

Low voltage transformer AGInode™ device REX2™ single phase option

Introduction

The Elster low voltage (LV) transformer AGInode device brings EnergyAxis® System metering and network communication to monitoring of low voltage single phase distribution transformers. The LV transformer AGInode device is designed for easy installation on pole top and pad mount transformers without interrupting service to the loads. Transformers to 167 kVA and loads to 1000 A at 240 V are supported.

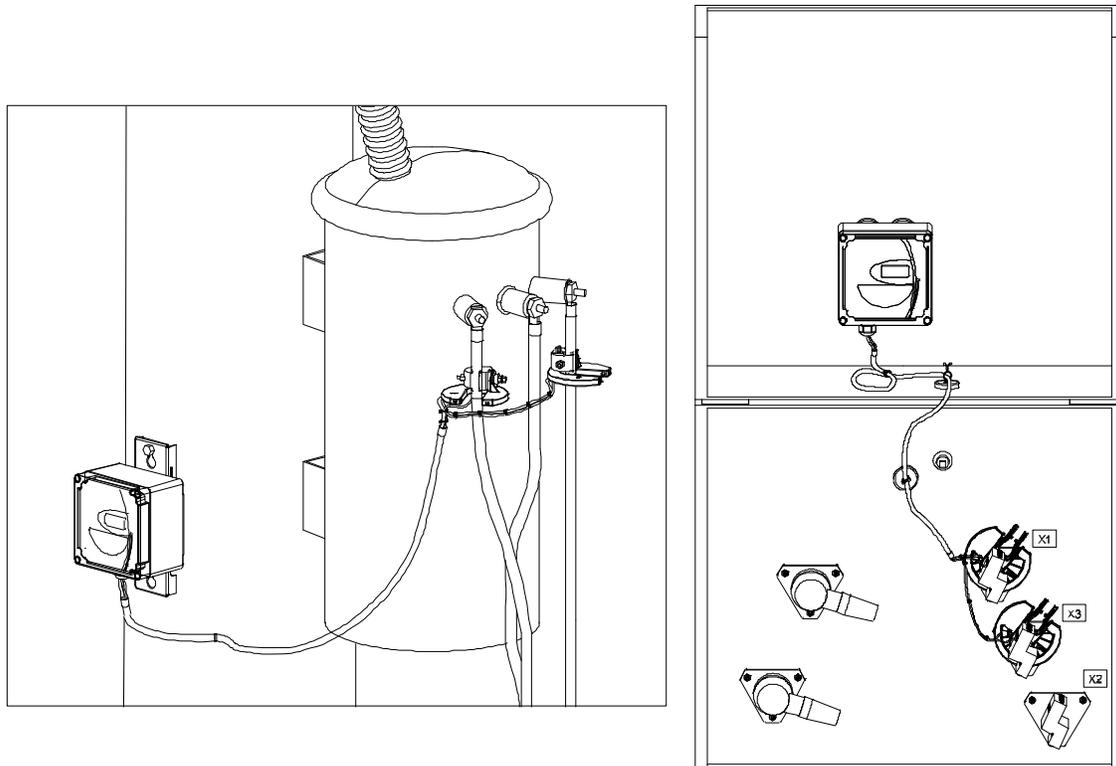


Figure 1. LV transformer AGInode device

The product consists of the following components:

- Two current sensors mount on the transformer X1 and X3 line outputs. The open-aperture current sensors are installed without interrupting service. Since meter measurements are made line-to-line essentially as a Form 2S, there is no connection to neutral.
- On the pole top LV transformer AGInode device, the X1 and X3 line voltage connections are made by insulation-piercing voltage connectors. The voltage connectors also support the current sensors and are easily installed and removed without interrupting service.
On the pad mount product version, the current sensors are held in place by patented sliding retainers. The voltage connections are made by attaching #14 supply wires to the transformer output terminals.
- A meter enclosure contains the meter assembly and interface electronics for the current sensors. On pole top installations, the meter enclosure is mounted to the utility pole near the transformer via an integral mounting bracket. The enclosure can be attached to the pole with lag bolts or straps. The clear front of the meter enclosure permits verification of meter operation during installation. After installation, all interaction with the meter is via the meter's integral RF connection. Access or visibility from the ground is not required. There are no indicator lights to attract nuisance attention.
In pad mount installations, the meter enclosure is magnetically mounted to the inside of the transformer cover. Magnetic mounting allows flexible positioning to take advantage of available space. The unit communicates with nearby EnergyAxis node meters without an external antenna or penetration of the transformer enclosure.
- An integrated cable assembly connects the current sensors and voltage clamps to the meter enclosure. The cable assembly is approximately 60 inches long to accommodate most installations. The pad mount product includes a magnetic cable support to aid in cable positioning.

Planning the installation

▲ WARNING

Use authorized utility procedures to install and service this metering equipment. Dangerous voltages are present. Equipment damage, personal injury, or death can result if safety precautions are not followed.

Since the REX2 LV transformer AGInode device will communicate with a nearby EnergyAxis network, pick a transformer monitoring site that will be within reach (ideally 600 feet or less) of another EnergyAxis meter or collector. Closer spacing is recommended for pad mount installations.

Choose a transformer monitoring site with suitable line voltage and currents. The LV transformer AGInode device is rated for 240 VAC 3-wire distribution only and can be used at load currents to 1000 A, typically with transformer ratings up to 167 kVA.

Planning pole top installations

To measure the transformer's total current output, the LV transformer AGInode device current sensors must be positioned so that all load current on each X1 and X3 output line passes through the aperture of a current sensor. This is most easily accomplished when there is a single drop-lead pigtail wire connected to each transformer output bushing. In this case, the two current sensors and voltage connectors are positioned on the drop leads, between the transformer X1 and X3 output bushings and the first load splice or tap-off point.

If multiple load cables are connected directly to the transformer bushings, the load cables must be bundled together with tape or cable ties so that all cables connected to the same transformer bushing fit within the 1.75-inch width of a current sensor. Since all wires connected to the same bushing are at equal voltage, the voltage clamp for each sensor connects to just one of the cables in the bundle.

The voltage connection to the transformer X1 and X3 output lines is accomplished with insulation-piercing connectors made by Groupe Sicame. The connectors also support and position the current sensors. The voltage connectors pierce the cable insulation and form a weather-tight seal when the clamp bolt is tightened. The clamp-bolt has a plastic double-head (1/2-inch hex nut) to guarantee proper installation torque. When the proper torque is reached, the outer nut head breaks off. The inner nut head remains and allows the connector to be removed later.

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| NOTICE |
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Two Sicame connector sizes may be ordered with the pole top LV transformer AGInode device. The connector size is specified when the order is placed. The "large" connector is labeled for usage with 3/0 through 750 MCM cables which are used on most transformers. The "small" connector is labeled for usage with #4 AWG through 2/0 cables which are typically found on smaller transformers. Contact your Elster sales representative for help with ordering the desired connectors.

The meter enclosure is mounted on the utility pole at a convenient location less than five feet from the planned locations of the current sensors. Visibility from the ground is not required. The enclosure may be mounted on poles with straps or 1/2-inch lag bolts.

Planning pad mount installations

The LV AGInode device can fit most pad mount distribution transformers including Type 1 and 2 designs. The important points for a successful installation are:

- The transformer enclosure must be ferrous steel to support magnetic mounting. Please contact your Elster sales representative for support for non-magnetic enclosures.
- There must be sufficient room under the transformer cover for the LV transformer AGInode device's meter enclosure. The meter enclosure is approximately 8 inches square and 5.5 inches deep. A position at the top front of the cover usually offers the best mounting position. The meter box is mounted with powerful magnets which permit adjustment of the mounting position during installation.
- There must be sufficient room on the transformer line outputs for the LV transformer AGInode device current sensors. The text below provides more detail.
- The node's EnergyAxis radio is able to communicate through the cover clearances of most pad mount transformers. It is advisable to position another EnergyAxis meter or node device within 200 feet to assure reliable communication.

The current sensors of the LV transformer AGInode device fit on the transformer output terminals, before the first load connections. Each current sensor is 0.5-inch thick, with an aperture width of 1.75 inches. Each current sensor is held in place by a patented sliding retainer.

For smaller transformers which are not equipped with "step" or "Z" terminals, the current sensors may be positioned at the most convenient positions on the output studs or the terminals before the first load connections.

For transformers equipped with "step" or "Z" terminals, the current sensors must fit behind the terminals. If the transformer bushing diameters are less than 1.75 inches, the sensors can be mounted over the bushings. In this case, there must be a minimum 0.5-inch clearance between the ends of the bushing mounting bolts and the inside face of the output terminals.

If the bushing diameters exceed 1.75 inches, the current sensors are mounted between the bushing and the inside face of the terminal, over the transformer output stud (and lock nut if one is used). In this case, there must be 0.5-inch minimum clearance between the end of the transformer bushing and the inside face of the output terminals.

Performing the installations

Pole top installation

⚠ WARNING

The LV transformer AGInode device may be installed on energized transformers only by personnel trained and equipped for live-line service.

Use authorized utility procedures to install and service this equipment. Dangerous voltages are present. Equipment damage, personal injury, or death can result if safety precautions are not followed.

1. Choose the installation site following the guidelines in the section "Planning the installation" on page 2.
2. Prepare the site and inspect for safety issues following your utility's procedures. In particular, check for minimum clearances to nearby high voltages.
3. Mount the meter enclosure to the pole. Temporarily support the sensor assemblies and connecting cable so they do not interfere with mounting the enclosure.

The meter enclosure can be mounted to the pole at a convenient location that is less than five feet from the current sensor mounting positions. The enclosure does not need to be visible from the ground. For best RF communication, the front of the enclosure should be unobstructed by metal parts. The meter enclosure should be mounted upright with the LCD horizontal.

⚠ CAUTION

Use only straps or ½-inch bolts to mount the meter enclosure. If lag bolts are used, do not hammer the bolts after the meter enclosure is hung on the bolts. Hammering the lag bolts after the meter enclosure is hung on the bolts will cause shock damage to the meter enclosure and components.

The meter enclosure bracket accommodates support bolts spaced 10.5 inches (preferred) or 10 inches. If 10-inch spacing is required, install the included 2-inch by 2-inch square washer under the head of the upper mounting bolt.

⚠ CAUTION

Use caution when installing the AGInode device with fixed 10-inch fastener separation to prevent damage to the enclosure. The 10-inch fastener separation provides less clearance space between the bolts and the enclosure. Unless caution is used when installing the AGInode device with fixed 10-inch fasteners, shock damage can compromise the performance of the enclosure and components.

For mounting on wood poles, use ½-inch lag bolts that are at least 2.5 inches long. Drive the lag bolts into the pole leaving at least 1 inch of the bolt shanks exposed. Hang the meter assembly onto the bolts and tighten the bolts so that the bracket is securely held on the pole.

For strap-mounting on poles, note that both band slots are open to permit hooking onto pre-installed bands. Loosely install two bands (band width less than 1 inch) on the pole. Hook the bracket slots onto the bands. Position the enclosure and complete tightening of the bands.

4. Mount the current sensors. The current sensors are positioned on the X1 and X3 transformer drop wires between the transformer output bushings and the point where loads are connected. Either current sensor can be placed on either wire. The top of the current sensors (the side containing the insulating piercing connector and labeled "SOURCE") must face toward the transformer bushings.

NOTICE

For best measurement accuracy, orient the sensor aperture openings away from the transformer tank. The two sensor apertures should be parallel with each other or turned away (outward) from each other. Figure 1 shows an example with the sensor apertures non-parallel and the left sensor aperture turned outward.

For each sensor, loosen the mounting bolt until the voltage connector jaws fit over the cable. Finger-tighten the mounting bolt until the sensor is lightly held on the cable. Orient the sensor (see the Notice below), and tighten the bolt with a 1/2-inch socket driver until the bolt head breaks off.

NOTICE

The Sicame voltage connectors may ship with two bolt head designs (see Figure 2). The type A bolt head requires a 1/2-inch socket for both outer breakaway and inner heads. The type B bolt head requires a 1/2-inch socket for the outer breakaway head but requires a 5/8-inch socket on the inner head. Exercise care while tightening the type B bolt head to make sure that the socket driver is aligned and fully engaged with the connector bolt.

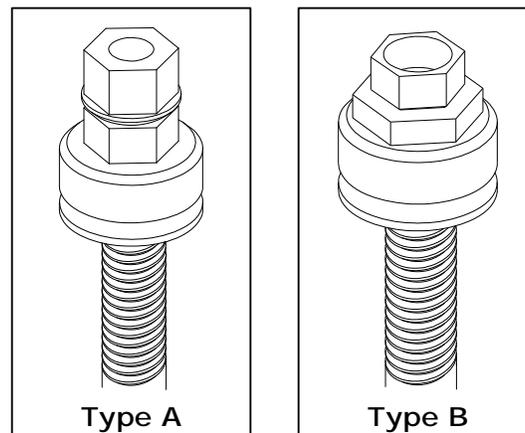


Figure 2.

Tips for making a good voltage connection include:

- Use a 6-point 1/2-inch socket to tighten the connector bolt.
- Use a power driver (screwdriver or impact wrench) to tighten the bolt. This facilitates two-handed installation: One hand holds and aligns the sensor and connector while the other hand operates the driver.
- While tightening the bolt, carefully align the power driver shaft with the bolt to achieve the best connection between the socket and bolt head.
- The voltage connector bites into both the main transformer cable and a smaller black voltage "tap" wire which powers the LV AGI Node. Before final tightening of the connector bolt, make sure that the voltage "tap" cable extends into the sealing cap (on top of the connector), and both tap and transformer cables are aligned with their respective connector jaws.

- The large voltage connector can be ordered with a “Turbo Spacer” option which holds the connector jaws open and facilitates connector alignment. Consult your Elster Solutions Sales Representative for ordering details. The Turbo Spacer is a red plastic part which is visible from the rear of the voltage connector. Please note that the Turbo Spacer fractures with a popping sound during tightening of the connector bolt.
 - The correct bolt torque is achieved by tightening the connector bolt until the outer bolt head breaks off. If it is necessary to loosen or remove a voltage connector, the bolt must be re-torqued to 80 inch-pounds using a torque wrench. Elster Solutions recommends replacing the voltage connector with a new unit if it is necessary to remove a connector.
5. Check that the meter is energized. The LCD display should show activity. The triangle error symbol should not be lit. If there is sufficient load current, the right energy arrow will pulse. If the display is not lit, check the voltage connectors.

NOTICE

If the display does not light, the most common cause is an unsuccessful voltage connection at one of the voltage connectors. Inspect the main cable and smaller tap cable (at the rear of the connector) to make sure both cables are aligned with the connector jaws. The voltage connectors may be loosened, realigned, and re-torqued to 80 inch-pounds to achieve a successful connection. However, Elster Solutions recommends carrying a small supply of extra new voltage connectors and changing the connector when the initial connection attempt is unsuccessful.

If the display still does not light or there is an abnormal indication (for example, triangle error indicator lit), the meter should be returned to the shop for service.

6. Restrain the sensor cable to prevent wind-driven movement. Excess cable should be tie-wrapped in a loop and anchored to a stable object. Form a drip loop in the sensor cable under the meter enclosure to help the sensor cable shed rain. If hammer-driven staples are preferred, use an insulated staple sized for ½ inch electrical cable and be careful not to strike the cable or over-drive the staple.

Pad mount installation

⚠ WARNING

The LV transformer AGInode device may be installed on energized transformers only by personnel trained and equipped for live-line service.

Use authorized utility procedures to install and service this equipment. Dangerous voltages are present. Equipment damage, personal injury, or death can result if safety precautions are not followed.

1. Choose the installation site following the guidelines mentioned in “Planning the installation” on page 2.
2. Prepare the site and inspect for safety issues following your utility’s procedures.
3. Begin by mounting the meter enclosure. The most available space is usually at the top front of the transformer enclosure. The meter enclosure is mounted inside the transformer cover via four strong magnets. Choose a lateral position which offers best clearance to the transformer wiring. With the transformer cover fully open, attach the meter enclosure to the transformer cover as shown in Figure 3.

NOTICE

The four pad mount enclosure magnets and two cable clamp magnets are shipped with circular steel keeper plates to reduce stray magnetic flux. The plates are made of mild steel with zinc plating. Before meter installation, remove the plates by sliding them laterally off the magnets. The keeper plates are not used in the AGInode device installation, but they must be re-attached to the magnets whenever the unit is air-shipped.

Perform a trial closure of the transformer cover and adjust the meter enclosure position as needed to avoid interference with transformer power cables.

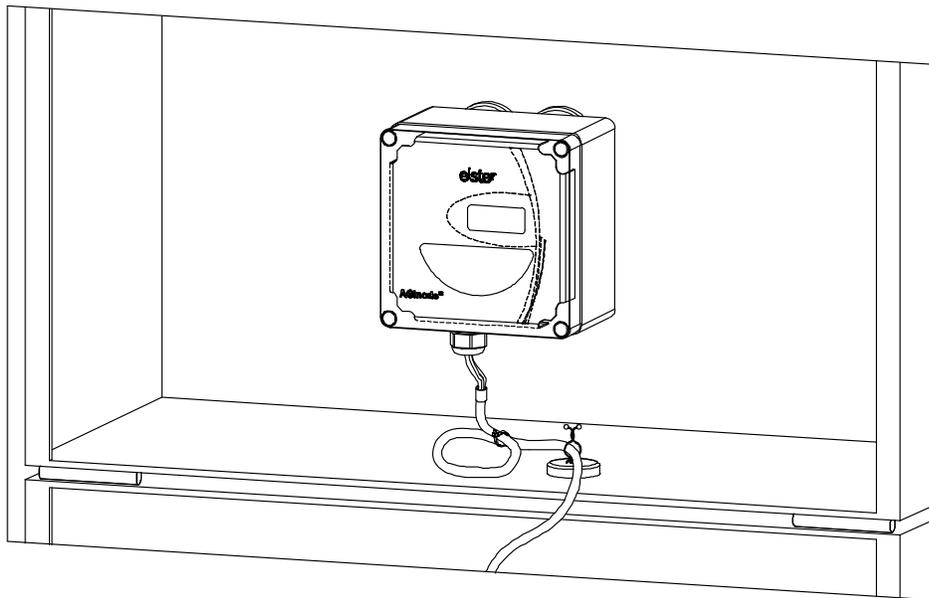


Figure 3.

4. Examine the transformer line output terminals and verify there is space for the LV AGInode device current sensors. The current sensors are 0.5-inch thick, with an aperture width of 1.75 inches. Current sensor mounting options are discussed above in "Planning pad mount installations" on page 3.
The current sensors are positioned on the X1 and X3 transformer line outputs with the sensor apertures parallel or turned away from each other. Either current sensor can go on either transformer terminal. The side of the sensors marked "SOURCE" must face inward towards the transformer. See Figure 4.
5. To prepare each sensor for installation:
 - a. Remove the sliding retainer by squeezing the retainer handles together.
 - b. Center the sliding retainer in the sensor aperture and slide the retainer out of the aperture.
6. To install each sensor:
 - a. Slide the sensor into place on the transformer X1 or X3 output (see Step 4).
 - b. Squeeze the sliding retainer handles together and slide the retainer into the sensor aperture (see Figure 4).
 - c. Push the retainer into the sensor aperture until the rubber pad is slightly compressed and the sensor stays in position.

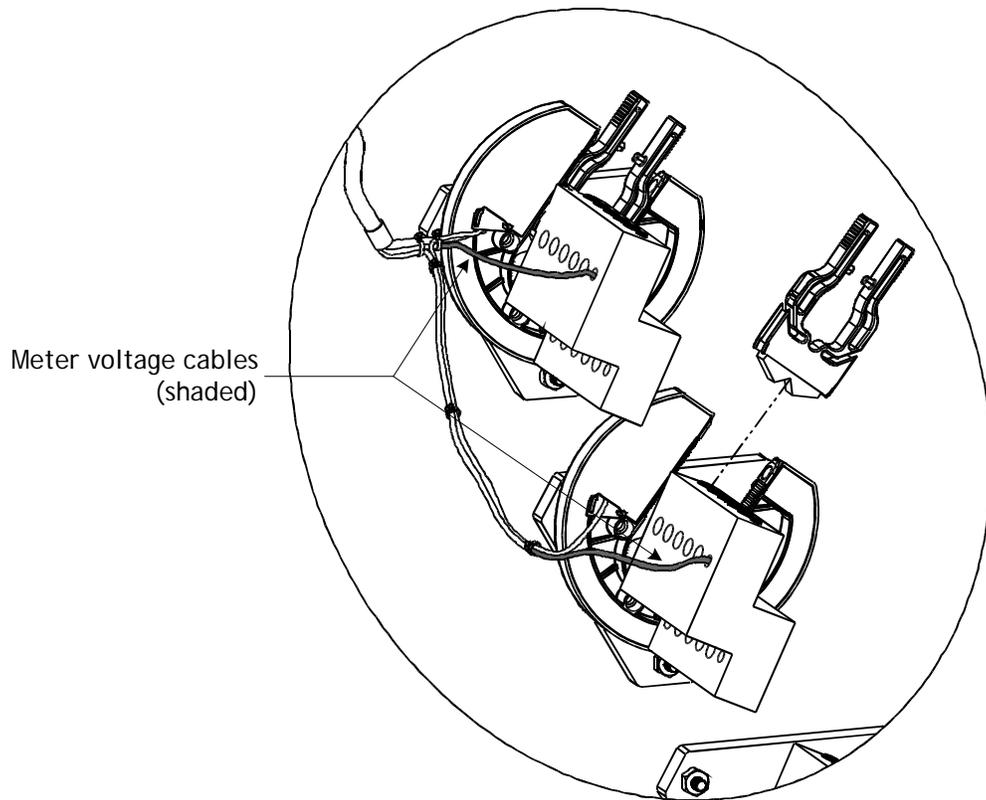


Figure 4.

7. Connect the LV transformer AGInode device voltage cables to the transformer output lines. Note that each voltage cable exits the cable harness near a current sensor. To properly phase the meter, connect each voltage cable to the transformer output line which is monitored by the associated current sensor.

The voltage cables, which are #14 wire with high voltage insulation, are typically connected to the street light terminal positions. Alternatively, a user-provided ring-terminal can be installed and captured under an available terminal screw.

Strip each voltage cable and make the connections.

8. Check that the meter is energized. The LCD display should show activity. The triangle error symbol should not be lit. If there is sufficient load current, the right energy arrow will pulse. If the display is not lit, check the voltage connections. If the display still does not light or there is an abnormal indication (for example, triangle error indicator lit), the meter should be returned to the shop for service.
9. Position the sensor cable using the provided magnetic cable clamps. Attach the magnetic clamps to the sensor cable using the plastic twist-locks (see Figure 5). Attach and position the magnetic clamps on the transformer cover and enclosure wall as desired to support the sensor cable. The sensor cable may be looped and tie-wrapped to take up excess length if desired.
10. Perform a final inspection on the installation. Close and secure the transformer using standard utility practices.

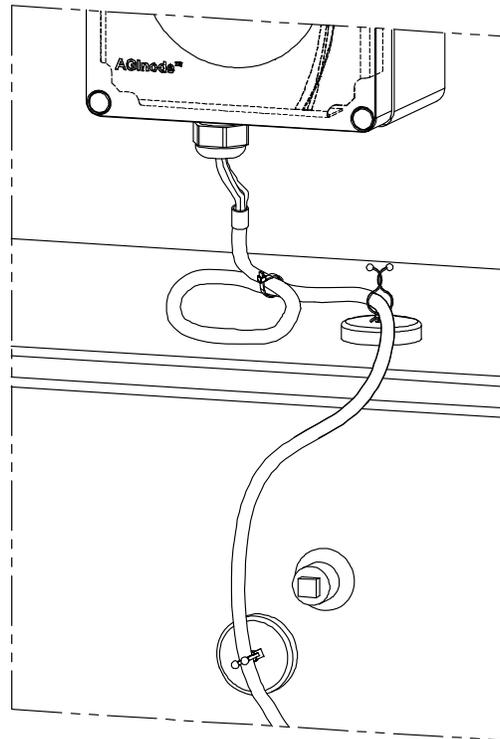


Figure 5. Sensor cable with magnetic clamps

Removing the LV transformer AGInode device from service

⚠ WARNING

Wear safety equipment and use authorized utility procedures to uninstall this equipment. Dangerous voltages are present. Equipment damage, personal injury, or death can result if safety procedures are not followed.

The LV transformer AGInode device may be uninstalled and re-used as desired by the utility. In general, to remove the LV transformer AGInode device from service, reverse the installation procedure. While removing the AGInode device from service, please note the following:

Pole top notes

To remove a current sensor from the transformer cable, use a ½-inch wrench to loosen the voltage connector. Then, with a safety-gloved hand, grasp the voltage connector and gently disengage the connector from the transformer output cable. It may be desirable to tape or insulate the small puncture holes where the voltage connector pierced the cable insulation.

If it is desired to move the pole top LV AGI transformer node to a new location, use this procedure to install new voltage connectors:

- Order two new voltage connectors from Elster or Sicame USA. The large connector for 3/0 - 750MCM cables is the Sicame TTD 0810F (add "T" for Turbo Spacer). The connector for # 4 - 2/0 cables is the Sicame TTD 0510F.
- Remove the old voltage connectors from the sensors by unscrewing the voltage connector bolt. Each voltage connector consists of two jaw parts plus the bolt.

- Note that the insulation on the #14 voltage wire has been deformed (crushed) by the clamping action of the voltage connector. To get a good weather seal with the new connector, gently warm the wire insulation with a heat gun to remove the crush marks.
- The new voltage connector comes with protective wire caps on both top and bottom. Compare the new connector with the old and remove the lower protective wire cap by sliding the cap sideways.
- Install the new voltage connector on the sensor assembly. If the new connector is the TTD 0510F, make sure to re-install the original plastic spacer between the connector body and the sensor flange. Make sure the voltage wire passes through the smaller "tap wire" side of the connector. The end of the voltage wire should push into the protective wire cap on the top of the connector. Tighten the clamp bolt finger-tight.

Pad mount notes

1. To disengage the current sensor retainers, hold the current sensor with the safety-gloved left hand. With the safety-gloved right hand, squeeze the retainer handles fully together.
2. To disengage the retainer, align the retainer and handles with the current sensor aperture.
3. Gently moving the retainer back and forth will help find the position where the retainer is fully disengaged.
4. After removing the retainer, the current sensor may be removed from the transformer output.

Operating the LV transformer AGInode device

The REX2 LV transformer AGInode device includes the following enhancements and differences relative to the REX2 single phase meter (Type R2S):

- The meter is a 3-wire, single phase meter, similar to ANSI Form 2
- The meter nominal operating voltage is 240 VAC only
- The Class current is 1000 A
- The test amperage is 150 A
- The meter register constant (K_h) is 5.0

The meter is ordered with the standard REX2 meter order form (PB42-2004). In the load profile section, set the K_h pulse count divisor to at least 10 for a 60-minute interval to avoid possible overflow at high load current. For 30- and 15-minute intervals, the recommended minimum divisors are 5 and 2, respectively.

Specification summary for the REX2 LV transformer AGInode device

| Item | Standard or test | Performance level |
|-----------------------|---|--|
| Operating voltage | | 240 VAC nominal 192 VAC to 288 VAC max range. |
| Current | | 1000 A Class/maximum current 150 A Test amps 500 mA starting current |
| Frequency | | 50 Hz or 60 Hz ± 5 % |
| Operating temperature | | -40 °C to +65 °C continuous ambient -40 °C to +85° C ANSI C12 test, 168 hours |
| Meter enclosure | | Polycarbonate, rated NEMA 4X, IP66 |
| Performance | Applicable parts of ANSI C12.1-2001 and C12.20-2002 | Accuracy Class 1.0 % (0.5 % typical) |

FCC and Industry Canada Compliance

User Information (Part 15.105)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- reorient or relocate the receiving antenna
- increase the separation between the equipment and the receiver
- connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- consult the dealer or an experienced radio/TV technician for help

If you experience trouble with this equipment, please use the Return Material Authorization (RMA) feature available at the Online Customer Services at www.elstersolutions.com. Do not attempt to repair this equipment yourself unless you are replacing the entire module.

Compliance Statement (Part 15.19)

This device complies with Part 15 of the FCC Rules and Class B digital apparatus requirements for ICES-003. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation of the device.

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Énoncé de conformité

Cet appareil est conforme à la Partie 15 des règles de la FCC et aux exigences relatives aux appareils numériques de classe B conformément à l'avis sur la compatibilité électromagnétique ACEM-3. L'utilisation de cet appareil est soumise aux deux conditions suivantes : (1) Cet appareil ne doit pas provoquer d'interférences nocives et (2) cet appareil doit accepter toutes les interférences reçues notamment celles pouvant provoquer un fonctionnement intempestif de l'appareil.

Antenna Compliance

To reduce potential interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than permitted for successful communication.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada.

Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Warning (Part 15.21)

Changes or modifications not expressly approved by Elster could void the user's authority to operate the equipment.

RF Radiation Safety Guidelines

The device should be installed in a location where there will be a separation greater than 20 cm (8 inches) from locations occupied by humans.

Collocation Statement

Collocation of simultaneously-transmitting (co-transmitting) antennas located within 20 cm of each other within a final product is not allowed.

Notes:

DISCLAIMER OF WARRANTIES AND LIMITATIONS OF LIABILITY

There are no understandings, agreements, representations, or warranties either express or implied, including warranties of merchantability or fitness for a particular purpose, other than those specifically set out by any existing contract between the parties. Any such contract states the entire obligation of the seller. The contents of this document shall not become part of or modify any prior existing agreement, commitment, or relationship.

The information, recommendations, descriptions, and safety notices in this document are based on Elster experience and judgment with respect to operation and maintenance of the described product. This information should not be considered as all-inclusive or covering all contingencies. If further information is required, Elster should be consulted.

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

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