INTERPLANT STANDARD - STEEL INDUSTRY		
IPSS	**SPECIFICATION FOR THERMOCOUPLES**	**IPSS: 2-07-044-13** ***(Second Revision)***
	No Corresponding IS	Formerly-: IPSS: 2-07-044-95

0. FOREWORD

0.1 This Interplant Standard has been prepared by the Standards Committee on Computerization & Automation, IPSS 2:7, with the active participation of the representatives of all the steel plants, major consultancy organizations and established manufacturers. Originally, the standard was published in 1997. Based on recent developments, it is revised and adopted in February, 2013.

0.2 Interplant standards on design parameters primarily aim at achieving rationalization and unification of parts and assemblies of process and auxiliary equipment used in steel plants and these are intended to provide guidance to the steel plant engineers, consultants and manufacturers in their design activities.

0.3 This standard was first published in 1988. The first revision has been carried out to update the standard in general.

1. SCOPE

1.1 This Interplant standard lays down the requirements for thermocouples suitable for use in steel plants.

2. TYPE

2.1 The following types of thermocouples are covered under this standard:

a) Type J - Iron constantan conforming to ITS-90 `Reference tables for iron constantan thermocouples'

b) Type K - Chromel-alumel conforming to ITS-90 `Reference tables for nickel / chromium-nickel / aluminium thermocouples'

c) Type S - Platinum 10% rhodium – platinum conforming to ITS-90 `Reference tables for platinum / rhodium-platinum thermocouples'

d) Type R - Platinum 13% rhodium – platinum conforming to ITS-90 `Reference tables for platinum / rhodium-platinum thermocouples'

e) Type B - Platinum 30% rhodium – platinum 6% rhodium conforming to ITS-90 `Reference tables for platinum / 30 percent rhodium / 6 percent rhodium thermocouples'

f) Type N Nicrosil Nisil (nickel chromium – silicon/ nickel – silicon) conforming to ITS - 90

3. MATERIAL

A. Insulating Materials

i) **Porcelain Beads or Silimenite, Recrystaline Alumina** -: Conforming to IS 8495(Part1):1977 (Re-affairmed in 2004) `Ceramic components for thermocouples and resistance thermometers:Part 1 Thermal Blocks'

ii) Magnesium oxide of purity above 99.4%

B. Sheathing Material – The type of sheathing material shall be as per Table-1 (clause 4.1)

4. OPERATING PARAMETERS FOR T/C ASSEMBLY

4.1 Operating conditions under which the thermocouple is expected to work shall be as follows:

TABLE-1 (Clause 3.1 B)

Type	Material of Wire		Sheathing Material	Operating Temp Dec C		Operating Pressure
	Designation	Composition		Cont Maxm Range	Spot Reading (Max)	
J	Iron Constantian	Fe Cu 60% Ni 40%	Porcelain/ Silimenite/ SS316	0 To + 800	1100	Atmospheric High Press Up to 250 Kg/sq cm

K	Chromel Alumel	Ni 90% Cr 10% Ni 95% Al, Si, Mn	Porcelain/ Silimenite/ SS316 / Inconel -600 / Ker-610 / Ker-710 / Recrystalline Alumina	- 158 To + 1150	1300	Atmospheric High Press Up to 250 Kg/sq cm
S	Pt - Rh 10- Pt	Pt 90% Rh 10% Pt 100%	Porcelain/ Silimenite/ SS316 / Inconel -600 / Ker-610 / Ker-710 / Recrystalline Alumina	0 To + 1400	1650	Atmospheric High Press Up to 250 Kg/sq cm
R	Pt - Rh 13- Pt	Pt 87% Rh 13% Pt 100%	Porcelain/ Silimenite/ SS316 / Inconel -600 / Ker-610 / Ker-710 / Recrystalline Alumina	0 To + 1400	1650	Atmospheric High Press Up to 250 Kg/sq cm
B	Pt / Rh 30- Pt/ Rh 6	Pt 70% Rh 10% Pt 94% Rn 6%	Porcelain/ Silimenite/ SS316 / Inconel -600 / Ker-610 / Ker-710 / Recrystalline Alumina	300 To + 1500	1700	Atmospheric High Press Up to 250 Kg/sq cm
N	Nicr- sil	Cr 14.4% Si 1.4 % Mg 0.1 % Nisil4.4% Ni – balance	Porcelain/ Silimenite/ SS316 / Inconel -600 / Ker-610 / Ker-710 / Recrystalline Alumina	-250 To 1250	1300	Atmospheric High Press Up to 250 Kg/sq cm

5. DIAMETER OF ELEMENT WIRE

5.1 Diameter of thermocouple element wire will be selected on the basis of range of temperature to be measured and the composition of the wires. It will be as follows:

i) Single thermocouple of base metal

a) Range of measurement up to 110 deg C - 3.2 mm dia
b) Range up to 600 deg C - 1.6 mm dia

ii) Duplex thermocouple of base metal - 1.6 mm dia

iii) Noble metal thermocouple like Pt / Rh- Pt all ranges - 0.45 mm dia / 0.5 mm dia

6. NUMBER OF ELEMENTS

6.1 The number of elements required in one assembly shall be one of the following:

i) Simplex - Single thermocouple

ii) Duplex - Twin thermocouple

7. MOUNTING

7.1 Flange type / bushing type as per requirement (to be specified by the customer).

8. PHYSICAL DIMENSIONS

8.1 Overall Length / Insertion Length – Shall be specified as required.

8.2 Outside Diameter of the Sheath – It shall be as given below:

i) 21 mm for metallic and porcelain sheath or as per requirement
ii) 3 to 10 mm for mineral insulated thermocouple

9. THERMOCOUPLE HEAD

9.1 It shall consist of the following:

i) Die cast aluminium painted with black stove enamel heat resistant paint with ¾ inch gland entry, painting preferably be done after chromating,

ii) Porcelain terminal block conforming to IS 8595-1977 (Re-affairmed in 2004)

iii) Brass screw silver coated

iv) Cable gland with neoprene / teflon grommet nominal dia of gland ¾ inch or as specified, and

v) Threaded head cover with S/S chain and suitable gasket/ hinged cover with gasket and cover locking screw with screw retainer

vi) SS tag plate (minimum size 40 mm x 10 mm x 3 mm)

10. ACCURACY

10.1 As per relevant Indian Standards mentioned in clause 13.1.

11. RESPONSE TIME

11.1 Better than 8 seconds for bare element, when checked in water-bath at 90 deg C.

12. ACCESSORIES

12.1 The following accessories shall be supplied against specific request:

I) Thermowell of SS 316 conforming to ASME 19.3 with process connection as required (thickness as required may be mention)

II) Thermowell of silicon carbide / porcelain, as required, conforming to IS 8495-1977 (Re-affairmed in 2004)

III) Compression fittings / unions

IV) Flexible metallic conduit 3 metres long, and

V) Extension nipples with thermowell connection

VI) Type of thermowells barstock / tubler shall be selected considering the length of thermowell and pressure of fluid.

13. VALUES

13.1 The thermocouple elements emf values in millivolts shall b e as per the table in:

i)	As per ITS-90	For J type
ii)	As per ITS-90	For S & R type
iii)	As per ITS-90	For K type
iv)	As per ITS-90	For B type
v)	As per ITS-90	For N type

14. CALIBRATIONS

14.1 Test & calibration certificate of thermocouple traceable to national standard.