Three Phase Pole Mount Liquid Filled Transformer

Operation and Installation Manual

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SAVE THESE INSTRUCTIONS

Safety

Larson Electronics meets or exceeds all applicable industry standards relating to product safety in its MT-UPM series of pole mount transformers. We actively promote safe practices in the use and maintenance of our products through our service literature, instructional training programs, and the continuous efforts of all Larson Electronics employees involved in product design, manufacture, marketing, and service.

We strongly urge that you always follow all locally approved safety procedures and safety instructions when working around high voltage lines and equipment.

Safety information

The instructions in this manual are not intended as a substitute for proper training or adequate experience in the safe operation of the equipment described. Only competent technicians who are familiar with this equipment should install, operate, and service it.

A competent technician has these qualifications:

- Is thoroughly familiar with these instructions.
- Is trained in industry-accepted high and low-voltage safe operating practices and procedures.
- Is trained and authorized to energize, de-energize, clear, and ground power distribution equipment.
- Is trained in the care and use of protective equipment such as arc flash clothing, safety glasses, face shield, hard hat, rubber gloves, clampstick, hotstick, etc.

Following is important safety information. For safe installation and operation of this equipment, be sure to read and understand all cautions and warnings.

Hazard Statement Definitions

This manual may contain four types of hazard statements:

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in equipment damage only.

Safety instructions

Following are general caution and warning statements that apply to this equipment. Additional statements, related to specific tasks and procedures, are located throughout the manual.

DANGER

Hazardous voltage. Contact with hazardous voltage will cause death or severe personal injury. Follow all locally approved safety procedures when working around high- and low-voltage lines and equipment. G103.3

WARNING

Before installing, operating, maintaining, or testing this equipment, carefully read and understand the contents of this manual. Improper operation, handling or maintenance can result in death, severe personal injury, and equipment damage. G101.0

WARNING

This equipment is not intended to protect human life. Follow all locally approved procedures and safety practices when installing or operating this equipment. Failure to comply can result in death, severe personal injury and equipment damage. G102.1

WARNING

Power distribution and transmission equipment must be properly selected for the intended application. It must be installed and serviced by competent personnel who have been trained and understand proper safety procedures. These instructions are written for such personnel and are not a substitute for adequate training and experience in safety procedures. Failure to properly select, install or maintain power distribution and transmission equipment can result in death, severe personal injury, and equipment damage. G122.3

Product information

Introduction

These instructions have been prepared to assist competent technicians in the installation, operation and service of Larson Electronics' MT-UPM series Three-phase pole mount transformers.

Pole mount transformers are designed for instal-lation on Three-phase above ground systems. All units are constructed for weather exposed mounting on a utility pole. Although every effort has been made to anticipate normal installation, operation and servicing problems, these instructions do not cover all possible variations in equipment or application conditions. All possible installation, operation or service contingencies are not discussed. If additional information is required, contact a factory representative at:

Larson Electronics
Phone: 1-214-616-6180
Toll Free: 1-800-369-6671
E-mail: sales@larsonelectronics.com

Read this manual first

Read and understand the contents of this manual and follow all locally approved procedures and safety practices before connecting or operating this equipment.

Additional information

These instructions cannot cover all details or variations in the equipment, procedures, or process described, nor provide directions for meeting every possible contingency during installation, operation, or maintenance. For additional information, contact your Larson Electronics representative.

Safety requirements

Before you start work

Check your supplies and equipment

Check your tools and supplies before beginning work. Make sure all needed equipment is in good working order; make sure all necessary materials are available.

While you are working

Protect yourself

Observe all safe practices and procedure regulations established by your employer. Wear all protective gear and clothing (boots, helmets, gloves, masks, goggles, safety glasses) supplied by your employer or required for safety on the job.

Follow manufacturer's instructions when installing or using any apparatus or attachments. Observe all precautions recommended in manufacturer's literature.

Handle all electrical equipment with respect. Make sure you know circuit and load current conditions before operating or servicing a system connected transformer.

Lift and move transformer with care

Before moving the transformer, check the total weight of the equipment (see nameplate) and check the condition and capacity of all lifting and hoisting equipment. When lifting unit from above, use lifting lugs only. Do not use bushings as handles. Do not use worn, frayed or damaged hooks, cables, or slings. Do not use fork lifts or cranes with load capacity less than the weight of the transformer. Do not drop transformer from truck.

Mount transformer securely

The transformer must be securely fastened to the utility pole.

When you make the system connection

Make sure multiple voltage switches and tap-changers are in the proper position.

Make sure the tank is grounded before doing any other work.

The transformer tank ground must be connected to a permanent, low-impedance ground.

⚠ WARNING

Failure to ground the unit prior to energizing could result in equipment failure or personal injury.

Clean all bushings and terminals before making system connections

Clean bushings, terminal lugs, and all connection points before making connections. Remove all dirt, grease, or foreign material.

Complete the neutral connections before making other system connections

Connect all available transformer neutrals to system neutrals before completing other system connections.

Keep unused leads isolated from system wiring

Insulate all unused leads from ground and from all other leads and connections.

Observe manufacturer's instructions when installing attachments

Follow manufacturer's instructions for installing accessories or attachments. Make sure all connectors are correctly rated for the application.

Check insulating fluid level before energizing the transformer

Make sure the insulating fluid is at the proper level before the transformer is energized.

During operation

De-energize the transformer before operating non-loadbreak accessories.

Tap-changers

The transformer must be de-energized before tap-changer settings are adjusted.

Multiple voltage switches

The transformer must be de-energized before multi-voltage switch settings are changed. (Check the transformer nameplate for the correct voltage before re-energizing the unit.) Check tap-changer position before energizing a transformer with a multi-voltage switch.

⚠ WARNING

When multiple voltage switches are set to connect transformer windings in parallel, tap-changers must be in the position shown on the transformer nameplate. Tap-changers usually cannot be used to adjust voltage ratings when transformer windings are connected in parallel. Before re-energizing transformer after resetting multiple voltage switches, check tap-changer settings against nameplate information for correct voltages. Failure to have tap switch in correct position could result in equipment failure or personal injury after unit is energized.

Internal fuses

The transformer must be de-energized before it can be opened to service internal fuses.

WARNING

Do not attempt to open an energized transformer. Opening an energized unit could result in personal injury or death.

Do not exceed transformer ratings

Transformers should be operated only at the ratings specified on the transformer nameplate. Prolonged overload operation will measurably shorten the projected service life of a mineral oil-filled transformer.

WARNING

Exceeding transformer ratings may result in equipment damage or personal injury.

Receiving

Immediately upon receipt, the transformer should be inspected for evidence of any damage or mishandling that may have occurred during shipment. Notify your Larson Electronics representative of any evidence of damage or defect observed. Claims for shipping damage should be filed with the delivering carrier.

Before the transformer is moved, parts or attachments that may have been loosened or damaged during shipment should be tightened, repaired or replaced.

CAUTION

Equipment damage. Before moving the transformer, check the total weight of the equipment (see nameplate) and check the condition and capacity of all lifting and hoisting equipment. When lifting unit from above, use lifting lugs only. Do not use bushings or any other apparatus as handles. Do not use worn, frayed or damaged hooks, cables or slings. Do not use fork lifts or cranes with load capacity less than the weight of the transformer. Do not drop the transformer from truck. Improper lifting may result in equipment damage.

Moving the transformer

Moving transformer shipped on pallets

Transformers shipped on pallets may be moved by fork lift trucks of proper capacity. Pallet mounted equipment may also be moved by crane or hoist.

WARNING

Lifting a non-palletized transformer with a fork truck may cause damage to the transformer. Failure to comply may also result in serious personal injury.

Lifting the transformer by crane or hoist

For unloading, lifting lugs are provided near the top of the transformer tank. Cable pull angles should not be over 30° from the vertical. Otherwise, spreaders should be used to hold the lifting cables apart to avoid any bending of the tank or lifting hooks. Do not use oblong links, hooks, or other similar lifting hardware under lifting lugs. This could compromise lug load rating. Do not attempt to lift the transformer by placing a continuous loop of cable or chain around the unit or lifting lugs.

WARNING

Lift the transformer using all of the lifting pads or lugs provided. Do not use radiators, cooling fins, or other apparatus other than lifting lugs for lifting. Failure to comply may result in serious personal injury or damage to the equipment.

Storage

Transformers should be stored in an upright position on a pallet to prevent damage from standing water. Do not double stack or store where they will be subject to mechanical damage.

Installation

Make sure you understand the purpose and function of all equipment and accessories. Wear any protective clothing or equipment required. Use a hotstick for all grounding, testing, disconnect, or reconnect operations when possible. Treat the transformer as energized until you have verified its condition.

Pre-service inspection

New transformers or transformers energized after a period of storage, should be thoroughly inspected before being connected to the system.

1. The transformer exterior should be inspected for nicks, dents, and scratches. Any damage to weather-resistant finishes should be repaired promptly.
2. The tank cover, cover seals and all gaskets or seals at operating devices should be inspected for evidence of insulating fluid seepage. Leaking or improperly tightened gaskets and seals must be repaired before the transformer is placed in service.
3. Larson Electronics' MT-UPM series transformers are shipped ready for installation, with the insulating fluid at the 25°C level. On units which are not gauge equipped, the fluid level can be determined by removing the oil-level plug, or removing the tank cover.

WARNING

The transformer tank must be vented to zero pressure before the cover or oil-level plug is removed. Vent by manually operating the pressure relief device with a hotstick. Failure to properly vent the transformer to atmospheric pressure before and after moving, prior to installation, and before initiating any inspection or repair procedures may result in damage to the equipment or in serious personal injury.

Care should be taken to avoid bodily contact with oil which may be released from the transformer during the venting procedures.

Reconfiguring factory low voltage internal connections

If transformer internal connections are reconfigured from the original factory setting a Turns Ratio Test must be performed prior to energizing in accordance to IEEE Std C57.12.90™ standard. This will ensure the unit produces correct output voltage and polarity.

WARNING

Failure to perform Turns Ratio Test prior to energizing could result in equipment failure or personal injury.

Mounting the transformer

The transformer should be mounted level. The pole must be strong enough to support the weight of the transformer.

WARNING

Failure to verify the load bearing capacity and condition of the pole prior to mounting the transformer could result in death, personal injury or equipment damage.

Non-loadbreak accessories

All settings of multiple voltage switches and tap-changers should be made prior to any high voltage or low voltage connections.

The multiple voltage switch was set at the factory at the highest voltage position. Check the position of this switch.

The tap-changer was set at the factory to the rated nameplate voltage. The tap positions are referenced on the nameplate. Check the position of the tap-changer.

WARNING

High voltage switches and tap-changers are no-load devices. Do no operate unless the transformer is de-energized. Operating switches when transformer is energized could result in equipment failure or personal injury.

External connections

Transformers must be connected and operated as indicated by the transformer nameplate.

WARNING

Make only those connections indicated on the diagrams and information on the transformer nameplate. Available transformer neutrals must be connected to system neutrals. Leads and connections not in use must be insulated from ground and from all other leads. Improper connections may result in personal injury or equipment damage.

Clean all bushings and terminals before making system connections. Remove all dirt, grease, or foreign material.

WARNING

The transformer tank must be grounded before any other electrical connection is made. A transformer which is system connected and not grounded should be regarded as energized. An energized transformer is extremely dangerous. Contact with an energized transformer tank can be fatal. Wye-Wye winding connected transformers (no Delta winding) are designed for use on systems having a grounded neutral connector. All windings designed for grounded neutral operation MUST be permanently and solidly grounded to the system neutral without resistance.

Ground connections

The transformer tank must be connected to a permanent, low-resistance ground. Larson Electronics' MT-UPM series pole mount transformers are equipped with a grounding nut for making the ground connection.

Low voltage connections

Eye-bolt terminals are the standard low-voltage connectors on Larson Electronics' MT-UPM series overhead transformers.

CAUTION

Over tightening of the eye bolt terminals may result in equipment damage.

Eye bolt terminals should be tightened in accordance with the following torque requirements.

Eye Bolt Size	Torque
3/8-16	175-200 in-lb
1/2-13	375-425 in-lb

Accessories

Three-phase overhead transformers may be equipped with a variety of optional equipment. Many types of fuses and switches are available and different gauges and pressure-relief devices may be obtained. Most accessories are factory installed and no field work is required to prepare them for operation. Follow manufacturer's instructions for installing accessories or attachments. Make sure all connectors are correctly rated.

Secondary breaker

For transformers equipped with secondary breakers, the secondary breakers are designed to provide transformer protection against secondary faults. Secondary breakers are not intended to protect loads or to be used as an on/off switch.

WARNING

When the low voltage terminals are connected in parallel, it is possible that an induced voltage may be present at the load when the secondary breaker is open. Verify that no voltage is present at load in accordance with industry operating procedures prior to working on load. Failure to verify that no voltage is present at load in accordance with industry operating procedures can result in serious personal injury or death.

Surge arresters–connection

Surge arresters ordered with the transformer are installed at the factory. Arrester and tank ground connections must be completed BEFORE the transformer is connected to the high voltage line. Proper connection places the arrester in a direct shunt relationship to the transformer insulation.

High voltage connections

High voltage connections are provided by internally clamped bushings with tin-plated eye bolt terminals suitable for either copper or aluminum conductors. Do not connect high voltage until all other connections are made.

Operation

Larson Electronics' MT-UPM series transformers are designed to carry a rated load with a temperature rise equal to or less than the value shown on the nameplate. The coil insulation has been carefully made with thermally-upgraded materials to ensure long life at rated loads. Severe and prolonged overloads of mineral oil-filled transformers will result in overheating and accelerated aging of the insulation, which may lead to premature failure.

Maintenance

Disconnection

WARNING

The transformer MUST be de-energized before any service is performed. Working on an energized transformer is extremely dangerous–do not attempt to open or service energized equipment. Opening or servicing an energized unit could result in personal injury or death.

Exterior maintenance

Periodically inspect all exposed surfaces for evidence of tampering, battered metal, etc. Dents or deformities should be repaired at once. Scratched or weathered paint or protective coatings should be touched up promptly. Keep the area around the transformer clean. Do not store tools, materials or equipment on or against the transformer.

Inspect plugs and switches. Look for evidence of insulating fluid seepage around tank-wall gaskets, seals, etc. Replacement of gaskets or seals in the tank wall may require that the tank be opened and the insulating fluid be drawn down to the appropriate level.

Cover removal

To remove a tank cover perform the following:

1. Thoroughly clean the cover. Remove all dirt, grease and moisture.
2. Vent the transformer to atmospheric pressure. A pressure relief valve may be specified for this purpose. If a pressure relief valve is not installed, relieve pressure by slowly removing the vent plug located near the top of the tank. Stand to the side when venting tank.

WARNING

Failure to vent transformer tank to zero pressure prior to removing cover may result in serious personal injury.

3. Loosen, then remove the cover band. Remove ground strap from connection.
4. Remove the cover. Lift vertically to prevent damage to cover, tank gaskets, or bushings. Remove the cover gently. The high voltage bushing leads are attached with sufficient slack to allow cover to be lifted enough for the leads to be disconnected.

Internal inspection

Internal inspections should note defects or damage which will or might prevent proper operation of the transformer.

Inspect For:

1. Moisture on underside of cover.
2. Loose, shifted, or damaged parts (bushings, fuse holders, etc.)
3. Broken or loose connections.
4. Contaminated insulating fluid (sediment or foreign objects on the tank bottom, dirt or air bubbles suspended in the fluid).

Note: If the transformer has been stored outdoors for an extended period of time, a sample of the insulating fluid should be checked for moisture content.

CAUTION

The life of any transformer depends on the absence of moisture in the insulation. Therefore, if a transformer seal is broken for any reason, it is imperative that the transformer be kept free of moisture and resealed carefully. Excess moisture in the transformer fluid leads to accelerated breakdown of insulation and may result in equipment failure.

Handling insulating fluid

Mineral oil-filled transformers–non-PCB (<1 ppm) insulating fluid

Refer to IEEE Std C57.106™ standard, Guide for Acceptance and Maintenance of Insulating Oil in Equipment, for additional guidelines when testing or handling insulating oil.

Envirotemp™ FR3™ fluid-filled transformers–high firepoint, non-PCB (<1 ppm) insulating fluid

Refer to IEEE Std C57.147 standard, Guide for Acceptance and Maintenance of Natural Ester Fluids in Transformers, for additional guidelines when testing or handling insulating fluid.

To lower the insulating fluid level

1. Prepare a clean, dry storage container to receive the fluid.
2. Use pumps and hoses that have not been contaminated by contact with dissimilar fluids. Use a metal or non-rubber hose as oil dissolves the sulfur found in rubber and will prove harmful to the conductor material.
3. Place the pump intake line in the transformer tank.
4. Place the output line nozzle on the bottom of the storage container. Do not permit the fluid to splash into the receiving container. (Splashing will introduce air and moisture into the fluid.)

To restore the insulating fluid level

1. Pump from near the bottom of the temporary storage tank. Do not permit the intake line to suck air.

Note: It may be necessary to add extra fluid to the storage container from a reserve supply to replace the small quantity lost in the pump and lines and to prevent aeration of replacement fluid at the intake.

2. To prevent aeration at the outflow, direct the fluid stream parallel to and along the upper surface of the core clamp.
3. Pump slowly. Fill the transformer tank only to the 25°C level stamped on the tank wall.
4. Sufficient time should be allowed between refilling and energizing the transformer to be sure that any gas bubbles created during the filling process have been dissipated.

Contaminated insulating fluid

If moisture is found inside the tank, or there is evidence that the insulating fluid may be otherwise contaminated, a fluid sample should be taken for analysis. Samples should be drawn from the bottom of the tank. If moisture is present in the fluid, the transformer must be dried out. Contact your Larson Electronics representative for special instructions on dry-out or other decontamination processes.

Note: Fluid samples should be taken when the unit is warmer than the surrounding air to avoid condensation of moisture on the fluid. Samples must be drawn from the bottom of the transformer tank.

A clean and dry bottle is required. Rinse the bottle three (3) times with the fluid being sampled. Make sure fluid being sampled is representative of the fluid in the unit.

Test samples should be taken only after the fluid has settled for some time, varying from several hours to several days for a large transformer. Cold insulating fluid is much slower in settling.

Disposal

When disposing of a transformer or transformer insulating fluid, follow all applicable state and federal regulations regarding the disposal of oil-filled electrical equipment.

Reinstalling the transformer cover

The transformer cover, cover band and nut-bolt assembly should be reassembled immediately after maintenance to minimize the potential for contamination. The cover band nut-bolt assembly should be tightened per the following torque requirements.

Cover band torque requirements

Tank Diameter	Torque
20" and below	132-156 in-lbs.
Above 20"	168-204 in-lbs.

Bushing removal and replacement

To remove and replace transformer bushings perform the following:

1. Open the transformer tank and lower the insulating fluid level to expose the bushing.
2. Disconnect all internal and external cables and leads. Note the position of all nuts, flat washers, spring washers, etc. Release the internal bushing clamp bolts and remove the clamp. Remove the bushing and gasket.
3. Install a new bushing and gasket. The original gasket may be reused unless pinched or cut. Center the bushing and gasket to obtain an effective seal. Install the interior bushing clamp and clamp bolts. Tighten the clamp bolts.
4. Reconnect all external and internal cables and leads. Replace all nuts, flat washers, spring washers, etc., in their original positions. Tighten all connections.

⚠ CAUTION

The life of any transformer depends on the absence of moisture in the insulation. Therefore, if a transformer seal is broken for any reason, it is imperative that the transformer be kept free of moisture and carefully resealed. Excess moisture in the transformer fluid leads to accelerated breakdown of insulation and may result in equipment failure.

5. Restore the insulating fluid to the 25°C level. Inspect the bushing to tank seal for leaks or seepage. Repair as required. Close and reseal the tank.

Testing

CAUTION

Failure to disconnect arresters during dielectric test may result in failure of the transformer upon energizing.

Surge arresters

Surge arresters must be disconnected before dielectric tests are run on the transformer. Arresters should be reconnected immediately after tests are completed.

Accessories

Accessory items on transformers vary in function and are not generic for simple instruction. Information on accessories can be obtained from your Larson Electronics representative.

Replacement parts

When ordering replacement parts, please provide:

1. Transformer serial number
2. Description of replacement part required

To order parts, contact:

Larson Electronics
Phone: 1-214-616-6180
Toll Free: 1-800-369-6671
E-mail: sales@larsonelectronics.com

THESE INSTRUCTIONS MAY NOT COVER ALL DETAILS OR VARIATIONS OF THIS PRODUCT FOR YOUR EQUIPMENT OR INSTALLATION REQUIREMENTS. SHOULD FURTHER INFORMATION NOT COVERED BY THESE INSTRUCTIONS BE REQUIRED, PLEASE CONTACT LARSON ELECTRONICS BY EMAIL AT SALES@LARSONELECTRONICS.COM OR BY PHONE AT 1-877-348-9680 FOR FURTHER ASSISTANCE.

PLEASE VISIT LARSONELECTRONICS.COM FOR **WARRANTY** AND **RETURN** INFORMATION.