



Bharat Heavy Electricals Ltd
Boiler Auxiliaries Plant
Ranipet - 632 406

Specification No : 02

Rev. No : 06

Dated 24/10/2017

FANS ENGINEERING



**TECHNICAL SPECIFICATION
 FOR
 LUBE OIL SYSTEM FOR AXIAL FANS**

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06	24/10/2017	VIKRAM SINGH	P.PURUSHOTHAMAN	P.SAHA	REVIEWED & UPDATED.
05	11/10/2012	P NATARAJAN	P.NATARAJAN	RSGK	GEAR PUMP ADDED
04	02/07/2012	KUNDAN KUMAR	A VAITHINATHAN	RSGK	VAR 05 ADDED
03	29/07/2010	V SIVANATHAN	J CHITTI BABU	RSGK	VAR 03.04 ADDED
02	12/09/2006	S RAMANAN&R SURESH	MGG SEKARAN	K GOPALSAMY	
01					
00					
Rev.No	Date	Prepared	Checked	Approved	Record of Revisions.

SYSTEM OUTPUT:

Var. 01	15 LPM @ 35 Bar	Var. 06	60 LPM @ 45 Bar
Var. 02	25 LPM @ 35 Bar	Var. 07	60 LPM @ 63 Bar
Var. 03	40 LPM @ 35 Bar	Var. 08	70 LPM @ 63 Bar
Var. 04	50 LPM @ 35 Bar	Var. 09	90 LPM @ 63 Bar
Var. 05	60 LPM @ 35 Bar	Var. 10	-----

1.0 Function

The Lube Oil System unit provides the oil for the hydraulic blade adjustment device (HAD) and the lubrication of the Fan bearing and Motor bearing.

The unit will be in constant operation during operation of the fan but can also be kept in operation when the fan is idle.

1.1 Technical requirements

The unit has to be supplied with a covering hood. The side panels, the covering, and the door(s) should be dismountable. The door(s) should be with Metal frame having transperence glass and should have a lock. A lamp in each wall of 20 Watts fluorescent type is to be provided for illumination inside the hood.

It is important that the pumps with motors, the tank heating cartridge, oil filter, pressure measuring devices, and temperature sensors, are designed and laid out in a way that any damaged unit can be exchanged without interruption in the unit's operation.

The drive motors must have an indication of the required rotation direction; the rating plates have to be mounted in an easily visible place which is safe against the loss of the plate.

The lowest point of the oil tank should be equipped with an outlet with drain cock and a plug bolt as well as with covers for cleaning purposes. The bottom should show a slope of 2% in the direction of the outlet. The Tank should have suitable BAFFLE PLATE to prevent direct flow between return and suction.

1.2 Arrangement of Devices

All parts have to be easily accessible. The dismounting of the different pumps should be easily achievable even during operation. The instruments need to be visible when the doors are closed.

All operation and indication devices have to be arranged on a panel located on top of the tank in a way that is clearly laid out and easily accessible.

Similarly, the devices and instruments on the tank need to be laid out in an easily accessible manner. Electrical cables must be mountable without difficulties. The instruments and monitoring devices have to be mounted in a way that isolates them from vibration.

Motors and pumps have to be mounted in a way that prevents transfer of vibrations on to the unit.

1.3 Design of the components and the Lube Oil Unit

If not mentioned specifically, the design of the devices / instruments is based on oil viscosity according to ISO VG 68.

The manometers of the local pressure indicators should be glycerin filled manometers.

Pressure, level and flow switches/transmitters should be chosen so that a given setting point will also be adhered to when hysteresis are taken into account.

The power of the motor and the pumps should be laid out in a way that will enable a cold start (15°C) without problems.

The pressure relief valves need to be directly controlled valves and have to be dimensioned based on a two – pump operation, e.g. considering the oil volume flow of two pumps.

1.4 Oil Piping System

The maximum oil velocity in all pipes is 3 (m/s). The pipes have to be dimensioned according to the respective oil flow.

The oil pipe system should have as few fittings as possible oil in order to keep the possibility of leaks to an absolute minimum.

1.5 Visual control of oil return flow and flow from leakages

For visual control of return oil flow of leaking oil, well visible inspection glasses should be installed inside the covering hood in vertical direction.

Exception: The inspection glass for the return oil flow from the bearing should be installed outside the covering in vertical direction.

1.6 Ventilation

The ventilation of the oil tank is carried out through a breather. To avoid the formation of foam, the return flow pipe has to be mounted at level lower than the oil level a side of baffle plate. All return lines should be away from Suction strainer to avoid Air-Lock.

The pressure equalization line (ventilation line to the bearing), however, has to be mounted at a level higher than the oil level. This pipe ends directly under the container upper cover. All return lines should be seal welded with the top surface of the tank to avoid water/dust ingress in to the oil tank.

1.7 Electric Cabling

The electric cabling of the unit has to be in accordance with the terminal plans approved by BHEL. For measuring instruments with an electrical connection a terminal box has to be mounted at the oil unit. Cables have to be equipped with cable glands.

1.8 Operating Conditions

It should be taken into consideration that under the operating conditions described above the oil temperature in the tank should not exceed 80°C.

Furthermore, the heating system should be laid out in a way that will guarantee a minimum oil temperature of 20°C even in case of minimal external temperature and non-operating pumps

1.9 GENERAL

Scheme drawing will be final over any ambiguity in this specification.

Refer LOS SCHEME Drawing, G.A. Drawing, BHEL Offer Format as in Enquiry.

Two number of vertically mounted Screw Pump (Gear pump if specify in enquiry) with LT motor as per BHEL specification and/or Customer's Specification, shall be mounted on top of the Tank.

Two pumps with motors, 1 no. Duplex cooler and 1 no. duplex filter are provided with the system. Normally one pump, one cooler and filter will be in operation while the other is a standby.

The standby pump is started through control logic, hooked to pressure switch/transmitter. Non – return valves are provided at pump out let to prevent pressurized oil, flowing back to the tank.

A differential pressure switch/ Transmitter (DPS/DPT) and differential pressure gauge (DPG) connected across the filter indicates the choking condition of the filter through alarm / indication.

A level switch / Transmitter is fitted in the tank to monitor the minimum oil level and indicates an alarm when the oil level goes down below the minimum.

Oil Level Indicator to be mounted in Oil Tank such a way that level indicator shows max. level point of tank capacity.

The filters are provided with separate drain line with valve.

2.0 SCOPE OF SUPPLY OF LUB OIL SYSTEM:

The entire item covered in the respective scheme drawings shall be supplied by the Vendor. All loose pipelines, flexible hoses, flanges, fittings, fasteners, reducers, expanders, etc., as required to connect the pressure lines from the system to each bearing and return line pipes shall be of seamless steel where ever steel pipes envisaged.

Necessary pipes, clamps & fixing fasteners including foundation bolts for site assembly are to be included. Any other requirement as found necessary to the system for making the total assembly of the system should also be accounted and supplied by the system supplier.

3.1 FABRICATION OF THE SYSTEM:

LUB OIL TANK FABRICATION:

The lube oil tank (at least 5mm plate of IS 2060) with capacity as in the table below:

Variant	Capacity	Tank volume (min)	
Var. 01	15 LPM @ 35 bar	250 Liters	L-1200 mm, B-800 mm, H-360 mm.
Var. 02	25 LPM @ 35 bar	250 Liters	L-1200 mm, B-800 mm, H-360 mm.
Var. 03	40 LPM @ 35 bar	250 Liters	L-1200 mm, B-800 mm, H-360 mm.
Var. 04	50 LPM @ 35 bar	400 Liters	L-1200 mm, B-800 mm, H-500 mm.
Var. 05	60 LPM @ 35 bar	400 Liters	L-1200 mm, B-800 mm, H-500 mm.
Var. 06	60 LPM @ 45 bar	400 Liters	L-1200 mm, B-800 mm, H-500 mm.
Var. 07	60 LPM @ 63 bar	400 Liters	L-1200 mm, B-800 mm, H-500 mm.
Var. 08	70 LPM @ 63 bar	500 Liters	L-1200 mm, B-1000 mm, H-600 mm
Var. 09	90 LPM @ 63 bar	600 Liters	L-1200 mm, B-1000 mm, H-600 mm
Var. 10	-----	-----	-----

Leak test (Kerosene or water) before painting shall be conducted. The tank shall have a man hole for cleaning. The tank bottom frame will be mounted to have provisions for foundation bolts to mount the system on concrete pedestal. "L" shaped oil collecting tray around the tank top shall be provided with two outlets suitable screw plugged in.

Hook for lifting the oil system shall be in such a way the slings do not foul with the instrument panel and canopy. Hooks to be fixed above the roof.

Tag number for the instruments, as indicated in the scheme drawing shall be punched in stainless steel sheet and attached to respective instruments.

The name plates of the respective components indicating the make, model no, range etc. shall be available in the respective equipment.

Anodized plate showing the lube oil system scheme drawing shall be provided on the tank. Necessary wiring shall be done suitable with respective junction boxes provided in the system.

3.2 SURFACE TREATMENT:

Degrease the tank internal surface by acetone or petrol or ether or trichloro ethane. Surface to be cleaned by wire brushing followed by compressed air cleaning.

3.3 PAINTING:

3.3.1 TANK (INTERNAL):

Primer coating shall be done with two coats of Epoxy Zinc rich primer. Finish painting of Epoxy- Glossy finish shall be applied in two coats (shade white or yellow)

3.3.2 LUBE OIL SYSTEM EXCLUDING TANK INTERNALS:

One coat of red oxide zinc chrome primer to IS-2074 (varnish medium – CNSL or ALKYD) followed by two coats of synthetic enamel paint to IS-2932 (smoke grey shade)

4.0 INSPECTION PROCEDURE FOR OIL CIRCULATION SYSTEM:

BHEL / Authorized representative will inspect the lube oil system as per approved quality plan. The supplier shall arrange for suitable panel with indication lamps/alarm for checking the set values of various instruments and their functions.

The following details will be checked during inspection.

- a) Approved copies (CAT-1) of scheme drawing, As-built GA drawing, Piping Layout, packing list, LT Motor Data sheet and wiring diagram.
- b) Ensure the make, range, model no. of each component as per the approved drawing.
- c) Checkup overall dimensions, workmanship, finish and aesthetic appearance
- d) Ensure leak free operation of valves, cocks, etc.
- e) Run test for at least two hours each pump for smooth and leak free operation

- f) Check the pressure developed and flow, noise, vibration, current drawn at rated flow and pressure, etc. shall also be checked Noise is to be less than 85 dB at one meter from oil supply unit.
- g) Increase the pressure up to 1.5 times the operating pressure and check for leakage of components.
- h) Check for the operation of built in valve of the pump if any, for which the pressure is to be set above operating pressure.
- i) Check the set points of the control Instruments as per the scheme drawing.
- j) Check pressure drop across the filter.
- k) All Loose items to be checked for proper connection with mating thread/fittings.

5.1 VERIFY THE FOLLOWING DOCUMENTS:

Purchase Oder No., reference Drawing No., System No. and Test certificates of
(i) Motor & Pump (ii) Coolers (iii) Filters (iv) Pressure gauges, Transmitters, Switches and other instruments.

Qualified welders to be employed for welding process. Necessary welding procedure to be followed. 100% LPI to be carried out on all welds.

Acceptance norms for motors shall be as per approved data sheet. For other items as per the specification

5.2 PACKING INSTRUCTIONS:

The total oil system package should be supplied in two parts:

5.3 ASSEMBLY:

The total, pump with motor, oil cooler, filter, local instruments enclosure with all process and impulse piping's. (Totally in assembled condition).

5.4 PIPING & LOOSE ITEMS:

Please refer the approved packing list for the items. The loose pipes ends shall be covered with plastic caps. The bundle shall be covered by plastic sheet with silica-gel and shall be neatly packed in wooden box avoid damage due to transport shocks. The upside of the wooden box to be marked outside.

6.0.0 DETAILS TO BE FURNISHED ALONG WITH THE OFFER:

Specification and make of all sub-delivery items like motor, pump, cooler, filter, suction strainers, instruments etc., Details of cooler inlet/outlet flange connection & cooling water flow rate.

Any deviation with respect to our specification shall be separately indicated as “list of deviations” in the appropriate BHEL form sent with enquiry. Any deviations indicated elsewhere in the offer will not be considered as deviations. Specific acceptance/comments on each clause of the specification shall be submitted, in a Xerox copy of this specification.

7.0 DETAILS TO BE FURNISHED AFTER AWARD OF THE CONTRACT (within three weeks from the date of Purchase Order)

7.1 Arrangement drawing showing the lube oil system assembly in three different views with critical dimensions including foundation, base frame, end connection details, overall dimensions, total weight of the system and bill of materials other than instruments.

7.2 A separate instrument schedule (LOS DATA Sheet) showing all the instruments of system like make, model no, range, end connection and type as being offered.

7.3 List of loose items to suit the inside and outside piping drawings. Loose pipes and fittings should have complete compatibility with lube. Oil system, fan bearing housing and hyd. Actuating device (HAD).

7.4 The numbering of the valves, instruments, etc., shall be same as, that of BHEL scheme drawings. If KKS tag nos. of instruments is called for, then the same shall be indicated in the arrangement drawing.

Junction box wiring diagram has to be clearly indicated the connection of instruments – viz. The set point of instruments, location, NO/NC contacts etc. 20% spare terminals shall be provided.

Cable glands and Lugs for outgoing cables shall be provided.

8.0 DOCUMENTS REQUIRED within six weeks after placement of purchase order.

8.1 **Packing list of the entire scope of supply**, giving detailed listing of the lube oil system assembly, other loose – dispatch able items with Qty. (m meters for pipes) and wt. in kg. for every item.

8.2 Operation and Maintenance instruction manual covering all the equipment and instruments in the Vendor scope. (three hard copies.)

8.3 Arrangement drawing (Issued by BHEL) – three hard copies.

8.4 Test certificate in 4 copies.

- 8.5** All Instruments Data Sheet along with GA drawing.
- 8.6** All the above soft form in **CD-ROM**.
- 8.7** List of two year operational spares with price details. The ordering code for each equipment/instrument shall be clearly indicated.

9.0 LIST OF SPECIFICATIONS ENCLOSED:

Sl.n o.	Description of item
01	Pressure Gauge
02	Differential Pressure Gauge
03	Temperature Gauge & Thermo well
04	Differential Pressure Switch
05	Level switch (external type)
06	Pressure Switch
07	LT Motor
08	Oil Cooler
09	Oil Filter
10	Lube Oil Pump
11	Flexible hose
12	Electronic transmitter for DP/FLOW/LEVEL *LT-ULTRA SOUND/ RADOR/DP TYPE **FLOW- DP/ROTOR

BHARAT HEAVY ELECTRICALS LTD
BOILER AUXILIARIES PLANT, RANIPET – 632 406
Specification for Pressure Gauge, Rev 04 Dt 24/10/2017

- 1.0 Dusty, salty, corrosive and highly polluted atmosphere with an ambient temperature of 50°C (max.)
- 2.0 100mm dial size, calibrated in bar or kg/cm² with an accuracy of $\pm 1\%$ FSD is used to measure the oil pressure (max. at 70°C) with Glycerin Filled.
- 3.0 Mounting and connection : Direct with bottom connection
- 3.1 Scale : Industrial concentric 270°C linear
- 3.2 Type of sensing element : Bourdon
- 3.3 Over range protection : 125% of FSD
- 3.4 Zero adjustment : Micro meter adjustment from the front after removing bezel
- 3.5 Construction / Protection : IP 55 as per IS 2147
- 3.6 Process Connection : 1/2" NPT (male)
- 3.7 Range :
(For TLT type) : 0-10 bar, 0-60 bar, 0-100 bar or as per Enquiry.
(For KKK type) : 0-2 bar, 0-6 bar, 0-16 bar or as per Enquiry.
- 3.8 Over pressure protection : Safety blow – out at back of gauge
- 3.9 Pressure standard : IS 3624
- 4.0 Painting : Stove enameled anti corrosive
- 5.0 Material
- 5.1 Case : Die cast Aluminum
- 5.2 Bourdon, Socket & Movement Assembly : Stainless steel 304 / 316
- 5.3 Bezel : Die cast Aluminum / ABS plastic threaded to use inner neoprene 'O' ring
- 5.4 Window : Shatter proof glass or Acrylic
- 5.5 Dial and pointer : Aluminum (with black letter on white dial)
- 6.0 Test
- 6.1 Routine test (on all gauges) : As per QP: Fan 308/02
- 6.2 Type test : Enclosure protection test
- 7.0 Documents
- 7.1 TC for routine tests & type tests : As per QP: Fan 308/02
- 7.2 Compliance certificate for bourdon and movement assembly materials
- 7.3 Compliance and guarantee certificate
- 7.4 O & M manuals (two hard copies & soft copies)
- 7.5 Data Sheet & GA drawing
- 8.0 Packing
- 8.1 Each gauge shall be packed in Thermocol box.
- 8.2 Such boxes shall be packed in a carton or case with adequate cushioning material.

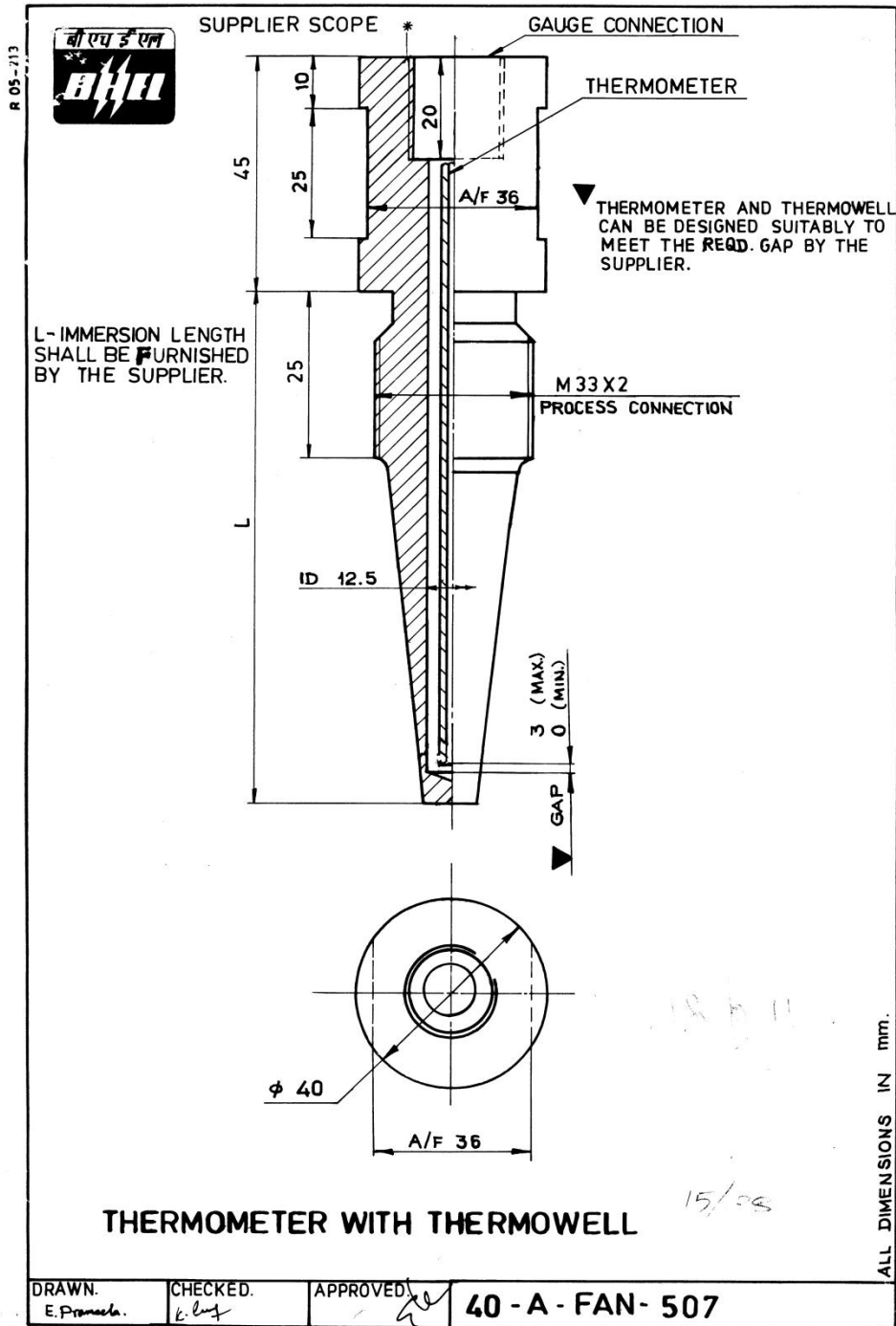
BHARAT HEAVY ELECTRICALS LTD
BOILER AUXILIARIES PLANT, RANIPET – 632 406
Specification for Differential Pressure Gauge Rev 05 Dt 24/10/2017

- 1.1 Type & Medium : Online & Lub. Oil ISO VG 68 at 40-70 °C
- 1.2 Scale : Industrial concentric 270°C linear
- 1.3 Type of sensing element : Bourdon / Diaphragm / Bellows
- 1.4 Proof pressure : 150% of Max. Pressure
- 1.5 Construction / Protection : IP 55 as per IS 2147
- 1.6 Process connection : 1/4" NPT (Female)
- 1.7 Range
 - (For TLT type) : 0-7 bar, 0-10 bar or As per Enquiry.
 - (For KKK type) : 0-2 bar, 0-6 bar or As per Enquiry.
- 1.8 Painting : Stove enameled anti corrosive
- 2.0 Material
- 2.1 Case : Die cast aluminum
- 2.2 Pressure port : Stainless steel – 304/316
- 2.3 Bourdon / Diaphragm / Bellows : Stainless steel – 304/316
- 2.4 Internal parts : Steel cadmium plated (or) SS Weather proof oil tight
- 2.5 Bezel : Die cast aluminum/ABS plastic
Threaded to use inner neoprene 'O' ring
- 2.6 Window : Shatter proof glass or Acrylic
- 2.7 Dial end pointer : Aluminum (with black letter on white dial)
- 2.8 Accuracy : +/- 2% FSD
- 3.0 Tests
- 3.1 Routine test : As per QP: Fan 308/02
- 3.2 Type test : As per QP: Fan 308/02
- 4.0 Documents
- 4.1 TC for routine tests & type test
- 4.2 Compliance certificate for Bourdon and movement assembly material.
- 4.3 Compliance and guarantee certificate
- 4.4 O & M manuals (2 hardcopies and one soft copy)
- 4.5 Data Sheet & GA drawing
- 5.0 Packing
- 5.1 Each gauge shall be packed in a thermocol box
- 5.2 Such boxes shall be packed in a carton or case with adequate cushioning material.

BHARAT HEAVY ELECTRICALS LTD
BOILER AUXILIARIES PLANT, RANIPET – 632 406
Specification for Temperature Gauge with Thermo well (Bourdon Type) Rev 05 Dt 11/10/2012

1. Dusty, salty, corrosive and highly polluted atmosphere with an ambient temperature of 50°C (max.).
2. Lub. Oil is allowed at 40°C to 70°C through circulation system.
- 3.0 Type : Rigid stem type with adjustable union
- 3.1 Mounting and connection : Direct with bottom connection
- 3.2 Scale : Industrial concentric 270°C linear
- 3.3 Dial size : Approx. 100mm
- 3.4 Calibration : In degree centigrade
- 3.5 Accuracy : $\pm 1.0\%$ FSD
- 3.6 Over temperature stability : 110% of FSD
- 3.7 Zero adjustment : Micro meter adjustment from the front after opening the bezel
- 3.8 Construction / Protection : IP 55 as per IS 2147
- 3.9 Connection between gauge and thermo well) : Supplier's scope
- 3.10 Type of construction : Bottom entry suitable for vertical mounting with capillary
- 3.11 Thermo well process connection : M33 x 2
- 3.12 Range : 0 to 100°C
- 3.13 Sensing medium : Liquid / Inert gas filled
- 3.14 Response time : Not more than 15 seconds
- 3.15 Painting : Stove enameled anti corrosive bright finish (Not Applicable for SS304 casing)
- 4.0 Material
- 4.1 Case : Die cast aluminum
- 4.2 Bourdon, Bulb & thermo well : Stainless steel 304/316
- 4.3 Movement assy. & capillary material.
 - Capillary size : $\Phi 1.5\text{mm}$
 - Capillary sheath : $\Phi 4.5\text{mm}$
 - Capillary length : 5 meters or to suit the layout.
- 5.0 Dimension
- 5.1 Bulb OD / Length : $\Phi 12\text{mm}$ / length 80mm
- 5.2 Thermo well : Refer sketch.40-A-FAN-507
- 6.0 Tests
- 6.1 Routing tests & type test : As per QP: Fan 307/02
- 7.0 Documents : TC and O & M manual (3 copies required)
: Data Sheet & GA drawing

TECHNICAL SPECIFICATION FOR LUBE OIL SYSTEM
FOR AXIAL FAN, SL. NO.02/REV. 06



BHARAT HEAVY ELECTRICALS LIMITED
BOILER AUXILIARIES PLANT, RANIPET – 632 406
Specification for Differential Pressure Switch, Rev 05 Dt 11/10/2012

1. Dusty, salty, corrosive and highly polluted atmosphere with an ambient temperature of 50°C.
2. Lub. oil passes through at 40°C to 70°C through circulation system
- 3.0 Type : Online
- 3.1 Mounting and connection : Direct with bottom connection
- 3.2 Calibration : In bar or Kg / cm²
- 3.3 Accuracy : $\pm 1.0\%$ FSD
- 3.4 Proof pressure : 150% of max. Pressure
- 3.5 Construction / Protection : IP 55 as per IS2147
- 3.6 Process connection : 1/4" NPT (Female)
- 3.7 Cable entry : 3/4" NPT (F) (If not, supplier shall provide suitable adopter)
- 3.8 Range : 1.0 to 6 bar style 01
0.2 to 1.5 bar style 02
- 3.9 Set point adjustment : Continuously field adjustable throughout the range with calibrated scale
- 3.10 Sensing element : Diaphragm sealed piston Actuated type / Bellows type
- 3.11 Switching element : 2 Nos. SPDT
- 3.12 Type of contact : Heavy duty, snap action (micro switch type – Auto reset)
- 3.13 Contact rating : 5A / 240VAC / 50 Hz
- 3.14 Terminal strip : To be provided inside the switch enclosure suitable for Φ 2.5mm wire stud type or screw type with pressure plate
- 3.15 Differential / Dead band : Fixed minimum
- 3.16 Connection : Male & female Plug & Socket (7 pin) with 0.5 Sq.mm cable (crimped pin type) in vendor scope
- 4.0 Painting : Stove enameled anti corrosive
- 5.0 Material
- 5.1 Case : Die cast Aluminum
- 5.2 Pressure port : Stainless steel 304 / 316
- 5.3 Sensing element : Stainless steel / viton 304 / 316
- 5.4 Internal parts : Steel cadmium plated (or) anodized aluminum (or) ss weather proof oil tight
- 6.0 Tests
- 6.1 Routine tests : As per QP: FAN 308 / 02
- 6.2 Type test : As per QP: FAN 308 / 02
- 6.3 Two sets of O & M manual shall be supplied before dispatch.

BHARAT HEAVY ELECTRICALS LTD
BOILER AUXILIARIES PLANT, RANIPET – 632 406
Specification for Level Switch Rev 02 Dt 11/10/2012

- 1.0 Dusty, Salty, Corrosive and highly polluted atmosphere with an ambient temperature of 50°C
- 2.0 General
- 2.1 Application : Fan Lube oil system tank level monitoring
- 2.2 Medium : Lubrication Oil (ISO VG68)
- 2.3 Temperature of Medium : 70°C to 80°C
- 2.4 Type : Magnetic switch type
- 2.5 Mounting : Flange mounted in the lube oil tank
(manufacturer's standard)
- 2.6 Construction / Protection : IP 55
- 2.7 Cable entry : Bottom/side/top
- 2.8 Switching element : 2 Nos. SPDT
- 2.9 Type of contact : Heavy duty snap action micro switch type (Auto reset)
- 2.10 Contact Rating : 5A / 240V AC
- 2.11 Terminal strip : To be provided inside the switch enclosure suitable for 2.5 Sq.mm wire stud of screw type with pressure plate.
- 2.12 Set point : Initiate contact at falling level of oil in the tank

Dimensional Drg. showing flange details shall be submitted along with the offer.

- 3.0 Material
- 3.1 Float and stem: Stainless steel
- 4.0 Tests
- 4.1 Routine tests : 1. repeatability at raising / falling
(on all switches) parameters
2. HV test at 1.5 HV for one minute.
3. IR test before / after HV test
- 4.2 Type test : 1. Enclosure protection test
2. Contact rating test
- 5.0 Documents
3 set of the following documents shall be submitted prior to dispatch.
- 5.1 Compliance certificate for float and stem
- 5.2 Compliance and guarantee certificate
- 5.3 Packing : The switches shall be packed in a carton or case
with adequate cushioning material.

BHARAT HEAVY ELECTRICALS LIMITED
BOILER AUXILIARIES PLANT, RANIPET – 632 406
Specification for Pressure Switch, Rev 05 Dt 11/10/2012

1. Dusty, salty, corrosive and highly polluted atmosphere with an ambient temperature of 50°C.
2. Lub. oil passes through at 40°C to 70 °C through circulation system.
- 3.0 Type : Online
- 3.1 Mounting and connection : Direct with bottom connection
- 3.2 Calibration : In bar or Kg / cm²
- 3.3 Accuracy : ± 1.0% FSD
- 3.4 Proof pressure : 150% of max. Pressure
- 3.5 Construction / Protection : IP 55 as per IS2147
- 3.6 Process connection : **1/4"** NPT (Female)
- 3.7 Cable entry : 3/4" NPT (F) (If not, supplier shall provide suitable adopter)
- 3.8 Range : 0 to 12 bar style 01; 0 to 6bar style 02
0 to 1.5 bar style 03; 8 to 32bar style 04
1 to 10 bar style 05
- 3.9 Set point adjustment : Continuously field adjustable throughout the range with calibrated scale
- 3.10 Sensing element : Diaphragm sealed piston Actuated type / Bellows type
- 3.11 Switching element : 2 Nos. SPDT
- 3.12 Type of contact : Heavy duty, snap action (micro switch type – Auto reset)
- 3.13 Contact rating : 5A / 240VAC / 50 Hz
- 3.14 Terminal strip : To be provided inside the switch enclosure suitable for Φ 2.5mm wire stud type or screw type with pressure plate
- 3.15 Differential / Dead band : Fixed minimum
- 3.16 Connection : Male & female Plug & Socket (7 pin) with 0.5 Sq.mm cable (crimped pin type) in vendor scope
- 4.0 Painting : Stove enameled anti corrosive
- 5.0 Material
- 5.1 Case : Die cast Aluminum
- 5.2 Pressure port : Stainless steel 304 / 316
- 5.3 Sensing element : Stainless steel / viton 304 / 316
- 5.4 Internal parts : Steel cadmium plated (or) anodized aluminum (or) ss weather proof oil tight
- 6.0 Routine tests & Type test : As per QP: FAN 308 / 02
- 7.0 Document
- 7.1 Compliance and guarantee certificate
- 7.2 Two sets of O & M manuals shall be supplied before dispatch
- 8.0 Each switch shall be packed in thermo Cole box / carton box wrapped inside with bubbled paper.
- 8.1 Such boxes shall be packed in a carton or ca se with adequate cushioning material.

BHARAT HEAVY ELECTRICALS LIMITED
BOILER AUXILIARIES PLANT, RANIPET – 632 406
Specification for LT Motor, Rev 02 Dt 31/01/2017

TITLE : TECHNICAL SPECIFICATION FOR BOUGHT OUT ITEMS

ITEM : LT MOTOR

Project : BHEL standard

		DESIGNATION	SIGNATURE	DATE
REPAIRED	K S S MANIAN	Ex. Addl. Engr.		31.01.2017
CHECKED	M JEYAMURUGANAND	S D G M		31.01.2017
APPROVED	M JEYAMURUGANAND	S D G M		31.01.2017

ISSUED BY **EDC ECI**

Record of revision

REVISION NO : 02	CI 39.0 PACKING DRAWING INCLUDED
REVISION NO : 01	CI 2.1 Reviewed & Revised
REVISION NO : 00	INITIAL RELEASE : 19.3.2013 Based on TDC TCI 140 Rev 08 & TFN LTM rev 05

TECHNICAL SPECIFICATION FOR LUBE OIL SYSTEM
FOR AXIAL FAN, SL. NO.02/REV. 06



TECI: LT MOTOR: REV 02

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CI No.	CHARACTERISTICS	REQUIREMENT	VENDOR COMPLIANCE (Refer Note: 2)
1.0	<u>SITE CONDITIONS</u>		
1.1	Altitude above mean sea level	1000 m.	
1.2	Ambient temperature condition	6 to 50°C.	
1.3	Relative humidity	100 %	
1.4	Atmosphere	Tropical, Dusty, salty, corrosive & highly polluted in a coal based Thermal power plant.	
2.0	<u>GENERAL</u>		
2.1	Reference standards	IS 325, IS 1231, IS 4722, IS 6362, IS 2253, IS 12065, IS 12075, IS 4691 & <u>IS 12615</u> <u>Energy efficient.</u>	
2.2	Design ambient	50°C	
2.3	Application/ Type (Normal/ Energy efficient)	As per Enquiry & PO.	
2.4	Duty cycle	Continuous S1	
2.5	Rated voltage, frequency & Phases	415 V AC $\pm 10\%$; 50 Hz $\pm 5\%$; (PI check enquiry for voltage) 10% absolute sum - 3 phase	
2.6	Minimum starting voltage	80% of the rated voltage	
2.7	Minimum voltage under which motor will run satisfactorily	75% of the rated voltage for 5 minutes	
2.7	Capacity to restart (at voltage specified in point No. 2.4)	i. TWO successive starts from cold condition ii. Two HOT restarts starts from Hot condition iii. Three equally spread start per hour	
2.8	High speed bus transfer withstand capability	Suitable to withstand 150 % of rated voltage	
2.9	Type of balancing for rotor	Dynamic balancing	
2.10	Direction of rotation	Suitable for both directions	
2.11	Direction of cooling air	Non-drive end to driving end	
2.12	Class of insulation	Class F with temperature rise limited to Class B.	
2.13	Winding treatment	The insulation shall be given tropical and fungicidal treatment for successful operation of the motor in hot, humid & tropical climate.	
2.14	Allowed winding temperature rise at continuous full load	60°C by thermometer method & 70°C by resistance method	

TECHNICAL SPECIFICATION FOR LUBE OIL SYSTEM
FOR AXIAL FAN, SL. NO.02/REV. 06



TECI: LT MOTOR: REV 02

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CI No.	CHARACTERISTICS	REQUIREMENT	VENDOR COMPLIANCE (Refer Note: 2)
2.15	Starting current	Less than or equal to 600% full load current subject to tolerance as per IS. (Normal motor) Less than or equal to 700% full load current subject to tolerance as per IS. (Energy efficient)	
2.16	Starting time & locked rotor withstand time	The locked rotor withstands time (LRWT) at 110% rated voltage (RV) under HOT condition shall be at least 3 sec. more than the starting time at 80% of rated voltage for motors with acceleration time up to 20 sec. at RV and 5 sec. where the accelerating time is more than 20 sec. at RV.	
2.17	Vibration	The peak amplitude of vibration shall be as per IS 12075 Within the limits specified by IS 12065. (<80 dB at full load condition) @ 1 metre distance.	
2.18	Noise level	TEFC, IP 55 as per IS 4691.	
2.19	Type of enclosure	Horizontal foot mounted.	
2.20	Type of mounting	Ball or roller type / bearings effectively sealed against ingress of dust. The bearing shall be so constructed that the loss of lubricating grease is kept to minimum.	
2.21	Bearings	Sealed bearings are also acceptable. Grease	
2.22	Lubricant Type	Bearings shall have a minimum life of 40000 Working hours.	
2.23	Bearing life	Motors shall be provided with key slotted bare shaft extension with key at the driving end.	
2.24	Shaft extension	Weather proof IP 55 as per IS 4691, Capable of being turned through 360° in steps of 90°.	
2.25	Terminal box Type	Double compression type nickel plated brass cable glands and insulated tinned copper crimping lugs to suit the cable size shall be supplied along with the motor.	
2.26	Cable gland and lugs	i) Size of power cables will be intimated after PO. ii) For space heater cable glands and lugs suitable for 2CX2.5 to be provided	
2.27	Type of terminals	Stud / screw type with plain washers, spring washers / check nuts & lugs)	

TECHNICAL SPECIFICATION FOR LUBE OIL SYSTEM
FOR AXIAL FAN, SL. NO.02/REV. 06



TECI: LT MOTOR: REV 02

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CI No.	CHARACTERISTICS	REQUIREMENT	VENDOR COMPLIANCE (Refer Note: 2)
2.28	Fault level	40 KA for 0.25 Sec (Suitable HRC fuse backup will be provided by BHEL in MCC/switchgear	
2.29	Painting	Epoxy based paint (Colour shade 631/ Shade 632/ Shade 275/ RAL 5012 as per IS:5. This will be confirmed after PO.	
30.0	Space heaters	Separate space heater suitable for 240V, ! Phase, AC	
30.0.A	Motors above 30 kW	,50 Hz shall be provided	
30.0.B	Motors below 30 kW	Winding shall be suitable for heating continuously at 24 V, Single phase, AC,50 Hz	
30.0.C	Terminals for space heater	Separately terminated with clear identification in main terminal box.	
31.0	RTD for winding	Two numbers of Thermistors / RTD for each phase as below are to be provided A. Motors above 37 Kw shall have thermistors or RTD if specifically called for in enquiry. B. Motor rated 160kW and above shall have RTDs	
32.0	Bearing RTD	For motors 132 Kw and above bearing temperature detectors(RTD) shall also be offered.	
33.0	Terminals for RTD/ Thermistor	Thermistors/ RTDs shall be terminated in an auxiliary terminal box. Details shall be furnished in TB diagram.	
34.0	Earthing	Two number o of earthing provisions on terminal box and on motor body	
35.0	Name plate	As per IS 325 and Addl data on name plate: a. Bearing DE/ NDE details. b. Year of manufacture	
36.0	Lifting Device	Eye bolt or lugs to facilitate safe lifting	
37.0	<u>INSPECTION & TESTING</u>	As per applicable quality plan	

TECHNICAL SPECIFICATION FOR LUBE OIL SYSTEM
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CI No.	CHARACTERISTICS	REQUIREMENT	VENDOR COMPLIANCE (Refer Note: 2)
38.0	<u>DOCUMENTS</u> a) Along with offer: b) After placement of Purchase order (within 15 days)	One set of technical data sheet as per the enclosed format and Motor general arrangement drawing giving foundation details, shaft details. Three sets of the following for approval: 1. Technical Data sheet as per the enclosed format of TECI LT MOTOR - sheet 6 to 8 2. Motor general arrangement drawing giving foundation details, shaft details and weight 3. Motor Terminal box arrangement drawing 4. Motor characteristic curves. 5. Steel crate packing drawing. The following shall be submitted 1. Guarantee certificate. 2. O & M manuals. <u>3. Acceleration time and LRWT calculation shall be submitted for review.</u>	
39.0	<u>PACKING</u>	a) Packing as per Drawing No: - 3-00-114-39893 b) The packing shall meet the Transport, Environment & Storage hazards. c) As per Packing Procedure QA:CI: STD:PR:03 or as per Manufacturer's Standard Practice subject to approval. <u>Vendor shall check the applicable rated voltage in enquiry.</u>	

NOTE:

1. Refer current valid list for revision status of Quality Plan & Packing Procedure.

2. In 'Vendor compliance' column Vendor to indicate 'YES', 'NO' or 'NOT APPLICABLE'. Clarification, if any, in this column will not be considered.

TECHNICAL SPECIFICATION FOR LUBE OIL SYSTEM
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DATA SHEET - **Cust No:** **Project:**

CL. NO	CHARACTERISTICS	Vendor data (To be filled by vendor)
1.0	Application	
1.1	Fan / Load Curve referred	
2.0	Manufacturer	
3.0	Type & frame size	Normal / Energy efficient Frame size:
3.1	Degree of Protection	IP55
4.0	Rated output in kW	
4.1	Rated speed	
5.0	Rated voltage, frequency & phases	415 V AC $\pm 10\%$; 50 Hz $\pm 5\%$; (Check voltage as per enquiry), 10% absolute sum - 3 phase
6.0	Full load current	Amps
7.0	Energy efficient	As per IS 12615
8.0	Efficiency & power factor at Full load	Eff-- PF---
9.0	Efficiency & power factor at 75 % load	Eff-- PF---
10.0	Efficiency & power factor at 50 % load	Eff-- PF---
11.0	Duty Cycle	S1 - Continuous
12.0	Rated torque	
13.0	Starting current	600% of full load current
14.0	No load current (with mechanism coupled)	@ RV and Frequency
15.0	Starting torque in % of full load torque	
16.0	Pull up torque in % of full load torque	
17.0	Pull out torque in % of full load torque	
18.0	No load starting time (without mechanism coupled)	
19.0	Locked rotor withstand time at rated voltage	a. Hot b. Cold
20.0	Locked rotor withstand time at minimum starting voltage	a. Hot b. Cold
21.0	Locked rotor withstand time at 110% rated voltage	a. Hot b. Cold
22.0	Starting time at minimum starting voltage with mechanism coupled	
23.0	Starting time at rated voltage with mechanism coupled	
24.0	Maximum permissible starting time	
25.0	Stator thermal time constant	Minutes
26.0	Type & No of terminals brought out	
27.0	Stator winding connection	Delta/Star

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CL. NO	CHARACTERISTICS	Vendor data (To be filled by vendor)
28.0	Class of insulation & temperature rise	Class F; 60°C by thermometer method / 70°C by resistance method.
29.0	Minimum permissible starting voltage	Volts
30.0	Resistance per phase @20°C (Indicative)	Ohms
31.0	No of successive starts in Hot condition	ONE / TWO
32.0	Quantity and power consumption of space heater	Qty.== Watts==
33.0	Direction of rotation	Bi-Directional.
34.0	Bearing make & type	Make: Drive End; Non Drive End;
35.0	Lubricant quantity, grade & recommended interval of lubrication	
36.0	Type of mounting & shaft orientation <u>Terminal Box</u>	Foot mounting; Horizontal.
37.0	Location & angle of rotation	
38.0	Gland size for stator winding	
39.0	Gland size for space heater	Suitable for 2CX2.5 sq.mm(armoured), if applicable.
40.0	Cable entry	
41.0	GD ² of motor (kg-m ²)	
42.0	Total weight of motor (kg).	
43.0	Weight of stator (kg)	
44.0	Weight of rotor (kg)	
45.0	Anticipated bearing life in Hours	☐
46.0	Method of connection to driven equipment	
47.0	Limiting rotor temperature for determining safe stall time	Applicable YES NO
48.0	RTD for winding/ Bearing	
49.0	Grade of balance of motor	
50.0	Standard continuous rating at 40°C ambient.	
51.0	Derated rating of motor at 50°C. a. Locked Rotor KVA b. Ratio of Locked rotor KVA / Rated KW	Upward/ Downward— Upward / Downward—
52.0	Motor Dynamic Load	
53.0	Motor Static load	
54.0	PAINT SHADE	

Vendor's signature and seal

Rev No: :

Date ::

The following curves are to be enclosed during datasheet approval.

1. GA drawing, Terminal box arrangement
2. Torque Vs Speed with load curve superimposed.
3. Speed Vs Current
4. Time Vs Current
5. Thermal with stand curve
6. Load Vs Efficiency
7. Load Vs Slip
8. Load Vs Power factor
9. Speed Vs Time
10. Load Vs Current.

The following information shall be specifically provided for motors suitable for VFD drive (if called for in enquiry) during datasheet approval in addition to datasheet.

1. Stator RESISTANCE
2. Stator leakage reactance
3. Magnetising reactance
4. Rotor resistance referred to stator
5. Rotor reactance referred to stator

Vendor's signature and seal.

Date: :

BHARAT HEAVY ELECTRICALS LTD
BOILER AUXILIARIES PLANT, RANIPET – 632 406
SPECIFICATION FOR SHELL AND TUBE TYPE LUBE OIL COOLER
Spec. No.003 rev05 dt.24/10/2017 page 1 of 2

1. The cooler should work in dusty, salty, corrosive and highly polluted atmosphere with an ambient temperature of 50°C (max)
2. Clarified water is allowed at 38°C or as specify in scheme drawing through the tubes and hot lube oil (ISO VG 68) passes through the shell.
3. Cooling water outlet temperature, flow rate, Cooling Capacity (Kcal/hr) and pressure drop are to be furnished by the vendor.
4. Maximum permissible pressure drop across cooler is on oil side (<0.5 bar) and water side (<0.5 bar).
5. Both oil and cooling water inlet / outlet connections are to be of flange type.
6. One set of matching counter flanges for cooling water inlet and outlet with gaskets and fasteners shall also be supplied.
7. Shell is to be of IS 2062 and tubes can be of SS316 / brass suitable for the specified cooling water.
8. Hydraulic test certificate for cooler and compliance certificate for materials are required.
9. **Heat Load calculation (Oil side, Water Side), Calculation of LMTD, calculation of Heat Transfer Area etc. to be furnished by the Vendor.**

Table 1. For Lub Oil System of TLT Design FAN

Var. No.	LOS Capacity	Oil Flow Rate* (LPM)	Working Pressure in bar		Hyd. Test Pressure in bar		Oil inlet temperature (°C)	Oil outlet temperature (°C)
			Oil side (shell)	Water Side (tube)	Oil side (shell)	Water Side (tube)		
01	15 LPM@ 35 bar	10	5	3 to 5	10	10	60	45
02	25 LPM@ 35 bar	15	5	3 to 5	10	10		
03	40 LPM@ 35 bar	20	5	3 to 5	10	10		
04	50 LPM@ 35 bar	30	5	3 to 5	10	10		
05	60 LPM@ 35 bar	40	5	3 to 5	10	10		
06	60 LPM@ 45 bar	40	5	3 to 5	10	10		
07	60 LPM@ 63 bar	40	5	3 to 5	10	10		
08	70 LPM@ 63 bar	50	5	3 to 5	10	10		
09	90 LPM@ 63 bar	60	5	3 to 5	10	10		
10	-----							

* Standard oil flow rate for Cooler design. For Project specific requirement refer LOS scheme drawing / Enquiry.

BHARAT HEAVY ELECTRICALS LTD
BOILER AUXILIARIES PLANT, RANIPET – 632 406
SPECIFICATION FOR SHELL AND TUBE TYPE LUBE OIL COOLER
Spec. No.003 rev05 dt.24/10/2017 page 2 of 2

Table 2. For Lub Oil System of KKK Design FAN

Var. No.	LOS Capacity	Oil Flow Rate (LPM)	Working Pressure in bar		Hyd. Test Pressure in bar		Oil inlet temperature (°C)	Oil outlet temperature (°C)
			Oil side (shell)	Water Side (tube)	Oil side (shell)	Water Side (tube)		
01	5 LPM@ 5 bar	5	5	3 to 5	10	10	63	43
02	10 LPM@ 5 bar	10	5	3 to 5	10	10		
03	20 LPM@ 5 bar	20	5	3 to 5	10	10		
04	30 LPM@ 5 bar	30	5	3 to 5	10	10		
05	40 LPM@ 5 bar	40	5	3 to 5	10	10		
06	60 LPM@ 5 bar	60	5	3 to 5	10	10		
07	80 LPM@ 5 bar	80	5	3 to 5	10	10	64	54
08	80 LPM@ 12 bar	80	12	3 to 5	24	10		
09	100 LPM@ 12 bar	100	12	3 to 5	24	10		
10	175 LPM@ 12 bar	175	12	3 to 5	24	10		

BHARAT HEAVY ELECTRICALS LTD
BOILER AUXILIARIES PLANT, RANIPET – 632 406
SPECIFICATION FOR LUB OIL FILTER
Spec. No.004 rev05 dt.24/10/2017 page 1 of 2

- 1) Dusty, salty, corrosive and highly polluted atmosphere with an ambient temperature of 50°C (max.)
- 2) ISO VG68 Lubricating Oil at 40 to 70 °C passes through the filter.
- 3) Basket or twin type filter (IS 2062 body) with stainless steel filter elements are to be used with changeover valves.
- 4) Filter Element mesh size is to be 10μ (for TLT type) and 60μ (for KKK type).
- 5) Maximum permissible pressure drop in clean condition is to be ≤ 0.3 bar for TLT and ≤ 0.2 bar for KKK type.
- 6) Provision for AIR VENT is required and drain oil is to be connected back to oil tank.

Table 1. For Lub Oil System of TLT Design FAN

Var. No.	LOS capacity in LPM	Flow Rate in LPM	Working Pressure in bar	Test pressure for filter in bar
01	15	15	35	56
02	25	25		
03	40	40		
04	50	50		
05	60	60		
06	60	60	45	70
07	60	60	63	100
08	70	70		
09	90	90		
10	-----	-----	-----	-----

Table 2. For Lub Oil System of KKK Design FAN

Var. No.	LOS capacity in LPM	Flow Rate in LPM	Working Pressure in bar	Test pressure for filter in bar
01	5	5	5	08
02	10	10		
03	20	20		
04	30	30		
05	40	40		
06	60	60		
07	80	80		
08	80	80	12	18
09	100	100		
10	175	175		

BHARAT HEAVY ELECTRICALS LTD
BOILER AUXILIARIES PLANT, RANIPET – 632 406
SPECIFICATION FOR LUB OIL FILTER
Spec. No.004 rev05 dt.24/10/2017 page 2 of 2

INSPECTION:

- 1) Hydraulic test certificate require at specified test pressure and flow rate.
- 2) Pressure drop test under clean condition is required.
- 3) Compliance certificate for filter element.
- 4) Data Sheet and GA Drawing to be furnished by Vendor.

BHARAT HEAVY ELECTRICALS LTD
BOILER AUXILIARIES PLANT, RANIPET – 632 406
SPECIFICATION FOR LUB OIL PUMP
SPECN.NO: LOS: PUMP: REV 06, Dt 24/10/2017

1. Dusty, corrosive and highly polluted atmosphere with an ambient temp. of 50°C (max.)
2. ISO VG68 Lubricating Oil at 40 to 70°C is to be handled by a SCREW PUMP (Gear Pump if Project specific requirement) with mechanical seals and built in, externally adjustable pressure relief valve.
3. The vendor shall select the pump such that the indicated duty conditions are fully met (With sufficient margin / tolerance being on the positive side).
4. The vendor shall specify the speed, the direction of rotation as viewed from drive end and GD2 details of pump rotor along with the offer.
5. The vendor shall indicate the recommended motor rating for pump drive with sufficient margin (minimum 10%) over and above the maximum duty condition specified. The nearest standard motor frame size shall be given along with the offer.
6. Complete dimensional drawing of the pump clearly indicating the mounting flange details shaft extension, diameter and key details along with tolerance shall be furnished separately (along with offer). The pump shall be connected to the drive motor through suitable love joy coupling. Coupling Details to be furnished by the vendor. Procedure to adjust relief valve is to be furnished.
7. Inspection & documents:
 - i) Run test for two hours for smooth operation and to measure pressure, volume and current drawn at rated speed.
 - ii) Tolerance on volume is -0% to + 30%
 - iii) Material Certificate
 - iv) Compliance and guarantee certificate
 - v) Catalogues and O & M manuals in hard copy (2 sets) and soft Copies (2 CDs) required.
8. Packing: The pump shall be packed in sea worthy packing to avoid damage to the equipment during transit and handling.

BHARAT HEAVY ELECTRICALS LTD
BOILER AUXILIARIES PLANT, RANIPET – 632 406
SPECIFICATION FOR FLEXIBLE HOSE for TLT Design FAN

1.0.0 SITE CONDITIONS:

- 1.1.0 Ambient Temperature : 50°C
1.2.0 Atmosphere : Dusty, Salty, Corrosive and Highly polluted

2.0.0 GENERAL:

- 2.1.0 Application : To carry high pressure oil to Fan Main bearing and Hydraulic Actuating Device (HAD) and Motor Main Bearing.

2.2.0 TYPE:

- 2.2.1 Rubber oil resistant flexible hose with swivel nut at both ends/one end swivel nut 90° Elbow shall be as per SAE/RI/AT standard for Fan Main Bearing and HAD.
- 2.2.2 Rubber oil resistant flexible hose with swivel nut at one End and other end with flange end SAE/RI/AT standard for Motor Main Bearing



- 2.3.0 Material of end fitting : High quality carbon steel- Galvanized.

2.4.0 OPERATING / TEST CONDITIONS:

- 2.4.1 ID of Hose size required : Suitable for end connections/as per Enquiry
2.4.2 Working pressure : 35 bar, 45 bar, 63 bar / as per Enquiry
2.4.3 Medium Handled : Lubricant Oil ISO VG 68
2.4.4 Medium Temperature : 40 to 70°C
2.4.5 Surrounding Temperature : 50 to 80°C

2.5.0 Hydraulic test pressure:

- 2.5.1 At 1.5 times of working pressure with connecting unions for all hoses.

3.0.0 TESTS:

- 3.1.0 Hydraulic test at specified pressure with all fittings shall be conducted 180° bend position.

Type	Description	Length (in MM)
01	FLEXIBLE HOSE SAE100 R1 AT, 3/8" ID, Swivel Nut M18x1.5 BOTH ENDS	750
02	FLEXIBLE HOSE SAE100 R1 AT, 3/8" ID, ONE END Swivel Nut M18x1.5, OTHER END 90° ELBOW Swivel Nut M18x1.5	750
03	FLEXIBLE HOSE SAE100 R1 AT, 1/2" ID, Swivel Nut M22x1.5 BOTH ENDS	750
04	FLEXIBLE HOSE SAE100 R1 AT, 1/2" ID, ONE END Swivel Nut M22x1.5, OTHER END 90° ELBOW Swivel Nut M22x1.5	750
05	FLEXIBLE HOSE SAE100 R1 AT, 1/2" ID, ONE END Swivel Nut M22x1.5, OTHER END NB20 FLANGE CONNECTION	750
06	FLEXIBLE HOSE SAE100 R1 AT, 5/8" ID, Swivel Nut M26x1.5 BOTH ENDS	1000
07	FLEXIBLE HOSE SAE100 R1 AT, 5/8" ID, ONE END Swivel Nut M26x1.5, OTHER END 90° ELBOW Swivel Nut M26x1.5	1000
08	FLEXIBLE HOSE SAE100 R1 AT, 3/4" ID, Swivel Nut M30x2.0 BOTH ENDS	1000
09	FLEXIBLE HOSE SAE100 R1 AT, 3/4" ID, ONE END Swivel Nut M30x2.0, OTHER END 90° ELBOW Swivel Nut M30x2.0	1000

NOTE: For Swivel Nut, the thread length shall be 15mm(min) to hold the mating part. Before Dispatch of Hoses, thread size of Swivel Nut to be check properly with mating Male connector to avoid mismatch at site.

4.0 DOCUMENTS:

4.1 Six sets of the following documents shall be submitted:

4.1.1 T.C. for Hydraulic Test.

4.1.2 Compliance and Guarantee Certificate

4.1.3 Catalogues and O&M Manuals

BHARAT HEAVY ELECTRICALS LTD
BOILER AUXILIARIES PLANT, RANIPET – 632 406
SPECIFICATION FOR ELECTRONIC TRANSMITTER OF PRESSURE/ DIFFERENTIAL PRESSURE
/TEMPERATURE/ FLOW/ LEVEL

1	TYPE OF TRANSMITTER	Dual input , Microprocessor Based 2 wire type, HART protocol Compatible directly powered from 4-20mA input to DDCMIS
2	Accuracy	±0.1% of calibrated span (minimum)
3	Output signal range	4-20mA DC (Analog) along with superimposed digital signal (based on HART protocol) Built in LCD indicator with diagnostic detail
4	Turn down ratio	10:1 for vacuum/very low pressure application 30:1 for other application
5	Stability	±0.1% of calibrated span for six months for Ranges up to and including 70Kg/cm ² .±0.25% of calibrated span for six months for Ranges more than 70 Kg/cm ² (g)
6	Zero and span drift	±0.015% per deg. C at max span, ±0.11% per deg. C at min span
7	Load Impedance	500 ohms (min.) at 24V DC
8	Housing	Weather proof as per IP – 65 with durable corrosion resistant epoxy coating
9	Over Pressure	150% of Maximum operating pressure
10	Connection (Electrical)	Plug and Socket type
11	Process connection	½ Inch NPT(F)
12	Span and Zero	Continuous tamper proof. Remote as well as adjustability manual from instrument with zero suppressions and elevation facility.
13	Accessories	-Diaphragm seal, Pulsation dampeners, Syphon etc. as required by service and operating condition -2 valve manifold for absolute pressure transmitters (-3 valve manifold for gauge/vacuum pressure transmitters) and 5 valve manifold for DP/level /flow /Temperature transmitters. -For hazardous area, explosions proof enclosure as described in NEC article 500
14	Diagnostics	Self-indicating feature
15	Power supply	24V DC ± 10%
16	Adjustment/calibration/ maintenance	1)To be compatible with Centralized PC based system which is in customer's scope. 2)1 no. hand held type calibrator shall be provided per application (FD/ID/PA/GR FANS) which is to be compatible with HART protocol.

Notes:

In case it becomes necessary to use a DP transmitter for pressure measurement then a 3-valve manifold should be used in place of 2-valve manifold.

LVDT type is not acceptable.

Where the pressure fluids are corrosive viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.