PRESSURE COMPENSATOR WITH LEVEL SENSOR FOR SEAL CAVITY OF ELECTRIC MOTOR IN SUB-SEA APPLICATIONS

1.0 APPLICATION:

Pressure compensator and its auxiliaries procured against this specification are intended to use for pressure compensation of electric motors used in sub-sea applications.

2.0 SCOPE OF SUPPLY:

Supplier shall design, manufacture, test and supply pressure compensator and its auxiliaries as per technical requirements mentioned in this technical specification.

3.0 GENERAL REQUIREMENTS:

Pressure compensator shall meet below general requirements:

3.1 Safe and highly reliable

3.2 2500 hours continuous operation without maintenance.

3.3 Shelf-life of replaceable components if any: 5 years (Minimum).

4.0 TECHNICAL REQUIREMENTS:

4.1 Compensator type: Spring loaded rolling diaphragm type

4.2 Operating parameters:

SNo	DESCRIPTION	PARAMETER
4.2.1	Capacity of compensator	>=3.3 Litre
4.2.2	Maximum Seawater Pressure	60 bar
4.2.3	Pressure variation	0.15 (min)-0.26 bar(max)
4.2.4	Operating temperature	2°C to 75°C
4.2.5	Storage temperature	-30°C to 50°C
4.2.6	Relative humidity	≤95%
4.2.7	Fluid compatibility	SHELL TELLUS 32
4.2.8	Maximum envelope dimensions	Outer diameter 260 mm & Height 270 mm

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4.3 Hydraulic Connections:

4.3.1 For hydraulic system (Motor) : NPT ¾" & 2 no's

4.3.2 Suitable tee and cross fittings if necessary: As required

4.4 Material of construction:

4.4.1 The material of construction for internal components of the pressure compensator and its auxiliaries shall be compatible with the hydraulic fluid specified under operating parameter Clause 4.2.7.

4.4.2 The material of construction for components of the pressure compensator exposed to sea water shall be suitable for the surrounding environment, i.e., seawater-compatible.

4.5 Mounting:

Pressure compensator mounting brackets & fixing details. Material of mounting brackets and fastener shall be corrosion resistant to sea water.

4.6 Monitoring and control:

Compensator shall be provided with level transmitter for precise level measurement with high accuracy and output of 4-20 mA.

4.7 Safety provisions:

4.7.1 Pressure relief valve (safety valve):

The compensator shall be provided with Pressure relief valve for protection against internal pressure peaks. Pressure relief valve accuracy 20%.

4.7.2 Air bleed valve:

To facilitate air bleeding.

4.7.3 Strain relief connector (if required):

The compensator shall be provided with a strain relief connector for protecting the underwater connector.

4.7.4 Vendor may suggest any additional safety provisions in his offer for safe & satisfactory operation of pressure compensator.

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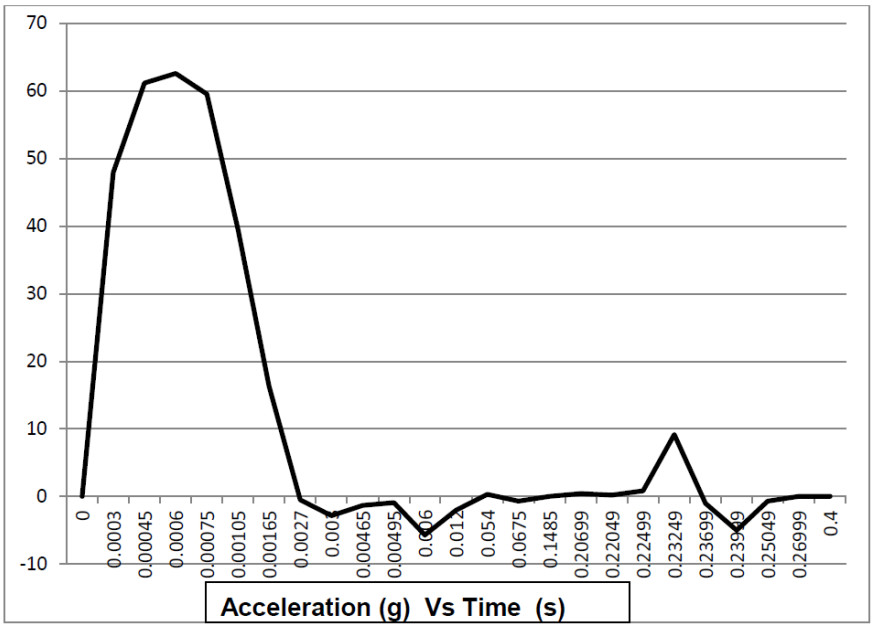
5.0 TESTS:

Supplier shall submit the detailed test plan along with general arrangement drawing and specifications of other auxiliary components used for testing. Below tests shall be conducted at supplier works:

5.1.1 Pressure tests.

5.1.2 Functional tests.

5.1.3 Shock test shall be performed on the pressure compensator to verify its ability to withstand shock loads. The test shall involve full sine wave shock pulses applied in all three orthogonal directions (X, Y, and Z axes), as illustrated below.



If the supplier has performed a shock load test on a pressure compensator of similar design, the corresponding test report shall be submitted for review and scrutiny.

In the event that the supplier is unable to perform the shock load test, a structural analysis report using Finite Element Method (FEM) software shall be provided. This analysis must demonstrate the pressure compensator's compliance with the specified shock load requirements.

5.1.4 Endurance testing for 168 hours at various pressure levels from 0 to 60 bar.

5.1.5 Supplier may perform any other test deemed to be required.

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6.0 DOCUMENTATION:

Supplier shall submit below documents along with technical offer:

- General arrangement drawing of pressure compensator indicating all technical parameters viz operating parameters, material specification, bill of materials etc
- List of sensors and their technical details
- List of safety provisions and their details
- Technical details and vendor details of other bought-out items

Supplier shall submit below documents after placement of PO for BHEL approval:

- Detailed cross-sectional assembly of the seal with parts identified, materials of construction and overall dimensions.
- Brief description on construction details of pressure compensators.
- Technical write-up giving salient features of the pressure compensator.
- Manufacturing quality plan for the pressure compensators
- Detailed test setup and test procedure for functional test & pressure test
- Detailed test setup and test procedure for pressure cycle test (168 hours).

Supplier shall submit below documents the time of equipment delivery:

- Detailed 3D models preferably in neutral format
- 3 sets of Operation & Maintenance manual including do's & don'ts, safe operating instructions, assembly-disassembly instructions, oil filling & emptying instructions.
- 3 sets of storage, handling and preservation instruction manual.

7.0 TEST CERTFICATES:

Material qualification test certificates / inspection certificates for all components like rolling diaphragm, compression spring, piston / plunger, casing, fasteners etc shall be submitted.

Sensors make and functional test certificates etc shall be submitted.

3 copies of test certificates for all the tests at Cl 5.0 shall be submitted.

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8.0 GUARANTEE:

The supplier shall furnish the guarantee certificate as having fulfilled various requirements outlined in this specification. The supplier shall rectify, replace damaged items free of cost without jeopardizing the purchaser's committed schedules.

The equipment covered in this specification shall be guaranteed for a period of 12 months from the date of commissioning or 18 months from the date of dispatch whichever is earlier against any defect in design, manufacture, materials or workmanship.

9.0 SPARES:

List of spares as indicated in the price format below are to be quoted.

S. No	DESCRIPTION	QTY (EACH)	PRICE (INR)
1			
2			
3			

The spares requirement will be finalized at a later date as per project requirements. BHEL reserves the right to order the spares along with the main equipment or separately. The bidder will keep the price for the spares valid till execution of order or till 12 months from the date of P.O., whichever is later.

10.0 PRICE FORMAT

With the techno-commercial part of their offers, the bidders will provide original un-priced price format, strictly in the BHEL price format provided and other commercial charges as per the commercial terms attached with the enquiry.

The price format shall be same for un-priced and priced offer.

No other price format will be accepted.

Prices for spares (Clause no-11) to be considered as an optional.

11.0 MARKING AND PACKING:

11.1 The packing case should be marked with

I. P.O. Number

II. S.No. of equipment

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III. Description of equipment, quantity

IV. Packing list no.

V. Manufacturer's stamp

VI. Top & Bottom indications

VII. Nature of the equipment, Fragile/Non fragile etc.

11.2 The pressure compensator shall be packed suitably to prevent mechanical damage during transportation.

11.3 While dispatching pressure compensator, suitable preservation shall be provided in the packing case to protect from adverse weather conditions.

12.0 REJECTION AND REPLACEMENT:

BHEL has the right to reject the entire or part of the ordered equipment not withstanding its initial acceptance if it does not meet the specification requirements and supplier shall replace the rejected equipment free of cost at the earliest without affecting BHEL commitments.

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RECORD OF REVISIONS

REV. NO.	DATE	REVISION DETAILS	REVISED	APPROVED

FORMAT TD-203 REV-00

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