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PROJECT : VISHNUGAD PIPALKOTI HEP (4 x 111 MW – V. FRANCIS)

GENERAL

Piston operated accumulator is required to store the oil energy in the form of pressure, where piston and oil is back up by pre-charged N₂ bottle bank/quad. Pressurized oil will be used to operate hydraulic servomotors to control the Hydro turbine through Governor & MIV. Reference drawing Nos. 32000119702 Rev.00, layout

1. SCOPE OF SUPPLY:

Piston Accumulator Station: - Quantity: four (04) sets, each set shall comprise of: -

Sl. No.	ITEMS	QTY.	Device No. (Dwg.no. 32200119702)
a.	1. Piston type accumulator for GOV & MIV:– 1.1) Total volume of piston accumulator for GOV & MIV = 2560 liters. 1.2) As shown in the drawing 8 nos. piston accumulator of GOV & MIV making total volume as 2560 Liters minimum capacity have been considered in a view to optimize the no. of accumulators. 1.3) The overall dimensions of the installed set (piston accumulator along with its mounting stand) should not exceed by 2600mm(L)x 3700mm(W)x 4000mm(H)	One set	GOV & MIV [375-1~8]
b.	Magnetic float operated non-contact flapper type level indicator Assy.	On each accumulator	312-1~8
c.	Magnetic float operated bistable Magnetic switches for high, low & very low oil level alarm & trip signals, mounted on accumulator as shown in the drawing.	3 Nos.	71G-3 ,4 & 5
d.	Level Transmitter (4-20 mA), mounted on accumulator as shown in the drawing.	1 No.	71G-14
e.	Complete set of safety cum shut-off block assembly.	1 No.	376 (Comprising of 322,306 & 328)
f.	Isolating valves (32 NB Ball Valve type)	On each accumulator	317-1~8
g.	Pressure gauge with damper & valve	1 No.	304, 323

REV.NO.		DISTRIBUTION.	QTY.	APPROVED:			
PREPARED				(PKB)			
CHECKED		HPE	01	PREPARED	CHECKED	ISSUED	DATE
APPROVED		MHX	04				22.04.2019
DATE				(DB)	(AP)	(AP)	



h.	Electrical terminal box with 20% spare terminals to suit 4 sq. mm wire, Protection class IP65.	1 No.	-
i.	Fabricated MS stand	1 No.	-
j.	Necessary Seamless stainless steel S304 piping, clamps, fitting & accessories.	1 set	-
k.	Anchor fastener & bolts for foundation of stand.	1 set	-
l.	Charging Block	1 set	385IV-1~4

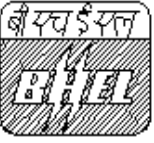
3. DESIGN PARAMETERS

- 3.1. Design pressure - 120 kg/cm²
- 3.2. Max. Working pressure - 100 kg/cm²
- 3.3. Test pressure - 180 kg/cm²
- 3.4. Oil Safety Relief Valve Setting
Blow-off - 110 kg/cm²
- 3.5. Capacity of accumulator - 320 Litres
- 3.6. Diameter of the piston accumulator to be decided by the vendor.
- 3.7. Total height of piston accumulator Assy. Should not be more than **4000 mm (±50 mm)** in fully assembled condition.
- 3.8. Leakage Tray shall be provided at the bottom of the piston accumulator.
- 3.9. Ambient Temp. - -5°C – 40°C
Operating Temperature - 20 – 40°C
- 3.10. Working media - Mineral oil ISO-VG-46 on lower chamber and Nitrogen gas on Upper chamber.

4. TECHNICAL REQUIREMENT:-

4.1. PISTON ACCUMULATOR (375) (Refer drawing no.

- a) Design and construction should conform to ASME Code Section VIII, Division. I & II
- b) Piston accumulator Oil outlet connection should be connected to common header of oil and Nitrogen gas connection (NP1 ~ NP8) should be as per drawing no. **32000119702** Rev.00.
- c) Piston accumulator to be connected to common header pipe (P1 & P2) having both ends flanged connections of **50 NB PN 100 ATA** . Pilot Operated Safety cum shut off Blocks of suitable capacity to be provided to cater the flow of the piston accumulators and flanged drain connection (T) with mating blind flanges. Sizes of connections and pipes shall be as per drawing no. **32000119702** Rev.00.
- d) Piston accumulator mounting stand:- Lifting lugs (Minimum 4 Nos.) to be provided with factor of safety 4. Anchor fasteners for foundation shall be of property class of 12.9.
Stand must be robust, sturdy with heavy duty structural steel channel /angle.
- e) All oil pipe & fittings shall be of seamless carbon steel.

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4.2 PILOT OPERATED SAFETY CUM SHUT-OFF BLOCK MANIFLOD ASSY. (376)

Manifold Assy. Consists of Device no. **306-D, 322-D, 328-D**

(a) Catridge Valve (Device no. **306-D**)

- | | |
|--------------------|---|
| Design Pressure | - 120 kg/cm ² |
| Discharge capacity | - 295 LPM |
| Type | - Spring Loaded poppet type without cushion (Size-Ø25) |

(b) Safety relief Valve (Device No. **322-D**)

- | | |
|-------------------|--------------------------------------|
| Set to operate at | - 110 kg/cm ² |
| Size | - Bidder has to decide |
| Type | - Direct operated spring loaded type |

(c) Drain valve (Device no.**328-D**) - Full bore ball valve (**25 NB**) with manual handle.

(d) Make: Eaton/Yuken / Rexroth / Moog / Tyco/ keystone/ wandfluh / KSB/Audco/Hydac

4.3 LEVEL INDICATOR (312) ON ACCUMULATOR, LEVEL SWITCH (71G-3, 4, 5) AND LEVEL TRANSMITTER (71G-14)

- Magnetic float operated non-contact type piston position Magnetic Flapper type level indicator (312) should be provided on piston accumulator.
- Magnetic bistable level switches (71G-3, 4, 5) mounted on accumulator should have single pole, double throw 1 NO + 1 NC contacts with rating 0.5 Amp. And shall be adjustable throughout the level indicator operating range.
- Level Transmitters (71G-14) output shall be 4-20 mA calibrated for full range and provided on accumulator.

4.4 PRESSURE GAUGES (DEVICE NO. 304)

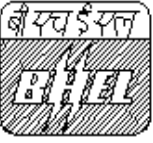
- Pressure Gauge (in the range of 0 – 160 Kg/Cm²) shall be shock and vibration-proof (preferably by filling with glycerine), calibration in Kg/Cm², IP67 protection, toughened glass and with black letters and figures on a white ground. Pressure Gauge shall be of circular dial, flush type mounting, size 150 mm having accuracy of ± 0.5 % FSD, preferably IP67 protection class and provided with toughened glass. Pressure Gauge should be completely made of stainless steel. Pressure Gauge shall be equipped with a relieve valve for safety reasons in case of leaks. Pressure gauge should be connected to isolating valve by minimesh.

b) Make – Ashcroft / Wika / Warea/Forbes Marshal/ Budenberg/Kobold

4.5 ISOLATING VALVE (DEVICE NO. 317)

Isolating valve (1-1/4" BSP) of ball valve (Device no. 317) type of class 900 with SS ball.

Make : Hydac/Hydair/Audco/Fouress/Leader

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4.6 General Note for Isolating Valve for oil (Device no. 323 & 317)

Material must be as given below: -

1. Valve Body: Cast/Forge steel
2. Valve spindle /shaft/pins: Stainless steel AISI 410 or better
3. Disc/Ball: Stainless steel (ASTM A 351 Gr.CF8 or better)
4. Gland/seal/seat: PTFE

5. WIRING / TERMINAL BOX

All electrical components shall be wired with 1.5 mm² cable up to the terminal box located suitably on the accumulator station and having screw types terminals and lugs. Wiring scheme shall be supplied along with the accumulator drawing for preparing cable schedule at our end for our customer. Box must be to suit IP 65 class.

Make for Terminal Box: Neptune / Rittel / Schneider / Hensel

Make for Terminal Bloc : Phoenix /Wago/Elemex

6. RATING PLATE

Rating plate shall be as per our drawing no. 12210149005 # 3 to be manufactured by supplier and to be mounted at suitable location on accumulator stand. This drawing will be given to successful bidder after placement of PO.

7. INSCRIPTION PLATE

Inscription plates of all electrical & mechanical components, Device no. shall be provided as per diagram of control gear drawing No. 22000020402 for Identification of each component by fixing metal tag duly engraved.

8. PACKING:

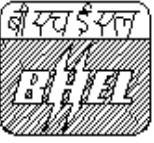
Each assembly shall be packed in a sufficiently strong reusable wooden box with silica gel packet and with adequate cushioning material and water proof cover to minimize the movement of the internals and ensure that the equipment is capable of withstanding the transit conditions without damages.

After testing of assy. Individual Piston Accumulator along with its accessories to be packed in single box, stand with piping and accessories to be packed in separate box.

9. DOCUMENTATION:

9.1) Along with the offer:

- a) **Catalogues and guaranteed technical particulars.**
- b) Catalogue of each BOM items shall be supplied with full technical details along with the offer, otherwise offer will be treated as incomplete and offer will be liable to reject.
- c) **Deviation (if any)** : Supplier to clearly list out deviation otherwise it'll be understood that he supplier is meeting all technical requirements mentioned in this purchase specification.

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9.2) After award of Contract:

The supplier shall submit the documents / drawings within 4 weeks after award of Purchase Order (PO) which shall include the following:

- Outline general arrangement drawings showing all the devices, overall Dimensions, layout, and foundation details.
- Revised drawing to be submitted within 2 weeks from the receipt of comments.
- Supplier has to furnish strength calculation of piston accumulator showing formula, standards, basic assumptions stress levels, safety factors etc. Submission of computer calculations without above details shall not be acceptable. Supplier to note that this calculation will be send for approval of our customer (NHPC) and vendor has to furnish calculation details as required by them.

9.3) 10 copies of Operation and maintenance manual covering catalogue and Drawings are to be supplied before the dispatch of equipment's.

9.4) 3 copies of test certificates to be supplied covering the following test & basic design data called in the scope of supply.

- 1)Capacity and pressure test certificate of accumulator
- 2)Adjustment & setting of relief valve
- 3)Calibration of Level transmitter
- 4)Pressure gauge calibration certificate.
- 5)GC and TC of bought out items
- 6)Compliance certificate
- 7)Minimum pressure required to move the piston accumulator

10. GUARANTEE

Equipment shall be guaranteed against bad workmanship and defective material for a period of 18 months from the date of supply.

11. INSPECTION & TESTING

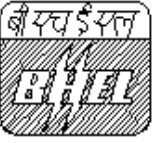
Inspecting & Testing shall be carried out at vendor's work by BHEL/BHEL's customer approved QAP and test procedure (Will be furnished to successful bidder).. Vendor shall have to submit the QAP for final customer approval

The following documents are required: -

- Test witness for hydraulic pressure test.
- Test witness for dimensional check.
- Test witness for operation of level switches & transmitter.
- Test witness for safety block.
- Material TC (Chemical Composition, Mechanical properties)

The following testing equipments are required.

- Power pack – up to 200 kg/cm²
- Test servomotor
- Test pressure gauge
- Multi meter

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v) 24 VDC source

Acceptance of inspection does not absolve the supplier of his responsibility to rectify the equipment in case it does not perform satisfactorily at hydro site where it is Actually used.

12. STORAGE & HANDLING

Supplier shall clearly mention the method of storage & handling in BHEL works / site for long storage. It shall also be mentioned if any special protection is to be provided for this purpose. The above should form part of O&M Manual.

13. LIST OF SPARES: (Annexure-1)

- | | | | |
|----|--|---|--------|
| 1. | Safety valve (device no. 322-D) | - | 2 Nos. |
| 2. | Oil Control Valve (Logic cartridge valve) (1 Set = 1 No.) | - | 2 Sets |
| 3. | Magnetic Switch (Device no.71G-3) | - | 3 Nos. |
| 4. | Sealings, gaskets, O-rings, packing (1 Set = 1 No. of each type) | - | 2 Sets |

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