

Diaphragm monitoring system

For sanitary applications

Model DMS-FP

WIKA data sheet DS 95.20



Applications

- Hygienic pressure measurement for the pharmaceutical industry and for aseptic food processing
- Pressure/vacuum monitoring on pipelines, fermenters, bioreactors and vessels as well as with processing and transport of high-quality and critical media
- Suitable for the production of active pharmaceutical ingredients (API)
- For gases, vapour; liquid, pasty, powdery and crystallising media

Special features

- Double-diaphragm system to ensure the separation of the process and the pressure measuring instrument
- Clamp connection easy to open for cleaning and seal replacement
- Suitable for SIP and CIP
- Patent applied for in various countries, e.g. DE 19 94 98 31

Description

The WIKA combinations of diaphragm seals, pressure measuring instruments and monitoring instruments are best suited for the harshest and hygienic measuring tasks. The systems can withstand the cleaning-vapour temperatures occurring in SIP processes and ensure a sterile connection between the medium and the diaphragm seal.

Patented diaphragm monitoring has been designed specifically for the highest safety requirements in the pharmaceutical and biotechnology industries. Through the diaphragm monitoring, the risk of an unnoticed rupture of the diaphragm is avoided, since this is immediately indicated on the monitoring instrument. In addition, an electrical signal can be transmitted to the system control. In the event of a diaphragm rupture, a second diaphragm in the pressure measuring instrument ensures the reliable separation of the environment and the process.



Diaphragm monitoring systems, model DMS-FP

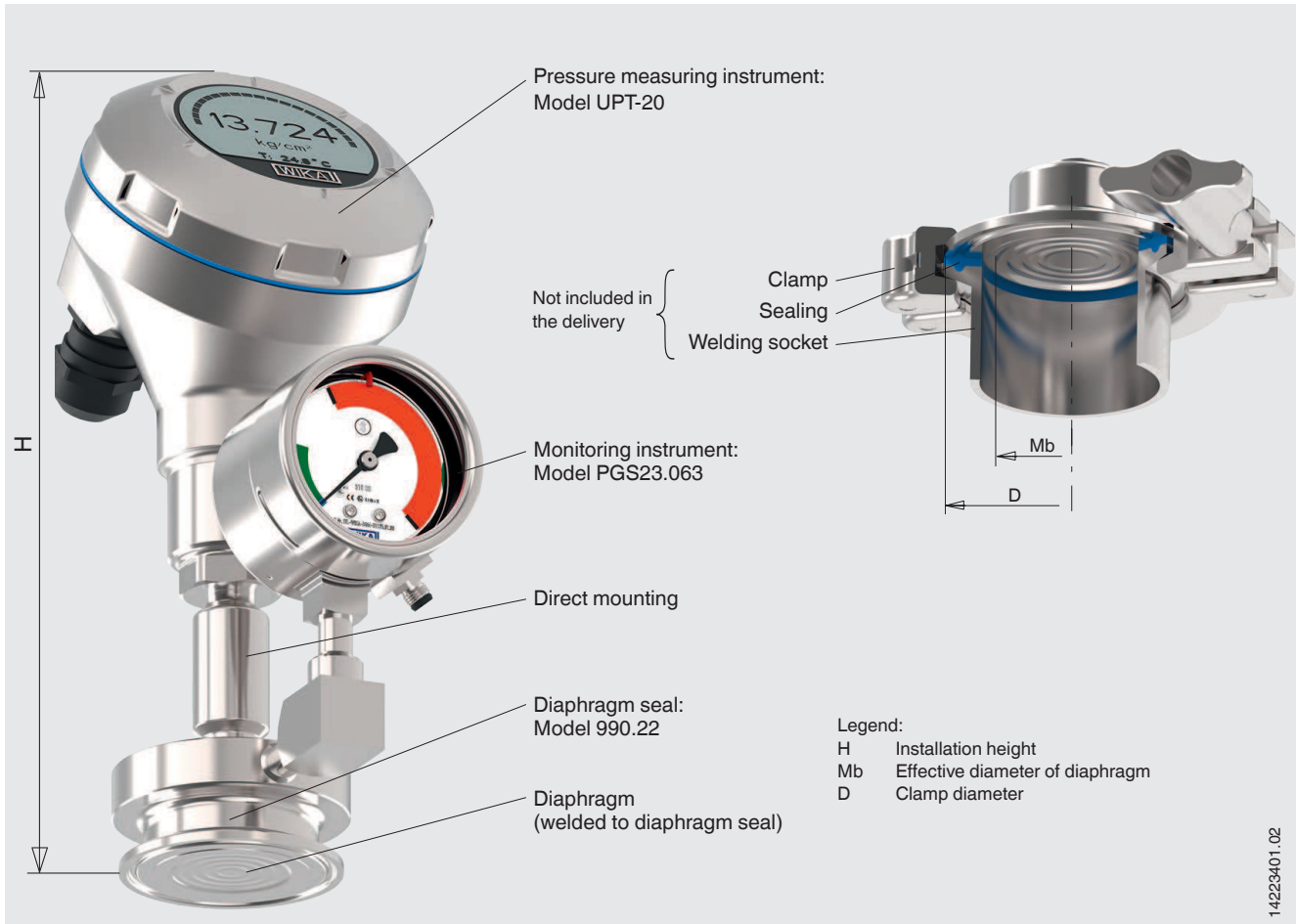
Mounting of the diaphragm seal to the measuring instrument is made as direct mounting as standard. A fluid inside the system, which is explicitly chosen to suit the particular application, hydraulically transmits the pressure to the pressure measuring instrument.

Diaphragm seals with clamp connection have been specifically developed for use in sterile processes and are integrated into the process by means of a clamp. This ensures the hygienic process integration of the diaphragm monitoring system.

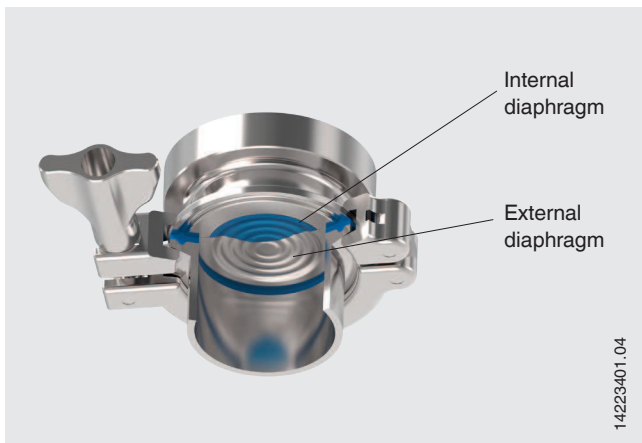
The diaphragm seal systems with WIKA diaphragm seals are successfully used in the life science industry, in food production, pharmaceutical and biotechnology applications.

Illustrative example of a diaphragm monitoring system

The diaphragm monitoring system is a combination of pressure measuring instrument, diaphragm seal and monitoring instrument.



Functional principle of diaphragm monitoring diaphragm seal typ 990.22



WIKA's patented double-diaphragm design (patent no. DE19949831) is the solution for critical processes where neither the medium should find its way into the environment, nor should the system fill fluid find its way into the product.

The space between the two diaphragms illustrated is evacuated. The vacuum that is generated by this is monitored by the monitoring instrument.

Should a diaphragm rupture, there will be an optical or electrical warning through the selected monitoring instrument.

Specifications

| Diaphragm seal system | | | | |
|---|---|------------------------------|-------------------------------|----------------------|
| Design | Pressure measuring instrument mounted to a diaphragm seal with clamp connection, welded | | | |
| Scale range | 0 ... 2.5 (0 ... 40) | 0 ... 4 (0 ... 60) | 0 ... 6 (0 ... 1,000) | 0 ... 10 (0 ... 150) |
| Gauge pressure in bar (psi) | 0 ... 16 (0 ... 250) | 0 ... 25 (0 ... 400) | 0 ... 40 (0 ... 600) | |
| Scale range ¹⁾ | -1 ... 1.6 (-30 inHg ... 25) | -1 ... 3 (-30 inHg ... 45) | -1 ... +5 (-30 inHg ... +70) | |
| Vacuum in bar (psi) | -1 ... 10 (-30 inHg ... 145) | -1 ... 15 (-30 inHg ... 220) | -15 ... 25 (-30 inHg ... 360) | |
| Permissible temperature range | | | | |
| Medium | +10 ... +80 °C (+50 ... +176 °F) for SIP and CIP max. +130 °C (+266 °F) | | | |
| Ambient | +10 ... +40 °C (+50 ... +104 °F) | | | |
| Storage | +10 ... +60 °C (+50 ... +140 °F) | | | |
| Ingress protection per IEC/EN 60529 | IP65 | | | |
| Material ²⁾ | | | | |
| wetted | Diaphragm: Stainless steel 1.4435 (316L); UNS S31603 Upper body of diaphragm seal: Stainless steel 1.4435 (316L); UNS S31603 | | | |
| Surface roughness | | | | |
| wetted | Ra ≤ 0.38 µm (30 µin) per ASME BPE SF3, electropolished (except for weld seam) | | | |
| non-wetted | Ra ≤ 0.76 µm (30 µin) (except for weld seam) | | | |
| Mounting type | Direct mounting | | | |
| Level of cleanliness of wetted parts | Oil and grease free per ASTM G93-03 level E (WIKA standard) and ISO 15001 (< 1,000 mg/m ²) | | | |
| System fill fluid | Medicinal white mineral oil KN 92 (FDA 21 CFR 172.878, 21 CFR 178.3620(a); USP, EP, JP) Recommendation for pharmaceutical and cosmetics applications | | | |

1) Under vacuum, the diaphragm monitoring function is only possible to a limited extent
2) Other materials on request

Operational safety with vacuum

Pressure measuring instruments with vacuum scale ranges are generally suitable for use with full vacuum.

Display behaviour for vacuum

The monitoring instrument is dependent upon the process pressure and can detect the diaphragm rupture up to a maximum of 250 mbar abs.

Specifications, monitoring instrument

| Monitoring instrument | Model PGS23.063 | Model 232.30.063 |
|-------------------------------------|--|---------------------------------|
| Design 1) | Pressure gauge with switch contact (safety version) | Pressure gauge (safety version) |
| Nominal size | 63 | |
| Material | Stainless steel, with solid baffle wall (Solidfront) and blow-out back | |
| Case | Stainless steel 316L | |
| Pressure element | Stainless steel | |
| Movement/bayonet ring | Aluminium | |
| Pointer/dial | Laminated safety glass | |
| Window | | |
| Ingress protection per IEC/EN 60529 | IP65 | IP54 |
| Pressure limitation | Steady: 3/4 x full scale value Short time: Full scale value Fluctuating: 2/3 x full scale value | |
| Electrical connection | Cable bushing with 2 m cable (optional connectors on request) | - |
| Reed switch model 851 | No control unit and no power supply required Direct switching up to 150 V, 0.5 A Also suitable for direct triggering of a programmable logic controller (PLC) Free from wear as without contact | - |

1) Recommendation: Model PGS23.063, since the electrical switch contact can be used for external alarm devices

Functional description

Diaphragm monitoring system is fully functional

Diaphragm monitoring system must be replaced



Process pressure

Should a diaphragm rupture occur, the full process pressure acts on the monitoring instrument. In the event of a diaphragm rupture, the monitoring instrument must therefore be designed for this process pressure.

Temperatures

The same process conditions apply to the monitoring instrument as to the pressure measuring instrument. The permissible temperature ranges for the monitoring instruments must be checked in the corresponding data sheet.

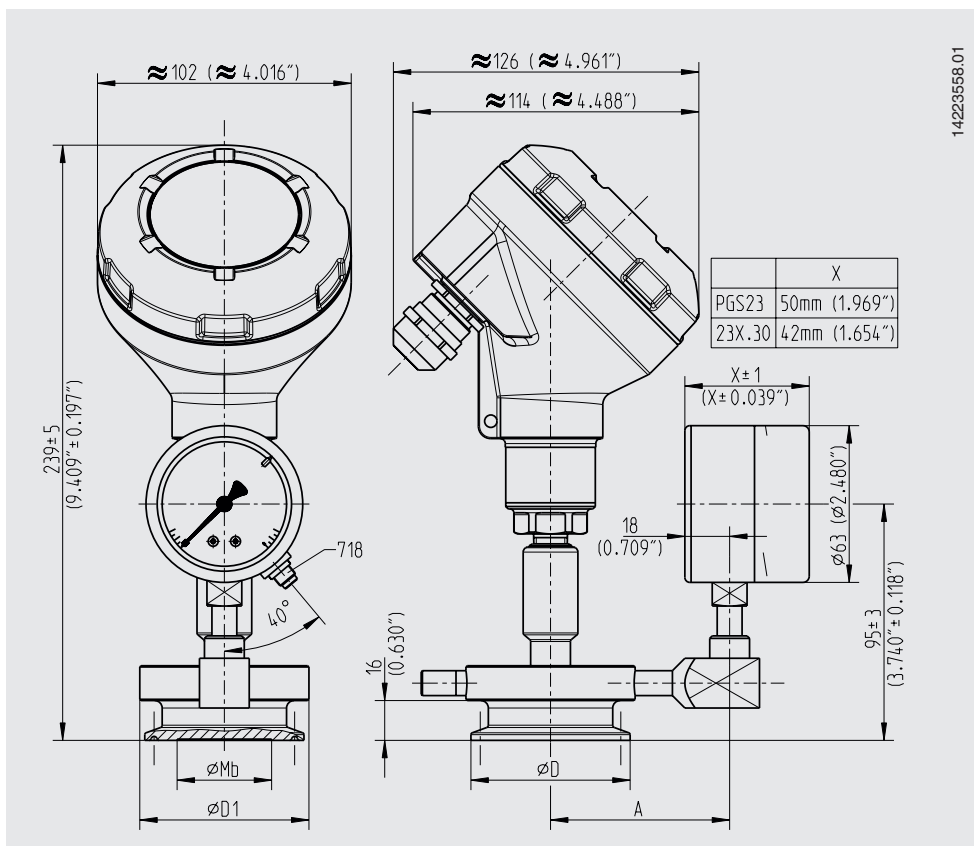
Medium

In the event of a diaphragm rupture, the measuring system of the monitoring instrument comes into contact with the medium. The measuring system must therefore be suitable for this medium.

Specifications, model DMS-FP with process transmitter model UPT-20

| Model UPT-20 | |
|-------------------------|---|
| Overload safety | Measuring range ≤ 16 bar (300 psi): 3 times Measuring range > 16 bar (300 psi): 2 times |
| Output signal | 4 ... 20 mA |
| Load in Ω | $\leq (U_+ - U_{min}) / 0.023$ A |
| Power supply | DC 12 ... 36 V |
| Accuracy specifications | 0.10 % of span |
| Material | |
| Case | Stainless steel 316Ti |
| Sensor | Stainless steel 316L |

Dimensions in mm (in)



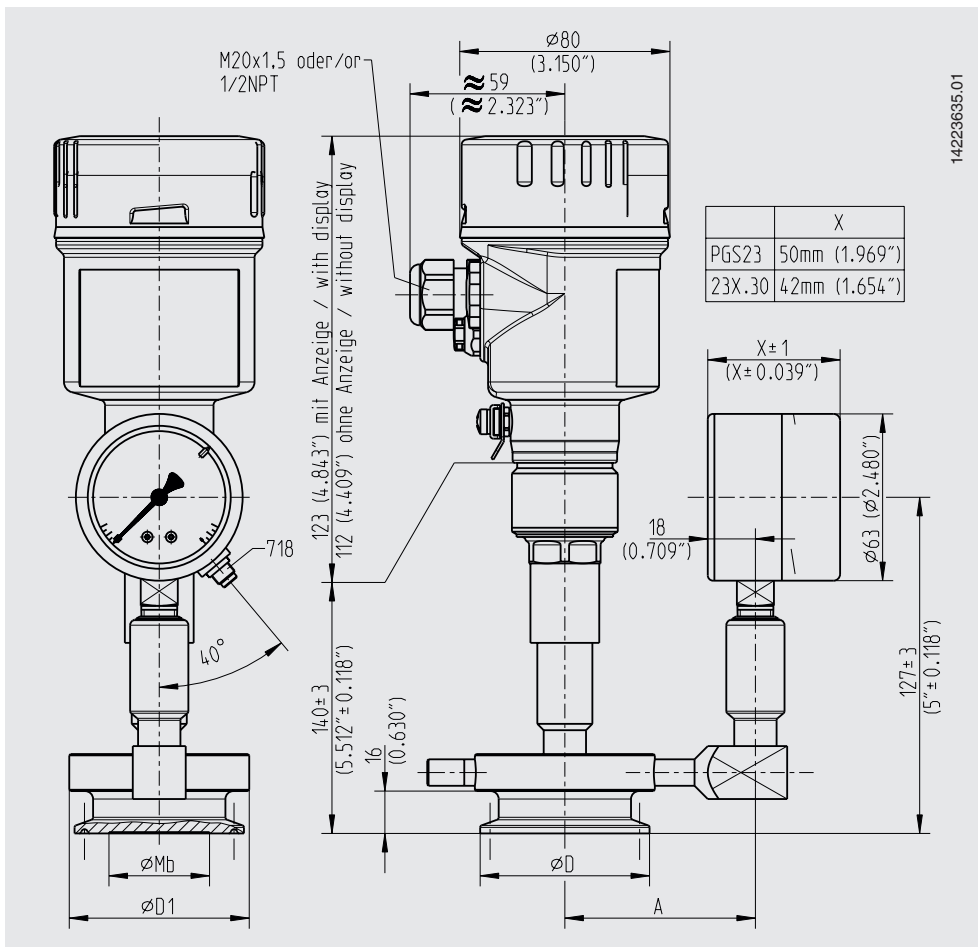
For further information see data sheet PE 86.05

Specifications, model DMS-FP with process transmitter model IPT-10

| Model IPT-10 | |
|---|---|
| Output signal | 4 ... 20 mA (2-wire) 4 ... 20 mA (2-wire with a superimposed communication signal 4 HART®) FOUNDATION™ Fieldbus PROFIBUS® PA |
| Load in Ω | $(U_B - U_B) / 0.023 \text{ A}$ |
| Accuracy at room temperature ¹⁾ | Measuring ranges < 40 bar: $\leq 0.1 \%$ of span |
| Material | |
| Case | Single chamber case, stainless steel 316Ti |
| Sensor | Stainless steel 316L |

1) Including non-linearity, hysteresis, zero offset and end value deviation (corresponds to measured error per IEC 61298-2). Calibrated in vertical mounting position with process connection facing downwards.

Dimensions in mm (in)



For further information see data sheet PE 86.11

Specifications, model DMS-FP with digital pressure gauge model CPG1500

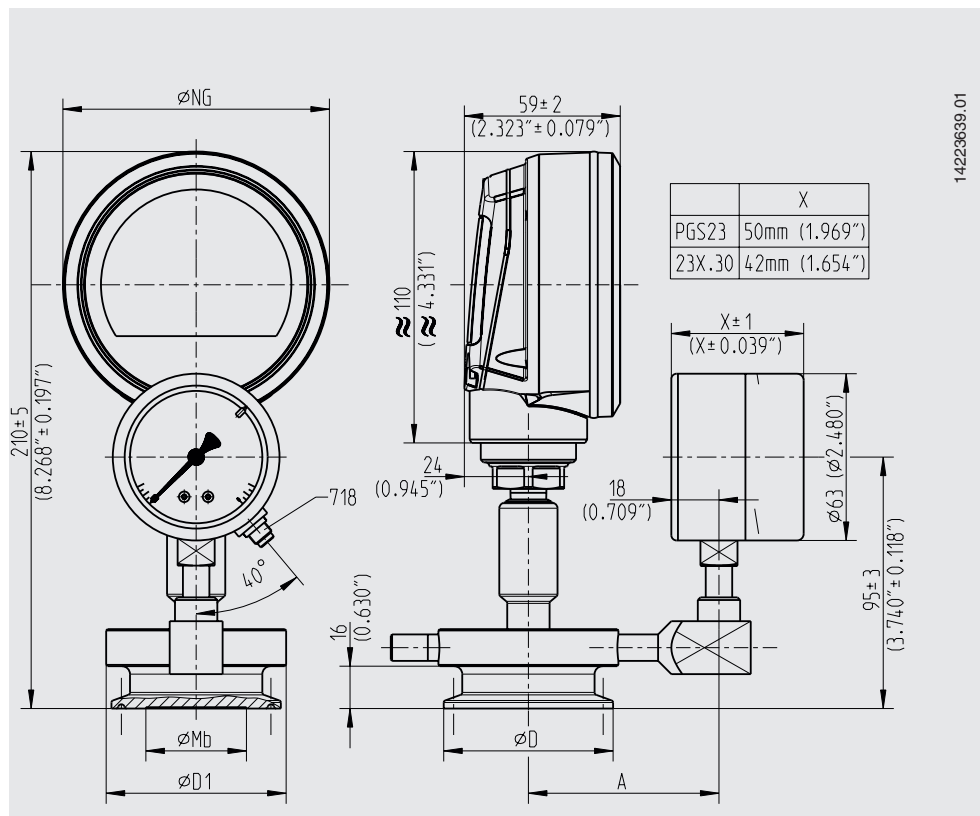
| Model CPG1500 | |
|-------------------------------|--|
| Overload safety | ≤ 25 bar (≤ 300 psi); 3 times > 25 bar ≤ 600 bar (> 300 ... ≤ 5,000 psi); 2 times |
| Accuracy ¹⁾ | 0.1 % FS |
| Display | 5 ½ digit 7-segment display (incl. a large matrix area for auxiliary information) Bar graph, 0 ... 100 % Selectable backlighting |
| Rotatable case | The case is rotatable by 330° |
| Resolution | 4 ... 5 ½ digits; selectable |
| Voltage supply | |
| Power supply | 3 x 1.5 V AA alkaline batteries ²⁾ |
| Maximum voltage | DC 4.95 V (sparking) |
| Battery life | typical 2,000 ... 2,500 h (without backlighting and WIKA-Wireless not active) |
| Battery status display | Symbol display with 4 bars indicates the battery status in 25 % steps |
| Material | |
| Case | Aluminium die-casting, nickel-plated |
| Sensor | Stainless steel 316 |

1) It is defined by the total measurement uncertainty, which is expressed with the coverage factor (k = 2) and includes the following factors: the intrinsic performance of the instrument, the measurement uncertainty of the reference instrument, long-term stability, influence of ambient conditions, drift and temperature effects over the compensated range during a periodic zero point adjustment.

2) For hazardous areas, only the following models are permitted:

- Duracell, Simply by Duracell MN1500
- Duracell, Duralock Plus Power MN1500
- Varta, RAYOVAC Maximum Plus 4006

Dimensions in mm (in)

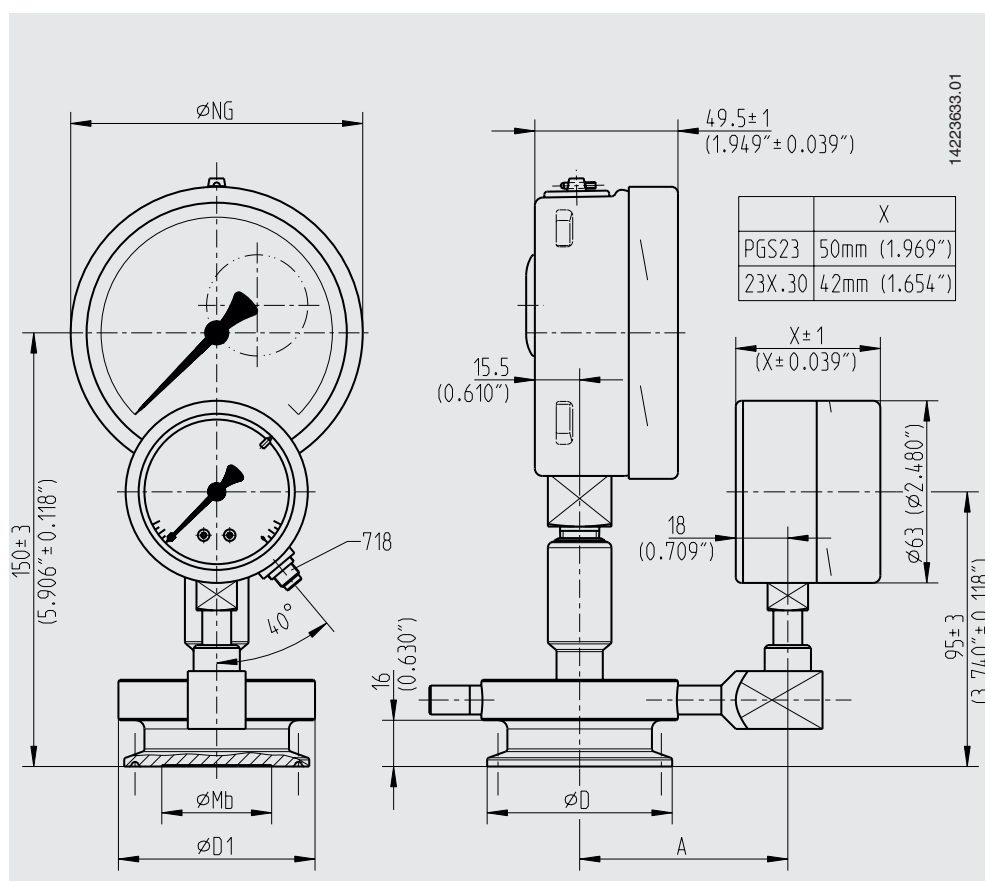


For further information see data sheet CT 10.51

Specifications, model DMS-FP with Bourdon tube pressure gauge model 23x.30.100

| Model 23x.30.100 | |
|-------------------------------------|---|
| Nominal size | 100 |
| Ingress protection per IEC/EN 60529 | IP65 |
| Pressure limitation | Steady: 3/4 x full scale value Fluctuating: 2/3 x full scale value Short time: Full scale value |
| Material | |
| Case | Stainless steel, with solid baffle wall (Solidfront) and blow-out back, scale ranges $\leq 0 \dots 16$ bar (lower mount) with compensating valve to vent case |
| Pressure element | Stainless steel 316L |
| Movement | Stainless steel 316L |
| Dial | Aluminium, white, black lettering |
| Pointer | Aluminium, black |
| Window | Laminated safety glass |

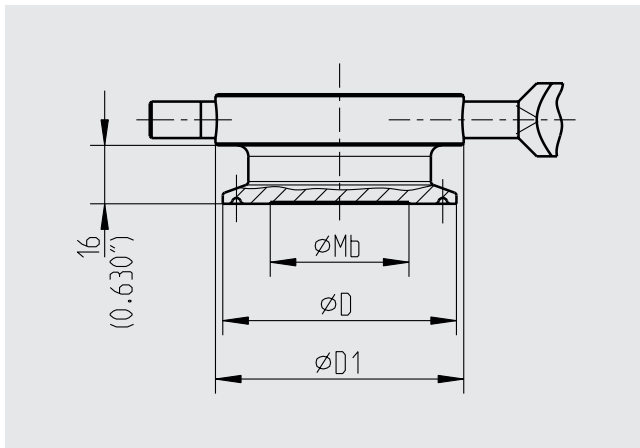
Dimensions in mm (in)



For further information see data sheet PM 02.04

Diaphragm seal model 990.22

Dimensions in mm (in)



Type of process connection: Clamp connection per DIN 32676

Pipe standard: Pipes per DIN 11866 row C or ASME BPE

| DN | For outer \varnothing of pipe x wall thickness | PN ¹⁾ | D | D1 | Mb | A |
|--------|--|------------------|--------------|------------|------------|------------|
| 1 1/2" | 38.1 x 1.65 (1.5 x 0.065) | 40 | 50.5 (1.988) | 58 (2.283) | 32 (1.26) | 67 (2.638) |
| 2" | 50.8 x 1.65 (2 x 0.065) | | 64 (2.52) | 68 (2.677) | 40 (1.574) | 72 (2.835) |

Type of process connection: Clamp connection per DIN 32676

Pipe standard: Pipes per DIN 11866 row B or ISO 1127 row 1

| DN | For pip Outer \varnothing of pipe x wall thickness | PN ¹⁾ | D | D1 | Mb | A |
|--------|---|------------------|--------------|------------|------------|------------|
| 1 1/2" | 42.4 x 2 (1.67 x 0.079) | 40 | 50.5 (1.988) | 58 (2.283) | 32 (1.26) | 67 (2.638) |
| 2" | 48.3 x 2 (1.901 x 0.079) | | 64 (2.52) | 68 (2.677) | 40 (1.574) | 72 (2.835) |

Type of process connection: Clamp connection

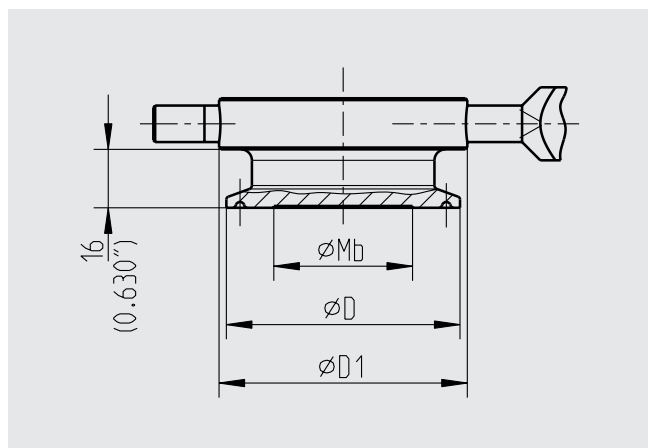
Pipe standard: Pipes per BS4825 part 3 and O.D. tube

| DN | For pipe Outer \varnothing of pipe x wall thickness | PN ¹⁾ | D | D1 | Mb | A |
|--------|--|------------------|--------------|------------|------------|------------|
| 1 1/2" | 38.1 x 1.6 (1.5 x 0.062) | 40 | 50.5 (1.988) | 58 (2.283) | 32 (1.26) | 67 (2.638) |
| 2" | 50.8 x 1.6 (2 x 0.062) | | 64 (2.52) | 68 (2.677) | 40 (1.574) | 72 (2.835) |

1) For maximum pressure range consider pressure rating of clamp.

Diaphragm seal model 990.52 and model 990.53

Dimensions in mm (in)



Diaphragm seal model 990.52

Type of process connection: Clamp connection per DIN 32676

Pipe standard: Pipes per DIN 11866 row A or DIN 11850 row 2

| DN | For pipe Outer \varnothing of pipe x wall thickness | PN ¹⁾ | D | D1 | Mb | A |
|----|--|------------------|--------------|------------|------------|------------|
| 40 | 41 x 1.5 (1.614 x 0.06) | 40 | 50.5 (1.988) | 58 (2.283) | 32 (1.26) | 67 (2.638) |
| 50 | 53 x 1.5 (2.087 x 0.06) | | 64 (2.52) | 68 (2.677) | 40 (1.574) | 72 (2.835) |

Diaphragm seal model 990.53



Type of process connection: Clamp connection per ISO 2852

Pipe standard: Pipes per ISO 2037 and BS 4825 part 1

| DN | For pipe Outer \varnothing of x wall thickness | PN ¹⁾ | D | D1 | Mb | A |
|----|---|------------------|--------------|------------|------------|------------|
| 38 | 38 x 1.2 (1.5 x 0.047) | 40 | 50.5 (1.988) | 58 (2.283) | 32 (1.26) | 67 (2.638) |
| 40 | 40 x 1.2 (1.745 x 0.047) | | | | | 67 (2.638) |
| 50 | 51 x 1.2 (2.008 x 0.047) | | 64 (2.52) | 68 (2.677) | 40 (1.574) | 72 (2.835) |

1) For maximum pressure range consider pressure rating of clamp.

Approvals

| Logo | Description | Country |
|---|---|----------------|
|  | 3-A Sanitary Standard These instruments are optionally 3-A marked based on a third party verification for conformance to the 3-A standard number 74. | USA |
|  | EHEDG Hygienic Equipment Design | European Union |

Certificates (option)

- 2.2 test report per EN 10204
(e.g. surface finish quality of wetted parts)
- 3.1 inspection certificate per EN 10204
(e.g. material proof, wetted metallic parts with suppliers' certificate (melting analysis), measurement accuracy: Listing of the single measured values)
- Others on request

Patents, property rights

- Diaphragm monitoring system registered under no. DE 19 94 98 31
- Further patents have been applied for, e.g. DE 102016015447 A1, and in other countries, e.g. USA and China

Approvals and certificates, see website

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