和文は裏面をご覧下さい。

INSTRUCTION MANUAL

Digital Indicating Controller BCS2, BCR2, BCD2

No. BCx21JE5 2016.04

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For detailed usage, refer to the Instruction Manual for the BCS2, BCR2, and BCD2. Please download the full Instruction Manual from Shinko website.
http://shinko-technos.co.jp/e/ → Support & Downloads → Downloads → Manuals

Thank you for purchasing our BCS2, BCR2, BCD2, Digital Indicating Controller. This manual contains instructions for the mounting, functions, operations and notes when operating the BCS2, BCR2, and BCD2. To ensure safe and correct use, thoroughly read and understand this manual before using this instrument. To prevent accidents arising from the misuse of this instrument, please ensure the operator receives this manual.

Safety Precautions (Be sure to read these precautions before using our products.)

The safety precautions are classified into 2 categories: "Warning" and "Caution".

⚠ Warning: Procedures which may lead to dangerous conditions and cause death or serious injury, if not carried out properly.

⚠ Caution: Procedures which may lead to dangerous conditions and cause superficial to medium injury or physical damage or may degrade or damage the product, if not carried out properly.

⚠ Warning

- To prevent an electric shock or fire, only Shinko or other qualified service personnel may handle the inner assembly.
- To prevent an electric shock, fire or damage to the instrument, parts replacement may only be undertaken by Shinko or other qualified service personnel.

⚠ SAFETY PRECAUTIONS

- To ensure safe and correct use, thoroughly read and understand this manual before using this instrument.
- This instrument is intended to be used for industrial machinery, machine tools and measuring equipment. Verify correct usage after purpose-of-use consultation with our agency or main office. (Never use this instrument for medical purposes with which human lives are involved.)
- External protection devices such as protective equipment against excessive temperature rise, etc. must be installed, as malfunction of this product could result in serious damage to the system or injury to personnel. Proper periodic maintenance is also required.
- This instrument must be used under the conditions and environment described in this manual. Shinko Technos Co., Ltd. does not accept liability for any injury, loss of life or damage occurring due to the instrument being used under conditions not otherwise stated in this manual.

⚠ Caution for Mounting

This instrument is intended to be used under the following environmental conditions (IEC61010-1)]: Overvoltage category Ⅱ, Pollution degree 2
Ensure the mounting location corresponds to the following conditions:

- A minimum of dust, and an absence of corrosive gases
- No flammable, explosive gases
- No mechanical vibrations or shocks
- No exposure to direct sunlight, an ambient temperature of -10 to 55℃ (14 to 131℉) (No icing)
- An ambient non-condensing humidity of 35 to 85%RH (Non-condensing)
- No large capacity electromagnetic switches or cables through which large current is flowing
- No water, oil or chemicals or where the vapors of these substances can come into direct contact with the unit
- Take note that the ambient temperature of this unit – not the ambient temperature of the control panel – must not exceed 55℃ (131℉) if mounted through the face of a control panel, otherwise the life of electronic components (especially electrolytic capacitors) may be shortened.

Caution with respect to Export Trade Control Ordinance

To avoid this instrument from being used as a component in, or as being utilized in the manufacture of weapons of mass destruction (i.e. military applications, military equipment, etc.), please investigate the end users and the final use of this instrument. In the case of resale, ensure that this instrument is not illegally exported.

Specifications

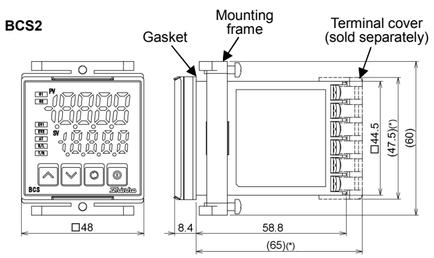
Power supply voltage	100 to 240 V AC 50/60Hz, Allowable fluctuation: 85 to 264 V AC 24 V AC/DC 50/60Hz, Allowable fluctuation: 20 to 28 V AC/DC
Base accuracy (At ambient temperature 23℃, for a single unit mounting)	Thermocouple: Within ±0.2% of each input span ±1 digit. However, R, S inputs, 0 to 200℃(32 to 392℉): Within ±6℃(12℉) B input, 0 to 300℃ (0 to 572℉): Accuracy is not guaranteed. K, J, E, T, N inputs, Less than 0℃ (32℉): ±0.4% of input span ±1 digit RTD: Within ±0.1% of each input span ±1 digit Direct current, voltage inputs: Within ±0.2% of each input span ±1 digit
Input sampling period	125 ms
Power consumption	100 to 240 V AC: Approx. 8 VA max.(11VA max. if all options added) 24 V AC: Approx. 5 VA max. (8 VA max. if all options are added) 24 V DC: Approx. 5 W max. (8 W max. if all options are added)
Ambient temperature/Humidity	-10 to 55℃, 35 to 85%RH (No icing, Non-condensing)
Weight	BCS2: Approx.110g, BCR2: Approx.160g, BCD2: Approx.220g
Accessories	Mounting frame: 1 piece (BCS2) Screw type mounting bracket: 1 piece (BCR2, BCD2) Instruction manual excerpt: 1 copy

Control output (OUT1)	Relay contact 1a, Control capacity: 3 A 250 V AC (resistive load) 1 A 250 V AC (inductive load cosϕ=0.4) Electric life: 100,000 cycles, Minimum applicable load: 10 mA 5 V DC Non-contact voltage (for SSR drive): 12 V DC±15% Max 40 mA (short circuit protected) Direct current: 4 to 20 mA DC (Resolution: 12000) Load resistance: Max. 550 Ω
EVT output	Relay contact 1a, Control capacity: 3 A 250 V AC (resistive load) 1 A 250 V AC (inductive load cosϕ=0.4) Electric life: 100,000 cycles, Minimum applicable load: 10 mA 5 V DC
Control output (OUT2) (DS, DA, EV2 options)	Relay contact 1a, Control capacity: 3 A 250 V AC (resistive load) 1 A 250 V AC (inductive load cosϕ=0.4) Electric life: 100,000 cycles (If EV2 option is ordered, and 019 is selected from Event Output EV2 allocation.) Non-contact voltage (for SSR drive): 12 V DC±15% Max 40 mA (short circuit protected) Direct current: 4 to 20 mA DC (Resolution: 12000) Load resistance: Max 550 Ω

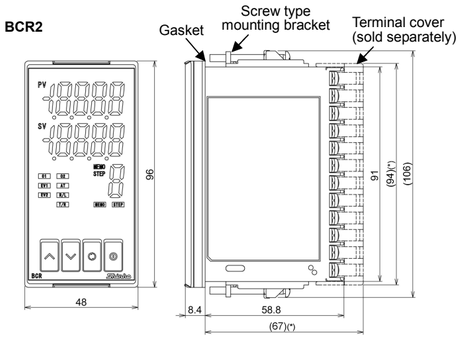
Dimensions (Scale: mm)

(*) When terminal cover is used.

BCS2



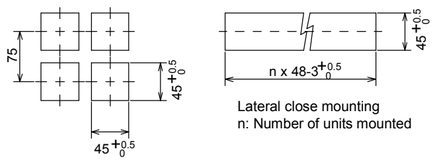
BCR2

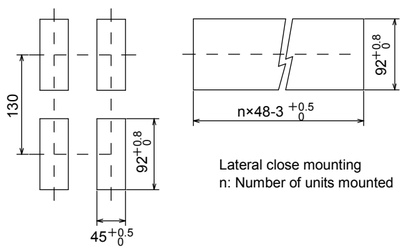


Panel Cutout (Scale: mm)

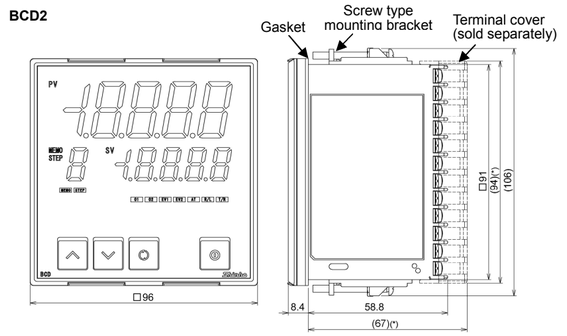
⚠ Caution

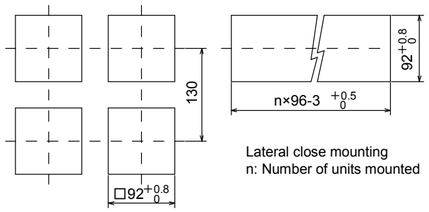
If lateral close mounting is used for the unit, IP66 specification (Drip-proof/ Dust-proof) may be compromised, and all warranties will be invalidated.





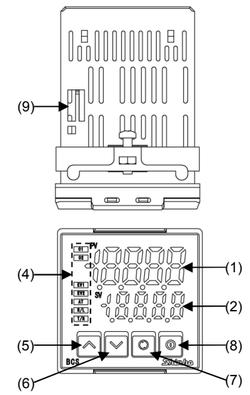
BCD2



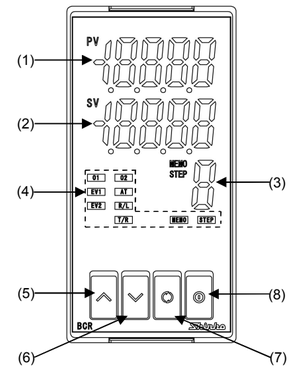


Names and Functions of Section

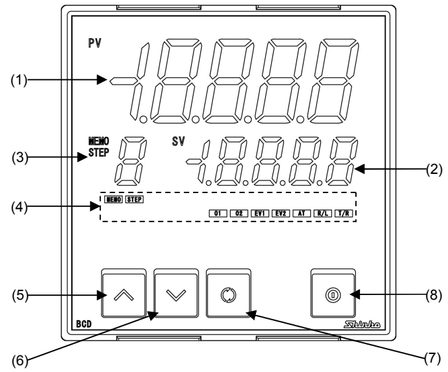
BCS2



BCR2



BCD2



Displays

(1)	PV Display	Indicates the PV (process variable), or setting characters in setting mode.
(2)	SV Display	Indicates the SV (desired value) or set data in setting mode. In Monitor mode, indicates MV (manipulated variable), remaining step time (Program control), step number (Program control) (*) or Set value memory number (Fixed value control) (*). (*) For BCS2 only
(3)	MEMO/STEP Display	Indicates Set value memory number or Step number (Program control). (For BCR2, BCD2)

Action Indicators

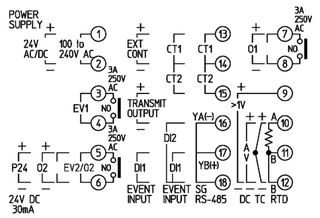
(4)	O1	Lit when control output OUT1 is ON. For direct current output type, flashes corresponding to the MV in 125 ms cycles.
	O2	Lit when control output OUT2 (EV2, DS, DA or EV2+D□ options) is ON. For direct current output type, flashes corresponding to the MV in 125 ms cycles.
	EV1	Lit when Event output 1 is ON.
	EV2	Lit when Event output 2 (EV2 or EV2+D□ options) is ON.
	AT	Flashes while AT or Auto-reset is performing.
	R/L	Lit while in Remote action (EIT option).
	T/R	Lit during Serial communication (C5W or C5 options) TX (transmitting) output.
	MEMO	Lit when Set value memory number is indicated. (For BCR2, BCD2)
	STEP	Lit when Step number (Program control) is indicated. (For BCR2, BCD2)

Keys, Connector

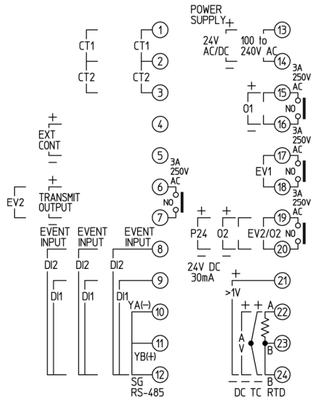
(5)	UP key	Increases the numeric value. If this key is pressed for 1 sec during Program control, the unit proceeds to the next step. (Advance function)
(6)	DOWN key	Decreases the numeric value.
(7)	MODE key	Selects the setting mode, and registers the set data. If the MODE key is pressed in RUN mode for 3 sec, the unit moves to Monitor mode.
(8)	OUT/OFF key	By pressing this key for 1 sec, one of the following items selected in [OUT/OFF key function] is indicated. • Control output OFF function: Turns control output ON or OFF. • Auto/Manual control: Switches the Auto/Manual control. • Program control: Starts or stops the Program control.
(9)	Console connector	By connecting to the tool cable (CMD-001, sold separately), the following operations can be conducted from an external computer using the Console software SWC-BCx01M. • Reading and setting of SV, PID and various set values • Reading of PV and action status • Function change. (Console connector is located on the top of the BCS2, BCR2, and BCD2 case.)

Terminal Arrangement

BCS2



BCR2, BCD2



⚠ Caution

Do not pull or bend the lead wire on the terminal side when wiring or after wiring, as it could cause malfunction.

POWER SUPPLY	Supply voltage 100 to 240 V AC or 24V AC/DC (For 24 V DC, ensure polarity is correct.)
EV1	Event output EV1
EV2	Event output EV2 (EV2, EV2+D□ options)
O2	Control output OUT2 (EV2, DS, DA, EV2+D□ options)
P24	24 V DC Insulated power output (P24 option)
O1	Control output OUT1
TC	Thermocouple input
RTD	RTD input
DC	DC voltage, current input
CT1	CT input 1 (C5W, EIW, W options)
CT2	CT input 2 (C5W, EIW, W options)
RS-485	Serial communication RS-485 (C5W, C5 options)
EVENT INPUT	Event input DI1 (C5W, EIW, EIT, EI options) (C5W: For BCR2, BCD2) Event input DI2 (C5W, EIW, EIT, EI options) (C5W, EIT: For BCR2, BCD2)
EXT CONT	External setting input (EIT option)
TRANSMIT OUTPUT	Transmission output (EIT option)

Key Operation Flowchart

Power ON

Starts from previous status (last shutdown).

△+▽+⊙+◎ (3 sec): CLr Data clear / no Yes/No

If Data clear no (No) is selected, and ⊙ is pressed, the unit will revert to PV/SV Display. If Data clear YES (Yes) is selected, the unit automatically reverts to PV/SV Display after data is cleared.

● **About Setting Item**

SEnS / K	Input type

- Upper left: PV Display: Indicates setting characters.
- Lower left: SV Display: Indicates factory default.
- Right side: Indicates the setting item.

[grey box]: This setting item is optional, and appears only when the option is ordered.

(*1) If 'Program control' is selected in [OUT/OFF key function], the unit enters Standby mode (Program control waiting).
(*2) Not available if 'Program control' is selected in [OUT/OFF key function].
(*3) If the option is ordered, and if 'Set value memory' is selected in [Event input DI1/DI2 allocation], setting items SV2 to SV4 are available. If 'Program control' is selected in [OUT/OFF key function], SV2 to SV9, Steps 1 to 9 time, Steps 1 to 9 wait value are available.
(*4) The unit cannot proceed to Monitor mode if it is in Standby of Program control.
(*5) Available only when 'Program control' is selected in [OUT/OFF key function].

● **Key Operation**

- △+▽+⊙+◎ (3 sec): Press and hold △, ▽, ⊙, ◎ (in that order) for approx. 3 sec.
- ▽+⊙ (3 sec): Press and hold the ▽, ⊙ keys (in that order) together for approx. 3 sec.
- △+⊙: Press and hold the △, ⊙ keys (in that order) together.
- △+▽ (3 sec): Press and hold the △, ▽ keys (in that order) together for approx. 3 sec.
- △+▽+⊙ (5 sec): Press and hold the △, ▽ and ⊙ keys (in that order) together for approx. 5 sec.
- Set (or select) each item with the △ or ▽ key, and register the value with the ⊙ key
- ↓⊙: If the ⊙ key is pressed, the unit proceeds to the next item, illustrated by an arrow. Pressing ◎ key moves back to the previous item.
- To revert to RUN mode, press and hold the ⊙ key for approx. 3 sec while in any mode.
- To revert to RUN mode, press and hold the ◎ key for approx. 3 sec while in any mode. If 'Control output OFF function' is selected in [OUT/OFF key function], the unit will enter Control output OFF status. If 'Auto/Manual control' is selected, the unit will enter Manual control status. If 'Program control' is selected, the unit will enter Program control RUN or Standby mode.

RUN Mode

By pressing the ◎ key for approx. 1 sec, one of the following items selected in [OUT/OFF key function] is indicated.

- 25 / 0: PV/SV Display (*1) ⇄ ◎ (1 sec)
- **Program Control**: 25 / 0 Program control RUN
- **Control Output OFF Function**: oFF Control output OFF
- **Auto/Manual Control**: 25 / 10.5 Manual control (MV flashes.)

Initial Setting Mode (▽+⊙ (3 sec))

Display	Default	Item
SEnS	K	Input type
SFLH	1370	Scaling high limit
SFLL	-200	Scaling low limit
dP	0	Decimal point place
EVo1	000	Event output EV1 allocation
EVo2	000	Event output EV2 allocation
H1	0.0	Heater burnout alarm 1 value
H2	0.0	Heater burnout alarm 2 value
LP_T	0	Loop break alarm time
LP_H	0	Loop break alarm span
EVI1	000	Event input DI1 allocation
EVI2	000	Event input DI2 allocation
rFLH	1370	External setting input high limit
rFLL	-200	External setting input low limit
TroS	PV	Transmission output type
TrLH	1370	Transmission output high limit
TrLL	-200	Transmission output low limit
S1	0	SV1 (*2)
S2	0	SV2 (*2)
S3	0	SV3 (*2)
S4	0	SV4 (*2)

Reverts to RUN mode.

If Alarm output (001 to 012) or Time signal output (015) is selected in [Event output EV1/EV2 allocation], and the ⊙ key is pressed, the following items will be indicated.

If 'Alarm output' is selected in [Event output EV1 allocation]:

Display	Default	Item
A1EA	no	EV1 alarm value 0 Enabled/Disabled
A1	0	EV1 alarm value
A1H	0	EV1 high limit alarm value
A1HY	1.0	EV1 alarm hysteresis
A1dY	0	EV1 alarm delay time
A1LA	noML	EV1 alarm Energized/De-energized

If 'Time signal output' is selected in [Event output EV1 allocation]:

Display	Default	Item
TS1S	1	TS1 output step number
TS1F	00.00	TS1 OFF time
TS1o	00.00	TS1 ON time

By pressing the ⊙ key, the unit moves to the item after [Event output EV1 allocation].

If Alarm output (001 to 012) or Time signal output (015) is selected in [Event output EV2 allocation], read EV2, TS2 for EV1, TS1.

Main Setting Mode (⊙)

Display	Default	Item
S1	0	SV1
Ti_1	00.00	Step 1 time
Wi_1	0	Step 1 wait value
S2	0	SV2
		Indicates setting items for Steps 2 to 9. (*3)
Wi_9	0	Step 9 wait value

Reverts to RUN mode.

Monitor Mode (◎ (3 sec) (*4))

Display	Item
25 / [MV]	MV indication (Decimal point flashes.)
25 / [Remaining time]	Remaining time (*5)
25 / [Step number]	Current step number (BCS2) (*5)
25 / [Memory number]	SV number (BCS2) (*2)

Reverts to RUN mode.

Sub Setting Mode (△+⊙)

Display	Default	Item
AT	----	AT/Auto-reset Perform/Cancel
P	10	OUT1 proportional band
I	200	Integral time
d	50	Derivative time
ArW	50	ARW
rESET	0	Manual reset
C	30	OUT1 proportional cycle
HYS	1.0	OUT1 ON/OFF hysteresis
oLH	100	OUT1 high limit
oLL	0	OUT1 low limit
orAT	0	OUT1 rate-of-change
CACT	Air	OUT2 cooling method
P_b	10	OUT2 proportional band
C_b	30	OUT2 proportional cycle
HYSb	1.0	OUT2 ON/OFF hysteresis
oLHb	100	OUT2 high limit
oLLb	0	OUT2 low limit
db	0	Overlap/Dead band
ConT	HEAT	Direct/Reverse action
A1	0	EV1 alarm value
A1H	0	EV1 high limit alarm value
A2	0	EV2 alarm value
A2H	0	EV2 high limit alarm value
H1	0.0	Heater burnout alarm 1 value
H2	0.0	Heater burnout alarm 2 value
LP_T	0	Loop break alarm time
LP_H	0	Loop break alarm span

Reverts to RUN mode.

Engineering Mode 1 (△+▽ (3 sec))

Display	Default	Item
LoCK	----	Set value lock
EVI1	000	Event input DI1 allocation
EVI2	000	Event input DI2 allocation
EVo1	000	Event output EV1 allocation
EVo2	000	Event output EV2 allocation
SoT	1.000	Sensor correction coefficient
So	0.0	Sensor correction
FILT	0.0	PV filter time constant
CMSL	noML	Communication protocol
CMno	0	Instrument number
CMSP	96	Communication speed
CMFT	7EVn	Data bit/Parity
CMST	1	Stop bit
CMdY	10	Response delay time
SVTC_b	0	SVTC bias
rEMT	LoCL	Remote/Local
rFLH	1370	External setting input high limit
rFLL	-200	External setting input low limit
rT_b	0	Remote bias
TroS	PV	Transmission output type
TrLH	1370	Transmission output high limit
TrLL	-200	Transmission output low limit
M_SU	MIn	Step time unit
PrEF	SToP	Power restore action
S_SV	0	Program start temperature
S_SL	PV	Program control start type
rEPT	0	Number of repetitions
rASS	SVST	SV Rise/Fall rate start type
rAPU	0	SV rise rate
rAPd	0	SV fall rate
PSV	oFF	Indication when control output OFF
AT_b	20	AT bias
AT_T	1.0	AT gain
EoUT	oFF	Output status when input errors occur
AMNU	oFF	OUT/OFF key function
AMrS	AUTo	Auto/Manual after power interruption
TIME	00.00	Indication time
PSr1	0.0	OUT1 MV preset value
PSr2	0.0	OUT2 MV preset value
FUnC	CnTr	Controller/Converter
EdIF	no	Error indication Enabled/Disabled

Reverts to RUN mode.

Engineering Mode 2 (△+▽+⊙ (5 sec))

Display	Default	Item
CoSL	noML	Control method
TPAH	0.40	Proportional gain 2DOF coefficient (α)
TIbT	1.35	Integral 2DOF coefficient (β)

Reverts to RUN mode.

Setting tables

Input type		
K□C	K	-200 to 1370 ℃
K□.C	K	-200.0 to 400.0 ℃
J□C	J	-200 to 1000 ℃
R□C	R	0 to 1760 ℃
S□C	S	0 to 1760 ℃
B□C	B	0 to 1820 ℃
E□C	E	-200 to 800 ℃
T□.C	T	-200.0 to 400.0 ℃
N□C	N	-200 to 1300 ℃
PL2C	PL-Ⅱ	0 to 1390 ℃
C□C	C(W/Re5-26)	0 to 2315 ℃
PT.C	Pt100	-200.0 to 850.0 ℃
JPT.C	JPt100	-200.0 to 500.0 ℃
PT□C	Pt100	-200 to 850 ℃
JPTC	JPt100	-200 to 500 ℃
K□F	K	-328 to 2498 ℉
K□.F	K	-328.0 to 752.0 ℉
J□F	J	-328 to 1832 ℉
R□F	R	32 to 3200 ℉
S□F	S	32 to 3200 ℉
B□F	B	32 to 3308 ℉
E□F	E	-328 to 1472 ℉
T□.F	T	-328.0 to 752.0 ℉
N□F	N	-328 to 2372 ℉
PL2F	PL-Ⅱ	32 to 2534 ℉
C□F	C(W/Re5-26)	32 to 4199 ℉
PT.F	Pt100	-328.0 to 1562.0 ℉
JPT.F	JPt100	-328.0 to 932.0 ℉
PTF	Pt100	-328 to 1562 ℉
JPTF	JPt100	-328 to 932 ℉
420A	4 to 20 mA	-2000 to 10000
020A	0 to 20 mA	-2000 to 10000
0_1B	0 to 1 V	-2000 to 10000
0_5B	0 to 5 V	-2000 to 10000
1_5B	1 to 5 V	-2000 to 10000
010B	0 to 10 V	-2000 to 10000

Decimal point place	
□□□0	No decimal point
□□0.0	1 digit after decimal point
□0.00	2 digits after decimal point
0.000	3 digits after decimal point

Event output EV1/EV2 allocation	
000	No event
001	High limit alarm
002	Low limit alarm
003	H/L limits alarm
004	H/L limits independent
005	H/L limit range alarm
006	H/L limit range independent
007	Process high alarm
008	Process low alarm
009	High limit with standby
010	Low limit with standby
011	H/L limits with standby
012	H/L limits with standby independent
013	Heater burnout alarm output
014	Loop break alarm output
015	Time signal output
016	Output during AT
017	Pattern end output
018	Output by communication
019	Heating/Cooling control relay contact output (for EV2 only)

EV1/EV2 alarm value 0 Disabled/Enabled	
no	Disabled
YES	Enabled

EV1/EV2 alarm Energized/De-energized	
noML	Energized
rEVS	De-energized

Event input DI1/DI2 allocation	
000	No event
001	Set value memory
002	Control ON/OFF
003	Direct/Reverse action
004	Preset output 1 ON/OFF
005	Preset output 2 ON/OFF
006	Auto/Manual control
007	Remote/Local
008	Program control Run/Stop
009	Program control Holding/Not holding
010	Program control Advance function
011	Integral action Holding

Transmission output	
PV	PV transmission
SV	SV transmission
MV	MV transmission
DV	DV transmission

AT/Auto-reset Perform/Cancel	
----	AT/Auto-reset Cancel
AT	AT Perform
AT_S	AT on startup Perform
rSET	Auto-reset Perform

OUT2 cooling method	
Air	Air cooling
oIL	Oil cooling
WAT	Water cooling

Direct/Reverse action	
HEAT	Reverse action
CooL	Direct action

Set value lock	
----	Unlock
LoC1	Lock 1
LoC2	Lock 2
LoC3	Lock 3
LoC4	Lock 4
LoC5	Lock 5

Communication protocol	
noML	Shinko protocol
ModA	Modbus ASCII
Modr	Modbus RTU
JnML	Shinko protocol (JC command allocation)
JMdA	Modbus ASCII (JC command allocation)
JMdr	Modbus RTU (JC command allocation)

Communication speed	
96	9600 bps
192	19200 bps
384	38400 bps

Data bit/Parity	
8non	8 bits/No parity
7non	7 bits/No parity
8EVn	8 bits/Even
7EVn	7 bits/Even
8odd	8 bits/Odd
7odd	7 bits/Odd

Stop bit	
1	1 bit
2	2 bits

Remote/Local	
LoCL	Local
rEMT	Remote

Step time unit	
MIn	Hours:Minutes
SEC	Minutes:Seconds

Power restore action	
SToP	Stop
ConT	Continue (resume)
HoLd	Suspend (on hold)

Program control start type	
PV	PV start
PVr	PVR start
SV	SV start

SV Rise/Fall rate start type	
SVST	SV start
PVST	PV start

Indication when control output OFF	
oFF	OFF indication
noFF	No indication
PV	PV indication
PVAL	PV + Any Alarm active

Output status when input errors occur	
oFF	Output OFF
on	Output ON

OUT/OFF key function	
oFF	Control output OFF
AMnU	Auto/Manual control
ProG	Program control

Auto/Manual after power interruption	
AUTo	Automatic control
MAnU	Manual control

Controller/Converter function	
CnTr	Controller
CnVT	Converter

Error indication Enabled/Disabled	
no	Disabled
YES	Enabled

Control method	
noML	Usual PID
2doF	2DOF PID