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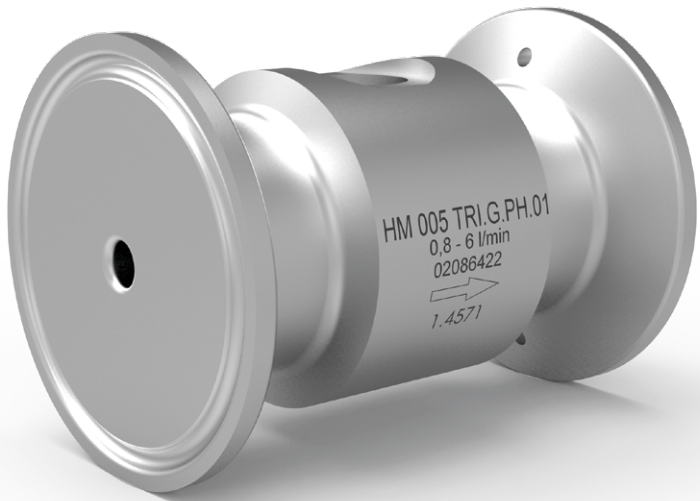
Küppers Elektromechanik GmbH

Technical Datasheet



HM TRI Series

Turbine Flow Meters

for pharmaceutical applications

Description

The HM TRI turbine flow meter series (TRI for Tri-Clamp connectors) is used to measure continuous and discontinuous flow rates. They are mainly used for flow measurement of water, alcohol, disinfectants and detergents in the pharmaceutical and food sector.

Only high-grade steels and materials that can withstand corrosive liquids are used in the production of turbine flow meters. Combined with the innovative flushable PTFE bearings, the HM TRI guarantees optimum measuring accuracy in compliance with all common material specifications in the pharmaceuticals sector. The design is dead space free and CIP-capable, and therefore also meets the highest hygiene standards.

The combination of various turbine wheel dimensions and blade geometries allows a wide range of sizes that can cover a huge measuring range. This makes the HM TRI ideal for a variety of applications in the field of metering as well as for dosing and process control.

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

For applications in hazardous areas, we offer intrinsically safe sensors and amplifiers with Ex protection in accordance with ATEX, IECEx and CSA.

Principle and Design

Turbine flow meters (HM) are volume counters operating on the Woltmann impeller counter principle. They use the average flow velocity to record the flow rate through the pipe.

The flow of the medium is directed at the turbine wheel in the axial direction and so rotated. The speed of the freely turning wheel over a wide range is directly proportional to the average flow velocity. The low weight of the turbine wheel ensures very short response times as well as very dynamic behaviour in flow changes. Two flow straighteners generate quasi-laminar flow, which in turn contributes to increasing the measurement accuracy.

The speed of the turbine wheel is measured by the sensor through the housing wall. Pulses per unit of volume are available for analysis. The calibration factor (K-factor) of the flow meter describes the exact pulse rate per unit of volume. In order to determine the individual calibration factor of a flow meter, we calibrate each of our meters in house prior to delivery. The operating viscosity specified by the customer is taken into account for calibration. A corresponding calibration certificate is included with every flow meter we supply.

The KEM turbines feature a short response time between 5 and 50 ms depending on the nominal diameter, which is advantageous for precise filling processes.

Turbine flow meters have a resolution of up to 3,000 pulses per litre. The milled and turned precision components are the reason why the HM series has neither wetted weld seams nor soldered connections. All market-related requirements for piping and material standards can thus be fully guaranteed.

Applications

- Consumption measurement
- Dosing
- Process control
- Pharmaceutical liquids
- Ultrapure water
- Alcohol
- Disinfectants and cleaning agents

Features

- High measuring accuracy up to ±0.1 %[1)]
- Exceptional repeatability of ±0.05 %
- Short response times (from 5 ms)
- Dynamic measuring system
- Dead space optimized design
- Rinsable PTFE plain bearing
- Threadless pipe connections according to DIN 32676

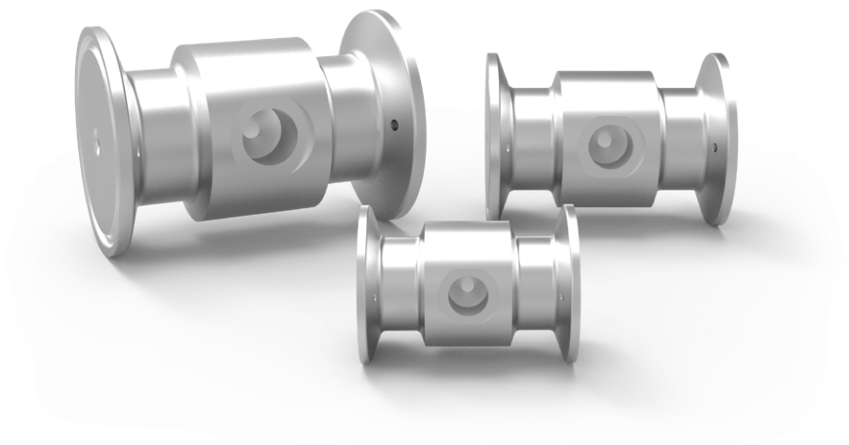
[1)] Under laboratory conditions; incl. linearization; viscosity ≥1 mm²/s.

Technical Data – Sizes

HM Type[2]	Measuring Range (l/min)			K-Factor[3] (pulses/l)	max. Pressure (bar/psi)	max. Frequenz[3] (Hz)	Weight (kg)
HM 003 TRI	0.3	to	1.5	32,500	16 [232]	1,000	0.6
HM 004 TRI	0.5	to	4	24,000	16 [232]	1,250	0.6
HM 005 TRI	0.8	to	6	17,800	16 [232]	1,740	0.6
HM 006 TRI	1.2	to	10	11,000	16 [232]	1,750	0.6
HM 007 TRI	2.0	To	20	3,200	16 [232]	1,800	0.6
HM 009 TRI	3.3	to	33	1,900	16 [232]	2,400	0.6
HM 011 TRI	6.0	to	60	1,300	16 [232]	2,800	0.6
HM 013 TRI	8.5	to	85	900	16 [232]	3,000	1.6
HM 017 TRI	12	to	120	380	16 [232]	1,600	1.6
HM 019 TRI	15	to	150	310	16 [232]	1,600	1.6
HM 022 TRI	20	to	200	217	10 [145]	1,600	2.8
HM 024 TRI	25	to	250	170	10 [145]	2,000	3.5
HM 028 TRI	30	to	360	155	10 [145]	2,000	3.5
HM 030 TRI	35	to	400	130	10 [145]	1,850	3.2

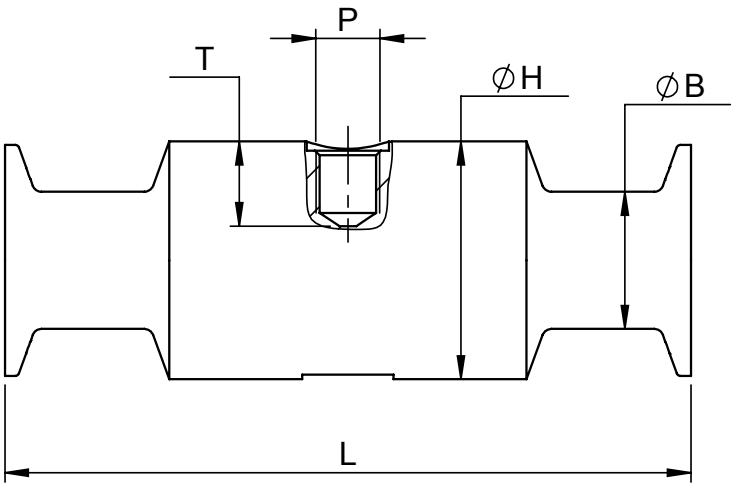
Technical Data – General

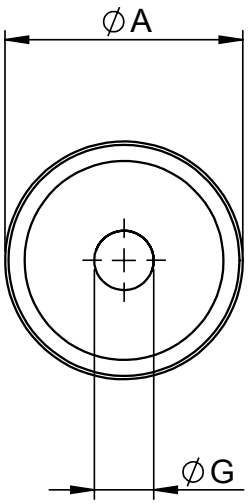
Measuring Accuracy	±0.1 %[4]
Repeatability	±0.05 % (under the same conditions)
Linearity	±1 % of actual flow
Viscosity Range	1 mm^2/s
Materials	Housing: as per DIN 1.4404 [AISI 316L] Wheels: as per 1.4460 [AISI 329] Bearing: PTFE Inner seal: FKM
Medium Temperature	-40 °C up to +150 °C [-40 °F up to +302 °F]
Dimensions	See dimensional drawing (page 4)



[2] Exact type designation on request.
[3] Average values for single sensors at viscosity of 1 mm^2/s; higher viscosities may differ.
[4] Under laboratory conditions; incl. linearization; viscosity ≥1 mm^2/s.

Dimensional Drawing – Tri-Clamp Connection (DIN 32676) for pipes according to DIN 11866 series A





Typ HM	Ø A	Ø B	G	Ø H	L	P[6)]	T[6)]
HM 003 TRI	50.5 mm [1.99 in]	30 mm	4 mm [0.16 in]	40 mm [1.57 in]	68 mm [2.68 in]	M14x1.5	17 mm [0.67 in]
HM 004 TRI	50.5 mm [1.99 in]	30 mm	4 mm [0.16 in]	40 mm [1.57 in]	68 mm [2.68 in]	M14x1.5	17 mm [0.67 in]
HM 005 TRI	50.5 mm [1.99 in]	30 mm	5 mm [0.20 in]	40 mm [1.57 in]	68 mm [2.68 in]	M14x1.5	16.5 mm [0.65 in]
HM 006 TRI	50.5 mm [1.99 in]	30 mm	5 mm [0.20 in]	40 mm [1.57 in]	68 mm [2.68 in]	M14x1.5	16.5 mm [0.65 in]
HM 007 TRI	50.5 mm [1.99 in]	30 mm	7 mm [0.28 in]	40 mm [1.57 in]	68 mm [2.68 in]	M14x1.5	15.5 mm [0.61 min]
HM 009 TRI	50.5 mm [1.99 in]	30 mm	9 mm [0.35 in]	40 mm [1.57 in]	68 mm [2.68 in]	M14x1.5	14.5 mm [0.57 in]
HM 011 TRI	50.5 mm [1.99 in]	30 mm	11 mm [0.43 in]	40 mm [1.57 in]	68 mm [2.68 in]	M14x1.5	13.5 mm [0.53 in]
HM 013 TRI	50.5 mm [1.99 in]	30 mm	13 mm [0.51 in]	52 mm [2.05 in]	150 mm [5.91 in]	M14x1.5	18.5 mm [0.73 in]
HM 017 TRI	50.5 mm [1.99 in]	30 mm	17 mm [0.67 in]	52 mm [2.05 in]	150 mm [5.91 in]	M14x1.5	16.5 mm [0.65 in]
HM 019 TRI	50.5 mm [1.99 in]	30 mm	19 mm [0.75 in]	52 mm [2.05 in]	150 mm [5.91 in]	M14x1.5	15.5 mm [0.61 min]
HM 022 TRI	64 mm [2.52 in]	46 mm	22 mm [0.87 in]	64 mm [2.52 in]	197 mm [7.76 in]	M14x1.5	20 mm [0.79 in]
HM 024 TRI	64 mm [2.52 in]	46 mm	24 mm [0.94 in]	64 mm [2.52 in]	197 mm [7.76 in]	M14x1.5	19 mm [0.75 in]
HM 028 TRI	64 mm [2.52 in]	46 mm	28 mm [1.10 in]	64 mm [2.52 in]	197 mm [7.76 in]	M14x1.5	17 mm [0.67 in]
HM 030 TRI	64 mm [2.52 in]	46 mm	30 mm [1.18 in]	64 mm [2.52 in]	197 mm [7.76 in]	M14x1.5	16 mm [0.63 in]

[6)] Only applies for single pickup holes of type „G“.
Attention: the total installation height is the result of the height (H) and the height of the electronics (dimensions in separate datasheet).

Calibration

In-house calibration is performed on volumetric calibration rigs or in our DAkkS calibration laboratory, depending on the needs of the client.

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 engineers, processes and measuring equipment in accordance with the international standard DIN EN ISO/IEC 17025:2018.

The KEM calibration certificate not only verifies the accuracy of a flow meter, but also guarantees its traceability to national standards 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 specification (percent 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

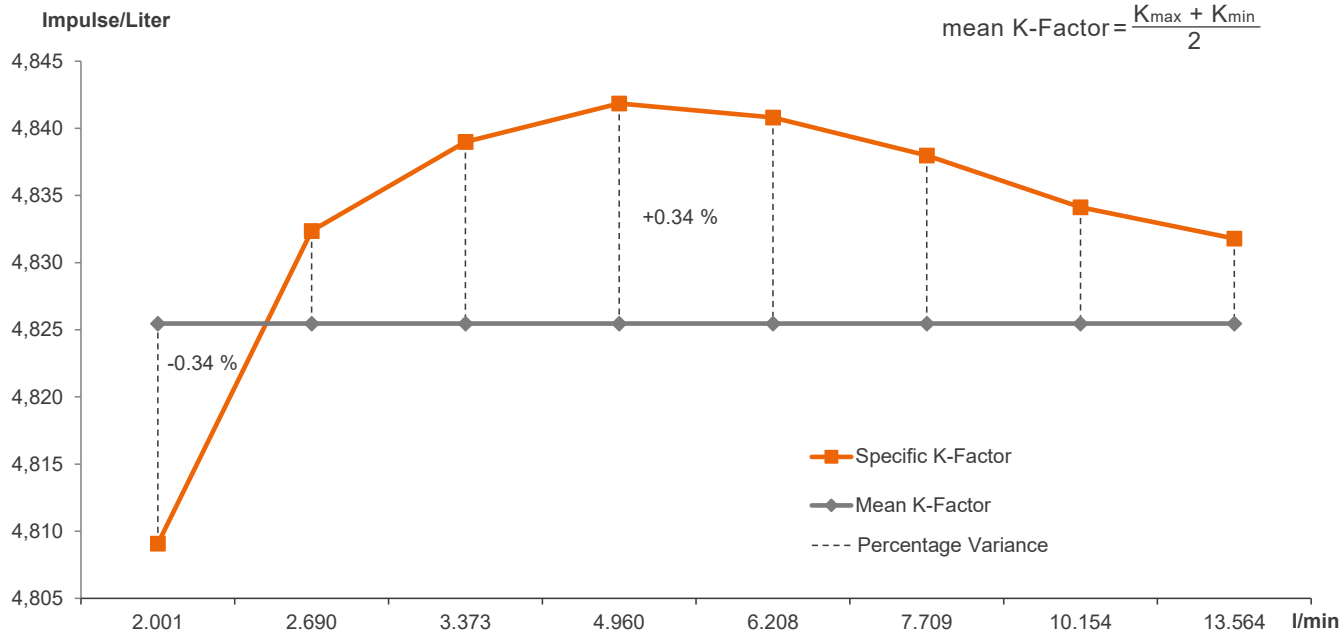
The flow is directly dependent on the measured frequency and the associated calibration factor:

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

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

Calibration protocol

Example: HM 007 TRI



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