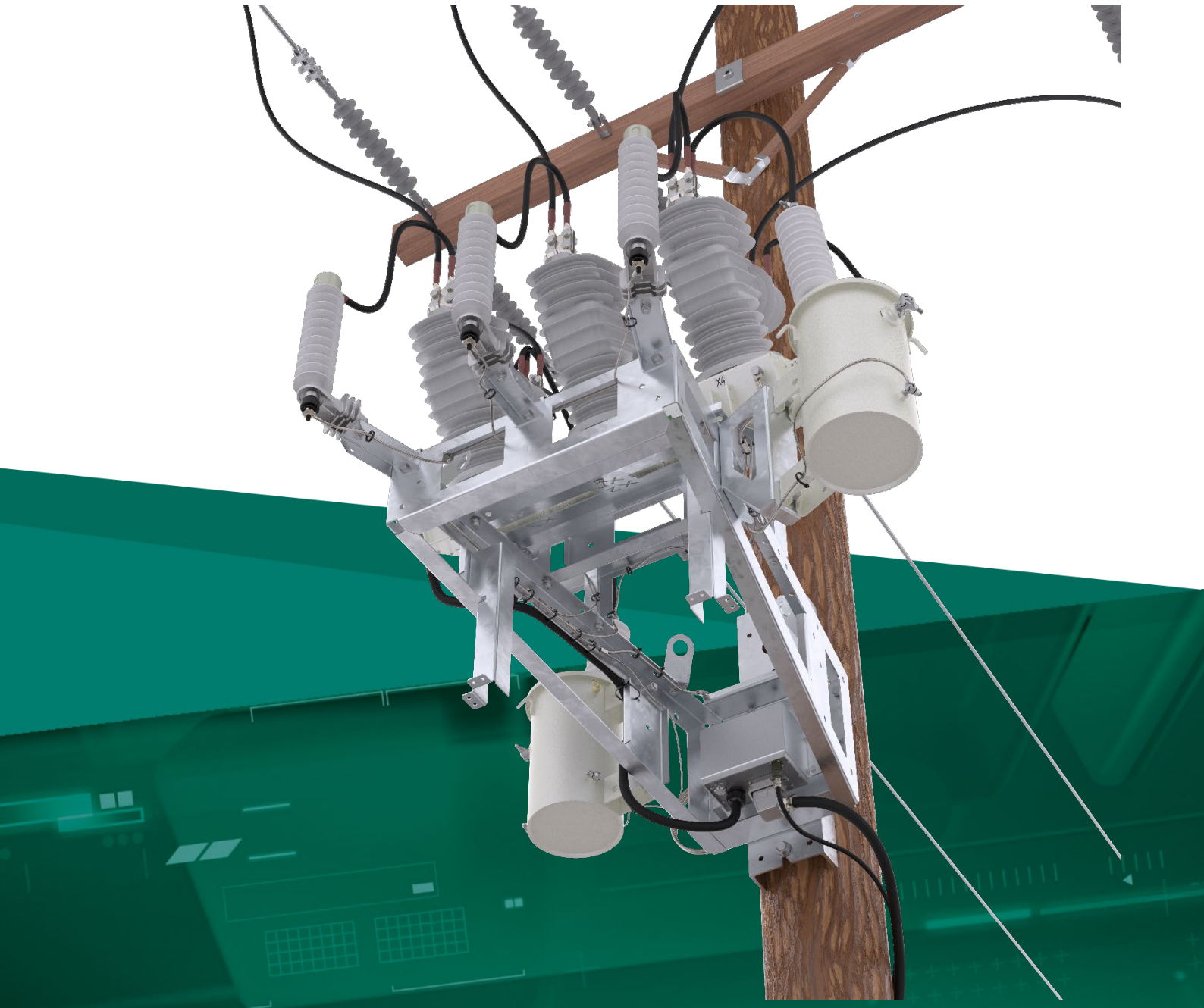
TAVRIDA ELECTRIC
Excellence in Engineering

# Rec35_Smart5_HDG

**AUTOMATIC CIRCUIT RECLOSER**

38 kV, 16 kA, 1250 A



TECHNICAL MANUAL

VERSION 4.10

The present Technical Manual contains the information necessary for installation, commissioning, and operation. It is absolutely necessary for the proper and safe use of the recloser to read the Technical Manual carefully and to adhere to the instructions as well as relevant regulations.

## Safety First

- Installation, operation, and maintenance shall only be carried out by trained and experienced personnel who are familiar with the equipment and electrical safety requirements;
- During installation, commissioning, operation, and maintenance of the equipment the relevant legal regulations (such as NFP70E, CEC, ANSI), accident prevention regulations, and the connecting conditions of the electric utilities shall be followed;
- Take note that during the operation of the recloser certain parts are subject to dangerous voltage. Mechanical parts, also remote-controlled, can move quickly. Failure to comply may result in death, severe personal injury, or damage to equipment;
- Pay attention to the hazard statements located throughout this manual;
- The operating conditions of the recloser shall comply with the technical data specified in this manual;
- Personnel installing, operating, and maintaining the equipment shall be familiar with this manual and its contents.

# Contents

# 1 Introduction

## Applicability

This Technical Manual applies to the following range of products manufactured by Tavrida Electric and Magvatech:

| Product | Description |
|---|---|
| Rec35_Smart5_HDG | 38 kV three-phase Automatic Circuit Recloser |
| OSM35_Smart_5 | 38 kV, three-phase gang operated Outdoor Switching Module, with 600:1 and 200:1 CT ratios, and 150 V actuator coil voltage |

The model number is shown on the equipment rating plates. If your equipment does not correspond to the numbers in the table above then this manual is not applicable. Please contact your nearest Tavrida Electric office or Sales Representative for the correct documents.

Every care has been taken in the preparation of this manual. However, please note that not all the details or variations in the equipment or process being described can be covered. Nor is expected to address all contingencies associated with the installation and operation of this equipment. For any further information please contact your nearest Tavrida Electric office or Sales Representative.

## Hazard Statements

This manual contains three types of hazard statements, as follows:

**DANGER:** Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.

**WARNING:** Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

**CAUTION:** Indicates a potentially hazardous situation that, if not avoided, could result in personal injury or equipment damage.

## Safety Instructions

General hazard statements applying to this equipment are described in this section. Statements relating to specific tasks or procedures are located throughout this manual.

**DANGER:** Contact with hazardous voltage will cause death or severe personal injury. Contact with Recloser or Control Cubicle terminals should only be undertaken when equipment is isolated from applicable sources of voltage.

**WARNING:** This equipment is not intended to protect human life. Follow all locally approved safety procedures when installing or operating this equipment. Failure to comply may result in death or severe personal injury.

**WARNING:** Before working with the equipment described in this manual carefully read and understand the contents of this manual. Improper handling, installation, operation, or maintenance can result in death, severe personal injury, or damage to equipment.

**WARNING:** Power distribution equipment must be properly selected for the intended operation. It must be installed, used, and understand all relevant safety procedures. Failure to comply can result in death, personal injury, or equipment damage.

# 2 Technical Parameters

Table 1 – Recloser technical parameters

| Parameter | OSM35_Smart_5(600.200_150_All) |
|---|---|
| **Rated data** | |
| Rated voltage (Ur) | 38 kV |
| Rated continuous current (Ir) | 1250 A[1)] |
| Rated power frequency withstand voltage (Ud), 1 min dry | 70 kV |
| Rated power frequency withstand voltage (Ud), 10s wet | 70 kV |
| Rated lightning impulse withstand voltage (peak) (Up) | 170 kV[2)] |
| Rated short-circuit breaking current (Isc) | 16 kA |
| Rated short-circuit making current, peak | 41.2 kA |
| Rated short-time withstand current, 4s (Ik) | 20 kA |
| Rated peak withstand current (Ip) | 52 kA |
| Rated frequency (fr) | 50/60 Hz |
| **Switching performance** | |
| Mechanical life (CO-cycles) | 30 000 |
| Operating cycles, rated current (CO-cycles) | 30 000 |
| Maximum number of CO-cycles per hour | Refer to recloser control manual |
| Electrical endurance, breaking current (O-CO cycles) | See Figure 1 |
| Closing time, not more than[3)] | 60 ms |
| Opening time, not more than[3)] | 15 ms |
| Break time, not more than[3)] | 25 ms |
| Rated operating sequence | O-0.2s-CO-1.5s-CO-2s-CO-2s-CO[4)] |
| **Standards** | |
| International Standard<br>American Standard | IEC 62271-100, IEC 62271-111<br>IEEE C37.60 |
| **Other data** | |
| Current sensing | 3 current transformers |
| Voltage sensing | 6 voltage sensors |
| Main contact resistance, not more than | < 32 µOhm |
| Solar radiation | ≤ 1.1 kW/m² |
| Degree of protection | IP65 |
| Weight | 93 kg (205 lbs) |

1) When used with 600:1 CT ratio. 600A – when used with 200A CT ratio.
2) 200 kV rating external with closed contacts is available with installed extenders (not supplied in standard configuration). Please ask your local representative for details.
3) Outdoor Switching Module value only. Does not include control processing time. Refer to control manual for more information on additional time to calculate a complete fault interruption cycle.
4) Fastest operating sequence when used with SEL-651R-2 Recloser Control. Subject to change when used with different controls.

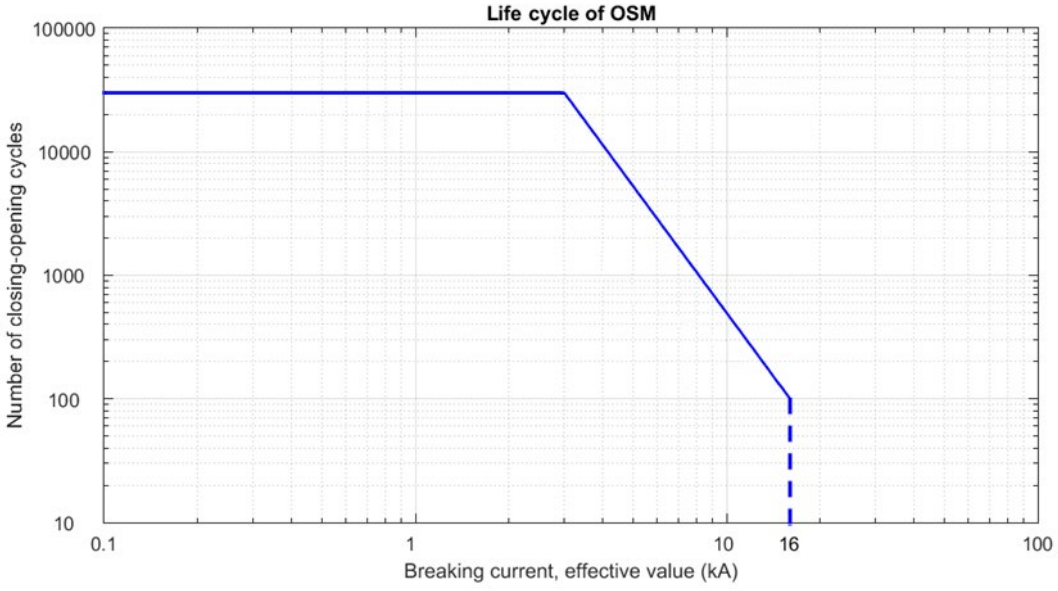



Figure 1

***Outdoor Switching Module electrical endurance***

Table 2 –Current Transformers and Voltage Sensors parameters

| Parameter | OSM35_Smart_5(600.200_150_All) | |
|---|---|---|
| **Current transformers** | | |
| CT ratio | 600:1 | 200:1 |
| Rated primary current | 600A | 200A |
| Rated continuous thermal current | 1250A | 600A |
| Rated secondary current | 1 A | |
| Rated output, at PF=0.8...1 | 1.0 VA | |
| Accuracy class of protection transformers according to IEC 61869 | 5P20 | 5P20 |
| Measuring accuracy class, IEC 61869-2 | 0.1/0.2s | 0.2/0.5s |
| Accuracy limit factor (ALF), IEC 61869-6 at: | | |
| 25% of rated burden | 24 | 31 |
| 50% of rated burden | 23 | 26 |
| 100% of rated burden | 21 | 20 |
| Accuracy class of protection transformers according to IEEE C57.13 | C100 | C20 |
| Accuracy limit factor (ALF) according to IEEE C57.13 | 20 | |
| **Voltage Sensors** | | |
| Voltage sensor ratio range | 0.108 - 0.123 V/kV | |
| Voltage sensors ratio error within rated temperature range | 0.5 % for all 6 sensors | |

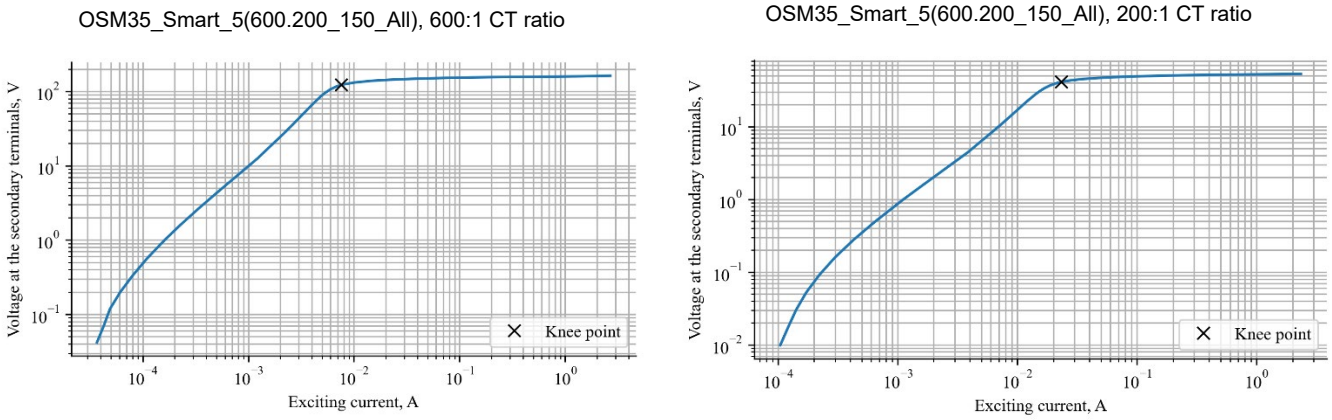



**Figure 2**

***Current transformers excitation curves for OSM35_Smart_5(600.200_150_All) - 600:1 CT and 200:1 CT ratio[1]***

[1] Built-in current transformers should not be tested by injecting voltage into CTs secondary winding terminals due to design specifics of Magvatech Switching Modules, that may have two current transformers working simultaneously or utilize overvoltage protection for CTs circuits.
The only valid method of ratio verification and measuring saturation curves is “direct” method by applying current to CT’s primary winding.

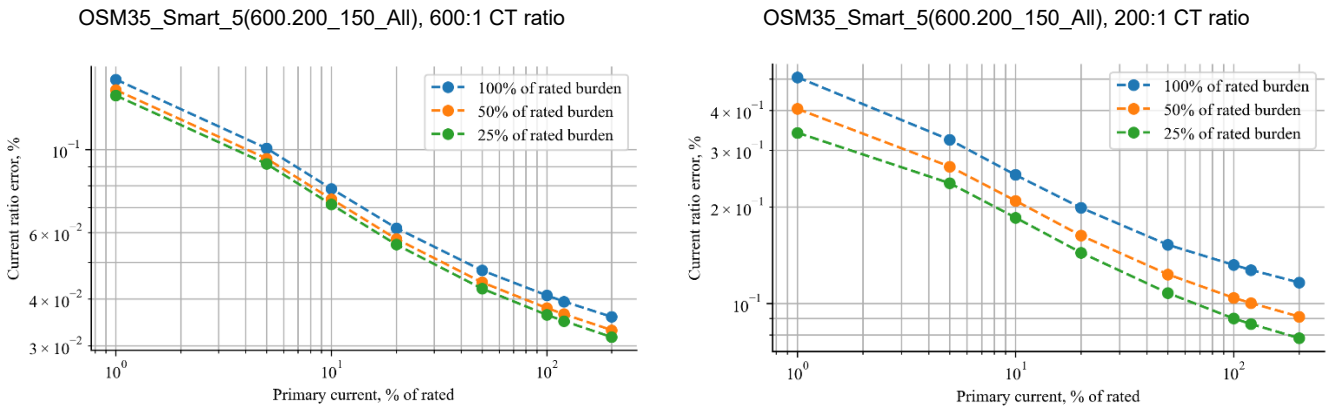



**Figure 3**

***Current ratio error curves for OSM35_Smart_5(600.200_150_All) - 600:1 CT and 200:1 CT ratio***

**Table 3 – Ambient conditions**

| | |
|---|---|
| Maximum ambient temperature | + 55 °C |
| Minimum ambient temperature | - 40 °C |
| Humidity | 100% condensing |
| Altitude | Up to 3000 m [2] |
| Pollution level | Very heavy (according to IEC 60815) |

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[2] Derating according to ANSI C37.60 is applied for altitudes above 1000 m

# 3 Product Description

# 3.1 Overview

The Rec35_Smart5_HDG is a three-phase recloser designed for pole-mounted and substation applications with rated maximum voltage of up to 38 kV.

The Outdoor Switching Module consists of two main parts: the pole carrying primary circuits and the basement performing mounting and interface functions. The pole contains breaker contacts, supporting insulation, current, and voltage sensors, all casted into silicon rubber. The basement is made of a corrosion-resistant aluminum alloy with a paint finish and provides environment-protected housing for contained secondary circuits (IP65). Mounting and earthing provisions are represented by four holes (M12) on each side of the housing.

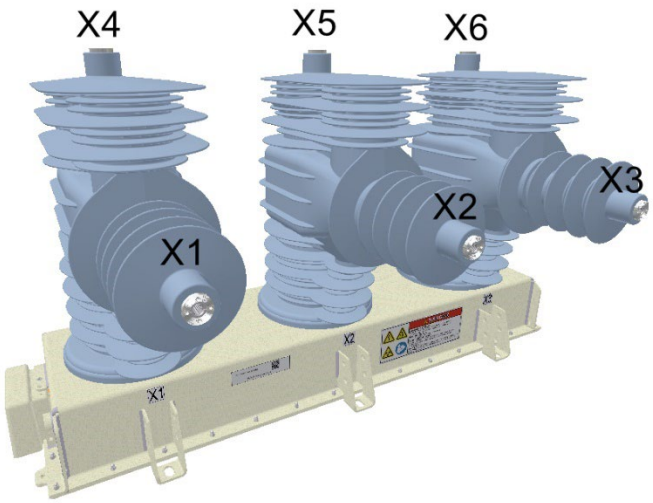


Figure 4

***The general arrangement of the OSM35_Smart_5***

# 3.2 Magnetic Actuator

Magvatech has the most reliable mechanical structure of the vacuum circuit breaker. It uses single-coil magnetic actuators. All switching elements of a pole are assembled along a single axis. All mechanical movements are therefore direct and linear. The design of the magnetic actuator guarantees minimum contacts discrepancy at closing and electrical or mechanical tripping.

Due to the design, any typical failures of critical components, such as mechanical latching, gears, chains, bearings and levers, tripping and closing coils, motors to charge springs are completely avoided.

# 3.3 Vacuum Interrupter

Magvatech vacuum interrupters are the most compact in its class and show excellent mechanical, voltage withstand, and current breaking capabilities. The use of a specially designed axial magnetic field distribution provides even current density over the contact surface and consequently substantial improvement of vacuum interrupting performance. Advanced technology and materials provide vacuum integrity in vacuum interrupter during the entire switching module lifetime (30 years).

# 3.4 Current and Voltage Sensing

Current sensing is performed by current transformers that are inbuilt into each pole. It ensures a precise acquisition of both phase and neutral currents at a wide range with low saturation.

Precise low power capacitive voltage sensors on source and load side terminals with accuracy as low as 0.5% are inbuilt into each pole. It allows the recloser to provide power quality monitoring and network self-healing algorithms implementation.

For details on the sensor's parameters refer to the “Technical Parameters” section of this guide.

# 3.5 Main Circuit Bushings

The main circuit bushings are manufactured from UV stable polymer. They are covered by light grey silicon rubber bushing boots which provide a creepage distance for a heavy polluted environment.

Each type of bushing extension has special inserts in the bull-end to withstand torques applied during mounting procedures.

**Figure 5**

***Bushing insert***

# 3.6 Cable Terminals

4-hole NEMA pads with a 90-degree angle are available for installation.

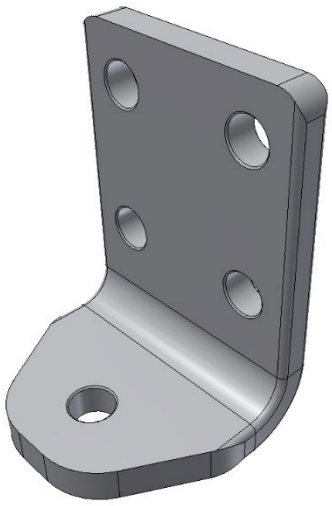

**Figure 6**

***NEMA pads***

To install the connector, align the special inserts in the bull-end of bushing with the hole at the pads and fasten with the M12 Socket head bolts as shown in Figure 6. Tighten the bolts to 40Nm.

Tools required:

- A torque wrench
- Hex key size 10 mm

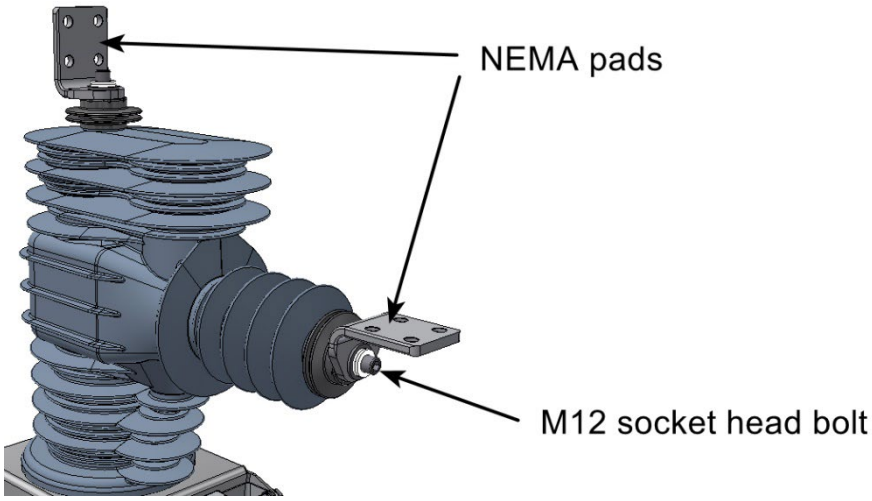


Figure 7

***NEMA pads installation***

# 3.7 Wildlife Protective Covers

Custom-designed terminal covers provide reliable protection from outages caused by animal contact.

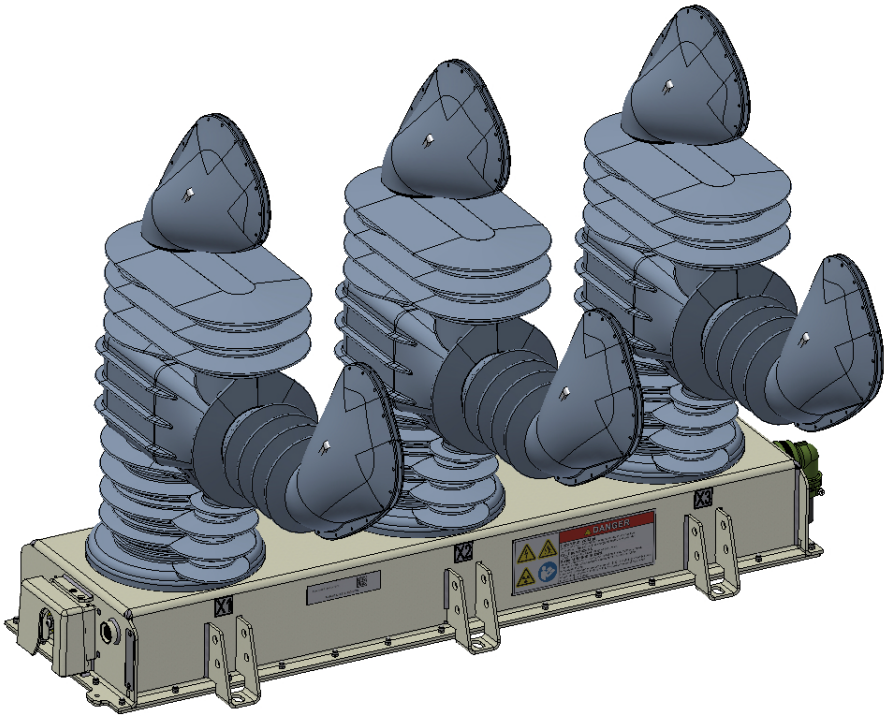

Figure 8

***Wildlife protective covers***

# 3.8 Mechanical Trip and Lockout Mechanism

A mechanical trip hook is located at the right side of the mechanism enclosure (Figure 9). When the hook is pulled down, the Outdoor Switching Module is mechanically opened, locked in the OPEN position, and electrically isolated from the driver. The Outdoor Switching Module remains locked and cannot be operated until the trip hook is pushed back into the operating position.

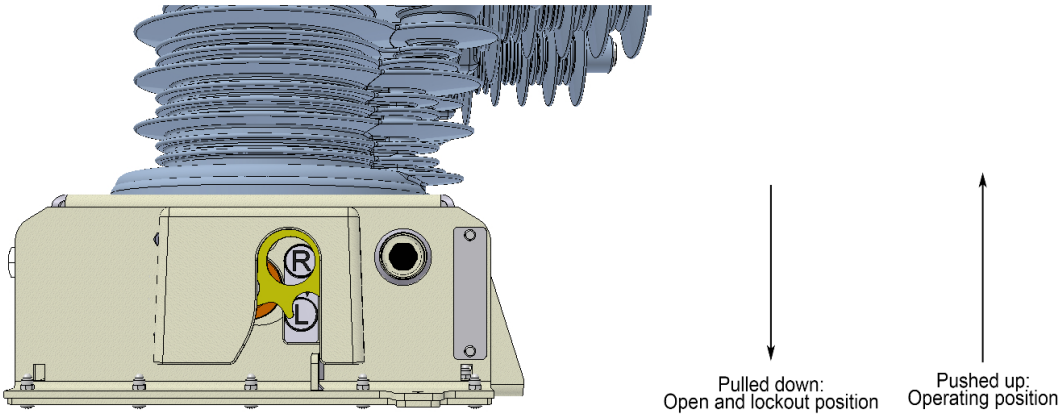


Figure 9

***Mechanical trip hook operation***

# 3.9 Main Contact Position Indicators

The position indicators are located under a protective cover at the rear and bottom sides of the enclosure and are clearly visible in any Outdoor Switching Module mounting position. The indicator color is red “I” when the main contacts are closed and green “O” when they are open.

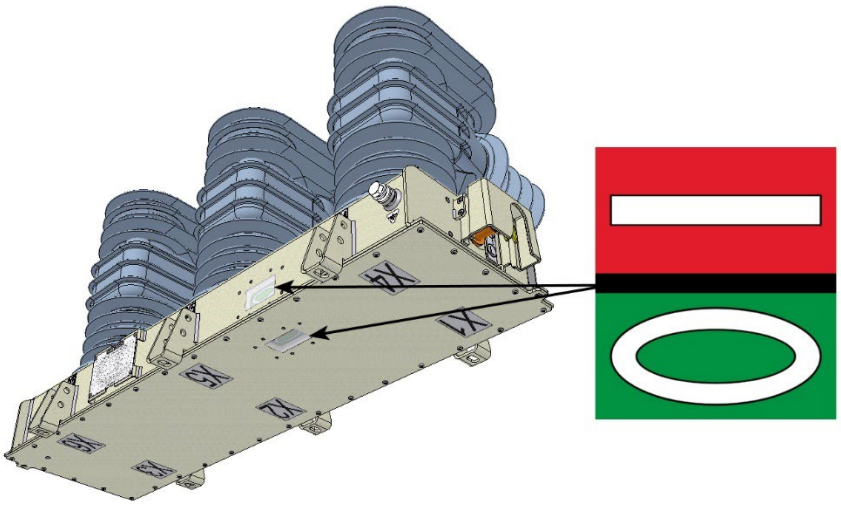

Figure 10

***Main contact position indicators***

# 3.10 Nameplates and Labels

Each Outdoor Switching Module has the following rating plates:

- Serial number plate
- Rating plate

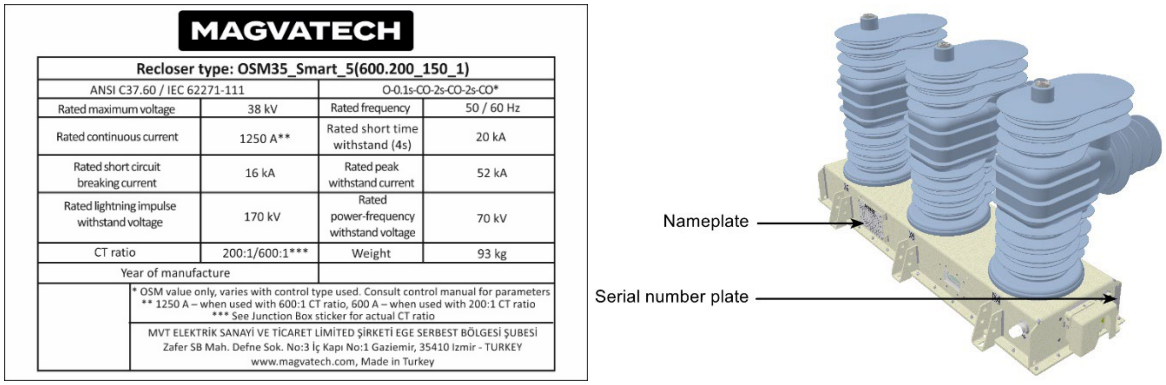


Figure 11

***Outdoor Switching Module nameplates arrangement***

The following information is also provided on the Outdoor Switching Module tank:

- Warning label
- Label with calibration coefficients of the delivered unit


Figure 12

***Warning label***

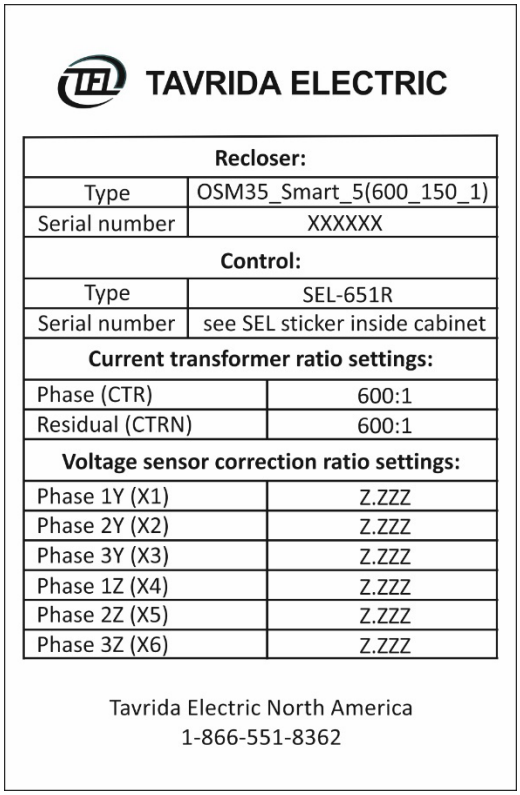


Figure 13

***Label with calibration coefficients***

# 4 Receiving and Inspection

# 4.1 Packing

The recloser is delivered in a wooden crate with mounting hardware, Outdoor Switching Module, and accessories pre-assembled.

Figure 14

***Recloser wooden crate***

# 4.2 Transportation

The recloser shall be transported in the original packing only. The packed goods shall be handled in accordance with the handling symbols. Loading procedures for recloser packing units shall be carried out only with forklifts or cranes.

Lifting gear must not be attached to the bushings, use only lifting lugs attached to the side mounts with suitable clearance of straps or chains. During transportation, the recloser must not be exposed to impacts or dropped.

# 4.3 Unpacking, Goods Received Control

Before unpacking, please check the carton for damage and dampness. Removal of the products from the original packing must be carried out with due care. Every recloser and shall be subject to a completeness control.

# 4.4 Storage

Should immediate installation not be possible, the recloser shall be stored in the original packing under the following conditions:

- The Outdoor Switching Module is switched off.
- Desiccants must be placed in the packing.
- Storage must be closed dry, well ventilated and the room temperature should be between - 40°C and + 40°C (IEC62271-1/ DIN VDE 0670 Part 1000).

Unpacked and assembled equipment can be stored before installation. Keep it in a clean, dry location with sufficient air circulation and temperature to prevent condensation. Insulation must be protected against dirt and moisture.

**WARNING!** It is not permitted to stack more than two packages during storage.

# 5 Installation: Primary Part

# 5.1 General Information

All local and national electrical codes, standards, and practices must be adhered to during the installation and commissioning of this device. Only licensed and qualified personnel shall perform installation, commissioning and operation.

# 5.2 Mounting Kit

The Rec35_Smart5_HDG recloser mounting kit is equipped with provisions for surge arrestors, power transformers, and protective earthing. An example of a pole mounting kit assembly is shown on Figure 15.

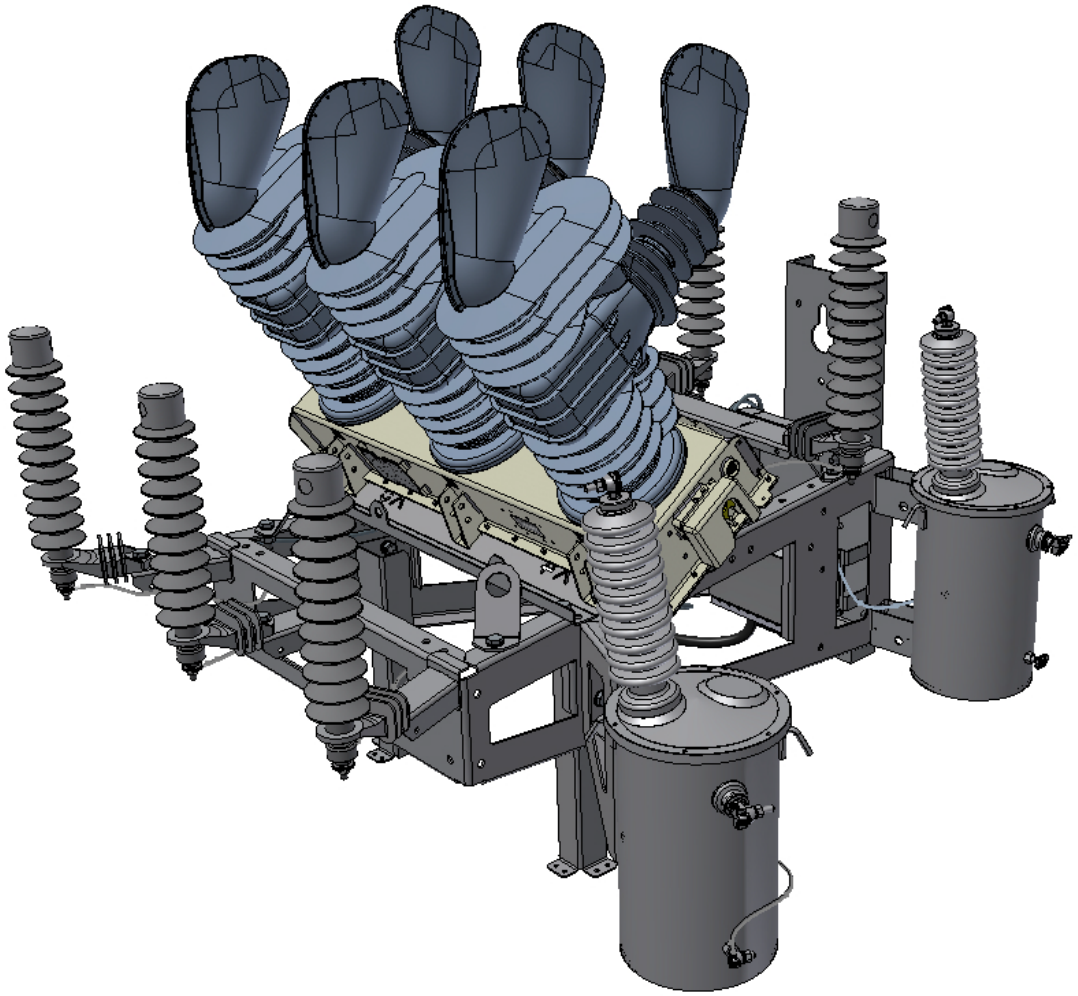

Figure 15

***Pole mounting kit***

# 5.3 Lifting the Recloser

The Rec35_Smart5_HDG recloser is equipped with lifting lugs intended for vertical lifting. When lifting the recloser for mounting or any other purpose, follow general safety practices, lift the load smoothly, and do not allow it to shift. It is recommended to make a single-lift assembly on the ground before mounting the recloser to the pole.

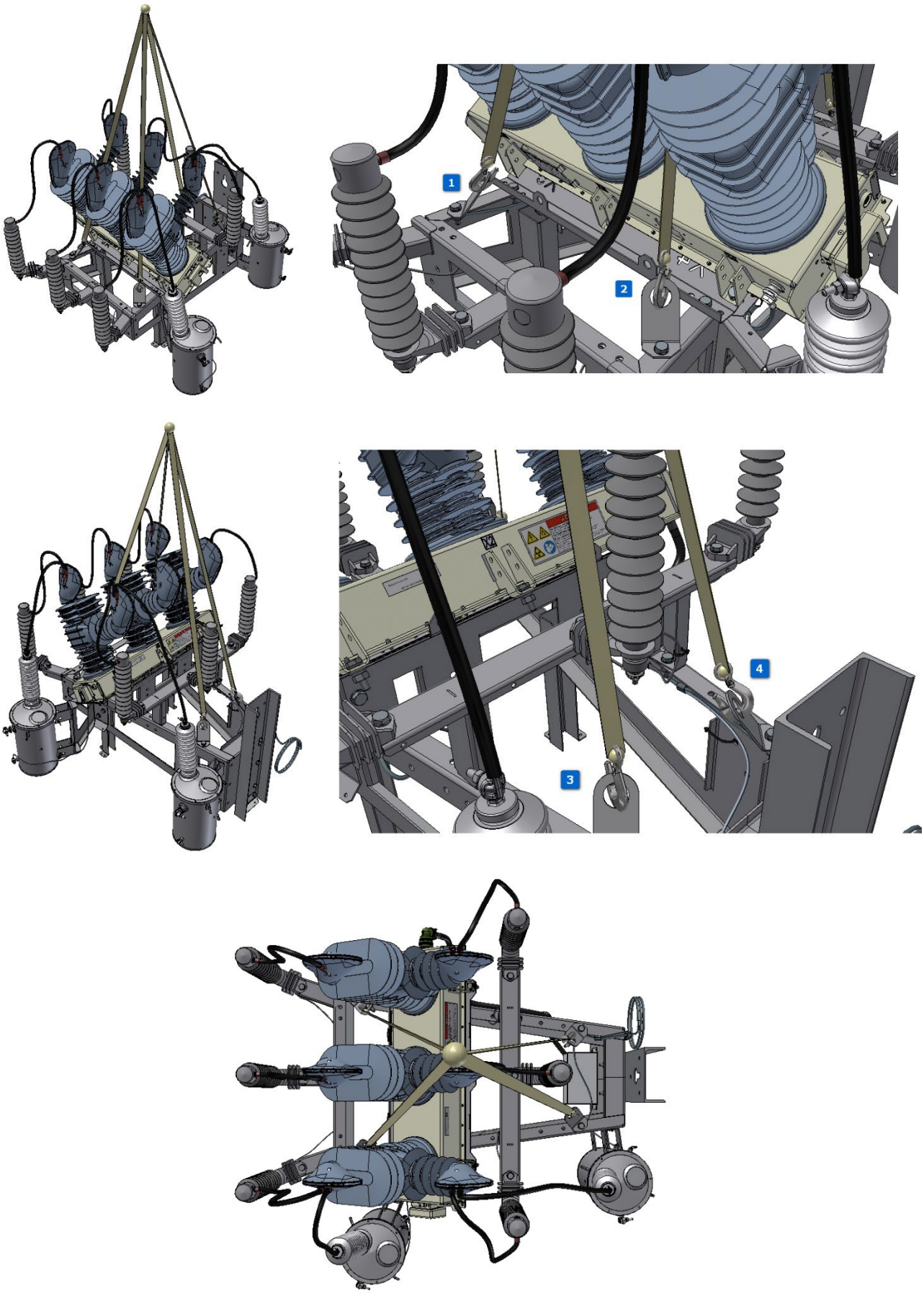


**Figure 16**
***Lifting the recloser***

# 5.4 Main Terminal Connection

Connection to the NEMA terminals:

- Crimp NEMA terminal lug to a cable according to manufacturer's recommendations.
- Contact surfaces shall be preliminarily smoothed out with a steel file card or metallic brush and the abrasive dust shall be removed with rags.
- Connect cable lug to NEMA terminal using M12 bolts and nuts.
- Fix the lugs to the NEMA terminals tighten the nuts hard to 20 Nm
- Use corresponding protective covers to protect the connections from an environment

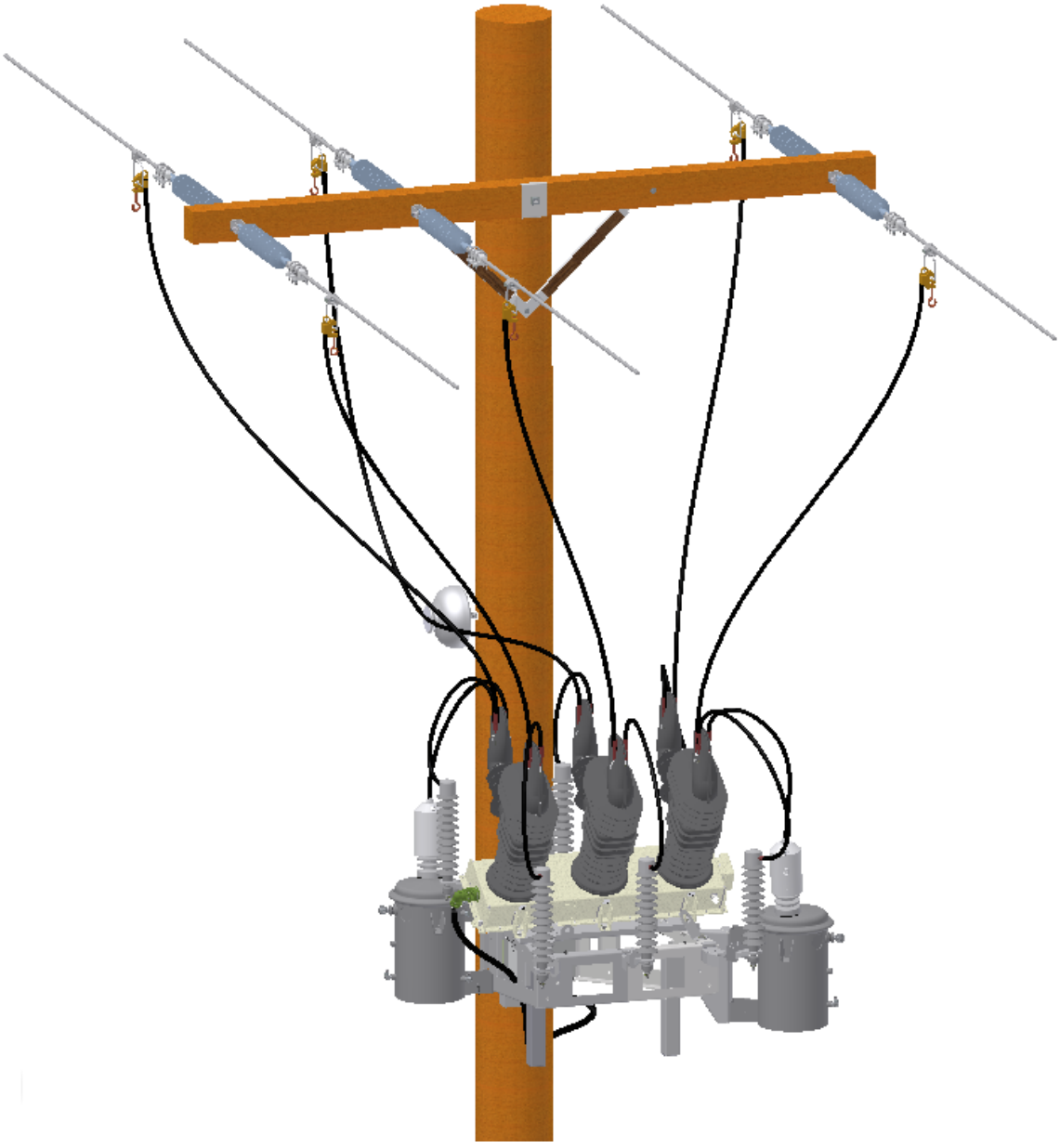

Figure 17

***Complete recloser assembly on the pole***

# 6 Installation: Secondary Part

# 6.1 Connection to Recloser Control

The OSM35_Smart_5 secondary connection is made by Amphenol GTS07R-28-21S connector (37 pin) which is located on the side of the enclosure.

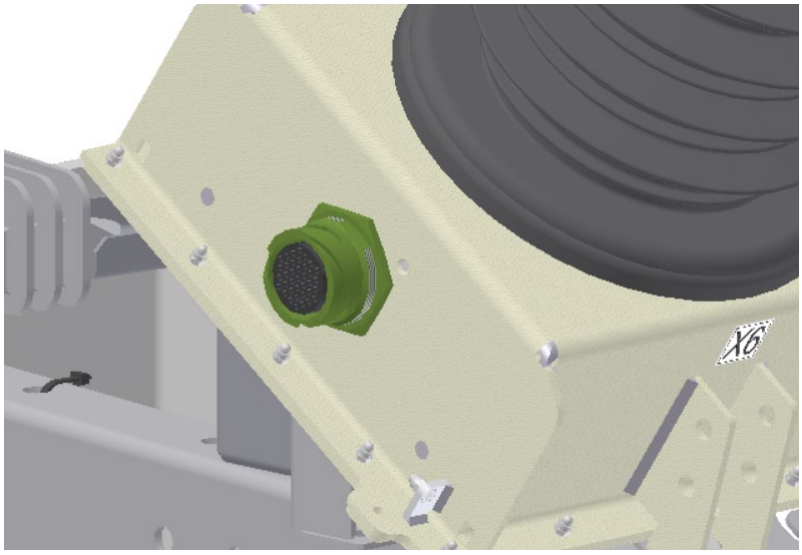


Figure 18

***Switching module connector arrangement***

# 6.2 Junction Box

In case the scope of your recloser supply contains a junction box the connection between Outdoor Switching Module and Recloser Control has to be made through this junction box. The junction box secondary connection is made by Harting 42 pin Han-DD type terminal which is placed on the bottom of the Junction Box.

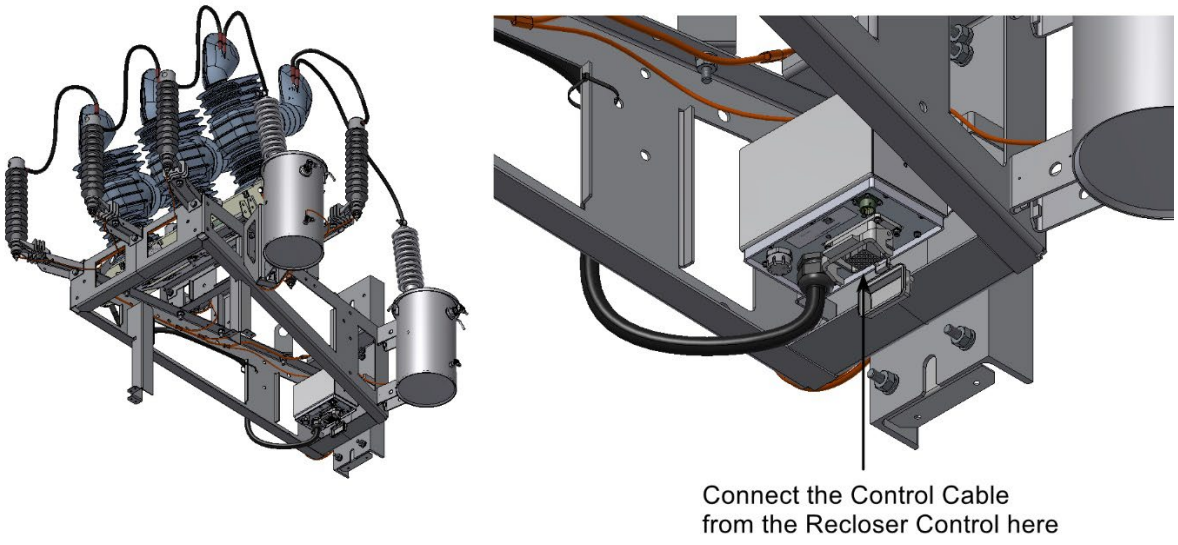


Figure 19

***Control cable connection through the junction box***

# 6.3 Auxiliary Circuit Terminations

Pin arrangement of GTS07R-28-21S terminal is as follows for OSM35_Smart_5(600.200_150_All):

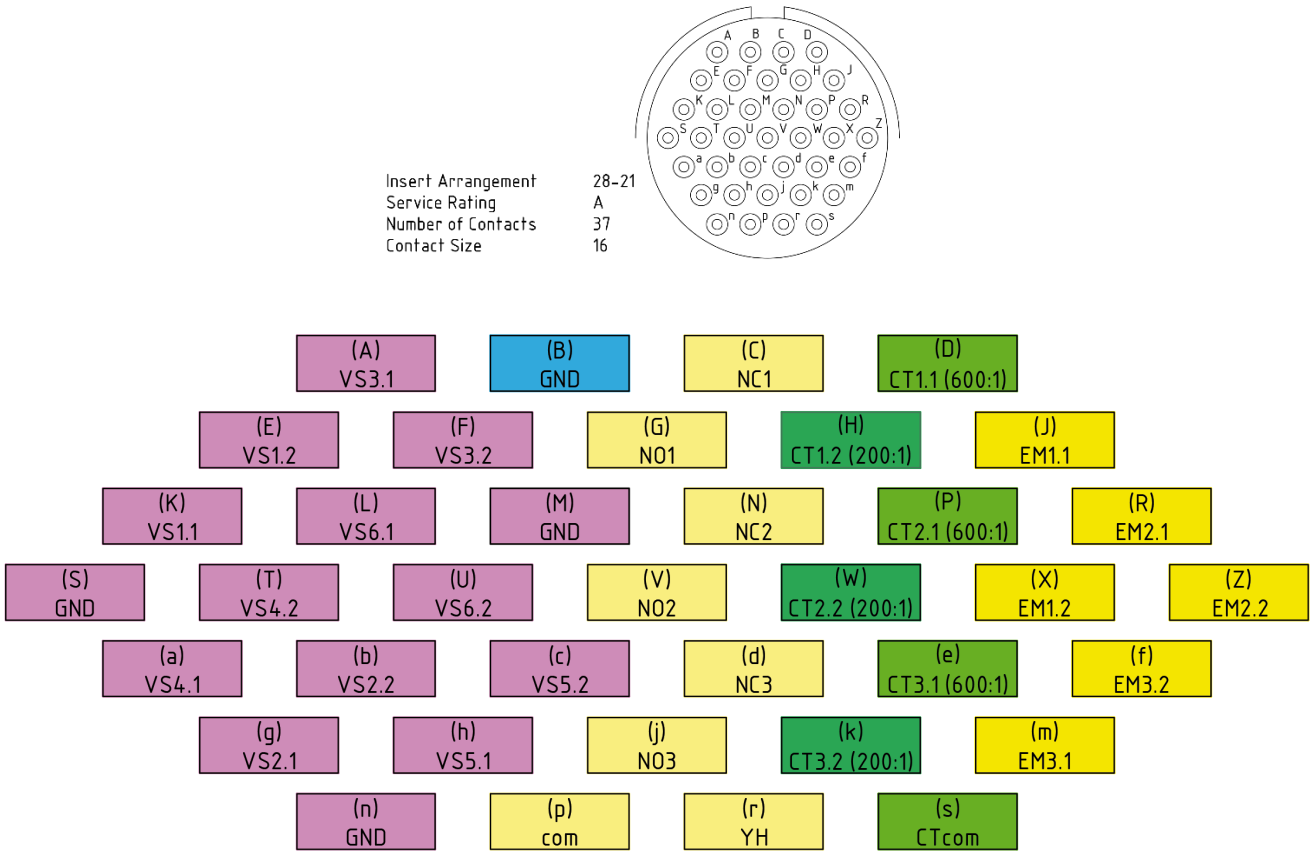


Figure 20

***GTS07R-28-21S terminal pin arrangement***

**Table 4 – Harting Han-42 DD terminal pinout**

| Pin | Designation | Note |
|---|---|---|
| C | NC1 | NC1 auxiliary contact |
| N | NC2 | NC2 auxiliary contact |
| d | NC3 | NC3 auxiliary contact |
| G | NO1 | NO1 auxiliary contact |
| V | NO2 | NO2 auxiliary contact |
| j | NO3 | NO3 auxiliary contact |
| p | COM | Auxiliary contacts common point |
| r | YH | Yellow handle contact |
| J | EM1.1 | Actuator coil 1 (1) |
| R | EM2.1 | Actuator coil 2 (1) |
| m | EM3.1 | Actuator coil 3 (1) |
| X | EM1.2 | Actuator coil 1 (2) |
| Z | EM2.2 | Actuator coil 2 (2) |
| f | EM3.2 | Actuator coil 3 (2) |
| a | VS4.1 | X4-1 voltage sensor |
| T | VS4.2 | X4-2 voltage sensor |
| h | VS5.1 | X5-1 voltage sensor |
| c | VS5.2 | X5-2 voltage sensor |
| L | VS6.1 | X6-1 voltage sensor |
| U | VS6.2 | X6-2 voltage sensor |
| K | VS1.1 | X1-1 voltage sensor |
| E | VS1.2 | X1-2 voltage sensor |
| g | VS2.1 | X2-1 voltage sensor |
| b | VS2.2 | X2-2 voltage sensor |
| A | VS3.1 | X3-1 voltage sensor |

| Pin | Designation | Note |
|---|---|---|
| F | VS3.2 | X3-2 voltage sensor |
| B | GND | Ground |
| M | GND | Ground |
| S | GND | Ground |
| n | GND | Ground |
| H | CT1.2 | Phase 1 CT for 200:1 |
| W | CT2.2 | Phase 2 CT for 200:1 |
| k | CT3.2 | Phase 3 CT for 200:1 |
| s | CTcom | CTs common point |
| D | CT1.1 | Phase 1 CT for 600:1 |
| P | CT2.1 | Phase 2 CT for 600:1 |
| e | CT3.1 | Phase 3 CT for 600:1 |

# 6.4 Protective Earthing

The metal enclosures of the Outdoor Switching Module must be connected according to the applicable regulations (DIN VDE 0141) via the marked screw to earthing arrangement of the pole. Components such as power transformers, surge arresters, mounting hardware, and recloser control should also be connected to the earthing arrangement.

The earthing connections can be carried out with cables or a bus bar (zinc-coated steel or copper). The cross-section must be dimensioned such that a worst-case fault current (short circuit) does not cause a weakening of the earthing connection. The earthing bolts should be tightened to 30 ± 2 Nm torque.

Reference values for cross-sections of earthing connection (copper):

| Duration of fault current (1 s) | Max. temperature of earthing connection | Cross-section earthing connection |
|---|---|---|
| <10 kA/10 kA | 300 °C | 35-70 mm² (1...3/0 AWG) |
| 16 kA | 300 °C | 70-95 mm² (3/0...4/0 AWG) |

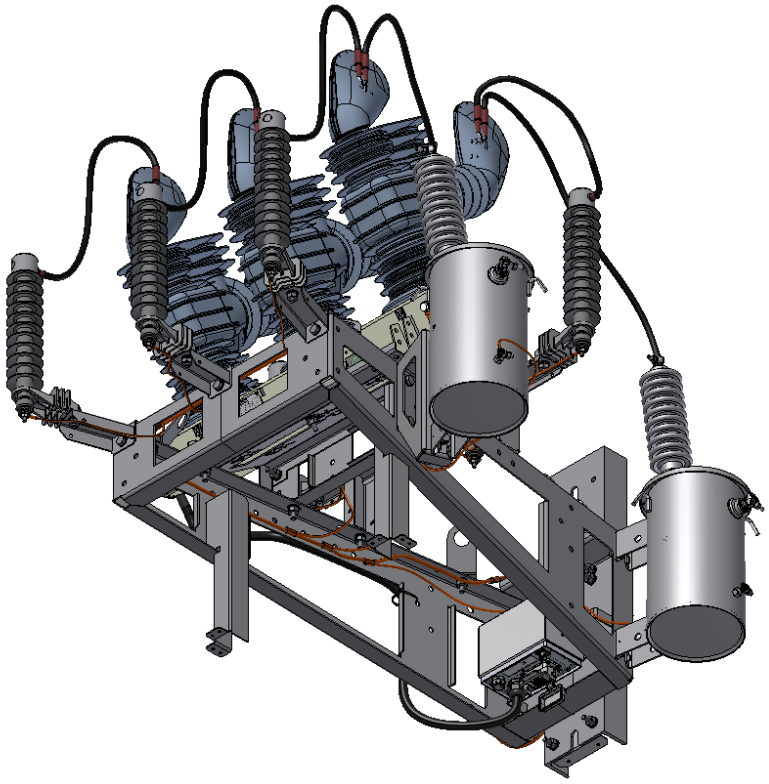

Figure 21

***Rec35_Smart5_HDG earthing arrangement***

## 6.5 Settings Required for SEL-651R with Multi-Recloser Interface

When recloser is controlled by SEL-651R with Multi-Recloser Interface, it is necessary to make sure that settings of control relay are adjusted to provide compatibility with OSM35_Smart series Magvatech switching module.

**Global Settings**:

RECL_CFG := A2

V1YRCF, V2YRCF, V3YRCF, V1ZRCF, V2ZRCF, V3ZRCF should be set to RCF coefficients provided with each recloser.

**Group 1-8 Settings**:

PTRY := 234.5, PTRZ := 234.5

CTR and CTRN settings should be set to corresponding CT ratio of the recloser.

# 7 Commissioning and Maintenance

# 7.1 General

Commissioning, operation and maintenance are only permitted for qualified and trained personnel.

**Danger** Insofar as installation, commissioning or retrofit is carried out on energized equipment, the relevant safety regulations, including all national and local standards, must be adhered to.

**Caution** The Outdoor Switching Module must always be tested and operated together with the appropriate recloser control. Individual testing is not possible and may lead to the destruction of the Outdoor Switching Module.

# 7.2 Commissioning Primary Part

Commissioning tests should include:

- Operating conditions of the Outdoor Switching Module comply with the requirements of the rating plate.
- Check for damage, remove dirt.
- Check bolted connections for fixing points and main terminals (also torques).
- Protective earthing.
- Check the manual trip mechanism as follows:

  Pull down the manual trip hook when the module is in the closed position. The manual trip hook shall remain in the lowered position and the module shall open. Initiate ”Close“ instruction. It shall be ignored, as in this position of the manual trip hook the actuator coils are isolated. Push the hook upward. It shall remain in the upper position. Initiate ”Close“ instruction again. This time it shall be executed.

# 7.3 Commissioning Secondary Part

Please consult the Recloser Control manual for commissioning procedures with the control.

SEL-651R settings specific for Tavrida Electric Rec35_Smart reclosers are shown below.

True PT ratio Vpri./Vsec. = 8793.75.

PTRY or PTRZ = Vpri./Vsec. * (8/300)234.5 = 8793.75 * (8/300) = 234.5

Mandatory SEL-651R setting specific for all Tavrida Electric reclosers are RECL_CFG:=A2.

# 7.4 Maintenance

Under normal operating conditions (see chapter ”Ambient conditions”) the Outdoor Switching Module is maintenance-free for a period of at least 30 years or until it has reached the permissible number of operating cycles.

# 7.5 High Voltage Test

All Magvatech switching modules have successfully passed necessary high voltage tests and do not require field testing. However, if installation procedures require such testing, below are instructions specific to testing Magvatech switching modules.

The module shall be clean. Use a dry cloth to clean the insulation prior to testing.

The test after shipment, service or maintenance shall be made at 80% rated value – for equipment rated to 70kV testing voltage should be 56kV (see IEC 62271-111:2012 and IEEE Std C37-60-2012).

Assemble the circuit for the test:

- Connect the high voltage source to the two terminals of the pole in which the tested VI is installed.
- Connect the surge arrester in parallel with the sample.
- Connect a resistor in series between source and sample.

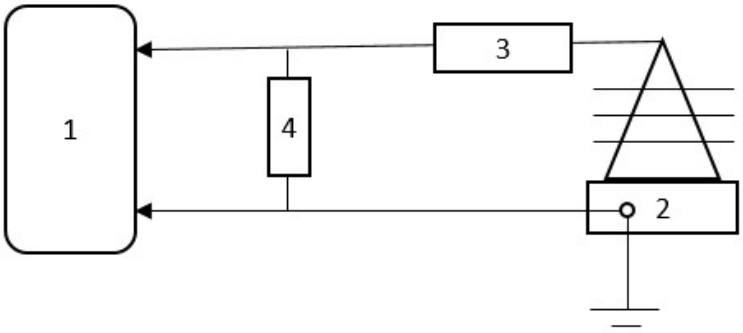


Figure 22

***Test circuit***

Scheme in which: 1 - SM; 2 - high voltage source; 3 - high voltage resistor; 4 - a set of surge arrestors.

Requirements for selecting a surge arrester and a resistor for high-voltage testing:

- Surge Arrester:
  - For a test voltage of 60 kV, a surge arrester with **a Maximum Continuous Operating Voltage (MCOV)** of 48 kV should be used (e.g., model AZES006G048060).
- Resistor Specifications:
  - Voltage Rating: the resistor must have a nominal voltage rating of at least 60 kV. A 30% safety margin is recommended, resulting in **a minimum voltage rating** of 78 kV.
  - Wattage Rating: the resistor must have **a wattage rating** of no less than 500 W. (e.g., model 85-RG18 rod resistor).
  - Energy Rating: the resistor must have **a nominal energy rating** of at least 4,900 Joules for a 10 ms pulse duration.
  - Peak Pulse Wattage: the resistor must withstand **a minimum peak pulse wattage** of 100 Joules for a 10 ms pulse duration.

Test instructions:

- The voltage increases smoothly up to the test value at a speed of 2 kV / s.
- In the event of discharges in the VI, the rise in the test voltage should be stopped or slightly reduced, and after a hold time of 10-15 s, continue to increase the voltage. The series of discharges increase the dielectric strength of the vacuum insulation. This is normal in the presence of a vacuum.
- In case of loss of air tightness of the VI, the increase in electrical strength does not occur, and it is impossible to raise the voltage to 80% of the declared value due to the operation of the protection of the high voltage source.

# 7.6 Non-conformity

If during installation, commissioning, operation, or maintenance any non-conformity occurs, contact your local Tavrida Electric representative or use the technical or warranty support request form on our website www.tavrida.com/tena/.

# 8 Legal Information

# 8.1 Warranty

Unless otherwise stated in the contract, the warranty period is 5 years from the date of invoice. If agreed to otherwise, the contract conditions apply. No warranty is given in the case of:

a) the warranty period run out during a period of storage;

b) operating conditions, ambient conditions, transport, and storage conditions do not correspond to those described in the technical manual;

c) unauthorized manipulation of the device has been carried out, such as opening the housing or damaging the seal;

d) the device has not been properly installed, such as incorrect connection voltages.

# 8.2 Quality Regulations

TÜVNORD

CERTIFICATE

Management system as per
ISO 9001 : 2015

The Certification Body TÜV NORD Turkey Teknik Kontrol ve Belgelendirme A.Ş. hereby confirms as a result of the audit, assessment and certification decision according to ISO/IEC 17021-1:2015, that the organization

MVT ELEKTRİK SAN. VE TİC. LTD. ŞTİ.
Ege Serbest Bölgesi, Zafer Sb Mah., Defne Sok., No:3
35410 Gaziemir, İzmir
Turkey

operates a management system in accordance with the requirements of ISO 9001 : 2015 and will be assessed for conformity within the 3 year term of validity of the certificate.

Scope

Automatic circuit breaker, switching modules, control module production an
silicone rubber production and packaging and shipment of these products.

Certificate Registration No. 1002124
Audit Report No. TR 2249

Valid from 2024-08-12
Valid until 2027-08-11
Initial certification 2024

Certification Body
at TÜV NORD Turkey Teknik Kontrol ve Belgelendirme A.Ş.

Istanbul, 2024-08-12

The certificate inquiry can be done by reading the square code generated by TBDS on mobile devices or by using TBDS Docu
https://tbds.turkak.org.tr.

TÜRKAK BDS NO
YS-DE0C-CC4F

TÜRKAK
Kalite Yönetim Sistemi
TS EN ISO/IEC 17021
AB-0003-YS

TÜV NORD Turkey Teknik Kontrol ve E
Şehit Mehmet Fatih Öngül Sokak, No
Odak Plaza, Kozyatağı, Kadıköy,
TR-34742 Istanbul
www.tuv-turkey.com tuv-nord@tuv-turk

F-025-1-R06

TÜVNORD

CERTIFICATE

Management system as per
ISO 14001 : 2015

The Certification Body TÜV NORD Turkey Teknik Kontrol ve Belgelendirme A.Ş. hereby confirms as a result of the audit, assessment and certification decision according to ISO/IEC 17021-1:2015, that the organization

MVT ELEKTRİK SAN. VE TİC. LTD. ŞTİ.
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Turkey

operates a management system in accordance with the requirements of ISO 14001 : 2015 and will be assessed for conformity within the 3 year term of validity of the certificate.

Scope

Automatic circuit breaker, switching modules, control module production and assembly, silicone rubber production and packaging and shipment of these products.

Certificate Registration No. 2002124
Audit Report No. TR 2249

Valid from 2024-08-12
Valid until 2027-08-11
Initial certification 2024

Certification Body
at TÜV NORD Turkey Teknik Kontrol ve Belgelendirme A.Ş.

Istanbul, 2024-08-12

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AB-0003-YS

TÜV NORD Turkey Teknik Kontrol ve Belgelendirme A. Ş.
Şehit Mehmet Fatih Öngül Sokak, No 5, Kat 4,
Odak Plaza, Kozyatağı, Kadıköy,
TR-34742 Istanbul
www.tuv-turkey.com tuv-nord@tuv-turkey.com

F-025-1-R06

All manufacturing facilities of the company have been certified and comply with (DIN EN) ISO 9001:2015, ISO 14001:2015, and BS OHSAS 18001:2007.

All technical data of the vacuum circuit breaker are stored in an electronic database for each step of the manufacturing process. Testing of the circuit breakers is carried out in accordance with the relevant standards and beyond that, the following routine tests are carried out:

- Visual check and functionality tests
- Mechanical operation test (1000 C-O cycles)
- Dielectric withstand test
- Partial discharge test
- Measurement of the resistance of the main circuit
- Sensors calibration

## 8.3 Complaints and Transport Damage

All products are shipped exclusively with original packing to ensure safe transport and avoid transport damage (see Packing, Goods Received Control).

Tavrida Electric will not accept any claims for damages caused by improper transport, storage as well as unpacking. Transport damage must be reported in writing to the supplier as soon as it is discovered. A period of a maximum of 3 weeks after receipt is allowed for this.

For legitimate claims, Tavrida Electric will supply replacement equipment free of charge according to our warranty regulations. Tavrida Electric reserves the right to verify any claim.

## 8.4 Environmental Friendliness

The modules are manufactured from environmentally friendly materials. Therefore, special disposal is not required.

## 8.5 Liability

Damages and demands for reimbursement of expenses incurred by the customer (in the following: compensation) for whatever legal reasons, especially due to non-compliance of obligations of the contractual obligations and for unauthorized actions, are excluded. This does not apply, insofar as there is a compulsory liability such as according to the product liability law in cases of malice, gross negligence, because of damage to life, the body, or health, because of damage to important contractual obligations.

Compensation for damage to important contractual obligations, however, is limited to the damage which can be predicted as typical of the contract insofar as there is no malice or gross negligence, because of damage to life, the body, or health. A change of the obligation to provide proof to the disadvantage of the customer is not connected with these regulations.

## 8.6 Copyright

# 9 Appendices

# 9.1 Dimensions and Weights

| Dimensions and weights | |
|---|---|
| Creepage distance (from upper terminal to base) | 1201 mm |
| Creepage distance (from lower terminal to base) | 1297 mm |
| OSM35_Smart_5 switching module weight | 93 kg (205 lbs) |

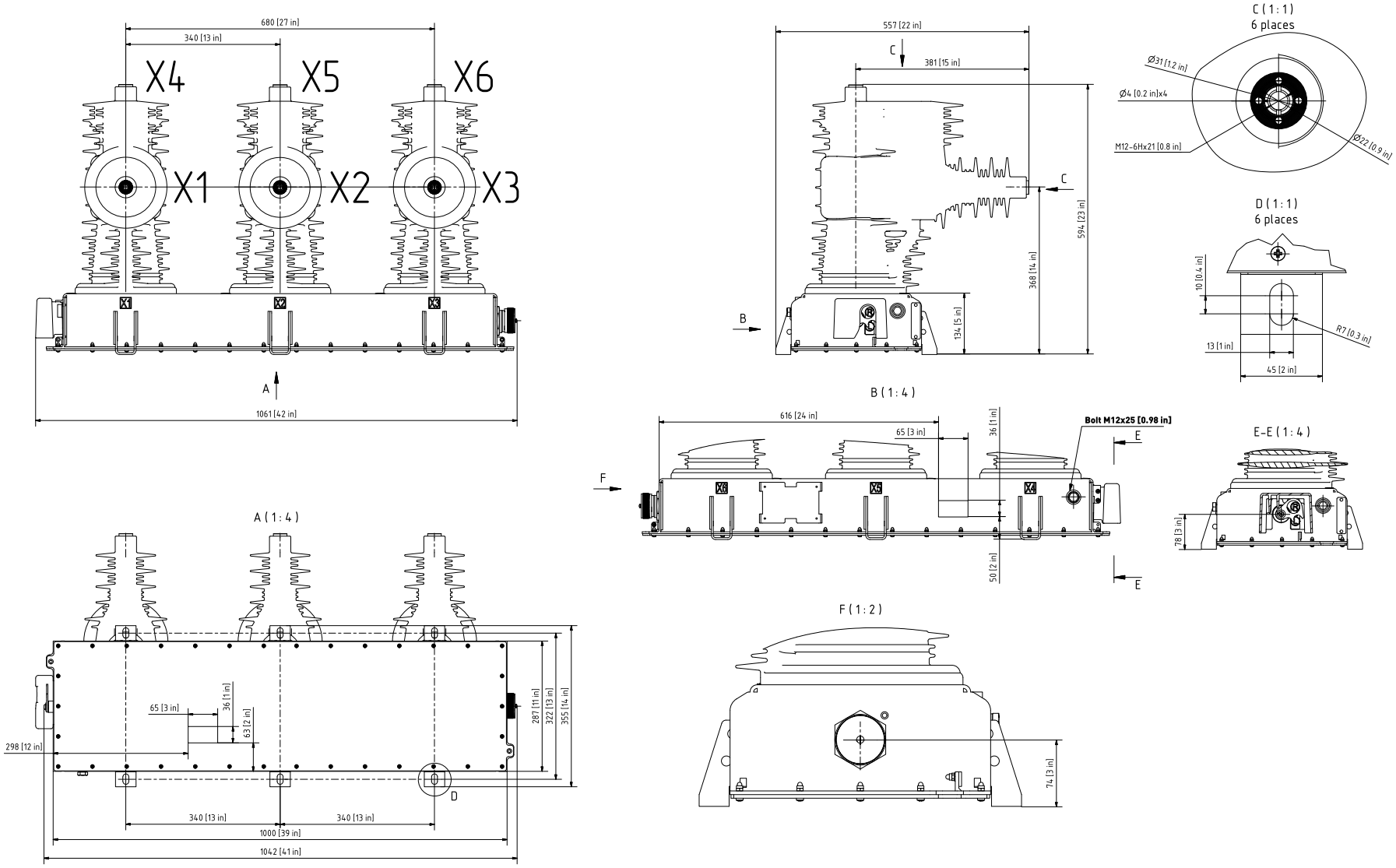



**Figure 23**

***OSM35_Smart_5 drawing***

# 9.2 Circuit Diagrams

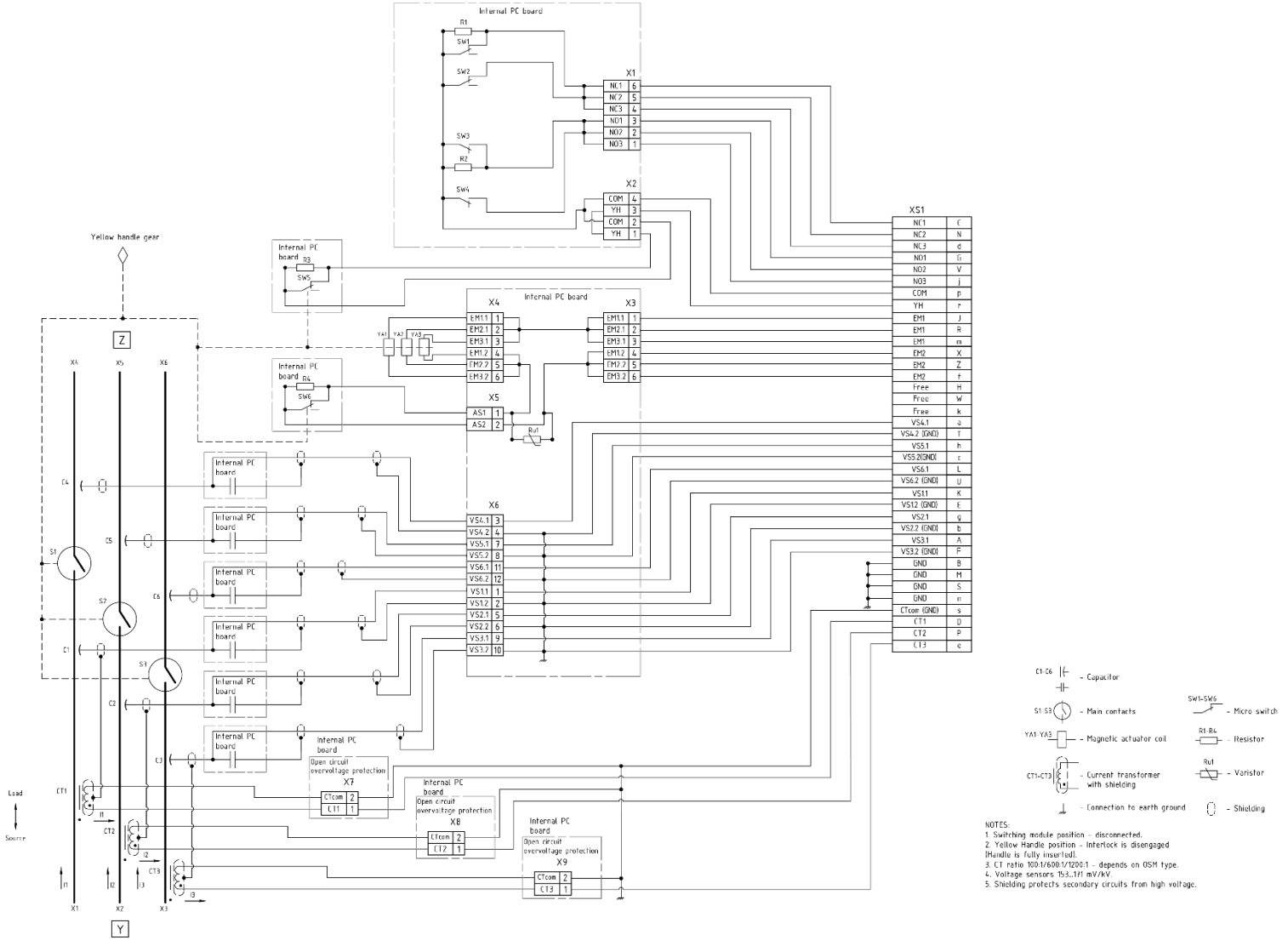



**Figure 24**

***OSM35_Smart_5(All_150_All) circuit diagram***

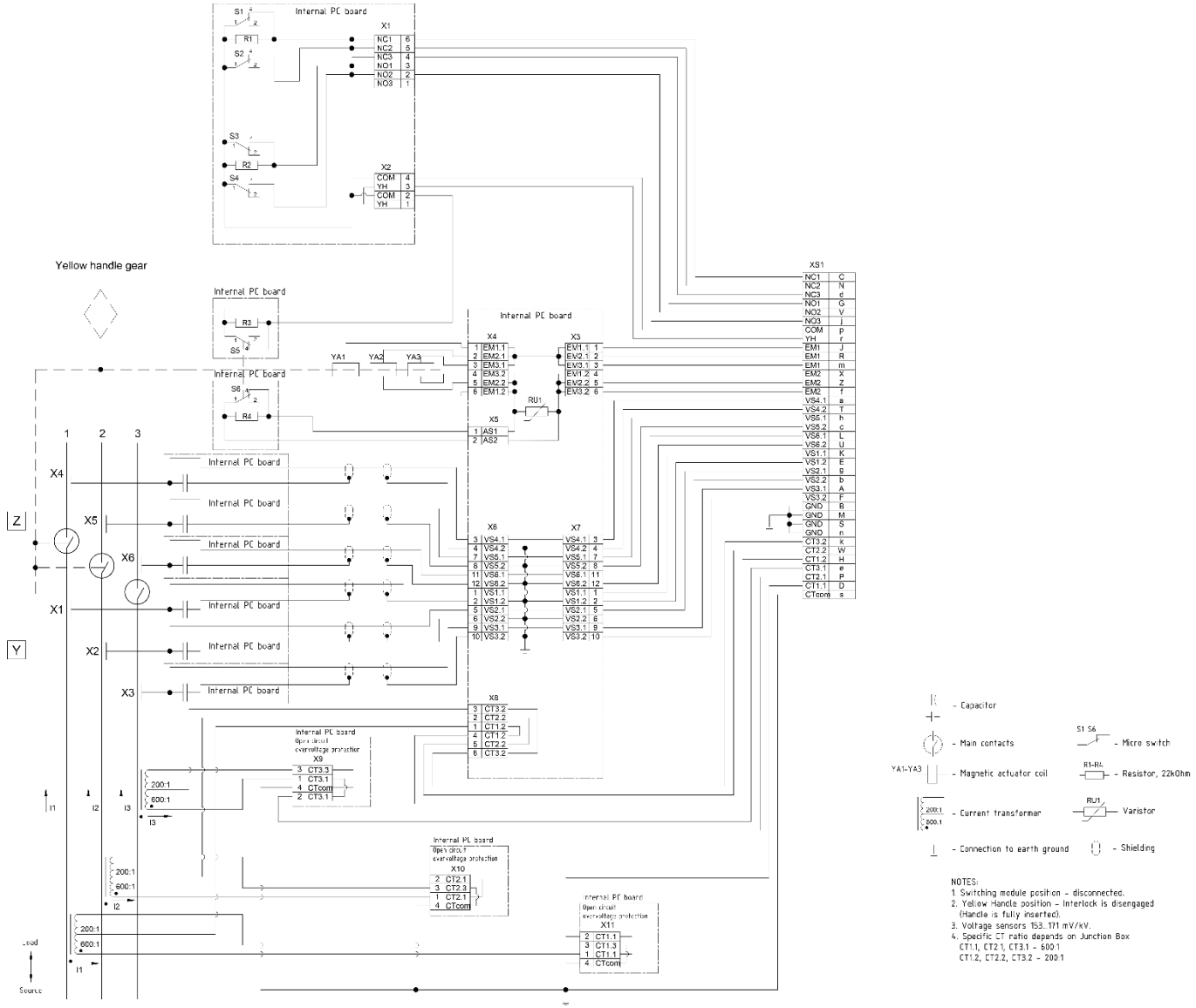
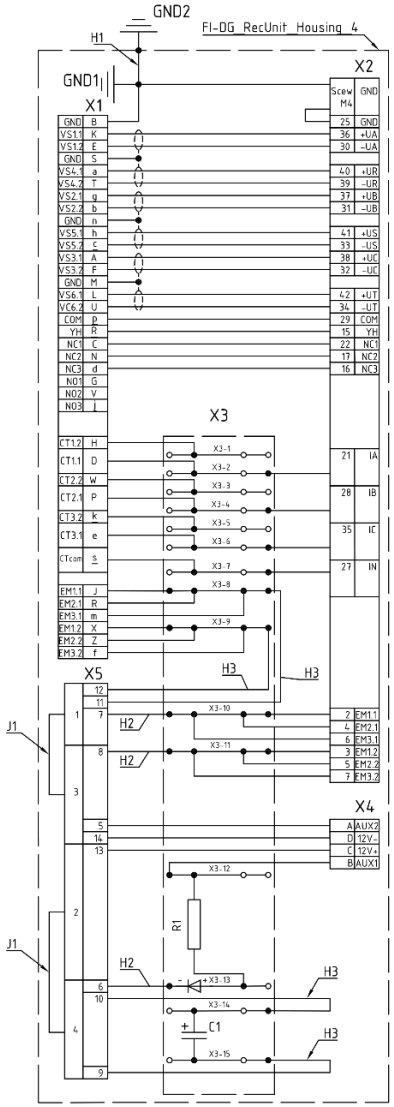
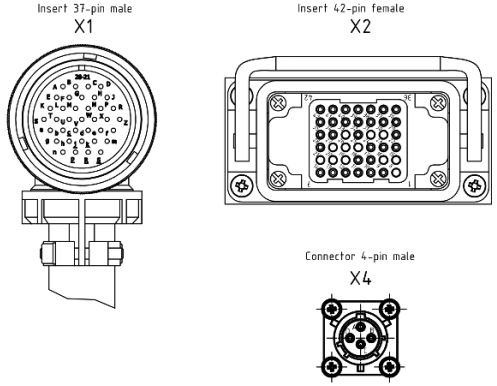



**Figure 25**

***OSM35_Smart_5(600.200_150_All) circuit diagram***



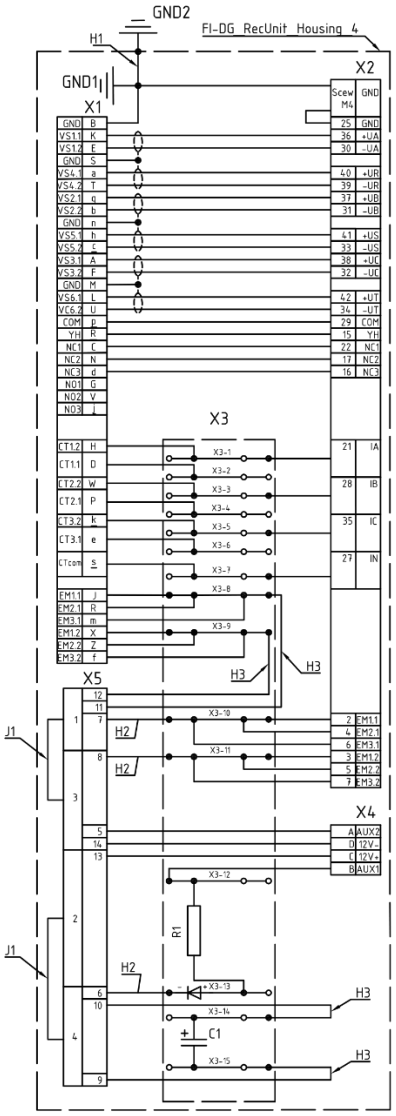



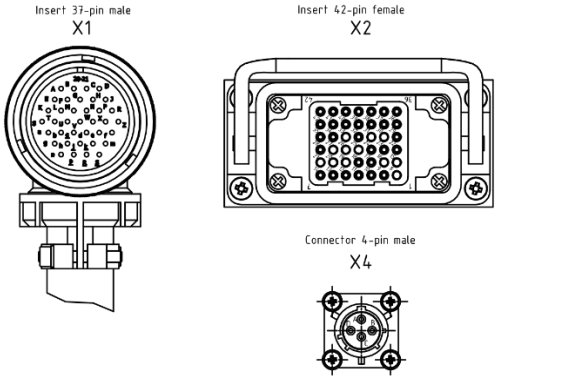

| Item | Description | Qty | Ref. |
|---|---|---|---|
| X1 | FI-TR_Unit_Umbilical_JB-Sm5(200.600_ST) | 1 | |
| X2 | FI-TR_Unit_Harness_158 | 1 | |
| X3-1..12, X3-14,15 | FI-TR_StandDet_Connector_DIN(2.5_C_1_4_2_gr_0) | 14 | |
| X3-13 | FI-TR_StandDet_Connector_DIN(2.5_EAD-A_1_3_2_gr_1) | 1 | |
| X4 | FI-TR_Unit_Harness_35 | 1 | |
| X5 | MVT_StandComp_RelaySocket_Klemsan(2) | 1 | |
| H1 | FI-TR_Unit_Harness_34(375_1.5_gy_R_R) | 1 | |
| H2 | FI-TR_Unit_Harness_34(110_1_b_ES_ES) | 3 | |
| H3 | FI-TR_Unit_Harness_34(130_1_b_ES_ES) | 4 | |
| J1 | FI-TR_Unit_Harness_34(70_1_b_ES_ES) | 2 | |
| R1 | FI-CM_StandDet_Resistor_TH(1K_10%_300_CCR2_2_400_5) | 1 | |
| C1 | FI-CM_StandDet_Capacitor_ElectrolyticTH(120uF_400_20%_1_105_10000_NA) | 1 | |
| GND 1 | Stud M4 in FI-DG_RecUnit_Holder_1(5) | 1 | |
| GND 2 | Stud M4 in FI-DG_RecUnit_Housing_4 | 1 | |

- earth ground
- unconnected terminal
- connection
- shielding

**Figure 26**

***Junction box with safe trip function wiring diagram for OSM35_Smart_5(600.200_150_All) with 600:1 CT ratio circuit diagram***



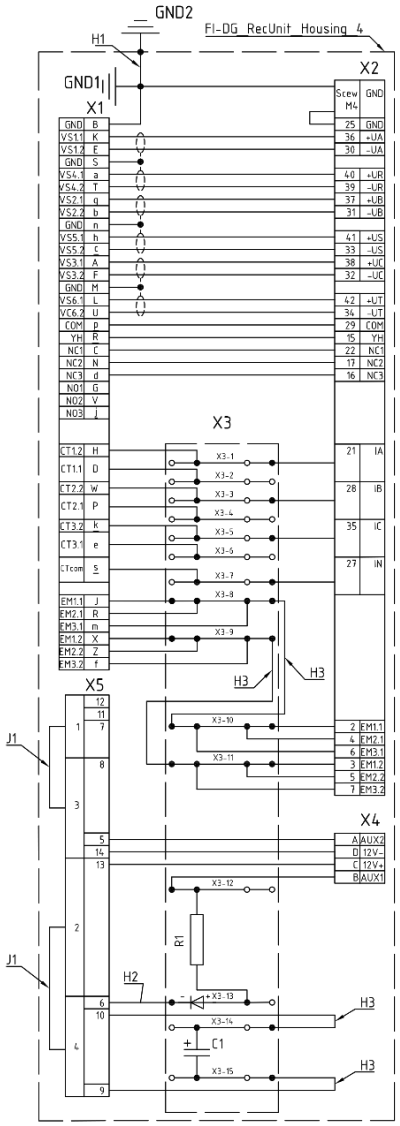



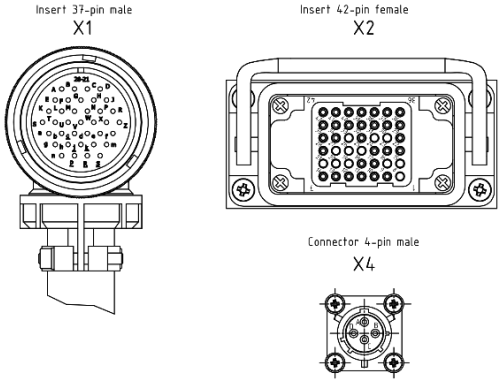

| Item | Description | Qty | Ref. |
|---|---|---|---|
| X1 | FI-TR_Unit_Umbilical_JB-Sm5(200.600_ST) | 1 | |
| X2 | FI-TR_Unit_Harness_158 | 1 | |
| X3-1..12, X3-14,15 | FI-TR_StandDet_Connector_DIN(2.5_C_1_4_2_gr_0) | 14 | |
| X3-13 | FI-TR_StandDet_Connector_DIN(2.5_EAD-A_1_3_2_gr_1) | 1 | |
| X4 | FI-TR_Unit_Harness_35 | 1 | |
| X5 | MVT_StandComp_RelaySocket_Klemsan(2) | 1 | |
| H1 | FI-TR_Unit_Harness_34(375_1.5_gy_R_R) | 1 | |
| H2 | FI-TR_Unit_Harness_34(110_1_b_ES_ES) | 3 | |
| H3 | FI-TR_Unit_Harness_34(130_1_b_ES_ES) | 4 | |
| J1 | FI-TR_Unit_Harness_34(70_1_b_ES_ES) | 2 | |
| R1 | FI-CM_StandDet_Resistor_TH(1K_10%_300_CCR2_2_400_5) | 1 | |
| C1 | FI-CM_StandDet_Capacitor_ElectrolyticTH(120uF_400_20%_1_105_10000_NA) | 1 | |
| GND 1 | Stud M4 in FI-DG_RecUnit_Holder_1(5) | 1 | |
| GND 2 | Stud M4 in FI-DG_RecUnit_Housing_4 | 1 | |

– earth ground
– unconnected terminal
– connection
– shielding

Figure 27

***Junction box with safe trip function wiring diagram for OSM35_Smart_5(600.200_150_All) with 200:1 CT ratio circuit diagram***



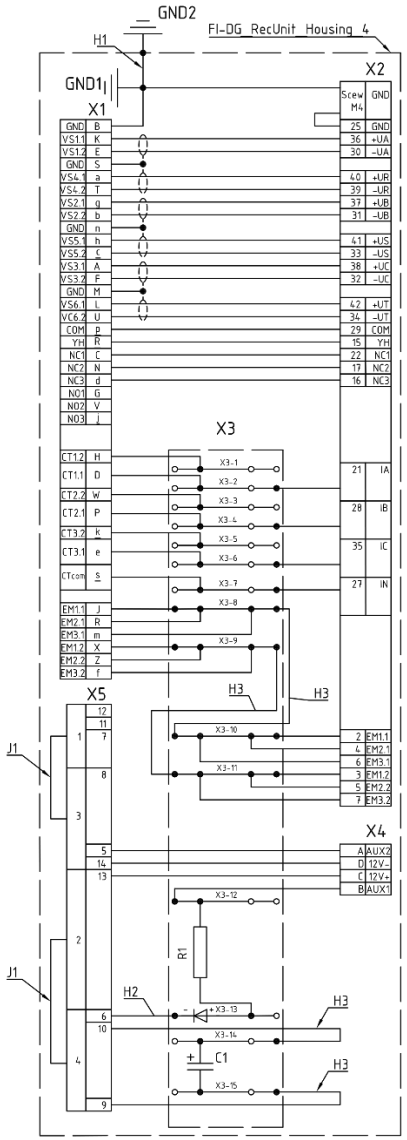

| Item | Description | Qty | Ref. |
|---|---|---|---|
| X1 | FI-TR_Unit_Umbilical_JB-Sm5(200.600_ST) | 1 | |
| X2 | FI-TR_Unit_Harness_158 | 1 | |
| X3-1..12, X3-14,15 | FI-TR_StandDet_Connector_DIN(2.5_C_1_4_2_gr_0) | 14 | |
| X3-13 | FI-TR_StandDet_Connector_DIN(2.5_EAD-A_1_3_2_gr_1) | 1 | |
| X4 | FI-TR_Unit_Harness_35 | 1 | |
| X5 | MVT_StandComp_RelaySocket_Klemsan(2) | 1 | |
| H1 | FI-TR_Unit_Harness_34(375_1.5_gy_R_R) | 1 | |
| H2 | FI-TR_Unit_Harness_34(110_1_b_ES_ES) | 1 | |
| H3 | FI-TR_Unit_Harness_34(130_1_b_ES_ES) | 4 | |
| J1 | FI-TR_Unit_Harness_34(70_1_b_ES_ES) | 2 | |
| R1 | FI-CM_StandDet_Resistor_TH(1K_10%_300_CCR2_2_400_5) | 1 | |
| C1 | FI-CM_StandDet_Capacitor_ElectrolyticTH(120uF_400_20%_1_105_10000_NA) | 1 | |
| GND 1 | Stud M4 in FI-DG_RecUnit_Holder_1(5) | 1 | |
| GND 2 | Stud M4 in FI-DG_RecUnit_Housing_4 | 1 | |

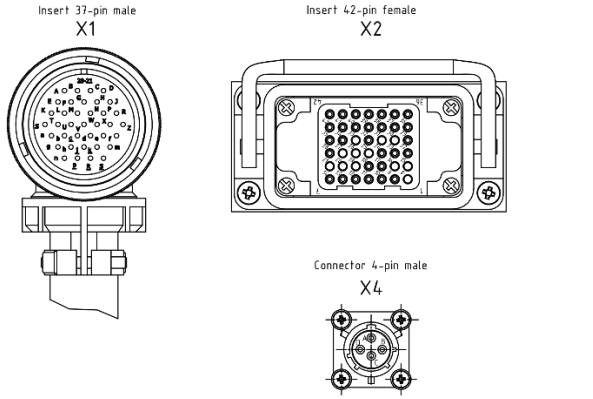
⏚ - earth ground  o - unconnected terminal

● - connection  ⦚ - shielding

**Figure 28**

***Junction box without safe trip function wiring diagram for OSM35_Smart_5(600.200_150_All) with 200:1 CT ratio circuit diagram***




| Item | Description | Qty | Ref. |
|---|---|---|---|
| X1 | FI-TR_Unit_Umbilical_JB-Sm5(200.600_ST) | 1 | |
| X2 | FI-TR_Unit_Harness_158 | 1 | |
| X3-1..12, X3-14,15 | FI-TR_StandDet_Connector_DIN(2.5_C_1_4_2_gr_0) | 14 | |
| X3-13 | FI-TR_StandDet_Connector_DIN(2.5_EAD-A_1_3_2_gr_1) | 1 | |
| X4 | FI-TR_Unit_Harness_35 | 1 | |
| X5 | MVT_StandComp_RelaySocket_Klemsan(2) | 1 | |
| H1 | FI-TR_Unit_Harness_34(375_1.5_gy_R_R) | 1 | |
| H2 | FI-TR_Unit_Harness_34(110_1_b_ES_ES) | 1 | |
| H3 | FI-TR_Unit_Harness_34(130_1_b_ES_ES) | 4 | |
| J1 | FI-TR_Unit_Harness_34(70_1_b_ES_ES) | 2 | |
| R1 | FI-CM_StandDet_Resistor_TH(1K_10%_300_CCR2_2_400_5) | 1 | |
| C1 | FI-CM_StandDet_Capacitor_ElectrolyticTH(120uF_400_20%_1_105_10000_NA) | 1 | |
| GND 1 | Stud M4 in FI-DG_RecUnit_Holder_1(5) | 1 | |
| GND 2 | Stud M4 in FI-DG_RecUnit_Housing_4 | 1 | |

- earth ground
- unconnected terminal
- connection
- shielding

**Figure 29**

***Junction box without safe trip function wiring diagram for OSM35_Smart_5(600.200_150_All) with 600:1 CT ratio circuit diagram***

# 9.3 Safe Trip Device

The safe trip package contains:

1. **JunctionBox_Sm5(ST.YYYY_XXX)** (junction box with built-in safe trip function for OSM35_Smart_5, where **XXX** is 100, 200, 600 or 1200 depending on CT ratio, **YYYY** is type of 4-pin receptacle). All types come mounted on frame with appropriate fasteners.
2. **Umbilical_22(12) or Umbilical_22.Amph(12)** (cable for extra circuits connection between SEL and junction box, 12m long before gland + 2m for wiring inside SEL cabinet).
3. Cable gland **LTCG ½ NPT** with nut **½ NPT.**

Field installation procedure for pole mounted Outdoor Switching Module:

1. Connect umbilical supplied with recloser to the junction box.
2. Connect connection cable **Umbilical_22(12) or Umbilical_22.Amph(12)** to the junction box 4-pin receptacle supplied with the junction box
3. Choose any of holes on SEL-651R bottom plate and fix cable gland in the hole.
4. Pass the other end of the connection cable **Umbilical_22(12) or Umbilical_22.Amph(12)** through cable gland into SEL cabinet
5. Strip the cable and wires of the connection cable **Umbilical_22(12) or Umbilical_22.Amph(12)** and crimp proper cable lugs to fit connection inside SEL-651R cabinet
6. Connect the cable to SEL-651R terminals according to the schematic below.
7. Using single insulated wire [14 – 18] AWG create short (~4”) link to connect terminals B01 and B08, connect B01 to B08 with this link.
8. Ensure output 201 of SEL-651R is programmed for relay malfunction.

   Example of logic that can be used to program OUT201 contact in SEL-651R is shown below. Actual programming may be different depending on the required functionality.

   OUT 201 = NOT [HALARM or (NOT PWR_SRC1 AND BTFAIL) or NOT IN204]

   HALARM – relay failure

   PWR_SRC1 – control power source available

   BTFAIL – battery/charger miss operation

   IN204 – yellow handle normal (monitors for main cable disconnect)

**Table 5 – Connections Inside SEL-651R for Safe Trip Functionality**

| Harness | Wire marking | Connection point 1 | Connection point 2 |
|---|---|---|---|
| **Umbilical_22(12) or Umbilical_22.Amph(12)** 4-pin cable “Connection point 1” is pre-wired on factory. | 1 | Pin designation A (1) | C01 |
| | 2 | Pin designation B (2) | C04 |
| | 3 | Pin designation C (3) | B09 |
| | Green/yellow | Pin designation D (4) | B04 |
| Link connector (not in the scope of supply) | N/A | B01 | B08 |

Functionality description:

The safe trip junction box **JunctionBox_Sm5(ST.YYYY_XXX)** provides safe trip of the following reclosers’ models:

- OSM35_Smart_5(600.200_150_1)

The safe trip junction box works with SEL-651R 42-pin Tavrida recloser interface with power supply 120VAC or 230VAC. It does not work with any type of SEL-651R with DC power supply.

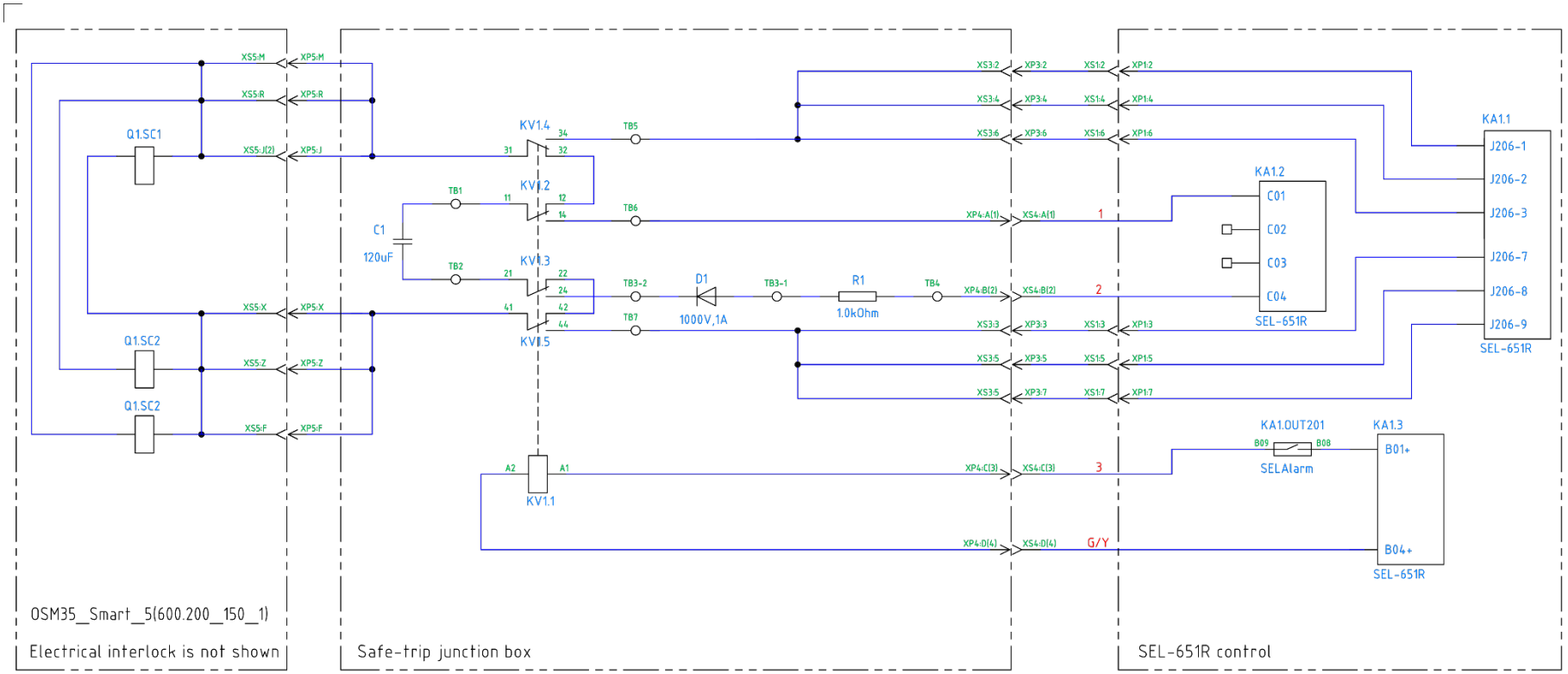
The SEL-651R shall have output 201 programmed for Relay Malfunction event.

The safe trip junction box provides recloser tripping in the following cases:

1. Malfunction of SEL-651R relay if it happens not later than 12 hours after AC power supply loss.
2. Disconnection of connection cable Umbilical_22(12) or Umbilical_22.Amph(12) from junction box or SEL if it happens not later than 12 hours after AC power supply loss.
3. Two previous cases will work even if main umbilical cable is disconnected, so, to provide safe trip option when umbilical is disconnected it is recommended to add one more output 201 activation event: the event of yellow handle locked-open (ask SEL for more details).

The trip function is provided by 120uF capacitor installed inside the junction box. The stored energy of capacitor is enough to trip the recloser within 12 hours after AC power lost in case of ambient temperature is 20°C. For lower temperature the storing time expecting to go down about 30% under -40°C. So, it is recommended to set battery malfunction assigned to OUT201 not more than 8h after AC power loss. It is not mandatory as the SEL-651R can provide safe trip in case of low battery without actuation of safe trip junction box. However, if the SEL-651R fails during battery back-up powering then safe trip junction box is able to trip within 8 hours after AC loss in worst case conditions.

.




C1 - capacitor 120uF, 400V
D1, TB3 - terminal block with diode, 1000V, 1A, built-in
KA1.1, KA1.2, KA1.3, KA.OUT201 - microprocessor control SEL-651R, Schweitzer Engineering Laboratories
KV1.1-KV1.5 - pilot relay 12VDC coil
Q1 - outdoor switching module
R1 - resistor 1kOhm, 2W
TB1, TB2, TB4-TB7 - connection terminals
XP1:1-XP1:42 - Connection Plug Male, panel mounted, Harting (SEL control box)
XP3:1-XP3:42 - Connection Plug Male, cable mounted, Harting (umbilical cable)
XP4:1-XP4:4 - Connection Plug Male, 4-pin, panel mounted (junction box)
XP5 - Connection Plug Male, cable mounted (junction box)
XS1:1-XS1:42 - Connection Plug Female, cable mounted (umbilical cable)
XS3:1-XS3:42 - Connection Plug Female, panel mounted (junction box)
XS4:1-XS4:4 - Connection Plug Female, 4-pin, cable mounted (connection cable)
XS5 - Connection Plug Female, panel mounted (switching module)

**Figure 30**

***Safe Trip device connection diagram***

# List of changes

| Document version | Change date | Scope of change | Reason of change |
|---|---|---|---|
| 1.0 | 16.02.2022 | Initial version of the document | Product introduction |
| 2.0 | 25.02.2022 | Circuit diagram added.<br>Connection terminations added.<br>Earthing arrangement picture added.<br>Safe Trip junction box description added. | Document improvement |
| 3.0 | 25.06.2023 | Sections 3.1 and 9.1 | Request |
| 4 | 28.12.2023 | - Table 1-2,<br>- Figure 2 - Current transformers excitation curves for OSM35_Smart_5(All_150_All) - 100:1 CT, 600:1 CT and 1200:1 CT ratio<br>- 9.2 Circuit Diagrams | Update |
| 4.1 | 28.02.2024 | Updating technical parameters | Update |
| 4.2 | 25.06.2024 | OSM35_Smart_5(600.200_150_All) | Update |
| 4.3 | 21.08.2024 | Updating technical parameters | Update |
| 4.4 | 23.10.2024 | 6.5 Settings Required for SEL-651R with Multi-Recloser Interface | Adding a section |
| 4.5 | 13.01.2024 | Section 9.3 Safe Trip Device<br>Section 7.3 Commissioning Secondary Part | Update |
| 4.6 | 31.01.2025 | 2 Technical Parameters<br>6.3 Auxiliary Circuit Terminations<br>9.2 Circuit Diagrams<br>9.3 Safe Trip Device<br>7.5 High Voltage Test | Update |
| 4.7 | 11.02.2025 | 2 Technical Parameters | Update |
| 4.8 | 02.04.2025 | General text edits | Update |
| 4.9 | 03.07.2025 | Update | Update |
| 4.10 | 23.07.2025 | Update | Update |

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