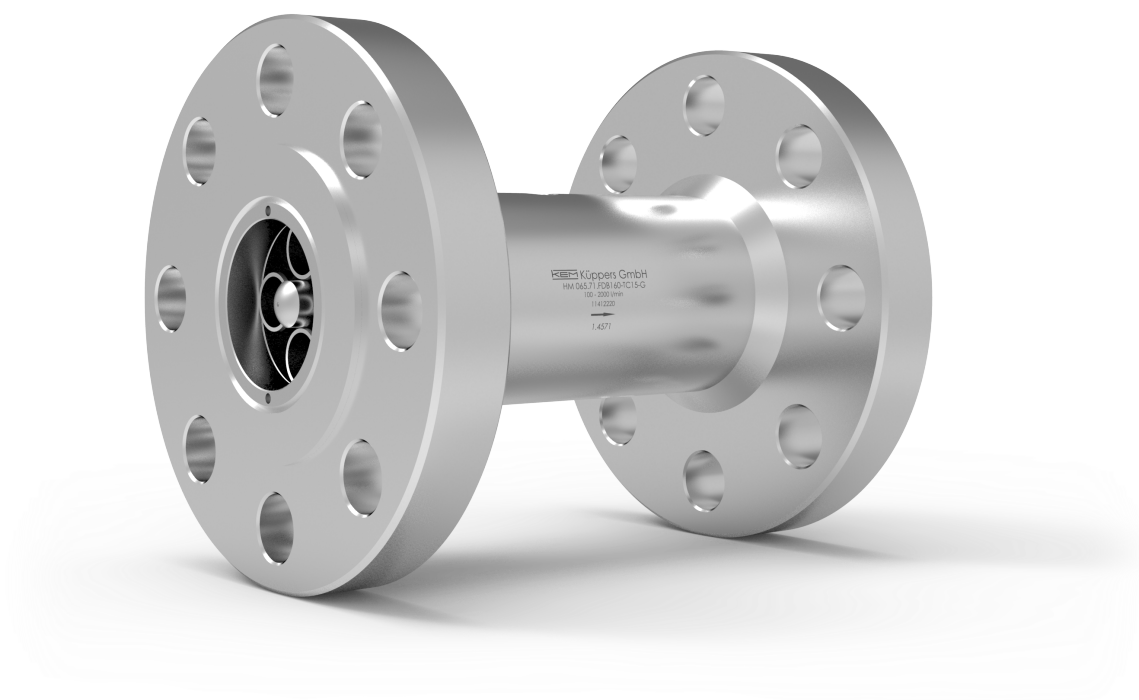


# Technical Datasheet



## HM F Series

Turbine Flow Meters  
with Flange Connections

## Description

The HM F turbine flow meter series (F for flange connections) is used to measure continuous and discontinuous flow rates. They are mainly used for lubrication and non-lubrication media. They are particularly suitable for low and medium viscosity liquids, such as water, emulsions, glycol mixtures and light oils.

Only high-grade steels that even withstand corrosive liquids are used in the production of turbine flow meters. Combined with the use of tungsten carbide bearings, the HM F guarantees optimum measurement accuracy and an extremely long service life even under the toughest application conditions.

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 F ideal for a variety of applications in the field of metering as well as for monitoring, mixing and dosing.

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, CSA and other standards. Additional certifications such as EAC (TR-CU) are available.

## Principle and Design

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

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 tapped by the contactless sensor technology (transducer) through the housing wall. The sensor system can be variably adapted to meet the requirements of the respective application. This also allows, for example, providing a signal to indicate the direction of flow.

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 width, which is advantageous for precise filling processes.

Turbine flow meters have a resolution of up to 100,000 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
- Filling process
- Dosing systems
- 2-component mixing plants
- Test stands
- Water (polluted and demineralized)
- Hydraulic and gear oils
- Fuels, gasoline, kerosene
- Coolants
- Additives
- Solvents
- Pharmaceutical liquids
- Cryogenic fluids

## Features

- High measuring accuracy up to  $\pm 0.1\%$ <sup>1)</sup>
- Exceptional repeatability of  $\pm 0.05\%$
- Short response times (from 5 ms)
- Robust carbide bearing
- Medium temperature:  $-60\text{ }^{\circ}\text{C}$  up to  $+350\text{ }^{\circ}\text{C}$  [ $-76\text{ }^{\circ}\text{F}$  up to  $+662\text{ }^{\circ}\text{F}$ ]
- Different nominal sizes
- Pressure stage up to PN400/6000 PSI
- Flange standard DIN Form B, ASME Raised Face (RF) & Ring Type Joint (RTJ)

<sup>1)</sup> Under laboratory conditions; incl. linearization; viscosity  $\geq 1\text{ mm}^2/\text{s}$ .

Technical Data – Sizes

Metric Flanges as per DIN-EN 1092-1 Form B / Inch Flanges as per ASME B 16.5 (class 150-2500)									
HM Type <sup>2)</sup>	Measuring Range <sup>3)</sup> (l/min)			K-Factor <sup>4)</sup> (pulses/l)		max. Frequency <sup>4)</sup> (Hz)		Nominal Size (mm)	Nominal Size (in)
				≥ 1 cst	> 8 cst	≥ 1 cst	> 8 cst		
HM F 003	0.3	to	1.5	32,000	32,500	1,000	1,000	15	½"
HM F 004	0.5	to	4	24,000	19,000	1,700	1,250		
HM F 005	0.8	to	6	17,800	17,800	1,740	1,780		
HM F 006	1.2	to	10	11,000	11,000	1,750	1,750		
HM F 007	2.0	to	20	5,200	5,200	1,800	1,800		
HM F 009	3.3	to	33	1,900	4,200	1,080	1,800		
HM F 011	6.0	to	60	1,300	2,700	1,080	2,600		
HM F 009	3.3	to	33	1,900	4,200	1,080	1,800	25	1"
HM F 011	6.0	to	60	1,300	2,700	1,080	2,600		
HM F 013	8.5	to	85	900	1,900	1,350	2,700		
HM F 017	12	to	120	380	840	1,300	2,600		
HM F 019	15	to	150	310	650	800	1,650		
HM F 022	20	to	200	217	450	800	1,600		
HM F 024	25	to	250	170	360	800	2,000		
HM F 011	6.0	to	60	1,300	2,700	1,080	2,600	40	1½"
HM F 013	8.5	to	85	900	1,900	1,350	2,700		
HM F 017	12	to	120	380	840	1,300	2,600		
HM F 019	15	to	150	310	650	800	1,650		
HM F 022	20	to	200	217	450	800	1,600		
HM F 024	25	to	250	170	360	800	2,000		
HM F 028	30	to	360	155	320	960	2,000		
HM F 030	35	to	400	130	270	860	1,850		
HM F 036	40	to	500	60	135	600	1,200		
HM F 040	50	to	750	105	110	1320	1,400		
HM F 017	12	to	120	380	840	1,300	2,600	50	2"
HM F 019	15	to	150	310	650	800	1,650		
HM F 022	20	to	200	217	450	800	1,600		
HM F 024	25	to	250	170	360	800	2,000		
HM F 028	30	to	360	155	320	960	2,000		
HM F 030	35	to	400	130	270	860	1,850		
HM F 036	40	to	500	60	135	600	1,200		
HM F 040	50	to	750	105	110	1320	1,400		
HM F 050	70	to	1,200	65	65	1,400	1,400		
HM F 036	40	to	500	60	135	600	1,200	65	2½"
HM F 040	50	to	750	105	110	1320	1,400		
HM F 050	70	to	1,200	65	65	1,400	1,400		
HM F 065	100	to	2,000	25	25	850	850		
HM F 040	50	to	750	105	110	1320	1,400	80	3"
HM F 050	70	to	1,200	65	65	1,400	1,400		
HM F 065	100	to	2,000	25	25	850	850		
HM F 080	160	to	3,200	11	11	615	615		
HM F 065	100	to	2,000	25	25	850	850	100	4"
HM F 080	160	to	3,200	11	11	615	615		
HM F 100	250	to	5,000	7	7	560	560		
HM F 150	350	to	10,000	3,400	3,400	600	1,200	150	6"
HM F 200	430	to	13,400	415	415	600	1,200	200	8"

<sup>2)</sup> Exact type designation on request.

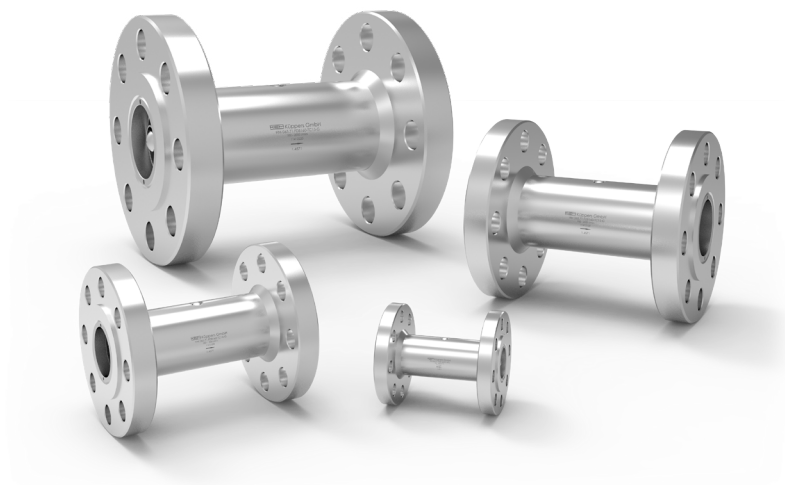
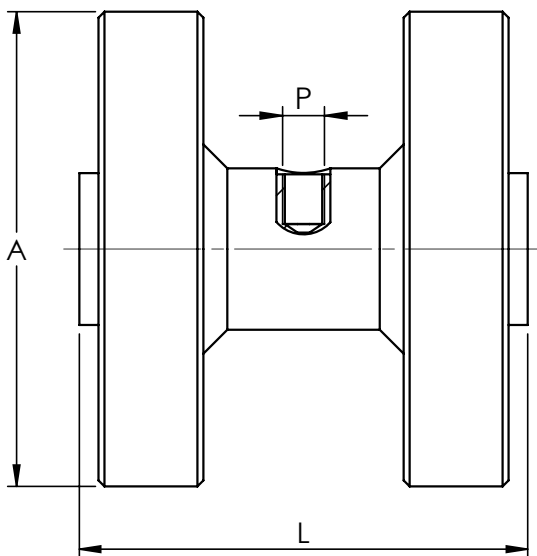
<sup>3)</sup> Extended measuring ranges on request.

<sup>4)</sup> Average values for single sensors at viscosity of 1 mm<sup>2</sup>/s; higher viscosities may differ.

### Technical Data – General

Measuring Accuracy	±0.1 % <sup>5)</sup>
Repeatability	±0.05 % (under the same conditions)
Linearity	±1 % of actual flow
Measuring Span	Standard: 1:10 Extended: on request
Viscosity Range	0.8 up to 30 mm <sup>2</sup> /s
Materials	Housing: as per DIN 1.4404 [AISI 316L], other material on request Wheels: as per DIN 1.4122, 1.4460 [AISI 329], other material on request Bearing: Tungsten carbide sleeve bearing
Medium Temperature	-60 °C up to +350 °C [-76 °F up to +662 °F]
Dimensions	See dimensional drawing

### Dimensional Drawing



<sup>5)</sup> Under laboratory conditions; incl. linearization; viscosity ≥1 mm<sup>2</sup>/s.

Metric Flanges as per DIN-EN 1092-1 Form B

HM Type	Nominal Size	A							L	P <sup>6)</sup>
		PN 16	PN 40	PN 100	PN 160	PN 250	PN 320	PN 400		
HM F 003 - 011	15 mm [0.59 in]	on request	95 mm [3.74 in]	105 mm [4.13 in]	105 mm [4.13 in]	130 mm [5.12 in]	130 mm [5.12 in]	145 mm [5.71 in]	110 mm [4.33 in]	M14x1.5
HM F 009 - 024	25 mm [0.98 in]	on request	115 mm [4.53 in]	140 mm [5.51 in]	140 mm [5.51 in]	150 mm [5.91 in]	160 mm [6.30 in]	180 mm [7.09 in]	150 mm [5.91 in]	M14x1.5
HM F 011 - 040	40 mm [1.57 in]	on request	150 mm [5.91 in]	170 mm [6.69 in]	170 mm [6.69 in]	185 mm [7.28 in]	195 mm [7.68 in]	220 mm [8.66 in]	174 mm [6.85 in]	M14x1.5
HM F 017 - 050	50 mm [1.97 in]	165 mm [6.50 in]	165 mm [6.50 in]	195 mm [7.68 in]	195 mm [7.68 in]	200 mm [7.87 in]	210 mm [8.27 in]	235 mm [9.25 in]	210 mm [8.27 in]	M14x1.5
HM F 036 - 065	65 mm [2.56 in]	185 mm [7.28 in]	185 mm [7.28 in]	220 mm [8.66 in]	220 mm [8.66 in]	on request	on request	on request	258 mm [10.16 in]	M14x1.5
HM F 040 - 080	80 mm [3.15 in]	200 mm [7.87 in]	200 mm [7.87 in]	230 mm [9.06 in]	on request	on request	on request	on request	316 mm [12.44 in]	M14x1.5
HM F 065 - 100	100 mm [3.94 in]	220 mm [8.66 in]	235 mm [9.25 in]	265 mm [10.43 in]	on request	on request	on request	on request	386 mm [15.20 in]	M14x1.5
HM F 150	150 mm [5.91 in]	285 mm [11.22 in]	300 mm [11.81 in]	on request	Higher pressures on request				400 mm [15.75 in]	M14x1.5
HM F 200	200 mm [7.87 in]	340 mm [13.39 in]	375 mm [14.76 in]	on request					400 mm [15.75 in]	M14x1.5

Inch Flanges as per ASME B 16.5 (Class 150-2500) Raised Face (RF) & Ring Type Joint (RTJ)

HM Type	Nominal Size	A						L	P <sup>6)</sup>
		150	300	600	900	1500	2500		
HM F 003 - 011	½"	90 mm [3.5 in]	95 mm [3.75 in]	95 mm [3.75 in]	120 mm [4.75 in]	120 mm [4.75 in]	135 mm [5.25 in]	110 mm [4.33 in]	M14x1.5
HM F 009 - 024	1"	110 mm [4.25 in]	125 mm [4.88 in]	125 mm [4.88 in]	150 mm [5.88 in]	150 mm [5.88 in]	160 mm [6.25 in]	150 mm [5.91 in]	M14x1.5
HM F 011 - 040	1 ½"	125 mm [5 in]	155 mm [6.12 in]	155 mm [6.12 in]	180 mm [7 in]	180 mm [7 in]	205 mm [8 in]	174 mm [6.85 in]	M14x1.5
HM F 017 - 050	2"	150 mm [6 in]	165 mm [6.5 in]	165 mm [6.5 in]	215 mm [8.5 in]	215 mm [8.5 in]	235 mm [9.25 in]	210 mm [8.27 in]	M14x1.5
HM F 036 - 065	2 ½"	180 mm [7 in]	190 mm [7.5 in]	190 mm [7.5 in]	245 mm [9.62 in]	on request	on request	258 mm [10.16 in]	M14x1.5
HM F 040 - 080	3"	190 mm [7.5 in]	210 mm [8.25 in]	210 mm [8.25 in]	on request	on request	on request	316 mm [12.44 in]	M14x1.5
HM F 065 - 100	4"	230 mm [9 in]	255 mm [10 in]	275 mm [10.75 in]	on request	on request	on request	386 mm [15.20 in]	M14x1.5
HM F 150	6"	280 mm [11 in]	320 mm [12.5 in]	355 mm [14 in]	Higher pressures on request			400 mm [15.75 in]	M14x1.5
HM F 200	8"	345 mm [13.5 in]	380 mm [15 in]	on request				400 mm [15.75 in]	M14x1.5

<sup>6)</sup> Only applies for single pickup holes of type „G“.

## 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

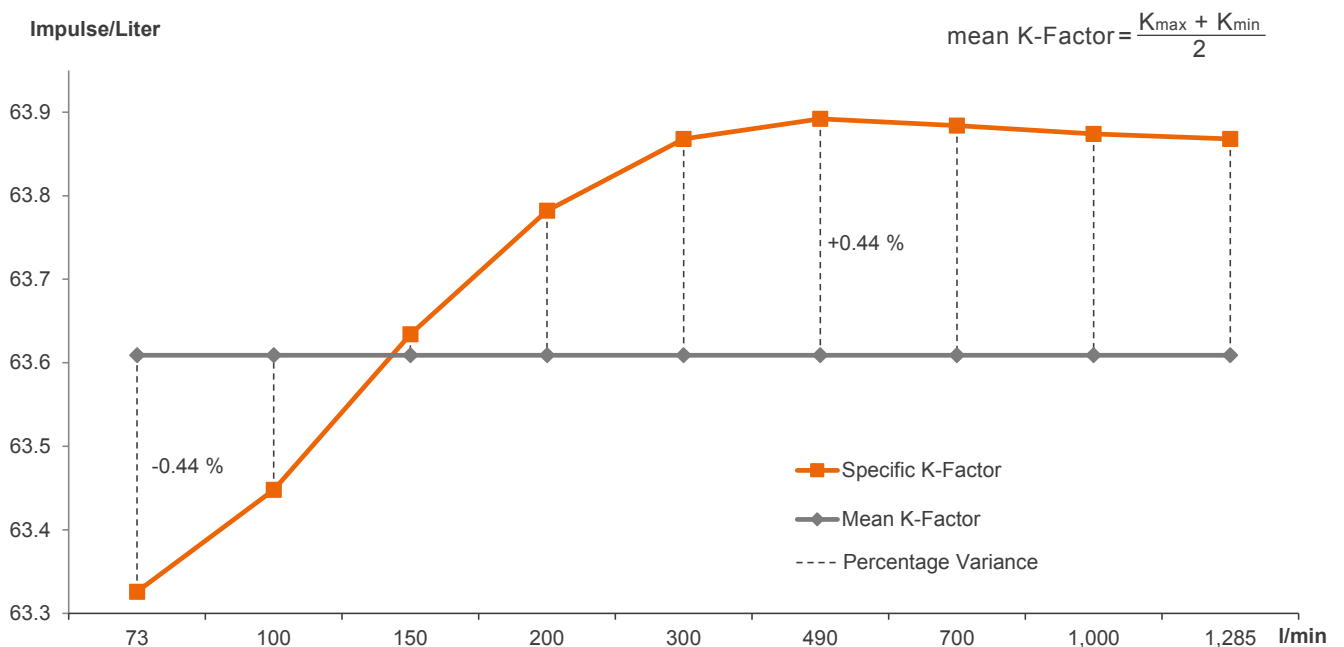
The flow is directly dependent on the measured frequency and the associated calibration factor:

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

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

## Calibration protocol

Example: HM F 050





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