SM100

Board type multi-channels temperature controller

Manual

HANYOUNG NUX

Greeting

Thank you for purchasing our products. This manual clearly explains the function of product, installation method, precautions, operation method and etc. Please read it thoroughly and get used to it before usage. Also, this manual must be delivered to the end user and end user must place this manual where it can be seen easily.

* Information in this manual may changed without prior notification.
* If you have any question or find error in this manual, please contact us
* Copying or reprinting this manual without notifying us is prohibited.

■ **Service (A/S)**

* Please send product to the nearest distributor, agency or head quarter for A/S purpose.
* When willing to have an on-site A/S, please call our A/S center and make an appointment.
* Before making an appointment for A/S, please check out our web and search for the same problem in our FAQ

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1. Before starting

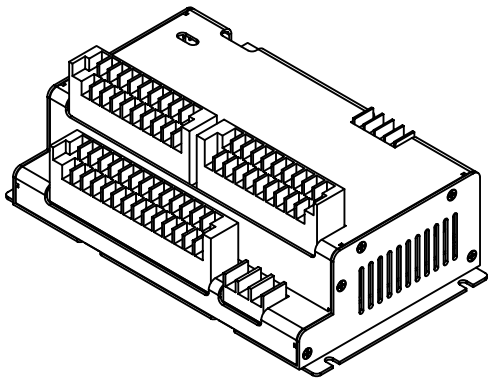
1.1 Checking the product

After purchasing the product, please check for the correct model type and check for any abnormal parts/scratches on the outside. If it is incorrect model type or find any abnormal parts/scratches on the outside, please contact to our nearest sales office.

1.1.1 Suffix Code

Model	Code			Information
SM100	□	□	□	Multi-channels board type temperature controller
Input type	K			K (CA) thermocouple input (IEC 584-1)
	P			Pt100 RTD input (IEC 751)
Output type		A		Control output (Voltage pulse output for running SSR)
		N		No control output (Indication only)
Input channel			20	20 channel (Standard)
			16	16 channel
			12	12 channel

1.1.2 What is included in the box



Temperature controller body

Manual

1.2 Safety information

1.2.1. Safety notice

- Please read through and follow the manual instructions clearly when operating for the safety issue. Doing so will protect the product and the system that is connected to the device.
- We are not responsible for any damages caused by the users misuse or lack of handling the product.
- When installing the protection or safety purpose circuit to the product, please install it on the outer part of product in order to protect the product and the system that is connected to the device. Do not install the mentioned circuits internally.
- Do not disassemble, repair and upgrade the product by yourself. Doing so may cause an electric shock, fire and malfunction to occur.
- Do not give strong impact to the product. It may damage the product or malfunction to occur.

1.2.2 Quality guarantee

- We will not guarantee issues that are not included in our quality assurance clause.
- We are not responsible for any damages and indirect loss if they are caused by unpredictable defect or natural disasters.

1.2.3. About the quality guarantee conditions of product

- Warranty validity is 1 year from the purchase date. Repairing of the product will be free as long as the product is used under a proper condition.
- Repairing will be charged according to our standard policies after warranty period is expired.
- Repairing will be charged if the product breaks due to the conditions in the below even in the warranty period.

  * Breakdowns due to the user's misuses.
  * Breakdowns due to the natural disasters.
  * Breakdowns caused by movement of product after installation is done.
  * Breakdowns due to the modification of product
  * Breakdowns due to the power troubles.

- Please contact our customer service center for A/S

2. How to install

2.1 Installation place and safety notice

2.1.1 Installation place

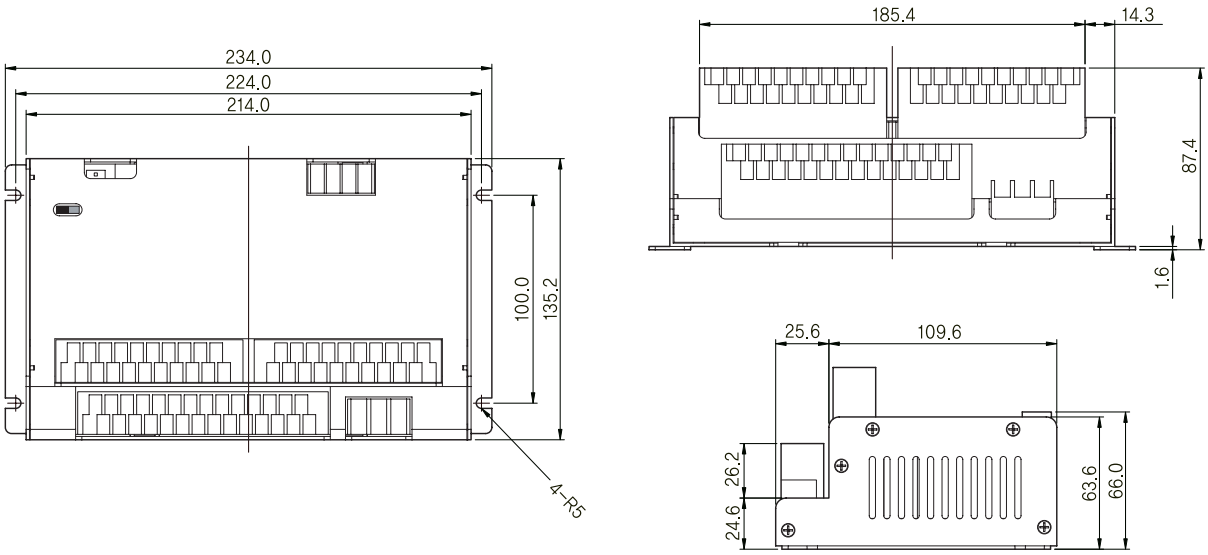
- Electric shock may occur so please use it after installing to the panel.
- Please avoid installing the product for following places where

· People can touch the terminal unconsciously.
· Directly exposed to the mechanical vibration or impact
· Exposed to the corrosive gas or combustion gas
· Temperature changes too frequently
· Temperature is either too high or too low
· Exposed to the direct rays
· Influenced by the electromagnetic waves too much
· Humidity is too high
· Too many combustible objects are present
· Too much dusts and salinity are present

2.1.2 Cautions

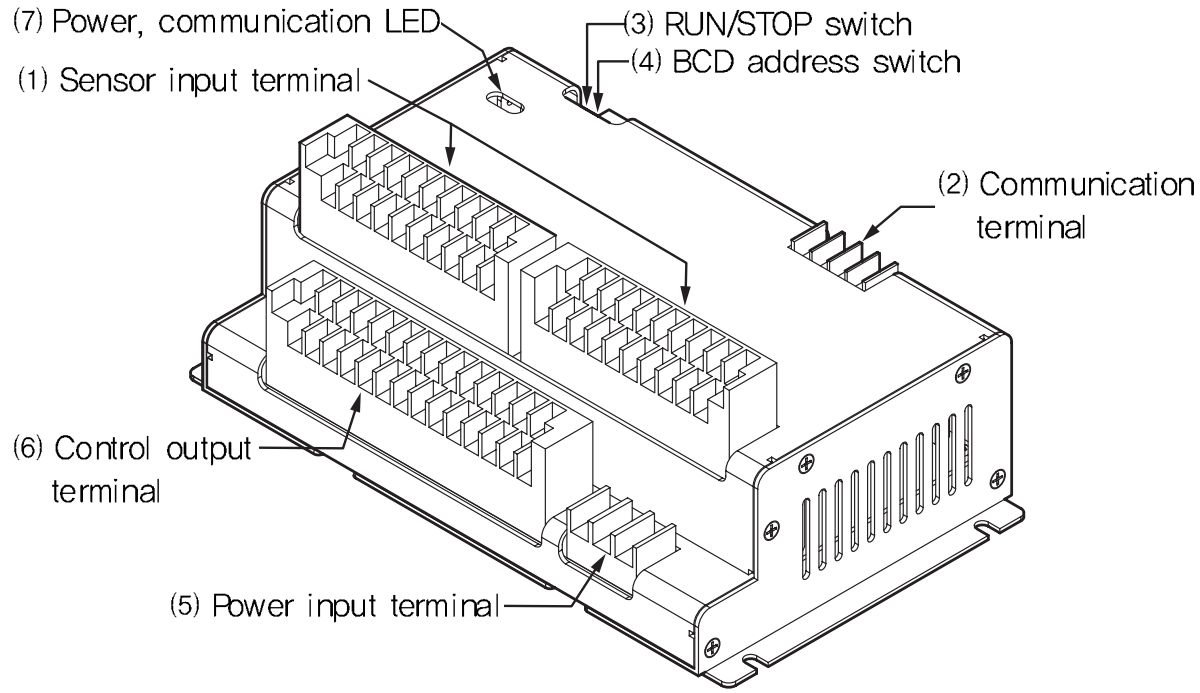
- When wiring, please turn OFF the power and do it.
- It operates at 100 – 240V a.c, 50 – 60 Hz without any separate adjustment. Electric shock and fire may occur when using at unrated power supply voltage.
- Do not handle the product with the wet hand. It may cause an electric shock to occur.
- Please follow the cautions in order to minimize the danger of fire, electric shock and personal injure.
- Please follow the instructions in this manual when installing and using the product.
- Regarding the ground (earth), please refer to the installation tips. But do not ever ground to the gas pipe, telephone line and lightening conductor. Doing so may cause explosion or fire to occur.
- Do not supply in the power until wiring is completely done.
- Do not block the opening for heat radiation. Blocking the opening may breakdown the product.
- Electric shock may occur when electric current is being applied. Therefore, do not touch the terminal when electric current is being applied.
- Please install the switch at power line which of purpose is to separate the device from the power.
- Please connect approx. 2 A fuse to the power line.

2.2 Dimension and panel cutout



2.3 Connection diagram

2.3.1. Terminal arrangement diagram



2.3.2. Connection method

CAUTION

- Before make the connection, please turn off the power for all of supplying devices and make sure that electric current is not applied to the cable.
- Electric shock may occur when electric current is being applied. Therefore, do not touch the terminal when electric current is being applied.
- Please make the connection after turning OFF the power
- Please do not touch any terminals other than the mentioned terminals in this manual.

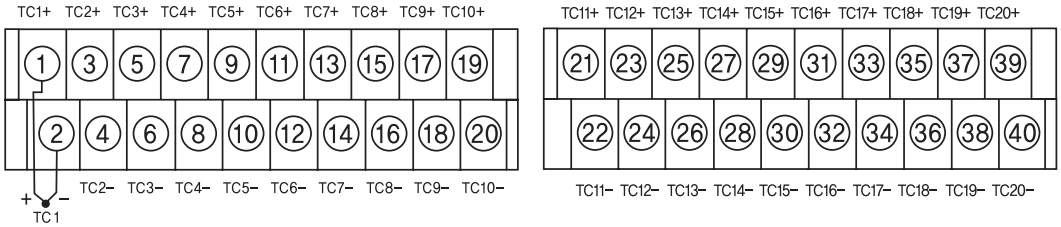
(1) Sensor input terminal

- Thermocouple (K)

① Check the position of sensor input terminal.

② Connect the '+' of thermocouple (K) Type sensor to TC1+ odd number and connect the '-' to TC1- even number.

③ Connect to the desired position (in between the TC1 ~ TC20)

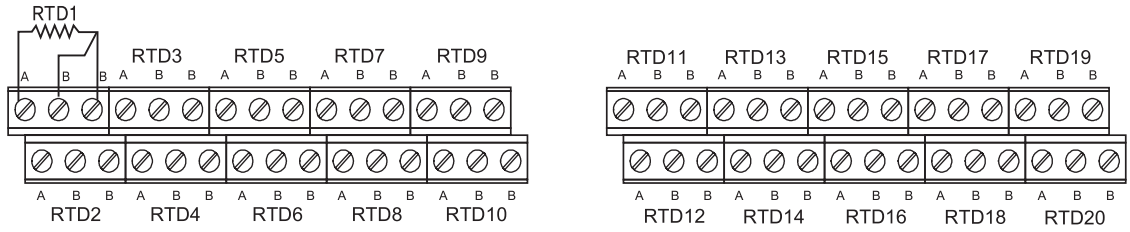


- RTD(Pt 100 Ω)

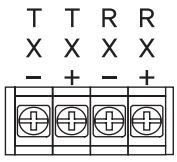
① Check the position of sensor input terminal.

② Please connect the RTD to each 'A' and 'B' just like an image below.

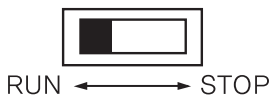
③ Connect to the desired position (in between the RTD1 ~ RTD20)



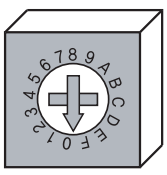
(2) Communication terminal



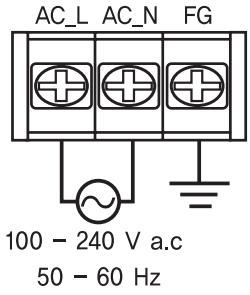
(3) RUN/STOP switch



(4) BCD address switch



(5) Power input terminal



• Power connection method

① Check the position of power terminal.

② Connect to the AC_L and AC_N in case of 2 wires.

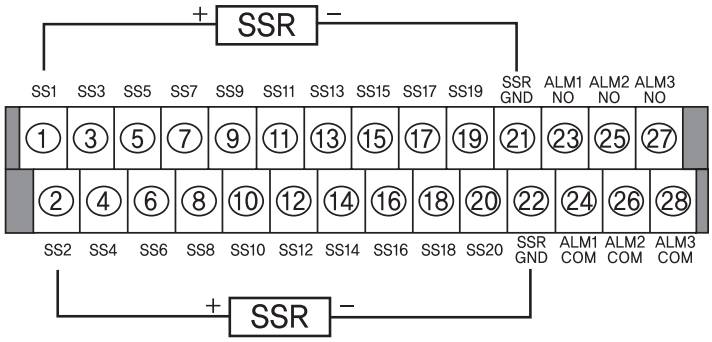
(6) Control output terminal

● Voltage pulse output for running SSR

① Check the position of control output terminal.

② Output is distinguished by channels and even if making the wiring by each channel, please follow the channel number for '+' and connect '–'of each voltage to the 'SSR COM'.

③ Connect to the desired channel output (in between the SS1 ~ SS20)

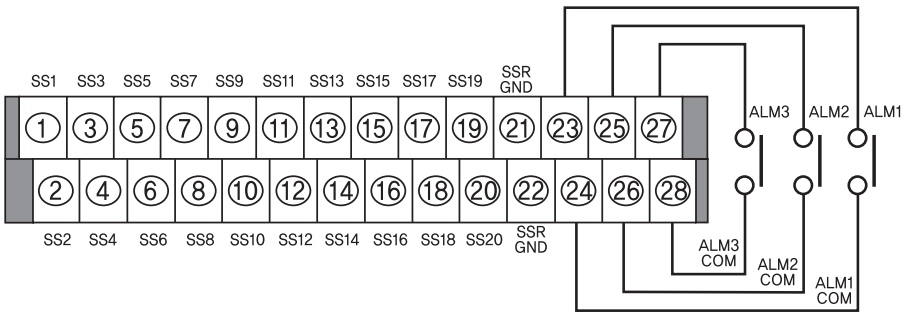


● Alarm output

① Check the position of alarm output terminal.

② ALM NO, ALM COM and a contact are a pair and total 3 contacts are support for alarm

③ Connect to the desired output (in between the ALM1 ~ ALM3)



(7) Power, communication LED

① POWER : Light ON when power is properly supplied in and operates properly

② RX : Light for data receiving becomes ON by communication

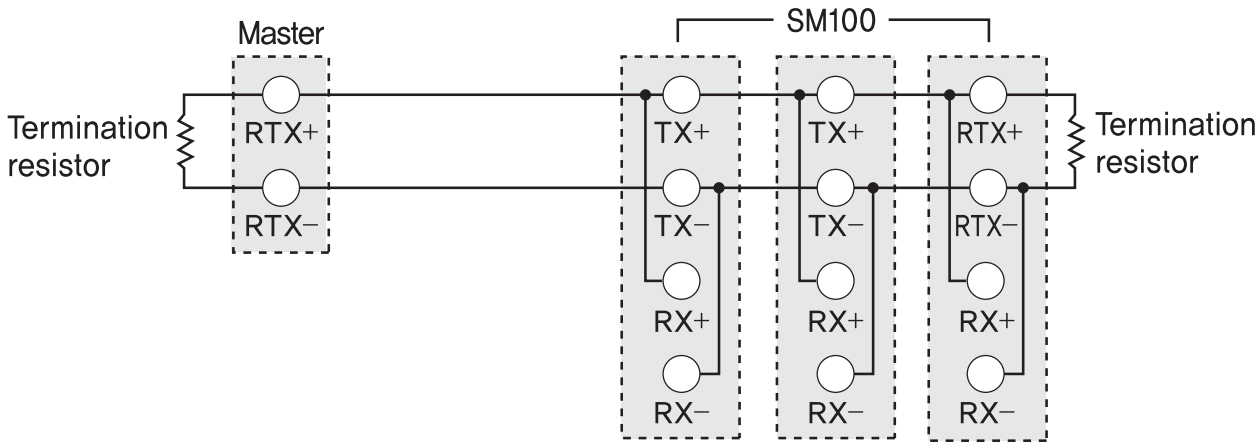
③ TX : Light for data transmitting becomes ON by communication

① POWER ② RX ③ TX

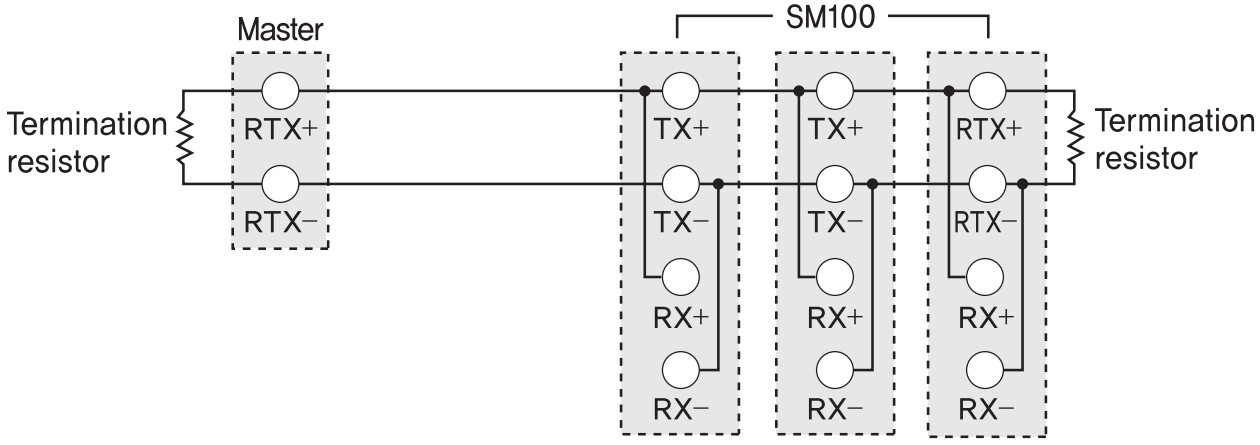
2.4 Communication connection (RS485/RS422)

Possible to connect up to maximum 15 devices

● 2 wire type connection



● 4 wire type connection



3. Operation

3.1 Protocol configuration

● Outline

- SM100 supports the RS422/485 communication and it operates the application of product and monitoring by using the exclusive program which installed on PC.

3.1.1 Communication protocol

- SM100 communication executed by ASCII character string and it can write and read the stated Register information.
- Communication format

〈PC-Link with SUM〉

STX	Address	Command	Data	SUM	CR	LF
STX	01 ~ 99	Refer to each Command		Check SUM	0x0D	0x0A

"Check Sum" is a created value by adding 1byte ASCII code from the next character of STX value to the before character of SUM value.

ex) STX 0 1 W H 0 4 F CR LF

Check Sum = 4F

Check Sum = "0"(0x30) + "1"(0x31) + "W"(0x57) + "H"(0x48) + "O"(0x4F)

= 0x30 + 0x31 + 0x57 + 0x48 + 0x4F = 0x14F

Check Sum is just 1byte value. so Check Sum 0x4F.

3.1.2 Communication command

- SM100 uses communication command as follows

Command	Information
D R S	D Register sequential read
D R R	D Register random read
D W S	D Register sequential write
D W R	D Register random write
W H O	Display self-information

3.1.3 How to use communication command

(1) DRS Command

- Applied when reading the sequential D Register value.
- Input the total reading numbers within Frame and beginning number of D Register.

〈Frame〉

Byte	1	2	3	1	2	1	4	2	1	1
Frame	STX	Address	DRS	,	Total numbers	,	D Register	SUM	CR	LF

* Total numbers : 01 ~ 32
* D Register : beginning D Register

〈 Responding Frame〉

Byte	1	2	3	1	2	1	4	1	···	1	4	2	1	1
Frame	STX	Address	DRS	,	OK	,	Data(1)	,	···	,	Data(n)	SUM	CR	LF

* Data : hexadecimal number world data character string

(2) DRR Command

- Applied when reading the random D Register value
- Input the total reading numbers within Frame and beginning number of D Register.

〈Frame〉

Byte	1	2	3	1	2	1	4	1	···	1	4	2	1	1
Frame	STX	Address	DRR	,	Total numbers	,	D Register(1)	,	···	,	D Register(n)	SUM	CR	LF

* Total numbers : 01 ~ 32

〈 Responding Frame〉

Byte	1	2	3	1	2	1	4	1	···	1	4	2	1	1
Frame	STX	Address	DRR	,	Total numbers	,	D Register(1)	,	···	,	D Register(n)	SUM	CR	LF

* Data : hexadecimal number world data character string

(3) DWS Command

- Applied when reading the series D Register
- Input the total writing numbers within Frame, beginning number of D Register and each data.

〈Frame〉

Byte	1	2	3	1	2	1	4	1	4	1	···	1	4	2	1	1
Frame	STX	Address	DWS	,	Total numbers	,	D Register	,	Data(1)	,	···	,	Data(n)	SUM	CR	LF

(3) DWS Command

- Applied when reading the series D Register
- Input the total writing numbers within Frame, beginning number of D Register and each data.

〈Frame〉

Byte	1	2	3	1	2	1	4	1	4	1	···	1	4	2	1	1
Frame	STX	Address	DWS	,	Total numbers	,	D Register	,	Data(1)	,	···	,	Data(n)	SUM	CR	LF

* Total numbers : 01 ~ 05
* D Register : beginning D Register
* Data : hexadecimal number world data character string

〈 Responding Frame〉

Byte	1	2	3	1	2	2	1	1
Frame	STX	Address	DWS	,	OK	SUM	CR	LF

(4) DWR Command

- Applied when reading the random D Register
- Input the total writing numbers within Frame, beginning number of D Register and each data.

〈Frame〉

Byte	1	2	3	1	2	1	4	1	4	1	···	1	4	1	4	2	1	1
Frame	STX	Address	DWR	,	Total numbers	,	D Register(1)	,	Data(1)	,	···	,	D Register(n)	,	Data(n)	SUM	CR	LF

* Total numbers : 01 ~ 05
* Data : hexadecimal number world data character string

〈Responding Frame〉

Byte	1	2	3	1	2	2	1	1
Frame	STX	Address	DWR	,	OK	SUM	CR	LF

(5) WHO Command

- Able to observe the information of SM100 through WHO Command

〈Frame〉

Byte	1	2	3	2	1	1
Frame	STX	Address	WHO	SUM	CR	LF

〈Responding Frame〉

Byte	1	2	3	1	2	1	10	8	2	1	1
Frame	STX	Address	WHO	,	OK	,	Name	Version	SUM	CR	LF

(6) Responding when error occurs

- When SM100 receives Command, it transmits the responding frame that is suitable with the corresponding Command. But, it transmits NG Frame as follows when there is error in receiving Command.

Byte	1	2	3	1	2	2	2	1	1
Frame	STX	Address	Command	,	NG	NG Code	SUM	CR	LF

- Detailed NG Code is as follows

NG Code	Information
0x01	Un-using Command
0x02	Un-using Register
0x03	Number of communication and number of Data is not same
0x04	Data exceeds the Hex (0x0 ~0xF) range
0x08	Error in terminating character (CR, LF)
0x10	SUM value not match
0x18	Value exceeds the afforded address range.
0x00	ETC

3.2 Register configuration

NO	+0	+100	+200	+300	+400	+500
0						
1	PV.1	PV1	PV3	PV5	PV7	PV9
2	PV.2	SV1	SV3	SV5	SV7	SV9
3	PV.3	MV1	MV3	MV5	MV7	MV9
4	PV.4	CH_STS1	CH_STS3	CH_STS5	CH_STS7	CH_STS9
5	PV.5	AL_STS1	AL_STS3	AL_STS5	AL_STS7	AL_STS9
6	PV.6	OUT_STS1	OUT_STS3	OUT_STS5	OUT_STS7	OUT_STS9
7	PV.7	RJC1	RJC3	RJC5	RJC7	RJC9
8	PV.8	TC1	TC3	TC5	TC7	TC9
9	PV.9					
10	PV.10	CHEN1	CHEN3	CHEN5	CHEN7	CHEN9
11	PV.11	TUNE1	TUNE3	TUNE5	TUNE7	TUNE9
12	PV.12					
13	PV.13					
14	PV.14					
15	PV.15					
16	PV.16					
17	PV.17					
18	PV.18					
19	PV.19					
20	PV.20	AL1TY1	AL1TY3	AL1TY5	AL1TY7	AL1TY9
21	SV.1	AL1VL1	AL1VL3	AL1VL5	AL1VL7	AL1VL9
22	SV.2	AL1HY1	AL1HY3	AL1HY5	AL1HY7	AL1HY9
23	SV.3	AL2TY1	AL2TY3	AL2TY5	AL2TY7	AL2TY9
24	SV.4	AL2VL1	AL2VL3	AL2VL5	AL2VL7	AL2VL9

: Read only Register

NO	+0	+100	+200	+300	+400	+500
25	PV.5	AL2HY1	AL2HY3	AL2HY5	AL2HY7	AL2HY9
26	PV.6	AL3TY1	AL3TY3	AL3TY5	AL3TY7	AL3TY9
27	PV.7	AL3VL1	AL3VL3	AL3VL5	AL3VL7	AL3VL9
28	PV.8	AL3HY1	AL3HY3	AL3HY5	AL3HY7	AL3HY9
29	PV.9					
30	PV.10	LBA1	LBA3	LBA5	LBA7	LBA9
31	PV.11	LBD1	LBD3	LBD5	LBD7	LBD9
32	PV.12	PB1	PB3	PB5	PB7	PB9
33	PV.13	TI1	TI3	TI5	TI7	TI9
34	PV.14	TD1	TD3	TD5	TD7	TD9
35	PV.15	AR1	AR3	AR5	AR7	AR9
36	PV.16	MR1	MR3	MR5	MR7	MR9
37	PV.17	CT1	CT3	CT5	CT7	CT9
38	PV.18	PO1	PO3	PO5	PO7	PO9
39	PV.19	HYS1	HYS3	HYS5	HYS7	HYS9
40	PV.20	DR1	DR3	DR5	DR7	DR9
41	MV.1	BS1	BS3	BS5	BS7	BS9
42	MV.2	FL1	FL3	FL5	FL7	FL9
43	MV.3	SVH1	SVH3	SVH5	SVH7	SVH9
44	MV.4	SVL1	SVL3	SVL5	SVL7	SVL9
45	MV.5					
46	MV.6					
47	MV.7					
48	MV.8					
49	MV.9					

: Read only Register

NO	+0	+100	+200	+300	+400	+500
50	MV.10					
51	MV.11	PV2	PV4	PV6	PV8	PV10
52	MV.12	SV2	SV4	SV6	SV8	SV10
53	MV.13	MV2	MV4	MV6	MV8	MV10
54	MV.14	CH_STS2	CH_STS4	CH_STS6	CH_STS8	CH_STS10
55	MV.15	AL_STS2	AL_STS4	AL_STS6	AL_STS8	AL_STS10
56	MV.16	OUT_STS2	OUT_STS4	OUT_STS6	OUT_STS8	OUT_STS10
57	MV.17	RJC2	RJC4	RJC6	RJC8	RJC10
58	MV.18	TC2	TC4	TC6	TC8	TC10
59	MV.19					
60	MV.20	CHEN2	CHEN4	CHEN6	CHEN8	CHEN10
61	CH_STS.1	TUNE2	TUNE4	TUNE6	TUNE8	TUNE10
62	CH_STS.2					
63	CH_STS.3					
64	CH_STS.4					
65	CH_STS.5					
66	CH_STS.6					
67	CH_STS.7					
68	CH_STS.8					
69	CH_STS.9					
70	CH_STS.10	AL1TY2	AL1TY4	AL1TY6	AL1TY8	AL1TY10
71	CH_STS.11	AL1VL2	AL1VL4	AL1VL6	AL1VL8	AL1VL10
72	CH_STS.12	AL1HY2	AL1HY4	AL1HY6	AL1HY8	AL1HY10
73	CH_STS.13	AL2TY2	AL2TY4	AL2TY6	AL2TY8	AL2TY10
74	CH_STS.14	AL2VL2	AL2VL4	AL2VL6	AL2VL8	AL2VL10

: Read only Register

NO	+0	+100	+200	+300	+400	+500
75	CH_STS.15	AL2HY2	AL2HY4	AL2HY6	AL2HY8	AL2HY10
76	CH_STS.16	AL3TY2	AL3TY4	AL3TY6	AL3TY8	AL3TY10
77	CH_STS.17	AL3VL2	AL3VL4	AL3VL6	AL3VL8	AL3VL10
78	CH_STS.18	AL3HY2	AL3HY4	AL3HY6	AL3HY8	AL3HY10
79	CH_STS.19					
80	CH_STS.20	LBA2	LBA4	LBA6	LBA8	LBA10
81	AL1_ST1	LBD2	LBD4	LBD6	LBD8	LBD10
82	AL2_ST2	PB2	PB4	PB6	PB8	PB10
83	AL2_ST1	TI2	TI4	TI6	TI8	TI10
84	AL2_ST2	TD2	TD4	TD6	TD8	TD10
85	AL3_ST1	AR2	AR4	AR6	AR8	AR10
86	AL3_ST2	MR2	MR4	MR6	MR8	MR10
87	DO_STS	CT2	CT4	CT6	CT8	CT10
88	DI_STS	PO2	PO4	PO6	PO8	PO10
89		HYS2	HYS4	HYS6	HYS8	HYS10
90		DR2	DR4	DR6	DR8	DR10
91		BS2	BS4	BS6	BS8	BS10
92		FL2	FL4	FL6	FL8	FL10
93		SVH2	SVH4	SVH6	SVH8	SVH10
94		SVL2	SVL4	SVL6	SVL8	SVL10
95						
96						
97	CH_NO					
98	ADDR					
99	Version					

: Read only Register

NO	+600	+700	+800	+900	+1000
0					
1	PV11	PV13	PV15	PV17	PV19
2	SV11	SV13	SV15	SV17	SV19
3	MV11	MV13	MV15	MV17	MV19
4	CH_STS11	CH_STS13	CH_STS15	CH_STS17	CH_STS19
5	AL_STS11	AL_STS13	AL_STS15	AL_STS17	AL_STS19
6	OUT_STS11	OUT_STS13	OUT_STS15	OUT_STS17	OUT_STS19
7	RJC11	RJC13	RJC15	RJC17	RJC19
8	TC11	TC13	TC15	TC17	TC19
9					
10	CHEN11	CHEN13	CHEN15	CHEN17	CHEN19
11	TUNE11	TUNE13	TUNE15	TUNE17	TUNE19
12					
13					
14					
15					
16					
17					
18					
19					
20	AL1TY11	AL1TY13	AL1TY15	AL1TY17	AL1TY19
21	AL1VL11	AL1VL13	AL1VL15	AL1VL17	AL1VL19
22	AL1HY11	AL1HY13	AL1HY15	AL1HY17	AL1HY19
23	AL2TY11	AL2TY13	AL2TY15	AL2TY17	AL2TY19
24	AL2VL11	AL2VL13	AL2VL15	AL2VL17	AL2VL19

: Read only Register

NO	+600	+700	+800	+900	+1000
25	AL2HY11	AL2HY13	AL2HY15	AL2HY17	AL2HY19
26	AL3TY11	AL3TY13	AL3TY15	AL3TY17	AL3TY19
27	AL3VL11	AL3VL13	AL3VL15	AL3VL17	AL3VL19
28	AL3HY11	AL3HY13	AL3HY15	AL3HY17	AL3HY19
29					
30	LBA11	LBA13	LBA15	LBA17	LBA19
31	LBD11	LBD13	LBD15	LBD17	LBD19
32	PB11	PB13	PB15	PB17	PB19
33	TI11	TI13	TI15	TI17	TI19
34	TD11	TD13	TD15	TD17	TD19
35	AR11	AR13	AR15	AR17	AR19
36	MR11	MR13	MR15	MR17	MR19
37	CT11	CT13	CT15	CT17	CT19
38	PO11	PO13	PO15	PO17	PO19
39	HYS11	HYS13	HYS15	HYS17	HYS19
40	DR11	DR13	DR15	DR17	DR19
41	BS11	BS13	BS15	BS17	BS19
42	FL11	FL13	FL15	FL17	FL19
43	SVH11	SVH13	SVH15	SVH17	SVH19
44	SVL11	SVL13	SVL15	SVL17	SVL19
45					
46					
47					
48					
49					

: Read only Register

NO	+600	+700	+800	+900	+1000
50					
51	PV12	PV14	PV16	PV18	PV20
52	SV12	SV14	SV16	SV18	SV20
53	MV12	MV14	MV16	MV18	MV20
54	CH_STS12	CH_STS14	CH_STS16	CH_STS18	CH_STS20
55	AL_STS12	AL_STS14	AL_STS16	AL_STS18	AL_STS20
56	OUT_STS12	OUT_STS14	OUT_STS16	OUT_STS18	OUT_STS20
57	RJC12	RJC14	RJC16	RJC18	RJC20
58	TC12	TC14	TC16	TC18	TC20
59					
60	CHEN12	CHEN14	CHEN16	CHEN18	CHEN20
61	TUNE12	TUNE14	TUNE16	TUNE18	TUNE20
62					
63					
64					
65					
66					
67					
68					
69					
70	AL1TY12	AL1TY14	AL1TY16	AL1TY18	AL1TY20
71	AL1VL12	AL1VL14	AL1VL16	AL1VL18	AL1VL20
72	AL1HY12	AL1HY14	AL1HY16	AL1HY18	AL1HY20
73	AL2TY12	AL2TY14	AL2TY16	AL2TY18	AL2TY20
74	AL2VL12	AL2VL14	AL2VL16	AL2VL18	AL2VL20

: Read only Register

NO	+600	+700	+800	+900	+1000
75	AL2HY12	AL2HY14	AL2HY16	AL2HY18	AL2HY20
76	AL3TY12	AL3TY14	AL3TY16	AL3TY18	AL3TY20
77	AL3VL12	AL3VL14	AL3VL16	AL3VL18	AL3VL20
78	AL3HY12	AL3HY14	AL3HY16	AL3HY18	AL3HY20
79					
80	LBA12	LBA14	LBA16	LBA18	LBA20
81	LBD12	LBD14	LBD16	LBD18	LBD20
82	PB12	PB14	PB16	PB18	PB20
83	TI12	TI14	TI16	TI18	TI20
84	TD12	TD14	TD16	TD18	TD20
85	AR12	AR14	AR16	AR18	AR20
86	MR12	MR14	MR16	MR18	MR20
87	CT12	CT14	CT16	CT18	CT20
88	PO12	PO14	PO16	PO18	PO20
89	HYS12	HYS14	HYS16	HYS18	HYS20
90	DR12	DR14	DR16	DR18	DR20
91	BS12	BS14	BS16	BS18	BS20
92	FL12	FL14	FL16	FL18	FL20
93	SVH12	SVH14	SVH16	SVH18	SVH20
94	SVL12	SVL14	SVL16	SVL18	SVL20
95					
96					
97					
98					
99					

: Read only Register

3.3 Parameter configuration

3.3.1. Operation parameter

Operation parameter	Information	Set range	Register	Default value
PV.n	process value	-199.9 ~ 999.9(K type) -199.0 ~ 640.0(RTD type)	0 + n ®	
SV.n	Set value	-199.9 ~ 999.9(K type) -199.0 ~ 640.0(RTD type)	20 + n ®	-199.9
RJC.n	RJC temperature		Note1 ®	
TC.n	TC temperature	-199.9 ~ 999.9(K type) -199.0 ~ 640.0(RTD type)	Note1 ®	
MV.n	output value	0.0 ~ 100.0	40 + n ®	0.0
CH_NO	number of CHANNEL	12, 16, 20	97 ®	
ADDR	ADDRESS	1 ~ 15	98 ®	
VERSION	ROM Version	-	99 ®	-

※ n = 1 ~ 20 ※ Note 1 = Refer to the Register configuration ※ ® = Read only

3.3.2. 3.3.2 Mode parameter

Symbol	Information	Set range	Unit	Register	Default value
CHEN.n	channel activation/deactivation	0 : channel deactivation, 1 : channel activation	ABS	Note1	1
TUNE.n	Auto - Tuning	0 : Off, 1 : On	ABS	Note1	0(Off)
CH_STS.n	channel state	Refer to the state displaying register	ABS	Note1 ®	0
OUT_STS.n	output state	Refer to the each channel output state displaying register	ABS	Note1 ®	0
AL1_STS.1	Alarm 1 each channel state 2	alarm output & DI & DO state displaying register	ABS	Note1 ®	0
AL1_STS.2	Alarm 1 each channel state 2		ABS	Note1 ®	0
AL2_STS.1	Alarm 2 each channel state 1		ABS	Note1 ®	0
AL2_STS.2	Alarm 2 each channel state 2		ABS	Note1 ®	0
AL3_STS.1	Alarm 3 each channel state 1		ABS	Note1 ®	0
AL3_STS.2	Alarm 3 each channel state 2		ABS	Note1 ®	0
AL_STS.n	each channel alarm state		ABS	Note1 ®	0
DO_STS	alarm output state		ABS	87 ®	0
DI_STS	contact input state		ABS	88 ®	0

※ n = 1 ~ 20 ※ Note 1 = Refer to the Register configuration ※ ® = Read only

3.3.3. Control parameter

Symbol	Information	Set range	Unit	Register	Default value
PB.n	Proportional band	0 ~ 1200.0	℃	Note1	20.0
TI.n	Integral time	1 ~ 3600	sec	Note1	240
TD.n	Differential time	1 ~ 3600	sec	Note1	60
AR.n	Over integral prevention	0(Auto), 0.1 ~ 100.0	%	Note1	100.0
MR.n	Manual Reset	0.0 ~ 100.0	%	Note1	100.0

※ n = 1 ~ 20 ※ Note 1 = Refer to the Register configuration

3.3.4. Alarm parameter

Symbol	Information	Set range	Unit	Register	Default value
AL1TY.n	Alarm1 type	Refer to the alarm operation		Note1	0
AL2TY.n	Alarm2 type			Note1	0
AL3TY.n	Alarm3 type			Note1	0
AL1VL.n	Alarm1 set value			Note1	0
AL2VL.n	Alarm2 set value			Note1	0
AL3VL.n	Alarm3 set value			Note1	0
AL1HY.n	Alarm1 Hysteresis			Note1	1.0
AL2HY.n	Alarm2 Hysteresis			Note1	1.0
AL3HY.n	Alarm3 Hysteresis			Note1	1.0
LBA.n	Loop break alarm	0(OFF), 0 ~ 7200	sec	Note1	480
LBD.n	Loop break alarm dead band	0 ~ 1200.0	℃	Note1	0

※ n = 1 ~ 20 ※ Note 1 = Refer to the Register configuration

3.3.5. Output parameter

Symbol	Information	Set range	Unit	Register	Default value
CT.n	Output cycle	1 ~ 100	sec	Note1	2
PO.n	Emergency output value	0.0 ~ 100.0	%	Note1	0
HYS.n	ON/OFF Hysteresis	0 ~ 120.0	℃	Note1	1.0
DR.n	Control direction	0 : Reverse direction 1 : Forward direction	ABS	Note1	0

※ n = 1 ~ 20 ※ Note 1 = Refer to the Register configuration

3.3.6. Input parameter

Symbol	Information	Set range	Unit	Register	Default value
BS.n	Input compensation	-1200.0 ~ 1200.0	℃	Note1	0
FL.n	Input filter	0 ~ 100	sec	Note1	0
SVH.n	SV upper boundary	TC : -199.9 ~ 999.9 RTD : 199.0 ~ 640.0	℃	Note1	999.9
SVL.n	SV lower boundary	TC : -199.9 ~ 999.9 RTD : 199.0 ~ 640.0	℃	Note1	-199.9

※ n = 1 ~ 20 ※ Note 1 = Refer to the Register configuration

3.4 Handling and operation

- Able to check the PV, RJC, MV, F/W Version and state of each channel and able to set the SV in the operation mode.

Symbol	Information	Set range	Unit	Register	Default value
PV.n	Current temperature value	-	℃	0 + n ®	-
SV.n	Target temperature value	SVL ~ SVH	℃	20 + n	-199.9
RJC.n	RJC temperature	-	℃	Note1 ®	-
TC.n	TC temperature	-199.9 ~ 999.9(K type) -199.0 ~ 640.0(RTD type)	℃	Note1 ®	-
CH_NO	Number of CHANNEL	12, 16, 20	ABS	97 ®	
ADDR	ADDRESS	1 ~ 15	ABS	98 ®	
VERSION	ROM Version	-	ABS	99 ®	-
CHEN.n	Channel activation/deactivation	0:channel deactivated, 1: channel activated	ABS	Note1 ®	0
TUNE.n	Auto-tuning	0: Off, 1:On	ABS	Note1 ®	0(Off)
CH_STS.n	Channel state	Refer to the state displaying register	ABS	Note1 ®	0
OUT_STS.n	Output state	Refer to the displaying register of output state of each channel	ABS	Note1 ®	0
AL1_STS1	Alarm 1 state 1 of each channel	Alarm output & DI & DO state displaying register	ABS	Note1 ®	0
AL1_STS2	Alarm 2 state 2 of each channel		ABS	Note1 ®	0
AL2_STS1	Alarm 2 state 1 of each channel		ABS	Note1 ®	0
AL2_STS2	Alarm 2 state 2 of each channel		ABS	Note1 ®	0
AL3_STS1	Alarm 3 state 1 of each channel		ABS	Note1 ®	0
AL3_STS2	Alarm 3 state 2 of each channel		ABS	Note1 ®	0
AL_STS.n					
DO_STS	Alarm output state		ABS	87 ®	0
DI_STS	Contact input state		ABS	88 ®	0

※ n = 1 ~ 20 ※ Note 1 = Refer to the Register configuration

(1) PV, SV, RJC, TC, MV, VERSION Register

- PV : This is the register that can display the measured temperature value of each channel. Only READ possible.
- SV : This is the register that can display the target temperature value of each channel. Only READ possible. But, it can be modified within the assigned register.

※ Modifiable register address = 102 + {(n-1)x50} -> n : channel number

- RJC : It compensates the contact temperature by detecting the contact temperature when using TC input.
- TC : It displays the sensor temperature value before compensating the contact temperature when using TC input
- MV : This is the register that displays an amount of control output of each channel. Only READ possible.
- VERSION : Display the version of F/W.

(2) Channel activated register

- CHEN.n : It activates/deactivates each channel. When deactivates the channel, all of related modes parameter will be deactivated. When Run/Stop switch is in Run state and once channel is activated then corresponding channel will become Run state.

CHEN.n = "0" channel deactivated
"1" channel activated

(3) Auto-tuning start register

- TUNE : This is the register that starts the Auto-tuning of each channel and this is structured as follows

TUNE.n = "0" AUTO TUNING STOP
"1" AUTO TUNING

※ Once Auto-tuning is finished, THEN.n value automatically become '0'

(4) State display register

- CH_STS : This is the state displaying register of each channel and only READ is possible. Following is the structure of this register.

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
SYS.E	CALIB	ADC	B.OUT	EEP.E	RJC	OVER	MOVER
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	0	0	0	0	AT	0	R/S

※ CH_STS : Register only read possible
※ Always maintain the values of Bit1, Bit3~Bit7, Bit15 as '0'.
※ CALIB : 1 = Calibration Data error
※ ADC : 1 = Input circuit error
※ B.OUT : 1 = Input sensor error
※ EEP.E : 1 = EEPROM READ WRITE error
※ RJC : 1 = Standard RJC error
※ OVER : 1 = Over the input range within +5%
※ MOVER : 1 = Over the input range within -5%
※ AT : 1 = Performing Auto-tuning
※ R/S : 1 = Operating

- Operation when error occurs

Type	Cause	PV state	Control state
CALIB	Calibration Error	Reverse control : 105 % Forward control : -5 %	0 %
ADC	Input circuit error	Reverse control : 105 % Forward control : -5 %	PO output after the control ends
B.OUT	Input sensor error	Reverse control : 105 % Forward control : -5 %	PO output after the control ends
ATE	Auto-tuning error	Normal process	Normal control
RJC	RJC Error	Display the temperature which of RJC temperature is being deleted	Display the temperature which of RJC temperature is being deleted
OVER	PV exceeded +5% of input range	Normal process	Normal control
MOVER	PV exceeded -5% of input range	Normal process	Normal control
SYS.E	System Data Error	Reverse control : 105 % Forward control : -5 %	0 %
EEP.E	EEPROM Error	Normal process	Normal process

(5) **Output state displaying register for each channel**

- OUT_STS.n : Display the output state of each channel

  OUT_STS.n = "0" NO

  "1" YES

(6) **Alarm output & DI & DO state displaying register**

- AL_STS.n : This is the register which displays the alarm output state for each channel and this is composed as follows.

〈Composition of AL_STS〉

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
0	0	0	0	0	0	0	0
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	0	0	0	0	ALM3	ALM2	ALM1

※ AL_STS.n resister : Read only

※ Always maintain "0" for the value of Bit3~Bit15

※ Action of ALM1 ~ ALM3

"0": OFF

"1": ON

- AL1_STS.k : This is the register which displays the alarm 1 output state for each channel and this is composed as follows. (k= 1 ~2)

〈Composition of AL_STS1〉

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
CH12	CH11	CH10	CH9	CH8	CH7	CH6	CH5
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
CH4	CH3	CH2	CH1	0	0	0	0

※ AL1_STS1 resister : Read only

※ Always maintain "0" for the value of Bit3~Bit15

※ Action of CH1~CH2

"0": ALM1 OFF

"1": ALM1 ON

〈Composition of AL1_STS2〉

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
CH20	CH19	CH18	CH17	CH16	CH15	CH14	CH13
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	0	0	0	0	0	0	0

※ AL1_STS2 resister : Read only

※ Always maintain "0" for the value of Bit0 ~ Bit7

※ Action of CH13 ~ CH20

"0": ALM1 OFF

"1": ALM1 ON

- AL2_STS.k : This is the register which displays the alarm 2 output state for each channel and this is composed as follows. (k= 1 ~2)

〈Composition of AL2_STS1〉

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
CH12	CH11	CH10	CH9	CH8	CH7	CH6	CH5
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
CH4	CH3	CH2	CH1	0	0	0	0

※ AL2_STS1 resister : Read only

※ Always maintain "0" for the value of Bit0 ~ Bit3

※ Action of CH1 ~ CH12

"0": ALM2 OFF

"1": ALM2 ON

〈Composition of AL2_STS3〉

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
CH20	CH19	CH18	CH17	CH16	CH15	CH14	CH13
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	0	0	0	0	0	0	0

※ AL2_STS2 resister : Read only

※ Always maintain "0" for the value of Bit0 ~ Bit7

※ Action of CH13 ~ CH20

"0": ALM2 OFF

"1": ALM2 ON

- AL3_STS.k : This is the register which displays the alarm 3 output state for each channel and this is composed as follows. (k= 1 ~2)

〈Composition of AL3_STS1〉

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
CH12	CH11	CH10	CH9	CH8	CH7	CH6	CH5
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
CH4	CH3	CH2	CH1	0	0	0	0

※ AL3_STS2 resister : Read only

※ Always maintain "0" for the value of Bit0 ~ Bit3

※ Action of CH1 ~ CH12

"0": ALM3 OFF

"1": ALM3 ON

〈Composition of AL3_STS2〉

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
CH20	CH19	CH18	CH17	CH16	CH15	CH14	CH13
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	0	0	0	0	0	0	0

※ AL3_STS2 resister : Read only

※ Always maintain "0" for the value of Bit0 ~ Bit7

※ Action of CH13 ~ CH20

"0": ALM3 OFF

"1": ALM3 ON

- DI_STS : Register that displays the state of Digital Input (D.I)

※ DI_STS resister: Read only

※ Action of DI

"0": OFF

"1": ON

- DO_STS : This is the register that displays the state of alarm output and compositions are as follow

〈Composition of DO_STS〉

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
0	0	0	0	0	0	0	0
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	0	0	0	0	ALM3	ALM2	ALM1

※ DO_STS resister : Read only

※ Always maintain "0" for the value of Bit3 ~ Bit15

※ Action of ALM 1, 2, 3

"0": ALM OFF

"1": ALM3 ON

(7) Control action

- SM100 supports PID control type and ON/OFF control type

〈Related parameters〉

Symbol	Information	Set range	Unit	Register	Default value
PB.n	Proportional band	0 ~ 1200.0	℃	Note1	20.0
TI.n	Integral time	1 ~ 3600	sec	Note1	240
TD.n	Differential time	1 ~ 3600	sec	Note1	60
AR.n	Over current prevention	0(Auto), 0.1 ~ 100.0	%	Note1	100.0
MR.n	Manual Reset	0.0 ~ 100.0	%	Note1	100.0

※ n = 1 ~ 20

※ Note1 = Refer to the Register configuration

① PB, T1, TD register

- PB : This is the constant for performing PID control which correspond the proportional band. When setting the PB as "0", it will start the temperature control by ON/OFF control method disregarding the other parameters.
- TI : This is the constant for performing PID control which correspond to the integral time.
- TD : This is the constant for performing PID control which correspond to the differential time.
- Register values of PB, TI and TD become set automatically when running the Auto-tuning.

② Over integral preventing function

- When performing the PID control, it prevents the overshoot which may occur due to the over integral by setting the proper value in the AR register
- When setting the AR as "0", it performs the over integral preventing function by calculating the AR value automatically.

③ Manual reset function

- If integral time (T.1) is "0" as PID control, the deviation occurrence cannot be avoided in between the PV and SV. So when T1=0, users can solve the deviation problem by adding the MR value. (MR value which users set for a certain purpose)

(8) Alarm action

- SM100 can set various alarm operations such as high alarm, low alarm, loop break alarm, alarm within range and etc.

〈Related parameters〉

Symbol	Information	Set range	Unit	Register	Default value
AL1TY.n	Alarm1 Type	Refer to the Alarm operation		Note1	0
AL2TY.n	Alarm2 Type			Note1	0
AL3TY.n	Alarm3 Type			Note1	0
AL1VL.n	Alarm1 Set value			Note1	0
AL2VL.n	Alarm2 Set value			Note1	0
AL3VL.n	Alarm3 Set value			Note1	0
AL1HY.n	Alarm1 Hysteresis			Note1	1.0
AL2HY.n	Alarm2 Hysteresis			Note1	1.0
AL3HY.n	Alarm3 Hysteresis			Note1	1.0
LBA.n	Loop break alarm			Note1	480
LBD.n	Loop break alarm dead band			Note1	0

※ n = 1 ~ 20

※ Note1 = Refer to the Register configuration

① Alarm operation selecting register

- AL1TY.n, AL2TY.n, AL3TY.n

The register for selecting alarm action 1, 2 and 3 of each channel and alarm operation are given in the below

〈Alarm operation type〉

Set value	Alarm operation	Standby	Set value	Alarm operation	Standby
0	None	x	8	Within deviation range	o
1	High deviation	x	9	High PV	x
2	Low deviation	x	10	Low PV	x
3	High/Low deviation	x	11	High PV	o
4	Within deviation range	x	12	Low PV	o
5	High deviation	o	13	High SV	x
6	Low deviation	o	14	Low SV	x
7	High/Low deviation	o	15	LBA	x

※ o : Standby Yes, x : Standby No

- AL1VL.n, AL2VL.n, AL3VL.n : AL1HY.n, AL2HY.n, AL3HY.n

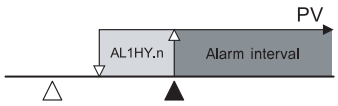
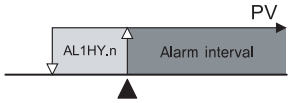
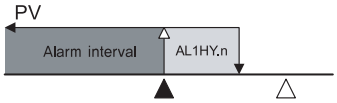
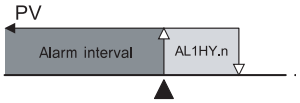
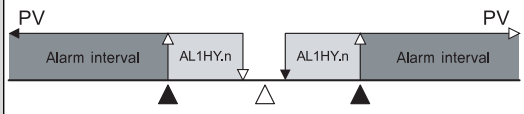
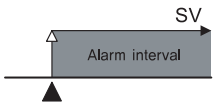
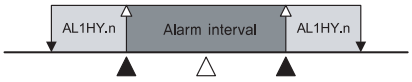
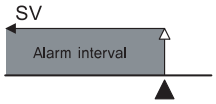
The register for selecting the values of alarm 1, 2 and 3 of each channel and values of hysteresis 1, 2 and 3

Event type	Alarm range (AL1VL1.n)		Hysteresis (AL1HY.n)	
	Set range	Default value	Set range	Default value
High deviation	0 ~ 1200.0	0	0 ~ 120.0	1.0
Low deviation	0 ~ 1200.0	0	0 ~ 120.0	1.0
High/Low deviation	0 ~ 1200.0	0	0 ~ 120.0	1.0
Within deviation range	0 ~ 1200.0	0	0 ~ 120.0	1.0
High PV	-199.9 ~ 999.9	-199.9	0 ~ 120.0	1.0
Low PV	-199.9 ~ 999.9	-199.9	0 ~ 120.0	1.0
High SV	-199.9 ~ 999.9	-199.9	0 ~ 120.0	1.0
Low SV	-199.9 ~ 999.9	-199.9	0 ~ 120.0	1.0

- AL1VL.n : The register that selects the alarm range regarding the alarm1 of each channel
- AL2VL.n : The register that selects the alarm range regarding the alarm2 of each channel
- AL3VL.n : The register that selects the alarm range regarding the alarm3 of each channel
- AL1HY.n : The register that selects the hysteresis boundary of alarm1 of each channel
- AL2HY.n : The register that selects the hysteresis boundary of alarm2 of each channel.
- AL3HY.n : The register that selects the hysteresis boundary of alarm3 of each channel

② Alarm action interval

- Depending on the setting of AL1TY.n, AL1VL.n, AL1HY.n the alarm action interval is set as follows

Alarm action	Alarm action interval △: SV, ▲ : Alarm interval(AL1VL.n)	Alarm action	Alarm action interval ▲: Alarm interval(AL1VL.n)
High deviation		High PV	
Low deviation		Low PV	
High/Low deviation		High SV	
Within deviation range		Low SV	

※ Operation method which depends on setting of AL1 (AL1TY.n, AL1VL.n, AL1HY.n), AL2 (AL2TY.n, AL2VL.n, AL2HY.n), AL3 (AL3TY.n, AL3VL.n, AL3HY.n) is same.

③ Standby action

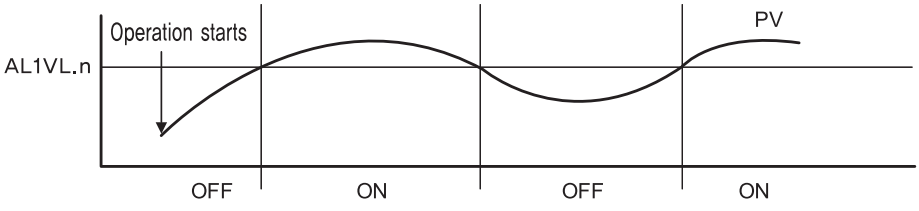
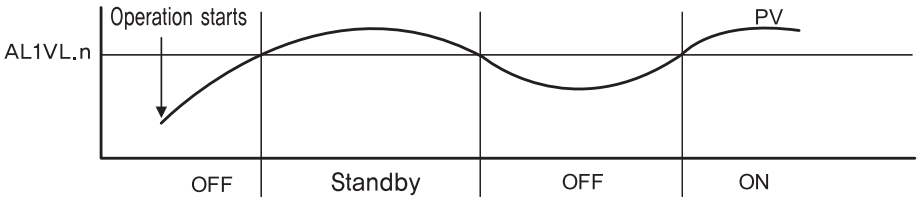
- Standby action means when it is under the condition given in the below chart, even if it satisfies the alarm ON condition, it does not let alarm to become ON at first time.

〈Standby action condition〉

※ Power ON for the first time ※ Operation starts for the first time

※ Alarm type change ※ SV change

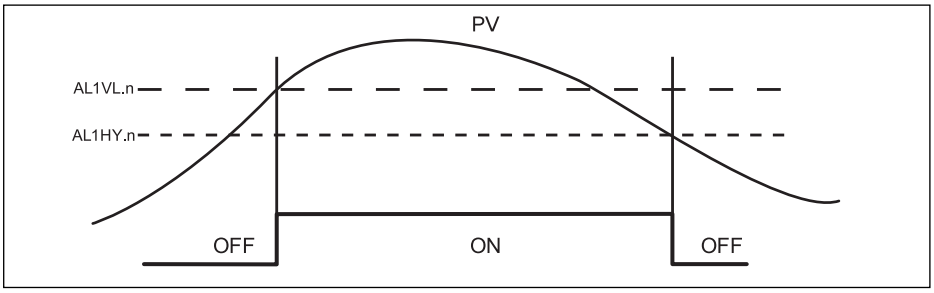
〈Example of standby action〉

Alarm type	Alarm action
High PV alarm when there is no standby action	
High PV alarm when there is standby action	

④ Alarm hysteresis action

- Alarm hysteresis applied depending on the AL1HY.n value.

〈Example of applying the alarm hysteresis〉



※ Alarm type :
High PV alarm action

⑤ Loop break alarm

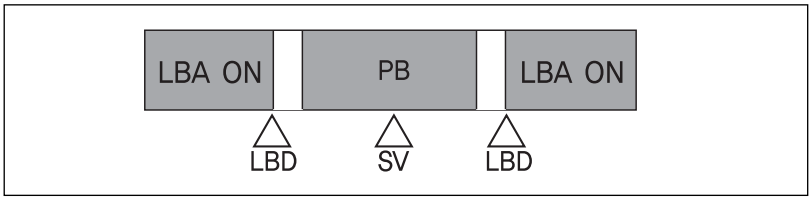
- Loop break alarm supervises PV variation for the time set in LBA parameter. Also, this is the function that detects any abnormal control loop.
- It starts to detect loop break when output value is either 0 % or 100 %.
- LBA does not operate when PV is within PB. It starts to operate when PV is not within PB.
- Loop break alarm starts to operate under the following conditions.

※ PV does not rise more than 2 ℃ within the time set in LBA under the condition where output is 100 % and control direction is reverse direction (heater control).
※ PV does not drop more than 2 ℃ within the time set in LBA under the condition where output is 0 % and control direction is reverse direction (heater control).
※ PV does not drop more than 2 ℃ within the time set in LBA under the condition where output is 100 % and control direction is forward direction (cooling control).
※ PV does not rise more than 2 ℃ within the time set in LBA under the condition where output is 0 % and control direction is forward direction (cooling control).

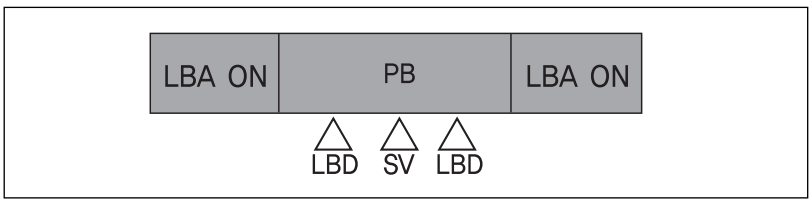
- Dead band of loop break alarm

※ Alarm is not generated if PV is within LBD even if the loop break alarm is under the alarm ON condition.

〈When LBD is bigger than PB〉



〈When LBD is smaller than PB〉



⑥ Alarm valid range

- All alarms are operated only when it is in operation mode

⑼ Input setting

〈Related parameters〉

Symbol	Information	Set range	Unit	Register	Default value
BS.n	Input compensation	-1200.0 ~ 1200.0	℃	Note1	0
FL.n	Input filter	0 ~ 120.0	sec	Note1	0
SVH.n	High SV limitation	-199.9 ~ 999.9	℃	Note1	999.9
SVL.n	Low SV limitation	-199.9 ~ 999.9	℃	Note1	-199.9

※ n = 1 ~ 20 ※ Note1 = Refer to the Register configuration

① Input compensation and input filter

- Able to compensate PV by setting the BIAS. Here, indicated value is PV + BIAS.
- This is applied to eliminate the unexpected noise .

※ Noise not only influences the control characteristic in bad way but also this is reason for creating the sudden output.

※ Time delay may occur in between the actual PV and measured PV when setting the input filter too excessively.

〈Input filtering operation〉

$$\text{Filtering PV} = \frac{PV - PV_1}{FILT / Ts + 1} + PV_1$$

• PV : Input • PV_1 : 前 Input • FILT : Filter value • Ts : Sampling time (1s)

② SV setting limitation

- SV value is limited by the high value and low value due to the SVH and SVL.
- SVH and SVL are changeable only within the input range.

⑽ Output setting

- SM100 only supports the voltage pulse output and also it affords various output options.

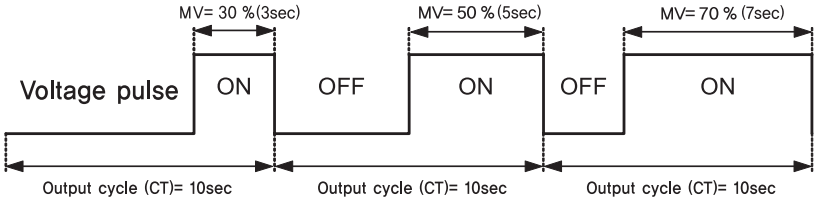
Symbol	Information	Set range	Unit	Register	Default value
CT.n	Output cycle	1 ~ 100	sec	Note1	2
PO.n	Emergency output value	0.0 ~ 100.0	%	Note1	0
HYS.n	ON / OFF Hysteresis	0 ~ 120.0	%	Note1	1.0
DR.n	Low SV limitation	0 : Reverse 1 : Forward	ABS	Note1	0

※ n = 1 ~ 20 ※ Note1 = Refer to the Register configuration

① Output cycle setting

- CT : It can set the ON/OFF cycle of voltage pulse output within the range from 1sec to 100sec.

〈ON/OFF cycle by the CT setting〉



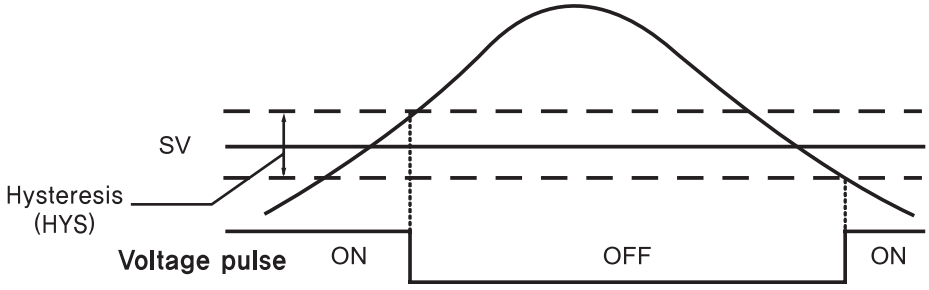
② Emergency output operation

- PO : It sets the value that will become output when error is generated.

③ ON/OFF hysteresis operation

- HYS : It sets the hysteresis boundary of ON/OFF control (PB=0).

〈Hysteresis boundary of ON/OFF control〉



④ Control direction setting register

- DR.n : This is the register that sets the control direction of each channel and they are composed as follows.

- DR action
  - "0" : Reverse direction control
  - "1" : Forward direction control

4. Specification

Model		SM100-□A20	SM100-□A16	SM100-□A12
Control output channel		20 channel	16 channel	12 channel
Measurement input	Input type	Thermocouple(K), range : -199.9 ℃ ~ 999.9 ℃ RTD (Pt100 Ω), range : -199.0 ℃ ~ 640.0 ℃		
	Display accuracy	± 0.5 % of max range (± 0.5 % of F.S)		
	RJC compensation accuracy	within the display accuracy		
	Sampling cycle	1 sec		
	Input compensation	-1200.0 ℃ ~ 1200.0 ℃		
	Input filter	0.0 sec ~ 120.0 sec		
	Burn-out action	Thermocouple : Upscale RTD : Upscale		
Setting and display	Setting type	Setting by the communication program		
	Number of setting	20	16	12
	Memory storage	Store by the semiconductor		
	Device address setting	Setting (1~15) by the internal HEX BCD switch		
	Display LED	Power indication, communication indication, control output indication		
Control output	Output type	Voltage pulse output for starting SSR (Starting voltage, resistive load: min 600 Ω)		
	Control action	time sharing PID or ON/OFF control		
	Number of PID group	1 group / channel		
		1 sec ~ 100 sec		
	Proportional band(P)	0 ℃ ~ 1200.0 ℃		
	Integral time(I)	1 sec ~ 3600 sec		
	Derivative time(D)	1 sec ~ 3600 sec		
	Over integral prevention	0.1 % ~ 100.0 % ※ "0" setting(Auto)		
	Manual reset	0.0 % ~ 100.0 % (when performing ON/OFF control)		
	Hysteresis	0 ℃ ~ 120.0 ℃ (when performing ON/OFF control)		
	Control output action	cooling control (forward action)/heating (reverse action) selectable		
	Emergency output	0.0 % ~ 100.0 %		

Model		SM100-□A20	SM100-□A16	SM100-□A12
Control output channel		20 channel	16 channel	12 channel
Event output	Number of output	1a 3 (AL1, AL2, AL3)		
	Control action type	15 types (Refer to the alarm operation)		
	Loop break alarm	0 sec ~ 7200 sec(OFF when "0" is set)		
	Hysteresis	0 ℃ ~ 120.0 ℃		
	Output action	ON/OFF action		
	Output type	Relay output		
	Contact capacity	5 A 250 V a.c, (5 A 30 V d.c)		
Contact input	Number of external contact input	1 (RUN/STOP by the internal DIP switch)		

Communication specification	Communication standard	EIA-RS485/422(4-Wire type)
	Communication type	Half duplex
	Max number of connectable device	15 ※HEX BCD Address setting type by the BCD switch
	Start bit	1 Bit
	Stop bit	1 Bit
	Parity bit	Even
	Data length	8 Bit
	Transmission speed	19200 bps
	Communication distance	1.2 ㎞ max
	Communication protocol	PC Link with SUM
	Response time	Receiving processing time + (response setting time x 25 ㎳)

General specification	Power supply voltage	100 V – 240 V a.c 50 HZ – 60 HZ
	Power supply voltage fluctuation	± 10 % of the rated power supply voltage
	Power consumption	25 V A max.
	Insulation resistance	20 MΩ min. power terminal and earth (ground) terminal (500V d.c mega)
	Dielectric strength	2000 V a.c for 1min, power terminal and earth (ground) terminal
	Ambient temperature	0 ℃ ~ 50 ℃
	Ambient humidity	20 % ~ 85 % RH (dew condensation not allowed)
	Storage temperature	-20 ℃ ~ 70 ℃ (dew condensation not allowed)
	Vibration resistance	10 Hz ~ 55 Hz 19.6 ㎨ 3 axis 6 directions 2 h
	Shock resistance	196 ㎨ 3 axes 3 times to each of 6 directions
	Case material	SPC
	Installation	Fixing by screws
	Weight	approx. 1000 g

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