Turbine Meter

Model PNF

Specification Data File

- Particularly suited to fiscal metering applications
- High accuracy
- Ranges from 28 to 8000 m$^3$/h
- Sizes from 100 mm to 500 mm (4 in to 20 in)
- Digital output
- Compact size
- Intrinsically safe or flameproof versions

PNF Turbine Meter

Introduction
ABB Kent-Taylor PNF Turbine Flowmeters are designed to measure the flow of both lubricating and non-lubricating liquids over a flow range of 28 to 8000 m$^3$/h (103 to 29,300 imperial gallons per minute) in 10 different sizes. The meters offer good linearity (±0.25%) and excellent repeatability (±0.02%) over wide flow ranges (typically 10:1) and are suitable for use over a wide operating pressure and temperature span. The meter output is a digital signal directly proportional to the flow in a convenient form for processing.

The PNF meter incorporates a rim around the outer periphery of the rotor blade tips and the output signal is generated from ferritic inserts in this rim. This provides the high pulse resolution that is required for meter prover duty, greater mechanical strength and partial viscosity compensation.

The complete rotor assembly of the PNF meter is statically balanced.

PNF Turbine Meters are widely used on major oil pipelines and for royalty and custody fiscal measurement.

The only moving component in the meter is the rotor and the only component subject to wear is the bearing assembly. The tungsten carbide bearings enable the meters to be guaranteed against wear for two years from the date of despatch, providing that the meter is operated within the published specifications.

ABB Instrumentation
 Principle of Operation
The basic construction of an ABB Kent-Taylor turbine meter is a bladed rotor suspended in the fluid stream with its axis of rotation parallel to the flow direction.

The rotor is driven by impingement of the liquid on the blades and the rotational speed is proportional to the fluid velocity which in turn is proportional to the volumetric flow rate.

The rotation of the rotor is detected by a pick-off coil fitted to the outside of the meter housing. The output signal is a continuous train of voltage pulses of sinusoidal form with each pulse representing a small discrete volume of liquid.

Floating Rotor
All ABB Kent-Taylor turbine meters feature a patented ‘floating rotor’ action which completely eliminates all end thrust and wear over the meter’s linear flow range, improves the repeatability and extends the linear flow range.

Specification
Sizes
4in, 5in, 6in, 8in, 10in, 12in, 14in, 16in, 18in and 20in.
100mm, 125mm, 150mm, 200mm, 250mm, 300mm, 350mm, 400mm, 450mm and 500mm.

Maximum Operating Pressure
Limited by flange pressure rating.

Operating Temperature Range
–50°C to 150°C.

Linearity
Better than ±0.25% over full linear range.
Better than ±0.15% over restricted flow range.

Repeatability
Better than ±0.02% of reading (when installed in conjunction with a meter prover)

Downstream Pressure
To ensure satisfactory operation of the meter it is essential that cavitation does not occur at any point in the meter. Contact ABB Kent-Taylor if any doubt exists about there being sufficient downstream pressure.

Response Time
Average 10ms for 50% step flow change.

Voltage Output
> 10mV r.m.s. into 22kΩ load at minimum flow rate.

Electrical Connector
Cannon type (mating connector supplied with each coil).

Coil Protection Box
All PNF meters are fitted with three threaded bosses to accept a coil protection box. The boss thread is M32 with a PG21 adaptor.

Recommended Cables
Twin core 14/0.0076in (16/0.2mm) twisted screened cable PVC covered with tinned copper braid.

Signal Transmission
Read-out equipment may be located up to 500m from the turbine meter.

Safety
Intrinsically Safe Systems
The use of an appropriate zener barrier provides a fully certified intrinsically safe system. Certificate details: BASEEFA certificate to SFA 3012, covered by No. Ex 75033/B
Code Ex ia IIC T4 and system certificate No. Ex 75034.

Flameproof systems
Alternatively the pick-off coil can be fitted into a flameproof conduit box to BS4683 Part 2 for Group IIB Temperature Class T6. BASEEFA certificate No. Ex82170 code Ex d IIB T6.

Filtration
The use of a strainer upstream of the turbine meter is recommended to prevent damage due to solids. ABB Kent-Taylor can make recommendations against plant detail.

Installation
Full instructions for the correct mechanical and electrical installation of the equipment are contained in the comprehensive users handbook supplied with each instrument.

Special Meters
Details given here apply to standard turbine meters. Meters of special material or with special couplings can also be supplied.

Meter Proving
PNF turbine meters are suitable for use with Meter Provers designed to minimum A.P.I. volume.

Notes
Minimum Linear Flow:
is the minimum flow at which the linearity (pulses per unit volume) is maintained within the specified limits.

Maximum Linear Flow:
is the normal maximum continuous rating of meter.

Extended Linear Flow:
is an overspeed figure for intermittent operation only i.e. in case of transients etc. Operation of a turbine meter at flows in excess of these latter figures may result in permanent damage to the unit.

Repeatability:
is the ability of the turbine meter to reproduce its output during consecutive proving runs under constant operating conditions within the normal linear flow range.

Viscosity:
all figures relate to a calibration on water (1 centistoke). An increase in viscosity tends to increase the minimum linear flow figure. For details of calibration at viscosities which differ from that of water, consultation with ABB Kent-Taylor is advised.

Specific Gravity:
low specific gravities also tend to increase the minimum linear flow figure.
Materials
Bearing and thrust washers: Tungsten carbide
Pulse generation inserts: Mu metal
Tube: Stainless steel to AISI 316
Flanges: Forged from either Carbon steel to ASTMA-105 (max. carbon content 0.23%) or Stainless steel to ASTMA182 Grade F316.

End couplings
"Slip-on" type flanges.
Flanges not in contact with the liquid.

Dimensions and Weights

<table>
<thead>
<tr>
<th>Nominal Size</th>
<th>Minimum Linear Flowrate</th>
<th>Maximum Linear Flowrate</th>
<th>Extended Linear Flowrate</th>
<th>Meter Factor ±10%</th>
<th>Approximate Press. Drop at Maximum Continuous Linear Flow (lb/in )</th>
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<tbody>
<tr>
<td>mm</td>
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<td>m/hr</td>
<td>Imperial gal/min</td>
<td>m/hr</td>
<td>Imperial gal/min</td>
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Flow
Uni-directional

Flanges
To mate with the Standards quoted in the Ordering Code.

Dimensions and Weights

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<th>Size nominal bore</th>
<th>Approx. Weight Flange Class (ANSI)</th>
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Dimensions and Weights

<table>
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<th>Overall length</th>
<th>Bore at inlet</th>
<th>Flange Class (ANSI)</th>
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Ordering Code

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B Material Certification / Inspection Standard
1 No certification
2 N.A.C.E. Standard to MR -01-75 (Para. 3.3, 3.5, 3.6, and Tables 1 and 2) and/or AD Merkblatt W2 DIN 50049 3.1B
3 Independent Inspectorate Certification

C Not allocated (enter 0)

D Flange Type/Material
22 ANSI 16.5 (ASA) 300 Carbon Steel
23 ANSI 16.5 (ASA) 150 Carbon Steel
26 ANSI 16.5 (ASA) 300 Stainless Steel
27 ANSI 16.5 (ASA) 300 Stainless Steel
99 Any other

E Pick-off Coil
1 Standard
2 Intrinsically Safe *
3 2off Standard
4 2off Intrinsically Safe *
5 3off Standard
6 3off Intrinsically Safe *

G Cable Entry
1 One plug and socket
2 Two plugs and sockets
3 Three plugs and sockets
4 One plug and socket in mechanical protection box
5 Two plugs and sockets in mechanical protection box
6 Three plugs and sockets in mechanical protection box
7 One plug and socket in flameproof box
8 Two plugs and sockets in flameproof boxes
9 Three plugs and sockets in flameproof boxes

H Calibration
4 Standard
5 Standard – Witnessed

Note
1. Material certification only applies to the flanged housing and not other components of the meter.