



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:HP:0059** Rev: **02**

Effective Date: **19/11/2020**

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Product: Position Feedback Transmitter and Limit Switch Assembly for Turbine bypass Application

Revision Record:

Rev. No	Date	Details of Revision
00	13 April 2017	First Release
01	21 April 2017	Clause 1(a) revised
02	16 November 2020	Clause 1 & 3 modified

1. Scope of Supply

This specification is applicable for supply of the following three types of assemblies:

- Capacitive/Magneto-resistive type transducer with limit switches housed in a single assembly called as “Position Feedback Transmitter Assembly”.
- Limit switches alone in a housing called as “Limit Switch Assembly”.

The scope covers design, manufacturing, testing and supplying of the above assemblies.

The transducer shall convert angle of rotation into analog electrical signal, while the limit switches provide digital indication on attaining preset angular position. The requirement of number of limit switches in an assembly may vary according to the valve. Please refer the P.O. for the exact requirement of number of limit switches in one assembly.

2. Description of Transducers and limit switches

2.1 Position transducer:

The output of the transducer shall be 5-15mA, linear to angle of rotation. Rotary angle shall be adjustable from 0°-30° to 0°-70°. **The transducer shall be of two wire type** i.e. Power to the transducer and output signal both together shall be through a two wire. The transducer shall be protected against reverse voltage and electromagnetic interference. The transducer shall be compatible for use in both the directions of rotation, i.e., clockwise and counterclock wise.

2.2 Cam type limit switches:

The limit switches shall be operated by individual cams. Cam shall be adjustable to any angle over 360°.The micro switches shall be snap action, rated to 230V Ac, 5A.

3. Technical Data:

3.1 For Capacitance type transducer

Supply voltage U_s	12....30V DC
Superposed a.c voltage ($U_s = 15.....27V$),	≤ 3 V RMS
Current limitation,	< 40 mA
Cutoff frequency (-3 dB)	250Hz
Angle of rotation,	Turns unrestricted, no stop
Rel. rotation angle range	0° to 30°.....70°
Axial and radial forces	≤ 20 N



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Driving torque	$\leq 0.1\text{Nm}$
Protection	IP65
Resistance to interference / destruction: (twisted lines, no shielding)	
Electrostatic Discharge IEC 61000-4-2	15kV
Burst IEC 61000-4-4	4kV
Surge IEC 61000-4-5 (1.2/50 μs , 2 Ω)	$\pm 2\text{ kV sym.},$ $\pm 4\text{kV asym.}$
EMF IEC 61000-4-3	3 V/m (26 MHz... 1 GHz)
EMF IEC 61000-4-6	3 V/m (150 KHz... 26 MHz)
Shock (IEC 60068-2-27)	50g/11 ms, 3 shocks Each in both directions of the 3 axes
Vibration (IEC 60068-2-6)	10 g, $f \leq 200\text{ Hz}$ Each of the 3 axes
Operating temperature	- 25.....+100°C
Admissible air humidity	$\leq 95\%$ relative humidity at 35°C
Nominal or operating values:	
Supply voltage,	12-30 V DC
Dynamic internal resistance	$> 1\text{ M.}\Omega$
Hysteresis	$\leq \pm 0.1\%$ FSR
Zero current I_0	5 mA
Current rise ΔI	10mA
Linearity	$\leq \pm 0.5\%$ Full Scale Range
Stability referred to full rotation angle of 70° - 25°...+80°C	$\leq \pm 1.0\%$ Full Scale Range
Dimensions	As per the enclosed sketch
Cam type Limit switches:	
Snap action type:	230V, 5A

3.2 For Magnetic type transducer

Casing Material	Salt water proof aluminium
Casing protection	IP 65
Terminal protection	IP 20
Shaft Material	Stainless steel
Shaft bearing	Ball bearing
Angular range	0° to 30°.....360°
Operating temperature range	-25°C to +80°C
Stability referred to full rotation angle at -25°...+80°C	$\leq 1.0\%$ FSR
Shock	50g, 6ms
Vibration	10g, 5-200 Hz
EMC Performance	EN 61000-6-2 EN 61000-6-3
Preadjustment	0....140°
Error output current	22.1 mA
Max.burden	400 Ohm



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Time constant on power-up	Ca. 20ms
Signal adjustment	Via membrane keys
Adjustment sense of rotation	Via jumper
Supply voltage	12.....33 V DC
Resolution	12bit/ FSR
Linearity	$\leq \pm 0.5\%$ Full Scale Range
Dimensions	As per the enclosed sketch
Cam type Limit switches:	
Snap action type:	230V, 5A

4.0 Details of Construction of Transmitter assemblies

The angular position transducer shall be coupled to a stainless steel shaft. This coupling shall be easily removable, if desired. Required number of cam actuated limit switches shall be mounted on the stainless steel shaft. The position transmitter, limit switches and the stainless steel shaft shall be enclosed in an aluminium housing. This assembly shall be suitable for mounting using the interface shown in Fig-A. The housing shall be fitted with additional anti-vibration pads to isolate the assembly from the vibrations of the actuators.

5.0 Testing

5.1 Type tests for transducers:

Type tests for transducers are required to be done to validate the design of the equipment and shall be carried out at a reputed laboratory. The tests shall be carried out whenever a change in the design is carried out.

1. Operation at Minimum and maximum supply voltage.
2. Short circuit current limitation to less than 40mA
3. Heat run test for the max. operating temperature
4. Hysteresis of output signal for the full range for capacitance type transducers

5.2 Routine tests for assemblies:

Test reports for the routine tests shall be submitted for every single assembly supplied to BHEL.

1. Dimensional test
2. Adjustment of Zero and full scale output with respect to full range of angular rotation.
3. Linearity of output signal for the full range
4. Hysteresis of output signal for the full range



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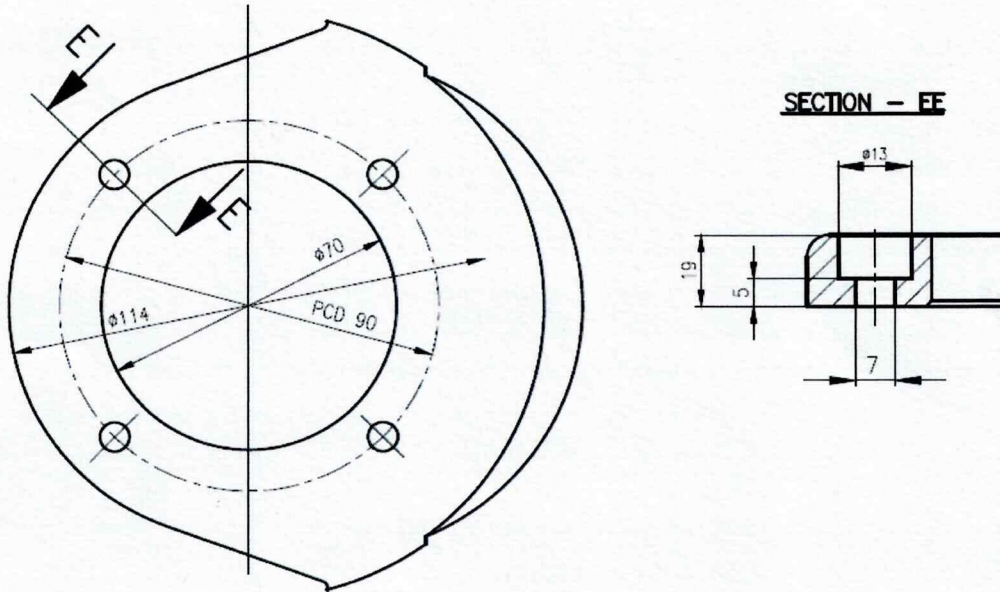
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FIG-A: MOUNTING DIMENSIONS ON THE ACTUATOR YOKE



- NOTE:** A) 4 Nos. of HSH Cap screw of M6x16 and 4 Nos. of spring washers shall be supplied along with the Feedback Transmitter / Limit Switch Assembly.
- B) The feedback transmitter shaft shall be $\phi 10$ mm in diameter with a minimum length of 30 mm projecting outside the feedback transmitter.

Signature		
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Designation	Sr. Engineer	Manager
Date	19 November 2020	19 November 2020
Action	Prepared By	Reviewed & Approved By