ABB MEASUREMENT & ANALYTICS | DATA SHEET

LMT100 magnetostrictive level transmitter

High accuracy liquid level and interface level detection



Measurement made easy K–TEK Level products

Features

- High accuracy: 0.01 % of full scale or ±1.27 mm
- No re–calibration needed: set it and forget it
- Superior sensor (patent #5,473,245)
- Local indication with HMI display
- Dual compartment housing with separate field terminal compartment
- Loop powered to 22 m (75 ft) probe length
- Total and/or interface level measurement
- Pressure to 165.48 bar (2400 psig)
  Std. 124.1 bar (1800 psig)
- Temperature range: –195.5 to 426.6 °C (–320 to 800 °F) with options
- Field replaceable/upgradable electronics module
- Built–in RFI/EMI filter
- Digital communications
- 4 to 20 mA HART® output
- HART 7 and FOUNDATION™ Fieldbus ITK6.3.0
- Global hazardous location approvals and SIL 2/3 capable

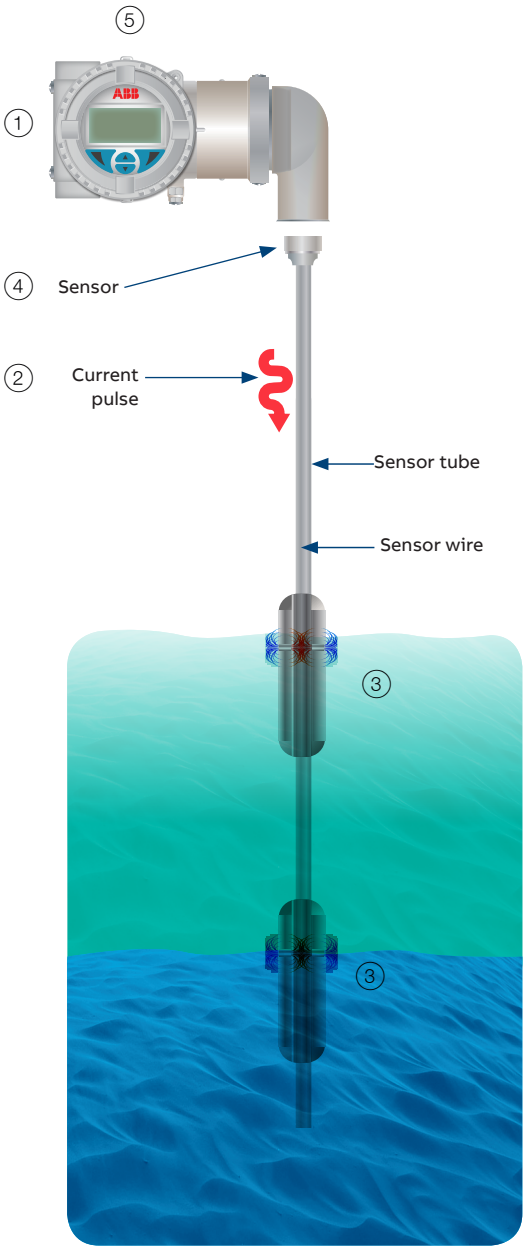
Options

- Two level indications
- RTD for process temperature measurement
- Glass viewing window
- 316/L stainless steel enclosure
- 21–point linearization table

Principle of operation:

The LMT100 is based upon the magnetostrictive principle.

1. The device electronics generates a low energy current pulse at fixed intervals.
2. The electrical pulses create a magnetic field which travels down a specialized wire inside the sensor tube.
3. The interaction of the magnetic field around the wire and the magnetic float causes a torsional stress wave to be induced in the wire. This torsion propagates along the wire at a known velocity, from the position of the magnetic float and toward both ends of the wire.
4. A patented sensing element placed in the transmitter assembly converts the received mechanical torsion into an electrical return pulse.
5. The microprocessor–based electronics measures the elapsed time between the start and return pulses (time of flight) and converts it into a position measurement which is proportional to the level of the float.

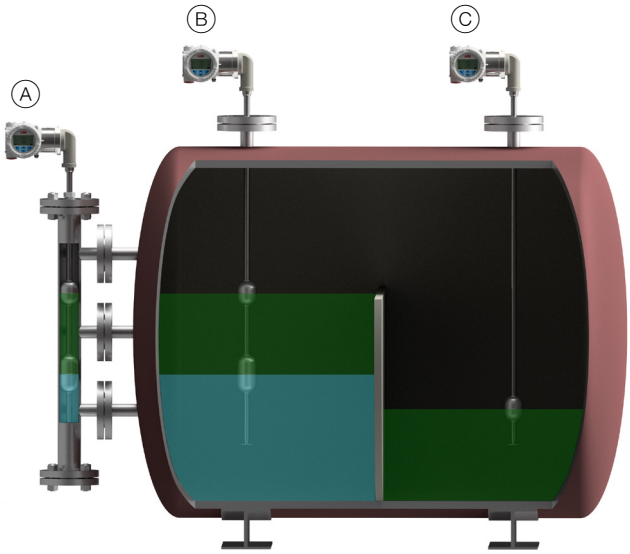


LMT100 transmitters installations:

A Installed in external chambers in a level and interface measurement application

B Installed directly into vessel, measuring level and interface level

C Installed directly into vessel measuring level only



LMT100 is preferred for:

- interface measurement
- exceptional performance with emulsion
- measurement with foam on layers fluid surface
- hydrocarbons and chemical control

Specification

Electronic transmitter		
Repeatability	±0.005 % of full scale or 0.31 mm (0.012 in), whichever is greater	
Non–linearity	±0.01 % of full scale or 0.86 mm (0.034in), whichever is greater	
Measuring accuracy	±0.01 % of full scale or 1.27 mm (0.050 in), whichever is greater[1]	
Supply voltage	12 to 43 V DC for 4 to 20mA HART loop powered, 9.0 to 32 V DC for Foundation Fieldbus	
Output/Communications	4 to 20mA HART7 or FOUNDATION Fieldbus ITK 6.3.0	
User interface	Interactive display, DTM, EDDL, FDI with NE107 messaging	
Write protection	Hardware switch and software switch	
Power consumption	4 to 20mA	at 36.0 V DC– 3.6 mA 0.13 W; 21mA 0.76 W at 12.0 V DC– 3.6 mA 0.043 W; 21mA 0.25 W
	HART mode (4.0mA)	at 36.0 V DC 0.144 W at 12.0 V DC 0.048 W
	FF mode (17 mA)	at 9.0 V DC 0.153 W at 32.0 V DC 0.544 W
Maximum line resistance	4 to 20mA	at 36.0 V DC and 21 mA, 1142 Ω* at 24.0 V DC and 21 mA, 571 Ω at 13.5 V DC and 21 mA, < 72 Ω** **Maximum allowable with HART communication is 700 Ω **See the current/resistance chart
	HART mode (4mA)	< 650 to 700 Ω
	FF mode (17mA)	at 32.0 V DC, 1500 Ω. at 9.0 V DC, 50 Ω.
Polarity protection	4 to 20 mA, diode in series with loop, FOUNDATION Fieldbus and Profibus PA, polarity insensitive	
Update rate	10 measurements per s	
Minimum measuring span	76.2 mm (3.0 in), consult factory if smaller span is required	
Damping	Field adjustable, range: 0 to 60 s	
Alarm output	For 4 to 20 mA: NE43, software or hardware selectable. Upscale (21 mA) or downscale (3.6 mA)	
Surge suppression	Integral surge suppression available with option code S1	
Ambient temperature	–40 to 85 °C (–40 to 185 °F) ambient[2]	
Humidity	0 to 100 % RH	
Linearization	21 point table available	
Temperature sensor (optional)	1000 ohm Pt RTD, option code SER or STL	
Temperature tolerance class	IEC 60751 class B, ±(0.3+0.005[t]) –70° to 230 °C	
Enclosure	Dual compartment	
Enclosure material	Cast low copper aluminum with powder coat or 316 stainless steel	
Remote transmitter	Standard remote distances of 5 m (16 ft), 10 m (33 ft), 20 m (66 ft), 30 m (98 ft)	
Device tag material	AISI 316 stainless steel	
Electrical connection	Two M20 x 1.5 or two ½in FNPT, adapters and bus connectors also available	
Ingress protection	IP66, NEMA 4X	

1 Measurement accuracy is recorded at factory ambient conditions (23.88 °F ±5.6 °C [75 °F ±10 °F]) using a calibration magnet. Accuracy may be further influenced by other factors such as float hysteresis, installation, process conditions and ambient conditions.
2 Some agency approvals may differ.

Sensor tube		
	Standard	**Options**
Material	316/L stainless Steel	Alloy 20, Hastelloy® C–276, PFA–TEFLON® jacketed, others on request
Process temperature	–195.5 to 121.1 °C (–320 to 250 °F)	up to 427 °C (800 °F) with options
Process pressure	–1.0 to 124.1 bar @ 149 °C (–14.7 to 1800 psig @ 300 °F)	165.47 bar (2400 psig) maximum with the HP probe type
Probe length	304.8 mm to 9.14 m (1 to 30 ft)	22.86 m (75 ft) maximum w/ W7 flexible probe in sensor well
Probe length tolerance	±3.2 mm (0.125 in) up to 3.0 m (10 ft); ±6.4 mm (0.25 in) up to 6.0 m (20 ft); ±9.0 mm (0.35 in) up to 9.0 m (29.5 ft); +/– 25.4 mm (1.0 in) up to 22.86 m (75 ft)	
Mounting	¾ in MNPT compression fitting	plugs, threaded fittings, loose flanges and welded flange process connections also available

HMI indicator (option)

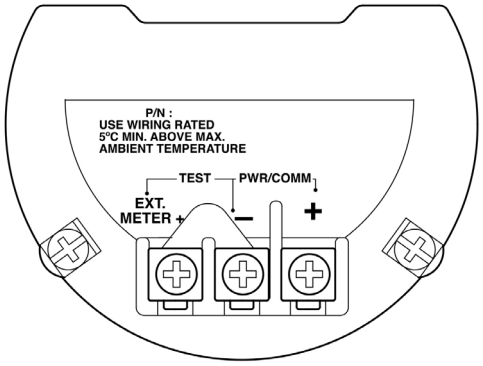
- Display of waveform for device performance confirmation
- Display of the current level as well as interface or the temperature of the measuring medium (optional)
- Application–specific visualizations which the user can select. Four operator pages can be configured to display multiple values in parallel
- Plain text fault diagnostics in conformance to NE107
- Menu–guided parameter settings with four buttons
- 'Easy set–up' function for fast commissioning
- Parameter settings of the device through the front glass with the housing closed
- During ongoing operation, the HMI indicator can be connected or disconnected and therefore also used as a configuration tool for other devices



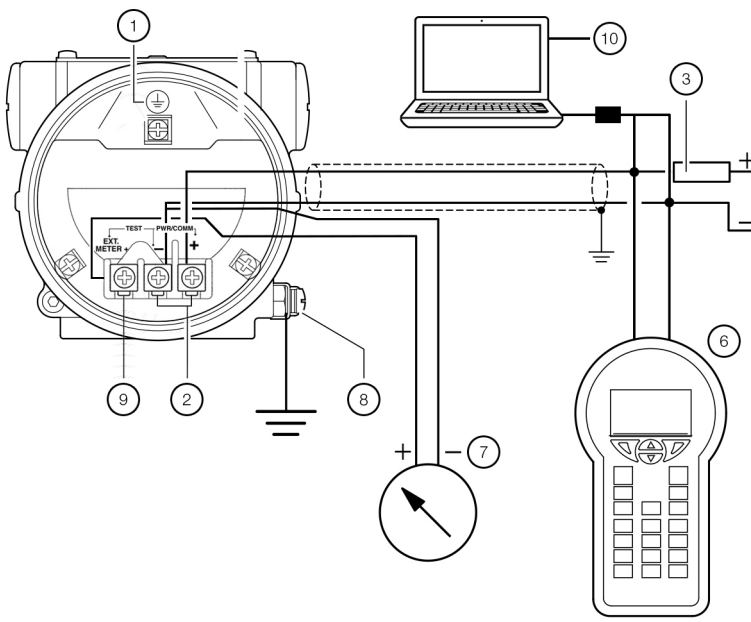
Electrical connections

Devices with HART communication

Current output/HART output



Terminal	Function/comment
PWR/COMM +	Power supply, current output/HART output
PWR/COMM –	
EXT.METER	Not assigned



1 Internal earthing terminal
2 Power supply, current output/ HART output
3 Load resistance
4 Power supply/supply isolator
5 PLC/DCS
6 HART handheld terminal
7 External indicator
8 External earthing terminal
9 Terminal for external indicator
10 Laptop

For connecting the signal voltage/supply voltage, twisted cables with a conductor cross–section of 0.8 to 0.35 mm² (18 to 22 AWG) and a maximum length of 1500 m (4921 ft) must be used. For longer leads a greater cable cross section is required.
For shielded cables the cable shielding must only be grounded on one side (not on both sides).
For the earthing on the transmitter, the inner terminal with the corresponding marking can also be used.
The output signal (4 to 20 mA) and the power supply are conducted via the same conductor pair.
The transmitter works with a supply voltage between 12 to 42 V DC. For devices with the type of protection 'Ex ia, intrinsic safety' (ATEX, IEC, FM, or CSA approval), the supply voltage must not exceed 30 V DC. In some countries the maximum supply voltage is limited to lower values. The permissible supply voltage is specified on the name plate on the top of the transmitter.

...Electrical connections

Power supply	
Devices with HART communication	
Terminals	PWR/COMM +/PWR/COMM –
Supply voltage	Non–Ex: 12 to 42 V DC Ex limitation voltage: 30 V
Residual ripple	Maximum 5 % or Uss = ±1.5 V
Power consumption	< 1 W
Devices with Foundation Fieldbus communication	
Terminals	Bus connection, polarity insensitive
Supply voltage	Non–Ex: 9 to 32 V DC Ex limitation voltage: 24V (for FISCO: 17.5V)
Residual ripple	Maximum 5 %
Power consumption	< 0.6 W

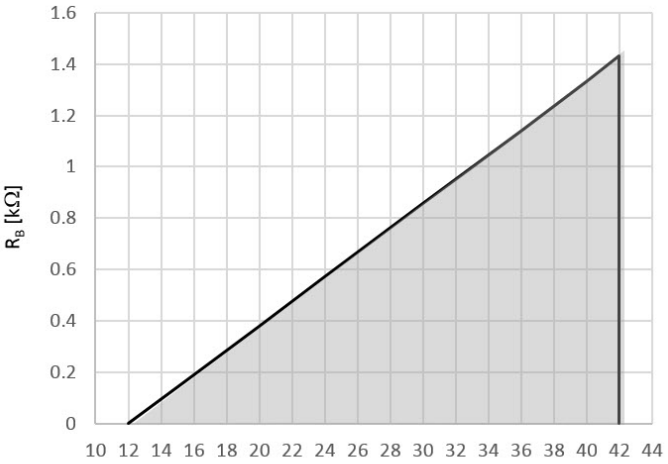
Current output/HART output
Only for devices with HART communication

Terminals: PWR/COMM +/PWR/COMM –

In HART communication, the smallest load is R_B = 250 Ω. The load is R_B is calculated as a function of the available supply voltage U_S and the selected signal current I_B as follows:

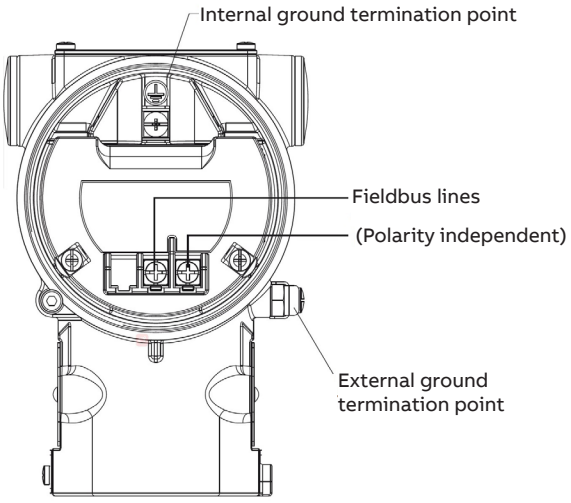
$$R_B = \frac{U_S - \text{min operating voltage (12.0) V DC}}{I_B}$$

R_B Load resistance
U_S Supply voltage
I_B Maximum signal current

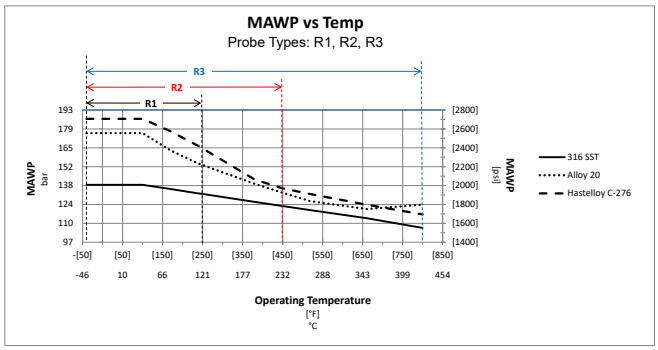


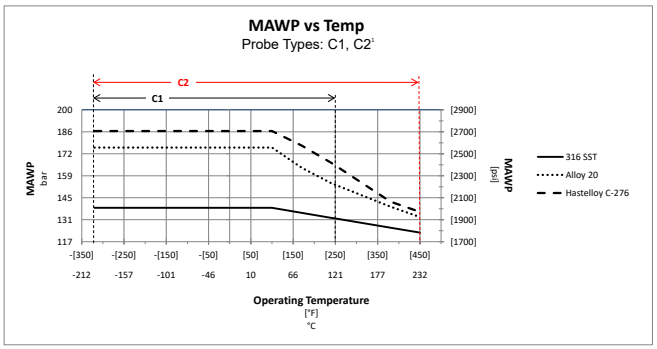
Devices with Foundation Fieldbus communication

Terminal	Function/comment
Bus connection	Power supply, polarity insensitive



Probe pressure/temperature charts

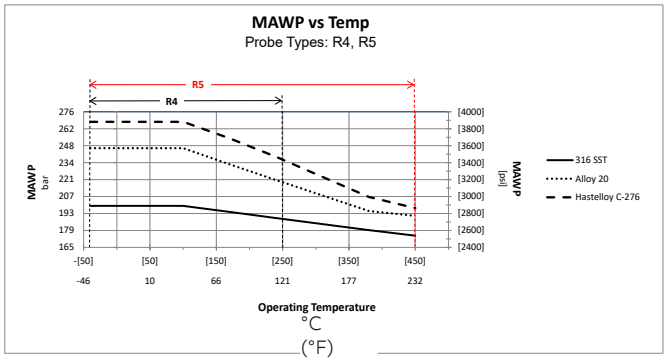


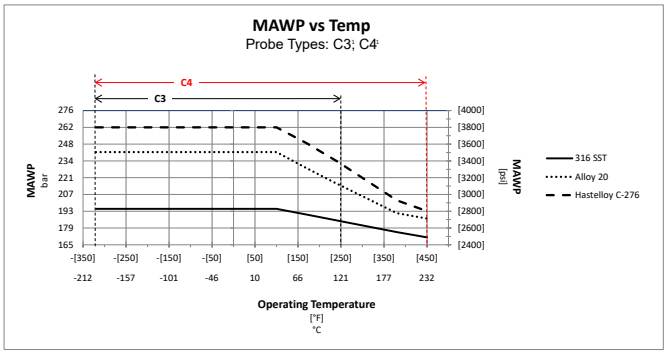


Note:
With SEU wire option temperatures up to 219.4 °C (427 °F)

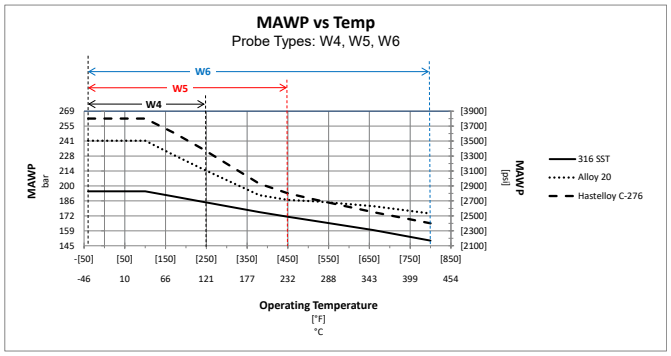
...Probe pressure/temperature charts

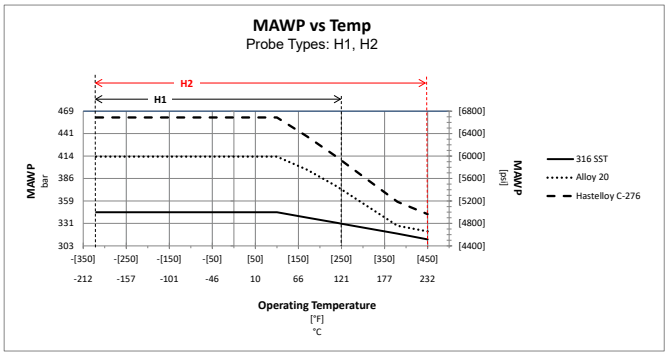
Probe pressure/temperature charts (continued)

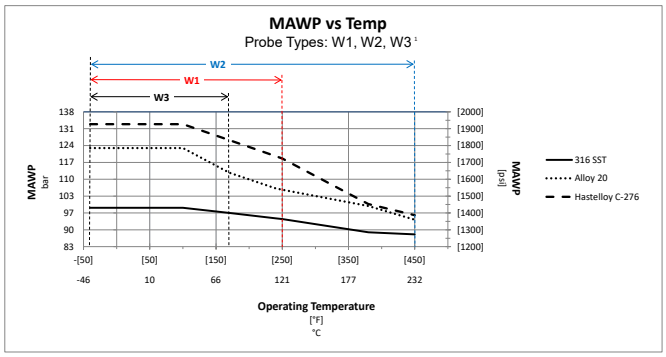


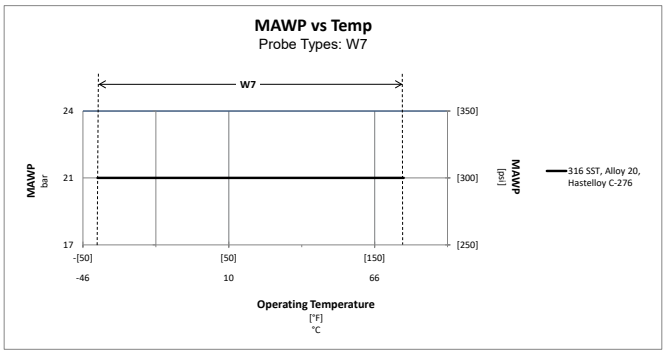


Note:
With SEU wire option temperatures up to 219.4 °C (427 °F)









Note:
Can be cleaned for a maximum of one hour at 149 °C (300 °F)

Probe selection guide

Probe Type	Probe Diameter	Maximum Insertion length	Minimum pressure	Maximum pressure	Minimum process temperature	Maximum process temperature	Minimum standard process connection size
Standard rigid probe							
R1	16mm (⅝ in)	9.14 m (30 ft)	–1.0 bar (–14.7 psig)	125.12 bar (1800 psig)	–80 °C (–112 °F)	121 °C (250 °F)	¾ in compression fitting, DN25/ 1 in ANSI flange
R2						230 °C (450 °F)	
R3		4.57 m (15 ft)				427 °C (800 °F)	
½ inch rigid probe							¾ in
R4	13 mm (½ in)	6.1 m (20 ft)	–1.0 bar (–14.7 psig)	125.12 bar (1800 psig)	–80 °C (–112 °F)	121 °C (250 °F)	½ in compression fitting, DN25/ 1 in ANSI flange
R5						230 °C (450 °F)	
Cryogenic rigid probe with nitrogen purged sensor							
C1	16 mm (⅝ in)	9.14 m (30 ft)	–1.0 bar (–14.7 psig)	125.12 bar (1800 psig)	–195.6 °C (–320 °F)	100 °C (212 °F)	¾ in compression fitting, DN25/ 1 in ANSI flange
C2						230 °C (450 °F)	
Cryogenic sensor well with removable nitrogen purged stainless steel sensor							
C3	C3 27 mm (1.05 in) *¾ in NPS Pipe	9.14 m (30 ft)	–1.0 bar (–14.7 psig)	125.12 bar (1800 psig)	–195.6 °C (–320 °F)	100 °C (212 °F)	1½ in welded fitting, DN25/1 in ANSI flange
C4						230 °C (450 °F)	
High pressure rigid probe							
H1[2]	16 mm (⅝ in)	9.14 m (30 ft)	–1.0 bar (–14.7 psig)	166.5 bar (2400 psig)	–80 °C (–112 °F)	121 °C (250 °F)	¾ in compression fitting, DN25/ 1 in ANSI flange
H2[2]						230 °C (450 °F)	
PFA–TEFLON jacketed rigid probe							
J1	19 mm (¾ in)	9.14 m (30 ft)	0.0 bar (0.0 psig)	4.46 bar (50 psig)	–40 °C (–40 °F)	121 °C (250 °F)	1 in compression fitting, DN25/ 1 in ANSI flange
J2						176.7 °C (350 °F)	
PFA–TEFLON jacketed sensor well with removable stainless steel rigid sensor							
J4[2]	19 mm (¾ in)	6.1 m (20 ft)	0.0 bar (0.0 psig)	4.46 bar (50 psig)	–40 °C (–40 °F)	121 °C (250 °F)	1 in compression fitting, DN25/ 1 in ANSI flange
J5[2]						176.7 °C (350 °F)	
Metal sensor well with removable stainless steel rigid sensor							
W1[2]	16 mm (⅝ in)	6.1m (20 ft)	–1.0 bar (–14.7 psig)	90.64 bar (1300 psig)	–80 °C (–112 °F)	121 °C (250 °F)	¾ in compression fitting, DN25/ 1 in ANSI flange
W2[2]						230 °C (450 °F)	

Notes:
1. Can be cleaned for a maximum of one hour at 149 °C (300 °F)
2. Integral RTD (SER and STL options) not available on this probe design

...Probe selection guide

Probe selection guide (continued)

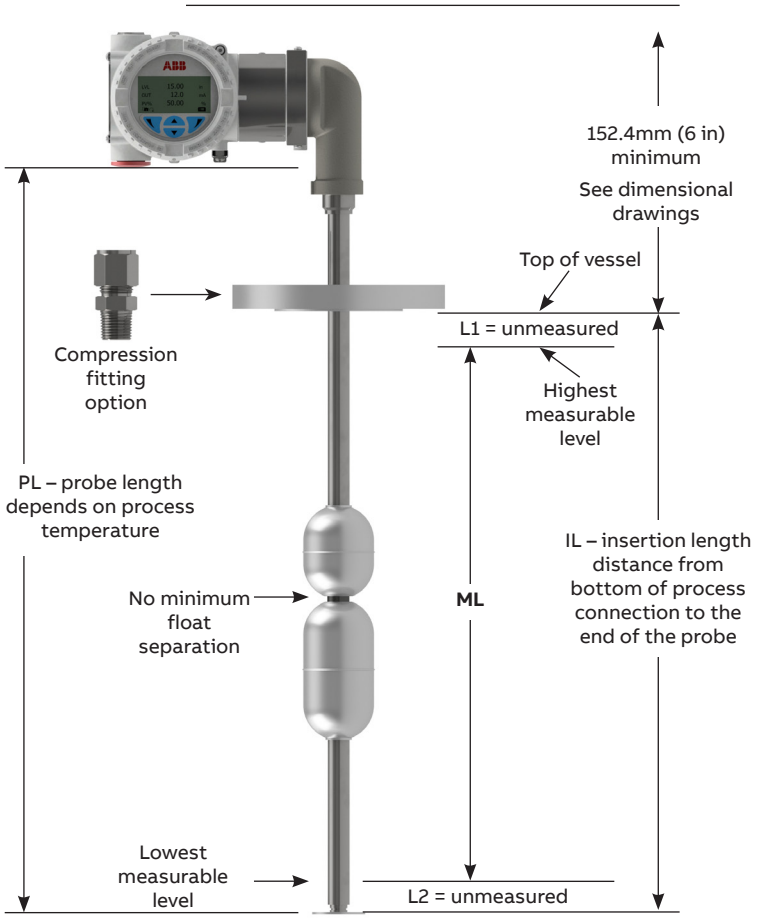
Probe type	Probe diameter	Maximum insertion length	Minimum pressure	Maximum pressure	Minimum process temperature	Maximum process temperature	Minimum standard process connection size
Metal sensor well with removable flexible braided stainless steel sensor element							
W3[1,2]	16 mm (⅝ in)	4.57m (15ft)	–1.0 bar (–14.7 psig)	90.64 bar (1300 psig)	–40 °C (–40 °F)	76.7 °C (170 °F)	¾ in compression fitting, DN25/ 1 in ANSI flange
Metal sensor well with removable stainless steel rigid sensor							
W4	27 mm (1.05 in) *¾ in NPS Pipe	9.14 m (30 ft)	–1.0 bar (–14.7 psig)	132 bar (900 psig)	–80 °C (–112 °F)	121 °C (250 °F)	1½ in welded threaded fitting, DN25/ 1 in ANSI flange
W5		4.57 m (15 ft)				230 °C (450 °F)	
W6						427 °C (800 °F)	
Segmented sensor well with SOLVAY SOLEXIS INC. flexible sensor element							
W7[2]	27 mm (1.05 in) *¾ in NPS Pipe	22.86 m (75 ft)	–1.0 bar (–14.7 psig)	21.7 bar (300 psig)	–26 °C (–15 °F)	77 °C (170 °F)	1 in compression fitting, DN25/ 1 in ANSI flange

Notes:
1. Can be cleaned for a maximum of one hour at 300 °F (149 °C)
2. Integral RTD (SER and STL options) not available on this probe design

L1 and L2 minimum unmeasurable distances *

Probe type	L1	L2
R1	25.4 mm (1 in)	133 mm (5.25 in)
R2	25.4 mm (1 in)	133 mm (5.25 in)
R3	25.4 mm (1 in)	133 mm (5.25 in)
R4	25.4 mm (1 in)	140 mm (5.5 in)
R5	25.4 mm (1 in)	140 mm (5.5 in)
C1	25.4 mm (1 in)	133 mm (5.25 in)
C2	25.4 mm (1 in)	133 mm (5.25 in)
C3	25.4 mm (1 in)	171 mm (6.75 in)
C4	25.4 mm (1 in)	171 mm (6.75 in)
H1	25.4 mm (1 in)	133 mm (5.25 in)
H2	25.4 mm (1 in)	133 mm (5.25 in)
J1	25.4 mm (1 in)	146 mm (5.75 in)
J2	25.4 mm (1 in)	146 mm (5.75 in)
J4	25.4 mm (1 in)	178 mm (7 in)
J5	25.4 mm (1 in)	178 mm (7 in)
W1	25.4 mm (1 in)	159 mm (6.25 in)
W2	25.4 mm (1 in)	159 mm (6.25 in)
W3	25.4 mm (1 in)	159 mm (6.25 in)
W4	25.4 mm (1 in)	171 mm (6.75 in)
W5	25.4 mm (1 in)	171 mm (6.75 in)
W6	25.4 mm (1 in)	171 mm (6.75 in)
W7 IL ≤ 12.19 m (40 ft)	25.4 mm (1 in)	209.55 mm (8.25 in)
W7 IL ≤ 22.86 m (75 ft)	25.4 mm (1 in)	330.2 mm (13 in)

* Magnet placement and float length determine final dimensions. Custom designs are also available.



Float selection guide

LMT100 with ⅝ in OD sensor (probe types – R1, R2, R3, H1, H2, C1, C2,W1, W2, W3)

FLOAT No.	MAX. O.D.		MATERIAL	LENGTH		Min. I.D.		Min. CLEAN FLUID S.G.	MAX. PRESS.	
	in	cm		in	cm	in	cm		psig	bar
01B	2.05	5.21	316 SS	2.67	6.78	0.7	1.78	0.71	350	24.1
02B	1.64	4.17	316 SS	1.42	3.61	0.71	1.8	1	200	13.8
05B	2.55	6.48	316 SS	7	17.78	0.8	2.03	0.71	560	38.6
06B	2.55	6.48	316 SS	11.5	29.21	0.8	2.03	0.73	600	41.4
07B	3.55	9.02	316 SS	5.92	15.04	0.8	2.03	0.49	575	39.6
08B	6.05	15.37	316 SS	5.94	15.09	0.8	2.03	0.33	600	41.4
15B	2.55	6.48	316 SS	7	17.78	0.7	1.78	0.52	330	22.8
17B	1.85	4.7	316 SS	2.93	7.44	0.7	1.78	0.78	350	24.1
18B	2.55	6.48	316 SS	7	17.78	0.96	2.44	0.63	330	22.8
29B	6	15.24	316 SS	5.81	14.76	1.46	3.71	0.4	600	41.4
401	2.55	6.48	316 SS	3.93	9.98	0.7	1.78	0.83	630	43.4
402	2.55	6.48	316 SS	5.43	13.79	0.7	1.78	0.73	630	43.4
41B	3.55	9.02	316 SS	3.44	8.74	0.7	1.78	0.55	800	55.2
09D	2	5.08	C–276	7.9	20.07	0.74	1.88	1.1	250	17.2
10D	3.55	9.02	C–276	5.93	15.06	0.74	1.88	0.55	520	35.9
11D	3.55	9.02	C–276	5.93	15.06	0.74	1.88	0.69	1350	93.1
17D	1.85	4.7	C–276	3	7.62	0.7	1.78	0.88	420	29
12F	2.88	7.32	CPVC	4	10.16	1.25	3.18	0.77	50	3.4
19F	1.88	4.78	CPVC	6	15.24	0.75	1.91	0.77	50	3.4
56F	1.88	4.78	CPVC	6	15.24	0.89	2.26	0.9	50	3.4
12E	2.88	7.32	PVC	4	10.16	1.25	3.18	0.7	50	3.4
19E	1.88	4.78	PVC	6	15.24	0.75	1.91	0.7	50	3.4
59E	2.38	6.03	PVC	13	33.02	1.26	3.2	0.61	15	1
14G	2.38	6.03	PVDF	4	10.16	1.19	3.02	0.85	50	3.4
55G	2.38	6.03	PVDF	4	10.16	0.88	2.24	0.68	50	3.4
52P	2.38	6.03	TEFLON (PFA)	4	10.16	0.89	2.26	0.94	50	3.4
53P	1.88	4.78	TEFLON (PFA)	6	15.24	0.81	2.06	1.06	50	3.4
210	2.55	6.48	TITANIUM*	8.1	20.58	1.46	3.71	0.65	75	5.2
231	2.55	6.48	TITANIUM*	5.44	13.82	0.7	1.78	0.45	700	48.3
232	2.55	6.48	TITANIUM*	8.44	21.44	0.7	1.78	0.42	700	48.3
233	2.55	6.48	TITANIUM*	11.44	29.06	0.7	1.78	0.4	700	48.3
241	2.55	6.48	TITANIUM*	8.44	21.44	0.7	1.78	0.41	350	24.1
251	2.55	6.48	TITANIUM*	3.94	10.01	0.7	1.78	0.47	575	39.6
252	2.55	6.48	TITANIUM*	5.44	13.82	0.7	1.78	0.43	575	39.6
253	2.55	6.48	TITANIUM*	6.94	17.63	0.7	1.78	0.41	575	39.6
254	2.55	6.48	TITANIUM*	8.44	21.44	0.7	1.78	0.39	575	39.6
255	2.55	6.48	TITANIUM*	9.94	25.25	0.7	1.78	0.38	575	39.6
261	1.88	4.78	TITANIUM*	4.21	10.69	0.7	1.78	0.58	250	17.2

*Titanium pressure ratings are valid to 100 °F. For higher temperatures, multiply the titanium pressure ratings by the factors listed to determine revised ratings:

65.6 °C (150 °F) = 0.84 93.3 °C (200 °F) = 0.74 121.1 °C (250 °F) = 0.64 148.9 °C (300 °F) = 0.55 176.7 °C (350 °F) = 0.48
204.4 °C (400 °F) = 0.42 232.2 °C (450 °F) = 0.35 260.0 °C (500 °F) = 0.34 287.8 °C (550 °F) = 0.30 315.6 °C (600 °F) = 0.28

Floats can be supplied with coatings for corrosion resistance and resistance to build–up. Consult factory.

...Probe selection guide

FLOAT No.	MAX. O.D.		MATERIAL	LENGTH		Min. I.D.		Min. CLEAN FLUID S.G.	MAX. PRESS.	
	in	cm		in	cm	in	cm		psig	bar
LMT100 with ⅝ in OD sensor (probe types – R1, R2, R3, H1, H2, C1, C2, W1, W2, W3)										
262	1.88	4.78	TITANIUM*	7.21	18.31	0.7	1.78	0.48	250	17.2
263	1.88	4.78	TITANIUM*	10.21	25.93	0.7	1.78	0.44	250	17.2
271	1.88	4.78	TITANIUM*	2.71	6.88	0.7	1.78	0.76	450	31
272	1.88	4.78	TITANIUM*	4.21	10.69	0.7	1.78	0.61	450	31
273	1.88	4.78	TITANIUM*	5.71	14.5	0.7	1.78	0.54	450	31
274	1.88	4.78	TITANIUM*	7.21	18.31	0.7	1.78	0.5	450	31
275	1.88	4.78	TITANIUM*	8.71	22.12	0.7	1.78	0.48	450	31
281	1.5	3.81	TITANIUM*	3.6	9.14	0.7	1.78	0.87	100	6.9
282	1.5	3.81	TITANIUM*	6.6	16.76	0.7	1.78	0.69	100	6.9
283	1.5	3.81	TITANIUM*	9.6	24.38	0.7	1.78	0.63	100	6.9
291	2.55	6.48	TITANIUM*	5.4	13.72	0.95	2.41	0.55	700	48.3
45T	2.55	6.48	TITANIUM*	10.67	27.1	0.74	1.88	0.75	2400	165.5
461	2.55	6.48	TITANIUM*	3.93	9.98	0.7	1.78	0.52	1000	68.9
462	2.55	6.48	TITANIUM*	5.43	13.79	0.7	1.78	0.48	1000	68.9
463	2.55	6.48	TITANIUM*	6.93	17.6	0.7	1.78	0.46	1000	68.9
471	2.55	6.48	TITANIUM*	3.33	8.46	0.9	2.29	0.73	1350	93.1
472	2.55	6.48	TITANIUM*	4.33	11	0.9	2.29	0.68	1350	93.1
473	2.55	6.48	TITANIUM*	5.33	13.54	0.9	2.29	0.66	1350	93.1
481	2.55	6.48	TITANIUM*	3.94	10.01	0.7	1.78	0.43	225	15.5
60T	5	12.7	TITANIUM*	4.85	12.32	0.93	2.36	0.33	900	62.1
LMT100 with ¾ in & 1 in (probe types – C3, C4, W4, W5, W6, W7)										
210	2.55	6.48	TITANIUM*	8.1	20.57	1.46	3.71	0.65	75	5.2
61T	5	12.7	TITANIUM*	4.75	12.07	1.46	3.71	0.43	900	62.1
29B	6	15.24	316 SS	5.81	14.76	1.46	3.71	0.36	600	41.4
58B	3.5	8.89	316 SS	5.69	14.45	1.46	3.71	0.67	575	39.6
LMT100 with ½ in OD sensor (probe types – R4, R5)										
20D	3.55	9.02	C–276	6	15.24	0.68	1.72	0.49	520	35.9
22D	2.55	6.48	C–276	8.5	21.59	0.65	1.65	0.74	150	10.3
53G	1.88	4.78	PVDF	6	15.24	0.81	2.06	0.85	50	3.4
54G	2.38	6.03	PVDF	4	10.16	0.81	2.06	0.67	50	3.4

*Titanium pressure ratings are valid to 100 °F. For higher temperatures, multiply the titanium pressure ratings by the factors listed to determine revised ratings:

65.6 °C (150 °F) = 0.84 93.3 °C (200 °F) = 0.74 121.1 °C (250 °F) = 0.64 148.9 °C (300 °F) = 0.55 176.7 °C (350 °F) = 0.48
204.4 °C (400 °F) = 0.42 232.2 °C (450 °F) = 0.35 260.0 °C (500 °F) = 0.34 287.8 °C (550 °F) = 0.30 315.6 °C (600 °F) = 0.28

Floats can be supplied with coatings for corrosion resistance and resistance to build–up. Consult factory.

Ordering information

Flameproof marking

- ATEX/IECEx
  - II ½ G Ex db IIC T6..T2 Ga/Gb
  - FM15ATEX0074X
  - IECEx FME 17.0004X
  - Power Supply 42 V DC/2W Max
- FM (C and US) approved
  - CLI Zone 1, AEx/Ex db IIC T6…T2 Gb
  - US – CLI GP ABCD, T6…T2
  - Canada – CLI GP BCD, T6…T2

Protection by enclosure marking

- ATEX/IECEx
  - II 2 D Ex tb IIIC T85 °C...T300 °C Db FM15ATEX0074X
  - IECEx FME17.0004X Power Supply 42 V DC/2W Max
- FM (C and US) approved
  - Zone 21 AEx/Ex tb IIIC T80 °C…T165 °C Db
  - US – CLII GP EFG, CLIII T6…T2
  - Canada – CLII GP EFG, CLIII T6…T2

Intrinsic/non–incendive marking

- ATEX/IECEx
  II 1 G Ex ia IIC T6…T4 Ga
  II 1 D Ex ia IIIC T80 °C Da;
  FISCO field device, FF–816 for (PA/FF output)
  FM17ATEX0062X – IECEx FME17.0004X
  II 3 G Ex ic IIC T6..T4 Gc
  II 3 D Ex ic IIIC T80 °C Dc
  FISCO Field Device, FF–816 for (PA/FF output)
  II 3 G Ex nA IIC T6..T4 Gc
  FM17ATEX0063X – IECEx FME17.0004X
- FM (C and US) approved
  CLI DIV1/GP ABCD, CLII/DIV1/GP EFG, CLIII;
  CLI ZONE 0 AEx/Ex ia IIC T6…T4 Ga;
  Zone 20 AEx ia IIIC T80 °C; CLII/III DIV1 Ex ia IIIC T80 °C;
  CLI/DIV2/GP ABCD; CLII/DIV2/GP FG; CLIII;
  CLI ZONE 2, AEx nC IIC T6…T4;
  CLI ZONE 2, Ex nL IIC T6…T4;
  FISCO field device, FF–816 for (PA/FF output)
  per 3KXL140000G0109

Example of code:

LMT100.M1.S6.R1.A1.P1.NT.B.N.S6.D1.L2.H1.51B.99Z – SER.TS // CN.R5.M5 IL=1234.12mm

Base model (continued)			
LMT100 insertion transmitter	**LMT100.....x– .../ /**	**xx**	**xx**
Approvals			
General purpose		Y0	
INMETRO, ATEX/IECEx flameproof, intrinsically safe, no–sparking (protection type marked by customer)		B4	
NEPSI (China), intrinsically safe		C1	
NEPSI (China), flameproof housing		C2	
NEPSI (China), non–sparking		C3	
NEPSI (China), ATEX/IECEx flameproof, intrinsically safe, non–sparking (protection type marked by customer)		C4	
ATEX/IECEx intrinsic safety		E1	
ATEX/IECEx flameproof housing		E2	
ATEX/IECEx non–sparking		E3	
EAC, intrinsically safe		G1	
EAC, flameproof housing		G2	
EAC, non–sparking		G3	
Multi–approval – North American (meeting FM and Canadian standards)/ATEX/IECEx explosion proof or flameproof, intrinsic safety or non–sparking (protection type marked by customer)		M1	
Combination approval – North American (meeting FM and Canadian standards) and INMETRO – flameproof/explosion proof, intrinsically safe, non–incendive/non–sparking (protection type marked by customer)		M2	
North American (meeting FM, and Canadian standards), iIntrinsically safe		N1	
North American (meeting FM and Canadian standards) explosion Proof/flameproof		N2	
North American (meeting FM and Canadian standards) non–incendive/non–sparking		N3	
Others		Z9	
Probe wetted material			
No wetted parts, no sensor well			Y0
316/L SS			S6
Hastelloy C–276			H1
Alloy 20			A2
TEFLON jacketed			P1
Special			Z9

...Ordering information

Example of code:

LMT100.M1.S6.R1.A1.P1.NT.B.N.S6.D1.L2.H1.51B.99Z – SER.TS // CN.R5.M5 IL=1234.12mm

Base model (continued)				
LMT100 insertion transmitter	**LMT100.....x–**	**xx**	**xx**	**xx**
Probe style and probe type				
⅝ in rigid probe, 1.0 to 125 bar (–14.7 to 1800 psig), –80 to 121 °C (–112 to 250 °F)				R1
⅝ in rigid probe, 1.0 to 125 bar (–14.7 to 1800 psig), –80 to 230 °C (–112 to 450 °F)				R2
⅝ in rigid probe, 1.0 to 125 bar (–14.7 to 1800 psig), –80 to 427 °C (–112 to 800 °F)				R3
½ in rigid probe, 1.0 to 125 bar (–14.7 to 1800 psig), –80 to 121 °C (–112 to 250 °F)				R4
½ in rigid probe, 1.0 to 125 bar (–14.7 to 1800 psig), –80 to 230 °C (–112 to 450 °F)				R5
⅝ in rigid probe for cryo services, 1.0 to 125 bar (–14.7 to 1800 psig), –195.6 to 121.1 °C (–320 to 250 °F), with Vapor Seal				C1
¾ in NPS (26.67mm/1.05 in OD) sensor well with ⅝ in rigid probe for cryo services, –1.0 to 125.12 bar (–14.7 to 1800 psig), –195.6 to 121.1 °C (–320 to 250 °F), with vapor seal				C3
⅝ in high pressure probe, –1.0 to 166.5 bar (–14.7 to 2400 psig), –80 to 121 °C (–112 to 250 °F)				H1
⅝ in high pressure probe, –1.0 to 166.5 bar (–14.7 to 2400 psig), –80 to 230 °C (–112 to 450 °F)				H2
¾ in PFA TEFLON jacketed rigid probe, 0.0 to 4.46 bar (0 to 50 psig), –40 to 121 °C (–40 to 250 °F)				J1
¾ in PFA TEFLON jacketed rigid probe, 0.0 to 4.46 bar (0 to 50 psig), –40 to 250 °C (–40 to 350 °F)				J2
¾ in PFA TEFLON jacketed sensor well with ½ in rigid probe, 0.0 to 4.46 bar (0 to 50 psig), –40 to 121 °C (–40 to 250 °F)				J4
¾ in PFA TEFLON jacketed sensor well with ½ in rigid probe, 0.0 to 4.46 bar (0 to 50 psig), –40 to 176.7 °C (–40 to 350 °F)				J5
⅝ in sensor well with ½ in rigid probe, –1.0 to 90.64 bar (–14.7 to 1300 psig), –80 to 121 °C (–112 to 250 °F)				W1
⅝ in sensor well with ½ in rigid probe, –1.0 to 90.64 bar (–14.7 to 1300 psig), –80 to 230 °C (–112 to 450 °F)				W2
⅝ in sensor well with ½ in flexible stainless steel braided probe, 0.013 to 90.64 bar (–14.7 to 1300 psig) –40 to to 76.7 °C (–40 to 170 °F)				W3[1]
¾ in NPS (26.67mm/1.05 in OD) sensor well with ⅝ in rigid probe, –1.0 to 132 bar (–14.7 to 1900 psig), –80 to 121 °C (–112 to 250 °F)				W4
¾ in NPS (26.67mm/1.05 in OD) sensor well with ⅝ in rigid probe, –1.0 to 132 bar (–14.7 to 1900 psig), –80 to 230 °C (–112 to 450 °F)				W5
¾ in NPS (26.67mm/1.05 in OD) sensor well with ⅝ in rigid probe, –1.0 to 132 bar (–14.7 to 1900 psig), –80 to 427 °C (–112 to 800 °F)				W6
1 in segmented sensor well with flexible SOLVAY SOLEXIS INC. sensor probe, –1.0 to 21.7 bar (–14.7 to 300 psig), –26 to 77 °C (–15 to 170 °F) (Viton o–rings standard)				W7[1]
Special				Z9

Notes:
1. Not available with C4, E2, M1, N2 approval codes.

...Ordering information

Example of Code:

LMT100.M1.S6.R1.A1.P1.NT.B.N.S6.D1.L2.H1.51B.99Z – SER.TS // CN.R5.M5 IL=1234.12mm

Base model (continued)						
LMT100 insertion transmitter	**LMT100.....x–**		**xx**	**xx**	**xx**	**x**
Probe end connection[1]						
None			Y0			
Retaining clip			A1			
Centering disk, O.D. 1	Minimum stilling well size					
38.1 mm (1.5 in)	1½ in sch. 40		C1			
50.8 mm (2.0 in)	2 in sch. 40		C2			
58.42 mm (2.3 in)	2.5 in sch. 40		C3			
73.025 mm (2.875 in)	3 in sch. 80		C4			
95.25 mm (3.75 in)	4 in sch. 80		C6			
Special			Z9			
Process connection style						
None				Y0		
Compression fitting				P1		
Welded process connection				P2		
Loose process connection				P3		
Special				Z9		
Process connection type						
None					YY	
ANSI/ASME RTJ					AJ	
ANSI/ASME raised face					AR	
British pipe thread (BSPP) G thread					GT	
NPT					NT	
DIN raised face					DR	
Fisher displacer flange 249B					FB	
Fisher displacer flange 249C					FC	
Fisher displacer flange 249N					FN	
Masoneilan displacer flange					MD	
Special					ZZ	
Process connection size						
None						Y
½ in (P1 compression fitting process connection only. R4 and R5 probe options)						A
¾ in (P1 compression fitting process connection only. R1 through R5, C1, C2, H1, H2, W1, W2, W3 probe options)						B
DN 25/ASME (ANSI) 1 in						C
DN 32/ASME (ANSI) 1–1/4 in						D
DN 40/ASME (ANSI) 1–½ in						E
DN 50/ASME (ANSI) 2 in						F
DN 65/ASME (ANSI) 2–½ in						G
DN 80/ASME (ANSI) 3 in						H
DN 100/ASME (ANSI) 4 in						J
Special						Z

1. Probe end connection to be selected depending on the float ID and weight.

...Ordering information

Example of code:

LMT100.M1.S6.R1.A1.P1.NT.B.N.S6.D1.L2.H1.51B.99Z – SER.TS // CN.R5.M5 IL=1234.12mm

Base model (continued)									
LMT100 insertion magnetostrictive transmitter LMT100.....x–	**xx**	**xxx**	**xxx**	**xxx**	**x**	**xx**	**xx**	**xx**	**xx**
Process connection pressure rating									
None					Y				
PN 25/ASME (ANSI) class 150					D				
PN 40/ASME (ANSI) class 300					E				
PN 63					F				
PN 100/ASME (ANSI) class 600					G				
PN 160/ASME (ANSI) class 900					H				
PN 250/ASME (ANSI) class 1500					J				
Compression fitting or threaded connection					N				
Special					Z				
Process connection material									
No wetted parts, no sensor well						Y0			
316/L SS						S6			
Hastelloy C–276						H1			
Carbon steel						C1			
TEFLON jacketed flange or TEFLON compression fitting						P1			
Special						Z9			
Housing									
None (for sensor well replacement only)							Y0		
Aluminum with 2 x M20 x 1.5							D1		
Aluminum with 2 x NPT ½ in							D2		
Stainless steel with 2 x M20 x 1.5							D3		
Stainless steel with 2 x NPT ½ in							D4		
Remote/aluminum/2 x M20 x 1.5*							R1		
Remote/aluminum/2 x NPT ½ in*							R2		
Remote/stainless Steel/2 x M20 x 1.5*							R3		
Remote/stainless Steel/2 x NPT ½ in*							R4		
Special							Z9		
Display									
No display, with blind cover								L0	
With through the glass (TTG) push buttons and display and glass cover								L2	
Special								Z9	
Output									
None (for sensor well replacement only)									Y0
Single 4 ... 20 mA + HART									H1
FOUNDATION Fieldbus									F1
Special									Z9

* in progress

...Ordering information

Example of Code:

LMT100.M1.S6.R1.A1.P1.NT.B.N.S6.D1.L2.H1.51B.99Z – SER.TS // CN.R5.M5 IL=1234.12mm

Base model (contnued)		
LMT100 insertion transmitter	**LMT100.....x–**	**xxx**
Float 1 option *see selection guide on page 10 and 11 of this data sheet		
None (replacement sensor well)		**00Y**
No float, replacement sensor without float with level measurement		**00R**
Special custom or interface float (consult factory)		**99Z**

FLOAT No.	**MAX O.D.**		**MATERIAL**	**LENGTH**		
	Inches	**cm**		**Inches**	**cm**	
F21T	2.55	6.48	TITANIUM	8.1	20.57	**210**
F23T1	2.55	6.48	TITANIUM	5.44	13.82	**231**
F23T2	2.55	6.48	TITANIUM	8.44	21.44	**232**
F23T3	2.55	6.48	TITANIUM	11.44	29.06	**233**
F24T1	2.55	6.48	TITANIUM	8.44	21.44	**241**
F25T1	2.55	6.48	TITANIUM	3.94	10.01	**251**
F25T2	2.55	6.48	TITANIUM	5.44	13.82	**252**
F25T3	2.55	6.48	TITANIUM	6.94	17.63	**253**
F25T4	2.55	6.48	TITANIUM	8.44	21.44	**254**
F25T5	2.55	6.48	TITANIUM	9.94	25.25	**255**
F26T1	1.88	4.78	TITANIUM	4.21	10.69	**261**
F26T2	1.88	4.78	TITANIUM	7.21	18.31	**262**
F26T3	1.88	4.78	TITANIUM	10.21	25.93	**263**
F27T1	1.88	4.78	TITANIUM	2.71	6.88	**271**
F27T2	1.88	4.78	TITANIUM	4.21	10.69	**272**
F27T3	1.88	4.78	TITANIUM	5.71	14.50	**273**
F27T4	1.88	4.78	TITANIUM	7.21	18.31	**274**
F27T5	1.88	4.78	TITANIUM	8.71	22.12	**275**
F28T1	1.5	3.81	TITANIUM	3.6	9.14	**281**
F28T2	1.5	3.81	TITANIUM	6.6	16.76	**282**
F28T3	1.5	3.81	TITANIUM	9.6	24.38	**283**
F29T1	2.55	6.48	TITANIUM	5.4	13.71	**291**
F40B1	2.55	6.48	316 SS	3.93	9.98	**401**
F40B2	2.55	6.48	316 SS	5.43	13.79	**402**
F46T1	2.55	6.48	TITANIUM	3.93	9.98	**461**
F46T2	2.55	6.48	TITANIUM	5.43	13.79	**462**
F46T3	2.55	6.48	TITANIUM	6.93	17.60	**463**
F47T1	2.55	6.48	TITANIUM	3.33	8.46	**471**
F47T2	2.55	6.48	TITANIUM	4.33	10.99	**472**
F47T3	2.55	6.48	TITANIUM	5.33	13.53	**473**
F48T1	2.55	6.48	TITANIUM	3.94	10.01	**481**
F1B	2.05	6.48	316 SS	2.67	6.78	**01B**

...Ordering information

Example of code:

LMT100.M1.S6.R1.A1.P1.NT.B.N.S6.D1.L2.H1.51B.99Z – SER.TS // CN.R5.M5 IL=1234.12mm

Base model (continued)

LMT100 insertion magnetostrictive transmitter	**LMT100.....x–**	**xxx**

Float 1 option (continued) *See selection guide on page 11 and 12 of this data sheet

FLOAT No.	MAX O.D.		MATERIAL	LENGTH		
	in	cm		in	cm	
F2B	1.64	4.17	316 SS	1.42	3.61	**02B**
F5B	2.55	6.48	316 SS	7	17.78	**05B**
F6B	2.55	6.48	316 SS	11.5	29.21	**06B**
F7B	3.55	9.02	316 SS	5.92	15.04	**07B**
F8B	6.05	15.37	316 SS	5.94	15.09	**08B**
F9D	2	5.08	C–276	7.9	20.07	**09D**
F10D	3.55	9.02	C–276	5.93	15.06	**10D**
F11D	3.55	9.02	C–276	5.93	15.06	**11D**
F12E	2.88	7.32	PVC	4	10.16	**12E**
F12F	2.88	7.32	CPVC	4	10.16	**12F**
F14G	2.38	7.32	PVDF	4	10.16	**14G**
F15B	2.55	6.48	316 SS	2.55	6.48	**15B**
F17B	1.85	4.7	316 SS	1.85	4.70	**17B**
F18B	2.55	6.48	316 SS	2.55	6.48	**18B**
F19E	1.88	4.78	PVC	6	15.24	**19E**
F19F	1.88	4.78	CPVC	6	15.24	**19F**
F20D	3.55	9.02	C–276	3.55	9.02	**20D**
F22D	2.55	6.48	C–276	2.55	6.48	**22D**
F29B	6	15.24	316 SS	6	15.24	**29B**
F30B	2.31	5.87	316 SS	2.31	5.87	**30B**
F31B	1.85	4.7	316 SS	1.85	4.70	**31B**
F41B	3.55	9.02	316 SS	3.55	9.02	**41B**
F45T	10.67	27.10	TITANIUM	10.67	27.10	**45T**
F50B	7.5	19.05	316 SS	7.5	19.05	**50B**
F50BDM	7.5	19.05	316 SS	7.5	19.05	**50M**
F52P	2.38	6.05	TEFLON (PFA)	2.38	6.05	**52P**
F53G	1.88	4.78	PVDF	1.88	4.78	**53G**
F53P	1.88	4.78	TEFLON (PFA)	1.88	4.78	**53P**
F54G	2.38	6.03	PVDF	4	10.16	**54G**
F55G	2.38	6.03	PVDF	4	10.16	**55G**
F56F	1.88	4.78	CPVC	6	15.24	**56F**
F58B	3.5	8.89	316 SS	5.69	14.45	**58B**
F59E	2.38	6.05	PVC	13	33.02	**59E**
F60T	5	12.7	TITANIUM	4.85	12.32	**60T**
F61T	5	12.7	TITANIUM	4.75	12.07	**61T**

...Ordering information

Example of code:

LMT100.M1.S6.R1.A1.P1.NT.B.N.S6.D1.L2.H1.51B.99Z – SER.TS // CN.R5.M5 IL=1234.12mm

The following codes behind the hyphen (–) are options which affect the construction and tagging of the transmitter.

Base model (continued)		
LMT100 insertion transmitter	**LMT100.....x–**	**xxx**
Float 2 option		
None (replacement sensor well)		00Y
No float, replacement sensor without float with level measurement		00R
Special		99Z

The following codes behind the hyphen (–) are options which affect the construction and tagging of the transmitter.

Options					
LMT100 insertion transmitter	**LMT100.....x–xxx.xxx...**	**xxx**	**xx**	**xx(x)**	**xx**
Additional approvals or certifications					
Furnished with CRN data package (includes tagging, MTR and hydro tests)		CRN			
SIL Certification					
SIL2 (HFT=0) and SIL3 (HFT=1) – certified acc. to IEC61508			CS		
Sensor probe options					
Add high temperature wire to cryogenic				SEU	
Add Teflon sleeve to probe for stick resistance only, not for corrosion resistance (max temp 176.7 °C [80.4 °F]); maximum probe length (7.6 mm [25 ft])				SEN[1]	
240 grit polish (316/L only)				SEP	
Add RTD temperature sensor (default placement is 82.55mm from tip of the probe)				SER	
Custom placement of RTD in sensor probes equipped with temperature option, typically RTD placement is 82.55 mm (3.25 in) from the tip of the probe.				STL	
Add nitrogen purged vapor seal to standard probe				SEV[2]	
Add a mechanical float stop on sensor tube				FS	
Sensor special				SEZ	
Device identification plate					
Add stainless steel hang tag, custom markings 4 lines, 22 characters per line					TS
Other tagging special					TZ

[1] R1 and W1 probes only
[2] C1, C2, C3 and C4 sensors already include vapor seals. This option applies to ridgid probes only. Option is not available on W3 and W7 sensors.

The following codes behind the hyphen (–) are options which affect the construction and tagging of the transmitter.

...Ordering information

Example of code:

LMT100.M1.S6.R1.A1.P1.NT.B.N.S6.D1.L2.H1.51B.99Z – SER.TS // CN.R5.M5 IL=1234.12mm

The following codes behind the hyphen (–) are options which affect the construction and tagging of the transmitter.

Options (continued)					
LMT100 insertion transmitter LMT100.....x–xxx.xx		**xxx**	**xx**	**xx(x)**	**xx**
Signal cable length (for remote transmitter only)					
5 m (approx. 16 ft)*		SC1			
10 m (approx. 33 ft)*		SC2			
20 m (approx. 66 ft)*		SC4			
30 m (approx. 98 ft)*		SC6			
Surge protector					
Surge/transient protector			S1		
Special other					
Special paint or treatment on housing				STH	
Special paint or treatment on flange				STF	
Nuclear use, device to be used in a nuclear facility (application must be reviewed by ABB)				P4	
Special				PZ	
Cleaning services					
Degreased (oil and grease free) for oxygen or chlorine service					P1
Silicone–free design					P7

* in progress

All codes located behind the // are for additional requirements and order comments.

These codes will not be included on the device tag.

...Ordering information

Example of code:

LMT100.M1.S6.R1.A1.P1.NT.B.N.S6.D1.L2.H1.51B.99Z – SER.TS // CN.R5.M5 IL=1234.12mm

All codes located behind the // are for additional requirements and order comments.

These codes will not be included on the device tag.

Additional order requirements and order comments			
LMT100.....x– .../xx.xxx...		**xx(x)**	**xxx**
Certificates			
Declaration of compliance with the order 2.1 acc. EN 10204		C4	
Test report 2.2 acc. EN 10204		C1	
MTR 3.1, material monitoring with inspection certificate 3.1 acc. EN 10204		C2	
MTR 3.2, material monitoring with inspection certificate 3.2 acc. EN 10204		C3	
With dye penetrant test on pressure bearing parts.		C9	
Material monitoring NACE MR 0175, MR 0103 with inspection certificate 3.1 acc. EN 10204		CN	
PMI positive material identification		CHD	
Certificate of origin		GS1	
Other certificates		CZ	
Drawings			
Drawings for approval required prior to construction			GD1
Drawings for record required			GD2
Certified as built drawings required			GD3
Other drawings			GDZ

All codes located behind the // are for additional requirements and order comments.

These codes will not be included on the device tag.

...Ordering information

Example of code:

LMT100.M1.S6.R1.A1.P1.NT.B.N.S6.D1.L2.H1.51B.99Z – SER.TS // CN.R5.M5 IL=1234.12mm

All codes located behind the // are for additional requirements and order comments.

These codes will not be included on the device tag.

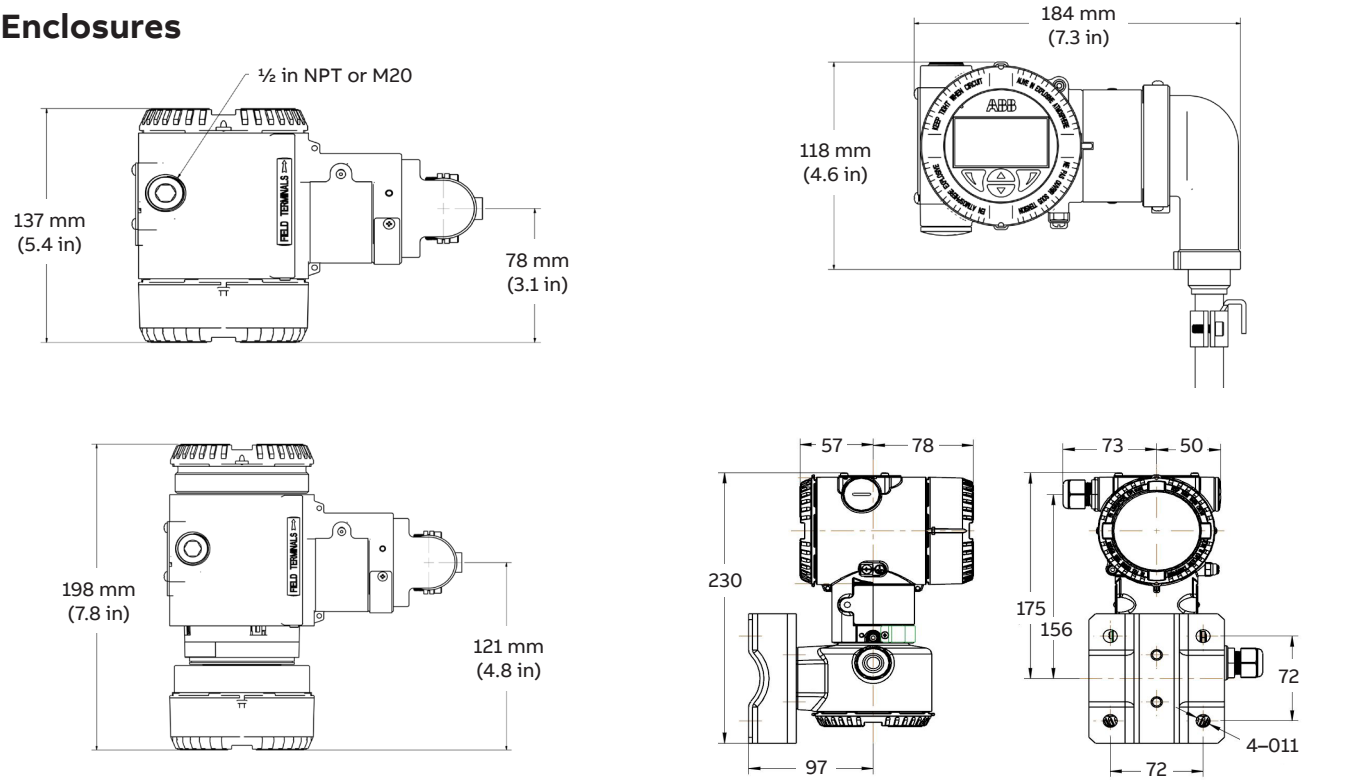
Additional order requirements and order comments (continued)		
LMT100.....x– .../xx.xxx...	**xx**	**xx**
Documentation language (installation, operation and maintenance manual)*		
German	M1[1]	
Spanish	M3[1]	
English	M5	
Chinese	M6	
Portuguese	MA	
Russian	MB	
Other languages – 'contact factory'	MZ	
Calibration and configuration		
3–point calibration verification certificate, default values of 100, 50 and 0 % of span, or customer specified points		R3
5–point calibration verification certificate, default values of 100, 75, 50, 25 and 0 % of span, or customer specified points		R5
Custom linearization or strapping table entered (up to 20 points)		RL
Calibrate for two float application		RF
Witnessed calibration, with certificate		RW
Printed record of configured settings in transmitter[1]		CG
Special calibration		RZ

[1] in progress
*English is default.
Chinese is default if NEPSI approval is selected

[1] refer LMT100 DS

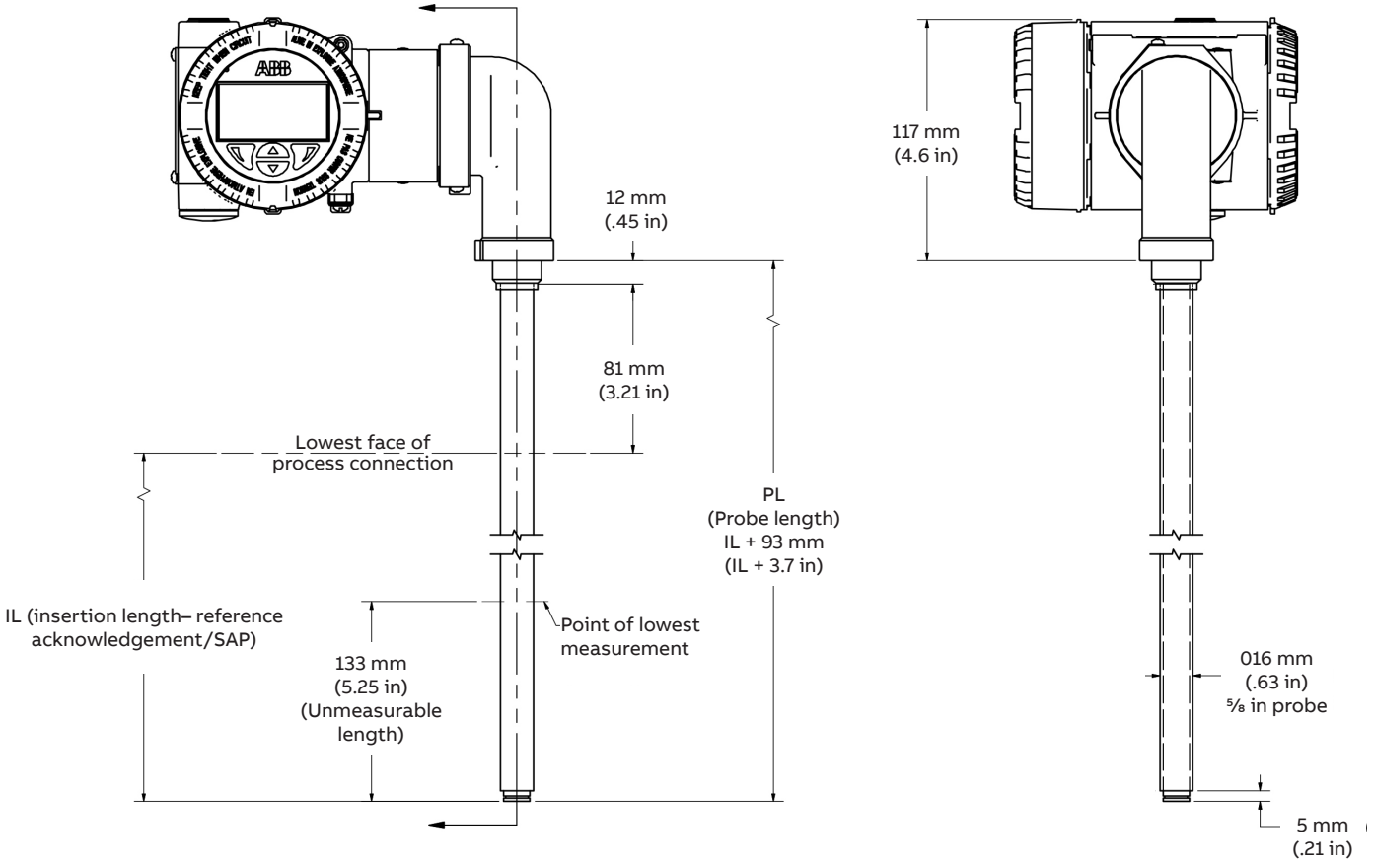
Insertion length on LMT100	**12345.12**	
Insertion length (IL)		
Inches	xxxxx.xx	in
Millimeters	xxxxx.xx	mm

Enclosures



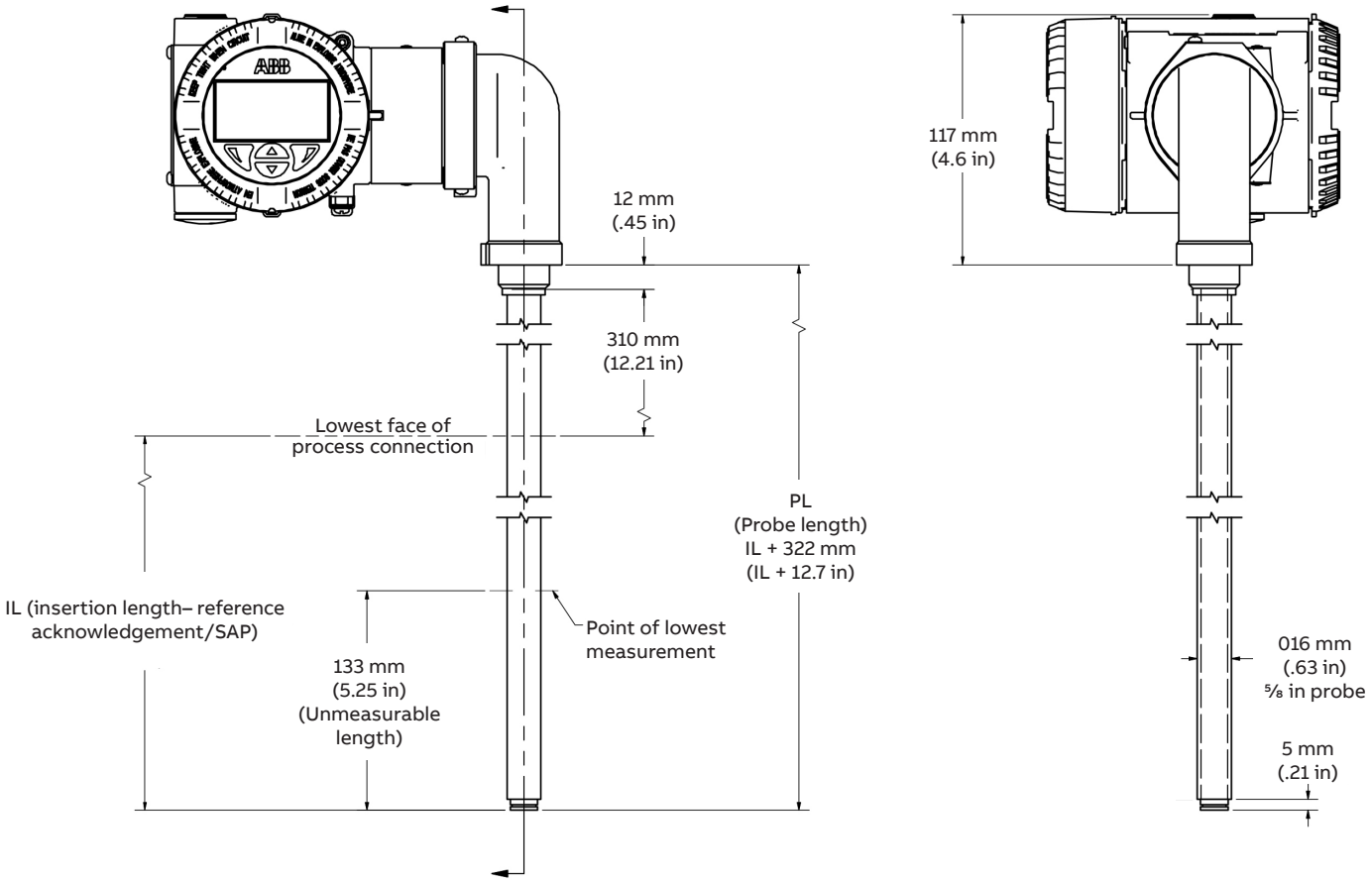
*Drawings for reference only

Probe type R1, C1, H1



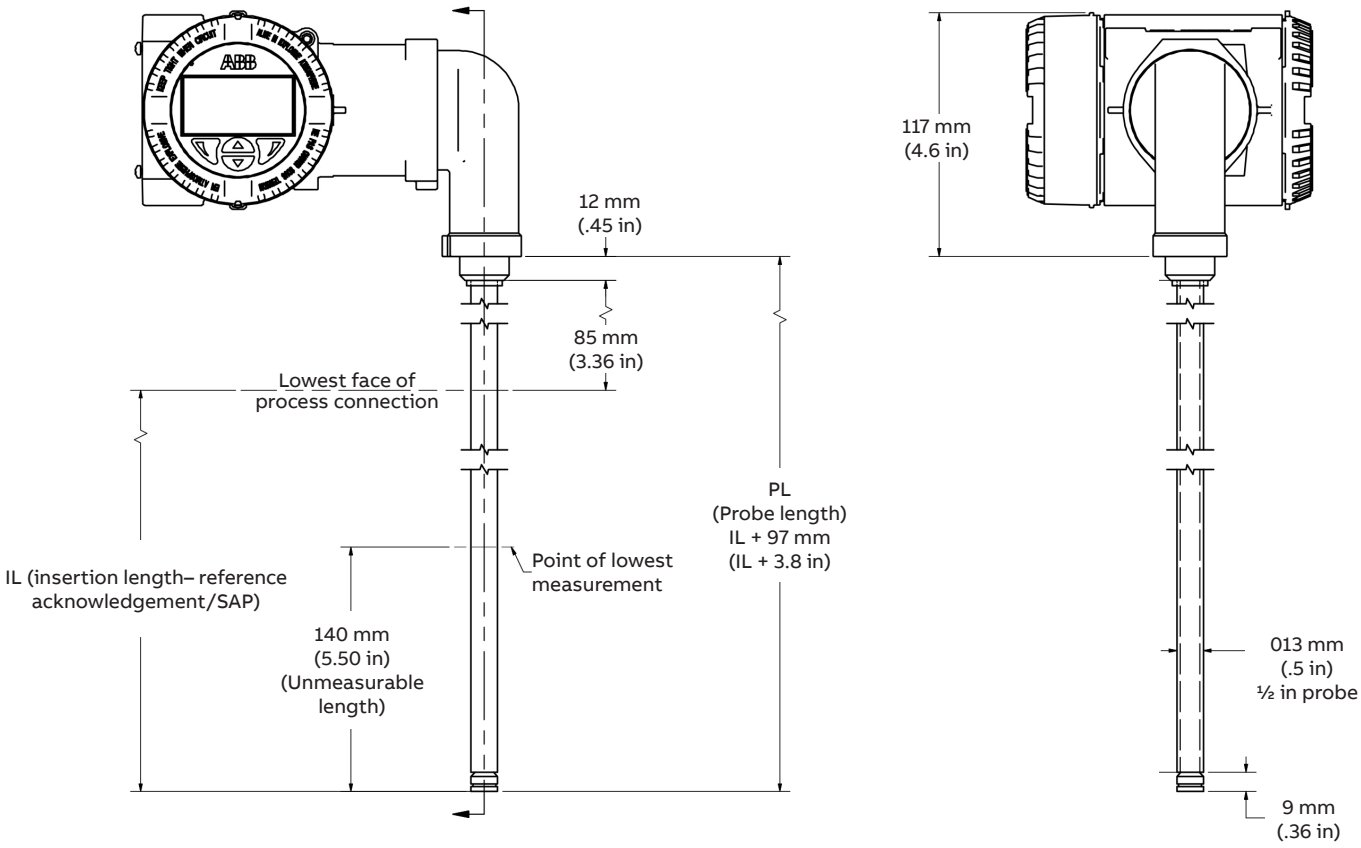
*Drawings for reference only

Probe type R2, R3, C2, H2



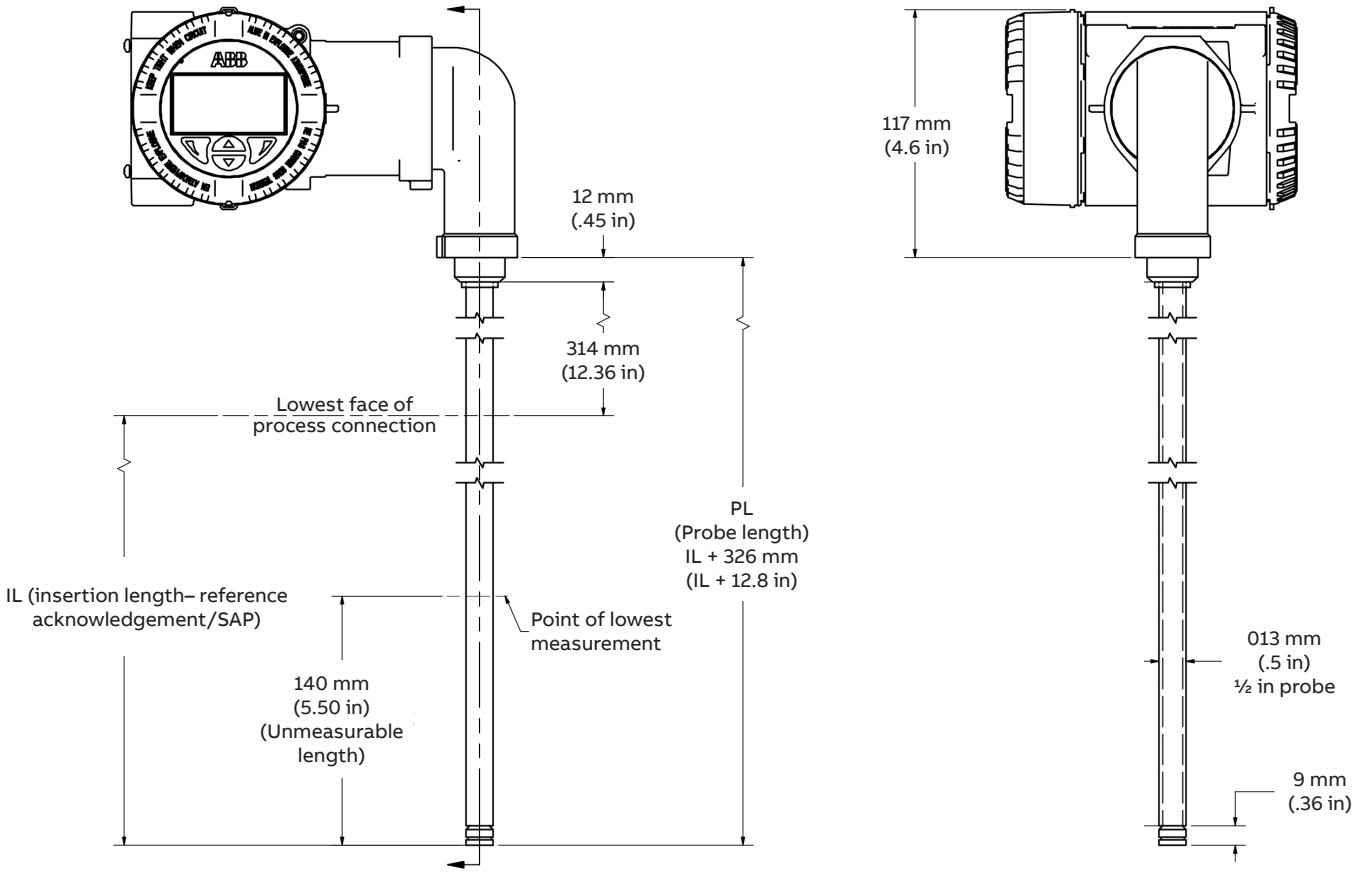
*Drawings for reference only

Probe type R4



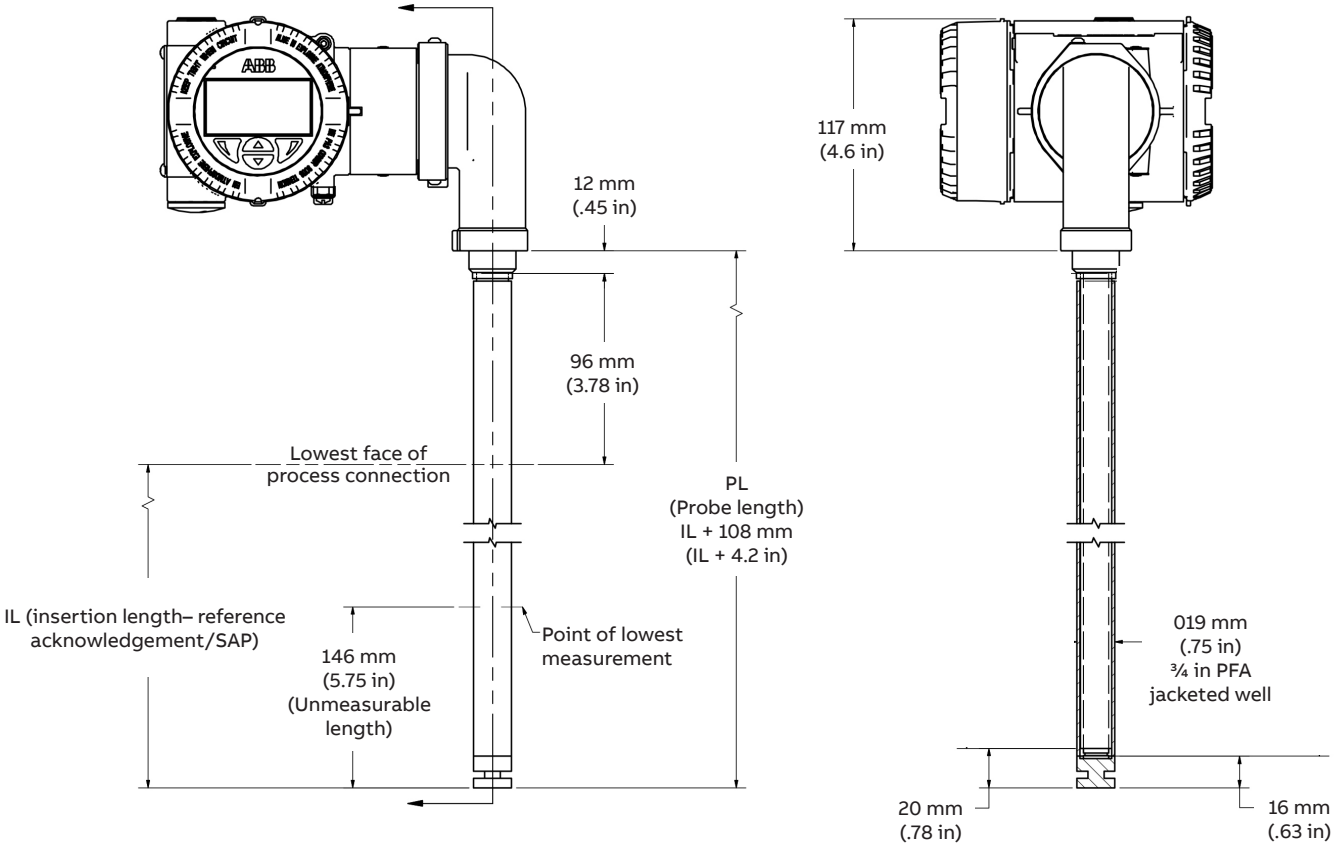
*Drawings for reference only

Probe type R5



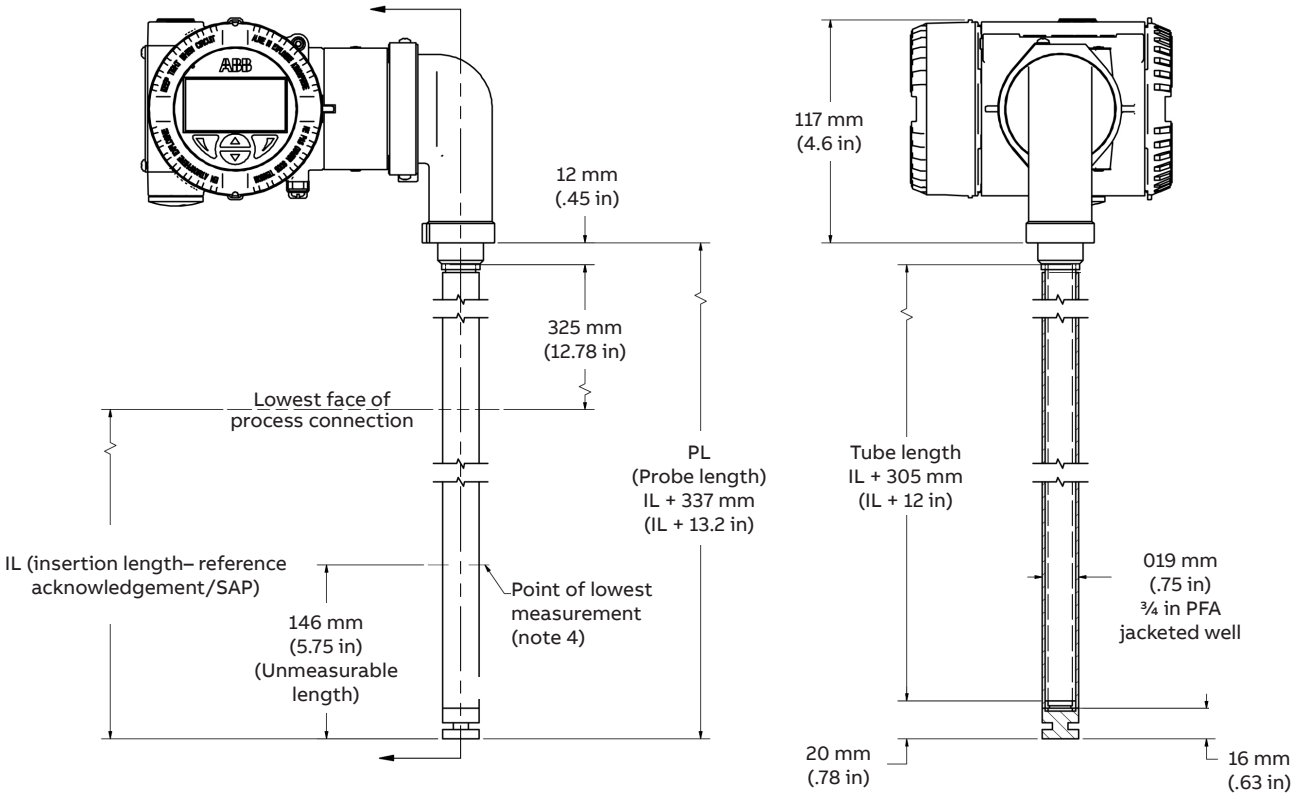
*Drawings for reference only

Probe type J1



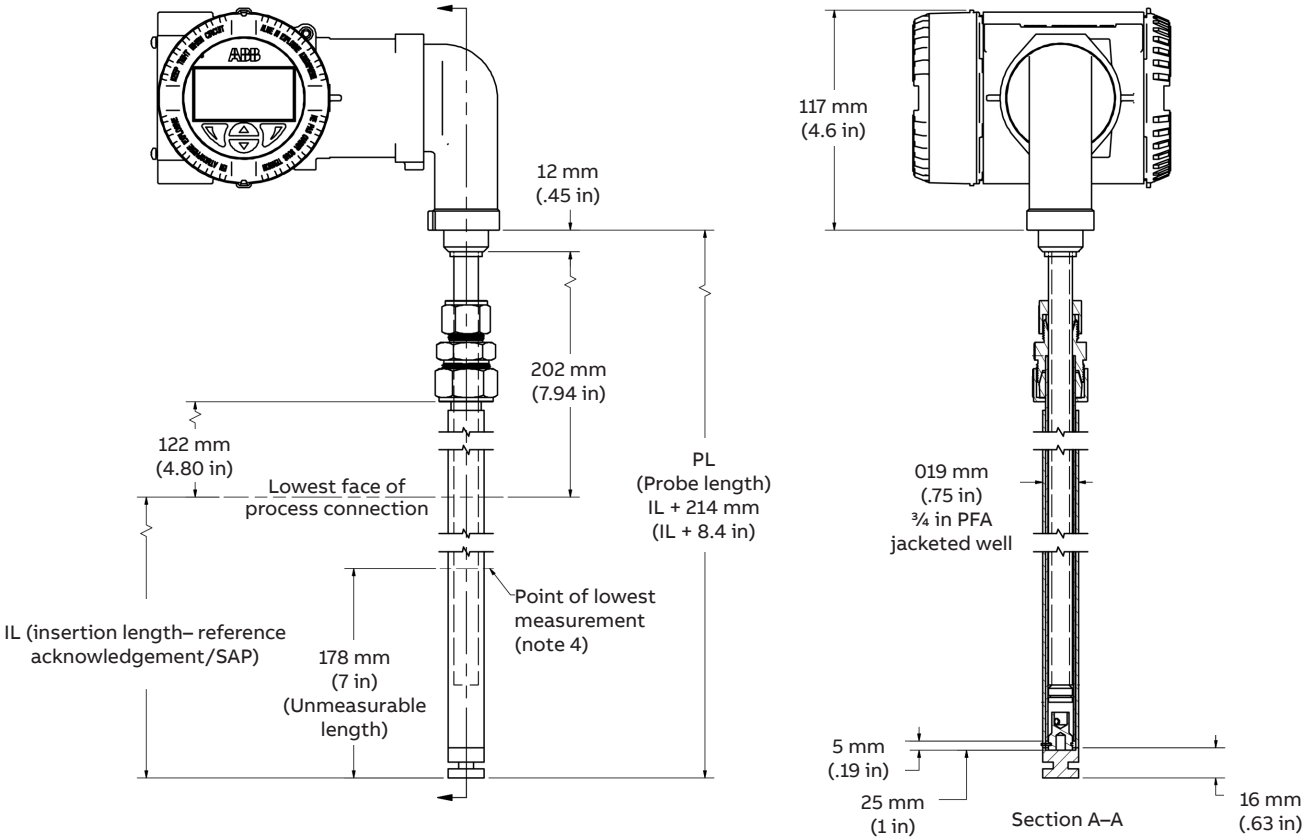
*Drawings for reference only

Probe type J2



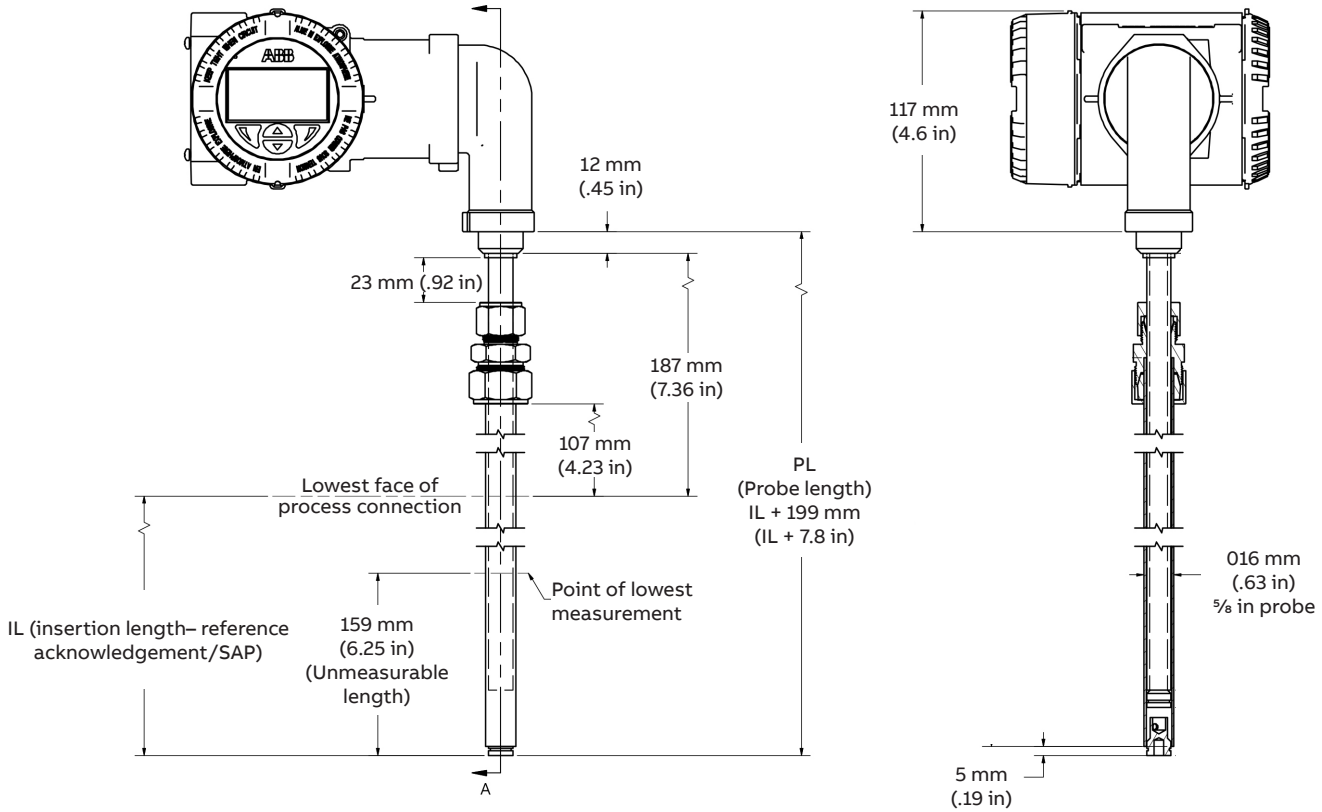
*Drawings for reference only

Probe type J4, J5



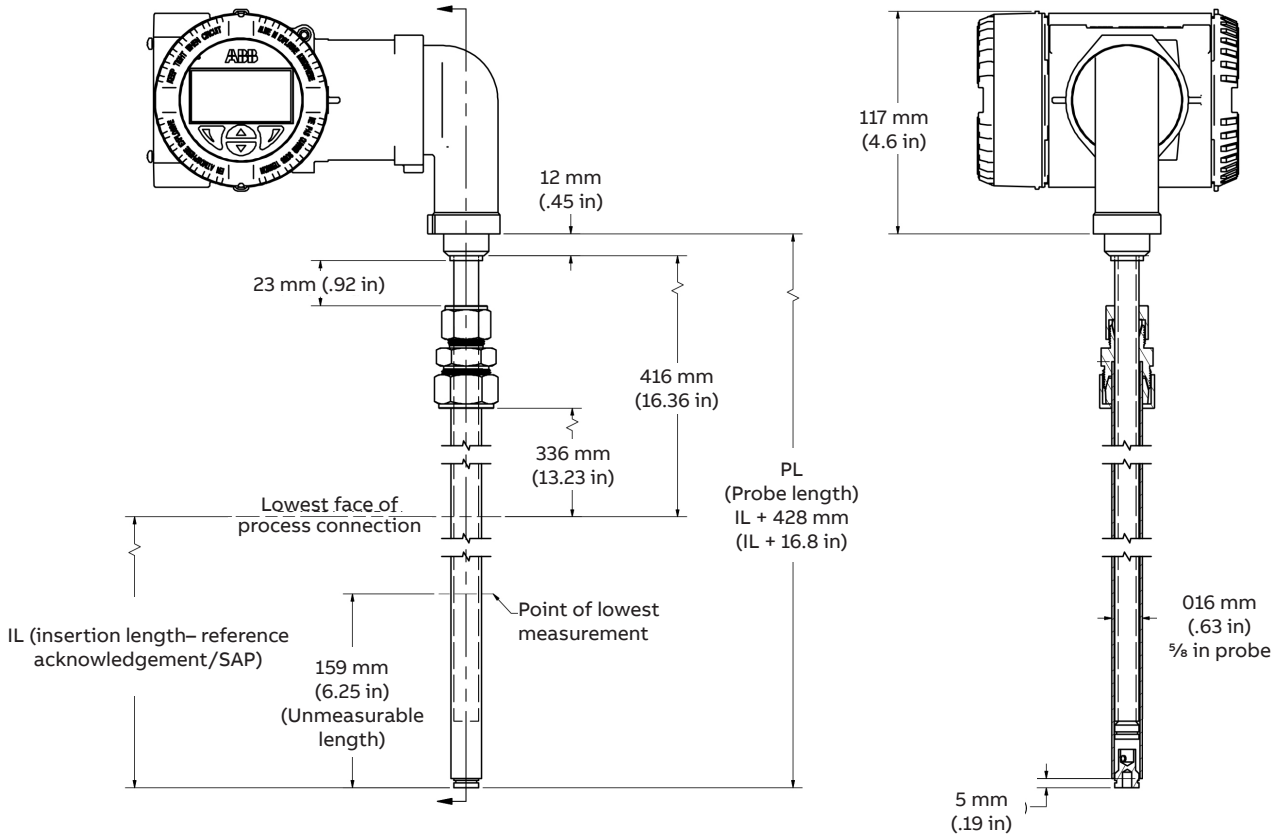
*Drawings for reference only

Probe type W1



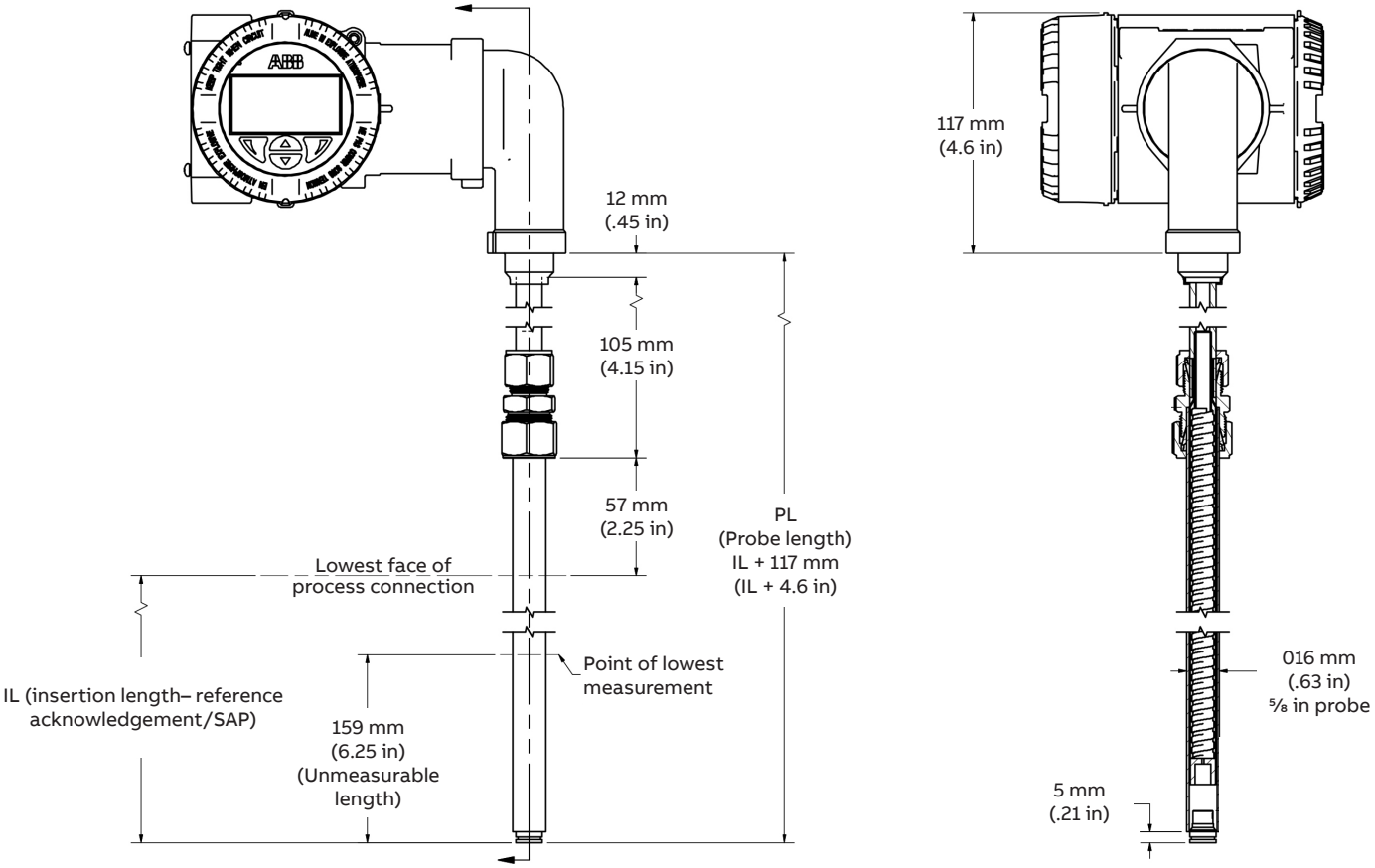
*Drawings for reference only

Probe type W2



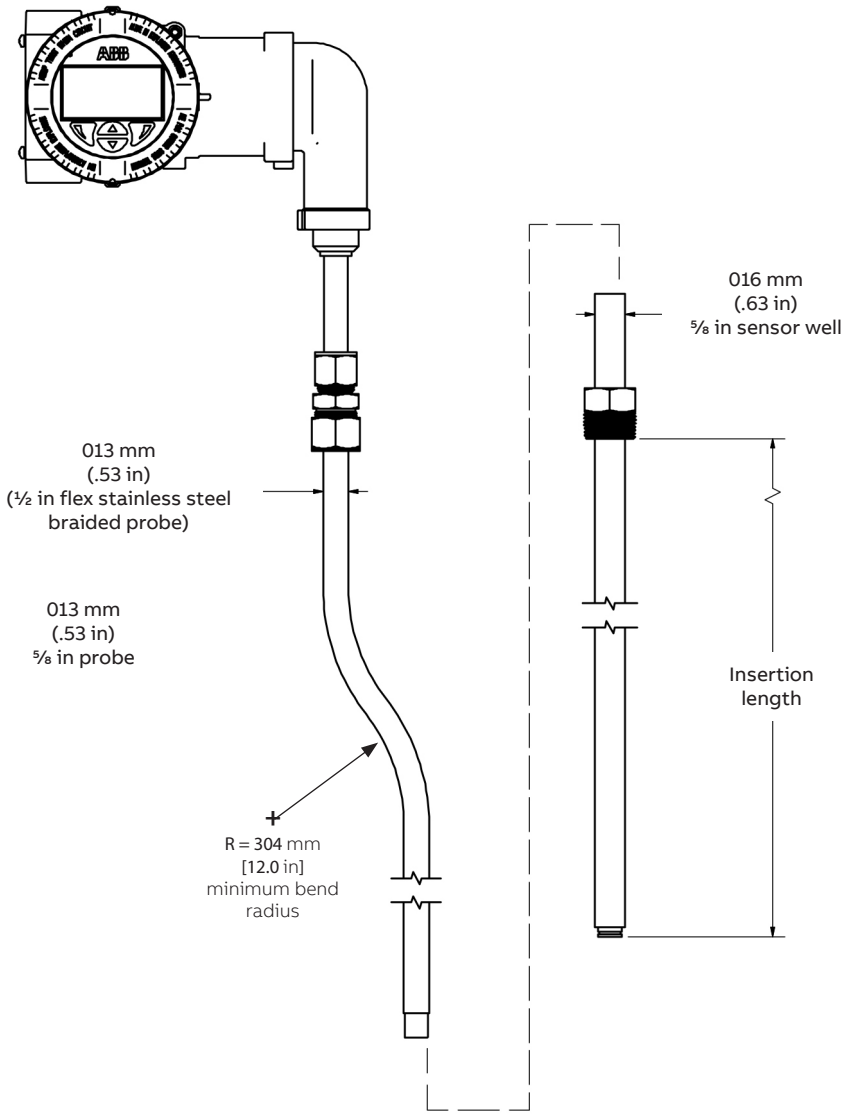
*Drawings for reference only

Probe type W3



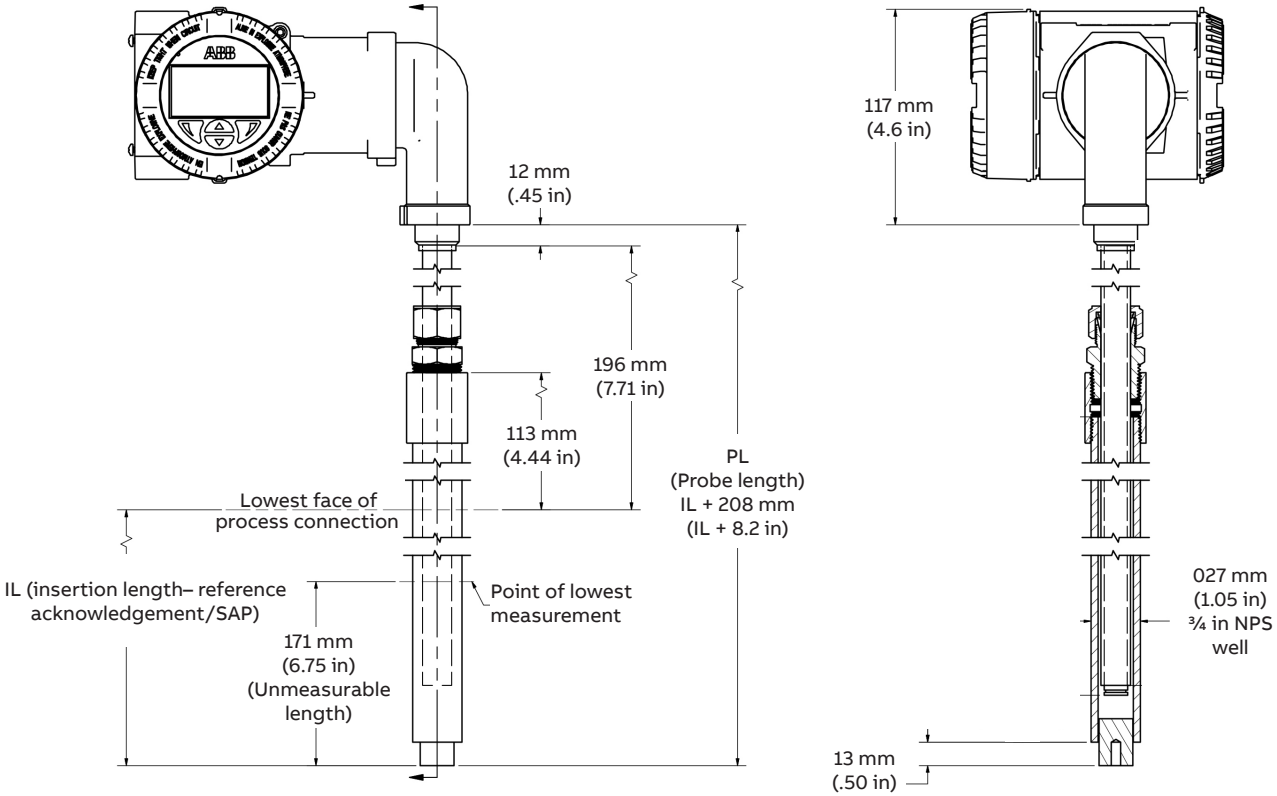
*Drawings for reference only

W3 well with probe (continued)



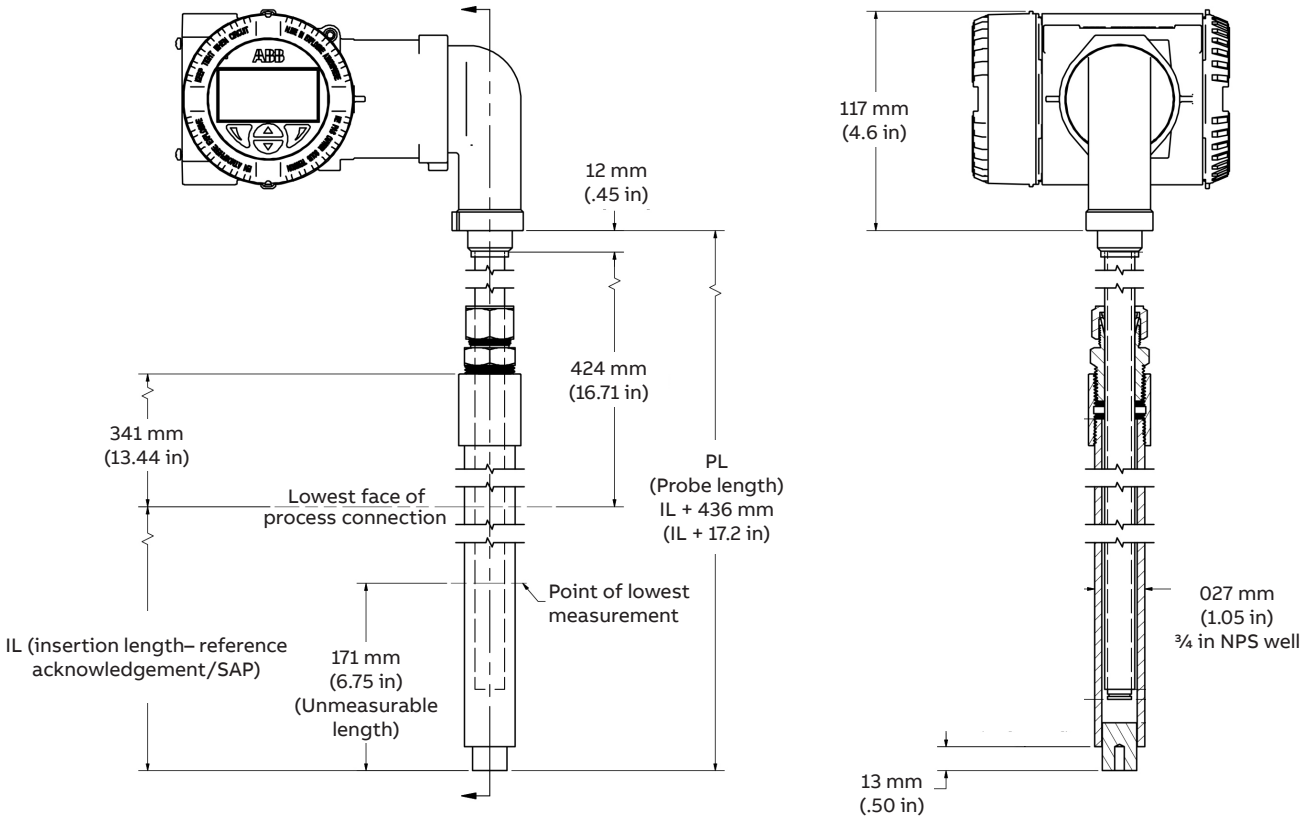
*Drawings for reference only

Probe type C3, W4



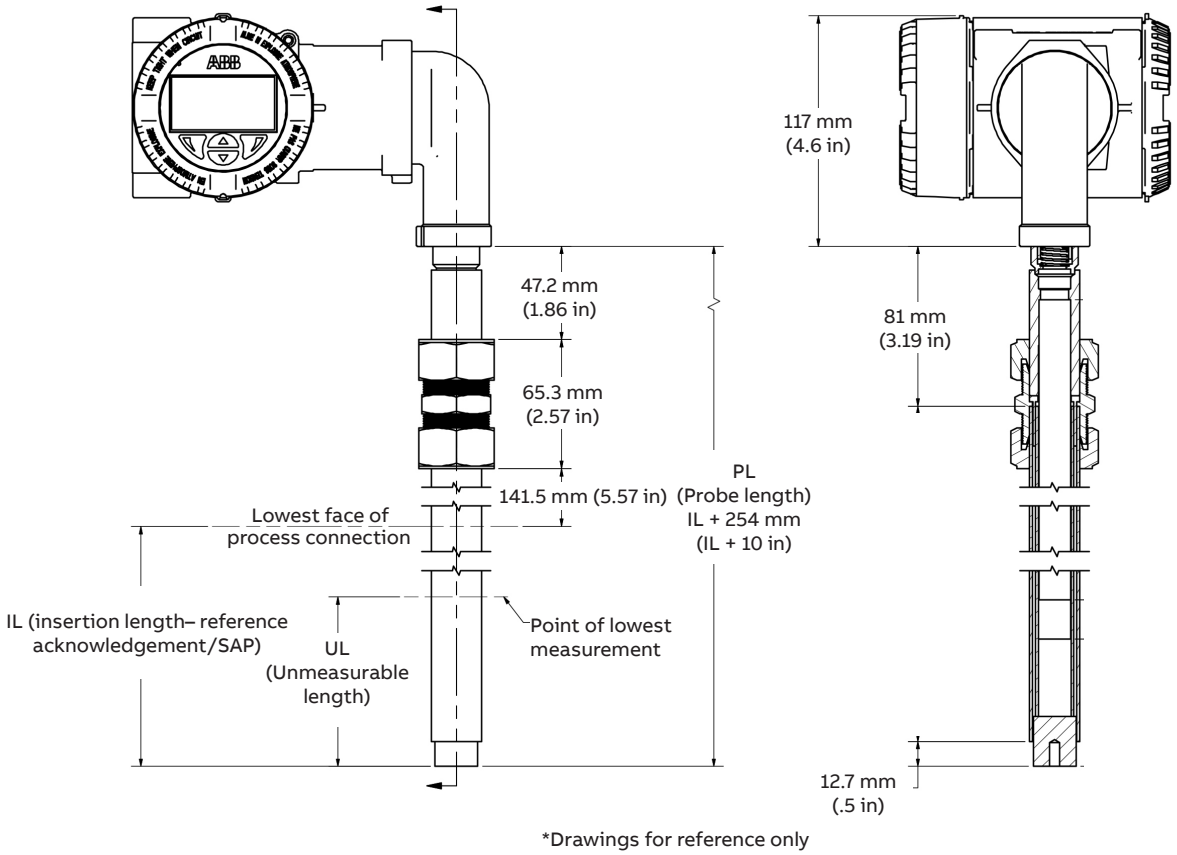
*Drawings for reference only

Probe type C4, W5, W6



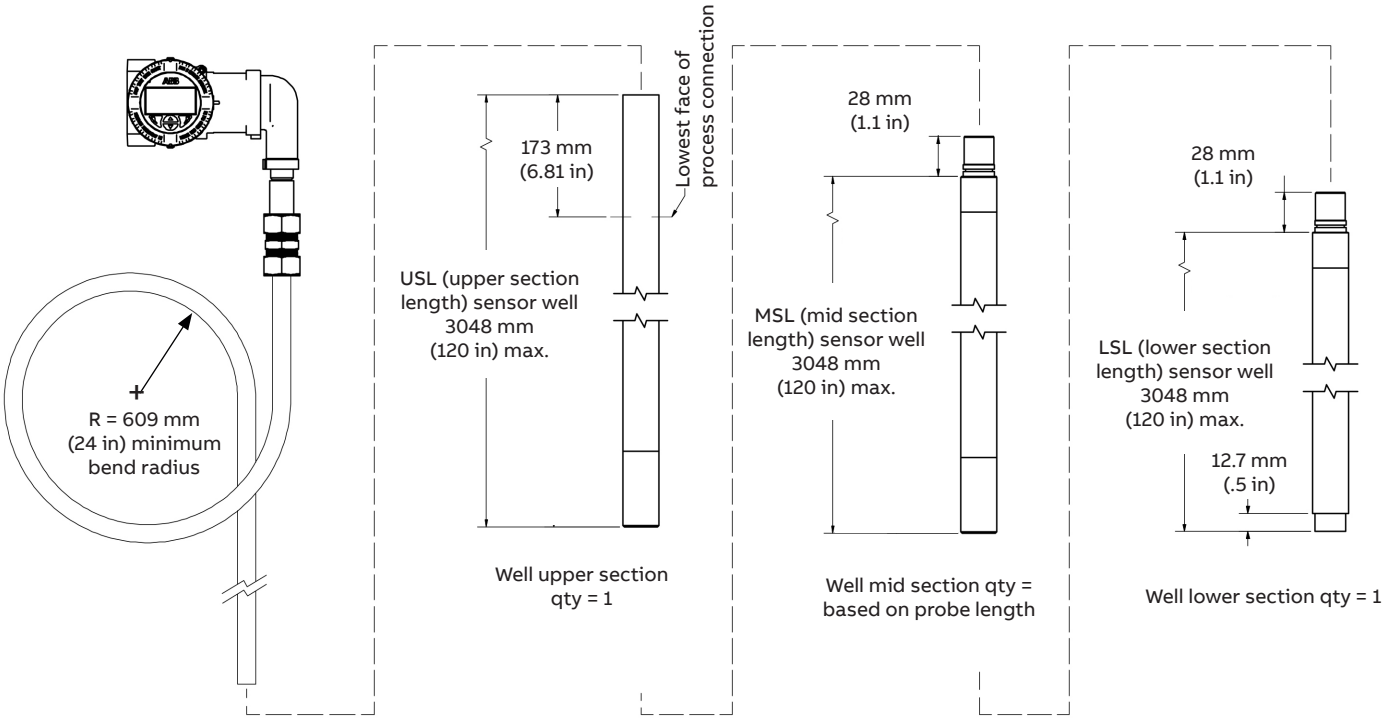
*Drawings for reference only

Probe type W7



*Drawings for reference only

Probe type W7 (continued)



*Drawings for reference only

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