

# JIS

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## JAPANESE INDUSTRIAL STANDARD

Gauge Glasses for Boilers



**JIS**

B 8211-1975  
(Reaffirmed: 1983)



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## JAPANESE STANDARDS ASSOCIATION



JAPANESE INDUSTRIAL STANDARD

J I S

Gauge Glasses for Boilers

B 8211-1975  
(Reaffirmed: 1983)1. Scope

This Japanese Industrial Standard specifies the gauge glasses for boilers, hereinafter referred to as the "gauge glasses".

Remark: The units and numerical values given in { } in this standard are in accordance with the International System of Units (SI), and are appended for reference.

2. Classification

The classification of gauge glasses and the maximum using pressure shall be as given in Table 1.

Table 1

| Classification                    |                     | Symbol of classification | Maximum using pressure <sup>(1)</sup>   |
|-----------------------------------|---------------------|--------------------------|-----------------------------------------|
| Round type                        |                     | T                        | 16 kgf/cm <sup>2</sup> {1.6 MPa} max.   |
| Flat type reflex system           |                     | B                        | 35 kgf/cm <sup>2</sup> {3.5 MPa} max.   |
| Flat type through-vision system   | P <sub>A</sub> type | P <sub>A</sub>           | 60 kgf/cm <sup>2</sup> {6.0 MPa} max.   |
|                                   | P <sub>B</sub> type | P <sub>B</sub>           | 120 kgf/cm <sup>2</sup> {12.0 MPa} max. |
| Circular type through-vision type |                     | C                        | 210 kgf/cm <sup>2</sup> {21.0 MPa} max. |

Note <sup>(1)</sup> Indicated by the maximum using pressure of the boiler to which the gauge glass is mounted.

- Remarks
1. In the case of round type and flat type reflex system, it may exceed the pressure more or less, depending on the agreement between the parties concerned.
  2. To the gauge glasses of flat Type through-vision system and circular type through-vision system, mica shall, as a rule, be used together.
  3. P<sub>A</sub> type of Flat type through-vision system, where it satisfies the specification of Remark of 3.3 (2), may be used at 120 kgf/cm<sup>2</sup>{12.0 MPa} or less.
  4. The usable temperature shall be subjected to the agreement between the parties concerned.

Applicable Standard:

JIS B 0621-Definitions and Designations of Geometrical Deviations

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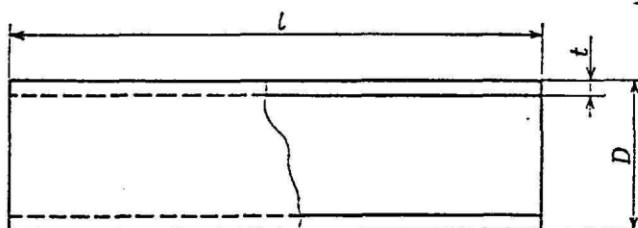
## 3. Shape and Dimensions

3.1 Round Type Gauge Glasses The round type gauge glasses shall be as follows:

- (1) Shape and dimensions shall be as given in Fig. 1.

Fig. 1

Unit: mm



|                                                 |         |     |     |
|-------------------------------------------------|---------|-----|-----|
| Outside diameter (D)<br>(tolerances $\pm 0.5$ ) |         | 16  | 19  |
| Thickness (t)                                   | Maximum | 3.0 | 3.5 |
|                                                 | Minimum | 2.0 | 2.5 |
| Length (l)<br>(tolerances $\pm 1$ )             |         | 160 | 160 |
|                                                 |         | 250 | 250 |
|                                                 |         | 300 | 300 |
|                                                 |         | 350 | 350 |
|                                                 |         | —   | 400 |
|                                                 |         | —   | 450 |
|                                                 |         | —   | 500 |

Remark: Exclusively in the case of supplementary goods for repairing, length other than specified in this table may be used.

- (2) The difference of outside diameters at both ends shall be 0.5 mm or less and the bend be 0.5 mm or less per 300 mm in length.
- (3) The sectional surface shall be practically a true circle.
- (4) Both ends shall be at right angles to the axis and the outside periphery shall be free from sharp corners.

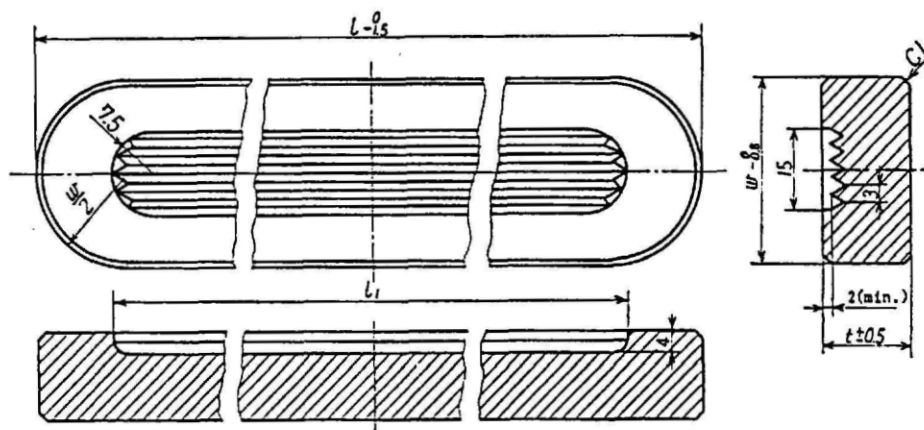
3.2 Flat Type Reflex System Gauge Glasses The flat type reflex system gauge glasses shall be as follows:

- (1) Shape and dimensions shall be as given in Fig. 2.

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Fig. 2

Unit: mm



Unit: mm

| Nominal number | B165 | B220 | B250 | B280 | B320 | B340 |
|----------------|------|------|------|------|------|------|
| $l$            | 165  | 220  | 250  | 280  | 320  | 340  |
| $l_1$          | 137  | 192  | 222  | 252  | 292  | 312  |
| $w$            | 34   | 34   | 34   | 34   | 34   | 34   |
| $t$            | 17   | 17   | 17   | 17   | 17   | 17   |

Remark: The nominal number shall be expressed by the symbol of classification and length of  $l$ .

- (2) The sum of parallelism and flatness of surface and seat surface shall be 0.4 mm or less.  
Further, the definitions and designations of parallelism and flatness shall be in accordance with JIS B 0621.
- (3) The surface shall be finished by polishing, and the surface in contact with boiler water shall be smooth as cast surface or finished surface.
- (4) The groove parts shall reflect uniformly and perfectly the beam of light, and indicate clearly the water level.

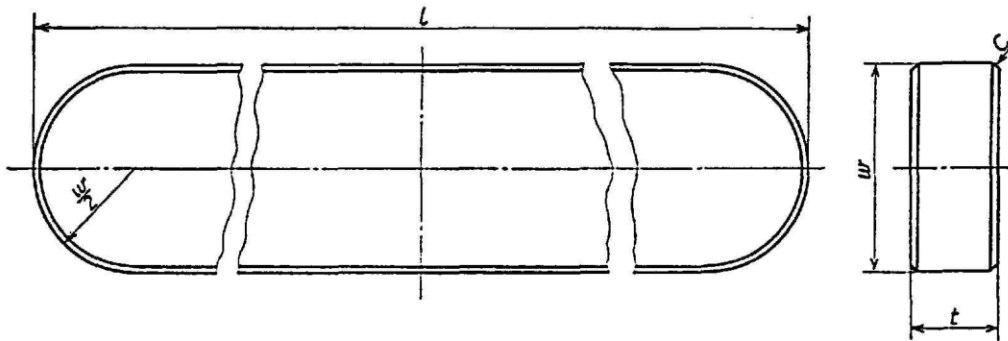
**3.3 Flat Type Through-Vision System Gauge Glasses** The flat type through-vision system gauge glasses shall be as follows:

- (1) The shape and dimensions shall be as given in Fig. 3.

## JAPANESE STANDARDS ASSOCIATION

Fig. 3

Unit: mm



| Classification<br>Nominal number | P <sub>A</sub> type |                    |                    |                    | P <sub>B</sub> type |                    |                    |                    |
|----------------------------------|---------------------|--------------------|--------------------|--------------------|---------------------|--------------------|--------------------|--------------------|
|                                  | P <sub>A</sub> 250  | P <sub>A</sub> 280 | P <sub>A</sub> 320 | P <sub>A</sub> 340 | P <sub>B</sub> 235  | P <sub>B</sub> 265 | P <sub>B</sub> 305 | P <sub>B</sub> 325 |
| $l$                              | 250                 | 280                | 320                | 340                | 235                 | 265                | 305                | 325                |
| $w$                              | 34                  | 34                 | 34                 | 34                 | 22                  | 22                 | 22                 | 22                 |
| $t$                              | 17                  | 17                 | 17                 | 17                 | 17                  | 17                 | 17                 | 17                 |
| $c$                              | 1                   | 1                  | 1                  | 1                  | 0.8                 | 0.8                | 0.8                | 0.8                |

Remark: The nominal number shall be expressed by the symbol of classification and the length of  $l$ .

- (2) Tolerances of dimensions and the sum of parallelism and flatness shall be as given in Table 2.  
Further, the definitions and designations of parallelism and flatness shall be in accordance with JIS B 0621.

Table 2

Unit: mm

| Classification<br>Symbol        | P <sub>A</sub> type | P <sub>B</sub> type |
|---------------------------------|---------------------|---------------------|
| $l$                             | 0<br>-1.5           | 0<br>-0.5           |
| $w$                             | 0<br>-0.8           | 0<br>-0.4           |
| $t$                             | ±0.5                | 0<br>-0.1           |
| Sum of parallelism and flatness | 0.2 max.            | 0.05 max.           |

Remark: In the case where P<sub>A</sub> type is used at a pressure exceeding 60 kgf/cm<sup>2</sup>{6.0 MPa}, the tolerance of dimension and the sum of parallelism and flatness shall be the same as those for P<sub>B</sub> Type.

# JAPANESE STANDARDS ASSOCIATION

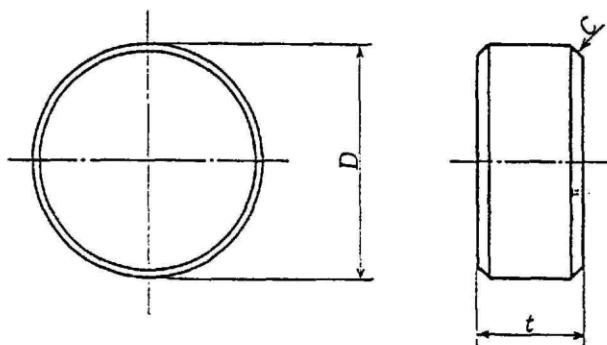
- (3) The perspective surfaces of  $P_A$  type and  $P_B$  type shall be finished by polishing.

3.4 Circular Type Through-Vision System Gauge Glasses The circular type through-vision system gauge glasses shall be as follows:

- (1) Shape and dimensions shall be as given in Fig. 4.

Fig. 4

Unit: mm



| Nominal number | C 34 | (C 33.5) |
|----------------|------|----------|
| $D$            | 34   | 33.5     |
| $t$            | 17   | 14       |
| $c$            | 0.8  | 0.8      |

Remarks 1. Because C 33.5 will be abolished in future, it shall not be used for new design.

2. The nominal number shall be expressed by symbol of classification and the outside diameter ( $D$ ).

- (2) Tolerances of dimensions and the sum of parallelism and flatness shall be as given in Table 3.

Further, the definitions and designations of parallelism and flatness shall be in accordance with JIS B 0621.

## JAPANESE STANDARDS ASSOCIATION

Table 3

Unit: mm

| Symbol \ Nominal number         | C 34<br>(C 33.5) |
|---------------------------------|------------------|
| $D$                             | 0<br>-0.4        |
| $t$                             | ±0.1             |
| Sum of parallelism and flatness | 0.05 max.        |

Remark: Because C 33.5 will be abolished in future, it shall not be used for new design.

- (3) The perspective surface shall be finished by polishing.

#### 4. Inspection and Tests

4.1 Appearance and Dimensions The dimension of each part of gauge glass shall comply with the specifications of 3., and each part shall have such transparency acceptable for practical use and be free from harmful flaws and foreign matters.

Further in flat type reflex system, flat type through-vision system and circular type through-vision system, bubbles and striae shall comply with the following specifications:

##### (1) Bubbles

- (a) Bubbles exceeding 0.5 mm up to 1 mm incl. in mean diameter shall be not more than 2 per 1 cm<sup>2</sup> of perspective surface. However, bubbles of 0.2 to 0.5 mm shall not aggregate closely.
- (b) Bubbles exceeding 1 mm up to 2 mm incl. in average diameter shall have a mutual linear distance of not less than 50 mm.
- (c) There shall not be bubbles exceeding 2 mm in average diameter.

- (2) Striae The striae shall be within the range not harmful to practical use, and in flat type reflex system and flat type through-vision system more or less bubbles may exist in longitudinal direction but shall not exist in lateral direction.

4.2 Hydraulic, Rapid Heating and Quenching and Corrosion Tests The materials of gauge glass shall comply with specifications of Table 4 and Table 5.

## JAPANESE STANDARDS ASSOCIATION

Table 4

|                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Classification of gauge glasses                                   | Round type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Flat type reflex system<br>Flat type through-vision system<br>Circular type through-vision system                                                                                                                                                                                                    |
| Pressure resistance (hydraulic test) (kgf/cm <sup>2</sup> or MPa) | Shall withstand hydraulic pressure of 2.0 times the respective maximum using pressure in Table 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                      |
| Heat resistance (rapid heating and quenching test)                | Throw into glycerol at 190°C, heat it for 5 min then throw vertically into water at 10°C to quench it. It shall not be damaged.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Throw into glycerol at 180°C, heat for 5 min, then throw vertically into water at 10°C to quench it. It shall not be damaged. Further, heat gradually from ordinary temperature to saturation temperature under the maximum using pressure and then air-cool in atmosphere. It shall not be damaged. |
| Corrosion resistance (corrosion test)                             | By using an autoclave, hang down the sample vertically into caustic soda solution of 300 mg/l in concentration (for round type, 1000 mg/l) to immerse completely, let it reach the test pressure specified in Table 5 gradually in about 1 h and 30 min and under the pressure after heating 5 h, cool to become atmospheric pressure, thereafter take out the sample, lightly wash with water and thereafter the surface shall be free from cloudiness for practical use and the decrease of mass per 1 cm <sup>2</sup> of sample surface area shall be not more than the value specified in Table 5. In this test, the caustic soda solution shall be 5 ml per 1 cm <sup>2</sup> of sample surface area and be put into a carbon steel vessel. |                                                                                                                                                                                                                                                                                                      |

Table 5

| Classification                      | Test pressure<br>kgf/cm <sup>2</sup> {MPa} | Decrease of mass<br>mg/cm <sup>2</sup> |
|-------------------------------------|--------------------------------------------|----------------------------------------|
| Round type                          | 35{3.5}                                    | 10.0                                   |
| Flat type reflex system             | 35{3.5}                                    | 4.5                                    |
| Flat type through-vision system     | 50{5.0}                                    | 7.0                                    |
| Circular type through-vision system |                                            |                                        |

Remark: The hydraulic test and rapid heating and quenching test shall be carried out on the product itself and the corrosion test may be carried out, as required, on a piece cut to a suitable size.

## JAPANESE STANDARDS ASSOCIATION

4.3 Delivery Test The delivery test shall be carried out based on 4.1 and 4.2 according to agreement between the parties concerned. However, when this delivery test is omitted, the manufacturer shall offer the substitutive test results.

### 5. Marking

The gauge glasses shall be packaged according to a suitable method, and the following items shall be marked on the body or packaging:

- (1) Classification and size (outside diameter x length) or nominal number [symbol and size (for flat type gauge glasses, the length and for circular type gauge glasses, the outside diameter)]

|                                     |                                        |                                        |
|-------------------------------------|----------------------------------------|----------------------------------------|
| Example: 1. Round type              | T 16 x 160                             | Example: 2. T 16 x 160                 |
| Flat type reflex system             | B 165                                  | B 165                                  |
| Flat type through-vision system     | P <sub>A</sub> 250, P <sub>B</sub> 235 | P <sub>A</sub> 250, P <sub>B</sub> 235 |
| Circular type through-vision system | C 34                                   | C 34                                   |

- (2) Manufacturer's name or its abbreviation