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

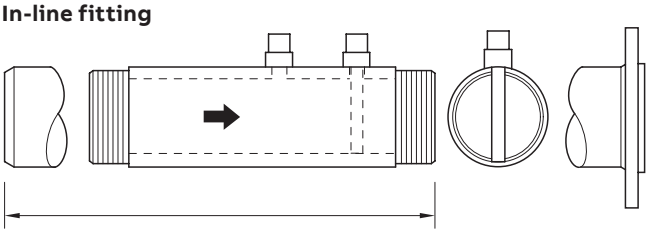
The outer impact tube has a number of pressure sensing holes facing upstream which are positioned at equal annular points in accordance with a log-linear distribution. The 'total pressures' developed at each upstream hole by sum of the impact of the flowing medium and the static pressure are firstly 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	

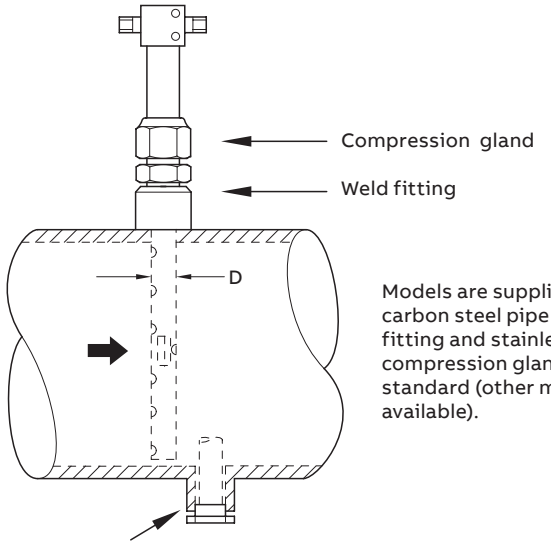
All models are supplied with a pipe section in the same material as Torbar probe

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



Models are supplied with carbon steel pipe weld fitting and stainless steel compression gland as standard (other materials available).

Threaded FPD350.T3 and FPD350.T4 models

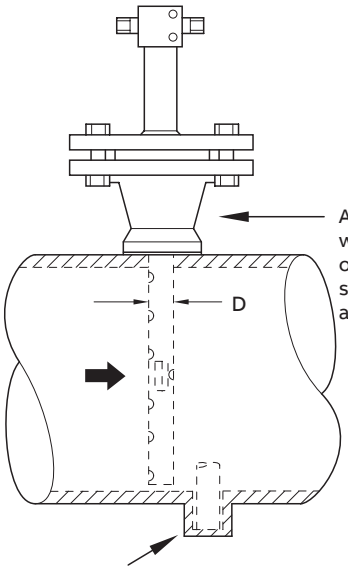
Threaded model FPD350.	Fluid	D mm (in.)	Fits pipe sizes mm (in.)
T3.E1	All	13 (0.5)	50 to 150 (2 to 6)
T4.E1	Gas / vapour	25 (1)	100 to 1800 (4 to 72)
T4.E1*	Liquid	25 (1)	100 to 600 (4 to 24)
T4.E2 **	All	25 (1)	100 to 3500 (4 to 140)

* 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 ºF)

Flanged fitting – standard



All Models are supplied without flanged pipe fitting or stud bolts and gaskets as standard. These are available as accessories.

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)

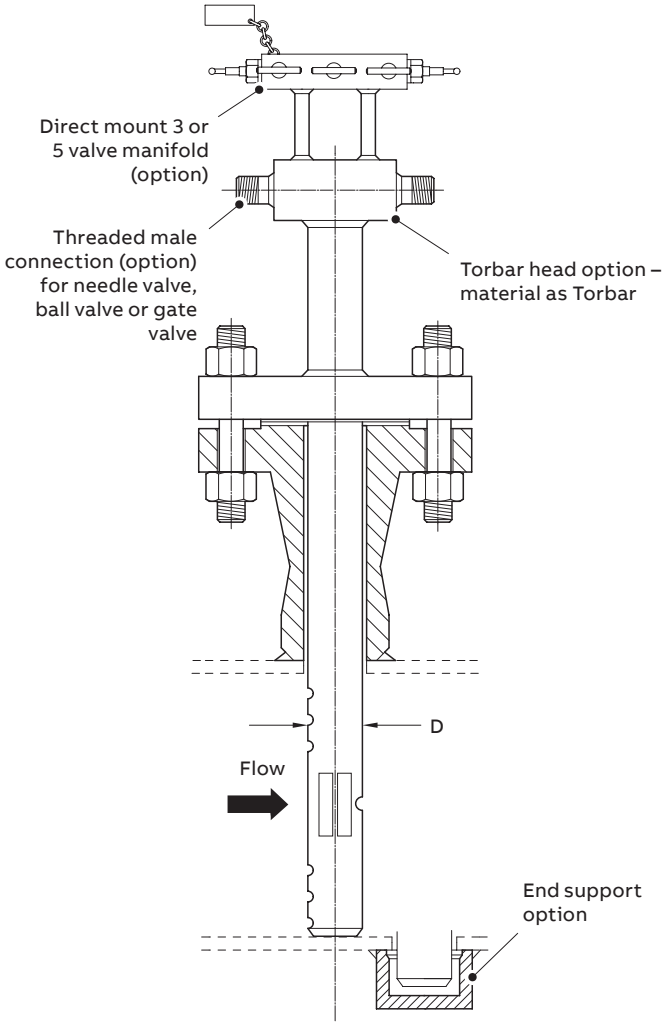
* For liquid flow applications where there is a possibility of process pulsations or intermittent excessive flow velocity, the end-support model should always be selected for pipe sizes over 250 mm (10 in.) internal diameter.

** 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

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.

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

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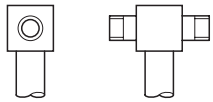
Options

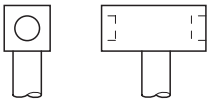
Probe material	Code
316 Stainless Steel	SS
304L Stainless Steel	S4
Alloy 400	M4
Alloy C276	U7

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

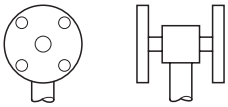
Male without valves



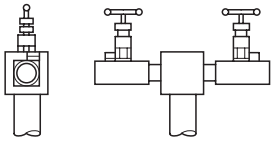
Female without valves



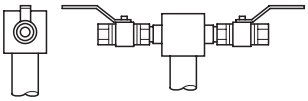
Flanged without valves



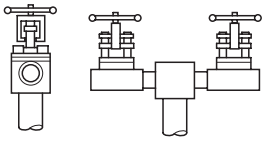
With needle valves



With ball vales

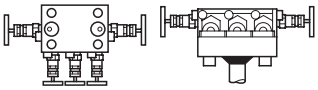


With gate valves

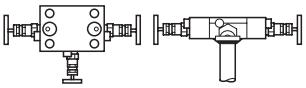


Direct mount head

Direct mount separate manifold



Direct mount integral manifold

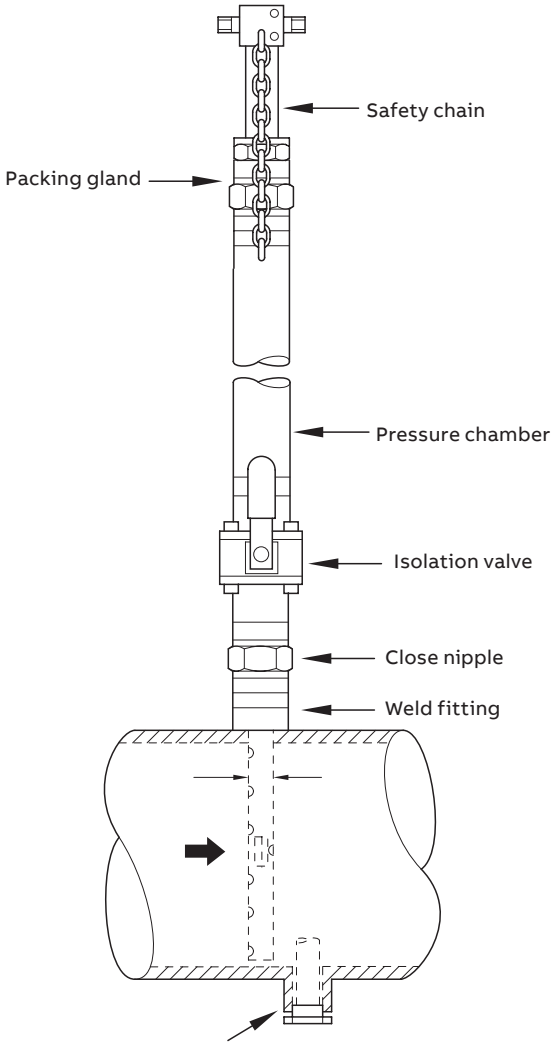


DP output connections / valves

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

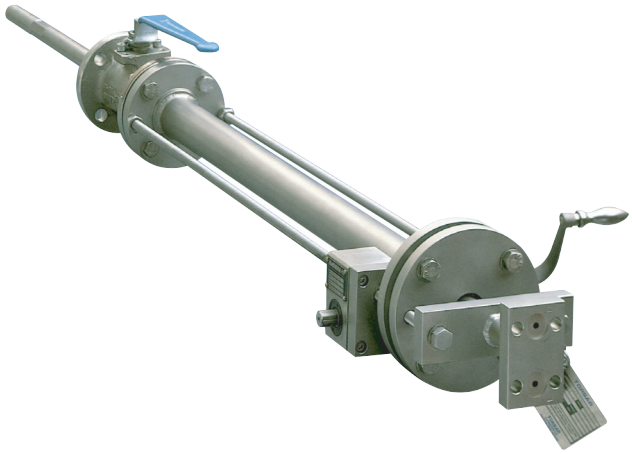
Basic model FPD350.	Fluid	D mm (in.)	Fits pipe sizes mm (in.)
L6	All	13 (0.5)	50 to 150 (2 to 6)
L7.E1	Gas / vapour	25 (1)	100 to 1800 (4 to 72)
L7.E1 *	Liquid	25 (1)	100 to 600 (4 to 24)
L7.E2 **	All	25 (1)	100 to 3000 (4 to 120)

* 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)



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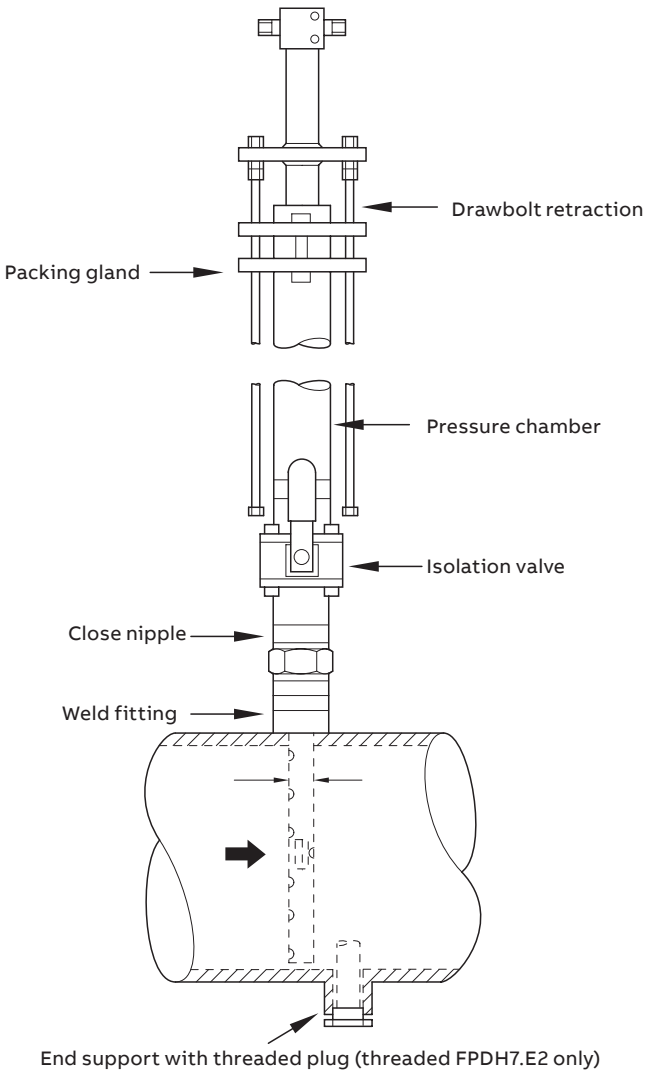
Threaded fitting – high pressure



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)

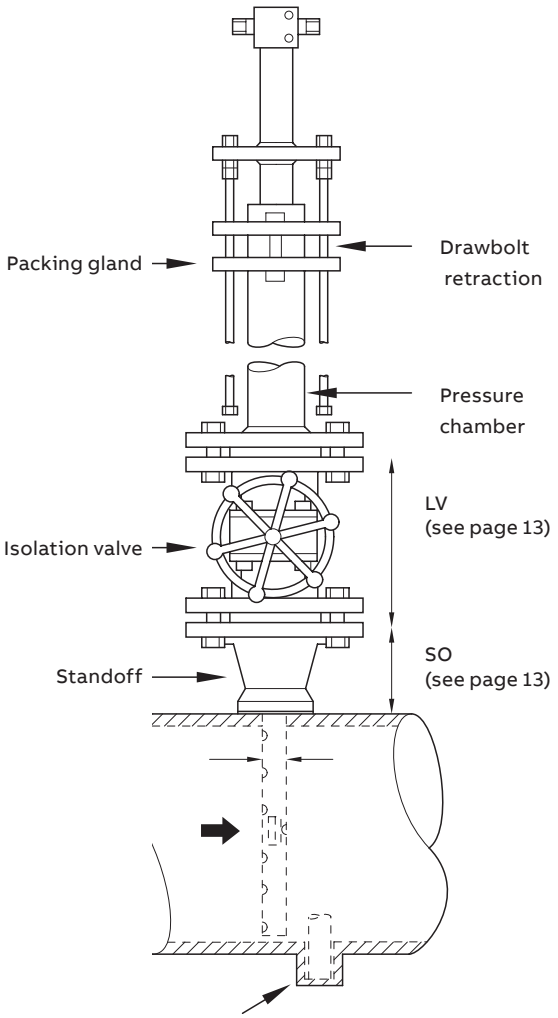
* For liquid flow applications where there is a possibility of process pulsations or intermittent excessive flow velocity, the end-support model should always be selected for pipe sizes over 250 mm (10 in.) internal diameter.

** 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 ºF)
With standard gate valve:	40 bar and 400 °C (580 psi and 752 ºF) (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 ºF)
With standard gate valve	100 bar and 400 °C (1450 psi and 752 ºF)
	(Temperature is at valve)
	(Pressure is 35 bar [500 psi] for FPD350.H8.E1 and FPD350.H8.E2)

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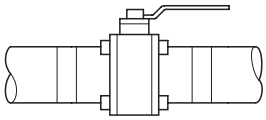
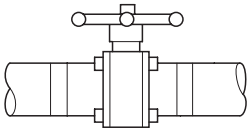
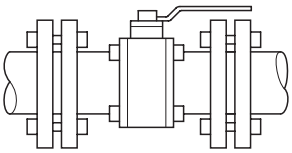
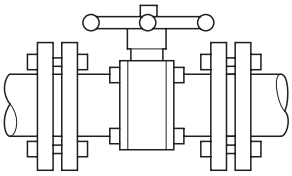
Process isolation valves

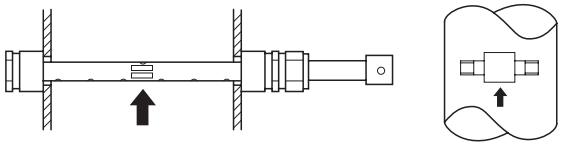
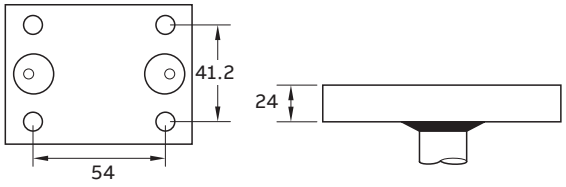
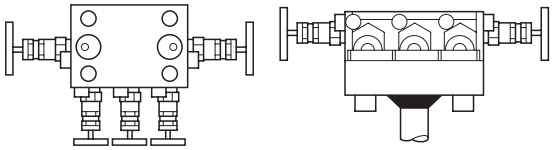
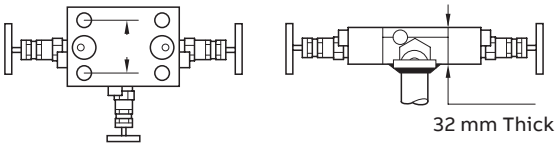
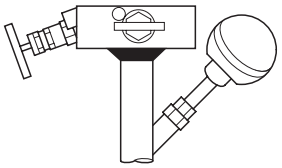
Valve type	Torbar model FPD350.	Valve size	Code (* is material – see below)	Maximum temperature at valve
Threaded ball 	L6	¾ in.	B*5	200 °C (392 °F)
	H6 (threaded) L7.E1 L7.E2 H7 (threaded)	1¼ in.	B*7	
Threaded gate 	H6 L7.E1 L7.E2 H7 (threaded)	1¼ in.	G*7	400 °C (752 °F)
Flanged ball 	H6 (flanged)	40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

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 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

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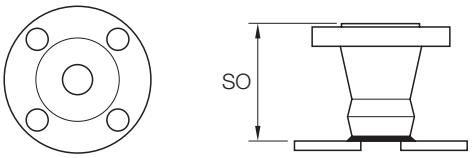
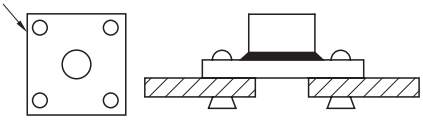
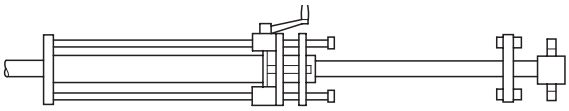
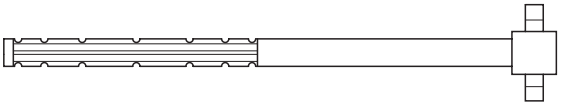
Accessories

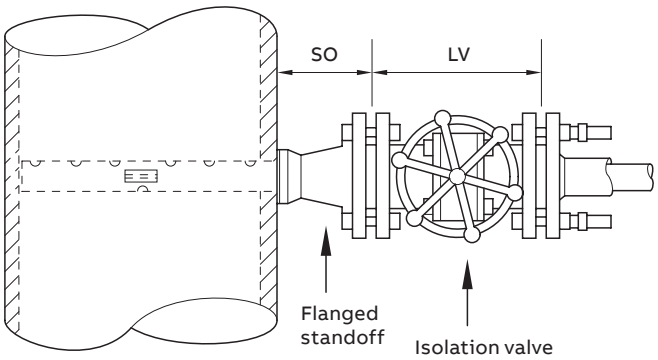
Description	Models FPD350.	Illustration
Flanged Pipe Fittings (Stand-Off). Material is specified by 'Pipe Fitting Material' in Model Number. Type, Size and Rating is specified with Model Number	Flanged versions of: T3 T4 T5 H6 H7 H8	
Stud Bolts, Nuts and Gasket	Flanged versions of: T3 T4 T5 H6 H7 H8	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)



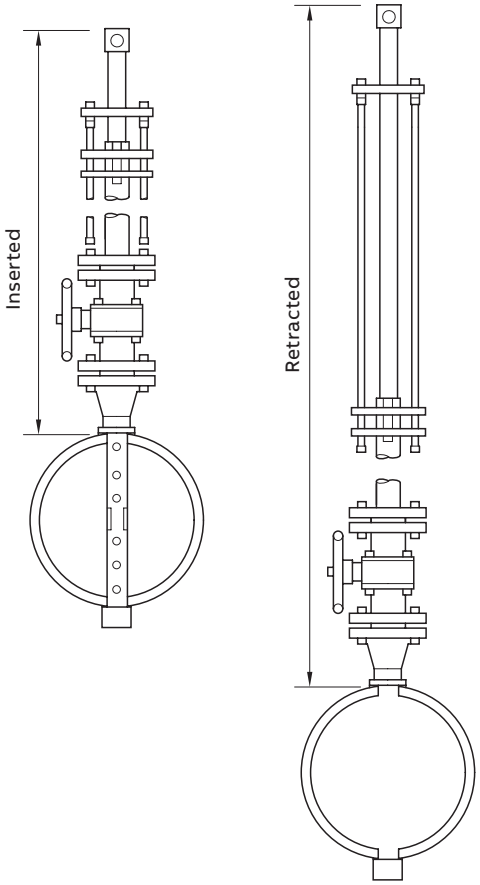
Dimensions

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

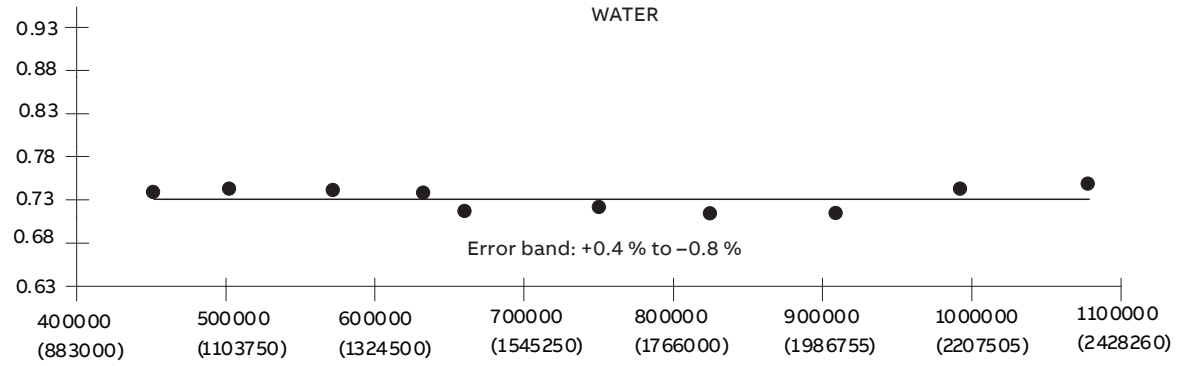
Inserted and retracted lengths mm (in.) (approximate values for information only – do not use for construction)

Lengths maybe affected if flanged end support fitted

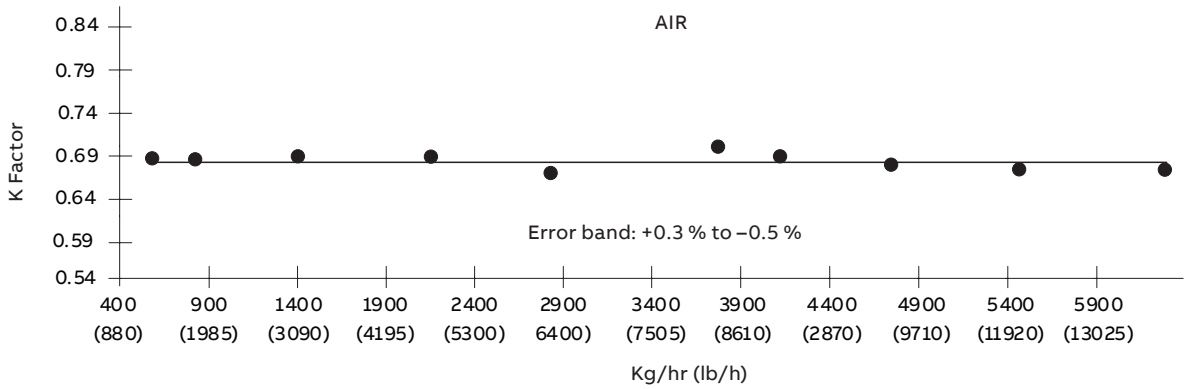
Withdrawable types (Hot-Taps)

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)

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

Gases (volumetric)

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

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

Liquids / gases / steam (mass)

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

DP to flow

Liquids (volumetric)

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

Gases (volumetric) – actual conditions

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

Gases (volumetric) – normal conditions

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

Liquids / gases / steam (mass)

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

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

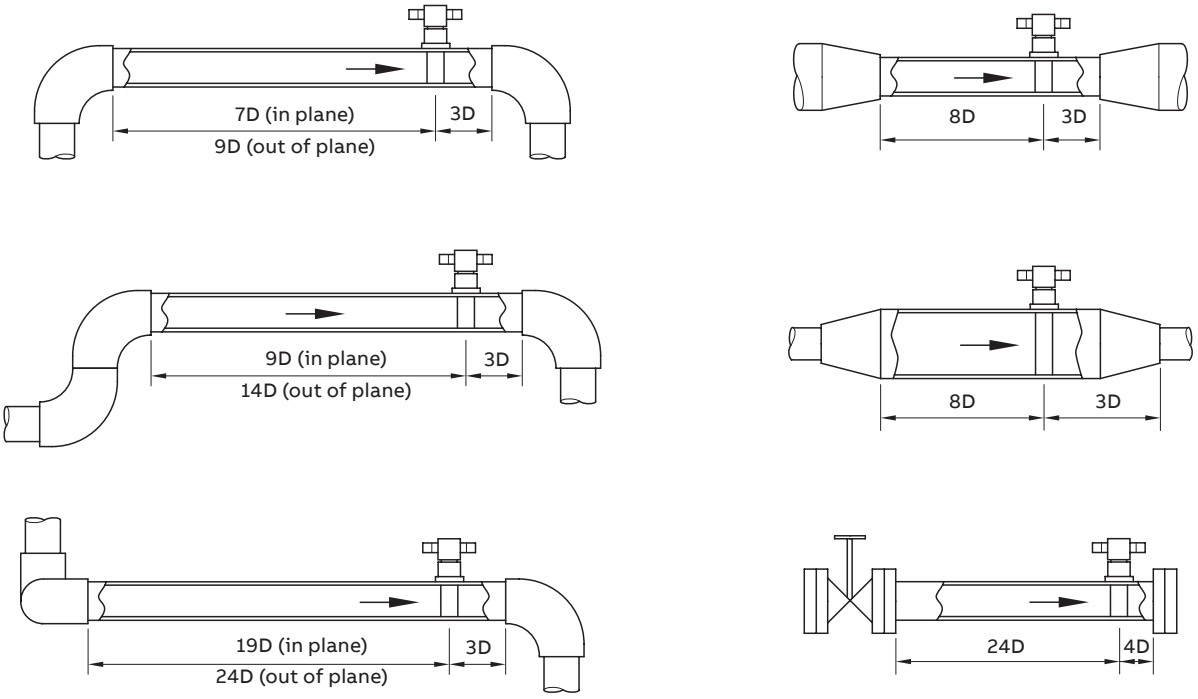
The above figures are theoretically derived and include a x10 safety factor over and above basic standards and specification.

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.

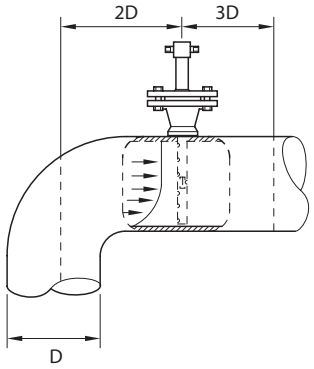
Where it is not possible to provide the specified distances and maximum accuracy is required, the use of a flow straightening spool piece allows for shorter distance



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.

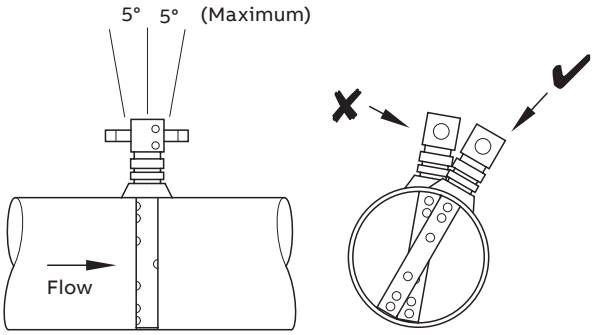
Before installation or removal of a Torbar it is imperative that careful reference is made to the appropriate installation instructions that are supplied with each Torbar shipment. The installation instructions are also available separately on request.

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.



General orientation

Gases **Liquids and steam**

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	XXX	XX	XXX	XXX	XX	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	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	XXX	XX	XXX	XXX	XXX	XXX	XX	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	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	XXX	XX	XXX	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													Y0									
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	XXX	XX	XXX	XX	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	XXX	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	XXX	XXX	XXX	XXX	XXX	XX	XXX	XX	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	XXX	XXX	XXX	XXX	XXX	XXX	XX	XXX	XX	XX	XXX	XX	XXX
	See page 27			See page 28				See page 29															
Tapping sets																							
Two sets														TN2									
Others														TNZ									
Bolt type and material															BGC								
ASTM A193 B7 / ASTM A194 2H															BGC								
ASTM A193 B8M / ASTM A194 8MA															BGS								
Others															BZ9								
Gasket material																GT1							
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)																	T1						
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																		DF1					
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																			P1				
Oxygen cleaning																			P1				
Others																			Z9				
Certification																				C2			
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																					CH1		
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)																						M1	
German																						M1	
Italian																						M2	
Spanish																						M3	
French																						M4	
Chinese																						M6	
Others																						MZ	
Added requirements																							MS1
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	XXX	XXX	XXX	XXX	XXX	XXX	XX	XXX	XX	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.)	305
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	XXX	XX	XXX	XX	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	XXX	XXX	XXX	XXX	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	XXX	XXX	XXX	XXX	XXX	XXX	XX	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																							MS1

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
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	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	XXX	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	XXX	XXX	XXX	XXX	XXX	XX	XXX	XX	XX	XXX	XX	XXX
Product design																							
Low pressure retractable Torbar – 25 mm (1 in.) OD probe	L7																						
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	XXX	XXX	XXX	XXX	XXX	XX	XXX	XX	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										T0												
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	XXX	XX	XXX	XX	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	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XX	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	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	XX	XXX	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	XXX	XXX	XXX	XXX	XXX	XXX	XXX	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	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XX	XXX	XX	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	XXX	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	XX	XXX	XX	XXX
	See page 45				See page 46																		
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																							
1¼ in. threaded ball valve – A216 carbon steel with 316 stainless steel trim												BC7											
1¼ in. threaded ball valve – stainless steel												BS7											
1½ in. flanged ball valve – A216 carbon steel with 316 stainless steel trim												BC8											
1½ in. flanged ball valve – Alloy 276												BH8											
1½ in. flanged ball valve – Alloy 400												BM8											
1½ in. flanged ball valve – aluminium-bronze												BA8											
1½ in. flanged ball valve – stainless steel												BS8											
1½ in. flanged gate valve – A216 carbon steel with 316 stainless steel trim												GC8											
1½ in. flanged gate valve – stainless steel												GS8											
2 in. flanged ball valve – A216 carbon steel with 316 stainless steel trim												BC6											
2 in. flanged ball valve – Alloy 276												BH6											
2 in. flanged ball valve – Alloy 400												BM6											
2 in. flanged ball valve – aluminium-bronze												BA6											
2 in. flanged ball valve – stainless steel												BS6											
2 in. flanged gate valve – A216 carbon steel with 316 stainless steel trim												GC6											
2 in. flanged gate valve – stainless steel												GS6											
3 in. flanged ball valve – A216 carbon steel with 316 stainless steel trim												BC9											
3 in. flanged ball valve – Alloy 276												BH9											
3 in. flanged ball valve – Alloy 400												BM9											
3 in. flanged ball valve – aluminium-bronze												BA9											
3 in. flanged ball valve – stainless steel												BS9											
3 in. flanged gate valve – A216 carbon steel with 316 stainless steel trim												GC9											
3 in. flanged gate valve – stainless steel												GS9											
Customer supplied												VF9											
Others												VZ9											
Design options																							
Partial insertion probe													TP2										
Gear retract													TP4										
Bidirectional													TP5										
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						

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	XXX	XX	XXX	XX	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	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XX	XXX	XX	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	XXX	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	XXX	XX	XXX	XX	XX	XXX	XX	XXX
	See page 49			See page 50																					
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																									
3 in. flanged ball valve – A216 carbon steel with 316 stainless steel trim													BC9												
3 in. flanged ball valve – stainless steel													BS9												
3 in. flanged gate valve – A216 carbon steel with 316 stainless steel trim													GC9												
3 in. flanged gate valve – stainless steel													GS9												
3 in. flanged ball valve – Alloy 400													BM9												
3 in. flanged ball valve – aluminium-bronze													BA9												
3 in. flanged ball valve – Alloy 276													BH9												
Customer supplied													VF9												
Others													VZ9												
Design options																									
Partial insertion probe														TP2											
Gear retract														TP4											
Bidirectional														TP5											
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							

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	XXX	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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DS/FPD350-EN Rev. M 06.2017