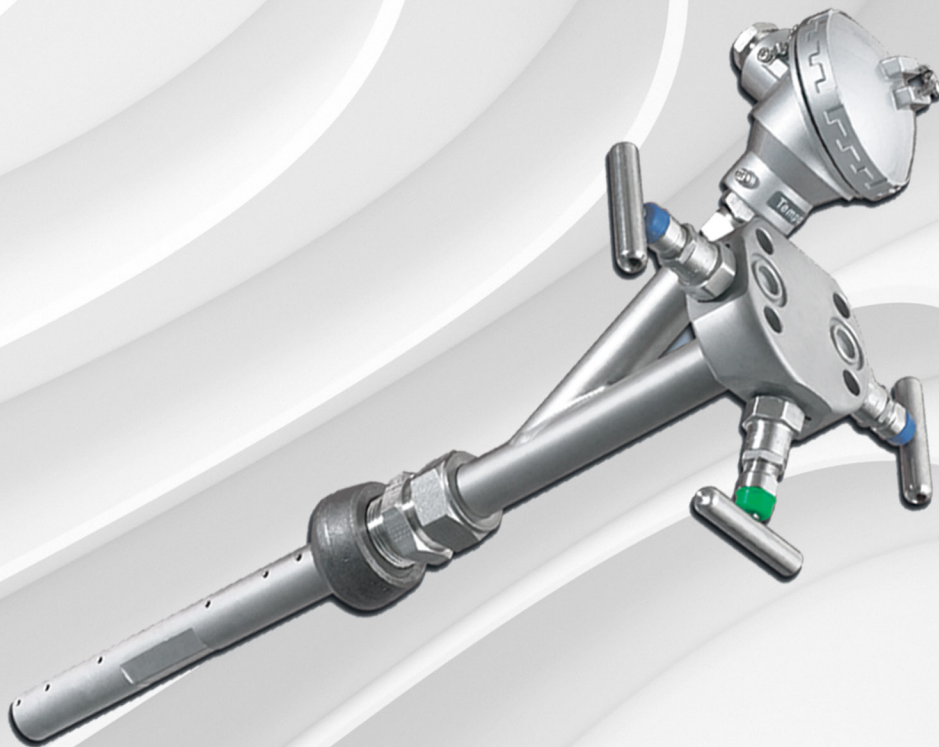

ABB MEASUREMENT & ANALYTICS | DATA SHEET

FPD350 Torbar

Averaging pitot tubes



Measurement made easy

Economical flow metering solutions for gases, liquids and steam

Unique profile shape

- Offers high flow turndown

No drift in co-efficient

- Ensures long term stability

One-piece outer tube

- For pipes up to 5000 mm (197 in.) diameter
- Ensures optimum strength

Low permanent pressure loss

- Means low energy consumption & cost
- Reduced carbon footprint

Suitable for wide range of pipe sizes

- For circular, square or rectangular section ducts of
- 10 to 8000 mm (0.4 to 315 in.) diameter

Dual averaging

- For improved accuracy with asymmetric flow profiles

Hot-tap versions available

- Allows insertion into pressurized pipes

Torbar

The Torbar is a multiport self-averaging flow meter with a design based on the classical pitot tube concept of fluid flow measurement and with thousands having been installed into a large variety of industries world wide.

The Torbar produces an averaged differential pressure (DP) signal proportional to the square of the flow rate.

The DP output is normally piped to a Differential Pressure transmitter in order to generate an electrical signal proportional to the flow rate. For certain applications, the DP transmitter can be mounted directly on to the Torbar via an integral valve manifold.

Each Torbar is designed to span the process pipe diameter and comprises four basic components:

- Outer impact tube – ONE PIECE CONSTRUCTION 1
- Internal averaging tube 2
- Low pressure chamber
- Head with HP and LP impulse connections

The outer impact tube has a number of pressure sensing holes facing upstream which are positioned at equal annular points in accordance with a log-linear distribution. The ‘total pressures’ developed at each upstream hole by sum of the impact of the flowing medium and the static pressure are firstly averaged within the outer impact tube and then to a second order (and more accurately) averaged within the internal averaging tube. This pressure is represented at the head as the high pressure component of the DP output. The low pressure component is generated from a single sensing hole located on the downstream side of the outer impact tube, measuring static pressure. For bi-directional flow measurement, the Torbar can be supplied with the same number of downstream ports as upstream.

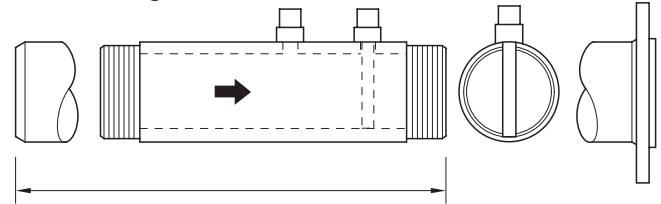
The Torbar is an improvement on the round sensor design due to the unique profiled flats which are positioned around the downstream hole in order to define the separation point at which the flow lines separate as the fluid passes around the outer impact tube. This feature creates a stable pressure area at the downstream pressure sensing hole thereby maintaining a more constant flow coefficient at high velocities enabling a very wide range of flow measurement (turndown).

¹ due to manufacturing constraints, units longer than 5 m (16.4 ft) will be of 2-piece construction.

² due to manufacturing constraints, not available for models FPD350.T1/T3 or for any units coded to include integral temperature elements.

Permanently installed types

In-line fitting



In-line fitting dimensions

Basic model FPD350.T1.	End fittings	Fits pipe sizes mm (in.)
W1	Butt weld	
T1	Threaded	13 to 50 (0.5 to 2)
F1	Flanged	

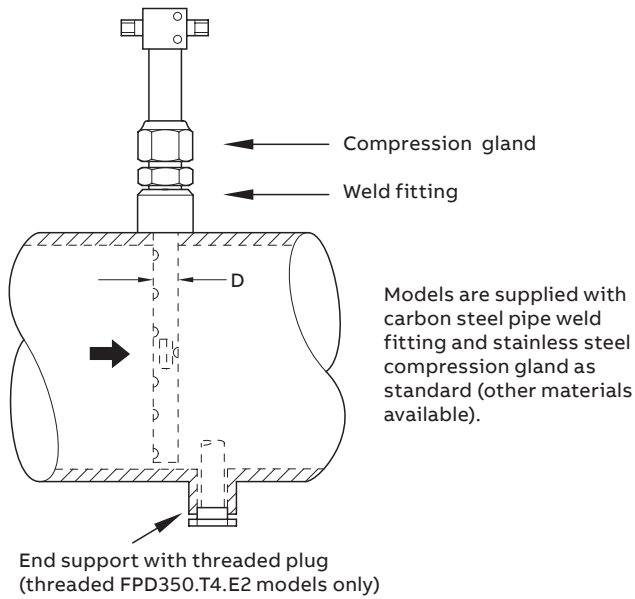
All models are supplied with a pipe section in the same material as Torbar probe

Pipe size NB	'A' mm (in.)	'A' mm (in.) flanged
½ in.	200 (8)	400 (16)
¾ in.	200 (8)	400 (16)
1 in.	225 (8.8)	425 (16.8)
1¼ in.	250 (10)	450 (18)
1½ in.	300 (12)	500 (20)
2 in.	400 (16)	600 (24)

Model FPD350.T1.	Maximum pressure / temperature
W1	50 bar / 450 °C (725 psi / 840 °F)
T1	50 bar / 200 °C (725 psi / 392 °F)
F1	As flange rating to Class 900 ANSI

Torbar

Threaded fitting



Threaded FPD350.T3 and FPD350.T4 models

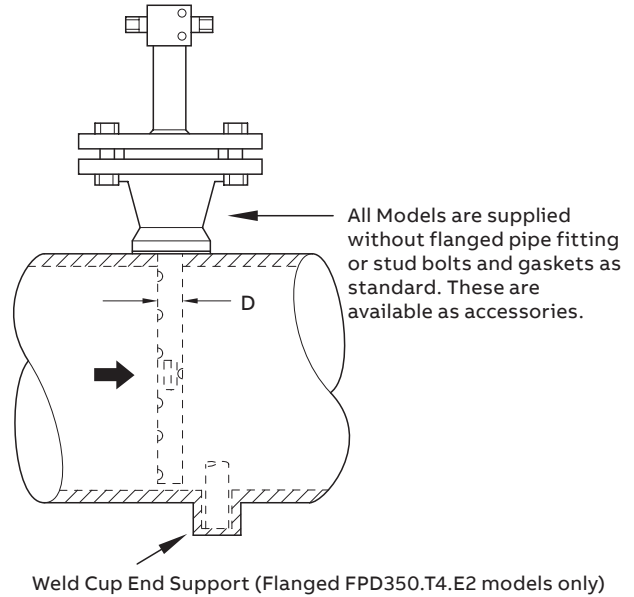
Threaded model FPD350.	Fluid	D mm (in.)	Fits pipe sizes mm (in.)
T3.E1	All	13 (0.5)	50 to 150 (2 to 6)
T4.E1	Gas / vapour	25 (1)	100 to 1800 (4 to 72)
T4.E1*	Liquid	25 (1)	100 to 600 (4 to 24)
T4.E2 **	All	25 (1)	100 to 3500 (4 to 140)

* For liquid flow applications where there is a possibility of process pulsations or intermittent excessive flow velocity, the end-support model should always be selected for pipe sizes over 250 mm (10 in.) internal diameter.

** With end support

Maximum pressure / temperature	
Threaded models FPD350.T3.E1 and FPD350.T4	50 Bar @ 400 °C (725 psi @ 752 °F)

Flanged fitting – standard



Flanged FPD350.T3 and FPD350.T4 models

Flanged model FPD350.	Fluid	D mm (in.)	Fits pipe sizes mm (in.)
T3.E1	All	13 (0.5)	50 to 150 (2 to 6)
T4.E1	Gas / vapour	25 (1)	100 to 1800 (4 to 72)
T4.E1*	Liquid	25 (1)	100 to 600 (4 to 24)
T4.E2 **	All	25 (1)	100 to 3500 (4 to 140)

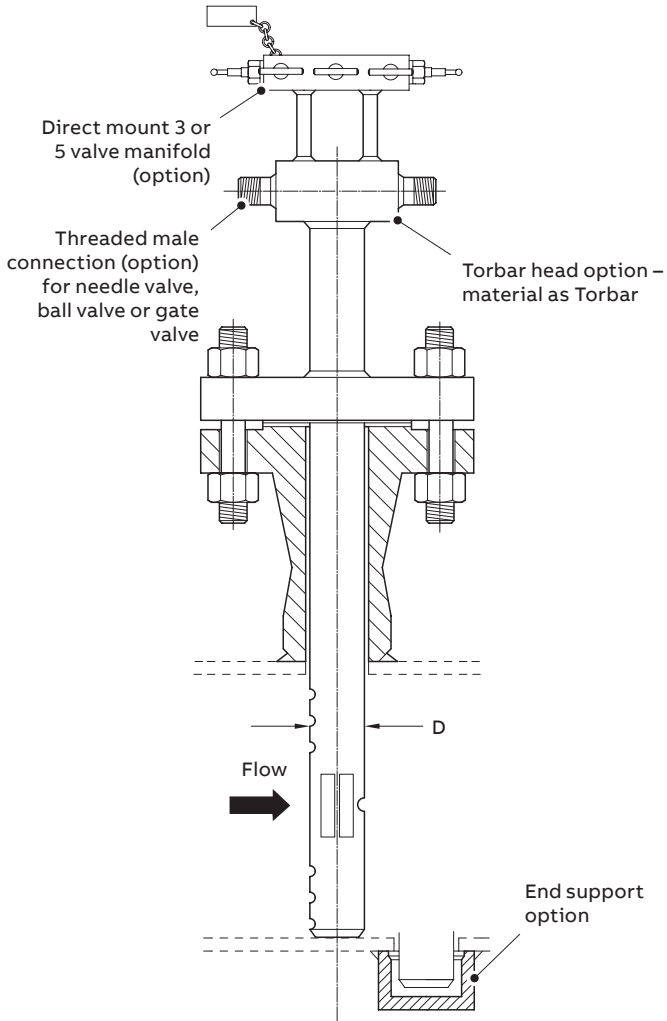
* For liquid flow applications where there is a possibility of process pulsations or intermittent excessive flow velocity, the end-support model should always be selected for pipe sizes over 250 mm (10 in.) internal diameter.

** With end support

Standard flange size	
Flanged model FPD350.T3	1 in. (DN 25)
Flanged model FPD350.T4	1½ in. (DN 40)
Other sizes available	

Maximum pressure / temperature	
All models as flange rating to class 1500 ANSI. For higher pressures / temperature consult factory.	

Flanged fitting – extra strength



Model FPD350.T5

Basic model FPD350	Fluid	D mm (in.)	Fits pipe sizes mm (in.)
T5.E1	Gas / vapour	60 (2.36)	250 to 1800 (10 to 72)
T5.E1*	Liquid	60 (2.36)	250 to 800 (10 to 32)
T5.E2**	Gas / vapour	60 (2.36)	400 to 8000 (16 to 320)
T5.E2 **	Liquid	60 (2.36)	400 to 5000 (16 to 200)

* For liquid flow applications where there is a possibility of process pulsations or intermittent excessive flow velocity, the end-support model should always be selected for pipe sizes over 600 mm (24 in.) internal diameter.

** With end support

Standard flange size	
Model FPD350.T5	3 in. (DN 80)
Other sizes available	
Maximum pressure / temperature	
All models as flange rating to class 2500 ANSI.	

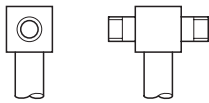
... Torbar

Options

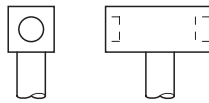
Probe material	Code
316 Stainless Steel	SS
304L Stainless Steel	S4
Alloy 400	M4
Alloy C276	U7

Probe material	Code
6MO	M1
Duplex	D1
Super Duplex	D2, D3
Other	Z9 (specify)

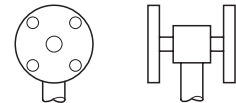
Male without valves



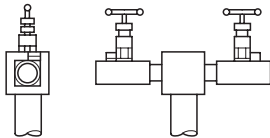
Female without valves



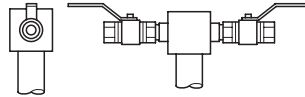
Flanged without valves



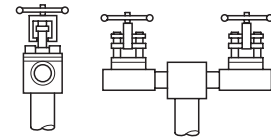
With needle valves



With ball valves



With gate valves



Direct mount head



Direct mount separate manifold



Direct mount integral manifold

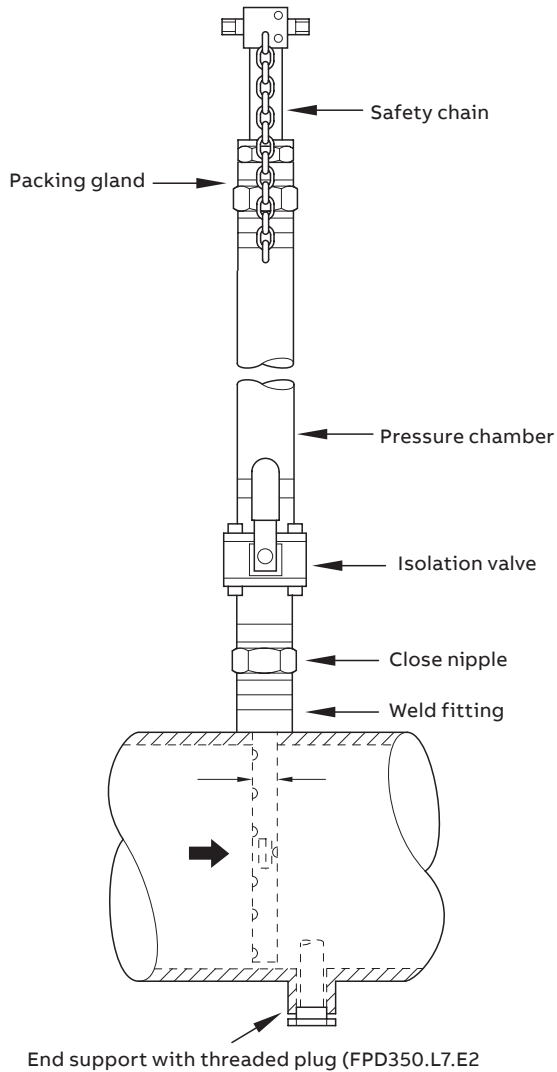


DP output connections / valves

Withdrawable types (Hot Tap)

Models FPD350.L7/H7/H8 with end supports must not be installed via hot-tap methods into a pressurized pipe because of the requirement to fit an end support. However, once installed, they can be inserted and withdrawn under pressure.

Threaded fitting – low pressure



Models FPD350.L6 and FPD350.L7

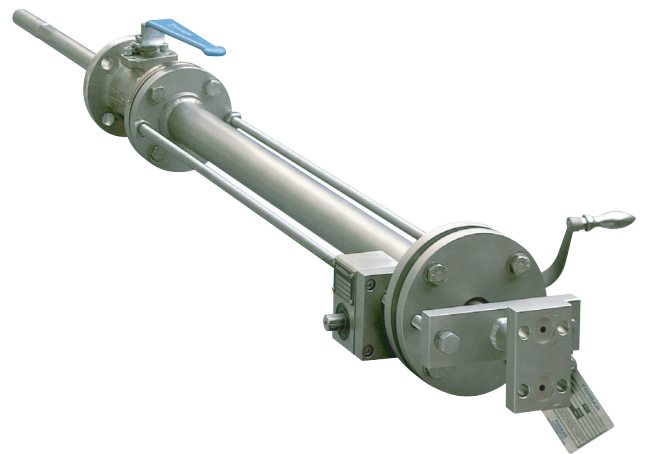
Basic model FPD350.	Fluid	D mm (in.)	Fits pipe sizes mm (in.)
L6	All	13 (0.5)	50 to 150 (2 to 6)
L7.E1	Gas / vapour	25 (1)	100 to 1800 (4 to 72)
L7.E1 *	Liquid	25 (1)	100 to 600 (4 to 24)
L7.E2 **	All	25 (1)	100 to 3000 (4 to 120)

* For liquid flow applications where there is a possibility of process pulsations or intermittent excessive flow velocity, the end-support model should always be selected for pipe sizes over 250 mm (10 in.) internal diameter.

** With end support

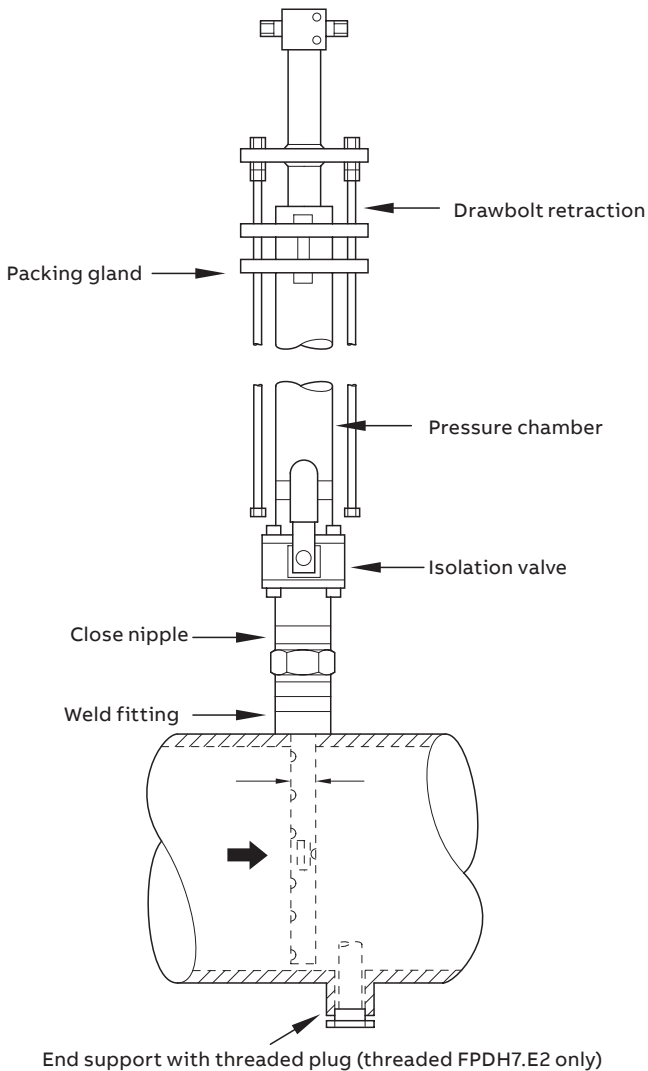
Supplied with weld fittings, isolation valve and pressure chamber with safety chain as standard. Gland packing material is supplied as non-asbestos graphite ribbon as standard. PTFE is available. Please specify at time of order. For isolation valve details refer to page 10.

Maximum pressure / temperature	
With standard ball valve:	10 bar and 200 °C (145 psi and 392 °F)
With standard gate valve:	10 bar and 400 °C (145 psi and 752 °F) (Temperature is at valve)



... Torbar

Threaded fitting – high pressure



FPD350.H7 threaded models

Threaded model FPD350.	Fluid	D mm (in.)	Fits pipe sizes mm (in.)
H6	All	13 (0.5)	50 to 150 (2 to 6)
H7.E1	Gas / vapour	25 (1)	100 to 1800 (4 to 72)
H7.E1 *	Liquid	25 (1)	100 to 600 (4 to 24)
H7.E2 **	All	25 (1)	100 to 3000 (4 to 120)

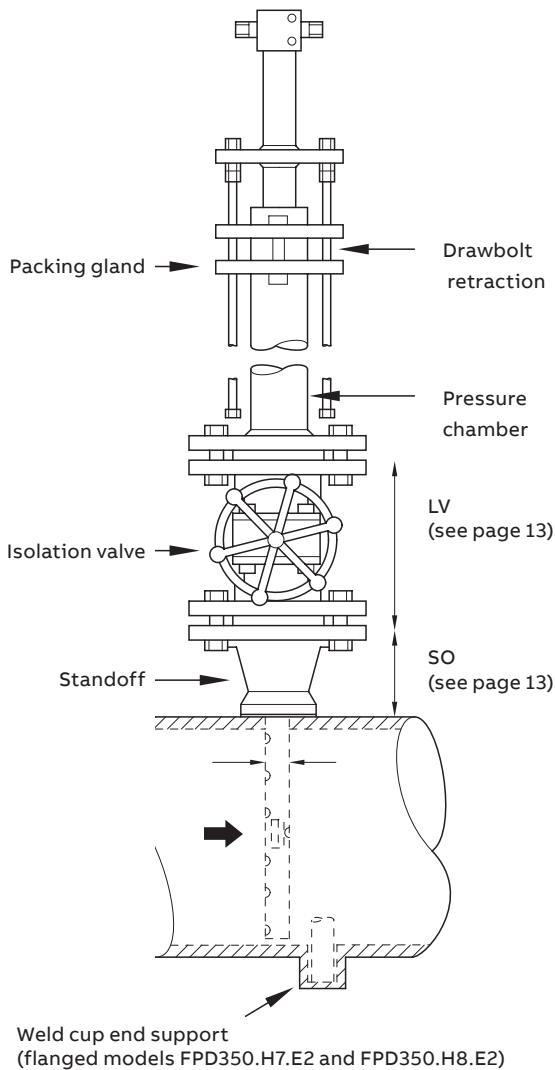
* For liquid flow applications where there is a possibility of process pulsations or intermittent excessive flow velocity, the end-support model should always be selected for pipe sizes over 250 mm (10 in.) internal diameter.

** With end support

Supplied with weld fittings, isolation valve, pressure chamber and draw bolt retraction (illustrated) as standard. Gland packing material is supplied as non-asbestos graphite ribbon as standard. PTFE is available (specify at time of order). Geared retraction — Optional. For isolation valve details refer to page 10.

Maximum pressure / temperature	
With standard ball valve:	40 bar and 200 °C (580 psi and 392 °F)
With standard gate valve:	40 bar and 400 °C (580 psi and 752 °F) (Temperature is at valve)

Flanged fitting



Flanged models FPD350.H6, FPD350.H7 and FPD350.H8

Flanged model FPD350	Fluid	D mm (in.)	Fits pipe sizes mm (in.)	Standard flange size
H6.E1	All	13 (0.5)	50 to 150 (2 to 6)	1½ in. (DN40)
H7.E1	Gas / vapour	25 (1)	100 to 1800 (4 to 72)	
H7.E1 *	Liquid	25 (1)	100 to 600 (4 to 24)	
H7.E2 **	All	25 (1)	300 to 3000 (12 to 120)	
H8.E1	Gas / vapour	60 (2.36)	300 to 1800 (12 to 70)	3 in. (DN80)
H8.E1 *	Liquid	60 (2.36)	300 to 800 (12 to 32)	
H8.E2 **	All	60 (2.36)	600 to 3000 (24 to 120)	

Other sizes available

* For liquid flow applications where there is a possibility of process pulsations or intermittent excessive flow velocity, the end-support model should always be selected for pipe sizes over 250 mm (10 in.) (Model FPD350.H7.E2) 600 mm (24 in.) (Model FPD350.H8.E2) internal diameter.

** With end support

Supplied with isolation valve and pressure chamber, and draw bolt retraction assembly and without flanged pipe fitting or stud bolts and gasket (Available as accessories). Gland packing material is supplied as non-asbestos graphite ribbon as standard. PTFE is available. Please specify at time of order. Geared retraction – Optional. For isolation valve details refer to page 10.

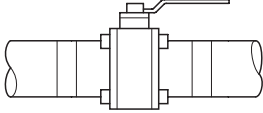
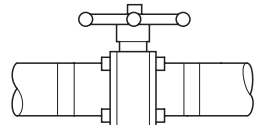
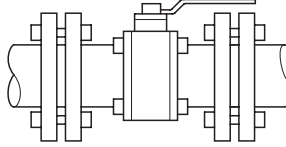
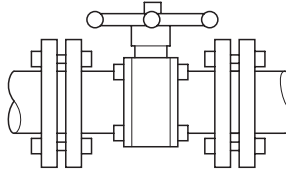
Maximum pressure / temperature	
With standard ball valve	100 bar and 200 °C (1450 psi and 392 °F)
With standard gate valve	100 bar and 400 °C (1450 psi and 752 °F)

(Temperature is at valve)

(Pressure is 35 bar [500 psi] for
FPD350.H8.E1 and FPD350.H8.E2)

... Torbar

Process isolation valves

Valve type	Torbar model FPD350.	Valve size	Code (* is material – see below)	Maximum temperature at valve
Threaded ball 	L6	¾ in.	B*5	200 °C (392 °F)
	H6 (threaded)	1¼ in.	B*7	
	L7.E1			
	L7.E2			
Threaded gate 	H6	1¼ in.	G*7	400 °C (752 °F)
	L7.E1			
	L7.E2			
	H7 (threaded)			
Flanged ball 	H6 (flanged)	40 mm (1½ in.)	B*8	200 °C (392 °F)
	H7.E1 (flanged)			
	H7.E2 (flanged)	50 mm (2 in.)	B*6	
	H8.E1	80 mm (3 in.)	B*9	
	H8.E2			
Flanged gate 	H6 (flanged)	40 mm (1½ in.)	G*8	400 °C (752 °F)
	H7.E1 (flanged)			
	H7.E2 (flanged)	50 mm (2 in.)	G*6	
	H8.E1	80 mm (3 in.)	G*9	
	H8.E2			

Code * defines valve material

316SS – (S) carbon steel – (C) Alloy 400 – (M) for other material specify

(Example: GC7 is 1¼ in. gate valve in carbon steel).

When valve is supplied by purchaser, whole code is: BZ9

Accessories

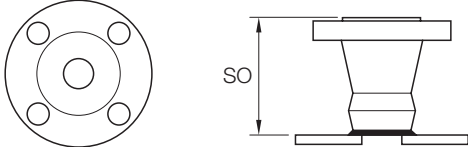
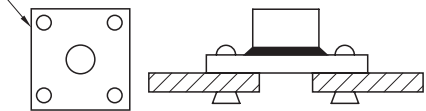
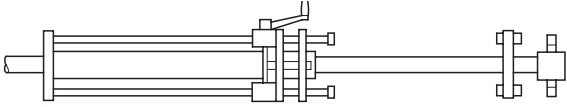
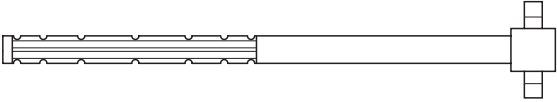
Description	Models FPD350.	Illustration
For vertical process pipe	T3 T4 T5 L6 L7 H6 H7 H8	
	T1	
Head for direct mounting of valve manifold or transmitter	T3 T4 T5 L6 L7 H6 H7	
Direct mounting head fitted with 3- or 5-valve manifold**	T3 T4 T5 L6 L7 H6 H7	
Head with integral 3- or 5-valve manifold for fitting of transmitter by others.	T3 T4 T5 L6 L7 H6 H7	
PT100 temperature element fitted through Torbar neck. For Hazardous Area Installations specify certification required. Maximum pressure 70 bar.	T4 T5 L7 H7	

* Default option is PNH – Horizontal Pipe

** Heads with an integral (welded) manifold are recommended rather than those with a direct-mounted (bolted) manifold – direct-mounted manifolds do not enable isolation of the transmitter when dismantling

... Torbar

Accessories

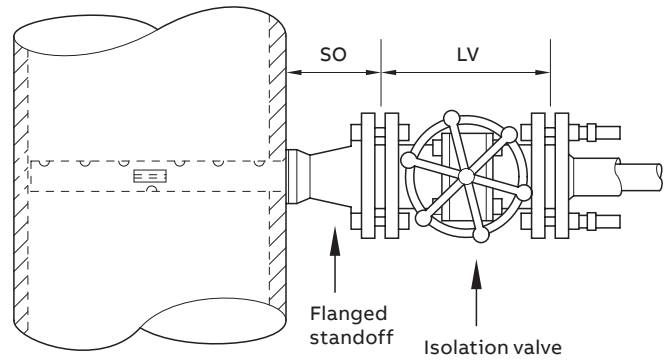
Description	Models FPD350.	Illustration
Flanged Pipe Fittings (Stand-Off). Material is specified by 'Pipe Fitting Material' in Model Number. Type, Size and Rating is specified with Model Number	Flanged versions of: T3 T4 T5 H6 H7 H8	
Stud Bolts, Nuts and Gasket	Flanged versions of: T3 T4 T5 H6 H7 H8	Standard Materials: Stud, Bolts and Nuts: A193-B7/A 194-2H Gasket: Asbestos-free Glass/Aramid Fibre/Nitrile Gasket Material: 316 Stainless Steel Spiral Wound
Thin duct wall Mounting Plate. Recommended for large ducts with wall thickness of less than 2 mm Max. temp 200 °C (392 °F)	Threaded versions of: T3 T4 L6 L7 H6 H7	Optional: 100 x 100 x 2 mm (4 x 4 x 0.08 in.) thick 
Gear Retraction Assembly (Material: 316 Stainless Steel)	H6 H7 H8	
Bi-Directional Probe	T4 T5 L7 H7 H8	

Dimensional information

Flanged standoff dimensions overall length SO mm (in.)				
ANSI Class	Size			
	1 in.	1½ in.	2 in.	3 in.
150	83 (3.3)	95 (3.7)	102 (4)	118 (4.6)
300	89 (3.5)	100 (4)	108 (4.3)	127 (5)
600	95 (3.7)	109 (4.3)	117 (4.6)	137 (5.4)
900	106 (4.2)	122 (4.8)	146 (5.7)	156 (6.1)
1500	106 (4.2)	122 (4.8)	146 (5.7)	171 (6.7)
2500	122 (4.8)	150 (6)	171 (6.7)	222 (8.7)

DIN Class	Size			
	DN25	DN40	DN50	DN80
PN10	67 (2.6)	78 (3)	86 (3.4)	98 (3.9)
PN16	67 (2.6)	78 (3)	86 (3.4)	98 (3.9)
PN25	67 (2.6)	78 (3)	86 (3.4)	98 (3.9)
PN40	67 (2.6)	78 (3)	86 (3.4)	106 (4.2)
PN64	89 (3.5)	101 (4)	108 (4.3)	127 (5)
PN100	89 (3.5)	103 (4)	111 (4.4)	131 (5.2)
PN160	100 (4)	116 (4.6)	140 (5.5)	150 (6)
PN260	100 (4)	116 (4.6)	140 (5.5)	165 (6.5)

Flanged isolation valve Overall length LV mm (in.)				
Size	ANSI Class			
	150	300	600	1500
1 in.	127 (5)	165 (6.5)	216 (8.5)	254 (10)
1½ in.	165 (6.5)	191 (7.5)	241 (9.5)	305 (12)
2 in.	178 (7)	216 (8.5)	292 (11.2)	368 (14.5)
3 in.	203 (8)	283 (11.1)	355 (14)	381 (15)



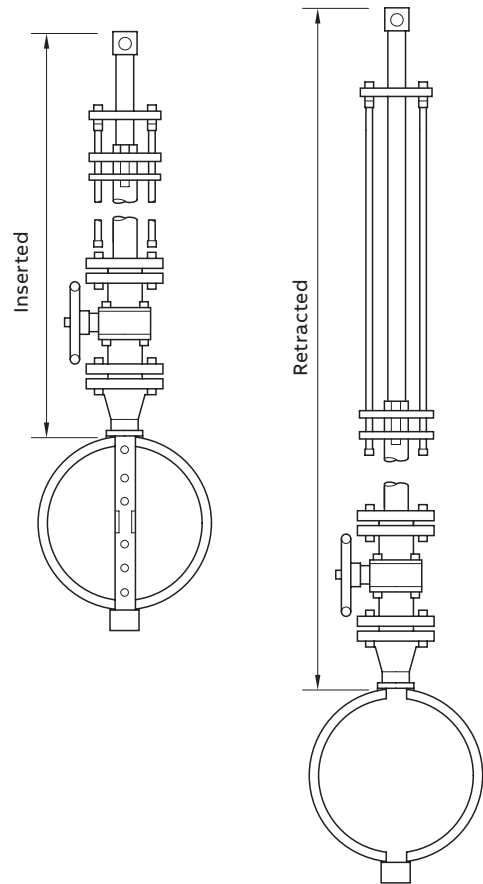
Dimensions

Note. Actual values of LV, SO must be supplied to ABB if the stand-off or process isolation valves are to be supplied by the customer.

... Torbar

... Torbar dimensional information

FPD350.L6	Inserted Retracted	ID + 236 (9.3) Inserted + ID + Wall + 211 (8.3)
FPD350.L7.E1	Inserted Retracted	ID + 346 (13.6) Inserted + ID + Wall + 208 (8.2)
FPD350.L7.E2	Inserted Retracted	ID + Wall + 371 (14.6) Inserted + ID + Wall + 233 (9.2)
FPD350.H6.E1 (threaded) FPD350.H7.E1 (threaded)	Inserted Retracted	ID + 493 (19.4) Inserted + ID + 355 (14)
FPD350.H7.E2 (threaded)	Inserted Retracted	ID + Wall + 518 (20.4) Inserted + ID + Wall + 380 (15)
FPD350.H6.E1 (flanged) FPD350.H7.E1 (flanged)	Inserted Retracted	ID + Wall + 2(SO + LV) + 340 (13.4) Inserted + ID + Wall + SO + LV
FPD350.H7.E2 (flanged)	Inserted Retracted	ID + 2 (Wall + SO + LV) + 380 (15) Inserted + ID + 2 x Wall + SO + LV + 40 (1.6)
FPD350.H8.E1	Inserted Retracted	ID + Wall + 2 (SO + LV) + 355 (14) Inserted + ID + Wall + SO + LV
FPD350.H8.E2	Inserted Retracted	ID + 2 (Wall + SO + LV) + 419 (16.5) Inserted + ID + 2 x Wall + SO + LV + 60 (2.4)



For geared retraction units (accessory TP4) add 100 mm (4 in.) to above dimensions

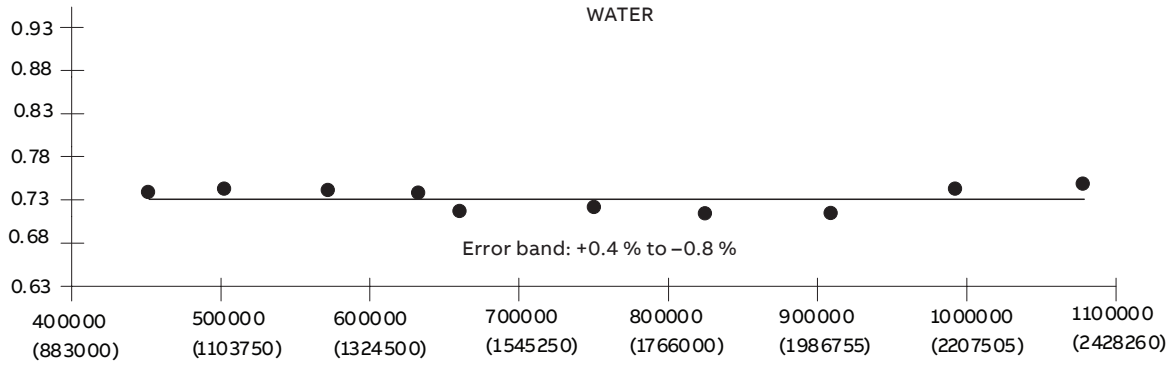
Inserted and retracted lengths mm (in.) (approximate values for information only – do not use for construction)

Lengths maybe affected if flanged end support fitted

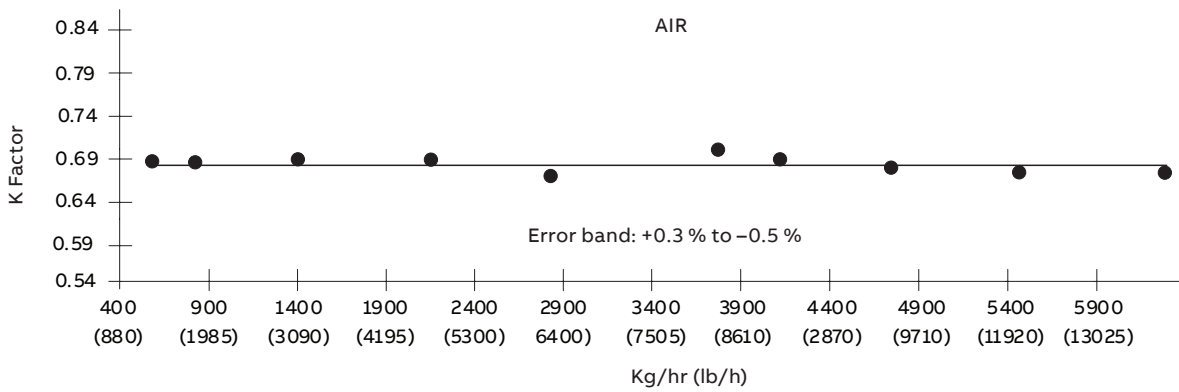
Withdrawable types (Hot-Taps)

Independent test reports

A range of Torbar models and sizes have been tested at Independent Flow Laboratories to determine the accuracy and repeatability of measurement. Those tests were conducted in both Air and Water.



Model FPD350.T4 (401) – size: 16 in. – serial no. Test 597



Model FPD350.T4 (401) – size: 12 in. – serial no. 20153

Full details of the test results above and of those shown in the table below are available on request.

Test fluid	Model FPD350.	Size mm (in.)	Serial number	Error band
Water	T1.F1	50 (2)	Test 197	+0.2 to -0.43 %
Water	T3.E1	100 (4)	Test 297	+1 to -1 %
Air	T4.E1 (threaded)	150 (6)	Test 397	+0.1 to -0.5 %
Air	T4.E2 (threaded)	450 (18)	20186	+0.6 to -0.5 %
Water	T4.E1 (flanged)	600 (24)	Test 697	+0.3 to -0.4 %

... Torbar

Differential pressure calculations and resonance frequency check

Torbar coefficient K			
	Model number FPD350.		
Pipe size (internal diameter) mm (in.)	T3 L6 H6	T4 L7 H7	T5 H8
50 (2)	0.6483		
75 (3)	0.7027		
100 (4)	0.7497	0.6174	
150 (6)	0.7671	0.6505	
200 (8)	0.6647		
250 (10)		0.6794	0.6876
300 (12)		0.6941	0.7024
350 (14)		0.7160	0.7303
400 (16)		0.7380	0.7564
450 (18)		0.7402	0.7699
600 (24)		0.7468	0.7815
900 (36)		0.7473	0.7847
1200 (48)		0.7475	0.7849
1500 (60)		0.7476	0.7850
1800 (72)	and above	0.7476	0.7850

For sizes not shown above, determine K by extrapolation.

If using classical flow equations from ISO5167, multiply K by 0.9091.

Copies of derivation of equations available on request.

For models FPD350.T1 (all sizes) K = 1

Torbar coefficients

Flow to DP

Liquids (volumetric)

$$DP = \left[\frac{Q_A \times \sqrt{D}}{K \times A \times 4.6285} \right]^2 \text{ mbar}$$

Gases (volumetric)

$$DP = \frac{S \times Pf}{(Tf + 273) \times Z} \times \left(\frac{Q_A \times 4.0323}{K \times A} \right)^2$$

$$DP = \left[\frac{S \times (Tf + 273)}{Pf} \right] \left[\frac{Q_B}{K \times A \times 66.839} \right]^2 \times Z \text{ mbar}$$

Liquids / gases / steam (mass)

$$DP = \left[\frac{Q_C}{K \times A \times \sqrt{D} \times 4.6285} \right]^2 \text{ mbar}$$

DP to flow

Liquids (volumetric)

$$\text{Flow (Q)} = \sqrt{DP} \times \left[\frac{K \times A \times 4.6285}{\sqrt{D}} \right] \text{ m}^3 / \text{h}$$

Gases (volumetric) – actual conditions

$$\text{Flow (Q)} = \sqrt{DP} \times \left[\frac{K \times A \times \sqrt{(Tf + 273)}}{\sqrt{S \times 4.0323 \times Pf}} \right] \times \sqrt{Z} \text{ Am}^3 / \text{h}$$

Gases (volumetric) – normal conditions

$$\text{Flow (Q)} = \sqrt{DP} \times \left[\frac{K \times A \times 66.839 \times \sqrt{Pf}}{\sqrt{S \times (Tf + 273) \times Z}} \right] \text{ Nm}^3 / \text{h}$$

Liquids / gases / steam (mass)

$$\text{Flow (Q)} = \sqrt{DP} \times (K \times A \times \sqrt{D} \times 4.6285) \text{ kg/hr}$$

Symbols and units

Q_A	=	Flow (m ³ /h)
Q_B	=	Flow (Nm ³ /h) at 0 °C, 1 atm (1.01325 bar)
Q_C	=	Flow (kg/h)
S	=	Specific gravity (Air = 1)
D	=	Density at actual conditions (kg/m ³) Base Density of water at 4 °C = 999.972 kg/m ³ Density of water at 15.555 °C = 999.012 kg/m ³ Base Density of Air at 0 °C 1 atm (1.01325 bar) = 1.293 kg/m ³
A	=	Pipe internal cross-section area (cm ²)
Tf	=	Actual temperature (°C)
Pf	=	Actual pressure (bar Absolute)
K	=	Torbar coefficient (see table)
Z	=	Compressibility factor (usually = 1)
DP	=	Differential Pressure (mbar)

Normal conditions 0 °C, 1 Atmosphere (1.01325 bar)

Statement of accuracy

The calculated differential pressure will lie within an uncertainty band of ± 1 % with 95 % confidence if the Torbar is installed strictly in accordance with the published Installation Instructions. For applications which do not conform to those instructions, it is recommended that an on site calibration is performed in order to achieve the optimum accuracy.

Resonance frequency check

This check is not necessary for liquid flows because the maximum allowable DP is reached before resonance occurs (see table opposite), or for Models FPD350.T1. For Gas and Vapor flows a Resonance Frequency Check MUST be made. Equations have been derived for the various Torbar models to determine low and high critical velocities (VL and VH) which define the narrow resonance band of velocities which should be outside the continuous operating flow range of the Torbar.

The following table lists the equations to calculate the values of VL and VH. If the calculation shows VL to VH to be within the continuous operating flow range, then an alternative, suitable model of Torbar should be selected to give acceptable values of VL and VH.

Always check that the maximum flow DP is less than the 'Maximum Allowable DP' as shown in the table on page 18.

Torbar model FPD350.	Critical velocities		Unsupported length L (m)
	VL (m/s)	VH (m/s)	
T3.E1 threaded	$0.472 \div L^2$	$0.728 \div L^2$	ID + Wall + 0.05
T3.E1 flanged	$0.472 \div L^2$	$0.728 \div L^2$	ID + Wall + SO
L6.E1 threaded	$0.472 \div L^2$	$0.728 \div L^2$	ID + Wall + 0.02
T4.E1 threaded	$1.843 \div L^2$	$2.840 \div L^2$	ID + Wall + 0.08 (3)
T4.E2 threaded	$8.08 \div L^2$	$12.44 \div L^2$	ID + 2 x Wall + 0.115
T4.E1 flanged	$1.843 \div L^2$	$2.840 \div L^2$	ID + Wall + SO
T4.E2 flanged	$8.08 \div L^2$	$12.44 \div L^2$	ID + 2 x Wall + SO + 0.05
L7.E1	$1.843 \div L^2$	$2.840 \div L^2$	ID + Wall + 0.05
L7.E2	$8.08 \div L^2$	$12.44 \div L^2$	ID + 2 x Wall + 0.10
H6.E1 threaded	$0.472 \div L^2$	$0.728 \div L^2$	ID + Wall + 0.05
H7.E1 threaded	$1.843 \div L^2$	$2.840 \div L^2$	ID + Wall + 0.05
H7.E2 threaded	$8.08 \div L^2$	$12.44 \div L^2$	ID + 2 x Wall + 0.10
H6.E1 flanged	$0.472 \div L^2$	$0.728 \div L^2$	ID + Wall + SO + LV + 0.05
H7.E1 flanged	$1.843 \div L^2$	$2.840 \div L^2$	ID + Wall + SO + LV + 0.05
H7.E2 flanged	$8.08 \div L^2$	$12.44 \div L^2$	ID + 2 x Wall + SO + LV + 0.10
T5.E1	$10.88 \div L^2$	$16.766 \div L^2$	ID + Wall + SO
T5.E2	$47.65 \div L^2$	$73.43 \div L^2$	ID + 2 x Wall + SO + 0.08
H8.E1	$10.88 \div L^2$	$16.766 \div L^2$	ID + Wall + SO + LV + 0.05
H8.E2	$47.65 \div L^2$	$73.43 \div L^2$	ID + 2 x Wall + SO + LV + 0.13

L = unsupported length (m)

ID = pipe internal diameter (m)

Wall = pipe wall thickness (m)

SO = overall length of flanged pipe fitting (m) – see page 10

LV = Overall length of isolation valve (m) – see page 10

The above equations are derived from Torbar resonance frequency data and calculations.

Critical velocity calculation

Torbar

Maximum allowable DP

Depending on the model and size of Torbar there is a maximum figure of Differential Pressure above which the Torbar should NOT be used due to the imposition of excessive mechanical stresses. Check the table below to ensure that the application is suitable. If the calculated DP exceeds the maximum shown below, then select an other appropriate model to suit the application. For bi-directional configurations (accessory code TP5), use 50 % of the figures in this table.

For liquid flow applications where there is a possibility of process pulsations or intermittent excessive flow velocity, then the end-support models should always be selected for pipe sizes over 250 mm (10 in.) diameter (T4, L7 and H7 series) and 600 mm (24 in.) (T5 and H8 series).

Pipe size (internal dia.)		Torbar base model number FPD350. *				
		T3, L6 and H6	T4, L7 and H7 (without end support)	T4, L7 and H7 (with end support)	T5 and H8 (without end support)	T5 and H8 (with end support)
in.	mm	Maximum allowable DP in mbar (in.wg)				
2	50	6250 (2509)				
3	75	2790 (1120)				
4	100	1565 (628)	5100 (2047)			
6	150	695 (279)	2285 (917)			
8	200		1285 (516)			
10	250		820 (329)	3250 (1305)	3400 (365)	
12	300		570 (229)	2250 (903)	2350 (943)	
14	350		415 (167)	1680 (674)	1725 (693)	
16	400		320 (128)	1285 (516)	1335 (536)	
18	450		250 (100)	1015 (407)	1055 (424)	4225 (1696)
24	600		140 (56)	570 (229)	590 (237)	2375 (953)
36	900		50 (20)	250 (100)	265 (106)	1055 (424)
48	1200		30 (12)	140 (56)	145 (58)	590 (237)
60	1500		20 (8)	90 (36)	90 (36)	380 (153)
72	1800		10 (4)	60 (24)	65 (26)	265 (106)

* For models FPD350.T1 (all sizes), maximum DP value is 2500 mbar. (84 in.wg)

Above 1800 mm (72 in.) – consult factory

For sizes not shown above determine maximum allowable DP by extrapolation

The above figures are theoretically derived and include a x10 safety factor over and above basic standards and specification.

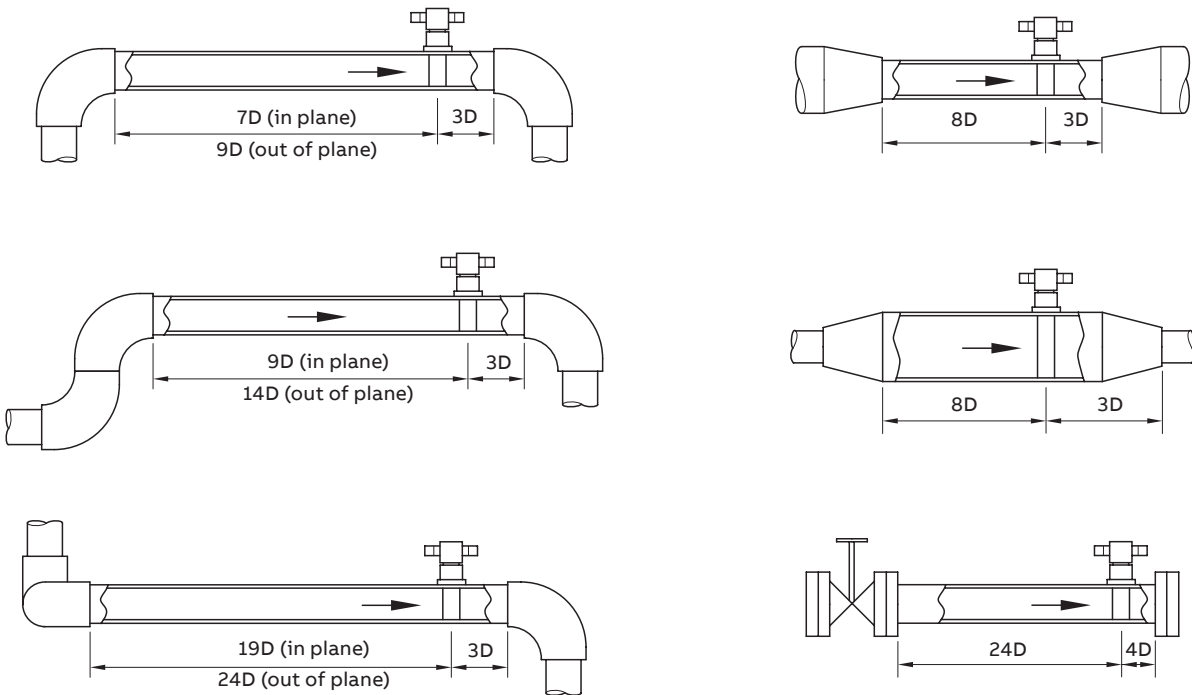
Installation and location

Recommended upstream and downstream distances

Correct location of the Torbar in the piping system is important in order to optimize performance. Flow that is disturbed by upstream configurations such as elbows, T's and valves may have an adverse effect on accuracy unless the Torbar is located at recommended positions shown in the table opposite. The diagrams illustrate the distances in multiples of pipe bore 'D' between the Torbar and the upstream and downstream disturbances.

If the Torbar is fitted within distances less than those shown, then absolute accuracy may be downgraded BUT repeatability of measurement will still be excellent due to inherent averaging characteristics.

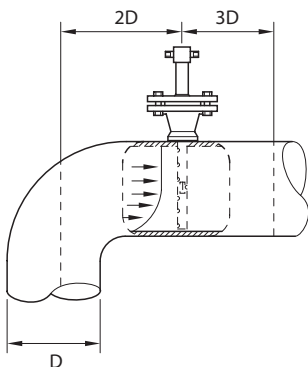
Where it is not possible to provide the specified distances and maximum accuracy is required, the use of a flow straightening spool piece allows for shorter distance



Installation pipe lengths

Elbow installation

The Torbar can be installed 2 diameters downstream of a 90° elbow at the exit of the elbow to give an accuracy of ±3 % to ±5 %.



Elbow installation

Torbar

Orientation in pipe

The Torbar must be installed at right angles to the pipe run and across a pipe diameter within the tolerances shown in the diagrams opposite.

To avoid 'noisy' signal outputs, do not locate the Torbar in a pulsating flow. A vibrating pipe can also distort the output signal and affect the structural limits of the Torbar. This limitation particularly applies to the integrally mounted transmitter option DM3V and to the TRIBAR configuration.

For vertical pipe applications, the 'head' of the Torbar is repositioned to ensure that DP connections are at the same vertical level. This is option VS. It is necessary to specify this option when ordering the Torbar.

It is essential that in all steam installations the entire Torbar head and fitting assembly are well lagged to prevent the formation of condensate in the Torbar head. The Torbar will not function correctly with condensate in the head. Filling tees or condensate pots should be fitted as appropriate.

Before installation or removal of a Torbar it is imperative that careful reference is made to the appropriate installation instructions that are supplied with each Torbar shipment. The installation instructions are also available separately on request.

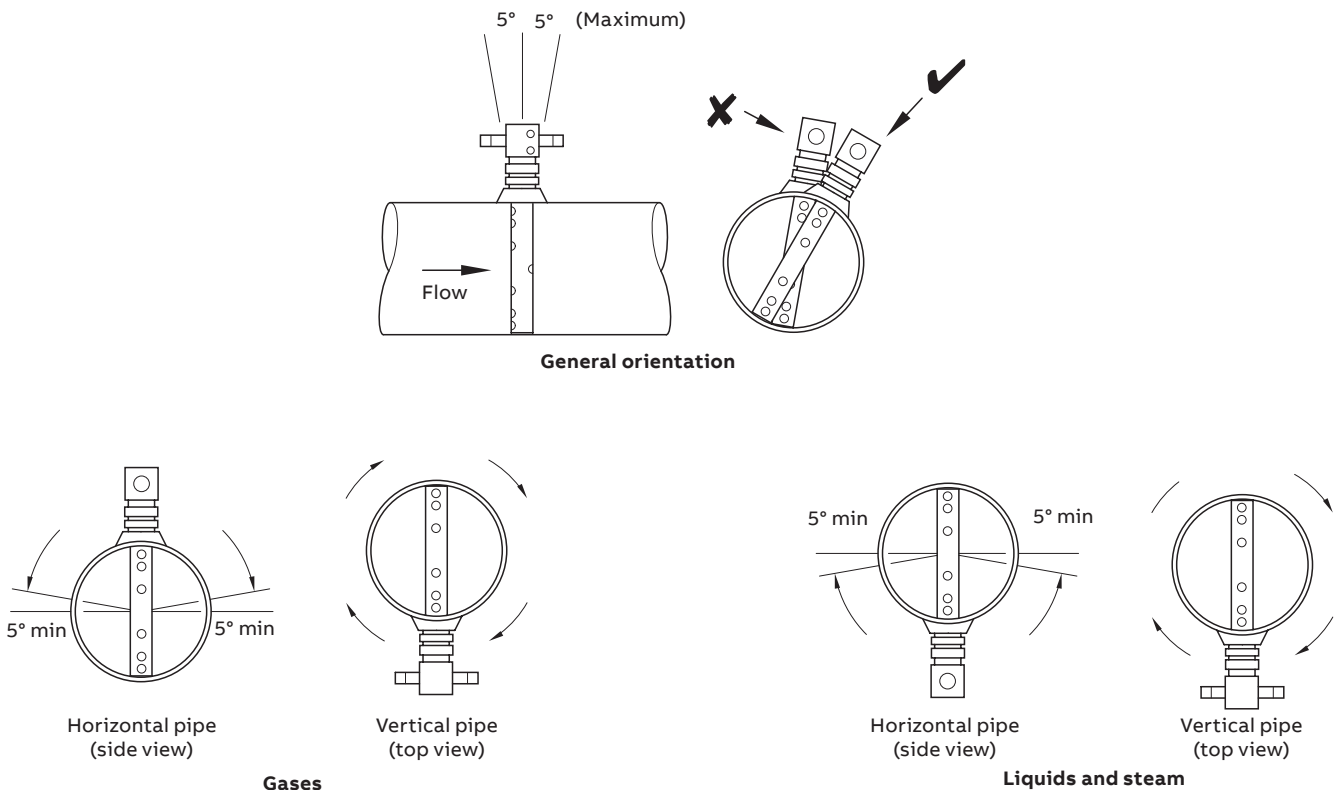
Warning. Refer to instruction manual before installing any Torbar flowmeter.

FPD585 StackFlowMaster – stack gas flow metering system

Introduction

The FPD585 StackFlowMaster series is a flow measurement system with integral purge to be used with the Torbar for the measurement of gas flow rates in chimneys and stacks where the dust concentration is higher than 20 mg/m³ or where any moisture content may be a problem. The purge duration and frequency is programmable to keep the Torbar sensing holes clean of contaminants.

The FPD585 StackFlowMaster is available with or without a DP transmitter and can be supplied with temperature and pressure compensation of the flow reading and separate stack pressure and temperature outputs when required. Other options and accessories are available.



Orientation of Torbar in pipe

Ordering information

FPD350 series 100 inline Torbar averaging pitot tube

FPD350.	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XXX	XX	XX	XXX	XX	XXX	XX	XXX
Product design																							
Inline Torbar	T1																						
Measurement design																							
Welded ends with integral end support	W1																						
Threaded ends with integral end support	T1																						
Flanged ends with integral end support	F1																						
Line nominal bore																							
DN 15 (½ in.)	015																						
DN 20 (¾ in.)	020																						
DN 25 (1 in.)	025																						
DN 32 (1¼ in.)	032																						
DN 40 (1½ in.)	040																						
DN 50 (2 in.)	050																						
Others	999																						
Probe material																							
316 / 316L stainless steel	S6																						
304 / 304L stainless steel	S4																						
321 stainless steel	S2																						
304H stainless steel	H4																						
310 stainless steel	S3																						
321H stainless steel	S1																						
904L stainless steel	S9																						
Alloy C276 (UNS N010276)	U7																						
Alloy 400 (UNS N04400)	M4																						
Alloy 625 (UNS N06625)	N2																						
22 % Cr duplex (UNS S31803)	D1																						
25 % Cr super duplex (UNS S32750)	D2																						
25 % Cr super duplex (UNS S32760)	D3																						
6 % Mo SS (UNS S31254)	M1																						
Alloy 600 (UNS N06600)	U3																						
Alloy 800 (UNS N08800)	U4																						
Alloy 825 (UNS N08825)	U5																						
Others	Z9																						
Pipe fitting material																							
316 / 316L stainless steel	S6																						
304 / 304L stainless steel	S4																						
321 stainless steel	S2																						
304H stainless steel	H4																						
310 stainless steel	S3																						
321H stainless steel	S1																						
904L stainless steel	S9																						
Alloy C276 (UNS N010276)	U7																						
Alloy 400 (UNS N04400)	M4																						
Alloy 625 (UNS N06625)	N2																						
22 % Cr duplex (UNS S31803)	D1																						
25 % Cr super duplex (UNS S32750)	D2																						
25 % Cr super duplex (UNS S32760)	D3																						
6 % Mo SS (UNS S31254)	M1																						
Alloy 600 (UNS N06600)	U3																						
Alloy 800 (UNS N08800)	U4																						
Alloy 825 (UNS N08825)	U5																						
Others	Z9																						
Standoffs, etc																							
None – In line design	Y0																						

Continued on next page...

... Ordering information | FPD350 series 100 inline Torbar averaging pitot tube

FPD350.	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XXX	XXX	XX	XX	XXX	XX	XXX	
See page 21																						
Process connection type																						
Weld prepared ends																						P1
Threaded BSPT																						T1
Threaded NPT																						T2
Raised face DN 15 (½ in.)																						R1
Raised face DN 20 (¾ in.)																						R2
Raised face DN 25 (1 in.)																						R3
Raised face DN 32 (1¼ in.)																						R6
Raised face DN 40 (1½ in.)																						R4
Raised face DN 50 (2 in.)																						R5
Flat face DN 15 (½ in.)																						F1
Flat face DN 20 (¾ in.)																						F2
Flat face DN 25 (1 in.)																						F3
Flat face DN 32 (1¼ in.)																						F6
Flat face DN 40 (1½ in.)																						F4
Flat face DN 50 (2 in.)																						F5
RTJ DN 25 (1 in.)																						J1
RTJ DN 40 (1½ in.)																						J2
RTJ DN 50 (2 in.)																						J3
Others																						Z9
Process connection rating																						
Not flanged																						Y0
ASME Class 150																						A1
ASME Class 300																						A3
ASME Class 600																						A6
ASME Class 900																						A7
DIN PN 6																						D0
DIN PN 10																						D1
DIN PN 16																						D2
DIN PN 25																						D3
DIN PN 40																						D4
DIN PN 63																						D5
DIN PN 100																						D6
DIN PN 160 (not fully rated)																						D7
Others																						Z9
Tapping type																						
Flanged DP connections (no valves)																						F1
Welded DP connections (no valves)																						W1
Threaded DP connections (no valves)																						T1
Direct mounting head																						D1
3-Valve integral (welded) manifold DM3V																						D2
5-Valve integral (welded) manifold DM5V																						D3
3-Valve direct-mounted (bolted) manifold 3VDM																						D4
5-Valve direct-mounted (bolted) manifold 5VDM																						D5
Ball valves																						V1
Needle valves																						V2
Gate valves																						V3
Globe valves																						V4
Double block and bleed valves																						V5
Tapping size																						
Not applicable																						T0
¼ in. NPT male																						T1
¼ in. NPT female																						T2
¼ in. BSP male																						T3
¼ in. BSP female																						T4
½ in. NPT male																						T5
½ in. NPT female																						T6
½ in. BSP male																						T7
½ in. BSP female																						T8
½ in. flanged (specification as mounting flange)																						F1
¾ in. flanged (specification as mounting flange)																						F2
½ in. socket weld																						S1
Others																						Z9
Tapping / Valve material																						
As probe																						Y0
316 stainless steel																						S6
Carbon steel																						C3
Alloy C276 (UNS N010276)																						U7
Alloy 400 (UNS N04400)																						M4
22 % Cr Duplex (UNS S31803)																						D1
25 % Cr Super Duplex (UNS S32750)																						D2
Others																						Z9

Continued on next page...

... Ordering information | FPD350 series 100 inline Torbar averaging pitot tube

FPD350.	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XXX	XXX	XX	XX	XXX	XX	XXX
See page 21											See page 22									
Pipe orientation and shape																				
Horizontal, circular pipe / duct												PNH								
Vertical, circular pipe / duct												PNV								
Process isolation valve																				
No isolation valve												Y0								
Bolt type and material																				
ASTM A193 B7 / ASTM A194 2H												BGC								
ASTM A193 B8M / ASTM A194 8MA												BGS								
Others												BZ9								
Gasket material																				
Asbestos-free 1.6 mm												GT1								
Spiral wound – stainless steel windings with carbon steel outer; 4.5 mm												GT2								
Soft Iron												GP3								
Others												GZ9								
Surface treatment																				
Oxygen cleaning												P1								
Others												Z9								
Certification																				
Material certificates acc. EN 10204 3.1												C2								
Material certificates acc. EN 10204 3.2												C3								
Material certificates acc. NACE, latest revision												CN								
Dye penetrant inspection												C9								
Radiography (available on flanged units only)												C8								
Positive material identification												CA								
100 % dimensional check												C6								
Others												CZ								
Testing																				
Impact testing @ -46 °C												CH1								
Impact testing @ -196 °C												CH2								
Hardness survey												CH3								
HIC testing												CH4								
Magnetic particle inspection												CH5								
Ultrasonic inspection												CH6								
Heat treatment trace												CH7								
Pressure test												CH8								
Others												CHZ								
Documentation language (default = English)																				
German												M1								
Italian												M2								
Spanish												M3								
French												M4								
Chinese												M6								
Others												MZ								
Added requirements																				
Material source limitations apply												MS1								

...Ordering information | FPD350 series 300 Torbar averaging pitot tube

FPD350		XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XXX	XXX	XXX	XXX	XX	XX	XXX	XX	XXX	XX	XXX
Product design																										
Permanently installed Torbar – 13 mm (½ in.) OD probe		T3																								
Measurement design																										
Unsupported version		E1																								
Supported version		E2																								
Line nominal bore																										
DN 50 (2 in.)		050																								
DN 80 (3 in.)		080																								
DN 100 (4 in.)		100																								
DN 125 (5 in.)		125																								
DN 150 (6 in.)		150																								
Others		999																								
Probe material																										
316 / 316L stainless steel		S6																								
304 / 304L stainless steel		S4																								
321 stainless steel		S2																								
304H stainless steel		H4																								
310 stainless steel		S3																								
321H stainless steel		S1																								
904L stainless steel		S9																								
Alloy C276 (UNS N010276)		U7																								
Alloy 400 (UNS N04400)		M4																								
Alloy 625 (UNS N06625)		N2																								
22 % Cr duplex (UNS S31803)		D1																								
25 % Cr super duplex (UNS S32750)		D2																								
25 % Cr super duplex (UNS S32760)		D3																								
6 % Mo SS (UNS S31254)		M1																								
Alloy 600 (UNS N06600)		U3																								
Alloy 800 (UNS N08800)		U4																								
Alloy 825 (UNS N08825)		U5																								
Others		Z9																								
Pipe fitting material																										
Carbon steel		C3																								
316 / 316L stainless steel		S6																								
304 / 304L stainless steel		S4																								
321 stainless steel		S2																								
Low temperature carbon steel (A350 LF2 C1/A333 Gr 6)		C4																								
1-¼ Cr-½ Mo low alloy F11 (UNS K11597)		F4																								
25 % Cr super duplex (UNS S32750)		D2																								
25 % Cr super duplex (UNS S32760)		D3																								
316H stainless Steel		H6																								
304H stainless steel		H4																								
310 stainless steel		S3																								
321H stainless steel		S1																								
904L stainless steel		S9																								
22 % Cr Duplex (UNS S31803)		D1																								
6 % Mo SS (UNS S31254)		M1																								
Alloy 400 (UNS N04400)		M4																								
Alloy 600 (UNS N06600)		U3																								
Alloy 625 (UNS N06625)		N2																								
Alloy 800 (UNS N08800)		U4																								
Alloy 825 (UNS N08825)		U5																								
Alloy C276 (UNS N010276)		U7																								
Others		Z9																								
Standoffs, etc																										
Threaded connection without end support		T1																								
Threaded connection with threaded end support		T2																								
Flanged standoff without end support		F1																								
Flanged standoff with weld cup end support		F2																								
Customer supplied (versions without flanged end supports)		F7																								
Customer supplied (versions with flanged end supports)		F8																								

Continued on next page...

...Ordering information | FPD350 series 300 Torbar averaging pitot tube

FPD350	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XXX	XXX	XXX	XX	XX	XXX	XX	XXX	
See page 24																						
Process connection type																						
Threaded BSPT																						T1
Threaded NPT																						T2
Raised face DN 25 (1 in.)																						R3
Raised face DN 40 (1½ in.)																						R4
Flat face DN 25 (1 in.)																						F3
Flat face DN 40 (1½ in.)																						F4
RTJ DN 25 (1 in.)																						J1
RTJ DN 40 (1½ in.)																						J2
Others																						Z9
Process connection rating																						
Not flanged																						Y0
ASME Class 150																						A1
ASME Class 300																						A3
ASME Class 600																						A6
ASME Class 900																						A7
ASME Class 1500																						A8
ASME Class 2500																						A9
DIN PN 6																						D0
DIN PN 10																						D1
DIN PN 16																						D2
DIN PN 25																						D3
DIN PN 40																						D4
DIN PN 63																						D5
DIN PN 100																						D6
DIN PN 160																						D7
DIN PN 250																						D8
Others																						Z9
Tapping type																						
Flanged DP connections (no valves)																						F1
Welded DP connections (no valves)																						W1
Threaded DP connections (no valves)																						T1
Direct mounting head																						D1
3-Valve integral (welded) manifold DM3V																						D2
5-Valve integral (welded) manifold DM5V																						D3
3-Valve direct-mounted (bolted) manifold 3VDM																						D4
5-Valve direct-mounted (bolted) manifold 5VDM																						D5
Ball valves																						V1
Needle valves																						V2
Gate valves																						V3
Globe valves																						V4
Double block and bleed valves																						V5
Tapping size																						
Not applicable																						T0
¼ in. NPT male																						T1
¼ in. NPT female																						T2
¼ in. BSP male																						T3
¼ in. BSP female																						T4
½ in. NPT male																						T5
½ in. NPT female																						T6
½ in. BSP male																						T7
½ in. BSP female																						T8
½ in. flanged (specification as mounting flange)																						F1
¾ in. flanged (specification as mounting flange)																						F2
½ in. socket weld																						S1
Others																						Z9
Tapping / Valve material																						
As probe																						Y0
316 stainless steel																						S6
Carbon steel																						C3
Alloy C276 (UNS N010276)																						U7
Alloy 400 (UNS N04400)																						M4
22 % Cr Duplex (UNS S31803)																						D1
25 % Cr Super Duplex (UNS S32750)																						D2
Others																						Z9

Continued on next page...

...Ordering information | FPD350 series 300 Torbar averaging pitot tube

FPD350	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XXX	XXX	XXX	XX	XX	XXX	XX	XXX
See page 24												See page 25										
Pipe orientation and shape																						
Horizontal, circular pipe / duct												PNH										
Vertical, circular pipe / duct												PNV										
Horizontal, rectangular pipe / duct												RNH										
Vertical, rectangular pipe / duct												RNV										
Process isolation valve																						
No isolation valve												YO										
Tapping sets																						
Two sets												TN2										
Others												TNZ										
Bolt type and material																						
ASTM A193 B7 / ASTM A194 2H												BGC										
ASTM A193 B8M / ASTM A194 8MA												BGS										
Others												BZ9										
Gasket material																						
Asbestos-free 1.6 mm												GT1										
Spiral wound – stainless steel windings with carbon steel outer; 4.5 mm												GT2										
Soft iron												GP3										
Others												GZ9										
Fitting accessories																						
Duct mounting plate (in carbon steel or stainless steel to match pipe fitting material)												DF1										
Cooling fins												CF1										
Frequency collar												FC1										
Air eliminator package – pair of stainless steel air eliminators, no valves or fittings (supplied loose)												AV1										
Air eliminator package – pair of stainless steel air eliminators with valves and fittings (supplied loose)												AV2										
Air eliminator package – pair of DZR air eliminators for seawater applications (supplied loose)												AV3										
Air eliminator package – pair of DZR air eliminators with valves and fittings for seawater applications (supplied loose)												AV4										
Pair of condensate pots in carbon steel – ½ in. BSPTF tappings (supplied loose)												CP1										
Pair of condensate pots in carbon steel – ½ in. NPT tappings (supplied loose)												CP2										
Pair of condensate pots in carbon steel – ½ in. butt weld Schedule 160 tappings (supplied loose)												CP3										
Pair of condensate pots in stainless steel – ½ in. BSPTF tappings (supplied loose)												CP4										
Pair of condensate pots in stainless steel – ½ in. NPT tappings (supplied loose)												CP5										
Pair of condensate pots in stainless steel – ½ in. butt weld Schedule 160 tappings (supplied loose)												CP6										
Surface treatment																						
Oxygen cleaning												P1										
Others												Z9										
Certification																						
Material certificates acc. EN 10204 3.1												C2										
Material certificates acc. EN 10204 3.2												C3										
Material certificates acc. NACE, latest revision												CN										
Dye penetrant inspection												C9										
Radiography (available on flanged units only)												C8										
Positive material identification												CA										
100 % dimensional check												C6										
Others												CZ										
Testing																						
Impact testing @ -46 °C												CH1										
Impact testing @ -196 °C												CH2										
Hardness survey												CH3										
HIC testing												CH4										
Magnetic particle inspection												CH5										
Ultrasonic inspection												CH6										
Heat treatment trace												CH7										
Pressure test												CH8										
Others												CHZ										
Documentation language (default = English)																						
German												M1										
Italian												M2										
Spanish												M3										
French												M4										
Chinese												M6										
Others												MZ										
Added requirements																						
Material source limitations apply												MS1										

Ordering information | FPD350 series 400 Torbar averaging pitot tube

FPD350	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XXX	XXX	XXX	XXX	XX	XXX	XX	XXX	XX	XXX	XX	XXX	XX	XXX
Product design																										
Permanently installed Torbar – 25 mm (1 in.) OD probe																										
T4																										
Measurement Design																										
Unsupported version																										
E1																										
Supported version																										
E2																										
Line nominal bore																										
DN 100 (4 in.)																										
100																										
DN 125 (5 in.)																										
125																										
DN 150 (6 in.)																										
150																										
DN 200 (8 in.)																										
200																										
DN 250 (10 in.)																										
250																										
DN 300 (12 in.)																										
300																										
DN 350 (14 in.)																										
350																										
DN 400 (16 in.)																										
400																										
DN 450 (18 in.)																										
450																										
DN 500 (20 in.)																										
500																										
DN 600 (24 in.)																										
600																										
DN 750 (30 in.)																										
750																										
DN 900 (36 in.)																										
900																										
DN 1000 (40 in.)																										
001																										
DN 1100 (44 in.)																										
101																										
DN 1200 (48 in.)																										
201																										
DN 1300 (52 in.)																										
301																										
DN 1400 (56 in.)																										
401																										
DN 1500 (60 in.)																										
501																										
DN 1600 (64 in.)																										
601																										
DN 1700 (68 in.)																										
701																										
DN 1800 (72 in.)																										
801																										
DN 1900 (76 in.)																										
901																										
DN 2000 (80 in.)																										
002																										
DN 2100 (84 in.)																										
102																										
DN 2200 (88 in.)																										
202																										
DN 2300 (92 in.)																										
302																										
DN 2400 (96 in.)																										
402																										
DN 2500 (98 in.)																										
502																										
DN 2600 (102 in.)																										
602																										
DN 2700 (106 in.)																										
702																										
DN 2800 (110 in.)																										
802																										
DN 2900 (114 in.)																										
902																										
DN 3000 (118 in.)																										
003																										
DN 3100 (122 in.)																										
103																										
DN 3200 (126 in.)																										
203																										
DN 3300 (130 in.)																										
303																										
DN 3400 (134 in.)																										
403																										
DN 3500 (138 in.)																										
503																										
Others																										
999																										
Probe material																										
316 / 316L stainless steel																										
S6																										
304 / 304L stainless steel																										
S4																										
321 stainless steel																										
S2																										
304H stainless steel																										
H4																										
310 stainless steel																										
S3																										
321H stainless steel																										
S1																										
904L stainless steel																										
S9																										
Alloy C276 (UNS N010276)																										
U7																										
Alloy 400 (UNS N04400)																										
M4																										
Alloy 625 (UNS N06625)																										
N2																										
22 % Cr duplex (UNS S31803)																										
D1																										
25 % Cr super duplex (UNS S32750)																										
D2																										
25 % Cr super duplex (UNS S32760)																										
D3																										
6 % Mo stainless steel (UNS S31254)																										
M1																										
Alloy 600 (UNS N06600)																										
U3																										
Alloy 800 (UNS N08800)																										
U4																										
Alloy 825 (UNS N08825)																										
U5																										
Others																										
Z9																										

Continued on next page...

...Ordering information | FPD350 series 400 Torbar averaging pitot tube

FPD350, XX XX XXX XX	XX XX XX XX XX XX XX XX XXX XXX XXX XXX XXX XX XXX XX XX XXX XX XXX
See page 27	
Pipe fitting material	
Carbon steel	C3
316 / 316L stainless steel	S6
304 / 304L stainless steel	S4
321 stainless steel	S2
Low temperature carbon steel (A350 LF2 C1/A333 Gr 6)	C4
1-¼ Cr-½ Mo low alloy F11 (UNS K11597)	F4
25 % Cr super duplex (UNS S32750)	D2
25 % Cr super duplex (UNS S32760)	D3
316H stainless steel	H6
304H stainless steel	H4
310 stainless steel	S3
321H stainless steel	S1
904L stainless steel	S9
22 % Cr Duplex (UNS S31803)	D1
6 % Mo SS (UNS S31254)	M1
Alloy 400 (UNS N04400)	M4
Alloy 600 (UNS N06600)	U3
Alloy 625 (UNS N06625)	N2
Alloy 800 (UNS N08800)	U4
Alloy 825 (UNS N08825)	U5
Alloy C276 (UNS N010276)	U7
Others	Z9
Standoffs, etc	
Threaded connection without end support	T1
Threaded connection with threaded end support	T2
Flanged standoff without end support	F1
Flanged standoff with weld cup end support	F2
2 flanged standoffs and external flanged end support	F3
2 flanged standoffs and internal flanged end support	F4
External flanged end support only (no standoffs supplied)	F5
Internal flanged end support only (no standoffs supplied)	F6
Customer supplied (versions without flanged end supports)	F7
Customer supplied (versions with flanged end supports)	F8
Process connection type	
Threaded BSPT	T1
Threaded NPT	T2
Raised face DN 40 (1½ in.)	R4
Raised face DN 50 (2 in.)	R5
Raised face DN 80 (3 in.)	R6
Flat face DN 40 (1½ in.)	F4
Flat face DN 50 (2 in.)	F5
Flat face DN 80 (3 in.)	F6
RTJ DN 40 (1½ in.)	J2
RTJ DN 50 (2 in.)	J3
RTJ DN 80 (3 in.)	J4
Others	Z9
Process connection rating	
Not flanged	Y0
ASME Class 150	A1
ASME Class 300	A3
ASME Class 600	A6
ASME Class 900	A7
ASME Class 1500	A8
ASME Class 2500	A9
DIN PN 6	D0
DIN PN 10	D1
DIN PN 16	D2
DIN PN 25	D3
DIN PN 40	D4
DIN PN 63	D5
DIN PN 100	D6
DIN PN 160	D7
DIN PN 250	D8
Others	Z9

Continued on next page...

...Ordering information | FPD350 series 400 Torbar averaging pitot tube

FPD350, XX XX XXX XX XX XX XX XX	XX XX XX XXX XXX XXX XXX XXX XX XXX XX XXX XX XXX
See page 27	See page 28
Tapping type	
Flanged DP connections (no valves)	F1
Welded DP connections (no valves)	W1
Threaded DP connections (no valves)	T1
Direct mounting head	D1
3-Valve integral (welded) manifold DM3V	D2
5-Valve integral (welded) manifold DM5V	D3
3-Valve direct-mounted (bolted) manifold 3VDM	D4
5-Valve direct-mounted (bolted) manifold 5VDM	D5
Ball valves	V1
Needle valves	V2
Gate valves	V3
Globe valves	V4
Double block and bleed valves	V5
Tapping size	
Not applicable	T0
¼ in. NPT male	T1
¼ in. NPT female	T2
¼ in. BSP male	T3
¼ in. BSP female	T4
½ in. NPT male	T5
½ in. NPT female	T6
½ in. BSP male	T7
½ in. BSP female	T8
½ in. flanged (specification as mounting flange)	F1
¾ in. flanged (specification as mounting flange)	F2
½ in. socket weld	S1
Others	Z9
Tapping / Valve material	
As probe	Y0
316 stainless steel	S6
Carbon steel	C3
Alloy C276 (UNS N010276)	U7
Alloy 400 (UNS N04400)	M4
22 % Cr Duplex (UNS S31803)	D1
25 % Cr Super Duplex (UNS S32750)	D2
Others	Z9
Pipe orientation and shape	
Horizontal, circular pipe / duct	PNH
Vertical, circular pipe / duct	PNV
Horizontal, rectangular pipe / duct	RNH
Vertical, rectangular pipe / duct	RNV
Process isolation valve	
No isolation valve	Y0
1½ in. flanged ball valve – carbon steel	BC8
2 in. flanged ball valve – carbon steel	BC6
3 in. flanged ball valve – carbon steel	BC9
1½ in. flanged ball valve – stainless steel	BS8
2 in. flanged ball valve – stainless steel	BS6
3 in. flanged ball valve – stainless steel	BS9
1½ in. flanged ball valve – Alloy 400	BM8
2 in. flanged ball valve – Alloy 400	BM6
3 in. flanged ball valve – Alloy 400	BM9
1½ in. flanged ball valve – Alloy 276	BH8
2 in. flanged ball valve – Alloy 276	BH6
3 in. flanged ball valve – Alloy 276	BH9
1½ in. flanged ball valve – aluminium-bronze	BA8
2 in. flanged ball valve – aluminium-bronze	BA6
3 in. flanged ball valve – aluminium-bronze	BA9
1½ in. flanged gate valve – carbon steel	GC8
2 in. flanged gate valve – carbon steel	GC6
3 in. flanged gate valve – carbon steel	GC9
1½ in. flanged gate valve – stainless steel	GS8
2 in. flanged gate valve – stainless steel	GS6
3 in. flanged gate valve – stainless steel	GS9
Customer supplied	VF9
Others	VZ9
Design options	
Partial Insertion probe	TP2
Bidirectional	TP5
Special neck length	TP6
Bayonet end fitting	TP7

Continued on next page...

...Ordering information | FPD350 series 400 Torbar averaging pitot tube

FPD350.XX XX XXX XX XX XX XX XX XX XX XX XXX XXX XXX XXX XXX XXX										XXX	XXX	XXX	XX	XXX	XX	XXX	XX	XXX	XX	XXX		
		See page 27			See page 28			See page 29														
Tapping sets																						
Two sets										TN2												
Others										TNZ												
Bolt type and material																						
ASTM A193 B7 / ASTM A194 2H										BGC												
ASTM A193 B8M / ASTM A194 8MA										BGS												
Others										BZ9												
Gasket material																						
Asbestos-free 1.6 mm										GT1												
Spiral wound – stainless steel windings with carbon steel outer; 4.5 mm										GT2												
Soft iron										GP3												
Others										GZ9												
Temperature element – operating pressure limited to maximum of 70 bar (1015 psi)																						
Integral PT100 sensor, neck mounted – aluminium IP65 head without transmitter													T1									
Integral PT100 sensor, neck mounted – aluminium IP65 head with transmitter													T2									
EEx ia integral PT100 sensor, neck mounted – aluminium IP65 head without transmitter													T3									
EEx ia integral PT100 sensor, neck mounted – aluminium IP65 head with transmitter													T4									
Integral type K thermocouple sensor, neck mounted – aluminium IP65 head with transmitter													T5									
EEx ia integral type K thermocouple sensor, neck mounted – aluminium IP65 head with transmitter													T6									
Fitting accessories																						
Duct mounting plate (in carbon steel or stainless steel to match pipe fitting material)													DF1									
Cooling fins													CF1									
Frequency collar													FC1									
Air eliminator package – pair of stainless steel air eliminators, no valves or fittings (supplied loose)													AV1									
Air eliminator package – pair of stainless steel air eliminators with valves and fittings (supplied loose)													AV2									
Air eliminator package – pair of DZR air eliminators for seawater applications (supplied loose)													AV3									
Air eliminator package – pair of DZR air eliminators with valves and fittings for seawater applications (supplied loose)													AV4									
Pair of condensate pots in carbon steel – ½ in. BSPTF tappings (supplied loose)													CP1									
Pair of condensate pots in carbon steel – ½ in. NPT tappings (supplied loose)													CP2									
Pair of condensate pots in carbon steel – ½ in. butt weld Schedule 160 tappings (supplied loose)													CP3									
Pair of condensate pots in stainless steel – ½ in. BSPTF tappings (supplied loose)													CP4									
Pair of condensate pots in stainless steel – ½ in. NPT tappings (supplied loose)													CP5									
Pair of condensate pots in stainless steel – ½ in. butt weld Schedule 160 tappings (supplied loose)													CP6									
Surface treatment																						
Oxygen cleaning													P1									
Others													Z9									
Certification																						
Material certificates acc. EN 10204 3.1													C2									
Material certificates acc. EN 10204 3.2													C3									
Material certificates acc. NACE, latest revision													CN									
Dye penetrant inspection													C9									
Radiography (available on flanged units only)													C8									
Positive material identification													CA									
100 % dimensional check													C6									
Others													CZ									
Testing																						
Impact testing @ –46 °C													CH1									
Impact testing @ –196 °C													CH2									
Hardness survey													CH3									
HIC testing													CH4									
Magnetic particle inspection													CH5									
Ultrasonic inspection													CH6									
Heat treatment trace													CH7									
Pressure test													CH8									
Others													CHZ									
Documentation language (default = English)																						
German													M1									
Italian													M2									
Spanish													M3									
French													M4									
Chinese													M6									
Others													MZ									
Added requirements																						
Material source limitations apply													MS1									

Ordering information | FPD350 series 500 Torbar averaging pitot tube

FPD350		XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XXX	XXX	XXX	XXX	XX	XXX	XX	XXX	XX	XXX	XX	XXX	XX	XXX
Product design																												
Permanently installed Torbar – 60 mm (2 in.) OD probe																											T5	
Measurement design																												
Unsupported version																											E1	
Supported version																											E2	
Line nominal bore																												
DN 250 (10 in.)	250	DN 4100 (162 in.)	104																									
DN 300 (12 in.)	300	DN 4200 (166 in.)	204																									
DN 350 (14 in.)	350	DN 4300 (170 in.)	304																									
DN 400 (16 in.)	400	DN 4400 (174 in.)	404																									
DN 450 (18 in.)	450	DN 4500 (177 in.)	504																									
DN 500 (20 in.)	500	DN 4600 (181 in.)	604																									
DN 600 (24 in.)	600	DN 4700 (185 in.)	704																									
DN 750 (30 in.)	750	DN 4800 (189 in.)	804																									
DN 900 (36 in.)	900	DN 4900 (193 in.)	904																									
DN 1000 (40 in.)	001	DN 5000 (197 in.)	005																									
DN 1100 (44 in.)	101	DN 5100 (200 in.)	105																									
DN 1200 (48 in.)	201	DN 5200 (204 in.)	205																									
DN 1300 (52 in.)	301	DN 5300 (208 in.)	305																									
DN 1400 (56 in.)	401	DN 5400 (212 in.)	405																									
DN 1500 (60 in.)	501	DN 5500 (216 in.)	505																									
DN 1600 (64 in.)	601	DN 5600 (220 in.)	605																									
DN 1700 (68 in.)	701	DN 5700 (224 in.)	705																									
DN 1800 (72 in.)	801	DN 5800 (228 in.)	805																									
DN 1900 (76 in.)	901	DN 5900 (232 in.)	905																									
DN 2000 (80 in.)	002	DN 6000 (236 in.)	006																									
DN 2100 (84 in.)	102	DN 6100 (240 in.)	106																									
DN 2200 (88 in.)	202	DN 6200 (244 in.)	206																									
DN 2300 (92 in.)	302	DN 6300 (248 in.)	306																									
DN 2400 (96 in.)	402	DN 6400 (252 in.)	406																									
DN 2500 (98 in.)	502	DN 6500 (256 in.)	506																									
DN 2600 (102 in.)	602	DN 6600 (260 in.)	606																									
DN 2700 (106 in.)	702	DN 6700 (264 in.)	706																									
DN 2800 (110 in.)	802	DN 6800 (268 in.)	806																									
DN 2900 (114 in.)	902	DN 6900 (272 in.)	906																									
DN 3000 (118 in.)	003	DN 7000 (276 in.)	007																									
DN 3100 (122 in.)	103	DN 7100 (280 in.)	107																									
DN 3200 (126 in.)	203	DN 7200 (284 in.)	207																									
DN 3300 (130 in.)	303	DN 7300 (288 in.)	307																									
DN 3400 (134 in.)	403	DN 7400 (292 in.)	407																									
DN 3500 (138 in.)	503	DN 7500 (296 in.)	507																									
DN 3600 (142 in.)	603	DN 7600 (300 in.)	607																									
DN 3700 (146 in.)	703	DN 7700 (304 in.)	707																									
DN 3800 (150 in.)	803	DN 7800 (308 in.)	807																									
DN 3900 (154 in.)	903	DN 7900 (312 in.)	907																									
DN 4000 (158 in.)	004	DN 8000 (315 in.)	008																									
		Others	999																									
Probe material																												
316 / 316L stainless steel																											S6	
304 / 304L stainless steel																											S4	
321 stainless steel																											S2	
304H stainless steel																											H4	
310 stainless steel																											S3	
321H stainless steel																											S1	
904L stainless steel																											S9	
Alloy C276 (UNS N010276)																											U7	
Alloy 400 (UNS N04400)																											M4	
Alloy 625 (UNS N06625)																											N2	
22 % Cr duplex (UNS S31803)																											D1	
25 % Cr super duplex (UNS S32750)																											D2	
25 % Cr super duplex (UNS S32760)																											D3	
6 % Mo stainless steel (UNS S31254)																											M1	
Alloy 600 (UNS N06600)																											U3	
Alloy 800 (UNS N08800)																											U4	
Alloy 825 (UNS N08825)																											U5	
Others																											Z9	

Continued on next page...

...Ordering information | FPD350 series 500 Torbar averaging pitot tube

FPD350.XX XX XXX XX	XX XX XX XX XX XX XXX XXX XXX XXX XXX XX XXX XX XXX XX XXX
See page 31	
Pipe fitting material	
Carbon steel	C3
316 / 316L stainless steel	S6
304 / 304L stainless steel	S4
321 stainless steel	S2
Low temperature carbon steel (A350 LF2 C1/A333 Gr 6)	C4
1-¼ Cr-½ Mo low alloy F11 (UNS K11597)	F4
25 % Cr super duplex (UNS S32750)	D2
25 % Cr super duplex (UNS S32760)	D3
316H stainless Steel	H6
304H stainless steel	H4
310 stainless steel	S3
321H stainless steel	S1
904L stainless steel	S9
22 % Cr Duplex (UNS S31803)	D1
6 % Mo SS (UNS S31254)	M1
Alloy 400 (UNS N04400)	M4
Alloy 600 (UNS N06600)	U3
Alloy 625 (UNS N06625)	N2
Alloy 800 (UNS N08800)	U4
Alloy 825 (UNS N08825)	U5
Alloy C276 (UNS N010276)	U7
Others	Z9
Standoffs, etc	
Flanged standoff without end support	F1
Flanged standoff with weld cup end support	F2
2 flanged standoffs and external flanged end support	F3
2 flanged standoffs and internal flanged end support	F4
External flanged end support only (no standoffs supplied)	F5
Internal flanged end support only (no standoffs supplied)	F6
Customer supplied (versions without flanged end supports)	F7
Customer supplied (versions with flanged end supports)	F8
Process connection type	
Raised face DN 80 (3 in.)	R6
Raised Face DN 100 (4 in.)	R7
Raised Face DN 150 (6 in.)	R8
Flat face DN 80 (3 in.)	F6
Flat Face DN 100 (4 in.)	F7
Flat Face DN 150 (6 in.)	F8
RTJ DN 80 (3 in.)	J4
RTJ DN 100 (4 in.)	J5
RTJ DN 150 (6 in.)	J6
Others	Z9
Process connection rating	
ASME Class 150	A1
ASME Class 300	A3
ASME Class 600	A6
ASME Class 900	A7
ASME Class 1500	A8
ASME Class 2500	A9
DIN PN 6	D0
DIN PN 10	D1
DIN PN 16	D2
DIN PN 25	D3
DIN PN 40	D4
DIN PN 63	D5
DIN PN 100	D6
DIN PN 160	D7
DIN PN 250	D8
Others	Z9
Tapping type	
Flanged DP connections (no valves)	F1
Welded DP connections (no valves)	W1
Threaded DP connections (no valves)	T1
Direct mounting head	D1
3-Valve integral (welded) manifold DM3V	D2
5-Valve integral (welded) manifold DM5V	D3
3-Valve direct-mounted (bolted) manifold 3VDM	D4
5-Valve direct-mounted (bolted) manifold 5VDM	D5
Ball valves	V1
Needle valves	V2
Gate valves	V3
Globe valves	V4
Double block and bleed valves	V5

Continued on next page...

...Ordering information | FPD350 series 500 Torbar averaging pitot tube

FPD350.XX XX XXX XX XX XX XX XX XX		XX	XX	XXX	XXX	XXX	XXX	XXX	XX	XXX	XX	XXX	XX	XX	XXX	XX	XXX
		See page 31		See page 32													
Tapping size																	
Not applicable																T0	
¼ in. NPT male																T1	
¼ in. NPT female																T2	
¼ in. BSP male																T3	
¼ in. BSP female																T4	
½ in. NPT male																T5	
½ in. NPT female																T6	
½ in. BSP male																T7	
½ in. BSP female																T8	
½ in. flanged (specification as mounting flange)																F1	
¾ in. flanged (specification as mounting flange)																F2	
½ in. socket weld																S1	
Others																Z9	
Tapping / Valve material																	
As probe																Y0	
316 stainless steel																S6	
Carbon steel																C3	
Alloy C276 (UNS N010276)																U7	
Alloy 400 (UNS N04400)																M4	
22 % Cr Duplex (UNS S31803)																D1	
25 % Cr Super Duplex (UNS S32750)																D2	
Others																Z9	
Pipe orientation and shape																	
Horizontal, circular pipe / duct																PNH	
Vertical, circular pipe / duct																PNV	
Horizontal, rectangular pipe / duct																RNH	
Vertical, rectangular pipe / duct																RNV	
Process isolation valve																	
No isolation valve																Y0Y	
3 in. flanged ball valve – carbon steel																BC9	
3 in. flanged ball valve – stainless steel																BS9	
3 in. flanged ball valve – Alloy 400																BM9	
3 in. flanged ball valve – Alloy 276																BH9	
3 in. flanged ball valve – aluminium-bronze																BA9	
3 in. flanged gate valve – carbon steel																GC9	
3 in. flanged gate valve – stainless steel																GS9	
Others																VZ9	
Design options																	
Centre coupling																TP1	
Partial insertion probe																TP2	
Bidirectional																TP5	
Special neck length																TP6	
Bayonet end fitting																TP7	

Continued on next page...

...Ordering information | FPD350 series 500 Torbar averaging pitot tube

FPD350.XX XX XXX XX XX XX XX XX XX XX XX XXX XXX XXX XXX XXX XX XX XXX XX XXX	See page 31	See page 32	See page 33																			
Tapping sets																						
Two sets																			TN2			
Others																			TNZ			
Bolt type and material																						
ASTM A193 B7 / ASTM A194 2H																			BGC			
ASTM A193 B8M / ASTM A194 8MA																			BGS			
Others																			BZ9			
Gasket material																						
Asbestos-free 1.6 mm																			GT1			
Spiral wound – stainless steel windings with carbon steel outer; 4.5 mm																			GT2			
Soft iron																			GP3			
Others																			GZ9			
Temperature element – operating pressure limited to maximum of 70 bar (1015 psi)																						
Integral PT100 sensor, neck mounted – aluminium IP65 head without transmitter																			T1			
Integral PT100 sensor, neck mounted – aluminium IP65 head with transmitter																			T2			
EEx ia integral PT100 sensor, neck mounted – aluminium IP65 head without transmitter																			T3			
EEx ia integral PT100 sensor, neck mounted – aluminium IP65 head with transmitter																			T4			
Integral type K thermocouple sensor, neck mounted – aluminium IP65 head with transmitter																			T5			
EEx ia integral type K thermocouple sensor, neck mounted – aluminium IP65 head with transmitter																			T6			
Fitting accessories																						
Cooling fins																			CF1			
Frequency collar																			FC1			
Slotted ports																			SH1			
Air eliminator package – pair of stainless steel air eliminators, no valves or fittings (supplied loose)																			AV1			
Air eliminator package – pair of stainless steel air eliminators with valves and fittings (supplied loose)																			AV2			
Air eliminator package – pair of DZR air eliminators for seawater applications (supplied loose)																			AV3			
Air eliminator package – pair of DZR air eliminators with valves and fittings for seawater applications (supplied loose)																			AV4			
Pair of condensate pots in carbon steel – ½ in. BSPTF tappings (supplied loose)																			CP1			
Pair of condensate pots in carbon steel – ½ in. NPT tappings (supplied loose)																			CP2			
Pair of condensate pots in carbon steel – ½ in. butt weld Schedule 160 tappings (supplied loose)																			CP3			
Pair of condensate pots in stainless steel – ½ in. BSPTF tappings (supplied loose)																			CP4			
Pair of condensate pots in stainless steel – ½ in. NPT tappings (supplied loose)																			CP5			
Pair of condensate pots in stainless steel – ½ in. butt weld Schedule 160 tappings (supplied loose)																			CP6			
Surface treatment																						
Oxygen cleaning																			P1			
Others																			Z9			
Certification																						
Material certificates acc. EN 10204 3.1																			C2			
Material certificates acc. EN 10204 3.2																			C3			
Material certificates acc. NACE, latest revision																			CN			
Dye penetrant inspection																			C9			
Radiography (available on flanged units only)																			C8			
Positive material identification																			CA			
100 % dimensional check																			C6			
Others																			CZ			
Testing																						
Impact testing @ -46 °C																			CH1			
Impact testing @ -196 °C																			CH2			
Hardness survey																			CH3			
HIC testing																			CH4			
Magnetic particle inspection																			CH5			
Ultrasonic inspection																			CH6			
Heat treatment trace																			CH7			
Pressure test																			CH8			
Others																			CHZ			
Documentation language (default = English)																						
German																			M1			
Italian																			M2			
Spanish																			M3			
French																			M4			
Chinese																			M6			
Others																			MZ			
Added requirements																						
Material source limitations apply																						

Ordering information | FPD350 series L6 retractable Torbar averaging pitot tube

FPD350		XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XXX	XXX	XXX	XXX	XX	XX	XXX	XX	XXX
Product design																							
Low pressure retractable Torbar – 13 mm (½ in.) OD probe L6																							
Measurement design																							
Unsupported version E1																							
Line nominal bore																							
DN 50 (2 in.) 050																							
DN 80 (3 in.) 080																							
DN 100 (4 in.) 100																							
DN 125 (5 in.) 125																							
DN 150 (6 in.) 150																							
Others 999																							
Probe material																							
316 / 316L stainless steel S6																							
304 / 304L stainless steel S4																							
321 stainless steel S2																							
304H stainless steel H4																							
310 stainless steel S3																							
321H stainless steel S1																							
904L stainless steel S9																							
Alloy C276 (UNS N010276) U7																							
Alloy 400 (UNS N04400) M4																							
Alloy 625 (UNS N06625) N2																							
22 % Cr duplex (UNS S31803) D1																							
25 % Cr super duplex (UNS S32750) D2																							
25 % Cr super duplex (UNS S32760) D3																							
6 % Mo SS (UNS S31254) M1																							
Alloy 600 (UNS N06600) U3																							
Alloy 800 (UNS N08800) U4																							
Alloy 825 (UNS N08825) U5																							
Others Z9																							
Pipe fitting material																							
Carbon steel C3																							
316 / 316L stainless steel S6																							
304 / 304L stainless steel S4																							
321 stainless steel S2																							
Low temperature carbon steel (A350 LF2 C1/A333 Gr 6) C4																							
1-¼ Cr-½ Mo low alloy F11 (UNS K11597) F4																							
25 % Cr super duplex (UNS S32750) D2																							
25 % Cr super duplex (UNS S32760) D3																							
316H stainless Steel H6																							
304H stainless steel H4																							
310 stainless steel S3																							
321H stainless steel S1																							
904L stainless steel S9																							
22 % Cr Duplex (UNS S31803) D1																							
6 % Mo SS (UNS S31254) M1																							
Alloy 400 (UNS N04400) M4																							
Alloy 600 (UNS N06600) U3																							
Alloy 625 (UNS N06625) N2																							
Alloy 800 (UNS N08800) U4																							
Alloy 825 (UNS N08825) U5																							
Alloy C276 (UNS N010276) U7																							
Others Z9																							
Standoffs, etc																							
Threaded connection without end support T1																							

Continued on next page...

...Ordering information | FPD350 series L6 retractable Torbar averaging pitot tube

FPD350.XX XX XXX XX XX XX XX XX XX XX XXX XXX XXX XXX XXX XXX XX XX XXX XX XXX	
See page 35	
Process connection type	
Threaded BSPT	T1
Threaded NPT	T2
Others	Z9
Process connection rating	
Not flanged	Y0
Tapping type	
Welded DP connections (no valves)	W1
Threaded DP connections (no valves)	T1
Direct mounting head	D1
3-Valve integral (welded) manifold DM3V	D2
5-Valve integral (welded) manifold DM5V	D3
3-Valve direct-mounted (bolted) manifold 3VDM	D4
5-Valve direct-mounted (bolted) manifold 5VDM	D5
Ball valves	V1
Needle valves	V2
Gate valves	V3
Globe valves	V4
Double block and bleed valves	V5
Tapping size	
Not applicable	T0
¼ in. NPT male	T1
¼ in. NPT female	T2
¼ in. BSP male	T3
¼ in. BSP female	T4
½ in. NPT male	T5
½ in. NPT female	T6
½ in. BSP male	T7
½ in. BSP female	T8
½ in. socket weld	S1
Others	Z9
Tapping / Valve material	
As probe	Y0
316 stainless steel	S6
Carbon steel	C3
Alloy C276 (UNS N010276)	U7
Alloy 400 (UNS N04400)	M4
22 % Cr Duplex (UNS S31803)	D1
25 % Cr Super Duplex (UNS S32750)	D2
Others	Z9
Pipe orientation and shape	
Horizontal, circular pipe / duct	PNH
Vertical, circular pipe / duct	PNV
Horizontal, rectangular pipe / duct	RNH
Vertical, rectangular pipe / duct	RNV
Process isolation valve	
¾ in. threaded ball valve – A216 carbon steel body with 316 stainless steel trim	BC5
¾ in. threaded ball valve – stainless steel	BS5
Customer supplied	VF9
Others	VZ9
Design options	
Special neck length	TP6
Packing gland material	
PTFE (replaces the standard graphite material)	PG1
Tapping sets	
Two sets	TN2
Others	TNZ

Continued on next page...

...Ordering information | FPD350 series L6 retractable Torbar averaging pitot tube

FPD350.	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XXX	XXX	XXX	XXX	XX	XX	XXX	XX	XXX
See page 35										See page 36												
Fitting accessories																						
Duct mounting plate (in carbon steel or stainless steel to match pipe fitting material)																	DF1					
Air eliminator package – pair of stainless steel air eliminators, no valves or fittings (supplied loose)																	AV1					
Air eliminator package – pair of stainless steel air eliminators with valves and fittings (supplied loose)																	AV2					
Air eliminator package – pair of DZR air eliminators for seawater applications (supplied loose)																	AV3					
Air eliminator package – pair of DZR air eliminators with valves and fittings for seawater applications (supplied loose)																	AV4					
Pair of condensate pots in carbon steel – ½ in. BSPTF tappings (supplied loose)																	CP1					
Pair of condensate pots in carbon steel – ½ in. NPT tappings (supplied loose)																	CP2					
Pair of condensate pots in carbon steel – ½ in. butt weld Schedule 160 tappings (supplied loose)																	CP3					
Pair of condensate pots in stainless steel – ½ in. BSPTF tappings (supplied loose)																	CP4					
Pair of condensate pots in stainless steel – ½ in. NPT tappings (supplied loose)																	CP5					
Pair of condensate pots in stainless steel – ½ in. butt weld Schedule 160 tappings (supplied loose)																	CP6					
Surface treatment																						
Oxygen cleaning																	P1					
Others																	Z9					
Certification																						
Material certificates acc. EN 10204 3.1																	C2					
Material certificates acc. EN 10204 3.2																	C3					
Material certificates acc. NACE, latest revision																	CN					
Dye penetrant inspection																	C9					
Radiography (available on flanged units only)																	C8					
Positive material identification																	CA					
100 % dimensional check																	C6					
Others																	CZ					
Testing																						
Impact testing @ -46 °C																	CH1					
Impact testing @ -196 °C																	CH2					
Hardness survey																	CH3					
HIC testing																	CH4					
Magnetic particle inspection																	CH5					
Ultrasonic inspection																	CH6					
Heat treatment trace																	CH7					
Pressure test																	CH8					
Others																	CHZ					
Documentation language (default = English)																						
German																	M1					
Italian																	M2					
Spanish																	M3					
French																	M4					
Chinese																	M6					
Others																	MZ					
Added requirements																						
Material source limitations apply																	MS1					

Ordering information | FPD350 series L7 retractable Torbar averaging pitot tube

FPD350.XX		XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XXX	XXX	XXX	XX	XXX	XX	XX	XXX	XX	XXX
Product design																							
Low pressure retractable Torbar – 25 mm (1 in.)	L7																						
OD probe																							
Measurement design																							
Unsupported version	E1																						
Supported version	E2																						
Line nominal bore																							
DN 100 (4 in.)	100																						
DN 125 (5 in.)	125																						
DN 150 (6 in.)	150																						
DN 200 (8 in.)	200																						
DN 250 (10 in.)	250																						
DN 300 (12 in.)	300																						
DN 350 (14 in.)	350																						
DN 400 (16 in.)	400																						
DN 450 (18 in.)	450																						
DN 500 (20 in.)	500																						
DN 600 (24 in.)	600																						
DN 750 (30 in.)	750																						
DN 900 (36 in.)	900																						
DN 1000 (40 in.)	001																						
DN 1100 (44 in.)	101																						
DN 1200 (48 in.)	201																						
DN 1300 (52 in.)	301																						
DN 1400 (56 in.)	401																						
DN 1500 (60 in.)	501																						
DN 1600 (64 in.)	601																						
DN 1700 (68 in.)	701																						
DN 1800 (72 in.)	801																						
DN 1900 (76 in.)	901																						
DN 2000 (80 in.)	002																						
DN 2100 (84 in.)	102																						
DN 2200 (88 in.)	202																						
DN 2300 (92 in.)	302																						
DN 2400 (96 in.)	402																						
DN 2500 (98 in.)	502																						
DN 2600 (102 in.)	602																						
DN 2700 (106 in.)	702																						
DN 2800 (110 in.)	802																						
DN 2900 (114 in.)	902																						
DN 3000 (118 in.)	003																						
Others	999																						
Probe material																							
316 / 316L stainless steel	S6																						
304 / 304L stainless steel	S4																						
321 stainless steel	S2																						
304H stainless steel	H4																						
310 stainless steel	S3																						
321H stainless steel	S1																						
904L stainless steel	S9																						
Alloy C276 (UNS N010276)	U7																						
Alloy 400 (UNS N04400)	M4																						
Alloy 625 (UNS N06625)	N2																						
22 % Cr duplex (UNS S31803)	D1																						
25 % Cr super duplex (UNS S32750)	D2																						
25 % Cr super duplex (UNS S32760)	D3																						
6 % Mo SS (UNS S31254)	M1																						
Alloy 600 (UNS N06600)	U3																						
Alloy 800 (UNS N08800)	U4																						
Alloy 825 (UNS N08825)	U5																						
Others	Z9																						

Continued on next page...

...Ordering information | FPD350 series L7 retractable Torbar averaging pitot tube

FPD350.XX XX XXX XX	XX XX XX XX XX XX XX XXX XXX XXX XXX XX XXX XX XXX XX XXX	XX XX XX XX XX XX XX XXX XXX XXX XXX XX XXX XX XXX
See page 38		
Pipe fitting material		
Carbon steel	C3	
316 / 316L stainless steel	S6	
304 / 304L stainless steel	S4	
321 stainless steel	S2	
Low temperature carbon steel (A350 LF2 C1/A333 Gr 6)	C4	
1-¼ Cr-½ Mo low alloy F11 (UNS K11597)	F4	
25 % Cr super duplex (UNS S32750)	D2	
25 % Cr super duplex (UNS S32760)	D3	
316H stainless Steel	H6	
304H stainless steel	H4	
310 stainless steel	S3	
321H stainless steel	S1	
904L stainless steel	S9	
22 % Cr duplex (UNS S31803)	D1	
6 % Mo SS (UNS S31254)	M1	
Alloy 400 (UNS N04400)	M4	
Alloy 600 (UNS N06600)	U3	
Alloy 625 (UNS N06625)	N2	
Alloy 800 (UNS N08800)	U4	
Alloy 825 (UNS N08825)	U5	
Alloy C276 (UNS N010276)	U7	
Others	Z9	
Standoffs, etc		
Threaded connection without end support	T1	
Threaded connection with threaded end support	T2	
Process connection type		
Threaded BSPT	T1	
Threaded NPT	T2	
Others	Z9	
Process connection rating		
Not flanged	Y0	
Tapping type		
Welded DP connections (no valves)	W1	
Threaded DP connections (no valves)	T1	
Direct mounting head	D1	
3-Valve integral (welded) manifold DM3V	D2	
5-Valve integral (welded) manifold DM5V	D3	
3-Valve direct-mounted (bolted) manifold 3VDM	D4	
5-Valve direct-mounted (bolted) manifold 5VDM	D5	
Ball valves	V1	
Needle valves	V2	
Gate valves	V3	
Globe valves	V4	
Double block and bleed valves	V5	
Tapping size		
Not applicable	T0	
¼ in. NPT male	T1	
¼ in. NPT female	T2	
¼ in. BSP male	T3	
¼ in. BSP female	T4	
½ in. NPT male	T5	
½ in. NPT female	T6	
½ in. BSP male	T7	
½ in. BSP female	T8	
½ in. socket weld	S1	
Others	Z9	
Tapping / Valve material		
As probe	Y0	
316 stainless steel	S6	
Carbon steel	C3	
Alloy C276 (UNS N010276)	U7	
Alloy 400 (UNS N04400)	M4	
22 % Cr duplex (UNS S31803)	D1	
25 % Cr super duplex (UNS S32750)	D2	
Others	Z9	
Pipe orientation and shape		
Horizontal, circular pipe / duct	PNH	
Vertical, circular pipe / duct	PNV	
Horizontal, rectangular pipe / duct	RNH	
Vertical, rectangular pipe / duct	RNV	

Continued on next page...

...Ordering information | FPD350 series L7 retractable Torbar averaging pitot tube

FPD350.	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XXX	XXX	XXX	XX	XXX	XX	XXX	XX	XXX
See page 38												See page 39									
Process isolation valve																					
1¼ in. threaded ball valve – A216 carbon steel with 316 stainless steel trim												BC7									
1¼ in. threaded ball valve – stainless steel												BS7									
Customer supplied												VF9									
Others												VZ9									
Design options																					
Partial insertion probe												TP2									
Bidirectional												TP5									
Special neck length												TP6									
Packing gland material																					
PTFE (replaces the standard graphite material)												PG1									
Tapping sets																					
Two sets												TN2									
Others												TNZ									
Temperature element – operating pressure limited to maximum of 70 bar (1015 psi)																					
Integral PT100 sensor, neck mounted – aluminium IP65 head without transmitter												T1									
Integral PT100 sensor, neck mounted – aluminium IP65 head with transmitter												T2									
EEx ia integral PT100 sensor, neck mounted – aluminium IP65 head without transmitter												T3									
EEx ia integral PT100 sensor, neck mounted – aluminium IP65 head with transmitter												T4									
Integral type K thermocouple sensor, neck mounted – aluminium IP65 head with transmitter												T5									
EEx ia integral type K thermocouple sensor, neck mounted – aluminium IP65 head with transmitter												T6									
Fitting accessories																					
Duct mounting plate (in carbon steel or stainless steel to match pipe fitting material)												DF1									
Air eliminator package – pair of stainless steel air eliminators, no valves or fittings (supplied loose)												AV1									
Air eliminator package – pair of stainless steel air eliminators with valves and fittings (supplied loose)												AV2									
Air eliminator package – pair of DZR air eliminators for seawater applications (supplied loose)												AV3									
Air eliminator package – pair of DZR air eliminators with valves and fittings for seawater applications (supplied loose)												AV4									
Pair of condensate pots in carbon steel – ½ in. BSPTF tappings (supplied loose)												CP1									
Pair of condensate pots in carbon steel – ½ in. NPT tappings (supplied loose)												CP2									
Pair of condensate pots in carbon steel – ½ in. butt weld Schedule 160 tappings (supplied loose)												CP3									
Pair of condensate pots in stainless steel – ½ in. BSPTF tappings (supplied loose)												CP4									
Pair of condensate pots in stainless steel – ½ in. NPT tappings (supplied loose)												CP5									
Pair of condensate pots in stainless steel – ½ in. butt weld Schedule 160 tappings (supplied loose)												CP6									
Surface treatment																					
Oxygen cleaning												P1									
Others												Z9									
Certification																					
Material certificates acc. EN 10204 3.1												C2									
Material certificates acc. EN 10204 3.2												C3									
Material certificates acc. NACE, latest revision												CN									
Dye penetrant inspection												C9									
Radiography (available on flanged units only)												C8									
Positive material identification												CA									
100 % dimensional check												C6									
Others												CZ									
Testing																					
Impact testing @ -46 °C												CH1									
Impact testing @ -196 °C												CH2									
Hardness survey												CH3									
HIC testing												CH4									
Magnetic particle inspection												CH5									
Ultrasonic inspection												CH6									
Heat treatment trace												CH7									
Pressure test												CH8									
Others												CHZ									
Documentation language (default = English)																					
German												M1									
Italian												M2									
Spanish												M3									
French												M4									
Chinese												M6									
Others												MZ									
Added requirements																					
Material source limitations apply												MS1									

Ordering information | FPD350 series H6 retractable Torbar averaging pitot tube

	FPD350,XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XX	XX	XXX	XX	XXX	XX	XXX
Product design																										
High pressure retractable Torbar – 13 mm (½ in.) OD probe	H6																									
Measurement design																										
Unsupported version	E1																									
Line nominal bore																										
DN 50 (2 in.)		050																								
DN 80 (3 in.)		080																								
DN 100 (4 in.)		100																								
DN 125 (5 in.)		125																								
DN 150 (6 in.)		150																								
Others		999																								
Probe material																										
316 / 316L stainless steel			S6																							
304 / 304L stainless steel			S4																							
321 stainless steel			S2																							
304H stainless steel			H4																							
310 stainless steel			S3																							
321H stainless steel			S1																							
904L stainless steel			S9																							
Alloy C276 (UNS N010276)			U7																							
Alloy 400 (UNS N04400)			M4																							
Alloy 625 (UNS N06625)			N2																							
22 % Cr duplex (UNS S31803)			D1																							
25 % Cr super duplex (UNS S32750)			D2																							
25 % Cr super duplex (UNS S32760)			D3																							
6 % Mo SS (UNS S31254)			M1																							
Alloy 600 (UNS N06600)			U3																							
Alloy 800 (UNS N08800)			U4																							
Alloy 825 (UNS N08825)			U5																							
Others			Z9																							
Pipe fitting material																										
Carbon steel			C3																							
316 / 316L stainless steel			S6																							
304 / 304L stainless steel			S4																							
321 stainless steel			S2																							
Low temperature carbon steel (A350 LF2 C1/A333 Gr 6)			C4																							
1-¼ Cr-½ Mo low alloy F11 (UNS K11597)			F4																							
25 % Cr super duplex (UNS S32750)			D2																							
25 % Cr super duplex (UNS S32760)			D3																							
316H stainless Steel			H6																							
304H stainless steel			H4																							
310 stainless steel			S3																							
321H stainless steel			S1																							
904L stainless steel			S9																							
22 % Cr Duplex (UNS S31803)			D1																							
6 % Mo SS (UNS S31254)			M1																							
Alloy 400 (UNS N04400)			M4																							
Alloy 600 (UNS N06600)			U3																							
Alloy 625 (UNS N06625)			N2																							
Alloy 800 (UNS N08800)			U4																							
Alloy 825 (UNS N08825)			U5																							
Alloy C276 (UNS N010276)			U7																							
Others			Z9																							
Standoffs, etc																										
Threaded connection without end support				T1																						
Flanged Standoff without end support				F1																						
Customer supplied				F7																						

Continued on next page...

...Ordering information | FPD350 series H6 retractable Torbar averaging pitot tube

FPD350.XX XX XXX XX XX XX XX XX XX XX XXX XXX XXX XXX XXX XXX XXX XXX XX XX XXX XX XXX	
See page 41	
Process connection type	
Threaded BSPT	T1
Threaded NPT	T2
Raised face DN 40 (1½ in.)	R4
Raised face DN 50 (2 in.)	R5
Flat face DN 40 (1½ in.)	F4
Flat face DN 50 (2 in.)	F5
RTJ 1½ in.	J2
RTJ 2 in.	J3
Others	Z9
Process connection rating	
Not flanged	Y0
ASME Class 150	A1
ASME Class 300	A3
ASME Class 600	A6
Others	Z9
Tapping type	
Flanged DP connections (no valves)	F1
Welded DP connections (no valves)	W1
Threaded DP connections (no valves)	T1
Direct mounting head	D1
3-Valve integral (welded) manifold DM3V	D2
5-Valve integral (welded) manifold DM5V	D3
3-Valve direct-mounted (bolted) manifold 3VDM	D4
5-Valve direct-mounted (bolted) manifold 5VDM	D5
Ball valves	V1
Needle valves	V2
Gate valves	V3
Globe valves	V4
Double block and bleed valves	V5
Tapping size	
Not applicable	T0
¼ in. NPT male	T1
¼ in. NPT female	T2
¼ in. BSP male	T3
¼ in. BSP female	T4
½ in. NPT male	T5
½ in. NPT female	T6
½ in. BSP male	T7
½ in. BSP female	T8
½ in. flanged (specification as mounting flange)	F1
¾ in. flanged (specification as mounting flange)	F2
½ in. socket weld	S1
Others	Z9
Tapping / Valve material	
As probe	Y0
316 stainless steel	S6
Carbon steel	C3
Alloy C276 (UNS N010276)	U7
Alloy 400 (UNS N04400)	M4
22 % Cr Duplex (UNS S31803)	D1
25 % Cr Super Duplex (UNS S32750)	D2
Others	Z9
Pipe orientation and shape	
Horizontal, circular pipe / duct	PNH
Vertical, circular pipe / duct	PNV
Horizontal, rectangular pipe / duct	RNH
Vertical, rectangular pipe / duct	RNV

Continued on next page...

...Ordering information | FPD350 series H6 retractable Torbar averaging pitot tube

FPD350.	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XX	XX	XXX	XX	XXX
											See page 41				See page 42							
Process isolation valve																						
1¼ in. threaded ball valve – A216 carbon steel with 316 stainless steel trim											BC7											
1½ in. flanged ball valve – A216 carbon steel with 316 stainless steel trim											BC8											
2 in. flanged ball valve – A216 carbon steel with 316 stainless steel trim											BC6											
1¼ in. threaded ball valve – stainless steel											BS7											
1½ in. flanged ball valve – stainless steel											BS8											
2 in. flanged ball valve – stainless steel											BS6											
1½ in. flanged ball valve – Alloy 400											BM8											
2 in. flanged ball valve – Alloy 400											BM6											
1½ in. flanged ball valve – Alloy 276											BH8											
2 in. flanged ball valve – Alloy 276											BH6											
1½ in. flanged ball valve – aluminium-bronze											BA8											
2 in. flanged ball valve – aluminium-bronze											BA6											
1½ in. flanged gate valve – A216 carbon steel with 316 stainless steel trim											GC8											
2 in. flanged gate valve – A216 carbon steel with 316 stainless steel trim											GC6											
1½ in. flanged gate valve – stainless steel											GS8											
2 in. flanged gate valve – stainless steel											GS6											
Customer supplied											VF9											
Others											VZ9											
Design options																						
Gear retract											TP4											
Special neck length											TP6											
Packing gland material																						
PTFE (replaces the standard graphite material)											PG1											
Tapping sets																						
Two sets											TN2											
Others											TNZ											
Bolt type and material																						
ASTM A193 B7 / ASTM A194 2H											BGC											
ASTM A193 B8M / ASTM A194 8MA											BGS											
Others											BZ9											
Gasket material																						
Asbestos-free 1.6 mm											GT1											
Spiral wound – stainless steel windings with carbon steel outer; 4.5 mm											GT2											
Soft Iron											GP3											
Others											GZ9											
Fitting accessories																						
Frequency collar											FC1											
Air eliminator package – pair of stainless steel air eliminators, no valves or fittings (supplied loose)											AV1											
Air eliminator package – pair of stainless steel air eliminators with valves and fittings (supplied loose)											AV2											
Air eliminator package – pair of DZR air eliminators for seawater applications (supplied loose)											AV3											
Air eliminator package – pair of DZR air eliminators with valves and fittings for seawater applications (supplied loose)											AV4											
Pair of condensate pots in carbon steel – ½ in. BSPTF tappings (supplied loose)											CP1											
Pair of condensate pots in carbon steel – ½ in. NPT tappings (supplied loose)											CP2											
Pair of condensate pots in carbon steel – ½ in. butt weld Schedule 160 tappings (supplied loose)											CP3											
Pair of condensate pots in stainless steel – ½ in. BSPTF tappings (supplied loose)											CP4											
Pair of condensate pots in stainless steel – ½ in. NPT tappings (supplied loose)											CP5											
Pair of condensate pots in stainless steel – ½ in. butt weld Schedule 160 tappings (supplied loose)											CP6											
Surface treatment																						
Oxygen cleaning											P1											
Others											Z9											

Continued on next page...

...Ordering information | FPD350 series H6 retractable Torbar averaging pitot tube

FPD350.	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XXX	XXX	XXX	XXX	XXX	XX	XX	XXX	XX	XXX	XX	XXX
			See page 41			See page 42			See page 43																
Certification																									
Material certificates acc. EN 10204 3.1																					C2				
Material certificates acc. EN 10204 3.2																					C3				
Material certificates acc. NACE, latest revision																					CN				
Dye penetrant inspection																					C9				
Radiography (available on flanged units only)																					C8				
Positive material identification																					CA				
100 % dimensional check																					C6				
Others																					CZ				
Testing																									
Impact testing @ -46 °C																					CH1				
Impact testing @ -196 °C																					CH2				
Hardness survey																					CH3				
HIC testing																					CH4				
Magnetic particle inspection																					CH5				
Ultrasonic inspection																					CH6				
Heat treatment trace																					CH7				
Pressure test																					CH8				
Others																					CHZ				
Documentation language (default = English)																									
German																					M1				
Italian																					M2				
Spanish																					M3				
French																					M4				
Chinese																					M6				
Others																					MZ				
Added requirements																									
Material source limitations apply																					MS1				

Ordering information | FPD350 series H7 retractable Torbar averaging pitot tube

FPD350.XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XXX	XXX	XXX	XXX	XXX	XX	XXX	XX	XXX	XX	XXX	XX	XXX
Product design																									
High pressure retractable Torbar – 25 mm (1 in.) OD probe	H7																								
Measurement design																									
Unsupported version	E1																								
Supported version	E2																								
Line nominal bore																									
DN 100 (4 in.)	100																								
DN 125 (5 in.)	125																								
DN 150 (6 in.)	150																								
DN 200 (8 in.)	200																								
DN 250 (10 in.)	250																								
DN 300 (12 in.)	300																								
DN 350 (14 in.)	350																								
DN 400 (16 in.)	400																								
DN 450 (18 in.)	450																								
DN 500 (20 in.)	500																								
DN 600 (24 in.)	600																								
DN 750 (30 in.)	750																								
DN 900 (36 in.)	900																								
DN 1000 (40 in.)	001																								
DN 1100 (44 in.)	101																								
DN 1200 (48 in.)	201																								
DN 1300 (52 in.)	301																								
DN 1400 (56 in.)	401																								
DN 1500 (60 in.)	501																								
DN 1600 (64 in.)	601																								
DN 1700 (68 in.)	701																								
DN 1800 (72 in.)	801																								
DN 1900 (76 in.)	901																								
DN 2000 (80 in.)	002																								
DN 2100 (84 in.)	102																								
DN 2200 (88 in.)	202																								
DN 2300 (92 in.)	302																								
DN 2400 (96 in.)	402																								
DN 2500 (98 in.)	502																								
DN 2600 (102 in.)	602																								
DN 2700 (106 in.)	702																								
DN 2800 (110 in.)	802																								
DN 2900 (114 in.)	902																								
DN 3000 (118 in.)	003																								
Others	999																								
Probe material																									
316 / 316L stainless steel	S6																								
304 / 304L stainless steel	S4																								
321 stainless steel	S2																								
304H stainless steel	H4																								
310 stainless steel	S3																								
321H stainless steel	S1																								
904L stainless steel	S9																								
Alloy C276 (UNS N010276)	U7																								
Alloy 400 (UNS N04400)	M4																								
Alloy 625 (UNS N06625)	N2																								
22 % Cr duplex (UNS S31803)	D1																								
25 % Cr super duplex (UNS S32750)	D2																								
25 % Cr super duplex (UNS S32760)	D3																								
6 % Mo SS (UNS S31254)	M1																								
Alloy 600 (UNS N06600)	U3																								
Alloy 800 (UNS N08800)	U4																								
Alloy 825 (UNS N08825)	U5																								
Others	Z9																								

Continued on next page...

...Ordering information | FPD350 series H7 retractable Torbar averaging pitot tube

FPD350.XX XX XXX XX XX XX XX XX XX XX XX XXX XXX XXX XXX XXX XXX XX XXX XX XX XXX XX XXX	
See page 45	
Pipe fitting material	
Carbon steel	C3
316 / 316L stainless steel	S6
304 / 304L stainless steel	S4
321 stainless steel	S2
Low temperature carbon steel (A350 LF2 C1/A333 Gr 6)	C4
1-¼ Cr-½ Mo low alloy F11 (UNS K11597)	F4
25 % Cr super duplex (UNS S32750)	D2
25 % Cr super duplex (UNS S32760)	D3
316H stainless Steel	H6
304H stainless steel	H4
310 stainless steel	S3
321H stainless steel	S1
904L stainless steel	S9
22 % Cr duplex (UNS S31803)	D1
6 % Mo SS (UNS S31254)	M1
Alloy 400 (UNS N04400)	M4
Alloy 600 (UNS N06600)	U3
Alloy 625 (UNS N06625)	N2
Alloy 800 (UNS N08800)	U4
Alloy 825 (UNS N08825)	U5
Alloy C276 (UNS N010276)	U7
Others	Z9
Standoffs, etc	
Threaded connection without end support	T1
Threaded connection with threaded end support	T2
Flanged standoff without end support	F1
Flanged standoff with weld cup end support	F2
2 flanged standoffs and external flanged end support	F3
2 flanged standoffs and internal flanged end support	F4
External flanged end support only (no standoffs supplied)	F5
Internal flanged end support only (no standoffs supplied)	F6
Customer supplied (versions without flanged end supports)	F7
Customer supplied (versions with flanged end supports)	F8
Process connection type	
Threaded BSPT	T1
Threaded NPT	T2
Raised face DN 40 (1½ in.)	R4
Raised face DN 50 (2 in.)	R5
Raised face DN 80 (3 in.)	R6
Flat face DN 40 (1½ in.)	F4
Flat face DN 50 (2 in.)	F5
Flat face DN 80 (3 in.)	F6
RTJ DN 40 (1½ in.)	J2
RTJ DN 50 (2 in.)	J3
RTJ DN 80 (3 in.)	J4
Others	Z9
Process connection rating	
Not flanged	Y0
ASME Class 150	A1
ASME Class 300	A3
ASME Class 600	A6
Others	Z9
Tapping type	
Flanged DP connections (no valves)	F1
Welded DP connections (no valves)	W1
Threaded DP connections (no valves)	T1
Direct mounting head	D1
3-Valve integral (welded) manifold DM3V	D2
5-Valve integral (welded) manifold DM5V	D3
3-Valve direct-mounted (bolted) manifold 3VDM	D4
5-Valve direct-mounted (bolted) manifold 5VDM	D5
Ball valves	V1
Needle valves	V2
Gate valves	V3
Globe valves	V4
Double block and bleed valves	V5

Continued on next page...

...Ordering information | FPD350 series H7 retractable Torbar averaging pitot tube

FPD350	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XXX	XXX	XXX	XXX	XXX	XXX	XX	XXX	XX	XXX	XX	XXX	XX	XXX
See page 45			See page 46			See page 47																		
Gasket material																								
Asbestos-free 1.6 mm																		GT1						
Spiral wound – stainless steel windings with carbon steel outer; 4.5 mm																		GT2						
Soft Iron																		GP3						
Others																		GZ9						
Temperature element – operating pressure limited to maximum of 70 bar (1015 psi)																								
Integral PT100 sensor, neck mounted – aluminium IP65 head without transmitter																		T1						
Integral PT100 sensor, neck mounted – aluminium IP65 head with transmitter																		T2						
EEx ia integral PT100 sensor, neck mounted – aluminium IP65 head without transmitter																		T3						
EEx ia integral PT100 sensor, neck mounted – aluminium IP65 head with transmitter																		T4						
Integral type K thermocouple sensor, neck mounted – aluminium IP65 head with transmitter																		T5						
EEx ia integral type K thermocouple sensor, neck mounted – aluminium IP65 head with transmitter																		T6						
Fitting accessories																								
Duct mounting plate (in carbon steel or stainless steel to match pipe fitting material)																		DF1						
Slotted ports																		SH1						
Air eliminator package – pair of stainless steel air eliminators, no valves or fittings (supplied loose)																		AV1						
Air eliminator package – pair of stainless steel air eliminators with valves and fittings (supplied loose)																		AV2						
Air eliminator package – pair of DZR air eliminators for seawater applications (supplied loose)																		AV3						
Air eliminator package – pair of DZR air eliminators with valves and fittings for seawater applications (supplied loose)																		AV4						
Pair of condensate pots in carbon steel – ½ in. BSPTF tappings (supplied loose)																		CP1						
Pair of condensate pots in carbon steel – ½ in. NPT tappings (supplied loose)																		CP2						
Pair of condensate pots in carbon steel – ½ in. butt weld Schedule 160 tappings (supplied loose)																		CP3						
Pair of condensate pots in stainless steel – ½ in. BSPTF tappings (supplied loose)																		CP4						
Pair of condensate pots in stainless steel – ½ in. NPT tappings (supplied loose)																		CP5						
Pair of condensate pots in stainless steel – ½ in. butt weld Schedule 160 tappings (supplied loose)																		CP6						
Surface treatment																								
Oxygen cleaning																		P1						
Others																		Z9						
Certification																								
Material certificates acc. EN 10204 3.1																		C2						
Material certificates acc. EN 10204 3.2																		C3						
Material certificates acc. NACE, latest revision																		CN						
Dye penetrant inspection																		C9						
Radiography (available on flanged units only)																		C8						
Positive material identification																		CA						
100 % dimensional check																		C6						
Others																		CZ						
Testing																								
Impact testing @ -46 °C																		CH1						
Impact testing @ -196 °C																		CH2						
Hardness survey																		CH3						
HIC testing																		CH4						
Magnetic particle inspection																		CH5						
Ultrasonic inspection																		CH6						
Heat treatment trace																		CH7						
Pressure test																		CH8						
Others																		CHZ						
Documentation language (default = English)																								
German																		M1						
Italian																		M2						
Spanish																		M3						
French																		M4						
Chinese																		M6						
Others																		MZ						
Added requirements																								
Material source limitations apply																				MS1				

Ordering information | FPD350 series H8 retractable Torbar averaging pitot tube

FPD350	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XXX	XXX	XXX	XXX	XXX	XX	XXX	XX	XXX	XX	XXX	XX	XXX	XX	XXX
Product design																												
High pressure retractable Torbar – 60 mm (2 in.) OD probe	H8																											
Measurement design																												
Unsupported version	E1																											
Supported version	E2																											
Line nominal bore																												
DN 250 (10 in.)	250																											
DN 300 (12 in.)	300																											
DN 350 (14 in.)	350																											
DN 400 (16 in.)	400																											
DN 450 (18 in.)	450																											
DN 500 (20 in.)	500																											
DN 600 (24 in.)	600																											
DN 750 (30 in.)	750																											
DN 900 (36 in.)	900																											
DN 1000 (40 in.)	001																											
DN 1100 (44 in.)	101																											
DN 1200 (48 in.)	201																											
DN 1300 (52 in.)	301																											
DN 1400 (56 in.)	401																											
DN 1500 (60 in.)	501																											
DN 1600 (64 in.)	601																											
DN 1700 (68 in.)	701																											
DN 1800 (72 in.)	801																											
DN 1900 (76 in.)	901																											
DN 2000 (80 in.)	002																											
DN 2100 (84 in.)	102																											
DN 2200 (88 in.)	202																											
DN 2300 (92 in.)	302																											
DN 2400 (96 in.)	402																											
DN 2500 (98 in.)	502																											
DN 2600 (102 in.)	602																											
DN 2700 (106 in.)	702																											
DN 2800 (110 in.)	802																											
DN 2900 (114 in.)	902																											
DN 3000 (118 in.)	003																											
Others	999																											
Probe material																												
316 / 316L stainless steel	S6																											
304 / 304L stainless steel	S4																											
321 stainless steel	S2																											
304H stainless steel	H4																											
310 stainless steel	S3																											
321H stainless steel	S1																											
904L stainless steel	S9																											
Alloy C276 (UNS N010276)	U7																											
Alloy 400 (UNS N04400)	M4																											
Alloy 625 (UNS N06625)	N2																											
22 % Cr duplex (UNS S31803)	D1																											
25 % Cr super duplex (UNS S32750)	D2																											
25 % Cr super duplex (UNS S32760)	D3																											
6 % Mo SS (UNS S31254)	M1																											
Alloy 600 (UNS N06600)	U3																											
Alloy 800 (UNS N08800)	U4																											
Alloy 825 (UNS N08825)	U5																											
Others	Z9																											

Continued on next page...

...Ordering information | FPD350 series H8 retractable Torbar averaging pitot tube

FPD350.XX XX XXX XX	XX XX XX XX	XX XX XX XXX XXX XXX XXX XXX XXX XX XXX XX XX XXX XX XXX
See page 49		
Pipe fitting material		
Carbon steel		C3
316 / 316L stainless steel		S6
304 / 304L stainless steel		S4
321 stainless steel		S2
Low temperature carbon steel (A350 LF2 C1/A333 Gr 6)		C4
1-¼ Cr-½ Mo low alloy F11 (UNS K11597)		F4
25 % Cr super duplex (UNS S32750)		D2
25 % Cr super duplex (UNS S32760)		D3
316H stainless Steel		H6
304H stainless steel		H4
310 stainless steel		S3
321H stainless steel		S1
904L stainless steel		S9
22 % Cr duplex (UNS S31803)		D1
6 % Mo SS (UNS S31254)		M1
Alloy 400 (UNS N04400)		M4
Alloy 600 (UNS N06600)		U3
Alloy 625 (UNS N06625)		N2
Alloy 800 (UNS N08800)		U4
Alloy 825 (UNS N08825)		U5
Alloy C276 (UNS N010276)		U7
Others		Z9
Standoffs, etc		
Flanged standoff without end support		F1
Flanged standoff with weld cup end support		F2
2 flanged standoffs and external flanged end support		F3
2 flanged standoffs and internal flanged end support		F4
External flanged end support only (no standoffs supplied)		F5
Internal flanged end support only (no standoffs supplied)		F6
Customer supplied (versions without flanged end supports)		F7
Customer supplied (versions with flanged end supports)		F8
Process connection type		
Raised face DN 80 (3 in.)		R6
RTJ DN 80 (3 in.)		J4
Flat face DN 80 (3 in.)		F6
ASME Class 150		A1
ASME Class 300		A3
Others		Z9
Process connection rating		
ASME Class 150		A1
ASME Class 300		A3
Others		Z9
Tapping type		
Flanged DP connections (no valves)		F1
Welded DP connections (no valves)		W1
Threaded DP connections (no valves)		T1
Direct mounting head		D1
3-Valve integral (welded) manifold DM3V		D2
5-Valve integral (welded) manifold DM5V		D3
3-Valve direct-mounted (bolted) manifold 3VDM		D4
5-Valve direct-mounted (bolted) manifold 5VDM		D5
Ball valves		V1
Needle valves		V2
Gate valves		V3
Globe valves		V4
Double block and bleed valves		V5

Continued on next page...

...Ordering information | FPD350 series H8 retractable Torbar averaging pitot tube

FPD350	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XXX	XXX	XXX	XXX	XXX	XX	XXX	XX	XX	XXX	XX	XXX																		
See page 49			See page 50			See page 51																																				
Temperature element – operating pressure limited to maximum of 70 bar (1015 psi)																																										
Integral PT100 sensor, neck mounted – aluminium IP65 head without transmitter																		T1																								
Integral PT100 sensor, neck mounted – aluminium IP65 head with transmitter																		T2																								
EEx ia integral PT100 sensor, neck mounted – aluminium IP65 head without transmitter																		T3																								
EEx ia integral PT100 sensor, neck mounted – aluminium IP65 head with transmitter																		T4																								
Integral type K thermocouple sensor, neck mounted – aluminium IP65 head with transmitter																		T5																								
EEx ia integral type K thermocouple sensor, neck mounted – aluminium IP65 head with transmitter																		T6																								
Fitting accessories																																										
Air eliminator package – pair of stainless steel air eliminators, no valves or fittings (supplied loose)																		AV1																								
Air eliminator package – pair of stainless steel air eliminators with valves and fittings (supplied loose)																		AV2																								
Air eliminator package – pair of DZR air eliminators for seawater applications (supplied loose)																		AV3																								
Air eliminator package – pair of DZR air eliminators with valves and fittings for seawater applications (supplied loose)																		AV4																								
Pair of condensate pots in carbon steel – ½ in. BSPTF tappings (supplied loose)																		CP1																								
Pair of condensate pots in carbon steel – ½ in. NPT tappings (supplied loose)																		CP2																								
Pair of condensate pots in carbon steel – ½ in. butt weld Schedule 160 tappings (supplied loose)																		CP3																								
Pair of condensate pots in stainless steel – ½ in. BSPTF tappings (supplied loose)																		CP4																								
Pair of condensate pots in stainless steel – ½ in. NPT tappings (supplied loose)																		CP5																								
Pair of condensate pots in stainless steel – ½ in. butt weld Schedule 160 tappings (supplied loose)																		CP6																								
Surface treatment																																										
Oxygen cleaning																		P1																								
Others																		Z9																								
Certification																																										
Material certificates acc. EN 10204 3.1																		C2																								
Material certificates acc. EN 10204 3.2																		C3																								
Material certificates acc. NACE, latest revision																		CN																								
Dye penetrant inspection																		C9																								
Radiography																		C8																								
Positive material identification																		CA																								
100 % dimensional check																		C6																								
Others																		CZ																								
Testing																																										
Impact testing @ -46 °C																		CH1																								
Impact testing @ -196 °C																		CH2																								
Hardness survey																		CH3																								
HIC testing																		CH4																								
Magnetic particle inspection																		CH5																								
Ultrasonic inspection																		CH6																								
Heat treatment trace																		CH7																								
Pressure test																		CH8																								
Others																		CHZ																								
Documentation language (default = English)																																										
German																		M1																								
Italian																		M2																								
Spanish																		M3																								
French																		M4																								
Chinese																		M6																								
Others																		MZ																								
Added requirements																																										
Material source limitations apply																																										
																								MS1																		

Notes

Notes



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