YAMATAKE **Specification**

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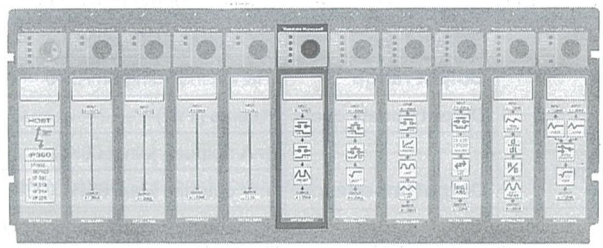
IntellpaK

High Function Millivolt Converter IP 301

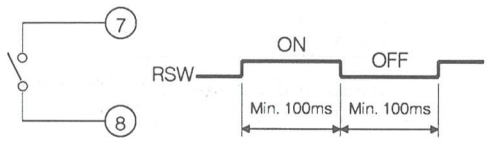
The IntellpaK IP301 is microprocessor-based a high-function millivolt converter.
This unit receives a thermocouple signal, resistance thermometer bulb signal, DC current signal, DC voltage signal, or potentiometer signal as an input signal, and outputs the converted DC current signal or DC voltage signal.
Various calculation functions are set by connecting the Handy Loader QN715A.

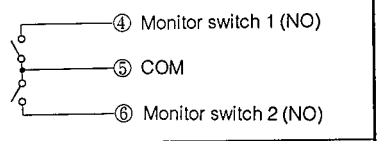


Features

- The response time of 300ms, with accuracy as high as ±0.15%FS.
- Both input and output ranges permit execution of scaling in the multi-range system.
- The monitor switch output and communication function, and other options etc. are available. With the monitor switch output, up to three different calculation types can be set.
- The input and output are isolated from each other.
- Remote switch input and self diagnosis can be provided as standard features.

Specifications

Input	**Input type**	Thermocouple, resistance thermometer bulb, DC current, potentiometer (resistor) See Table 1 (page 4).			
	Input sampling cycle	100ms (TYP)			
	Input digital filter	First-order lag filter system: 0.0 to 99.9sec variable (filter off at 0.0).			
	Input bias current	Thermocouple, mV input: -0.15 to +0.15μA			
		Resistance thermometer bulb input: 0.9 ±0.2mA			
	Input impedance	mA input: Max. 30Ω			
		Voltage input (V): 50KΩ min.			
	Allowable wiring resistance	Thermocouple, mV input: Max. 250Ω			
		General resistance thermometer bulb input: Max. 10Ω in each line			
		Resistance thermometer bulb input (for Zener barrier) : Max. 80Ω (each line, including Zener barrier)			
	Intrinsic safety explosion-proof	Zener barrier provided: Applicable only to platinum resistance thermometer bulb input and potentiometer input.			Additional processing
		Model No. of Zener barrier: 8907/12-02/120 (for 1 wire), 8907/22-02/120 (for 2 wires). See Catalog No. SS2-3260-8900.			
	Burnout	Thermocouple input: Up-scale (at delivery time) (Scale-down can be done by DIP switches after delivery.)			
	Isolation	The input and output sections are isolated from each other.			
	Remote switch input (RSW)	**Function**	Signal source for various calculations requiring DI. The operation object is specified by the Handy Loader QN715A101.		
		Input mode	With contact provided, or no voltage semiconductor contact.		
		Input time	The same state of ON or OFF is required to be held for a minimum of 100ms.		
		Input contact capacity	20V DC, 10mA min.		
		Isolation	Not isolated between the remote switch input and output.		

<table>
<tr><td rowspan="11">Calculation section</td><td rowspan="2">Type of setting</td><td colspan="3">With no monitor switch: One type can be selected from group A.</td></tr>
<tr><td colspan="3">With monitor switch output provided: One type can be selected from group A, and two types from group M.</td></tr>
<tr><td>Setting range</td><td colspan="3">See Table 4 (page 5 to 6).</td></tr>
<tr><td>Setting sequence</td><td colspan="3">Group M is set first, and then group A is set (necessary condition).</td></tr>
<tr><td rowspan="8">Calculation types</td><td>Group A</td><td colspan="2">Group M</td></tr>
<tr><td>No operation</td><td>Low monitor</td><td>Keeping monitor (low)</td></tr>
<tr><td>Reverse</td><td>High monitor</td><td>Keeping monitor (high)</td></tr>
<tr><td>Analog memory</td><td>Deviation monitor</td><td>Keeping monitor (deviation)</td></tr>
<tr><td>Preset</td><td>Arrival monitor</td><td>Keeping monitor (arrival)</td></tr>
<tr><td>—</td><td>Timer monitor (low)</td><td>Change rate monitor</td></tr>
<tr><td>—</td><td>Timer monitor (high)</td><td>—</td></tr>
<tr><td colspan="3">Note (1) Since the group M monitor has no external contact output, DO must be connected to the DI of the other group's internal calculation.</td></tr>
<tr><td rowspan="5">Output</td><td>Output type</td><td colspan="3">DC current, DC voltage See Table 2 (page 4).</td></tr>
<tr><td>Output range</td><td colspan="3">Range including 0mA: 0 ~ 110%FS Range not including 0mA: –10 ~ 100%FS</td></tr>
<tr><td>Output update cycle</td><td colspan="3">100ms (TYP)</td></tr>
<tr><td rowspan="3">Output impedance</td><td colspan="3">mA output: Min. 500KΩ</td></tr>
<tr><td colspan="3">mV output: Max. 60Ω</td></tr>
<tr><td colspan="3">Voltage output (V): Max. 10Ω</td></tr>
<tr><td rowspan="4">Self diagnosis</td><td>Load resistance</td><td colspan="3">Max. 600Ω in 20mA range</td></tr>
<tr><td>Manual output</td><td colspan="3">The output value (–10.0 ~ 10.0%) can be set irrespective of input by the Handy Loader QN715A101.</td></tr>
<tr><td>Input underrange check</td><td colspan="3">When the PV input is less than –10% of the range, this is regarded as alarm, and calculation is performed with the PV input as –10%.</td></tr>
<tr><td>Input overrange check</td><td colspan="3">When the PV input is less than 110% of the range, this is regarded as an alarm, and calculation is performed with the PV input as 110%.</td></tr>
<tr><td rowspan="6">Optional functions</td><td>EEPROM adjustment area sum check</td><td colspan="3">The EEPROM adjustment area is sum-checked only when the power supply is turned ON.</td></tr>
<tr><td>EEPROM user area sum check</td><td colspan="3">The EEPROM user area is sum-checked during usual operation. The time required for error detection is within 13 sec.</td></tr>
<tr><td>Error indication</td><td colspan="3">OPR/ALM LED blinks at 0.5 sec intervals when an error is detected.</td></tr>
<tr><td>Error type</td><td colspan="3">Readable by the Handy Loader QN715A101.</td></tr>
<tr><td rowspan="4">Monitor switch output</td><td>Output mode</td><td>'a' contact</td><td rowspan="4"> 
</td></tr>
<tr><td>No. of output contacts</td><td>2 contacts</td></tr>
<tr><td>Output contact capacity</td><td>250V AC, 30V DC, 0.5A, resistive load</td></tr>
<tr><td>Output contact life</td><td>100,000 times, resistive load</td></tr>
<tr><td>Communication</td><td colspan="3">Connected to the mother board within the communication system 11ch rack (QN716A101) where the communication module (IP390A) is mounted.</td></tr>
<tr><td colspan="4">For details, see Catalog No. CP-SS-1411E.</td></tr>
<tr><td rowspan="8">General specifi-cations</td><td>Accuracy</td><td colspan="3">±0.15%FS See Table 1 (page 4).</td></tr>
<tr><td>Input / output response</td><td colspan="3">300ms (TYP). 95% response to step input.</td></tr>
<tr><td>Power supply type</td><td>AC</td><td colspan="2">DC</td></tr>
<tr><td>Rated power voltage</td><td>100 ~ 240V AC, 50/60Hz</td><td colspan="2">24 ~ 48V DC</td></tr>
<tr><td>Power voltage</td><td>90 ~ 264V AC, 50/60Hz</td><td colspan="2">20 ~ 56V DC</td></tr>
<tr><td>Power consumption</td><td>Max. 12VA</td><td colspan="2">Max. 12VA</td></tr>
<tr><td>Starting current</td><td>—</td><td colspan="2">Max. 0.5A</td></tr>
<tr><td>Peak power current value and width when turning on power supply</td><td>20A, 2ms</td><td colspan="2">20A, 0.2ms</td></tr>
<tr><td>Insulation resistance</td><td colspan="3">Min. 50MΩ between each terminal and case, and between primary and secondary terminals by using a 500V DC megger</td></tr>
</table>

General specifications	**Dielectric strength**	1500V AC, 1 min or 1800V AC, 1 sec between primary terminal and case, and between primary and secondary terminals.	
		500V AC, 1 min or 600V AC, 1 sec between secondary terminal and case	
		1000V AC, 1 min or 1200V AC, 1 sec between input and output	
	Temperature characteristics	Standard range: ±0.18%FS, ±57μV or ±33μV, whichever is larger (by an input conversion value per ambient temperature 10°C).	
		Intermediate range: Value of standard range x 1.2, ±57μV or ±33μV, whichever is larger (by an input conversion value per ambient temperature 10°C).	
	Allowable ambient temperature	0 to 50°C	
	Storage temperature	–20 to +70°C	
	Allowable ambient humidity	Max. 90%RH at 40°C Non-dewing	
	Vibration resistance	Max. 0.5G, 10 to 60Hz, XYZ directions, 2 hours each	Excluding DIN rail mounted type.
	Impact resistance	Max. 50G, three times in vertical direction	
	Case material	Polycarbonate	
	Color of case	Gray, Munsell 2.5PB3.5/1	
	Wiring terminal screw	M3.5	
	No. of times Handy Loader jack can be connected / disconnected	Max. 1000 times (with the Handy Loader curl cord combined)	
	Mounting	Rack mount	
		Wall mount: Vibration-absorbing bracket (Part No. 81404080-001) is used where the wall is subject to vibration.	
		DIN rail mount: Can not be applied in locations Subject to vibration or impact.	
	Weight	Approx. 0.6kg	

Attachments

Name of Article	Part No.	Q'ty
Mounting brackets	81403255-101	1 set
Vibration-absorbing bracket	81404080-001	1 set
Various labels	N-3217	1 set
Test data	—	1 copy
Instruction manual	—	1 copy
—	—	—
—	—	—
—	—	
—	—	

Options

Name of Article	Model	Weight (approximately)
5ch rack (non-communicaiton system)	QN717A101	2.6kg
11ch rack (communication system)	QN716A101	1.6kg
Blind cover for rack	81403291-001	10kg
Zener barrier (for 1 wire)	8907/12-02/120	320g
Zener barrier (for 2 wires)	8907/22-02/120	320g
Handy Loader	QN715A101	400kg
Handy Loader case	81403304-001	74g
Curled cord for Handy Loader	81403280-001	210g
* With connecting curled cord, output cable and leather case provided.		

Model Configuration Table

I	II	III	IV	V	VI	VII

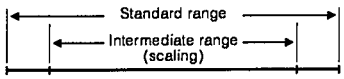
EX. Standard range (K, –50 to 1350°C); IP301KC5A0000
Standard range (K, 100 to 350°C); IP301KC5A000012S1

I Basic model	II Standard range input	III Output range	IV Power voltage	V Optional function	VI Additional processing	VII Specified range input	Contents
IP300A							High function millivolt converter
Selected from Table 2. ▶							~
	Selected from Table 2. ▶						~
			A				90 ~ 264V AC, 50/60Hz
			D				20 ~ 56V DC
				00			None
				01			Monitor switch output
				02			Communication
				03			Monitor switch output, and communication
					00		None
					T0		Torrid zone processing
					E0		Intrinsic safety explosion proof (with Zener barrier)
					G0		Torrid zone processing and intrinsic safety explosion proof (with Zener barrier)
						Selected from Table 3. ▶	~ (Entry is not necessary for the standard range input. Keep this column blank.)

Table 1. Input Range

Range / Input type	Code: Range	Code: Unit, characteristic	Symbol	Standard range: °C range	Standard range: °F range	Accuracy: Standard range	Accuracy: Intermediate range (maximum error value)
Thermo-couple	K		K	-50 – 1350	-50 – 2450	±0.15%FS	± 84μV
	E		E	-200 – 800	-300 – 1450	±0.15%FS	±105μV
	J		J	-50 – 1050	-50 – 1900	±0.15%FS	± 96μV
	T		T	-200 – 400	-300 – 750	±0.15%FS	± 41μV
	B		B	0 – 1820	0 – 3300	±0.15%FS	± 21μV
	R		R	0 – 1760	0 – 3200	±0.15%FS	± 32μV
	S		S	0 – 1760	0 – 3200	±0.15%FS	± 29μV
	D		PR40–20	0 – 1900	0 – 3400	±0.3 %FS	± 15μV
	W		WRe5–26	0 – 2320	0 – 4200	±0.15%FS	± 57μV
	X		WRe0–26	0 – 2320	0 – 4200	±0.15%FS	± 59μV
	U		N (Nicrosil-Nisil)	0 – 1300	32 – 2350	±0.15%FS	± 72μV
	Y		PLII (Platinel II)	0 – 1300	32 – 2350	±0.15%FS	± 80μV
Resistance thermometer bulb	F		Pt100 (JIS-'89 Pt100 / IEC or equivalent)	-200 – 630	—	±0.15%FS	±470mΩ
				(0 – 400)	—	(±0.15%FS)	±230mΩ
	P		JPt100 (old JIS Pt100)	-200 – 630	—	±0.15%FS	±470mΩ
				(-50 – 100)	—	(±0.15%FS)	± 90mΩ
	H		IEC Pt100Ω	-200 – 630	-300 – 1150	±0.15%FS	±470mΩ
	Q		Pt50Ω (old JIS Pt50)	-200 – 630	—	±0.15%FS	±240mΩ
	N		Ni508Ω	-50 – 150	-50 – 300	±0.15%FS	±800mΩ
Current, voltage, resistance (linear)	Range		Indication setting unit (on Handy Loader)	Standard range (set at delivery)	Maximum range (can be set by user)	Maximum range	Intermediate range (maximum error value)
	C		mA	4 – 20mA	0 – 20mA	±0.15%FS	±0.030mA
	1		mA	10 – 50mA	0 – 50mA	±0.15%FS	±0.075mA
	2		mA	2 – 10mA	0 – 10mA	±0.15%FS	±0.015mA
	3		mA	0 – 1mA	0 – 1mA	±0.15%FS	±0.0015mA
	4		V	0 – 10V	0 – 20V	±0.15%FS	±0.03V
	5		mV	1 – 5V	0 – 5V	±0.15%FS	±7.5mV
	6		mV	0 – 1V	0 – 1V	±0.15%FS	±1.5mV
	7		V	-4 – 4V	-10 – 10V	±0.15%FS	±0.03V
	8		mV	0 – 100mV	0 – 100mV	±0.15%FS	±0.15mV
	M		mV	10 – 10mV	-10 – 10mV	±0.15%FS	±0.03mA
	9		Ω	0 – 2000Ω	0 – 2000Ω	±0.15%FS	±3Ω

Note (1) • In all cases, input conversion accuracy
• Reference conditions :
Ambient temperature 23.5 ±1°C
Power voltage 105 ±2V AC or 24 ±0.5V DC



Where,
standard range within 0 to 100°C : Not defined.
standard range within 100 to 300°C : ±1%FS
intermediate range within 33 to 431μV : ±140μV

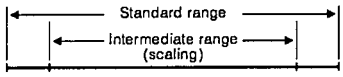
Where,
standard range within 0 to 500°C : ±1%FS
intermediate range within 0 to 363μV : ±75μV

Maximum error:
The maximum error value in an intermediate range is an error which occurs when the rekevant range is included nearest to the standard range.

Example 1:
When the intermediate range is -100 to 300°C, it is included within the standard range of -200 to 300°C. Therefore, the maximum error value is ±41μV.

The value in parenthesis is accuracy at scaling in this range.

Note (2) RTD range change at work site from F to P is impossible.



Maximum error value :
The maximum error value in an intermediate range (including the standard range) is an error which occurs when the relevant range is included within the nearest maximum range.

Example 1:
When the intermediate range is 4 to 24mA, it is included within the standard range of 0 to 50mA. Therefore, the maximum error value is ±0.075mA.

Example 2:
When the standard range is 4 to 20mA, it is included in the maximum range of 0 to 20mA. Therefore, the maximum error value is ±0.030mA.

C	°C, with linearize.	Applicable only to thermocouple, and resistance thermometer bulb inputs.
D	°C, linearize not provided.	
F	°F, with linearize.	Example: K thermocouple, standard range, °C, linearize provided → KC
G	°F, linearize not provided.	
0	Linear input of current, voltage, and resistance, etc.	Applicable only to linear input. Example: 4 – 20mA DC → CO

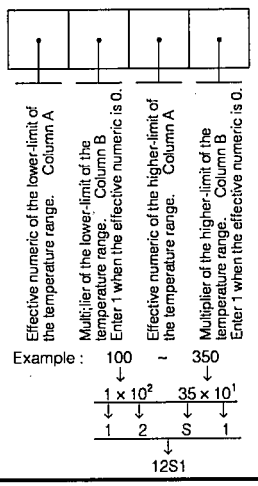
Table 2. Output Range

Code	Standard range (set at delivery)	Maximum range (can be set by user)
C	4 – 20mA	0 – 20mA
2	2 – 10mA	0 – 10mA
5	1 – 5V	0 – 5V
8	0 – 100mV	0 – 100mV
M	0 – 10mV	0 – 10mV

Accuracy by output scaling width

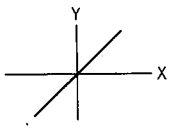
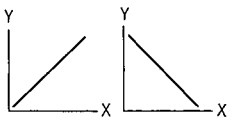
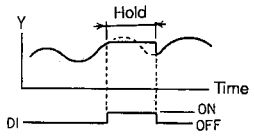
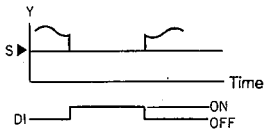
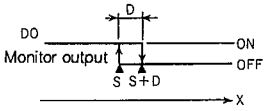
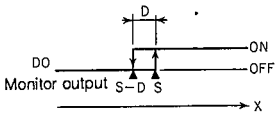
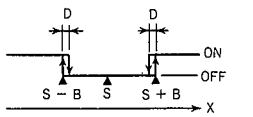
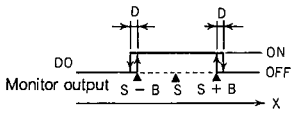
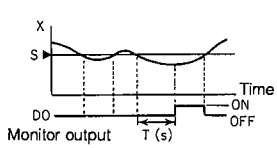
More than 80% : 0.15% FS (defined value)
Less than 80% – 50% : ±0.15% FS x 2
Less than 50% – 20% : ±0.15% FS x 4
0 – 0.5mA : ±0.15% FS x 2

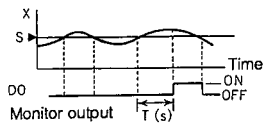
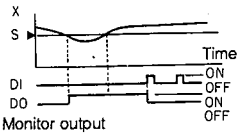
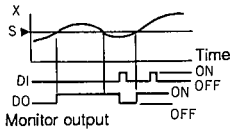
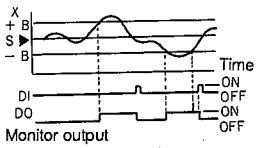
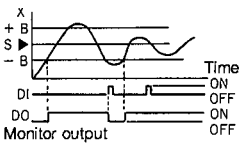
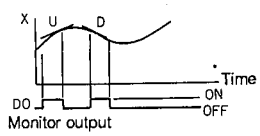
Table 3. Enter when specifying the Working Temperature Range (Scaling is limited to within the standard range.)



A						B	
Code	Effective numeric	Code	Effective numeric	Code	Effective numeric	Code	Multiplier
0	0	B	11	R	25	1	10^1
1	1	C	12	S	35	2	10^2
2	2	D	13	T	45	3	10^3
3	3	E	14	U	55	8	10^0
4	4	F	15	V	65	A	-1×10^1
5	5	G	16	W	75	B	-1×10^2
6	6	J	17	X	85	Y	-1×10^0
7	7	K	18	Y	95	—	—
8	8	L	19	—	—	—	—
9	9	M	21	—	—	—	—
—	—	N	22	—	—	—	—
—	—	P	23	—	—	—	—
—	—	Q	24	—	—	—	—

Table 4. Calculation

Group	Name and Function		Calculation contents (Remarks: X = Input signal, Y = Output signal, DI = Digital input, DO = Digital output)	Parameter setting range Figure in parentheses ( ) means an initial value
	Symbol	Abbreviation		
A	**No operation** • Input signal is used as an output signal as it is. • No calculation		 Y = X DI, DO: None	—
	NOP	NOP		
	Reverse • Input signal is reversed and it is used as an output signal.		 Y = 100 – X DI : Reversed when DI is OFF. DI : Not reversed when DI is ON. DO: None	—
	REV.	RVS		
	Analog memory • Output signal is held temporarily.		 Y = X (i) DI : Output is not held when DI is OFF. DI : Output is held when DI is ON. DO: None	—
	ANALOG MEMORY	ANM		
	Preset value • Preset value is output irrespective of the input signal.		 Y = S DI : Preset value is not output when DI is OFF. DI : Preset value is output when DI is ON. DO: None	Preset value S = -999.9 to 999.9 (0.0)
	PRESET	PRS		
M	**Low monitor** • ON when the input signal level is less than the monitor's set value. • Fail safe high-limit alarm		 DO: monitor output ON when X < S DO: monitor output OFF when X < S + D DI : None	Monitor S = -999.9 to 999.9% (0.0) Differential D = 0.1 to 200.0% (1.0)
	LOW	LMS		
	High monitor • ON when the input signal level is higher than the monitor's set value. • Fail-safe low-limit alarm		 DO: monitor otuput ON when S < X DO: monitor output OFF when S – D < X DI : None	Monitor S = -999.9 to 999.9% (100.0) Differential D = 0.1 to 200.0% (1.0)
	HIGH	HMS		
	Deviation monitor • Monitor output ON when the input signal level exceeds the bandwidth.		 DO: monitor output ON when X < S – B, S + B < X DO: monitor output OFF when S – B + 0.1% < X, X < S + B – 0.1% DI: None	Monitor S = –999.9 to 999.9% (0.0) Differential D = 0.1 (%) fixed Bandwidth B = 0.1 to 200.0% (1.0)
	DEV	DMS		
	Arrival monitor • Monitor output ON when the input signal level is within the bandwidth.		 DO: monitor output ON when the input signal level is within the bandwidth. DO: monitor output OFF when X < S – B + 0.1%, < X DI : None	Monitor S = –999.9 to 999.9% (0.0) Differential D = 0.1 (%) fixed Bandwidth B = 0.1 to 200.0% (1.0)
	DEV	AMS		
	Timer monitor (low) • The timer function is activated when the input signal level is lower than the monitor's set value.		 DO: monitor output ON when X < S is continued for T sec. DO: monitor output OFF when X > S (time count is cleared). DI : None	Monitor S = –999.9 to 999.9% (0.0) Differential D = 0.1 (%) fixed Bandwidth B = 0.1 to 200.0% (0)
	LOW	TLM		

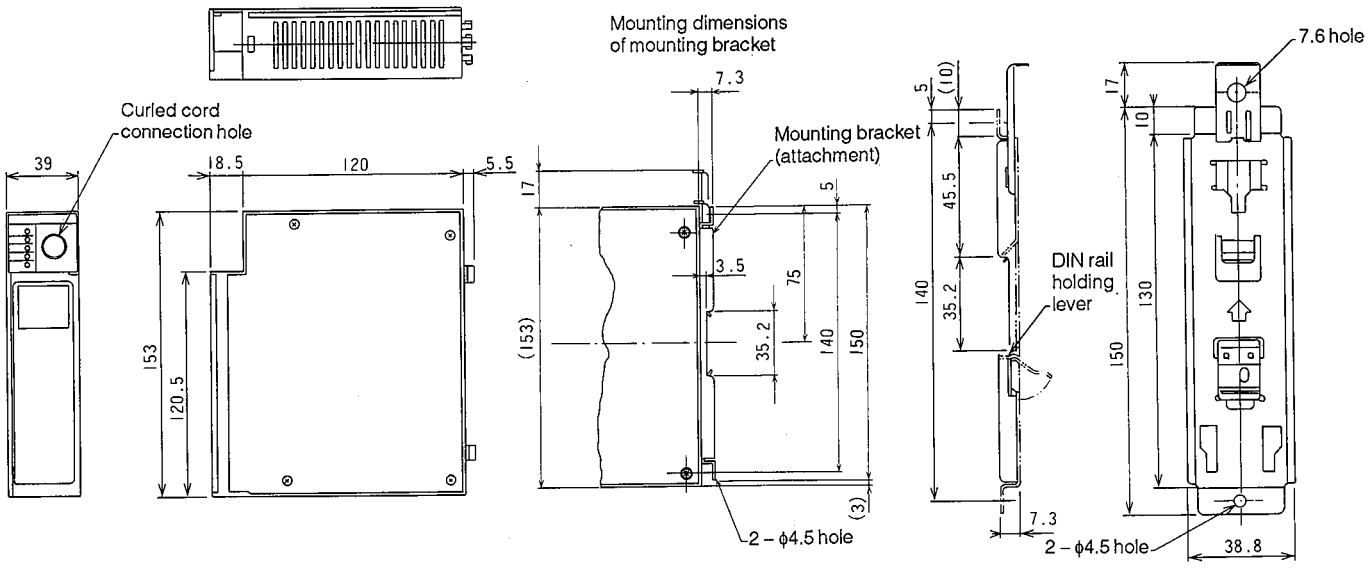
M	**Timer monitor (high)** • The timer function is activated when the input signal level is higher than the monitor's set value. HIGH **THM**		DO: monitor output ON when X > S is continued for T sec. DO: monitor output OFF when X < S (time count is cleared). DI: None	Monitor S = –999.9 to 999.9% (100.0) Time T = 0 to 5000s (0)
	Monitor sustain (low) • Monitor output ON when the input signal level is lower than the monitor's set value. Once the monitor output ON, it is continued until DI turns on. LOW **KLM**		DO: Monitor output ON when X < S. Once DO ON, it continueds even when S < X, unless DI turns on. DI : Monitor output OFF when DI ON.	Monitor S = –999.9 to 999.9% (0.0)
	Monitor sutain (high) • Monitor output ON when the input signal level is higher than the monitor's set value. Once the monitro output ON, it is continued until DI turns on. HIGH **KHM**		DO: Monitor output ON when X > S. Once DO is ON, it it continued until DI turns on. DI : Monitor output OFF when DI is ON.	Monitor S = –999.9 to 999.9% (100.0)
	Monitor sustain (deviation) • Monitor output ON when the input siganl level is out of the bandwidth. Once monitor otuput ON, it is continued until D turns on. DEV **KDM**		DO: Monitor output ON when X < S – B or S + B < X. Once DO ON, it continues even when S – B < X < S + B, unless DI turns on. DI : Monitor output OFF when DI is ON.	Monitor S = -999.9 to 999.9% (0.0) Bandwidth B = 0.1 to 200.0% (1.0)
	Monitor sustain (arrival) • Monitor output ON when the input signal level is within the bandwidth. Once monitor output is ON, it continues until DI tunrs on. DEV **KAM**		DO: Monitor output ON when S – B < X S + B. Once DO is ON, it continues even when X < S – B or S + B < X, unless DI turns on. DI : Monitor output OFF when DI on.	Monitor S = -999.9 to 999.9% (0.0) Bandwidth B = 0.1 to 200.0% (1.0)
	Monitor chagne rate • The input signal's change rate is monitored. • An error in the input signal source is detected. D.RATE **DRM**		DO: Monitor output ON when the change rate exceeds its higher-limit or lower-limit. (The higher-limit and lower-limit of the change rates are set in positive values.) DI : None	Higher-limit U = 0 to 999.9%/s (100.0) Lower-limit D = 0 to 999.9%/s (100.0)

External Dimensions

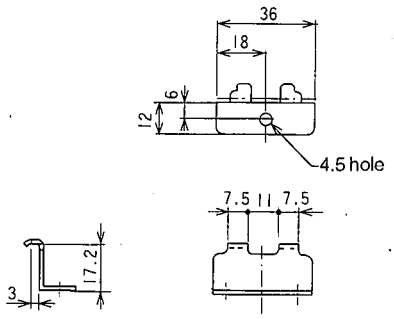
Unit : mm

External Dimensions of Instrument

Mounting bracket Part No. 81403255-101

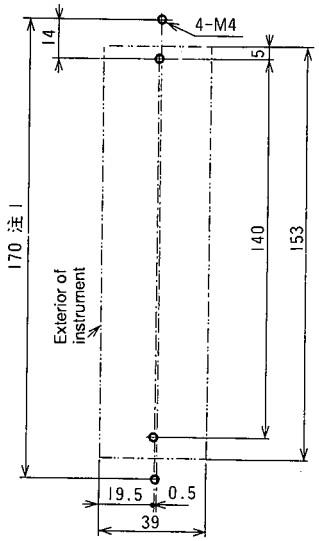


Vibration-absorbing bracket Part No. 81404080-001

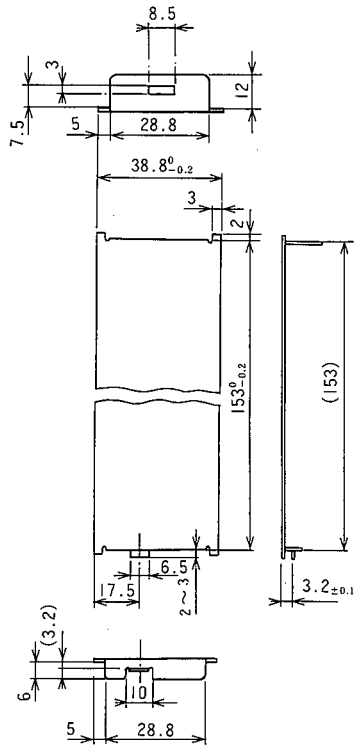


Material: Steel plate SPCC t1.6
Galvanized black
chromate processing

Mounting dimensions of vibration-absorbing bracket

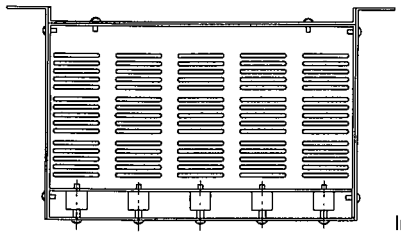


Blind cover for rack Part No. 81403291-001

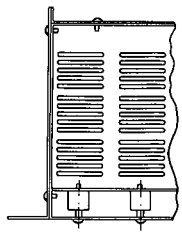


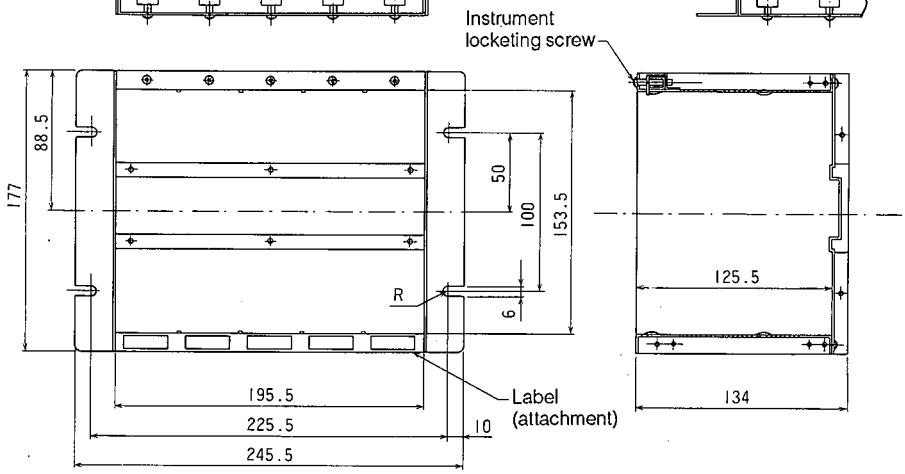
5ch rack (non-communication system) Model QN717A101

Wall mount



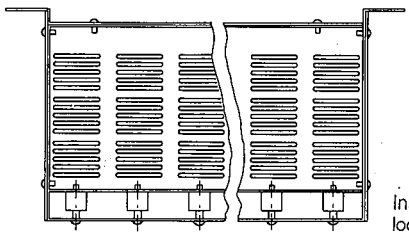
Panel mount



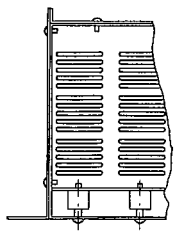


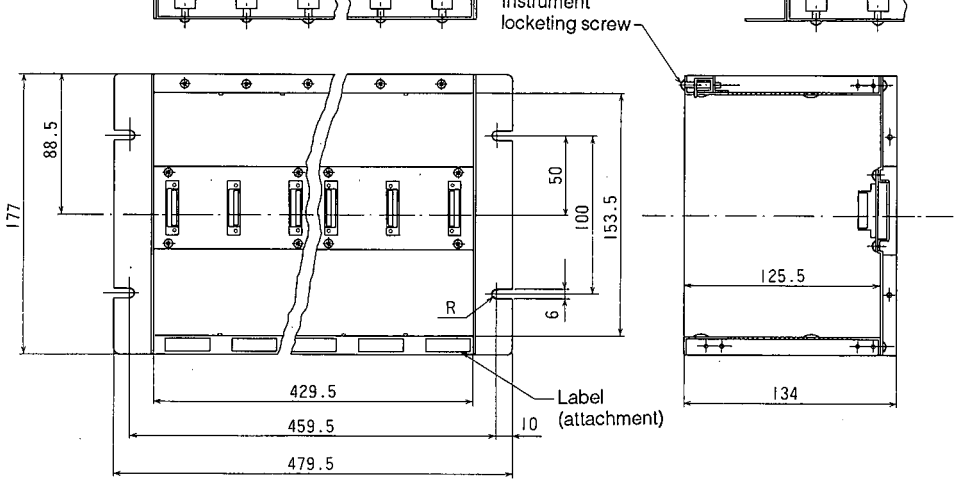
11ch rack (communication system) Model QN716A101

Wall mount



Panel mount

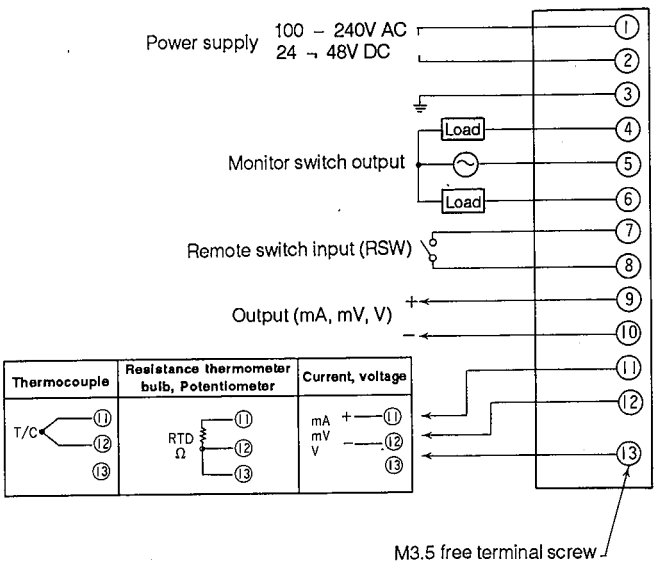




Caution: Rack mount

When two or more racks are stacked, keep a minimum space of 100mm between the upper and lower racks, and install a fan for forced ventilation.

External Terminal Connection Diagram



Cautions :

1. **Power supply**
   Take the starting current of the instrument power supply into account (with DC power supply).
2. **Combination with data input device, etc.**
   When the output of this instrument is applied to an A/D converter or analog scanner, etc.m a dispersion error may occur in the read data.
   To prevent this error, take any of the following measures.
   (1) For A/D conversion of the output of this instrument, use a low speed integral A/D converter.
   If a sequential comparison high-speed A/D converter is used, check the functions by combination tests in advance.
   (2) Insert an isolator with no switching power supply between this instrument and the A/D converter.
   (3) Perform mean processing via personal computer, etc. during data reading.

Specifications are subject to change without notice.

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