Aramak

Flow Measurement

with Orifice or Pitot

Up- and downstream lengths

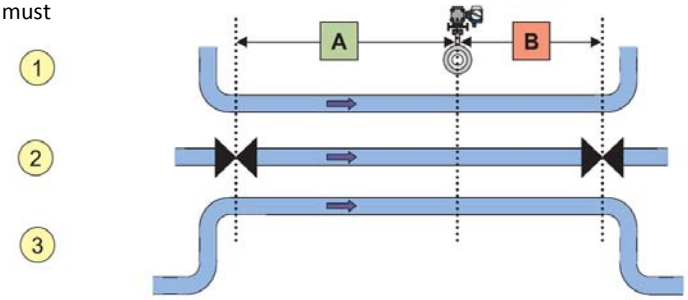
A symmetrical flow profile is the requirement for accurate measurement and is ensured by buildup free piping and sufficiently long up- and downstream lengths.

The flow profile is altered by obstacles in the process line, in the form of narrowings, bends, elbows, etc. The flow settles down again when it passes through a straight section of piping, the Inlet run section. The same is true for obstacles after the measuring point: the back-pressure which occurs leads to a change in the flow profile at the pressure tapping point. Therefore, try and keep to straight outlet runs. The use of flow conditioners allows a reduction in the length of the necessary up- and downstream lengths. The increase in expected errors through reduction without a flow conditioner is shown in the following diagram (see “Reduced upstream length”).

The standard prescribes the up- and downstream lengths to maintain the flow profiles. Use the diagram and the table to determine how large these must be:

A Upstream; B Downstream

1. 90° elbow
2. Valves open
3. 2x 90° elbows



	Orifice plate or nozzle Venturi: use half lengths						Pitot tube	
	Upstream			Downstream			Upstream	Downstream
	β= 0,1	β= 0,5	β= 0,75	β= 0,1	β= 0,5	β= 0,75		
90° elbow	10	14	36	4	6	8	7 x D	3 x D
2x 90° elbow	14	20	42	4	6	8	9 x D	3 x D
3x 90° elbow	34	40	70	4	6	8	18 x D	4 x D
Pipe constriction	5	6	22	4	6	8	7 x D	3 x D
Pipe expander	16	18	38	4	6	8	24 x D	4 x D
Valve, open	18	22	36	4	6	8	30 x D	4 x D

COMPENSATION

Alongside differential pressure Δp, pressure p and temperature T are test variable of flow q. If there are no strong fluctuations in pressure and temperature, then the accuracy of the differential pressure signal is fully sufficient for the majority of measuring points. There is then no need for any Compensation.

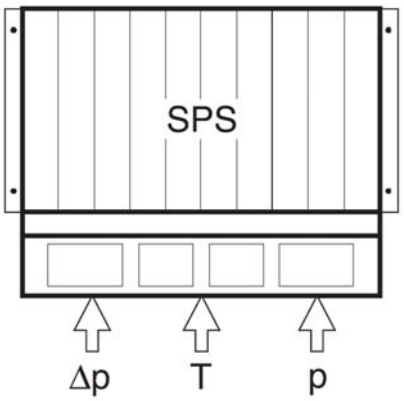
With some applications, particularly in the gas and steam sectors, a special compensation is required. A change in pressure and/or temperature leads to a change in density. If this is not taken into account, total accuracy may be reduced.

The following parameters are required for compensation:

- Gases: compensation of P and T
- Saturated steam: either P or T are compensated
- Superheated steam: compensation of P and T
- Liquids: compensation of T (very rare)

Both on the process side and on the system side, there are two possibilities for implementing compensation (large differences in price and effort).

The process variables are fed into the (available) PLC or Flow Computer. The flow equations are programmed there. With this solution the investment costs are low, but the commissioning costs are increased.



SELECTION STRUCTURE

OFT-			
	Orifice Flange Material		
		Stainless Steel	S
		Carbon Steel	C
	Orifice Flanged Rating		
		300#	300
		600#	600
		Special	
	Orifice Flanged Type		
		Weld Neck	WN
		Socket Weld	SW
		Slip On	SO
		Special	XX
	Orifice Flange Size		
		Size Specified in mm	XXX
	Orifice Plate Material		
		S.S. 316	1
		S.S. 304	2
		Special	X
	Taping		
		Flanged Tap 1/4" NPTF	A
		Flanged Tap 1/2" NPTF	B
		Flanged Tap 3/4" NPTF	C
		Pipe Tap D,D/2	D
		Pipe Tap 3D,8D	E
	Transmitter		
		4~20 mA with Display, 24VDC Loop	10
		4~20 mA without Display, 24VDC Loop	11
		4~20 mA HART with Display, 24VDC Loop	20
		4~20 mA HART without Display, 24VDC Loop	21
	Accessries		
		Tag Plate Included	10
		2 way Valve manifold, Forged	20
		3 way Valve manifold,Milled with Hand Knob	30
		3 way Valve manifold, Forged	31
		5 way Valve Manifold, Milled with Hand Knob	40
		5 way Valve Manifold, Forged	41
		6 way S.S. Condensate Chambers, 1/2" NPT-F	50
		4 way S.S. Condensate Chambers, 1/2" NPT-F	51

Sample

OFT-C-WN-200-1-B-20-10,40

Orifice Flange Material	Stainless Steel
Orifice Flanged Rating	300#
Orifice Flanged Type	Weld Neck
Orifice Flange Size	200
Orifice Plate Material	S.S. 316
Taping	Flanged Tap 1/2" NPTF
Transmitter	4~20 mA HART with Display, 24VDC Loop
Accessories	Tag Plate Included
Accessories	5 way Valve Manifold, Milled with Hand Knob

PTT-			
	Pito Tube Material		
		Stainless Steel	S
		Carbon Steel	C
	Pitot Tube Connection		
		Flanged 2" 150 # R.F.	211
		Flanged 2" 300 # R.F.	221
		Flanged 2" 150 # F.F.	212
		Flanged 2" 300 # F.F.	222
		Flanged 1" 150 # R.F.	111
		Flanged 1" 300 # R.F.	121
		Flanged 1" 150 # F.F.	112
		Flanged 1" 300 # F.F.	122
		Screw 1" NPT M	100
		Screw 2" NPT M	200
		Special	
	Orifice Line Size		
		Size Specified in mm	XXX
	Transmitter		
		4~20 mA with Display, 24VDC Loop	10
		4~20 mA without Display, 24VDC Loop	11
		4~20 mA HART with Display, 24VDC Loop	20
		4~20 mA HART without Display, 24VDC Loop	21
	Accessries		
		Tag Plate Included	10
		2 way Valve manifold, Forged	20
		3 way Valve manifold,Milled with Hand Knob	30
		3 way Valve manifold, Forged	31
		5 way Valve Manifold, Milled with Hand Knob	40
		5 way Valve Manifold, Forged	41
		6 way S.S. Condensate Chambers, 1/2" NPT-F	50
		4 way S.S. Condensate Chambers, 1/2" NPT-F	51

Sample

PTT-S-100-2000-20-10,40

Pito Tube Material	Stainless Steel
Pitot Tube Connection	Screw 1" NPT M
Line Size	2000 mm
Transmitter	4~20 mA HART with Display, 24VDC Loop
Accessories	Tag Plate Included
Accessories	5 way Valve Manifold, Milled with Hand Knob

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