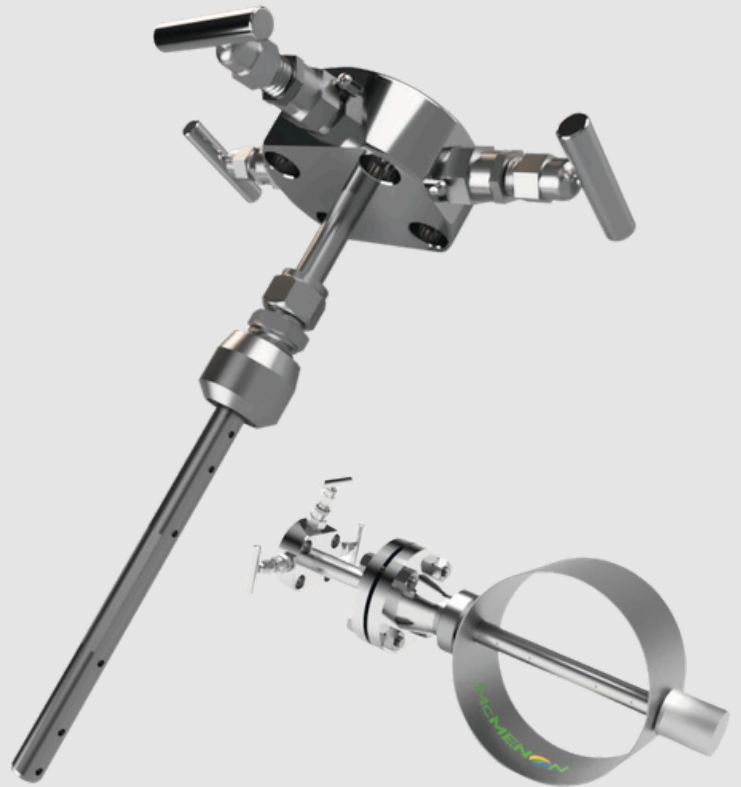


# McMenon QBar™ Averaging Pitot Tube



## Engineering Flow and Temperature Excellence

### Product Highlights

- Multi-port design ensures stable, well-averaged DP signal.
- High turndown and long-term coefficient stability.
- Extremely low permanent pressure loss – reduced energy consumption.
- One-piece construction available up to 5 m; robust and durable.
- Suitable for circular, square, or rectangular ducts.
- Dual averaging for improved accuracy in asymmetric flow.
- Hot-tap (retractable) versions available for pressurised systems.

### Areas of Application

- Steam distribution and boiler monitoring
- Combustion air measurement
- Process gases and industrial ventilation systems
- Water and wastewater treatment flow monitoring
- Oil & gas production and refining
- Chemical and petrochemical processing
- HVAC and large industrial ducting

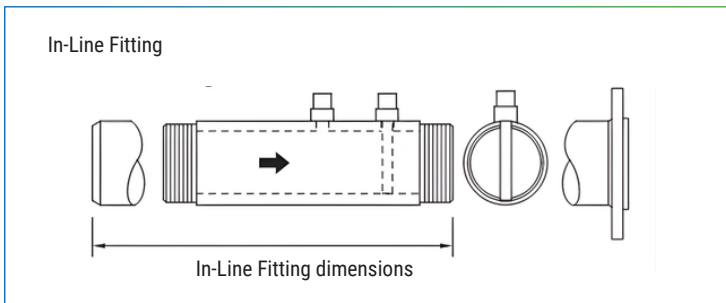
## Product Overview & Principle of Operation

The McMenon QBar™ Averaging Pitot Tube is a multi-port, self-averaging differential pressure Flow Meter designed for gases, liquids, and steam. Multiple upstream sensing ports, arranged according to a log-linear distribution, produce an averaged total pressure, while a single downstream port measures static pressure.

The resulting differential pressure (DP) is proportional to the square of flow velocity. The tube's streamlined profile ensures a stable coefficient at high velocities and enables a wide turndown ratio.

## QBar™ Product Types

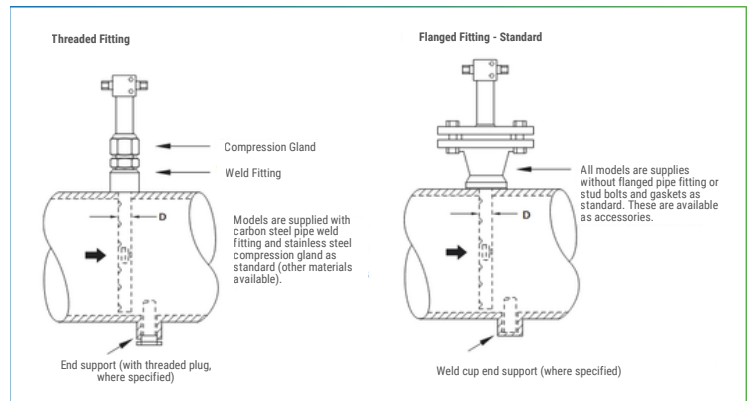
### A. In-Line Models



Model	End Type	Pipe Sizes	Max Pressure / Temperature
T1.W1	Welded	½–2 in.	50 bar @ 450 °C
T1.T1	Threaded	½–2 in.	50 bar @ 200 °C
T1.F1	Flanged	½–2 in.	Up to ASME 900

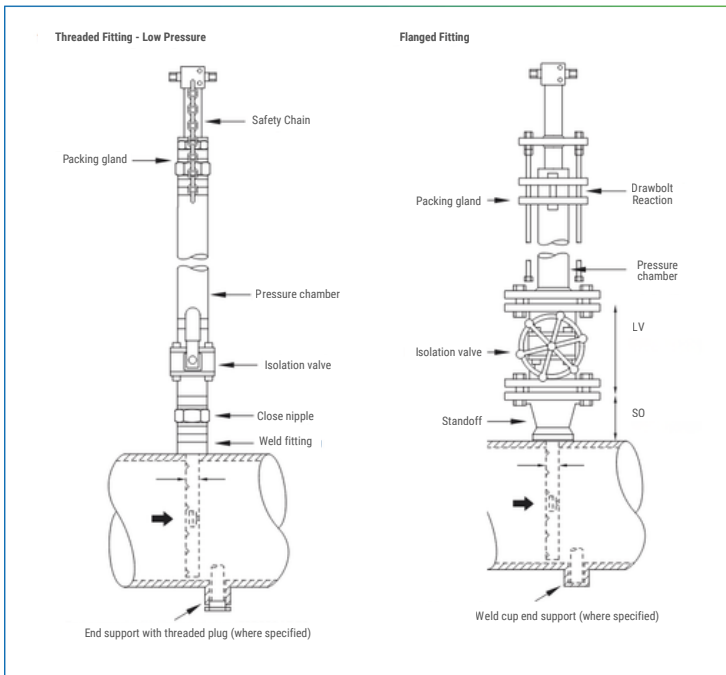
Sizes	Overall Length
½ in.	200
1 in.	225
1½ in.	300
2 in.	400

### B. Insertion Models



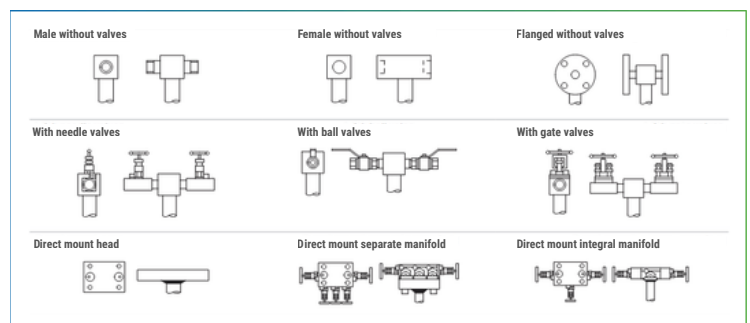
Model	Fluid	Probe Ø	Pipe Sizes	Max Pressure / Temp
T3.E1	All	13 mm	2–6 in.	50 bar @ 400 °C
T4.E1	Gas/Vapour	25 mm	4–72 in.	As per ASME class 1500
T4.E1 (Liquid)	Liquid	25 mm	4–24 in.	As per ASME class 1500
T4.E2	All (Support)	25 mm	4–140 in.	As per ASME class 1500
T5.E1/E2	High Strength	60 mm	10–320 in.	As per ASME class 2500

### C. Retractable (Hot-Tap) Models



Model	Pressure Class	Probe Ø	Pipe Sizes	Max Pressure / Temp
L6	Low Pressure	13 mm	2–6 in.	10 bar @ 200–400 °C
L7.E1	Low Pressure	25 mm	4–72 in.	Valve-dependent
L7.E2	Low Pressure (Support)	25 mm	4–120 in.	Valve-dependent
H6/H7/H8	High Pressure	13–60 mm	2–120 in.	Up to 100 bar

## Head Arrangements



### DP output connections / valves

Available head configurations include threaded or flanged DP taps, ball/needle/gate valves, direct-mount transmitter heads, integral 3- or 5-valve manifolds, and bi-directional probe options.

## QBar™ K-Factors

Pipe ID (mm)	T3/L6/H6	T4/L7/H7	T5/H8
50	0.5894	-	-
75	0.6388	0.5615	-
100	0.6816	0.6954	-
150	0.6974	0.7256	-
200	-	0.7511	-
250	-	0.7763	0.6251
300	-	0.7878	0.6386
350	-	0.7955	0.6639
400	-	0.8031	0.6877
450	-	0.8091	0.6999
600	-	0.8091	0.7105
900+	-	-	0.7134

For sizes not shown, determine by extrapolation.

For all T1 Models, K = 1.

Uncertainty on K-Factor is ± 1% with 95% confidence if the QBar is installed strictly in accordance with the published instructions.

## Maximum Allowable Differential Pressure

Pipe size (internal dia.)	Torbar base model number				
	T3, L6 and H6	T4, L7 and H7 (without end support)	T4, L7 and H7 (with end support)	T5 and T8 (without end support)	T5 and T8 (with end support)
mm and Inch	Maximum allowable DP in mbar (in.wg)				
50 mm - 2 in.	6250 (2509)				
75 mm - 3 in.	2790 (1120)				
100 mm - 4 in.	1565 (628)	5100 (2047)			
150 mm - 6 in.	695 (279)	2285 (917)			
200 mm - 8 in.		1285 (516)			
250 mm - 10 in.		820 (329)	3250 (1305)	3400 (365)	
300 mm - 12 in.		570 (229)	2250 (903)	2350 (943)	
350 mm - 14 in.		415 (167)	1680 (674)	1725 (693)	
400 mm - 16 in.		320 (128)	1285 (516)	1335 (536)	
450 mm - 18 in.		250 (100)	1015 (407)	1055 (424)	4225 (1696)
600 mm - 24 in.		140 (56)	570 (229)	590 (237)	2375 (953)
900 mm - 36 in.		50 (20)	250 (100)	265 (106)	1055 (424)
1200 mm - 48 in.		30 (12)	140 (56)	145 (58)	590 (237)
1500 mm - 60 in.		20 (8)	90 (36)	90 (36)	380 (153)
1800 mm - 72 in.		10 (4)	60 (24)	65 (26)	265 (106)

## Flow & Differential Pressure Equations

Differential Pressure to Flow	Flow to Differential Pressure
$q_m = \frac{\pi}{4} K \varepsilon D^2 \sqrt{2 \Delta P \rho_f} = K A \sqrt{2 \Delta P \rho_f}$ $q_v = \frac{q_m}{\rho_f}$ $q_n = \frac{273.15 \cdot q_m \cdot P}{1.01325 \cdot \rho_f \cdot (T + 273.15) \cdot Z}$	$\Delta P = \frac{1}{2 \rho_f} \left( \frac{q_m}{K A} \right)^2$ $\Delta P = \frac{\rho_f}{2} \left( \frac{q_v}{K A} \right)^2$

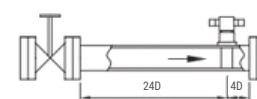
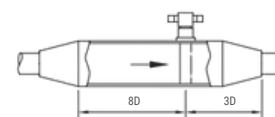
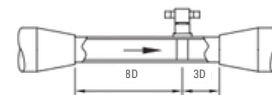
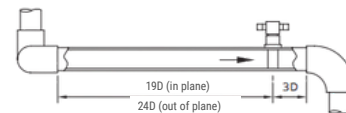
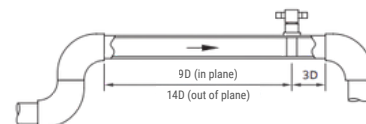
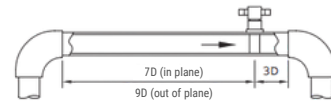
### Symbols & Units

Pressure	<i>P</i>	Pa
Temperature	<i>T</i>	K
Compressibility at Base Conditions	<i>Z</i>	-
K Factor	<i>K</i>	-
Pipe Internal Cross-Sectional Area	<i>A</i>	m <sup>2</sup>
Density	$\rho_f$	kg/m <sup>3</sup>
Differential Pressure	$\Delta P$	Pa
Mass Flow	<i>q<sub>m</sub></i>	kg/s
Volume Flow - Actual	<i>q<sub>v</sub></i>	m <sup>3</sup> /s
Volume Flow - Normalised to Base Conditions	<i>q<sub>n</sub></i>	Nm <sup>3</sup> /s

Note: Base conditions of 0 °C and 1.01325 bar

## Installation Requirements

Recommended upstream/downstream straight lengths: 20–24D after double elbows, 8–9D after single elbows. QBar™ can be installed 2D downstream of an elbow with ±3–5% accuracy. Orientation must ensure the probe crosses the pipe diameter orthogonally.





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