Turbine flowmeter HM-E / HMP-E

Application/Specified usage

- Measurement of flow and volume of pure, low viscous media in food and pharmaceutical applications.
- Designed for hygienic applications in food-, beverage- and pharmaceutical industries.

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/Process connection

- Sensor completely made of stainless steel
- Compliant to 3-A Sanitary Standard 28-
- 2-part housing ensures simple cleaning and maintenance
- High media resistance due to stainless steel AISI 316L and Rulon™ bearings
- Nominal widths according to ASME BPE and DIN 11850 Series 2
- Tri-Clamp 1", 1½" and 2"

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 universal transmitter "NCI-45"

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.

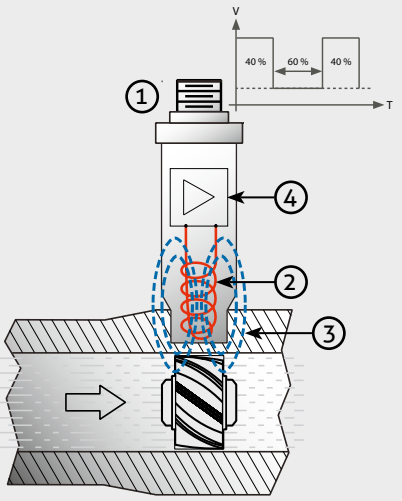
Communication

4...20 mA

HMP-E

HMP-E

Non-contact pulse measurement



Two-part housing makes the device easy to clean andmaintain

· 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 conform
· 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 DN25...DN50 resp. 1"...2"

HM-E

Flow straightener (inlet)

Rotor

Flow straightener (outlet)

Signal Probe / Turbine housing

Long-lived combination of Rulon 123™ plain bearings and AISI 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.

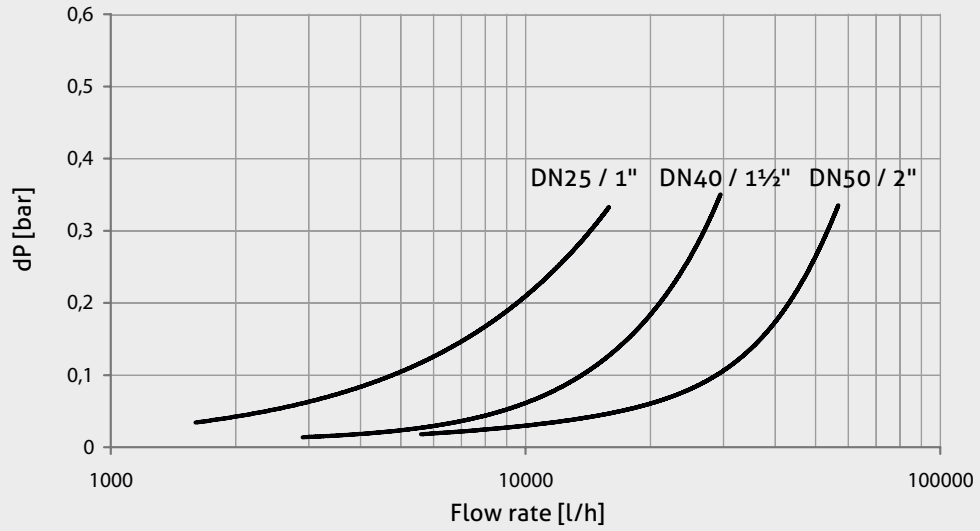
Technical data HM-E / HMP-E		
Process connection	Tri-Clamp Nominal widths Tube standards	DIN 32676 (see Dimensions table, page 4) DN25 (1"), DN40 (1½"), DN50 (2") DIN 11850 Series 2 (DIN 11866 Series A) ASME-BPE 2004
Materials	Housing Clamping ring Rotor Adhesive	AISI 316L (1.4404) AISI 304 (1.4301) AISI 316L (1.4404) GSP 1325-2
Materials (HM-E)	Surface Plain bearing Gasket	R_a ≤ 0.8 µm (electropolished) Rulon 123™ Silicon rubber
Materials (HMP-E)	Surface Plain bearing Gasket	R_a ≤ 0.5 µm (electropolished) Rulon 123™ (PTFE compound) with USP class VI PTFE with USP class VI
Temperature range	Environment	-40...85 °C (-40...185 °F)
Operating pressure	PN10	Max. 10 bar (150 psi)
Protection class	Signal probe	IP 69 K, NEMA 4X
Measuring range	DN25 / 1" DN40 / 1½" DN50 / 2"	1 600...15 900 l/h 2 900...29 500 l/h 5 600...56 750 l/h
Accuracy	Measuring accuracy Reproducibility	±0.50 % of measured value over the entire range ±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.

Technical data signal probes		
HTExxx	Environment Material Measuring principle Mechanical connection Electrical connection Signal cable Output unit	-40...85 °C (-40...185 °F) Stainless steel AISI 304 (1.4301) Eddy current 5/8"-18 (UNF-20) M12 3-core, shielded, max. 150 m Pulses per volume
HTE000	Process temperature Supply voltage Signal Frequency range	max. 120 °C (248 °F) 8...24 V DC; 0.8 watt max. PNP pulse output, unscaled, (0.5...supply voltage -0.7) V 0...1 000 Hz, depends on flow rate and nominal width

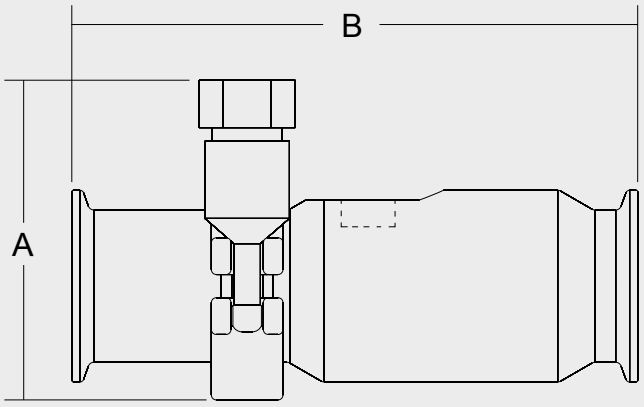
Conventional Usage

- Not suitable for use in explosive atmospheres.
- Not suitable for safety-related unit parts (SIL).
- The turbine flow meter contains components which may physically wear and shed particles of Rulon. Caution should be exercised when using the turbine flow meter in injectable liquids.

Pressure loss



Dimensional drawing HM-E / HMP-E



Side view

Installation sizes

DIN 11850 Series 2 / DIN 11866 Series A	ID [mm]	Tri-Clamp	A [mm]	B [mm]
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]
1"	22.20	50.5	86.2	149.4
1½"	34.90	50.5	92.2	155.7
2"	47.62	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.

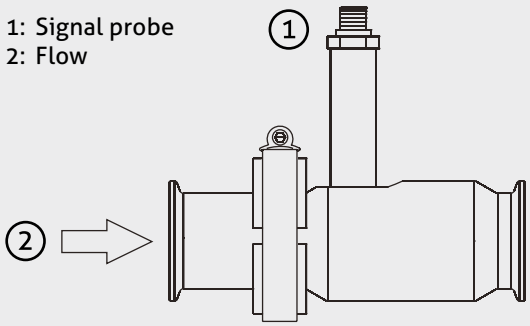
Typical product viscosities

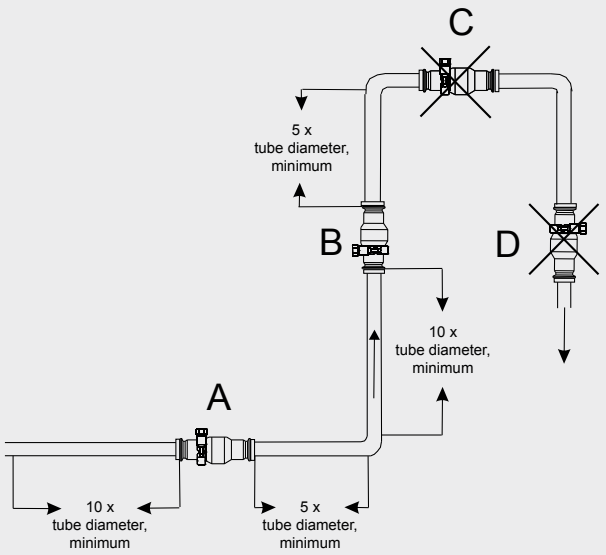
Medium	Viscosity [cP]
Water (20 °C / 68 °F)	1
Water (5 °C / 41 °F)	1.52
Ethanol	1.19
Milk (20 °C / 68 °F)	2...5
Fruit juice (20 °C / 68 °F)	2...5
Glycol (20 °C / 68 °F)	40
Olive oil (40 °C / 104 °F)	40
Olive oil (20 °C / 68 °F)	100
Sugar solution 65Bx (20 °C / 68 °F)	120

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

1: Signal probe
2: Flow

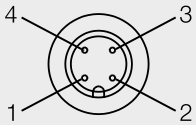




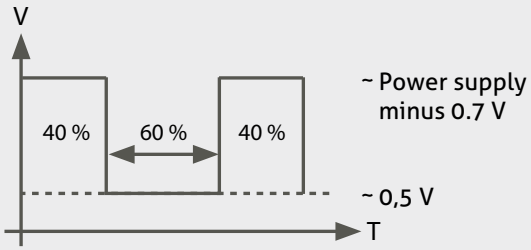
M12 connector assignment of HTE signal probe

M12 connector

1: Power supply +
2: Not assigned
3: Power supply -
4: Pulse output



HTE000 signal output



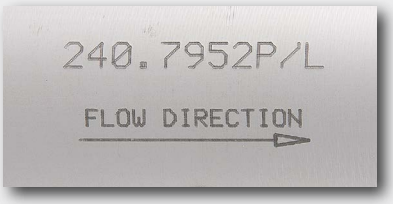
Output:	square
Power supply:	8...24 V DC, 0.8 watt max.
Frequency range:	0...1 000 Hz
Duty cycle (low/high):	60:40

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)
DN25 / 1"	1 600...15 900	238	106...1 051
DN40 / 1½"	2 900...29 500	86	69...705
DN50 / 2"	5 600...56 750	29	45...457

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

K-factor

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

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...90 °C (-67...194 °F)
- 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!

Note on CE

- Applicable directives:
  Electromagnetic Compatibility Directive 2014/30/EU
- Compliance with the applicable EU directives is identified by the CE label on the product.
- The operating company is responsible for complying with the guidelines applicable to the entire installation.

Disposal

- Electrical devices should not be disposed of with household trash. They must be recycled in accordance with national laws and regulations.
- Take the device directly to a specialized recycling company and do not use municipal collection 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.

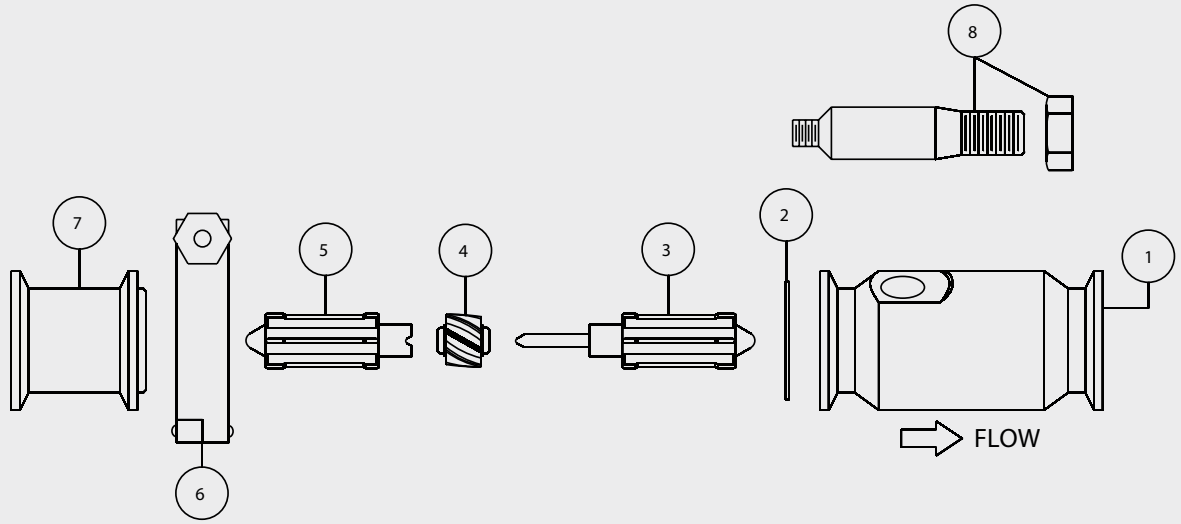
Assembling the turbine

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

NCI-45 for signal probe HTE000

· Conversion of pulse signals to flow rate measurement and volume counting.

Features

· 2-line LC display with intuitive 3-button operation
· Pre-configured for frequency to current
· Default input values 0...1 100 Hz adjusted to 4...20 mA
· Scaling is customer adjustable via NCI menu

Universal switch converter NCI-45

Note on 3-A Sanitary Standard 28-

Information on installation according to 3-A standard is available on our website:
www.anderson-negele.com/3A28.pdf

Click on the PDF icon to download the document.

PDF

Click or Scan

Order Code for Turbine only - Signal Probe must be ordered seperately

HM-E Turbine flowmeter for food applications
HMP-E Turbine flowmeter for pharmaceutical applications, inlcuding material certificates for all wetted parts and calibration certificate

Tube nominal width
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 (max. 120 °C/248 °F)
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)
NCI-45-115-02090U91-00666	Pre-configured Universal Transmitter NCI-45 for signal probe HTE000 configuration: frequency-to-current converter 0...1 100 Hz / 4...20 mA (scaling adjustable)

Connection Cable

PVC-cable with M12 connection, brass nickel-plated, IP69K, shielded

M12-PVC/5G-8m	5 pin, length 8 m
M12-PVC/5G-15m	5 pin, length 15 m
M12-PVC/5G-30m	5 pin, length 30 m

NEGELE MESSTECHNIK GMBH
Raiffeisenweg 7
87743 Egg an der Guenz

Phone +49 (0) 83 33 . 92 04 - 0
Fax +49 (0) 83 33 . 92 04 - 49
sales@anderson-negele.com

Tech. Support:
support@anderson-negele.com
Phone +49 (0) 83 33 . 92 04 - 720