Manual

# MQM
# Quantometers

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Metreg Technologies GmbH

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Manual

metreg

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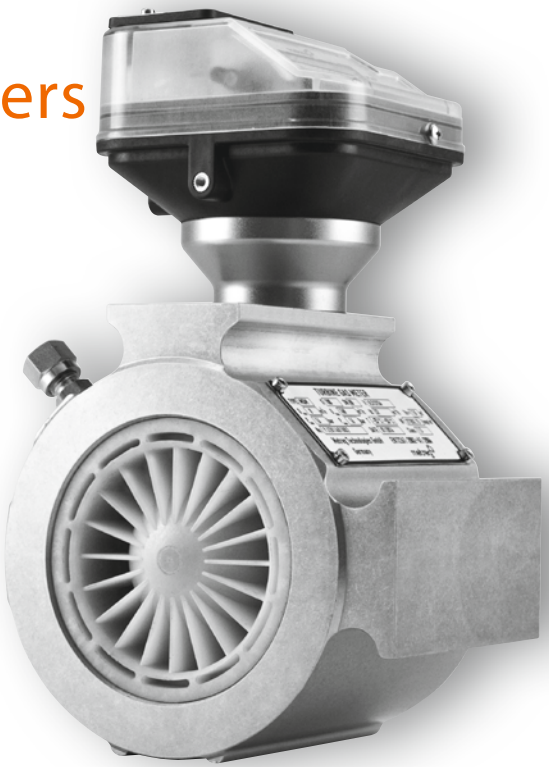


# Table of Content

**Manual MQM Quantometers**

# 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 DVGW codes of practice G 492 and / or G 495.

# 2. Basic safety instructions

### Requirements for the personnel

The operational staff must be qualified, instructed and authorized according 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 the legal regulations.

### Designated use

The MQM Quantometer is designed for 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 and non-explosive 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 -20°C to +60°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 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)

## 4. Use and Scope of Quantometers

The Quantometer MQM is designed for none fiscal or in-plant metering of natural gas and approved according the European guidelines of 97/23/EG. The MQM Quantometer is suitable to be installed in hazardous area of Category 2 (Zone 1) ⟨Ex⟩ II 2 G c IIC T4 X.

The MQM Quantometer is suitable for the following gases:

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

The MQM Quantometer cannot be used for: Oxygen, Acetylene and other aggressive gases as well as for explosive gases and gas mixtures. The meter should not be used in applications with the presence of strong pulsations. These conditions will result in an increased error and may significantly decrease the meter's lifetime.

## 5. Design of the MQM Quantometer

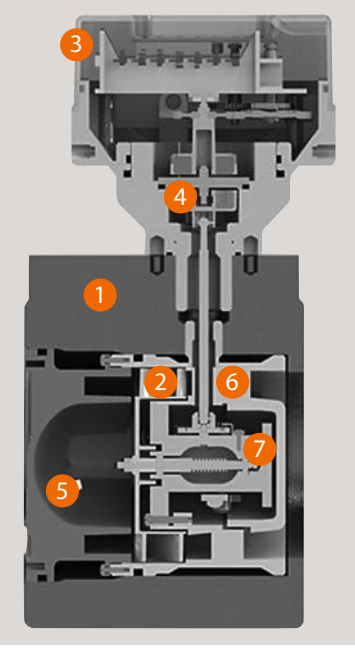



*Fig. 1: Sectional view of MQM Quantometer*

### Zähleraufbau

1 Meter housing
2 Turbine rotor
3 Meter index head
4 Magnet coupling
5 Flow conditioner
6 Measuring unit housing
7 Measuring unit

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

# 6. Technical Data

| Meter type | MQM Quantometer |
|---|---|
| **Approval** | PED 97 / 23 / EC |
| **Size** | G 10 to G 1000 |
| **Nominal diameter** | DN 25 (2“) to DN 150 (6“) |
| **Pressure rating** | PN 16 and ANSI CLASS 150 |
| **Rangeability** | 20:1 or higher depending on the operation pressure |
| **Temperature ranges** | |
| • gas temperature | -20°C to +60°C |
| • ambient temperature | -25°C to +55°C |
| • storage temperature | -25°C to +55°C |
| **Housing material** | Aluminum |
| **Max. operation pressure** | 20 barg |
| **Accuracy** | $Q_{min} \leq Q < Q_t$: ±3.0 %<br>$Q_t \leq Q \leq Q_{max}$: ±1.5 %<br><br>$Q_t = 0{,}2\ Q_{max}$ |

| Meter index | |
|---|---|
| Number of indexes | 1 |
| Number of digit rollers per index | 8 |
| Meter index head | Composite (optional: Aluminum) |
| Protection class | IP 65 |

| Pulse generators | |
|---|---|
| **LF-pulse generator** | 1 LF (reed contact), add. 1 LF as option |
| **Contact type** | make contact (normally open) |
| **Max. contact load** | 10 W |
| **Max. switching voltage** | 50 VDC / 200 VDC |
| **Max. switching current** | 0.1 A / 0.5 A |
| **Resistance** | 100 Ω in series to reed contact |
| **Max. switching frequency $f_{max}$** | 500 Hz |
| **HF-pulse generator:** | 1 HF (inductive sensor, acc. NAMUR specs) |
| Supply voltage | 8.2 VDC (internal resistance of 1kΩ) |
| Current consumption (sensor covered) | < 1 mA |
| Current consumption (sensor free) | > 2.1 mA |
| Max. switching frequency $f_{max}$ | 1500 Hz |
| **Anti tampering contact** | 1 Reed contact in series with 100 Ω resistor |
| Contact type | make contact (normally closed) |
| Max. contact load | 10 W |
| Max. switching voltage | 175 VDC |
| Max. switching current | 0.25 A |
| Resistance | 100 Ω in series to reed contact |

### Rangeability and pulse weighting data

| DN [mm] | G-Type | $Q_{min}$ [m³/h] | $Q_{max}$ [m³/h] | HF *) [imp/m³] | NF [imp/m³] |
|---|---|---|---|---|---|
| 25 | 10 | 2 | 16 | 140000 | 10 |
| 25 | 16 | 2,5 | 25 | 140000 | 10 |
| 25 | 25 | 4 | 40 | 140000 | 10 |
| 50 | 40 | 6,5 | 65 | 10400 | 10 |
| 50 | 65 | 10 | 100 | 10400 | 10 |
| 80 | 100 | 8 | 160 | 27000 | 1 |
| 80 | 160 | 12,5 | 250 | 27000 | 1 |
| 80 | 250 | 20 | 400 | 27000 | 1 |
| 100 | 160 | 12,5 | 250 | 13500 | 1 |
| 100 | 250 | 20 | 400 | 13500 | 1 |
| 100 | 400 | 32 | 650 | 13500 | 1 |
| 150 | 400 | 32 | 650 | 5400 | 1 |
| 150 | 650 | 50 | 1000 | 5400 | 1 |
| 150 | 1000 | 80 | 1600 | 5400 | 1 |

*)The absolute number of the pulses depends on the meter size and the individual meter itself. The stated values are of typical size. Exact values determined by calibration of the meter are located on the nameplate.

## 7. Installation

### Recommendations and requirements for the installation of the MQM Quantometer:

- Preferably, the meter should be installed horizontally, with index head upward.
- Straight inlet pipe ≥ 5 DN and outlet pipe ≥ 1 DN in the nominal pipe diameter is recommended for high accuracy.
- Ensure that the gas flow is in the same direction as shown by the arrow at the meter housing.
- Avoid heavy vibrations and pulsations in the point of measurement. Installation of a suitable compensator can effectively damp down this kind of disturbance.
- Drastic changes in the gas flow as well as strongly pulsating flow will increase the measuring error. They arise for example during frequently switching on-off of solenoid valves. The pressure impulses by opening the valve very fast may damage the ball bearings of the turbine rotor and cause failure of the Quantometer.
- 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 choose
  - o Flow direction from top to bottom
  - o Do Not install the meter at the lowest point of the piping

**Attention: The MQM Quantometer 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 turbine gas meter: Horizontal installation or vertical installation**

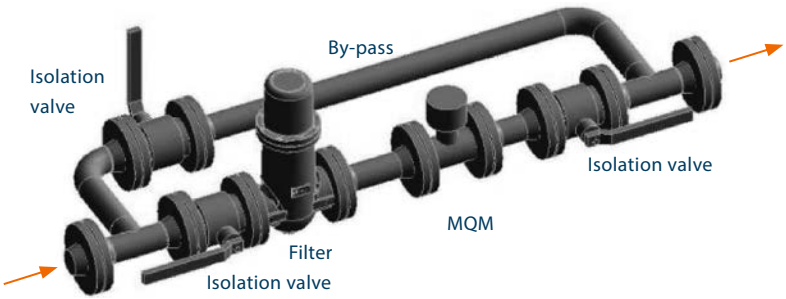



*Figure 2: Typical horizontal installation of the MQM Quantometer (recommended)*

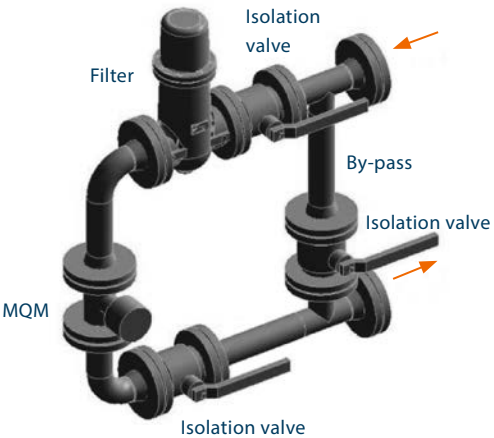



*Figure 3: Typical vertical installation of the MQM turbine gas meter (only DN ≤ 150)*

**Notice: Ensure that the gas flow is in the same direction as shown by the arrow at the meter housing.**

# 9. Preliminary work

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

1. Remove the plastic cover sheets 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 turbine rotor rotates easily and stops smoothly.
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. A cone-shaped start-up sieve may be installed for initial operation. After 4-6 weeks it should be removed to avoid perturbations of the flow profile with resulting decrease of the accuracy.
6. Make sure that there is no intrusion of the sealing element into the pipe during installation and operation (concentric mounting).
7. Check that in addition to the meter-length there is enough installation space for the two seals between inlet and outlet flanges.
8. The meter must be installed stress-free. Therefore in addition to point 7 observe strictly the proper alignment of the Quantometer's inlet to outlet axis with the connecting piping axis.

### Necessary equipment fort he meter installation:

1. **Suitable and certified gaskets:**
   - Dimensions according DIN EN 1514-1 or DIN 2690
2. Screws according DIN ISO 4014 and ASME B 1.1
3. Nuts according DIN EN ISO 4032 and ASME B 1.1

| DN [mm] | Pressure ANSI Class | Flanges according ANSI B 16.5 Stud bolts with continuous thread and nuts | | | |
|---|---|---|---|---|---|
| | | Min. Operating temperatur of the screws and nuts | Number of screws | Strength class screws | Strength class screws |
| 25 | 150 | - 25°C | 4 x M12 | ASTM A 193 | ASTM A 194 |
| | | | | Grade B7 | Grade 2H |
| 50 | 150 | - 25°C | 4 x M16 | ASTM A 193 | ASTM A 194 |
| | | | | Grade B7 | Grade 2H |
| 80 | 150 | - 25°C | 8 x M16 | ASTM A 193 | ASTM A 194 |
| | | | | Grade B7 | Grade 2H |
| 100 | 150 | - 25°C | 8 x M16 | ASTM A 193 | ASTM A 194 |
| | | | | Grade B7 | Grade 2H |
| 150 | 150 | - 25°C | 8 x M20 | ASTM A 193 | ASTM A 194 |
| | | | | Grade B7 | Grade 2H |

| DN [mm] | Pressure class PN | | Flanges according DIN EN 1092-1 Hexagon screws and nuts | | |
|---|---|---|---|---|---|
| | | Min. operating temperatur of the screws and nuts | Number of screws | Strength class screws | Strength class screws |
| 25 | 16 | - 10°C | 4 x M12 | 5.6 / 8.8 | 5 / 8 |
| 50 | 16 | - 10°C | 4 x M16 | 5.6 / 8.8 | 5 / 8 |
| 80 | 16 | - 10°C | 8 x M16 | 5.6 / 8.8 | 5 / 8 |
| 100 | 16 | - 10°C | 8 x M16 | 5.6 / 8.8 | 5 / 8 |
| 150 | 16 | - 10°C | 8 x M20 | 5.6 / 8.8 | 5 / 8 |

| DN [mm] | Pressure class PN | | Flanges according DIN EN 1092-1 Hexagon screws and nuts | | |
|---|---|---|---|---|---|
| | | Min. operating temperatur of the screws and nuts | Number of screws | screw material | screw material |
| 25 | 16 | - 40°C | 4 x M12 | 25CrMo4 | 25CrMo4 |
| 50 | 16 | - 40°C | 4 x M16 | 25CrMo4 | 25CrMo4 |
| 80 | 16 | - 40°C | 8 x M16 | 25CrMo4 | 25CrMo4 |
| 100 | 16 | - 40°C | 8 x M16 | 25CrMo4 | 25CrMo4 |
| 150 | 16 | - 40°C | 8 x M20 | 25CrMo4 | 25CrMo4 |

## During Installation of the meter has to been checked:

**1.** The meter is mounted in the right flow direction.
**2.** The meter is installed gas-tight.
**3.** The meter is installed stress-free.

- In horizontal pipes the meter is installed with the index head upright.
  In case of vertical installations the oil pump must be mounted in upright position (if the meter is equipped with an oil pump).
- Connecting screws and nuts must be tightened crosswise.
- For connecting the pressure test point please refer to chapter 15.
- For connecting the temperature test point please refer to chapter 16.

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 nearby the Quantometer is not allowed.**

# 10. Lubrication and Maintenance of the MQM Quantometer

**1.** Quantometers with permanent lubricated ball bearings (no oil pump) are maintenance-free.
**2.** Quantometers with an oil pump need periodic lubrication.
The initial lubrication procedure is:
**a.** Use only oil recommended and supplied by Metreg Technologies.
One set of oil for commissioning is delivered with the meter.
**b.** Specified oil: Shell Morlina S2 BL 5 or Shell Morlina S2 BL 10
**c.** Fill in the oil before commissioning the meter and after the correct installation of the meter described in chapter 7 and 8.
**d.** Fill an adequate quantity of oil in the supply tank, and then horizontally pull the hand lever dependent on the size of the meter:
DN 50: 3 strokes
DN 80: 5 strokes
DN 100: 5 strokes
DN 150: 9 strokes
**e.** When the lubrication procedure is finished, close the cover of the supply tank to avoid any dirt or impurities to enter the lubrication system.

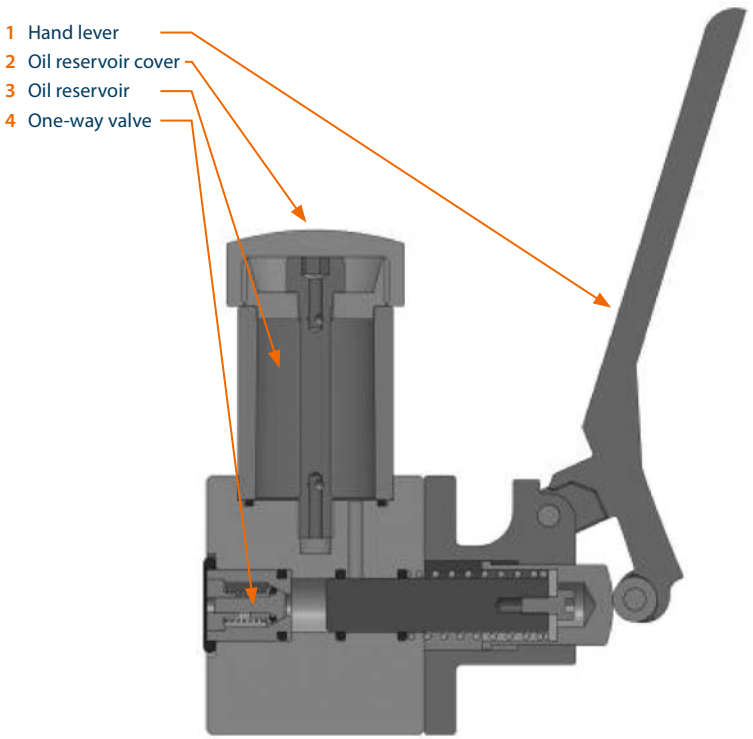



*Figure 4: Sectional drawing of the oil pump*

## 11. Maintenance of MQM Quantometers

1. Quantometers without oil pump do not require special services. They are maintenance-free.
2. Quantometers with an oil pump require periodically maintenance:
   - 2.1. Lubrication every 2 to 3 months if the gas is clean and filtered upstream the meter:
     DN 50: 2 strokes, DN 80: 4 strokes, DN 100: 4 strokes, DN 150: 7 strokes
   - 2.2. If the gas is carrying dust and/or moisture then the lubrication has to be done at least every month.
3. A repair of the Quantometer has only to be done by competent and authorized personnel like the Service Engineers from Metreg Technologies.

## 12. Commissioning of the MQM Quantometer

**The start-up procedure of the MQM Quantometer follows the installation and leakage test of the connections:**

1. Open slowly the upstream valve (fig. 2 and fig. 3) to pressurize the pipe until operation pressure is achieved.
2. The rate of pressure increase shall not exceed 350 mbar/s.
3. At operation pressure level open the upstream valve completely.
4. Slightly open the downstream valve (fig. 2 and fig. 3).
5. At operation pressure level the downstream valve can be opened completely.
6. Perform a leakage test on the meter at operation pressure.
7. Remove the startup sieve after 4 to 6 weeks (if installed).

## 13. Decommissioning procedure of the MQM Quantometer

1. Take care of appropriate ventilation of the installation room.
2. Depressurize to atmosphere only to areas with no active ignition sources.
3. Reduce the operating pressure slowly (e. g. < 350 mbar/s).
4. Open the bolts and nuts of the flanges only if the pipe is completely depressurized.
5. Carefully take out the meter from the pipe connection.

# 14. Pulse Generators

**Two low frequency (LF) pulse generators are plugged to the meter index head in standard delivery. A third low frequency (LF) pulse generator is optional. The function of these three LF-pulsers is:**

- 1 LF-pulser for flow measurement
- 1 additional LF-pulser for flow measurement (option)
- 1 LF-pulser as anti tampering contact.

*Figure 5: The LF assembly*

*Figure 6: Installed LF assembly with the MQM Quantometer*

As an option one high frequency (HF) pulse generator can be installed onto the meter. The function of the HF pulser is the determination of the actual gas flow in high resolution. The HF-pulser follows NAMUR specification and is typically connected to the input of flow computers or appropriately equipped volume correctors. For the connection use shielded cable.

The blades of the turbine rotor are scanned by the high-frequency sensor. Each blade passing the HF-sensor creates a pulse. Figure 7 shows a MQM Quantometer with fitted HF-sensor.

*Abb. 7: MQM Quantometer mit HF-Sensor*

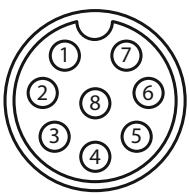
**The connection of the LF pulse transmitter unit is different depending on whether the meter head is made of composite or aluminum.**

**Index head out of composite:**
**The LF-pulser unit comes standard with three meter cable.**
**The cable configuration is as follows:**

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

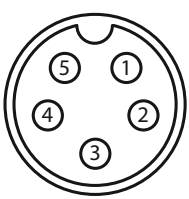
**Index head out of aluminium:**
**The connection of the LF-pulser unit is designed via a plug connection:**

- 1 LF-pulser for flow measurement
  - o Pin 5 – Blue (+)
  - o Pin 6 – Grey (-)
  - o Pin 7 – Pink (+)
- 2 LF-pulser for flow measurement (option)
  - o Pin 5 – Blue (+)
  - o Pin 6 – Yellow (-)
  - o Pin 7 – Pink (+)
- 1 LF-pulser as anti tampering contact
  - o Pin 1 – Yellow (-)
  - o Pin 2 – White (+)




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

- o Pin 4 – Red (+)
- o Pin 3 – Black (-)




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

## 15. Pressure Measuring Point

There is a pressure test point within the MQM Quantometer as shown in figure 8. The pressure tap is marked with "pm". The pressure test point is 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.

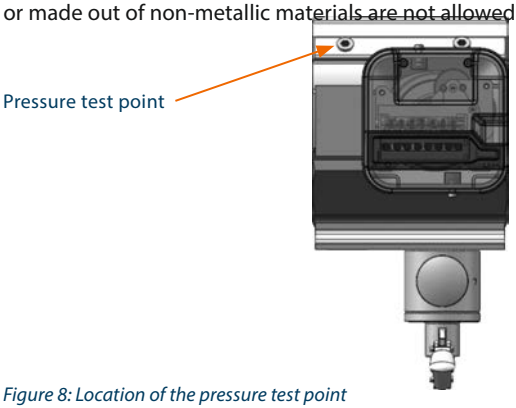



*Figure 8: Location of the pressure test point*

## 16. Temperature Measuring Point

There is one temperature test point as shown in figure 9. The temperature tap is marked with "tm". The temperature tap is locked with a screw (G ¼"). In case of using the temperature tap remove the plug screw and replace it by a temperature pocket with an integral thread of G ¼". The temperature pocket is designed for a temperature sensor with a diameter of 6 mm.

**Notice: If the temperature tap of the Quantometer is not used the temperature measurement point should be located 1-3 DN downstream of the meter.**

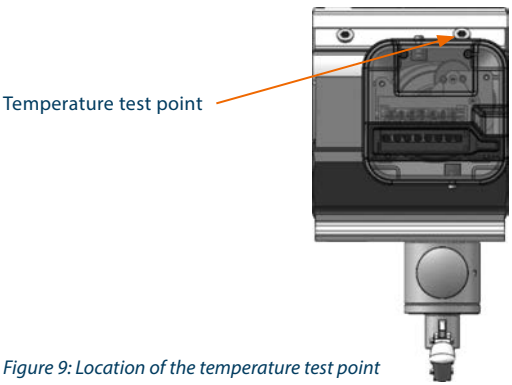



*Figure 9: Location of the temperature test point*

## 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 Quantometer 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:**

- Das Messgerät ist an beiden Flanschen mit Schutzfolien versehen
- The meter is on both flanges covered with a protection cover
- For transportation the oil pump (if installed) is not filled with oil
- Prevent from rain and moisture
- Prevent from mechanical vibrations or impacts
- Unpack and check:
  - the packing list to account for all items received
  - Inspect each item for damage

# 19. Annex A

## CE Declaration of Conformity

CE

Konformitätserklärung
Declaration of Conformity
Declaration de conformité

metreg
Metreg Technologies GmbH

**Produkt** Quantometer
Product Quantometer - Turbine Gas Flow Meters
Produit Quantomètres - Compteurs de gaz

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

| | | |
|---|---|---|
| **Richtlinie**<br>Directive<br>Directive | PED | ATEX |
| **Produktkennzeichnung**<br>Product marking<br>Marquage de produit | CE1521 | Ex II 2 G c IIC T4 X |
| **EU-Richtlinien**<br>EC-Directives<br>Directives européenne | 97/23/EC | 94/9/EC |
| **Normen**<br>Standards<br>Normes | GB 50316<br>GB 150 | EN 13463/1 |
| **EU-Baumusterprüfung**<br>EC Type-Examination<br>Décision d'approbation européenne | | Unterlagen hinterlegt<br>Documentation filed<br>Documentation déposer |
| **Überwachungsverfahren**<br>Surveillance Procedure<br>Methode à garder | 97/23EC Annex III Modul H | 94/9/EC Annex 8<br>Modul A |
| **Überwachungsinstanz des Systems**<br>Surveyor of the System<br>Auditeur de la systéme | Notified Body 1521<br>HPI verification service | Notified Body 0035<br>TÜV 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 procedures. 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 fabrcation ets soumise au Procédé de surveillance indiqué. L'assemblage des composants du produit ne génére aucune source d'allumage supplémentaire.

Ulf Lehmann
Qualitätssicherung und Prüfstelle

Dr. Achim Zajc
Geschäftsführer Technik, Marketing & Sales

# 20. Annex B

**The pulse generators have an own ATEX approval and have the following marking:**

| Pulse generator | Sensor type | EG-Baumusterprüf-Bescheinigung 94/9/EG Kennzeichnung auf den Impulsgebern |
|---|---|---|
| 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<br>⟨Ex⟩ II 1G Ex ia IIC T6<br>Ga Ta: -20…70° C<br>⟨Ex⟩ II 1G Ex ia IIC T5<br>Ga Ta: -20…80° C<br>⟨Ex⟩ II 1D Ex ia IIIC T90° C<br>Da Ta: -20…70° C<br>⟨Ex⟩ II 1D Ex ia IIIC T100° C<br>Da Ta: -20…80° C |

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