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PROJECT: PUNATSANGCHHU-II (6 X 170 MW) V. FRANCIS

GENERAL

Piston operated accumulator is required to store the oil energy in the form of pressure, where pressurized oil is backed up by pre-charged N₂ bottle bank/quad. Pressurized oil will be used to operate hydraulic servomotors to control the opening closing of BFV (penstock valve).

Refer drawing no. 32200618802 Rev.00 for hydraulic scheme of piston accumulator station.

1. SCOPE OF SUPPLY :

Piston accumulator station: - Quantity: 3 sets,
Each set shall comprise of:-

Sl.No.	ITEMS	QTY.	Device No. (Dwg.no. 32200618802)
a.	Piston type accumulator:- ➤ Total internal volume of piston accumulators for BFV = 900 liters (minimum) ➤ Total no. of accumulators = 3 Nos. ➤ Internal volume of each accumulator = 300 Liters ➤ The overall height of the installed set (piston accumulators along with its mounting stand, piping & mounting accessories) should not be more than 4000 mm (± 50 mm)	1 Set	375PV-1 To 375PV-3
b.	Magnetic float operated non-contact flapper type level indicator Assy.	On each accumulator	312PV-1 To 312PV-3
c.	Magnetic float operated bistable Magnetic switches for high, low & very low oil level alarm & trip signals, mounted on the accumulator as shown in the drawing.	3 Nos.	71PV - 3 ,4 & 5
d.	Level Transmitter (4-20 mA), mounted on the same accumulator on which magnetic level switches are mounted as shown in the drawing.	1 No.	71PV-14
e.	Complete set of safety cum shut-off block assembly.	1 No. (As per drawing)	376PV (Comprising of Device Nos. 322PV, 306PV & 328PV)
f.	Isolating valves (32 NB Ball Valve type) class 900	3 Nos. (As per drawing)	317PV-1 To 33PV-3

REV.NO.		DISTRIBUTION.	QTY.	APPROVED:			
PREPARED				PKB			
CHECKED		HPE	01	PREPARED	CHECKED	ISSUED	DATE
APPROVED		MM(H)	04				
DATE				VKN	AP	AP	10.10.19



h.	Pressure gauge with minimess & isolating valve	1 set	304PV & 323PV
i.	Electrical terminal box with 20% spare terminals to suit 4 mm ² wire, Protection class IP65.	1 No.	-
k.	Fabricated MS stand	1 No.	-
l.	Necessary SS304 piping, clamps, fitting & accessories.	1 set	-
m.	Anchor fastener & bolts for foundation of stand.	1 set	-
n.	Charging Block with N2 Safety Valve	3 Nos. (As per drawing)	[385PV-1 to 385PV-3] & [311PV-1 to 311PV-3]

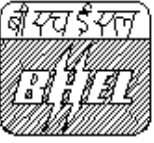
3. DESIGN PARAMETERS:

- 3.1. Design pressure - 120 kg/cm²
- 3.2. Normal Working pressure - 100 kg/cm²
- 3.3. Test pressure - 180 kg/cm²
- 3.4. Dead Pressure - 70 kg/cm²
(After which no oil shall be drawn)
- 3.5. Oil Safety Relief Valve Setting (Blow-off) - 110 kg/cm²
- 3.6. Nitrogen gas Safety Relief Valve Setting (Blow-off) - 116 kg/cm²
- 3.7. Diameter of the piston accumulator to be decided by the vendor.
- 3.8. Leakage Tray shall be provided at the bottom of the piston accumulators.
- 3.9. Ambient Temp. - -5°C – 40°C
Operating Temperature - 20 – 40°C
- 3.10. Working media - Mineral oil ISO-VG- 46 in lower chamber and Nitrogen gas in Upper chamber. Sealing of the piston accumulator should suit this working media.

4. TECHNICAL REQUIRMENT:

4.1. PISTON ACCUMULATOR (375PV-1~3):

- a) Design and construction should conform to ASME Code Section VIII, Division. I.
- b) Each piston accumulator Oil outlet connection should be connected to Common header of oil and Nitrogen gas outlet connection should be connected to charging block as per as per drawing no. 32200618802 Rev.00
- c) Each piston accumulator to be connected to common header pipe having both ends flanged connections (P1 & P2) of **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 matching blind flange to be of PN 16 ATA. Sizes of connections and pipes shall be as per drawing no. 32200618802 Rev.00.
- d) The piston accumulator oil side process connection should be 32 NB DIN 100 ATA flange connection and Piston accumulator gas side process connection should also 32 NB DIN 100 ATA Flange.

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- e) Piston accumulator mounting stand should be designed and manufactured by supplier must be robust and sturdy. Each piston accumulator should be mounted with minimum 3 nos. U type mounting clamp. 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.
- f) **All oil pipe & flanges shall be of seamless stainless steel to ASTM A 312 TP 304L Schedule 40/80 as specified in the drawing.**
- f) **All Nitrogen pipe shall be of seamless stainless steel to ASTM A 312 TP 304L Schedule 160.**

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

Manifold Assy. Consists of Device no. **306PV, 322PV & 328PV.**

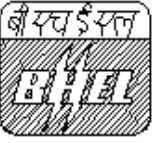
- (a) Catridge Valve (Device no. 306PV)
 - Design Pressure - 120 kg/cm²
 - Discharge capacity - 150 LPM
 - Type - Spring Loaded poppet type without cushion (Size-Ø16)
- (b) Safety relief Valve (Device No. 322PV)
 - Set to operate at - 110 kg/cm²
 - Size - Bidder has to decide
 - Type - Direct operated spring loaded type
- (c) Drain valve (Device no.328PV) - Full bore ball valve (25 NB) with manual handle with manifold mounting type.

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

- a) Magnetic float operated non-contact type piston position (Magnetic Flapper type) level indicator (312) should be provided on each piston accumulator.
- b) Magnetic bistable level switches (71PV-3, 4, 5) mounted on accumulator should have one no. 'NO' (Normally open type) contacts with rating 0.5 Amp and shall be adjustable throughout the level indicator operating range.
- c) Level Transmitters (71PV-14) output shall be 4-20 mA calibrated for full range and provided on one accumulator on which bistable level switches are mounted.

4.4 PRESSURE GAUGES ALONGWITH ISOLATING VALVE (DEVICE NO. 304PV & 323PV)

- a) Pressure gauge (304PV) shall be of ϕ 150 / ϕ 160, bourdon tube type having internal dampening / glycerin filled device facility to avoid pulsation/vibration, 0-200 kg/cm² range to be mounted with isolating valve on common header pipe assembly. Moving parts should be of stainless steel ANSI-304/316 with zero adjustment.
- b) Accuracy class Standard type class 1.0 or better for Pressure gauge.
- c) Needle type valve (Device no. 323 PV) along with minimess hose and coupler should be provided for connecting the pressure gauge.

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4.5 N2 GAS SAFETY VALVE (DEVICE NO, 311PV-1 ~ 3)

Three nos. safety valve to be provided on nitrogen side as per schematic drawing. Blow off pressure of safety valve to be set at 116 Kg/cm². The safety valve should be mounted on charging block as per schematic drawing.

4.6 ISOLATING BALL VALVE (DEVICE NO. 317PV-1 ~3)

Isolating valve of ball valve type of class 900 with SS ball should be provided on Nitrogen gas side as per schematic drawing.

4.7. CHARGING BLOCK [385PV-1~3]

Charging blocks as per schematic drawing should be provided. These blocks shall be used for charging the N2 in to the pressure system [piston accumulator – N2 bank] from the Nitrogen charging cylinders through charging kit.

5. WIRING / TERMINAL BOX:

Terminal box (Protection class of IP65) should be provided for termination of electrical components. All electric components shall be wired up-to terminal block of terminal box with ferrule Nos. as per wiring diagram at suitable location and wiring inter-connection cable shall be routed suitably neat & clean. Terminal box should have atleast 20% extra spare terminals. Sufficient working space must be available all around the terminal blocks inside the terminal box for wiring. All electrical components shall be wired with 1.5 mm² cable up to the terminal blocks.

Terminal block: The screw type terminal blocks should be provided and each terminal block should be suitable for connecting 4 sq mm. wire. The insulating material of the terminal blocks shall be polyamide 6.6.

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 Hydraulic scheme of piston accumulator and N2 bottle bank drawing for Identification of each component by fixing metal tag duly engraved.

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8. PACKING:

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

Packing list and list of boxes shall be furnished by the supplier before dispatch.

9. DOCUMENTATION:

9.1) Along with the offer:

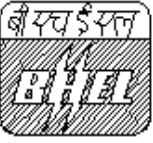
- a) Bill of material along with model code, make, quantity & catalogue, **incomplete offer is not acceptable.** Guaranteed technical particulars.
- b) Catalogue of each BOM items shall be supplied with full technical details along with the offer, otherwise offer will be treated as incomplete and offer 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.
- d) Vendor has to submit the credentials with following documents.
 - i. Organizational infrastructure
 - ii. Manufacturing and testing facilities
 - iii. Ranges of products offered
 - iv. List of past supplies
 - v. Performance certificates from end users and completion certificates
 - vi. Availability of after sales services in India
- e) Documents listed above in sl. no. 'd' of documentation are required by our customer (PHPA-II). During technical scrutiny, if any other documents are required by our customer then same to be submitted by the vendor. Failure to submit the same may lead to rejection of the offer. Price bid shall be opened only of those vendors who shall be approved by our customer.

9.2) After award of Contract

The supplier shall submit the documents / drawings within **8 weeks** after award of Purchase Order (PO) which shall include the following:

- a) Outline general arrangement drawings showing all the devices, overall Dimensions, layout, and foundation details.

After incorporating our comments subsequent revised drawing shall also to be submitted within 2 weeks of receipt of comments.

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9.3) 10 copies of Operation and maintenance manual covering catalogue and Drawings are to be supplied within one month of dispatch. **In addition, to this soft copy of the O & M manual to be submitted.**

9.4) 3 copies of test certificates to be supplied covering the following test & basic design data called in the scope of supply and for all the items covered in spare list.

- 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 for each accumulator
- 8) Chemical and Mechanical properties of piston accumulator
- 9) DPT of weld joints and pressure test of pipes assembly

In addition to this soft copy of the test certificates to be submitted.

10. GUARANTEE / WARRANTEE

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

11. INSPECTION & TESTING

Testing will be carried out at supplier's work by BHEL / BHEL's Customer (PHPA-II) / BHEL appointed TPIA as per approved QA plan and test procedure (Will be furnished to successful bidder).

The following documents are required:-

- i) Test witness for hydraulic pressure test.
- ii) Test witness for dimensional check.
- iii) Test witness for operation of level switches & transmitter.
- iv) Test witness for safety block.
- v) Test witness of DPT of weld joints of pipes
- vi) Material TC (Chemical Composition, Mechanical properties)

The following testing equipments are required.

- i) Power pack – up to 120 kg/cm²
- iii) Test pressure gauge
- iv) Multi meter
- v) 24 VDC source

Acceptance after 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 shall be 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. SPARES FOR PISTON ACCUMULATOR –**QTY. - 1 SET (CONSISTING OF THE FOLLOWING ITEMS)**

SL. NO.	ITEM DESCRIPTION	QUANTITY
1	Pressure gauge (Device no.304PV)	3 Nos.
2	Level Switch (Device no.71PV-3)	3 Nos.
3	Level Transmitter (71PV-14)	1 No.
4	Oil Safety Relief Valve (Device No.322PV)	1 No.
5	Cartridge Valve (Device No. 306PV) with spring and cover assembly	1 No.
6	All types of seal, gasket of couplings , pipe flanges, isolating valves & hydraulic valves (1 Set = 2 no. of each type)	2 set
7	N2 gas safety valve (Device No. 311PV-1)	1 No.
8	Isolating Valve for Pr. Gauge (Device no.323)	1 No.
9	Isolating valve (Device no. 317PV-1)	1 No.
10	Isolating valve (Device no. 328PV)	1 No.

Note: Individual price break up of each items of above spares to be indicated in the offer by bidder.

**Annexure -I****LIST OF INSTRUMENTS & DEVICES ASSEMBLED ON PISTON ACCUMULATOR**

S.No.	Device No.	Description	Specification	Quantity	Make
1	306PV	Unloader Valve	Refer clause no. 4.2	1 No.	Yuken / Hydac / Bosch Rexroth / Vickers / Parker / EPE
2	322PV	Pr. Relief Valve (Oil Safety Relief Valve)	Refer clause no. 4.2	1 No.	
3	311PV-1~3	Pr. Relief Valve (N2 gas Safety Relief Valve)	Refer clause no. 4.5	3 Nos.	
4	385PV-1~3	Charging block	Refer clause no. 4.7	3 Nos.	
5	328PV	Isolating valve	Refer clause no. 4.2	1 No.	Hydac / Yuken / Rexroth / L&T / Audco / MHA Zentgraf
	317PV-1~3		Refer clause no. 4.6	3 Nos	
6	71 PV-3, 71 PV -4 , 71 PV -5	Level Switch	Refer clause no. 4.3	3 No.	As per Accumulator Manufacturer's Standards
7	71PV-14	Oil level Transmitter	Refer clause no. 4.3	1 No.	
8	312PV-1~3	Magnetic float operated non- contact flapper type level indicator	Refer clause no. 4.3	3 Nos.	
9	304PV	Pressure Gauge	Refer clause no. 4.4	1 No.	Ashcroft / Wika / Budenberg / Kobold
10	323PV	Isolating valve	Refer clause no. 4.4	1 No.	Hydac / Yuken / Rexroth / L&T / Audco / MHA Zentgraf
11	--	Anchor Fastener with bolt & nut	Refer clause no. 4.1	1 Set	Hilti
12	--	Electrical Terminal Box and Terminal blocks	Refer clause no. 5	1 Set	[Hencel / Rittal / Neptune/ Schneider (For Terminal Box)] ----- [Elmex / Connectwell / Wago / Phoenix / Weid Muller (for Terminal blocks)]

Note:

- 1. Vendor has to use all the above instruments and devices from their manufacturing range only, if they are suiting to our technical specification.**
- 2. All the above makes of the instruments and devices shall require end customer approval.**