

4. PARTS DESCRIPTION

Set value (SV) display [Orange]
Displays SV or STEP set value (SV1, SV2).
Displays various parameter set values.

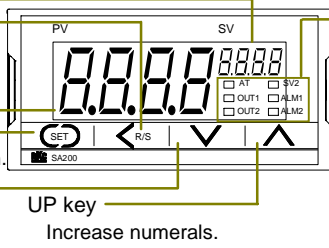
Measured value (PV) display [Green]
Displays PV or various parameter symbols.

Shift & R/S key
Shifts digits when settings are changed.
Selects the RUN/STOP function.

Set key
Used for parameter calling up and set value registration.

DOWN key
Decrease numerals.

UP key
Increase numerals.



Indication lamps

Autotuning (AT) lamp [Green]
Flashes during autotuning execution.

Output lamps (OUT1, OUT2) [Green]

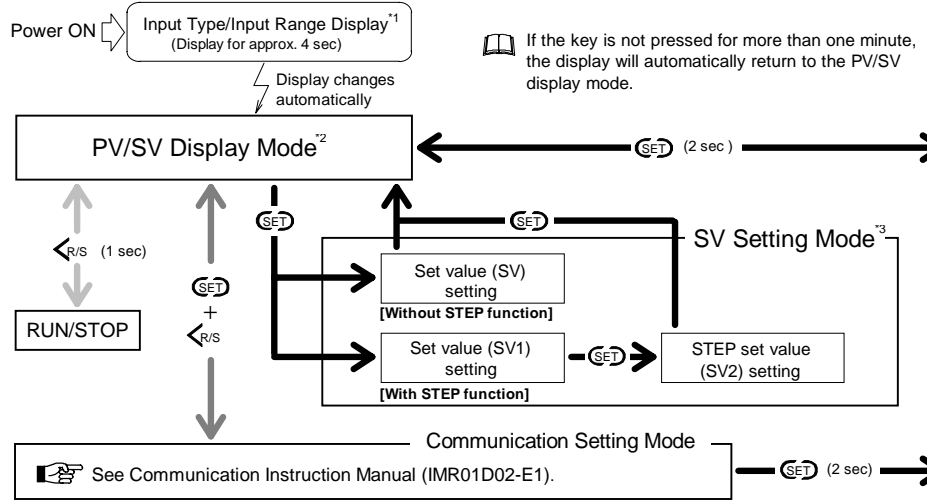
OUT1: Lights when output1 is turned on.
OUT2: Lights when output2 is turned on.

STEP set value (SV2) lamp [Orange]
Lights when the SV2 of STEP function is selected.

Alarm lamps (ALM1, ALM2) [Orange]
ALM1: Lights when alarm1 is turned on.
ALM2: Lights when alarm2 is turned on.

To avoid damage to the instrument, never use a sharp object to press keys.

5. SETTING



1 Input type/Input Range Display
Input type: Thermocouple K Input range: 0 to 1372°C
Symbol: Input range high: 1372
Input type symbol (See Table) Input range low: 0
Engineering unit (Voltage/current input: No display)

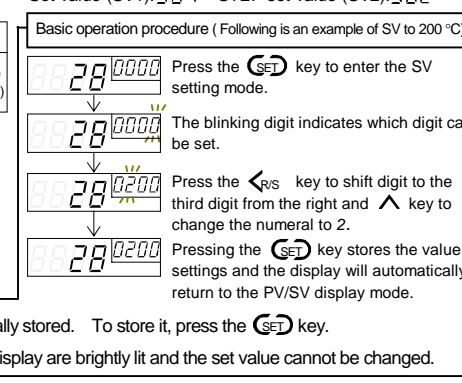
Input Type Symbol Table

SYMBOL	INPUT TYPE	Thermocouple (TC)	RTD	Voltage (Current)
K	K	J	R	S
B	B	E	F	P
U	U	L	Pt	Pt
V	V	U	L	Pt
P	P	U	L	Pt
H	H	U	L	Pt

2 PV/SV Display Mode
The controller will display the measured value (PV) and the set value (SV).
If the STEP function is provided, the SV display will show the set value (SV1) or STEP set value (SV2) depending on whether the contact input is opened or closed.
The controller can be switched to RUN or STOP mode.

When the set value is changed, it is not automatically stored. To store it, press the SET key.
When the set data is locked, the digits on the SV display are brightly lit and the set value cannot be changed.

3 SV Setting Mode
The blinking digit on the SV display indicates which digit can be set.
Setting range: Within input range
Factory set value: Temperature input 0 (0.0) °C[°F], Voltage/current inputs 0.0 %
If the STEP function is provided, the following parameter symbols are displayed on the PV.
Set value (SV1): 581 STEP set value (SV2): 582



Parameter Setting Mode

(A) Return to first parameter setting item

LbA Control loop break alarm (LBA)
Setting range: 0.0 to 200.0 min.
Factory set value: 8.0 min.

Lbd LBA deadband (LBD)
Setting range: 0 to span
Factory set value: Temp. input 0 (0.0) °C[°F], Voltage/current inputs 0.0 %

AL1 Alarm 1 (ALM1)
Setting range: Process alarm, SV alarm: Same as input range
Deviation alarm: -span to +span
Factory set value: Temp. input 50 (50.0) °C[°F], Voltage/current inputs 5.0 %

AL2 Alarm 2 (ALM2)
Setting range: Process alarm, SV alarm: Same as input range
Deviation alarm: -span to +span
Factory set value: Temp. input 50 (50.0) °C[°F], Voltage/current inputs 5.0 %

ATU Autotuning (AT)
Setting range: or: AT start or execution off: AT end or cancel
Factory set value: off

STU Self-tuning (ST)
Setting range: or: Self-tuning ON off: Self-tuning OFF
Factory set value: off

P Heat-side proportional band (P)
Setting range: 0 to span
ON/OFF action control when set to 0 (0.0).
Factory set value: Temp. input 30 (30.0) °C[°F], Voltage/current inputs 3.0 %

I Integral time (I)
Setting range: 0 to 3600 sec
(0 sec: Integral action OFF)
Factory set value: 240 sec

D Derivative time (D)
Setting range: 0 to 3600 sec
(0 sec: Derivative action OFF)
Factory set value: 60 sec

Ar Anti-reset windup (ARW)
Setting range: 0 to 100 % of heat-side proportional band (0 %: Integral action OFF)
Factory set value: 100 %

T Heat-side proportioning cycle time (T)
Setting range: 1 to 100 sec (0 can not be set.)
Factory set value: 20 sec

Pc Cool-side proportional band (Pc)
Setting range: 0 to 1000 % of heat-side proportional band (0 can not be set.)
Factory set value: 100 %

db Overlap/Deadband (db)
Setting range: -span to +span
Factory set value: Temp. input 0 (0.0) °C[°F], Voltage/current inputs 0.0 %

t Cool-side proportioning cycle time (t)
Setting range: 1 to 100 sec (0 can not be set.)
Factory set value: 20 sec

Pb PV bias (Pb)
Setting range: -span to +span
Factory set value: Temp. input 0 (0.0) °C[°F], Voltage/current inputs 0.0 %

df Digital filter (dF)
Setting range: 0 to 100 sec
(0 sec: Digital filter OFF)
Factory set value: 0 sec

LCK Set data lock (LCK)
Setting range: 0 (Unlock) 1 (Lock)
Factory set value: 0000 See Lock Level Table

Lock Level Table

Setting	Lock level
0000	SV and all parameter can be set.
0001	Only SV and alarms can be set.
0010	Only setting items other than alarms can be set.
0100	Only setting items other than SV can be set.
0011	Only SV can be set.
0101	Only alarms can be set.
0110	Only setting items other than SV and alarms can be set.
0111	SV and all parameter cannot be set.

Some parameter symbols may not be displayed depending on the specification.

6. OPERATION

6.1 Operating Precautions

- All mounting and wiring must be completed before the power is turned on.
- Connect the input signal wiring and turn the power on. If the input signal wiring is not complete prior to turning the power on, the instrument determines that burnout has occurred.
- The settings for the SV and all parameters should be appropriate for the controlled object.
- A power supply switch is not furnished with this instrument. It is ready to operate as soon as the power is turned on. [Factory set value: RUN (operation start)]
- A power failure of 20 ms or less will not affect the control action. When a power failure of more than 20 ms occurs, the instrument assumes that the power has been turned off. When power returns, the controller will retain the conditions that existed prior to shut down.
- The alarm hold action is activated when the power is turned on or the SV is changed, including an SV change made with the STEP function.

6.2 RUN/STOP

RUN/STOP can be selected by key operation or by open or closed contact input (option).

Conditions when changed to STOP mode

Control, Alarm: Control OFF, Alarm OFF
Output: OUT1 output OFF (OPEN), OUT2 output OFF (OPEN)
Autotuning (AT): AT canceled (The PID constants are not updated)

Display when changed to STOP mode

RUN/STOP mode	RUN/STOP Mode with Contact Input ¹	
	With Key Operation	With Contact Input
RUN Mode	RUN	STOP (dSFP) ²
STOP Mode	STOP (L5FP) ²	STOP (SFP) ²

¹Contact input: Terminal No.10, 12

²Characters in parentheses are those shown on the PV display.

dSFP: Only contact input is in the STOP mode L5FP: Only key operation is in the STOP mode SFP: Both key operation and contact input are in the STOP mode

7. FUNCTIONS

7.1 STEP (option)

The instrument has two set values (SV). This STEP function selects these two set values (SV) by contact input (Terminal No.10, 11).

Contact open: Set value (SV1) Contact closed: STEP set value (SV2)

7.2 Set Data Lock (LCK)

The set data lock function permits locking of critical parameters and prevents unauthorized personnel from changing parameters.

7.3 Autotuning (AT)

The AT function automatically measures, computes and sets the optimum PID and LBA constants.

Requirements for AT start

- Start AT when all the following conditions are satisfied:
- Prior to starting the AT, end all the parameter settings other than PID and LBA.
- Confirm that the LCK function has not been engaged.

Requirements for AT cancellation

The AT is canceled if any of the following conditions exist:

- When the SV (SV1, SV2) is changed.
- When a power failure longer than 20 ms occurs.
- When the power is turned off.
- When the PV bias value is changed.
- When the RUN/STOP is changed to the STOP mode.
- When the AT does not end in nine hours after autotuning started.
- When the PV becomes abnormal when burnout occurs.

If the AT is canceled, the controller immediately changes to PID control. The PID and LBA constants will be the same as before AT was activated.

When AT is completed, the controller immediately changes to PID control. If the control system does not allow the AT cycling process, do not use AT and set each PID constant to meet the needs of the application.

7.4 Self-tuning (ST)

The ST function is used to automatically calculate and set adaptive PID constants anytime the power is turned on, the SV is changed or the controller detects unstable control conditions.

The ST function should be turned off when the controlled system is affected by ripples that occurs due to periodic external disturbances.

The power to the controlled system must be turned on before the power to the instrument is turned on or SV is changed. This is required when ST function is on.

To activate the ST function, the following parameters must not be set to zero: P≠0, I≠0, D≠0, ARW≠0.

When the heat/cool PID action is selected, the ST function can not be activated.

When the AT function is activated, the ST function can not be turned on.

When the ST function is activated, the PID and ARW settings cannot be changed, only monitored.

7.5 Control Loop Break Alarm (LBA)

The LBA function is activated when control output reaches 0% or 100%. The time required for the LBA output to turn on includes both the time from the initial occurrence of loop failure and the LBA setting time. We recommend that the set value of LBA be twice the value of the integral time (I).

When AT function is turned on, the LBA function can not be activated.

If LBA setting time does not match the controlled object requirements, the LBA will malfunction by turning on or off at inappropriate times or not turning on at all.

7.6 Alarms (ALM)

Alarm Action: (▲: SV ▲: Alarm set value)

¹ Alarm status where the alarm set value is set to plus.
² Alarm status where the alarm set value is set to minus.
Alarm differential gap: Temperature input 2 (2.0) °C[°F] Voltage/current inputs 2.0 %

The alarm outputs are assigned to OUT1/OUT2.

8. ERROR DISPLAYS

Error display

Display	Description	Solution
Err	The error codes are shown in the SV display. When two or more errors occur simultaneously, the error code numbers are totaled and displayed as one number.	Turn off the power once. If an error occurs after the power is turned on again, contact your nearest RKC sales office or agent.

Over-scale and Under-scale

Display	Description	Solution
Measured value (PV) is flashing	PV is outside of input range.	To prevent electric shock, always turn off the power before replacing the sensor. Check the sensor or input lead
oooo flashing	Over-scale - PV is above the high input display range limit.	
uuuu flashing	Under-scale - PV is below the low input display range limit.	

9. INPUT RANGE TABLE

TC/RTD

Type	Range	Code	Range	Code	Range	Code
K	0 to 200 °C	K : 01	0 to 400 °C	K : 02	0 to 600 °C	K : 03
	0 to 800 °C	K : 04	0 to 1000 °C	K : 05	0 to 1200 °C	K : 06
	0 to 1372 °C	K : 07	-199.9 to +300.0 °C	K : 08	0.0 to 400.0 °C	K : 09
	0.0 to 800.0 °C	K : 10	0 to 100 °C	K : 13	0 to 300 °C	K : 14
	0 to 450 °C	K : 17	0 to 500 °C	K : 20	0.0 to 200.0 °C	K : 29
	0.0 to 600.0 °C	K : 37	-199.9 to +800.0 °C	K : 38	0.0 to 800.0 °C	K : A1
	0 to 1600 °F	K : A2	0 to 2502 °F	K : A3	0.0 to 800.0 °F	K : A4
	20 to 70 °F	K : A9	-199.9 to +999.9 °F	K : B2		
	0 to 200 °C	J : 01	0 to 400 °C	J : 02	0 to 600 °C	J : 03
	0 to 800 °C	J : 04	0 to 1000 °C	J : 05	0 to 1200 °C	J : 06
0 to 1372 °C	J : 07	-199.9 to +300.0 °C	J : 08	0.0 to 400.0 °C	J : 09	
0 to 450 °C	J : 10	0 to 200.0 °C	J : 22	0.0 to 600.0 °C	J : 23	
-199.9 to +600.0 °C	J : 30	0 to 800 °F	J : A1	0 to 1600 °F	J : A2	
0 to 2192 °F	J : A3	0 to 400 °F	J : A6	-199.9 to +999.9 °F	J : A9	
0.0 to 800.0 °F	J : B6					
0 to 1600 °C	R : 01	0 to 1769 °C	R : 02	0 to 1350 °C	R : 04	
0 to 3200 °F	R : A1	0 to 3216 °F	R : A2			
0 to 1600 °C	S : 01	0 to 1769 °C	S : 02			
0 to 3200 °F	S : A1	0 to 3216 °F	S : A2			
400 to 1800 °C	B : 01	0 to 1820 °C	B : 02			
800 to 3200 °F	B : A1	0 to 3308 °F	B : A2			
0 to 800 °C	E : 01	0 to 1000 °C	E : 02			
0 to 1600 °F	E : A1	0 to 1832 °F	E : A2			
0 to 1200 °C	N : 01	0 to 1300 °C	N : 02	0.0 to 800.0 °C	N : 06	
0 to 2300 °F	N : A1	0 to 2372 °F	N : A2	0.0 to 999.9 °F	N : A5	
-199.9 to +400.0 °C *2	T : 01	-199.9 to +100.0 °C *2	T : 02	-100.0 to +200.0 °C	T : 03	
0.0 to 350.0 °C	T : 04	-199.9 to +752.0 °F *2	T : A1	-100.0 to +200.0 °F	T : A2	
-100.0 to +400.0 °F	T : A3	0.0 to 450.0 °F	T : A4	0.0 to 752.0 °F	T : A5	
0 to 2000 °C	W : 01	0 to 2320 °C	W : 02	0 to 4000 °F	W : A1	
0 to 1300 °C	A : 01	0 to 1390 °C	A : 02	0 to 1200 °C	A : 03	
0 to 2400 °F	A : A1	0 to 2534 °F	A : A2			
-199.9 to +600.0 °C *2	U : 01	-199.9 to +100.0 °C *2	U : 02	0.0 to 400.0 °C	U : 03	
-199.9 to +999.9 °F *2	U : A1	-100.0 to +200.0 °F	U : A2	0.0 to 999.9 °F	U : A3	
0 to 400 °C	L : 01	0 to 800 °C	L : 02			
0 to 800 °F	L : A1	0 to 1600 °F	L : A2			
-199.9 to +649.0 °C	D : 01	-199.9 to +200.0 °C	D : 02	-100.0 to +50.0 °C	D : 03	
-100.0 to +100.0 °C	D : 04	-100.0 to +200.0 °C	D : 05	0.0 to +50.0 °C	D : 06	
0.0 to 100.0 °C	D : 07	0 to 200.0 °C	D : 08	0.0 to 300.0 °C	D : 09	
0.0 to 500.0 °C	D : 10					
-199.9 to +999.9 °F	D : A1	-199.9 to +400.0 °F	D : A2	-199.9 to +200.0 °F	D : A3	
-199.9 to +100.0 °F	D : A4	-199.9 to +300.0 °F	D : A5	0.0 to 100.0 °F	D : A6	
0.0 to 200.0 °F	D : A7	0.0 to 400.0 °F	D : A8	0.0 to 500.0 °F	D : A9	
-199.9 to +649.0 °C	P : 01	-199.9 to +200.0 °C	P : 02	-100.0 to +50.0 °C	P : 03	
-100.0 to +100.0 °C	P : 04	-100.0 to +200.0 °C	P : 05	0.0 to +50.0 °C	P : 06	
0.0 to 100.0 °C	P : 07	0.0 to 200.0 °C	P : 08	0.0 to 300.0 °C	P : 09	
0.0 to 500.0 °C	P : 10					

*1 Accuracy is not guaranteed between 0 to 399 °C (0 to 751 °F).

*2 Accuracy is not guaranteed between -199.9 to 100.0 °C (-199.9 to 148 °F).

Voltage/current inputs

Type	Range	Code	Type	Range	Code
0 to 5 V DC	0.0 to 100.0	4 : 01	0 to 20 mA DC	0.0 to 100.0	7 : 01
0 to 10 V DC	0.0 to 100.0	5 : 01	4 to 20 mA DC	0.0 to 100.0	8 : 01
1 to 5 V DC	0.0 to 100.0	6 : 01			

10. REMOVING THE INTERNAL ASSEMBLY

- WARNING**
- To prevent electric shock or instrument failure, only qualified personnel should be allowed to remove the internal assembly.
 - To prevent electric shock or instrument failure, the power must be turned off before removing internal assembly.
 - To prevent injury or instrument failure, do not touch the printed wiring boards when removing the internal assembly.

