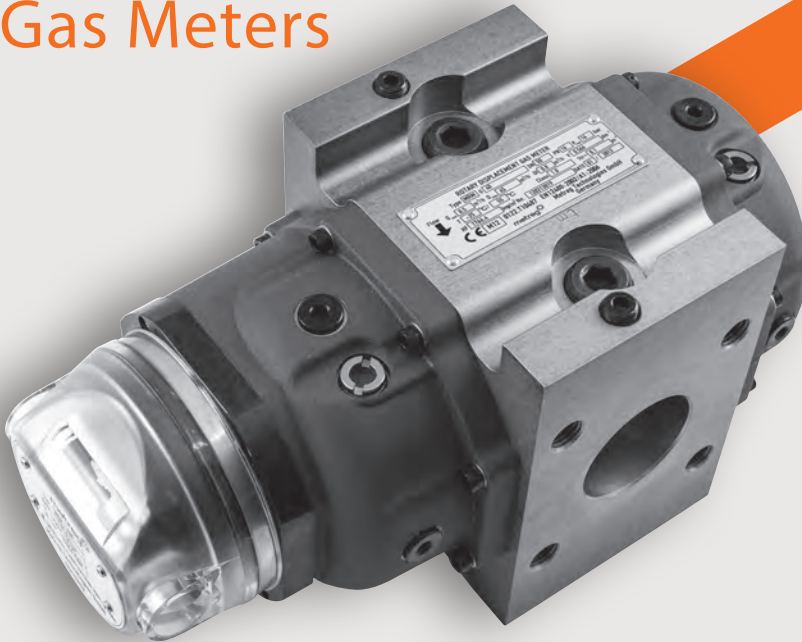


Manual

MRM

# Rotary Displacement Gas Meters



livinggas.

metreg   
Metreg Technologies GmbH



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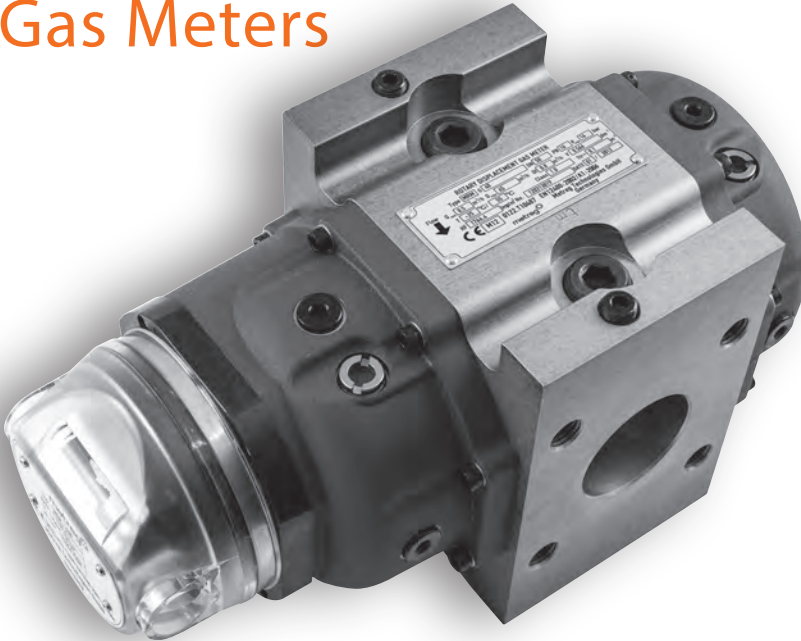
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# MRM

## Rotary Displacement Gas Meters



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# 1. Purpose of this Manual

The instruction manual is dedicated to technical staff with adequate training and technical knowledge in the sector of gas distribution industry according to the applicable technical laws and requirements. For example staff who are educated according to DVGW codes of practices G 492 and / or G495.

## 2. Basic safety instructions

### Requirements for the personnel

The operational staff must be qualified, instructed and authorized according to the assigned functions. All service and maintenance work shall be performed exclusively by persons with proven expert knowledge, including knowledge of occupational safety and environmental protection.

Protective actions have to be defined according to the legal regulations.

### Designated use

The rotary displacement gas meter MRM is designed for fiscal or in-plant volume measurement of combustible gases of the 1., 2. and 3. gas family (natural gas, town gas, propane, butane and others), purified and dried biogas as well as other inert, non-aggressive gases as well as nonexplosive gases and gas mixtures.

The permissible operating pressure range reaches up to 20 bar dependent on the design of the meter, the temperature range runs from at least -25°C to +55°C.

The manufacturer is not liable for damage caused by improper or not-designated use.

### Safety at work

Wear the required personal protective equipment according to federal/national regulations.

### Operational safety

The device is permitted to operate in technical faultless and fail-safe condition only. Responsible is the operator.

### Product safety

This measuring device is designed, manufactured and tested according to the state-of-art demands. It meets all legal requirements and complies with the EC directives. The manufacturer confirms the device-specific EC Declaration of Conformity by fixing the CE mark to the device.

The device has left the factory in perfect condition.

Warranty could be extended only in case of proper installation and operation according to this manual.

### 3. Declaration

- Declaration of Conformity (Annex A)
- Depending on the country where the MRM rotary displacement gas meter is installed the period of the validity of the calibration may vary and is based on the country regulations.

### 4. Use and Scope

The MRM rotary displacement gas meter is designed for fiscal metering of natural gas and approved according the European requirements of EN12480. The MRM rotary displacement gas meter is suitable to be installed in hazardous area of Category 2 (Zone 1)  $\text{Ex}$  II 2 G c IIC T4 X.

The MRM rotary displacement gas meter is suitable for the following gases:

- Natural gas, town gas, propane, butane, ethylene, air, nitrogen.
- Further gases on request.

The MRM rotary displacement gas meter cannot be used for: oxygen, acetylene and other aggressive gases as well as for explosive gases and gas mixtures.

### 5. Overview of the design of the MRM rotary displacement gas meter

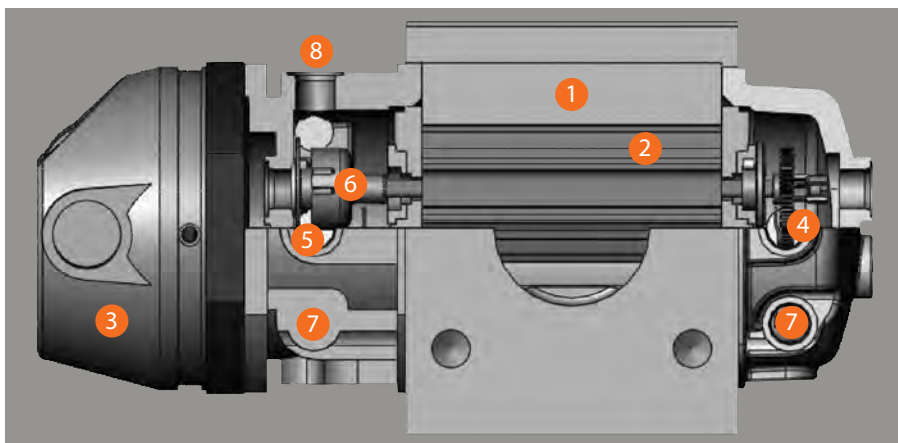


Figure 1: Sectional view of MRM Rotary Displacement Gas Meter

- |                       |                             |
|-----------------------|-----------------------------|
| 1 Meter housing       | 5 Lubricated gears          |
| 2 Pistons             | 6 Magnetic coupling         |
| 3 Meter index head    | 7 Oil level gauge           |
| 4 Synchronizing gears | 8 Oil filling or drain hole |

**Note:** In case of failure or damage: Repairs are only allowed to be done by authorized repair centers.

## 6. Technical Data

Meter type	MRM rotary displacement gas meter						
Approval:	MID according DIN EN 12480:2002/A1:2006 "Gas meters – Rotary displacement gas meters"; OIML R137-1&2: 2012 „Gas meters“						
Size:	G 10 to G 1000						
Nominal diameter:	DN 25 (2") to DN 200 (8")						
Pressure rating:	PN 16 and CLASS 150						
Rangeability:	Up to 200:1						
Temperature ranges:							
• gas temperature	-25°C to +55°C						
• ambient temperature	-25°C to +55°C						
• storage temperature	-25°C to +55°C						
Housing material:	Aluminum						
Max. operation pressure:	16 bar(g), Class 150						
Accuracy:	$Q_{\min} \leq Q < Q_i: \pm 2.0 \%$ $Q_i \leq Q \leq Q_{\max}: \pm 1.0 \%$						
	<table> <tr> <th>G-Type</th><th>Qt</th></tr> <tr> <td>G10, G16</td><td>0.1 <math>Q_{\max}</math></td></tr> <tr> <td>G25 to G1000</td><td>0.05 <math>Q_{\max}</math></td></tr> </table>	G-Type	Qt	G10, G16	0.1 $Q_{\max}$	G25 to G1000	0.05 $Q_{\max}$
G-Type	Qt						
G10, G16	0.1 $Q_{\max}$						
G25 to G1000	0.05 $Q_{\max}$						

Meter index	
Number of indexes:	1
Number of digit rollers per index:	8
Meter index head:	Composite (optional: Aluminum)
Protection class:	IP 67

Pulse generators	
LF pulse generator:	1 LF (reed contact), additional 1 LF option
Contact type:	Normally open
Max. contact load:	10 W
Max. switching voltage:	50 VDC
Max. switching current:	0.1 A
Resistance:	100 $\Omega$ in series to reed contact
$f_{\max}$ :	500 Hz
HF-pulse generator:	1 HF (inductive sensor, acc. NAMUR specs)
Supply voltage:	8.2 VDC (internal resistance of 1k $\Omega$ )
Current consumption (sensor covered):	< 1 mA
Current consumption (sensor free):	> 3 mA
Max. switching frequency $f_{\max}$ :	2000 Hz
Anti tampering contact:	1 Reed contact
Contact type:	Normally closed
Max. contact load:	10 W
Max. switching voltage:	175 VDC
Max. switching current:	0.5 A
Resistance:	100 $\Omega$ in series to reed contact

## Rangeability and pulse weighting data:

DN [mm]	G-Type	Smallest $Q_{\min}$ [m <sup>3</sup> /h]	$Q_{\max}$ [m <sup>3</sup> /h]	Standard Rangea- bility	Largest Rangea- bility	V [dm <sup>3</sup> ]	NF [Pulse/m <sup>3</sup> ]
25	10	0,4	16	1:20	1:40	0,177	10
50	16	0,5	25	1:20	1:50	0,210	10
50	25	0,5	40	1:50	1:80	0,283	10
50	40	0,65	65	1:50	1:100	0,566	10
50	65	0,5	100	1:50	1:200	0,708	10
80	100	0,8	160	1:50	1:200	1,05	1
80	160	1,6	250	1:50	1:160	2,78	1
100	160	1,6	250	1:50	1:160	2,78	1
100	250	2,0	400	1:50	1:200	4,2	1
100	400	3,2	650	1:50	1:200	5,66	1
150	400	6,5	650	1:50	1:100	10,5	1
150	650	10,0	1000	1:50	1:100	15,7	1
200	1000	16,0	1600	1:50	1:100	19,7	1

## 7. Installation

### Recommendations and requirements for the installation of the MRM rotary displacement gas meter:

- Preferably, the meter should be installed horizontally.
- There is no straight inlet or outlet pipe length required.
- At the inlet of the rotary displacement gas meter a cone sieve is recommended.  
In case of vertical gas flow from bottom to top an additional cone sieve at the outlet protects the meter from dust falling back on the pistons when the gas flow stops.
- Ensure that the gas flow is in the same direction as shown at the meter housing's nameplate.
- Avoid strong vibrations and pulsations at the point of measurement (e. g. solenoid valve in shift on-off operation). Such pulsations in continuous operation may reduce the long-time strength of ball bearings and pistons and increase wear and tear.
- Filter (small mesh size) should be installed upstream of the meter to protect it from any contamination (suspended particles > 50 µm) during start-up and operation.
- The gas should be dry. If condensate may be occur then the installation of a condensation trap upstream of the meter is recommended (in some filter types it is integrated). In this case do not install the meter at the lowest point of the piping.

**Attention:** The MRM meter is not suitable for oxygen and other highly corrosive gases as well as for explosive gases and gas mixtures.



## 8. Mounting Position / Direction of Flow

There are two positions of installation possible for the rotary displacement gas meter:  
Horizontal installation or vertical installation

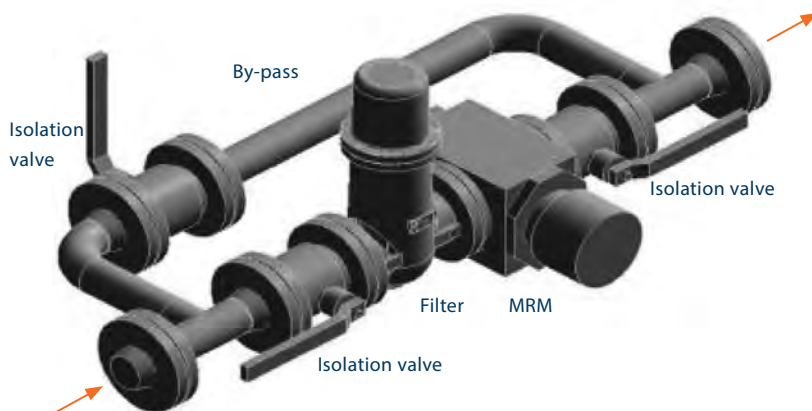


Figure 2: Typical horizontal installation of the MRM rotary displacement gas meter (recommended)

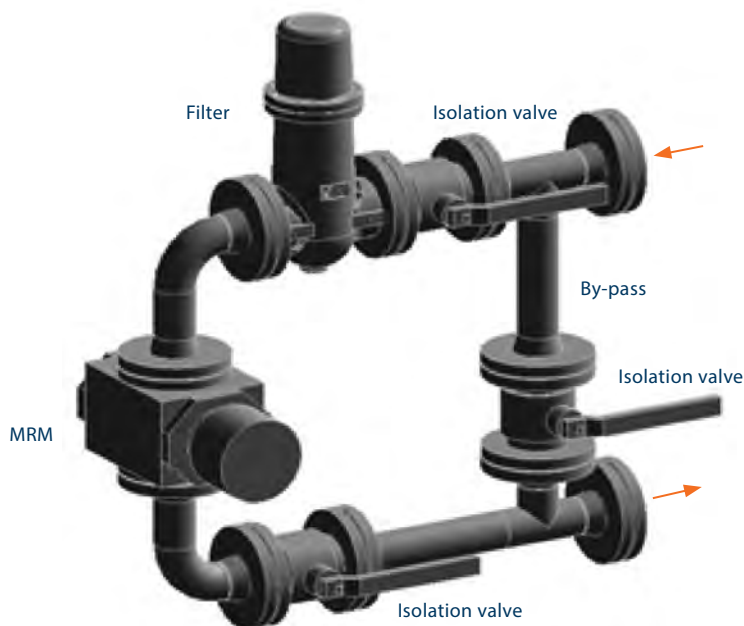


Figure 3: Typical vertical installation of the MRM rotary displacement gas meter

**Notice:** Ensure that the gas flow is in the same direction as shown at the meter housing's nameplate.

## 9. Preliminary work and meter installation

**Before the installation of the meter make sure that the following steps has been observed:**

1. Remove the plastic cover sheets at the inlet and outlet of the meter.
2. Inspect the meter for completeness (e. g. plugs, provided oil volume) and for absence of any transport damages.
3. Clean the flange surfaces (e. g. with petroleum).
4. Check by blowing into the meter that the impellers rotate easily.
5. Prior to the meter's installation check that no contaminations, condensate, dirt and debris are in the pipe. Especially the cleaning of elbows in vertical installations is important to prevent damage of the meter by contaminations, dirt and debris passing.
6. Ensure the inside wall of the pipe is clean without accumulated filth or other coal minerals.
7. Check that in addition to the meter-length there is enough installation space for the two seals between inlet and outlet flanges for stress-free installation of the meter.

### **Necessary equipment for the meter installation:**

1. Suitable and certificated gaskets:
  - Dimensions according DIN EN 1514-1 or DIN 2690
  - Thickness of the gaskets 2 mm
2. Screws according DIN ISO 4014, maximum tightening torque is specified in the following table.
3. Strength class of 5.6 for the screws.

DN [mm]	Flange with threaded holes			
	DIN EN 1092-1		ANSI B 16.5	
	PN 16		Class 150	
	Number of screws	Max. tightening torque [Nm]	Number of screws	Max. tightening torque [Nm]
25	4 x M12	35	4 x 1/2"	35
50	4 x M16	80	4 x 5/8"	80
80	8 x M16	80	4 x 5/8"	80
100	8 x M16	80	8 x 5/8"	80
150	8 x M20	80	8 x 3/4"	80
200	12 x M20	80	8 x 3/4"	80

### **To the installation of the meter itself:**

1. Make sure that the meter is mounted in the right flow direction.
2. Make sure that the meter is installed gas tight.
3. Make sure that the meter is installed stress-free.
  - Horizontal assembling of the impeller axes, this has to be proofed by a water spirit level check.
  - In the design of the piping the installation space of the meter and the thickness of the two seals has to be taken into account.
  - Connecting screws and nuts must be tightened crosswise.

A protective cover is recommended for outdoor installation especially when the meter is mounted together with a volume corrector.

**After installation of the meter: Welding of piping and flanges with the installed flowmeter is not allowed.**

## 10. Lubrication of the MRM rotary displacement gas meter

1. Use only oil recommended and supplied by Metreg Technologies.  
One set of oil for commissioning is delivered with the meter.
2. Specified oil:  
Viscosity class 15, Kinematic viscosity 40°C: 16.2 mm<sup>2</sup>/s;  
110°C: 4.44 mm<sup>2</sup>/s, Viscosity index 205 and a Flash point of 178 °C
3. Fill in the oil before commissioning the meter  
(see chapter 12 for commissioning the meter) and after the correct installation  
of the meter described in chapter 7 and 8.
4. To fill in the oil into the meter the meter has to be depressurized.
5. Follow the described procedure:
  - a. Unscrew the plug.

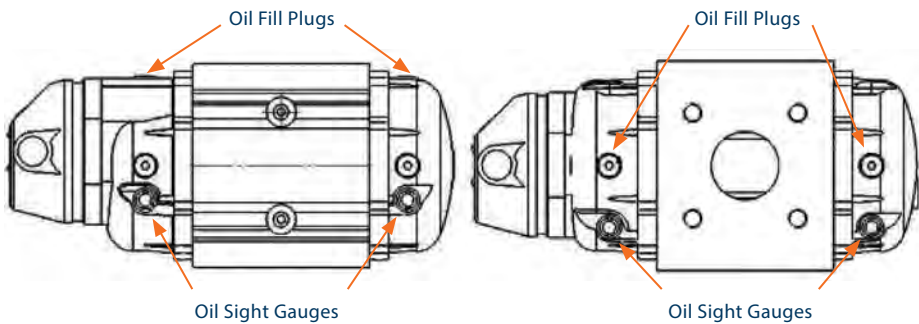


Figure 4: Position of oil fillers and oil level glasses

- b. Fill the special lubricating oil through the filling hole of both sides  
the rear and front side. No oil is needed by the counter index.
- c. Fill the oil up to the center mark line of the oil sight glass and close  
the filler holes by the plugs.

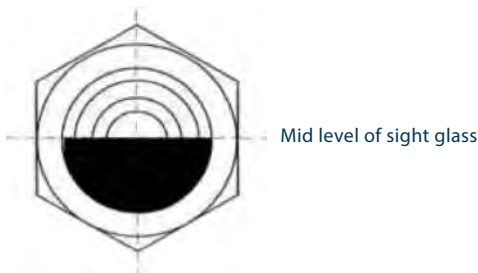


Figure 5: Perfect oil level after filling in

- d. Do not overfill the lubricating oil. For guidance of the maximum oil to be filled into the meter depending on the installation position and meter size is given in the table below:

Flow Direction		Oil quality in (ml) for Commissioning and Oil Changes			
		G 10 to G 25	G 40 to G 100	G 160 to G400 (DN 100)	G 400 to G1000 (DN 150)
Horizontal	Front Side	6	18	60	600
	Rear Side	5	13	55	600
Vertical	Front Side	36	108	310	2300
	Rear Side	25	85	280	2300

- e. Reseal the filling hole with the screw.

## 11. Maintenance

1. Generally the rotary displacement gas meter does not require special services. The maintenance intervals depend on the operating conditions. Metreg suggests to check the oil level regularly, at least once a year.
2. The oil should be replaced every 5 years.
3. When the oil level is 3 mm lower than the central mark line of oil sight glass oil should be added to the central mark line:

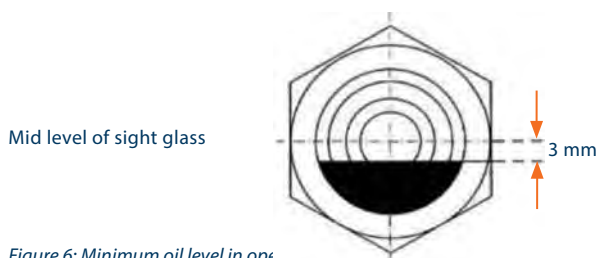


Figure 6: Minimum oil level in op

4. The lubricating oil needs to be changed when the color of the oil has changed or the oil level is higher than the central mark line. This means that the oil is degenerated or it contains impurities.
5. A repair of the MRM rotary displacement gas meter has only to be done by competent and authorized personal like the Service Engineers from Metreg Technologies.
6. Don't break any seals. If only one of the seals is damaged or broken the meter cannot be used for custody transfer measurements of natural gas according MID (2004 / 22 / EG).

## 12. Commissioning of the MRM rotary displacement gas meter

The start-up procedure of the MRM rotary displacement gas meter follows the installation and leakage test of the connections:

1. The work has to be done under survey of an appointed person who coordinates and controls the activities.
2. Open slowly the upstream valve (fig. 2 and fig.3) to pressurize the pipe until operation pressure is achieved.
3. The rate of pressure increase shall not exceed 350 mbar/s.
4. At operation pressure level open the upstream valve completely.
5. Slightly open the downstream valve (fig. 2 and fig.3)
6. At operation pressure level the downstream valve can be opened completely.
7. Perform a leakage test at operation pressure.
8. Perform a pressure lost measurement across the two measurement points of the meter as a bench mark value for one or more flow rates. In case of maintenance work a comparison of the actual pressure loss with the initial pressure loss (the increase should be < 50 % than the initial value at start-up) is a good indicator if the pistons rotate smoothly or if there is any change in the performance.

The following relation is valid:

$$\Delta p \sim p_{abs} \cdot Q^2$$

$\Delta p$ : nominal pressure loss

$p_{abs}$ : absolute pressure

$Q$ : operating flow rate

## 13. Decommissioning of the MRM rotary displacement gas meter

1. The work has to be done under survey of an appointed person who coordinates and controls the activities.
2. Take care of appropriate ventilation of the installation room.
3. Depressurize to atmosphere only to areas with no active ignition sources.
4. Reduce the operating pressure slowly (e. g. < 350 mbar/s).
5. Open the bolts and nuts of the flanges when the pipe is completely depressurized.
6. Carefully take out the meter from the pipe connection.
7. Drain the oil out of the meter via the drain plug.

## 14. Pulse Generator

Two low frequency pulse (LF) generators are plugged to the meter index head in standard delivery. The function of this two LF pulses is:

- 1 LF pulser for flow measurement
- 1 LF pulser as anti tampering contact.

Optional a second LF pulser for flow measurement can be plugged to the meter index head.



Figure 7: LF assembly



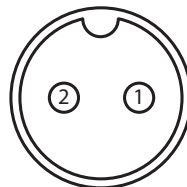
Figure 8: Installed LF assembly with MRM rotary displacement gas meter

**The LF pulser unit comes standard with three meter cable.  
The cable configuration is as follows:**

- 1 LF- Pulser for volume flow measurement
  - Black (-)
  - Red (+)
  - Blue (+)
- 2 LF- Pulser for volume flow measurement (option)
  - Black (-)
  - Red (+)
  - Blue (+)
- 1 LF- Pulser as anti tampering contact
  - Yellow (-)
  - White (+)

**The connection of the HF pulser (option) is designed  
via a plug connection:**

- Pin 1 – Red (+)
- Pin 2 – Black (-)



### Warning!

All pulse generators are intrinsically safe. If the meter is installed in hazardous area they should be connected to external devices like electronic volume correctors (EVC's) only via intrinsically safe circuits.

## 15. Pressure Measuring Point

There are two pressure test points as shown in figure 9. The regular pressure test point is marked with " $p_m$ " and the other with " $p$ ". The two pressure test points are designed for a connection of steel tubing with a diameter of 6 mm. The steel tubing should be according DIN EN 10305-1. The pipe connection or fitting should be in accordance to DIN 2353. It may only be used seamless drawn stainless steel tubes according to DIN EN 10216-5:2014-03. Pipes not made of stainless steel or made out of non-metallic materials are not allowed.

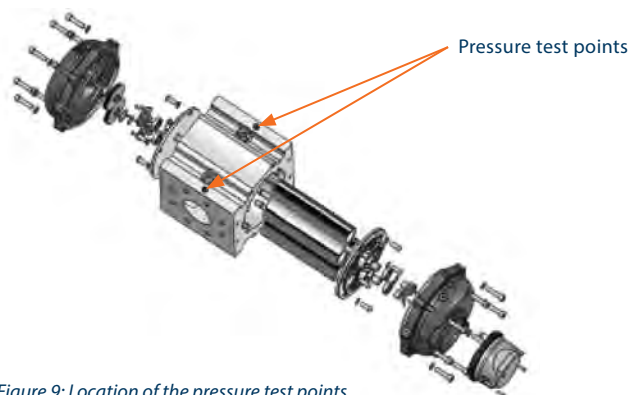


Figure 9: Location of the pressure test points

## 16. Temperature Measuring Point

There are 2 temperature test points as shown in figure 10. The regular temperature test point is marked with " $t_m$ " and the other with " $t$ ". The temperature taps are locked with a screw (G 1/4"). In case of using the temperature taps remove the plug screws and replace them by a temperature pocket with an integral thread of G 1/4". The temperature pocket is designed for a temperature sensor with a diameter of 6 mm.

**Notice:** If the temperature taps of the rotary displacement gas meter are not used the temperature measurement points must be located up to 3 DN upstream of the meter.

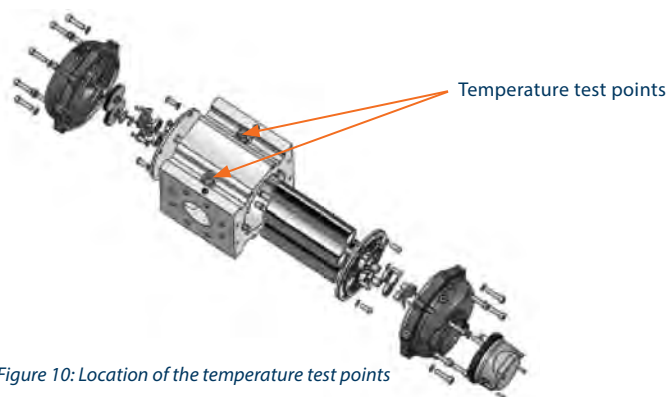


Figure 10: Location of the temperature test points



## 17. Cleaning

For cleaning the meter from dust and dirt please do not use any solvents. It is suitable to use a damp cloth only for that purpose.

## 18. Transport and Storage

The rotary displacement gas meter and accessories shall be stored in the original packaging. Secure the measuring device from rotating or slipping. Be careful during loading and transportation to or from the measuring point.

**Some requirements for transportation and storage of the meter are:**

- The meter is on both flanges covered with a protection cover.
- For transportation the meter is not filled with oil.
- Prevent from rain and moisture.
- Prevent from mechanical vibrations or impacts.
- Unpack and check:
  - o Check the packing list to account for all items received.
  - o Inspect each item for damage.

## 19. Annex A

### CE Declaration of Conformity



Konformitätserklärung  
Declaration of Conformity  
Declaration de conformité



**Produkt**  
Product  
Produit

Drehkolbengaszähler  
Rotary Gas Meters  
Compteurs de piston de rotation de gaz

**Typ,Ausführung**  
Type, Model  
Marquage de produit

MRM

Richtlinie Directive Directive	MID	PED	ATEX
<b>Produktkennzeichnung</b> Product marking Marquage de produit	CE Mxx0122	CE1521	II 2 G c IIC T4 X
<b>EU-Richtlinien</b> EC-Directives Directives européenne	2004/22/EC	97/23/EC	94/9/EC
<b>Normen</b> Standards Normes	OTML R137-1&2 EN 12480/A1:2006	GB 50316 GB 150	EN 13463/1
<b>EU-Baumusterprüfung</b> EC Type-Examination Décision d'approbation européenne	T10658		Unterlagen hinterlegt Documentation filed Documentation déposer
<b>Überwachungsverfahren</b> Surveillance Procedure Methode à garder	2004/22/EC Modul D	97/23EC Annex III Modul H	94/9/EC Annex 8 Modul A
<b>Überwachungsinstanz des Systems</b> Surveyor of the System Auditeur de la système	Notified Body 0122 NMI Certin B.V. Hugo de Grootplein 1 NL-3341 EG Dordrecht	Notified Body 1521 MPI verification service	Notified Body 0035 TUV Rheinland

**Wir erklären als Hersteller:**

Die entsprechend gekennzeichneten Produkte sind nach den aufgeführten Richtlinien und Normen hergestellt. Sie stimmen mit den geprüften Baumustern überein. Die Herstellung unterliegt dem genannten Überwachungsverfahren. Durch den Zusammenbau der Produktkomponenten werden keine zusätzlichen Zündquellen erzeugt.

**We declare as manufacturer:**

Products labelled accordingly are manufactured according to the listed directives and standards. They correspond to the type approval samples. The production is subject to the stated surveillance procedure. No additional ignition sources are being created by assembly of the product's components.


**Déclaration du fabricant:**

Les produits désignés en conséquence ont été fabriqués conformément aux exigences des exigences des Directives et Normes citées. Ils conformes au type éprouvé. La fabrication est soumise au Procédé de surveillance indiqué. L'assemblage des composants du produit ne génère aucune source d'allumage supplémentaire.

Ulf Lehmann  
Qualitätssicherung und Prüfstelle

Dr. Achim Zajc  
Geschäftsführer Technik, Marketing & Sales

The pulse generators have their own ATEX approval and has the following marking:

Pulse generator	Sensor types	EG-Type-Examination Certificate 94/9/EG Identification of the pulse generator
LF-pulse generator	Reed switch, magnetically triggered	Connection only to intrinsically safe circuits when installed in hazardous area
HF Pulse generator	Proximity switch acc. NAMUR specs.	PTB 01 ATEX 2191  ia IIC T6 Ga



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