

7424671/2023/EEMRT-ENE51

**Mehru Electrical & Mechanical Engineers (P) Ltd.**

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 CIN : U29299RJ1995PTC010898 email : sales@mehru.net / mehruworks@vsnl.com

**NOTE : DRAWING APPROVAL SUBJECT TO VALID TYPE TEST REPORTS, TO BE CHECKED DURING ACCEPTANCE TESTS.**  
**GTP FOR 220 KV CAPACITOR VOLTAGE TRANSFORMER**

Rev No. 01 / Doc No. 220CVT-GTP-01

1	Name and address of manufacturer	Mehru Electrical & Mechanical Engineers Pvt. Ltd.,		
		SP-2,180,KEHRANI Industrial Area,		
		Bhiwadi - 301019 (Rajasthan), India		
2	Manufacturer's type designation	Outdoor, Oil Cooled, Single Phase,		
		Single Pole Insulated, Capacitor Voltage Transformer		
a)	Type of installation	Outdoor pedestal mounting		
3	Standards applicable	IS 16227 /IEC 61869		
4	Rated primary voltage $U_r$ (kV)	220 kV/ $\sqrt{3}$		
5	Rated secondary voltage (V)	110 V/ $\sqrt{3}$		
a)	Rated Transformation Ratio	220kV/ $\sqrt{3}$ /110V/ $\sqrt{3}$		
6	Number of secondary	Three		
7	Rated frequency (Hz)	50 Hz		
8	Rated output of each secondary winding (VA)	Winding-1	Winding -2	Winding-3
		50 VA	50 VA	50 VA
9	Total simultaneous burden (VA)	50 VA	50 VA	50 VA
10	Rated total thermal burden (VA)	300VA		
11	Highest system voltage (kV)	245 kV		
12	Rated voltage factor and corresponding rated time	1.2 Continuous & 1.5 for 30 Seconds		
13	Accuracy class of each secondary winding	Winding-1	Winding -2	Winding-3
		3P	3P	0.2
14	Capacitance			
	i) of high voltage capacitor (pF)	4700 pF		
	ii) of intermediate voltage capacitor (pF)	79000 pF		
15	Equivalent capacitance (pF)	4400 pF (+10%-5% )		
16	Natural frequency of CVT (kHz)	> 500 kHz		
17	Self tuning frequency of CVT (kHz)	> 500 kHz		
18	Band width (kHz)	40kHz to 500kHz		
19	Maximum Temperature over ambient (50 Deg.C)	50 Deg. C		
20	One minute power frequency test voltage of secondary winding (kV rms)	3 kV		
21	One minute power frequency test voltage of H.F. terminal (kV rms)	4 kV		
22	One minute power frequency test voltage of (kV rms) (dry & wet)	460 kV		
23	1.2/50 micros impulse withstand test voltage of Capacitor (kVp)	1050 kVp		
24	250/2500 micros switching surge withstand voltage of capacitor (dry & wet) (kVp)	NA	Chief Engineer (Projects)	
25	Max. Radio Interference voltage at 1.1 $U_r$ /Root 3 at 1.0 MHz (Micro volts)	< 1000 micro volts	APTransco	
26	Total weight (kg)	430 KGS (Approx)		
27	Quantity of oil	25 kgs. FOR CAPACITOR UNIT (IEC-60867) SYNTHETIC OIL 60 kgs. FOR EMU (IEC-60296) MINERAL OIL		
28	Whether CVTs are hermetically sealed if so how	Yes, SS Bellow		

1) Minimum 300mm plinth shall be maintained for CT/PT/CVT/Isolators in the substation during foundation works to ensure safe live to ground clearances as per IE rules.

2) Since the supply of terminal connectors is not in the scope of manufacturer as mentioned in the drawings, the EPC contractors shall be instructed to supply the same in line with CT/PT/CVT/Isolators requirement and compatibility.

**GTP FOR 220 KV CAPACITOR VOLTAGE TRANSFORMER**

Rev No. 01 / Doc No. 220CVT-GTP-01

29	Whether similar equipment is type tested	We confirm
30	Total Creepage Distance	6125 mm (minimum)
31	Primary terminal	30 DIA , 80mm long
32	Mounting Dimension	450±5mm x 450±5mm, 20±2 Dia
33	Siesmic Acceleration	0.5g
34	Cantilever Strength of bushing	500kgf
35	Range of frequency for which accuracy are valid	Metering = 99% to 101% (49.5 Hz to 50.5 Hz) & protection = 96% to 102 % (48 Hz to 51 Hz)
36	Type of Oil Used	for CVD - Synthetic Oil, for EMU - Mineral Oil as per IS 335
37	Dielectric material for capacitor unit	1. Capacitor tissue paper 2. BOPP Films (Biaxially oriented plain polypropelene film)
38	Equivalent series resistance over entire range	< 40 Ohms
39	Partial Discharge	at Um = 10pC & 1.2 Um/root 3 = 5pC (Max.)
40	Tan Delta	<0.5%
41	Stray capacitance & Conductance	200pF & 20µS (Max.)
42	Maximum Altitude	1000 Mtrs
43	IP protection for terminal box	IP-55
44	Insulation class	Class "A"
45	Minimum clearance between phases recommended (mm)	Not in our scope
46	Minimum center to center spacing recommended (mm)	Not in our scope
47	Minimum distance from nearby earthed objects (mm)	Not in our scope
48	Tank material & Tank coating	Tank- M.S. & Tank coating- Hot dip galvanized
49	Hardware exposed to atmosphere	Hot Dip Galvanized



1) Minimum 300mm plinth shall be maintained for CT/PT/CVT/Isolators in the substation during foundation works to ensure safe live to ground clearances as per IE rules.

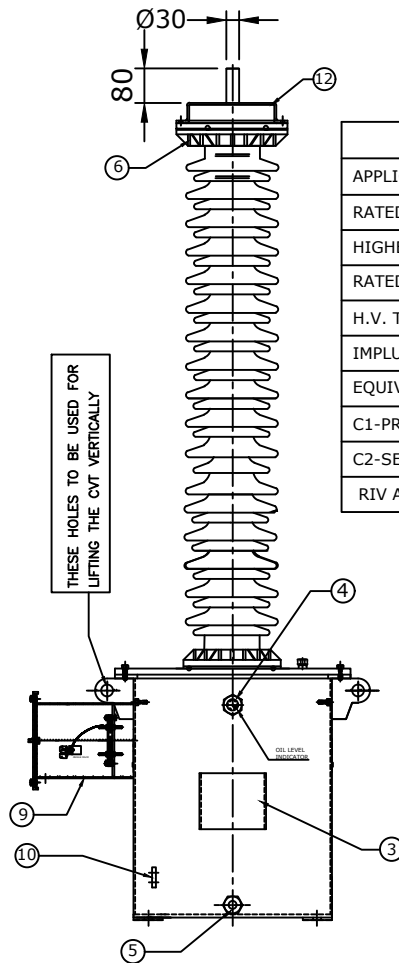
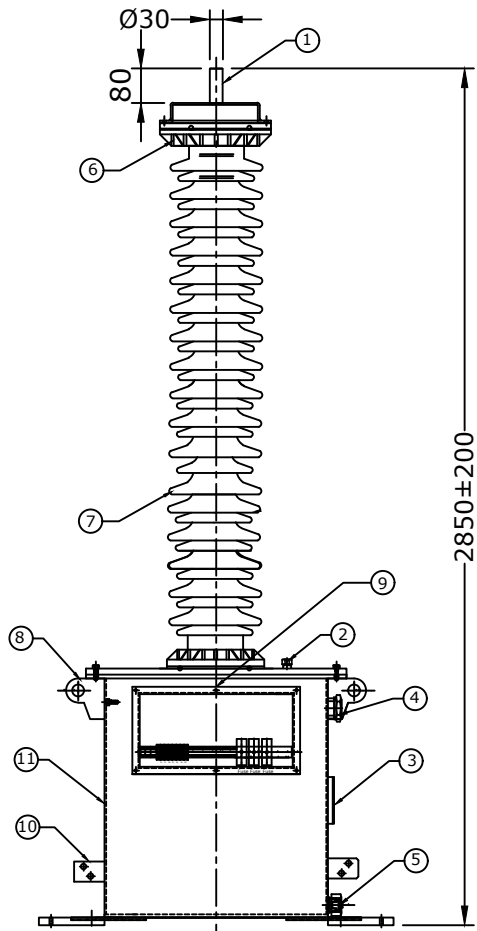
2) Since the supply of terminal connectors is not in the scope of manufacturer as mentioned in the drawings, the EPC contractors shall be instructed to supply the same in line with CT/PT/CVT/Isolators requirement and compatibility.

**NOTE : DRAWING APPROVAL SUBJECT TO VALID TYPE TEST REPORTS, TO BE CHECKED DURING ACCEPTANCE TESTS.**

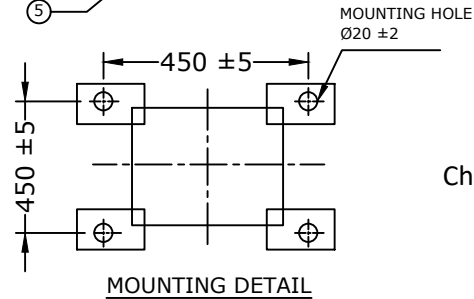
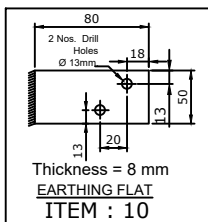
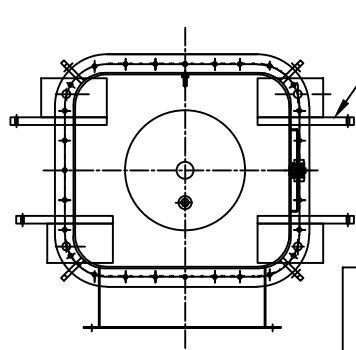
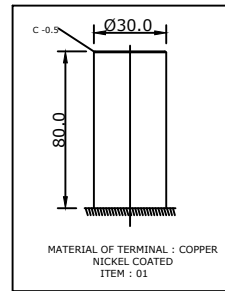
Chief Engineer (Projects)

APTransco

Drawing approval subject to valid vendor registration



TECHNICAL DETAILS :-	
APPLICABLE STANDERED	IS : 16227/IEC-61869
RATED VOLTAGE	220kV/√3
HIGHEST SYSTEM VOLTAGE	245 kV
RATED FREQUENCY	50 Hz
H.V. TEST VOLTAGE	460kV rms for 1 Min
IMPLUSE TEST VOLTAGE	1050 kVp
EQUIVALENT CAPACITANCE	4400pF (+10% -5%)
C1-PRIMARY CAPACITANCE	4700pF (Approx)
C2-SECONDARY CAPACITANCE	79000pF (Approx)
RIV AT 156 kV	≤ 1000 μV



REV.	REVISION DESCRIPTION	DATED INITIALS
R2	COMMENT UPDATED	27.05.2023
R1	COMMENT UPDATED	25.05.2023
R0	FOR APPROVAL	22.05.2023
REV.	REVISION DESCRIPTION	DATED INITIALS

Chief Engineer (Projects)

APTransco

UNLESS OTHERWISE SPECIFIED  
 1. ALL DIMENSIONS IN mm  
 2. TOLERANCE WHEREVER NOT INDICATED : ±5%

S.No.	DESCRIPTION	QTY	MATL
1	H.T TERMINAL	1	COPPER NICKEL COATED
2	OIL FILLING PLUG	2	BRASS/M.S(HDG)
3	NAME AND RATING PLATE	1	AL. ANODIZED
4	OIL LEVEL INDICATOR	1	BRASS+ TOUGHENED GLASS
5	OIL DRAIN PLUG	1	M.S (HDG)
6	BUSHING FLANGE	2	GI/CI
7	BUSHING (JOINTED)	1	PORCELAIN
8	LIFTING HOOK	4	M.S (HDG)
9	SECONDARY TERMINAL BOX	1	M.S (HDG)
10	EARTHING TERMINAL (FLAT)	2	M.S (HDG)
11	TANK WITH COVER (EMU)	1	M.S (HDG)
12	HOOD	1	ALUMINUM

NOTES :-

- NOMINAL CREEPAGE DISTANCE - 6125 mm.
- OIL QUANTITY :-  
 25 kgs. FOR CAPACITOR UNIT (IEC-60867) SYNTHETIC OIL  
 60 kgs. FOR EMU (IEC-60296) MINERAL OIL
- TOTAL WEIGHT OF CVT :- 430 KGS.
- WEIGHTS INDICATED ARE APPROXIMATE
- ALL FERROUS PARTS EXPOSED TO THE ATMOSPHERE SHALL BE HOT DIP GALVANIZED AS PER IS 4759 & 2629.
- MAKE OF BUSHING : IEC/ABIL/MODERN/BHEL/CJI
- INSULATION CLASS : 'A'
- FOR GASKET (CORK) JOINTS WHEREVER USED, NITRITE BUTYL RUBBER GASKETS SHALL BE USED. THE GASKET SHALL BE FITTED IN PROPERLY MACHINED GROOVE WITH ADEQUATE SPACE FOR ACCOMMODATING THE GASKET UNDER COMPRESSION.

NAME	DATE	MATERIAL
DGN. SPS	22.05.2023	AS ABOVE
DRN. SWET	22.05.2023	
CHD. BLS	22.05.2023	
SCALE:	N.T.S	

TITLE:  
 GENERAL ARRANGEMENT DRAWING FOR  
 220KV CAPACITOR VOLTAGE TRANSFORMER

**MEHRU**  
 MEHRU ELECTRICAL AND MECHANICAL ENGINEERS PRIVATE LIMITED.

SCALE: N.T.S

DRAWING NO.: ME-220CVT-GA-01-R2



**CAPACITOR VOLTAGE TRANSFORMER**  
MAKE TO IS : 16227/IEC-61869

**NOTE : DRAWING APPROVAL SUBJECT TO VALID TYPE TEST REPORTS, TO BE CHECKED DURING ACCEPTANCE TESTS.**

HIGHEST SYSTEM VOLTAGE	245 kV
RATED LINE VOLTAGE	220 kV
Equivalent Capacitance	4400pF (+10%-5%)
FREQUENCY	50 Hz
OVERVOLTAGE FACTOR	1.5 FOR 30 SECONDS
CONTINUOUS VOLTAGE FACTOR	1.2
TEMPERATURE CATEGORY	-10°C to + 50°C
INSULATION LEVEL	460/1050(kVp)
SIMULTANEOUS BURDEN	50 VA - 50 VA - 50 VA
THERMAL BURDEN	300 VA
SERIAL No.	
NOMINAL INTERMEDIATE VOLTAGE	-8kV
NOMINAL CREEPAGE DISTANCE	- 6125 mm.

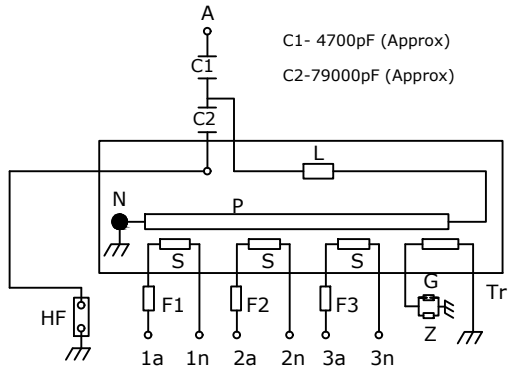
RATED PRIMARY VOLTAGE	220kV/√3
WDG I	RATED SECONDARY VOLTAGE 110 V / √3
	SECONDARY CONNECTION 1a -1n
	BURDEN 50 VA
	CLASS 3P
WDG II	RATED SECONDARY VOLTAGE 110 V / √3
	SECONDARY CONNECTION 2a -2n
	BURDEN 50 VA
	CLASS 3P
WDG III	RATED SECONDARY VOLTAGE 110 V / √3
	SECONDARY CONNECTION 3a -3n
	BURDEN 50 VA
	CLASS 0.2
YEAR OF MFD.	
PO. NO.	

Drawing approval subject to valid vendor registration

**NOTES:**

1. MATERIAL OF NAME PLATE : AL. ANODIZED.
2. THICKNESS OF NAME PLATE : 1.2 mm.
3. SERIAL NO. SHALL BE ENGRAVE BEFORE DISPATCH.

**CAUTION : WHEN HF TERMINAL IS NOT IN USE IT SHOULD BE SHORTED TO EARTH.**



- A - HV TERMINAL
- C1 - PRIMARY CAPACITANCE
- C2 - SECONDARY CAPACITANCE
- HF - HIGH FREQUENCY TERMINAL
- L - COMPENSATING REACTOR
- F1, F2 & F3 - HRC FUSE 16Amp.
- Z - G - FERRO- RESONANCE SUPPRESSION CIRCUIT
- P - PRIMARY WINDING OF INTERMEDIATE VT
- S - SECONDARY WINDING OF INTERMEDIATE VT
- Tr - INTERMEDIATE VOLTAGE TRANSFORMER

MADE IN INDIA BY:  
**MEHRU ELECTRICAL AND MECHANICAL ENGINEERS (P) LTD.**  
SP-2 180,KEHRANI RIICO INDUSTRIAL AREA, BHIWADI-301019 ( RAJASTHAN)

Chief Engineer (Projects)

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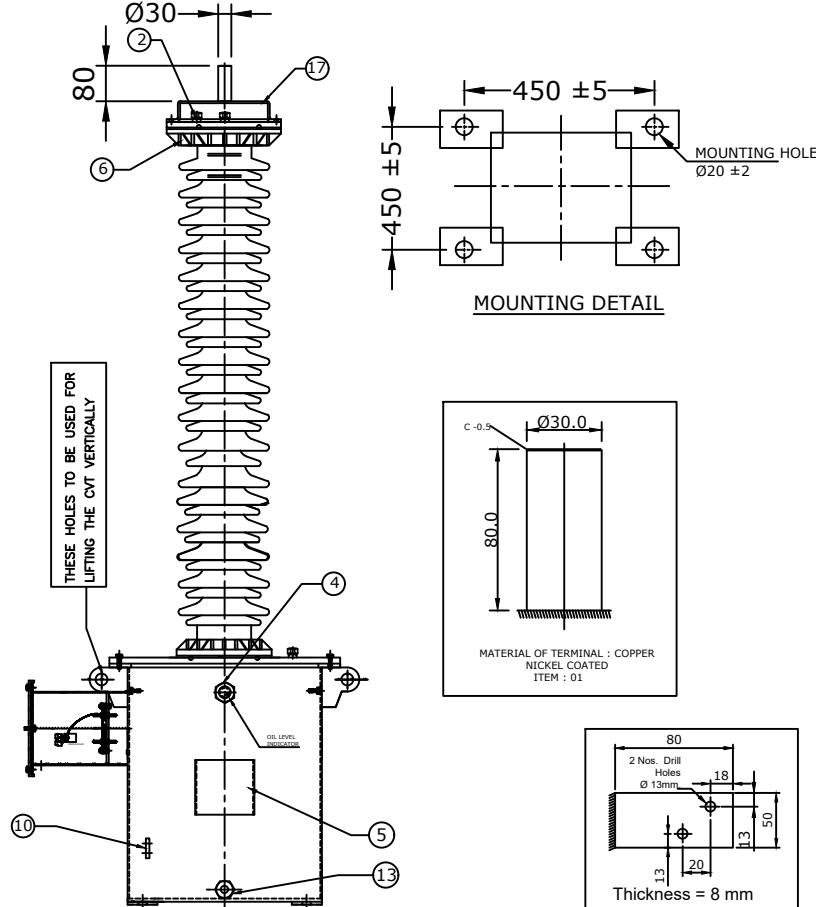
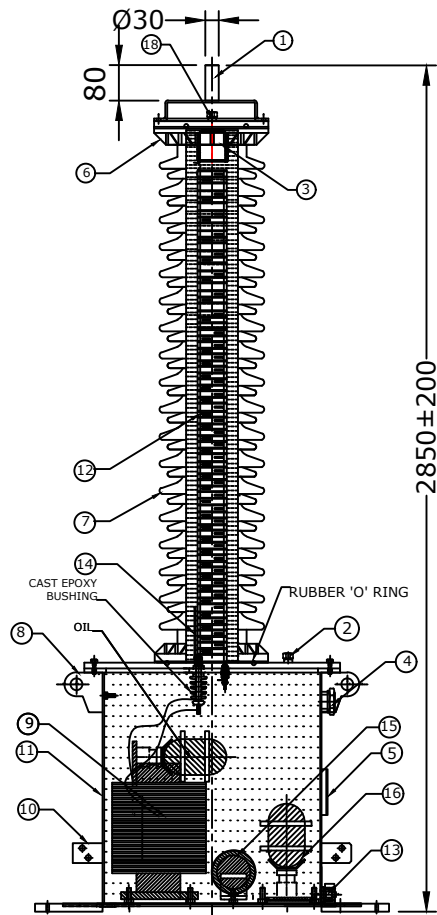
180 ±20

190 ±25

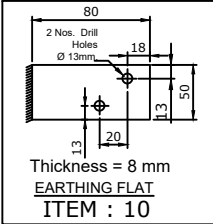
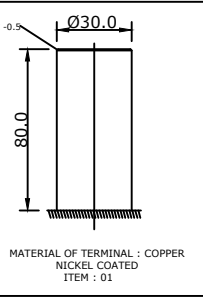
R2	COMMENT UPDATED	27.05.2023
R1	COMMENT UPDATED	25.05.2023
R0	FOR APPROVAL	22.05.2023
REV.	REVISION DESCRIPTION	DATED INITIALS

UNLESS OTHERWISE SPECIFIED 1. ALL DIMENSIONS IN mm 2. TOLERANCE WHEREVER NOT INDICATED : ±5%	DGN.	SPS	22.05.2023	MATERIAL AL. ANODISED	
	DRN.	SWET	22.05.2023		
	CHD.	BLS	22.05.2023		
	SCALE:	N.T.S			
TITLE: NAME PLATE DRAWING FOR 220KV CAPACITOR VOLTAGE TRANSFORMER				SCALE: N.T.S	
				DRAWING NO.:	ME-220CVT-NP-01-R2

Drawing approval subject to valid vendor registration

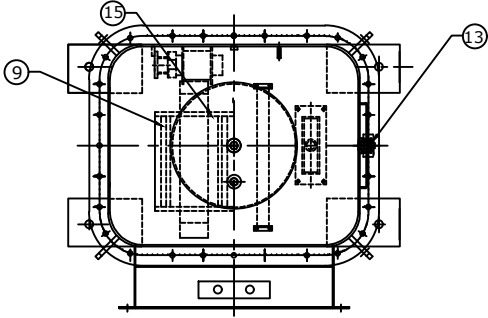


THESE HOLES TO BE USED FOR LIFTING THE CVT VERTICALLY

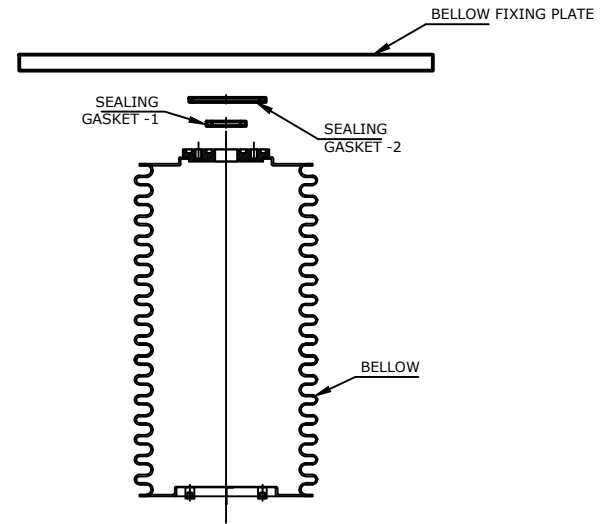


NOTES :-

1. NOMINAL CREEPAGE DISTANCE - 6125 mm.
2. OIL QUANTITY :-  
25 kgs. FOR CAPACITOR UNIT (IEC-60867) SYNTHETIC OIL  
60 kgs. FOR EMU (IEC-60296) MINERAL OIL
3. TOTAL WEIGHT OF CVT :- 430 KGS.
4. WEIGHTS INDICATED ARE APPROXIMATE
5. ALL FERROUS PARTS EXPOSED TO THE ATMOSPHERE SHALL BE HOT DIP GALVANIZED AS PER IS 4759 & 2629.
6. MAKE OF BUSHING : IEC/ABIL/MODERN/BHEL/CJI
7. INSULATION CLASS : 'A'



S.No.	DESCRIPTION	QTY	MATL
1	H.T TERMINAL	1	COPPER NICKEL COATED
2	OIL FILLING PLUG	2	BRASS/M.S(HDG)
3	BELLOW	1	S.S
4	OIL LEVEL INDICATOR	1	BRASS+ TOUGHENED GLASS
5	NAME AND RATING PLATE	1	AL. ANODIZED
6	BUSHING FLANGE	2	GI/CI
7	BUSHING (JOINTED)	1	PORCELAIN
8	LIFTING HOOK	4	M.S (HDG)
9	INDUCTION VOLTAGE TRANSFORMER	1	CRGO/COPPER
10	EARTHING TERMINAL (FLAT)	2	M.S (HDG)
11	TANK WITH COVER (EMU)	1	M.S (HDG)
12	CAPACITOR ELEMENT	1	COPPER/PAPER
13	OIL DRAIN PLUG	1	M.S (HDG)
14	VOLTAGE DIVIDER TAP CONNECTION	1	STD
15	COMPENSATING REACTOR	1	STD
16	FERRO RESONANCE SUPPRESSION CIRCUIT	1	STD
17	HOOD	1	ALUMINUM
18	NITROGEN VALVE	1	BRASS

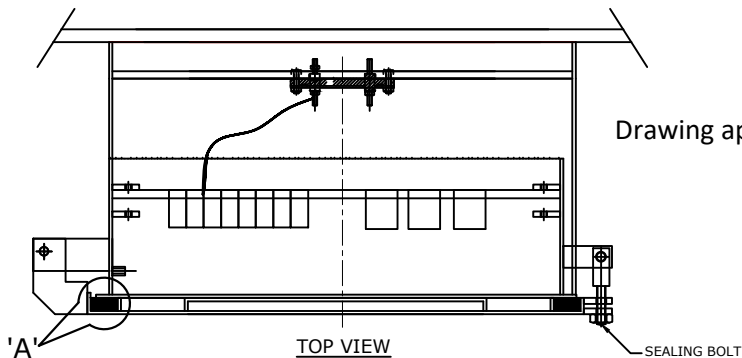


Chief Engineer (Projects)

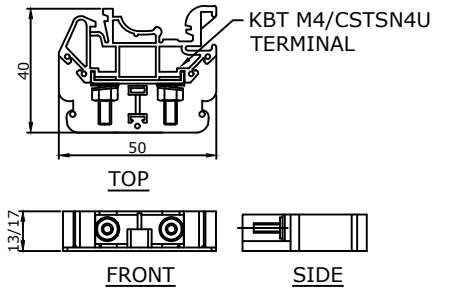
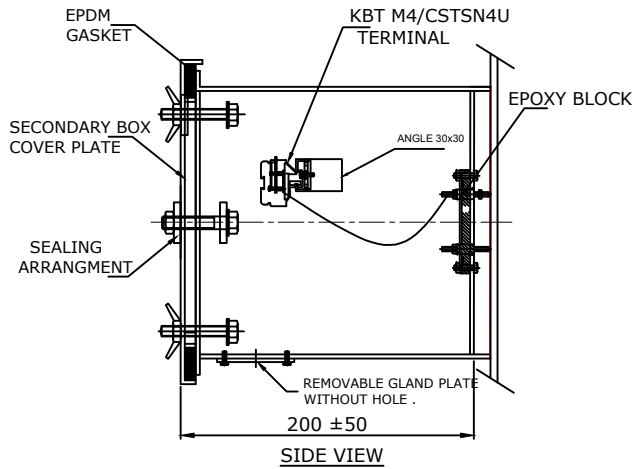
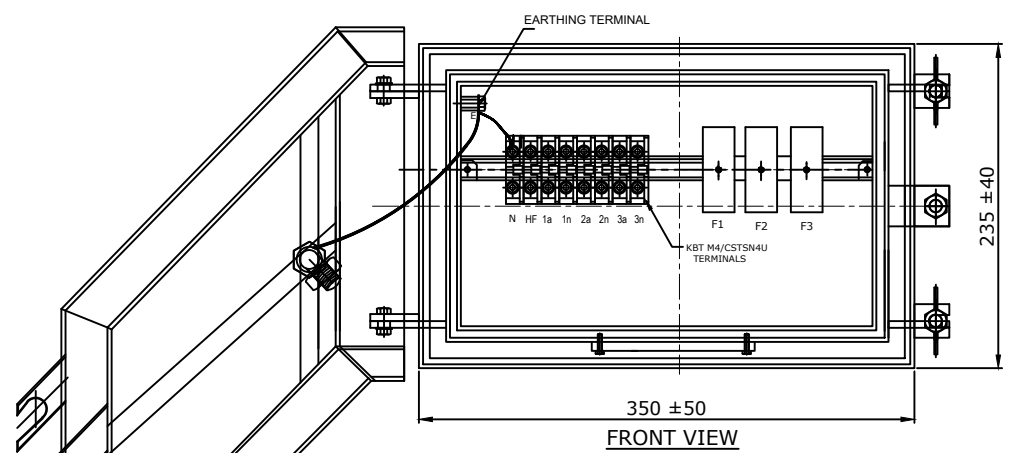
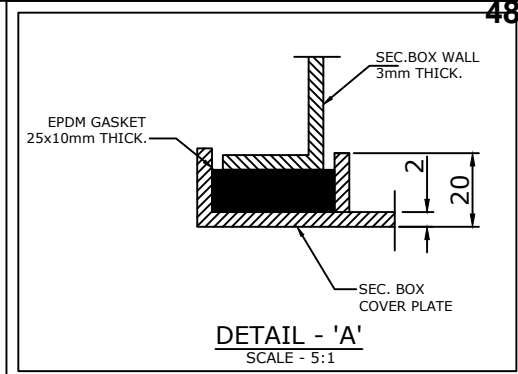
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REV.	REVISION DESCRIPTION	DATED INITIALS
R2	COMMENT UPDATED	27.05.2023
R1	COMMENT UPDATED	25.05.2023
R0	FOR APPROVAL	22.05.2023

UNLESS OTHERWISE SPECIFIED 1. ALL DIMENSIONS IN mm 2. TOLERANCE WHEREVER NOT INDICATED : ±5%	NAME	DATE	MATERIAL  AS ABOVE	 MEHRU ELECTRICAL AND MECHANICAL ENGINEERS PRIVATE LIMITED.	
	DGN.	SPS			22.05.2023
	DRN.	SWET			22.05.2023
	CHD.	BLS			22.05.2023
SCALE:	N.T.S		TITLE:	SCALE:	
			SECTIONAL ARRANGEMENT DRAWING FOR 220KV CAPACITOR VOLTAGE TRANSFORMER	N.T.S	
				DRAWING NO.: ME-220CVT-SE-01-R2	



Drawing approval subject to valid vendor registration



MATERIAL : POLYAMIDE  
MAKE : ELEMEX/CONNECTWELL  
TERMINAL (DETAIL)

NOTES:-

1. SECONDARY TERMINAL BOX SHALL BE PROVIDED WITH REMOVABLE GLAND PLATE WITHOUT HOLE.
2. SECONDARY TERMINAL BOX SHALL BE PROVIDED WITH COVER.
3. M.S(HDG) SHEET THICKNESS FOR TERMINAL BOX 3.0mm & FOR COVER 2.0mm.
4. MATERIAL OF GASKET: EPDM 10mm THICK.
5. DEGREE OF PROTECTION : IP 55
6. FOR GASKET (CORK) JOINTS WHEREVER USED, NITRITE BUTYL RUBBER GASKETS SHALL BE USED. THE GASKET SHALL BE FITTED IN PROPERLY MACHINED GROOVE WITH ADEQUATE SPACE FOR ACCOMMODATING THE GASKET UNDER COMPRESSION.

F1,F2 & F3 : FUSE 16 Amp.  
HF : TAN DELTA TESTING TERMINAL  
N : NEUTRAL TERMINAL  
E : EARTHING TERMINAL

Chief Engineer (Projects)

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REV.	REVISION DESCRIPTION	DATED INITIALS
R1	COMMENT UPDATED	25.05.2023
R0	FOR APPROVAL	22.05.2023

UNLESS OTHERWISE SPECIFIED		NAME	DATE	MATERIAL
1.	ALL DIMENSIONS IN mm	DGN. SPS	22.05.2023	M.S(HDG)
2.	TOLERANCE WHEREVER NOT INDICATED : ±5%	DRN. SWET	22.05.2023	
		CHD. BLS	22.05.2023	
		SCALE: N.T.S		

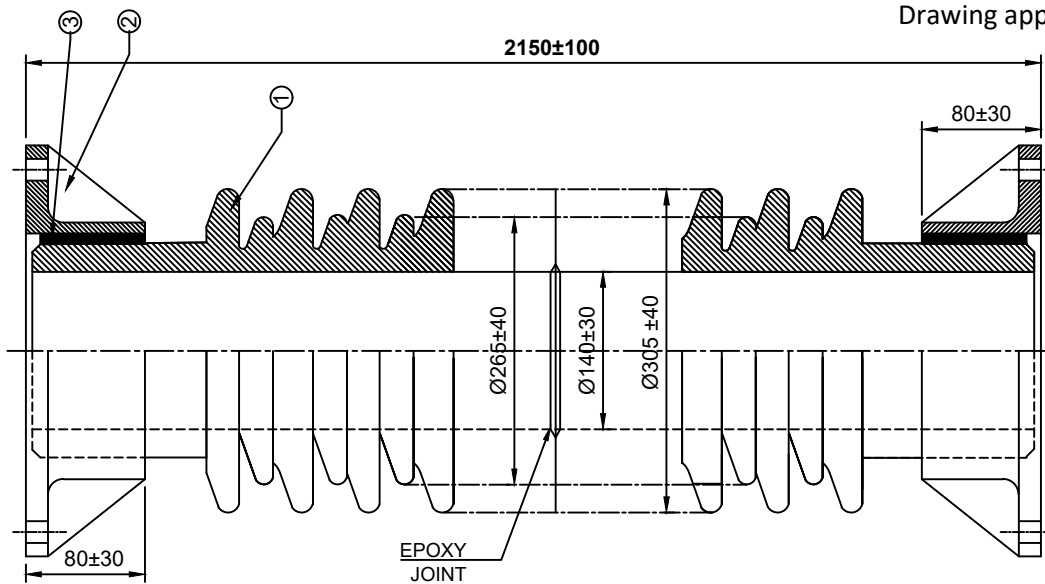
TITLE:  
SECONDARY TERMINAL BOX DRAWING FOR  
220KV CAPACITOR VOLTAGE TRANSFORMER

**MEHRU**  
MEHRU ELECTRICAL AND MECHANICAL ENGINEERS PRIVATE LIMITED.

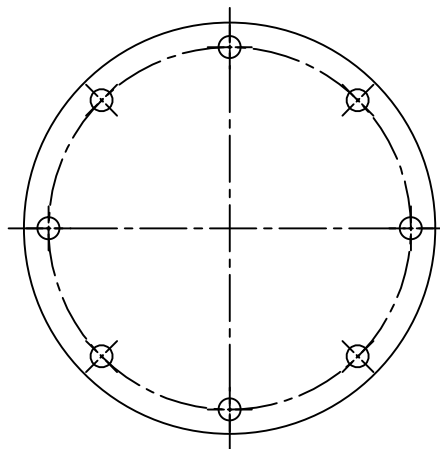
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DRAWING NO.: ME-220CVT-STB-01-R1

Drawing approval subject to valid vendor registration



FRONT VIEW

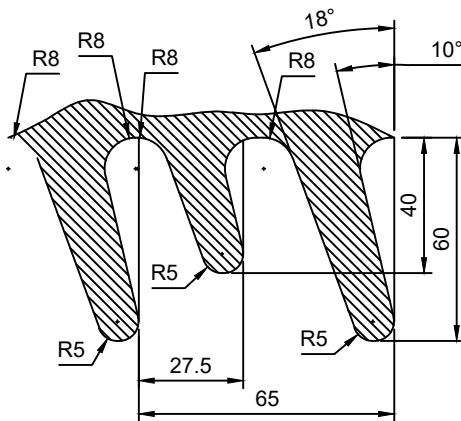


BOTTOM VIEW

\* MAKE OF BUSHING : IEC/MODERN/BHEL/ABIL/CJI

NOTES:-

1. Electrical Insulation level :-460 kV/1050 kV(P)
2. Nominal creepage distance - 6125 mm.
3. Cantilever load :- 500kgf
4. Colour of Glaze : BROWN.
5. Unspecified test & Tolerance as per IEC: 62155, IEC-815, IS:5621-1980
6. One epoxy joint (Maximum)



Shed Profile

Chief Engineer (Projects)

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Item No.	Description	Material
1	INSULATOR	Porcelain
2	FLANGES	MCI/SGI/ALU.
3	CEMENT	Portland

UNLESS OTHERWISE SPECIFIED 1. ALL DIMENSIONS IN mm 2. TOLERANCE WHEREVER NOT INDICATED : ±5%	DGN.	NAME	DATE	MATERIAL PORCELAIN	 MEHRU ELECTRICAL AND MECHANICAL ENGINEERS PRIVATE LIMITED.
	DRN.	SWET	22.05.2023		
	CHD.	BLS	22.05.2023	SCALE: N.T.S	
	SCALE:	N.T.S		TITLE: HOLLOW PORCELAIN BUSHING DRAWING FOR 220KV CAPACITOR VOLTAGE TRANSFORMER	
REV.	FOR APPROVAL	22.05.2023			
	REVISION DESCRIPTION	DATED INITIALS			

As per IEC 62155, the drawing is for reference only. The drawing is not to be used for manufacturing without the approval of the design engineer.