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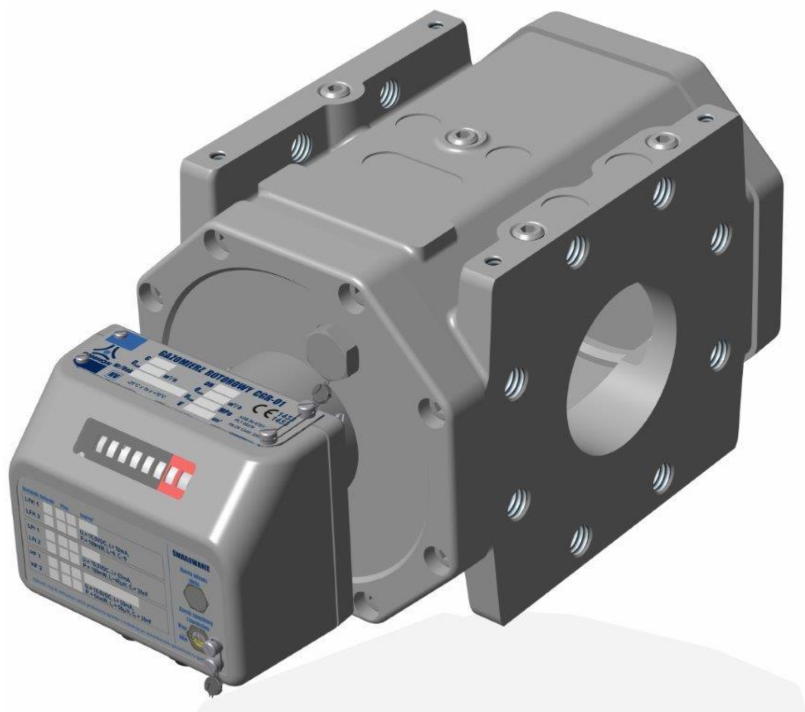
ISO 9001
ISO 14001
PN-N-18001
OHSAS 18001

CGR-FX ROTARY GAS METERS

OPERATING MANUAL



CGR-FX / OM 16-06

June 2016

PRIOR TO INSTALLATION AND START-UP PLEASE READ CAREFULLY THESE INSTRUCTIONS

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I. INTENDED USE AND CONDITIONS OF USE

Intended use

Rotary gas meters series CGR-FX are electromechanical pressure devices designed to measure the volume of gas flowing through a system. The standard version meters may be used in places with probable occurrence of explosive atmospheres formed as mixtures of gases with air classified as explosion groups IIA and IIB (and group IIC for the special versions). Table 1 lists the physical properties of the most common gases and gas mixtures that may be measured with rotary gas meters.

CGR-FX Rotary Gas Meters enable the gas flows to be measured in any from among four directions (horizontally – from left to right side, or from right to left side, and vertically – from top to bottom or from bottom to top).

CGR-FX meters are manufactured with aluminum bodies and with cast iron bodies. Meters with cast iron bodies may be manufactured as high temperature resistant version (HTR), according to EN 12480:2002, Appendix C.

CGR-FX meters may be optionally equipped with a mechanical output. Mechanical output may be used to drive peripheral devices. Rotational speed of the output shaft is the same as the speed of the fastest drum in the index unit. Maximum permissible load torque on the mechanical output shaft is 0.25 Nm.

As an option the CGR-FX Meters may be equipped with an internal by-pass that opens automatically if there is a failure of rotors (seizure of rotors). This feature enables the gas flow to pass by the measuring cartridge.

The rotary gas meters can be used both indoors in stabilized temperature conditions and outdoors (open location).

Conditions for use

1. Compliance with Directive 2004/22/WE (MID) :
   - certificate — T10569 (NMI)
   - CE marking CE [Mxx] 1450 — (INiG - Oil and Gas Institute)
   - high temperature resistant version (option) — HTR p_{max} = 0.4 MPa
   - ambient temperature range — –25° C ≤ Ta ≤ + 70° C
   - gas temperature range — from –20° C to + 60° C
   - storage temperature range — from -30^{o} C to + 70^{o} C
   - maximum working pressure — p_{max} = 2.0 MPa
   - mechanical environment class — M2
   - electromagnetic environment class — E2
   - metrological parameters — Tables 2A, 2B.
   - metrological accuracy class — 1.0
   - operational position — HV,
2. Compliance with Directive 94/9/WE (ATEX) :
   - certificate — KDB 04ATEX034 rev. 5,
   - CE marking CE 1453 — (Central Mining Institute, Experimental Mine ”Barbara”).
   - operation conditions standard — Ex II 2G Ex ia IIB T5 Gb
     special — Ex II 2G Ex ia IIC T5 Gb
   - meter case index of protection — IP66/IP67,
   - ambient temperature — –25° C ≤ t ≤ + 70° C

3. Compliance with Directive 97/23/WE (PED) :
   - CGR-FX certificate 44065/JN/001/04
   - CE marking CE 1433 (Office of Technical Inspection)
   - compliance with technical specification WUDT/UC/2003.
   - maximum calculated pressure for gas meter bodies:
     - connection PN16 PS = 16 bar,
     - connection PN20 (ANSI150) PS = 20 bar,
     - connection PN25 (only cast iron bodies) PS = 25 bar.
   - ambient temperature –25° C ≤ to ≤ + 70° C

4. Compliance with Directive 2004/108/WE (EMC) :
   - requirements met by the use of LF and HF pulse emitters (NAMUR) compliant with the following harmonized standards: EN 60947-5-2:2011, EN 60947-5-6:2000.

Table 1. Physical properties of the most common gases and gas mixtures that may be measured with CGR-FX. Densities under pressure of 101.325 kPa at 20° C

Gas or gas mixture	Chemical symbol (formula)	Density ρ [kg/m^3]	Relative density ρ_w	Gas meter embodiment
argon	Ar	1.66	1.38	standard IIB
nitrogen	N_2	1.16	0.97	standard IIB
butane	C_4H_{10}	2.53	2.1	standard IIB
carbon dioxide	CO_2	1.84	1.53	standard IIB
ethane	C_2H_6	1.27	1.06	standard IIB
ethylene	C_2H_4	1.17	0.98	standard IIB
natural gas	$\approx CH_4$	ca. 0.75	ca. 0.63	standard IIB
helium	He	0.17	0.14	standard IIB
methane	CH_4	0.67	0.55	standard IIB
propane	C_3H_8	1.87	1.56	standard IIB
carbon monoxide	CO	1.16	0.97	standard IIB
acetylene	C_2H_2	1.09	0.91	**special IIC**
hydrogen	H_2	0.084	0.07	**special IIC**
air	–	1.20	1	standard IIB

The meter creates pressure drop in the system. The values of the pressure drops is determined at Q_{max} (**for air at atmospheric conditions, density ρ_0 = 1.2 kg/m^3**) for all CGR gas meter versions are given in Table 2.

At actual conditions, pressure loss Δp_r [Pa] is calculated according to the formula:

$$\Delta p_{rz} = \rho_w \frac{p_a + p}{p_a} \cdot Wpd \cdot \Delta p$$

where: $\rho_w = \rho / \rho_0$ – relative gas density (compared to air density) as in Table 1,
p_a – atmospheric pressure ($p_a \cong 101$ [kPa]),
p – gauge gas pressure upstream the gas meter [kPa],
Wpd – Pressure drop coefficient determined from Fig. 1
Δp – pressure drop at Q_{max} from Table 2 [Pa].

NOTE: Pressure drop in a damaged meter when the by-pass is open, at real conditions, may be calculated with the above formula. Please replace Δp from Table 2, column [10] with BΔp

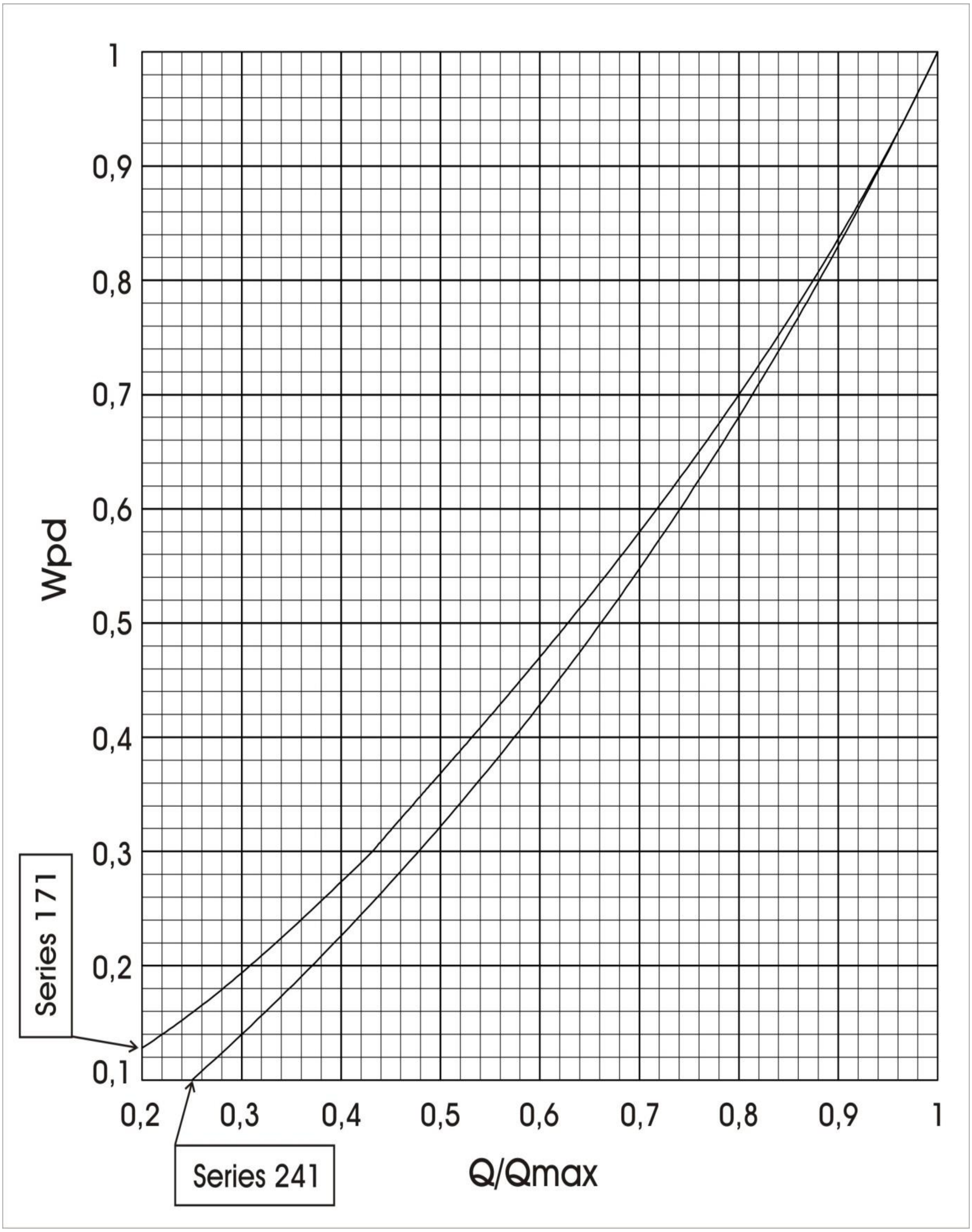


Fig. 1. Pressure drop coefficient as a function of the relative flow Q/Q_{max}.

Table 2a. Basic metrological parameters of CGR-FX gas meters in aluminium bodies.

DN Nominal diameter	**G** meter size.	$\mathbf{Q_{max}}$ Maxi-mum flow.	$\mathbf{Q_{min}}$ minimum flow (range)	$\mathbf{Q_{max} / Q_{min}}$ (range)	**LF** pulse value	**HF** pulse value (approx)	**V** cyclic volume	**Δp** pressure drop at Q_{max}	**BΔp**[3] at Q_{max}	Series.
[mm]	[–]	[m^3/h]	[m^3/h]	[–]	[imp./m^3]	[imp./m^3]	[dm^3]	[Pa]	[kPa]	[–]
1	2	3	4	5	6	7	8	9	10	11
40/50	G10	16	0,8 ÷ 0,16	20 ÷ 100	10/100[2]	15390	0.23	75 / 65	0,15	
40/50	G16	25	1,3 ÷ 0,16	20 ÷ 160	10/100[2]	15390	0.23	160 / 140	0,40	
40/50	G16	25	1,3 ÷ 0,16	20 ÷ 160	100[2]	17400	0.31	105/80	0,36	
40/50	G16	25	1,3 ÷ 0,16	20 ÷ 160	10	11200	0.31	105/80	0,36	
40/50	G25	40	2,0 ÷ 0,16	20 ÷ 250	10/100[2]	15390	0.23	375/280	0,90	
40/50	G25	40	2,0 ÷ 0,16	20 ÷ 250	100[2]	17400	0.31	240/180	0,85	
40/50	G25	40	2,0 ÷ 0,16	20 ÷ 250	10	11200	0.31	240/180	0,85	
40/50	G25	40	2,0 ÷ 0,25	20 ÷ 160	100[2]	11050	0,50	110/80	0,80	
40/50	G25	40	2,0 ÷ 0,25	20 ÷ 160	10	7170	0.50	110/80	0,80	
40/50/65[1]	G40	65	3,2 ÷ 0,25	20 ÷ 250	100[2]	17400	0.31	340 / 320 / 240	2,10	„171”
40/50/65[1]	G40	65	3,2 ÷ 0,25	20 ÷ 250	10	11200	0.31	340 / 320 / 240	2,10	
40/50/65[1]	G40	65	3,2 ÷ 0,25	20 ÷ 250	100[2]	11050	0,50	280 / 210 / 150	2,05	
40/50/65[1]	G40	65	3,2 ÷ 0,25	20 ÷ 250	10	7170	0.50	280 / 210 / 150	2,05	
40/50/65[1]	G40	65	3,2 ÷ 0,40	20 ÷ 160	10	4340	0.81	195 / 150 / 110	2,00	
50/65[1]/80	G65	100	5,0 ÷ 0,40	20 ÷ 250	10	7170	0.50	330 / 310 / 320	4,55	
50/65[1]/80	G65	100	5,0 ÷ 0,40	20 ÷ 250	10	4340	0.81	325 / 270 / 200	4,50	
50/65[1]/80	G65	100	5,0 ÷ 0,65	20 ÷ 160	10	2800	1.24	275 / 225 / 200	4,40	
50/65[1]/80	G100	160	8,0 ÷ 0,65	20 ÷ 250	1/10[2]	4340	0.81	650 / 540 / 430	10,5	
50/65[1]/80	G100	160	8,0 ÷ 0,65	20 ÷ 250	1/10[2]	2820	1.24	550 / 450 / 395	4,0[4]	
80	G160	250	13,0 ÷ 1,0	20 ÷ 250	1/10[2]	2820	1.24	1000	8,5[4]	
80/100[1]	G65	100	5,0 ÷ 0,65	20 ÷ 160	10	1630	1.29	115 / 85	1,20	
80/100	G100	160	8,0 ÷ 0,65	20 ÷ 250	1/10[2]	1630	1.29	220 / 190	2,70	
80/100	G100	160	8,0 ÷ 1,0	20 ÷ 160	10[2]	1560	2.00	180 / 135	2,60	
80/100	G100	160	8,0 ÷ 1,0	20 ÷ 160	1	1080	2.00	180 / 135	2,60	
80/100	G160	250	13,0 ÷ 1,0	20 ÷ 250	1/10[2]	1630	1.29	510 / 470	6,30	
80/100	G160	250	13,0 ÷ 1,0	20 ÷ 250	10[2]	1560	2.00	370 / 280	6,20	
80/100	G160	250	13,0 ÷ 1,0	20 ÷ 250	1	1080	2.00	370 / 280	6,20	
80/100	G160	250	13,0 ÷ 1,6	20 ÷ 160	10[2]	1740	3.34	270 / 210	6,00	"241"
80/100	G160	250	13,0 ÷ 1,6	20 ÷ 160	1	645	3.34	270 / 210	6,00	
80[1]/100	G250	400	20,0 ÷ 1,6	20 ÷ 250	10[2]	1560	2.00	875 / 660	4,2[4]	
80[1]/100	G250	400	20,0 ÷ 1,6	20 ÷ 250	1	1080	2.00	875 / 660	4,2[4]	
80[1]/100	G250	400	20,0 ÷ 1,6	20 ÷ 250	10[2]	1740	3.34	580 / 460	4,0[4]	
80[1]/100	G250	400	20,0 ÷ 1,6	20 ÷ 250	1	645	3.34	580 / 460	4,0[4]	
100[1]	G400	650	32,0 ÷ 2,5	20 ÷ 250	10[2]	1740	3.34	1200	9,2[4]	
100[1]	G400	650	32,0 ÷ 2,5	20 ÷ 250	1	645	3.34	1200	9,2[4]	

(1) – meter versions that are not included in EN12480, Table 7; these meters are acceptable by OIML Recommendations R137 1&2
(2) – meter version available only with 9-digit counter.
(3) – pressure drop on damaged meter with blocked rotors and open by-pass.

(4) – pressure drop on damaged meter and open double by-pass,

Table 2b. Basic metrological parameters of CGR-FX gas meters in cast iron bodies.

DN nominal diameter	**G** meter size	$\mathbf{Q_{max}}$ maximum flow	$\mathbf{Q_{min}}$ minimum flow (range)	$\mathbf{Q_{max} / Q_{min}}$ (range)	**LF** pulse value	**HF** pulse value (approx.)	**V** cyclic volume	**Δp** pressure drop at Q_{max}	**BΔp**(3) at Q_{max}	Series
[mm]	[–]	[m^3/h]	[m^3/h]	[–]	[imp./m^3]	[imp./m^3]	[dm^3]	[Pa]	[kPa]	[–]
1	2	3	4	5	6	7	8	9	10	11
40/50	G10	16	0,8 ÷ 0,25	20 ÷ 65	100(2)	11050	0.50	33 / 17	0,10	
40/50	G10	16	0,8 ÷ 0,25	20 ÷ 65	10	7170	0.50	33 / 17	0,10	
40/50	G16	25	1,3 ÷ 0,25	20 ÷ 100	100(2)	11050	0.50	45 / 35	0,30	
40/50	G16	25	1,3 ÷ 0,25	20 ÷ 100	10	7170	0.50	45 / 35	0,30	
40/50	G25	40	2,0 ÷ 0,25	20 ÷ 160	100(2)	11050	0.50	110/80	0,80	
40/50	G25	40	2,0 ÷ 0,25	20 ÷ 160	10	7170	0.50	110/80	0,80	
40/50/65(1)	G40	65	3,2 ÷ 0,25	20 ÷ 250	100(2)	11050	0.50	280 / 210 / 150	2,05	
40/50/65(1)	G40	65	3,2 ÷ 0,25	20 ÷ 250	10	7170	0.50	280 / 210 / 150	2,05	„171”
40/50/65(1)	G40	65	3,2 ÷ 0,40	20 ÷ 160	10	4340	0.81	195 / 150 / 110	2,00	
50/65(1)/80	G65	100	5,0 ÷ 0,40	20 ÷ 250	10	7170	0.50	330 / 310 / 320	4,55	
50/65(1)/80	G65	100	5,0 ÷ 0,40	20 ÷ 250	10	4340	0.81	325 / 270 / 200	4,50	
50/65(1)/80	G65	100	5,0 ÷ 0,65	20 ÷ 160	10	2800	1.24	275 / 225 / 200	4,40	
50/65(1)/80	G100	160	8,0 ÷ 0,65	20 ÷ 250	1/10(2)	4340	0.81	650 / 540 / 430	10,5	
50/65(1)/80	G100	160	8,0 ÷ 0,65	20 ÷ 250	1/10(2)	2820	1.24	550 / 450 / 395	4,0(4)	
80	G160	250	13,0 ÷ 1,0	20 ÷ 250	1/10(2)	2820	1.24	1000	8,5(4)	
80/100	G100	160	8,0 ÷ 1,0	20 ÷ 160	10(2)	1560	2.00	180 / 135	2,60	
80/100	G100	160	8,0 ÷ 1,0	20 ÷ 160	1	1080	2.00	180 / 135	2,60	
80/100	G160	250	13,0 ÷ 1,0	20 ÷ 250	10(2)	1560	2.00	370 / 280	6,20	
80/100	G160	250	13,0 ÷ 1,0	20 ÷ 250	1	1080	2.00	370 / 280	6,20	
80/100	G160	250	13,0 ÷ 1,6	20 ÷ 160	10(2)	1740	3.34	270 / 210	6,00	
80/100	G160	250	13,0 ÷ 1,6	20 ÷ 160	1	645	3.34	270 / 210	6,00	
80(1)/100	G250	400	20,0 ÷ 1,6	20 ÷ 250	10(2)	1560	2.00	875 / 660	4,2(4)	„241”
80(1)/100	G250	400	20,0 ÷ 1,6	20 ÷ 250	1	1080	2.00	875 / 660	4,2(4)	
80(1)/100	G250	400	20,0 ÷ 1,6	20 ÷ 250	10(2)	1740	3.34	580 / 460	4,0(4)	
80(1)/100	G250	400	20,0 ÷ 1,6	20 ÷ 250	1	645	3.34	580 / 460	4,0(4)	
100(1)	G400	650	32,0 ÷ 2,5	20 ÷ 250	10(2)	1740	3.34	1200	9,2(4)	
100(1)	G400	650	32,0 ÷ 2,5	20 ÷ 250	1	645	3.34	1200	9,2(4)	

(1) – meter versions that are not included in EN12480, Table 7; these meters are acceptable by OIML Recommendations R137 1&2

(2) – meter version available only with 9-digit counter.

(3) – pressure drop on damaged meter with blocked rotors and open by-pass.

(4) – pressure drop on damaged meter and open double by-pass,

NOTE: Qmin values for a specific meter size may be determined in the range as per Tables 2a and 2b, column 4.

II. DESIGN AND FUNCTION

The rotary gas meter is a volumetric rotary machine based on the principle of proportionality of the speed of rotation of rotors to the actual volume of gas flowing through the gas meter at particular pressure and temperature conditions. The gas flowing into the gas meter (Fig. 2) fills the measurement chamber and the inlet overpressure causes rotation of rotors and transport of a portion of gas to the gas meter output. The rotational motion of rotors is transmitted to the counter by means of gears and magnetic clutch. The counter mechanism totals up the volume flowing through the device, and a revolving counter indicates the total volume.

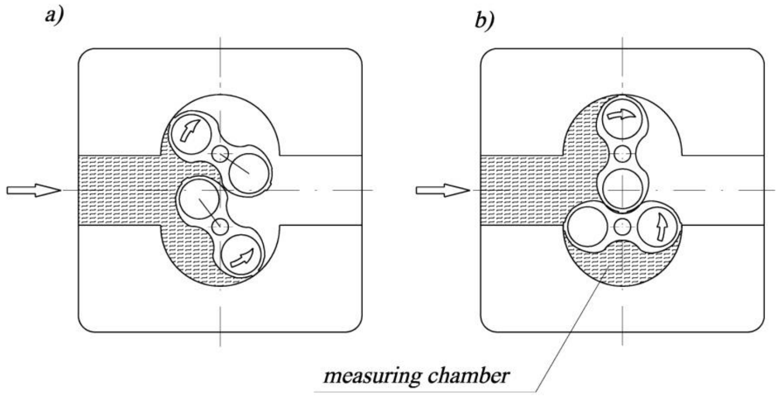


Fig. 2. Operation of the rotary gas meter.

The rotary gas meter (Fig. 3) is built of the following basic elements:

Main body. The main body assembly consists of the main body and the front and back covers. The covers are fixed to the body with screws. The main body is provided with pressure and temperature measurement taps. The front cover includes a gas-tight partition to separate the gas chamber from the environment as well as the oil filler plug and oil level inspection window.

The measurement assembly. The measurement assembly is secured between the main body covers using elastic sealing inserts. The assembly consists of the measurement chamber with rotating rotors and two side chambers separated by internal partitions. The rotors are installed in these covers using roller bearings. Both side chambers contain a reserve supply of oil for lubrication of bearings and gears of the measurement system. Lubrication is achieved by means of oil spray generated by blades installed on rotor shafts.

The measurement assembly may be provided with automatic by-pass which opens if a failure of meter occurs (blockage of rotors). If so gas flow may omit the measuring cartridge. The meter failure (opened by-pass) is signaled by the control circuit that sends an appropriate signal to an external device.

This is an optional solution.

Drive transmission assembly. The drive transmission assembly is installed in the front cover and transmits the rotary motion of the rotors from the measurement assembly to the counter through a gas-tight partition. The assembly consists of a cog gear and a magnetic clutch. The driven part of the clutch may be complete with an inducer for the high frequency emitter.

The counter assembly. The counter assembly further reduces the rotational speed (by means of a worm gear and cylindrical gears) to drive the mechanical counter and the elements that induce the low frequency electric signal emitters. The assembly is also complete with sockets for transmitting the low and high frequency electric signals outside the gas meter. As an option the index head may be provided with mechanical drive shaft.

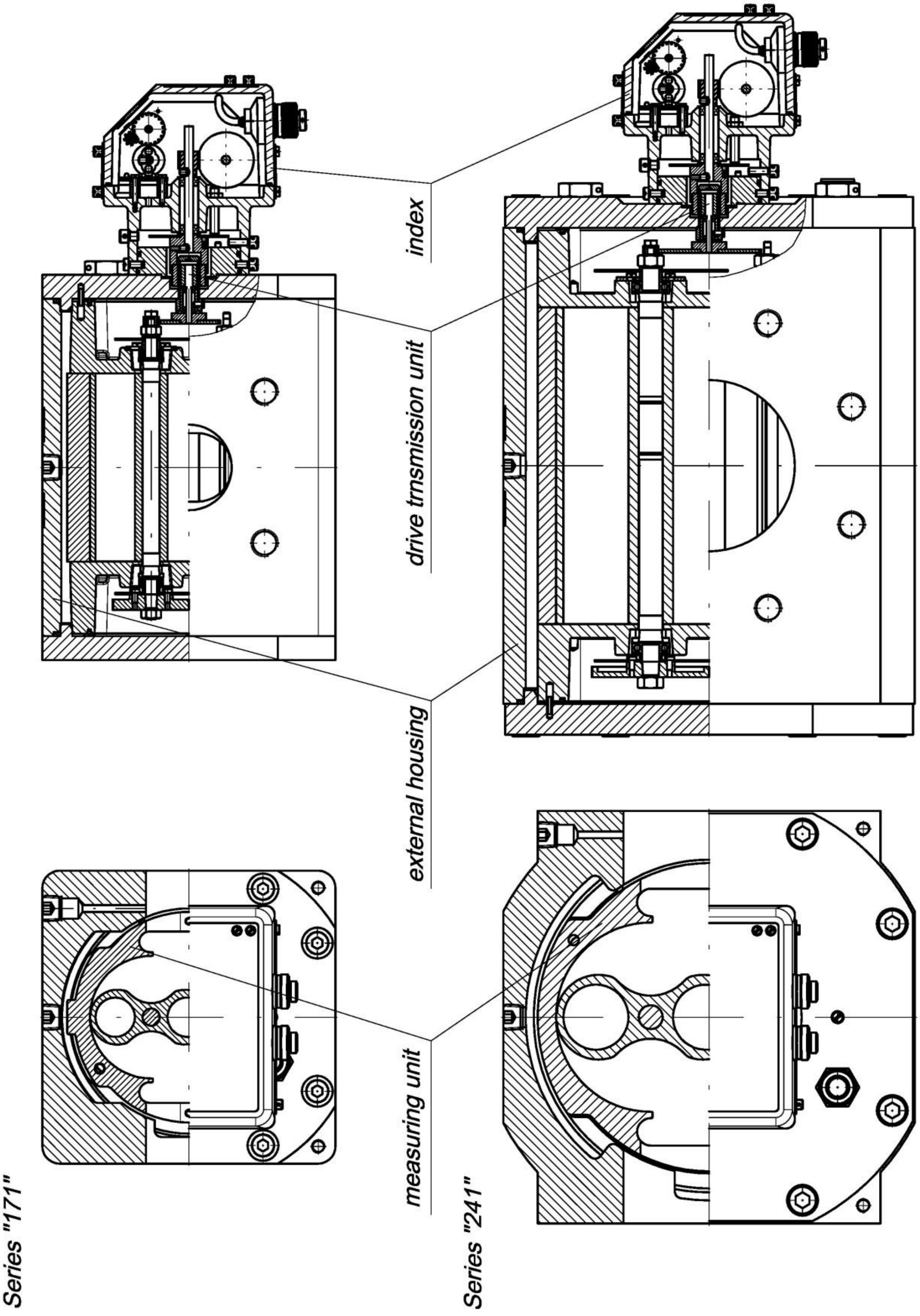


Fig. 3. Cross-section of the rotary gas meters CGR-FX

III. READOUT DEVICE AND MEASUREMENT OUTPUTS

The gas meters CGR-FX are equipped with a readout device in the form of a mechanical counter and electric signal outputs.

The index head may be provided with:

- mechanical output (drive shaft),
- replaceable HF pulse sensor installed in the index head support,

The meter housing is provided with pressure and temperature measurement taps (options). The outputs allow to monitor the gas meter operation and to connect the external equipment. Fig. 4 shows the location of the measurement outputs on the gas meter.

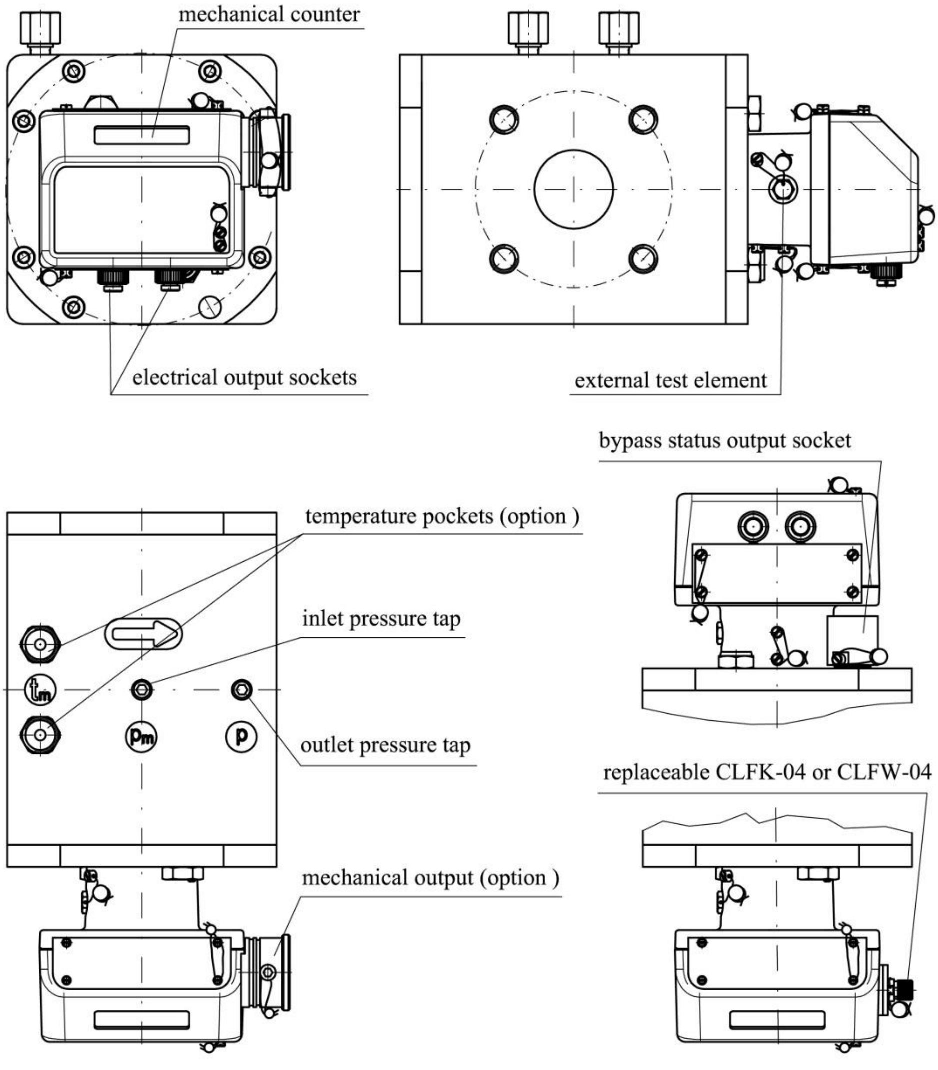


Fig. 4. Location of measurement outputs of the CGR-FX gas meters.

The mechanical counter is located inside the counter assembly and visible through a polycarbonate inspection window. The counter allows direct readout of the actual volume of gas that has flown through the gas meter under particular pressure and temperature conditions. The counter assembly may be rotated around the horizontal axis of the gas meter in a range of ca. 350^{o}, allowing for convenient readout of the counter from virtually all directions.

Electric signal outputs. There are two possible types of electric signal outputs: low frequency (LF) outputs and high frequency (HF) outputs. The counter may be equipped with the maximum of two sockets and six electric pulse emitters. The pulse emitters are:

- one or two inductive high frequency emitters HF,
- one or two inductive low frequency emitters LFI,
- one or two low frequency reed contact emitters LFK,
- one low frequency emitter LFW equipped with Wiegand sensor,
- one control circuit utilising normally closed reed relay switch AFK.

The reed relay emitters LFK and LFW are designed to work with a battery-powered or grid/battery-powered data logger and volume converter located in the vicinity of the gas meter (up to ca. 2 m). The induction emitters, both of the LFI and the HF type, may emit electric current signals over significantly longer distances (up to ca. 200 m, depending on conditions). Due to high power consumption, they are designed to work only with grid-powered volume converters. Gas volumes corresponding to individual pulses of the LF emitter are presented in Table 2. The number of HF pulses per one square meter of gas is determined individually for each gas meter and listed on the type plate. The approximate value of the HF emitter constant is given in Table 2. The HF output is particularly useful for tracking changes in the flux of the gas flowing through the gas meter.

All emitters located in the gas meter counter assembly are connected to Amphenol-Tuchel C091 31N006 100 2 sockets located in the back wall of the counter case. Cords connected to sockets should be equipped with Amphenol-Tuchel C091 31H006 100 2 plugs. Amphenol-Tuchel connections in CGR gas meters are in the IP67 protection class. Table 3 presents potential connections of emitters to individual electric signal output sockets.

Table 3. Potential connections of gas meter emitters to electrical output sockets.

	Pin	Polarity	LFK 1 or LFW 1		LFK 2 or LFW 2		AFK		(*) LFI 1		(*) LFI 2		HF 1		HF 2	
Socket 1	1	–	S						O							
	4	+		S						O						
	2	–			O		P		P		O				O	
	5	+				O		P		P		O				O
	3	–					O						P			
	6	+						O						P		
Socket 2	1	–			P				O							
	4	+				P				O						
	2	–			O		O		O		P				O	
	5	+				O		O		O		P				O
	3	–											O		P	
	6	+												O		P
	S – standard connections, P – preferred connections, O – optional connections Sockets 1 and 2 with pin numbering are shown in Fig. 8a and 8b.															
Standard versions of the CGR-FX gas meter features one low frequency reed contact emitter LFK 1																

One of the inductive emitters installed in the counter may act as a control element in the gas meter. If the counter is not equipped with a HF emitter, an external control element may be connected to the gas meter for testing purposes (see section VII). Inductive HF emitter type CHFI-04 by Common S.A. should be used as the external control element. The type plate of the gas meter includes the value of the constant for emitters HF1 and HF2; this value is also valid for the external control element emitter. After disconnecting the control element, the socket is tightly plugged and sealed (Fig. 9).

In line with the conditions for use, the CGR-FX gas meters should be equipped with emitters allowing for at least Ⓔx II 2G Ex ib IIC T5 Gb protection. This condition is satisfied for instance by the following emitters used in the counter:

- HF type Bi1-EG05-Y1(1) by Hans Turck GmbH Ⓔx II 1G Ex ia IIC T6
- LFI type Si5-K09-Y1(1) by Hans Turck GmbH Ⓔx II 1G Ex ia IIC T6
- LFK type CLFK-03 by Common S.A.
- LFW type CLFW-01 by Common S.A.
- LFW type CLFW-02 by Common S.A.

(1) – required linear characteristics of the emitter power circuit.

Acceptable intrinsic safety parameters

Bi1-EG05-Y1	Si5-K09-Y1	CLFK-03	CLFW-01 CLFW-02
U_i = 20 V DC	U_i = 20 V DC	U_i = 15.5 V DC	U_i = 30 V DC
I_i = 60 mA	I_i = 60 mA	I_i = 52 mA	I_i = 52 mA
P_i = 200 mW	P_i = 130 mW	P_i = 169 mW	P_i = 0.6 W
L_i = 150 µH	L_i = 350 µH	$L_i \approx 0$	$L_i \approx 0$
C_i = 150 nF	C_i = 250 nF	$C_i \approx 0$	$C_i \approx 0$

ATTENTION!

The total voltage of separate galvanic intrinsically safe circuits connected to one connector must comply with: $U_{i1} + U_{i2} \leq 30$ V

Intrinsic safety parameters of the emitters installed in the gas meter are listed in the type plate.

The intrinsic safety requirements are met by the following emitters:

- HF type CHFI-04 (1) by Common S.A. Ⓔx II 2G Ex ia IIC T6.
- LFK type CLFK-04 by Common S.A.
- LFW type CLFW-04 by Common S.A.

(1) - required linear characteristics of the emitter power circuit.

Acceptable intrinsic safety parameters

CHFI-04	CLFK-04	CLFW-04
U_i = 20 V DC	U_i = 15.5 V DC	U_i = 30 V DC
I_i = 60 mA	I_i = 52 mA	I_i = 52 mA
P_i = 200 mW	P_i = 169 mW	P_i = 0.6 W
L_i = 150 µH	$L_i \approx 0$	$L_i \approx 0$
C_i = 150 nF	$C_i \approx 0$	$C_i \approx 0$

NOTICE!

Intrinsic safety parameters are electrical parameters determined during analysis of the device construction. Their values are determined for the most unfavorable operating conditions or a failure of the device. Values of these parameters are limited to safe levels of specific gas mixture. They are not to be regarded as rated working parameters of the device operation.

Compatibility of intrinsic safety parameters of external connected devices are presented in the Table below.

Compatibility conditions for intrinsic safety parameters				
External device		**Condition**	**Gas meter**	
Output voltage	**Uo**	≤	**Ui**	Input voltage
Output current	**Io**	≤	**Ii**	Input current
Output power	**Po**	≤	**Pi**	Input power
Maximum external capacitance	**Co**	Co ≥ Ci+Ck	**Ci**	Internal capacitance
Maximum external inductivity	**Lo**	Lo ≥ Li+Lk	**Li**	Internal inductivity

As regards the cable parameters (Ck), (Lk) the following shall be presumed:

- The most unfavourable parameters declared by the cable manufacturer.
- Parameters measured in accordance with **EN 60079-14.** or 200pF/m and 1μH/m, or 30μH/Ω, where the connection contains two or three leads (with or without screen).

Nominal operating parameters of the emitters:

LFK (reed contact) and LFW (Wiegand) [open collector emitters]

CLFK-03 / CLFK-04 / CLFW-01 / CLFW-02 / CLFW-04

closed switch resistance	R_z = 100Ω ÷ 2 kΩ
open switch resistance	R_o > 100 MΩ
max. switching frequency	f_p = 2 Hz

Inductive proximity emitters – NAMUR standard

	Si5-K09-Y1	**Bi1-EG05-Y1 / CHFI-04**
max. switching frequency	f_p = 2 Hz	f_p = 0.5 kHz
rated operating voltage	Un = 8,2V	
rated current of non-activated switch	I >= 2,1mA	
rated current of activated switch	I <= 1,2mA	

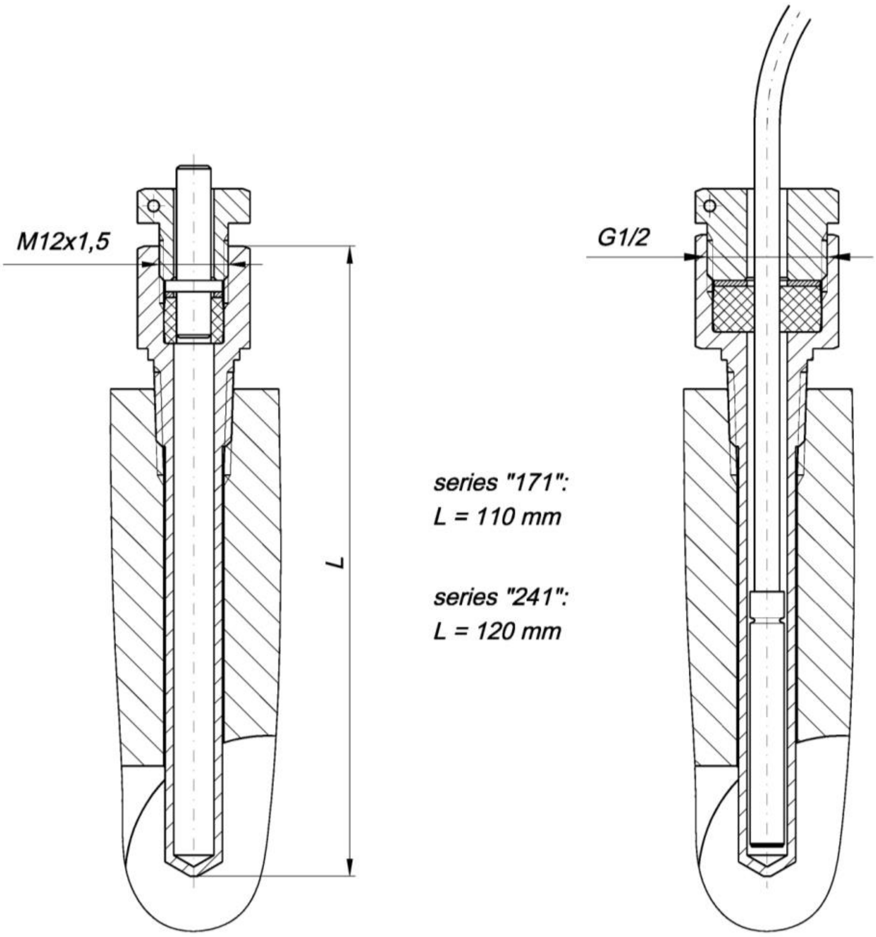
The remaining nominal operating parameters of the emitters used in the gas meters are in line with the requirements of the PN-EN 60947-5-6:2002 standard.

Please observe the polarity when making connections to external devices. It is not required in case of LFK and AFK emitters only.

Temperature measurement output.

The rotary gas meters CGR-FX allows temperature measurements only when delivered as a special order version; temperature measurements are not available in the standard version. Temperature probes are not a part of the meter with the temperature tapping and it is necessary to order them separately.

Temperature measurement outputs may be located on both sides of the main body (Fig. 4). The temperature measurement taps may be fitted with thermowell(s) (Fig. 5); with the length of L=110 mm for the bodies of the “171” series and L=120 mm for the bodies of the “241” series. It is recommended to fill the thermowell with silicon oil prior to installation of temperature probe. Temperature taps which are not used are plugged with ¼” NPT plugs.

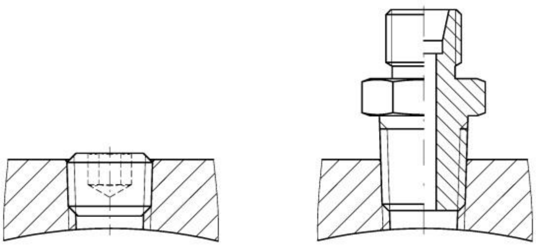


a) Thermowell b) Thermowell with temperature probe

Fig. 5 Thermowells

Pressure measurement output.

Pressure measurement outputs (pressure measurement taps) are located at both sides of the main body (Fig. 4). Openings are provided with ¼” NPT thread (Fig. 6).



a.) b.)

Fig. 6. ¼” NPT pressure measurement tap

The outputs are used to connect pressure transducers, either directly to the socket (Fig. 6b) or via three-way valves. Outputs that are not in use are blinded with plugs (Fig. 6a). Both plugs and sockets may be protected by installation seals.

Mechanical counter output (option)

The gas meter may be optionally equipped with a mechanical output. The mechanical output may be used to drive external, removable devices connected to the gas meter counter. A paddled tip of the counter shaft is located on the right side of the counter and covered by a protective cap. The rotational speed of the shaft is identical to the speed of the fastest counter barrel. The shaft rotates in counter-clockwise direction; the direction is marked on the plate (Fig. 7b) fixed at the mechanical output cover. The values of the maximum acceptable allowable momentum of the mechanical output shaft tip M_{max} = 0,25 [Nmm] and the constant corresponding to one complete turn of the drive shaft, 1 tr = …… [m^3] are also given on the plate

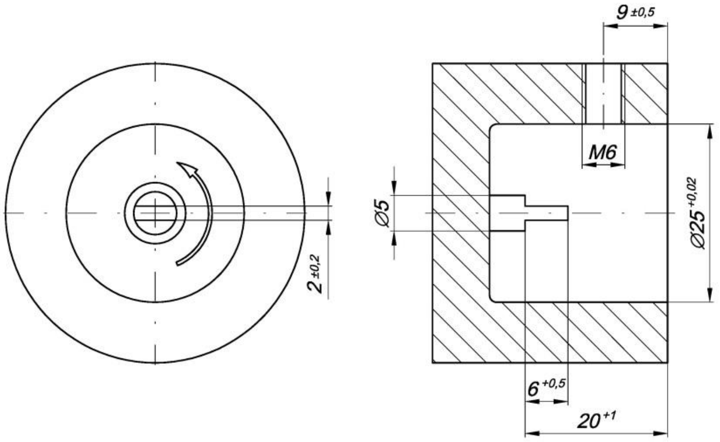


Fig. 7a Mechanical output drive shaft

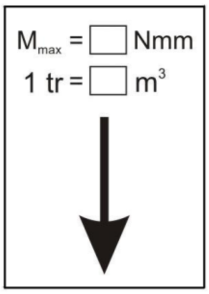


Fig. 7b Mechanical output type plate

IV. LABELLING AND PROTECTION

Information on the basic technical parameters of the gas meter along with the serial number and manufacture year is listed on rating plates (Figs. 8a, 8b and 8c) fixed to the counter casing.

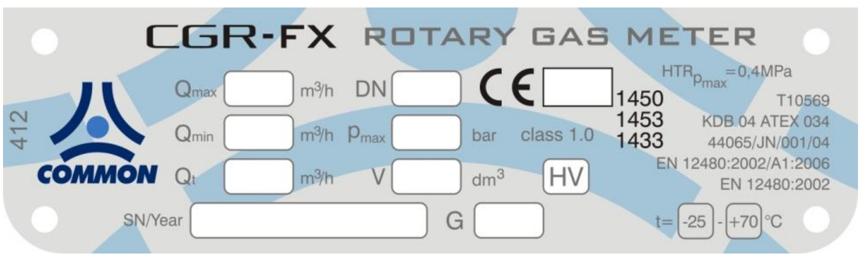


Fig. 8a. Type plates – special version HTR

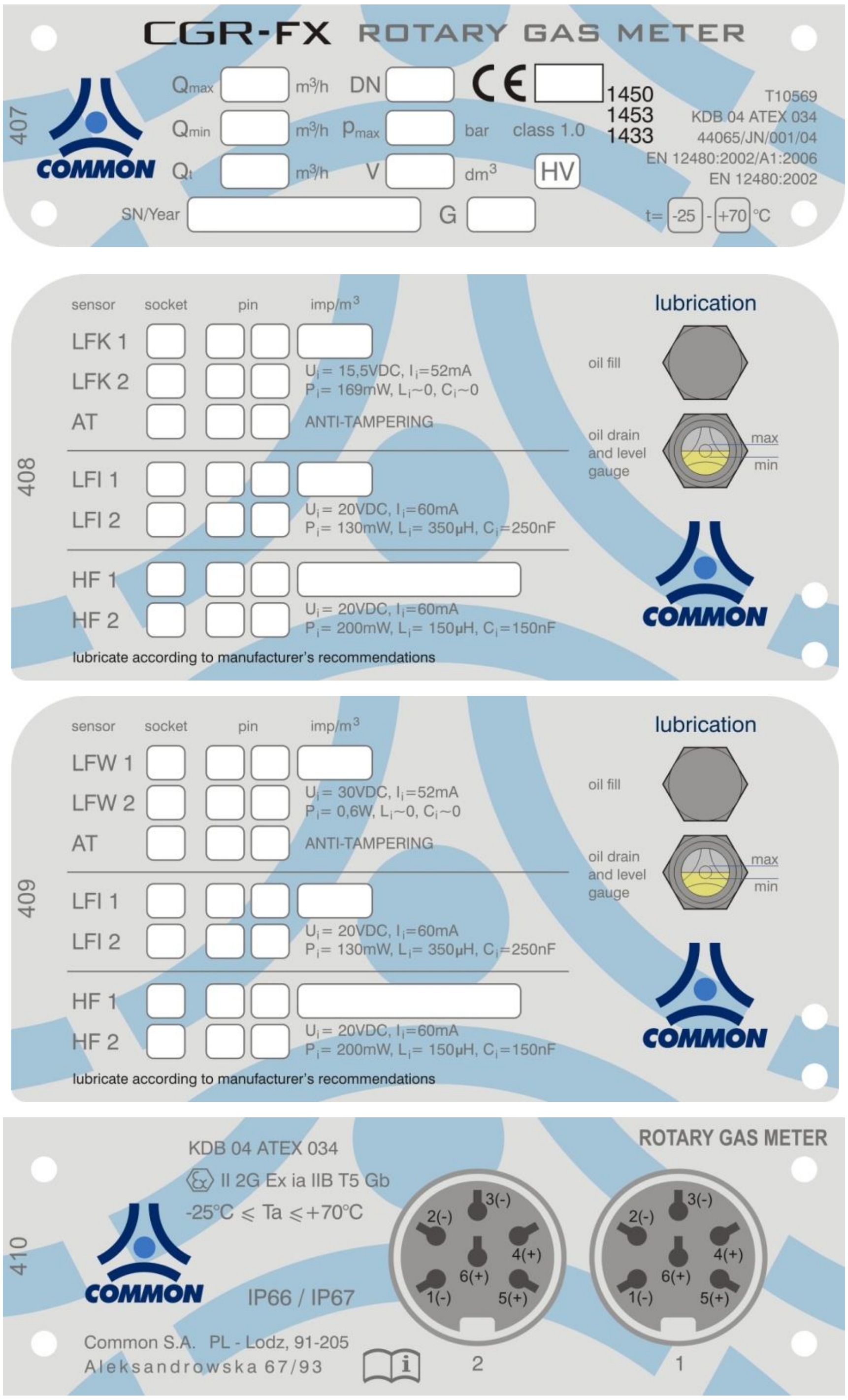


Fig. 8b. Type plates – standard version for IIA and IIB explosion groups

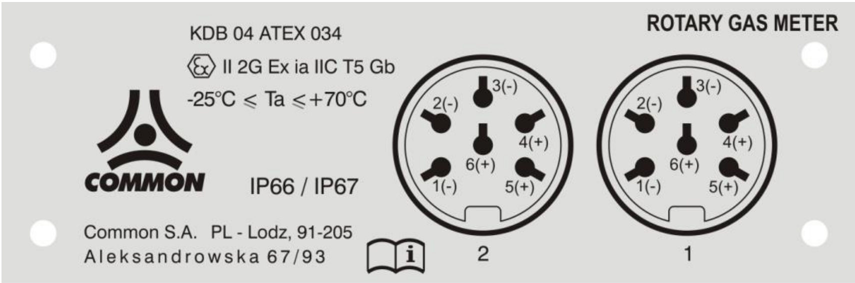
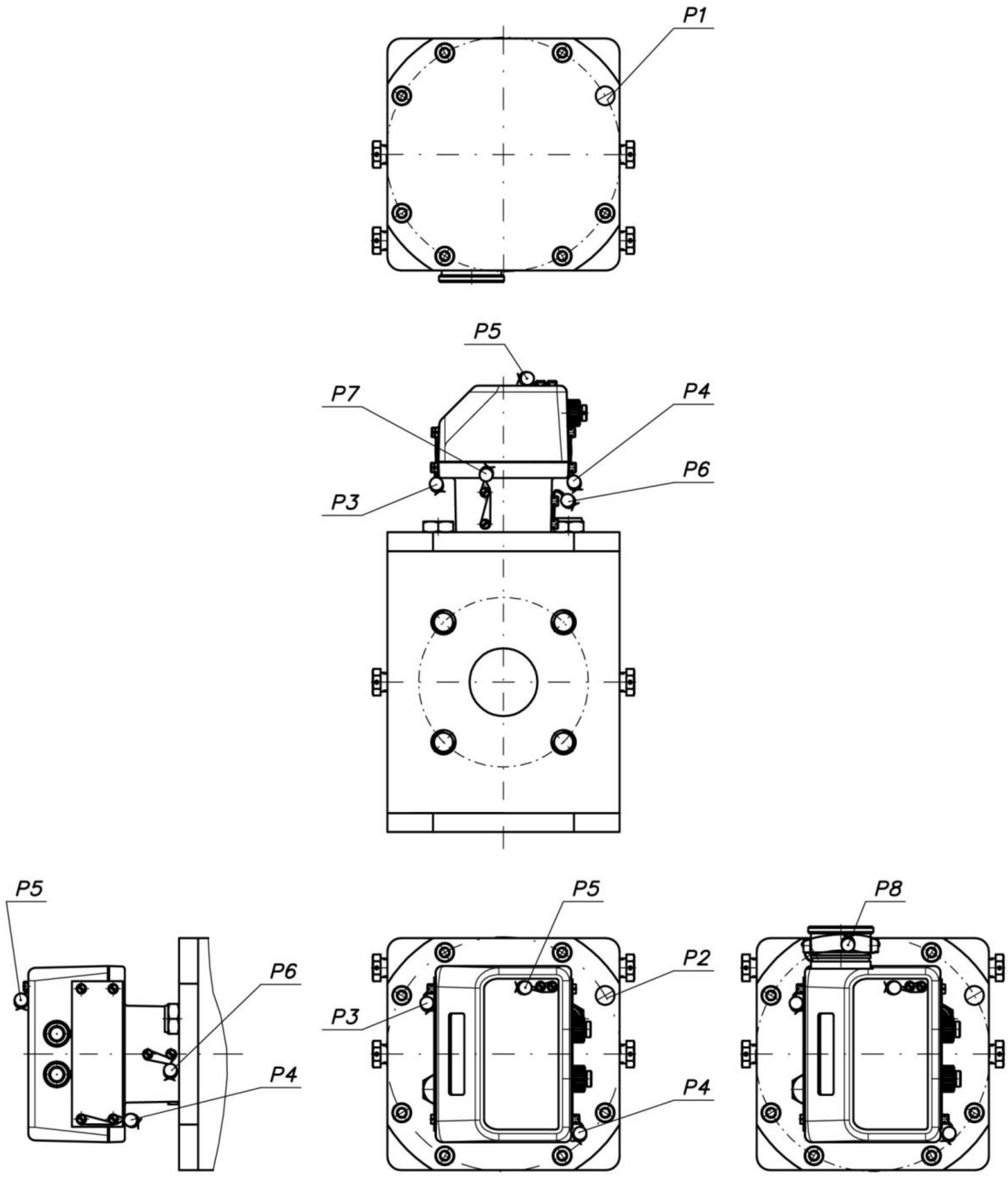


Fig. 8c. Type plates – special version for IIC explosion group

The top of the gas meter body features signs informing about the direction of gas flow and the locations of pressure and temperature measurement outputs (Fig. 4).

Following verification by the authorized manufacturer laboratory, each gas meter is protected with seals placed in locations shown in Fig.9. On customer's request the gas meter may be delivered along with the calibration certificate.



P1, P2, P3, P4, P5, P6 – metrological seals
P7, P8 – optional protection seals

Fig. 9. Locations of seals on CGR-FX rotary gas meter.

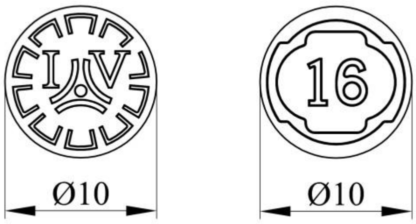


Fig. 10a Initial verification seal (sample) Fig. 10b Sample of protective sticker

Re-calibration period depends on metrological regulations in the country where the meter has been installed. Before the end of the verification period, the gas meter should be submitted for secondary verification in an authorized laboratory.

Re-calibration of meters may be performed by COMMON S.A., in our own laboratory. It is also possible to make necessary adjustments and repairs, if required.

Retaining the verification stamp seal is required for the gas meter to be considered a legal measurement device.

V. PACKAGING, TRANSPORT AND STORAGE

The gas meter is supplied in factory-made packaging which provides appropriate protection during transport and storage (Figs 11a and 11b). The packaging consists of reinforced cardboard box and profiled cardboard inserts. Appropriate information regarding the contents and restrictions regarding gas meter loading/unloading and transport is printed on the packaging. Side walls of the box feature handle holes for transporting the gas meter. Gas meters submitted for repair or renewed legal approval should be sent in factory-made packaging or other packaging providing at least equal protection during transport.

Every rotary gas meter produced by Common S.A. is supplied with the following:

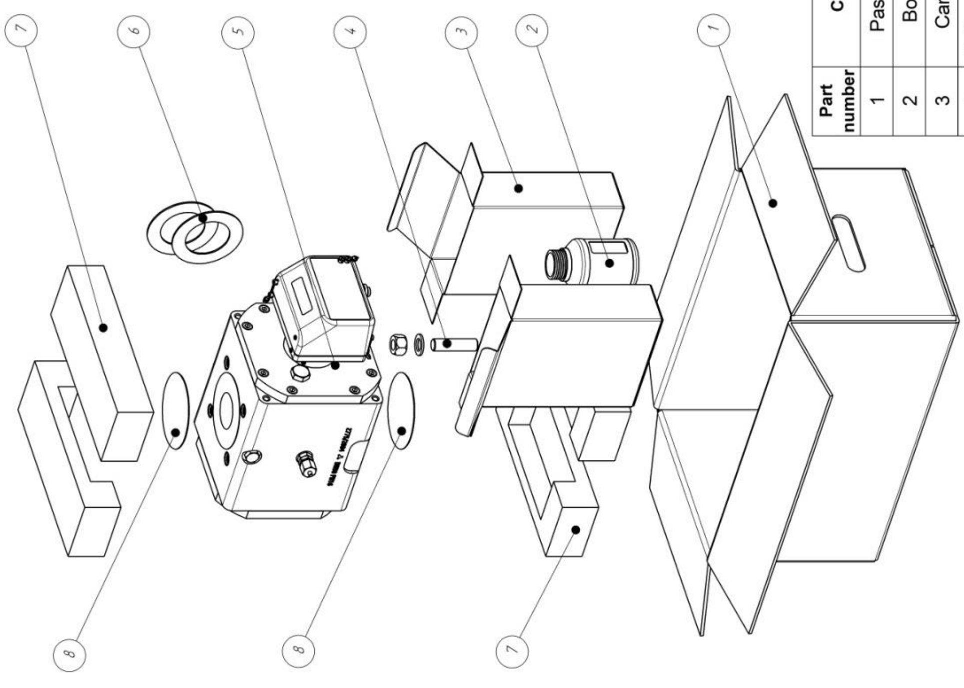
- a 6-pin Amphenol-Tuchel C091 31H006 100 2 plug to be used for connecting a converter or data logger to the low frequency electric signal output;
- a bottle of oil for gas meter lubrication;
- a set of elements for fixing the gas meter in the installation: hexagonal flat end M16x70 set screws compliant with the PN-EN ISO 4026:2004 standard, washers and nuts;
- the technical manual.

The rotary gas meter is a high precision measurement device and should be handled with appropriate caution.

Following principles should be observed during transport and storage of the gas meters:

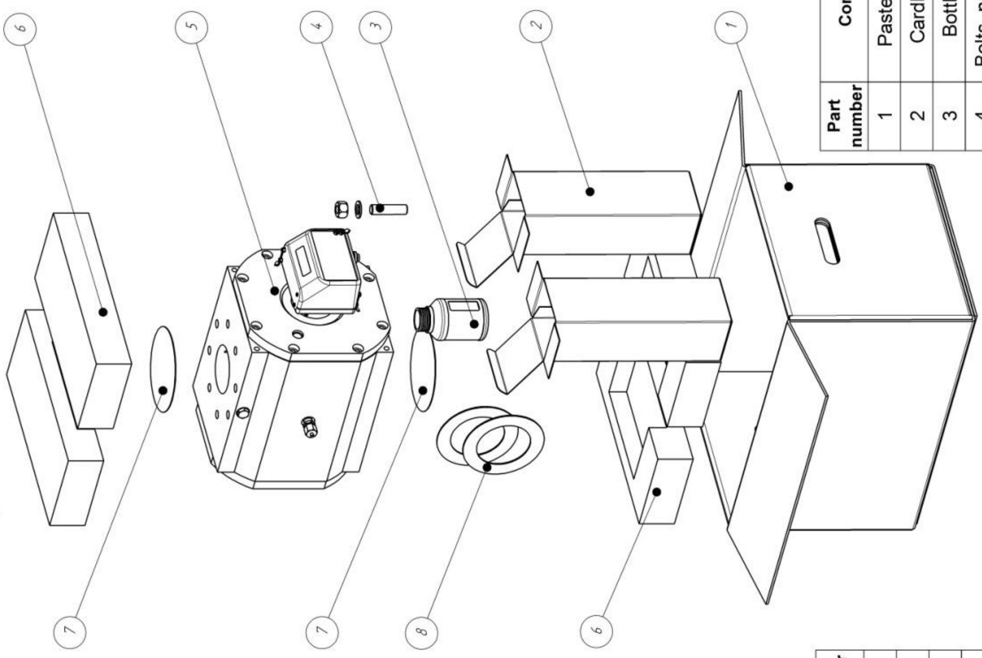
1. Gas meters should not be thrown, turned over or subjected to strong impacts (e.g. during fast transport using carts without springs).
2. It is not allowed to lift the meter by the index head.
3. Factory-placed covers or other shields of gas meter should not be removed until directly before installation.
4. The storage site should protect the gas meter from atmospheric precipitation and moisture.
5. Care should be taken of the seals placed on the gas meter. **Damage of seals may lead to warranty voidance and legal consequences as regards the clearance of accounts between the gas supplier and the customer.**
6. It is not required for the gas meter to be primed with oil during warehouse storage.

Packing of CGR series "171"



Part number	Component	Number
1	Pasteboard box	1
2	Bottle with oil	1
3	Cardboard box	2
4	Bolts, nuts, washers	
5	Rotary gas meter	1
6	Seals	2
7	Cardboard inserts	4
8	Protective sticker	2

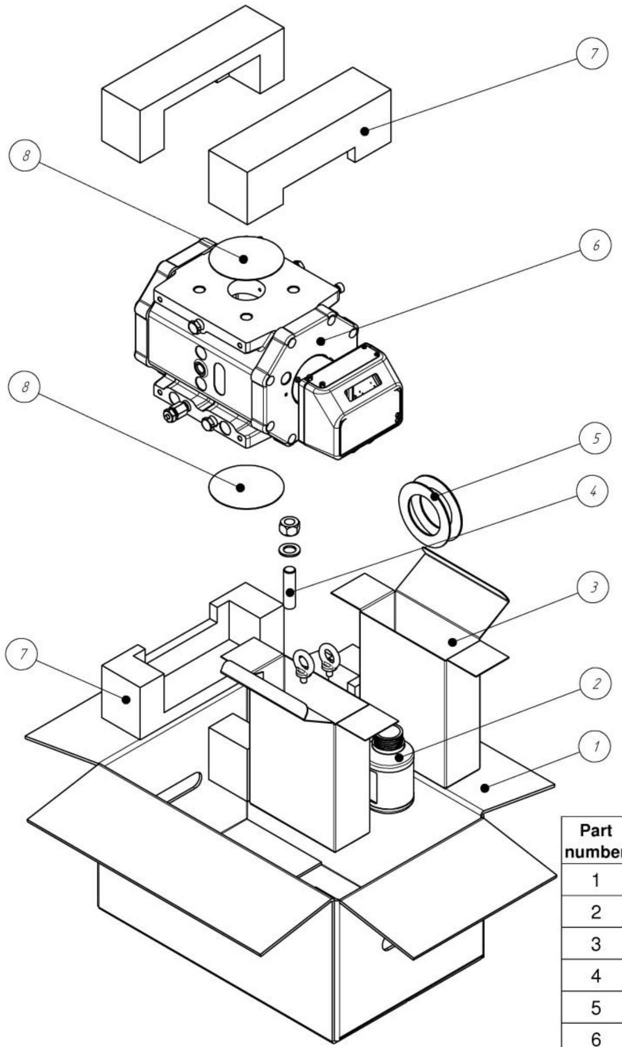
Packing of CGR series "241"



Part number	Component	Number
1	Pasteboard box	1
2	Cardboard box	2
3	Bottle with oil	1
4	Bolts, nuts, washers	
5	Rotary gas meter	1
6	Cardboard inserts	4
7	Protective sticker	2
8	Seals	2

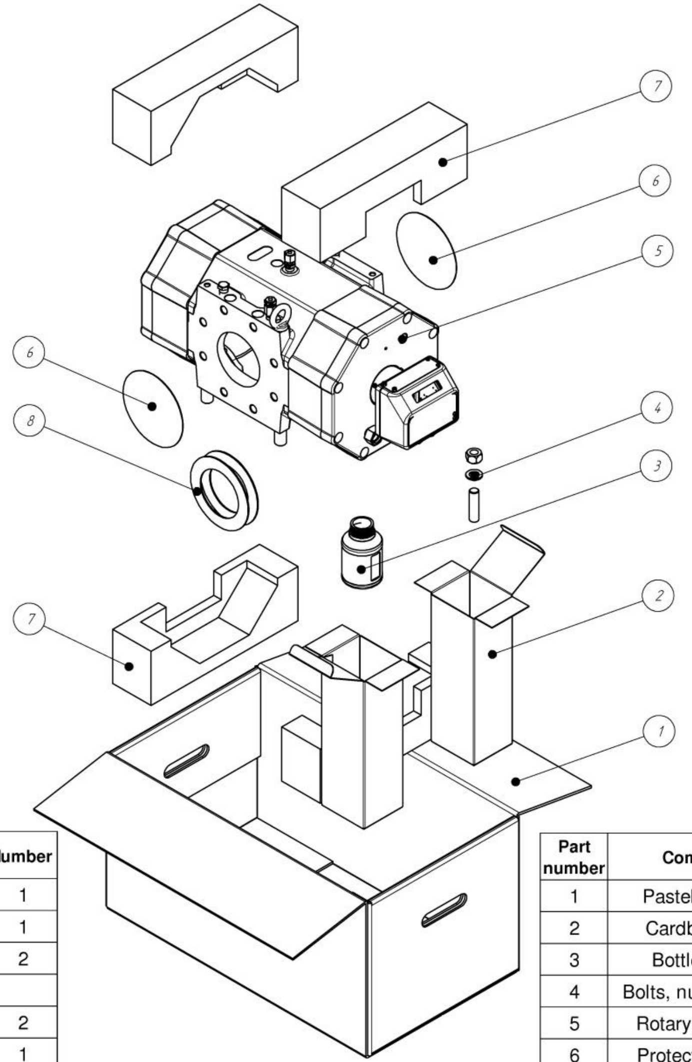
Fig. 11a. Packaging of the CGR-FX gas meters (aluminum bodies)

Packing of CGR HTB series "171"



Part number	Component	Number
1	Pasteboard box	1
2	Bottle with oil	1
3	Cardboard box	2
4	Bolts, nuts, washers	
5	Seals	2
6	Rotary gas meter	1
7	Cardboard inserts	4
8	Protective sticker	2

Packing of CGR HTB series "241"



Part number	Component	Number
1	Pasteboard box	1
2	Cardboard box	2
3	Bottle with oil	1
4	Bolts, nuts, washers	
5	Rotary gas meter	1
6	Protective sticker	2
7	Cardboard inserts	4
8	Seals	2

Fig. 11b. Packaging of the CGR-FX gas meters (cast iron bodies)

VI. INSTALLATION AND OPERATION

Before installing the gas meter ensure that it is suitable for the system's operational parameters. In particular, following type plate information should be taken into consideration:

- **Acceptable gas meter gauge pressure [MPa], labelled p_{max},**
- **Maximum actual flow [m^3/h], labelled Q_{max} .**

Maximum flow of the gas meter, Q_{max}, may be exceeded by not more than 25% for not longer than 30 minutes.

Rotary gas meters CGR-FX may be operated in the following four operating positions (Figure 12 a, b, c, d):

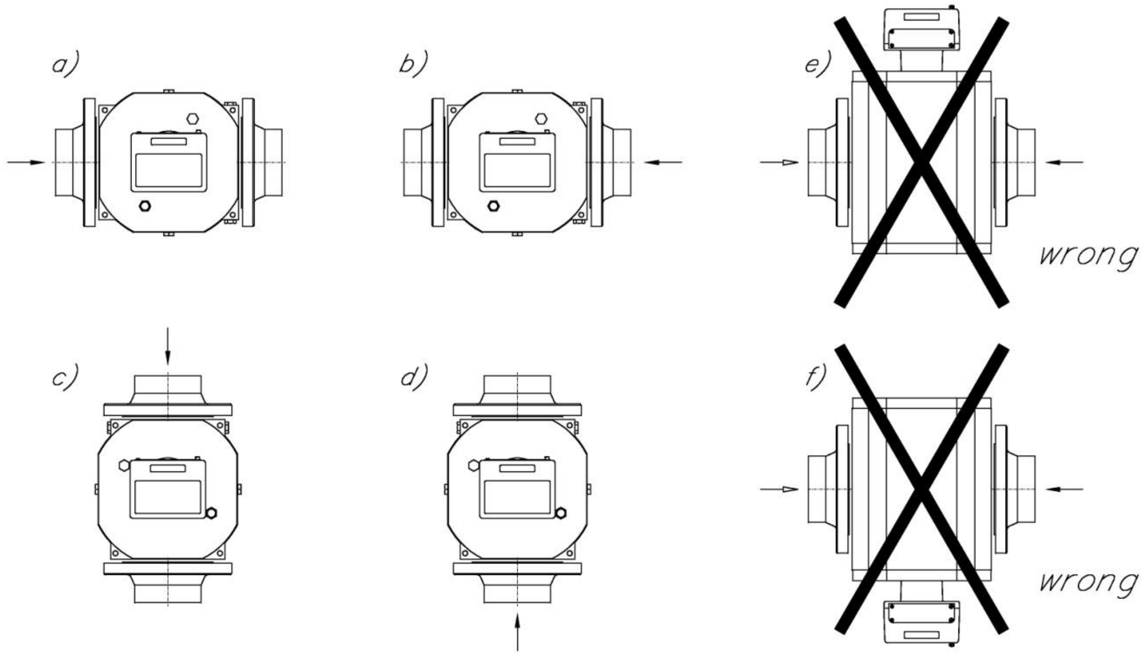


Fig. 12. Operating positions of the CGR-FX rotary gas meter.

The gas meter may not be placed vertically!
Figure 12 e) & f)

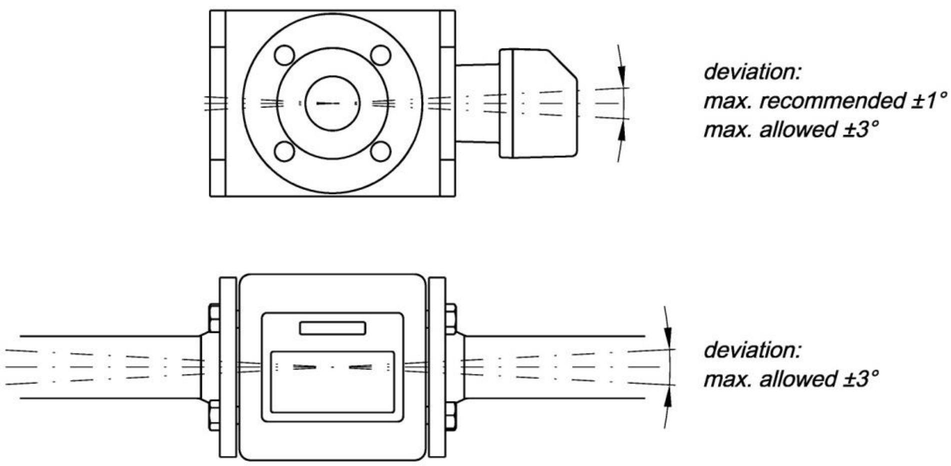


Fig. 13. Acceptable deviations from the horizontal position of the gas meter.

Gas meters should not be installed at the lowest point of the system lines, as condensate and impurities may accumulate in that area.

The rotary gas meters can be used both indoors in stabilized temperature conditions and outdoors (open location). In the latter case, it is recommended that the gas meter is shielded from direct exposure to atmospheric factors (metal containers, casings, roofs, shields etc.)

The gas meter must be placed between pipes of appropriate nominal diameter, with axial alignment of the gas meter relative to the pipes according to gas industry regulations. The static load of the system of ducts (pipes) should not exceed values provided for in the EN 12480:2002 standard.

Dimensions listed in Tables 4a, 4b, 4c, 4d and illustrated in Figure 14 may be helpful when designing the location for the installation of the gas meter.

Table 4a. Basic dimensions and weights of CGR-FX gas meters in aluminium bodies.

Qmax	DN					A	B	L	Weight at V_{cycl}		Series
m3/h	40	50	65	80	100	mm	mm	mm	kg	dm^3	
16w	+	+				165	171	277	11	0.23	"171"
25p	+	+				165	171	277	11	0.23	
25w	+	+				184	171	296	12	0.31	
40s	+	+				165	171	277	11	0.23	
40p	+	+				184	171	296	12	0.31	
40w	+	+				225	171	337	14	0.50	
65s	+	+	+			184	171	296	12	0.31	
65p	+	+	+			225	171	337	14	0.50	
65w	+	+	+			295	171	407	19	0.81	
100s		+	+	+		225	171	337	14	0.50	
100p		+	+	+		295	171	407	19	0.81	
100w		+	+	+		391	171	503	24	1.24	
160s		+		+		295	171	407	19	0.81	
160p		+		+		391	171	503	24	1.24	
250s				+		391	171	503	24	1.24	
160p				+	+	249	241	356	25	1.29	"241"
160w				+	+	314	241	421	31	2.00	
250s				+	+	249	241	356	25	1.29	
250p				+	+	314	241	421	31	2.00	
250w				+	+	439	241	546	42	3.34	
400s				+	+	314	241	421	31	2.00	
400p				+	+	439	241	546	42	3.34	
650s					+	439	241	546	42	3.34	

p – basic version;
w – low-speed version (larger overall dimensions, reduced pressure loss and noise level),
s – compact version (smaller overall dimensions, increased pressure loss and noise level),

Table 4b. Basic dimensions and weights of CGR-FX gas meters in cast iron bodies.

Qmax	DN					A	B	L	Weight at V_{cycl}		Series
m3/h	40	50	65	80	100	mm	mm	mm	kg	dm^3	
16w	+	+				246	181	358	33	0.50	"171"
25w	+	+				246	181	358	33	0.50	
40w	+	+				246	181	358	33	0.50	
65p	+	+	+			246	181	358	33	0.50	
65w	+	+	+			316	181	428	38	0.81	
100s		+	+	+		246	181	358	33	0.50	
100p		+	+	+		316	181	428	38	0.81	
100w		+	+	+		412	181	524	45	1.24	
160s		+		+		316	181	428	38	0.81	
160p		+		+		412	181	524	45	1.24	
250s				+		412	181	524	45	1.24	
160w				+	+	327	253	439	64	2.00	"241"
250p				+	+	327	253	449	64	2.00	
250w				+	+	452	253	564	78	3.34	
400s				+	+	327	253	439	64	2.00	
400p				+	+	452	253	564	78	3.34	
650s					+	452	253	564	78	3.34	

p – basic version;
w – low-speed version (larger overall dimensions, reduced pressure loss and noise level),
s – compact version (smaller overall dimensions, increased pressure loss and noise level),

Table 4c. Dimension “K” (diameter of stud circle)

	DN40	DN50	DN65	DN80	DN100
PN 16	110	125	145	160	180
PN 20 (ANSI 150)	98.5	120.7	139.5	152.4	190.5
PN 25	110	125	145	160	190

Table 4d. Quantity of installation studs (n)

	DN40	DN50	DN65	DN80	DN100
PN 16	4 x M16	4 x M16	4 x M16	8 x M16	8 x M16
PN 20 (ANSI 150)	4 x M16	4 x M16	4 x M16	4 x M16	8 x M16
PN 25	4 x M16	4 x M16	8 x M16	8 x M16	8 x M20

Impurities contained within the gas and the system may cause mechanical damage to the rotors and reduce the measurement accuracy. Therefore, a filter with efficacy not worse than

10 μm should be placed in front of the gas meter (particularly when the flowing gas contains large amounts of impurities). In addition, the inflow section of the system should be carefully cleaned and blown through before installing the gas meter, and a Top Hat Filter should be placed at the inlet of the inflow section; the filter should be removed after 1 ÷ 2 months of operation. If the filter is not removed, monitoring of the filter impurity level should be provided by means of pressure drop measurements or regular check-ups. If clogged, the sack filter may be destroyed by the gas pressure, and filter residue may seriously damage the gas meter.

The manufacturer is not responsible for any damages or stoppage of the gas meter resulting from insufficient filtration of the gas flowing through the meter.

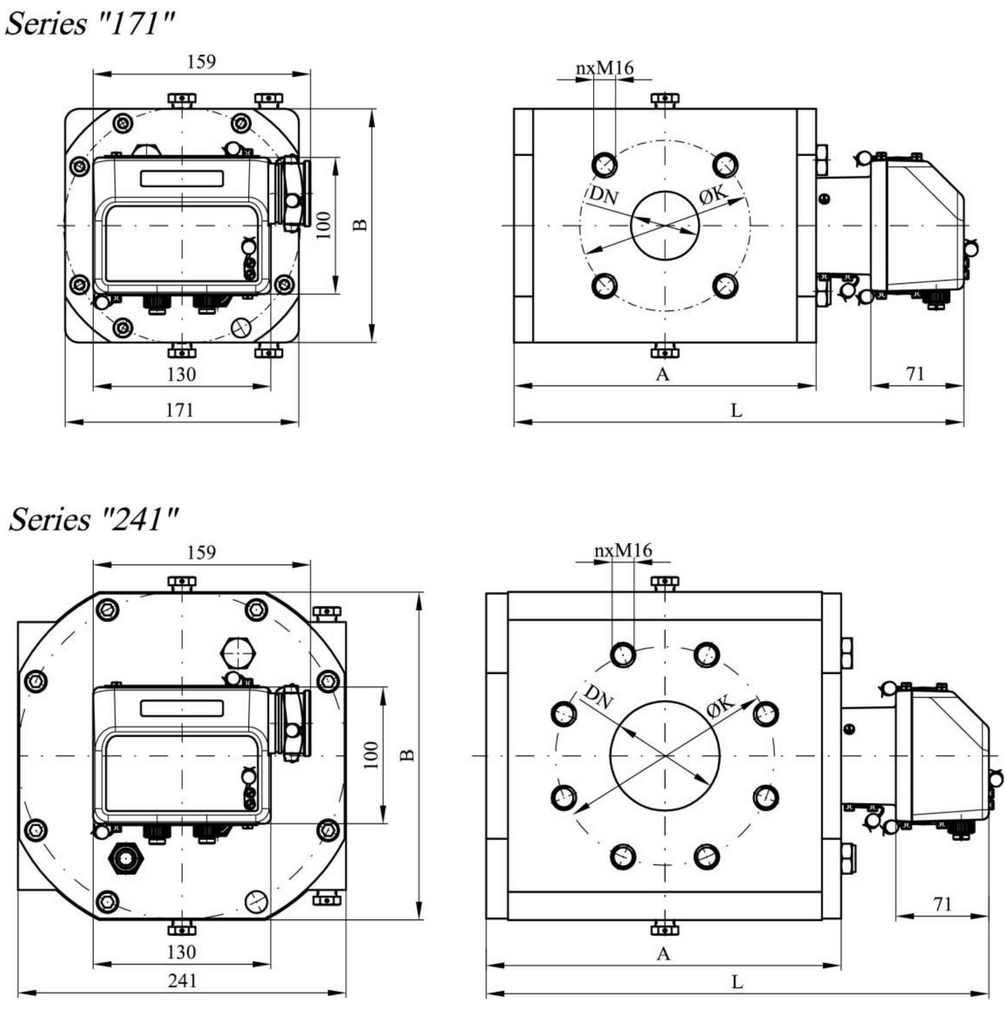


Fig. 14. Basic dimensions of CGR-FX rotary gas meters.

The user should be aware of certain risks associated with changes in the gas flow intensity. If the gas flow was relatively low for a long time after system initiation, the assembly-related contaminants (e.g. welding residues) are retained in front of the gas meter. Only after the flow is significantly increased, the contaminants may be swept away by the gas, causing gas meter damage. For this reason, the sack filter may prove useful in the period in which maximum system capacity is being reached. In all cases, protection of the gas meter from mechanical damage is in the user's best interest.

Before final installation of the gas meter ensure it is properly oriented, i.e. that the arrow on the meter body points in the direction of the gas flow.

The gas meter should be connected to the pipeline flanges using the factory-supplied M16x70 stud bolts or M16x45 bolts of appropriate length (mechanical property class 5.8) Appropriate seals should be selected for specific flange types and nominal pressures.

Do not exceed the torque of 160 Nm when tightening the screws!

The gas meter should be primed with oil after installation and before start-up. Oils supplied and recommended by the gas meter manufacturer should be used. Following oils may be used with gases listed in Table 1:

- Lubrina L12 rotary gas meter oil (distributed by Common S.A.);
- VR09 rotary gas meter oil (distributed by Common S.A.);
- Shell Tellus T15.

Other types of oils should be used for lubrication of gas meters in cases when the gas flowing through the meter is other than one of the gases listed in Table 1. In such cases, consult the oil type with the manufacturer of the gas meter!

Oil level should be controlled during priming and subsequent refills. The level of oil in the gas meter should be visible in the sight glass, between the MIN and MAX lines (Fig. 15c). The sight glass plug is also used as a drain plug and should be placed in the bottom opening of the front cover. If the control plug is located in the top opening of the cover, it should be removed and replaced with the oil filler plug (Fig. 15a).

Approximate amounts of oil, depending on the gas meter position and size (Fig. 12.):

position	series "171"	series "241"
"a" or "b"	30 mL	50 mL
"c" or "d"	50 mL	85 mL

Volume required to refill the oil between the Min and Max lines, depending on the gas meter position and size (Fig. 12):

position	series "171"	series "241"
"a" or "b"	10 mL	20 mL
"c" or "d"	15 mL	30 mL

On customer’s request the gas meter may be equipped with:

- oil filler plug (Fig. 15a) – standard version,
- pressure oil refill valve (Fig. 15b) – special version.

Each standard CGR-FX gas meter may be transformed into special version by installation of a pressure valve and an oil refill assembly.

If the gas meter is equipped with an oil filler plug (Fig. 15a), oil may be poured into the gas meter using the top opening in the front cover after removal of the plug.

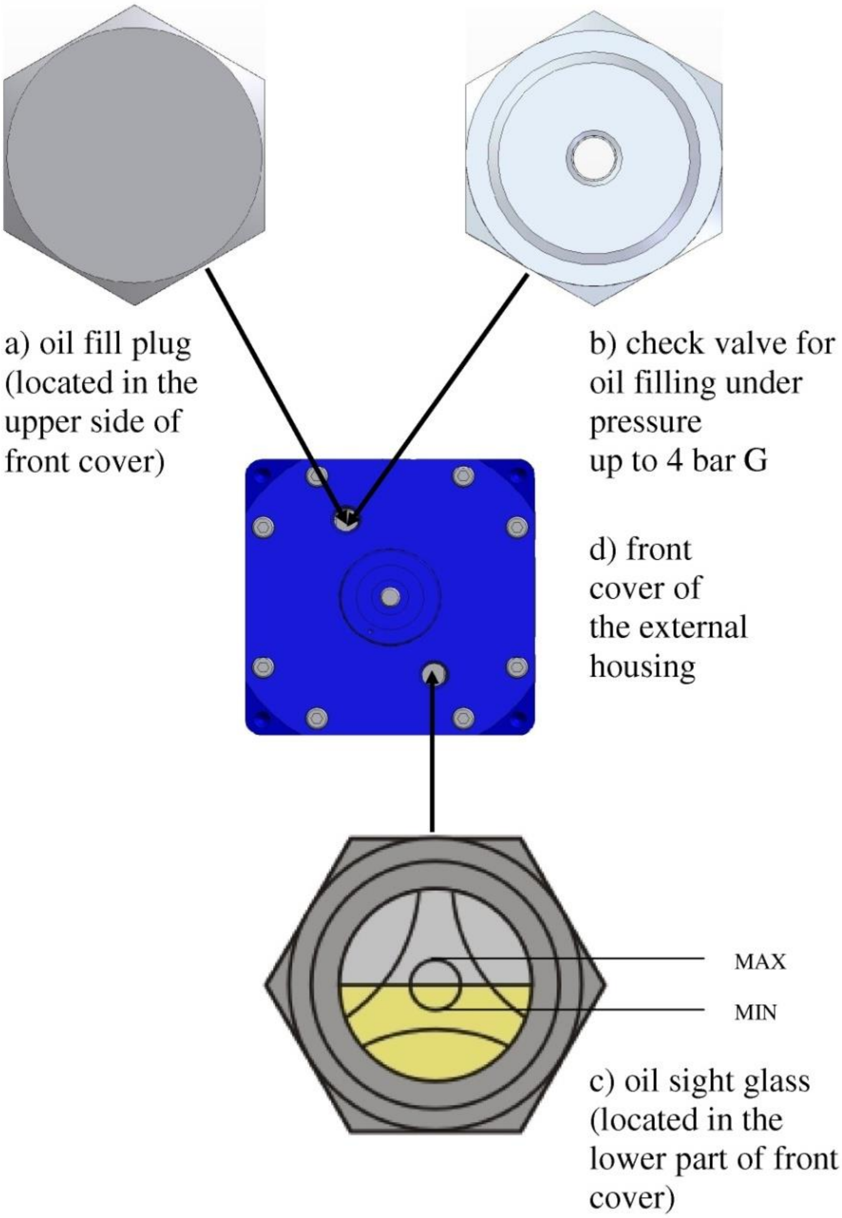


Fig. 15. Oil filler plug.

Caution!

Gas pressure inside the gas meter should be reduced to atmospheric level before removal of the oil filler plug.

If the gas meter is equipped with a pressure valve (Fig. 15b), oil may be refilled without reducing the system pressure to atmospheric level. Detailed information is presented in Section **VIII. Additional equipment.**

Caution!
The pressure valve must not be removed when the gas meter is installed in the system under working pressure

In a typical installation setting, i.e. in a bypass system (Fig. 16), the gas meter start-up procedure should proceed as follows:

1. The gas meter is installed with valves 1, 2, 5 being closed and the bypass valve 4 remaining open. The blow-off valve 3 remains open after system the system is degassed.
2. After levelling the gas meter and tightening the bolts connecting the gas meter to the pipeline, the gas meter should be filled with oil according to instructions.
3. Next, air should be removed from the system using valve 5, according to appropriate regulations. Valve 3 should remain open.
4. Having removed the air, valve 3 is closed and the installation is filled with gas with pressure increase rate not larger than 30 ± 10 kPa/s.
5. Valve 5 is closed when the gas meter counter stops indicating the flow (associated with pressure equilibration).
6. Valve 1 is opened, followed by valve 2.
7. Bypass valve 4 may be closed after the valve 2 has been opened in full.

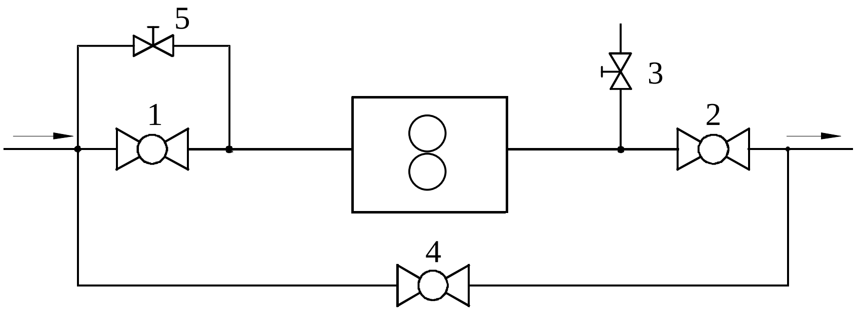


Fig. 16. A diagram of a bypass measurement system

When removing the gas meter, the above steps should be followed in reverse order, i.e.

1. Bypass valve 4 is closed first
2. Valve 2 is closed, followed by valve 1.
3. The measurement segment is slowly degassed using the blow-off valve 3, with pressure drop not larger than 30 ± 10 kPa/s.

Caution!
Drain the oil before uninstalling the gas meter!

The same principle should be followed in other installation settings, i.e. the flow of the gas through the gas meter should be opened or closed very slowly. Rapid change in the flow caused by sudden opening of the valve may damage the rotor bearings due to a large difference of pressure upstream and downstream of the rotor.

If there is a risk of gas meter overload (i.e. exceeding Q_{max} by more than 25 %), during exploitation, the use of a restrictor orifice is recommended. The orifice should be installed at a distance of 5÷10 nominal diameters (DN) behind the gas meter. The orifice dimensions are selected individually on the basis of the nominal diameter and gas flow, pressure and temperature. Common S.A. may design and deliver appropriate orifice at customer's request.

Counter readout correctness should be checked after installing the gas meter. Every barrel of the counter should turn smoothly and a full turn of a barrel should turn the neighbouring left barrel by 1/10 of a full turn.

VII. OPERATION MONITORING, MAINTENANCE, FAILURES, REPAIRS

In any doubt regarding the correctness of gas meter readings, the gas meter should be removed from the system and submitted to an appropriate laboratory for verification of its metrological characteristics. The test may be performed using the control element, without breaking the legal approval seal. One of the inductive emitters installed in the counter may act as a control element. If the counter is not equipped with a HF emitter, an external HF emitter (type CHFI-04 by COMMON S.A.) should be connected to act as a control element (Fig. 17). For more information on the HF transmitter type CHFI-04 in Chapter ***VIII. ADDITIONAL EQUIPMENT.***

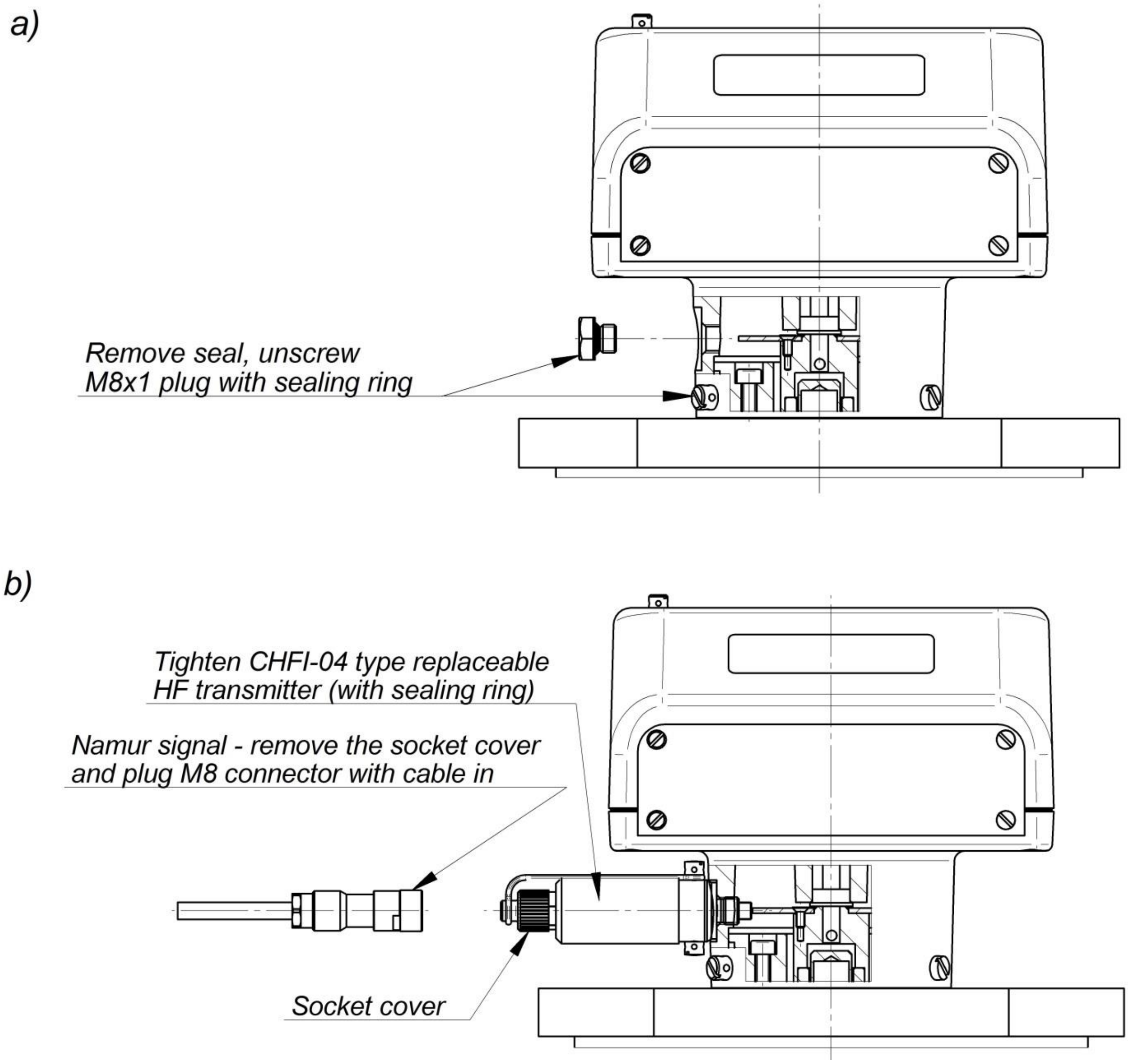


Fig. 17. Connection of the control element.

The external control element is installed in a special M5-threaded opening in the cylindrical part of the counter, after removing the protection seal no. 7 and the blocking screw (Fig. 17a.). The control element should be screwed in to a depth allowing for a proper (i.e. consistent with the Namur standard) emitter signal to be obtained. This should be achieved with ca. 0.5 mm spacing between the emitter head and the inductive element (Fig. 17b). After completion of the test and removal of the control element, the hole should be tightly closed using a plug. A protection seal should be placed on the plug.

The gas meters CGR-FX are complete with a system for lubrication of rotors and inner gears. The remaining mechanisms are furnished with bearings complete with lubricant reserves. Therefore, the only activity required for the maintenance of the gas meters is the monitoring of the oil level and possibly oil refill. Only oils supplied and recommended by the gas meter manufacturer should be used for oil refills.

Oil refills may be made only when the gas flow is shut off.

If the gas meter is equipped with an oil filler plug (Fig. 15a), gas pressure should be reduced to atmospheric level before the oil refill procedure. The oil may be poured through the top opening in the front cover of the gas meter after removal of the plug.

If the gas meter is equipped with a pressure valve (Fig. 15b), oil may be refilled without reducing the system pressure to atmospheric level. Detailed information is presented in Section **VIII. Additional equipment.**

Dust and other impurities may be removed from the gas meter surface using a cloth soaked in soap and water. Do not clean with solvents or other chemicals.

In case of any incorrectness in gas meter operation (e.g. irregular counter work or counter stoppage, elevated noise, crackling, oil leaks), the gas meter should be immediately submitted for repair.

Gas meter repairs may be performed only by the manufacturer or a company authorized by the manufacturer.
Users must not attempt to repair the gas meters themselves!

Repairs associated with breaking the verification seals require new calibration of the gas meter, according to local regulations.

The CGR-FX gas meters are subject to manufacturer's warranty. The warranty proceedings are in line with the general trade law regulations.

VIII. ADDITIONAL EQUIPMENT

Oil refills in pressurized conditions.

It is possible to refill oil without the need to reduce the gas pressure to the atmospheric level when using a special version of the rotary gas meter equipped with a pressure valve (Fig. 15b). A “single use” syringe supplied with the oil container is used for pumping the oil into the valve.

Caution!
Pertains to systems with maximum gas pressure of 0.5 MPa.
Before starting the oil refill procedure, stop the flow of the gas in the measurement system and wait several minutes until the oil level is stabilized in the gas meter.

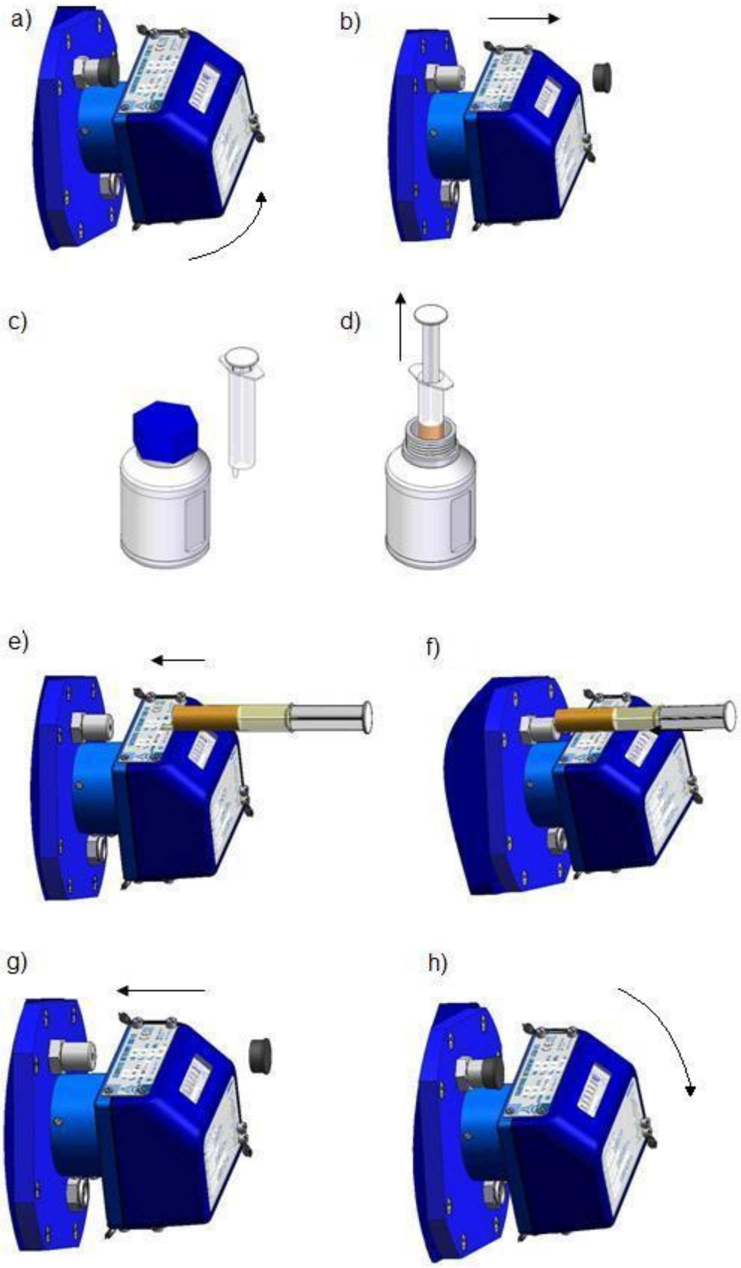


Fig. 18. Oil refill procedure in pressurized conditions.

The sequence of steps when pumping the oil (Fig. 18):

a. Turn the counter head so that the pressure valve is easily accessible;
b. Remove the cap protecting the valve from contamination;
c. Prepare the oil pumping kit;
d. Draw appropriate amount of oil into the syringe;
e. Insert the syringe tip into the pressure valve opening;
f. Pump an appropriate amount of oil into the valve while monitoring the oil level in the inspection window;
g. Remove the syringe tip from the valve, replace the protective cap, return excess oil from the syringe into the container;
h. Return the counter head to its previous, readout-convenient position.

CHFI-04 type replaceable HF transmitter

Ancillary external replaceable high frequency transmitter of CHFI-04 type (Fig. 19) may be installed on the cylindrical neck of the index head. It can be used as a control element if the index head is not equipped with internal HF transmitter.

Installation of CHFI-04 pulse emitter is shown in Fig. 17.

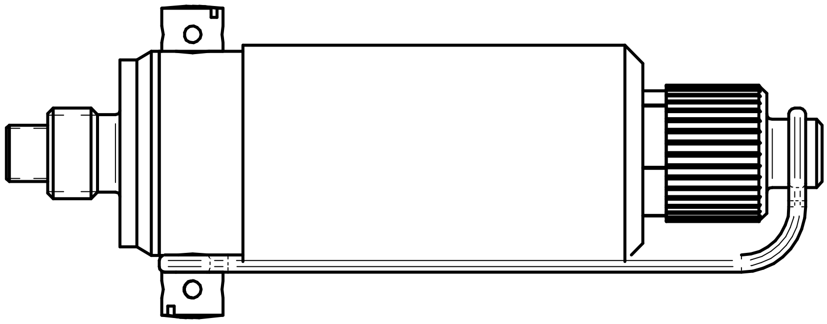


Fig. 19. CHFI-04 replaceable HF transmitter

Internal by-pass

CGR-FX Rotary Meters may be provided with internal by-pass, as an option. The by-pass is designed so as to provide continuous gas flow in case of meter failure (blockage of rotors) . When a failure situation occurs the membrane breaks and opens the gas flow through the by-pass that omits the meter measurement chamber. The break of the membrane activates the control circuit and signals the meter failure. The by-pass is being activated when the pressure difference on the meter, ΔpKr, is reached thus breaking the membrane. The membrane used in the CGR-FX meters breaks at ΔpKr = 100 [kPa].

External connection of the by-pass is shown in Fig. 20a. Remove the cap (1) and connect the M8 connector (2) with the cable. The by-pass is provided with the control circuit that should be connected to a monitoring device, e.g. CMK-03 Volume Converter. In case of meter blockage that results in breaking of the membrane the failure status is signaled by the control circuit . The intrinsic safety parameters of the by-pass control circuit are the same as for CLFK-03 emitter and are printed in the rating plate (Fig. 20b)

Fig. 20a. Connection of the internal by-pass.

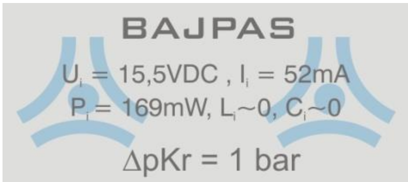


Fig. 20b. By-pass rating plate.

NOTES:

1. It is recommended to install the CGR-FX meter with by-pass on the inlet side (higher pressure)
2.
3. Pressure regulators with slum shut valves should be so as they do not engage earlier than the by-pass is opened .

Connecting a volume converter to the gas meter.

Due to tariff requirements, it is often required (or recommended) for the gas meters to be operated together with electronic devices such as data loggers or volume converters and data transmission devices. Common S.A. manufactures such devices, e.g. battery/grid-powered volume converters CMK-03 and data loggers CRS-03, CRI-02. Common S.A. may deliver these devices on special orders, together with installation services. Figure 24 presents an example installation of this type.

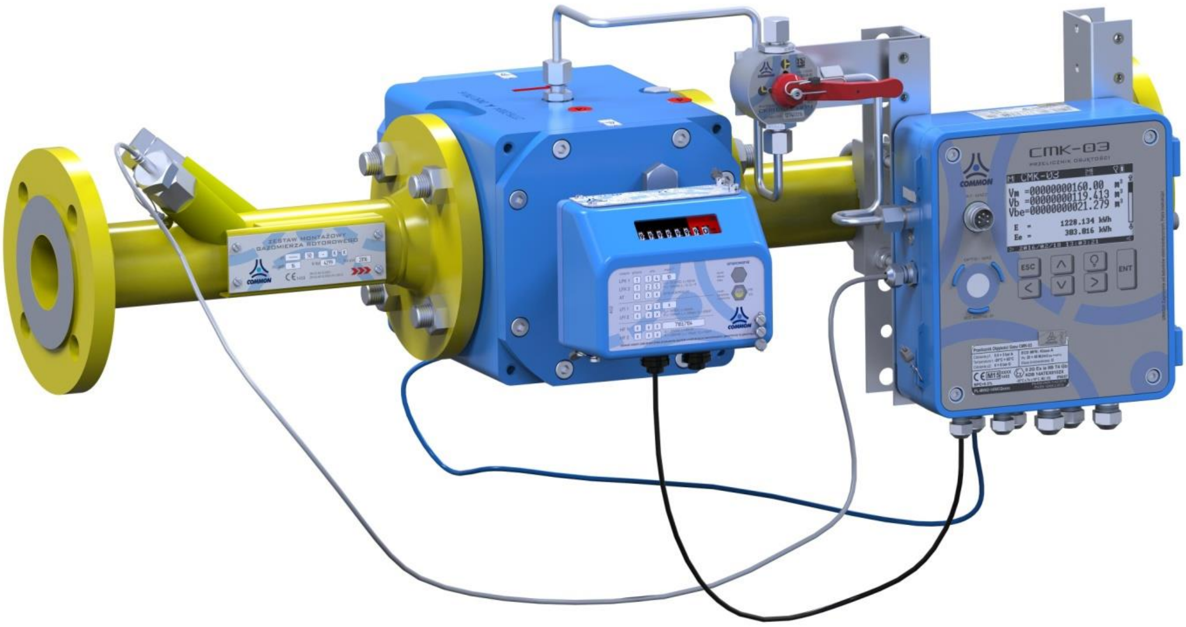


Fig. 21. An assembly consisting of a rotary gas meter and a CMK-03 Volume Converter (example)

The converter receives three input signals: the flow signal (from the low- or high-frequency pulse emitter), the pressure signal and the temperature signal. The pressure signal is collected at the pulse pressure measurement output. It is recommended that the pressure pulse is obtained through the three-way CKMT valve (Fig. 22) allowing the pressure being disconnected from the sensor for the removal and inspection thereof.

Fig. 22. A three-way CKMT valve

The valve handle position is secured by a seal. The valve may be operated only under supervision of the gas company representative; after operation, the handle is again secured with an installation seal.

The temperature is measured by a temperature probe installed in an appropriate thermowell in the inflow section (upstream the gas meter) (Fig. 24), or in a thermowell in the gas meter.

One should keep in mind that all activities associated with connection of additional equipment to the gas meter are also associated with breaking the protection seals and thus may be performed only by representatives of the gas company or the manufacturer. Unused electrical outlet sockets must remain plugged with factory-made plugs and installation seals.

IX. LIST OF STANDARDS AND TECHNICAL SPECIFICATIONS

- EN 12480:2002 and EN 12480:2002/A1:2006
  Gas meters – Rotary displacement gas meters
- EN 13463-1:2009
  Non-electrical Equipment For Use in Potentially Explosive Atmospheres - Part 1: Basic Method And Requirements
- EN 60079-0:2012
  Explosive atmospheres – Part 0: Equipment – General Requirements
- EN 60079-11:2012
  Explosive atmospheres – Part 11: Equipment Protection By Intrinsic Safety 'I'
- EN 60947-5-2:2011
  Low-voltage switchgear and controlgear – Part 5-2: Control circuit devices and switching elements – proximity switches.
- EN 60947-5-6:2000
  Low-voltage switchgear and controlgear – Part 5-6: Control circuit devices and switching elements – DC interface for proximity sensors and switching amplifiers (NAMUR)
- WUDT/UC/2003
  Requirements of Office of Technical Inspection – Pressure Equipment

	**After ending the usage period, the gas meter should under no circumstances be discarded into municipal waste containers. The Waste Act of 27 April 2001 imposes an obligation for selective collection of metallic waste. Gas meters should be best returned to the manufacturer who would recycle them in an appropriate fashion. If unable to do so, the user is obliged to deliver the gas meter to an appropriate recycling point.**
	Gas meter packaging should never be discarded into municipal waste containers. The packaging has been appropriately labelled; pursuant to the Act of 11 May 2001 on packaging and packaging waste, the user is obliged to submit the packaging for an appropriate recycling process.

Note: Common S.A. reserves the right to modify the design of the gas meters while retaining the compliance with relevant standards and requirements regarding accuracy and safety of operation.