Larson Electronics LLC
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## MT-PML-R7-3P-GMF-1.75MVA-YC-LT-DF-A6-BB-CZ-2B6-M1

# 1.75 MVA Pad Mount Transformer - 24940Y/14400 Grounded Wye Primary, 600Y/347 Wye Secondary - KNAN/Bell Green

**Product ID: 294077**



**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-GMF-1.75MVA-YC-LT-DF-A6-BB-CZ-2B6-M1 Pad Mount Transformer | Ratings |
|---|---|
| **Transformer Type: Pad Mounted, Compartmental-Type** | Meets/Exceeds DOE 2016 Efficiency Ratings |
| **Transformer Configuration: Liquid Filled Pad Mounted** | Meets/Exceeds CSA Efficiency Ratings |
| **Transformer Feed Type: Loop Feed** | Complies with ANSI / IEEE C57.12.00 |
| **Operation: Step-Down Operation (Not Approved for Step-Up)** | Complies with ANSI / IEEE C57 12.28 |
| **Phase: Three Phase** | Complies with ANSI / IEEE C57 12.29 |
| **Capacity: 1.75 MVA (1750 KVA)** | Complies with ANSI / IEEE C57 12.34 |
| **Vector Group: YnYn0** | Complies with ANSI / IEEE C57 12.35 |
| **Primary Voltage: 24940GrdY/14400** | Complies with ANSI / IEEE C57.12.70 |
| **Primary Voltage Switch: N/A** | Complies with ANSI / IEEE C57.12.110 |
| **Primary Voltage Class: 25 kV Class** | Complies with ANSI / IEEE C57.12.131 |
| **Primary Phasor: Grounded Wye** | Complies with ANSI / IEEE C62.11 |
| **Primary BIL: 125 kV** | Complies with ANSI / IEEE C62.22 |
| **Secondary Voltage: 600Y/347** | Complies with ANSI / IEEE 386 |
| **Secondary Voltage Class: 1.2 kV Class** | Complies with ANSI / IEEE C2 |
| **Secondary Phasor: Wye-N** | Complies with ANSI / IEEE C37.47 |
| **Secondary BIL: 30 KV** | Complies with ANSI Z535.4 |
| **Frequency: 60 Hz** | Complies with ASTM D3487 |
| **Temperature Rise: 65°C** | Complies with ASTM D6871 |
| **Insulation Rating: Class E Insulation - 120°C, 248°F** | Complies with NEMA 260-1996 |
| **Cooling Class: KNAN; Self-Cooled** | Complies with 10 CFR Part 431 |
| **Forced Air (Fans): None** | Complies with CSA C2.1-06 |
| **Tap Changer: 5-position Tap Changer** | Complies with CSA C50 |
| **Tap Qty: (2) FCAN Above Taps, (2) FCBN Below Taps** | Complies with CSA C88 |
| **Tap %: 2.5%** | Complies with CSA C88.1 |
| **Tap Changer Switch Rating: 300-Amp, 25 kV** | Complies with CSA C88-16 |
| **Tap Changer Switch Location: High Voltage (HV) [Left Side] Front Compartment** | Complies with CSA C227.4 |
| **Impedance (Typical): 5.0-7.5% Typical** | Complies with CSA C227.5 |
| **Primary Connection Type: Dead Front** | 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: 25 kV Class, 125 kV BIL, 600A, Dead Break, IEEE 386 Color Maroon**
**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: 10 kV Class Elbow Arrestor**
**Primary Surge Arrestor MCOV Rating: 8.4 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, 6-Hole Spade, Externally Clamped, Accepts up to (6) Double Lug connections with (3) 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: 2-Position Load Break Switch, Hot Stick Operable**
**Load Break Switch Qty: (3)**
**Load Break Switch Rating: 300-Amp, 25 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*: 281 Gallons**
**Fluid (Oil) Weight*: 2,160 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: Copper**
**Ambient Temperature Rating: 40°C**
**Ambient Operating Temperature Range: -40°C to +40°C (-50°F to +104°F)**
**Sound Level: 60 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**

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 %: 99.30%**

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

**Load Losses Based on 85°C Reference Temp.**

**No Load Loss (in watts): +/- 1,900W**

**Full Load Loss (in watts) at 100%: +/- 10,500W**
**Total Load Loss (in watts) at 100%: +/- 12,400W**

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

**Total Load Loss (in watts) at 50%: +/- 4,375W**

***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***

**Seismic Rating: Yes**
**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*: 20"-W x 5"-D**
**LV Compartment Base Wireway Dimensions*: 20"-W x 5"-D**
**MV/LV Compartment Cabinet Depth*: 24"-D**
**Tank Cover Access Handhole: N/A**
**Dimensions*: 75"-W x 73"-D x 73"-H**
**Dry Weight (w/o Oil)*: 4,217 lb**
**Total Weight (Liquid Filled)*: 9,800 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-GMF-1.75MVA-YC-LT-DF-A6-BB-CZ-2B6-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 1750 KVA (1.75 MVA), the industrial transformer features a dual rated primary voltage of three-phase 24940Y/14400 grounded Wye and a secondary voltage of three-phase 600Y/347 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.

copper transformer winding material helps improve performance, reduce weight and lower cost. Compared to copper, copper 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-GMF-1.75MVA-YC-LT-DF-A6-BB-CZ-2B6-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 1750 KVA (1.75 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-GMF-1.75MVA-YC-LT-DF-A6-BB-CZ-2B6-M1 features biodegradable cooling fluid (KNAN) with a capacity of 350 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% loan 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-GMF-1.75MVA-YC-LT-DF-A6-BB-CZ-2B6-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-GMF-1.75MVA-YC-LT-DF-A6-BB-CZ-2B6-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.


Non PCB
MINERAL OIL
NOTICE
WARNING
ADVERTENCIA
DO NOT OBSTRUCT


LARSON
MAGNETICS







# 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

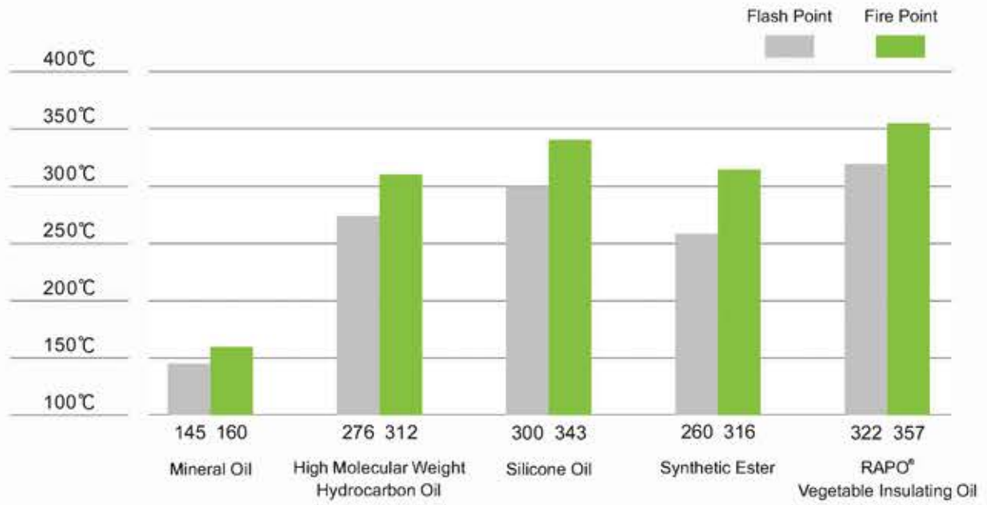



- If RAPO® spillover, it can be cleaned by normal means, instead of the way to deal with toxic waste.
- RAPO® is real green insulating oil which can avoid punishment by government regulations and eliminate the cleanup process.

## Less-flammable Character

Mineral oil's fire point is in the range of 147-165ºC (296.6-329ºF). The relatively lower fire point might result in transformers' fire and explosion. The fire point of RAPO® vegetable insulating oil is up to 350ºC, 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

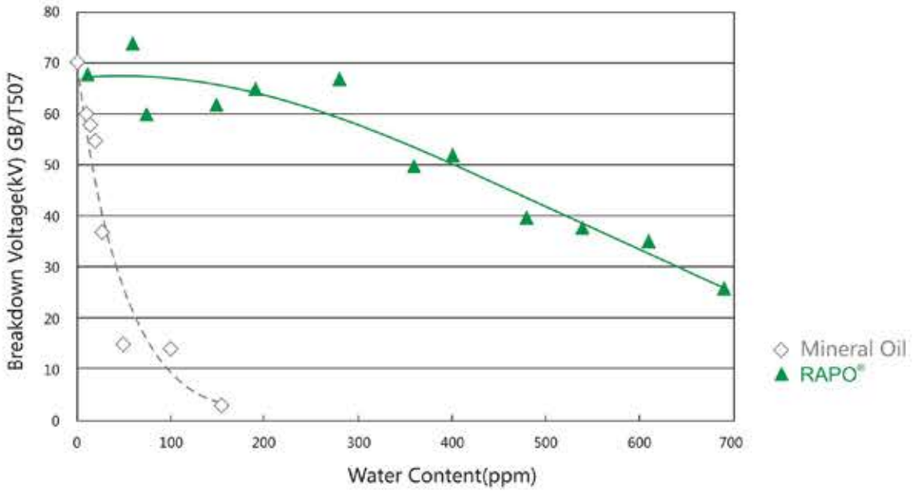



- RAPO® vegetable insulating oil can effectively save equipment maintenance, replacement and other costs, and avoid the economic losses caused by the transformer fire.
- RAPO® can be used indoors or in the compact space.
- RAPO® can help to reduce the use of fire-fighting equipment (sprinkler) and firewalls if space is limited.
- RAPO® can reduce insurance costs.

## Excellent Electrical Character

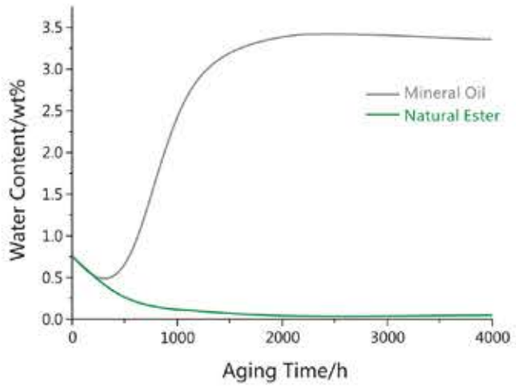
RAPO® vegetable insulating oil has a higher breakdown voltage than mineral insulating oil.

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

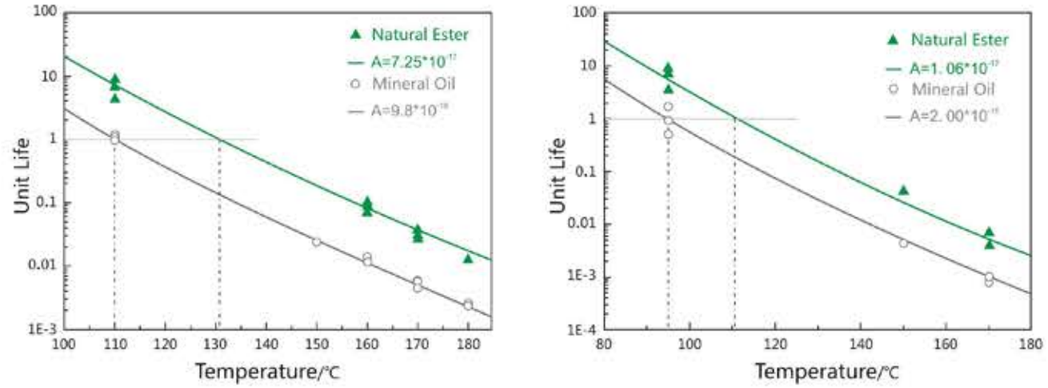



Ester chain in natural ester can make it have "polar" region, the region covered by ester chain effects like a magnetic fields which has a special attraction to water molecule and can absorb the water which exists in insulation cellulose paper material. So RAPO® has extremely high water saturation at 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℃ 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℃ | 65℃ | 78℃ |
| RAPO® Vegetable Insulating Oil | 80℃ | 115℃ | 160℃ |





## 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℃ | 0.06 | ASTM D924 | ≤0.2 |
| | 100℃ | 1.37 | ASTM D924 | ≤4 |
| Volume resistivity (Ω•cm @25℃) | | $6.9\times10^{13}$ | DL/T 421 | — |
| Physical and Chemical Properties | | | | |
| Relative density ($g\cdot cm^{-3}$ @15℃) | | 0.919 | ASTM D1298 | ≤0.96 |
| Color | | L0.5 | ASTM D1500 | ≤1.0 |
| Total acid number (mgKOH/g) | | 0.024 | ASTM D974 | ≤0.06 |
| Viscosity($mm^2/s$) | 40℃ | 36.07 | GB/T 265 | ≤50 |
| | 100℃ | 8.263 | GB/T 265 | ≤15 |
| Thermal Properties | | | | |
| Flash point(open cup)/℃ | | 322 | GB/T 3536 | ≥275 |
| Fire point/℃ | | 357 | GB/T 3536 | ≥300 |
| Pour point/℃ | | -27 | GB/T 3535 | ≤-10 |

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# 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


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- **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)



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- **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: James Thomas

Name: James Thomas
Position: Operations Manager


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# 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



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# Frequently Asked Questions (FAQ)

**Q. What type of transformers does Larson Electronics offer?**

A. Larson Electronics offered dry type transformers and liquid filled transformers. For liquid filled transformers, Larson Electronics' offers overhead distribution transformers (utility pole mount), pad mounted distribution transformers (mounts to a concrete pad), pad mounted power transformers, underground submersible distribution transformers, and substation transformers.

**Q. What are the main benefits of a liquid filled transformer?**

A. Liquid filled transformers have higher energy efficiency, durability, short circuit strength, low sound level, lower maintenance costs, and longer useful life expectancy compared to dry type transformers.

**Q. What types of transformer liquids does Larson Electronics use?**

A. Larson Electronics offered mineral oil fluid (ONAN) and biodegradable fluid (KNAN). On request we can provide brand name FR3 fluid or other brand name fluids for additional cost and lead time. All fluids offered by Larson Electronics are non-PCB containing fluids.

**Q. What is the difference between mineral oil (ONAN) and biodegradable fluid (KNAN)?**

A. Mineral oil has a flash point of 147-165°C. Biodegradable insulation fluids have a higher flash point up to 350°C. Using biodegradable fluids reduce the risk of potential fire due to the transformer overheating. Utilizing biodegradable fluids extends the lifespan on the transformer due to better insulation, higher flash point, better moisture resistance, and higher maximum voltage breakdown points over mineral oils.

**Q. What is the difference between FR3 fluid and biodegradable fluid?**

A. Envirotemp FR3 is a brand name of biodegradable ester oils made by Cargill. Cargill is not the only manufacturer of biodegradable ester fluids used for cooling liquid filled transformers. Larson Electronics stocks RAPO biodegradable fluid that exceeds testing for ASTM D6871. Cargill Envirotemp FR3 can be used in substitution of the standard biodegradable fluid. This substitution will increase cost and lead times.

**Q. Do Larson Electronics transformers contain PCB?**

A. All dry-type and liquid filled transformers manufactured by Larson Electronics are PCB (polychlorinated biphenyl) free at the time of shipment. Mixtures of polychlorinated biphenyls (PCB's) were banned commercially for use as transformers cooling fluids in 1977 due to being toxic, bio-accumulative, not at all biodegradable, and difficult to dispose of safely. None of Larson Electronics transformers contain PCB and only use PCB-free fluids.

**Q. What are the transformer ratings?**

A. IEEE Std C57.12.20 (Overhead Type), IEEE Std C57.12.34 (Three-Phase Pad-Mounted Compartmental), IEEE Std C57.12.38 (Single-Phase Pad-Mounted), IEEE Std C57.12.36 (Distribution Substation Transformers). For more detailed list of standards, please see the ASTM Certificate 1 link.

**Q. Is this transformer UL Listed? Is this transformer CSA Listed?**

A. By default, no. The majority of medium voltage transformer installations do not require certification by a Nationally Recognized Testing Laboratory (NRTL) unless being installed inside a building. Medium voltage equipment is built to and complies to ANSI, ASTM, DOE, IEEE, and NETA standards. UL is one of multiple NRTLs per OSHA certification for testing

facilities for USA standards. CSA is one of multiple NRTLs per Canada certification standards. For an additional fee, we can submit your order for NRTL testing after completion of build. This testing service is per order, requires payment of testing fees, and will increase lead time.

**Q. What is the lifespan of a transformer?**

A. The average lifespan of a liquid filled transformer is 25 years. Many transformers will survive past the 25 year mark and are still in service for up to 35 years.

**Q. What is the difference between Loop Feed and Radial Feed?**

A. Radial feed Transformers will have three high voltage bushings (H1, H2, and H3). There is one bushing for each phase to allow for the incoming high voltage cables. On Wye and Grounded Wye connected Transformers, there will also be an H0 bushing. Loop feed Transformers will have six high voltage bushings (H1A, H2A, H3A, H1B, H2B, and H3B). There are two bushings for each phase. This allows the customer to connect all of their Transformers in a loop configuration. It will also allow the customer to bring two feeds to the Transformer. A four position switch can be used to switch between the A feed and the B feed.

**Q. What is the difference between Dead Front and Live Front?**

A. Live-front: The voltage-carrying parts are exposed. Live-front terminations have high voltage connectors, arresters, or fuses are exposed to the operator after cabinet has been opened. Dead-front: Often referred to as dead-front bushings. Safety is enhanced as there are no current-carrying parts exposed to the operator. For overhead distribution transformers and underground submersible transformers, live front is common. For pad mount transformers, the primary is typically dead front and the secondary is live front. Protection barriers can be added to live front pad mounted transformers

**Q. What is the difference between copper and aluminum windings inside the transformer?**

A. Transformers wound with aluminum or copper wire have similar losses and performance. The choice of using copper or aluminum windings depends upon the application and the individual preferences. The type of winding material does not affect the transformer's reliability. A transformer's life is defined by the life of its insulation system.

**Q. How many BTU's of heat does a transformer generate?**

A. The heat a transformer generates is dependent upon the transformer losses. To determine air conditioning requirements multiply the sum of the full load losses (obtained from factory or test report) of all transformers in the room by 3.41 to obtain the BTUs/hour. For example: A transformer with losses of 2000 watts will generate 6820 BTUs/hour.

**Q. Do you have to ground this transformer?**

A. In most cases the enclosure of the transformer is grounded for safety reasons. However, a transformer will function properly without being grounded. Be sure to research all grounding requirements for your specific application against the NETA and NEC as well as any local electrical codes.

**Q. What types of transformer protection are available?**

A. For over-current protection, Larson Electronics offers Fuses, breakers and interrupters. For over-voltage protection, Larson Electronics offers arresters. Larson Electronics can provide both Primary and Secondary protection equipment.

**Q. What is required for mounting this transformer?**

A. For mounting requirements, please see the ASTM Certificate 2 link.

**Q. Does my primary and secondary voltage matter for a transformer?**

A. Yes, this matters greatly. For primary voltage, most transformers will be equipped with a tap changer for small primary voltage changes due to voltage drop for losses experienced in the transmission line. Some transformers will be equipped with dual voltage primaries with a voltage selector switch to choose which voltage to operate the transformer on. In both cases, these are designed to provide a steady output voltage. It is very important to confirm what voltage your primary voltage being delivered from the utility provider and what the required electrical voltage for the building or house is. You cannot only provide the KVA size, or the abbreviated primary voltage as there is not standardized voltage across the country and each region can be different. Once manufacturing has started, these cannot be changed.

**Q. Where is the detailed dimensional drawing for this unit?**

A. We can provide a feature drawing that shows accessories and estimated form factor. Due to the variety of options and varying voltages, an exact dimensional drawing for the specific unit you have ordered is not available until after purchase and engineering has completed the drawing for your sales order. We do not offer completed detailed engineered drawings before purchase. The feature drawings are detailed enough for concrete pad designs and preliminary engineering site designs.

**Q. What is the warranty of this transformer?**

A. 12 months from point of connecting electrical service to the transformer or 18 months from point of ordering, whichever comes first.

**Q. Can this transformer be customized?**

A. Yes, Larson Electronics allows for customization of all transformers. Please send customization requests to sales@larsonelectronics.com. If you have an engineered specification or engineered drawings, please provide those at the time of request.