



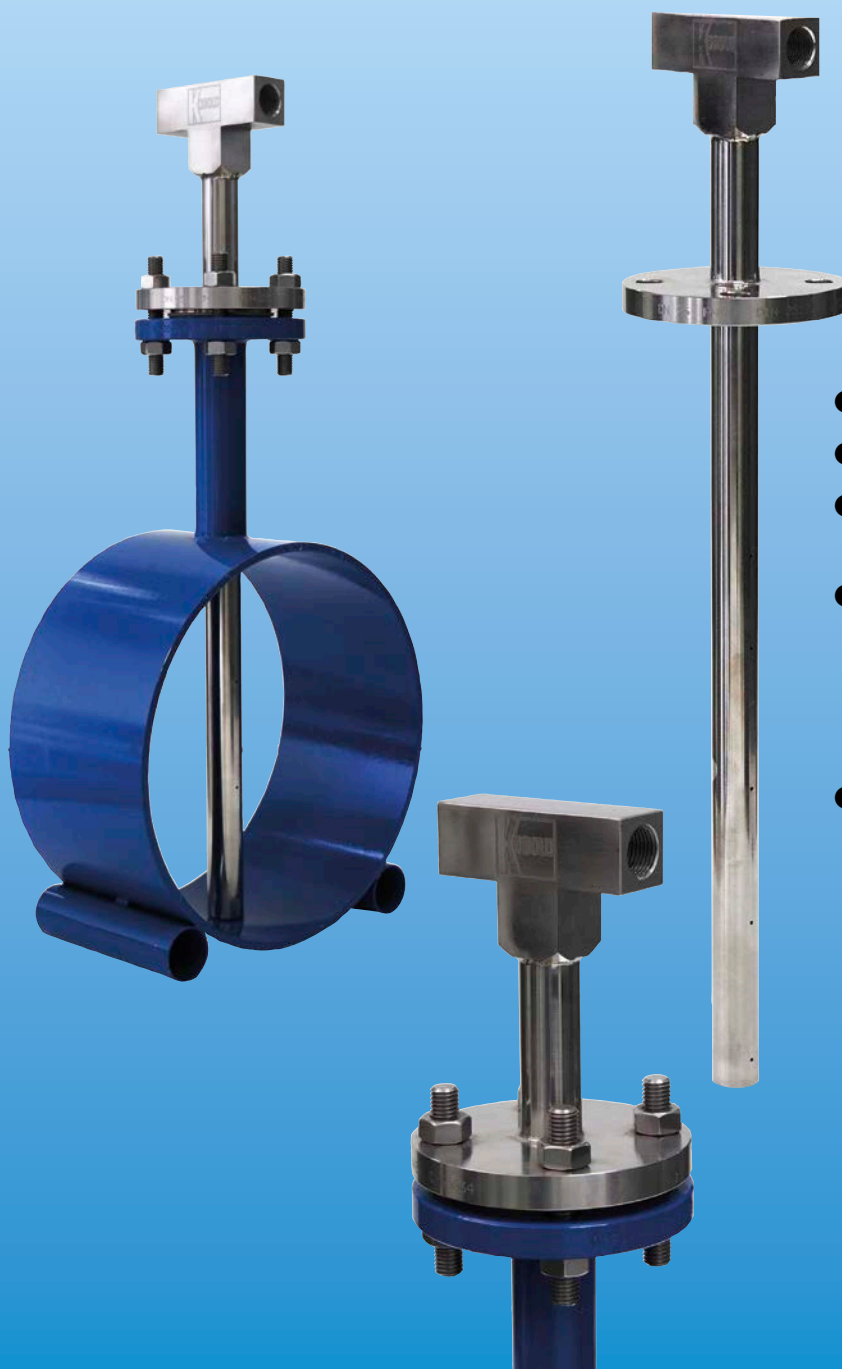
## KOBAR

Pitot tube



measuring  
•  
monitoring  
•  
analysing

## ANU



- Sizes: DN 50 ... DN 8000
- $p_{\max}$ : 400 bar;  $t_{\max}$ : 1175 °C
- Flow measurement of steam, gas, and liquid
- Sensor material: 1.4404, 1.4571, 1.4432, Alloy C-276, Alloy 800, Alloy 600, Alloy 400, PVDF, others
- Material of mounting parts: carbon steel, 1.4404, 1.4571, 1.4432, Alloy C-276, Alloy 800, Alloy 600, Alloy 400, PVDF, others



GS

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**Description**

Pitot tube sensors are classified as differential pressure sensors for flow measurement.

The measuring principle of a pitot tube utilises the differences between the dynamic pressure on the upstream side and the static pressure on the downstream side.

The pitot tube sensors are used for flow measurement of gas, steam and liquids.

The pressure loss in a pitot tube sensor is less than primary elements using differential pressure for flow measurement.

The standard probe material is 1.4404, however, depending on the operating pressure and temperature, the pitot tube sensors can be manufactured in other materials, such as Alloy c-276, Alloy 625, Alloy 400, 600, 800 PTFE, PVDF, etc..

Optionally, the pitot tube sensor may include a temperature sensor (RTD or TC).

**Applications**

- Power generation
- Oil production and refining
- Water treatment and distribution
- Gas processing and transmission
- Chemical and petrochemical industry

**Head Transmitter**

Kobar probes generate a differential pressure signal that is proportional to the flow rate. In conjunction with a DP transmitter, such as PAD, the Kobar probe we obtain a flowmeter with analog output.



**General specifications**

**Calculation and design**

The design, manufacturing, and calculation, is based on internal study at KOBOLD MESURA.

**Line size**

The client provides the pipe line size and schedule (pipe wall thickness) or the internal diameter. Standard size ranges from DN50 to DN8000

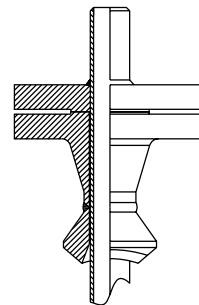
**Sensor material**

Standard sensor material is stainless steel 1.4404. Other materials are available on request.

**Process Connections**

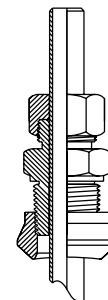
**Flange connection**

Flange ANSI B16.5, or EN-1092-1  
 Raised Face (RF), or Ring Joint (RTJ).  
 Rating according to pipeline rating



**Thread connection**

Compression fitting with thread according to diameter of sensor tube.  
 Thread NPT-M



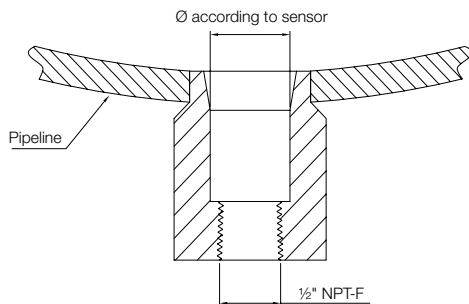
### End Support

End support is recommended to guarantee a more robust support.

Recommended for large pipe diameters, or critical working conditions.

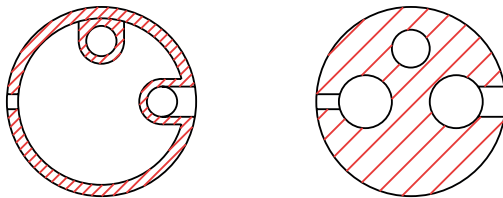
This accessory is supplied with the pitot tube.

The end support material according to the material of the pipe line.



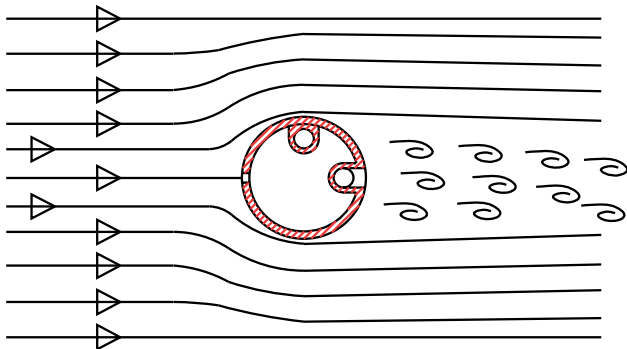
### High Pressure and Temperature

For high pressure and temperature applications, the Kobar sensor is manufactured from a barstock and special materials suitable to the application requirements. i.e. Alloy C-276, Alloy 600, Alloy 400, Duplex and others.



### Unrecovered Pressure Loss

The pitot tube presents only a small obstruction to the flow, particularly when compared to orifice plates. Consequently, unrecovered pressure loss is low.



### Important information for design and calculation

The customer has to provide the following essential process data for calculation and design.

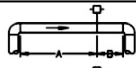

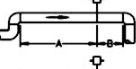
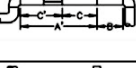
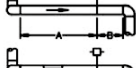

- Line size
- Inside pipe diameter (ID) or thickness (SCH) of the line
- Fluid name
- Maximum flow
- Normal flow
- Minimum flow
- Operating temperature
- Operating pressure
- Operating density
- Operating viscosity
- Molecular weight
- Cp/Cv Specific heat ratio (Only gas or steam)

### Essential information for designing and manufacturing

- Line size
- Inside pipe diameter (ID) or thickness (SCH) of the line
- Pipe material
- Process connection (Flanged, or threaded).
- Remote or compact model



**Upstream & Downstream Lengths**

	Upstream lengths					Downstream lengths
	Without vanes		With vanes			B
	In plane A	Out of plane A	A <sup>1</sup>	C	C <sup>1</sup>	
	8	10	-	-	-	4
	-	-	8	4	4	4
	11	16	-	-	-	4
	-	-	8	4	4	4
	23	28	-	-	-	4
	-	-	8	4	4	4
	12	12	-	-	-	4
	-	-	8	4	4	4
	18	18	-	-	-	4
	-	-	8	4	4	4
	30	30	-	-	-	4
	-	-	8	4	4	4

- If proper lengths of straight run are not available, position the mounting such that 80% of the run is upstream and 20% is downstream.
- “In plane A” means the sensor is in the same plane as the elbow. “Out of plane A” means the sensor is perpendicular to the plane of the elbow.
- The information contained in this manual is applicable to circular pipes only. Consult the factory for instructions regarding use in square or rectangular ducts.
- Straightening vanes may be used to reduce the required straight run length.



**Mounting Positions**

The mounting position of the KOBAR pitot tube is different depending on whether the application is for flow measurement of liquid, gas or steam.

**Liquid Services**

For liquid service in horizontal pipes, the pitot tube is installed with transmitter down. Thus, the air bubbles do not affect the transmitter. We recommend max. angle of 120°.

**Horizontal pipe**



**Vertical pipe**



**Steam Service**

For steam service, the pitot tube is always installed in a horizontal position. The steam condenses in the connection adapters. The differential pressure is then transmitted across the condensate column to the transducer which is located below it.

**Note:** For steam service, we recommend the use of condensate pots between Manifold and process connection, (Refer to data sheet ZUB-CP).

**Horizontal pipe**



**Vertical pipe**



**Recommended mounting orientation**

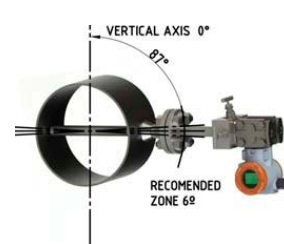
For installation of KOBAR we recommend to comply with the angle limits shown in the following figures.

**Horizontal installation**

for liquids



for steam



**Gas Service**

For Gas service in horizontal pipes, the pitot tube is installed with transmitter up. This is so that solid deposits in liquid do not affect the transmitter. We recommend a max. angle of 120°.

**Horizontal pipe**



**Vertical pipe**



**Vertical installation**

for gas, liquids or steam

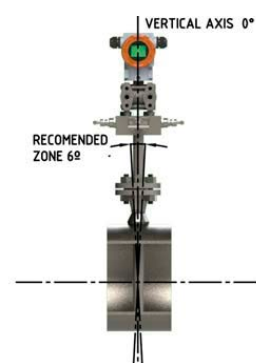


**Horizontal installation**

for gas



**Parallel with pipe line**



**Specifications, Model ANU-R (Remote Version)**

**Description**

KOBAR pitot tube remote version. With thread connection 1/2" NPT-F to connect to remote KOBOLD DP transmitter model PAD.

**Pipe diameter**

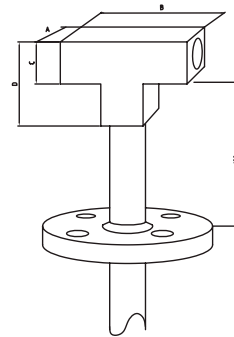
Pipeline size 50 mm ... 8000 mm. Depending on model.



**Sensor size**

Immersion length according to pipeline dimension. The diameter of sensor Ø13 mm....Ø60 mm. according to process data. Temperature, pressure, flow, size. Standard material AISI 316L. Other materials are available such as AISI 316Ti, Duplex 1.4462, 904L, Alloy 600, Alloy 400, Alloy 800, Alloy C276 and others.

Sensor size	A	B	C	D
Ø13	30 mm	90 mm	30 mm	60 mm
Ø25	30 mm	90 mm	30 mm	60 mm
Ø60.3	60 mm	110 mm	40 mm	80 mm



**Process connection**

Flange connection:

With flange connection ANSI B16.5 or EN-1092-1 Raised Face (RF), or Ring Joint (RTJ) according to standard pipeline. Standard material AISI 316L supplied with welding neck counter-flange, and weldolet for complete assembly. Weldinsert and flange materials according to the pipe material.

Thread connection:

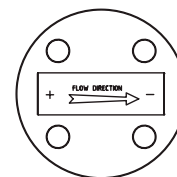
With threaded compression fitting according to the sensor dimensions. Standard material AISI 316L optional supply thread insert.

**End support**

End support material is according to pipeline material and sensor diameter.

**Marking and identification**

The pitot tube head is marked, with an arrow indicating flow direction, and (+) indicating upstream, and (-) downstream.





**Ordering Details Pitot Tube ANU-R** (Example: ANU-R2 R60 E 00 00)

(Application data sheet should be filled out while ordering)

Model	Type	Process connection	Material sensor/ connection	End support <sup>1)</sup>	Options
ANU-		R60 = compression fitting G1			
		R80 = compression fitting G1½			
		N60 = compression fitting 1" NPT-M			
		N80 = compression fitting 1-1½" NPT-M			
		F65 = flange DN 25 PN40			
		F67 = flange DN 25 PN100			
		F95 = flange DN 50 PN40			
		F96 = flange DN 50 PN63			
		F97 = flange DN 50 PN100			
		FB5 = flange DN 80 PN40			
		FB6 = flange DN 80 PN63			
		FB7 = flange DN 80 PN100			
		A6A = flange ANSI 1" 150 lbs (L1)			
		A6B = flange ANSI 1" 300 lbs			
		A6D = flange ANSI 1" 600 lbs			
		A8A = flange ANSI 1-½" 150 lbs			
		A8B = flange ANSI 1-½" 300 lbs			
		A8D = flange ANSI 1-½" 600 lbs			
		A9A = flange ANSI 2" 150 lbs			
		A9B = flange ANSI 2" 300 lbs			
A9D = flange ANSI 2" 600 lbs					
ABA = flange ANSI 3" 150 lbs					
ABB = flange ANSI 3" 300 lbs					
ABD = flange ANSI 3" 600 lbs					
YYY = special connection					
	R1 = remote version with sensor Ø13		E = stainless steel 1.4404 (316L)	00 = without	
	R2 = remote version with sensor Ø25		Y = special material according to customer specification	CS = with end support carbon steel	00 = without
	R6 = remote version with sensor Ø60			ES = with end support stainless steel 1.4404 (316L)	RT = temperature sensor Pt100/3w with M12 plug
				YY = special material according to customer specification	

<sup>1)</sup> This option is only defined by the result of the calculation

**Specifications, Model ANU-C (Compact Version)**

**Description**

KOBAR pitot tube version compact. With base connections for mounting Manifold, and KOBOLD PAD transmitter.

**Pipe diameter**

Pipeline size 50 mm ... 8000 mm. Depending on model.



**Process connection**

Flange connection:

With flange connection ANSI B16.5 or EN-1092-1 Raised Face (RF), or Ring Joint (RTJ) according to standard pipeline. Standard material AISI 316L supplied with counter-flange welding neck, and weldolet for complete assembly. Weldinsert and flange material according to the material of the pipeline.

Thread connection:

With threaded compression fitting according to the sensor dimensions. Standard material AISI 316L optional supply threadinsert.

**Sensor size**

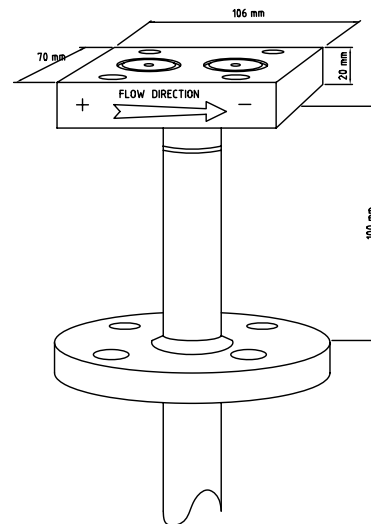
Immersion length according to pipeline dimension. The diameter of sensor  $\varnothing 13$  mm... $\varnothing 60$  mm. According to process data. Temperature, pressure, flow, size. Standard material AISI 316L. Other materials are available such as. AISI 316Ti, Duplex 1.4462, 904L, Alloy 600, Alloy 400, Alloy 800, Alloy C276 and others.

**End support**

End support material is according to pipeline material and sensor diameter.

**Marking and identification**

On one side of the pitot tube's manifold base, an arrow is marked indicating the flow direction, a (+) indicating upstream, and a (-) downstream.







**Ordering Details Pitot Tube ANU-C** (Example: ANU-C1 RE50 E 00 00)

(Application data sheet should be filled out while ordering)

Model	Type	Process connection	Material sensor/ connection	End support <sup>1)</sup>	Options
ANU-	<p><b>C1</b> = compact version with sensor Ø13</p> <p><b>C2</b> = compact version with sensor Ø25</p> <p><b>C6</b> = compact version with sensor Ø60</p>	<b>R60</b> = compression fitting G1	<p><b>E</b> = stainless steel 1.4404 (316L)</p> <p><b>Y</b> = special material according to customer specification</p>	<p><b>00</b> = without</p> <p><b>CS</b> = with end support carbon steel</p> <p><b>ES</b> = with end support stainless steel 1.4404 (316L)</p> <p><b>YY</b> = special material according to customer specification</p>	<p><b>00</b> = without</p> <p><b>OP</b> = with transmitter PAD-DEXS2NS0CH, assembled and configured</p> <p><b>RT</b> = temperature sensor Pt100/3w with M12 plug</p>
		<b>R80</b> = compression fitting G1½			
		<b>N60</b> = compression fitting 1" NPT-M			
		<b>N80</b> = compression fitting 1-1½" NPT-M			
		<b>F65</b> = flange DN 25 PN40			
		<b>F67</b> = flange DN 25 PN100			
		<b>F95</b> = flange DN 50 PN40			
		<b>F96</b> = flange DN 50 PN63			
		<b>F97</b> = flange DN 50 PN100			
		<b>FB5</b> = flange DN 80 PN40			
		<b>FB6</b> = flange DN 80 PN63			
		<b>FB7</b> = flange DN 80 PN100			
		<b>A6A</b> = flange ANSI 1" 150 lbs (L1)			
		<b>A6B</b> = flange ANSI 1" 300 lbs			
		<b>A6D</b> = flange ANSI 1" 600 lbs			
		<b>A8A</b> = flange ANSI 1-½" 150 lbs			
		<b>A8B</b> = flange ANSI 1-½" 300 lbs			
		<b>A8D</b> = flange ANSI 1-½" 600 lbs			
		<b>A9A</b> = flange ANSI 2" 150 lbs			
		<b>A9B</b> = flange ANSI 2" 300 lbs			
<b>A9D</b> = flange ANSI 2" 600 lbs					
<b>ABA</b> = flange ANSI 3" 150 lbs					
<b>ABB</b> = flange ANSI 3" 300 lbs					
<b>ABD</b> = flange ANSI 3" 600 lbs					
<b>YYY</b> = special connection					

<sup>1)</sup> This option is only defined by the result of the calculation

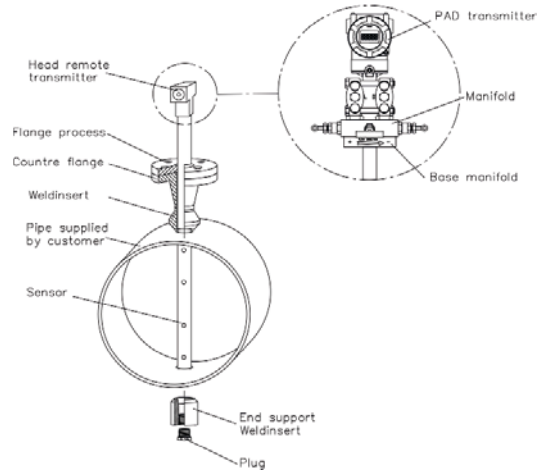


**KOBAR pitot tube Model ANU**

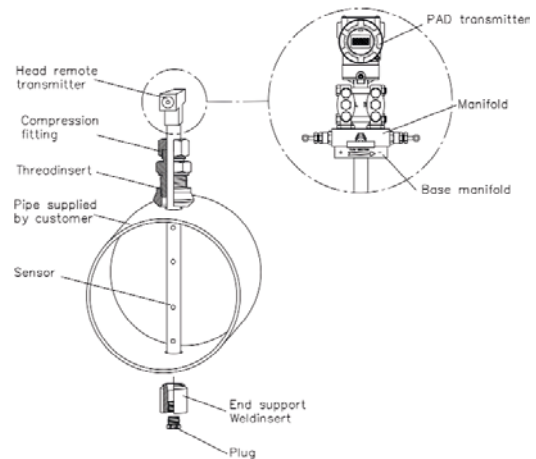
<b>Accessories</b>	<b>Code</b>
Needle valve (1/2" NPT male/female) stainless steel	V-2003 CDAD ABAA
3-way Manifold (compact mounting)	V-3151 CHHH IBAA
Weld fitting G1" female, carbon steel	ZUB-ANUF 1R60
Weld fitting G1" female, stainless steel 1.4404 (316L)	ZUB-ANUF 2R60
Weld fitting 1" NPT female, carbon steel	ZUB-ANUF 1R80
Weld fitting 1" NPT female, stainless steel 1.4404 (316L)	ZUB-ANUF 2R80
Weld fitting G1-1/2" female, carbon steel	ZUB-ANUF 1N60
Weld fitting G1-1/2" female, stainless steel 1.4404 (316L)	ZUB-ANUF 2N60
Weld fitting 1-1/2" NPT female, carbon steel	ZUB-ANUF 1N80
Weld fitting 1-1/2" NPT female, stainless steel 1.4404 (316L)	ZUB-ANUF 2N80
Counter flange and weldinsert size according to pitot flange, carbon steel	-
Counter flange and weldinsert size according to pitot flange, stainless steel 1.4404 (316L)	-
Special flange and weldinset material	-
Mounting of differential pressure transmitter PAD (Adjustment of PAD and Manifold not included)	-
Adjustment of differential pressure transmitter PAD	-
Differential pressure transmitter, range: 0.75 ....15 mbar stainless steel 1.4404 1/4" NPT female IP67 Power supply 12-25 V <sub>DC</sub> , for flow measurement	PAD-DEE2S2NSOCH
Same as above but range 1.5 ... 75 mbar	PAD-DEE3S2NSOCH
Same as above but range 3,73 ... 373 mbar	PAD-DEE4S2NSOCH
Mounting of customer provided DP transmitter (Adjustment as customer provided DP transmitter not included)	
Configuration of differential pressure transmitter PAD (Model PAD-DEEX2NS0DH. Other codes subject to add-on price	

**Examples of construction and possible accessories**

- Remote head and to the right in a circle the detail of the compact
- Connection to flanged process and final support



- Remote head and to the right in a circle the detail of the compact
- Connection to process compression fitting and final support



**Limits of Use**

KOBAR pitot tube, remote or compact				
Without end support	Fluid	Fits pipe sizes mm (inch)		
		Sensor Ø13	Sensor Ø25	Sensor Ø60
	Liquid	50...150 2"...6"	100...600 <sup>1)</sup> 4"...24" <sup>1)</sup>	250...800 <sup>1)</sup> 10"...32" <sup>1)</sup>
Gas/steam	50...150 2"...6"	100...1800 4"...72"	250...1800 10"...72"	

<sup>1)</sup> 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 internal diameter.

KOBAR pitot tube, remote or compact			
Without end support	Fluid	Fits pipe sizes mm (inch)	
		Sensor Ø25	Sensor Ø60
	Liquid	100...600 <sup>1)</sup> 4"...24" <sup>1)</sup>	250...800 <sup>1)</sup> 10"...32" <sup>1)</sup>
Gas/steam	100...1800 4"...72"	250...1800 10"...72"	

<sup>1)</sup> 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 internal diameter.

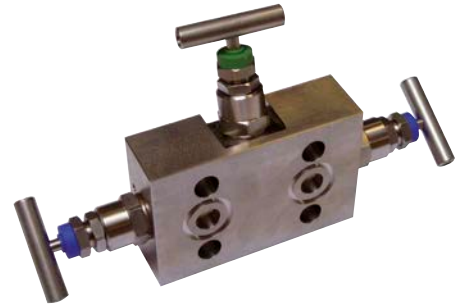


**Accessories**

**Manifold (Direct mounting)**

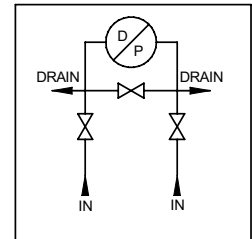
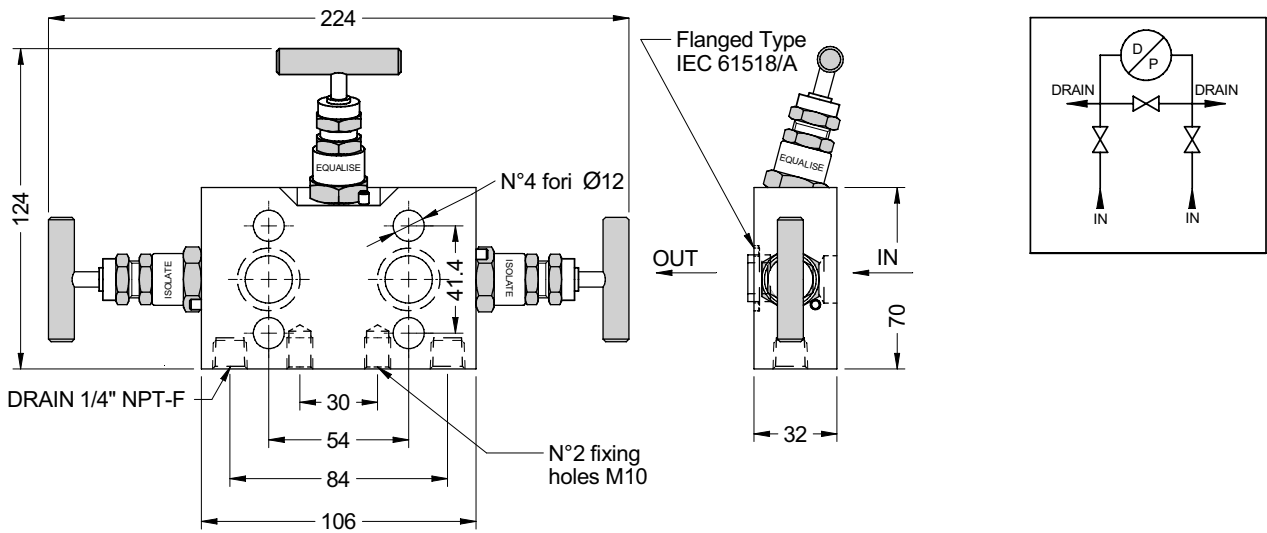
**Technical Details**

Material: AISI 316L  
 Pressure rating: 6000 psi  
 Temperature range: -73 °C ... +210 °C (PTFE gasket), standard  
 -54 °C ... +510 °C (GRAFOIL® gasket), on request  
 Weight: 2.17 kg



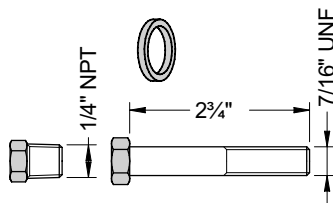
**3-way Manifold valve**

(inlet: flanged/outlet: flanged according to IEC 61518 Type A)



**Included accessories:**

- 4 carbon steel screws (stainless steel on request)
- 2 plugs
- 2 PTFE gaskets



**Order Code: V-3151CHHHIBAA** (PTFE gasket)

**Accessories**

**Condensation Pot**

**Description**

The condensation pots prevent direct contact of hot steam with DP transmitter and ensure that the impulse tubing are always full. Both condensate pots are always at the same level to prevent inaccurate readings. The condensate pots are filled with water before commissioning whereas the water level in the pots is maintained by condensing steam in the process.

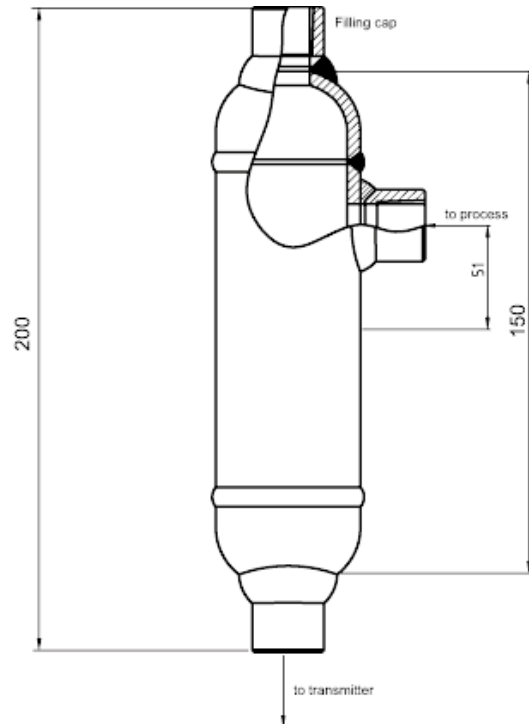
**Technical Details**

Material: steel A105 or stainless steel AISI 316L  
 Volume: 316 cm<sup>3</sup>  
 Weight: approx. 1.7 kg



**Dimensions [mm]**

ASTM A-105 / ASTM AISI 316L



**Order Details** (Example: ZUB-CP W 1 C VT)

Model	Connection input/output	Filling cap	Material/PN	Options
ZUB-CP.	<p>W = welding connection 21.3 mm</p> <p>Y = other (specify in clear text)</p>	<p>1 = 1/2" NPT female with closed plug</p> <p>Y = other (specify in clear text)</p>	<p>C = steel A105; PN 100</p> <p>E = stainless steel 316L; PN 100</p> <p>R = steel A105; PN 250</p> <p>L = stainless steel 316L; PN 250</p>	<p>VT = visual inspection</p> <p>LP = liquid penetration test</p> <p>PT = pressure test</p> <p>RT = radiographic welding test</p> <p>UT = ultrasonic test</p> <p>HT = hardness test</p> <p>PW* = post weld heat treatment</p> <p>MT = magnetic particle test</p> <p>IT = impact test (resilience)</p> <p>NC = material according to NACE MR-0175/ISO15156</p> <p>MC = material certificate 3.1 according to EN10204</p>

\* Not available for material stainless steel



**Application Data Sheet (ADS)**

KOBAR Pitot Tube	
<b>GENERAL DATA</b>	
Customer:	
Project:	
Order confirmation No.:	
Customer P.O. No.:	
Calculation Date:	
Model No.:	
Tag No.:	
<b>PRODUCT DESCRIPTION<sup>1)</sup></b>	
Pitot tube type:	Line size:
Process connection:	Wall thickness or schedule:
	Pipe outer diameter:
	Pipe material:
<b>INPUT DATA</b>	
Medium name:	
Medium state:	Reference pressure:
Gas                      Liquid                      Steam	Reference temperature:
Pipe inner diameter:	Reference compressibility:
Operating pressure:	Reference density:
Operating temperature:	
Operating viscosity:	
Isentropic exponent (Cp/Cv):	
Compressibility at flow	
Operating density:	
<b>Flow values</b> (Mention measuring units)	
Minimum:	
Normal:	
Maximum:	(This value is set as Upper Range Value)
<b>CALCULATION DATA</b> (Nominal conditions)	
Sensor size:	<b>Permanent pressure loss</b>
DP at normal flow:	at normal flow:
Coefficient K:	at max flow:
Expansion correction factor Y	

<sup>1)</sup> Essential information to make the offer