

Hybrid gas density monitor with reference chamber

With Modbus® or analogue 4 ... 20 mA signal

Model GDM-RC-100-T

WIKA data sheet SP 60.80

Applications

- High-voltage equipment
- Gas density monitoring in closed SF₆ gas compartments
- Remote monitoring of the SF₆ condition
- Raising an alarm when defined limit values have been reached

Special features

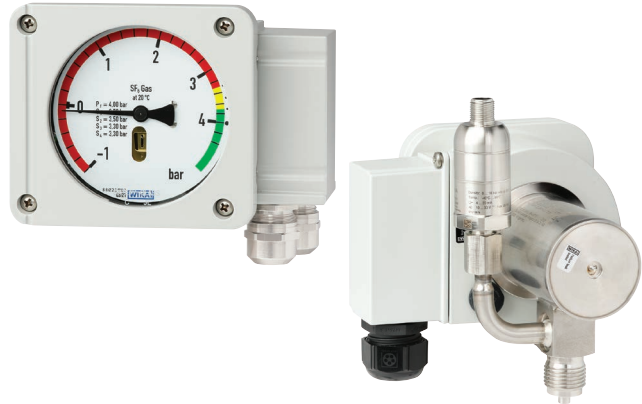
- Ideally suited for smart grid or modernisation projects
- Modbus® delivers measured values for pressure, temperature and gas density as digital signal
- The 4 ... 20 mA variant outputs the absolute pressure at 20 °C [68 °F] or the gas density in g/l as an analogue signal
- Suitable for alternative gases
- Complete local display of the density and vacuum range on a 100-mm dial

Description

Gas density is a crucial operating parameter for high-voltage plants. If the required gas density is not present, safe operation of the plant cannot be guaranteed.

The WIKA gas density measuring instruments provide reliable warnings against dangerously low gas levels, even under extreme ambient conditions. If the gas density drops as a result of a leakage, the switch contacts will switch. In addition to the traditional gas density monitor, with the model GDM-RC-100-T high-precision sensors and evaluation electronics are incorporated.

Via the on-site display, the pressure based on 20 °C [68 °F] can be read directly on the instrument. With the integrated switch contacts, simple switching tasks can be realised quickly and without complication. The integrated 4 ... 20 mA or Modbus® sensors integrated or attached to the instrument enable remote monitoring of the plant.



Left: Hybrid gas density monitor with integrated transmitter, model GDM-RC-100-T

Right: Hybrid gas density monitor with attached transmitter, model GDM-RC-100-T

The measured data for pressure, temperature and gas density are transmitted using the standardised Modbus® RTU protocol. The model GDM-RC-100-T can also be configured for alternative gases consisting of N₂, CF₄, O₂, CO₂, 3M™, Novec™ 4710, He and Ar.

The analogue version of the GDM-RC-100-T uses the proven technology of the 4 ... 20 mA analogue signal and outputs the absolute pressure at 20 °C [68 °F] or the gas density in g/l for SF₆ gas as an analogue signal.

The data storage enables trend analysis to be carried out, so that critical SF₆ gas conditions can be predicted and rectified in time. An optimisation of the maintenance strategy from time-based (TBM) to condition-based (CBM) is possible through the use of the GDM-RC-100-T.

TBM = Time Based Maintenance
CBM = Condition Based Maintenance

Specifications of the gas density monitor

Basic information	
Measurement principle	Reference gas measurement
Nominal size of the optical display	100 mm
Product label	Lasered onto the reference chamber, maximum resistance to weathering
Self-indication in case of malfunction	Integrated into the instrument, the switch contact is actuated in case of leakage in the reference chamber

Accuracy specifications		
Switching accuracy		
-1 ... +5 bar at 20 °C [68 °F]	<ul style="list-style-type: none"> ■ ±70 mbar at calibration pressure at 20 °C [68 °F], gaseous phase ■ ±100 mbar at calibration pressure at -30 ... +50 °C [-22 ... +122 °F], gaseous phase 	
-1 ... +9 bar at 20 °C [68 °F]	<ul style="list-style-type: none"> ■ ±100 mbar at calibration pressure at 20 °C [68 °F], gaseous phase ■ ±150 mbar at calibration pressure at -30 ... +50 °C [-22 ... +122 °F], gaseous phase 	
-1 ... +11.5 bar at 20 °C [68 °F]	<ul style="list-style-type: none"> ■ ±150 mbar at calibration pressure at 20 °C [68 °F], gaseous phase ■ ±200 mbar at calibration pressure at -30 ... +50 °C [-22 ... +122 °F], gaseous phase 	
Calibration pressure	First switch point below filling pressure	
Indication accuracy		
-1 ... +5 bar at 20 °C [68 °F]	<ul style="list-style-type: none"> ■ ±70 mbar at calibration pressure at 20 °C [68 °F], gaseous phase ■ ±100 mbar at calibration pressure at -30 ... +50 °C [-22 ... +122 °F], gaseous phase 	
-1 ... +9 bar at 20 °C [68 °F]	<ul style="list-style-type: none"> ■ ±100 mbar at calibration pressure at 20 °C [68 °F], gaseous phase ■ ±150 mbar at calibration pressure at -30 ... +50 °C [-22 ... +122 °F], gaseous phase 	
-1 ... +11.5 bar at 20 °C [68 °F]	<ul style="list-style-type: none"> ■ ±150 mbar at calibration pressure at 20 °C [68 °F], gaseous phase ■ ±200 mbar at calibration pressure at -30 ... +50 °C [-22 ... +122 °F], gaseous phase 	
Calibration pressure established by means of reference isochore, generated by Prof. Bier		
Switch hysteresis	Measuring range	Hysteresis level
	-1 ... +5 bar at 20 °C [68 °F]	Typically < 90 mbar ¹⁾
	-1 ... +7.5 bar at 20 °C [68 °F]	Typically < 150 mbar ¹⁾
	-1 ... +11.5 bar at 20 °C [68 °F]	Typically < 220 mbar ¹⁾
Lower switch hysteresis on request		

1) In accordance with BS 6134:1991, rate of pressure change 1 % of end value per second.

Measuring range		
Measuring range	<ul style="list-style-type: none"> ■ 0 ... 10 bar abs. at 20 °C [68 °F] SF₆ gas ■ 0 ... 12.5 bar abs. at 20 °C [68 °F] SF₆ gas 	
Maximum overpressure	1.43 times the measuring range	
Minimum bursting strength	30 bar	
Dial		
Scale range	End of measuring range	1.3 bar or 1.8 bar above the first switch point below the filling pressure
Scale graduation	<ul style="list-style-type: none"> ■ Single scale (divided into sections of different colours) ■ Double scale (divided into sections of different colours) ■ Triple scale (divided into sections of different colours) 	
Material	Aluminium	

Process connection	
Standard	EN 837
Thread size	G ½ B
Connection	Axial or radial
Spanner flats	22 mm
Material	Stainless steel

Other connections and connection locations on request.

Switch contacts	
Switch model	Potential-free change-over contact
Number of switches	<ul style="list-style-type: none"> ■ 1 switch contact ■ 2 switch contact ■ 3 switch contact ■ 4 switch contact Up to 4 switch contacts possible as change-over contact
Switching function	Change-over contact
Switching direction	<ul style="list-style-type: none"> ■ Falling density ■ Rising density
Switch point setting	In accordance with customer specification, max. difference of lowest to highest contact: 4 bar
Maximum number of cycles	10,000 mechanical and electrical
Insulation resistance of contact	> 100 Mohms
Min. switching current	10 mA
Min. switching voltage	12 V
Circuits	Galvanically isolated
Monitoring functions	
Self-monitoring	Integrated into the instrument, the switch contact is actuated in case of leakage in the reference chamber

Electrical characteristics		
Supply voltage	Resistive load A	Inductive load A
≤ DC 30 V	5 ¹⁾	3 ¹⁾
≤ DC 50 V	1	1
≤ DC 75 V	0.75	0.75
≤ DC 125 V	0.5	0.03
≤ DC 250 V	0.25	0.03
≤ AC 125 V	5 ¹⁾	2 ¹⁾
≤ AC 250 V	5 ¹⁾	2 ¹⁾

1) Only up to 70 °C [158 °F] ambient temperature.
At 70 ... 80 °C [158 ... 176 °F] ambient temperature, the contacts must be operated with a maximum of 1 A.

Electrical connection	
Connection type	12-pin TTI plug-in terminal
Wire cross-section	<ul style="list-style-type: none"> ■ Min. 0.25 mm² ■ Max. 2.5 mm²
Grounding	In cable socket

Material	
Wetted parts	
Reference chamber (pressure element)	Stainless steel, filling with reference gas
Process connection	Stainless steel
Non-wetted parts	
Case and cover	Aluminium die-casting, powder-coated
Cable gland of switch contacts	→ For cable glands, see "Versions of cable glands"
Movement	Brass
Pointer	Aluminium, black
Window	Laminated safety glass
Dial	Aluminium

Operating conditions	
Operating temperature	-40 ... +80 °C [-40 ... +176 °F], gaseous phase
Storage temperature	-40 ... +70 °C [-58 ... +158 °F]
Relative humidity	≤ 95 % r. h. (non-condensing) Compensating diaphragm against condensation
Leak test	
Process connection / Bellows	≤ 1 x 10 ⁻⁸ mbar x l/s
Vibration resistance	4 g at a distance of 50 mbar from the switch point, no contact bouncing (20 ... 80 Hz)
Shock resistance	<ul style="list-style-type: none"> ■ 50 g/11 ms no contact bouncing at a distance of 200 mbar from the switch point ■ 150 g without damage
Ingress protection of the complete instrument	IP65, IP67 for versions with integrated transmitter IP67 for versions with attached transmitter

Test of dielectric strength	
Dielectric strength	<ul style="list-style-type: none"> ■ 2 kV pin on grounding (case) ■ 2 kV pin on pin (switch contact to switch contact) ■ 1 kV pin on pin within the switch contact – 1 minute
Lightning	7 kV x 1.2/50 μs

Dial layouts

The diagram illustrates four different dial layouts for a pressure gauge, labeled V1 through V4. Above the dials is a photograph of the physical gauge. Each dial layout is shown with its corresponding features listed below it.

V1: Full scale	V2: Partial scale	V3: Partial scale +	V4: Exploded scale
<ul style="list-style-type: none"> ■ Full scale ■ Vacuum display 	<ul style="list-style-type: none"> ■ Full scale ■ Vacuum display 	<ul style="list-style-type: none"> ■ Full scale ■ Vacuum display 	<ul style="list-style-type: none"> ■ Exploded scale

Optional calibration valve

All weld seams are qualified in accordance with DIN EN ISO 15613 in combination with DIN EN ISO 15614-1 and DIN EN ISO 15614-12 by the notified body TÜV Süd.

Tightening torque, test connection: 40 Nm \pm 10 %

Gas-tight: Leakage rate $\leq 1 \cdot 10^{-8}$ mbar · l/s

Sensor technology

Digital sensor technology, model GD-20-D

Compensated pressure range in bar abs. at 20 °C [68 °F] (g/l SF ₆)	Pressure in bar abs.	Temperature	Output parameters	Output signal
0 ... 2 (12.28)	0 ... 2.4	-40 ... +80 °C [-40 ... +176 °F]	<ul style="list-style-type: none"> ■ Density ■ Pressure at 20 °C [68 °F] ■ Pressure ■ Temperature 	Modbus® RTU
0 ... 3 (18.65)	0 ... 3.7			
0 ... 6 (38.87)	0 ... 7.5			
0 ... 8 (53.4)	0 ... 10.1			
0 ... 10 (68.96)	0 ... 12.9			
0 ... 12 (85.79)	0 ... 15.7			
0 ... 16 (124.64)	0 ... 21.3			

Accuracy specifications			
Accuracy ¹⁾			
Compensated pressure ranges in bar abs. at 20 °C [68 °F] (g/l SF ₆) 0 ... 2 (12.28) 0 ... 3 (18.65) 0 ... 6 (38.87)	For -40 ... -20 °C [-40 ... -4 °F]	<ul style="list-style-type: none"> ■ ± 2 % (standard) ■ ± 1.5 % (option) 	
	For -20 ... +80 °C [-4 ... +176 °F]	<ul style="list-style-type: none"> ■ ± 1.25 % (standard) ■ ± 0.75 % (option) 	
Compensated pressure ranges in bar abs. at 20 °C [68 °F] (g/l SF ₆) 0 ... 8 (53.4) 0 ... 10 (68.96) 0 ... 12 (85.79) 0 ... 16 (124.64)	For -40 ... +80 °C [-40 ... +176 °F]	<ul style="list-style-type: none"> ■ ± 1.25 % (standard) ■ ± 0.6 % (option) 	
Pressure accuracy	<ul style="list-style-type: none"> ■ ± 1 % at 20 °C [68 °F] (standard) ■ ± 0.2 % at 20 °C [68 °F] (option) 		
Temperature accuracy	± 1.5 K		
Reference conditions	Per IEC 61298-1		

1) Specifications apply to measurement of the compensated pressure over the entire temperature range from -40 ... +80 °C [-40 ... +176 °F], valid only for pure SF₆ gas and a gas mixture consisting of 6 % 3M™ Novec™ 4710, 5 % O₂ and 89 % CO₂.

Analogue sensor technology, model GD-20-A

Compensated pressure range in bar abs. at 20 °C [68 °F] (g/l SF ₆)	Accuracy ¹⁾	Output parameters	Output signal
0 ... 2 (12.28)	<ul style="list-style-type: none"> ■ ±2 % (standard) ■ ±1.5 % (option) 	Absolute pressure at 20 °C [68 °F]	4 ... 20 mA
0 ... 3 (18.65)			
0 ... 6 (38.87)			
0 ... 8 (53.4)			
0 ... 10 (68.96)			
0 ... 12 (85.79)			
0 ... 16 (124.64)			

1) Specifications apply to measurement of the compensated pressure over the entire temperature range from -40 ... +80 °C [-40 ... +176 °F], valid only for pure SF₆ gas. Accuracy is achieved after a max. of 60 minutes operating time.

Density range in g/l SF ₆ (compensated pressure in bar abs. at 20 °C [68 °F])	Accuracy ¹⁾	Output parameters	Output signal
0 ... 10 (1.64)	<ul style="list-style-type: none"> ■ ±2 % (standard) ■ ±1.5 % (option) 	SF ₆ gas density in g/l	4 ... 20 mA
0 ... 16 (2.59)			
0 ... 25 (3.97)			
0 ... 40 (6.16)			
0 ... 60 (8.87)			
0 ... 80 (11.33)			

1) Specifications apply to measurement of the compensated pressure over the entire temperature range from -40 ... +80 °C [-40 ... +176 °F], valid only for pure SF₆ gas. Accuracy is achieved after a max. of 60 minutes operating time.

Pressure reference

Absolute

Long-term stability at reference conditions

±0.1 % per year for the density signal

Overload safety and burst pressure

Compensated pressure range in bar abs. at 20 °C [68 °F] (g/l SF ₆)	Overload safety in bar abs.	Burst pressure in bar abs.
0 ... 2 (12.28)	6.2	10
0 ... 3 (18.65)	14.5	24
0 ... 6 (38.87)	14.5	24
0 ... 8 (53.4)	31	52
0 ... 10 (68.96)	31	52
0 ... 12 (85.79)	31	52
0 ... 16 (124.64)	62	103

Case (attached transmitter)

Case	
Case material	316L
Case options	<ul style="list-style-type: none"> ■ Cable outlet ■ Metal cable outlet, shield optionally connected (heavy-duty version)

Suitable for the following gases

- SF₆
- N₂
- CF₄
- O₂
- CO₂
- 3M™ Novec™ 4710
- He
- Ar

Gas mixtures and components can be individually configured and combined ex-works. The calculation is based on the physical principle of the partial pressure method. The gas mixture cannot be changed subsequently.

Output signal

Output signal	
Voltage supply	DC 10 ... 30 V
Power consumption	
Model GD-20-A	≤ 0.75 W
Model GD-20-D	≤ 0.45 W
Maximum permissible load R _A (model GD-20-A)	$R_A \leq (U_B - 9.5 \text{ V}) / 0.023 \text{ A}$ with R _A in ohm and U _B in V
Time response	
Settling time ¹⁾	< 10 ms
Switch-on time ²⁾	≤ 500 ms

1) e.g. with any sudden pressure spikes

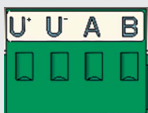
2) Time after switching on until the first measured value is output.

Electrical connections with integrated transmitter

Electrical connection, digital versions (model GD-20-D)

Modbus®-RTU via RS-485 interface

- via 4-wire terminal in cable socket
- Conductor cross-section 0.205 ... 2.5 mm²
- Metal EMC cable gland M20 x 1.5, sealing range 6 ... 12 mm, tightening torque 8 Nm

4-wire terminal in cable socket		
	U ₊	DC 10 ... 30 V
	U ₋	Mass
	A	RS-485 signal
	B	RS-485 signal

Electrical connection, analogue version (model GD-20-A)

- Via 2-wire terminal in cable socket
- Conductor cross-section 0.205 ... 2.5 mm²
- Metal EMC cable gland M20 x 1.5, sealing range 6 ... 12 mm, tightening torque 8 Nm

2-wire terminal in cable socket



U ₊	DC 10 ... 30 V
U ₋	Mass
A	Do not use
B	Do not use

Electrical connections with attached transmitter

Electrical connection, digital versions (model GD-20-D)

- Modbus[®]-RTU via RS-485 interface
- Circular connector M12 x 1 metal (5-pin)
- Circular connector M12 x 1 plastic (5-pin)

Circular connector M12 x 1 (5-pin)



1	-	-
2	U ₊	Supply voltage
3	U ₋	Mass
4	A	Signal RS-485
5	B	Signal RS-485

Electrical connection, analogue version (model GD-20-A)

- Circular connector M12 x 1 metal (5-pin)
- Circular connector M12 x 1 plastic (5-pin)

Circular connector M12 x 1 (5-pin)



1	U ₊	Supply voltage
2	-	-
3	U ₋	Mass
4	-	-
5	-	-

Output parameters

Output parameters digital versions (model GD-20-D)

- Absolute pressure at 20 °C [68 °F]: bar, MPa, kPa, psi, Pa, N/cm²
- Gauge pressure based on 1,013 mbar at 20 °C [68 °F]: bar, MPa, kPa, psi, Pa, N/cm²
- Density: g/litre, kg/m³
- Temperature: °C, °F, K
- Absolute pressure: bar, MPa, kPa, psi, Pa, N/cm²
- Gauge pressure based on 1,013 mbar: bar, MPa, kPa, psi, Pa, N/cm²

Output parameters analogue version (model GD-20-A)

Absolute pressure at 20 °C [68 °F] or gas density in g/l for SF₆ gas as 4 ... 20 mA current signal


Operating conditions		
Electrical safety		
Model GD-20-D	Reverse polarity voltage U ₊ vs. U ₋	DC 30 V
Model GD-20-A	Reverse polarity voltage U ₊ vs. U ₋	DC 40 V

EMC tests

EMC tests	
Immunity to EMF	30 V/m (at 80 MHz to 6 GHz)
Immunity against surge voltages (surge) per IEC 61000-4-5	1 kV, non-symmetrical, cables to ground, RS485A to RS485B, U ₊ vs. U ₋
ESD per IEC 61000-4-2	8 kV contact discharge, 15 kV indirect discharge, 8 kV indirect discharge
Immunity against conducted HF signals in accordance with IEC 61000-4-6	10 V at 150 kHz to 80 MHz
Immunity against fast transients (burst) per IEC 61000-4-4	4 kV

Approvals

Approvals included in the scope of delivery

Logo	Description	Country
	EU declaration of conformity	European Union
	EMC directive	
	EN 61326 emission (group 1, class B) and immunity (industrial application)	
	Pressure equipment directive	
	Low voltage directive	
	RoHS directive	

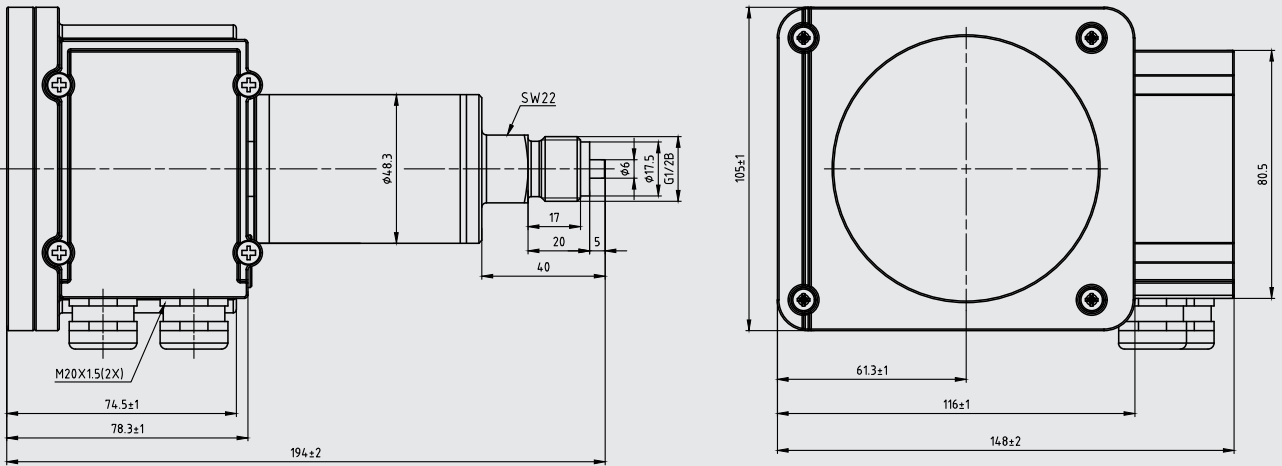
Manufacturer's information and certificates

Logo	Description
-	China RoHS directive

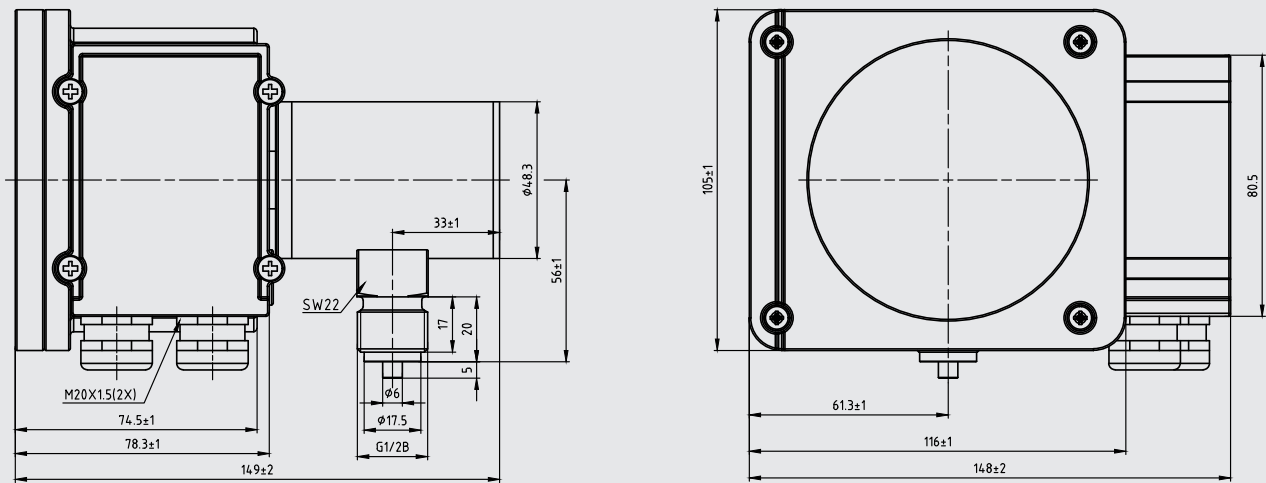
→ For approvals and certificates, see website

Dimensions in mm

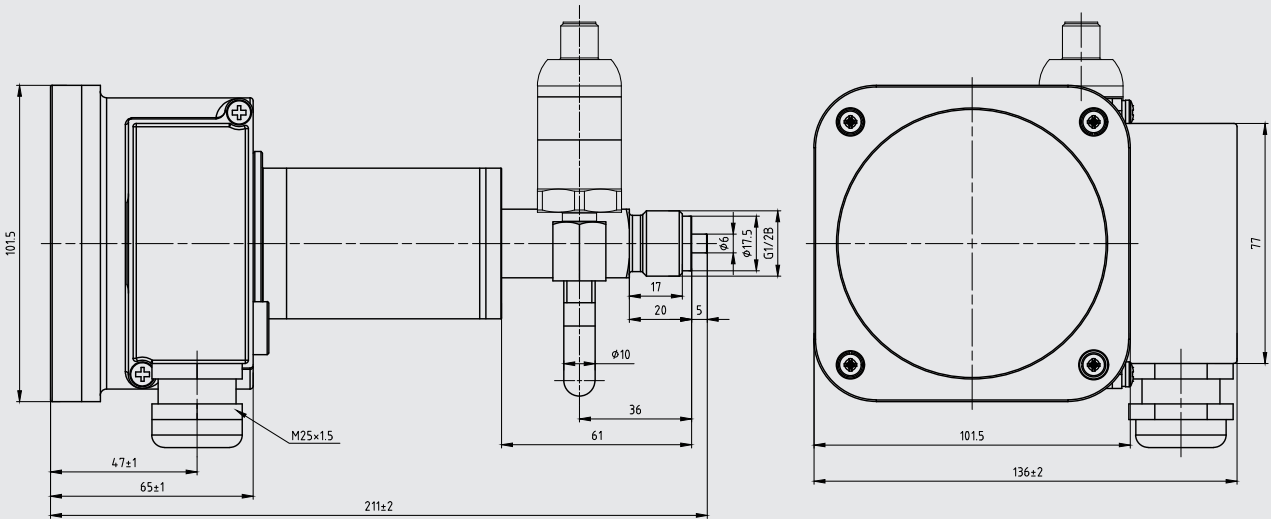
Model GDM-RC-100-T with integrated transmitter and rear process connection G 1/2 B



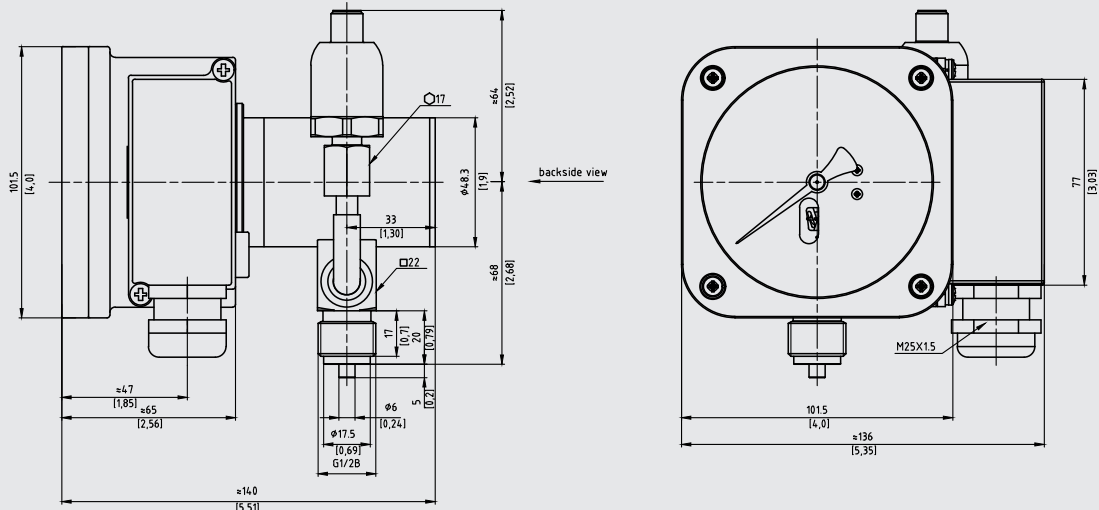
Model GDM-RC-100-T with integrated transmitter and vertical process connection G 1/2 B



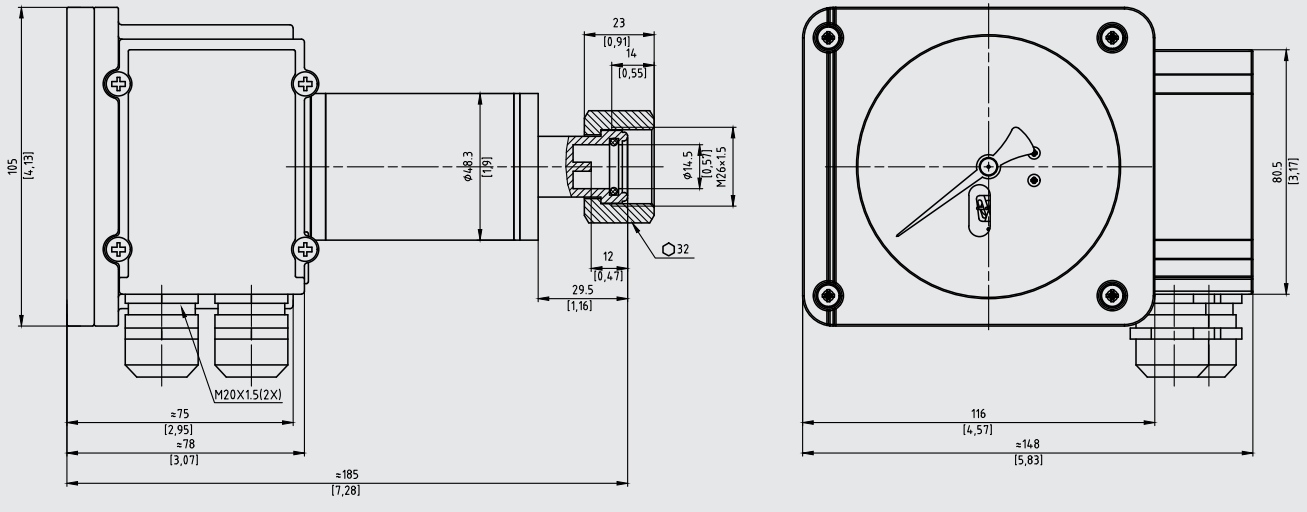
Model GDM-RC-100-T with attached analogue transmitter and rear process connection G 1/2 B



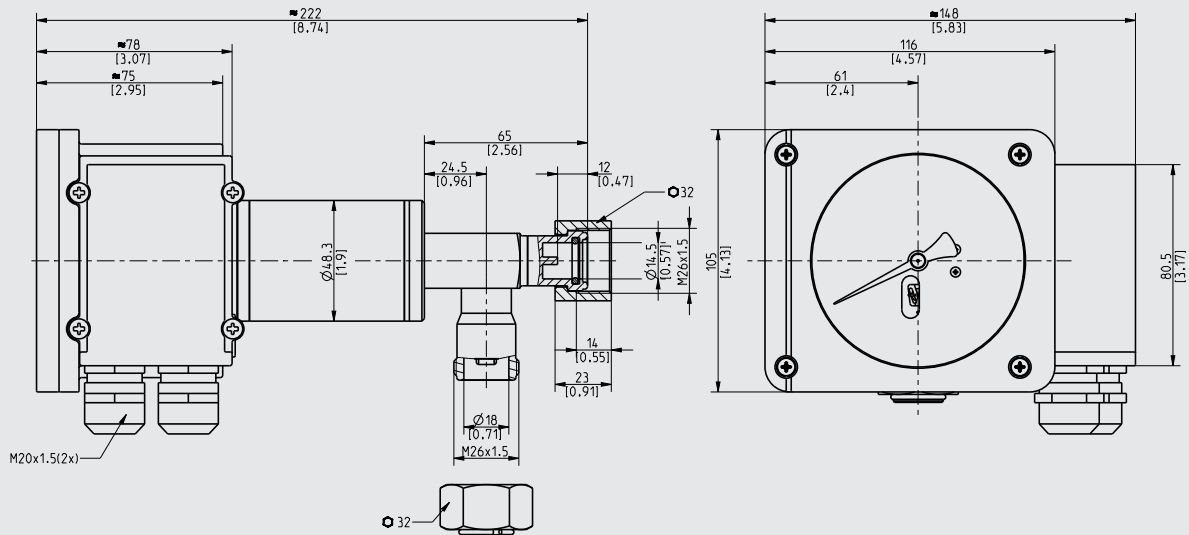
Model GDM-RC-100-T with attached digital transmitter and vertical process connection G 1/2 B



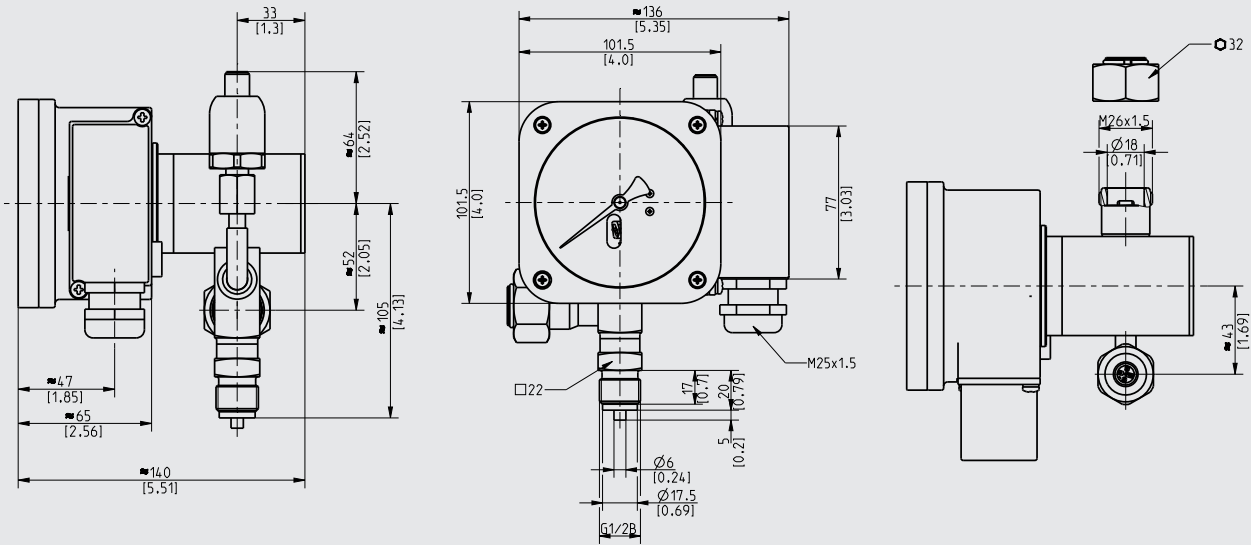
Model GDM-RC-100-T with integrated transmitter and rear process connection DN 8



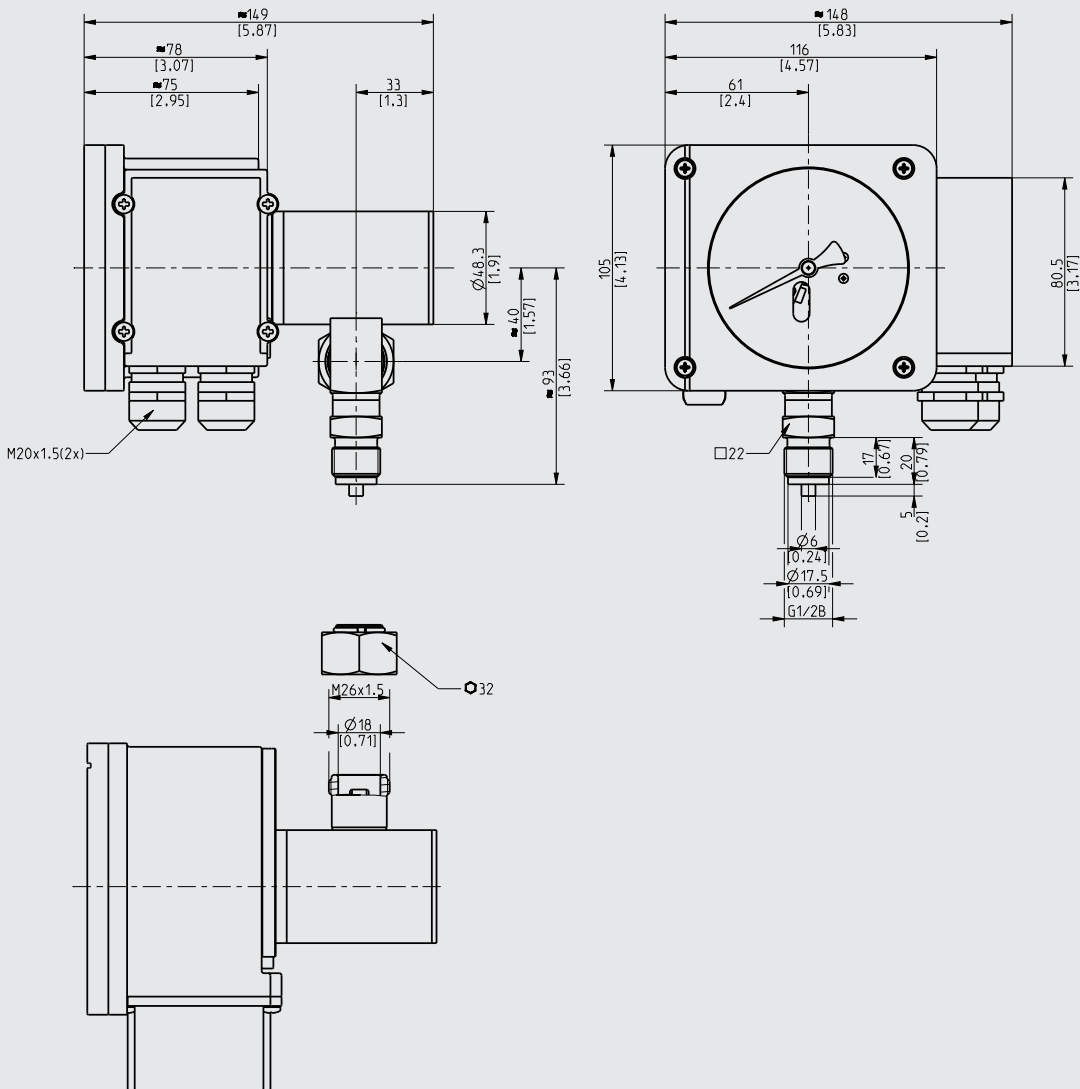
Model GDM-RC-100-T with integrated transmitter and rear process connection DN 8 and recalibration valve



Model GDM-RC-100-T with attached digital transmitter and vertical process connection G ½ B and recalibration valve



Model GDM-RC-100-T with integrated transmitter and vertical process connection G ½ B and recalibration valve



Optional versions, model GDM-RC-100-T with attached analogue GD-20-A transmitter

Designation	Case ingress protection	Temperature range in °C	Shield provided by customer	Shield connected on the instrument side	Assignment	
					U ₊	U ₋
Cable outlet 2 m, plastic	IP67	-40 ... +80 °C [-40 ... +176 °F]	Yes	-	Brown	Blue
Cable outlet 5 m, plastic			Yes	-		
Cable outlet 10 m, plastic			Yes	-		
Cable outlet 2 m, SS			Yes	-		
Cable outlet 5 m, SS			Yes	-		
Cable outlet 10 m, SS			Yes	-		
Cable outlet 2 m, shield connected, SS			Yes	Yes		
Cable outlet 5 m, shield connected, SS			Yes	Yes		
Cable outlet 10 m, shield connected, SS			Yes	Yes		


Versions of cable glands for model GDM-RC-100-T with integrated transmitter

Model		Material	Thread	Sealing range	Tightening torque	Order number
Switch contacts	Standard	Metal	M20 x 1.5	6 ... 13 mm	8 Nm	64418982
	Option	Metal	M25 x 1.5	9 ... 17 mm	10 Nm	64419009
	Option	Metal	M25 x 1.5	7 ... 12 mm	10 Nm	64423057
Sensor, EMC cable gland	Standard	Metal	M20 x 1.5	6 ... 12 mm	8 Nm	64427986
Sensor technology	Option	Metal	M20 x 1.5	6 ... 13 mm	8 Nm	64418982

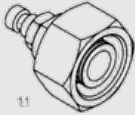
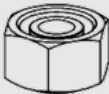


Versions of cable glands for model GDM-RC-100-T with attached transmitter

Model		Material	Thread	Sealing range	Tightening torque	Order number
Switch contacts	Standard	Plastic	M25 x 1.5	5 ... 13 mm	8 Nm	2196018
	Option	Plastic	M25 x 1.5	8 ... 17 mm	8 Nm	64419018
	Option	Metal	M25 x 1.5	9 ... 17 mm	10 Nm	64419009
	Option	Metal	M25 x 1.5	7 ... 12 mm	10 Nm	64423057

Accessories

Model	Description	Order number
Modbus® start-up kit	<ul style="list-style-type: none"> ■ Power supply unit for sensor ■ Connection cable ■ Interface converter (RS-485 to USB) ■ USB cable type A to type B ■ Modbus® tool software on USB stick 	14075896
WIKAsoft-GD for configuration and testing of the digital sensor	Free download from: www.wika.com/download	-
Optional accessories		
Recalibration valve 	Model GLTC-CV <ul style="list-style-type: none"> ■ Enables easy recalibration of the gas density monitor without dismounting ■ Welded permanently to the instrument or available as loose valve for retrofitting 	-
Connection cable for Switching outputs	<ul style="list-style-type: none"> ■ Terminal without wiring ■ Connector mounted on the instrument side, cable with loose ends 	-

Accessories for version with calibration valve

	Description	Order number
	Adapter from test connection (M26 x 1.5) to quick coupling	14146937
	Protective cap for test connection (M26 x 1.5)	14193772
	Calibration system for SF ₆ gas density measuring instruments, model BCS-10	See WIKA data sheet SP 60.08
	Calibration system for SF ₆ gas density measuring instruments, model ACS-10	See WIKA data sheet SP 60.15

Ordering information for mechanical instrument

Model (with attached or integrated transmitter) / Process connection and connection location / Pressure unit at 20 °C [68 °F] / Filling pressure / Number of switch points / Switch configuration at 20 °C [68 °F] / Gas mixture / Dial layout / Optional accessories

Sensor ordering information

Model (analogue or digital) / Compensated pressure range / Accuracy / Gas mixture

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