Reference junction compensation (cold junction compensation) error		PV with incorrect cold contact compensation	ALO3

• Resistance temperature detector (RTD)

Error	Range No.	Indication	Alarm code
Resistor burnout		Upscale (110 % FS)	ALD I
Line A burnout		Upscale (110 % FS)	ALD I
Line B burnout		Upscale (110 % FS)	ALO I, ALO3
2- or 3-wire burnout		Upscale (110 % FS)	ALO I, ALO3
Short circuit, lines A and B		Downscale (–10 % FS)	RL02
Short circuit, lines A	41 (Pt100)	–235 °C (–5 % FS)/–235 °F	ALO2
and B	42 (JPt100)	–235 °C (–5 % FS)/–235 °F	ALO2
	43 (Pt100)	–235 °C (–9 % FS)/–235 °F	ALO2
	44 (JPt100)	–235 °C (–9 % FS)/–235 °F	ALO2

! Handling Precautions

• If the temperature unit is Fahrenheit, a PV low limit alarm (RLD2) is generated at -235 °F, which is within the PV range, for PV ranges 41-44.

• DC voltage/current

Error	Range No.	Indication	Alarm code
Burnout	84 (0–1 V)	Downscale (–3 % FS)	ALO2
	86 (1–5 V)	Downscale (–10 % FS)	ALO2
	87 (0–5 V)	Downscale (–3 % FS)	ALO2
	88 (0–10 V)	Downscale (0 % FS)	None
	89 (0–20 mA)	Unknown (around 0 % FS)	None
	90 (4–20 mA)	Downscale (–10 % FS)	ALO2

■ If an error occurs in communication with model SLP-C1F

When this device is communicating with a PC running SLP-C1F that is connected using the model 81441177-001 USB loader cable or the model SLP-ULCJA0 USB loader cable (A to micro-B), reading or writing may fail. In this case, unplug the USB loader cable from the PC's USB connector, wait at least 10 seconds, and then plug it in again.

Chapter 12. Calibration and Inspection

Do not switch to calibration/inspection mode while the object of control is in operation.

When this device is in calibration/inspection mode, the state of control outputs and event outputs is fixed and these outputs do not function. Take this into consideration when calibrating or inspecting.

! Handling Precautions

 It may be necessary to disconnect or reconnect the wiring for calibration and inspection.
 In this case, follow the warnings and cautions regarding wiring given in Chapter 4. Wiring.

The user can calibrate and inspect the input and output functions of this device.

The following are available:

- I/O inspection (external contact input, control output and event output, key input)
- PV input calibration
- Current output calibration
- CT input calibration

Use the SLP-C1F Smart Loader Package for calibration and inspection.

Starting calibration and inspection

Start the SLP-C1F Smart Loader Package to display the menu screen. Select [Menu] \rightarrow [Calibration and checking] from the pull down menu. A dialog box saying "Calibrate" will be displayed.

When [OK] is selected, the calibration and checking screen is displayed and this device enters calibration/inspection mode.

When this device is in this mode, the lower display says EESE.

Handling Precautions

- Azbil Corporation will not be liable for problems caused by incorrect calibration or checking by the user.
- To restore the settings when the product was shipped during calibration or checking:

If you select [Command] \rightarrow [Restore adjustment values] from the pulldown menu, any current calibration settings will be discarded and the settings when the product was shipped will be restored. If you accidentally execute this command during calibration or checking, all the current calibration data will be lost.

Ending calibration and inspection

To end calibration or inspection, do either one of the following.

- On the calibration and checking screen of the Smart Loader Package, select [File]
 → [Quit] from the pull-down menu.
- When you click the [x] icon in the upper right corner of the calibration and checking screen, EESE disappears and the device returns to normal mode.

! Handling Precautions

• If you disconnect the loader cable before completing calibration or inspection with the Smart Loader Package, this device will remain in calibration/inspection mode. To return this device to normal mode, turn the power off and then on.

Precautions for calibration

Failure to observe the following precautions will lead to poor accuracy.

- When calibrating the RTD input, use wires of the same type and length for the three wires.
- Power this device for at least 1 hour before starting calibration.
- Calibrate this device within the ambient temperature range specified by the standard conditions.
- Do not calibrate this device where it is exposed to wind or in a fluctuating ambient temperature.
- Do not calibrate with instruments or conditions that do not satisfy the specifications shown in Measuring instruments required for calibration (p. 12-2) below.

Measuring instruments required for calibration

Measuring instrument	Specifications
Reference current/ voltage generator	Accuracy: ± 0.025 % or less, minimum resolution (voltage): 1 uV or less, minimum resolution (current): 1 μ A or less
Resistor	Accuracy: ± 0.025 % or less, minimum resolution: 0.1 Ω or less
Ammeter	Accuracy: ± 0.05 % or less, minimum resolution: 1 μ A or less
Voltmeter	Accuracy: ±0.025 % or less, minimum resolution: 1 μV or less
Thermometer	Accuracy: ±0.1 °C or less, minimum resolution: 0.1 °C or less

Calibration and checking procedure

Inspection of I/Os

- (1) Select the [I/O check] tab.
- (2) Select the desired item to check.
- (3) Press [Execute].

For inputs (external contact input, key input), the status (ON/OFF) retained by this device is loaded and displayed on the PC.

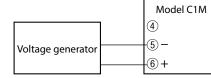
For outputs (control output, event output), the status (ON/OFF) selected by the checkbox is output from the output terminals of this device.

• PV input calibration

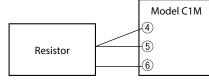
- (1) Select the [PV Calibration] tab.
- (2) Select a gain No. in ascending order.
- (3) Press [Read].
- (4) Apply the voltage, current, or resistance indicated on the right of the gain No. to the PV input terminals.

Before application, connect this device to the measuring instrument as follows.

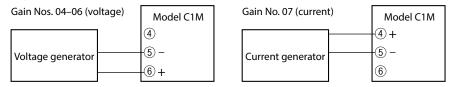
• If T (thermocouple) is selected as the PV input type by the model No. (digit **7**):



• If R (RTD) is selected as the PV input type by the model No. (digit **1**):



If L (DC voltage/current) is selected as the PV input type by the model No. (digit ⁽¹⁾):



- (5) Keep applying the voltage, current or resistance for 30 seconds or longer.
- (6) Press [Write].
- (7) Return to step 3 and repeat the procedure until the calibration of the last gain is completed.

! Handling Precautions

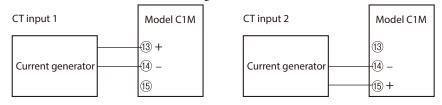
- When calibrating the PV input, be sure to adjust all gains according to the model that is used.
- Warm up this device from power-on to the start of calibration.
- Connect external instruments for adjustment before starting warm-up to achieve the following input statuses:

• Thermocouple:	0 mV input
· RTD:	100 Ω input
• Voltage:	0 mV input
· Current:	0 mA input

• Do not leave the PV input terminals open during warm-up.

Current transformer (CT) input calibration

- (1) Select the [CT Input Calibration] tab.
- (2) Select the channel to calibrate.
- (3) Select [Zero] in the [Zero/Span] field. Both zero and span should be calibrated for one channel. Therefore, after selecting a channel, first calibrate zero and then span.
- (4) Press [Read].
- (5) Keep applying the zero calibration current to the CT input terminals of the selected channel for 30 seconds or longer. Before application of current, connect this device to the measuring instrument as shown.



- (6) Press [Write].
- (7) Select [Span] in the [Zero/Span] field.
- (8) Press [Read].
- (9) Keep applying the span calibration current to the CT input terminals of the selected channel for 30 seconds or longer.
- (10) Press [Write].
- (11) If there are other channels to calibrate, return to step 4.

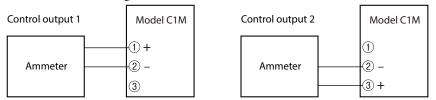
Handling Precautions

• When calibrating the CT input, apply a DC current (mA) to the input terminals.

• Current output calibration

- (1) Select the [Analog Output Calibration] tab.
- (2) Select the channel to calibrate.Control output 1 is indicated as "OUT1" and control output 2 is "OUT2."
- (3) Select [Zero] in the [Zero/Span] field.Both zero and span should be calibrated for one channel. Therefore, after selecting a channel, first calibrate zero and then span.
- (4) Press [Read].
- (5) The zero calibration current is output to the output terminal of the selected channel.

Keep this state for 30 seconds or longer. The figures below illustrate how to connect the measuring instrument.



- (6) Check the current indicated by the ammeter to the 3rd digit after the decimal point, enter it in [Adjustment value], and press [Write].
- (7) Select [Span] in the [Zero/Span] field.
- (8) Press [Read].
- (9) The span calibration current is output to the output terminal of the selected channel.

Keep this state for 30 seconds or longer.

- (10) Check the current indicated by the ammeter to the 3rd digit after the decimal point, enter it in [Adjustment value], and press [Write].
- (11) If there are other channels to calibrate, return to step 4.

Chapter 13. Disposal

Disposal of Electrical and Electronic Equipment (for Environmental Protection)

This is an industrial product subject to the WEEE Directive.

Do not dispose of electrical and electronic equipment in the same way as household waste.

Old products contain valuable raw materials and must be returned to an authorized collection point for correct disposal or recycling.



Chapter 14. Specifications

Specifications

• PV input (selectable by model No.)

ltem		Description
Number of inputs		1
Sampling cycle		50, 100, 300, 500 ms
Thern	nocouple input	
	Thermocouple type	K, J, E, T, R, S, B, N (JIS C 1602: 2015) PLII, PR40-20 (ASTM E1751/E1751M-20) WRe5-26 (ASTM E988-96 (Reapproved 2002) JIS C 1602:2015 (C thermocouple)) DIN U, DIN L (DIN 43710:1985)
	Indication accuracy (under standard conditions)	± 0.3 % FS ± 1 digit (excluding the reference junction compensation point) (Negative range: ± 0.6 % FS ± 1 digit. Other exceptions: see the PV input range table)
	Reference junction compensation (cold junction compensation) accuracy	\pm 0.5 °C (under standard conditions) (For every 1 °C outside the temperature range of the standard conditions, the accuracy decreases by \pm 0.05 °C.)
	Reference junction (cold junction) compensation method	Select "0" (internal compensation (by this device) or "1" (external compensation (by another device)).
	Allowable input*	–0.5 to +12 V
	Input bias current	+0.2 μA max. (under standard conditions)
	Thermocouple/ compensating lead wire diameter	0.3 to 0.65 mm
	Operation upon input wire burnout	C Operation when a PV input error occurs (p. 11-4)
RTD		
	RTD type	Pt100 (JIS C 1604:2013) JPt100 (JIS C 1604:1989)
	Indication accuracy (under standard conditions)	±0.2 % FS ±1 digit
	Allowable input*	-0.5 to +12 V
	Measuring current	1 mA (typical), from terminals 5 and 6
	Wiring resistance effect	±0.05 % FS/Ω max.
	Allowable wiring resistance	85 Ω max.
	Operation upon input wire burnout	Operation when a PV input error occurs (p. 11-4)
DC vo	bltage	
	DC voltage type	0–1 V 1–5 V 0–5 V 0–10 V
	Indication accuracy (under standard conditions)	±0.2 % FS ±1 digit
	Allowable input*	–0.5 to +12 V
	Input impedance	1 MΩ min.
	Operation upon input wire burnout	C Operation when a PV input error occurs (p. 11-4)

ltem		Description	
DC cu	DC current		
	DC current type	0–20 mA 4–20 mA	
	Indication accuracy (under standard conditions)	±0.2 % FS ±1 digit	
	Allowable input*	30 mA or less, or 4 V or less	
	Input impedance	100 Ω max. (with 20 mA input)	
	Operation upon input wire burnout	Operation when a PV input error occurs (p. 11-4)	

* A voltage or current input greater than the allowable input may damage the circuits.

• Digital input (DI1-2) (optional)

ltem	Description
Number of inputs	2
Input type	Non-voltage contacts or open collector
Allowable ON contact resistance	250 Ω max.
Allowable OFF contact resistance	100 kΩ min.
Allowable ON residual voltage	1.0 V max.
Terminal current while ON	Approx. 7.5 mA (when shorted) / approx. 5.0 mA (at a contact resistance of 250 Ω)
Minimum hold time	Sampling cycle + 10 ms
Open terminal voltage	5.5 V DC ±1 V
Parallel connection circuit voltage	24 V DC max.

• Current transformer inputs (CT1-2) (optional)

ltem	Description
Number of inputs	2
Measurement method	RMS
Input object	Current transformer with 100–4000 turns (availability is in 100-turn units)
Measurement current	0.4–50.0 A AC, 50/60 Hz (800 turns, 1 power wire pass)
Allowable measured current	0.0–70.0 A AC and peak current 110 A (800 turns, 1 power wire pass)
Indication accuracy (under standard conditions)	\pm 5 % FS \pm 1 digit (not including accuracy of current transformer in the case of sine waves)
Indication resolution	0.1 A AC
Indication update cycle	100 ms
Allowable input current	0.0–100 mA AC, peak current: 141.4 mA (at the CT input terminals of this device)
Transient overvoltage	Supply voltage + 250 V
Precautions when using a CT	Do not use CT input for phase control.

• Control output (selectable by model No.)

ltem	Description	
Relay output		
Contact configuration	1c (SPDT)	
Contact rating	250 V AC / 30 V DC, 3 A (resistive load)	
Service life	N.O. side: 100,000 cycles or more N.C. side: 100,000 cycles or more	
Minimum switching specifications (reference value)	5 V, 100 mA	
Minimum open/close time	50 ms	
Voltage pulse output (for SSR drive)		
Voltage when open	19 V DC ±15 %	
Internal resistance	18 Ω	
Allowable current	24 mA max	
OFF-state leak current	100 μA max.	
Short-circuit protection function	Yes	
Minimum OFF/ON time	1 ms	
Current output		
Output type	0–20 mA DC or 4–20 mA DC	
Allowable load resistance	600 Ω max.	
Output accuracy (under	±0.3 % FS	
standard conditions)	However, ±1 % FS at 0–1 mA	
Output resolution	1/12500 (at 0–20 mA DC), 1/10000 (at 4–20 mA DC)	
Output update cycle	Same as sampling cycle	

● Event relay (EV1–3) (optional)

ltem	Description
Number of outputs	3 (for models with 3 EV outputs) 2 (for models with 2 EV outputs with independent contacts)
Contact configuration	1a (SPST)
Contact rating	250 V AC / 30 V DC, 2 A (resistive load)
Service life	100,000 cycles or more
Minimum switching specifications (reference value)	5 V, 10 mA
Minimum open/close time	50 ms

• Loader communication

Item	Description
Cables	Dedicated USB loader cable (included with models SLP-C1FJA0 and SLP-C1FJA3)

RS-485 communication (optional)

ltem	Description
Transmission line	3-wire system
Transmission speed	4800, 9600, 19200, 38400 bps
Data length	8 bits / 7 bits
Parity bit	Even parity, odd parity, no parity
Stop bits	1 or 2
Communication protocol	Host communication: compliant with CPL, Modbus™/RTU, Modbus/ASCII, or PLC link
Terminating resistor	External resistor (120 Ω , 1/2 W or more) recommended
Network	Multidrop (up to 31 slave stations for 1 host station)
Communications/synchronization type	Half-duplex, start-stop synchronization
Maximum cable length	500 m

I/O Isolation

Items enclosed by solid lines are isolated from other signals. The presence or absence of input/output depends on the model. Thick solid lines indicate reinforced insulation.

Power		Event outputs 1–3
DIs 1–2 RS-485 communication	Internal circuits	* On models with independent contacts, event outputs 1 and 2 have reinforced insulation.
CT inputs 1–2		Control output 1 (relay)
PV input Loader communication		Control outputs 1–2 (voltage pulse, current)

• Standard conditions

ltem	Description
Ambient temperature	$25 \pm 3 \degree$ C (provided there is a space of 2 cm below the product)
Ambient humidity	60 ±5 % RH (without condensation or freezing)
Power	105 V AC ±10 %
Power frequency	50/60 Hz ±1 Hz
Vibration	0 m/s ²
Shock	0 m/s ²
Mounting angle	Reference plane ±3°

• Operating conditions

ltem	Description
Ambient temperature	–10 to +55 °C for independent mounting
Ambient humidity	10–85 % RH (without condensation or freezing)
Power	85–264 V AC, 50/60 Hz ±2 Hz (Rated power: 100–240 V AC, 50/60 Hz)
Vibration	0–5 m/s ² (10–60 Hz for 2 h each in the X, Y, and Z directions)
Shock	0–100 m/s ²
Mounting angle	Reference plane ±10°

• Transport and storage conditions

ltem	Description
Ambient temperature	-20 to +70 °C
Ambient humidity	10–85 % RH (without condensation or freezing, protected from humidity and dust)
Vibration	0–10 m/s ² (10–60 Hz for 2 h each in the X, Y, and Z directions)
Shock	0–300 m/s ² (vertically 3 times)
Drop test	Drop height 60 cm (free fall on 1 corner, 3 edges, 6 sides)

• Other specifications

ltem		D	escription	
Protection class	(only w	IP66 (device front side) (only when individually mounted in a panel using the included gasket)		
Nonvolatile memory	EEPRON	EEPROM (durability: 100,000 erase/write cycles)		
Power consumption	8 VA or	8 VA or less (6 VA at 100 V AC, 8 VA at 264 V AC)		
Allowable transient power loss	20 ms n	20 ms max.		
Elevation	2000 m	2000 m max.		
Mass		Approx. 130 g (for panel mounting: including the supplied mounting bracket, model No. 84515488-001)		
Terminal screw tightening torque	0.6 ±0.1	N∙m		
Legal control/authentication		Law/ directive	Certificate/ file No., etc.	Notes
	CE	LVD		EN 61010-1
	CE	EMC*		EN 61326-1 (For use in industrial locations)
	CE	RoHS		EN IEC63000
	UKCA	LVD		EN 61010-1
	UKCA	EMC*		EN 61326-1 (For use in industrial locations)
	UKCA	RoHS		EN IEC63000
	КС	Korean Radio Act	R-R- A2B-A146	
Overvoltage category	II (IEC 6	0364-4-443, l	EC 60664-1)	
Allowable pollution degree	2			
Insulation resistance	20 MΩ min. (Power terminals, and between power terminals and isolated I/O terminals) (with a 500 V DC insulation resistance tester)			
Dielectric strength		1500 V AC for 1 minute		
Power-on inrush current	18 A ma	18 A max. / 1.5 ms max.		
Case material/color	Modified PPE/black			
Protective sheet material/color	Polyester film/black			

 * During EMC testing, the indication or output may fluctuate by the equivalent of ± 10 % FS.

Appendix

ROM version history

This section describes added functions and changes to specifications for each ROM version.

- ROM version 1.01 (available from January 2023)
 - New function
- Added the password function.
 Password (p. 5-104)
- (2) Added the event remaining time display function.Event remaining time display setup (p. 5-97)

• Functional improvement

- (1) Even if PLC link communication is enabled by the SLP, if the setting for [Communication type] is anything other than "3" (PLC link), PLC link communication will not work.
 Common settings (p. 9-19)
- (2) Changed the conditions for displaying the [Control action (direct/reverse)] setting.
 Setup bank (p. 6-19)
- (3) Changed the display transition using keys when [Bit 1: SP] of [PV/SP display setup] is set to "0" (No).
 C→ PV/SP display setup (p. 5-95)

Program modification

- If a timeout, C1M error, or PLC error occurs during cyclic or triggered data transfer from the PLC to the C1M in PLC link communication, C1M parameters will not be updated.
 Transfer settings (p. 9-20)
- (2) Improved the latch operation when output assignments A–D are set to "14" (MV ON/OFF status 1) or "15" (MV ON/OFF status 2).
 C→ Latch (p. 5-74)

• ROM version 1.00 (available from January 2022)

- New function
- (1) New release
- Functional improvement

(None)

Program modification

(None)

Description of used symbols, terms, and abbreviations

Abbreviations are used in the descriptions, tables, and illustrations of this manual. The main abbreviations are explained below.

Information such as detailed meanings as well as other abbreviations and words can be found on the website of Azbil Corporation.

https://www.compoclub.com/products/knowledge/word/index.html

 Symbol % FS (% of full scale)

Full scale error

The full scale is the input range of a controller or recorder. The control or display accuracy of a device that has a specified measurement range setting for temperature, flow rate, etc., is expressed with this term. The range of error is obtained by multiplying the range specified for the device by this percentage.

• A

AT (auto-tuning)

A function to automatically calculate the optimum value of the PID control parameters (P, I, D).

• C

CJ (cold junction)

Cold junction compensation

A reference junction compensation in which the temperature of the reference junction is set to 0 °C.

CPL (Controller Peripheral Link)

CPL communication, CPL communication protocol

A type of communication, or a communication protocol, that can be used with Azbil's controllers, etc. Used to connect to a device and read and write its internal data.

CT (current transformer)

Used to detect the current applied to a heater. Heater burnout, relay short circuit, etc., can be monitored.

• D

D (derivative)

D action (derivative action)

A control action that gives a controlled variable proportional to the speed at which the process value deviates from the set point. It makes a large correction while the deviation is small. It is not used alone but works in combination with P or PI action.

DI (digital input)	
	External contact input
	Used to switch remote/local, multiple SPs, auto/manual, etc., of controllers, etc.
DO (digital output)	
	External output
	An ON/OFF signal is output to external devices from control output terminals, relay terminals, and event output terminals.
● E EV (event)	
	Event output
	A function of a controller or recorder that determines process (PV) abnormalities, etc., independently from the main control. A function to output abnormalities as alarms is also expressed as EV. Used with PV high/low limit alarm, deviation high/low limit alarm, etc. It is also possible to output the mode of a device (ready, manual, etc).
● I	
l (integral)	
	I action (integral action)
	A control action in which the amount of change in correction is proportional to the integrated value of the deviation. When an offset occurs, integral action works to eliminate the offset by changing the manipulated variable. I action is not used alone, but always with proportional action.
L LSP (local set point)	
	Local SP
	The SP stored in the device. For the C1M, LSP has the same meaning as SP.
● M Motor feedback (MFB)
	Motor opening
	The opening signal sent from the motor controlled by a controller. The C1M does not have an MFB function.
MV (manipulated vari	iable)
	A signal sent to an actuator. It is also called "control output."

O OH (output high limit)

MV high limit

The highest MV allowed. It can be set for normal control output, control output for cooling, control output during AT, etc.

OL (output low limit)

MV low limit

The lowest MV allowed. It can be set for normal control output, control output for cooling, control output during AT, etc.

• P

P (proportional)

P action (proportional action)

Proportional control A control method in which the amount of correction is proportional to the amount of deviation. The range of the controlled variable to be corrected is called the proportional band. When only P action is used for control, an offset occurs in which the controlled variable becomes stable at a value equal to or less than the set point.

PID (proportional, integral, and derivative)

PID control

A control method that uses proportional, integral, and derivative actions.

PLC (programmable logic controller)

Programmable controller

A sequencer.

PV (process value)

Present value

Present value, measured value, detected value

• R

RJ (reference junction)

Reference junction compensation

A thermocouple has two junctions for the purpose of temperature measurement, one at the object being measured and the other connected to the measuring instrument. The junction connected to the measuring instrument is called the reference junction.

RSP (remote set point)

Remote SP

An SP sent from an external device. The C1M does not have an RSP function.

RTD (resistance temperature detector)

An RTD consists of a resistance element composed of unshielded wires made from a material such as platinum, internal lead wires, a protective tube, terminals, etc. It measures temperature by utilizing the fact that the electrical resistance of the resistance element changes with temperature. The operating temperature range is -200 to +500 °C for platinum resistance temperature detectors.

• S

SCR (silicon controlled rectifier)

A thyristor (power regulator).

It is composed of semiconductor element transistors and is used for heater control in combination with a controller that continuously outputs a current signal for proportional control.

SLP (Smart Loader Package)

Application software that runs on a computer and facilitates configuration and monitoring of Azbil controllers.

SP (set point)

The target value

A set point specified by controllers, etc. It is also called the SV (set value).

SSR (solid-state relay)

Used for heater control in combination with a controller that outputs voltage pulses.

ST (self-tuning)

A function that automatically sets PID values when the set point is changed or a disturbance occurs. Unlike auto-tuning, the controller determines when to activate this function.

• Т

T/C (thermocouple)

Used for temperature measurement. For the purpose of generating thermoelectromotive force, one end of two kinds of metal wires is electrically connected. The combinations of metals in commonly used thermocouples include platinum–platinum rhodium (R thermocouple), alumel-chromel (K thermocouple), iron-constantan (J thermocouple), and copper-constantan (T thermocouple).

● U U (unit)

The smallest unit of an industrial quantity (°C, Pa, L/min, etc.) of a PV range. For a range of -200 to +200 °C, 1 U = 1 °C. For 0.0 to 200.0 °C, 1 U = 0.1 °C.

For DC voltage input with a scaling of 0.00 to 10.00, 1 U = 0.01. 0.1 U is one tenth of 1 U.

UF (user function)

User-defined function

A function for displaying settings and monitoring data specified by the user in the operation display of a controller. Up to 8 items can be specified.

-MEMO-

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Revision History of CP-SP-1448E

Date	Rev.	(New) Page No.	Description	
June 2022	1			
Nov. 2023	2	v	Added CAUTION	
		vi	Changed descripions	
		D-6	Changed Item and Contents	
		3-3	Changed Handling Precautions	
		4-2, 4-3	Changed Symbols used in the terminal wiring label and Wiring precautions	
		5-30	Changed Handling Precautions	
		5-49	Changed words	
		5-75	Added descriptions	
		5-91	Changed Number of CT turns / number of CT power wire passes	
		5-92	Changed Handling Precautions	
		5-97	Added Handling Precautions	
		5-104	Added Handling Precautions	
		6-24	Changed Item	
		7-18	Changed Communication program example	
		9-1	Added descriptions and changed Supported PLC protocol	
		9-6, 9-7, 9-8	Deleted Connectible PLCs and changed Usable devices	
		9-12-9-18	Changed PLC Link Setup	
		9-19	Added Handling Precautions	
		10-1	Added Decimal point information	
		10-4	Changed Item	
		10-10	Changed *2 and *3	
		11-5	Added If an error occurs in communication with model SLP-C1F	
		12-2 12-4	Changed descriptions	
		12-4 14-1-14-6	Changed Handling Precautions Changed Specifications	
		App-1-App-6	Added ROM version and changed styles	

Terms and Conditions

We would like to express our appreciation for your purchase and use of Azbil Corporation's products.

You are required to acknowledge and agree upon the following terms and conditions for your purchase of Azbil Corporation's products (system products, field instruments, control valves, and control products), unless otherwise stated in any separate document, including, without limitation, estimation sheets, written agreements, catalogs, specifications and instruction manuals.

1. Warranty period and warranty scope

1.1 Warranty period

Azbil Corporation's products shall be warranted for one (1) year from the date of your purchase of the said products or the delivery of the said products to a place designated by you.

1.2 Warranty scope

In the event that Azbil Corporation's product has any failure attributable to azbil during the aforementioned warranty period, Azbil Corporation shall, without charge, deliver a replacement for the said product to the place where you purchased, or repair the said product and deliver it to the aforementioned place. Notwithstanding the foregoing, any failure falling under one of the following shall not be covered under this warranty:

- (1) Failure caused by your improper use of azbil product (noncompliance with conditions, environment of use, precautions, etc. set forth in catalogs, specifications, instruction manuals, etc.);
- (2) Failure caused for other reasons than Azbil Corporation's product;
- Failure caused by any modification or repair made by any person other than Azbil Corporation or Azbil Corporation's subcontractors;
- (4) Failure caused by your use of Azbil Corporation's product in a manner not conforming to the intended usage of that product;
- (5) Failure that the state-of-the-art at the time of Azbil Corporation's shipment did not allow Azbil Corporation to predict; or
- (6) Failure that arose from any reason not attributable to Azbil Corporation, including, without limitation, acts of God, disasters, and actions taken by a third party.

Please note that the term "warranty" as used herein refers to equipment-only-warranty, and Azbil Corporation shall not be liable for any damages, including direct, indirect, special, incidental or consequential damages in connection with or arising out of Azbil Corporation's products.

2. Ascertainment of suitability

You are required to ascertain the suitability of Azbil Corporation's product in case of your use of the same with your machinery, equipment, etc. (hereinafter referred to as "Equipment") on your own responsibility, taking the following matters into consideration:

- (1) Regulations and standards or laws that your Equipment is to comply with.
- (2) Examples of application described in any documents provided by Azbil Corporation are for your reference purpose only, and you are required to check the functions and safety of your Equipment prior to your use.
- (3) Measures to be taken to secure the required level of the reliability and safety of your Equipment in your use Although azbil is constantly making efforts to improve the quality and reliability of Azbil Corporation's products, there exists a possibility that parts and machinery may break down. You are required to provide your Equipment with safety design such as fool-proof design,^{*1} and fail-safe design^{*2} (anti-flame propagation design, etc.), whereby preventing any occurrence of physical injuries, fires, significant damage, and so forth. Furthermore, fault avoidance,^{*3} fault tolerance,^{*4} or the like should be incorporated so that the said Equipment can satisfy the level of reliability and safety required for your use.
 - *1. A design that is safe even if the user makes an error.
 - *2. A design that is safe even if the device fails.
 - *3. Avoidance of device failure by using highly reliable components, etc.
 - *4. The use of redundancy.

3. Precautions and restrictions on application

3.1 Restrictions on application

Please follow the table below for use in nuclear power or radiation-related equipment.

	Nuclear power quality*5 required	Nuclear power quality* ⁵ not required
Within a radiation controlled area* ⁶	Cannot be used (except for limit switches for nuclear power*7)	Cannot be used (except for limit switches for nuclear power*7)
Outside a radiation controlled area* ⁶	Cannot be used (except for limit switches for nuclear power*7)	Can be used

- *5. Nuclear power quality: compliance with JEAG 4121 required
- *6. Radiation controlled area: an area governed by the requirements of article 3 of "Rules on the Prevention of Harm from Ionizing Radiation," article 2 2 4 of "Regulations on Installation and Operation of Nuclear Reactors for Practical Power Generation," article 4 of "Determining the Quantity, etc., of Radiation-Emitting Isotopes,"etc.
- *7. Limit switch for nuclear power: a limit switch designed, manufactured and sold according to IEEE 382 and JEAG 4121.

Any Azbil Corporation's products shall not be used for/with medical equipment.

The products are for industrial use. Do not allow general consumers to install or use any Azbil Corporation's product. However, azbil products can be incorporated into products used by general consumers. If you intend to use a product for that purpose, please contact one of our sales representatives.

3.2 Precautions on application

you are required to conduct a consultation with our sales representative and understand detail specifications, cautions for operation, and so forth by reference to catalogs, specifications, instruction manual, etc. in case that you intend to use azbil product for any purposes specified in (1) through (6) below. Moreover, you are required to provide your Equipment with fool-proof design, fail-safe design, antiflame propagation design, fault avoidance, fault tolerance, and other kinds of protection/safety circuit design on your own responsibility to ensure reliability and safety, whereby preventing problems caused by failure or nonconformity.

- (1) For use under such conditions or in such environments as not stated in technical documents, including catalogs, specification, and instruction manuals
- (2) For use of specific purposes, such as:
 - Nuclear energy/radiation related facilities
 [When used outside a radiation controlled area and where nuclear power quality is not required]
 [When the limit switch for nuclear power is used]
 - Machinery or equipment for space/sea bottom
 - Transportation equipment
 - [Railway, aircraft, vessels, vehicle equipment, etc.]
 - * Antidisaster/crime-prevention equipment
 - * Burning appliances
 - * Electrothermal equipment
 - * Amusement facilities
 - * Facilities/applications associated directly with billing
- (3) Supply systems such as electricity/gas/water supply systems, large-scale communication systems, and traffic/air traffic control systems requiring high reliability
- (4) Facilities that are to comply with regulations of governmental/public agencies or specific industries
- (5) Machinery or equipment that may affect human lives, human bodies or properties
- (6) Other machinery or equipment equivalent to those set forth in items (1) to (5) above which require high reliability and safety
- 4. Precautions against long-term use

Use of Azbil Corporation's products, including switches, which contain electronic components, over a prolonged period may degrade insulation or increase contact-resistance and may result in heat generation or any other similar problem causing such product or switch to develop safety hazards such as smoking, ignition, and electrification. Although acceleration of the above situation varies depending on the conditions or environment of use of the products, you are required not to use any Azbil Corporation's products for a period exceeding ten (10) years unless otherwise stated in specifications or instruction manuals.

5. Recommendation for renewal

Mechanical components, such as relays and switches, used for Azbil Corporation's products will reach the end of their life due to wear by repetitious open/close operations.

In addition, electronic components such as electrolytic capacitors will reach the end of their life due to aged deterioration based on the conditions or environment in which such electronic components are used. Although acceleration of the above situation varies depending on the conditions or environment of use, the number of open/close operations of relays, etc. as prescribed in specifications or instruction manuals, or depending on the design margin of your machine or equipment, you are required to renew any Azbil Corporation's products every 5 to 10 years unless otherwise specified in specifications or instruction manuals. System products, field instruments (sensors such as pressure/flow/level sensors, regulating valves, etc.) will reach the end of their life due to aged deterioration of parts. For those parts that will reach the end of their life due to aged deterioration, recommended replacement cycles are prescribed. You are required to replace parts based on such recommended replacement cycles.

6. Other precautions

Prior to your use of Azbil Corporation's products, you are required to understand and comply with specifications (e.g., conditions and environment of use), precautions, warnings/cautions/notices as set forth in the technical documents prepared for individual Azbil Corporation's products, such as catalogs, specifications, and instruction manuals to ensure the quality, reliability, and safety of those products.

7. Changes to specifications

Please note that the descriptions contained in any documents provided by azbil are subject to change without notice for improvement or for any other reason. For inquires or information on specifications as you may need to check, please contact our branch offices or sales offices, or your local sales agents.

8. Discontinuance of the supply of products/parts

Please note that the production of any Azbil Corporation's product may be discontinued without notice. After manufacturing is discontinued, we may not be able to provide replacement products even within the warranty period.

For repairable products, we will, in principle, undertake repairs for five (5) years after the discontinuance of those products. In some cases, however, we cannot undertake such repairs for reasons, such as the absence of repair parts. For system products, field instruments, we may not be able to undertake parts replacement for similar reasons.

9. Scope of services

Prices of Azbil Corporation's products do not include any charges for services such as engineer dispatch service. Accordingly, a separate fee will be charged in any of the following cases:

- (1) Installation, adjustment, guidance, and attendance at a test run
- (2) Maintenance, inspection, adjustment, and repair
- (3) Technical guidance and technical education
- (4) Special test or special inspection of a product under the conditions specified by you

Please note that we cannot provide any services as set forth above in a nuclear energy controlled area (radiation controlled area) or at a place where the level of exposure to radiation is equivalent to that in a nuclear energy controlled area.



Azbil Corporation Advanced Automation Company

1-12-2 Kawana, Fujisawa Kanagawa 251-8522 Japan URL: https://www.azbil.com Specifications are subject to change without notice. (11)