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 it up 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**
  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

- Option
- The control mode (Output No. 1) can be selected from 1, 3, 5 or 6 only.
- Multiple selection in different option zones is not available.
  Assign it in the order of 3rd zone → 2nd zone → 1st zone

Control mode (Output No. 1)
1: ON-OFF pulse type Pd
2: ON-OFF servo type Pd
(Standard load specification)
3: Current output type Pd
4: SSR drive pulse type Pd
5: Voltage output type Pd
6: ON-OFF servo type Pd
(Very light load specification)

Control mode (Output No. 2)
0: None
1: ON-OFF pulse type Pd
2: Current output type Pd
3: SSR drive pulse type Pd
4: Voltage output type Pd

Communications interface (1st zone)
0: None
R: RS232C
A: RS422A
S: RS485
B: Remote input for set value switching

Transmission signal output (2nd zone)
0: None
1: 4.20mA
2: 0-1V
3: 0-10V
4: Other
B: External set value switching

Remote signal input (3rd zone)
0: None
5: 4.20mA
6: 0-1V
7: 0-10V
8: Other
B: External set value switching

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

MEASURING RANGES

Universal input

<table>
<thead>
<tr>
<th>Measuring ranges</th>
<th>Scale ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>0.0 to 1820.0°C</td>
</tr>
<tr>
<td>R</td>
<td>0.0 to 1760.0°C</td>
</tr>
<tr>
<td>S</td>
<td>0.0 to 1760.0°C</td>
</tr>
<tr>
<td>K</td>
<td>-200.0 to 1370.0°C</td>
</tr>
<tr>
<td>E</td>
<td>-270.0 to 1000.0°C</td>
</tr>
<tr>
<td>J</td>
<td>-200.0 to 1200.0°C</td>
</tr>
<tr>
<td>T</td>
<td>-200.0 to 200.0°C</td>
</tr>
<tr>
<td>WRe5-WRe26</td>
<td>0.0 to 2310.0°C</td>
</tr>
<tr>
<td>W-WRe26</td>
<td>0.0 to 2310.0°C</td>
</tr>
<tr>
<td>Ni-Mo Ni</td>
<td>-50.0 to 1410.0°C</td>
</tr>
<tr>
<td>CR-AuFe</td>
<td>0.0 to 280.0K</td>
</tr>
<tr>
<td>N</td>
<td>0.0 to 1300.0°C</td>
</tr>
<tr>
<td>Platinel II</td>
<td>0.0 to 1390.0°C</td>
</tr>
<tr>
<td>U</td>
<td>0.0 to 600.0°C</td>
</tr>
<tr>
<td>L</td>
<td>-10 to 10mV</td>
</tr>
<tr>
<td>10mV</td>
<td>-10 to 10mV</td>
</tr>
<tr>
<td>20mA</td>
<td>-20 to 20mV</td>
</tr>
<tr>
<td>50mV</td>
<td>-50 to 50mV</td>
</tr>
<tr>
<td>100mV</td>
<td>-100 to 100mV</td>
</tr>
<tr>
<td>9V</td>
<td>-5 to 5 V</td>
</tr>
<tr>
<td>10V</td>
<td>-10 to 0 V</td>
</tr>
<tr>
<td>DC current</td>
<td>0 to 20mA</td>
</tr>
<tr>
<td>JP100</td>
<td>-200.0 to 649.0°C</td>
</tr>
<tr>
<td>Old Pt100</td>
<td>-200.0 to 649.0°C</td>
</tr>
<tr>
<td>Pt100</td>
<td>-200.0 to 850.0°C</td>
</tr>
</tbody>
</table>

Resistance thermometer

<table>
<thead>
<tr>
<th>Measuring ranges</th>
<th>Scale ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td>JP100</td>
<td>-200.0 to 649.0°C</td>
</tr>
<tr>
<td>Old Pt100</td>
<td>-200.0 to 649.0°C</td>
</tr>
<tr>
<td>Pt100</td>
<td>-200.0 to 850.0°C</td>
</tr>
</tbody>
</table>

[Standards]
WRe5-WRe26, W-WRe26, Ni-Mo Ni, Platinel II, CR-AuFe,
Pt50: JIS C 1604-1981
NAMES OF VARIOUS PARTS

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.
9. Process value (PV) indication
10. Set value (SV) indication
11. Alarm activation (AL1 to 4) indication
12. LCD display
   Display
   1. Operation status (RUN) indication
   2. Slope (SLOPE) indication
   3. Alarm-standby (WAIT) indication
   4. Remote (REM) indication
   5. Executing set value number (NO.) indication
   6. Error (ERR) indication
   7. Auto-tuning operation (AT) indication
   8. Manual operation (MAN1/MAN2) indication
   9. Process value (PV) indication
   10. Set value (SV) indication
   11. Alarm activation (AL1 to 4) indication
   12. LCD display
   13. Function keys
   14. It is used for moving the cursor and for selecting a parameter.
   15. It is used for changing a setting value (or selecting a parameter) in descending or ascending order.
   16. It is used for registering the settings.
   17. 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.
   18. It is used to switch the operation screen or to switch the settings screen.
   19. Engineering port
**INPUT SPECIFICATIONS**

Input type: Thermocouple

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
- 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): 1000Ω or less
- DC voltage (V): 3000Ω 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
  - Inductive load: 100 to 240VAC
- Smallest load: 5VDC 10mA or more

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 2mA or more
- Feedback resistance: ±10Ω to ±20Ω

Current output type:
- Contact capacity: Small CR element built-in

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

Voltage output type:
- Output signal:
  - 0 to 20mA

**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%
- 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
- Alarm types, alarm deadband

**ALARM SPECIFICATIONS**

Number of alarm points: 4 points

Alarm types:
- Absolute value alarm, deviation alarm

Output signal:
- 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

### 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/s²

**Shock:** 0m/s²

**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 DC, 50/60Hz ± 2%  
24V Power supply specifications 50/60Hz ± 2%

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

**Installation height:** Altitude 2000m or below

**Vibration:** 2m/s²

**Shock:** 0m/s²

**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/s² (10 to 60Hz)

**Shock:** 392m/s²

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/s²

**Shock:** 0m/s²

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

### SAFETY 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
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 50Ω or more)
- 0 - 10V (Output resistance Approx.10Ω, Load resistance 50Ω or more)
Output accuracy: ±0.1% of full scale

Remote signal input
By using external 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
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

<table>
<thead>
<tr>
<th>Input type</th>
<th>Accuracy rating</th>
<th>Exceptional specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>±0.1%±1digit</td>
<td>Less than 400°C: Not specified / 400°C to less than 800°C: ±0.2% ± 1 digit</td>
</tr>
<tr>
<td>R, S</td>
<td></td>
<td>0°C to less than 400°C: ±0.2% ± 1 digit</td>
</tr>
<tr>
<td>N</td>
<td></td>
<td>-200°C to less than 0°C: ±0.2% ±1digit or the value equivalent to ±60μV, whichever is greater</td>
</tr>
<tr>
<td>K</td>
<td></td>
<td>-270°C to less than 0°C: ±0.2% ±1digit or the value equivalent to ±60μV, whichever is greater</td>
</tr>
<tr>
<td>E</td>
<td></td>
<td>-200°C to less than 0°C: ±0.2% ±1digit or the value equivalent to ±60μV, whichever is greater</td>
</tr>
<tr>
<td>J</td>
<td></td>
<td>-270°C to less than 0°C: ±0.2% ±1digit or the value equivalent to ±60μV, whichever is greater</td>
</tr>
<tr>
<td>T</td>
<td></td>
<td>-200°C to less than 0°C: ±0.2% ±1digit or the value equivalent to ±40μV, whichever is greater</td>
</tr>
<tr>
<td>U</td>
<td></td>
<td>-270°C to less than 0°C: ±0.2% ±1digit or the value equivalent to ±40μV, whichever is greater</td>
</tr>
<tr>
<td>L</td>
<td></td>
<td>-200°C to less than 0°C: ±0.2% ±1digit</td>
</tr>
<tr>
<td>WRe5-WRe26</td>
<td></td>
<td>-270°C to less than 0°C: ±0.2% ±1digit</td>
</tr>
<tr>
<td>W-WRe26</td>
<td></td>
<td>-200°C to less than 0°C: ±0.2% ±1digit</td>
</tr>
<tr>
<td>NiMo-Ni</td>
<td></td>
<td>-270°C to less than 0°C: ±0.2% ±1digit</td>
</tr>
<tr>
<td>Platinet II</td>
<td>±0.2%±1digit</td>
<td>0K to less than 200K: ±0.5% ± 1 digit / 20K to less than 50K: ±0.3% ± 1 digit</td>
</tr>
<tr>
<td>CR-AuFe</td>
<td></td>
<td>0°C to less than 100°C: Not specified / 100°C to less than 200°C: ±0.5% ± 1 digit</td>
</tr>
<tr>
<td>PR5-20</td>
<td></td>
<td>0°C to less than 100°C: ±0.1% ± 1 digit / 400°C to less than 800°C: ±0.8% ± 1 digit</td>
</tr>
<tr>
<td>PrRh40-PrRh20</td>
<td></td>
<td>4K to less than 20K: ±0.5% ± 1 digit / 20K to less than 50K: ±0.3% ± 1 digit</td>
</tr>
</tbody>
</table>

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

WRe5-WRe26, W-WRe26, NiMo-Ni, Platinet II, CR-AuFe, PrRh40-PrRh20 : ASTM Vol.14.03
U. L : DIN43710 - 1985
Pr100 : IEC751 (1985), JIS C 1604 - 1997
JP50 : JIS C 1604 - 1981
## TERMINAL ARRANGEMENT

### Option terminals

Communications interface (1st zone) | Transmission signal output (2nd zone) | Remote signal input (3rd zone) | External set value switching
---|---|---|---
R | A | S | 1/2/3/4 | 5/6/7/8 | B
RD | RDA | SA | | | 1st ↔ 2nd ↔ 3rd zone
SD | RDB | SB | | | ※
SG | SDA | SG | | | ※
SDB | | | | | SV6
SG | | | | | SV4
R/L only | R/L only | R/L only | | | SV2
COM | COM | COM | | | SV1

R : RS23C A : RS422A S : RS485

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

- Ring type
  - Diameter: 0.7 or less
  - Length: 7 or less
  - (In pressed condition)

- Spade type
  - Diameter: 0.7 or less
  - Length: 7 or less
  - (In pressed condition)
  * Use terminal with insulation

■ EXTERNAL DIMENSIONS

- Panel cutout
- Closed mounting panel dimensions

Specifications subject to change without notice. Printed in Japan (I) 2008. 2. Recycled Paper