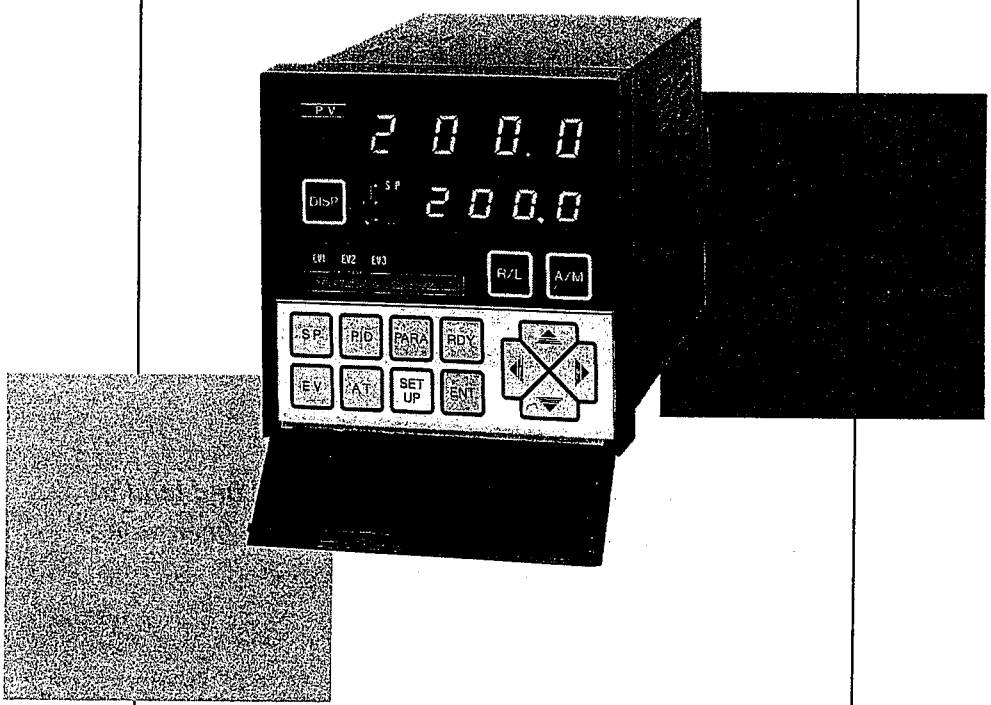
YAMATAKE

No. CP-UM-1206E

DIGITRONIK
Digital Indicating Controller
SDC200

User's Manual



Yamatake Corporation

RESTRICTIONS ON USE

When using this product in applications that require particular safety or when using this product in important facilities, pay attention to the safety of the overall system and equipment. For example, install fail-safe mechanisms, carry out redundancy checks and periodic inspections, and adopt other appropriate safety measures as required.

Precautions!!

Failure in wiring to the instrument may cause a fault and lead to a serious trouble. Be sure to recheck if wiring has been done correctly before the instrument is energized.

For wiring check, refer to the following;

- **"Wiring" (pages 86 and 87)**
- **"External Wiring Diagram" (pages 88 and 90)**

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FOREWORD

(Although this user manual includes many setting items, their initial values (preset at delivery time) may be normally used as they are.)

How to use the instruction manual and relevant index.

How to use \ Index	1.	2. General				3. Outline of operation			4. Setting				
	Model selection guide and specifications	1. General	2. Features	3. Basic functional block diagram	4. Major functions	1. Component parts of the front panel of instrument	2. Keying operation methods	3. DISP key indications	1. General	2. Basic operation flow	3. Setup setting	4. Parameter setting	5. Event EV setting
To understand the SDC200	○	○	○	○	○	○	○	○	○	○			
1. What specifications and functions are provided?	7 - 11				12 - 22				28				
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Setting and operation by instrument maker												○	○
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- ○ mark in ☐ indicates the relevant title in the index.
- Figure in ☐ indicates the page on which the relevant content is described.

4. Setting			5. Operation and other instructions						6. Troubleshooting									7.	8.	9.	10.
6. PID setting	7. SP setting	8. Fully opening / fully closing adjustment of modutrol motor	1. Operation	2. Stop	3. Manual mode	4. SP ramp setting	5. PID auto tuning function	6. Smart tuning function	1. Alarm indication	2. RDY key is not changed over.	3. Normal manipulated variable is not output.	4. Setup indication does not proceed from C1.	5. SP is not selected.	6. SP numeric cannot be set.	7. When the manipulated variable causes hunting.	8. When display is cleared and darkened.	9. Abnormal action of motor and wiring error	External dimensions	Installation	Wiring	External wiring diagram
58	62																				
																		84			
																		○	○	○	○
																		84			
																				86	
																					88
○	○	○																			
		70																			
○	○		○	○	○	○	○	○													
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1. MODEL SELECTION GUIDE AND SPECIFICATIONS

Refer to the model number of the purchased product.

1. Model selection guide table

I II III IV V VI VII

Example : I II III IV V VI VII

SDC200 5G K09 A 0 07 01

Code No.	Model No.		Specifications						
I	Basic model No.	SDC200	Digital indicating controller						
II	Output type control mode	0D	Relay output SPDT (ON-OFF) Time proportional PID						
		2G	Relay output M/M (modutrol motor) Position proportional PID						
		5G	Current output 4 to 20mA DC Continuous proportional PID						
		6D	Voltage output 22.5V±10% DC (ON-OFF) Time Proportional PID						
		3D	Relay output + Relay output Heat/cool control (Heat-side and cool-side are settable)						
		AK	Current output + Relay output Heat/cool control (Heat-side and cool-side are settable)						
		5K	Current output + Current output Heat/cool control (Heat-side and cool-side are settable)						
		9K	Voltage output + Relay output Heat/cool control (Heat-side and cool-side are settable)						
		BK	Current output + Voltage output Heat/cool control (Heat-side and cool-side are settable)						
III	Type of input and range		Type of input	Range		Resolution		PV range code	Range change
		T44	Thermocouple T(CC)	-199.9 to +300.0°C	-300 to +700°F	0.1°C	1°F	6	The range is changeable within the thermocouple input ranges.
		K04	Thermocouple J(CA)	0.0 to 400.0°C	0 to 750°F	0.1°C	1°F	12	
		J08	Thermocouple J(IC)	0 to 800°C	0 to 1600°F	1°C	1°F	2	
		E08	Thermocouple E(CRC)	0 to 800°C	0 to 1800°F	1°C	1°F	1	
		K08	Thermocouple K(CA)	0 to 800°C	0 to 1600°F	1°C	1°F	11	
		K09	Thermocouple K(CA)	0 to 1200°C	0 to 2400°F	1°C	1°F	3	
		U13	Thermocouple N	0 to 1300°C	32 to 2372°F	1°C	1°F	9	
		Y13	Thermocouple PLII	0 to 1300°C	32 to 2372°F	1°C	1°F	10	
		R16	Thermocouple R(PR13)	0 to 1600°C	0 to 3100°F	1°C	1°F	4	
		S16	Thermocouple S(PR10)	0 to 1600°C	0 to 3100°F	1°C	1°F	5	
		B18	Thermocouple S(PR30-6)	0 to 1800°C	0 to 3300°F	1°C	1°F	0	
		D19	Thermocouple PR40-20	0 to 1900°C	(0 to 3400°F)	1°C	1°F	8	
		W23	Thermocouple W(WRe5-26)	0 to 2300°C	0 to 4200°F	1°C	1°F	7	
		F50	JIS'89 Pt100 (equivalent to IEC-DIN)	-200 to +500°C	-300 to +900°F	1°C	1°F	20	The range is changeable within the RTD input ranges.
		F46	JIS'89 Pt100 (equivalent to IEC-DIN)	-199.9 to +200.0°C	-300 to +400°F	0.1°C	1°F	21	
		F32	JIS'89 Pt100 (equivalent to IEC-DIN)	-100.0 to +150.0°C	-150.0 to +300.0°F	0.1°C	0.1°F	32	
		F36	JIS'89 Pt100 (equivalent to IEC-DIN)	-50.0 to +200.0°C	-50.0 to +400.0°F	0.1°C	0.1°F	31	
		F33	JIS'89 Pt100 (equivalent to IEC-DIN)	-40.0 to +60.0°C	-40.0 to +140.0°F	0.1°C	0.1°F	30	
		F01	JIS'89 Pt100 (equivalent to IEC-DIN)	0.0 to 100.0°C	0.0 to 200.0°F	0.1°C	0.1°F	34	
		F03	JIS'89 Pt100 (equivalent to IEC-DIN)	0.0 to 300.0°C	0.0 to 500.0°F	0.1°C	0.1°F	33	
		F05	JIS'89 Pt100 (equivalent to IEC-DIN)	0.0 to 500.0°C	0 to 900°F	0.1°C	1°F	29	
		P46	JIS'89 JPt100 (old JIS Pt100)	-199.9 to +200.0°C	-300 to +400°F	0.1°C	1°F	22	
		P32	JIS'89 JPt100 (old JIS Pt100)	-100.0 to +150.0°C	-150.0 to +300.0°F	0.1°C	0.1°F	26	
		P36	JIS'89 JPt100 (old JIS Pt100)	-50.0 to +200.0°C	-50.0 to +400.0°F	0.1°C	0.1°F	25	
		P33	JIS'89 JPt100 (old JIS Pt100)	-40.0 to +60.0°C	-40.0 to +140.0°F	0.1°C	0.1°F	24	
		P01	JIS'89 JPt100 (old JIS Pt100)	0.0 to 100.0°C	0.0 to 200.0°F	0.1°C	0.1°F	28	
		P03	JIS'89 JPt100 (old JIS Pt100)	0.0 to 300.0°C	0.0 to 500.0°F	0.1°C	0.1°F	27	
		P05	JIS'89 JPt100 (old JIS Pt100)	0.0 to 500.0°C	0 to 900°F	0.1°C	1°F	23	
		C01	Current 4 to 20mA DC linear	Programmable	-1999 to +9999	—	—	40	The range is changeable within the linear input ranges.
		L02	Voltage -10 to +10mV DC linear	Programmable	-1999 to +9999	—	—	42	
		M01	Voltage 0 to 10mV DC linear	Programmable	-1999 to +9999	—	—	41	
		V01	Voltage 1 to 5V DC linear	Programmable	-1999 to +9999	—	—	45	

IV	Power voltage	A	90 to 264V AC 50–60Hz												
V	Communi-cation function	0	No communication function is provided.												
		A	RS-422 communication function is provided.												
		B	RS-232C communication function is provided.												
VI	Option I (Optional functions) (Note 1)		RSW	EV3	RSP	AUX	0D	2G	5G	6D	3D	AK	5K	9K	BK
		00	—	—	—	—	▨	▨	▨	▨	▨	▨	▨	▨	▨
		01	○	—	—	—	▨	▨	▨	▨	▨	▨	▨	▨	▨
		02	○	○	—	—	▨		▨	▨			▨		
		03	○	—	○	—	▨	▨	▨	▨	▨	▨	▨	▨	▨
		04	○	○	○	—	▨		▨	▨			▨		
		05	○	—	—	○	▨	▨	▨	▨	▨	▨		▨	▨
		06	○	○	—	○	▨		▨	▨					
		07	○	—	○	○	▨	▨	▨	▨	▨	▨		▨	▨
		08	○	○	○	○	▨		▨	▨					
VII	Option II (Optional functions)	01	No data is attached.												
		D1	Data is attached.												
		T1	Tropical treatment												
		B1	Data attached + Tropical treatment												
		K1	Anti-sulfuration treatment												

(Note 2) The intrinsic safety explosion-proof measure will be taken by special specification.

Note 1: Mark ○ shows that the corresponding function is provided.
Mark — shows that no corresponding function is provided.
Mark ▨ shows that a corresponding model number is provided.
RSW: External switch input EV3: Event 3 (option) RSP: Remote setting AUX: Auxiliary output

Note 2: **Intrinsic safety explosion-proof measure**

To use the platinum resistance thermometer bulb and Zener barrier in combination as a safety intrinsic safety explosion-proof measure, contact Yamatake Corporation salesman for special specification.

Model number of recommended Zener barrier (Yamatake Corporation data No. SS2-3260-8900)

(1) For 1 wire: 8907/12-02/120 (2) For 2 wires: 8907/22-02/120

2. Specifications

PV input	Type of input	Thermocouple, RTD, DC voltage, DC current, See the model selection guide [Type of input, range].	
	Input sampling cycle	0.25 s	
	Input digital filter	0.0 to 120.0 s variable (Filter is off at 0.0 s)	
	Input bias	−100 to +100U variable (U: °C, Pa, %, and other industrial units. Decimal point position is included.)	
	Input impedance	Thermocouple input: 1MΩ Min.	
		Voltage input: 1MΩ Min.	
		Current input: 100Ω Max.	
	Allowable wiring resistance	Thermocouple input: 250Ω Max.	
		RTD input: 4Ω Max.	
	Burnout	Thermocouple input: Up scale	Down scale: Less than −10% FS Up scale: More than 110% FS Scale over output value is settable.
		RTD input: Up scale (Up scale when one wire or more is broken.)	
		Current input: Down scale	
Indications and setting	PV constant indication system	Digital 4 digits 7-segment LED indication	
	Constant storage system	Semiconductor non-volatile memory	
	Indication and setting ranges	Thermocouple • RTD input: See model selection guide [Type of input/range] page 6.	
		Programmable range input (mV, V, mA): −1999 to +9999 (decimal point position, 3 digits selectable)	

Indications and setting	**Indication and setting accuracy**	±0.2%FS ±1U under standard conditions See model selection guide table [Type of input/range] page 6.				
		Provided D19: ±0.3%FS ±1U. B18 (0 to 260°C, 0 to 500°F): ±5%FS ±1U. T44 (–200 to –45°C, –300 to –50°F): ±0.6%FS ±1U				
	Indication and setting unit	Thermocouple input: 1, 0.1°C or 1, 0.1°F (Differs according to the type of input and ranges)				
		RTD input: 1, 0.1°C or 1, 0.1°F (Differs according to the type of input and ranges.)				
		Programmable range input (mV, V, mA): 1, 0.1, 0.01, 0.001 (decimal point position, 3 digits selectable.)				
	Setting system	Local system: Standard type Max. 8 SP are settable (One SP is employable in a mode)				
		Remote system: Option (See option), See remote setting input (RSP) page 17.				
	External switch input	Option: See option external switch function (RSW) page 20.				
Control output	**Auto tuning**	System: PID control constants fully automatic instrumentation setting system (excluding heat/cool control PID)				
	Time proportional PID	Position proportional PID	Continuous PID	Time proportional PID	Heat/cool control PID Note (1)	
	0D type	2G type	5G type	6D type	3D, AK, 5K, 9K, BK	
Control output ratings	Relay contact SPDT 250V AC, 5A resistive load	Relay contact 2SPDT 250V AC, 0.5A resistive load, 24V AC, 2A resistive load Adaptable motor: Modutrol motor of power 50VA max. and inrush current 1A max. such as M904, M944 Motor feedback resistance: 100 ↔ 2500Ω adjustable	Current 4 to 20mA DC Allowable load resistance: 600Ω Max. Output accuracy: ±0.25% (under standard conditions) Output update cycle: 0.25 s	Voltage Opening voltage 22.5V DC ±10% Internal resistance 1.5kΩ ±10%	Note (1) (See page 11) Combination of left specifications	
No. of PID groups	3 groups	3 groups	3 groups	3 groups	Heat side, cool side 1 group each	
Proportional band (P) : %FS	0.0 to 999.9 On-off control action is done when P=0.	0.1 to 999.9 On-off control action is impossible.	0.1 to 999.9 On-off control action is impossible.	0.0 to 999.9 On-off control action is done when P=0.	0.1 to 999.9 On-off control action is impossible.	
Cycle time: sec	5 to 120	—	—	1 to 60	—	
Integral time (I) : Sec.	0 to 3600 PD action is done when I=0	0 to 3600 PD action is done when I=0	0 to 3600 PD action is done when I=0	0 to 3600 PD action is done when I=0	0 to 3600 PD action is done when I=0	
Derivative time (D) : Sec.	0 to 1200 PI action is done when D=0	0 to 1200 PI action is done when D=0	0 to 1200 PI action is done when D=0	0 to 1200 PI action is done when D=0	0 to 1200 PI action is done when D=0	
Manual reset: U	0 to 100	0 to 100	0 to 100	0 to 100	0 to 100	
Differential gap: U	0 to 100	—	—	0 to 100	Combination of left specifications	
Dead band: % output	—	0.5 to 25.0	—	—	–100.0 to +50.0	
Output limiter **Lower-limit: %**	0 to Upper-limit	0 to Upper-limit	–10 to Upper-limit	0 to Upper-limit	Combination of left specifications	
Output limiter **Upper-limit: %**	Lower-limit to 100	Lower-limit to 100	Lower-limit to 110	Lower-limit to 100	Combination of left specifications	
Set point ramp (SP ramp)	SP ramp UP (SPU) SP ramp DOWN (SPd)	Setting range: 0 – 9999U/min. 0 – 99.9U/min. 0 – 999/hr, 0 – 999.9/hr Functions are individually selectable by local SP/remote SP. Effective when SPU ≠ 0 and SPd ≠ 0. Note (2) (See page 11)				
Output action direct/reverse selection	Possible	Possible	Possible	Possible	Possible	
Auto/manual selection	Auto ↔ manual: Bumpless/preset outputs are selectable when auto/manual modes are selected. On-off control action of 0D and 6D is possible at automatic operation.					

Event (EV1, 2)	**No. of channels**	Standard 2 outputs (EV1 output, EV2 output) and option output (EV3 output) are selectable out of 7 types of events. The same type of event is doubly selectable.			
	Output action	On-off action			
	Output rating	Relay contact SPST relay Contact rating: 120V AC 1A, 240V AC 0.5A resistive load			
	Type Setting range Differential gap	Type of event	Setting range	Differential gap	Remarks
		PV	−1999 to +9999	0 to 100U	Process value
		DEV	−1999 to +9999	0 to 100U	Deviation value
		|DEV|	0 to 9999	0 to 100U	Absolute deviation value
		MV	Lower-limit value − Upper-limit value %	0 to 10%	Control output
		RSP	−1999 to +9999	0 to 100U	Remote setting input
		Alarm	Turns on during alarm display. See alarm codes.		
		Auto tuning	Turns on during the execution of auto tuning.		
		SP	−1999 to +9999	0 to 100U	Executing setting value
	On delay time	0 to 9999 s Settable in case of PV, DEV, |DEV|, MV, RSP & SP.			
	Standby sequence	Presence/absence is settable. Settable in case of PV, DEV, |DEV|, MV, RSP and SP.			

U: °C, kgf/cm^2, % and other industrial units. Decimal point position is interlocked with the decimal point of an input range, and the decimal point of linear input is also interlocked with the setting of C5.

Option I (Optional functions)

External switch input (RSW)	**Function**	Three items are selectable out of non-operation, auto/manual, remote/local, READY/RUN, AT, ad LSP No. selection; provided that the option (additional function) [Remote system] only is applicable as remote/local function.
	Input channel	3 channels
	Input rating	Dry contact, Off voltage 8V±1V, On current 6mA±2mA
Event (EV3)	**Event (EV3)**	One EV3 output is addable. Specifications are the same as those in EV1 and EV2 except that the output contact is SPDT.
Remote setting (RSP)	**Type of input**	1 to 5V DC or 4 to 20mA DC selectable (4 to 20mA is selected at the delivery time)
	Input impedance	Voltage input: 1MΩ type. Current input: 100Ω max.
	Input indicating accuracy	±0.2%FS ±1U under standard conditions (FS: 1 to 5V or 4 to 20mA full span input)
	Input sampling cycle	0.25 s
	Input digital filter	0.0 to 120.0 s variable (Filter is off at 0.0)
	Input scaling	Indicating values corresponding to input 0% FS and 100% FS are settable.
Auxiliary output (AUX)	**Type of output**	One of PV, SP, DEV, RSP, MV and [motor opening] is selected.
	Output rating	4 to 20mA DC allowable load resistance: 600Ω Max.
	Scaling	An output value corresponding to 4 to 20mA DC is settable. Reverse scaling is also possible.
	Output accuracy	±0.2% under standard condition
	Output update cycle	0.25 s
Communication function RS-422 Communication functions when Yamatake-Honeywell protocol converter CMC400 (option) is connected. For details, refer to the product manual for CMC400.	**Communication system**	Network Multidrop system 1-to-16 units max. (Instruments function in slave stations only)
		Synchronous system Start-stop synchronization
		Information direction Half-duplex
	Interface system	Transmission type Balanced (differential) type
		Data line Bit serial
		Signal line 3 transmitting/receiving lines
		Transmission speed 1200, 2400, 4800, 9600bps
		Communication distance 300m max.
		Others Conforms to RS-422.
	Message character	Character configuration 11 bits/character
		Format 1 start, even parity, 1 stop bit standard
		Data code 8-bit binary code

Communication function RS-232C	**Communication system**	Network 1-to-1 (Slave station function only)
		Information direction Half-duplex
		Synchronous system Start-stop synchronization
	Interface system	Transmission type Unbalanced type
		Data line Bit serial
		Signal line 3 transmitting/receiving lines
		Transmission speed 1200, 2400, 4800, 9600bps
		Communication distance 15m max.
		Others Conforms to RS-232C.
	Message character	Character configuration 11bits/character
		Format 1 start, even parity, 1 stop bit standard
		Data code 8-bit, ASCII code

General specifications

Rated power voltage	90 to 264V AC 50Hz – 60Hz	
Vibration resistance	4.9 m/s² Max. (10 to 60Hz in X, Y, and Z directions, 2 hours each)	
Shock resistance	490 m/s² Max. (in vertical direction, 3 times, under packaged condition)	
Insulation resistance	50MΩ Min. by 500V DC megger between case of ground terminal and power terminals	
Direlectric strength	1500V AC, 1 min. between case or ground terminal and power terminals	
Allowable ambient temperature **Allowable ambient humidity** **Storage temperature** **Power consumption** **Mass**	0 to 50°C 10 to 90%RH –20 to +70°C 18VA under standard conditions Approx. 1kg	
Coating color	Mask indicator	Black smoke
	Mask setter	Metallic hair line
	Instrument frame	Black
	Case	Black
Installation	Indoor panel flush-mount Inclination: Within ±15°	
Standard accessories	Mounting bracket: 1 set Part No. N3174 Unit indicating label: 1 sheet Part No. N3132	
Auxiliary parts (option)	Dust cover packing: 1 set Part No. 81401330A	

Alarm code

Alarm code	Meanings	Remedial measures
AL01	PV is not within –10 to +110%FS of the range.	Check sensors for breakage.
AL90	Mounting failure of PC board. (Check only when power is applied.)	Ask Yamatake Corporation for repair.
AL92	Instrument adjusting data error.	Ask Yamatake Corporation for repair.
AL93	SET UP parameter data were broken.	Reset data.
AL94	PARA parameter data were broken.	
AL95	PID parameter were broken.	
AL96	SP or EV data were broken.	
AL98	RAM error	Ask Yamatake Corporation for repair.
AL99	ROM error	

Description of Note (1) given on page 8

Combined output on heat/cool control

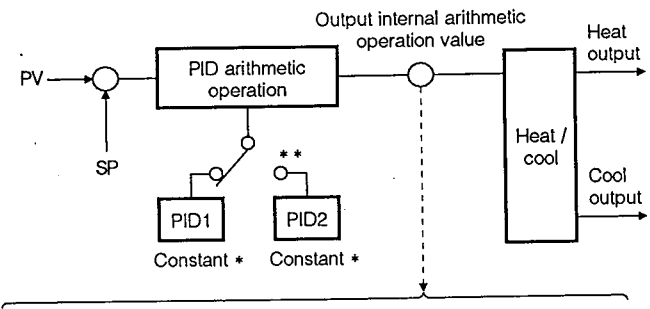
3D	AK	5K	9K	BK
Relay + Relay	Current + Relay	Current + Current	Voltage + Relay	Current + Voltage

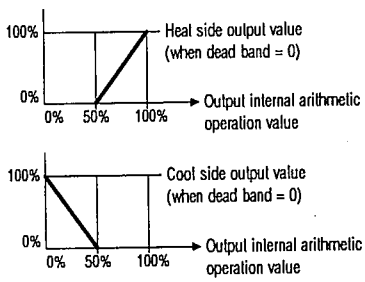
Heat/cool control action

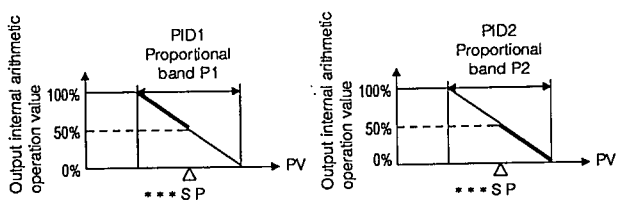
* The following control constants are individually settable to PID1 for heat control and PID2 for cool control.
- Proportional band, integral time, derivative time
- Manual reset value, control output value (upper limit, lower limit)

** PID1 and PID2 are automatically selectable inside.
- PID1 is selected when output internal arithmetic operation value ≧ 50%.
- PID2 is selected when output internal arithmetic operation value < 50%.

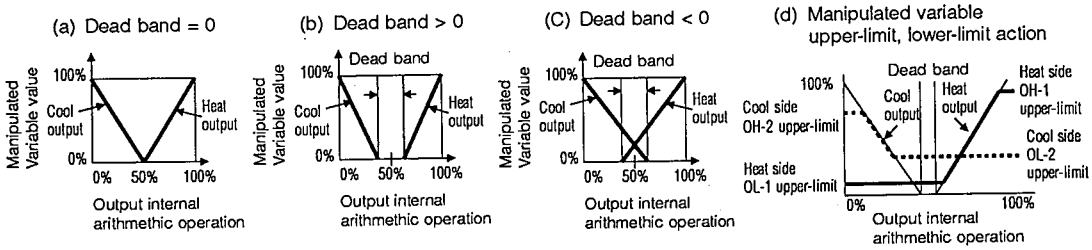
*** SP value does not always become a selection point between PID1 and PID2, which are 50% each of the output internal arithmetic operation value.







The output internal arithmetic operation value means the output % value resulting from the PID operation of the deviation between PV and SP inside SDC200.
The difference between this value and external output is such that the 0 to 100% output of the heat output corresponds to 50 to 100% of the output internal arithmetic operation value, for example, when the dead band = 0.



Description of Note (2) given on page 8 Set point ramp (SP ramp)

Ramp is settable by selecting 0 to 9999U/min., 0.0 to 999.9U/min, 0 to 9999U/hr, 0.0 to 999.9U/hr and other variables (SPU, SPd) per unit time.
- SPU: SET POINT UP
- SPd : SET POINT down

PV is used in place of initial SP in the following cases.
- When the power supply is turned on.
- When READY is changed over to RUN.
- When MANUAL is changed over to AUTO.

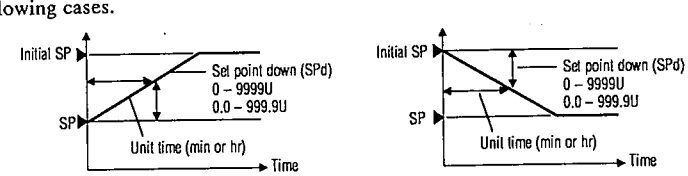


Fig. 1 Description of Notes (1) and (2) in specifications

2. GENERAL

1. General

SDC200 is a microprocessor-based general-purpose indicating controller (96mm × 96mm in size) which executes control of temperature, pressure flow, rotating speed, and other process variables. It receives a PV (Process Variable; measured value of thermocouple, RTD, or linear input) input to execute PID control operation to meet a preset SP (set point setting) or RSP (remote set input), and transmits the manipulated variable for adjustment. Optimum PID values can be automatically written into the internal memory by auto tuning.

2. Features

(1) Indication

- ♦ Data are digitally indicated by 4 digits 2-stage LED display with high accuracy of ±0.2% FS.
- ♦ Green OK indication informs an operator of normal operation within a range of constant DEV (deviation).
- ♦ Events EV1, EV2, EV3 and outputs OT1, OT2 are indicated.
- ♦ MAN (manual), REM (remote), and AT (auto tuning) are indicated.

(2) Input

- ♦ PV input uses a multirange system in each group (thermocouple, RTD, linear group).
- ♦ Cascade control by RSP (remote setting input).
- ♦ Three out of the following functions are remote-controlled by external switch input.
  - Non-operation
  - Selection of eight LSP setting (setting by front keys)
  - R/L (remote/local) selection
  - READY/RUN selection
  - A/M (auto/manual) selection
  - Execution of auto tuning
  - PID group selection
  - Direct action/reverse action selection

(3) SP (setting) function

- ♦ Eight SP values can be set and selected.
- ♦ LSP direct change convenient for trial run and start-up operation.
- ♦ SP ramp function effective for eight SP selection and LSP/RSP selection

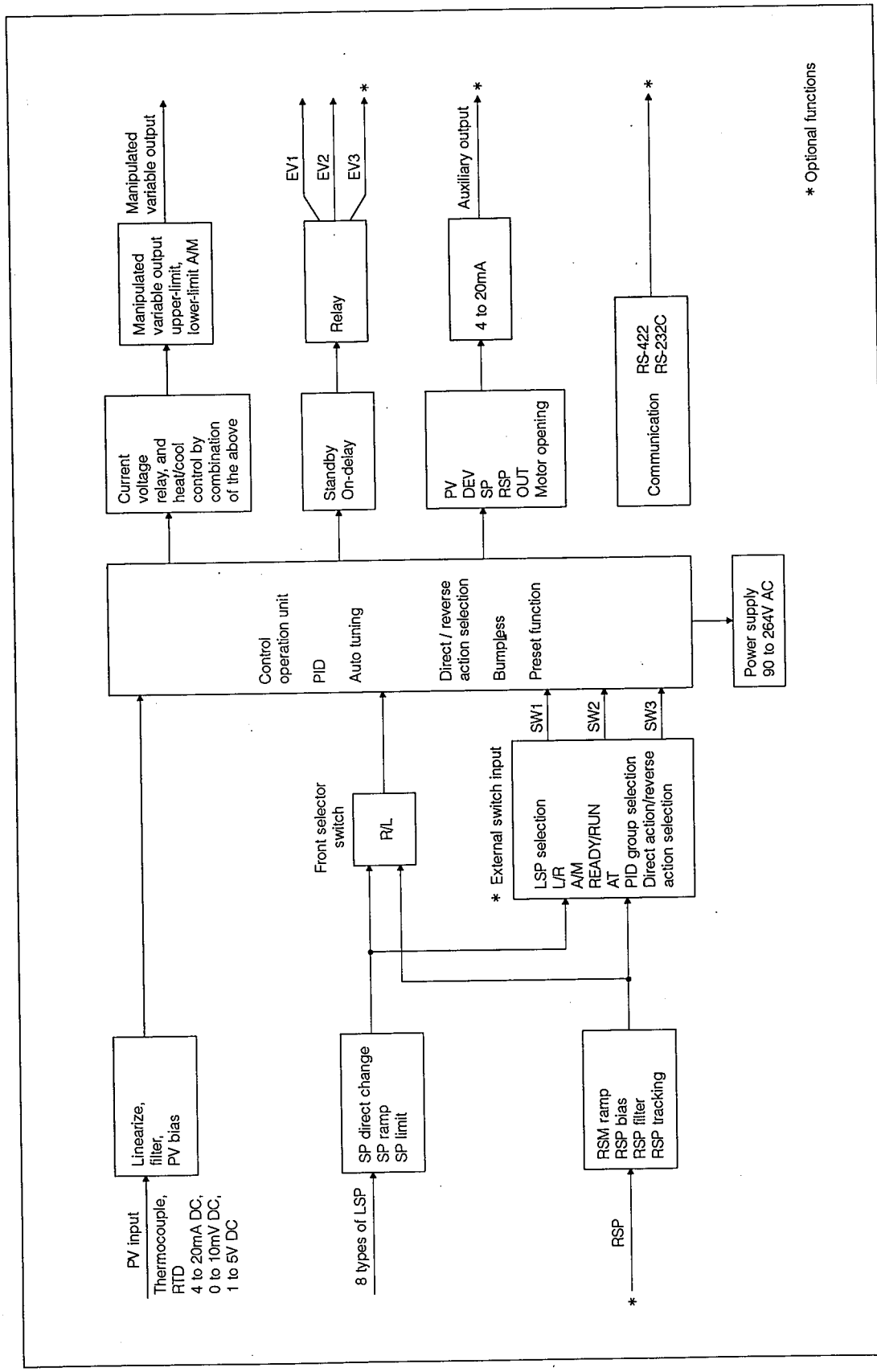
(4) Output

- ♦ Manipulated variable output is combined with current, voltage and relay signals.
- ♦ The control action consists of PID, time proportional PID, ON/OFF, motor driven position proportional PID, and various heat/cool PID control action.
- ♦ PID control action is executed by auto tuning system.
- ♦ Auxiliary output of one selected out of PV, SP, RSP, DEV, OUT, and motor opening, which can be scaled.
- ♦ Communication function is selected from RS-422 and RS-232C.
- ♦ Two standard events plus three optional additional events consisting of relay contact output, standby, and on-delay high function output.
  Event types are PV, DEV, |DEV|, OUT, RSP, alarm, auto tuning and SP.

(5) Easy-to-operate console

- ♦ Four-direction selection/numeric setting multi-keys
- ♦ Sound key informs of keying input.

3. Basic functional block diagram



4. Description of major functions

4-1. Multirange system

(1) When SDC200 at hand is desired to be used with other type of input, an input in the same group can be applied simply by changing the input code.

(2) The type of PV input can be changed, this instrument is conveniently adaptable to an instrumentation change and emergencies.

(3) Since the PV input type can be changed, this instrument is conveniently adaptable to an instrumentation change and emergencies.

(4) No adjustment is necessary after a range change.

For example, to change 0 to 800°C of the J type into 0 to 400°C of the K type, change Code No. as follows:

Setup C4: Code No. 2

⇩

C4: Code No. 12

Thermocouple group		
Type	Range	Code No.
T (CC)	−199.9 to +300.0°C	6
K (CA)	0.0 to 400.0°C	12
J (IC)	0 to 800°C	2
E (CRC)	0 to 800°C	1
K (CA)	0 to 800°C	11
K (CA)	0 to 1200°C	3
N	0 to 1300°C	9
PLII	0 to 1300°C	10
R (PR13)	0 to 1600°C	4
S (PR10)	0 to 1600°C	5
B (PR30-6)	0 to 1800°C	0
PR40-20	0 to 1900°C	8
W (WRe5-26)	0 to 2300°C	7

RTD group		
Type	Range	Code No.
Pt100 equivalent to IEC • DIN	−200 to +500°C	20
Pt100 equivalent to IEC • DIN	−199.9 to +200.0°C	21
Pt100 equivalent to IEC • DIN	−100.0 to +150.0°C	32
Pt100 equivalent to IEC • DIN	−50.0 to +200.0°C	31
Pt100 equivalent to IEC • DIN	−40.0 to +60.0°C	30
Pt100 equivalent to IEC • DIN	0.0 to 100.0°C	34
Pt100 equivalent to IEC • DIN	0.0 to 300.0°C	33
Pt100 equivalent to IEC • DIN	0.0 to 500.0°C	29
Old JIS Pt100	−199.9 to +200.0°C	22
Old JIS Pt100	−100.0 to +150.0°C	26
Old JIS Pt100	−50.0 to +200.0°C	25
Old JIS Pt100	−40.0 to +60.0°C	24
Old JIS Pt100	0.0 to 100.0°C	28
Old JIS Pt100	0.0 to 300.0°C	27
Old JIS Pt100	0.0 to 500.0°C	23

Linear group		
Type	Range	Code No.
4 to 20mA DC	−1999 to +9999	40
−10 to +10mV DC	−1999 to +9999	42
0 to 10mV DC	−1999 to +9999	41
1 to 5V DC	−1999 to +9999	45

4-2. Programmable range

(1) The programmable range can be used to directly read process values into which linear input signals from various sensors have been converted by the instrument.

(2) The programmable range is provided to specify indicating values corresponding to 0% and 100% of voltage or current PV input signals.

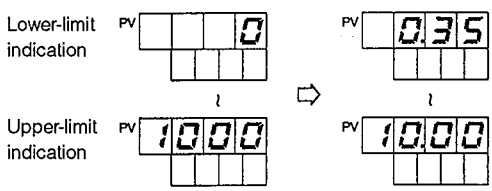
(3) When C5, 6 and 7 have been changed and thereby the PV range has changed, call C9 and 10, and push (ENT) key and ◈ keys to change the SP range as well.

(4) The programmable range cannot be used for the thermocouple input and RTD input other than the linear input.

For example,

when such an input that the pressure range of 0.35 to 10.00kgf/cm^2 is output as 4 to 20mA is applied, the initial indication is 0 to 1000.

To indicate the pressure range as 0.35 to 10.00, set the decimal point position to 2 by setup C5, the PV lower-limit value to 0.35 by setup C6, and the PV upper-limit value to 10.00 by setup C7.



Call setup C9 and 10, and change the SP range.

4-3. PID auto tuning

(1) Complicated PID value setting can be automatically done by the limit cycle method.

(2) There are two auto tuning arithmetic expressions in selection of parameter setting At.

1: General auto tuning

2: Auto tuning suppressing overshoot

(3) Auto tuning starting can be executed at any point of PV>SP, PV<SP, and PV= SP.

(4) Generally, the PID constants obtained by auto tuning during the stationary running of PV=SP are most suitable.

(5) Auto tuning can be executed by [AT] key or external switch.

(6) During auto tuning, the SP output limit upper-limit value (100% in case of 0D type, 6D type) and lower-limit value (0% in case of 0D type, 6D type) are changed over to each other twice, and each PID value is automatically calculated and then the resultant numerics are stored.

(7) Since the internal PID values are automatically rewritten at the same time as the end of arithmetic operation, any operation is not required after the start of auto tuning.

(8) The rewritten PID values are kept as they are until the next auto tuning is executed or the PID values are manually changed.

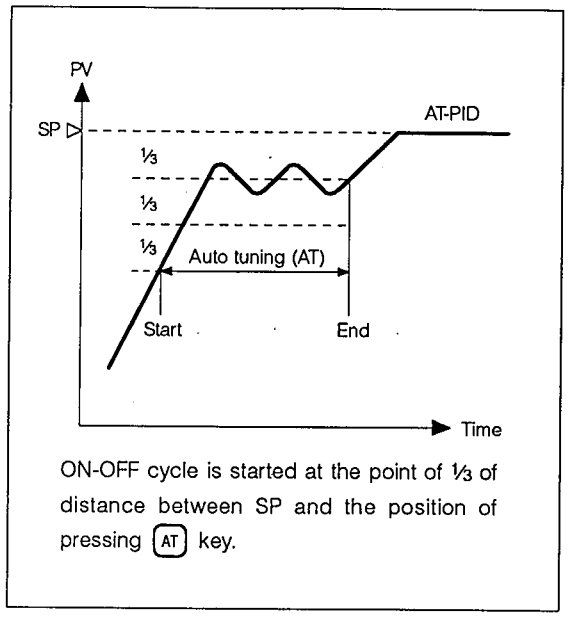
(9) The PID values written by auto tuning can be checked by calling each item of parameter mode P.I.D.

(10) Auto tuning can be interrupted halfway by pressing [AT] key again.

(11) Auto tuning can also be run or stopped by external switch input RSW (when allocated to 4 by one of setup C27, 28 and 29).

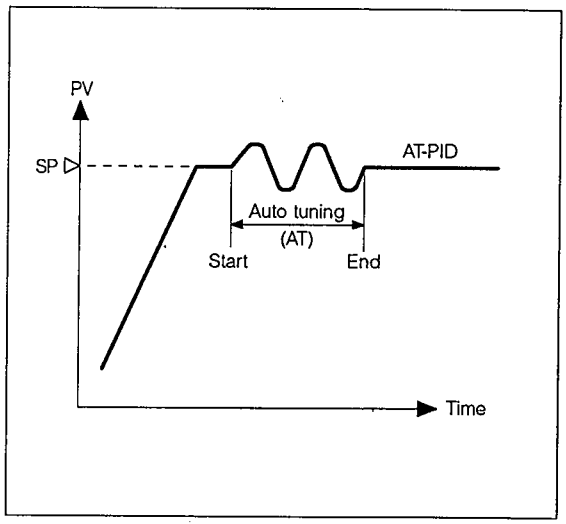
Execution is done when RSW ON

Execution is released when RSW OFF.



ON-OFF cycle is started at the point of ⅓ of distance between SP and the position of pressing [AT] key.

PID auto tuning at start



PID auto tuning during stationary running of PV=SP

(No auto tuning function is provided in case of heat/cool control.)

4-4. Smart tuning

The smart tuning is a new function intended to improve the controllability by AI (Artificial Intelligence).

In reverse action, overshoot is suppressed by the brake function, and the rising time is shortened by the turbo function.

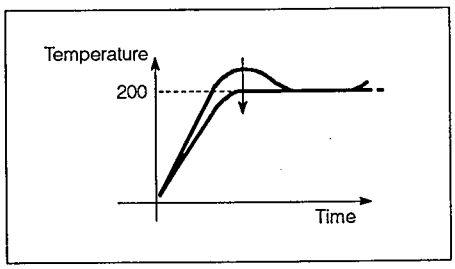
In direct action, undershoot is suppressed, and the falling time is shortened.

(In case of the model for heat/cool control, no smart tuning function is provided.)

See pages 75 to 78.

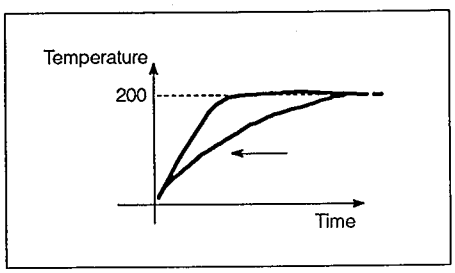
When an overshoot occurs, it is reduced.

Brake function



When rising is delayed, the rising time is shortened.

Turbo function



Select the AI control by parameter setting AI-C.

0: Smart tuning is not used.
1: Smart tuning is used.

Select the AI tuning by parameter setting AI-t.

0: No learning is done.
1: Learning automatically ends
(brake and turbo values are automatically written)
2: Learning automatically ends
(brake and turbo values are written when setting AI – t = 0).

Set brakes 1 to 3 by PID setting br-1.

0 to 30
- The brake is more effective as the numeric increase.
- When the brake is excessively effective, rising and falling are delayed.

Set turbo 1 to 3 by PID setting tU-1.

0 to 10
- The turbo is more effective as the numeric increases.
- When the turbo is excessively effective, PV is waved.

4-5. SP ramp

(1) When an SP value is selected during running, a disturbance may occur due to a sudden change in SP value. To prevent this disturbance from occurring, the SP ramp can be used.

(2) This function is provided to change slowly an execution SP from A to B by a ramp of constant previously specified without abruptly changing it when such a change is executed.
At the start time, the execution SP is slowly reached from the normal temperature by a certain ramp.

(3) This function serves to protect the instrument and object and suppress overshoot and undershoot.

(4) RSP ramp or LSP ramp can be set by parameter setting.

(5) After the power supply to the instrument is turned on, a PV value becomes an SP value at the same time as running starts. The SP value is slowly changed by a ramp, and reaches the set SP value.

(6) When SP is changed, the SP value before changed becomes an SP value at the ramp start point.

(7) When LSP ramp is provided, the ramp function is effective immediately after switched to LSP even if the previous SP is not provided with a ramp, and the LSP set value is reached.

(8) When RSP ramp is provided, the ramp function is similarly effective irrespective of the previous SP after switched to RSP, and the RSP set value is reached.

(9) When the manual mode is switched to the automatic mode, the PV value at that time is used as a ramp start SP value.

Set the set value reach time unit by parameter setting r-t.

0: U/min

1: 0.1U/min

2: U/hr

3: 0.1U/hr

Set the SP ramp up value by parameter setting SPU.

0 to 9999U or 0.0 to 999.9U

Set the SP ramp down value by parameter setting SPd.

0 to 9999U or 0.0 to 999.9U

Set whether or not LSP is provided with SP ramp by parameter setting L-rA.

0: Not provided

1: Provided

Set whether or not RSP is provided with RSP ramp by parameter setting r-rA.

0: Not provided

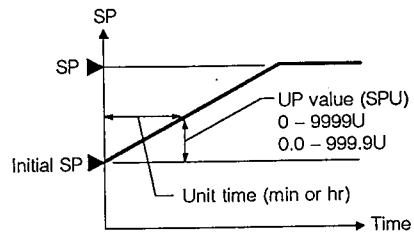
1: Provided

PRECAUTION

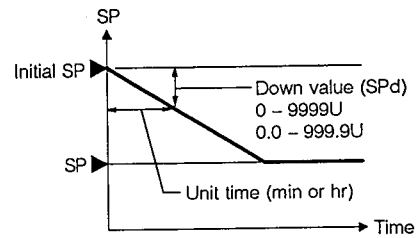
For example, when the heater capacity of a dryer, etc. is excessively large, the PV value is abruptly greater than the SP value at the same time as starting irrespective of the SP ramp function, and the same operating condition as the SP ramp function is not effective may be developed. The SP ramp function is smoothly operated by setting PV below SP when the temperature rises, or by setting PV above SP when it falls.

Be careful about a manipulated variable caused by balance between the load of a dryer, etc. and the heater capacity.

Setting of ramp up at SP selection time



Setting of ramp down at SP selection time



PV is used in place of the initial SP in the following cases.

- When power supply is turned on.
- When READY is switched to RUN.
- When MANUAL is switched to AUTO.

SP ramp function (SP ramp)

4-6. RSP remote setting input (option)

(1) This instrument receives external setting signals (4 to 20mA DC or 1 to 5V DC), and executes program control, cascade control, and other control function.

(2) Since remote setting input (RSP) is internally isolated from the process variable (PV), input (PV), auxiliary output (AUX) and manipulated variable output (OUT), a highly reliable instrumentation system can be established without using any external isolator.

(3) Momentarily changing RSP values can always be monitored together with PV values by the two-range upper and lower indicators.

(4) A range of set points corresponding to RSP signal values (4 to 20mA, for example) can be freely scaled.)

Set the input type by setup C18.

0: 4 to 20mA (initial value)

1: 1 to 5V

Set the lower-limit value of RSP input by setup C19.

−1999 to +9999U
(initial value: 0)

Set the upper-limit value of RSP input by setup C20.

−1999 to +9999U
(initial value: 1000)

4-7. Input digital filter (PV FILTER)

A digital filter changes sharp noise into gentle one to prevent mal-function from occurring. When a digital filter is enlarged, the response is reduced.

Digital filters having variable filter constants are provided for PV input and RSP input.

The filter constant is defined by the equation given to the right.

$$OUT = \frac{1}{1 + TS} IN$$

S: Laplace operator

T: Filter constant
Set 0.0 to 120.0 sec by parameter setting.
The initial value is 0.0.

4-8. Bumpless MANUAL output

The bumpless function is provided to lessen disturbance when AUTO mode is switched to MANUAL mode.

This function starts the arithmetic operation with a manipulated variable value which was just output in AUTO mode when AUTO mode has been switched to MANUAL mode.

This also applies to the MANUAL → AUTO selection correspondingly.

Set the output at MANUAL selection time by setup C13.

0: Bumpless (initial value)
1: Preset

4-9. Preset MANUAL output

The preset MANUAL output can be used when a specific manipulated variable is desired in emergency.

When AUTO → MANUAL selection was made, the manipulated variable value is output as preset by preset MANUAL (C14).

Also, a manipulated variable value is output as preset by preset MANUAL when power has been recovered in MANUAL mode from being interruped.

Set 1 by setup C13, and then set a preset value by C14.

0 to 100% (relay, voltage output)
−10 to +110% (current output)

4-10. EV event type selection

(1) The event output can be used as an upper-limit alarm of PV value or as input signals of various sequences.

(2) Three event outputs are provided, and an event mode is independently selectable out of 12 kinds; provided that one of three EV outputs is optionally added, and two EV outputs are normally provided.

(3) Event type is selected by parameter setting, and the action point of that type is selected by event setting.

Events 1, 2, 3 can be set by selecting the following numeric characters in parameter setting.

Event type

0: PV direct action
1: PV reverse action
2: Deviation direct action
3: Deviation reverse action
4: Absolute deviation direct action
5: Absolute deviation reverse action
6: OUT direct action
7: OUT reverse action
8: RSP direct action
9: RSP reverse action
10: Alarm (Output at alarm occurrence time given on page 10)
11: Auto tuning
12: SP direct action
13: SP reverse action

Event action points (event set values)

PV	−1999	to	+9999 U
DEV	−1999	to	+9999 U
|PV|	0	to	9999 U
RSP	−1999	to	+9999 U
OUT	−10.0	to	+110.0%
SP	−1999	to	+9999 U

4-11. Auxiliary output (option)

(1) The auxiliary outputs can be used separately according to their types.

Example:

The auxiliary output of PV value can operate a recorder, or the auxiliary output of SP value can operate several controller units with the same SP value.

(2) One of auxiliary output signals PV, SP, DEV, RSP, OUT and motor opening is freely selectable.

(3) The observation range of auxiliary outputs can be expanded by the output range scaling system before transmitting the outputs.

Select the auxiliary output type by setup C21.

0: PV
1: SP
2: DEV
3: RSP
4: OUT
5: Motor opening

Set the lower-limit value of auxiliary output by setup C22.

−1999 to +9999U (initial value: 0)

Set the upper-limit value of auxiliary output by setup C23.

−1999 to +999U (initial value: 1000)

4-12. Communication input/output (option)

Two types of communication systems RS-422 and RS-232C are selected according to the models.

4-13. RSP tracking

(1) The RSP tracking can be used to reset LSP set value by RSP (4 to 20mA or 1 to 5V input).

(2) When two external switches are used for LSP selection and one external switch for REMOTE/LOCAL selection, four LSP types can be remotely set by RSP.

(3) This function is provided to use an RSP value as an LSP set point when RSP is switched to LSP (by R/L key or external switch). This function is not effective in READY mode.

(4) Since the preset LSP is switched to an RSP value by RSP tracking, the LSP ramp does not function, even if LSP ramp is preset.

Set whether the RSP tracking function is effective or not by parameter setting r-tr indicator.

0: Not provided
1: Provided

4-14. LSP direct change

(1) The LSP direct change function is conveniently employable for changing the LSP while monitoring a PV change condition by gradually changing LSP when the instrument is initialized or when a trial run is made.

(2) A change value turns to an LSP when pressing the ENT key after changing the numeric value by ⊠ keys in normal LSP change. By presetting the LSP direct change function, a numeric turns to an LSP simultaneously when the numeric is changed by ⊠ keys.

(3) If the DISP key is pressed without pressing the ENT key, and LSP value returns to the last LSP value before change.

(4) Since the LSP direct change function takes precedence of the LSP ramp function, the LSP ramp function, the LSP ramp does not function during the LSP direct change.

(5) If power is interrupted when an LSP is changed by the LSP direct change function, the LSP is erased, while the DISP key is kept alive, so that the LSP returns to the last value.

If the ENT key is pressed in advance when using the LSP direct change function, the operation is restarted after power recovery with an LSP value which was obtained last when the ENT key was pressed.

The LSP direct change function can be used by selecting setup C8.

0: One LSP value is used (initial value)

1: LSP direct change, using one LSP value

2: LSP selection, using 2 to 8 LSP values, and set values and PID group change are possible.

3: LSP selection only is possible, using 2 to 8 LSP values.

4-15. External switch input (RSW)

(1) LSP set values can be remotely selected by using the external switch input (SW1, SW2, and SW3) even when an operator is not present at the site.

(2) Three external switches SW1, SW2 and SW3 are provided.
Three out of eight items given below are externally selectable by these switches.

① Selection of 8 LSPs
② Selection of PID group number
③ Non-operation
④ READY/RUN selection
⑤ AUTO/MANUAL selection
⑥ REMOTE/LOCAL selection
⑦ Auto tuning RUN/STOP selection
⑧ Direct action/reverse action selection

(3) When selection of eight LSPs 0 to 7 is preset by external switches, the external switches take precedence, and SP setting cannot be selected by console keys.
Although 8 SP values can be indicated and the numeric values can be changed by console keys, SP setting can be selected only by external switches.

- To select LSP by the external switch input, select 2 or 3 by setup C8 in advance.

  2: LSP and PID group can be selected, and SP value can be changed.

  3: Although LSP can be selected, PID group selection and SP value change are impossible.

- No. of LSPs selected and PID group are selected by C26 as follows:

  When C26: 0, LSP is not selected.
  When C26: 2, LSP0 and LSP1 are switched by SW1.

Therefore, two items out of items ③ to ⑧ are selectable by C28 and C29, and they are externally switchable by SW2 and SW3.

Selection of LSP	Connection Terminals		
	SW1 ㉔—㉗	SW2 ㉕—㉗	SW3 ㉖—㉗
LSP0	OFF	—	—
LSP1	ON	—	—

When C26:4, LSP0 to 3 are selectable by SW1 and SW2. Therefore, one item out of item 3 to 8 is selectable by C29, and it is externally switchable by SW3.

Selection of LSP	Connection Terminals		
	SW1 ㉔—㉗	SW2 ㉕—㉗	SW3 ㉖—㉗
LSP0	OFF	OFF	—
LSP1	ON	OFF	—
LSP2	OFF	ON	—
LSP3	ON	ON	—

When C26:8, LSP0 to 7 are selectable by SW1, 2, 3. Therefore, the other items cannot be selected.

Selection of LSP	Connection Terminals		
	SW1 ㉔—㉗	SW2 ㉕—㉗	SW3 ㉖—㉗
LSP0	OFF	OFF	OFF
LSP1	ON	OFF	OFF
LSP2	OFF	ON	OFF
LSP3	ON	ON	OFF
LSP4	OFF	OFF	ON
LSP5	ON	OFF	ON
LSP6	OFF	ON	ON
LSP7	ON	ON	ON

(4) When PID1 group is selected by an external switch, it is necessary to preset PID1 by setup C26.

When PID1 to 3 groups are selected by external switches, it is necessary to preset PID3 by setup C26.

(5) If SW1 and SW2 are OFF when PID1 or PID3 are selected, the PID group specified by SP key is selected.

(6) The output system is of a transistor open collector type, and the action is of ON-OFF output type.

When C26:PID1, PID1 is selected by SW1. Therefore, when two items out of items 3 to 8 are allocated to SW2 and SW3 by C28 and C29, they are externally selectable.

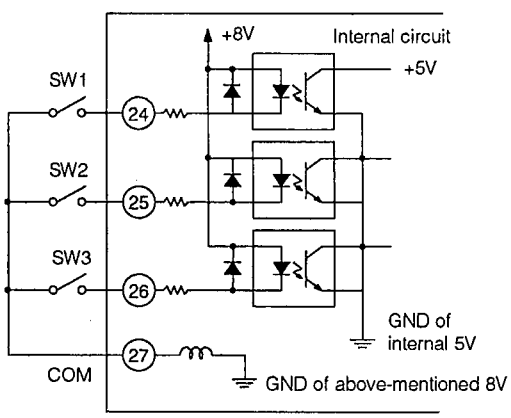
Selection of PID	SW1	SW2	SW3
PID1	ON	—	—

When C26:PID3, PID1 to 3 can be selected by SW1 and SW2. Therefore, when one item out of items 3 to 8 is allocated to SW3 by C29, it is externally selectable.

Set one item by setup C29.

Selection of PID	SW1	SW2	SW3
PID1	ON	OFF	—
PID2	OFF	ON	—
PID3	ON	ON	—

Internal circuit and connection diagram of external switches



4-16. Green belt See PARA key 95-L, H

The control status of the instrument is indicated in the green belt.

- The green belt lights when PV value is controlled between the upper-limit value and lower-limit value.
- The green belt goes out when PV value is controlled outside the upper or lower limit value.
- The green belt flashes when the instrument is placed in READY mode.

The lower-limit and upper-limit of the green belt are selected by parameter setting.

0 to 100 (initial value: 5)

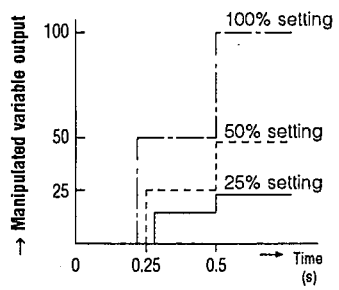
4-17. Manipulated variable output limit

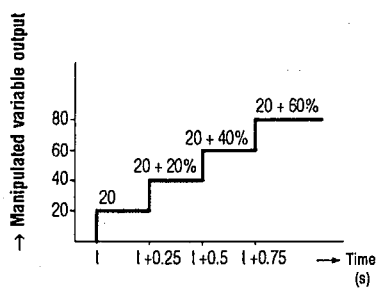
When the manipulated variable output changes, that output value is reached with a certain item delay by this function.

When a motor is causing a hunting, it can be suppressed by using this function.

The manipulated variable output increase or decreases by ½ of the set value of the manipulated variable output limit every 0.25 sec.

For example, when the manipulated variable output limit has been set to 40%, the output increases by 20% every 0.25 sec, and reaches the 80% output after 0.75 sec, as shown in the right figures.





4-18. Proportional band of heat/cool control, and precautions

When the heat proportional band P1 is set to 8%, the cool proportional band P2 to 2%, and the dead band to 4% within the temperature input range of −50.0 to +200.0°C, the proportional band P1 or P2 is automatically selected at the output internal arithmetic operation value of 50%.

The temperature width of the heat side proportional band is as follows:

P1 × (100% − dead band)/2
= 8% × 250°C range × 48%
= 9.6°C

The temperature width of the cool side proportional band is as follows:

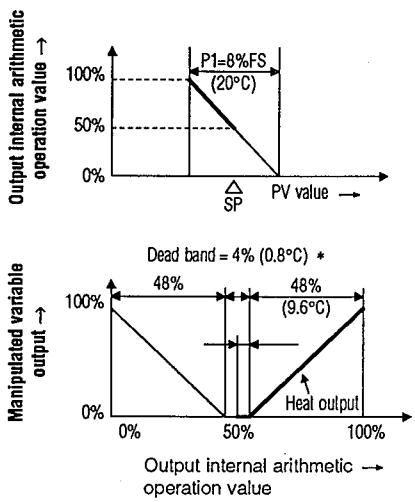
P2 × (100% − dead band)/2
= 12% × 250°C × 48%
= 14.4°C

*** Note that the dead band becomes narrower when the proportional band is narrow.**

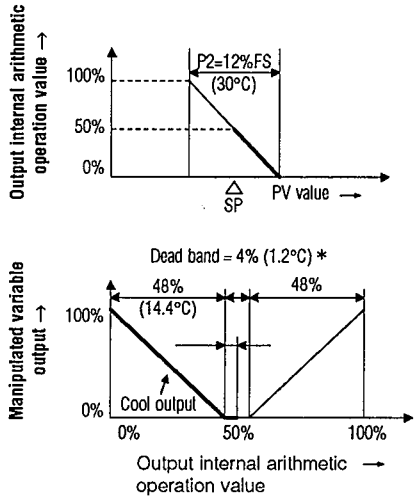
The output internal arithmetic operation value means the output % value resulting from PID arithmetic operation applied to the deviation between PV and SP in SDC200.

The difference from the external output is such that the 0 to 100% output of the heat output corresponds to the 50 to 100% of the output internal arithmetic operation value, for example, when dead band = 0.

(1) When output internal arithmetic value ≧ 50%



(2) When output internal arithmetic operation value < 50%



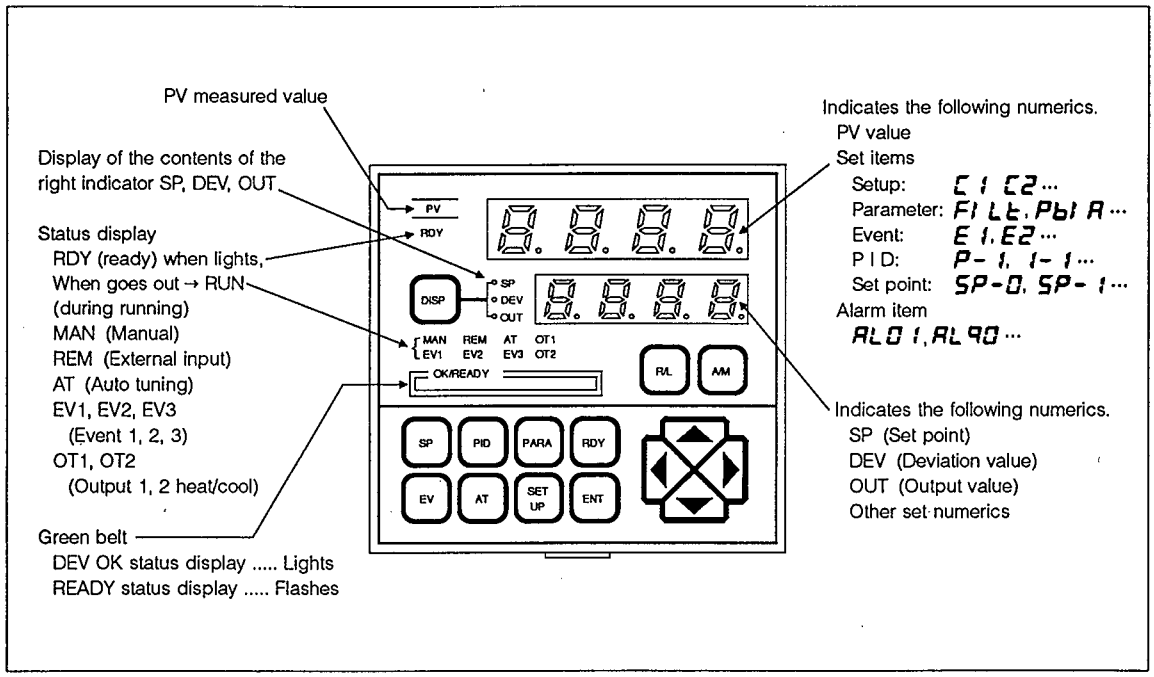
PRECAUTION

- ***P_1 = 0 and P_2 = 0 cannot be set in case of the heat/cool control. Therefore, the output cannot be turned on/off by setting P = 0.***
- *The output value is abruptly changed if PID constants are selected under the control without integral control action of $I_1 = I_2 = 0$. When this is a problem, set the heat output control PID constants and cool output control PID constants to the same values, as follows:*
  P1 = P2, I1 = I2 = 0, d1 = d2, rE − 1 = rE − 2
- *When one of the heat side and cool side does not use integral I.*
  If I is set to 0 on one side, I is 0 on the other heat or cool side, so both Is become ineffective. When I = 3600, the manual reset rE cannot be used any longer, but the integral I of the other heat or cool side acts as preset.

3. OUTLINE OF OPERATION

1. Component Parts on the Front Panel of Instrument

1-1. Indications and names



1-2. Functions of operation keys (For the descriptions of abbreviations, see page 87.)

DISP — Changes the display selection. Interrupts the setting action and other action.

R/L — Selects REMOTE SP/LOCAL SP. Selects RSP/LSP.

A/M — Selects AUTO/MANUAL modes.

SP — Sets and selects SP. Selects PID groups.

PID — Sets and changes control constants.

PARA — Sets and changes parameters.

RDY — Selects RUN/READY run/ready (standby mode)

EV — Sets events and selects types.

AT — RUN or STOP auto tuning

SET UP — Sets and changes instrument setup.

ENT — Prepares for entry, or stores data.

Changes entry, or shifts setting items (multikeys)
When setting a numeric, shift the numeric characters, and by the upper/lower key, and shift the digits by the left/right key.
When calling a set item, transfer to the preceding/following item by the upper /lower key, and to the left/right item by the left/right key.

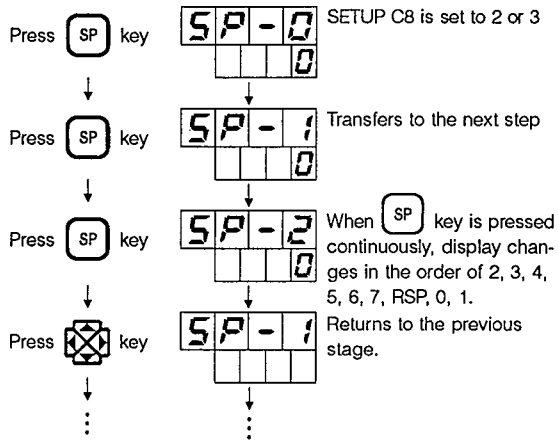
2. Outline of Keying Operation

Display sequentially changes from the upper part to the lower part in each table by pressing [SP], [PID], [PARA], [EV], [SET UP], respectively. Display can be reset to the last one by pressing ◆ key (the upper key) of ◆ key.

2-1. Calling of SP setting (example)

SP setting can be called, each time [SP] key is pressed. When lower key or ◆ keys is pushed after SP display, the following display appears in the same way as in pressing the [SP] key.

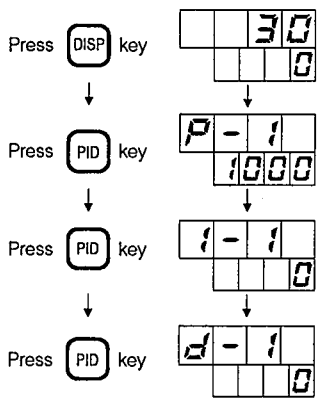
Example:



2-2. Calling of other modes from SP

Press the next key after pressing [DISP] key when you want to transfer from [SP] keying operation to other keying operation.

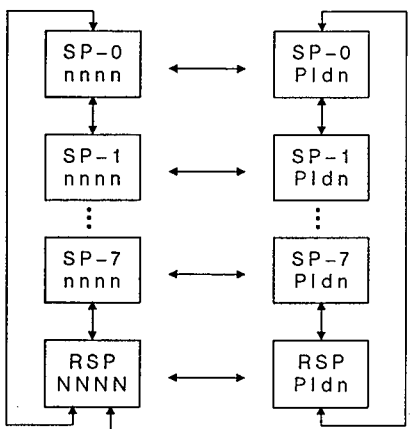
Example: For changing from SP setting to PID setting



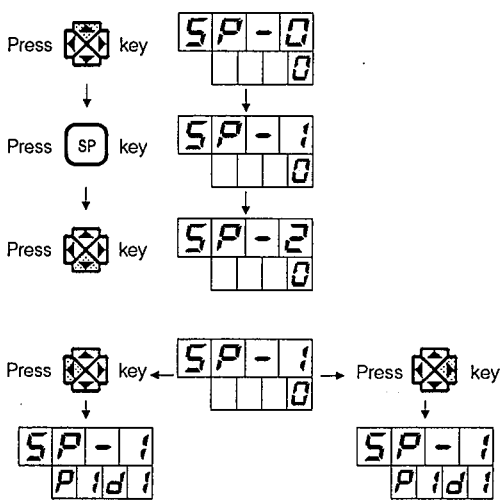
2-3. Functions of ◆ key matrix

Items can be transferred by pressing the upper, lower, left, and right keys of ◆ keys.

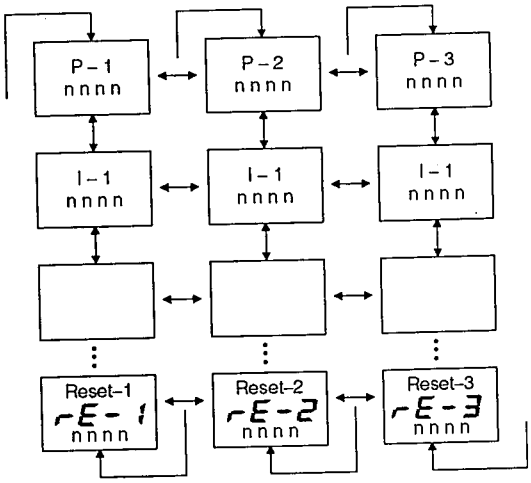
(1) SP setting

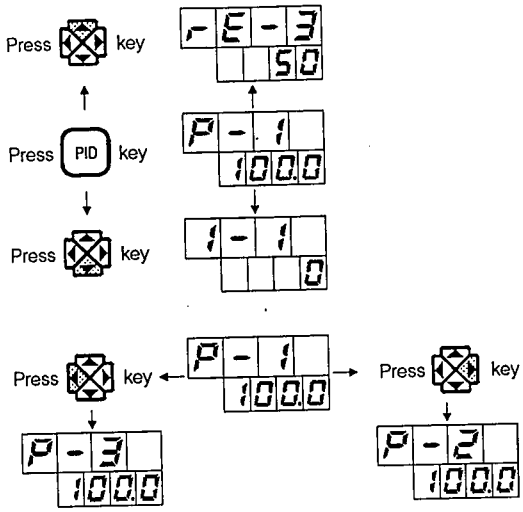


For RSP NNNN, a numeric is not changeable by the keys on the front panel of instrument.

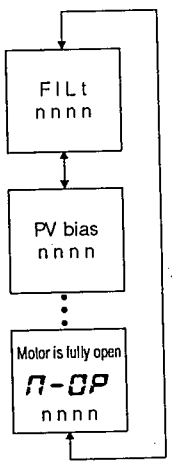


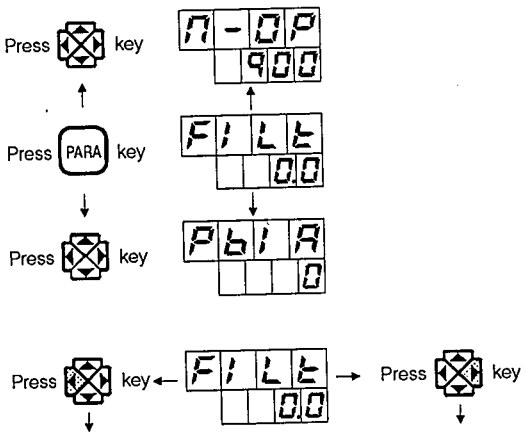
(2) In case of PID



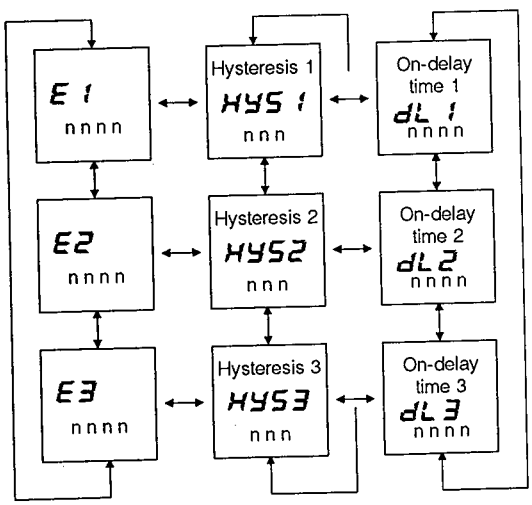


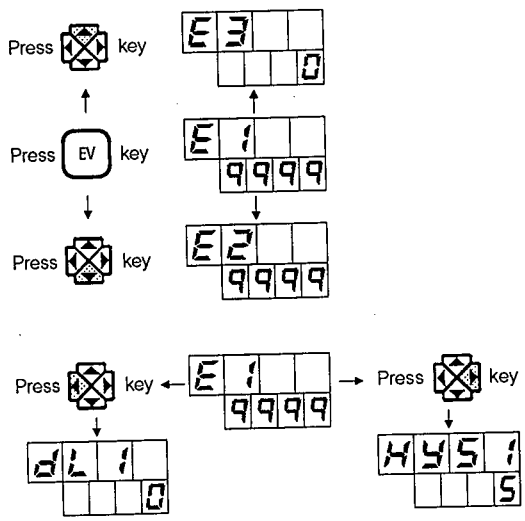
(3) In case of PARA





(4) In case of EV





2-4. Numerical setting and change

By pressing [ENT] key, the instrument is ready for setting, and the position to be set flashes. It is possible that a hyphen in (SP-0) other than numerics flashes. In such a case, press [ENT] key again, and a numeric position flashes.

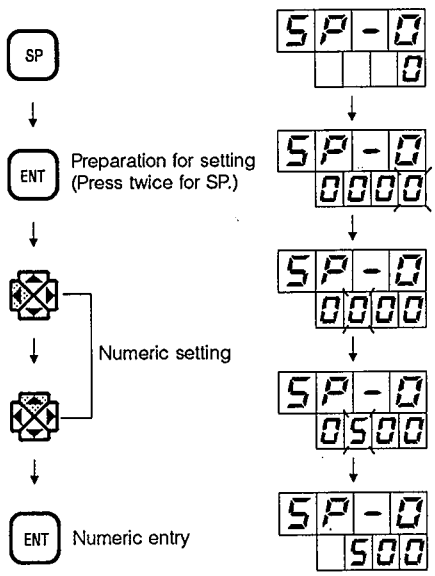
(1) Press [ENT] key after producing an item to be set.

(2) The least significant digit LED of the lower indicator flashes.

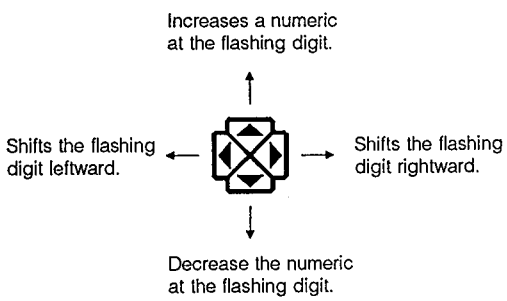
(3) Transfer flashing to a necessary digit by either right or ◈ key of ◈ keys, and set a numeric by either upper or lower key of ◈ keys.

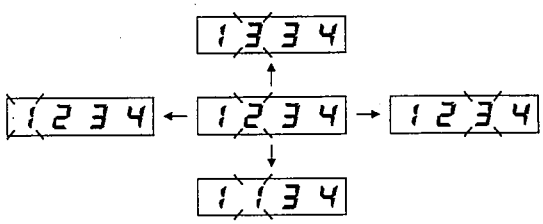
(4) After setting the numeric, press [ENT] key to enter the numeric.

(5) Example: Set SP to 500.



(6) Functions of ◈ keys when the lower indicator is flashing





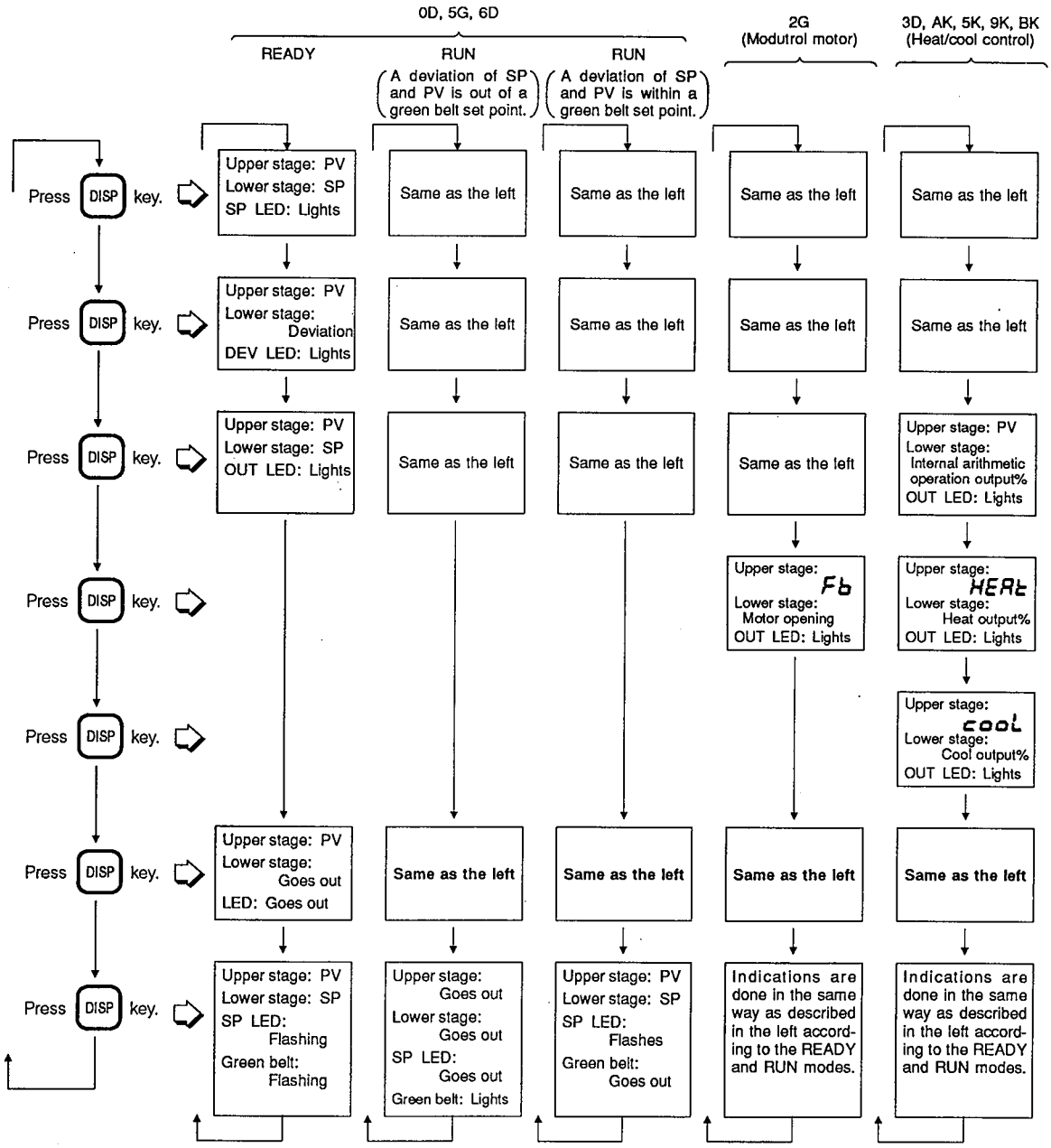
3. DISP key indications selection

(The following indications are all called initial indication mode.)

Each time DISP key is pressed, the indications of the upper stage and lower stage indicators are selected as follows.

These indications differ according to whether the instrument is set to READY or RUN mode (according to whether a deviation of SP and PV is within or out of a green belt set point during run).

The motor opening is indicated for 2G modutrol motor, while the output is indicated for 3D, AK, 5K, 9K, and BK heat/cool control.

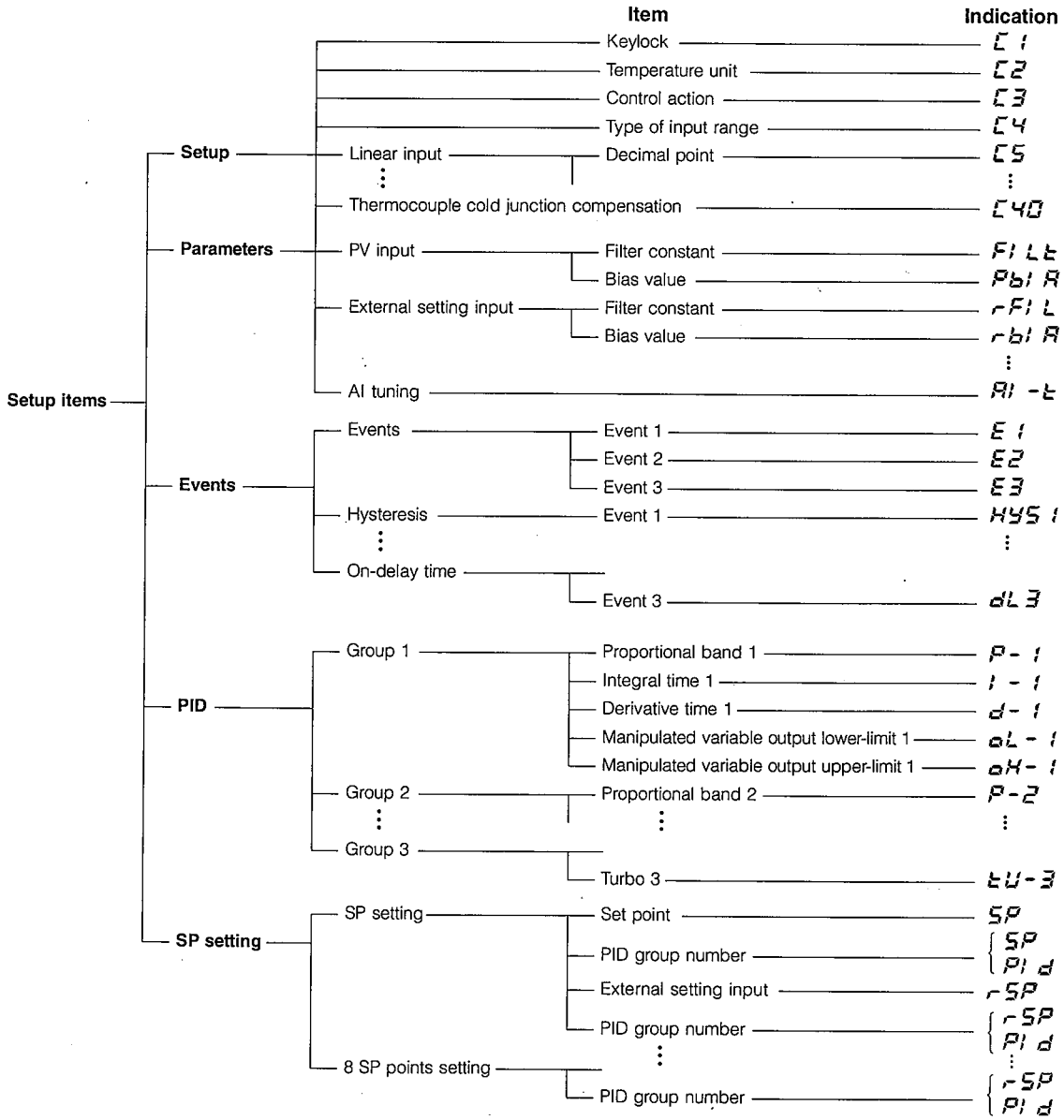


If the indications are cleared and darkened, the above indications are selected by pushing DISP key.

4. SETTING

1. General The following five setting items are provided.

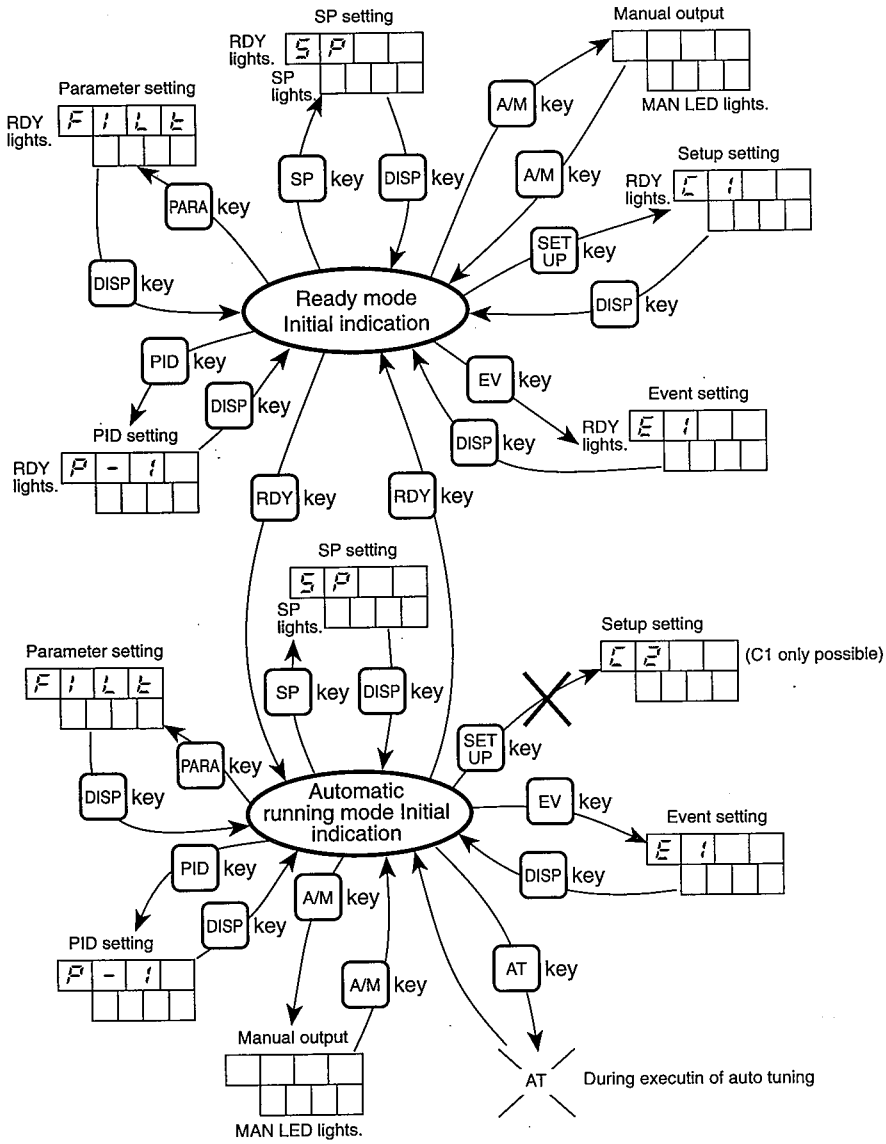
1. Setup — Item to be set to determine the specifications for SDC200 according to equipment. Set this item in ready mode. ..... See page 32.
2. Parameter — Item to be set to determine the constants of SDC200. This item can be set at any time. ..... See page 45.
3. Event — Item to be set to obtain the signal output at the points required in various modes. ..... See page 54.
4. PID — Item to set PID values for optimum control. When PID values are found by auto tuning, this item is automatically set. ..... See page 58.
5. SP setting — Item to be set according to the number of SP selection points selected by setup. ..... See page 62.



Various settings transition diagram

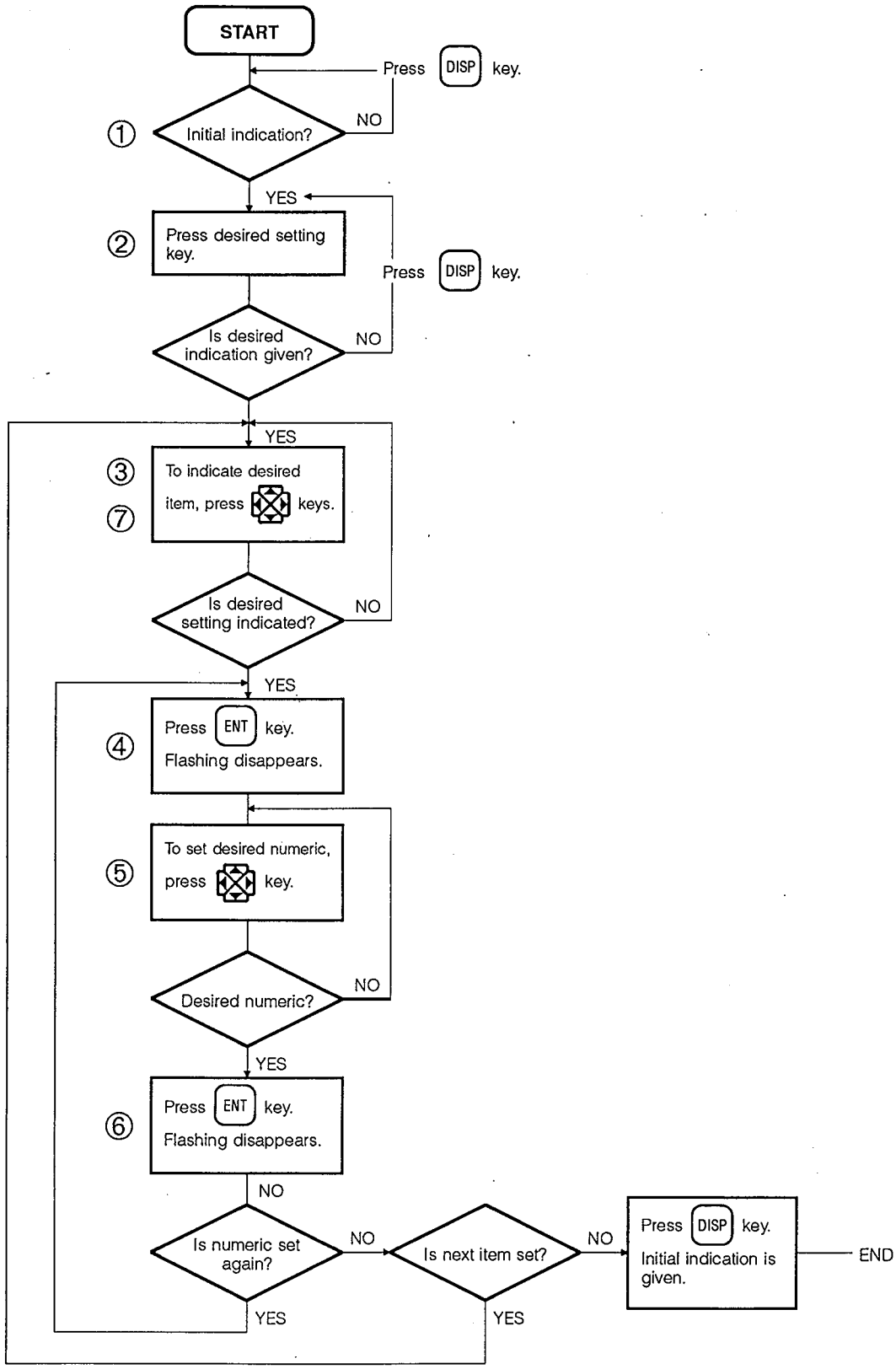
Ready mode: Means a standby status in which RDY LED lights before running.
Execute the following settings from this status. [SET UP] key is alive only in the ready mode.
When [DISP] key is pressed in any setting status, the initial indication in the ready mode is restored.

Automatic running mode: Means an automatic operation status in which RDY LED goes out. Execute the following setting from this status. [AT] key (PID auto tuning) is alive only in the automatic running mode.
The automatic running mode is switched to the ready mode by pressing [RDY] key.
When [DISP] key is pressed in any setting status, the initial indication of the automatic running mode is restored.



Note: If how to do is uncertain on the course of setting, press [DISP] key to return to the original status, and retry setting.

2. Setting Operation Flow



Description of setting operation flow

Various settings are set in the following procedure.

① To give the initial indication — Press DISP key.

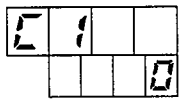
PV / SP

When the initial indication of PV indication is given on the upper indicator, start with setup ②.

② To indicate desired setting — Press a desired setting key.

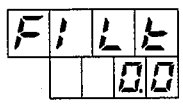
← Upper-stage item is indicated.

1. Setup setting (set in ready mode) — SET UP key



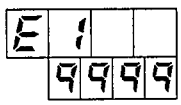
← Setup item is indicated.

2. Parameter setting — PARA key



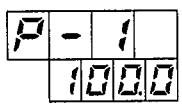
← Parameter item is indicated.

3. Event setting — EV key



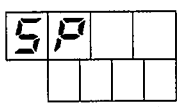
← Event item is indicated.

4. PID setting — PID key



← SP is indicated.

5. SP setting — SP key



← SP is indicated.

③ To set the desired item — Press the upper/lower key of ◀▶ keys.

← Desired item is indicated.

④ To set the desired item — Press ENT key.

← Numeric on the lower indicator flashes.

⑤ To set the numeric — Press ▲▼ key.

Shift the numeric by the upper/lower key.

Shift the digits by the left/right key.

⑥ To store the numeric — Press ENT key.

← Numeric flashing on the lower indicator disappears.

⑦ To indicate a desired next item — Press the upper/lower key of ◀▶ keys.

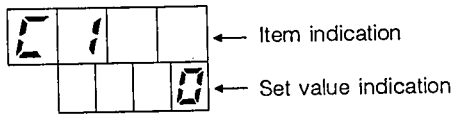
← The next item is indicated.

3. Setup Setting

3-1. Setup setting items

Setup setting is done to make the specifications of SDC200 meet the user's specifications. (This setting is done in the ready mode.)

A setup item is indicated on the upper indicator, while a set point is indicated on the lower indicator.



If an initial value satisfies demand specification, it is no longer necessary to set this item.

Change setup setting as required, while referring to the following items and pages.

The initial value marked with ↓ in the initial value column can be used as it is, except for special cases.

The initial values must be changed in the following cases.

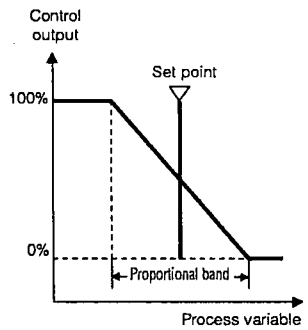
- **When the type of PV input range is changed (C4) ..... See page 38**
- **When the SP value direct change function is used (C8) ..... See page 40**
- **When more than one LSP are used (C8) ..... See page 40**
- **When an RSP input is 1 to 5V (option C18 to 20). ..... See page 41**
- **When an auxiliary output is used in SP, DEV, RSP, OUT or motor opening (option C21 to C23) ..... See page 42**
- **When external switches are used (option C26 to 29) ..... See page 43**
- **When the communication function is used (option C31 to 33) ..... See page 44**

When [SET UP] key is pressed, the following items are sequentially indicated. Call a desired item, and set a desired set value to it. The following initial values are set to the individual items at the delivery time from the factory.

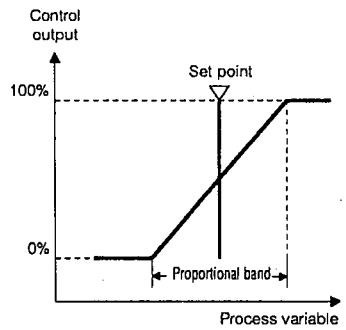
SETUP key

Codes	Setup item	Selection of setting range	Initial value in set value indicator	Description
C 1	Key lock	0: No key lock 1: Setup change not allowable PID and other changes are allowable. 2: Setting data are not changeable. RDY/RUN, R/L and A/M are changeable. 3: DISP only is changeable. RDY/RUN, R/L, and A/M are not changeable, but they are changeable by RSW and communication. 4: LSP value is settable, LSP number is selectable, and DISP and A/M keys are usable. Other setting is disable.	0 ↓	C_1 = 0 is changeable, because keylock does not function.
C2	Temperature unit	0: Centigrade (°C) 1: Fahrenheit (°F)	0 or – ↓	Set by T/C, RTD input.

Codes	Setup item	Selection of setting range	Initial value in set value indicator	Description
C3	Control action	0: Reverse action 1: Direct action	0 ↓	0: Reverse action As the process variable increases, the control output decreases. This is generally used for heating control, etc. 1: Direct action As the process variable increases, the control output increases correspondingly, and this is generally used for cooling control, etc.
C4	Type of PV range	0 to 12: Thermocouple (T/C) 20 to 34: Resistance thermometer bulb (RTD) 40 to 45: Current, voltage (linear)	— ↓	Preset when the model number is specified. See PV range code (page 6)
C5	Linear PV decimal point position	0: xxxx 1: xxx.x 2: xx.xx 3: x.xxx	0 ↓	Not indicated when the input type is T/C RTD.
C6	Linear PV lower limit	–1999 to upper limit U	0 ↓	Set when it is the linear input.
C7	Linear PV upper limit	Lower limit to 9999U	1000U ↓	
C8	LSP setting system	0: Only one LSP is used An SP value is normally changed. 1: Only one LSP is used. An SP value is directly changed. 2: 2 to 8 LSP0 to LSP7 are used. SP value, PID group, and selected SP are changeable. (**) 3: 2 to 8 LSP0 to LSP7 are used. Neither SP value nor PID group is changeable. Selected SP is changeable (**)	0	(**) • Eight LSPs (LSP0 to LSP7) can be selected by console keys when external switches are not provided. • External switches, if provided, take precedence of console keys. • Eight LSPs can be selected by console keys when external switches are not used, even if these switches are provided. (C26:0) LSP0 to LSP7: 8 LSPs • Since external switches function preferentially in the following cases, the SP selection by console keys becomes ineffective, provided that an SP value is changeable. • LSP0, LSP1 (2 LSPs) when LSP0, 1 are selected by one external switch • LSP0 to LSP3 (4 LSPs) when LSP0 to LSP3 are selected by two external switches
C9	SP limit lower-limit	0% to upper-limit of range	Lower limit of range ↓	0% of range corresponds to the lower limit of PV range. 100% of range corresponds to the upper limit of PV range. Shared by LSP and RSP. See page 36.
C10	SP limit upper-limit	Lower-limit to 100% of range	Upper limit of range ↓	



Reverse action



Direct action

U: °C, Pa and other industrial units.
The decimal point position is interlocked with the decimal point of range, while the linear input is interlocked with C5 setting.

Codes	Setup item	Selection of setting range	Initial value in set value indicator	Description
C11	Setting of manipulated variable in case of PV over-range	0: Not set 1: Set	0 ↓	C12 is set when C11=1
C12	Manipulated variable in case of PV over-range	0 to 100% (TP type)* −10 to 110% (CP type)	0% ↓	
C13	MANUAL and other MV output	0: Bumpless 1: Preset	0 ↓	Bumpless When AUTO is switched to MANUAL an AUTO output value MV is output, and arithmetic operation is started with the MV value. Preset When AUTO is switched to MANUAL, a value preset by C14 is selected, and arithmetic operation is started with the value. An MV output value in MANUAL power recovery can be set as a preset value.
C14	Preset MANUAL value	0 to 100% (TP type) * −10 to +110% (CP type)	0% ↓	
C15	Manipulated variable in READY mode	0 to 100% (TP type) * −10 to +110% (CP type)	0% ↓	Output setting in READY mode. In case of heat/cool control, set the heat side output in READY mode.
C16	Cool side manipulated variable in READY mode		0% ↓	In case of heat/cool control, set the cool side output in READY mode.
C17	READY event	0: Functions 1: Does not function	0% ↓	
C18	RSP input type	0: 4 to 20mA 1: 1 to 5V	0	Not indicated unless RSP is provided.
C19	RSP 4mA(1V) setting	−1999 to +9999U	Lower limit of range ↓	**See page 36.** Set when RSP is provided.
C20	RSP 20mA(5V) setting	−1999 to +9999U	Upper limit of range ↓	
C21	Type of auxiliary output	0: PV 1: SP 2: DEV 3: RSP 4: OUT 5: Motor opening	0 ↓	Not indicated unless AUX (auxiliary outptu) is provided.
C22	Auxiliary output 4mA setting	−1999 to +9999U (OUT, other than motor opening) −199.9 to +999.9% (OUT, motor opening)	0	**See page 36.** Set when the auxiliary output is provided.
C23	Auxiliary output 20mA setting	−1999 to +9999U (OUT, other than motor opening) −199.9 to +999.9% (OUT, motor opening)	0 ↓	
C24	READY auxiliary output	0: Output action is continued. 1: Preset READY auxiliary output	0 ↓	C25 is set when C24-1
C25	Preset READY auxiliary output value	−1999 to +9999U	0 ↓	

* TP type: Time Proportioning type relay output, voltage output
CP type: Current Proportioning type current output
U: °C, Pa and other industrial units.
. The decimal point position is interlocked with the decimal point of range, while the linear input is interlocked with C5 setting.

References

C22: 0.0%, C23: 110.0% → 4mA when fully closed, 20mA when fully open.
C22: 100.0%, C23: 0.0% → 20mA when fully closed, 20mA when fully open. (C22 > C23 setting possible)

<table>
<tr><th>Codes</th><th>Setup item</th><th>Selection of setting range</th><th>Initial value in set value indicator</th><th>Description</th></tr>
<tr><td>C26</td><td>Selection of No. of LSPs or PID group number by SW selection</td><td>0: LSP set value is not selected.
The contents of C27, C28 and C29 are selectable by SW1, SW2 and SW3.
2: Two LSP values are selectable by SW1.
The contents of C28 and C29 are selectable by SW2 and SW3.
4: Four LSP values are selectable by SW1 and SW2.
8: Eight LSP values are selectable by SW1, SW2 and SW3.
PID1: Switchable to PID1 by SW1.
The contents of C28 and C29 are selectable by SW2 and SW3.
PID3: One of PID1, 2 and 3 can be selected by SW1.
The contents of C29 are selectable by SW3.
See page 13.</td><td>0</td><td>• When 0 or 1 is set by C8, C26 is fixed at 0.
• If PID1, PID2 and PID3 are not selected by any switches of SW1, SW2 and SW3, the PID values previously specified by SP key are effective.
Not indicated unless RSW is provided.</td></tr>
<tr><td>C27</td><td>SW1 allocation</td><td rowspan="3"><table><tr><th>Allocation</th><th>ON</th><th>OFF</th></tr><tr><td>0</td><td>NOP
(Non operation)</td><td>NOP</td></tr><tr><td>1</td><td>READY</td><td>RUN</td></tr><tr><td>2</td><td>MANUAL</td><td>AUTO</td></tr><tr><td>3</td><td>REMOTE (RSP)</td><td>LOCAL (LSP)</td></tr><tr><td>4</td><td>AUTO TUNING</td><td>——</td></tr><tr><td>5</td><td>Direct/reverse action is inverted.</td><td>Direct/reverse action is as preset by C3.</td></tr></table></td><td>0</td><td rowspan="3">Set when SWs are provided.
A lower number takes precedence of others when numbers are set doubly in the modes other than NOP.
An item corresponding to C26 setting only is set. See pages 20 and 22.
Not indicated unless RSW is provided.</td></tr>
<tr><td>C28</td><td>SW2 allocation</td><td>0</td></tr>
<tr><td>C29</td><td>SW3 allocation</td><td>0</td></tr>
<tr><td>C30</td><td>Heat/cool allocation</td><td>0: Output 1: Heat 2: Cool
1: Output 1: Cool 2: Heat</td><td>0 ↓</td><td>Not indicated in other than heat/cool manipulated variable.
Set by heat/cool.</td></tr>
<tr><td>C31</td><td>Communication address</td><td>0, 1 to 254</td><td>0</td><td>Set when the communication function is provided.
0: Communication is rejected.
Not indicated unless the communication function is provided.</td></tr>
<tr><td>C32</td><td>Transmission speed</td><td>0: 9600 1: 4800
2: 2400 3: 1200 (bps)</td><td>0</td><td>Not indicated unless the communication function is provided.</td></tr>
<tr><td>C33</td><td>Communication code</td><td>0: 8 bit even party bits
1 stop bit
1: 8 bit no parity bit
2 stop bits</td><td>0</td><td>Not indicated unless the communication function is provided.</td></tr>
<tr><td>C34</td><td>Transmitting codes</td><td>0: Binary
(for CMC300/400, MA500 DIM)
1: ASCII
(for MX100 SCM)</td><td>0</td><td>• Not indicated unless the communication function is provided.
• However, not indicated even when the RS-232C communication function is provided.
(Indicated only when the RS-422 communication function is provided.)</td></tr>
<tr><td>C35</td><td>Input/output</td><td>(Hexadecimal)</td><td></td><td rowspan="2">See the separate table
Not rewritable</td></tr>
<tr><td>C36</td><td>Option type</td><td></td><td></td></tr>
</table>

Codes	Setup item	Selection of setting range	Initial value in set value indicator	Description
C37	Device code	136		Not rewritable
C38	ROM ID	Undefined		
C39	ROM version	ROM version		
C40	Thermocouple cold junction compensation	0: Inside 1: Outside	0	Model of thermocouple input only. Not indicated in other than input type T/C.

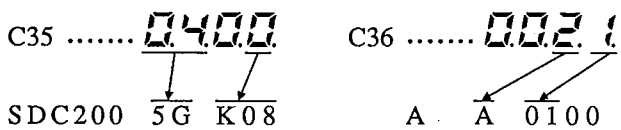
C35

1000th and 100th place	10th place	Unit place
0.1 : 6D 0.2 : 0D 0.4 : 5G 1.4 : BK 2.1 : 9K 2.2 : 3D 2.4 : AK 4.4 : 5K 8.8 : 2G	0	0: Thermocouple input 1: RTD input 2: Voltage and current input

C36

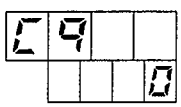
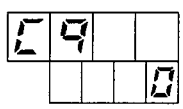
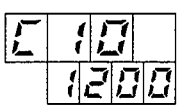
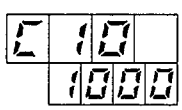
1000th place	100th place	10th place	Unit place
0	0: Other than heat/cool 1: Heat/cool	0: No communication function is provided 1: RS-232C 2: RS-422	Option code Model No. 14, 15 digits 0 : 00 1 : 01 3 : 03 5 : 02 7 : 04 9 : 05 b : 07 d : 06 F : 08

Example



Reference

Examples of C9, C10, C19, C20, C22 and C23 initial values

Model No.	SDC2005GK09 Input: 0 to 1200°C	SDC2005GC01 Input: 4 to 20mA
C9 (SP limit lower-limit) (C19 RSP setting C22 Auxiliary output setting)	 Indication of lower limit of input range	 Indication of lower limit of input range
C10 (SP limit upper-limit) (C20 RSP setting C23 Auxiliary output setting)	 Indication of upper-limit of input range	 Indication of upper-limit of input range

3-2. Setup mode setting procedure

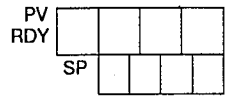
For the contents of setup functions, see pages 32 to 36.

Since almost all setup contents are employable by setting initial values, only a part of operating procedures will be described.

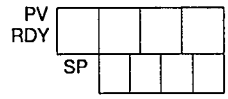
Neither setup mode setting nor setup mode change is possible during run.

(1) Keying operation procedure

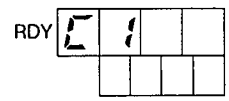
When the instrument is ready with initial indication given, start with step ③.

① To give initial indication — Press DISP key. ⇩ 

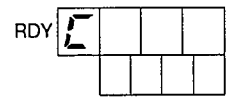
PV value is indicated on the upper indicator.

② To set the instrument to the ready mode — Press RDY key. ⇩ 

RDY LED lights.

③ To set the setup mode — Press SET UP key. ⇩ 

C1 is indicated on the upper indicator.

④ To call a desired item — Press ◆ key. ⇩ 

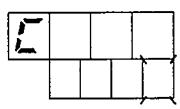
The desired item is indicated on the upper indicator.

By pressing the lower key of ◆ keys, C1, C2, C3 ... are indicated sequentially.

By pressing the upper key of ◆ keys, C40, C39, C38 ... are indicated sequentially.

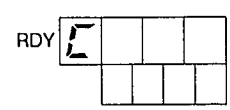
By pressing the right key of ◆ keys, C1, C11, C21 ... are indicated sequentially.

By pressing the left key of ◆ keys, C31, C21, C11 ... are indicated sequentially.

⑤ To make a numeric settable — Press ENT key. ⇩ 

A numeric on the lower indicator flashes.

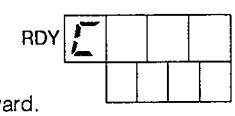
⑥ To set a desired numeric — Press ◆ key. ⇩ Shift the numeric by the upper/lower key of ◆ keys.
Shift the digits by the left/right key of ◆ keys.

⑦ To store the desired numeric — Press ENT key. ⇩ 

The lower indicator flashing disappears and the numeric is stored.

When correction is desired. ← Check ◇ Check if the set value or changed value is correct.

⇩ Transfer to the next item

⑧ To call a next desired item — Press ◆ key. ⇩ 

The desired item is indicated.

⋮

Repeat step ④ onward.

(2) Change of the type of PV input range Call C4.

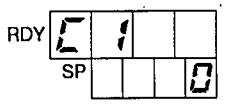
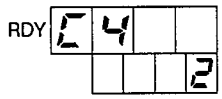
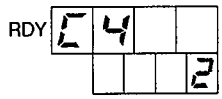
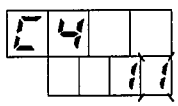
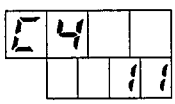
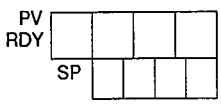
The PV input range can be changed in each group (thermocouple, RTD, linear input).

See the type and code number of PV input range shown below.

The PV input range can be changed simply by changing the setting of only the code number of PV range.

Example: Change from J 0 to 800°C to K 0 to 800°C Set C4:11.

Start with the ready mode where an initial indication is given (keying operation procedure ②).

③ To set the setup mode	Press [SET UP] key. ⇩	 C1 is indicated on the upper indicator.
④ To indicate C4	Press the lower key of keys three times. ⇩	 C4 is indicated on the upper indicator.
⑤ To make a numeric changeable	Press [ENT] key. ⇩ To set the PV range code K08. ⇩	 The numeric on the lower indicator flashes.
⑥ To indicate the numeric of Code No. as 11	Shift the numeric by the upper /lower key of keys, and shift the digits by the left/right key of keys. ⇩	 11 is indicated on the lower indicator.
⑦ To store the numeric	Press [ENT] key. ⇩	 Flashing disappears, and J08 has been changed to K08.
⑧ To restore the initial indication	Press [DISP] key.	 PV is indicated on the upper indicator.

References

Type and code number of PV input range

Thermocouple group		
Type	Range	Code No.
T (CC)	–199.9 to +300.0°C	6
K (CA)	0.0 to 400°C	12
J (IC)	0 to 800°C	2
E (CRC)	0 to 800°C	1
K (CA)	0 to 800°C	11
K (CA)	0 to 1200°C	3
N	0 to 1300°C	9
PLII	0 to 1300°C	10
R (PR13)	0 to 1600°C	4
S (PR10)	0 to 1600°C	5
B (PR30-6)	0 to 1800°C	0
PR40-20	0 to 1900°C	8
W (WRe5-26)	0 to 2300°C	7

Linear group		
Type	Range	Code No.
4 to 20mA DC	–1999 to +9999	40
–10 to +10mV DC	–1999 to +9999	42
0 to 10mV DC	–1999 to +9999	41
1 to 5V DC	–1999 to +9999	45

RT group		
Type	Range	Code No.
Pt100 equivalent to IEC • DIN	–200 to +500°C	20
Pt100 equivalent to IEC • DIN	–199.9 to +200.0°C	21
Pt100 equivalent to IEC • DIN	–100.0 to +150.0°C	32
Pt100 equivalent to IEC • DIN	–50.0 to +200.0°C	31
Pt100 equivalent to IEC • DIN	–40.0 to +60.0°C	30
Pt100 equivalent to IEC • DIN	0.0 to 100.0°C	34
Pt100 equivalent to IEC • DIN	0.0 to 300.0°C	33
Pt100 equivalent to IEC • DIN	0.0 to 500.0°C	29
Old JIS Pt100	–199.9 to +200.0°C	22
Old JIS Pt100	–100.0 to +150.0°C	26
Old JIS Pt100	–50.0 to +200.0°C	25
Old JIS Pt100	–40.0 to +60.0°C	24
Old JIS Pt100	0.0 to 100.0°C	28
Old JIS Pt100	0.0 to 300.0°C	27
Old JIS Pt100	0.0 to 500.0°C	23

(3) When the direct change of LSP value is used, call C8.

Set to C8:1 (direct change)

Start with the status where a setup item is indicated (keying operation procedure ③).

④ To indicated C8	Press the lower key of keys seven times. ⇩	RDY C8 / 0 — C8 is indicated on the upper indicator, while 0 is indicated on the lower indicator.
⑤ To make a numeric changeable	Press ENT key. ⇩	RDY C8 / 0 — 0 on the lower indicator flashes.
⑥ To change the numeric from 0 to 1	Press the upper key of keys once. ⇩	RDY C8 / 1 — 1 flashes on the lower indicator.
⑦ To store the numeric	Press ENT key. ⇩	RDY C8 — Flashing disappears.
⑧ To restore the initial indication	Press DISP key.	PV RDY / SP — The initial indication of PV and SP is given.

(4) When more than one LSP are used.

This is established by changing numeric 0 to 2 or 3 in place of 1 in step ⑥ of item (3) above. The difference between setting to 2 and that to 3 is as follows:

2: When eight LSPs 0 to 7 are used, SP value and PID group number are changeable, and SP value is selectable.

3: When LSPs 0 to 7 are used, SP value and PID group number are unchangeable, but SP value is selectable.

(5) When RSP input is used as 1 to 5V (when RSP is provided as option), call C18.

Example: Set to C18:1 for the input of 1 to 5V (the input terminal + side is then connected to ㉝ and the – side to ㉞ and ㉟).

Start with the status where a setup item is indicated (keying operation procedure ③).

④ To indicate C18	Press the lower key of keys seven times, and the right key once. ⇩	RDY C 18 / 0	C18 is indicated on the upper indicator, while 0 is indicated on the lower indicator.
⑤ To make the numeric changeable	Press ENT key. ⇩	RDY C 18 / 0	0 on the lower indicator flashes.
⑥ To change the numeric from 0 to 1	Press the upper key of keys once. ⇩	RDY C 18 / 1	1 is indicated on the lower indicator.
⑦ To store the numeric	Press ENT key. ⇩	RDY C 18 / 1	Flashing disappears.
⑧ To restore the initial indication	Press DISP key.	PV RDY / SP	The initial indication of PV and SP is given.

Reference

C18: RSP input type
0: 4 to 20mA DC 1: 1 to 5V DC

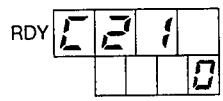
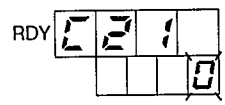
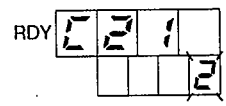
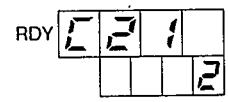
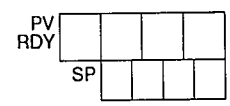
C19: The lower-limit indication of RSP input 4mA (1V) can be set.
–1999 to +9999U (initial value 0%FS)

C20: The upper limit indication of RSP input 20mA (5V) can be set.
–1999 to +9999U (initial value 100%FS)

C19 > C20 is also settable.

(6) When the auxiliary output is used as SP, DEV or RSP (when the auxiliary output is provided as option), call C21.

Example: To set the auxiliary output to DEV, set to C21: 2.
Start with the status where a setup item is indicated (keying operation procedure ③).

④ To indicate C21	Press the right key of keys twice	 C21 is indicated on the upper indicator, while 0 is indicated on the lower indicator.
⑤ To make the numeric changeable	Press ENT key.	 0 on the lower indicator flashes.
⑥ To change the numeric from 0 to 2	Press the upper key of keys twice.	 2 is indicated on the lower indicator.
⑦ To store the numeric	Press ENT key.	 Flashing disappears.
⑧ To restore the initial indication	Press DISP key.	 The initial indication on PV and SP is given.

Reference

C21 Type of auxiliary output
0: PV (initial value) 2: DEV (deviation) 4: OUT (manipulated variable)
1: SP (set point) 3: RSP (remote set input) 5: Motor opening

C22 The lower-limit indication of auxiliary output 4mA is settable.
–1999 to +9999U (initial 0%FS)

C23 The upper-limit indication of auxiliary output 20mA is settable.
–1999 to +9999U (initial value 200%FS)

C22 > C23 is also settable.

(7) When external switches are used (when external switches are provided as option), call C26.

Example: When four LSPs are selected by external switches, set to C26: 4 (by using RSW SW1 and SW2).
Start with the status where a setup is indicated (keying operation procedure ③).

④ To indicate C26	Press the lower key of keys five times and the right key once. ⇩	RDY C26 / 0	C26 is indicated on the upper indicator, while 0 is indicated on the lower indicator.
⑤ To make the numeric changeable	Press ENT key. ⇩	RDY C26 / 0 (flashing)	0 on the lower indicator flashes.
⑥ To change the numeric from 0 to 4	Press the upper key of keys four times. ⇩	RDY C26 / 4	4 is indicated on the lower indicator.
⑦ To store the numeric	Press ENT key. ⇩	RDY C26 / 4	Flashing disappears.
⑧ To restore the initial indication	Press DISP key.	PV RDY / SP	The initial indication of PV and SP is given.

Reference

- *External switches SW1 and SW2 are used to select four LSPs as in the above example. Therefore, the following items are selectable by SW3 (C29).*

C29	SW3 ON	SW3 OFF	C29	SW3 ON	SW3 OFF	C29	SW3 ON	SW3 OFF
0	NOP (non operation)	NOP	3	REMOTE (RSP)	LOCAL (LSP)	5	Direct/reverse action is inverted.	Direct/reverse action is as preset by C3.
1	READY	RUN	4	AUTO TUNING	—			
2	MANUAL	AUTO						

- *Type of external switch selection by C26*
  - *0: No external switch is used.*
  - *2: Two LSPs are selected by external switch. C27 is not indicated (SW1 is used).*
  - *4: Four LSPs are selected by external switches. C27 and 28 are not indicated (SW1 and 2 are used).*
  - *8: Eight LSPs are selected by external switches. C27, 28 and 29 are not indicated (SW1, 2, and 3 are used)*
  - *PID1: PID1 group is selected by external switch. C27 is not indicated (SW1 is used).*
  - *PID3: PID1 to 3 groups are selected by external switches. C27 and 28 are not indicated (SW1 and 2 are used).*

(8) Call C31 to C33 when the communication function is provided.

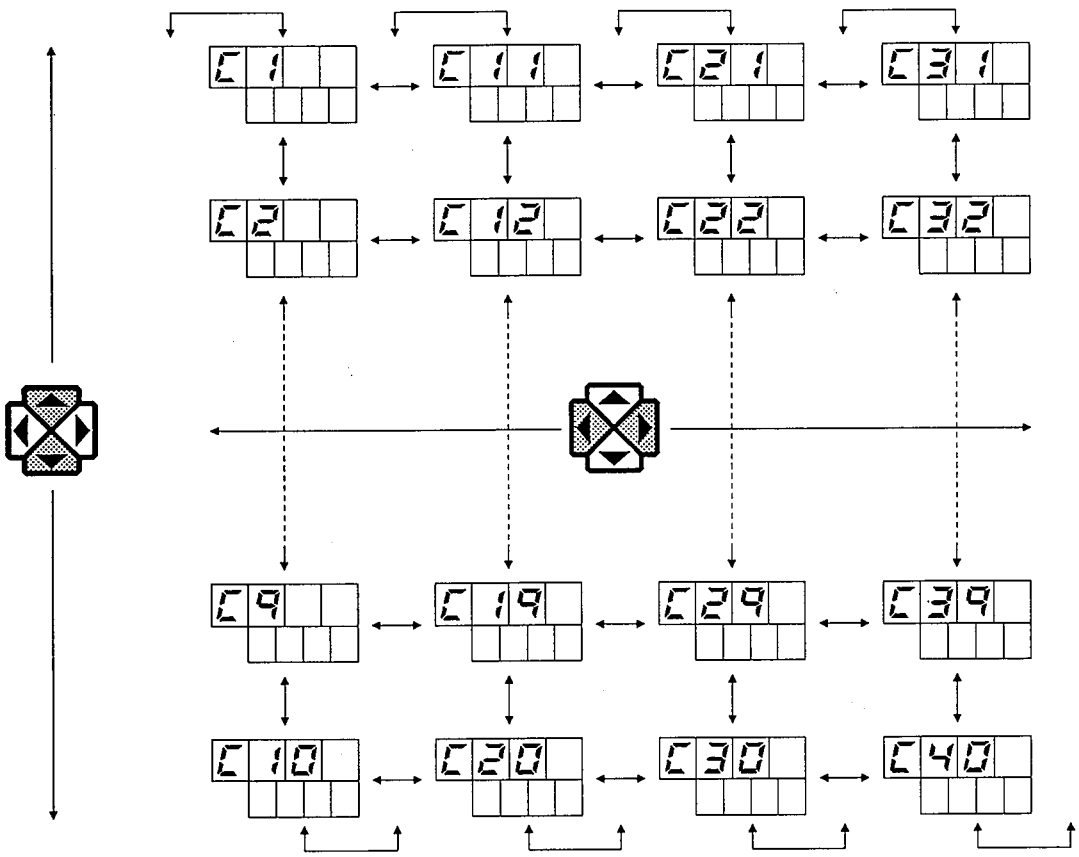
3-3. Functions of multikeys

By pressing the lower key of keys, C1, C2, C3 ..... are indicated sequentially.

By pressing the upper key of keys, C40, C39, C38 ..... are indicated sequentially.

By pressing the left key of keys, C31, C21, C11 ..... are indicated sequentially.

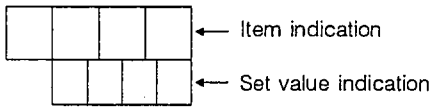
By pressing the right key of keys, C1, C11, C21 ..... are indicated sequentially.



4. Parameter Setting

4-1. Parameter setting items

Parameters are set to decide constants as the controllers.



The parameters code indicating an item is indicated on the upper indicator, while a setting value is indicated on the lower indicator.

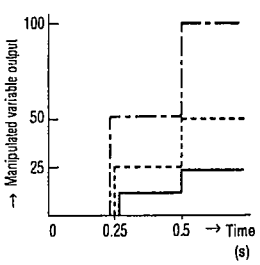
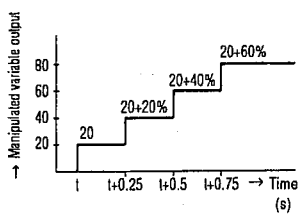
If an initial value satisfies the required specifications, setting of this parameter may be skipped to transfer to the next item.

An initial value marked with ↓ in the initial value column is employable as it is, except for special cases.

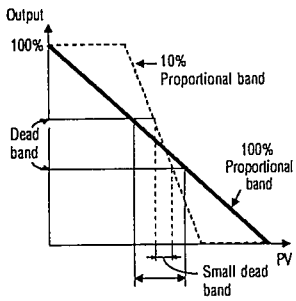
- Reset the time proportional output cycle to meet the instrument when the model numbers are 0D, 6D, 3D, AK, 9K and BK.
- It is necessary for using auto tuning and events to change the initial values.

1, 2, 3 ... are indicated sequentially as parameter items by pressing the lower key of ◁▽ keys after pressing [PARA] key; while 30, 29, 28 ... are indicated sequentially by pressing the upper key of △▷ key after pressing [PARA] key.

When [PARA] key is pressed, the following items are indicated sequentially. Call a necessary item, and set a set value.

No.	Codes	Parameter items	Selection of setting range	Initial value in set value indicator	Description
1	FILt	PV filter constant	0.0 to 120.0 s	0.0↓	
2	rbiA	PV bias	−100 to +100U	0U↓	
3	rFiL	RSP filter constant	0.0 to 120.0 s	0.0↓	Indicated when RSP is provided.
4	rbiA	RSP bias	−1999 to +9999	0U↓	
5		Time proportional output cycle (output 1)	5 to 120 s. (relay type) 1 to 60 s. (voltage type)	10	Set for TP and 0D, 6D and 3D, AK, 9K, and BK, respectively. Indicated by heat/cool TP.
6	c42	Time proportional output cycle (output 2)	Same as specified above.	10	Set for 3D, AK, 9K, and BK. Indicated by heat/cool TP.
7	outL	Manipulated variable output limit. When the manipulated variable is going to be changed to a certain value, it depends upon the set value until the next value is reached. The manipulated variable output increases or decreases every 0.25 sec. by ½ of the set value.	1 to 100% (0.5 s) 	100%↓	Example: When the manipulated variable output is abruptly changed from 20% to 80% with the set value of 40%, it changes by 20% every 0.25 sec, and reaches 80%. 

U: °C, Pa and other industrial units. Decimal point position is interlocked with the decimal point of range, while the linear input is also interlocked with C5.

No.	Codes	Parameter items	Selection of setting range	Initial value in set value indicator	Description
8	I out	Initial output PID operation Initialize	0 to 100%	0% ↓	Initial manipulated variable output to be used for PID arithmetic operation when READY is switched to RUN, or RUN is set by power ON.
9	rPId	Reset PID PID operation initialize	0: Initialized when SP is selected, but not initialized when SP value is set. 1: Not initialized in each case of SP selection and SP value setting. 2: Initialized in each case of SP selection, and SP value setting.	0	SP selection means the following. LSP_n <----> LSP_m LSP_n <----> RSP The initialize of set value 0 causes output bumpless. The initialize of set value 2 causes starting with the output according to the deviation between SP and PV.
10	dIFF	ON/OFF control Differential	0 to 100U	5U ↓	Indicated in 0D, 6D (TP).
		Position proportional Dead band	0.5 to 25.0% output * Indicated in 2G (M/M)	5.0%↓	
		Heat/cool Dead band	−100% to +50.0% output *. Indicated in 3D, AK, 5K, 9K, BK (heat cool).	0.0% ↓	
11	Et1	Event type 1	Event types 0: PV direct action 1: PV reverse action 2: Dviation direct action 3: Deviation reverse action 4: Absolute value deviation direct action 5: Absolute value deviation reverse action 6: OUT direct action 7: OUT reverse action 8: RSP direct action 9: RSP reverse action 10: Alarm (Alarm code generation given on page 10) 11: Auto tuning 12: SP direct action 13: SP reverse action	0 ↓	Standby function is settable in event types other than alarm and auto tuning. **For the action of event standby, see page 52.**
12	Ed1	Event 1 standby		0 ↓	
13	Et2	Event type 2		0 ↓	
14	Ed2	Event 2 standby		0 ↓	
15	Et3	Event 3 type	Event standby 0: No event standby function is provided. 1: Event standby function is provided. This parameter also functions when power is recovered and reset. Standby function is settable in event types other than alarm and auto tuning.	0 ↓	Event 3 is option. Indicated only in event 3.
16	Ed3	Event 3 standby		0 ↓	

* : In the dead band % output, PV width changes according to proportional band setting. Therefore, if the proportional band is smaller (10%), the PV width with respect to the dead band % output also becomes smaller (small dead band) even if the dead band % output is set to the same value.

No.	Codes	Parameter items	Selection of setting range	Initial value in set value indicator	Description
17	r-tr	RSP tracking	0: Not provided 1: Provided	0↓	Indicated when RSP is provided.
18	r-rA	RSP ramp	0: Not provided 1: Provided	0↓	
19	FILt	LSP ramp	0: Not provided 1: Provided	0↓	
20	SPU	SP ramp up	0 to 9999U, 0 to 999.9U	0↓	No ramp in 0. Shared for RSP and LSP.
21	SPd	SP ramp down	0 to 9999U, 0 to 999.9U	0↓	
22	rA-t	Set value reach time Unit setting (SP ramp)	0: U/min 1: 0.1U/min 2: U/hr 3: 0.1U/hr	0	* *
23	gb.-L	Green belt lower-limit	0 to 100U	5↓	
24	gb.-H	Green belt upper-limit	0 to 100U	5↓	
25	n-CL	Input when motor is fully closed.	0 to 999	100↓	Indicated in 2G(M/M). **See page 66.**
26	n-OP	Input when motor is fully open.	0 to 999	900↓	
27	dP	Temperature 0.1°C/F.	0: Not provided 1: Provided	0	Not indicated for linear input. * * *
28	At	Auto tuning system	0: AT is not executed. 1, 2: AT of system 1 or 2 is executed.	0	Not indicated on heat/cool control. 1: Ordinary auto tuning 2: Auto tuning difficult to over-
29	AI-C	AI control	0: Smart tuning is not used. 1: Smart tuning.	0	Not indicated on heat/cool control.
30	AI-t	AI tuning (learning function)	0: Not learnt 1: Automatic end of learning 2: Manual end of learning	0	Not indicated on heat/cool control. Not indicated when AI-C=0.

* *: When setup C5=3, and rA-t =1 or 3 are selected for the linear input, the value of SPU or SPd is actually 0.××××. However, since this value cannot be indicated by SDC200, only the significant digits below the decimal point are indicated as ××××.

* * *: When the selected temperature range is in 0.1 degree unit, parameter dP is not effective.
The 0.1 degree unit indication is executed in PV, DEV indication within the range of −199.9 to +999.9 degrees.
Temperature is indicated in one-degree unit in any other temperature range. However, while the left key of  keys is pressed, the most significant digit is erased, and temperature is indicated in 0.1 degree unit.

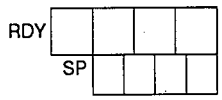
4-2. Parameter constants setting procedure

For the contents of parameter setting, see pages 45 to 47.

Since almost all parameter contents are employable by setting initial values, only a part of operating procedure will be described.

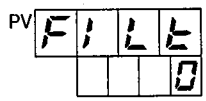
(1) Keying operation procedure

① To give initial indication, Press DISP key.



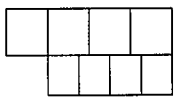
PV value is indicated on the upper indicator.

② To set the parameter setting mode Press PARA key.



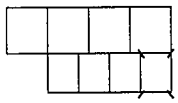
FILT (filter) is indicated on the upper indicator.

③ To indicate a desired item Press key.



Desired item is indicated on the upper indicator.

④ To make the numeric changeabl Press ENT key.



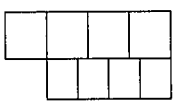
The numeric on the lower indicator flashes.

⑤ To set the numeric Press key.

Shift the numeric by the upper/lower key of keys.

Shift the digits by the left/right key of keys.

⑥ To store the numeric Press ENT key.



The lower indicator flashing disappears.

When correction is desired.

Check

Check if the set value or changed value is correct.

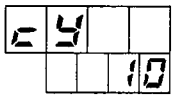
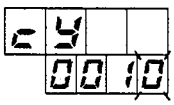
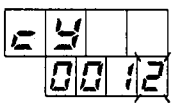
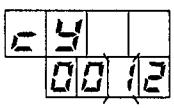
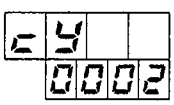
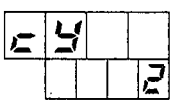
Transfer to the next item

Transfer to the next set item by keys.

(2) Time proportional output cycle setting

Example: When the time proportional output cycle is changed from 10 to 2.

Start with the status where the parameter setting mode is indicated (step ② of item (1)).

③ To indicate cycle	Press the lower key of keys four times. ⇩	 CY (cycle) is indicated on the upper indicator, while 10 is indicated on the lower indicator.
④ To make the numeric changeable	Press [ENT] key. ⇩	 0 on the lower indicator flashes.
⑤ To change the numeric from 10 to 2	Press the upper key of keys twice. ⇩	 0 is changed to 2.
	Press the left key of keys. ⇩	 The 10th place flashes.
	Press the lower key of once. ⇩	 Flashing character is changed from 1 to 0.
⑥ To store the numeric	Press [ENT] key.	 Flashing disappears.

Reference

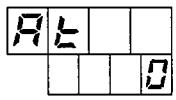
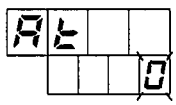
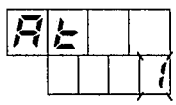
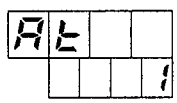
The time proportional output cycle value changes according to the models.

0D, 3D (relay output): 5 to 120 s
6D, 9K (voltage output): 1 to 60 s

(3) Auto tuning setting

Example:

When 1 is set to execute the ordinary auto tuning. Start with the status where the parameter setting mode is indicated (step ② of item (1)).

③ To indicate (auto tuning)	Press the upper key of keys three times.		At (auto tuning) is indicated on the upper indicator, while 0 is indicated on the lower indicator.
⇩			
④ To make the numeric changeable	Press ENT key.		0 on the lower indicator flashes.
⇩			
⑤ To change the numeric from 0 to 1	Press the upper key of keys once.		Flashing character is changed from 0 to 1.
⇩			
⑥ To store the numeric	Press ENT key.		Flashing disappears.

Reference

Contents of auto tuning setting

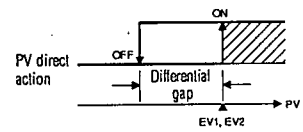
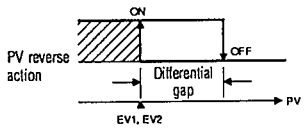
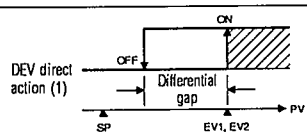
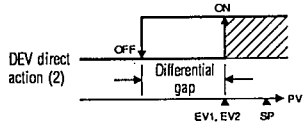
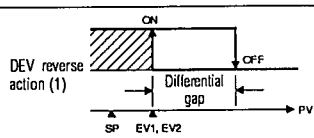
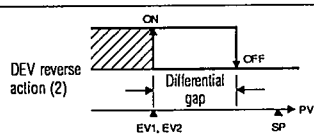
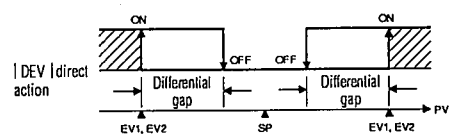
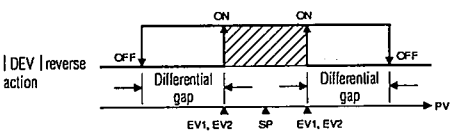
0: No auto tuning is executed.
1: Ordinary auto tuning is executed.
2: Auto tuning difficult to overshoot is executed.

(4) Event type setting

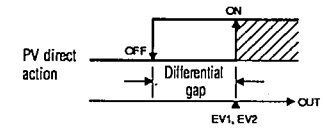
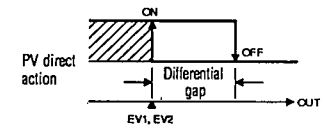
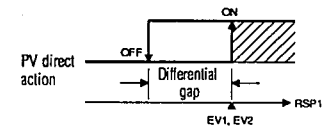
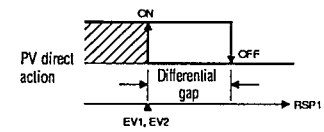
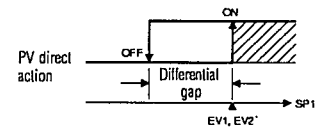
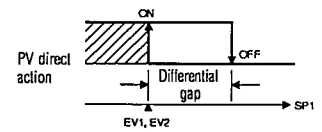
Event type can be set by indicating event 1 Et 1 and setting the following number to the lower indicator by parameter setting.

The event types of event 2 Et2 and event 3 Et3 can also be set similarly.

The action point of set event is specified by event setting.

Set No.	Event type	Action
0	Et1 0 PV direct action	
1	Et1 1 PV reverse action	
2	Et1 2 Deviation direct action DEV	 EV1 and EV2 values are positive  Ev1, EV2 are negative.
3	Et1 3 Deviation reverse action DEV	 EV1 and EV2 values are positive  Ev1, EV2 are negative.
4	Et1 4 Absolute value deviation direct action |DEV|	
5	Et1 5 Absolute value deviation reverse action |DEV|	

Note: DEV and |DEV| show SP values during a change of SP ramp.

Set No.	Event type	Action
6	Output positive action	
7	Output reverse action	
8	RSP direct action	
9	RSP reverse action	
10	Alarm	• When alarm has been set to EV1, the contact output at terminal ⑥ and ⑦ is turned ON if the alarm code given on page 10 is produced.
11	Auto tuning	• When auto tuning has been set to EV1, the contact output at terminals ⑥ and ⑦ is turned on only during execution of PID auto tuning.
12	SP direct action	
13	SP reverse action	

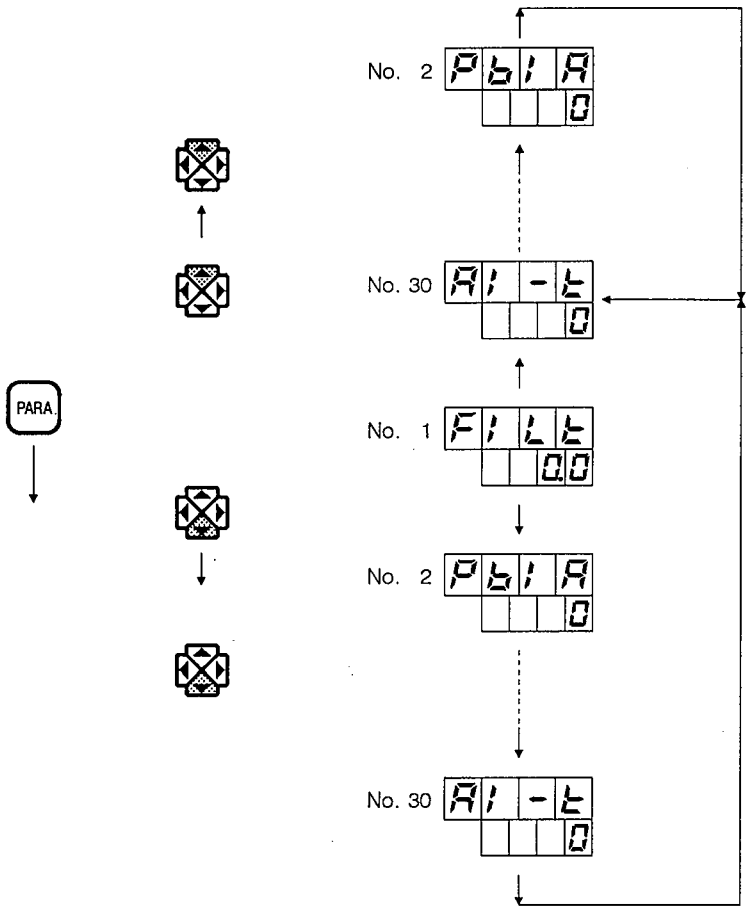
Reference

Event standby

- *If an event value is placed within the hatched area ▨ shown in the figure above at RUN start or power recovery time, the output is turned off (in the ordinary event case, the output is then turned on).*
- *If an event value is changed once from the hatched area ▨ to a value other than the differential gap, the standby status is cancelled. When an event value enters into the hatched area ▨ again, the output is turned on.*
- *If an event value enters into the hatched area ▨ from other than that area, the output is turned on. At this time, the event standby action is the same as in the ordinary event.*
- *The output is turned off in READY mode.*

4-3. Functions of multikeys

Items are transferred in the order of No.1, 2 ..... 30 by pressing the lower key of keys, while they are transferred in the order of No.1, 30, 29 ..... 2 by pressing the upper key of keys.



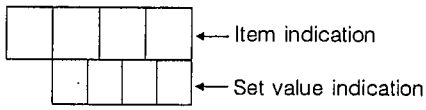
5. Event EV setting (Constants setting)

5-1. Event EV setting items

After event types are set, their action points (constants) are set as described below.

It is necessary to determine the events to be processed in parameter modes No. 12 to 17 before setting constants by [EV] key.

An item is indicated on the upper indicator, while a constant is indicated on the lower indicator.



If an initial value satisfies the required specification, this item may be skipped to transfer to the next item.

An initial value marked with ↓ in the initial value column is employable as it is, except for special cases.

It is also necessary to set the number of numerics for functioning an event.

Option event 3 (EV3) is not indicated normally.

When an event type has been changed, the constant setting must also be changed.

The following items are indicated sequentially by pressing [EV] key. Call necessary items, and set data to them.

No.	Codes	Event items	Selection of setting range	Initial value in set value indicator	Description
1	E 1	Event 1 set point	PV −1999 to +9999U DEV −1999 to +9999U |DEV| 0 to +9999U RSP −1999 to +9999U OUT −10.0 to +110.0% SP −1999 to +9999U	9999U	Not settable for alarm tuning. Indication is done as [-][-][-][-] For changing the event type, it is not effective to check the left setting range (Reset a numeric.)
2	E2	Event 2 set point			
3	E3	Event 3 set point			
4	HYS 1	Event 1 hysteresis	0 to 100U for other than OUT OUT 0.0 to 10.0%	5U 0.5%	Not settable for alarm and auto tuning. (The hysteresis means the differential gap given in pages 51 and 52.)
5	HYS2	Event 2 hysteresis			
6	HYS3	Event 3 hysteresis			
7	dL 1	Event 1 on-delay time	0 to 9999 s	0 s	Not settable for alarm and auto tuning. The on-delay time is provided to set a delay-time when it is desired to actuate the instrument with a delay time of certain seconds after reaching a set point.
8	dL2	Event 2 on-delay time			
9	dL3	Event 3 on-delay time			

Related key items

Setting what type of event is done in the parameter mode. The PARA key related items are described below.

Reference PARA key

No.	Codes	Event items	Selection of setting range	Initial value in set value indicator	Description
12	EE 1	Event 1 type	**Event type setting** 0: PV direct action 1: PV reverse action 2: Deviation direct action 3: Deviation reverse action 4: Absolute value deviation direct action 5: Absolute value deviation reverse action 6: MV direct action 7: MV reverse action 8: RSP direction action 9: RSP reverse action 10: Alarm 11: Auto tuning 12: SP direct action 13: SP reverse action **Setting whether event standby is provided or not.** 0: No event standby is provided. 1: Event standby is provided. This function is also alive when power is recovered.	0	• Event 3 is option • Standby is settable in all event types other than alarm and auto tuning.
13	Ed 1	Event 1 standby (See page 52)		0 ↓	
14	EE2	Event 2 type		0	
15	Ed2	Event 2 standby (See page 52)		0 ↓	
16	EE3	Event 3 type		0	
17	Ed3	Event 3 standby (See page 52)		0 ↓	

5-2. Event constants setting procedure

Set the number of the action points of event.

(1) Keying operation procedure

① To give the initial indication — Press DISP key. — PV / SP — PV value is indicated on the upper indicator.

② To set the event setting mode — Press EV key. — E 1 / 9999 — E1 is indicated on the upper indicator, while 9999 is indicated on the lower indicator.

③ To make the numeric changeable — Press ENT key. — E 1 / 9999 — The unit place on the lower indicator flashes.

④ To set a numeric — Press ◁▷△▽ key. — Shift the numeric by the upper/lower key of △▽ keys. Shift the digits by the left/right key of ◁▷ keys.

⑤ To store the numeric — Press ENT key. — E 1 — Flashing disappears.

When correction is desired. ← Check — Check if the set contents are correct.

Transfer to the next item

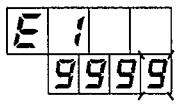
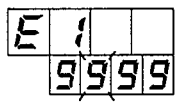
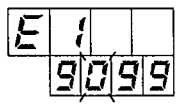
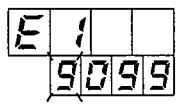
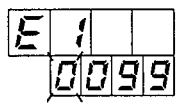
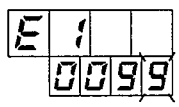
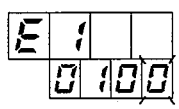
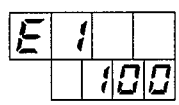
Press the lower key of △▽ keys to indicate the next item.

(2) Event action points setting

Example:

PV value acts at 100°C.

Start with the status where E 1 for event setting is indicated (step ② of item (1)).

③ To make the numeric changeable	Press [ENT] key. ⇩		The unit place on the lower indicator flashes.
④ To make the 100th place flash	Press the left key of keys twice. ⇩		The 100th place flashes.
⑤ To change 9 to 0	Press the lower key of keys nine times. ⇩		9 is changed to 0.
⑥ To make the 1000th place flash	Press the left key of keys once. ⇩		The 1000th place flashes.
⑦ To change 9 to 0	Press the lower key of keys nine times. ⇩		9 is changed to 0.
⑧ To make the unit place flash	Press the left key of keys once. ⇩		The unit place flashes.
⑨ The change 99 to 100	Press the upper key of keys once. ⇩		99 is changed to 100.
⑩ To store 100	Press [ENT] key.		Flashing disappears.

5-3. Functions of multikeys

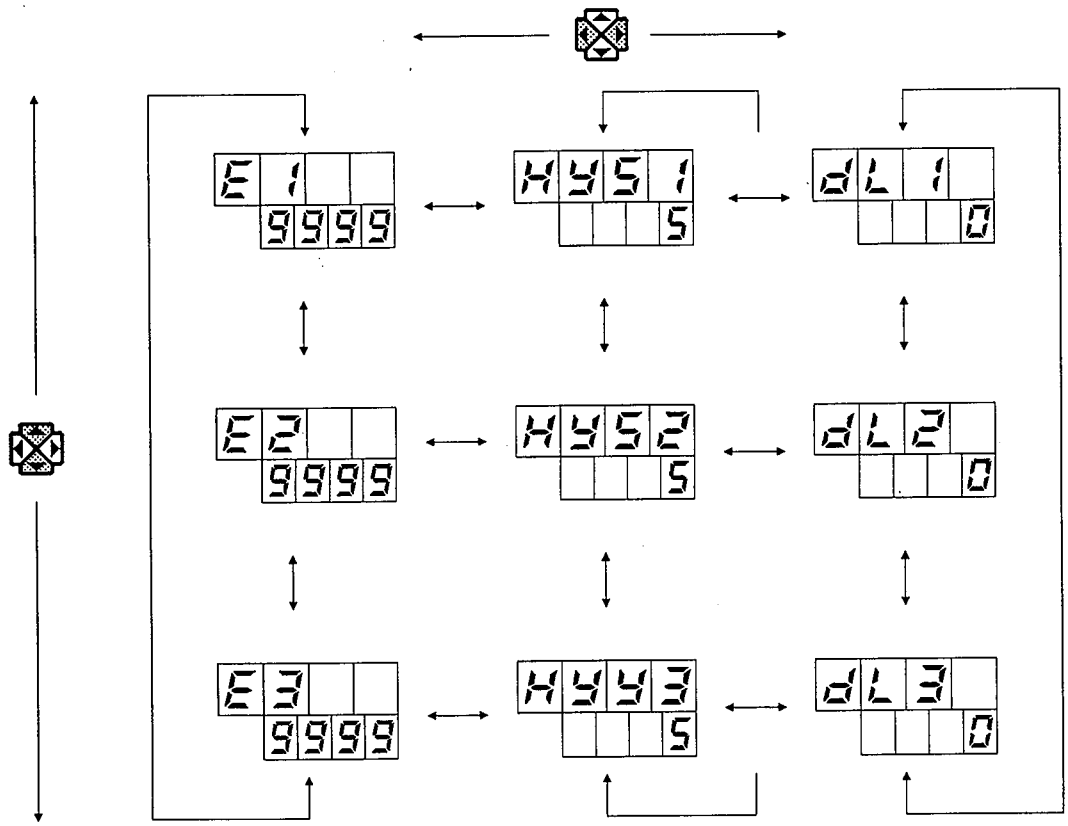
Items are called by using multikeys as follows:

When the lower key of keys is pressed, event setting E1 indication is changed in the order of E2, E3, E1 ..... (same as in hysteresis and on-delay).

When the upper key of keys is pressed, event setting E1 indication is changed in the order of E3, E2, E1 ..... (same as in hysteresis, and on-delay).

When the left key of keys is pressed, event setting E1 indication is changed in the order of dL1, HYS1, E1 ..... (same as in events E2 and E3).

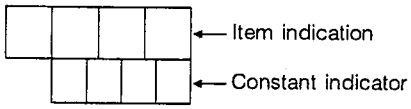
When the right key of keys is pressed, event setting E1 indication is changed in the order of HYS1, dL1, E1 ..... (same as in events E2 and E3).



6. PID setting (constants setting)

6-1. PID setting items

- Max. 3 PID groups are settable.
- Since PID group number is used in pair with SP set point, optimum PID constants can be set to that SP set point.



- When a number of SP set points are used selectively, PID group number is also selected at the same time SP set point is selected. APID item is indicated on the upper indicator, while a constant is indicated on the lower indicator.
- **Setting of PID constants is not necessary when PID constants of each of 3 groups are set by auto tuning. These constants are set during auto tuning.**
- PID setting can be called to set PID constants when optimum PID constants are known or for slightly changing PID constants after auto tuning.
- The first and second groups are used for heat/cool control, but the third group is not employable for it. Both brake and turbo cannot then be used.
- Be careful since this operation is related to setup C8 (page 33) and SP setting (page 62). The heat/cool control is also related to setup C30 (page 35).

When [PID] key is pressed, the following items are sequentially indicated.

No.	Codes	PID items	Selection of setting range	Initial value on constants indicator	Description
1	P-1	Proportional band 1	0.0 to 999.9% (TP type) 0.1 to 999.9% (CP type) 0.1 to 999.9% (Heat/cool type)	100.0	ON-OFF control is executed in time proportional output 0D or 6D when set to P=0.
2	I-1	Integral time 1	0 to 3600 s	0	Settable when P≠0
3	d-1	Derivative time 1	0 to 1200 s	0	Settable when P≠0
4	oL-1	Manipulated variable lower-limit 1	0 to upper-limit% (TP type) * −10 to upper-limit% (CP type)	0 −10	Settable when P≠0
5	oH-1	Manipulated variable upper-limit 1	Lower limit to 100% (TP type) * Lower limit to 110% (CP type)	100 110	Settable when P≠0
6	rE-1	Manual reset 1	0 to 100%	50	Settable when P≠0 and I=0
7	br-1	Brake 1	0 to 30 (function stops when set to 0) Overshoot/undershoot suppression parameter.	0	Not indicated when PARA AI – C = 0. [----] is indicated when P=0.
8	tU-1	Turbo 1.	0 to 10 (function stops when set to 0). Rising/falling time shortening parameter.	0	Not indicated on heat/cool control.

* TP type: Time Proportional type relay output, voltage output
CP type: Current Proportioning type current output

No.	Codes	PID items	Selection of setting range	Initial value on constants indicator	Description
9	P-2	Proportional band 2	Same as P–1 to tu–1	Same as P–1 to tu–1	Same as P–1 to tu–1
10	I -2	Integral time 2			
11	d-2	Derivative time 2			
12	oL-2	Manipulated variable lower-limit 2			
13	oH-2	Manipulated variable upper-limit 2			
14	rE-2	Manual reset 2			
15	br-2	Brake 2			
16	tU-2	Turbo 2			
17	P-3	Proportional band 3			
18	I -3	Integral time 3			
19	d-3	Derivative time 3			
20	oL-3	Manipulated variable lower-limit 3			
21	oH-3	Manipulated variable upper-limit 3			
22	rE-3	Manual reset 3			
23	br-3	Brake 3			
24	tU-3	Turbo 3			

However, in case of heat/cool control,

P-1, I-1, d-1, oL-1, oH-1, and rE-1 groups are selectable when the previous output internal arithmetic operation value is 50% or more, while P-2, I-2, d-2, oL-2, oH-2, and rE-1 groups are selectable when the previous output internal arithmetic operation value is less than 50%.

P-3 group is not used (not indicated).

For the heat/cool control action, see pages 11 and 22.

Related key items:

To use the smart tuning by which overshoot at a set point and the rising time up to a set point are shortened, the following parameters must also be effective.

■ **PARA key items**

gb-L	Lower-limit of green belt In reverse action: Used as reference for rising time shortening procesing. In direct action: Used as reference for undershoot suppressing processing.
gb-H	Upper-limit of green belt In reverse action: Used as reference for overshoot suppressing processing. In direct action: Used as reference for rising time shortening processing.
At	Auto tuning selection 0: No auto tuning is executed. 1: Auto tuning is used in system 1. 2: Auto tuning is used in system 2.
AI-c new item	Smart tuning ON-OFF 0: No smart tuning is executed. 1: Smart tuning is used.
AI-t new item	Learning function selection 0: Without learning 1, 2: Learning

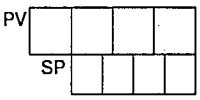
* AI–t is indicated only when AI–c = 1

6-2. PID constants setting procedure

This procedure is done to set or change the numerics of optimum PID constants when these constants are known in other than auto tuning.

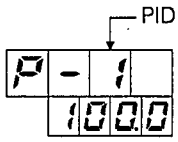
(1) Keying operation procedure

① To give the initial indication — Press DISP key.



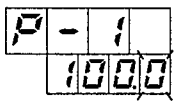
PV value is indicated on the upper indicator.

② To set the PID setting mode — Press PID key.



P-1 is indicated on the upper indicator, while 100.0 is indicated on the lower indicator.

③ To set a numeric — Press ENT key.



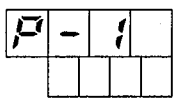
The unit place on the lower indicator flashes.

④ To set a numeric — Press ◆ key.

Shift the numeric by the upper/lower key of ◆ keys.

Shift the digits by the left/right key of ◆ keys.

⑤ To store the numeric — Press ENT key.

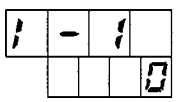


Flashing disappears.

When correction is required. — Check — Check if the set contents are correct.

Transfer to the next item

⑤ To call the next item — Press the lower key of ◆ keys.



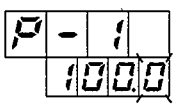
The next item is indicated.

(2) Proportional band P constants change

Example: When the proportional band P is changed to 10.

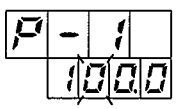
Start with the status where PID constant P- 1 is indicated (step ② of item (1))

③ To change the numeric — Press ENT key.



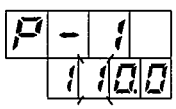
The unit place on the lower indicator flashes.

④ To make the 100th place flash — Press the left key of ◆ keys twice.



The 100th place flashes.

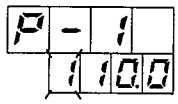
⑤ To change 0 to 1 — Press the upper key of ◆ keys once.



0 is changed to 1.

⑥ To make the 1000th place flash

Press the left key of keys once.

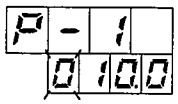


1000th place flashes.

⇩

⑦ To change 1 to 0

Press the lower key of keys once.

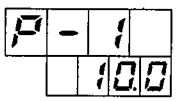


1 is changed to 0.

⇩

⑧ To store 10.0

Press ENT key.



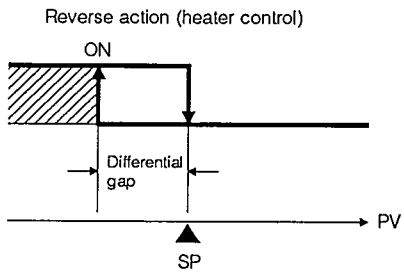
Flashing disappears.

6-3. ON-OFF output setting

The ON-OFF output can be set by setting the proportional band P to 0.

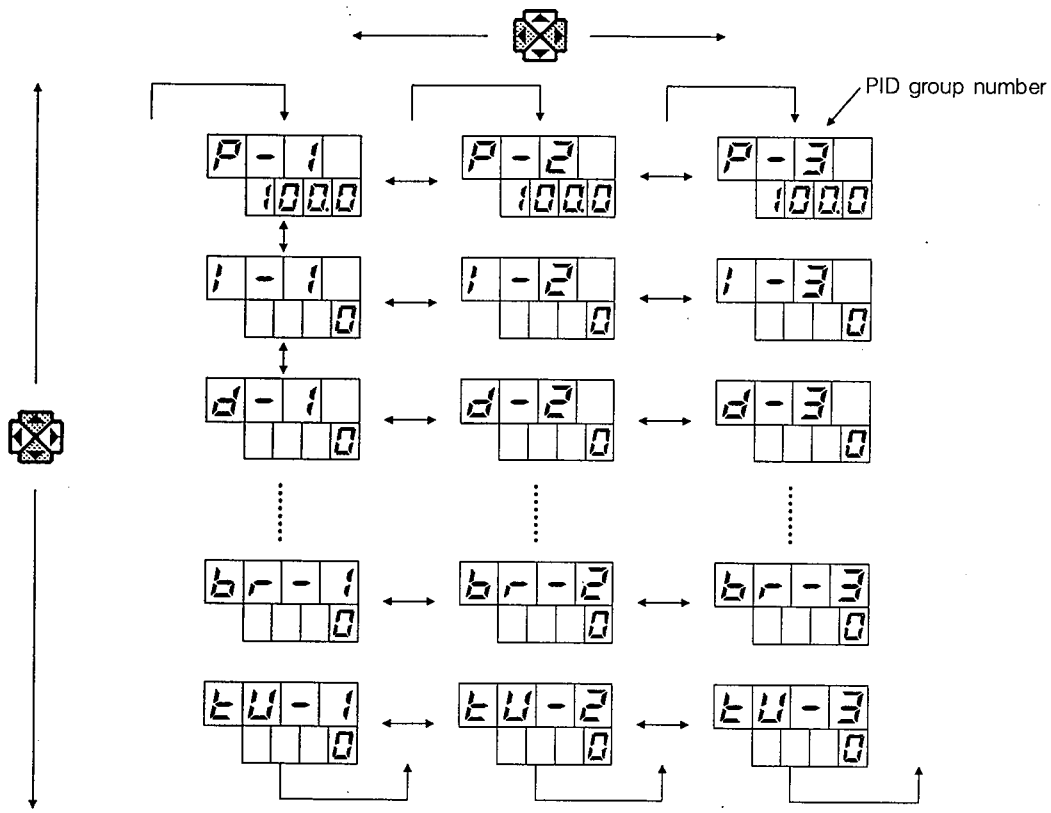
However, the proportional band P can be set to 0 only for the time proportional output in Model No. 0D or 6D.

Differential (differential gap) can be set by parameter item *dIFF*.



6-4. Functions of multikeys

PID items are called by using multikeys as follows.



7. SP setting

7-1. SP setting items

The SP using methods are classified into two kinds; in one method, only one LSP (local set point) is used, while in the other, more than one LSP are set and they are used selectively (see page 66). (See setup C8 and C26)

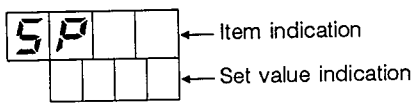
One RSP (remote set point) can also be input as SP.

When one LSP is used as SP, the SP value can be directly changed. (See setup C8).

For eight LSPs and one RSP, optimum PID can be selected out of three PID groups.

Eight LSPs can be selected by pressing [SP] key, [ENT] key, and ◀▶▲▼ keys. Also, LSP and RSP can be changed over by pressing [R/L] key.

The selection of eight LSPs and the LSP/RSP changeover can be selected by remote switches (RSW). (See setup C26 to C29).



When one LSP is used (set to setup C8: 0), the following items are sequentially indicated by pressing [SP] key.

No.	Codes	PID items	Selection of setting range	Initial value in set value indicator	Description
1	SP	LSP value	SP limit lower-limit value to upper-limit value	Center value of range	See C9 and 10.
2	SP PId n	PID group specification (when LSP is used.)	1 to 3	1	n=1 to 3
3	rSP	RSP value	SP limit lower-limit value to upper-limit value	—	Indicates when RSP is provided. (See C9 and 10.)
4	rSP PId n	PID group specification (when LSP is used.)	1 to 3	1	Indicates when RSP is provided. n=1 to 3

When eight LSPs are used (set to setup C8: 2), the following items are sequentially indicated by pressing [SP] key.

No.	Codes	PID items	Selection of setting range	Initial value in set value indicator	Description
1	SP-0	LSP 0 value	SP limit lower-limit value to upper-limit value	Center value of range	
2	SP-0 PId n	PID group specification (when LSP0 is used)	1 to 3	1	n=1 to 3
3	SP-1	LSP 1 value	SP limit lower-limit value to upper-limit value	Center value of range	
	⋮				
15	SP-7	LSP 7 value	SP limit lower-limit value to upper-limit value	Center value of range	
16	SP-7 PId n	PID group specification (when LSP7 is used)	1 to 3	1	n=1 to 3
17	rSP	RSP value	SP limit lower-limit value to upper-limit value	—	
18	rSP PId n	PID group specification (when RSP is used)	1 to 3	1	n=1 to 3

By setting setup C26, certain ones of LSP2 to 7 are not indicated.

Setup items related to SP setting

No.	Codes	PID items	Selection of setting range	Initial value in set value indicator	Description
8	C8	LSP setting system	0: One LSP is used for a normal change of SP value. 1: One LSP is used for direct change of SP value. 2: 2 to 8 out of LSP0 to 7 are used for changing SP value and PID group or selecting SP. 3: 2 to 8 out of LSP0 to 7 are used for selecting SP. However, neither SP value nor PID group is changeable.	0	When C26: 2, 4 or 8 is set, SP values cannot be selected from the front panel in C8: 2, 3, but the remote selection takes precedence of the front operation. When C26: 0 is set, setting of C8: 0, 1, 2, 3 is effective.
9	C9	SP limit lower-limit	0 to upper limit of range	0	If C9: 300 or C10: 500 is set, the SP value cannot be set to 200 or SP value cannot be set to 600.
10	C10	SP limit upper-limit	Lower limit to 100% of range	100	
18	C18	RSP input type	0: 4 to 20mA 1: 1 to 5V	0	When set to C18: 1, connect the + side to RSP input terminal ㉝, and the – side to the RSP input terminals ㉞ and ㉟.
19	C19	RSP 4mA(1V) setting	–1999 to +9999U	Lower-limit of range	Set when RSP is provided.
20	C20	RSP 20mA(5V) setting	–1999 to +9999U	Upper-limit of range	Set when RSP is provided.
26	C26	No. of LSP selected by RSW	0, 2, 4, 8, PID1, PID3.	0	No. of selected LSPs must be set by C26 when LSPs are selected by RSW.
27 28 29	C27 C28 C29	Allocation of RSW1 Allocation of RSW2 Allocation of RSW3	See table below	0	C27, 28, and 29 are effective when C26 is 0. C28, 29 are effective when C26 is 2. C29 is effective when C26 is 4. C27, 28, 29 are not effective when C26 is 8. C28 and 29 are effective when C26 is PID1. C29 is effective when C26 is PID3.

Allocation	ON	OFF
0	NOP (Non operation)	NOP
1	READY	RUN
2	MANUAL	AUTO
3	REMOTE (RSP)	LOCAL (LSP)
4	AUTO TUNING	——
5	Direct/reverse action is inverted.	Direct/reverse action is the same as in C3 setting.

PARA items related to the selection (changeover) of one out of eight LSPs.

No.	Codes	PID items	Selection of setting range	Initial value in set value indicator	Description
10	rPId	PID operation initials (in SP changeover)	0: PID operation is reset when SP is selected. 1: PID operation is continued when SP is selected.	0	This code is normally set to 0 without any trouble. If functions in $LSP_{n1} \leftrightarrow LSP_{n2}$, or $LSP_{n1} \leftrightarrow$ RSP.
17	r-tr	RSP tracking	0: Not provided 1: Provided	0	Indicated when RSP is provided.
18	r-rA	RSP ramp	0: Not provided 1: Provided	0	Indicated when RSP is provided.
19	L-rA	LSP ramp	0: Not provided 1: Provided	0	
18	SPU	SP ramp up	0 to 9999U or 0 to 999.9U	0	0: No ramp Shared for LSP and RSP.
19	SPd	SP ramp down	0 to 9999U or 0 to 999.9U	0	0: No ramp Shared for LSP and RSP
18	rA-t	Set point reach time unit setting (SP ramp)	0: U/min 1: 0.1U/min 2: U/hr 3: 0.1U/hr	0	

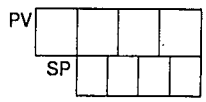
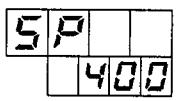
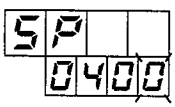
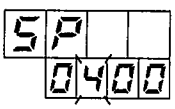
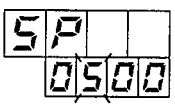
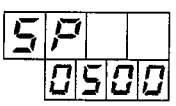
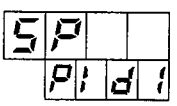
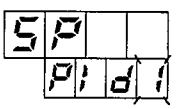
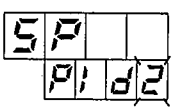
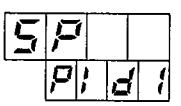
7-2. SP setting procedure

Observe the following procedure for setting control points.

Select SP values to be controlled, and the PID group number of optimum control constants at these points. The setting procedure changes, depending upon the selected numerics by setup C8.

(1) Selection of setup C8: 0 when one LSP is used.

Example: Setting of SP value: 500 and PID group number: 2

① To give the initial indication	Press [DISP] key. ⇩		PV value is indicated on the upper indicator.
② To set the SP setting mode	Press [SP] key. ⇩		SP is indicated on the upper indicator, and 50%FS (400 in this example) is indicated on the lower indicator.
③ To make SP value changeable	Press [ENT] key. ⇩		The unit place on the lower indicator flashes.
④ To make the 100th place flash	Press the left key of  keys twice. ⇩		The 100th place flashes.
⑤ To indicate 5	Press the upper key of  keys. ⇩		5 is indicated in place of 4.
⑥ To store 500	Press [ENT] key. ⇩		Flashing disappears.
⑦ To indicate PID group	Press the right key of  keys once. ⇩		PID1 is indicated on the lower indicator.
⑧ To make the group number changeable	Press [ENT] key. ⇩		1 on the lower indicator flashes.
⑨ To change 1 to 2	Press the upper key of  keys once. ⇩		1 is changed to 2.
⑩ To store the group number 2	Press [ENT] key. ⇩		Flashing disappears.

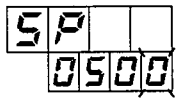
(2) Selection of setup C8: 1 for setting of direct change

Example: Setting of direct change

Start with the status where SP indication is given (step ②) of item (1)).

③ To set the SP value setting mode

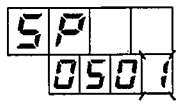
Press [ENT] key.



The unit place on the lower indicator flashes.

④ To change the SP value from 500 to 501

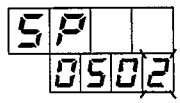
Press the upper key of keys once.



501 is indicated, and simultaneously 501 is used as an execution SP.

⑤ To change 501 to 502

Press the upper key of keys once.



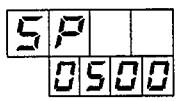
502 is indicated and simultaneously 502 is used as an execution SP.

Reference

- *Event if the LSP ramp function is preset, the direct change takes precedence of the LSP ramp function, causing 501 or 502 to be set as an execution SP.*

⑥ To restore the initial indication here

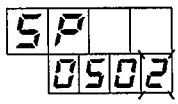
Press [DISP] key.



The indication is restored to 500, and the execution SP is also restored to 500.

⑦ To change 500 to 502

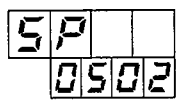
Press the upper key of keys twice.



502 is indicated and simultaneously 502 is set as an execution SP.

⑧ To store the SP value

Press [ENT] key.



502 is set as an execution SP, and the SP value is kept unchanged after that even when [DISP] key is pressed.

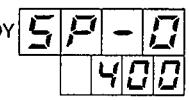
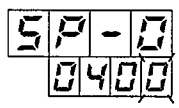
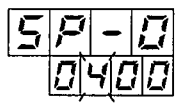
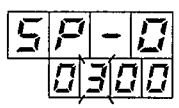
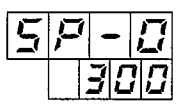
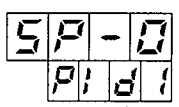
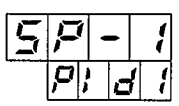
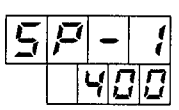
(3) Example of setting two or more set points (LSP0 to 7 are used) to be used selectively (setting of setup C8: 2) in the case of the range of 0 to 800°C.

Example of entering numerics to the following:

SP-0: 300	PID: 1
SP-1: 350	PID: 1
SP-2: 400	PID: 1
SP-3: 450	PID: 2
SP-4: 500	PID: 2
SP-5: 550	PID: 2
SP-6: 600	PID: 3
SP-7: 700	PID: 3

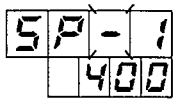
(For an example of selecting an execution SP, see (4).)

Start with the status where the initial indication is given (step 1 of item (①)).

② To set the SP setting mode	Press SP key. ⇩	RDY 	SP-0 is indicated on the upper indicator, while the 50% range is indicated on the lower indicator.
③ To make the SP value changeable	Press ENT key. ⇩		The unit place on the lower indicator flashes.
④ To make the 100th place flash	Press the left key of keys twice. ⇩		The 100th place flashes.
⑤ To indicate 3	Press the lower key of keys once. ⇩		3 is indicated in place of 4.
⑥ To store 300	Press ENT key. ⇩		Flashing disappears.
⑦ To indicate PID group	Press the right key of keys once. ⇩		PID1 is indicated on the lower indicator. Since the group number of PID is 1, keep this indication as it is.
⑧ To indicate the PID group number of LSP-1	Press the lower key of keys once. ⇩		SP-1 is indicated on the upper indicator, while PID1 is indicated on the lower indicator. Since the group number of PID is 1, PID1 remains unchanged.
⑨ To indicate the set value of LSP-1	Press the left key of keys once. ⇩		SP-1 is indicated on the upper indicator, and the 50% range (400 in this example) is indicated on the lower indicator.

⑩ To make SP value changeable

Press [ENT] key.

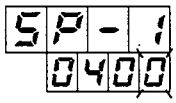


The hyphen below SP-1 flashes.
This is not an execution LSP.

(An LSP to be executed during run is indicated out of eight LSPs by the position of the hyphen. The SP to be executed is marked with a center hyphen.)

⇩

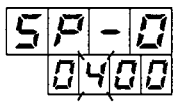
Press [ENT] key agin.



The unit place flashes.

⑫ To make the 10th place flash

Press the left key of ◀ keys once.

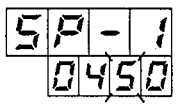


The 10th place flashes.

⇩

⑬ To change 0 to 5

Press the upper key of ▲ keys five times.

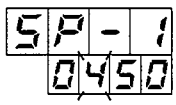


0 is changed to 5.

⇩

⑭ To make the 100th place flash

Press the left key of ◀ keys once.

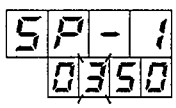


The 100th place flashes.

⇩

⑮ To change 4 to 3

Press the lower key of ▼ keys once.



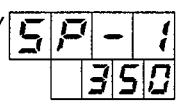
4 is changed to 3.

⇩

⑯ To store 350

Press [ENT] key.

RDY

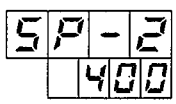


Flashing disappears.

⇩

⑰ To indicate the set value of LSP-2

Press the lower key of ▼ keys once.

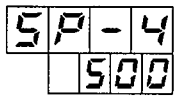
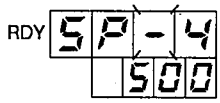
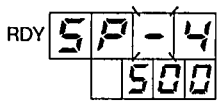
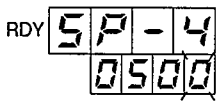
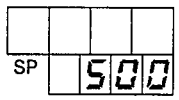


SP-2 is indicated on the upper indicator, while the 50% range (400 in this example) is indicated on the lower indicator.

Repeat steps ③ to ⑰ similarly to set the other set points.

(4) Selection of an execution SP

Example: For selecting SP-4 500°C preset in (3) as an execution SP.
Start with the status where SP indication is given (step ② of item (1)).

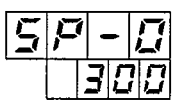
③ To indicate SP-4	Press the lower key of keys four times.		SP-4 is indicated on the upper indicator, while 500 is indicated on the lower indicator.
④ To make the hyphen flash	Press ENT key.		The hyphen below flashes.
⑤ To shift the hyphen to the center position	Press the upper key of keys once.		The hyphen below shifts to the center position.
⑥ To store the hyphen at the center position	Press ENT key.		The hyphen at the center position stops flashing, and the unit place on the lower indicator flashes
⑦ To restore the initial indication	Press DISP key.		PV is indicated on the upper indicator, while SP is indicated on the lower indicator.

(5) In case of setup C8: 3 setting

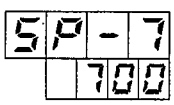
When set to C8:3, LSP-0 to 7 are indicated, and eight kinds of SP are selectable, but the PID group number of each SP is not changeable.

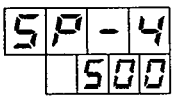
The action of the instrument by keying operation are described below.
Start with the status where SP indication is given in case of item (1) (step ② of item (1)).

- SP indication is changeable from SP-0 to 7 by pressing the upper/lower key of keys.

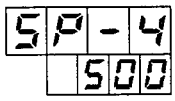


SP-0 to 7 are indicated selectively.



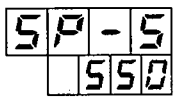
-  When execution SP-4 is indicated.

- Press ENT key.

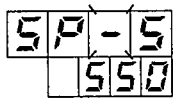


Indication is kept unchanged, and no flashing occurs.

No key sounds when keying input operation is done.

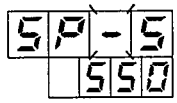
-  When SP-5 other than execution SP is indicated.

Press ENT key.



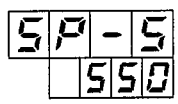
A hyphen flashes.

Press the upper key of  keys.



The hyphen shifts to the center.

Press ENT key.



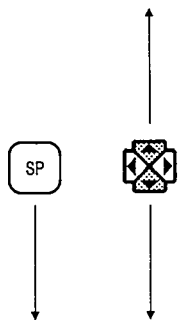
SP-5 is indicated as an execution SP.

Numeric column on the lower indicator does not flash.

7-3. Functions of multikeys

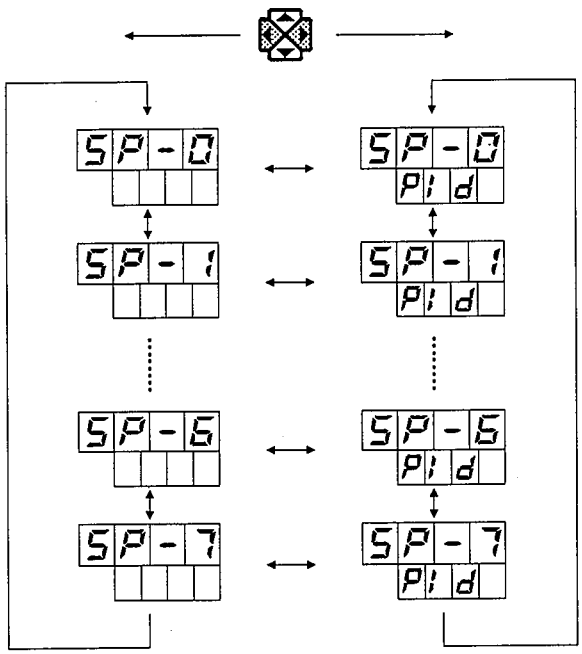
 keys function on the upper, lower, right and left sides.

However, SP key functions on the lower side only.



SP–n: Selection SP

SP–n: Non-selection SP



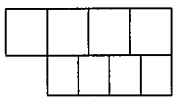
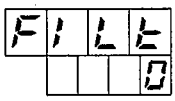
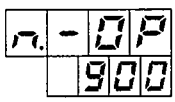
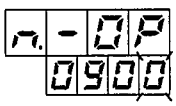
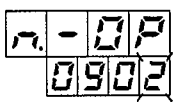
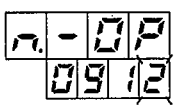
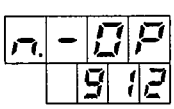
8. Fully opening/fully closing adjustment of modutrol motor (required in case of model number SDC2002G only)

This adjustment is done to correct a dispersion in the resistance of the feedback potentiometer so that the stroke of the valve is from the fully closed position to the fully open position with respect to the 0 to 100% output of SCD200.

The input when the motor is fully closed and input when the motor is fully open are given as parameter setting items.

The parameter n-CL for the former input an n-OP for the latter input are automatically set by adjusting the valve stroke from the fully closed position to the fully open position by the following method.

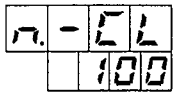
(1) Fully open position adjustment of modutrol motor

① To give the initial indication	Press DISP key.	PV 	PV value is indicated on the upper indicator.
② To set a parameter	Press PARA key.		FILT (filter) is indicated on the upper indicator.
③ To call the input when the motor is fully open	Press the upper key of keys five times.		Motor OP is indicated on the upper indicator, while 900 is indicated on the lower indicator.
④ To make the numeric changeable	Press ENT key.		The unit place on the lower indicator flashes.
⑤ To rotate the motor to fully open position	Press the upper key of keys continuously.		OUT1 LED lights. As the motor rotates to fully open position, the numeric indicated increases and the motor stops at the fully open position. The changing numeric indication also stops.
	Release holding from the lower key of keys.		The number 912 at the fully open position differs, depending upon the motors. OUT1 LED goes out.
⑥ To store the numeric	Press ENT key.		Flashing disappears.

(2) Fully opening/fully closing adjustment of modutrol motor

⑦ To call the input when the motor is fully closed

Press the upper key of  keys.

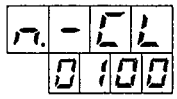


Motor CL is indicated on the upper indicator, while 100 is indicated on the lower indicator.

⇩

⑧ To make the numeric changeable

Press [ENT] key.

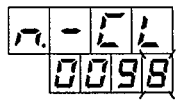


The unit place on the lower indicator flashes.

⇩

⑨ To rotate the motor to the fully closed position

Press the lower key of  keys continuously.

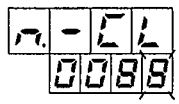


OUT2 LED lights.

As the motor rotates to the fully closed position, the numeric indicated decreases, and the motor stops at the fully closed positions. The changing numeric indication also stops.

⇩ ....

Release holding from the lower key of  key.



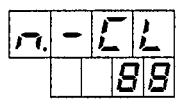
The numeric at the fully closed position differs, depending upon the motors.

OUT2 LED goes out.

⇩

⑩ To store the numeric

Press [ENT] key.



Flashing disappears.

5. OPERATION AND OTHER INSTRUCTIONS

Turn on the power switch and set SP values, optimum PID constants, and EV events values.

1. Operation

① Press [RDY] key. When the RDY lamp goes out, the instrument starts the automatic running (RUN). OUT1 and OUT2 indications during running are as follows:

In case of 5G

OUT1 lights normally

4 to 20mA is output

In case of 0D and 6D

OUT1 lights — output ON

OUT1 goes out — output OFF

In case of 3D and 9K

OUT1 lights — Output 1 side ON

OUT2 lights — Output 2 side ON

In case of 5

OUT1 lights normally

OUT2 lights normally

In case of 2G motor output

OUTPUT1 lights — ON between terminals ⑩ and ⑪, ON between fully open direction rotating motor side terminals ② and ③.

OUTPUT2 lights — ON between terminals ⑫ and ⑪, and ON between fully closing direction rotating motor side terminals ① and ③.

In case of AK, and BK

OUT1 lights normally

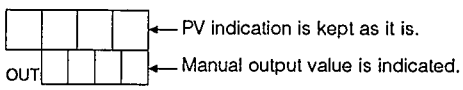
OUT2 lights — Output 2 side ON

2. Stop

① To stop the operation during run, press [RDY] key again. The RDY lamp lights, and the manipulated variable output becomes a manipulated variable in the READY mode (setting of setup C: 15), and the operation stops, setting the standby mode. When [RDY] key is pressed once more, the READY lamp goes out, and the automatic running restarts.

3. Manual mode

① When [A/M] key is pressed in the automatic mode, the MAN lamp lights and the instrument is switched to the manual mode.



② By pressing the upper and lower keys of [◇] keys in the manual mode, the output can be set to a desired position within 0 to 100% (−10 to +110% in case of 5G output).

③ To change over the manual mode to the automatic mode, press [A/M] key. The MAN lamp goes out, and the automatic mode is selected.

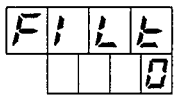
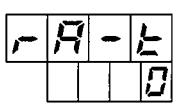
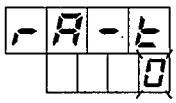
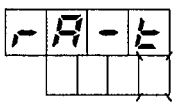
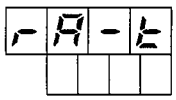
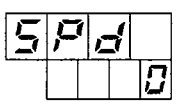
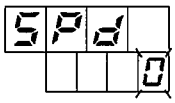
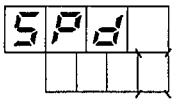
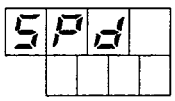
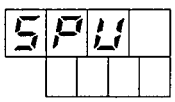
④ Bumpless or preset is selectable for an output change during changeover from the manual mode to the automatic mode. This selection is established by setting the bumpless by setup C13, or setting the preset by C13 and 14. The bumpless is selected when the manual mode is changed over to the automatic mode.

4. SP ramp setting

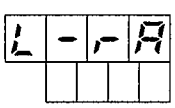
If SP is changed during running, disturbance may occur due to an abrupt SP change. An SP point can be slowly transferred to the next point by the preset ramp.

- First set the unit time (min, hr) by parameter setting.
- Then set a ramp setting numeric per unit time by parameter setting. Different numerics can be set for ramp up and ramp down. Therefore, the ramp can be changed only in one direction of up an down. When 0 is set, a step change occurs in place of the ramp.
- Whether a ramp is provided or not is selectable for the local SP and remote SP. The setting of ramp up and ramp down is common to the local SP and remote SP.

Operation

① To set the parameter setting mode	Press PARA key. ⇩		Filter is indicated on the upper indicator.
② To indicate the unit time	Press the upper key of keys nine times. ⇩		Unit time is indicated on the upper indicator.
③ To set the unit time setting mode	Press ENT key. ⇩		0 on the lower indicator flashes.
④ To set the unit time	Press the upper key of keys disired number of times. ⇩		Any numeric of 0 to 3 is set. 0: U/min, 1: 0.1U/min, 2: U/hr, 3: 0.1U/hr
⑤ To store the unit time	Press ENT key. ⇩		Flashing on the lower indicator disappears, and the numeric remains unchanged.
⑥ To indicate SP ramp down	Press the upper key of keys once. ⇩		SPd is indicated on the upper indicator.
⑦ To set the numeric setting mode	Press ENT key. ⇩		The lower indicator flashes.
⑧ To set a numeric	Press the upper and left keys of keys until the desired numeric is obtained. ⇩		The numeric is indicated on the lower indicator (set other than 0).
⑨ To store the numeric	Press ENT key.		Flashing disappears and the numeric remains un-
⑩ To indicate SP ramp up	Press the upper key of keys once. ⇩		SPu is indicated on the upper indicator.

After SPu is indicated, repeat steps ⑦ to ⑨ similarly.

⑭ To indicate LSP ramp	Press the upper key of keys once.		After L-ramp is indicated.

After L-ramp is indicated, repeat steps ⑦ to ⑨ to set 1 to the lower indicator.

Caution

For example, if the heater capacity of a dryer is too large, the PV value may abruptly become greater than SP value at the same time as starting irrespective of the SP ramp function, thus setting the same operating status as the SP ramp function is not effective.

Be carefull about the manipulated variable output caused by the balance between the load of the dryer and the heater capacity.

5. PID auto tuning function

When the PID constants for optimum control are known, set the PID constants for optimum control are known, set the PID constants according to the PID constants setting procedure given on page 58, and operate the instrument.

(1) Execution of auto tuning (when PID constants are not known)

Auto tuning is executed under the following conditions during stationary running.

- PV alarm AL01 is not issued.
- Automatic running mode is set.
- Parameter At is preset to 1 or 2.
- Parameter AI–C is preset to 0.
- Group number for storing the constants obtained by auto tuning is preset to the PID of execution SP.
- The stationary running of SP=PV is being executed in the RUN mode.

Operation

① To start auto tuning Press [AT] key. AT LTD flashes.

⇩

PID automatic arithmetic operation ends.
AT LED goes out.
PID constants are stored.

Auto tuning ends.

(2) Example of eight SP values setting and PID group setting

When eight SP values and PID groups are set as shown to the right, PID values by auto tuning are as follows.

Setting

SP–0: 300°C	PID: Group 1	SP–4: 500°C	PID: Group 2
SP–1: 350°C	PID: Group 1	SP–5: 550°C	PID: Group 2
SP–2: 400°C	PID: Group 1	SP–6: 600°C	PID: Group 3
SP–3: 450°C	PID: Group 2	SP–7: 700°C	PID: Group 3

- If auto tuning is done when SP–0: 300°C, the optimum PID values at PS300°C are also set to the PID values of SP–1 and SP–2.
- If auto tuning is done similarly when SP–2: 400°C, the optimum PID values at SP400°C are set to the PID values of SP–0 and SP–1.
- This means that the previous optimum PID values at SP300°C have been changed to the optimum values at SP400°C.
- If auto tuning is executed several times in the same PID group, this execution ends with the status where the PID values in the last execution are reset finally.
- This is the same as in PID group 2 and group 3.

Reference

- *Optimum PID constants are obtained during stationary running of SP=PV.*
- *In case of 5G or 2G output, the output limiters OL and OH of PID setting can be set so that the equipment or object may not be damaged during auto tuning due to a maximum or minimum output change, or PV change.*

6. Smart tuning function

The smart tuning is used to adjust the brake constants to suppress overshoot/undershoot, and the turbo constants to shorten the rising/falling time other than the ordinary PID constants. This function cannot be used for the heat/cool control. See page 16.

When the brake and turbo constants are known, first set the PID constants, and the upper and lower limits of the green belt (see page 47), and then set the brake and turbo constants according to the PID constants described on page 58 before starting running.

(1) Execution of smart tuning (when the brake and turbo constants are unknown)

Smart tuning is executable when the following conditions are satisfied.

- The upper and lower limits of the green belt (gb–H, L) are preset as parameters. The initial value 5 may be usable as it is.
- The AI tuning is preset to AI–C: 1 as a parameter.
- The parameter AI–t is preset to 1 or 2 when the learning function is to be used.
- PID values have been stored in the PID group n of an execution SP (for example, after execution of auto tuning).
  Also, [br–n] and [tu–n] belonging to the PID group n of an execution SP are 0 each.
- RDY LED lights in the ready mode (no control is executed in the ready mode).

Operation procedure

① To start smart tuning in the RUN mode — Press [RDY] key. → RDY LED goes out, and **AT LED lights**. (AT LED lights during learning.)

⇩ The learning ends and **AT LED goes out**. Constants are stored in brake [br–n] and turbo [tu–n]. The value of n is the same numeric as the PID group number.

⇩ The smart tuning ends.

② For SP>PV — Press [RDY] key. → RDY LED lights.

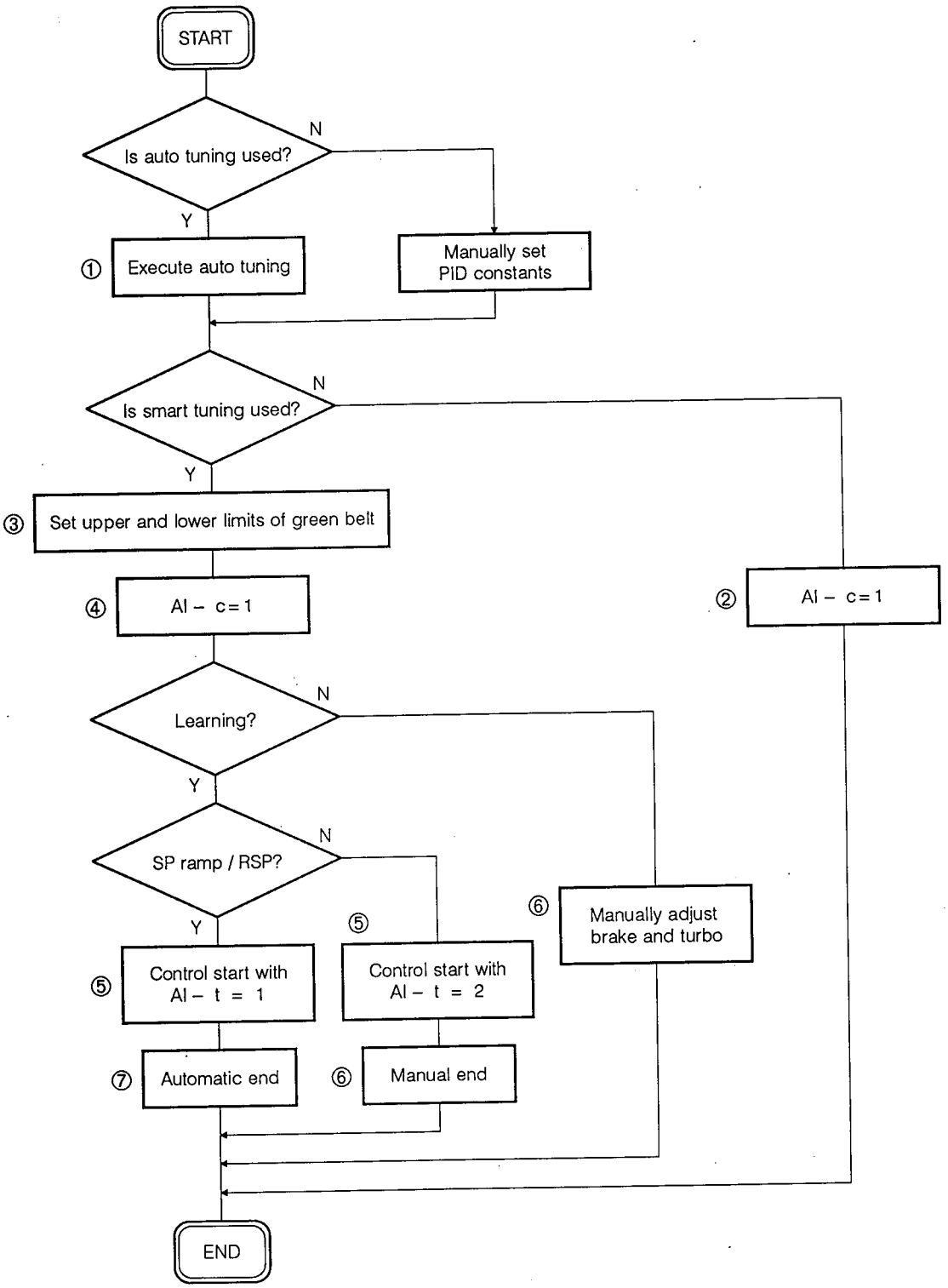
When the execution of step ① → ② is repeated five times after the difference between SP and PV (SP>PV) becomes sufficiently large, the brake and turbo constants are stabilized.

When set to AI–t:2, execute smart tuning repeatedly about five times, and then set to AI–t:0. The brake and turbo values are stored by setting to AI–t:0. AI–t:1 need not be set, since it is automatically stored at the same time as AT LED goes out.

Reference

- *When auto tuning is executed again after the execution of smart tuning, the brake [br–n] and turbo [tu–n] values of the reset PID group become 0 each. Therefore, the smart must be executed again.*
- *Although the green belt is within the allowable width of overshoot, the rising is unstable*

(2) Overall smart tuning operation flow



① **Execution of auto tuning**

Execute auto tuning and decide the PID constants.

First set AI – c = 0 and At = 1 to make the auto tuning function executable. Press the AT key and execute the auto tuning. The AT lamp (red) on the console flashes during execution of the auto tuning. (If the better result is known to be obtainable when At = 2, set to At = 2 and execute the auto tuning.)

After the auto tuning has been executed, At may be reset to 0. The br – n and tu – n of the PID group, for which the auto tuning has been executed, are reset to 0 each after the end of the execution.

② **Smart tuning off**

Set the smart tuning on-off parameter [AI– c] to 0. The smart tuning function is then ineffective and AI – t, brn and tu–n are also not indicated.

③ **Setting of upper and lower limits of green belt**

Set the lower limit [gb–L] and upper limit [gb–H] of the green belt as a reference for overshoot and rising. This green belt setting is specially important in smart tuning. If this width is set to an excessively narrow value, rising may become unstable. It is better to set a little wider width at first.

④ **Smart tuning on**

Set the smart tuning ON-OFF parameter [AI – c] to 1.

⑤ **Start of learning**

First place SDC200 in the READY mode. Learning is started by switching the READY mode to the RUN mode after setting the learning selection parameter [AI – t] to 1 or 2. When control is repeated after that, the brake [br–n] and turbo [tu–n] are automatically adjusted to improve the overshoot and rising time. The AT lamp lights continuously during learning.

The results of learning are stored in the non-volatile memory in SDC200 after the normal end by the methods mentioned in items 6 and 7.

After the end of learning, the brake and turbo values are fixed, and they are kept unchanged even if the power supply is turned off.

Note 1: When control is to be stopped during learning, set SDC200 to the READY mode.

Note 2: Don't turn off the power supply during learning.
Otherwise, the results of learning done so far are lost, so the learning must be retried.

Note 3: AI – t = 1 does not correspond to the SP ramp. Try learning when AI – t = 2, or manually set the brake and turbo constants.

Note 4: There is a possibility that the overshoot and rising may not be improved, but the controllability may be reduced on the contrary according to some process characteristics, even if learning has been executed. In such a case, manually set the brake and turbo constants, or set to AI – c = 0 to turn off the smart tuning.

⑥ **Manual end of learning**

If the learning is no longer required to be continued after executing learning with AI – t = 2, set AI – t = 0. SDC200 ends the learning, and stores the brake and turbo constants in the non-volatile memory.

When the learning ends, the AT lamp goes out.

⑦ **Automatic end of learning**

If learning is executed with AI – t = 0, SDC200 ends it by its own decision, and writes the brake and turbo values in the non-volatile memory.

When the learning ends, the AT lamp goes out, and AT – t is set to 0.

⑧ **Manual adjustment of brake and turbo**

- Brake
  Set the overshoot/undershoot supression degree by [br–n].
  The setting range is within 0 to 30.
  The suppression effect is increased as the set value becomes larger.
- Turbo
  Set the rising/falling time shortening degree by [tu–n].
  The setting range is within 0 to 10.
  The shortening effect is increased as the set value becomes larger.

(3) How to use the smart tuning in combination with various functions

ⓐ **SP ramp**

The smart tuning function is effective even when SP ramp is being used.

In case of reverse action (heat), the overshoot, which may be produced after SP has reached a constant value in SP up mode, is suppressed.

In case of direct action (cool), the undershoot, which may be produced after SP has reached a constant value in SP down mode, is suppressed.

However, at the automatic end by AI – t = 1, the stable effect of learning cannot be obtained. Use this function by applying the manual end by AI – t = 2, or the manual adjustment of brake and turbo.

ⓑ **Remote SP**

The smart tuning function is effective even when a remote SP is used.

In case of reverse action (heat), the overshoot, which may be produced after SP has reached a constant value in SP up mode, is suppressed.

In case of direct action (cool), the undershoot, which may be produced after SP has reached a constant value in SP down mode, is suppressed.

However, the stable results of learning cannot be obtained at the automatic end by AI – t = 1. Use this function by applying the manual end by AI – t = 2 or the manual adjustment of brake and turbo.

(4) Restriction

The smart tuning function cannot be used on the heat/cool control.

6. TROUBLESHOOTING

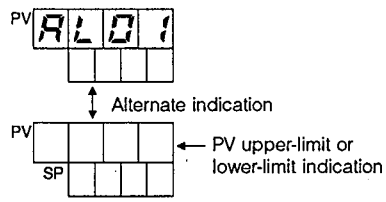
1. Alarm indication

SDC200 normally executes PV input check, memory check and other self diagnoses.

Whether an error is detected, an alarm code meeting the contents of the error is indicated on the upper indicator.

If an alarm indication is given, take a remedial measure as specified.

Example: When a sensor is disconnected at the PV input terminals.



Remedial measures:

① Check the wiring of the PV input terminals.

② Check the PV upper-limit or lower-limit range.

Alarm code

Alarm code	Meaning	Remedial measures
AL01	PV is not within the range of –10 to +110%FS.	Check sensor for disconnection.
AL90	PC board is mounted abnormally (check only at power on time.)	Contact Yamatake-Honeywell for repair.
AL92	Allowable adjustment data error	Contact Yamatake-Honeywell for repair.
AL93	The contents of SETUP parameter are destroyed.	Reset
AL94	The contents of PARA parameter are destroyed.	
AL95	The contents of PID parameter are destroyed.	
AL96	The contents of SP or EV are destroyed.	
AL98	RAM error	Contact Yamatake-Honeywell for repair.
AL99	ROM error	

2. When READY/RUN cannot be selected even by pressing [RDY] key during initial indication.

(1) READY/RUN has been selected by a remote switch.

- Turn on (READY) the remote switch by which READY/RUN has been set to light RDY LED.
- Press [SET UP] key to indicate C27, 28 and 29, and change over to "0" the setup set to "1".

The remote switch is then not effective, but the front panel key is effective. If the number of the remote switch set to READY/RUN is unknown, short the external terminals ㉔–㉗, ㉕–㉗ and ㉖–㉗ sequentially until RDY LED lights.

3. Normal manipulated variable is not output.

(1) No manipulated variable is output at all. The READY mode is preset. ⇨ Press [RDY] key to set the RUN mode.

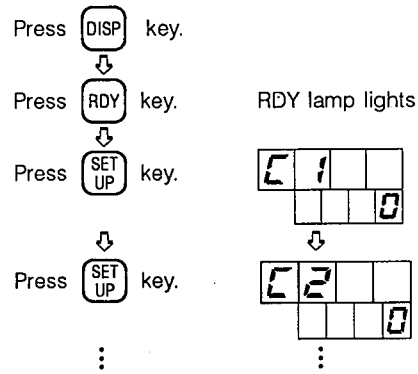
(2) The manipulated variable does not change beyond a certain value. The output limiters are activated. ⇨ Set the **OL** (lower limit of manipulated variable) to 0 in the PID setting mode. Set the **OH** (upper limit of manipulated variable) to 100 in the PID setting mode.

(3) The manipulated variable acts reversely. The setting of direct/reverse action is wrong. ⇨ Change over the setting of the control action of **setup C3 from 0 to 1 or from 1 to 0.**

4. When the setup indication does not proceed from C1.

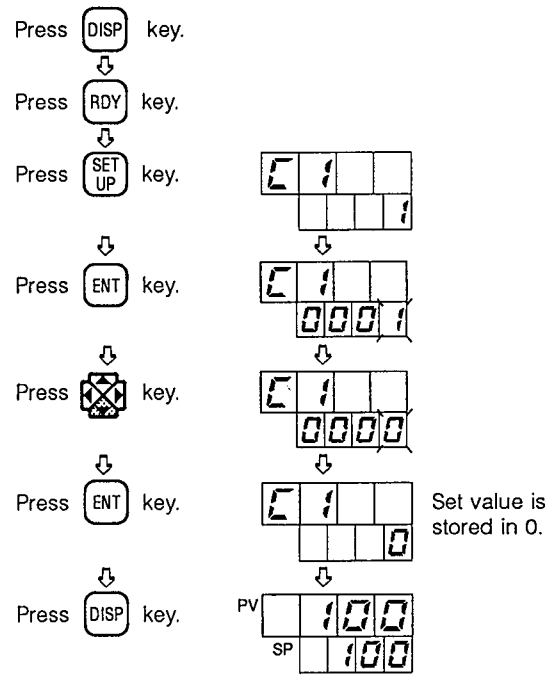
(1) Setup cannot be changed in the RUN mode.

Light the RDY LED lamp.



(2) When setup does not proceed in the status of (1). If setup C1 has been set to 1, 2, 3, or 4, setup change is impossible.

Set C1 to 0.

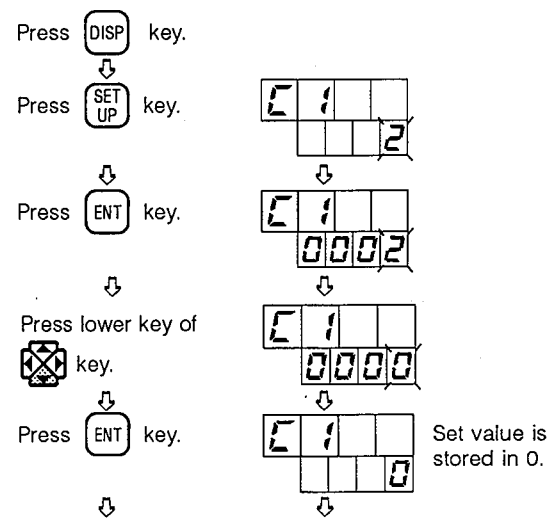


5. When SP cannot be selected.

(1) SP is not selectable when setup C1 is preset to 2 or 3.

Set C1 to 0 (provided that C26=0).

Note: SP is not selectable by SP key when C1=2. However, SP is selectable by RSW, if used.

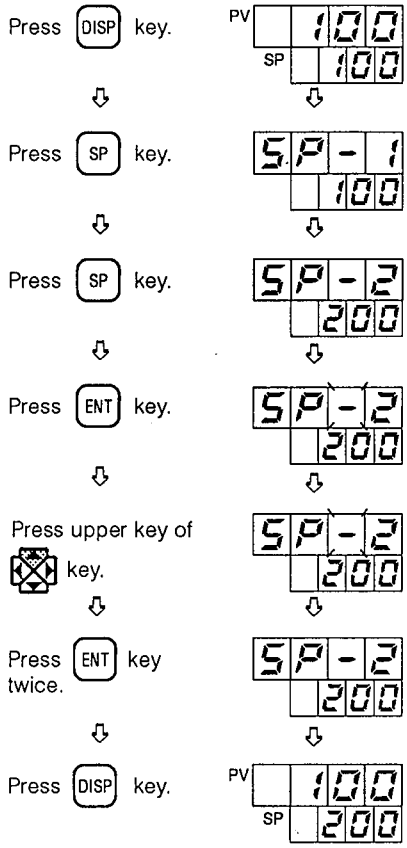


(2) SP is not selectable when setup C8 is preset to 0 or 1.

Set C8 to 2 (reset as in C1)

(3) SP is not selectable by the front panel (SP) key when setup C26 is preset to 2, 4, or 8.

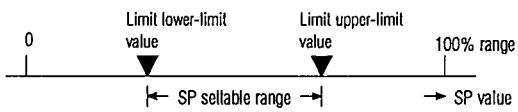
Set C26 to 0 (reset as in C1).



6. When SP numeric cannot be set.

(1) The settable SP numeric is within the range of the SP limit lower-limit set by setup C9 and the SP limit upper-limit set by C10.

Reset C9 and C10.



(2) When setup C8=3 (SP value and PID group are unchangeable)

Set C8 to 0 – 2.

7. When the manipulated variable causes hunting.

The proportional band P is smaller, and the integral I is greater.

⇩

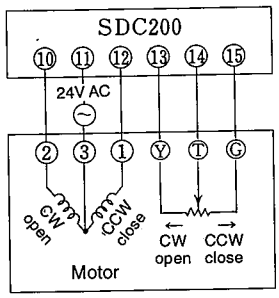
Increase the proportional band P, and decrease the integral I.

8. When the indication is cleared and darkened.

Press (DISP) key to change over the indication.

9. Abnormal action of motor, and wiring error (in heating operation)

Assuming that the fully closing/fully opening adjustment of the motor has been done on a wiring error condition, the resulting abnormal action of the instrument is described below.



The motor actions with the power supply turned on, those with ◈ keys pressed, and the indication of the SDC200 in such cases are shown in the following table.

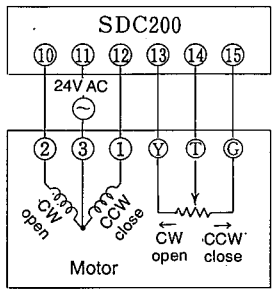
Setup C3 is then set to 0.
(Any values may be used as SP set values and PV input values of SDC200)

(CW: Clockwise direction
CCW: Counterclockwise direction)

(1) Turn on the power supply and press the lower key of ◈ keys in case of the motor fully closing input (parameter value Π-CL = 65).

Phenomenon		Symptom	Cause
Motor action ( ) is indicated by front LED on SDC200.		Indication	Wiring error
When power is turned on.	When ◈ key is pressed.	When ◈ key is pressed.	
Rotates in open direction from 50% position, and stops at fully open position. (OT2 lights during rotation, and goes out at fully open position.)	Rotates from fully open position to fully closed position, and stops there.	65 → 001	Y wire is disconnected.
		65 → 955	T wire is disconnected.
		65 → 0000 → 340 → 24	T wire and G wire are reversed.
	Kept fully open.	65 → 951	1 wire and 2 wire are reversed.
Moves a little from 50% position in closing direction, rotates in open direction, and stops at fully opened position. (OT2 lights during rotation, and goes out at fully open position.)	Rotates from fully open position to fully closed position, and stops there.	65 → 25 → 919	G wire and Y wire are reversed.
Rotates from 50% position in closing direction, and stops at fully closed position. (OT2 lights during rotation, and goes out at fully open position.)	Kept fully closed.	65 → 955	G wire is disconnected.
		65 → 739	T wire and Y wire are reversed.
Moves a little from 50% position in closing direction and stops. (OT2 lights during rotation, and goes out after stop.)	Rotates from 50% position in closing direction, and stops at fully closed position.	500 → 61	3 wire and 1 wire are reversed.
Kept stopped at 50% position (OT2 and OT1 are kept put out.)	Kept stopped at 50% position.	Kept stopped at 516	1 wire is disconnected.
		Kept stopped at 516	3 wire is disconnected.
		Indication only is changed from 57 to 510.	3 wire and 2 wire are reversed.
	Rotates in closing direction from 50% position, and stops at fully closed position.	500 → 61	2 wire is disconnected.

- The indicated numeric changes according to the models.
- When the motor stops, OT1 and OT2 go out. However, if the proportional band is narrow, either OT1 or OT2 may light at the fully open or fully closed position. This lamp can be put out by widening the proportional band.



(CW: Clockwise direction
CCW: Counterclockwise direction)

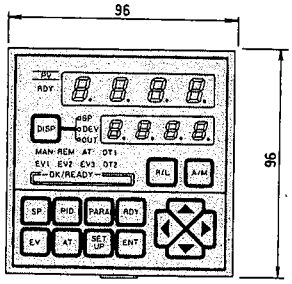
(2) Turn on the power supply and press the upper key of keys in case of the motor fully opening input (parameter value: n-OP = 951).

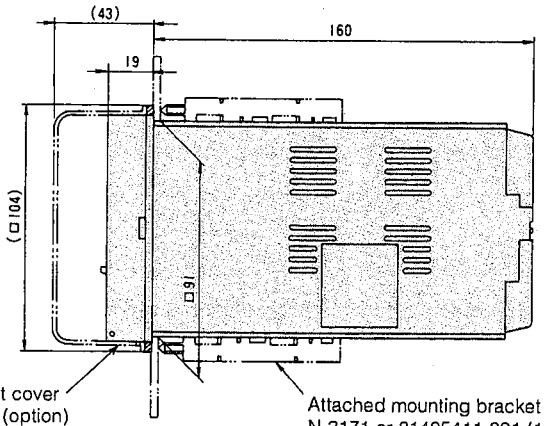
Phenomenon		Symptom	Cause
Motor action ( ) is indicated by front LED on SDC200.		Indication	Wiring error
When power is turned on.	When key is pressed.	When key is pressed.	
Rotates in open direction from 50% position, and stops at fully open position. (OT2 lights during rotation, and goes out at fully open position.)	Kept fully open.	951 → 001	Y wire is disconnected.
		951 → 360 → 992	T wire is disconnected.
		951 → 0000	T wire and G wire are reversed.
	Rotates from fully open position to fully closed position, and stops there.	951 → 60	1 wire and 2 wire are reversed.
Moves a little from 50% position in open direction, and rotates in open direction, and then stops at fully open position. (OT1 lights during rotation, and goes out at fully open position.)	Kept fully open.	951 → 026	Y wire and G wire are reversed.
Rotates from 50% position in closing direction, and stops at fully closed position. (OT1 lights during rotation, and goes out at fully open position.)	Rotates from fully closed position in open direction and stops at fully open position.	951 → 957	G wire is disconnected.
		951 → 800 → 954	T wire and Y wire are reversed.
Moves a little from 50% position in closing direction and stops. (OT1 lights during rotation, and goes out after stop.)	Kept stopped as it is.	951 → 483	2 wire is disconnected.
		951 → 466	3 wire and 1 wire are reversed.
Kept stopped at 50% position. (OT1 and OT2 are kept put out.)	Kept stopped at 50% position.	951 → 522	3 wire is disconnected.
	Rotates in open direction from 50% position, and stops at fully open position.	951 → 521 → 951	1 wire is disconnected.
		951 → 609 → 951	3 wire and 2 wire are reversed.

- The indicated numeric changes according to the models.
- When the motor stops, OT1 and OT2 go out. However, if the proportional band is narrow, either OT1 or OT2 may light at the fully open or fully closed position. This lamp can be put out be widening the proportional band.

7. EXTERNAL DIMENSIONS

External dimensions

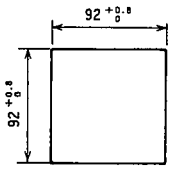




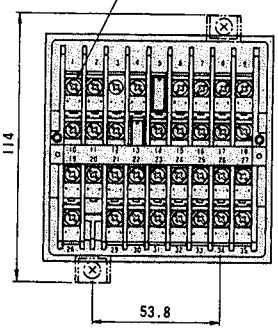
• Packing, dust cover
814011330A (option)
• Soft dustproof cover
N-3225 (option)

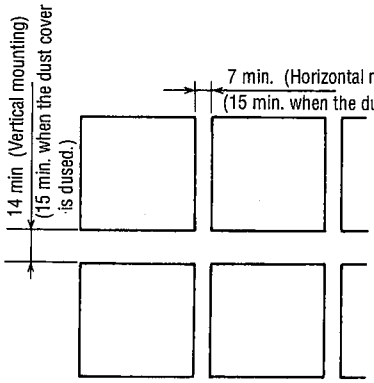
Attached mounting bracket
N-3171 or 81405411-001 (1st)

Panel cutout size

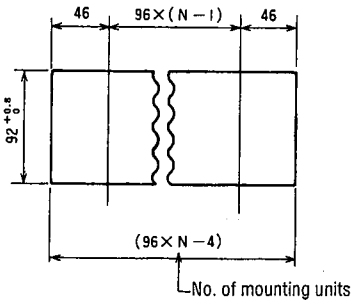


Panel cutout size





Vertical and horizontal mounting
panel cutout sizes (recommendable)



Panel cutout size for closed
mounting (recommendable)

8. INSTALLATION

1. Mounting place

Mount the instrument at following places in the same way as in general digital electronic instruments.

(1) A place free of any noticeable temperature change at normal temperature or so.

(2) A place free of a corrosive gas atmosphere

(3) A place not subjected to a low or high humidity

(4) A place free of mechanical vibrations

(5) A place free of dust particles, soot, or the like.

(6) A place where is not affected by electrical noises

(7) A place where is not subjected to a strong magnetic field

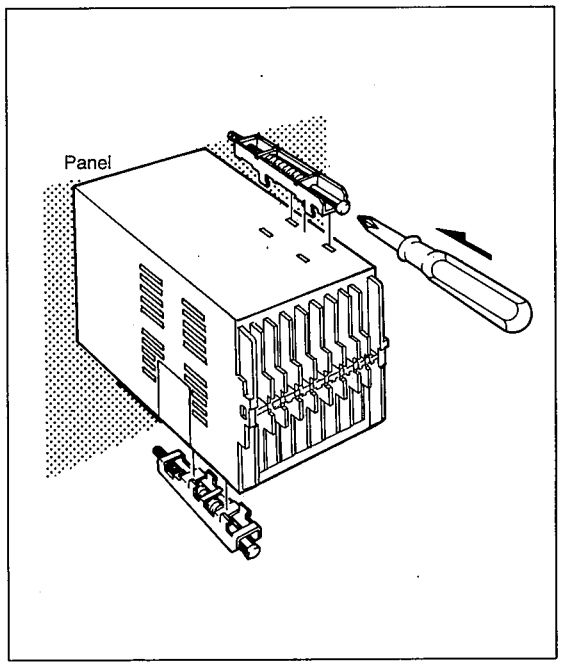


Fig. 7-1 Mounting method

2. Mounting method

(1) Keep instrument within a mounting angle of 15°, if it is tilted down from the horizontal level on the rear side.

(2) Use a steel panel having a plate thickness of thicker than 2 mm.

(3) Insert the instrument case from the panel cutout.

(4) Fix the upper and lower panels of the instrument securely by using the attached mounting brackets.

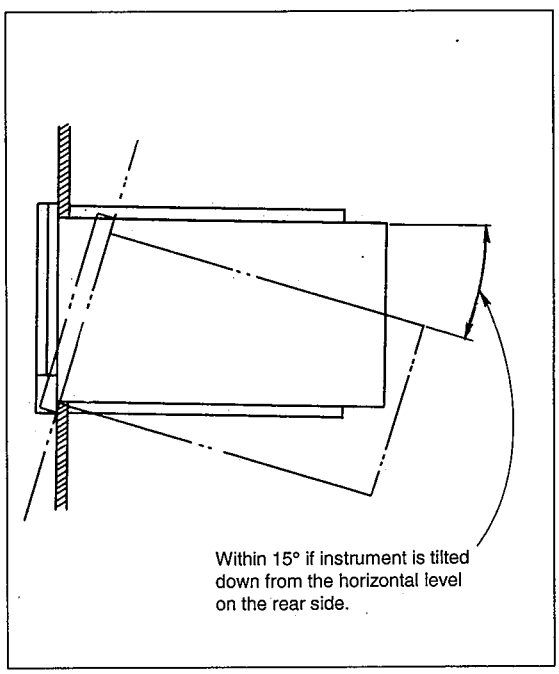


Fig. 7-2 Mounting angle

9. WIRING

CAUTIONS

Use shielded cables for the SDC200 input/output cables so as not to introduce noises.

1. Cautions on wiring

(1) Digital units are apt to be affected by electrical noises, so that a trouble and a wrong operation may be caused by those which are negligible for analog units.

In order to prevent an effect of noises, connect cables with due care according to the instructions of this chapter.

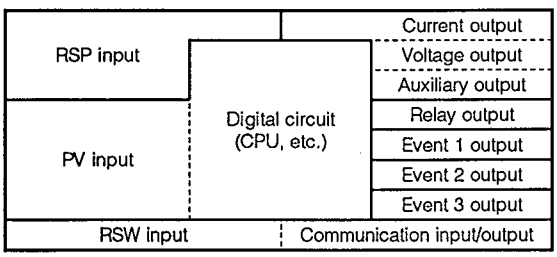
(2) Use solderless terminals conforming to M3.5 screws.

(3) Connect cables according to the wiring diagram of the corresponding model number after confirming the instrument model number. After wiring, check them for normal condition.

(4) If a voltage mode signal is applied to the PV input (terminal Nos. ㉙ and ㉚) or RSP input (terminal Nos. ㉞ and ㉟) terminal for current input by mistake, a large current flows, thus causing a trouble. Check if the input signal types.

(5) Separate the input/output signal cables from a motor cable or power cable of 100V or more by 30cm or more. Don't pass these cables through the same conduit or duct.

(6) **Isolation between input/output signals.**



Note: Dashed line ----- means non-isolation.

- No isolation is done among the current output, voltage output, and auxiliary output, and between the RSW input and communication input/output. Use isolators as required.

(7) Caution on use of mudutrol motor

Use an auxiliary relay without fail when a 100V AC or 200V AC type modutrol motor is used.

Recommendable modutrol motors (M904F, M944B, E) don't require any auxiliary relay.

Separate the wiring cable of the motor power terminals ⑩, ⑪ and ⑫ from that of the feedback resistor terminals ⑬, ⑭ and ⑮ by 30 cm or more.

Never wire the terminals ⑩ to ⑮ together by a 6-conductor cable, etc. Otherwise, SDC200 may be damaged by noises when the motor is started.

Table 8-1. Compensating lead wire specifications

	Old symbol (reference)	Symbol	Classification based on use and tolerance	Ambient temperature (°C)	Color of sheathed cables
JIS C1610–1981					
B	—	BX-G	Ordinary class for general use	0 to 100	Gray
R	—	RX-G SX-G	Ordinary class for general use	0 to 150	Black
S		RX-H SX-H	Ordinary class for heat resistance		
K	CA	KX-G	Ordinary class for general use	-20 to +150	Blue
		KZ-GS	Precision class for general use		
		KX-H	Precision class for heat resistance		
		KX-HS	Precision class for heat resistance		
		WX-G	Ordinary class for general use		
		WX-H	Ordinary class for heat resistance		
		VX-G	Ordinary class for general use	-20 to +100	
E	CRC	EX-G	Ordinary class for general use	-20 to +150	Purple
		EX-H	Ordinary class for heat resistance		
J	IC	JX-G	Ordinary class for general use		Yellow
		JX-H	Ordinary class for heat resistance		
T	CC	TX-G	Ordinary class for general use		Brown
		TX-GS	Precision class for general use		
		TX-H	Ordinary class for heat resistance		
		TX-HS	Precision class for heat resistance		
Other than JIS					
PR40-20		No exclusive compensating lead wire is provided. Copper wire is used instead.			
WRe0-26		Exclusive compensating lead wire is used.			
WRe5-26		Exclusive compensating lead wire is used.			
Ni-Ni•Mo		——			

2. Input/output signal cables

2-1. Thermocouple input signal cable

(1) Connect a thermocouple line cable to terminals. Connect the thermocouple input by extending it with a compensating lead wire, if the wiring distance is long or a sensor is connected to terminals.

Use a shielded compensating lead wire.

2-2. Input signal cables for those other than thermocouples, and digital input/output signal cables

(1) Use a shielded polyethylene insulated vinyl sheathed cable for instrumentation use conforming to JCS-364 or equivalent:

(generally called a twisted shielded cable for instrumentation use.)

(2) A shielded multiconductor microphone cord (MVVS) may be used, if electromagnetic induction noises are comparatively low.

Reference Recommendable commercially available twisted shielded cables

Fujikura Cable Co.	2 conductors	IPEV-S-0.9mm² × 1P
	3 conductors	ITEV-S-0.9mm² × 1T
Hitachi Cable Co.	2 conductors	KPEV-S-0.9mm² × 1P
	3 conductors	KTEV-S-0.9mm² × 1T

2-3. Remote switch input contact

(1) Use a no-voltage remote switch input and a micro-current contact.

2-4. Signal cables for communication (option)

(1) Be carefull since the communication circuit may be broken, if ⊕ and ⊖ communication terminals are shorted with each other.

(2) Don't connect the SDC200 together with another instrument connected to the same RS-422 communication line to the same addresses (except for address 0).

3. Grounding

(1) Connect the instrument by one-point grounding to G terminal (③ terminal). Don't perform any jumper wiring. Mount a grounding terminal board (earth bar) separately and connect shielded cables, etc. to ground, since only one G terminal is provided.

- Grounding type: Category 3 grounding or higher (Lower than 100Ω)
- Grounding wire: Annealed copper wire of more than 2mm² (AWG14)
- Grounding wire length: Max. 20m

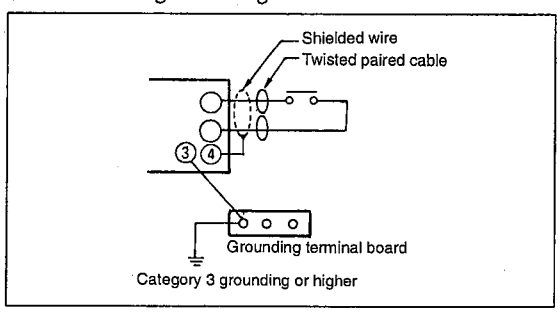


Fig. 8-1 Grounding method

4. Instrument power supply

(1) Obtain the SDC200 power supply from a single-phase instrument power source in such a way as the instrument is not affected by noises as much as possible.

(2) It is recommended to use a line filter having an additional insulation transformer, if noises are introduced noticeably from the power source.

Be careful not to bundle the primary and secondary of the power cable together or not to put them into the same conduit or duct after taking a countermeasure against noises.

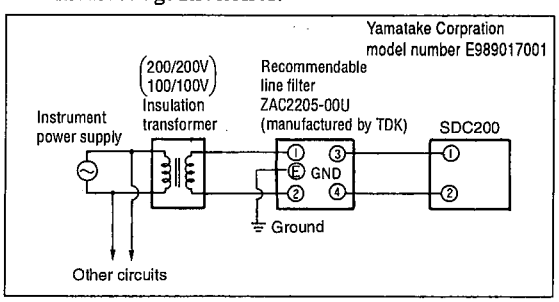


Fig. 8-2 Power noise reduction method

5. Noise generation sources and noise reduction methods

5-1. Noise generation sources

(1) The following noise generation sources are generally presumable:

① Relays and contacts
② Solenoid coils and solenoid valves
③ Power line (higher than 100V AC, in particular)
④ Inductive load
⑤ Motor commutator
⑥ Phase angle control SCR
⑦ Radio communication equipment
⑧ Welding machine

5-2. Noise reduction method

(1) A CR filter is effective for quick-rising noises.

- Recommendable CR filter Yamatake Corporation model number E989010001 (953M500333311 manufactured by Matsuo electric or equivalent)

(2) A varistor is effective for noises having a high crest value. Be careful since the varistor is shorted, if it becomes defective.

- Recommendable varistor Yamatake Corporation model number E968010471 for 100V use
  E968011821 for 200V use

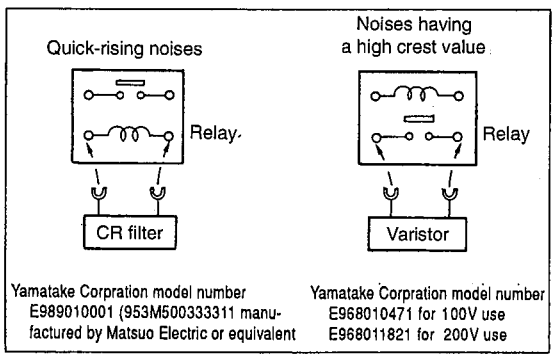
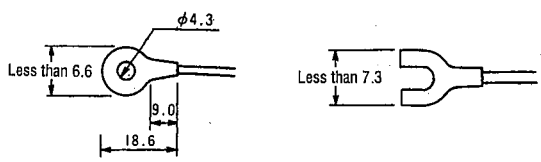


Fig. 8-3 Noise reduction method

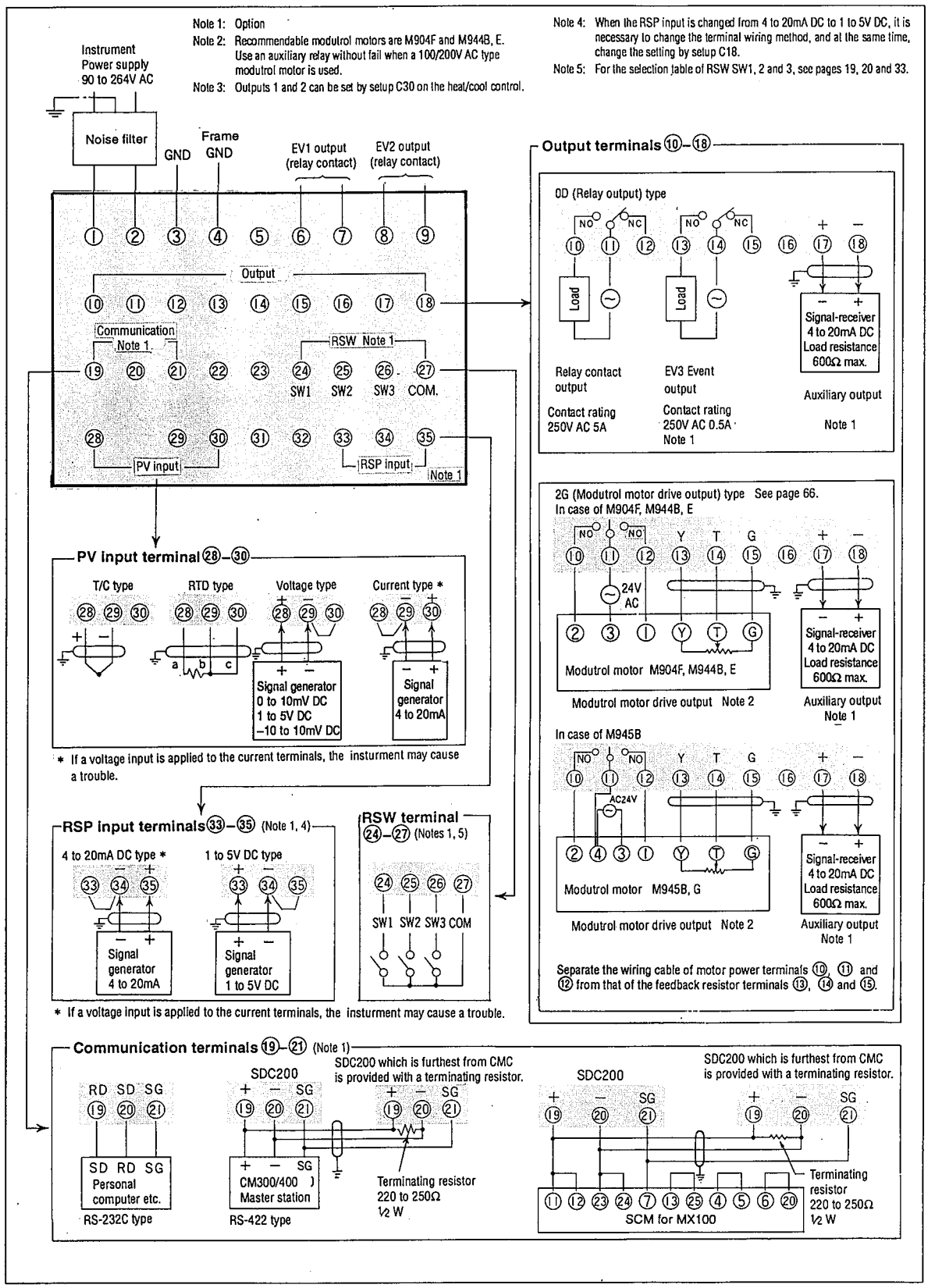
For terminal connection

Use terminal connection, use solderless terminals conforming to M3.5 screws



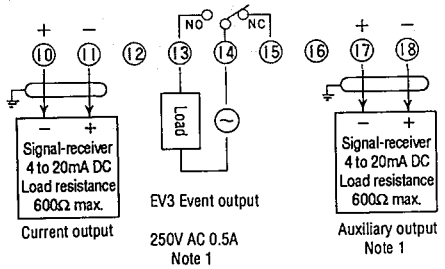
(Note) Use circular solderless terminals so that cables are not disconnected from terminals, if the instrument is mounted at a place subject to noticeable vibrations and impacts.

10. EXTERNAL WIRING DIAGRAM

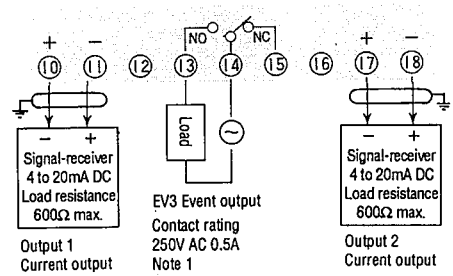


Output terminals ⑩ to ⑱

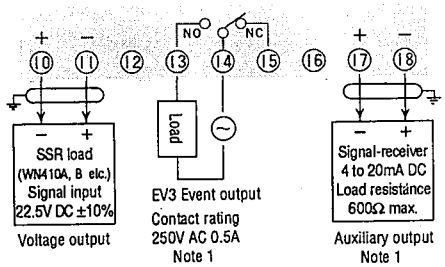
5G (Current output) type



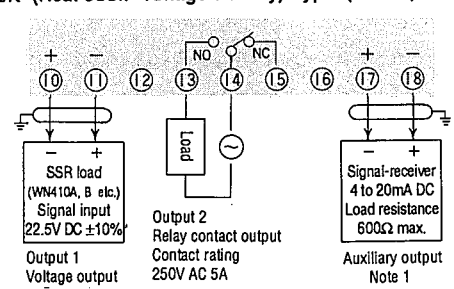
5K (Heat cool: Current + Current) type (Note 3)



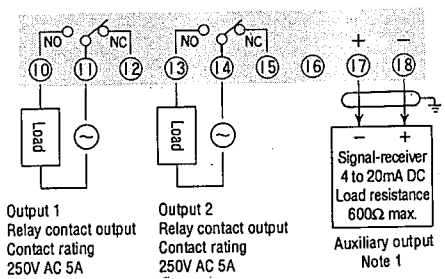
6D (Voltage output) type



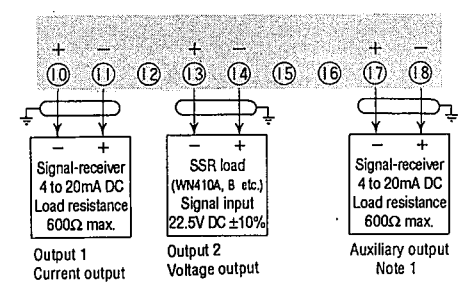
9K (Heat cool: Voltage + Relay) type (Note 3)



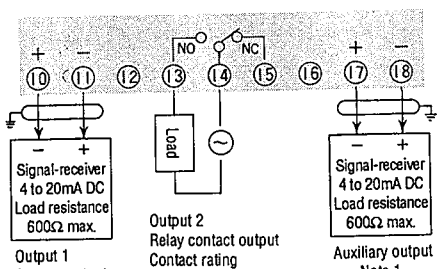
3D (Heat cool: Relay + Relay) type (Note 3)



BK (Heat cool: Current + Voltage) type (Note 3)



AK (Heat cool: Current + Relay) type (Note 3)



Caution

If a voltage-mode signal is applied to the PV input terminals (terminal Nos. ㉙ and ㉚, or RSP input terminals (terminal Nos. ㉞ and ㉟) by mistake, a large current may flow, thus causing a trouble. After checking if the current input source signal is properly output within the range of 4 to 20mA, connect it to the current input terminals of SDC200.

Caution on combination with data input instruments

When the output of SDC200 is input to an A/D converter, analog scanner, or other instruments, a trouble may occur due to a dispersion in read data. To avoid such a trouble in advance, it is recommendable to take any of the following remedial measures.

Remedial measures:

1. Use a low-speed integral type A/D converter.
2. Insert an isolator having no switching power supply between SDC200 and A/D converter.
3. Apply equalizing processing by a personal computer during data reading.

Description of Abbreviations

AT: Auto Tuning. Automatic adjustment.
Optimum PID numerics are automatically set by arithmetic operation.

AUX: Auxiliary output.
There are four kinds of auxiliary outputs; PV, SP, DEV and RSP.

A/M: Auto/Manual.
Automatic mode/manual mode.

CP: Current proportioning.
Continuous current proportioning output of 4 to 20mA.

DEV: Deviation.
Process variable (PV) minus Set point (SP)

DISP: Display.
The contents of the 4-digits indicators on the right side are changed over by pressing the DISP key.

EV: Event signal.
On-off signal which is output according to control status. Used as alarm input, control event, time event, etc.

EV1: Event 1. Signal 1. Same as EV.

EV2: Event 2. Signal 2. Same as EV.

EV3: Event 3. Signal 3. Same as EV.

LSP: Local Set Point. Set value by front panel keys.

MAN: Manual. Manual mode.
The % output value of 0 to 100% is manually output during running.

OL: Output Low.
Lower limit of output (manipulated variable). The lower-limit value of output is set.

OH: Output high.
The upper limit of output (manipulated variable). The upper-limit value of output is set.

OT1: Output 1.
The output ON-OFF status is indicated under ON-OFF control or time proportional control. On the heat/cool control, OT1 means either output of the heat side and cool side.

OT2: Output 2.
On the heat/cool control, OT2 means either output of the heat side and cool side.

OUT: Output.
For example, when the output is 4 to 20mA, the output is indicated in the form of –10.0 to +110.0%.

PARA: Parameter. Variable.
A variable is set to a desired numeric.

PID: Three Mode Proportioning.
P: Proportioning. Proportional action.
I: Integral. Integral control action or reset action.
D: Derivative. Derivative control action or rate action.

PV: Process Variable.
Measured value of thermocouple. RTD or linear input.

RDY: Ready. Running standby, or preparation.
Standby status before running (no manipulated variable is output). Setup or parameter is set in this status.

READY: Ready. Running standby or preparation. Same as RDY.

REM: Remote setting input. Externally setting input.
For example, the value set front panel keys is not used, but the input of 4 to 20mA DC is applied externally, and this value is used as a set value.

RSP: Remote Set Point. Same as REM.

RUN: Running. Control running status.
Opposite word to Ready.

R/L: Remote Set Point/Local Set Point.
Externally setting input/setting by front panel keys

SET UP: Setup. Prearrangement.
Basic setting of direct/reverse control action, and input range, etc.

SP: Set Point. Set value.
Set point for controlling temperature, for example.

SW1: Remote Switch 1.
External switch 1

SW2: Remote Switch 2.
External switch 2

SW3: Remote Switch 3.
External switch 3

TP: Time Proportioning.

Specification are subject to change without notice.

YAMATAKE

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WORK SHEETS FOR SDC200 SETTING

Client	1. Model No.		
	SDC200	Person in charge of instrumentation	
	Tag Name	Person in charge of business	
		Date	

1. Setup

No.	Display, set value at delivery from factory	Item	Set value by user
1	C 1 / 0	Key lock 0: No key lock is provided 1: SET UP change is disabled 2: Set data change is disabled 3: DISP only is changeable 4: LSP value change and LSP number selection are enabled DISP and A/M keys and usable	C 1
2	C 2 / 0 / -	Temperature unit 0: Centigrade (°C) –1: Fahrenheit (°F) Set this item in case of T/C or RTD input	C 2
3	C 3 / 0	Control action 0: Reverse action 1: Direct action	C 3
4	C 4	Type of PV range Already set when model number was designated	C 4
5	C 5 / 0	Linear PV decimal point position 0: 1: 2: 3:	C 5
6	C 6 / 0	Linear PV lower-limit –1999 to upper-limit U	C 6
7	C 7 / 1000	Linear PV upper-limit Lower-limit to 9999U	C 7
8	C 8 / 0	LSP setting system 0: One point of LSP is used 1: One point of LSP and direct change are used 2: 2 to 8 points of LSP0 to LSP7 are used 3: After a numeric is set in 2 above, it cannot be changed	C 8
9	C 9 / 0	SP limit lower-limit 0% to upper-limit	C 9
10	C 10 / 100	SP limit upper-limit Lower limit to 100% FS of range	C 10
11	C 11 / 0	Control output setting in case of PV overrange 0: Not provided 1: Provided	C 11
12	C 12 / 0	Control output in case of PV overrange 0 to 100 (TP type) –10 to 110 (CP type)	C 12

No.	Display, set value at delivery from factory	Item	Set value by user
13	C 13 / 0	Manual operation output 0: Bumpless 1: Preset	C 13
14	C 14 / 0	Preset manual value 0 to 100 (TP type) –10 to 110 (CP type)	C 14
15	C 15 / 0	Control output in Ready mode 0 to 100% (TP type) –10 to 110% (CP type)	C 15
16	C 16 / 0	Cool side control output in Ready mode 0 to 100% (TP type) –10 to 110% (CP type)	C 16
17	C 17 / 0	Event in Ready mode 0: Operated 1: Not operated	C 17
18	C 18 / 0	Type of remote SP input 0: 4 to 20mA 1: 1 to 5V	C 18
19	C 19 / 0	Remote SP input lower-limit setting % –1999 to 9999U	C 19
20	C 20 / 100	Remote SP input upper-limit setting % –1999 to 9999U	C 20
21	C 21 / 0	Type of auxiliary output 0: PV 1: SP 2: DEV 3: RSP 4: OUT 5: Motor opening	C 21
22	C 22 / 0	Auxiliary output lower-limit setting % –1999 to 9999U	C 22
23	C 23 / 100	Auxiliary output upper-limit setting % –1999 to 9999U	C 23
24	C 24 / 0	Auxiliary output in Ready mode 0: Output operation continuaiton 1: Setting output in Ready mode	C 24
25	C 25 / 0	Setting output value in Ready mode –1999 to 9999U	C 25
26	C 26 / 0	LSP selection count and PID group selection by external SW 0, 2, 4, 8, PID 1, 3	C 26

No.	Display, set value at delivery from factory	Item	Set value by user
27	C27 0	SW1 assignment	C27
28	C28 0	SW 2 assignment	C28
29	C29 0	SW3 assignment	C29
30	C30 0	Heat/cool allocation 0: 1 → Heat 2 → Cool 1: 1 → Cool 2 → Heat	C30

No.	Display, set value at delivery from factory	Item	Set value by user
31	C31 0	Communication address 0, 1 to 254	C31
32	C32 0	Transmission speed 0: 9600 1: 4800 2: 2400 3: 1200	C32
33	C33 0	Communication code 0: 8-bit even parity, 1 stop 1: 8-bit no parity, 2 stop	C33
40	C40 0	Thermocouple cold junction compensation 0: Inside 1: Outside	C40

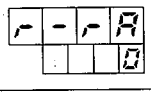
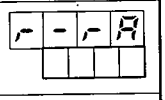
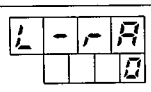
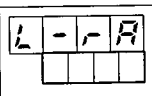
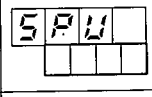
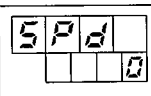
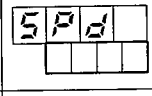
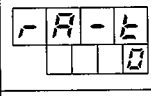
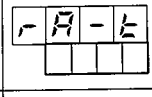
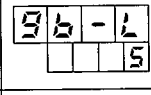
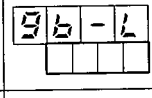
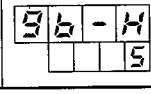
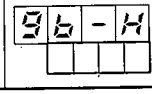
2. Parameters

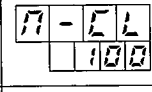
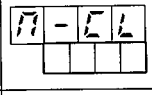
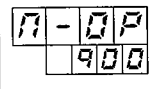
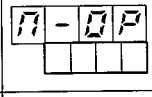
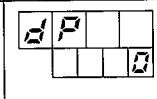
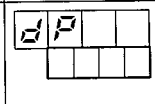
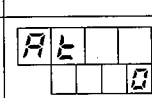
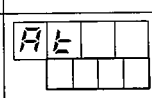
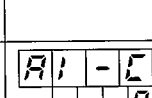
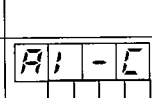
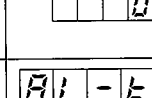
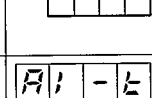
No.	Display, set value at delivery from factory	Item	Set value by user
1	FILt 0.0	PV filter constant 0.0 to 120.0 sec	FILt
2	Pbia 0	PV bias –100 to 100U	Pbia
3	rFlt 0.0	Remote SP filter 0.0 to 120.0	rFlt
4	rbia 0	Remote SP bias –1999 to 9999U	rbia
5	cy 10	Time proportional output cycle 5 to 120 sec (relay) 1 to 60 sec (voltage)	cy
6	cy2 10	Time proportional output 2 cycle 5 to 120 sec (relay) 1 to 60 sec (voltage)	cy2
7	owtL 100	Control output change limit 1 to 100% (0.5 sec)	owtL
8	iout 0	Initial out 0 to 100%	iout
9	rPid 0	Reset PID 0: Initialized when SP is changed, and not initialized when SP value is set 1: Not initialized in each case of SP change, and SP setting 2: Initialized in each case of SP change and SP setting	rPid

No.	Display, set value at delivery from factory	Item	Set value by user
10	dIFF 5	ON/OFF control 0 to 100U	dIFF
	dIFF 5.0	Positional proportion For the dead zone, see page 43 0.5% to 25.0% output	
	dIFF 0.0	Heat/cool For the dead zone, see page 43 –100.0 to 50.0% output	
11	Et1 0	Event 1 Type of event Note 1	Et1
12	Ed1 0	Event 1 ready 0: Ready is not provided 1: Ready is provided	Ed1
13	Et2 0	Event 2 Type of event Note 1	Et2
14	Ed2 0	Event 2 ready 0: Ready is not provided 1: Ready is provided	Ed2
15	Et3 0	Event 3 Type of event Note 1	Et3
16	Ed3 0	Event 3 ready 0: Ready is provided 1: Ready is not provided	Ed3

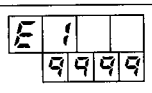
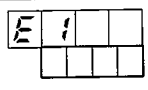
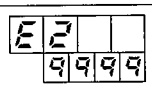
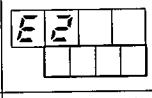
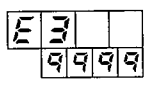
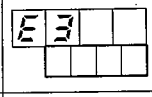
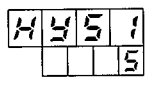
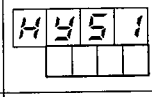
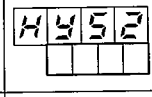
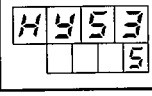
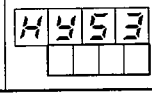
Note 1 0: PV direct action 1: PV reverse action 2: Deviatio direct action
3: Deviatio reverse action 4: Absolute value deviation direct action
5: Absolute value deviation reverse action 6: OUT direct action
7: OUT reverse action 8: RSP direct action 9: RSP reverse action
10: Alarm 11: Auto tuning 12: SP direct action 13: SP reverse action

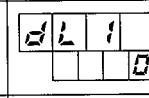
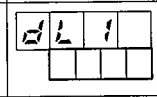
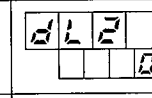
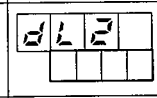
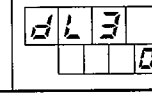
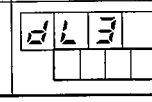
No.	Display, set value at delivery from factory	Item	Set value by user
17	r-tr 0	RSP tracking 0: Not provided 1: Provided	r-tr

No.	Display, set value at delivery from factory	Item	Set value by user
18		RSP ramp 0: Note provided 1: Provided	
19		LSP ramp 0: Not provided 1: Provided	
20		SP ramp rising gradient 0 to 9999U 0 to 999.9U	
21		SP ramp falling gradient 0 to 9999U 0 to 999.9U	
22		SP ramp unit setting 0: U/min 1: 0.1/min 2: U/hour 3: 0.1/hour	
23		Lower-limit of green belt 0 to 100U	
24		Upper-limit of green belt 0 to 100U	

No.	Display, set value at delivery from factory	Item	Set value by user
25		Input at motor full close time 0 to 999	
26		Input at motor full open time 0 to 999	
27		Indication of 0.1°C/°F in temperature 0: Not provide 1: Provided	
28		Auto tuning selection 0: Not AT run 1: AT run 2: AT run difficult to overshoot	
29		AI control 0: Not used 1: Smart tuning is used	
30		Learning function 0: Not learnt 1: Automatic end of learning 2: Manual end of learning	

3. Events

No.	Display, set value at delivery from factory	Item	Set value by user
1		Event 1 set value Note 1	
2		Event 2 set value Note 1	
3		Event 3 set value Note 1	
4		Event 1 hysteresis Other than OUT: 0 to 100U OUT: 0.0 to 10.0%	
5		Event 2 hysteresis Other than OUT: 0 to 100U OUT: 0.0 to 10.0%	
6		Event 3 hysteresis Other than OUT: 0 to 100U OUT: 0.0 to 10.0%	

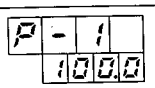
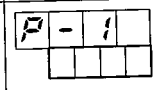
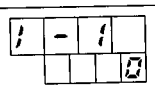
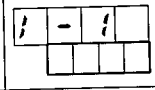
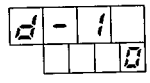
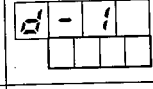
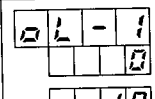
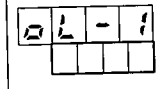
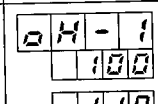
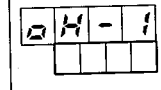
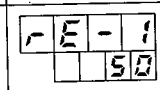
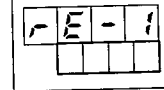
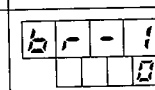
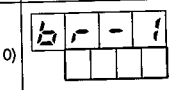
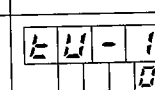
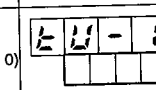
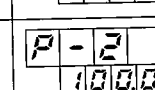
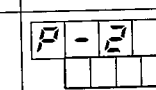
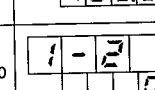
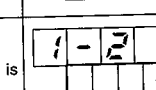
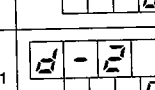
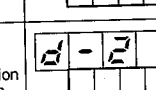
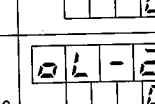
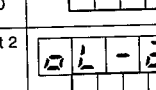
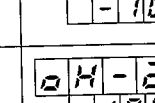
No.	Display, set value at delivery from factory	Item	Set value by user
7		Event 1 On-delay time 0 to 9999 sec	
8		Event 2 On-delay time 0 to 9999 sec	
9		Event 3 On-delay time 0 to 9999 sec	

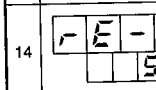
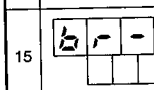
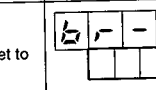
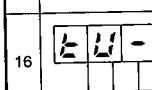
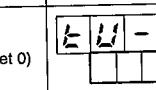
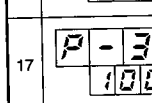
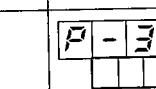
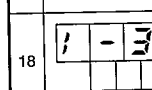
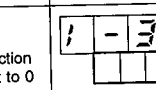
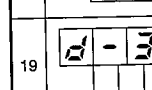
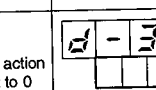
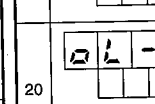
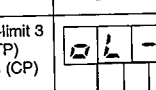
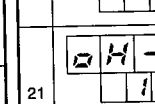
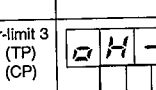
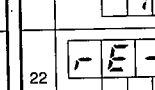
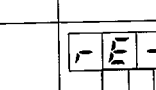
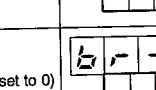
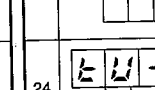
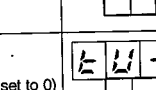
Note 1 PV: −1999 to 9999U RSP: −1999 to 9999U
DEV: −1999 to 9999U OUT: −10.0 to 110.0%
|DEV| : 0 to 9999U SP: −1999 to 9999U

U: Industrial unit such as °C, kgf/cm^2, and mmHg.

The decimal point position is interlocked with C5.

4. PID

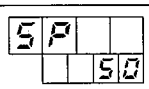
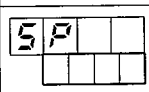
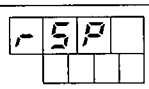
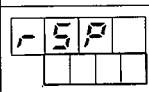
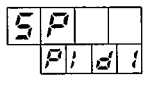
No.	Display, set value at delivery from factory	Item	Set value by user
1		Proportional band 1 0.0 to 999.9% (TP) 0.1 to 999.9% (CP)	
2		Integral time 1 0 to 3600 sec No integral control action is provided when set to 0	
3		Derivative time 1 0 to 1200 sec No derivative control action is provided when set to 0	
4		Control output lower-limit 1 0 to upper-limit % (TP) –10 to upper-limit % (CP)	
5		Control output upper-limit 1 Lower-limit to 100% (TP) Lower-limit to 110% (CP)	
6		Manual reset 1 0 to 100%	
7		Brake 1 0 to 30 (non-function when set to 0)	
8		Turbo 1 0 to.10 (non-function when set to 0)	
9		Proportional band 2 0.0 to 999.9% (TP) 0.1 to 999.9% (CP)	
10		Integral time 2 0 to 3600 sec No integral control action is provided when set to 0	
11		Derivative time 2 0 to 1200 sec No derivative control action is provided when set to 0	
12		Control output lower-limit 2 0 to upper-limit% (TP) –10 to upp-limit% (CP)	
13		Control output upper-limit 2 Lower-limit to 100% (TP) Lower-limit to 110% (CP)	

No.	Display, set value at delivery from factory	Item	Set value by user
14		Manual reset 2 0 to 100%	
15		Brake 2 0 to 30 (non-function when set to 0)	
16		Turbo 2 0 to 10, (non-function when set 0)	
17		Proportional band 3 0.0 to 999.9% (TP) 0.1 to 999.9% (CP)	
18		Integral time 3 0 to 3600 sec No integral control action is provided when set to 0	
19		Derivative time 3 0 to 1200 sec No derivative control action is provided when set to 0	
20		Control output lower-limit 3 0 to upper-limit % (TP) –10 to upper-limit % (CP)	
21		Control output upper-limit 3 Lower-limit to 100% (TP) Lower-limit to 110% (CP)	
22		Manual reset 3 0 to 100%	
23		Brake 3 0 to 30 (non-function when set to 0)	
24		Turbo 3 0 to 30 (non-function when set to 0)	

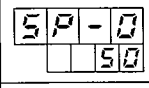
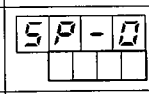
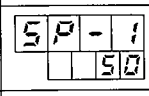
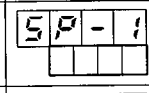
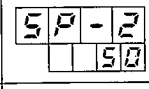
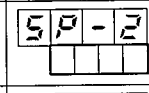
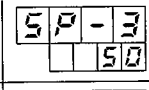
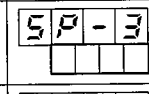
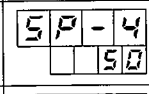
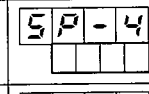
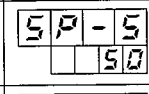
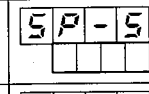
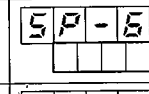
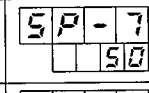
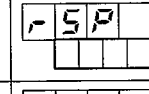
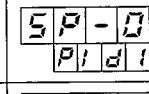
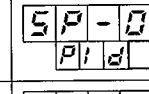
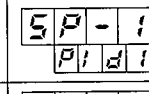
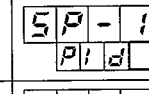
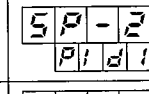
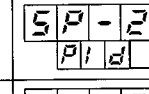
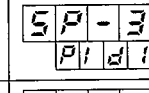
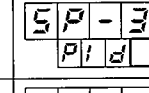
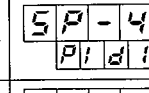
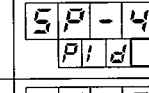
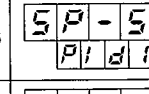
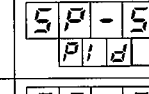
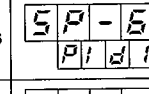
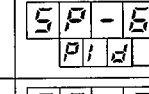
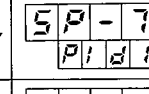
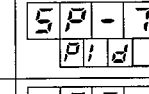
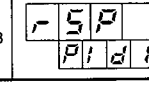
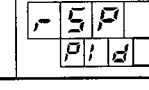
TP type: Time Proportioning type relay output or voltage output
CP type: Current Proportioning type current output

5. SP setting

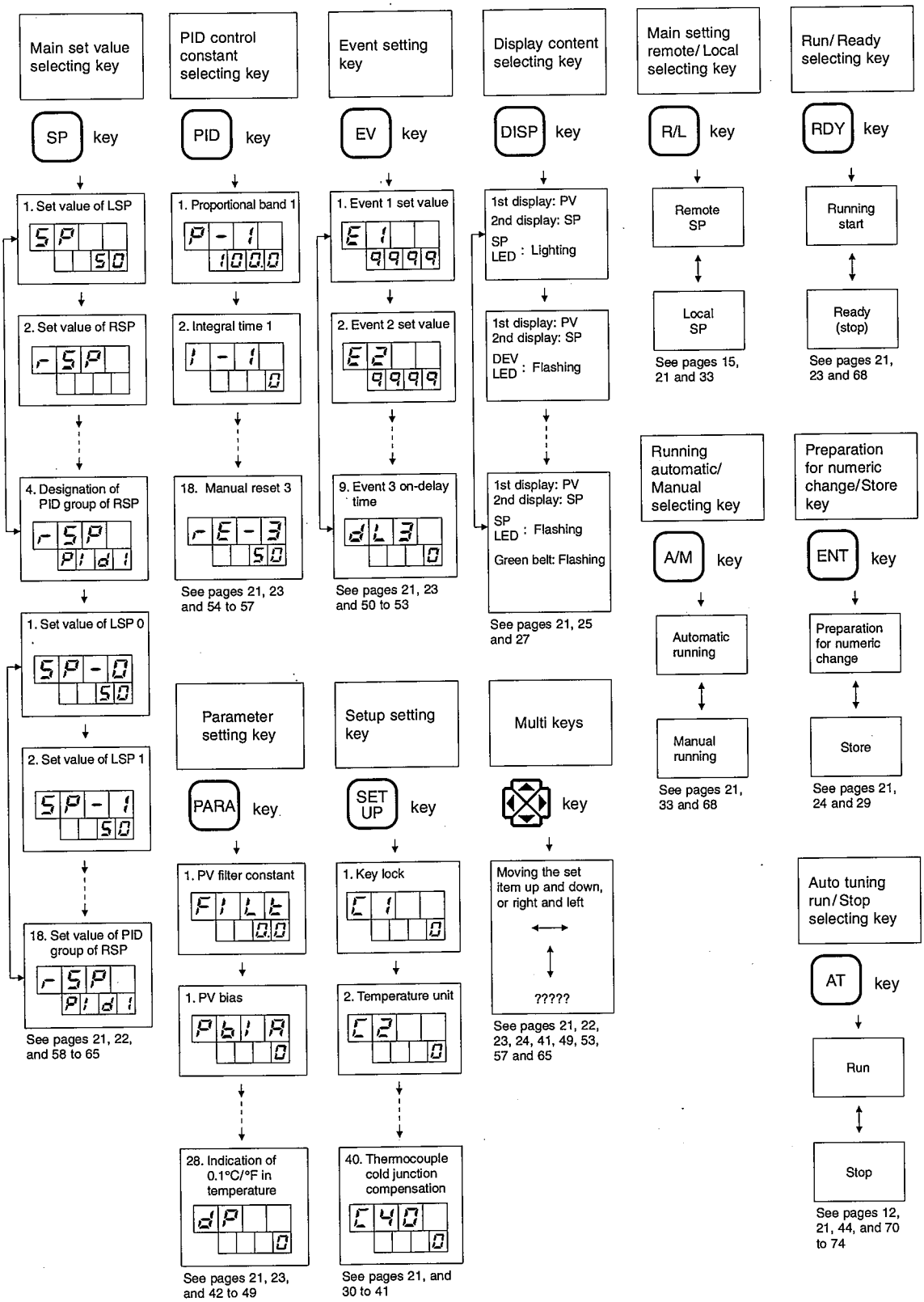
Setting of 1 point of LSP

No.	Display, set value at delivery from factory	Item	Set value by user
1		Set value of LSP	
2		Set value of RSP	
3		Designation of PID group	
4		Designation of PID group of RSP	

Setting of 8 points of LSP

No.	Display, set value at delivery from factory	Item	Set value by user
1		Set value of LSP0	
2		Set value of LSP1	
3		Set value of LSP2	
4		Set value of LSP3	
5		Set value of LSP4	
6		Set value of LSP5	
7		Set value of LSP6	
8		Set value of LSP7	
9		Set value of RSP	
10		Designation of PID group of LSP0	
11		Designation of PID group of LSP1	
12		Designation of PID group of LSP2	
13		Designation of PID group of LSP3	
14		Designation of PID group of LSP4	
15		Designation of PID group of LSP5	
16		Designation of PID group of LSP6	
17		Designation of PID group of LSP7	
18		Designation of PID group of RSP	

Functions of Keys



Specifications are subject to change without notice.

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