DB1000 SERIES

DIGITAL INDICATING CONTROLLER

PERFORMANCE SPECIFICATION CHINO

The DB1000 series is a 96×96mm digital indicating controller with the indicating accuracy of ±0.1% and the control cycle of approximately 0.1 seconds.
Various functions including universal input and multiple setting values (8 types) are provided as standard.

■ FEATURES

●Large easy-to-view 5-digit display

Process value (PV) and set value (SV) are displayed by large easy-to-view 5-digit display indicators. The resolution of 0.1°C is enabled for more than 1000°C.

●Highly-functional operation screen and settings screen

The controller inherits the operation screen and the settings screen adopting the LCD (liquid-crystal-display) which has been familiarized for long time. Furthermore, the screens have become high-definition and highly sophisticated.

●Outstanding controllability

Two types of PID algorithms, the position-type PID algorithm and the speed-type PID algorithm, have been installed. You can select the optimum PID algorithm for an object controlled.

●Operability inheriting previous models

The controller inherits the settings screen which has been familiarized for long time. You can set up it with operation which is not different from previous models. The performance of touching-keys has been improved and the outstanding operability has been realized.

●High-precision remote signal input and transmission signal output

The high-precision (0.1% of full scale) analog remote signal input and the analog transmission signal output can be added.

●24V power supply voltage type available

The power supply voltage 24V (AC/DC) type, which is advantageous in respect of safe, is available.

●Motor feedback value indication enabled in ON-OFF servo output type

[Operation screen of the ON-OFF servo output type]

Simultaneous indications of ON/OFF status of output, control output value (MV) and motor feedback value have been realized.

●Universal input

Various measurement ranges of DC voltage (up to maximum 10V) inputs, DC current input, thermocouple inputs and resistance thermometer inputs have been built-in.

●2 colors of casing available

You can select the color of casing from 2 colors of gray with OA equipment feeling and black with high-class feeling.

●Conforming to international safety standards and European directives (CE)

The controller is in conformity with European directives (CE), and is UL and c-UL approved.

●Conforming to RoHS

The controller is an environmental consideration product which does not contain directed hazardous substances such as lead, etc.

■ MODELS

DB1□□□B□□□–□□□

- Input signal
  - 0: Universal input
  - 4: 4-wire resistance thermometer
- Control mode (Output No. 1)
  - 1: ON-OFF pulse type PID
  - 2: ON-OFF servo type PID (Standard load specification)
  - 3: Current output type PID
  - 5: SSR drive pulse type PID
  - 6: Voltage output type PID
  - 8: ON-OFF servo type PID (Very light load specification)
- Control mode (Output No. 2) *
  - 0: None
  - 1: ON-OFF pulse type PID *1
  - 3: Current output type PID *1
  - 5: SSR drive pulse type PID *1
  - 6: Voltage output type PID *1
- Communications interface (1st zone) *
  - 0: None
  - R: RS232C
  - A: RS422A
  - S: RS485
  - B: Remote input for set value switching *2
- Transmission signal output (2nd zone) *
  - 0: None
  - 1: 4-20mA
  - 2: 0-1V
  - 3: 0-10V
  - 4: Other
  - B: External set value switching *2
- Remote signal input (3rd zone) *
  - 0: None
  - 5: 4-20mA
  - 6: 0-1V
  - 7: 0-10V
  - 8: Other
  - B: External set value switching *2
- Case color
  - G: Gray
  - B: Black*
- Panel sealing and terminal cover *
  - 0: None
  - 1: Terminal cover
  - 2: IP54 panel sealing
  - 3: IP54 panel sealing + Terminal cover
- Power supply voltage
  - A: 100 to 240V (AC)
  - D: 24VAC / 24VDC

* Option

*1 The control mode (Output No.1) can be selected from 1, 3, 5 or 6 only.

*2 Multiple selection in different option zones is not available.
Assign it in the order of 3rd zone → 2nd zone → 1st zone

■ MEASURING RANGES

●Universal input

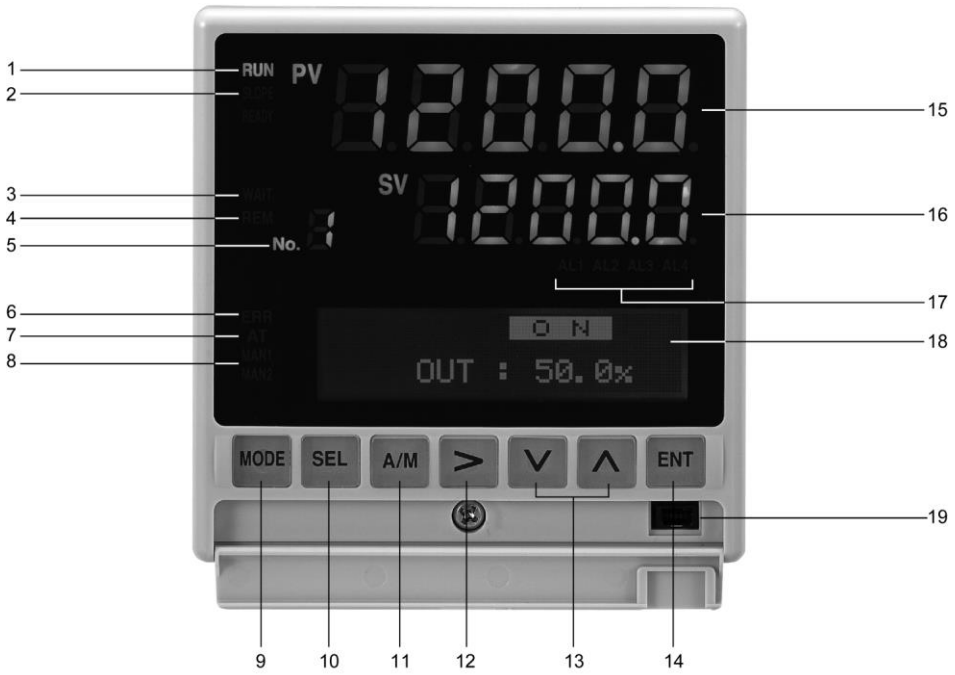
Measuring ranges		Scale ranges
Thermocouples	B	0.0 to 1820.0℃
	R	0.0 to 1760.0℃ 0.0 to 1200.0℃
	S	0.0 to 1760.0℃
	K	-200.0 to 1370.0℃ 0.0 to 600.0℃ -200.0 to 300.0℃
	E	-270.0 to 1000.0℃ 0.0 to 700.0℃ -270.0 to 300.0℃ -270.0 to 150.0℃
	J	-200.0 to 1200.0℃ -200.0 to 900.0℃ -200.0 to 400.0℃ -100.0 to 200.0℃
	T	-270.0 to 400.0℃ -200.0 to 200.0℃
	WRe5-WRe26	0.0 to 2310.0℃
	W-WRe26	0.0 to 2310.0℃
	NiMo-Ni	-50.0 to 1410.0℃
	CR-AuFe	0.0 to 280.0K
	N	0.0 to 1300.0℃
	PR5-20	0.0 to 1800.0℃
	PtRh40-PtRh20	0.0 to 1880.0℃
	Platinel II	0.0 to 1390.0℃ 0.0 to 600.0℃
	U	-200.0 to 400.0℃
	L	-200.0 to 900.0℃
DC voltage	10mV	-10 to 10mV
	20mV	-20 to 20mV
	50mV	-50 to 50mV
	100mV	-100 to 100mV
	5V	-5 to 5 V
	10V	-10 to 0 V
DC current	20mA	0 to 20 mA
Resistance thermometer	JPt100	-200.0 to 649.0℃ -200.0 to 400.0℃ -200.0 to 200.0℃ -100.0 to 100.0℃
	Old Pt100	-200.0 to 649.0℃ -200.0 to 400.0℃ -200.0 to 200.0℃ -100.0 to 100.0℃
	JPt50	-200.0 to 649.0℃
	Pt100	-200.0 to 850.0℃ -200.0 to 400.0℃ -200.0 to 200.0℃ -100.0 to 100.0℃

●4-wire resistance thermometer

Measuring ranges		Scale ranges
Resistance thermometer	JPt100	-200.0 to 649.0℃ -200.0 to 400.0℃ -200.0 to 200.0℃ -100.0 to 100.0℃
	Old Pt100	-200.0 to 649.0℃ -200.0 to 400.0℃ -200.0 to 200.0℃ -100.0 to 100.0℃
	JPt50	-200.0 to 649.0℃
	Pt-Co	4.0 to 374.0K
	Pt100	-200.0 to 850.0℃ -200.0 to 400.0℃ -200.0 to 200.0℃ -100.0 to 100.0℃

[Standards]
K, E, J, T, R, S, B,N :IEC584 (1977,1982), JIS C 1602 -1995, JIS C 1605 -1995
WRe5-WRe26, W-WRe26, NiMo-Ni, Platine II, CR-AuFe,
PtRh40-PtRh20: ASTMVol.14.03 U, L : DIN43710 - 1985
Pt100 : IEC751 (1995), JIS C 1604 -1997
OldPt100 : IEC751(1983), JIS C 1604 -1989, JIS C 1606 -1989
JPt100 : JIS C 1604 -1981, JIS C 1606 - 1986
JPt50 : JIS C 1604 -1981

■ NAMES OF VARIOUS PARTS



Display

1. Operation status (RUN) indication
   Lights in operation.
2. Slope (SLOPE) indication
   Lights in slope operation of SV.
3. Alarm-standby (WAIT) indication
   Lights in alarm-standby status or when alarm is cancelled.
4. Remote (REM) indication
5. Executing set value number (NO.) indication
6. Error (ERR) indication
   Lights when sampling of input is abnormal.
7. Auto-tuning operation (AT) indication
   Lights in auto-tuning operation.
8. Manual operation (MAN1/MAN2) indication
   Lights when the output No.1 or No. 2 is in manual output operation.
15. Process value (PV) indication
16. Set value (SV) indication
17. Alarm activation (AL1 to 4) indication
18. LCD display

Function keys

9. It is used for switching between the operation screen and the mode screen of Mode 0, or for switching from the settings screen to the mode screen.
10. It is used to switch the operation screen or to switch the settings screen.
11. It is used for switching between the automatic output operation and the manual output operation.
12. It is used for moving the cursor and for selecting a parameter.
13. It is used for changing a setting value (or selecting a parameter) in descending or ascending order.
14. It is used for registering the settings.

19. Engineering port

■ INPUT SPECIFICATIONS

Input type: Thermocouple
B, R, S, K, E, J, T, N, WRe5-WRe26, W-WRe26, NiMo-Ni, CR-AuFe, PR5-20, PtRh40-PtRh20, Platinel II, U, L
DC voltage
±10mV, ±20mV, ±50mV, ±100mV, ±5V, ±10V
DC current
0 to 20mA
Resistance thermometer
Pt100, JPt100, Old Pt100, JPt50, Pt-Co

Measuring range: Thermocouple 28 ranges, DC voltage 6 ranges, DC current 1 range, Resistance thermometer 14 ranges
* For details, refer to [Measuring ranges].

Accuracy rating: ±0.1% of measuring range ± 1 digit
*For details, refer to [Detailed specifications of accuracy ratings].

Reference junction compensation accuracy:
K, E, J, T, N, Platinel II --- ±0.5°C or a value equivalent to ±20μV, whichever is greater
(at ambient temperature of 23°C ± 10°C)
Others --- ±1.0°C or a value equivalent to ±40μV, whichever is greater

Resolution: Approx. 1/30000

Sampling rate: Approx. 0.1 seconds

Burnout: Upscale burnout is only enabled in thermocouple, DC voltage (±50mV or less) and resistance thermometer (3-wire type). For the burnout, the output value of Output No. 1 can be set arbitrarily, the output value of Output No. 2 is fixed at 0% and the high limit alarm is set to ON (for the upscale burnout).
* The burnout is disabled in DC voltage (±100mV or more), DC current and resistance thermometer (4-wire type).

Input impedance: Thermocouple 1MΩ or more
DC voltage 1MΩ or more
DC current Approx. 250Ω

Allowable signal source resistance:
Thermocouple 100Ω or less
DC voltage (mV) 100Ω or less
DC voltage (V) 300Ω or less

Allowable wire resistance (resistance thermometer):
5Ω or less (same resistance for all wires)

Rated current (resistance thermometer):
Approx. 1mA

Maximum allowable input:
Thermocouple ±20V, DC voltage ±20V
DC current ±30mA, ±7.5V
Resistance thermometer 500Ω, ±5V

Maximum common mode voltage:
30VAC

Common mode rejection ratio:
130dB or more (50/60Hz)

Normal mode rejection ratio:
50dB or more (50/60Hz)

■ DISPLAY SPECIFICATIONS

Display element: Upper display LED
Lower display LCD (with back light) 108 x 24 dots

Display content: Upper display
PV 5-digit, SV 5-digit, status indications, etc.
Lower display
MV, output status, setting screens, etc.

■ CONTROL SPECIFICATIONS

Control cycle: Approx. 0.1 seconds

Output type: ON-OFF pulse type, ON-OFF servo type, Current output type, SSR drive pulse type, Voltage output type

ON-OFF pulse type: Output signal ON-OFF pulse conductive signal
Contact capacity
Resistive load 100 to 240VAC
30VDC 5A or less
Inductive load 100 to 240VAC
30VDC 2.5A or less
Smallest load 5VDC 10mA or more
Contact protection
Small CR element built-in
ON-OFF pulse cycle 1 to 180 seconds

ON-OFF servo type: Output signal ON-OFF servo conductive signal
Contact capacity of standard load
Resistive load 100 to 240VAC 30VDC 5A or less
Inductive load 100 to 240VAC 30VDC 2.5A or less
Smallest load 5VDC 10mA or more
Contact capacity of very light load
Resistive load 100 to 240VAC 30VDC 20mA or less
Inductive load 100 to 240VAC 30VDC 20mA or less
Smallest load 5VDC 1mA or more
Feedback resistance 100Ω to 2kΩ
Contact protection Small CR element built-in

Current output type: Output signal 4 to 20mA
Load resistance 750Ω or less

SSR drive pulse type:
Output signal ON-OFF pulse voltage signal
Output voltage ON voltage 12VDC ± 20%
OFF voltage 0.8VDC or less
Load current 20mA or less
Pulse cycle 1 to 180 seconds

Voltage output type: Output signal 0 to 10V
Output impedance Approx. 10Ω

■ SETTING SPECIFICATIONS

SV relations: SV 8 types (maximum 5 digits setting)
SV rate-of-change

Control relations: PID 8 types P 0 to 999.9%
I ∞, 1 to 9999 seconds
D 0 to 9999 seconds
A.R.W. (Anti reset windup)
High limit --- 0 to 100.0%
Low limit --- -100 to 0.0%

Output relations: Output deadband
Output preset
Output limiter 8 types
Rate-of-change limiter for output 8 types

Alarm relations: Alarm value 4 points 8 types, alarm types, alarm deadband

■ ALARM SPECIFICATIONS

Number of alarm points:
4 points

Alarm types: Absolute value alarm, deviation alarm

Output signal: Relay output signal (a contact)
1 common terminal for AL1 and AL2, 1 common terminal for AL3 and AL4
Contact capacity
Resistive load 100 to 240VAC 30VDC 3A or less
Inductive load 100 to 240VAC 30VDC 1.5A or less
Smallest load 5VDC 10mA or more

■ GENERAL SPECIFICATIONS

Rated power voltage: General power supply specifications 100 to 240VAC
24V power supply specifications 24VAC/24VDC

Rated power supply frequency:
General power supply specifications 50/60Hz
24V power supply specification 50/60Hz (24VAC)

Maximum power consumption:
General power supply specifications
Without options 100VAC 10VA
240VAC 15VA
With options 100VAC 15VA
240VAC 20VA
24V power supply specifications
Without options 24VAC 10VA
24VDC 5W
With options 24VAC 15VA
24VDC 10W

Working temperature range:
-10 to 50°C

Working humidity range:
10 to 90%RH

Power failure countermeasures:
Settings stored in EEPROM
(Rewrite count: One million times or less)

Terminal screws: M3.5

Insulation resistance: Between primary terminals and secondary terminals
20MΩ or more (500VDC)
Between primary terminals and ground terminal
20MΩ or more (500VDC)
Between secondary terminals and ground terminal
20MΩ or more (500VDC)
*Primary terminal: Terminals for power supply (100 to 240VAC), control output and alarm output

Withstand voltage: Between primary terminals and secondary terminals
1500VAC (for 1 minute)
Between primary terminals and ground terminal
1500VAC (for 1 minute)
Between secondary terminals and ground terminal
500VAC (for 1 minute)
*Primary terminal: Terminals for power supply (100 to 240VAC), control output and alarm output

Casing: Fire-retardant polycarbonate

Color: Gray or black

Mounting: Panel mounting

External dimensions: 96 (H) x 96 (W) x 127 (D)
*The depth from the front panel is 120mm.

Weight: Without options Approx. 450g
With options Approx. 580g

■ SAFTY STANDARD

CE : EN61326: 1997 +A1+A2+A3
EN61010-1: 2001 (Overvoltage category II, pollution degree 2)
* Under the test conditions of EMC directives, there may be variation of indication value or output value which is equivalent to maximum ±10% or maximum 2mV, whichever is greater.

UL: UL61010-1 2nd edition

c–UL: CAN/CSA C22.2 No.61010-1-04

■ REFERENCE OPERATING CONDITIONS

Ambient temperature: 23°C ± 2°C

Ambient humidity: 55%RH ± 5% (no dew condensation)

Power voltage: General power supply specifications
100VAC ± 1%
24V power supply specifications
24VDC ± 1%

Power supply frequency:
General power supply specifications
50/60Hz ± 0.5%
24V power supply specifications
DC

Mounting angle: Forward or backward ±3°, lateral ±3°

Installation height: Altitude 2000m or below

Vibration: 0m/s^2

Shock: 0m/s^2

Mounting condition: Single-unit panel mounting (Space above, below, right and left of the unit is needed.)

Wind: None

External noise: None

Warm up time: 30 min. or longer

■ NORMAL OPERATING CONDITIONS

Ambient temperature: -10°C to 50°C (-10°C to 40°C for closed mounting)

Ambient humidity: 10 to 90%RH (no dew condensation)

Power voltage: General power supply specifications 90 to 264VAC
24V Power supply specifications 21.6 to 26.4VDC/AC

Power supply frequency:
General power supply specifications 50/60Hz ± 2%
24V Power supply specifications DC, 50/60Hz ± 2%

Mounting angle: Forward or backward ±10°, lateral ±10°

Installation height: Altitude 2000m or below

Vibration: 2m/s^2

Shock: 0m/s^2

Mounting condition: Single-unit panel mounting (Space above and below of the unit is needed.)

External noise: None

Rate of ambient temperature change:
10°C/hour or less

■ TRANSPORT CONDITIONS

Ambient temperature: -20°C to 60°C

Ambient humidity: 5 to 90%RH (no dew condensation)

Vibration: 4.9m/s^2 (10 to 60Hz)

Shock: 392m/s^2

Under the condition that the unit is packed for shipment by the factory

■ STORAGE CONDITIONS

Ambient temperature: -20°C to 60°C
For long term storage, the temperature should be 10°C to 30°C.

Ambient humidity: 5 to 90%RH (no dew condensation)

Vibration: 0m/s^2

Shock: 0m/s^2

Under the condition that the unit is packed for shipment by the factory

■ OPTIONS

●Transmission signal output

Output a signal corresponding to set value (SV), process value (PV), manipulated value (MV), etc.

Number of output: 1 point

Output signal: 4 - 20mA (Load resistance 400Ω or less)
0 - 1V
(Output resistance Approx.10Ω, Load resistance 50kΩ or more)
0 - 10V
(Output resistance Approx.10Ω, Load resistance 50kΩ or more)

Output accuracy: ±0.1% of full scale

●Remote signal input

By using extermal contacts, switching of remote mode and local mode is enabled. With the remote mode, the setting of SV is enabled by remote signal.

Number of inputs: 1 point

Input signal: 4 - 20mA (Input impedance Approx.50Ω)
0 - 1V (Input impedance Approx. 500kΩ)
0 -10V (Input impedance Approx.100kΩ)

Input accuracy: ±0.1% ± 1digit

Remote signal input: R/L (Remote/Local)

●Communications interface

With RS232C, RS422A or RS485, the setting and measured values of the controller can be transmitted to a master CPU and various parameters can be set by the master CPU.

Number of communications points:
1 point

Communications type: RS232C, RS422A, RS485

Communications speed: 2400/4800/9600/19200/38400 bps

Protocol: MODBUS (RTU), MODBUS (ASCII), PRIVATE

●2-output type

2 kinds of output with direct and reverse actions are outputted and simultaneous control of heating/cooling is enabled.

Control cycle: Approx. 0.1 seconds

Output type: ON-OFF pulse type, Current output type, Voltage output type, SSR drive pulse type
Any combinations of these types are enabled.

Control system: PID system

●External set value switching

The selection of executing No. (SV) is enabled.

Number of inputs: 4 points

Input signal: No-voltage contact, open-collector signal

External contact capacity:
5VDC 2mA

●Panel sealing

By mounting the controller to a panel, it has the panel sealing equivalent to [IP54 compliance].

●Terminal cover

It covers the terminals for safe. The cover is transparent.

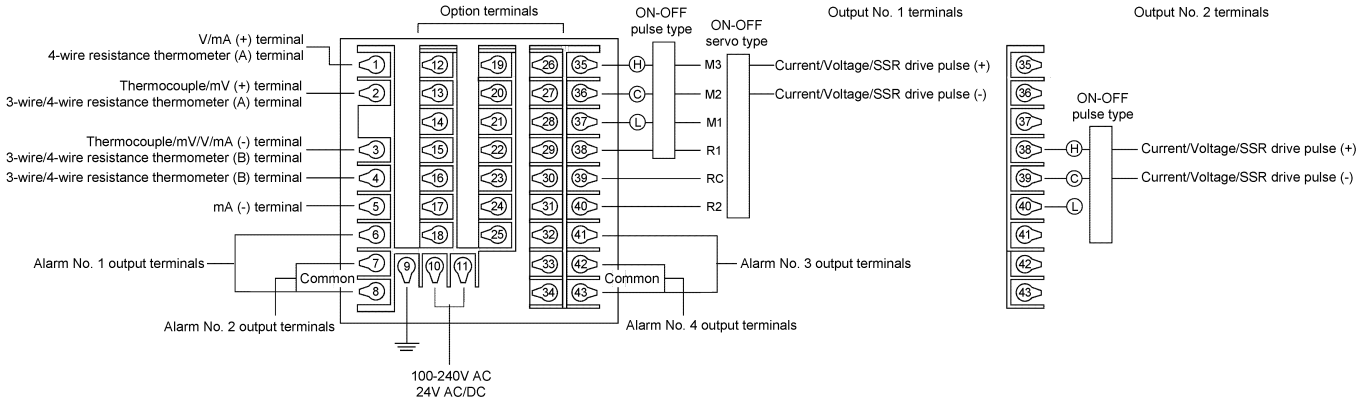
■ DETAILED SPECIFICATIONS OF ACCURACY RATINGS

Input type		Accuracy rating	Exceptional specifications
Thermocouple	B	±0.1%±1digit	Less than 400℃: Not specified / 400℃ to less than 800℃: ±0.2% ±1 digit
	R、S		0℃ to less than 400℃: ±0.2% ±1 digit
	N		
	K		-200℃ to less than 0℃: ±0.2% ±1digit or the value equivalent to ±60μV, whichever is greater
	E		-270℃ to less than 0℃: ±0.2% ±1digit or the value equivalent to ±80μV, whichever is greater
	J		-200℃ to less than 0℃: ±0.2% ±1digit or the value equivalent to ±80μV, whichever is greater
	T		-270℃ to less than 0℃: ±0.2% ±1digit or the value equivalent to ±40μV, whichever is greater
	U		-200℃ to less than 0℃: ±0.2% ±1digit or the value equivalent to ±40μV, whichever is greater
	L		-200℃ to less than 0℃: ±0.2% ±1digit
	WRe5-WRe26		
	W-WRe26		0℃ to less than 400℃ ±0.3% ±1 digit
	NiMo-Ni		
	Platinel Ⅱ		
	CR-AuFe	±0.2%±1digit	0K to less than 200K: ±0.5% ±1 digit / 20K to less than 50K: ±0.3% ±1 digit
	PR5-20		0℃ to less than 100℃: Not specified / 100℃ to less than 200℃: ±0.5% ±1 digit
	PtRh40-PtRh20		0℃ to less than 400℃: ±1.5% ±1 digit / 400℃ to less than 800℃: ±0.8% ±1 digit
DC voltage / DC current		±0.1%±1digit	
Resistance thermometer	Pt100 Old Pt100 JPt100	±0.1%±1digit	For the measuring range of [-100℃ to 100℃] only: ±0.15% ±1digit
	JPt50		
	Pt-Co	±0.15%±1digit	4K to less than 20K : ±0.5% ±1digit / 20K to less than 50K : ±0.3%±1digit

* The above ratings are the measurement range conversion accuracies under the reference operating conditions.
For thermocouple inputs, the reference junction compensation accuracy is added.

* K, E , J, T, R, S, B, N : IEC584 (1977 - 1982), JIS C 1602 - 1995, JIS C 1605 - 1995
WRe5-WRe26, W-WRe26, NiMo-Ni, Platinel II, CR-AuFe, PtRh40-PtRh20 : ASTM Vol.14.03
U、L : DIN43710 - 1985
Pt100 : IEC751 (1995), JIS C 1604 -1997
Old dPt100 : IEC751 (1983), JIS C 1604 - 1989、JIS C 1606 - 1989
JPt100 : JIS C 1604-1981, JIS C 1606 - 1986
JPt50 : JIS C 1604 -1981
WRe5-WRe26、W-WRe26、NiMo-Ni、Platinel Ⅱ、CR-AuFe、PtRh40-PtRh20：ASTM Vol.14.03

■ TERMINAL ARRANGEMENT



●Option terminals

Communications interface (1st zone)

R	A	S
RD	RDA	SA
SD	RDB	SB
SG	SDA	SG
	SDB	
	SG	
R/L only	R/L only	R/L only
COM	COM	COM

R : RS232C A : RS422A S : RS485

Transmission signal output (2nd zone)

1 / 2 / 3 / 4

Remote signal input (3rd zone)

5 / 6 / 7 / 8

R／L only
COM

External set value switching

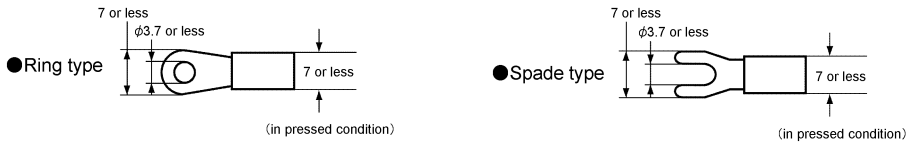
B
1st ← 2nd ← 3rd zone

※
※
SV8
SV4
SV2
SV1
COM

Based on combination with other options, assign the zone in the above order.

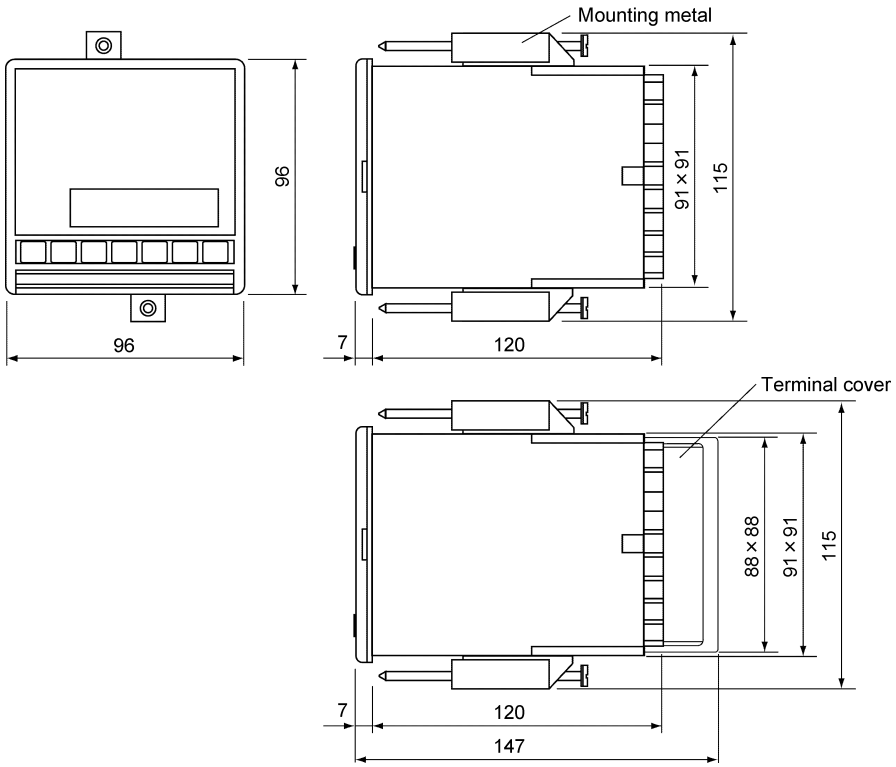
※Preset manual or remote A/M switching terminals (option)

● ABOUT CRIMP STYLE TERMINALS

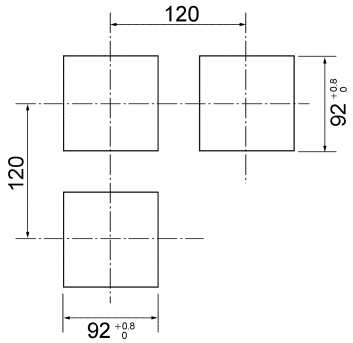


*Use terminal with insulation

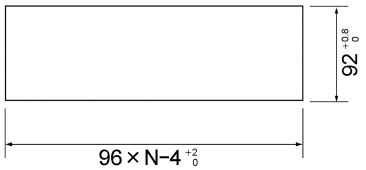
■EXTENAL DIMENSIONES



●PANEL CUTOUT



●Closed mounting panel dimensions



N : Number of mounted instruments

Unit: mm

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