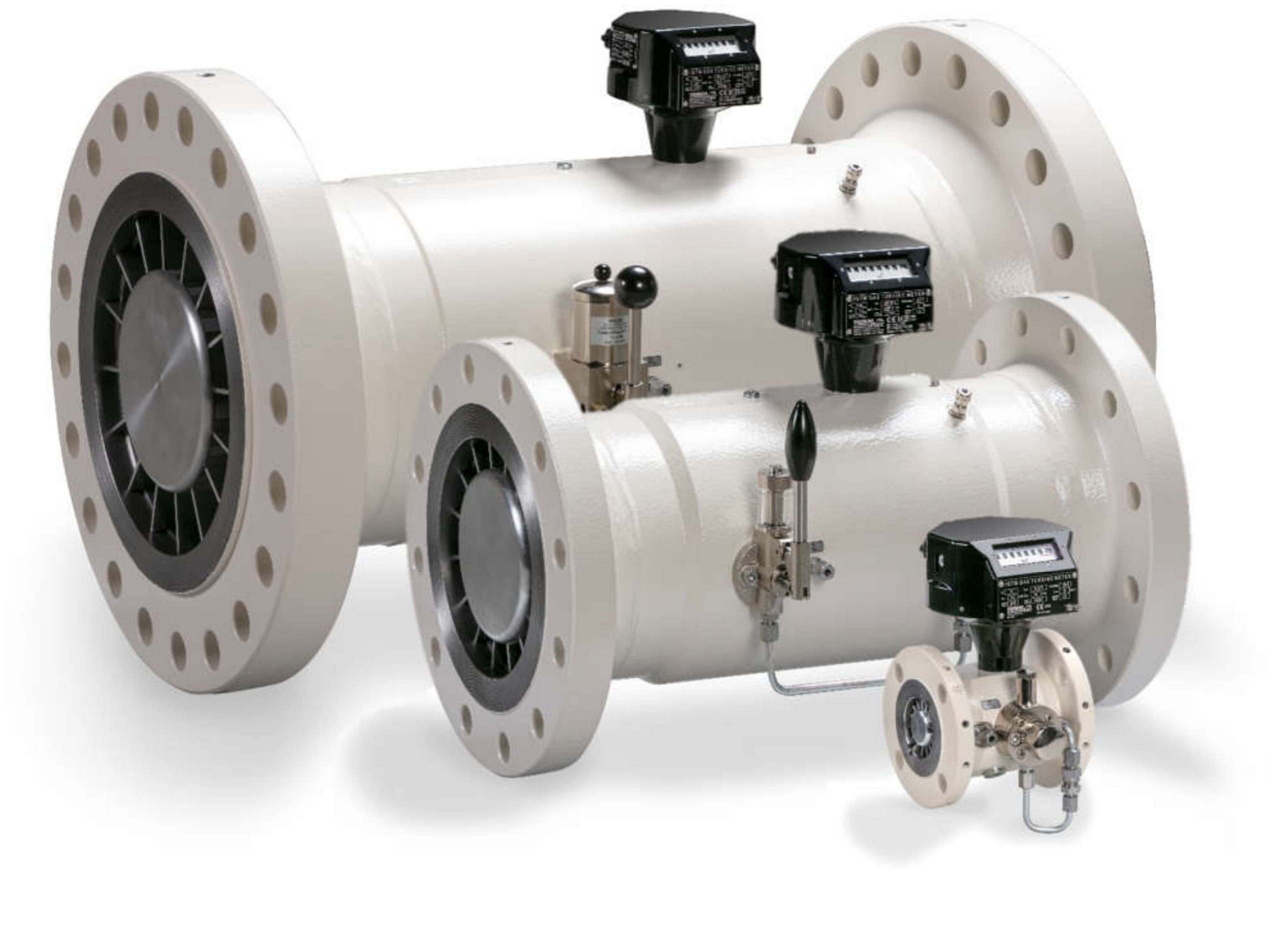
INSTRUCTION MANUAL

GAS TURBINE METER

IGTM – CT / – WT



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Introduction

Congratulations on the purchase of your high-precision gas volume meter, the IGTM gas turbine meter. This instruction manual contains all the information to obtain the highest possible measurement accuracy and describes the handling, installation and maintenance of your gas turbine meter. It is most important that you follow the safety recommend-dations for the installation of the meter, the electrical wiring, and the maintenance instructions.

Aim of the instruction manual

This instruction manual provides information that is required for trouble-free and safe operation.

The IGTM has been designed and manufactured with the state of the technology and according to the latest safety standards and regulations. However, hazards may occur during operation that can be avoided by following these instructions. The device may only be used for its intended purpose and when it is in a technically perfect condition.

WARNING

In the case of improper handling, all warranty claims will expire. In addition, the IGTM may lose its approvals.

Hints and symbols

DANGER

This warning informs you of imminent dangers that can occur as a result of incorrect operation/ misbehavior. If these situations are not avoided, death or serious injury may occur as a result.

WARNING

This warning informs you about possible dangerous situations that can occur due to incorrect operation/behavior. If these situations are not avoided, minor or slight injuries may occur as a result.

CAUTION

This note informs you about potentially dangerous situations that can occur due to incorrect operation/behavior. If these situations are not avoided, property damage to the device or in the environment may result.

NOTE

This warning informs you about potentially dangerous situations that can occur due to incorrect operation/behavior. If these situations are not avoided, property damage to the device or in the surroundings may occur as a result.

ACTION NOTE

This note provides recommended actions for proper handling of your device.

Validity of the instruction manual

This instruction manual describes the IGTM gas turbine meter. The IGTM is always only one component of a complex plant. The instructions of the other components of the plant must also be followed. If you find any inconsistent instructions, please contact vemm tec Messtechnik GmbH and/or the manufacturers of the other components.

Safety instructions

DANGER

Any work on the device must only be performed by trained personnel with the appropriate qualifications.

NOTE

During the work, pay attention to your local regulations for personal protection equipment.

DANGER

When using flammable gases within the hazardous area, never connect the IGTM to electronic, non-intrinsically safe electrical circuits.

NOTE

Ensure that all electrical connection specifications correspond to the device's requirements. Please follow any applicable local regulations in the country of installation. Use only cables that fit to the cable connections.

Intended use and field of application

The IGTM gas turbine meter is approved according to the European standard EN 12261 and suitable for use in hazardous areas of zone 1, see ATEX labeling

II 2G Ex h IIC T4 Gb

The IGTM-CT model series is approved for volume measurement in custody transfer.
The IGTM-WT model series is intended for volume measurement for internal measurements.

CAUTION

If damage occurs to the seals, the device is no longer protected against tampering. Without this protection, the device can no longer be used for custody transfer.

The devices are suitable for measurements of the following gas types

- ✓ flammable gases: Natural gas / city gas / propane / butane / etc.
- ✓ non-combustible gases: Air / Nitrogen / Inert gases / etc.

An overview of the suitable gas types are shown in the list of usable gases, other fields of application on request

Warranty of the manufacturer

For IGTM gas turbine meters supplied by vemm tec, we assume liability for faults in compliance with the General Terms and Conditions (GTC) of vemm tec Messtechnik GmbH for a period of 12 months after start of operation and 18 months after delivery. For spare parts supplied for the purpose of supplementary performance (elimination of the fault or delivery of a fault-free item), the remaining period of limitation shall apply as for the original goods, as if they had been a part of the original goods. The warranty does not apply to

a) Damages caused by unsuitable or improper use, faulty installation or start of operation by the purchaser or third parties, natural abrasion, faulty or improper handling or maintenance, unsuitable operating fluids or replacement materials, faulty installation work, chemical, electronic or electrical influences,

b) Devices, materials, parts or accessories from other manufacturers,

c) Correctness of all externally performed calibrations or testing.

Improper use includes damage to seals and not following this instruction manual.

vemm tec assumes no liability for the goods being suitable for the purpose desired by the customer if incomplete and incorrect information about the customer's requirements and operating conditions was provided with the order.

Within the above-mentioned warranty period, the original parts or complete IGTM that are the subject of complaint will be repaired, redelivered or refunded free of charge at our discretion. Provided that vemm tec has been notified in writing within the mentioned period, the complained parts or the complete IGTM have been sent to the address specified by vemm tec and the inspection by personnel authorized by vemm tec has proved that the conditions for liability for defects have been fulfilled. Externally performed calibrations or tests are not subject to liability for faults. If the vemm tec inspection shows that there is no obligation for subsequent performance, the customer will be charged for all costs incurred by vemm tec for this procedure. To remedy the defect, vemm tec shall take the above-mentioned measures, irrespective of whether the defect was already apparent or latent before delivery of the goods to the customer.

Goods delivered by vemm tec may only be returned after written confirmation by vemm tec. In the event of authorized return, vemm tec shall be entitled to charge the customer for the costs incurred for disassembly, collection and freight of the goods.

Excluded are, as far as legally permissible, all other further claims of the customer against vemm tec and our subcontractors, including claims for damages due to secondary damages and from the performance of the rework and new delivery, unless there is a case of gross negligence or intent on our part or liability is mandatory for the lack of warranted properties. Warranty claims must be addressed to vemm tec or to the vemm tec representative from whom the goods were originally ordered.

Device description

The **vemm tec gas turbine meter IGTM** (**International Gas Turbine Meter**) complies to all relevant international standards. The IGTM is available in two models as CT and WT:

The **IGTM-CT** model (**Custody Transfer**) is approved in the European Union (EU) and in many other countries worldwide for custody transfer. It provides high-precision gas volume measuring with a mechanical counter and high-frequency pulse generators. The IGTM-CT has a housing length of three times the nominal size (3 DN) and is applicable and approved for all common pressure ratings.

Figure 1 - the IGTM-CT

The **IGTM-WT** model (**Wafer Type**) is a meter for internal measurements. It has a shorter design with an aluminum housing, which can be mounted between two flanges. The IGTM-WT is only available for low pressure PN10/16 and ANSI 150. It is not approved for custody transfer.

Figure 2 - the IGTM-WT

Principle of operation

The principle of operation of the IGTM is based on a mechanical measurement of the gas flow. For this purpose, the gas flow is accelerated by gas flow conditioner at the meter inlet and is also cleaned from undesirable turbulences and asymmetries before the gas reaches the turbine wheel. The gas flow at the turbine blades generates a rotation of the turbine wheel, which has an almost linear relationship to the gas flow within a predefined measuring range (from Qmin to Qmax). Therefore, the rotating speed is a measurement value for the gas volume flowing through the turbine. To determine the gas volume, the rotating speed is transmitted to the counter head via an efficient mechanical transmission. In the counter head, it drives an adjusted roller register, which indicates the gas volume flowing through. In addition, high-frequency pulse generators can also be installed in the counter head (HF3 and HF4) or directly at the turbine wheel (HF1 and HF2), which detect the rotating speed of the turbine wheel and precisely determine the gas volume by using a correction factor (k-factor).

1	flow conditioner	**6**	oil pump
2	IGTM housing	**7**	temperature measuring ports
3	HF-NAMUR-pulse generators	**8**	turbine wheel
4	counter head with LF-REED-pulse generators	**9**	measuring unit with reference wheel
5	pressure measuring ports	**10**	measuring unit housing

Figure 3 – components IGTM

Counterhead

The counter head has protection class IP 67 according to IEC 60529, and is dustproof and protected against splashing water. The counter head is equipped with a special air filter that compensates the pressure drop between the counter head and the environment. Due to this feature, the IGTM can be installed outside, but we recommend the installation of a sun and weather protection covering the counter head. All offered IGTM plug-in connections for the pulse generators have also the protection class IP 67.

Figure 4 - counterhead IGTM

Each counter head is equipped with high quality bearings and polished low friction gears. To ensure that each conversion of the mechanical counter corresponds to the actual volume, a calibration is performed at the factory. As part of this factory calibration, the gear transmission ratio is checked and adjusted if necessary. These gears are located inside the counter head, although the head is sealed to protect against tampering. The total volume recorded is shown on a large eight-digit non-resettable roller register.

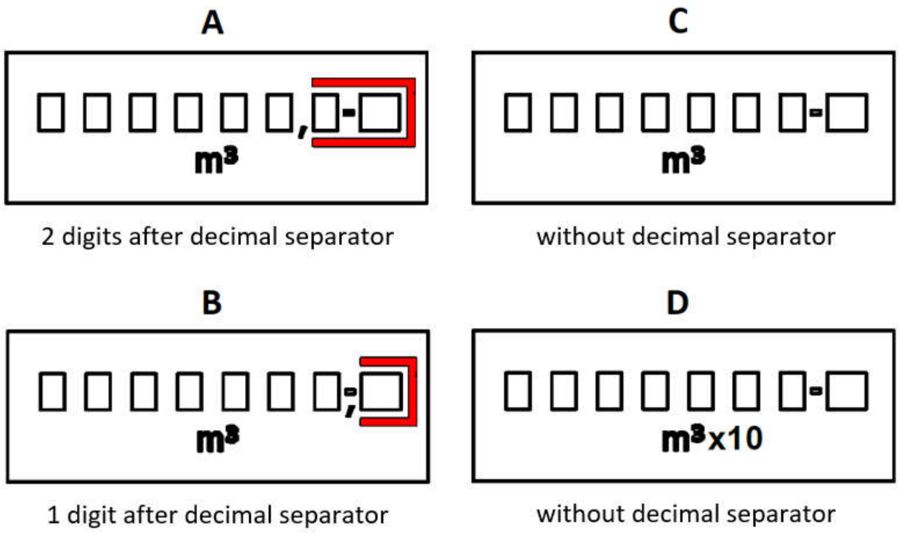


Figure 5 - Variations of the eight-digit roller register

NOTE

The hyphen in front of the last digit is used for exact reading of the strokes at the last roll it is not a decimal separator

For easy reading of the displayed volume value, the counter head can be rotated 350° without breaking the seals.

ACTION NOTE

To turn the counter head, loosen the two Allen screws on the left and right side of the counter head and the slotted screw on the rear side. Turn the top of the counter head cautiously with both hands and without lifting the counter head. After positioning, tighten the screws again with minimal effort.

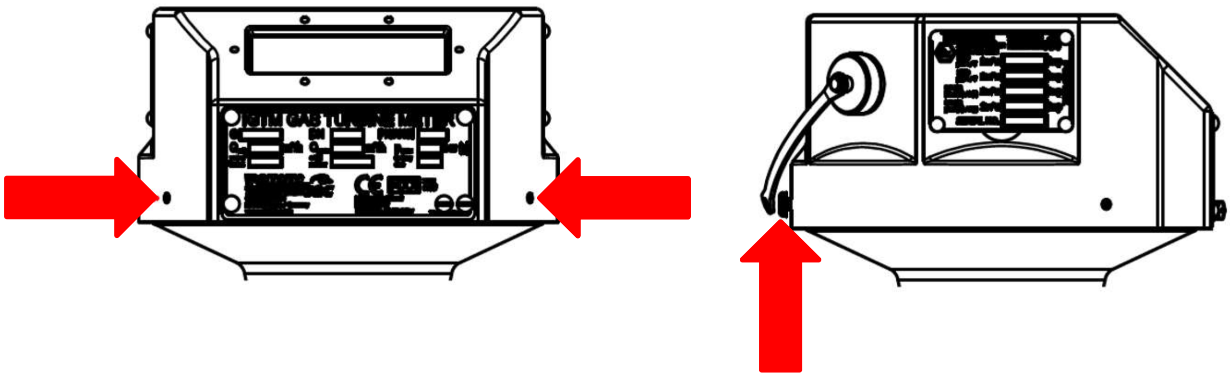


Figure 6 - Screwings of the counter head

CAUTION

Pay attention to the sealing of the counter head when turning it. If the seal is damaged, the device is no longer protected against tampering. Without protection the device can no longer be used for custody transfer.

Pulse generators

Your IGTM gas turbine meter can be equipped with a number of pulse generators. The pulse generators are suitable for use with electronic volume conversion device or flow computers. The following types of pulse generators can be equipped:

Table 1 – pulse generators IGTM

pulse generator	max. frequency	type	measuring position	description
1R1, 2R1	$f_{max} \leq 1$ Hz	LF-REED-pulse generator	counter head	1R1 is available as **standard LF-REED pulse generator** for IGTM-CT and WT, 2R1 is optionally available
1R10, 2R10	$f_{max} \leq 10$ Hz	LF-REED-pulse generator	counter head	1R10 and 2R10 are optionally available for IGTM-CT and WT, can only be used instead of 1R1 and 2R1
HF3, HF4	$f_{max} \leq 200$ Hz	HF-NAMUR-pulse generator	counter head	HF3 is available as **standard HF-NAMUR-pulse generator** for IGTM-CT, HF4 is optionally available
HF1, HF2	$f_{max} \leq 4500$ Hz	HF-NAMUR-pulse generator	turbine wheel or reference wheel	HF1 and HF2 are installed to the IGTM housing the measuring position is directly at the turbine wheel or reference wheel, optionally available for IGTM-CT

The connection sockets of all pulse generators of the counter head are "female" and located on the rear side of the counter head. The connection sockets of the HF1 and HF2 pulse generators are "male". Each socket has a pulse plate indicating the type of pulse generator, the k-factor (number of pulses per cubic meter) and the connecting pins with polarity.

Figure 7 – connection sockets pulse generators counter head

HF-NAMUR-signal HF3 or HF4
Pin 1 (+) Pin 2 (–)
LF-REED-signal 1R1, 1R10 or 2R1, 2R10
Pin 4 Pin 5
Tamperswitch (optional feature)
Pin 3 Pin 6

NOTE

Connectors for the connection can be ordered additionally with your measuring device. The connectors are generally delivered unassembled. On request, the connector can also be delivered fully assembled with a cable of the desired length.

LF-REED-pulse generators

As standard, the counter head of the IGTM is equipped with a low-frequency LF-REED pulse generator 1R1. One pulse will be emitted per revolution of the last digit roller of the roller register. Depending on the meter size, the measured volume per pulse can be 0.1 ; 1 ; 10 or 100 m³. In addition, a second LF-REED pulse generator 2R1 can be equipped.

NOTE

Optionally, the IGTM can also be equipped with one or two 1R10 LF-REED-pulse generators. This enables 10 pulses per revolution of the last digit roller of the roller register.

NOTE

A maximum of two LF-REED-pulse generators can be installed in the counter head.

NOTE

The low frequency REED signal can be used with a electronical volume conversion device which can be located in the hazardous area with the IGTM.

NOTE

LF-REED-pulse generators do not require a power supply to generate pulses. A 100 Ohm resistor is connected in series to the LF-REED pulse generator. When connecting the LF-REED pulse generator to non-intrinsically safe devices, an electrical safety barrier should be used.

HF-NAMUR-pulse generator

The HF-NAMUR-pulse generators produce a high-frequency signal according to the NAMUR-standard EN 60947-5/6 of 8.2V at a direct current supply between 1.2mA and 2.1mA. The HF-NAMUR-pulse generators cannot be used in combination with battery-powered devices. An additional external voltage supply is required.

The HF3 HF-NAMUR-pulse generator is equipped as standard in the counter head of the CT-models. The HF3 produces a high-frequency signal up to 200 Hz, which is generated by means of a rotating pulse generator disk. Optionally, a second HF4 pulse generator can be added to the counter head. The HF4 generates pulses with the identical frequency as the HF3.

Furthermore, the IGTM-CT can be equipped with one or two HF-NAMUR-pulse generators in the housing of the gas turbine meter (HF1, HF2). The HF1 and HF2 generates a pulse for each blade of the turbine wheel passing by. CT models from DN100 and above use the HF2 with a reference wheel for the pulse generation, it rotates synchronously with the turbine wheel.

HF-NAMUR-signal HF1 or HF2

Pin 1 (+)
Pin 2 (–)

Examples of applications for two HF NAMUR pulse generators:

Verification of the integrity of the pulse signal

Possible in combination of HF1/HF2 or HF3/HF4. The number of pulses of the HF pulse generators has to be compared.

Verification of the integrity of the turbine wheel

Possible in combination of HF1/HF2. The number of pulses generated by HF1 and HF2 has to be compared

Verification of the flow direction or reverse flow

possible in combination of HF1/HF2 or HF3/HF4. With the phase offset of the HF pulses, the flow direction of the gas can be detected and simultaneously any reverse flow can be identified.

The pulse frequency under maximum flow of HF-NAMUR-pulse generators is depending on the meter size. The k-factor (pulses per m^3) for your turbine meter is calculated during the calibration of the meter and is shown on the pulse plates and on the calibration certificate. The calibrated k-factor is the correction factor for your volume calculations or electronical volume conversion device or flow computer.

Temperature measuring ports

The IGTM can be equipped with up to two temperature sensors for measuring the gas temperature. For this purpose, up to 2 thermowells are available for the IGTM housing.

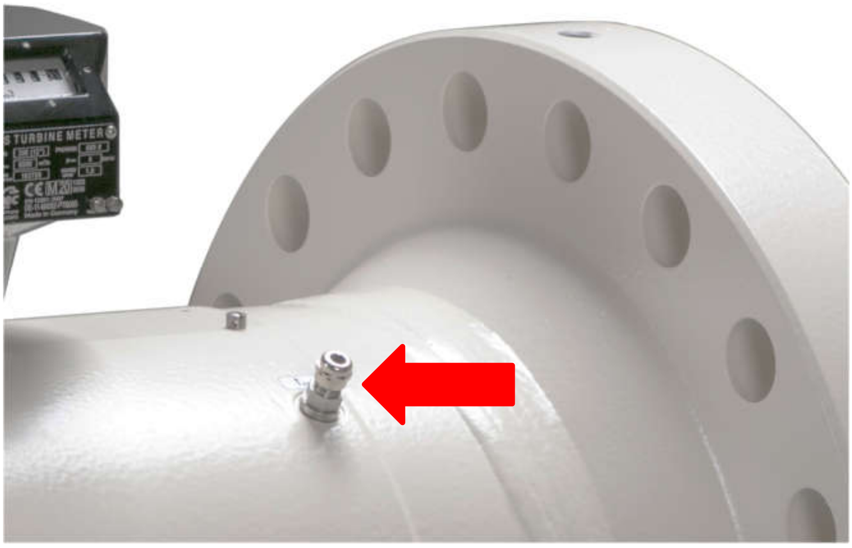


Figure 8 – Temperature measuring ports IGTM

NOTE

Meter housings without temperature measuring points must use external temperature measuring ports located at the outlet of the meter. These must only be installed within a distance of max. 600mm or three times the nominal size away from the meter.

Pressure measuring ports

For measuring the static gas pressure in the pipeline, a pressure measuring port is provided at the IGTM housing. The pressure measuring port is labeled with **Pm** or **Pr**. The pressure port is available with a G 1/8 internal screw thread for 6mm steel pipe. Other pressure port options such as ½" NPT or M12x1.5 are also available on request.

Figure 9 – Pressure measuring ports IGTM

CAUTION

The provided pressure port is not suitable for ¼" pipes. For this type of pipe, the pressure port must be replaced to match. Inform our sales representative when ordering if you want to use ¼" pipe.

Lubrication device

The **IGTM-CT** series is generally equipped with a lubrication device. The variant and operation of the oil pump depends on the nominal size of the meter:

The **IGTM-WT** series will be delivered up to DN 100 with permanent lubricated bearings without oil pump. Only from DN 150 lubrication devices are necessary for the operation as for the IGTM-CT series.

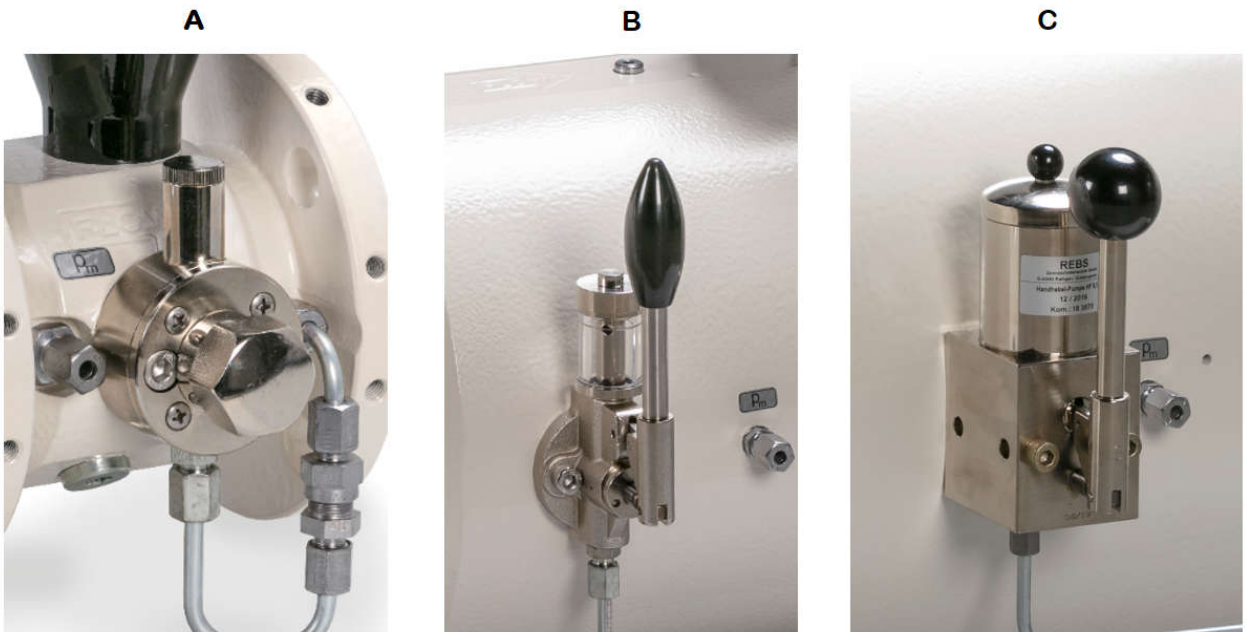


Figure 10 - Variants of oil pumps IGTM

Variant A – IGTM-CT DN 50 to DN 100 and IGTM-WT DN 150 to DN 200 – oil pump with pushbutton
After removing the rotatable cover, the oil pump is ready for operation. Lubrication is performed by pressing several times the underneath located pushbutton
Variant B – IGTM-CT DN 150 to DN 250 – Oil pump with a lever (small version)
The oil pump is ready for operation. Lubrication is performed by moving the lever several times in the direction towards the IGTM.
Variant C – IGTM-CT DN 300 and above – Oil pump with a lever (large version)
The oil pump is ready for operation. Lubrication is performed by moving the lever several times in the direction towards the IGTM.

CAUTION

For operation of the lubrication device, ensure sufficient space of at least 5cm to any obstacle.

CAUTION

Initial lubrication of the ball bearings must be performed when starting up the IGTM. More detailed information is provided in the chapter Installation and initial operation

NOTE

IGTM-CT from DN 50 to DN 100 with pressure ratings PN10/16 or ANSI 150 can also be delivered with permanent lubricated bearings without oil pump.

NOTE

Use only lubricating oils of the brand ISOFLEX PDP 38 or equivalent. For gas temperatures higher than -10°C it is also suitable to use the brand Shell MORLINA S2.

Installation and initial operation

Scope of delivery

The **contents of each package** are checked for completeness and approved by quality assurance personnel before shipment

- ✓ IGTM gas turbine meter
- ✓ Liquid lubricant for initial lubrication and two years of operation (only necessary for IGTM with lubrication device)
- ✓ Connector for pulse generator in meter head (if ordered)
- ✓ Connectors for pulse generator on housing (if ordered)
- ✓ Copy of documents of calibration of the meter (if required)
- ✓ Copy of documents of leak and strength test of the housing (if required)
- ✓ The Instruction Manual (Printed or as PDF)

The **original certificates** are delivered separately and the following documents can be provided

- ✓ Inspection certificate in accordance to EN 10204 - 3.1 or 3.2 (if required)
- ✓ Certificate of the material strength test of the IGTM housing
- ✓ Certificate of the leak test of the IGTM
- ✓ CE - declaration of conformity of the manufacturer
- ✓ Calibration certificate of the atmospherical calibration
- ✓ Calibration certificate of the high pressure calibration (if required)
- ✓ additional documentation for ATEX
- ✓ Full material documentation for all parts that are subject of PED - pressure equipment directive
- ✓ Full welding documentation

NOTE

Check the measuring device and the accessories for completeness and damages using the order confirmation and the delivery document. Please contact your vendor immediately if the goods are incomplete or damaged.

Transport and storage

The IGTM gas turbine meter is a high-precision measuring device, proper handling is required.

NOTE

Do not lift the meter using the counter head.

NOTE

Use the provided transport lugs to lift the measuring device.

NOTE

Take precautions to protect the meter from shocks or impacts during transport.

NOTE

Store the device in its original packaging to avoid any damage..

NOTE

The IGTM should be stored in a dry and dust-free place, at temperatures from -25°C to +55°C.

NOTE

If the IGTM will be stored longer than 3 months or proper storage conditions are not possible, vemm tec recommends an effectiv preservation against corrosion of the IGTM.

Mounting position and flow direction

Your IGTM is a mechanical measuring device that can only work effectively if the following instructions for installation are followed.

NOTE

Install the meter preferably indoors. For outdoor installation, the meter must be protected from direct sunlight and adverse weather conditions.

The specified **flow direction** for the meter is indicated on the meter with an arrow →

CAUTION

Pay attention to the correct flow direction, reverse flowing gas can damage the meter.

The required mounting position of the meter is shown on the meter's plate on the backside of the counter head.

H for horizontal **V** for vertical **HV** for horizontal and vertical

The IGTM is by default configured for horizontal mounting only. Meters up to DN 100 are suitable for vertical use as well.

CAUTION

For vertical mounting, an additional adapter for the oil pump is required. When ordering, please inform our sales representatives about the mounting position of the meter

Installation instructions

CAUTION

Ensure that only trained and qualified personnel are involved in the installation of the IGTM.

CAUTION

During installation, pay attention to the safety regulations in force on site.

CAUTION

During installation, pay attention to the flow direction of the meter as shown on the housing.

WARNING

Use only screw connections for the installation that are suitable for the intended use of the meter and for the pressure rating of the meter. Read the standards that are applicable to you.

WARNING

Use only gaskets that are suitable for the operating medium and the flange connection. Read the standards that are applicable to you.

ACTION NOTE

Align the gasket always concentrically to the contact surface and avoid that the gasket extends into the inlet and outlet pipe.

Inlet and outlet section

The inlet and outlet section is a straight piece of pipe with the same nominal diameter as the IGTM that is upstream and downstream of the meter without any control or safety valves, filters, T-pieces, etc. For the application of the IGTM, a minimum length of twice the nominal size must be ensured for the inlet and outlet section.

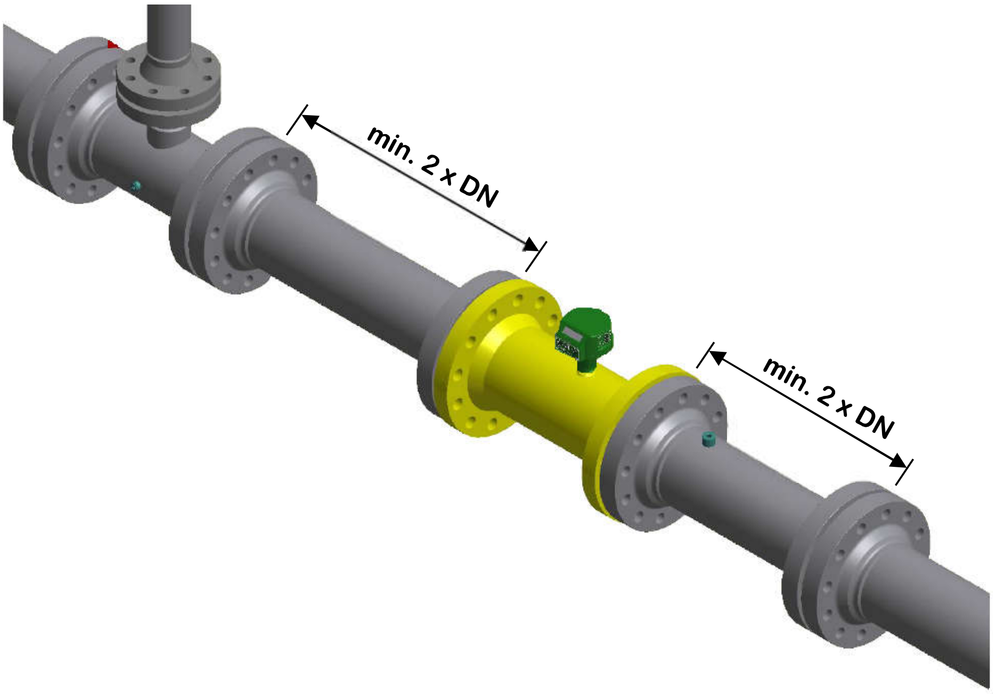


Figure 11 - Inlet and outlet section IGTM

vemm tec recommends for IGTM-CT with **accuracy class 0.5** an inlet section of **at least 5 x DN** without control or safety valves, filters, T-pieces, etc.

Initial lubrication

Before the start-up, the lubrication device must be filled, because the IGTM is delivered without oil in the lubrication device. For permanently lubricated IGTM without oil pump, no lubrication of the bearings is required for start-up.

ACTION NOTE

Use the included lubricating oil bottle, which is sufficient for two years with normal application and clean and dry gas.

ACTION NOTE

Fill the oil into the reservoir provided on the pump and then tighten the top to prevent contamination of the oil.

ACTION NOTE

At this point, push the filled pump to fill the lubrication system with oil. The minimum number of the required pumping strokes is shown in the Table 2.

ACTION NOTE

Check the oil level in between. It will be needed to refill the oil reservoir.

Table 2 - Lubricating oil quantity at start-up

DN	IGTM-CT	IGTM-WT
50	24 Strokes = 3,4 cm³	permanently lubricated
80	26 Strokes = 3,7cm³	permanently lubricated
100	26 Strokes = 3,7cm³	permanently lubricated
150	8 Strokes = 4 cm³	29 Strokes = 4,1 cm³
200	12 Strokes = 6 cm³	29 Strokes = 4,1 cm³
250	12 Strokes = 6 cm³	--
300	20 Strokes = 10 cm³	--
400	20 Strokes = 10 cm³	--
500	20 Strokes = 10 cm³	--

NOTE

After initial operation, lubrication of the bearings must be performed at periodic intervals, see section Maintenance. Periodic use of lubricating oil is necessary for constant friction of the bearings and for cleaning.

Initial operation

CAUTION

When starting up the IGTM, initial lubrication of the bearings must be performed.

CAUTION

Fill the pipeline slowly up to the operating pressure.

CAUTION

The maximum rate that the pressure increases must not be higher than 350mbar/s and do not exceed the permissible Qmax of the meter by more than 20% when filling.

ACTION NOTE

After the filling process, perform a leak check of all flange connections.

Maintenance

In order to obtain a long service life of your IGTM, we recommend performing maintenance of the meter periodically. If the gas is clean and dry, a performed maintenance is effective for 3 months. Damp gas or dirty gas will reduce the effectiveness time of the lubrication. Shorter maintenance intervals of less than 3 months are recommended by vemm tec.

Generally, each IGTM-CT is equipped with an oil pump. Optionally, IGTM-CT up to DN 100 can be delivered with permanently lubricated bearings and without oil pump. The permanently lubricated versions are free of maintenance.

Maintenance intervals

Meters equipped with an oil pump must be lubricated periodically as shown in Table 3. In general applications (clean and dry gas, normal operating conditions) lubrication is sufficient for 3 months. In case of dirty gas or adverse operating conditions, lubrication needs to be performed more frequently.

Table 3 – Lubricating oil quantity for maintenance intervals

DN	IGTM-CT	IGTM-WT	Wartungsintervall
50	7 Strokes = 1 cm³	permanently lubricated	3 months* / 14days**
80	7 Strokes = 1 cm³	permanently lubricated	3 months* / 14days**
100	10 Strokes = 1,4 cm³	permanently lubricated	3 months* / 14days**
150	6 Strokes = 3 cm³	22 Strokes = 3,1 cm³	3 months* / 14days**
200	6 Strokes = 3 cm³	22 Strokes = 3,1 cm³	3 months* / 14days**
250	6 Strokes = 3 cm³	--	3 months* / 7days**
300	6 Strokes = 3 cm³	--	3 months* / 7days**
400	6 Strokes = 3 cm³	--	3 months* / daily**
500	6 Strokes = 3 cm³	--	3 months* / daily**

)** regular lubrication requirement *)** higher lubrication requirements for specific gases (see list of usable gases)

CAUTION

Over-lubrication can result higher measurement uncertainties in the lower flow range of the meter.

NOTE

Ensure that the oil reservoir is always tightened after filling to avoid contamination of the oil.

NOTE

If major parts of the meter are exchanged (turbine wheel, bearings, gears, or assemblies), a new calibration of the meter is required to ensure measurement accuracy.

Deinstallation instructions

DANGER

Perform deinstallation only when the pipeline is not under pressure. Do not uninstall a meter that is under pressure.

CAUTION

Ensure that only trained and qualified personnel perform the deinstallation of the IGTM.

CAUTION

During deinstallation, pay attention to the safety regulations in force on site.

CAUTION

The pressure drop must not exceed 350mbar/s and when reducing the pressure do not exceed the permissible Qmax of the meter by more than 20%.

CAUTION

Pay attention to the sealing during deinstallation. If seals and labels are removed, damaged or painted, the calibration of the meter is void. The warranty conditions specified in this manual only apply if all seals and labels are undamaged and complete.

Technical specifications

Table 4 - specifications IGTM

specifications	IGTM-CT		IGTM-WT
accuracy class	1.0 or 0.5		1.5
size	G40 to G10000		G40 to G1600
housing material	gray cast iron	steel	aluminum
nominal size	DN50 to DN250	DN50 to DN500	DN50 to DN200
pressure rating	PN10 / PN16 ANSI 150	PN10 to PN100 ANSI 150 bis ANSI 600	PN10 / PN16 ANSI 150
operating pressure	max. 20bar	max. 103bar	max. 20bar
gas temperature	-25°C to +55°C		-25°C to +55°C
protection class	IP67		IP67

Measuring range

The permissible measuring range of the IGTM-CT in the low pressure range from 0 to 4 bar (g) is 1:20 or optionally 1:30 (Q_{min} /Q_{max}). For special applications for gases with a density of less than 0.6, the measuring range may be limited to 1:10 or 1:5.

In the high pressure range of more than 16 bar (g), the permissible measuring range of the IGTM-CT can be increased to 1:50.

NOTE

The permissible measuring range of the IGTM is determined by national regulations or approvals. Please inform yourself in advance about the legal regulations prescribed in your country.

Accuracy classes and error limits

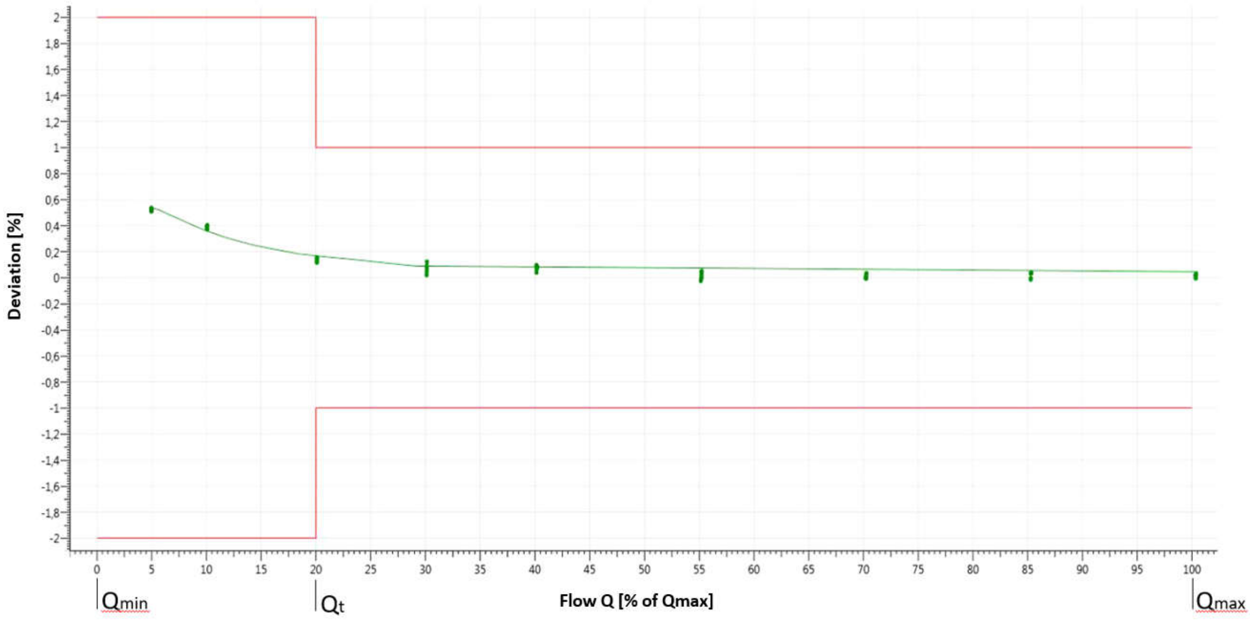


Figure 12 - measuring range and error limits

The permissible error limits of the **IGTM-CT** in **accuracy class 1.0**

- in the upper flow range: **± 1,0 % from $Q_t \leq Q \leq Q_{max}$**
- in the lower flow range: **± 2,0 % from $Q_{min} \leq Q \leq Q_t$**

Optionally, the **IGTM-CT** can be delivered in **accuracy class 0.5** with the following error limits

- in the upper flow range: **± 0,5 % from $Q_t \leq Q \leq Q_{max}$**
- in the lower flow range: **± 1,0 % from $Q_{min} \leq Q \leq Q_t$**

The permissible error limits of the **IGTM-WT** in **accuracy class 1.5**

- in the upper flow range: **± 1,5 % from $Q_t \leq Q \leq Q_{max}$**
- in the lower flow range: **± 3,0 % from $Q_{min} \leq Q \leq Q_t$**

The **repeatability** of the measurement of each flow point for the IGTM is **± 0.1 %** or better

The **transition flow** Q_t depends on the measuring range

Q_t = 20 % of Qmax for measuring range 1:20 and smaller

Q_t = 15 % of Qmax for measuring range 1:30

Q_t = 10 % of Qmax for measuring range 1:50 and higher

Performance data overview

Table 5 - Pressure loss Δp and Qmin IGTM-CT

DN	Size	Qmax m^3/h	max. Δp at Qmax mbar	Qmin 1:10 m^3/h	Qmin 1:20 m^3/h	Qmin 1:30 m^3/h
50	G 40	65	5	6.5	--	--
	G 65	100	10.4	10	5	--
80	G 100	160	5.1	16	8	--
	G 160	250	11.8	25	13	8
	G 250	400	23.8	40	20	13
100	G 160	250	3.5	25	13	--
	G 250	400	7.7	40	20	13
	G 400	650	15.8	65	32	20
150	G 400	650	5.8	65	32	20
	G 650	1000	13.8	100	50	32
	G 1000	1600	24.8	160	80	50
200	G 650	1000	2.5	100	50	32
	G 1000	1600	6.3	160	80	50
	G 1600	2500	13.5	250	130	80
250	G 1000	1600	3.3	160	80	50
	G 1600	2500	8.0	250	130	80
	G 2500	4000	16.3	400	200	130
300	G 1600	2500	3.1	250	130	80
	G 2500	4000	7.9	400	200	130
	G 4000	6500	18.7	650	320	200
400	G 2500	4000	5.0	400	200	130
	G 4000	6500	8.1	650	320	200
	G 6500	10000	15.9	1000	500	320
500	G 4000	6500	2.4	650	320	200
	G 6500	10000	4.9	1000	500	320
	G 10000	16000	8.6	1600	800	500

Table 6 – pulse values IGTM-CT

DN	Size	Qmax m³/h	pulse values 1R1 & 2R1 Imp/m³	pulse values 1R10 & 2R10 Imp/m³	pulse values HF3 & HF4 Imp/m³	pulse values HF1 & HF2 Imp/m³
50	G 40	65	10	100	4350	153000
	G 65	100	10	100	4350	153000
80	G 100	160	1	10	1250	44000
	G 160	250	1	10	1250	44000
	G 250	400	1	10	700	25500
100	G 160	250	1	10	790	17000
	G 250	400	1	10	790	17000
	G 400	650	1	10	435	9500
150	G 400	650	1	10	375	6500
	G 650	1000	1	10	375	6500
	G 1000	1600	0.1	1	130	2100
200	G 650	1000	0.1	1	150	2800
	G 1000	1600	0.1	1	150	2800
	G 1600	2500	0.1	1	85	1575
250	G 1000	1600	0.1	1	140	1625
	G 1600	2500	0.1	1	140	1625
	G 2500	4000	0.1	1	80	920
300	G 1600	2500	0.1	1	85	970
	G 2500	4000	0.1	1	85	970
	G 4000	6500	0.1	1	70	650
400	G 2500	4000	0.1	1	55	540
	G 4000	6500	0.1	1	55	540
	G 6500	10000	0.1	1	30	310
500	G 4000	6500	0.1	1	40	310
	G 6500	10000	0.1	1	40	310
	G 10000	16000	0.01	0.1	8	170

Table 7 – Pressure loss Δp, pulse values, Qmin IGTM-WT

DN	Size	Qmax m^3/h	Qmin m^3/h	max. Δp at Qmax mbar	pulse values 1R1 & 2R1 Imp/m^3	pulse values 1R10 & 2R10 Imp/m^3	pulse values HF3 & HF4 Imp/m^3
50	G 40 + 65	100	6	5	10	100	4350
65	G 100	160	13	8	10	100	7200
80	G 100 + 160	250	10	5.1	1	10	1250
	G 250	400	20	23.8	1	10	700
100	G 160 + 250	400	13	3.5	1	10	790
	G 400	650	32	15.8	1	10	435
150	G 400 + 650	1000	32	5.8	1	10	375
	G 1000	1600	80	24.8	0.1	1	130
200	G 650 + 1000	1600	50	2.5	0.1	1	150
	G 1600	2500	130	13.5	0.1	1	85

Dimensions and weight

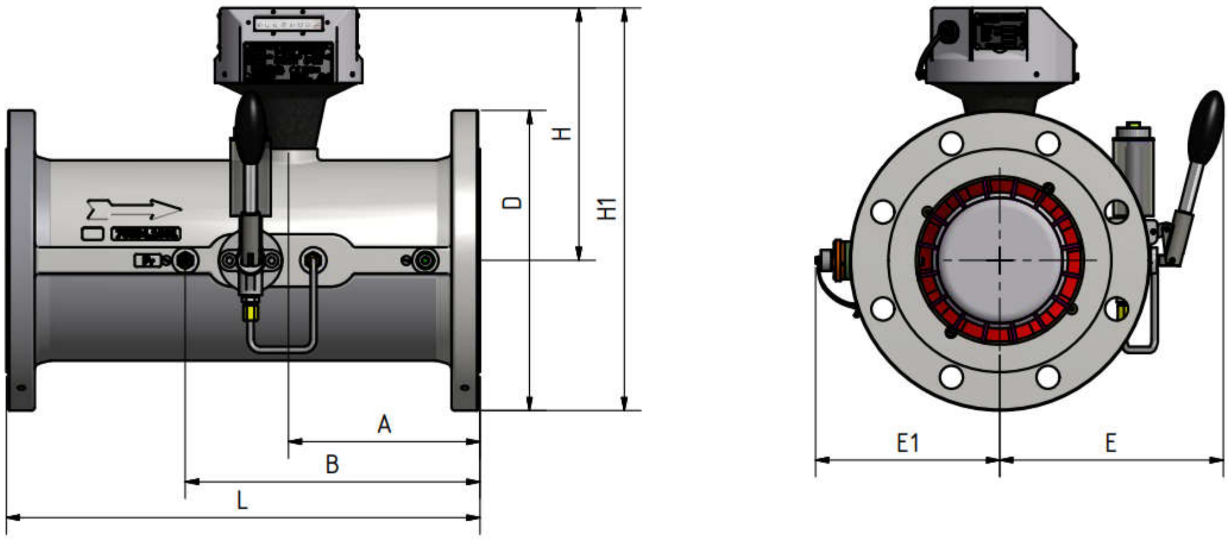


Figure 13 – dimensions IGTM-CT

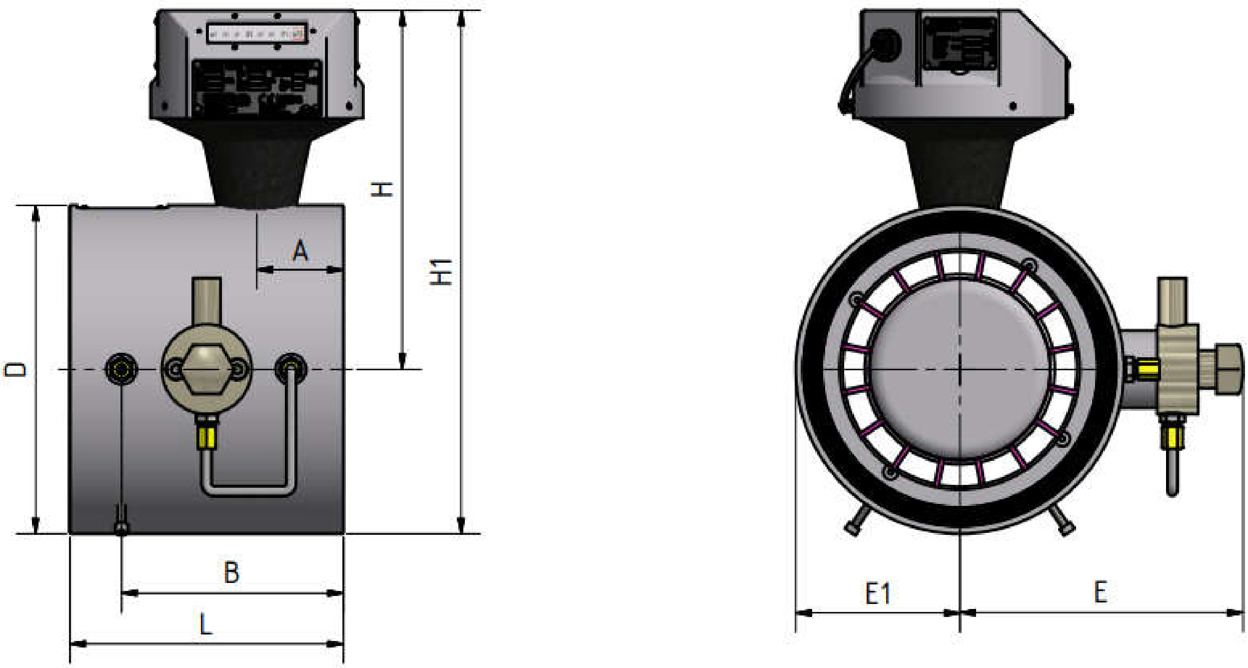


Figure 14 – dimensions IGTM-WT

Table 8 - Dimensions and weight IGTM-CT

DN	pressure rating	housing material	A mm	B mm	E mm	D mm	H mm	H1 mm	L mm	weight kg
50	PN 10/16, ANSI 150	Gray cast iron	62	109	102	165	215	298	150	11
	PN 10/16, ANSI 150	Steel			127		200	283		24
	PN 25/40, ANSI 300	Steel			127		200	283		24
	PN63/100, ANSI 600	Steel			127		200	283		24
80	PN 10/16, ANSI 150	Gray cast iron	92	160	120	200	205	305	240	17
	PN 10/16, ANSI 150	Steel				191	192	288		26
	PN 25/40, ANSI 300	Steel				210	192	297		28
	PN63/100, ANSI 600	Steel				210	192	297		29
100	PN 10/16, ANSI 150	Gray cast iron	120	205	135	220	230	340	300	27
	PN 10/16, ANSI 150	Steel			140	229	215	330		36
	PN 25/40, ANSI 300	Steel			140	254	215	342		43
	PN63/100, ANSI 600	Steel			140	273	215	352		50
150	PN 10/16, ANSI 150	Gray cast iron	182	280	190	285	255	398	450	45
	PN 10/16, ANSI 150	Steel			215	285	250	393		63
	PN 25/40, ANSI 300	Steel			215	300	250	400		70
	PN63/100, ANSI 600	Steel			215	345	250	423		100
200	PN 10/16, ANSI 150	Gray cast iron	240	340	230	340	270	440	600	76
	PN 10/16, ANSI 150	Steel				340		440		83
	PN 25/40, ANSI 300	Steel				360		450		106
	PN63/100, ANSI 600	Steel				375		458		155
250	PN 10/16, ANSI 150	Steel	300	415	240	395	285	483	750	110
	PN 25/40, ANSI 300	Steel				425		498		150
	PN63/100, ANSI 600	Steel				450		510		240
300	PN 10/16, ANSI 150	Steel	360	385	260	445	320	543	900	160
	PN 25/40, ANSI 300	Steel				485		563		210
	PN63/100, ANSI 600	Steel				515		578		290
400	PN 10/16, ANSI 150	Steel	480	625	300	565	355	638	1200	430
	PN 25/40, ANSI 300	Steel						645		450
	PN63/100, ANSI 600	Steel						665		590
500	PN 10/16, ANSI 150	Steel	600	730	390	670	375	710	1500	620
	PN 25/40, ANSI 300	Steel				715		735		740
	PN63/100, ANSI 600	Steel				730		742		925

Table 9 - Dimensions and weight IGTM-WT

DN	pressure rating	housing material	A mm	B mm	E mm	D mm	H mm	H1 mm	L mm	weight kg
50	PN 10/16 ANSI 150	Aluminum	31,5	87	-	102	176	227		3.6
65	PN 10/16 ANSI 150	Aluminum	31,5	87	-	122	189	250	120	4.7
80	PN 10/16 ANSI 150	Aluminum	26,5	82	-	138	197	266		5.1
100	PN 10/16 ANSI 150	Aluminum	51	123	-	158	207	286	150	6.8
150	PN 10/16 ANSI 150	Aluminum	57	146	190	216	235	343	180	12.8
200	PN 10/16 ANSI 150	Aluminum	69	150	218	270	262	397	200	19.2

Norms, standards and regulations

International	
OIML R 6	General regulations for volumetric gas meters (replaced by R137)
OIML R 32	Rotary piston meter and gas turbine meter (replaced by R137)
OIML R 137-1	Gas meters - Part 1: Requirements (replaces R6, R31 and R32)
ISO 9951	Gas flow measurement in closed pipes - Turbine meters (replaced by EN 12261)
AGA 7	Gas measurement with turbine meters
EN 12261	Gas meter - gas turbine meter
EN IEC 60079-0	Electrical equipment for potentially hazardous areas

European Union – EU	
2014/32/EU (MID)	European Measuring Instruments Directive
2014/68/EU (PED)	European Pressure Equipment Directive
2014/34/EU (ATEX)	European ATEX - Directive: Equipment and protective systems intended for use in hazardous areas
2011/65/EU (RoHS)	European Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment

National – Germany	
DIN 30690-1	Components in gas supply installations - Part 1: Requirements for components in gas supply installations

PTB

PTB-A 7.1	Volume gas meters
PTB-Prüfregeln Band 29	Gas meters - testing of volume gas meters with air at atmospheric pressure
PTB-Prüfregeln Band 30	High pressure testing of gas meters
TR G 13	Installation and operation of turbine meters

DVGW

G 260/I	Gas composition
G 260/II	Supplementary rules for gases of the 2nd gas family
G 261	Gas quality test
G 285	Note for hydrate inhibition in natural gases with methanol.
G 469	Pressure test methods for gas supply pipelines and installations
G 486	Real gas factors and compressibility numbers of natural gases -. Calculation and application
G 486-B2:2005-12	Supplementary requirements for the calculation and application of real gas factors and compressibility numbers of natural gases
G 491	Gas pressure regulating stations for inlet pressures above 4 to 100 bar - Planning, manufacturing, erection, testing, commissioning
G 492/II	Systems for gas volume measurement with an operating pressure above 4 bar up to 100 bar - planning and erection
G 493	Procedure of issuing a DVGW certificate for manufacturers of gas pressure regulating and gas metering stations
G 495:2006-07	Gas installations - Maintenance; Worksheet

Usable gases

Gas	Symbol	density	CT	WT	version of IGTM housing	remark
Acetylene	C_2H_2	1,17	X		SA**	Teflon coating required
Ammonia*	NH_3	0,77	X		Standard	Viton O-rings required
Argon	Ar	1,78	X	X	Standard	
Biogas			X		SA**	Measuring unit SA**, Viton O-rings required
Butane	C_4H_{10}	2,70	X	X	Standard	
Natural gas		0,83	X	X	Standard	
Ethan	C_2H_6	1,36	X	X	Standard	
Ethylene (gaseous)	C_2H_4	1,26	X		Standard	Measuring unit SA**
Lazy gas*			X		SA**	Viton O-rings required
Freon (gaseous)*	CCl_2F_2	5,66	X		Standard	Viton O-rings required
Helium	He	0,18	X	X	SA**	Measuring unit SA**
Carbon dioxide	CO_2	1,98	X	X	Standard	
Carbon monoxide	CO	1,25	X		Standard	
Air		1,29	X	X	Standard	
Methane	CH_4	0,72	X	X	Standard	
Pentane	C_5H_{12}	3,46	X	X	Standard	
Propane	C_3H_8	2,02	X	X	Standard	
Propylene (gaseous)	C_3H_6	1,92	X		Standard	Measuring unit SA**
Acid gas*			X		SA**	Measuring unit SA**, Viton O-rings required
Sulfur dioxide (0,2%)	SO_2	2,93	X		SA**	Measuring unit SA**
Hydrogen sulfide (0,2%)*	H_2S	1,54	X		SA**	Measuring unit SA**, Viton O-rings required
City gas		0,90	X		Standard	
Nitrogen	N_2	1,25	X	X	Standard	
Hydrogen	H_2	0,09	X		SA**	smaller measuring range

*) higher lubrication requirement **) Special application

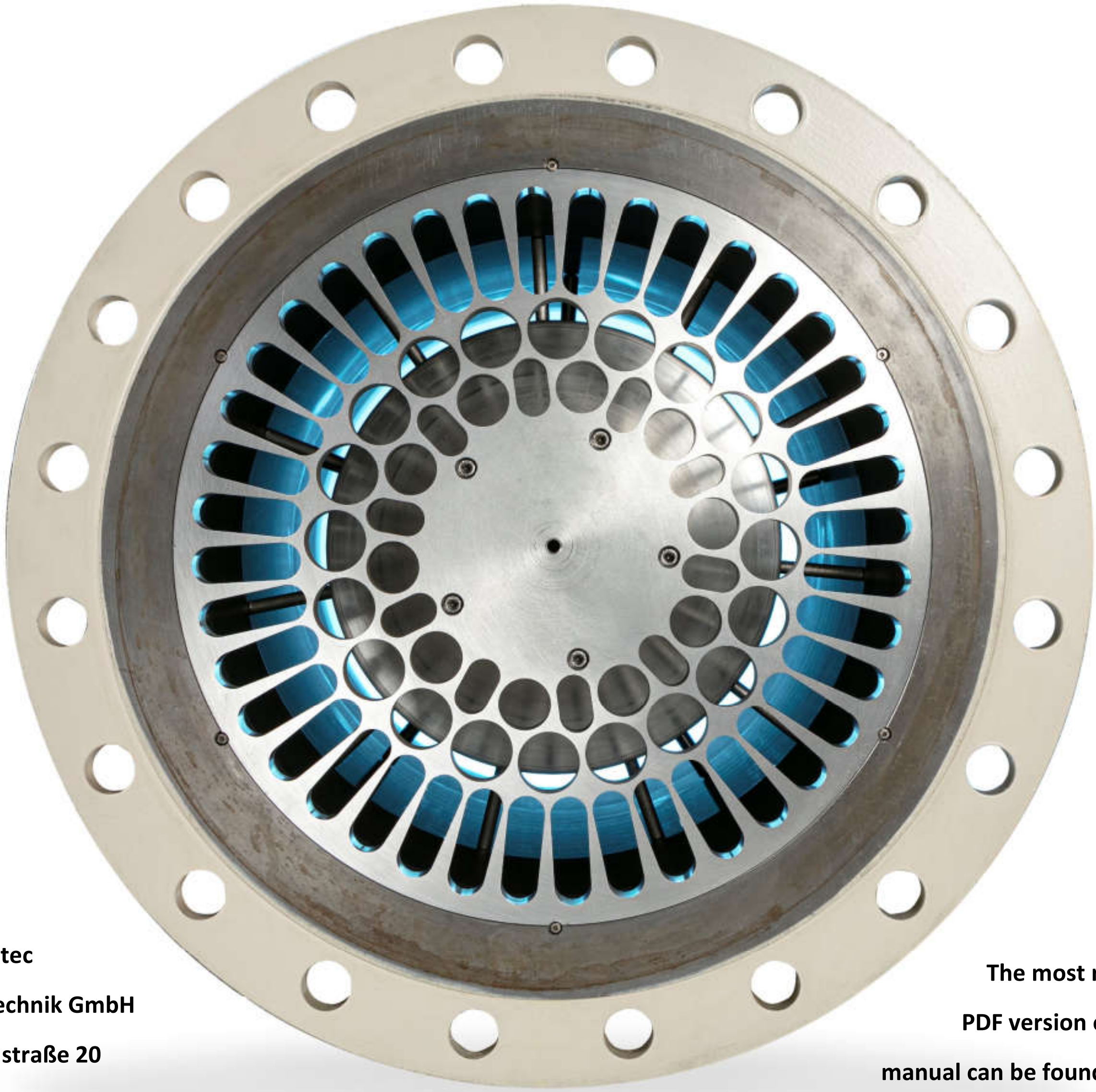
Environmental commitment

vemm tec is committed to making a contribution to the environment. We want to reduce possible harmful influences of our products on the environment during their life cycle as far as possible. This includes the recycling of our products at the end of their life cycle and also the waste generated during the production process.

The end of the life cycle is not directly traceable by us, as it is up to you as the user to decide when and to which extent our products are disposed to. Almost all parts of our products can be recycled after disassembly.

The main parts that should be recycled are the housing (steel or cast iron), the measuring mechanism and the counter head, and some other parts made of aluminum or stainless steel. Based on the total weight, more than 70% of the products can be recycled without any problems.

However, at the end of the life cycle of our products, you are welcome to contact vemm tec for advice on the possibilities of recycling or returning the complete product to vemm tec for disposal (>95%).



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