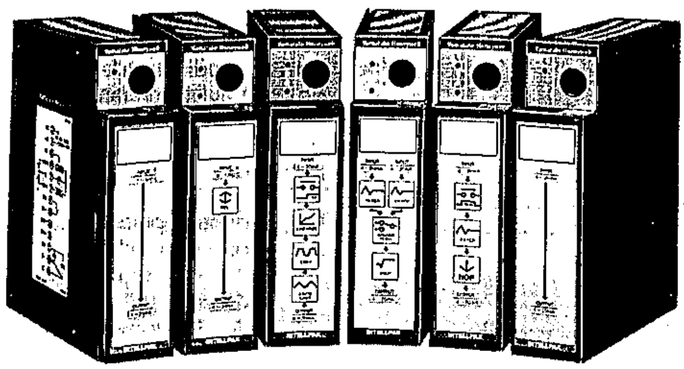
Yamatake

IntellpaK
Intelligent Signal Converters
IP300 Series

Product Manual



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1. General

The intelligent signal converters IP300 series are designed as multifunction signal converters each having a built-in microprocessor.
These units receive thermocouple signals, resistance thermometer bulb signals, linear signals, and potentiometer signals as input signals, and output various mA, mV, and V signals after signal amplification, isolation, various calculations, and other signal processing.
By connecting exclusive handy loader QN715A, indications, range setting, scaling, manual output, and other various calculations of input/output signals connected to the instrument can be processed at site.

2. Features

Accuracy ....High accuracy ±0.15% FS
Microcomputerized calculations
Digital setting by loader

Security ....Input/output values monitoring (LED, loader display)
Self-diagnosis (LED, loader display)

FA system ....Communication function (option)

Prices ....Equivalent to those of conventional analog instruments

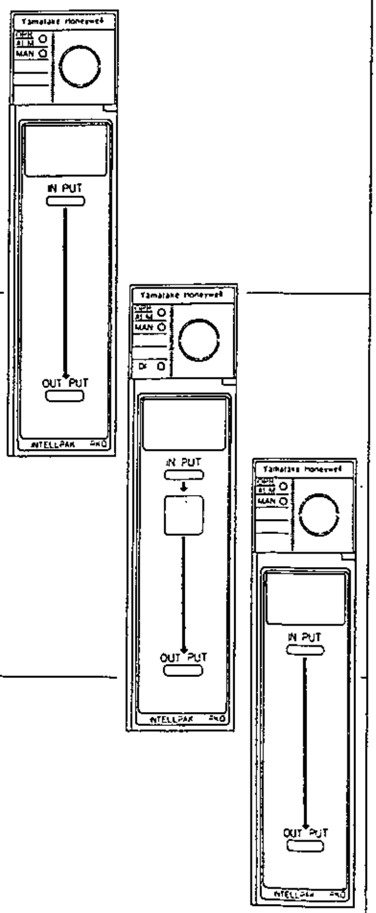
Space-saving ....A monitor output function is attached.
Max. 4 times composite calculations can be done by one unit.

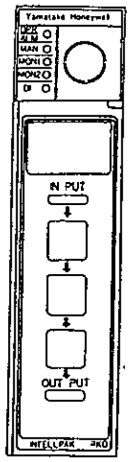
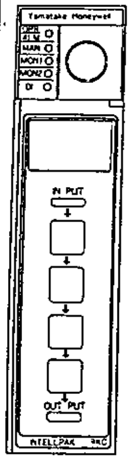
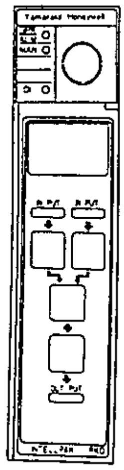
Stock-saving and maintenance ....Free power supply
Input/output scaling (Setting by loader)
Input/output multirange (Setting by loader and instrument)
Various calculations in setup mode

Manpower-saving ....Easy adjustment by digital setting at site
Manual output mode
A false signal output from the handy loader.

Installation ....Wall-mount
DIN rail-mount
Rack-mount

3. Models and Functions

Model No.	Name	Functions	External views
IP300	Millivolt converter	o This signal converter has one input range and one output range only. o The types of inputs consist of 12 types of thermocouples, 7 types of resistance thermometer bulbs, linear types (mA, mV, V), and potentiometer type. o The types of outputs consist of mA, mV, and V. o The input/output type is not changeable. o Both input and output can be scaled. o The inputs and outputs are isolated from each other. o Free power supply.	
IP301	High-function type millivolt converter	o This signal converter has full-multi input and output ranges. o The types of inputs consist of 12 types of thermocouples, 7 types of resistance thermometer bulbs, linear types (mA, mV, V), and potentiometer type. o The types of outputs consist of mA, mV, and V. o Both input and output can be scaled. o Input and output are isolated from each other. o A remote contact signal input can control inner calculation. o One of four calculations is selectable. o Free power supply. o Monitor and communication functions are provided as options.	
IP302	Isolator	o This signal converter has one input range and one output range only. o The types of inputs and outputs are limited to 4~20 mA or 1~5 V. o The input/output type is not changeable. o Both input and output can be scaled. o Inputs and outputs are isolated from each other. o Free power supply.	

Model No.	Name	Functions	External views
IP313	Calculation unit	o This unit serves as a signal converter having multi-input/output ranges. o The types of inputs consist of linear types (mA, mV, V). o Both input and output can be scaled. o A remote contact signal input can control inner calculation. o 2-monitor outputs are provided as a standard function. o One is selectable from 37-calculation functions. o Inputs and outputs are isolated from each other. o Free power supply. o A communication function is provided as an option.	
IP314	Composite calculation unit	o This unit serves as a signal converter having multi-input/output ranges. o The types of inputs consist of linear types (mA, mV, V). o Both input and output can be scaled. o A remote contact signal input can control inner calculation. o 2-monitor outputs are provided as a standard function. o Four are selectable from 37-calculation functions. o Inputs and outputs are isolated from each other. o Free power supply. o A communication function is provided as an option.	
IP326	2-input calculation unit	o This unit serves as a signal converter having multi-input/output ranges. o The types of inputs consist of linear types (mA, mV, V). o Two linear inputs can be applied. o Both input and output can be scaled. o Not isolated between two inputs. o A remote contact signal input can control inner calculation. o Four are selectable from 37-calculation functions. Six arithmetic patterns are selectable. o Inputs and outputs are isolated from each other. o Free power supply. o A communication function is provided as an option.	

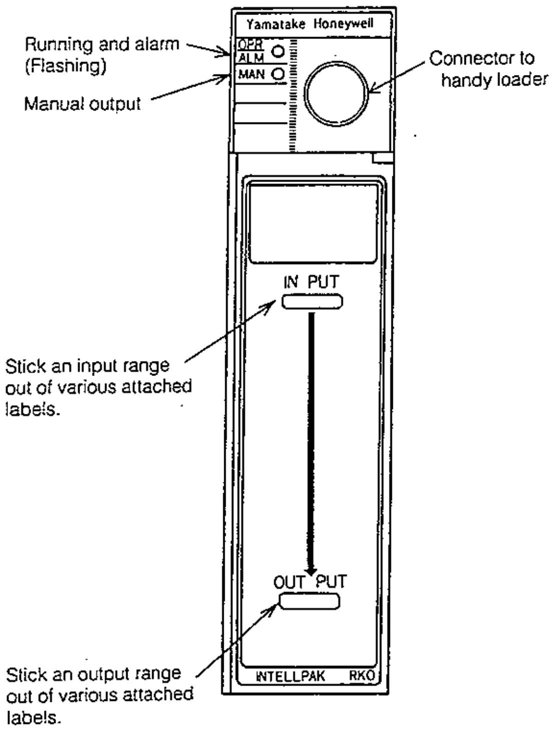
4. Model and Function Table

Function / Model	Input							Output				Calculation				
	Voltage/current input	Thermocouple/resistance thermometer bulb input	Potentiometer input	Remote contact signal input	Change of input type	Input scaling	PV bias filter	Change of output type	Output scaling	Characteristic output	Monitor switch contact output	Basic calculation	High function type calculation	Two-input calculation	Plural times calculation (up to 4 times)	Communication
IP300 Millivolt converter	O	O	O	–	–	O	O	–	O	O	–	–	–	–	–	–
IP301 High function type millivolt converter	O	O	O	O	O	O	O	O	O	O	Δ	O	–	–	–	Δ
IP302 Isolator	□	–	–	–	–	O	O	–	O	–	–	–	–	–	–	–
IP313 Calculation unit	O	–	–	O	O	O	O	O	O	–	O	O	O	–	–	Δ
IP314 Composite calculation unit	O	–	–	O	O	O	O	O	O	–	O	O	O	–	O	Δ
IP326 Two-input calculation unit	O	–	–	O	O	O	O	O	O	–	–	O	O	O	O	Δ
IP390A Communication module	When the model with communication option function is selected, this communication IP390A and the 19-inch rack QN716A shall be used.															

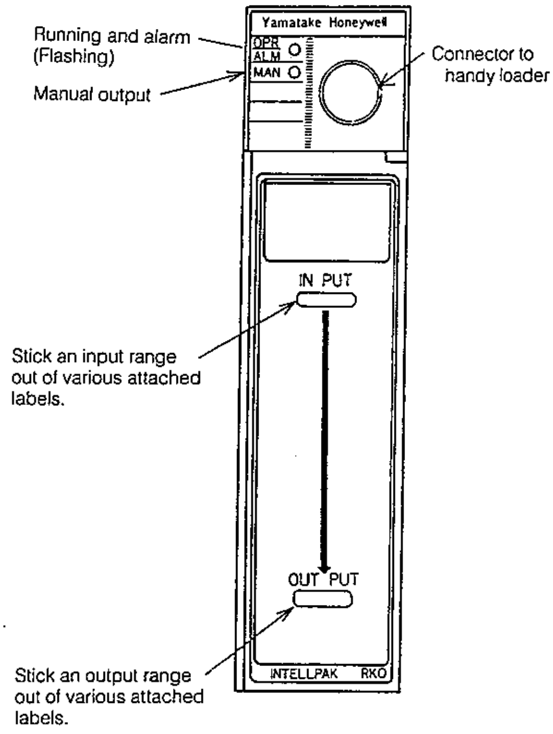
Basic calculation: Means Nos. 00, 18, 25 and 26 calculations given in Table 10 on page 13.
High function type calculation: Means Nos. 01 to 17, 19 to 24 and 27 calculations given in Table 10 on page 13.
Two-input calculation: Means Nos. 28 to 37 calculations given in Table 10 on page 13.

O: Enable –: Disable Δ: Enable at option □: Only in part of linear (4 ∼ 20mA, 1 ∼ 5V)

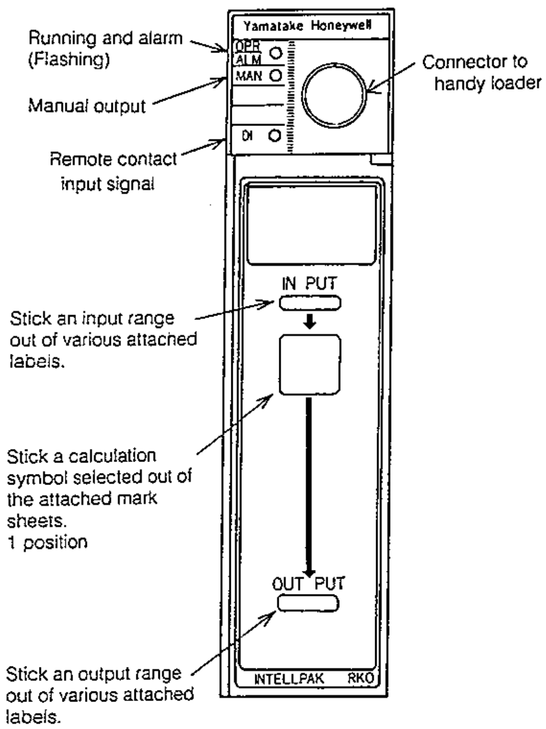
5. External Views and Indications



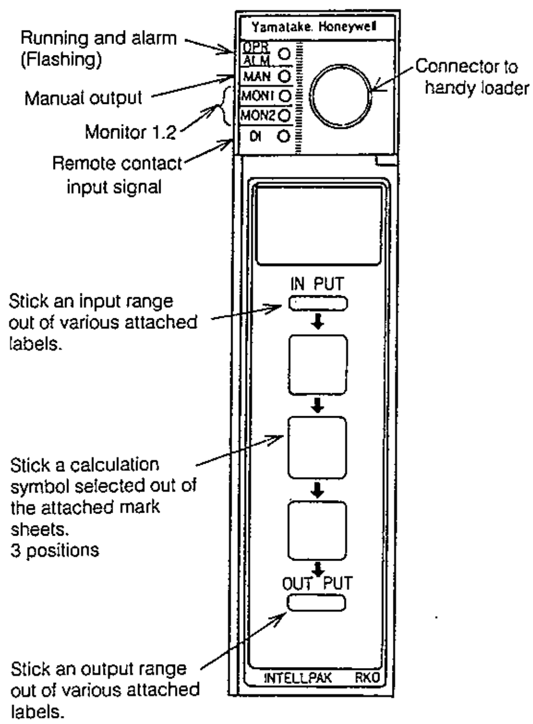
IP300 millivolt converter



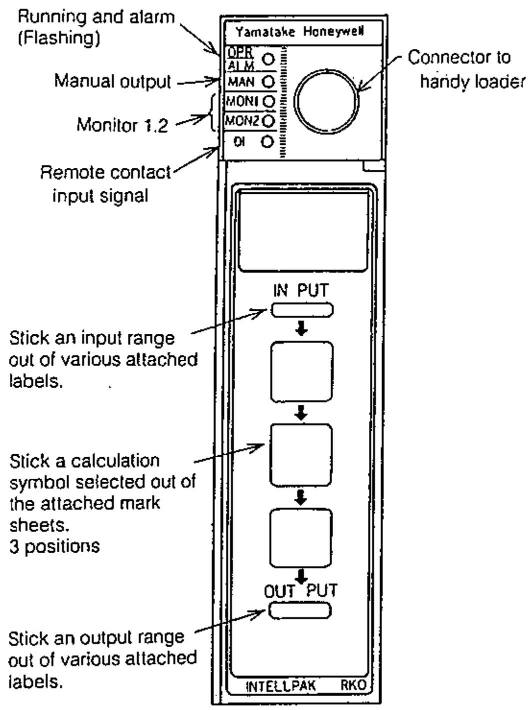
IP302 Isolator



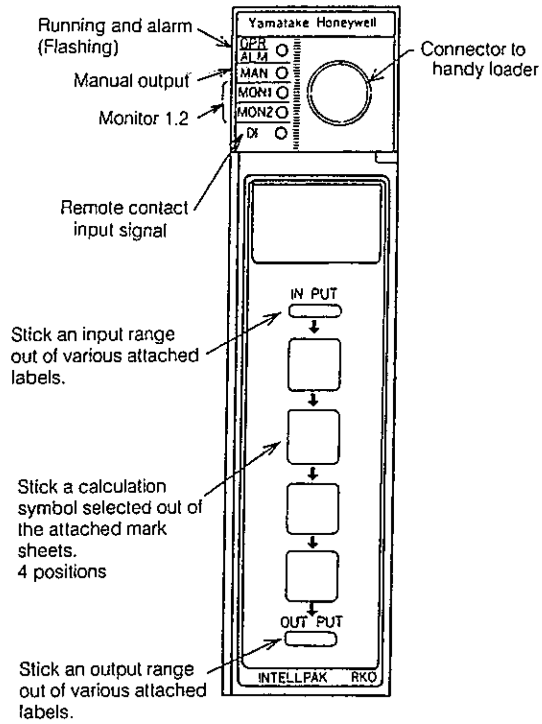
IP301 high-function type millivolt converter



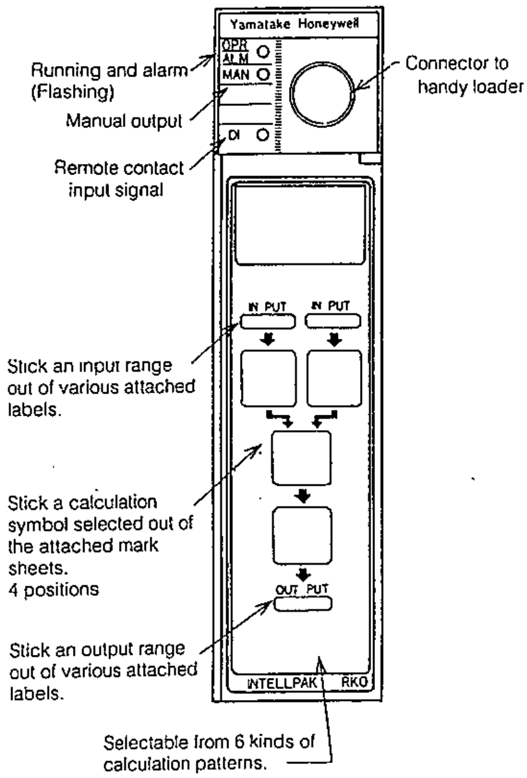
IP301 high-function type millivolt converter with a monitor (option)



IP313 calculation unit



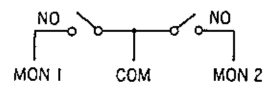
IP314 composite calculation unit



IP326 two-input calculation unit

2. SPECIFICATIONS

Specifications

Input/output conversion accuracy		±0.15% FS, For the accuracy according to scales, see Table 1.
Signal input	Input range	See Table 1
	Input bias current	Thermocouple, mV input: Max. ±0.15 μA Resistance thermometer bulb input: 0.9±0.2 mA
	Input impedance	Voltage input: Min. 500 kΩ Current input: Max. 30 Ω
	Wiring resistance	Thermocouple input, mV input: Max. 250Ω Resistance thermometer bulb input (for non-Zener barrier): Max. 10Ω (each line) Resistance thermometer bulb input (for Zener barrier): Max. 80Ω (each line, including Zener barrier)
	Burnout	Thermocouple input: Up-scale (at delivery time) Scale-down can be done by dip switches.
	Sampling time	100 msec (TYP)
Remote switch signal (Note 1)	Input mode	Contact or no-voltage semi-conductor contact
	Input time	The same status shall be kept unchanged for longer than 100 msec (ON or OFF).
	Input contact capacity	20 V DC, Min. 100 mA (Externally employed contact capacity)
Converted signal output	Output range	See Table 2
	Output impedance	Current output: Min. 500 kΩ mV output: Max. 60Ω Voltage output (V): Max. 10Ω
	Load resistance	Max. 600Ω in 20 mA range
	Output range	Range including 0 mA: 0~110% FS Range excluding 0 mA: −10~110% FS
	Output update cycle	100 mSec (TYP)
Monitor outputs (Note 2)	No. of output contacts	NO contact 2 circuits
	Output contact capacity	250 V AC, 30 V DC, 0.5 A resistive load 
	Output contact life	100,000 times, resistive load
	Output mode	Contact output

Note 1: IP301, 313, 314, and 326 are provided with a remote contact signal input function.
Remote contact signal is used for starting calculation operations with an ON signal or for stopping calculation operations.
Note 2: A monitor output function is provided for IP301 as an option, and also provided for IP313 and 314 as standard functions.

General Specifications

Power voltage	AC: AC90 ~ 264 V 50 – 60 Hz DC: DC20 ~ 56 V
Power consumption	Max. 12 VA
Starting current	Max. 0.5 A in case of DC power supply
Peak power current value and width when turning on the power supply	AC power supply: 20 A peak max. 2 msec DC power supply: 20 A peak max. 0.2 msec
Allowable ambient temperature	0 ~ 50°C
Temperature characteristic	In case of full span; ±0.018%/°C or ±5.7μV/°C or ±0.33 μA/°C, whichever is larger (by an input conversion value)
	In case of no-full span; Numeric value of (B) in Table 1 x 0.12/°C or ±5.7 μV/°C or ±0.33 μA/°C, whichever is larger (by an input conversion value)
Storage temperature	−20 ~ 70°C
Allowable ambient humidity	Max. 90% RH at 40°C
Insulation resistance	50 MΩ between each terminal and case by using a 500 V DC megger
Dielectric strength	1500 V AC, 1 min between power terminals and case
	500 V AC, 1 min between secondary terminals and case
	1000 V AC, 1 min between input terminals and output terminals
Vibration resistance	Max. 0.5 G, 10 ~ 60 Hz, XYZ directions (excluding DIN rail mounted type) 2-hours
Impact resistance	Max. 50 G, 3 times in vertical direction (excluding DIN rail mounted type)
Weight	Main unit: Max. 0.6 kg 19-inch rack (11 ch): Max. 2.6 kg 5ch rack: Max. 1.6 kg
Mounting	Rack-mount, wall-mount, or DIN rail mount
No. of connectable/disconnectable times of loader jack	Max. 1000 times (with the loader curl cord combined)
Wiring temrinal screw	M3.5
Attachments	Mounting brackets, Vibration-absorbing bracket, Various labels N-3217 (Input/output labels, mark sheets) IP326 label: N-3218

Options	Handy loader: QN15A101, for handy loader curl cord: 81403280-001
	19-inch rack (11ch): QN716A101 5ch rack: QN717A101 Blind cover: 81403291-001

Table 1. Input Types, Unit and Characteristics

Code	Input type (range at delivery)	Full scale (FS) (full span after delivery)		Applicable Model IP300	IP301	IP302	IP313	IP314	IP326	Remarks
K□	Thermocouple JIS K	-50 ~ 1350°C	-50 ~ 2450°F	O	O	-	-	-	-	Any of the following is entered in the second digit of the code according to the unit and characteristic: C: Unit °C, with linearize D: Unit °C, without linearize F: Unit °F, with linearize G: Unit °F, without linearize When the range code of Model No. at purchase of IP301 is F, the input of the P range cannot be changed. When the range code of Model No. at purchase is other than F, the input of the F range cannot be changed. The F range is indicated as "P" on the loader. When the range code of IP300 is P or F, and the temperature range is specified by the VII code, the narrowest full span including that range is selected. Unless the temperature range is specified, the widest full span (-200 ~ 630°C) is selected.
E□	Thermocouple JIS E	-200 ~ 800°C	-300 ~ 1450°F	O	O	-	-	-	-	
J□	Thermocouple JIS J	-50 ~ 1050°C	-50 ~ 1900°F	O	O	-	-	-	-	
T□	Thermocouple JIS T	-200 ~ 400°C	-300 ~ 750°F	O	O	-	-	-	-	
B□	Thermocouple JIS B	-0 ~ 1820°C	-0 ~ 3300°F	O	O	-	-	-	-	
R□	Thermocouple JIS R	-0 ~ 1760°C	-0 ~ 3200°F	O	O	-	-	-	-	
S□	Thermocouple JIS S	-0 ~ 1760°C	-0 ~ 3200°F	O	O	-	-	-	-	
D□	Thermocouple PR40-20	-0 ~ 1900°C	-0 ~ 3400°F	O	O	-	-	-	-	
W□	Thermocouple WRe5-26	-0 ~ 2320°C	-0 ~ 4200°F	O	O	-	-	-	-	
X□	Thermocouple WRe0-26	-0 ~ 2320°C	-0 ~ 4200°F	O	O	-	-	-	-	
U□	Thermocouple Nicrosilal-Nisil	-0 ~ 1300°C	-32 ~ 2350°F	O	O	-	-	-	-	
Y□	Thermocouple Platinel	-0 ~ 1300°C	-32 ~ 2350°F	O	O	-	-	-	-	
P□	Platinum resistance thermometer bulb JIS'89Pt100 (old JIS Pt100)	-200 ~ 630°C	-	O	O	-	-	-	-	
P□		-0 ~ 400°C	-	O	O	-	-	-	-	
P□		-50 ~ 100°C	-	O	O	-	-	-	-	
Q□	Platinum resistance thermometer bulb Pt50	-200 ~ 630°C	-	O	O	-	-	-	-	
H□	Platinum resistance thermometer bulb JIS'89Pt100 (IEC. DIN or equivalent)	-200 ~ 630°C	-300 ~ 1150°F	O	O	-	-	-	-	
F□		-200 ~ 630°C	-	O	O	-	-	-	-	
F□		-0 ~ 400°C	-	O	O	-	-	-	-	
F□		-50 ~ 100°C	-	O	O	-	-	-	-	
N□	Nickel resistance thermometer bulb Ni508Ω	-50 ~ 150°C	-50 ~ 300°F	O	O	-	-	-	-	
C□	DC4 ~ 20mA	0 ~ 20mA		O	O	O	O	O	O	In IP326, the code of the input 1 and that of the input 2 are to be successively entered. In IP300, IP301, IP302, IP313, and IP314, the left code is to be entered in the first digit, and "0" in the second digit.
1□	DC10 ~ 50mA	0 ~ 50mA		O	O	-	O	O	O	
2□	DC2 ~ 10mA	0 ~ 10mA		O	O	-	O	O	O	
3□	DC0 ~ 1mA	0 ~ 1mA		O	O	-	O	O	O	
4□	DC0 ~ 10V	0 ~ 20V		O	O	-	O	O	O	
5□	DC1000 ~ 5000mV	0 ~ 5000mV		O	O	O	O	O	O	
6□	DC0 ~ 1000mV	0 ~ 1000mV		O	O	-	O	O	O	
7□	DC-4 ~ 4V	-10 ~ 10V		O	O	-	O	O	O	
8□	DC0 ~ 100mV	0 ~ 100mV		O	O	-	O	O	-	
8□	DC0 ~ 100mV	-10 ~ 100mV		-	-	-	-	-	O	
M□	DC0 ~ 10mV	-10 ~ 10mV		O	O	-	O	O	-	
M□	DC0 ~ 10mV	0 ~ 10mV		-	-	-	-	-	O	
9□	Resistance value 0~2kΩ	0 ~ 2kΩ		O	O	-	-	-	-	

Note 1: When the P or F input is specified in IP300, the full scale is -200 to 630°C. However, when the temperature range is specified within the full scale of -50 to 100°C or 0 to 400°C, the full scale is -50 to 100°C or 0 to 400°C, respectively, and the input range out of the full scale cannot be scaled.

Note 2: With the P or F input of IP301, or each input of mA, mV, and V of IP301, IP313, IP314, and IP326, the narrowest full scale including the scaled input range is automatically selected.

Table 2. Output Type

Code	Output range at delivery time	Full span after delivery	Applicable models IP300	IP301	IP302	IP313	IP314	IP326
C	DC4 ~ 20mA	DC0 ~ 20mA	O	O	O	O	O	O
5	DC1 ~ 5V	DC0 ~ 5V	O	O	O	O	O	O
M	DC0 ~ 10mV	DC0 ~ 10mV	O	O	-	O	O	O
7	DC-4 ~ 4V	DC-5 ~ 5V	O	-	-	-	-	-
8	DC0 ~ 100mV	DC0 ~ 100mV	O	O	-	O	O	O
2	DC2 ~ 10mA	DC0 ~ 10mA	O	O	-	O	O	O

Table 3. Output Accuracy

Scaling width of output range	Accuracy
100 ~ 80% of full span	As specified.
80% ~ 50% of full span	Specified value x 2
50% ~ 20% of full span	Specified value x 4

Note 3: The conversion accuracy is increased up to twice as high as the specified value within the output current range of 0 to 0.5mA.

Note 4: The conversion accuracy drops as follows when the scaling of the output range is narrow.

3. MODEL NUMBERS

Model configuration table

I	II	III	IV	V	VI	0	VII

Ex.:

I	II	III	IV	V	VI	0	VII
IP300	K C	C	A	0 0	0		0

↑ With °C indication (Refer to Note 1.)

Note: Entry of VII is necessary only when a working temperature range is specified in IP300, or 302.

Code No.	Model No.		
I	Basic model	IP300	Millivolt converter
		IP301	High-function type millivolt converter
		IP302	Isolator
		IP313	Calculation unit
		IP314	Composite calculation unit
		IP326	Two-input type calculation unit

Code No.	Model No.		Code	Input type (range at delivery time)	Full scale (FS) (full span after delivery)		IP300	IP301	IP302	IP313	IP314	IP326
II	Input type and range	Thermocouple	K□	JIS K	-50 ~ 1350°C	-50 ~ 2450°F	O	O	–	–	–	–
			E□	JIS E	-200 ~ 800°C	-300 ~ 1450°F	O	O	–	–	–	–
			J□	JIS J	-50 ~ 1050°C	-50 ~ 1900°F	O	O	–	–	–	–
			T□	JIS T	-200 ~ 400°C	-300 ~ 750°F	O	O	–	–	–	–
			B□	JIS B	0 ~ 1820°C	0 ~ 3300°F	O	O	–	–	–	–
			R□	JIS R	0 ~ 1760°C	0 ~ 3200°F	O	O	–	–	–	–
			S□	JIS S	0 ~ 1760°C	0 ~ 3200°F	O	O	–	–	–	–
			D□	PR40-20	0 ~ 1900°C	0 ~ 3400°F	O	O	–	–	–	–
			W□	WRe5-26	0 ~ 2320°C	0 ~ 4200	O	O	–	–	–	–
			X□	WRe0-26	0 ~ 2320°C	0 ~ 4200°F	O	O	–	–	–	–
			U□	Nicrosilal-Nisil	0 ~ 1300°C	32 ~ 2350°F	O	O	–	–	–	–
			Y□	Platinel	0 ~ 1300°C	32 ~ 2350°F	O	O	–	–	–	–
			□: Refer to Note 1 on next page									
		Resistance thermometer bulb	P□	Platinum resistance thermometer bulb JIS'89JPt100 (old JISPt100) Note 2	-200 ~ 630°C	–	O	O	–	–	–	–
			P□		0 ~ 400°C	–	O	O	–	–	–	–
			P□		- 50 ~ 100°C	–	O	O	–	–	–	–
			Q□	Platinum resistance thermometer bulb Pt50	-200 ~ 630°C	–	O	O	–	–	–	–
			H□	Platinum resistance thermometr bulb JIS'89Pt100 (IEC.DIN or equivalent) Note 2	-200 ~ 630°C	-300 ~ 1150°F	O	O	–	–	–	–
			F□		-200 ~ 630°C	–	O	O	–	–	–	–
			F□		0 ~ 400°C	–	O	O	–	–	–	–
			F□		-50 ~ 100°C	–	O	O	–	–	–	–
			N□	Nickel resistance thermometer bulb Ni508Ω	-50 ~ 150°C	-50 ~ 300°F	O	O	–	–	–	–
			□: Refer to Note 2 on next page									
		Linear	C□	DC4 ~ 20mA	0 ~ 20mA		O	O	O	O	O	O
			1□	DC10 ~ 50mA	0 ~ 50mA		O	O	–	O	O	O
			2□	DC2 ~ 10mA	0 ~ 10mA		O	O	–	O	O	O
			3□	DC0 ~ 1mA	0 ~ 1mA		O	O	–	O	O	O
			4□	DC0 ~ 10V	0 ~ 20V		O	O	–	O	O	O
			5□	DC1000 ~ 5000mV	0 ~ 5000mV		O	O	O	O	O	O
			6□	DC0 ~ 1000mV	0 ~ 1000mV		O	O	–	O	O	O
			7□	DC-4 ~ 4V	-10 ~ 10V		O	O	–	O	O	O
			8□	DC0 ~ 100mV	0 ~ 100mV		O	O	–	O	O	–
			8□	DC0 ~ 100mV	-10 ~ 100mV		–	–	–	–	–	O
			M□	DC0 ~ 10mV	-10 ~ 10mV		O	O	–	O	O	–
			M□	DC0 ~ 10mV	0 ~ 10mV		–	–	–	–	–	O
			9□	Resistance value 0 ~ 2kΩ	0 ~ 2kΩ		O	O	–	–	–	–
			□: Refer to Note 3 on next page									

		Code	Range at delivery time	Full scale (full span after delivery)	Applicable model					
					IP300	IP301	IP302	IP313	IP314	IP326
III	Output type and range	C	DC4 ∼ 20mA	DC0 ∼ 20mA	O	O	O	O	O	O
		5	DC1 ∼ 5V	DC0 ∼ 5V	O	O	O	O	O	O
		M	DC0 ∼ 10mV	DC0 ∼ 10mV	O	O	-	O	O	O
		7	DC-4 ∼ 4V	DC-5 ∼ 5V	O	-	-	-	-	-
		8	DC0 ∼ 100mV	DC0 ∼ 100mV	O	O	-	O	O	O
		2	DC2 ∼ 10mA	DC0 ∼ 10mA	O	O	-	O	O	O
IV	Power supply	A	For AC, AC90 ∼ 264V		O	O	O	O	O	O
		B	For DC, DC20 ∼ 56V		O	O	O	O	O	O
V	Option I	00	With out option		O	O	O	O	O	O
		01	With monitor output, IP301 only		-	O	-	-	-	-
		02	With communication		-	O	-	O	O	O
		03	With monitor output and communication, IP301 only Note 4		-	O	-	-	-	-
VI	Option II	0	Without option		O	O	O	O	O	O
		T	Tropical zone treatment		O	O	O	O	O	O
		E	For zener barrier		O	O	-	-	-	-
		G	For tropical zone treatment + for zener barrier Note 5		O	O	-	-	-	-
VII	Temperature range	xxxx	Specification of temperature range		O	O	-	-	-	-

Note 1: With the thermocouple input; Any of the following shall be entered in the second digit of the code according to the unit and characteristic.
C: Unit °C, with linearize
D: Unit °C, without linearize
F: Unit °F, with linearize
G: Unit °F, without linearize

Note 2: With the resistance thermometer bulb input: When the range code of the Model No. at purchase of IP301 is F, the input to the P range cannot be changed.
When the range code of the Model No. at purchase is other than F, the input to the F range cannot be changed.
The F range is indicated as "P" on the loader.
When the range code of IP300 is P or F, and the temperature range is specified in the VII code, the narrowest full span including that range is selected. Unless the temperature range is specified, the wiedest full span (−200 ∼ 630°C) is selected.

Note 3: With linear input: In IP326, enter the code of input 1 and that of input 2 successively. In IP300, IP301, IP302, IP313, and IP314, enter the left code in the first digit, and "0" in the second digit.

Note 4: In IP313, and IP314, a monitor switch is provided as a standard.

Note 5: When code E or G is selected, only the platinum resistance thermometer bulb input and the resistance value (1 ∼ 2 kΩ input) are used in combination with the intrinsic safety explosion-proof zener barrier (Yamatake Model No. 8907/22-02/120 or 8097/12-02/120).
In this case, zero span calibration in combination with the zener barrier is required to correct an error in the zener barrier. The code N□ in Table 1 cannot also be used.
In IP300, the code E or G can be selected only when the code in Table 1 is P□, Q□, or H□.

VII. Enter when specifying the working temperature range. (This designation can be done for Models IP300 and IP301 only.)

(Example)

VII			
1	2	S	1

1 2 S 1
$= 1 \times 10^2 \sim 35 \times 10^1 = 100 \sim 350$

- 1st digit → Effective numeric of the low-limit of temperature range. — Table 4
- 2nd digit → Multiplier — Table 5
- 3rd digit → Effective numeric of the high-limit of temperature range — Table 4
- 4th digit → Multiplier — Table 5

Table 4. Effective Numeric

Code	Effective numeric	Code	Effective numeric	Code	Effective numeric	Code	Effective numeric
0	0	9	9	L	19	V	65
1	1	B	11	M	21	W	75
2	2	C	12	N	22	X	85
3	3	D	13	P	23	Y	95
4	4	E	14	Q	24		
5	5	F	15	R	25		
6	6	G	16	S	35		
7	7	J	17	T	45		
8	8	K	18	U	55		

Table 5

Code	Multiplier	Code	Multiplier
1	10^1	A	-1×10^1
2	10^2	B	-1×10^2
3	10^3	Y	-1×10^3
8	10^0		

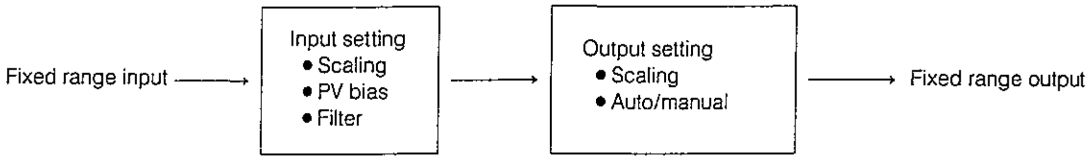
Note 2: A selectable range is within the full span in Table 1.

4. FUNCTIONAL CONFIGURATION AND SETTING

Intelligent signal converters IP300 and 301 are designed to convert various inputs (12 kinds of thermocouples, 7 kinds of resistance thermometer bulbs, linear input mA, mV, V, and resistance values)
IP302 is a low-priced isolator to convert two kinds of signals (4~20 mA DC and 1~5 V).
P313, 314, and 326 calculation units are used to calculate linear inputs variously and output them.

1. IP300 millivolt converter

1-1 Functional configuration



1-2 Setting

(1) Inputs are sorted into 12 kinds of thermocouples, 7 kinds of resistance thermometer bulbs, linear mA, mV, V, and potentiometers.
Outputs are sorted to mA, mV, V linearized or non-linearized signals.

(2) When no setting is done, this converter receives inputs and ranges specified according to the model number, and outputs the output ranges specified according to the model number.

(3) The input and output are set by turning on the power supply and connecting QN715A101 handy loader after wiring to the instrument.
- o For scaling, set the high-limit and low-limit of the input range, and those of the output range in the setup mode.
- o Set the PV bias and filter in the parameter mode.

(4) For details of operation, refer to product manual No. CP-UM-1250 for handy loader.

1-3 Alarm Display

(1) If a trouble is detected by the self-diagnostic function, the OPR/ALM lamp of the instrument flashes.

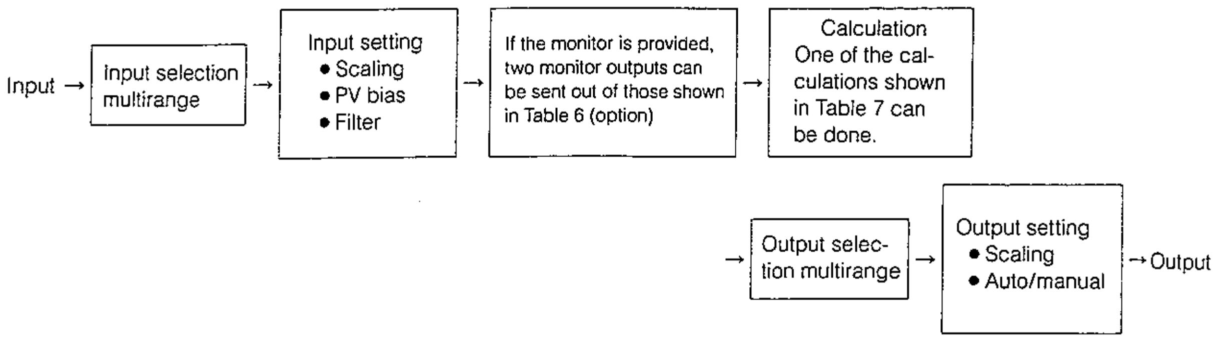
(2) By connecting the handy loader, the alarm contents are displayed as a message as follows. (No handy loader operation is required.)

*** ALARM ***

o UNDER RANGE	Input is smaller than specified.
o OVER RANGE	Input is larger than specified.
o CABLE DATA CLASH	Adjusting data were broken.
o PARAMETER CLASH	Setting parameters were broken.

2. IP301 High-function Type Millivolt Converter

2-1 Functional configuration



2-2 Setting

(1) Perform input selection, input setting, and output setting by turning on the power supply and connecting QN715A101 handy loader after wiring to the instrument.
(2) The kinds of inputs are sorted into 12 kinds of thermocouples, 4 kinds of resistance thermometer bulbs, linear mA, mV, V, and potentiometers, and one of these inputs can be selected in a multirange. The kinds of outputs are sorted into mA, mV, and V outputs. Also, either linearized or non-linearized thermocouples/resistance thermometer bulbs are selectable.
(3) For selecting inputs, set the dip switches of the instrument as shown in Table 5.
(Set the dip switches before wiring.)
- The dip switch cover can be easily opened by inserting a screwdriver from the side marked with (△).
- Set SW200 of input code 6 (0~1000 mV) and input code 5 (1000~5000 mV) to the mV column. Don't set them to the V column.
- Mount the dip switch cover after setting without fail. Be careful not to allow the cover tip to touch the dip switch lever when mounting the cover.

(4) Perform input selection and scaling in the setup mode of the handy loader after setting the dip switches.
(5) Set the output selection by the instrument and handy loader.
(6) Set the PV bias and filter in the parameter mode.
(7) Two out of those specified in Table 6 can be output when a monitor output function is provided. (option)

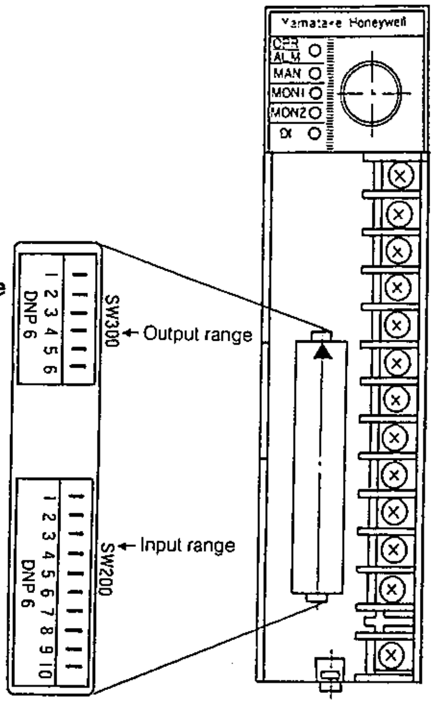
Table 5

SW300 output range

Dip SW	mA	mV	V
1	OFF	ON	ON
2	ON	OFF	OFF
3	OFF	ON	OFF
4	OFF	OFF	ON
5	ON	OFF	OFF
6	OFF	ON	ON

SW200 input range

Dip SW	mA	mV T/C	V	RTD 0~2kΩ
1	ON	OFF	OFF	OFF
2	OFF	OFF	ON	OFF
3	OFF	ON	OFF	ON
4	ON	OFF	OFF	OFF
5	OFF	OFF	ON	OFF
6	OFF	OFF	OFF	ON
7	ON	ON	ON	ON
8	OFF	OFF	OFF	ON
9	OFF	(OFF)	OFF	OFF
10	ON	ON	ON	OFF



Note: To set the burnout down scale by T/C, change over the DIP SW9 of SW200 from (OFF) to ON.

Table 6

No.	Symbol	Abbreviation	Name/contents	No.	Symbol	Abbreviation	Name/contents	No.	Symbol	Abbreviation	Name/contents
00	NOP	NOP	No operation	04	DEV	AMS	Arrival monitor Turns on when a deviation value is low.	08	HIGH	KHM	Holding monitor high
01	LOW	LMS	Low monitor Turns on when an input is low.	05	LOW	TLM	Timer monitor low	09	DEV	KDM	Holding monitor deviation
02	HIGH	HMS	High monitor Turns on when an input is high.	06	HIGH	THM	Timer monitor high	10	DEV	KAM	Holding monitor arrival
03	DEV	DMS	Deviation monitor Turns on when a deviation value is high.	07	LOW	KLM	Holding monitor low	11	D.RATE	DRM	Change rate monitor deviation

(8) One of the calculations shown in Table 7 can be done.

Table 7

No.	Symbol	Abbreviation	Name/contents	No.	Symbol	Abbreviation	Name/contents
00	NOP	NOP	No operation	25	ANALOG MEMORY	ANM	Analog memory
18	REV	RVS	Reverse	26	PRESET	PRS	Preset value

(9) For details of operation, refer to product manual No. CP-UM-1250 for handy loader.

2-3 Alarm display

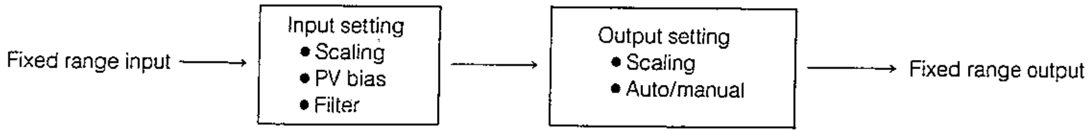
(1) If a trouble is detected by the self-diagnostic function, the OPR/ALM lamp of the instrument flashes.
(2) By connecting the handy loader, the alarm contents are displayed as a message as follows.(No handy loader operation is required.)

*** ALARM ***

o UNDER RANGE	Input is smaller than specified.	o CALB DATA CLASH	Adjusting data were broken.
o OVER RANGE	Input is larger than specified.	o PARAMETER CLASH	Setting parameters were broken.

3. IP302 Isolator

3-1 Functional configuration



3-2 Setting

(1) The kinds of inputs are 4~20 mA DC and 1~5 V, and also the kinds of outputs are 4~20 mA DC and 1~5 V.
(2) When no setting is done, this converter receives an input range specified according to the model number and outputs an output range specified according to the model number.
(3) Set the input and output by turning on the power supply and connecting QN715A101 handy loader after wiring to the instrument.
- o For scaling, set the high-limit and low-limit of the input range, and those of the output range in the setup mode.
- o Set the PV bias and filter in the parameter mode.
- o For details of operation, refer to product manual No. CP-UM-1250 for handy loader.

3-3 Alarm Display

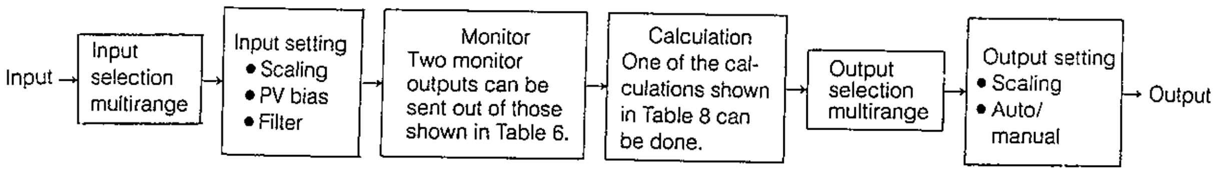
(1) If a trouble is detected by the self-diagnostic function, the OPR/ALM lamp of the instrument flashes.
(2) By connecting the handy loader, the alarm contents are indicated as a message as follows. (No handy loader operation is required.)

*** ALARM ***

o UNDER RANGE	Input is smaller than specified.	o CABLE DATA CLASH	Adjusting data were broken.
o OVER RANGE	Input is larger than specified.	o PARAMETER CLASH	Setting parameters were broken.

4. IP313 Calculation Unit

4-1 Functional configuration



4-2 Setting

(1) Perform input selection, input setting, and output setting by turning on the power supply and connecting QN715A101 handy loader after wiring to the instrument.
(2) The kinds of inputs are selectable from 10 ranges of linear inputs mA, mV, and V.
(3) For selecting the inputs, set the dip switches of the instrument as shown in Table 5 before wiring to the terminals. The dip switch cover can easily be opened by inserting a screwdriver from the side marked with (▲).
Don't set SW200 of input code 6 (0~1000 mV) or input code 5 (1000~5000 mV) to the V column, but set SW200 to the mV column.
Mount the dip switch cover without fail after setting. Be careful not to allow the cover tip to touch the dip switch lever when mounting the cover.
(4) Perform input selection and scaling in the setup mode of the handy loader after setting the dip switches.
(5) Set the output selection by the instrument and handy loader.
(6) Set the PV bias and filter in the parameter mode.
(7) Two monitor outputs can be selectively sent out of those shown in Table 6. (standard equipment)
(8) One of the calculations shown in Table 8 can selectively be done.

Table 6

No.	Symbol	Abbreviation	Name/contents	No.	Symbol	Abbreviation	Name/contents	No.	Symbol	Abbreviation	Name/contents
00	NOP	NOP	No operation	04	DEV	AMS	Arrival monitor Turns on when a deviation value is low.	08	HIGH	KHM	Holding monitor high
01	LOW	LMS	Low monitor Turns on when an input is low.	05	LOW	TLM	Timer monitor low	09	DEV	KDM	Holding monitor deviation
02	HIGH	HMS	High monitor Turns on when an input is high.	06	HIGH	THM	Timer monitor high	10	DEV	KAM	Holding monitor arrival
03	DEV	DMS	Deviation monitor Turns on when a deviation value is high.	07	LOW	KLM	Holding monitor low	11	D.RATE	DRM	Change rate monitor

Table 8

No.	Symbol	Abbre-viation	Name/contents	No.	Symbol	Abbre-viation	Name/contents	No.	Symbol	Abbre-viation	Name/contents
00	NOP	NOP	No operation	17	DRATE LIMIT	DRL	Change rate limiter	23	MAX HOLD	MAX	Maximum value hold
12	FILTELR	FLT	First-order lag filter	18	REV	RVS	Reverse	24	MIN HOLD	MIN	Minimum value hold
13	R/B	R/B	Ratio/bias	19	d/dt	LED	Lead	25	ANALOG MEMORY	ANM	Analog memory
14	SCALING	SCL	Scaliing	20	LEAD LAG	L/L	Lead/lag	26	PRESET	PRS	Preset value
15	ROOT	SQR	Extraction of square root	21	ISIG.I ABS	ABS	Absolute value	27	SOFT PRESET	SPR	Soft preset
16	LIMIT	HLL	High-low limiter	22	LINEARIZE	TBL	Linearize table 20 broken line conversion				

(9) For details of opereation, refer to product manual No.CP-UM-1250 for handy loader.

4-3 Alarm Display

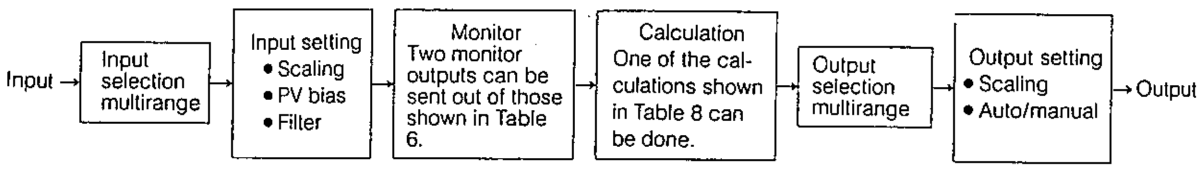
(1) If a trouble is detected by the self-diagnostic function, the OPR/ALM lamp of the instrument flashes.
(2) The alarm contents are displayed as shown below by connecting the handy loader. (No handy loader opereation is required.)

*** ALARM ***

- o UNDER RANGE Input is smaller than specified.
- o OVER RANGE Input is larger than specified.
- o CABLE DATA CLASH Adjusting data were broken.
- o PARAMETER CLASH Setting parameters were broken.

5. IP314 Composite calculation unit

5-1 Functional configuration



5-2 Setting

(1) Perform input selection, input setting, and output setting by turning on the power supply and connecting QN715A101 handy loader after wiring to the instrument.
(2) The kinds of inputs are selectable from 10 ranges of linear inputs mA, mV, and V.
(3) For selecting the inputs, set the dip switches of the instrument as shown in Table 5 before wiring to the terminals. The dip switch cover can easily be opened by inserting a screwdriver from the side marked with (▲).
Don't set SW200 of input code 6 (0~1000 mV) or input code 5 (1000~5000 mV) to the V column, but set SW200 to the mV column.
Mount the dip switch cover without fail after setting. Be careful not to allow the cover tip to touch the dip switch lever when mounting the cover.
(4) Perform handy loader setting after setting the dip switches.
(5) Set the output selection by the instrument and handy loader.
(6) Set the PV bias and filter in the parameter mode.
(7) Two monitor outputs can be selectively sent out of those shown in Table 6. (standard equipment)
(8) Perform calculation in series after selecting four out of the calculations shown in Table 8, if two monitor outputs are not used, or after selecting two out of the calculations shown in Table 8, if two monitor outputs are used.
(9) For details of opereation, refer to product manual No.CP-UM-1250 for handy loader.

5-3 Alarm Display

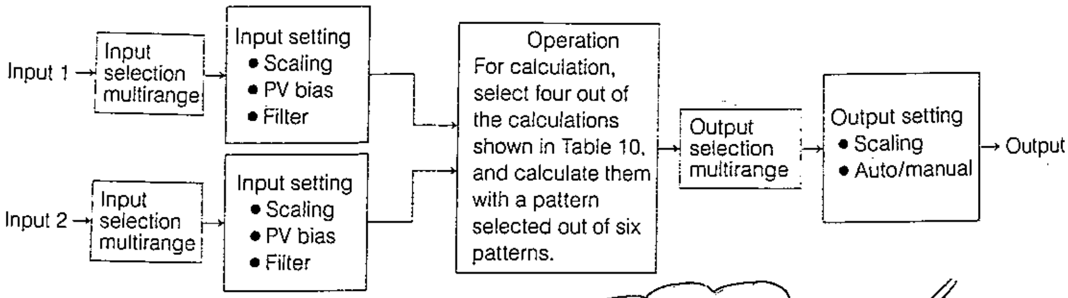
(1) If a trouble is detected by the self-diagnostic function, the OPR/ALM lamp of the instrument flashes.
(2) The alarm contents are displayed as shown below by connecting the handy loader. (No handy loader operation is required.)

*** ALARM ***

- o UNDER RANGE Input is smaller than specified.
- o OVER RANGE Input is larger than specified.
- o CABLE DATA CLASH Adjusting dta were broken.
- o PARAMETER CLASH Setting parameters were broken.

6. IP326 Two-input Calculation Unit

6-1 Functional configuration



6-2 Setting

(1) Perform two-input selection, setting, one-output selection, and setting by turning on the power supply and connecting QN715A101 handy loader after wiring to the instrument.

(2) The kinds of inputs are selectable out of 10 ranges of linear inputs mA, mV, and V.

(3) For selecting the inputs, set the dip switches of the instrument as shown in Table 9 before wiring to the terminals.

- The dip switch cover can easily be opened by inserting a screwdriver from the side marked with (▲).
- Don't set SW200 and SW201 of input code 6 (0~1000 mV) and input code 5 (1000~5000 mV) to the V column, but set them to the mV column.
- Mount the dip switch cover without fail after setting. Be careful not to allow the cover tip to touch the dip switch lever when mounting the cover.

(4) Perform handy loader setting after setting the dip switches.

(5) Select the output by setting the instrument and handy loader.

(6) Set the PV bias and filter in the parameter mode.

(7) Select four out of the calculations shown in Table 10, and execute them by selecting one of six patterns shown in Table 11.

(8) Input one of 28~37 in Table 10 to the two-input calculation (where input 1 and input 2 are joined with each other).

(9) No external output can be taken out of the monitor. However, DI inputs for other operations can be controlled from the DO outputs by utilizing DO as an internal operation.

Table 9

SW300 output range

Dip SW	mA	mV	V
1	OFF	ON	ON
2	ON	OFF	OFF
3	OFF	ON	OFF
4	OFF	OFF	ON
5	ON	OFF	OFF
6	OFF	ON	ON

SW201 input 2

Dip SW	mA	mV	0~20V	−10~10V
1	OFF	OFF	OFF	ON
2	OFF	OFF	ON	ON
3	ON	OFF	OFF	OFF
4	OFF	ON	OFF	OFF
5	OFF	OFF	ON	ON
6	ON	OFF	OFF	OFF

SW200 input 1

Dip SW	mA	mV	0~20V	−10~10V
1	OFF	OFF	OFF	ON
2	OFF	OFF	ON	ON
3	ON	OFF	OFF	OFF
4	OFF	ON	OFF	OFF
5	OFF	OFF	ON	ON
6	ON	OFF	OFF	OFF

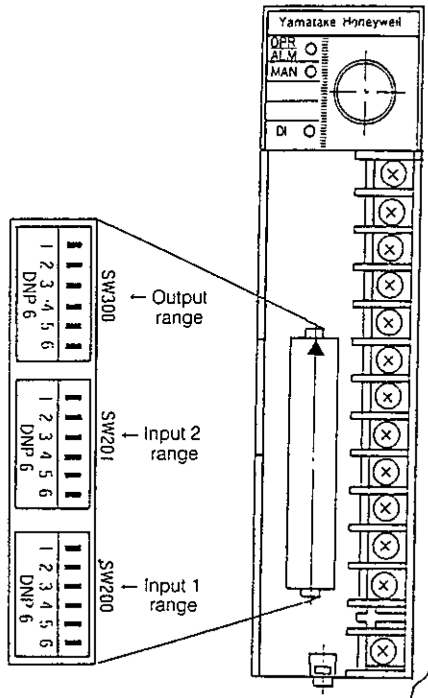


Table 10

No.	Symbol	Abbreviation	Name/contents	No.	Symbol	Abbreviation	Name/contents	No.	Symbol	Abbreviation	Name/contents	No.	Symbol	Abbreviation	Name/contents
00	NOP	NOP	No operation	10	IDEV	KAM	Holding monitor arrival	20	LEAD LAG	L L	Lead lag	30	CHANGE POINT	CPS	Change point selector
01	LOW	LMS	Low monitor Turns on when an input is low.	11	D.RATE	DRM	Change rate monitor	21	ISIG.I ABS	ABS	Absolute value	31	SOFT S SELECTOR	SSS	Soft switch selector
02	HIGH	HMS	High monitor Turns on when an input is high.	12	FILTER	FLT	First-order lag filter	22	LINEARIZE	TBL	Linearize table 20 broken line conversion	32	°C TEMP COMP	TCP	Temperature compensation
03	DEV	DMS	Deviation monitor Turns on when a deviation value is high.	13	R/B	R/B	Ratio/bias	23	MAX. HOLD	MAX	Maximum value hold	33	kgf/cm² PRESS COMP	PC 1	Pressure compensation 1
04	IDEV	AMS	Arrival monitor Turns on when a deviation value is low.	14	SCALING	SCL	Scaling	24	MIN HOLD	MIN	Minimum value hold	34	mmH₂O PRESS COMP	PC 2	Pressure compensation 2
05	LOW	TLM	Timer monitor low	15	ROOT	SQR	Extraction of square root	25	ANALOG MEMORY	ANM	Analog memory	35	+	ADD	Addition/ subtraction
06	HIGH	THM	Timer monitor high	16	LIMIT	HLL	High-low limiter	26	PRESET	PRS	Preset value	36	×	MUL	Multiplication
07	LOW	KLM	Holding monitor low	17	D.RATE LIMIT	DRL	Change rate limiter	27	SOFT PRESET	SPR	Soft preset	37	÷	DVD	Division
08	HIGH	KHM	Holding monitor high	18	REV	RVS	Reverse	28	HIGH SELECTOR	HLS	High-low selector				
09	IDEV	KDM	Holding monitor deviation	19	d/dt	LED	Lead	29	SWITCH SELECTOR	SWS	Switch selector				

※ DRL, HLS Detail Ref. 13 Page. DRL : P24, HLS : P30.

Table 11 2-input calculation pattern profiles

No.	Calculation pattern	No.	Calculation pattern
1	Input 1 → **F1** → F2 → F3 → F4 → Output Input 2 → **F1**	4	Input 1 → F1 → F2 → **F3** → F4 → Output Input 2 → **F3**
2	Input 1 → F1 → **F2** → F3 → F4 → Output Input 2 → **F2**	5	Input 1 → F1 → F2 → **F4** → Output Input 2 → F3 → **F4**
3	Input 1 → F1 → **F3** → F4 → Output Input 2 → F2 → **F3**	6	Input 1 → F1 → F2 → F3 → **F4** → Output Input 2 → **F4**

Notes:
- No. 00~37 in Table 10 are input to F1~F4 and calculated.
- One of No.28~37 is input to the calculation of the parts (parts marked with **F1** **F2** **F3** **F4** where input 1 and input 2 are joined with each other.

6-3 Alarm display

(1) If a trouble is detected by the self-diagnostic function, the OPR/ALM lamp of the instrument flashes.

(2) The alarm contents are displayed as shown below by connecting the handy loader. (No handy loader opereation is required.)

*** ALARM ***

- o UNDER RANGE — Input is smaller than specified.
- o OVER RANGE — Input is larger than specified.
- o CH 2 UNDER RANGE — Channel 2 input is smaller than specified.
- o CH 2 OVER RANGE — Channel 2 input is larger than specified.
- o CABLE DATA CLASH — Adjusting data were broken.
- o PARAMETER CLASH — Setting parameters were broken.

1. Kinds of calculation functions and description of contents kinds

Table 7.

No.	Symbol	Abbreviation	Name/contents	IP301	IP313	IP314	IP326
00	NOP	NOP	No operation	○	○	○	○
01	LOW	LMS	Low monitor Turns on when an input is low.	⊛	○	○	○
02	HIGH	HMS	High monitor Turns on when an input is high.	⊛	○	○	○
03	DEV	DMS	Deviation monitor Turns on when a deviation value is high.	⊛	○	○	○
04	DEV	AMS	Arrival monitor Turns on when a deviation value is low.	⊛	○	○	○
05	LOW	TLM	Timer monitor low	⊛	○	○	○
06	HIGH	THM	Timer monitor high	⊛	○	○	○
07	LOW	KLM	Keeping monitor low	⊛	○	○	○
08	HIGH	KHM	Keeping monitor high	⊛	○	○	○
09	DEV	KDM	Keeping monitor deviation	⊛	○	○	○
10	DEV	KAM	Keeping monitor arrival	⊛	○	○	○
11	D RATE	DRM	Change rate monitor deviation	⊛	○	○	○
12	FILTER	FLT	First-order lag filter	—	○	○	○
13	R/B	R/B	Ratio/bias	—	○	○	○
14	SCALING	SCL	Scaling	—	○	○	○
15	ROOT	SQR	Extraction of square root	—	○	○	○
16	LIMIT	HLL	High-low limiter	—	○	○	○
17	D RATE LIMIT	DRL	Change rate limiter	—	○	○	○
18	REV	RVS	Reverse	○	○	○	○
19	d/dt	LED	Lead	—	○	○	○
20	LEAD LAG	L/L	Lead/lag	—	○	○	○
21	|SIG.| ABS	ABS	Absolute value	—	○	○	○
22	LINEARIZE	TBL	Linearize table 20-broken line conversion	—	○	○	○
23	MAX HOLD	MAX	Maximum value keeping	—	○	○	○
24	MIN HOLD	MIN	Minimum value keeping	—	○	○	○
25	ANALOG MEMORY	ANM	Analog memory	○	○	○	○
26	PRESET	PRS	Preset value	○	○	○	○
27	SOFT PRESET	SPR	Soft preset	—	○	○	○
28	HIGH SELECTOR	HLS	High/low selector	—	—	—	○
29	SWITCH SELECTOR	SWS	Switch selector	—	—	—	○
30	CHANGE POINT	CPS	Change point selector	—	—	—	○
31	SOFTS SELECTOR	SSS	Soft switch selector	—	-	—	○
32	°C TEMP COMP	TCP	Temperature correction.	—	—	—	○
33	kgf/cm² PRESS COMP	PC 1	Pressure correction 1	—	—	—	○
34	mmH₂O PRESS COMP	PC 2	Pressure correction 2	—	—	—	○
35	+	ADD	Addition/ subtraction	—	—	—	○
36	×	MUL	Multiplication	—	—	—	○
37	÷	DVD	Division	—	—	—	○

(Note) Applicable to IP301 with a monitor function.

2. Description of the contents about the kinds of calculation operations

- O Parameter: A numeric value to be set in a calculation function.
- O DI: This digital ON-OFF input signal is used for starting calculation operation with an ON signal or for stopping calculation operation.
- O DO: This digital ON-OFF output signal is used as a monitor output, or an F1 DO F1 DO output signal can be used as a DI input signal of other calculation operation F2.
  (The signals which can be taken out as an external output are the monitor output s only of 01 to 11 in Table 7. In 1P326, however, they cannot be taken out as external output regardless of use of the monitor output, but they are used simply as DI input signals of the following calculation F2.)
- O Input: PV (0 ~ 100%) means (0 ~ 100%FS).

No. 00 No operation (NOP) Input: PV (0 to 100%)

Parameter 1 : None

Parameter 2 : None

DI : None

D$\bar{O}$: None

Calculation contents:

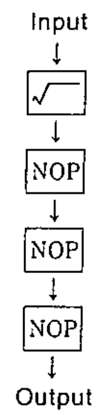
An input is output as it is.
NOP is specified when no calculation operation is done.

Comments:

NOP is used when calculation processing is not necessary in a converter or a calculationunit having a calculation function.

Example:

For using IP314 as a square root extractor



No. 01 Low monitor (LMS) Input: PV (0 to 100%)

Parameter setting	S : Monitor set value (0.1% unit)	Setting range	-999.9 to 999.9	initial value 0.0
Parameter setting	D : Differential (0.1% unit)	Setting range	0.1 to 200.0	initial value 1.0

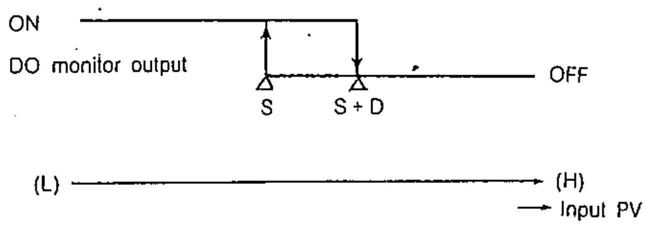
DI : None

D$\bar{O}$: Monitor output

Calculation contents:

D$\bar{O}$ = ON when PV < S

D$\bar{O}$ = OFF when PV > S + D

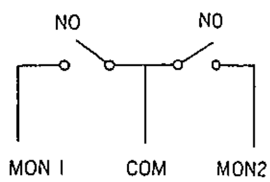


When power is turned on:

D$\bar{O}$ = OFF when S < PV < S + D

Comments:

LMS is used for low-limit alarm, etc. It is also employable as a fail-safe high-limit alarm which functions even if power is interrupted.



No. 02 High monitor (HMS) Input: PV (0 to 100%)

Parameter setting	Item	Unit	Setting range	initial value
Parameter setting	S : Monitor set value	(0.1% unit)	-999.9 to 999.9	100.0
Parameter setting	D : Differential	(0.1% unit)	0.1 to 200.0	1.0

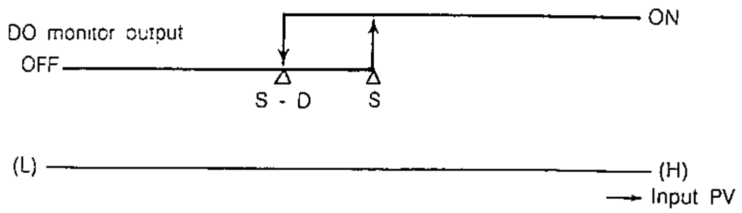
DI : None

DŌ : Monitor output

Calculation contents:

DŌ = ON when PV > S

DŌ = OFF when PV < S - D

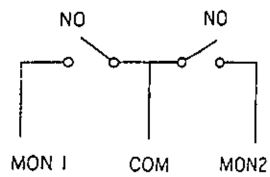


When power is turned on:

DŌ = OFF when > PV > S - D

Comments:

HMS is used for a high-limit alarm. It is also employable as a fail-safe low-limit alarm which functions even if power is interrupted. (Reverse action type of LMS)



No. 03 Deviation monitor (DMS) Input: PV (0 to 100%)

Parameter setting	Item	Unit	Setting range	initial value
Parameter setting	S : Monitor set value	(0.1% unit)	-999.9 to 999.9	0.0
Parameter setting	B : Bandwidth	(0.1% unit)	0.1 to 200.0	1.0

DI: None

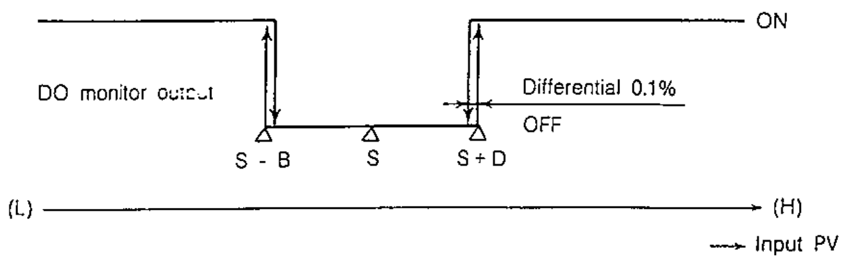
DŌ: Monitor output

Calculation contents:

DŌ = ON when PV < (S - B) : (S + B) < PV

DŌ = OFF when (S - B + 0.1%) < PAV, PV < (S + B - 0.1%)

(Differential is 0.1% fixed.)

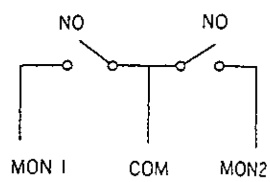


When power is turned on:

DŌ = OFF when PV exists between S + B - 0.1% and S + B or between S - B and S - B + 0.1%.

Comments:

DMS is used for a deviation type absolute value alarm with main set value [S] being preset as a center value.



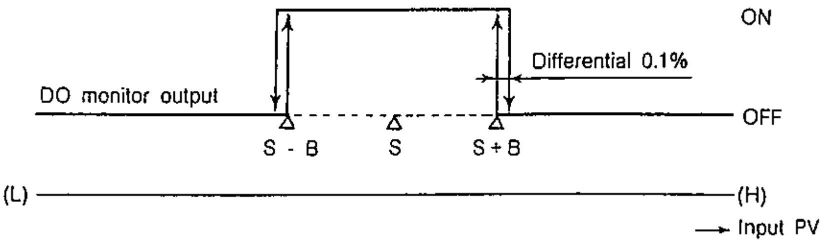
No. 04 Arrival monitor (AMS) Input: PV (0 to 100%)	Comments:
Parameter setting S : Monitor set value (0.1% unit) Setting range -999.9 to 999.9 initial value 0.0	AMS detects that a signal value is close to main set value [S], and it is employable as a signal to judge whether processing or running is possible or not. (Reverse action type of DMS)
Parameter setting B : Bandwidth (0.1% unit) Setting range 0.1 to 200.0 initial value 1.0	
DI : None	
$D\bar{O}$: Monitor output	

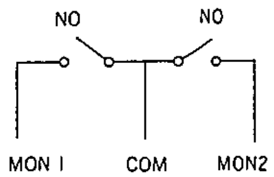
Calculation contents:

$D\bar{O}$ = ON when (S - B) < PV, PV < (S + B)

$D\bar{O}$ = OFF when PV < S - B - 0.1%), (S + B + 0.1%) < PV

(Differential is 0.1% fixed.)





When power is turned on:

$D\bar{O}$ = OFF when PV exists between S + B + 0.1% and S - B - 0.1%, S - B.

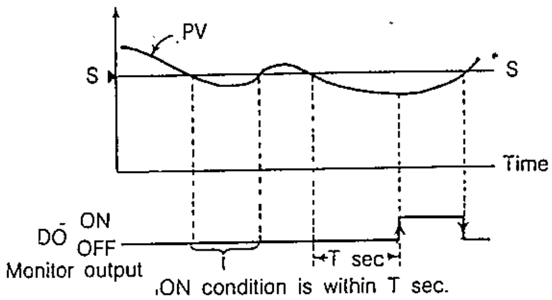
No. 05 Timer monitor (low) (TLM) Input: PV (0 to 100%)	Comments:
Parameter setting S : Monitor set value (0.1% unit) Setting range -999.9 to 999.9 initial value 0.0	TLM is an LMS plus a timer function, and it is used as a timer to start or stop a system according to process signal values. It is useful for reducing the alarm frequency, if it serves as an alarm.
Parameter setting T : Timer set value (1sec unit) Setting range 0 to 5000 initial value 0	
DI: None	
$D\bar{O}$: Monitor output	

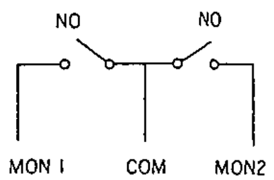
Calculation contents:

$D\bar{O}$ = ON when PV < S is continued for T seconds

$D\bar{O}$ = OFF when PV > S

(When PV > S, the time count is cleared.)





When power is turned on:

Time count is cleared.

No. 06 Timer monitor (high) (THM) Input: PV (0 to 100%)

Parameter setting S : Monitor set value (0.1% unit)	Setting range -999.9 to 999.9	initial value 100.0	
Parameter setting T : Timer set value (1sec unit)	Setting range 0 to 5000	initial value 0	

DI: None

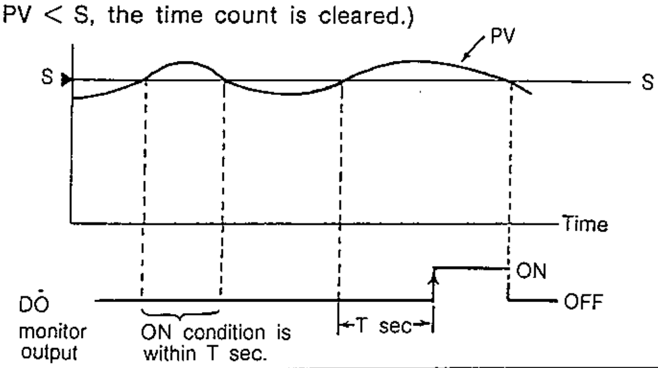
$D\bar{O}$: Monitor output

Calculation contents:

$D\bar{O}$ = ON when PV > S is continued for T seconds.

$D\bar{O}$ = OFF when PV < S

(When PV < S, the time count is cleared.)

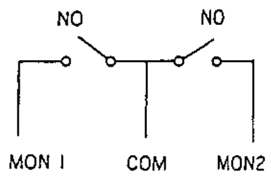


When power is turned on:

Time count is cleared.

Comments:

TMS is an HMS plus a timer function, and it is used as a timer to start or stop a system according to process signal values.
It is useful for reducing the alarm frequency, if it serves as an alarm.
(Reverse action type of TLM)



No. 07 Keeping monitor (Low) (KLM) Input: PV (0 to 100%)

Parameter setting S : Monitor set value (0.1% unit)	Parameter 2 : None	Setting range -999.9 to 999.9	initial value 0.0

DI: Monitor output reset $D\bar{O}$: Monitor output

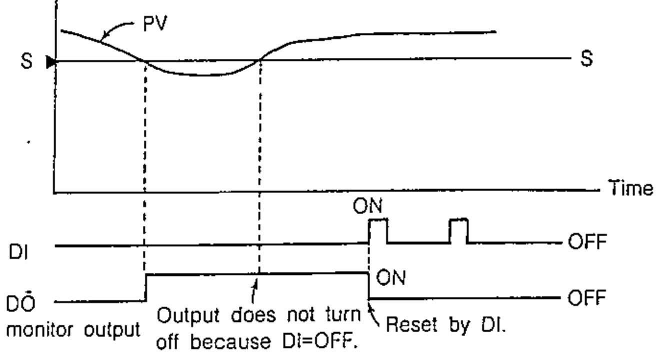
Calculation contents:

$D\bar{O}$ = ON when PV < S

Once $D\bar{O}$ = ON, it is continued until DI turns on.

($D\bar{O}$ does not turn off even when PV > S). No differential function is provided.

(Note) DO = ON when DI = ON and also PV < S.

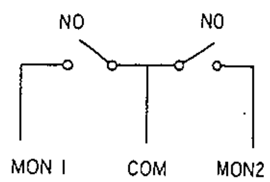


When power is turned on:

$D\bar{O}$ = ON when PV < S, and $D\bar{O}$ = OFF when PV > S

Comments:

Once KLM has functioned, its status remains unchanged until it is reset. This is useful for monitoring the system action or troubles in the unmanned operation mode. It is also employable as an alarm when a system is not reset automatically when a trouble occurred.



No. 08 Keeping monitor (high) (KHM) Input: PV (0 to 100%)

Parameter setting	S : Monitor set value (0.1% unit)	Setting range -999.9 to 999.9	initial value 100.0

Parameter 2 : None

DI: Monitor output reset

$\overline{DO}$: Monitor output

Calculation contents:

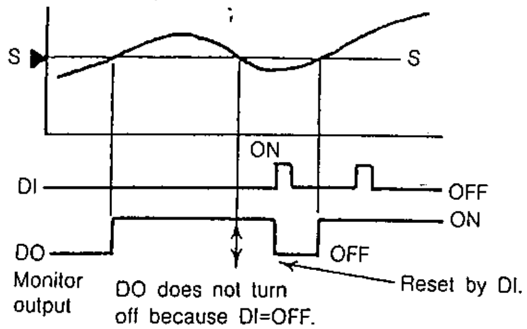
$\overline{DO}$ = ON when PV > S

Once $\overline{DO}$ = ON, it is continued until DI turns on.

($\overline{DO}$ does not turn off even when PV < S.)

No differential function is provided.

$\overline{DO}$ = ON when DI = ON and also PV > S.

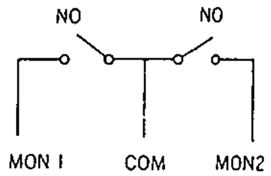


When power is turned on:

$\overline{DO}$ = ON when PV > S, and $\overline{DO}$ = OFF when PV < S.

Comments:

Once KHM has functioned, its status remains unchanged until it is reset.
This is useful for monitoring the system action or troubles in the unmanned operation mode.
It is also employable as an alarm when a system is not reset automatically when a trouble occurred.
(Reverse action type of KLM)



No. 09 Keeping monitor (Deviation) (KDM) Input: PV (0 to 100%)

Parameter setting	Setting	Setting range	initial value
Parameter setting	S : Monitor set value (0.1% unit)	-999.9 to 999.9	0.0
Parameter setting	B : Bandwidth (0.1% sec)	0.1 to 200.0	1.0

DI: Monitor output reset

$\overline{DO}$: Monitor output

Calculation contents:

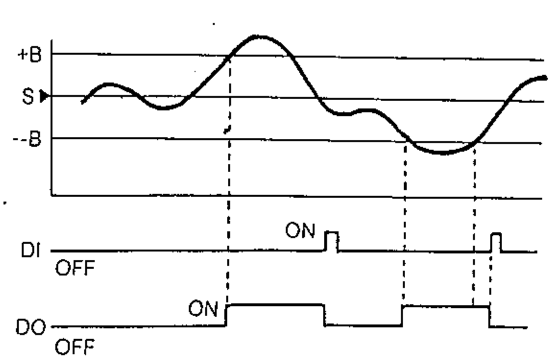
$\overline{DO}$ = ON when PV < S - B or S + B < PV

Once $\overline{DO}$ = ON, it is continued until DI turns on.

($\overline{DO}$ does not turn off even when S - B < PV < S + B.)

No differential function is provided.

$\overline{DO}$ = ON, if DI = ON and (PV < S - B or S + B < PV).



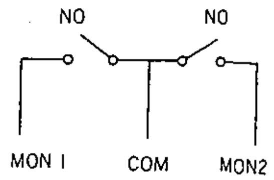
When power is turned on:

$\overline{DO}$ = ON when PV < S - B or S + B < PV

$\overline{DO}$ = OFF when S - B < PV < S + B

Comments:

Once KDM has functioned, its status remains unchanged until it is reset.
This is useful for monitoring the system action or troubles in the unmanned operation mode.
It is also employable as an alarm when a system is not reset automatically when a trouble occurred.



No. 10 Keeping monitor (Arrival) (KAM) Input: PV (0 to 100%)

Parameter setting	S :	Monitor set value	(0.1% unit)	Setting range	-999.9 to 999.9	initial value	0.0
Parameter setting	B :	Bandwidth	(0.1% unit)	Setting range	0.1 to 200.0	initial value	1.0

DI: Monitor output reset

D$\overline{\text{O}}$: Monitor output

Calculation contents:

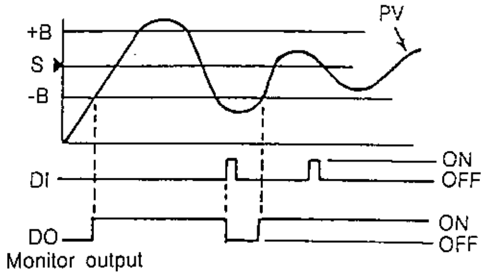
D$\overline{\text{O}}$ = ON when S - B < PV < S + B

Once D$\overline{\text{O}}$ = ON, it is continued until DI turns on.

(D$\overline{\text{o}}$ does not turn off even when PV < S - B or S + B < PV.)

No differential function is provided.

D$\overline{\text{O}}$ = ON when DI = ON and also S - B < PV < S + B.

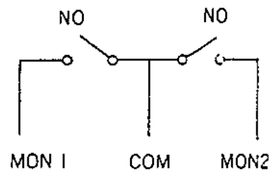


When power is turned on:

D$\overline{\text{O}}$ = ON when S - B < PV < S + B
D$\overline{\text{O}}$ = OFF when PV < S - B or S + B < PV

Comments:

Once KAM has functioned, its status remains unchanged until it is reset. This is useful for monitoring the system action or troubles in the unmanned operation mode. It is also employable as an alarm when a system is not reset automatically when a trouble occurred. (Reverse action type of KDM)



No. 11 Change rate monitor (DRM) Input: PV (0 to 100%)

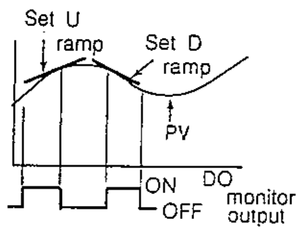
Parameter setting	U :	High-limit or change rate	(0.1%/sec unit)	Setting range	0 to 999.9	initial value	100.0
Parameter setting	D :	Low-limit of change rate	(0.1%/sec unit)	Setting range	0 to 999.9	initial value	100.0

DI: None

D$\overline{\text{O}}$: Monitor output

Calculation contents:

D$\overline{\text{O}}$ = ON when the change rate of PV has exceeded either high-limit or low-limit of the change rate. The high-limit and low-limit of the change rate are set by a positive value.



When power is turned on:

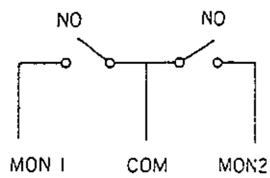
D$\overline{\text{O}}$ = OFF

Cautions:

Calculation operation is done after converting the change rate into the unit of 0.1 second.

Comments:

DRM is used for monitoring a change of process signal values. It is also employable for detecting a trouble of the input signal source.



No. 12 First-order lag filter (FLT) Input: PV (0 to 100%)

Parameter setting	T :	Filter constant	(0.1sec unit)	Setting range	0 to 999.9	initial value	0

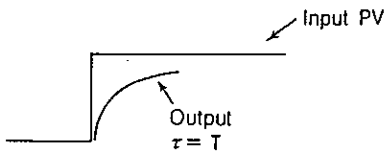
Parameter 2 : None

DI: None

D$\bar{O}$: None

Calculation contents:

First-order lag filter



When power is turned on:

PV(k-1) is set to 0.

Comments:

FLT is used for suppressing a quick change of a signal.

No. 13 Ratio bias (R/B) Input: PV (0 to 100%)

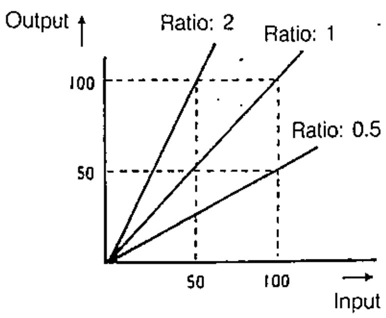
Parameter setting	R: Ratio (0.001sec unit)	Setting range	-9.999 to 9.999	initial value	1.000
Parameter setting	B: Bias (0.01sec unit)	Setting range	-99.99 to 200.00	initial value	0.00

DI: None

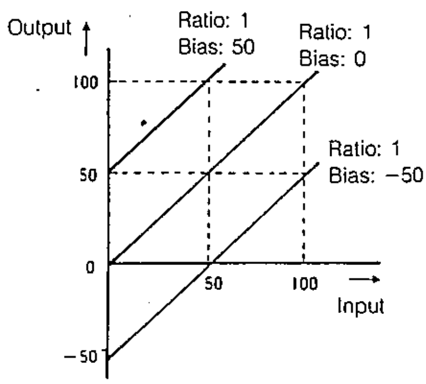
D$\bar{O}$: None

Calculation contents:

PV is multiplied by a ratio, and then, a bias is added to PV.



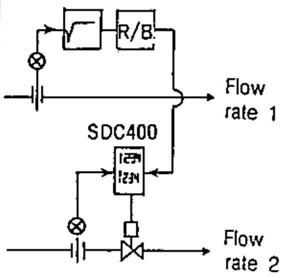
Ratio: Variable
Bias: 0



Ratio: 1
Bias: Variable

Comments:

Flow rate ratio setting (Example)



Ratio setting of the flow rate 2 setting signal is made by the flow rate 1 value.
Flow rate 2 =
R × flow rate 1 + B

No. 14 Scaling (SCL) Input: PV (0 to 100%)

Parameter setting			Setting range		Initial value	
Parameter setting	L : Low-limit value of scaling	(0.1 unit)	Setting range	-999.9 to 999.9	initial value	0.0
Parameter setting	H : High-limit value of scaling	(0.1 unit)	Setting range	-999.9 to 999.9	initial value	0.0

DI: None

D$\bar{O}$: None

Calculation contents:

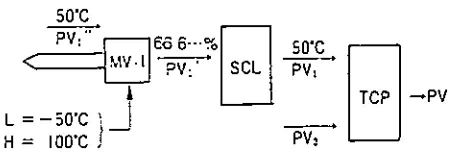
An input is scaled by a parameter value.

$$PV = L + (H - L) \times PV' \times \frac{1}{100}$$

Ex. Use of No. 32 temperature compensation (TCP)

$$PV = PV_2 \times \frac{273 + T}{273 + PV_1}$$

T is a value of °C like 20°C. Therefore, PV_1 is also the value of °C, and not just a numeric value like 1. The value is scaled.
PV_1 is as follows when 50°C input is given under -50 to 100°C range:



$$PV_1'\% = \frac{PV_1'' - L}{H - L} \times 100 = \frac{100}{150} \times 100$$

$$PV_1 = L + (H - L) \times PV_1' \times \frac{1}{100}$$

$$= 50°C$$

Comments:

SCL is used for executing calculation processing and monitor setting in industrial units, or for changing calculation operation units.

No. 15 Square root extraction (SQR) Input: PV (0 to 100%)

Parameter setting	D : Dropout	(0.1 unit)	Setting range	0.0 to 10.0	initial value	0.0

Parameter 2 : None

DI: None

D$\bar{O}$: Turns on in case of dropout.

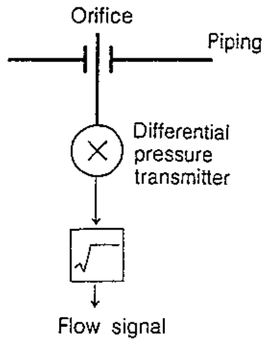
Calculation contents:

$\sqrt{PV}$ is calculated.

Output = 0 and D$\bar{O}$ = ON when PV < D.

Comments:

SQR is mainly used for converting a differential pressure signal into a flow signal.

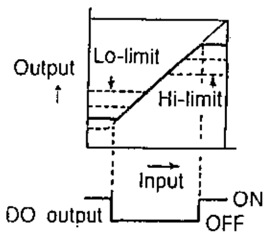


No. 16 High-low limiter (HLL) Input: PV (0 to 100%)							Comments:
Parameter setting	L : Low-limit (0.1% unit)		Setting range	-999.9 to 999.9	initial value	0.0	HLL designates the high-limit value and low-limit value of output signals. It is used for using only a partial range of a signal.
Parameter setting	H : High-limit (0.1% unit)		Setting range	-999.9 to 999.9	initial value	0.0	
DI: None							
DŌ: Turns on when an output signal reaches either limit.							

Calculation contents:

PV = L and DŌ = ON when PV < L.

PV = H and DŌ = ON when PV > H.

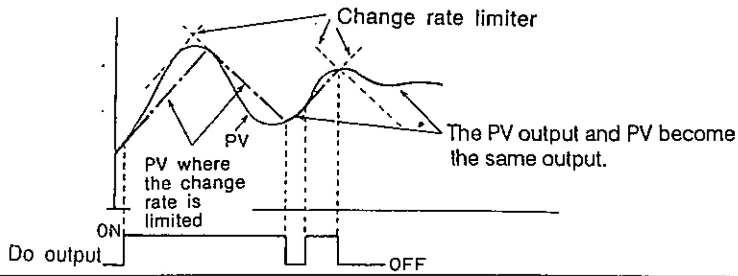


No. 17 Change rate limiter (DRL) Input: PV (0 to 100%)								Comments:
Parameter setting	U :	High-limit of change rate	(0.1% unit)	Setting range	0 to 999.9	initial value	100.0	DRL is used for suppressing an abrupt change of signal.
Parameter setting	D :	Low-limit of change rate	(0.1% unit)	Setting range	0 to 999.9	initial value	100.0	
DI: Limit action is reset. ← Pls Note!!								
DŌ: Turns on when the change rate reaches either limit.								

Calculation contents:

A PV change rate is limited within a preset change rate (when DI-OFF).

DŌ = ON when the change rate reaches either limit.



When power is turned on:

DŌ = OFF.

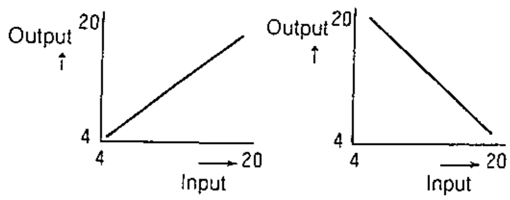
Cautions:

Calculation operation is done after converting the change rate into the unit of 0.1 seconds.

No. 18 Reverse (RVS) Input: PV (0 to 100%)	Comments:
Parameter 1 : None	RVS reverse a signal.
Parameter 2 : None	
DI: Not reversed	
DO: None	

Calculation contents:

PV = 1 -PV when DI = OFF.



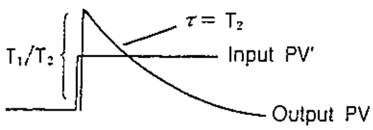
RVS does not function when DI is provided.

RVS functions when DI is not provided.

No. 19 Lead (LED) Input: PV (0 to 100%)						Comments:
Parameter setting	T_1 : Lead time (0.1sec unit)	Setting range	0 to 999.9	initial value	0.0	LED outputs a signal change, and it is utilizable for feed forward, etc.
Parameter setting	T_2 : Lag time (0.1sec unit)	Setting range	0 to 999.9	initial value	0.0	
DI: None						
D$\bar{O}$: None						

Calculation contents:

$$PV(Output) = \frac{T_1 S}{1 + T_2 S} \times PV' \text{ (Input)}$$



When power is turned on:

PV = Ø from Xn-1 = Xn9 and Yn-1 = Ø

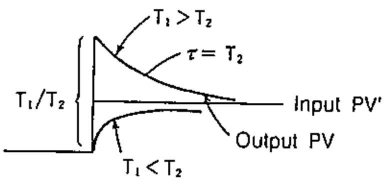
No. 20 Lead, lag (L/L) Input: PV (0 to 100%)						Comments:
Parameter setting	T_1 : Lead time (0.1sec unit)	Setting range	0 to 999.9	initial value	0.0	(L/L) is used for compensating the dead time in a system or other purposes.
Parameter setting	T_2 : Lag time (0.1sec unit)	Setting range	0 to 999.9	initial value	0.0	

DI: None

$\overline{DO}$: None

Calculation contents:

$$PV\ (Output) = \frac{1 + T_1S}{1 + T_2S} \times PV'\ (Input)$$



When power is turned on:

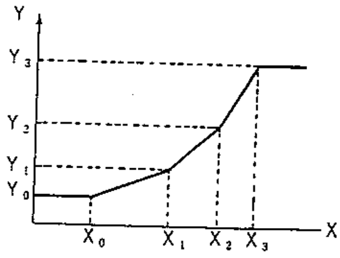
Output = input from Xn -1 = Xn9 and Yn -1 = Yn. 54

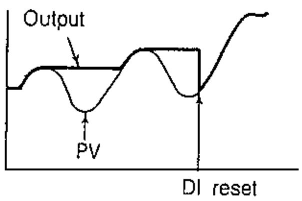
No. 21 Absolute value (ABS) Input: PV (0 to 100%)	Comments:
Parameter 1 : None	ABS obtains an absolute value of an input value which contains a minus value.
Parameter 2 : None	
DI: None	
$\overline{DO}$: PV is a minus value.	

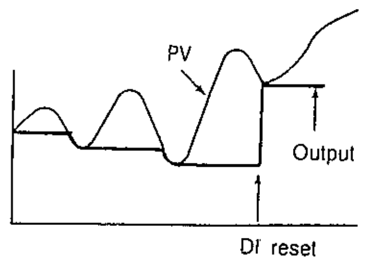
Calculation contents:

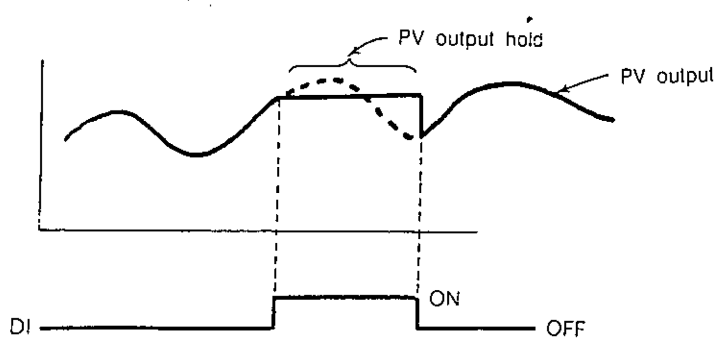
An absolute PV value is output.

When PV< 0, PV = | PV | and $\overline{DO}$ = ON.

No. 22 **Linearize table (TBL)** Input: PV (0 to 100%)	Comments:
Parameter setting X? : Linearize table (0.1% unit) Setting range -999.9 to 999.9	An optional function can be prepared by max. 20 broken lines. This TBL is used when an input signal has a special non-linear characteristic or when a nonlinear characteristics is required for an output.
Parameter setting Y? : Line conversion (0.1% unit) Setting range -999.9 to 999.9	
DI: None	
$\overline{DO}$: None	
Calculation contents: The following data are set as parameters. 1. No. of broken lines (1 to 20) 2. X (No. of broken lines +1 point, 0.1% unit) 3. Y (No. of broken lines +1 point, 0.1% unit) Broken line conversion is done according to the preset (X, Y) values.  An example when the number of broken lines is 3.	
Cautions: If two or more broken line tables are set in a composite calculation unit, each broken line table is equal to each other. The following action is not guaranteed because of the execution time of calculation operation. 1) 100msec update cycle 2) Time accuracy in calculation operation related to time, such as a filter, etc.	

No. 23 **Maximum value keeping (MAX)** Input: PV (0 to 100%)	Comments:
Parameter 1 : None	MAX is utilizable for data analysis, etc.
Parameter 2 : None	
DI: Maximum value reset	
$\overline{DO}$: None	
Calculation contents: The maximum value up to the present is output. The maximum value is set when DI = ON.  	
When power is turned on; Maximum value = nPV	

No. 24 **Minimum value keeping (MIN)** Input: PV (0 to 100%)	Comments:
Parameter 1 : None	MIN is utilizable for data analysis, etc.
Parameter 2 : None	
DI: Minimum value reset	
D$\bar{O}$: None	
Calculation contents: The minimum value up to the preset is output. The minimum value is set when DI = ON.  	
When power is turned on: Minimum value = PV	

No. 25 **Analog memory (ANM)** Input: PV (0 to 100%)	Comments:
Parameter 1 : None	ANM is used for temporarily storing a process value into memory. The held value is digitally stored into memory, and it is stable.
Parameter 2 : None	
DI: Pv output hold when DI = ON	
D$\bar{O}$: None	
Calculation contents: PV is held when DI = ON. (The last PV is set as the preset PV.) (Note) Processing follows PV output when DI = OFF.  	

No. 26 Preset value (PRS) Input: PV (0 to 100%)

Parameter setting S : Preset value (0.1% unit) Setting range -999.9 to 999.9

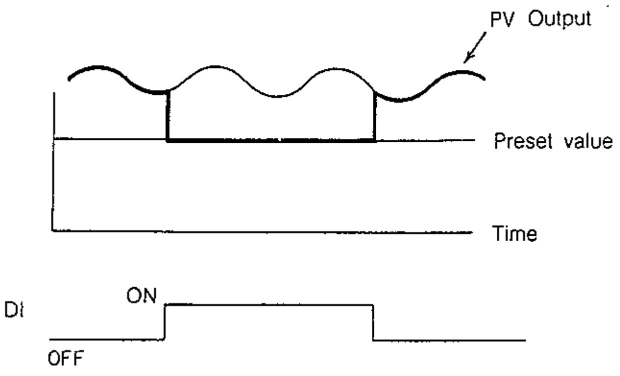
Parameter 2: None

DI: A preset value is output.

D$\bar{O}$: None

Calculation contents:

PV = S (Preset value) when DI = ON.



Comments:

PRS outputs a preset value when DI turns on, irrespective of input values.
It is useful for fail safe design of a system.

No. 27 Soft preset (SPR) Input: PV (0 to 100%)

Parameter setting S : Preset vaue (0.1% unit) Setting range -999.9 to 999.9 initial value 0.0

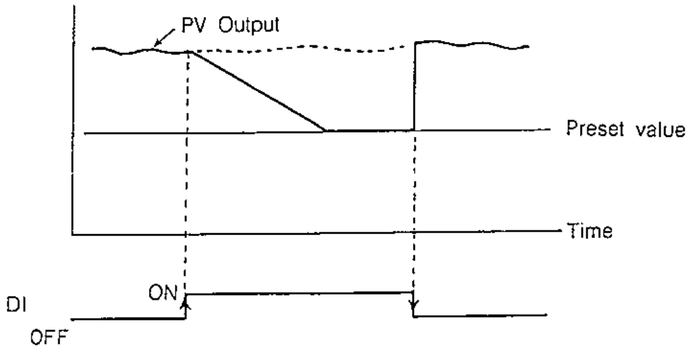
Parameter setting R : Ramp (0.1%/sec unit) Setting range 0.1 to 999.9 initial value 10.0

DI: A preset value is output.

D$\bar{O}$: None

Calculation contents:

A preset value is output bumplessly when DI = ON.
The ramp to the preset value meets the set parameter.



When power is turned on:

PV approaches a preset value from PV = 0, if DI = ON when turning on the power supply.

Comments:

SPR is used for outputting a preset value bumplessly.

No. 28 High-low selector (HLS) Input: PV1 (0 to 100%), PV2 (0 to 100%)	Comments:
Parameter setting: 0 : Low selector, 1 : High selector. Setting range: 0 to 1. Initial value: 0	HLS selects one of two inputs, whichever is larger or smaller.
Parameter 2: None	
DI: None	
D$\bar{O}$: DO turns on when PV1 input < PV2 input.	
Calculation contents: 1. In case of low selector: Either PV1 or PV2 input is output, whichever is smaller, by comparing them with each other. D$\bar{O}$ = ON, if PV1 input is smaller than PV2 input. 2. In case of high selector: Either PV1 or PV2 input is output, whichever is larger, by comparing them with each other. D$\bar{O}$ = ON, if the PV1 input is smaller than PV2 input. Your Vessel case : High Selector.	

No. 29 Switch selector (SWS) Input: PV1 (0 to 100%), PV2 (0 to 100%)	Comments:
Parameter 1 : None	Either one of two inputs is selected and output according to a DI command.
Parameter 2 : None	
DI: PV input is output.	
D$\bar{O}$: DO turns on when PV1 input < PV2 input.	
Calculation contents: PV2 input is output when DI = ON. PV1 input is output when DI = OFF. D$\bar{O}$ = ON when PV1 input is smaller than PV2 input.	

No. 30 Change point selector (CPS) Input: PV1 (0 to 100%), PV2 (0 to 100%)

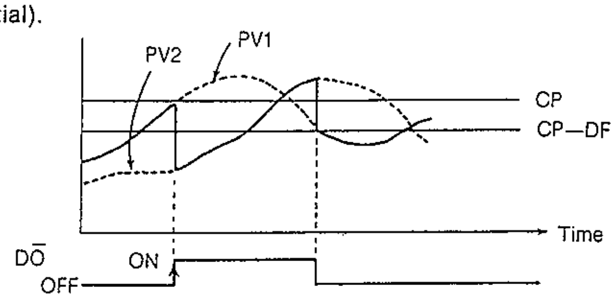
Parameter setting			Setting range		initial value	
Parameter setting	S : Change point	(0.1% unit)	Setting range	-999.9 to 999.9	initial value	100.0
Parameter setting	D : Differential	(0.1% unit)	Setting range	0 to 99.9	initial value	0.0

DI: None

DŌ: Do turns on when PV2 input is output.

Calculation contents:

PV2 input is output when PV1 input is larger than the change point (CP). DŌ turns on.
PV1 input is output and DŌ-OFF when PV1 input is smaller than (change point - differential).

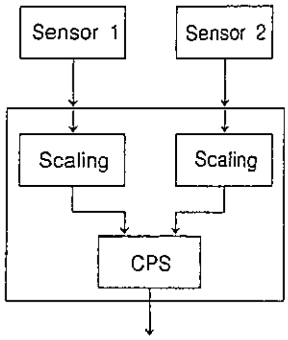


When power is turned on:

PV1 input is output when CP > PV1 is input.

Comments:

A narrow range sensor is automatically selected as an application example.



No. 31 Soft switch selector (SSS) Input: PV1 (0 to 100%), PV2 (0 to 100%)

Parameter setting			Setting range		initial value	
Parameter setting	R : Ramp	(0.1% unit)	Setting range	0.1 to 999.9	initial value	10.0

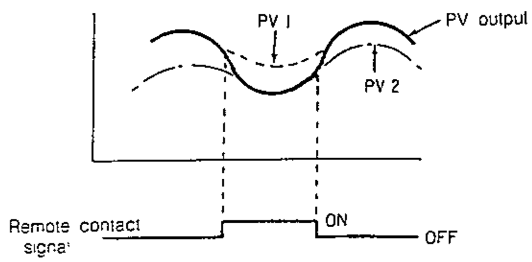
Parameter 2 : None

DI: PV2 input is output.

DŌ: None

Calculation contents:

PV2 input is output when DI = ON.
PV1 input is output when DI = OFF.
PV1 output and PV2 output are switched from each other bumplessly by parameter R (ramp).

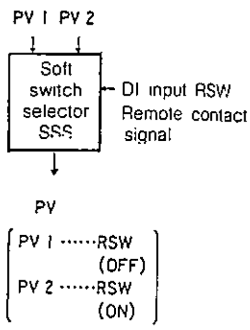


When power is turned on:

PV2 input is output when DI = ON, and PV1 input is output when DI = OFF.

Comments:

SSS is used for eliminating an output bump which may be produced in a switch selector.



No. 32 Temperature correction (TCP) Input: PV1 PV2 (0 to 100%)	Comments:
Parameter setting T : Temperature (0.1 unit) Setting range -300.0 to 2000.0 initial value 0.0	Since the volume of a gas is expanded or contracted according to the temperature, the volume is corrected to a value at reference temperature T.
Parameter setting S : 0 = °C, 1 = °F Setting range 0 or 1 initial value 0	
DI: None	
D̄O: None	

Calculation contents:

Parameter setting S: Ø (when °C)

$$PV = PV2 \times \frac{273 + T}{273 + PV1}$$

Parameter setting S: 1 (when °F)

$$PV = PV2 \times \frac{459.4 + T}{459.4 + PV1}$$

PV1: No. 1 input

PV2: No. 2 input

PV: Output

Note: For PV_1 input, the calculation output value of No. 14 scaling (SCL) is used. See page 23.

No. 33 Pressure correction 1 (PC1) Input: PV1 PV2 (0 to 100%)	Comments:
Parameter setting P : Pressure (0.1 unit) Setting range -999.9 to 999.9 initial value 0.0	Since the volume of a gas if expanded or contracted according to the pressure, it is converted into a volume at reference pressure P.
Parameter 2 : None	
DI: None	
D̄O: None	

Calculation contents:

$$PV = PV2 \times \frac{1.033 + PV1}{1.033 + P}$$

PV1: No. 1 input

PV2: No. 2 input

PV: Output

example

P = 0

PV1 = 0.5 kgf/cm^2 abs

PV2 = 50%

PV output = 74%

$$PV = 50 \times \frac{1.033 + 0.5}{1.033 + 0} = 74$$

Note: For PV_1 input, the calculation output value of No. 14 scaling (SCL) is used. See page 23.

No. 34 Press correction 2 (PC2) Input: PV1 PV2 (0 to 100%)

Parameter setting	P : Pressure mmH_2O abs (1 unit)	Setting range	-999.9 to 999.9	initial value	0

Parameter 2 : None

DI: None

$D\bar{O}$: None

Calculation contents:

$$PV = PV2 \times \frac{10330 + PV1}{10330 + P}$$

PV1: No. 1 input

PV2: No. 2 input

PV: Output

example

P = 0

PV1 = 100 mmH_2O

PV2 = 50%

PV output = 50.5%

$$PV = 50 \times \frac{10330 \div 100}{10330 \div 0} = 50.5$$

Note: For PV_1 input, the calculation output value of No. 14 scaling (SCL) is used. See page 23.

Comments:

Since the volume of a gas is expanded or contracted according to the pressure, it is converted into a volume at reference pressure P.

No. 35 Addition and subtraction (ADD) Input: PV1 (0 to 100%), PV2 (0 to 100%)

Parameter setting	A : Coefficient A (0.1% unit)	Setting range	-999.9 to 999.9	initial value	100.0
Parameter setting	B : Coefficient B (0.1% unit)	Setting range	-999.9 to 999.9	initial value	100.0

DI: None

$D\bar{O}$: DO turns on when PV1 input < PV2 input.

Calculation contents:

$$PV = \frac{A}{100} \times PV1 + \frac{B}{100} \times PV2$$

$D\bar{O}$ = ON when PV1 < PV2

PV1: No. 1 input (%)

PV2: No. 2 input (%)

PV: Output (%)

example

PV1 = 70%

PV2 = 30%

A = 50%

B = 50%

PV output = 50%

$$PV = \frac{50}{100} \times 70 - \frac{50}{100} \times 30 = 50$$

Comments:

Two inputs are added to each other after multiplying them by coefficients A, B respectively. An average value is calculated, if A = B = 50% is selected.

No. 36 **Multiplication (MUL)** Input: PV1 (0 to 100%), PV2 (0 to 100%)	Comments:
Parameter 1 : None	MUL is used for obtaining the product of two process values.
Parameter 2 : None	
DI: None	
D$\bar{O}$: DO turns on when PV1 input < PV2 input.	
Calculation contents: $PV = PV1 \times PV2 \times \frac{1}{100}$ PV1: No. 1 input (%) PV2: No. 2 input (%) PV: Output (%) example PV1 = 60% PV2 = 40% PV output = 24% $PV = 60 \times 40 \times \frac{1}{100} = 24$	

No. 37 **Division (DVD)** Input: PV1 (0 to 100%), PV2 (0 to 100%)	Comments:
Parameter setting A : Coefficient 1 (0.1% unit) Setting range -999.9 to 999.0 initial value 0.0	DVD is used for obtaining a ratio of two process values.
Parameter 2 : None	
DI: None	
D$\bar{O}$: DO turns on when PV1 input < PV2 input.	
Calculation contents: $PV = \frac{PV1}{PV2} \times 100 + A$ PV1: No. 1 input (%) PV2: No. 2 input (%) PV: Output (%) example PV1 = 50% PV2 = 100% A = 50% PV output = 100% $PV = \frac{50}{100} \times 100 + 50 = 100$	

6. INSTALLATION

1. Mounting Place

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

(1) A place where the temperature does not change noticeably and it is close to normal temperature.
(2) A place free of a corrosive gas atmosphere.
(3) A place where the relative humidity is higher than or lower than specified.
(4) A place free of mechanical vibrations
(5) A place free of dust particles, soot, or the like
(6) A place free of being affected by electric noises
(7) A place free of a strong magnetic field

2. Mounting Method

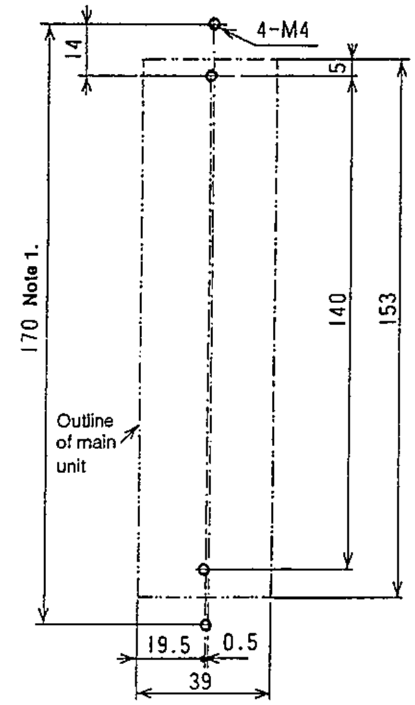
The following three mounting methods are available.

2-1 Wall-mount
2-2 DIN rail-mount
2-3 Rack-mount
  11ch rack QN716A101 (with a communication connector)
  5ch rack QN717A101
  Blind plate for rack 81403291-001

When the instrument is provided with a communication function, it is mounted by using the 11ch rack.
The communication function is connected by the connector inside the rack.

2-1 Wall mounting

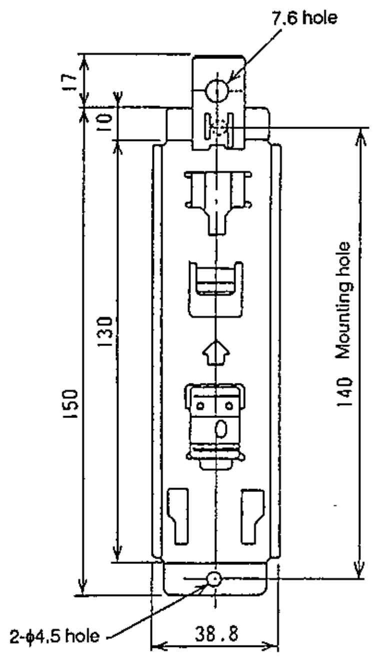
(1) Wall mounting pitch dimension drawing



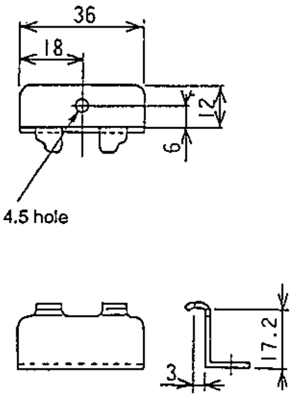
Note 1: When the instrument is mounted where there is no vibration, the two outer holes (170 pitch) are not required.

Reference (accessories)

Mounting fixture

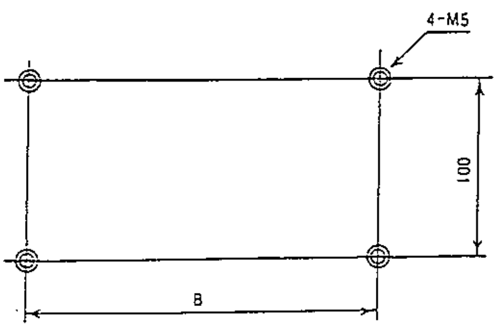


Vibration-absorbing bracket



Material: Cold rolled steel plate SPCC t1.6, Galvanized, Black chromate processing

(2) Rack mounting pitch dimension drawing



Model No.	B
QN717A101 (5 CH)	225.4
QN716A101 (11CH)	459.4

(2) Wall mounting method

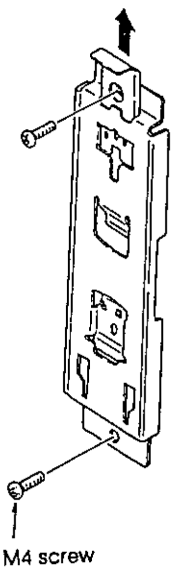
① Mount the mounting fixture on the wall, using the two upper and lower holes. Pitch 140mm.

② Lift the click of the mounting fixture, and insert the main unit into the mounting fixture.

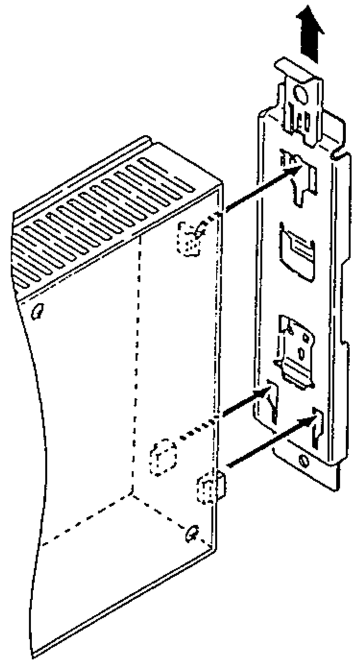
③ Push down the main unit completely.

④ Lower the click of the mounting fixture, and fix it.

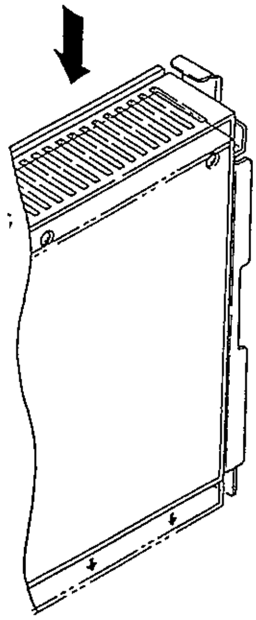
①



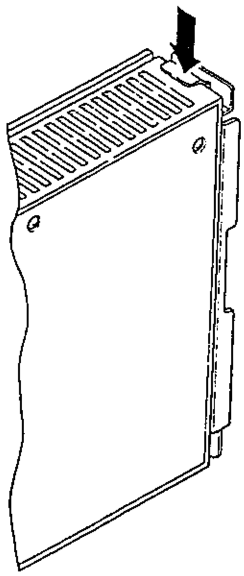
②



③



④



— When the vibration-absorbing bracket is to be mounted, steps ⑤ and ⑥ are added. —

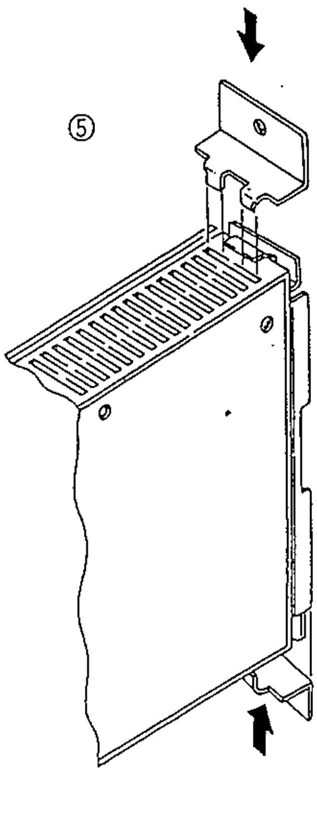
The mounting fixture and the vibration-absorbing brackets are accessories.

⑤ After fixing the instrument with the mounting fixture, insert the clicks of the vibration-absorbing brackets deep into the ventilating slit. 2 pcs.

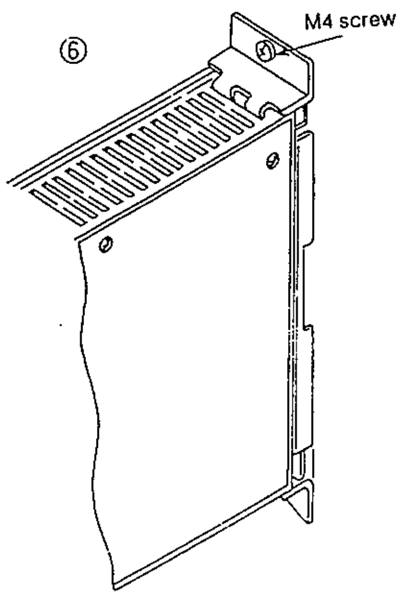
⑥ Fix the vibration-absorbing brackets with two M4 screws.

Note 1:
To remove the main unit from the mounting fixture. lift the click of the mounting fixture with a conventional type screwdriver.

⑤



⑥



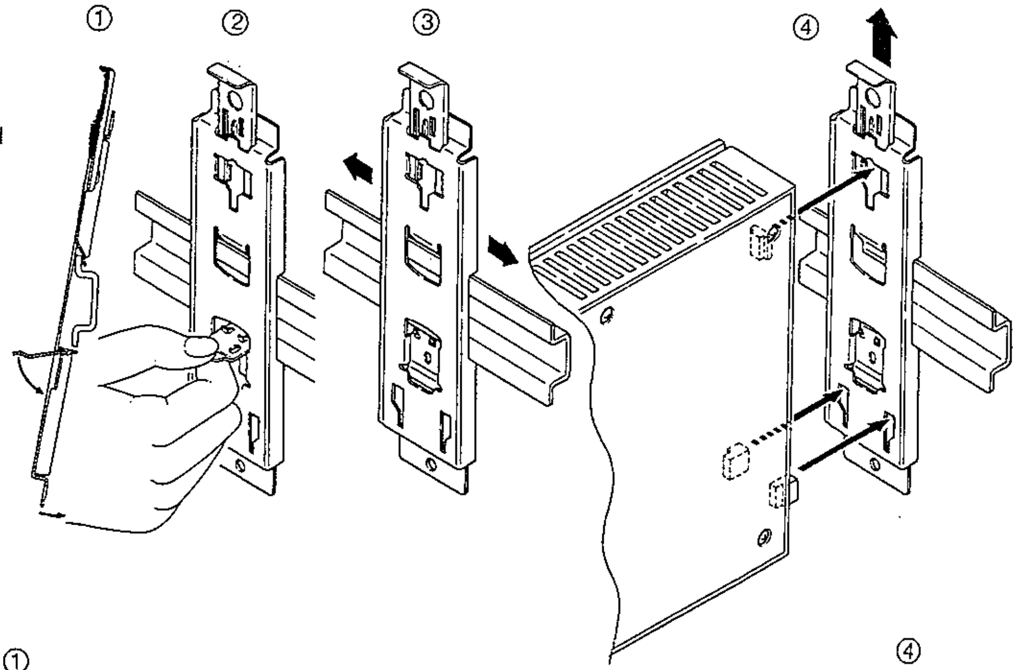
2-2 DIN rail mounting

①,② Mount the mounting bracket to the DIN rail as shown in the figure.

③ Fix the mounting bracket to a specified position.

④ Lift the mounting bracket claw upward, and insert the instrument into the mounting bracket.

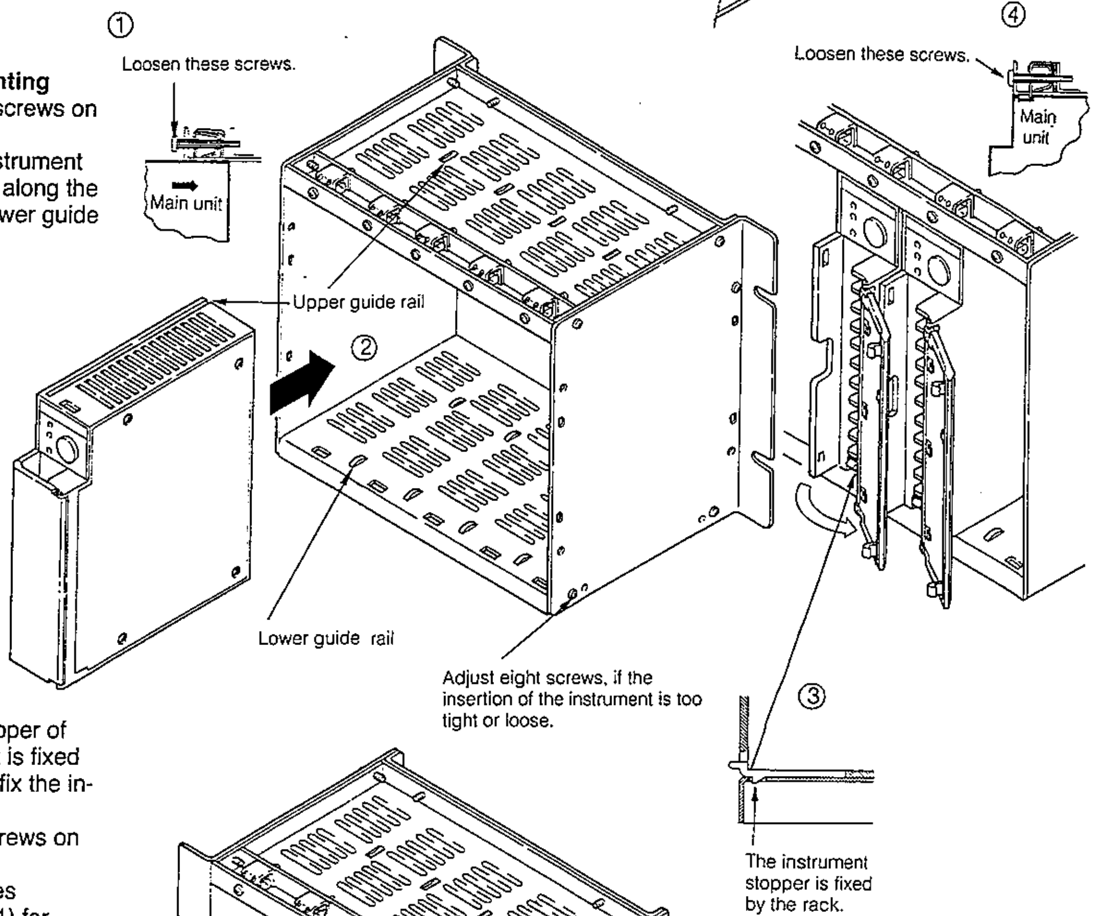
⑤,⑥ Observe the same procedure as described in ③ and ④ in the wall-mounting method.



2-3 Rack mounting

① Loosen the screws on the rack.

② Insert the instrument into the rack along the upper and lower guide rails.

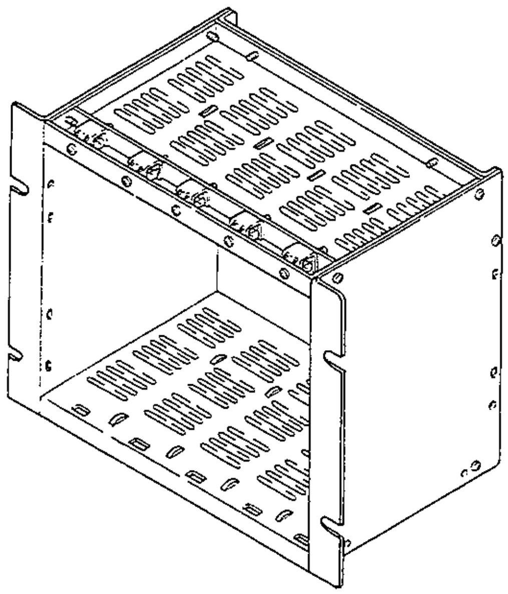


③ The lower stopper of the instrument is fixed by the rack to fix the instrument.

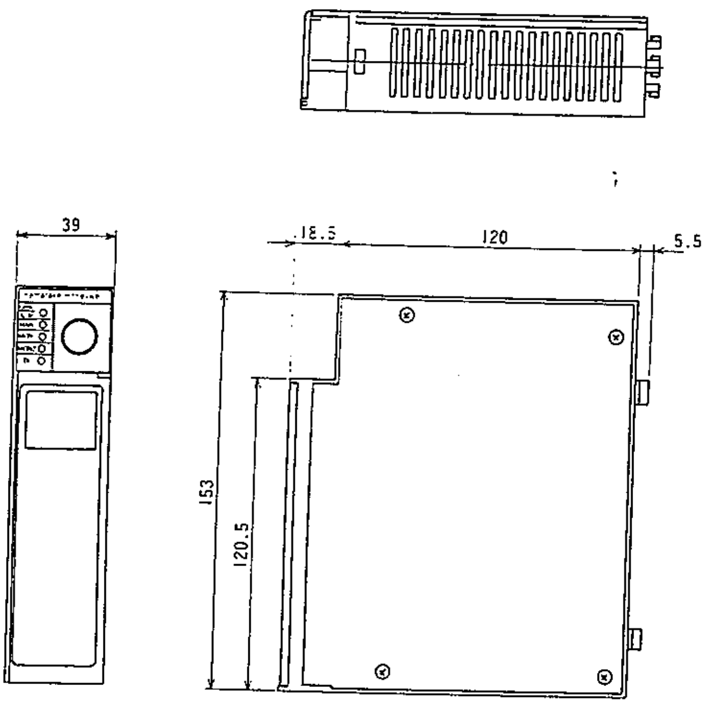
④ Tighten the screws on the rack.

⑤ Use blind plates (81403291-001) for rack into an empty space of the rack.

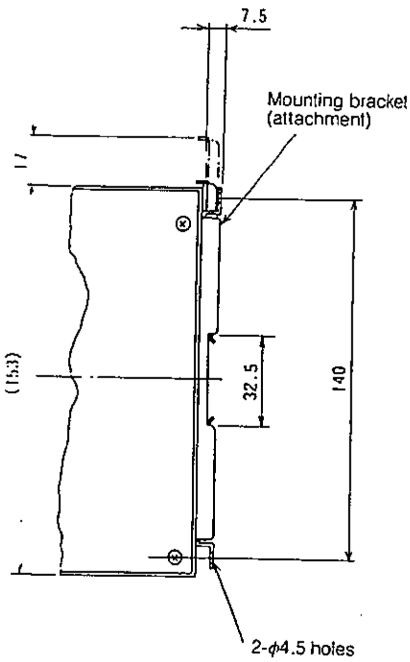
⑥ Two kinds of racks are selectively assembled according to the assembly methods of the side plates as shown in the right figure.



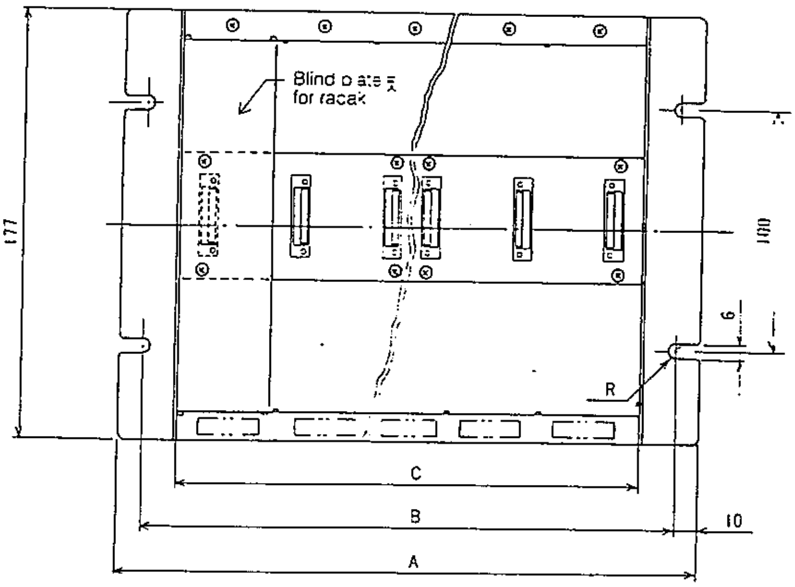
External Dimensions of Instrument

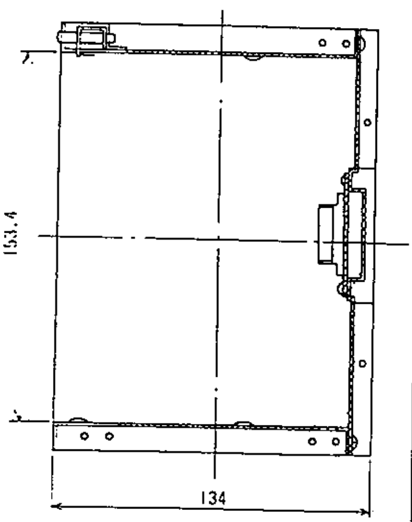


External Dimensions of Mounting Bracket



External Dimensions of Rack





QN717A101(5ch)	245.4	225.4	195.4
QN716A101(11ch)	479.4	459.4	429.4
Model	A	B	C

Caution

(1) For input/output cables of instrument, use shielded cables to prevent noises as required.

1. Cautions on wiring

(1) Digital units are apt to be affected by electrical noises. Electrical noises that may be left out of consideration for analog units sometimes cause a trouble or the malfunction of digital units.
Connect cables with due care according to the instructions in this chapter for the purpose of preventing the instrument from being affected by noises.

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

(3) Connect cables according to the connection diagram of the corresponding model number after confirming the model number of your instrument.
After connections, make sure that cables have been connected securely without fail.

(4) Separate input/output signal cables more than 30 cm from a drive power cable and a power cable of higher than 100 V. Don't pass them through the same conduit or duct.

2. Input/output signals

2-1 Thermocouple input signal cable

(1) For thermocouple inputs, connect the thermocouple cable to the terminals. Extend the thermocouple cable by using a compensating lead wire, if the wiring distance is long or if sensors are connected to the terminals.
Use a shielded compensating lead wire as much as possible.

2-2 Remote contact signal input contact

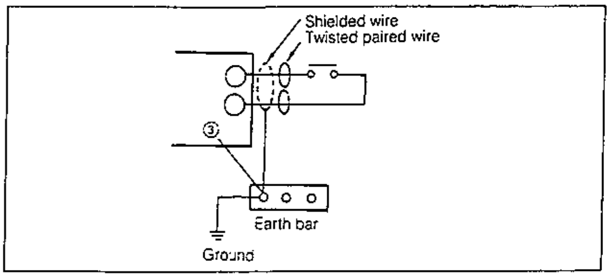
(1) use no-voltage signals as remote contact signal inputs.

(2) Hold on-off contact signals for longer than 100 msec.

3. Grounding

(1) Connect the instrument to the G terminal as one-point grounding. Don't perform any jumpering connection. Mount the G terminal on a separate grounding terminal board (earth bar) provided as shown in the following figure, and connect it to ground by using a shielded wire or the like.

- Kind of grounding: Category 3 grounding at least (Lower than 100Ω)
- Grounding wire: A soft copper wire of more than 2 mm^2 (AWG14)
- Grounding wire length: Max. 20 m



Grounding method

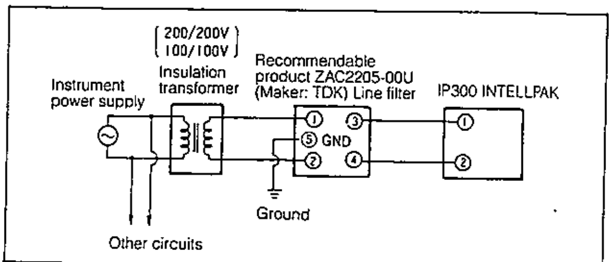
4. Instrument power supply

(1) Obtain the instrument power supply from a single-phase instrument power source.
Take a noise preventive measure into due consideration so that the instrument is not affected by noises as much as possible.

Table 12 Compensating lead wire specifications

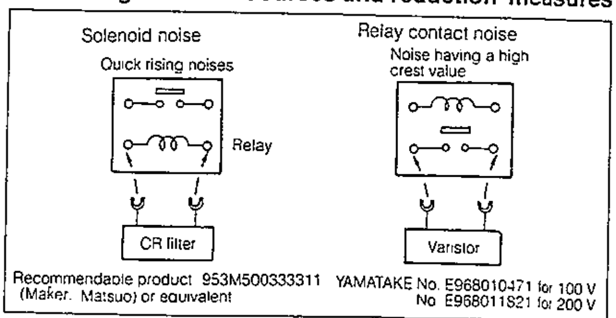
	Old symbol (reference)	Symbol	Divisions of uses and divisions by tolerances	Working ambient (°C) temperature	Color identification of sheathed wires
JIS C1610−1981					
B	—	BX−G	General normal class	0~100	Gray
R	—	RX−G SX−G	General normal class	0~150	Black
S		RX−H SX−H	Heat-resisting normal class		
K	CA	KX−G	General normal class	−20~150	Blue
		KX−GS	General precision class		
		KX−H	Heat-resisting precision class		
		KX−HS	Heat-resisting precision class		
		WX−G	General normal class		
		WX−H	Heat-resisting normal class		
		VX−G	General normal class	−20~100	
E	CRC	EX−G	General normal class	−20~150	Purple
		FX−H	Heat-resisting normal class		
J	IC	JX−G	General normal class		Yellow
		JX−H	Heat-resisting normal class		
T	CC	TX−G	General normal class		Brown
		TX−GS	General precision class		
		TX−H	Heat-resisting normal class		
		TX−HS	Heat-resisting precision class		
Wires other than specified in JIS.					
PR-40-20	No exclusive compensating lead wire is available. Copper wire is used as a substitute.				
WRe0-26	The exclusive compensating lead wire is used.				
WRe0-26	The exclusive compensating lead wire is used.				
Ni-Ni-Mo	—				

(2) It is recommended to add an insulation transformer and use a line filter, if noises are introduced much from the power source.
Don't bundle the primary and secondary of power cable together, or don't pass them through the same conduit or duct after taking the above noise preventive measure.



Power noise reduction measure

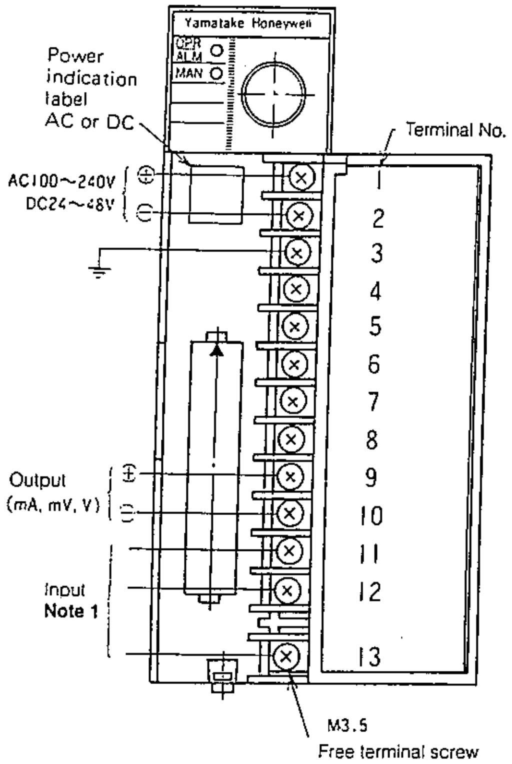
5. Noise generation sources and reduction measures



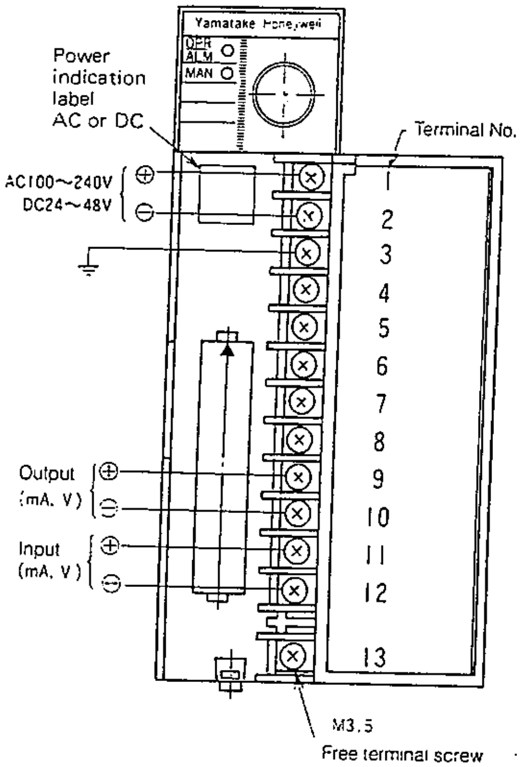
Noise reduction methods

9. EXTERNAL TERMINAL CONNECTION DIAGRAM

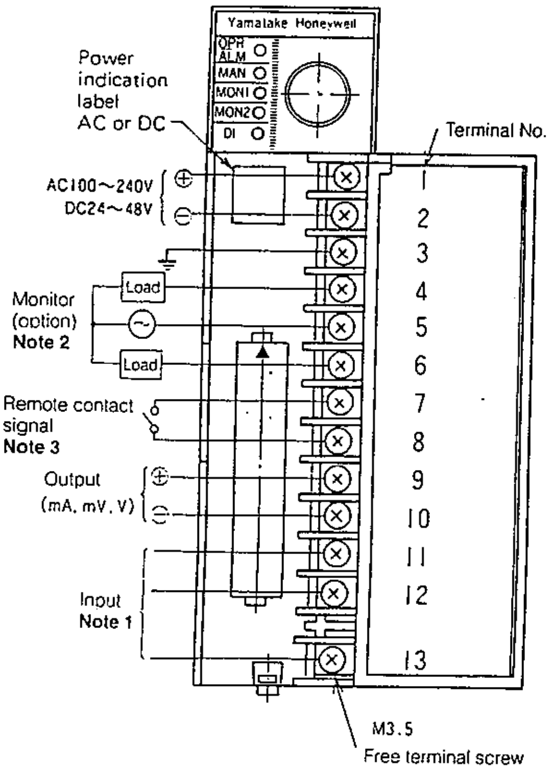
IP300 (Millivolt converter)



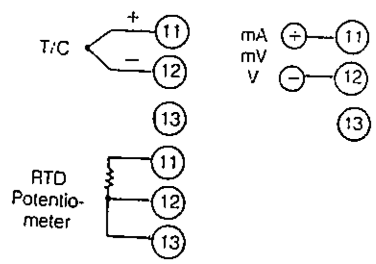
IP302 (Isolator)



IP301 (High-function type millivolt converter)



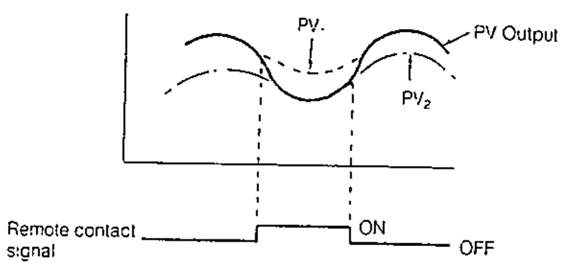
Note 1. Input



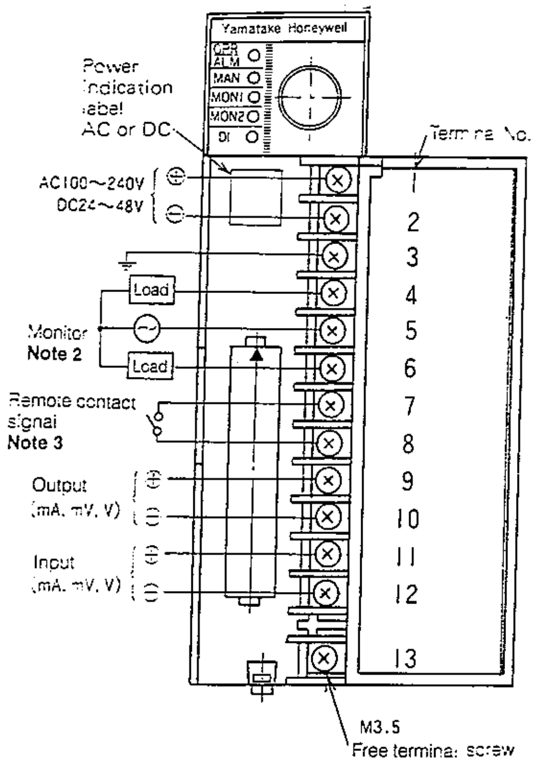
Note 2. Monitor contact capacity
250 V AC 30 V DC 0.5 A (resistive load)

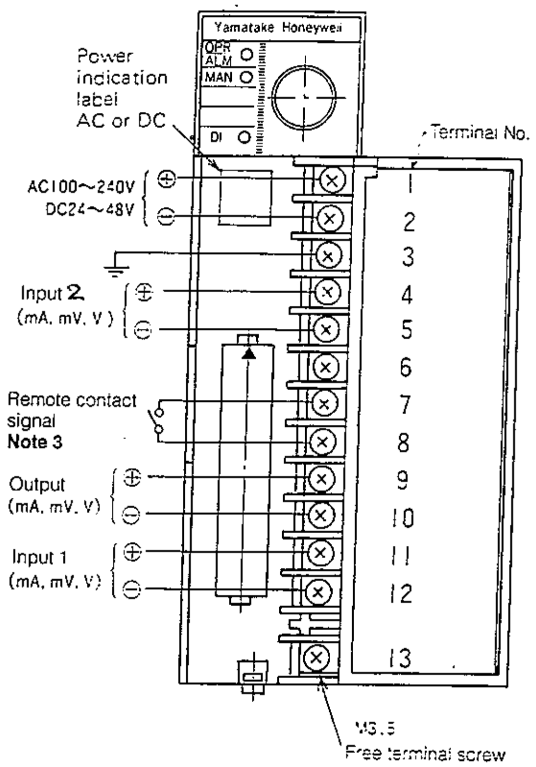
Note 3. Remote contact signal
Remote contact signal is used for starting calculation operation with an ON signal, or for stopping calculation operations

Example Soft switch selector (SSS)



IP313 (Calculation unit) IP314 (Composite calculation unit)	IP326 (2-input calculation unit)





Items to be checked before connecting external terminals

- **For changing the kinds of input/output** (input/output codes), reset the dip switches as shown below before connecting external terminals. (Input codes are set as specified in model numbers at the delivery time.)
- the dip switch cover can easily be opened by inserting a screwdriver from the side marked with (▲).
- For input code 6 (0~1000 mV) and input code 5 (1000~5000 mV). Don't set SW200 to the V column, but set it to the mV column.
- Mount the dip switch cover without fail after setting. Be careful not to allow the cover tip to touch the dip switch lever when mounting the cover.

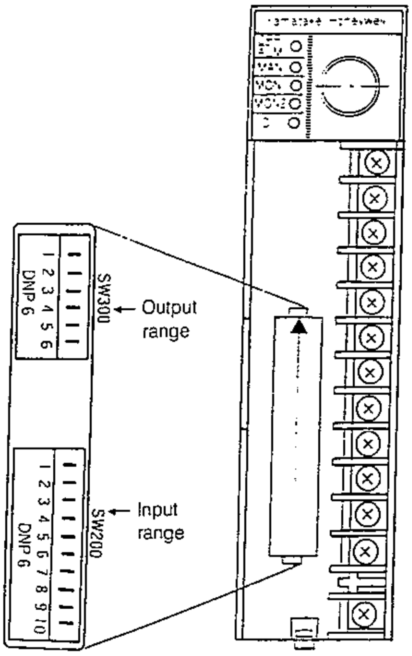
Model number IP301·313·314

SW300 output range

Dip SW	mA	mV	V
[illegible]	OFF	ON	ON
2	ON	OFF	OFF
3	OFF	ON	OFF
4	OFF	OFF	ON
5	ON	OFF	OFF
6	OFF	ON	ON

SW200 input range

Dip SW	mA	mV T/C	V	RTD [illegible]
1	ON	OFF	OFF	OFF
2	OFF	OFF	ON	OFF
3	OFF	ON	OFF	ON
4	ON	OFF	OFF	OFF
5	OFF	OFF	ON	OFF
6	OFF	OFF	OFF	ON
7	ON	ON	ON	ON
8	OFF	OFF	OFF	ON
9	OFF	(OFF)	OFF	OFF
10	ON	ON	ON	OFF



- To set the burnout down scale by T/C, change over the DIP SW9 of SW200 from (OFF) to ON.

Model number IP326

SW300 output range

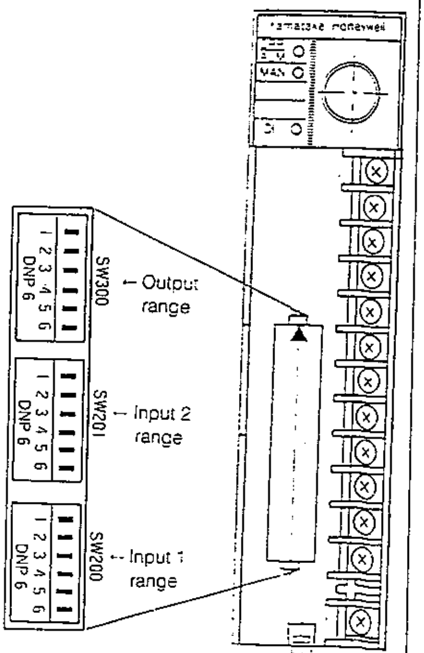
Dip SW	mA	mV	V
1	OFF	ON	ON
2	ON	OFF	OFF
3	OFF	ON	OFF
4	OFF	OFF	ON
5	ON	OFF	OFF
6	OFF	ON	ON

SW201 input 2

Dip SW	mA	mV	[illegible]	−10~10V
1	OFF	OFF	OFF	ON
2	OFF	OFF	ON	ON
3	ON	OFF	OFF	OFF
4	OFF	ON	OFF	OFF
5	OFF	OFF	ON	ON
6	ON	OFF	OFF	OFF

SW200 input 1

Dip SW	mA	mV	[illegible]	−10~10V
1	OFF	OFF	OFF	ON
2	OFF	OFF	ON	ON
3	ON	OFF	OFF	OFF
4	OFF	ON	OFF	OFF
5	OFF	OFF	ON	ON
6	ON	OFF	OFF	OFF



10. CAUTIONS ON USE

Cautions

1. If two or more racks are stacked, keep a space of more than 100 mm between the upper and lower racks, and mount a fan for forced ventilation.
2. Use an integral type A/D converter for A/D conversion of the instrument outputs. Check the functions by combined tests in advance, if a sequential comparison type high-speed A/D converter is used.
3. Take the starting current of the instrument power supply into account (in case of DC power supply.)
4. Be careful not to allow the cover tip to touch the dip switch lever when mounting the dip switch cover.
5. Use a minus screwdriver for lifting the mounting bracket lever when detaching the instrument from the mounting bracket.
6. The loader voltage output and resistance value output are of a handy structure type. Don't use the loader in an unfavorable environment subjected to sulfide gas, dust particles, etc.
7. The liquid crystal display (LCD) of the loader has no back light. Don't use the loader in a dark place.
8. Don't perform copy operation of the handy loader during regular operation, otherwise monitor relays may chatter.
9. Be careful since the input/output range type, etc. are not copied by the handy loader copy operation.
10. Don't mount the handy loader on a noisy desk or iron plate, otherwise it may be affected by noises.

ORDERING INFORMATION

Specify —

1. Model Number
2. Specifications
3. Accessories

Order Form —

1. Your usual source, or
2. Yamatake-Honeywell Co., Ltd.
   Totate International Building,
   2-12-19, Shibuya, Shibuya-ku,
   Tokyo, 150 Japan