The DB600 series is a 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. There are three types of size.

DB670 --- 96 x 96mm, DB650 --- 48 x 96mm, DB630 --- 48 x 48mm

**FEATURES**

- **Excellent control performance**
  PID control algorithm and Z control algorithm are selectable according to the application. PID control algorithm: Conventional control method
  Z control algorithm: Our new algorithm (patent pending) which has evolved the PID control method. Especially, the effect can be expected such as overshoot suppression and speedy recovery in the event of disturbance control (during opening and closing of the electric furnace).

- **Large easy-to-view 5-digit 11 segments 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.

- **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 touch-keys has been improved and the outstanding operability has been realized.

- **What is Z control?**
  Z Control is applied from control algorithm of skunk cabbage (white arum).
  Skunk cabbage is a plant that generates heat to maintain body temperature at about 20 °C in spite of changes in the outside temperature. Incorporating system of heating control by minimum energy to the controller.

- **Excellent control**
  Control algorithm (PID control, Z control)
  You can choose the control algorithm PID control and Z control depending on the controlled object or application.
  **PID control**
  Conventional control algorithm
  **Z control**
  It is our original control algorithm which we evolved from general PID control. Especially during heating control, it can suppress overshoot effect, shortening stabilization time, speed up of returning speed from disturbance (ex. the opening and closing of the oven door).
  **Achieve better control condition by new auto-tuning**
  Improved conventional auto-tuning and determine more appropriate control parameter setting. Compared to the conventional method, it can suppress overshooting and deduct of the settling time.

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

- **Various operating status in one glance**
  Operating condition
  Setting value ramp (option for program model) Analog bar output

- **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.

- **Program Operation (option)**
  Set 4 patterns, 12 steps.

- **Conforming to international safety standards and European directives (CE) (conformity pending)**
  The controller is in conformity with European directives (CE), and is UL and c-UL approved.

- **Engineering Software (Standard attached)**
  By connecting to PC with exclusive USB engineering cable (RZ-EC3) (sold separately), you can load / save parameter data and acquisition.
### DB600 SERIES

#### DB670

<table>
<thead>
<tr>
<th>Control algorithm</th>
<th>0: PID control</th>
<th>2: 2 control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control output 1</td>
<td>1: ON-OFF pulse output type</td>
<td>2: ON-OFF servo output type</td>
</tr>
<tr>
<td></td>
<td>3: Current output type</td>
<td>5: SSR drive pulse output type</td>
</tr>
<tr>
<td></td>
<td>6: Voltage output type</td>
<td></td>
</tr>
<tr>
<td>Control output 2</td>
<td>0: None</td>
<td>1: ON-OFF pulse output type</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3: Current output type</td>
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<tr>
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<td></td>
<td></td>
<td>6: Voltage output type</td>
</tr>
<tr>
<td>Communications interface</td>
<td>+ 5 External signal input points (Option)</td>
<td>3: 0 to 10V</td>
</tr>
<tr>
<td></td>
<td>2: ON-OFF servo output type</td>
<td>4: 4 to 20mA</td>
</tr>
<tr>
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</tr>
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<td></td>
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<td>Transmission signal output</td>
<td>+ 2 Status event output points (Option)*5</td>
<td>0: None</td>
</tr>
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<td>1: 4 to 20mA</td>
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</tr>
<tr>
<td></td>
<td>+ 2 Event output points (mechanical relay output) [EV3,4]*1</td>
<td></td>
</tr>
<tr>
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<td>5: 0 to 1V + 2 Event output points (mechanical relay output) [EV3,4]*1</td>
<td></td>
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<tr>
<td></td>
<td>6: 0 to 10V + 2 Event output points (mechanical relay output) [EV6,7]*1</td>
<td></td>
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<tr>
<td></td>
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</tr>
<tr>
<td>Programming function (Option)</td>
<td>-: None</td>
<td>P: Available</td>
</tr>
<tr>
<td>2 Alarm event outputs</td>
<td>+ Heater disconnection detection (Option)</td>
<td>0: None</td>
</tr>
<tr>
<td></td>
<td>1: 2 Event output points (mechanical relay output) [EV1,2]*3</td>
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<td>Power voltage</td>
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<td>D: 24V AC/DC</td>
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#### DB650

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*12 It can be specified when Control output 1 is “1”, “3”, “5” or “6”.
*13 It can be specified when 2 Event output points is only 1 point [EV2].

---

*Does not operate at alarm event.*
DB630

Control algorithm
0: PID control
Z: Z control

Control output 1
1: ON-OFF pulse output type
2: Current output type
3: SSR drive pulse output type
6: Voltage output type

Control output 2 (Option)
0: None
1: ON-OFF pulse output type
3: Current output type
5: SSR drive pulse output type
6: Voltage output type

Communications interface
+ 1 External signal input point / 5 External signal input points
/ 5 Status event output points (Option)*2
0: None
S: RS485 + 1 External signal input points [DI 1]
D: 5 External signal input points [DI 1 to 5]
E: 5 Event output points (open corrector output) [EV 5 to 9]

Programming function (Option)
-: None
P: Available

2 Alarm event output points (Option)
0: None
1: 2 Event output points (mechanical relay output) [EV1,2]*1

Power voltage
A: 100 to 240V AC
D: 24V AC/DC

- MEASURING RANGES

<table>
<thead>
<tr>
<th>Input type</th>
<th>Measuring ranges</th>
<th>Measuring accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>0.0 to 1820.0°C</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>R</td>
<td>0.0 to 1760.0°C</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>S</td>
<td>0.0 to 1760.0°C</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>N</td>
<td>0.0 to 1760.0°C</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>K1</td>
<td>-200.0 to 1370.0°C</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>K2</td>
<td>-200.0 to 500.0°C</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>E</td>
<td>-200.0 to 900.0°C</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>J</td>
<td>-200.0 to 1200.0°C</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>T</td>
<td>-200.0 to 400.0°C</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>U</td>
<td>-200.0 to 400.0°C</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>L</td>
<td>-200.0 to 900.0°C</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>W-Res26</td>
<td>0.0 to 2310.0°C</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>W-Res26</td>
<td>0.0 to 2310.0°C</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>Platinel 5</td>
<td>0.0 to 1390.0°C</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>PtRh40-PtRh20</td>
<td>0.0 to 1880.0°C</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>Au-Pt</td>
<td>0.0 to 1000.0°C</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>Pt100</td>
<td>-200.0 to 850.0°C</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>JPt100</td>
<td>-200.0 to 200.0°C</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>Pt50</td>
<td>-200.0 to 649.0°C</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>20mV</td>
<td>-20.00 to 20.00mV</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>100mV</td>
<td>-100.00 to 100.00mV</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>5V</td>
<td>-5.000 to 5.000mV</td>
<td>±0.1% of FS ±1digit</td>
</tr>
<tr>
<td>10V</td>
<td>-10.00 to 10.00mV</td>
<td>±0.1% of FS ±1digit</td>
</tr>
</tbody>
</table>

*1 When specification with control output 2, number of event output points is only 1 point [EV2]
*2 Does not operate at alarm event.

* Accuracy indicates the performance under reference operating condition.
* For thermocouple, the reference junction compensation accuracy is added to the above measured accuracy.
* To measure DC current, ranges is converted to DC voltage by optional shunt resistor [250 Ω].

* For thermocouple, the reference junction compensation accuracy is added to the above measured accuracy.
DB600 SERIES

NAMES OF VARIOUS PARTS

Display
1. Measured value (PV)/ Parameter setting title
2. Setting value (SV)/ operating condition/ parameter setting value
3. Cursor for setting parameter
4. Analog bar
5. Output
6. Event
7. Operating condition display
   - Constant value operation (program operation OFF)
   - Program operation (program operation ON)
   *Option model only
8. Setting value ramp display
   - Constant value operation (program operation OFF)
   - Program operation (program operation ON)
   *Option model only
9. Pattern No. (program operation ON)
   *Option model only
10. Execution No./ Step No.
    - Constant value operation (program operation OFF)
    - Program operation (program operation ON)
    *Option model only
11. Operation screen display
    Lights when displaying [PV/SV], [PV/OUT], [PV/OUT2]

Function keys
12. [MODE] key : Depending on the screen of which key is pressed at, following screen is displayed.
    - Displays operation initial screen, when displaying operation screen expect for operation initial screen.
    - Displays initial screen of MODE0, when displaying operation initial screen of operation screen.
    - Displays operation initial screen, when displaying initial screen of setting screen.
    - Displays initial screen of setting screen, when displaying setting screen expect for initial screen.
    [SELECT] key (REVERSE) : Switches operation screen or MODE screen in reverse direction
    [CANCEL] key : While setting/changing of parameter (dot at first digit of setting value blinks), setting/changing can be canceled. After the cancelation, dot blinking of setting value turns OFF.
13. [A/M] key : Switches AUTO/MAN of output 1/output 2. Operates while displaying operation screen. It cannot be operated while displaying setting screen.
    [>] key : Moves cursor for setting parameter to the right when setting numeric value on the parameter setting screen. It cannot be operated while displaying operation screen.
14. [v] key : Decreases (decrement/changing of parameter) setting parameter and initial screen of each setting screen.
15. [A] key : Increases (increment/changing of parameter) setting parameter and initial screen of each setting screen.
16. [ENTER] key : Registers setting / changing parameter. After the registration, dot blinking of setting value of setting/ changing parameter turns OFF.
    [SELECT] key: Switches operation screen and MODE screen to the forward direction.
**INPUT SPECIFICATIONS**

Input type: Thermocouple
B, R, S, N, K, E, J, T, U, L, WRe5-WRe26, W-Re 26, Platinel II, PiRh40-PiRh20, Au-Pt
DC voltage ±20mV, ±100mV, ±5V, ±10V
Resistance thermocouple P100, JH100, P150

Measuring range: Thermocouple 16 ranges, DC voltage 4 ranges, DC voltage 1 range
Temperature range: °C
Accuracy rating: ±0.1% of FS ±1 digit of measuring range
Reference junction compensation accuracy: ±1.0°C (ambient temperature 23°C ± 10°C)
±2.0°C (temperatures other than above)
Sampling rate: Approx. 0.1 seconds

Burnout: Upper limit burnout is provided for thermocouple, resistance thermocouple, and DC voltage (20mA) only as standard.
Output 1 produces PV abnormal output and output 2 is fixed to 0% when burnout occurs.
Upper limit alarm event is output.
Input impedance: Thermocouple 1MΩ or more
DC voltage Approx. 1MΩ

Allowable signal source resistance: Thermocouple 100Ω or less
DC voltage (mV) 100Ω or less
DC voltage (V) 300Ω or less
Allowable wire resistance: Resistance thermocouple 10Ω/1 wire or less
(resistance of 3 wires should be equal to one another)
Maximum allowable input:
Thermocouple ±10VDC
DC voltage (mV) ±10V DC
DC Voltage (V) ±20V DC
Resistance thermocouple ±5V DC

Maximum common mode voltage: 30VAC

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

**CONTROL SPECIFICATIONS**

Control interval: Approx. 0.1 seconds
Output type: ON-OFF pulse output, ON-OFF servo output (DB650 and DB670 only), Current output, SSR drive pulse output, Voltage output

ON-OFF pulse type:
Contact type: 1a contact
Pulse cycle: Approx. 1 to 180 seconds
Contact capacity: Resistive load 240VAC 3A
Inductive load 240VAC 1.5A
Minimum load 5VDC 10mA

ON-OFF servo output type:
Contact type: 1a contact
Feedback resistance: 100Ω to 2KΩ
Contact capacity: Resistive load 240VAC 3A
Inductive load 40VAC 1.5A
Minimum load 5VDC 10mA

Current output type:
Output specification: 4 to 20mA DC
Load resistance: 600Ω or less
SSR drive pulse output type:
Pulse cycle: Approx. 1 to 180 seconds
Output specification: ON 12V DC ±20%
(load current 21mA or less)
OFF 0.8V DC or less

Voltage output type:
Output specification: 0 to 10V DC
Output resistance: Approx. 10Ω
Load resistance: 50KΩ or more

 Specification with 2 outputs:
Output type: Any combination between ON-OFF pulse, output, current output, SSR drive pulse output and voltage output is possible.
Insulation: Non-isolated between 2 outputs
(ON-OFF pulse output type excluded)
Control system: Z, PID

**DISPLAY SPECIFICATIONS**

Display: Segment type LCD (LED backlight)

**GENERAL SPECIFICATIONS**

Rated power voltage: 100 to 240V AC(±10%)
24V AC/DC(±10%)
Rated power supply frequency: 50/60Hz(±2%)

Maximum power consumption:
100 to 240V AC (without option) DB630 100V AC 4VA
24V AC 5VA
100 to 240V AC (with option) DB630 100V AC 4VA
24V AC 4VA
24V AC 3VA
24V AC 2VA
24V DC 30W
24V DC 24W
24V DC 18W
24V DC 12W
24V AC/DC (without option) DB630 24V AC 4VA
DB650 24V AC 4VA
DB670 24V AC 4VA
24V DC 30W
24V DC 24W
24V DC 18W
24V DC 12W
24V AC/DC (with option) DB630 24V AC 7VA
DB650 24V AC 4VA
DB670 24V AC 4VA
24V DC 5W
24V DC 3W
24V DC 1.5W

Countermeasure against power failure:
Store setting contents in non-volatile memory.
(Rewrite: 1 million times)

Insulation resistance:
Between the primary and secondary terminals 20MΩ or more (500V DC)
*Primary terminal: Power terminal (100 to 240V AC) EV1 to 4 output terminals (relay output), ON-OFF pulse output terminal (relay output), ON-OFF servo output terminal (M3,M2,M1)
Secondary terminal: Power terminal (24V AC/DC), all terminals expect primary terminals

Withstand voltage:
Between the primary and secondary terminals 1500V AC (1 minute)
*See “Insulation resistance” for the primary and secondary terminals.

Casing:
Fire-retardant polycarbonate (UL94V-2)

Color:
Gray

Mounting:
Panel mounting type

External dimensions:
DB630 96(W) x 96(H) x 73(D)mm
DB650 48(W) x 96(H) x 73(D)mm
DB670 96(W) x 96(H) x 73(D)mm

Depth from panel surface is 65mm

Weight:
DB630 (Without option) Approx. 120g
DB650 (Without option) Approx. 150g
DB670 (Without option) Approx. 230g

DB630 (With option) Approx. 240g
DB650 (With option) Approx. 330g
DB670 (With option) Approx. 330g

Terminal screw:
M3.0

Engineering port:
DB630 At the bottom of the case
DB650 At the top of the case
DB670 At the top of the case
**REFERENCE OPERATING CONDITIONS**

Ambient temperature: 23°C ± 2°C
Ambient humidity: 55%RH ± 5% (no condensation)
Power voltage: 100VAC ± 1%
Power supply frequency: 50/60Hz ± 0.5%
Mounting orientation: Backward / forward ±3°, laterally ±3°
Installation height: Below 2000m
Vibration: 0m/s²
Shock: 0m/s²
Installation condition: Single panel mounting (space required around)
Wind: None
External noise: None
Warm up time: At least 30 minutes

**NORMAL OPERATING CONDITIONS**

Ambient temperature: -10°C to 50°C (-10°C to 40°C for close installation)
Maximum ambient humidity (ambient temperature -10 to 31°C): 90%RH (no condensation)
Maximum ambient humidity (ambient temperature 31 to 50°C): 90 to 50%RH (no condensation)
*Decreases linearly from 90% RH at 31°C, or to 50% RH at 50°C.*
Minimum ambient humidity: 20%RH
Power voltage: 100 to 240V AC
Vibration: 4.9m/s² or less (10 to 60Hz)
Shock: 0m/s²
Power supply frequency: 50/60Hz ± 2%
Mounting orientation: Backward/forward ±10°, laterally ±10°
Installation height: Below 2000m
Vibration: 0m/s²
Shock: 0m/s²
Installation condition: Panel mounting (space above and below)
External noise: None
Ambient temperature variation ratio: 10°C/hour or less

**TRANSPORT CONDITIONS**

Ambient temperature: -20°C to 60°C
Ambient humidity: 5 to 95%RH (no condensation)
Vibration: 4.9ms² or less (10 to 60Hz)
Shock: 382ms² or less (under factory packing condition)

**STORAGE CONDITIONS**

Ambient temperature: -20°C to 60°C
*+10 to 30°C for long-term storage
Ambient humidity: 5 to 95%RH (no condensation)
Vibration: 0m/s²
Shock: 0m/s² (under factory packing condition)

**STANDARD**

Safety: EN61010-1 (CE marking)
UL61010-1 2nd edition (UL)
CAN/CSA C22.2 No.61010-1(c-UL)
Setup category: CAT.II, pollution degree: 2

EMC applicable: CE marking
EN61326-1 ClassA Table2
EN50113 ClassA Group1
EN61000-3-2 ClassA
EN61000-3-3
*Indication or output value varies by the amount equivalent to ±10% of FS or ±2mV, whichever is larger, during testing.

Structure: Casing protection
IEC60529 IP65 equivalent
(Unapplied for close installation)

**OPTIONS**

Programing Function (option)
Output point: 1 point
Patterns: 4 patterns (Max. 9,999 times repeatable)
Steps: 12 steps /1pattern
Step setup range: Target value --- Input scale range
Ramp rate --- 99.999 to 99.999
Time --- 0 to 999 hours 59 minutes or 0 to 999 minutes 59 seconds
Start temperature: Select either PV start or SV start (arbitrary value settable)
End output: Select either constant value control (setting: -5 to 105%)

Transmission signal output (option for DB630/670)
Output point: 1 point
Output signal: 4 to 20mA DC (load resistance 400Ω or less)
0 to 1V DC (load resistance 50kΩ or more)
0 to 10V DC (load resistance 50kΩ or more)
Accuracy: ±0.3% of full scale
Output updating interval: Approx. 0.1 seconds
Insulation: Non-isolated between the adjustment output 1 and 2
*(ON-OFF pulse output type excluded)*

Remote signal input (option for DB630/670)
Input point: 1 point
Input signal: 4 to 20mA DC (Input impedance Approx. 50Ω)
0 to 1V DC (Input impedance Approx. 500kΩ)
0 to 10V DC (Input impedance Approx. 10kΩ)
Maximum allowable input: DC current ±30mA or less
±1.5V DC or less
DC voltage ±20V DC or less
Accuracy: ±0.3% of full scale ±1digit
Sampling rate: Approx. 0.1 seconds
External signal switch: R/L (Remote/Local)

Communications interface (option)
Type: DB630 / RS485
DB650 / RS422A,RS485
DB670 /
Protocol: MODBUS-RTU, MODBUS-ASCII, Private (used for digital transmission/digital remote input)
Function: Host communication/digital transmission/digital remote input

Alarm specifications (option)
Number of alarm points:
Mechanical Relay : DB630 2 points
DB650/670 4 points
2 digit
Alarm event [E’1 b]: Absolute value alarm, deviation alarm, absolute value deviation alarm, set point alarm, heater disconnection alarm (only for the case adjustment output 1 uses ON-OFF pulse output or SSR drive pulse output), timer1, timer2, FAIL
Status event [E’1 b]: Constant value operation RUN, preset manual, remote input, SV rise, SV fail
Program function:
Step switching, step 4 to 12, RUN, STOP, ADVANCE, RESET, END, SV keep

Heater disconnection detection (option)
Functions: Measure heater current using an external current transformer (CT) to detect disconnection.
Input points: 1 point
Input signals: 5.0-50.0A (50 / 60Hz)
*Specified external current transformer (CT) required
Accuracy: ±5.0% of FS ±1digit

External signal input (option)
Input point: DB630 5 points maximum, COM shared
DB650 7 points maximum, COM shared
DB670 7 points maximum, COM shared
Input signal: No voltage contact
External contact capacity:
5V DC 2mA
Function:
Constant value operation RUN/READY switch,
AUTOMAN switch, preset manual, timer 1, timer 2, alarm event reset, execution No. selection, program/constant value operation switch, program operation RUN/STOP switch, program operation ADVANCE, program operation RESET, program pattern selection
### TERMINAL ARRANGEMENT

#### DB670

<table>
<thead>
<tr>
<th>DB670</th>
<th>Measuring input +</th>
<th>Measuring input A+</th>
<th>Measuring input B+</th>
<th>Measuring input b</th>
<th>Control output 1+</th>
<th>Control output 1-</th>
<th>Control output 2+</th>
<th>Control output 2-</th>
<th>EV1</th>
<th>DI1</th>
<th>EV5</th>
<th>Remote input +</th>
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<td>EV18</td>
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## EXTERNAL DIMENSIONS

### DB670

![DB670 Diagram]

### PANEL CUTOUT

![PANEL CUTOUT Diagram]

### DB650

![DB650 Diagram]

### PANEL CUTOUT

![PANEL CUTOUT Diagram]

### DB630

![DB630 Diagram]

### PANEL CUTOUT

![PANEL CUTOUT Diagram]

Unit: mm

N: Number of mounted Instruments

Specifications subject to change without notice. Printed in Japan (I) 2016. 5