

MT-PML-R7-3P-DNH-3MVA-YE-LT-DF-A6-BB-AZ-2B4-M1

3 MVA Pad Mount Transformer - 2400V Delta Primary, 480Y/277 Wye Secondary - KNAN/Bell Green

Product ID: 296254



Larson Electronics LLC manufactures a wide variety of products, including custom built to spec designs. The pictures displayed for this unit are a general representation of form factor for the product line and may not accurately represent this exact configuration in every detail due to custom builds and changes between similar products in our standard catalog. The specifics for this configuration are listed in the specification table and supporting documentation (CAD files, Dimensional Drawing, Name Plate Diagram, Wiring Diagram, etc.). This means that specific details (receptacles, plugs, wires, connections, mounting brackets, external finishes, etc.) may not be accurately represented in images vs specifications. Please review specifications and do not order based solely on images.

MT-PML-R7-3P-DNH-3MVA-YE-LT-DF-A6-BB-AZ-2B4-M1 Pad Mount Transformer

Transformer Type: Pad Mounted, Compartmental-Type
Transformer Configuration: Liquid Filled Pad Mounted
Transformer Feed Type: Loop Feed
Operation: Step-Down Operation (Not Approved for Step-Up)
Phase: Three Phase
Capacity: 3 MVA (3000 KVA)
Vector Group: DYN1
Primary Voltage: 2400V
Primary Voltage Switch: N/A
Primary Voltage Class: 5 kV Class
Primary Phasor: Delta
Primary BIL: 45 kV
Secondary Voltage: 480Y/277
Secondary Voltage Class: 1.2 kV Class
Secondary Phasor: Wye-N
Secondary BIL: 30 kV
Frequency: 60 Hz
Temperature Rise: 65°C
Insulation Rating: Class E Insulation - 120°C, 248°F
Cooling Class: KNAN; Self-Cooled
Forced Air (Fans): None
Tap Changer: 5-position Tap Changer
Tap Qty: (2) FCAN Above Taps, (2) FCBN Below Taps
Tap %: 2.5%
Tap Changer Switch Rating: 600-Amp, 15 kV
Tap Changer Switch Location: High Voltage (HV) [Left Side] Front Compartment
Impedance: 5.0-7.5% Typical, Target 5.75%
Primary Connection Type: Dead Front

Ratings

Meets/Exceeds DOE 2016 Efficiency Ratings
Meets/Exceeds CSA Efficiency Ratings
Complies with ANSI / IEEE C57.12.00
Complies with ANSI / IEEE C57.12.28
Complies with ANSI / IEEE C57.12.29
Complies with ANSI / IEEE C57.12.34
Complies with ANSI / IEEE C57.12.35
Complies with ANSI / IEEE C57.12.70
Complies with ANSI / IEEE C57.12.110
Complies with ANSI / IEEE C57.12.131
Complies with ANSI / IEEE C62.11
Complies with ANSI / IEEE C62.22
Complies with ANSI / IEEE 386
Complies with ANSI / IEEE C2
Complies with ANSI / IEEE C37.47
Complies with ANSI Z535.4
Complies with ASTM D3487
Complies with ASTM D6871
Complies with NEMA 260-1996
Complies with 10 CFR Part 431
Complies with CSA C2.1-06
Complies with CSA C50
Complies with CSA C88
Complies with CSA C88.1
Complies with CSA C88-16
Complies with CSA C227.4
Complies with CSA C227.5
Complies with CSA C802-3

Primary Termination Arrangement: V Terminal Arrangement
Primary Termination: Externally Clamped Integral Bushings w/ Removable Studs, 600A Dead Break Elbows
Primary Connection Qty: (6) Primary Connections for use w/ Elbow Connectors
Primary Parking Stand Qty: (6) Welded Brackets for Installing Accessory Parking Stand Bushings
Primary Bushing Rating: 15 kV Class, 45 kV BIL, 600A, Dead Break, IEEE 386 Color Green
Primary Neutral Connection: Primary HO Neutral Internally Bonded to Tank
Primary Surge Arrestors: (3) High Voltage Elbow Surge Arrestors, Included
Primary Surge Arrestor Voltage Rating: 18 kV Class Elbow Arrestor
Primary Surge Arrestor MCOV Rating: 15.3 kVrms
Primary Over Current Protection (OCP): Bayonet Expulsion Fuse in series w/ Partial-Range Current-Limiting Fuse
Primary Over Current Protection Method: Fused, Oil-Immersed
Primary Over Current Protection Holder: Bayonet Fuse Holder w/ Flapper Valve and External Drip Shield
Primary Grounding Provisions: (1) NEMA Ground Bar attached to tank via (2) Welded Ground Bungs in HV Cabinet
Secondary Connection Type: Live Front
Secondary Termination Arrangement: Staggered Terminal Arrangement
Secondary Connections: NEMA Spade Terminals, 10-Hole Spade, Externally Clamped, Accepts up to (10) Double Lug connections with (5) cables per side of Spade connector
Secondary Connection Qty: (4) Externally Clamped One-Piece Epoxy Bushings Copper Threaded Studs
Secondary Connection Supports: N/A
Secondary Over Current Protection (OCP): N/A
Secondary Neutral Connection: Secondary X2 Neutral Grounded to Tank via 1/2"-13 UNC Tapped Hole, 7/16" Deep Bung & Copper Ground Strap
Secondary Grounding Provisions: (1) NEMA Ground Bar attached to tank via (2) Welded Ground Bungs in LV Cabinet
Metering Current Transformer (CT): N/A
Metering Panel: N/A
Auxiliary Control Panel : N/A
Load Break Switch: 4-Position Load Break Switch
Load Break Switch Qty: (1)
Load Break Switch Rating: 600-Amp, 15 kV
Load Break Switch Location: High Voltage (HV) Front Compartment
Efficiency Standard(s): Meets DOE 2016 Standards, Meets CSA Standards Meets ANSI/IEEE Standards
K-Factor Rating (Harmonic Mitigation): K-1 (Standard)
Pulse Drive Rating: N/A
Insulation Fluid: Biodegradable Natural Vegetable Oil Ester Insulating Fluid - Non-PCB Fluid
Fluid (Oil) Capacity*: 330 Gallons
Fluid (Oil) Weight*: 2,545 lb
Liquid Level Indicator: Analog Dial Gauge
Temperature Indicator: Analog Dial Gauge
Pressure/Vacuum Indicator: Analog Dial Gauge
Pressure Relief Device: Included, Automatic Action
Fault Indicator: N/A
Gas Sampler Valve: Included, Schrader Valve
Fill Valve: 1" NPT Port w/ Removable Bolt Plug
Fill Valve Location: Front Compartment
Drain Valve: 1" NPT Port w/ 5/8" NPT Sampler Valve
Drain Valve Location: Front Compartment
Winding Material: Aluminum
Ambient Temperature Rating: 40°C
Ambient Operating Temperature Range: -40°C to +40°C (-50°F to +104°F)
Sound Level: 63 dBA
Elevation (Altitude): 3300ft (1000 meters) Above Sea Level
Core Material: Grain Oriented Steel
Tank Material: Coated Steel
Cabinet Material: Coated Steel
Base Platform Material: Coated Steel
Portability: Lifting lugs, provisions for jacking under base, w/ base construction suitable for using rollers or skidding
Housing Type: Compartmental Air-Filled Cabinet w/ Locking Doors, HV Compartment Left, LV Compartment Right, Steel Barrier Separation, HV Door Spring-Loaded Release Pin in LV Compartment
Enclosure Rating: NEMA 3R Weatherproof Wiring Cabinet, Sealed Tank
Seismic Rating: Yes

Complies with CSA C802.1

Features

Pentahead Bolt Entry Assembly

High-Fire Point Insulating Fluid

Non-PCB Insulating Fluid

Tamper Proof Housing

Hinged Front Compartment Doors, Pad Lockable

NEMA 3R Wiring Compartment

Hot Stick Included, HV Door Mount

Efficiency %: 98.00%

Based on transformer operating at 50% of nameplate base kVA.

Load Losses Based on 85°C Reference Temp.

No Load Loss (in watts): +/- 5,985W

Full Load Loss (in watts) at 100%: +/- 24,402W

Total Load Loss (in watts) at 100%: +/- 30,387W

Total Losses at 55°C LL Temp. & 20°C NL Temp.

Total Load Loss (in watts) at 50%: +/- 12,090W

Note: Losses offered are typical only, not guaranteed

Labeling:

Externally Stencilled (Painted) KVA Rating

Externally Stencilled (Painted) Voltage Rating

External Non-PCB Label

External Warning & Danger Label

External Barcode Label

Internal Busing & Accessory Labeling

Stainless Steel Riveted Nameplate

Factory Tests:

Winding Resistance Test

Insulation Resistance Test

Voltage Ratio Error Test

Short-circuit Impedance Test

No-load Loss (Wattage) Test

Load Loss (Wattage) Test

Induced Voltage Withstand Test

Separate Source Voltage Withstand Test

Pressure Integrity Test Test

Shipping:

Shipped on pallet on open flatbed

Palletized on Wooden Pallet w/ Skid Pockets

Pallet Skid Facing Outward Sides of Truck

Note: Crated shipping in lieu of palletizing can be done upon request for an additional fee

Paint Type: Weatherproof and UV Resistant Epoxy Coating and Undercoating

Finish Color: Munsell™ 7.0 GY 3.29/1.5 Bell Green

Mounting: Pad Mounted

Conduit Opening: Bottom Feed Underground Entry/Exit

HV Compartment Base Wireway Dimensions*: 21"-7 x 7"-D

LV Compartment Base Wireway Dimensions*: 26"-W x 7"-D

MV/LV Compartment Cabinet Depth*: 24"-D

Tank Cover Access Handhole: N/A

Dimensions*: 90"-W x 80"-D x 83"-H

Dry Weight (w/o Oil)*: 5,810 lb

Total Weight (Liquid Filled)*: 12,576 lb

*Please note that numbers are approximate and subject to change

Special Orders - Requirements

Contact us for special requirements

Toll Free: 1-800-369-6671

Intl: 1-214-616-6180

Fax: 1-903-498-3364

E-mail: sales@larsonelectronics.com

The MT-PML-R7-3P-DNH-3MVA-YE-LT-DF-A6-BB-AZ-2B4-M1 from Larson Electronics is an Industrial Pad Mount Transformer that offers powerful, reliable, and efficient power distribution in indoor, outdoor, and public locations. The low operating costs, low heat emissions, and low cost of ownership makes this transformer ideal for a wide range of applications and businesses. An enclosed design caters to installations on concrete pads without protective fencing.

****PLEASE NOTE: ANY FREE SHIPPING OFFERS DO NOT APPLY TO POWER DISTRIBUTION PANELS, TRANSFORMERS, OR SUBSTATIONS****

Transformer Features: With a transformer rating of 3000 KVA (3 MVA), the industrial transformer features a dual rated primary voltage of three-phase 2400V Delta and a secondary voltage of three-phase 480Y/277 V Wye. An input voltage switch allows the transformer to be switched between primary voltages. The unit has a primary loop feed for single installations and dead-front primary connections. This transformer features a 5-position tap changer with two, +/- 2.5% taps above and two, +/- 2.5% taps below to allow small changes for voltage.

Aluminum transformer winding material helps improve performance, reduce weight and lower cost. Compared to copper, aluminum windings have lower eddy losses due to higher resistivity. This transformer consists of rectangular coil and five-legged wound core design with three coils and four core loops (this is for three-phase transformers only; single-phase units have one coil and two core loops).

The MT-PML-R7-3P-DNH-3MVA-YE-LT-DF-A6-BB-AZ-2B4-M1 is air cooled and does not have fans or mounting provision for fans.

Enclosure Design: This pad mounted transformer is a compartmental design. The tank and housing are fabricated from steel. The front electrical enclosure carries a NEMA 3R rating. The high voltage and low voltage compartments are located in front of the transformer tank, with the high voltage compartment on the left side and low voltage compartment on the right side. The HV and LV compartments are air filled and separated by a full length steel barrier between the compartments. A removable steel plate at the base of the HV and LV compartments prevents rodents and other intrusions from entering the enclosure once installed. This steel plate allows for underground conduit entry into the enclosure compartments. Two hinged exterior doors allows for access into the compartments. A single pad lockable handle on the low voltage compartment door allows for securing the transformer. A spring loaded pin within the low voltage compartment prevents the high voltage door from being opened without pulling the safety pin. A hot stick is included in the high voltage compartment, mounted to the HV door.

Temperature Rise: This unit features 65°C temperature rise for reduced heat waste, increased reliability and longer life. At 65°C temperature rise, the transformer offers 3000 KVA (3 MVA). The transformer meets standard efficiency requirements. The combination of low temperature rise and high efficiency makes this unit suitable for use in electrical rooms, air conditioned spaces in buildings, underground vaults and similar locations, in addition to outdoor areas.

Insulation Fluid: The MT-PML-R7-3P-DNH-3MVA-YE-LT-DF-A6-BB-AZ-2B4-M1 features biodegradable cooling fluid (KNAN) with a capacity of 330 gallons. We offer transformers with FR-3 oil fluid, if needed.

Biodegradable Fluid: Biodegradable cooling fluid (vegetable oil) has a higher heat capacity compared to mineral oil, making the liquid safer to use and more reliable during operations. Vegetable oil has a higher flash point and fire point than mineral oil, hydrocarbon oil, silicone oil and synthetic ester. This cooling fluid is also non-toxic and can tolerate higher breakdown voltages than mineral oil. When operating at high temperatures, biodegradable cooling liquid sustains up to 120% load conditions, which helps preserve the transformer's lifespan and performance.

Gauges: The following gauges are included with the system: liquid level, temperature and pressure/vacuum gauges. Standard liquid level, temperature and pressure/vacuum gauges are analog, manual reading types. These gauges do not have auxiliary contacts.

Fault Pressure Devices: This transformer features an automatic action fault pressure device. Fault pressure devices are used to detect high rates of pressure rise within the tank.

Rapid Rise Relay: There are no rapid rise relays on the unit. This safety component is designed for protection when a rapid increase in tank pressure occurs. The relay is suitable for detecting sudden pressure fluctuations above predetermined safe limits.

Surge Arrestors: This system comes with high elbow surge arrestors on the primary side. Designed for over-voltage and transient voltage protection, the components prevent damage caused by lightning, internal switching or voltage surges. We can offer models without high elbow surge arrestors that have mounting provisions for customer-provided surge arrestors.

Valves: The MT-PML-R7-3P-DNH-3MVA-YE-LT-DF-A6-BB-AZ-2B4-M1 is equipped with a pressure relief valve, fill valve, and drain valve with sampler port.

Protection Fuses: This transformer does not contain protection fuses. For units without protection fuses, up stream protection is provided. We recommend provisions for protection fuses when possible, as blown fuses may require more frequent oil changes.

Mount: The heavy-duty enclosure makes the unit suitable for both indoor and outdoor applications. This power distribution system can be pad mounted on concrete pads.

Benefits: The MT-PML-R7-3P-DNH-3MVA-YE-LT-DF-A6-BB-AZ-2B4-M1 pad mount transformer offers many benefits to consumers. This transformer provides owners with significant energy savings, as well as offering environmental benefits. Higher efficiency not only extends the life of the transformer, but also turns into cost savings for owners in the form of lower energy bills and decreased cost of ownership.

Applications: General purposes, industrial sites, electrical rooms, underground vaults, manufacturing facilities, steel plants, offshore, commercial, military, processing plants, electric power distribution, utilities, public locations, and more. Larson Electronics is a manufacturer and as such can build stationary and portable transformer systems to your specifications. Although we carry several models of power distribution transformer systems, we can deliver custom ordered units almost as quickly as our prebuilt units. If this model does not meet your needs, please contact us at 1-800-369-6671 or sales@larsonelectronics.com to discuss your specific requirements.

THREE PHASE PAD MOUNTED TRANSFORMER

MT-PML-R7-3P-DMR-3MVA-YE-LT-DF-A6-BB-AZ-2B4-M1

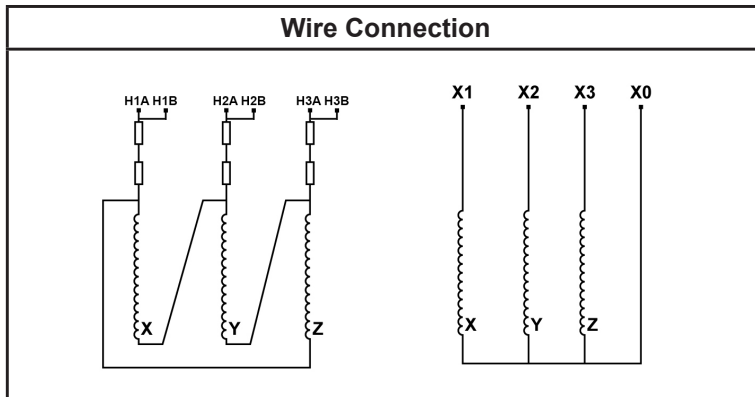
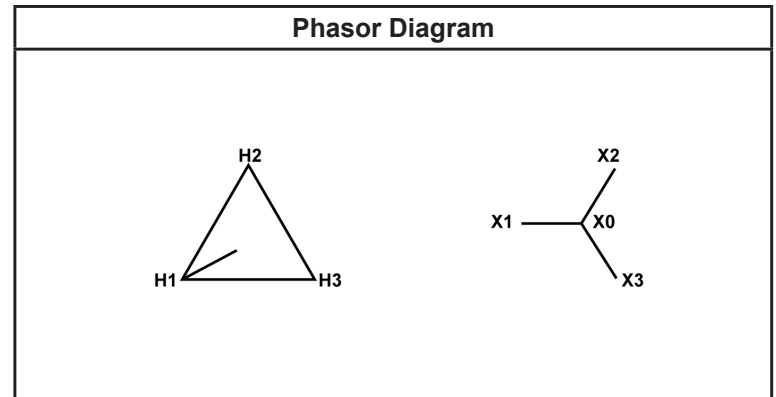
High Voltage		
Tap Position	Voltage (V)	Current (A)
1	13101	132.2
2	12782	135.5
3	12470	138.9
4	12158	142.5
5	11854	146.1
Low Voltage		
Voltage (V)		Current (A)
480		3608.5

Rated Capacity	3000	KVA
HV	12470	V
LV	480/277 V	
Impedence	XXX	%
Use Condition	Outdoor	
Phase	3 Phase	
Vector Group	DYN1	
Rated Frequency	60	Hz
Cooling Type	KNAN	

Product Code	292135	
Serial Number	XXXXXX	
HV BIL	95	LV BIL 30
Winding Con.	HV: AL	LV: AL
Temp. Rise	65	
Oil Capacity	330	
Total Weight	12,576	
Body Weight	XXXX	
Step-Up Operation:	NO	

Tank must be solidly grounded - NON-PCB Oil

Biodegradable Ester Oil



Maximum operating pressures of liquid preservation system _____ kPa (lbf/in²) positive and _____ kPa (lbf/in²) negative.

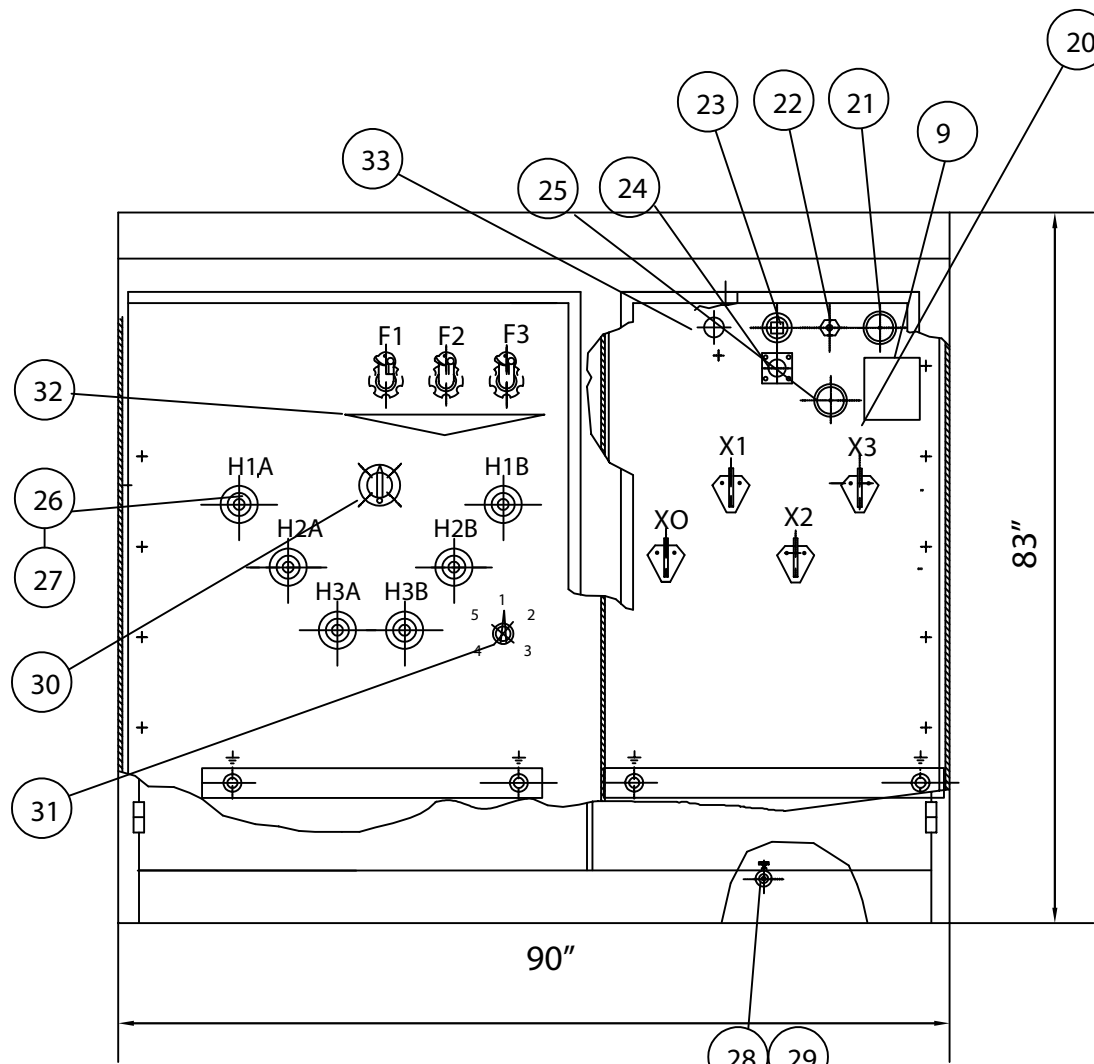
Tank designed for ____ kPa (lbf/in²) vacuum filling.

Liquid level below top surface of the highest point of the highest manhole flange at 25 °C _____ mm (in). Liquid level changes _____ mm (in) per 10 °C change in liquid temperature.

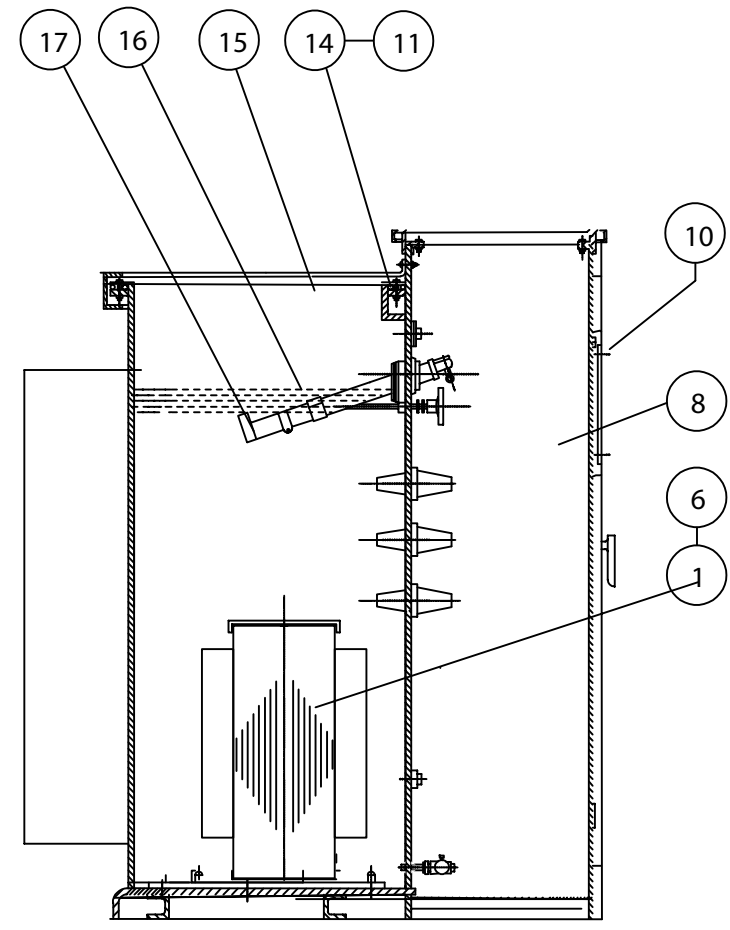
ANSI C57.12.34 - DOE 2016 Compliant - Manufactured xx/2022



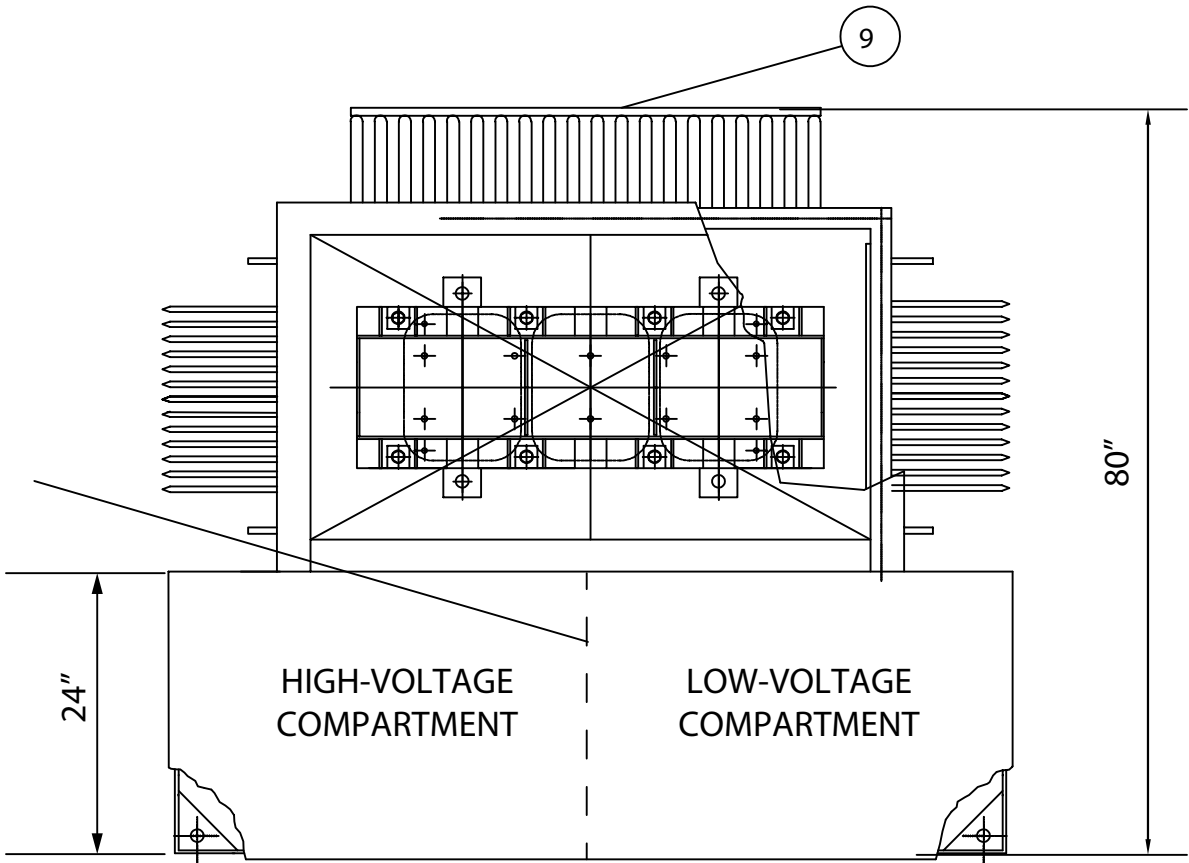
Larson Magnetics LLC
Kemp, TX USA



FRONT VIEW



SIDE VIEW



PAD VIEW

Approx Weight: 12,576 lbs
Approx Fluid Capacity: 330 Gal.

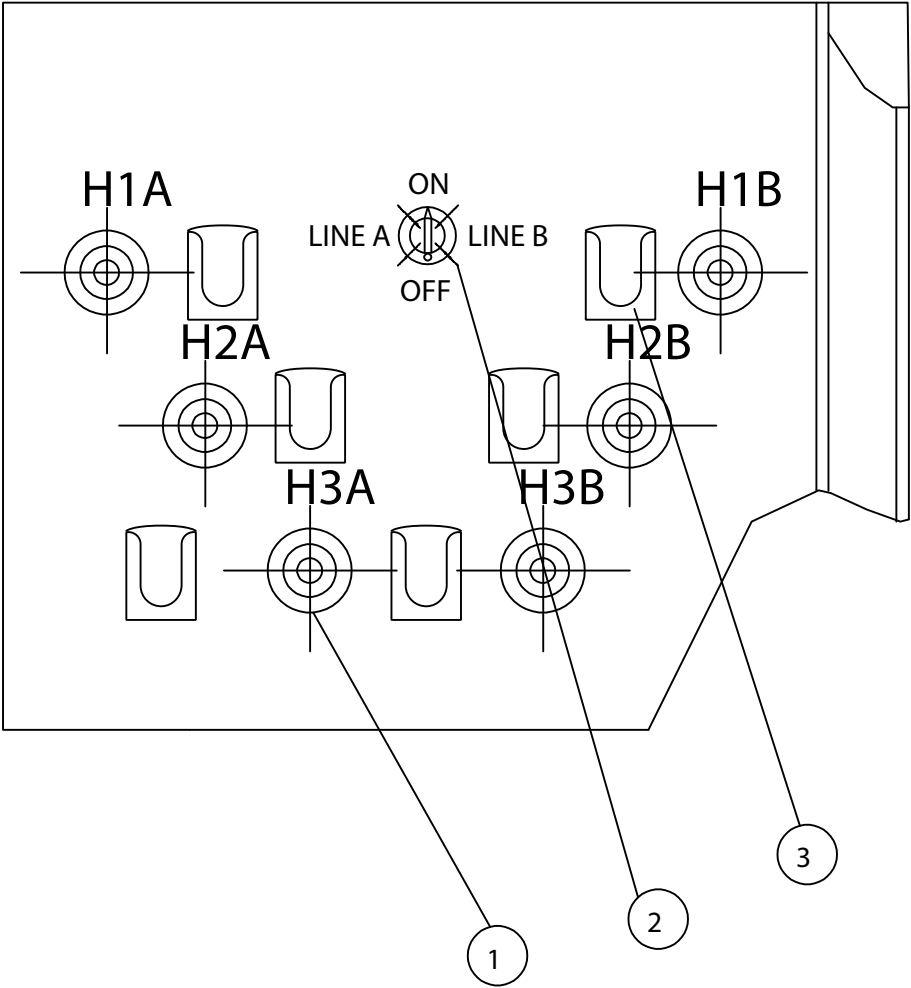
No.	NAME	REMARK
33	Gas Sampler Valve	Schrader Valve
32	Drip Shield	
31	5 taps Tap changer	
30	Load break switch	(1) 4-Pos. LBOR
29	Oil Sampler Valve	3/4" NPT
28	Oil drain valve	1" NPT Port
27	HV Bushing accessory	elbow arrestors
26	High voltage Bushing	125 kV
25	Temperature indicator	
24	Oil level indicator	Dial Gauge
23	Oil tank Fill Port	1" NPT w/ Plug
22	Pressure relief	Automatic Action
21	Pressure indicator	Dial Gauge
20	Low voltage bushings	NEMA Spade Terminal
17	Bayonet fuse	
16	Insulation oil	biodegradable oil
15	Transformer Tank	Steel
14	Tank cover	Steel
13	Nitrogen Blanket	
12	Nuts	
11	Bolts	
10	Rivets	
9	Nameplate	SS Plate, Riveted
8	MV/LV Compartment	Steel
7	MV/LV Barrier	
6	Active part assembly	
5	LV leads assembly	
4	HV leads assembly	
3	High voltage coil	
2	Low voltage coil	
1	Core assembly- Shell type	aluminum wound

All dimensions are in inches

For approval / preliminary design only. Not for order build specific

Designed by:	Checked by:	Approved by:	k.V.A:	Voltage:	Date:	Scale:	Note! Do not scale copies
			SKU: MT-PML-R7-3P-DMR-3MVA-YE-LT-DF-A6-BB-AZ-2B4-M1				
Drg. No. :			Code:		Paper:	Rev.	Sheet:

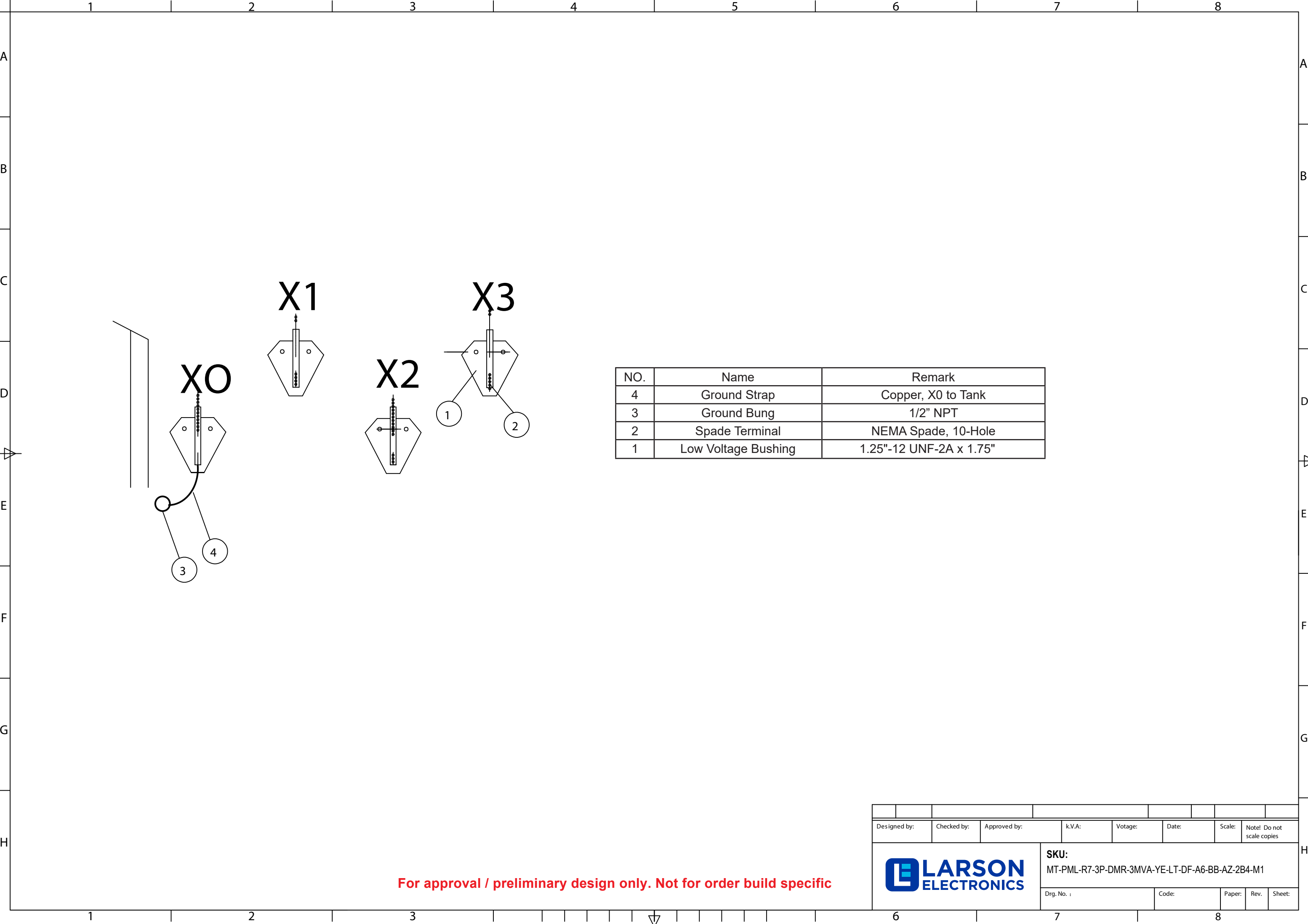
High voltage Bushings



NO.	Name	BIL	Amperage	Remark
3	Parking Stand			
2	Load Break Switch	95kV	300A+	4-Position LBOR
1	Low Voltage Bushing	95kV	600A	Dead Break Connector

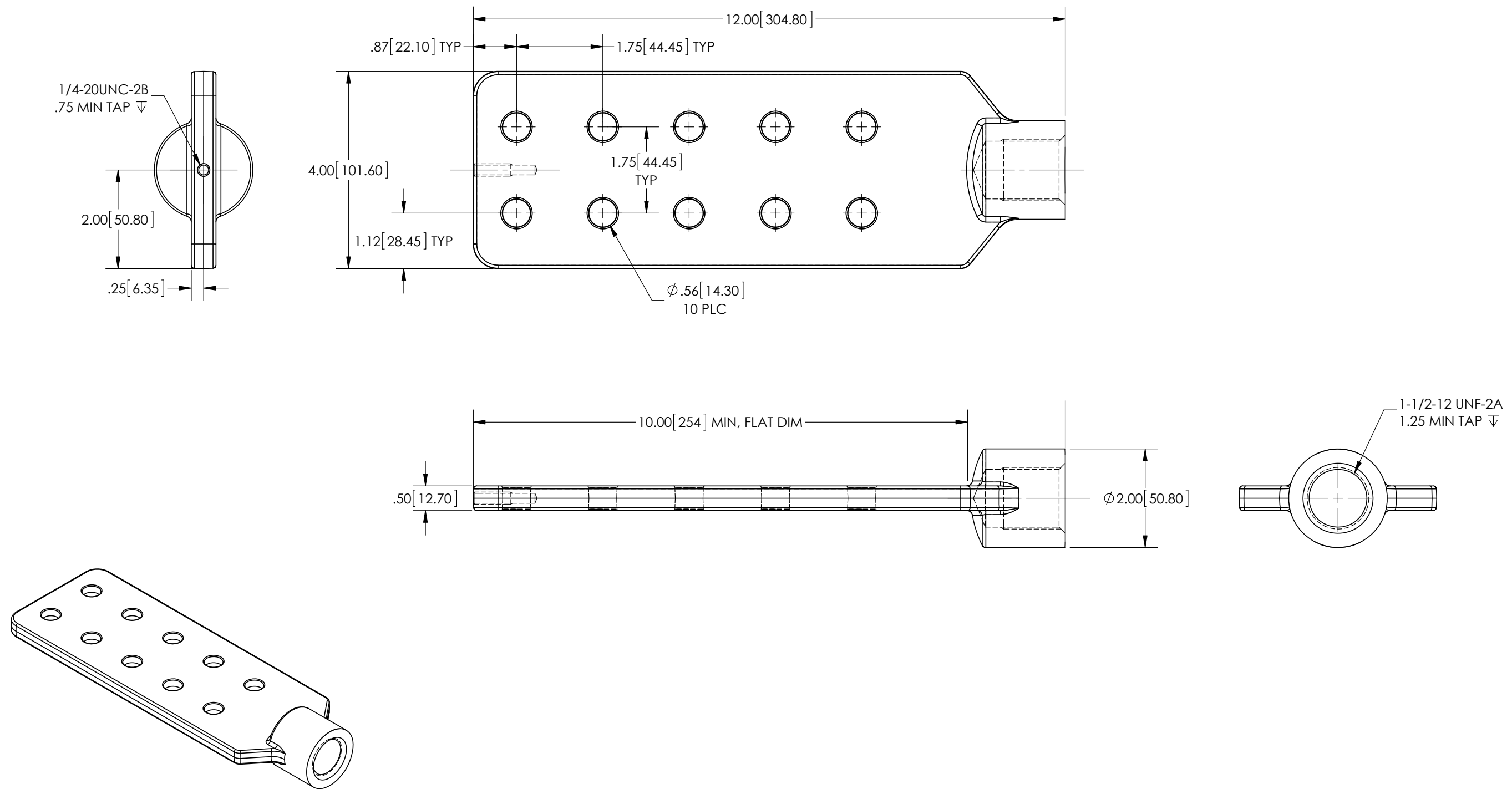
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Designed by:	Checked by:	Approved by:	k.V.A:	Votage:	Date:	Scale:	Note! Do not scale copies	
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			Drg. No. :			Code:		Paper:









RAPO® VEGETABLE INSULATING OIL CHARACTERS

Environmental Character

Environmental friendly

Based on natural plants

Almost 100% biodegradation

Non oral toxicity

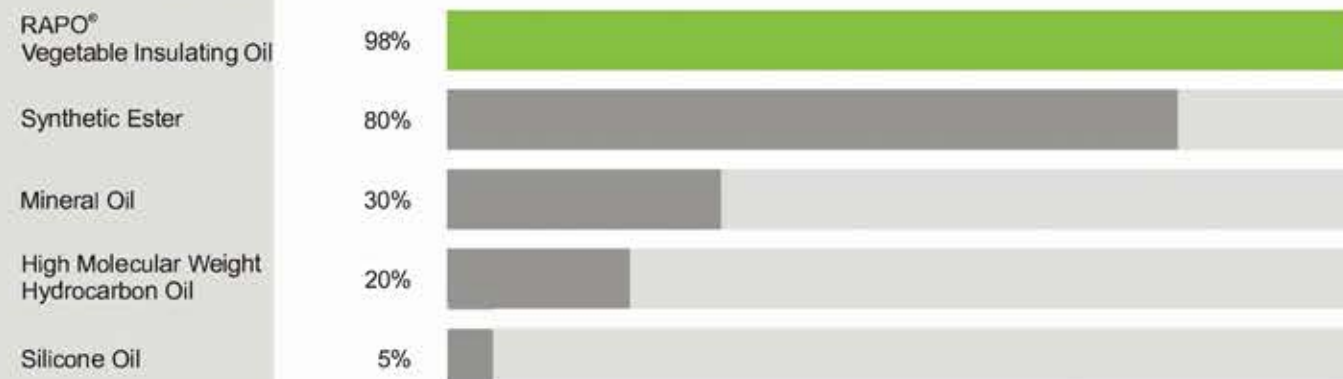
Non toxicity for aquatic animals

None halogen, polycyclic aromatic hydrocarbons

Petroleum independency



Transformer oil biodegradability comparison



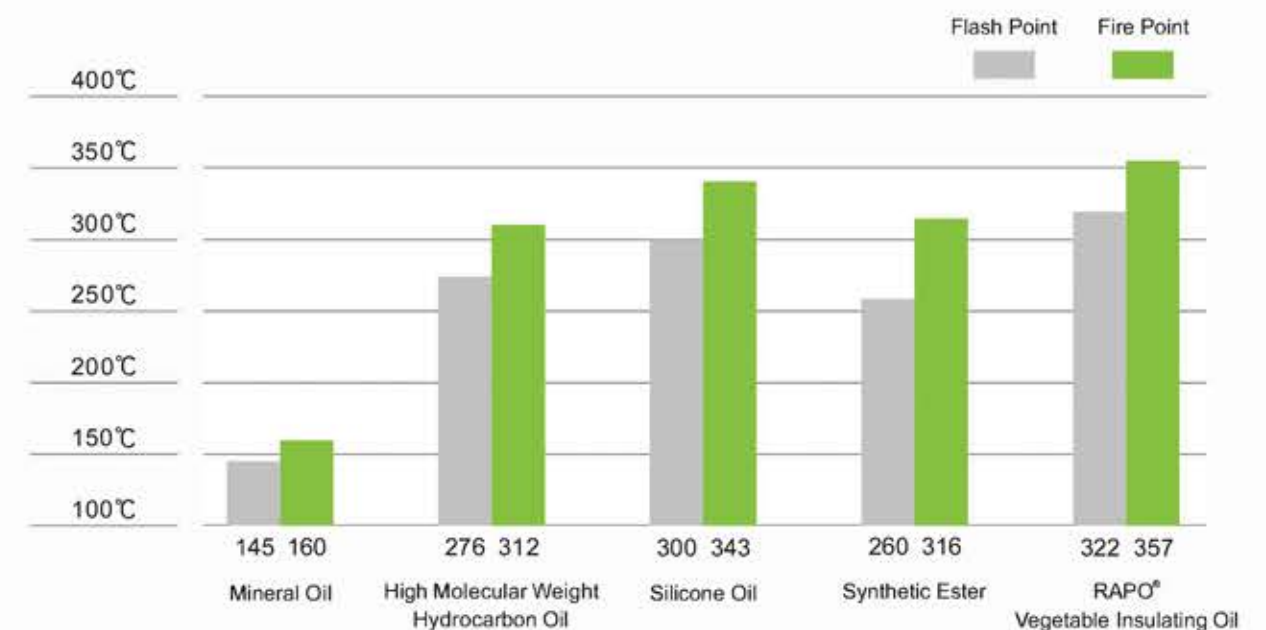
● If RAPO® spillover, it can be cleaned by normal means, instead of the way to deal with toxic waste.

● RAPO® is real green insulating oil which can avoid punishment by government regulations and eliminate the cleanup process.

Less-flammable Character

Mineral oil's fire point is in the range of 147-165°C (296.6-329°F). The relatively lower fire point might result in transformers' fire and explosion. The fire point of RAPO® vegetable insulating oil is up to 350°C, higher than most of fire-resistant oil and other insulating oil in use, greatly improved the safety and reliability of transformers and grid system.

Fireproof performance comparison of various types of transformer oil



● RAPO® vegetable insulating oil can effectively save equipment maintenance, replacement and other costs, and avoid the economic losses caused by the transformer fire.

● RAPO® can be used indoors or in the compact space.

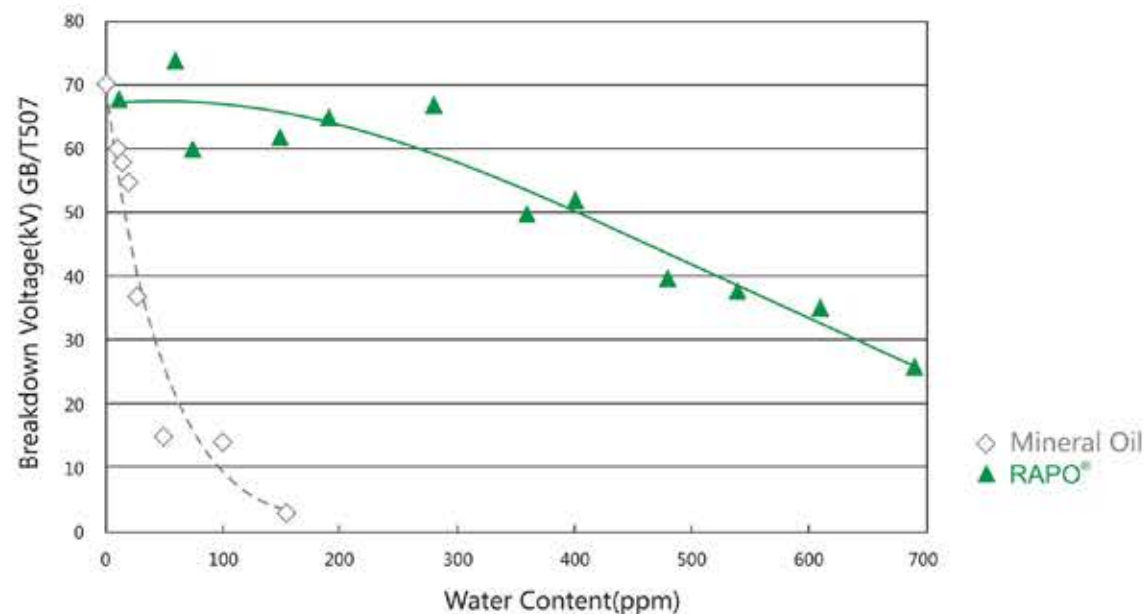
● RAPO® can help to reduce the use of fire-fighting equipment (sprinkler) and firewalls if space is limited.

● RAPO® can reduce insurance costs.

Excellent Electrical Character

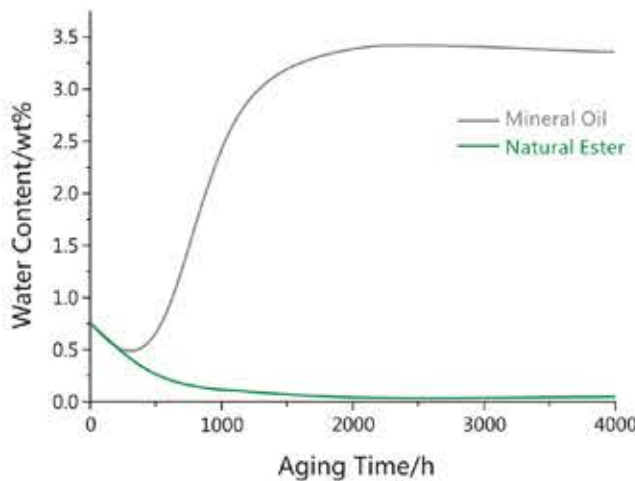
RAPO® vegetable insulating oil has a higher breakdown voltage than mineral insulating oil.

	Dielectric Breakdown (kV)	Standards Request (kV)
RAPO® Vegetable Insulating Oil	72	≥35
Mineral Oil (typical)	65	≥30

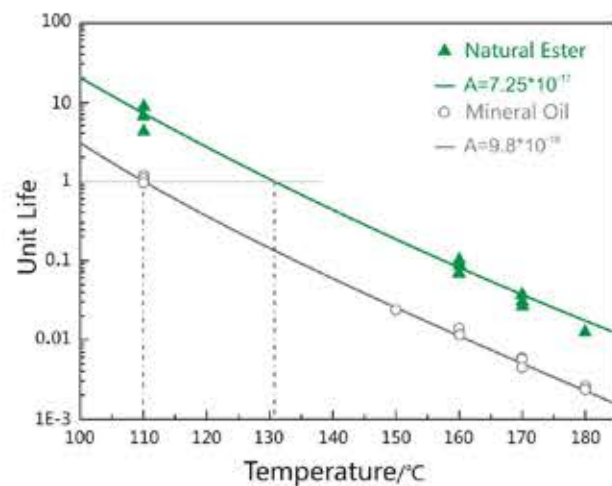
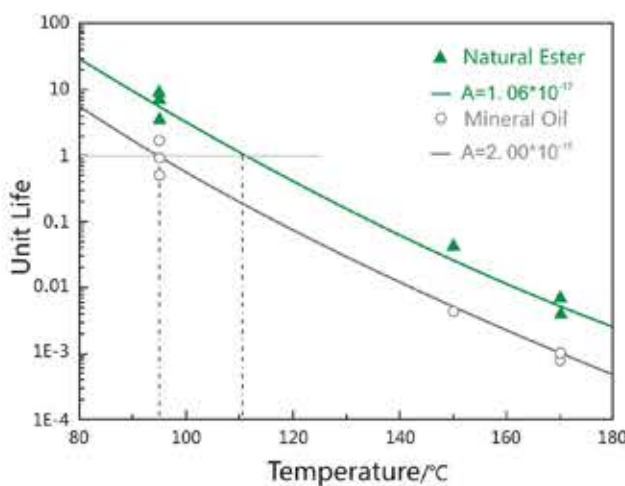


Ester chain in natural ester can make it have "polar" region, the region covered by ester chain effects like a magnetic fields which has a special attraction to water molecule and can absorb the water which exists in insulation cellulose paper material. So RAPO® has extremely high water saturation at various temperatures compared to mineral oil. Under normal operating environment, water saturation of RAPO® is 5-8 times than mineral oil.

Due to the higher water saturation of RAPO®, RAPO® vegetable insulating oil can keep the breakdown voltage to be over 60kV even if the water content exceeds over 300ppm. In contrast, the breakdown voltage decreases dramatically under 35kV when mineral oil contains a little amount of water such as 55ppm.



During thermal aging, RAPO® can absorb the water in insulation paper or pressboard which can accelerate the aging progress of insulation paper and pressboard. So RAPO® can prolong the insulation paper and pressboard aging process and improve the life span of the transformer.



Experimental data shows that insulation paper infiltrated by RAPO® can work with a long time in the environment whose temperature is 10-15°C higher than the maximum allowable one and has same life expectancy with the insulation paper infiltrated by mineral oil, can well prevent the production of precipitates, so that can increase the overload of the transformers. Transformers using RAPO® as filled oil can work in a long term with up to 120% load conditions and without affecting transformer's life and performance.

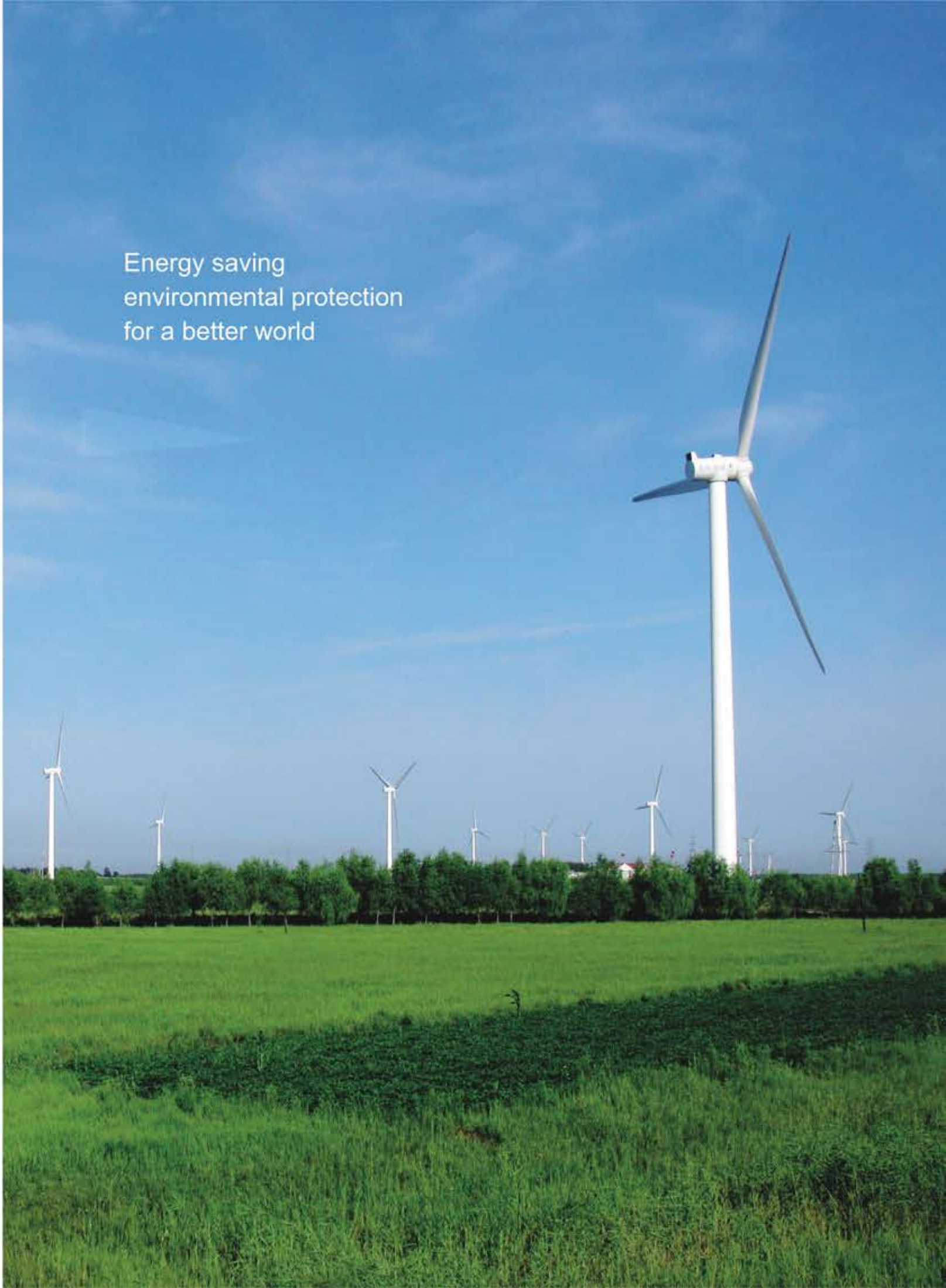
Insulating Oil Type	Top Liquid Temperature Rise	Average Winding Temperature Rise	Hottest Spot Temperature
Mineral Oil	60°C	65°C	78°C
RAPO® Vegetable Insulating Oil	80°C	115°C	160°C



RAPO® VEGETABLE INSULATING OIL
PARAMETERS

Test Items		RAPO® Insulating Oil	Test Methods	ASTM D6871
Electrical Properties				
Breakdown voltage (kV/2.5mm)		72	IEC 156	≥35
Dissipation factor (%)	25°C	0.06	ASTM D924	≤0.2
	100°C	1.37	ASTM D924	≤4
Volume resistivity (Ω•cm @25°C)		6.9×10 ¹³	DL/T 421	—
Physical and Chemical Properties				
Relative density (g•cm ⁻³ @15°C)		0.919	ASTM D1298	≤0.96
Color		10.5	ASTM D1500	≤1.0
Total acid number (mgKOH/g)		0.024	ASTM D974	≤0.06
Viscosity(mm ² /s)	40°C	36.07	GB/T 265	≤50
	100°C	8.263	GB/T 265	≤15
Thermal Properties				
Flash point(open cup)/°C		322	GB/T 3536	≥275
Fire point/°C		357	GB/T 3536	≥300
Pour point/°C		-27	GB/T 3535	≤-10

Energy saving
environmental protection
for a better world



CERTIFICATE OF COMPLIANCE

Certificate Number MH63693
Report Reference MH63693-20200528
Issue Date 2020-JUNE-05

Issued to: GUANG DONG JOOYN NEW MATERIAL TECHNOLOGY CO.,LTD.
No.17, Guinan Industrial Park, Wuguishan Town
Zhongshan, Guangdong 528458 CHINA

**This certificate confirms that
representative samples of** DIELECTRIC MEDIUMS
Dielectric Medium, "RAPO Natural Ester".

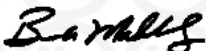
Have been investigated by UL in accordance with the
Standard(s) indicated on this Certificate.

Standard(s) for Safety: UL 340, Comparative Flammability of Liquids
Additional Information: See the UL Online Certifications Directory at
<https://iq.ulprospector.com> for additional information.

This Certificate of Compliance does not provide authorization to apply the UL Mark. Only the UL Follow-Up Services Procedure provides authorization to apply the UL Mark.

Only those products bearing the UL Mark should be considered as being UL Certified and covered under UL's Follow-Up Services.

Look for the UL Certification Mark on the product.



Bruce Mahrenholz, Director North American Certification Program

UL LLC

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please contact a local UL Customer Service Representative at <http://ul.com/aboutul/locations/>



Material Safety Data Sheet

1、 Identification of the Substance/Mixture and of the Company

1.1 Product Identifier

Material Name: RAPO® Natural Ester

CAS No: 68956-68-3

1.2 Relevant identified uses of the substance or mixture and uses advised against

Product Use: Dielectric coolant fluid.

Uses advised against: None.

1.3 Details of the supplier of the substance or mixture

Company: Guangdong JOOYN new Material Technology Co., Ltd.

Address: No.17 Guinan Industrial Park, Wuguishan Town, Zhongshan City

Telephone: 0760-88209990

Emergency Telephone: 0760-88206886

Email: zhuoyuan@jooyn.cn

2、 Hazards Identification

This product is not classified as hazardous in accordance with Regulation (EU) No. 453/2010.

2.1 Classification of the substance or mixture

Regulation (EC) No 1272/2008 (CLP): Not classified.

Regulation 67/548/EEC or 1999/45/EC: Not belong to hazardous according to EC.

2.2 Label elements

Regulation (EC) No 1272/2008 (CLP): No symbol or signal word required.

Regulation 67/548/EEC or 1999/45/EC: No symbol or signal word required.

2.3 Other hazards

None.

3、 Composition/Information on Ingredients

3.1 Substance

CAS No.: 68956-68-3.

Description: Mix natural triglycerides(Vegetable Oil). **Percent:** >98.5

4、 First Aid Measures

4.1 Description of first aid measures

Inhalation: None envisaged due to the low vapor pressure of the substance.

Skin: Wash with soap and water. Obtain medical attention if irritation develops.

Eyes: Irrigate with copious amounts of water. Obtain medical attention if irritation develops.

Ingestion: Do not induce vomiting, obtain medical attention.

4.2 Most important symptoms and effects, both acute and delayed

No adverse effects expected.

4.3 Indication of any immediate medical attention and special treatment needed

No special treatment required.

5、 Fire Fighting Measures

5.1 Extinguishing media

Carbon dioxide, dry powder, foam or water fog. Do not use water jets.

5.2 Special hazards arising from the substance or mixture

None.

5.3 Advice for fire fighters

Self-contained breathing apparatus may be required.

6、 Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures

Spilt product constitutes a slip hazard. Avoid contact with skin and eyes.

6.2 Environmental precautions

Avoid contaminating any lakes, streams, ponds, groundwater or soil.
Avoid flushing into drains. In the event of a large spillage contain product as thoroughly as possible and dispose of in accordance with local regulations.

6.3 Methods and material for containment and cleaning up

Soak up spilt material with absorbent granules for disposal.

7、 Handling and Storage

7.1 Precautions for safe handling

Avoid eye and prolonged skin contact.

7.2 Conditions for safe storage

Sealed in a dry and shading environment.

7.3 Specific end use(s)

Exposure to air should be minimised. Opened containers should be properly resealed.

8、 Exposure Controls/Personal Protection

8.1 Control Parameters

No relevant control parameters.

8.2 Exposure Controls

Eye washes should be available for emergency use.

Respiratory protection: Not required for normal use.

Skin protection: Wear coveralls.

Hand protection: Wash hands after use. For prolonged or repeated skin contact gloves are recommended.

Eye protection: If splashes are likely to occur wear safety glasses.

9、 Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Appearance: Light yellow clear liquid.

Odour: No.

pH: Neutral.

Freezing point: -24 °C.

Initial boiling point and boiling range: >300 °C.

Flash point: 322 °C (open cup).

Flammability (solid, gas): Not available.

Upper/lower flammability or explosive limits: The maximum sample quantity 0.6% at 50 °C, non-combustible and non-explosive.

Vapor pressure: Not available.

Vapor density: Not available.

Relative density: 0.92 g.cm⁻³ at 20 °C.

Water solubility: <1mg/l.

Solubility: Not applicable.

Partition coefficient: Not available.

Auto-ignition temperature: 406°C.

Decomposition temperature: Not available.

Viscosity: 33~36mm²/s at 40 °C.

Explosive properties: Non-explosive.

Oxidizing properties: Non-oxidizing.

9.2 Other information

Not applicable.

10 Chemical Stability and Reactivity

10.1 Reactivity

Stable under normal conditions of use.

10.2 Chemical stability

Stable under normal conditions of use.

10.3 Possibility of hazardous reactions

Hazardous polymerization does not occur.

10.4 Conditions to avoid

Temperatures >250 °C.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

No data available.

11、 Toxicological Information

Likely routes of exposure: Skin and eyes are the most likely routes for exposure. Accidental ingestion may occur. Inhalation is not expected to be a relevant route of exposure. The basic ingredient of this product is vegetable oil, so it is non-toxic.

Acute oral toxicity: None toxicity.

Test methods	Test object	Dosage/ (mg/kg)	Lethal rate/%
OECD GUIDELINE FOR TESTING OF CHEMICALS	3 Mices	5000 (maximum dose)	0

Acute dermal toxicity: None toxicity.

Acute inhalation toxicity: Low volatility makes inhalation unlikely.

Skin corrosion/irritation: No effect.

Eye corrosion/irritation: No effect.

Respiratory or skin sensitisation: No effect.

Aspiration hazard: Not considered an aspiration hazard.

Carcinogenicity/mutagenicity: Not considered a mutagenic hazard or carcinogen.

12、 Ecological Information

When used and/or disposed of as indicated no adverse environmental effects are foreseen. Ecotoxicological effects based on knowledge of similar substances.

12.1 Toxicity

The substances do not pose a hazard to aquatic organisms.

Test methods	Test object	Dosage/(mg/kg)	Lethal rate/%
OECD 203	10 carp/crucian	25 (maximum solubility)	0

12.2 Persistence and degradability

Readily biodegradable. Biodegradation degree of 20 days is 98%.

12.3 Bioaccumulative potential

No potential for bioaccumulation.

12.4 Mobility in soil

Product has low mobility in soil.

12.5 Results of PBT and vPvB assessment

The product does not meet criteria for toxicity which requires further assessment.
It is not considered PBT or vPvB.

12.6 Other adverse effects

No other adverse effects envisaged.

13、 Disposal Considerations

Waste treatment methods Product and packaging must be disposed of in accordance with local and national regulations. Unused product may be returned for reclamation.

14、 Transport Information

Not classified as hazardous under air (ICAO/IATA), sea (IMDG), road (ADR) or rail (RID) regulations.

14.1 UN number

Not relevant.

14.2 UN proper shipping name

Not relevant.

14.3 Transport hazard class

Not relevant.

14.4 Packing group

Not relevant.

14.5 Environmental hazards

Not relevant.

14.6 Special precautions for user

Not relevant.

15、 Regulatory Information**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

The product is not regulated to Registration, Evaluation, Authorization and Restriction (REACH) of chemicals in the European Union.

15.2 Chemical safety assessment

A chemical safety assessment has been performed for this substance.

16、 Other Information

Compiled according to regulation 1907/EC/2006.

16.1 Changes from last issue

Not obvious change.



Certification

Manufacturer: Larson Electronics LLC
Address: 9419 US-HWY 175
Kemp, Texas 75143

Declare the following equipment conforms to the standard(s) as listed:

Model: MT-PML & MT-UPM Series
Description: Overhead & Pad Mounted Distribution Transformers

The MT-PML & MT-UPM series complies with the below standards set forth by the listed Association's requirements. Purchased and manufactured components are evaluated to Larson Electronics LLC Quality Control Management system per ISO 9001:2015. This certification applies to all specimens manufactured in accordance to the manufacture's drawings and options configured per the specification data sheet.

Evaluated Standards:

- **ASTM A240/A240M (2020a):** Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
- **ASTM D117 (2018):** Standard Guide for Sampling, Test Methods, and Specifications for Electrical Insulating Liquids
- **ASTM D1535 (2014; R2018):** Standard Practice for Specifying Color by the Munsell System
- **ASTM D3487 (2016; E2017):** Standard Specification for Mineral Insulating Oil Used in Electrical Apparatus
- **ASTM D6871 (2017):** Standard Specification for Natural (Vegetable Oil) Ester Fluids Used in Electrical Apparatus
- **ASTM D877/D877M (2019):** Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes
- **ASTM D92 (2012a):** Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
- **ASTM D97 (2017b):** Standard Test Method for Pour Point of Petroleum Products
- **D4059-00 (2018):** Standard Specifications for Analysis of Polychlorinated Biphenyls in Mineral Insulating Oils By Gas Chromatography.
- **EPA 712-C-98-075 (1998):** Fate, Transport and Transformation Test Guidelines - OPPTS 835.3100- "Aerobic Aquatic Biodegradation"
- **EPA 821-R-02-012 (2002):** Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms



- **ANSI / IEEE C2:** National Electric Safety Code
- **ANSI / IEEE C12.1 (2014; E2016):** Electric Meters - Code for Electricity Metering
- **ANSI / IEEE C12.10 (2011):** Physical Aspects of Watthour Meters - Safety Standards
- **ANSI / IEEE C12.7 (2014):** Requirements for Watthour Meter Sockets
- **ANSI / IEEE C57.106-1991 (R1998):** Guide for Acceptance and Maintenance of Insulating Oil in Equipment.
- **ANSI / IEEE C2 (2017; E2017; INT 2017):** National Electrical Safety Code
- **ANSI / IEEE C37.47 (2011):** Standard for High Voltage Distribution Class Current-Limiting Type Fuses and Fuse Disconnecting Switches
- **ANSI / IEEE C57.12.00 (2015):** General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
- **ANSI / IEEE C57.12.20 (2017):** Overhead-Type Distribution Transformers 500 kVA and Smaller; High Voltage, 34 500 V and Below; Low Voltage, 7970/13 800Y V and Below
- **ANSI / IEEE C57.12.21 (2000):** Pad-Mounted, Compartmental-Type, Self-Cooled, Single-Phase Distribution Transformers With High-Voltage Bushings: High Voltage (34 500 GrdY/19 920 V and Below) and Low Voltage (240/120 V, 167 kVA and Smaller)
- **ANSI / IEEE C57.12.25 (1990):** Requirements for Pad-Mounted Compartmental-Type Single-Phase Distribution Transformers with Separable Insulated High-Voltage Connectors, High-Voltage, 34500 Grd. Y/19920 Volts and Below; Low Voltage, 240/120; 167 KVA and Smaller.
- **ANSI / IEEE C57.12.28 (2014):** Standard for Pad-Mounted Equipment - Enclosure Integrity
- **ANSI / IEEE C57.12.29 (2014):** Standard for Pad-Mounted Equipment - Enclosure Integrity for Coastal Environments
- **ANSI / IEEE C57.12.31 (2010):** Standard for Pole-Mounted Equipment - Enclosure Integrity
- **ANSI / IEEE C57.12.34 (2015):** Standard Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers, 10 MVA and Smaller; High Voltage, 34.5 kV Nominal System Voltage and Below; Low Voltage, 15 kV Nominal System Voltage and Below
- **ANSI / IEEE C57.12.35 (2013):** Standard Bar Coding for Distribution Transformers and Step-Voltage Regulators
- **ANSI / IEEE C57.12.38 (2014):** Standard for Pad-Mounted-Type, Self-Cooled, Single-Phase Distribution Transformers; High Voltage, 34 500 GrdY/19 920 V and Below, Low Voltage, 240/120 V; 167 kVA and Smaller
- **ANSI / IEEE C57.12.70 (2020):** Terminal Markings And Connections For Distribution And Power Transformers
- **ANSI / IEEE C57.12.80 (2010):** Standard Terminology for Power and Distribution Transformers
- **ANSI / IEEE C57.12.90 (2015; C2017):** Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers
- **ANSI / IEEE C57.12.110 (2018):** Recommended Practice for Establishing Liquid Immersed and Dry-Type Power and Distribution Transformer Capability when Supplying Nonsinusoidal Load Currents
- **ANSI / IEEE C57.13 (2016):** Requirements for Instrument Transformers
- **ANSI / IEEE C57.91 (2011):** Guide for Loading Mineral-Oil-Immersed Transformers
- **ANSI / IEEE C57.98 (2011):** Guide for Transformer Impulse Tests
- **ANSI / IEEE C57.106 (2015):** Guide for Acceptance and Maintenance of Insulating Oil in Equipment
- **ANSI / IEEE C57.109 (2018):** Guide for Liquid-Immersed Transformer Through-Fault-Current Duration
- **ANSI / IEEE C57.147 (2018):** Guide for Acceptance and Maintenance of Natural Ester Fluids in Transformers
- **ANSI / IEEE C57.154 (2012):** Standard for the Design, Testing, and Application of Liquid-Immersed Distribution, Power, and Regulating Transformers Using High-Temperature Insulation Systems and Operating at Elevated Temperatures
- **ANSI / IEEE C62.11 (2020):** Standard for Metal-Oxide Surge Arresters for Alternating Current Power Circuits (>1kV)



- **ANSI / IEEE C62.22 (2009):** Guide For The Application Of Metal-Oxide Surge Arresters For Alternating-Current Systems
- **ANSI / IEEE 386 (2016):** Separable Insulated Connector Systems for Power Distribution Systems Rated 2.5 kV through 35 kV
- **CSA C2.1:06 (R2022):** Standard for Single-phase and three-phase liquid-filled distribution transformers
- **CAN / CSA C50-14 (R2018):** Mineral insulating oil, electrical, for transformers and switches
- **CSA C88:1 (R2018):** Power Transformer And Reactor Bushings
- **CSA C88:16 (R2021):** Power transformers and reactors
- **CSA C227.1:** Single Phase Pad Mounted Distribution Transformers
- **CAN / CSA C227.2:** Three-Phase, Live-Front, Pad-Mounted Distribution Transformers
- **CSA C227.3:06 (R2022):** Low-profile, single-phase, pad-mounted distribution transformers with separable insulated high-voltage connectors
- **CSA C227.4 (R2021):** Three-phase, pad-mounted distribution transformers with separable insulated high-voltage connectors
- **CSA C227.5-08 (R2018):** Three-Phase Live-Front Pad-Mounted Distribution Transformers
- **CSA C301.2:06 (R2022):** Standard for Three-phase submersible distribution transformers
- **CAN / CSA C802.1-13 (R2018):** Minimum efficiency values for liquid-filled distribution transformers
- **CSA C802.3-15 (R2020):** Minimum efficiency values for power transformers
- **NARA 10 CFR Part 431:** Energy Efficiency Program for Certain Commercial and Industrial Equipment
- **NEMA 260-1996 (R2019):** Safety Labels For Pad-Mounted Switchgear And Transformers Sited In Public Areas
- **NEMA C12.10 (2011):** Physical Aspects of Watthour Meters - Safety Standards
- **ANSI / NEMA Z535 (2011):** Safety color chart
- **ANSI / NEMA Z535.1 (2022):** Safety colors
- **ANSI / NEMA Z535.2 (2011):** Environmental and facility safety signs
- **ANSI / NEMA Z535.3 (2022):** Criteria for safety symbols
- **ANSI / NEMA Z535.4 (2011, R2017):** Product safety signs and labels
- **ANSI / NEMA Z535.5 (2022):** Safety tags and barricade tapes (for temporary hazards)
- **ANSI / NEMA Z535.6 (2011, R2017):** Product safety information in product manuals, instructions, and other collateral materials
- **NETA ATS (2021):** Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems
- **TR-1 (2013):** Transformers, Regulators and Reactors

Signed for and on behalf of: Larson Electronics, LLC

Place of issue: Kemp, TX

Signature:

Name: James Thomas

Position: Operations Manager

Concrete Pad Construction Details
MT-PML-RX-3P-XX-R1 Series
Three Phase Pad Mounted Transformers

Purpose and Scope

This document shows construction details for concrete pads for three-phase, pad-mounted transformers.

General Information

1. When a pad is installed by the customer, that customer shall provide all materials. In areas of known unusually soft soil conditions, AHJ may require special treatment. Before pouring or setting the pad, the customer or contractor may be required to request an inspection by AHJ to approve the installation. AHJ shall determine the acceptability of each pad installation.
2. The installation of the pad includes the two ground rods and the interconnecting ground wire.

Application

3. If a pad-mounted transformer cannot be located away from vehicular traffic, the customer shall provide suitable barriers for the protection of the transformer. AHJ shall determine the protection requirements.
4. If the customer is to use bus duct, the secondary opening is not needed. Grout in the window of precast pads.
5. The pad sizes are based on maximum dimensions, including cooling radiators, of the various configured transformers.

Construction Notes

6. In general, all equipment pads should be installed as level as practical. Pads supporting oil-filled equipment must be leveled to within 1 inch in 8 feet in all directions.
7. In general, all equipment pads should be installed as level as practical. Pads supporting oil-filled equipment must be leveled to within 1 inch in 8 feet in all directions.
8. An equipment pad SHALL NOT be placed on an elevated berm, mound or structure either earthen or otherwise when placed in a Flood Plain. If local knowledge of the area in which the equipment is to be placed identifies a high likelihood that uninsulated terminals of the equipment will come in contact with floodwater and the location cannot be moved to a location less likely to have flood levels come in contact with the exposed terminals, a Subsurface Fully Insulated Device should be installed in lieu of the pad mount design. In some cases such as transformers, because of capacity limits of subsurface material coded equipment it may not be possible to provide a transformer of sufficient capacity to serve loads in excess of the capabilities of a 1000 kVA UCO.
9. The transformer pad shall be placed on firm, compacted native material or on engineered fill which has been compacted at least to the requirements this document
10. The area under the pad shall be excavated to the required grade, or to a depth necessary to reach firm, undisturbed material, whichever is deeper. The material can be considered firm if it cannot be penetrated by thumb except with moderate effort.
11. If firm material has not been reached within a depth of 3 feet, excavate 3 feet beyond the perimeter of the pad and backfill the entire excavated area to the required grade and to the requirements of Note 12.
12. In case it has been necessary to excavate deeper than the required grade to reach firm material, backfill to the required grade in one of the following ways:
 - A. Backfill with clean, non-expansive soil compacted to 90% of maximum density. Soil shall be placed in layers not more than 8 inches thick before compaction. Maximum density and in-place density is to be determined by by ASTM D-1556 and ASTM D-1557 respectively. A copy of the test results may be required by AHJ.
 - B. Backfill with soil-cement slurry consisting of one sack of Portland cement per cubic yard and clean native soil or sand. When slurry is used as a backfill material, the customer will not be required to use a poured-in-place pad.

Concrete Pad Construction Details

MT-PML-RX-3P-XX-R1 Series

Three Phase Pad Mounted Transformers

13. In areas of known soft soil conditions, trenches within the pad excavation area for the installation of conduits shall be backfilled in one of the ways specified in Note 12.
14. In addition to the above, precast pads shall be placed on a 3-inch layer of slurry backfill or sand screeded level to provide uniform bearing.
15. Conduit windows shall be grouted with non-shrink grout (asphalt or blacktop is not approved for grouting).
16. Concrete shall be designed to attain a strength of 2,500 pounds per square inch (psi) at 28 days. Slump for concrete placement shall not exceed 3 inches. Reinforcing steel shall be per ASTM A615, Grade 40 minimum.
17. A minimum distance of 6 feet shall be maintained between ground rods.
18. Wood-float or light broom finish the top of the slab. Finish all exposed edges with a finishing tool. Vertical edges shall have a 3/4-inch chamfer. Slope exposed horizontal surfaces slightly for drainage. Moist-cure concrete for at least 7 days after pouring. Do not install transformer until 14 days after pouring concrete. See Note 19 for exceptions to this requirement.
19. The transformer may be installed earlier than the 14 days specified above, provided the concrete has attained a compressive strength of at least 1,500 psi obtained as follows (this procedure is permitted only for urgent cases where earlier pouring of pad is not practical):
 - A. For a six-sack mix using normal Portland cement, the transformer may be installed after 7 days; or for a six-sack mix using high early-strength cement, the transformer may be installed after 72 hours.
 - B. All concrete must be moist-cured to the minimum period specified above before installing the transformer.
 - C. Verify the required strength by either concrete cylinder test or Schmidt hammer test.
20. Belled ends of conduits should be placed approximately 1 inch above the concrete pad surface. If belled ends are removed, install end bell fittings. Temporarily plug or cap all conduits.
21. Only AHJ-approved utility electric-service-related equipment and structures may be installed in the area beneath the transformer pad. The area 6 feet deep and 12 inches horizontally around the pad shall be free of all foreign substructures.

Construction Notes for Precast Pads

22. Concrete shall be designed to attain a strength of 2,500 psi in 28 days.
23. Inserts and securing of inserts shall be of sufficient strength to lift the pad. A minimum of three inserts with 7/8-inch diameter, UNC thread and 2-1/4 inch inside depth, steel, galvanized with temporary plugs shall be provided.
24. Inserts shall be installed flush with the surface of the pad.
25. Reinforcing bars shall be as per ASTM A615, Grade 40 minimum.
26. 24. All exposed edges shall have a 3/4-inch chamfer or radius.
27. Surface shall have a light broom or wood-float finish.
28. The surface of the pad shall be level and flat.
29. Precast pads shall be permanently identified with manufacturer's name and have the weight stenciled on top of the pad.

Concrete Pad Details for Three Phase Transformers

[illegible]



Certification

Manufacturer: Larson Electronics LLC
Address: 9419 US-HWY 175
Kemp, Texas 75143

Declare the following equipment conforms to the standard(s) as listed:

Model: MT-PML, MT-UPM
Description: Liquid Filled Distribution Transformers

Evaluated Listings:

FCC: Radio Frequency Emission & Authorization Status

The MT-PML and MT-UPM Series of industrial liquid filled power distribution transformers complies with Federal Communications Commission requirements for Radio Frequency Emission & Authorization Status. This product is not capable of emitting rf energy and does not require FCC authorization. This certification applies to all specimens manufactured in accordance to the manufacture's drawings.

Signed for and on behalf of: Larson Electronics, LLC
Place of issue: Kemp, TX

Signature: *James Thomas*

Name: James Thomas
Position: Operations Manager

Frequently Asked Questions (FAQ)