TAVRIDA ELECTRIC

Rec15/25

Automatic Circuit Recloser
15 kV, 16 kA, 630 A
27 kV, 12.5 kA, 630 A

User Guide

This document contains information on Rec15/25 series automatic recloser transportation, storage, installation, commissioning, operation, troubleshooting, decommissioning and disposal.

This document also contains a basic description of the Rec15/25 series autoreclosers functional parts, accessories and functionality. For a detailed functionality and component description refer to the Product Guide. The Product Guide can be downloaded from the Tavrida Electric website or obtained from a Tavrida Electric representative.

This document is intended for the following audiences:

- Procurement
- Fitters
- Commissioning engineers
- Operatives
- Asset management

Read this document carefully and inspect the equipment to become familiar with it before trying to install, operate, service or maintain it.

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. Local safety regulations should be followed.

Safety first

- Installation, operation and maintenance shall only be carried out by trained and experienced personnel who are familiar with the equipment and the electrical safety requirements.
- During installation, commissioning, operation and maintenance of the equipment, the relevant legal regulations (such as DIN/VDE/IEC), accident prevention regulations and the connection condition of the electric utilities shall be observed.
- Take note that during operation of the autorecloser, certain parts are subject to dangerous voltage. Failure to comply with safety requirements 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 OSM 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.

Safety Instructions

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

DANGER! Contact with hazardous voltage can cause death or severe personal injury. Contact with the Rec15/25 or the RC5_3 terminals should only be undertaken when equipment is isolated from applicable sources of voltage.

WARNING! Follow all locally approved safety procedures when installing or operating this equipment. 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 purpose.

Abbreviations

ABR	Automatic Backfeed Restoration
BAT	Battery
BF	Bolted Fault
BTM	Bluetooth Module
CC	Control Cable (Umbilical)
CLP	Cold Load Pickup
CPM	Control Panel Module
CU	Current unbalance
D	Delayed
DPS	Door Position Switch
EF	Earth Fault protection element
EF1	Low set Earth Fault protection element for Delayed trips
EF2	Low set Earth Fault protection element for Instantaneous trips
EF3	High set Earth Fault protection element for Instantaneous trips
EL	Event Log
I	Instantaneous
I/O	Input/Output
IOI	Input/Output Interface
IOM	Input/Output Module
LCD	Liquid Crystal Display
HL	Hot Line protection element
LP	Load Profile
LS	Loss of Supply protection element
ME	Measurement Element
ML	Malfunction Log
MMI	Man Machine Interface
MPM	Main Processor Module
OC	Overcurrent protection element
OC1	Low set Overcurrent protection element for Delayed trips
OC2	Low set Overcurrent protection element for Instantaneous trips
OC3	High set Overcurrent protection element for Instantaneous trips
OCR	Overcurrent protection element with reclosing
OSM	Outdoor Switching Module
PCI	Personal Computer Interface
PSFM	Power Supply Filter Module
RC	Recloser Control Cubicle
RCM	Recloser Control Module
RTC	Real Time Clock
RTU	Remote Telecommunication Unit
SCADA	Supervisory Control and Data Acquisition
SD	Source Detector
SEF	Sensitive Earth Fault
SEFR	Sensitive Earth Fault with reclosing
TEL	Tavrida Electric
TCI	Telecommunications Interface
TELARM	Tavrida Electric Automated Relay Manager
TDI	TELARM Dispatcher Interface
UF	Under-Frequency
UV	Under Voltage
VRC	Voltage Reclosing Control
VT	Voltage Transformer
VU	Voltage Unbalance
ZSC	Zone Sequence Coordination

Contents

1. PRODUCT DESCRIPTION 7
- 1.1. Rec15/25 application description 8
- 1.2. Product main components 8
  - 1.2.1. Outdoor switching module 8
    - *1.2.1.1. OSM housing* 8
    - *1.2.1.2. Mechanical trip and lockout mechanism* 9
    - *1.2.1.3. Mechanical position indicator* 9
  - 1.2.2. RC5_3 control cubicle 10
    - *1.1.1.1. Control panel module (CPM)* 12
    - *1.1.1.2. Backup battery* 13
    - *1.1.1.3. Power supply filter module (PSFM)* 14
    - *1.1.1.4. Bluetooth module (BTM)* 14
    - *1.1.1.5. Input/output module (IOM)* 15
  - 1.2.3. Umbilical cable 16
- 1.3. Technical parameters 17
- 1.4. Disclaimers, precautions, warranty description and limitation 20

2. NAMEPLATES AND SEALS 21
- 2.1. Nameplates 22
  - 2.1.1. Nameplates on the switching module 22
  - 2.1.2. Nameplates on the RC5_3 23
- 2.2. Seals 24
  - 2.2.1. Seals on switching module 24
  - 2.2.2. Seals in RC5_3 24

3. PRODUCT HANDLING 25
- 3.1. Transportation 26
- 3.2. Storage 27
- 3.3. Inspection 27
- 3.4. Unpacking 27
- 3.5. Handling requirements 28
  - 3.5.1. OSM handling 28
  - 3.5.2. RC handling 28

4. INSTALLATION 29
- 4.1. Required equipment 30
- 4.2. Installation procedure 30
  - 4.2.1. OSM installation requirements 30
  - 4.2.2. RC5_3 installation 30
  - 4.2.3. Earthing requirements 31
  - 4.2.4. Connecting the RC5_3 to the auxiliary supply 31
- 4.3. Dismounting procedure 32

5. COMMISSIONING 33
- 5.1. No-load tests 35
  - 5.1.1. RC5_3 power supply check 35
  - 5.1.2. Checking CVCS coefficients 35
  - 5.1.3. Checking phase sequences 35
- 5.2. On-load tests 36

6. OPERATION 37
- 6.1. Switching 39
  - 6.1.1. Mechanical trip of switching module 39
  - 6.1.2. Operation via MMI 39
    - *6.1.2.1. Tripping* 40
    - *6.1.2.2. Closing* 40
    - *6.1.2.3. Delayed closing* 40
    - *6.1.2.4. Indication* 40
- 6.2. Logging 41
  - 6.2.1. Logs 41
  - 6.2.2. Counters 42
- 6.3. Measurements 43
- 6.4. Date and time settings 43
- 6.5. Other RC5_3 control options 43

6.5.1. PCI – Personal Computer Interface 43
6.5.1.1. Connection establishment via USB 43
6.5.1.2. Connection establishment via Bluetooth 44
6.5.1.3. Operation 44
6.5.2. TELARM Dispatcher Interface (TDI) 47
6.5.2.1. Connection establishment 47
6.5.2.2. Operation 48
6.6. Settings modifications 49
6.6.1. Protection settings modifications 49
6.6.1.1. Downloading protection settings 49
6.6.1.2. Protection settings modification 49
6.6.1.3. Uploading protection settings 50
6.6.2. Communication settings modifications 51
6.6.2.1. Downloading communication settings 51
6.6.2.2. Changing communication settings 53
6.6.2.3. Uploading communication settings 54
7. MAINTENANCE AND TROUBLESHOOTING 55
7.1. Maintenance 56
7.2. Troubleshooting 56
7.2.1. PCI CONNECTION PROBLEMS 56
7.2.2. CPM malfunction 56
7.2.3. Active malfunctions 56
7.2.3.1. RCM fault 57
7.2.3.2. Driver fault 57
7.2.3.3. IOM fault 57
7.2.3.4. RTU short circuit 57
7.2.3.5. Loss of AC supply 58
7.2.3.6. Battery fault 59
7.2.3.7. Battery sensor fault 59
7.2.3.8. Excessive trip time event 60
7.2.3.9. Excessive close time 61
7.2.3.10. OSM coil isolated 62
7.2.3.11. OSM coil short circuit 64
7.2.3.12. Driver not ready 64
7.3. Rec15/25 component replacement procedures 64
7.3.1. RCM replacement 64
7.3.1.1. Dismounting 64
7.3.1.2. Installation 65
7.3.2. CPM replacement 66
7.3.2.1. Dismounting 66
7.3.2.2. Installation 66
7.3.3. PSFM replacement 66
7.3.3.1. Dismounting 66
7.3.3.2. Installation 67
7.3.4. Battery replacement 67
7.3.4.1. Dismounting 67
7.3.4.2. Installation 68
7.3.5. Battery sensor replacement 68
7.3.5.1. Dismounting 68
7.3.5.2. Installation 68
7.3.6. RC5_3 replacement 68
7.3.7. OSM replacement 68
8. DISPOSAL 69
9. APPENDICES 71
Appendix 1. OSM drawings 72
Appendix 2. RC5_3 drawings 73
Appendix 3. Package drawings 74
Appendix 4. RC5_3 wiring diagram 75

1. Product description

1.1. Rec15/25 application description

The Rec15/25 can be applied in radial or loop overhead distribution lines. The main application purposes are:

- Clearing transient faults by performing autoreclosing;
- Isolating sustained faults in the overhead line network
- Isolating sustained faults in a network where conventional protection coordination is not possible;
- Performing backfeed restoration.

The recloser can also be used at outdoor substations feeding overhead distribution lines for:

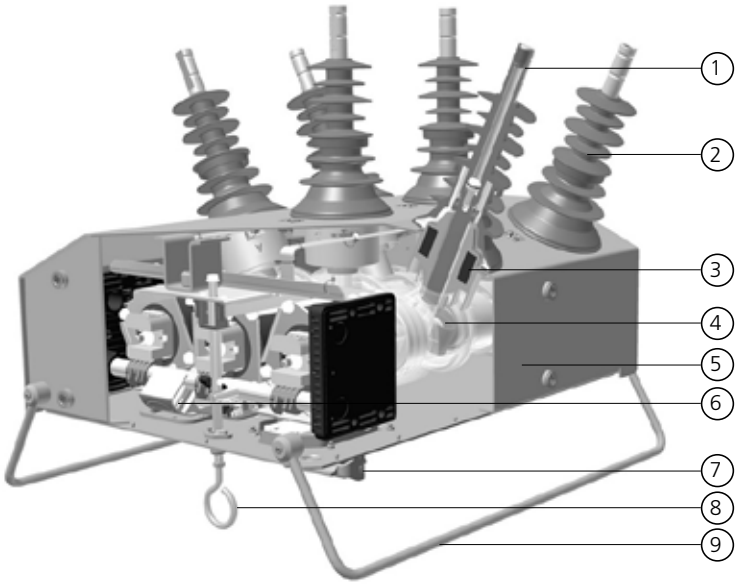
- Outgoing feeder with autoreclosing functionality;
- Bus coupler with backfeed restoration capability;
- Incoming feeder with overcurrent protection for busbar faults, undervoltage protection for backfeed restoration purposes and ability to accept transformer internal protection tripping commands.

1.2. Product main components

1.2.1. Outdoor switching module

The OSM is equipped with six high voltage bushings with embedded current and voltage sensors. The bushings are covered by silicone rubber insulation and mount on the top of the tank and provide 500 mm (OSM15) or 860 mm (OSM25) creepage distance.

The bushings are marked with the terminal designation X1, X2 or X3 for the default source side and X4, X5 or X6 for the default load side. The source and load side can be reversed in the RC settings if required.



1. Terminal
2. Six HV silicone bushings
3. Current sensors built into the bushings
4. Vacuum circuit breaker
5. Protective tank
6. Mechanical position indicator
7. Harting connector
8. Manual trip operation mechanism
9. Support rail

Figure 1

General arrangement of the OSM25_AI_1(4).

1.2.1.1. OSM housing

The OSM tank is made of corrosion resistant anodized aluminum alloy. The tank is coated with light gray RAL 7038 powder coating. Threaded holes (M12x30) on each side of the tank allow the application of various kits and OSM installation on various poles and structures. These threaded holes can also be used to install a set of lifting lugs on the tank. The earthing provision (M12x30 threaded hole) is labelled for identification.

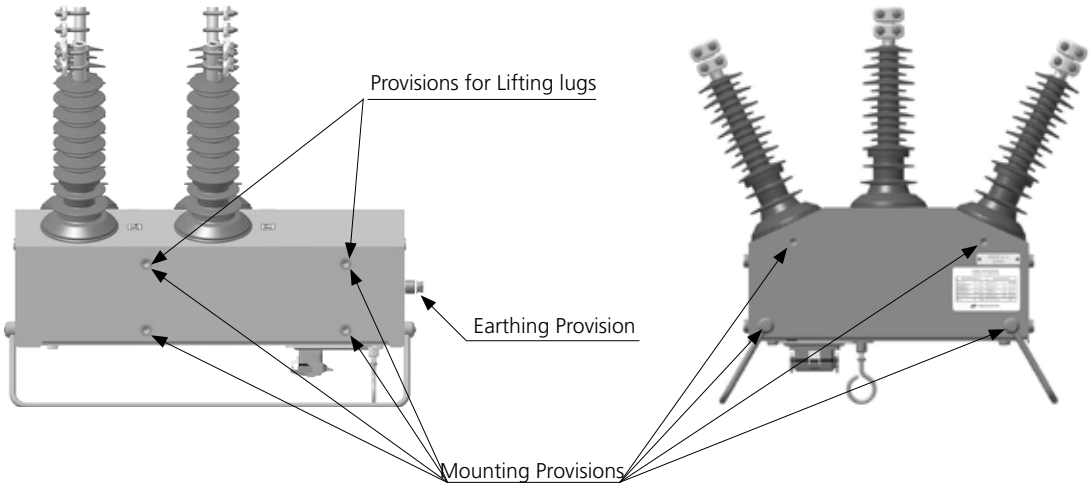
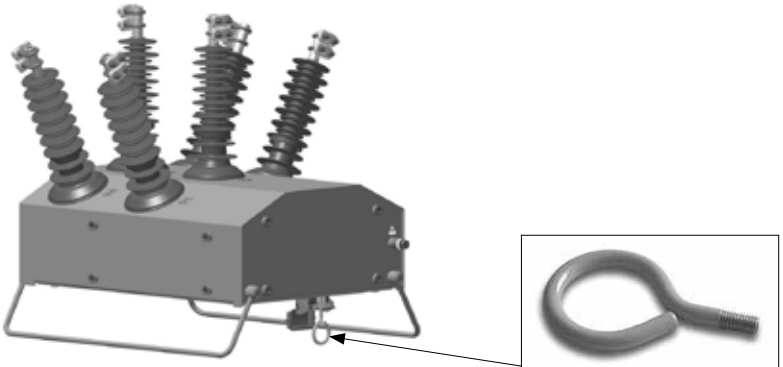


Figure 2

OSM25_AI_1(4) housing

1.2.1.2. Mechanical trip and lockout mechanism

A mechanical trip hook is located at the bottom of the tank (Figure 3). When the hook is pulled down, the OSM is mechanically tripped, locked in the OPEN position and electrically isolated from the driver. An "OSM Coil Isolated" warning event is generated by the RC5_3 to provide indication of the locked state. The OSM remains locked and cannot be operated until the trip hook is pushed back into the operating position.



OSM15(25)_AI_1(4)

Figure 3

Mechanical trip hook

1.2.1.3. Mechanical position indicator

The position indicator is located under a protective cover at the bottom of the tank and is clearly visible from the ground (Figure 4). The indicator color is red when the OSM is closed and green when it is open.

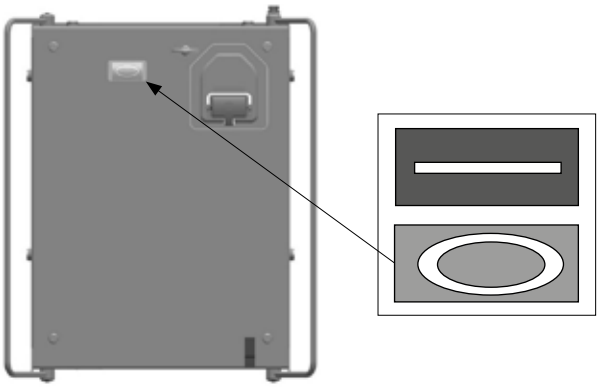


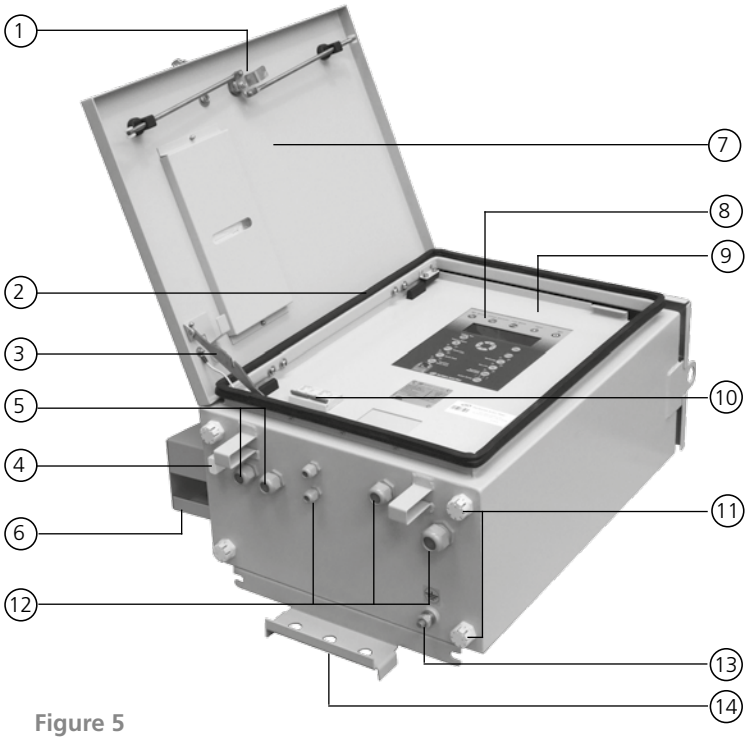
Figure 4

Position indicator

OSM15(25)_AI_1(4)

1.2.2. RC5_3 control cubicle

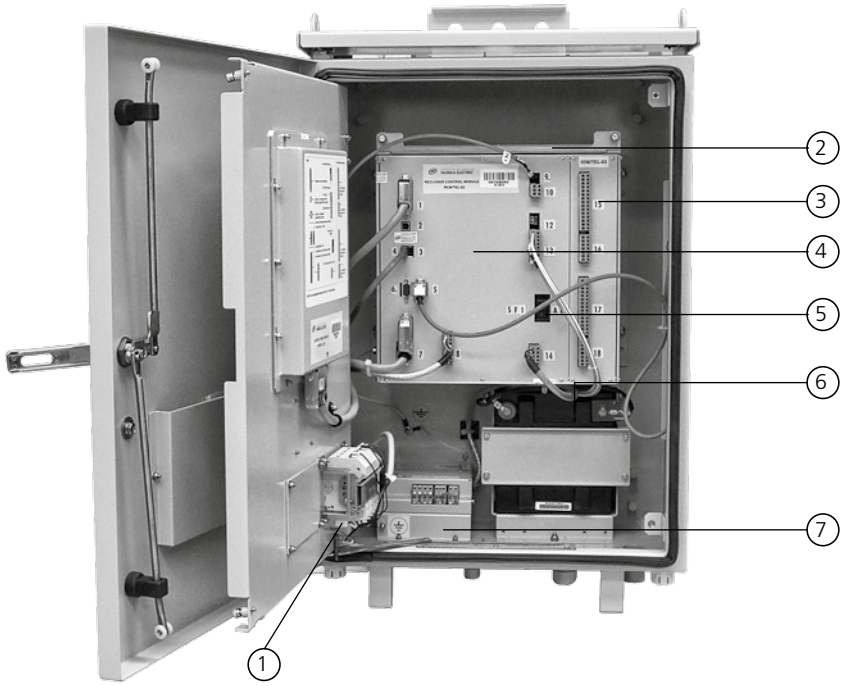
The RC5_3 recloser control cubicle is made from powder coated aluminum, the same as the OSM tank. The RC5_3 main components are shown at figure below.



1. Three-point locking system
2. Rubber seal
3. Fixing rod
4. Bluetooth Module protective cap
5. 2 x IP65 glands for Power supply cable (9...17 mm)
6. Anti-vandal cover of Control Cable
7. External door
8. Control panel module
9. Internal door
10. Thermal overcurrent circuit breakers
11. Dust proof drainage filter
12. IP65 glands:
- 2 x 4…10 mm;
- 1 x 9…17 mm;
- 1 x 11...21 mm;
13. Earthing stud
14. Mounting brackets

Figure 5

RC5_3 with internal door closed



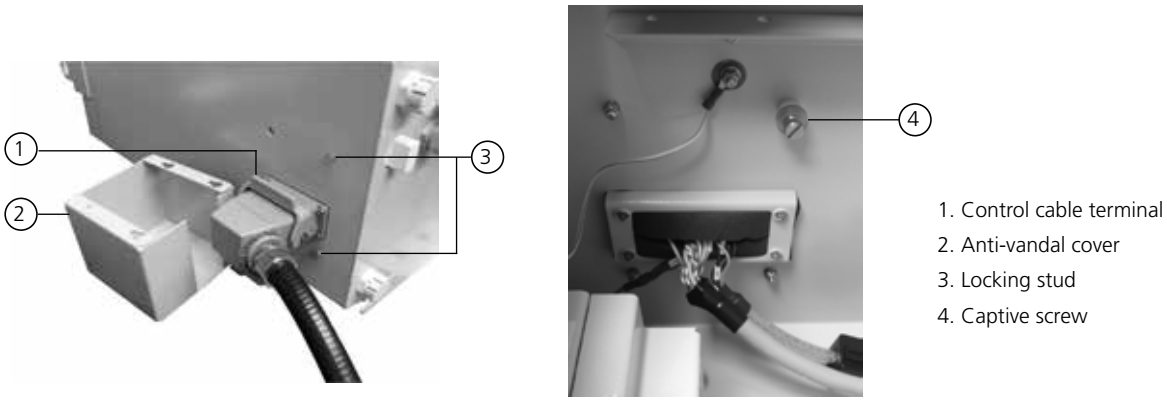
1. Door position switch
2. Remote telecommunication unit (RTU) mounting plate
3. Place for Input/Output module (IOM)
4. Recloser Control Module (RCM)
5. Battery circuit breaker
6. Battery
7. Power supply filter module

Figure 6

RC5_3 with internal door open

The external door has a padlock provision that is suitable for a shackle with up to a 12 mm diameter. The external door can be securely fixed in the open position.

The anti-vandal cover is fixed from inside the housing with one captive screw. It protects the umbilical cable from unauthorised disconnection.



1. Control cable terminal
2. Anti-vandal cover
3. Locking stud
4. Captive screw

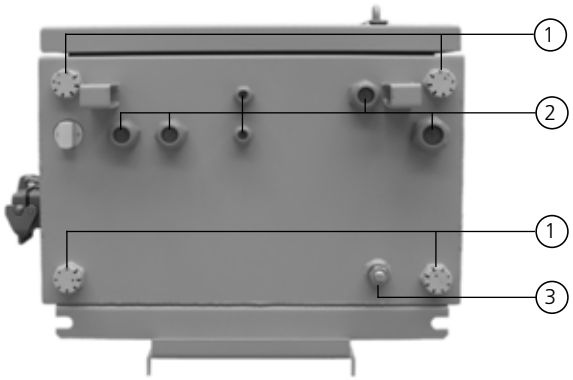
Figure 7
Control cable connection

The RC5_3 is equipped with different cable glands for:

- I/O cable or external RTU connections (11…21 mm)
- Antenna (4.5…10 mm)
- Power supply cable (9…17 mm)

Cable glands are delivered with installed plastic caps.

The housing has provisions for protection against dust and water ingress.



1. Dustproof drainage filter
2. Plastic caps
3. Earthing stud

Figure 8
RC housing provisions

The RC5_3 is equipped with a Door Position Switch which is used for disabling the CPM at closed RC, as well as a SCADA indication of the RC door position.

The door position switch is mounted on the internal door and actuated by the lever mounted opposite to the switch on the external door (Figure 9).

Figure 9

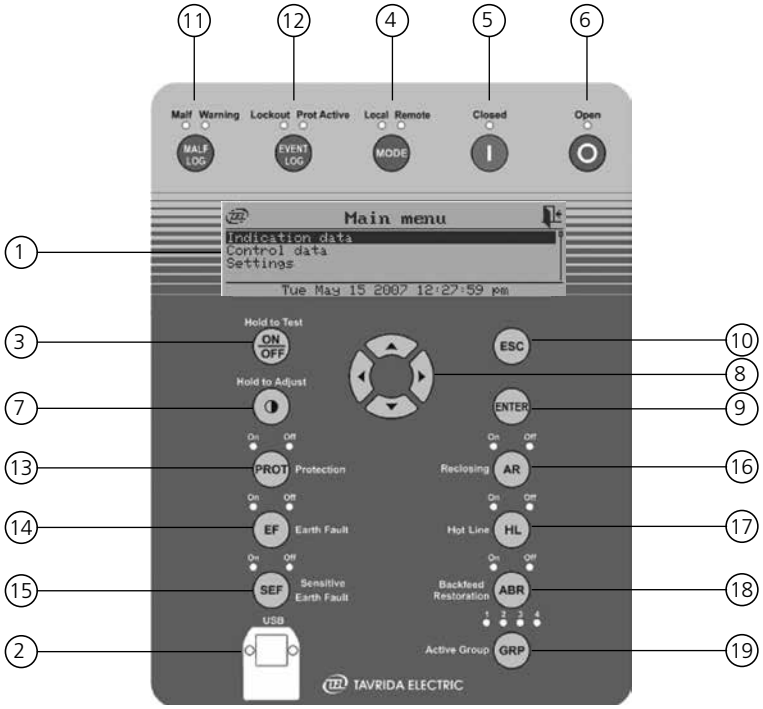
Door position switch

1.1.1.1. Control panel module (CPM)

The CPM provides local control and indication functions of the Rec15/25 (Figure 10). Control buttons and indication LEDs are located at the front side of the CPM (Figure 11). The CPM has an integrated USB interface for PC connection.

Figure 10

Control panel module (CPM)



1. LCD
2. USB Port

General Control Pushbuttons

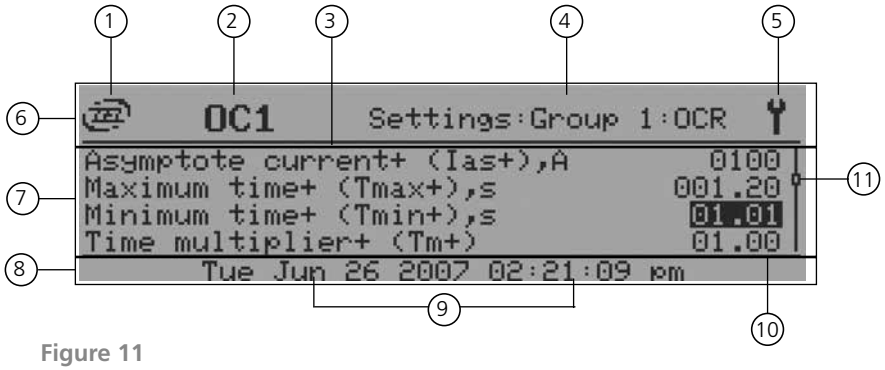
3. ON / OFF / Test
4. Control Mode
5. Closed
6. Open

LCD Control Pushbuttons

7. LCD Contrast
8. Navigation
9. Enter
10. Escape

Fast Key Pushbuttons

11. Malfunction Log
12. Event Log
13. Protection ON/OFF
14. Earth Fault ON/OFF
15. Sensitive Earth Fault ON/OFF
16. Reclosing ON/OFF
17. Hot Line ON/OFF
18. Backfeed Restoration ON/OFF
19. Active (Protection) Group



1. TEL Logo
2. Title string
3. Label of Indication data, Control data or Settings
4. Path
5. Context icon
6. Title Bar
7. Menu Bar
8. Status Bar
9. Date and Time
10. Parameter values of Indication data, Control data or Settings
11. Scroll Bar

Figure 11

CPM control and indication functions

1.1.1.2. Backup battery

A rechargeable 12 V DC GENESYS 26EPX battery (Figure 12) provides the RC5_3 with auxiliary power when the main auxiliary power is not present. The power supply system is designed to provide battery optimum charging and optimize battery lifetime.

Figure 12
Rechargeable backup battery

1.1.1.3. Power supply filter module (PSFM)

The PSFM is used for an RC5_3 auxiliary power supply connection (Figure 13). This module provides impulse noise protection for all internal modules of the RC5_3.

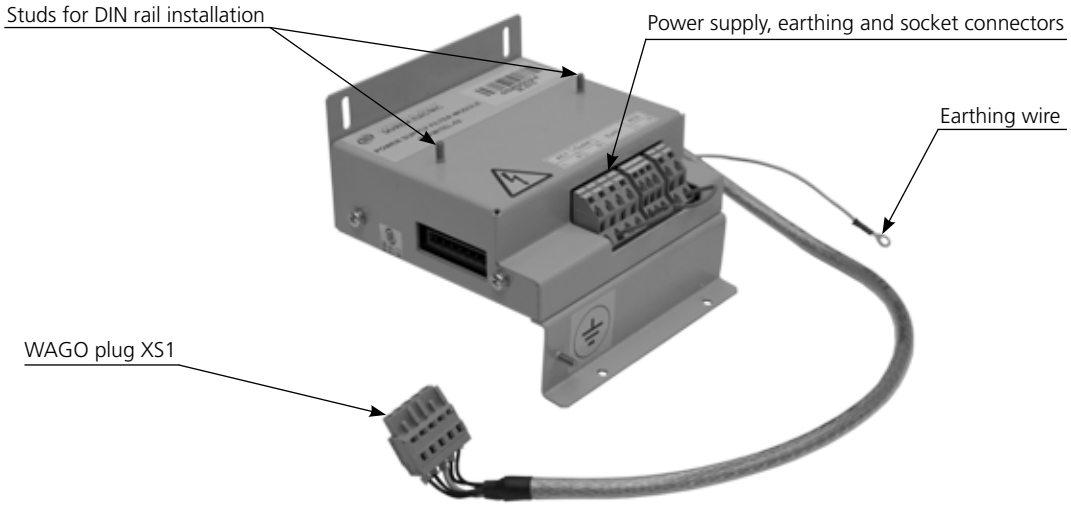


Figure 13
Power supply filter module

1.1.1.4. Bluetooth module (BTM)

The RC can be supplied with a Bluetooth module on request. The Bluetooth module provides point-to-point wireless connection between the RC and a personal computer. It is connected to the RCM via a USB cable (Figure 14).

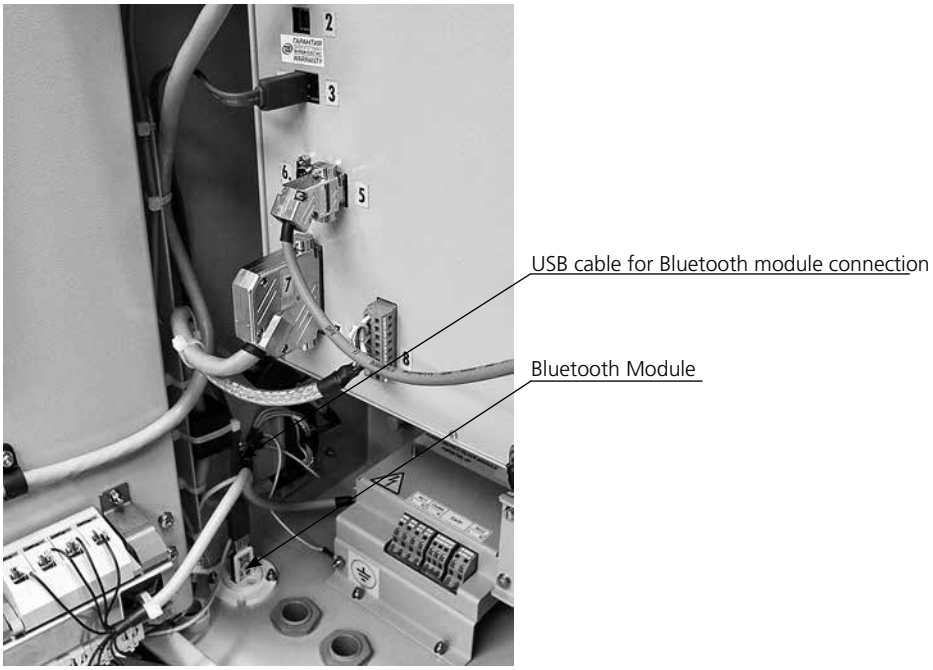


Figure 14

Bluetooth module connection

1.1.1.5. Input/output module (IOM)

The RC can be supplied with an IOM (Figure 15) module on request. It provides control and indication functions with the aid of digital inputs/outputs. The IOM contains twelve digital inputs and twelve digital outputs. The location of these connectors (marked "15"…"18") with these inputs and outputs are shown in Figure 16.

Figure 15

Input/Output module

Digital inputs are potentially isolated by means of opto-couplers (Figure 17).

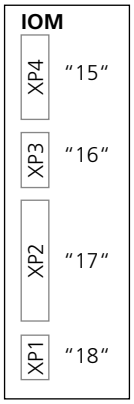


Figure 16

Location of IOM connectors

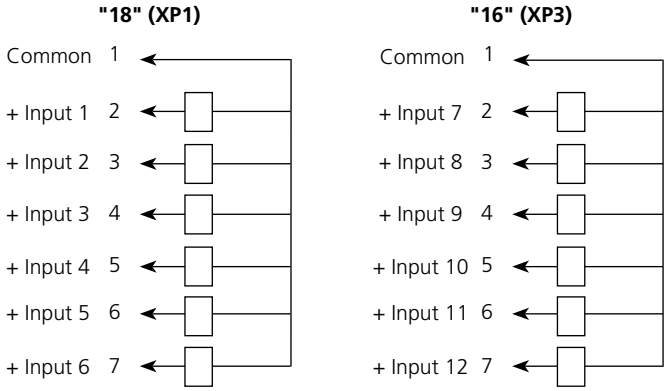


Figure 17
Digital inputs

Bistable relays with changeover contacts are used for the digital outputs as illustrated in Figure 18.

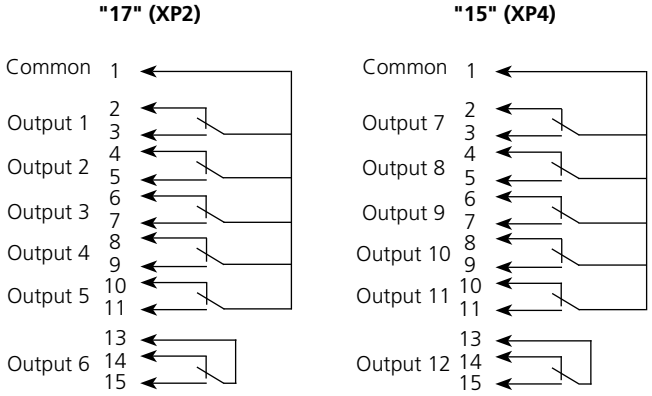


Figure 18
Digital outputs

1.2.3. Umbilical cable

The umbilical control cable (Figure 19) connects the OSM actuators, metering and auxiliary wiring to the RC. Control cable wires are protected by PVC coated steel armoured sleeve. The cable is equipped with a heavy duty 42 pin male connector on the OSM side and heavy duty 32 pin female connector on the RC side. The connection is made using heavy-duty connectors. These connectors exhibit excellent mechanical properties and prevent rust.

Advanced CVCSs, control module (CM) and the circuit breaker technology allows unplugging the umbilical cable when the device is in operation. The position of the main contacts will remain the same, as when the umbilical cable is plugged unless there are preprogrammed actions. There are no hazardous voltages from either side of the unplugged umbilical and it will not cause any injury.

The umbilical cable can be plugged in when the main line is energised.

Figure 19

General view of umbilical cable

1.3. Technical parameters

Table 1. Rated data

Parameter	OSM15_Al_1	OSM25_Al_1
Rated data		
Rated maximum voltage (Ur)	15.5 kV	27 kV
Rated short-duration powerfrequency withstand voltage (Ud), 1 min dry	50 kV	60 kV
Rated short-duration powerfrequency withstand voltage, 10s wet	45 kV	50 kV
Rated lightning impulse withstand voltage (peak) (Up)	110 kV	125 kV
Rated continuous current (Ir)	630 A	
Rated cable-charging current switching	10 A	25 A
Rated line-charging current switching	2 A	5 A
Rated short-circuit breaking current (Isc)	16 kA	12.5 kA
Rated peak withstand current (Ip)	41.6 kA	32.5 kA
Rated short-time withstand current (Ik)	16 kA	12.5 kA
Rated duration of short circuit (tk)	4 s	4 s
Rated frequency (fr)	50/60 Hz	
Switching performance		
Mechanical life (CO-cycles)	30 000	
Operating cycles, rated current (CO-cycles)	30 000	
Electrical endurance, breaking current (O-CO cycles)	50	
Closing time, not more than	77 ms	
Opening time for overcurrent protection according to IEC 62271-111/C37.60, not more than (at I>2xIp)	43 ms	
Clearing time for overcurrent protection according to IEC 62271-111/C37.60, not more than (at I>2xIp)	51 ms	
Rated operating sequence	O-0.1s-CO-2s-CO-2s-CO	
General information		
Main circuit resistance	< 85 µOhm	< 95 µOhm
Weight	68 kg	72 kg
Altitude	2000 m (derating according to ANSI C37.60 applied above 1000m)	
Humidity	100%, condensing	
Solar Radiation	≤ 1.1 kW/m^2	
Temperature Range	-40 °C ... +55 °C	
Type of driving mechanism	Monostable magnetic actuator	
Pollution level	very heavy (as per IEC 60815)	

Table 2. Sensors parameters

Parameter	Phase current sensors	Zero-sequence current sensor	Voltage sensors
Measurement range	1-8000[1)] A	1 ... 8000[1)] A	0.3 … 27 kV
Range of sensor coefficients at 20 °C	1.8 … 2.2 V/kA	1.8 … 2.2 V/kA	0.1 … 0.2 V/kV

Table 3. Measurement accuracy[2)]

Parameter	Basic error	Ranges where accuracy is guaranteed
Phase to earth voltages	The greater of ±1.0% or ±0.1 kV	0.3…16.0 kV
Line to line voltages	The greater of ±1.0% or ±0.1 kV	0.5…27.0 kV
Phase currents	The greater of ±1% or ±2A	0…630 A
Active, reactive and total power	±2%	40 … 630 A, 4.5 … 27 kV
Residual current[3)]	The greater of ±5% or ±0.5A	1…400 A
Frequency - at dF/dt<0.2Hz/s - at dF/dt<0.5Hz/s	 ±0.025Hz ±0.05Hz	45…55 Hz, 55…65 Hz
Power factor	±0.02	0 … 1
Active and reactive energy	±2%	40…630 A, 4.5…27 kV

Table 4. Electromagnetic compatibility

Parameter	Value	Applicable standard
Rated power frequency voltage (1 min)	2 kV	IEC 60255-5
Rated impulse voltage, kV at 0.5J	5 kV	IEC 60255-5
Electrical fast transient/burst immunity	4 kV	IEC 60255-22-4 (Level IV)
Surge immunity (applied to external AC voltage terminals) - common - transverse	 4 kV 2 kV	IEC 61000-4-5 (Level IV)
Control elements surge withstand capability (SWC)	125 kV (7 kA)	IEEE C37.60-2003

Table 5. Power supply characteristics

Parameter	Value
Supply voltage range, V	AC – 85 ÷ 265 DC – 110 ÷ 220[4)]
Rated power consumption, VA, not more than	40
Maximum power consumption, VA, not more than	75
Expected lifetime without auxiliary supply using built-in battery, hours	48

Table 6. Degree of protection

Component	Degree of protection
Outdoor switching module	IP65
Recloser cubicle	IP65

1) The Rogowski coil can measure current a wide range but for the purpose of over-voltage protection, suppressors are fitted to the secondary circuits. These suppressors chop the signal from the Rogowski coil in case primary current exceeds 8 kA.
2) In case the RC5_3 settings for sensor coefficients correspond to related OSM technical parameters. Error is measured at normal climatic conditions.
3) Note that overcurrent protection pickup setting value shall not exceed SEF pickup setting value times 300.
4) Additional DC circuit breakers shall be used to protect the RC in case of DC power supply.

Table 7. I/O Module (IOM) parameters

Digital inputs	Value
Rated voltages of signal applied to digital inputs - for IOM-04 - for IOM-03	 12/24/30/48/60 V DC 110/125/220 V DC
Pickup voltage of signal applied to digital inputs - for IOM-04 - for IOM-03	 Above 7 V Above 100 V
Reset voltage - for IOM-04 - for IOM-03	 Below 3 V Below 30 V
Maximum continuous voltage of signal applied to digital inputs - for IOM-04 - for IOM-03	 75 V 275 V
Input resistance - for IOM-04 - for IOM-03	 3 kOhm 125 kOhm
Recognition time, ms - not more	20
Reset time, ms - not more	20
Digital outputs	**Value**
Rated voltage	250 VAC
Rated current	16 A
Breaking capacity DC1 (at L/R=1ms): 30/110/220 V	16/0.3/0.12 A
Minimum switching load	500 mW (10V/5mA)

Table 8. Rechargeable Battery (BAT) parameters

BAT parameters	Value
Type[1)]	G26EPX EnerSys 0765-2003 sealed lead acid
Rated voltage	12 V
Rated capacity	26 Ah
Temperature range	-40 °C...+55 °C
Maximum amount of recharging cycles from full discharge state	300
Relative capacity at different temperatures - at -40°C - at -20°C - at 0°C - at +25°C - at +40°C - at +55°C	 25 % 65 % 84 % 100 % 110 % 120 %
Expected battery life at average operating temperature, years - at +20°C - at +25°C - at +30°C - at +40°C	 16 10 6.5 2.7

1) Only the battery types described in this guide can be used in the RC.

1.4. Disclaimers, precautions, warranty description and limitation

DANGER
Hazardous voltage

It may cause death, serious injury or equipment damage.

Always de-energize the power line and ground all equipment terminals before performing any works at the HV assembly.

All work on protection device equipment should be performed by qualified personnel only.

Precautions should be taken before opening the inner door of the RC5_3, as interior parts are energized with > 100V.

2. Nameplates and seals

2.1. Nameplates

2.1.1. Nameplates on the switching module

Switching module nameplates are placed on a tank and fixed with rivets (Figure 20).

Nameplate information:

Table 9. Technical parameters nameplate information

Parameter	Value	
	OSM15_Al_1	OSM25_Al_1
Manufacturer	Tavrida Electric	
Type	Outdoor Switching Module	
Rated maximum voltage, kV	15.5	27
Rated normal current, up to, A	630	
Rated frequency, Hz	50/60	
Weight, kg	68	72
Rated operating sequence	O-0,1s-CO-2s-CO-2s-CO	
Rated lightning impulse withstand voltage, up to, kV	110	125
Rated power-frequency withstand voltage, up to, kV	50	60
Rated short-circuit breaking current (RMS) , kA	16	12.5
Rated peak withstand current , kA	41.6	32.5
Rated short-time withstand current (4 s), kA	16	12.5
Year of manufacture	XXXX	
Applicable standards	IEEE C37.60/IEC 62271-111	

Table 10. Serial number nameplate information

Parameter	Value
Switching module type	OSM15_Al_1(x) / OSM25_Al_1(x)
Serial number	№ XXXXXX

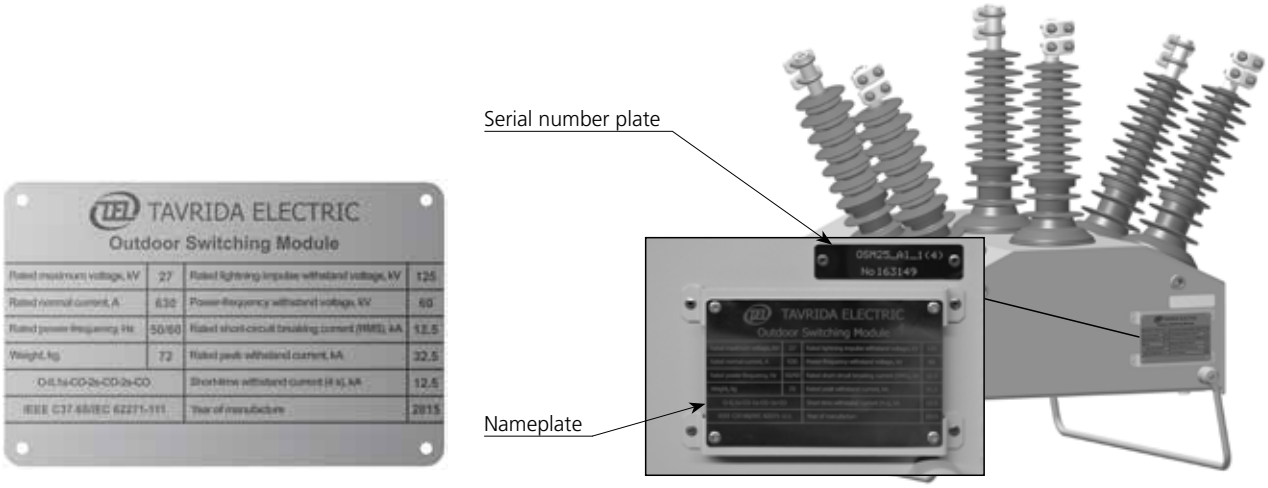


Figure 20
OSM25_Al_1(4)nameplate

2.1.2. Nameplates on the RC5_3

The RC5_3 nameplates are visible on the front of the internal RC door (Figure 21).

Nameplate information:

Table 11. Technical parameters nameplate information

Parameter	Value
Manufacturer	Tavrida Electric
Type	Recloser Control Cubicle RecUnit_RC5_3
Rated supply voltage, V	85-265
Rated supply frequency, Hz	50/60
Weight, kg	41
Degree of protection	IP 65
Year of manufacture	XXXX
Applicable standards	IEEE C37.60/IEC 62271-111

Table 12. Serial number nameplate information

Parameter	Value
Manufacturer	Tavrida Electric
Recloser control cubicle type	Recloser Control Cubicle RecUnit_RC5_3 (EN_0_0_0_0)
Serial number	XXXXXXXX
Month/year of manufacture	XX.XXXX

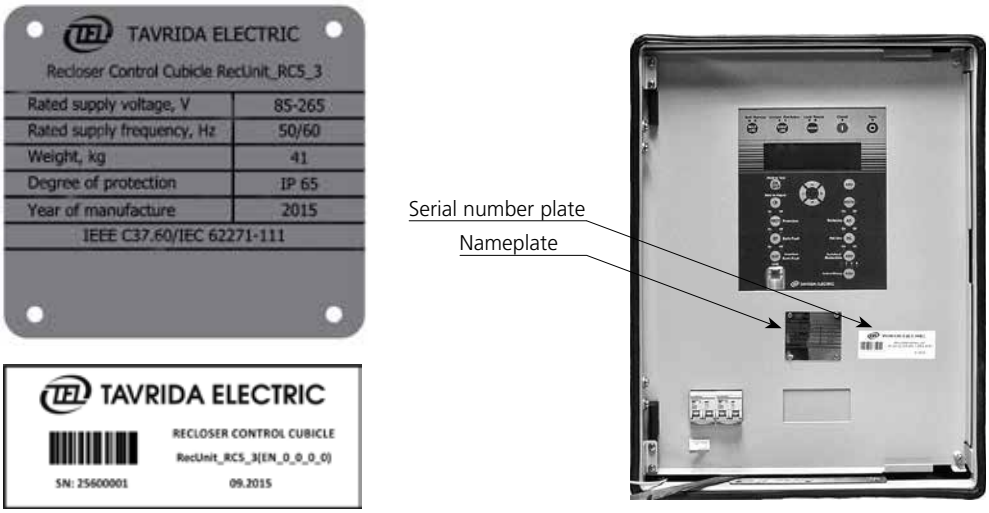


Figure 21
RC5_3 nameplates

2.2. Seals

Seals are placed onto components which should not be opened by unauthorized persons. Warranty for all products is void if the seal is removed, damaged or tampered with.

2.2.1. Seals on switching module

Seals are installed at the bottom of the switching module tank (Figure 22).

Figure 22
OSM25_Al_1(4) seals

2.2.2. Seals in RC5_3

Inside the RC5_3 the RCM and CPM are sealed (Figure 23).

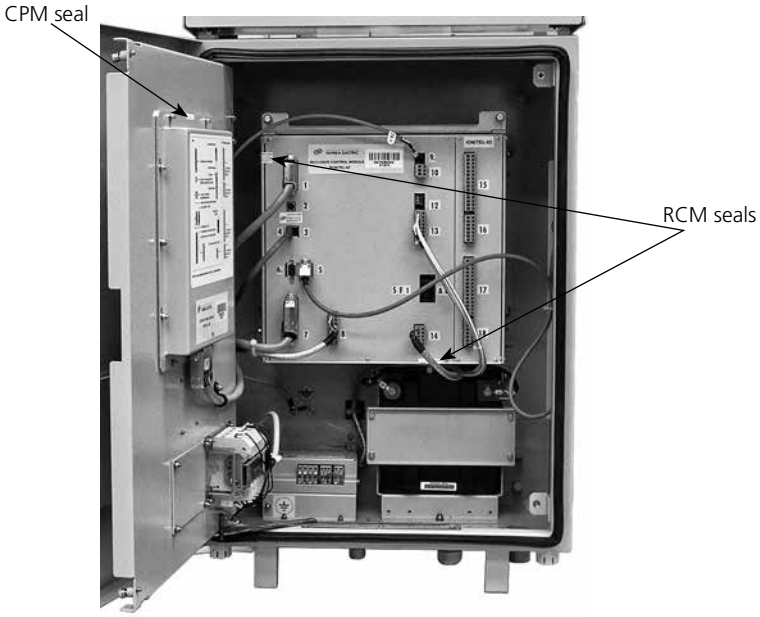


Figure 23
RC5_3 seals

3. Product handling

3.1. Transportation

The health of the equipment is critically dependent on safe and careful handling during transportation, loading and unloading where sudden impacts or shocks can lead to damage of critical components.

It is important to provide adequate fixing to minimise the risk of damage during transportation. Fixation could be provided by using webbing slings.

The Rec15/25 package consists of a wooden pallet fumigated according to ISPM15 rules and galvanized steel collars and cover (see Figure 24). For details on package dimensions and weight refer to Appendix 3 of this guide.

Figure 24

Rec15/25 package

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

To move the Rec15/25 package, use a hydraulic lift or fork lift truck (see Figure 25)

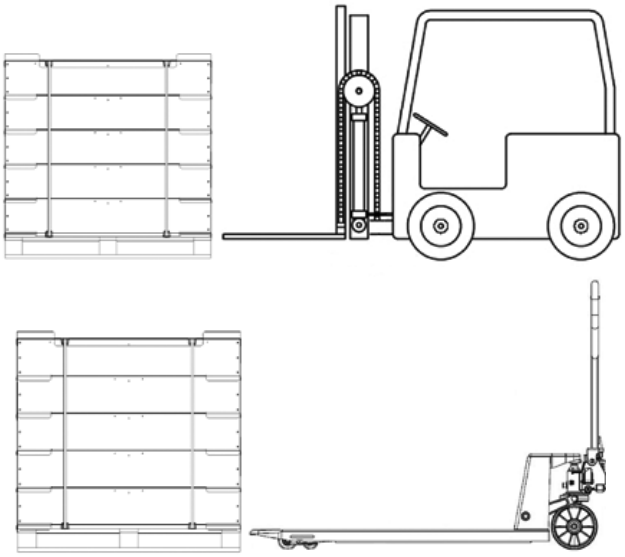


Figure 25

Rec15/25 package lifting methods

3.2. Storage

The packaged Rec15/25 should be stored in dry storage areas with natural ventilation.

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

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.

3.3. Inspection

Each Rec15/25 is completely assembled, tested, and inspected at the factory. It is in good condition when accepted by the carrier for shipment. Upon receipt, inspect the package for signs of damage. After unpacking the Rec15/25, inspect its components thoroughly for damage incurred during shipment. If damage is discovered, file a claim with the carrier immediately.

The inspection process is described in the table below:

Table 13. Inspection list

#	Object	Inspection description
1	Plastic details	Absence of mechanical damages, scratches, spots
2	Silicon insulation	Absence of mechanical damages
3	Metal parts	Absence of mechanical damages, rust and spots

3.4. Unpacking

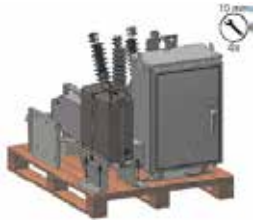
Follow the recommendation below to unpack:

1. Cut stapping tapes

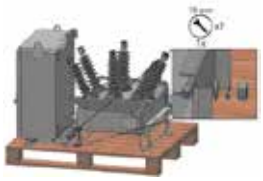
2. Unscrew four screws from cover and take it off

3. Remove screws from collars

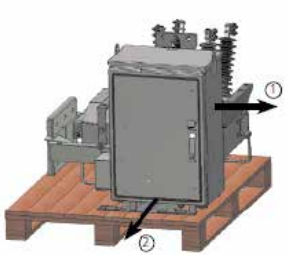
4. Take off collars one by one



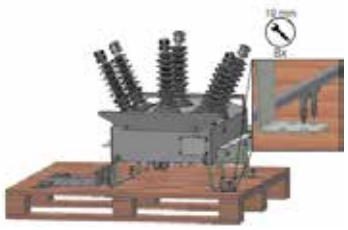
5. Cut strapping tapes and unscrew four screws that hold M-detail



6.Unscrew fasteners that hold RC on holder



7. Remove RC[1)] by pushing from left to right, then forward



8. Unscrew eight screws holding the mounting bracket

[1)] for OSM and RC lifting requirements refer to section 3.5 Handling requirements.

3.5. Handling requirements

To avoid equipment damage, follow the handling recommendations listed below:

1. In case a crane is used, the Rec15/25 components should be lifted using special lifting provisions located at the RC cubicle and the OSM mounting kit. See Handling and Installation guide for details;
2. The HV assembly and the RC should be appropriately fixed/lifted to avoid equipment damage;
3. In case the Rec15/25 components are delivered on a pallet, it can be moved using a properly rated forklift vehicle.

3.5.1. OSM handling

To handle the OSM separately from the frame use four 12 mm eyebolts (not included with delivery) screwed into upper holes of the OSM tank.

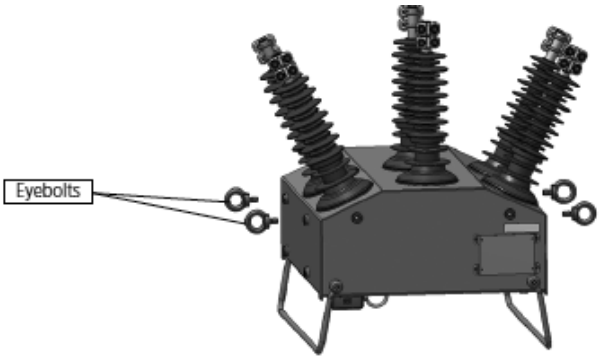


Figure 26

OSM lifting provisions

3.5.2. RC handling

The RC5_3 has two holders with lifting provision. Two holders placed at the bottom of the RC together with a mounting bracket allowing it to stand in the vertical position without any additional equipment.

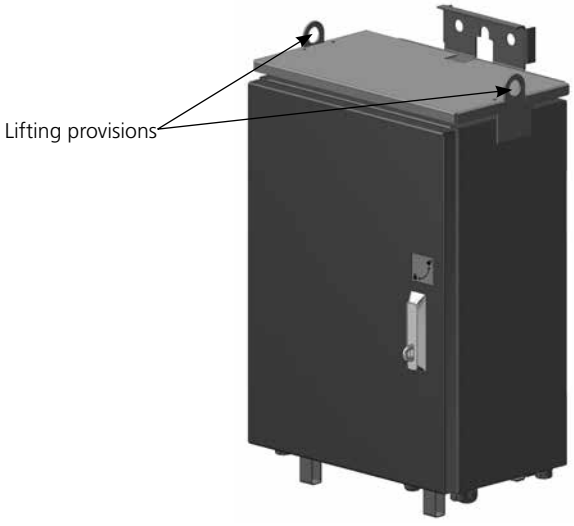


Figure 27

RC lifting provisions

4. Installation

Installation operations are carried out by utility technical personnel and can be supervised by Tavrida electric technical representatives. This chapter describes installation procedures and required equipment. For more detailed information about the installation process contact a Tavrida electric technical representative.

4.1. Required equipment

1. Set of wrenches (8-24mm);
2. Set of screw drivers (+ and -);
3. Screw driver "-" 2.5x0.4 for WAGO terminals;
4. Diagonal pliers;
5. Power line connection provision:
    - Wires (preferable insulated) (6 pcs.);
    - Support insulators 3 pcs. (if required);
    - Cable lugs applicable for chosen connection wires and M12 bolt (6 pcs.);
    - Connection clamps (waterproof if insulated connection wires are used) (6 pcs.).
6. Hydraulic cable terminal lug manual clamp up to 240mm2;
7. Alcohol for insulation cleaning;
8. Crane or other lift for OSM and RC5_3 lifting.

4.2. Installation procedure

WARNING! This User Guide is offered as a guide only. It should be used in conjunction with the utility's own safety procedures. Before installation begins, all necessary precautions should be carried out.

4.2.1. OSM installation requirements

Before starting the OSM installation, make sure that:

- The OSM main contacts are open,
- The control cable (umbilical) is disconnected
- The OSM umbilical socket cover is closed.

The mounting kit and surge arresters (depending on particular installation) should be installed according to procedure described in the Handling and Installation guide.

ATTENTION! The HV assembly lifting facilities should not come into contact with bushings, surge arresters or auxiliary VT bushing extensions.

ATTENTION! When installing the HV assembly, make sure that the connection to the line is performed according to the procedure described in the Handling and Installation guide.

4.2.2. RC5_3 installation

Before starting the RC installation, make sure that:

- The RC doors are closed,
- The control cable (umbilical) is disconnected,
- The RC umbilical socket cover is closed.

Figure 28

RC5_3 lifting provisions

4.2.3. Earthing requirements

ATTENTION! The OSM and RC5_3 should be connected to the same earthing bar using 12mm nuts and bolts tightened to 50 Nm. Do not violate this. For more details see the Handling and Installation guide.

Earthing points on the OSM and RC5_3 are shown below.

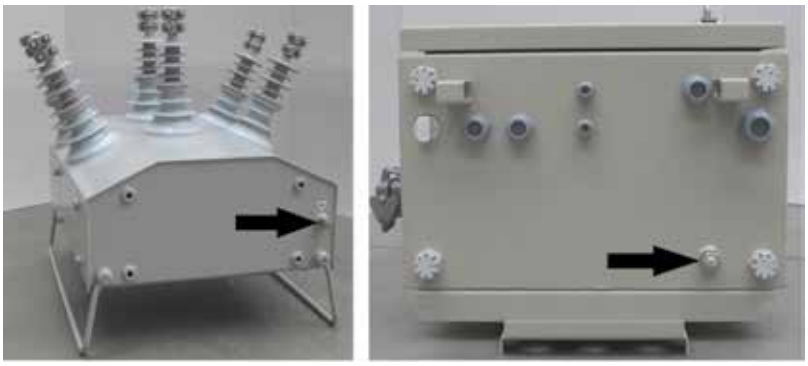


Figure 29

Earthing terminals position

ATTENTION! Make sure that the system impedance to ground is less than 5 ohms. System impedance to ground can be measured on site using special equipment or previously measured value for particular grounding bar can be provided by the utility. In case this requirement is not met – it may lead to death or injury to people during operation.

4.2.4. Connecting the RC5_3 to the auxiliary supply

ATTENTION! Auxiliary supply VT connection wire should not be earthed inside the VT secondary compartment.

Before the auxiliary supply from a pole mounted VT is connected to the RC5_3, resistance measurement should be performed. Switch digital Multi-meter to the Ohm metering mode and enable beeping signal. Connect one electrode to the earthing bar (with the connected VT base earthing bar) and second electrode to both connection wires (one by one or to both of them simultaneously). Resistance should be infinite, sound signal should not appear.

Resistance measurement is not performed in case an external AC/DC supply is used.

ATTENTION! Corresponding AC1 and AC2 earthing jumpers should be removed before external AC/DC source with predefined neutral is connected to the RC5_3

After the main line is powered, the commissioning engineer should make sure that the auxiliary supply is connected correctly. The auxiliary supply voltage should be checked by digital voltmeter.

For that purpose the RC5_3 battery switch should be set OFF, corresponding AC switch (both switches if two supply options is used) set ON.

Measured AC voltage at terminals 1-2 and 8-9 (in case two VTs are installed) should not exceed the limits of 85-265 V.

Connection terminals for the RC auxiliary power supply are shown below (Figure 30).

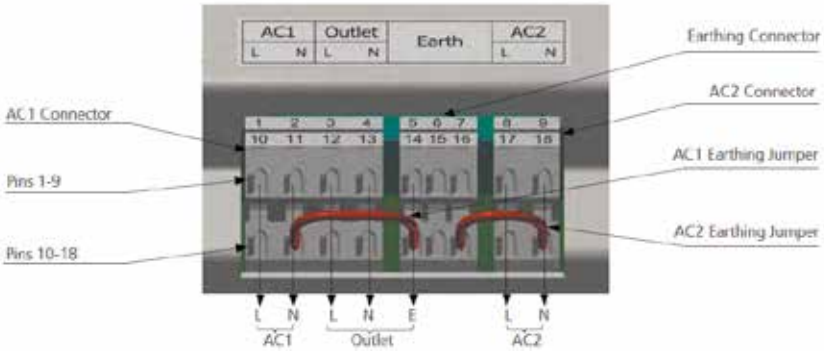


Figure 30

Auxiliary supply connections inside PSFM

4.3. Dismounting procedure

Protection device dismounting should be performed in reverse order to the installation procedure. All safety procedures and precautions should be applied accordingly. The integrity of the line should be restored in case the protection device is removed completely.

5. Commissioning

5.1. No-load tests

ATTENTION. Before powering the main line, the OSM should be in the OPEN position. The OSM shall be closed via the MMI only after the no-load tests are performed.

5.1.1. RC5_3 power supply check

Switch on the battery switch. Make sure that local time and date are correct. If date, time or both are incorrect connect to the RC via USB, Bluetooth or TDI (see "6.5. Other RC5_3 control options" for details) and synchronize date and time on your computer with the RTC of the RC using TELARM. Date and time is visible at the MMI screen.

Synchronize date and time procedure:
TELARM->On-line->Synchronize date and time

After that the commissioning engineer should make sure that the MMI menu navigation is OK, indication on the MMI is OK.

For each of the conditions described below check that MMI displays no errors and MMI LED function (Lockout LED, Mode – Local LED, State – Open LED, On or Off LED of each protection button, Active group – 1 LED)

- Battery switch is OFF, AC supply switch is ON;
- Battery switch is ON, AC supply switch is OFF;
- Battery switch is ON, AC supply switch is ON.

NOTE: Up to 60 s might be required for the RC5_3 circuits energizing.

5.1.2. Checking CVCS coefficients

Check that the CVCS coefficients in the RC5_3 settings correspond to the RTC.

CVCS coefficient indications:
MMI - > Main menu -> Settings -> System -> Measurement

To correct coefficients, connect to the RC via TELARM:
TELARM -> On-line -> Rec -> System settings -> System -> ME settings

Change "Wires to terminal connection" setting. Check that all other System settings in TELARM are correct for the particular device. How to upload settings is described in "6.6. Settings modifications".

5.1.3. Checking phase sequences

After powering the main line at the OSM OPEN state, the commissioning engineer should perform the PHASE SEQUENCE check-up. The negative sequence voltage (U2) should be less than 1kV.

Negative voltage sequence indication:
MMI -> Main menu -> Indication data -> Measurement -> U2

If the negative sequence voltage is observed, it is recommended to change the software setting (changing phase sequence System-Phase sequence).

Changing phase sequence:
TELARM -> On-line -> Rec -> System settings -> System -> Configuration -> Wires to terminal connection

Change “Wires to terminal connection” setting. Check that all other System settings in TELARM are correct for this particular device. How to upload the System settings is described in the “Operation” chapter.

5.2. On-load tests

After all No-load tests are executed, the main contacts can be closed (via the MMI, USB, Bluetooth or TDI).

Check that measurements of phase currents, power factors, active and reactive power etc. are correct:
MMI -> Main menu -> Indication data -> Measurement

6. Operation

6.1. Switching

6.1.1. Mechanical trip of switching module

NOTE! Operation of the mechanical trip hook should be done by means of high voltage operating rod for 15/25 kV live-line operations.

To trip the OSM mechanically, pull down the manual trip hook to the lockout position (Figure 31). In this position, the OSM is mechanically locked in the OPEN position and the actuator is electrically isolated. This prevents CLOSING (locally or remotely).

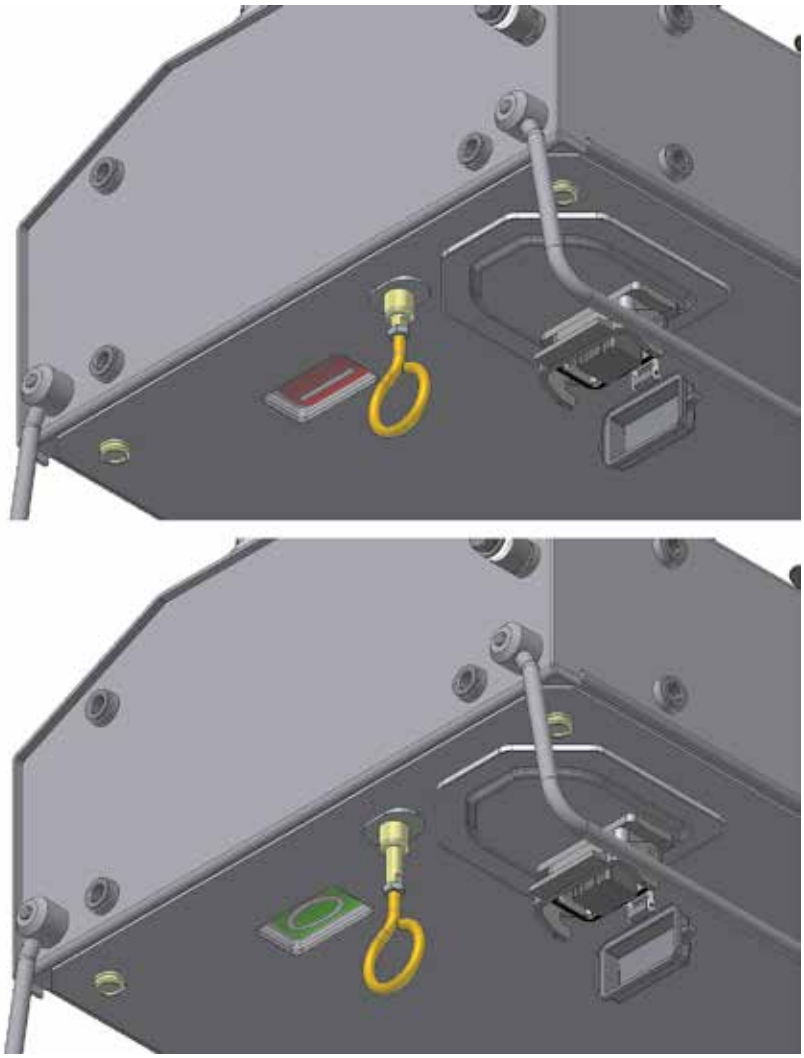


Figure 31

Mechanical trip of switching module

6.1.2. Operation via MMI

To operate the device via the MMI, change the mode of the protection device to "Local" by pressing the "MODE" button (Figure 32).

Local device mode indication is:
"Local" LED above the "MODE" button is active.

6.1.2.1. Tripping

To trip the switching module via the MMI, push the green button «O» (Figure 32).

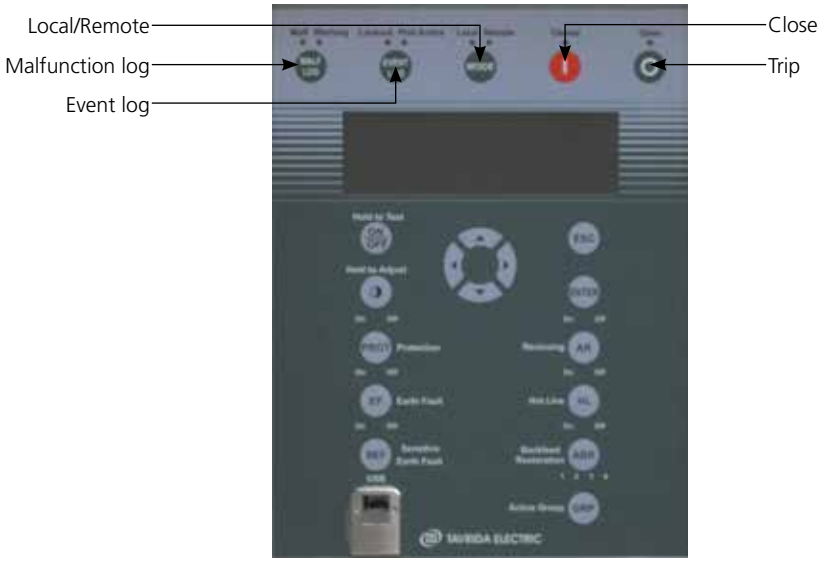


Figure 32

Switching module operation control via MMI

6.1.2.2. Closing

To close the OSM via the MMI, push the red button «1» (Figure 32).

NOTE! Make sure that the RC is in Local mode.

NOTE! Make sure that the manual trip hook is pushed back into the operating position. If it is not, change the mechanical trip hook position using the high voltage operating rod applicable for 15/25 kV live-line operations.

6.1.2.3. Delayed closing

The Rec15/25 functionality provides an option of delayed closing, meaning that after the close button is pushed the OSM will not be closed instantaneously, but after some delay. The corresponding setting is configurable in setup menu:
Main menu -> Settings -> System -> MMI -> Close delay.

You may stop delayed closing by pressing the ESC button.

6.1.2.4. Indication

The open state of the OSM main contacts is indicated via
- LED above "O" button
- mechanical position window on the OSM

The closed state of the OSM main contacts is indicated via
- LED above "1" button
- position window on OSM

6.2. Logging

6.2.1. Logs

From the control panel the following logs can be read:

- Event log (EL)
- Malfunction log (ML)

Other logs like Fault profile, Load profile, Communication log are available only using a PC via the PCI, TCI or TDI interfaces.

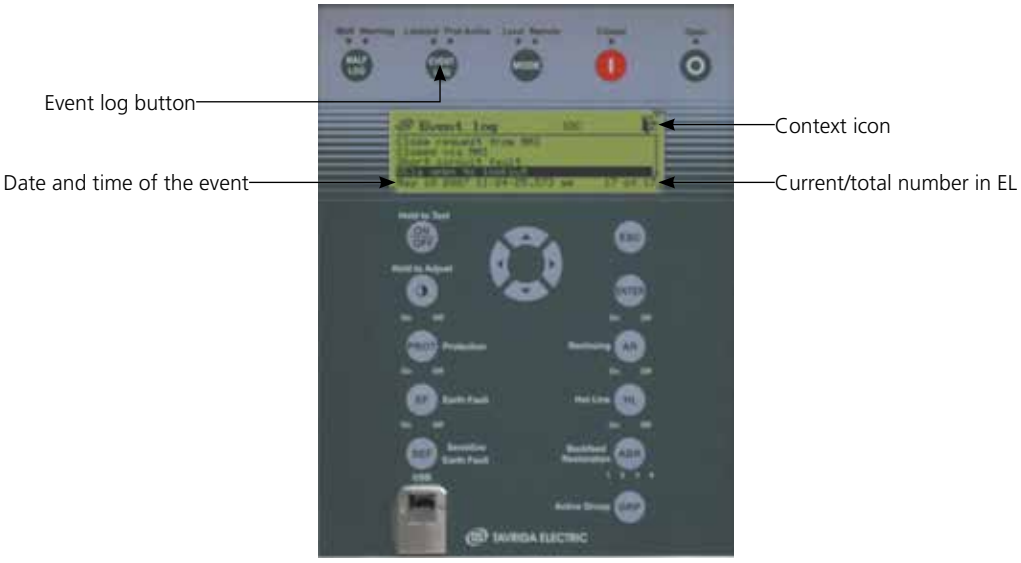


Figure 33

Event log via MMI

This screen (Figure 33) is a default one in case "Lockout" is present. Pressing the "Event Log" button provides transition to this screen from any menu.

To enter the EL via the MMI menu:
Main menu -> Indication data -> IDC -> Event log

The latest event is placed at the bottom of the list. Info about the number of the event in the list, time and date of the event is displayed on the screen.

To navigate in the EL, use arrow buttons. The "open door pictogram" marker in the top right corner of the screen means that additional info is applicable. To see this additional info, press the ENTER button, to go back to the EL menu press ESC button

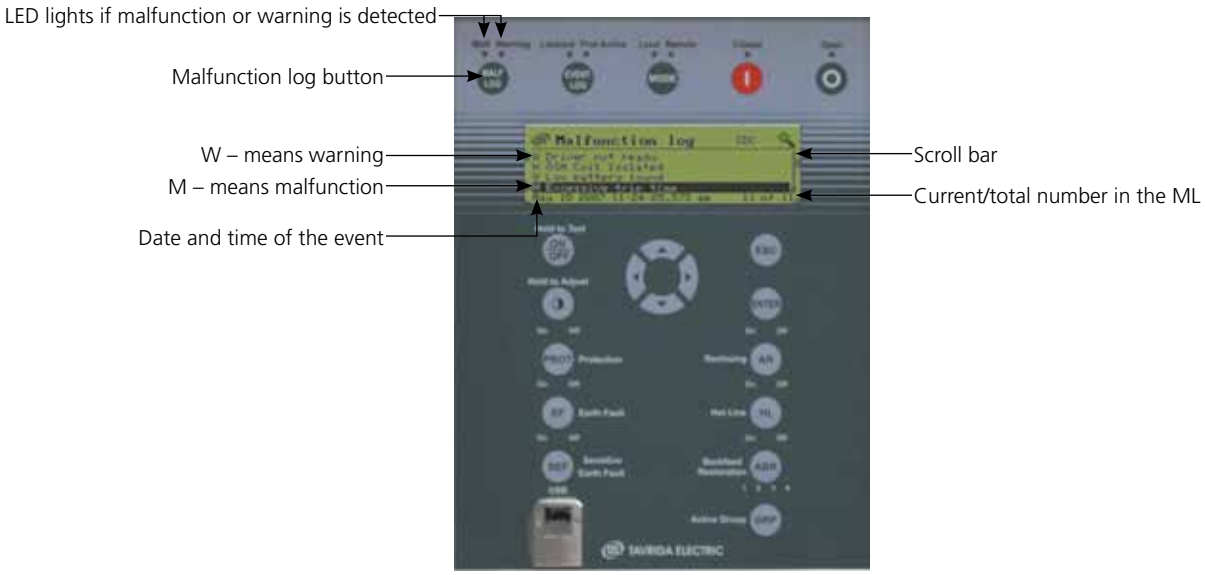


Figure 34

Malfunction log via MMI

This screen (Figure 34) is a default one in case LOCKOUT is absent and there are some unread events in the Malfunction log. Pressing the "Malfunctioning log" pushbutton provides transition to this screen from any menu.

To enter the ML via the MMI menu:
Main menu -> Indication data -> IDC -> Malfunction log

Some events have characters that classify events: "M" – malfunction or "W" - warning. A character is shown in the beginning of the event description string.

It is not possible to see the load profile via the MMI. Load profile step can be changed via the MMI.

To change Load profile step via the MMI:
Main menu -> Settings -> System -> IDC -> Load profile step

NOTE! It is only possible to erase all logs at once, single event removal is not possible.

To erase all readings in all logs, select corresponding function in the menu as shown below and confirm the action:
Main menu -> Control data -> Erase logs

6.2.2. Counters

From the control panel the following counters can be read:

- Protection counters
  Main menu -> Indication data -> IDC -> Protection counters

- Lifetime counters
  Main menu -> Indication data -> IDC -> Lifetime counters

- Log filling counters
  Main menu -> Indication data -> IDC -> Log filling counters

6.3. Measurements

All measurement data is available via the MMI menu
Main menu -> Indication data -> ME

6.4. Date and time settings

Time and date readings are available in every MMI menu.

Changing time and date settings:
Main menu -> Control data -> Set date and time

Daylight saving time settings:
Main menu -> Settings -> System -> RTC

6.5. Other RC5_3 control options

6.5.1. PCI – Personal Computer Interface

The PCI provides Indication and control via a PC (with installed TELARM software). The connection is established via the USB port located on the front the Control Panel Module (CPM), via RS-232 port #5 on the RCM or via a Bluetooth module (BTM).

The PCI provides the following control and indication functionality:
- Indication signals generated by PCI
- Uploading & Downloading of data via PC
- Uploading software via PC

To operate the recloser via the USB interface it is required to have:
A PC with
- Installed RC driver (follow the steps of automatic installer on your PC)
- Installed TELARM (can be provided by your local Tavrida Electric represenatative)
- Imported TELARM model for a particular project
- USB 2.0 Type A Male to Type B Male cable

To operate the recloser via a Bluetooth interface you need:
A PC with
- Installed RC driver (follow the steps of automatic installer on your PC)
- Installed TELARM (can be provided by your local Tavrida Electric represenatative)
- Imported TELARM model for particular project
- USB Bluetooth adapter

6.5.1.1. Connection establishment via USB

1. Connect the PC and the RC5_3 with Type A Male to Type B Male USB cable [1)]:
2. In TELARM settings chose menu:
   Main Menu -> Tools -> Options

[1)] **NOTE!** The USB cable is not in the standard scope of supply, however it can be ordered separately. Please contact the Tavrida Electric representative for details.

In the pop-up menu select “Communication” tab (see Figure 35):

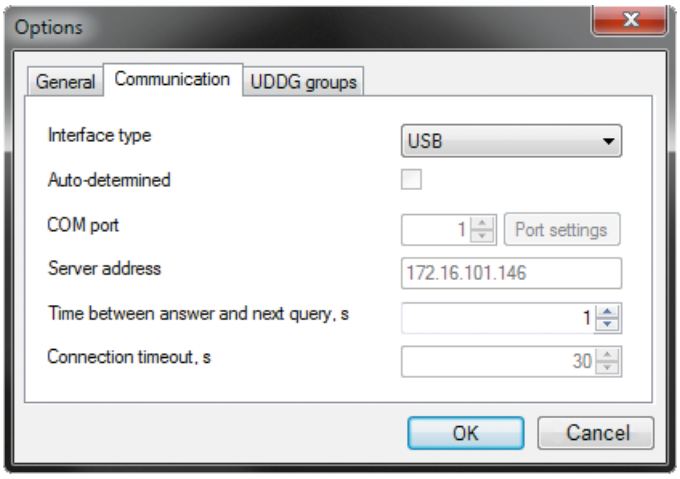


Figure 35

“Options” window

3. Set “Interface type” to USB;
4. Select protection device in TELARM scheme and choose:
   Main Menu -> On-Line -> Connect

6.5.1.2. Connection establishment via Bluetooth

To connect to the Rec15/25 via TELARM via Bluetooth:

1. Connect the PC and the RC using Bluetooth;

NOTE! To connect with the RC via the Bluetooth BTM mode should be enabled at the MMI:
Main menu -> Settings -> System -> Configuration -> BTM mode.

2. In TELARM settings chose menu:
   Main Menu -> Tools -> Options…

   Popup window will appear (see Figure 35);

3. Choose Communication settings
4. Set “Interface type” to Bluetooth;
5. Set Auto-determined COM port or choose appropriate COM port;
6. Select protection device in TELARM scheme and in TELARM main menu choose:
   Main Menu -> On-Line -> Connect

6.5.1.3. Operation

NOTE! Operation via PCI is possible in “Local” mode only. Current operation mode can be verified on the MMI.

NOTE! System status and logs are automatically downloaded to TELARM after the RC5_3 is connected via PCI.

After PCI connection is established, the following commands can be executed from TELARM:

- Upload settings to the device (see chapter Settings):
  Main Menu -> On-Line -> Upload settings to the device…

- Download settings from the device (see chapter Settings):
  Main Menu -> On-Line -> Download settings from the device…

- Trip:
  Main Menu -> On-Line -> Trip…

  Command is duplicated by button on toolbar

- Close command:
  Main Menu -> On-Line -> Close…

  Command is duplicated by button on toolbar

  NOTE! The confirmation popup window will appear after a Trip/Close command is requested (see Figure 36)

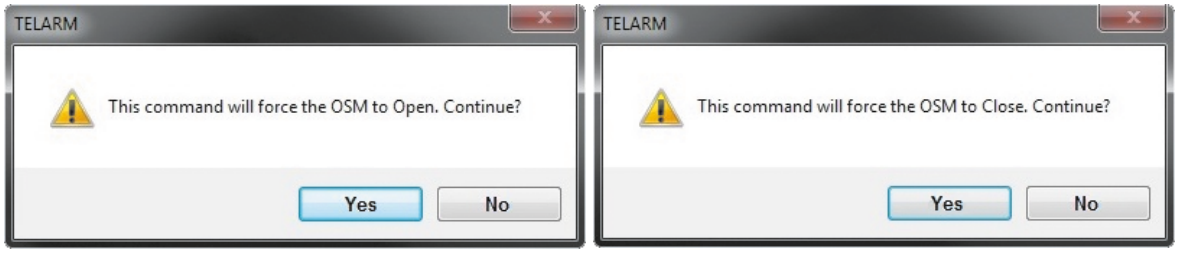


Figure 36

Confirmation window of Trip/Close command

Upon confirmation, the command will be sent to the controller.

- Switch protection state or particular element[1)] ON/OFF (see Figure 37):
  Main Menu -> On-Line -> Switch element On/Off -> Prot on…

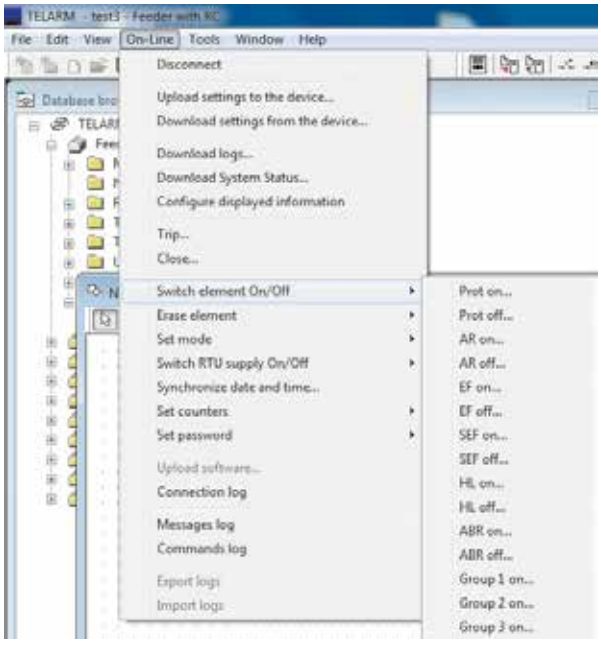


Figure 37

Switching protection state or particular element ON/OFF

- Synchronize date and time:
  Main Menu -> On-Line -> Synchronize date and time…

  NOTE! The confirmation popup window will appear after the Synchronize date and time command is requested (see Figure 38)

[1)] For protection elements description please refer to Product guide

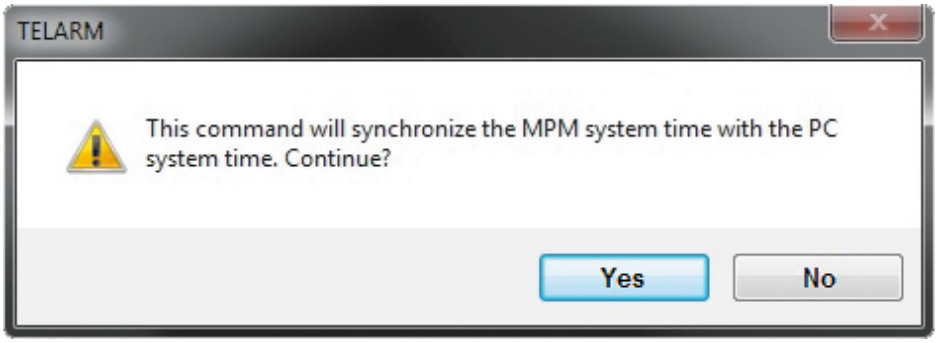


Figure 38

Confirmation window of date and time sincronization

Upon confirmation, the command will be sent to the controller.

- Upload software:
  Main Menu -> On-Line -> Upload software…

NOTE! After "Upload software" is selected, the pop-up browser menu will appear. Use this menu to select the appropriate firmware [1)] to be uploaded to the RC (see Figure 39)

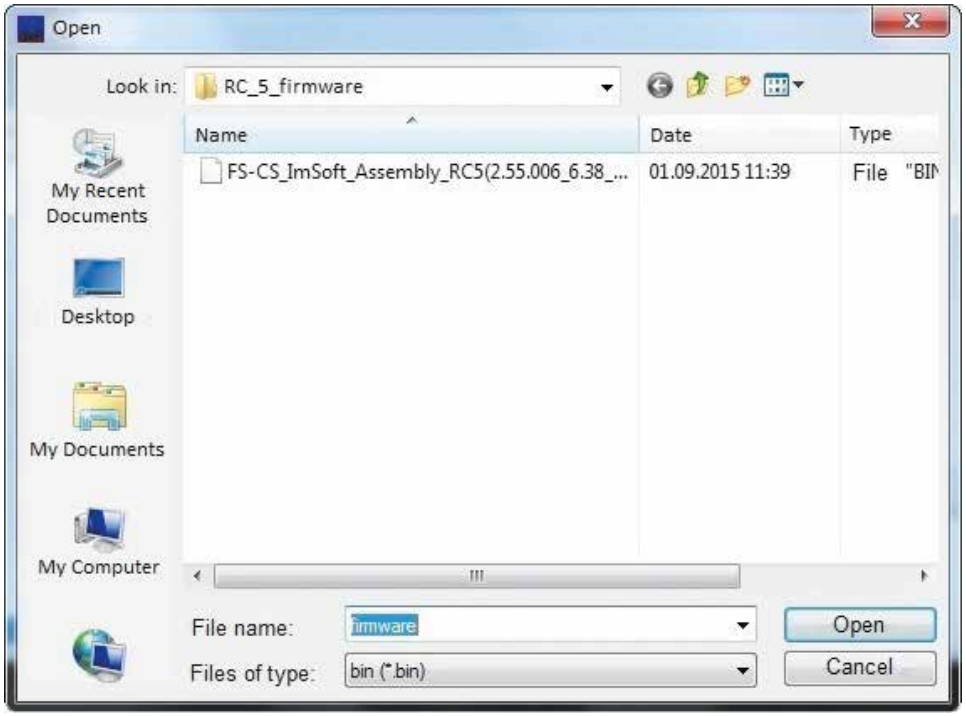


Figure 39

Firmware selection window

Uploading process will start automatically after firmware file is selected.

NOTE! It is possible to upload firmware via USB in Local mode only.

NOTE! The settings may change after a firmware update. Check that Protection, Communication and System settings are correct after updated firmware is uploaded to the controller.

ATTENTION. Operation via USB is possible in Local mode only.

[1)] Appropriate firmware is a approved by Tavrida Electric RC5_3 firmware version. To clarify which firmware is suitable contact your local Tavrida Electric representative.

6.5.2. TELARM Dispatcher Interface (TDI)

6.5.2.1. Connection establishment

It is possible to connect an external modem to be used for remote communication and control using TELARM Dispatcher Interface (TDI) system.

To establish a TDI connection it is required to have:

A PC with
- Installed TELARM (can be provided by your local Tavrida Electric represenatative);
- Access to the internet;

Installed Internet Server on a PC with static IP
- Corresponding certificate in TELARM root folder

Appropriate configuration for all objects mentioned above

NOTE! Access to an internet server can be established via different ways which could be provided by Tavrida Electric technical representatives. So far, all connections via TDI were provided completely or partially by Tavrida Electric technical representatives.

Remote connection and operation are possible only in case the corresponding TELARM model is imported to the computer and connection between the PC and the RC via Internet Server is established.

The communication system architecture for protection devices is shown in Figure 40.

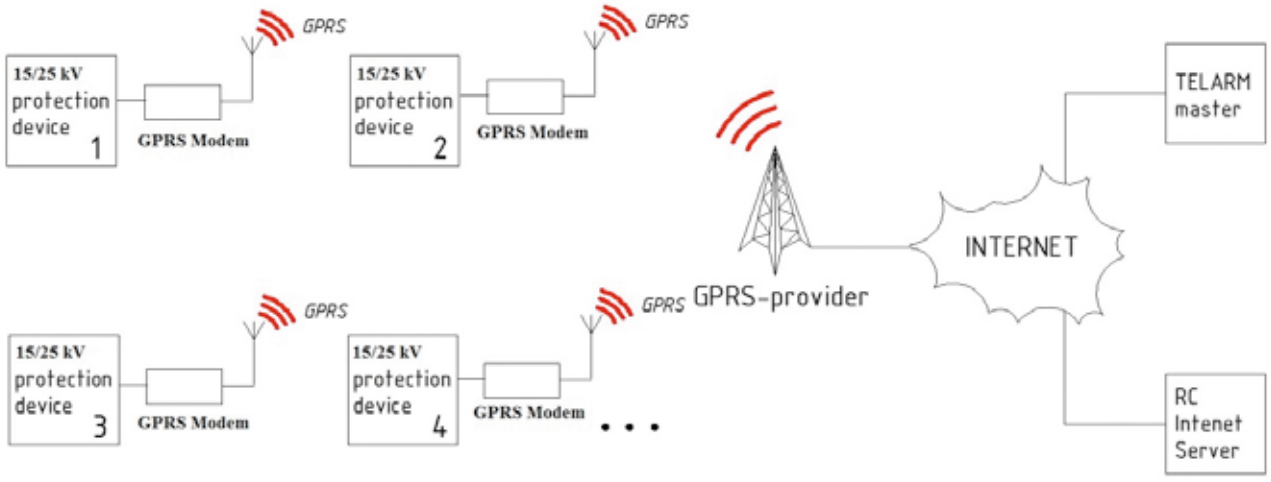


Figure 40
TDI communication architecture

TELARM connection procedure over TDI is described below:

NOTE! The following actions will be successful in case the Internet server, the RC and the PC settings are correct.

- Check that your PC has connection to Internet;
- In TELARM settings chose menu:
  Main Menu -> Tools -> Options…

A popup window will appear (see Figure 35);

- Choose Communication settings;
- Set “Interface type” to Internet;

- Enter server address corresponding to Internet Server IP address.
- Select protection device in TELARM scheme and choose:
  Main Menu -> On-Line -> Connect

6.5.2.2. Operation

NOTE! Operation via the TDI is possible in "Remote" mode only. Current operation mode can be verified on the MMI.

After the TDI connection is established, the following commands can be executed from TELARM:

- Upload settings to the device (see chapter Settings):
  Main Menu -> On-Line -> Upload settings to the device…

- Download settings from the device (see chapter Settings):
  Main Menu -> On-Line -> Download settings from the device…

- Download logs:
  Main Menu -> On-Line -> Download logs…

- Download system status:
  Main Menu -> On-Line -> Download System Status…

- Trip:
  Main Menu -> On-Line -> Trip…

  Command is duplicated by button  on toolbar

- Close command:
  Main Menu -> On-Line -> Close…

  Command is duplicated by button  on toolbar

  NOTE! After a Trip/Close command request, a popup window will appear (see Figure 36)

  Upon confirmation, the command will be sent to the controller.

- Switch protection state or particular element [1)] ON/OFF (see Figure 37)
  Main Menu -> On-Line -> Switch element On/Off -> Prot on…

- Synchronize date and time command:
  Main Menu -> On-Line -> Synchronize date and time…

  NOTE! After a Synchronize date and time command request, a popup window will appear (see Figure 38)

  Upon confirmation, the command will be sent to the controller.

[1)] For protection elements description please refer to Product guide

6.6. Settings modifications

6.6.1. Protection settings modifications

6.6.1.1. Downloading protection settings

To download protection settings from the device, make sure that TELARM connection is established.

To download protection settings:

1) Single click on the device in TELARM scheme;
2) In "On-Line" menu click "Download settings from the device…" (see Figure 41)

After protection settings are downloaded:

3) The successful downloading reading will appear in Connection log in case connection was established via PCI or in Massages log in case connection was established via TCI (Figure 41).
4) Click the button next to the "Protection settings downloaded" line to open "Recloser settings" window
5) In "Recloser settings" window double click on "Group 1" (or other protection group) to open "Protection settings" window
6) For convenience, it is possible to hide or show protection element settings by using "+" and "–" buttons. It is possible to display the TCC by pushing the TCC button.
   NOTE! The settings that are downloaded from the device are pale grey and cannot be changed.

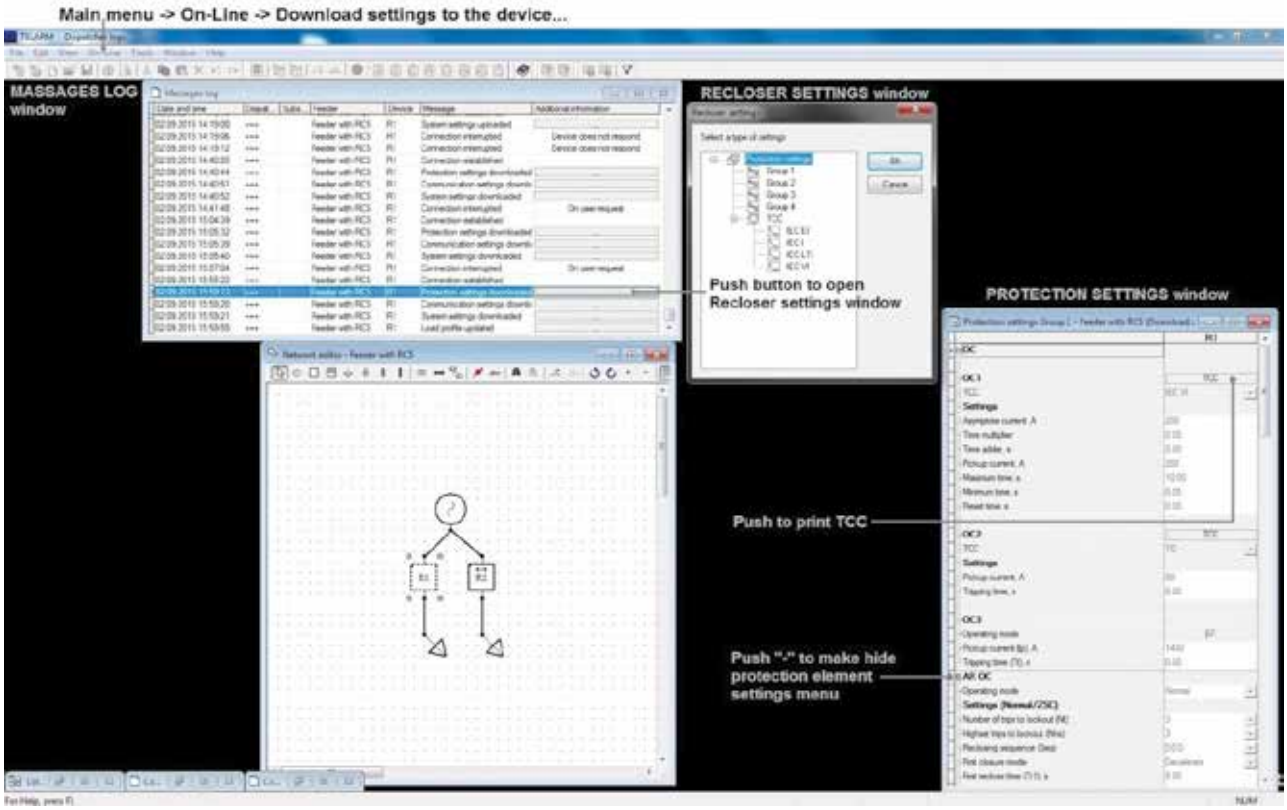


Figure 41

Downloading protection settings via TELARM.

6.6.1.2. Protection settings modification

Protection settings can be changed locally (via the MMI or the PCI) or remotely via the TDI interface.

Protection settings modifications using the MMI:

Main menu -> Settings -> Protection -> Group #

Protection settings can be changed in each protection group independently.

NOTE! To apply updated settings it is required to upload them to the controller. Uploading settings is described in "Uploading protection settings".

To edit protection locally (PCI) the following actions should be performed:

1) Open the model in the database where settings shall be changed (Figure 42)
2) Double click on "Group 1" submenu (or other protection settings group) of the model
   Database browser -> Model -> Protection settings -> Group 1

3) "Protection settings" window will popup

After "Protection settings window Group 1" (or other protection settings group) appears it is possible to:

1) Change protection settings;
2) For your convenience you may hide or show protection element settings by using "+" and "–" buttons. You may plot the TCC curve of the protection element by pushing the TCC button (Figure 42).

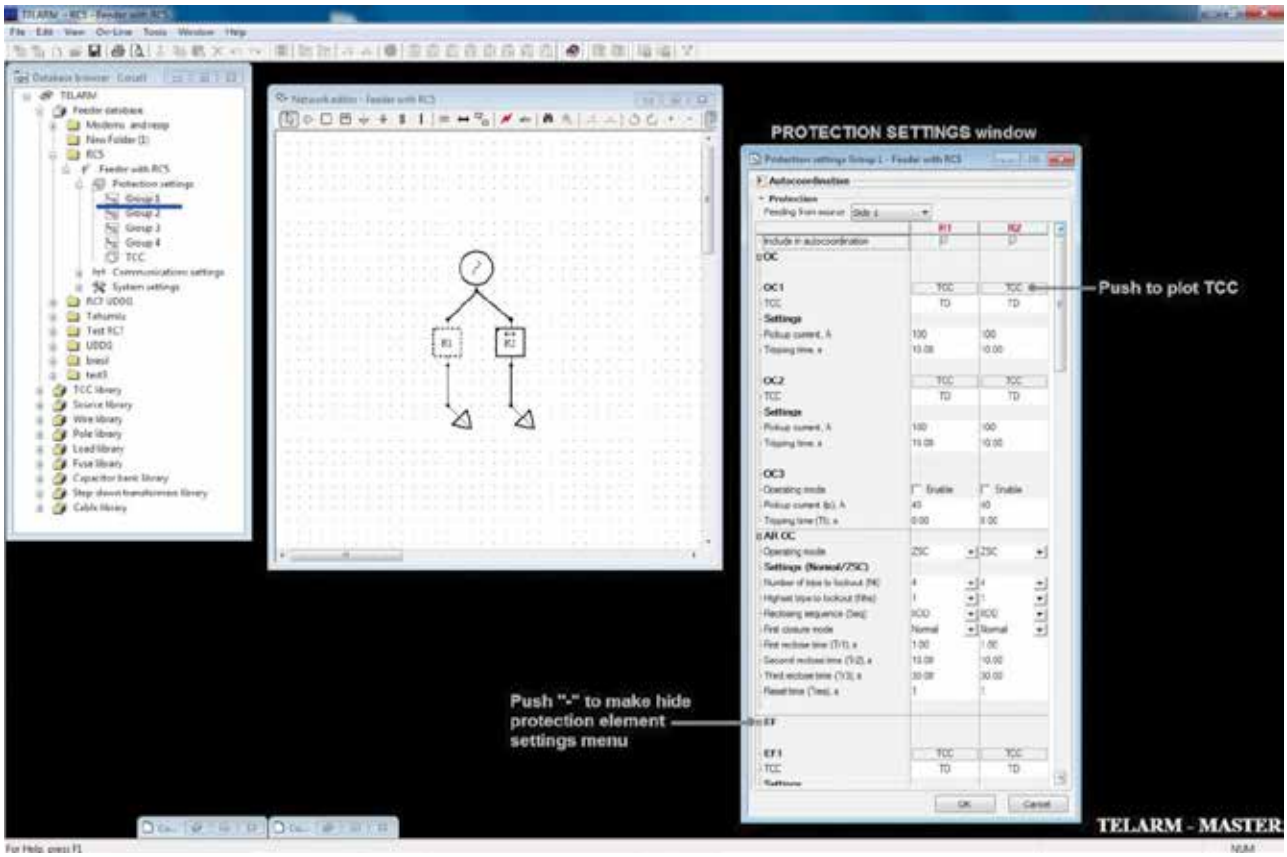


Figure 42

Changing protection settings via TELARM.

6.6.1.3. Uploading protection settings

To upload protection settings to the device, make sure that you are connected to it.

To upload protection settings to the controller using TELARM interface it is required to mark settings as "Approved". To approve settings:

1) Right click on the submenu "Protection settings" in Database browser and choose "Mark as Ready" (Figure 43);
2) Right click on the same submenu and choose "Mark as Approved";
3) The green "V" sign will appear near the submenu after successful approval.

Approved protection settings can be uploaded to the device:

4) In "On-Line" menu click "Upload settings to the device…" (Figure 43);
5) The reading "Protection settings uploaded" will appear in the Connection log after successful uploading if settings were uploaded via PCI. "Communication settings uploaded" will appear in Messages log if settings were uploaded via TDI;
6) It is possible to check correctness of the uploaded settings by pushing the button near the reading in Connection log if protection settings were uploaded via PCI or in Messages log if protection settings were uploaded via TDI.

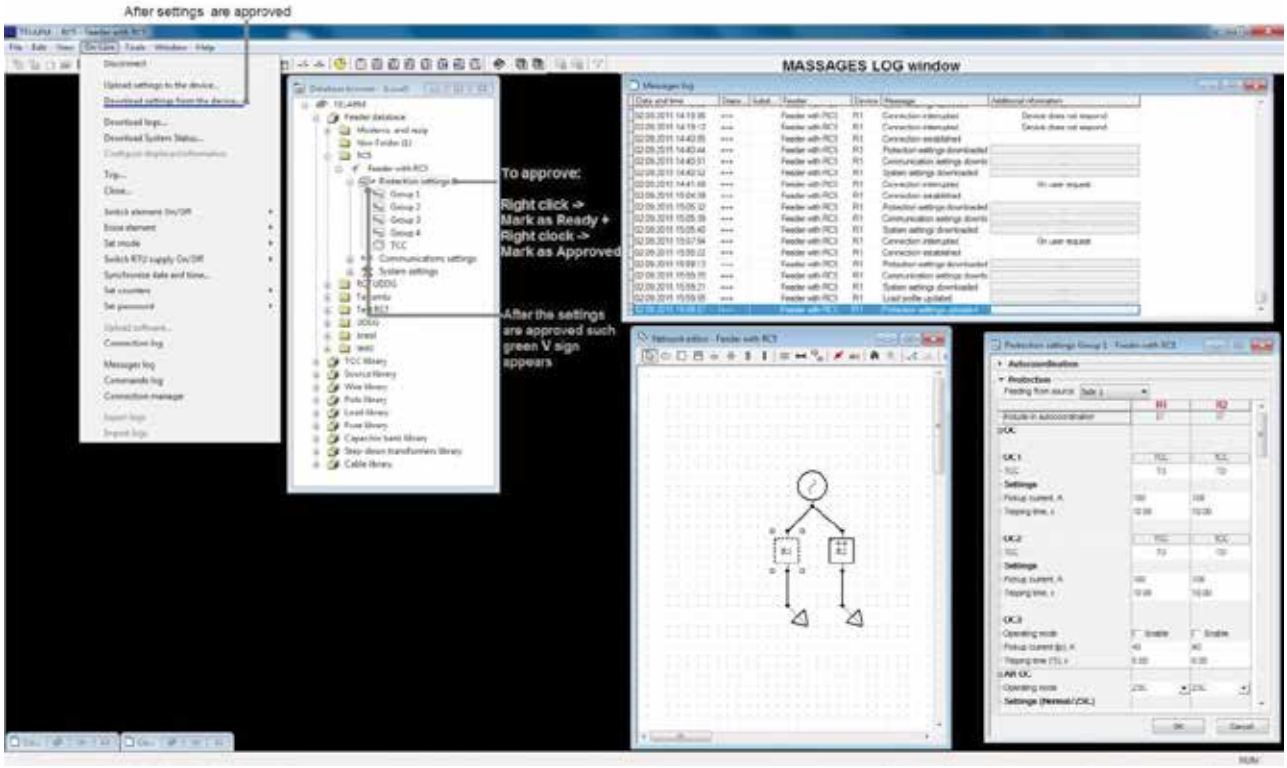


Figure 43

Uploading protection settings via TELARM.

6.6.2. Communication settings modifications

In general, to modify settings it is recommended to follow the following procedure:

1) Download latest settings from the device;
2) Modify downloaded settings (alternatively, settings can be created from scratch);
3) Upload modified settings back into protection device.

The same settings can be uploaded to multiple devices, however, every Rec15/25 needs to have a unique serial number, slave number for SCADA, etc.

6.6.2.1. Downloading communication settings

To download communication settings:

1) Connect to the device (refer to 6.5.1.1, 6.5.1.1 or 6.5.3.1 depending on interface)
2) Select the device on the TELARM;
3) Select "Main Menu -> On-Line -> Download settings from device" (Figure 44).

When settings are downloaded, corresponding reading will appear in logs:

- In "Connection log" if downloaded via the PCI (see Figure 44);
- In "Messages log" if downloaded via the TDI (see Figure 45).

4) To open "Recloser settings" window, click the button next to the line "Communication settings downloaded" in "Messages log" (or "Communication settings downloaded" in Connection log).

NOTE! Communication settings downloaded from the device are highlighted in pale grey and cannot be changed directly in the "Recloser settings" window. To change the settings refer to clause 6.6.2.2 of this guide.

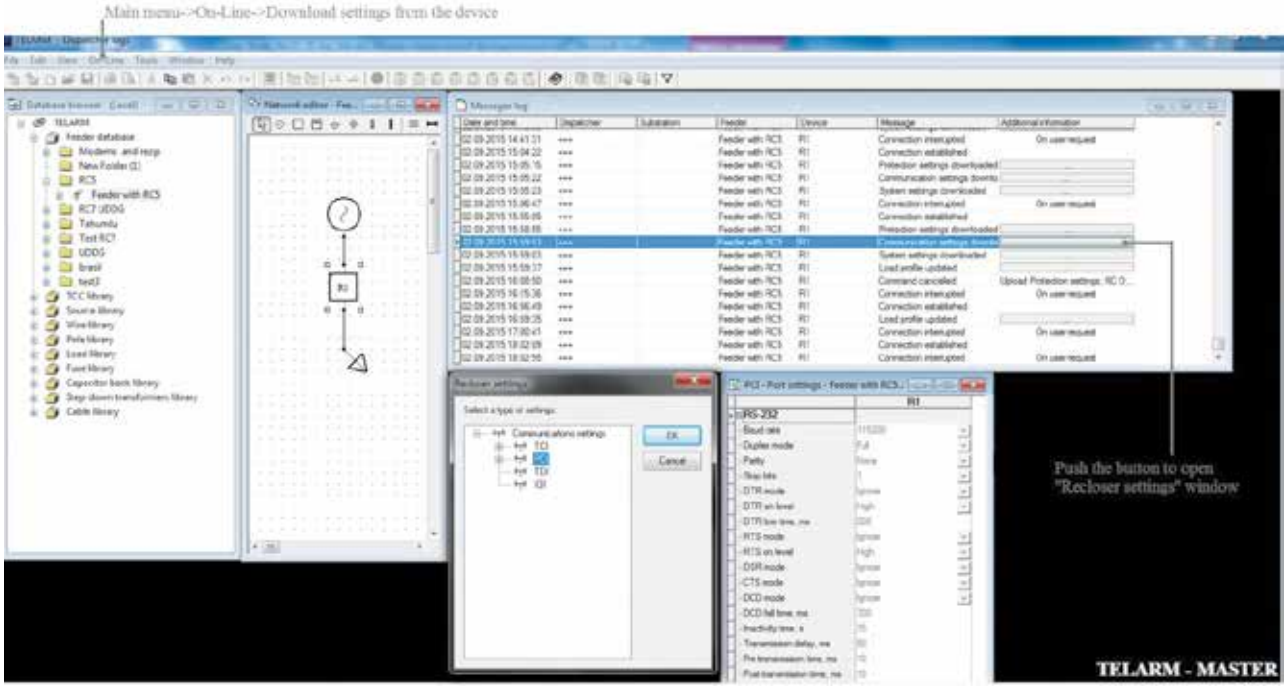


Figure 44

Downloading communication settings via PCI in TELARM.

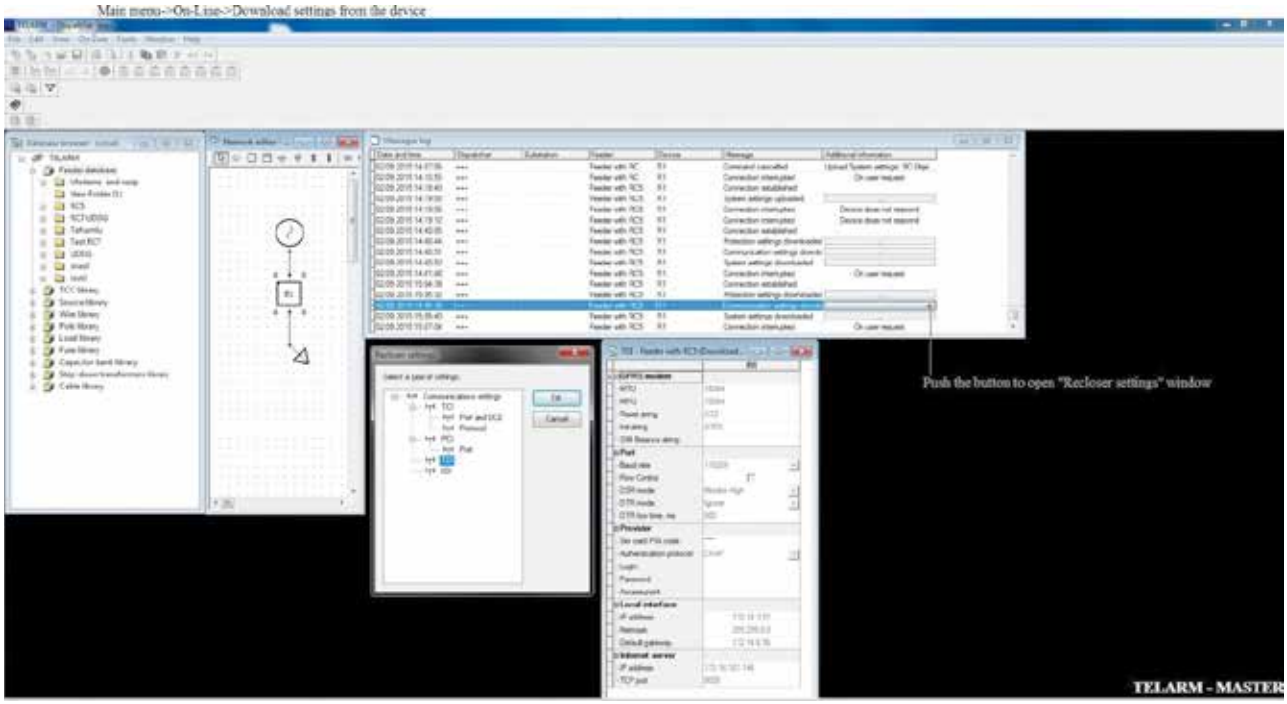


Figure 45

Downloading communication settings via TDI in TELARM.

6.6.2.2. Changing communication settings

Communication settings can be changed locally (via the MMI or PCI) or remotely via the TDI.

NOTE! If RC communication settings are changed, settings on the TELARM dispatcher PC shall be changed correspondingly.

Communication settings modifications using the MMI:
Main menu -> Settings -> Comms settings -> TDI settings

NOTE! To apply modified settings, uploading them to the controller is required (refer to clause 6.6.2.3 of this guide).

To open the TDI settings menu and change settings via local connection (USB or Bluetooth) the following procedure should be executed:

3) In Database browser, open the appropriate network model (Figure 46);
4) Double click on the submenu "TDI"
   Database browser -> Model ->Communication settings->TDI;

5) The corresponding communication settings window will popup. Alternatively, open it directly from the logs menu as described in previous chapter.
   The TDI settings can be changed in the applicable range.

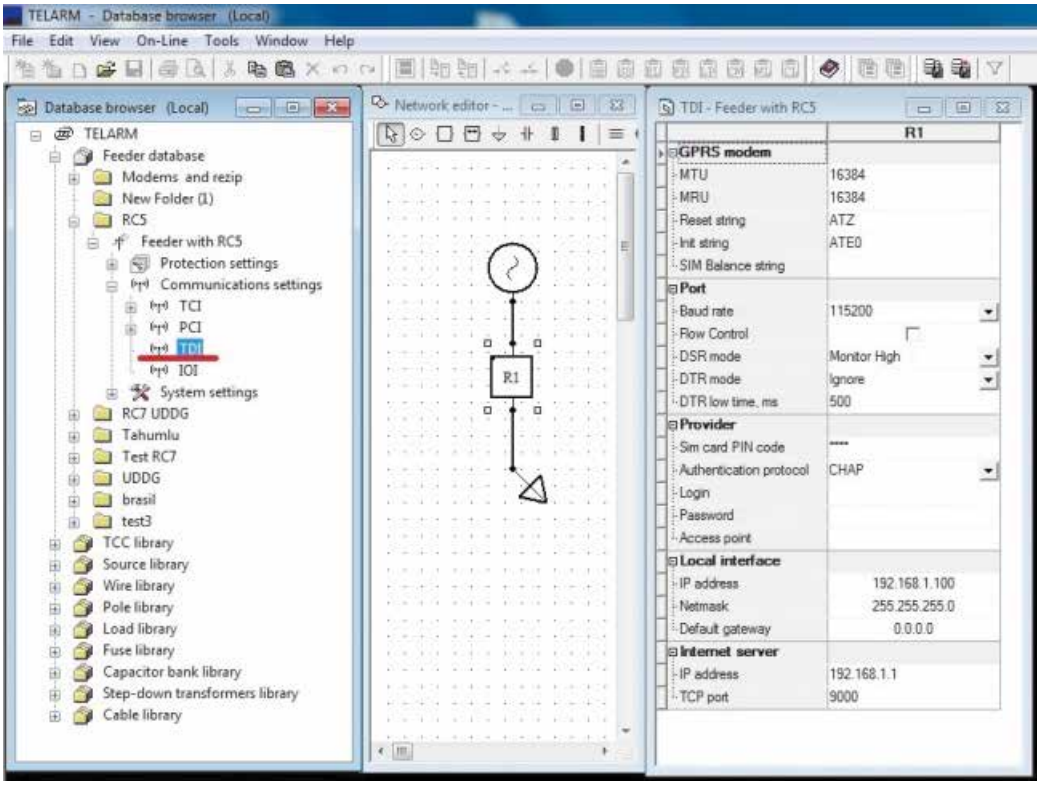


Figure 46

Changing communication settings via TELARM.

6.6.2.3. Uploading communication settings

1) Connect to the device (refer to 6.5.1.1, 6.5.1.1 or 6.5.3.1 depending on interface).
2) Mark modified settings as "Approved" in TELARM.

To approve settings:

- Right click on the submenu Communication settings in Database browser and select "Mark as Ready" (Figure 47);
- Right click on the same submenu and choose "Mark as Approved";
- After successful approval, the submenu will be marked with green "V" sign.

3) Select "Upload settings to the device" in "On-line menu"
Main menu -> On-Line -> Upload settings to the device;

4) When settings are uploaded, the corresponding reading will appear in logs:
   - in "Connection log" if downloaded via PCI (see Figure 44)
   - in "Messages log" if downloaded via TDI (see Figure 45);

5) To check the correctness of settings, press the button next to the line in "Connection log" (PCI interface) or "Messages log" (TDI interface).

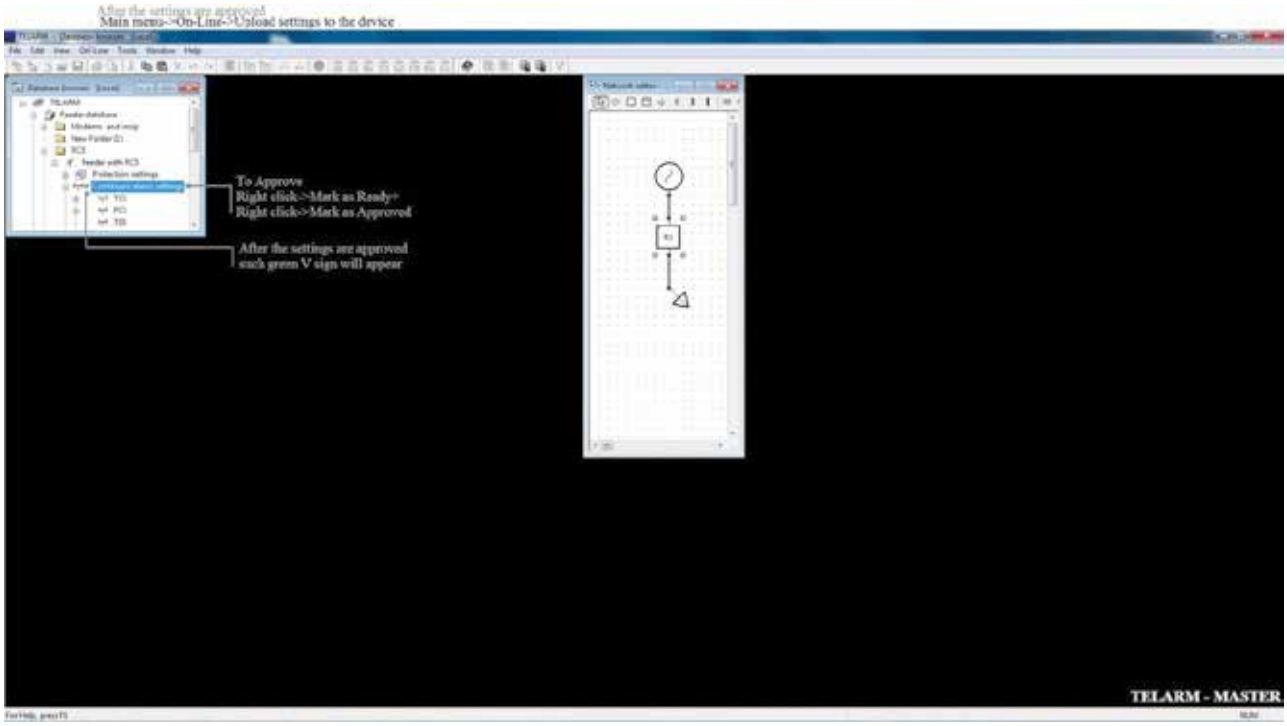


Figure 47
Uploading communication settings via TELARM

7. Maintenance and troubleshooting

7.1. Maintenance

The Rec15/25 is a maintenance free device. No regular maintenance operations are required during the entire period of operation.

7.2. Troubleshooting

NOTE! In case the actions listed below do not help, contact your nearest Tavrida Electric representative.

WARNING! All replacement operations of the HV assembly equipment require power line de-energizing. All necessary precautions (visible line gaps, temporary groundings etc.) should be applied.

7.2.1. PCI CONNECTION PROBLEMS

NOTE! In case there are problems connecting to the device via the PCI interface check the following.

Possible reason	Malfunction identification procedure	Corrective action
RCM is shutdown	Check that secondary power supply switches are in ON position Check the voltage on power supply inputs of the RCM The voltage shall be in the range 85-265 V.	In case the voltage at the secondary power supply inputs of the RCM is absent, find the reasons of the malfunction similar to "Loss of auxiliary supply" described in paragraph labeled Loss of AC supply
Improper connection to Rec15/25 via PCI	Check the connection according to chapter 6.5.1 of this guide	It is no malfunction
RCM malfunction	The most likely reason for malfunction in a control cubicle if no other reason was identified.	Replace the RCM

7.2.2. CPM malfunction

NOTE! If it is possible to connect to the device via the PCI interface but the CPM doesn't work properly, check the following.

Possible reason	Malfunction identification procedure	Corrective action
Low or no contrast of the screen	Check if LEDs on the CPM are lit Check if the screen lights but no readings are visible Push the button "Contrast" several times till the readings become clearly visible	It is no malfunction
The CPM mode is disabled via PCI	Download System settings from the RCM. Check in section "Configuration" the CPM mode The CPM mode is disabled if the check box is not ticked	Activate CPM mode via PCI
Improper connection of plugs connecting the CPM and the RCM	Check the connection of the plug "1" and plug "19"	Provide reliable connection of the plugs "1" and "19"
RCM malfunction	Connect new CPM via new wiring to the RCM If the new CPM with new wiring doesn't work properly it is most likely a malfunction of the RCM	Replace the RCM
Malfunction of wiring connecting the RCM and the CPM	If the new CPM with new wiring works properly, replace the new wiring with the old one If the new CPM doesn't work properly with the old wiring it is a wiring malfunction	Replace wiring
CPM malfunction	If the new CPM works properly with the old wiring it is CPM malfunction	Replace the CPM

7.2.3. Active malfunctions

Replacing procedure for components is described in paragraph "7.3. Rec15/25 components replacing procedures"

7.2.3.1. RCM fault

Possible reason	Malfunction identification procedure	Corrective action
Internal fault of the RCM.	None	Replace the RCM

7.2.3.2. Driver fault

Possible reason	Malfunction identification procedure	Corrective action
Internal fault of the driver module.	None	Replace the RCM

7.2.3.3. IOM fault

Possible reason	Malfunction identification procedure	Corrective action
Internal fault of the Input/Output module	None	Replace the IOM. If the new IOM does not work as well, replace the RC together with the IOM

7.2.3.4. RTU short circuit

Possible reason	Malfunction identification procedure	Corrective action
Internal RTU short circuit	Disconnect the RTU from the power supply Turn the RTU supply on via the MMI If signal disappears short circuit is inside the RTU	Replace RTU
Short circuit in the wires connecting RTU and RCM	If the signal does not disappear disconnect Plug "10" If the signal disappears the short circuit is in the wiring between the RTU and the RCM	Replace the wiring
RCM malfunction	If the signal does not disappear the problem is in the RCM	Replace the RCM

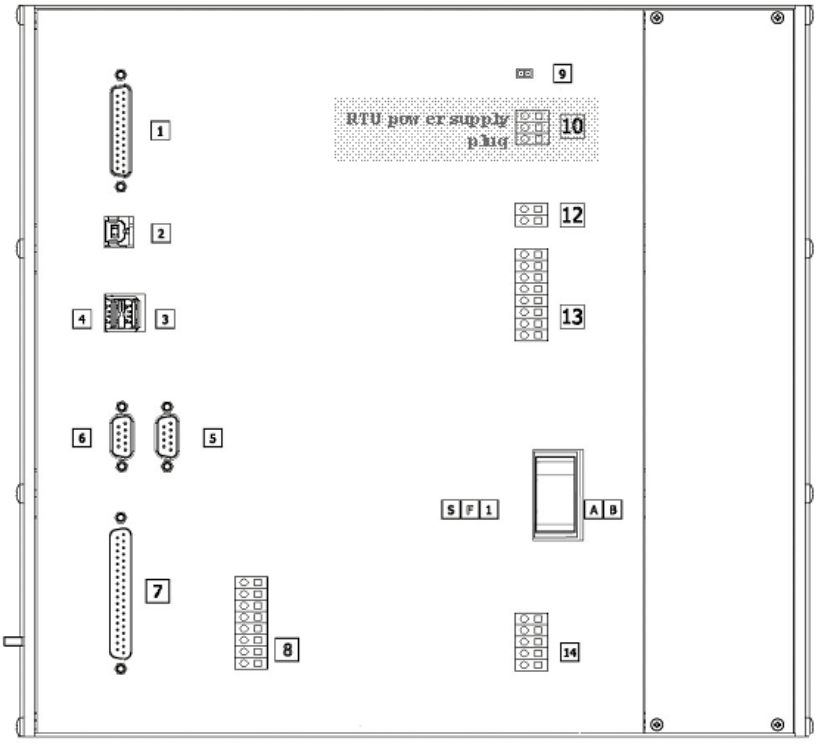


Figure 48
RCM RTU power supply plug

NOTE! Wire numbers shall comply with the numbers of the socket.

7.2.3.5. Loss of AC supply

Possible reason	Malfunction identification procedure	Corrective action
Auxiliary transformer malfunction	Check the voltage at the power supply input terminals (see Figure 49) If the voltage is less than 85 V it is a malfunction of the auxiliary transformer	Check the auxiliary transformer and its wiring, fix the malfunctioning component
PSFM malfunction	If the voltage is between 85-265 V, check the voltage at the RCM input (see Figure 50) If the voltage is less than 85 V, the malfunction is in the PSFM	Replace PSFM
RCM malfunction	In case the voltage at the RCM inputs is between 85-265 V it is an RCM malfunction	Replace the RCM

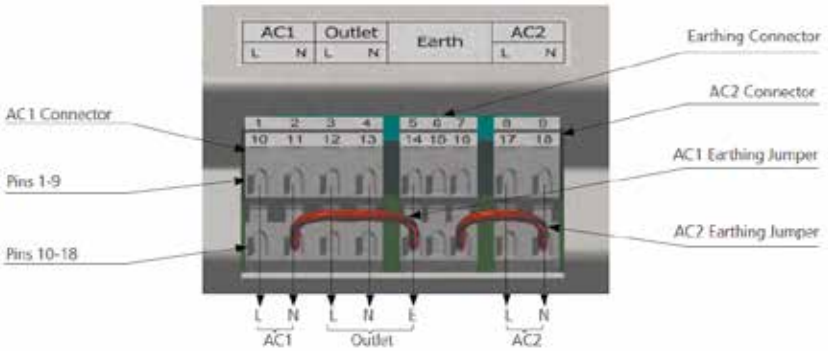


Figure 49

Auxiliary supply connections inside PSFM

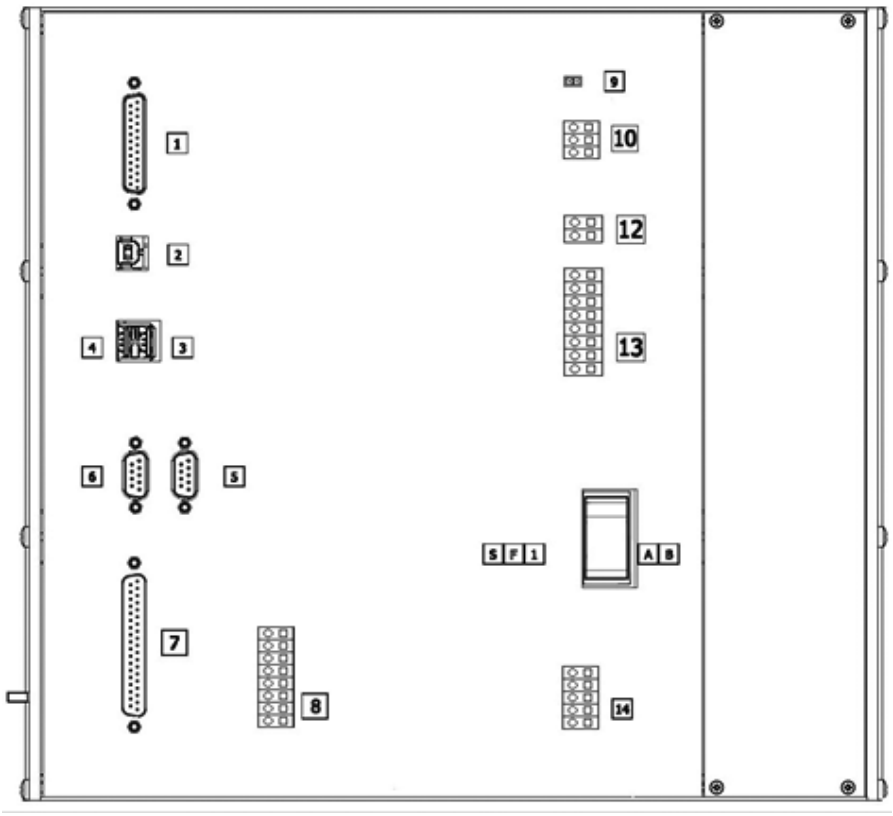


Figure 50

RCM auxiliary supply connections

7.2.3.6. Battery fault

Possible reason	Malfunction identification procedure	Corrective action
The battery is disconnected by the battery switch	Check if the battery switch is in the ON position Check that the battery is properly connected to the RCM. Plug "13" wires 1(+) and 2(-) Check the wiring connection to the battery terminals. "+" terminal = wire with "+" mark "-" terminal = battery sensor In case signal disappears you have located the problem	Turn the battery switch to ON position. Provide reliable connection of wiring
Wiring malfunction	Disconnect the wiring from the RCM. Plug "13" wires 1(+) and 2(-) Disconnect the wiring from the battery Wires marked "+" and "-" Check that switch and wiring is not short circuited or broken. NOTE! Reconnect the wiring properly after the tests are done	Replace the wiring assembly
Internal fault of the battery	If none of the above described reasons were confirmed it is likely to be an internal battery fault	Replace the battery

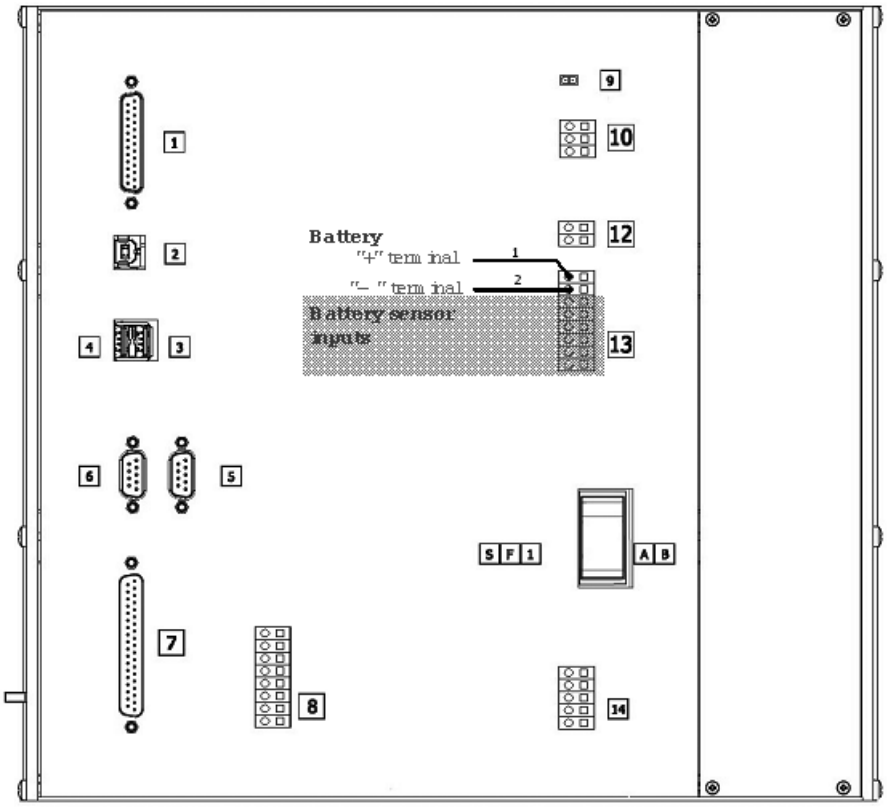


Figure 51

RCM battery and battery sensor inputs Plug "13"

NOTE! Wire numbers comply with the numbers of inputs in the plug.

7.2.3.7. Battery sensor fault

Possible reason	Malfunction identification procedure	Corrective action
Battery sensor wiring is not properly connected to the RCM	Check the battery sensor wiring connection to the RCM Plug "13", wires 3,4,5,6,7,8	Provide reliable connection of the battery sensor
Failure of battery temperature sensor	If none of the above described reasons were confirmed it is likely a battery temperature sensor fault	Replace the wiring assembly

7.2.3.8. Excessive trip time event

Possible reason	Malfunction identification procedure	Corrective action
OSM coil short circuit	Check if the reading in the malfunction log "OSM coil short circuit" is present	Refer to 7.2.3.11
OSM coil open circuit	Check if the reading in malfunction log "OSM coil open circuit" is present	Refer to 7.2.3.10
Driver is not ready	Check if the malfunction "Driver is not ready" is present Wait for 1 min and open the OSM	The "Excessive trip time malfunction" will disappear
RCM malfunction	Switch off the RC5_3 and battery Disconnect plug "8" from the RCM Disconnect wire 7 and 8 from plug "8" Short circuit inputs 7 and 8 of plug "8" by a short piece of insulated wire. See Figure 52 Connect plug "8" to the RCM Switch on RC5_3 and battery The indication of the main contact position should change to "Open" If the indication doesn't change to "Open" the malfunction is in the RCM	Replace the RCM
Open circuit in Control Cable	If RCM replacement doesn't help: Switch off the RC5_3 and the battery Disconnect "8" plug from the RCM Disconnect the control cable from the RC5_3. Disconnect the control cable from the OSM Short circuit pins 22 and 29 of the heavy duty connector of the control cable (OSM side) as it is shown in Figure 53 Connect the control cable to the RC5_3 Connect plug "8" to the RCM Switch on the RC5_3 and battery The indication of the main contacts position should change to "Open" If the indication doesn't change to "Open" the malfunction is in the control cable	Replace the control cable
OSM malfunction	If none of the above described actions helped it is an OSM malfunction	Replace the OSM

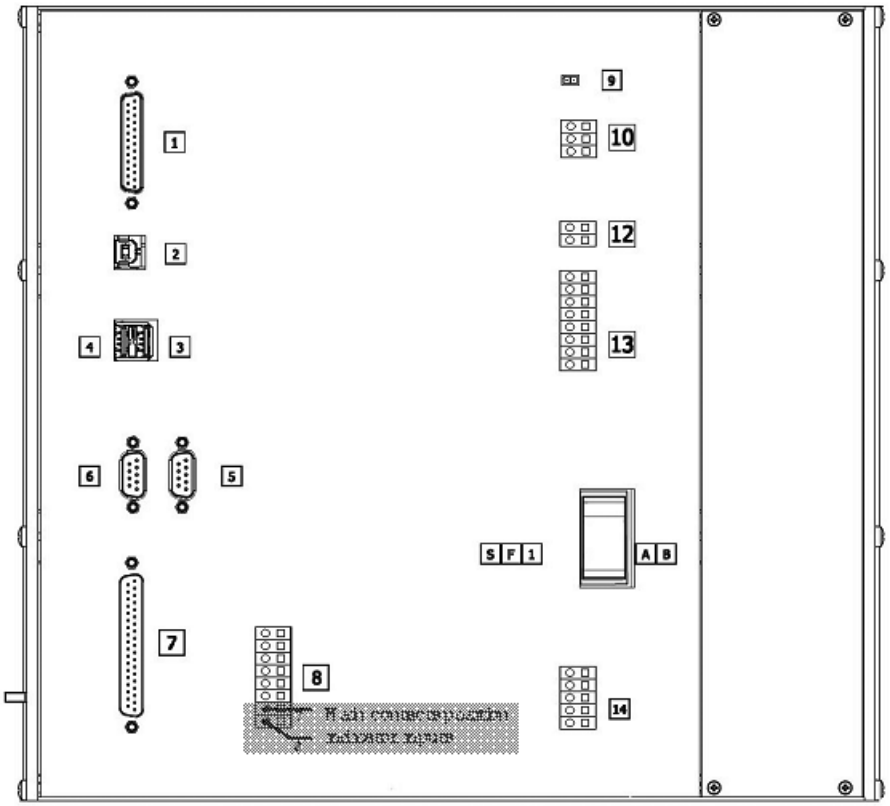


Figure 52

RCM main contact position indicator inputs

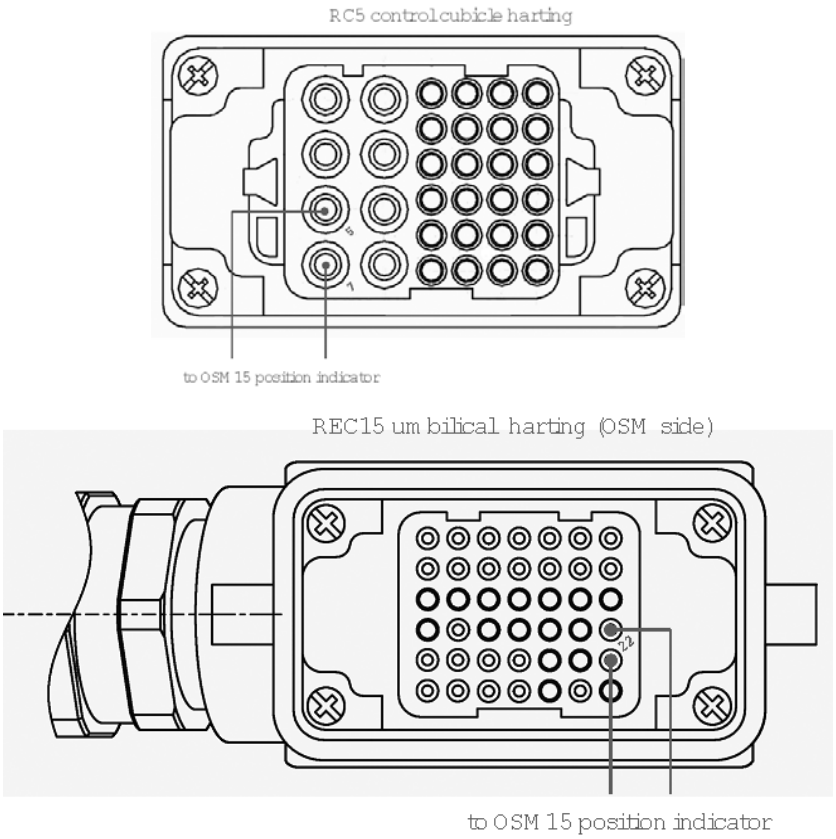


Figure 53

Main contact position indicator inputs of heavy duty connector of the RC5_3 (upper picture) and umbilical heavy duty connector from the OSM side (lower picture).

NOTE! To short circuit the two pins of the connectors use two miniature crocodile clips and a wire.

7.2.3.9. Excessive close time

Possible reason	Malfunction identification procedure	Corrective action
OSM coil short/open circuit	Check if the reading "OSM coil short circuit" or "OSM coil open circuit" appears with "Excessive trip time" reading.	Fix the "OSM coil short circuit" (refer to 7.2.3.11) or "OSM coil open circuit" (refer to 7.2.3.10) malfunction first
Driver is not ready	Check that the malfunction "Driver is not ready" is present Wait for 1 min and open the OSM	The "Excessive close time malfunction" will disappear
RCM malfunction	Switch off the RC5_3 and battery Disconnect plug „8" from the RCM The indication of main contact position should change to "Close" If the indication doesn't change to "Close" the malfunction is in the RCM	Replace the RCM
Short circuit in the wiring connecting the RCM with control cable	Switch off the RC5_3 and the battery Disconnect the control cable from the RC5_3. Switch on the RC5_3 and battery The indication of main contact position should change to "Close" If the indication doesn't change to "Close" the malfunction is in the wiring connecting the RCM with control cable	Replace the RC5_3
Open circuit in Control Cable	Switch off the RC5_3 and the battery Connect the control cable to the RC5_3. Disconnect the control cable from the OSM Switch on the RC5_3 and the battery The indication of the main contact position should change to "Close" If the indication doesn't change to "Close" the malfunction is in the control cable	Replace the control cable
OSM malfunction	If none of the above described actions helped it is an OSM malfunction	Replace the OSM

7.2.3.10. OSM coil isolated

Possible reason	Malfunction identification procedure	Corrective action
The OSM is switched off manually	Check if the OSM is switched off manually.	Return the OSM to “operated” position.
Wiring connecting drivers of the RCM and control cable are not properly connected	Check that wiring connecting the drivers of the RCM and control cable are properly connected	Connect wiring properly
The RCM malfunction	Switch off the RC5_3 and the battery and wait for 2 minutes Short circuit inputs 1 and 2 of plug “8” of the RCM (see Figure 54) Switch on the RC5_3 and the battery The malfunction readings should change to “OSM coil short circuit” In case the reading doesn’t change the malfunction is in the RCM **NOTE!** Remove the short circuiting wiring after the test. Connect the wiring to the drivers properly (Figure 54)	Replace the RCM
Wiring assembly in the RC5_3 is open circuited	Switch off the RC5_3 and the battery and wait for 2 minutes Short circuit pins 1 and 3 of the RC5_3 heavy duty connector as it is shown in Figure 55 Switch on the RC5_3 and the battery The malfunction readings should change to “OSM coil short circuited” If the reading doesn’t change the malfunction is in wiring assembly between the RCM and control cable **NOTE!** Remove the short circuiting wiring after the test.	Replace the RC5_3
Control Cable is not connected properly	Check that the heavy duty plugs of the control cable, OSM and RC5_3 are visually not damaged Check that the control cable is connected properly	Connect control cable properly
Control Cable malfunction	Switch off the RC5_3 and the battery and wait for 2 minutes Short circuit pins 37 and 39 of the heavy duty connector of the control cable (OSM side) as it is shown in Figure 55 Switch on the RC5_3 and the battery The malfunction readings should change to “OSM coil short circuited” If the reading doesn’t change the malfunction is in the control cable **NOTE!** Remove the short circuiting wiring after the test.	Replace the control cable
OSM malfunction	If none of the above described actions helped it is an OSM malfunction	Replace the OSM

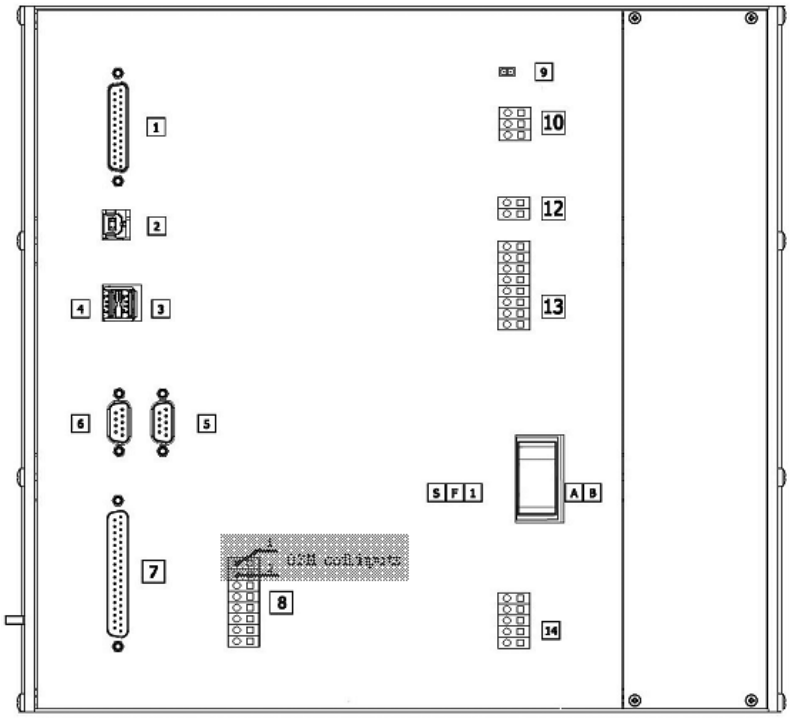


Figure 54

RCM OSM coil inputs

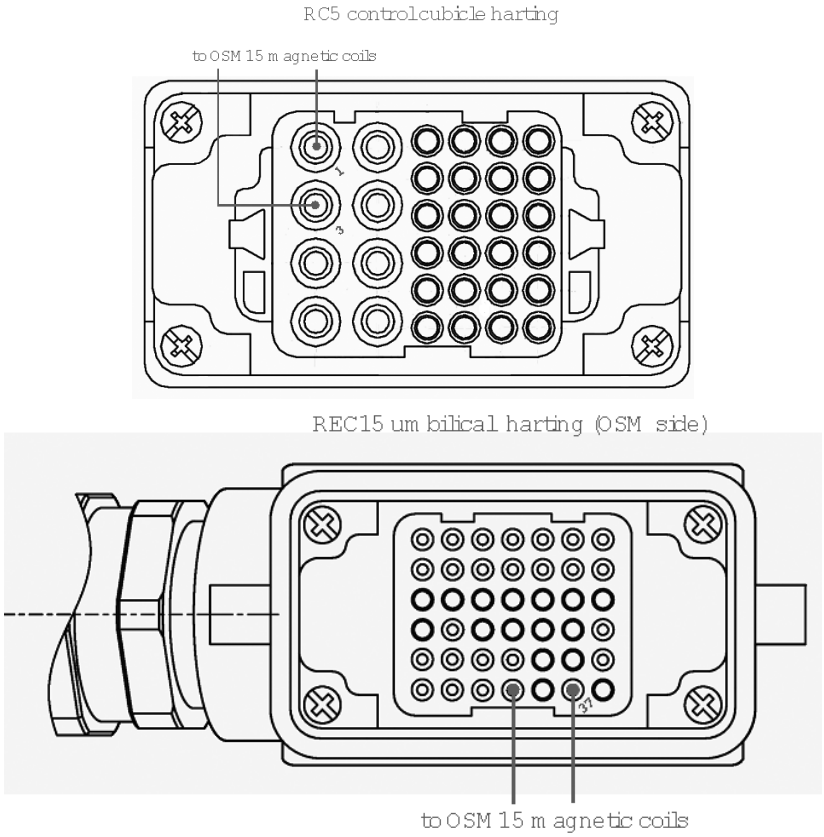


Figure 55

OSM coil inputs of heavy duty connector of RC5_3 (upper picture) and umbilical heavy duty connector from OSM side (lower picture)

NOTE! To short circuit the two pins of the connectors use two miniature "crocodile" clips and a wire.

7.2.3.11. OSM coil short circuit

Possible reason	Malfunction identification procedure	Corrective action
Wiring connecting drivers of the RCM and control cable are not properly connected	Check that wiring connecting drivers of the RCM and control cable are properly connected	Connect wiring properly
The RCM malfunction	Switch off the RC5_3 and the battery and wait for 2 minutes Open circuit driver inputs of the RCM Plug "8" inputs 1 and 2 Switch on the RC5_3 and battery The malfunction readings should change to "OSM coil open circuited" If the reading doesn't change the malfunction is in the RC5_3 NOTE! After this test remember to connect the wiring to the drivers properly	Replace the RCM
Wiring assembly connecting the RCM and umbilical is short circuited	Switch off the RC5_3 and the battery and wait for 2 minutes Disconnect control cable from the RC5_3 Switch on the battery switch and/or auxiliary supply switch The malfunction readings should change to "OSM coil open circuited" If the reading doesn't change the malfunction is in wiring assembly between the RCM and control cable NOTE! After this test remember to connect the control cable to RC5_3	Replace the RC5_3
Control Cable is not connected properly	Check that the heavy duty plugs of the control cable, OSM and RC5_3 are visually not damaged Check that the control cable is connected properly	Connect control cable properly.
Control Cable malfunction	Switch off the RC5_3 and the battery and wait for 2 minutes Disconnect the control cable from the OSM Switch on the battery switch and/or auxiliary supply switch The malfunction readings should change to "OSM coil open circuited" If the reading doesn't change the malfunction is in control cable	Replace the control cable
OSM malfunction	If none of the above described actions helped it is an OSM malfunction	Replace the OSM

7.2.3.12. Driver not ready

Possible reason	Malfunction identification procedure	Corrective action
Switching capacitors are still charging	Wait for 60 s. If the signal disappears this warning is not associated with any malfunction.	Not required
OSM coil short circuit or OSM coil isolated	In case this message has not disappeared and messages "OSM coil short circuit" or "OSM coil isolated" appear it is necessary to remove the reason of these malfunctions.	Fix the "OSM coil short circuit" (refer to 7.2.3.11) or "OSM coil open circuit" (refer to 7.2.3.10)
RCM malfunction	If none of the above described actions helped it is an RCM malfunction	Replace the RCM

7.3. Rec15/25 component replacement procedures

7.3.1. RCM replacement

7.3.1.1. Dismounting

1) Disconnect all wiring assemblies and the earthing wire connected to the RCM;
2) Unscrew four nuts fixing the RCM and remove the washers (see Figure 56);
3) Pull the RCM from the fixing studs and take it out of the housing.

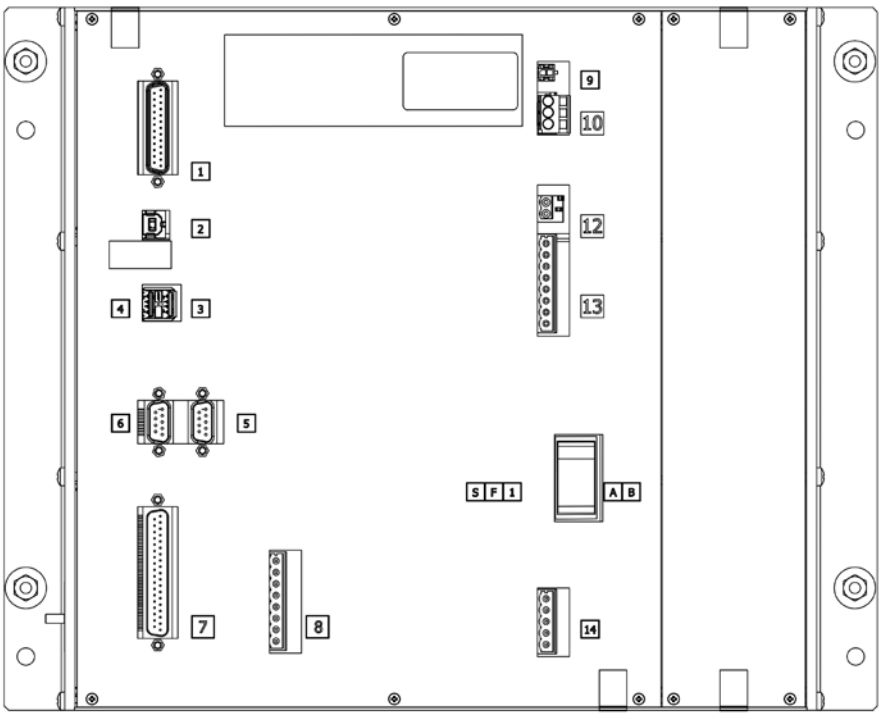


Figure 56

RCM with fixing nuts and washers (marked by arrows)

7.3.1.2. Installation

1) Take a spare RCM with appropriate protective, system and communication settings and put it on the fixing studs and install washers;
2) Tighten four nuts fixing RCM;
3) Connect the wiring to the RCM according to the wiring assembly diagram (Figure 57);

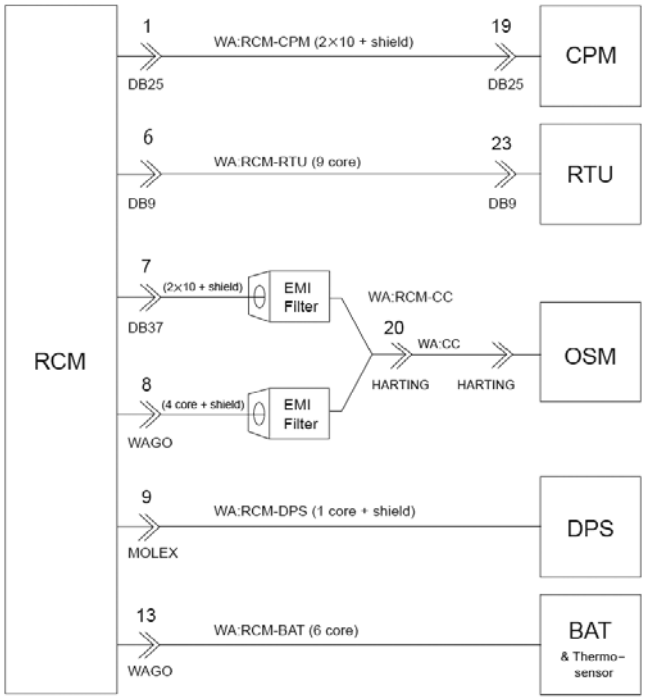


Figure 57

RCM Wiring diagram.

Plug numbering correspond to socket numbering

7.3.2. CPM replacement

7.3.2.1. Dismounting

1. Disconnect plug “19” from the CPM ;
2. Unscrew six nuts fixing the CPM and remove the washers (Figure 58);
3. Pull the CPM from the fixing studs and take it out of the housing.

Figure 58

Nuts holding CPM on RC5_3 internal door

7.3.2.2. Installation

1. Install the CPM on the fixing studs
2. Tighten six nuts fixing the CPM
3. Connect plug “19” to the CPM

7.3.3. PSFM replacement

7.3.3.1. Dismounting

1) Make sure that there is no voltage on any inputs of the PSFM;
2) Disconnect all auxiliary supply wiring from the PSFM;
3) Disconnect plug “14” from the RCM;
4) Disconnect earthing wires;
5) Remove cable ties fixing cable “14”;
6) Unscrew four nuts fixing the PSFM and remove the washers;
7) Take the PSFM out of the housing.

Figure 59

PSFM fixing provisions

7.3.3.2. Installation

1) Install the new PSFM on the fixing studs inside the RC5_3;
2) Tighten four nuts with washers fixing the PSFM;
3) Connect plug “14” to RCM;
4) Connect one earthing wire from the control cubicle to the stud on the PSFM marked with the grounding sign. Earthing wire from the PSFM connection to the stud on the control cubicle located above the PSFM;
5) In case you have a PSFM without a plug, use the old one. Numbers on the wires correspond to numbers on plug “14”;
6) Connect the auxiliary supply wiring to the inputs of the PSFM.

7.3.4. Battery replacement

7.3.4.1. Dismounting

1) Switch off the battery circuit breaker;
2) Disconnect the plug “13” from the RCM;
3) Disconnect the wires from the battery terminals - the minus terminal should be disconnected first;
4) Unscrew four bolts from the battery fixing plate (Figure 60);
5) Remove the Battery.

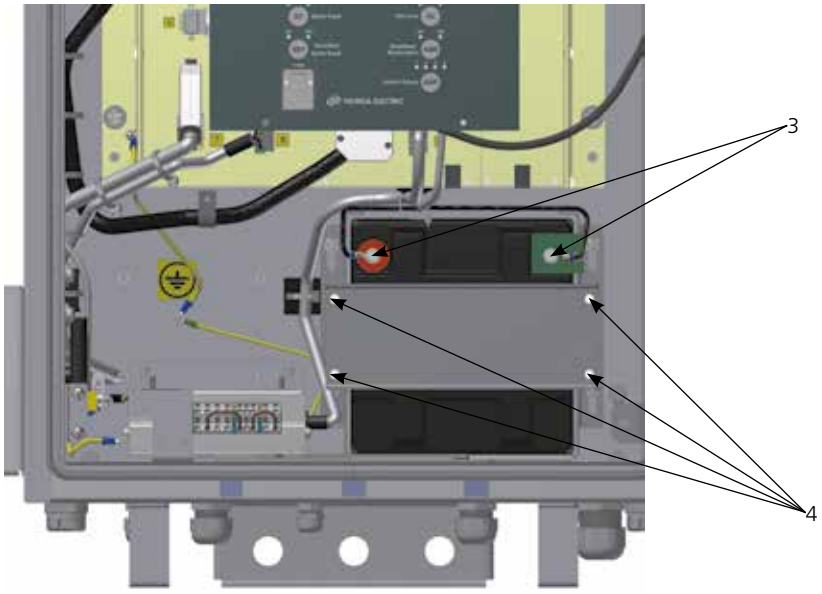


Figure 60

Battery fixing provisions.

7.3.4.2. Installation

1) Switch off the battery circuit breaker;
2) Disconnect plug "13" from the RCM;
3) Mount the battery to the appropriate place;
4) Install battery fixing plate and fix it with four bolts (Figure 60);
5) Install plus terminal to the battery;
6) Install battery temperature sensor and minus terminal to the battery;
7) Connect plug "13" to the appropriate RCM socket;
8) Switch on the battery circuit breaker.

7.3.5. Battery sensor replacement

7.3.5.1. Dismounting

1) Turn the battery switch off;
2) Disconnect plug "13" from the RCM;
3) Disconnect the wires from the battery terminals (the minus terminal must be disconnected first);
4) Remove cable ties fixing the cable that leads to the battery sensor and to the battery "+"terminal;
5) Disconnect the battery sensor.

7.3.5.2. Installation

1) Turn the battery switch off;
2) Install "+" terminal to the battery "+" terminal;
3) Install battery sensor and minus terminal to the battery;
4) Connect wires that lead to battery sensor and to battery "+"terminal to the plug "13" according their numbering(wire marked 1 is installed in input 1 and so on);
5) Turn the battery switch on.

7.3.6. RC5_3 replacement

RC5_3 dismounting and installation should be performed according to the Installation section of this document.

NOTE! To upload protection and communication settings to a newly installed RC, refer to chapter 6.6.1.3 and 6.6.2.3 correspondingly.

7.3.7. OSM replacement

OSM dismounting and installation should be performed according to the Installation section of this document.

NOTE! Each OSM is supplied with current and voltage sensor (CVCS) coefficients, if the OSM has been replaced, it is recommended to upload the correct CVCS coefficients into the RC. To upload sensor coefficients refer to chapter 5.1.2 of this guide..

8. Disposal

The 12 V DC GENESYS 26EPX control battery has a life expectancy of ten years. It is recommended that the battery be replaced after ten years or if the battery life calculated by the controller is expired - whichever occurs first.

NOTE! Battery life decreases at higher temperatures. Dispose of expired batteries in an environmentally responsible manner. Consult local regulations for proper battery disposal.

Remaining product components do not require any special destruction methods and can be recycled as conventional waste.

9. Appendices

Appendix 1. **OSM drawings**

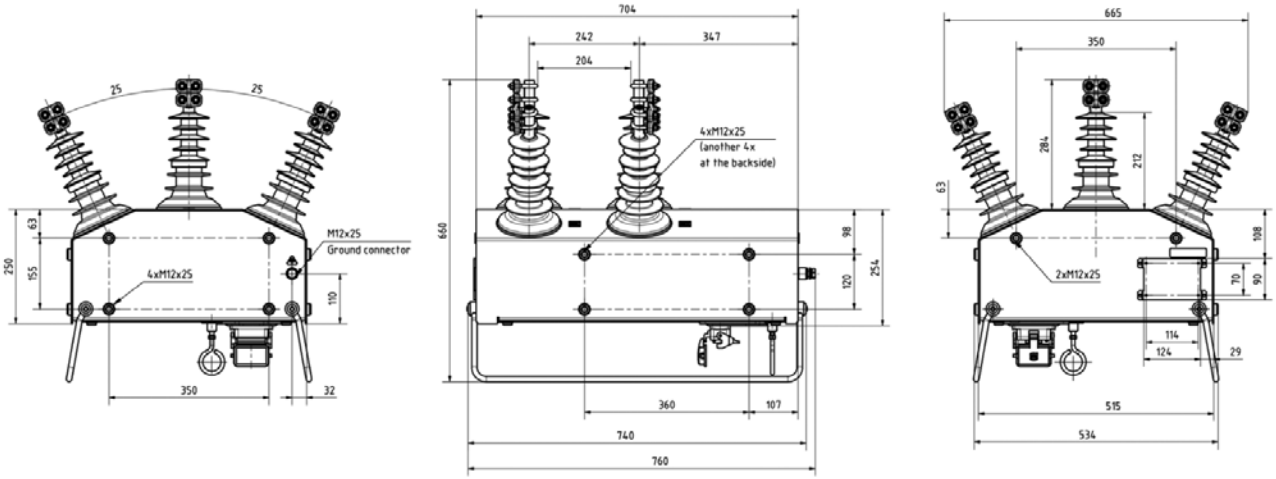


Figure 61

OSM15_AI_1(4) dimensions

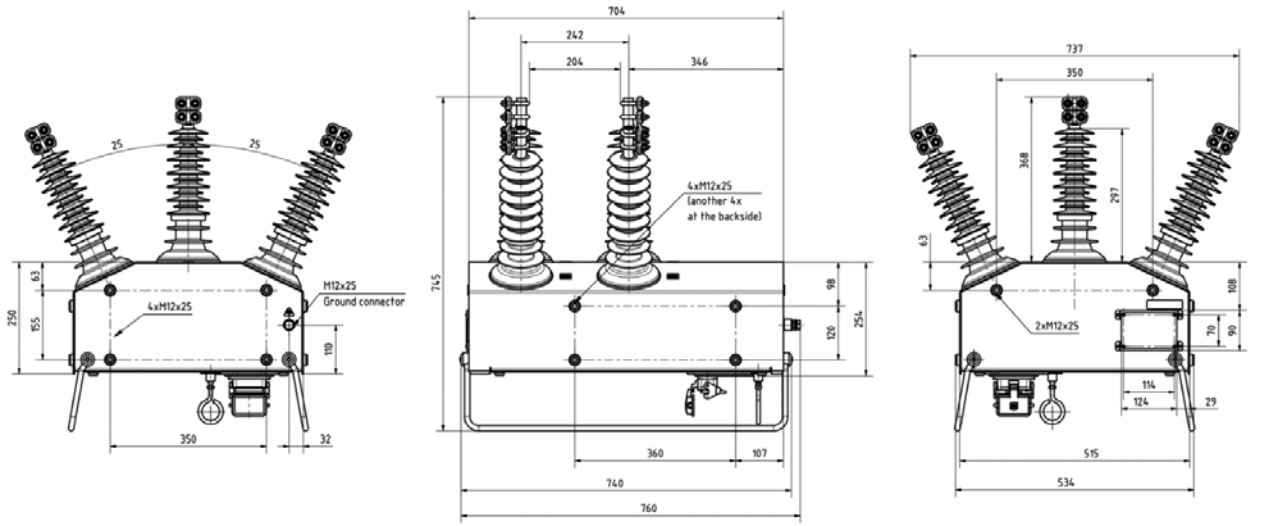


Figure 62

OSM25_AI_1(4) dimensions

Appendix 2. **RC5_3 drawings**

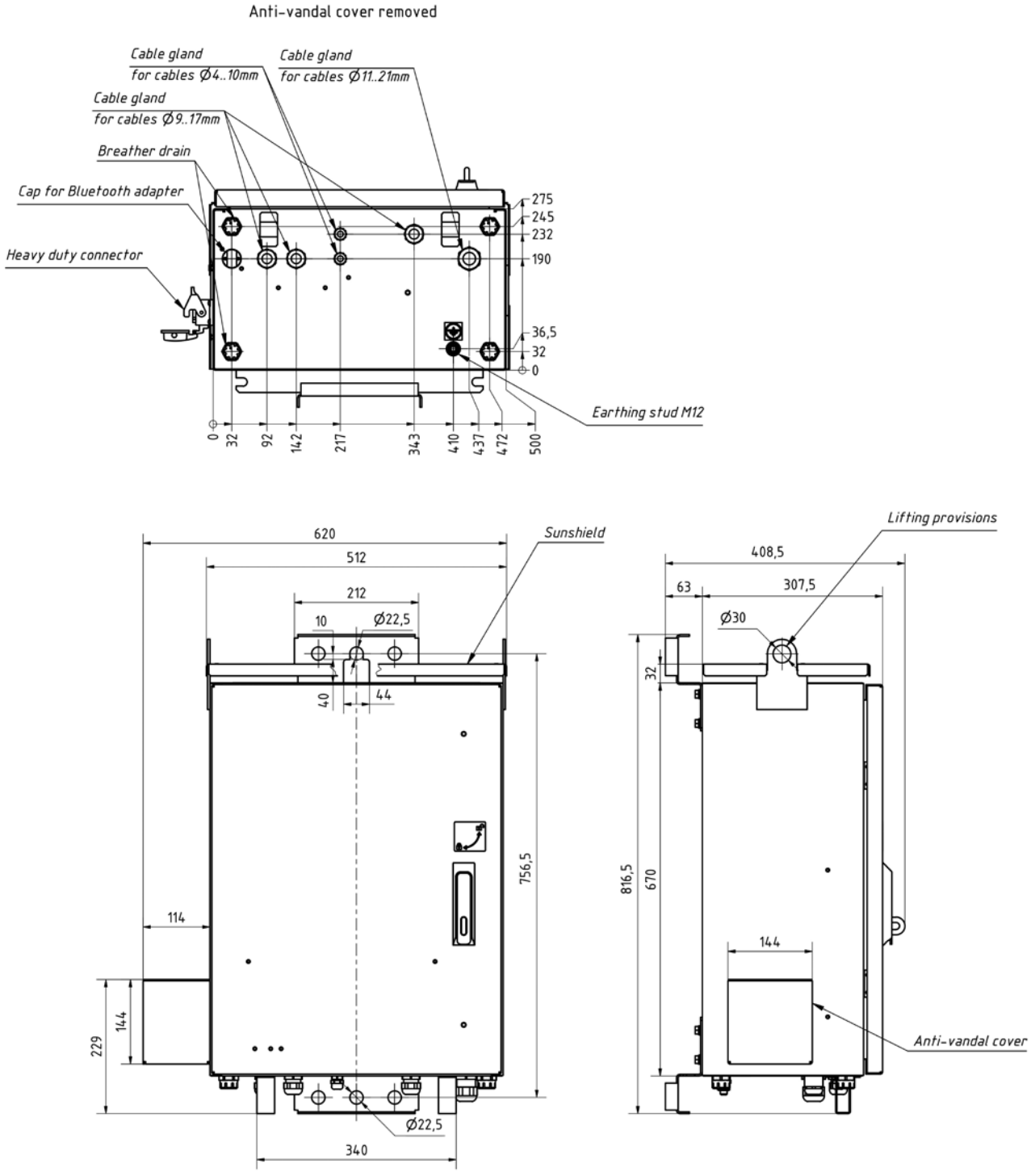


Figure 63

RC5_3 dimensions

Appendix 3. **Package drawings**

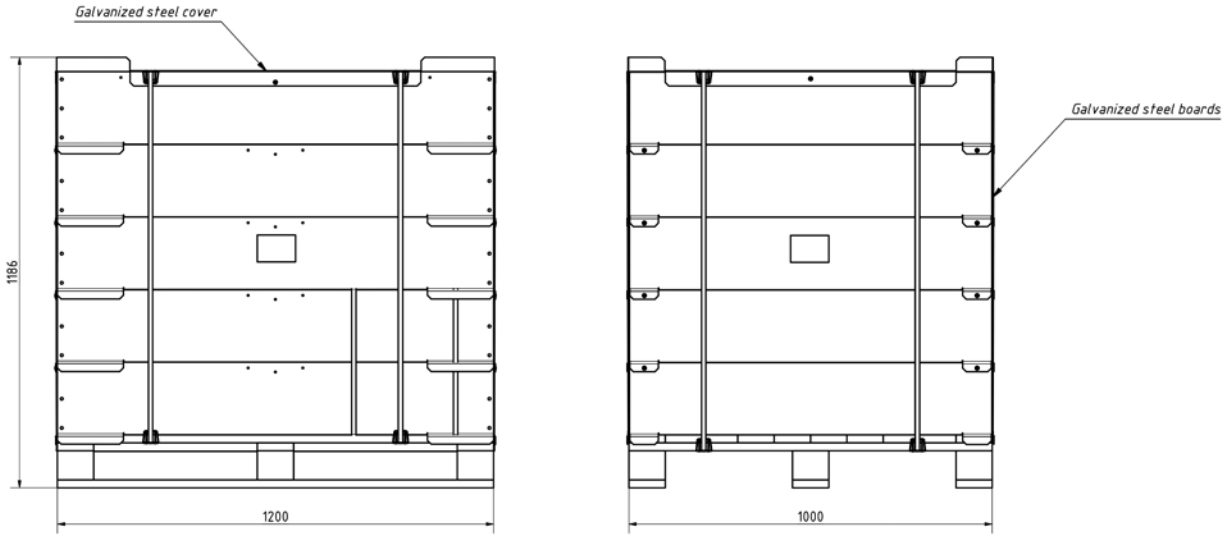
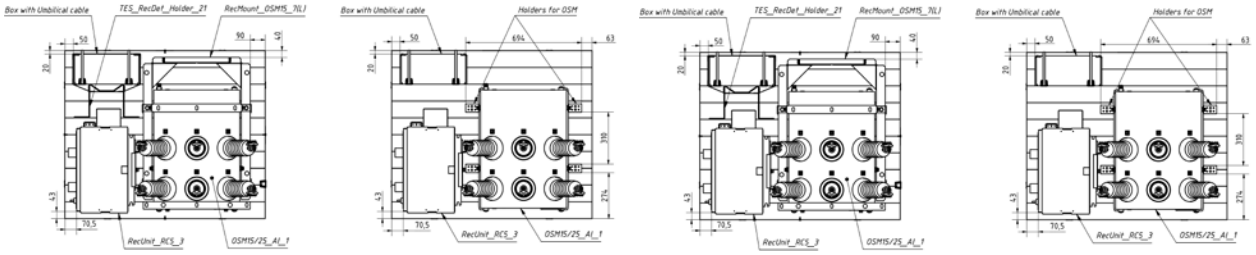
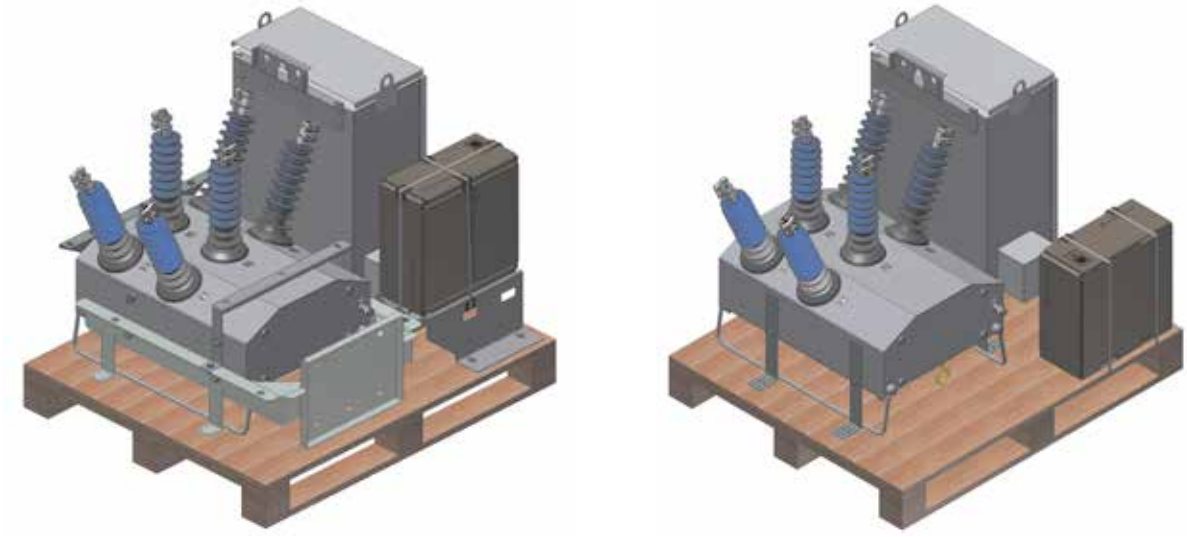


Figure 64

Rec15/25 package dimensions





a) b)

Figure 65

Placement of Rec15/25 components in a box:

a) with mounting kit;

b) without mounting kit.

Appendix 4. **RC5_3 wiring diagram**

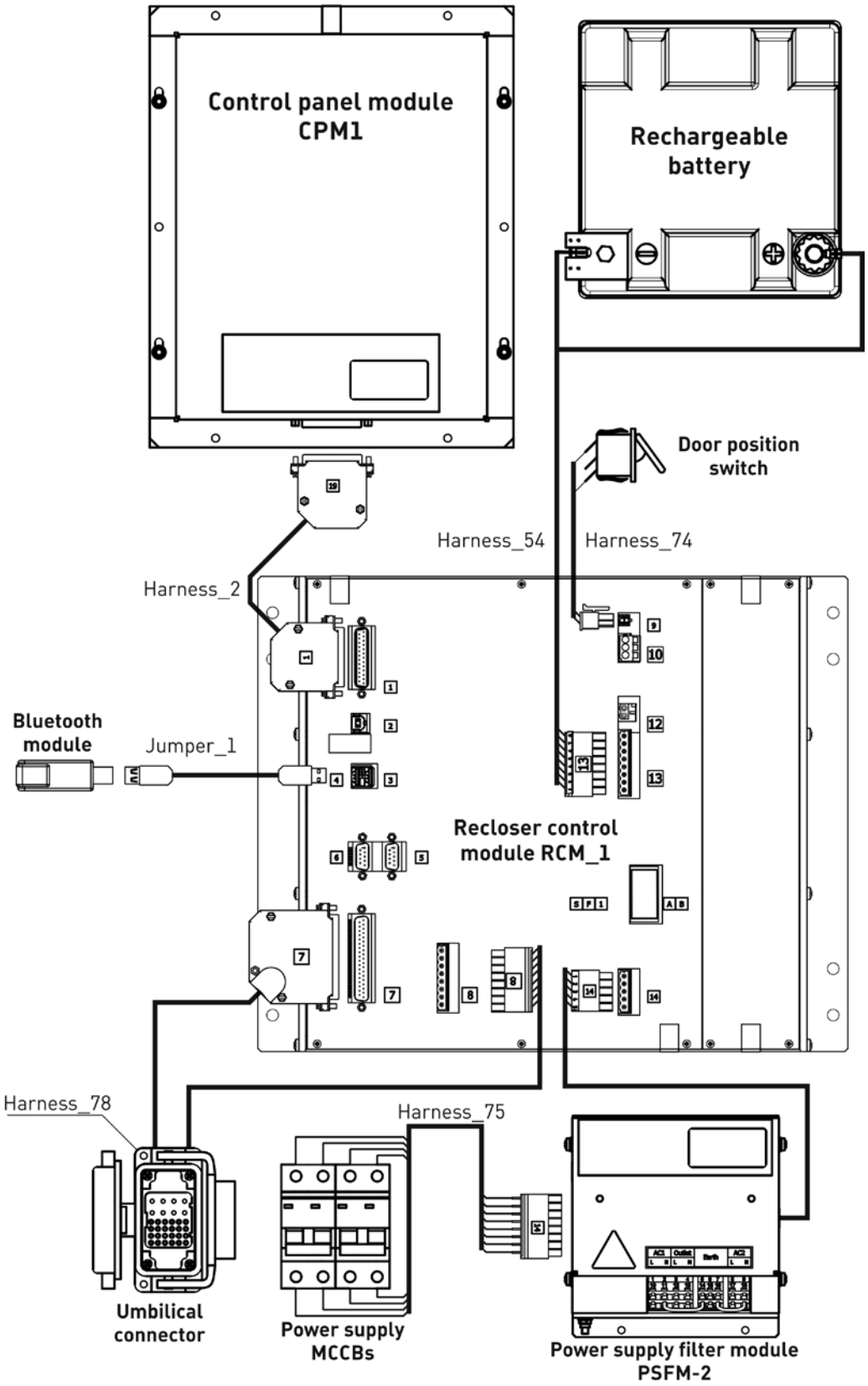


Figure 66

RC5_3 wiring diagram

TAVRIDA ELECTRIC

Switzerland
Tavrida Electric AG

Rheinweg 4, 8200
Schaffhausen, Switzerland
Phone: +41 (0) 52 630 26 00
Fax: +41 (0) 52 630 26 09
E-Mail: info@tavrida.ch
Web: www.tavrida.ch

India
Tavrida Electric India Private Limited

15 NC, Block-A, New Alipore
Kolkata - 700 053, West Bengal, India
Phone: +91 33 2488 1715/3260 8634
Fax: +91 33 2488 1766
E-Mail: info@tavrida.in
Web: www.tavrida.in

China
Tavrida Electric (Qingdao) Co., Ltd.

No. 336, Songling Road, Laoshan District
266104 Qingdao, China
Phone: +86 (532)-55552366
Fax: +86 (532)-55552377
E-Mail: info@tavrida.cn
Web: www.tavrida.cn

Brazil
Tavrida Electric do Brazil

Av. Ireno da Silva Venâncio,199
GP04A - Protestantes
Votorantim / SP, Brazil
Telefone: +55 (15) 3243-2555
Fax: +55 (15) 3243-4233
E-Mail: info@tavrida.com.br
Web: www.tavrida.com.br

South Africa
Tavrida Electric Africa (Pty) Ltd.

Cnr.Van Dyk and Commissioner Streets
Boksburg East, Gauteng, 1459,
Republic of South Africa
Phone: +27 11 9142199
Fax: +27 11 9142323
E-Mail: support@tavrida.co.za
Web: www.tavrida.co.za

Document code: TES_RecDoc_UG_Rec15-25 Version: Rev 1.0 Date: 12/02/2016