I/H CONVERTER
(Current to hydraulic Pressure converter)

1.0 APPLICATION

This specification specifies the requirements of current-to-hydraulic pressure **proportional** converter (I/H converter) used in steam turbine governing system.

2.0 TECHNICAL DETAILS

2.1 DESCRIPTION

"I/H Converter with manual actuating knob".

2.2 TYPE

The I/H convertor shall be of proportional type meeting the flow requirements as mentioned below in the hydraulic data and the electrical data. The convertor shall have in-built dither and shall be of "plug and play" type system without any other software modules for its functioning.

2.3 ELECTRICAL DATA (*to be mentioned on the name plate*)

Supply voltage	:	+24V DC (permissible range 20 – 30 V DC including ripple)
Power consumption	:	Normal: (*to be indicated by supplier)* Max: (*to be indicated by supplier)*
Input signal	:	4 – 20 mA
Protection class	:	*Selected as per variant table and to be indicated accordingly*

2.4 HYDRAULIC DATA (*to be mentioned on name plate*)

Supply pressure	:	8±1 bar (g) (normal) 11 bar (g) (max)
Output signal pressure	:	1.5 – 4.5 bar (gauge)
	:	4 mA corresponds to 1.5 bar (*adjustable between minimum 1 to 2 bar)* 20 mA corresponds to 4.5 bar (*adjustable between a minimum 3 to 5 bar)*
Outlet volumetric flow	:	~45 lpm (minimum) at ΔP = 1 bar
Degree of filtration	:	≤50 microns (admissible contamination level – NAS 1638 Class 7)
Leakage	:	< 4 lpm
Viscosity	:	40 – 50 cSt

2.5 PERFORMANCE CHARACTERISTICS

Hysteresis	:	<0.2% of total range
Repeatability	:	<0.1% of total range
Accuracy	:	<0.1% of output value
Conversion time	:	< 35 msec

2.6 ENVIRONMENTAL DATA

Surrounding temperature	:	-40 °C to +85 °C
Impact strength	:	50 g for 0.005 seconds (total 18 impulses)
Vibration	:	18 to 500 Hz at 4.2g
Humidity	:	100% condensing
Working temperature of fluid	:	+30 °C to +70 °C

2.7 HYDRAULIC CONNECTIONS

All the hydraulic connections shall be on one side of the manifold block, which shall be part of the supply of the converter.

Supply, drain and output signal connections shall be of suitable NPT female threaded type and shall be indicated by the supplier.

The supply shall also include hydraulic blocks (if applicable) and suitable flushing plates and mounting connecting parts and fasteners as may be necessary.

2.8 ELECTRICAL CONNECTIONS

Electrical connection : Cable
Cable length : 5 meters

2.9 ADDITIONAL SCOPE (to be supplied with actuator)

i) 1 set of soft seals of all types used in the convertor.
ii) Connecting plates
iii) Flushing plates
iv) Brackets for mounting
v) Fasteners as required

3.0 DESCRIPTION (NAME) PLATE

Language : English

Data as per clause 2.3 & 2.4 shall be included in the description plate.

4.0 DOCUMENTS

The description catalogues giving full sectional details and mounting details of the convertor shall be furnished along with the offer and also with the consignment. 15 copies of Operation, Maintenance & Trouble shooting manuals in English language shall be supplied within 4 weeks of placement of order.

5.0 TEST CERTIFICATE

Three (3) copies of test certificate and adjustment protocol shall be furnished for each converter assembly quoting BHEL standard number, Purchase order number and serial number of the equipment.

6.0 GUARANTEE CERTIFICATE

A guarantee certificate for 24 months of trouble free performance from the data of shipment or 12 months from the date of commissioning whichever is later shall be furnished.

7.0 PACKING

The material shall be properly packed to ensure it is capable of withstanding transit risks without damage. Hydraulic port opening shall be plugged or closed with a locking plate.

The packing shall be sea-worthy.

8.0 ACCEPTANCE CRITERION

8.1 OFFER STAGE

Vendor shall submit following test certificates:

i) Input signal versus pressure
ii) Flow versus differential pressure
iii) Dynamic response test (Pressure versus time)

8.2 Vendor shall provide a reference list of the offered product in steam turbine applications and supplied to OEMs.

8.3 The offer is liable to be rejected if the reference list does not have at least ten different references of I/H convertors in similar application for steam turbines and under successful trouble free operation for more than 2 years.

8.4 End user feedback from the above references shall be furnished along with the offer for consideration of the offer.

9.0 MARKING

9.1 A tag bearing 12 digit material code shall be attached to each converter.

9.2 The following details shall be marked on packing case

a) Manufacturer's name
b) Manufacturer's model number
c) BHEL order number
d) BHEL standard number, TC51275.

10.0 VARIANT TABLE

VARIANT No.	I/H CONVERTER MODEL	MATERIAL CODE
01	Explosion proof complying to NEC Class I Div I Group B, C & D	TC9751275016
02	Weather proof complying to Protection Class IP65	TC9751275024

11.0 RECORD OF REVISIONS

Rev	Date	Rev. Details	Revised	Approved

12.0 CHECK LIST (***to be duly filled and certified by supplier***)

S.No.	Description	Yes / No	Document No.
1.0	Company name		
2.0	Model No. of IH converter offered		
3.0	Detailed catalogue enclosed		
4.0	Additional literature enclosed		
5.0	General arrangement drawing enclosed		
6.0	Cross section drawing enclosed		
7.0	Oil connection details and mounting details enclosed		
8.0	Supply oil cleanliness requirement		
9.0	Filter requirement in oil supply line		
10.0	Recommendation of filter type and size		
11.0	Power consumption Normal: Maximum:		
12.0	Electrical connection diagram enclosed		
13.0	Deviation to specification		
14.0	Details of deviation to be specification enclosed		

(Signature and Seal of company)