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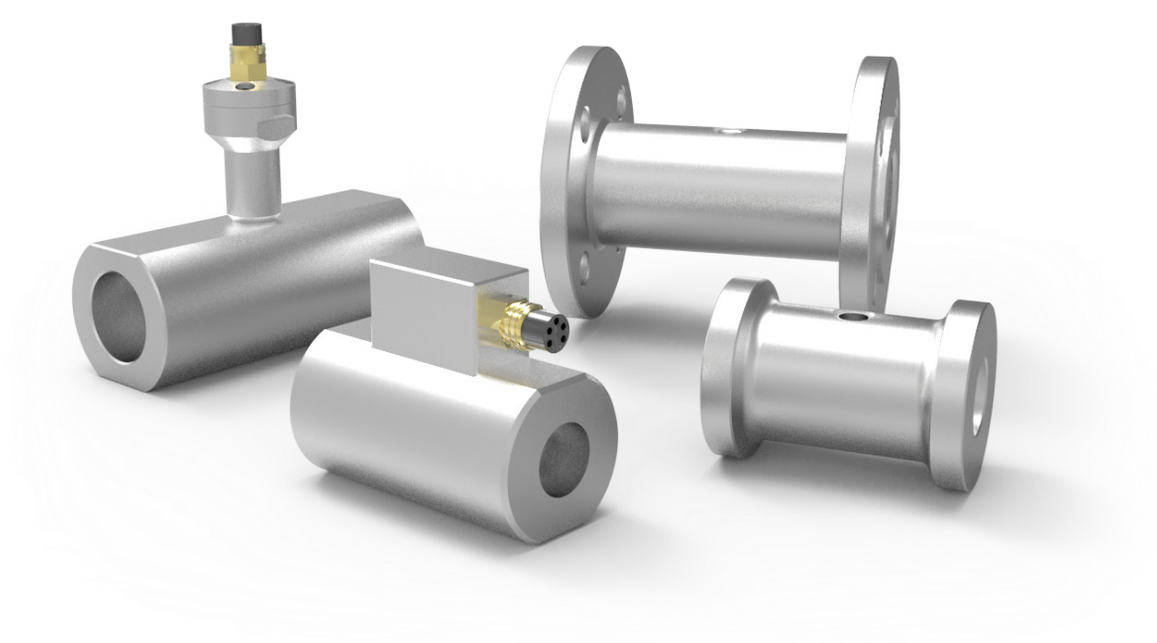
Küppers Elektromechanik GmbH

Technical Datasheet



HM Subsea Series

Turbine Flow Meters
for Subsea Immersion Applications

Description

The HM Turbine Flow Meters for Subsea Immersion Applications are reliable, durable and robust flow instruments, specifically developed for challenging subsea flow applications. They are primarily used in applications with low and medium viscosity liquids, such as seawater, glycol mixtures and various hydraulic fluids.

Only high-quality stainless steels, which even withstand corrosive liquids, are used in the production of our Turbine Flow Meters. In combination with tungsten carbide bearings, the HM Subsea Series guarantees an optimum measurement accuracy as well as an extremely long service life even under the toughest application conditions.

The variety of different turbine wheel dimensions and blade geometriesallows a broad spectrum of sizes that can cover an enormous measuring range. This highly qualifies the HM Subsea Series for a variety of applications in the field of metering as well as for monitoring.

Short response times, very dynamic performance and high measuring accuracy ensure accurate regulation and control of flow rates in the most demanding applications.

Principle and Design

Turbine Flow Meters (HM) are volume counters operating on the Woltmann impeller counter principle. They record the volume flow in a pipe via the average flow velocity.

The turbine wheel is forced into rotation by the axial flowing medium. The speed of the freely rotating turbine wheel is directly proportional to the average flow velocity over a wide range. The turbine wheel's low weight enables very short response times as well as a very dynamic behavior in case of flow changes. Two built-in flow straighteners generate a quasi-laminar flow and in consequence an increased.

The contactless sensor technology (transducer) detects the rotational speed of the turbine wheel inductively through the housing wall. The sensor system can be flexibly adjusted to meet the requirements of the respective application. For example, it is possible to provide a signal indicating the flow direction.

Pulses per volumetric unit are available for evaluation purposes. The calibration factor (K-Factor) of the flow meter indicates the precise pulse rate per volumetric unit. Prior to delivery, every customized flow meter is calibrated by KEM in-house to determine the individual K-Factor. That process covers the operating viscosity specified by the customer. The calibration certificate is an integral part of every delivered KEM flow meter.

KEM Turbine Flow Meters feature a short response time between 5 and 50 milliseconds depending on the nominal width, which is advantageous for precise filling processes.

Turbine Flow Meters support a resolution up to 100,000 pulses per liter. Thanks to milled and turned precision components, HM Subsea Series neither have welding seams nor solder points in contact with the flowing media. All market requirements for piping and materials standards are completely covered.

Applications

Well Control

- Blowout Prevention
- Valve Actuation
- Remotely Operated Vehicle
- Wellhead Additives
- Subsea Production System
- Pipe Laying System
- Water/Chemical Injection
- Subsea Network

Features

- API 17F (ISO 13628-6)
- High Resolution
- Short Response Time
- High Pressure Shock Resistance
- Large Viscosity Range
- NACE MR0175
- Norsok Standard
- Low Maintenance
- PED 97/23/EC

Technical Data – Sizes

Type	Measuring Range (l/min)			K-Factor[1] (pulses/l)	max. Frequency[1] (Hz)
HM 003	0.3	to	1.5	32,000	1,000
HM 004	0.5	to	4.0	24,000	1,250
HM 005	0.8	to	6.0	17,800	1,740
HM 006	1.2	to	10.0	11,000	1,750
HM 007	2.0	to	20.0	5,200	1,800
HM 009	3.3	to	33.0	1,900	1,080
HM 011	6.0	to	60.0	1,300	1,350
HM 013	8.5	to	85.0	900	1,300
HM 017	12	to	120	380	800
HM 019	15	to	150	310	925
HM 022	20	to	200	217	800
HM 024	25	to	250	170	800
HM 028	30	to	360	155	960
HM 030	35	to	400	130	860
HM 036	40	to	500	60	600

Testing

- 3.1. Material Test Certificate
- Positive Material Certification
- Non Destructive Examination
- Hyperbaric Pressure Test
- Vibration Test
- EMC Testing
- Hydrostatic Pressure Test

Features

- Robust Tungsten Carbide Bearing
- Submersible up to 7,000 m
- DIN 1.4404 [AISI 316L] Stainless Steel Housing
- DIN 1.4460 [AISI 329] Duplex Steel Turbine Wheel
- Filtration > 100 Micron
- Low Pressure Drop
- Light Weight and Small Overall Length Design

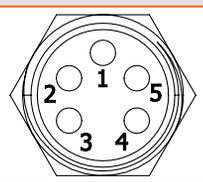
Technical Data – General

Measuring Accuracy	Up to ±0.1 %[2]
Repeatability	±0.05 % (under the same conditions)
Linearity	±1.0 % of actual flow (viscosity ≥ 1 mm²/s)
Measuring Span	Standard 1:10 Extended 1:100
Viscosity Range	0.8 up to 30 mm²/s
Materials	Housing: as per DIN 1.4404 [AISI 316L], other material on request Rotor: as per DIN 1.4460 [AISI 329], other material on request Bearing: Tungsten carbide sleeve bearing
Connection Type	ANSI, DIN, BASPP, NPTF, Autoclave Engineers Medium Pressure Fittings (AEMP)
Temperature Range	-40 °C up to +60 °C [-40 °F up to 140 °F] depending on output and subsea connector option
Operating Pressure	Up to 1,400 bar [20,300 psi], depending on fitting
Depth Rating	Up to 690 bar [10,000 psi]

[1] Average values with single-pickup type VTE 02-*.
[2] Under laboratory conditions; incl. linearization; viscosity ≥1 mm²/s.

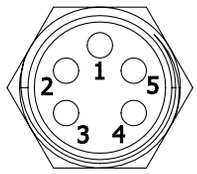
Electrical Data VTE 02

Supply Voltage U_B	10 - 30 V DC, regulated 7 - 30 V DC („U“, NAMUR operation) 5 - 10 V DC („N“)
Quiescent Current	< 1 mA
Frequency Range	0.5 to 5,000 Hz
Ambient Temperature	-40 °C up to +80 °C [-40 °F up to 176 °F]
Electrical Connection	SubConn MCBH-5F Face view 1 = $+U_B$ 2 = n.c./NAMUR- („N“, „U“) 3 = 0 V (not „N“) 4 = Signal Push Pull (Not „N“) 5 = n.c.



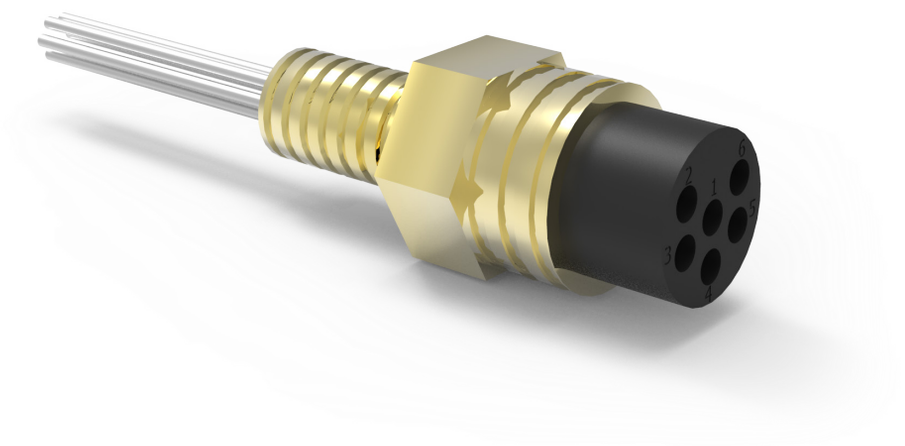
Electrical Data WT.02

Analogue Signal	
Type	4 - 20 mA, 2-wire (passive)
Resolution	5 µA
Supply Voltage	12 - 30 V DC, regulated
Allowable Load U_B	-12 V/20 mA, max. 800 Ω
Operating Modes	ON (Frequency proportional current) OFF (Supply current 4 mA independent of frequency)
Digital Output	
Type	Open collector, potential free
Protective Resistor	1,600 Ω
Frequency Range	1.0 to 5,000 Hz
Ambient Temperature	-40 °C up to +70 °C [-40 °F up to 158 °F]
Operating Modes	OFF (Frequency output disabled) 1:1 (Output frequency = input frequency) CORR (Scaleable output frequency) SW (Switch output)
Electrical Connection	SubConn MCBH-5F Face view 1 = +I 2 = -I 3 = Emitter (Digital ground) 4 = Collector (Frequency output) 5 = Remote input



Subsea Connector[3)]

The SubConn® Micro Circular BH 5F 5-pin female connector is the HM Subsea Series standard connector. Tailor-made designs are possible as well as frequency or analogue output via subsea connections to customer requirements such as SubConn®, SEACON®, Burton™ or Teledyne DGO.



SubConn® Micro Circular BH 5F

Connector Specifications	
Insulation Resistance	> 200 mΩ
Contact Resistance	< 0.01 Ω
Wet Matings	> 500
Temperature Rating (Water)	-4 °C up to +60 °C [+25 °F up to +140 °F]
Temperature Rating (Air)	-40 °C up to +60 °C [-40 °F up to 140 °F]
Storage Temperature Rating	-40 °C up to +60 °C [-40 °F up to 140 °F]
Depth Rating	690 bar [10,000 psi]
Material Specifications	
Connector Body	Chloroprene rubber
Bulkhead Body	Brass, stainless steel
Contacts	Female socket in plated brass (UNS 36000)
Location Pin	Stainless steel DIN 1.4305 [AISI 303]
O-Rings	Nitrile
Locking Sleeves	ABS
Snap Rings	Stainless steel DIN 1.4319 [AISI 302]

[3)] Other Subsea Connector option available on request.

Calibration

In-house calibration is performed on volumetric calibration rigs or at the wishes of the customer in our DAkkS calibration laboratory.

The KEM calibration lab uses a high-precision load cell system. With an accuracy of 0.05 % for the mass and 0.1 % for the volume of flowing liquids, we occupy a leading position worldwide. The German Accreditation Body (DAkkS) has accredited the laboratory with engineers, processes and measuring equipment in accordance with the international standard DIN EN ISO/IEC 17025:2005.

The KEM calibration certificate not only verifies the accuracy of a flow meter, but also guarantees its traceability to national standards as well as ensuring all requirements according to international quality standards are met.

The calibrations are performed with different hydrocarbons. This ensures the optimum simulation of changing operating conditions in density and viscosity even when temperatures change. This way the primary viscosity for the use of the flow meter can be specifically taken into account when viscosity fluctuations occur in a customised application.

The calibration result is the specified calibration factor (K-factor) in pulses per litre. This K-factor accordingly applies only at a certain flow velocity or a certain flow rate.

The calibration factor varies only very slightly at different volume flow rates. The individual measuring points provide the calibration curve of the flow meter from which the average K-factor is determined. The average calibration factor applies to the entire measuring range.

The linearity error specification (percentage deviation) refers to the average K-factor. To further increase the measurement accuracy in onsite use, the specific K-factors can be used to calculate the flow rate. For this, KEM also supplies optional special electronics.

Calculation of volume flow

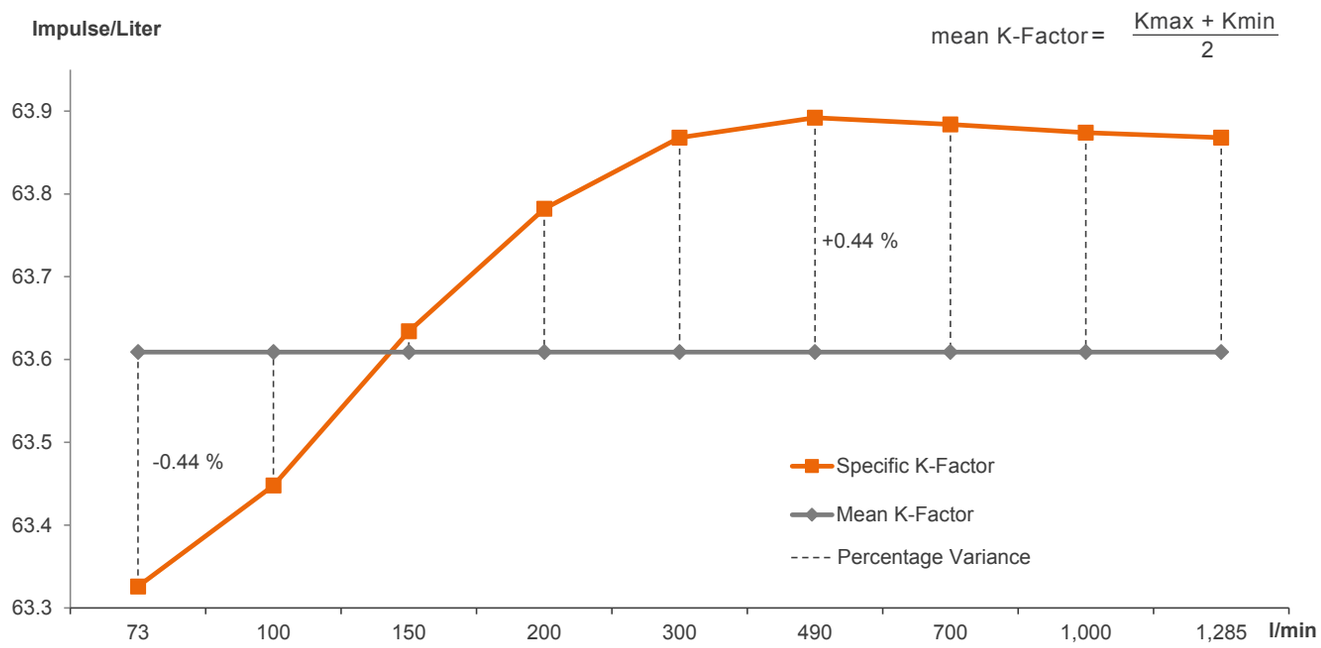
The flow is directly dependent on the measured frequency and the associated calibration factor:

$$Q = \frac{f * 60}{K} \text{ l/min}$$

Q = Volume Flow
f = Measuring frequency
K = Specific K-Factor

Calibration Protocol

Example: HM F 050



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