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Autonics sensors & controllers

Autonics
Sensors & Controllers

Processor Controller

KPN Series

User Manual

Thank you very much for selecting Autonics products.
For your safety, please read the following before using.

Preface

Thank you for purchasing Autonics product.

Please familiarize yourself with the information contained in the **Safety Precautions** section before using this product.

This user manual contains information about the product and its proper use, and should be kept in a place where it is easy to access.

User Manual Guide

- Please familiarize yourself with the information in this manual before using the product.
- This manual provides detailed information on the product's features. It does not offer any guarantee concerning matters beyond the scope of this manual.
- This manual may not be edited or reproduced in either part or whole without permission.
- A user manual is not provided as part of the product package.
  Visit our web site (www.autonics.com) to download a copy.
- The manual's content may vary depending on changes to the product's software and other unforeseen developments within Autonics, and is subject to change without prior notice.
  Upgrade notice is provided through out homepage.
- We contrived to describe this manual more easily and correctly. However, if there are any corrections or questions, please notify us these on our homepage.

User Manual Symbols

Symbol	Description
 Note	Supplementary information for a particular feature.
 Warning	Failure to follow instructions can result in serious injury or death.
 Caution	Failure to follow instructions can lead to a minor injury or product damage.
 Ex.	An example of the concerned feature's use.
※1	Annotation mark.

Safety Precautions

- Following these safety precautions will ensure the safe and proper use of the product and help prevent accidents and minimize hazards.
- Safety precautions are categorized as Warnings and Cautions, as defined below:

Warning	**Warning**	Cases that may cause serious injury or fatal accident if instructions are not followed.
Caution	**Caution**	Cases that may cause minor injury or product damage if instructions are not followed.

Warning

- In case of using this unit with machinery (Ex: nuclear power control, medical equpment, ship, vehicle, train, airplane, combustion apparatus, safety device, crime/disaster prevention equipment, etc) which may cause damages to human life or property, it is required to install fail-safe device.
  It may cause a fire, human injury or property loss.
- Install the unit on the panel.
  It may cause electric shock.
- Do not connect, inspect, or repair when power is ON.
  It may cause electric shock.
- Wire properly after checking the input specifications and terminal number.
  It may cause a fire.
- Do not disassemble the case. Please contact us if it is required.
  It may cause electric shock or a fire.

Caution

- This unit shall not be used outdoors.
  It might shorten the life cycle of the product or cause electric shock.
- When wiring relay output terminal, AWG 20(0.5mm2) should be used.
  It may cause a malfunction or fire due to contact failure.
- Please observe the rated specifications.
  It might shorten the life cycle of the product and cause a fire.
- Do not use beyond of the rated switching capacity of relay contact.
  It may cause insulation failure, contact melt, contact failure, relay broken or fire, etc.
- In cleaning unit, do not use water or an oil-based detergent and use dry towels.
  It may cause electric shock or a fire.
- Do not use this unit in place where there are flammable or explosive gas, humidity, direct ray of the light, radiant heat, vibration and impact etc.
  It may cause a fire or an explosion.
- Do not inflow dust or wire dregs into the unit.
  It may cause a fire or a malfunction.
- Please wire properly after checking the terminal polaritywhen connecting temperature sensor.
  It may cause a fire or a malfunction.

Specifications and dimensions in this user manual are subject to change without notice.

Table of Contents

1 Product Introduction

1.1 Features

KRN series – standard PID temperature controller – realizes more powerful control with super high-speed sampling cycles of 50 ms and ±0.3% display accuracy. It supports diverse control modes including heating/cooling simultaneous control, and automatic/manual control and communication functions. In addition, KRN series covers all necessary features for high performance temperature controllers – that is, diverse input sensor support, multi SV setting, SSRP + current output, high resolution display and compact size.

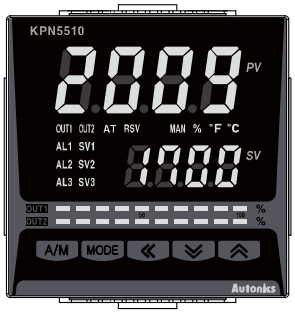
- Easy and fast setting by user parameter group and parameter mask functions
- Easy check control output MV with Bar graph
- Super high-speed sampling cycle (10 times faster compared to existing models); 50 ms sampling cycle and ±0.3% display accuracy
- Improved visibility with wide display and high luminance LED
- High performance control with heating/cooling control and automatic/manual control modes
- Communication function supported : RS485(Modbus RTU method)
- High performance control with heating/cooling control and automatic/manual control modes PC parameter setting via USB and RS 485 communication: Integrated device management program (DAQMaster) supported

  ※ Communication converter, sold separately: SCM-US (USB to Serial converter), SCM-38I (RS232C to RS485 converter), SCM-US48O (USB to RS485 converter)
- Selectable SSR output or current output
- Heater disconnection alarm (CT input) function

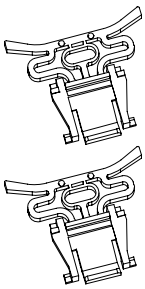
  ※CT, sold separately: CSTC-E80LN, CSTC-E200LN
- Multi-SV (up to 3) setting (selectable by digital input terminal)
- Space saving mounting possible with compact design; downsized by 38% depth-based (panel rear length: 60mm)
- Multi-input/multi-range

1.2 Components and accessories

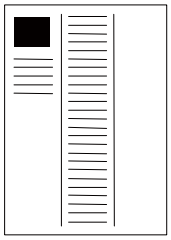
(1) Components



KPN Series



Brackets



Manual

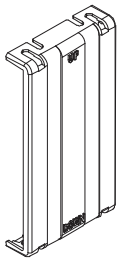
Note

Make sure all of the above components are included with your product package before using it.
If components are missing or damaged, please contact Autonics or your distributor.

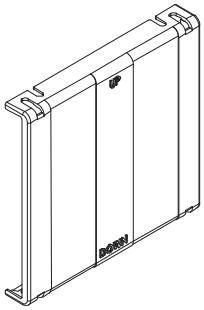
(2) Accessories

- Terminal cover

· RHA-COVER
(48×96mm)



· RLA-COVER
(96×96mm)



- Communication converter

SCM-WF48 (USB to RS485 converter)	SCM-US48I (USB to RS485 converter)
	
SCM-38I (RS232C to RS485 converter)	SCM-US (USB to Serial converter)
	

Note

For more informaiton ‘Communication converters’ sold separately, refer to the manual of each products.
Visit our website(www.autonics.com) to download the manuals.

- Current transformer (CT)

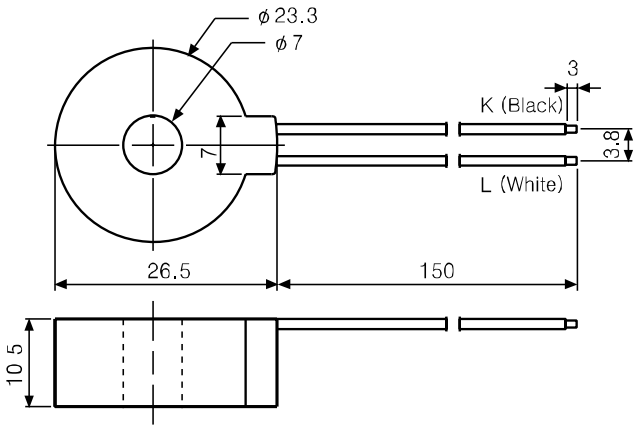
CSTC-E80LN

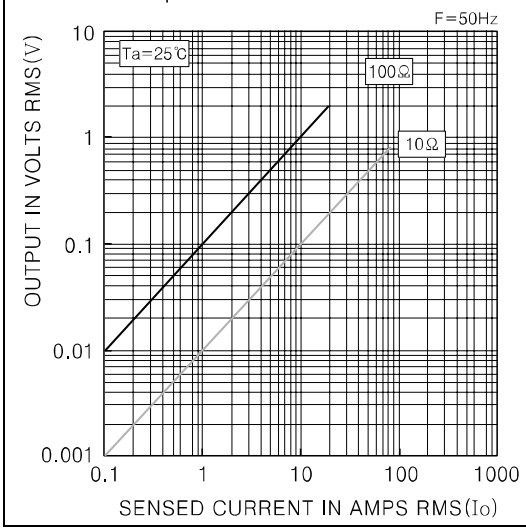
• Max. load current: 80A(50/60Hz)

※ Max. load current for KPN Series is 50A.

• Current ratio: 1/1000

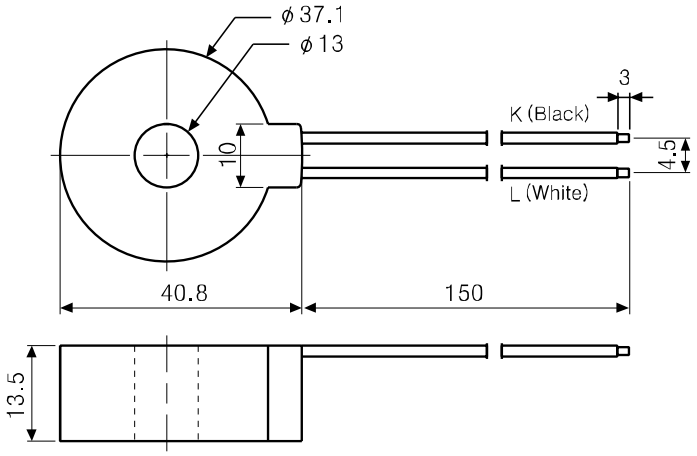
• Wire wounded resistance: 31 →±10%

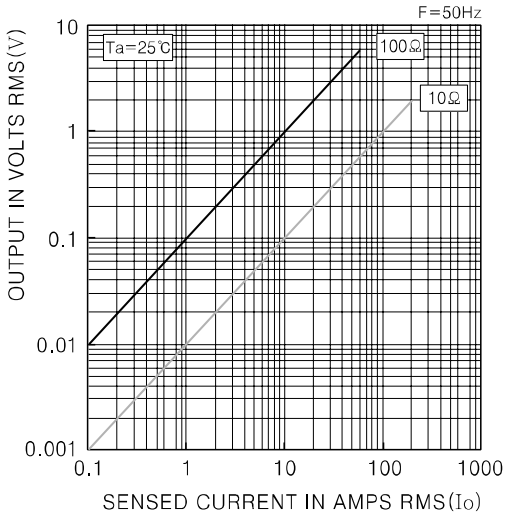




CSTC-E200LN

- Max. load current: 200A(50/60Hz)
  ※Max. load current for KPN Series is 50A.
- Current ratio: 1/1000
- Wire wounded resistance: 20 →±10%





Note

Images of components and accessories may differ from actual products.

For more information about CT, refer to the manual of this unit.

Visit out website (www.autonics.com) to download the manuals of this unit.

Caution

※Do not supply primary current in case that CT output is open. High voltage will be generated in CT output.

※The current for above two CTs is 50A same but inner hole sizes are different. Please use this for your environment.

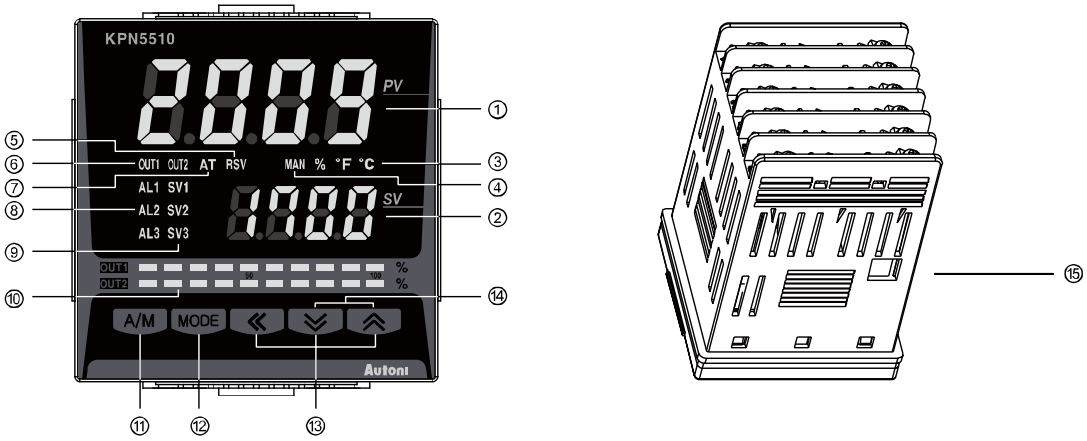
1.3 Ordering information

KPN5	5	0	0	-	0	0	0
①	②	③	④		⑤	⑥	⑦

Category			Description
①Item	KPN5		Temperature / Process Controller
②Size	2		DIN W96 X H48mm
	3		DIN W48 X H96mm
	5		DIN W96 X H96mm
③Number of control outputs	0		1 output type (Heating or Cooling type)
	1		2 output type (Heating&Cooling)
④Control output ※1	1 output type	0	Relay, current, SSR drive voltage selection output
	2 output type	1	OUT1: Current, SSR drive voltage selection output OUT2: Current, SSR drive voltage selection output
		3	OUT1: Current, SSR drive voltage selection output OUT2: Relay output
		7	OUT1: Relay output OUT2: Current, SSR drive voltage selection output
		9	OUT1: Relay output OUT2: Relay output
⑤Option com. output	0		None
	2		RS485
⑥Option I/O	0		None
	3		Transmission output+Remote SV
⑦Power supply	0		100 - 240VAC 50/60Hz

※1. The 1 output type is heating or cooling output type and the 2 output type is heating & cooling output type.
The 1 output type is able to use only one output among relay, current, SSR drive voltage outputs.
OUT1 of the 2 output type is fixed as heating output and OUT2 of the 2 output type is fixed as cooling output.
If you select the SSR drive voltage or current output model, you can select the appropriate control output.

1.4 Part descriptions



① Measured value (PV) display part
RUN mode: Displays currently measured value (PV).
Set mode: Displays the parameters.

② Set value (SV) display part
RUN mode: Displays the set value (SV).
Set mode: Displays the set value of the parameter.

③ Unit (℃/℉/%) indicator: Displays the unit set at display unit [dUnt] in parameter 3 group.

④ Manual control indicator: Turns ON during manual controlling.

⑤ Remote SV control indicator: Turns ON during remote SV controlling

⑥ Control output (OUT1, OUT2) indicator: Turns ON when the control output is ON.

※ When using current output, in case that for manual control MV is 0.0%, the control output indicator turns OFF but the other cases it turns ON always. In case that for auto control MV is over 3.0%, it turns ON and the MV is below 2.0%, it turns OFF.

⑦ Auto tuning indicator: Flashes by 1 sec. when executing auto tuning.

⑧ Alarm output (AL1, AL2, AL3) indicator: Turns ON when the alarm output is ON.

⑨ Multi-SV indicator: The SV 1 to 3 indicator turns ON when using multi SV function.

⑩ Bar graph for control output: Displays control output MV as bar graph. The KRN5□00 as 1 output type has one bar graph (OUT1), and the KPN5□1□as 2 output type has two bar graphs (OUT1, OUT2).

⑪ A/M key: Used when switching auto control to manual control.

⑫ MODE key: Used when entering parameter setting group, returning to RUN mode, moving parameter, saving the set value.

⑬ ≪ ≫ ∧ keys: Used when entering the set value changing mode and moving or changing up/down digit.

⑭ When pressing ≫ ∧ keys for 3 sec. at the same time, it operates the function (RUN/STOP, alarm clear, auto-tuning) set at digital input key [dI-U] in parameter 5 group.

⑮ PC loader port: It is the PC loader port for serial communication to set and monitor parameters by PC. Use this port for connection SCM-US (USB to serial convertor).

※ Display part is different by options.

Note

7-segment characters

A	b	C	d	E	F	G	H	I	J	K	L	M
A	B	C	D	E	F	G	H	I	J	K	L	M

n	o	P	q	r	S	t	U	u	V	W	X	Y	Z
N	O	P	Q	R	S	T	U	V	W	X	Y	Z

0	1	2	3	4	5	6	7	8	9	0	-1	/
0	1	2	3	4	5	6	7	8	9	0	-1	/

2 Specifications

2.1 Ratings

Series		KPN52□□	KPN53□□	KPN55□□
Power supply		100 - 240VAC, 50/60Hz		
Allowable voltage range		90 to 110% of rated voltage		
Power consumption		Max. 15VA		
Display method		7Segment: red/green, control output display bar graph: red/green		
Character size	PV(W x H)	8.5X17.0mm	7.0X14.6mm	11.0X22.0mm
	SV(W x H)	6.0X12.0mm	6.0X12.0mm	6.0X12.0mm
Input type	RTD	JPt 100Ω, DPt 100Ω, DPt 50Ω, Cu 100Ω, Cu 50Ω, Nickel 120Ω (6 types)		
	Thermocuples	K, J, E, T, L, N, U, R, S, B, C, G, PLII(13 types)		
	Analog	Voltage: 0 to 100mV, 0 to 5V, 1 to 5V, 0 to 10V(4 type) Current: 0 to 20mA, 4 to 20mA(2 types)		
Display accuracy	RTD	At room temperature (23℃±5℃): (PV ±0.3% or ±1℃, select bigger one)±1Digit※1 Out of room temperature range: (PV ±0.5% or ±2℃, select bigger one)±1Digit		
	Thermocuples			
	Analog	At room temperature (23℃±5℃): ±0.3% F.S.±1Digit Out of room temperature range: ±0.5% F.S.±1Digit		
	CT input	±5% F.S.±1Digit		
Control output	Relay	OUT1, OUT2: 250VAC 3A 1a		
	SSR	Max. 11VDC±2V 20mA		
	Current	DC4 - 20mA or DC0 - 20mA or selectable (max. load 500Ω)		
Alarm output	Relay	AL1, AL2, AL3 Relay: 250VAC 3A 1a		
Option output	Transmission	DC4 - 20mA (max. load 500Ω, output accuracy: ±0.3% F.S.±1Digit)		
	Communication	RS485 communication output (Modbus RTU method)		
Option input	CT	0.0 - 50.0A(primary heater current value measuring range) ※CT ratio is 1/1000		
	Remote SV	1-5VDC or DC4-20mA (Current input: use external resistance 250Ω)		
	Digital input	Contact input: ON-max. 2kΩ, OFF-min. 90kΩ		
		Non-contact input: ON- Residual voltage max.1.0V, OFF-leakage current max.0.1mA		
Control type	Heating, Cooling	ON/OFF, P, PI, PD, PID control		
	Heating&Cooling			
Hysteresis		Thermocouple/RTD: 1 to 100℃/℉ (0.1 to 100.0℃/℉) variable, Analog: 1 to 100 Digit		
Proportional band (P)		0.1 to 999.9℃(0.1 to 999.9%)		
Integral time (I)		0 to 9999 sec.		
Derivative time (D)		0 to 9999 sec.		
Control period (T)		0.1 to 120.0 sec. (relay output, SSR drive voltage output only)		
Manual reset value		0.0 to 100.0%		

Sampling period		50ms	
Dielectric strength		2000VAC 50/60Hz for 1 min. (between input terminal and power source terminal)	
Vibration		0.75mm amplitude at frequency of 5 to 55 Hz (for 1 min.) in each X, Y, Z direction for 2 hours	
Relay life cycle	Mechanical	Over 10,000,000 times	
	Electrical	Over 100,000 times (250VAC 3A resistance load)	
Insulation resistance		Over 100MΩ (at 500VDC megger)	
Noise resistance		Square shaped noise by noise simulator (pulse width 1 μs) ±2KV R-phase, S-phase	
Memory retention		Approx. 10 years (when using non-volatile semiconductor memory type)	
Environment	Ambient temperature	-10 to 50℃, storage: -20 to 60℃	
	Ambient humidity	35 to 85% RH, storage: 35 to 85% RH	
Protection		IP65(front part)	
Insulation type		Double insulation or reinforced insulation (mark: ⧈, dielectric strength between the measuring input part and the power part: 1kV)	
Weight※2		Approx. 230g (approx. 160g)	Approx. 316g (approx. 220g)

※1. At room temperature (23℃ ± 5℃)

- TC K, J, T, N, E type, below -100℃ / L, U, PLⅡ, RTD Cu50Ω, DPt50Ω: (PV ±0.3% or ±2℃, select the higher one)±1Digit
- TC C, G and R, S type, below 200℃: (PV ±0.3% or ±3℃, select the higher one)±1Digit
- TC B type, below 400℃, there is no accuracy standards.

Out of room temperature range

- RTD Cu50Ω, DPt50Ω: (PV ±0.5% or ±3℃, select the higher one) ± 1Digit
- RTD R, S, B, C, G: (PV 0.5% or ±10℃, select the higher one) ± 1Digit
- Other sensors: Below -100℃, within ±5℃

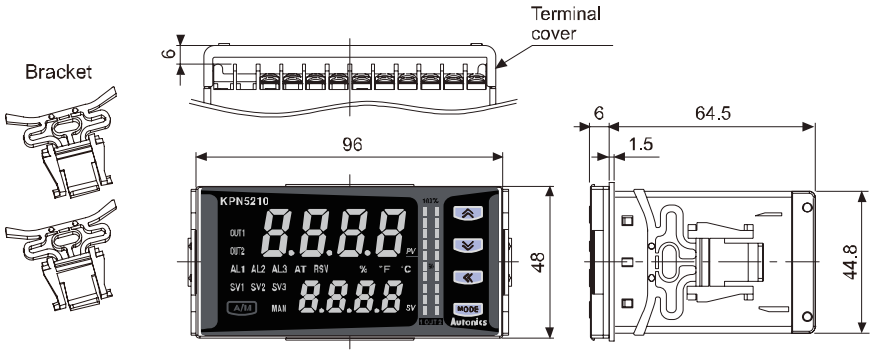
※2. The weight is with packaging and the weight in parentheses is only unit weight.

※ Environment resistance is rated at no freezing or condensation.

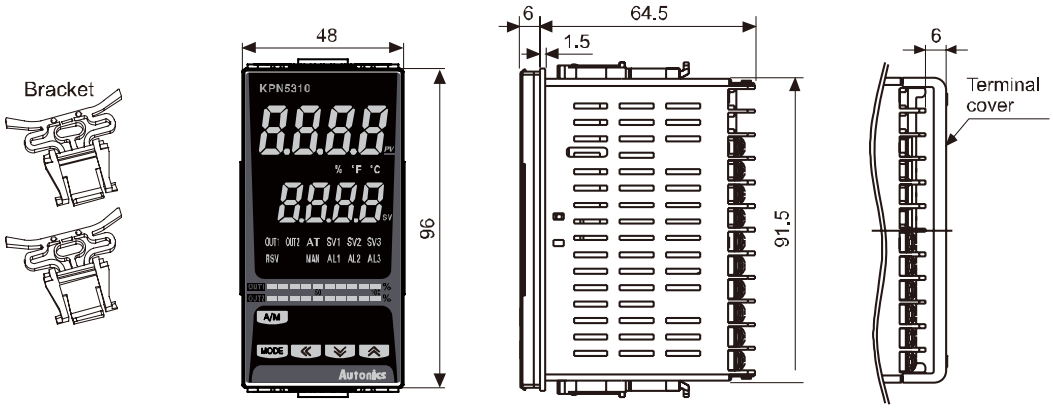
3 Dimensions

Unit: mm

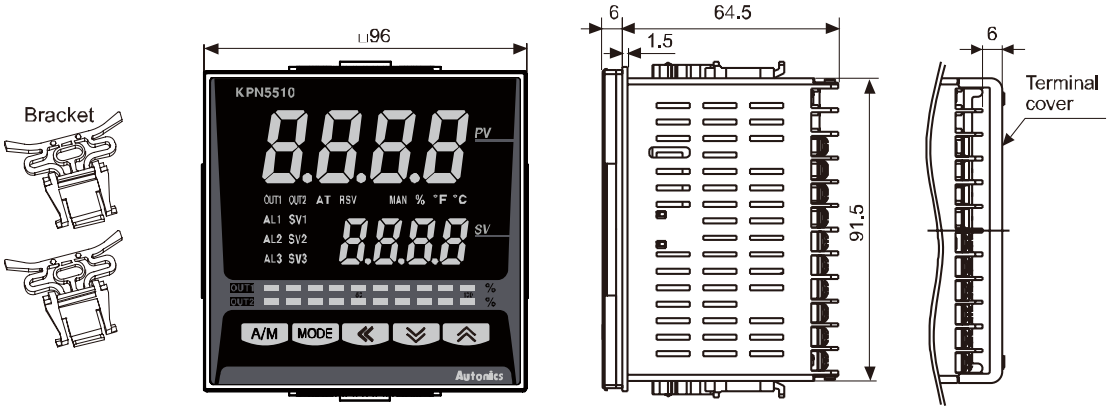
(1) KPN52□□



(2) KPN53□□

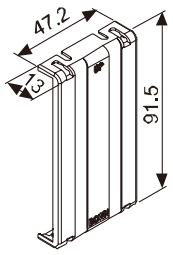


(3) KPN55□□

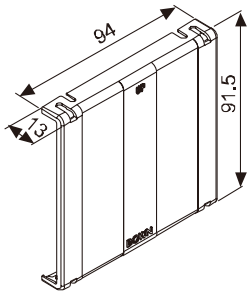


(4) Terminal cover (sold separately)

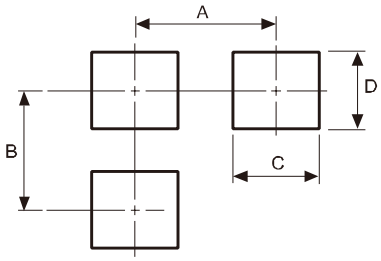
• RHA-COVER(48×96mm)



• RLA-COVER(96×96mm)



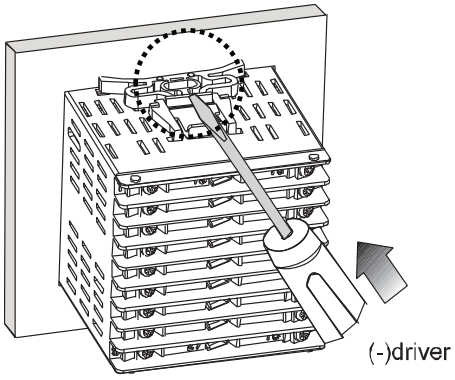
(5) Panel cut-out



(Unit:mm)

Model \ Unit	A	B	C	D
KPN52	Min. 115	Min. 65	$92^{+0.8}_{0}$	$45^{+0.6}_{0}$
KPN53	Min. 65	Min. 115	$92^{+0.8}_{0}$	$92^{+0.8}_{0}$
KPN55	Min. 115	Min. 115	$45^{+0.6}_{0}$	$92^{+0.8}_{0}$

▪ Installations

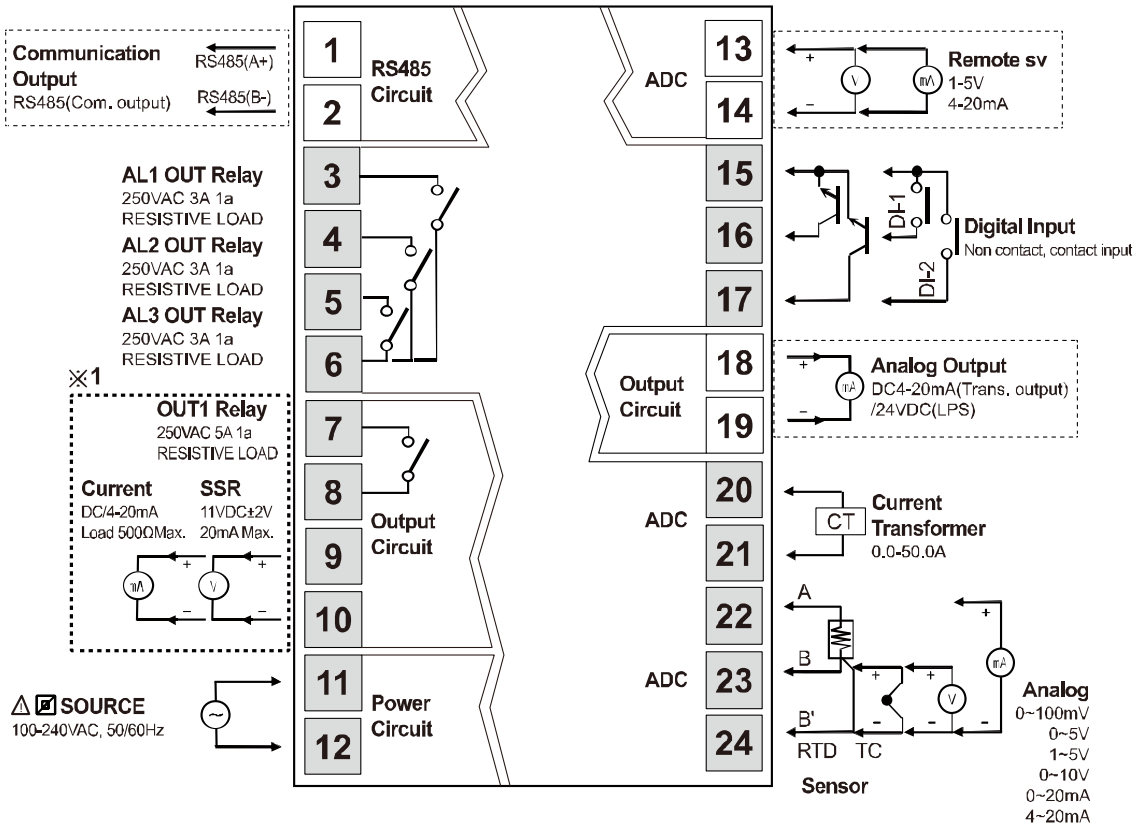


Mount this unit into a panel, fasten bracket by pusing with a flat-head driveras shown.

4 Connections

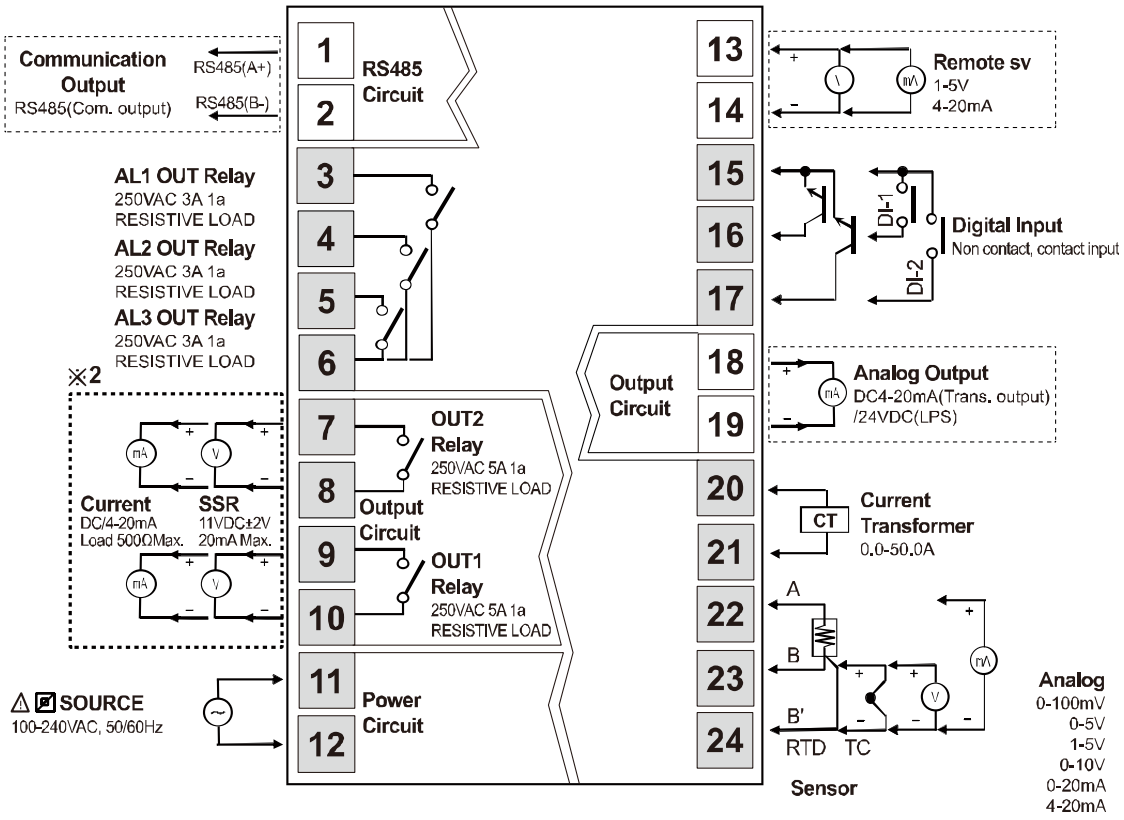
Standard model has shaded terminals only. ⬚ is option specification.

(1) KPN5□00



※1. Set relay output [rLY], current [CUr] or SSR drive voltage output [SSr] at OUT1 control output [oUt 1] in parameter 3 group.

(2) KPN5□1□



※2. OUT1, OUT2

Model	OUT1 control output	OUT2 control output
KPN5□11	Current, SSR drive voltage selection output	Current, SSR drive voltage selection output
KPN5□13	Current, SSR drive voltage selection output	Relay output
KPN5□17	Relay output	Current, SSR drive voltage selection output
KPN5□19	Relay output	Relay output

4.1 Wiring precautions

- Mixing up the input terminals with output terminals and vice versa can lead to product damage.
- Use only sensors supported by the product.
- Make sure to connect rated SSRs or loads to the output terminals.
- Make sure to connect communication cable with correct communication terminals (A, B).
- Make sure to observe correct polarity of power source terminals. (+ and -).

4.1.1 Sensor connection

(1) Compensation wire connection

For thermocouple sensors, use compenstion wire of the same specification as input sensors. Using an extension wire of different specifications and/or material increases inaccuracy of temperature sensing. It is recommended to choose high performance compensation wire for more reliable sensing.

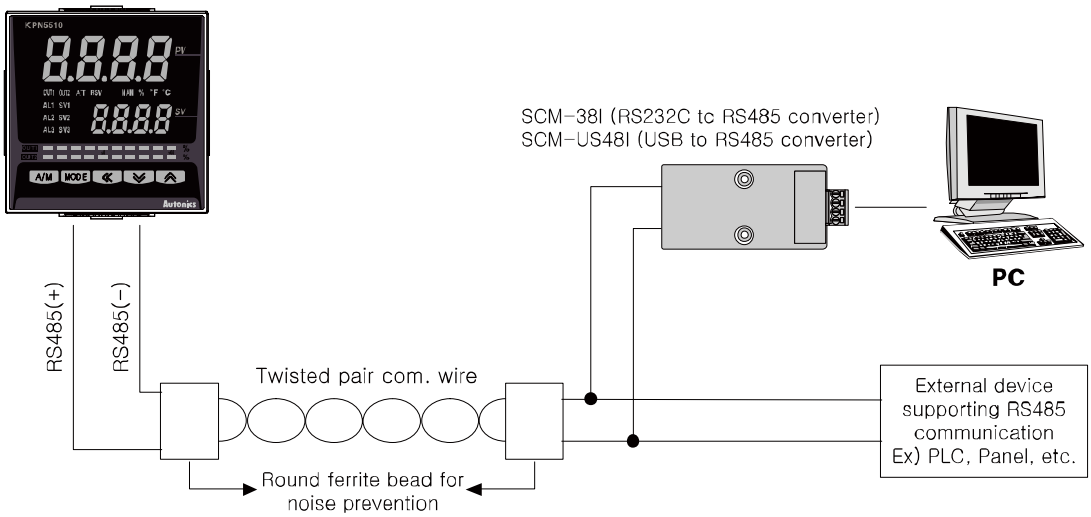
(2) Measurement error

Do not mix up the direction of the input sensor connector.
Carefully adjust both load and sensor positions.
Make sure the sensor is securely attached to the input connector.

(3) AC power cable and wiring

Do not put the sensor lines in close proximity of the AC power lines.

4.1.2 Communication line wiring



Note

Do not tie together with the AC power line.

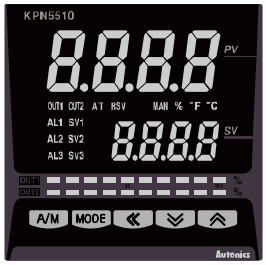
Only use twisted pair wires for the communication lines. Do not allow the communication line to exceed 800m in length.

For further details, please refer to'6.6 Communication'.

5 Preparation and Startup

5.1 Powering ON and initial display

When supplying the power to the product, the display part flashes for 1 sec. It displays the model type (option, output, control output) and flahses the input type twice and it operates in RUN mode.

① Flashes whole display parts	② Displays model type	③ Flashes input type twice	④ RUN mode
			

5.2 Basic controls

5.2.1 Parameter setting sequence

Each parameter setting is related. Follow this sequence for initial setting.

Parameter 3 Group [PAr3] → Parameter 4 Group [PAr4] → Parameter 5 Group [PAr5] → Parameter 2 Group [PAr2] → Parameter 1 Group [PAr 1] → SV Setting Group [SU]

Note

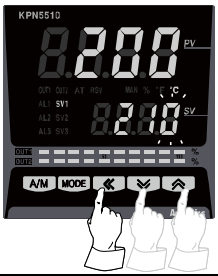
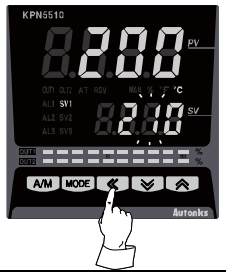
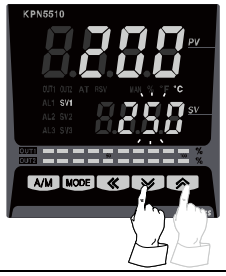
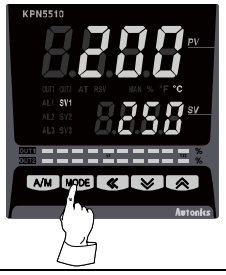
Changing Parameter 3 Setting Group's parameters can sometimes reset other associated parameters. Always make sure to check if such parameters have been affected.

5.2.2 SV setting

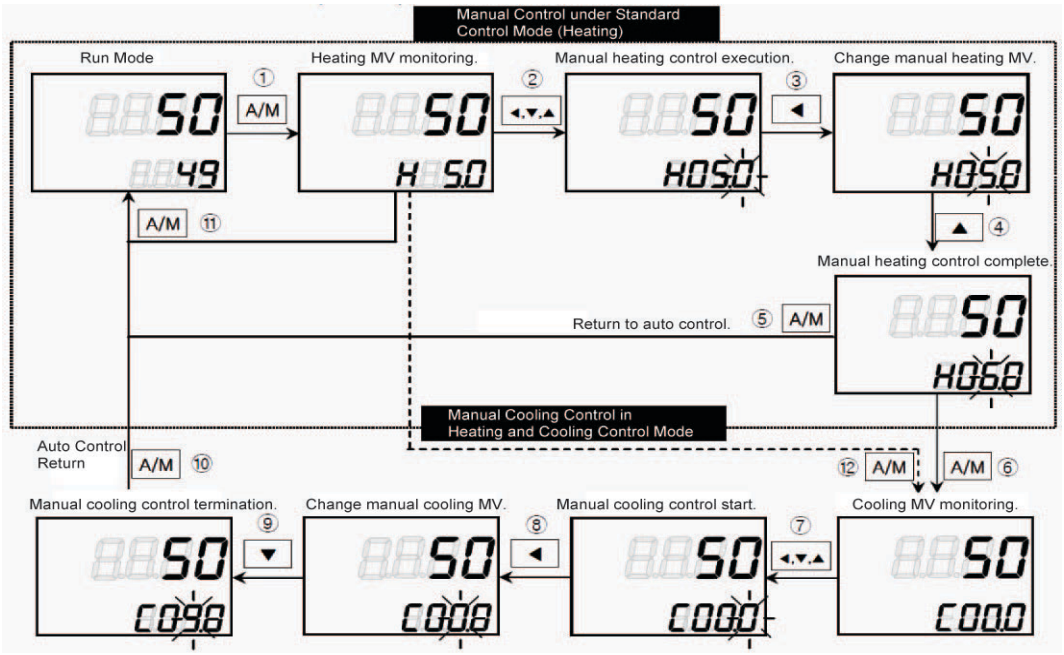
You can set the temperature to control with ≪, ≫, ≫ keys.
Set range is within SV low-limit value [L - SU] to SV high-limit [H - SU] value.

Ex.

In case of changing set temperature from 210℃ to 250℃

		Press any key among ≪, ≫, ≫ in RUN mode to enter into SV setting mode. Last digit (10^0 digit) on SV display part flashes.
		Press the ≪ key to move digit. (10^0 → 10^1 → 10^2 → 10^3 → 10^0)
		Press the ≫, ≫ keys to raise or lower the setting value.
		Press the MODE key to save the setting value. If there is no additional key operation in 3 sec., the changed SV is automatically saved.

5.2.3 MV Monitoring and Manual Control Setting



① While in Run mode, press the A/M key to commence manual control. The SV display shows H (heating control) or C (cooling control) and simultaneously displays the MV to indicate commencement of MV monitoring.

② If any one of ≪, ≫, ≫ is pressed while MV monitoring is in progress, the MAN lamp turns on and the last digit flashes to indicate activation of manual control.

③ Press the ≪ key to change the flashing digits. ($10^0 \rightarrow 10^1 \rightarrow 10^2 \rightarrow 10^3 \rightarrow 10^0$)

④ Select the digit and configure the desired MV value using the ≫, ≫ keys.

⑤ To stop manual control, press the A/M key. The MAN lamp turns off, and the system returns to auto control mode.

⑥ While in heating and cooling control mode, set the manual heating MV and then press the A/M key to see C (cooling control) and the current cooling MV value on the SV display indicating commencement of cooling MV monitoring.

⑦ If any one of the ≪, ≫, ≫ keys is pressed while MV monitoring is in progress, the MAN lamp turns on and the last digit flashes to indicate activation of manual control.

⑧ Press the ≪ key to change the flashing digit.($10^0 \rightarrow 10^1 \rightarrow 10^2 \rightarrow 10^3 \rightarrow 10^0$)

⑨ Select the digit and configure desired cooling MV value using the ≫, ≫ keys.

⑩ To stop manual control, press the A/M key. The MAN lamp turns off, and the system returns to auto control mode.

⑪ While in standard control mode (heating control or cooling control), press the A/M key once from the MV monitoring stage, or any other stage. It returns to auto control mode.

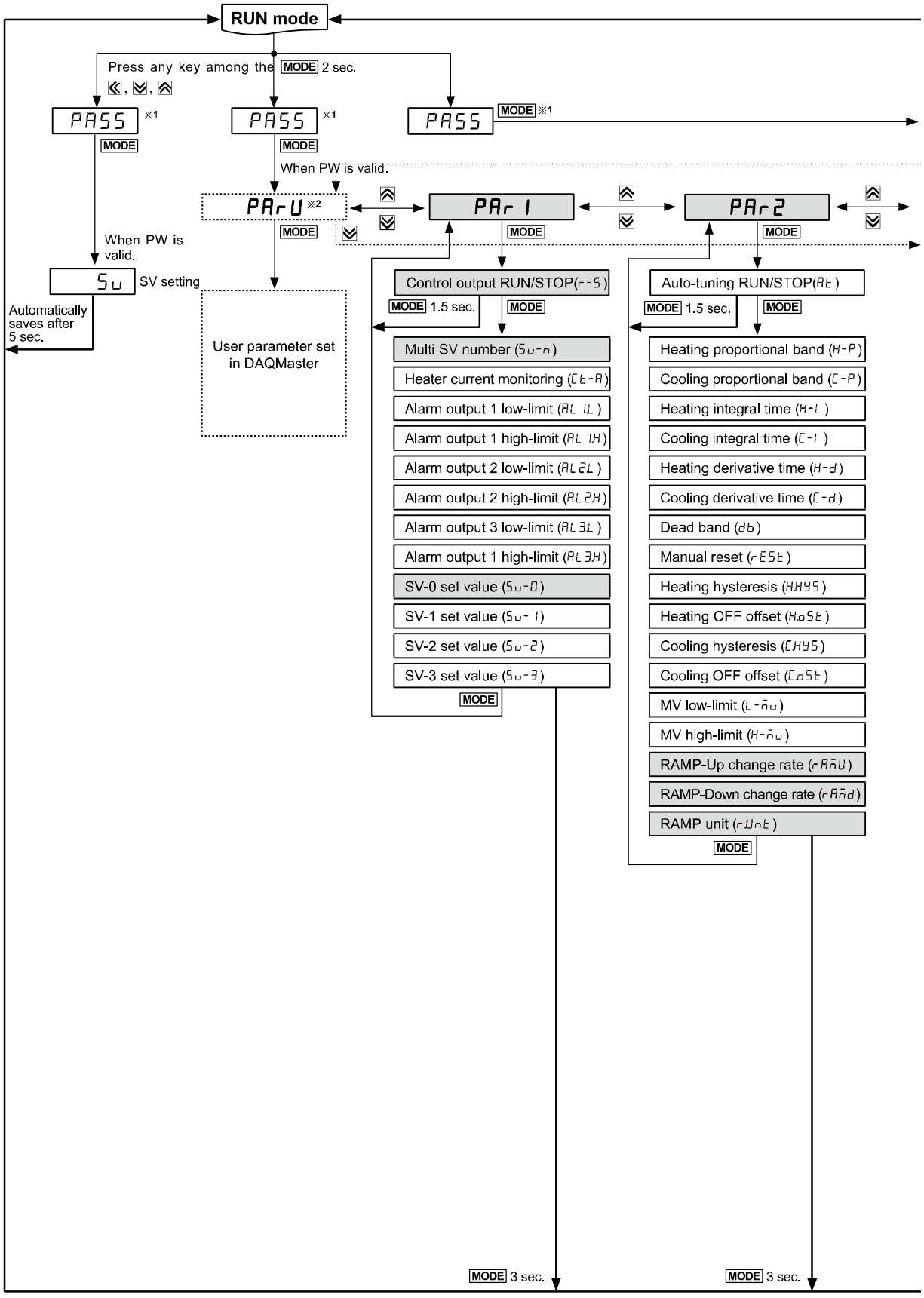
⑫ During heating and cooling control mode, press the A/M key once from the MV monitoring stage, or any other stage. It skips the system to the cooling MV monitoring stage.

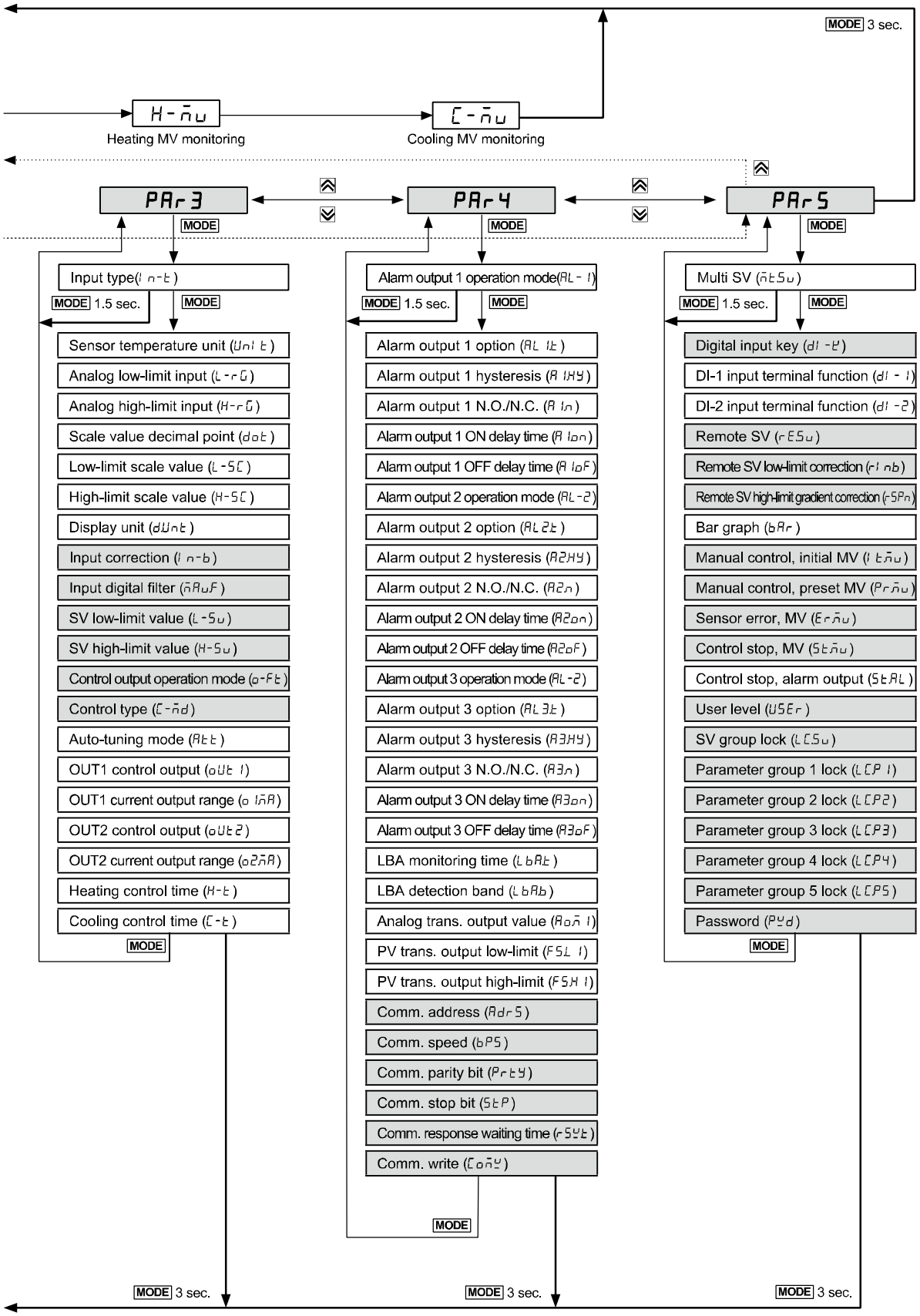
Note

For heating and cooling control, the system returns to auto control after going through heating monitoring, manual heating control, cooling monitoring, and manual cooling control stages in sequence.

Heating MV remains in effect during cooling monitoring and manual cooling control.

5.3 Parameter Reference Chart




MODE 3 sec.
H-ou
Heating MV monitoring
C-ou
Cooling MV monitoring
PAr3
PAr4
PAr5
MODE
Input type(In-t)
MODE 1.5 sec.
Sensor temperature unit (Unit)
Analog low-limit input (L-rG)
Analog high-limit input (H-rG)
Scale value decimal point (dot)
Low-limit scale value (L-SC)
High-limit scale value (H-SC)
Display unit (dUnt)
Input correction (In-b)
Input digital filter (oAuF)
SV low-limit value (L-Su)
SV high-limit value (H-Su)
Control output operation mode (o-Ft)
Control type (C-od)
Auto-tuning mode (Att)
OUT1 control output (oUt1)
OUT1 current output range (o1nA)
OUT2 control output (oUt2)
OUT2 current output range (o2nA)
Heating control time (H-t)
Cooling control time (C-t)
Alarm output 1 operation mode(AL-1)
Alarm output 1 option (AL1t)
Alarm output 1 hysteresis (A1HY)
Alarm output 1 N.O./N.C. (A1n)
Alarm output 1 ON delay time (A1on)
Alarm output 1 OFF delay time (A1oF)
Alarm output 2 operation mode (AL-2)
Alarm output 2 option (AL2t)
Alarm output 2 hysteresis (A2HY)
Alarm output 2 N.O./N.C. (A2n)
Alarm output 2 ON delay time (A2on)
Alarm output 2 OFF delay time (A2oF)
Alarm output 3 operation mode (AL-3)
Alarm output 3 option (AL3t)
Alarm output 3 hysteresis (A3HY)
Alarm output 3 N.O./N.C. (A3n)
Alarm output 3 ON delay time (A3on)
Alarm output 3 OFF delay time (A3oF)
LBA monitoring time (LbAt)
LBA detection band (LbAb)
Analog trans. output value (Aou1)
PV trans. output low-limit (FSL1)
PV trans. output high-limit (FSH1)
Comm. address (Adrs)
Comm. speed (bPS)
Comm. parity bit (PrtY)
Comm. stop bit (StP)
Comm. response waiting time (rSUt)
Comm. write (CoMY)
Multi SV (mtSu)
Digital input key (di-K)
DI-1 input terminal function (di-1)
DI-2 input terminal function (di-2)
Remote SV (rESu)
Remote SV low-limit correction (rlnb)
Remote SV high-limit gradient correction (rSPn)
Bar graph (bAr)
Manual control, initial MV (Itou)
Manual control, preset MV (Prou)
Sensor error, MV (Erou)
Control stop, MV (Stou)
Control stop, alarm output (StAL)
User level (USEr)
SV group lock (LCSu)
Parameter group 1 lock (LCP1)
Parameter group 2 lock (LCP2)
Parameter group 3 lock (LCP3)
Parameter group 4 lock (LCP4)
Parameter group 5 lock (LCP5)
Password (PWd)
MODE 3 sec.
MODE 3 sec.
MODE 3 sec.

※1. [PASS] parameter is displayed only when password is set. It is not displayed when purchasing the unit since the default password is set to [0000].
If the password is not valid, the screen is changed to the password code screen. Press any key among ◁, ▽, △ to return to password entering window. Press the MODE key to return to RUN mode.
If you forget the password, contact our service center after checking the password code.

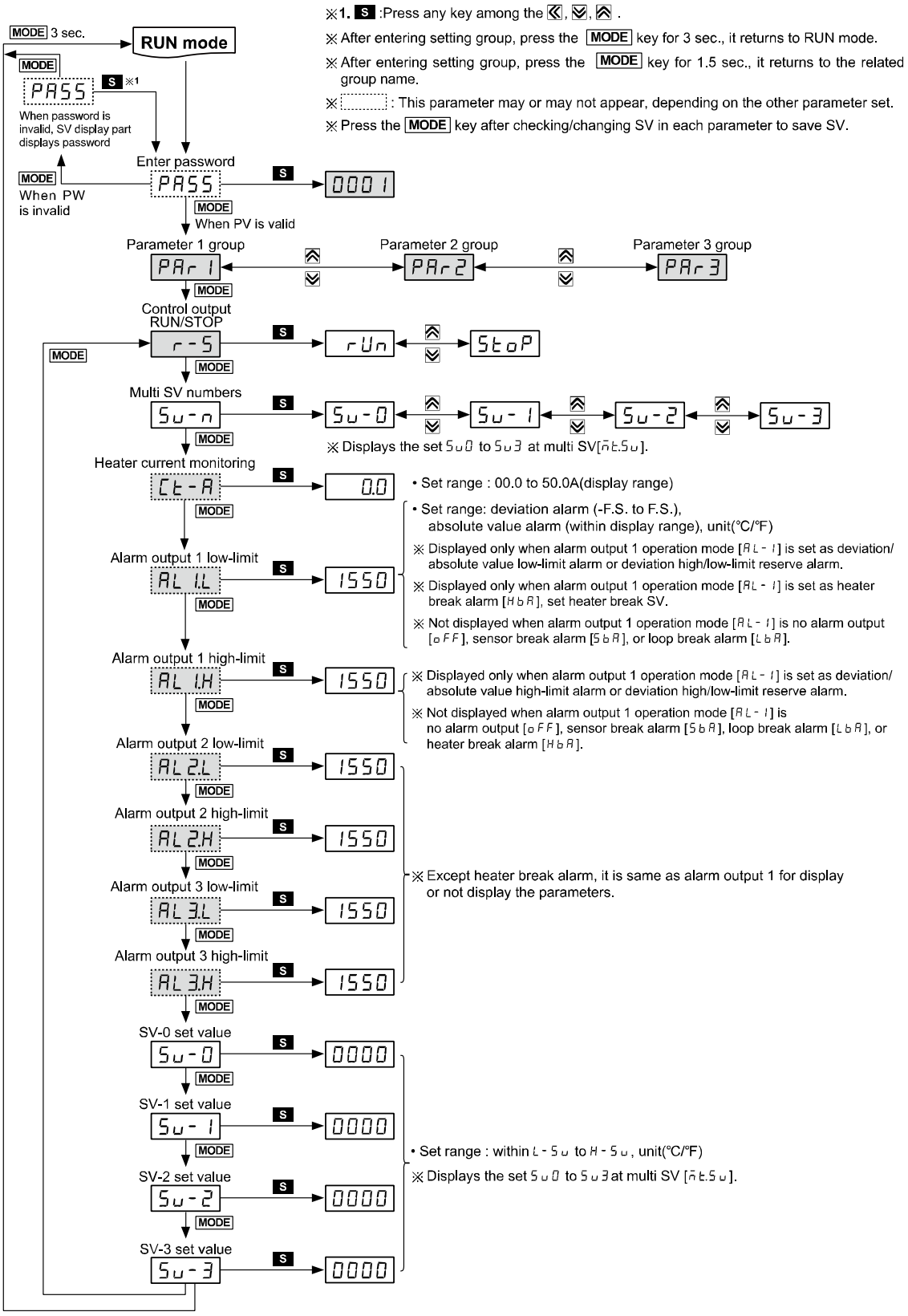
※2. It is displayed when setting user parameter group in the integrated device management program (DAQMaster).

Note

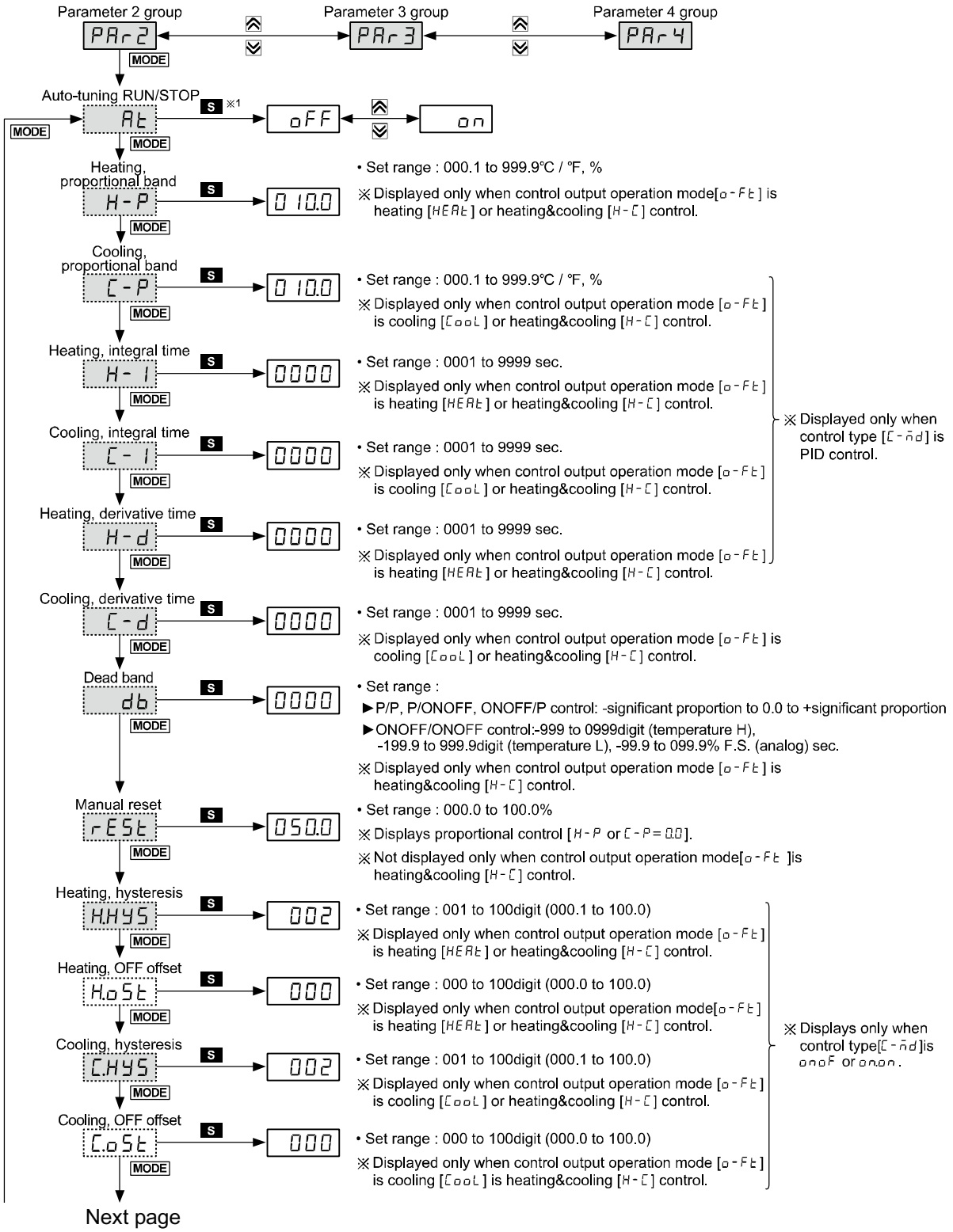
- Press the MODE key over 2 sec. in RUN mode to enter into setting mode.
- Press the MODE key for 1.5 sec. while in setting mode to move to other parameter group.
- Press the MODE key over 3 sec. while in setting mode to return to RUN mode.
- Press the MODE key at the lowest level of parameter to move parameter group screen. Press ◁, ▽ keys to move other parameter groups.
- If there is no additional key operation within 30 sec. after entering into setting mode, it is automatically returned to RUN mode and previous setting value remains.
- The shaded parameters are displayed in common. The others may not be displayed by the specifications of the product, other parameter's setting, or parameter mask setting.

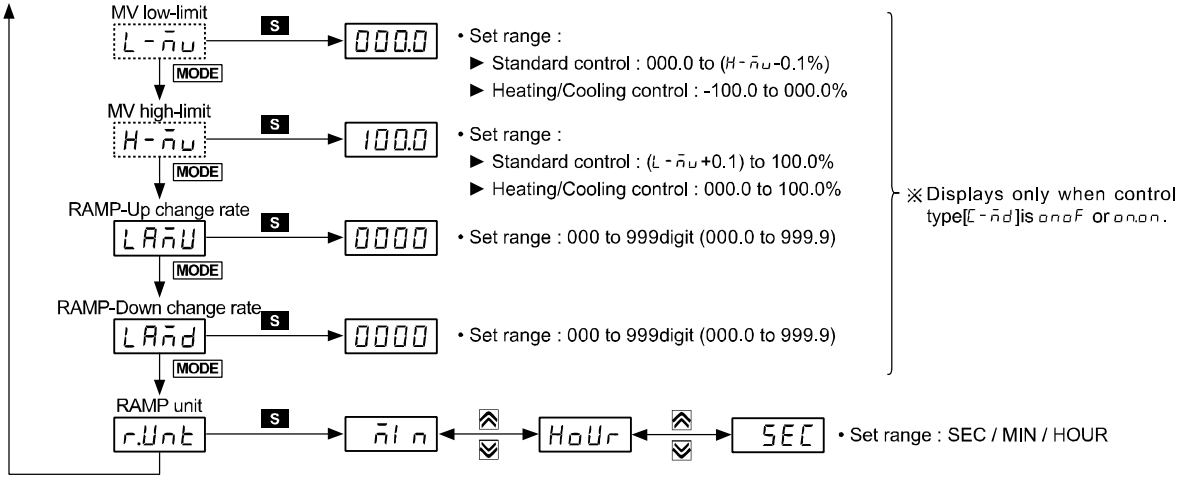
5.4 Parameter Setting Groups

5.4.1 Parameter 1 Setting Group [PAr 1]

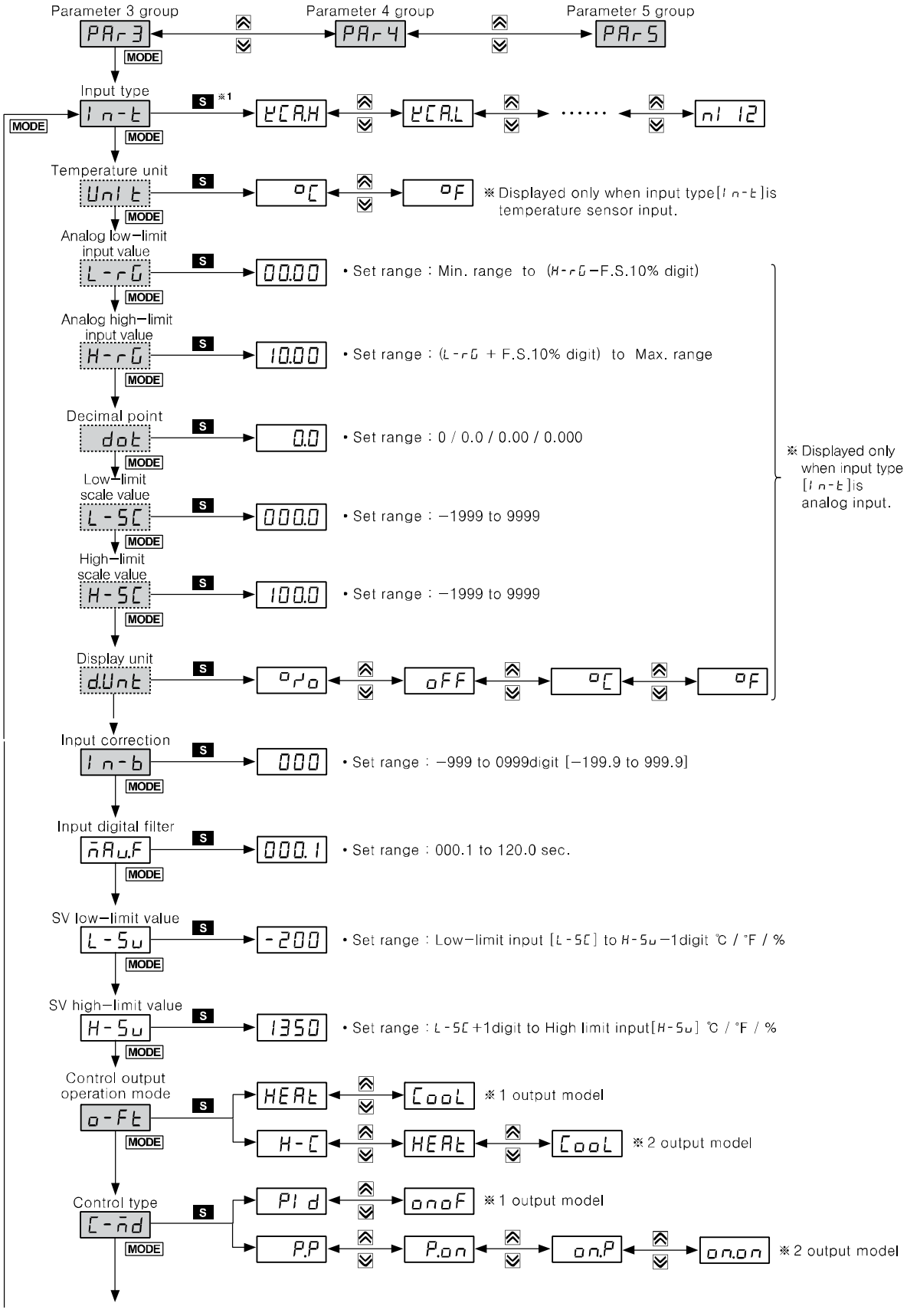


5.4.2 Parameter 2 Setting Group [PAr2]

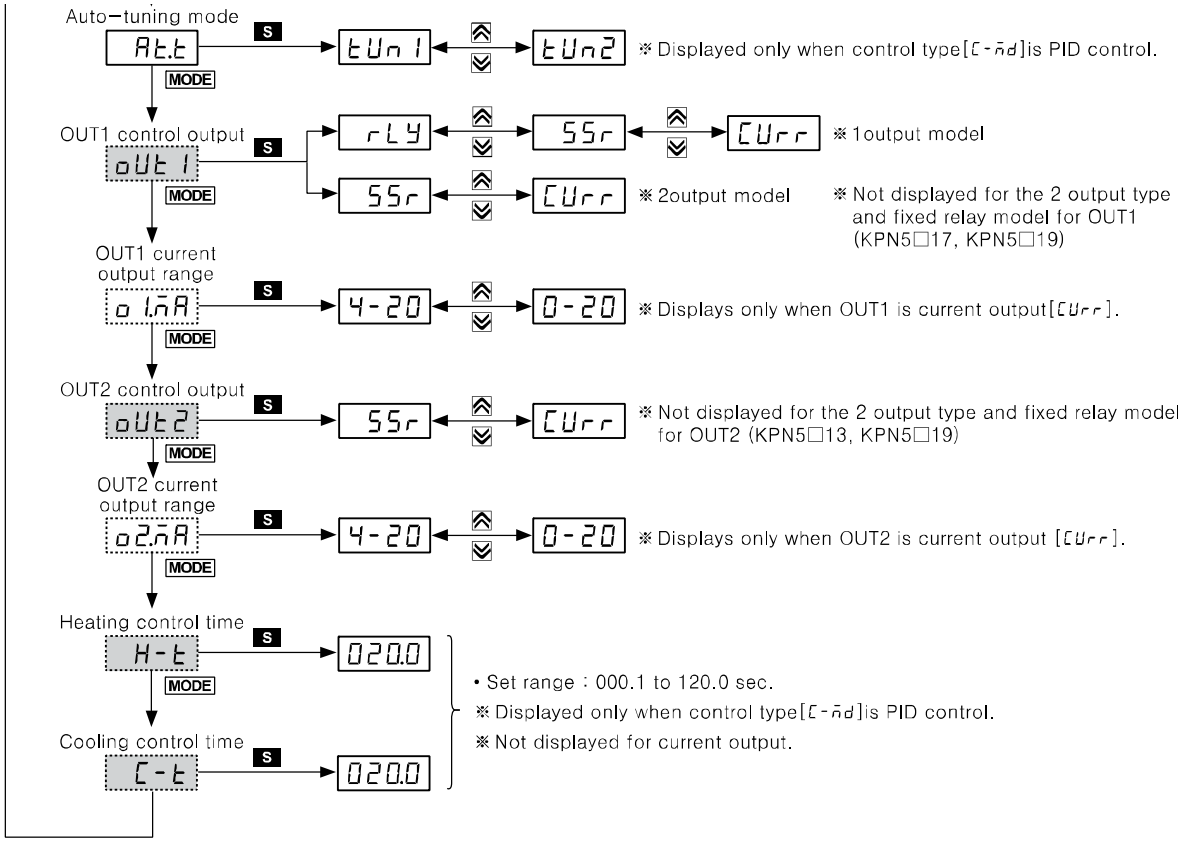




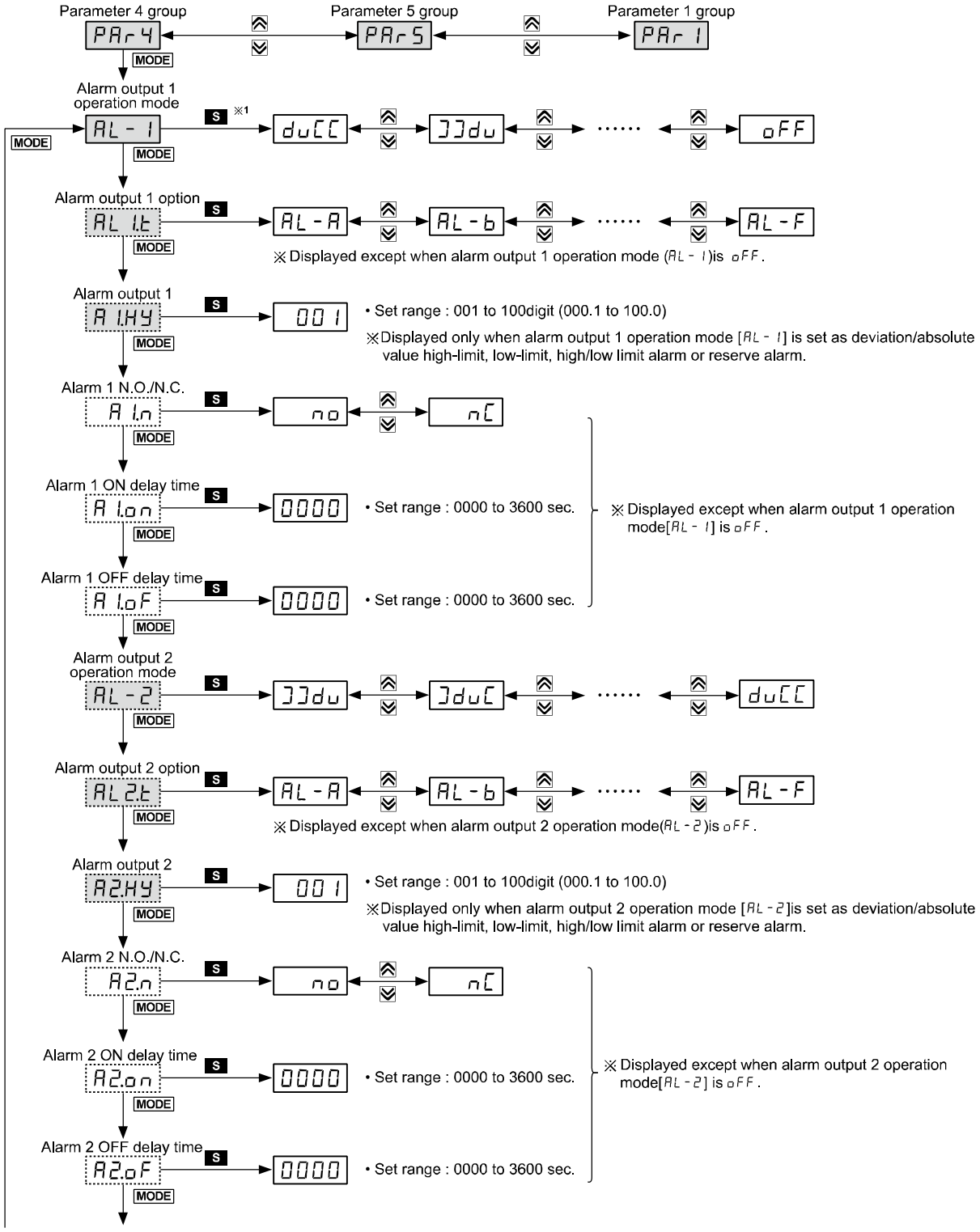
5.4.3 Parameter 3 Setting Group [PAr3]



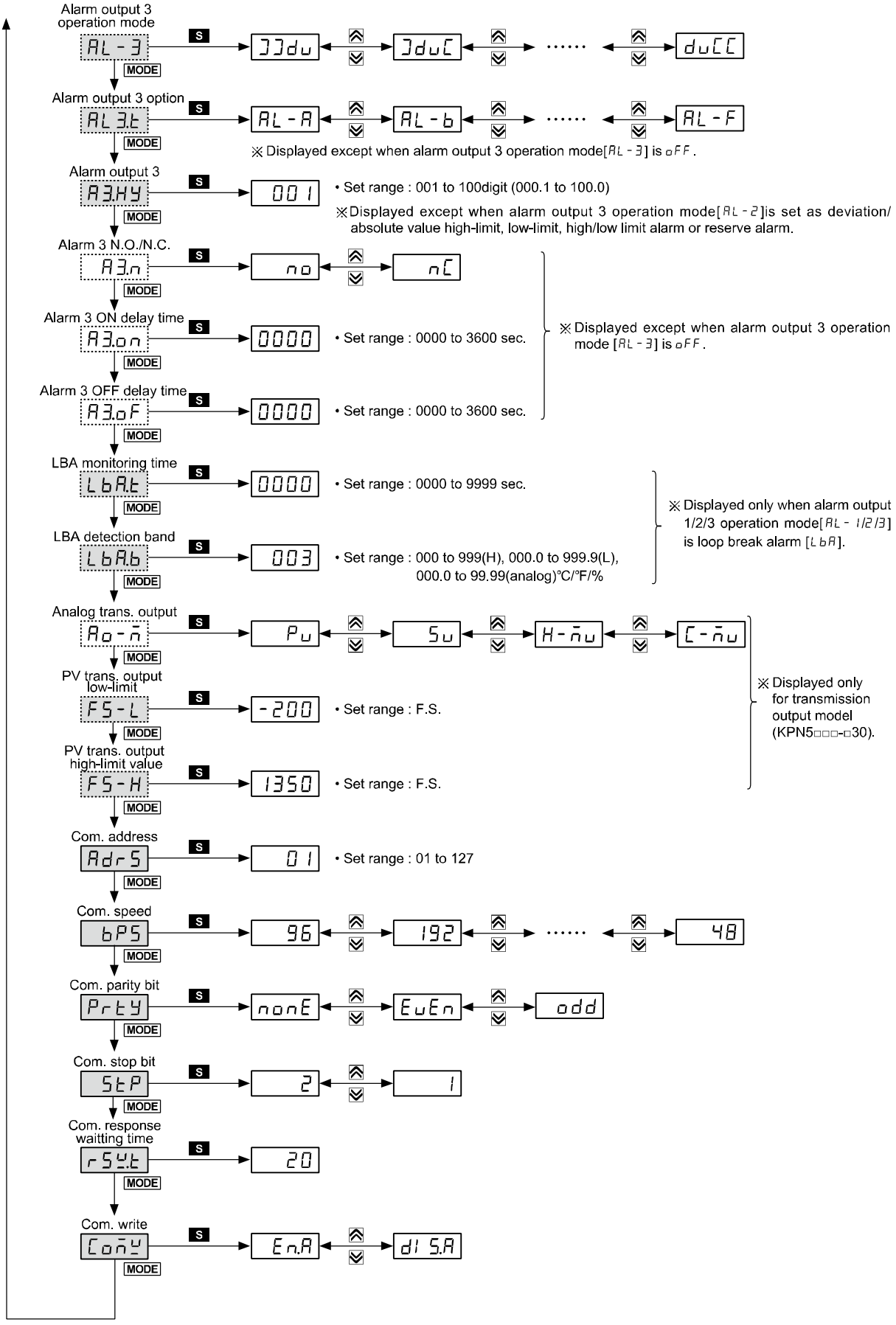
Next page


Auto-tuning mode
AT.t
S
MODE
tUn1
tUn2
※ Displayed only when control type[C-Ad]is PID control.
OUT1 control output
oUt1
rLY
SSr
CUrr
※ 1output model
※ 2output model
※ Not displayed for the 2 output type and fixed relay model for OUT1 (KPN5□17, KPN5□19)
OUT1 current output range
o1.nA
4-20
0-20
※ Displays only when OUT1 is current output[CUrr].
OUT2 control output
oUt2
※ Not displayed for the 2 output type and fixed relay model for OUT2 (KPN5□13, KPN5□19)
OUT2 current output range
o2.nA
※ Displays only when OUT2 is current output [CUrr].
Heating control time
H-t
020.0
• Set range : 000.1 to 120.0 sec.
※ Displayed only when control type[C-Ad]is PID control.
※ Not displayed for current output.
Cooling control time
C-t

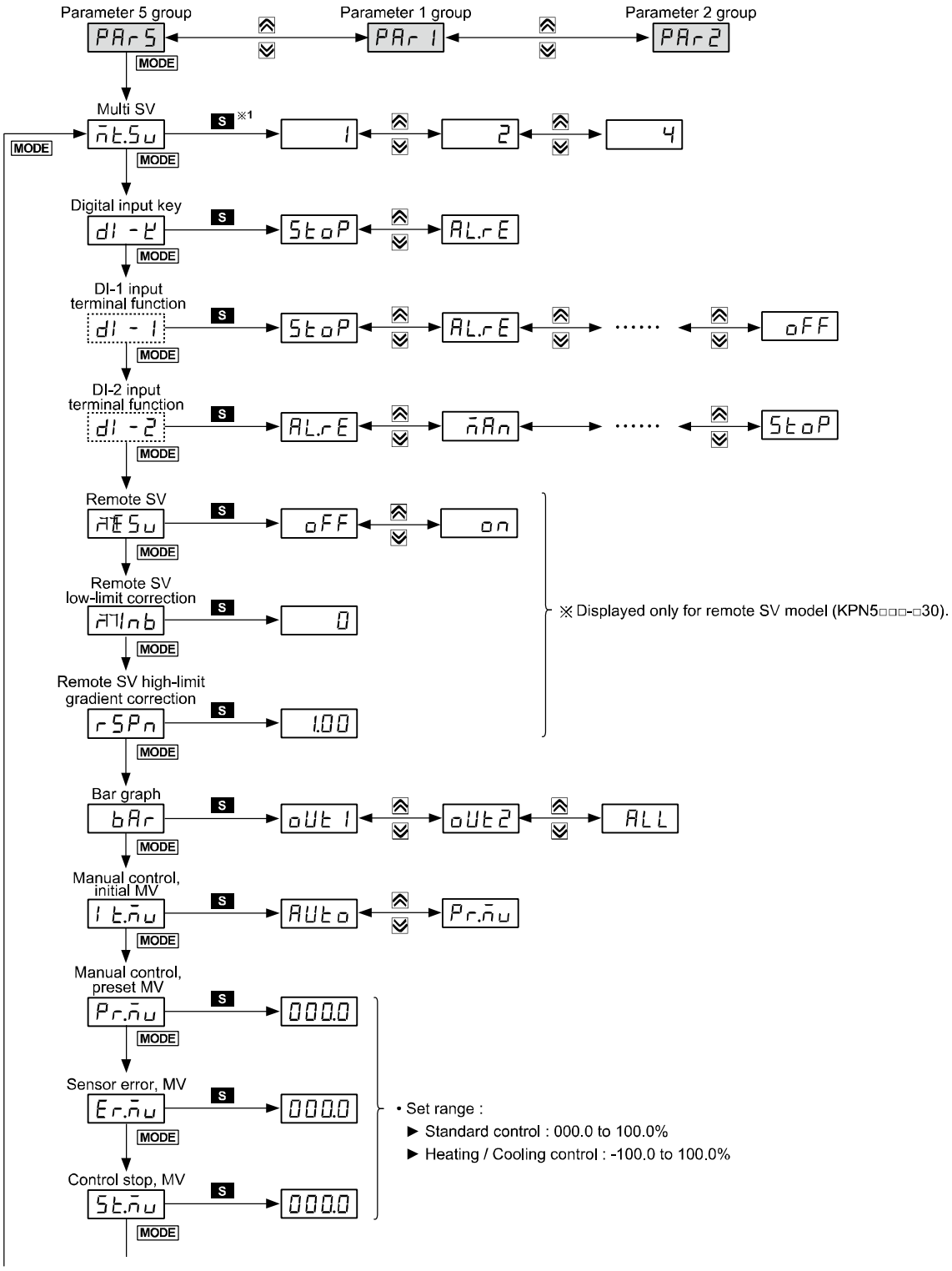
5.4.4 Parameter 4 Setting Group [PAr4]



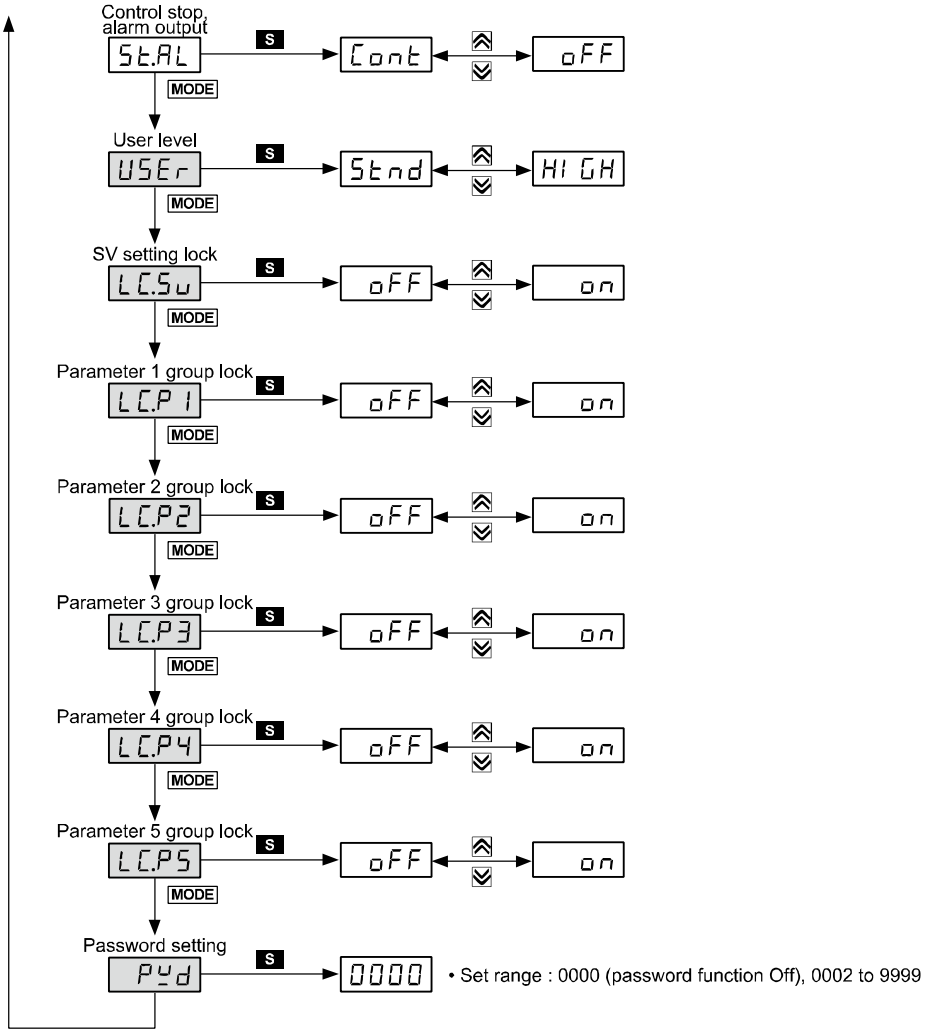
Next page


Alarm output 3 operation mode
AL-3
MODE
S
JJdu
Jdu[
.....
du[[
Alarm output 3 option
AL3t
AL-A
AL-b
AL-F
※Displayed except when alarm output 3 operation mode[AL-3] is oFF.
Alarm output 3
A3HY
001
• Set range : 001 to 100digit (000.1 to 100.0)
※Displayed except when alarm output 3 operation mode[AL-2]is set as deviation/ absolute value high-limit, low-limit, high/low limit alarm or reserve alarm.
Alarm 3 N.O./N.C.
A3n
no
nC
Alarm 3 ON delay time
A3on
0000
• Set range : 0000 to 3600 sec.
Alarm 3 OFF delay time
A3oF
0000
• Set range : 0000 to 3600 sec.
※Displayed except when alarm output 3 operation mode [AL-3] is oFF.
LBA monitoring time
LbAt
0000
• Set range : 0000 to 9999 sec.
LBA detection band
LbAb
003
• Set range : 000 to 999(H), 000.0 to 999.9(L), 000.0 to 99.99(analog)℃/℉/%
※Displayed only when alarm output 1/2/3 operation mode[AL-1/2/3] is loop break alarm [LbA].
Analog trans. output
Ao-n
Pu
Su
H-nu
C-nu
PV trans. output low-limit
FS-L
-200
• Set range : F.S.
PV trans. output high-limit value
FS-H
1350
• Set range : F.S.
※Displayed only for transmission output model (KPN5□□□-□30).
Com. address
AdrS
01
• Set range : 01 to 127
Com. speed
bPS
96
192
48
Com. parity bit
PrtY
nonE
EuEn
odd
Com. stop bit
StP
2
1
Com. response waitting time
rSWt
20
Com. write
ComY
EnA
diSA

5.4.5 Parameter 5 Setting Group [PAr5]



Next page


Control stop, alarm output
St.AL
S
Cont
oFF
MODE
User level
USEr
S
Stnd
HI GH
MODE
SV setting lock
LC.Su
S
oFF
on
MODE
Parameter 1 group lock
LC.P1
S
oFF
on
MODE
Parameter 2 group lock
LC.P2
S
oFF
on
MODE
Parameter 3 group lock
LC.P3
S
oFF
on
MODE
Parameter 4 group lock
LC.P4
S
oFF
on
MODE
Parameter 5 group lock
LC.P5
S
oFF
on
MODE
Password setting
PYd
S
0000
• Set range : 0000 (password function Off), 0002 to 9999

6 Parameter Settings and Functions

6.1 Input

6.1.1 Input types and temperature ranges

Input type			Display	Temp. range(℃)	Temp. range((℉)
Thermocouple (TC)	K(CA)	1	tC.K1	-200 to 1350	-328 to 2463
		0.1	tC.K2	-199.9 to 999.9	-199.9 to 999.9
	J(IC)	1	tC.J1	-200 to 800	-328 to 1472
		0.1	tC.J2	-199.9 to 800.0	-199.9 to 999.9
	E(CR)	1	tC.E1	-200 to 800	-328 to 1472
		0.1	tC.E2	-199.9 to 800.0	-199.9 to 999.9
	T(CC)	1	tC.t1	-200 to 400	-328 to 752
		0.1	tC.t2	-199.9 to 400.0	-199.9 to 752.0
	B(PR)	1	tC-b	0 to 1800	32 to 3272
	R(PR)	1	tC-r	0 to 1750	32 to 3182
	S(PR)	1	tC-S	0 to 1750	32 to 3182
	N(NN)	1	tC-n	-200 to 1300	-328 to 2372
	C(TT)※1	1	tC-C	0 to 2300	32 to 4172
	G(TT)※2	1	tC-G	0 to 2300	32 to 4172
	L(IC)	1	tC.L1	-200 to 900	-328 to 1652
		0.1	tC.L2	-199.9 to 900.0	-199.9 to 999.9
	U(CC)	1	tC.U1	-200 to 400	-328 to 752
		0.1	tC.U2	-199.9 to 400.0	-199.9 to 752,0
	Platinel II	1	tC-P	0 to 1390	32 to 2534
RTD	Cu 50Ω	0.1	Cu.50	-199.9 to 200.0	-199.9 to 392.0
	Cu 100Ω	0.1	Cu.10	-199.9 to 200.0	-199.9 to 392.0
	JPt 100Ω	1	JPt.1	-200 to 650	-328 to 1202
		0.1	JPt.2	-199.9 to 650.0	-199.9 to 999.9
	DPt 50Ω	0.1	dPt.5	-199.9 to 600.0	-199.9 to 999.9
	DPt 100Ω	1	dPt.1	-200 to 650	-328 to 1202
		0.1	dPt.2	-199.9 to 650.0	-199.9 to 999.9
	Nickel 120Ω	1	ni.12	-80 to 200	-112 to 392
Analog	Voltage	0 to 10V	A-u1	-1999 to 9999 (Display range is variable according to decimal point position.)	
		0 to 5V	A-u2		
		1 to 5V	A-u3		
		0 to 100mV	A.nu1		
	Current	0 to 20mA	A.nA1		
		4 to 20mA	A.nA2		

※1: C(TT) : Same as existing W5(TT) type sensor

※2: G(TT) : Same as existing W(TT) type sensor

Note

Temperature sensors convert the subject temperature to electrical signals for the temperature controller allowing it to control output.

SV (Setting Value) can only be set within the input range.

6.1.2 Input type [PAr3 → In-t]

This product supports multiple input types, making it possible for the user to choose from thermocouples, RTDs, and analog voltage/current.

If you change the input specification,
the SV's high/low limits are automatically set to the new specification's max/min values for temperature sensors. As for analog inputs, high/low input values are set to the max/min temperature range and the SV high/low limits set to high/low scale values.

Setting group	Parameter	Set range	Factory default	Unit
PAr3	In-t	Refer to 6.1.1	K.CA.H	-

6.1.3 Sensor temperature unit [PAr3 → Unit]

When selecting the input temperature sensor, you can set the desired units (℃, ℉) of temperature value to be displayed.

Setting group	Parameter	Set range	Factory default	Unit
PAr3	Unit	°C / °F	°C	-

Note

This parameter is not displayed for analog input.

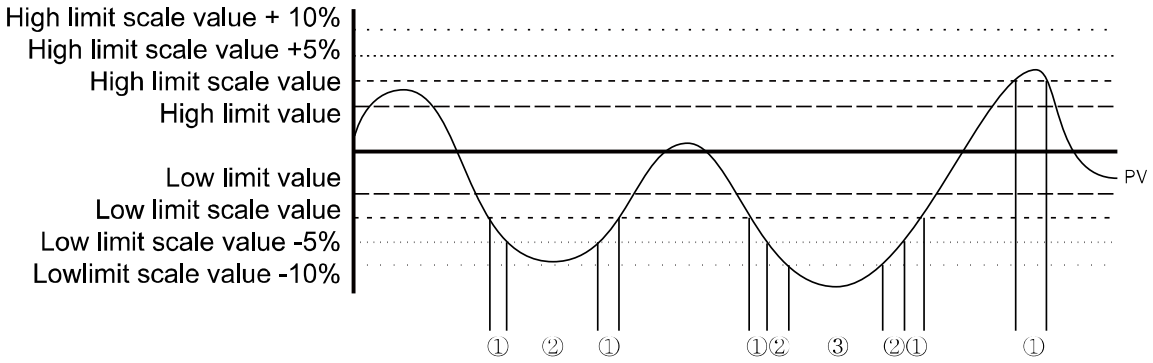
6.1.4 Analog input/scale value

With analog input selected, you can set the analog input range (high/low limit input values) and the display scale (high/low limit scale values) within the designated input range.

The decimal point positions remain fixed when configuring the high/low limit input values. You can change the input values at Au 1: 00.00, Au2/Au3: 0.000, Ana 1: 000.0, AnA 1/AnA2: 00.00 decimal points.

If the upper and lower limit scale settings are identical, Err flashes twice and setting mode is displayed.

For analog input, ±5% of the set high/low limit input value is extended. Analog output is also extended compairing input value. (For temperature sensor input, ±5% extension is applied within the temperature range.)



No	PV	Display
①	±5% section	Flashes PV
②	±5 to 10% section	Flashes HHHH or LLLL
③	over ±10% section	Flashes oPEn

Note

This parameter is not displayed for temperature sensor input.

6.1.4.1 Analog low-limit input value [PAr3 → L-rG]

You can set the low limit input values for actual use within the analog input range.

Setting group	Parameter	Set range	Factory default	Unit
PAr3	L-rG	Min. temperature range to high limit input value [H-rG] – F.S. 10%	00.00	-

6.1.4.2 Analog high-limit input value [PAr3 → H-rG]

You can set the high limit input values for actual use within the analog input range.

Setting group	Parameter	Set range	Factory default	Unit
PAr3	H-rG	Low limit input value [L-rG] + F.S. 10% to Max. temperature range	10.00	-

6.1.4.3 Decimal point [PAr3 → dot]

You can set the decimal point positions for PV (Present Value) and SV (Setting Value) within high and low limit scale values.

Setting group	Parameter	Set range	Factory default	Unit
PAr3	dot	0 / 0.0 / 0.00 / 0.000	0.0	-

6.1.4.4 Scale low-limit value [PAr3 → L-SC]

You can set the display scales of lower limit values for analog input [L-rG].
(Based on the decimal point position setting.)

Setting group	Parameter	Set range	Factory default	Unit
PAr3	L-SC	-1999 to 9999	000.0	-

6.1.4.5 Scale high-limit value [PAr3 → H-SC]

You can set the display scales of high limit values for analog input [H-rG].
(Based on the decimal point position setting.)

Setting group	Parameter	Set range	Factory default	Unit
PAr3	H-SC	-1999 to 9999	100.0	-

6.1.4.6 Display unit [PAr3 → d.Unt]

When you select analog input type, you can set the display units.

Setting group	Parameter	Set range	Factory default	Unit
PAr3	d.Unt	°C / °F / °ro / oFF	°ro	-

Setting	Parameter function
°C	Sets the display unit to ℃ and turns on the ℃ indicator.
°F	Sets the display unit to ℉ and turns on the ℉ indicator.
°ro	Sets the display unit to % and turns on the % indicator.
oFF	Sets the display unit to an undefined unit. The LED unit indicator does not turn on.

6.1.5 Input correction [PAr3 → In-b]

This feature is used to compensate for input error caused by thermocouples, RTDs, or analog input devices, not by the controller itself.

This input correction function is mainly used when the sensor cannot be attached directly to controlled objects. It is also used to compensate for temperature error between the sensor's installation point and the actual measuring point.

Setting group	Parameter	Set range	Factory default	Unit
PAr3	In-b	-999 to 0999 (Temperature H, Analog), -199.9 to 999.9 (Temperature L)	0000	℃/℉/-

Ex.

If the controller displays 78℃ when the actual temperature is 80℃, set the input bias [In-b] to '002' in order to adjust the controller's display temperature to 80℃.

After input correction, the PV is out of the temperature range by each sensor, it displays 'HHHH' or 'LLLL'.

Note

Make sure that an accurate temperature error measurement is taken before setting values of input correction. An inaccurate initial measurement can lead to greater error.

Many of today's temperature sensors are graded by their sensitivity. Since higher accuracy usually comes at a higher cost, most people tend to choose sensors with medium sensitivity. Measuring each sensor's sensitivity correction for input correction function in order to ensure higher accuracy in temperature reading.

6.1.6 Input digital filter [PAr3 → ñAu.F]

It is not possible to perform high accuracy control if the PV (Present Value) fluctuates because of noise elements, disturbance, or instabilities in the input signal. Using the input digital filter function can stabilize PV to realize more reliable control.

Setting group	Parameter	Set range	Factory default	Unit
PAr3	ñAu.F	000.1 to 120.0	000.1	sec.

Ex.

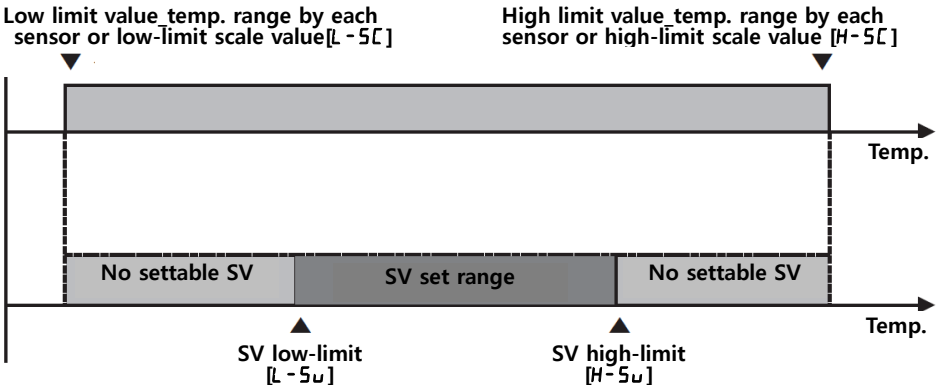
If the input digital filter is set to 0.4 seconds, digital filtering is applied to a sampling value collected over 0.4 seconds (400 ms).

Note

When the input digital filter is used, PV (Present Value) can vary from the actual input value.

6.1.7 SV high/low limit value [PAr3 → H-Su/L-Su]

You can limit the SV (Setting Value) range within the temperature range of the sensor or analog input type in order to prevent the system from controlling with improper SV.



Setting group	Parameter	Set range	Factory default	Unit
PAr3	H-Su SV high-limit value	SV low-limit [L-Su]+ 1digit to high limit value by each sensor or high-limit scale value [H-SC]	1350 (Temp.) 000.0 (Analog)	℃/℉
	L-Su SV low-limit value	SV low-limit [L-Su] or low-limit scale value [L-SC] to SV high-limit [H-Su] or high-limit scale value [H-SC]	-200 (Temp.) 100.0 (Analog)	℃/℉

Note

If setting over or below of high/low-limit input range of input temperature sensor type or high/low-limit scale value of analog, the SV is not saved and the previous settings are retained.

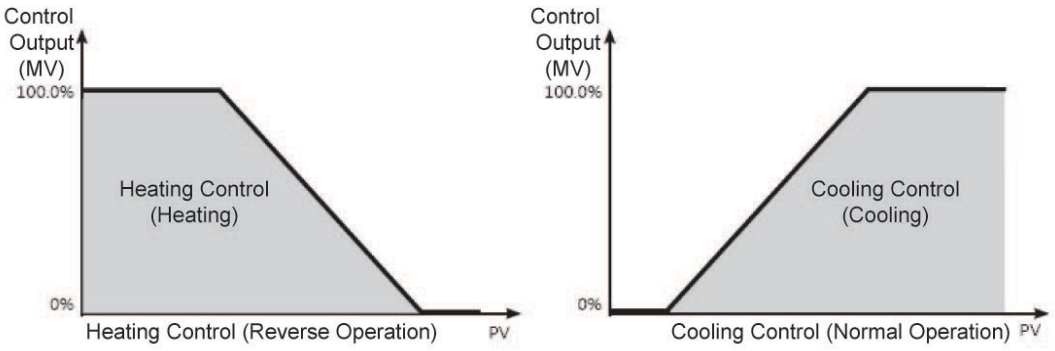
SV is available to set within the 'SV low-limit [L-Su] to SV high-limit [H-Su]' range. You can not set SV as 'SV low-limit[L-Su] > SV high-limit[H-Su]'.

6.2 Control output

6.2.1 Control output mode [PAr3 → o-Ft]

Control output modes for general temperature control include heating [HEAt], cooling [CooL], and heating and cooling [H-C].

Heating control and cooling control are mutually opposing operations with inverse outputs.



The PID time constant varies based on the controlled objects during PID control.

Setting group	Parameter	Set range	Factory default	Unit
PAr3	o-Ft	Standard model: HEAt / CooL	HEAt	-
		Heating & Cooling model: HEAt / CooL / H-C	H-C	-

6.2.1.1 Heating control [PAr3 → o-Ft → HEAt]

As reverse operation, if PV is lower than SV, it is set the output to supply power to the load(heater).

6.2.1.2 Cooling control [PAr3 → o-Ft → CooL]

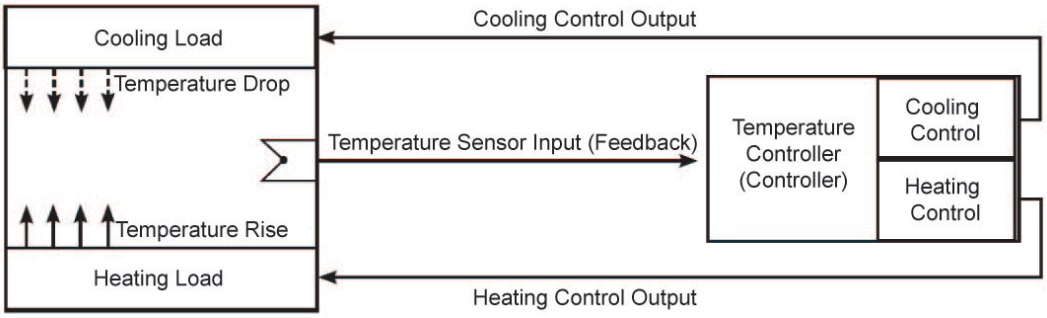
As normal operation, if PV is higher than SV, it is set the output to supply power to the load (cooler).

6.2.1.3 Heating & Cooling control [PAr3 → o-Ft → H-C]

Heating and cooling with a single temperature controller when it is difficult to control subject temperature with only heating or cooling.

Heating and cooling control mode controls the object using different PID time constants for each heating and cooling.

It is also possible to set heating and cooling control in both PID control or ON/OFF control mode. Heating/cooling output can be selected among Relay output, SSR output and current output depending on model types choosen according to your application environment. (Note that only standard SSR control is available for SSR output in OUT2.)



Note

For heating and cooling control, OUT1 control output is dedicated to heating control and OUT2 control output to cooling control.

6.2.1.3.1. Dead band/Overlap band [PAr2 → db]

In heating and cooling control, it is possible to designate a dead band between heating and cooling control bands based on SV (Setting Value).

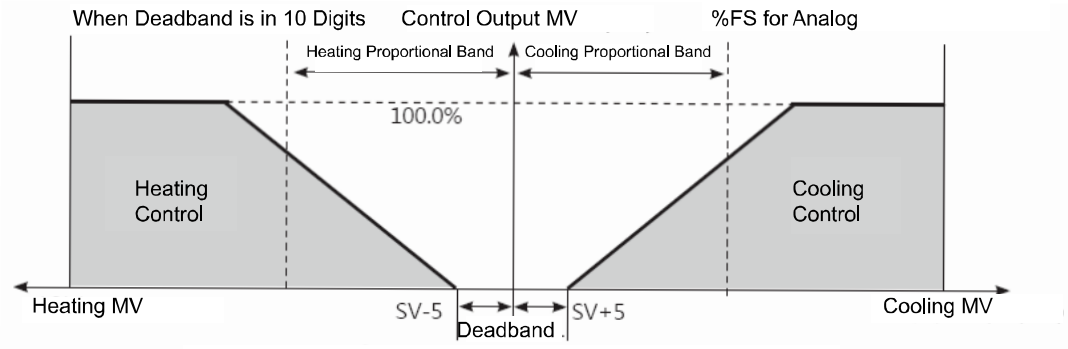
A dead band forms around the SV when db is set to a positive value (+). No control occurs in the dead band area. Therefore, heating and cooling MVs become 0.0% in the formed dead band. An overlap band (simultaneous application of heating and cooling MVs) forms around the SV when db is set to a negative value (-).

Set db to 0 when a dead band or an overlap band is not used.

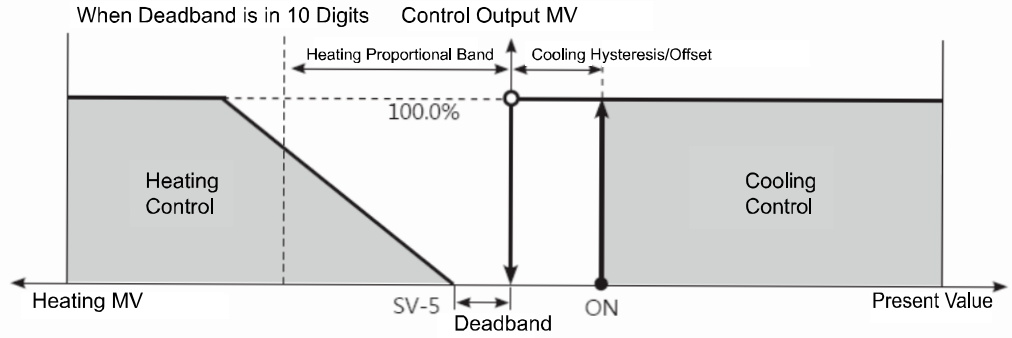
Setting group	Parameter	Set range	Factory default	Unit
PAr2	db	Refer to the below.	Refer to the below.	

- PID/PID, PID/ON-OFF, ON-OFF/PID control
  - Set range (temperature): -(proportional band) to +(proportional band) (based on the lower value when proportional bands are different)
  - Set range (analog): -99.9to 099.9
  - Factory default: 0000(temperature H), 000.0(temperature L, analog), (unit: temperature ℃/℉, analog % F.S.)
- ON-OFF/ON-OFF control
  - Set range (temperature):
    -999(overlap band) to 0000(not used) to 0999(dead band) (temperature H)
    199.9(overlap band) to 000.0(not used) to 999.9(dead band) (temperature L)
  - Set range (analog): -99.9(overlap band) to 000.0(not used) to 099.9(dead band)
  - Factory default: 0000(temperature H), 000.0(temperature L, analog), (Unit: temperature ℃/℉, analog % F.S.)

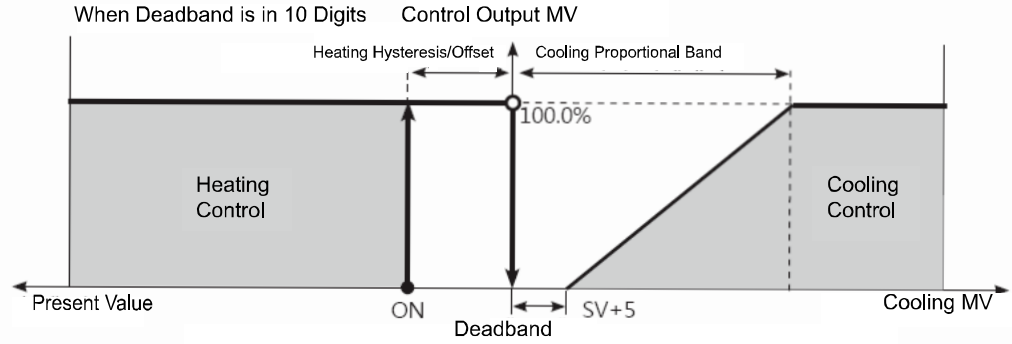
(1) Using dead band



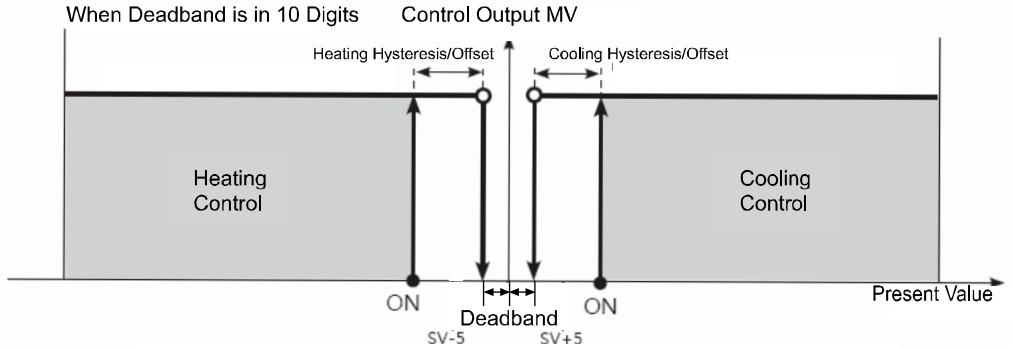
<PID-PID Control with Heating and Cooling Control>



<PID-ON/OFF Control with Heating and Cooling Control>

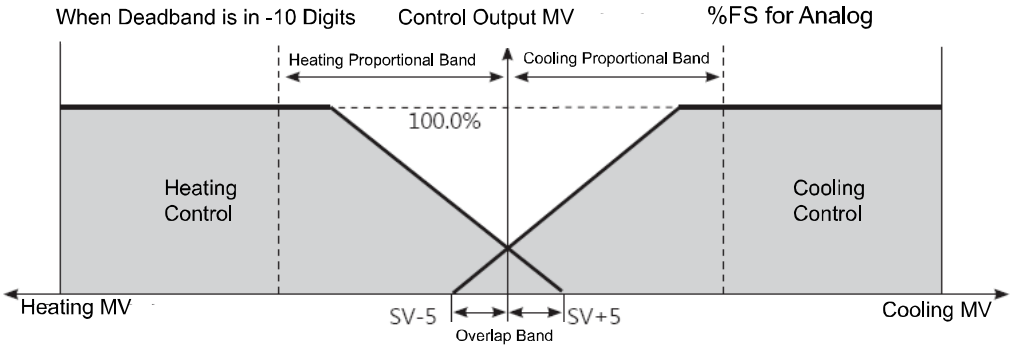


<ON/OFF-PID Control with Heating and Cooling Control>

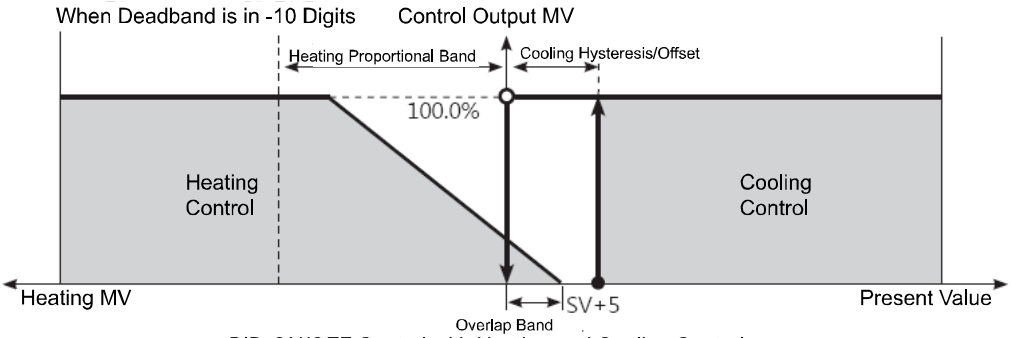


<ON/OFF-ON/OFF Control with Heating and Cooling Control>

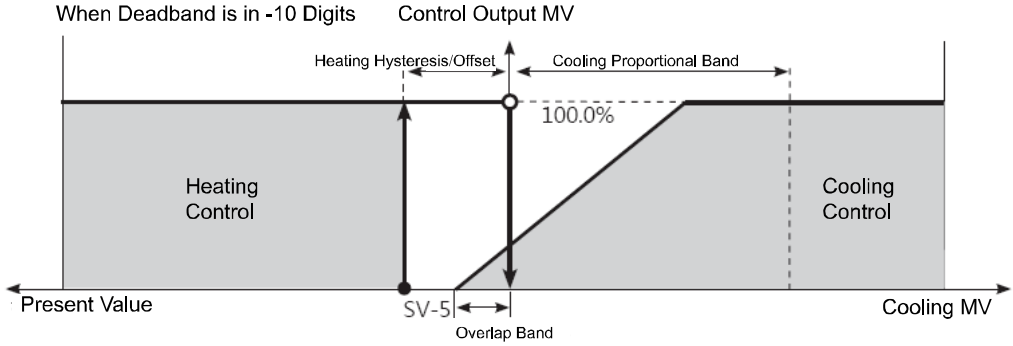
(2) Using overlap band



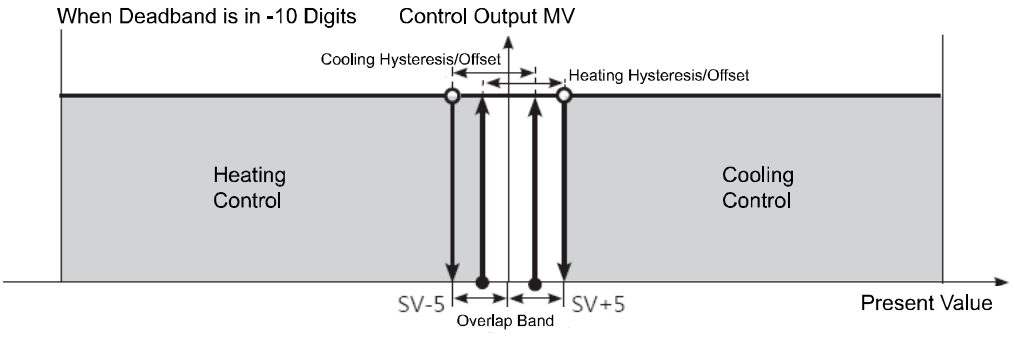
<PID-PID Control with Heating and Cooling Control>



<PID-ON/OFF Control with Heating and Cooling Control>

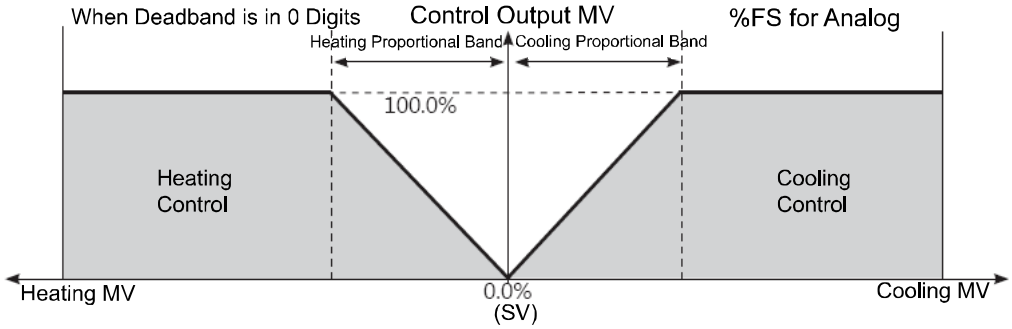


<ON/OFF-PID Control with Heating and Cooling Control>

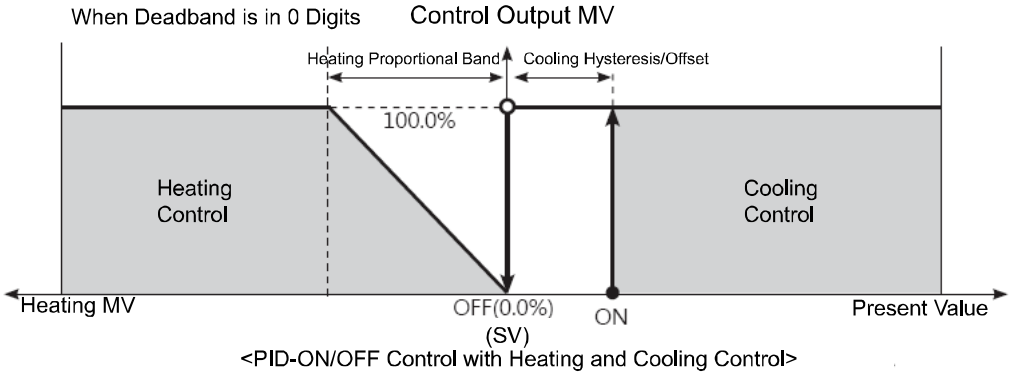


<ON/OFF-ON/OFF Control with Heating and Cooling Control>

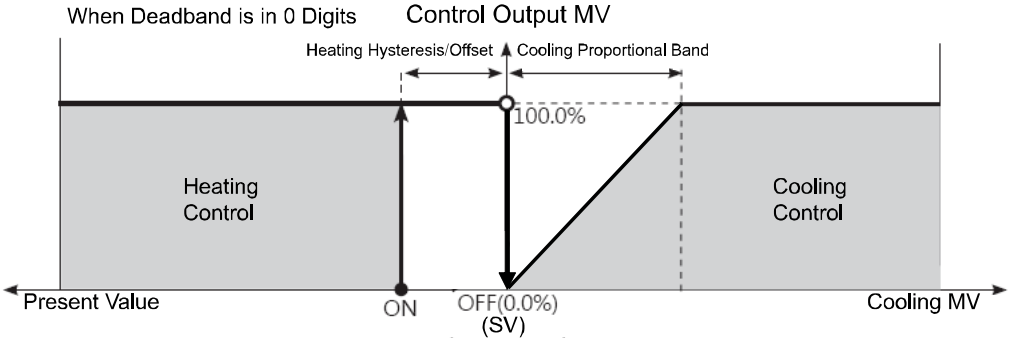
(3) Using neither dead band nor overlap band



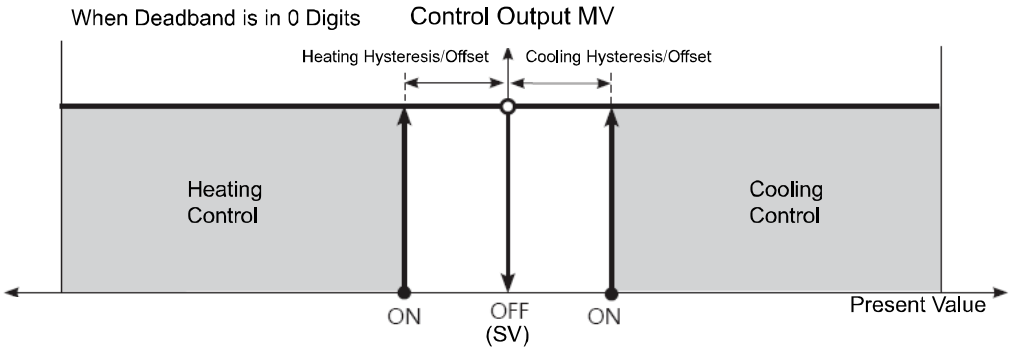
<PID-PID Control with Heating and Cooling Control>



<PID-ON/OFF Control with Heating and Cooling Control>



<ON/OFF-PID Control with Heating and Cooling Control>

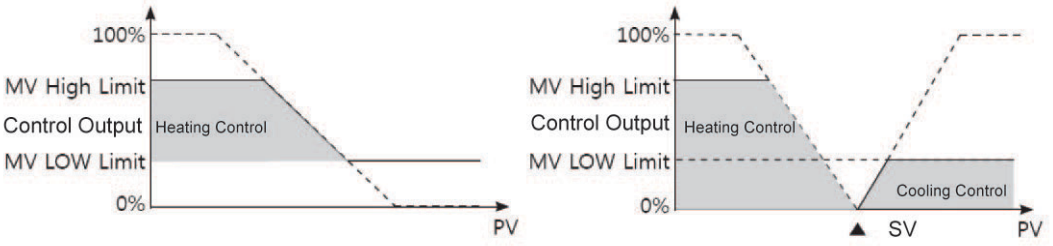


<ON/OFF-ON/OFF Control with Heating and Cooling Control>

6.2.2 MV high/low-limit [PAr2 → H-ou / L-ou]

MV high/low-limit values [H-ou / L-ou] for control output can be configured to the actual MV, provided the temperature controller's MV calculation exceeds the limits.

During heating and cooling control, cooling MV carries a "-" prefix. Therefore, the high-limit is expressed as a + value on the heating side and the lower limit as a - value on the cooling side.



<Standard Control (Heating Control)> <Heating and Cooling Control>

Parameter	Description
L-ou	MV low-limit set
H-ou	MV high-limit set

Setting group	Parameter	Set range	Factory default	Unit
PAr2	H-ou	Standard control: MV low-limit value [L-ou] + 0.1 to 100.0	100.0	%
		Heating & Cooling control: 000.0 to 100.0 (PID control) 0.0 (OFF)/ 100.0 (ON) (ON/OFF control)	100.0	%
	L-ou	Standard control: 000.0 to MV high-limit value [H-ou] − 0.1	0.0	%
		Heating & Cooling control: - 100.0 to 000.0 (PID control), -100.0 (ON)/0.0 (OFF) (ON/OFF control)	-100.0	%

Note

Same MV limits applied during auto-tuning.

MV limits are not applied to manual control, MV upon control stop, MV upon a sensor error, and initial manual control MV.

MV high/low-limit configuration is not available for ON/OFF control in standard control mode (heating or cooling control).

6.2.3 RAMP [PAr2 → rAnU / rAnd / r.Unt]

Ramp is a feature used to configure the slope toward SV (Setting Value). The feature limits change rate of SV and thereby restricts sudden temperature changes (increase and decrease) in the control subject.

Ramp is commonly used in applications where rapid temperature changes (increase and decrease) could impact negatively on the control subject.

Parameter	Description
rAnU	RAMP-Up change rate
rAnd	RAMP-Down change rate
r.Unt	RAMP time unit set

Setting group	Parameter	Set range	Factory default	Unit
PAr2	rAnU	000 to 999 (temperature H, analog), 000.0 to 999.9 (temperature L)	000	
	rAnd	000 to 999 (temperature H, analog), 000.0 to 999.9 (temperature L)	000	
	r.Unt	SEC (sec.), nIn (min.), HoUr (hour)	nIn	-

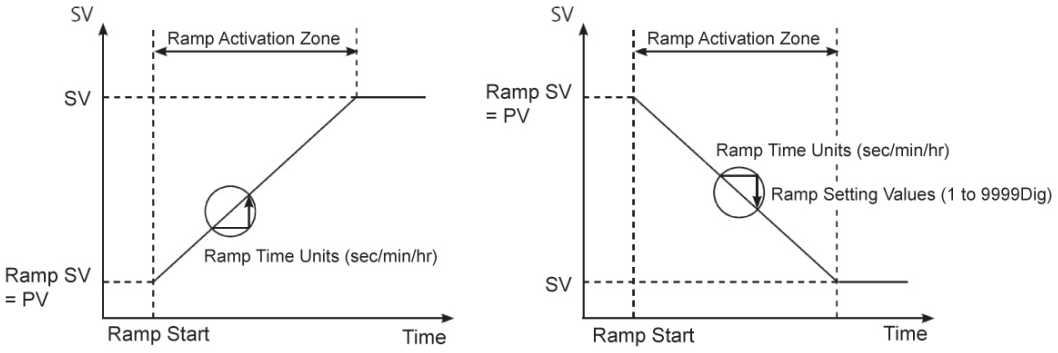
Note

Activating the ramp feature when the ramp is not in operation limits the change rate of SV (Setting Value) based on PV (Present Value). Changing SV or ramp parameters while the ramp is in operation limits the change rate of SV based on SV at the point of the change.
Control operates based on changed SV (hereinafter referred to as RAMP SV) - changed by preset change rate (slope). Set RAMP-Up change rate and RAMP-Down change rate independently.
During RAMP operation, Alarm operates based on the last SV.
Setting the rate of ramp change to 0 deactivates the ramp feature.
If the ramp feature has been activated, RAMP SV is displayed on SV display part.

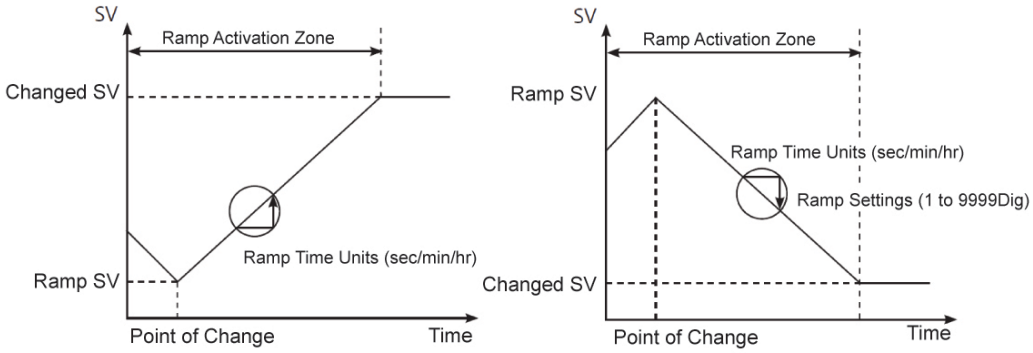
RAMP feature by operation status

Operation stauts	Ramp Up/Down	RAMP feature
All operations	When it is 0	Inactive
oPEn, HHHH, LLLL, Auto-Tuning, Auto → Manual, RUN → STOP	Regardless of conditions	Inactive
oPEn, HHHH, LLLL, after completing Auto-Tuning, PV = SV	Regardless of conditions	Inactive
Power ON, SV changing, STOP → RUN, Manual → Auto, Ramp Rate changing	When it is not 0	Active

RAMP feature operation graph



<Activating Ramp when Ramp is not in operation>



<Changing SV or Ramp Parameter when Ramp is in operation>

6.2.4 Auto/ Manual control

- Auto control: This mode is to make temperature reach SV with MV calculated by PID control.
- Manual control: This mode is to make temperature reach SV with user's defined MV.

Note

When in manual control mode, parameter settings can only be checked and cannot be modified (except for lock parameters).

When the unit is powered on following a power interruption or shutdown, the previous control mode (auto or manual) is maintained.

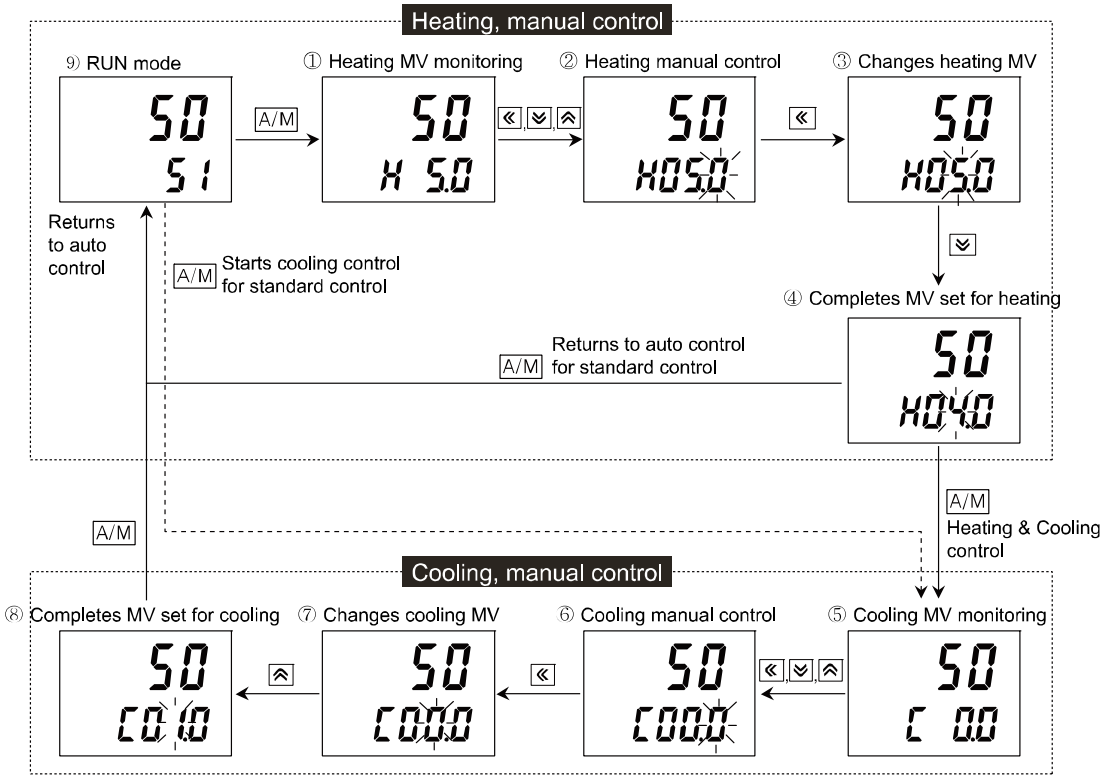
If switching to manual control during Auto-tuning, Auto-tuning is stopped.
It is possible to switch to manual control mode while in STOP.

When sensor break alarm[5bA] occurs in standard control mode, the sensor error MV (Er.mu) is applied. In this state, manual and auto control MV settings can be modified.

It is still possible to switch auto/manual control mode while in controlling operation.

Operation priority: Manual Control > Stop > Open (sensor disconnection)

6.2.4.1 Manual/Auto Control Switching



(1) In standard control(heating or cooling), manual control switching

- ①, ⑤: Press the A/M key once in RUN mode, it enters MV monitoring mode. The SV display part displays H (for heaing control) or C (for cooling control) and the current MV.
- ②, ⑥: During monitoring MV, press any one of ≪ ≫ ≫ keys, the last digit (10^0 Digit) flashes and it switches to manual control.
- ③, ⑦: Press the ≪ key to change the flashing digit.(10^0 → 10^1 → 10^2 → 10^3 → 10^0)
- ④, ⑧: Press the ≫ ≫ key continuously, it moves as 0→1→2→3→4→5→6→7→8→9→0 and it is related with upper/lower digit.
  By ≪ ≫ ≫ keys, set the desired MV.
- ⑨: Press the A/M in ① to ⑧ status, the MAN lamp turns OFF and the system returns to auto control mode.

(2) Heating & Cooling contro, manual control switching

- ①: Press the A/M key once in RUN mode, it enters heating MV monitoring mode. The SV display part displays H and the current heating MV.
- ②: During monitoring heating MV, press any one of ≪ ≫ ≫ keys, the last digit (10^0 Digit) flashes and it switches to manual control.
- ③: Press the ≪ key to change the flashing digit.(10^0 → 10^1 → 10^2 → 10^3 → 10^0)
- ④: Press the ≫ ≫ key continuously, it moves as 0→1→2→3→4→5→6→7→8→9→0 and it is related with upper/lower digit.
  By ≪ ≫ ≫ keys, set the desired MV.
- ⑤: Press the A/M in ① to ⑧ status, it enters cooling MV monitoring mode. The SV display part displays C and the current cooling MV.
- ⑥: During monitoring cooling MV, press any one of ≪ ≫ ≫ keys, the last digit (10^0 Digit) flashes.

- ⑦: Press the ◁◁ key to change the flashing digit.(10^0 → 10^1 → 10^2 → 10^3 → 10^0)
- ⑧: Press the ▽△ key continuously, it moves as 0→1→2→3→4→5→6→7→8 →9→0 and it is related with upper/lower digit.
  By ◁◁▽△ keys, set the desired MV.
- ⑨: Press the A/M in ⑤ to ⑧ status, the MAN lamp turns OFF and the system returns to auto control mode.

Note

For heating and cooling control, the system returns to auto control after going through heating monitoring, manual heating control, cooling monitoring, and manual cooling control stages in sequence.

Heating MV remains in effect during cooling monitoring and manual cooling control.

When digital input terminal (DI-1, DI-2) function is set as AUTO/MANUAL, auto/manual control function by the front A/M key and communication does not operate.

(3) By digital input terminal (DI), auto/manual switching

When digital input terminal (DI) is set as AUTO/MANUAL, it switches to manual control when digital input terminal (DI) is ON(Close) (MAN lamp turns ON). It returns to auto control when digital input terminal (DI) is OFF(Open).
For auto control stauts of digital input terminal, only monitoring is available. For manual control stauts, monitoring and changing MV are available.

Note

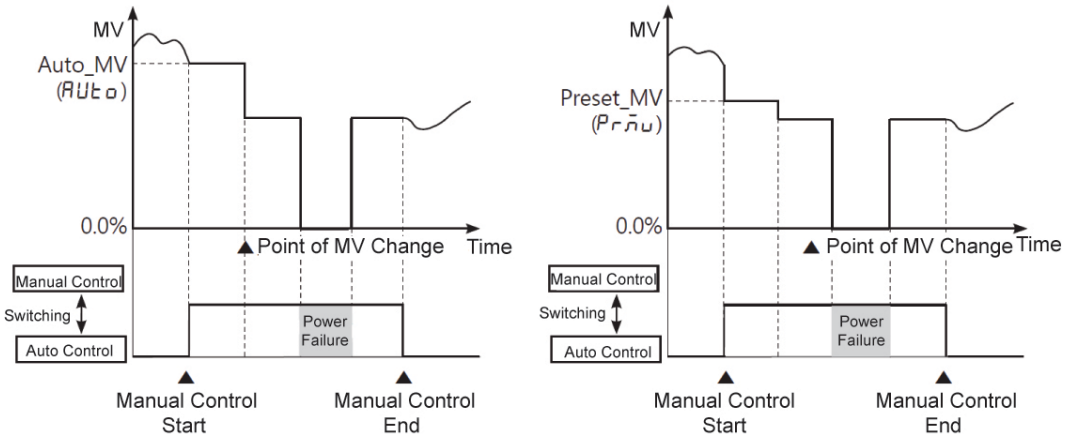
For more information of digital input terminal (DI), refer to ‘6.7.4.1 Digital input terminal function [PRr5 → dI - 1/dI -2]”.

6.2.4.2 Manual control, initial MV [PArS → I t.mU]

When switching from auto control to manual control, you can select the initial MV at the switching point.

AUto : Controls with the auto control MV at the before-switching point as initial MV.

Pr.mU : Controls with the set Pr.mU (preset manual MV) value as initial MV.



<Auto-MV (AUto)> <PRESET-MV (Pr.mU)>

Setting group	Parameter	Set range	Factory default	Unit
PArS	I t.mU	AUto / Pr.mU	AUto	-

6.2.4.3 Manual control, preset MV [PArS → Pr.mU]

For manual control, initial MV is set as Pr.mU (preset manual MV), you can set the desired preset manaul MV.

Setting group	Parameter	Set range			Factory default	Unit
PArS	Pr.mU	Standard control	ON/OFF control	000.0 (OFF)/ 100.0 (ON)	000.0	%
			PID control	000.0 to 100.0		
		Heating& Cooling control	ON/OFF control	- 100.0 (cooling ON) / 000.0 (OFF) / 100.0 (heating ON)		
			PID control	- 100.0 (cooling) to 000.0 (OFF) to 100.0 (heating)		

Note

For heating & cooling control, when SV is within 0.1 to 100.0, it is applied to heating MV. When SV is within 0.1 to - 100.0, it is applied to cooling MV.

6.2.5 Output type

6.2.5.1 Control output [PAr3 → oUt 1]

(1) 1-output model

This model supports relay output, current output, and SSR drive voltage output. You can select the desired one output type.
oUt 1: Select control output of OUT1

Setting group	Parameter	Set range	Factory default	Unit
PAr3	oUt 1	rLY / SSr / CUrr	rLY	-

(2) 2-output model

No	Model	Control output	Factory default
1	KPN5□11-□□0	OUT1: Current, SSR drive voltage selection output	SSr
		OUT2: Current, SSR drive voltage selection output	SSr
2	KPN5□13-□□0	OUT1: Current, SSR drive voltage selection output	SSr
		OUT2: Relay output	rLY
3	KPN5□17-□□0	OUT1: Relay output	rLY
		OUT2: Current, SSR drive voltage selection output	SSr
4	KPN5□19-□□0	OUT1: Relay output	rLY
		OUT2: Relay output	rLY

6.2.5.2 Current output range [PAr3 → o1rA/o2rA]

When control output is set as current output, high/low-limit of current output is selectable between 4-20mA or 0-20mA.

- o1.rA: Current output range of OUT1
- o2.rA: Current output range of OUT2

Note

When current output (oUt 1, oUt2) is current output model, this parameter is displayed.

6.3 Temperature control

6.3.1 Temperature control type [PAr3 → C-nd]

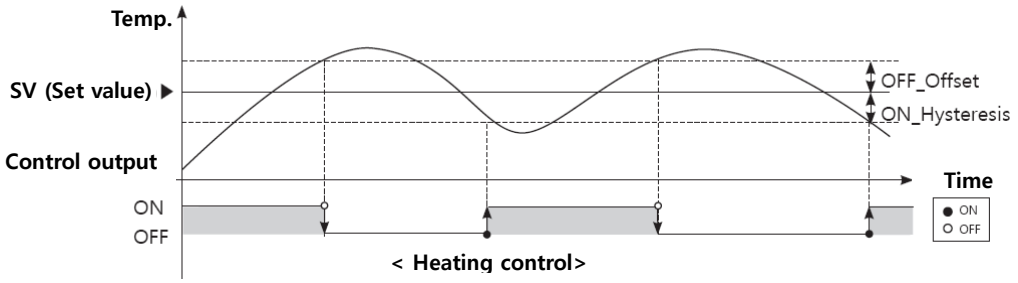
You can select the desired control type to control temperature.

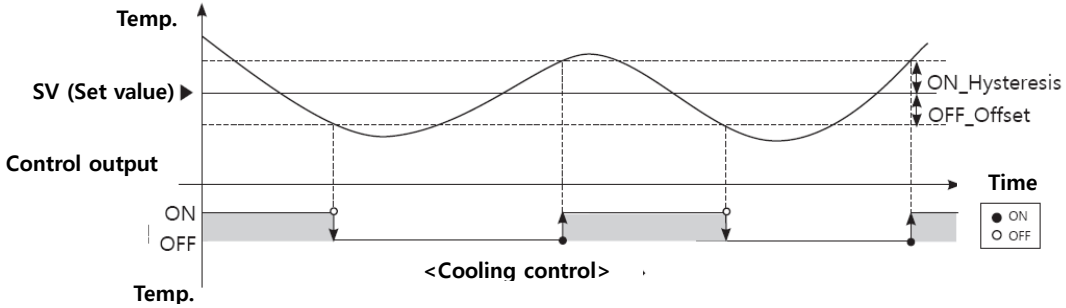
SV		Description	
		Heating	Cooling
Standard control	PId	PID control	
	onoF	ON/OFF control	
Heating & Cooling control	P.P	PID control	PID control
	P.on	PID control	ON/OFF control
	on.P	ON/OFF control	PID control
	on.on	ON/OFF control	ON/OFF control

Setting group	Parameter	Set range		Factory default	Unit
PAr3	C-nd	Standard	PId / onoF	PId	-
		Heating&Cooling	P.P / P.on / on.P / on.on	P.P	

6.3.2 ON/OFF control [PAr3 → C-nd → onoF]

Controls the temperature by comparing PV (Present Value) with SV (Setting Value) and turning power to the load on or off.





6.3.2.1 Hysteresis [PAr2 → H.HYS/H.oFt/C.HYS/C.oFt]

Hysteresis is to adjust control output ON/OFF point in ON/OFF control mode.
ON_Hysteresis sets the output on point and OFF_Offset sets the off point.

Setting hysteresis too low can result in hunting induced by disturbance (noise, chattering, etc.).
To minimize hunting, set ON_Hysteresis and OFF_Offset values with consideration to the heater or cooler's capacity and thermal characteristics, the control subject's response characteristics, the sensor's response characteristics and installation conditions, and other defining factors.

Parameter	Description
H.HYS	ON Hysteresis set for heating control
H.oFt	OFF_Offset set for heating control
C.HYS	ON Hysteresis set for cooling control
C.oFt	OFF_Offset set for cooling control

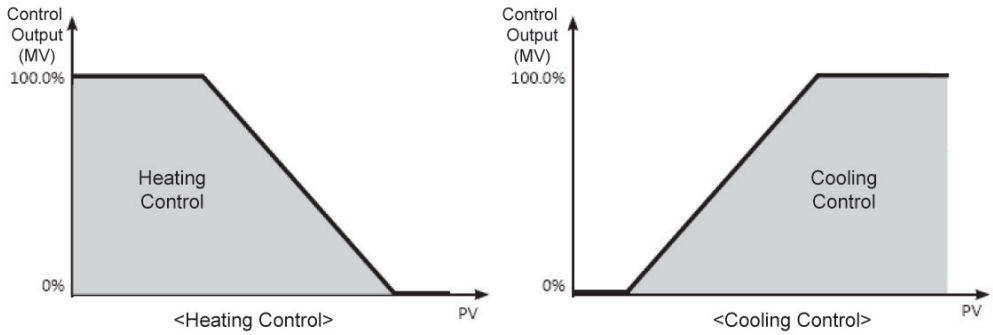
Setting group	Parameter	Set range	Factory default	Unit
PAr2	H.HYS	Temperature H, analog: 001 to 100 Temperature L: 00.1 to 10.0	002	℃/℉/-
	C.HYS			
	H.oFt	Temperature H, analog: 001 to 100 Temperature L: 00.1 to 10.0	000	
	C.oFt			

6.3.3 PID control [PAr3 → C-nd → PId]

PID control is a combination of proportional (P), integral (I), and derivative (D) controls and offers superb control over the control subjects, even with a delay time.

Proportional control (P) implements smooth, hunting-free control;
Integral control (I) automatically corrects offsets;
and Derivative control (D) speeds up the response to disturbance.

Through these actions, PID control realizes ideal temperature control.



Note

Application of PID control

- Proportional (P) control: Select PID control and set integral time and derivative time to 0000.
- Proportional Integral (PI) control: Select PID control and set derivative time to 0000.
- Proportional Derivative (PD) control: Select PID control and set integral time to 0000.

When using multi-SV function, PID time constants for Su0 to Su3 are applied same.

6.3.3.1 Proporional band [PAr2 → H-P/C-P]

When PV (Present Value) is within the Proportional Band (P), the ON/OFF ratio needs to be adjusted during the proportional period (T). The defined proportional control (time proportional control) section is called as the proportional band.

Parameter	Description
H-P	Proportioanl band for heating
C-P	Proportioanl band for cooling

Setting group	Parameter	Set range	Factory default	Unit
PAr2	H-P C-P	000.1 to 999.9	0 10.0	Temp.: ℃/℉ Analog: %

6.3.3.2 Integral time [PAr2 → H-I /C-I]

MVs from integral and proportional operation become the same when deviation is consistent.
The time taken for the two MVs to match is called the integral time.

Parameter	Description
H-I	Integral time for heating
C-I	Integral time for cooling

Setting group	Parameter	Set range	Factory default	Unit
PAr2	H-I C-I	0000 to 9999	0000	sec.

Note

Integral control is not conducted if the integral time is set to 0.
Setting the integral time too short can intensify Correction Movements and cause hunting.

6.3.3.3 Derivative time [PAr2 → H-d/C-d]

In accordance with the deviation of the ramp, the time taken for the MV gained from derivative operation to reach the MV gained from proportional control is called the derivative time.

Parameter	Description
H-d	Derivative time for heating
C-d	Derivative time for cooling

Setting group	Parameter	Set range	Factory default	Unit
PAr2	H-d C-d	0000 to 9999	0000	sec.

Note

Derivative control is not conducted if the derivative time is set to 0.
When using multi-SV function, PID time constants for Su0 to Su3 are applied same.

6.3.3.4 Control time [PAr3 → H-t/C-t]

If relay or SSR is used to output MV under proportional control, the output is on for a fixed amount of time (within the control period, as a percentage of the MV) and then remains off for the rest of the time. The preset period when output ON/OFF takes place is called the proportional control period.

Control with SSR drive voltage output has a faster response than that of relay output. Therefore, by configuring a shorter control period, more responsive temperature control is achieved.

Parameter	Description
H-t	Control time for heating
C-t	Control time for cooling

Setting group	Parameter	Set range	Factory default	Unit
PAr3	H-t C-t	00.1 to 120.0	Relay output: 020.0 SSR drive voltage output: 002.0	sec.

Note

For heating & cooling control, set the control time for heating and the control time for cooling individually.

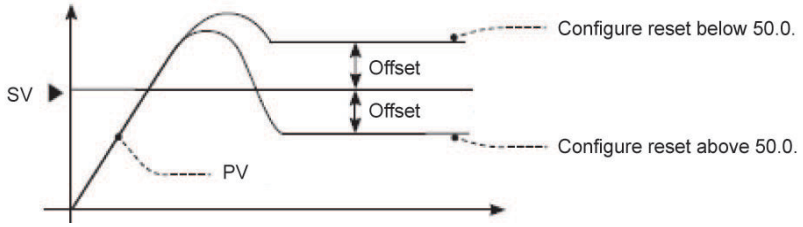
6.3.3.5 Offset correction/manual reset [PAr2 → rESt]

When selecting P / PD control mode, there are certain temperature differences even after PV reaches stable status since heater's rising and falling time is inconsistent due to thermal characteristics of control objects, such as heat capacity and the heater capacity. This temperature difference is called OFFSET. Offset can be corrected using manual reset.

Setting group	Parameter	Set range	Factory default	Unit
PAr2	rESt	000.0 to 100.0	050.0	%

- Manual reset adjustment based on control result

  Under stable control conditions, set the offset to 50% if PV and SV are identical, to over 50.0% if PV is lower than SV, and to below 50.0% if PV is higher than SV.



Note

The offset correction feature can only be used when proportional control is in effect. If setting the integral value to 0,the manual reset parameter is displayed.

The user cannot configure the manual reset setting during heating and cooling control. Instead, the setting is automatically set to 0% for both heating and cooling.

Applicable only when integral time is set to 0 (under P control or PD control only).

Switching from heating and cooling control to standard control (P, PD control) automatically configures the reset setting to 50%.

6.3.4 Auto-tuning

Auto-tuning measures the control subject's thermal characteristics and thermal response rate, and calculates and set the PID time constant for fast response characteristics and high stability. (Set control type [C-nd] as PID)

It stops the progress automatically when error [oPEn] occurs during operating auto-tuning. To stop auto-tuning, set as [oFF].

(Maintains the before P, I, D value before executing auto-tuning)

6.3.4.1 Auto-tuning RUN/STOP [PAr2 → At]

Auto-tuning automatically stores PID time constants upon termination. These PID time constants can then be modified by the user to suit their usage environment.

When auto-tuning is in progress, the AT lamp located on the front of the controller flashes in 1-second intervals. When auto-tuning finishes, the AT lamp automatically goes off and the auto-tuning parameter will return to oFF.

When auto-tuning is in progress and digital input [di-1, di-2] feature is RUN/STOP or AUTO/MANUAL, auto-tuning will be automatically ended, if concerned digital input is inputted or a sensor disconnection error occurs. (Restored the PID used prior to the auto-tuning session)

Set value	Description
oFF	Auto-tuning OFF
on	Auto-tuning ON

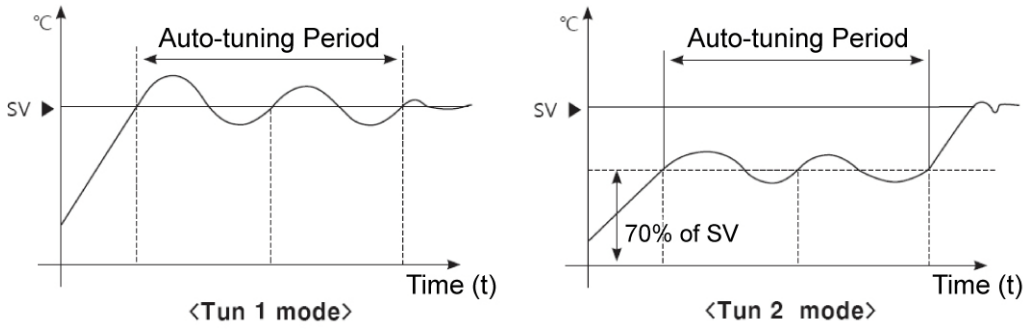
Setting group	Parameter	Set range	Factory default	Unit
PAr2	At	oFF / on	oFF	-

Note

- Auto-tuning continues to run even if the temperature reading exceeds or falls below the input range.
- When auto-turning is in progress, parameters can only be referenced and not changed.
- Auto-tuning is not available in manual control.

6.3.4.2 Auto-tuning mode [PAr 3 → At.t]

Auto-tuning is available in Tun1 MODE (SV) or Tun2 MODE (70% of SV), depending on the baseline value used.



Set value	Description
tUn 1	**Tun1 mode:** Auto-tuning and calculates the PID time constant based on SV (set value).
tUn2	**Tun2 mode:** Auto-tuning and calculates the PID time constant based on 70% of SV (set value).

Setting group	Parameter	Set range	Factory default	Unit
PAr 3	At.t	tUn 1 / tUn2	tUn 1	-

Note

In cooling control mode, TUN2 Mode calculates 70% based at 0℃.

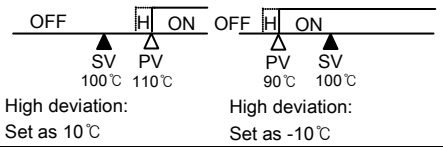
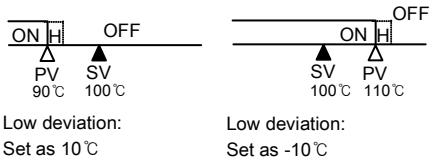
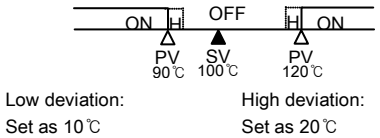
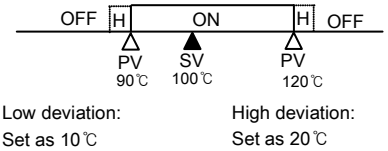
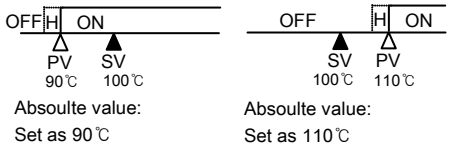
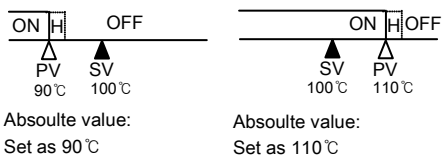
When SV=**-100**℃, TUN2 is performed at **-70**℃.

6.4 Alarm

This product has 3 alarms to operate individually when the value is too high or low. Alarm function is set by the combination of alarm mode and alarm option.
To clear alarm, use digital input function (setting as AL.rE) or turn the power OFF and ON.

6.4.1 Alarm operation [PAr4 → AL-1/AL-2/AL-3]

You can set the alarm operation.

Mode	Name	Operation	Description
oFF	-	-	No alarm output
duCC	Deviation high-limit alarm		If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON. Set deviation high-limit at AL 1.H/AL2.H /AL3.H.
JJdu	Deviation low-limit alarm		If deviation between PV and SV as low-limit is higher than set value of deviation temperature, the alarm output will be ON. Set deviation low-temperature at AL 1.L /AL2.L /AL3.L .
JduC	Deviation high/low-limit alarm		If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be ON. Set deviation high-limit at AL 1.H/AL2.H /AL3.H. Set deviation low-temperature at AL 1.L /AL2.L /AL3.L .
CdUJ	Deviation high/low-limit reverse alarm		If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be OFF. Set deviation high-limit at AL 1.H/AL2.H /AL3.H. Set deviation low-temperature at AL 1.L /AL2.L /AL3.L .
PuCC	Absolute value high-limit alarm		If PV is equal as or higher than the absolute value, the output will be ON. Set absolute high-limit at AL 1.H/AL2.H /AL3.H.
JJPu	Absolute value low-limit alarm		If PV is equal as or lower than the absolute value, the output will be ON. Set absoulte low-limit at AL 1.L /AL2.L /AL3.L .

Mode	Name	Operation	Description
LbA	Loop break alarm	-	It will be ON when it detects loop break.
SbA	Sensor break alarm	-	It will be ON when it detect sensor disconnection.
HbA	Heater break alarm	-	It will be ON when CT detects heater break.

※H: Alarm output □ hysteresis [A□.HY]

Parameter	Description
AL-1	Select alarm 1 mode
AL-2	Select alarm 2 mode
AL-3	Select alarm 3 mode

Setting group	Parameter	Set range	Factory default	Unit
PAr4	AL-1	oFF / duCC /]]du /]duC / [du] / PuCC /]]Pu / SbA / LbA / HbA	duCC	-
	AL-2		]]du	-
	AL-3		LbA	

6.4.2 Alarm option [PAr4 → AL 1.t /AL 2.t /AL 3t]

Users can select the desired alarm output options.

Set value	Option	Description
AL-A	Standard Alarm	If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.
AL-b	Alarm latch ※1	If it is an alarm condition, alarm output is ON and maintains ON status. (alarm output HOLD)
AL-C	Standby sequence1※2	First alarm condition is ignored and from second alarm condition, standard alarm operates. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, standard alarm operates.
AL-d	Alarm latch and standby sequence1	If it is an alarm condition, it operates both alarm latch and standby sequence. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, alarm latch operates.
AL-E	Standby sequence2	First alarm condition is ignored and from second alarm condition, standard alarm operates. When re-supplied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, standard alarm operates.
AL-F	Alarm latch and standby sequence2	Basic operation is same as alarm latch and standby sequence 1. It operates not only by power ON/OFF, but also alarm setting value, or alarm option changing. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, alarm latch operates.

- Condition of re-applied standby sequence for standby sequence 1, alarm latch and standby sequence 1: Powr ON

- Condition of re-applied standby sequence for standby sequence 2, alarm latch and standby sequence 2: Power ON, changing set temperature, alarm temperature (AL1, AL2, AL3) or alarm operation (AL-1, AL-2, AL-3), switching STOP mode to RUN mode

Parameter	Description
AL 1.t	Select alarm 1 option
AL2.t	Select alarm 2 option
AL3.t	Select alarm 3 option

Setting group	Parameter	Set range	Factory default	Unit
PAr 4	AL 1.t	AL-A / AL-b / AL-C / AL-d / AL-E / AL-F	AL-A	-
	AL2.t			-
	AL3.t			

Note

When selecting alarm output mode as LbA, SbA, HbA AL-C, AL-d options are not displayed.

6.4.3 Alarm output set value [PAr 1 → AL 1L / AL 1H / AL 2L / AL 2H AL 3L / AL 3H]

You can set alarm output activation values. According to the selected alarm output mode, configuration parameters [AL →H / AL →L] will be activated for each setting.

Parameter	Description
AL 1.L	Low limit value of alarm output 1. Reference value for determining heater break
AL 1.H	High-limit value of alarm output 1.
AL2.L	Low limit value of alarm output 2. Reference value for determining heater break.
AL2.H	High-limit value of alarm output 2.
AL3.L	Low limit value of alarm output 3. Reference value for determining heater break.
AL3.H	High-limit value of alarm output 3.

Setting group	Parameter	Set range	Factory default	Unit
PAr 1	AL 1.H	- (temperature) high/low deviation: -F.S. to F.S. by each input type - (temperature) alarm absolute value: within display range of each input type - (analog) high/low deviation value: - 1999 to 9999 within -F.S. to F.S. - (analog) alarm absolute value: within display range of each input type	Temperature : 1550 Analog : 100.0	-
	AL2.H			
	AL3.H			
	AL 1.L			
	AL2.L			
	AL3.L			

Note

Changing the alarm output mode or options resets the settings to the highest or lowest values that will not trigger output in the new mode.

6.4.4 Alarm output hysteresis [PAr 4 → A 1.HY/A2.HY/A3.HY]

- 'H' of operation graoup of '6.4.1 Alarm operation [PAr 4 → AL - 1/AL - 2/AL - 3]' is alarm output hysteresis. You can set the interval between ON and OFF of alarm output.
- You can select it (Alarm1 Hysteresis/ Alarm2 Hysteresis/ Alarm3 Hysteresis) by each alarm.

Parameter	Description
A 1.HY	Set interval between ON and OFF of alarm output 1
A2.HY	Set interval between ON and OFF of alarm output 2
A3.HY	Set interval between ON and OFF of alarm output 3

Setting group	Parameter	Set range	Factory default	Unit
PAr 4	A 1.HY A2.HY A3.HY	Temperature H, analog: 001 to 100 Temperature L: 000.1 to 100.0	001	Temperature: ℃/℉, Analog: Digit

Note

Alarm output hysteresis is also applied as same during heater break alarm [HbA].

When alarm mode is loop break alarm [LbA] or sensor break alarm [SbA], this parameter is not displayed.

6.4.5 Alarm output contact type [PAr 4 → A 1.n/A2.n/A3.n]

You can set realy contact type for alarm output.

Set value	Description
no	Normally Open: Stays open when normal and closes in the event of an alarm.
nC	Normally Closed: Stays closed when normal and opens in the event of an alarm.

Parameter	Description
A 1.n	Select contact type for alarm output 1
A2.n	Select contact type for alarm output 2
A3.n	Select contact type for alarm output 3

Setting group	Parameter	Set range	Factory default	Unit
PAr 4	A 1.n A2.n A3.n	no / nC	no	-

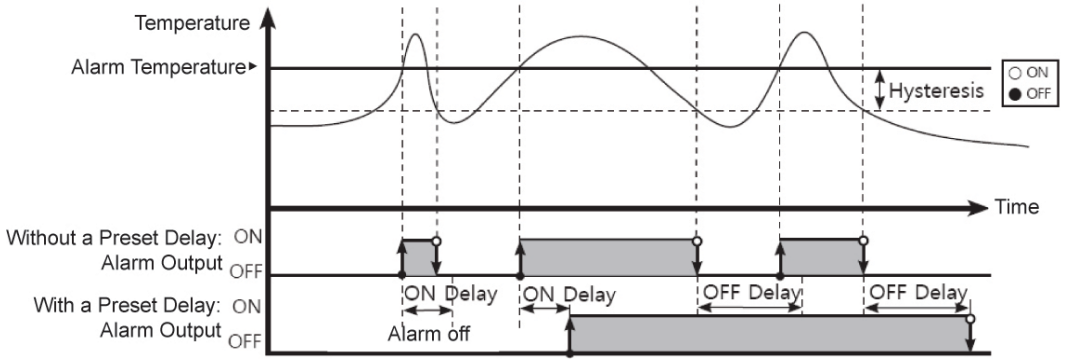
Front indicator operations

Set value	Alarm	Alarm output	Front indicators
no (Normally Open)	OFF	Open	□ OFF
	ON	Close	■ ON
nC (Normally Closed)	OFF	Close	□ OFF
	ON	Open	■ ON

6.4.6 Alarm output dealy time [PAr 4 → A 1.on/A 1.oF/A2.on/A2.oF/A3.on/A3.oF]

Alarm output delay can be set to prevent false alarms caused by erroneous input signals resulting from disturbances or noise.

With a preset delay time, alarm output does not turn on for the preset duration. Instead, the concerned alarm indicator on the front flashes in 0.5-second intervals.



Parameter	Description
A 1.on	Alarm Output 1 On Delay: Stands by for the preset duration upon an alarm event, checks the alarm trigger conditions, and turns on the alarm output if the conditions are still present.
A 1.oF	Alarm Output 1 Off Delay. Stands by for the preset duration following alarm output off, checks the alarm trigger conditions, and turns off the alarm output if the clear conditions are still present.
A2.on	Alarm Output 2 On Delay. Stands by for the preset duration upon an alarm event, checks the alarm trigger conditions, and turns on the alarm output if the conditions are still present.
A2.oF	Alarm Output 2 Off Delay. Stands by for the preset duration following alarm output off, checks the alarm trigger conditions, and turns off the alarm output if the clear conditions are still present.
A3.on	Alarm Output 3 On Delay. Stands by for the preset duration upon an alarm event, checks the alarm trigger conditions, and turns on the alarm output if the conditions are still present.
A3.oF	Alarm Output 3 Off Delay. Stands by for the preset duration following alarm output off, checks the alarm trigger conditions, and turns off the alarm output if the clear conditions are still present.

Setting group	Parameter	Set range	Factory default	Unit
PAr 4	A 1.on	0000 to 3600	0000	sec.
	A 1.oF		0000	sec.
	A2.on		0000	sec.
	A2.oF		0000	sec.
	A3.on		0000	sec.
	A3.oF		0000	sec.

6.4.7 Loop break alarm (LBA) [PAr4 → AL-1/AL-2/AL-3 → LbA]

Diagnoses the control loop by monitoring the control subject's temperature changes and sends out alarms if necessary.

- Heating control: When control output MV is 100% or high limit [H-ou] and PV is not increased over than LBA detection band [LbA.b]during LBA monitoring time [LbA.t], or when control output MV is 0% or low limit [L-ou] and PV is not decreased below than LBA detection band [LbA.b] during LBA monitoring time [LbA.t], alarm output turns ON.
- Cooling control: When control output MV is 0% or low limit [L-ou] and PV is not increased over than LBA detection band [LbA.b] during LBA monitoring time [LbA.t], or when control output MV is 100% or high limit [H-ou] and PV is not decreased below than LBA detection band [LbA.b] during LBA monitoring time [LbA.t], alarm output turns ON.

Main causes of LBA output ON

- Sensor error (disconnection, short)
- External controller error (magnet, auxiliary relay, etc)
- External load error (heater, cooler, etc)
- Wrong connection and disconnection of external devices

Note

Set alarm output mode[AL-□[as loop break alarm [LbA] and you can use loop break alarm.

When executing auto-tuning, LBA detection band [LbA.b] and LBA monitoring time [LbA.t] are automatically set by auto-tuning value.

In case of AT (auto-tuning)/manual control/stop control, loop break alarm [LbA] does not operates. When alarm reset is input, it initializeds LBA monitoring start time.

6.4.7.1 LBA monitoring time [PAr4 → LbA.t]

You can set the LBA monitoring time to check changes in the control subject's temperature. It is set automatically when executing Auto-tuning.

Setting group	Parameter	Set range	Factory default	Unit
PAr4	LbA.t	0000 to 9999	0000	sec.

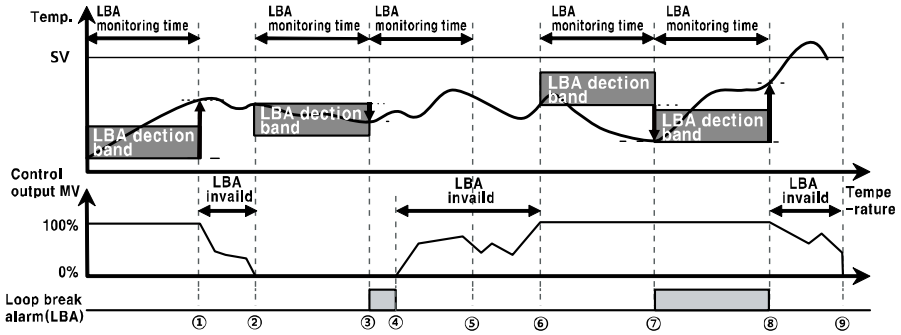
6.4.7.2 LBA detection band [PAr4 → LbA.b]

You can set the minimum value of deviation change to decrease during LBA monitoring time. It is set automatically when executing Auto-tuning.

Setting group	Parameter	Set range		Factory default	Unit
PAr4	LbA.b	Temperature H	000 to 999	003	℃/℉
		Temperature L	000.0 to 999.9	003.0	℃/℉
		Analog	00.00 to 99.99	00.20	%FS

Ex.

For heating control(cooling control), when control output MV is 100%(0% for cooling control) and PV is not increased over than LBA detection band [LbA.b] during LBA monitoring time [LbA.t], or when control output MV is 0%(100% for cooling control) and PV is not decreased below than LBA detection band [LbA.b] during LBA monitoring time [LbA.t], alarm output turns ON.



Start to control to ①	When control output MV is 100%, PV is increased over than LBA detection band [LbA.b] during LBA monitoring time [LbA.t].
① to ②	The status of changing control output MV (LBA monitoring time is reset.)
② to ③	When control output MV is 0% and PV is not decreased below than LBA detection band [LbA.b] during LBA monitoring time [LbA.t], loop break alarm (LBA) turns ON after LBA monitoring time.
③ to ④	Control output MV is 0% and loop break alarm (LBA) turns and maintains ON.
④ to ⑥	The status of changing control output MV (LBA monitoring time is reset.)
⑥ to ⑦	When control output MV is 100% and PV is not increased over than LBA detection band [LbA.b] during LBA monitoring time [LbA.t], loop break alarm (LBA) turns ON after LBA monitoring time.
⑦ to ⑧	When control output MV is 100% and PV is increased over than LBA detection band [LbA.b] during LBA monitoring time [LbA.t], loop break alarm (LBA) turns OFF after LBA monitoring time.
⑧ to ⑨	The status of changing control output MV (LBA monitoring time is reset.)

6.4.8 Sensor break alarm [PAr4 → AL-1/AL-2/AL-3 → SbA]

You can set the controller to send out an alarm when a sensor is not connected or disconnected during temperature control. Sensor break can be confirmed through an external alarm output contact, such as a buzzer or similar devices.

Set alarm output mode [AL-□] as SbA, sensor break alarm operates.

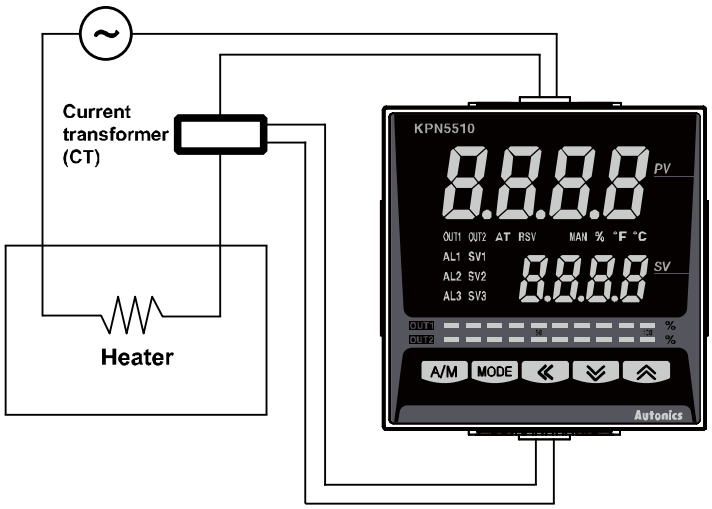
Note

Alarm output option can be set to standard alarm [AL-A] or alarm latch [AL-b].

6.4.9 Heater break alarm [PAr4 → AL-1/AL-2/AL-3 → HbA]

When using a heater to raise the temperature of the control subject, the temperature controller can be set to detect heater disconnection and send out an alarm by monitoring power supply to the heater.

Heater disconnection is detected by the controller using a current transformer (CT), which converts the current to the heater to a specific ratio (CT ratio) for monitoring. If the heater current value [Ct-A] measured by the C.T. is less than the heater detection setting value [AL□.L], the heater break alarm operates.



Note

- Heater break detection only takes place when the temperature controller's output is turned on. Otherwise, heater burnout will not be detected by the controller.
- Detection is only available in models with switching output (Relay contact output, SSR standard drive output). Models with linear output (current, SSR cycle/phase output) cannot detect.
- Current detection is not performed if OUT1's control output time is less than 250 ms.
- It is recommended to use the current transformer (CSTC-E80LN, CSTC-E200LN, sold separately).
- You can select the alarm option between standard alarm [AL-A] or alarm latch [AL-b].

6.4.9.1 Heater break detection value [PAr 1 → AL 1.L / AL2.L / AL2.L]

Set the alarm output value [AL □.L] as the reference value for heater burnout detection.

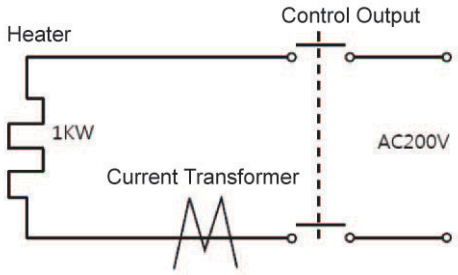
Setting group	Parameter	Set range	Factory default	Unit
PAr 1	AL 1.L	00.0 to 50.0	00.0	A
	AL2.L			
	AL3.L			

Note

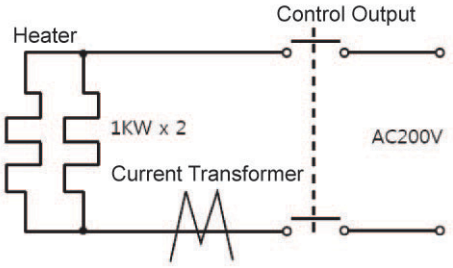
Set to 00.0 for OFF. Set to 50.0 for ON.

Ex.

Heater break set value = {(Normal heater current) + (Heater break current)}/2



If using a single output heater (capacity: 200 VAC, 1 KW, 5 A), normal heater current is 5 A, and burnout heater current is 0 A, the setting value is calculated as (5 A + 0 A)/2 = 2.5 A. Therefore, heater current values less than 2.5 A will be deemed heater burnout and the alarm will activate.



When two output heaters (capacity: 200 VAC, 1 KW, 5 A) are used, normal heater current is 10 A (5 A X 2 EA). If a single heater burns out, the heater current becomes 5 A. The setting value is calculated as (10 A + 5 A)/2 = 7.5 A). Heater current values of less than 7.5 A are deemed heater burnout and the alarm activates.

6.4.10 Alarm output clear [PAr5 → dI -Y → AL.rE]

Available only if alarm output option is set to alarm latch or alarm latch and standby sequence1, alarm latch and standby sequence2. It can be set to turn off alarm output when alarm output is on, alarm output conditions have been removed, or an alarm output clear signal that is greater than the minimal signal band is received. (However, alarm output clear is unavailable when alarm conditions remain in effect.)

You can assign the front panel's digital input key or the digital input terminals (DI-1, DI-2) for the alarm output deactivation feature.

(1) Clear alarm output by digital input key

If the digital input key has been assigned for alarm output deactivation and the alarm output option is set to alarm latch or alarm latch and standby sequence, press and hold the front → and → keys when alarm output is on.

(2) Clear alarm output by digital input terminal (DI)

When the digital input (DI) terminal is assigned to forced alarm (output) off, the alarm output clears when digital input (DI) terminal goes into the on state (close). (MAN lamp on).

Note

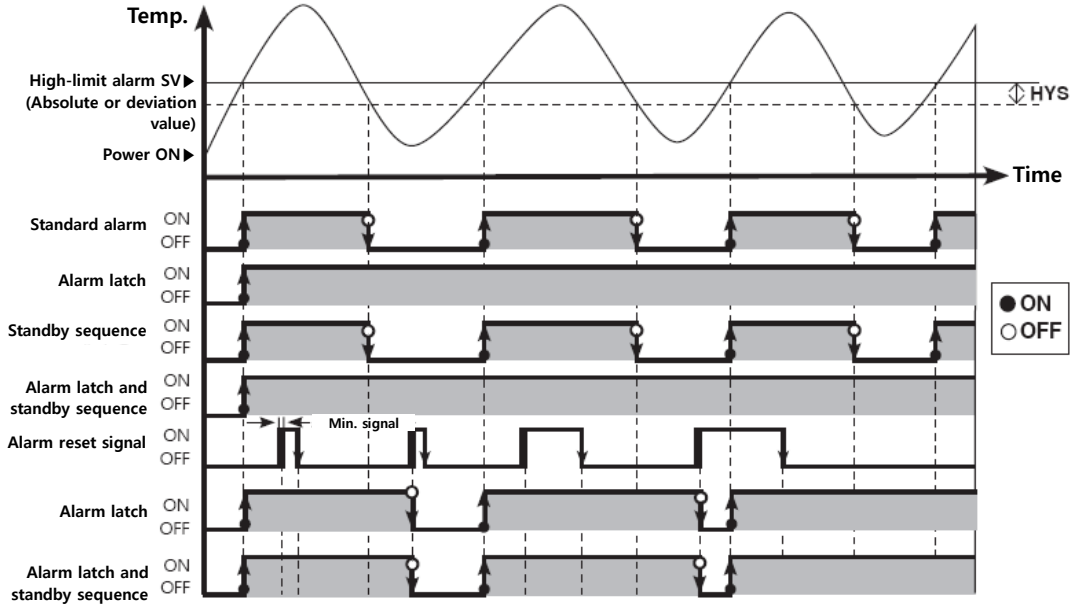
For more information of digital input key, refer to '6.7.4.2 Digital input key'.

For more information of digital input terminal(DI), refer to '6.7.4.1 Digital input terminal function [PAr5 → dI - 1/dI -2]'.

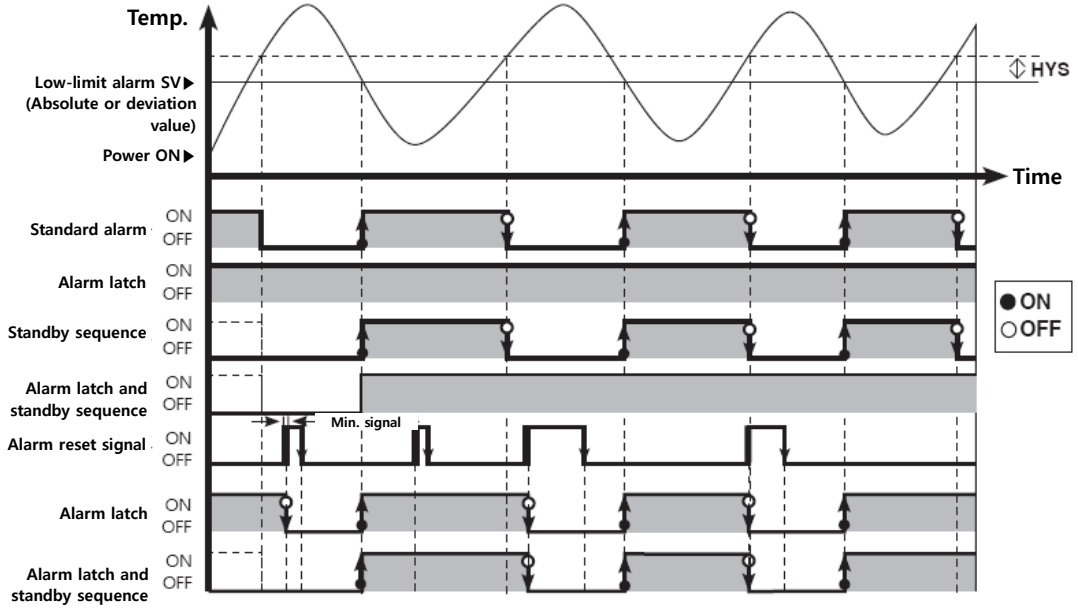
After clearing alarm output, alarm output operates normally at the next alarm output ON.

6.4.11 Alarm output operation

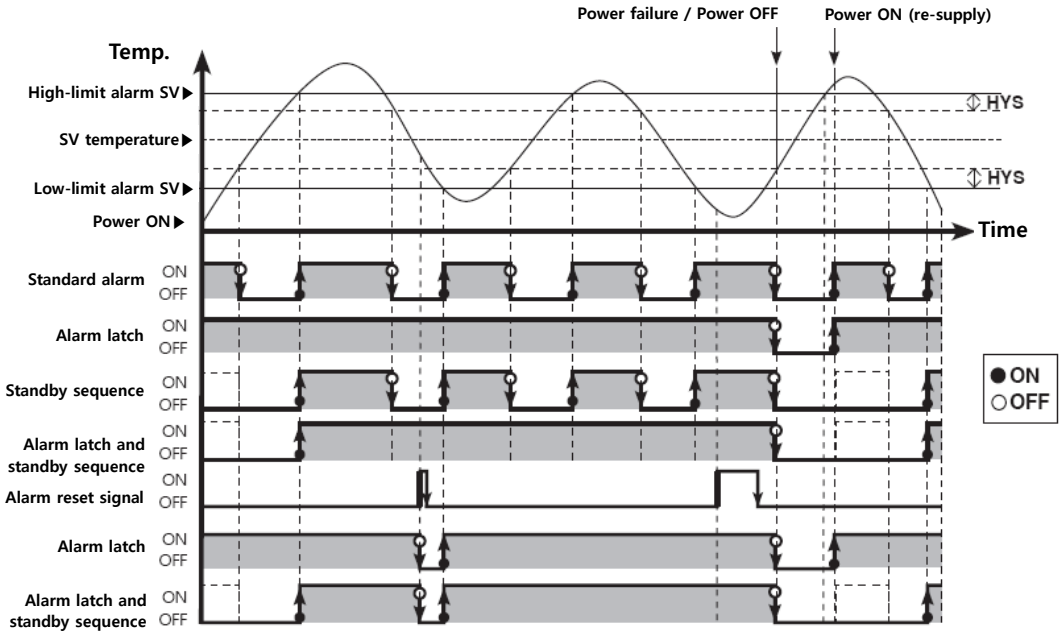
6.4.11.1 Absolute value high-limit alarm and deviation high-limit alarm



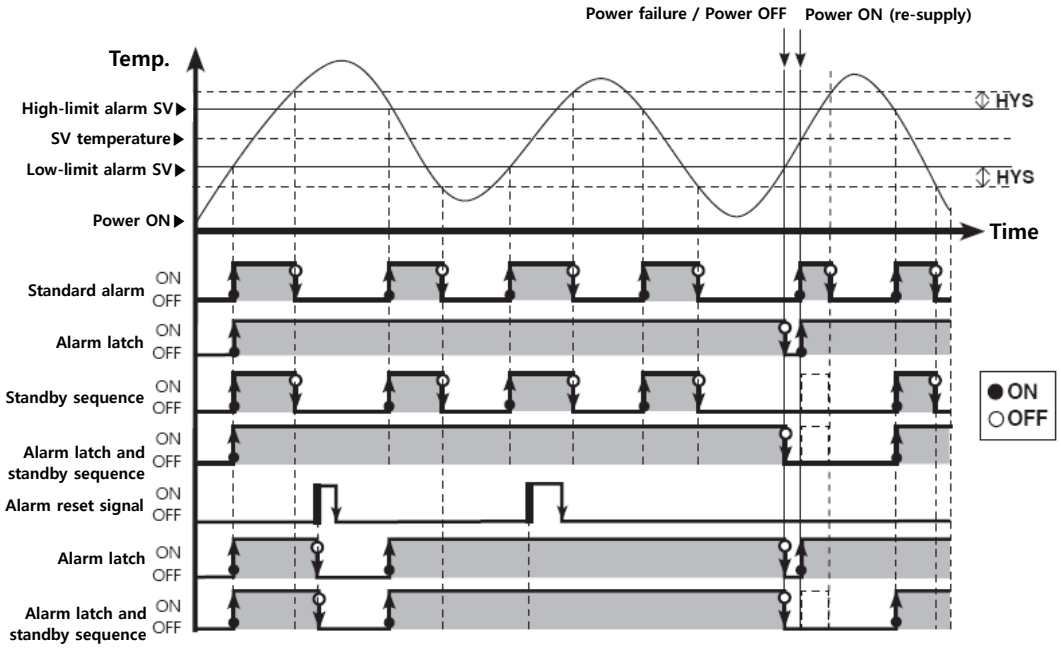
6.4.11.2 Absolute value low-limit alarm and deviation low-limit alarm



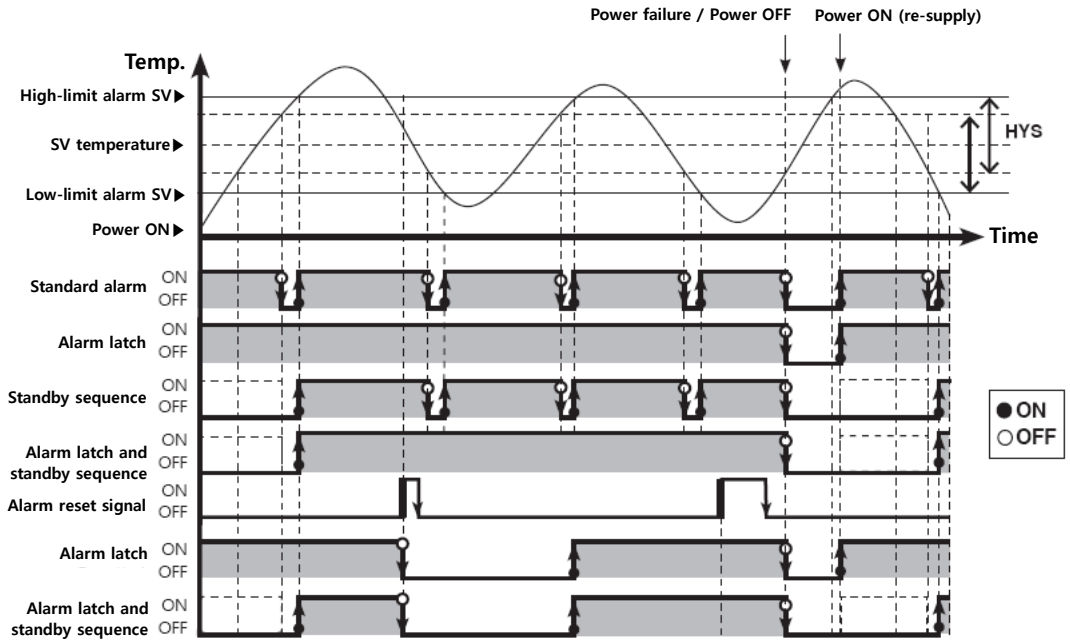
6.4.11.3 Deviation high/low-limit alarm



6.4.11.4 Deviation high/low-limit reverse alarm



6.4.11.5 Deviation high/low-limit alarm (hysteresis overlap)



6.5 Analog transmission

6.5.1 Analog transmission output value [PAr4 → Ao-n]

Transmission output is a type of auxiliary output that converts the controller's PV, SV, H-MV, and C-MV to analog current (DC 4 to 20 mA) for external transmission.

Set value	Description
Pu	PV transmission output
Su	SV transmission output
H-nu	Heating MV transmission output
C-nu	Cooling MV transmission output

Setting group	Parameter	Set range	Factory default	Unit
PAr4	Ao-n	Pu / Su / H-nu / C-nu	Pu	-

Note

This parameter is displayed in transmission output models only..

Transmission output is constant current output. Too great a resistance from the load can cause the output value to change. There is no optional output below 4 mA or above 20 mA.

6.5.2 Transmission output high/low-limit value [PAr4 → FS-L/FS-H]

If the transmission output value (Ao-n) is below the transmission output lower limit (FS-L), 4 mA output will be provided. If the transmission output is between the lower limit (FS-L) and upper limit (FS-H), a certain proportional output within the range 4 mA and 20 mA will be provided. If it is above the upper limit (FS-H), 20 mA output will be provided.

Set value	Description
FS-L	Transmission output (4mA) low-limit value setting
FS-H	Transmission output (20mA) high-limit value setting

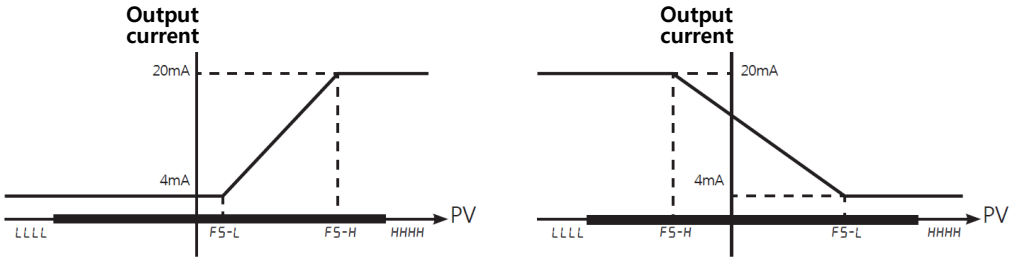
Setting group	Parameter	Set range		Factory default	Unit
PAr4	FS-L	Pu	Temperature: temperature range Analog: High/Low scale range	-200	Digit
		Su	SV low-limit value [L-Su] to SV high-limit value [H-Su]		
		H-nu/C-nu	000.0 to 100.0		
	FS-H	Pu	Temperature: temperature range Analog: High/Low scale range	1350	
		Su	SV low-limit value [L-Su] to SV high-limit value [H-Su]		
		H-nu/C-nu	000.0 to 100.0		

Note

If transmission output high limit (FS-H) is transmission output low limit (FS-L), the transmission output is 4 mA.

(1) Present value (PV) transmission output

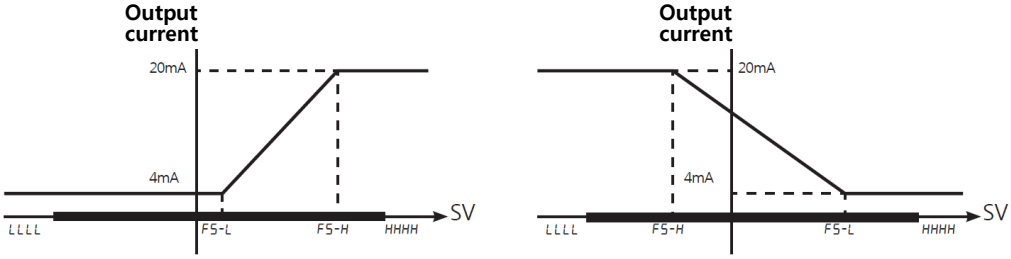
PV wthin sensor range or high/low limit scale can be converted and transmitted as current within the range of 4 mA and 20 mA.



※ ▬▬ : **Temperature range or high/low-limit scale range**

(2) Set value(SV) transmission output

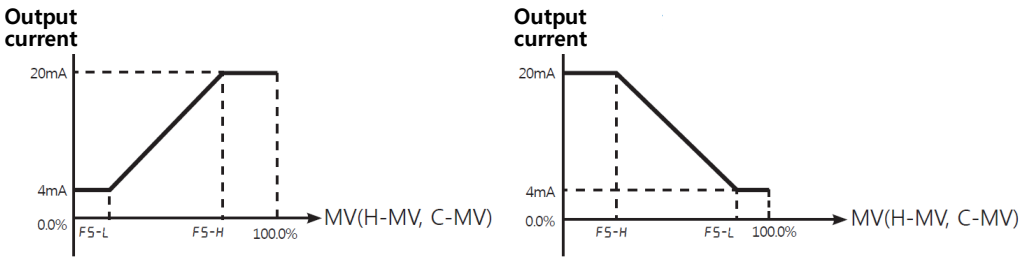
SV within sensor range or high/low limit scale can be converted and transmitted as current within the range of 4 mA and 20 mA. When ramp is in effect, ramp SV is transmitted step by step.



※ ▬▬ : **SV range (SV low-limit to SV high-limit)**

(3) Heating MV/Cooling MV transmission output

You can convert 0 to 100% of heating [H-mv]/cooling MV [C-mv] into 4 to 20 mA current.



6.6 Communication

This feature is used for external higher systems (PC, GP, etc.) to set the controller's parameters and to monitor the controller. It can also be used to transmit data to external devices.

No redundant unit addresses may exist along the same communication line. The communication cable must be twisted pair that supports RS485.

- Interface

Item	Description
Standard	Compliance with EIA RS485
Max. connections	31 units (address: 01 to 127)
Communication method	2-wire half duplex
Synchronization method	Asynchronous
Communication distance	Within max. 800m
Communication speed	2400, 4800, 9600, 19200, 38400 bps
Response wait time	5 to 99ms
Start bit	1bit (fixed)
Data bit	8bit (fixed)
Parity bit	None, Even, Odd
Stop bit	1, 2bit
Protocol	Modbus RTU (Character = 11Bit as fixed)

Note

You could modify the parameter (first in, first out) using keys during communication connection, but this may lead to errors and malfunctions.

6.6.1 Communication address [PAr 4 → Adr 5]

Set the address for data communication.

Setting group	Parameter	Set range	Factory default	Unit
PAr 4	Adr 5	01 to 127	01	-

6.6.2 Communication speed [PAr 4 → bPS]

Set the transmission speed (bps) for data communication.

Setting group	Parameter	Set range	Factory default	Unit
PAr 4	bPS	24(2400bps) / 48(4800bps) / 96(9600bps) / 192(19200bps) / 384(38400bps)	96	bps

6.6.3 Communication parity bit [PAr4 → PrtY]

Parity bit is a data communication method that adds one additional bit to each character in transmitted data as an indicator used to verify data loss and corruption. This parameter is used to enable or disable the parity bit option.

Set value	Description
nonE	Not set parity bit
EuEn	Set total bit with signal value of “1” as even numbers
odd	Set total bit with signal value of “1” as odd numbers

Setting group	Parameter	Set range	Factory default	Unit
PAr4	PrtY	nonE / EuEn / odd	nonE	-

6.6.4 Communication stop bit [PAr4 → StP]

You can set the number of bits to mark the end of a transmitted data string.

Set value	Description
1	Set end of data string to 1 bit.
2	Set end of data string to 2 bits.

Setting group	Parameter	Set range	Factory default	Unit
PAr4	StP	1 / 2	2	bit

6.6.5 Communication response waiting time [PAr4→ rSd.t]

Set a standby time to mitigate communication errors when communicating with a slow master device (PC, PLC, etc.). Once a standby time is set, the controller will respond after the defined standby time.

Setting group	Parameter	Set range	Factory default	Unit
PAr4	rSd.t	05 to 99	20	ms

Note

Shorter standby times can cause communication errors in the master device.

6.6.6 Enable/Disable communication write [PAr 4→ Con4]

This feature can change parameter settings stored in memory through communication with PC, GP, PLC, etc., in order to permit or prohibit writing.

Set value	Description
En.A	Parameter set/change enable by communication.
dI S.A	Prohibit parameter setting or modification by communication.

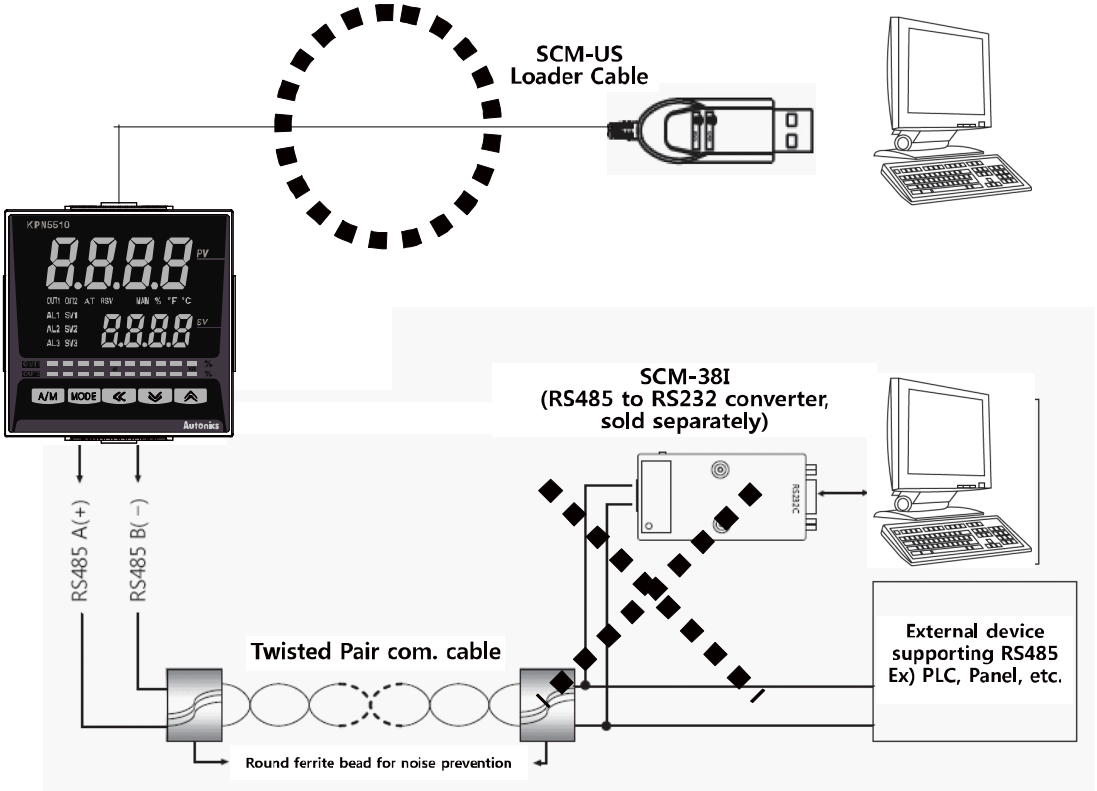
Setting group	Parameter	Set range	Factory default	Unit
PAr 4	Con4	En.A / dI S.A	En.A	-

Note

Reading parameter settings is always available even in disable communication write.

6.6.7 USB to Serial connection

Data can be transmitted by SCM-US(USB to Serial converter, sold separately). However, RS485 communication through a USB-to-serial connection is blocked by hardware.



6.7 Additional Features

6.7.1 Monitoring

Refer to the '5.2.3 MV Monitoring and Manual Control Setting'.

6.7.1.1 Control output MV monitoring

Monitors and displays the current control output MV.

6.7.1.1.1. Heating MV monitoring

Displays the current heating MV during heating control or heating and cooling control. Users may manually adjust the MV to control the temperature.

- Measurement range: H 0.0 to H 100 (Unit%)

Note

It can display MV with a moving decimal point [H99.9 → H 100].

6.7.1.1.2. Cooling MV monitoring

Displays the current cooling MV during cooling control or heating and cooling control. Users may manually adjust the MV to control the temperature.

- Measurement range: C 0.0 to C 100 (Unit%)

Note

It can display MV with a moving decimal point [C99.9 → C 100].

6.7.1.2 Heater current value monitoring [PAr 1 → Ct-A]

A feature that monitors and displays the current of a heater (load) being controlled by control output.

Setting group	Parameter	Measurement range	Unit
PAr 1	Ct-A	0.0 to 50.0	A

Note

Heater (load) current value is measured by a current transformer (CT) and is displayed.

6.7.2 RUN/STOP [PAr 1 → r-S]

Users can run or stop control output by force while in Run mode

The stop command stops control output. Auxiliary output, however, is not affected by the command.

This feature can be enabled by configuring parameters. In addition, the front panel's digital input keys ( ) and digital input terminals (DI-1 and DI-2) can be assigned to the run/stop feature.

Set value	Description
rUn	Forced control output run in Stop mode.
StoP	Forced control output stop in Run mode.

Setting group	Parameter	Set range	Factory default	Unit
PAr 1	r-S	rUn / StoP	rUn	-

Note

With stop enabled, the front panel's SV display indicates StoP.

The stop status will remain in effect after turning OFF the power and re-supplying the power. When stop is in effect, STOP MV [St.oU] is output. In case of a sensor break occuring while in STOP, STOP MV [St.oU] is output.
The run/stop setting remains in effect after re-supplying power. If the Digital Input [di - 1, di -2] feature has been set for RUN/STOP, RUN/STOP feature by modifying front keys or parameter is unable.

6.7.2.1 STOP, control output [PAr5 → St.oU]

This parameter sets the control output value when in the stop state. With ON/OFF control, select between 100.0 (ON) and 000.0 (OFF). With PID control, the user can adjust the MV between 000.0 and 100.0.

Setting group	Parameter	Set range			Factory default	Unit
PAr5	St.oU	Standard control	ON/OFF control	000.0 (OFF)/ 100.0 (ON)	000.0	%
			PID control	000.0 to 100.0	000.0	
		Heating &Cooling control	ON/OFF control	-100.0 (cooling ON) /000.0 (OFF) / 100.0 (heating ON)	000.0	
			PID control	-100.0 (cooling) to 100.0 (heating)	000.0	

Note

Ignores MV from ON/OFF control or PID control and sends out a control value based on the defined MV.

6.7.2.2 STOP, alarm output [PAr5 → St.AL]

You can set alarm output for STOP.

Set value	Description
oFF	Alarm output ceases along with a stop under all conditions. (However, reverting to Run mode after a stop in alarm latch or alarm latch and standby sequence restores the alarm output to the previous state.)
Cont	Alarm output continues regardless of control operation.

Setting group	Parameter	Set range	Factory default	Unit
PAr 1	r-5	Cont / oFF	Cont	-

6.7.3 Multi SV

Multi SV function allows users to set multiple SVs [nt.Su] and save each setting in Su0 to Su3. Users can change Su-n or select desired SV using external DI (Digital Input, DI-1, DI-2) terminals.

This feature supports up to four SVs which can be independently configurable.

6.7.3.1 Number of multi SV [PAr5 → nt.Su]

This parameter sets the number of Multi SVs. Select the number of Multi SVs required by the control subject.

Number of SVs	SV set
1 EA	SV-0
2 EA	SV-0, SV-1
4 EA	SV-0, SV-1, SV-2, SV-3,

Setting group	Parameter	Set range	Factory default	Unit
PAr5	nt.Su	1 / 2 / 4	1	EA

Note

If the Digital Input [dI - 1, dI -2] feature has been set for multi SV [nt.Su], the number of Multi SV[nt.Su] is not modified by pressing a key or communication.

6.7.3.2 Multi SV number selection [PAr 1 → Su-n]

You can set the SV(set value) number to be controlled.

Setting group	Parameter	Set range	Factory default	Unit
PAr 1	Su-n	Su-0 / Su- 1 / Su-2 / Su-3	Su-0	-

Note

The range of figures assigned to each SV (SV No.) varies depending on the number of Multi SVs [nt.Su] setting.

6.7.3.3 Multi SV set value [PAr 1 → Su-0/ Su- 1/ Su-2/ Su-3]

Set the desired set value of multi SV individually.

Setting group	Parameter	Set range	Factory default	Unit
PAr 1	Su-0	SV low-limit [L -Su] to SV high-limit [H-Su]	0	℃, ℉, -
	Su- 1		0	
	Su-2		0	
	Su-3		0	

6.7.4 Digital input

6.7.4.1 Digital input terminal function [PAr5 → dI - 1/dI -2]

By connecting an external input to a digital input terminal, you can perform preset digital input terminal functions.

Set value	Description
oFF	No function.
StoP	Run/Stop
AL.rE	Forced alarm output clear
mAn	Auto/Manual control selection.
mt.Su	Multi SV selection.

In the case one of DI-1 or DI-2 being set for Multi SV[mt.Su], Su-0 is selected as the SV if the terminal's external contact signal is off and Su- 1 is selected if the signal is on.

If both DI-1 and DI-2 are configured for Multi SV[mt.Su], you can select the SV using combinational logic of the terminals. If multi SV [mt .Su] are changed from 4 to 2, DI-2 will be turned OFF automatically, changed from 4 to 1, both DI-1 and DI-2 will be turned OFF or changed from 2 to 1, concerned DI will be OFF.

DI-1	DI-2	Multi SV NO
OFF	OFF	Su-0
ON	OFF	Su- 1
OFF	ON	Su-2
ON	ON	Su-3

Setting group	Parameter	Set range	Factory default	Unit
PAr5	dI - 1	oFF / StoP / AL.rE / mAn / mt.Su	StoP	-
	dI -2		AL.rE	

Note

When powered on, digital input feature checks always the settings of terminal input.

Multi SV parameter will be activated only if Multi SV is more than 2.

This digital input terminal function operates regardless with lock and password set.

6.7.4.2 Digital input key

With digital input key enabled in Run mode, press and hold ▼▲ keys at the same time for three seconds to activate the preset function.

6.7.4.2.1. Digital input key function [PArS → dI-U]

In order to use the digital input key feature, each function has to be first assigned to the keys.

Set value	Description
StoP	Run/Stop
AL.rE	Forced alarm output clear

Setting group	Parameter	Set range	Factory default	Unit
PArS	dI-U	StoP / AL.rE	StoP	-

Note

If digital input key and digital input terminal set same, digital input key does not act.

6.7.4.2.2. Digital input key usage

Press the digital input keys on the front panel to execute the function assigned to the keys.
When in Run mode, press and hold ▼▲ keys to execute the assigned function (run/stop or alarm output deactivation).

Note

If the same function is assigned to a digital input key and the digital input terminal, activation takes place as an "or" function and deactivation as an "and" function. (except Multi SV feature of digital input terminals)

Digital input key functions operate irrespective of password set.

6.7.5 Error

The controller diagnoses input signals for errors and displays messages accordingly. These messages inform the user of device problems.

Message	Input	Description	Output
HHHH	Temperature sensor	Flashes at 0.5-second intervals if the input value is above the input range.	Standard type: Heating: 0%, Cooling: 100% Heating&Cooling: Heating: 0%, Cooling: 100%
	Analog	Flashes at 0.5-second intervals if the input value is over 5 to 10% of high limit or low limit value.	Normal output
LLLL	Temperature sensor	Flashes at 0.5-second intervals if the input value is below the input range.	Standard type: Heating: 100%, Cooling: 0% Heating&Cooling: Heating: 100%, Cooling: 0%
	Analog	Flashes at 0.5-second intervals if the input value is over 5 to 10% of low limit or high limit value.	Normal output
OPEN	Temperature sensor	Flashes at 0.5-second intervals in the event of an input disconnection.	Outputs the set MV at ErMV
	Analog	Flashes at 0.5-second intervals if F.S. is over ±10%.	
ERR	Temperature sensor	Flashes at 0.5-second intervals if there is error for setting and it returns to the error-before screen.	-
	Analog		

When input value returns to the input range, alarm is deactivated and it operates normally.

Note

When supplying power or in standard control state,
for heating control, if HHHH is displayed, it outputs 0%. If LLLL is displayed, it outputs 100%.
For cooling control, if HHHH is displayed, it outputs 100%. If LLLL is displayed, it outputs 0%.

When supplying power or in standard control state,
for heating & cooling contro, if HHHH is displayed, it outputs 0% for heating, 100% for cooling. If LLLL is displayed, it ouputs 100% for heating, 0% for cooling.

6.7.5.1 MV for sensor break error [oPEn] [PArS → Er.mu]

In the event of a sensor open error you can set control output value to predefined MV instead of ON/OFF control or PID control.

Ignores MV by ON/OFF control or PID control, and sends out a control value based on the defined MV.

Setting group	Parameter	Set range			Factory default	Unit
PArS	Er.mu	Standard control	ON/OFF control	000.0 (OFF)/ 100.0 (ON)	000.0	%
			PID control	000.0 to 100.0	000.0	
		Heating & Cooling control	ON/OFF control	-100.0 (coolingON) /000.0 (OFF) / 100.0 (heating ON)	000.0	
			PID control	-100.0 (cooling) to 100.0 (heating)	000.0	

6.7.6 User level [PArS → USEr]

You can limit parameter display by setting user level (standard level or high level).

When you set as a standard level user, the main function parameters shaded on the entire parameter list(refer to the '5.4 Parameter Setting Groups') are only displayed.

Parameter	Description
Stnd	Displays main function parameters only.
HI GH	Displays main function parameters and all advanced function parameters.

Setting group	Parameter	Set range	Factory default	Unit
PArS	USEr	Stnd / HI GH	Stnd	-

6.7.7 Lock

6.7.7.1 SV group lock [PAr5 → LC.5u]

You can restrict SV parameter modification by locking SV group parameters, which include SV selection, digital input key (dI -t), A/M key for monitoring and manual control, parameter reset (Init), etc.

Set value	Function
on	Lock SV setting group
oFF	Unlock SV setting group

Setting group	Parameter	Set range	Factory default	Unit
PAr5	LC.5u	on / oFF	oFF	-

6.7.7.2 Parameter group lock [PAr5 → LC.P1/LC.P2/LC.P3/LC.P4/LC.P5]

Lock or unlock individual parameter groups from PAr 1 (Parameter 1 group) to PAr5 (Parameter 5 group). Even if parameter group is locked, you can read parameter settings.

However, SV setting lock and parameter group lock[LC.5u/LC.P□] of Parameter 5 group [PAr5] are available to change SV.

Parameter	Description
on	Parameter group lock
oFF	Parameter group unlock

Parameter	Description
LC.P1	Parameter 1 group lock
LC.P2	Parameter 2 group lock
LC.P3	Parameter 3 group lock
LC.P4	Parameter 4 group lock
LC.P5	Parameter 5 group lock

Setting group	Parameter	Set range	Factory default	Unit
PAr5	LC.P1 to LC.P5	on / oFF	oFF	-

6.7.8 Parameter initialization [Init]

This function is to initialize all parameters in memory to factory defaults.
Press the front keys for 5 sec. in RUN mode, Init parameter is displayed. Select YES and all parameters are initialized.

Setting group	Parameter	Set range	Factory default	Unit
-	Init	YES / no	no	-

Note

If the password feature is activated, it is required to enter the password to activate this function. Initizling the parameters also resets the password.

6.7.9 Password [PAr5 → PWd]

Only the user who enters password can change and set SV setting group features (except by digital input key) and parameter 1 to 5 groups features. Password setting applies to SV setting group features (except by digital input key), and parameter 1 to 5 groups features comprehensively.
Changing the password setting automatically activates password function. Setting the password to 0000, however,it cannot use password. 0001 is a read-only password. Under this password, any users can check parameter settings without knowing the password. The user, however, cannot change parameter settings.
Accessing the PWd parameter with the read-only password displays a coded form of the setting.

- Set method
  1st Press the MODE key in RUN mode.
  2nd Press the ▼ ▲ key, select PAr5 group and press the MODE key.
  3rd Press the MODE key and search PWd.
  4th Press the ◀ key and select the desired digit.
  5th Press the ▼ ▲ key to set password (0000, 0002 to 9999) and press the MODE key.
  6th Repeat step 4 and 5 and enter the set password.
  7th Press the MODE key or do not enter any keys for 3 sec. to save the password.

Setting group	Parameter	Set range	Factory default	Unit
PAr5	PWd	0000 (Password OFF), 0002 to 9999 (Password ON)	0000	-

Note

Digital input terminal feature and digital input key function are not related with password.

6.7.9.1 Enter password [PASS]

When the password is set and entering SV setting group or parameter set groups in RUN mode, [PASS] parameter to check the set password appears. Enter the set password and you can enter the set parameters.

- Set method

  1st Enter SV setting group or parameter set groups.

  2nd PASS parameter appears. Press the ◁ key to select desired digit.

  3rd Press the ▽△ key and enter the password (0001 to 9999) and press the MODE key.

Setting group	Parameter	Set range	Factory default	Unit
PAr5	PASS	0001 (read-only password), 0002 to 9999	0001	-

Note

This parameter appears except 0000 password. If you do not know the password, 0001 password only can read parameters.

When entering wrong password, coded from of the set password SV and error message [Err] flash by 1 sec. in turns at the SV display part.

6.7.9.2 Password recovery

Entering wrong password displays a coded form of the password on the SV display part.

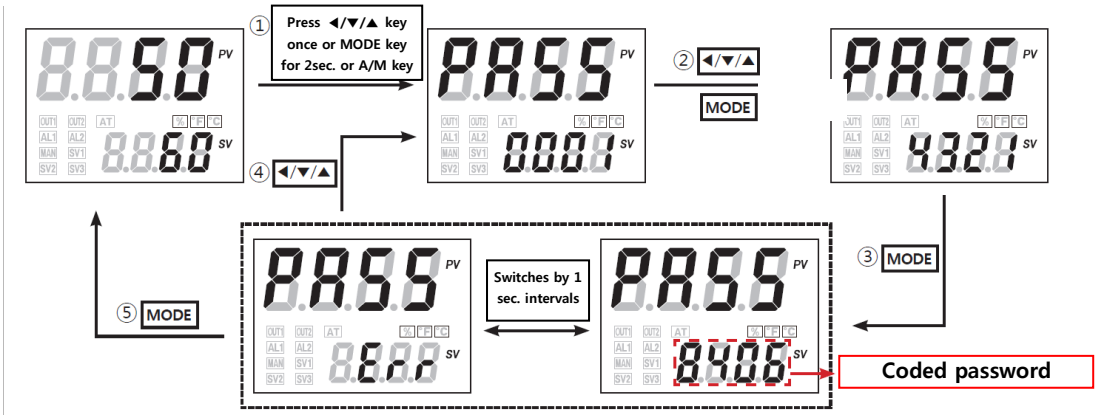
Sumit this code to Autonics to recover your lost password.

When entering wrong password (the set password is 1234)

1st Enter SV setting group or parameter set groups.

2nd PASS parameter appears. Press the ◂ key and select the desired digit.

3rd Press the ▾/▴ key and enter the password and press the MODE key. When entering wrong password 4321.



When entering wrong password, a coded form of the password and Err flash by 1 sec. in turns at the SV display part.

7 Parameter Description by Setting group

7.1 SV Setting group [SV]

Parameter		Description	Set range	Unit	Factory default
SV	Set Value	SVSet value	Within L-SV to H-SV	℃/℉/-	0
▲+▼ key	Digital Input Key Execute	Digital input key	Press ▼▲ keys for 3sec.	-	-
A/M key	Auto_Manual Monitoring/Control	MV monitoring /Manual control key	Press A/M key for over 1 sec.	-	-
InIt	Parameter Initialize	Parameter factory default initialization	no / YES	-	no

7.2 MV monitoring/Manual control setting group [MV]

Parameter		Description	Set range	Unit	Factory default
H-MV	Heating_MV	Heating MV	H 0.0 to H 100	%	-
C-MV	Cooling_MV	Cooling MV	C 0.0 to C 100	%	-

※ It monitors heating and cooling MV and controls manually.

7.3 Parameter 1 setting group [PAr 1]

Parameter		Description	Set range	Unit	Factory default
r-S	RUN_STOP	Control output RUN/STOP	rUn / StoP	-	rUn
Su-n	Multi SV No	Multi SV number	Su-0 / Su-1 / Su-2 / Su-3	-	Su-0
Ct-A	Heater Current Monitoring	Heater current value monitoring	0.0 to 50.0 (display range)	A	0.0
AL1.L	Alarm1_Low	Alarm output1 low-limit set value	Deviation alarm: -F.S. to F.S. Absoulte value alarm: within display range	℃/℉/ -	1550
AL1.H	Alarm1_High	Alarm output1 high-limit set value			1550
AL2.L	Alarm2_Low	Alarm output2 low-limit set value			1550
AL2.H	Alarm2_High	Alarm output2 high-limit set value			1550
AL3.L	Alarm3_Low	Alarm output3 low-limit set value			0000
AL3.H	Alarm3_High	Alarm output3 high-limit set value			0000
Su-0	SV-0 Setting Value	SV-0 Set value	Within L-Su to H-Su	℃/℉/ -	0000
Su-1	SV-1 Setting Value	SV-1 Set value	Within L-Su to H-Su	℃/℉/ -	0000
Su-2	SV-2 Setting Value	SV-2 Set value	Within L-Su to H-Su	℃/℉/ -	0000
Su-3	SV-3 Setting Value	SV-3 Set value	Within L-Su to H-Su	℃/℉/ -	0000

7.4 Parameter 2 Setting group [PAr2]

Parameter		Description	Set range	Unit	Factory default
At	Auto-Tuning Execute	Auto-tuning RUN/STOP	oFF / on	-	oFF
H-P	Heating_ Proportinal Band	Heating, proportional band	000.1 to 999.9	℃/℉, %	0 10.0
C-P	Cooling_ Proportinal Band	Cooling, proportional band			
H-I	Heating_Integral Time	Heating, integral time	0000 to 9999	sec.	0000
C-I	Cooling_Integral Time	Cooling, integral time			
H-d	Heating_Derivation Time	Heating, derivative time	0000 to 9999	sec.	0000
C-d	Cooling_Derivation Time	Cooling, derivative time			
db	Dead_Overlap band	Heating&Cooling, control deadband	P/P, P/ONOFF, ONOFF/P control : -proportional band to 0.0 to +proportional band (when proportional bands are different, it is based on the small value) ONOFF/ONOFF control : -999 to 0999 (temperature H) -199.9 to 999.9 (temperature L)	Digit	0000
			-99.9to 099.9 (analog)	%F.S.	000.0
rESt	Manual Reset	Proportional control, manual reset	000.0 to 100.0	%	050.0
H.HYS	Heating_ON Hysteresis	Heating, hysteresis	001 to 100 (000.1 to 100.0)	Digit	002 (002.0)
H.oSt	Heating_OFF Offset	Heating, OFF point offset	000 to 100 (000.0 to 100.0)	Digit	000
C.HYS	Cooling_ON	Cooling, hysteresis	001 to 100	Digit	002

Parameter		Description	Set range	Unit	Factory default
	Hysteresis		(0001 to 1000)		(002.0)
C.oSt	Cooling_OFF Offset	Cooling, OFF point offset	000 to 100 (000.0 to 100.0)	Digit	000
L-ou	MV Low Limit	MV low limit	000.0 to H-ou-0.1 (Standard control) -100.0 to 000.0 (Heating&Cooling)	%	-100.0
H-ou	MV High Limit	MV high limit	L-ou+0.1 to 100.0 (Standard control) 000.0 to 100.0 (Heating&Cooling)	%	100.0
rAoU	Ramp_Up Rate	Ramp-Up change rate	000 to 999 (000.0 to 999.9)	Digit	000
rAod	Ramp_Down Rate	Ramp-Down change rate	000 to 999 (000.0 to 999.9)	Digit	000
r.Unt	Ramp Time Unit	Ramp time unit	SEC / oIn / HoUr	-	oIn

7.5 Parameter 3 Setting group [PAr3]

Parameter		Description	Set range		Unit	Factory default
In-t	Input Type	Input type	Refer to input range chart		-	K CA.H
Unit	Unit	Sensor temperature unit	°C / °F		-	°C
L-rG	Low Input Range	Analog low-limit input value	Min. range to H-rG - F.S.10%		Digit	00.00
H-rG	High Input Range	Analog high-limit input value	L-rG+F.S.10% to Max. range		Digit	10.00
dot	Scaleing Decimal Point	Scale value decimal point position	0 / 0.0 / 0.00 / 0.000		-	0.0
L-SC	Low Scailing	Scale low-limit display value	-1999 to 9999		-	000.0
H-SC	High Scailing	Scale high-limit display value	-1999 to 9999		-	100.0
dUnt	Display Unit Lamp	Display unit	°C / °F / °r o / oFF		-	°r o
In-b	Input Bias	Input correction	-999 to 0999 (-199.9 to 999.9)		Digit	0000
nAuF	Input Digital Filter	Input digital filter	000.1 to 120.0		sec.	000.1
L-Su	SV Low Limit	SV low-limit	Input low-limit [L-SC] to H-Su-1Digit		℃/℉/%	-200
H-Su	SV High Limit	SV high-limit	L-Su+1digit to input high-limit [H-SC]		℃/℉/%	1350
o-Ft	Control Operating Type	Control output operation mode	Standard	HEAt / CooL	HEAt H-C	HEAt
			Heating& Cooling	HEAt /CooL / H-C		H-C
C-nd	Control Method	Temperature control type	Standard	PId / onoF	PId P.P	PId
			Heating& Cooling	P.P/P.o n/on.P /on.on		P.P
AtE	Auto-Tuning Type	Auto-tuning mode	tUn1 / tUn2		-	tUn1
oUt1	Output1(SSR_C	OUT1 control output	Standar	rLY/	rLY	rLY

Parameter		Description	Set range		Unit	Factory default
	urr) Type	type	d	SSr / CUrr		
			Heating & Cooling	SSr / CUrr	SSr	SSr
o1.mA	OUT1 Current Range	OUT1 current output range	4-20 / 0-20		-	4-20
oUt2	Output2(SSR_Curr) Type	OUT2 control output type	SSr / CUrr		-	SSr
o2.mA	OUT2 Current Range	OUT2 current output range	4-20 / 0-20		-	4-20
H-t	Heating_Conrol Time	Heating, control time	000.1 to 120.0		sec.	020.0 (Relay)
C-t	Cooling_Conrol Time	Cooling, control time	000.1 to 120.0		sec.	000.0 (SSR)

7.6 Parameter 4 Setting group [PAr 4]

Parameter		Description	Set range	Unit	Factory default
AL-1	Alarm1 Mode	Alarm output1 operation mode	oFF / duCC /]]du /]duC / [du] / PuCC /]]Pu / LbA / SbA / HbA	-	duCC
AL 1.t	Alarm1 Type	Alarm output1 option/type	AL-A / AL-b / AL-C / AL-d / AL-E / AL-F	-	AL-A
A1.HY	Alarm1 Hysteresis	Alarm output1 hysteresis	001 to 100 (000.1 to 100.0)	Digit	001
A1.n	Alarm1 NO/NC	Alarm output1 contact type	no / nC	-	no
A1.on	Alarm1 ON Delay Time	Alarm output1 ON delay time	0000 to 3600	sec.	0000
A1.oF	Alarm1 OFF Delay Time	Alarm output1 OFF delay time	0000 to 3600	sec.	0000
AL-2	Alarm2 Mode	Alarm output2 operation mode	oFF / duCC /]]du /]duC / [du] / PuCC /]]Pu / LbA / SbA / HbA	-	]]du
AL2.t	Alarm2 Type	Alarm output2 option/type	AL-A / AL-b / AL-C / AL-d / AL-E / AL-F	-	AL-A
A2.HY	Alarm2 Hysteresis	Alarm output2 hysteresis	001 to 100 (000.1 to 100.0)	Digit	001
A2.n	Alarm2 NO/NC	Alarm output2 contact type	no / nC	-	no
A2.on	Alarm2 ON Delay Time	Alarm output2 ON delay time	0000 to 3600	sec.	0000
A2.oF	Alarm2 OFF Delay Time	Alarm output2 OFF delay time	0000 to 3600	sec.	0000
AL-3	Alarm3 Mode	Alarm output3 operation mode	oFF / duCC /]]du /]duC / [du] / PuCC /]]Pu / LbA / SbA / HbA	-	LbA
AL3.t	Alarm3 Type	Alarm output3 option/type	AL-A / AL-b / AL-C / AL-d / AL-E / AL-F	-	AL-A

Parameter		Description	Set range	Unit	Factory default
A3.HY	Alarm3 Hysteresis	Alarm output3 hysteresis	001 to 100 (000.1 to 100.0)	Digit	001
A3.n	Alarm3 NO/NC	Alarm output3 contact type	no / nC	-	no
A3.on	Alarm3 ON Delay Time	Alarm output3 ON delay time	0000 to 3600	sec.	0000
A3.oF	Alarm3 OFF Delay Time	Alarm output3 OFF delay time	0000 to 3600	sec.	0000
LbAt	LBA Time	LBA monitoring time	0000 to 9999	sec.	0000
LbAb	LBA Band	LBA detection band	0000 to 999 (H) 000.0 to 99.99 (L) 000.0 to 99.99 (analog)	℃/℉ %	002
Ao.n1	Analog Output Mode	Analog transmission output value	Pu / Su / H-nu / C-nu	-	Pu
FS.L	Low Out Scale	Transmission output low-limit value	F.S.	-	-200
FS.H	High Out Scale	Transmission output high-limit value	F.S.	-	1350
AdrS	Unit Address	Communication address	01 to 127	-	01
bPS	Bit Per Second	Communication speed	24 / 48 / 96 / 192 / 384	-	96
PrtY	Parity Bit	Communication parity bit	nonE / EuEn / odd	-	nonE
StP	Stop Bit	Communication stop bit	1 / 2	-	2
rSUt	Respons Waiting Time	Communication response waitting time	5 to 99	ms	20
ConY	Communication Write	Communication write enable/disable	En.A / dI S.A	-	En.A

7.7 Parameter 5 Setting group [PAr5]

Parameter		Description	Set range		Unit	Factory default
nt.Su	Multi SV	Number of multi-SV	1 / 2 / 4		EA	1
dI -F	Digital Input Key Function	Front DI input key function	0 : oFF 1 : At 2 : StoP 3 : AL.rE		-	StoP
dI - 1	Digital Input 1 Func	DI-1 input terminal function	oFF / StoP / AL.rE / nAn / nt.Su /rE.Su		-	oFF
dI -2	Digital Input 2 Func	DI-2 input terminal function			-	oFF
rE.Su		Remote SV	oFF/on		-	oFF
r1 nb		Remote SV low-limit value correction	-999 to 999 (-199.9 to 999.9)		-	0000
rSPn		Remote SV high-limit value correction	0.100 to 5.000		-	1.000
bAr		Bar graph	Standard control	oFF / oUt 1	oUt 1	oUt 1
			Heating& Cooling	oFF / oUt 1/ oUt2/ ALL	ALL	ALL
It.nu	Initial Manual MV	Manual control, initial manual	AUto / Pr.nu		-	AUto
Pr.nu	Preset Manual MV	Manual control, reset manual	000.0 to 100.0 (Standard control) -100.0 to 100.0 (Heating&Cooling)		%	000.0
Er.nu	Error MV	Sensor error, MV	000.0 to 100.0 (Standard control) -100.0 to 100.0 (Heating&Cooling)		%	000.0
St.nu	Stop MV	Control stop, MV	000.0 to 100.0 (Standard control) -100.0 to 100.0 (Heating&Cooling)		%	000.0
St.AL	Stop AlarmOut	Control stop, Alarm output	Cont / oFF		-	Cont
USEr	User Level	User level	Stnd / HI GH		-	Stnd.
LC.Su	Lock SV	SV lock setting	on / oFF		-	oFF
LC.P1	Lock Parameter 1	Parameter1 group lock	on / oFF		-	oFF

Parameter		Description	Set range	Unit	Factory default
LC.P2	Lock Parameter 2	Parameter2 group lock	on / oFF	-	oFF
LC.P3	Lock Parameter 3	Parameter3 group lock	on / oFF	-	oFF
LC.P4	Lock Parameter 4	Parameter4 group lock	on / oFF	-	oFF
LC.P5	Lock Parameter 5	Parameter5 group lock	on / oFF	-	oFF
PYd	Password Setting	Password set	0000 : Password function Off 0002 to 9999	-	0000

7.8 Password input parameter

Parameter		Description	Set range	Unit	Factory default
PASS	Password	Password input	0001 to 9999 (0001 for reading)	-	0001

7.9 Initialized parameters by changing the related parameters

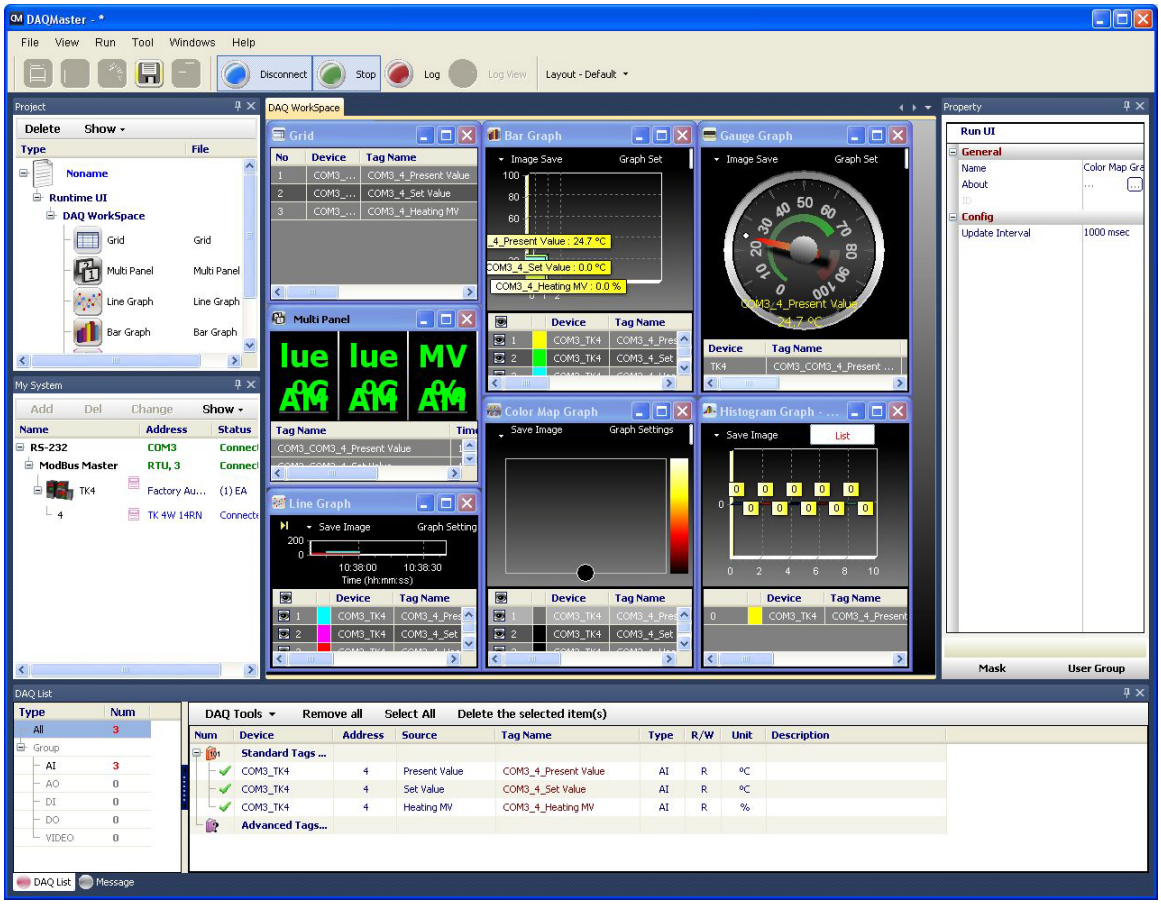
Changed parameter	Description	Initialized parameters
In-t	Input type	Su-n, AL 1.L, AL 1.H, AL2.L, AL2.H, AL3.L, AL3.H, Su0 ~Su3, db, H.HYS, H.oSt, C.HYS, C.oSt, rAnU, rAnd, r.Unt, L-rG, H-rG, dot, L-SC, H-SC, d.Unt, In-b, L -Su, H -Su, LbA.t, LbA.b, Ao-n, FS-L, FS-H.
Unit	Temperature unit	Except L-rG, H-rG, dot, L-SC, H-SC, d.Unt, these are same as the initialized parameters of when changing input type.
H-Su	SV high-limit value	SV > H-Su, SV is initialized as H-Su
L-Su	SV low-limit value	SV < L-Su, SV is initialized as L-Su
o-Ft	Control output operation mode	L-nu, H-nu, C-nd, Er.nu, Pr.nu, St.nu
C-nd	Temperature control type	L-nu, H-nu, Er.nu, Pr.nu, St.nu
AL-1, AL-2, AL-3	Alarm mode/option	AL 1.L, AL 1.H, AL2.L, AL2.H, AL3.L, AL3.H

8 DAQMaster

8.1 Overview

DAQMaster is a comprehensive device management program that can be used with Autonics thermometers, panel meters, pulse meters, counters, recorders, and indicators, etc.

DAQMaster provides GUI control for easy and convenient management of parameters and multiple device data monitoring.



Note

For more descrptions, visit our web site (www.autonics.com) and download 'DAQMaster user manual'.

8.2 Features

DAQMaster has the following features.

(1) Supports multi-device

- Simultaneously monitor multiple devices and set parameters.
- Simultaneously connect units with different addresses in a single device.
- Use Modbus Remote Terminal Unit (RTU) to enable the use of multiple RS232 ports.

(2) Device scan

In cases of multiple units (with different addresses) connected together, use unit scan to automatically search for units.

(3) Convenient user interface

Freely arrange the windows for data monitoring, attributes, and projects.
Saving a project also saves the screen layout.

(4) Project management

You can save added device information, data monitoring screen layouts, and I/O source selection as project files. Open project files to load the saved settings.
Provides a project list for simple and easy project file management.

(5) Monitoring data log

When monitoring, save data log files as either DAQMaster data files (.ddf) or CSV (.csv) files. Open files saved in the .csv format directly from Microsoft Excel.
Define log data file naming/saving rules and destination folders to make file management convenient.

(6) Data analysis

Perform spreadsheet and graph analyses of .ddf data files using DAQMaster's data analysis feature. Save spreadsheet data as .rtf, .txt, .html, or .csv files.

(7) Modbus map table reporting

Print address map reports of registered Modbus devices. Modbus map table reports can be saved in .html and .pdf formats.

(8) Supports multi-langauge

Supports Korean, English, Japanese and Simplified Chinese.
To add a different language, modify the files in the Lang folder, rename, and save.

(9) Supports script

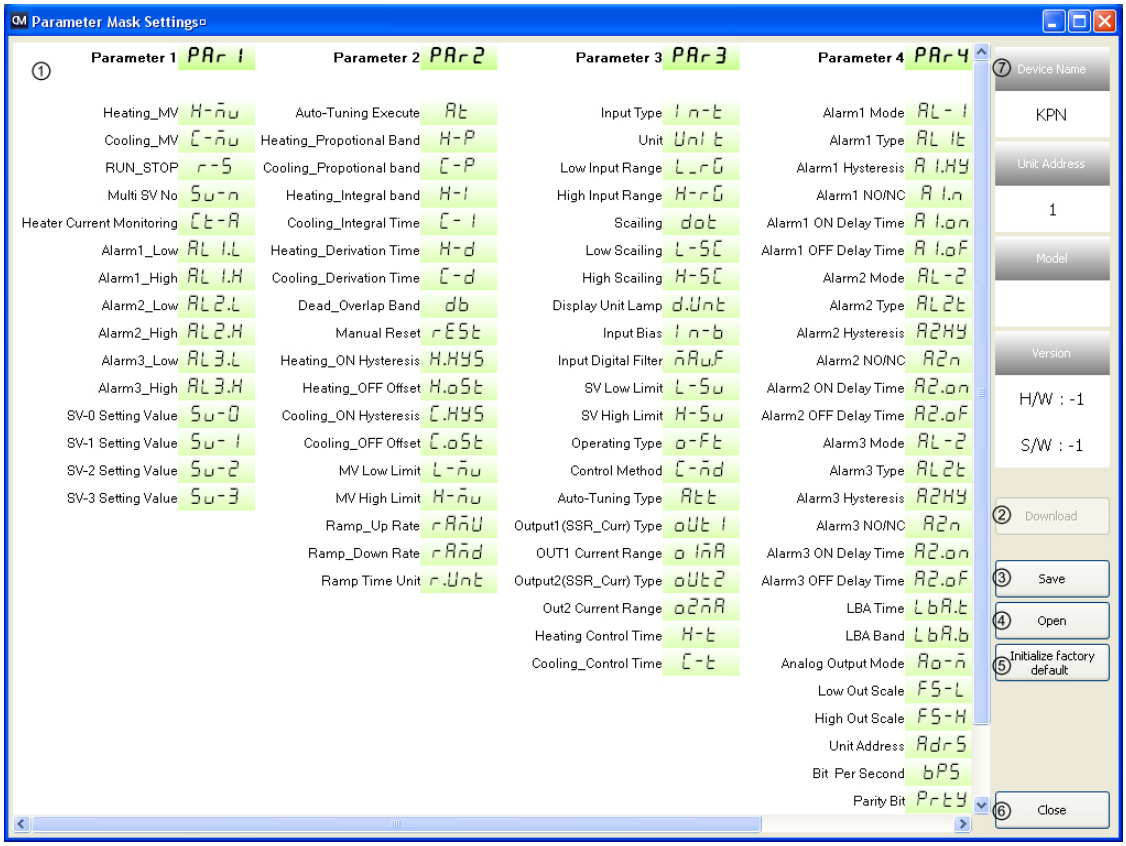
Uses the Lua Script language and deals with different I/O processes for individual devices.

8.3 KPN series special features

Parmaeter mask and user parameter group is available by DAQMaster.
Visit our website (www.autonics.com) to download DAQMaster program and the user manual.

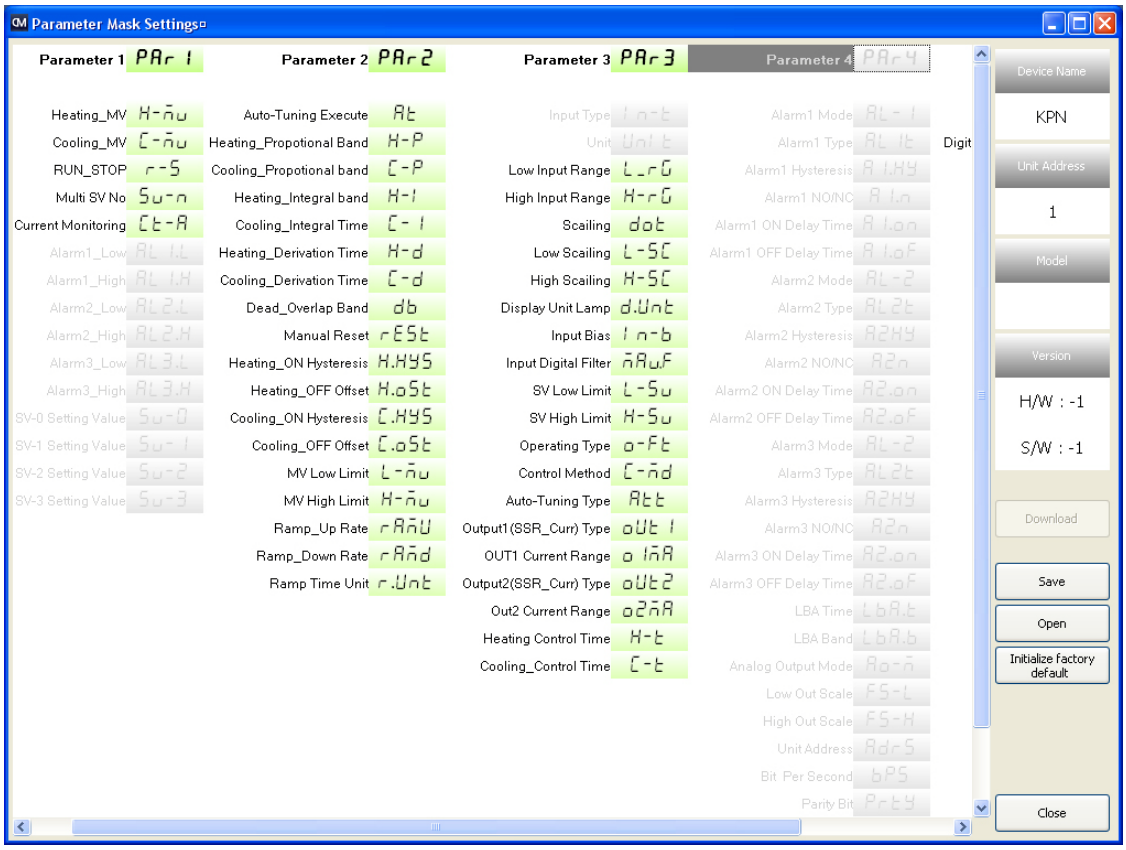
8.3.1 Parameter mask

This feature is able to hide unnecessary parameters to user environment or less frequenctly used parameters in parameter group. Masked parameters are not only displayed. The set value of masked parameters are applied.



No	Item	Description
①	Parameter mask selection	Select the to-be masked parameters. Right-click the to-be masked parameters and they turn gray.
②	Download	Applies the set masked parameters to the device.
③	Save	Saves the set masked parameters as a mask information file.
④	Open	Opens the saved mask information file.
⑤	Initialize factory default	Clears the set for the masked parameters. Download this setting to apply it to the device.
⑥	Close	Closes the Parameter Mask Settings dialog.
⑦	Device information	Displays device name, unit address, model name, and version.

Ex.

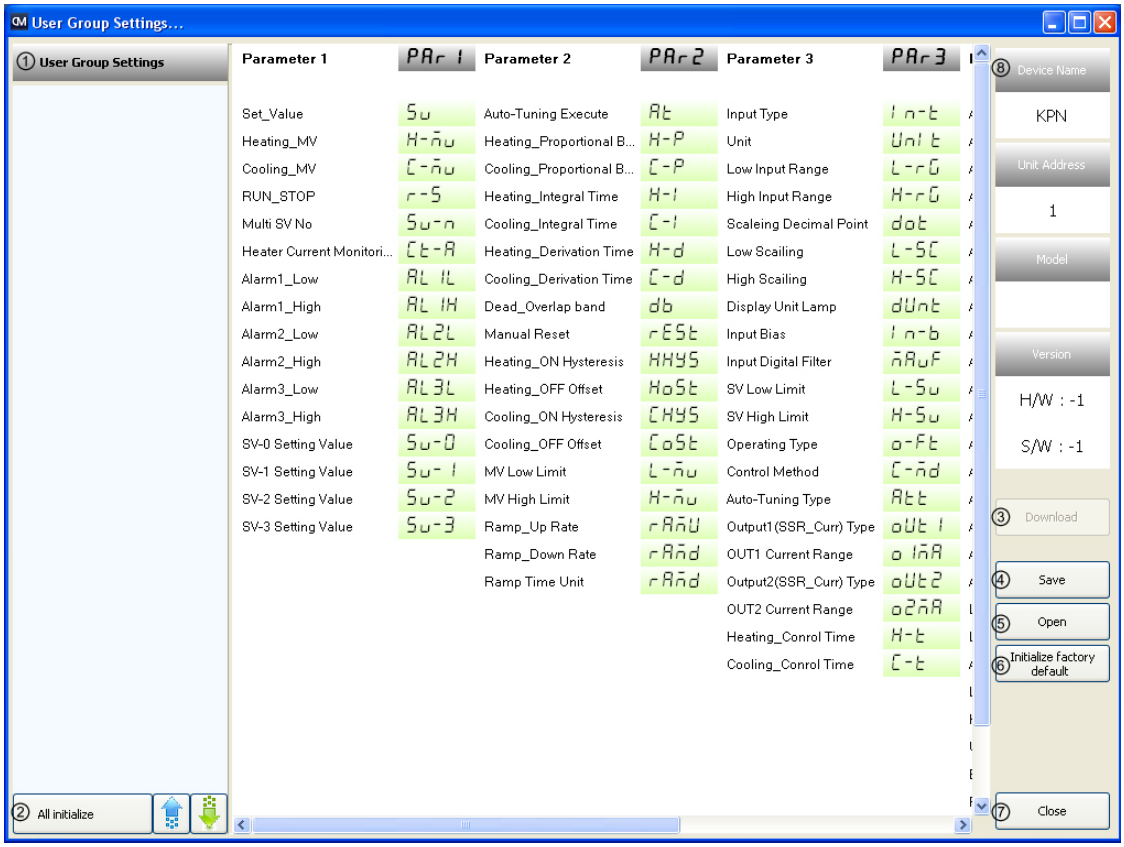


Example of masking alarm, SV setting parameters of parameter 1 group, input type, unit of parameter 3 group, and all of parameter 4 group.

8.3.2 User parameter group [PArU]

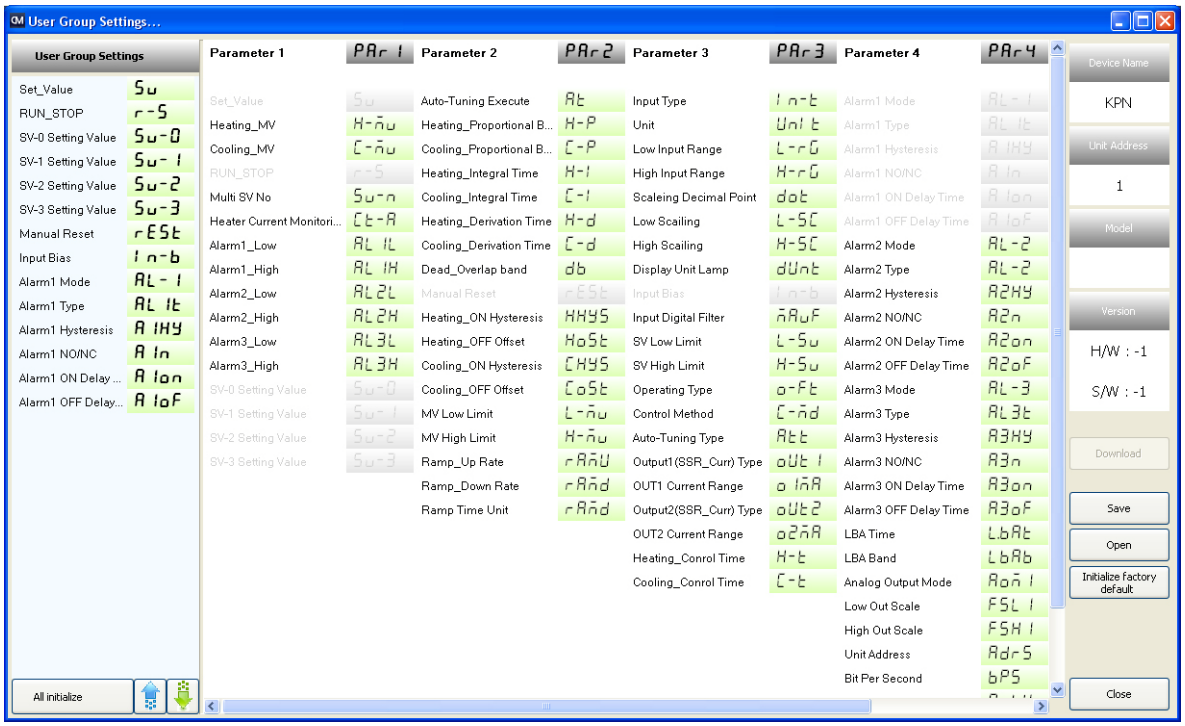
This feature is able to set the frequently used paramters to the user paramter group. You can quickly and easily set parameter settings.
User parameter group can have up to 30 parameters. You can set this by the integrated device management program, DAQMaster. For more information, refer to the DAQMaster user manual.

Visit out webpage (www.autonics.com) to download DAQMaster program and the user manual.



No	Item	Description
①	User group parameters	Displays the selected parameters as user group parameter Double-click the parameters for the user group, and these parameters turn gray. To delete the parameters at the user group, double-click the parameters.
②	User group selection	- All initialize: Initializes the set user group. - ↑, ↓: Changes the selected parameter order up/down.
③	Download	Applies the set user group to the device.
④	Save	Saves the set user group as a user group information file.
⑤	Open	Opens the saved user group file.
⑥	Initialize factory default	Clears the set for the user group. Download this setting to apply it to the device.
⑦	Close	Closes the User Group Settings dialog.
⑧	Device information	Displays device name, unit address, model name, and version.

Ex.



Example of the set user group with SV setting, control output RUN/STOP, alarm outptu 1 low/high-limit, SV-0/1/2/3 set value, manual reset, input correction, alarm output 1 mode/option/hysteresis/contact type/ON delay time/OFF delay time parameters.

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