SR80 Series (SR82 / SR83 / SR84) Digital Controller
Instruction Manual

Thank you for purchasing the Shimaden SR80 series digital controller.
Please check that the delivered product is the correct item you ordered. Please do not begin operating this product until you have read this instruction manual thoroughly and understand its contents.

"Notice"
Please ensure that this instruction manual is made accessible to the final user of this instrument.

Preface
This instruction manual is provided for those who will be involved in the wiring, installation, operation and routine maintenance of the SR80 series (SR82, SR83 and SR84). This manual describes the care, installation, wiring, function and operating procedure of the SR80 series. Keep this manual at the work site during operation of the SR80 series. While using this instrument, you should always follow the guidance provided herein.

For matters concerning safety, potential damage to equipment and/or facilities, additional instructions and notes are indicated by the following headings:

Indicates matters which may result in accidents leading to injury or death if proper attention is neglected.

⚠**WARNING**

Indicates matters which may result in damage to equipment and/or facilities.

⚠**CAUTION**

Indicates that additional instructions and notes have been provided.

NOTE
The mark ⏚ represents a protective conductor terminal.
Ensure that it is grounded properly.

Matters to be attended to for safety's sake:

⚠ WARNING

The SR80 series controllers are control instruments designed for industrial use to control temperature, humidity and other physical values. You must not employ this series for the control of any device potentially having a serious effect on human life without employing adequate and effective safety measures. We assume no responsibility for any accident arising from the use of this product without first taking effective safety measures.

⚠ WARNING

• The instrument should be installed, for example, in a control panel to prevent its terminal portion from accidental contact with a human body during its operation.

• The instrument should not be pulled out from its case. Never place your hand or an electric conductor inside it as such act may cause an electric shock resulting in serious injury or death.

• Make sure to ground the protective conductor (earth) terminal prior to using the instrument.

⚠ CAUTION

In the event a potential failure of the instrument could cause damage to the connected equipment, facilities or products, safety measures such as installing a fuse or an overheating protection device must be taken prior to the use of the instrument. We assume no responsibility for any accident which may occur as a result of not employing appropriate safety measures

⚠ CAUTION

• The ⚠mark on the plate affixed to the instrument: On the terminal nameplate affixed to the case of the instrument, the ⚠mark has been printed. This is to warn you of the risk of electric shock which may result if the charger is touched while it is energized.

• In the external power circuit to be connected to the power terminal of the instrument, a switch or a breaker as means to turn power off must be installed. Such a switch or a breaker should be fixed adjacently to the instrument so that it can be operated with ease, and with an indication that it is a means to turn power off. Use a switch or a breaker which meets the requirements of IEC60947.

• Fuse: Since the instrument does not have a built-in fuse, make sure to install a fuse in the power circuit to be connected to the power terminal. The fuse should be positioned between the switch or the breaker and the instrument and be attached to the L side of the power terminal.
Fuse rating/type: 250V AC 0.5 A/medium lagged or lagged type. Use a fuse which meets IEC60127 requirements.

• In the wiring operation, make sure to fasten terminal connections.

• Power voltage and frequency must be within their rated ranges.

• Voltage/current of a load to be connected to the output terminal and the alarm terminal should be within a rated range. If it goes out of the range, a rise in temperature will reduce the product life and/or result in problems with the product.
The output terminal should be connected with a device which meets IEC61010 requirements.

• Voltage/current out of its specified range should not be applied to the input terminal. It may reduce the product life and/or result in problems with the product.
For the rated voltage/current, refer to "7. Specifications."
In case input is of voltage (mV or V) or current (4-20 mA), the input terminal should be connected with a device which meets IEC61010 requirements.

• The SR80 series controller is provided with a draft hole.
Take care to prevent metal or other foreign matter from entering into it. Failure to do so may cause problems with the instrument or even fire

• Do not block the draft hole and maintain it free from dust and dirt. A rise in temperature or insulation failure may result in a shortening of the product life and/or problems with the instrument. For spaces required to be kept in its installation, see "2-3. Drawings showing external dimensions and panel cutout."

• It should be noted that repeated tolerance tests against voltage, noise, surge, etc. may lead to deterioration of the instrument.

• Users are prohibited from modifying the instrument and using it in an anomalous way.

• When employing the instrument, you are requested to observe matters to be attended to as described in the instruction manual concerning safe and correct operation of the instrument in order to use it safely while maintaining its reliability

• It takes 30 minutes to display the correct temperature after applying power to the digital controller. (Therefore, turn the power on more than 30 minutes prior to the operation.)

• To ensure safety and maintain the functions of this device, do not disassemble this device. If this device must be disassembled for replacement or repair, contact your dealer.

• This device is designed for mounting on the panel. Only the device mounted on the front of the panel facing outward is of protection class of IP66. Do not use for the device not facing outward or in environment where water or solids in excess of IEC60529 may get inside.

SHIMADEN CO., LTD.

SR80F-1KE
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Contents

1. Introduction

1-1. Check before use

This product is fully checked for quality assurance prior to shipment. Nevertheless, you are requested to ensure that there is no error, damage or missing components by confirming the model codes and checking the external view of the product and the number of items attached.

Confirmation of model codes:
Check the model codes stuck to the case of the product to confirm that the respective codes represent what was specified when you ordered the product, referring to the following table of codes:

□ - □□ - □ - □□ - □□□□□□□
① ②③ ④   ⑤   ⑥ ⑦ ⑧⑨⑩⑪

	Item	Code and description
①	Series	SR82, SR83, SR84
②	Input	1: Thermocouple 2: R.T.D. (Multi-range) 3: Voltage (mV) (programable-rage) 4: Current (4-20mA) (programable-rage) 6: Voltage (V) (programable-rage)
③	Output 1	Y: Contact I: Current P: SSR drive voltage V: Voltage
④	Output 2	Y: Contact I: Current P: SSR drive voltage V: Voltage N: None

⑤	Power supply	90: 100-240V AC 10: 24V AC 02: 24V DC
⑥	Event output / heater break alarm	0:None 1:Event 2:Event + heater break alarm (30A) *1 3:Event + heater break alarm (50A) *1
⑦	Remote input *2	00: None 14: 4-20mA DC (Not insulated) 15: 1-5V DC (Not insulated) 16: 0-10V DC (Not insulated)
⑧	Analog output *3	0: None 3: 0-10mV DC 4: 4-20mA DC 6: 0-10V DC
⑨	Communication *3	0: None 5: RS-485 7: RS-232C 8: CC-Link (only for SR83)
⑩	External input (DI)/ set value bias	0:Without 1:With
⑪	Special item	0:Without 1:With R:Square root extraction

*1. Selectable only when Control Output 1 is Y or P. either of Heater break alarm or Remote input is used.
*2. Either of Heater break alarm or Remote input is used.
*3. Either of Analog output or Communication is used.

Check the following items attached:
This instruction manual	1 copy
Unit decal	1 sheet
Current transformer (included in heater break alarm option)	1
Communication instruction manual (Communication option)	1 copy

> **Note**: Contact our representative or sales office for any problems with the product, shortage of the attached components or any other matters requiring clarification.

1-2. Matters requiring attention for use

(1) Do not use a hard or pointed object in operating the front keys. They should be operated by touching them lightly with your fingers.
(2) When you clean the instrument, wipe it lightly with a dry piece of cloth. Solvents such as thinner should not be used.

2. Installation and wiring

2-1. Installation site (environmental conditions)

Indoors
Location without direct sunlight
Location with no dew condensation

> ⚠ CAUTION
>
> The instrument should not be installed in those places as listed below. Its use in any of such places may cause trouble or damage or an outbreak of fire:

(1) Where flammable gas, corrosive gas, soot, and dust or other particles which can deteriorate insulation are generated or are abundant.
(2) Where the ambient temperature is below -10°C or above 50°C.
(3) Where the relative humidity exceeds 90%RH or below the dew point.
(4) Where highly intense vibration or impact is generated or transferred.
(5) Near high voltage power lines or where inductive interference is likely to be affected.
(6) Where dew drops or rays of the sun directly fall.
(7) Where the elevation is in excess of 2,000 m.
(8) Outdoors.
(9) Supply voltage fluctuation not to exceed 10% of the Nominal supply voltage.

> **Note**: The environmental conditions belong to IEC60664 installation category II and the degree of pollution is rated as 2 under this standard.

2-2. Mounting

┌─────────────── ⚠ CAUTION ───────────────┐
│ For safety's sake and to maintain the proper functioning of the │
│ product, you should not draw it out from its case. │
│ If it is necessary to draw out the instrument, contact our office in │
│ your neighborhood │
└──┘

(1) Machine the mounting hole by referring to the panel cutout drawings in Section 2-3.
(2) Applicable thickness of the mounting panel is from 1.0 to 4.0 mm
(3) Be sure to install this product with the attached gasket. Failure to do so could result in electric shock. After wiring, do not touch terminal elements or other charged parts. Failure to do so could result in electric shock.
(4) This product is provided with pawls which fix it when it is pressed straight into the front panel.

2-3. Drawings showing external dimensions and panel cutout

(1) SR82

Panel cutout
Unit: mm

(2) SR83

Panel cutout
Unit: mm

(3) SR84

Panel cutout
Unit: mm
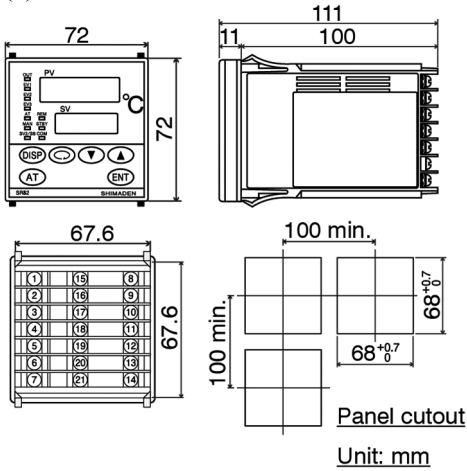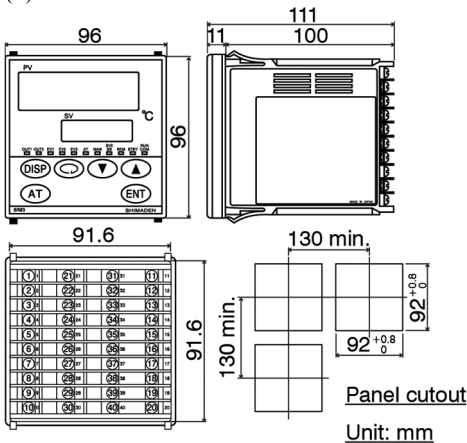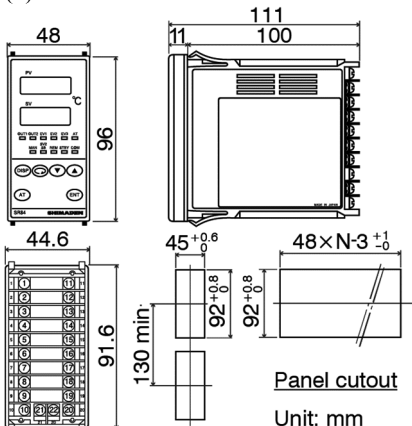
(4) Current transformer (CT) for heater break alarm
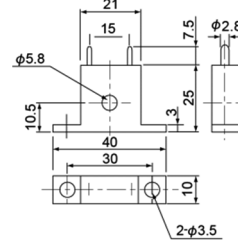
For 0-30 A (CTL-6-S)   For 0-50 A (CTL -12-S36-8)
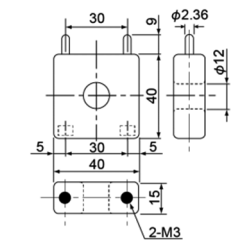
2-4. Wiring

┌─────────────── ⚠ WARNING ───────────────┐
│ • The product must be disconnected from its power source │
│   during wiring operation so as to prevent electric shock. │
│ • The protective conductor (earth) terminal ⊕ must be grounded │
│   prior to use. Otherwise, electric shock may result. │
│ • Do not touch the wired terminals and charged devices while │
│   power is on. │
└──┘

(1) Wiring should be carried out according to the drawings in "2-5. Terminal arrangement." Confirm that there is no wrong connection
(2) Use crimp terminals which meet the M3.5 screw and are less than 7 mm in width.
(3) For thermocouple input, select a compensation wire suitable for the particular type of thermocouple.
(4) For R.T.D. input, each lead should be less than 5Ω in resistance and three leads should have the same resistance.
(5) The input signal line should be conducted safely apart from high voltage power lines.
(6) Shield wiring (one-point grounding) works effectively against static induction noise.
(7) Twisting the input signal wire at equal intervals is effective against electromagnetic induction noise.
(8) For power lines, use wire or cable which is 1 mm² in size or thicker and is equivalent to or higher in grade than 600V vinyl insulated wire
(9) Earth wiring should be carried out with less than 100Ω ground resistance by using wire which is 2 mm² or thicker.
(10) Noise filter: If the instrument appears to be easily affected by power supply noise, use a noise filter for preventing malfunction. The noise filter should be mounted on the grounded panel and make wiring between the controller and the power terminal as short as possible.

┌─────────────── ⚠ CAUTION ───────────────┐
│ If the product is a thermocouple input specification, the cold junction is exposed │
│ at the terminal No. 6 (for SR82) or the terminal No. 8 (for SR83/SR84) │
│ Do not touch here with a screwdriver or anything when writing. │
└──┘

Make this wiring as short as possible.
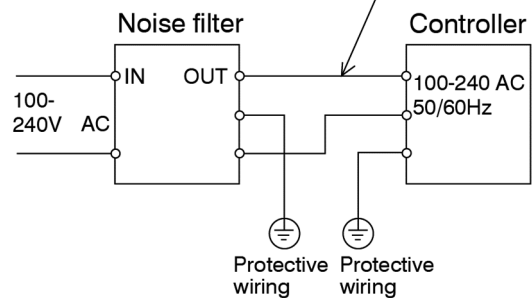
Recommended noise filter: TDK's RSEL-2003W

(11) Connection of current transformer (CT):
   Pass one load wire through the hole specifically provided or CT. CT terminals on the secondary side are wired to the CT input terminal of the SR80 controller.

To CT input terminal of the controller (No polarity)

Wiring for heater (load)
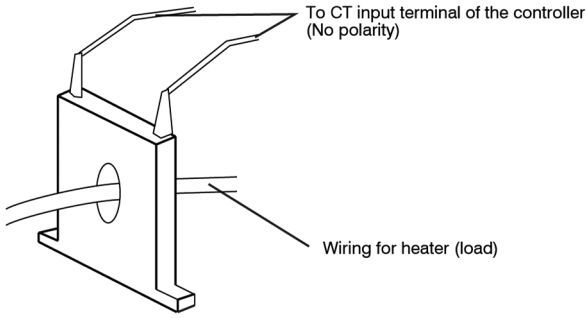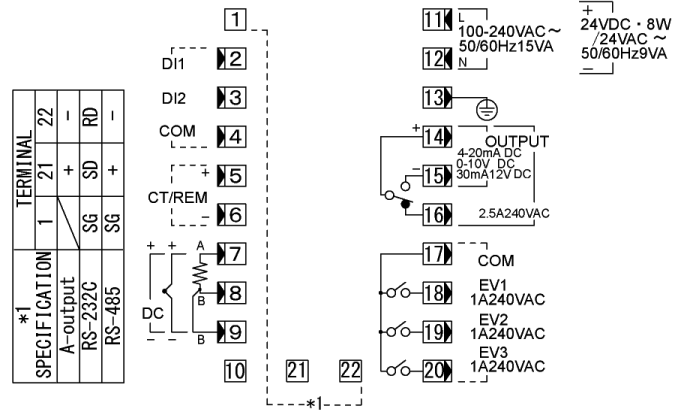
2-5. Terminal arrangement

(1) SR82
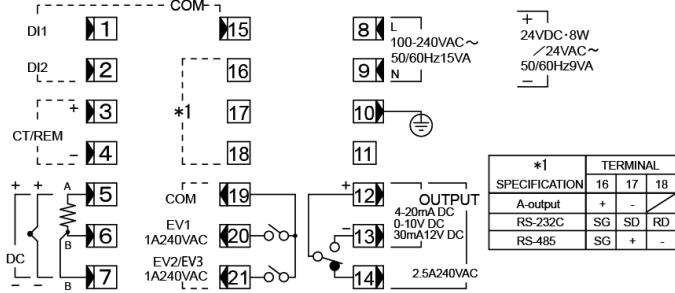
(2) SR83
1 Output
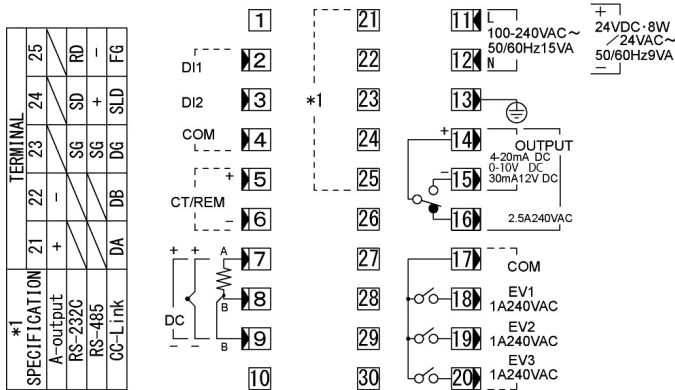
2 Output
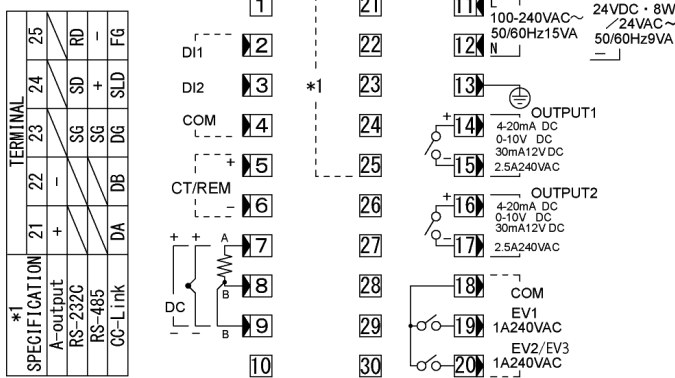
(3) SR84
1 Output

2 Output
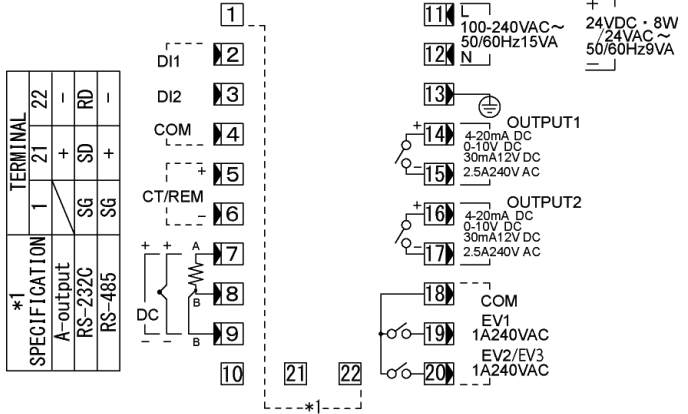
2-6. Terminal arrangement table

Name of terminal and description		SR82	SR83		SR84	
			1 output	2 output	1 output	2 output
Power terminal	100 - 200V AC	8-9	11-12		11-12	
	24V AC					
	24V DC					
Protective conductor terminal (⏚)		10	13		13	
Input	R.T.D.: A, Thermocouple/voltage/current: +	5	7		7	
	R.T.D.: B	6	8		8	
	R.T.D.: B, Thermocouple/voltage/current: –	7	9		9	
Control output 1	Contact: COM, SSR drive voltage/voltage/current: +	12	14	14	14	14
	Contact: NO, SSR drive voltage/voltage/current: –	13	15	15	15	15
	Contact: NC	14	16	—	16	—
Control output 2	Contact: COM, SSR drive voltage/voltage/current: +	—	—	16	—	16
	Contact: NO, SSR drive voltage/voltage/current: –	—	—	17	—	17
	Contact: NC	—	—	—	—	—
Event output (option)	Contact: COM	19	17	18	17	18
	Contact: NO (EV1)	20	18	19	18	19
	Contact: NO (EV2)	21	19	20	19	20
	Contact: NO (EV3)	—	20	—	20	—
Remote input (option)	+	3	5		5	
	–	4	6		6	
Heater break alarm (option)	+	3	5		5	
	–	4	6		6	
Analog output (option)	+	16	21		21	
	–	17	22		22	
Communication (option)	RS-232C: SG RS-485: SG	16	23		1	
	SD +	17	24		21	
	RD –	18	25		22	
External input (DI) (option)	Contact: COM	15	4		4	
	Contact: NO (DI1)	1	2		2	
	Contact: NO (DI2)	2	3		3	

3. Front panel

3-1. Drawing and names of parts

As an example, the front panel of SR83 is shown below.
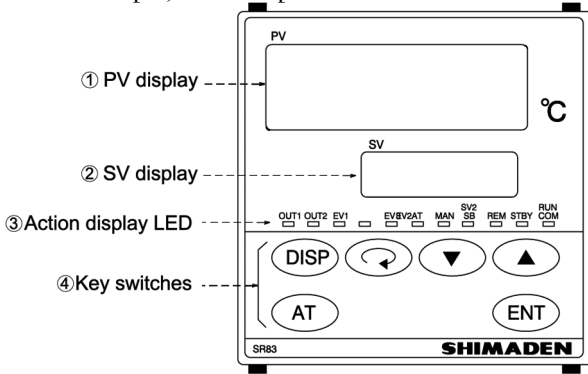
3-2. Description of front panel parts

① PV display (red)

(1) Displays current measured value (PV) on the mode 0 basic screen.
(2) Displays parameter type on each parameter screen.
(3) Displays error message when trouble arises in the system.

② SV display (green)

(1) Displays target set value on the mode 0 basic screen.
(2) Displays selected item or set value on each parameter screen.

③ Action display LED

(1) OUT1 monitor LED (green)
   • For contact or SSR drive voltage output, the LED lights when output turns ON and goes out when output turns OFF.
   • For current or voltage output, the light intensity changes in proportion to the rise and fall of output level.
(2) OUT2 monitor LED (green)
   • For contact or SSR drive voltage output, the LED lights when output turns ON and goes out when output turns OFF.
   • For current or voltage output, the light intensity changes in proportion to the rise and fall of output level.
(3) EV1 (Event 1) monitor LED (orange)
   • Lights when event 1 is in action.
(4) EV2 (Event 2) monitor LED (orange)
   • Lights when event 2 is in action.
(5) EV3 (Event 3) monitor LED (orange)
   • Lights when event 3 is in action.
(6) AT (Auto Tuning) monitor LED (green)
   • Lights during AT standby and flashes during execution of AT.
(7) MAN (Manual) monitor LED (green)
   • Flashes during MAN execution (control output is in manual operation).
(8) SV2/SB monitor LED (green)
   • Lights while SV2 is in use.
   • Lights while set value bias is in use.
   • Flashes during ramping execution, goes out when ramping stops if it is for SV1 but lights if it is for SV2.
(9) REM (Remote) monitor LED (green)
   • Lights when rEM is selected for remote setting.
   • Flashes in case remote input is below the remote switching set value and local SV is being used.
   • Goes out when Loc is selected for remote setting. (10) STBY (Standby) monitor LED (green)
   • Lights when Stb is selected for STBY setting and goes out when EXE is selected.
(11) COM (Communication)/RUN monitor LED (green)
   • Lights when COM is set for communication mode and goes out when LOC is set.

④ Key switches

(1) DISP (Disp) key
   • When this key is pressed on any parameter screen, the mode 0 basic screen returns onto the display.
(2) ↻ (parameter) key
   • When pressed on any of the mode 0 and 1 screen groups, the next screen appears.
   • When this key is pressed continuously for 3 seconds on the mode 0 basic screen, the direct call screen of the mode 1 screen group appears.
(3) ▼ (down) key
   • When pressed on any screen, the decimal point of the least digit flashes and data decreases or the decimal point moves backward.
(4) ▲ (up) key
   • When pressed on any screen, the decimal point of the least digit blinks and data increases or the decimal point moves forward.
(5) AT AT (auto tuning) key
   • Used to prepare for execution/stop of auto tuning action (in mode 0 screen group).
   • Moves screens backward, i.e., in the direction opposite to moves by the ↻ key (in mode 1 screen group)
(6) ENT (entry/registration) key
   • Registers data changed by means of ▼ or ▲ key on any of the mode 0, 1 and 2 screen groups. (The decimal point of the least digit goes out.)
   • When pressed continuously for 3 seconds on the 0-1 and 0-2 control output screens, switching between manual and auto of control output is accomplished.

4. Screens

4-1. Power application and initial screen display

Upon applying power, the power-on initial screens shown below come onto display, each for about 1.5 sec. (Continuous operation)
Then the basic screen of the mode 0 screen group is displayed.
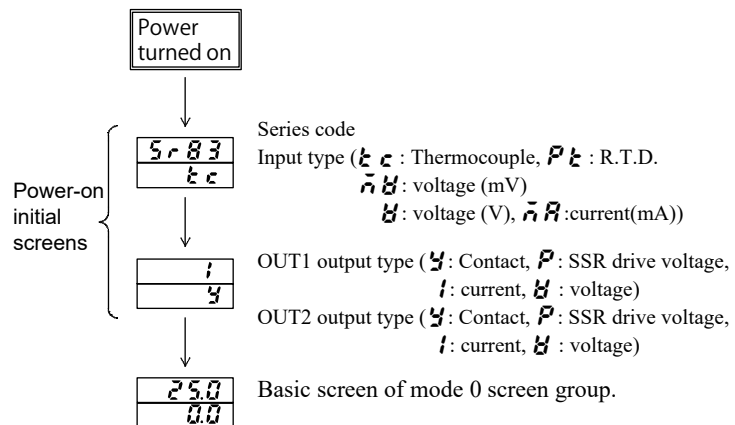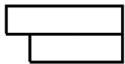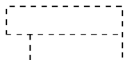
4-2. Screen configuration

In the SR80 series, screens are divided by the frequency of use for the operation of the controller into the following screen groups.

(1) Mode 0 screen group
   The group includes the basic screen (for setting target value and checking current measured value) which is used in relatively high frequency in the operation, PID parameters and the screen for event setting, etc.

(2) Mode 1 screen group
   This group includes setting screens for changing input status and controllability as the occasion demands and screens for locking items intended not to be changed, these screen being less high in frequency of use.

Note 1: Screen frames in 4-2 are as follows.

Screens always shown by key operation or some other means.

Screen displayed or skipped depending on input/output types and control action settings.

Screens displayed only when appropriate options are added or selected.

Mode 1 To 1-0

To 0-18

⟳ key →

👆 3 seconds

Mode 0

0-0

Basic screen   Initial value: Lower limit value of measuring range
Setting range: Within measuring range

PV is displayed, and SV is displayed and set.

0-1

OUT1 Control output value display screen
(Setting OUT1 manual operation)

OUT1 control output value is displayed in SV display. When ENT key is pressed for 3 seconds on this screen, MAN lamp flashes and OUT1 is changed to manual operation. For details, see Section 5-2.

0-2

OUT2 Control output value display screen
(Setting OUT2 manual operation)

OUT2 control output value is displayed. When ENT key is pressed for 3 seconds on this screen, MAN lamp flashes and OUT2 is changed to manual operation. For details, see Section 5-2.

0-3

SV1 setting screen   Initial value: 0 digit
Setting range: Within set limiter range

SV1 is set.

0-4

SV2 setting screen   Initial value: 0 digit
Setting range: Within set limiter range

SV2 is set.

0-5

Set value bias setting screen   Initial value: 0 digit
Setting range: -1999～9999 digit

Set value bias is set. The set value is valid while DI to which SB is assigned is shorted, and is added to target value (SV).
For details, see Section 4-6 (1).

0-6

SV1/SV2 switching screen   Initial value: SV1
Setting range: SV1, SV2

SV1: Control is carried out according to the setting of SV1.
SV2: Control is carried out according to the setting of SV2.
This screen is not displayed when non or sb has been set for SV_m.

0-7

Remote switch screen   Initial value: Loc
Setting range: Loc, rEm

Setting method of SV value is selected.
Loc: Local SV (SV to be set by key operation)
rEm: Remote SV (SV to be set by remote input)

0-8

Remote monitor screen
Remote input value is displayed.

0-9

Standby switching screen   Initial value: EXE
Setting range: EXE, Stb

Control output can be put in the state of standby.
EXE: Ordinary control is carried out.
Stb: Control is stopped and control output is turned to 0%.

When 5co or Hb has been set in event alarm mode setting screens, the set value setting screen for the relevant event shall not be displayed.

0-10

EV1 set value setting screen   Initial value: Higher limit value of setting range
Setting range: Within measuring range

EV1 set value is set.

0-11

EV2 set value setting screen   Initial value: Lower limit value of setting range
Setting range: Within measuring range

EV2 set value is set.

0-12

EV3 set value setting screen   Initial value:
This screen is not displayed when scaleover has been selected.

EV3 set value is set.

PID parameters for control output 1 (OUT1) of SV1

0-13

Proportional band setting screen   Initial value: 3.0%
Setting range: oFF, 0.1 - 999.9%

When P≠OFF

A ratio (%) to measuring range at which control output changes are set.
The level of control output changes in proportion to the difference between PV value and SV value.
When oFF is set, control output is put in ON-OFF action.

When P=OFF

0-14

Hysteresis setting screen   Initial value: 20 digit
Setting range: 1～1000 digit

Hysteresis in ON-OFF action is set.

0-15

Integral time setting screen   Initial value: 120 seconds
Setting range: oFF, 1～6000 seconds

This is the function to correct any offset caused by proportional action.

0-16

Derivative time setting screen   Initial value: 30 seconds
Setting range: oFF, 1～3600 seconds

A change in control output is estimated, overshoot due to integration is suppressed, and control stability is increased.

0-17

Manual reset value setting screen   Initial value: Output 1:   0.0%
Output 2: -50.0%
Setting range: -50.0～50.0%

Manual reset value is used to increase or decrease output to correct an offset.

PID parameters for control output 2 (OUT2) of SV1

Mode 1

0-18

`P _ 2`
`3.0`

Proportional band setting screen
Initial value: 3.0%
Setting range: oFF, 0.1～999.9%

When P≠OFF

When P=OFF

0-19

`dF_2`
`2.0`

Hysteresis setting screen
Initial value: 2.0 digit
Setting range: 1～1000 digit

0-20

`I _ 2`
`120`

Integral time setting screen
Initial value: 120 seconds
Setting range: oFF, 1～6000 seconds

0-21

`d _ 2`
`30`

Derivative time setting screen
Initial value: 30 seconds
Setting range: oFF, 1 - 3600 seconds

0-22

`db_2`
`0.0`

Dead band setting screen
Initial value: 0.0
Setting range: -1999～5000 digit
In case 2-output control is carried out, the action range of control output 2 has to be set by taking characteristics of the object to be controlled and any energy-saving effect into account.

PID parameters for control output 1 (OUT1) of SV2/SB and Remote

0-23

`P21`
`3.0`

When P≠OFF

When P=OFF

0-24

`dF21`
`2.0`

0-25

`I21`
`120`

0-26

`d21`
`30`

0-27

`rr21`
`0.0`

PID parameters for control output 2 (OUT2) of SV2/SB and Remote

0-28

`P22`
`3.0`

When P≠OFF

When P=OFF

0-29

`dF22`
`2.0`

0-30

`I22`
`120`

0-31

`d22`
`30`

0-32

`db22`
`0.0`

To return to 0-0.

1-0

`PArA`
`1`

Direct call screen
Initial value: 1
Setting range: 1～73
When the screen No. you want to call in the mode 1 screen group is set, that screen is displayed.

1-1

`E1_n`
`A_Hi`

EV1 alarm mode setting screen
Initial value: Higher limit absolute value alarm
Setting range: 8 types
Please refer to "6-2 Event type list."

Sco or Hb

1-2

`E1_d`
`2.0`

EV1 hysteresis setting screen
Initial value: 2.0 digit
Setting range: 1～1000 digit
Hysteresis during the event action is set.

1-3

`E1_t`
`oFF`

EV1 standby setting screen
Initial value: oFF
Setting range: oFF, 1 - 4
Event output action to be used, with or without standby action, is set.
For details, see Section 6-3.
oFF: Alarm action without standby
1: Alarm action with standby (when power is ON)
2: Alarm action with standby (When power is On and STBY is in execution)
3: Alarm action with standby (When power is ON, STBY is in execution, and SV is changed)
4: Control action without standby

1-4

`E1_t`
`oFF`

EV1 delay time setting screen
Initial value: oFF
Setting range: oFF, 1～9999 Sec.
Delay time during event action is set.
For details, see Section 6-4.

1-5

`E2_n`
`A_Lo`

EV2 alarm mode setting screen
Initial value: Lower limit absolute value alarm
Setting range: 8 types
Please refer to "6-2 Event type list."

Sco or Hb

1-6

`E2_d`
`2.0`

EV2 Hysteresis setting screen
Initial value: 2.0 digit
Setting range: 1～1000 digit
Hysteresis during event action is set.

1-7

`E2_t`
`oFF`

EV2 standby setting screen
Initial value: oFF
Setting range: oFF, 1 - 4
Event output action to be used and standby action are set.
For details, see Section 6-3.

1-8

`E2_t`
`oFF`

EV2 delay time setting screen
Initial value: oFF
Setting range: oFF, 1～9999 Sec.
Delay time during event action is set.
For details, see Section 6-4.

1-9

`E3_n`
`Sco`

EV3 alarm mode setting screen
Initial value: Scaleover
Setting range: 8 types
Please refer to "6-2 Event type list."

Sco or Hb

1-10

`E3_d`
`2.0`

EV3 Hysteresis setting screen
Initial value: 2.0 digit
Setting range: 1～1000 digit
Hysteresis during event action is set.

1-11

`E3_t`
`oFF`

EV3 standby setting screen
Initial value: oFF
Setting range: oFF, 1～4
Event output action to be used and standby action are set.
For details, see Section 6-3.

NOTE: Functions, initial values and setting ranges of the 0-25 to 0-32 screens are the same as the other PID parameters.

1-12

```
E3_t
  oFF
```

EV3 delay time setting screen
Initial value: oFF
Setting range: oFF, 1～9999 Sec.

Delay time during event action is set.
For details, see Section 6-4.

1-13

```
Ao_n
  PH
```

Analog output mode setting screen
Initial value: PV
Setting range: 5 types

One of the five types shown in the table below is assigned to analog output.

PV [PH]	SV [SH]	DEV [dEH]
OUT1 [o1]	OUT2 [o2]	

Decimal point position of the scale setting screen decided from
1-64 Measuring range setting and 1-65 Decimal point position screen.

1-14

```
Ao_L
  0.0
```

Analog output lower limit scale setting screen
Initial value: As per table below
Setting range: As per table below

Lower limit scale of analog output is set.
It is conditional that Ao_L≠Ao_H.

MODE	Setting range	Initial value
PV, SV	Within measuring range	Lower limit value of measuring range
DEV	-100.0～100.0%	-100.0%
OUT1, OUT2	0.0～100.0%	0.0%

1-15

```
Ao_H
 100.0
```

Analog output higher limit scale setting screen
Initial value: As per table below
Setting range: As per table below

Higher limit scale of analog output is set.
It is conditional that Ao_L≠Ao_H.

MODE	Setting range	Initial value
PV, SV	Within measuring range	Higher limit value of measuring range
DEV	-100.0～100.0%	100.0%
OUT1, OUT2	0.0～100.0%	100.0%

1-16

```
dc1
 noP
```

DI1 setting screen
Initial value: noP
Setting range: 8 types

Action for DI1 input is set. For details, see Section 4-6(2).

[noP] No processing
[StB] Standby action (level input)
[--] When it is not established on the 1-52 screen
[SH] SV1/SV2 selection (level input)
[Sb] SB action (level input)
[At] AT action (edge input)
[nAn] MAN action (level input)
[dA] DA characteristics action (level input)
[StP] Ramp temporary stop action (level input)
[rEn] REM action (level input)

Either one of them is displayed according to setting on the 1-52 SB/SV2 selection setting screen

1-17

```
dc2
 noP
```

DI2 setting screen
Initial value: noP
Setting range: 8 types

Action for DI1 input is set. For details, see Section 4-6(2).
For action types to be assigned, refer to those listed above.

1-18

```
Hb_A
 0.0
```

Heater current monitor screen

Load current detected by CT is displayed for monitoring.
In case control output is in ON-OFF action, however, [----] is displayed when effective current is not detected.

1-19

```
Hb_n
 LocP
```

Heater break action mode setting screen
Initial value: Lock
Setting range: Lock, rEAL

Heater break action mode is set.
Lock: When an alarm is output, the alarm output is locked, that is, alarm output will continue even when CT current returns to its normal value. Alarm output does not stop unless OFF is set for alarm current value or power is turned OFF.
rEAL: When an alarm is output, it is released automatically if CT current returns to its normal value.

1-20

```
Hb_S
 oFF
```

Heater break alarm value setting screen
Initial value: oFF
Setting range: oFF, 0.1～50.0A

While control output is ON, load line current is detected by CT and if it is smaller than the set current value, it is taken as abnormal and an alarm is output. (Heater break must be assigned to an event.)

1-21

```
HL_S
 oFF
```

Heater break loop value setting screen
Initial value: oFF
Setting range: oFF, 0.1～50.0A

While control output is ON, load line current is detected by CT and if it is larger than the set current value, it is taken as abnormal and an alarm is output. (Heater break must be assigned to an event.)

1-22

```
rE_b
 0.0
```

Remote bias value setting screen
Initial value: 0digit
Setting range: -1999～1999digit

Remote bias value is set.

1-23

```
rE_F
 oFF
```

Remote filter setting screen
Initial value: oFF
Setting range: oFF, 1～100 Sec.

Remote filter is set.

1-24

```
rE_P
 oFF
```

Remote switching point setting screen
Initial value: oFF
Setting range: oFF, 0.1～50.0%.

Remote switching point is set. For details, see Section 4-6(3).

1-25

```
rE_d
 2.0
```

Remote switching point Hysteresis setting screen
Initial value: 2.0%
Setting range: 0.1～10.0%

Hysteresis at the remote switching point is set.

1-26

```
rE_L
 0.0
```

Remote lower limit scale setting screen
Initial value: Lower limit value of measuring range
Setting range: Within measuring range.

Remote lower limit scale value is set.
It is conditional that rE_L ≠ rE_H

1-27

```
rE_H
 100.0
```

Remote higher limit scale setting screen
Initial value: Higher limit value of measuring range
Setting range: Within measuring range.

Remote higher limit scale value is set.
It is conditional that rE_L ≠ rE_H

1-28

```
rE_t
 n.o
```

Remote tracking setting screen
Initial value: no
Setting range: no, yES

Remote SV value can be transferred to local SV value.
yES: Upon switching from remote SV to local SV, remote SV is copied in local SV.
no: Remote tracking does not function.

For details, please refer to the communication interface instruction manual.

1-29

```
Conn
 Loc
```

Communication mode selection screen
Initial value: LOC
Setting range: COM→LOC

Communication mode is selected.
LOC mode: Only read commands by communication are valid.
COM mode: Read and write commands by communication are valid.
Only changing COM to LOC is possible by front key operation.

1-30

```
AdrS
```

Communication address setting screen
Initial value: 1
Setting range: 1～99

Machine Number(s) is set when a plurality of instruments are connected for communication.

1-31

```
bPS
 1200
```

Communication speed setting screen
Initial value: 1200 bps
Setting range: 1200, 2400, 4800, 9600, 19200 bps

A speed at which data is transmitted to host computer is set.

1-32

```
dAtA
 7E1
```

Communication data format setting screen
Initial value: 7E1
Setting range: 7E1, 7E2, 7N1, 7N2 8E1, 8E2, 8N1, 8N2

Communication data format is set.

1-33

```
CtrL
 1
```

Communication control code setting screen
Initial value: 1
Setting range: 1～3

Communication control code is set.
1:STX_ETX_CR 2:STX_ETX_CRLF 3:@_:_CR

1-34

```
bcc
 1
```

Communication BCC check setting screen
Initial value: 1
Setting range: 1～4

Operating method to be used in BCC check is set.
1: ADD 2: ADD_two's cmp 3: XOR 4: None

1-35

```
nEn
 EEP
```

Communication memory mode setting screen
Initial value: EEP
Setting range: EEP, Ram, r_E

EEP: Data is written into EEPROM.
Ram: Data is written into RAM.
r_E: Data is written in EEPROM. (SV and OUT are written into RAM.)

1-36

`dELY` `20`

Communication delay time setting screen
Initial value: 20
Setting range: oFF, 1～100

Delay time from receipt of communication command to transmission is set.

1-37

`Act` `rA`

Output characteristics setting screen
Initial value: rA
Setting range: rA, dA

Control characteristics of control output is set.
For 2-output characteristics, see Section 6-5.
rA: The more PV value is in excess of SV value, the lower the output (heating control).
dA: The more PV value is in excess of SV value, the higher the output (cooling control).

1-38

`o_C` `30`

Control output 1 proportional cycle setting screen
Initial value: contact output 30 sec, SSR drive voltage 3 sec.
Setting range: 1～120 Sec.

Proportional cycle time of control output 1 is set.

1-39

`o_2C` `30`

Control output 2 proportional cycle setting screen
Initial value: contact output 30 sec, SSR drive voltage 3 sec.
Setting range: 1～120 Sec.

Proportional cycle time of control output 2 is set.

1-40

`o_L` `0.0`

SV1 control output 1 lower limit output limiter setting screen
Initial value: 0.0%
Setting range: 0.0～99.9% on condition that o_L<o_H.

Lower limit output limiter of SV1 control output 1 is set.

1-41

`o_H` `100.0`

SV1 control output 1 higher limit output limiter setting screen
Initial value: 100.0%
Setting range: 0.1～100.0% on condition that o_L<o_H.

Higher limit output limiter of SV1 control output 1 is set.

1-42

`o_2L` `0.0`

SV1 control output 2 lower limit output limiter setting screen
Initial value: 0.0%
Setting range: 0.0～99.9% on condition that o_2L<o_2H.

Lower limit output limiter of SV1 control output 2 is set.

1-43

`o_2H` `100.0`

SV1 control output 2 higher limit output limiter setting screen
Initial value: 100.0%
Setting range: 0.1～100.0% on condition that o_2L<o_2H.

Higher limit output limiter of SV1 control output 2 is set.

1-44

`o21L` `0.0`

SV2, SB/REM
control output 1 lower limit output limiter setting screen
Initial value: 0.0%
Setting range: 0.0～99.9% on condition of o21L<o21H.
Lower limit output limiter of SV2 control output 1 is set.

1-45

`o21H` `100.0`

SV2, SB/REM
control output 1 higher limit output limiter setting screen
Initial value: 100.0%
Setting range: 0.1～100.0% on condition that o21L<o21H.
Higher limit output limiter of SV2 control output 1 is set.

1-46

`o22L` `0.0`

SV2, SB/REM
control output 2 lower limit output limiter setting screen
Initial value: 0.0%
Setting range: 0.0～99.9% on condition that o22L<o22H.
Lower limit output limiter of SV2 control output 2 is set.

1-47

`o22H` `100.0`

SV2, SB/REM
control output 2 higher limit output limiter setting screen
Initial value: 100.0%
Setting range: 0.1～100.0% on condition that o22L<o22H.
Higher limit output limiter of SV2 control output 2 is set.

1-48

`o_E` `0.0`

Control output 1 error output setting screen
Initial value: 0.0%
Setting range: 0.0～100.0%

Control output 1 in the case of scaleover of measured input value is set.

1-49

`o_2E` `0.0`

Control output 2 error output setting screen
Initial value: 0.0%
Setting range: 0.0～100.0%

Control output 2 in the case of scaleover of measured input value is set.

1-50

`PH_b` `0.0`

PV bias setting screen
Initial value: 0 digit
Setting range: -1999～1999 digit

This is used to correct an error of input from sensor, etc.
When bias is applied, control, too, is carried out with the corrected value.

1-51

`PH_F` `oFF`

PV filter setting screen
Initial value: oFF
Setting range: oFF, 1～100 Sec.

Suppress harmful effects caused by signal fluctuation or too much noise.

1-52

`SH_n` `non`

SB/SV2 selection setting screen
Initial value: non
Setting range: non, SV, Sb

Which of SB and SV2 functions is to be used is selected and set.
non: Neither SV2 function nor SB function can be used.
SV: SV2 function can be used.
Sb: SB function (set value bias) can be used.

1-53

`SH_L` `0.0`

SV set value lower limit limiter setting screen
Initial value: Lower limit value of measuring range
Setting range: Within measuring range

Lower limit limiter of SV set value is set,
but it is necessary that SV_L<SV_H.

1-54

`SH_H` `800.0`

SV set value higher limit limiter setting screen
Initial value: higher limit value of measuring range
Setting range: Within measuring range

Higher limit limiter of SV set value is set,
but it is necessary that SV_L<SV_H.

1-55

`rP_U` `oFF`

Ramp ascending value setting screen
Initial value: oFF
Setting range: oFF, 1～9999 digit

Upon switching between SV and SV2 or SB switching, it is feared to cause an abrupt change in load. By setting an amount of change (value of ascent), target value changes gradually.

1-56

`rP_d` `oFF`

Ramp descending value setting screen
Initial value: oFF
Setting range: oFF, 1～9999 digit

Upon switching between SV and SV2 or SB switching, it is feared to cause an abrupt change in load. By setting an amount of change (value of descent), target value changes gradually.

1-57

`rP_U` `SEc`

Ramp unit setting screen
Initial value: SEc
Setting range: SEc., min

The unit of ramp value is set.

1-58

`rP_r` `×1`

Ramp multiplier setting screen
Initial value: ×1
Setting range: ×1, ×0.1

A multiplier for ramp is set.
×1:×1   ×0.1:×0.1

1-59

`At_P` `0.0`
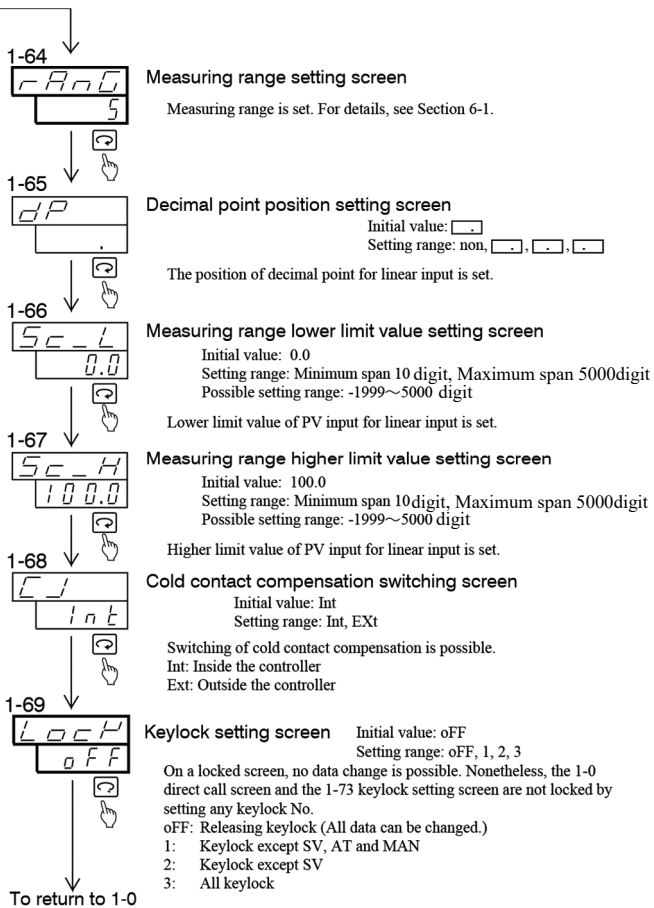
AT point setting screen
Initial value: 0 digit
Setting range: 0～5000 digit

AT point is set. For details, see Section 4-6 (4).

1-60

`SF` `0.40`

SV1 control output 1 target value function setting screen
Initial value: 0.40
Setting range: 0.00～1.00

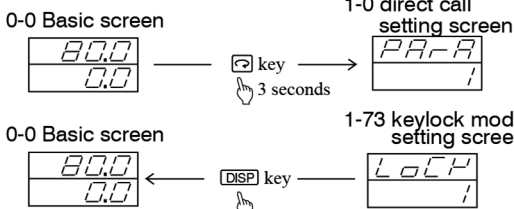This is used for correction if overshoot or undershoot from set value arises during execution of PID control.

1-61

`SF_2` `0.40`

SV1 control output 2 target value function setting screen
Initial value: 0.40
Setting range: 0.00～1.00

This is used for correction if overshoot or undershoot from set value arises during execution of PID control.

1-62

`SF21` `0.40`

SV2, SB/REM
control output 1 target value function setting screen
Initial value: 0.40
Setting range: 0.00～1.00
This is used for correction if overshoot or undershoot from set value arises during execution of PID control.

1-63

`SF22` `0.40`

SV2, SB/REM
control output 2 target value function setting screen
Initial value: 0.40
Setting range: 0.00～1.00
This is used for correction if overshoot or undershoot from set value arises during execution of PID control.

1-64

```
rAnG
    5
```

Measuring range setting screen

Measuring range is set. For details, see Section 6-1.

1-65

```
dP
 .
```

Decimal point position setting screen

Initial value: ▯.
Setting range: non, ▯.▯, ▯.▯, ▯.▯

The position of decimal point for linear input is set.

1-66

```
Sc_L
 0.0
```

Measuring range lower limit value setting screen

Initial value: 0.0
Setting range: Minimum span 10 digit, Maximum span 5000digit
Possible setting range: -1999~5000 digit

Lower limit value of PV input for linear input is set.

1-67

```
Sc_H
100.0
```

Measuring range higher limit value setting screen

Initial value: 100.0
Setting range: Minimum span 10digit, Maximum span 5000digit
Possible setting range: -1999~5000 digit

Higher limit value of PV input for linear input is set.

1-68

```
C_J
 Int
```

Cold contact compensation switching screen

Initial value: Int
Setting range: Int, EXt

Switching of cold contact compensation is possible.
Int: Inside the controller
Ext: Outside the controller

1-69

```
LocH
 oFF
```

Keylock setting screen

Initial value: oFF
Setting range: oFF, 1, 2, 3

On a locked screen, no data change is possible. Nonetheless, the 1-0 direct call screen and the 1-73 keylock setting screen are not locked by setting any keylock No.
oFF: Releasing keylock (All data can be changed.)
1: Keylock except SV, AT and MAN
2: Keylock except SV
3: All keylock

To return to 1-0

4-4. How to move from screen to screen

(1) Moving between mode 0 screen group and mode 1 screen group

・Pressing the ⟳ key continuously for 3 seconds on the basic screen of the mode 0 screen group brings the direct call screen of the mode 1 screen group onto display. Pressing the ⟨DISP⟩ key on any screen of the mode 1 screen group, the display returns to the basic screen of the mode 0 screen group.

0-0 Basic screen
```
80.0
 0.0
```
— ⟳ key → (3 seconds)

1-0 direct call setting screen
```
PArA
   1
```

0-0 Basic screen
```
80.0
 0.0
```
← ⟨DISP⟩ key —

1-73 keylock mode setting screen
```
LocH
   1
```

NOTE: The ☞ mark shown above means pressing the key above the mark. This applies to all the subsequent drawings.

(2) Moving from screen to screen in the mode 0 screen group

・The next screen appears every time the ⟳ key is pressed.

0-0 Basic screen
```
80.0
 0.0
```
— ⟳ key →

0-1 OUT1 control output value display screen
```
80.0
o 0.0
```

(3) Moving from screen to screen in the mode 1 screen group

・There are three methods of moving from screen to screen in the mode 1 screen group as shown below:

i) To press the ⟳ key in the same way as in the mode 0 screen group. (See (2) above.)

ii) To enter the number of a screen you want to call on the 1-0 direct call screen.

1-0 direct call screen
```
PArA
   1
```
→ ▲ (Several times) →

1-0 direct call screen
```
PArA
  59.
```
(Decimal point flashes.)

→ ⟨ENT⟩ key →

1-62 AT point setting screen
```
At_P
 0.0
```
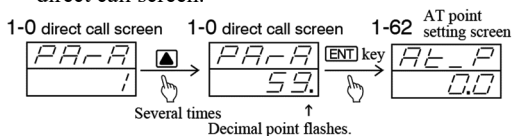
iii) The preceding screen appears every time the ⟨AT⟩ key is pressed. (This function of AT key works only in the mode 1 screen group.)

1-53 SV limiter lower limit value setting screen
```
SH_L
 0.0
```
← ⟨AT⟩ key —

1-54 SV limiter higher limit value setting screen
```
SH_H
800.0
```
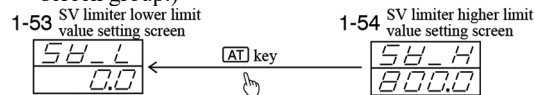
The decimal point of the scale depends on the 1-64 Measuring range setting screen and the 1-65 Decimal point position setting screen.

4-5. Data change on each screen

To change data on each screen, press the ▽ or △ key.
Changed data should be registered by pressing the ⟨ENT⟩ key.
Once the data is registered, the decimal point on the bottom right stops flashing and goes out.

4-6. Supplementary explanation about screens

(1) 0-5 set value bias setting screen
By setting a bias value for a target set value beforehand, the original target set value added with the bias value becomes the new target value when the DI assigned for SB turns ON (shorted).
DI ON = Target set value (SV) + bias value (SB)
DI OFF = Target set value (SV)
NOTE: To use the set value bias function, you have to assign SB to a DI and set SB for SV mode.

(2) 1-16 DI1 setting screen and 1-17 DI2 setting screen
・If you select [S H], SV2 takes effect when DI input turns ON.
・When to detect external control input signal:
Level input: The action is maintained as long as the contact remains ON.
Edge input: The action is maintained even when the contact is turned OFF after it has been in action for 0.3 seconds or longer. If the contact remains ON for 0.3 seconds subsequently, the action is released.
・If an action of the same type is assigned to DI1 and DI2, the assignment to DI2 becomes void.
・An action assigned to a DI cannot be controlled by key operation. (Priority is given to DI input.)
・An action through DI input is held even after release of the DI assignment.

(3) 1-24 remote switching point setting screen
Setting a remote switching point on this screen allows local SV to be switched to remote SV at the time when remote input reaches the desired value (%).
・When oFF is set for remote switching point
Conventional remote switching action
By switching to remote on the remote switching setting screen (rEm) of the user setting screen group, local is immediately switched to remote and the remote lamp lights.
・When a value, i.e., not "oFF", is set for remote switching point → remote switching action according to applied voltage or current.
In case the value of voltage or current input remotely upon switching to remote on the remote switching setting screen (rEm) exceeds the set value (%) of remote switching point, SV is switched to remote and remote lamp lights. If remote input falls below the set value (%) of remote switching point, it switches to local SV and the remote lamp flashes.
Note: There is no remote switching while AT is in execution.
Note: If the remote input at the time when remote switching is set on the remote switching setting screen (rEm) is below the set value (%) of remote switching point, the remote lamp flashes and it is switched to local SV.

(4) 1-62 AT execution point setting screen

For the purpose of avoiding hunting due to a limit cycle with a set SV AT execution, a virtual SV value (AT execution point) is set for AT to run at a point away from the actual SV value.
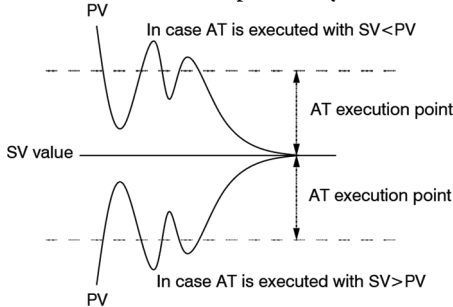
Note 1: For AT execution point, an absolute value of difference between SV value and virtual SV value is to be input.

Note 2: When 0 is set for AT execution point, SV value serves as the AT point.

Note 3: When PV value is in the AT execution point area, SV value serves as the AT point.

5. Supplementary notes on key operation

5-1. AT

When AT is executed, PID constants are calculated and defined from repeated ON/OFF action (100%/0%) output for the measuring value increase and decrease around the set value and are stored in the internal memory to complete operation. Upon completion, control using stored PID constants begins.

How to execute AT

1. Press the ⒶⓉ key in the mode 0 screen group. Auto tuning is brought to the state of standby. (AT lamp lights.)
2. Press the ⒺⓃⓉ key to register. Auto tuning is executed. (AT lamp flashes.)

Note: AT can be executed even with remote SV. (The remote SV at the time when AT execution point is set is used in the execution.)

Note: AT cannot be executed in the mode 1 screen group.

- AT is not executed in the following conditions (When the ⒺⓃⓉ key is pressed, the AT lamp goes out.)
1. During ramp control
2. During manual operation
3. In the state of STBY
4. "oFF" setting for proportional band (ON/OFF action)
5. Selection of 2 or 3 on the keylock mode setting screen
6. Scaleover of PV value (measured value)

Cancellation of AT

AT can be cancelled in mid-operation by pressing the ⒶⓉ key again. Press the ⒺⓃⓉ key for confirmation. The AT lamp goes out.

Note: When AT is cancelled in the mid-operation, PID values remain unchanged.

- AT is automatically cancelled under the following conditions:
1. Output value remains at 0% or 100% for two or more hours.
2. Power supply is interrupted due to power failure or for other reason.
3. Scaleover of PV (measured value) during AT execution.
4. STBY is executed.

5-2. Manual adjustment

On the 0-1 OUT1 control output value display screen and 0-2 OUT2 control output value display screen, it is possible to change to the control output manual mode and to set a manual control output value.

Control output 1 → is shown. Control output 2 → is shown.
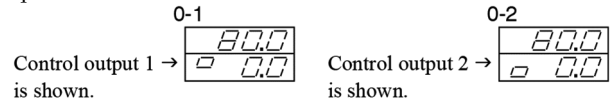
Change to manual control mode

On a display screen of control output intended to be changed (0-1 or 0-2), press the ENT key for 3 seconds continuously. The MAN lamp flashes and it is changed to the manual mode to allow you to set a control output value by means of the ▽ or △ key. Likewise, the manual control output mode is switched to the ordinary automatic mode by continuously switching the ⒺⓃⓉ key for 3 seconds. Then the MAN lamp goes out.

- Rules applied to manual control
1. Manual control action and output value are kept in memory even when power is turned OFF and is reapplied.
2. When the measuring range is changed, the manual control mode is cancelled and replaced by automatic control mode.
3. Upon switching auto to manual, balanceless and bumpless control is carried out. If the measured value is out of the proportional band at the time of mode switching, however, balanceless and bumpless control is not performed.
4. The control output range in the manual control mode is within a range defined by output limiter. (When P=OFF or during ON/OFF action, control is carried out with lower limit ▽ : % and higher limit △ 100.0%.
   Nevertheless, 100% output is displayed as follows on account of limited display space.

0-1   0-2
↑   ↑
Flashing Flashing
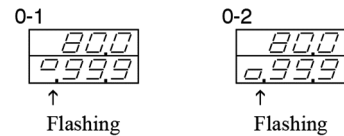
6. Suppleme

6-1. Measuring range list

Input type		Code	Measuring range	Code	Measuring range
Thermocouple	B *1	01	0 - 1800 °C	15	0 - 3300 °F
	R	02	0 - 1700 °C	16	0 - 3100 °F
	S	03	0 - 1700 °C	17	0 - 3100 °F
	K	04	-100.0 - 400.0 °C	18	-150 - 750 °F
	K	05	0.0 - 800.0 °C	19	0 - 1500 °F
	K	06	-200 - 1200 °C	20	-300 - 2200 °F
	E	07	0 - 700 °C	21	0 - 1300 °F
	J	08	0 - 600 °C	22	0 - 1100 °F
	T	09	-199.9 - 200.0 °C	23	-300 - 400 °F
	N	10	0 - 1300 °C	24	0 - 2300 °F
	PLII	11	0 - 1300 °C	25	0 - 2300 °F
	C(WRe5-26)	12	0 - 2300 °C	26	0 - 4200 °F
	U	13	-199.9 - 200.0 °C	27	-300 - 400 °F
	L	14	0 - 600 °C	28	0 - 1100 °F
	K *2			29	10.0 - 350.0 K
	AuFe-Cr *3			30	0.0 - 350.0 K
	K *2			31	10 - 350 K
	AuFe-Cr *3			32	0 - 350 K
R.T.D	Pt100	01	-200 - 600 °C	17	-300 - 1100 °F
		02	-100.0 - 100.0 °C	18	-150.0 - 200.0 °F
		03	-100.0 - 300.0 °C	19	-150 - 600 °F
		04	-50.0 - 50.0 °C	20	-50.0 - 120.0 °F
		05	*4 0.00 - 50.00 °C	21	0.0 - 120.0 °F
		06	0.0 - 100.0 °C	22	0.0 - 200.0 °F
		07	0.0 - 200.0 °C	23	0.0 - 400.0 °F
		08	0.0 - 500.0 °C	24	0 - 1000 °F
	JPt100	09	-200 - 500 °C	25	-300 - 1000 °F
		10	-100.0 - 100.0 °C	26	-150.0 - 200.0 °F
		11	-100.0 - 300.0 °C	27	-150 - 600 °F
		12	-50.0 - 50.0 °C	28	-50.0 - 120.0 °F
		13	*4 0.00 - 50.00 °C	29	0.0 - 120.0 °F
		14	0.0 - 100.0 °C	30	0.0 - 200.0 °F
		15	0.0 - 200.0 °C	31	0.0 - 400.0 °F
		16	0.0 - 500.0 °C	32	0 - 1000 °F

mV		Code	
	-10 - 10	01	The scaling function allows you to select any value within the following ranges:
	0 - 10	02	
	0 - 20	03	
	0 - 50	04	Scaling range: -1999 - 9999 digit
	10 - 50	05	Span: 10 - 5000 digit
	0 - 100	06	but lower limit side < higher limit side
V	-1 - 1	01	
	0 - 1	02	
	0 - 2	03	
	0 - 5	04	
	1 - 5	05	
	0 - 10	06	
mA	0 - 20	01	
	4 - 20	02	

*1 Thermocouple B: 400 °C and 750 °F or below is not covered by accuracy guarantee.

*2 Accuracy
10.0 - 30.0 K : ±(1.0 %FS + 1 digit)
30.0 - 70.0 K : ±(0.5 %FS + 1 digit)
70.0 - 350.0 K : ±(0.25 %FS + 1 digit)

*3 Accuracy
10.0 - 280.0 K : ±(0.25 %FS + 1 digit)
280.0 - 350.0 K : ±(0.5 %FS + 1 digit)

*4 Accuracy ±(0.3 ℃+1 digit)

Note: The following codes represent the respective factory-set measuring ranges

Input	Standard/rating	Code	Measuring range
Thermocouple	JIS K	05	0.0 - 800.0 °C
R.T.D.	JIS Pt100	07	0.0 - 200.0 °C
Voltage(mV)	0 - 10mV DC	02	0.0 - 100.0
Voltage(V)	1 - 5V DC	05	0.0 - 100.0
Current (mA)	4 - 20mA DC	02	0.0 - 100.0

Note: If you change a measuring range code, all measuring ranges related to data such as SV value, event set values, PID are initialized.

Note: When a type code of event, remote input or analog output is changed, all data related to it are initialized.

6-2. Event type list

Event type code	Event type	Setting range of event set value	Initial value of event set value
① A‗Hi	Higher limit absolute value	Within measuring range	Higher limit value of measuring range
② A‗Lo	Lower limit absolute value	Within measuring range	Lower limit value of measuring range
③ d‗Hi	Higher limit deviation value	-1999 - 9999 digit	2000 digit
④ d‗Lo	Lower limit deviation value	-1999 - 9999 digit	-1999 digit
⑤ d‗o	Out of higher and lower limit ranges	0 - 9999 digit	2000 digit
⑥ d‗i	Within higher and lower limit ranges	0 - 9999 digit	2000 digit
⑦ Sco	Scaleover	EV output continues when scaleover occurs.	
⑧ Hb	Heater break	Event output continues when heater break alarm is output.	
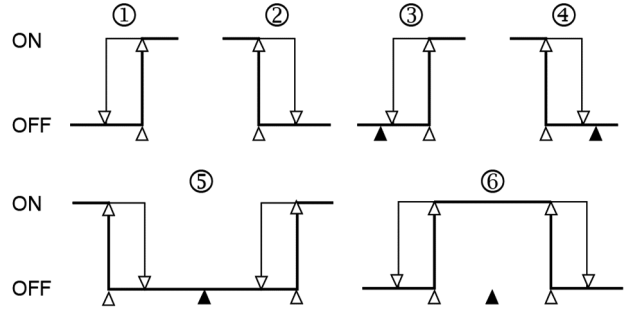
△ : Set value for action   ▲ : SV value

NOTE: Code 8 in the above table can be selected and set only when the instrument includes the heater break alarm option.

6-3. Event standby action

- In case an event output is used as an alarm, set "oFF," "1," "2," or "3."
- In case an event output is used as control output, set "4."
  If scaleover occurs on the event set value side, however, event output remains OFF during standby.
- When "1" has been set for event action, the standby action functions when:
  1. power is applied.
- When "2" has been set for standby action, the standby action functions when:
  1. power is applied;
  2. STBY→ EXE;
- When "3" has been set for standby action, the standby action functions when:
  1. power is applied;
  2. STBY→ EXE;
  3. SV is changed where standby set value is a deviation value. (Except during remote input, though.)
- When the standby action setting is changed to "oFF" or "4" while standby is in action, the standby action is cancelled immediately.
- If, upon applying power, PV value is out of the range in which event action is ON, standby action becomes void even when "1," "2," or "3" has been set for it.

6-4. Event delay time

- If a factor which has turned event action ON disappears, the event will not be output and delay time measurement is aborted.
- If a factor to turn event action ON arises and delay time is changed within the setting range of delay time, the time starting from the occurrence of the factor to activate the event (i.e., a total time) works as the delay time.

6-5. Set value Function

- The Expert PID implements an overshoot suppression feature, which is called "SF," Set value Function. If a greater value is set to SF, the suppression feature is intensified, while if a smaller value is set, the feature is weakened.

6-6. 2-output characteristics
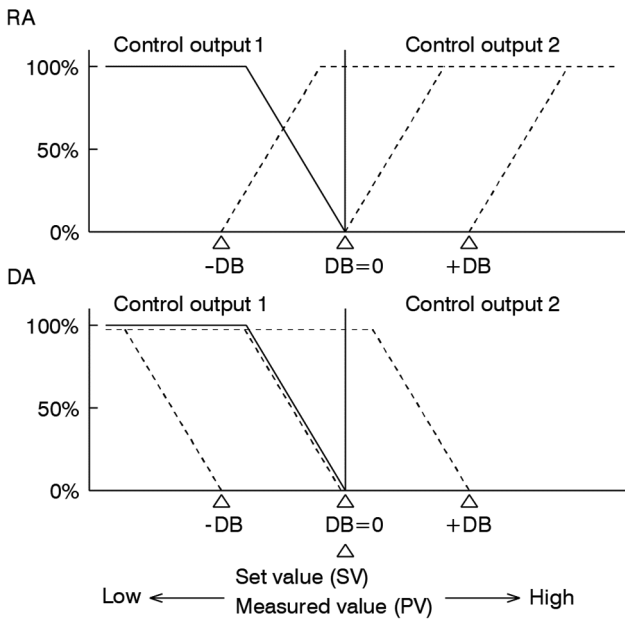
6-7. Error messages

If a problem arises in the controller, one of the following error messages will be displayed on the screen.

(1) Problems with measured input (shown on PV display)

`ScHH` Indicates thermocouple break, R.T.D.A break, or PV value being about 10% on the high side of higher limit of measuring range.

`ScLL` Indicates PV value being about 10% on the low side of lower limit of measuring range due to inverse polarity of input wiring.

`CJHH` Indicates that Reference contact (CJ) defects to higher side for thermocouple input.

`CJLL` Indicates that Reference contact (CJ) defects to lower side for thermocouple input.

`b - - -` Indicates break of B (middle) or multiple break of A.B.B. for R.T.D. input.

`c - - -` Indicates break of B (bottom) for R.T.D. input.

(2) Problems with remote input (shown on SV display)

`rEHH` Indicates that remote input value has exceeded higher limit of remote scale (+110%FS).

`rELL` Indicates that remote input value has fallen below lower limit of remote scale (-10%FS).

(3) Problems with heater break alarm (shown on SV display)

`HbHH` Indicates that CT input value has exceeded 55A.

`HbLL` (Indicates that CT input value has fallen below -5A.)

> NOTE: If a problem arises and its cause appears to lay inside the instrument, please call our representative or sales office.

7. Specifications

■ DISPLAY

• LED display	:	Measured value (PV) display/ 7-segment red LED 4 digits Set value (SV) display / 7-segment green LED 4 digits
Display accuracy	:	Within measuring range ± (0.25% FS + 1 digit)
Range in which display accuracy is maintained	:	23°C ± 5°C
Display resolution	:	Depends on measuring range (0.001, 0.01, 0.1, 1)
Sampling cycle	:	250 msec. (0.25 sec.)
• Action display/color	:	11 types, LED lamp display

Control output	:	(OUT1, 2)/green
Event action	:	(EV1, 2, 3)/orange
Auto tuning action	:	(AT)/green
Manual control action	:	(MAN)/green
Set value bias action	:	(SV2/SB)/green
Remote action	:	(REM)/green
Standby action	:	(STBY)/green
Communication status	:	(COM/RUN)/green

■ SETTING

Setting method	:	By front key switch operation
Setting range	:	Same as measuring range (within setting limiter)
Setting limiter	:	Higher and lower limits separate setting; free within measuring range (Lower limit < higher limit)
Set value resolution	:	Depends on range and scaling, (0.001, 0.01, 0.1, 1)
Setting key type	:	6 types - PARA (parameter selection), UP, DOWN, AT, ENT and DISP keys
• Ramp control upon reaching set value	:	Ascending/descending ramp control
Ramp setting range	:	OFF, 1 - 9999 digit
Ramp unit time	:	/sec, /min switching by front key operation and communication
Ramp rate	:	×1, ×0.1 switching by front key operation and communication

■ INPUT

• Thermocouple	:	B, R, S, K, E, J, T, N, PL II, C(WRe5-26), {L, U (DIN43710)}K, AuFe-Cr, Kelvin digit input
Allowable external resistance range	:	100Ω maximum
Input impedance	:	500kΩ minimum
Burnout function	:	Standard feature (up scale)
Cold junction temperature compensation accuracy	:	± 2°C (within a range from 5 to 45°C)
• R.T.D.	:	Pt100 / JPt100
Amperage	:	About 0.25 mA
Allowable range of lead wire resistance	:	5Ω maximum / wire
• Voltage (multiple input)	:	-10 - 10, 0 - 10, 0 - 20, 0 - 50, 10 - 50, 0 -100mV DC, or -1 - 1, 0 - 1, 0 - 2, 0 - 5, 1 -5, 0 - 10V DC
Input impedance	:	500kΩ minimum
• Current	:	0 - 20mA, 4 - 20mA DC
Receiving impedance	:	250Ω
• Sampling cycle	:	250 msec. (0.25 sec.)
• PV bias	:	-1999 - 1999 digit
• PV gain	:	- 19.99 - 19.99%
• PV filter	:	OFF, 1 - 100 sec.
• Reference contact compensation switching	:	INT (internal) / EXT (external) switching by front key operation
• Isolation	:	Insulated from various outputs (not insulated from system, DI (external switching input) and CT input)

■ CONTROL (SR82: 1 output only)
• Control system　　　　:
　　One output operation: Expert PID control with auto tuning function
　　RA (reverse characteristics)
　　　　　　　　　: Heating action
　　DA (due characteristics)
　　　　　　　　　: Cooling action Two output operation (option)
　　　　　　　　　: Expert PID + PID (control outputs 1 and 2 individually in action) control with auto tuning function
　　RA (reverse characteristics)
　　　　　　　　　: Heating action (output 1 side)
　　　　　　　　　　and cooling (output 2 side)
　　DA (due characteristics)
　　　　　　　　　: 2-stage heating action (by both of control outputs 1 and 2)

• PID(Control outputs 1 and 2 individually)
　Control output 1　　　　:
　　Proportional band (P): OFF, 0.1 - 999.9% (OFF=ON / OFF action)
　　Integral time (I)　　: OFF, 1 - 6000 sec. (OFF= with manual reset)
　　Derivative time (D)　: OFF, 0 - 3600 sec.
　　Manual reset　　　　: -50.0 to +50.0% (valid when I=OFF)
　　ON/OFF hysteresis　: 1 - 1000 digit (valid during ON / OFF action)
　Control output 2 (only when two output option is added):
　　Proportional band (P): OFF, 0.1 - 999.9% (OFF=ON / OFF action)
　　Integral time (I)　　: OFF, 1 - 6000 sec.
　　Derivative time (D)　: OFF, 0 - 3600 sec.
　　ON/OFF hysteresis　: 1 - 1000 digit (valid during ON / OFF action)
　　Dead band　　　　: -1999 - 5000 digit
　　　　　　　　　　Separate setting for SB / SV2 is possible.
　　　　　　　　　　Setting range is the same as the one listed above.
• Proportional cycle　　: (for contact and SSR drive voltage output)
　　Control output 1　: 1 - 120 sec.
　　Control output 2　: 1 - 120 sec.
• AT point setting　　　: 0 - 5000 digit
• Control output characteristics
　　　　　　　　　: RA (reverse characteristics) / DA (due characteristics)
　　　　　　　　　　Switchable by front key operation or DI (external switching input) through communication.
• Higher and lower limit output limiter
(individually for control outputs 1 and 2):
　　Lower limit side　: 0.0 - 99.9%,
　　Higher limit side　: 0.1 - 100.0% on condition that lower limit value < higher limit value.
　　　　　　　　　　Separate setting for SB / SV2 is possible.
　　　　　　　　　　Setting range is the same as the one listed above.
• Control output at time of error
(individually for control outputs 1 and 2)
　　　　　　　　　: 0.0 - 100.0%
• Control output type / rating
(common to control outputs 1 and 2):
　　Contact (Y)　　　: 240V AC 2.5A / resistive load
　　SSR drive voltage (P): 12V ±1.5V DC, load current 30mA maximum
　　Current (I)　　　: 4 - 20mA DC, load resistance 600Ω maximum.
　　Voltage (V)　　　: 0 - 10V DC, load current 2mA maximum
• Output resolution
　　Control output 1　: About 0.0125% (1 / 8000)
　　Control output 2　: About 0.5% (1 / 200)
• Sampling cycle　　　: 250 msec. (0.25 sec.)
• Manual control
　　Manual switching　: Front key operation or DI (external switching input) through communication
　　Manual control output
　　　　　　　　　: 0.0 - 100.0% (out of output limiter range possible)

Setting resolution　　　: 0.1%
Manual automatic control
　　　　　　　　　: Balance less bump less (within proportional band, though)
• Isolation　　　　: Insulated between control output and system and Various inputs (not insulated between control output of current, voltage or SSR and analog output)

■ EVENT OUTPUT (optional)
• Number of event outputs
　　　　　　　　　: SR82 - 2
　　　　　　　　　　SR83 - 3 (2 when 2 output option is added)
　　　　　　　　　　SR84 - 3 (2 when communication option, analog output option and/or 2 output option are added)
　　　　　　　　　　(In case of 2 event outputs, EV2 and EV3 are common output with OR.)
• Event type　　　: Selectable from 8 types (7 types when heater break alarm option is not added)
　　A_Hi　: Higher limit absolute value alarm
　　A_Lo　: Lower limit absolute value alarm
　　D_Hi　: Higher limit deviation value alarm
　　D_Lo　: Lower limit deviation value alarm
　　D_i　: Higher / lower limit deviation value alarm (within range)
　　D_o　: Higher/lower limit deviation value alarm (out of range)
　　Sco　: Scaleover (input trouble alarm)
　　Hb　: Hearer break alarm (selectable only when heater break alarm option is added)
• Event setting range　: Deviation value alarm
　　　　　　　　　　Higher limit alarm　　: -1999 - 9999 digit
　　　　　　　　　　Lower limit alarm　　: -1999 - 9999 digit
　　　　　　　　　　Higher/lower limit alarm: 0 - 9999 digit
　　　　　　　　　　Absolute value alarm Both higher and lower limits : Within measuring range
　Event setting system : By front key operation
• Event action　　　: ON/OFF action
• Event hysteresis　　: 1 - 1000 digit
• Standby/non standby action
　　　　　　　　　: Selectable from 5 types
　　　　　　　　　　Alarm action without standby
　　　　　　　　　　Alarm action with standby (When power is ON)
　　　　　　　　　　Alarm action with standby (When power is ON, when standby is switched to execution)
　　　　　　　　　　Alarm action with standby (When power is ON, when standby is switched to execution, including the time when SV is changed)
　　　　　　　　　　Control action
• Event action delay　: OFF, 1 - 9999 sec.
• Event output/rating　: Contact 240V AC 1.0A (resistive load)
• Output updating cycle : 250 msec. (0.25 sec.)

■ ANALOG OUTPUT
(optional, not selectable together with communication type (1) and (2))
• The number of analog output
　　　　　　　　　: 1
• Output signal　　　: Selectable from 5 types (3 types for instrument with one output)
　　PV　: Measured value
　　SV　: Set value
　　DEV　: Bias output
　　OUT 1　: Control output 1
　　OUT 2　: Control output 2(selectable only when 2 output option is added)
• Output type/rating　: 0 - 10 mV DC/FS Output impedance: 10 Ω
　　　　　　　　　　0 - 10 V DC/FS Load current: 2mA maximum
　　　　　　　　　　4 - 20 mA DC/FS Load resistance
　　　　　　　　　: 300 Ω maximum

- Output scaling :
  - PV/SV : Within measuring range(inverted scaling possible)
  - OUT1/OUT2 : 0.0-100.0%(inverted scaling possible)
  - DEV : -100.0 - 100.0% (inverted scaling possible) on condition that Ao_L Ao_H
- Output accuracy : ±0.25% FS (to displayed value)
- Output resolution : 0.01% FS (1/10000)
- Output updating cycle : 250 msec. (0.25 sec.)
- Isolation : Insulated from system and various inputs (not insulated from control outputs I, P and V)

■ HEATER BREAK ALARM
(optional, not selectable together with REM input)
- Current capacity : 30A or 50A CT to be specified when order is placed.
- Alarm action : Heater amperage detected by external CT (CT attached).
  Alarm output ON upon detection of heater break while control output is ON.
  Alarm output ON upon detection of heater loop alarm while control output is OFF.
- Current setting range : 0.1 - 50.0A (Alarm action stops when OFF is set.)
- Setting resolution : 0.1A
- Current display : 0.0 - 55.0A
- Display accuracy : Approx. 3% FS(for 50Hz / 60Hz sine wave)
- Minimum time for action confirmation
  : ON (OFF) time 500 msec. min
- Alarm output/rating : Contact 240V AC 1.0A (resistive load)
- Alarm action display : "Event" lamp lights during action.
- Alarm holding mode : Switchable between holding and not holding on the setting screen.
- Sampling time : 500 msec. (0.5 sec.)
- Isolation : Insulated between CT input and various outputs (not insulated from system and other inputs)

■ REMOTE
(optional, not selectable together with heater break alarm)
- Remote setting : By external analog signal
  Switching to remote : By key, communication and DI (external switching)
  input (valid only when DI option is added)
  Remote / local switching function by remote signal
- Remote switching point : OFF, 0.1 - 50.0%
- Remote switching hysteresis
  : 0.1 - 10.0%
- Remote scaling : Within measuring range (inverted scaling possible)
  Accuracy of setting : ±(0.25% SF + 1 digit)
  Setting signal : 0 - 10V, 1 - 5V DC
  Input impedance: 500kΩ
  4 - 20mA DC Receiving impedance: 250Ω
- Remote bias : -1999 - 1999 digit
- Remote filter : OFF, 1 - 100 sec.
- Sampling cycle :500 msec. (0.5 sec.)
- Isolation :Insulated between remote input and various outputs (not insulated from system and various inputs)

■ COMMUNICATION
(optional, not selectable together with analog output for SR82 and SR84)
- Communication type (1) : RS-232C, RS-485
- Communication system : RS-232C 3-line half duplex system
  RS-485 2-line half duplex multiple drop (bus) system
- Synchronization system : Start-stop synchronization system
- Communication distance
  : RS-232C maximum 15m
  RS-485 maximum 500m
  (depending on conditions)

- Communication speed : 1200, 2400, 4800, 9600, 19200 bps
- Data bit length : 7 bits, even parity, stop bit 1
  7 bits, even parity, stop bit 2
  7 bits, no parity, stop bit 1
  7 bits, no parity, stop bit 2
  8 bits, even parity, stop bit 1
  8 bits, even parity, stop bit 2
  8 bits, no parity, stop bit 1
  8 bits, no parity, stop bit 2
- Communication address: 1 - 99
- Communication memory mode
  : EEP/RAM/r_E
- Communication BCC : Add/Add two's cmp / XOR / None
- Communication delay time
  : OFF, 1 - 100
- Communication code : ASCII code
- Communication protocol
  : Shimaden standard protocol
- The number of instruments allowed to be connected
  : RS-232C 1
  RS-485 32 maximum
  (depending on conditions; host included)
- Isolation : Insulated between communication signal and various inputs / system / various outputs
- Communication type (2)
  : Conforming with Mitsubishi Electric Company's CC-Link
  (only for SR83, simultaneous selection of analog output is not possible)
- Transmission speed : 156K, 625K, 2.5M, 5M, 10Mbps
- Private station : 1
- Communication method
  : Polling method
- Synchronization method
  : Frame synchronous method
- Coding system : NRZI system
- Transmission line : Bus (RS-485)
- Transmission format : Conforming with HDLC

■ DI (EXTERNAL SWITCHING) INPUT (optional)
*DI stands for "Digital Input."
- Number of DI point : 2
- DI input type : Selectable from 8 types
  (7 types if the remote option is not added.)
  NOP : No operation
  STB : Execution/standby
  SB/SV2 : Set value bias/set value 2
  AT : Auto tuning
  MAN : Manual
  STP : Ramp temporary stop
  DA : Direct action
  REM : Remote (selectable only when remote option is added)
- DI input rating : No-voltage contact, open collector input (about 5V/2mA impress)
- Isolation : Insulated between DI input and various outputs (not insulated from system and various inputs)

■SET VALUE 2 (SV2)/Set Value Bias (SB) (optional)
(DI option is prerequisite.)
- Action input : No-voltage contact by SB/SV2 selection through DI (external switching) input (in action duringclosed input)
- Selection of setting : Absolute value setting (SV2)
  Deviation value setting (SB)
- Setting range :
  Absolute value setting : Within measuring range
  Deviation value setting : -1999 - 5000 digit
  SV2 allows PID and output limit to be set.

■ OTHERS

- Data storage : By non-volatile memory (EEPROM)
- Ambient temperate / humidity ranges for use
  : -10 - +50℃ /below 90% RH
  (on condition that there is no dew
  condensation)
- Temperature for storage
  : Between-20 and +65℃
- Over voltage category : ll
- Elevation : Max. 2000 m
- Pollution class : 2 (IEC 60664)
- Temperature range for maintaining accuracy
  : 23±5℃
- Power voltage : 100V-240V AC±10% (50/60 Hz),
  24V AC±10% (50/ 60Hz),
  24V DC±10%.
  (One of the above to be specified)
- Power consumption : 15VA maximum
- Input noise removal ratio
  : Normal mode 60 dB minimum (50/60 Hz)
  Common mode 140 dB minimum (50/60 Hz)
- Applicable standards :
  Safety : IEC61010-1 , EN61010-1
  IEC61010-2-030 , EN61010-2-030
  EMC : EN61326-1
- Insulation resistance :
  Between input / output terminals and power terminal
  : 500V DC 20MΩ minimum
  Between input/output terminals and protective conductor terminal
  : 500V DC 20MΩ minimum
- Dielectric strength : 1 minute at 3000V AC between input/output
  terminals and power terminal
  1 minute at 1500V AC between power
  terminal and protective conductor terminal
- Protective structure : Only front panel has simple dustproof and drip
  -proof structure (equivalent to IP66)
  (Panel thickness :1.2-3.2mm)
- Material of case : PPE resin molding (equivalent to UL94V-1)
- External dimensions : SR82:H72 × W72 × D111mm
  (Inside depth of panel: 100mm)
  SR83:H96 × W96 × D111mm
  (Inside depth of panel: 100mm)
  SR84:H96 × W48 × D111mm
  (Inside depth of panel: 100mm)
- Mounting : Push-in panel (one-touch mount)
- Applicable panel thickness
  : 1.0 - 4.0 mm
- Panel cutout size
  SR82: H68 × W68mm
  SR83: H92 × W92mm
  SR84: H92 × W45mm
- Weight
  SR82: 300g
  SR83: 420g
  SR84: 280g