Digital Controller

CB100/CB400
CB500/CB700
CB900

Initial Setting Manual

Thank you for purchasing this RKC instrument. In order to achieve maximum performance and ensure proper operation of your new instrument, carefully read all the instructions in this manual. Please place this manual in a convenient location for easy reference.

SYMBOLS

WARNING : This mark indicates precautions that must be taken if there is danger of electric shock, fire, etc., which could result in loss of life or injury.

CAUTION : This mark indicates that if these precautions and operating procedures are not taken, damage to the instrument may result.

⚠ : This mark indicates that all precautions should be taken for safe usage.

📖 : This mark indicates important information on installation, handling and operating procedures.

📖 : This mark indicates supplemental information on installation, handling and operating procedures.

☞ : This mark indicates where additional information may be located.

⚠ **WARNING**

- An external protection device must be installed if failure of this instrument could result in damage to the instrument, equipment or injury to personnel.

- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to instrument and equipment.

- This instrument must be used in accordance with the specifications to prevent fire or damage to instrument and equipment.

- This instrument is not intended for use in locations subject to flammable or explosive gases.

- Do not touch high-voltage connections such as power supply terminals, etc. to avoid electric shock.

- RKC is not responsible if this instrument is repaired, modified or disassembled by other than factory-approved personnel. Malfunction can occur and warranty is void under these conditions.

CAUTION

- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take adequate measures.
- This instrument is protected from electric shock by reinforced insulation. Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.
- Be sure to provide an appropriate surge control circuit respectively for the following:
  - If input/output or signal lines within the building are longer than 30 meters.
  - If input/output or signal lines leave the building, regardless the length.
- This instrument is designed for installation in an enclosed instrumentation panel. All high-voltage connections such as power supply terminals must be enclosed in the instrumentation panel to avoid electric shock by operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- All wiring must be in accordance with local codes and regulations.
- All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action.
  The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.
- To prevent instrument damage or failure, protect the power line and the input/output lines from high currents with a protection device such as fuse, circuit breaker, etc.
- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.
- Tighten each terminal screw to the specified torque found in the manual to avoid electric shock, fire or malfunction.
- For proper operation of this instrument, provide adequate ventilation for heat dispensation.
- Do not connect wires to unused terminals as this will interfere with proper operation of the instrument.
- Turn off the power supply before cleaning the instrument.
- Do not use a volatile solvent such as paint thinner to clean the instrument. Deformation or discoloration will occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to instrument display, do not rub with an abrasive material or push front panel with a hard object.
- Do not connect modular connectors to telephone line.

NOTICE

- This manual assumes that the reader has a fundamental knowledge of the principles of electricity, process control, computer technology and communications.
- The figures, diagrams and numeric values used in this manual are only for purpose of illustration.
- RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
- RKC is not responsible for any damage and/or injury resulting from the use of instruments made by imitating this instrument.
- Periodic maintenance is required for safe and proper operation of this instrument. Some components have a limited service life, or characteristics that change over time.
- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.
- No portion of this document may be reprinted, modified, copied, transmitted, digitized, stored, processed or retrieved through any mechanical, electronic, optical or other means without prior written approval from RKC.

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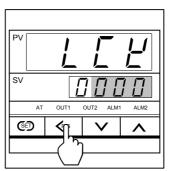# *MEMO*

1. TRANSFER TO MODE

Initialization is to set parameters relating to instrument specifications (input type, input range, alarm type, etc.) and those relating to instrument characteristics (setting limiter, alarm differential gap, etc.).

⚠ **WARNING**

Parameters in the Initialization mode should be set according to the application before setting any parameter related to operation. Once the Parameters in the Initialization mode are set correctly, those parameters are not necessary to be changed for the same application under normal conditions. If they are changed unnecessarily, it may result in malfunction or failure of the instrument. RKC will not bear any responsibility for malfunction or failure as a result of improper changes in the Initialization mode.
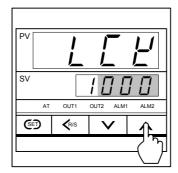

1.1 Go to Initialization Mode

📖   The ▨ section in each image of the controller shows the digits which are not high-lighted.

1. Turn on the power to this controller. The instrument goes to the PV/SV display after confirming input type symbol and input range.

2. Press the SET key for two seconds to go to the Parameter Setting Mode from the PV/SV display.

☞   For details on parameter setting mode, see the **CB100/CB400/CB500/CB700/CB900 Instruction Manual (IMCB25-E□)**.

3. Press the SET key until "LCK" (Set Data Lock display) will be displayed.

4. The high-lighted digit indicates which digit can be set. Press <R/S key to high-light the thousands digit.

Set data lock function display

5. Press the UP key to change 0 to 1.

Set data lock function display

Set value
0 : Initialization mode locked
1 : Initialization mode unlocked

6. Press the SET key to store the new set value. The display goes to the next parameter, and the Initialization mode is unlocked.

CT1 input value display

The parameter displayed varies on the instrument specification.

7. Press the <R/S key for two seconds while pressing the SET key to go to the Initialization Mode. When the controller goes to the Initialization Mode, "Cod" will be displayed.

CT1 input value display

Initialize code selection display of initialization mode

1.2 Exit Initialization Mode

📖 **When any parameter setting is changed in the Initialization Mode, check all parameter set values in SV Setting Mode and Parameter Setting Mode.**

📖 The ▭ section in each image of the controller shows the digits which are not high-lighted.

1. Press the <R/S key for two seconds while pressing the SET key from any display in the Initialization Mode. The controller goes back to the operation mode and the PV/SV display will be displayed.

2. Press the SET key for two seconds in the PV/SV display.

3. Press the SET key until "LCK" (Set Data Lock display) will be displayed.

4. The high-lighted digit indicates which digit can be set. Press <R/S key to high-light the thousands digit. (See *4.* on P. 1.)

5. Press the DOWN key to change 1 to 0.

Set value
0 : Initialization mode locked
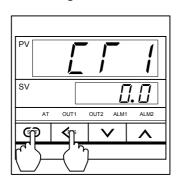1 : Initialization mode unlocked

Set data lock function display

6. Press the SET key to store the new set value. The display goes to the next parameter, and the Initialization mode is locked.

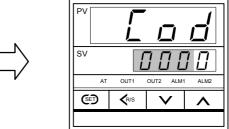The parameter displayed varies on the instrument specification.

CT1 input value display

2. SETTING

2.1 Initial Setting Menu

The "Cod" display will be displayed when the controller goes to the Initialization Mode. Initializing items are classified into 3 initialize code groups in initialization mode.

📖　　There are parameters which are not displayed depending on the specification.
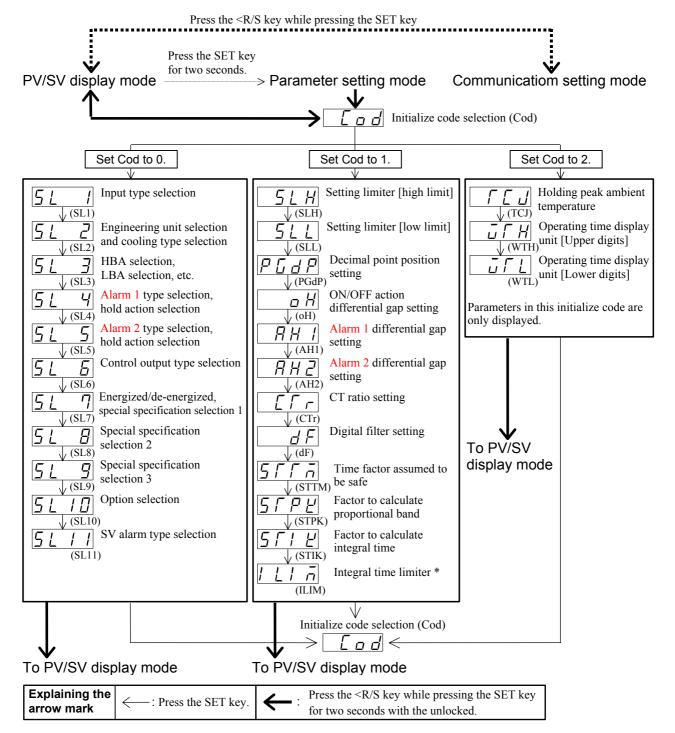
Press the <R/S key while pressing the SET key

PV/SV display mode　　Press the SET key for two seconds. →　Parameter setting mode　　Communicatiom setting mode

Cod Initialize code selection (Cod)

| Set Cod to 0. | Set Cod to 1. | Set Cod to 2. |

Set Cod to 0.

SL 1 (SL1)　Input type selection

SL 2 (SL2)　Engineering unit selection and cooling type selection

SL 3 (SL3)　HBA selection, LBA selection, etc.

SL 4 (SL4)　Alarm 1 type selection, hold action selection

SL 5 (SL5)　Alarm 2 type selection, hold action selection

SL 6 (SL6)　Control output type selection

SL 7 (SL7)　Energized/de-energized, special specification selection 1

SL 8 (SL8)　Special specification selection 2

SL 9 (SL9)　Special specification selection 3

SL 10 (SL10)　Option selection

SL 11 (SL11)　SV alarm type selection

Set Cod to 1.

SLH (SLH)　Setting limiter [high limit]

SLL (SLL)　Setting limiter [low limit]

PGdP (PGdP)　Decimal point position setting

oH (oH)　ON/OFF action differential gap setting

AH1 (AH1)　Alarm 1 differential gap setting

AH2 (AH2)　Alarm 2 differential gap setting

CTr (CTr)　CT ratio setting

dF (dF)　Digital filter setting

STTM (STTM)　Time factor assumed to be safe

STPK (STPK)　Factor to calculate proportional band

STIK (STIK)　Factor to calculate integral time

ILIM (ILIM)　Integral time limiter *

Set Cod to 2.

TCJ (TCJ)　Holding peak ambient temperature

WTH (WTH)　Operating time display unit [Upper digits]

WTL (WTL)　Operating time display unit [Lower digits]

Parameters in this initialize code are only displayed.

To PV/SV display mode

Initialize code selection (Cod)

Cod

To PV/SV display mode　　To PV/SV display mode

| **Explaining the arrow mark** | ← : Press the SET key. | ← : Press the <R/S key while pressing the SET key for two seconds with the unlocked. |

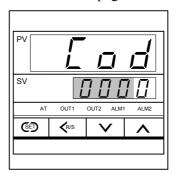* No display is made for the instrument with the modbus communication specification (Z-1021 specification).

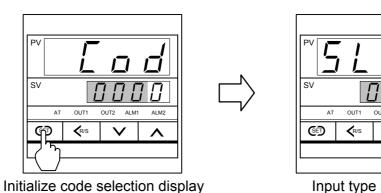# 2.2 Procedure for Setting Each Parameter

■ Example of changing the setting

When the display unit shows *SL1* (Input type selection) in initialize code *0*, the following procedure is for changing the input type from K to J.

📖 The ▢ section in each image of the controller shows the digits which are not high-lighted.

1. Change the instrument to the initialize code selection display.
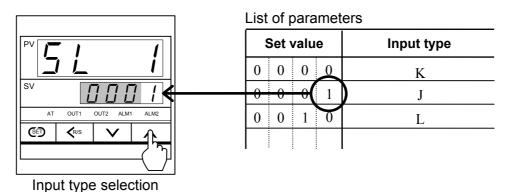☞ See **1.1 Transfer to Initialization Mode** on page 1.

Initialize code selection display

2. As *SL1* belongs to the group of initialize code *0*, do not change the initialize code (the units digit) but press the SET key to change to *SL1*.
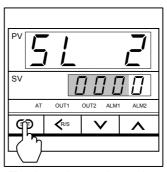
Initialize code selection display   Input type selection

3. Press the UP key to change the number to 1.

Input type selection

List of parameters

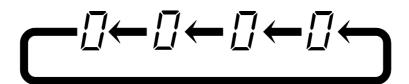| Set value				Input type
0	0	0	0	K
0	0	0	1	J
0	0	1	0	L

4. Press the SET key to store the new set value. The display goes to the next parameter.

Engineering unit setting

📖   If the initialize code is set to *1* or *2*, enter *1* or *2* in the units digits of the set value (SV) display unit by pressing UP or DOWN key.

📖   If the set value corresponds to any digit other than the units digit, press the shift key to move the brightly lit digit. The brightly lit digit moves as follows every time the shift key is pressed.

    IMCB04-E10

2.3 List of Parameters in Initialize Code 0 (Cod = 0)

(1) SL1 (Input type selection)

📖 **When any parameter setting is changed in the Initialization Mode, check all parameter set values in SV Setting Mode and Parameter Setting Mode.**

Factory set value varies depending on the input type.

Set value				Input type	
0	0	0	0	K	
0	0	0	1	J	
0	0	1	0	L	
0	0	1	1	E	
0	1	0	0	N	
0	1	1	1	R	
1	0	0	0	S	TC input [1]
1	0	0	1	B [2]	
1	0	1	0	W5Re/W26Re [2]	
1	0	1	1	PL II	
0	1	0	1	T	
0	1	1	0	U [3]	
1	1	0	0	Pt100 Ω (JIS/IEC)	RTD input [1]
1	1	0	1	JPt100 Ω (JIS)	
1	1	1	0	0 to 5 V DC	
1	1	1	0	0 to 10 V DC [4]	Voltage input [1]
1	1	1	1	1 to 5 V DC	
1	1	1	0	0 to 20 mA DC	Current input [1,5]
1	1	1	1	4 to 20 mA DC	

[1] Any input change in TC and RTD Group is possible. Any input change in voltage and current Group except for 0 to 10 V DC input is possible. No input change between TC and RTD Group and voltage and current Group is possible.
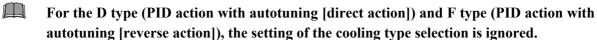
[2] W5Re/W26Re and B are not available with Z-1021 specification (Modbus communication).

[3] Type U input is not available with Z-1038 specification.
If set value is set to "0110" with Z-1038 specification, becomes input type K (0.0 to 800.0 °C).

[4] The input type of Z-1010 specification is fixed to 0 to 10 V DC due to the hardware difference.

[5] For the current input specification, a resistor of 250 Ω must be connected between the input terminals.

(2) SL2 (Engineering unit selection and cooling type selection)

📖 **For the D type (PID action with autotuning [direct action]) and F type (PID action with autotuning [reverse action]), the setting of the cooling type selection is ignored.**

📖 **The upper 2 digits are not used. Do not change the setting, as this may cause malfunction.**

Factory set value varies depending on the instrument specification.

Set value				Description	
			0	°C	Engineering unit selection
			1	°F	
		0		Air cooling (A type) [1]	Cooling type selection
		1		Water cooling (W type) [2]	
0	0			00□□ Fixed	

[1] A type... Heat/cool PID action with autotuning (Air cooling)

[2] W type...Heat/cool PID action with autotuning (Water cooling)

(3) SL3 (Heater break alarm [HBA], control loop break alarm [LBA], special specification, or control loop break alarm [LBA] output selection)

📖   **Cannot be used the heater break alarm (HBA) for the following instruments.**
- **Instrument without the alarm 2 (ALM2) output.**
- **Instrument of the process alarm, deviation alarm, band alarm, SV alarm or control loop break alarm (LBA) is used as the alarm 2 (ALM2).**
- **Instrument whose control output is the current output type.**

📖   **Cannot be used the control loop break alarm (LBA) for the following instruments.**
- **Instrument without both the alarm 1 (ALM1) output and the alarm 2 (ALM2) output.**
- **Instrument whose control action is the A type or W type.**

📖   **Cannot be output the control loop break alarm (LBA) from the alarm 1 (ALM1) for the following instruments.**
- **Instrument without the alarm 1 (ALM1) output.**
- **Instrument of the process alarm, deviation alarm, band alarm or SV alarm is used as the alarm 1 (ALM1).**

📖   **Cannot be output the control loop break alarm (LBA) from the alarm 2 (ALM2) for the following instruments.**
- **Instrument without the alarm 2 (ALM2) output.**
- **Instrument of the process alarm, deviation alarm, band alarm, SV alarm or heater break alarm (HBA) is used as the alarm 2 (ALM2).**
- **Instrument with the Z-168 specification.**

Factory set value varies depending on the instrument specification.

Set value				Description	
			0	Heater break alarm (HBA) not provided	Heater break alarm (HBA) selection
			1	Heater break alarm (HBA) provided [1]	
		0		Control loop break alarm (LBA) not provided	Control loop break alarm (LBA) selection
		1		Control loop break alarm (LBA) provided	
	0			Z-132 specification not provided [2]	Special specification selection
	1			Z-132 specification provided [3]	
0				LBA is output from alarm 1	Selection of control loop break alarm (LBA) output terminals
1				LBA is output from alarm 2	

[1] When be shipped with "heater break alarm (HBA) provided," "Z-132 specification provided" is set.

[2] Normal HBA action.

[3] If heater break or welding continues for more than three seconds, a heater break alarm (HBA) will occur.

(4) SL4 (Alarm 1 [ALM1] type selection, hold action selection)
SL5 (Alarm 2 [ALM2] type selection, hold action selection)

📖 **SL4 is set to 0000 in the following cases.**
- **When the instrument does not have ALM1 output**
- **When Control Loop Break Alarm (LBA) is provided and assigned to ALM1**
- **When the SV alarm is provided and assigned to ALM1**

📖 **SL5 is set to 0000 in the following cases.**
- **When the instrument does not have ALM2 output**
- **When Control Loop Break Alarm (LBA) is provided and assigned to ALM2**
- **When the SV alarm is provided and assigned to ALM2**
- **When the Heater Break Alarm (HBA) is provided**
- **When the instrument has Z-168 specification**

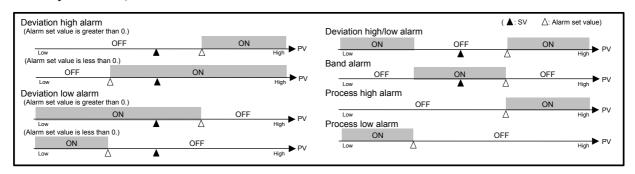Factory set value varies depending on the instrument specification.

Set value				Description	Set value				Description
0	0	0	0	No alarm	1	0	0	1	Deviation high alarm with hold action *
0	0	0	1	Deviation high alarm	1	1	0	1	Deviation low alarm with hold action *
0	1	0	1	Deviation low alarm	1	0	1	0	Deviation high/low alarm with hold action *
0	0	1	0	Deviation high/low alarm	1	0	1	1	Process high alarm with hold action *
0	1	1	0	Band alarm	1	1	1	1	Process low alarm with hold action *
0	0	1	1	Process high alarm					
0	1	1	1	Process low alarm					

* Hold action:

When Hold action is ON, the alarm action is suppressed at start-up or the control set value change until the measured value enters the non-alarm range.

● **Alarm action type**

Both of the Alarm 1 and Alarm 2 outputs of this instrument are turned on when burnout occurs regardless of any of the following actions taken (High alarm, low alarm, etc.). In addition, when used for any purposes other than these alarms (event, etc.), specify the Z-124 specification (not to be forcibly turned on).

(5) SL6 (Control action type selection)

📖 **Conduct setting so as to meet the instrument specification. An incorrect setting may cause a malfunction.**

📖 **When control action is of the type D or F, Control action type selection (Cool-side) setting is ignored.**

Factory set value varies depending on the instrument specification.

Set value				Description	
			0	Direct action (D type)	Direct/reverse action selection
			1	Reverse action (F, A and W type)	
		0		PID action with autotuning (D, F type) [1]	Control action type selection
		1		Heat/Cool PID action with autotuning (A, W type) [2]	
	0			Heat-side time proportioning output (M, V, G, T output) [3, 4]	Control output type selection (Heat-side)
	1			Heat-side continuous output (Current output: 4 to 20 mA DC)	
0				Cool-side time proportioning output (M, V, T output) [3]	Control output type selection (Cool-side)
1				Cool-side continuous output (Current output: 4 to 20 mA DC)	

[1] D type: PID action with autotuning (Direct action)
F type: PID action with autotuning (Reverse action)
[2] A type: Heat/cool PID action with autotuning (Air cooling)
W type: Heat/cool PID action with autotuning (Water cooling)
[3] M output: Relay contact output G output: Trigger output for triac driving
V output: Voltage pulse output T output: Triac output
[4] The G output cannot be selected in the heat/cool control.

(6) SL7 (Energized/de-energized selection, special specification selection 1)

📖 **The following instrument is set to 0000.**
Instrument without both the alarm 1 (ALM1) output and the alarm 2 (ALM2) output.

Factory set value varies depending on the instrument specification.

Set value				Description	
			0	Alarm 1 energized alarm	Alarm 1 energized/
			1	Alarm 1 de-energized alarm	de-energized alarm selection
		0		Alarm 2 energized alarm	Alarm 2 energized/
		1		Alarm 2 de-energized alarm	de-energized alarm selection
	0			Alarm 1 Z-124 specification not provided [1]	Alarm 1 special
	1			Alarm 1 Z-124 specification provided [2]	specification selection
0				Alarm 2 Z-124 specification not provided [1]	Alarm 2 special
1				Alarm 2 Z-124 specification provided [2]	specification selection

[1] The alarm output is forcibly turned on when the burnout function is activated.

[2] No alarm action is taken by the burnout function. (Same as the normal alarm action.)

(7) SL8 (Special specification selection 2)

📖 **Any digits other than the tens digit are not used. As malfunction may result, do not change any of other digits.**

Factory set value varies depending on the instrument specification.

Set value				Description
0	0	0	0	Z-185 specification not provided [1]
0	0	1	0	Z-185 specification provided [2]

[1] For control actions of the F or D type, normal control is performed regardless of the activation of the burnout function. For control actions of the A or W type, both outputs on the heat and cool sides are turned off.

[2] The control output is forcibly turned off when the burnout function is activated.

(8) SL9 (Special specification selection 3)

📖 **Any item set in the Z-168 specification has priority over that set in SL3 (heater break alarm selection).**

Factory set value varies depending on the instrument specification.

Set value				Description	
			0	Z-168 specification not provided [1]	Special specification selection
			1	Z-168 specification provided [2]	
		0		Z-1018 specification not provided	Display selection when operation
		1		Z-1018 specification provided [3,4]	stops (STOP).
	0			Z-1041 specification not provided (CT1)	CT1 input value monitoring selection [5,6]
	1			Z-1041 specification provided (CT1)	
0				Z-1041 specification not provided (CT2)	CT2 input value monitoring selection [5,6]
1				Z-1041 specification provided (CT2)	

[1] It becomes the item set in SL3 (heater break alarm selection).

[2] Heater break alarm for three-phase heater.

[3] When operation is changed to the STOP state by RUN/STOP selection, a parameter symbol to indicate the STOP state is displayed on the SV display.

[4] Can't be selected for the instrument with the modbus communication specification (Z-1021 specification).

[5] For "Heater break alarm (HBA) provided," the CT input value is displayed regardless of CT input value monitoring selection.

[6] Z-1041 specification is exclusive use software. For the instrument other than the Z-1041 specification, always set 0.

(9) SL10 (Option selection)

📖 **If the communication protocol is changed, turn the power off once, then turn is on again.**

Factory set value varies depending on the instrument specification.

Set value				Description	
			0	RUN/STOP function not provided	RUN/STOP function selection
			1	RUN/STOP function provided	
		0		RKC standard communication	Communication protocol selection [1]
		1		Modbus communication	
	0			Communication function not provided	Communication function selection
	1			Communication function provided	
0				Self-tuning not provided	Self-tuning function selection [2]
1				Self-tuning provided	

[1] For the standard product without Z-1021 specification, invalidated even if a modbus communication is set.
For the hardware with the Z-1021 specification (hardware dedicated to modbus communication), always set the mode to *1*: modbus communication.

[2] For the A or W control action type, there is no self-tuning function (*0* : self-tuning not provided).

(10) SL11 (SV alarm type selection)

📖 **The following instrument always set it to *0* : Alarm 1, SV alarm not provided.**
  • **Instrument without the alarm 1 (ALM1) output.**
  • **Instrument of the process alarm, deviation alarm, band alarm or control loop break alarm (LBA) is used as the alarm 1 (ALM1).**

📖 **The following instrument always set it to *0* : alarm 2, SV alarm not provided.**
  • **Instrument without the alarm 2 (ALM2) output.**
  • **Instrument of the process alarm, deviation alarm, band alarm, heater break alarm (HBA) or control loop break alarm (LBA) is used as the alarm 2 (ALM2).**
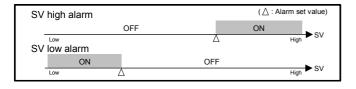 • **Instrument with the Z-168 specification.**

📖 **The following conditions must be satisfied in order to effectuate SV alarm.**
  • **SL4 (Alarm 1 [ALM1] type selection, hold action selection) should be set to 0000. The content of the SL4 setting has priority over that of the SL11 setting.**
  • **SL5 (Alarm 2 [ALM2] type selection, hold action selection) should be set to 0000. The content of the SL5 setting has priority over that of the SL11 setting.**

Factory set value varies depending on the instrument specification.

Set value				Description	
			0	Alarm 1, SV alarm not provided	Alarm 1, SV alarm selection
			1	Alarm 1, SV alarm provided	
		0		Alarm 1, SV high alarm	Alarm 1, SV alarm type selection
		1		Alarm 1, SV low alarm	
	0			Alarm 2, SV alarm not provided	Alarm 2, SV alarm selection
	1			Alarm 2, SV alarm provided	
0				Alarm 2, SV high alarm	Alarm 2, SV alarm type selection
1				Alarm 2, SV low alarm	

● **SV alarm action type**

2.4 List of Parameters in Initialize Code 1 (Cod = 1)

(1) SLH (Setting limiter [high limit])

☞   Set the limiter by referring to Input range table (P.17)

■ Setting method

Press the <R/S key to move the digit, then enter the high limit of the set value (SV) by pressing the UP or DOWN key. The set value (SV) display shows the numeric value.

Factory set value varies depending on the instrument specification.

Input type		Setting range
Thermocouple input (TC)	K	SLL to 1372 °C (SLL to 2502 °F)
	K [1]	SLL to 800.0 °C
	J	SLL to 1200 °C (SLL to 2192 °F)
	R	SLL to 1769 °C (SLL to 3216 °F)
	S	SLL to 1769 °C (SLL to 3216 °F)
	B [2]	SLL to 1820 °C (SLL to 3308 °F)
	E	SLL to 1000 °C (SLL to 1832 °F)
	N	SLL to 1300 °C (SLL to 2372 °F)
	T	SLL to 400.0 °C (SLL to 752.0 °F)
	W5Re/W26Re [2]	SLL to 2320 °C (SLL to 4208 °F)
	PL II	SLL to 1390 °C (SLL to 2534 °F)
	U [3]	SLL to 600.0 °C (SLL to 999.9 °F)
	L	SLL to 900 °C (SLL to 1652 °F)
RTD input	Pt100 Ω (JIS/IEC) [4]	SLL to 649.0 °C (SLL to 999.9 °F)
	JPt100 Ω (JIS)	SLL to 649.0 °C (SLL to 999.9 °F)
Voltage input	0 to 5 V DC	SLL to 9999 (programmable scale)
	0 to 10 V DC [5]	
	1 to 5 V DC	
Current input	0 to 20 mA DC [6]	SLL to 9999 (programmable scale)
	4 to 20 mA DC [6]	

SLL: Setting limiter [low limit]

[1] Input type K (SLL to 800.0 °C) is selectable when Z-1038 specification is used.

[2] Can't be selected for the instrument with the modbus communication specification (Z-1021 specification).

[3] Type U input is not available with Z-1038 specification.

[4] IEC (International Electrotechnical Commission) is equivalent to JIS, DIN and ANSI.

[5] For the 0 to 10 V DC (Z-1010 specification), no input type cannot be changed as the hardware differs.

[6] For the current input specification, a resistor of 250 Ω must be connected between the input terminals.

(2) SLL (Setting limiter [low limit])

☞　Set the limiter by referring to Input range table (P.17)

■ Setting method

Press the <R/S key to move the digit, then enter the high limit of the set value (SV) by pressing the UP or DOWN key. The set value (SV) display shows the numeric value.

Factory set value varies depending on the instrument specification.

Input type		Setting range
Thermocouple input (TC)	K	0 to SLH °C (0 to SLH °F)
	K [1]	0.0 to SLH °C
	J	0 to SLH °C (0 to SLH °F)
	R	0 to SLH °C (0 to SLH °F)
	S	0 to SLH °C (0 to SLH °F)
	B [2]	0 to SLH °C (0 to SLH °F)
	E	0 to SLH °C (0 to SLH °F)
	N	0 to SLH °C (0 to SLH °F)
	T	−199.9 to SLH °C (−199.9 to SLH °F)
	W5Re/W26Re [2]	0 to SLH °C (0 to SLH °F)
	PL II	0 to SLH °C (0 to SLH °F)
	U [3]	−199.9 to SLH °C (−199.9 to SLH °F)
	L	0 to SLH °C (0 to SLH °F)
RTD input	Pt100 Ω (JIS/IEC) [4]	−199.9 to SLH °C (−199.9 to SLH °F)
	JPt100 Ω (JIS)	−199.9 to SLH °C (−199.9 to SLH °F)
Voltage input	0 to 5 V DC	−1999 to SLH (programmable scale)
	0 to 10 V DC [5]	
	1 to 5 V DC	
Current input	0 to 20 mA DC [6]	−1999 to SLH (programmable scale)
	4 to 20 mA DC [6]	

SLH: Setting limiter [high limit]

[1] Input type K (0.0 to SLH °C) is selectable when Z-1038 specification is used.

[2] Can't be selected for the instrument with the modbus communication specification (Z-1021 specification).

[3] Type U input is not available with Z-1038 specification.

[4] IEC (International Electrotechnical Commission) is equivalent to JIS, DIN and ANSI.

[5] For the 0 to 10 V DC (Z-1010 specification), no input type cannot be changed as the hardware differs.

[6] For the current input specification, a resistor of 250 Ω must be connected between the input terminals.

■ Input range table

Thermocouple input (TC)

Type	Input range	Type	Input range
K	0 to 200 °C	B	0 to 1820 °C [1, 3]
	0 to 400 °C		800 to 3200 °F [3]
	0 to 600 °C		0 to 3308 °F [1, 3]
	0 to 800 °C	E	0 to 800 °C
	0 to 1000 °C		0 to 1000 °C
	0 to 1200 °C		0 to 1600 °F
	0 to 1372 °C		0 to 1832 °F
	0 to 100 °C	N	0 to 1200 °C
	0 to 300 °C		0 to 1300 °C
	0 to 450 °C		0 to 2300 °F
	0 to 500 °C		0 to 2372 °F
	0.0 to 800.0 °C [4]	T	−199.9 to +400.0 °C [2]
	0 to 800 °F		−199.9 to +100.0 °C [2]
	0 to 1600 °F		−100.0 to +200.0 °C
	0 to 2502 °F		0.0 to 350.0 °C
	20 to 70 °F		−199.9 to +752.0 °F [2]
J	0 to 200 °C		−100.0 to +200.0 °F
	0 to 400 °C		−100.0 to +400.0 °F
	0 to 600 °C		0.0 to 450.0 °F
	0 to 800 °C		0.0 to 752.0 °F
	0 to 1000 °C	W5Re/W26Re	0 to 2000 °C [3]
	0 to 1200 °C		0 to 2320 °C [3]
	0 to 450 °C		0 to 4000 °F [3]
	0 to 800 °F	PL II	0 to 1300 °C
	0 to 1600 °F		0 to 1390 °C
	0 to 2192 °F		0 to 1200 °C
	0 to 400 °F		0 to 2400 °F
	0 to 300 °F		0 to 2534 °F
R	0 to 1600 °C [1]	U	−199.9 to +600.0 °C [2]
	0 to 1769 °C [1]		−199.9 to +100.0 °C [2]
	0 to 1350 °C [1]		0.0 to 400.0 °C
	0 to 3200 °F [1]		−199.9 to +999.9 °F [2]
	0 to 3216 °F [1]		−100.0 to +200.0°F
S	0 to 1600 °C [1]		0.0 to 999.9 °F
	0 to 1769 °C [1]	L	0 to 400 °C
	0 to 3200 °F [1]		0 to 800 °C
	0 to 3216 °F [1]		0 to 800 °F
B	400 to 1800 °C [3]		0 to 1600 °F

[1] 0 to 399 °C (0 to 799 °F): Accuracy is not guaranteed.
[2] −199.9 to −100.0 °C (−199.9 to −158.0 °F): Accuracy is not guaranteed.
[3] Can't be selected for the instrument with the modbus communication specification. (Z-1021 specification)
[4] Input type K (0.0 to 800.0 °C) is selectable when Z-1038 specification is used.

RTD input

Type	Input range
Pt100 (JIS/IEC)	−199.9 to +649.0 °C
	−199.9 to +200.0 °C
	−100.0 to +50.0 °C
	−100.0 to +100.0 °C
	−100.0 to +200.0 °C
	0.0 to 50.0 °C
	0.0 to 100.0 °C
	0.0 to 200.0 °C
	0.0 to 300.0 °C
	0.0 to 500.0 °C
	−199.9 to +999.9 °F
	−199.9 to +400.0 °F
	−199.9 to +200.0 °F
	−100.0 to +100.0 °F
	−100.0 to +300.0 °F
	0.0 to 100.0 °F
	0.0 to 200.0 °F
	0.0 to 400.0 °F
	0.0 to 500.0 °F
JPt100 (JIS)	−199.9 to +649.0 °C
	−199.9 to +200.0 °C
	−100.0 to +50.0 °C
	−100.0 to +100.0 °C
	−100.0 to +200.0 °C
	0.0 to 50.0 °C
	0.0 to 100.0 °C
	0.0 to 200.0 °C
	0.0 to 300.0 °C
	0.0 to 500.0 °C

Voltage input

Type	Input range
0 to 5 V DC	
0 to 10 V DC *	0.0 to 100.0 %
1 to 5 V DC	

* For the 0 to 10 V DC (Z-1010 specification), no input type cannot be changed as the hardware differs.

Current input

Type	Input range
0 to 20 mA DC	
4 to 20 mA DC	0.0 to 100.0 %

For the current input specification, a resistor of 250 Ω must be connected between the input terminals.

(3) PGdP (Decimal point position setting)

Use to select a decimal point position of the input range (voltage input and current input). PGdP is displayed only for voltage or current input.

📖 **Inappropriate settings may result in malfunction.**

Factory set value: 0001

Set value				Description
0	0	0	0	No decimal place (□□□□)
0	0	0	1	One decimal place (□□□.□)
0	0	0	2	Two decimal places (□□.□□)
0	0	0	3	Three decimal places (□.□□□)

(4) oH (ON/OFF action differential gap setting)

Setting range
TC and RTD inputs: 0 to 100 °C [°F] or 0.0 to 100.0 °C [°F]
Voltage and current inputs: 0.0 to 10.0 % of span

Factory set value
TC and RTD inputs: 2 °C [°F] or 2.0 °C [°F]
Voltage and current inputs: 0.2 %

(5) AH1 (Alarm 1 [ALM1] differential gap setting)

📖 **Not displayed when there is no alarm 1 (ALM1).**

Setting range
TC and RTD inputs: 0 to 100 °C [°F] or 0.0 to 100.0 °C [°F]
Voltage and current inputs: 0.0 to 10.0 % of span

Factory set value
TC and RTD inputs: 2 °C [°F] or 2.0 °C [°F]
Voltage and current inputs: 0.2 %

(6) AH2 (Alarm 2 [ALM2] differential gap setting)

📖 **Not displayed when there is no alarm 2 (ALM2).**

Setting range
TC and RTD inputs: 0 to 100 °C [°F] or 0.0 to 100.0 °C [°F]
Voltage and current inputs: 0.0 to 10.0 % of span

Factory set value
TC and RTD inputs: 2 °C [°F] or 2.0 °C [°F]
Voltage and current inputs: 0.2 %

(7) CTr (CT ratio setting)

📖 **Not displayed when there is no heater break alarm (HBA).**

Set the number of times that a wire is wound on to the hole of a CT.

Setting range: 0 to 9999
Factory set value: CTL-6-P-N: 800
                          CTL-12-S56-10L-N: 1000

(8) dF (Digital filter setting)

Setting range: 0 to 100 sec (If *0* is set, the PV digital filter is turned off.)
Factory set value: 1

(9) STTM (Time factor assumed to be safe)

📖 **Displayed when the self-tuning is provided.**

📖 **As this factor is so adjusted that the self-tuning result optimum to most controlled-objects is obtained, do not change it.**

This is the factor to adjust the reference time of establishing the stabilized state of a measured value. The larger the set value, the longer the time until the measured value is stabilized.

Setting range: 0 to 200
Factory set value: 100

(10) STPK (Factor to calculate proportional band)

📖 **Displayed when the self-tuning is provided.**

📖 **As this factor is so adjusted that the self-tuning result optimum to most controlled-objects is obtained, do not change it.**

This is the factor to adjust the proportional band to be calculated by the self-tuning function. The larger the set value, the larger the proportional band thus calculated.

Setting range: 0 to 200
Factory set value: 67

(11) STIK (Factor to calculate integral time)

📖 **Displayed when the self-tuning is provided.**

📖 **As this factor is so adjusted that the self-tuning result optimum to most controlled-objects is obtained, do not change it.**

This is the factor to adjust the integral and derivative times to be calculated by the self-tuning function. The larger the set value, the larger the integral and derivative times thus calculated.

Setting range: 0 to 200
Factory set value: 16

(12) ILIM (Integral time limiter)

📖 **Displayed only for the instrument with the heat/cool control specification.**

📖 **Not displayed when the instrument is provided with the modbus communication specification (Z-1021 specification).**

This function is used to restrict the integral time calculated by the autotuning (AT) function during heat/cool control.
If the integral time is limited by this function, the derivative time which is equal to 1/4 of the limited integral time is automatically set.

Setting range: 4 to 3600 seconds
Factory set value: 3600 seconds (Z-1022 specification: 500 seconds)

2.5 List of Parameters in Initialize Code 2 (Cod = 2)

Parameters in initialize code 2 are only displayed.

(1) TCJ (Holding peak ambient temperature)

The maximum ambient temperature on the rear terminal board of the instrument is stored and displayed on the set value (SV) display unit. Displayed when input type is TC input.

Display range: −10 to +100 °C
Display resolution: 1 °C

(2) WTH (Operating time [Upper digits])

The integrated value (upper 2 digits) of power on time is shown on the set value (SV) display unit.
If the total operating time exceeds 100,000 hours, the integrated operating time is reset.

Display range: 0 to 10 (Operating time from 0 to 100000 hours can be displayed for both the upper and lower digits.)
Display resolution: 10,000 hours

(3) WTL (Operating time [Lower digits])

The integrated value (lower 4 digits) of power on time is shown on the set value (SV) display unit.
If the total operating time exceeds 9,999 hours, these digits move to the operating time display unit [Upper digits] (WTH).

Display range: 0000 to 9999
Display resolution: 1 hour

Example: When the integrated value of operating time equals to 100,000 hours.
   The upper 2 digits of 100,000 hours are shown on the operating time display unit [upper digits] (WTH) and the lower 4 digits are shown on the operating time display unit [lower digits].

Operating time display unit (Upper digits)   Operating time display unit (Lower digits)

3. COMMUNICATION INITIAL

■ List of Communication Initialize Identifiers

📖   Note that there are identifiers which cannot be communicated depending on the specification.

📖   The number of digits is 6 for all data.

☞   For details on the structure of communication data, see the **CB100/CB400/CB500/CB700/CB900 Communication Instruction Manual (IMCB03-E□).**

ID: Identifier   (RO: Read only   R/W: Read/write)

Name	ID	Data range	Factory set value	R/W
Initialization mode selection	IO	0: RO 1: R/W	0	R/W
Setting necessary code [Cod]	IP	0 to 2	0	R/W
Input type selection [SL1]	XI	0 to 15 [1]	To vary depending on the specification	R/W
Engineering unit and cooling type selection [SL2]	XQ	0: °C (Air cooling) 1: °F (Air cooling) 2: °C (Water cooling) 3: °F (Water cooling)	To vary depending on the specification	R/W
Heater break alarm (HBA), control loop break alarm (LBA), special specification, or control loop break alarm (LBA) output selection [SL3]	LV	0: No function provided 1: HBA provided 2: LBA provided, LBA is output from alarm 1 5: HBA (Z-132 specification) provided 10: LBA provided, LBA is output from alarm 2	To vary depending on the specification	R/W
Alarm 1 (ALM1) type or Alarm 1 (ALM1) with hold action selection [SL4]	XA	0 to 15 [2]	To vary depending on the specification	R/W
Alarm 2 (ALM2) type or Alarm 2 (ALM2) with hold action selection [SL5]	XB	0 to 15 [2]	To vary depending on the specification	R/W

ID: Identifier   (RO: Read only   R/W: Read/write)

Name	ID	Data range	Factory set value	R/W
Control action type selection [SL6]	CA	0 to 15 [3]	To vary depending on the specification	R/W
Energized/de-energized alarm selection, special specification selection 1 [SL7]	Z1	0 to 15 [4]	0	R/W
Special specification selection 2 [SL8]	Z2	0: Z-185 specification not provided 2: Z-185 specification provided	0	R/W
Special specification selection 3 [SL9]	Z3	0 to 14 [5]	0	R/W
Option selection [SL10]	DH	0 to 15 [6]	0	R/W
SV alarm type selection [SL11]	XC	0 to 15 [7]	0	R/W
Setting limiter (high limit) [SLH]	XV	See input range table (P.17 to 19)	To vary depending on the specification	R/W
Setting limiter (low limit) [SLL]	XW			
Setting the position of decimal point [PGdP]	XU	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places	1	R/W
Differential gap setting of ON/OFF action [oH]	MH	For TC/RTD inputs: 0 (0.0) to 100 (100.0) °C [°F] For voltage/current inputs: 0.0 to 10.0 % of span	TC, RTD input: 2 or 2.0 Voltage/current input: 0.2	R/W
Differential gap setting of alarm 1 (ALM1) [AH1]	HA	For TC/RTD inputs: 0 (0.0) to 100 (100.0) °C [°F] For voltage/current inputs: 0.0 to 10.0 % of span	TC, RTD input: 2 or 2.0 Voltage/current input: 0.2	R/W
Differential gap setting of alarm 2 (ALM2) [AH2]	HB		TC, RTD input: 2 or 2.0 Voltage/current input: 0.2	
CT ratio setting [CTr]	XR	0 to 9999	CTL-6-P-N: 800 CTL-12-S56-10L-N: 1000	R/W
Digital filter setting [dF]	F1	0 to 100 seconds	0	R/W

ID: Identifier   (RO: Read only   R/W: Read/write)

Name	ID	Data range	Factory set value	R/W
Time factor assumed to be safe [STTM]	GH	0 to 200	100	R/W
Factor to calculate proportional band [STPK]	PU	0 to 200	67	R/W
Factor to calculate integral time [STIK]	IU	0 to 200	16	R/W
Integral time limiter [ILIM]	IL	4 to 3600 seconds	3600 Z-1022 specification: 500	R/W
Holding peak ambient temperature [TCJ]	HP	-10 to $+100$ °C	0	RO
Operating time display unit (Upper digits) [WTH]	UT	0 to 10	0	RO
Operating time display unit (Lower digits) [WTL]	UU	0 to 9999	0	RO

*1   Input type table

Input type		Set value
Thermocouple input (TC)	K	0
	J	1
	L	2
	E	3
	N	4
	T	5
	U [a]	6
	R	7
	S	8
	B [b]	9
	W5Re/W26Re [b]	10
	PL II	11
RTD input (RTD)	Pt100 Ω (JIS/IEC)	12
	JPt100 Ω (JIS)	13
Voltage input	0 to 5 V DC	14
	0 to 10 V DC [c]	14
	1 to 5 V DC	15
Current input	0 to 20 mA DC	14
	4 to 20 mA DC	15

[a] 6 is K input (0.0-800.0 °C) when Z-1038 specification is used.
   (Type U input is not available with Z-1038 specification.)

[b] Can't be selected for the instrument with the modbus communication specification (Z-1021 specification).

[c] To be fixed to *14* for the 0 to 10 V DC (Z-1010 specification). No input type cannot be changed as the hardware differs.

[2]   0:   No alarm   7:   Process low alarm
      1:   Deviation high alarm   9:   Deviation high alarm with hold action
      2:   Deviation high/low alarm   10:   Deviation high/low alarm with hold action
      3:   Process high alarm   11:   Process high alarm with hold action
      5:   Deviation low alarm   13:   Deviation low alarm with hold action
      6:   Band alarm   15:   Process low alarm with hold action

📖   **Do not set 4, 8, 12 or 14. Malfunction may result.**

[3]   0:   PID action with autotuning (Direct action), time proportioning output (relay contact output, voltage pulse output, trigger (for triac driving) output or triac output.

      1:   PID action with autotuning (Reverse action), time proportioning output (relay contact output, voltage pulse output, trigger (for triac driving) output or triac output.

      3:   Heat/cool PID action with autotuning, heat-side time proportioning output (relay contact output, voltage pulse output or triac output) or cool-side time proportioning output (relay contact output, voltage pulse output, triac output).

      4:   PID action with autotuning (Direct action) or current output.

      5:   PID action with autotuning (Reverse action) or current output.

      7:   Heat/cool PID action with autotuning, heat-side current output or cool-side time proportioning output (relay contact output, voltage pulse output, triac output).

    11:   Heat/cool PID action with autotuning, heat-side time proportioning output (relay contact output, voltage pulse output or triac output) or cool-side current output.

    15:   Heat/cool PID action with autotuning, heat-side current output or cool-side current output.

📖   **Do not set 2, 6, 8, 9, 10, 12, 13 or 14. Malfunction may result.**

[4]   0:   Alarm 1 (Energized alarm), alarm 2 (Energized alarm)

      1:   Alarm 1 (De-energized alarm), alarm 2 (Energized alarm)

      2:   Alarm 1 (Energized alarm), alarm 2 (De-energized alarm)

      3:   Alarm 1 (De-energized alarm), alarm 2 (De-energized alarm)

      4:   Alarm 1 (Energized alarm, Z-124 specification provided), alarm 2 (Energized alarm)

      5:   Alarm 1 (De-energized alarm, Z-124 specification provided), alarm 2 (Energized alarm)

      6:   Alarm 1 (Energized alarm, Z-124 specification provided), alarm 2 (De-energized alarm)

      7:   Alarm 1 (De-energized alarm, Z-124 specification provided), alarm 2 (De-energized alarm)

      8:   Alarm 1 (Energized alarm), alarm 2 (Energized alarm, Z-124 specification provided)

   9:   Alarm 1 (De-energized alarm), alarm 2 (Energized alarm, Z-124 specification provided)

  10: Alarm 1 (Energized alarm), alarm 2 (De-energized alarm, Z-124 specification provided)

  11: Alarm 1 (De-energized alarm), alarm 2 (De-energized alarm, Z-124 specification provided)

  12: Alarm 1 (Energized alarm, Z-124 specification provided), alarm 2 (Energized alarm, Z-124 specification provided)

  13: Alarm 1 (De-energized alarm, Z-124 specification provided), alarm 2 (Energized alarm, Z-124 specification provided)

  14: Alarm 1 (Energized alarm, Z-124 specification provided), alarm 2 (De-energized alarm, Z-124 specification provided)

  15: Alarm 1 (De-energized alarm, Z-124 specification provided), alarm 2 (De-energized alarm Z-124 specification provided)

📖   Z-124 specification: This specification is for forcibly turning off the control output when the burnout function is activated.

[5] 0: Z-168 specification and Z-1018 specification not provided

   1:   Z-168 specification provided

   2:   Z-1018 specification provided

   3:   Z-168 specification and Z-1018 specification provided

   4:   Z-1041 specification (CT1 input value monitoring) provided

   6:   Z-1018 specification and Z-1041 specification (CT1 input value monitoring) provided

   8:   Z-1041 specification (CT2 input value monitoring) provided

  10: Z-1018 specification and Z-1041 specification (CT2 input value monitoring) provided

  12: Z-1041 specification (CT1 and CT2 input value monitoring) provided

  14: Z-1018 specification and Z-1041 specification (CT1 and CT2 input value monitoring) provided

📖   **Do not set 5, 7, 9, 11 and 13. Malfunction may result.**

📖   Z-168 specification: Heater break alarm for three-phase heater specification.

📖   Z-1018 specification: This specification is for displaying the *STOP* parameter symbol on the SV display when operation stops (STOP).

📖   Z-1041 specification: This specification can monitor the CT (current transformer) input value regardless of types of control output (even if there is no heater break alarm [HBA]).

[6] 0: No option function provided (No optional function provided)

1: RUN/STOP function provided

4: Communication function provided (RKC standard communication)

5: Communication function provided (RKC standard communication), RUN/STOP function provided

6: Communication function provided (MODBUS communication)

7: Communication function provided (MODBUS communication), RUN/STOP function provided

8: Self-tuning provided

9: Self-tuning provided, RUN/STOP function provided

12: Self-tuning provided, Communication function provided (RKC standard communication)

13: Self-tuning provided, Communication function provided (RKC standard communication), RUN/STOP function provided

14: Self-tuning provided, Communication function provided (MODBUS communication)

15: Self-tuning provided, Communication function provided (MODBUS communication), RUN/STOP function provided

📖 **Do not set 2, 3, 10 or 11. Malfunction may result.**

[7] 0: No alarm

1: Alarm 1 (SV high alarm)

3: Alarm 1 (SV low alarm)

4: Alarm 2 (SV high alarm)

5: Alarm 1 (SV high alarm), alarm 2 (SV high alarm)

7: Alarm 1 (SV low alarm), alarm 1 (SV high alarm)

12: Alarm 2 (SV low alarm)

13: Alarm 1 (SV high alarm), alarm 2 (SV low alarm)

15: Alarm 1 (SV low alarm), alarm 2 (SV low alarm)

📖 **Do not set 2, 6, 8, 9, 10, 11 or 14. Malfunction may result.**

MEMO

RKC

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