1. Specification of Smart Absolute Pressure Transmitter:

Sl. No.	Parameters	Specification
1	Type	SMART Absolute Pressure Transmitter
2	Measurement Range	As per Table 1
3	Service Medium	As per Table 1
4	Maximum Turndown Ratio (TD)	100:1
5	Output	Two wire 4–20 mA with superimposed Digital communication HART protocol.
6	Power Supply	12 to 30 V DC.
7	Local Indication	min 4½ digits LCD – Local Alpha Numeric Digital display in Engineering units.
8	Hazardous Area Certification	Both Intrinsically safe and Explosion proof suitable for use in Hydrogen atmosphere. (CENLEC / CSA / FM / ATEX or any equivalent approval).
9	Safety Integrity Level Standard (SIL)	Safety Instrumented System Certification as per IEC 61508 standard, SIL 2 and above.
10	Zero & Span Adjustments	Zero and Span are to be adjusted from the Handheld HART Communicator and provision for local adjustment to be set anywhere within the range limits.
11	Failure mode alarms	High alarm ≥ 21.0 mA
		Low Alarm ≤ 3.6 mA
12	Accuracy @ TD 8:1	≤± 0.09 % of Calibrated span (including the effect of Terminal - Based linearity, hysteresis & repeatability)

13	Ambient Temperature Effect for 28°C variation @ TD 8:1	≤ ± 0.4 % of span
14	Stability	≤± 0.2 % of URL for 10 years
15	Power Supply Effect	≤± 0.005 % of Calibrated Span per Volt.
16	Nominal Operating Temperature	-20 – 70°C
17	Total Response time	≤ 150 millisecond
18	Wetted Material	As per Table 4
19	Fill Fluid	As per Table 4
20	Transient/Lightening Protection	To be provided
21	Electrical Connection	½ " – 14 NPT (F) with SS plug for dust proof.
22	Transmitter Process connection	½ " – 14 NPT (F) or suitable for the quoted manifold
23	Housing Material	Polyurethene covered aluminum with ½- 14 NPT conduit entry.
24	External Grounding screw assembly on transmitter body	Required
25	Mounting Bracket	Stainless Steel Bracket with SS fasteners, bolts, nuts, washers and U- clamps suitable for 2 inch pipe mounting.
26	Calibration	Calibration shall be carried out at room temperature in 5 steps ascending and 5 steps descending. Calibration certificate is to be provided. Calibration shall be traceable to National Standards.
27	Manifold	2-way valve manifold to be provided; Make: Same Transmitter manufacturer's manifold or Parker/Swagelok/DKlok.

2. Specification of Smart Differential Pressure Transmitter:

Sl. No.	Parameters	Specification
1	Type	SMART Differential Pressure Transmitter
2	Measurement Range	As per Table 2
3	Service medium	As per Table 2
4	Maximum Turndown(TD) Ratio	100:1
5	Output	Two wire 4–20 mA with superimposed Digital communication HART protocol.
6	Power Supply	12 to 30 V DC.
7	Local Indication	Min 4 ½ digit LCD- Local Alpha Numeric Digital display in Engineering unit.
8	Hazardous Area Certification for all Transmitters	Both Intrinsically safe and Explosion proof suitable for use in Hydrogen atmosphere.(CENELEC / CSA / FM / ATEX or any equivalent approval).
9	Safety Integrity Level Standard (SIL)	Safety Instrumented System Certification as per IEC 61508 standard, SIL 2 and above.
10	Zero & Span Adjustments	Zero and Span are to be adjusted from the Handheld HART Communicator (HHC) and provision for local adjustment to be set anywhere within the range limits.
11	Failure mode alarms	High alarm ≥ 21.0 mA
		Low Alarm ≤ 3.6 mA
12	Reference Accuracy @ TD 5:1	≤ ±0.075%Span for URL above 100 mbar ≤ ±0.1%Span for URL below 100 mbar (including the effect of Terminal - based linearity, hysterisis & repeatability).
13	Ambient Temperature effect for 28 ˚C variation @ TD 5:1	≤±0.4%Span for URL above 100 mbar ≤±0.75%Span for URL below 100 mbar
14	Stability	≤±0.2%URL for 5 years , for URL above 100 mBar ≤±0.2%URL for 1 years , for URL below 100 mBar
15	Power Supply Effect	≤± 0.005 % of Calibrated Span per volt.
16	Mounting Position Effect	Zero shifts can be calibrated out.

17	Static Pressure effect	Span error: ≤ ± 0.2 % of span /70 bar for URL above 100 mbar. Span error: ≤ ± 0.45 % of span /70 bar for URL above 100 mbar.
18	Maximum Static pressure	As per Table 2
19	Nominal Operating Temperature	-20 – 70°C
20	Total Response time	≤ 300 msec
21	Wetted Material	As per Table 4
22	Fill Fluid	As per Table 4
23	Transient / Lightening Protection	To be provided
24	Electrical Connection	½ " – 14 NPT (F) with SS plug for dust proof.
25	Transmitter Process Connection	½ " – 14 NPT (F) or suitable for the quoted manifold
26	Housing Material	Polyurethene covered aluminum with 1/2"-14 NPT Conduit entry.
27	External Grounding screw assembly on transmitter body	Required.
28	Mounting Bracket	Stainless Steel Bracket with SS fasteners, bolts, nuts, washers and U-clamps suitable for 2 inch pipe mounting.
29	Calibration	Calibration shall be carried out at room temperature in 5 steps ascending and 5 steps descending. Calibration certificate is to be provided. Calibration shall be traceable to National Standards.
30	Manifold	5-way valve manifold to be provided; Make: Same Transmitter manufacturer's manifold or Parker/Swagelok/DKlok.

3. Specification of Smart Vacuum Pressure Transmitter

Sl. No	Parameters	Specification
1	Type	SMART Vacuum Pressure Transmitter
2	Measurement Range	As per Table 3
3	Service Medium	As per Table 3
4	Maximum Turndown Ratio(TD)	15:1
5	Output	Two wire 4–20 mA with superimposed Digital communication HART protocol.
6	Power Supply	12 to 30 V DC.
7	Local Indication	min 4½ digits LCD – Local Alpha Numeric Digital display in Engineering units.
8	Hazardous Area Certification	Both Intrinsically safe and Explosion proof suitable for use in Hydrogen atmosphere. (CENLEC / CSA / FM / ATEX or any equivalent approval).
9	Safety Integrity Level Standard (SIL)	Safety Instrumented System Certification as per IEC 61508 standard, SIL 2 and above.
10	Zero & Span Adjustments	Zero and Span are to be adjusted from the Handheld HART Communicator and provision for local adjustment to be set anywhere within the range limits.
11	Failure mode alarms	High alarm ≥ 21.0 mA
		Low Alarm ≤ 3.6 mA
12	Accuracy @ TD 3:1	≤± 0.08 % of Calibrated span (including the effect of Terminal - Based linearity, hysteresis & repeatability)
13	Ambient Temperature Effect for 28°C variation @ TD 3:1	≤ ± 0.4 % span
14	Stability	≤± 0.2 % of URL for 10 years
15	Power Supply Effect	≤± 0.005 % of Calibrated Span per Volt.
16	Nominal Operating Temperature	-20 – 70°C
17	Total Response time	≤ 300 millisecond
18	Wetted Material	As per Table 4
19	Fill Fluid	As per Table 4
20	Transient /Lightening Protection	To be provided

21	Electrical Connection	½ " – 14 NPT (F) with SS plug for dust proof.
22	Transmitter Process connection	½ " – 14 NPT (F) or suitable for the quoted manifold
23	Housing Material	Polyurethane covered aluminum with ½”-14 NPT conduit entry.
24	External Grounding screw assembly on transmitter body	Required
25	Mounting Bracket	Stainless Steel Bracket with SS fasteners, bolts, nuts, washers and U- clamps suitable for 2 inch pipe mounting.
26	Calibration	Calibration shall be carried out at room temperature in 5 steps ascending and 5 steps descending. Calibration certificate is to be provided. Calibration shall be traceable to National Standards.
27	Manifold	2-way valve manifold to be provided; Make: Same Transmitter manufacturer's manifold or Parker/Swagelok/DKlok.

Table – 1 Range, Medium & Quantity for Absolute pressure transmitter

Sl.No.	Item	Range	Medium	Quantity
1	Absolute Pressure transmitter with 2 –way valve manifold	0 to 30 bar	N2O4	3
2		0 to 30 bar	MMH	3
3		0 to 50 bar	GN2	2
4		0 to 20 bar	LOX	4
5		0 to 14 bar	LH2	8
6		0 to 14 bar	GH2	6
7		0 to 1 bar	LOX	1
8		0 to 1 bar	LH2	1
9		0 to 30 bar	Water	7
10		0 to 50 bar	GN2/DM Water	10
11		0 to 400 bar	GN2/DM Water	5
12		0 to 200 bar	GN2/DM Water	5
13		0 to 300 bar	GN2	4
14		0 to 100 bar	GN2	4
15		0 to 50 bar	GN2	2
16		0 to 25 bar	GN2	2
17		0 to 30 bar	GN2	4
18		0 to 30 bar	H2O2	7
19		0 to 30 bar	Isrosene	6
20		0 to 30 bar	water	2
21		0 to 30 bar	DM water	1
22		0 to 30 bar	GN2/Air	2
23		0 to 20 bar	GN2	2
24		0 to 700 bar	GN2	3
25		0 to 12 bar	GH2	1
26		0 to 2 bar	GN2	1
27		0 to 2.5 bar	LH2	1
28		0 to 120 bar	LOX	2
29		0 to 15 bar	LOX	2
30		0 to 210 bar	GO2	1
31		0 to 120 bar	LH2	1
32		0 to 20 bar	LH2	2
33		0 to 350 bar	GH2	2
34		0 to 170 bar	GH2	1
35		0 to 75 bar	GH2	1
36		0 to 25 Bar	GH2	2
37		0 to 80 bar	GHe	2
38		0 to 330 bar	GHe	1
39		0 to 120 bar	GN2	2
40		0 to 50 bar	GN2	5
41		0 to 20 bar	GN2	3
42		0 to 300 bar	GN2	1
43		0 to 15 bar	Water	1

44		0 to 300 bar	GH2	2
45		0 to 80 bar	GN2	1
46		0 to 210 bar	GO2	1
47		0 to 50 bar	GO2	1
48		0 to 20 bar	GO2	1
49		0 to 120 bar	LH2	1
50		0 to 100 bar	LH2	1
51		0 to 300 bar	GN2	1

Table – 2 Range, Line pressure, medium & quantity for differential pressure transmitter

Sl.no.	Item	Range	Line pressure	Medium	Quantity
52	Differential Pressure Transmitter with 5- way valve manifold	0 to 1000 mbar	10 bar	water	2
53		0 to 1 bar	14 bar	LH2	2
54		0 to 1 bar	360 bar	LOX	2
55		0-200 bar	180 bar	GN2/DM Water	1
56		-100 to 100 mBar	15 bar	GN2/DM Water	2
57		0 to 300 mbar	25 bar	H2O2	3
58		0 to 300 mbar	25 bar	Isrosene	1
59		0 to 300 mbar	25 bar	Water	1
60		0 to 0.2 bar	30 bar	DM water	2
61		0 to 1 bar	30 bar	DM water	2
62		0 to 1 bar	30 bar	LN2	1
63		0 to 1 bar	30 bar	GN2	3
64		-4 to 4bar	25 bar	LH2	1
65		-2 to 2 bar	20 bar	LH2	1
66		0 to 200 mbar	90 bar	LOX	1
67		0 to 500 mbar	90 bar	LN2	1

Table – 3 Range, Medium & Quantity for vaccum pressure transmitter

Sl.No.	Item	Range	Medium	Quantity
68	Vacuum Pressure Transmitter with 2-way valve manifold	0 to 1000 mbar	mixed gases	3
69		0 to 100 mbar	mixed gases	1
70		0 to 40 mbar	mixed gases	2
71		0 to 1000 mbar	H2O2	7
72		0 to 200 mbar	H2O2	3
73		0 to 100 mbar	H2O2	1
74		0 to 1000 mbar	GH2	5
75		0 to 500 mbar	Hot gas	2
76		0 to 150 mbar	GH2	2
77		0 to 500 mbar	GH2	2
78		0 to 2000 mbar	GH2	1

Table – 4 wetted material & fill fluid

Sl. No.	Medium	Fill fluid	Diaphragm material	Flange & Adapter material	O-Ring Material	Special Cleaning	Electrical Housing	Calibration fluid
1	LOX / GO2	Inert Fil(Kryotx)l	316L SS	316 SS	PTFE	Oxygen cleaning for transmitter in Oxygen service as per relevant oxygen service standard	Certified for EEx ia IIC , T6	GN2

2	GN2/LN2	Silicone oil	316L SS	316 SS	PTFE		Certified for EEx ia IIC , T6	GN2
3	LH2	Inert Fill(Kryotx)	Gold plated 316 SS	316 SS	PTFE		Certified for EEx ia IIC , T6	GN2
4	GH2	Inert Fill(Kryotx)	Gold plated 316L SS	316 SS	PTFE		Certified for EEx ia IIC , T6	GN2
5	GHe	Silicone oil	316L SS	316 SS	PTFE		Certified for EEx ia IIC , T6	GN2
6	Water/DM water/ Isrosene / hot gases	Silicone Oil	316L SS	316 SS	PTFE		Certified for EEx ia IIC , T6	GN2
7	MMH/UH 25	Silicone oil	Hastelloy-C276/304L SS	316 SS	PTFE		Certified for EEx ia IIB , T6	GN2
8	N2O4/MON3	Silicone oil	316L SS	316 SS	PTFE		Certified for EEx ia IIB , T6	GN2
9	H2O2	Inert Fill(Kryotx)	316L SS	316 SS	PTFE		Certified for EEx ia IIB , T6	GN2

4. Specification of 2 Valve Manifold:

Sl.No.	Parameters	Specification
1	Type	2 valve manifold
2	Material	MMH: Hastelloy C /SS304L; UH25, UDMH, N2O4, LH2, LOX, GH2, GO2, GN2, GHe, Water, Kerosene,H2O2 : 316SS
3	Packing material	PTFE
4	Seat type	Integral
5	Instrument Connection	Suitable for quoted transmitter interface
6	Process connection	½ inch-14 NPTF
7	Maximum Operating Pressure	400 bar manifold for transmitter range upto 250 bar
		680 bar manifold for transmitter range between 250 to 500 bar
8	Operating Temperature	0 to 100 Deg C
9	Hydro Testing	To be carried out at 1.5 times the maximum operating pressure for all the manifolds and certificate to be provided
10	Material Test certificate	To be provided
11	Mounting Bolts	To be supplied with SS material.
12	Oxygen cleaning	Oxygen cleaning to be carried out for transmitters operating medium is oxygen

5. Specification of 5 valve Manifold:

1	Type	5 valve manifold
2	Material	MMH: Hastelloy C/SS304L;; UH25, UDMH, N2O4, LH2, LOX, GH2, GO2, GN2, GHe, Water, Kerosene, H2O2 : 316SS
3	Packing material	PTFE
4	Seat type	Integral
5	Instrument Connection	Suitable for quoted transmitter interface
6	Process connection	½ inch-14 NPTF
7	Maximum Operating Pressure	400 bar manifold for transmitter static pressure range upto250 bar
		680 bar manifold for transmitter static pressure range between 250 to 500 bar
8	Operating Temperature	0 to 100 Deg C
9	Hydro Testing	To be carried out at 1.5 times the maximum operating pressure for all the manifolds and certificate to be provided
10	Material Test certificate	To be provided
11	Mounting Bolts	To be supplied with SS material.
12	Oxygen cleaning	Oxygen cleaning to be carried out for transmitters operating medium is oxygen

General conditions:

1. Party shall quote with detailed technical specification and printed product catalogue, manufacturer datasheet containing product matrix and Part No de-codification details.
2. Items shall be delivered within 24 weeks from the date of issue of P.O.
3. Party shall quote the models such that the max URL of the particular model meets the following requirement:
    a. For Absolute Transmitter max URL should be <8 times the measurement range.
    b. For Vacuum Transmitter max URL should be <3 times the measurement range.
    c. For Differential Transmitter max URL should be <5 times the measurement range.
4. Technical compliance statement to our indented specification shall be provided.
5. Operation Manual in English to be supplied.
6. Party shall submit a detailed drawing of transmitters indicating the cross sectional details and dimensions.
7. The inspection of transmitters shall be done by QC division of vendor scope of inspection shall be as per Quality Assurance Plan (QAP).
8. The cost of the valve manifold need to be quoted along with pressure.
9. The commercial terms such as packing and for-Warding (P&F), freight and GST to be quoted separately.
10. All transmitters should have been calibrated within 6 months prior to date of dispatch.
11. After PO release, the test certificates, applicable standards, calibration charts shall be submitted to department before dispatch the items to obtain 'Dispatch Clearance'.
12. Guarantee: The transmitters shall be guaranteed for satisfactory performance over a period of 18 months from the date of dispatch from the Supplier's works or 12 months from the date of commissioning at the Purchaser's site, whichever happens to be earlier.

Pre-qualification criteria

13. The Bidder's capability shall be evaluated based on the following Pre-Qualification (PQ) criteria. The Bidders shall suitably fill-up the information solicited in "Item Specification" and submit as part of the Techno-Commercial Bid (TCB). Those Bidders who comply with the PQ criteria only will be screened-in for opening and evaluation of Price Bid. The information to be submitted in the TCB shall be complete

in all respects substantiated by valid documents and there shall not be any further opportunity for the Bidders to submit any information or document unless the Department solicits so at their own discretion.

14. Any lack of information or incomplete/ ambiguous information or false information or information non-compliant with the PQ criteria shall be treated as sufficient cause to summarily reject such Bids.
15. The original equipment manufacturers of the system, or their Indian Subsidiary/authorized dealers/ system integrators are alone eligible to participate in the tender. For the same, Dealers/System integrators must attach an authorization letter from OEM of the system specific to this product.
16. The Bidder must have successfully supplied 50% of order value and installed similar type of Pressure Transmitters for aerospace testing or manufacturing facility. The claim shall be substantiated by Purchase Order(s) and inspection release note(s)/ acceptance certificate(s) by third-party inspection agency or client dated between 01/01/2022 and 31/12/2023.