EDISON

LOW VOLTAGE DRY-TYPE TRANSFORMER

Installation, Operation, and Maintenance Manual

www.edisontransformer.com

EDISON

Safety Warnings

This manual contains critical safety instructions for the handling, operation, and maintenance of Edison Transformers.

- **DANGER:** Immediate hazards leading to severe injury or death. ⚠ DANGER
- **WARNING:** Potential hazards that may cause injury or property damage. ⚠ WARNING
- **CAUTION:** Practices that could result in minor injuries or reduce performance. ⚠ CAUTION
- **IMPORTANT:** Guidelines for proper operation unrelated to safety concerns. ⚠ IMPORTANT

Table of Contents

1. Introduction ⚠ IMPORTANT

This manual applies to Edison Transformers, including low voltage ventilated enclosure styles. Proper adherence to these guidelines ensures optimal performance and a long lifespan.

2. Standards ⚠ CAUTION

Edison Transformers comply with the following standards:

- IEEE C57.12-01: Dry-Type Distribution and Power Transformer Requirements
- CSA C22.2 : General Requirements
- NEMA ST 20: Transformer Sound Levels
- UL1561: Dry-Type Transformers
- CSA 802.2 : Minimum Efficiency for Dry Type Transformers
- DOE 2016 : Minimum Efficiency for Dry Type Transformers

3. Inspection on Receiving ⚠ WARNING

Upon receiving the transformer, it's crucial to inspect it for any physical damage or irregularities in packaging. Verify that all parts listed on the packing slip are present. Document any damages observed on the shipping documents. In case of damage, promptly file a claim with the carrier and provide copies of relevant information to the local sales office detailing the circumstances.

If the inspection occurs outdoors, ensure precautions are taken to prevent inclement weather from exacerbating any hazards.

4.Storage ⚠ CAUTION

Transformers intended for delayed installation or energization should be stored indoors in their original shipping cartons, maintaining a clean, dry, and temperature-stable environment. It is advised to store them in a heated building, dry location with temperatures between −40°C to 60°C is preferred. In cases where storage at lower temperatures is unavoidable, they must be gradually warmed to −25°C using warm air or radiant heat before energizing.

For outdoor storage, use weatherproof coverings and silica gel to absorb moisture.

Do not stack units to avoid structural damage.

5. Dryout ⚠ WARNING

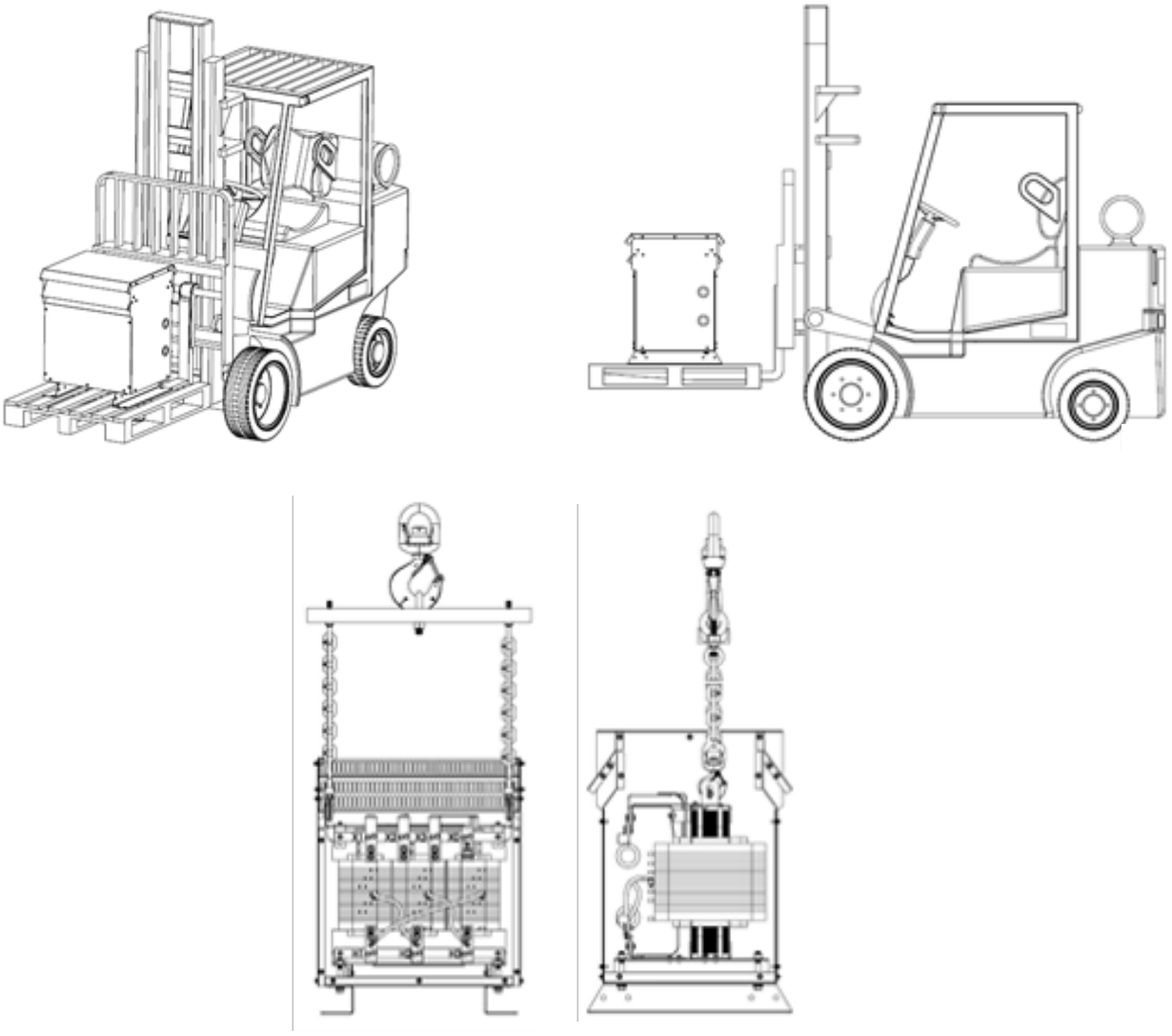
If a transformer has been exposed to moisture, such as condensation or rain, or stored in a high-humidity environment, it must be dried out before being energized. If the transformer was in operation, it should be taken out of service and dried. The following methods are recommended for drying:

- Any free moisture on the surface of the transformer should be blown off (at a maximum of 25 PSI) or wiped away to reduce the drying time.
- External forced air, either hot or warmed, or radiant heat should be directed through the windings, ensuring all ventilation openings are cleared. The recommended temperature should not exceed 110°C. This process should continue for 24 hours or until all signs of moisture or condensation are completely gone.

6. Handling and Lifting ⚠ CAUTION

Transformers may be lifted using a forklift truck if the blades or forks are sufficiently long to pass completely under the case. However, given that most general-purpose transformers have a high center of gravity, extreme caution must be exercised during lifting or movement.
Alternatively, you can remove the top cover to access the lifting holes on the core clamps, as demonstrated in figure attached. Utilize spreaders or slings of appropriate size according to the transformer's dimensions.

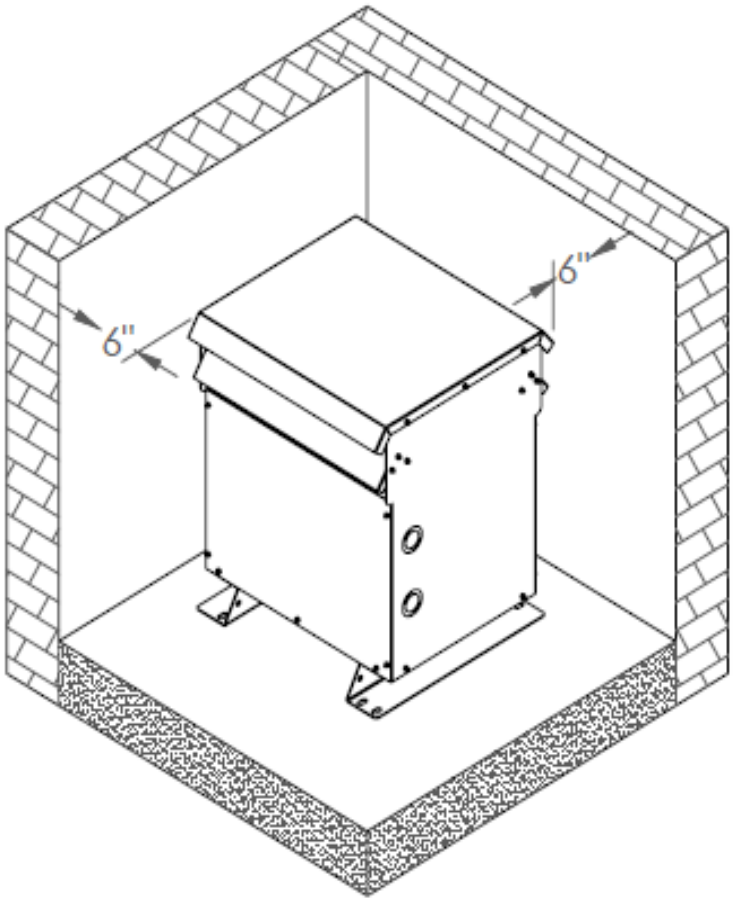
Note: For safety reasons, it's imperative not to attempt lifting or moving a transformer from any points other than those specifically indicated.



Proper lifting techniques with forklifts and cranes with spreaders.

7. Site Preparation ⚠ WARNING

- Ensure the site is free of corrosive substances, dust, and flammable materials.
- Maintain at least 6 inches clearance from adjacent walls for ventilation.
- Use sound-dampening materials in noise-sensitive areas.



Transformer installation site showing clearances and airflow

8. Pre-Installation Checks ⚠ DANGER

8.1) Ventilation

Transformers must be installed in areas where they can be cooled by convection, ensuring that the average ambient temperature does not exceed 30°C (86°F) and should not surpass 40°C (104°F) at any point. Adequate ventilation is crucial for transformers to operate at their nameplate kVA capability and ensure longevity.

The distance a transformer should be positioned is minimum 6 inches away from any wall or obstruction as indicated on the nameplate. These distance measurements must be followed to allow for free, unimpeded airflow through the ventilation openings or around a non-ventilated unit.

8.2) Location

When selecting a location for dry-type transformers, several factors should be considered, including accessibility, ventilation, environmental conditions, and noise levels (refer to the 'Reduction of Sound Levels' section). Installations should be in areas relatively free from dust, excessive moisture, chemicals, fertilizers, and other corrosive substances. They should also be separated from flammable materials in compliance with NEC regulations.

Wall-mount brackets are available for units up to 45 KVA. Regardless of the location, dry-type transformers must be installed upright in areas with adequate free air circulation. NEC codes should be consulted for the minimum required clearances from adjacent structures. It's strongly recommended to fence in the transformer to prevent unauthorized access.

8.3) Mounting

When installing a transformer, ensure the surface is robust enough to support its weight. To maintain their enclosure rating (Type 3R), the Ventilated transformers must be installed upright with the top point facing upward.

For wall-mounted installation:

Do not install wall-mounted transformers over flammable materials, and avoid storing flammable materials under a wall-mounted transformer.

8.4) Ease of Access

According to NEC standards, transformers must be accessible for inspection. However, it's crucial not to place transformers in areas where stored items might obstruct natural air convection or

hinder inspection. Additionally, avoid positioning transformers in passageways or areas where people could come into contact with live parts during inspections. Protection should be ensured under all circumstances.

8.5) Safety Precautions

The installation, operation, and maintenance of a transformer entail several potential safety hazards, including but not limited to:

- Incorrect tap changing procedures
- Exposure to arc flash
- Presence of lethal voltages
- Handling heavy components
- Dealing with high-temperature elements

To ensure safety, personnel must strictly adhere to all relevant safety protocols, including OSHA requirements, local safety regulations, NFPA 70 standards, and established best practices. It's imperative to exercise caution and use sound judgment when installing, operating, and maintaining transformers.

Specific safety measures to observe include:

- Avoid close proximity to high-voltage electrical terminations when the transformer is energized, as they pose a risk of electrocution.
- Do not remove enclosure panels or doors while the transformer is energized. Ensure panels are properly installed before energizing the transformer for operation.
- Inadequate or improper maintenance may lead to reduced transformer lifespan, personal injury, or property damage.

For detailed safety instructions and guidelines, please refer to the relevant sections of this instruction book.

9. Installation ⚠ DANGER

Grounding

- Ground all metallic parts per NEC standards.
- Use the Ground Points provided for Grounding marked as GND.

Mounting

- Floor mount units must be secured with Grade 5 or Grade 8 bolts depending on size.
- Maintain 18–24 inches spacing for stacked units.

Installation

- Disconnect all incoming power before installation.
- Only qualified personnel should install, inspect, or maintain transformers, as normal operating voltages can be hazardous.
- This ventilated dry-type power transformer is designed for indoor installation in dry locations. It can be used in humid environments, but dryout procedures must be followed if the unit is decommissioned for any period. Refer to the dryout instructions for guidance.
- Standard dry-type transformers are rated for operation at altitudes up to 1000 meters (3300 feet). If installed at a higher altitude, confirm the transformer rating for such an installation.
- This transformer should not be installed in environments containing dust, mildew, chemicals, corrosive gases, oils, or other chemical vapors. If this is unavoidable, take necessary precautions to prevent contaminants from entering the transformer enclosure.
- Adequate ventilation is crucial for proper operation. Dry, clean air is the most effective cooling method for the transformer. Filtered air may help reduce maintenance if the location has unusually high airborne contaminants.
- If the installation site has restricted airflow, sufficient ventilation must be provided. Forced ventilation, such as installing a fan to evacuate air or bring in fresh air, may be necessary. Consult the fan manufacturer for the specific Watt or BTU capacity of the fan.
- For standard units, the ambient temperature should not exceed 40°C. Special designs can be made for higher temperatures; consult the factory for details.
- A minimum of 6 inches clearance should be maintained from walls and other objects for adequate air circulation. If the unit is to be positioned near combustible materials, refer to the National Electric Code (NEC) or applicable local codes for minimum clearance requirements.
- The transformer should be installed in a location where water cannot accumulate, such as on a raised concrete slab.
- Wiring Through Knockouts using proper fittings is preferred.

Edison Transformers are shipped with a set of spare Viton washers to ensure the integrity of enclosure during installation and maintenance..

When to Use Spare Viton Washers

1. Damaged Washers:

If any Viton washer is found to be cracked, deformed, or otherwise damaged during installation or maintenance, replace it immediately with a spare washer.

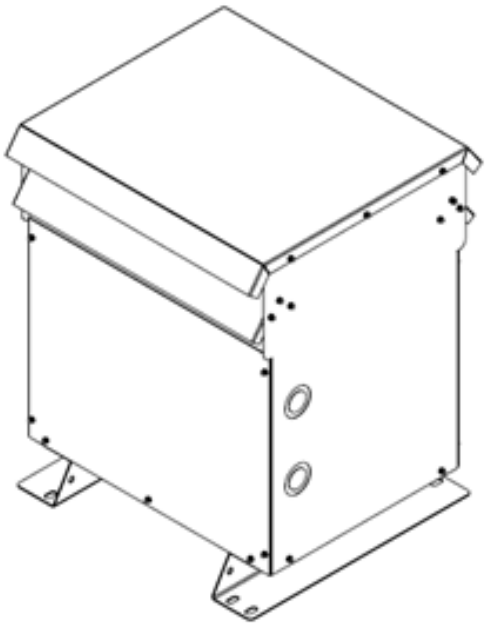
Installation Instructions for Viton Washers

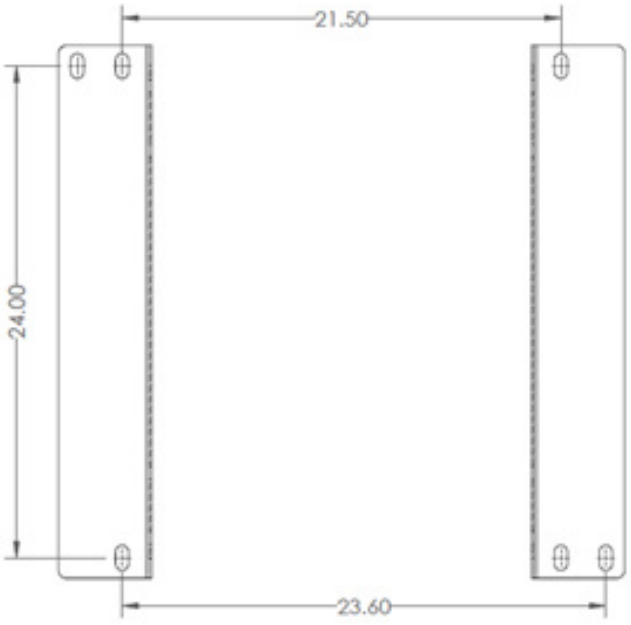
1. Ensure the surface where the washer will be seated is clean, dry, and free from debris.
2. Place the Viton washer evenly over the fitting or access point.
3. Tighten the corresponding bolts or fittings uniformly to avoid uneven pressure on the washer. Use torque values recommended in the manual.

Spare Washer Storage

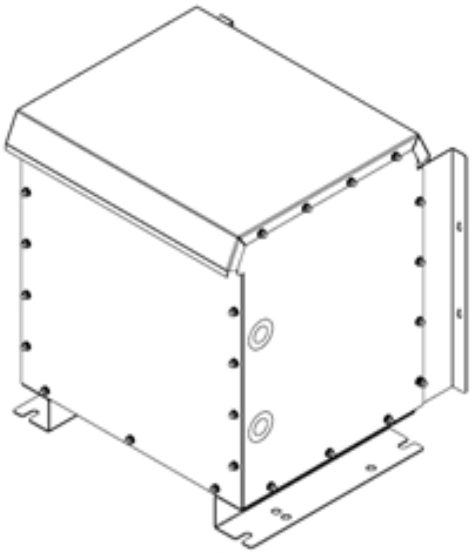
- Store spare washers in a cool, dry location away from direct sunlight or exposure to chemicals.
- Keep washers in their original packaging to prevent contamination or deformation.

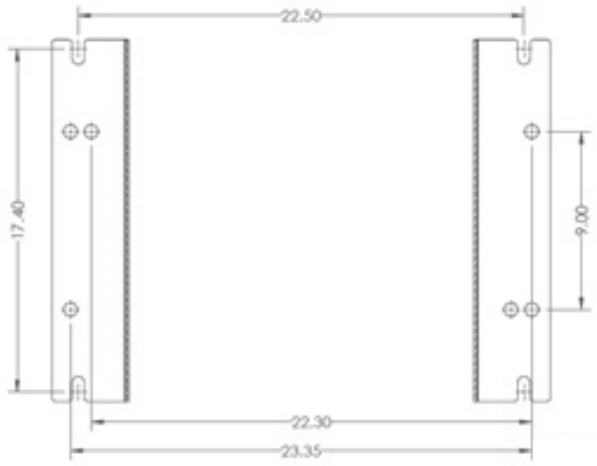
75 kVA Mounting Details

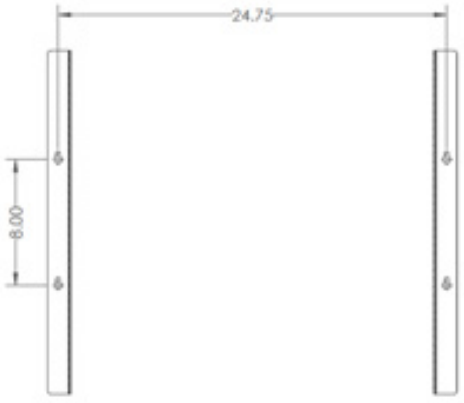




30&45 kVA Mounting Details







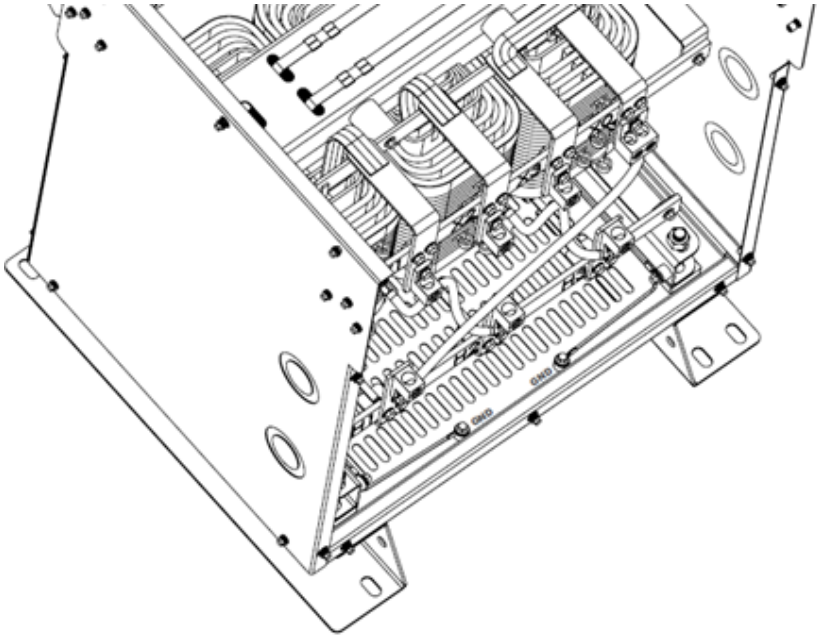


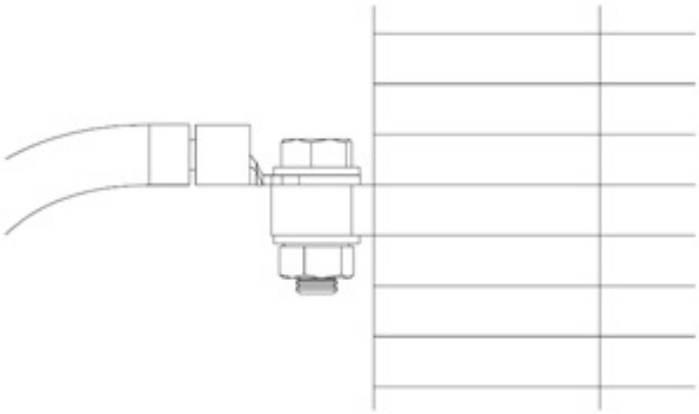
Image showing Grounding Locations

10. Cable Connections and Tap Positions ⚠ DANGER

Cable Connections

- Use wires rated for 90°C insulation and coat exposed ends with a suitable joint compound.

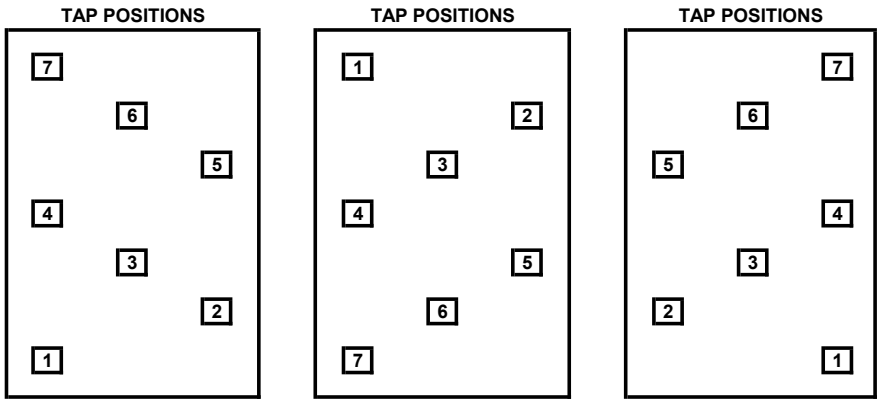
Tap Adjustments



Turn off power to the equipment before working on it. Discharge all static charges stored in the coils. Failure to follow these instructions may result in death or serious injury.

To change the tap position:

- De-energize the transformer in accordance with the electrical code.
- Remove the enclosure front panel to access the transformer winding with high-voltage taps.
- Use an appropriate grounding device to ground the coils and discharge any static charge.
- Locate the tap jumpers.
- Remove any varnish, paper, or epoxy from the required taps.
- Change the tap jumpers on each phase to the appropriate tap connection. Ensure the tap jumpers are set to the same position for each phase. Refer to Nameplate for Tap Details.
- Verify that the taps are securely tightened. Inspect the enclosure to ensure all hand tools and other foreign materials are removed.
- Reinstall the enclosure front panel.
- Energize the transformer.



Type -1 Configuration | Type -2 Configuration | Type -3 Configuration

Standard knockout sizes are attached below

Dimensions of conduit bushings and diameter of knockouts and widths of flat surrounding surfaces

Trade size of conduit,	Bushings				Knockout diameter				Minimum width of flat surrounding surfaces,	
	Overall diameter,		Height,		Minimum,		Maximum,			
inches	inches	(mm)	inches	(mm)	inches	(mm)	inches	(mm)	inch	(mm)
1/2	1	(25.4)	3/8	(9.5)	0.859	(21.82)	0.906	(23.01)	0.13	(3.4)
3/4	1-15/64	(31.4)	27/64	(10.7)	1.094	(27.79)	1.141	(29.98)	0.16	(4.1)
1	1-19/32	(40.5)	33/64	(13.1)	1.359	(34.52)	1.406	(35.71)	0.20	(5.0)
1-1/4	1-15/16	(49)	9/16	(14.3)	1.719	(43.66)	1.766	(44.86)	0.27	(7.0)
1-1/2	2-13/64	(56)	19/32	(15.1)	1.969	(50.01)	2.016	(51.21)	0.31	(7.8)
2	2-45/64	(68.7)	5/8	(15.9)	2.453	(62.31)	2.50	(63.50)	0.36	(9.2)
2-1/2	3-7/32	(81.8)	3/4	(19.1)	2.953	(75.01)	3.00	(76.20)	0.30	(7.8)
3	3-7/8	(98.4)	13/16	(20.6)	3.578	(90.88)	3.625	(92.08)	0.33	(8.3)
3-1/2	4-7/16	(113)	15/16	(23.8)	4.094	(103.99)	4.156	(105.56)	0.34	(8.6)
4	4-31/32	(126)	1	(25.4)	4.609	(117.07)	4.672	(118.67)	0.38	(9.7)
5	6-7/32	(158)	1-3/16	(30.2)	5.688	(114.48)	5.750	(146.05)	0.48	(12.2)
6	7-7/32	(183)	1-1/4	(31.8)	6.781	(172.24)	6.844	(173.84)	0.56	(14.2)

Torque Values for Cable Connections:

Connector Type	Torque (in-lbs)
TI 29U	275
TI 2A 29U	275

Bolt Tightening Torque Charts:

BOLT TIGHTENING TORQUE CHART			
Bolt Size	TPI	TORQUE	
		N.m	ft.lb
$\frac{1}{4}$"	20	16	12
$\frac{5}{16}$"	18	33	25
$\frac{3}{8}$"	16	59	44
$\frac{1}{2}$"	13	145	105
$\frac{5}{8}$"	11	285	210

11. Field Testing ⚠ DANGER

Warning▪ Tests should only be conducted by authorized personnel in accordance with recognized safety standards and codes

Conduct the following tests before commissioning:

1. Insulation Resistance Test: Minimum **300 Mohms** for 0.6 kV windings.
2. Verify the selection of taps and voltage ratio. All taps should be in identical position on each coil. Verify that the taps connections and cables connections are clean. Check that the connections are tight. Taps should only be changed when the unit is de-energized. See section 10 **Cable Connections and Tap Positions.**

12. Operation and Pre-Energization Checks ⚠ DANGER

For the safe and proper operation of the transformer, please perform the following checks before energizing:

- Insulation resistance: Ensure that the insulation resistance between the core and primary, core and secondary, and primary and secondary windings is greater than 300 Mohms.
- Output voltage: Measure and verify that the output voltage matches the specifications on the nameplate before connecting to any loads.
- Phase connections: Verify correct phase connections by referring to the nameplate vector diagram.
- Ensure that primary taps for all coils are connected to identical percentage tap positions to prevent shorting of turns. Refer to the nameplate for tap positions.
- Grounding: Ground the enclosure with appropriately sized conductor.
- Load balancing: Balance the total load among all phases as much as possible to optimize performance. Each phase's kVA loading must not exceed 33% of the nameplate kVA rating.
- Electrical connections: Check the clearance and tightness of all electrical connections.
- Moisture exposure: If there's suspicion of moisture exposure during transit or storage, ensure the transformer is dry before energization by conducting an insulation resistance test. Refer to the section 5 of manual for dry-out procedures.

Transformers can be positioned upright on walls, floors, posts, beams, or other supportive locations with suitable accessories. Ventilated transformers should be placed in dry areas free from dust, dirt, and corrosive fumes. Avoid installing them in areas prone to high moisture, excessive heat, or other adverse conditions.

13. Sound Level Reduction ⚠ CAUTION

Transformer noise emanates from the steel core, an inherent trait present in all transformers that cannot be entirely eradicated. Hence, meticulous attention is necessary when selecting the transformer's placement, especially in environments with low ambient noise levels.

Improper installation often unintentionally amplifies the transformer's sound, making it seem significantly louder than it actually is.

This amplification occurs through the reflection of sound waves off surrounding objects and resonance from mounting structures and electrical connections, a situation best avoided whenever possible.

To mitigate transformer noise, adhere to these installation guidelines:

- Install the casing on vibration mounts to reduce sound levels further.
- Use flexible conduit couplings to minimize vibration transfer from the casing to incoming and outgoing conduits.
- Avoid mounting transformers on walls, balconies, or floors with low mass, as this can amplify sound waves in the structure. The weight of the mounting surface should equal or exceed the transformer's weight to reduce distortion or strain on the casing.
- Plant shrubbery near outdoor units to disrupt the sound pattern, ensuring that sprinklers are directed away from the transformer.
- Adjust tap settings if the incoming line voltage exceeds over-voltage thresholds.
- Check neighbouring transformers for noise generation and isolate them with acoustical barriers if necessary.
- Tighten loose parts of the transformer enclosure, such as panels or bolts.
- Verify core and coil integrity, retightening bolts, nuts, and coil support blocks if necessary.
- Ensure balanced loads across all three phases to meet ANSI tolerances.
- Disconnect loads generating triplen harmonics to assess and address over-excitation.
- Opt for installation in areas where sound is least objectionable.
- Avoid stairways, hallways, or surfaces prone to resonance or echoing. If unavoidable, employ acoustic absorbing materials to cover reflective surfaces like concrete or masonry walls, floors, and ceilings.
- Ensure the transformer is away from reflective surfaces.

Sound Ratings (NEMA Standard): Below Chart specifies the allowable Sound level for K1 Rated Transformers

kVA Rating	Max dB
9.01 to 15.00	45
15.01 to 30.00	45
30.01 to 50.00	45
50.01 to 75.00	50
75.01 to 112.50	50
112.51 to 150.00	50
150.01 to 225.00	55
225.01 to 300.00	55

14. Maintenance ⚠ WARNING

Disconnect all incoming power before installation.

Only qualified personnel should install, inspect, or maintain transformers, as normal operating voltages can be hazardous.

Dry-type transformers generally require minimal maintenance, but periodic care and inspection are essential for long-term, reliable operation. The frequency of inspections depends on the installation conditions.

- For transformers located in clean and dry environments, an annual inspection is typically sufficient.
- For transformers in locations with dust or chemical vapors, inspections may need to be conducted every three to six months.

Follow these maintenance procedures:

1. De-energize the transformer safely.
2. Ground the unit for at least one minute to drain any static charge.
3. Remove debris or foreign materials from all ventilation openings.
4. Remove the enclosure panel or door to access the high-voltage windings.
5. Inspect and clean any dirt, especially on the insulating surfaces.
6. Check the insulators, terminals, and terminal boards for signs of discharge, cracks, breaks, or burns. Ensure all hardware is properly tightened.
7. Use a vacuum cleaner, blower, or compressed air (max. 25 PSI) to clean the windings. The

compressed air should be clean and dry. Leads, terminals, and other insulating surfaces can be brushed or wiped with a dry cloth.

8. Ensure all tools and hardware are removed from the transformer before closing the enclosure.

9. Re-energize the transformer.

Liquid cleaners are discouraged as some may adversely affect insulating materials.

While humidity conditions are irrelevant when the transformer is energized, de-energized dry-type transformers that cool to ambient temperature may be susceptible to humidity effects. If moisture is detected, it should be removed using heated air from a blower with a maximum temperature of 110°C or 230°F. Heat distribution within the enclosure is crucial. Incandescent lamps or heaters can also be used, provided they adhere to the temperature limitations.

15. Troubleshooting ⚠ WARNING

If any of the following issues are identified, the transformer must be taken out of service immediately. Prompt attention to the problem may help prevent further damage or potential hazards. If the issue cannot be resolved, do not restore power to the transformer. Please contact the factory for further assistance.

Problem Observed	Possible Causes
Overheating	Poor ventilation, high harmonics, continuous load
Low Output Voltage	Incorrect tap settings or moisture exposure
Excess secondary voltage	Improper taps connection, high input voltage
Unbalanced secondary voltage	Continuous overload, neutral ungrounded, harmonics, wrong tap connections
Insulation failure	Continuous overload, poor ventilation, dirt accumulation on the coils, lighting, surge
Excessive cables heating	Incorrect cables size, improper cables routing, connections not tight enough.
Vibration and noise	Bad frequency, high input voltage, loosed core clamp, bad primary tap connection
Smoking	Continuous overload, Insulation failure
Burned insulation	Lightning, surge, broken bushing, taps or lightning arrestor; dust on the coils
High exciting current	Bad frequency, high input voltage, short turns
Reduce or zero voltage	Shorted turns, loose taps, opened breaker or fuses in Input Side

16. Warranty ⚠ IMPORTANT

16.1) Warranty Registration

Visit www.edisontransformer.com to activate the warranty.

16.2) Disclaimer Of Warranties and Limitation Of Liability

This document does not establish any understandings, agreements, representations, or warranties, express or implied, beyond those explicitly outlined in any existing contract between the parties. Any such contract defines the entire obligation of the seller, and the contents of this document do not modify or become part of any prior or existing agreement, commitment, or relationship.

The information, recommendations, descriptions, and safety notations provided in this document are based on industry experience and judgment regarding transformers. This information may not cover all contingencies and should not be considered exhaustive. For further information, please consult the local sales office.

No warranties, express or implied, including warranties of fitness for a particular purpose or merchantability, or warranties arising from course of dealing or usage of trade, are made regarding the information, recommendations, descriptions, and safety notations contained herein.

In no event shall the manufacturer be liable to the user, whether in contract, tort (including negligence), strict liability, or otherwise, for any special, indirect, incidental, or consequential damages or losses, including but not limited to damage or loss of equipment, plant, or power systems, the cost of capital, loss of profits or revenues, cost of replacement power, additional expenses in the use of existing power facilities, or claims against the user by its customers resulting from the use of the information, recommendations, descriptions, and safety notations contained herein.

17. Safety Disclaimer ⚠ IMPORTANT

SAFETY DISCLAIMER

Edison Transformers and its affiliates strive to provide comprehensive safety information in this manual. However, users are responsible for ensuring compliance with all applicable safety regulations, standards, and codes.

- This manual does not cover all possible scenarios, variations, or unique conditions. For situations not explicitly addressed here, consult qualified personnel or Edison Transformers directly.
- Only trained and authorized personnel should handle, install, operate, or maintain transformers.
- Failure to follow instructions may result in severe personal injury, death, or property damage.
- Edison Transformers assumes no responsibility for injuries, damage, or loss resulting from improper use or non-compliance with these guidelines.

By using this manual, you acknowledge the inherent risks associated with handling electrical equipment and agree to take all necessary precautions to mitigate these risks.


EDISON