




PURCHASE SPECIFICATIONS
FOR
100 KVA ISOLATION TRANSFORMER
FOR
OIL RIG APPLICATION



SPECIFICATION NO:	OR 12537
REVISION NO:	01
DATE:	07.05.15

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SPECIFICATIONS FOR 100 KVA ISOLATION TRANSFORMER FOR OIL RIG APPLICATION

1.0 Introduction

This specification covers the requirements of 100KVA enclosed dry type power transformer used in electrical system for oil rig application. This specification is generally based on IS 2026 for Power Transformers and IS 11171 dry type power transformer.

The transformer shall have delta connected 415VAC, 50Hz primary winding and star connected 415VAC (L-L), 50Hz secondary winding with neutral brought out. The transformer shall be used as an isolation transformer to feed the AC auxiliary load & lighting loads of VFD house and will be placed inside the AC power control room (AC PCR).

As oil rig application calls for economic usage of space, supplier shall make every effort to minimize dimensions through optimum design.

2.0 Scope of supply

Item No	Item Description	BHEL Style Code
01	100KVA dry type transformer, 3-Phase, Delta-Star, Primary 415VAC, 50Hz Secondary 415VAC (L-L), 50Hz with neutral brought out as per BHEL specification no-OR12537 Rev 01	BP9048135281

3.0 Working conditions

Ambient temperature	:	0-55 deg.c
Climate	:	Saline, Oily & Dusty
Relative Humidity	:	95% Max



4.0 Technical parameters

Rating	:	100 KVA
No. of phases	:	Three Phase
Connection	:	Primary – Delta connected Secondary – Star connected With neutral brought out
Vector Group	:	DYN 11
Rated Primary voltage	:	415 VAC , 50 Hz \pm 3%, 3 Phase
Rated Secondary voltage	:	415 VAC at No load line to line
Frequency	:	50 Hz \pm 3%
Voltage regulation	:	4% max
Percentage impedance	:	4% with tolerance as per IS 11171: 1985/ IS 2026:1977
Insulation class	:	F
Max. temperature rise	:	90 Deg.C above ambient temperature
Cooling	:	Natural air-cooled (AN)
Dielectric voltage	:	3 KV rms 50 Hz for one minute i) between primary and secondary Winding. ii) between shorted windings and frame.
Service condition	:	Altitude, Reference ambient temperature wave shape of Supply voltage and symmetry of poly phase supply voltage as per IS 11171:1985.
Inspection cover	:	Should be removable from front.



Application	:	Lighting and AC auxiliaries load
Applicable standard	:	As per IS 11171 & IS 2026: 1977
Winding material	:	Electrolytic grade copper
Terminal marking	:	As per IS 11171:1985/IS 2026:1977 part-IV Primary:- 1U,1V,1W Secondary:- 2U,2V,2W,2N (All terminals on front side)
Earthing terminal	:	2 nos. earthing terminals shall be provided
Ability to withstand SC	:	As per IS 2026 (part 1) : 1977
Roller	:	Bi-directional Roller for easy movement to be provided
External Hardware	:	Zinc Plated passivated/ Stainless steel
Enclosure	:	IP23
Impregnation	:	VPI

5.0 Design & Construction features

The transformer shall be generally in line with OGA drawing No. 37211010940 Rev 00 attached with this specification. Supplier shall work out details and submit OGA drawing meeting requirement of reference drawing along with the offer for reference. Following design & construction features to be complied:

- i) Complete winding on each limb shall be covered with non-inflammable insulating tape and suitably processed with class H insulation material. All materials used in the construction shall be compatible or better than class H insulation temperature index, and permissible temperature rise specified in specification.
- ii) Mounting angles of transformer core shall be of steel and powder coated to simens Grey colour Shade 7032 shade.



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- iii) The enclosure for the transformer core shall be of robust frame construction with bolted covers. Two nos M12 size eye bolts for lifting purpose to be provided on the top of the cubicle and should be removable by unscrewing. In case the lifting eyebolt is fixed on frame, the frame should be strong enough to take full load of assembled transformer on lifting by eyebolt .
- iv) Enclosure shall be powder coated after seven tank process with simens Grey colour Shade 7032 shade.
- v) Four heavy duty plain rollers to be provided at the bottom of the enclosure for rolling of the transformer cubicle. It should be possible to bolt the rollers from bottom without opening any of the covers.
- vi) Thickness of sheet used for transformer cover shall be minimum 2 mm thick. The enclosure covers for the transformer should be louvered for natural cooling. Louvers shall be provided at all four vertical sides of transformer, as per attached indicative drawing.
- vii) Sufficiently large inspection cover shall be provided enabling easy access to workman to attend the terminals for wiring, after opening of inspection cover. Inspection covers shall be fixed using M5/M4 screws on suitable stiffener, welded over cover sheet or bolted with frame at end. As shown in the reference drawing inspection cover shall be provided at both sides, ensuring freedom, to place the transformer as required. However it is made clear that supplier, at it's discretion, is also free to use options like providing two panel hinged doors in place of inspection cover for terminal access.
- viii) As shown in reference drawing three no. undrilled gland plate shall be provided, one at top cover and one at each widthwise face (refer drawing). BHEL shall use any one of the three gland plate, based on transformer placement. Holes for cable gland shall be drilled by BHEL at convenient location during installation. Size of gland plate shall be sufficient to accommodate cable and cable gland, specified in relevant section.
- ix) As maximum possible number louvers are desired over coversheet for, it is suggested that rating plate & diagram plate may be fixed at the bottom portion of front face of the transformer cover, as shown reference drawing. However supplier has to decide and submit it's own design for approval.
- x) Diagram plate to be provided on the transformer suitably as shown in OGA drawing.
- xi) As space availability is major constraint, supplier shall work out it's most compact design meeting above requirement, and submit OGA with it's offer.



Other design and construction features to comply with general rules for transformer design and available standards.

6.0 Dimensions

The maximum limiting dimension of the transformer shall be as following:

1000 mm (L) x 700 mm (W) x 1000 mm (H)

7.0 Terminations and cable entry

Terminal board shall be of 20 mm, minimum thick Epoxy Glass. Following shall be the terminations on the terminal board:

Primary – 3 Nos marked as per IS 2026 part IV
Secondary – 4 Nos marked as per IS 2026 part IV
Earthing - As per IS 2026 part IV

Terminals shall be provided on front side such that it should be accessible after opening of any of the two inspection covers. Projected terminal box, beyond dimension furnished here is not permissible due to space constraints. **Supplier shall submit their GA drawings and obtain approval from BHEL before manufacturing.**

Primary and secondary terminals should be of brass stud of M12 size for termination of crimped lugs of 50 mm² cables on primary side & 70 mm² cables on secondary side. Studs to be provided with respective tightening hardware also including Nuts (two nos.), plain & spring washers. Anodized Aluminum labels to be fixed by screws on terminal board for terminal markings.

Two nos. M8/M10 size steel stud type earth terminals to be provided on the enclosure. Core shall be earthed.

After installation cable entry can be either from top or through any of the two widthwise faces, and shall be decided after installation at BHEL. Therefore supplier shall provide undrilled cable gland plates, sufficiently large, at all three faces as shown in reference drawing. Exact location and size of gland plate shall be worked out by supplier and shall be submitted in OGA drawing with offer. Size of cable gland plate shall be sufficient to accommodate all incoming and outgoing cables. **Location of cable gland plate shall be such that cable can reach cable terminal easily (without much bend or stress) thru cable bush. Indicative termination location to be marked in drawings to be submitted to BHEL for**



approval. Holes in cable glands plate shall be done at Bhopal by BHEL and rubber bush shall be fitted for cable entry.

8.0 Rating plate:

Rating Plate anodized aluminum / stainless steel shall have minimum information as per IS 11171: 1985. The following minimum information to be provided:

- | | | |
|----|--------------------------|------------------------------|
| a) | Kind of Transformer | : Dry Type |
| b) | Standard Complied | : (IS 11171) & BHEL OR 12537 |
| c) | Rated KVA | : 100 KVA |
| d) | Manufacturer's name | : |
| e) | Manufacturer's Sl. No. | : |
| f) | Year of manufacture | : |
| g) | Class of Insulation | : F |
| h) | Max. temp. rise | : |
| i) | No. of phase | : 3 Primary. 3+N Secondary |
| j) | Rated frequency | : 50 Hz |
| k) | Rated voltage | : 415/415 V |
| l) | Rated current | : |
| m) | Connection symbol | : $\Delta Y 11$ |
| n) | Insulation level | : 3 kV AC rms 50 Hz |
| o) | Impedance voltage | : 4% |
| p) | Type of cooling | : AN |
| q) | Mass of core and winding | : |
| r) | Mass with Enclosure | : |
| s) | ISI mark (if applicable) | : |

9.0 Type test, routine test & Acceptance of transformer/s:

Type tests as mentioned below, in presence of BHEL engineers shall be conducted in first transformer, as per relevant clause of IS and our specification. After successful tests, supplier shall furnish test results in quadruplet and the same shall be counter signed by BHEL representative. Following type tests are to be carried out as per relevant clause of IS 2026:

Type tests:

- 1) Measurement of winding resistance (16.2 of IS: 2026 (part) -1977)
- 2) Measurement of voltage ratio and check of voltage vector relationship (16.3 of IS: 2026 (part-1) -1977).



- 3) Measurement of impedance voltage, short-circuit impedance and load loss (16.4 of IS: 2026 (part-1) – 1977).
- 4) Measurement of no load loss and current (16.5 of IS: 2026 (part -1) -1977)
- 5) Separate –source voltage with stand test (14 of IS 11171)
- 6) Induced overvoltage withstand test (15 of IS 11171)
- 7) Temperature rise test (17 of IS 11171)
- 8) Measurement of IR Value- Primary with 1KV & secondary with 500 V Insulation tester.

Subsequent transformers shall be subjected to routine test, as per relevant clause of IS and our specification. After successful tests supplier shall furnish test results in quadruplet and the same shall be counter signed by BHEL representative. Following routine tests are to be carried out:

Acceptance Criteria after successful type tests (routine tests):

- 1) Measurement of winding resistance (16.2 of IS: 2026 (part) -1977)
- 2) Measurement of voltage ratio and check of voltage vector relationship (16.3 of IS: 2026 (part-1) -1977).
- 3) Measurement of impedance voltage, short-circuit impedance and load loss (16.4 of IS: 2026 (part-1) – 1977).
- 4) Measurement of no load loss and current (16.5 of IS: 2026 (part -1) - 1977)
- 5) Separate –source voltage with stand test (14 of IS 11171)
- 6) Induced over voltage withstand test (15 of IS 11171)
- 7) Measurement of IR valves Primary with 1KV & secondary with 500 V Insulation tester.

No separate charges shall be payable for conducting any of these type/routine tests.

Inspection by BHEL shall not relieve supplier their warranty/ after sales commitment in any manner.

10.0 Document required to be furnished along with offer

Following documents are required along with offer for technical evaluation of the offer:

- i) General arrangement drg indicating over all dimensions, termination details and terminal sizes, terminals layout and cable entry locations.
- ii) Technical data as per clause 12.



11.0 Test certificate

Test certificate showing the compliance with above type and routine tests and shall be furnished by supplier.

11.0 Warranty:

The transformer is intended to be commissioned at Oil Rig site. Supplier shall provide on site replacement and rectification warranty against design & manufacturing defect and component failure for twelve months from the date of commissioning at site or 24 months from the date of dispatch, whichever is earlier.

12.0 Data Sheet:

Bidder shall furnish data sheet with following minimum information along with their offer:

- 1) Name of manufacturer :
- 2) Type :
- 3) Reference standard :
- 4) Rated power (KVA) :
- 5) voltage ratio :
- 6) No. of phase :
- 7) Rated frequency :
- 8) Vector Group :
- 9) Type of cooling :
- 10) Impedance voltage :
- 11) No load losses at rated
Frequency and rated voltage :
- 12) Load losses at normal
Ratio rated current and at 75° C :
- 13) Insulation class :
- 14) Insulation level :
- 165 Average temperature rise
Of windings over ambient
Temperature of 50° C :
- 16) Enclosure protection class :
- 17) Outline dimensions
(Length, width & height) :
- 18) Winding material :
- 19) No load current at rated
Voltage & frequency :
- 20) Efficiency at unity power factor at 75° C:
 - a) At full load :
 - b) At 3/4th of full load :
 - c) At 1/2 of full load :
- 21) Percentage regulation at full load
 - a) At unity power factor :
 - b) At 0.8 power factor (lagging) :



- 22) Mass of unit
- a) Core and winding :
- b) Total Mass :

13.0 ACCESSORIES:

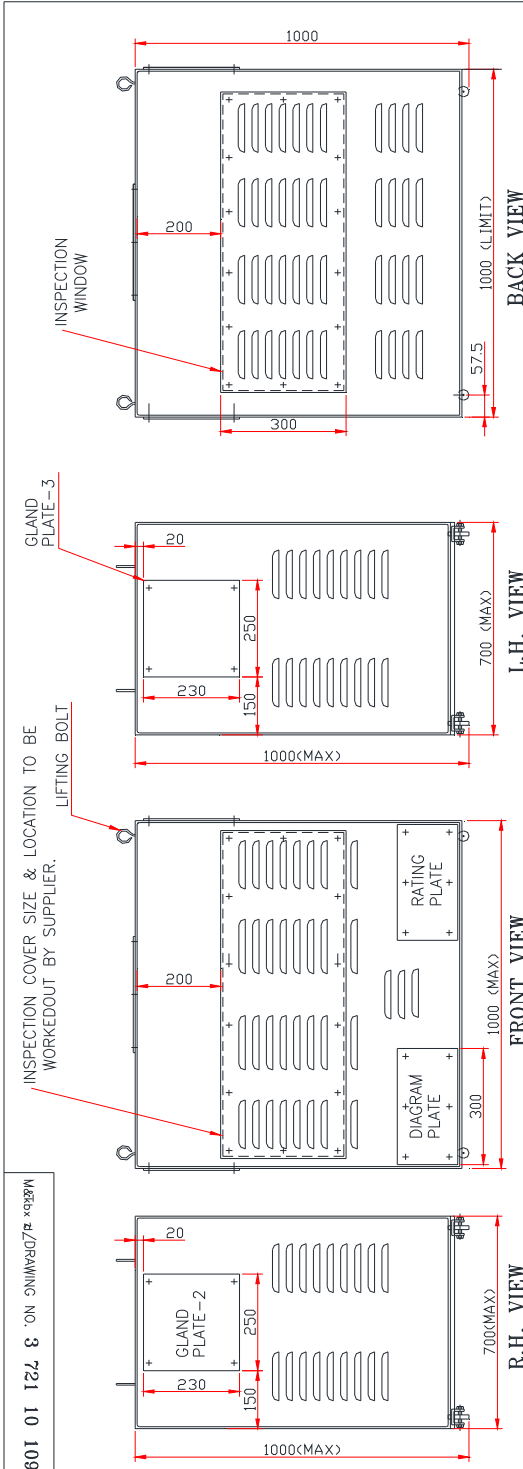
Following accessories, as per details provided in relevant sections, is in the scope of supplier and to be supplied duly fixed on transformer:

1. Loose Copper Terminals (Lugs) for cable connection at each terminal
2. Two nos. nuts with two nos. plane & spring washer for each terminal
3. Diagram Plate
4. Rating plate as per our specification
3. Two nos. inspection cover
5. Three nos. undrilled cable gland plate
6. Earthing Bolt
7. Bi-directional Rollers
8. Cable glands- 3 Nos (Loose)
9. Lifting Eyebolts

Details of Revision:

- Rev 00 : Original
- Rev 01 : Rate secondary voltage changed from 240V to 415VAC

(ALL DIMENSIONS ARE IN mm.)



- NOTES:-**
1. ENCLOSURE SHOULD BE CONFORMING WITH IP-23 IS 2147-1962.
 2. EXTERNAL PAINTING SHOULD BE OF LIGHT GREY TO SHADE NO. 631 IS-5.
 3. SHEET THICKNESS MIN. 2mm.
 4. INSPECTION COVER SIZE SHALL BE DECIDED BY SUPPLIER.
 5. DIMENSIONS ARE FOR REFERENCE ONLY. ALONG WITH OFFER SUPPLIER SHALL SUBMIT IT'S OGA AFTER WORKING OUT DETAIL AS PER OUR SPECIFICATION.
 6. ALL PRIMARY & SECONDARY TERMINATION TO BE ON FRONT SIDE.
 7. REFER BHEL SPEC NO-OR12537 FOR DETAILED TECHNICAL SPECIFICATIONS.

FOR REFERENCE ONLY AC PCR FOR OIL RIG M/S OIL INDIA LTD-DULAJAN		mRln dh idh; jk TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT Hkky' gshn b;stDvDg' f;ve;sh Hkky' BHPAL BHARAT HEAVY ELECTRICALS LTD. BHOPAL	c;uk;k DRN. SS W;g;h; k;g;h; SA Loh;=; RKA In DATE 01.05.15 01.05.15 01.05.15	In DATE 01.05.15 01.05.15 01.05.15	In DATE 01.05.15 01.05.15 01.05.15
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