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***Technical Specification of
Transformer With In-built Rectifier to Track
Width Mine Plough for
T-90 Tanks***



BEML LTD




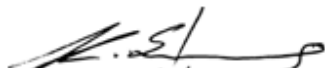
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1) GENERAL DESCRIPTION:

The Transformer with in-built Rectifier unit is required to operate the TWMP T-90 (Track Width Mine Plough) externally i.e., from the test stand. The purpose for employing this transformer unit is to provide 28V, 300A supply to the TWMP T-90 to operate. This Transformer-Rectifier unit is a 3-Phase step down transformer with built in Rectifier unit, which converts 415V, 3-phase input ac power into desired 18V, 20V, 24V, 28V, 30V, 32V dc output voltage and 110V , 220V AC output Voltage for other usage.

2) TRANSFORMER OBJECTIVE:

Supply, testing of transformer unit (with in built Rectifier) for operating Mine plough which is mounted on the test stand.

3) SUB-SYSTEMS :

The below listed Items are the subsystems of Transformer assembly:

- Transformer
- Rectifier
- MCCB (Moulded Case Circuit Breaker)
- Measuring Instruments & Accessories
- Connectors
- Cables
- Mechanical accessories

SPECIFICATION

TRANSFORMER -

- Input - 3 phase ,415V, 10KVA, 50 Hz AC
- Output – (18V, 20V, 24V, 28V, 30V, 32V) \pm 0.5V DC, 300A and 110V AC, 220 VAC \pm 10.0 VAC at 50 Hz.
- Off-Load Tap changer switch on the primary winding to select output as either (18V, 20V, 24V, 28V, 30V, 32V) DC and (110V , 220V) \pm 10.0 VAC

RECTIFIER-

- Set of suitable HRC fuses from the output of transformer to the diode assembly for SC protection purpose.
- 500A, 60mV DC shunt.

MCCB (Moulded Case Circuit Breaker)-

- 25A Triple pole supply moulded case circuit breaker to make transformer ON/OFF & also to protect transformer in the event of over load.
- Double pole MCCB for the supply on indicator lamp.

MEASURING INSTRUMENTS & ACCESSORIES -

- DIN 96 X 90 deg Voltmeter scaled 0-35V DC to measure output voltage of the transformer.
- DIN 96 X 90 deg Ammeter scaled, 0-500A DC to measure Output current of the transformer.
- DIN 96 X 90 deg voltmeter scaled 0-500V AC with switch to measure input voltage of transformer.
- DIN 96 X 90 deg Voltmeter scaled 0-240 V AC to measure output voltage of the transformer.
- DIN 96 X 90 deg Ammeter scaled, 0-500A AC to measure Output current of the transformer.
- 500A, 60mV DC shunt.
- Green LED's to be provided to indicate the transformer input is ON and for Output is ON.

CONNECTORS-

- GARO model P-463-6 pin input connector to take 3-phase, 415V supply from wall socket.
- Heavy duty socket SB-ORD-277 IV* wired to the diode assembly to provide the output from transformer.
- Heavy duty pin connector AB-ORD-1013 to mate with the output socket of the transformer.
- Socket TV06RW-25-01-ASN to provide the O/P of transformer to input pin of fuse box of the TWMP T-90.

CABLES –

- 15 Meter, 4 core, 6 sq mm, 20A cable to harness the 3-phase, 415 V supply from wall socket to input power adaptor box of transformer through GARO connector P-463-6.
- 5 Meter , output cable 4x25 sq mm, 4x16 AWG to accept a free issue heavy duty socket to harness the output from transformer to fuse box of TWMP T-90. Vendor has to choose output cable such that it should withstand upto 560A

MECHANICAL ARRENGEMENT-

- Transformer cabinet dimension 750x750x1000mm (approx), & it should be dust proof, & water proof.
- Transformer should be Air cooled.
- Transformer should have mild steel enclosure with lifting lugs, heavy duty casters & removable top cover.
- 4 Movable wheels on the base of transformer assembly.

4) **TECHNICAL SPECIFICATIONS:-**

SL. No	DESCRIPTION	QTY	SPECIFICATION	MAKE	COMPANY STD. / IS STD.	Wt/Kg
1	Transformer Cabinet	1	750x750x1000 mm (Approx)	Rittal/Preston		
2	Input cable	1	4 Core,6 Sq mm,20A Length-15 Meter	Raychem		
3	Output cable	1	4x25 Sq mm, 4x16 AWG	Raychem		
4	Voltmeter	1	0-35V DC,90 DEG Scale	CONCEPT Electronics		
5	Ammeter	1	0-500A DC ,90 DEG Scale	CONCEPT Electronics		
6	Input Connector(P)	1	Garco Model P-463-6	GARO		
7	Output connector(S)	1	TV06RW-25-01-ASN	Amphenol		
8	Switch	1	Tap change to select output as	SCHNEIDER Electrical		

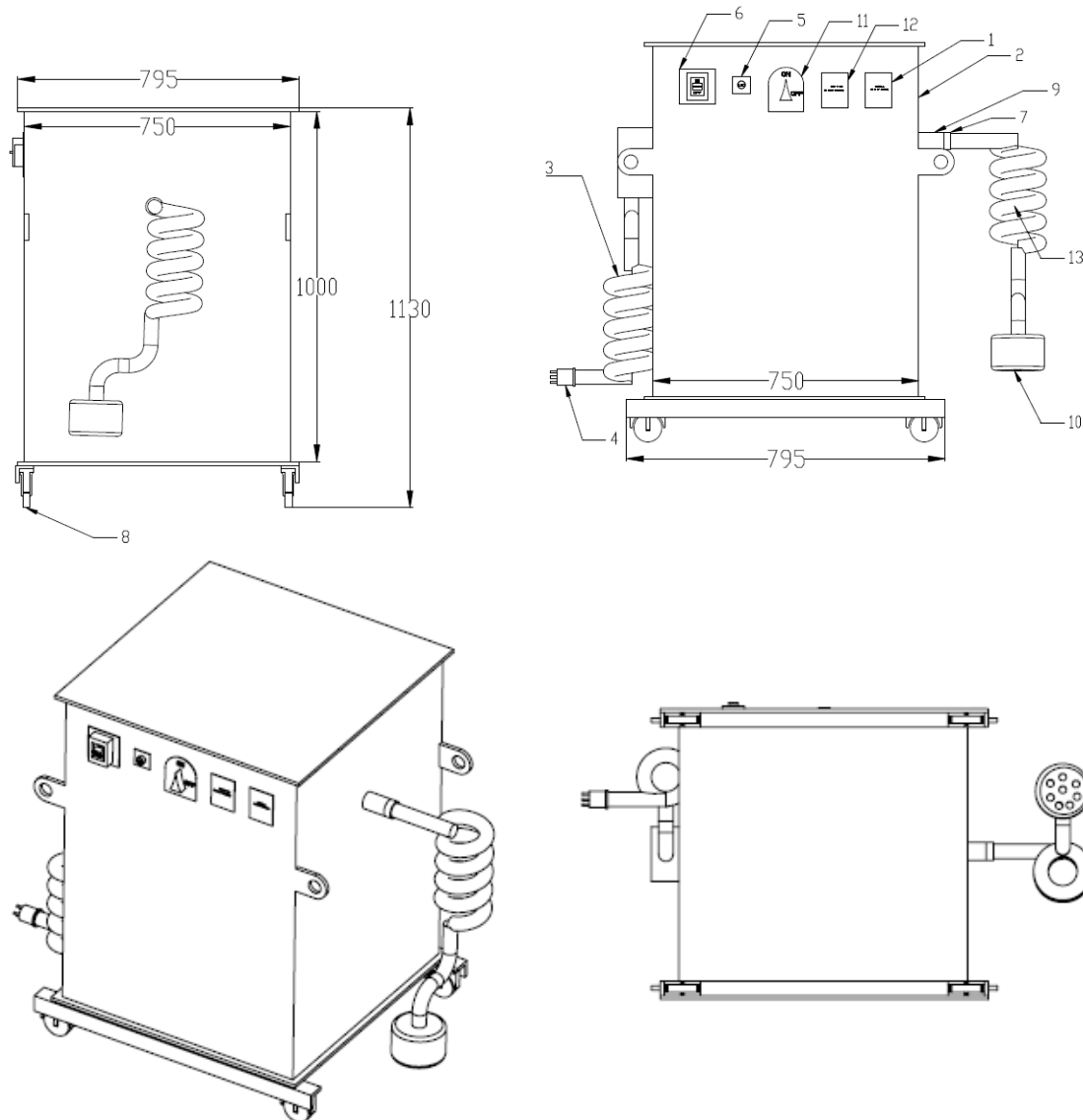
Specification of Transformer with in-built rectifier for Track width Mine Plough for T-90

			24/28 V			
9	LED	1	Green LED	CONCEPT Electronics		
10	MCCB	1	25A, Triple pole MCB	SCHNEIDER Electric		
11	PIN	1	AB-ORD-1013	AB Connectors Limited		
12	Roller	4	Heavy duty caster wheels	-----		
13	Socket	1	SB-ORD-277 IV*	AB Connectors Limited		
14	Voltmeter	1	0-240V AC, 90 DEG Scale	CONCEPT Electronics		
15	Ammeter	1	0-500A ,90 DEG Scale	CONCEPT Electronics		
16	Voltmeter	1	0-500V AC, 90 DEG Scale	CONCEPT Electronics		

Table-1

*Connector only has two pins, the transformer positive output should be connected to the positive terminal of connector and the negative output of the transformer should be connected to the negative terminal of the connector

5) TRANSFORMER MODEL:



Note:

The S/no's 1, 2, description mentioned in above drawing are given below in Table-2

Table-2

SL. No	DESCRIPTION	QTY	SPECIFICATION	MAKE	COMPANY STD./IS STD.	Wt/Kg
01	AMMETER	01	0-500A DC 90 DEG SCALE	CONCEPT ELECTRONICS		
02	CABINET	01	750x750x1000 MM (APPROX.)	RITTAL / PRESTON		
03	INPUT CABLE	01	4 CORE, 6 SQ MM, 20A, LENGTH-15MM	RAYCHEM		
04	INPUT CONNECTOR	01	GARO MODEL P-463-6	GARO		
05	LED	01	GREEN LED	CONCEPT ELECTRONICS		
06	MCCB	01	25A, TRIPLE POLE MCCB	SCHNEIDER ELECTRIC		
07	PIN	01	AB-ORD-1013	AB CONNECTORS LIMITED		
08	ROLLER	04	HEAVY DUTY CASTER WHEELS	---		
09	SOCKET	01	SB-ORD-277 IV	AB CONNECTORS LIMITED		
10	OUTPUT CONENCTOR	01	TV06RW-25-01-ASN	AMPHENOL		
11	SWITCH	01	TAP CHANGE TO SELECT OUTPUT AS 24 & 28V	SCHNEIDER ELECTRIC		
12	VOLTMETER	01	0-35 V DC, 90 DEG SCALE	CONCEPT ELECTRONICS		
13	OUTPUT CABLE	01	4x25 SQ MM, 4x16 AWG	RAYCHEM		

14	Voltmeter	1	0-240V AC,90 DEG Scale	CONCEPT Electronics		
15	Ammeter	1	0-500A AC ,90 DEG Scale	CONCEPT Electronics		
16	Voltmeter	1	0-500V AC,90 DEG Scale	CONCEPT Electronics		

6) MAINTAINABILITY FEATURES:

The following maintainability features should be incorporated in the Transformer Assembly.

- a. The input and output cables carrying power should be tagged for easy identification. Polarity of the connectors should be indicated for proper connection.
- b. Easy accessibility of fuses and other accessories in case of repair
- c. Protective cap for all plugs and sockets should be provided to avoid any damage

7) ACCEPTANCE CRITERIA:

Transformer unit should comply following test standards as per **IS: 2026** are mentioned below:

7.1) ROUTINE TESTS:-

Following tests shall constitute the routine test,

Transformer shall be subjected to routine tests as per IS: 2026, all results obtained during the tests shall be furnished to BEML in triplicate for approval/comments.

- a) Measurement of winding resistance
- b) Measurement of voltage ratio, polarity, & phase relationship.
- c) Measurement of Impedance voltage/short circuit impedance.

- d) Measurement of no load losses & no load current.
- e) Measurement of load losses.
- f) Measurement of insulation resistance.
- g) Induced over voltage withstand test.
- h) Separate source voltage withstand test.
- i) Unbalance current test (unbalanced current should not be more than 2% of full load current in neutral at full load condition.
- j) Test on on-load tap-changer.

7.2) TYPE TEST:-

- a) Impulse voltage withstand test
- b) Temperature rise test
- c) Short circuit test
- d) Heat run test

7.3) TEST CERTIFICATES:-

The transformer offered / supplied shall be fully type tested as per the relevant standards & all test reports shall furnish along with transformer unit to BEML.

NOTE:-

- a) Visual inspection is to be made to verify that there is no damage to transformer – rectifier unit.
- b) Transformer unit should be Dust proof & water proof there should be no leakage from transformer. IP65 ingress protection has to be maintained.
- c) Meters, Indicators should be in good condition & working properly.
- d) All the tests should be carried out in the presence of BEML representative.
- e) **Sealing requirements:** The Transformer-Rectifier system should have complete sealing for water ingress.
- f) **EMI/EMC specification:** The Transformer-Rectifier system should not have any EMI/EMC interference. It should be compliant with MIL-STD-461F.

8) MARKING ON TRANSFORMER:-

- . Following information should be given on the rating plate
 - Indication of source of manufacturer;

- Reference to this Indian Standard i.e., Ref to **IS:2026**
- Type & Manufacturer serial no.
- Range of current minimum & maximum.
- Duty cycle at maximum current.
- Rated input voltage, frequency, no. of phases.
- Type of cooling.
- Mass.
- Class of insulation.
- Country of manufacture.
- The polarity of the output terminals shall be marked in relation to polarity. in the following manner :
 - a) Positive terminal as '+', and
 - b) Negative terminal as '-'

9) SCOPE OF SUPPLY:-

SN	Description	BEML Part No. / Drawing No.
1	Transformer with in-built rectifier	710 ZZ 00463

The transformer rectifier unit to be supplied shall consists of-

- a) Input 3-phase 415V Transformer with output (18V, 20V, 24V, 28V, 30V, 32V) \pm 0.5V DC,300A and (110 , 220) VAC \pm 10.0 VAC at 50 Hz
- b) Mild steel enclosure with lifting lugs .Heavy duty casters & Removable top cover.
- c) 25A triple pole supply miniature circuit breaker.
- d) Set of open fuses from the output of transformer to diode assembly.
- e) 3-phase diode assembly with aluminum heat sink.
- f) 500A, 60mV DC shunt.
- g) Double pole MCCB for the supply and indicator lamp.
- h) DIN 96, 90 deg Ammeter scaled 0-500A DC
- i) DIN 96 ,90 deg voltmeter scaled 0-500V DC
- j) OFF-Load Tap change switch on the primary winding to select output as either 24V or 28V.

- k). 15 Meter, 4 core, 6 sq mm, 20A cable to harness the 3-phase, 415 V supply from wall socket to input power adaptor box of transformer through GARO connector P-463-6.
- l). 5 Meter , output cable 4x25 sq mm ,4x16 AWG to accept a free issue heavy duty socket to harness the output from transformer to fuse box of TWMP T-90. Vendor has to choose output cable such that it should withstand up to 560A.
- m) DIN 96 ,90 deg voltmeter scaled 0-500V for AC.
- n) DIN 96, 90 deg Ammeter scaled 0-500A for AC.
- o) Two sets of tools required for maintenance and 1 No. digital multimeter and 1 No. Digital Clamp multimeter of Fluke make for each unit..

Note: Supplier has to Develop and Supply, as per PTS Document No.: BEML/R&D DEF/TWMP T-90/TRANS RECT/0001 dated 12 Aug 2020. In the event of insufficient details and any deviation in the selection of materials, aggregates, components, systems and sub-system will be in consultation and clearance obtained from BEML before development.

10) DELIVERABLES:-

- a) Transformer with in-built rectifier unit should be packed with bubble sheet & thin plastic material & should be enclosed in wooden box while dispatching the item to BEML by the vendor.
- b) Transformer unit should be painted in smoke gray colour meeting all the paint standards by the vendor.
- c) All the test certificates (Type test, Routine test, etc) should be submitted along with transformer unit.
- d) Vendor should provide service manual/user catalogue/maintenance manual along with transformer with in-built rectifier unit.

11) PERFORMANCE GAURANTEE:-

- a) Guarantee period shall be 12 months from the date of commissioning or 18 months from the date of supply whichever is earlier. If Transformer-rectifier unit fails during this guarantee period, the supplier shall be repair the same at his cost at his works.
- b) If supplier situated outside KGF shall have to establish suitable & adequate arrangement for repairing & testing of failed transformer in KGF at his own cost. This arrangement have to be continued upto the completion date of guarantee period.