

Turbine flowmeter HM-E / HMP-E

Area of application

- Measurement of flow and volume of pure low-viscosity media in food and pharmaceutical applications

Application Examples

- Process water, demineralized water, aqueous media such as filtered fruit juice or beer, alcohols, light oils, saline solutions, cleaning agents, and acids.

Hygienic design

- Hygienic design, confirmed by 3-A certification
- 2-part housing ensures simple cleaning and maintenance
- High media resistance due to stainless steel 316L and Rulon™ bearings
- Nominal widths according to ASME BPE and DIN 11850 Series 2
- Universal clamp connection.

Features

- High quality and hygienic alternative to industrial, non-hygienic turbine, paddle wheel or variable area flowmeters
- Economical alternative to mass flowmeters in non-conductive, low-viscosity media
- Cost-effective and compact alternative to magnetic-inductive flowmeters in applications that require a small probe

Options / Accessories

- 3-wire signal probe with M12 connection
- Pre-fabricated cable for M12 connector
- Analog output via universal transmitter "NCI-45"
- External on-site display on "PEZ" digital indicator

Measuring Principle

- The signal probe (1) generates an electromagnetic field (3) in an oscillating circuit (2).
- This electromagnetic field penetrates the stainless steel walls of the housing and induces an induction current (eddy current) in the turning rotor blades.
- This induction current, in turn, generates an electromagnetic field that counteracts the magnetic field generated by the oscillating circuit and thus causes a change in the oscillating circuit voltage.
- The integrated amplifier (4) processes these voltage changes into a pulse signal with a frequency that is directly proportional to the rotational speed of the turbine.

Certificates



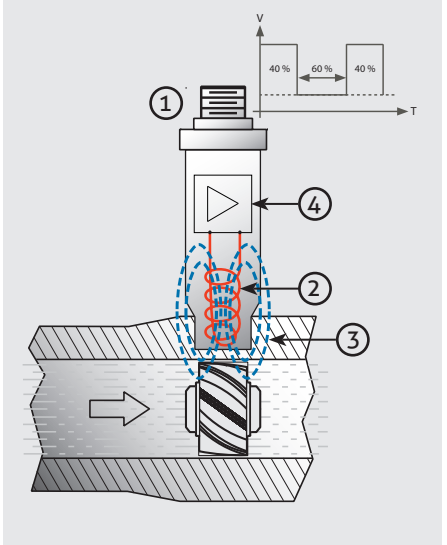
HMP-E 020



HMP-E 020



Non-contact pulse measurement



Two-part housing makes the device easy to clean and maintain

- Springs and fasteners for internal parts are unnecessary in the 2-part housing. This improves cleanability and results in a simpler design that lowers the risk of product contamination.



Hygienic stainless steel design

- 3-A certification
- Compact size enables the use in diverse applications in tight spaces
- Massive turbine housing of stainless steel – insensitive to thermal influences

Tri-Clamp process connection

- Universal Tri-Clamp connection for tubes as per DIN 11850 Series 2 or ASME BPE
- Nominal widths DN20...DN50 or 3/4" ...2"

HM-E



Flow straightener
(inlet)



Rotor



Flow straightener
(outlet)



Signal Probe / Turbine housing

Long-lived combination of Rulon 123™ plain bearings and 316L stainless steel shaft

- In contrast to other material combinations involving hard ceramics, which have a tendency to fracture, the Rulon/stainless steel combination withstands the process conditions during air streams and steam sterilization.

Non-magnetic measurement of rotor

- Non-magnetic measurement of the rotor using an eddy current signal probe eliminates the interaction of forces between the rotor and probe. This improves accuracy and extends machinery service life. These forces generate a resistance on the rotor and are detrimental to the accuracy and service life of the plain bearings and shaft.

Rapid response time

- Due to the low mass moment of inertia of the turbine wheel, response time is extremely rapid at less than 50 ms. This makes it possible to easily detect rapid flow changes.

Pharmaceutical model (HMP-E)

- Material specification in agreement with ASME BPE standards
- Surfaces with product contact are electropolished ($R_a \leq 0,5 \mu\text{m}$)
- Certificates are included with the delivery: materials, calibration, USP Class VI for Rulon™ and sealing materials

Optional:

- measurement protocol for surface roughness and delta ferrite content

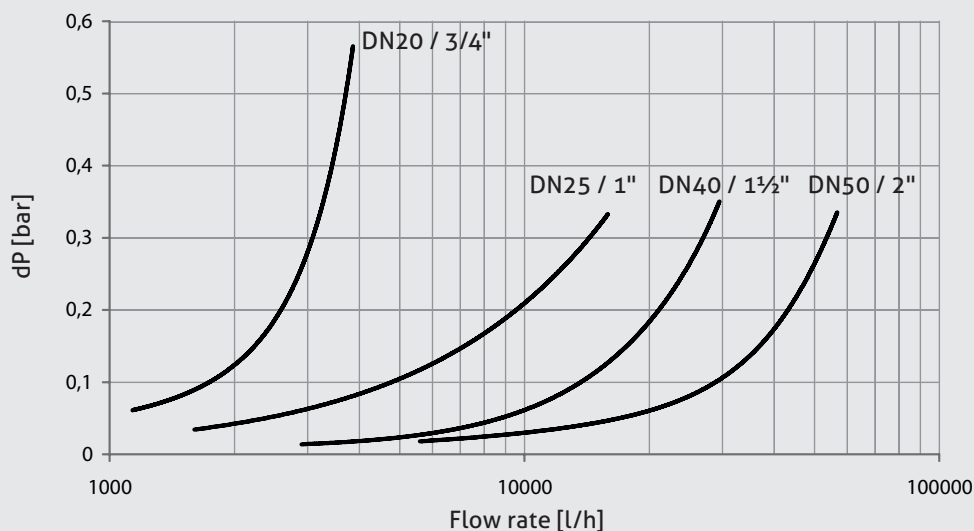
Technical data		
Process connection	Tri-Clamp Nominal widths Tube standards	as per DIN 32676 (see Dimensions table, page 4) DN20 (3/4"), DN25 (1"), DN40 (1.5"), DN50 (2") DIN 11850 Series 2 (DIN 11866 Series A) ASME-BPE 2004
Materials	Housing Clamping ring Rotor Plain bearing Adhesive Gasket Signal probe	Stainless steel 316L (1.4404) Stainless steel 304 (1.4301) Stainless steel 316L (1.4404) Rulon 123™ (PTFE compound) with USP class VI GSP 1325-2 Silicone; Pharma (HMP-E) with EPDM USP class VI Stainless steel 304 (1.4301)
Surface (with product contact)	HM-E (food) HMP-E (pharma)	$R_a \leq 0.8 \mu\text{m}$ (electropolished) $R_a \leq 0.5 \mu\text{m}$ (electropolished)
Temperature range	Process environment	Max. 150 °C (300 °F) -40...+85 °C
Operating pressure	PN10	10 bar (150 psi)
Protection class	Signal probe	IP 69 K, NEMA 4X
Signal probe	Measuring principle Mechanical connection Supply voltage Electrical connection Signal cable	Eddy current 5/8"-18 (UNF-20) 8...24 V DC; 0.8 watt max. M12 3-core, shielded, max. 150 m
Pulse output	Signal Frequency range Output unit	PNP pulse output, unscaled Duty cycle (low/high): 60:40 $V_{\text{max}} = \text{supply voltage} - 0.7 \text{ V}$ $V_{\text{min}} = 0.5 \text{ V}$ 0...1000 Hz, depends on flow rate and nominal width Pulses per volume
Measuring range	DN20 / 3/4" DN25 / 1" DN40 / 1.5" DN50 / 2"	1100...3900 l/h 1600...15900 l/h 2900...29500 l/h 5600...56750 l/h
Accuracy	Measuring accuracy Reproducibility	$\pm 0.50 \%$ of measured value over the entire range $\pm 0.10 \%$
Response time		50 ms
Measuring media	Product viscosity Purity Media resistance	Max. 100 cP (1 cP = 1mPa · s) Particle size < 20 μm Adhere to the general resistance charts.
Certifications	CE conformity Hygiene / cleanability	2004/108/EC 3-A TPV 28-03 (for ASME version)

Conventional Usage

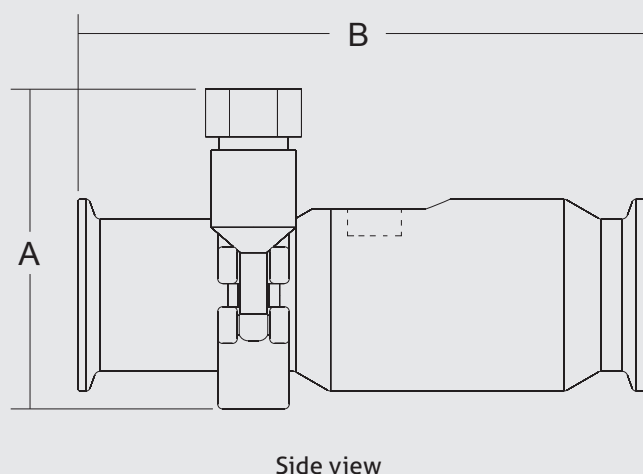


- Not suitable for applications in explosive areas.
- Not suitable for applications in security-relevant equipments (SIL).
- Not to be used for measurement of ultrapure media (e.g. WFI - water for injection).

Pressure loss



Dimensional drawing HM-E / HMP-E



Installation sizes

DIN 11850 Reihe 2	ID [mm]	Tri- Clamp	A [mm]	B [mm]
DN20	20,0	34,0	86,2	149,4
DN25	26,0	50,5	86,2	149,4
DN40	38,0	50,5	92,2	155,7
DN50	50,0	64,0	98,6	219,2

Installation sizes

ASME BPE	ID [mm]	Tri- Clamp	A [mm]	B [mm]
3/4"	15,75	50,5	86,2	149,4
1"	22,10	50,5	86,2	149,4
1½"	34,80	50,5	92,2	155,7
2"	47,50	64,0	98,6	219,2

Mechanical installation (installation notes)



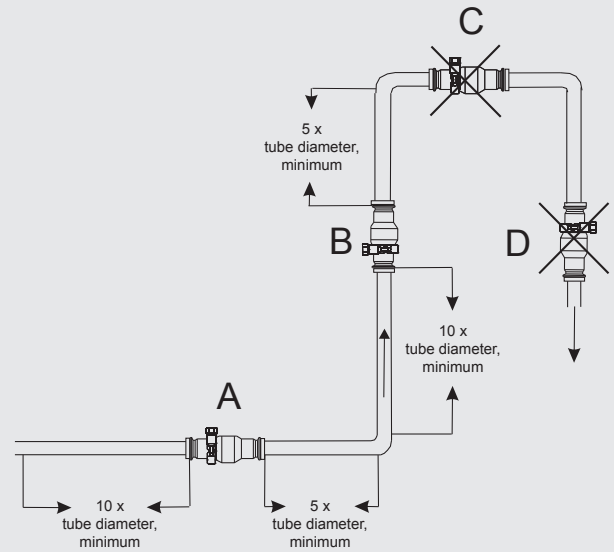
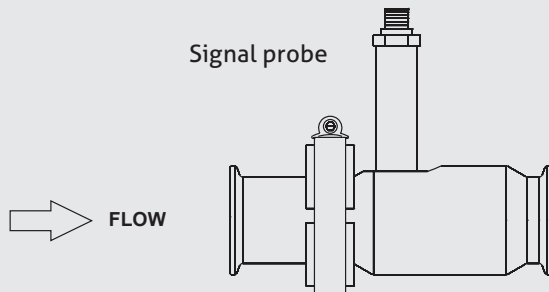
- Adhere to the operating conditions for the measuring media specified in the "Technical data" section.
- Avoid installation locations that may be subject to strong vibrations.
- Ensure that the arrow on the turbine housing points in the direction of flow.
- Select an installation location at which the turbine is fully filled with liquid.
- Install the turbine in a vertical or horizontal tube section and avoid upward slopes.
- Install the turbine in vertical tube sections with an upward direction of flow or in horizontal tube sections at the lowest point in the tube.
- Install the flowmeter in a tube with at least the 10-fold diameter in the inlet section and the 5-fold diameter in the outlet section.

Typical product viscosities

Medium	Viscosity [cP]
Water (20 °C)	1
Water (5 °C)	1,52
Ethanol	1,19
Milk (20 °C)	2...5
Fruit juice (20 °C)	2...5
Glycol (20 °C)	40
Olive oil (40 °C)	40
Olive oil (20 °C)	100
Sugar solution 65Bx (20 °C)	120

Mechanical connection/installation notes

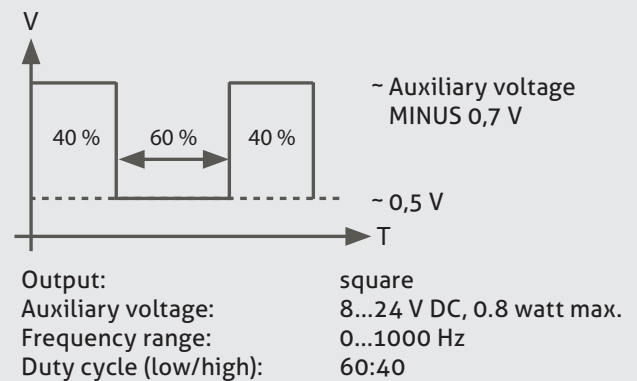
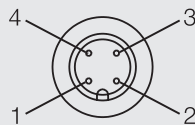
- Screw the signal probe all the way into the tapped hole of the turbine without applying force
- Tighten the lock nut



M12 connector assignment of HTE signal probe

M12 connector assignment

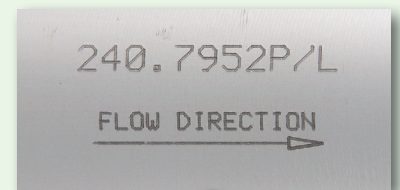
1. +24 V auxiliary voltage
2. Not assigned
3. -Auxiliary voltage
4. Pulse output



Calibration

- Because of production-related tolerances, the volume of fluid moved by the rotor is not precisely the same for each flowmeter. For this reason, a calibration factor (K-factor) is determined at the factory for each measuring device.
- The K-factor specifies the number of pulses per volume unit and is engraved on the turbine housing of each device in "P/L" (pulses per liter).

K-factor for turbine housing



Measurement range (flow rate, pulse frequency)

Nominal width	Measurement range [l/h]	Calibration factor* [pulse/liter] (example)	Pulse frequency* [Hz] (example)
DN20 / 3/4"	1100...3900	770	235...834
DN25 / 1"	1600...15900	238	106...1051
DN40 / 1½"	2900...29500	86	69...705
DN50 / 2"	5600...56750	29	45...457

*) The applicable K-factor is used for the exact computation of the flow rate of the flowmeter.

K-factor

$$\text{Flow rate [l/h]} = \frac{f_{\text{pulse}}[\text{Hz}] \times 3600 \text{ s}}{\text{K-factor [P/L]}}$$

Transport / Storage



- No outdoor storage
- Dry and dust free
- Not exposed to corrosive media
- Protected against solar radiation
- Avoiding mechanical shock and vibration
- Storage temperature -55 °C...+90 °C
- Relative humidity max. 98 %

Reshipment



- Sensors shall be clean and must not be contaminated with dangerous media!
- Use suitable transport packaging only to avoid damage of the equipment!

Cleaning / Maintenance



- In case of using pressure washers, don't point nozzle directly to electrical connections!

Advice to EMC



- The device agrees to following standards: EMC directive 2004/108/EC.
- The accordance with applicable EU-guidelines is confirmed with CE-labeling of the device.
- You have to guarantee the EMC directives for the entire equipment.

Disposal



- This instrument is not subject to the WEEE directive 2002/96/EC and the respective national laws.
- Pass the instrument directly on to a specialised recycling company and do not use the municipal collecting points.

Maintenance intervals



- If the specified operating conditions are adhered to, the average service life of the rotor bearing is approx. 8000 operating hours.
- Heavy rotor wear can lead to turbine housing damage. To avoid secondary damage due to a bearing defect, an annual inspection and a check are recommended after 8000 operating hours at the latest.
- Applications with a high flow speed (outside of the specified range), erosive media or permanent start-stop operation can lead to premature bearing wear.

Opening the turbine



- Before removing the probe, ensure that the line is not pressurized.
- Disconnect the signal cable and fully remove the probe from the product line.
- Open the clamping ring and separate the turbine housing.
- Remove the flow straightener from the turbine housing by turning it slightly.
- Check each component for visible damage as you remove it from the housing.
- Check the rotor bearing and the shaft for wear and damage. Rotor wear primarily occurs on the bearing side that faces downstream.

Assembling the turbine



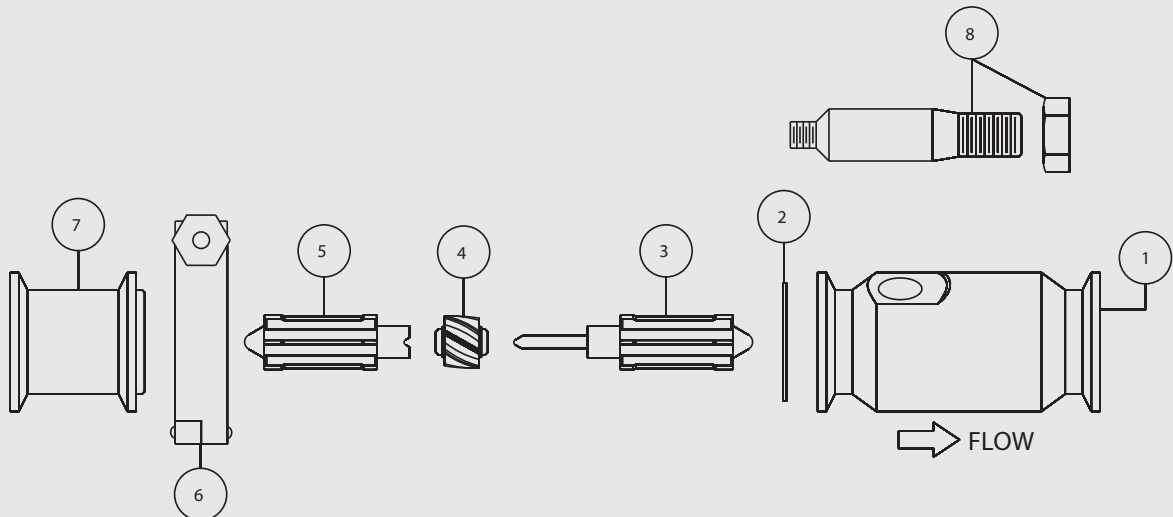
- Prior to installation, ensure that the rotor can move freely on the shaft.
- Turn the parts until they are in the right position. Align the installed parts as shown in the figure. Do not use force when assembling the parts.
- Ensure that the gasket is properly seated in the groove between both parts of the turbine housing.
- Attach the clamping ring and install the device in the process line..

Replacing the rotor



The replacement of the rotor and flow straighteners will cause a change of the calibration factor of the turbine. To meet the specified accuracy a recalibration of the turbine meter is necessary.

Fig.: Assembling the turbine



- | | |
|-------------------------------|-------------------------------|
| 1. Turbine housing | 5. Flow straightener (inlet) |
| 2. Gasket | 6. Clamping ring |
| 3. Flow straightener (outlet) | 7. Straightener housing |
| 4. Rotor | 8. Signal probe with lock nut |

Area of application

- Pulse counting, configurable as frequency, rpm or time measurement, or displacement measurement with encoder.

Features

- Freely programmable on frontal keypad
- Freely configurable display scope and counting parameters
- Difference or sum counting possible via two inputs
- Hold and reset function, maximum and minimum value memory
- Two adjustable relay switch outputs
- Analog output 0/4...20 mA (option)
- Field housing for wall installation (option)

PEZ | Universal counter, 4½ places



Order configuration

- When using a turbine flowmeter and an HTE signal probe, select the PEZ with the "PNP" input type.

Area of application

- Conversion of analog, pulse and temperature signals, configurable for flow rate measurement and volume counting.

Features

- Freely-programmable by means of BlueControl™ software
- High functionality: difference or sum counting, MIN/MAX, limit value, linearization, sample&hold, ...
- 2-line LC display with intuitive 3-button operation
- Universal output for current and voltage
- Counter/frequency input & relay switch outputs (option)

Universal switch converter NCI-45



Order configuration (When used in combination with turbine flowmeter and HTE signal probe.)

NCI-45-115-02090U91-00666

Universal Transmitter NCI-45
configuration: frequency-to-current converter
0...1100 Hz / 4...20 mA (scaling adjustable via NCI user interface)

Order Code

HM-E	(Turbine flowmeter for food applications; additionally required: signal probe HTE000)		
HMP-E	(Turbine flowmeter for pharmaceutical applications; additionally required: signal probe HTE000)		
	Tube nominal width		
	020	(DN20 / 3/4")	
	025	(DN25 / 1")	
	040	(DN40 / 1½")	
	050	(DN50 / 2")	
		Tube standard	
		1	(DIN 11850 Series 2 or DIN 11866 Series A)
		2	(ASME BPE)
		Model	
		00	(standard)
		01	(3/4" NPT threaded connection for integral display)
HMP-E	050	1	00

Accessories / spare parts

HTE000	3-wire signal probe with M12 connector
HM-E600-020	Spare parts kit for HM-E DN20 / 3/4" (consisting of: 2 x straightener, 1 x rotor, 1 x gasket)
HM-E600-025	Spare parts kit for HM-E DN25 / 1" (consisting of: 2 x straightener, 1 x rotor, 1 x gasket)
HM-E600-040	Spare parts kit for HM-E DN40 / 1½" (consisting of: 2 x straightener, 1 x rotor, 1 x gasket)
HM-E600-050	Spare parts kit for HM-E DN50 / 2" (consisting of: 2 x straightener, 1 x rotor, 1 x gasket)
HMP-E600-020	Spare parts kit for HMP-E DN20 / 3/4" (consisting of: 2 x straightener, 1 x rotor, 1 x gasket)
HMP-E600-025	Spare parts kit for HMP-E DN25 / 1" (consisting of: 2 x straightener, 1 x rotor, 1 x gasket)
HMP-E600-040	Spare parts kit for HMP-E DN40 / 1½" (consisting of: 2 x straightener, 1 x rotor, 1 x gasket)
HMP-E600-050	Spare parts kit for HMP-E DN50 / 2" (consisting of: 2 x straightener, 1 x rotor, 1 x gasket)

Options

CAL/HM-E	factory calibration certificate for turbine flowmeter HM-E (In scope of delivery with HMP-E)
CERT/2.2/HM-E	factory certificate 2.2 acc.to EN10204 (only product contacting surface)
CERT/3.1/HM-E	inspection certificate 3.1 acc. to EN10204 (only product contacting surface) (In scope of delivery with HMP-E)

Connection Cable

PVC-cable with M12-connection, brass nickel-plated, IP 67, shielded	
M12-PVC / 4G-5 m	PVC-cable 4-pin, length 5 m
M12-PVC / 4G-10 m	PVC-cable 4-pin, length 10 m
M12-PVC / 4G-25 m	PVC-cable 4-pin, length 25 m

PVC-cable with M12-connection

