

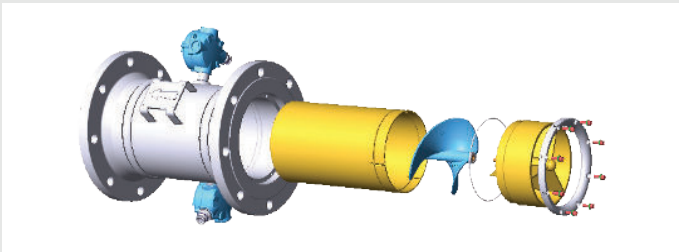


HTM Series Helical Turbine Meters



The HTM series of turbine meters is designed for high accuracy volume measurement of crude oils and other liquid hydrocarbons.

M&T helical turbine meters are preferred for their high robustness and performance on liquid hydrocarbons custody transfer such as export loading terminals, FPSOs, pipelines, separators.



Features & Benefits

- Low to high viscosity design for single or multi-viscosity metering applications with stable meter factors
- Superior linearity and repeatability
- Counting starts from close to zero flow
- Helical rotor protected against severe corrosion
- Helical rotor rounded front profile for meter performance stability when fibres or contaminants are present in crude oil
- 3 part special design self cleaning tungsten carbide bearings for long life
- Stainless steel interchangeable measurement cartridge for easy site maintenance and downtime reduction
- Special materials available (duplex, hastelloy, inconel)
- Low pressure drop

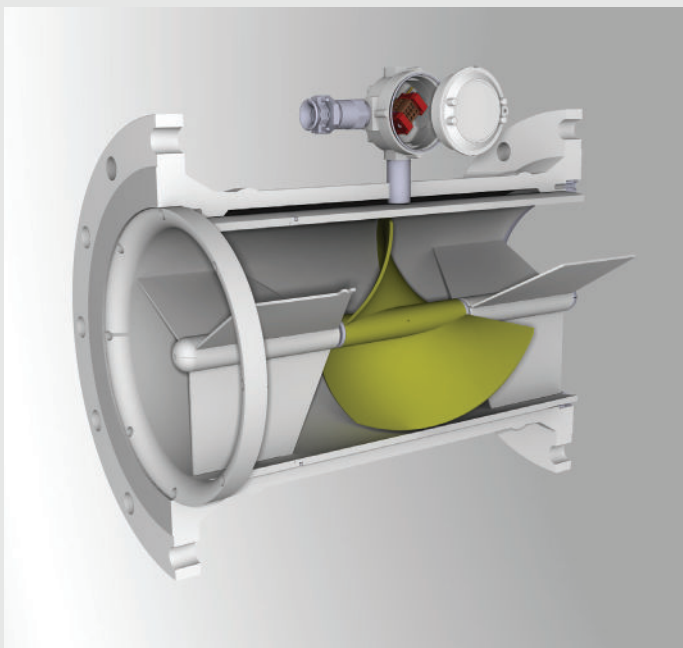
Applications

- FSO & FPSO custody transfer (crude oil)
- On and offshore allocation metering (crude oil, condensates)
- Pipeline metering stations (crude oil, refined products)
- Tanker loading/offloading terminals (crude oil, refined products, petrochemicals)
- Storage management (crude oil, refined products, petrochemicals)



Design

The turbine meter consists of a dual helical blade rotor that rotates proportionally to the volume of liquid flowing through the meter. Small magnets in each blade cause the sensors to switch state every time a rotor blade passes. Two sensors at a 135° angle are normally fitted. The rotor is located in a pressure balanced measuring chamber that is maintained in the flow meter body by means of a screwed retaining ring.



Every pulse generated by the sensor corresponds to a volume value or pulse weight.

The nominal number of pulses per volume unit (K-Factor) depends on the meter size and is accurately determined during flow meter calibration (laboratory proving or field proving).

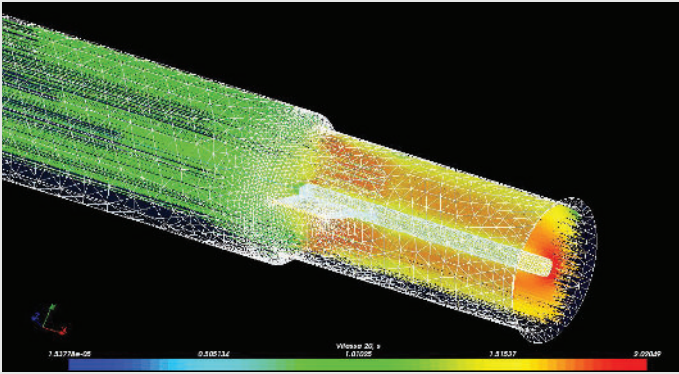
The M&T helical turbine meters (HTM) have a unique internal design that allows reliable and stable meter factors even when viscosity changes.



Performance Reliability

- Cross plates supporting the HTM rotors are welded to the two part measuring chamber system. This ensures perfect bearing set alignment to ensure that friction is minimised for the best measurement performance.
- Unlike other turbine assembly systems, the HTM measuring chamber can be removed and then reinstalled without need of recalibration.
- The tungsten carbide grade for the bearings is carefully selected to minimize erosion - even in harsh conditions such as sand content in hydrocarbons.
- The shaft is lubricated by means of small ducts embedded in the bearing pockets, preventing the accumulation of particles or paraffin that could increase friction.





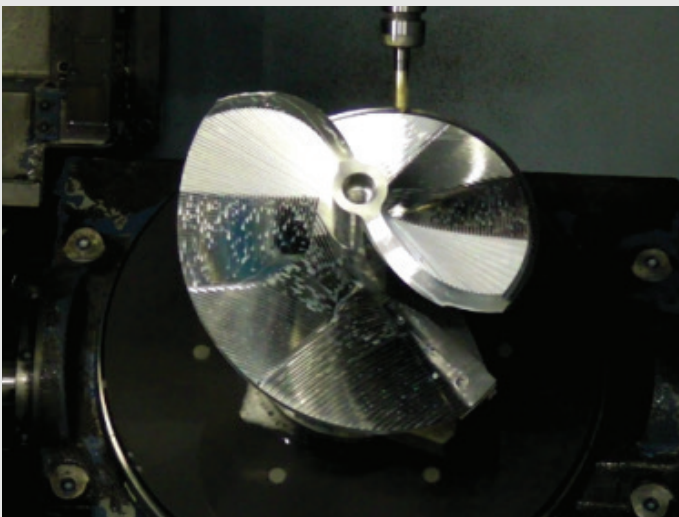
All internal parts are designed and tested using advanced FEA & CFD tools for optimal development of all mechanical parts which influence the helical turbine meter performance.

Critical parts and components such as bearing system are optimised in order to prevent any unexpected failure and to ensure a longer meter lifetime.

Manufacturing

HTM turbine meter rotors are manufactured from one single piece of material (light alloy or titanium, and stainless steel for sizes <6").

We use the most advanced CNC machines available on the market.



International Approvals

M&T's helical turbine meters have received approvals for fiscal metering and custody transfer in many countries. In addition, they comply with the relevant International standards, such as API, OIML and GOST.



Calibration Uncertainty

All HTM meters are calibrated at accredited laboratories such as Trapil (France), using hydrocarbons of similar viscosity to site conditions.

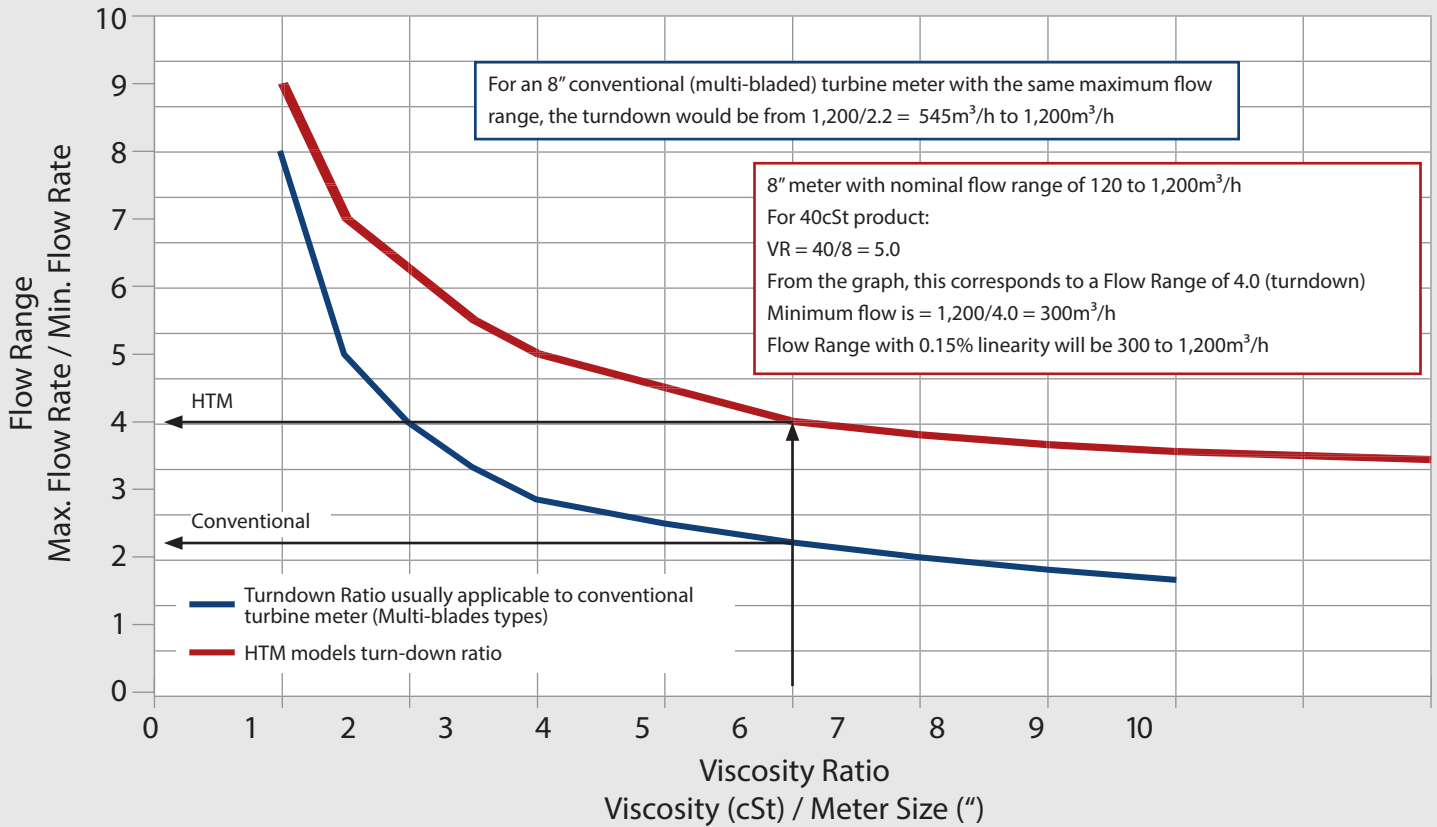
Typical laboratory uncertainty: 0.043%

Thanks to its excellent repeatability performance (better than +/- 0.01%), this turbine can also be used as a master meter for proving other meters.

Typically, the turbine meters are calibrated on 6 flowrates over 3 runs to achieve the API or OIML requirement for custody transfer measurement.

HTM Performance & Technical Data

HTM performance against conventional turbine meter



Flow Range at +/-0.15% linearity & +/-0.02% repeatability vs Viscosity Ratio

Nominal Flow Ranges

Type	Meter Size		Flow Rate (m ³ /h)		Flow Rate (BPH)	
	Inch	mm	Min.	Max.	Min.	Max.
HTM01	1"	25	1.4	14	9	90
HTM015	1½"	40	3.4	34	21	210
HTM02	2"	50	6	60	38	380
HTM03	3"	80	15	150	94	940
HTM04	4'	100	30	300	189	1890
HTM06	6"	150	60	600	377	3770
HTM08	8"	200	120	1200	755	7550
HTM10	10"	250	200	2000	1258	12580
HTM12	12"	300	300	3000	1887	18870
HTM14	14"	350	350	3500	2201	22010
HTM16	16"	400	400	4000	2516	25160
HTM18	18"	450	540	5400	3396	33960
HTM20	20"	400	670	6700	4214	42140

See Note 1

Note 1 - Extended flow ranges may be available depending on your process conditions. Please contact us for more details.

Note 2 - Other weights for #900, #1500 & #2500 available upon request (given lengths are for face to face flanges).

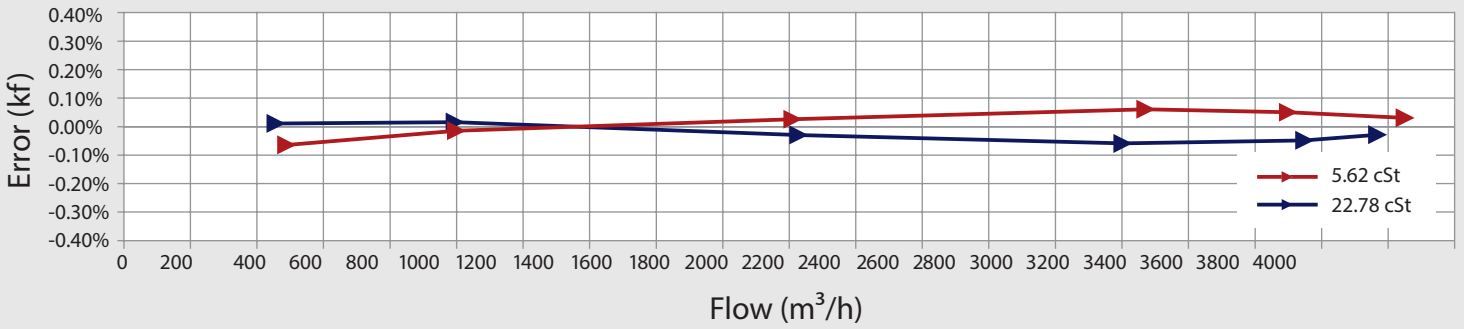
Length & Weight

Type	Meter Length		Weight (kg)			Weight (lb)		
	Inch	mm	#150	#300	#600	#150	#300	#600
HTM01	5½"	140	8	9	10	18	20	22
HTM015	6½"	165	12	14	15.5	26	31	34
HTM02	6½"	165	15	16.5	19	33	36	42
HTM03	10	254	25	29	33	54	64	73
HTM04	12	305	38	51	63	84	113	139
HTM06	14	356	42	59	83	93	131	184
HTM08	16	406	74	98	139	162	216	307
HTM10	20	508	108	147	224	239	324	494
HTM12	24	610	182	234	304	400	515	670
HTM16	32	813	289	392	489	636	864	1077
HTM18	36	914	390	520	-	858	1144	-
HTM20	40	1016	474	640	-	1043	1408	-

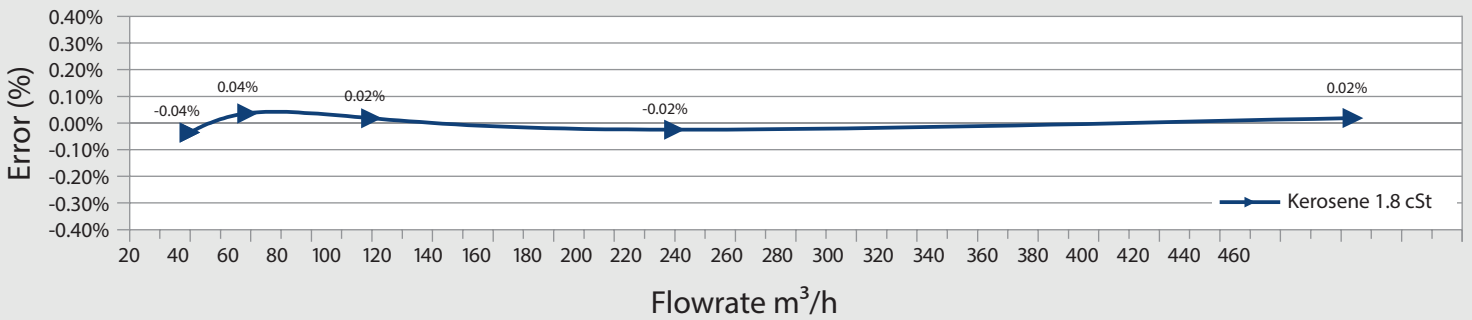
See Note 2

Calibration Curves

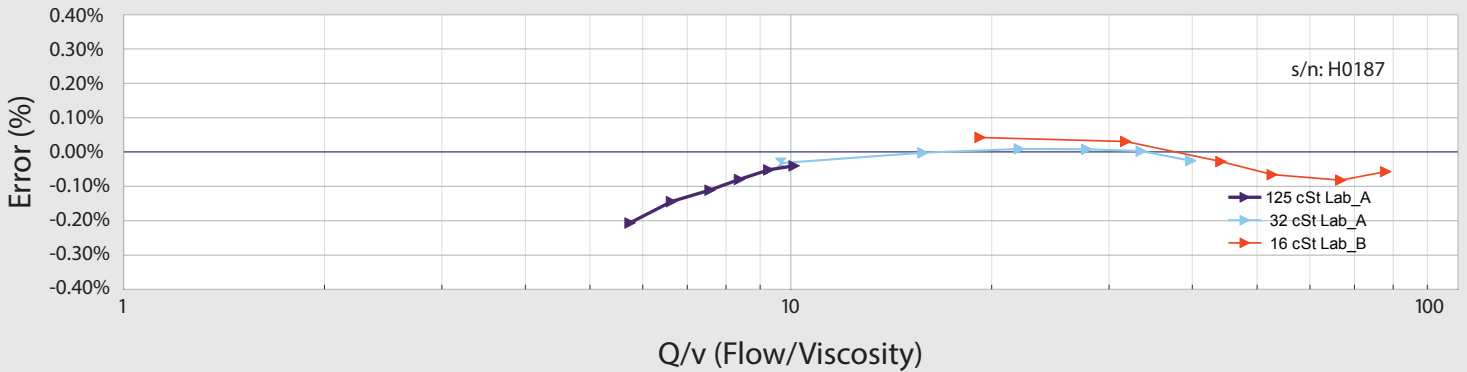
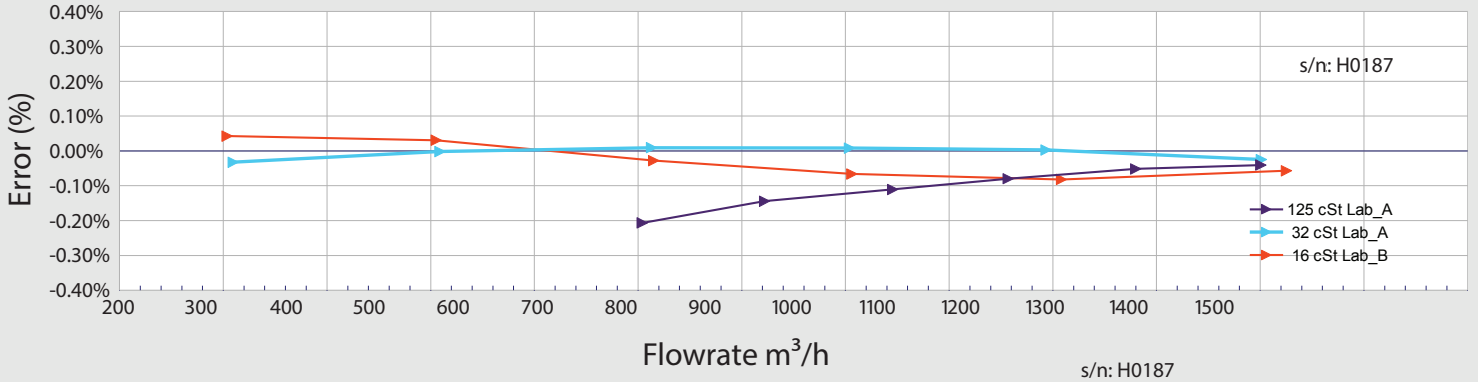
HTM 16" Master Meter calibrated better than +/-0.1% linearity on 2 products



HTM 6" Master Meter calibrated better than +/-0.04% on jet fuel



HTM 10" calibrated on medium to high viscosity at 2 different labs



Specifications

Metrology

Compliances	OIML R117-1 class 0.3, MID 2004/22/EC API MPMS ch5.3, GOST
Accuracy	+/- 0.15% of the measured value (standard) up to +/- 0.1% on single viscosity use (premium)
Repeatability	Better than +/- 0.02%
Installation	7D upstream with recommended flow conditioner + 5D downstream

Certifications

Safety	ATEX 94/9/EC II 2 G Exd IIC T6..T3 Gb IECEX / ATEX : Zone 1 IIC T3 – T5 Gb MET U.S. and Canada Class 1 Division 1 Group A, B, C, D, T5 US - Class 1 Zone 1 AEx db IIC T5 Gb Canada - Ex db IIC T5 Gb
Pressure	PED 97/23/EC ASME B31.3
Metrology	OIML R117-1 (PTB-1.5-4035948) GOST SIRIM (ATS 05/10) MIGAS (14599/18.06/DMT/2009) SPRING (WMO 423/08) INMETRO (P-0004-11-054524-10)
Environment	EMC 89/336/EC
Ingress Protection	IP 66/67 IEC529

Process

Temperature	Process: -40°C to +150°C Ambient: -40°C to +150°C
Pressure	According to flange pressure rating
Viscosity	0.2 to 120 cSt (higher upon request)
Density	400 to 1500 kg/m ³

Body

Materials	Carbon steel, low temp carbon steel, stainless steel, duplex, super duplex stainless steel
Flanges	ANSI 150, 300, 600, 900, 1500, 2500
Sensor Enclosure	SS 316L

Sensor

Type	MR 3-wire open drain with integrated pull-up resistor
Input Voltage/Current	6 to 24 Vdc/13mA typical to 20mA max
Output Current	20mA max
Junction Box	Copper free aluminium (std), SS 316L
Connection	¾" NPT, M20
Optional	2-wire NAMUR

Measuring Chamber

2 Parts Assembly	SS 316L
Bearing System	Shaft, sleeve & thrust in tungsten carbide
Rotor Design	Helicoidal type with rounded front profile
Rotor Material	Light alloy (standard) corrosion protected, stainless steel, titanium

HTM Series - Ordering Codes

HTM	HTM					Product Line	
	01	1"/DN25				Meter Size	
	015	1½"/DN40					
	02	2"/DN50					
	03	3"/DN80					
	04	4"/DN100					
	06	6"/DN150					
	08	8"/DN200					
	10	10"/DN250					
	12	12"/DN300					
	16	16"/DN400					
	18	18"/DN450					
	20	20"/DN500					
	A	150# ANSI RF Flanges				Pressure Class	
	B	300# ANSI RF Flanges					
	C	600# ANSI RF Flanges					
	D	Other (please contact us)					
			BODY	FLANGES	INTERNALS	Materials of Construction	
	1	CS A106 or equ					
	2	LTCS A333 Gr6					
	3	SS 316L					
	4	Other					
		1	Light alloy (Standard)				Rotor Material
		2	Titanium				
		3	Stainless Steel				
		1	1 Pick off with integral preamplifier				Sensor
		2	2 Pick offs with integral preamplifier				
		3	3 Pick offs with integral preamplifier				
		0	Without				Flow Conditioning Element*
		1	With				
		0	None				Electronic Register
		1	Local				
		2	Remote				
		0	None				Documentation
		1	Standard				
		2	Customised				
		0	None				Special Request**
		S	Special Request				

↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
HTM	12	A	1	1	2	1	0	1	0

Example Product Code

* Please refer to previous page for Flow Conditioner information
 ** Upstream and downstream lengths can be provided upon request