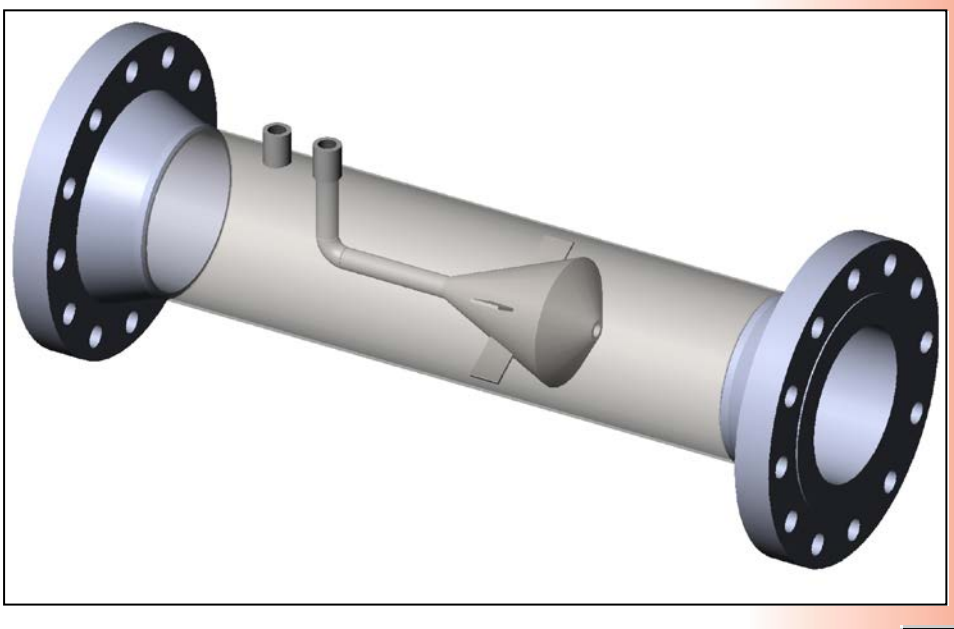
INTRA-AUTOMATION

MESS- UND REGELINSTRUMENTE / MEASUREMENT AND CONTROL

Certified according to ISO 9001; PED 97/23/EC; ATEX 2014/34/EU

IntraCone
Cone Flow Meter

Type: ICM



Technical Information

02/2016

FLOW

THE EXPERT IN LEVEL AND FLOW

Intra-Automation
Technical Information
02/2016

Technical details subject to be changed without notice.

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IntraCone
CONE FLOW METER
Type: ICM

List of Contents:

1. General Description

Cone Flow Meters are designed to measure the volume flow of liquids, steam and gases according to the differential pressure principle. A conical flow element is placed in the centre of a pipe line, in which the fluid to be measured is passing through. With a tap in front (flow direction) of the flow element the pipe pressure (static pressure) is measured. Passing by the element, the flow velocity raises and generates an under-pressure behind the cone, where the second tap is located. The two measured pressure values are to be compared. The outcome is called “differential pressure”. With this differential pressure now the flow can be calculated.

2. Main Features

- Cone Flow Meters can be used in a great variety of applications: liquids, gases, steam, slurries etc.
- High accuracy (± 0,5 % of the measured value) is achievable
- Wide Turndown Ratio: 10:1
- Minimal in- and outlet requirements, provided by a pipe run.
- Low pressure loss (compared with orifice plates of the same β)
- Self-cleaning (due to the form of the cone behind the flow element a partial vacuum is generated, which avoids abrasion on the flow element.

NOTE

What makes IntraCones different from main competitor’s products?
Compared to other Cone-Flow-Meters, which are made from metal sheets (accepting the deviations in dimensions, coming from the production procedures, which means, they have to be calibrated to the application’s process conditions), IntraCones (up to DN500/10”) are calculated first, and then they are made of bar stock material on a turning lathe, with dimensions be accurate to the fraction of a mm. They do not deserve to be calibrated anymore and have a very high accuracy for lifetime. On larger pipe sizes (> DN500/10”), Intra also makes the cones form metal sheets, but due to the fact, that they are manufactured especially for the application, the dimensional accuracy is very high.

3. Equations

Beta ratio: $$\beta = \sqrt{\frac{D^2 - d^2}{D}}$$

Area ratio: $$m = \frac{D^2 - d^2}{D^2}$$

Outside diameter of cone: $$d = \beta_{cone} * D$$

Differential pressure: $$\Delta P = P_H - P_L$$

Volumetric flow: $$q_v = K * \varepsilon \sqrt{\frac{\Delta P}{\rho}}$$

Where:

β	:	Equivalent diameter ratio
D	:	Inside diameter of pipe
d	:	Diameter of largest cross section of cone
q_v	:	Volumetric Flow rate
ρ	:	Operating density
K	:	K-factor
ε	:	Expansion factor of gas
m	:	Area ratio
ΔP	:	Differential pressure

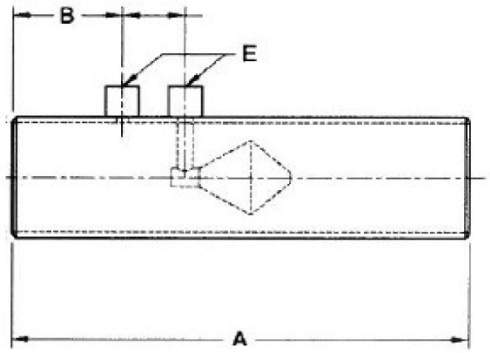
4. Technical Data

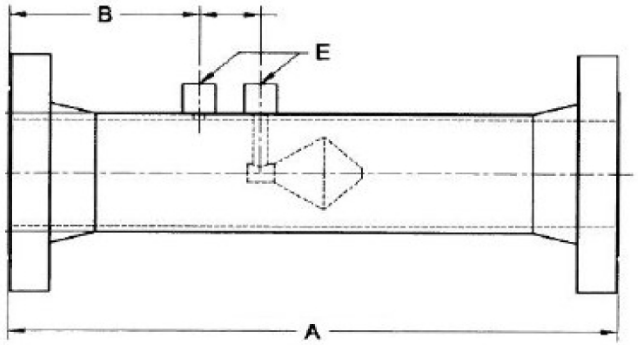
Standard Accuracy	± 0,5 % of actual flow
Standard repeatablitity	< ± 0,1 %
Flow Ranges	10:1 and greater
Standard Beta ratios	0,45 to 0,80
Head Loss	Depending on beta ratio and ΔP
Installation Piping Requirements	3D upstream 1D downstream (depending on installation situation)
Materials of Construction	Duplex 2205, 304SS, 316SS, Hastelloy C276, 254, SMO, carbon steels (other materials also available, on request)
Line Sizes	15…3000 mm (or larger, on request)
End Fittings	Flanged, threaded, hub or welding ends (others on request)
Op. Temperature (max.)	+1292 °F (+700 °C) (higher temperatures on request)
Op. Pressure (max.)	42 MPa (420 bar)
Configurations	Precision flow tube - custom calibrated for customer needs - ASME – construction available

Up- and downstream pipe requirements (in multiples of outside pipe diameter [D]):

Size	Disturbing Part	Gas measurement		Water measurement	
		Inlet	Outlet	Inlet	Outlet
All sizes	1 Elbow	**1D**	**1D**	**0D**	**0D**
	2 Elbows	**1D**	**1D**	**0D**	**0D**
	T connection pipe	**1D**	**1D**	**0D**	**0D**
	Butterfly valve (Control valve)	**10D** for unfavourable position	**5D** for downstream of valve	**3D** for unfavourable position	**3D** for downstream of valve
	Butterfly valve (Cut-off valve)	**5D**	**3D**	**3D**	**3D**
	Ball valve (Cut off)	**1D**	**1D**	**0D**	**0D**
	Heat exchange (acc. to type)	**1D**	**0D**	**n/a**	**n/a**
	Thermal converter (Special order)	**n/a**	**n/a**	**0D**	**0D**
	Diverging duct (0,67D-D)length 2,5D	**2D**	**2D**	**1D**	**1D**
	Diverging duct (3D-1D)length 3,5D	**1D**	**1D**	**1D**	**1D**

Dimensions of cone flow meters type ICM:





Size		Welding Ends		Weld Neck Flanges ANSI B16.5									
				150# RF		300# RF		600# RF		900# RF		1500# RF	
Dimension		A	B	A	B	A	B	A	B	A	B	A	B
DN	inch	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
25	1	200	72	311	128	324	134	337	140	use 1500 lbs dimensions for these sizes		359	152
40	1½	250	75	374	137	387	143	403	151			428	164
50	2	295	85	422	149	435	155	454	165			511	193
65	2½	300	85	440	155	452	161	471	171			522	196
80	3	350	85	490	155	508	164	528	174	566	193	597	209
100	4	400	95	552	171	572	181	616	203	641	216	661	225
150	6	550	105	728	194	747	204	797	229	842	251	906	283
200	8	650	120	853	222	873	231	930	260	987	289	1089	339
250	10	695	120	898	222	930	237	1013	279	1076	311	1216	380
300	12	745	125	974	239	1005	255	1069	287	1158	332	1323	414
350	14	750	150	1004	277	1035	293	1093	322	1189	369	1360	455
400	16	750	150	1004	277	1042	296	1118	334	1195	372	1385	468
450	18	800	160	1079	300	1118	319	1181	351	1270	395	1467	494
500	20	900	170	1189	315	1224	332	1294	367	1408	424	1624	532
600	24	1200	241	1505	393	1536	409	1619	451	1797	540	2026	654

Notes:

Dim. A - Base Dimension is Dimension A of the Welding-ends-type.
For the flanged types Dimension A equates to Dimension A of the Welding-end-types plus 2x Dimension h of the applied flanges (>300 # 2 x h + 12,8mm)

Dim. B - Base Dimension is Dimension B of the Welding-ends-type.
For the flanged types Dimension B equates to Dimension B of the Welding-end-types plus 1x Dimension h of the applied flanges (>300 # 2 x h + 6,4 mm)

Dim E - The distance between the pressure taps is 54mm.
Pressure taps: - nominal size < DN50 / 2" = ¼"NPT-F, - nominal size ≥ DN50 / 2" = ½"NPT-F

5. Application Questionnaire

General Information:

Client:	
Reference no.	
TAG-no.	

Application data:

Existing pipe:

- Inside diameter ____ mm — - Wall thickness ____ mm

Existing pipe runs:

- Inlet ____ mm — - Outlet ____ mm

Process fluid:

- Name: ____ ☐ liquid ☐ gas ☐ abrasive ☐ corrosive

Solids? ☐ YES ☐ NO — Gas bubbles? ☐ YES ☐ NO

- Kind of solids		- Kind of gas	
- Solid ratio	%	- Gas ratio	%
- Particle size	µ	- Bubble size	µ

Physical dimension	Minimum	Normal	Maximum
Flow range	Nm³/h	Nm³/h	Nm³/h
Op. pressure	bar a	bar a	bar a
Op. temperature	°C	°C	°C
Viscosity	cp	cp	cp
Standard density	kg/Nm³	kg/Nm³	kg/Nm³
Op. density	kg/m³	kg/m³	kg/m³

Customer prefers:

Preferred material ____

Preferred connection ☐ Welding ends ☐ DIN flanges ☐ ANSI flanges

Additional equipment to be quoted for:

- Δp-Transmitter ☐ Yes / ☐ No - ☐ linear or ☐ square root output
- Pressure transmitter ☐ Yes / ☐ No
- Temperature transmitter ☐ Yes / ☐ No
- Accessories (piping/valves) ☐ Yes / ☐ No
- Flow Computer ☐ Yes / ☐ No

Notes:

6. Ordering Code

Code	Description				
ICM	Cone Flow Meter				
	Size (Please insert as indicated below)				
	XXX	**ANSI**	**DIN**		
		0,5”	DN15		
		0,75”	DN20		
		1”	DN25		
		1,25”	DN32		
		1,5”	DN40		
		2”	DN50		
		2,5”	DN65		
		3”	DN80		
		3,5”			
		4”	DN100		
		5”	DN125		
		:	:		
		:	:		
		60”	DN1500		
	Process connections				
	W	**0**	**0**	Weld ends	
	F			**Flanges**	
		A		**ANSI flange face**	
			F	FF	
			R	RF	
			J	RTJ	
		D		**DIN flange face**	
			B	Form B	
			C	Form C	
			F	Form F	
			N	From N	
		Y	**0**	Other flange standard, please specify	
	T			**Thread ends**	
		N		**NPT**	
			M	Male	
			F	Female	
		G		**G**	
			M	Male	
			F	Female	
		R		**R**	
			M	Male	
			F	Female	
		Y	**0**	Other thread standard, please specify	

Pressure rating flange & Pipe schedule (please insert as indicated below)

XXX	Pressure rating		Schedule	
	ANSI	**DIN**		
		PN16	Std	
	150# (20 bar)		Std	
		PN40	80	
	300# (50 bar)		80	
		PN64	80	
		PN100	80	
	600# (110 bar)		80	
	900# (150 bar)		120	
		PN160	160	
		PN250	160	
	1500# (260 bar)		160	
		PN320	XXS	
		PN420	XXS	
	2500# (420 bar)		XXS	

ICM					

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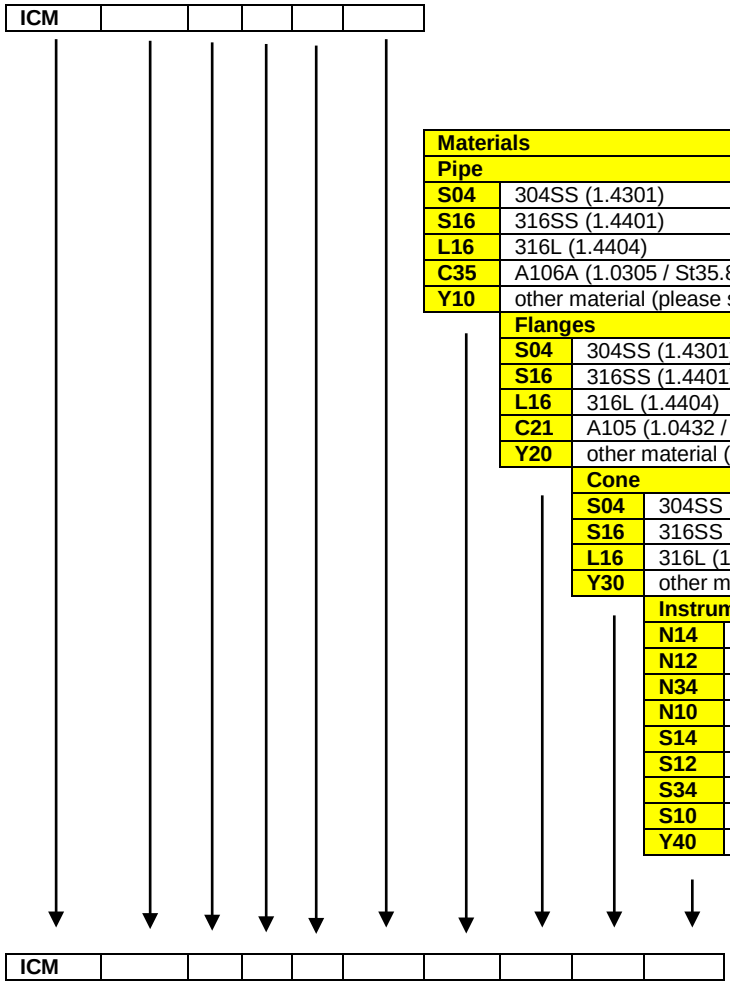
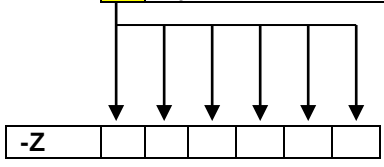
Ordering code ICM / Continuation:



Options:
(Multiple choice possible, please add to the order code with a **"-Z"**)

Code	Description
-Z	Option to be added
0	Material certification acc. EN 10204-3.1
1	NACE MR01-75
2	PED
3	CRN
4	X-Ray test
5	Dye Penetration test



ROOM FOR YOUR NOTES

Besides the products covered by this brochure, Intra-Automation GmbH also manufactures other high-quality and high precision instruments for industrial measurement tasks. For more information, please contact us (contact details on the backside of this brochure).

Flow measurement

Itabar®-Flow Sensor

IntraSonic IS210 Ultrasonic Flow Meter

Level measurement

ITA-mag. Level Gauge

MAGLINK Level Indicator

Other Measurement Tasks:

DigiFlow Flow and Level Computers

IntraCon Digital Controllers

IntraDigit Digital Indicators / Meters

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