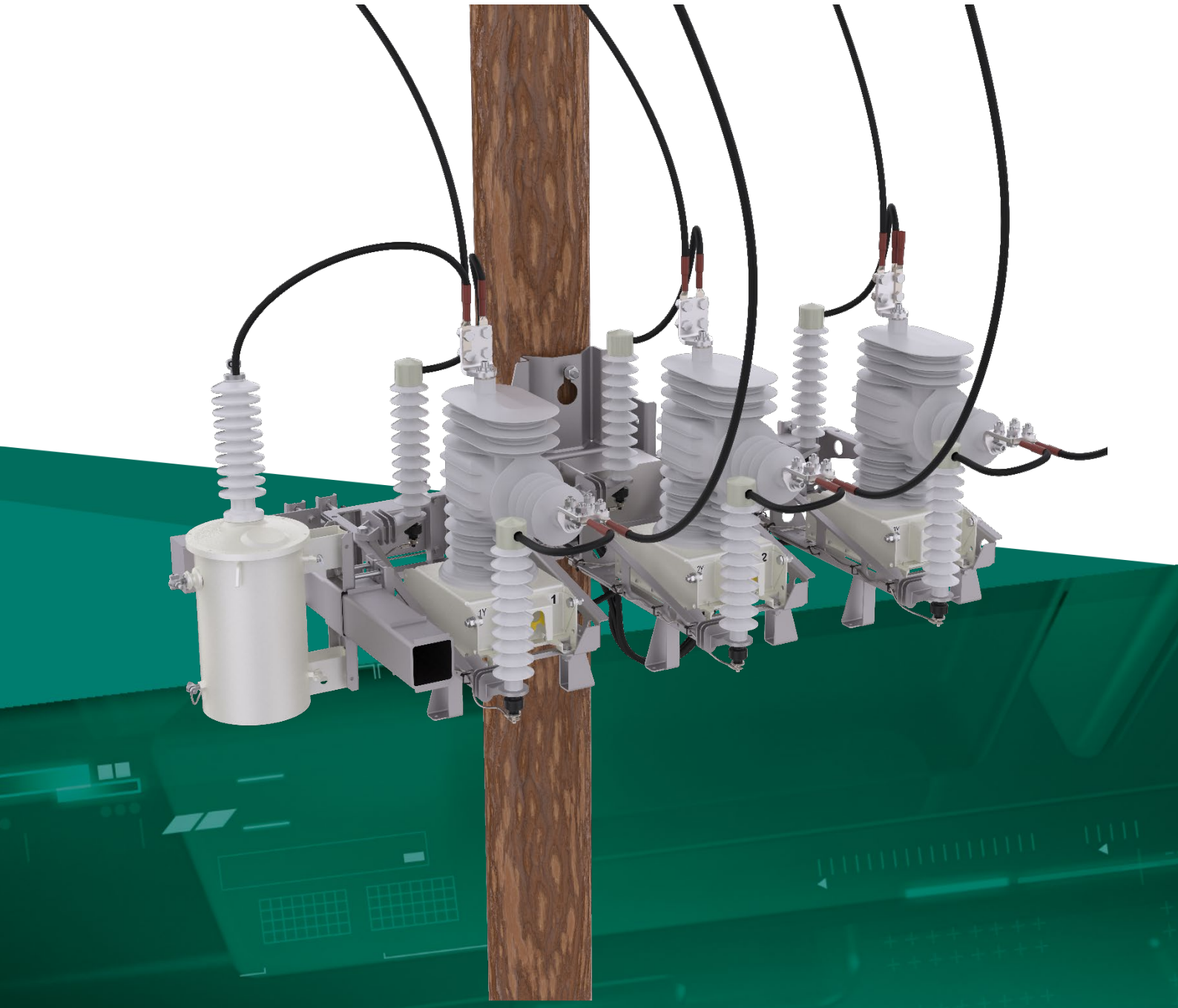
TAVRIDA ELECTRIC
Excellence in Engineering

Rec35_Smart4_HDG

AUTOMATIC CIRCUIT RECLOSER

38 kV, 16 kA, 1250 A



TECHNICAL MANUAL

VERSION 4.8

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_Smart4_HDG	38 kV Triple-Single Automatic Circuit Recloser
OSM35_Smart_4E	38 kV, single-phase independently 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_4E(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)	16 kA
Rated peak withstand current (Ip)	38 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
Interrupting 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 µOhm
Solar radiation	≤ 1.1 kW/m²
Degree of protection	IP65
Weight	96 kg (212 lbs)

1) When used with 600:1 CT ratio, 600A – when used with 200:1 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.

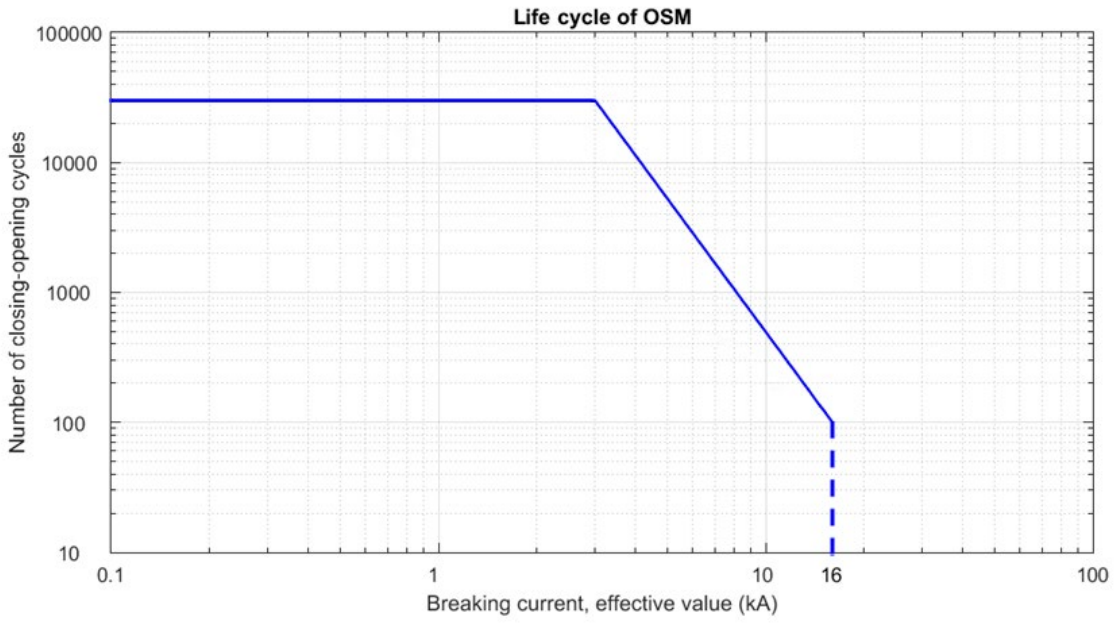


Figure 1

Outdoor Switching Module electrical endurance

Table 2 – Current Transformers and Voltage Sensors parameters

Parameter	OSM35_Smart_4E(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	

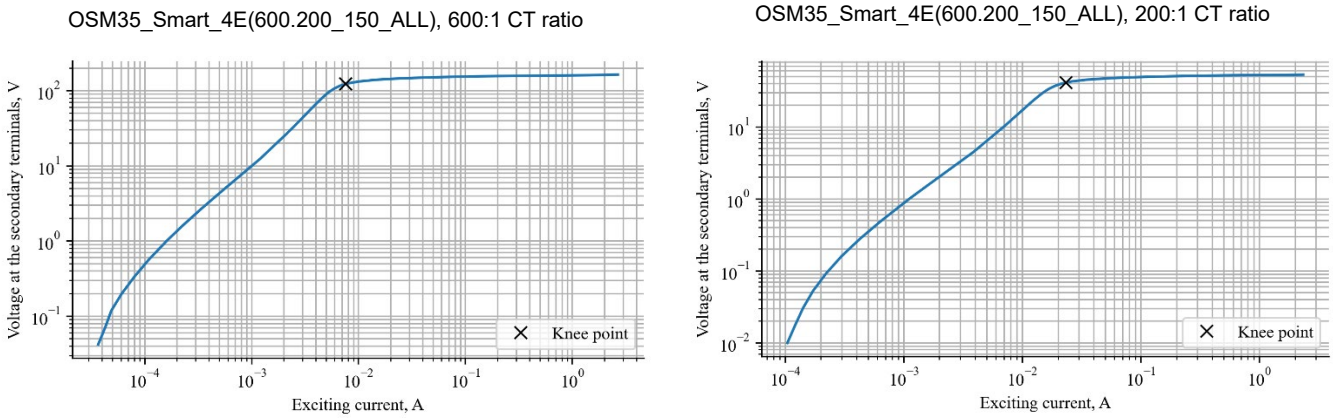


Figure 2

Current transformers excitation curves for OSM35_Smart_4E(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.

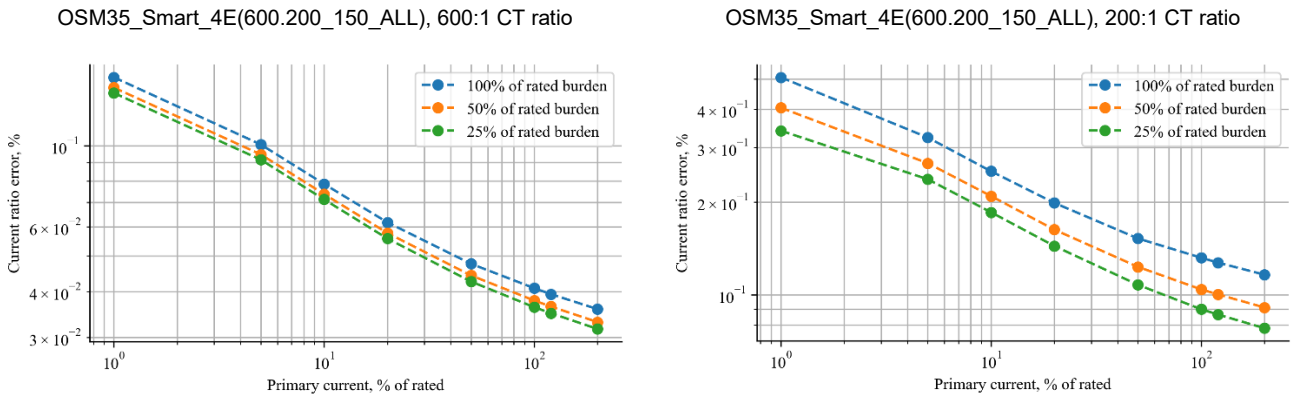


Figure 3

Current ratio error curves for OSM35_Smart_4E(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_Smart4_HDG recloser is designed to meet the triple-single recloser assembly concept with the rated maximum voltage of 38 kV. It consists of three OSM35_Smart_4E single-phase Outdoor Switching Modules connected to Multi-Recloser Interface (MRI) control through the Junction Box. Individual and independent operational mechanism for each module allows any spatial arrangement of three-phase recloser providing application flexibility.

The OSM35_Smart_4E 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. OSM 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 Outdoor Switching Module

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

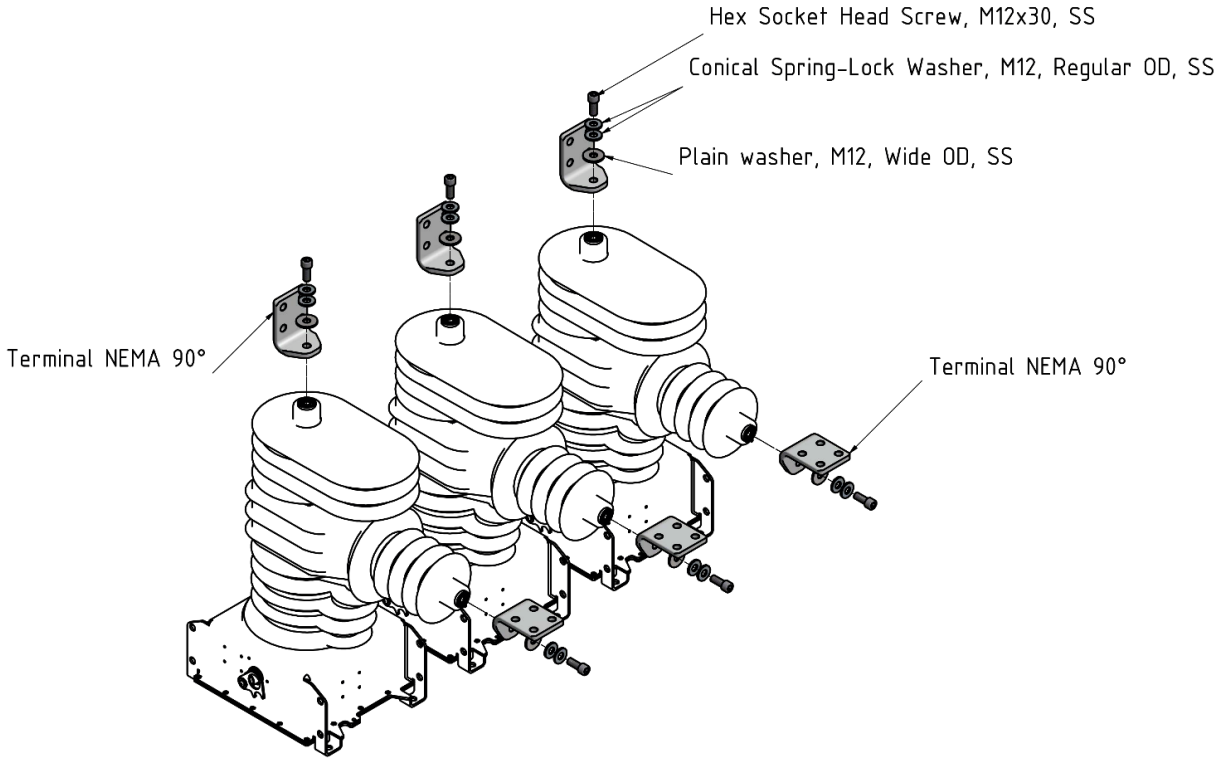

Figure 7

NEMA Pads Installation – Without Plastic Bird Guard Holder

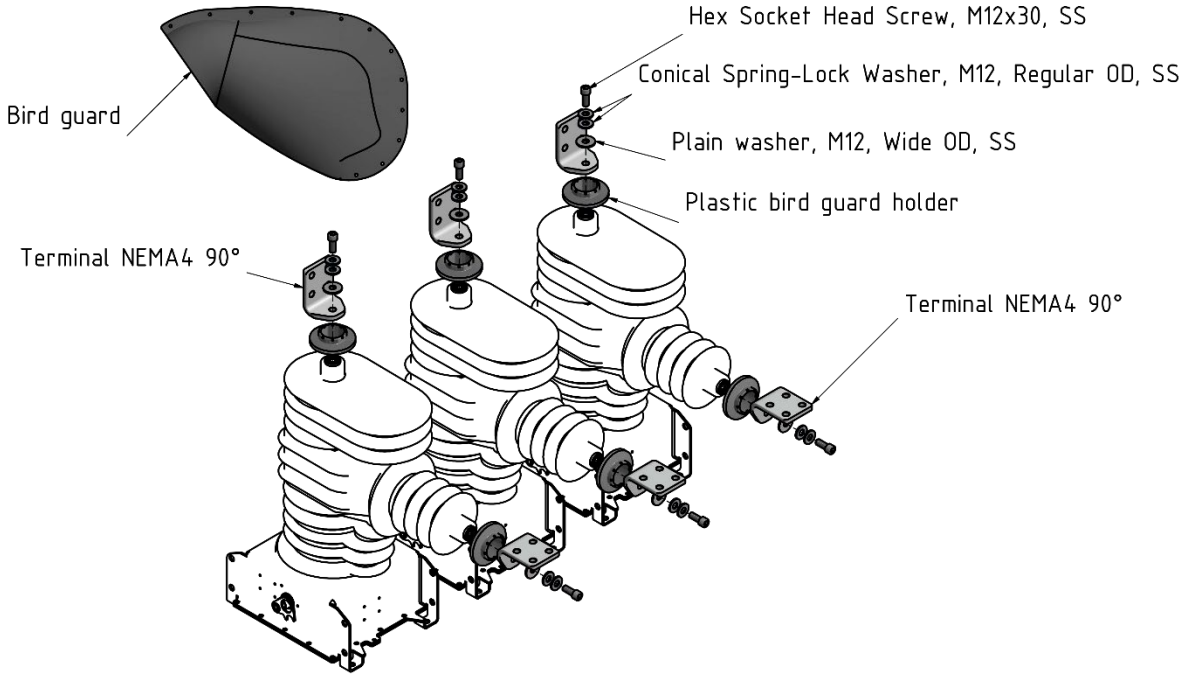

Figure 8

NEMA Pads Installation – With Plastic Bird Guard Holder

3.7 Wildlife Protective Covers

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

Figure 9

Wildlife protective covers

3.8 Mechanical Trip and Lockout Mechanism

A mechanical trip hook is located at the right side of each mechanism enclosure (Figure 10). 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.

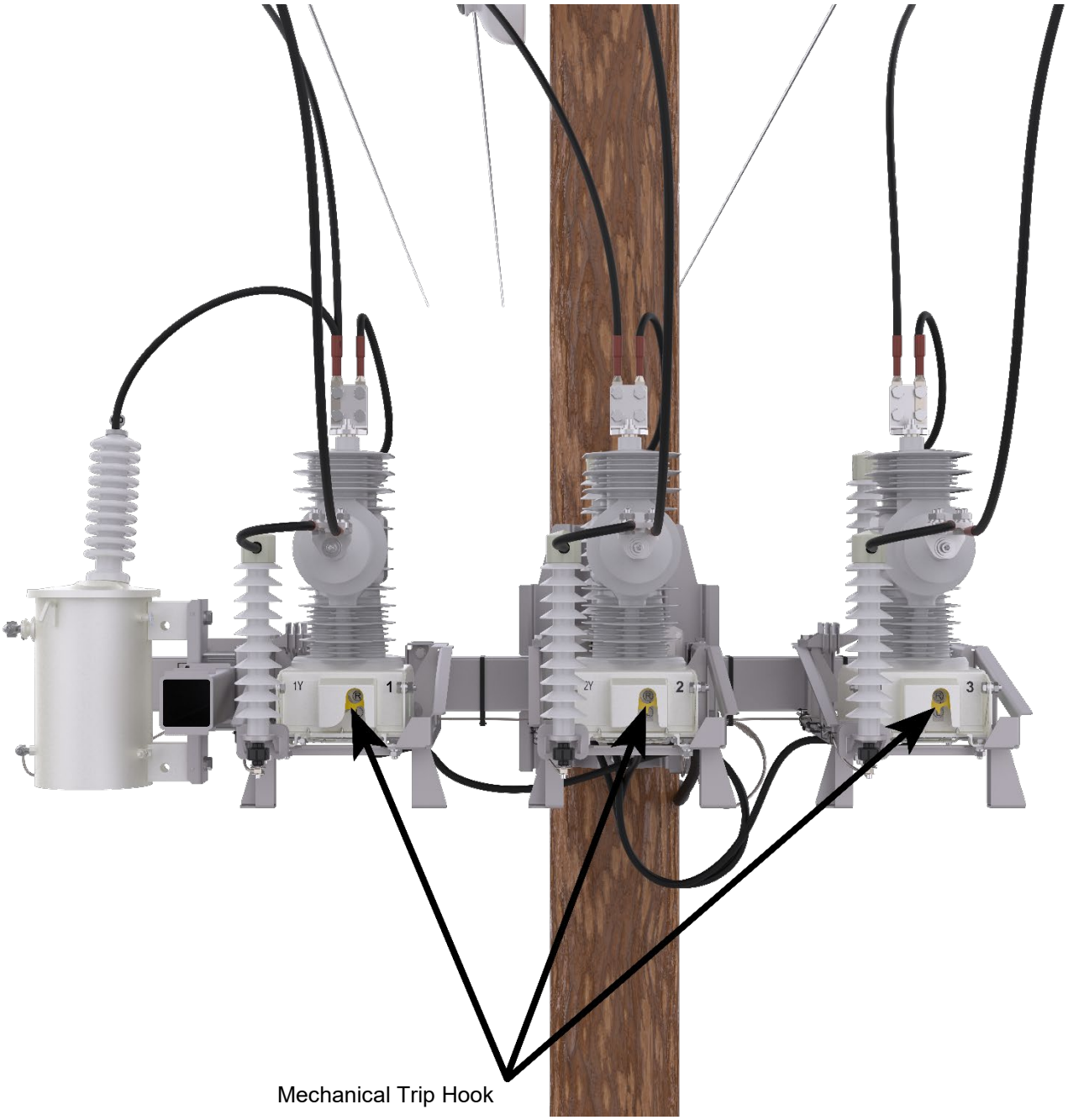

Figure 10

Mechanical trip hooks

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.

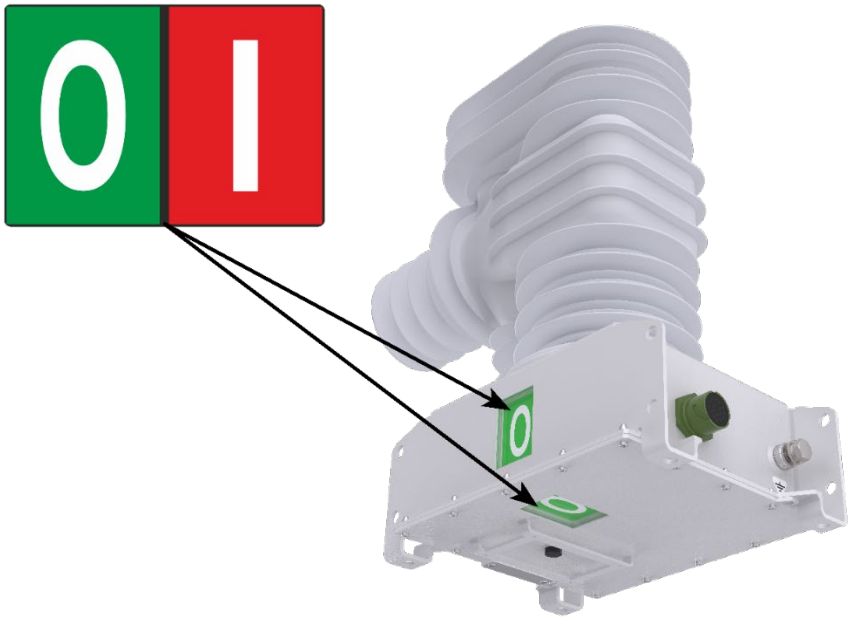

Figure 11

Main contact position indicators

3.10 Nameplates and Labels

Each Outdoor Switching Module has the following rating plates:

- Serial number plate
- Rating plate

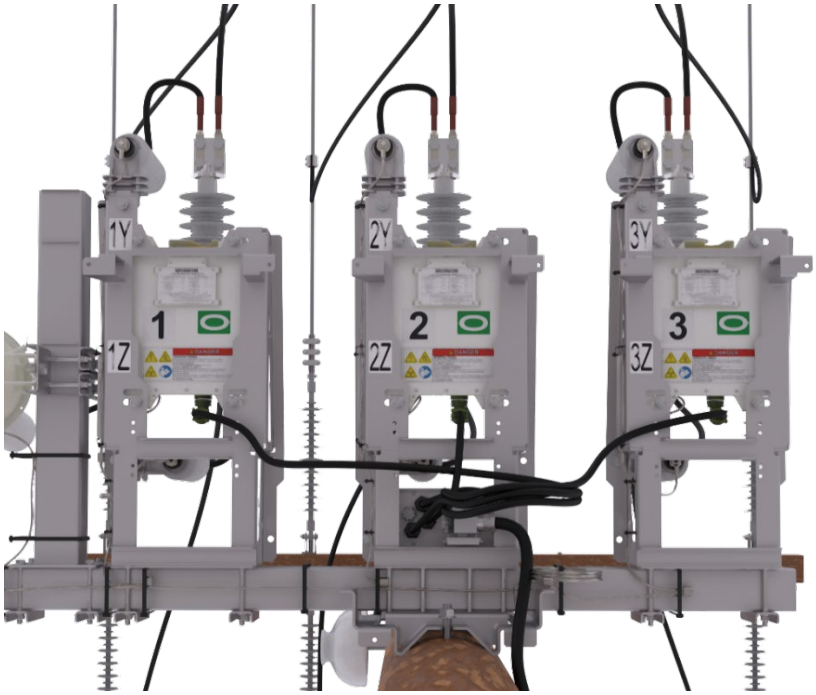

Figure 12

Outdoor Switching Module nameplates arrangement

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

- Warning label
- Rating plate
- Phase designation

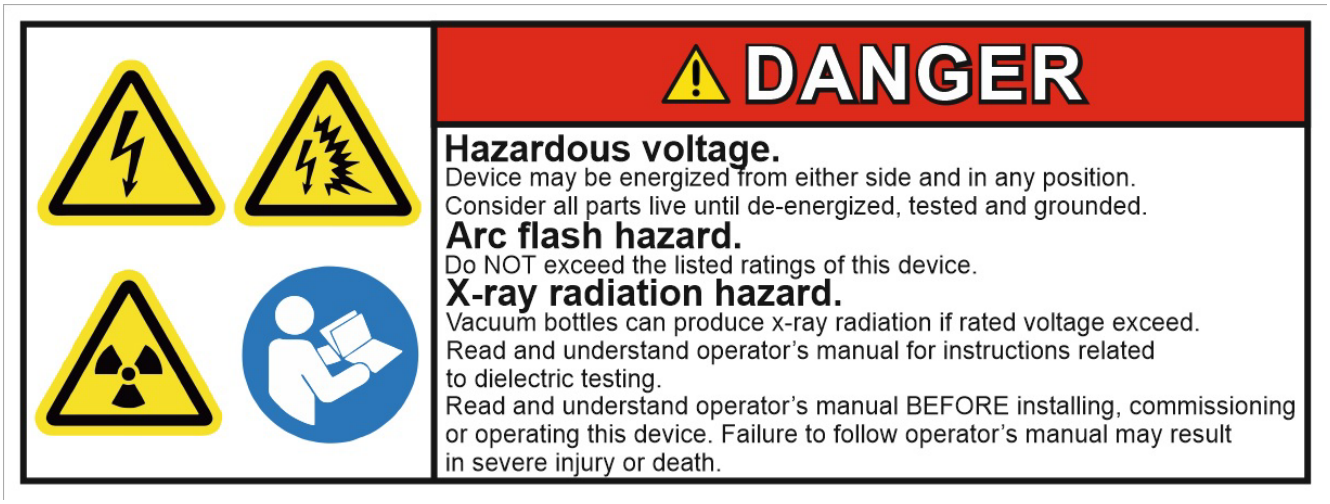

Figure 13

Warning label

MAGVATECH

Recloser type: OSM35_Smart_4E(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)	16 kA
Rated short circuit breaking current	16 kA	Rated peak withstand current	38 kA
Rated lightning impulse withstand voltage	170 kV	Rated power-frequency withstand voltage	70 kV
CT ratio	200:1/600:1***	Weight	32 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 SB Mah. Defne Sok. No:3 İç Kapı No:1 Gaziemir, 35410 Izmir - TURKEY www.magvatech.com, Made in Turkey		

Figure 14

Rating plate

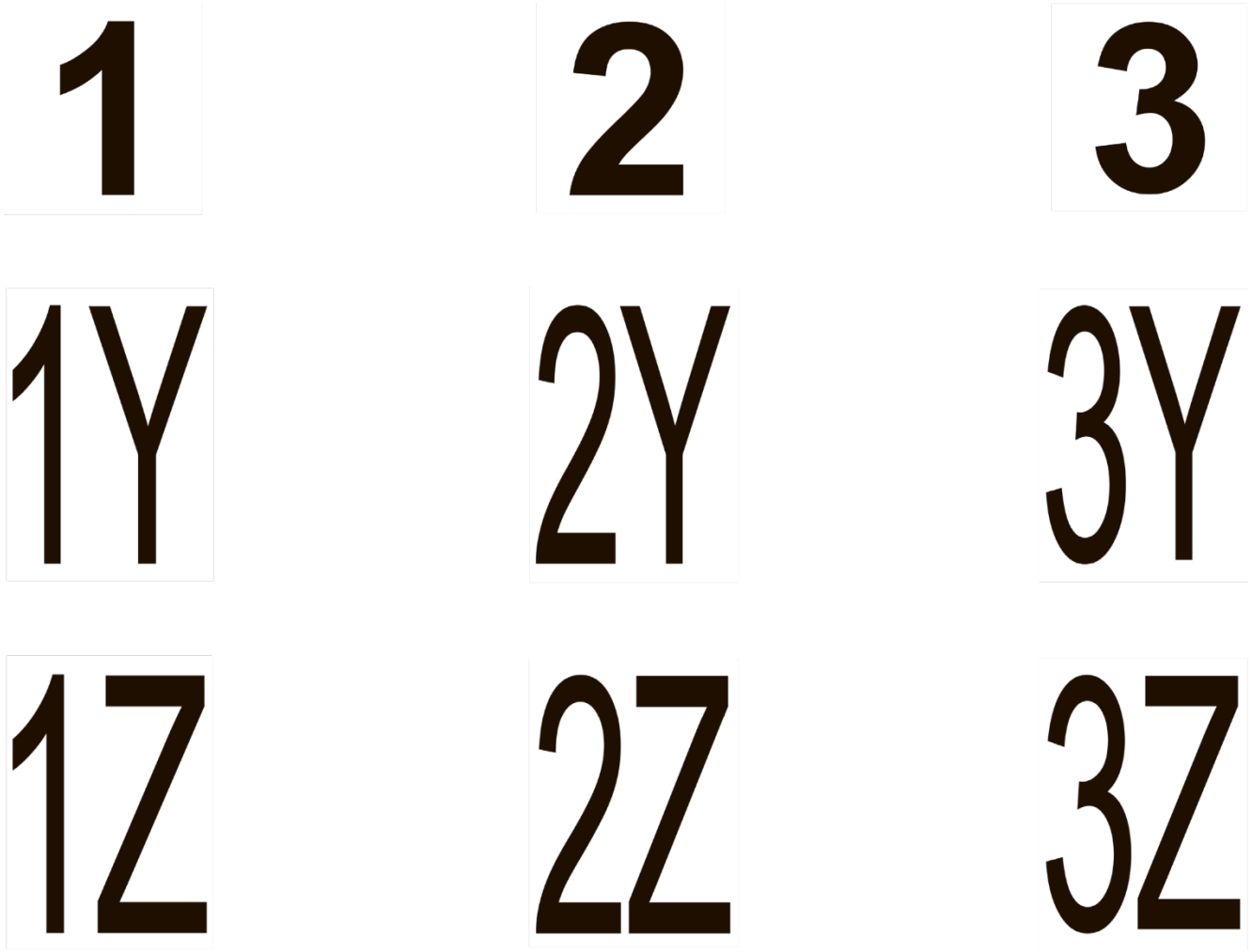

Figure 15

Phase designation

3.11 Junction Box

The Junction Box provides an interface between three single-phase switching modules and recloser control. It consists of two main parts: three cables to connect switching modules to the box and the housing containing necessary wiring interconnections. The Junction Box housing is made of a corrosion-resistant aluminum alloy with a paint finish providing IP65 degree protection of internal components. The Junction Box is connected to recloser control via Harting 42DD terminal with SEL MRI pinout and to switching modules via the Amphenol 17-pin connectors.

Figure 16

Junction box view

The cables are UV-stable and provide necessary shielding for measurement and control circuit.

CT ratio, functionality, and calibration data are marked on the junction box housing.

TAVRIDA ELECTRIC	
Recloser:	
Type	TNA_Rec35_Smart4_HDG
Serial number	FVB1VVVVVVVVVVNNNNNNN
OSM:	
Type	OSM35_Smart_4E(600.200_150_1)
Phase 1 S/N	XXXXXXXXXXXXXXXXXXXXX
Phase 2 S/N	XXXXXXXXXXXXXXXXXXXXX
Phase 3 S/N	XXXXXXXXXXXXXXXXXXXXX
Control:	
Type	SEL-651R
Serial number	YYYYYYYYY
Current transformer ratio settings:	
Phase (CTR)	200:1/600:1
Residual (CTRN)	200:1/600:1
Voltage sensor correction ratio settings:	
Phase 1Y	Z.ZZZ
Phase 2Y	Z.ZZZ
Phase 3Y	Z.ZZZ
Phase 1Z	Z.ZZZ
Phase 2Z	Z.ZZZ
Phase 3Z	Z.ZZZ
TEL: 1-866-551-8362	

Figure 17

Label with calibration coefficients

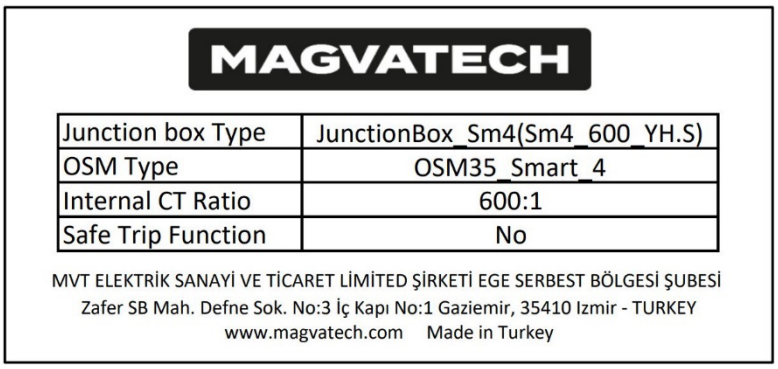

Figure 18

CT Ratio and Functionality Label – Junction Box

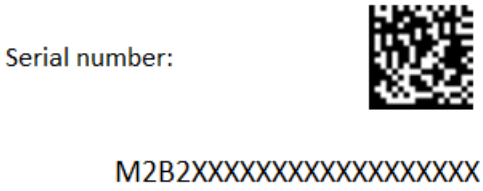

Figure 19

Serial number

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.

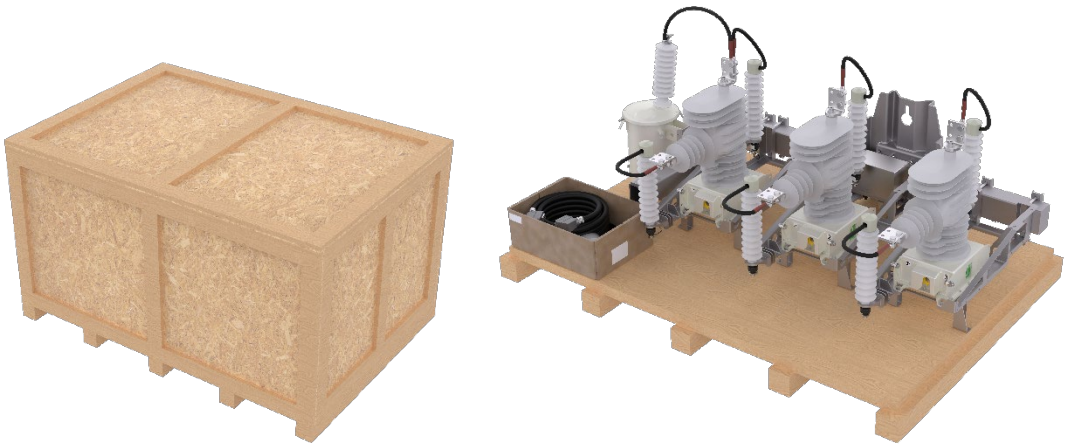

Figure 20

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_Smart4_HDG recloser mounting kit is equipped with provisions for surge arrestors, power transformers, and protective earthing to mount on electrical crossarm. It is designed to accommodate HxW [4''…4.5'']x[3''…4.5''] cross-sections and [6'..10'] crossarm lengths. An example of 6' long crossarm mounting kit assembly is shown on Figure 21.

Figure 21

Crossarm mounting kit

5.3 Lifting the Recloser

The Rec35_Smart4_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.

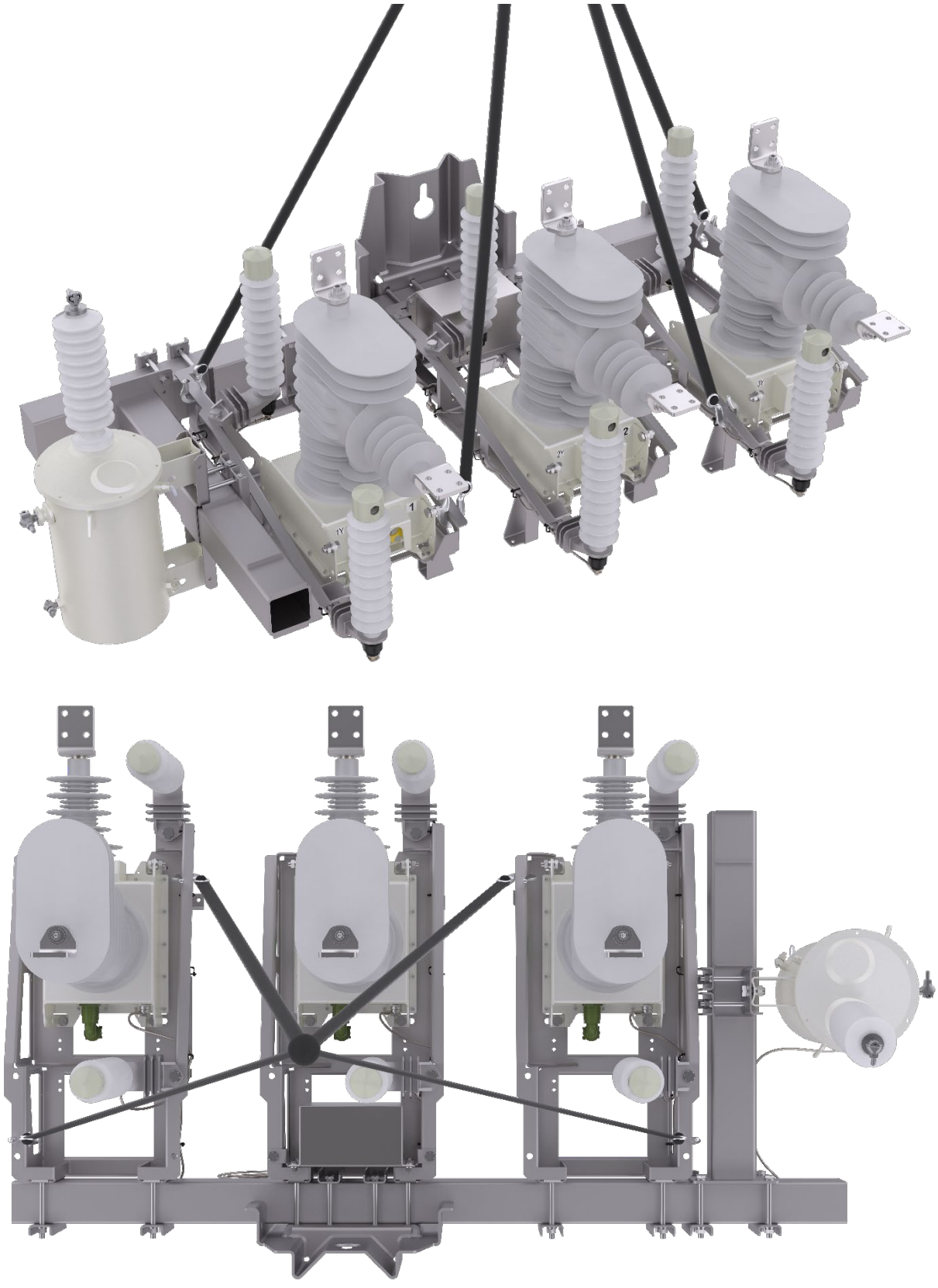

Figure 22

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 23

Complete recloser assembly on the pole

6 Installation: Secondary Part

6.1 Connection to Recloser Control

The Outdoor Switching Module secondary connection to the Junction Box is made by the Amphenol connector 17 pin (Amphenol GTS07R20-29S) placed on the side of the enclosure.

Figure 24

Switching module connector arrangement

The Junction Box connection to SEL recloser control is made through Harting 42 pin Han-DD type terminal which is placed on the bottom of the Junction Box.

Figure 25

Junction box connector arrangement

6.2 Auxiliary Circuit Terminations

Pin arrangement of Amphenol 17-pin terminals is as follows:

Figure 26

Amphenol terminal pin arrangement

Table 4 – Amphenol 17-pin terminal pinout

Pin	Designation	Note
A	+U1Y	Voltage sensor contact 1
B	- U1Y	Voltage sensor ground 1
C	+U1Z	Voltage sensor contact 2
D	-U1Z	Voltage sensor ground 2
E	CT2	CT contact 2
F	free	free
G	EM1.1	Actuator coil 1
H	EM1.2	Actuator coil 2
J	CT1	CT contact 1
K	CTcom	CT common contact
L	YH	Yellow handle contact
M	COM1	Relay common contact 1
N	COM2	Relay common contact 2
P	NC1	Normally closed auxiliary contact 1
R	free	free
S	GND	Ground contact
T	free	free

Pin arrangement of Harting Han-42 DD terminal is as follows:

Figure 27

Harting Han-42 DD terminal pin arrangement

Table 5 – Harting Han-42 DD terminal pinout

Pin	Designation	Note
1	-	-
2	EM1.1	Actuator coil (1)
3	EM1.2	Actuator coil (2)
4	EM2.1	Actuator coil (1)
5	EM2.2	Actuator coil (2)
6	EM3.1	Actuator coil (1)
7	EM3.2	Actuator coil (2)
8	-	-
9	-	-
10	-	-
11	-	-
12	-	-
13	-	-
14	-	-
15	YH	Yellow handle contact
16	NC3	NC3 auxiliary contact
17	NC2	NC2 auxiliary contact
18	-	-
19	-	-
20	-	-
21	I_A	
22	NC1	NC1 auxiliary contact
23	-	-
24	-	-
25	GND	Ground – Screw M4
26	-	-
27	I_N	
28	I_B	
29	COM	Auxiliary contacts common point

Pin	Designation	Note
30	-U1Y	
31	-U2Y	
32	-U3Y	
33	-U2Z	
34	-U3Z	
35	I_C	
36	+U1Y	
37	+U2Y	
38	+U3Y	
39	-U1Z	
40	+U1Z	
41	+U2Z	
42	+U3Z	

6.3 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 28

Rec35_Smart4_HDG earthing arrangement

6.4 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.

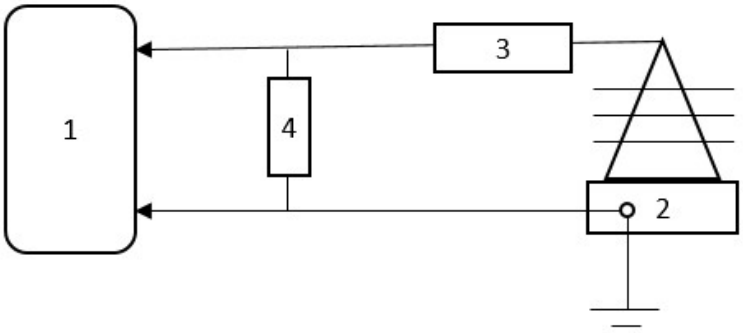

Figure 29

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
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TÜRKAK BDS NO
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TÜRKAK
Kalite Yönetim Sistemi
TS EN ISO/IEC 17021
AB-0003-YS

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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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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
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AB-0003-YS

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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 ISO 9001:2015, ISO 14001:2015, and ISO 45001:2018.

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_4E switching module weight	33 kg (73 lbs)
Recloser Crossarm assembly with 2x Power Transformers (approximate weight)	360 kg (794 lbs)

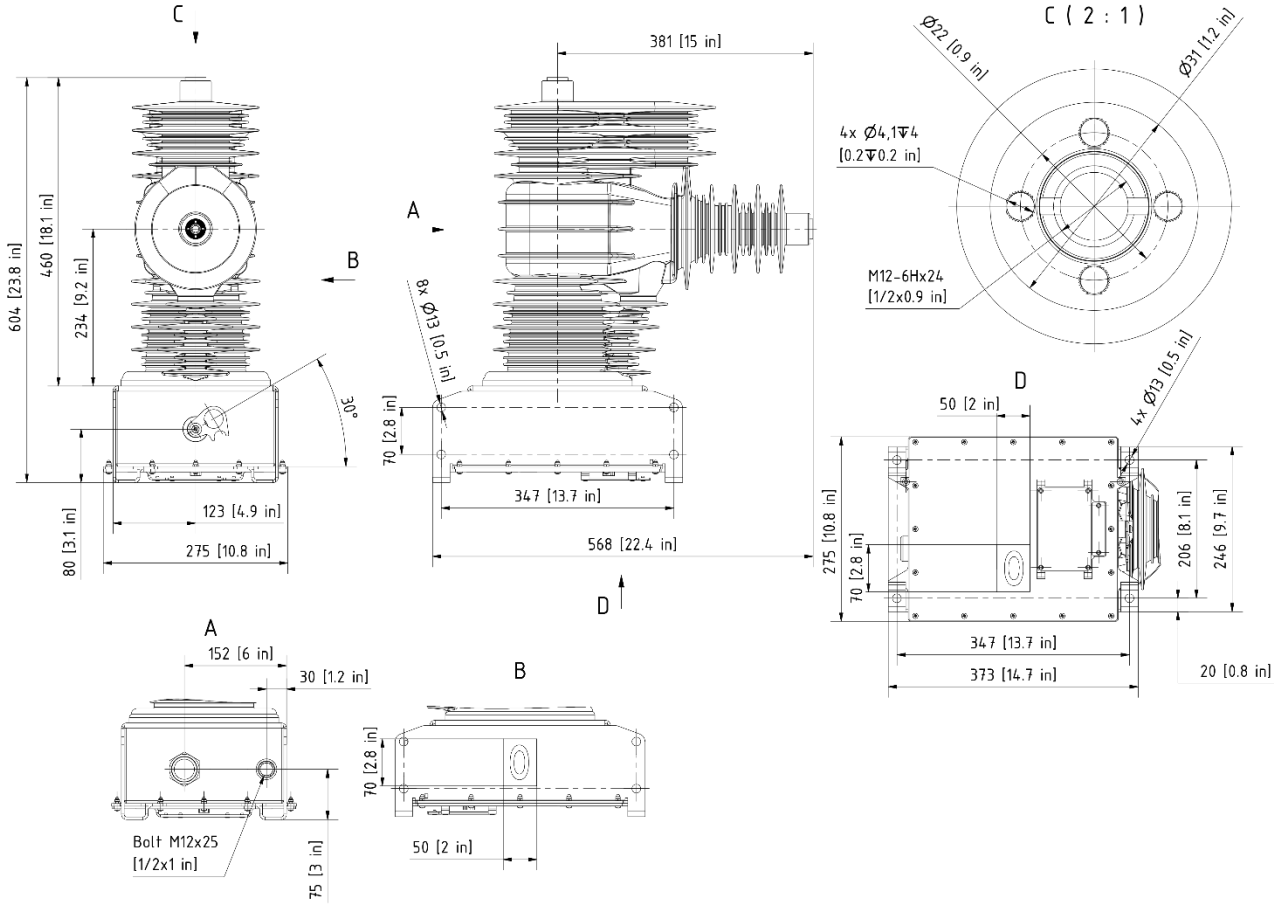
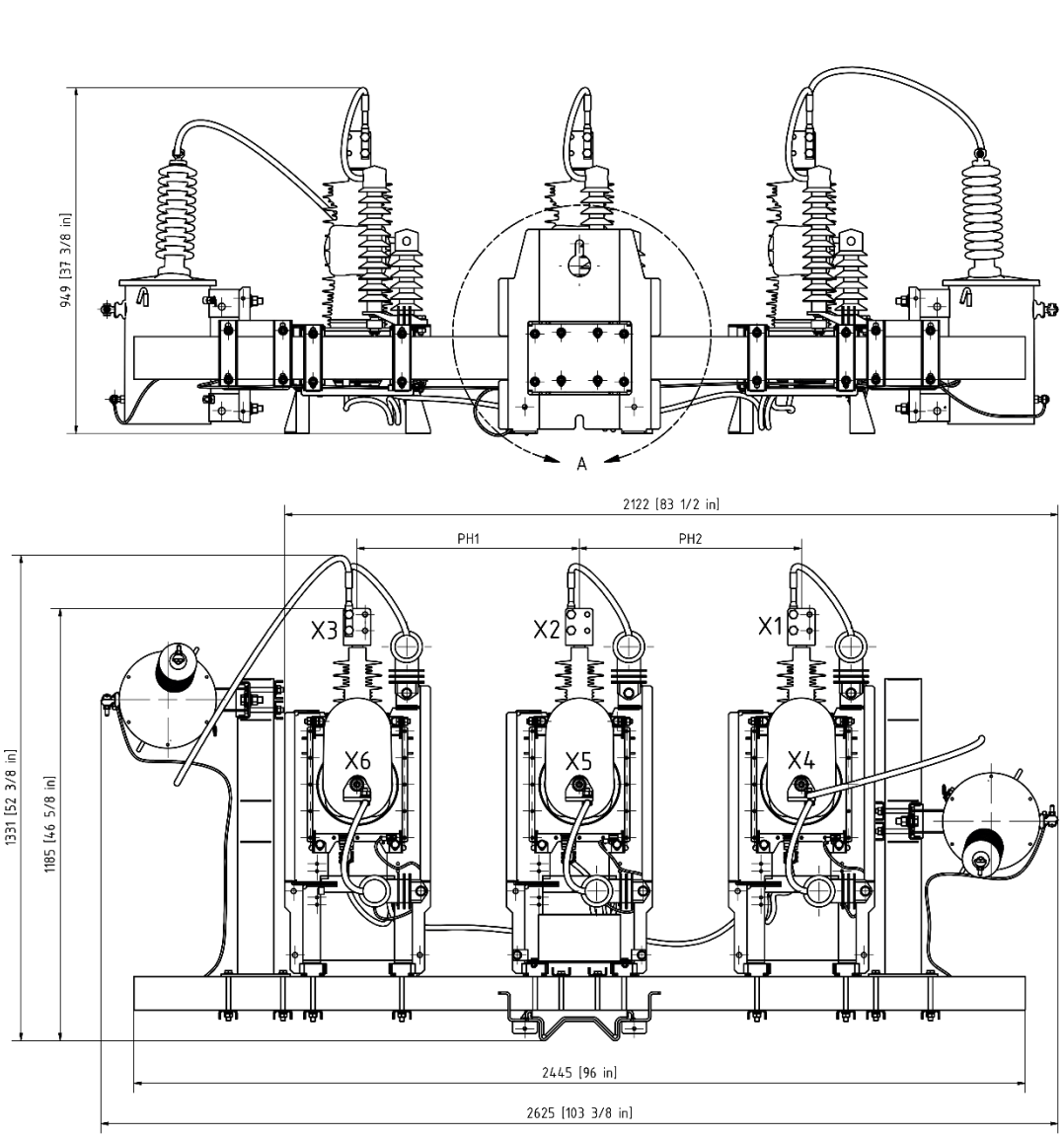
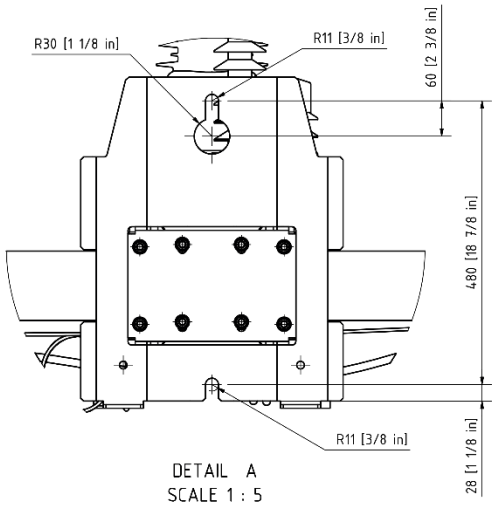


Figure 30

OSM35_Smart_4E drawing





SEL phases designation	Tavrida phases designation
V1Y	X1
V2Y	X2
V3Y	X3
V1Z	X4
V2Z	X5
V3Z	X6

MK configuration	PH1 mm [in]	PH2 mm [in]
(3) single-phase OSMs on 6' crossarm with 22"&22" ph-ph distances and space for 1 CPT, Universal Crossarm Mounting Kit	559 mm [22 in]	559 mm [22 in]
(3) single-phase OSMs on 8' crossarm with 24"&24" ph-ph distances and space for 2 CPTs, Universal Crossarm Mounting Kit	610 mm [24 in]	610 mm [24 in]
(3) single-phase OSMs on 10' crossarm with 35"&35" ph-ph distances and space for 2 CPTs, Universal Crossarm Mounting Kit	889 mm [35 in]	889 mm [35 in]
(3) single-phase OSMs on 8' alley-arm crossarm with 24"&24" ph-ph distances and space for 2 CPTs, Universal Crossarm Mounting Kit	610 mm [24 in]	610 mm [24 in]

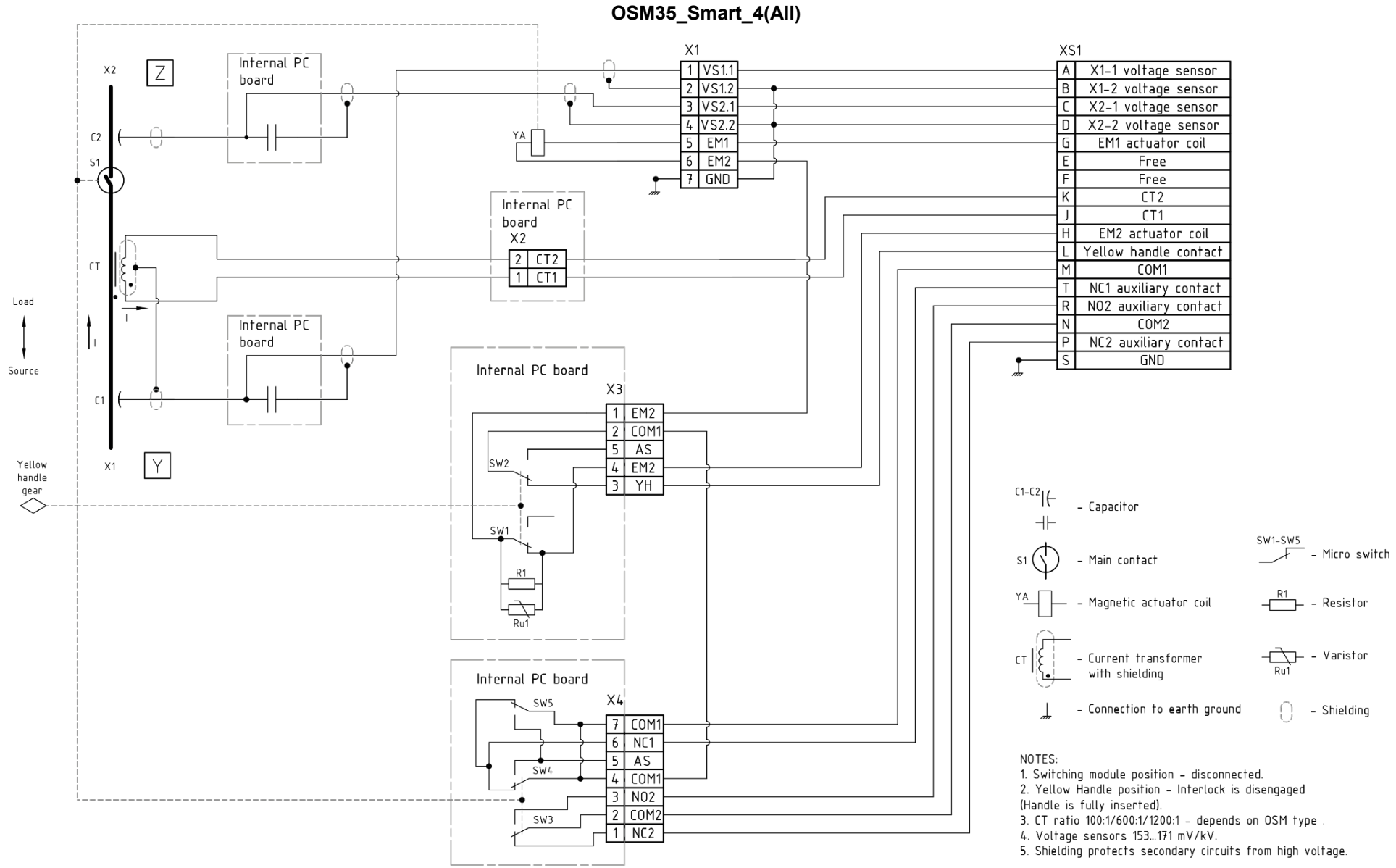
NOTES:
1. Dimensions are for reference only.
2. Dimensions are shown in mm [in].

Figure 31

Rec35_Smart4_HDG Crossarm assembly drawing

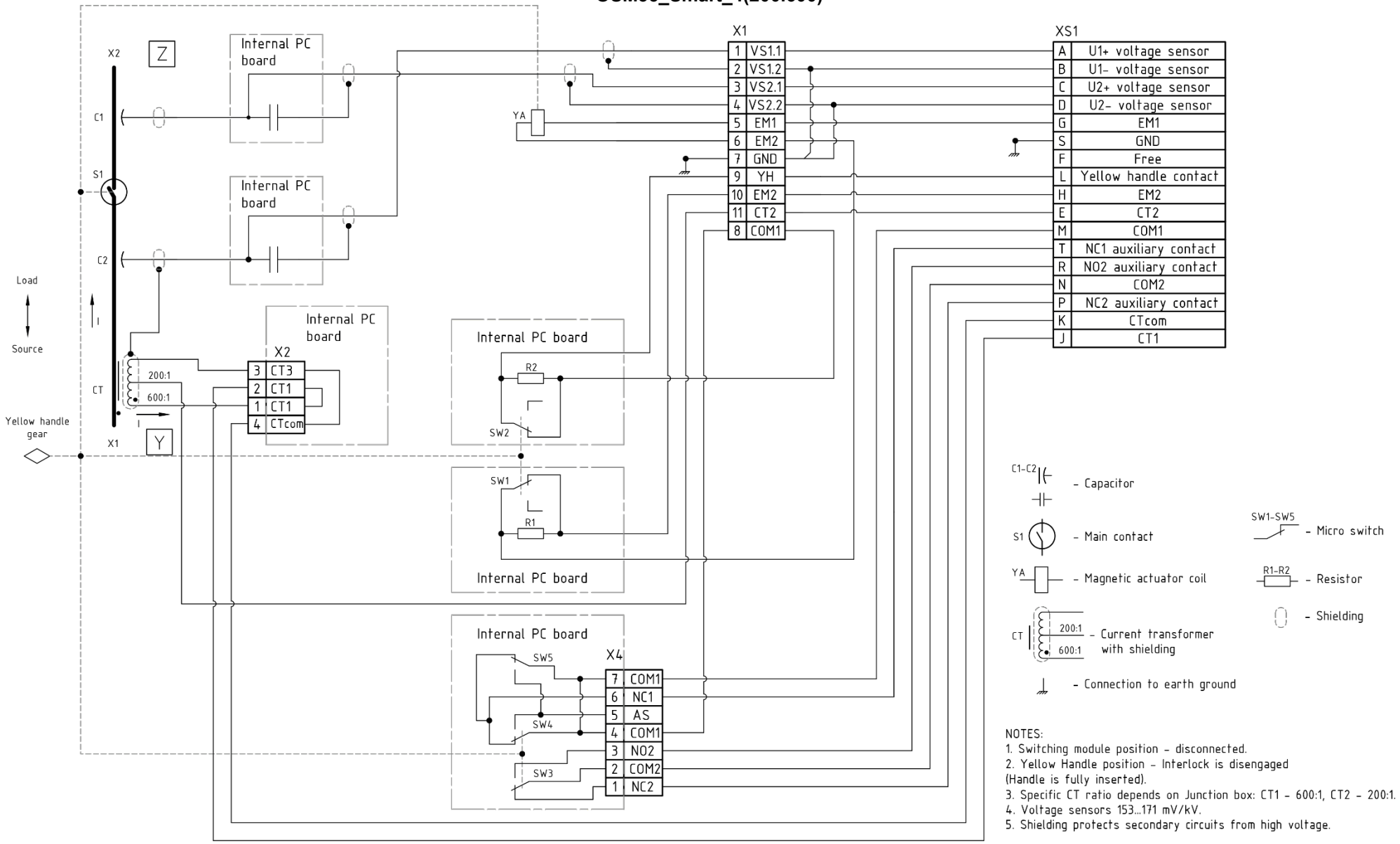
9.2 Circuit Diagrams

OSM35_Smart_4(All)



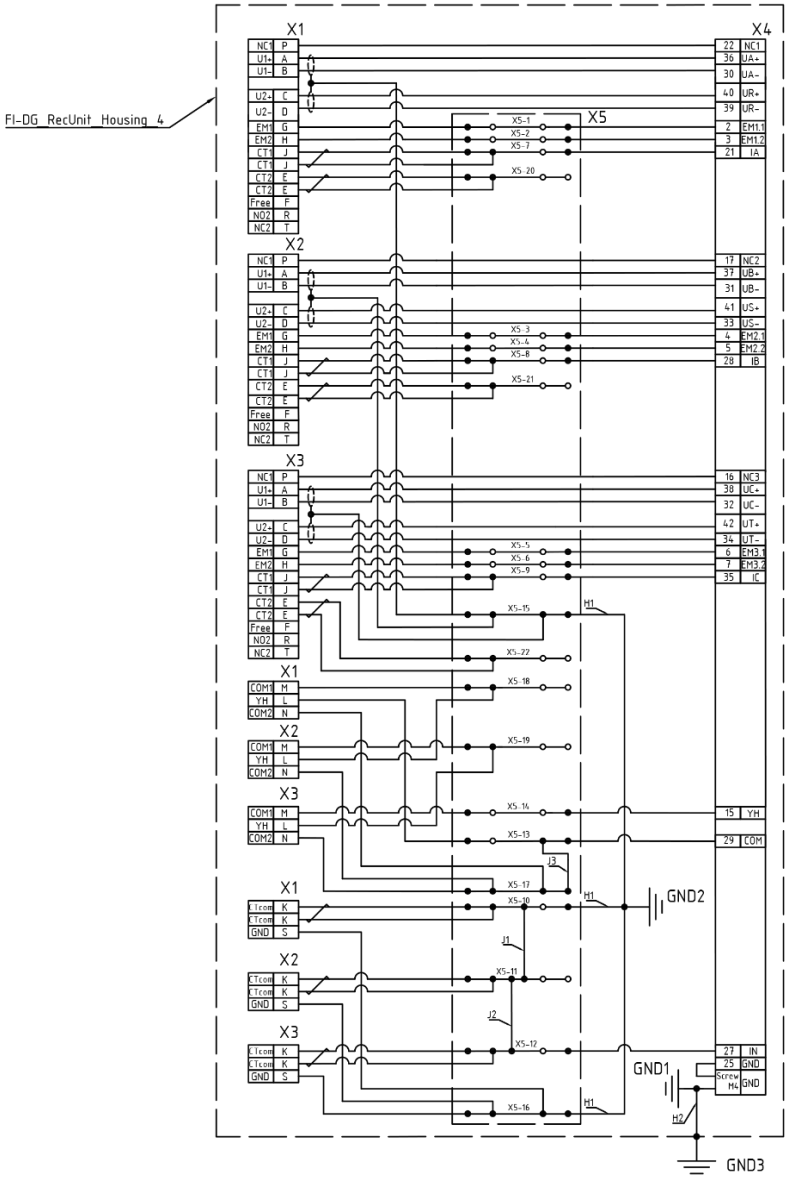
NOTES:
1. Switching module position – disconnected.
2. Yellow Handle position – Interlock is disengaged (Handle is fully inserted).
3. CT ratio 100:1/600:1/1200:1 – depends on OSM type .
4. Voltage sensors 153...171 mV/kV.
5. Shielding protects secondary circuits from high voltage.

OSM35_Smart_4(200.600)



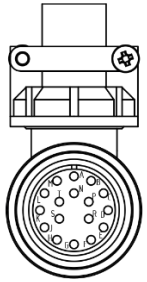
NOTES:
1. Switching module position – disconnected.
2. Yellow Handle position – Interlock is disengaged (Handle is fully inserted).
3. Specific CT ratio depends on Junction box: CT1 – 600:1, CT2 – 200:1.
4. Voltage sensors 153...171 mV/kV.
5. Shielding protects secondary circuits from high voltage.

Junction box wiring diagram for 3 x OSM35_Smart_4E(600.200_150_ALL), 600:1 CT ratio



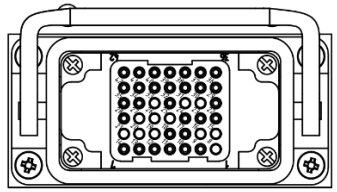
Connector 17-pin male

X1, X2, X3



Insert 42-pin female

X4

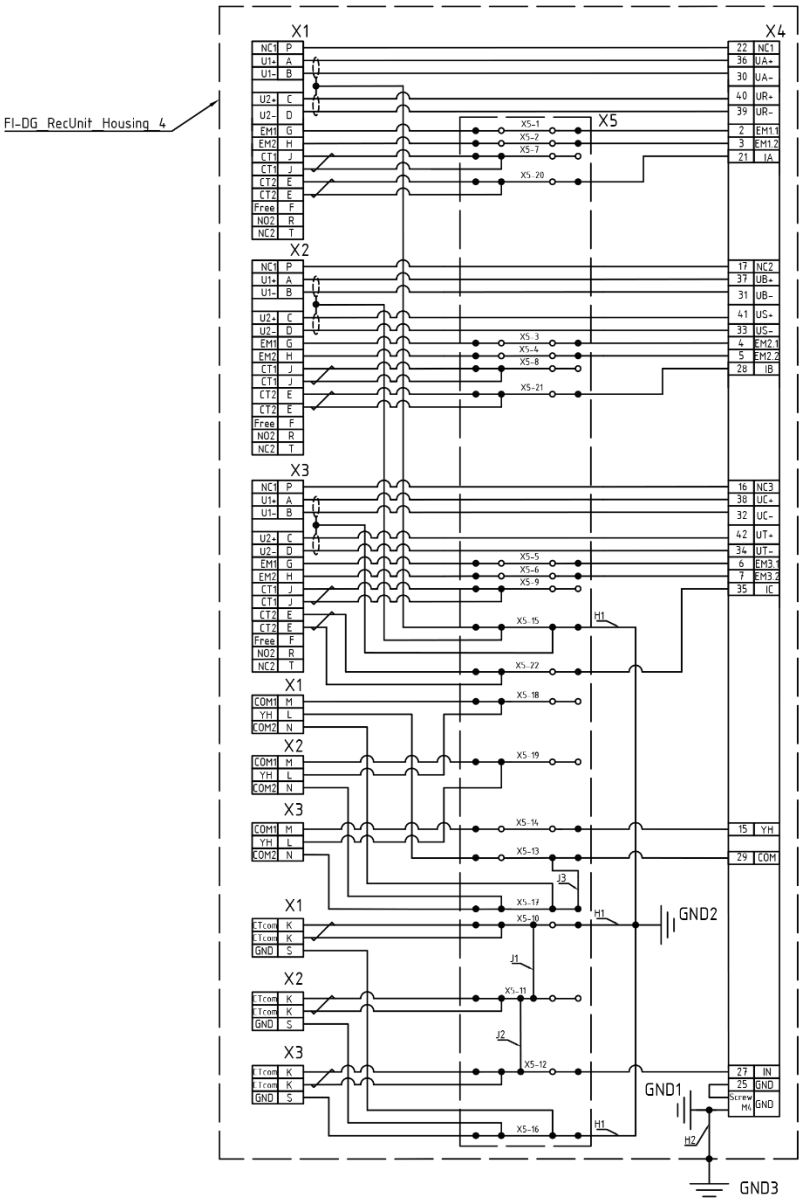


Item	Description	Qty	Ref
X1	FI-TR_Unit_Umbilical_7(A.YH-NC)	1	
X2	FI-TR_Unit_Umbilical_7(B.YH-NC)	1	
X3	FI-TR_Unit_Umbilical_7(C.YH-NC)	1	
X4	FI-TR_Unit_Harness_50	1	
X5-1..22	FI-TR_StandDet_Connector_Spring(2.5_C_2		
	_4_F_gr_0)	19	
J1, J2	FI-TR_StandDet_Jumper_Plug-in(2_1_y)	2	
J3	FI-TR_Unit_Harness_34(100_1_b_ES_ES)	1	
H1	FI-TR_Unit_Harness_34(255_1_gy_ES_R)	3	
H2	FI-TR_Unit_Harness_34(375_1.5_gy_R_R)	1	
GND 1	Stud M4 in FI-DG_RecUnit_Holder_1(0)	1	
GND 2	Stud M4 in FI-DG_RecUnit_Holder_1(0)	1	
GND 3	Stud M4 in FI-DG_RecUnit_Housing_4	1	

- earth ground
- connection
- unconnected terminal
- shielding

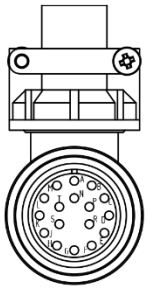
Each connector X1, X2, X3 is divided into separate items for better readability of the diagram.

Junction box wiring diagram for 3 x OSM35_Smart_4E(600.200_150_ALL), 200:1 CT ratio



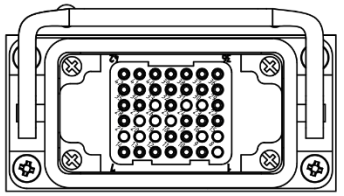
Connector 17-pin male

X1, X2, X3



Insert 42-pin female

X4



Item	Description	Qty	Ref
X1	FI-TR_Unit_Umbilical_7(A.YH-NC)	1	
X2	FI-TR_Unit_Umbilical_7(B.YH-NC)	1	
X3	FI-TR_Unit_Umbilical_7(C.YH-NC)	1	
X4	FI-TR_Unit_Harness_50	1	
X5-1..22	FI-TR_StandDet_Connector_Spring(2.5_C_2		
	_4_F_gr_0)	19	
J1, J2	FI-TR_StandDet_Jumper_Plug-in(2_1_y)	2	
J3	FI-TR_Unit_Harness_34(100_1_b_ES_ES)	1	
H1	FI-TR_Unit_Harness_34(255_1_gy_ES_R)	3	
H2	FI-TR_Unit_Harness_34(375_1.5_gy_R_R)	1	
GND 1	Stud M4 in FI-DG_RecUnit_Holder_1(0)	1	
GND 2	Stud M4 in FI-DG_RecUnit_Holder_1(0)	1	
GND 3	Stud M4 in FI-DG_RecUnit_Housing_4	1	

⏚ - earth ground

● - connection

○ - unconnected terminal

{} - shielding

Each connector X1, X2, X3 is divided into separate items for better readability of the diagram.

List of changes

Document version	Change date	Scope of change	Reason of change
1.0	26.04.2021	Initial version of the document	Product introduction
2.0	03.12.2021	Mounting kit design, labels added, bushing extensions option added	Update
3.0	04.07.2023	- Table 1-2, - Figure 2 - Current transformers excitation curves for OSM35_Smart_4(All) - 100:1 CT, 600:1 CT and 1200:1 CT ratio - 9.2 Circuit Diagrams	Update
4.0	28.12.2023	Updating the main image	Update
4.1	28.02.2024	Updating technical parameters	Update
4.2	21.08.2024	Updating technical parameters	Update
4.3	23.10.2024	6.4 Settings Required for SEL-651R with Multi-Recloser Interface	Adding a section
4.4	13.01.2025	Section 7.3 Commissioning Secondary Part	Update
4.5	31.01.2025	2 Technical Parameters 7.5 High Voltage Test	Update
4.6	11.02.2025	2 Technical Parameters	Update
4.7	02.04.2025	General text edits	Update
4.8	02.07.2025	Update	Update

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