



Form No. 2038

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PRODUCT STANDARD

TRANSFORMER

ENGG INSTRUCTONS

TR 10023P

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TITLE: SPECIFICATIONS FOR TRANSFORMER OIL PUMPS**1.0. APPLICATION**

1.1 Pumps shall be used for circulating hot transformer oil to IS: 335 up to 100°C through transformer windings and cooling equipments and shall operate without undue vibration and with minimum of noise less than 70db.

2.0. CONSTRUCTION

2.1 The pump & driving motor shall be built as a unit on a common shaft and impeller shall be directly mounted on the motor shaft. Thus equipment shall form a leakproof glandless close coupled unit for outdoor installation without protective covering.

2.2 Pump & the integral motor shall incorporate bearings (only reputed make like FAG/SKF etc.) capable of withstanding the thrust due to moving parts and action of impeller, when mounted with the axis of spindle either in vertical or horizontal plane.

2.3 Impeller design to be such that it does not obstruct oil flow when pump is not working.

2.4 Pump unit shall be suitable for mounting in horizontal or vertical positions.

2.5 The design of pump to be such that there are no pockets where air / gases can collect. Air release plug at the highest point and drain plug at the lowest point of the pump shall be provided. SS / Brass plugs to be of Hex. Head type and shall be provided with teflon / nylon washers.

2.6 Arrow shall be cast on inline pump bodies to indicate direction of oil flow. Further an arrow shall also be cast on both type of pump bodies (inline & centrifugal) to indicate direction of impeller rotation. However, for inline pumps an arrow plate of anodised aluminum rivetted to body can also be accepted.

2.7 An anodised aluminium warning plate indicating 'pump should not be run without oil' shall be put on the pump.

2.8 MATERIALS OF CONSTRUCTION FOR INLINE PUMPS.

- | | |
|------------------------|---|
| a. Body | : Aluminium alloy BS 1490 Gr LM6 |
| b. Shaft | : EN8/BS 970/SS |
| c. Bearing | : SKF / FAG / Any reputed |
| d. Class of Insulation | : F |
| e. Varnished | : Dr. Bake & co. (F-50 or equivalent) or Any equivalent reputed make. |
| f. Rotor | : Aluminium die cast. |

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g. Impeller : Aluminium alloy BS1490 GR LM6 / Gunmetal Grade LTB2 of IS:318

MATERIALS OF CONSTRUCTION FOR CENTRIFUGAL PUMP.

- a. Body : Aluminium alloy BS 1490 Gr LM6 / Cast Iron FG200 of IS210
- b. Shaft : EN8/BS 970/SS
- c. Bearing : SKF / FAG / Any reputed
- d. Class of Insulation : F
- e. Varnished : Dr. Bake & co. (F-50 or equivalent) or Any equivalent reputed make.
- f. Rotor : Aluminium die cast.
- g. Impeller : Aluminium alloy BS1490 GR LM6 / Gunmetal Grade LTB2 of IS:318

3.0. **MOTOR**

- 3.1 Motor used for pumps shall be squirrel cage induction type conforming generally to IS: 325 and shall be suitable for continuous operation and 'direct on line' starting. Wound stator should be varnished with F-50 or equivalent and VPI system to be implemented.
- 3.2 Motor shall be designed to permit circulation of transformer oil through windings for cooling purposes.
- 3.3 Insulation for motor winding shall conform class-F of IS:1271. Windings shall be impregnated to make them non-hygroscopic for operation in transformer oil at 100°C.
- 3.4 The rotor shall have smooth finish without vanes so as to minimise friction losses when rotating in transformer oil.
- 3.5 The motor bearing shall be suitable for lubrication by internal circulation of transformer oil.
- 3.6 Motor shall be suitable for 415 volts (rated voltage) 3-phase, 50-hz A.C. supply. Further, motor shall be suitable for voltage variation of $\pm 10\%$ over rated value and frequency variation of $\pm 3\%$.
- 3.7 Motor shall be designed to operate for a period of not less than 10-minutes at 70% of rated voltage without stalling or injurious over heating.
- 3.8 Motor shall be capable of starting at 80% of the rated voltage the starting current at rated voltage shall not exceed 6-times the rated full load current.
- 3.9 Technical data for pump motor shall be furnished as per page-7 of this specification.

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4.0. TERMINAL BOX

- 4.1 Terminal box shall be of weather proof design. Epoxy moulded terminal box should be provided to take care of oil temperature upto 115°C .
- 4.2 The terminals to be of stud type of adequate size and length. Incoming leads from winding shall be locked and additional hardwares, i.e. washers, nuts and lock nuts shall be provided for outgoing leads.
- 4.3 A wiring diagram on anodised aluminium plate shall be rivetted on inside of the terminal box cover.
- 4.4 Terminal marking shall be done as per IS: 4728-1975 by engraving on terminal board and filling the same with paint.
- 4.5 Terminal box shall be provided with 1" B.S. conduit entry. Conduit entry hole shall point downwards and should be closed for transportation and longer storage.

5.0. DRILLING

Flange shall be drilled as below holes to be off centre and back of the flanges shall be spot faced / machined.

- (I) Upto 100mm NB. as per IS: 3639.
100mm 4 holes of 18dia on 180 PCD
- (II) 150mm and 200mm NB as per IS: 1536
Table (iv)
150mm 8holes of 23dia on 240 PCD
200mm 8holes of 23dia on 295 PCD

6.0. PAINTING / PLATING

- 6.1 The internal surface of pump and motor housing after proper cleaning shall be painted with transformer oil resisting paint / varnish. Test certificate of oil resistant paint / varnish should be furnished along with supply.
- 6.2 In side of terminal box shall be painted with two coats of non-yellowing white paint.
- 6.3 Outside surface after removing rust, grease and dirt etc. by necessary pretreatment sand / shot blasting shall be applied with two coats of red-oxide zinc chromate priming paint to IS: 2074, followed by two coats of polyurethane paint to IS:13213 of light grey shade conforming to 631 of IS:5. In case of pumps having aluminium bodies one coat of etch primer to IS:5666 shall also be applied before priming paint. Refer inquiry for specific finishing paint shade.
- 6.4 All hardwares used shall be zinc plated and passivated to grade Fe / Zn 12.5 of IS: 1573 or SS.

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7.0. TESTING

Following type and routine tests shall be carried out on pump motor set, wherever applicable. Method of test shall be as per IS:325.

7.1 ROUTINE TESTS

7.1.0 Tests should be conducted with instruments calibrated as per NABL standards.

7.1.1. Assembled pump motor unit shall be oil-pressure tested at min.4kg / cm² for 30 minutes at room temperature

7.1.2. Insulation resistance test.

7.1.3. High voltage test at 2.5kv for 1 minute, to be conducted between line terminal and the earth.

7.1.4. No load running of motor and reading of current, voltage, frequency, power input and speed.

7.1.5. Locked rotor test at 100 / 135 volts and reading of current and power input.

7.2 PERFORMANCE TEST

All assembled pumps shall be tested for their performance in a closed loop filled with transformer oil conforming to IS: 335 at room temperature. A minimum five sets of reading shall be taken i.e. one at duty point and two each on above & below duty point so that operating curve can be drawn. Readings of discharge, head, voltage, current, power input shall be recorded. Tolerance on nominal flow shall be minus 5% & plus 10%.

8.0. TYPE TESTS

The following tests shall be conducted on one pump motor set per lot supplied against one purchase order.

8.1 The pump shall withstand vacuum test corresponding to an absolute pressure of 250 torr , max. for 30 minutes without any damage / deformation. Hydraulic pressure test as per cl 7.1.1 above shall be repeated after vacuum test.

8.2 The assembled pump motor set shall be oil pressure tested with transformer oil to IS: 335 at 1.0kg / cm² for 24hrs at room temperature.

8.3 Temp. rise test by resistance method to measure the temp. rise of motor winding over hot oil. temp. rise of the motor when passing transformer oil at 90°C shall not exceed oil temperature by more than 30°C for class-F insulation.

8.4 I.P. 55/ I.P.67/I.P.68 degree of protection – typical test certificate for similar design of terminal box shall be submitted.

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8.5 All the type tests should be conducted at any NABL lab or if conducted at supplier works then should be witnessed by BHEL / customer /any authorised inspection agency. The type test certificates should not be old more than 5 year at the time of enquiry.

9.0. RATING PLATE

A rating plate of SS stating the following shall be provided on each pump

- Discharge in LPM and head in meters.
- Name of manufacturer.
- Manufacturer's serial no.
- Motor rating in KW.
- Class of insulation.
- Rated current voltage, No. of Phase & frequency in Hz.
- Speed in RPM
- Winding connection.
- Suction and delivery size.
- Type of pump i.e. in line or centrifugal.

10.0. TEST CERTIFICATES

All pump motor sets shall be issued with six copies of test certificate containing the following information.

10.1 Rating plate details.

10.2 Routine test results as per clause 7.1.

10.3 Purchase order no. and date of testing.

10.4 Performance characteristics curves with flow vs head , flow vs efficiency , flow vs input KW.

11.0. BLANKING

All pump motor units shall be properly blanked with suitable gaskets and good quality painted steel blanking plates and plated hardwares to avoid ingress of dust and foreign particles etc. in to the pump motor during transit / storage.

12.0. GUARANTEE

Supplier shall guarantee the performance of the pump motor sets for a period of 24-months from the receipt or 18-months from the date of commissioning whichever is earlier and shall undertake to replace the defective pumps free of cost at site during this period.

13.0. Vendor should take the guarantee that maximum input losses supported by calculations is accurate which will be subsequently measured at our works/site during heat run test of transformer. Any variation in measurement of losses on higher side will have penalty & commercial implication. This is mandatory clause precisely to be confirmed by the vendors while quoting their offers.

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14.0 FOLLOWING INFORMATION SHALL BE FURNISHED ALONG WITH THE OFFER.

- (i) Three copies of pump drawings showing the outline dimensions, mounting and weight etc.
- (ii) Three copies of performance curve of the pump.
- (iii) Combined efficiency of the pump motor at duty point.
- (iv) Technical data of pump motor as per page-7.
- (v) Five sets of operation & maintenance instruction booklet shall be supplied along with each lot.
- (vi) Guarantee certificate of maximum input losses of quoted pump.

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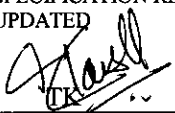
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TITLE : SPECIFICATION FOR TRANSFORMER OIL PUMPS

PROFORMA. OF TECHNICAL DATA FOR PUMPS MOTOR

1. Manufacturer
2. Type
3. Application
4. Pump motor rating in kw
5. Max. power consumption at duty point
6. Duty cycle as per IS:325
7. Rated voltage , no. of phase & freq.
8. Allowable voltage variation
9. Allowable frequency variation
10. Allowable combined variation
11. Full load current
12. Rated speed
13. Full load efficiency of motor
14. Combined efficiency of pump motor
15. Full load power factor
16. Method of starting
17. Starting current
18. Type of enclosure
19. Class of insulation
20. Starting torque (% of F.L.T)
21. Maximum torque (% of F.L.T)
22. Suitability for outdoor application
23. Safe stall time in seconds
24. Temp rise over oil temp of 90°C
25. Type size and nos. of terminals bought out
26. Type of connection star / delta.
27. Suitability of hor. / vert. mtg.
28. Type and make of bearings
29. Total wt. of pump motor
30. Suitability of motor wdg. for space heating by 24V A.C. supply when pump is idle
31. Acceleration time in secs
32. Dimensional outline drawing
33. Suitability of terminal box for IP-55/IP-66/IP-67 protection

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