

**PURCHASE SPECIFICATIONS**  
**OF**  
**500KVA DRY TYPE TRANSFORMER**  
**FOR**  
**OIL RIG APPLICATIONS**



SPECIFICATION NO. : OR12423  
REVISION NO. : Rev 00  
DATE : 01.03.2011  
DISTRIBUTION : PI - 4 copies  
O/C - 1 copy

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## **SPECIFICATION FOR 500 KVA DRY TYPE TRANSFORMER**

### **01. GENERAL:**

This specification covers the requirement of 500KVA transformer for use in electrical system for drilling oil rigs. The transformer shall be suitable for semi outdoor conditions and shall have self supporting structure with top lifting arrangement.

The transformer shall have delta connected 600VAC, 50Hz primary and star connected 415VAC, 50Hz secondary with neutral brought out. The transformer shall be used to feed a common MCC bus which shall be used to feed various AC motors, Lighting loads, A/Cs and other AC auxiliary loads of the rig.

### **02. TECHNICAL SPECIFICATION:**

RATING	:	500KVA
DUTY	:	Continuous
PRIMARY	:	600VAC, 3 Phase, 50Hz, delta connected Taps at (+)2.5% & (-) 2.5% and (+)5% & (-)5% (Tap links should be accessible)
SECONDARY	:	415VAC, 3 phase, 50Hz, star connected and neutral brought out
VECTOR GROUP	:	DYN 11
TYPE	:	Cast resin core dry type transformer with encapsulated winding
ENCLOSURE	:	IP23 (Semi outdoor application)
COOLING	:	Natural Air Cooled (AN)
INSULATION	:	Class F (Epoxy Encapsulated)
INSULATION LEVEL	:	Rated short duration withstand voltage 3KV RMS as per IS -11171
DIMENSION	:	Length : 1570 mm max. Breadth : 1050 mm max. Height : 1900 mm max.

AMBIENT TEMP.	:	50 DEG. C.
IMPEDANCE VOLTAGE	:	4.5%
TERMINALS	:	Terminal box shall be provided with tin plated flat copper terminations for 3 Nos primary (3 phase) & 5 Nos secondary terminals (3 Phase + 2 Neutral) suitable for 32mm wide copper terminal with 2 Nos 11mm dia hole at 25mm centre distance as per drg no-34406104003. Cable glands of suitable size with neoprene gasket for 300sqmm cable (36mm OD) shall be provided (Total 8 nos). Transformer shall have top cable entry as per enclosed Drg-37211010564, R00. Both primary & secondary terminals shall be brought on one side of the of the transformer. <b>Acceptable make of glands are Commet, Jainson &amp; Brako.</b>
CABLE GLANDS	:	Total 8 Nos : 3 Nos for primary (3 Ph) and 5 Nos for secondary ( 3 Ph + 2 N) suitable for 36mm OD cable. Single compression type cable glands to be provided on non-magnetic plate (SS or Aluminum) at the top of the transformer.
WINDING MATERIAL:	:	Electrolytic grade copper
INSPECTION COVER:	:	Should be removable from front
APPLICATION	:	Two such transformers shall be connected in parallel to feed AC loads like 3 phase motors, Compressors, Lighting loads etc.
STANDARDS	:	Generally as per IS 11171-1985 & IS 2026-1977 following latest amendments.

**03. IMPORTATNT NOTES:**

Following points to be taken care by the supplier during design and manufacturing of transformer.

- a) The transformer shall be placed in semi outdoor confined compartment with flap /hinge type doors, where only two sides will be accessible and open to free air for ventilation. The other two sides shall be very close to compartment walls and free air ventilation will be obstructed. This aspect should be taken care during design of transformer.
- b) The power supply to transformer may contain significant spikes and harmonics generated by thyristor converters, hence the design of transformer should be suitable for spikes & harmonics.

- c) The transformer shall operate in oil rig drilling sites which are normally very humid with relative humidity reaching more than 95%. The design of transformer should be suitable for working in such humid environment.
- d) Temperature rise & terminal marking of the transformer shall be as per IS 11171:1985. SC withstand ability of transformer shall be as per IS 2026:1977.
- e) 2 Nos earthing point shall be provided at the bottom of the transformer for earthing of transformer enclosure.
- f) Transformer shall be provided **bi-directional roller** with locking arrangement for easy movement .
- g) All hardware used for transformer assembly shall be zinc plated & passivated.
- h) Transformer core shall be earthed to main frame of the enclosure at two independent points.
- i) The construction of transformer shall be rugged enough to withstand frequent transit & vibration during transportation from one site to another and during operation.
- j) Transformer shall be provided with suitable **rating plate, diagram plate & lifting lugs**. Supplier to ensure that lifting lugs have sufficient safety factor and high tensile strength suitable to take transformer load.
- k) Transformer to be painted as per standard industrial painting process however painting should be resistant to various chemicals used in drilling oil rigs.
- l) Cable terminal identification label (1U, 1V, 1W, 2U, 2V, 2W & 2N1, 2N2) of approximate 60 x 60mm size to be provided near glands for identification.
- m) Only tinned copper or phosphor bronze washer / spacer to be used. Also phosphor bronze screws shall be used, wherever required.
- n) Tubular insulators are not acceptable. Only epoxy insulators to be used, wherever required.
- o) Enclosure sheet of transformer shall not be less than 2mm thick sheet steel with louvers at all sides.
- p) Sketch No-CEE/ORE/4/4831, showing location of the transformer with available space, door location and opening is enclosed. After installation at site the transformer shall be accessible from two sides only i.e face C & D below flap type doors whereas remaining two sides i.e. A & B shall be non-accessible due presence of wall. Hence all the parts which require access during maintenance and inspection shall be face C or D only. Preferably, access cover for tapping shall be provided at the face D and rating plate & vector diagram to be provided on the face C. No projection of terminal box is permissible.

**04. RATING PLATE:**

Stainless steel / Anodised aluminum rating plate shall have information as per IS 11171-1985. Following minimum information to be provided necessarily on the rating plate.

- a) Transformer type
- b) IS followed
- c) Manufacturers name
- d) Manufacturers SI No for the transformer
- e) Year of manufacturing
- f) Class of insulation
- g) Max possible temperature rise
- h) No of Phases
- i) Rated Frequency
- j) Rated Voltage including tapping
- k) Rated current for each winding
- l) Connection symbol
- m) Vector group
- n) Type of cooling
- o) Total weight

Details of rating plate to be submitted by the supplier for approval after placement of PO.

**05. ROUTINE & TYPE TESTS:**

The transformer shall be subjected to following tests as per IS 11171-1985 / IS 2026-1977 witnessed by BHEL and/or ultimate customer's representative for acceptance.

- a) Measurement of winding resistance
  - 1. HV side in all taps
  - 2. LV side
- b) Measurement of voltage ratio and checking of voltage vector relationship.
- c) Measurement of impedance voltage, short circuit impedance & load losses.
- d) Measurement of no load loss & current.
- e) Separate source voltage with stand test
- f) Induced voltage with stand test
- g) Temperature rise test
- h) Measurement of IR
- i) Core and Bolt test

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

**06. DOCUMENTS/INFORMATION TO BE SUBMITTED ALONG WITH OFFER:**

Following information or documents to be furnished by the supplier along with offer.

SL	Documents/Information	Supplier to furnish details with their offer
01	Type of transformer	
02	Rating of transformer	
3	Primary Winding Details	
04	Secondary Winding Details	
05	Reference standard/s	
06	No of Phases	
07	Rated Frequency	
08	Vector Group	
09	Type of Cooling	
10	Impedance Voltage	
11	Tapping on HV	
12	Enclosure type	
13	No Load losses at rated voltage	
14	No load current at rated voltage	
15	Total losses (Cu+ Iron) at rated load	
16	Insulation class	
17	Insulation level	
18	Average temp rise of windings over ambient temp (50 Degree)	
19	Dimension (L X B X H)	
20	Winding material	
21	Efficiency at unity PF at full load	
22	Efficiency at unity PF at half load	
23	Percentage Regulation at unity PF	
24	Percentage Regulation at 0.8 PF (Lag)	
25	Approx. weight of transformer in Kg	

**07. DOCUMENTS TO BE SUBMITTED AFTER PLACEMENT OF PO FOR APPROVAL:**

Supplier shall furnish following drawings, documents or information within one week from the date of placement of PO for approval of BHEL.

- a) OGA drawing
- b) Exterior finish of transformer
- c) Details of rating & diagram plate
- d) Total Weight of transformer in Kg

**08. WARRANTY:**

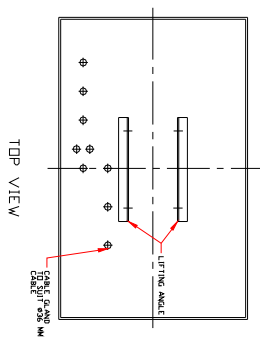
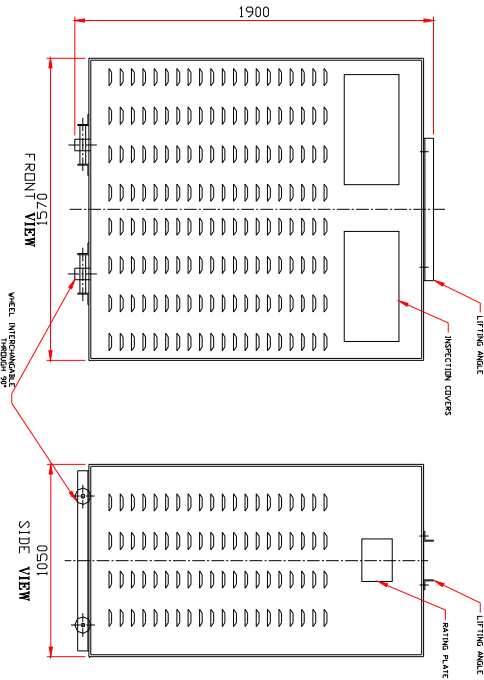
Supplier shall provide the guarantee / warrantee for the offered transformer for 12 months from the date of commissioning or 18 months from the date of supply, whichever is earlier.

FIRST ANGLE PROJECTION

M&E/3/2010 10564

(ALL DIMENSIONS ARE IN mm.)

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- NOTES :-
1. TRANSFORMER SHALL BE DRY TYPE RESIN CAST 500 KVA DYN 11 600/415VAC
  2. TRANSFORMER SHALL BE DELTA-STAR WINDING WITH NEUTRAL TERMINAL.
  3. TRANSFORMER SHALL BE SUITABLE FOR OIL RIGS APPLICATION.

DNCG TENDER REF : DNCG SIVASAGAR TENDER NO BHSK3011  
 BHEL OFFER REF : BHS/BNCG/SVS/OTN-06/200-11/REV 01 DTD 19/9/2010

INVENTORY No.	SIGN. & DATE	REF. DRG. NO.
ADDITIONAL INFORMATION STATUS OF DRAWING M DISTRIBUTION OF PRINTS OFFICE COPY - 1, RFM - 4 TCK(RFM) - 1		
REV	DATE	ALTERED
		CHECKED
		APPROVED
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT OIL RIG ACPGR ONGC SIVASAGAR		
DRAWING NO. 3 721 10 10564		
DRY TYPE TRANSFORMER		
BHARAT HEAVY ELECTRICALS LTD. BHOPAL		
500 KVA, 600/415V, 3PH, 50HZ		
REF: CC-06503		
SCALE 1 : 2		
M&E/3/2010 10564		
3 721 10 10564		
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