

# DB1000 SERIES DIGITAL INDICATING CONTROLLER



The DB1000 series controllers are  $96 \times 96$ mm digital controllers with the indicating accuracy of  $\pm 0.1\%$  and the sampling period of 0.1 second.

These controllers have a variety of features including multi-programming function (8 kinds), universal inputs scaling function as well as easy-to-read colored LCD displays and the interactive type settings with the dot-matrix LCD display.



## ■ FEATURES

- **Indicating accuracy;  $\pm 0.1\%$ ; Sampling period: 0.1 second**

The high-performance microprocessor provides the indicating accuracy of  $\pm 0.1\%$  and the sampling period of 0.1 second.

- **Easy simple-mode operation**

By separating the parameters at the settings up through switching between the simple function mode and multi-function mode, the normal running is simplified.

- **8 kinds of setpoint**

By using the front-panel keys, 8 kinds of setpoint being programmed are freely selectable and independent PID parameters can be set each setting value.

- **Universal inputs**

Two types of universal inputs, the total of 34 inputs including 28 thermocouple inputs, 5 DC voltage inputs and 1 DC current input, or 12 resistance thermometer inputs, are prepared.

- **Auto-tuning function**

The optimum PID parameters can be calculated automatically by the auto tuning function.

- **Versatile alarm function**

Four alarm points are available on each setpoint. High/low alarm and deviation/absolute alarm can be set independently on each alarm point.

- **Universal power voltage**

The controllers are designed for 85 to 264VAC.

- **CE-marking (Option)**

The models with CE-marking are available as an option.

## MODEL CODES

DB1 ☐☐☐☐☐☐



### Input signal

- 1 : Thermocouples, DC voltage/current  
2 : Resistance thermometers

### Control mode (Output 1)

- 1 : On-off pulse type PID  
2 : On-off servo type PID (standard)  
3 : Current output type PID  
5 : SSR drive pulse type PID  
6 : Voltage Output type PID (option)  
8 : On-off servo type PID (Light load) (option)

### Control mode (Output 2) (option)

- 0 : None  
1 : On-off pulse type P\*<sup>1</sup>  
3 : Current output type P\*<sup>2</sup>  
5 : SSR drive pulse type P\*<sup>1</sup>  
6 : Voltage Output type P\*<sup>2</sup>  
M: MOS relay output(Alarm3,4)\*<sup>3</sup>

### CE-marking

- : None  
E : With CE-marking

### Communications interface (option)

- 0 : None  
R: RS-232C  
A: RS-422A  
S: RS-485  
B: External set value switching input\*<sup>4</sup>

### Transmission signal output (option)

- 0 : None  
1: 4 to 20mA  
2: 0 to 1V  
3: 0 to 10V  
4: Others  
B: External set value switching input\*<sup>4</sup>

### Remote setting for SV (option)

- 0 : None  
5: 4 to 20mA  
6: 0 to 1V  
7: 0 to 10V  
8: Others  
B: External set value switching input\*<sup>4</sup>

\*<sup>1</sup> Applicable when Output 1 is the current output type PID system or voltage output type PID system. CE-marking is not available.

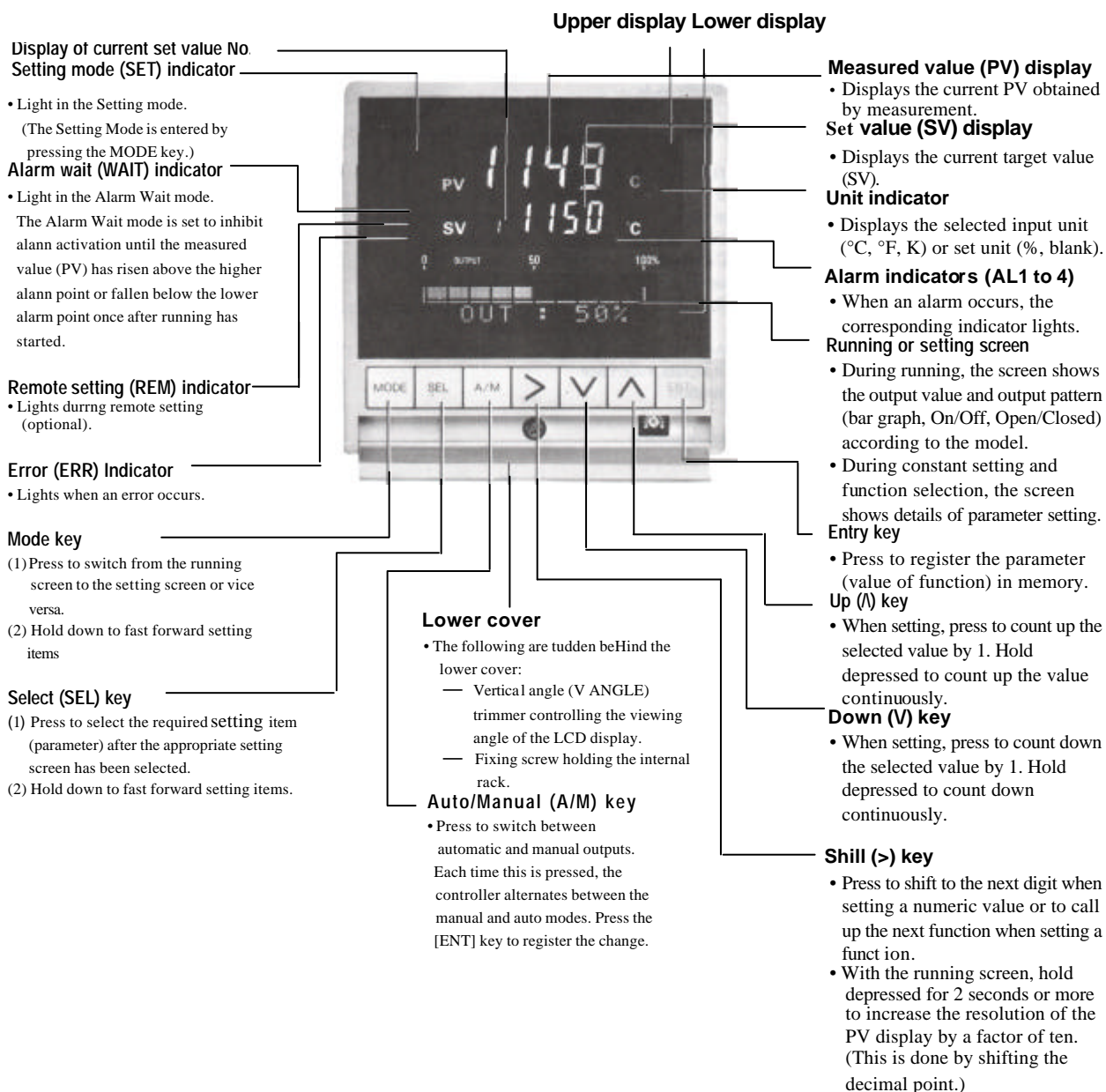
\*<sup>2</sup> Applicable when Output 1 is the on-off servo type PID system. CE-marking is not available.

\*<sup>3</sup> Applicable except the on-off servo type PID system(with CE-marking)

\*<sup>4</sup> The external set value switching input can be designated at any place.

## MEASURING RANGE

Input		Input range	
1 type	Thermocouple	B	0 to 1820°C 32 to 3300°F
		R	0 to 1760°C 32 to 3200°F
			0 to 1200°C 32 to 2100°F
		S	0 to 1760°C 32 to 3200°F
		K	-200 to 1370°C -300 to 2450°F
			0 to 6000°C 32 to 1100°F
			-200.0 to 300.0°C -300 to 550°F
		E	-270 to 1000°C -450 to 1800°F
			0 to 700.0°C 32 to 1250°F
			-270 to 300°C 450 to 550°F
			-270 to 150°C 450 to 300°F
		J	-200 to 1200°C -300 to 2100°F
			-200.0 to 900.0°C -300 to 1650°F
			-200.0 to 400.0°C -300 to 700°F
			-100.0 to 200.0°C -400 to 300°F
		T	-270 to 400°C -450 to 700°F
			-200.0 to 200.0°C -300 to 300°F
		WWR5-26	0 to 2320°C 32 to 4200°F
2 type	Resistance Thermometer	WWR5-26	0 to 2320°C 32 to 4200°F
		Ni-NiMo	0 to 1310°C 32 to 2350°F
		AuFe-Cr	0 to 300.0K 400 to 80°F
		N	0 to 1300°C 32 to 2350°F
		PRS-20	0 to 1800°C 32 to 3250°F
		PR20-40	0 to 1880°C 32 to 3400°F
		Platinel	-100 to 1390°C -100 to 2500°F
			-100.0 to 600.0°C 400 to 1100°F
		U	-200.0 to 400.0°C -300 to 750°F
		L	-200.0 to 900.0°C -300 to 1650°F
		DC voltage/ current	-10 to 10mV, -20 to 20mV, -50 to 50mV
		Pt 100	-100 to 100 mV, -5 to 5V, -20 to 20mA
		Pt 100	-200.0 to 649.0°C -300 to 1200°F
			-200.0 to 400.0°C -300 to 700°F
			-200.0 to 300.0°C -300 to 550°F
			-200.0 to 200.0°C -300 to 300°F
			-100.0 to 100.0°C -100 to 200°F
		JPt 100	-200.0 to 649.0°C -300 to 1200°F
			-200.0 to 400.0°C -300 to 700°F
			-200.0 to 300.0°C -300 to 550°F
		Pt 50	-200.0 to 200.0°C -300 to 300°F
			-100.0 to 100.0°C -100 to 200°F
			-100.0 to 100.0°C -100 to 200°F
		Pt-Co	-200.0 to 649.0°C -300 to 1200°F
			4.0 to 374.0K 450 to 200°F



## ■ GENERAL SPECIFICATIONS

<b>Input signals</b>	: Thermocouples: B, R, S, K, E, J, T, WWR5-26, WWR50-26, Ni-NiMo, AuFe-Cr, N. PR5-20, PR20-40, Platine1, U, L  DC voltages: $\pm 10\text{mV}$ , $\pm 20\text{mV}$ , $\pm 50\text{mV}$ , $\pm 100\text{mV}$ , $\pm 5\text{V}$  DC currents: $\pm 20\text{mA}$  Resistance thermometers : Pt100, JPt100, JPt50, Pt-Co
<b>Measuring range</b>	: Refer to the measuring range table. Type 1: Total of 34; thermocouples $\times 28$ , DC voltages $\times 5$ , DC current $\times 1$ Type 2: Total of 12 resistance thermometers; Pt100 $\times 5$ , JPt100 $\times 5$ , JPt50 $\times 1$ , PtCo $\times 1$
<b>Measuring accuracy</b>	: Larger value of $\pm 0.1\%$ of input span $\pm 1$ digit or $10\mu\text{V}$ (With thermocouple inputs, reference junction temperature compensation accuracy is not included.) For details, refer to "Detailed Accuracy Rating Specifications"
<b>Temp. compensation accuracy</b>	: $0.5^\circ\text{C}$
<b>Sampling period</b>	: Approx. 0.1 second
<b>Burn-out</b>	: Higher-limit burnout function provided as standard with thermocouple and mV inputs.  Output in case of burnout: Optional set value between -5% and 105% of control output  Operation in case of burnout: Higher-limit alarm
<b>Sensor compensation</b>	: $\pm 1000$ times the display resolution
<b>Digital filter constant</b>	: 0 to 99.9 seconds
<b>Scaling</b>	: DC voltage and DC current inputs. Optional scaling within 4 digits
<b>Displays</b>	: Upper: 7-segment back-lit LCD Lower: Full dot-matrix ( $96 \times 20$ dots) back-lit LCD  Adjustable angle of viewing ( $\pm 20^\circ$ )
<b>Display data</b>	: Upper Display: Simultaneous display of PV and SV (0 to 3 digits) Top row : Measured value (PV), 4 digits with unit Bottom row : Set value (SV), 4 digits with unit Executing setting number Indication (1-digit digital indication) Others : Alarm indicators, setting mode indicator, alarm waiting indicator, remote setting indicator, error indicator  Lower Display: In running mode: Status display (80-dot) and digital display (max. 3 digits) In setting mode: Parameter (value or function)
<b>Automatic resume</b>	: In the setting mode, if no key is pressed for 1 minute or more, the unit automatically returns to the running mode.
<b>Power supply</b>	: 85 to 264VAC, 50/60Hz
<b>Ambient temperature</b>	: -10 to $+50^\circ\text{C}$
<b>Ambient humidity</b>	: Less than 90% RH (with no condensation)
<b>Countermeasure against power failure</b>	: Parameters held in EEPROM

<b>Allowable signal source resistance</b>	: Thermocouple inputs: Less than 100 Ohm : Voltage inputs: Less than 300 Ohm ( $\pm 5\text{V}$ ) Less than 100 Ohm (mV) Resistance thermometer inputs: Less than 5 Ohm (perline)
<b>Input resistance</b>	: Thermocouple and mV inputs: More than 8M Ohm Voltage inputs: More than 1M Ohm Current inputs: 250 Ohm
<b>Measuring current</b>	: 2mA with resistance thermometer inputs
<b>Maximum common mode voltage</b>	: 250VAC
<b>Common mode rejection ratio</b>	: More than 130dB
<b>Series mode rejection ratio</b>	: More than 50dB
<b>Insulation resistance</b>	: Between measuring terminal and ground terminal: more than 20M Ohm• at 500VDC Between power supply terminal and ground terminal: more than 20M Ohm• at 500VDC Between measuring terminal and power supply terminal: more than 20M Ohm, at 500VDC
<b>Dielectric strength</b>	: Between measuring terminal and ground terminal: 1 minute at 500VAC Between power supply terminal and ground terminal: 1 minute at 1500VAC Between measuring terminal and power supply terminal: 1 minute at 1500VAC
<b>Power consumption</b>	: 100V, max. 15VA, 200V, max. 20VA.
<b>Case</b>	: ABS resin
<b>Color</b>	: <b>Gray</b>
<b>Mounting</b>	: Flush
<b>Weight</b>	: Approx. 750g (1.7 lbs)

## ■ CONTROL SPECIFICATIONS

<b>Control switching</b>	: Approx. 0.1 second period
<b>Control method</b>	: Current output type PID On-off pulse type PID SSR drive pulse PID On-off servo type PID
<b>Control set values</b>	: 8 (4-digit) values can be set.
<b>Set value change</b>	: Setting of slope when the control set point is changed.
<b>Ratio</b>	: 0000 to 9999/minute (0 for step response)
<b>Control setting accuracy rating</b>	: $\pm 0.1\%$ of input span : The relative error between indicated and actual values: $\pm 1$ digit
<b>Auto tuning</b>	: Provided as standard. PID constants can also be set manually.
<b>PIO values</b>	: Can be set independently for each of 8 SVs P 0 to 999.9% (0 for on/off control) I $\infty$ 1 to 9999 seconds D: 0 to 9999 seconds
<b>Anti-reset windup</b>	: Setting 1 range Upper limit +99.9 to 0.0% Lower limit -99.9 to 0.0%
<b>Output limiter</b>	: Independent higher and lower limits can be set. corresponding to each of 8 SVs, from -5 to 105%
<b>Output change limiter</b>	: Independent limits can be set for each of 8 SVs, from 0.1 to 100%
<b>Output presetting</b>	: Output setting in case PV=SV during P operation, from 0.0 to 100.0%

- Output deadband** : Can be set during on/off control (with P-0).  
Setting range: 0.1 to 9.9%.
- Auto/Manual selection** : From Manual to Auto by balanceless bumpless  
Manual output is from 0 to 100%
- Control action** : Direct/reverse changeable
- Current output type PID system  
Output signal: 4 to ,20mA (or 1 to 5mA)  
Load resistance: Less than 750Ohm (3KOhm) with 1 to 5mA)
  - On-off pulse type PID system  
Output signal:  
On-off pulse conductive signal  
Contact capacity:  
Resistance load    100VAC less than 2A,  
                                 200VAC less than 1A  
Inductive load    100VAC less than 1A  
                                 200VAC less than 0.5A  
On-off pulse period: Variable between  
                                 approx.1 to 180 seconds  
                                 (in 1-second steps)
  - SSR drive pulse PID system  
Output signal: On-Off pulse voltage signal  
ON: 12VDC% ± 10% (max. 20mA)  
OFF: Less than 0.6VDC  
On-off pulse period: Variable between  
                                 approx. 1 to 180 seconds  
                                 (in 1 -second steps)
  - On-off servo type PID system  
Output signal: On-off servo conductive  
signal  
Contact capacity: Inductive load 100VAC 1A  
                                 200VAC 0.5 A Mm.  
                                 20mA Light load: Max.  
                                 20mA, Min. 1mA  
Feedback resistance: 1000to 2KOhm)

## ■ ALARM SPECIFICATIONS

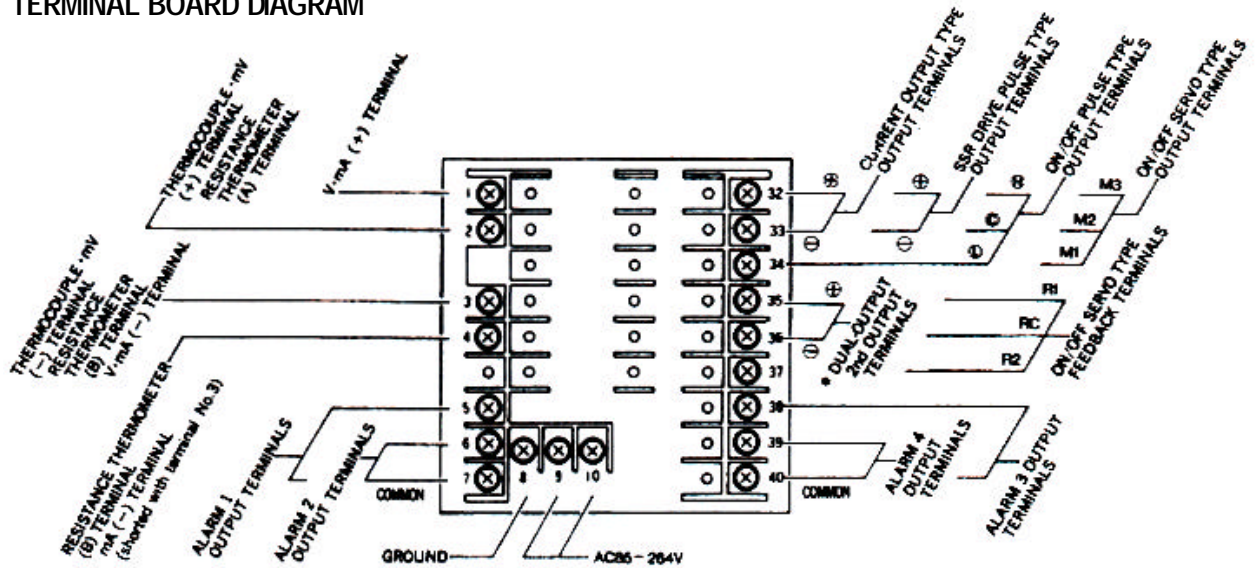
- Alarm points** : 4 points for each control set point (SV)
- Alarm system** : Higher-limit, lower-limit, deviation and  
absolute-value alarms. Independent setting for  
each set value.
- Alarm dead band** : 1000 times set resolution
- Alarm outputs** : Transistor open-collector output (max. load 24  
VDC, 50mA)\*  
ALARM 1 and ALARM 2: C terminal used in  
common  
ALARM 3 and AIARM 4: C terminal used in  
common  
\*MOS relay output available as option  
(Note)  
The outputs of Alarm 3 and Alarm 4 are not  
available on on-off servo type PID system  
(with CE-marking)

## OPTIONAL FUNCTIONS

Option name	Contents										
Communications interface	An RS-232C, RS-422A or RS-485 interface is available For transmitting set values and measured values to a host computer, or for setting parameters from the computer. It can be used for zone control.										
Transmission signal output	A signal proportional to the set value, measured value or output value can be output. Transmitted contents: 1 kind from set value, measured value and output value is optionally selectable. Transmission system: Analog transmission 1 kind from 4 to 20mA DC, 0 to 1VDC, and 0 to 10VDC (to be specified) With scaling function (optionally setting within 4 digits) Load: Current transmission - Max.400Ω Voltage transmission - 1mA Output resolution: 12-bit (0.024%) Transmission accuracy rating: 0.2% of input span (against indicated value) Insulation: Isolation between input/output signal and transmission signal: 500VDC, more than 20 MΩ or 250VAC.										
Remote/local switching	Switching between remote and local operation can be done using an external contact signal. The remote operation mode allows the control point to be set by an external signal. The ratio and bias of the remote input can also be set and the unit can also be used as a secondary controller in cascade control. Remote input: 1 kind from 4 to 20mA DC, 0 to 1VDC, and 0 to 10VDC (to be specified) With scaling function (optionally setting within 4 digits) Input impedance: 4 to 20mA - 61.9Ω 0 to 1V - approx. 1MΩ 0 to 10V - approx. 100KΩ Remote input shifting: ± 1000 times the SV set resolution. Insulation: Isolation between input/output signal and remote input signal Setting accuracy: ± 0.2% of input span										
Voltage output PID	For use to connect inverters as control equipment Output signal: 0 to 10VDC Current capacity: 2mA										
External set value switching	The eight internal set values can be selected using external contact signals. External contact capacity: 12VDC, more than 2mA										
Dual output	By outputting 4 to 20mA for Output 1 and 20 to 4mA for Output 2, cooling or heating control is possible. <div style="display: flex; align-items: center;"> <table border="1" style="margin-right: 20px;"> <tr> <th>Output 1</th><th>Output 2</th></tr> <tr> <td>4 to 20mA (Load resistance: 400Ω)</td><td>20 to 4mA (Load resistance : 400Ω)</td></tr> <tr> <td>On-off pulse output</td><td>On-off pulse output</td></tr> <tr> <td>SSR drive pulse output</td><td>SSR drive pulse output</td></tr> <tr> <td></td><td>20 to 4mA (Load resistance : 750Ω)</td></tr> </table> <div style="text-align: center;"> </div> </div> <p>Dead band: ± 99.9%, of the scale range PID values: Standard on output 1 P=0 to 9999% (On-off action is done when P=0)</p>	Output 1	Output 2	4 to 20mA (Load resistance: 400Ω)	20 to 4mA (Load resistance : 400Ω)	On-off pulse output	On-off pulse output	SSR drive pulse output	SSR drive pulse output		20 to 4mA (Load resistance : 750Ω)
Output 1	Output 2										
4 to 20mA (Load resistance: 400Ω)	20 to 4mA (Load resistance : 400Ω)										
On-off pulse output	On-off pulse output										
SSR drive pulse output	SSR drive pulse output										
	20 to 4mA (Load resistance : 750Ω)										
Lower limit burnout	In case of burnout, the output is fixed at a set value and a lower-limit alarm is generated. Control output at burnout: Optional set value between -5 and 105% Lower-limit alarm output is ON at burnout.										
MOS relay alarm output	Both AC load and DC load can be used by using solid state MOS relays on AL3 and AL4 in 4 alarm outputs. Contact capacity: 400VDC, 100mA 264VAC, 50mA										
Preset manual*	With external make-contact signal, output is fixed at the preset value. The speed of changing from the auto value to the preset value is limited by the output change limit of this option. Setting range: Preset value 0 to 100% Change limit value 0.1 to 100.0%										
Relay unit	A unit converting alarm outputs from transistor outputs to relay outputs is available.										
A/M external switching*	Output is maintained at the manual output condition by an external make-contact signal.										
Current output signal 1 to 5mA	The output of a current output type PID controller is 1 to 5mA.										
Abnormal CPU output 100%	When the CPU is abnormal, the output is set forcibly to 100%.										
4-wire type Pt input	A resistance thermometer type controller for 4-wire type sensor										
Speed type PID	A controller modified from position type PID to speed type PID.										
Screen resume OFF	The function to automatically resume the running screen from the setting screen can be switched OFF.										
Square root calculation	The square roots of DC voltage and current inputs are calculated and used for control.										
Installation above eye level	The angle of viewing can be adjusted for optimum viewability.										
CE-marking	CE-marking EN55011 Group 1 Class A EN50082-2 (Industrial Environment) EN61010-1 + A2 The indication equivalent to ± 200 μV, the temperature indication equivalent to thermoelectromotive force of ± 200 μV or 5°C may vary under the test environment requested by EMC directive. Max. common mode voltage: 30VAC										

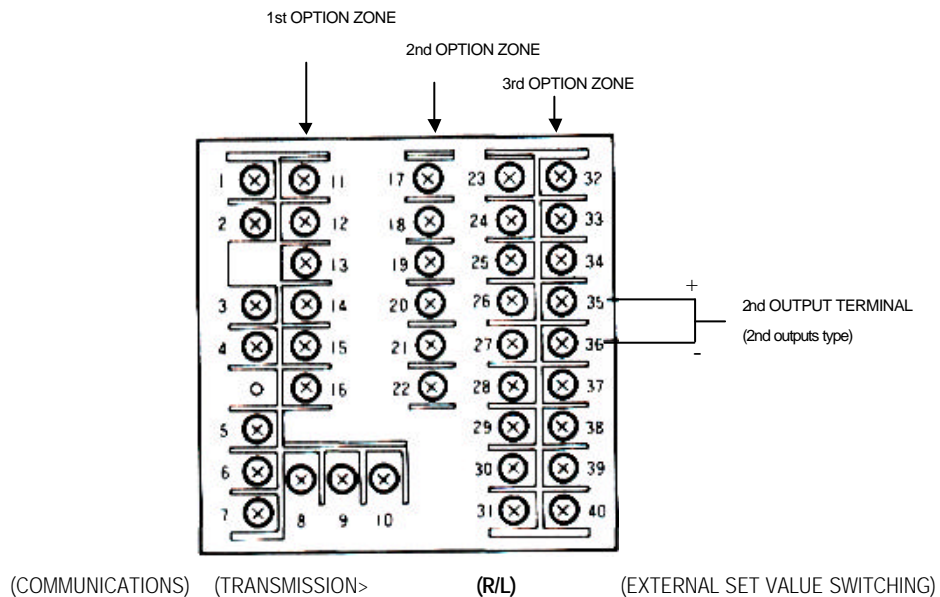
\* In combination with set value switching external input.

## ■ TERMINAL BOARD DIAGRAM

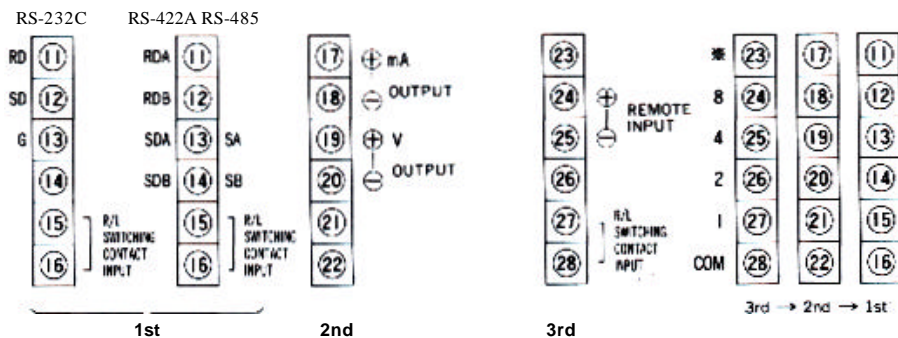


\* : Optional

## ■ OPTION TERMINALS



(COMMUNICATIONS) (TRANSMISSION> (R/L) (EXTERNAL SET VALUE SWITCHING)



Using zone is decided in the above order by combination with other options.

\* Preset manual or AIM external switching terminals.

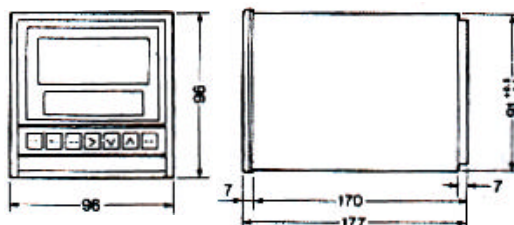


## ■ DETAILED ACCURACY RATING SPECIFICATIONS

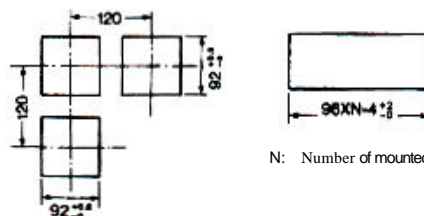
Input	Accuracy Range (of Input span)	Exception
Thermocouple	B	0 to 100°C: $\pm 5\%$ $\pm 1$ digit 100 to 400°C: $\pm 4\%$ $\pm 1$ digit 400 to 800°C: $\pm 0.15\%$ $\pm 1$ digit
	R	0 to 200°C: $\pm 0.15\%$ $\pm 1$ digit
	S	0 to 200°C: $\pm 0.15\%$ $\pm 1$ digit
	K	0 to 200°C: $\pm 0.15\%$ $\pm 1$ digit
	E	-270 to -200°C (for measuring range of -270 to 150°C and -270 to 300°C): $\pm 2\%$ $\pm 1$ digit
	J	-270 to -200°C (for measuring range of -270 to 150°C and -270 to 300°C): $\pm 2\%$ $\pm 1$ digit
	T	-270 to -200°C (for measuring range of -270 to 150°C and -270 to 300°C): $\pm 2\%$ $\pm 1$ digit
	WWRe 5-26	-270 to -200°C (for measuring range of -270 to 150°C and -270 to 300°C): $\pm 2\%$ $\pm 1$ digit
	WWRe 0-26	-270 to -200°C (for measuring range of -270 to 150°C and -270 to 300°C): $\pm 2\%$ $\pm 1$ digit
	Ni-NiMo	-270 to -200°C (for measuring range of -270 to 150°C and -270 to 300°C): $\pm 2\%$ $\pm 1$ digit
	N	-270 to -200°C (for measuring range of -270 to 150°C and -270 to 300°C): $\pm 2\%$ $\pm 1$ digit
	AuFe-Cr	20 K or under: $\pm 0.5\%$ $\pm 1$ digit 20 to 50 K: $\pm 0.3\%$ $\pm 1$ digit
	PR5-20	0 to 100°C: $\pm 4\%$ 100 to 200°C: $\pm 0.5\%$ $\pm 1$ digit
	PR20-40	0 to 300°C: $\pm 1.5\%$ $\pm 1$ digit 300 to 800°C: $\pm 0.8\%$ $\pm 1$ digit
Resistance Thermometer	DC voltages	
	DC currents	$\pm 0.1\%$ $\pm 1$ digit
	Pt100	-100 to 100°C scale: $\pm 0.15\%$ $\pm 1$ digit
	JPt100	-100 to 100°C scale: $\pm 0.15\%$ $\pm 1$ digit
	JPt50	-100 to 100°C scale: $\pm 0.15\%$ $\pm 1$ digit
	Pt-Co	20K or under: $\pm 0.5\%$ $\pm 1$ digit 20 to 50K: $\pm 0.3\%$ $\pm 1$ digit
		$\pm 0.15\%$ $\pm 1$ digit

Note: 1 digit refers to the set resolution.

## ■ EXTERNAL DIMENSIONS



### • Panel Cut-out Diagram



N: Number of mounted units

UNIT : mm

Specifications subject to change without notice. Original 2000.11

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