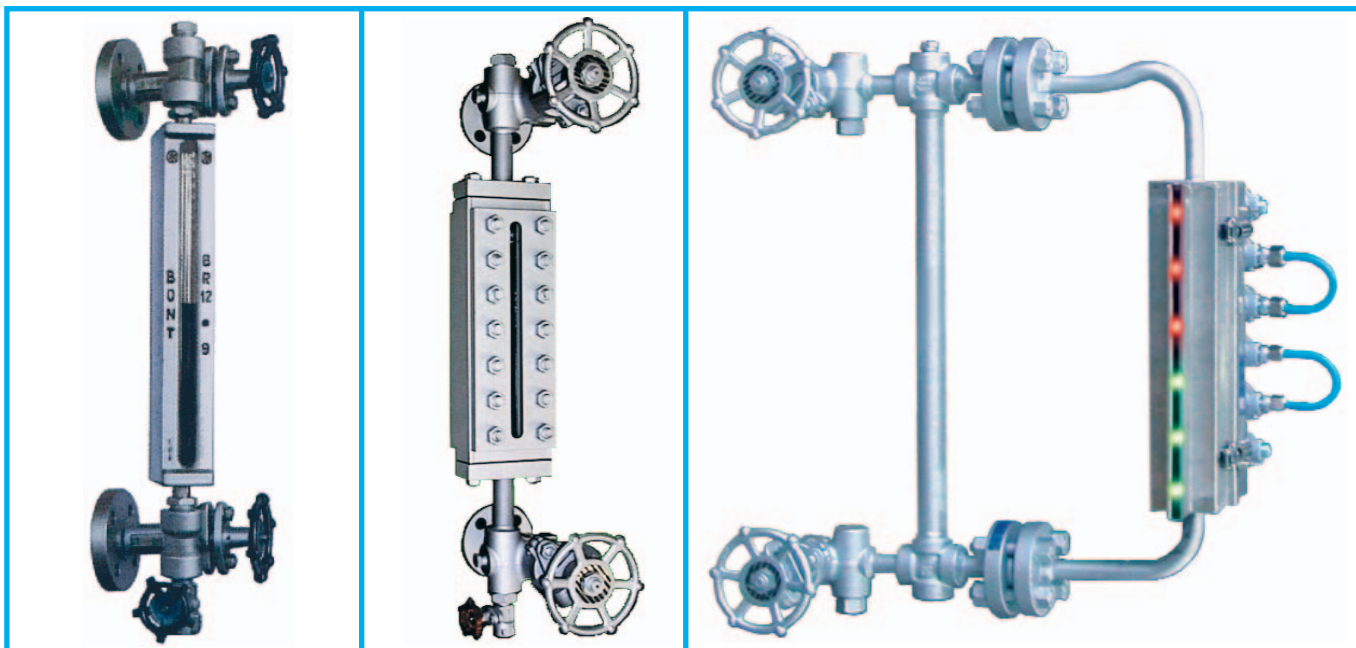


BONETTI®



BONT® GLASS LEVEL GAUGES

- Reflex
- Transparent
- Bicolour

BONT® Glass Level Gauges

General information

CESARE BONETTI Company has been manufacturing level gauges since their origin. This product has been our industrial speciality in Italy and all over the world since the twenties.

This catalogue describes our glass level gauges, whereas our magnetic level gauges are shown in a separate bulletin.

When you only state the operating conditions, namely:

- fluid
- working pressure
- working temperature

we are able to supply the most suitable level gauge from both the points of view functionality and price.

There are three basic types of glass level gauges:

- reflex
- transparent
- bicolour.

BONT reflex level gauges (Fig. 701)

Working principle:

The liquid level is distinguished by the different brightness of the reflex glass in the water or in the steam space. In fact, where there is liquid in contact with the glass, the incidental light is refracted to the inside of the gauge and absorbed; in the steam space, the incidental light is reflected against the glass grooves and the glass appears very bright (Fig. 701).

Applications:

Reflex level gauges can be used in most of application and offer great advantages in terms of:

- low initial cost
- low operating cost
- easy level reading

Reflex level gauges cannot be used in certain cases as for example:

- when the separation level between two liquids has to be read (interface);
- when besides the level indication, the observation of the liquid colour is required;
- when the process fluid is high-pressure water steam, since in this case the glass must be protected from the solvent action of the boiler water by using mica shields;
- when the process fluid is such that can corrode the glass (e.g. high temperature alkaline solutions or hydrofluoric acid), since mica shields or Polytrifluorochloroethylene shields must be used to protect the glass.

BONT transparent level gauges (Fig. 702 and 703)

Working principle:

Apart from glass tube level gauges, transparent level gauges are always fitted with two plate transparent glasses between which the fluid is contained. The fluid level is indicated as the result of the different transparency of the two media (Fig. 702) and in some cases (for water steam), by conveying upwards on to the surface of separation (between liquid and gaseous substances) a source of light (Fig. 703) located at the back of the gauge, the rays of which are totally reflected down to the observer.

Applications:

Transparent level gauges are suitable for almost all installations. In fact they permit:

- the use of mica shields or Polytrifluorochloroethylene shields to protect the glass from the corrosive action of the process fluid;
- the observation of interface;
- the observation of the liquid colour.

BONT bicolour level gauges (Fig. 704)

Working principle:

The two opposite glasses fitted into these bicolour level gauges are not parallel to each other. By means of a suitable illuminator into which a red and a green screens are fitted,

- the portion of visible length occupied by steam appears red whereas

- the portion of visible length occupied by water appears green.

The level reading is very easy even at a considerable distance.

The reading of the bicolour level gauges is not affected by the blind spaces between one port-hole and the successive one (Fig. 704). Details on page 224-25.

Applications:

Their main application is on high pressure steam boilers.

BONT bicolour level gauges with parallel glasses (Fig. 812)

Working principle:

It is a variation of transparent level gauges, however equipped with two reflex glasses and a back illuminator, fitted with suitable coloured filters. The sharp reading is given by the contrast between the bright colour (usually: red) of filters in the lower part containing liquid and the colour of upper part of visible window (Fig. 812).

Applications:

These level gauges are particularly suitable for liquids:

- colourless,
- very fluid,
- non-corrosive for glasses (e.g. ammoniacal solutions, trichloroethylene, water steam up to 32 bar, etc.).

Remote Reading Level Gauges, type ITT-RDR

Now these level gauges are not frequently requested because Magnetic Remote Reading Level Gauges are preferred (specific bulletin on request).

Nevertheless they are appreciated and we still produce them.

The system includes: drum connections, condensate pot, downward connection pipes, operating device, down gauge body.

Usually bodies type BT29 or BT33 are used.

Further details on request.

Request of Offer and Order

The above descriptions are given as general information on the possible uses of BONT level gauges.

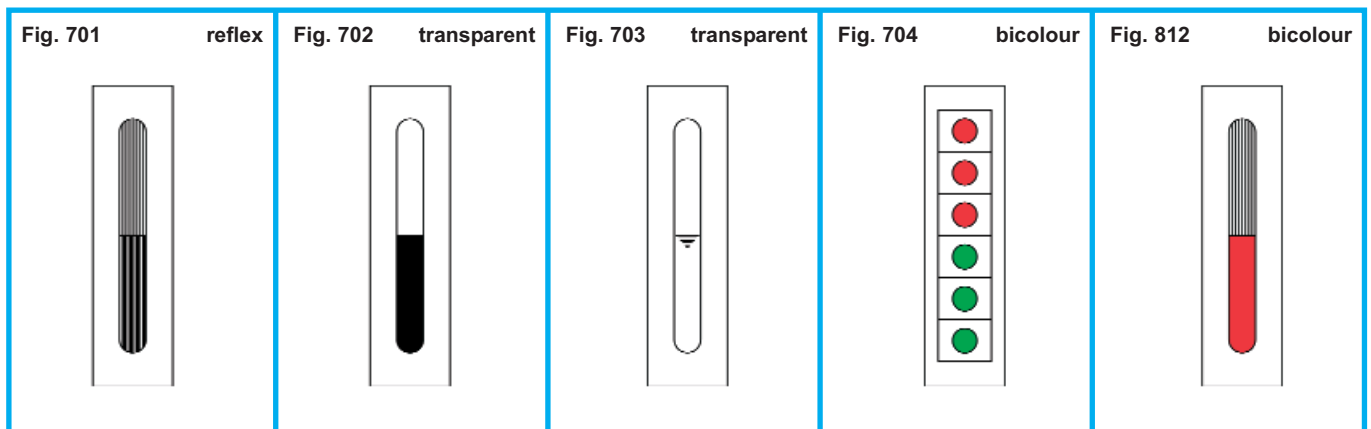
However the characteristics of the plant by same performances should guide the planner towards a well defined type of level gauge, that is most suitable for the purpose.

Guide elements can be:

- pressure, temperature, colour, viscosity, density, corrosion power of the process fluid,
- environmental conditions as dangerous area, indoor or outdoor, corroding atmosphere, etc.

Therefore when enquiring about level gauges or when placing order the following information must be supplied:

- type of the process fluid
- maximum working pressure
- maximum working temperature
- centre to centre distance between the vessel connections (or visible length required)
- type of connections (flanged, threaded, etc.) and standard (UNI, ASME, BS, DIN, AFNOR, GOST, etc.) according to which they are required
- optionals requested: see
 - page 27 for shut-off valves
 - page 37 for gauges bodies.

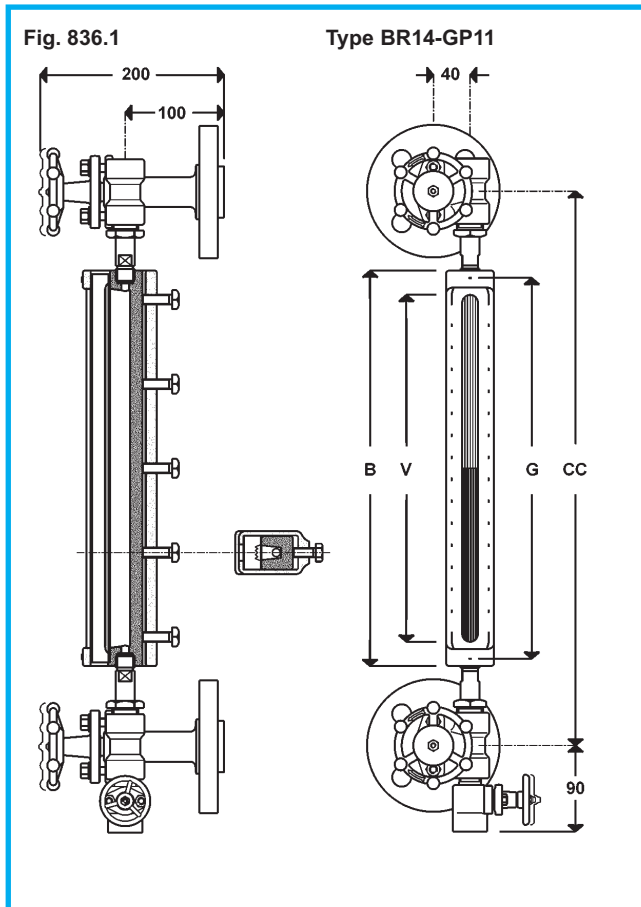


| Fig. 706 Material Schedule | Body and wetted pieces | Trim of shut-off valves (Remark 8) | Remarks | Application |
|----------------------------------|--|--|---|--|
| 51 | Forged carbon steel | Stainless steel | | |
| 52 | Forged carbon steel | Stainless steel | Exclusion of copper, silver and their alloys | General purpose |
| 55 | Forged carbon steel ASTM A350 LF2 | Stainless steel AISI 316 | Exclusion of copper, silver and their alloys | Non corrosive fluids at low temperature up to -45,6 °C (-50 °F) |
| 61 | Forged stainless steel AISI 304 | Stainless steel AISI 316 | External not wetted parts of stainless steel AISI 304 | Corrosive fluids and/or fluids at temperature lower than -45,6 °C (-50 °F) |
| 62 | Forged stainless steel AISI 304 | Stainless steel AISI 316 | External not wetted parts of carbon steel. Exclusion of copper, silver and their alloys. | Corrosive fluids |
| 63 | Forged stainless steel AISI 316 | Stainless steel AISI 316 | External not wetted parts of stainless steel AISI 304 | Corrosive fluids and/or fluids at temperature lower than -45,6 °C (-50 °F) |
| 64 | Forged stainless steel AISI 316 | Stainless steel AISI 316 | External not wetted parts of carbon steel. Exclusion of copper, silver and their alloys. | Corrosive fluids |
| SPECIAL | For some types of level gauges we have normally available components made of different nuances of AISI 316, Monel 400 (ASTM B164 - Class A), Hastelloy B, Hastelloy C, Incoloy 825, Carpenter 20 CB 3, Nickel, Titanium, Ebonite, PVC, Polypropylene, PTFE. Apply to us for other materials. | | | |

- 1 The tag indicating the type of the level gauge consists of two parts that define:
 - the type of the level gauge body
 - the type of the set of valves.
- 2 The level gauges having their tag followed by a "Z" are special constructions. They are suitable for operating conditions different than the ones shown in Fig. 864 for the corresponding standard type.
- 3 The nominal passage diameter in the BONT level gauges is 10 mm, if not otherwise indicated. Only the gauge bodies type BR25 and BT25 have a "large chamber" with 40 mm inside diameter and are usually used where the medium boils or surges.
- 4 The ASME ratings and the operating conditions shown in Fig. 864 refer to size 9. For smaller sizes the operating conditions can be higher. See diagrams on each description page or apply to us.
- 5 The classification shown in the column «ASME ratings» could be modified by temperature operating condition, due to the maximum limit temperature suitable for the glass according DIN 7081/199-05. As shown in the Table of Fig. 864 the maximum operating conditions are generally higher than those of ASME rating. Apply to us for further information.
- 6 The ASME ratings and the operating conditions shown in Fig. 864 refer to standard materials as carbon steel, stainless steel, Hastelloy and to standard glass joints. When special materials (Monel, Nickel, Ebonite, PVC, etc.) and/or special joints (pure PTFE, Kel-F, etc.) are required, the maximum operating conditions have to be verified.
- 7 In Fig. 706 are indicated the main Material schedules currently manufactured.
Boldface are given the ones of major diffusion.

- 8 In Fig. 706 is indicated the material of the piston for the set of valves type GP11 and GP12.
For a detailed list of material currently employed on shut-off valves, refer to tables shown on the pages illustrating the level gauges valves (from page 27 to page 33)
- 9 For type BR13-G51, the ASME rating is an indication only.
- 10 Types BR26, BR27, BT26, BT27 are manufactured for ASME 600 rating. Anyway the operating conditions must take into consideration the vessel project, the welding difficulties on the vessel of the level gauge body and especially that there are no shut-off fittings.
- 11 The type BTV-GP11 is equipped with a glass transparent tube. Because of its brittleness this level gauge can be used with dangerless fluids only, although in presence of glass protector.
- 12 In case the level gauge must be fitted directly on a steam boiler drum, please state it clearly.
- 13 **Most of Figures show the level gauges fitted with the Sets type GP11, GP12 (Fig. 834 page 29). They can also be fitted with Sets G41, G42, GS41, GS42 (see pages 30 and 31). In the latter case the level gauges identification tag changes after the hyphen, e.g. from BR24-GP11 to BR24-G41. The maximum operating conditions, ratings and applications are a function of the gauge body, therefore Fig. 864 and 706 are still valid.**
- 14 In case of fluid corrosive for the glass, please refer to our Technical department to define maximum allowable temperature and glass protection.

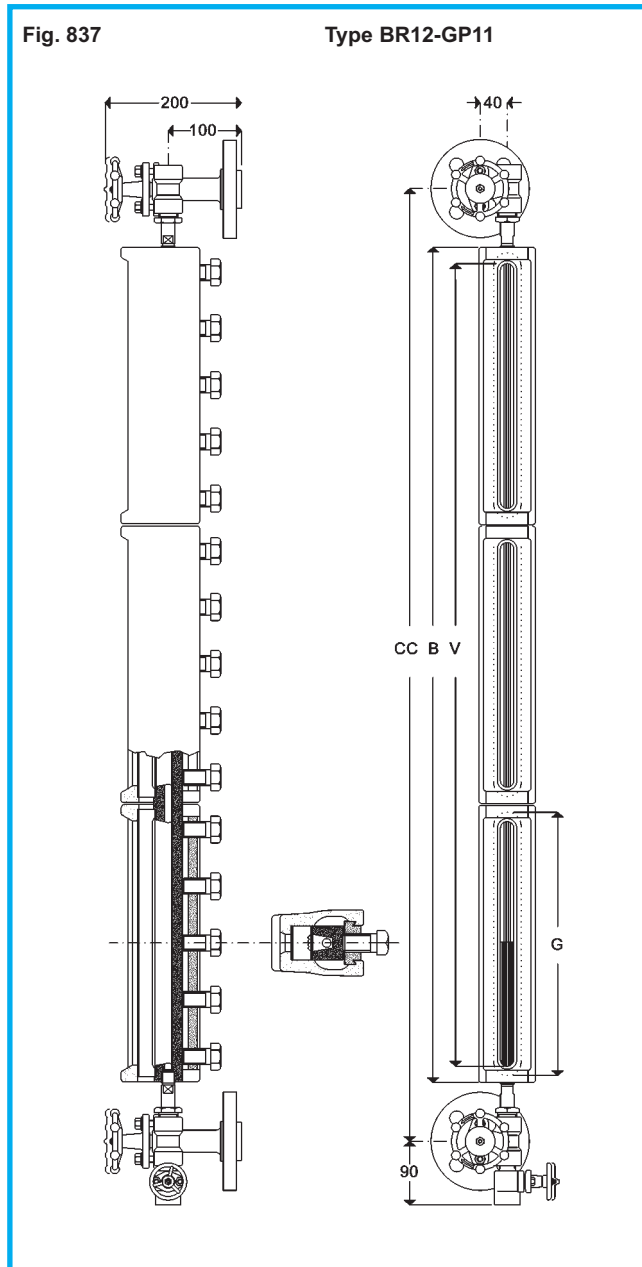
Reflex **BONT**® Level Gauges type BR14 with GP11 and G11 valves



| Size | Length of glass G | length of body B | Visible length V | CC min with GP11 G | CC min. with G11 kg | Weight |
|------|----------------------|---------------------|---------------------|-----------------------|------------------------|--------|
| 3 | 165 | 178 | 145 | 291 | 279 | 9,0 |
| 4 | 190 | 203 | 170 | 316 | 304 | 9,4 |
| 5 | 220 | 233 | 200 | 346 | 334 | 9,8 |
| 6 | 250 | 263 | 230 | 376 | 364 | 10,3 |
| 7 | 280 | 293 | 260 | 406 | 394 | 10,8 |
| 8 | 320 | 333 | 300 | 446 | 434 | 11,3 |
| 9 | 340 | 353 | 320 | 466 | 454 | 11,7 |

- Connections between gauge and valves are made by end tubes and stuffing boxes.
- According to the position of the shut-off valves compared with the gauge body, the level gauge is named "right-handed" or "left-handed". Fig. 836.1 shows a left-handed gauge. Each level gauge can be assembled right-handed or left-handed. Usually two level gauges (1 right and 1 left) are installed on steam vessels.
- According to some Steam Boiler Regulations, the visible length of the level gauges installed on steam boilers must be not shorter than a fixed length. Therefore the suitability of the smaller sizes must be checked.
- When ordering a level gauge please state:
 - Centre to centre distance between connections (CC)
 - Standard, Size and Finishing of connections
 - Whether right-handed or left-handed.
- Flanges are finished to customer prescriptions. Please state:
 - Standard
 - Size
 - Pressure class
 - Finishing
The inside passage through the gauge is 10 mm.
- Instead of flanges, connections can be delivered with threaded ends. Standard is 3/4" NPT, union. Other Standard and size on request.
- BR14 gauges are fitted with reflex glasses type A (see page 38).
- Operating conditions and material schedules on pages 4 and 5.
- Applicable optionals and bolting torques on pages 27, 36, 37.

Reflex **BONT**® Level Gauges type BR12 with GP11, GP12, G11 and G12 valves



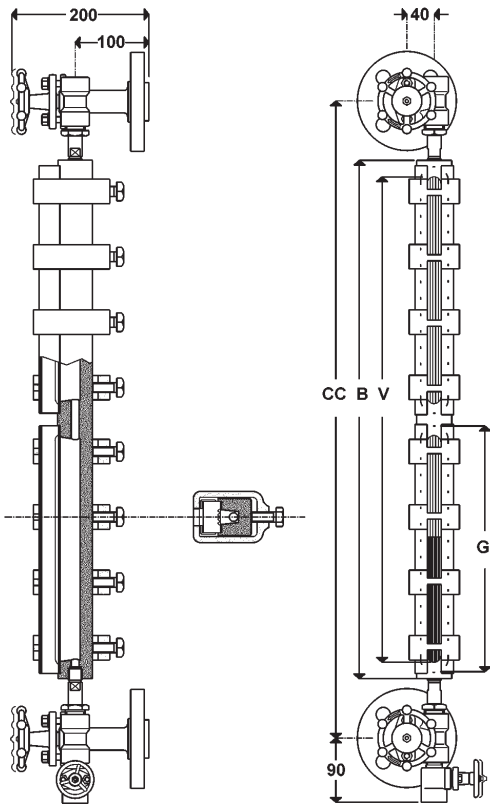
| Size | length of glass G | length of body B | Visible length V | CC min. with GP11 | CC min. with GP12 | CC min. with G11 | CC min. with G12 | Weight kg |
|------|-------------------|------------------|------------------|-------------------|-------------------|------------------|------------------|-----------|
| 1 | 115 | 128 | 95 | 241 | 209 | 229 | 178 | 11,7 |
| 2 | 140 | 153 | 120 | 266 | 234 | 254 | 203 | 12,1 |
| 3 | 165 | 178 | 145 | 291 | 259 | 279 | 228 | 12,9 |
| 4 | 190 | 203 | 170 | 316 | 284 | 304 | 253 | 13,3 |
| 5 | 220 | 233 | 200 | 346 | 314 | 334 | 283 | 14,1 |
| 6 | 250 | 263 | 230 | 376 | 344 | 364 | 313 | 15 |
| 7 | 280 | 293 | 260 | 406 | 374 | 394 | 343 | 15,5 |
| 8 | 320 | 333 | 300 | 446 | 414 | 434 | 383 | 16,5 |
| 9 | 340 | 353 | 320 | 466 | 434 | 454 | 403 | 17,2 |
| 2x4 | 190 | 413 | 380 | 526 | 494 | 514 | 463 | 18,2 |
| 2x5 | 220 | 473 | 440 | 586 | 554 | 574 | 523 | 19,8 |
| 2x6 | 250 | 533 | 500 | 646 | 614 | 634 | 583 | 21,7 |
| 2x7 | 280 | 593 | 560 | 706 | 674 | 694 | 643 | 22,6 |
| 2x8 | 320 | 673 | 640 | 786 | 754 | 774 | 723 | 24,6 |
| 2x9 | 340 | 713 | 680 | 826 | 794 | 814 | 763 | 26 |
| 3x6 | 250 | 803 | 770 | 916 | 884 | 904 | 853 | 28,4 |
| 3x7 | 280 | 893 | 860 | 1006 | 974 | 994 | 943 | 29,8 |
| 3x8 | 320 | 1013 | 980 | 1126 | 1094 | 1114 | 1063 | 32,8 |
| 3x9 | 340 | 1073 | 1040 | 1186 | 1154 | 1174 | 1123 | 34,9 |
| 4x7 | 280 | 1193 | 1160 | 1306 | 1274 | 1294 | 1243 | 36,9 |
| 4x8 | 320 | 1353 | 1320 | 1466 | 1434 | 1454 | 1403 | 40,9 |
| 4x9 | 340 | 1433 | 1400 | 1546 | 1514 | 1534 | 1483 | 43,7 |
| 5x7 | 280 | 1493 | 1460 | 1606 | 1574 | 1594 | 1543 | 44,3 |
| 5x8 | 320 | 1693 | 1660 | 1806 | 1774 | 1794 | 1743 | 49,1 |
| 5x9 | 340 | 1793 | 1760 | 1906 | 1874 | 1894 | 1843 | 52,6 |
| 6x8 | 320 | 2033 | 2000 | 2146 | 2114 | 2134 | 2083 | 57,2 |
| 6x9 | 340 | 2153 | 2120 | 2266 | 2234 | 2254 | 2203 | 61,4 |
| 7x9 | 340 | 2513 | 2480 | 2626 | 2594 | 2614 | 2563 | 70,3 |

- Connections between gauge and valves are made:
 - for **BR12** with **GP11** or **G11**, by end tubes and stuffing boxes
 - for **BR12** with **GP12** or **G12**, by NPT screwed nipples.
- According to the position of the shut-off valves compared with the gauge body, the level gauge is named "right-handed" or "left-handed". Fig. 837 shows a left-handed gauge. Each level gauge can be assembled right-handed or left-handed. Usually two level gauges (1 right and 1 left) are installed on steam vessels.
- According to some Steam Boiler Regulations, the visible length of the level gauges installed on steam boilers must be not shorter than a fixed length. Therefore the suitability of the smaller sizes must be checked.
- When ordering a level gauge please state:
 - Centre to centre distance between connections (CC)
 - Standard, Size and Finishing of connections
 - Whether right-handed or left-handed.
- Flanges are finished to customer prescriptions. Please state:
 - Standard
 - Size
 - Pressure class
 - Finishing
 The inside passage through the gauge is 10 mm.
- Instead of flanges, connections can be delivered with threaded ends. Standard is 3/4" NPT, union. Other Standard and size on request.
- BR12 gauges are fitted with reflex glasses type A (see page 38).
- Operating conditions and material schedules on pages 4 and 5.
- Applicable optionals and bolting torques on pages 27, 36, 37.
- Gauge bodies without valves can be supplied:
 - end connected (threaded or flanged)
 - side connected (threaded or flanged)
 - back connected (threaded or flanged).
 Please state connecting dimensions and Standard.

Reflex **BONT**® Level Gauges type BR22 with GP11, GP12, G41/42 and GS41/42 valves

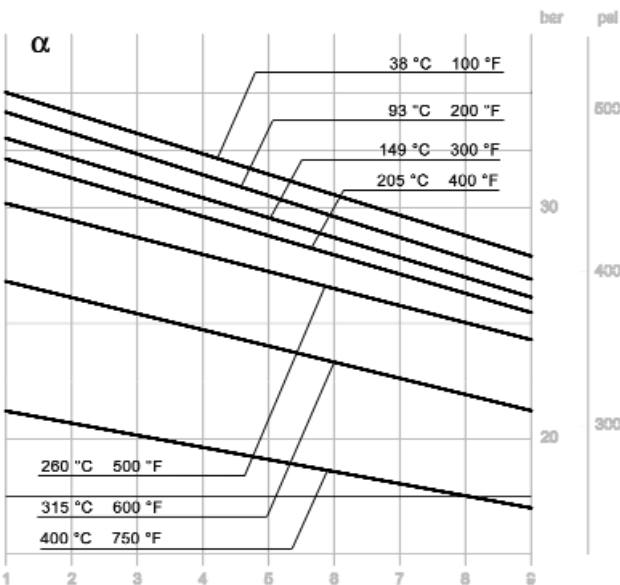
Fig. 838.1

Type BR22-GP11



| Size | length of glass G | length of body B | Visible length V | CC minimum | | Weight kg | CC min. Weight G & GS 41 & 42 kg | |
|------|-------------------|------------------|------------------|------------|------|-----------|----------------------------------|------|
| | | | | GP11 | GP12 | | G & GS | kg |
| 1 | 115 | 128 | 95 | 241 | 209 | 10,0 | 218 | 15,0 |
| 2 | 140 | 153 | 120 | 266 | 234 | 10,3 | 243 | 15,7 |
| 3 | 165 | 178 | 145 | 291 | 259 | 10,8 | 268 | 16,2 |
| 4 | 190 | 203 | 170 | 316 | 284 | 11,1 | 293 | 16,5 |
| 5 | 220 | 233 | 200 | 346 | 314 | 11,3 | 323 | 16,7 |
| 6 | 250 | 263 | 230 | 376 | 344 | 12,0 | 353 | 17,4 |
| 7 | 280 | 293 | 260 | 406 | 374 | 12,2 | 383 | 17,6 |
| 8 | 320 | 333 | 300 | 446 | 414 | 12,8 | 423 | 18,2 |
| 9 | 340 | 353 | 320 | 466 | 434 | 13,0 | 443 | 18,4 |
| 2x4 | 190 | 413 | 380 | 526 | 494 | 13,9 | 503 | 19,3 |
| 2x5 | 220 | 473 | 440 | 586 | 554 | 14,4 | 563 | 19,8 |
| 2x6 | 250 | 533 | 500 | 646 | 614 | 15,7 | 623 | 21,1 |
| 2x7 | 280 | 593 | 560 | 706 | 674 | 16,1 | 683 | 21,5 |
| 2x8 | 320 | 673 | 640 | 786 | 754 | 17,4 | 763 | 22,8 |
| 2x9 | 340 | 713 | 680 | 826 | 794 | 17,8 | 803 | 23,2 |
| 3x6 | 250 | 803 | 770 | 916 | 884 | 19,4 | 893 | 24,8 |
| 3x7 | 280 | 893 | 860 | 1006 | 974 | 20,0 | 983 | 25,4 |
| 3x8 | 320 | 1013 | 980 | 1126 | 1094 | 21,9 | 1103 | 27,3 |
| 3x9 | 340 | 1073 | 1040 | 1186 | 1154 | 22,5 | 1163 | 27,9 |
| 4x7 | 280 | 1193 | 1160 | 1306 | 1274 | 23,9 | 1283 | 29,3 |
| 4x8 | 320 | 1353 | 1320 | 1466 | 1434 | 26,5 | 1443 | 31,9 |
| 4x9 | 340 | 1433 | 1400 | 1546 | 1514 | 27,3 | 1523 | 32,7 |
| 5x7 | 280 | 1493 | 1460 | 1606 | 1574 | 27,8 | 1583 | 33,2 |
| 5x8 | 320 | 1693 | 1660 | 1806 | 1774 | 31,0 | 1783 | 36,4 |
| 5x9 | 340 | 1793 | 1760 | 1906 | 1874 | 32,0 | 1883 | 37,4 |
| 6x8 | 320 | 2033 | 2000 | 2146 | 2114 | 35,6 | 2123 | 41,0 |
| 6x9 | 340 | 2153 | 2120 | 2266 | 2234 | 36,8 | 2243 | 42,2 |
| 7x9 | 340 | 2513 | 2480 | 2626 | 2594 | 41,5 | 2603 | 46,9 |

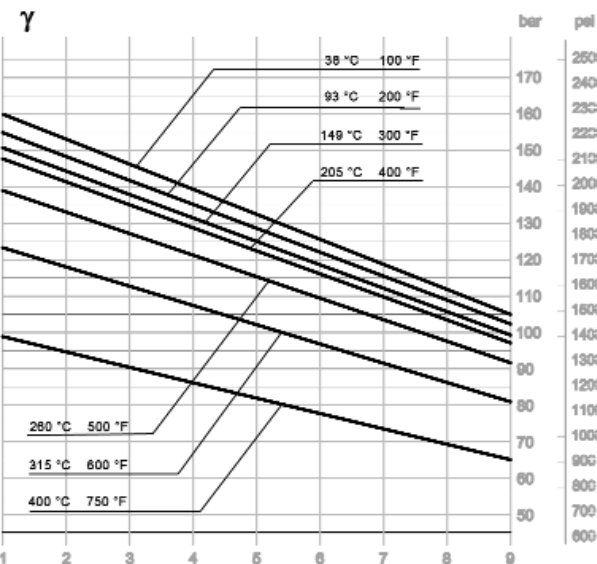
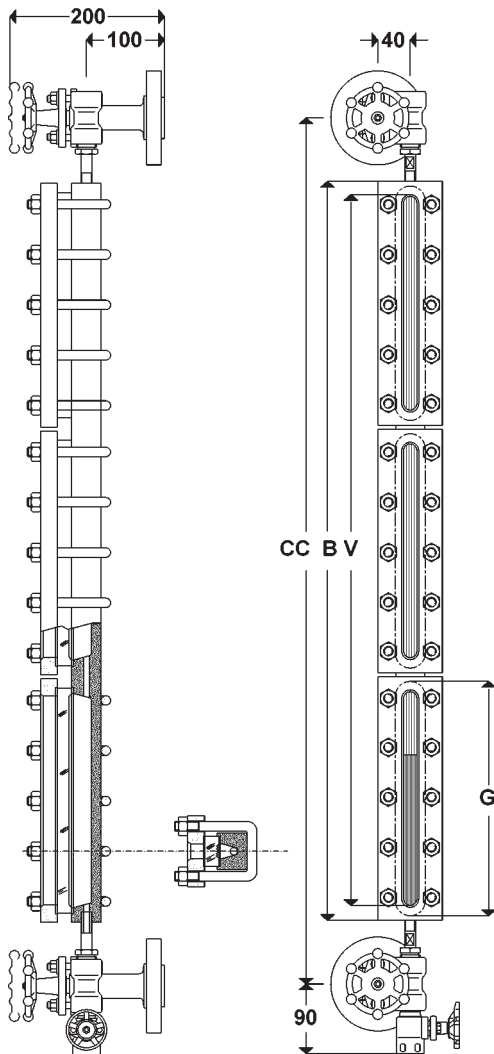
- Connections between gauge and valves are made
 - for **BR22-GP11**, by end tubes and stuffing boxes
 - for **BR22-GP12**, by NPT screwed nipples
 - for **BR22-G41/42 & GS41/42**, by NPT screwed nipples.
 Minimum CC distance, shown on table is referred to 1/2" NPT connections.
 On request 3/4" NPT connection can be supplied.
- According to the position of the shut-off valves compared with the gauge body, the level gauge is named "right-handed" or "left-handed". Fig. 838.1 shows a left-handed gauge. Each level gauge can be assembled right-handed or left-handed. Usually two level gauges (1 right and 1 left) are installed on steam vessels.
- According to some Steam Boiler Regulations, the visible length of the level gauges installed on steam boilers must be not shorter than a fixed length. Therefore the suitability of the smaller sizes must be checked.
- When ordering a level gauge please state:
 - Centre to centre distance between connections (CC)
 - Standard, Size and Finishing of connections
 - Whether right-handed or left-handed.
- Flanges are finished to customer prescriptions. Please state:
 - Standard
 - Size
 - Pressure class
 - Finishing
 The inside passage through the gauge is 10 mm.
- Instead of flanges, connections can be delivered with threaded ends. Standard is 3/4" NPT, union. Other Standard and size on request.
- BR22 gauges are fitted with reflex glasses type B (see page 38).
- Operating conditions and material schedules on pages 4 and 5. Graph below shows rating for size 9 and smaller, combined included.
- Applicable optionals and bolting torques on pages 27, 36, 37..
- Gauge bodies without valves can be supplied:
 - end connected (threaded or flanged)
 - side connected (threaded or flanged)
 - back connected (threaded or flanged).
 Please state connecting dimensions and Standard.
- For level gauges type **BR22-G41**, **BR22-G42**, **BR22-GS41**, **BR22-GS42**, see page 30-31.



Reflex **BONT**® Level Gauges type BR23 with GP11, GP12, G41/42 and GS41/42 valves

Fig. 839.1

Type BR23-GP11

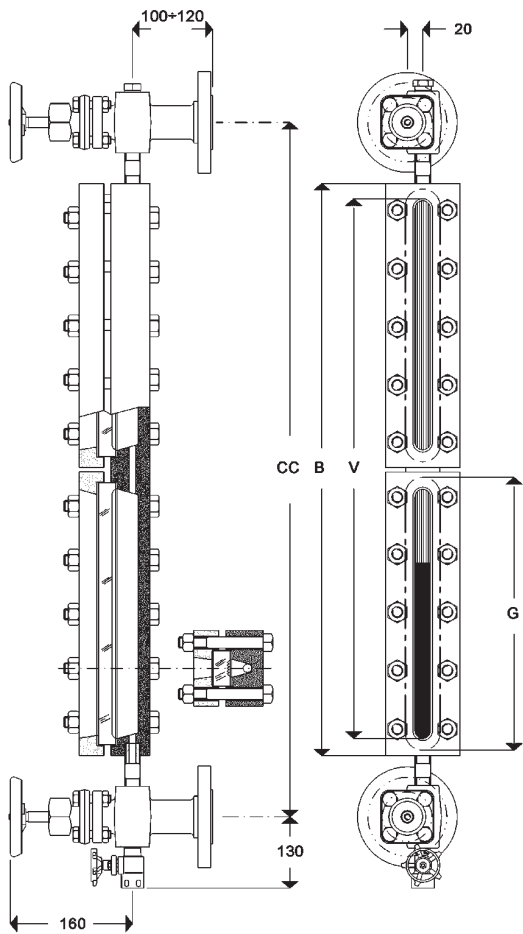


| Size | length of glass G | length of body B | Visible length V | CC minimum | | Weight kg | CC min. Weight G & GS | |
|------|-------------------|------------------|------------------|------------|------|-----------|-----------------------|------|
| | | | | GP11 | GP12 | | 41 & 42 | kg |
| 1 | 115 | 128 | 95 | 241 | 209 | 10,4 | 218 | 15,8 |
| 2 | 140 | 153 | 120 | 266 | 234 | 10,8 | 243 | 16,2 |
| 3 | 165 | 178 | 145 | 291 | 259 | 11,7 | 268 | 17,1 |
| 4 | 190 | 203 | 170 | 316 | 284 | 12,2 | 293 | 17,6 |
| 5 | 220 | 233 | 200 | 346 | 314 | 13,0 | 323 | 18,4 |
| 6 | 250 | 263 | 230 | 376 | 344 | 13,9 | 353 | 19,3 |
| 7 | 280 | 293 | 260 | 406 | 374 | 14,2 | 383 | 19,6 |
| 8 | 320 | 333 | 300 | 446 | 414 | 15,2 | 423 | 20,6 |
| 9 | 340 | 353 | 320 | 466 | 434 | 15,7 | 443 | 21,1 |
| 2x4 | 190 | 413 | 380 | 526 | 494 | 18,0 | 503 | 23,4 |
| 2x5 | 220 | 473 | 440 | 586 | 554 | 19,5 | 563 | 24,9 |
| 2x6 | 250 | 533 | 500 | 646 | 614 | 21,4 | 623 | 26,8 |
| 2x7 | 280 | 593 | 560 | 706 | 674 | 22,0 | 683 | 27,4 |
| 2x8 | 320 | 673 | 640 | 786 | 754 | 23,9 | 763 | 29,3 |
| 2x9 | 340 | 713 | 680 | 826 | 794 | 24,9 | 803 | 30,3 |
| 3x6 | 250 | 803 | 770 | 916 | 884 | 28,9 | 893 | 34,3 |
| 3x7 | 280 | 893 | 860 | 1006 | 974 | 29,7 | 983 | 35,1 |
| 3x8 | 320 | 1013 | 980 | 1126 | 1094 | 32,7 | 1103 | 38,1 |
| 3x9 | 340 | 1073 | 1040 | 1186 | 1154 | 34,2 | 1163 | 39,6 |
| 4x7 | 280 | 1193 | 1160 | 1306 | 1274 | 37,5 | 1283 | 42,9 |
| 4x8 | 320 | 1353 | 1320 | 1466 | 1434 | 41,5 | 1443 | 46,9 |
| 4x9 | 340 | 1433 | 1400 | 1546 | 1514 | 43,5 | 1523 | 48,9 |
| 5x7 | 280 | 1493 | 1460 | 1606 | 1574 | 45,3 | 1583 | 50,7 |
| 5x8 | 320 | 1693 | 1660 | 1806 | 1774 | 50,2 | 1783 | 55,6 |
| 5x9 | 340 | 1793 | 1760 | 1906 | 1874 | 52,8 | 1883 | 58,2 |
| 6x8 | 320 | 2033 | 2000 | 2146 | 2114 | 58,1 | 2123 | 63,5 |
| 6x9 | 340 | 2153 | 2120 | 2266 | 2234 | 62,0 | 2243 | 67,4 |
| 7x9 | 340 | 2513 | 2480 | 2626 | 2594 | 71,3 | 2603 | 76,7 |

- Connections between gauge and valves are made
 - for **BR23-GP11**, by end tubes and stuffing boxes
 - for **BR23-GP12**, by NPT screwed nipples
 - for **BR23-G41/42 & GS41/42**, by NPT screwed nipples.
 Minimum CC distance, shown on table is referred to 1/2" NPT connections.
 On request 3/4" NPT connection can be supplied.
- According to the position of the shut-off valves compared with the gauge body, the level gauge is named "right-handed" or "left-handed". Fig. 839.1 shows a left-handed gauge. Each level gauge can be assembled right-handed or left-handed. Usually two level gauges (1 right and 1 left) are installed on steam vessels.
- According to some Steam Boiler Regulations, the visible length of the level gauges installed on steam boilers must be not shorter than a fixed length. Therefore the suitability of the smaller sizes must be checked.
- When ordering a level gauge please state:
 - Centre to centre distance between connections (CC)
 - Standard, Size and Finishing of connections
 - Whether right-handed or left-handed.
- Flanges are finished to customer prescriptions. Please state:
 - Standard
 - Size
 - Pressure class
 - Finishing
 The inside passage through the gauge is 10 mm.
- Instead of flanges, connections can be delivered with threaded ends. Standard is 3/4" NPT, union. Other Standard and size on request.
- BR23 gauges are fitted with reflex glasses type B (see page 38).
- Operating conditions and material schedules on pages 4 and 5. Graph below shows rating for size 9 and smaller, combined included.
- Applicable optionals and bolting torques on pages 27, 36, 37.
- Gauge bodies without valves can be supplied:
 - end connected (threaded or flanged)
 - side connected (threaded or flanged)
 - back connected (threaded or flanged).
 Please state connecting dimensions and Standard.
- For level gauges type **BR23-G41**, **BR23-G42**, **BR23-GS41**, **BR23-GS42**, see page 30-31.

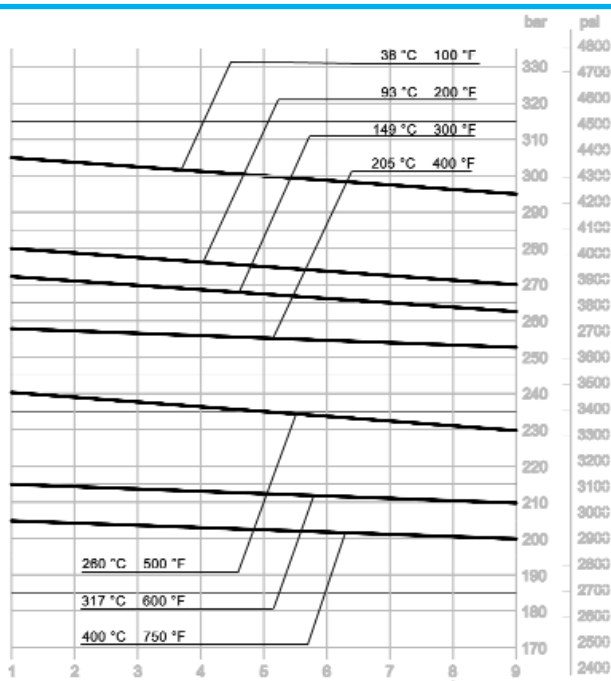
Reflex **BONT**® Level Gauges type BR28 with GP12, G41/42 and GS41/42 valves

Fig. 856
Type BR28-G41



| Size | length of glass | length of body | Visible length V | CC min. | Weight with GP12 | CC min. Weight G & GS | |
|------|-----------------|----------------|------------------|---------|------------------|-----------------------|-------|
| | G | B | | with | kg | 41 & 42 | kg |
| 1 | 115 | 165 | 95 | 246 | 18,8 | 255 | 24,2 |
| 2 | 140 | 190 | 120 | 271 | 19,6 | 280 | 25,0 |
| 3 | 165 | 215 | 145 | 296 | 20,5 | 305 | 25,9 |
| 4 | 190 | 240 | 170 | 321 | 21,5 | 330 | 26,9 |
| 5 | 220 | 270 | 200 | 351 | 22,7 | 360 | 28,1 |
| 6 | 250 | 300 | 230 | 381 | 24,1 | 390 | 29,5 |
| 7 | 280 | 330 | 260 | 411 | 25,4 | 420 | 30,8 |
| 8 | 320 | 370 | 300 | 451 | 26,8 | 460 | 32,2 |
| 9 | 340 | 390 | 320 | 471 | 27,7 | 480 | 33,1 |
| 2x4 | 190 | 450 | 380 | 531 | 38,9 | 540 | 44,3 |
| 2x5 | 220 | 510 | 440 | 591 | 41,3 | 600 | 46,7 |
| 2x6 | 250 | 570 | 500 | 651 | 44,1 | 660 | 49,5 |
| 2x7 | 280 | 630 | 560 | 711 | 46,7 | 720 | 52,1 |
| 2x8 | 320 | 710 | 640 | 791 | 49,5 | 800 | 54,9 |
| 2x9 | 340 | 750 | 680 | 831 | 51,3 | 840 | 56,7 |
| 3x6 | 250 | 840 | 770 | 921 | 64,1 | 930 | 69,5 |
| 3x7 | 280 | 930 | 860 | 1011 | 68,0 | 1020 | 73,4 |
| 3x8 | 320 | 1050 | 980 | 1131 | 72,2 | 1140 | 77,6 |
| 3x9 | 340 | 1110 | 1040 | 1191 | 74,9 | 1200 | 80,3 |
| 4x7 | 280 | 1230 | 1160 | 1311 | 89,3 | 1320 | 94,7 |
| 4x8 | 320 | 1390 | 1320 | 1471 | 94,9 | 1480 | 100,3 |
| 4x9 | 340 | 1470 | 1400 | 1551 | 98,5 | 1560 | 103,9 |
| 5x7 | 280 | 1530 | 1460 | 1611 | 110,6 | 1620 | 116,0 |
| 5x8 | 320 | 1730 | 1660 | 1811 | 117,6 | 1820 | 123,0 |
| 5x9 | 340 | 1830 | 1760 | 1911 | 122,1 | 1920 | 127,5 |
| 6x8 | 320 | 2070 | 2000 | 2151 | 140,3 | 2160 | 145,7 |
| 6x9 | 340 | 2190 | 2120 | 2271 | 145,7 | 2280 | 151,1 |
| 7x9 | 340 | 2550 | 2480 | 2631 | 169,3 | 2640 | 174,7 |

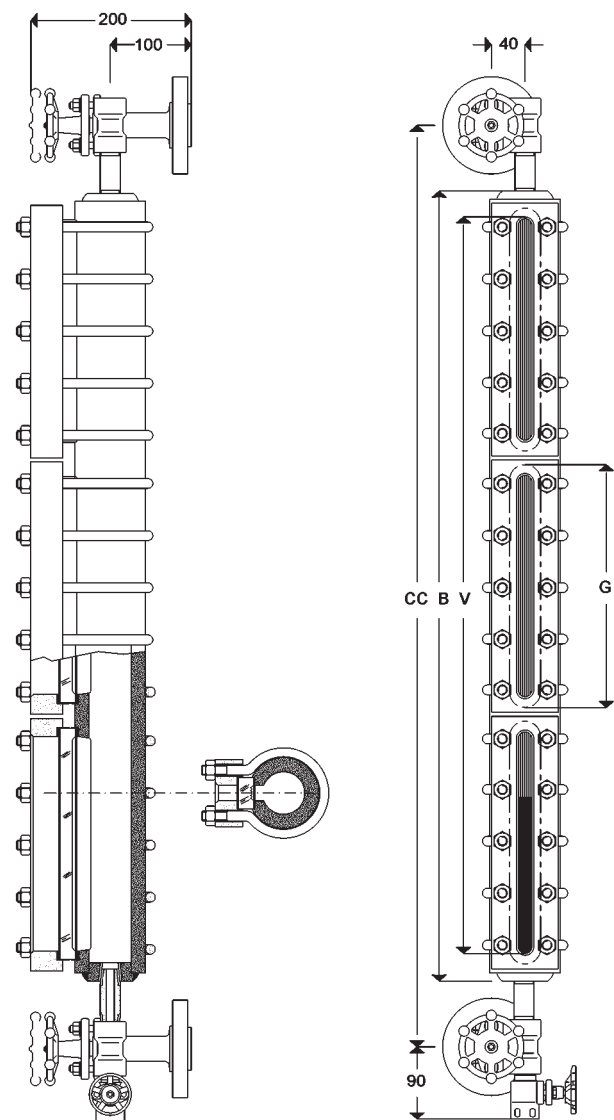
- Connections between gauge and valves are made
 - for **BR28-GP11**, by end tubes and stuffing boxes
 - for **BR28-GP12**, by NPT screwed nipples
 - for **BR28-G41/42 & GS41/42**, by NPT screwed nipples. Gauge/valve standard NPT connection is 1/2". On request 3/4" NPT connection can be supplied.
- According to the right or left position of the stop valves handle of the gauge body, the level gauges are named right handed or left-handed. Fig. 856 shows a left-handed level gauges.
- When ordering a level gauge please state:
 - Centre to centre distance between connections (CC)
 - Standard, Size and Finishing of connections
 - Whether right-handed or left-handed.
- Flanges are finished to customer prescriptions. Please state:
 - Standard
 - Size
 - Pressure class
 - Finishing
 The inside passage through the gauge is 12,5 mm.
- Instead of flanges, connections can be delivered with threaded ends. It is standard 3/4" NPT union.
- BR28 gauges are fitted with reflex glasses type B (see page 38).
- Operating conditions and material schedules on pages 4 and 5. Graph below shows rating for size 9 and smaller, combined included.
- Applicable optionals and bolting torques on pages 27, 36, 37.
- Gauge bodies without valves can be supplied:
 - end connected (threaded or flanged)
 - side connected (threaded or flanged)
 - back connected (threaded or flanged).
 Please state connecting dimensions and Standard.
- For level gauges type **BR28-G42**, **BR28-GS41**, **BR28-GS42**, see page 30-31.



Reflex **BONT**® Level Gauges type BR25 with GP12, G41/42 and GS41/42 valves

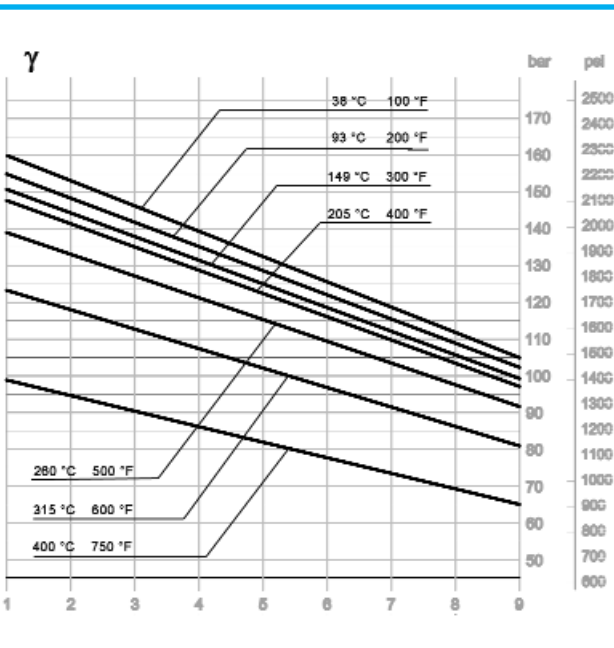
Fig. 841

Type BR25-GP12



| Size | length of glass G | length of body B | Visible length V | CC min. with GP12 | Weight kg | CC min. G & GS 41 & 42 | Weight kg |
|------|-------------------|------------------|------------------|-------------------|-----------|------------------------|-----------|
| 1 | 115 | 158 | 95 | 239 | 14,4 | 248 | 19,8 |
| 2 | 140 | 183 | 120 | 264 | 15,5 | 273 | 20,9 |
| 3 | 165 | 208 | 145 | 289 | 16,6 | 298 | 22,0 |
| 4 | 190 | 233 | 170 | 314 | 18,6 | 323 | 24,0 |
| 5 | 220 | 263 | 200 | 344 | 19,0 | 353 | 24,4 |
| 6 | 250 | 293 | 230 | 374 | 20,3 | 383 | 25,7 |
| 7 | 280 | 323 | 260 | 404 | 22,8 | 413 | 28,2 |
| 8 | 320 | 363 | 300 | 444 | 23,3 | 453 | 28,7 |
| 9 | 340 | 383 | 320 | 464 | 24,2 | 473 | 29,6 |
| 2x4 | 190 | 443 | 380 | 524 | 26,6 | 533 | 32,0 |
| 2x5 | 220 | 503 | 440 | 584 | 29,2 | 593 | 34,6 |
| 2x6 | 250 | 563 | 500 | 644 | 31,8 | 653 | 37,2 |
| 2x7 | 280 | 623 | 560 | 704 | 34,4 | 713 | 39,8 |
| 2x8 | 320 | 703 | 640 | 784 | 37,9 | 793 | 43,3 |
| 2x9 | 340 | 743 | 680 | 824 | 39,6 | 833 | 45,0 |
| 3x6 | 250 | 833 | 770 | 914 | 43,3 | 923 | 48,7 |
| 3x7 | 280 | 923 | 860 | 1004 | 47,2 | 1013 | 52,6 |
| 3x8 | 320 | 1043 | 980 | 1124 | 52,4 | 1133 | 57,8 |
| 3x9 | 340 | 1103 | 1040 | 1184 | 55,0 | 1193 | 60,4 |
| 4x7 | 280 | 1223 | 1160 | 1304 | 60,0 | 1313 | 65,4 |
| 4x8 | 320 | 1383 | 1320 | 1464 | 66,9 | 1473 | 72,3 |
| 4x9 | 340 | 1463 | 1400 | 1544 | 70,4 | 1553 | 75,8 |
| 5x7 | 280 | 1523 | 1460 | 1604 | 72,8 | 1613 | 78,2 |
| 5x8 | 320 | 1723 | 1660 | 1804 | 81,5 | 1813 | 86,9 |
| 5x9 | 340 | 1823 | 1760 | 1904 | 85,8 | 1913 | 91,2 |
| 6x8 | 320 | 2063 | 2000 | 2144 | 96,0 | 2153 | 101,4 |
| 6x9 | 340 | 2183 | 2120 | 2264 | 101,2 | 2273 | 106,6 |
| 7x9 | 340 | 2543 | 2480 | 2624 | 116,6 | 2633 | 122,0 |

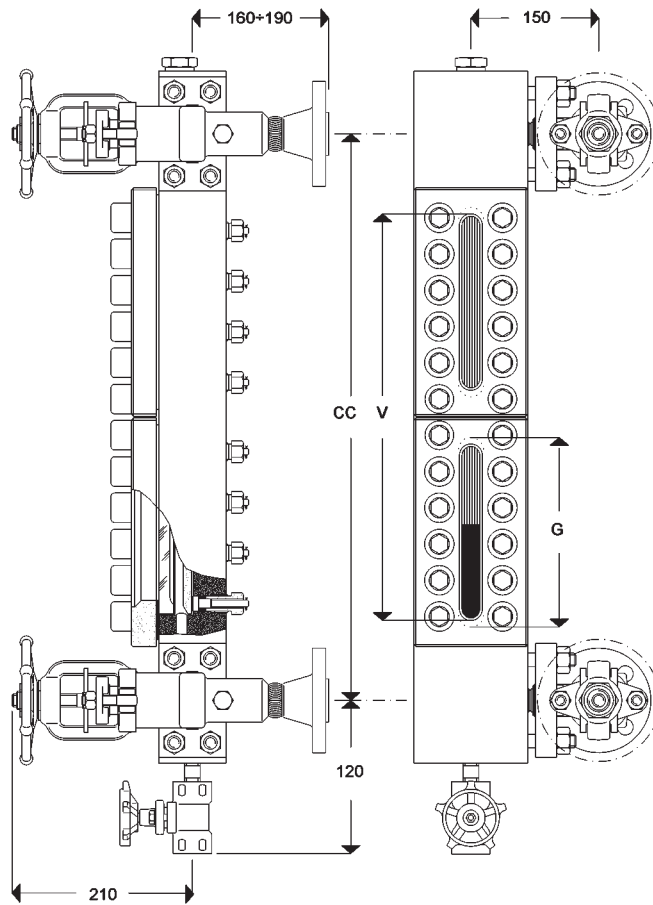
- Type BR25-GP12 level gauge is LARGE CHAMBERED. The gauge body is machined from a tube having thick wall and internal Ø of about 40 mm. Large chamber level gauges should be used where the medium boils or surges.
- Connections between gauge and valves are made by NPT screwed nipples. Minimum CC distance, shown on table is referred to 1/2" NPT connections. On request 3/4" NPT connection can be supplied.
- According to the position of the shut-off valves compared with the gauge body, the level gauge is named "right-handed" or "left-handed". Fig. 841 shows a left-handed gauge. Each level gauge can be assembled right-handed or left-handed.
- When large chamber body is required with butt-welding end caps, length of body (B) and minimum C. to C. (CC min) have to be increased of 40 mm.
- When ordering a level gauge please state:
 - Centre to centre distance between connections (CC)
 - Standard, Size and Finishing of connections
 - Whether right-handed or left-handed.
- Flanges are finished to customer prescriptions. Please state:
 - Standard
 - Size
 - Finishing
 - Pressure class
 The inside passage through the gauge is 40 mm.
- Instead of flanges, connections can be delivered with threaded ends. Standard is 3/4" NPT, union. Other Standard and size on request.
- BR25 gauges are fitted with reflex glasses type B (see page 38).
- Operating conditions and material schedules on pages 4 and 5. Graph below shows rating for size 9 and smaller, combined included.
- Applicable optionals and bolting torques on pages 27, 36, 37.
- Gauge bodies without valves can be supplied:
 - end connected (threaded or flanged)
 - side connected (threaded or flanged)
 - back connected (threaded or flanged).
 Please state connecting dimensions and Standard.
- For level gauges type BR25-G41, BR25-G42, BR25-GS41, BR25-GS42, see page 30-31.



Reflex **BONT**[®] Level Gauges type BR13 with G51 valves

Fig. 857

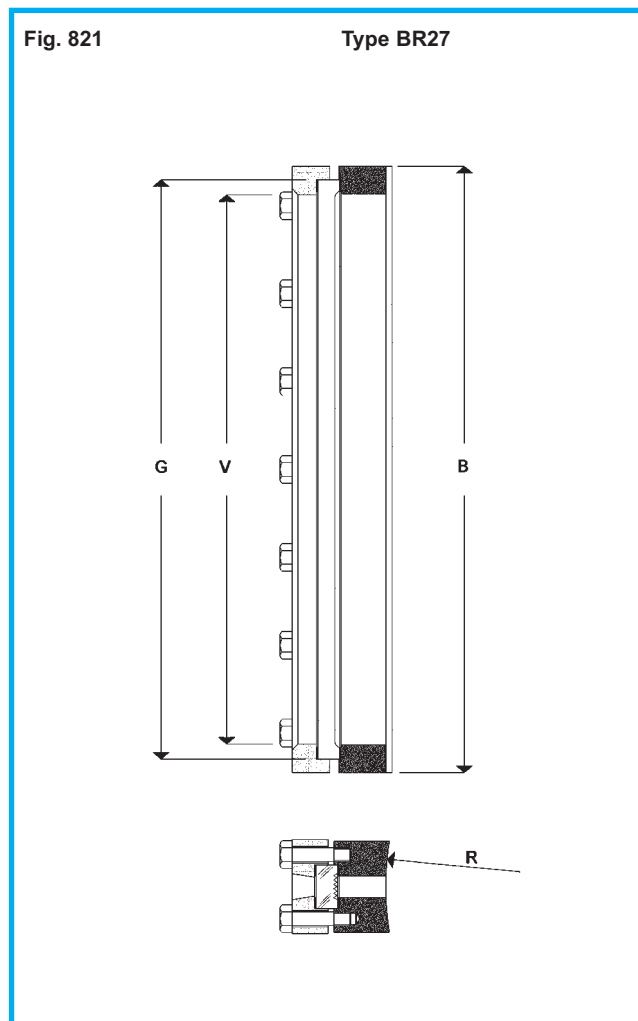
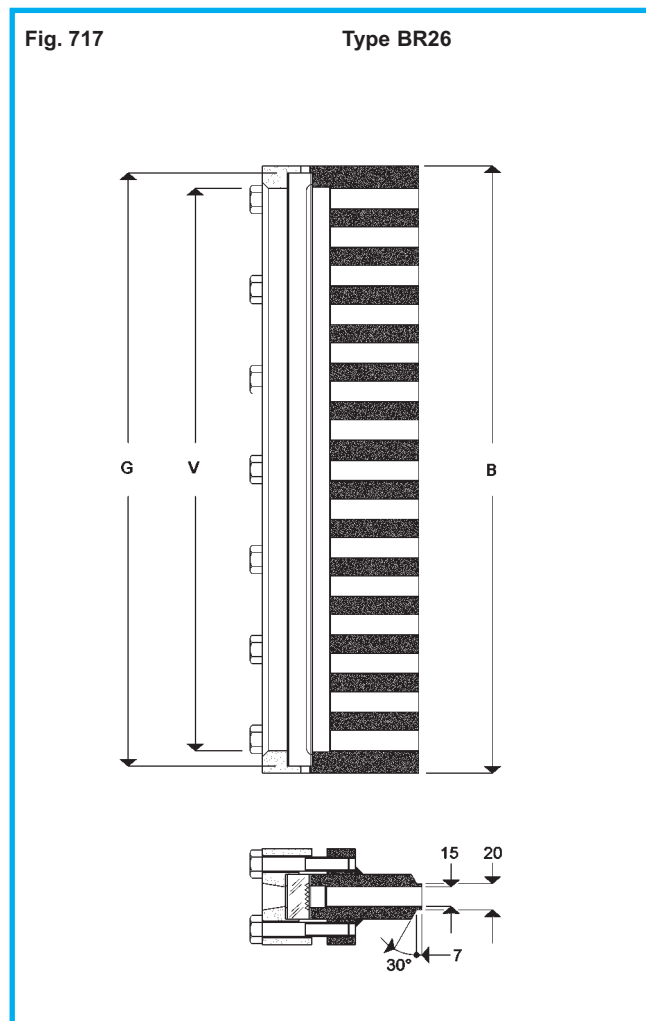
Type BR13-G51



- 1 Connections between gauge and valves are made by flanges. Gauge body cannot be rotated on its axis. Other connections on request.
- 2 According to the right or left position of the handwheel of the stop valves on the gauge body, the level gauges are named right-handed or left-handed fig. 857 shows a right-handed level gauge.
- 3 When ordering a level gauge please state:
 - Centre to centre distance between connections (CC)
 - Standard. Size and Finishing of connections
 - Whether right-handed or left-handed.
- 4 Flanges are finished to customer prescriptions. Please state:
 - Standard - Size
 - Pressure class - Finishing
 The inside passage through the gauge is at least 12,5 mm.
- 5 Instead of flanges, connections to vessel can be delivered with threaded ends or with weld ends.
- 6 BR13 gauges are fitted with reflex glasses type A-BR13 (see page 38), that ARE NOT COMPRESSED by the tightening screw. Joint Dimensions and Maintenance Instructions on request.
- 7 Operating conditions and material schedules on pages 4 and 5.
- 8 Applicable optionals and bolting torques on pages 27, 36, 37.
- 9 Gauge bodies without valves can be supplied:
 - end connected (threaded or flanged)
 - side connected (threaded or flanged)
 - back connected (threaded or flanged).
 Please state connecting dimensions and Standard.

| Size | length of glass G | length of body B | Visible length V | CC min. length | Weight kg |
|------|-------------------------|------------------------|------------------------|-------------------|--------------|
| 3 | 165 | 481 | 143 | 331 | 75,0 |
| 4 | 190 | 506 | 168 | 356 | 78,0 |
| 5 | 220 | 536 | 198 | 386 | 81,0 |
| 6 | 250 | 566 | 228 | 416 | 85,0 |
| 7 | 280 | 596 | 258 | 446 | 88,0 |
| 8 | 320 | 636 | 298 | 486 | 92,0 |
| 9 | 340 | 656 | 318 | 506 | 94,0 |
| 2x4 | 190 | 721 | 383 | 571 | 106,0 |
| 2x5 | 220 | 794 | 456 | 644 | 112,0 |
| 2x6 | 250 | 867 | 529 | 717 | 120,0 |
| 2x7 | 280 | 897 | 559 | 747 | 126,0 |
| 2x8 | 320 | 980 | 642 | 830 | 134,0 |
| 2x9 | 340 | 1043 | 705 | 893 | 138,0 |
| 3x6 | 250 | 1168 | 830 | 1018 | 155,0 |
| 3x7 | 280 | 1198 | 860 | 1048 | 164,0 |
| 3x8 | 320 | 1324 | 986 | 1174 | 176,0 |
| 3x9 | 340 | 1430 | 1092 | 1280 | 182,0 |
| 4x7 | 280 | 1499 | 1161 | 1349 | 202,0 |
| 4x8 | 320 | 1668 | 1330 | 1518 | 218,0 |
| 4x9 | 340 | 1817 | 1479 | 1667 | 226,0 |
| 5x7 | 280 | 2012 | 1674 | 1862 | 260,0 |
| 5x8 | 320 | 2204 | 1866 | 2054 | 270,0 |
| 5x9 | 340 | 2356 | 2018 | 2206 | 302,0 |
| 6x8 | 320 | 2591 | 2253 | 2441 | 314,0 |
| 6x9 | 340 | 2700 | 2362 | 2550 | 344,0 |
| 7x9 | 340 | 2978 | 2640 | 2828 | 358,0 |

Reflex **BONT**[®] Level Gauges Weld - on Bodies, type BR26 and BR27

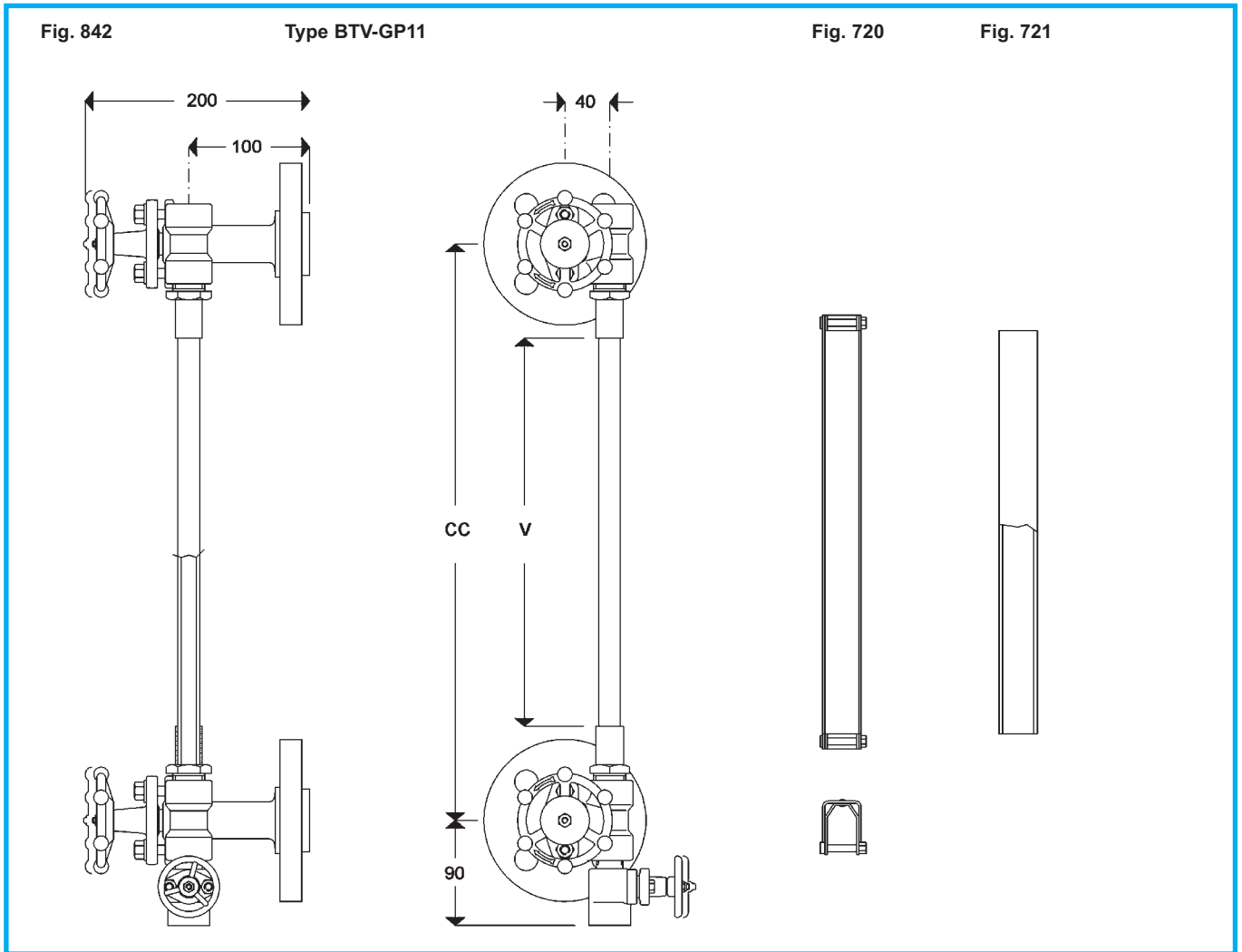


| Size | Length. of glass G | Length. of body B | Visible length V | Weight | |
|------|--------------------------|-------------------------|------------------------|------------|------------|
| | | | | BR26 kg | BR27 kg |
| 1 | 115 | 128 | 95 | 4.8 | 3.6 |
| 2 | 140 | 153 | 120 | 5.7 | 4.3 |
| 3 | 165 | 178 | 145 | 6.6 | 5.0 |
| 4 | 190 | 203 | 170 | 7.5 | 5.7 |
| 5 | 220 | 233 | 200 | 8.6 | 6.6 |
| 6 | 250 | 263 | 230 | 9.8 | 7.5 |
| 7 | 280 | 293 | 260 | 10.9 | 8.3 |
| 8 | 320 | 333 | 300 | 12.4 | 9.4 |
| 9 | 340 | 353 | 320 | 13.1 | 10.0 |

- 1 These gauge bodies are suitable for welding directly on the vessel. Therefore, no valves can be fitted between vessel and gauge, and in case of glass breakage, the fluid flowing from the vessel cannot be stopped.
- 2 It is necessary to control the suitability of the vessel wall, on which the gauge body is to be welded as this must not be excessively weakened by the holes or communicating window with the gauge. Steel plates to strengthen the vessel wall should be used whenever this is possible.
- 3 During the welding operation, be careful to not expose the gauge body for long time to high temperatures, as this might damage the flatness of the glass sealing surface.
- 4 For BR26 the connecting lip is provided to facilitate the welding operation.

- 5 When enquiring or ordering BR27 please state the external radius (R) of the vessel on which the gauge must be welded.
- 6 For visible lengths over 320 mm two or more single gauge bodies will have to be welded on the vessel. In this case it is advisable to fit the gauge bodies not along the same vertical line, but offset.
- 7 BR26 and BR27 are fitted with reflex glasses type B (see page 38).
- 8 Operating conditions and material schedules on pages 4 and 5.
- 9 Applicable optionals and bolting torques on pages 36, 37.

Tubular glass **BONT®** Level Gauges type BTV-GP11



Dimensions:

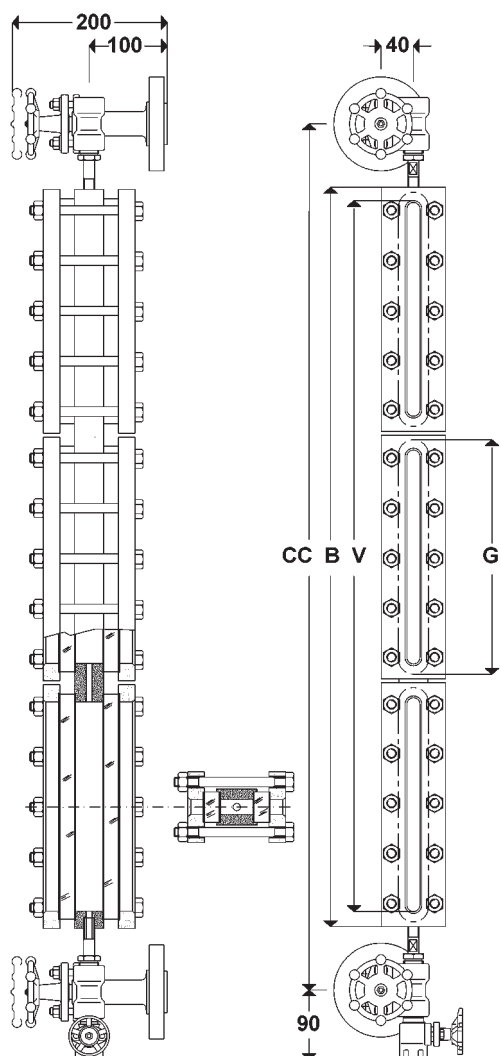
| | | |
|-------------------|--------|---------------|
| Max C. to C. | CC max | = 2000 mm |
| Glass tube length | G | = CC - 28 mm |
| Visible length | V | = CC - 110 mm |
| Weight | | nearly kg 7,0 |

- 1 Type BTV-GP11 level gauges are equipped with a transparent glass tube of 16 mm outside diameter. The limitation of the operating conditions is due to the glass tube, while the valves type GP11 are suitable for higher pressure and temperature.
- 2 As the glass tubes are usually found on sale up to a maximum standard length of about 2000 mm, when the centre to centre distance is longer than this size, the installation of several, cascade disposed level gauges or the application of an intermediate support with stuffing-boxes are necessary. In the latter case the length of each glass tube will be half the centre to centre distance minus 17 mm.
- 3 To protect the glass tube against shocks we supply on request
 - U shaped metallic protector (Fig. 720) to be fixed to the stuffing box gland and/or
 - acrylic resin tube protector (Fig. 721) sealed by O-Rings to the stuffing box gland.
- 4 According to the position of the shut-off valves compared with the gauge body, the level gauge is named "right-handed" or "left-handed". Fig. 842 shows a left-handed gauge. Each level gauge can be assembled right-handed or left-handed. Usually two level gauges (1 right and 1 left) are installed on steam vessels.
- 5 When ordering a level gauge please state:
 - Centre to centre distance between connections (CC)
 - Standard, Size and Finishing of connections
 - Whether right-handed or left-handed.
- 6 Flanges are finished to customer prescriptions. Please state:
 - Standard
 - Size
 - Pressure class
 - Finishing
 The inside passage through the gauge is 10 mm.
- 7 Instead of flanges, connections can be delivered with threaded ends. Standard is 3/4" NPT, union. Other Standard and size on request.
- 8 BTV-GP11 gauges are fitted with glass tubes having 16 mm outside diameter and length equal to the centre to centre distance minus 28 mm.
- 9 Operating conditions and material schedules on pages 4 and 5.
- 10 Applicable optionals on pages 27 and 37.

Transparent **BONT**® Level Gauges type BT23 with GP11, GP12, G41/42 and GS41/42 valves

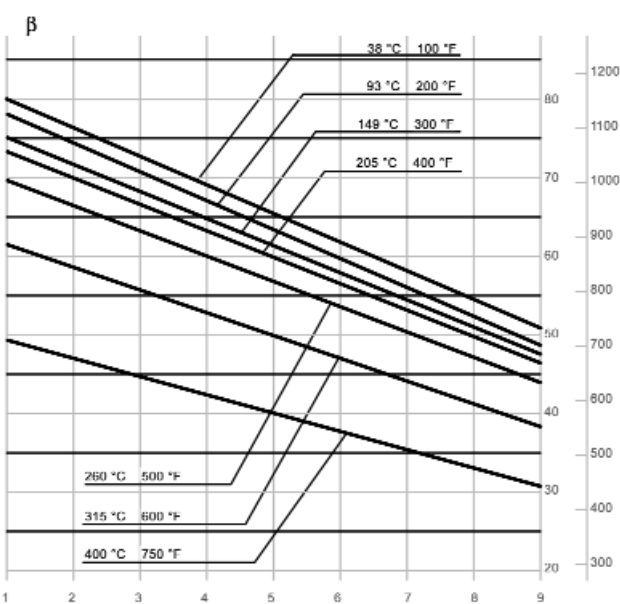
Fig. 843.1

Type BT23-GP11

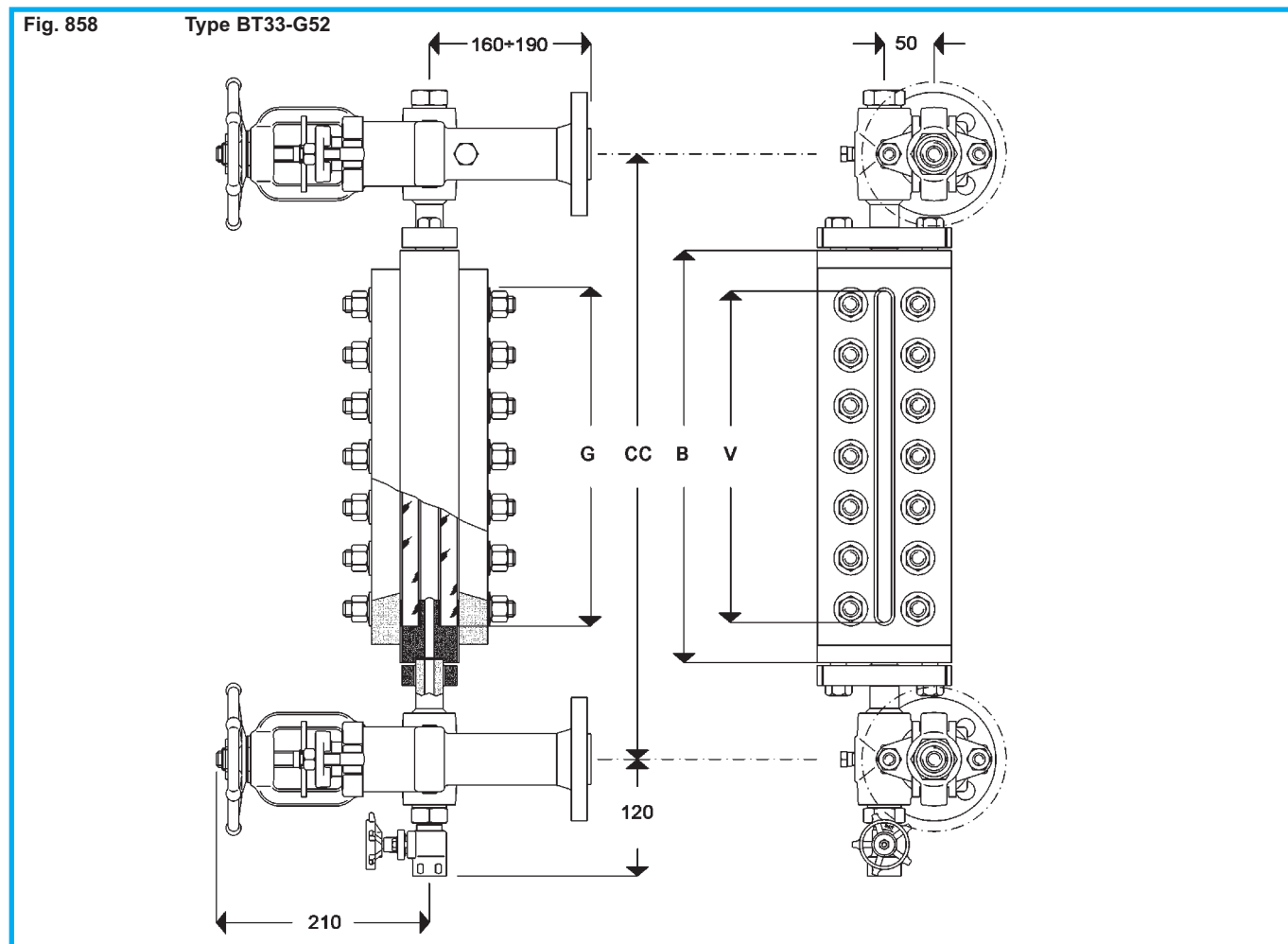


| Size | length | length | Visible | CC minimum | | Weight | CC min. | Weight |
|------|----------|---------|---------|------------|------|--------|---------|--------|
| | of glass | of body | | length | GP11 | | | |
| | G | B | V | | | kg | kg | kg |
| 1 | 115 | 128 | 95 | 241 | 209 | 10,9 | 218 | 16,3 |
| 2 | 140 | 153 | 120 | 266 | 234 | 11,5 | 243 | 16,9 |
| 3 | 165 | 178 | 145 | 291 | 259 | 12,3 | 268 | 17,7 |
| 4 | 190 | 203 | 170 | 316 | 284 | 12,9 | 293 | 18,3 |
| 5 | 220 | 233 | 200 | 346 | 314 | 13,9 | 323 | 19,3 |
| 6 | 250 | 263 | 230 | 376 | 344 | 14,6 | 353 | 20,0 |
| 7 | 280 | 293 | 260 | 406 | 374 | 15,6 | 383 | 21,0 |
| 8 | 320 | 333 | 300 | 446 | 414 | 16,7 | 423 | 22,1 |
| 9 | 340 | 353 | 320 | 466 | 434 | 17,4 | 443 | 22,8 |
| 2x4 | 190 | 413 | 380 | 526 | 494 | 18,9 | 503 | 24,3 |
| 2x5 | 220 | 473 | 440 | 586 | 554 | 20,8 | 563 | 26,2 |
| 2x6 | 250 | 533 | 500 | 646 | 614 | 22,4 | 623 | 27,8 |
| 2x7 | 280 | 593 | 560 | 706 | 674 | 24,5 | 683 | 29,9 |
| 2x8 | 320 | 673 | 640 | 786 | 754 | 26,7 | 763 | 32,1 |
| 2x9 | 340 | 713 | 680 | 826 | 794 | 27,7 | 803 | 33,1 |
| 3x6 | 250 | 803 | 770 | 916 | 884 | 30,3 | 893 | 35,7 |
| 3x7 | 280 | 893 | 860 | 1006 | 974 | 33,2 | 983 | 38,6 |
| 3x8 | 320 | 1013 | 980 | 1126 | 1094 | 36,4 | 1103 | 41,8 |
| 3x9 | 340 | 1073 | 1040 | 1186 | 1154 | 38,6 | 1163 | 44,0 |
| 4x7 | 280 | 1193 | 1160 | 1306 | 1274 | 41,9 | 1283 | 47,3 |
| 4x8 | 320 | 1353 | 1320 | 1466 | 1434 | 46,3 | 1443 | 51,7 |
| 4x9 | 340 | 1433 | 1400 | 1546 | 1514 | 49,2 | 1523 | 54,6 |
| 5x7 | 280 | 1493 | 1460 | 1606 | 1574 | 50,7 | 1583 | 56,1 |
| 5x8 | 320 | 1693 | 1660 | 1806 | 1774 | 56,2 | 1783 | 61,6 |
| 5x9 | 340 | 1793 | 1760 | 1906 | 1874 | 59,8 | 1883 | 65,2 |
| 6x8 | 320 | 2033 | 2000 | 2146 | 2114 | 66,1 | 2123 | 71,5 |
| 6x9 | 340 | 2153 | 2120 | 2266 | 2234 | 70,4 | 2243 | 75,8 |
| 7x9 | 340 | 2513 | 2480 | 2626 | 2594 | 80,9 | 2603 | 86,3 |

- Connections between gauge and valves are made
 - for **BT23-GP11**, by end tubes and stuffing boxes
 - for **BT23-GP12**, by NPT screwed nipples
 - for **BT23-G41/42 & GS41/42**, by NPT screwed nipples.
 Minimum CC distance, shown on table is referred to 1/2" NPT connections.
 On request 3/4" NPT connection can be supplied.
- According to the position of the shut-off valves compared with the gauge body, the level gauge is named "right-handed" or "left-handed". Fig. 843.1 shows a left-handed gauge. Each level gauge can be assembled right-handed or left-handed. Usually two level gauges (1 right and 1 left) are installed on steam vessels.
- According to some Steam Boiler Regulations, the visible length of the level gauge installed on steam boilers must be not shorter than a fixed length. Therefore the suitability of the smaller sizes must be checked.
- When ordering a level gauge please state:
 - Centre to centre distance between connections (CC)
 - Standard, Size and Finishing of connections
 - Whether right-handed or left-handed.
- Flanges are finished to customer prescriptions. Please state:
 - Standard
 - Size
 - Finishing
 - Pressure class
 The inside passage through the gauge is 10 mm.
- Instead of flanges, connections can be delivered with threaded ends. Standard is 3/4" NPT, union. Other Standard and size on request.
- BT23 gauges are fitted with transparent glasses type B (see page 38).
- Operating conditions and material schedules on pages 4 and 5. Graph below shows rating for size 9 and smaller, combined included.
- Applicable optionals and bolting torques on pages 27, 36, 37.
- Gauge bodies without valves can be supplied:
 - end connected (threaded or flanged)
 - side connected (threaded or flanged)
 - back connected (threaded or flanged).
 Please state connecting dimensions and Standard.
- For level gauges type **BT23-G41**, **BT23-G42**, **BT23-GS41**, **BT23-GS42**, see page 30-31.



Transparent **BONT**® Level Gauges type BT33 with G52 valves

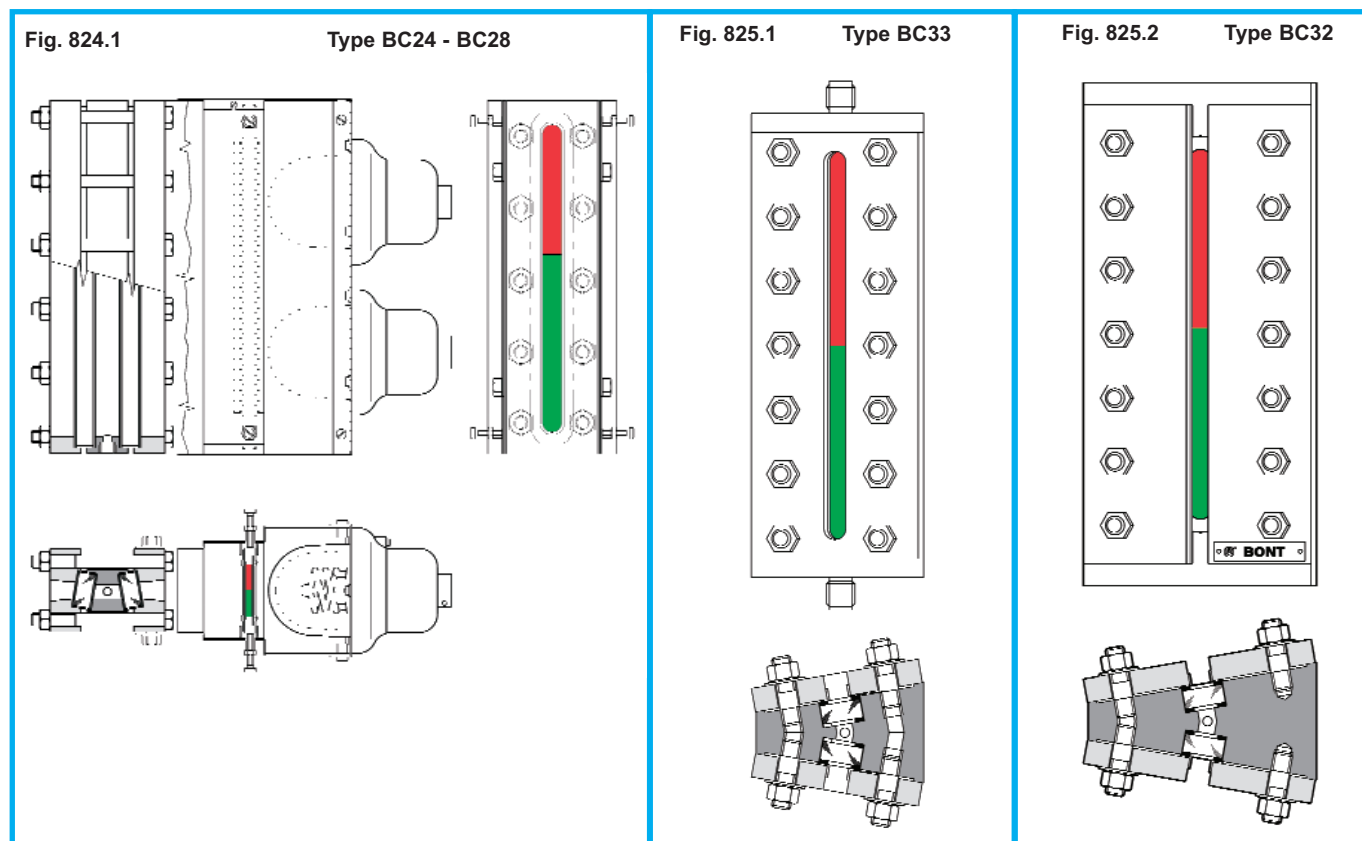


| Size | length of glass G | length of body B | Visible length V | CC min. length | Weight kg |
|------|----------------------|---------------------|---------------------|----------------|--------------|
| 3 | 165 | 225 | 145 | 387 | 41,1 |
| 4 | 190 | 250 | 170 | 412 | 43,4 |
| 5 | 220 | 280 | 200 | 442 | 46,3 |
| 6 | 250 | 310 | 230 | 472 | 49,1 |
| 7 | 280 | 340 | 260 | 502 | 51,9 |
| 8 | 320 | 380 | 300 | 542 | 55,6 |
| 9 | 340 | 400 | 320 | 562 | 57,5 |
| 2x4 | 190 | 457 | 377 | 619 | 62,9 |
| 2x5 | 220 | 517 | 437 | 679 | 68,5 |
| 2x6 | 250 | 577 | 497 | 739 | 74,1 |
| 2x7 | 280 | 637 | 557 | 799 | 79,7 |
| 2x8 | 320 | 717 | 637 | 879 | 87,2 |
| 2x9 | 340 | 757 | 677 | 919 | 91,0 |
| 3x6 | 250 | 844 | 764 | 1006 | 99,2 |
| 3x7 | 280 | 934 | 854 | 1096 | 107,6 |
| 3x8 | 320 | 1054 | 974 | 1216 | 118,9 |
| 3x9 | 340 | 1114 | 1034 | 1276 | 124,5 |
| 4x7 | 280 | 1231 | 1151 | 1393 | 135,5 |
| 4x8 | 320 | 1391 | 1311 | 1553 | 150,5 |
| 4x9 | 340 | 1471 | 1391 | 1633 | 158,0 |
| 5x7 | 280 | 1528 | 1448 | 1690 | 163,3 |
| 5x8 | 320 | 1728 | 1648 | 1890 | 182,1 |
| 5x9 | 340 | 1828 | 1748 | 1990 | 191,5 |
| 6x8 | 320 | 2065 | 1985 | 2227 | 213,7 |
| 6x9 | 340 | 2185 | 2105 | 2347 | 224,9 |
| 7x9 | 340 | 2542 | 2462 | 2704 | 258,4 |

1 Connections between gauge and valves are made by flanges and bolts.
Provided valves are closed, gauge body can be easily rotated on its axis even with boiler under steam in order to adjust easy reading from control floor.

- 2 According to the right or left position of the stop valves handle on the gauge body, the level gauges are named right-handed or left-handed. Fig. 858 shows a right-handed level gauge. Usually two level gauges (1 right and 1 left) are installed on steam vessels.
- 3 According to some Steam Boiler Regulations, the visible length of the level gauges installed on steam boilers must be not shorter than a fixed length. Therefore the suitability of the smaller sizes must be checked.
- 4 For visible length over 320 mm we manufacture combined level gauges having two or more gauge bodies on common centre piece. Side gauge for by-passing blind distance is recommended (see Fig. 820, page 36).
- 5 When ordering a level gauge please state:
 - Centre to centre distance between connections (CC)
 - Standard, Size and Finishing of connections
 - Whether right-handed or left-handed.
- 6 Flanges are finished to customer prescriptions. Please state:
 - Standard
 - Pressure class
 - Size
 - Finishing
 The inside passage through the gauge is at least 12.5 mm.
- 7 Instead of flanges, connections can be delivered with welding ends (Socket welding or Butt welding). Please state connecting dimensions, size and Standard.
- 8 BT33 gauges are fitted with transparent glasses type B (see page 38).
- 9 Operating conditions and material schedules on pages 4 and 5.
- 10 Applicable optionals and bolting torques on pages 27, 36, 37.
- 11 Gauge bodies without valves can be supplied:
 - end connected (threaded or flanged)
 - side connected (threaded or flanged)
 - back connected (threaded or flanged).
 Please state connecting dimensions and Standard.
- 12 **This level gauge is in compliance with ASME Boiler - Section I - requirements**

Bicolour **BONT**® Level Gauges type BC24, BC28, BC33, BC32



Design and working principle

BONT® bicolour level gauges are made of:

- 1 metallic centre piece containing steam and water of which level is to be measured;
- 1 or more flat transparent glasses (long or circular) on the front face of the gauges;
- an equal number of identical glasses on the back face of the gauge;
- 1 or more front covers and an equal number of back covers holding the glass assemblies against the centre piece;
- 1 illuminator case containing suitable lamps and two coloured glass screens (normally one green and one red);
- 1 set of shut-off valves for connection to boiler or tank.

The bicolour level gauge has a trapezoidal body and consequently the front and the back glasses are non-parallel.

They form a small angle. This special assembly and the different index of refraction of water and steam allows that the red and the green light of the illuminator entering the gauge passes through the gauge itself and is seen by the observer as follows:

- **RED** in correspondence of **STEAM**
- **GREEN** in correspondence of **WATER**.

Application

Bicolour level gauges are manufactured by our Company since more than 50 years. At the beginning only port-hole level gauges were produced (that is with small circular glasses) suitable for high pressure water/steam, up to 225 bar (see BONT® level gauges type BC1-G55). For these severe conditions the small circular glasses are absolutely necessary and cannot be substituted by other types of glasses.

In the recent year bicolour gauges have been very much appreciated because of the brilliant and sure reading they give and therefore they are more and more requested for low and medium pressure water/steam also, for which long glasses can safely be used. In case of combined level gauges, with the bicolour reading it is not necessary to use side bodies for the uninterrupted visibility, allowing a simplification of the instrument.

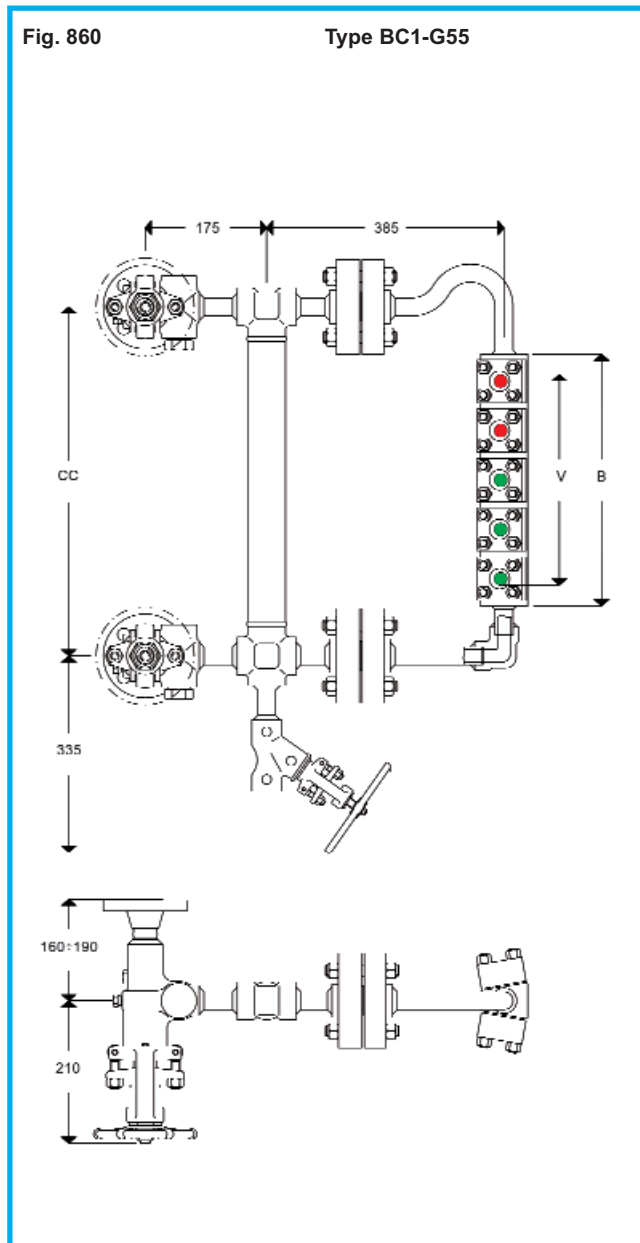
For the same operating conditions, we produce both transparent and bicolour level gauges, (see Fig. 824, 825.1 and 825.2).

Dimensions (Body length, C to C Distance according to the different type of valve sets, etc.), Description and Maintenance Instructions of the Bicolour Level Gauges are identical to those of the corresponding Transparent Level Gauge.

| Level Gauge | | Max. Operating Conditions | | Fluid |
|-------------|-----------------------|---------------------------|----------------|--------------|
| Bicolour | Transparent | Pressure bar | Temperature °C | |
| BC24-GP11 | Fig. 844 BT24-GP11 | 20 | 211 | Water steam |
| | BT24-GP11 | 105 62 | 38 300 ★ | Other fluids |
| BC28-GP11 | Fig. 846 BT28-GP11 | 40 | 249 | Water steam |
| | BT24-GP11 | 120 80 | 38 300 ★ | Other fluids |
| BC33-G52- | Fig. 858 BT33-G52 | 90 | 302 | Water steam |
| BC32-G52- | Fig. 859 BT32-G52 | 103 | 313 | Water steam |

★ NOTE: Maximum allowable temperature according to DIN 7081 / 1999-05.
For operating condition with temperature over 300 °C, please apply to our Sales or Technical department.

Bicolour **BONT**[®] Level Gauges type BC1 with G55 valves



- 1 According to the right or left position of the handwheel of the stop valves on the gauge body, the level gauges are named right-handed or left-handed. Fig. 860 shows a left-handed level gauge. Usually two level gauges (1 right and 1 left) are installed on steam vessel.
- 2 This level gauge consists of one gauge type BC1, and one set of valves type G55. It MUST be installed with the gauge body in vertical position. G55 set is connected to a vertical pipe, which links upper and bottom gauge parts. It avoid condensate to flow through gauge body therefore granting better visibility and longer life of glasses. Gauge body is connected to pipe/valve assembly through two flanges and can be easily removed for inspection and service.
- 3 This gauge consists of a central body type BC1 and a certain number of covers attached to the front and the back of the body: the covers contain small circular glasses. **Central body is manufactured of stainless steel for a longer life of the whole instrument.** The illuminator is fitted with a bicolour filter: half of it is red and half green. The illumination of the gauge is based on the difference of refractive indexes of steam and water. The light source projects its rays through the adjacent coloured filter and in the steam and water spaces these coloured light rays are refracted to a different degree depending upon the refractive index of the medium. This permits only one colour of light to

| Size | Number of port-holes | C. to C. | Length of body | Visible length | Weight kg |
|------|----------------------|--------------------|----------------|----------------|-----------|
| | | distance CC min | B | V | |
| 5 | 5 | 472 | 372 | 311 | 94 |
| 6 | 6 | 545 | 445 | 384 | 100 |
| 7 | 7 | 618 | 518 | 457 | 107 |
| 8 | 8 | 691 | 591 | 530 | 113 |
| 9 | 9 | 764 | 664 | 603 | 119 |
| 10 | 10 | 837 | 737 | 676 | 126 |
| 11 | 11 | 910 | 810 | 749 | 132 |

Longer or shorter visible length can be supplied on request

emerge from each medium, the other being absorbed in the wall of the gauge.

In particular the circular glasses appear:

- **RED** in correspondence of **STEAM**
- **GREEN** in correspondence of **WATER**

The level can be:

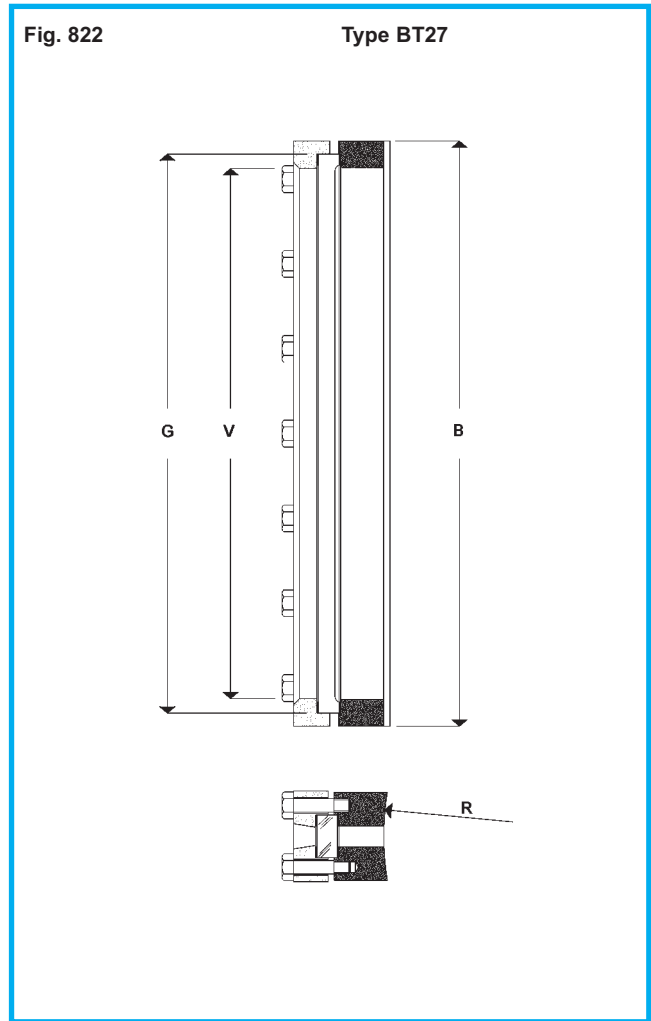
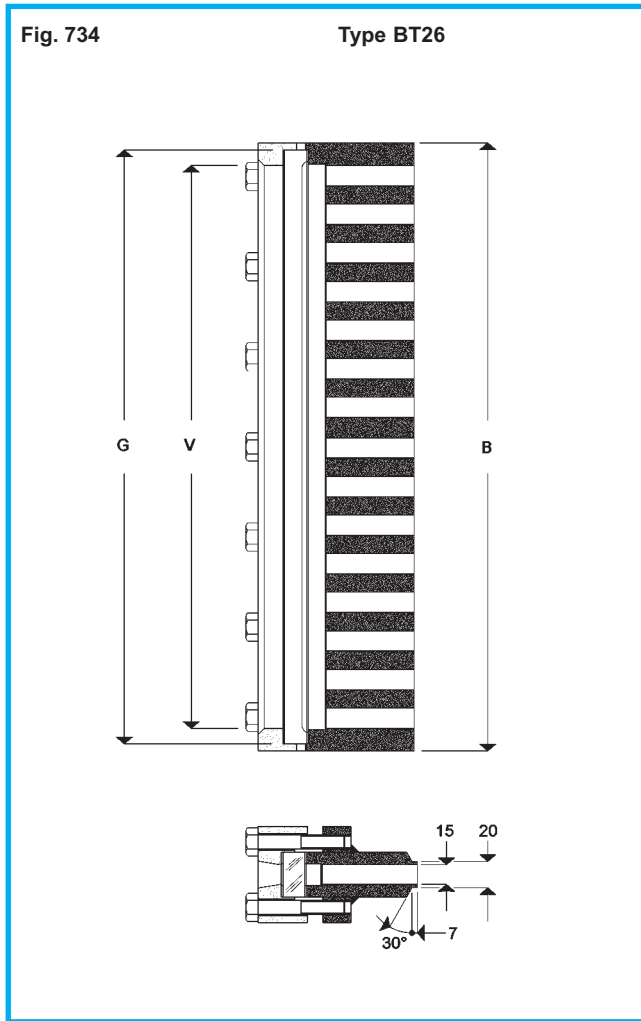
- read by observer standing directly **IN FRONT** of the level gauge, at the same height of body,
- or it can be outfitted with:
 - special "periscope" mirrors able to transmit the signal to the control station by means of a simple periscopic arrangement with mirrors. The mirrors (both top and bottom) are adjustable to assist alignment,
 - closed TV circuit, also transmitting a 4-20 mA signal
 - "Red Cherry" optics-fiber system: this system can transmit the red and green light signal to the control station by means of fiber-optic remote viewing device.

Ask for peculiar bulletin.

Needs of each plant should be known before stating supplying details.

- 4 The standard illuminator is explosion-proof and consists of a stainless steel box containing as many bulbs as the number of port holes and suitable for 12 V AC power supply. The illuminator is slotted so as to fit into the level gauge centre piece. The red and green coloured filters are placed in front of the bulbs. The red filter must be placed in correspondence of the narrow side of the gauge body; the green filter on the wide side. In this way the view of red steam and green water will be produced. Should a bulb fail it can be easily replaced by opening the backside of the illuminator. We recommend to use original bulbs as spares.
- 5 We manufacture BC1 gauges with adequate number of port holes on one single centre piece. Shorter or longer visible length than those listed in the table can be supplied on request.
- 6 Centre to centre distance (CC) shown on table are referred to bodies with holes having standard pitch of 73 mm. To meet special visibility request, different pitch length can be supplied.
- 7 When ordering a level gauge please state:
 - Centre to centre distance between connections (CC)
 - Standard, Size and Finishing of connections
 - Whether right-handed or left-handed.
- 8 Flanges are finished to customer prescriptions. Please state:
 - Standard
 - Size
 - Pressure class
 - Finishing
 The inside passage through the gauge is at least 12,5 mm.
- 9 Instead of flanges, connections can be delivered with welding ends (Socket welding or Butt welding). Please state connecting dimensions, size and Standard.
- 10 BC1 gauges are fitted with transparent glass discs (Ø 31,6 x 12,7 mm). Dimensions of joints and mica and Maintenance Instructions on request.
- 11 Operating conditions and material schedules on pages 4 and 5.
- 12 Applicable optionals and bolting torques on pages. 27 and 37.
- 13 Gauge bodies without valves can be supplied:
 - end connected (threaded or flanged)
 - side connected (threaded or flanged)
 - back connected (threaded or flanged).
 Please state connecting dimensions and Standard.
- 12 **This level gauge is in compliance with ASME Boiler - Section I - requirements**

Transparent **BONT**® Level Gauges Weld - on Bodies, type BT26 and BT27



| Size | Length. of glass G | Length. of body B | Visible length V | Weight | |
|------|--------------------------|-------------------------|------------------------|------------|------------|
| | | | | BT26 kg | BT27 kg |
| 1 | 115 | 128 | 95 | 4.8 | 3.6 |
| 2 | 140 | 153 | 120 | 5.7 | 4.3 |
| 3 | 165 | 178 | 145 | 6.6 | 5.0 |
| 4 | 190 | 203 | 170 | 7.5 | 5.7 |
| 5 | 220 | 233 | 200 | 8.6 | 6.6 |
| 6 | 250 | 263 | 230 | 9.8 | 7.5 |
| 7 | 280 | 293 | 260 | 10.9 | 8.3 |
| 8 | 320 | 333 | 300 | 12.4 | 9.4 |
| 9 | 340 | 353 | 320 | 13.1 | 10.0 |

- 1 These gauge bodies are suitable for welding directly on the vessel. Therefore, no valves can be fitted between vessel and gauge, and in case of glass breakage, the fluid flowing from the vessel cannot be stopped.
- 2 It is necessary to control the suitability of the vessel wall, on which the gauge body is to be welded as this must not be excessively weakened by the holes or communicating window with the gauge. Steel plates to strengthen the vessel wall should be used whenever this is possible.
- 3 During the welding operation, be careful to not expose the gauge body for long time to high temperatures, as this might damage the flatness of the glass sealing surface.
- 4 For BT26 the connecting lip is provided to facilitate the welding operation.

- 5 When enquiring or ordering BT27 please state the external radius (R) of the vessel on which the gauge must be welded.
- 6 For visible lengths over 320 mm two or more single gauge bodies will have to be welded on the vessel. In this case it is advisable to fit the gauge bodies not along the same vertical line, but offset.
- 7 BT26 and BT27 are fitted with transparent glasses type B (see page 38).
- 8 Operating conditions and material schedules on pages 4 and 5.
- 9 Applicable optionals and bolting torques on pages 36, 37.

Sight Glasses for BONT® Level Gauges

Standards and Quality

Glasses fitted in our level gauges and spare glasses comply with the following Standards:

- DIN 7081 - ONORM M 7354 - MIL G 18498 B
- TGL 7210 - OMV H 2009 - Esso Eng. Spec. 123
- BS 3463 - JIS B 8211 - S.O.D. Spec. 123

Physical and chemical features:

- Resistance to bending strain: >150 N/mm²
- Mean coefficient of linear expansion (30 °C to 300 °C):
 $5,0 \cdot 10^{-6} \cdot K^{-1}$ - DIN 52328
- Transition temperature: 550 °C - DIN 52324.
- Hydrolytic resistance: Class 1 - DIN 12111 and ISO 719
- Alkali resistance: Class 2 - DIN 52322 and ISO 695
- Acid resistance: Class 1 - DIN 12116

Material is always borosilicate glass pre-stressed and optically tested. "Pre-Stressed", "hardened", "extra hard" and similar definitions are perfectly equivalent.

We never use "soda-lime" glasses, since they have quite insufficient features.

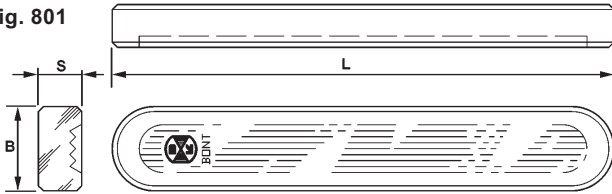
Special attention shall be paid to length, width, thickness and especially flatness tolerances. From the latter point of view BONT® sight glasses have very strict tolerance values, definitely lower than most of the ones on the market. What above ensures less stress and longer life of glass and joints.

Reflex or transparent glasses

There are two types of sight glasses:

Reflex Glass

Fig. 801



These glasses have one smooth face (external face) and the other face provided with moulded prismatic grooves (internal face). For application with reflex level gauges.

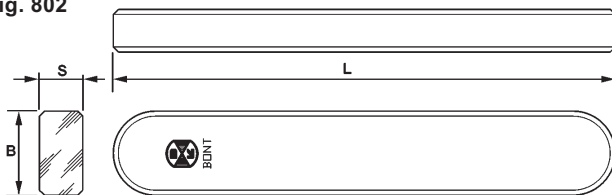
Reflex glasses have following dimensions:

| Size | Type A | | | Type B | | | Type A-BR13 | | |
|------|-------------|------------|--------------|-------------|------------|--------------|-------------|------------|--------------|
| | Length L | Width B | Thickn. S | Length L | Width B | Thickn. S | Length L | Width B | Thickn. S |
| 1 | 115 | 30 | 17 | 115 | 34 | 17 | 115 | 30 | 17 |
| 2 | 140 | 30 | 17 | 140 | 34 | 17 | 140 | 30 | 17 |
| 3 | 165 | 30 | 17 | 165 | 34 | 17 | 165 | 30 | 17 |
| 4 | 190 | 30 | 17 | 190 | 34 | 17 | 190 | 30 | 17 |
| 5 | 220 | 30 | 17 | 220 | 34 | 17 | 220 | 30 | 17 |
| 6 | 250 | 30 | 17 | 250 | 34 | 17 | 250 | 30 | 17 |
| 7 | 280 | 30 | 17 | 280 | 34 | 17 | 280 | 30 | 17 |
| 8 | 320 | 30 | 17 | 320 | 34 | 17 | 320 | 30 | 17 |
| 9 | 340 | 30 | 17 | 340 | 34 | 17 | 340 | 30 | 17 |

- Sizes of glasses are now indicated by Arabic numerals (1, 2, etc.). Former size indication was in Roman numerals (I, II, etc.).

Transparent Glasses

Fig. 802

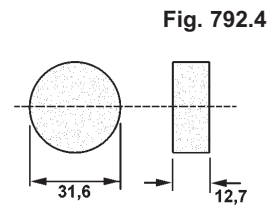


These glasses have both smooth faces. For application with transparent level gauges.

Transparent glasses have following dimensions:

| Size | Type A | | | Type B | | | Type A-BT12 | | | |
|------|-------------|------------|--------------|-------------|------------|--------------|-------------|------------|--------------|---|
| | Length L | Width B | Thickn. S | Length L | Width B | Thickn. S | Length L | Width B | Thickn. S | |
| 1 | 115 | 30 | 17 | 115 | 34 | 17 | - | - | - | - |
| 2 | 140 | 30 | 17 | 140 | 34 | 17 | - | - | - | - |
| 3 | 165 | 30 | 17 | 165 | 34 | 17 | 163 | 27.6 | 16.8 | |
| 4 | 190 | 30 | 17 | 190 | 34 | 17 | 188 | 27.6 | 16.8 | |
| 5 | 220 | 30 | 17 | 220 | 34 | 17 | 218 | 27.6 | 16.8 | |
| 6 | 250 | 30 | 17 | 250 | 34 | 17 | 248 | 27.6 | 16.8 | |
| 7 | 280 | 30 | 17 | 280 | 34 | 17 | 278 | 27.6 | 16.8 | |
| 8 | 320 | 30 | 17 | 320 | 34 | 17 | 318 | 27.6 | 16.8 | |
| 9 | 340 | 30 | 17 | 340 | 34 | 17 | 338 | 27.6 | 16.8 | |

- Sizes of glasses are now indicated by Arabic numerals (1, 2, etc.). Former size indication was in Roman numerals (I, II, etc.).
- Transparent glasses Type A (cross section 30 x 17 mm) are only spare parts for old pattern level gauges manufactured by us before 1945.
- Transparent glasses type A-BT12 are only spare parts for transparent bodies type BT12, no more in production.
- A special transparent glass is the round glass for application with high pressure (usually bicolour) level gauges. This glass is a small disc (Fig. 792.4) with very strict tolerances.



Joints for glasses

- Each sight glass is usually supplied with 2 joints (1 sealing joint + 1 cushion joint).
- Length and width of joint are the same as those of the respective glass.
- Reflex glasses type A-BR13 - for fitting in reflex gauges type BR13 - need special sized joints. See maintenance instructions.
- Transparent glasses type A-BT12 - for fitting in transparent gauges type BT12, no more in production - need special sized joints. See maintenance instructions.

Protection for glasses

When glass protection against corrosive fluids is to be taken in consideration (including boiler water pressured over 35 bar), you must remember that only smooth surfaces can be shielded by smooth sheets having same length and width as sight glass.

Therefore:

- reflex glasses: only external face can be shielded by mica sheets or other materials against corrosive environmental agents,
 - transparent glasses: both faces can be shielded by mica or transparent polytrifluorochloroethylene (Kel-F) sheets.
- Protection of the internal glass face in contact with fluid is usually sufficient.
- Mica sheets inside level gauges are always recommended for application with water steam: thickness of mica sheets is usually 0.15 to 0.20 mm.

Non-frosting Blocks

Frost on gauge obstructing level reading could develop when level gauge operates at fairly low temperature. In such cases non-frosting block of transparent acrylic resin must be fastened and sealed outside the gauge body. This block shall protrude according to the thickness of the frost (see Fig. 773 and 829).

Recommended protrusion:

| Working temperature of fluid | Protrusion of block |
|------------------------------|---------------------|
| 0 °C through -19 °C | 38 mm |
| - 20 °C through -49 °C | 75 mm |
| - 50 °C through -99 °C | 150 mm |
| -100 °C and lower | 200 mm |