

# INSTRUCTION

for

## FLEMCO Flow Meter

### Liquid and Gas

#### Application

FLEMCO flow meter measures liquid or gas flow according to the differential pressure principle. The fluid must be in one phase and the pipe shall run full in the measuring section.

Changes of flow shall be slowly i.e. without pulsations.

#### Storage

Before installation the flow meter must be kept clean and protected against corrosion and physical damage.

#### Pipe Run

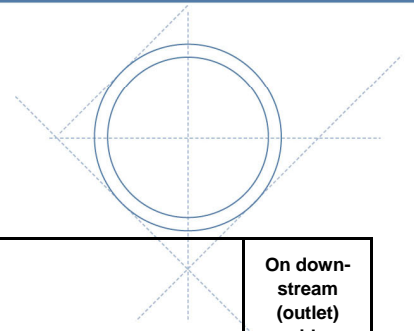
The FLEMCO flow meter shall be mounted between 2 flanges. The 2 adjacent pipe sections shall form a straight cylindrical pipe of constant cross-sectional area without any obstructions.

The inner pipe diameter  $D$  must not vary more than 0,3% of  $D$  used in the bore calculation.

The required minimum straight lengths of pipe vary according to beta and the nature of obstruction - bends, reducers etc. From the table below it can be seen how many times the inner pipe diameter  $D$  is required for "zero additional uncertainty".

The values in the brackets give "+/-0,5% additional uncertainty". These are applicable when the length of the straight pipe run is between the unbracket and the bracket values.

If the straight lengths are shorter than the bracketed values no information is available of the value of any further uncertainty.



$\beta$	On upstream (inlet) side of the primary device							On downstream (outlet) side
	Single 90° bend or tee (flow from one branch only)	Two or more 90° bends in the same plane	Two or more 90° bends in different planes	Reducer (2 D to D over a length of 1,5 D to 3 D)	Expander (0,5 D to D over a length of 1 D to 2 D)	Globe valve fully open	Gate valve fully open	All fittings included in this table
≤ 0,20	10 (6)	14 (7)	34 (17)	5	16 (8)	18 (9)	12 (6)	4 (2)
0,25	10 (6)	14 (7)	34 (17)	5	16 (8)	18 (9)	12 (6)	4 (2)
0,30	10 (6)	16 (8)	34 (17)	5	16 (8)	18 (9)	12 (6)	5 (2,5)
0,35	12 (6)	16 (8)	36 (18)	5	16 (8)	18 (9)	12 (6)	5 (2,5)
0,40	14 (7)	18 (9)	36 (18)	5	16 (8)	20 (10)	12 (6)	6 (3)
0,45	14 (7)	18 (9)	38 (19)	5	17 (9)	20 (10)	12 (6)	6 (3)
0,50	14 (7)	20 (10)	40 (20)	6 (5)	18 (9)	22 (11)	12 (6)	6 (3)
0,55	16 (8)	22 (11)	44 (22)	8 (5)	20 (10)	24 (12)	14 (7)	6 (3)
0,60	18 (9)	26 (13)	48 (24)	9 (5)	22 (11)	26 (13)	14 (7)	7 (3,5)
0,65	22 (11)	32 (16)	54 (27)	11 (6)	25 (13)	28 (14)	16 (8)	7 (3,5)
0,70	28 (14)	36 (18)	62 (31)	14 (7)	30 (15)	32 (16)	20 (10)	7 (3,5)
0,75	36 (18)	42 (21)	70 (35)	22 (11)	38 (19)	36 (18)	24 (12)	8 (4)
0,80	46 (23)	50 (25)	80 (40)	30 (15)	54 (27)	44 (22)	30 (15)	8 (4)

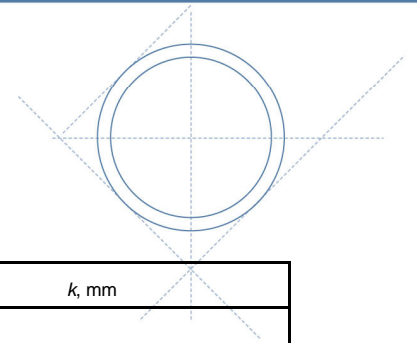
For all $\beta$ values	Fittings	Minimum upstream (inlet) straight length required
	Abrupt symmetrical reduction having a diameter ratio $\geq 0,5$	30 (15)
	Thermometer pocket or well of diameter $\leq 0,03 D$ Thermometer pocket or well of diameter between $0,03 D$ and $0,13 D$	5 (3) 20 (10)

It is recommended to use full bore valves upstream of the flow meter.  
The valves shall be fully open.

The inside surface of the measuring pipe shall be clean, free from pitting and deposit for at least a length of 10 times D upstream and 4 times D downstream of the orifice plate.

The inner roughness shall be below the limits given in the table below.

Upper limits of relative roughness of the upstream pipe-line for orifice plates											
$\beta$	≤ 0,3	0,32	0,34	0,36	0,38	0,4	0,45	0,5	0,6	0,7	0,8
Corner taps 104k/D	25	18,1	12,9	10,0	8,3	7,1	5,6	4,9	4,2	4,0	3,9
Flange taps and D and D/2 taps 104k/D	25	18,1	12,9	10	10	10	10	10	10	10	10



Typical inner pipe wall roughness are stated below.

Examples of values of the pipe well roughness  $k$

Material	Condition	$k$ , mm
brass, copper, aluminium, plastics, glass	smooth, without sediments	< 0,03
steel	new, seamless cold drawn	< 0,03
	new, seamless hot drawn	0,05 to 0,10
	new, seamless rolled	0,10
	new, welded longitudinally	0,10 to 0,20
	new, welded spirally	0,20 to 0,30
	slightly rusted	0,50 to 2
	rusty	> 2
	encrusted	0,03 to 0,05
cast iron	with heavy incrustations	0,10 to 0,20
	bituminized, new	0,13
	bituminized, normal	0,25
	galvanised	1,0 to 1,5
asbestos cement	new	> 1,5
	rusty	0,03 to 0,05
	encrusted	
asbestos cement	bituminized, new	
	bituminized, normal	

## Installation

The FLEMCO flow meter must be centred carefully in the pipe line. The flow meter is suitable for both horizontal and vertical pipe lines. The FLEMCO shall be installed in the pipe line respecting the flow arrow on the flow meter.

## Gas

When the flow meter is installed in a horizontal pipe measuring a flow which tends to condensate the orifice plate is provided with a drain hole to let the liquid pass the flow meter. The drain hole must be at the bottom of the pipe. The electronics shall be mounted above the pipe line.

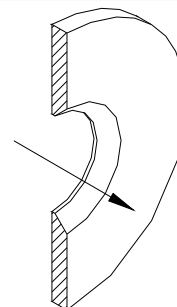
## Liquid

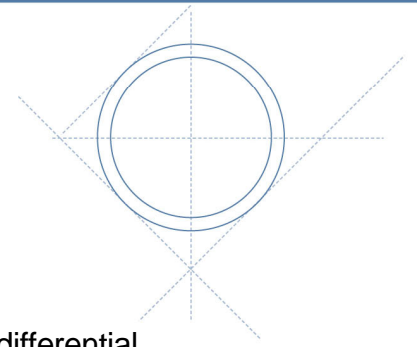
If a liquid in a flow measurement tends to form a gas the flow meter is provided with a vent hole to let the gas pass the orifice plate. The vent hole must be in the top of the flow meter.

The electronics shall be mounted below the pipe line.

Flange gaskets must suit the fluid and the service conditions.

The inner diameter of the flange gaskets must be greater than the inner pipe diameter. It is advised that the outer diameter of the gaskets is equal to the diameter of





the bolt circle minus the diameter of a bolt.

### **Electronics, Differential pressure transmitter**

When the FLEMCO flow meter is supplied as a complete unit, the differential pressure transmitter is calibrated to the required flow rate.

### **Power supply**

The electronics shall be powered with 24 Vdc with max. 2 % ripple. The max load Must exceed 500 Ohm.

The 2 wire connection is connected to + and – respectively.

### **Output signal**

As standard the output signal is analogue 4 – 20 mA, linear to flow. Other output signals and communication standards are available.

### **Damping of output signal**

The output signal from the electronics is damped suitable for flow measurement, further adjustment should not be necessary.

### **Setting of a new flow rate**

Is a new flow rate required a new differential pressure calculation has to be performed. The differential transmitter is re-ranged by using a hand-held communicator connected to test terminals on the transmitter.

### **Other Requirements**

For explosion proof applications special requirements are applicable. Digital communication is possible for certain types. For full details see transmitter instruction manual.

### **Instrument Connection**

The flow meter is normally supplied with a 3 valve manifold valve in connection with the differential pressure transmitter in order to isolate and equalise.

### **Maintenance**

The FLEMCO flow meter no special maintenance. It is however important that the flow meter suffers no mechanical damages .

### **References**

ISO 5167, DIN 1952, DIN 19205 part 1, ASME MFC-3M, Shell Flow Meter Engineering Handbook, R.W. Miller : Flow Measurement Engineering Handbook.