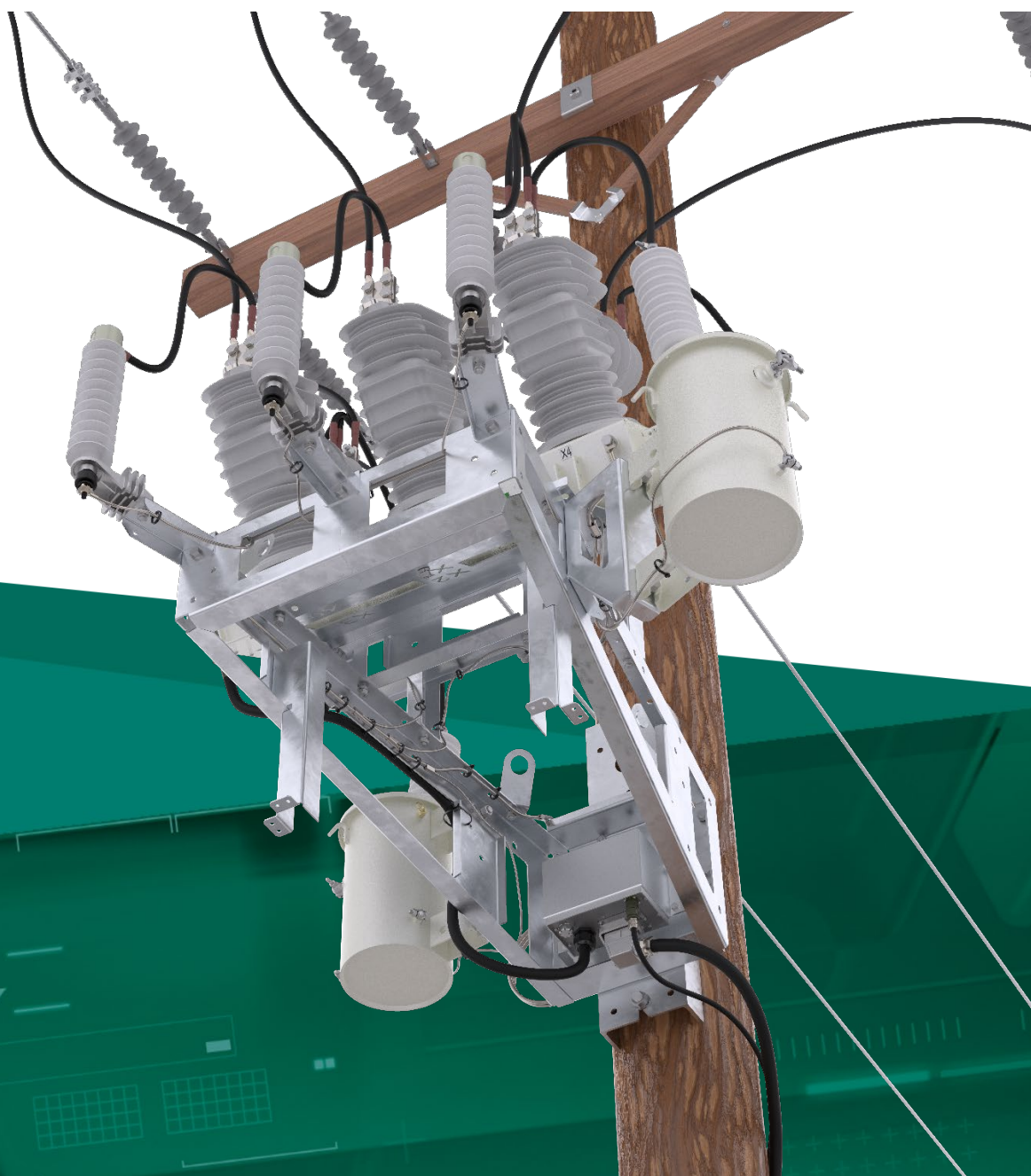


Rec35_Smart5_HDG

**AUTOMATIC
CIRCUIT
RECLOSER**

38 kV, 16 kA, 1250 A



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	4
2	Technical Parameters	6
3	Product Description	10
	3.1 Overview	11
	3.2 Magnetic Actuator	11
	3.3 Vacuum Interrupter	11
	3.4 Current and Voltage Sensing	11
	3.5 Main Circuit Bushings	12
	3.6 Cable Terminals	12
	3.7 Wildlife Protective Covers	13
	3.8 Mechanical Trip and Lockout Mechanism	13
	3.9 Main Contact Position Indicators	14
	3.10 Nameplates and Labels	14
4	Receiving and Inspection	16
	4.1 Packing	17
	4.2 Transportation	17
	4.3 Unpacking, Goods Received Control	17
	4.4 Storage	17
5	Installation: Primary Part	18
	5.1 General Information	19
	5.2 Mounting Kit	19
	5.3 Lifting the Recloser	19
	5.4 Main Terminal Connection	21
6	Installation: Secondary Part	22
	6.1 Connection to Recloser Control	23
	6.2 Junction Box	23
	6.3 Auxiliary Circuit Terminations	23
	6.4 Protective Earthing	25
	6.5 Settings Required for SEL-651R with Multi-Recloser Interface	26
7	Commissioning and Maintenance	27
	7.1 General	28
	7.2 Commissioning Primary Part	28
	7.3 Commissioning Secondary Part	28
	7.4 Maintenance	28
	7.5 High Voltage Test	28
	7.6 Non-conformity	29
8	Legal Information	30
	8.1 Warranty	31
	8.2 Quality Regulations	31
	8.3 Complaints and Transport Damage	32
	8.4 Environmental Friendliness	32
	8.5 Liability	32
	8.6 Copyright	32
9	Appendices	33
	9.1 Dimensions and Weights	34
	9.2 Circuit Diagrams	36
	9.3 Safe Trip Device	41

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
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 ²⁾	60 ms
Opening time, not more than ²⁾	15 ms
Break time, not more than ²⁾	25 ms
Rated operating sequence	O-0.2s-CO-1.5s-CO-2s-CO-2s-CO ³⁾
Standards	
International Standard American Standard	IEC 62271-100, IEC 62271-111 IEEE C37.60
Other data	
Current sensing	3 current transformers
Voltage sensing	6 voltage sensors
Main contact resistance, not more than	< 32 μ Ohm
Solar radiation	≤ 1.1 kW/m ²
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) 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.

3) Fastest operating sequence when used with SEL-651R-2 Recloser Control. Subject to change when used with different controls.

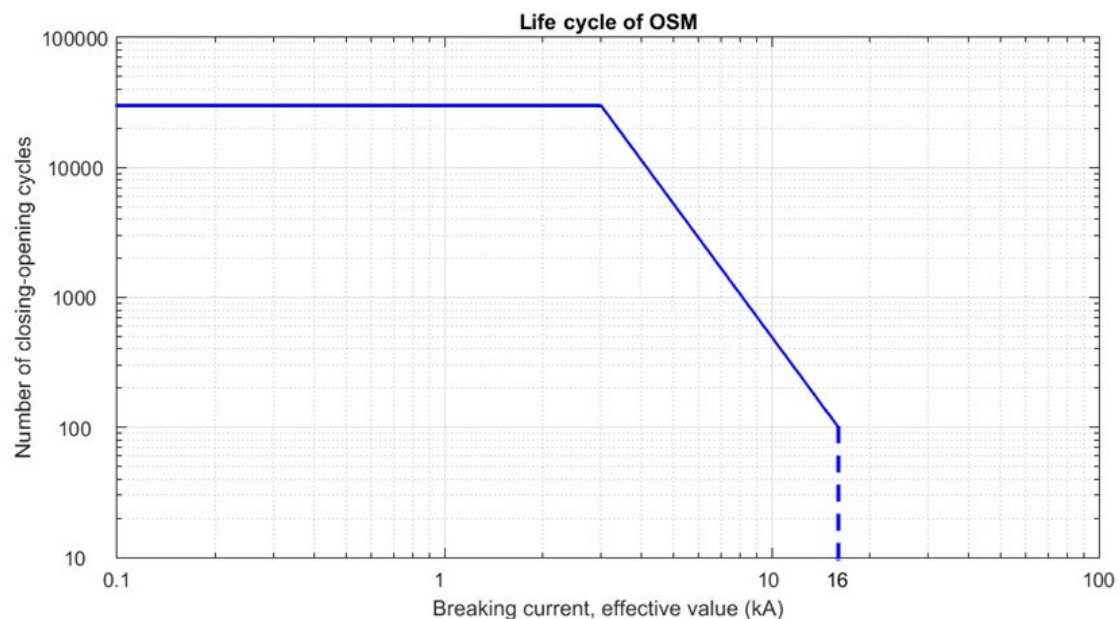


Figure 1
Outdoor Switching Module electrical endurance

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	

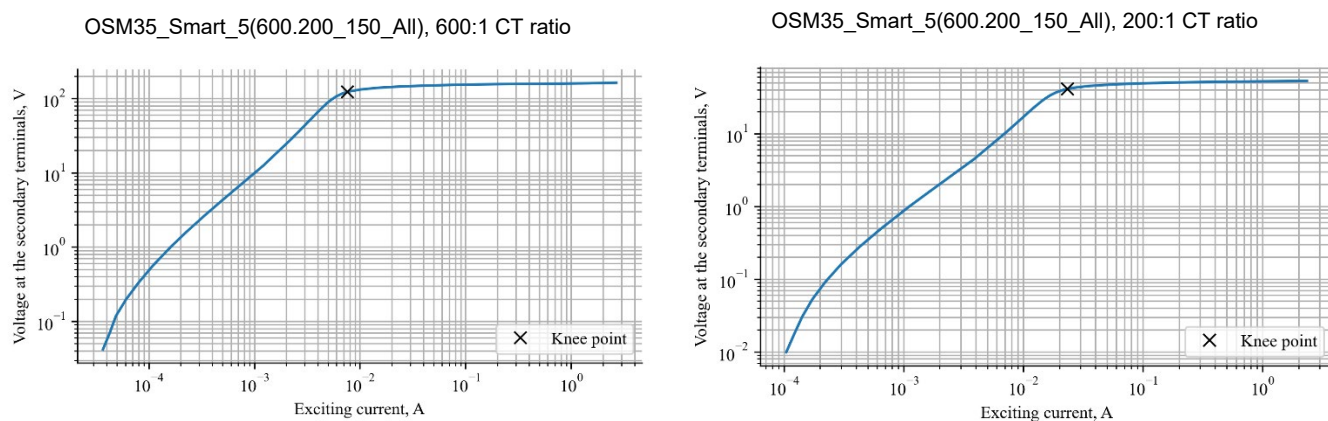


Figure 2

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

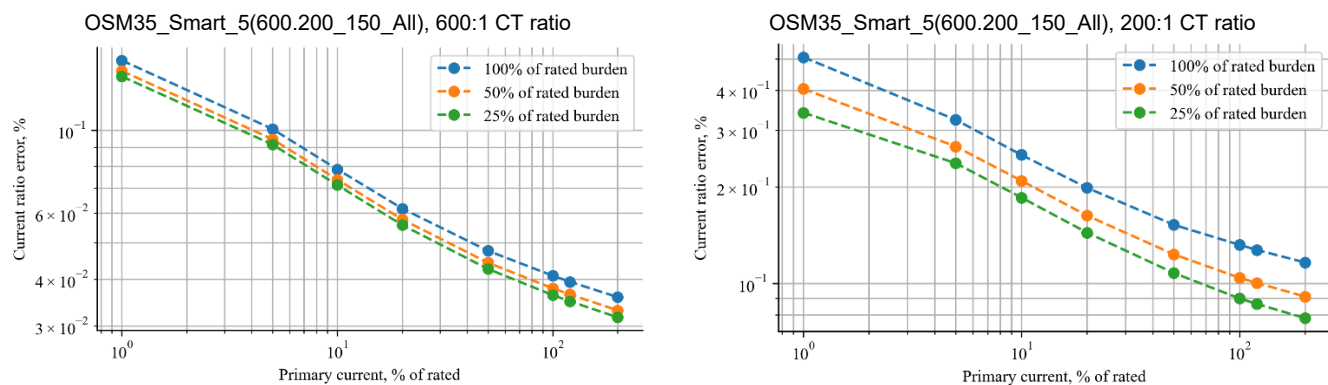


Figure 3

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 ¹
Pollution level	Very heavy (according to IEC 60815)

¹ 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.

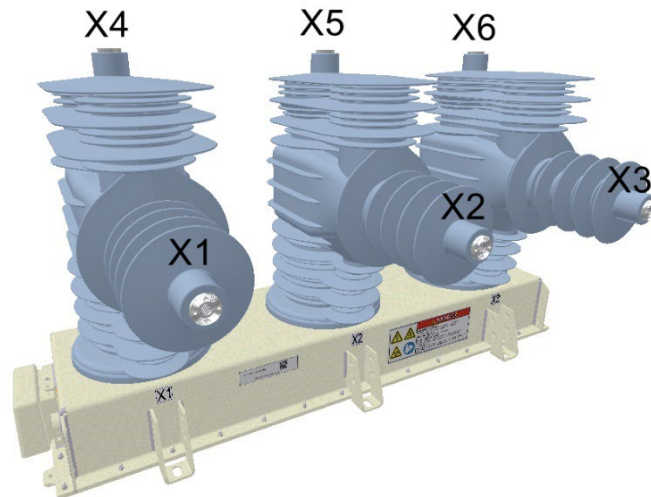


Figure 4

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.

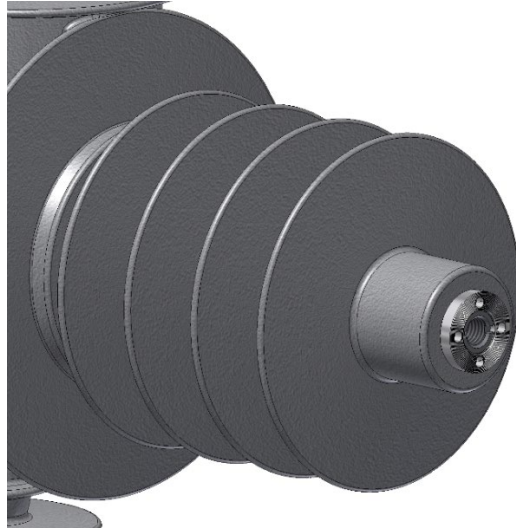


Figure 5
Bushing insert

3.6 Cable Terminals

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

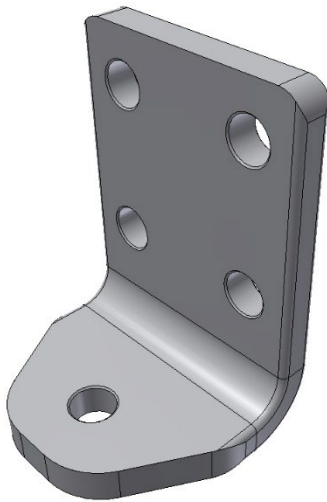


Figure 6
NEMA pads

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

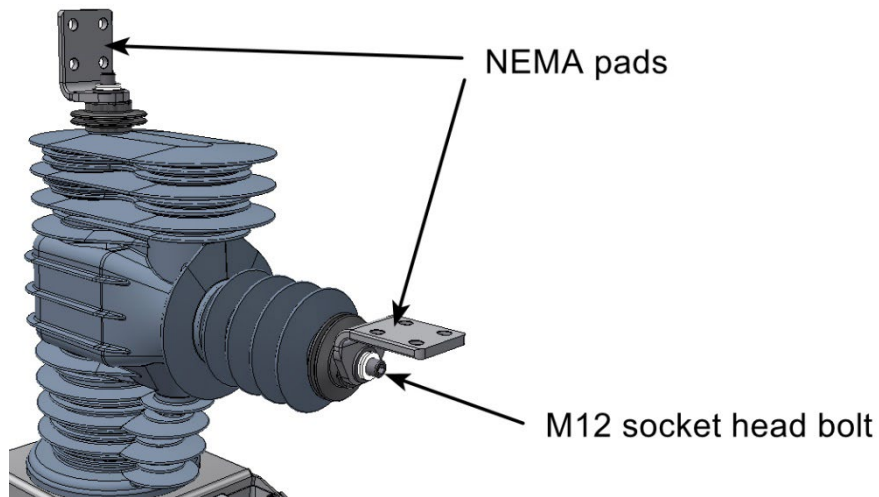


Figure 7
NEMA pads installation

3.7 Wildlife Protective Covers

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

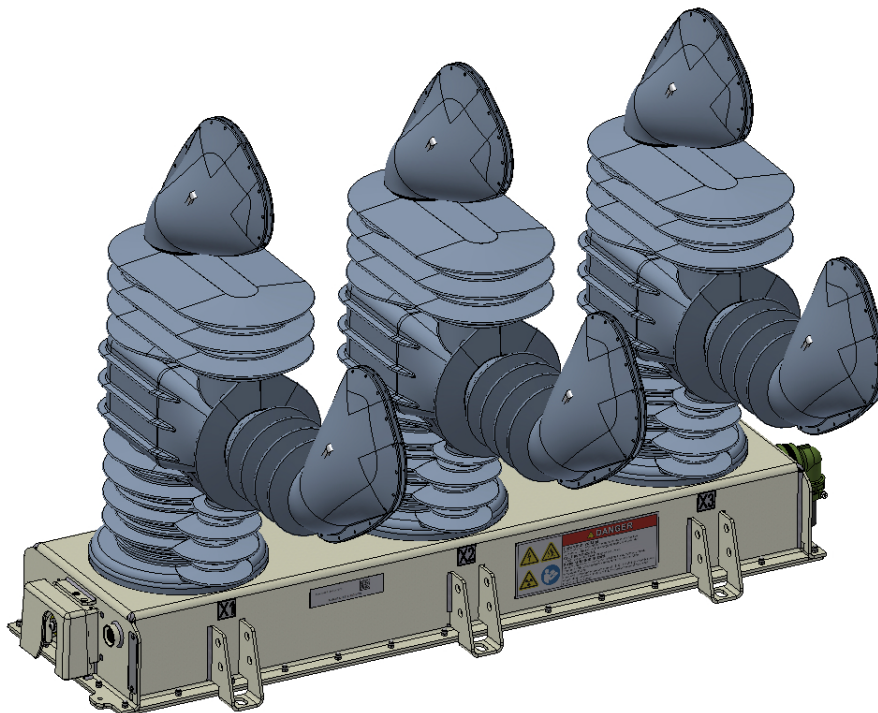


Figure 8
Wildlife protective covers

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.

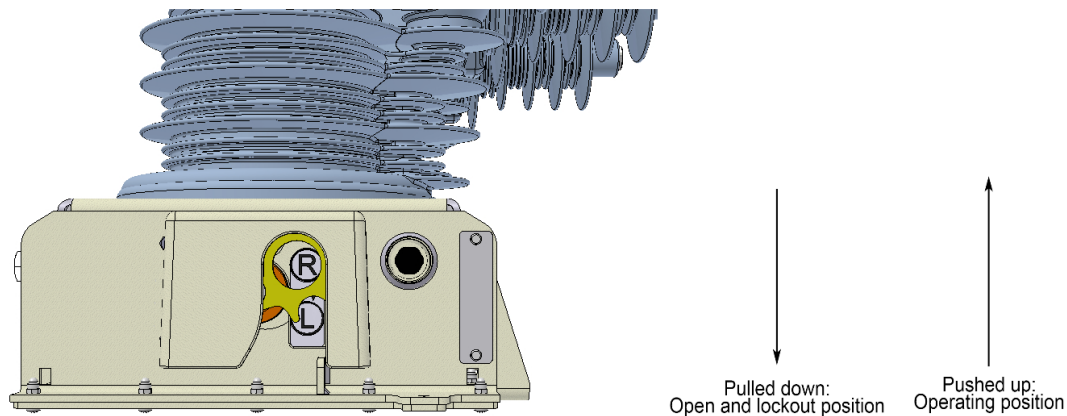


Figure 9
Mechanical trip hook operation

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.

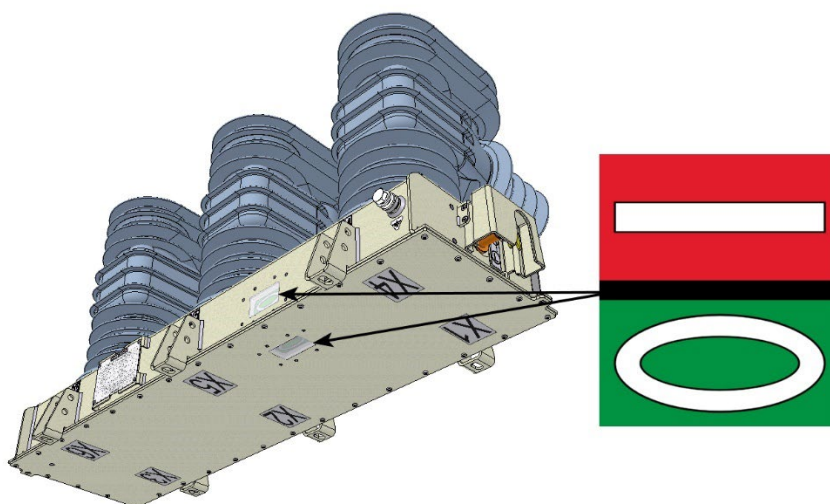


Figure 10
Main contact position indicators

3.10 Nameplates and Labels

Each Outdoor Switching Module has the following rating plates:

- Serial number plate
- Rating plate

MAGVATECH			
Recloser type: OSM35_Smart_5(600.200_150_1)			
ANSI C37.60 / IEC 62271-111		O-0.1s-CO-2s-CO-2s-CO*	
Rated maximum voltage	38 kV	Rated frequency	50 / 60 Hz
Rated continuous current	1250 A**	Rated short time withstand (4s)	20 kA
Rated short circuit breaking current	16 kA	Rated peak withstand current	52 kA
Rated lightning impulse withstand voltage	170 kV	Rated power-frequency withstand voltage	70 kV
CT ratio	200:1/600:1***	Weight	93 kg
Year of manufacture			
* OSM value only, varies with control type used. Consult control manual for parameters ** 1250 A – when used with 600:1 CT ratio, 600 A – when used with 200:1 CT ratio *** See Junction Box sticker for actual CT ratio MVT ELEKTRİK SANAYİ VE TİCARET LİMİTED ŞİRKETİ EGE SERBEST BÖLGESİ ŞUBESİ Zafer 58 Mah. Defne Sok. No:3 İç Kapı No:1 Gazilemir, 35410 İzmir - TURKEY www.magvatech.com, Made in Turkey			

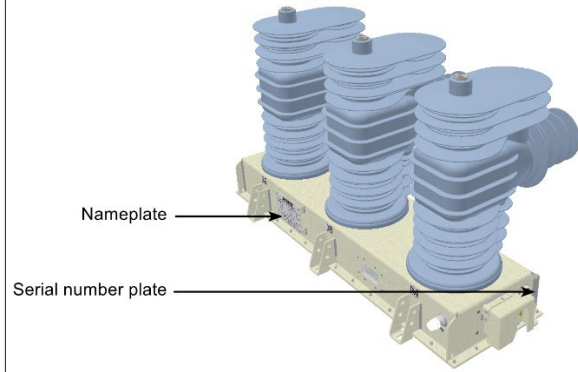


Figure 11

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

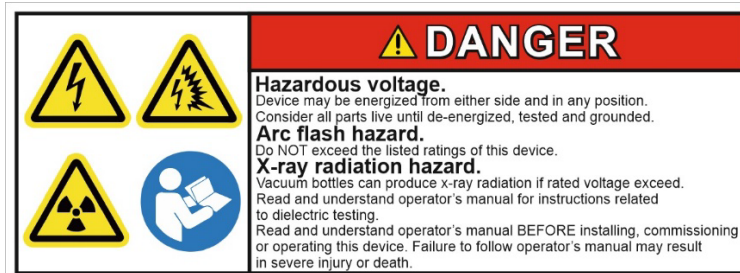


Figure 12

Warning label

TEL TAVRIDA ELECTRIC	
Recloser:	
Type	OSM35_Smart_5(600_150_1)
Serial number	XXXXXX
Control:	
Type	SEL-651R
Serial number	see SEL sticker inside cabinet
Current transformer ratio settings:	
Phase (CTR)	600:1
Residual (CTRN)	600:1
Voltage sensor correction ratio settings:	
Phase 1Y (X1)	Z.ZZZ
Phase 2Y (X2)	Z.ZZZ
Phase 3Y (X3)	Z.ZZZ
Phase 1Z (X4)	Z.ZZZ
Phase 2Z (X5)	Z.ZZZ
Phase 3Z (X6)	Z.ZZZ
Tavrida Electric North America	
1-866-551-8362	

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.

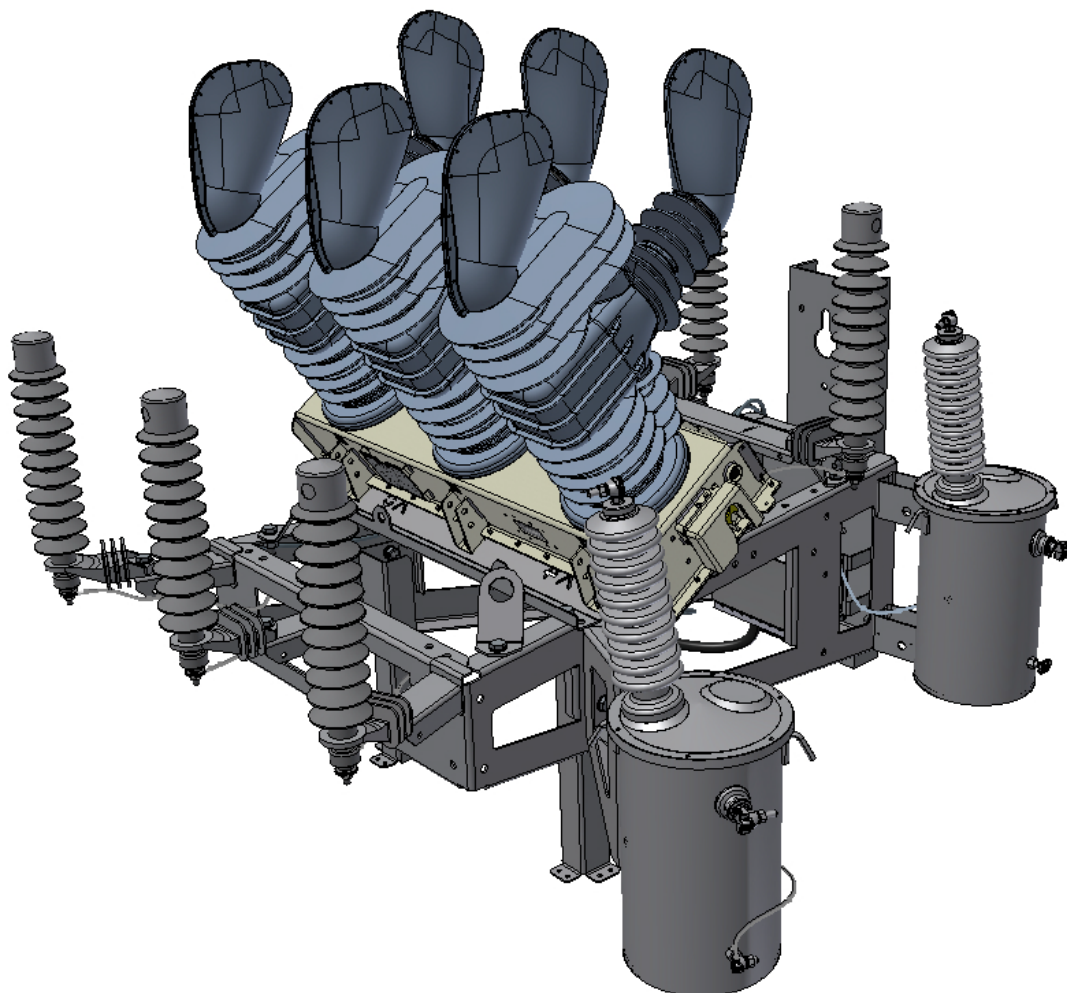


Figure 15
Pole mounting kit

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.

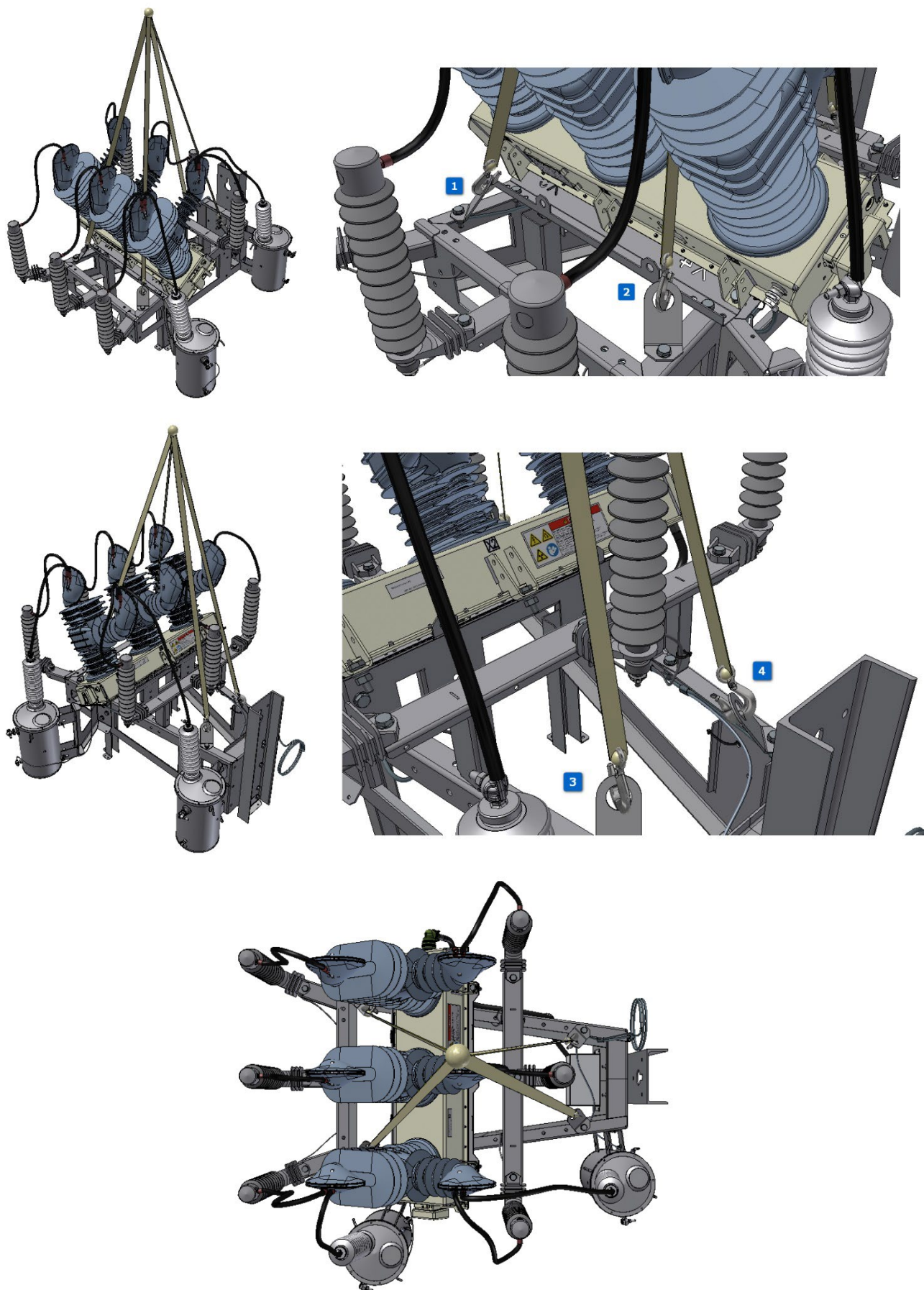


Figure 16
Lifting the recloser

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

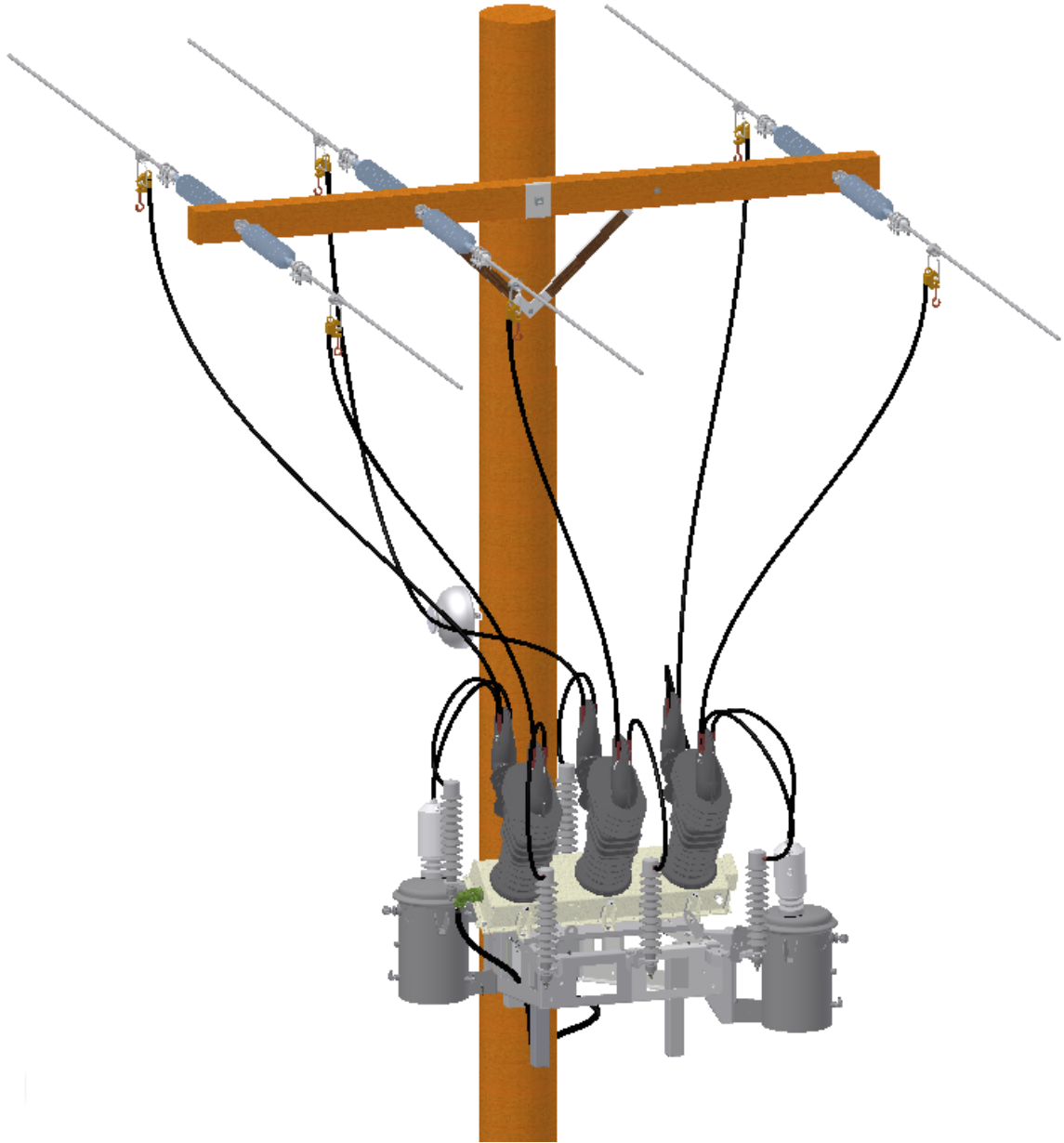


Figure 17
Complete recloser assembly on the pole

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.

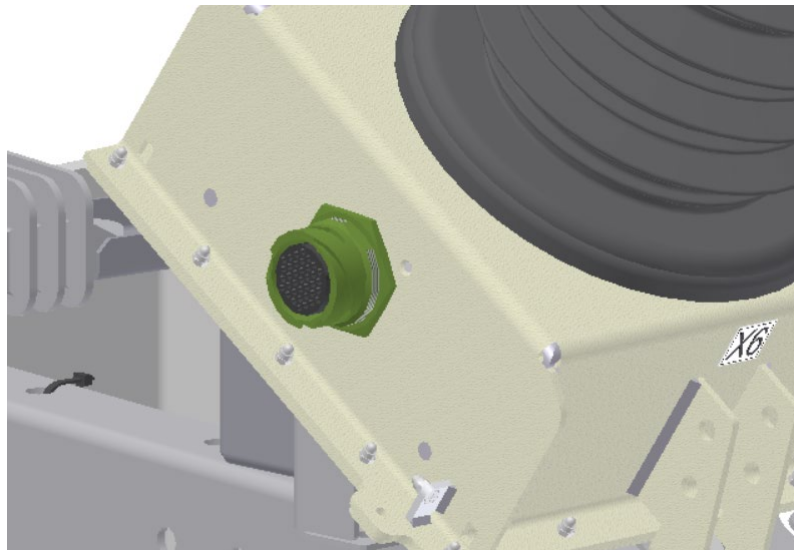
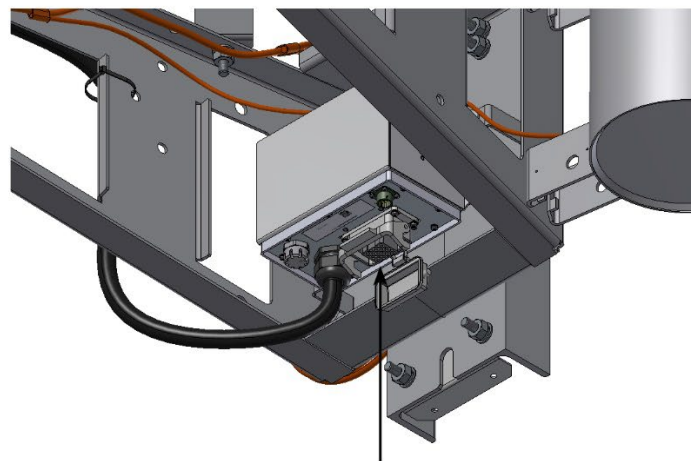
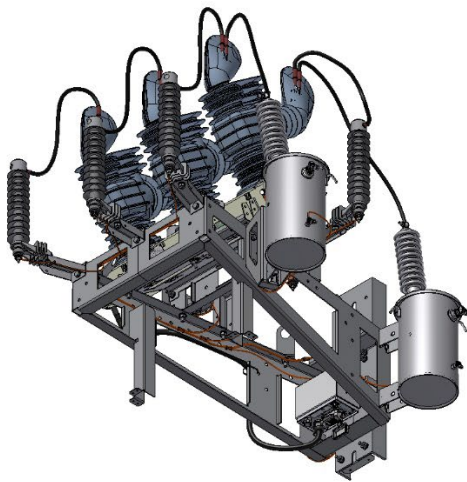


Figure 18
Switching module connector arrangement

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.



Connect the Control Cable
from the Recloser Control here

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):

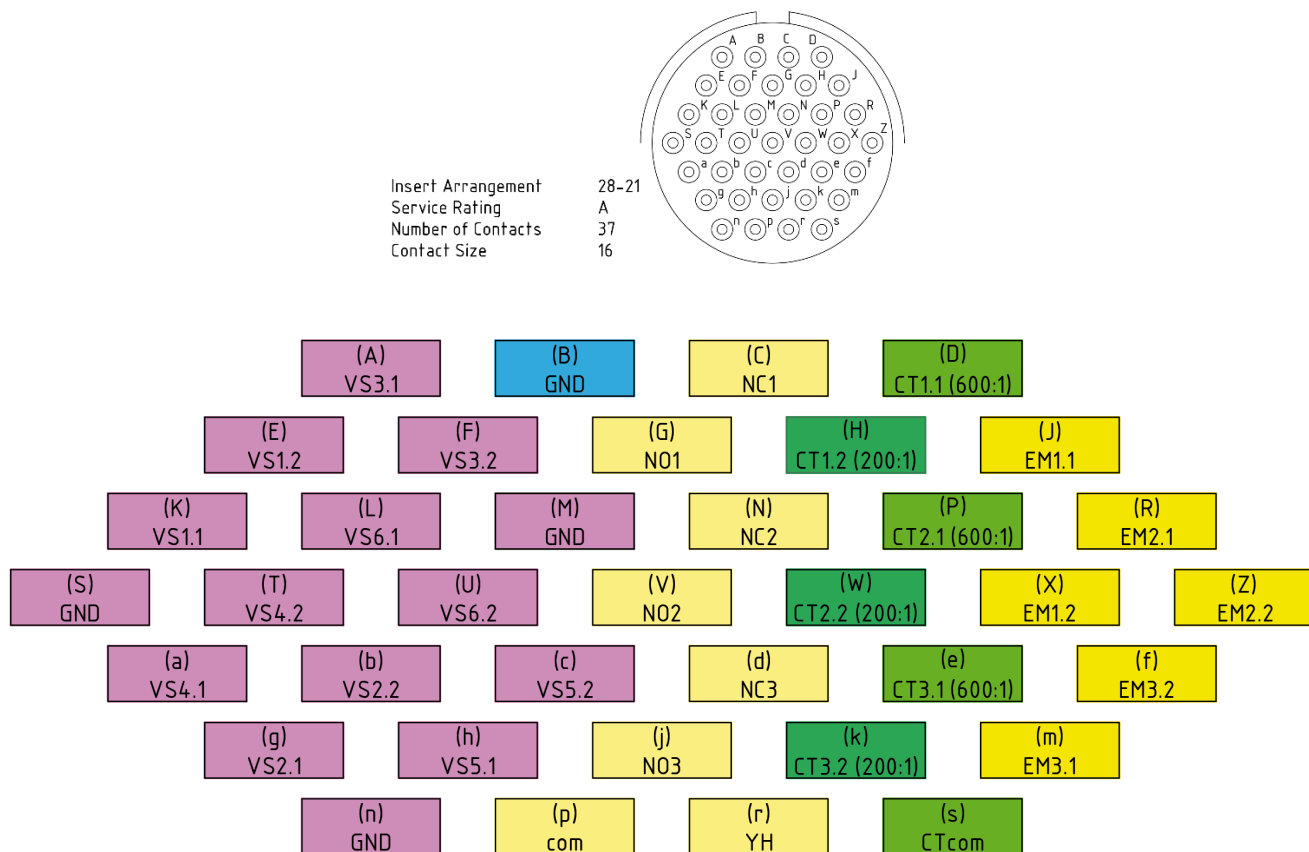


Figure 20
GTS07R-28-21S terminal pin arrangement

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 mm ² (1...3/0 AWG)
16 kA	300 °C	70-95 mm ² (3/0...4/0 AWG)

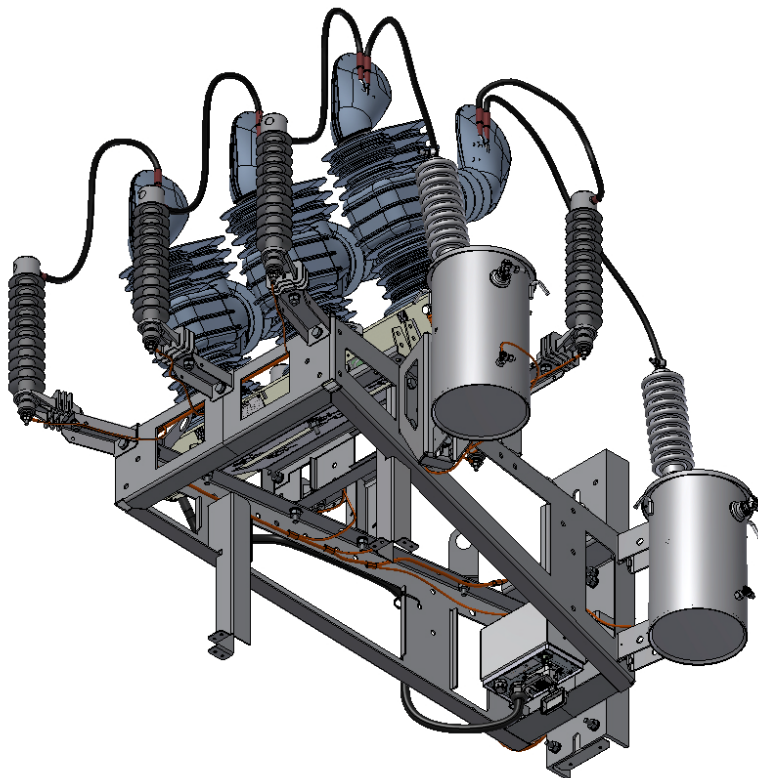


Figure 21
Rec35_Smart5_HDG earthing arrangement

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 $V_{pri}/V_{sec} = 8793.75$.

$PTRY \text{ or } PTRZ = V_{pri}/V_{sec} * (8/300)234.5 = 8793.75 * (8/300) = 234.5$

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.

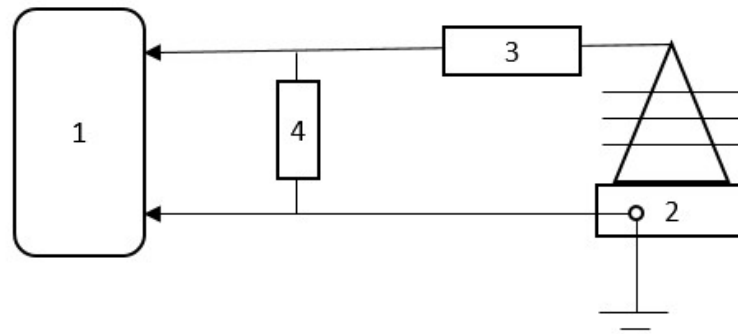


Figure 22
Test circuit

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



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

Without our written permission, this documentation may not be used, also not in extract form, for own general publications, printouts, handbooks, training, lectures, etc. nor copied and further processed. This includes also duplicating or re-copying in any form of data carriers and microfilms. One-time written permission is not automatically to be taken as a part or complete surrender of the copyright provisions. We reserve the right to changes. The issue of a new version of these operating instructions renders all other older versions obsolete.

Tavrida Electric and its associated companies make every effort to adapt the contents of their documentation to the latest and most current state of development of the products.

The present documentation was produced with the greatest care. However, we are not liable for possible errors in this information text, user-side incorrect interpretation, and/or for consequences arising therefrom.

© Copyright 2021; Tavrida Electric reserves the right to make changes to the design and data of their products. Tavrida Electric accepts no responsibility or liability for losses or damage caused by improper actions based on this publication.

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)

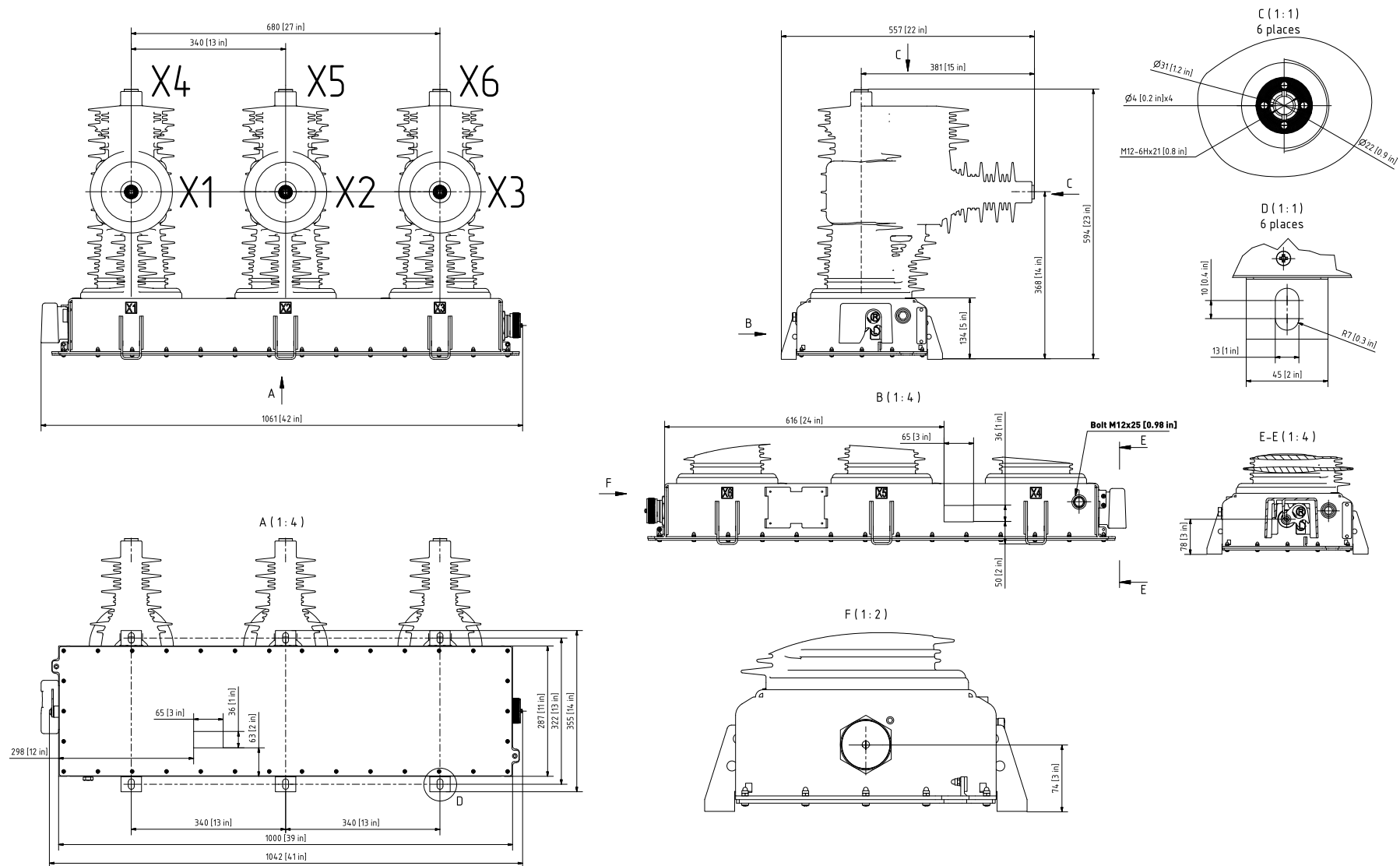


Figure 23
OSM35_Smart_5 drawing

9.2 Circuit Diagrams

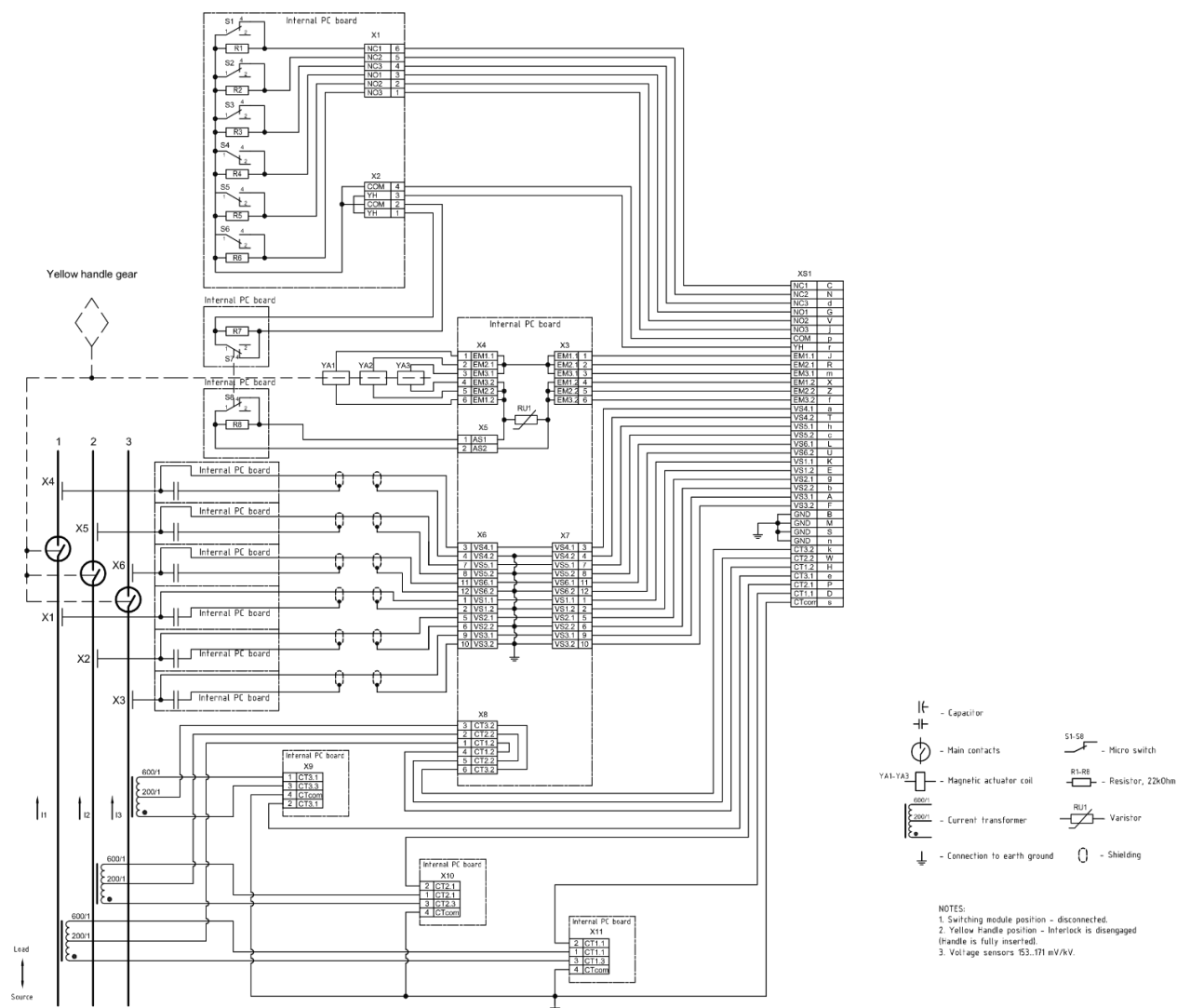
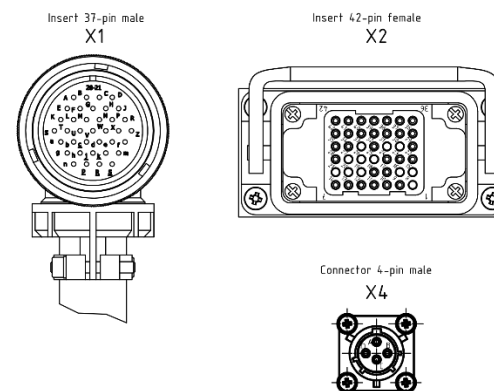
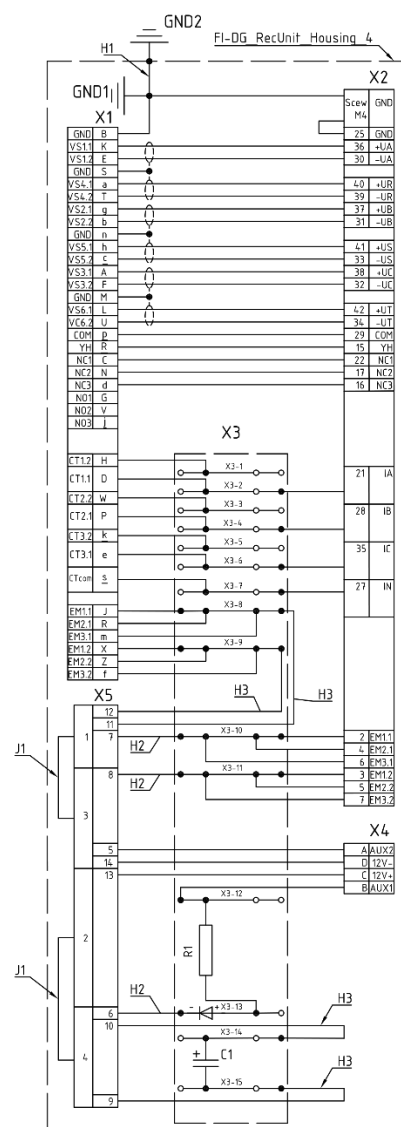


Figure 24
OSM35_Smart_5(600.200_150_All) circuit diagram

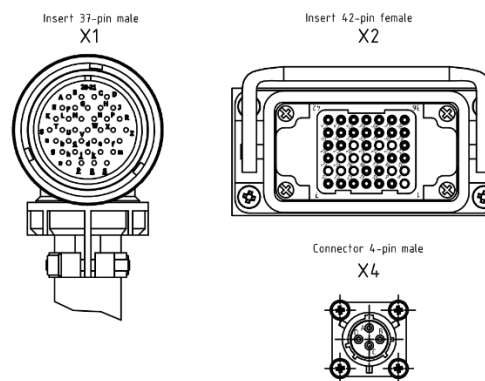
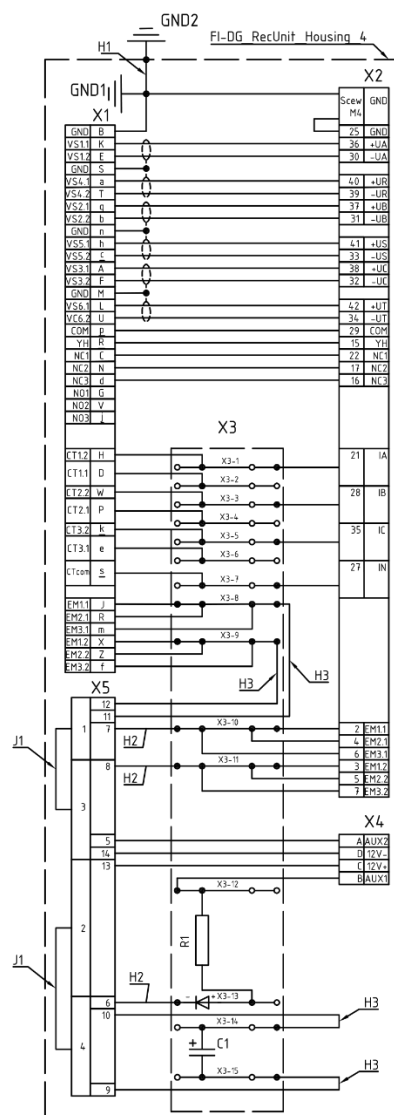


Item	Description	Qty	Ref.
X1	FI-TR_Unit_Umbilical_JB-Sm5(200.600_ST)	1	
X2	FI-TR_Unit_Harness_158	1	
X3-1,12, X3-14,15	FI-TR_StandDef_Connector_DIN(25_C_1_4_2_gr_0)	14	
X3-13	FI-TR_StandDef_Connector_DIN(25_EAD-A_1_3_2_2_gr_1)	1	
X4	FI-TR_Unit_Harness_35	1	
X5	MVT_StandComp_RelaySocket_Klemsan(2)	1	
H1	FI-TR_Unit_Harness_34(375_15_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_StandDef_Resistor_TH(1K_10%_300_CCR2_2_400_5)	1	
C1	FI-CM_StandDef_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 25

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

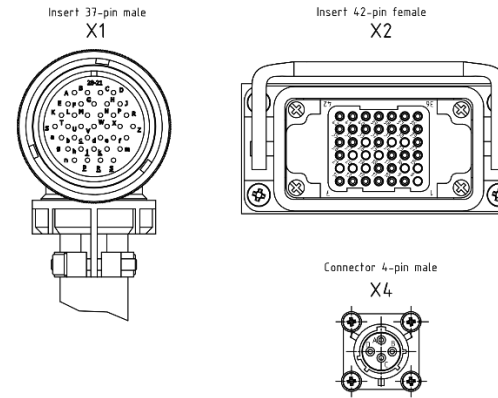
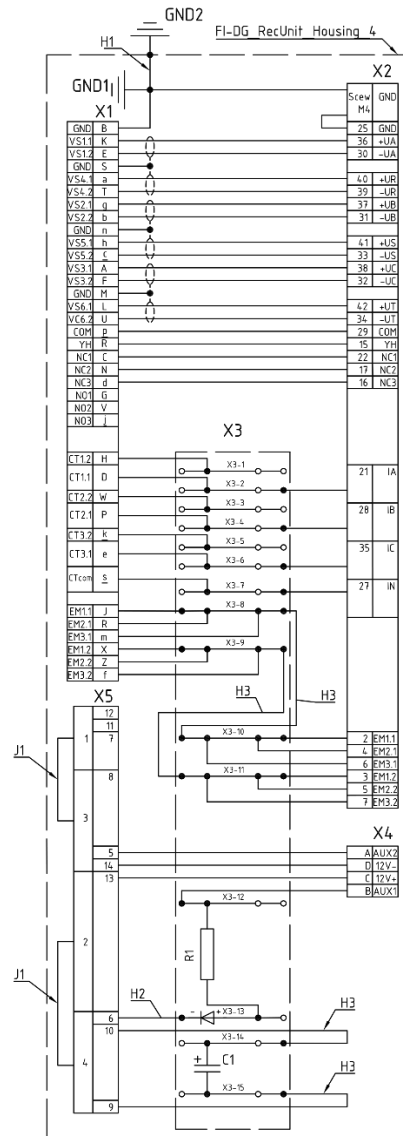


Item	Description	Qty	Ref.
X1	FI-TR_Unit_Umbilical_JB-Sm5(200.600_ST)	1	
X2	FI-TR_Unit_Harness_158	1	
X3-1,12, X3-14,15	FI-TR_StandDet_Connector_DIN(2.5_C_1_4_2_gr_0)	14	
X3-13	FI-TR_StandDet_Connector_DIN(2.5_EAD-A_1_3_2_ _gr_1)	1	
X4	FI-TR_Unit_Harness_35	1	
X5	MVT_StandComp_RelaySocket_Klemsan(2)	1	
H1	FI-TR_Unit_Harness_34(375_15_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	



Figure 26

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_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 28

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)

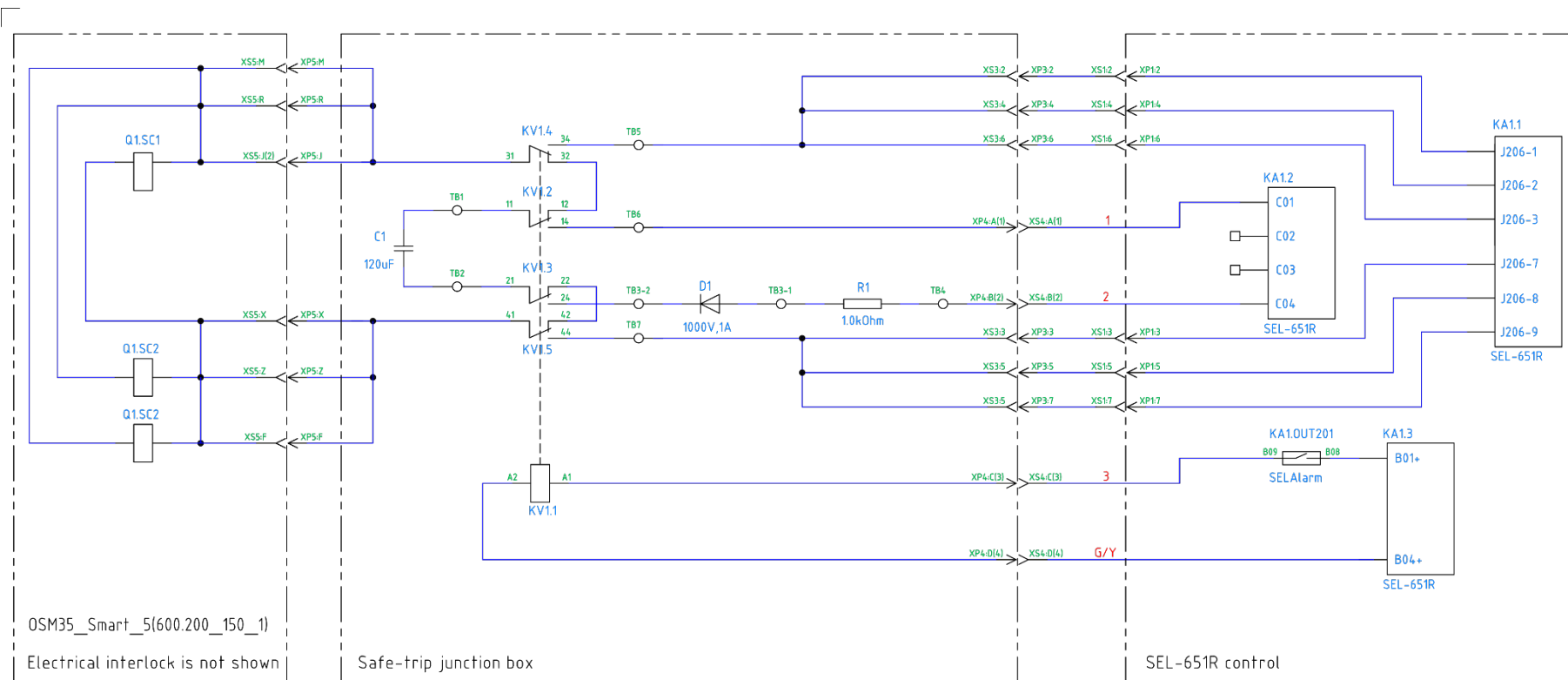
The safe trip junction box works with SEL-651R 42-pin Tavrida recloser interface with power supply 120VAC or 230VAC. It does not work with any type of SEL-651R with DC power supply.

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 29
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. Connection terminations added. Earthing arrangement picture added. 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, - Figure 2 - Current transformers excitation curves for OSM35_Smart_5(All_150_All) - 100:1 CT, 600:1 CT and 1200:1 CT ratio - 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 Section 7.3 Commissioning Secondary Part	Update
4.6	31.01.2025	2 Technical Parameters 6.3 Auxiliary Circuit Terminations 9.2 Circuit Diagrams 9.3 Safe Trip Device 7.5 High Voltage Test	Update
4.7	11.02.2025	2 Technical Parameters	Update
4.8	02.04.2025	General text edits	Update

North America (USA)**Tavrida Electric North America (US) Inc.**

2000 Tall Pines Dr. Suite 200
Largo, FL 33771
USA

Phone: +1 (604) 540-6604

Fax: +1 (604) 540-6604

E-Mail: info@tavrida-na.com

North America (Canada)**Tavrida Electric North America Inc.**

1105 Cliveden Ave.,
Delta, BC V3M 6G9,
Canada

Phone: +1 (866) 5511-8362

Fax: +1 (604) 540-6604

E-Mail: info@tavrida-na.com

Latin America**Tavrida Electric do Brazil**

Av. Ireno da Silva Venâncio,
199 GP04A – Protestantes,
Votorantim / SP, 18111-100, Brazil

Phone: +55 (15) 3243-2555

Fax: +55 (15) 3243-4233

E-Mail: info@tavrida.com.br

Europe**Tavrida Electric GmbH**

Im Leimen 14,
88069 Tettnang,
Germany

Phone: +49 7542 94 678 51

Fax: +49 7542 94 678 61

E-Mail: info@tavrida.de

South Africa**Tavrida Electric Africa (Pty) Ltd.**

Unit 8, N12 Industrial Park,
188 Dr Vosloo Road, Bartlett,
Boksburg, 1459, South Africa

Phone: +27 11 9142199

Fax: +27 11 9142323

E-Mail: support@tavrida.co.za

China**Tavrida Electric Qindao Co. Ltd.**

No. 336, Songling Road, Laoshan District,
266104 Qingdao,
China

Phone: +86 (532)-55552366

Fax: +86 (532)-55552377

E-Mail: info@tavrida.cn

www.tavrida.com/tena

This document is copyright and is intended for users and distributors of Tavrida Electric product. It contains information that is the intellectual property of Tavrida Electric and the document, or any part thereof, should not be copied or reproduced in any form without written permission from Tavrida Electric.

Tavrida Electric applies a policy of ongoing development and reserves the right to change product without notice. Tavrida Electric does not accept any responsibility for loss or damage incurred as a result of acting or refraining from action based on information in this document.