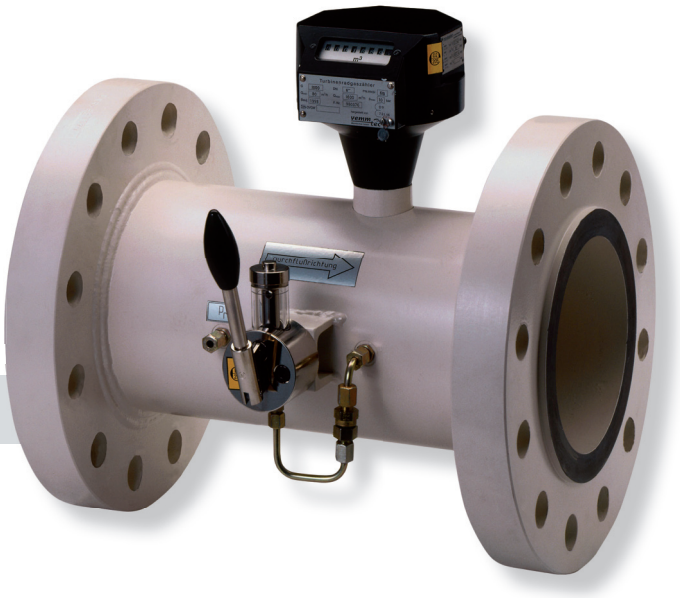
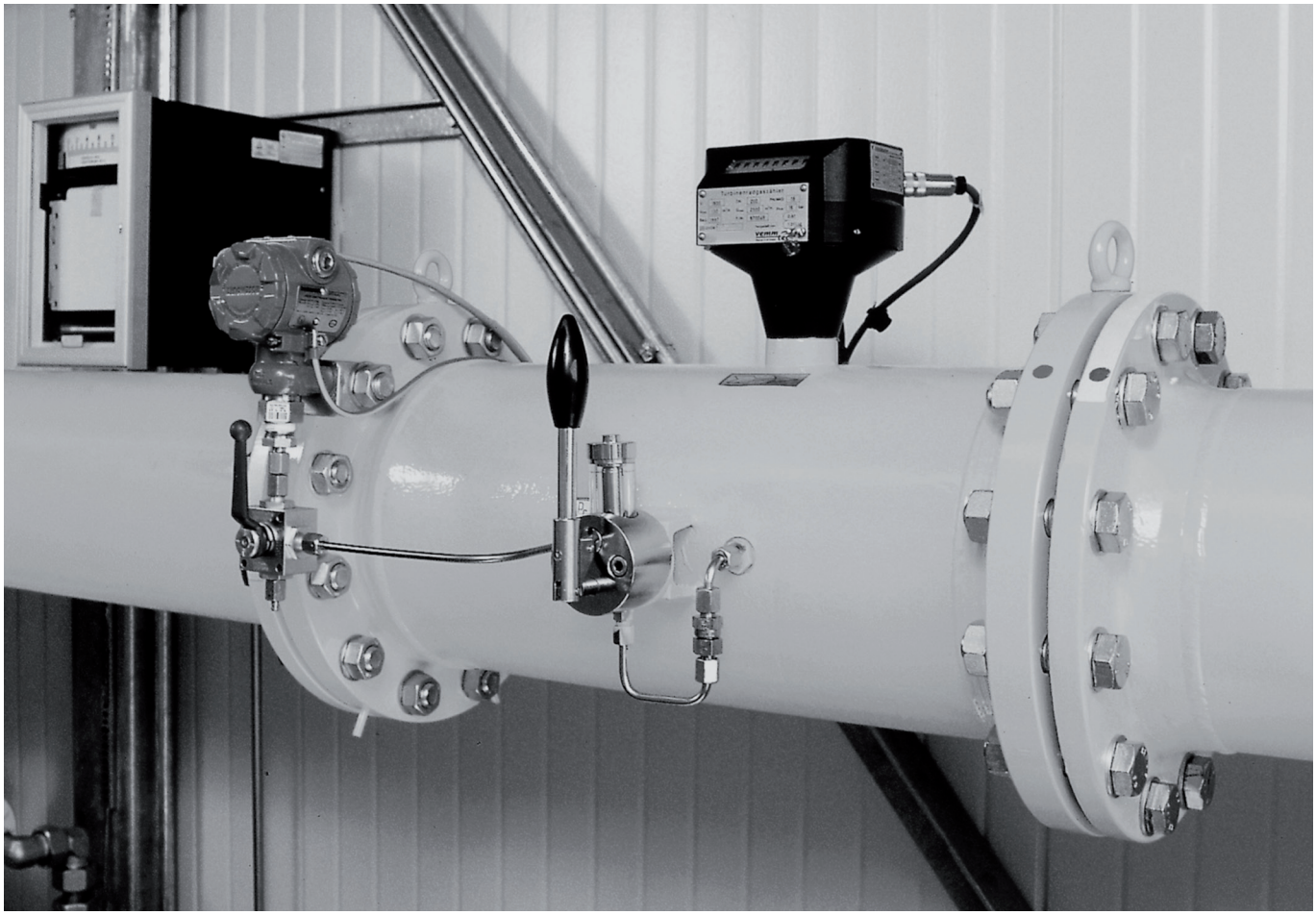
Pietro Fiorentini



IGTM-CT
Gas Turbine Meter

with electronic outputs and mechanical counter

Documentation and Technical Specifications



General

The IGTM-CT Gas Turbine Meter is a highly accurate flow meter, approved for custody transfer measurement, equipped with electronic pulse outputs and a mechanical counter. This document explains the performance, ranges, dimensions, calibration and outputs of the instrument. It details the installation, safety requirements and material specifications. The IGTM-CT measures gas volume flowing through an annular passage in the meter. The flowing gas volume is totalised on a local mechanical counter. In addition, low or high frequency pulse signals are generated to infer the gas flow and volume. The indicated gas volume is the actual volume flowing through the meter at the actual temperature and pressure. The IGTM is available in two models: CT and WT. The IGTM-CT is used for high accuracy and custody transfer applications. The IGTM-WT is an economically priced meter with a good accuracy and suitable for all other applications. A dedicated specification sheet is available for the IGTM-WT.

Operation

The operation of the IGTM is based on the measurement of the velocity of gas. The flowing gas is accelerated and conditioned by the meter´s straightening section. The straightening vanes prepare a steady flow profile and removes undesired swirl, turbulence and asymmetry before the gas enters the turbine wheel. The dynamic forces of the flowing fluid cause the rotor to rotate. The turbine wheel is mounted on the main shaft, with special high precision, low friction ball bearings. The turbine wheel has helical blades that have a known angle relative to the gas flow. The conditioned and accelerated gas drives the turbine wheel with an angular velocity that is proportional with the gas velocity. The rotating turbine wheel drives the index head with the eight digit mechanical counter via shafts and gears. The volume and flow rate can also be indicated electronically. A proximity probe generates a signal at each passing blade of the turbine wheel. With the device-specific K-factor and the number of pulses the passed volume can be calculated. With the measured frequency the flow rate can be determined.

Sizes, Flow Rate and Flanges

The available nominal diameter of the IGTM-CT gas turbine meter ranges from DN 50 (2”) to DN 600 (24”). Other sizes are available on request. The IGTM-CT can be delivered with G rates ranging from G 40 to G 16 000, which means that IGTM-CT is available for flow rates from 7 m^3/h to 25 000 m^3/h. The MID approval is valid for meter sizes DN 80 (3”) G 100 and above. The relationship between G value and flow rate for each diameter is shown in table 3 on the last page of this brochure. IGTM-CT meters with a Carbon Steel meter body can be manufactured either with ANSI flanges or with DIN flanges:

- ANSI 150# RF - ANSI 600# RF (or ANSI 600 RTJ)
- PN10 - PN100

IGTM-CT meters with a Ductile Iron (EN-GJS-400-18-LT) meter body are available in diameters from DN 50 (2”) to DN200 (8”) and with a pressure class PN10 - PN16 or ANSI 150# RF.
In case of a Stainless Steel meter body; please enquire.

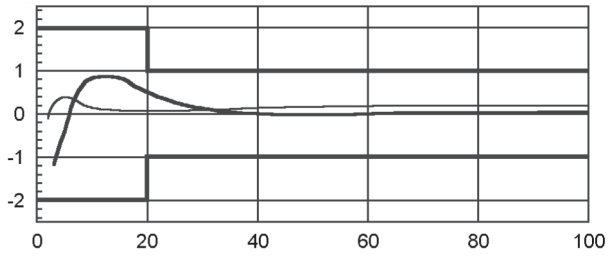
Accuracy

Standard accuracy limits for the IGTM-CT are in accordance with the MID directive (2014/32/EU) and many other regulations:
± 1% for 0.2 Qt to Qmax (Range 1:20: Qt = 0.2 Qmax)
± 2% for Qmin to 0.2 Qt (Range ≥1:30: Qt = 0.2 Qmax)

As an option the accuracy limits can be improved to:
± 0.5% for 0.2 Qt to Qmax
± 1% for Qmin to 0.2 Qt

These limits are valid for the meter performance in ambient air. Performance is better with an application at high-pressure. On request we can offer meters with better accuracy specifications. The repeatability of the vemm tec IGTM-CT is better than 0.1%. A typical performance curve at different pressures are shown in picture 1.

Performance curve [%]



Pic. 1

Q/Qmax [%]
– Ambient Pressure
– Pressure > 4 bar

Approvals

The IGTM-CT is specifically designed in accordance with all relevant and published standards, like EC directives, EN 12261, AGA 7, ISO 9951 and OIML R137-1 (replacing R6 and R32). Many national standards and laws are based on the above.

The IGTM-CT meter is approved for custody transfer in all European Union (EU) countries by the approval according to EU directive 2014/32/EU (MID). Metrological approvals are also obtained in Brazil, Algeria,Tunisia, Serbia, Malaysia, South Korea and China. Others are in process, please enquire.

Verification and Calibration

Gas flow meters for custody transfer purposes usually should have a verification (or legal calibration). This calibration can be performed at the test installation at our factory, approved by German Weights and Measures (GN 5). This will result in a Verification Certificate, recognised by most Metrological Institutes.

Non-custody transfer meters can also be calibrated at our testinstallation. A calibration certificate will be provided.

In both cases (verification or calibration) a certificate with the measured values can be issued.
On request we can also take care for a high-pressure calibration, performed at a certified independent institute such as NMi, PIGSAR, FORCE or EnBW (PasCaLab).

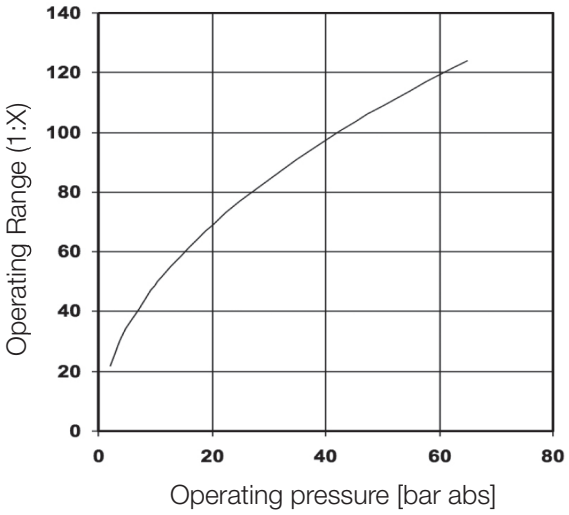
Flow range

The flow range of gas turbine meters is mentioned in table 3 and laid down in the applicable approvals. The standard turn down ratio (Qmin:Qmax) of an IGTM-CT is 1:20. This range is the standard performance when calibrated with air under ambient conditions.

With the DN 50 (2”), with special designs or with low density gases the range may be restricted. MID approved meters always have a range of at least 1:20.

Meters with improved ranges of 1:30 or 1:40 are available. Please enquire.

At a higher pressure, the density of the gas increases and with an increasing density the available driving force at the turbine wheel increases. The larger force relatively decreases the influence of the bearing resistance and so decreases the minimum required flow Qmin. Because of this, the actual linear operating range increases:
At higher pressures the flow range highly improves!
Picture 2 shows this relationship.



Pic. 2

Example:
At 28 bar the operating range improved from 1:20 to 1:80

Overload

The IGTM-CT is designed to deal with over-ranging of at least 20% of Qmax. Any over-ranging must occur slowly and without pulsations.

Temperature Ranges

As standard the IGTM-CT is designed to operate at (gas and environmental) temperatures between -20 °C to +60 °C. Special low and high gas temperature designs are available on request. The MID approval allows operation between -25 °C to +55 °C.

Pressure Loss

The pressure loss is an important design parameter of the IGTMCT. The pressure loss is minimized as a result of the design of the internal flow conditioner and the shape of the channels upstream and downstream of the turbine wheel. The pressure loss of the IGTM at reference conditions (Natural gas under ambient pressure) is provided in table 3. The pressure loss under actual conditions depend on actual flow, pressure and density. Please refer to the IGTM Manual for more information.

Gas Types

The IGTM-CT in its standard design can be used for all nonaggressive gases, such as natural gas, methane, propane, butane, city gas and fabricated gas, air, nitrogen, etc. For aggressive gases, like sour gas and biogas, special designs are available with eloxated parts, internal protection or special O-rings. Refer to table 1, for detailed requirements for different types of gases.

Material of Construction

The materials of construction are listed in the table below.

Part	Material
Housing	Ductile Iron (EN-GJS-400-18-LT) Carbon Steel (Cast or Welded) Stainless Steel (on request)
Straightening Vane	Aluminium
Turbine Wheel	Aluminium
Metering Insert	Aluminium
Bearing Block	Aluminium
Bearings	Stainless Steel
Shafts	Stainless Steel
Gears	Stainless Steel or Synthetic Material
Magnetic Coupling	Stainless Steel
Index Head	Aluminium

Index Head

The standard index head is equipped with a dedicated vent provision that prepares the meter for tropical use. The IGTM is certified for IP 67 applications. A high gas temperature index head can be supplied as an option.

The index head can be turned through 350° without violating the lead seal. An 8-digit non-resettable display shows the totalized volume. During the verification or calibration, the ratio of the adjustment gears is checked and (if necessary) adjusted to make the accuracy of the measurement as good as possible.

Pulse Signals

Dependent on meter size, one revolution of the last (right hand) roll of the mechanical index can represent 0.1, 1 or 10 m^3. As standard, the index head is equipped with one low frequency Reed (contact closure) switch (1R1) of a high quality that gives one (de-bounced) pulse at one revolution of the last wheel of the counter.

As an option a Reed switch (1R10) can be provided that gives 10 pulses per one revolution of the last wheel of the counter. A maximum of two Reed switches can be provided per meter. Every Reed switch is connected in series with a resistor and in parallel with a capacitor for de-bouncing the signal.

In the index head also a pulse/high frequency sensor (HF3) is provided as standard. This proximity sensor provides a middlehigh frequency signal generated by a rotating impulse-disk. The signal is intrinsically safe in accordance with the NAMUR standard (EN60947-5/6) for intrinsically safe signals. A second (similar) sensor (HF4) can be installed in the index head as an option.

By installing optional HF sensors in the meter body, it is possible to sense each passing blade of the turbine wheel (HF1) and/or of the reference wheel (HF2). The detection is based on special proximity switches. The signal is also intrinsically safe in accordance with EN60079-0 and EN60079-11. Interface barriers between hazardous area and safe area must be suitable for the application and are available on request.

The IGTM-CT can be equipped with HF1/HF2 sensors only, without an index head. This option requires an electronic counter, a volume converter or a flow computer, to indicate actual and converted volume. For custody transfer purposes however, a mechanical counter is often a mandatory requirement.

Pulse Signals

The IGTM-CT is standard equipped with a lubrication system. The oil pump is dimensioned according to the size of the meter.

To achieve the long life of the IGTM-CT, regular lubrication is required. Typically, for clean gas applications, a 3-month interval between two lubrication services is recommended. Dirty gas requires a more frequent lubrication.

As an option the IGTM-CT models with PN10/16 or ANSI 150 flanges and a diameter ≤ DN 100 (4”) can be provided with lifetime lubricated bearings.

Surface Treatment and Painting

Before applying a corrosion-protective layer, each ductile iron IGTM meter body is shot blasted. Carbon steel bodies are mechanically treated. The standard color of the meter body is white (RAL 9001). Stainless steel bodies are supplied without coating. The color of the index head is black.

Alternative surface treatments like other colors, special coatings or zinc treatments can be offered on request. These special treatments can improve the protection against corrosion.

Material and Safety Tests

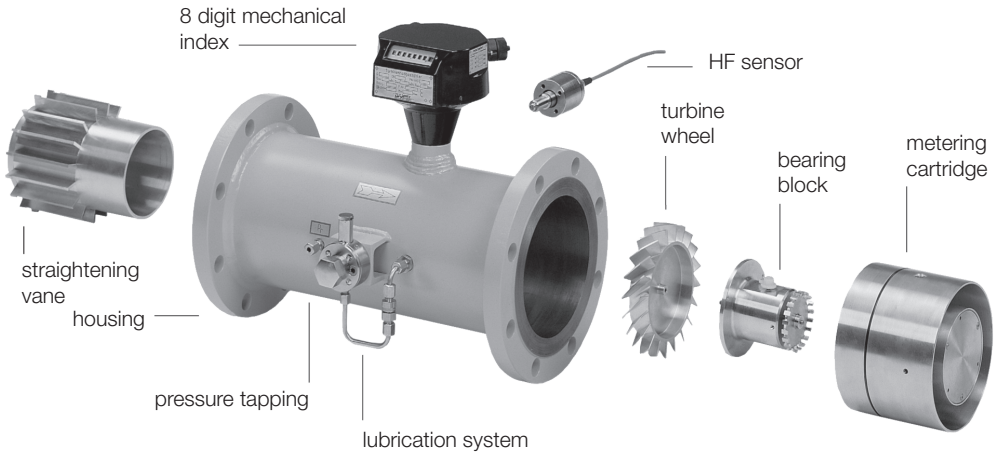
All IGTM-CT meters are statically tested in accordance with the appropriate standards and customer requirements:

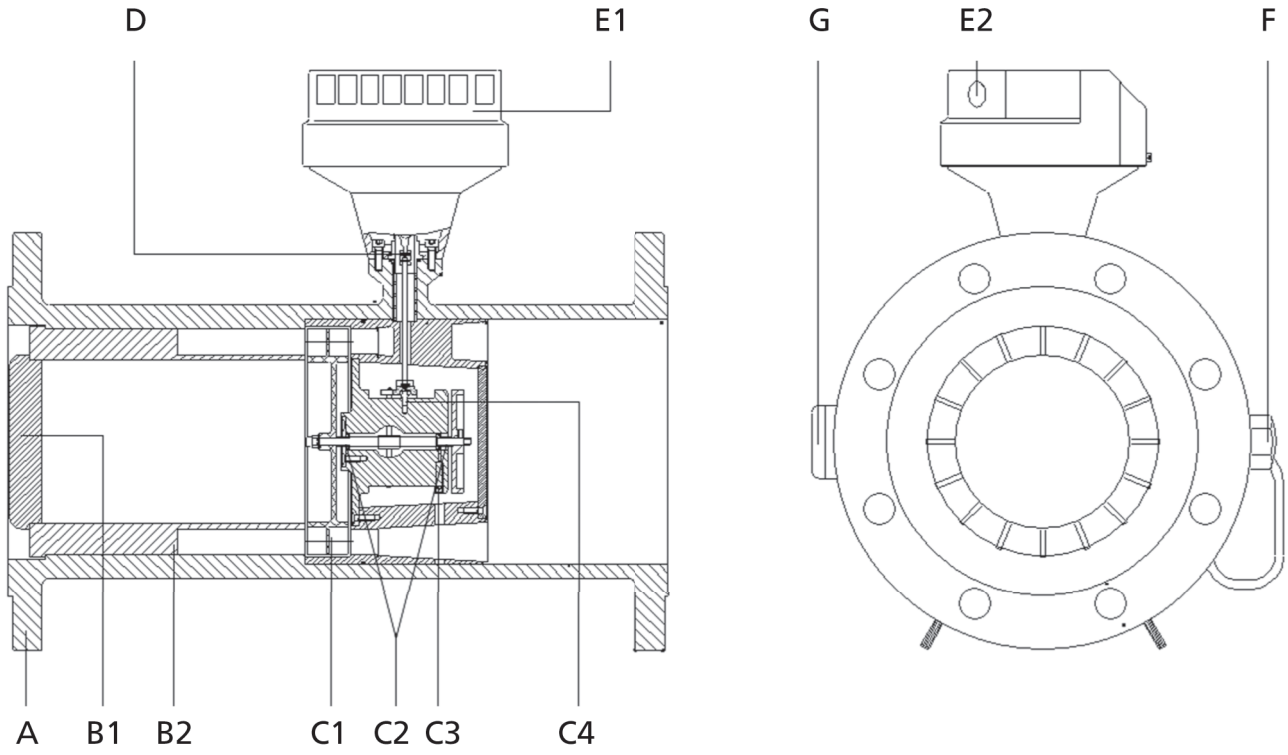
- Hydro test at 1.5 x maximum operating pressure
- Air seal test at 1.1 x maximum operating pressure

Other tests like MI, TÜV certification, NDT and US testing and others are available on request.

Code	Description	Max. frequency *	Remarks
1R1, 2R1	Reed switch	< 1 Hz	1R1 standard, 2R1 optional **
1R10, 2R10	Reed switch, freq. x 10	< 10 Hz	1R10 and/or 2R10 optional **
HF3, HF4	HF NAMUR sensor (in the index head)	< 200 Hz	HF3 standard, HF4 Optional
HF1	HF NAMUR sensor (at the turbine wheel)	< 4.5 kHz	Optional
HF2	HF NAMUR sensor (at the reference wheel)	< 4.5 kHz	Optional (only for IGTM-CT sizes DN100mm (4") and up)

*) Maximum pulse frequency depends on meter size: please refer to table 3
**) A maximum of 2 reed switches can be supplied per meter





A	Pressure containing meter housing with end-flanges
B	Flow deflector (straightening vane)
B1	Central cone
B2	Guiding vanes
C	Metering insert cartridge with turbine wheel
C1	Turbine wheel
C2	Precision Bearings
C3	Bearing block
C4	Internal gears, shafts and axis
D	Magnetic coupling (gas tight sealed)
E	Index head with nameplates
E1	Mechanical counter
E2	Connector for Pulse transmitters [1R1; HF3 + options]
F	Oil Pump
G	High Frequency pulse transmitters [HF1; HF2]

Documentation

The IGTM-CT gas turbine meter comes with an installation, operation and maintenance manual. Calibration certificates and material certificates can be provided as an option. Depending on the order and the meter chosen, the optionally ordered certification package contains:

- 3.1 certificate with declaration of conformity
- Material certificates for pressure containing parts
- Welding test certificates (when applicable)
- Pressure test certificate
- Calibration certificates (as ordered)
- Applicable CE compliancy certificate (MID / PED / ATEX)

Installation

Usually gas turbine meters are installed with a certain straight upstream pipe length. The IGTM-CT is equipped with an internal flow conditioner that takes care that the meter meets the requirements of the MID Directive, EN 12261 and OIML recommendations. This allows the meter to be installed with minimum 2D upstream piping. For highly accurate applications however, vemm tec recommends an upstream section of 5D.
Fittings like valves, filters, control valves, reducers, T-pieces, bends, safety shut off valves in the upstream section should be preferably 5D or more from the meter inlet. In these cases the application of an upstream flow conditioner might be considered. This could be a tube bundle straightener, straightening vanes, or other designs.

The downstream section length of the meter is not prescribed but for the best performance it should be ≥ 1D. The temperature sensor should be installed in this section. Optionally a thermo-well can be installed in the meter body.

The meter is equipped for horizontal installation as standard.
Meters ≤DN 100 (4”) diameter can also be operated vertically. If the meter is provided with a lubrication pump, please indicate vertical use on your order. Meters that are used under MID approval must be installed horizontally.

The gas flow must be free from liquids, dust and particles. These can damage the delicate bearings and the rotor. Also when dust collects over time it has an adverse effect on the metering accuracy. Non-clean gases should be filtered with a 5-micron particle filter.
Pulsating gas flow and vibrations should be avoided.

The meter axis should be identical to the upstream piping axis. Gaskets immediately upstream of the meter should not protrude.

The meter is preferably installed indoors, but is suitable for outdoor installation (IP67). If the meter is installed outdoors, it is recommended to protect the meter against direct sunlight.

Additional Instrumentation

The indicated volume (under actual conditions) will often be converted to volume at base conditions by a volume converter or flow computer. Parameters for these conversions are:

Pressure

A pressure tapping enables the measurement of the static pressure near the turbine wheel. The pressure measurement point is located on the meter housing and marked with Pm (pressure at metering conditions). The bore is 3 mm and perpendicular to the wall. This bore is as standard provided with a fitting. Connection with 6 mm stainless (standard) tubing or larger is recommended.

Temperature

The temperature measurement should preferably be located within 3 D downstream of the meter. No pressure reducing parts should be located between the temperature device and the meter. The temperature should be measured within the center third of the pipe. As an option, your IGTM-CT can be equipped with an integrated thermo-well.

No devices that can influence the pressure or the temperature of the gas should be installed between a gas meter and the sensor.

Ordering Information

In order to quickly process your enquiry, we need the following information for adequate pricing and sizing:

- Nominal pipe size in mm or inches for installing the meter
- Application: Custody transfer, accurate measurement or industrial measurement.
- Preferred body material: Ductile iron, carbon steel or stainless steel
- Flow rate: Maximum, minimum (actual or standard/normal cubic meter per hour, please specify); or G-size.
- Pressure: Maximum, minimum and normal operating pressure (indicate if you specify in absolute pressure or gauge pressure)
- Temperature: Maximum, minimum and normal operating temperature
- Gas type, composition or analysis (if available)
- Flange connection, pressure rating and face type
- Output signals required (LF reed switch, HF at index head or HF at turbine wheel, dual pulse output)
- Installation conditions (Indoor-Outdoor, ambient conditions)
- Flow direction horizontal (left-right; right-left) or vertical (up-down; down-up)
- Optional services and additional equipment required (calibrations, barriers, volume correctors, filters, meter tubes)
- Please always mention the country in which the meter will be mounted into a system. We need that for allocating the internal responsibility

Alternatives

For industrial application vemm tec offers the IGTM-WT; an aluminium gas turbine meter that can be clamped between PN10; PN16 and ANSI 150# RF flanges. This model is available for DN 50 (2”) to DN 200 (8”). Please ask for our documentation for more information.

For low flow applications vemm tec offers the OMEGA VI rotary gas meter range in the diameters DN 50 (2”) to DN 100 (4”) for flows between 0.6 m^3/h to 480 m^3/h. The Omega VI has a high turn down ratio; up to 1:200. Please enquire for more information.

Table 1 Gas types

Gas type	Symbol	Density @1,013 bar [kg/m3]	Meter housing	Notes
Acetylene	C2H2	1,17	Special	Aluminium parts Teflon coated
Air		1,29	Standard	
Ammonia	NH3	0,77	Standard	O-rings / Lubrication
Argon	Ar	1,78	Standard	
Biogas			Special	O-rings / special Internal
Butane	C4H10	2,7	Standard	
Carbon dioxide	CO2	1,98	Standard	Except foodstuff industry
Carbon monoxide	CO	1,25	Standard	
City gas		0,9	Standard	
Ethane	C2H6	1,36	Standard	
Ethylene (gas phase)	C2H4	1,26	Standard	Special Internal
Flue gases			Special	O-rings / Lubrication
Freon (gas phase)	CCl2F2	5,66	Standard	O-rings / Lubrication
Helium	He	0,18	Standard	Special internal
Hydrogen	H2	0,09	Special	Special flow range
Hydrogen sulphur (0,2%)	H2S	1,54	Special	O-rings / special Internal
Methane	CH4	0,72	Standard	
Natural Gas		0,83	Standard	
Nitrogen	N2	1,25	Standard	
Pentane	C5H12	3,46	Standard	
Propane	C3H8	2,02	Standard	
Propylene (gas phase)	C3H6	1,92	Standard	Special internal
Sour gas			Special	O-rings / lubrication
Sulphur dioxide (0,2%)	SO2	2,93	Special	Special internal
Other gas mixtures	Please enquire			

Table 2.1 Dimensions and weights

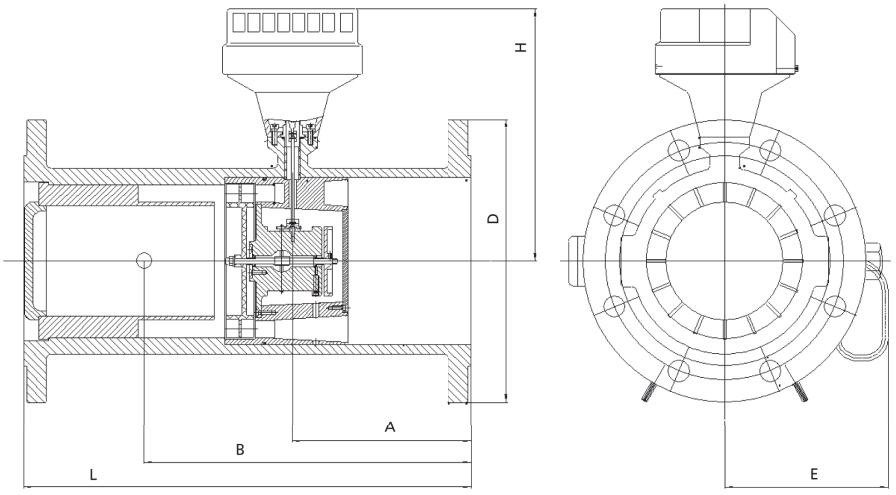


Table 2.1 Dimensions and weights

DN [mm] (Inch)	Size G	A [mm]	B [mm]	E [mm]	D [mm]	H Height	Overall size		Pressure class PN or ANSI	Body material	Weight [kg]
							Height H1 [mm] = H + ½D	Length L [mm]			
DN 50 (2”)	40 or 65	62	109	102 127 127 127 140 102 127 127 127	165 165 165 180 195 152 152 165 165	215 200 200 205 215 215 200 200 200	298 283 283 295 313 291 276 283 283	150	PN 10/16 PN 10/16 PN 25/40 PN 63 PN 100 ANSI 150 ANSI 150 ANSI 300 ANSI 400/600	Ductile Iron Steel Steel Steel Steel Ductile Iron Steel Steel Steel	11 24 24 24 33 11 24 24 24
DN 80 (3”)	100 or 160 or 250	92	160	120	200 200 200 215 230 191 191 210 210	205 192 192 192 192 205 192 192 192	305 292 292 300 307 301 288 297 297	240	PN 10/16 PN 10/16 PN 25/40 PN 63 PN 100 ANSI 150 ANSI 150 ANSI 300 ANSI 400/600	Ductile Iron Steel Steel Steel Steel Ductile Iron Steel Steel Steel	25 26 26 32 35 25 24 28 29
DN 100 (4”)	160 or 250 or 400	120	205	135 140 140 140 140 135 140 140 140 140	220 220 235 250 265 229 229 254 254 273	230 215 215 215 215 230 215 215 215 215	340 325 333 340 348 345 330 342 342 352	300	PN 10/16 PN 10/16 PN 25/40 PN 63 PN 100 ANSI 150 ANSI 150 ANSI 300 ANSI 400 ANSI 600	Ductile Iron Steel Steel Steel Steel Ductile Iron Steel Steel Steel Steel	27 24 39 42 48 29 36 43 43 50
DN 150 (6”)	400 or 650 or 1000	182	280	190 215 215 215 215 190 215 215 215 215	285 285 300 345 355 279 279 318 318 356	255 250 250 250 250 255 250 250 250 250	398 393 400 423 428 395 390 409 409 428	450	PN 10/16 PN 10/16 PN 25/40 PN 63 PN 100 ANSI 150 ANSI 150 ANSI 300 ANSI 400 ANSI 600	Ductile Iron Steel Steel Steel Steel Ductile Iron Steel Steel Steel Steel	45 45 40 74 90 50 63 70 80 100
DN 200 (8”)	650 or 1000 or 1600	240	340	230	340 340 340 340 360 375 415 430 343 343 381 381 419	270	440 440 440 440 450 458 478 485 442 442 461 461 480	600	PN 10 PN 10 PN 16 PN 16 PN 25 PN 40 PN 63 PN 100 ANSI 150 ANSI 150 ANSI 300 ANSI 400 ANSI 600	Ductile Iron Steel Ductile Iron Steel Steel Steel Steel Steel Ductile Iron Steel Steel Steel Steel	76 78 76 78 90 100 125 160 80 83 106 135 155

Table 2.2 Dimensions and weights

DN [mm] (Inch)	Size G	A [mm]	B [mm]	E [mm]	D [mm]	H Height	Overall size		Pressure class PN or ANSI	Body material	Weight [kg]
							Height H1 [mm] = H + ½D	Length L [mm]			
DN 250 (10”)	1000 or 1600 or 2500	300	415	240	395 405 425 450 470 505 406 445 445 508	285	483 488 498 510 520 538 488 508 508 539	750	PN 10 PN 16 PN 25 PN 40 PN 63 PN 100 ANSI 150 ANSI 300 ANSI 400 ANSI 600	Steel Steel Steel Steel Steel Steel Steel Steel Steel Steel	110 110 110 130 155 220 110 150 170 240
DN 300 (12”)	1600 or 2500 or 4000	360	385	260	445 460 485 515 530 585 483 521 521 559	320	543 550 563 578 585 613 562 581 581 600	900	PN 10 PN 16 PN 25 PN 40 PN 63 PN100 ANSI 150 ANSI 300 ANSI 400 ANSI 600	Steel Steel Steel Steel Steel Steel Steel Steel Steel Steel	120 130 150 180 240 345 160 210 240 290
DN 400 (16”)	2500 or 4000 or 6500	480	625	300	565 580 620 660 670 715 597 648 648 686	355	638 645 665 685 690 713 654 679 679 698	1200	PN 10 PN 16 PN 25 PN 40 PN 63 PN100 ANSI 150 ANSI 300 ANSI 400 ANSI 600	Steel Steel Steel Steel Steel Steel Steel Steel Steel Steel	355 380 415 455 500 600 432 450 500 590
DN 500 (20”)	4000 or 6500 or 10000	600	730	390	670 715 730 755 699 775 775 813	375	710 735 742 755 725 765 765 785	1500	PN 10 PN 16 PN 25 PN 40 ANSI 150 ANSI 300 ANSI 400 ANSI 600	Steel Steel Steel Steel Steel Steel Steel Steel	540 580 640 700 620 740 770 925
DN 600 (24”)	6500 or 10000 or 16000	720	900	440	715 840 845 813 915 915 640	430	790 850 855 840 890 890 900	1800	PN 10 PN 16 PN 25 ANSI 150 ANSI 300 ANSI 400 ANSI 600	Steel Steel Steel Steel Steel Steel Steel	620 670 730 750 980 1020 1240

Table 3 IGTM-CT gas turbine meter: technical specifications

The indicated frequency values and k-factors of HF1/HF2 and HF3/HF4 are for information only.
The final values will be mentioned at the meter´s nameplate and in the calibration certificate.

Nominal diameter [mm] [inch]	Size rating G	Qmax [m3/h]	Qmin (standard flow range) [m3/h]	Pressure lossat Qmax 1 bar with Nat. Gas [mbar]	Rotating speed turbine wheel at Qmax [min-1]	Turbine wheel blade angle	Turbine wheel number of blades	Max. frequency HF1/HF2 approx. [Hz]	Max. frequency HF3/HF4 approx. [Hz]	Max. frequency 1R1 Reed [Hz]	k-factor HF1/HF2 approx. [Imp/m3]	k-factor HF3/HF4 approx. [Imp/m3]	k-factor 1R1 Reed [Imp/m3]
DN 50 (2”)	G 40 *) G 65 *)	65 100	13 10	5,5 11,7	8900 13700	45 45	16 16	2800 4300	80 120	0,18 0,28	155000 155000	4400 4400	10 10
DN 80 (3”)	G 100 G 160 G 250	160 250 400	8 13 20	3,7 8,6 13,8	6200 9600 8900	45 45 30	16 16 16	1900 2900 2600	50 80 70	0,04 0,07 0,11	42200 42200 23500	1200 1200 670	1 1 1
DN 100 (4”)	G 160 G 250 G 400	250 400 650	13 20 32	3,1 6,8 10,8	4300 6900 6500	45 45 30	16 16 16	1200 1900 1700	60 90 80	0,07 0,11 0,18	17000 17000 9400	800 800 440	1 1 1
DN 150 (6”)	G 400 G 650 G 1000	650 1000 1600	32 50 80	3,1 7,1 11,3	3400 5200 4800	45 45 30	20 20 20	1100 1700 1600	70 100 60	0,18 0,28 0,04	6280 6280 3570	360 360 135	1 1 0,1
DN 200 (8”)	G 650 G 1000 G 1600	1000 1600 2500	50 80 130	2,5 4,3 10,2	2200 3500 3100	45 45 30	20 20 20	790 1300 1100	40 70 60	0,03 0,04 0,07	2840 2840 1510	150 150 80	0,1 0,1 0,1
DN 250 (10”)	G 1000 G 1600 G 2500	1600 2500 4000	80 130 200	2,5 4,9 7,9	2000 3100 2900	45 45 30	24 24 24	830 1300 1200	60 90 90	0,04 0,07 0,11	1870 1870 1110	135 135 80	0,1 0,1 0,1
DN 300 (12”)	G 1600 G 2500 G 4000	2500 4000 6500	130 200 320	2,5 4,9 7,9	1900 3000 2800	45 45 30	24 24 24	780 1300 1200	60 90 130	0,07 0,11 0,18	1120 1120 660	80 80 75	0,1 0,1 0,1
DN 400 (16”)	G 2500 G 4000 G 6500	4000 6500 10000	200 320 500	2,5 4,9 8,6	1600 2600 2300	45 45 30	24 24 24	610 990 1300	60 100 130	0,11 0,18 0,28	550 550 470	55 55 50	0,1 0,1 0,1
DN 500 (20”)	G 4000 G 6500 G 10000	6500 10000 16000	320 500 800	2,5 5,0 8,8	1400 2300 2000	45 45 30	24 24 24	540 860 750	60 100 30	0,17 0,28 0,04	310 310 170	40 40 8	0,1 0,1 0,01
DN 600 (24”)	G 6500 G 10000 G 16000	4000 16000 25000	200 800 1300	2,4 4,9 8,6	1100 1800 1400	45 45 30	24 24 24	420 670 500	40 70 50	0,02 0,04 0,02	150 150 75	15 15 7	0,01 0,01 0,01

*) Not approved under MID

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The data are not binding. We reserve the right to make changes without prior notice.

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