INTRA-AUTOMATION

MESS- UND REGELINSTRUMENTE / MEASUREMENT AND CONTROL

TÜVRheinland® CERT ISO 9001

IntraWedge
WEDGE FLOW METER

Type: IWM

Technical Information

01/2011

FLOW

THE EXPERT FOR LEVEL AND FLOW

Intra-Automation
Technical Information
01/2011

Technical details subject to be changed without notice.

For comments regarding this brochure, please contact:
info@intra-automation.de

IntraWedge
WEDGE FLOW METER

Type: IWM

List of Contents:

1. General Description

A Wedge Flow Meter is preferably applied in difficult-to-meter line fluids, like air entrained liquids, particular entrained liquids, high viscous liquids or slurry liquids, which are abrasive or fibrous. It is also applicable for clean liquids, gas/air and steam.
It consists of a measurement pipe with pressure taps in front and behind the flow element, a wedge restriction being welded into the measurement pipe from the top side. The pressure is being measured in front of the wedge (high or dynamic pressure side) and behind the wedge (static or low pressure side). By determining the difference of these two measurements, which is called the differential pressure, the volume flow of the fluid can be calculated, as all other characteristics of the measuring points are constant.
As the wedge has the profile of an isosceles triangle, the form is the same from both sides. So the measurement is possible in both directions.

2. Main Features

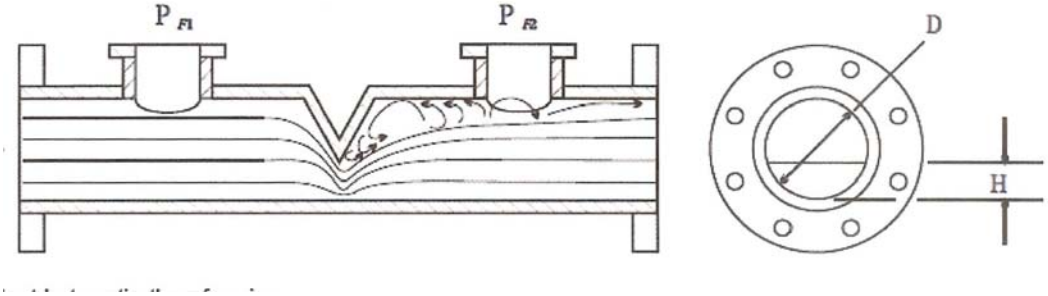
- Simple principle of operation allows functionality on any fluid.
- Long life without maintenance.
- Minimal upstream and downstream requirements.
- Low permanent pressure loss.
- Sizes ½" to 48".
- Different H/D (opening) ratios
- Bidirectional measurement possible.

3. Measuring Principle

The line fluid is forced downward similar to a segmental orifice plate, but is guided along a slopping "wedge" shape rather than a sharp edge. The pressure taps are located upstream and downstream of the wedge and in all cases are equipped with sealed sensors.

The differential pressure produced by the device is a function of the wedge segment opening (H) and the diameter of the body, D.

FLOW ➔



4. Equations

The equivalent beta ratio is:

$$\beta_{wedge} = \frac{D}{D} = \left(\frac{1}{\pi} \left\{ arc\cos\left[1 - \frac{2H}{D}\right] - 2\left[1 - \frac{2H}{D}\right]\left(\frac{H}{D} - \left[\frac{H}{D}\right]^2\right)^{1/2} \right\} \right)^{1/2}$$

Discharge coefficients are as follows for the line sizes indicated:

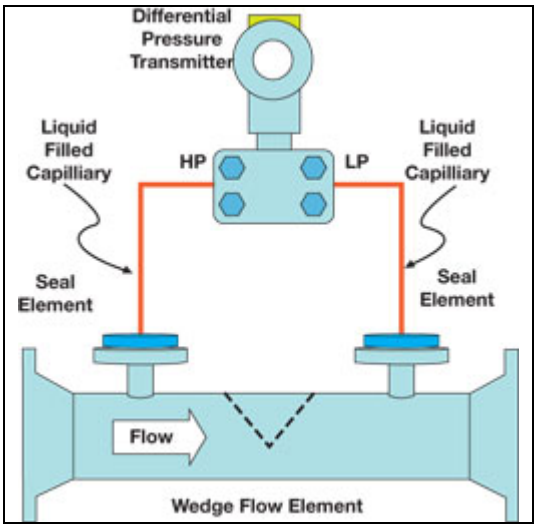
Line size:	Discharge coefficient:
0,5"	$C = 0{,}7883 + 0{,}107\left(1 - \beta^2{}_{wedge}\right)$
1…1,5"	$C = 0{,}6143 + 0{,}718\left(1 - \beta^2{}_{wedge}\right)$
1,5…24"	$C = 0{,}5433 + 0{,}2453\left(1 - \beta^2{}_{wedge}\right)$

The mass flow rate equation for incompressible flow is:

$$Q_M = N_{MG} \frac{Cd^2}{\sqrt{1-(d/D)^4}} \sqrt{F_P G_F} \sqrt{H_W}$$

N_{MG} = dimensional constant
H_W = differential inches of water
G_F = specific gravity
F_P = thermal expansion factor

The calculations for compressible flow are similar but must take account to temperature and adiabatic expansion and compressibility factors.



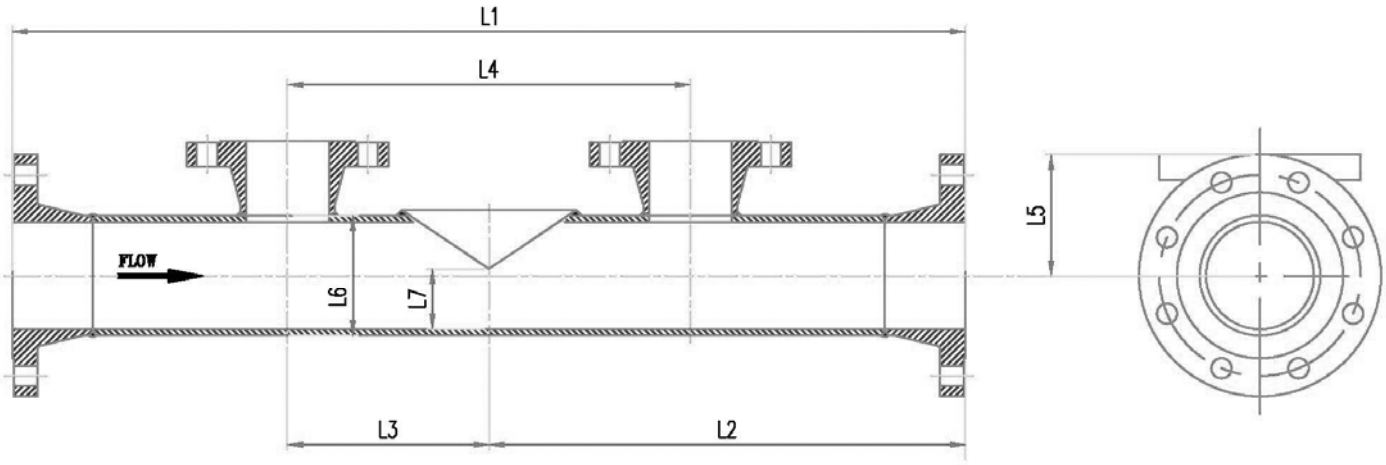
Solids and other debris easily pass under the restriction of the wedge meter. The inherent ruggedness of the restriction resists damage to its measuring edge.

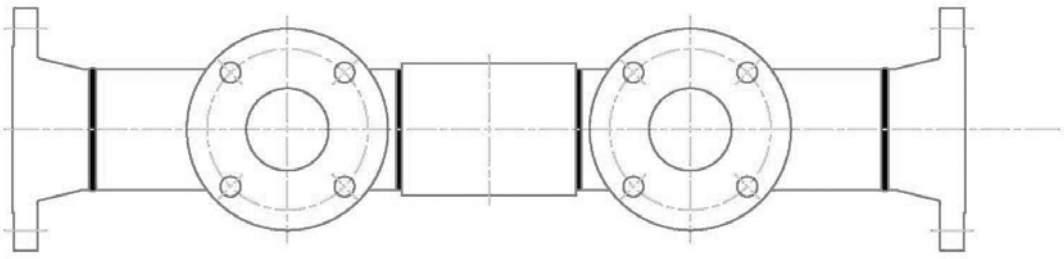
5. Dimensions

Table of standard dimensions:

Line size		L1		L2		L3		L4		L5		L6		L7	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
50	**2**	700	28	350	14	116	4,63	232	9,26	180	7,19	50	2	tba	tba
75	**3**	850	34	425	17	190	7,56	380	15,12	195	7,75	75	3	tba	tba
100	**4**	900	36	450	18	190	7,50	380	15,00	210	8,25	100	4	tba	tba
150	**6**	1000	40	500	20	225	9,00	450	18,00	235	9,31	150	6	tba	tba
200	**8**	1050	42	525	21	260	10,25	520	20,50	260	10,31	200	8	tba	tba
250	**10**	1125	45	565	22,5	295	11,75	590	23,50	285	11,38	250	10	tba	tba
300	**12**	1175	47	590	23,5	335	13,25	665	26,50	310	12,38	300	12	tba	tba
350	**14**	1225	49	615	24,5	350	14,00	700	28,00	325	13,00	350	14	tba	tba
400	**16**	1225	49	615	24,5	385	15,25	765	30,50	350	14,00	400	16	tba	tba
450	**18**	1300	52	650	26	420	16,75	840	33,50	375	15,00	450	18	tba	tba
500	**20**	1400	56	700	28	465	18,50	925	37,00	400	16,00	500	20	tba	tba
600	**24**	1550	62	775	31	525	21	1050	42,00	450	18,00	600	24	tba	tba

(Larger sizes on demand)





6. Order codes

Code	Description
IWM	Wedge Flow Meter
	Dimensions (inside diameter & wall thickness)
ID…/WS…	Please complete with dimensions in mm.
	Material of construction
C	Carbon Steel
S	Stainless Steel 316 / 316L
H	Hastelloy
M	Monel
Y	other material, please specify
	Pessure taps
F	Flanged, 3”
N	½” NPT pipe tap
Y	others, please specify
	Process connection 1
T000	Threaded connection
W000	Welding ends
XXXX	DIN flanges (see table 1)
XXXX	ANSI flanges (see table 2)
YYYY	Other standard flanges, please specify
	Process connection 2
	Threaded connections
NM	NPT male
NF	NPT female
GM	G male
GF	G female
RM	R male
RF	R female
	Welding ends
00	
	ANSI flanges
AF	FF
AR	RF
AJ	RTJ
	DIN flanges
DB	Form B
DC	Form C
DF	Form F
DN	Form N
	Other standard flanges
YY	Please specify
	H/D ratio
2	0,2
3	0,3
4	0,4
5	0,5
6	0,6
7	0,7

IWM						

Table 1 DIN flanges:

		Pressure ratings			
		PN16	PN40	PN64	PN100
	Code 2 ➔	1	2	3	4
Code 1	Pipe size				
D01	DN15				
D02	DN25				
D03	DN40				
D04	DN50				
D05	DN80				
D06	DN100				
D07	DN150				
D08	DN200				
D09	DN250				
D10	DN300				
D11	DN350				
D12	DN400				
D13	DN450				
D14	DN500				
D15	DN600				
D16	DN700				
D17	DN800				
D18	DN900				
D19	DN1000				

e.g.: DIN flange DN100 PN40 = D063

Table 2 ANSI flanges:

		Pressure ratings:		
		150 lbs	300 lbs	600 lbs
	Code 2 ➔	5	6	7
Code 1	Pipe size			
A01	½”			
A02	1”			
A03	1 ½”			
A04	2”			
A05	3”			
A06	4”			
A07	6”			
A08	8”			
A09	10”			
A10	12”			
A11	14”			
A12	16”			
A13	18”			
A14	20”			
A15	24”			
A16	28”			
A17	32”			
A18	36”			
A19	40”			

e.g. ANSI flange 10” 300 lbs = A096

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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