Gas density monitor
With integrated transmitter
Model GDM-100-TI

Applications
- Gas density monitoring of closed SF₆ tanks
- For indoor and outdoor installation in SF₆ gas-insulated switchgear

Special features
- On-site display with switch contact
- Remote readout (output 4 … 20 mA, 2-wire), measuring ranges from 0 … 10 g/litre to 0 … 80 g/litre
- High electromagnetic compatibility (EMC)
- Hermetically sealed, therefore no influence from atmospheric pressure fluctuation and differences in mounting heights

Description

The model GDM-100-TI features a model GD-10 analogue transmitter integrated into the rear of the case. Through this, the functions of switching and transmission are combined in just one gas density monitor. The combination of a gas density monitor and transmitter in one instrument enables the parallel operation of both instruments with only one process connection, provides additional safety through redundancy and simplifies the installation tasks on the electrical equipment.

The transmitter records the pressure and temperature of the SF₆ gas in the gas tank. The current gas density is ascertained from both measurement parameters by means of an electronic evaluation system. Thermally induced pressure changes are dynamically compensated and do not affect the output signal. The transmitter generates a density-proportional, standardised signal of 4 … 20 mA.

Recalibration of the zero point is not necessary due to the high long-term stability of the transmitter. The measuring cell ensures a high long-term sealing and is hermetically sealed to prevent leaks and remain independent of atmospheric pressure fluctuations and variations in the mounting height.
Gas density monitor

Nominal size in mm
100

Calibration pressure PE
To customer specification

Accuracy specifications
- ±1 % at an ambient temperature of 20 °C [68 °F]
- ±2.5 % at ambient temperature -20 ... +60 °C and with calibration pressure in accordance with reference isochore (reference diagram KALI-Chemie AG, Hanover, prepared by Dr. Döring 1979)

Scale range
Vacuum and overpressure range with measuring span of 1.6 ... 25 bar (at an ambient temperature of 20 °C [68 °F] and gaseous phase)

Permissible ambient temperature
Operation: -20 ... +60 °C [-4 ... +140 °F], gaseous phase
Storage: -40 ... +60 °C [-58 ... +140 °F]

Process connection
G ½ B per EN 837, lower mount
Stainless steel, spanner flats 22 mm
Other connections and connection locations on request.

Pressure element
Stainless steel, welded
Gas-tight: Leak rate ≤ 1 · 10⁻⁸ mbar · l / s
Test method: Helium mass spectrometry

Movement
Stainless steel
Bimetal link (temperature compensation)

Dial
Aluminium
Red, yellow, green area as specified in the order

Pointer
Aluminium, black

Case

<table>
<thead>
<tr>
<th>Selectable versions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1</td>
<td>Stainless steel, with gas filling</td>
</tr>
<tr>
<td>Option 2</td>
<td>Stainless steel, with filling liquid</td>
</tr>
</tbody>
</table>

Gas-tight: Leak rate ≤ 1 · 10⁻⁵ mbar · l / s

Window

<table>
<thead>
<tr>
<th>Selectable versions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1</td>
<td>Laminated safety glass</td>
</tr>
<tr>
<td>Option 2</td>
<td>Clear non-splintering plastic</td>
</tr>
</tbody>
</table>

Ring
Bayonet ring, stainless steel, secured by means of 3 welding spots

Permissible air humidity
≤ 90 % r. h. (non-condensing)

Ingress protection
IP65 per IEC/EN 60529

Weight
Case with gas filling: approx. 1.2 kg
Case with fill fluid: approx. 1.6 kg

High-voltage test 100 %
2 kV, 50 Hz, 1 s (wiring against case)

Switch contacts

Electrical connection

<table>
<thead>
<tr>
<th>Selectable versions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1</td>
<td>Cable socket with compression fitting M20 x 1.5</td>
</tr>
<tr>
<td></td>
<td>Wire cross-section max. 2.5 mm²</td>
</tr>
<tr>
<td>Option 2</td>
<td>Plug-in cable box</td>
</tr>
</tbody>
</table>

Number of switch contacts

<table>
<thead>
<tr>
<th>Selectable versions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1</td>
<td>1 magnetic snap-action contact</td>
</tr>
<tr>
<td>Option 2</td>
<td>2 magnetic snap-action contacts</td>
</tr>
<tr>
<td>Option 3</td>
<td>3 magnetic snap-action contacts</td>
</tr>
<tr>
<td>Option 4</td>
<td>4 magnetic snap-action contacts</td>
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</tbody>
</table>

Switching directions

<table>
<thead>
<tr>
<th>Selectable versions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1</td>
<td>Falling pressure</td>
</tr>
<tr>
<td>Option 2</td>
<td>Rising pressure</td>
</tr>
</tbody>
</table>

Switching functions

<table>
<thead>
<tr>
<th>Selectable versions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1</td>
<td>Normally open</td>
</tr>
<tr>
<td>Option 2</td>
<td>Normally closed</td>
</tr>
<tr>
<td>Option 3</td>
<td>Change-over contact (max. 2 switch points)</td>
</tr>
</tbody>
</table>
Circuits

<table>
<thead>
<tr>
<th>Selectable versions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1</td>
<td>Galvanically connected (not for change-over contact)</td>
</tr>
<tr>
<td>Option 2</td>
<td>Galvanically isolated</td>
</tr>
</tbody>
</table>

Switching accuracy
Switch point = calibration pressure $P_E$: see accuracy specifications
Switch point ≠ calibration pressure $P_E$: Parallel to the reference isochore of the calibration pressure

Max. switching voltage
AC 250 V

Switching power
Case with gas filling: 30 W / 50 VA, max. 1 A
Case with fill fluid: 20 W / 20 VA, max. 1 A

Switch point setting

<table>
<thead>
<tr>
<th>Selectable versions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1</td>
<td>Secured switch points, not adjustable</td>
</tr>
<tr>
<td>Option 2</td>
<td>Adjustable switch points</td>
</tr>
</tbody>
</table>

Material of switch contacts
80 % Ag / 20 % Ni, gold-plated

Further information on magnetic snap-action contacts in data sheet AC 08.01
Gas density sensor

Measuring ranges

<table>
<thead>
<tr>
<th>Density</th>
<th>g/litre</th>
<th>10</th>
<th>16</th>
<th>25</th>
<th>40</th>
<th>60</th>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density range (Pressure range based on 20 °C)</td>
<td>(bar abs.)</td>
<td>(1.64)</td>
<td>(2.59)</td>
<td>(3.97)</td>
<td>(6.16)</td>
<td>(8.87)</td>
<td>(11.33)</td>
</tr>
<tr>
<td>Overload safety</td>
<td>bar abs.</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>29</td>
<td>29</td>
<td>67</td>
</tr>
<tr>
<td>Burst pressure sensor element</td>
<td>bar abs.</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>35</td>
<td>35</td>
<td>80</td>
</tr>
</tbody>
</table>

Intended medium
Pure SF₆ gas

Measuring principle
Piezo-resistant

Output signal
4 ... 20 mA, 2-wire

Permissible max. load $R_A$
$R_A \leq (U_B - 10 \text{ V}) / 0.02 \text{ A}$ with $R_A$ in Ohms and $U_B$ in Volts

Power supply $U_B$
DC 10 ... 30 V

Accuracy specifications
- Point of optimal density:
  - -40 °C: 3 % of span
  - 20 °C: 1 % of span
  - 60 °C: 2.3 % of span
- Start and end of the measuring range:
  - -40 °C: 4 % of span
  - 20 °C: 2 % of span
  - 60 °C: 3.3 % of span

Stability per year
≤ 0.3 % of span (at reference conditions)

Electromagnetic compatibility (EMC) to IEC 61000-4
- IEC 61000-4-2 (ESD): test level 4 (8 kV)
- IEC 61000-4-3 (Field): test level 3 (10 V/m)
- IEC 61000-4-4 (Burst): test level X (±2 kV)
- IEC 61000-4-5 (Surge): test level 2 (±1 kV)
- IEC 61000-4-6 (Conducted RFI): test level 3 (10 V)

High-voltage strength
DC 750 V (electrical connections against case)

Permissible ambient temperature
- Operation: -40 ... +60 °C [-40 ... +140 °F], gaseous phase
- Storage: -40 ... +80 °C [-40 ... +176 °F]

Electrical connection
With built-in transmitter: Cable outlet, IP68
With built-in transmitter: Angular connector (2-pin), IP67

Electrical safety
Protection against reverse polarity and overvoltage

Materials
- Wetted parts: Stainless steel
- Case, terminal enclosure: Stainless steel

Internal pressure transmission medium
Synthetic oil
Dimensions in mm

Approvals

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<tr>
<th>Logo</th>
<th>Description</th>
<th>Country</th>
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<tbody>
<tr>
<td></td>
<td>EU declaration of conformity</td>
<td>European Union</td>
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<tr>
<td></td>
<td>EMC directive</td>
<td></td>
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<td></td>
<td>Pressure equipment directive</td>
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<td></td>
<td>Low voltage directive</td>
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<tr>
<td></td>
<td>EAC</td>
<td>Eurasian Economic Community</td>
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<tr>
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<td></td>
<td>Machinery directive</td>
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<td></td>
<td>Gas appliances directive</td>
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</tbody>
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Ordering information
Sealing range / Pressure unit / Process connection / Electrical connection / Filling pressure / Switch configuration / Gas mixture