

Prandtl's Pitot Tube

Pitot Tube /Cylindrical Probe VDEH

Taking Measurements

the angled pitot head is positioned in the pipeline through a drilled hole or a threaded gland (for maximum length, including wall thickness, see table). Sealing during test measurements can be made by the use of a drilled plug, otherwise by tightening the threaded packing gland. The spherical head should be positioned exactly in the centre of the pipe, directly against the direction of flow. It's position can be adjusted by loosening the union on the packing gland. The pitot tube is connected to a PD-manometer by hose, whereby the plus connection (+) of the pitot tube (vertical, downwards) is connected to the plus (+) connection of the inclined tube manometer. The minus (-) connection of the pitot tube (in direction of flow) should be likewise connected to the minus (-) connection of the manometer. The pitot tube and the PD manometer must both be suitable for the static pressure in the pipeline.

The air speed can be calculated from the reading from the PD manometer according to Bernoulli's theorems.

An abbreviated form for Prandtl's pitot tube for air at 20° C, 60% humidity and a barometric pressure of 1013 mbar is:

velocity $v = 4,0457 \times$ square root of DP (m/s)

It is simplest to order the differential pressure manometer with air velocity scale (20°C, 60% rH, 1013 mbar) or with a square root scale 0-100%. Details of the theoretical basis can be supplied on request. These also deal with the obtaining of median values from the velocity measurement profiles. Afterall,

the Pitot tube only takes local measurements.

N.B. the remarks '*inlet and outlet distances*' under '*Advantages*'.

Cylindrical Probe VDEH

Applications

In the guidelines SEB 384 700, pub. VDEH (Verein der Eisenhütten Leute) the cylindrical probe is recommended as well as Prandtl's pitot tube. Lacking an angled head, the cylindrical probe is very easy to install and remove.

Coefficient $K = 1.7$, otherwise the measurement and calculation are as with Prandtl's Pitot tube.

Construction

Cylindrical probe VDEH Type St 341 Z consists of a cylindrical shaft, Ø15mm, with drillings to take the total and static pressures. It has impuls tubes with an inner dia.of 6mm inside the shaft to the Ø13mm hose connections.

The downward directed connection = minus (-)

The connection directed along the direction of flow = plus (+)

Stainless steel (SS 316) version is argon arc welded.

Nominal Lengths and *order Nos.*

81.151	Nominal length 250mm
81.152	Nominal length 500mm
81.153	Nominal length 750mm
81.154	Nominal length 1000mm
81.155	Nominal length 1500mm
81.156	Nominal length 2000mm
81.157	Nominal length 2500mm

Order Nos. for special versions as under ST 341

Technical details and order nos. of available Prandtl's tubes

Type	St 309	St 306	St 310	St 311	St 312	St 370	St 371	St 341
Tube dia (mm)	3	6	10	14	17	8	12	15
Head bore (mm)	1	2	3	5	8	2	4	6
Hose gland dia (mm)	6	6	10	12	15	8	12	13
Head length (mm)	40	80	135	185	220	110	160	200
Material	brass	brass	brass	brass	brass	SS 316	SS 316	SS 316
Nom. Length (mm)	250*	250	250*	250*	-	250	250*	250
Order No.	81.002	81.041	81.011	81.026	-	81.063	81.070	81.101
		500	500*	500*	500	500	500*	500
	St 309 only	81.042	81.012	81.027	81.052	81.064	81.071	81.102
	usable	750	750*	750*	750	750	750*	750
* usually stock item	>1.8 m/s VDI 2088	81.043	81.013	81.028	81.053	81.065	81.082	81.103
		1000	1000*	1000*	1000	1000	1000*	1000
		81.044	81.014	81.029	81.054	81.066	81.083	81.104
		St 306 1500	1500	1500	1500	1500	1500	1500
Atmospheric dust	none	none	little	some	heavier	none	little	heavier
Temperature up to °C	160	400	400	400	400	600	600	600
Light union gland connectio (EL)	M12x1.5* 81.003		G 3/8* 81.020	G 3/4* 81.033	-	-	-	-
Heavy union gland connection (ES)				G 3/4* 81.034	G 3/4 81.059	G 3/4 81.089	G 3/4 81.111	G 3/4 81.112
				G 1 81.035	G 1 81.060	G 1 81.090	G 1 81.112	G 1 81.112
Maximum possible weldolet length (mm)	-	-	25	45	40	-	45	45
Compression fitting 12 mm (extra)			81.021	81.036	81.061	-	81.091	81.118

Type St 341 can be equipped with threaded packing glands PN 40 (Order No. 81.113) G 3/4" thread and/or stainless steel valves PN 40 (Order No. 81.120) EO 12 connectors

Straight reducer hose connections Unbreakable POM, 110°C available with various adaptors

Construction

Prandtl's Pitot tube

with a curved/arched head and hemispherical probe tip. Head and shaft formed from one tube. The geometrical proportions are those laid down by Prof. Ludwig Prandtl, and so arranged that the probe coefficient equals 1. Supplied with hose connections.

Plus (+) = downward directed outlet for total pressure

Minus (-) = outlet directed in the direction of flow for static pressure

For materials, diameters and nominal lengths, please see table.

Threaded packing gland union EL

Light construction, removable, to be screwed into pipeline-mounted nipple. Made from nickel-plated brass, with Perbunan gasket.

Female thread according to table.

Threaded packing gland union ES

Heavy construction, for permanent installation (should be ordered concurrently). Made from stainless steel SS 316 with heat-proof packing.

Female thread according to table.