FOUNDATION FIELDBUS TEMPERATURE TRANSMITTER.

1.0 SCOPE :

This specification covers the requirement of field mounted temperature transmitter, are based on Foundation Fieldbus Standard.

2.0 DESIGN:

The microprocessor based temperature transmitter shall convert the primary sensor input into a proportionate Fieldbus compatible output signal. The input can be any type of thermocouple (mill volts signal) or RTD. Retrofit type model is not acceptable.

3.0 SPECIFICATIONS:

1. Field transmitters shall be Fieldbus compatible. All such devices shall comply with Foundation Fieldbus standards as a whole and certified.
2. All field devices on the main field bus segment shall be able to communicate at a speed of 31.25 Kbps, as a minimum.
3. All devices shall support peer-to-peer communication. **The transmitter shall have LAS capability.**
4. All devices complying any of these standards must be interoperable. Manufacturer must ensure that all such devices have valid interoperability test clearance certificate like ITK 4.1 or higher for Foundation Fieldbus.
5. Fieldbus field devices which require power for their operation shall be capable of operating voltage levels available at bus level which shall typically be minimum 9.0V and maximum 32V DC. Devices, which don't require power supply, shall be capable of operating on the Fieldbus without affecting the existing Fieldbus voltage.
6. No field bus instrument in hazardous area, in general, shall draw current more than the specified limits as per FISCO/FNICO/entity from the bus power supply.
7. None of the Fieldbus devices shall be polarity sensitive.
8. All Fieldbus devices shall have capability to perform continuously their own self diagnostics to check their own health state.
9. All Fieldbus devices shall be EDDL (Electronic Device Description Language) enabled as per IEC-61804, latest version.
10. All Fieldbus devices and terminators shall be certified FISCO **/ FNICO / entity** as per IEC-60079-27.

4.0 Fieldbus Field transmitters – Temperature.

1. Temperature transmitter shall be able to accept any type of temperature sensor like RTD (Pt - 100, Ni etc with 2, 3 or 4 wire), thermocouple (ANSI / IS B, E, J, K, N, R, S, T) and mill volt (-10 to 100 mV). Thermocouple inputs shall have automatic cold junction compensation.
2. Transmitter shall be able to accept both grounded and ungrounded sensors.
3. The transmitters shall be able to output at the rate of 500 m sec per input.

4. Each temperature transmitter shall be provided with an integral output meter, which shall be able to display, digital output in user configured engineering units.
5. **Each transmitter shall have registered function block such as PID block, Signal characterizer block, Arithmetic block, Input selector block, Output splitter block.**
6. **Function block execution time shall be within 40 msec for Analog inputs, 50 msec for PID and 75 msec for Arithmetic block, 85 msec for CHAR block.**
7. **Function block execution time shall be within 100 msec for Analog inputs, 160 msec for PID and 130 msec for analog output.**
8. The temperature transmitter shall provide diagnostic as real time instrument status.
9. Each transmitter shall have capability to become device link master.
10. Each transmitter shall be provided with in-built lightning and surge protection.

5.0 Performance Specifications:

A	**Composite Accuracy: (for details refer Note-1)**	
Service		Liquid/ Gas/ Vapour
Transmitter accuracy- Temperature (with cold junction compensation with thermocouple element)		
1	For temperature > 350ºC	± 0.25% of range.
2	For temperature 150ºC to 350ºC	± 0.5% of range.
3	For temperature < 150ºC	± 0.75% of range
4	Span	0 to 600ºC adjustable
Transmitter accuracy- Temperature (with RTD element)		
1	For temperature > 350ºC	± 0.075% of full scale.
2	For temperature 150ºC to 350ºC	± 0.15% of full scale.
3	For temperature < 150ºC	± 0.2% of full scale.
4	Span	0 to 600ºC adjustable
B	**Output in case of Sensor failure (Open/burnout)**	**Should be configurable to low/high.**
C	**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)
D	**Configuration**	**By hand held Terminal. Please note that the model series being offered should be available in the Device Driver**

		List (DDL) of the Universal Handheld communicator and HMS software lest the transmitters offer will not be technically acceptable.

Note-1:

Composite accuracy:

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.

6.0 PHYSICAL SPECIFICATIONS:

1	Process connection	½" NPT-Female
2	Electrical connection	1/2"NPT-Female **& M20x1.5 (as per variant)**
3	Process Cover Material	316 SS
4	Electronic Housing	**Dual compartment** made of Die-cast Aluminum Alloy **& SS316 (as per variant)** with durable corrosion resistant coating.
5	Tag Plate Material	Stainless Steel
6	Mounting Bracket with bolt, nuts	Stainless steel
7	Mounting	Mounting bracket suitable for 2" inch Pipe mounting.
8	Environmental protection	IP67 and NEMA 4x

7.0 ACCESSORIES:

Following accessories shall be supplied with each transmitter.

1. Cable gland with sleeper type PVC sleeves Double compression type (SS304) 2 Nos. per transmitter with explosion proof approval from statutory agency.
2. A Stainless steel tag plate bearing relevant 12 digit material code of BHEL shall be attached to each item. Minimum size 100mm x 20mm. The following minimum identification markings shall be stamped on to an identification tag/ label fixed to the Transmitter.
    a. Manufacturers Type/ Model Number.

b. Span limit and Range limit.
c. The serial number of device.
d. Year of construction.
e. Marking for explosion protection.

3. Electrical entry dummy plug: 1 no. per transmitter with explosion proof approval from statutory agency. It is required only if transmitters are supplied with two cable entries
4. Mounting bracket : Mounting bracket 1 no per transmitter
5. The software files required for the transmitter configuration, diagnostics from DCS like DD files, CFF files etc shall be supplied in form of a CD/DVD along with each purchase order.

8.0 HAZARDOUS LOCATION: FISCO concept for Fieldbus loops.

1. Flame proof: Suitable for NEC Class I, Div.1, gas groups B, C & D.
2. Intrinsic safety: Suitable for NEC Class I, Div.1, Gas groups A, B, C &D.

9.0 OTHER FEATURES:

1. **Proven Track Record (PTR):** The instruments being offered as per specification should be operating satisfactorily in Hydrocarbon industry like Refinery, Petrochemical under similar process conditions for at least 4000 Hours. Prototype instruments or absolute instruments or instrument under phase out cycle or program shall not be offered or supplied. Vendor shall submit necessary supporting documents / past users confirmation supporting to above PTR requirements along with technical offer.
2. **Data storage:** Transmitter shall have non-volatile memory. Transmitter calibration, calibration coefficients, sensor module characterization etc. shall be stored in transmitter using nonvolatile memory data storage.
3. **Over range protection**-130% of sensor URL.
4. **Temperature Compensation:** Temperature sensor shall be provided to compensate for process temperature and ambient temperature variations. Compensation algorithm shall be performed / incorporated with in transmitter electronics and shall provide compensated output.
5. **Local Display:** Transmitter shall have LCD display unit with alphanumeric display. The process value display shall have minimum 5 digits. Facility for local user configuration like customization of process parameter display, engineering units, % of range, process scale selection and diagnostic messages. Configuration shall be possible with soft keys without opening transmitter cover. Display unit shall be plug in type and easily removable without any special tool & without interrupting the process measurement. Display unit shall have statutory approval as specified in this specification.

10.0 STATUTORY APPROVALS: INSPECTION AND TEST REQUIREMENTS.

1. Calibration test certificates shall be furnished.
2. Certificates for Explosion proof/ intrinsic safe execution shall be furnished.

3. The certification for use in hazardous areas shall be furnished by the vendor as specified.
4. Manufacturer shall offer transmitters model and its accessories (Cable glands etc.), which are having statutory approvals for explosion proof enclosure and intrinsically safe electronics. The transmitters/ accessories, which do not have statutory approvals at the time of submitting the quotation, shall not be offered and such offers are liable to rejection. All the statutory approvals shall be reviewed during factory inspection and subject to material rejection in case of non–compliance.
5. **For Imported transmitters, parts, components and accessories:** The instruments manufactured abroad should be and certified by any one of statutory authority like BASEEFA, FM, UL, PTB etc., and should also have the approval of Chief Controller Of Explosives (CCOE)-Nagpur.
6. **For Indigenous explosion proof transmitters, parts, components and accessories:** The instruments manufactured locally (indigenously), the testing shall be carried out by any of the approved test house like CMRI / ERTL The equipment shall bear the valid approval from Chief Controller Of Explosives (CCOE)-Nagpur & BIS.
7. **For Indigenous intrinsic safe transmitters, parts, components and accessories:** Instruments manufactured locally (indigenous) the testing shall be carried out by any of the approved test house like CMRI etc., The equipment shall bear the valid approval from Chief Controller Of Explosives (CCOE)- Nagpur & BIS.
    1. Approval other than above shall neither be offered nor will be acceptable.
    2. The statutory approval shall be applicable for:
        1. Transmitter assembly with inbuilt display unit.
        2. Cable glands.
        3. Dummy plugs for electrical entries.

11.0 PAINT COATINGS:

Manufacturer's well proven anticorrosive plant shall be used (If painting is done on any part).

12.0 WARRANTY BY OEM:

Vendor shall offer warranty of 24 months from date of supply or 18 months from date of commissioning which ever is earlier. Warranty shall include site visit of service engineer, repair, replacement of modules/ parts, re-installation, site tuning, transportation to works for repair and back to site, re-installation works, transportation etc. including to and fro travel from vendors work to site, lodging, boarding & local travel. Warranty shall be provided OEM & their authorized agency can handle the warranty services.

13.0 DOCUMENTS:

The following Technical Information / documents shall be furnished.

a. Along with offer (2 copies each)
   i. Technical catalogues/ literature.
   ii. Drawing showing the mounting details
b. After placement of order.
   i. Operation and Maintenance manual (1 set).
   ii. Inspection and Test certificates (3 copies).
   iii. Guarantee certificates (3 copies).
   iv. Calibration details (3 copies).
c. 1 soft copy of a) and b) above shall be supplied by the vendor after order placement.
d. Vendor to furnish filled up instrument data sheet as per ISA formats within one month of PO placement (1 soft copy and 4 hard copies).
e. The vendor shall provide the instructions on specific safety procedures for the preservation, installation, startup/commissioning and maintenance of the items being supplied.

14.0 PACKING:

1. The material shall be properly packed to ensure that it is capable of withstanding transit risks without damage.
2. The item shall be stored in a covered shed for long periods before installation. The packing shall be suitable for such storage.

15.0 The following details shall be properly packed on marking case.

1. Manufacturers name.
2. BHEL PURCHASE ORDER NUMBER.
3. BHEL product standard number

VARIANT TABLE:

Var. No.	Execution	BHEL Material Code
01	Weather proof	TC9755813012
02	Flame proof / Explosion proof	TC9755813020
03	Intrinsic safe	TC9755813039
04	Flame proof /explosion proof / Intrinsic safe with 2 electrical entries and CCOE India & BIS certification.	TC9755813047
05	Body material SS316L I.S. with Ex-proof (EExd-IIC) CENELEC EN-50018,Hazadous area class 1,division 2,group B&D	TC9755813055
06	Body material SS316, dual certification for Intrinsic safe and explosion proof (EExd-IIC), CENELEC EN-50018,Hazadous area classification IEC Zone-1, Gr. IIC, and T3 & T4	TC9755813063

07	I.S. (FISCO/FNICO/entity) & Ex-proof with dual sensor input & 2 electrical entries -1/2" NPT.	TC9755813071
08	I.S. (FISCO/FNICO/entity) & Ex-proof with dual sensor input & 2 electrical entries -M20x1.5.	TC9755813080

RECORD OF REVISIONS

Rev. No.	Date	Revision Details	Revised By	Approved By
00	3/10/07	First issue	--------	
01	09/07/10	Variant 07 & 08 added.	Ram	VVS
02	17/10/13	Updated.	RAM	PSVS
03	04/07/16	Clause 7 (1) modified.	Priyanka	RAM

Ref. Doc.