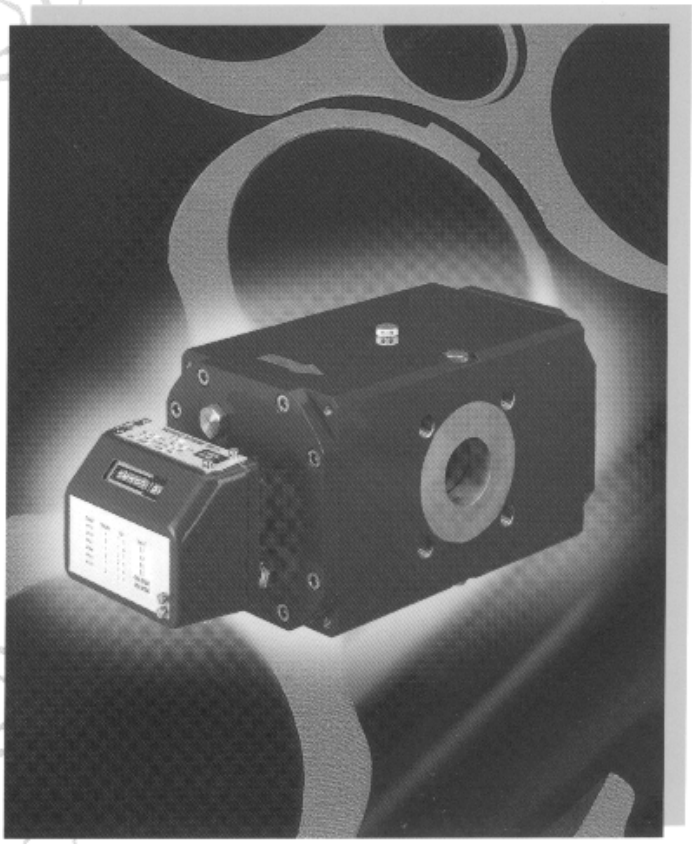
COMMON



ROTARY GAS METER

Manual

List of contents

1. Design and Function

1.1. Description

The rotary gas meters CGR serve for the volume measurement of flowing gases. They were developed by the company COMMON in close co-operation with the oil and gas industry. The standard version is appropriate for the gases in table 1 for pressure rates up to 100 bar. The operating pressure amounts to thus 0 to p_{max} the appropriate pressure rate of the meter.

Table 1. List of appropriate gases for the measurement with rotary gas metes in standard version

Gas	Symbol (chemical formula)	Density ρ_n* [kg/m³]	Density relating to air
Argon	Ar	1,78	1,38
Ethylene	C_2H_4	1,26	0,98
Butan	C_4H_{10}	2,71	2,09
Ethan	C_2H_6	1,36	1,06
Natural gas	-	~0,83	~0,64
Helium	He	0,18	0,14
Carbon dioxide	CO_2	1,97	1,53
Carbon monoxide	CO	1,25	0,97
Air	-	1,29	1,00
Methan	CH_4	0,72	0,55
Propane	C_3H_8	2,01	1,56
Nitrogen	N_2	1,25	0,97
Hydrogen	H_2	0,09	0,07

*(ρ_n at 1,01325 bar and 273,15 K)

The gas meters are specified by the following parameters:
Nominal size DN, maximal operating pressure p_{max} as well as maximum flow Q_{max} and minimum flow Q_{min} under operating pressure and operating temperature.
The admissible error between Q_{max} and Q_{min} under operating conditions is determined by the margins of error of rotary gas meters
The minimum flow results from the pattern approval.

1.2. Function

The gas flow through the measuring chamber of the rotary gas meter makes the two eight-shaped rotors to turn (fig. 1). That of the measuring chamber wall and one side of the rotor enclosed volume of gas will be transported at one complete cycle four times from the inlet to the outlet of the meter. The both rotors get over synchronising wheels in an angle of 90° to each other positioned.

The rotating motion of a rotor will be transferred over a toothed gearing and a gas tight and hermetic incorporated magnetic coupling into the external assembled counter head, and there over a roll counter indicated as an operating gas volume.

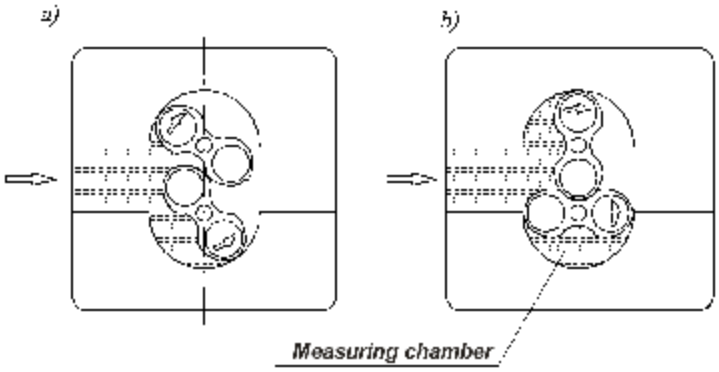


Figure 1: Function of the rotary gas meter

1.3. Meter sizes

The standard sizes of the COMMON rotary gas meters are arranged in table 2.

1.4. Dimensions

The external dimensions of the turbine gas meters can you take from the table 3. An allocation of the parameters takes place according to the figure 2. The dimensions are to be considered when planning from measuring systems.

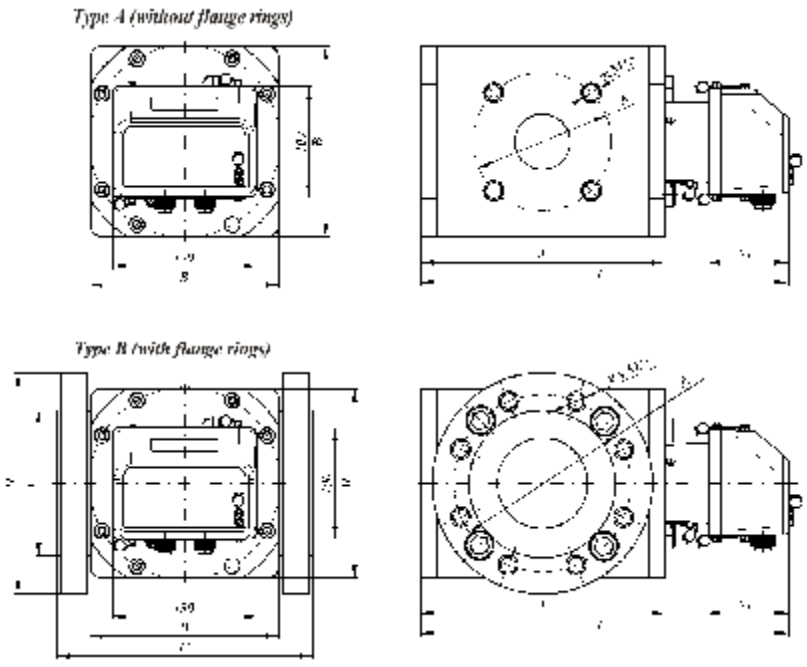


Figure 2: External dimensions of the rotary gas meter CGR

Table 2: Standard sizes of the rotary gas meter CGR

G – Size	DN	Cyclical volume V_z	Maximal flow Q_{max}	Revo-lution at Q_{max}	EU-Q_{min} (1:20)	National minimal flow Q_{min} at measurement range (^{x} - PTB certification planned)												NF-pulse output	HF-pulse output
						^{x}1:650	^{x}1:500	^{x}1:400	^{x}1:300	1:250	1:200	1:160	1:130	1:100	1:80	1:65	1:50	1:30	
	mm	dm³ /Cycl.	m³ /h	U/min	m³ /h	m³ /h												m³ /Imp.	m³ /Imp.
G16	**40, 50, 80**	**0,229**	25	1820	1,3	-	-	-	-	-	-	-	0,2	0,25	0,3	0,4	0,5	0,8	0,1	6,49783E-05
		0,316		1320		-	-	-	-	-	-	-	-	-	0,3	0,4	0,5	0,8		8,92741E-05
G25	**40, 50, 80**	**0,229**	40	2910	2,0	-	-	-	-	-	0,2	0,25	0,3	0,4	0,5	0,6	0,8	1,3	0,1	6,49783E-05
		0,316		2110		-	-	-	-	-	-	-	0,3	0,4	0,5	0,6	0,8	1,3		8,92741E-05
		0,503		1325		-	-	-	-	-	-	-	-	0,4	0,5	0,6	0,8	1,3		1,41806E-04
G40	**40, 50, 80**	**0,316**	65	3430	3,0	-	-	-	-	-	0,3	0,4	0,5	0,6	0,8	1,0	1,3	2,0	0,1	8,92741E-05
		0,503		2150		-	-	-	-	-	-	0,4	0,5	0,6	0,8	1,0	1,3	2,0		1,41806E-04
		0,823		1320		-	-	-	-	-	-	-	-	0,6	0,8	1,0	1,3	2,0		2,32728E-04
G65	**50, 80**	**0,503**	100	3310	5,0	-	-	-	-	0,4	0,5	0,6	0,8	1,0	1,3	1,6	2,0	3,0	0,1	1,41806E-04
		0,823		2025		-	-	-	-	-	-	0,6	0,8	1,0	1,3	1,6	2,0	3,0		2,32728E-04
		1,262		1320		-	-	-	-	-	-	-	0,8	1,0	1,3	1,6	2,0	3,0		3,57096E-04
	80, 100	**1,310**		1270		-	-	-	-	0,4	0,5	0,6	0,8	1,0	1,3	1,6	2,0	3,0		4,25908E-04
G100	**50, 80**	**0,823**	160	3240	8,0	-	-	-	-	0,6	0,8	1,0	1,3	1,6	2,0	2,5	3,0	5,0	1,0	2,28165E-04
		1,262		2110		-	-	-	-	-	0,8	1,0	1,3	1,6	2,0	2,5	3,0	5,0		3,53261E-04
	80, 100	**1,310**		2035		-	-	-	-	0,6	0,8	1,0	1,3	1,6	2,0	2,5	3,0	5,0		6,26878E-04
		2,020		1320		-	-	-	-	0,6	0,8	1,0	1,3	1,6	2,0	2,5	3,0	5,0		6,49783E-04
G160	**80, 100**	**1,310**	250	3180	13,0	-	-	^{x}0,6	^{x}0,8	1,0	1,3	1,6	2,0	2,5	3,0	4,0	5,0	8,0	1,0	6,26878E-04
		2,020		2060		-	-	-	^{x}0,8	1,0	1,3	1,6	2,0	2,5	3,0	4,0	5,0	8,0		6,49783E-04
		3,385		1230		-	-	-	-	1,0	1,3	1,6	2,0	2,5	3,0	4,0	5,0	8,0		1,10330E-03
G250	**80, 100**	**2,020**	400	3300	20,0	-	^{x}0,8	^{x}1,0	^{x}1,3	1,6	2,0	2,5	3,0	4,0	5,0	6,0	8,0	13,0	1,0	6,49783E-04
		3,385		1970		-	-	^{x}1,0	^{x}1,3	1,6	2,0	2,5	3,0	4,0	5,0	6,0	8,0	13,0		1,10330E-03
G400	**80, 100**	**3,385**	650	3200	30,0	^{x}1,0	^{x}1,3	^{x}1,6	^{x}2,0	2,5	3,0	4,0	5,0	6,5	8,0	10,0	13,0	20,0	1,0	1,10330E-03

Table 3: Dimensions and weights of the rotary gas meter CGR

DN	G-Size	Cyclical volume V_Z	A	B	L	C	E	H	K	n	Weight Al.-body	Weight cast-body	Model (according fig.2)
mm		dm³ /Cycle	mm	mm	mm	mm	mm	mm	mm		kg	kg	
40	**G16, G25**	**0,229**	165	171	277	-	-	-	110	4	10	-	A
	G16, G25, G40	**0,316**	184		296						12	-	
	G25,G40	**0,503**	225		337						14	25	
	G40	**0,823**	295		407						19	31	
50	**G16, G25**	**0,229**	165	171	277	-	-	-	125	4	10	-	A
	G16, G25, G40	**0,316**	184		296						12	-	
	G25,G40, G65	**0,503**	225		337						14	25	
	G40, G65, G100	**0,823**	295		407						19	31	
	G65, G100	**1,262**	391		503						24	37	
80	**G16, G25**	**0,229**	165	171	277	240*)	133*)	200*)	160	8	22	-	B
	G16, G25, G40	**0,316**	184		296						24	-	
	G25,G40, G65	**0,503**	225	171	337	240*)	133*)	200*)			14 (26*)	25 (–*)	A or B
	G40, G65, G100	**0,823**	295		407						19 (31*)	31 (–*)	
	G65, G100	**1,262**	391		503						24 (36*)	37 (–*)	
	G65, G100, G160	**1,310**	249	240	356	-	-	-	160	8	25 (30*)	56 (–*)	A
	G100, G160, G250	**2,020**	314		421						31 (36*)	68 (–*)	
	G160, G250, G400	**3,385**	439		546						42 (47*)	92 (–*)	
100	**G65, G100, G160**	**1,310**	249	240	356	300*)	158*)	200*)	180	8	25 (30*)	56 (–*)	A or B
	G100, G160, G250	**2,020**	314		421						31 (36*)	68 (–*)	
	G160, G250, G400	**3,385**	439		546						42 (47*)	92 (–*)	

*) Data are valid for the model „B“ according fig. 2.

1.5. Construction

The rotary gas meter consists of 3 main components:

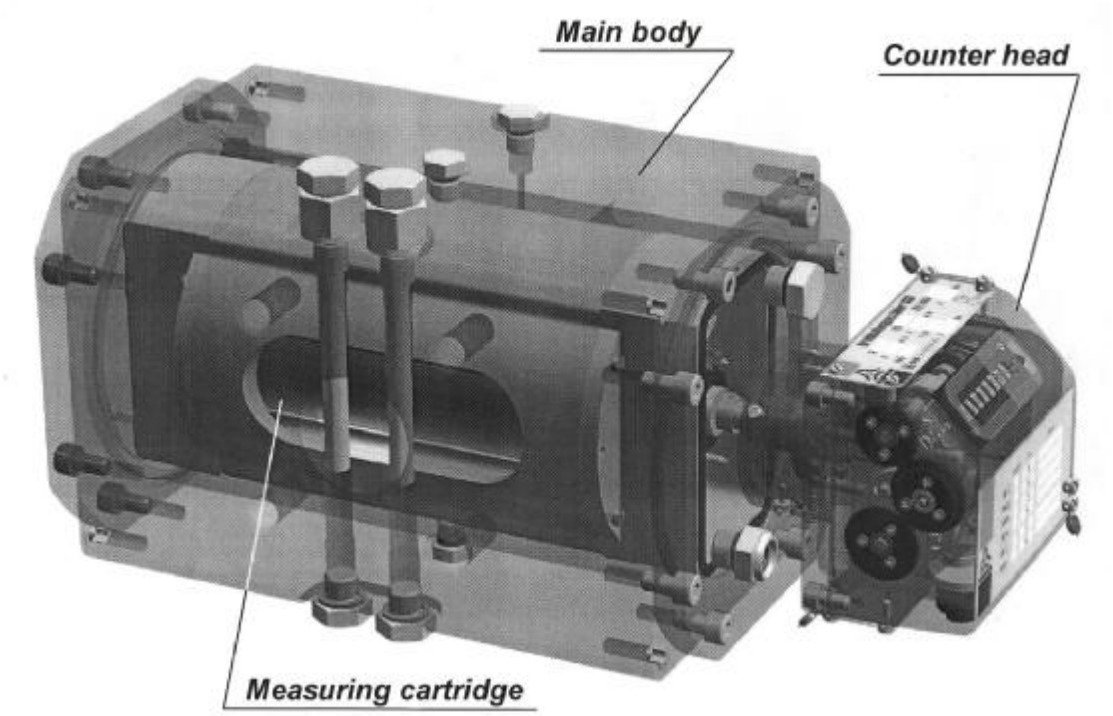


Figure 3: Transparent representation of the rotary gas meter CGR

1.5.1. Main housing

In the standard version the main housing is manufactured from extruded aluminium. The main housing consists of three parts, the front and rear covers and the central housing. The flanges for the connection of the inlet and outlet are prepared in the housing, as well as the blind holes for the threads of the connection bolts. For the extension of the installation length is a variant possible, with screwed on flange rings for at the nominal size DN 80 from the installation length 171mm on 240mm to come. The same is valid for the installation length DN 100 with 240mm installation length, for to come on 300mm. (see fig. 2.B)
The installation in the meter run occurs by DIN or ANSI flanges. For taking the inlet- or respectively reference pressure p_r and the outlet pressure, at the top and lower side of the meter, are two of each taps positioned in form of thread holes G • ” available.
Furthermore is the possibility for the installation of two temperature pockets available at the inlet side of the meter.

1.5.2. Measuring cartridge

The measuring cartridge as an independent assembly part contains the two rotors, the synchrony gearing in the rear side chamber and that first reducing toothed gearing in the front side chamber, which transfers the turning of the rotors to the magnetic coupling. The rotors are mounted in lubricated ball bearings in the interior housing. Front and rear chamber are connected by two diagonal arranged tubes through the measuring cartridge housing. The measuring cartridge gets set in the main housing and with Elastomere it has been held between the inboard walls of the main housing, which also prevent a bypass flow of unmeasured gas at the measuring cartridge.

1.5.3. Counter head

The transfer of the angular momentum from the main housing loaded by pressure into the counter head is made by a gas tight magnetic coupling. In the counter heading a further reduction of the rotating speed of the waves is made by snail and gear wheels up to the drive of the 8-digit roll counter. A gear set is to be implemented changeable to realise an adjustment of the roll counter.
To pick up electrical impulses is given a possibility by up to two HF Namur sensors, up to two NF Namur sensors and up to two NF Reed contacts. As standard each counter is equipped with one NF Reed contact. The electrical connection, to take the impulses from the counter head, can take place over up to two sockets, whereby one socket is installed as standard. The output signals of the HF sensors in the counter operate adjustment-independently proportionally to the HF sensors on the turbine or reference wheel of the meter.

1.6. Oil lubrication

The ball bearings of the rotors, which are mounted in the front and rear chamber inside wall of the measuring cartridge, will be lubricated. The oil, which itself in the front and rear chamber finds, gets over oil frames, which to the rotors are attached, tossed up and create an oil fog, which lubricated the bearings as well as the gear wheels. The synchrony gearing, as well the reducing gearing runs at professional oil filling not in the oil reserve of the chambers and thus the measurement accuracy and the Q_{min} will not be affected by the oil. The oil filling, oil control and the emptying will be performed over the front side of the main housing. There are situated two diagonal screws, whereby the upper serves the filling in and the lower can be unscrewed for the emptying of the oil. The oil-sight glass in the lower screw serves the oil level control. The front and rear chamber of the measuring cartridge is connected by two diagonal arranged tubes. Thus in each installation position the oil level in the front and rear chamber can be adjusted themselves, and create even a balanced level in both chambers.
In each case is on to regard the right oil quantity, because of a to high oil level, the measuring accuracy can be affected. Because the balance of the oil level in both chambers over the tubes in the measuring cartridge occurs, will be for the level by the filling balance out with a certain inaction.

1.7. Flow direction

The rotary gas meter CGR is suitable for the installation in the four flow directions, left - right, right - left, down - above and above - down. As standard the meter is prepared for the flow directions lefts - right and down - above. By the installation in an of the two other flow directions, the oil-sight glass is to change with the oil filling screw and given if the temperature pockets to assemble on the other side of the inlet flange. The counter head can then corresponding to the installation position get turned in a readable position.

1.8. Materials

All by the construction of the turbine gas meters CGT used materials guarantee the necessary stability and corrosion resistance. The meters are material-technically checked before distribution. Appropriate certificates in accordance with DIN EN 10204 can be requested. The main housing, the measuring cartridge housing, as well the rotors are produced from one aluminium alloy. Optionally main housing can also be manufactured from cast iron EN-GJS-400-15. Moved parts, like shafts, synchronous wheel, snails or bearings consist of stainless steel. Other gear and snail wheels are manufactured from plastic. The transparent parts like counter displays or the oil-sight glass consist of polycarbonates.

1.9. Measuring and pulse outputs

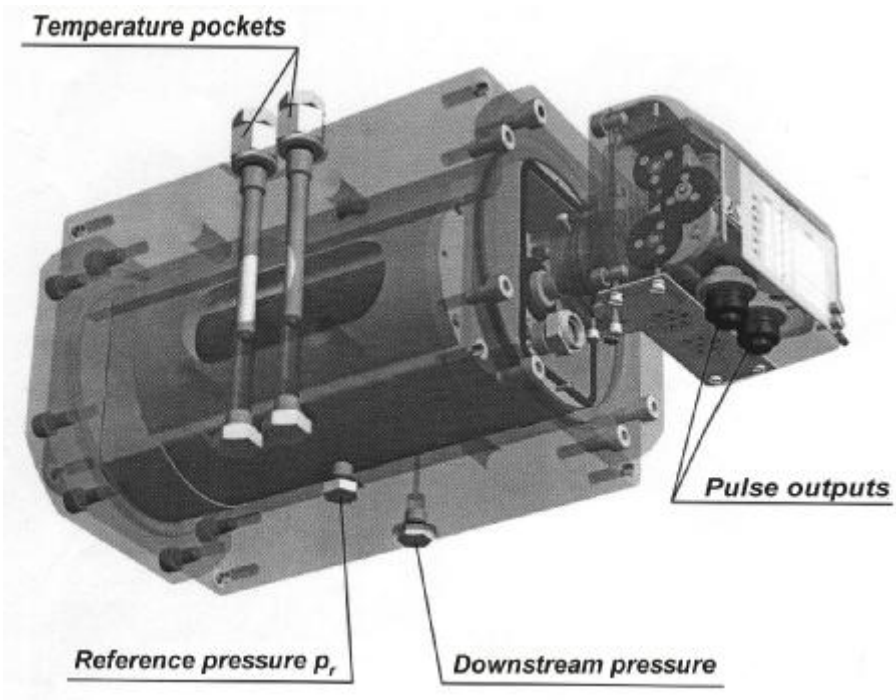


Figure 4: Measurement outputs of the rotary gas meter CGR

1.9.1. Counter head

The mechanical 8-digit roll counter head is the main counter of the turbine gas meter CGT. It displays the passed gas volume at operating pressure and operating temperature. Depending of the meter size, the display value corresponds to the lowest place 0.01 m³ up to 1 m³. The counter head is rotatable around 345°, so that it is configurable into almost all directions, in order to ensure a good readability in all installations.

1.9.2. NF-Reed-Contact

In the counter head Reed-Contacts (NF1 and NF2) are available depending upon execution up to two, whereby one Reed-Contact NF1 is equipped as standard. They are adjusted like the mechanical roll counter and output pulses, which are in direct relation to the mechanical display. This type of contacts is electric potential free and has a high long-term reliability. Mostly by Reed-Contacts battery powered devices are connected such as volume correctors or tariff devices. You find a representation of the position as well as the connection possibilities in the figures 6 and 7, as well as the specification of the pulse values in table 2. The technical data please take from the paragraph: „Technical data of the Reed-Contacts“.

1.9.3. NF-NAMUR-Pulse sensor

NF-NAMUR pulse generators are optionally possible up to two slot initiators (NF3 and NF4) in the counter head They are adjusted like the mechanical roll counter and the Reed-Contacts and output pulses, which are in direct relation to the mechanical display. The use of such active pulse generators is possible due to increased requirement of electric power consumption generally only with line power devices. Thus however pulses can be transferred over larger distances up to approximately 200 m surely. You find a representation of the position as well as the connection types in the figures 6 and 7 as well as the specification of the pulse values in table 2. The technical data please take from the paragraph: „Technical data of the NAMUR-Pulse sensors“. All pulse generators are certified for hazard areas and possess a EEx conformance certificate.

1.9.4. HF-NAMUR-Pulse sensor

Both pulse sensors (HF1 and HF2) are possible options, positioned in the counter head. There existing reference wheel generates the pulses in up to two approximation initiators (see fig. 5). You find a representation of the position as well as the connection possibilities in the figures 6 and 7.

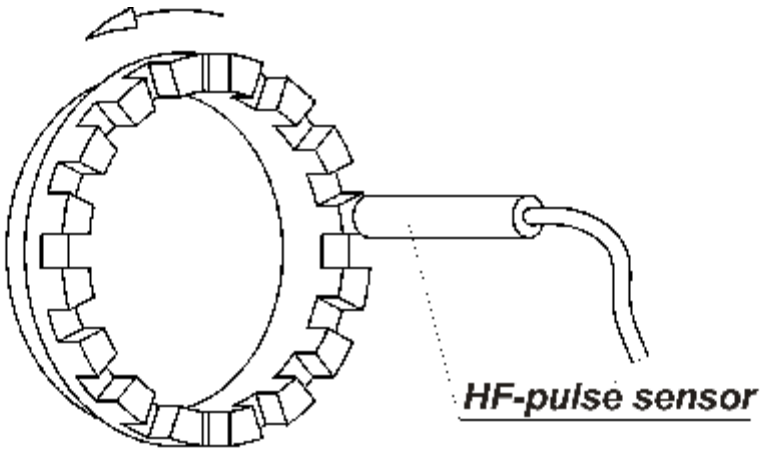


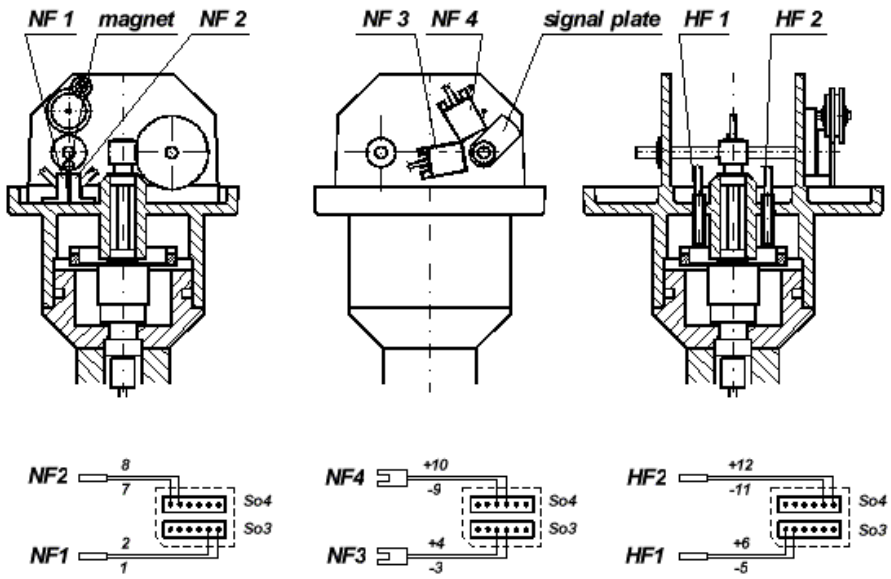
Figure 5: Representation of the HF-pulse sensors HF1 and HF2 in the counter head

The output signals are in fixed relation to the rotation of the turbine wheel and can not be changed by the adjustment gear wheels. They serve generally the control of line powered volume correctors, flow computers or data storage devices. The pulses can be transferred over larger distances up to approximately 200 m surely. The specifications in the table 2 are approximate values, whereby the exact impulse values of an each sensor and meter are determined during the calibration and can deviate from the indicated value in table 2. The technical data please take from the paragraph: „Technical data of the NAMUR-Pulse sensors“. All pulse generators are certified for hazard areas and possess a EEx conformance certificate.

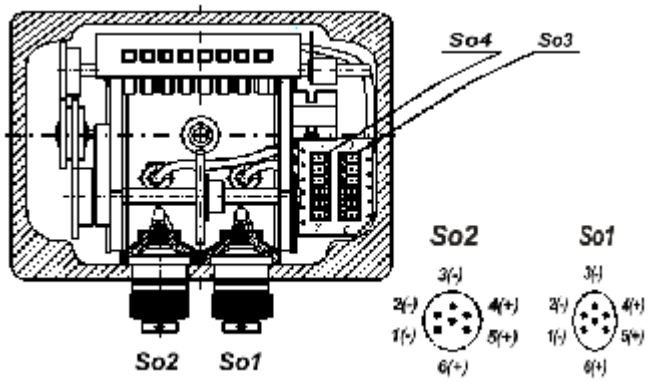
1.9.5. Link specification of the electrical pulse sensors

1.9.5.1. Position and connectors of the pulse sensors

The position and the connectors of the possible pulse generators in the counter head are represented in the figures 6 and 7, and table 4. The standard version contains only the NF Reed contact NF1. All other sensors can be installed on customer's request. The connection of the electrical pulses to the installation for clients is made by the sockets So l and So 2, whereby So 2 is installed optionally with more than 3 sensors or on customer's request in the counter head. Whether a pulse generator is and which impulse priority these have, can be taken from the pulse generator sign of the rotary gas meter (fig. 13).
The electrical connection to the socket is to be implemented over a plug of the company Tuchel with the designation C091 31 H006 100 6. An information plate (see fig. 14) of the electrical specification of the socket is positioned on the rear side of the counter head.



Figure



			Socket 3						Socket 4					
			NF1		NF3		HF1		NF2		NF4		HF2	
	Pin	Polarity	1	2	3	4	5	6	7	8	9	10	11	12
Socket 1	1	–	x		x									
	4	+		x		x								
	2	–			x				x		x		x	
	5	+				x				x		x		x
	3	–					x							
	6	+						x						
Socket 2	1	–			x				x					
	4	+				x				x				
	2	–			x				x		x		x	
	5	+				x				x		x		x
	3	–					x						x	
	6	+						x						x

x - Standard connection of the complete version
x - Alternative connections

Figure 7: Diagram of connections of the pulse sensors in the counter head of the rotary gas meter CGR

1.9.5.2.Technical data of the Reed-Contacts

The Reed-Contacts are passive sensors and used for low-frequency output signals only. They have the following technical data:

max switching voltage	24 V
max switching current	100 mA
contact resistance	0,15 Ω
max switching frequency	500 Hz

1.9.5.3. Technical data of the NAMUR-Pulse sensors

The NAMUR-Pulse generators are active sensors and used for low or high frequency output signals. They have the following technical data:

supply voltage	8,2 V
supply current inactive (low)	< 1,2 mA
supply current active (high)	> 2,1 mA
load resistance	1 kΩ
max switching frequency	5 kHz

The circuitry of the electrical connection is represented in figure 8 and the output signals which can be expected in figure 9.

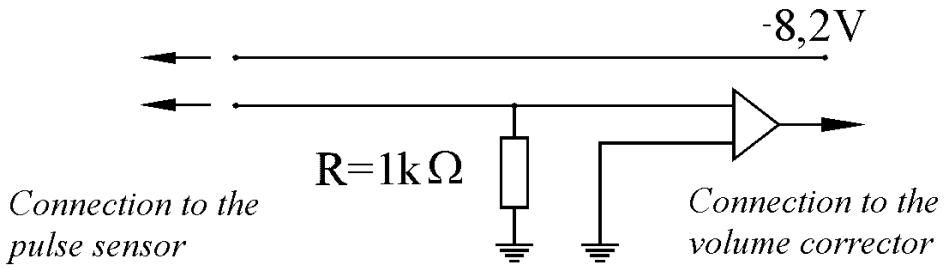
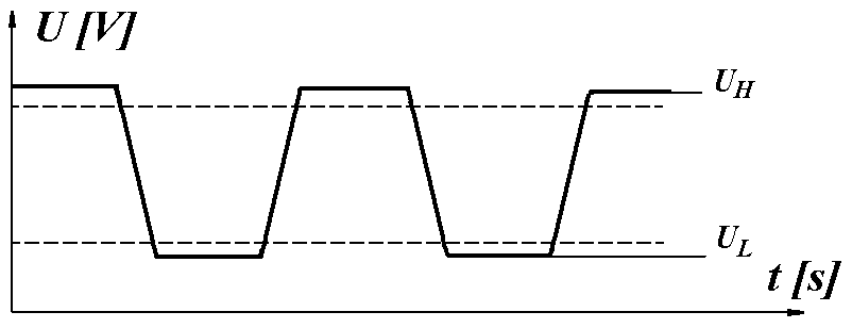


Figure 8: Diagram of connections of the inductive NAMUR initiators



inactive state: U_L < 1,2 V, active state: U_H > 2,1 V

Figure 9: Output signals of the inductive NAMUR initiators

1.9.6.Pressure measurement

The measurement of the operating pressure of the rotary gas meter can be done by the reference measuring tap p_r. These is available on the top and as doubles for the other flow direction on the underside of the meter (see fig. 4). The downstream pressure can be taken from the measuring tap with the marking p, which is positioned at the edge of the output flange.
The thread dimensions for the connection of a screw connector is represented in the figure 11.

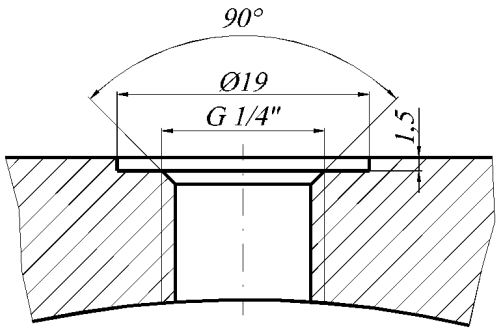


Figure 10: Dimensions of the pressure measuring taps

1.9.7. Temperature measurement

The measurement of the operating temperature can take place in the rotary gas meter by means of two temperature pockets, optionally installed in the upstream part of the meter body (see fig. 4). The second temperature pocket serves thereby the reference measurement. In standard version no temperature pockets are installed, but can be ordered however as accessories. Temperature pocket possess an internal thread G • " for the installation of a temperature sensor with a diameter of 6mm. The installation length please take from the figure 12. According to the request of the local verification offices the temperature pocket is to be filled with heat conducting oil or heat conducting paste.

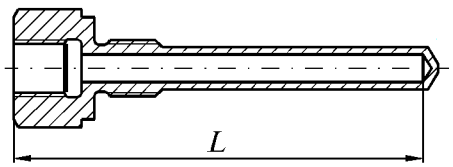


Figure 11: Temperature pocket for the installation into the rotary gas meter CGR

Table 5: Installation length of the Temperature pockets

Breadth of the meter body (see table 3) B[mm]	Installation length L [mm]
171	122
240	130

1.10. Designation and signs

The technical basic parameters of the turbine gas meter are noted on the type plate (fig. 12). It is equipped on the front of the counter head.
The specification concerning pulse outputs and their value can be taken from the pulse generator sign on the top side of the counter head (fig. 13).
The flow direction is indicated by arrows (fig. 15) on the front and rear side of the meter body.
The marking of the pressure and temperature measuring points takes place at the meter body according to the representation in figure 16.

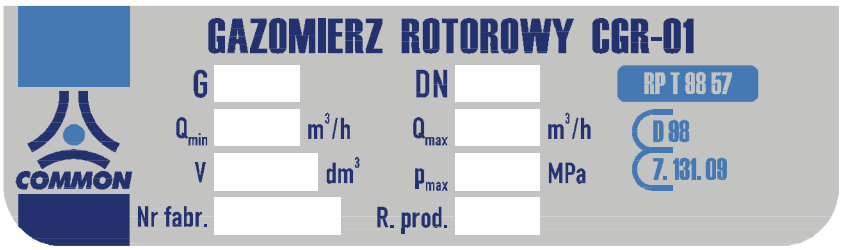


Figure 12: type plate

Figure 13: Pulse sensor sign

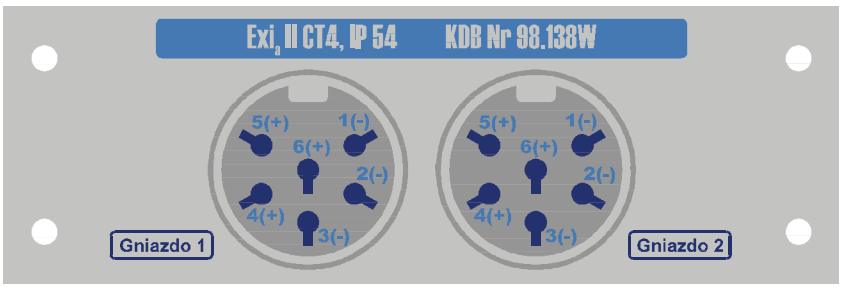


Figure 14: Sign for the connector identification of the pulse generators in the counter head

Figure 15: Arrow on the meter body for the specification of the flow direction

Figure 16: Information designation for the pressure and temperature measurement

2. Measuring values

The gas volume, which flows through a rotary gas meter, is displayed by the counter concerning the operating or line conditions pressure, temperature and compressibility only. In order to determine a comparable value independently to the respective operating conditions for accounting purposes, a conversion of the volume to standard conditions V_n is used. The standard volume determines itself from the following calculation:

$$V_n = \frac{V_b}{k} * \frac{p_b}{p_n} * \frac{T_n}{T_b} \approx \frac{V_b}{Z} * \frac{273 * (p_ü + 1)}{(t + 273)} \qquad (1)$$

where $k = Z/Z_n$

Definition:

V_b	– operating volume [m³/h]	T_b	– standard gas temperature abs. [K] (273,15 K)
V_n	– standard volume [m³/h]	T_n	– operating gas temperature abs. [K]
p_b	– operating pressure at the meter [bar]	k	– compressibility factor k (constant or calculation by GERG 88)
$p_ü$	– operating over pressure at the meter [bar]		
p_n	– standard pressure [bar] (1,01325 bar)	Z	– real gas factor
t	– operating gas temperature [°C]	Z_n	– real gas factor (standard condition: $Z_n \cong 1$)

The operation volume V_b of an accounting period determines itself from the difference of the counter statuses of the rotary gas meter the at the beginning and to the end of the period. The operation over pressure $p_ü$ is determined on the reference pressure point p_r of the meter as average value. The operation gas temperature t is determined as average value measured by a temperature sensor in the meter body or in the down stream pipe of the meter in accordance with PTB test rules Volume 20. The compressibility factor is determined by using the gas

quality, at systems up to 10 bar as constant or at higher pressures than variable over calculation methods in accordance with G 486.

3. Measuring accuracy

Each real measurement is falsified by measurement inaccuracies. This errors are a result of the physical characteristics of the measurement principle. The measuring characteristic of rotary gas meters is represented in figure 17. According to the EWG guideline of volume gas meters the margins of error are determined on the following values:

$$Q_t - Q_{max} \quad \leq \pm 1\%$$
$$Q_{min} - Q_t \quad \leq \pm 2\%$$

The separating flows Q_t can be taken from table6

The measurement range of the COMMON rotary gas meters is indicated in table 2.

Table 6: Separation flow Q_t for the different measurement ranges

Flow range	1:30	1:50	1:65	1:80	1:100	1:130	1:160	1:200	1:250
relative separation flow Q_t/Q_{max}	0,15	0,10	0,10	0,10	0,08	0,06	0,06	0,05	0,04

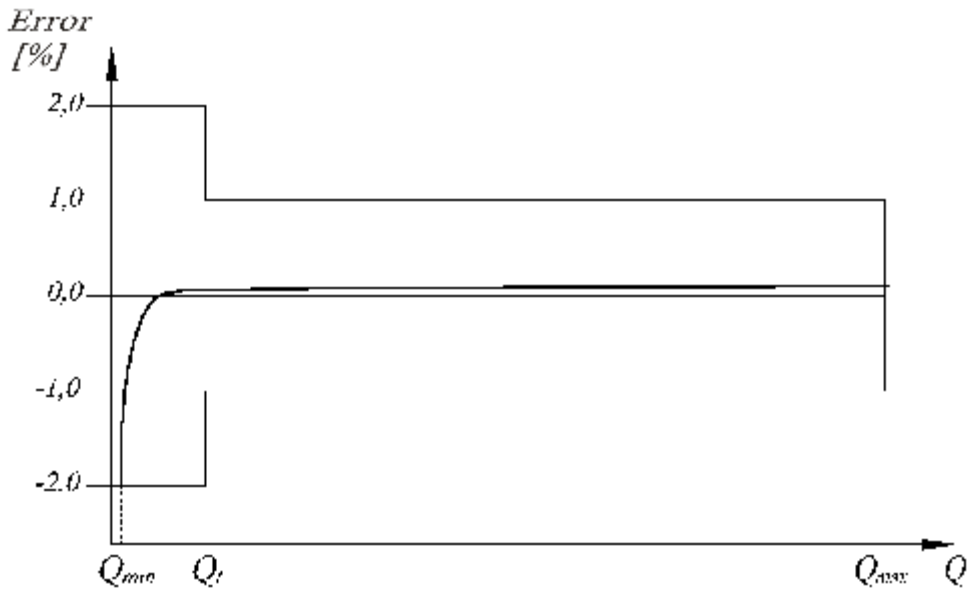


Figure 17: Error characteristic of a rotary gas meter

4. Pressure loss

The gas meter causes an inevitable pressure loss. The pressure loss values of the individual nominal sizes at a gas density ρ_0 = 1kg/m³, that can be taken from the diagram of the figure 18.

The real pressure loss Δpre is calculated according to the following formula:

$$\Delta p_{re} = \frac{\rho}{\rho_0} * \frac{p_a + p}{p_a} \Delta p \qquad (3)$$

Definition:

ρ – gas density according to table 1

ρ_0 – reference gas density (ρ_0 = 1kg/m³)

Δp – pressure loss for gas density ρ_0 (Abb.20)

Δp_{re} – operating pressure loss

p – gas over pressure in front of the meter

p_a – atmospheric pressure (p_a = 1bar)

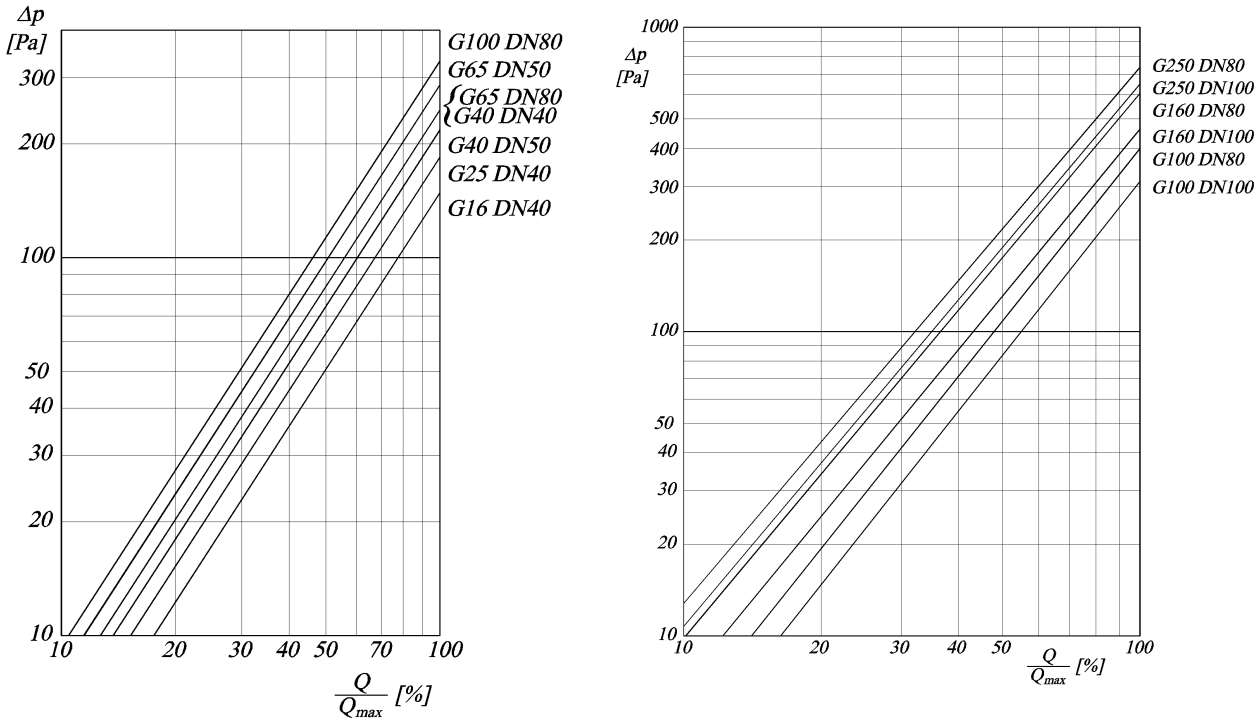


Figure 18: Pressure loss diagram of the rotary gas meter CGR of a density r_0 = 1 kg/m³

5. Transport and storage

The turbine gas meter CGT is a precise measuring instrument and is to handle with the utmost caution.

The following points are to be considered:

During transportation the meter is not to be thrown or to expose strong vibrations.

The transportation of the meter has to be done with emptied oil reservoir in the meter body.

The rotary gas meter has to be transported and to be stored in the intended installation position (fig. 19).

The gas meter should be transported in the original packaging up to the place of work.

Removing from fabrication catches and transportation covers is only recommendable at the installation place.

A raising of the turbine gas meter at the counter head is not admissible.
It is to be paid attention to as dry a storage as possible. The meter is to be protected against precipitation and other humidity.
It is to be made certain that by the transportation and by remove of the packing no verification seal is damaged or is removed, since otherwise the official verification is lost.
Storing gas meters do not need to be lubricated.
For mentioned above transport damages the manufacturer does not take over a warranty.

6. Installation

Before the gas meter is installed, it should be checked again, if the meter meets the requirements of to the gas measuring system. Very important is the check of the pressure rate PN of the installation, the maximum installation pressure p_{max} and maximum the flow rate Q_{max} under operating conditions, as well as the right flow direction.
The allowed installation position of the rotary gas meter for the installation, are in the figure 19 drawing a up to d figured. The counter head must situate in either case aside of the of the gas meter. The maximum deviation of the gas meter of the should 1° not trespass horizontal situation.

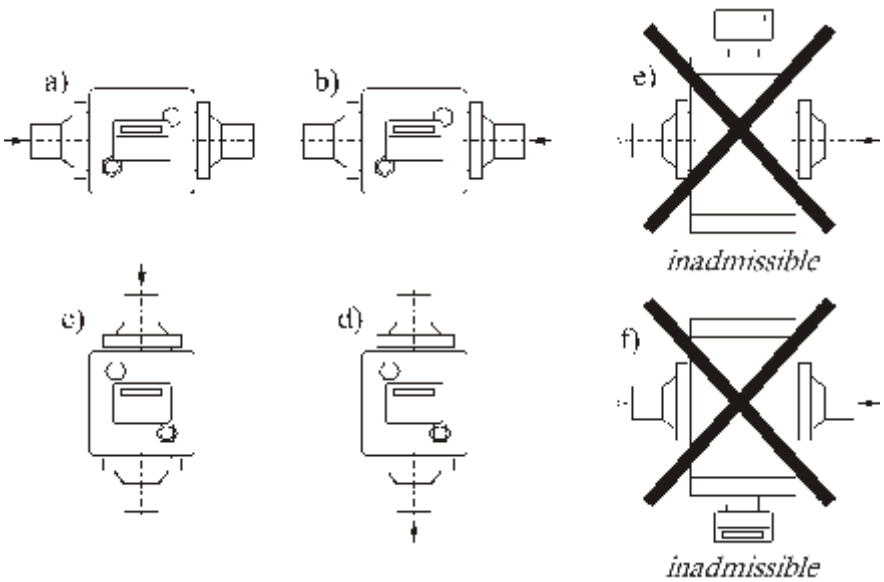


Figure 18: Permissible installation positions of the rotary gas meter CGR: a, b, c, d (installation positions e and f are inadmissible)

The gas meter has not to be installed at the deepest point of the installation, because otherwise condensate or contamination can settle in the meter and thus the function and measuring accuracy can be affected.
The installation of rotary gas meters should take place in closed rooms or cabinets if possible. In open air installations the meter has to be protected by suitable measures from precipitation, contamination or direct sun exposure. The area of application is with a gas temperature between -10°C and +60°C. The lowest ambient temperature has to be not lower than -25°C.

The installation, into which the rotary gas meter is to be installed, is to be conceived according to the technical guidelines, because otherwise by the manufacturer no warranty for the adherence of the error limits can be given.
The installation of the gas meter has to take place without tension into the piping. With larger meters the pipe installation, or if necessary the meter, is to be supported. After putting into operation of the rotary gas meter it has to be paid attention, that possible resonances are avoided by suitable measures.
It has to be paid attention of possible contamination of the gas, which can damage the meter and cause an influence of the measuring accuracy strongly. If possible, a filter has to be installed in front of gas meter, which has a fineness of minimal 10µm. In the starting phase a start sieve is recommendable, which avoids a damage of the meters by welding or installation pollution. It is recommendable to removed however after some time again from the pipe installation, in the case of contamination which were held back by the start sieve, could generate an additional pressure drop, which can have an influence on the measuring accuracy. The manufacturer of the rotary gas meters does not take responsibility for damage to the gas meter, which from insufficient filtering or contamination in the piping results.
The connection of volume correctors and add-on modules has to take place using the prescribed plug connectors (paragraph "link specification of the electrical pulse generators").

7. Putting into operation

The rotary gas meter is to be filled with oil only after complete installation into the meter run (see paragraph 8).
During the admission of the rotary gas meter with operating pressure largest caution is required, because by the difference of pressure for pressure-free subsequent installation briefly large gas flows can occur, which can load then the gas meter over the permitted flow and destroy the measurement cartridge. Filling the pipe installation by the installed rotary gas meter should be avoided. You find an example of the structure of a measuring system in figure 20.

- case a bypass in the installation is available, is before opening the valves 1 and 2 pre and behind the gas meter the following piping through to open the valve 4, to be filled. Afterwards over a needle valve 5, if it is available, or by very slow opening of input valve 1 the meter can be set under operating pressure. After it the output valve 2 is only opened slowly. As last step may not be forgotten to close the valves 4 and 5 again.
- with absence of the bypass at first the meter is by slow opening of the output valve 2 to connect with that follows installation. Afterwards very slowly and carefully the input valve 1 is to be opened, whereby the danger of the brief overload is very large here.
- for the purpose of the disassembly the meter installation has to be emptied. If a bypass is available, the valve 4 is opened as the first one. The meter has to be separated from the gas flow by slowly close from the input valve 1 and the output valve 2. Afterwards the gas meter is to be emptied over the bleed valve 3 slowly.

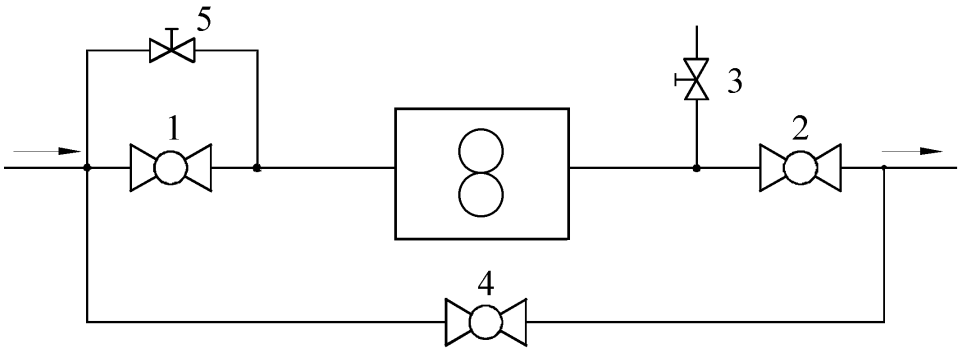


Figure 20: Pattern of a measuring system with bypass

8. Maintenance and lubrication

Turbine gas meters has to be serviced from instructed technical personnel only. Strong operation noises or jerky run point on a damage of the gas meter.
To maintenance of the rotary gas meter belongs:
– oil filling after the installation
– permanently control of the oil level
– refilling to the necessary oil level

Attention: The oil filling and oil emptying is to do only in the pressure free condition of the rotary gas meter!
For the oil filling has to be opened the oil screw on the upper side of the body front cover and the adequate quantity oil (tab.7) has to be filled in.
The oil level will take the stated level like shown in fig. 21 at the control oil screw on the lower part of the body front cover, after balance with the prevent measuring chamber.
The oil level should up to that "Max" - position near on reach. It will be recommended at least one time per month to control the oil level. The oil is not be allowed under that "Min" - position. The approximate values for the refilling from the "Min" to the "Max" - position are stated in table 7. The oil should be at one recognisable pollution complete changed. By screwing out of the oil controlling screw, the oil can be drained off. Also by draining off is to be taken care, that the oil from the rear site of the measuring cartridge will flow to the front side slowly.

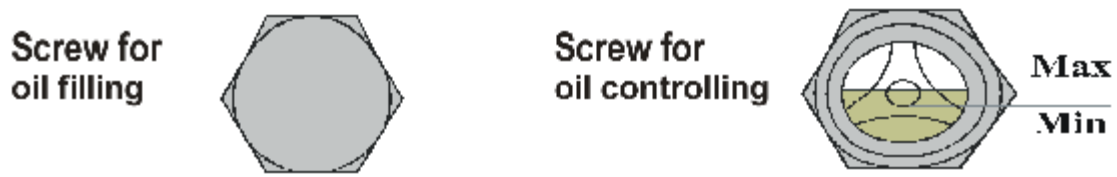


Figure 21: Screw for oil filling and oil controlling

For the oil filling Lubrina oil L12 from the company COMMON is recommended. As a substitute can get used also Isoflex PDP 10. However to the fact has to be paid attention, that different types of oil are not mixed.

Table 7: Quantity of oil for the first and refresh filling of the rotary gas meters

		First oil filling		Refresh oil filling	
Breadth of the main body B according tab. 3		B = 171 mm	B = 240 mm	B = 171 mm	B = 240 mm
Installation position according fig. 19	a, b	30 cm³	50 cm³	10 cm³	20 cm³
	c, d	50 cm³	80 cm³	15 cm³	30 cm³

9. Verification

The gas meter loses its permission for the application of custody transfer, if a seal were damaged or removed. The seal positions can be taken from the figure 22.

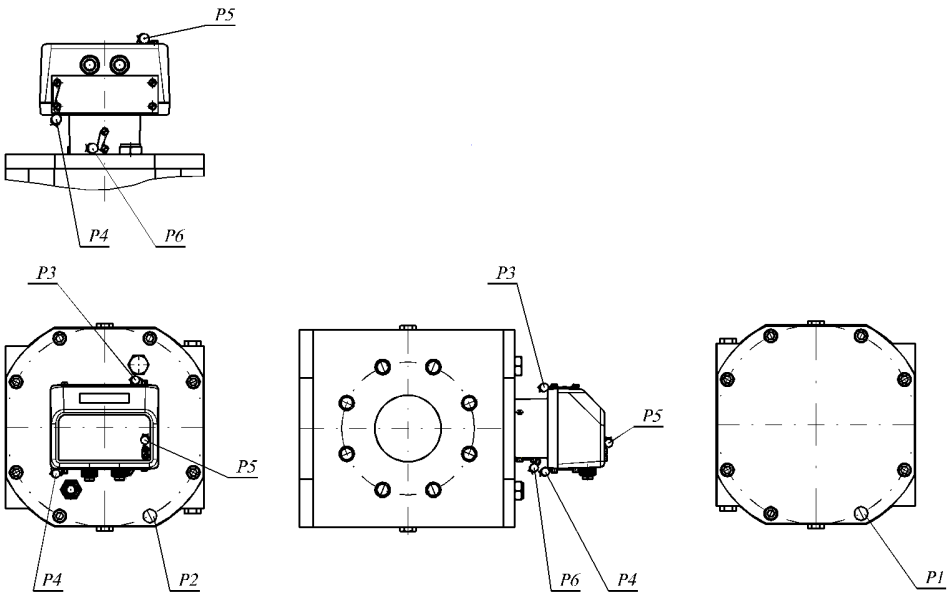


Figure 22: Seal position of the rotary gas meter CGR

Seals for add-on modules are not marked. At special information it is pointed out, that blind screw connections which are not be used by sensors, can be sealed too. Also with a break of these apparently unnecessary security seals the calibration validity of the measuring instrument goes out.