TEMPERATURE TRANSMITTER, 4-20MA, SMART HART

1. SCOPE:

1.1. This specification covers the requirement of field mounted smart temperature transmitter.

1.2. The microprocessor based smart temperature transmitter shall convert the primary sensor input into a proportionate 4-20mA DC output signal. The input can be any type of thermocouple (millivolts signal) or RTD. The transmitter shall be inherently smart. Retrofit type smart model is not acceptable.

1.3. In general, order of priority of the documents shall be as follows:

a Local regulatory and statutory requirement.
b Licensor Requirements (where applicable).
c Project specification and datasheets, wherever applicable.
d This specification and relevant equipment/system specification.
e Codes and standards.

2. GUARANTEE AND WARRANTY:

2.1. Bidder shall guarantee the supply against defective materials, design and workmanship as specified in the general purchase conditions.

2.2. Field transmitter's performance shall be guaranteed in accordance with requirements of applicable specifications and codes at conditions indicated in relevant equipment datasheets.

2.3. If the stated performances are not achieved, Bidder shall, at his own expenses, make necessary repairs, modifications and replacements to the supply to enable the performance to be achieved.

3. REFERENCE CODES & STANDARDS:

3.1. The following codes and standards shall be applied minimum as a part of the design and manufacturing of field transmitters. Latest edition of code/standard shall be referred.

3.2. IEC 60079: Electrical apparatus for explosive gas atmospheres:

a IEC 60079-0 General requirements.
b IEC 60079-1 Flameproof enclosures "d".
c IEC 60079-11 Intrinsic safety "i".
d IEC (EN) 60079-14 Electrical installations in hazardous areas.

3.3. IEC 60529 Degrees of protection provided by enclosures (IP).

3.4. IEC 6100-6-2 Electromagnetic compatibility, generic standards, immunity for industrial environments.

3.5. IEC 61000-6-4 Electromagnetic compatibility, generic standards, emission standard for industrial environments.

3.6. IEEE/ASTM SI 10 Standard for use of the international system of units (SI).

3.7. Namur NE 43 Standardization of the signal level for the breakdown information of digital transmitters.

3.8. ISA 71.04 Environmental Conditions for Process Measurement and Control Systems: Airborne Contaminants.

3.9. OISD-STD-113 Classified Areas for Electrical Installations at Hydrocarbon Processing and Handling Facilities.

3.10. ISO 9001 Quality Management Systems- Requirements.

3.11. IBR Indian Boiler Regulations.

3.12. National and Local authority regulations in India.

4. AMBIENT CONDITIONS:

4.1.	Ambient Air Design Dry Bulb Temperature:	45 Deg C
4.2.	Ambient Air Design Wet Bulb Temperature:	30 Deg C
4.3.	Ambient Temperature (C), Min/Max:	5 Deg C / 50 Deg C
4.4.	Relative Humidity (%), Max/Avg.:	65 / 70 (min) & 100 (max)

5. HAZARDOUS AREA PROTECTION:

5.1. Instruments shall meet the requirements IEC 60079 and shall be certified for installation in Zone-1 Gas group IIA, B & C and Temperature class T3r Zone-1 Gr. IIC, T3 as minimum. Transmitter enclosure shall be weatherproof IP66 or better as per IEC-60529.

5.2. Following certificates shall be supplied by Bidder for final submission to end user:

a Certificate from statutory authority like ATEX, BASEEFA, FM, PTB, CENELEC etc. for Items of foreign origin and from CMRI, ERTL etc. for items of Indian origin.

b All the indigenous equipment shall confirm to Indian Standards & shall have been tested and certified by Indian testing agencies.

c Approval certificates from Petroleum and Explosives Safety Organization (PESO / CCOE) or any other applicable statutory authority for items to be installed in India, irrespective of country of origin.

d All indigenous flameproof equipment shall have valid BIS license and corresponding marking as required by statutory authorities.

6. DESIGN REQUIREMENTS:

6.1. The design of transmitters shall be in compliance to the electromagnetic compatibility requirements as per "IEC 61000-4 - Electromagnetic compatibility for industrial process measurement and control equipment".

6.2. Load driving capability of the transmitter shall be minimum 600 Ohm at 24V dc.

6.3. The transmitter shall be provided with an integral indicator. Operation of the transmitter shall not be affected by removal or malfunctioning of the integral meter.

6.4. Transmitters shall be microprocessor based and it shall incorporate a non-volatile memory which shall store complete configuration data of the transmitter. All necessary signal conversions, including conversion to produce output with the required protocol shall be carried out in the transmitter electronics.

6.5. Cable entry shall be ½" NPT or M20, with Ex-d certified SS316 plug.

6.6. Threaded end connections shall be to NPT as per ANSI B 1.20.1 and flanged end connections shall be as per ANSI B 16.5.

6.7. It shall be possible to configure the transmitter with purchasers universal Hand Held communicator or HHC (Emerson 475 or Eqv.). It shall be possible to perform routine configuration, calibration, display process variable, diagnostics etc. from HHC.

6.8. It shall be possible to perform all the above functions online. The loop function shall remain unaffected while communication is going on between transmitter and the field communicator. No output interruption should occur.

6.9. The transmitter electronics shall monitor their performance during normal operation. The transmitter diagnostics shall be able to detect both an input sensor failure and transmitter electronics failure. The sensor &/or electronics failure shall be transmitted to the host system (e.g. DCS / PLC).

6.10. TRANSMITTER PERFORMANCE:

1.	Composite Accuracy: (for details refer Note-1)	
Service	Liquid/ Gas/ Vapour	
Transmitter accuracy- Temperature (with cold junction compensation with thermocouple element)		
a.	For temperature > 350ºC	± 0.25% of range.
b.	For temperature 150ºC to	± 0.5% of range.

	350ºC	
c.	For temperature < 150ºC	± 0.75% of range
d.	Span	0 to 600ºC adjustable
Transmitter accuracy- Temperature (with RTD element)		
e.	For temperature > 350ºC	± 0.075% of full scale.
f.	For temperature 150ºC to 350ºC	± 0.15% of full scale.
g.	For temperature < 150ºC	± 0.2% of full scale.
2.	Output in case of Sensor failure (Open/burnout)	Should be configurable to low/high.
3.	For dual sensor	Bump less Automatic switchover to backup sensor on primary sensor failure and changeover is to be alarmed.
		Accepts any combination of two sensor types (RTDs, TCs, mV or ohms)
4.	Configuration	By HHC (Emerson 475 / eqv.) / DCS / AMS / Hart Management System. Vendor shall provide DD / CFF files along with the transmitter.
5.	Input type	3-wire/4-Wire RTD Pt 100 to IEC 751 or Thermocouple E, K, J, T as per IASC96.1 (Selectable through universal Handheld communicator).
6.	No. of Inputs	One or Two as per variant table
7.	Characteristics	Linearised out put
8.	Output in case of Sensor failure (Open/burnout)	Should be configurable to low/high.
9.	Local Display	Display with engineering units shall be plug in type & easily removable without any special tool & without interrupting the process measurement. Display unit shall be built in Electronic casing(Digital indicator) with diagnostics details
10.	Damping	Adjustable 0-32 seconds
11.	Update time	500 msec or better.
12.	Ingress protection	IP66 or better
13.	In-built lighting and surge Protection	Required
14.	Electronic Housing	Dual Compartment, Made of low copper Aluminium Alloy or SS316 (as per variant table)
15.	Tag Plate Material	Stainless steel
16.	Mounting	2” Pipe Mountable (Vertical / Horizontal) along with necessary mounting accessories.
17.	Mounting Bracket (With bolts nuts)	Stainless steel
18.	Double Compression Cable glands (SS304)	Two no’s

6.11. Note-1: Composite accuracy:

a Composite accuracy is to be calculated as summation of all applicable accuracy of temperature transmitter, for converting sensor input to output in 4-20mA / FF (e.g. Basic accuracy, digital accuracy, D/A accuracy etc.) based on the figure / formula given in the product catalog for span, as specified above for various types of Temperature element

specified. All such accuracy / figures in the catalog shall be first converted to Deg. C and then percentage of these converted accuracy in specified span shall be calculated to compare the specified composite accuracy figure.

7. INSPECTION AND TESTING (refer attached ITP):

7.1. The following test shall be carried out on the transmitters and test report / certificates shall be provided.

b Calibration test.

c Functional Test.

8. SPECIAL INSTRUCTION TO BIDDER:

8.1. 4-20mA SMART HART transmitters shall comply latest HART specification / protocols.

9. NAME PLATE:

9.1. Field Transmitters shall have a corrosion resistant stainless steel Nameplate with stamped or engraved tag number. This tag plate shall be fixed to the instrument by means of screws, rivets etc.

9.2. The name plate shall include as a minimum;

a BHEL material code.

b Transmitter Tag number.

c Manufacturers Name, Model number.

d Serial numbers.

e Calibrated Range and Instrument Range.

9.3. Individual accessories (if supplied with transmitter) shall also be tagged.

10. DOCUMENTATION:

10.1. Bidder shall furnish at least following documents for information / review.

- Technical catalogues / literature.
- Drawing showing, mounting details.
- Specification sheet/ Data sheet as per attached format.
- Operation and Maintenance manual.
- Inspection and Test certificates.
- Guarantee certificate.
- Calibration procedure.

11. PACKING:

The material shall be properly packed to ensure that it is capable of withstanding transit risks without damage.

12. VARIANT TABLE:

Var. No.	Item Description	Material Code
01	Weather proof Temperature Transmitter	TC9755802010
02	Flame proof/explosion proof Temperature Transmitter	TC9755802029
03	Intrinsic safe Temperature Transmitter	TC9755802037
04	Hand held terminal for temperature transmitter Suitable for field configuration & suitable for intrinsic safe / explosion proof/ Flame proof execution.	TC9755802045
05	Flame proof/explosion proof & Intrinsic safe Temperature Transmitter with 2 electrical entries, dual sensor, auto changeover	TC9755802053

Var. No.	Item Description	Material Code
06	Flame proof/explosion proof & Intrinsic safe Temperature Transmitter with 2 electrical entries, dual sensor, auto changeover	TC9755802061
10	Smart temp. transmitter with body material SS316 L Flame proof/explosion proof (EExd-IIC) cenelec EN-50018,Hazadous area class 1,division 2,group B&D.	TC9755802100
11	Smart temp. transmitter with body material SS316, dual certification for Intrinsic safe and Flame proof/explosion proof (EExd-IIC), CENELEC EN-50018,Hazadous area classification IEC Zone-1, Gr. IIC, and T3 & T4	TC9755802118
12	Smart temp. Transmitter, Dual certification for Intrinsic safe & Flame proof/explosion proof (EExd-IIC) and SIL.	TC9755802126
13	Smart Temp transmitter, W.P, Dual sensor.	TC9755802134
14	SIL 2 Flameproof & Intrinsic safe Temperature Transmitter with 2 electrical entries ½"NPT, dual sensor, auto changeover	TC9755802142
15	SIL certified with dual sensor I.S. & flameproof with M20x1.5 electrical entries.	TC9755802150
16	Smart Temp transmitter, W.P, Dual sensor, SS316 Housing	TC9755820169

RECORD OF REVISION

Rev. No	Date	Revision Details	Revised	Approved
00	31-12-97	First issue.	---	(SN)
01	01-02-98	BHEL material codes added.	(JS)	(SN)
02	09-4-02	BHEL material codes added.	(VJK)	(VJK)
03	27-03-03	Variant 05 & Clause 3.3 are revised	(VJK)	(AK)
04	05-05-07	Variant 10 & Clause 3.2 &7.0 are revised.	(VJK)	(AK)
05	12-05-07	Variant 11 added.	(VJK)	(AK)
06	03-10-08	Variant 06 added.	(VJK)	(AK)
07	03.09.09	Cl.3.2 Electronic housing Dual Compartment.	(VJK)	(VVS)
08	01.06.10	Variant 12 added.	(YESH)	(PSVS)
09	09.07.10	Variant 14 & 15 added.	(RAM)	(VVS)
10	20.04.11	Variant 3.2 revised and in variant table-13 variant 13 added.	(LVAB)	(VVS)
11	14.02.12	Clauses 3.0, 6.0, 12.0(after revision-11.0) & 13.0(after revision-12.0) revised and 11.0 deleted	(LVAB)	(VVS)
12	11.02.16	Variant 16 added.	(I.S)	(PSVS)
13	18.03.21	Accuracy clause re-affirmed / updated	RAVI	RAM