

	HYDRO PROJECTS ENGINEERING DIVISION	SPECIFICATION NO	REV 00
	TITLE: SPECIFICATION OF P.P.SET FOR BFV SYSTEM	241594856-A	Page 1 of 18

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

1. GENERAL

This specification covers design, manufacturing, assembly, testing and supply of oil pressure pumping set for the operation / control of BF valve servomotors and its associated control valve. It should be designed for continuous duty type. Basically oil pressure system shall be designed according to the Diagram of Control gear drawing no. **12000018808 Rev.02**. The parts which are not indicated in detail on this drawing such as piping, fittings, valves, flanges & other instruments should also be supplied by the supplier. Complete system to be supplied in fully tested & assembled condition.

2. BASIC DESIGN DATA

- | | | | |
|----|-------------------------|---|--|
| A. | Basic Design | - | BHEL BHOPAL |
| B. | Type | - | Each system has dual installation of oil Pump motor set with continuous duty type. |
| C. | Pressures | | |
| | Normal working pressure | - | 100 kg/cm ² |
| D. | Tank design Temp. | - | (-) 10 to (+) 45° C |
| E. | Operating Feature | | |

E.1. Two pumps (main +standby) shall be operated when pressure falls to preset pressure settings. However, as per our design at times both pumps (main + standby) may be in operation.

E.2. Pressure pipe sizes are to be decided based on oil velocity in the pipe, which shall not be more than 3 m/sec & for drain pipes the velocity should not be more than 2 m/sec (It is for reference). However, **pipe sizes should be same as specified in the drawing of control gear diagram.**

E.3. The pressurized oil in the oil piston accumulator is controlled within specified limits by solenoid operated unloader valve with built in relief valves, which controls discharge oil from pump to oil piston accumulator or to oil sump tank.

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



3 TECHNICAL DETAILS AND SCOPE OF SUPPLY:

3.1 SUMP TANK (Device No. 313PV)

- a) Capacity = 3000 liters
- b) Dimensions Internal: Width = 1500 mm
: Length = 2000 mm
: Height = 1000 mm
Normal oil tank level: = 350 mm from bottom of sump
- c) Material for sump tank : IS: 2062 Gr. E250 (Fe 410 W A) Quality A
Material of Pipes : Seamless Stainless Steel
Material of flanges : Stainless Steel
- d) Plate thickness:
 - Bottom Plate - 10 mm
 - Side plate - 8 mm
 - Top plate - 20 mm

3.2 OIL PUMP (Device No. 301PV-A & B)

- a) Number - 2 Nos.
- b) Type - Triple screw pump
- c) Rated speed - 2900 rpm
- d) Rotation - Clock wise view from motor side
- e) Delivery pressure - 100 kg/cm²
- f) Suction pressure - (-) 0.4 kg/cm²
- g) Capacity - **70 (+10%,-5%) LPM** as per VDMA std. 24284 Group-II
- h) Medium of liquid - ISO – VG - 46 mineral oil heavy duty
- i) Viscosity range - 37-150 CST
- j) Range of permissible - (-) 10 deg. To (+) 75 deg. C
temperature
- k) Connection - Delivery: Pipe & Flange type 25 NB, DIN 100 ATA

The distance between bottom of the suction pipe and bottom of the tank to be maintained between 70-90 mm and the same to be shown in arrangement drawing also.

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3.3) ELECTRICAL MOTOR (Device no. 88 MPV-A & B)

Number	-	2 Nos.
Type	-	Totally enclosed fan cooled vertical Flange mounting, Squirrel cage induction motor
Output	-	22 kw depends on pump (301PV- A & B) characteristics
Voltage	-	415 V $\pm$ 10% , 50 Hz $\pm$ 5% , 3 phase
Speed	-	2900 rpm
Mounting	-	To suit oil pump (Device No. 301PV-A & B)
Insulation class	-	Class-F or better
Temp. raise	-	Should be limited to Class-B at 10 % continuous overload above rated load condition
Efficiency class	-	IE-3

Note: a) Motor should be capable of operation for a period of not less than 5 minutes with a voltage of 25% below nominal voltage at nominal frequency without injurious overheating.

3.4) MANIFOLD ASSEMBLY FOR MAIN & STAND BY PUMP:-

Consisting of device nos. 302PV, 306PV, 322PV, 363PV & 20PV- A & B).
(Manifold block must have test points 'T1 to T4' as per DCG 12000018808 REV.02)

3.4.1 UNLOADER VALVE ASSY. (DEVICE NO. 306PV,322PV,363PV WITH 20PV-A&B)

(a) Cartridge valve (Device no. 306PV)

Discharge capacity	-	70 LPM + 10%
Type	-	Spring loaded poppet type without cushion
Size	-	NG16

(b) Pressure Relief Valve (Device no. 322PV)

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

(c) Solenoid operated valve (Device no. 363PV with 20PV- A & B)

Type: 4-way, 2-position, spring off-set, solenoid operated with manual Over-ride Facility & shall be of continuously rated type normally open valve
Size: Bidder to decide.
Supply voltage: 230 VAC,50 Hz with plugin connector of LED indicator type

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3.4.2 NON RETURN VALVE (Device No.302PV):

Type	-	Spring loaded poppet type (Inline mounting / Manifold subplate mounting type)
Cracking Pressure	-	0.4 to 0.5 kg/cm ²
Capacity	-	Capable to cope-up the discharge of pump (main / standby) (75LPM+10%) at a pressure of 100 kg/cm ² with pressure drop (Del P) not more than 2 kg/cm ²
Size	-	Dia 16 or more

Operating Characteristics:

In first step during startup of power pack solenoid of main pump - motor set is in de-energized condition and unloader valve change the state to unload compulsorily regardless of pressure in the oil pressure accumulator and pump-motor starts on no-load. Then solenoids of main pump motor gets energized after 10-15 sec through timer and unloader valve return to its normal position under pilot pressure and pump-motor gets loaded. In second step now starting and stopping of unloader valve through solenoid valve is controlled by pressure switch within the specified limit of 100 – 96 kg/cm². In case the pressure falls further below 96 kg/cm² starting and stopping of unloader valve through solenoid valve is controlled by pressure switch within the specified limit of 99 – 95 kg/cm² through pressure switch. As per our design at times both pumps (main + standby) may be in operation.

The top of the tank shall be provided with a channel to collect split oil. All split oil shall be channeled to a bottle mounted on the side of the tank.

3.5 BALL VALVE (Device no. 321PV):

2 nos. Ball valve class 900 after the NRV (302PV) of size 25 NB to be provided for attending the NRV without stopping the machine in BF valve PP set. The ball of the valve should be of SS.

3.6 HAND PUMP (Device No. 349PV) AND ISOLATING VALVE (347PV):

- 80 cc per double stroke with built in NRV shall be connected as per drawing no. **12000018808 REV. 02**. Normal working pressure: 100 kg/cm².
- One no Ball valve (347PV) class 900 of size 25 NB on discharge line of hand pump as per drawing.. The ball of the valve should be of SS.

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3.7 RETURN LINE DUPLEX FILTER (Device no. 365PV, 33-88PV-b)

- a) Flow rate - **400 LPM or more**
- b) Liquid - Turbine oil ISO-VG-46
- Viscosity - 37-150 CST
- c) Filtration rate - 40 – 50 microns
- d) Bypass Valve - Required with cracking pressure of 3~5 kg/cm² opened Automatically
- e) Return line pressure - 16 kg/cm²
- f) Clogging Indication- Visual & electrical clogging indicator required and to Operate at a differential of 3~5 kg/cm²
- g) Filter Element - Type of filter material shall be S.S. re-useable type to be used. It should with stand the differential pressure of 10 kg/cm²
- h) Mounting - Top top mounted
- i) Inlet & Outlet - **DIN 65 NB, 16 ATA**
- Connection
- j) Pressure drop - **≤ 1 kg/cm² at 400 LPM**

3.8 AIR BREATHER CUM FILLER TANK MOUNTED (Device N0. 361PV)

- (a) Capacity of air flow : 2 M³ / Min.
- (b) Filtration rate : 10 microns
- (c) Pressure drop : 0.01 Bar (clean filter pressure drop)

3.9 OIL LEVEL INDICATOR “DIGITAL TYPE” (Device No. 314PV) WITH LEVEL SWITCHES (Device No. 71 PV – 1, 2, 12 & 16) AND LEVEL TRANSMITTER (71PV-15) FOR OIL SUMP TANK

3.9(A) - OIL LEVEL PROBE CUM TRANSMITTER (CAPACITANCE TYPE / MAGNETOSTRICTIVE TYPE)

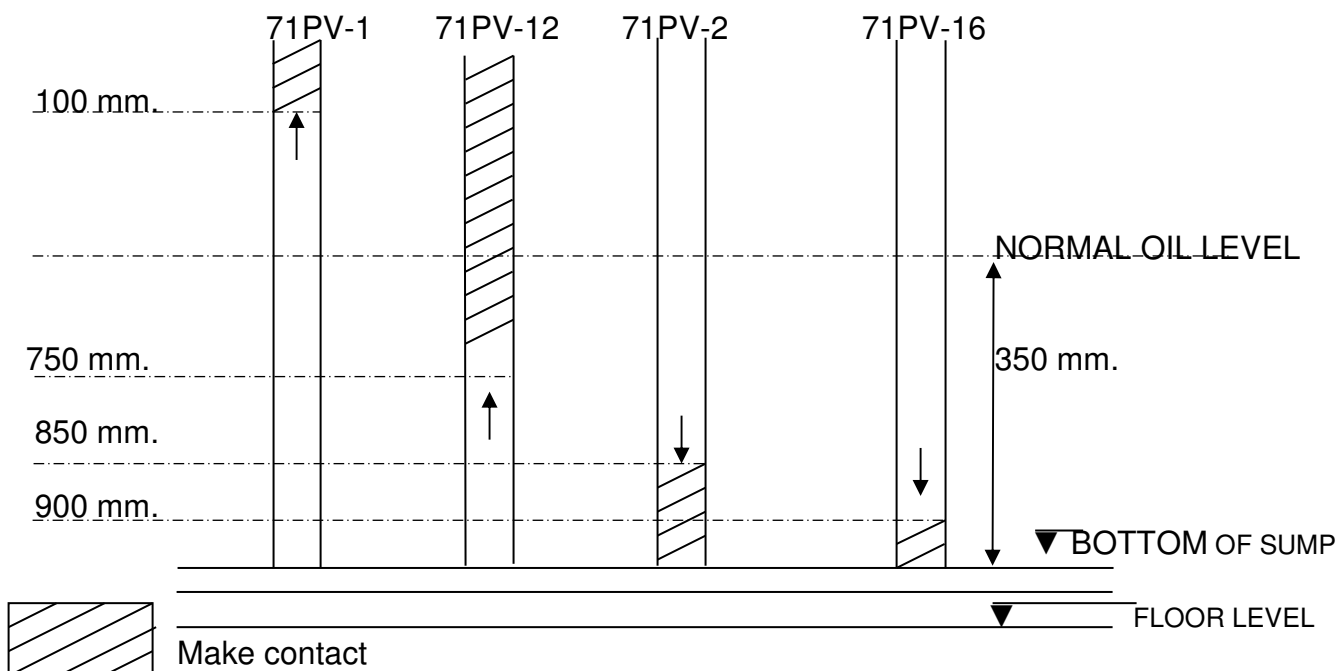
- a) Measuring range : 0 to 1000 mm
- b) Probe length : 1000 mm (From mounting surface)
- c) Fully insulated rod type probe having weather proof cast aluminum housing with cable entry
- d) Process connection : To be decided by vendor
- e) Material of probe : PTFE coated steel / Stainless steel
- f) Reference probe : Required
- g) Application media : Turbine oil

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- h) Medium temperature : -10 to 70 °C
- i) Ambient temperature : -10 to 50 °C
- j) The level controller cum transmitter shall be part of level probe housing.
- k) The level controller cum transmitter shall have integral indicator and push buttons for calibrating the range of level measurement.
- l) Output signal : 4 – 20 mA , corresponding to the calibrated span (Adjustable)
- m) Accuracy : $\pm 0.5\%$ of the calibrated span including linearity, hysteresis & repeatability
- n) Loop power supply : 24 VDC shall be derived from digital indicator
- o) Connection : 2 wire system
- p) Protection : IP 65 / IP67

3.9 (B) - DIGITAL INDICATOR CUM POWER SUPPLY UNIT FOR LEVEL PROBE

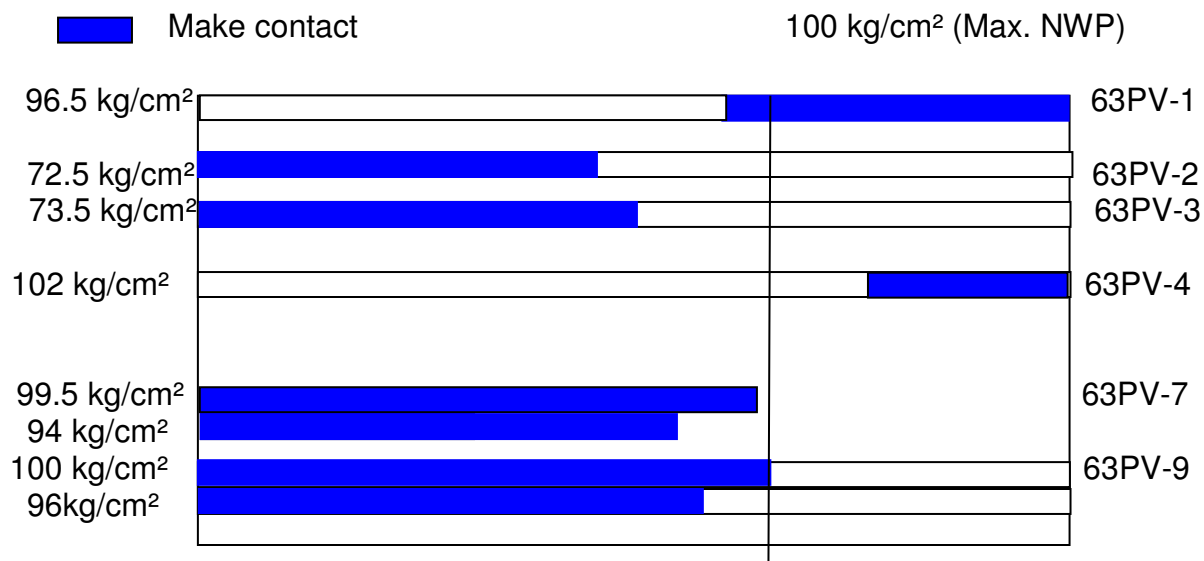
- a) Display : 4 / 5 digit LED / LCD display
- b) Input signal : 4 to 20 mA (From level transmitter)
- c) Power output : 24 VDC loop power supply to level transmitter
- d) Output signal (71G-15) : Separate one no. 4-20 mA output for retransmission
- e) Measuring range : **0 to 1000 mm** [Push buttons for configurations]
- f) Auxiliary power supply : 240 V AC $\pm 10\%$, 50 Hz
- g) Relay output : 4 Nos. (Change over type - SPDT), Potential free
- h) Contact Rating : DC 220 V, 0.5 A & AC 230 V, 5 A.
- i) Oil level switches must operate when oil level change into the direction of the arrow
- j) Accuracy : 0.25 % of FSD
- k) **Setting of level switches:(reading from top surface of the oil sump tank)**
 - i) 71PV – 1 : 100 mm (closes on rising of oil level)
 - ii) 71PV – 12 : 750 mm (closes on rising of oil level)
 - iii) 71PV – 2 : 850 mm (closes on falling of oil level)
 - iv) 71PV – 16 : 900 mm (closes on falling of oil level)
- l) Electrical terminal connection type: Screw type wire connection and push on fit type terminal blocks

**SWITCHING DIAGRAM [Switch dimensions wrt tank mounting surface] :-****3.10 OIL LEVEL SIGHT GAUGE FOR SUMP TANK & SS Scale (Dev. No. 314PV-1 , 314PV-2)**

- (a) 1 set Flush / surface mounted Fluid level gauge over lapping each other so that **complete range of level is visible.**
- (b) **Stainless steel graduated scale** for full length of sump tank to be fitted with min. graduation of 5mm (marked in RED at every 100 mm).

**3.11 DIAL TYPE THERMOMETER WITH 2 INDEPENDENT ELECTRICAL CONTACTS
(Device No. 23 PV – 6a,b)**

- (a) Dial size : Dia 100 mm
- (b) Measuring range : 0 -100 °C
- (c) Min. graduation : 2 Deg.C
- (d) Switching contact : Magnetic snap action type, 2 number' NO'(normally open) contacts ,each independently adjustable throughout the range for making contact at set point for alarm & shutdown
- (e) Setting of temperature : (+) 5 Deg. C – (+) 65 Deg. C adjustable.
- (f) Contacts rating : Suitable for switching voltage 220 VDC / 240 VAC, Switching current of 0.6 A continuous
- (g) Dielectric strength test : 2000 V for 1 min.
- (h) Installation stem length : 1020 mm from top plate of sump tank
- (i) Capillary length : 3 ~ 5 meter (to suit from top of the stem to dial)
- (i) Connection : ½" BSP Adjustable screw type fitting (preferably)
- (j) Accessories : Terminal box built-in type with plugin type connection

**3.12 PRESSURE SWITCHES (DEVICE NO. 63 PV-1, 2, 3, 4, 7 & 9)
SWITCHING DIAGRAM**

Quantity : 2 Nos
Type : Electronic pressure switch
Electronic contacts : 4NO+4NC, each contact of pressure switch shall be independent & potential free, 240 VAC, 0.5A & 220VDC, 2A / 0.5A
Max. operating pressure : 120 kg/cm²
Analog output : 4-20 mA
Setting accuracy : 0.5 %FS Max.
Input supply voltage : 22-32 VDC
Connection : 1/4" BSP (F)

3.13 MOISTURE DETECTOR (DEVICE NO. 95PV)

The online moisture detector with its probe immersed in oil senses the presence of moisture and gives signal to digital indicator unit. Indicator unit shall provide current signal for retransmission and relays output for alarms to SCADA / DCS in control room. The instrument shall be suitable for use with mineral lubricating oil to ISO grade VG 46 in the temperature range of -10' C to 70' C.

**Technical details:****Moisture Sensor cum transmitter:**

1. The sensor cum transmitter should be mounted from tank top in sump tank through pipe and flange mounting assembly.
2. The body of the sensor housing should be of SS material. The pipe and flange assembly for mounting the sensor from top of the sump tank surface should be of SS material.
3. Moisture sensor cum transmitter should provide dual analog output :
Analog output 1: Saturation level (Water activity, Range 0 to 1) – 4 ~ 20 mA DC
Analog output 2: Oil Temperature (Range 0 to 100 Deg C) – 4 ~ 20 mA DC
4. Power supply (24 VDC) of the sensor should be derived from moisture controller cum indicator.
5. Protection class of the sensor should be IP65 / IP 66.
6. Accuracy class: $\pm 2\%$.
7. Mounting connection of sensor : Preferably $\frac{1}{2}$ "BSP
8. Sensor cable from sensor to moisture controller cum indicator shall be provided.

Moisture controller cum indicator:

1. Moisture controller cum indicator shall be of panel mounting type and mounted in the mounting plate of PP set.
2. The indicator unit shall be provided with a Digital Display (LED / LCD type) for display of measured PPM / Saturation level in percentage and Oil temperature.
3. Input Supply: 240 VAC
However, Sensor supply shall be derived from the indicator / controller unit.
4. Input Signal: Two analog signals (4-20 mA) from moisture sensor i.e. moisture and Oil temperature.
5. Output Signal: output signal shall be available for retransmission to SCADA / CCS from digital indicator.
a) 4 – 20mA output for PPM / Saturation indication.
6. Alarm Contacts:
Two Nos. SPDT Potential free contacts, continuously adjustable throughout the range high and very high alarm. Contacts shall have capacity of 220 V DC / 110 VDC.
7. ACCURACY & REPEATABILITY: Accuracy & repeatability of the indicator shall be better than $\pm 0.5\%$.

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3.14 NEEDLE VALVE WITH MINIMESS (Device no.323PV-1 to 4)

Needle type valve to be provided in the line of pressure gauge and pressure switch with minimeSS hoses and coupler.

3.15 PRESSURE GAUGE (Device No. 305PV)

- (a) Type : Bourdon tube type with plus / internal dampening device / Glycerin filled circular dial industrial Gauge with concentric scale with zero adjustment.
- (b) Size of Dial : Dia 150/160, Flush panel mounting, Back / Bottom entry
- (c) Pr. Measuring Range : 0 ~ 160 kg/cm²
- (d) End connection : Vendor to decide
- (e) Accuracy class : Standard type class 1.0
- (f) Pressure Gauge shall be connected with minimeSS pipe & coupler after isolating needle valve.

Note: Pressure switches & pressure gauges to be connected with minimeSS pipe & coupler after isolating needle valve (Device no.323PV)

3.16 DRAIN VALVE NEEDLE TYPE (Device no.372PV)

25 NB class 300 Needle type drain valve with plug to be provided at the bottom most position to drain the complete oil of sump tank.

3.17 OIL PURIFIER CONNECTION (Device no.320PV-1 & 2)

Two nos. connection, one for oil purifier suction and other for oil purifier return to be provided up to bottom of tank. Size 1" BSP male with blanking cap to connect purifying machine.

3.18 OIL RELEASE NEEDLE VALVE (Device no. 328PV)

Oil release valve shall be of Needle valve type 25NB to class 900.

3.19 OIL STRAINER ASSEMBLY (Device No. 360PV-1 & 2)

Two nos. partition plate to divide sump in two chambers with strainers (360PV-1 & 2) with magnets to separate the iron particles. 750 micron S.S. mesh to be provide with a support of Dia 3 mm perforated mesh.

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3.20 OTHER CONNECTIONS AND ACCESSORIES:

- One Man- hole (Device No. 344PV) on front side at lower location of tank (600 mm dia. with suitable oil resistant gasket & Cover)
- Four Lifting lugs suitable for lifting complete weight of assembled power pack with factor of safety 4.
- Two set of tapping (one set equal to 1 no.1/2" BSP hole & 1 no.3/4" BSP hole) should be provided one set each on opposite side of tank
- One (no.) 100 NB & One (no.) 65 NB Flanged connections to DIN PN16 ATA for spare on side bottom at suitable place.
- A set of anchor fastener & bolt and nut for foundation to be supplied in loose condition.

3.21 PIPES AND FITTINGS:

- All pipe sizes are to be designed to cater full flow and velocity of oil shall not be more than 3 m/sec for pressure line and 2 m/sec for drain line (This is for reference). **However, pipe sizes should be same as specified in the control gear diagram.**
- All pressure pipes must be of suitable for 100Kg/cm² and drain pipes for 16Kg/cm².
- Pressure Pipe Flanges drilling conform to DIN Standard PN-100 ATA and Drain pipe flanges to DIN std. PN 16 ATA with full strength mating blind / blank flanges.
- All Pipes, Flanges & pipe fittings shall be of Stainless Steel.
- All pressure pipes must be hydrostatically pressure tested at 180 kg/cm² and drain pipes to 24 kg/cm² for not less than 30 minutes separately before painting & assy.

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3.22 **TERMINAL BOX & TERMINAL BLOCKS AND WIRING:**

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.

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.

Wire and wiring system:

a) Control circuit:

Multi- strand single core tinned copper conductor unsheathed 660 / 1100V polyvinyl chloride insulated cable - 2.5 mm² for solenoids & 1.5 mm² for instruments.

b) Power circuit Three phase

R - phase	Red
Y - phase	Yellow
B - phase	Blue
N - neutral	Black

c) Wire color coding: -

DC circuit	Gray
Earthing wire	Green

3.23 **BHEL MONOGRAM, RATING PLATE, INSTRUCTION PLATE:**

- Rating plate (Drawing. No.12210149005 #2) and Instruction plate (Drawing No. 12210149042) will be supplied by the supplier. Drawing will be given to successful bidder.
- **BHEL monogram size 100 to BP7250199013 to be arranged by the supplier.**

3.24 **IDENTIFICATION BY METALLIC INSCRIPTION PLATE**

Inscription plate of all electrical & mechanical components shall be provided by supplier as per diagram of control gear drawing no. 12000018808 for identification of each component.

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4. CLEANING, PAINTING AND PROTECTION:

Completed tank to be sand blasted and immediately painted with oil resisting paint. **Interior surface of the sump tank shall be given not less than one coat of compatible primer and not less than two coats of white oil proof epoxy paints.** Tentative colour coding for PP set is given in the drawing no. **12000018808 Rev. 02.** Painting requirement should be finalized by our customer during GA drawing approval. Paint thickness shall not be less than 90 micron.

5. PACKING:

Complete assembly shall be packed in a wooden box with silica gel packet & water proof cover(100 Micron polythene sheet) so that water shall not find the way to enter in the equipment and with adequate cushioning material to minimize the movement of the internals and ensure that the equipment is capable of withstanding the transit condition without any damages. All the instruments / devices mounted on the PP sets should have proper cushioning to protect the instruments from damages during transit. Packing list containing items in BOM shall be furnished by supplier before dispatch.

6. DOCUMENTATION:

6.1 The supplier shall submit the following documents at the time of offer which shall include the following.

- i) Bill of material along with model code, make, quantity & catalogue, **incomplete offer is not acceptable.**
- ii) Catalogues for the items mentioned in this specification to be submitted by supplier separately along with the offer.
- iii) Guaranteed technical particulars.
- iv) **List of Deviations:** Supplier to submit list of deviations, if any, from our spec. otherwise it will be understood that the supplier is meeting all the requirements mentioned in our spec.
- v) **Vendor has to submit the credentials containing the 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
- vi) Documents listed above in sl. no. 'v' 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.

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6.2 The supplier shall submit the following documents after placement of purchase order.

- i) Outline general arrangement drawings showing all the device, overall dimensions, layout, foundation details and bill of material / part list **within 8 weeks of PO** for approval by BHEL / BHEL's customer.
- ii) **Cross sectional arrangement Drg. of the pump along with BOM also to be submitted for our approval.**
- iii) Pump characteristics curve, Motor data sheet to be submitted for approval from BHEL / BHEL's customer.
- iv) QAP shall be supplied in triplicate for within 6 week after award of PO for approval by BHEL/BHEL's customer.

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

- v) **Manufacturing shall only be started after manufacturing clearance / approval of drawings and QAP.**

6.3 10-copies of Operation and maintenance manual covering catalogues and Drgs. are to be supplied. In addition to the same soft copy of O & M manual shall also be submitted.

6.4 3 copies of test certificates to be supplied covering the following test & basic design data called in the scope of supply and also for all the items covered in spare list.

- 1) Capacity test for oil pumps.
- 2) Setting of relief valve.
- 3) Insulation resistance measurement of motor.
- 4) Power consumption of motor with full load and no load current.
- 5) Gravity test of Sump tank for 24 hours for leakage.
- 6) Setting of Pressure switches and calibration certificate.
- 7) Setting of Level control switches.
- 8) Noise level measurement of Pump-motor set from 1 meter.
- 9) Pressure gauge calibration certificate.
- 10) Dial Thermometer calibration certificate & electrical contact operation.
- 11) TCs / Compliance certificates of raw material and all bought out items.
- 12) Test certificate of sand blasting.
- 13) Material TC (Chemical, Mechanical properties) of sump tank, pipes & flanges

In addition to the hard copy, soft copy above test certificates shall also be submitted.

6.5 Vendor shall have all the facility and instruments required for above testing at their works.

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7. INSPECTION & TESTING:

Inspecting & Testing shall be carried out at vendor's work by BHEL and BHEL's customer (PHPA-II) as per Customer **APPROVED Q.A. PLAN NO: QA / HT / 742 REV07 DTD.28.5.15 ENCLOSED**. Acceptance after testing or waiver 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. Complete Arrangement of P.P.Set will be witnessed as per test procedure supplied by BHEL to successful bidder after placement of order.

8. IDENTIFICATION

Each sump tank must be identified on the top of the panel as titled below, by S.S. name plate of 1.5mm thick, to be engraved and filled black paint. The letter height shall not be less than 50mm.

"P. P. SET FOR BFV –SR. NO.1 TO SR. NO. 3 respectively.

W.O. no to be engraved on each rating plate unit wise as follow:

32001X21117 (SR. NO.1) , 32003X21117 (SR. NO. 2) & 32005X21117 (SR. NO. 3)

Project Name – Punatsangchhu-II HEP

9. GUARANTEE / WARRANTEE:

The equipment supplied shall be guaranteed / warranted for and 18 months from the date of supply. During the period the supplier shall remain liable for repair/ replacement for any parts that may fail due to manufacturing / material defects at Punatsangchhu –II HEP site.

10. All fasteners must be zinc passivated and property clause P12 / P12.9.

**11. LIST OF SPARES FOR PP SET OF BFV:****QTY. - 1 SET (CONSISTING OF THE FOLLOWING ITEMS)**

SL. NO.	ITEM DESCRIPTION	QUANTITY
1.1	Level Sensor probe (Device no. 314)	1 sets
1.2	Level Indicator cum controller (71PV-15 & 71PV-1, 2, 12, 16)	
2	Complete set of all seals & packing 1 Set = 2 Nos. of each type	2 set
3	Ball bearing for pump (device no 301)	2 nos.
4	Ball bearing for Motor (device no 88MPV-A) (Driving End)	2 nos.
5	Ball bearing for Motor (device no 88MPV-A) (Non Driving End)	2 nos.
6	Complete Pump (device no 301PV-A) & Motor (device no 88MPV-A) in Assembled & tested condition	1 Set
7	Oil filter element – 40/50 Micron (To suit device no. 365PV)	3 Nos.
8	Unloader valve(device no 306PV) (logic Cartridge valve assy.)	1 No.
9	Safety Relief valve (device no 322PV)	1 No.
10	Non return valve (Device No. 302 PV)	1 No.
11	Solenoid valve (device no.363PV)	1 No.
12	Sight glass level gauge (device no. 314PV-1)	1 No.
13	Pressure Gauge (Device no. 305PV)	3 Nos.
14	Electronic pressure switch (Device no. 63PV)	1 No.

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

**Annexure -I****INSTRUMENTS & DEVICES ASSEMBLED ON ARRANGEMENT OF PP SET FOR BFV (DEVICE NO. 313PV)**

S.NO.	DEVICE NO.	DESCRIPTION	SPECIFICATION	MAKE	QTY
1	313PV	Oil Reservoir (Sump Tank)	Refer clause no. 3.1	Fabricated by vendor	01
2	301PV-A & B	Screw Pump, Vertical Tank Mounted Bracket and Flexible drive coupling	Refer clause no. 3.2	Tushaco Pumps / UT Pumps / Allweiler / Kral / Circor	02
3	88 MPV -A&B	Electric Motor 3 Phase	Refer clause no. 3.3	Kirlosker / ABB / Crompton Greaves / NGEF/ SIEMENS / BBL / ALSTOM	02

**MANIFOLD ASSY.(FOR MAIN & STAND BY PUMP) ASSEMBLY OF Device
No.306PV,322PV,302PV,363PV,20PV-A&B**

4	306PV	Solenoid Controlled Unloader Valve	Refer clause no. 3.4.1	Yuken / Hydac / Bosch Rexroth / Parker / Vickers	02
5	322PV	Pr. Relief Valve (Oil Safety Relief Valve)	Refer clause no. 3.4.1		02
6	363PV 20PV-A&B	Solenoid Controlled Direction Control Valve	Refer clause no. 3.4.1		02
7	302PV	Non Return Valve (Check Valve)	Refer clause no. 3.4.2	Yuken / Hydac / Bosch Rexroth / L&T / Audco / Vickers / MHA Zentgraf	02
8	321PV	Ball valve	Refer clause no. 3.5	Hydac /Yuken / Rexroth / L&T /Audco / MHA Zentgraf	02
9	349PV	Hand pump with inbuilt NRV	Refer clause no. 3.6	Rexroth / Yuken / Hydac / Hydropa / Polyhydron / Dowty / Hansa.TMP	01
10	347PV	Isolating valve for Hand pump	Refer clause no. 3.6	Hydac /Yuken / Rexroth / L&T /Audco / MHA Zentgraf	01
11	365PV	Return Line Filter	Refer clause no. 3.7	Hydac / Bosch Rexroth / Internorman / EPE / Pall / Vickers	01
12	33-88PVb	Electrical Clogging Indicator of Filter	Refer clause no. 3.7		01
13	361PV	Air Breather Cum Filler Tank Mounted	Refer clause no. 3.8	Rexroth / Stauff / Hydac / Yuken	01
14	314PV, 71PV-15, 71PV -1,71PV -2 , 71PV -12 & 71PV-16	Oil level sensor probe with level indicator cum level switches	Refer clause no. 3.9	Vega / Hydac / Nivelco / Rexroth / E+H / Emerson process / Magnetrol	1 Set



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15	314PV -1	Oil Level Sight Gauge	Refer clause no. 3.10	Hydac / Stuff / Rexroth / Yuken	1 Set
17	23PV-6 a,b	Dial Type Thermometer with stem length, Capillary & 2 Contacts	Refer clause no. 3.11	Ashcroft / Budenberg / Kobold / Wika	01
18	63 PV-1,2,3,4,7&9	Electronic Pressure switch (4 set point)	Refer clause no. 3.12	Hydac / Ashcraft / Bosch Rexroth / Wika / Barksdale	02
19	95PV	Online Moisture Sensor cum transmitter Controller cum Online moisture indicator	Refer clause no. 3.13	E+E / Hydac / Vaisala E+E / Hydac / Vaisala / Equivalent make	1 Set
20	323PV-1 to 4	Needle valve	Refer clause no. 3.14	Hydac /Yuken / Rexroth / L&T /Audco / MHA Zentgraf	04
21	305PV	Pressure Gauge	Refer clause no. 3.15	Ashcroft / Wika / Budenberg / Kobold	01
22	372PV	Drain valve (needle valve)	Refer clause no. 3.16	Hydac /Yuken / Rexroth / L&T /Audco / MHA Zentgraf	01
23	320PV-1 & 2	Oil Purifier Connections	Refer clause no. 3.17	Fabricated by vendor	02
24	328PV	Oil release valve (Needle valve)	Refer clause no. 3.18	Hydac /Yuken / Rexroth / L&T / Audco / MHA Zentgraf	01
25	-	Electrical Terminal Box , Terminal blocks	Refer clause no. 3.22	[Hencel / Rittal / Neptune/ Schneider (For Terminal Box)] [Elmex / Connectwell / Wago / Phoenix / Weid Muller (for Terminal blocks)]	1 Set
26	360PV-1, 360PV-2	Oil Strainer Assembly fitted with Magnet	Refer clause no. 3.19	Fabricated by vendor	02
27	-	Anchor Fastener with bolt & nut	Refer clause no. 3.20	Hilti	1 Set

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.**