LDB Flow Meter Instruction Manual

Edition 3

Table of Contents

1 Introduction

This technical information brochure contains technical specifications of the LDB electromagnetic flow meter series and provides installation instructions for end users and design engineers.

1.1 Supplier / manufacturer

Name: Wuxi QiuXin FlowMerer Co.,Ltd

Address: QinXiang Industrial Zone,117 West Shen Xiang Road,Huishan District, Wuxi City,Jiangsu Province,P.R.China,214152

1.2 Product name

Type LDB Electromagnetic Flowmeter

1.3 Product type

Electromagnetic Flowmeter for the measurement of conductive fluid flow in closed pipes. The principle of measurement is based upon Faraday's laws of electromagnetic induction.

1.4 Issue date

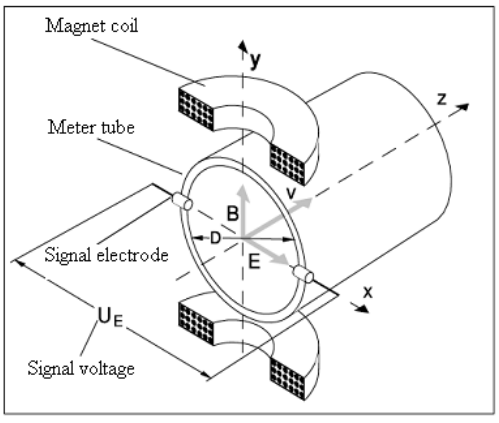
7th Feb, 2014

1.5 Document Version no.

V3.0 File: TI_LDB_V03_10_05.doc

2 Principle of Operation

Faraday's law of electromagnetic induction states that an inductive voltage is generated when a conductor moves through a magnetic field. This principle is used as the basis of flow measurement in the LDB electromagnetic flowmeter. In the electromagnetic flowmeter, the flowing fluid corresponds to the moving conductor as described in Faraday's law.



$$U_E \infty B * D * v$$

The induced voltage UE is directly proportional to magnetic field intensity (B), electrode spacing (D) and average fluid velocity (v). Since magnetic field intensity (B) and the electrode spacing (D) are constant values, induced voltage U_E is therefore directly proportional to the average flow velocity (v).

$$Q = (\Pi * D2) / 4 * v \quad \text{therefore} \quad U_E \infty Q$$

The equation for calculating volumetric flow rate (Q) shows that the induced voltage (UE) is linear and directly proportional to the average velocity (v). In the flowmeter transmitter, the induced voltage (UE) from the electrodes is used to calculate volumetric flow rate (Q) based upon the pipe's internal diameter.

U_E = Induced voltage

B = Magnetic field strength

D = Electrode spacing

V = Fluid velocity

Q = Instantaneous volumetric flow rate

3 Product Styles, Features and Applications

3.1 Product Styles

An electromagnetic flowmeter is comprised of a flow tube and a transmitter. Two product styles are available:

Compact type
Transmitter is integral with flow tube

Remote type
Transmitter is remote from flow tube

3.2 Features

Available Sizes	ISO: US:	DN15…DN3000 1/2”…56”
Accuracy	Standard: Optional:	±0.5% (0.6m/sec to 15 m/sec) ±0.2% (1.0m/sec to 15 m/sec)
Measurement Range	Up to:	381,704 m3/hr 1,727,305 gal/min
Maximum Flow Velocity	12m/sec	
Measurement Resolution	±1mm/sec	
Turndown	Up to 1500:1	
Process Connections	GB Flange JIS Flange DIN Flange (DIN 2501) ANSI Flange (B16.5) Wafer Design	
Lining Materials	Neoprene PTFE Polyurethane PFA Tefzel (PFA and Tefzel lining available with wire net reinforcement for negative pressure applications)	
Electrode Materials	316L Stainless Steel Hastelloy-C22 Hastelloy-B10 Titanium Tantalum Platinum/iridium Alloy Tungsten Carbide Coated 316L Stainless Steel	
Removable Electrode	In-situ Electrode Maintenance and Replacement Option Available	
Housing Protection Class	IP65 IP67 (Compact versions only) IP68 (Remote Versions Only)	
Remote Transmitter	Pipe Mount or Wall Mount	
Available Power Supplies	85…265VAC 16…36VDC	
Transmitter Configuration Options	Front Panel Keypad Hand Held Infrared Programmer	
Output Signals	1 x Active Current Output 1 x Passive Current Output 1 x Frequency / Pulse Output	
Status Outputs	2 x Contact / Status Outputs for Upper and Lower Flow Limit	
Digital Communication	RS485 Modbus, HART	

3.3 Applications

The LDB electromagnetic flowmeter range is designed to measure the volumetric flow of conductive liquids and slurries within closed pipelines in industries such as water & wastewater, chemical, petroleum, metal production, power, pharmaceutical, food & beverage, pulp & paper, etc. The LDB is the ideal instrument for measuring:

- Acidic & alkali fluids
- Paint
- Viscous fluids and slurries
- Water & wastewater flows

Note: the minimum conductivity of the measured flow must be ≥ 5μS/cm for the meter to function correctly.

4 Specifications

Sizes	Flanged (Metric)	DN15…DN3000	
	Flanged (US)	1/2”…56”	
	Wafer Design	DN15…DN100	
Nominal Pressure	GB,JIS and DIN Flange	0.6 MPa, 1.0 MPa, 1.6 MPa, 4.0 MPa	
	ANSI Flange	Class 150, Class 300	
	Wafer Design	1.6 MPa, 4.0 MPa	
	For additional pressure requirements, please contact manufacturer		
Accuracy (pulse output)	Standard	±0.5% (0.6m/sec to 12 m/sec)	
	Optional	±0.2% (1.0m/sec to 12 m/sec)	
Measurement Resolution	±1mm/sec		
Max Flow Tube Velocity	SI:	49 ft/s	
	US:	12 m/s	
Ambient Temperature	-25…+55°C / -13…+131°F		
Relative Humidity	5%…90%		
Conductivity	≥5 μS/cm		
Transmitter Mounting Availability	Compact type	Sizes: DN15…DN1000 1/2”…40”	
	Remote type	Sizes: DN15…DN3000 1/2”…56”	
	Note 1: Cable between flow tube and remote transmitter is type SMFE100 Note 2: Remote unit supplied with 10m cable as standard Note 3: Max cable length is 200m (650ft)		

	Material	**SI**	**US**
Liner Material Options	Neoprene (std)	DN15…DN3000	1/2”…56”
	PTFE	DN15…DN1000	1/2”…40”
	Polyurethane	DN15…DN300	1/2”…12”
	PFA	DN15…DN250	1/2”…10”
	PFA with optional wire reinforcement	DN80…DN250	3”…10”
	Tefzel	DN15…DN250	1/2”…10”
	Tefzel with optional wire reinforcement	DN80…DN250	3”…10”
Electrode Material Options	316L stainless steel (std)	DN15…DN3000	1/2”…56”
	Hastelloy – C22	DN15…DN1000	1/2”…40”
	Hastelloy – B10	DN15…DN1000	1/2”…40”
	Titanium	DN15…DN250	1/2”…10”
	Tantalum	DN15…DN250	1/2”…10”
	Platinum/iridium Alloy	DN15…DN250	1/2”…10”
	316L with tungsten carbide coating	DN15…DN600	1/2”…24”

Grounding Options	Flange Grounding		DN15…DN3000	1/2”…56”
	Grounding Ring		DN15…DN250	1/2”…10”
	Electrode Grounding		DN50…DN3000	2”…56”
	Inlet protection ring		DN50…DN300	2”…12”
	Type	**Liner**	**Standard**	**Optional**
Max Process Temperature Limits	Compact	Neoprene	80°C / 176°F	120°C / 248°F
		PTFE	80°C / 176°F	120°C / 248°F
		Polyurethane	80°C / 176°F	-
		PFA	80°C / 176°F	120°C / 248°F
		Tefzel	80°C / 176°F	-
	Remote	Neoprene	80°C / 176°F	120°C / 248°F
		PTFE	80°C / 176°F	120°C / 248°F 180°C / 356°F
		Polyurethane	80°C / 176°F	-
		PFA	80°C / 176°F	120°C / 248°F
		Tefzel	80°C / 176°F	-
Environmental Protection Class	Compact		IP 65	IP67
	Remote		IP 65	IP 68
Power Supply Options	85…265VAC / 45…63Hz, 20VA			
	16…36VDC, 16VA			
Display	2 or 3 line backlit LCD			
Configuration Access	Front panel keypad			
	Hand held infrared remote control (optional)			
Output Signals	Active analog current output		Max load resistance	0…1.5kΩ for 0…10mA 0…750Ω for 4…20mA
			Accuracy = same as pulse output ±0.1% of rate	
			Option: HART Protocol	
	Passive analog current output		Requires 24Vdc external supply to operate	
			Accuracy = same as pulse output ±0.1% of rate	
	Pulse / frequency and alarm outputs		Optically isolated open collector output powered either internally or externally Int. power: 28VDC with 1.2kΩ pull-up resistor Ext. power: ⩽36VDC, max current 250mA	
	Digital Communications		RS485 Modbus	
			HART (superimposed on current output)	
			All interfaces have built in lightning protection	
Electrical isolation	Isolation between all I/O and input power no less than 500V			
	Isolation between all I/O and ground no less than 500V			
	Isolation between flow tube and transmitter outputs no less than 500V			
Standard	JB/T 9248-1999 Electromagnetic Flowmeter			

5 Accuracy

Standard calibration (pulse output):

±0.5% of reading (flow velocity >0.6 m/s) or ±3mm/s of reading (flow velocity ≤0.6 m/s)

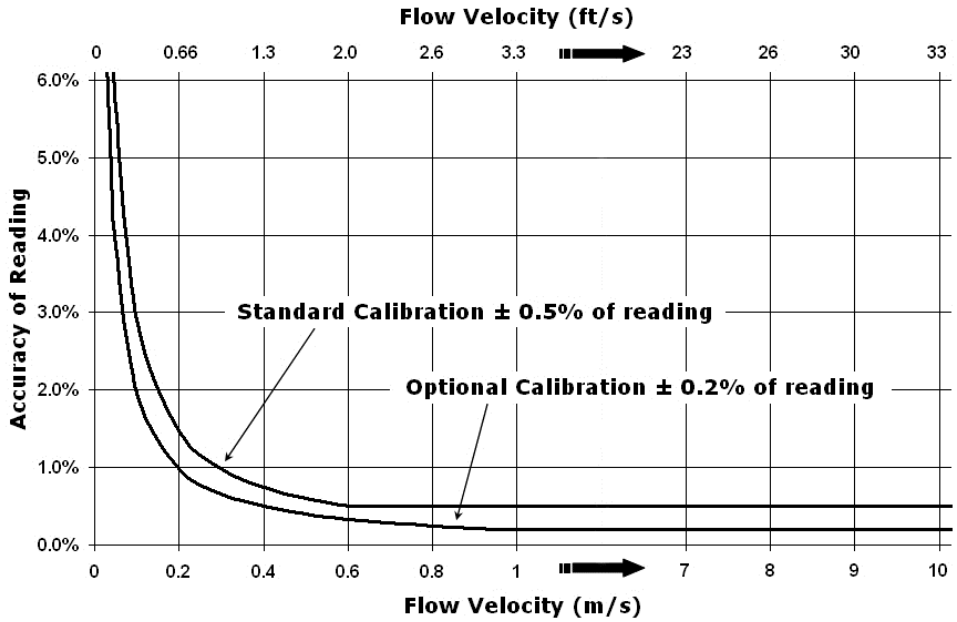
±0.5% of reading (flow velocity >1.97 ft/s) or ±0.01 ft/s of reading (flow velocity ≤1.97 ft/s)

Optional high accuracy calibration (pulse output):

±0.2% of reading (flow velocity>1.0 m/s) or ±2 mm/s of reading (flow velocity ≤1.0 m/s)

±0.2% of reading (flow velocity>3.28 ft/s) or ±0.006 ft/s of reading (flow velocity ≤3.28 ft/s)

Analog Output Accuracy: Same as pulse output plus ±0.1% of rate.



Flowmeter Error Curve

Accuracies stated under reference conditions per JB/T9248 – 1999:

- Ambient Temperature: 20°C (68°F) ±2°C (3.6°F)
- Relative Humidity: 60% … 70%
- Power supply: AC: 85 … 265 VAC / 45 … 63Hz or DC: 18…36V
- Installation conditions:
- Straight upstream section with length > 10×Pipe Ø, downstream section >5 Pipe Ø
- Warm-up time before testing: 30 minutes

6 Velocity / Flow Charcteristics

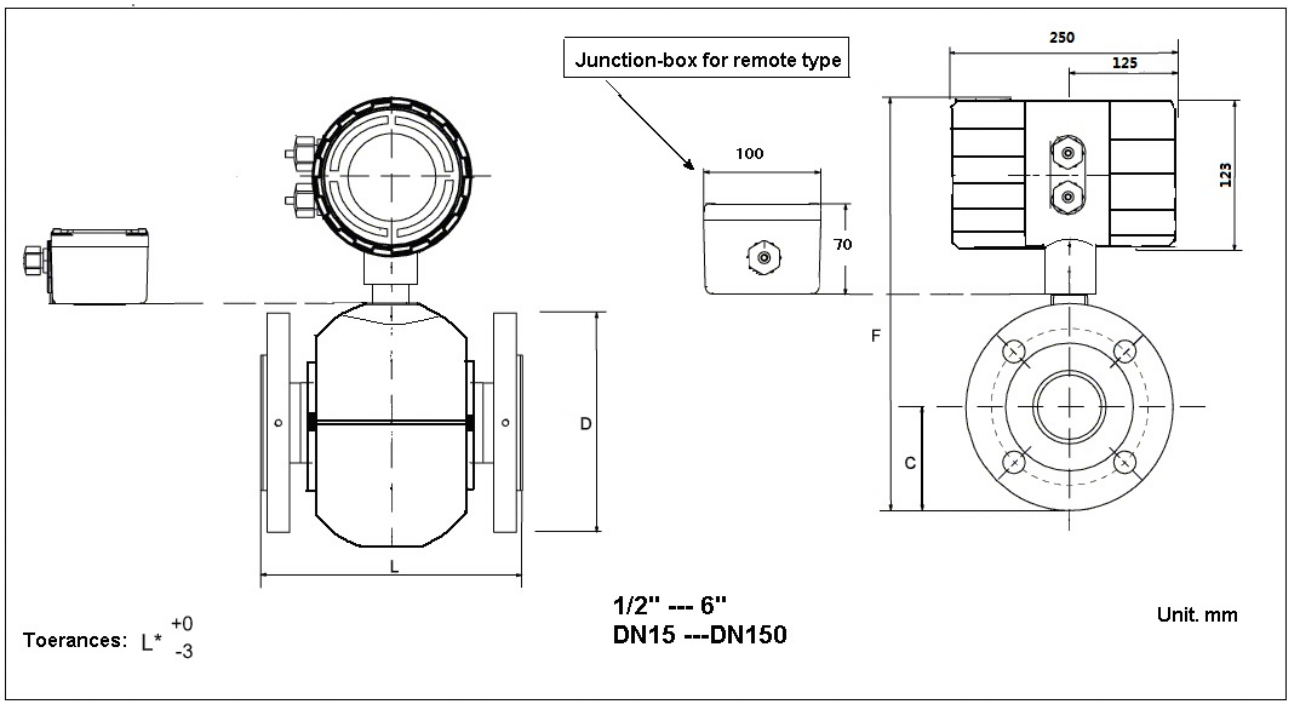
Nominal Diameter		Full scale flow (m3/h)			Full scale flow (US Gal/min)		
mm	Inches	v=0.3 m/s	v=1.0 m/s	v =15m/s	v=1.0 ft/s	v=3.0 ft/s	v=49 ft/s
		Min		Max	Min		Max
15	½	0.1909	0.6362	9.543	0.6120	1.836	29.99
20	¾	0.3393	1.131	16.96	1.377	4.131	67.47
25	1	0.5301	1.767	26.51	2.448	7.344	120.0
32	1½	0.8686	2.895	43.43	3.825	11.47	187.4
40	1½	1.357	4.524	67.86	5.508	16.52	269.9
50	2	2.121	7.069	106.0	9.792	29.38	479.8
65	2½	3.584	11.95	179.2	15.30	45.90	749.7
80	3	5.429	18.10	271.4	22.03	66.10	1080
100	4	8.482	28.27	424.1	39.17	117.5	1919
125	5	13.25	44.18	662.7	61.20	183.6	2999
150	6	19.09	63.62	954.3	88.13	264.4	4318
200	8	33.93	113.1	1696	156.7	470.0	7677
250	10	53.01	176.7	2651	244.8	734.4	11995
300	12	76.34	254.5	3817	352.5	1058	17273
350	14	103.9	346.4	5195	479.8	1439	23510
400	16	135.7	452.4	6786	626.7	1880	30708
450	18	171.8	572.6	8588	793.1	2379	38864
500	20	212.1	706.9	10603	979.2	2938	47981
600	24	305.4	1018	15268	1410	4230	69092
700	28	415.6	1385	20782	1919	5758	94042
800	32	542.9	1810	27144	2507	7520	122830
900	36	687.1	2290	34353	3173	9518	155457
1000	40	848.2	2827	42412	3917	11750	191922
1200	48	1221	4072	61073	5640	16921	276368
1400	56	1663	5542	83127	7677	23031	376168
1600	-	2171	7238	108574	10027	30081	491321
1800	-	2748	9161	137414	12690	38071	621829
2000	-	3393	11310	169647	15667	47001	767690
2200	-	4105	13685	205273	18957	56872	928904
2400	-	4886	16286	244292	22561	67682	1105473
2600	-	5734	19114	286703	26477	79432	1297396
2800	-	6650	22167	332508	30708	92123	1504672
3000	-	7634	25447	381705	35251	105753	1727302

Flow (m3/h) = 0.00282744 × D2 × V (D = mm, V = m/s)

Flow (US Gal/min) = 2.44799 × D2 × V (D = inch, V = ft/s)

7 LDB Flow Tube Dimensions

7.1 DN15 … DN150 / ½" … 6" Dimensions



7.1.1 DN15 … DN150 Dimensions (GB, DIN Sizes)

Nominal Size	Nominal Pressure Class	Dimensions			Bolt information						OD of flange (D)		Approximate weight	
					Diameter of Bolt Circle (K)		Diameter of Bolt Holes (A)		Number of bolts (n)					
GB,DIN		L	C	F	1.6	4.0	1.6	4.0	1.6	4.0	1.6	4.0	1.6	4.0
mm	MPa	mm	mm	mm	mm	mm	mm	mm	n	n	mm	mm	kg	kg
15	1.6 or 4.0	230	48	315	65	65	14	14	4	4	95	95	7	7
20		230	53	325	75	75	14	14	4	4	105	105	9	9
25		230	58	330	85	85	14	14	4	4	115	115	11	11
32		230	70	380	100	100	18	18	4	4	140	140	12	12
40		230	75	380	110	110	18	18	4	4	150	150	13	13
50		230	83	385	125	125	18	18	4	4	165	165	14	14
65		230	93	405	145	145	18	18	4	8	185	185	22	23
80		230	100	420	160	160	18	18	8	8	200	200	26	28
100		230	118	455	180	190	18	22	8	8	235	235	28	32
125		280	135	500	210	220	18	26	8	8	270	270	35	41
150		280	150	500	240	250	22	26	8	8	300	300	38	44

7.1.2 ½" … 6" Dimensions (ANSI, Metric Units)

Nominal Size	Nominal Pressure Class	Dimensions			Bolt information						OD of flange (D)		Approximate weight	
					Diameter of Bolt Circle (K)		Diameter of Bolt Holes (A)		Number of bolts (n)					
ANSI		L	C	F	150	300	150	300	150	300	150	300	150	300
inch	ANSI	mm	mm	mm	mm	mm	mm	mm	n	n	mm	mm	kg	kg
15	150 or 300	230	48	315	60.5	66.5	15.7	15.7	4	4	89	95	8	8
20		230	59	325	69.9	82.6	15.7	19.1	4	4	99	117	10	10
25		230	62	330	79.2	88.9	15.7	19.1	4	4	108	124	11	13
32		230	67	380	88.9	98.6	15.7	19.1	4	4	117	133	11	13
40		230	78	380	98.6	114.3	15.7	22.4	4	4	127	155	12	16
50		230	83	385	120.7	127	19.1	22.4	4	8	152	165	14	16
65		230	96	405	139.7	149.4	19.1	22.4	4	8	178	191	24	27
80		230	105	420	152.4	168.1	19.1	22.4	4	8	191	210	28	33
100		230	127	455	190.5	200.2	19.1	22.4	8	8	229	254	32	40
125		280	140	500	215.9	235	22.4	22.4	8	8	254	279	38	51
150		280	159	500	241.3	269.7	22.4	22.4	8	8	279	318	41	60

7.1.3 ½" … 6" Dimensions (ANSI, English Units)

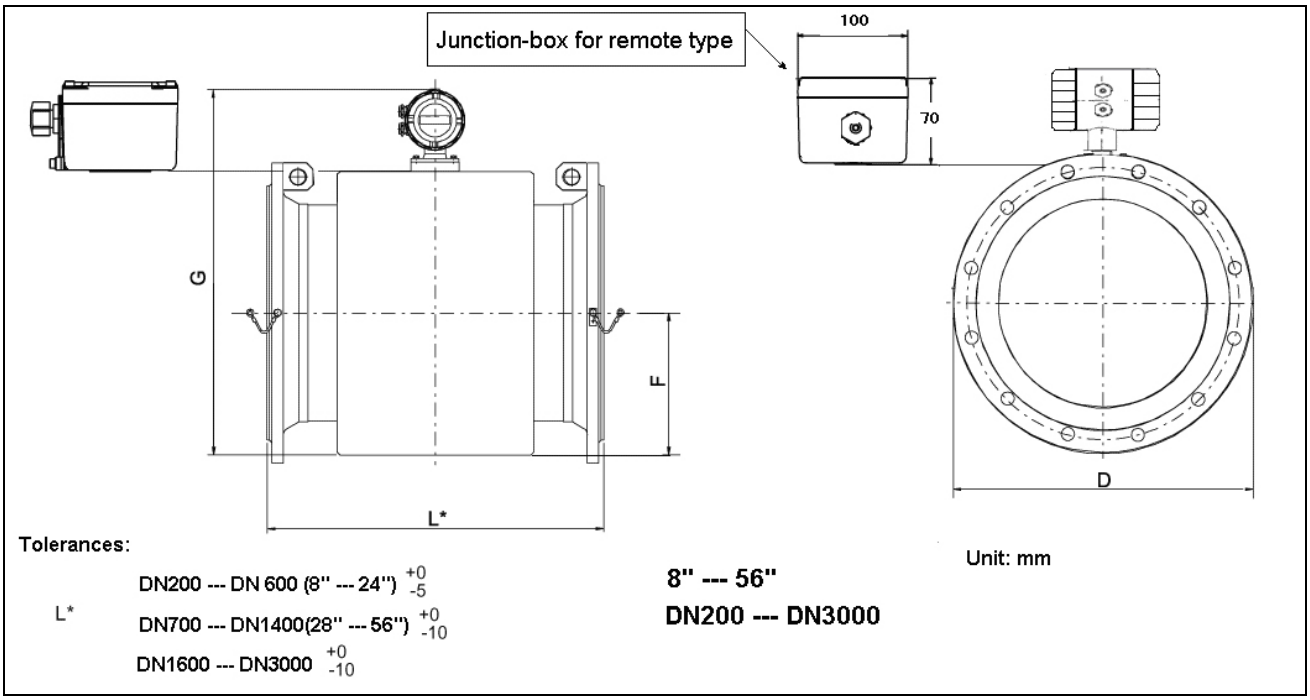
Nominal Size	Nominal Pressure Class	Dimensions			Bolt information						OD of flange (D)		Approximate weight	
					Diameter of Bolt Circle (K)		Diameter of Bolt Holes (A)		Number of bolts (n)					
ANSI		L	C	F	150	300	150	300	150	300	150	300	150	300
inch	ANSI	inch	inch	inch	inch	inch	inch	inch	n	n	inch	inch	lb	lb
15	150 or 300	9.05	1.89	12.4	2.38	2.62	0.62	0.62	4	4	3.50	3.75	18	19
20		9.05	2.32	12.8	2.75	3.25	0.62	0.75	4	4	3.88	4.62	21	23
25		9.05	2.46	12.99	3.12	3.50	0.62	0.75	4	4	4.25	4.88	26	28
32		9.05	2.64	14.96	3.50	3.88	0.62	0.75	4	4	4.62	5.25	25	30
40		9.05	3.07	14.96	3.88	4.50	0.62	0.88	4	4	5.00	6.12	28	36
50		9.05	3.27	15.16	4.75	5.00	0.75	0.88	4	8	6.00	6.50	31	36
65		9.05	3.77	15.94	5.50	5.88	0.75	0.88	4	8	7.00	7.50	53	59
80		9.05	4.14	16.54	6.00	6.62	0.75	0.88	4	8	7.50	8.25	62	73
100		9.05	5.02	17.91	7.50	7.88	0.75	0.88	8	8	9.00	10.0	71	89
125		11.02	5.52	19.69	8.50	9.25	0.88	0.88	8	8	10.0	11.0	84	112
150		11.02	6.27	19.69	9.50	10.62	0.88	0.88	8	8	11.0	12.5	91	132

Other connection styles and pressure classes can be supplied to customer specification. Please contact manufacturer.

Notes:

1) "L" distance is increased 3mm (0.12") when a grounding flange is installed.
2) "L" distance is increased 5mm (0.2") when a protection flange at inlet is installed.
3) "L" distance is increased 16mm (0.63") when a lining protection flange is installed.
4) Approximate weights are for remote flow tube only. For compact type, transmitter weight of 3.5 kg (7.7 lb) should be added to the values in the tables above.

7.2 DN200 … DN3000 / 8” … 56” Dimensions



7.2.1 DN200 … DN600 Dimensions (GB/DIN)

Nominal Size	Nominal Pressure Class	Dimensions			Bolt information						OD of flange (D)		Approximate weight	
					Diameter of Bolt Circle (K)		Diameter of Bolt Holes (A)		Number of bolts (n)					
GB,DIN		L	C	F	1.0	1.6	1.0	1.6	1.0	1.6	1.0	1.6	1.0	1.6
mm	MPa	mm	mm	mm	mm	mm	mm	mm	n	n	mm	mm	kg	kg
200	1.0 or 1.6	310	170	540	295	295	22	22	8	12	340	340	45	46
250		360	203	600	350	355	22	26	12	12	395	405	67	71
300		460	230	660	400	410	22	26	12	12	445	460	94	103
350		460	260	720	460	470	22	26	16	16	505	520	145	158
400		460	290	780	515	525	26	30	16	16	565	580	180	197
450		460	320	840	565	585	26	30	20	20	615	640	215	242
500		600	358	915	620	650	26	33	20	20	670	715	245	293
600		600	420	1040	725	770	30	36	20	20	780	840	335	418

7.2.2 8" … 24" Dimensions (ANSI / Metric Units)

Nominal Size	Nominal Pressure Class	Dimensions			Bolt information						OD of flange (D)		Approximate weight	
					Diameter of Bolt Circle (K)		Diameter of Bolt Holes (A)		Number of bolts (n)					
ANSI		L	C	F	150	300	150	300	150	300	150	300	150	300
inch	ANSI	mm	mm	mm	mm	mm	mm	mm	n	n	mm	mm	kg	kg
8	150 or 300	310	191	540	298.5	330.2	22.4	25.4	8	12	343	381	52	80
10		360	223	600	362	387.4	25.4	28.4	12	16	406	445	84	120
12		460	261	660	431.8	450.9	25.4	31.8	12	16	483	521	125	171
14		460	293	720	476.3	514.4	28.4	31.8	12	20	533	584	179	257
16		460	324	780	539.8	571.5	28.4	35.1	16	20	597	648	213	334
18		460	356	840	577.9	628.7	31.8	35.1	16	24	635	711	264	417
20		600	388	915	635	685.8	31.8	35.1	20	24	699	775	311	474
24		600	458	1040	749.3	812.8	35.1	41.1	20	24	813	914	423	690

7.2.3 8" … 24" Dimensions (ANSI, English units)

Nominal Size	Nominal Pressure Class	Dimensions			Bolt information						OD of flange (D)		Approximate weight	
					Diameter of Bolt Circle (K)		Diameter of Bolt Holes (A)		Number of bolts (n)					
ANSI		L	C	F	150	300	150	300	150	300	150	300	150	300
inch	ANSI	inch	inch	inch	inch	inch	inch	inch	n	n	inch	inch	lb	lb
8	150 or 300	12.20	7.52	21.26	11.75	13.0	0.88	1.00	8	12	13.5	15.0	116	176
10		14.17	8.77	23.62	14.25	15.25	1.00	1.12	12	16	16.0	17.5	185	264
12		18.11	10.27	25.98	17.0	17.75	1.00	1.25	12	16	19.0	20.5	277	377
14		18.11	11.52	28.35	18.75	20.25	1.12	1.25	12	20	21.0	23.0	395	568
16		18.11	12.77	30.71	21.25	22.5	1.12	1.38	16	20	23.5	25.5	471	736
18		18.11	14.02	33.07	22.75	24.75	1.25	1.38	16	24	25.0	28.0	583	919
20		23.62	15.27	36.02	25.0	27.0	1.25	1.38	20	24	27.5	30.5	687	1045
24		23.62	18.02	40.94	29.5	32.0	1.38	1.62	20	24	32.0	36.0	934	1521

Other connection styles and pressure classes can be supplied to customer specification. Please contact manufacturer.

Notes:

1) "L" distance is increased 4mm (0.16") when a grounding flange is installed.
2) "L" distance is increased 8mm (0.32") when a protection flange at inlet is installed.
3) "L" distance is increased 20mm (0.79") when a lining protection flange is installed.
4) Approximate weights are for remote flow tube only. For compact type, transmitter weight of 3.5 kg (7.7 lb) should be added to the values in the tables above.

7.2.4 DN700 … DN1400 Dimensions (GB/DIN)

Nominal Size	Nominal Pressure Class	Dimensions			Bolt information						OD of flange (D)		Approximate weight	
					Diameter of Bolt Circle (K)		Diameter of Bolt Holes (A)		Number of bolts (n)					
GB,DIN		L	C	F	0.6	1.0	0.6	1.0	0.6	1.0	0.6	1.0	0.6	1.0
mm	MPa	mm	mm	mm	mm	mm	mm	mm	n	n	mm	mm	kg	kg
700	0.6 or 1.0	700	448	910	810	840	26	30	24	24	860	895	435	509
800		800	508	1215	920	950	30	33	24	24	975	1015	545	626
900		900	558	1315	1020	1050	30	33	24	28	1075	1115	655	756
1000		1000	615	1430	1120	1160	30	36	28	28	1175	1230	810	935
1200		1200	728	1605	1340	1380	33	39	32	32	1405	1455	875	1051
1400		1400	838	1830	1560	1590	36	42	36	36	1630	1675	1235	1453

7.2.5 28” … 56” Dimensions (ANSI / Metric Units)

Nominal Size	Nominal Pressure Class	Dimensions			Bolt information						OD of flange (D)		Approximate weight	
					Diameter of Bolt Circle (K)		Diameter of Bolt Holes (A)		Number of bolts (n)					
ANSI		L	C	F	150	300	150	300	150	300	150	300	150	300
inch	ANSI	mm	mm	mm	mm	mm	mm	mm	n	n	mm	mm	kg	kg
28	150 or 300	27.56	18.15	37.8	31.3	33.74	0.87	1.42	40	36	32.95	36.26	1074	1613
32		31.5	20.76	49.61	35.43	38.5	0.87	1.65	48	32	37.05	41.5	1357	2257
36		35.43	23.09	53.54	39.76	42.87	1.02	1.77	44	32	41.61	46.14	1728	2765
40		39.37	25.07	58.66	44.13	46.89	1.18	1.77	44	40	46.26	50.12	2228	3419
48		47.24	29.76	65.35	52.56	55.75	1.30	2.01	44	40	54.8	59.49	2606	4410
56		55.12	34.76	74.41	60.75	65.0	1.30	2.36	60	36	62.99	69.49	3506	6951

7.2.6 28” … 56” Dimensions (ANSI, English units)

Nominal Size	Nominal Pressure Class	Dimensions			Bolt information						OD of flange (D)		Approximate weight	
					Diameter of Bolt Circle (K)		Diameter of Bolt Holes (A)		Number of bolts (n)					
ANSI		L	C	F	150	300	150	300	150	300	150	300	150	300
inch	ANSI	inch	inch	inch	inch	inch	inch	inch	n	n	inch	inch	lb	lb
28	150 or 300	27.56	18.15	37.8	31.3	33.74	0.87	1.42	40	36	32.95	36.26	1074	1613
32		31.5	20.76	49.61	35.43	38.5	0.87	1.65	48	32	37.05	41.5	1357	2257
36		35.43	23.09	53.54	39.76	42.87	1.02	1.77	44	32	41.61	46.14	1728	2765
40		39.37	25.07	58.66	44.13	46.89	1.18	1.77	44	40	46.26	50.12	2228	3419
48		47.24	29.76	65.35	52.56	55.75	1.30	2.01	44	40	54.8	59.49	2606	4410
56		55.12	34.76	74.41	60.75	65.0	1.30	2.36	60	36	62.99	69.49	3506	6951

7.2.7 DN1600 … DN3000 Dimensions (GB/DIN)

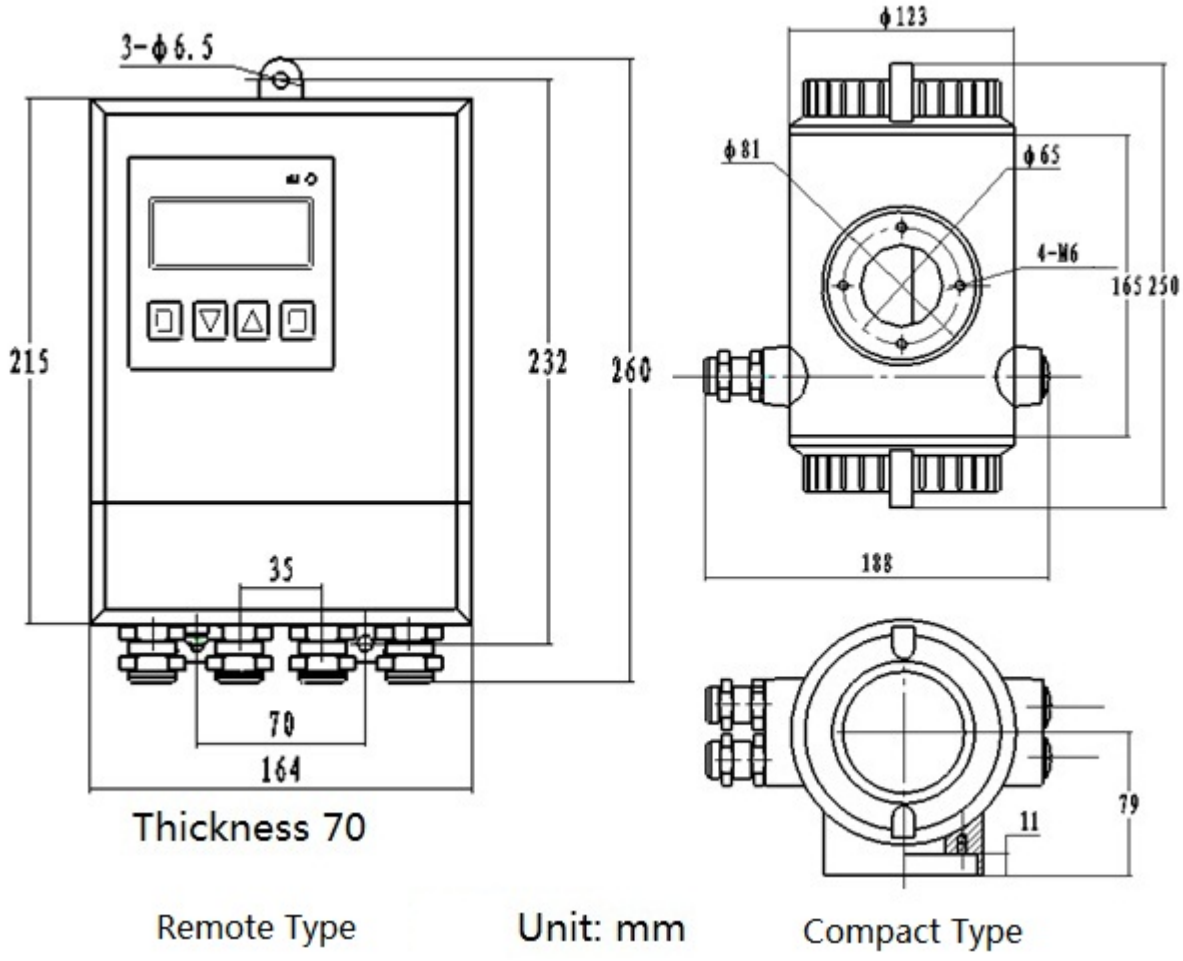
Nominal Size	Nominal Pressure Class	Dimensions			Bolt information						OD of flange (D)		Approximate weight	
					Diameter of Bolt Circle (K)		Diameter of Bolt Holes (A)		Number of bolts (n)					
GB,DIN		L	C	F	0.25	0.6	0.25	0.6	0.25	0.6	0.25	0.6	0.25	0.6
mm	MPa	mm	mm	mm	mm	mm	mm	mm	n	n	mm	mm	kg	kg
1600	0.25 or 0.6	1600	915	2180	1730	1760	30	36	40	40	1790	1830	1496	1555
1800		1800	1023	2380	1930	1970	30	39	44	44	1990	2045	1993	2085
2000		2000	1133	2580	2130	2180	30	42	48	48	2190	2265	2459	2610
2200		2200	1238	2680	2340	2390	33	42	52	52	2405	2475	2648	2830
2400		2400	1343	2890	2540	2600	33	42	56	56	2605	2685	3070	3310
2600		2600	1453	3110	2740	2810	33	48	60	60	2805	2905	3539	3875
2800		2800	1558	3320	2960	3020	36	48	64	64	3030	3115	4604	4930
3000		3000	1658	3480	31600	3220	36	48	68	68	3230	3315	5214	5580

Other connection styles and pressure classes can be supplied to customer specification. Please contact manufacturer.

Notes:

1) Approximate weights are for remote flow tube only. For compact type, transmitter weight of 3.5 kg (7.7 lb) should be added to the values in the tables above.

7.3 Transmitter Dimensions



8 Notes for Application

8.1 Necessary conditions for operation and accurate measurement

1) The measured fluid must be conductive. Minimum conductivity ≥5μs/cm.
2) The pipeline must be fully filled to ensure accurate measurement.
3) The grounding of the flow measurement system must be good.
4) The installation of the flowmeter should meet the requirements of the straight pipe section upstream and downstream.
5) The flowmeter should be kept from a strong magnetic field.

8.2 Selecting Size

The LDB is designed to continuously and accurately measure liquid flow within the rated flow range of 0.3 … 15m/s (1 … 49 ft/s). Generally the diameter selected for a flowmeter is equal to that of pipeline it is installed as it is generally easier to install, meets the process working conditions and has no pressure loss.

In some operating conditions (e.g. low velocity slurry flow), to ensure reliable operation, a smaller meter is recommended to increase flow velocity in order to prevent sedimentation and therefore measurement errors.

For a large diameter pipeline with stable flow at low velocity, a smaller diameter flowmeter is recommended as this reduces cost while at the same time ensuring the meter is operating in its optimum velocity range for greater accuracy.

In order to accommodate a smaller meter in a pipeline, reducers are necessary before and after the flowmeter. It is important to install reducers with a center cone angle no greater than 15° to ensure a consistent flow profile. Straight pipe run requirements upstream and downstream of the meter must be met in the installation otherwise accuracy may be compromised.

8.3 Recommended Flow Velocity

The optimum flow range for many applications is 1 … 5 m/s (3.3 … 16 ft/s). Taking into consideration accuracy, economy and long life, a flowmeter operating in this range will be of high accuracy, good linearity and low pressure loss, while abrasion to the lining and electrodes caused by fluid should be limited.

The recommended flow range for a fluid stream containing solid particles is 1 … 3 m/s (3.3 … 10 ft/s). Excessive abrasion to meter lining and electrodes caused by the suspended solid particles will be avoided because of the lower flow velocity.

The recommended flow range for a fluid that might deposit material in the pipeline is 2 … 5 m/s (6.5 … 16 ft/s). Higher flow velocity is necessary to eliminate excessive deposition. In addition, vertical meter installation will also help to eliminate deposition.

8.4 Fluid contacting parts

The parts contacting with the process fluid include lining, electrodes and grounding flange. Material

corrosion and abrasion resistance data along with process operating temperature must be taken into account when specifying meter wetted materials to ensure the meter is suitable for the application it is selected for.

8.5 Lining Properties

Neoprene is most commonly used for non- corrosive or weak corrosives, such as process water, wastewater, sewage, weak acid and alkali fluids.

PTFE has excellent compatibility to chemicals and has extremely good resistance to corrosive materials. It has poor performance to abrasive solutions and vacuum/negative pressure conditions.

PFA and Tefzel do not have the same chemical compatibility as PTFE, but have superior abrasion resistance. PFA and Tefzel linings are available with wire netting reinforcement to give improved vacuum/negative pressure performance.

Polyurethane rubber has extremely good abrasion resistance, but poor acid and alkali corrosion resistance. Its abrasion resistance is 10 times that of natural rubber, making it a suitable lining material for process fluids such as coal tar, pulp, sewage, etc.

8.6 Electrodes

A variety of different materials options are available for electrodes. Meters can be specified with various electrode material options depending upon the specific corrosion and abrasion resistance requirements of the process.

Available materials include:

- 316L Stainless Steel
- Hastelloy-C22 and B10 (Nickel Alloys)
- Titanium
- Tantalum
- platinum/iridium alloy

This range of materials covers nearly all chemical fluids. In order to select the right material for any particular application, it is important to consider the degree of corrosiveness of the fluid at process conditions: temperature, density, flow velocity, etc. For abrasive applications, carbide coated stainless steel material is available.

Some LDB flowmeter models are also available with an in-situ electrode replacement option. In applications where electrodes require replacement on a regular basis, this option allows for their replacement without having to shut down the pipeline. An electrode removal accessory with process isolation valve is simply attached to the electrode mounting point and used to withdraw the electrode from the line. The new electrode is installed using the reverse procedure to removal.

Electrode Removal Accessory in Place

8.7 Grounding Ring and Grounding Electrode

When installed in a plastic pipe or metal pipe with insulating lining, a grounding point at the flow tube is necessary in order to ensure reliable operation of the meter. Grounding can be achieved by fitting a

grounding ring or a third electrode in the flow tube.

Stainless steel is commonly used for grounding ring, but for more exotic materials, a grounding electrode is more commonly fitted. Made from the same material as the flow measurement electrodes, the grounding electrode establishes a reference potential and avoids any polarization caused by dissimilar materials, resulting to accurate and reliable flow measurement.

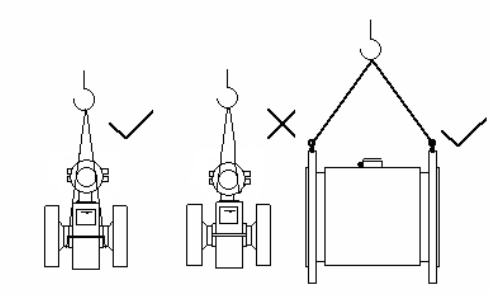
Grounding Ring

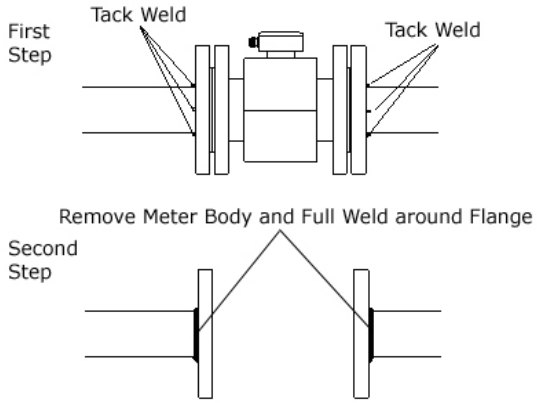
9 LDB Flow Tube Installation

Installation locations and positions vary dramatically depending upon the end users requirements. In general, electromagnetic flowmeters can be installed in horizontal, vertical and sloped orientations, but if the meter is not properly installed, performance may be less than specification. In order to get the best measurement performance, the following general installation requirements should be considered:

- The meter flow tube should be fully filled with process liquid at all times the meter is on-line. Measurement in partially filled pipes is highly inaccurate and unreliable.
- When installed in a Horizontal line, the electrode axis should be horizontal across the pipe whenever possible.
- Installation should allow upstream and downstream straight runs of at least 5 pipe Ø upstream and at least 3 pipe Ø downstream.
- The meter must be installed with the flow direction marker on its body in the direction of the actual flow.
- Adequate space should be allowed around the flowmeter for maintenance and service access.
- Reducers can be installed on the both ends of the flowmeter when the pipe diameter does not coincide with the flowmeter diameter. The reducers should have a cone angle of no more than 15°. When installing reducers, it is recommended that straight runs of 5 pipe Ø upstream and 3 pipe Ø downstream be included to provide confidence that flowmeter accuracy is maintained.
- Strong magnetic fields and vibration around the electromagnetic flowmeter should be avoided.
- Solid, secure support should be provided for the pipes on both sides of the flowmeter to prevent undue stress being placed upon the meter and flanges.
- Transmitters should be installed in locations where they are not constantly subjected to water spray or the possibility of flooding to prevent water ingress into the electronic unit.

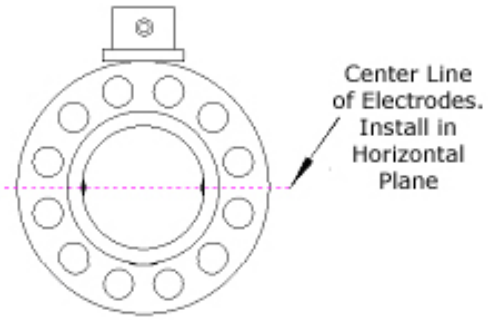
9.1 Installation Hints and Tips

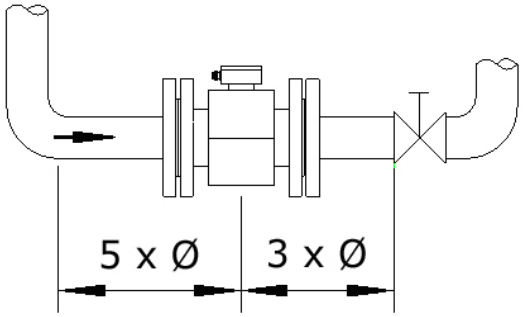




Lifting Instructions
Under no circumstances lift the meter its by transmitter enclosure or junction
Safety First - when moving and positioning flow tubes, always ensure lifting equipment is in good condition and its lifting capacity is adequate for the weight of the meter.

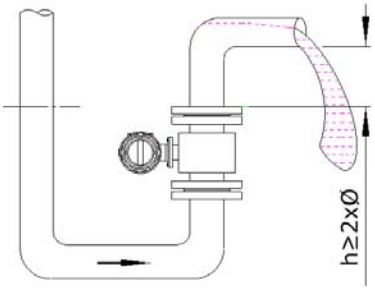
Protect Lining From Heat
When carrying out hot work around an installed flow meter, care must be taken to prevent flow tube lining from being heated and damaged. Always remove flow meter body before full welding around flanges.

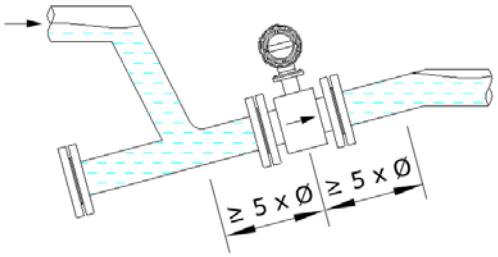




Horizontal Installation
The meter can be mounted in any position in a horizontal installation. It is recommended that the meter is installed with the electrodes in or close to the horizontal plane to ensure that any passing air or bubbles do not interfere with the measurement.

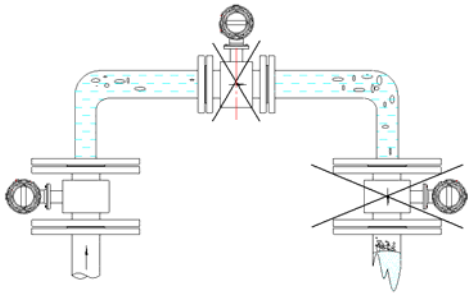
Straight Pipe Run Requirement
The flow meter should be installed with the necessary minimum straight pipe runs both upstream and downstream. Always install in a place where the pipeline will remain full of liquid.



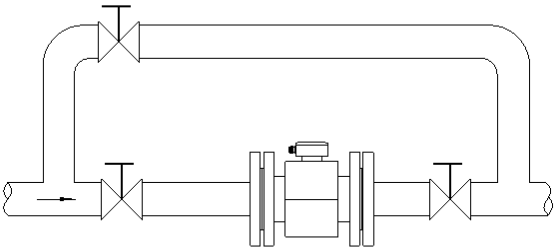


Vertical Installation
If installing in a vertical pipe, it is highly recommended that flow direction is upwards to guarantee that the pipe remains full at all times. Ensure upstream and downstream straight pipe run requirements are met.

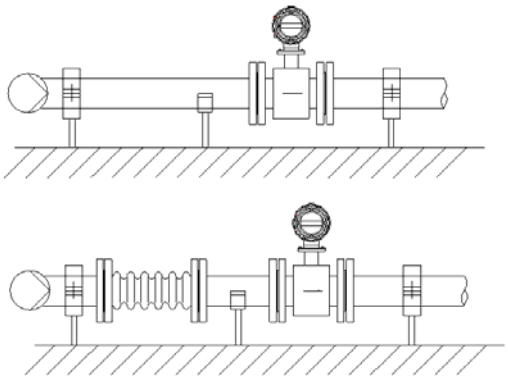
Installation in Partially Filled Pipes
To ensure that the meter remains full when used in a partially filled pipeline, a wet trap method such as an inclined dip or downwards U tube should be employed. A drain/clean out port should be installed at the lowest point for maintenance purposes. Where there is a possibility of solids being deposited in the line, do not install the meter at the lowest point to avoid the possibility of deposition in the meter body itself.



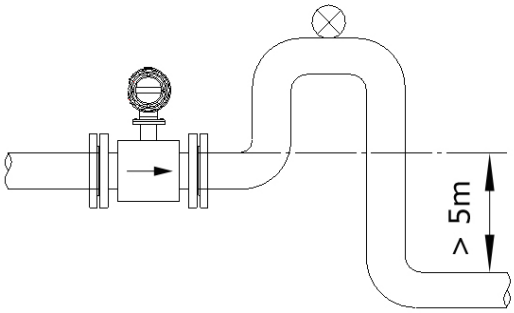
Avoid Areas Where Air Accumulates and Open Pipe Outlets
The meter must remain full of liquid in order to operate correctly. Avoid high points in pipes where air may tend to accumulate and vertical outlet legs.



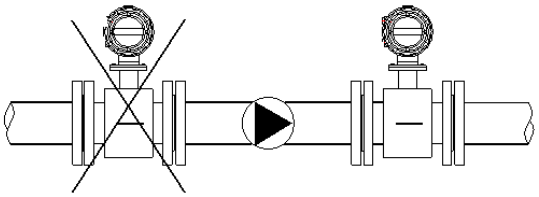
Bypass Line for Easier Maintenance
It is good practice to install a bypass around a meter to allow maintenance access without the need to shut down the line. Ensure upstream and downstream straight pipe run requirements are met.



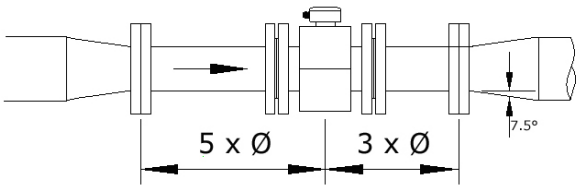
Avoid Strong Vibration
Piping should be securely fixed where there are vibrations present. It is recommended that the transmitter be mounted remotely in these installations. For installations with severe vibration, a flexible coupling is recommended to prevent the transmission of vibration through the pipe to the flow tube. In all cases, the flow meter should be properly supported upstream and downstream to prevent undue stress being placed upon the meter and flanges. NEVER support a meter on it's casing as this can cause internal damage to the meter coils.



Avoid Negative Pressure Situations
Where the pipe system has a fall of over 5m after a meter installation, it is advisable to install a vent or vacuum breaker above the meter to prevent damage to the meter liner.



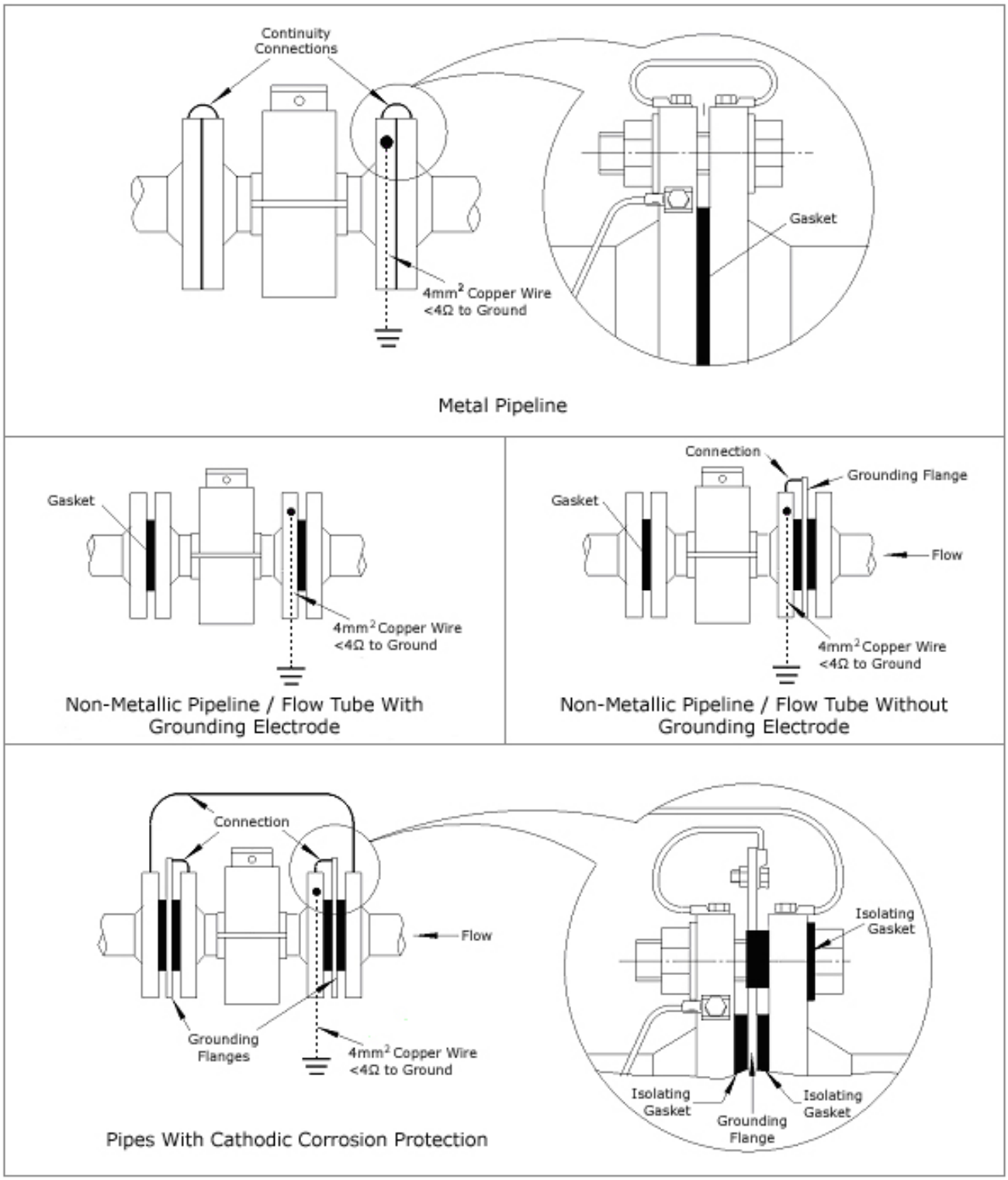
Avoid Installing Upstream of a Pump
Avoid installing a mag flow meter on the suction side of a pump as this may create negative pressure in the line and damage the meter lining. Wherever possible, always install downsteam of a pump.



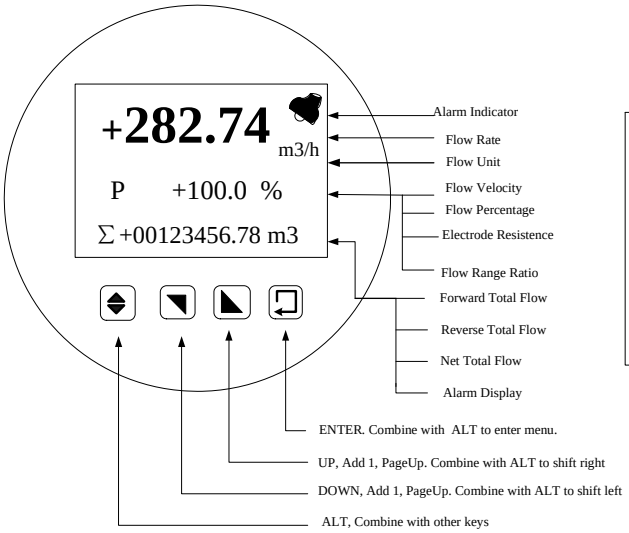
Ensure Straight Pipe Run Requirements are met when Reducing Pipe Diameter
When the pipe diameter is reduced to accommodate a flow meter, it is recommended that straight run pipe length requirements both upstream and downstream are built into the installation. It is further recommended that reducers with a center cone angle no greater than 15° be used to ensure the consistency of the liquid flow profile.

9.2 Flowmeter Grounding

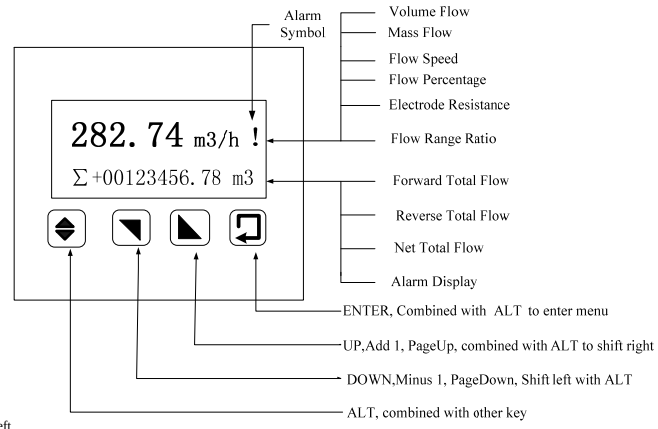
The flowmeter must be properly grounded for reliable operation. The flow meter should be installed and grounded depending upon the pipe type and site conditions.



10 LDB Transmitter



3-line LCD Transmitter Front Panel



2-line LCD Transmitter Front Panel

The instrument has two operation modes: measurement mode and setup mode. When powered up, the instrument automatically enters measurement mode and immediately begins to measure flow rate within the meter flow tube. In setup mode, the instrument configuration menu is accessed and instrument parameters can be adjusted to the users' desired configuration via the three front panel keys.
Setup mode access is protected by up to 5 passwords, each intended for use by different classes of users with different access requirements. Return to measurement mode after viewing and/or changing any parameter is simply achieved by pressing a key for 3 seconds.
When in setup mode, if there is no key operation for 3 minutes, the instrument automatically returns to measurement mode.

10.1 Alarm Functions

The LDB transmitter will indicate and report a variety of alarm conditions and diagnostics:

- Empty pipe alarm
- Excitation coil failure
- High Flow
- Low Flow

Upon empty pipe alarm (empty pipe, partial fill or low conductivity), the analog output and frequency outputs are set to zero signal. The flow meter can additionally be configured to register zero flow through the meter setup menu. Empty pipe alarm is also indicated on the instrument display.

Excitation Coil Failure is a built in diagnostic function within the instrument and is indicated on the front panel display.

The LDB has two dedicated flow limit alarm outputs that can be used to signal high or low flow condition. Limit values are set as a percentage of flow range between 0 … 199.9% of flow range. When the flow percentage is greater than (less than) the actual value, the instrument outputs an alarm signal while simultaneously displaying the alarm condition on the front panel display.

10.2 Pulse/Frequency Output

The LDB transmitter is equipped with a pulse frequency output that can be used for totalization or as a scaled frequency output of flow rate. The pulse/frequency output can be configured to either operate in reverse flow conditions or to read zero.

Frequency Mode

Output flow range can be set between 0 and 1…5kHz

Pulse Mode

Max output = 5000pulse/sec. The pulse width is programmable between 10 … 400mS and is a square wave at high frequency.

Output pulses resolution can be set to:

0.001…1.0 m^3/pulse

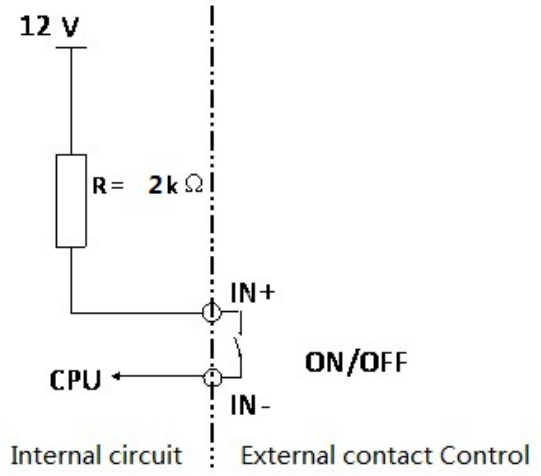
0.001…1.0 liter/pulse

0.001…1.0 USGal/pulse

0.001…1.0 UKGal/pulse

10.3 Internal Power Supply for Open Collector Outputs

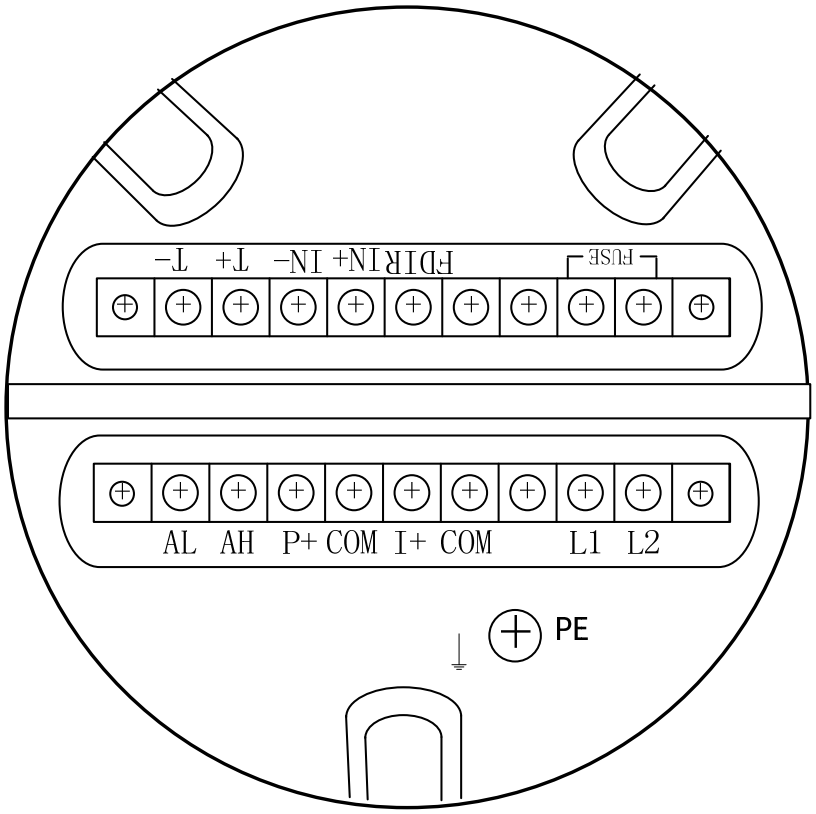
The alarm and pulse/frequency outputs are open collector type and can be powered internally or externally. The LDB is equipped with an internal power supply for powering the open collector outputs in the absence of an external source. To use the internal power supply, connect IN+ with the output terminals. Internal power is +12V and pull-up resistance is kΩ.



Caution: When internal power is used, do not connect external power to these outputs when the transmitter is supplying power to them as this may result in damage to the transmitter.

10.4 Connection Terminals

Wiring terminals are accessed through the back of the instrument. To access terminals, power down the instrument, remove back cover and then use a screw driver to connect the wire and terminals. Reassembly is the reverse preocedure.



10.4.1 Compact-type Terminal Function Table

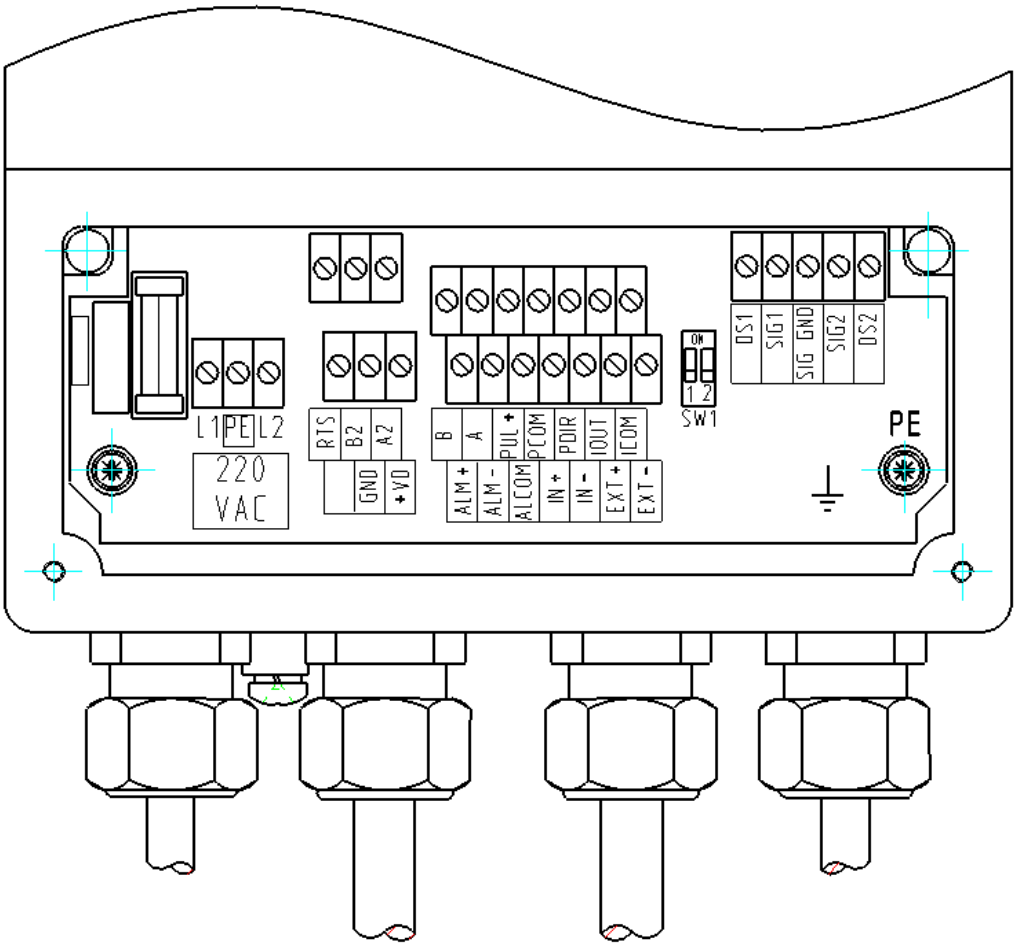
AL	Flow Low Alarm +ve	T+	RS-485 A
AH	Flow High Alarm +ve	T-	RS-485 B
P+	Frequency / Pulse Output +ve	IN+	Input contact +
COM	Alarm/flow direction/ pulse output -ve	IN-	Input contact -
I+	Current output +	FDIR	Flow direction indicator +ve
COM	Current output -		
L1	220VAC L(24VDC +)		
L2	220VAC N(24VDC -)	PE	Power Ground

10.4.2 Remote-type Terminal Function Table

DS1	Shield Drive 1	IOUT	Current output +
SIG1	Signal Input 1	ICOM	Current output -
SIG GND	Signal Ground	PUL+	Frequency/pulse output +
SIG2	Signal Input 2	PCOM	Frequency/pulse output -
DS2	Shield Drive 2	PDIR	Flow direction indicator +
Ext+	Coil Excitation +	A	RS-485 A
EXT-	Coil Excitation -	B	RS-485 B
L1	220VAC L(24VDC +)	ALM-	Flow Low Alarm +ve
L2	220VAC N(24VDC -)	ALM+	Flow High Alarm +ve
A2	Profibus-DP A	ALCOM	Alarm output -ve
B2	Profibus-DP B	IN+	Input contact +

RTS	Profibus-DP RTS	IN-	Input contact -
GND	Profibus-DP GND	+VO	Profibus-DP +5V
PE	Power ground		

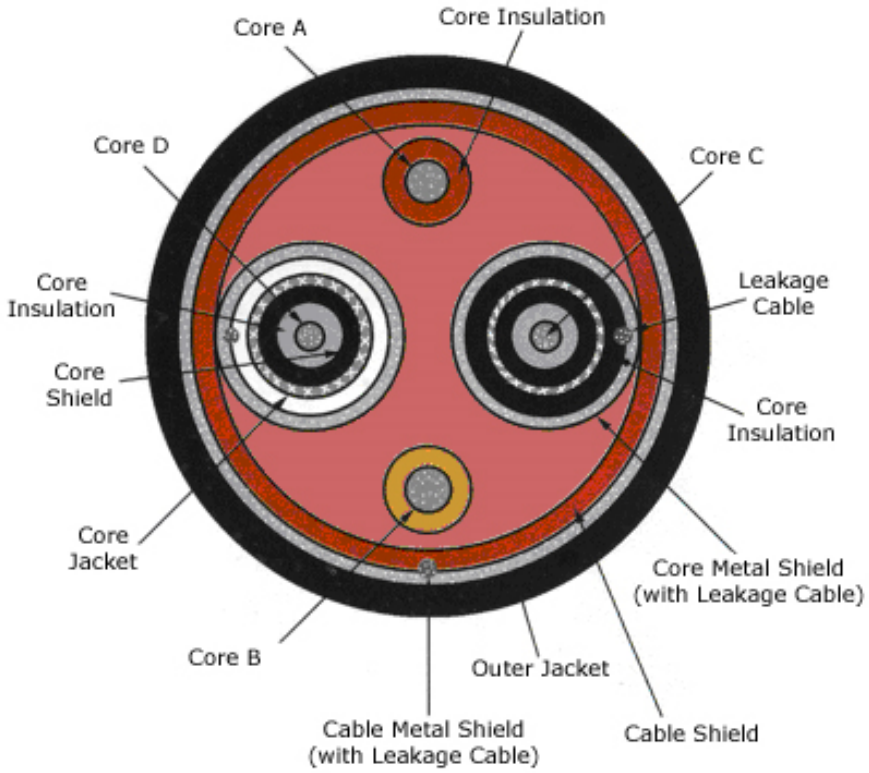
Remark: The dip switch SW1 is set to ON to supply +12V power to pulse output. If external power is used, turn the switch to OFF.



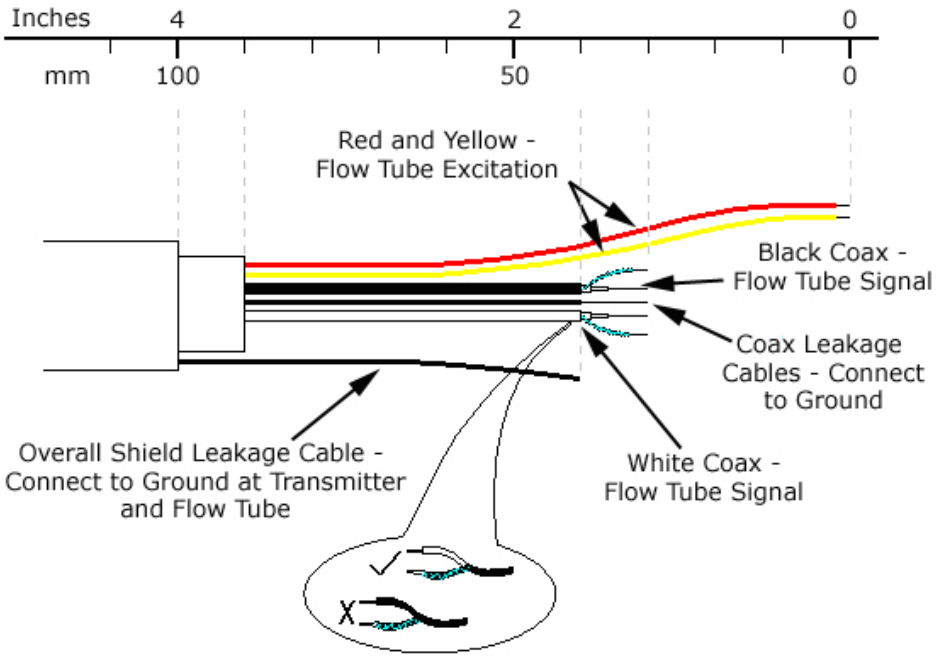
10.5 Connection of Remote Transmitter and Flow Tube

A remote type sensor and transmitter must be connected together using SMFE100 type cable. The cable has 4 separate cores: 2 are coaxial conductors each with two shielded layers and two are standard PVC insulated wire. The cable has an overall shield and PVC covering. The cable must be carefully terminated and connected to ensure meter performance.

Note: there is a dark semi-conducting layer beneath the braided shield of the coax conductors. This must be removed when terminating the cables.

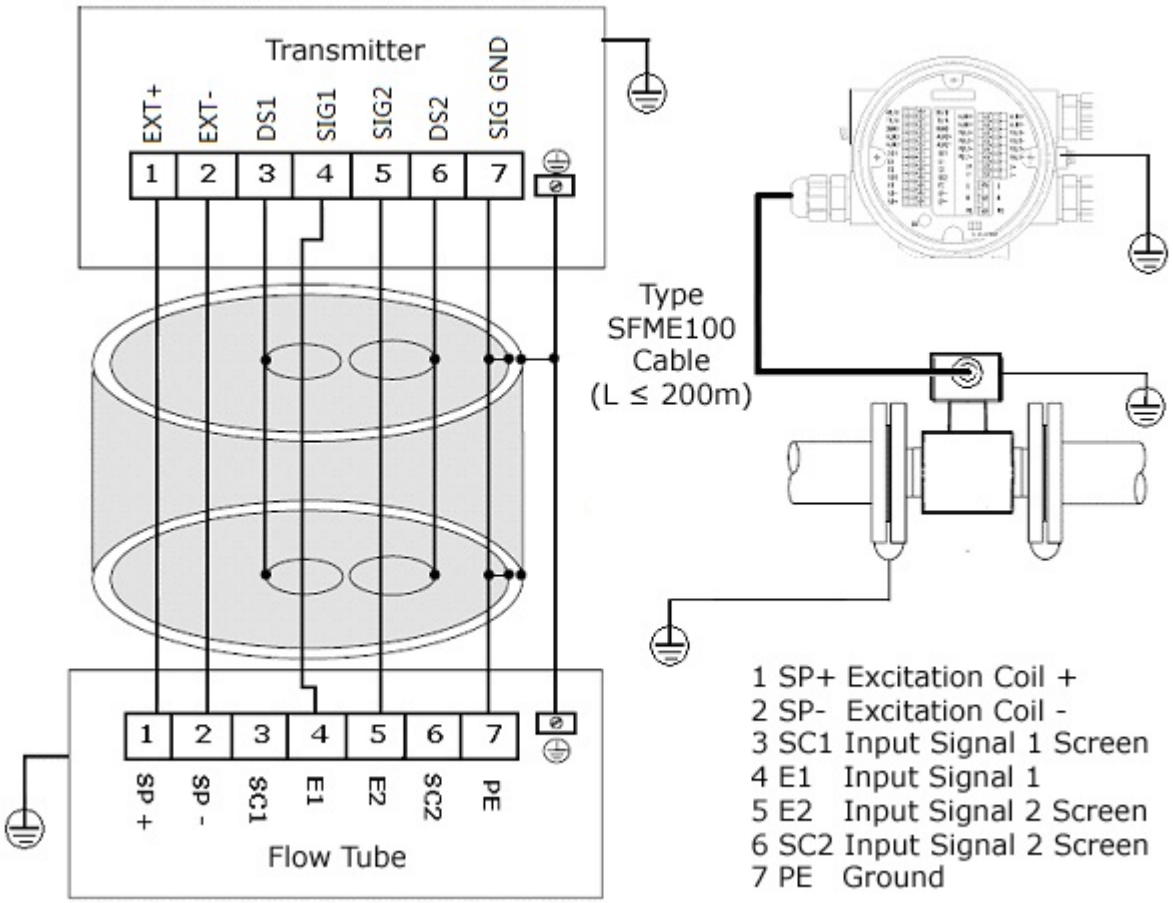


Cable Structure



Cable Preparation

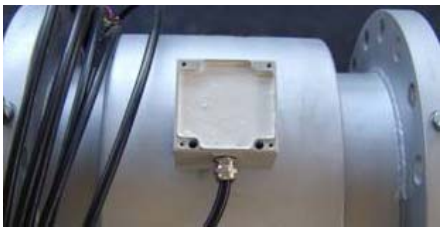
10.6 Transmitter to Flow Tube Connection



Interconnection between the transmitter and flow tube adopts a one-to-one wiring method. The cable is special-purpose type SMFE100 and must not exceed 200m (650ft) in length. Remote transmitter sets are supplied with a 10m (33ft) cable as standard. Longer lengths must be specified at the time of order.

Caution: If the instrument is to be installed in a very wet environment or in a place apt to be flooded, watertight conduit and seals must be fitted to prevent water ingress into the transmitter housing and flow tube termination box.

Remote models can be specified with environmental protection to IP68. In this case, the signal cable will be terminated in the flow tube terminal box at the factory and filled with sealant before shipment.



IP68 Option - Sealed Termination Box

10.7 Output wiring

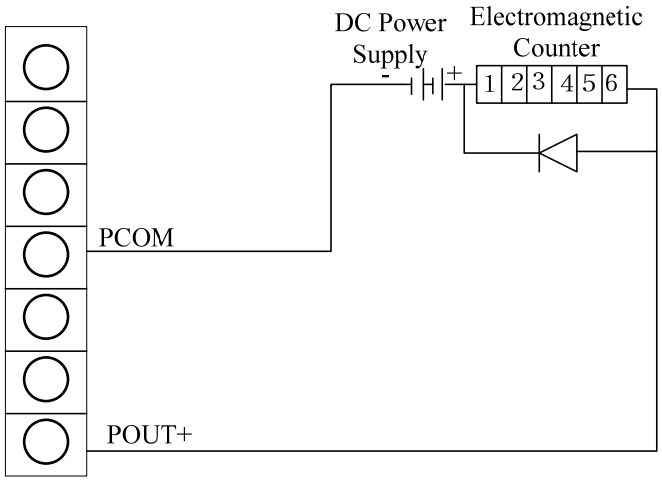
Output cables and power cables are supplied by the user and should be sized according to load current requirements and local code.

10.7.1 Pulse / Frequency Output Connection Detail

The LDB transmitter has one port that can be configured for either pulse or frequency output. When configured for frequency operation, the output will give a varying frequency output based upon flow reading. The frequency output is 1 and 5000Hz and can be ranged for any flow range by the user. When configured for pulse operation, the output will give a pulse for a user set volume of flow. Pulse outputs are commonly used for external totalization of flow throughput.

The pulse / frequency output is an Open Collector type and usually powered from an external source. The load connected to the outputs must be calculated to ensure that the maximum current rating is not exceeded. The connected power source must not exceed 36Vdc and the maximum current drain through the open collector output must not exceed 250mA. When supplying external power, jumper S1-1 on the cable termination panel must be removed.

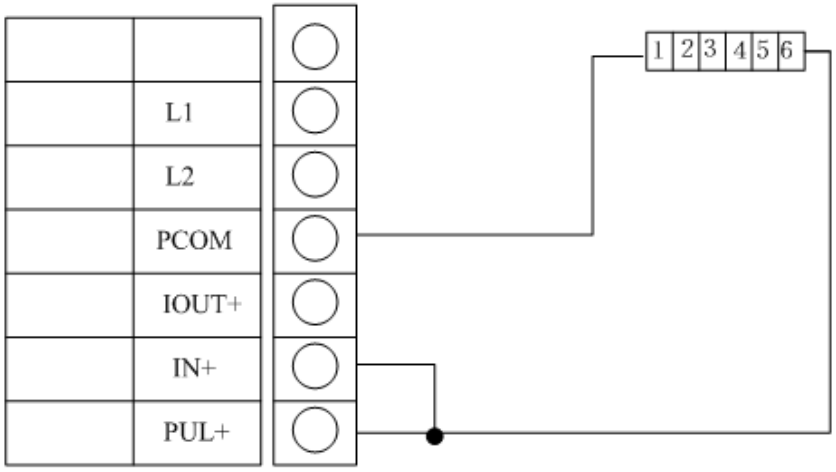
10.7.1.1 Electromagnetic Counter Connection Detail



A typical use of the pulse output is to connect it to an external electromagnetic counter to maintain a remote record of total flow through the meter.

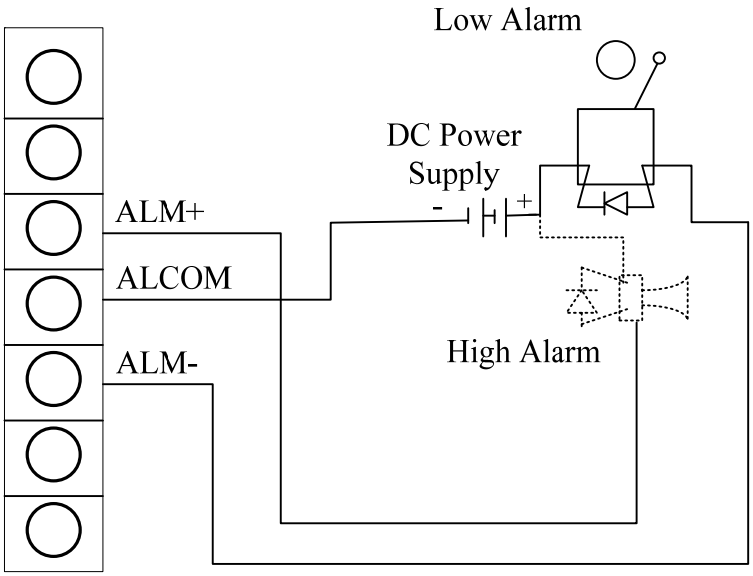
Note: when using an inductive load such as an electromagnetic counter, a diode should be installed as shown in the figure above to protect the output from power surges.

10.7.1.2 Electronic Counter Connection Detail



When connecting to SCADA or PLC systems, the pulse/frequency output should be configured so as not to exceed the maximum input frequency capability of the units input. Most PLC and SCADA system inputs are resistive, so a protection diode is often not required.

10.7.2 Alarm Output Connection Detail



Note: when using an inductive load such as a relay, a diode should be installed as shown in the figures above to protect the output. When supplying external power, the dip switch SW1 should be turned off.

10.8 Analog Outputs

The LDB transmitter has two analog outputs, one active and one passive. The provision of both an active and a passive output provides the user with total flexibility of connection to external devices and systems. The current outputs can be configured for either 0…10mA or 4…20mA operation. Flow range is configured to suit the users' requirements through the transmitter setup menu. The relationship between analog current output and flow as follows:

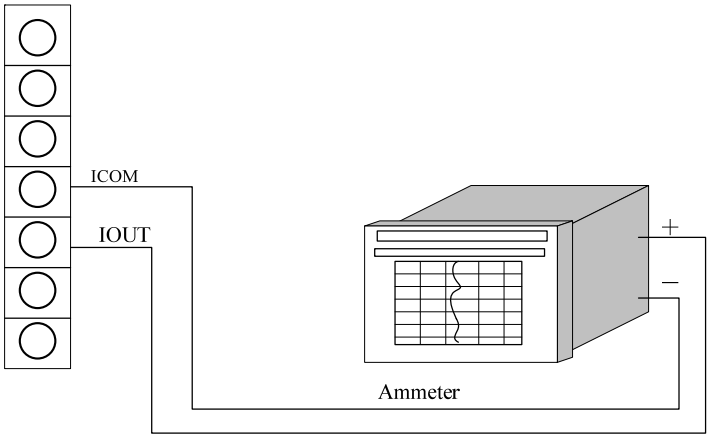
$$Io = \frac{Measurement\ Range}{Full\ Range\ Value} x\ Current\ Range + Zero\ Current$$

For 4…20mA, Zero_Current is 4, Current_Range is 16

For 0…10mA, Zero_Current is 0, Current_Range is 10

For the best analog output resolution, users should choose an appropriate range of the flowmeter output signal.

10.8.1 Active Current Output Connection Detail



The internal analog output supply is 24V. When configured for 4 … 20mA, the maximum load resistance is 750Ω. Do not connect external power to this output as this may result in damage to the transmitter.

10.8.2 Passive Current Output Connection Detail

Passive analog output **MUST** be indicated when ordering; otherwise active current output is default.
The passive analog output requires the connection of an external 24Vdc power supply in order to operate. It is ideal for connection to SCADA and PLC systems where complete input modules are powered from a common supply.
When passive analog output is applied, IOUT is to be connected to 24V+ while ICOM to 24V ground.

11 Accessories

11.1 VMX Flow Tube Simulator

Before shipping from the factory, the flowmeter has been thoroughly adjusted and tested to ensure it is working correctly. The VMX Simulator can be used to check the operation of the LDB transmitter and to loop check and fine tune the analog outputs to connected equipment.

12 Model LDB Electromagnetic Flow Meter Ordering Code

LDB-					-			-		-		-		-		-		-		-		-		-		-		-	
	1					2			3		4		5		6		7		8		9		10		11		12		13		14

1 Nominal Diameter(mm)/ [inches] (1)

0015 [½"]	0100 [4"]	0450 [18"]	1400 [56"]
0020 [¾"]	0125 [5"]	0500 [20"]	1600
0025 [1"]	0150 [6"]	0600 [24"]	1800
0032 [1¼]	0200 [8"]	0700 [28"]	2000
0040 [1½]	0250 [10"]	0800 [32"]	2200
0050 [2"]	0300 [12"]	0900 [36"]	2400
0065 [2½]	0350 [14"]	1000 [40"]	2600
0080 [3"]	0400 [16"]	1200 [48"]	3000

2 Flange Rating (1)

02	0.25 MPa	*1600 … 3000*
06	0.6 MPa	*700 … 3000*
10	1.0 MPa	*200 … 1400*
16	1.6 MPa	*15 … 600*
20	ANSI Class 150	*15 …1400*
40	4.0 MPa	*15 … 150*
50	ANSI Class 300	*15 … 1400*
AA	Special	

3 Electrode Material

1	316L Stainless Steel
3	Hastelloy C-22
4	Hastelloy B-10
5	Titanium
6	Tantalum
7	Platinum / Iridium Alloy
8	Tungsten Coated Stainless Steel

4 Lining Material

1	Neoprene (Hard rubber)	*≤ 3000*
2	PTFE	*≤ 1000*
3	Polyurethane	*≤ 300*
4	PFA	*≤ 250*
5	Tefzel	*≤ 250*
6	PFA with Wire Net	*80 … 250*
7	Tefzel with Wire Net	*80 … 250*

5 Grounding and Lining Protection

0	Flange ground	*15 … 3000*
1	Earth ring	*15 … 250*
2	Ground electrode	*50 … 3000*
3	Inlet protection ring	*50 … 3000*

6 Max. Process Temperature

A	80°C	*All Linings*
B	120°C	*Neoprene / PTFE / PFA / Tefzel*
C	180°C	*PTFE only*

7 Environmental Protection Class

1	IP65
2	IP67 (Compact Type Only)
3	IP68 (Remote Type Only)

8 Explosion Proofing

1	None
2	Ex DE IIC T6

9 Configuration – sensor/transmitter

1	Compact (15 … 1000)
2	Remote (with 10m cable)(2)

10 Power Supply

A	AC: 85 … 265 VAC / 45 … 63Hz
D	DC: 18 … 36 VDC

11 Display and Programming

2	2 line LCD display + keypad programming
3	3 line LCD display + keypad programming

12 Output and Input

0	Basic Configuration (current, pulse and contact outputs)
2	Basic Configuration + RS485
3	Basic Configuration + GPRS

13 Calibration Specification

1	3 point, 0.5% accuracy
2	3 point, 0.25% accuracy
3	Special

14 Flow Tube Configuration

1	Flange Type	*15 … 3000*
2	Flange type with removable electrodes	*15 … 3000*
3	Wafer Type	*15 … 100*

(1) Line size selection will be inches for ANSI Class 150/300 rating selection, DIN size for all other ratings

(2) Order longer cable length separately

13 Electromagnetic Flowmeter Application Worksheet

Ai	**Flowmeter Application Worksheet (Electromagnetic flowmeter)**	
Customer Name		
Contact		
Tel/Fax/Email		
Project Name		
Tag.No		
	Process Parameters	
Pipe Spec / Material		
Process Connection		
Fluid Type		
Max Flow		
Nor. Flow		
Min. Flow		
Fluid Temperature		
Operating Pressure		
Measuring range		
Power Supply	85 --- 265 VAC or 16 --- 36 VDC	
Accuracy % required	(±0.5 or ±0.2)	
	Manufacturers Configuration Sheet	
Nominal Diameter mm		
Nominal pressure MPa		
Electrode Material		
Lining Material		
Grounding/ Protection		
Temperature Rating		
IP Protection Class		
EX Certification		
Configuration	Compact or Remote	
Power Supply	85 --- 265 VAC or 16 --- 36 VDC	
Programming Display		
Input/output signal		
Inspection		
Connection type		
Electric connection		
Special signal cable		
Mating Flange Set		
Accessory 1		
Accessory 2		
Model Number	LDB-	
Remark		

This page is blank.