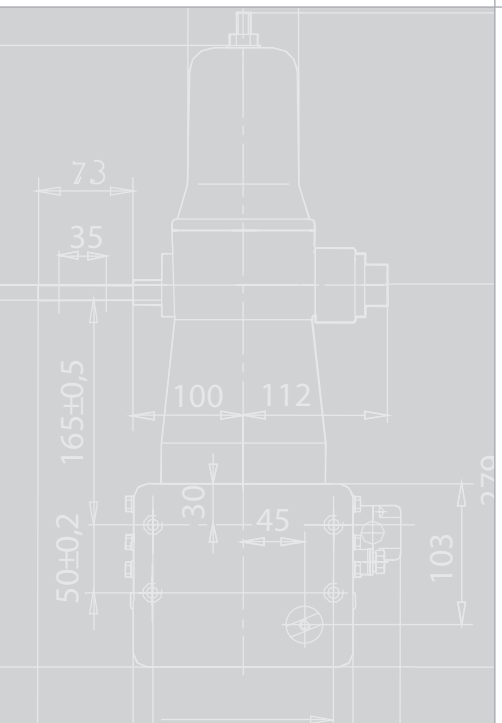
TAVRIDA ELECTRIC

ISM_LD Series

Vacuum Circuit Breakers
15kV, ...20kA, ...1000A
27kV, ...16kA, ...800A

Applications Manual MAN5002202

Revision 3



The following installation and operating Instructions contain information necessary for the methods of use, installation, commissioning and operation. It is absolutely necessary for the proper use of the vacuum circuit breakers to read the Installation and Operating Instructions carefully before starting and to adhere to the instructions and the relevant regulations.

Safety first

- Check whether the installation position (distances, spatial separation, and the surroundings) is suitable for the switching devices.

- 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, accident prevention regulations and the connecting conditions of the electric utilities shall be followed.

- Take note that during operation of the vacuum circuit breakers 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 vacuum circuit breakers 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.

For special configurations please contact TAVRIDA ELECTRIC NA.

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Introduction

1

Glossary

The following abbreviations are used in this operating manual:

AR: Automatic reclosing
CM: Control module
CO: Close open cycle
ISM: Indoor switching module
LED: Light emitting diode
MCB: Miniature circuit breaker
NC: Normally closed contact
NO: Normally open contact
PCD: Pole center distance
SCADA: Supervisory control and data aquisition
SF6: Insulating gas sulfur hexafluoride
VCB: Vacuum circuit breaker
VI: Vacuum interruptor

Make time
The make time is the time period from the energising of the closing circuit to the time when the current begins to flow in the first pole.

Closing time
The closing time is the time period from the energising of the closing circuit to the time when all three poles have contact.

Pre-arcing time
Interval of time between the initiation of current flow in the first pole during a closing operation and the instant when the contacts touch in all poles for three-phase conditions and the instant when the contacts touch in the arcing pole for single-phase conditions.

Opening time
The opening time is the time period from energising of the closing circuit up to the time when all the switching poles are separated.

Break time
The break time is the time period from the energising of the closing circuit up to the time when the arcs of all the poles are extinguished.

Open-close time (during AR)
Interval of time between the instant when the arcing contacts have separated in all poles and the instant when the contacts touch in the first pole during a reclosing cycle.

Dead time (during AR)
Interval of time between final arc extinction in all poles in the opening operation and the first reestablishment of current in any pole in the subsequent closing operation.

Scope

In comparison to conventional circuit breakers, the Tavrida Electric vacuum circuit breakers comprise two components:

· The ISM (Figure 1)

· The CM for controlling the ISM and monitoring both modules (Figure 2)

Both modules must only be operated together and are meant for indoor installations only. The possibility to choose the ISM and CM separately allows any type of switchgear to be easily equipped with regard to its primary and auxiliary circuits.

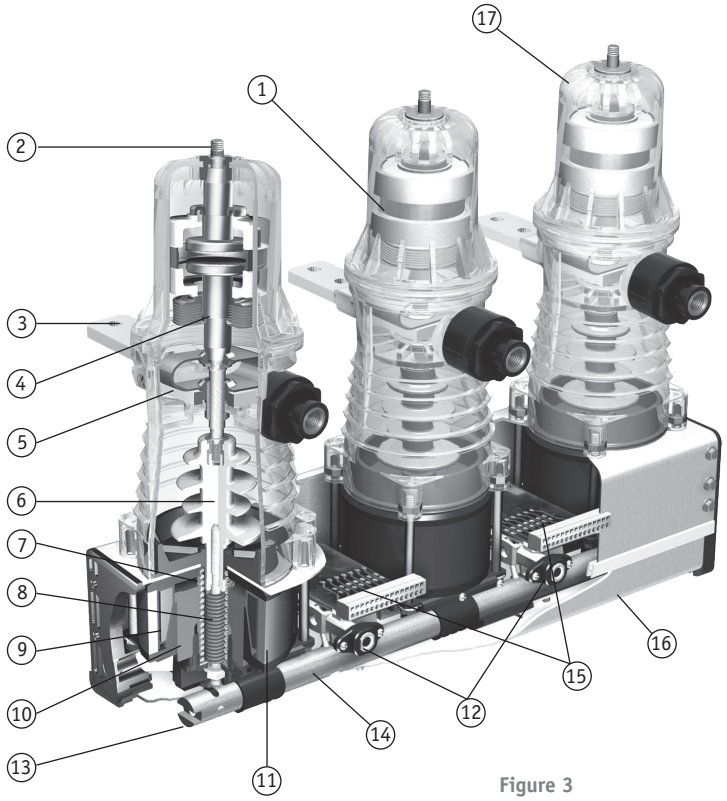
This manual contains information on the operation, installation, commissioning and testing of the following Tavrida breaker products:

Figure 1
ISM Module

Figure 2
CM Module

Design and Method of Operation: ISM and CM

Indoor Switching Module (ISM)



1. VI
2. Upper terminal
3. Lower terminal
4. Movable contact with bellows
5. Flexible junction shunt
6. Drive insulator
7. Opening springs
8. Contact pressure spring
9. Actuator coil
10. Armature
11. Magnetic actuator (complete module)
12. Interlocking pins
13. Stub shaft
14. Synchronizing shaft
15. Auxiliary contacts
16. Frame
17. Support insulator

Figure 3
View into the ISM

Control Module (CM)

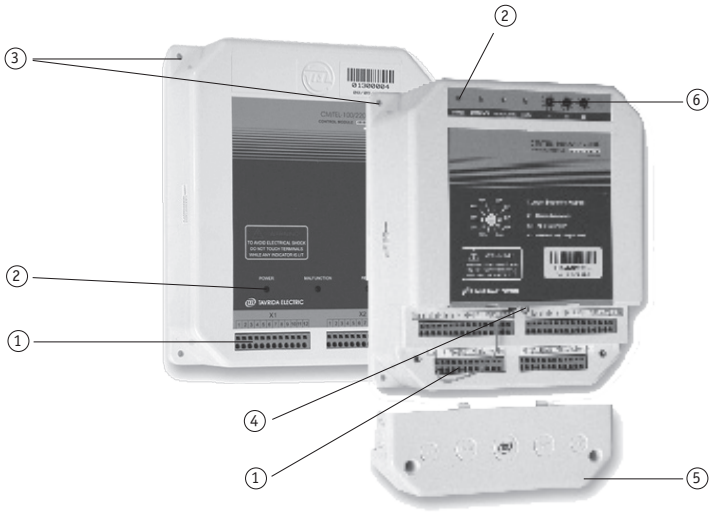


Figure 4
Control Modules

1. Terminals
2. LED indicators
3. Fastening holes
4. Earthing stud
5. Terminals cover
6. Current selector switches

Closing

In the open position the contacts are kept open by the force of the opening springs. To close the contacts the coils of the magnetic actuators get excited by a current impulse of the close capacitors of the CM. As a result the contacts close. At the same time the opening springs are compressed. In the close position the contacts are kept closed by means of the magnetic force only. The ISM maintains the closed position without mechanical latching also in case of a failure of the auxiliary power supply (Figure 5).

Opening

To open the contacts a current impulse in the reverse polarity derived from the opening capacitors of the CM is injected in the coils of the magnetic actuators releasing the magnetic holding force. The compressed opening springs and contact pressure springs open the contacts (Figure 5).

Manual-Emergency-Tripping

The ISM can also be manually opened. When the synchronizing shaft is rotated, a force exceeding the magnetic attraction forces of the ring magnet is applied to the armature, which subseqently starts to move. As the air gap increases, the opening springs and the contact pressure springs overcome the magnetic holding force, and the vacuum interrupter opens.

Manual Closing

The ISM can only be closed electrically via the CM. In the case of a failure of auxiliary power supply the contacts can be closed using an alternative auxiliary power supply such as a battery. Mechanical closing is not possible and leads to the destruction of the ISM.

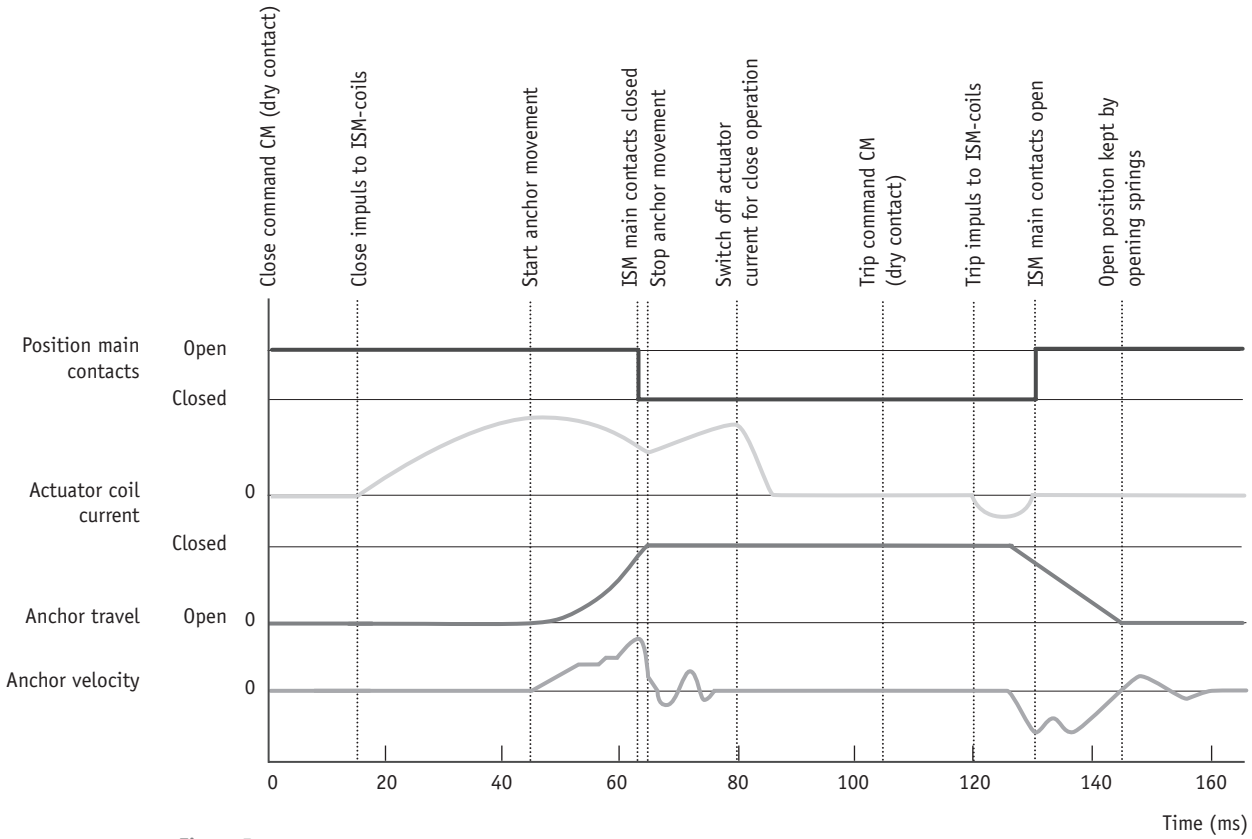


Figure 5

Typical oscillogram of ISM operation

Receiving, Handling, and Storage

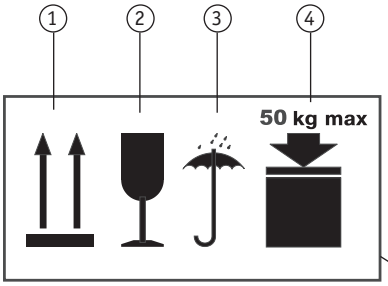
Receiving

The following information is provided on the ISM packing cartons (Figure 9):

· Handling symbols for transport and storage of the delivery unit (Figure 6)

· Label 1 for manufacturers´ and product information (Figure 7)

· Label 2 for logistics data (Figure 8)



1. This side up
2. Fragile
3. Protect from rain
4. Max. weight on the delivery unit
5. Serial number

Figure 6

Handling Symbols

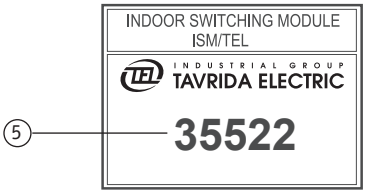


Figure 7

Product Information Label

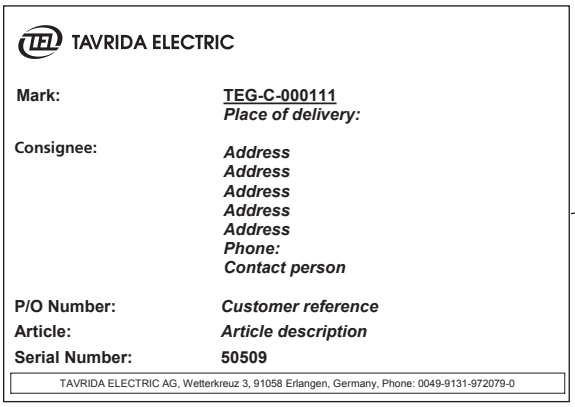


Figure 8

Logistics Data Label

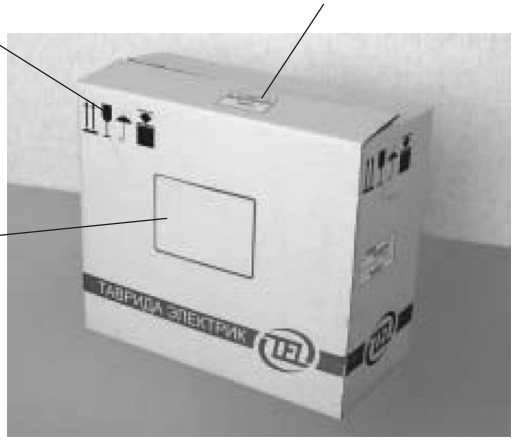
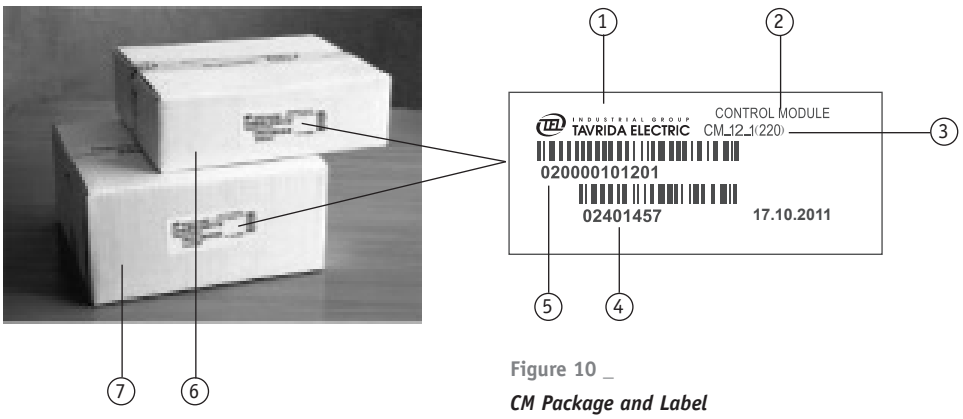


Figure 9

ISM Package

A label with the following information is fixed on each CM carton package (Figure 10).



1. Manufacturer
2. Product name
3. Type of device
4. Serial number
5. Product code
6. Carton package for CM_12_1(220) (265x220x55 mm)
7. Carton package for CM_12_2...3...CM_14_1 (265x220x130 mm)

Figure 10 _

CM Package and Label

A CM carton package must not have a weight of more than 30 kg applied to it.

Transport

ISM and CM shall be transported in the original packing only. The packed goods shall be handled in accordance with the handling symbols. Loading procedures for ISM packing units shall be carried out only with fork lifts or cranes. If possible the ISM packing unit shall be placed on a pallet. Lifting gear must not be attached to the support insulators. During transportation the ISM and CM must not be hit or dropped.

Handling and Incoming Inspection

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 ISM and every CM shall be subject to an incoming inspection.

Circuit breaker modules are heavy. Always use two people to lift out of the original packaging, with due care and attention to safe lifting procedures.

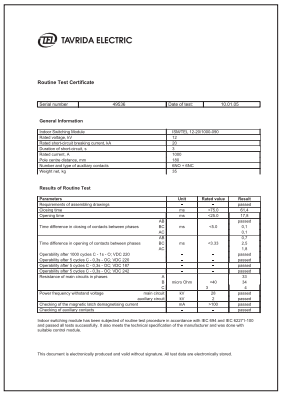
Figure 11

Scope of delivery for the ISM:

ISM

Screwdriver

Operating manual



Routine test certificate

When requested for 1000A operation, the ISM15_LD_1 and LD_3* require a heat sink set.

Figure 12

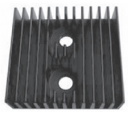
6x 

Heat sink
ITEA 741394.006

12x 

Bolts
ITEA 301611.004-03

*included

2x 

Heat sink
ITEA 741394.006

4x 

Bolts
ITEA 301611.004-03

The ISM25_LD_1 and LD_3* require an insulating cap set.

Figure 13

3x 

Lower cover part
ITEA 711671.004

3x 

Sealing ring
ITEA 754152.002

*included

1x 

Lower cover part
ITEA 711671.004

1x 

Sealing ring
ITEA 754152.002

3x 

Cap for upper connecting bolt
ITEA 711121.002

3x 

Upper cover part
ITEA 714323.001

1x 

Cap for upper connecting bolt
ITEA 711121.002

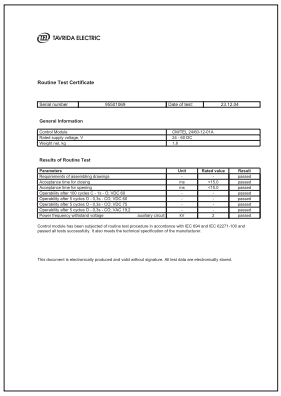
1x 

Upper cover part
ITEA 714323.001

Scope of delivery for the CM:

CM

Screwdriver



TAVRIDA ELECTRIC

Routine Test Certificate

Serial number	16061808	Date of test	23.12.16

General Information

Control Module	CM-TEL-100V-12-01A
Rated supply voltage, V	DC: 100 V
Weight, kg	1.5

Results of Routine Test

Parameters	Unit	Rated value	Result
Requirements of assembling drawings	-	-	passed
Acceptance time for closing	ms	<150	passed
Acceptance time for opening	ms	<150	passed
Operability after 10k cycles O - 0.3s - CO - 15s - CO	-	-	passed
Operability after 9 cycles O - 0.3s - CO - 15s - CO	-	-	passed
Operability after 8 cycles O - 0.3s - CO - 15s - CO	-	-	passed
Operability after 7 cycles O - 0.3s - CO - 15s - CO	-	-	passed
Power frequency withstand voltage, auxiliary circuit	kV	2	passed

Control module has been subjected of routine test procedure in accordance with IEC 694 and IEC 61271-100 and passed all tests successfully. It also meets the technical specification of the manufacturer.

This document is electronically produced and valid without signature. All test data are electronically stored.

Figure 14

CM Screwdriver Routine test certificate

The CM_14_1 contains additionally:

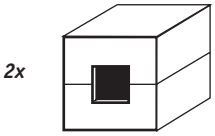


Figure 16

Cable ferrite filter Ferroxcube Co.
CSA 19/9.4/29-4S2-EN

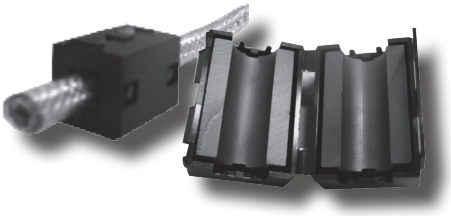


Figure 15

Further, the intactness of the devices should be checked visually for:

· Mechanical damage, scratches, discoloured places, corrosion

· Damage to the seals (Figure 18, Figure 19)

Any transport damage must be reported immediately to the carrier in writing.
Cases of damage must be photographically documented.

Rating Plate, Seal

Please check that the rating plates of the delivered devices correspond to the data of the order. The rating plate contains the following information (Figure 17):

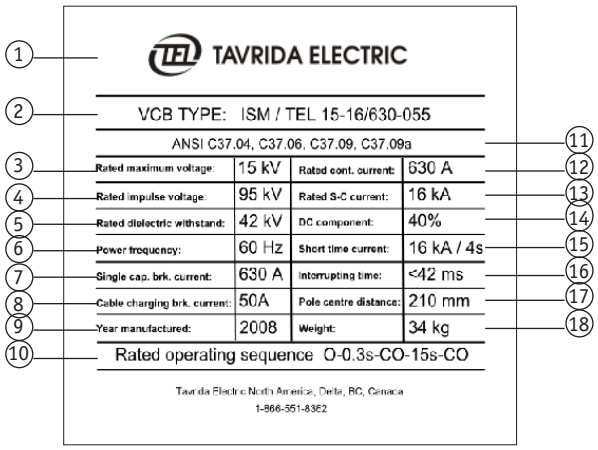
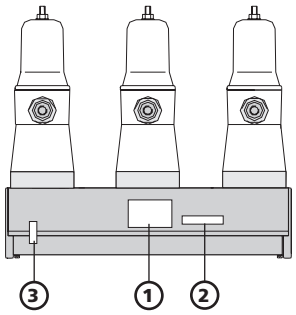


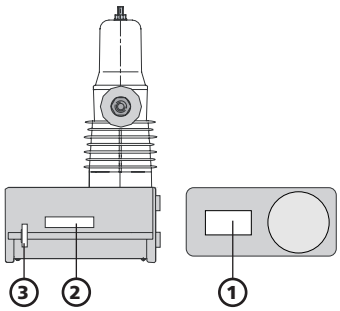
Figure 17

Rating plate

1. Manufacturer
2. Type of device
3. Rated maximum voltage
4. Rated impulse withstand voltage
5. Rated dielectric withstand voltage
6. Rated frequency
7. Single capacitor bank breaking current
8. Cable charging breaking current
9. Year manufactured
10. Rated operating sequence
11. Applicable ANSI standards
12. Rated continuous current
13. Rated short circuit current
14. DC component percentage
15. Rated short time current
16. Interrupting time
17. Pole centre distance
18. Weight

Arrangement of the labels (Figure 18, Figure 19):





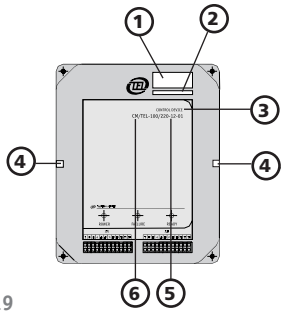
ISM

1. Rating plate
2. Serial number
3. Seal

Figure 18

Labelling three-phase ISM

Labelling single-phase ISM



CM

1. Serial number
2. Date of manufacture
3. Type description
4. Seal
5. Product code
6. Product name

Figure 19

Labelling of the CM_12_1

The manufacturer accepts no warranty for a device if the seal is broken or has been removed.

Storage

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

· The ISM is switched off.

· Dessicants must be placed in the packing.

· Storage must be dry, well ventilated and the room temperature should be between - 40°C and + 40°C

· If several ISM are stacked a maximum of two vertical layers is permitted.

· If several CM are stacked a maximum of 10 vertical layers is permitted.

If CM are stored longer than one year, the built-in capacitors shall be charged according to the following procedure before putting into operation:

· Switch On auxiliary power supply to CM for 20 seconds.

· Switch Off auxiliary power supply to CM for one minute.

· Repeat the described switching on and off procedure two times.

· Switch On auxiliary power supply to CM for at least 8 hours.

Installation

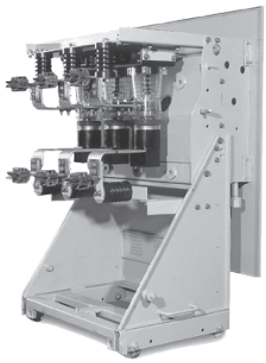
3

General, Preparation

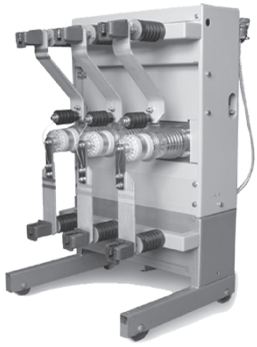
All applicable regulations must be adhered to during installation, commissioning and operation, including ANSI, IEEE, CEC, NEC, and other local, national or international standards / codes as required. Work shall only be performed by qualified personnel.

Figure 20

Vertical installation position of the ISM (draw out type)



Vertical installation position of the ISM (draw out type)



Horizontal installation position of the ISM (draw out type)

The wearing of gloves for handling the parts during installation is recommended.

Insulating material surfaces must be cleaned with clean and dry rags. The contact surfaces of connections must be cleaned before installation. If the contacts have become oxidized during transport or storage then the following sequence must be followed:

- Clean contact surfaces with a rough, dry cloth.
- With hard oxidation, clean with a hard plastic sponge, the upper layer must not be removed.

The nuts, washers and conical spring washers shall be used for connecting the upper terminals of the ISM with the busbars. The lower terminals of the ISM shall be connected with the same connecting elements.
If additional fastening material is required, steel bolts according to EN ISO 898 class 8.8 (800 N/mm²), nuts according to EN ISO 890 class 8 (880 N/mm²), washers to DIN 125 and conical spring washers to DIN 6796 shall be used.

ISM mounting and connection shall be made with dynamometic wrench only.

Installation of the ISM

All LD series can be installed in any position (Figure 20). The ISM shall be installed at the place designated for it (Figure 21) on a sufficiently stable frame.
In order to prevent bending loads at the support insulators the poles must be fixed as shown in Figure 21.
The torque of all fixing points shall not exceed the values stated in Figure 22.

Bus bars and cables shall be connected with the ISM primary terminals mechanically in a stress-free manner.
No pressure, tension or torsion forces shall act on the ISM. To avoid unacceptable high mechanical loads on the ISM, the bus bar connections shall rest on additional supporting insulators (Figure 21).

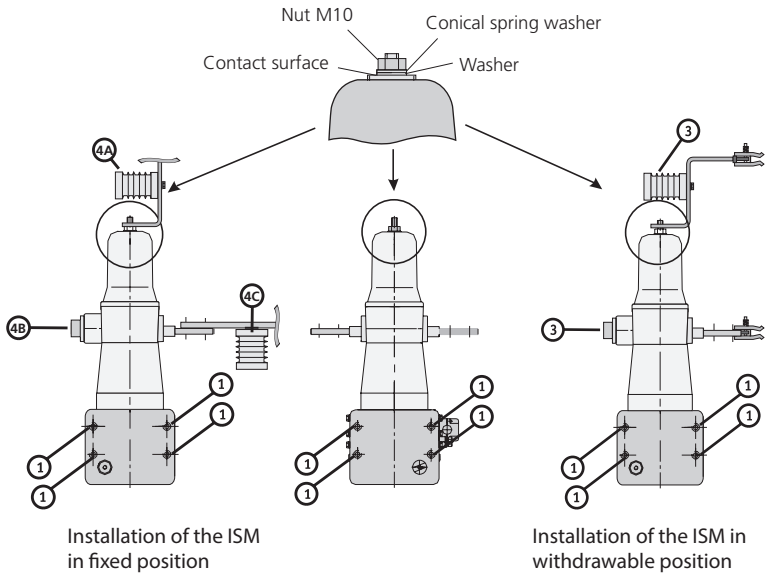
The following limits for maximum unsupported busbar length shall be applied to the design:

ISM15_LD_X	0.5 m
ISM25_LD_X	0.5 m

Other dimensions necessary for correct mounting are indicated in the overall drawings.

Fixing points, primary terminals

Figure 21



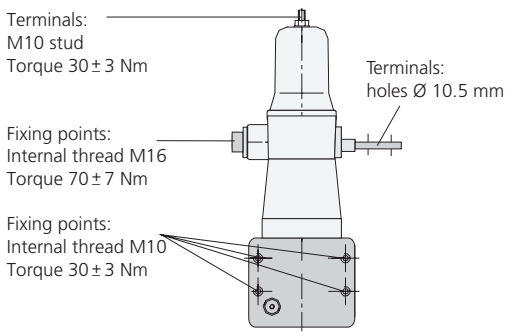
① Required fixing points (in each case)

② Required fixing points (for withdrawable versions)

③ Each two fixing points are required, either 4A+4B or 4A+4C (for fixed installations)

Bolt sizes and torques

Figure 22



Minimum Clearances due to Rated Insulation Voltage

The minimum clearances between the blank phases and to earth shall be according to VDE 0101.
The minimum clearances between phase to phase and phase to earth are equal (Figure 23).

Ur	Up	Minimum clearance (a)
15 kV	95 kV	120 mm
27 kV	125 kV	220 mm

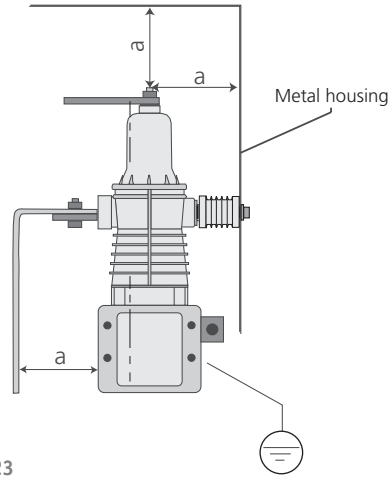


Figure 23

Measures for Complying with the Rated Insulation Level

Insulation cap set for 27 kV ISM

To comply with the rated impulse withstand voltage of 125 kV according to ANSI 37.09 it is recommended to cover the top connections of the 27kV ISM with an insulation cap set.
The insulation cap set is included in the scope of supply of the affected ISM.
The arrangement is shown in Figure 24.

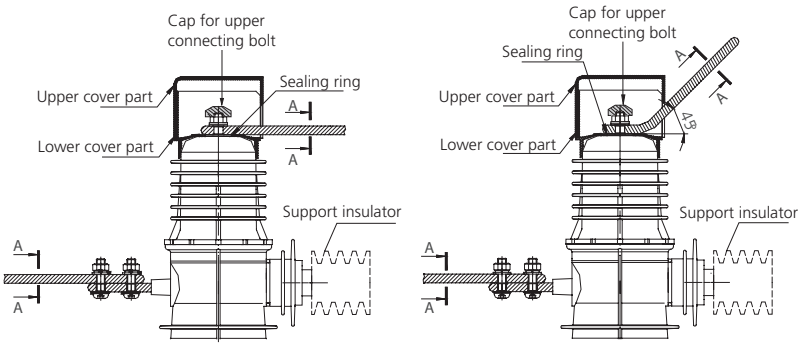


Figure 24

If the insulation cap set will not be used the compliance with the rated insulation level shall be approved by a voltage test.

Busbar for 27 kV ISM

If the PCD of the 27kV ISM is 210 mm, the connected bus bars shall have the shape as shown in Figure 25.

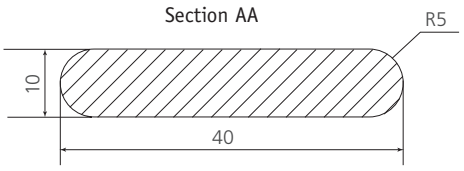


Figure 25

Phase segregation plates for 15 kV and 27 kV ISM

For 15 kV ISM with a PCD of 150 mm or 27 kV ISM with a PCD of 210 mm it is recommended to use segregation plates between the poles. Minimum size and position of the plates are shown in Figure 26.

If the plates will not be used the compliance with the rated insulation level shall be approved by a voltage test.
The segregation plates are not included in the scope of supply.

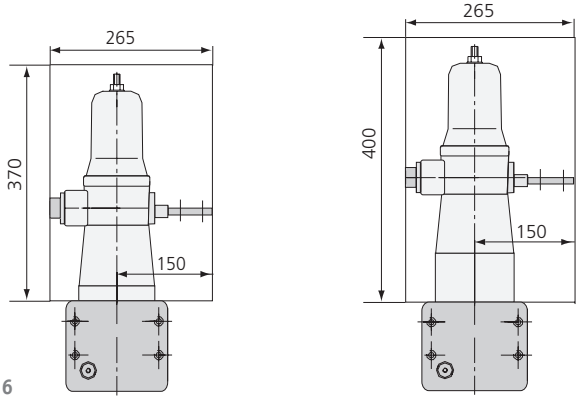


Figure 26

Recommended size and position of the segregation plates for ISM, 15 kV PCD 150 mm

Recommended size and position of the segregation plates for ISM, 27 kV PCD 210 mm

Minimum Clearances due to Electromagnetic Influence

The following clearances must be adhered to (Figure 27):

I_{sc}	Minimum clearance (b)
16 kA, 20 kA	120 mm
25 kA, 31 kA	220 mm

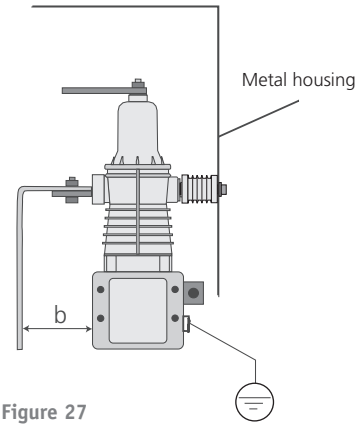


Figure 27

Coordination of Minimum Clearances

In case that due to rated insulation voltage and electromagnetic influence two different minimum clearances (a, b) exist than at least clearance (b) is to be selected. If the clearance is below (a), the compliance with the rated insulation level shall be approved by a voltage test (Figure 28).

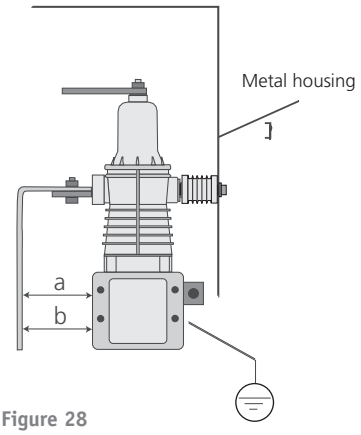


Figure 28

Heating, Heat Sink

The ISM15_LD modules are designed in such a manner that with installed heat sinks (two ITEA741394.006 per pole) at 1000 A rated current and 55°C ambient temperature, with free surroundings, no impermissible high temperatures will arise at the hottest spots of the ISM. The arrangement is shown in Figure 29.

In order to decide whether for an ISM in the respective panel more intensive heat dissipation or a reduction of the rated current values are required, a temperature rise test according to the relevant standards is recommended.

Initial state for ISM15_LD@ 1000A: Two mounted ITEA741394.006 heat sinks or equivalent per pole.
Initial state for ISM15_LD@ <800A: Without heat sink.

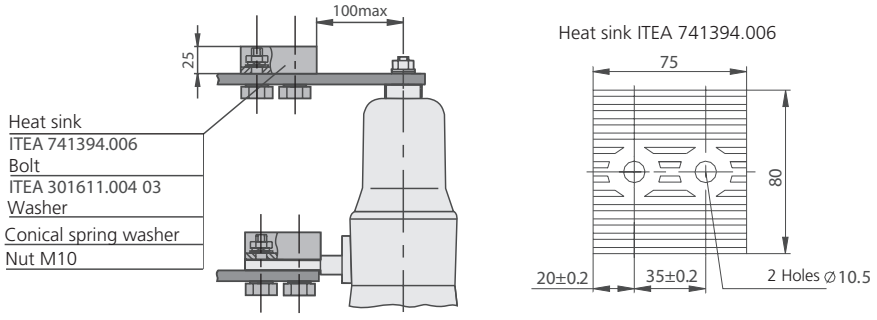


Figure 29

Protective Earthing

For personnel protection the metal housing of the ISM must be connected according to the applicable regulations, such as NFPA-70, via the marked earth screw of the ISM to the earth arrangement of the particular panel. The earth connection can be carried out with cable or a flat copper bar. The cross section must be dimensioned such that a worst-case fault current (short circuit) does not cause a weakening of the earth connection (Figure 30).

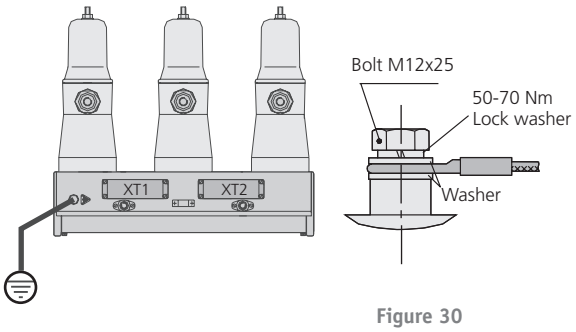


Figure 30

Reference values for cross sections of earth connections (copper):

Fault current(1 s)	Max. temperature	Cross section earth connection
16 kA	300 °C	55-95 mm²
20 kA	300 °C	70-120 mm²

The area around the earth screw shall be cleaned before providing the earth connections. After the occurrence of a short circuit, the proper condition of the protective earthing must be checked.

Mechanical Interlocking

The ISM provides the following interfaces for interlocking (Figure 31):

- Stub shafts at both sides with grooves and tapped holes (Figure 31, details 1 and 3).
- Two interlocking pins with tapped holes (Figure 31, detail 2).

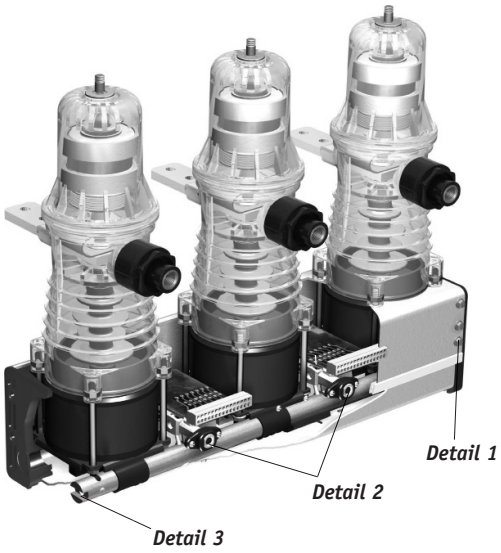
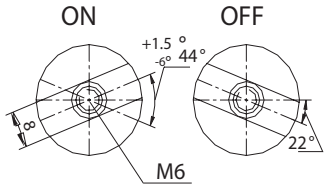
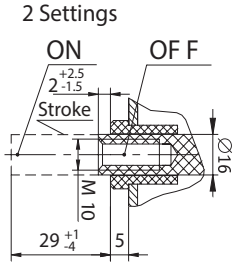


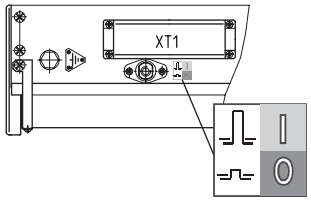
Figure 31
Mechanical interlocking

Detail 1

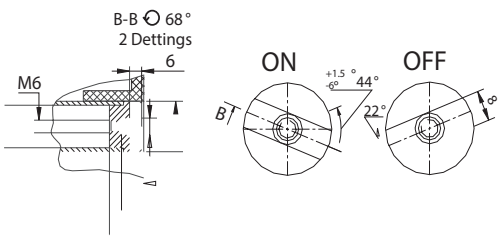


Detail 2





Detail 3



The following conditions must be fulfilled in carrying out mechanical interlocking:

- If the interlocking mechanism is attached to one of the interlocking pins, the weight of the directly attached movable part to the interlocking pins shall not exceed 0.35 kg. Exception is the ISM15_LD_1(55F) series, where the attached movable part shall not exceed 0.1 kg. If both interlocking pins are used, the sum of the attached weights shall not exceed 0.35 kg respectively 0.1 kg (Figure 32).
- If the attached part is joined with a lever mechanism, the weight (including directly moved parts) shall be decreased in proportion to the lever (Figure 33).
- If the interlocking mechanism is directly attached with the synchronizing shaft the moment of inertia of the attached mechanism shall not exceed 4.3 x 10^{-4} kg/m² (1.2 x 10 kg/m² for ISM15_LD_1(55F) series). If both stub shafts of the synchronizing shaft are used, the sum of the attached moments of intertia shall not exceed 4.3 x 10^{-4} kgm² respectively 1.2 x 10^{-4} kgm² (Figure 34).
- For manua-tripping a force of up to 250 N may be applied to the interlocking pins. However no static force shall be applied (Figure 35).
- It is not allowed to perform electrical trip/close commands while blocking the interlocking pins or the synchronizing shaft mechanically.

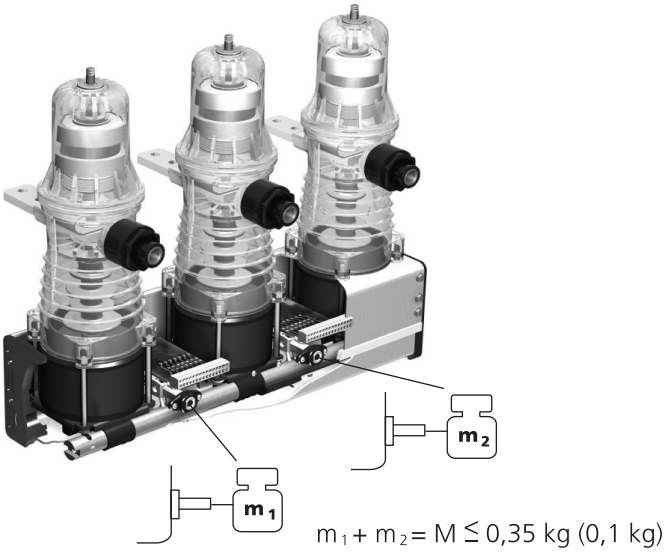


Figure 32

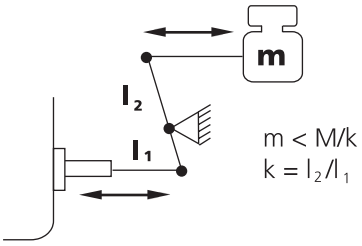


Figure 34

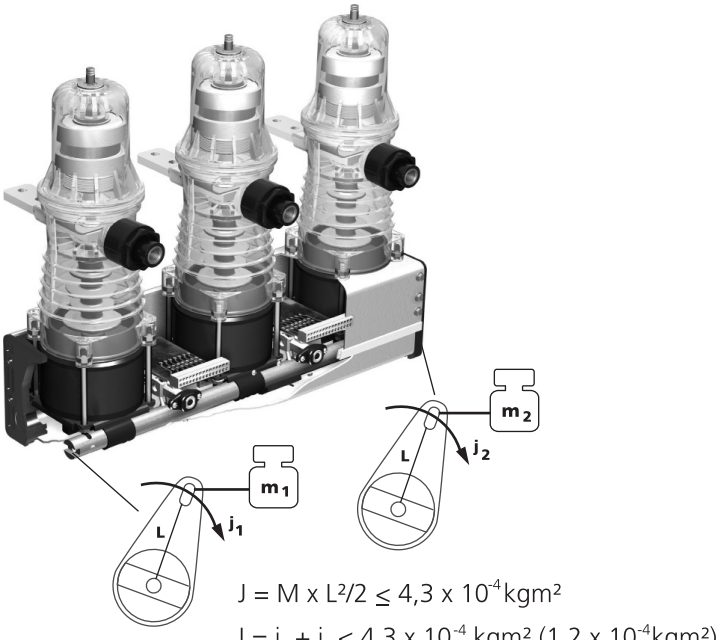


Figure 33

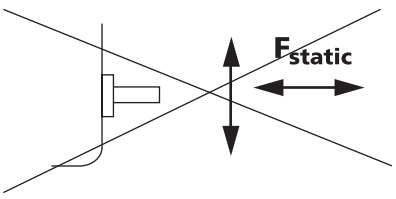


Figure 35

Design of mechanical interlocking at the side stub shafts

Single phase ISM are supplied with an installed interlocking lever (Figure 38, Figure 36).

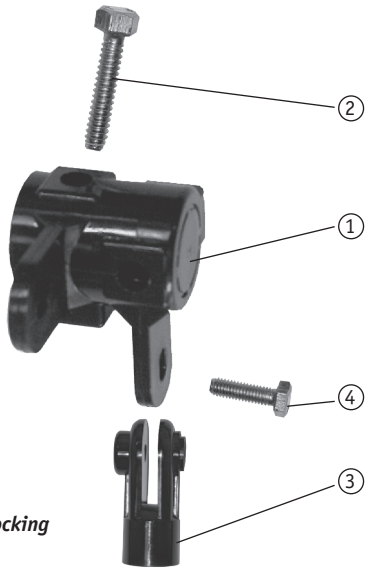


Figure 38

Individual parts of interlocking lever for single phase ISM

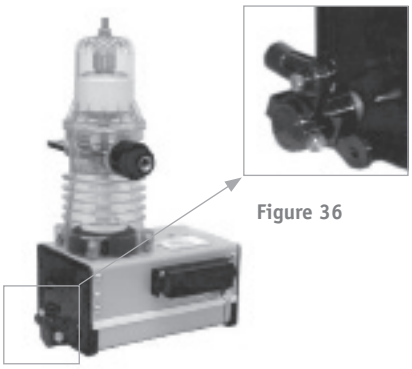


Figure 36

1. Interlocking lever basic element
2. Attachment bolt M8x40 for interlocking lever
3. Joining element
4. Attachment bolt for joining element

To the joining element (3) a mass M ≤ 0.35 kg respectively attached.

For three phase ISM locking levers can be executed with Tavrida Electric interlocking lever set APTA 44 26 11.004 (Figure 39) at both stub shafts (Figure 37).

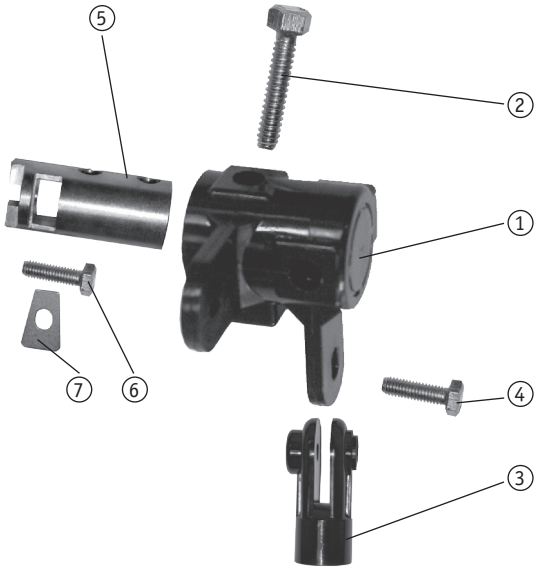


Figure 39

Individual parts of interlocking lever set APTA 44 26 11.004 for three phase ISM

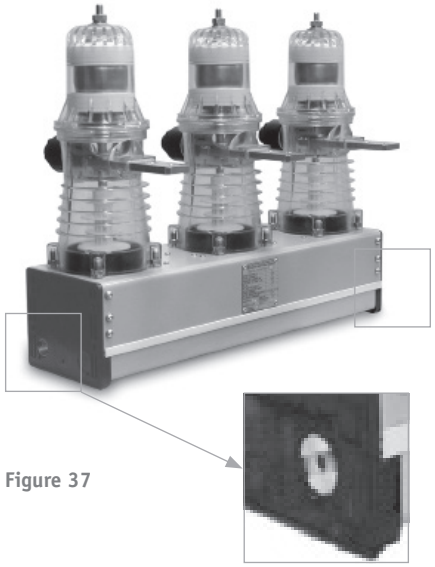
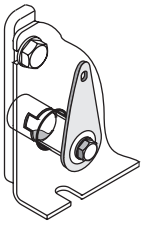


Figure 37

1. Interlocking lever basic element
2. Attachment bolt M8x40 for interlocking lever
3. Joining element
4. Attachment bolt for joining element
5. Extension shaft
6. Attachment bolt for extension shaft
7. Screw retaining device

To the joining element (3) a mass M ≤ 0.35 kg respectively M ≤ 0.1 kg may be attached. If two interlocking levers are used, the total mass at both stub shafts shall not exceed M = 0.35 kg respectively M = 0.1 kg.

In the following please find an example of a self-constructed trip unit (not in the scope of supply, Figure 40, Figure 42).



L = 19.5...50 mm
B = 22...50 mm
The length of L and B depends on the particular project.

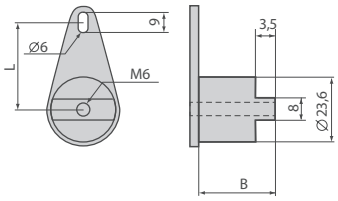


Figure 40
Connection between interlocking lever and synchronizing shaft

Figure 42

Construction and connection variants of interlocking lever at the side stub shafts (Figure 41, Figure 43)

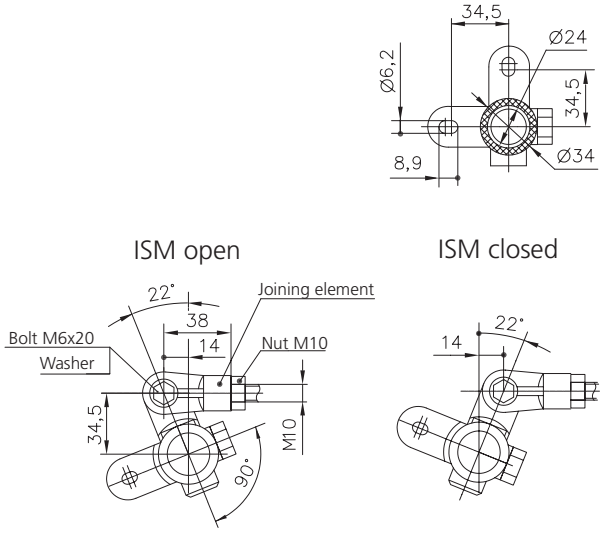


Figure 41
Position of interlocking lever as a function of ISM position

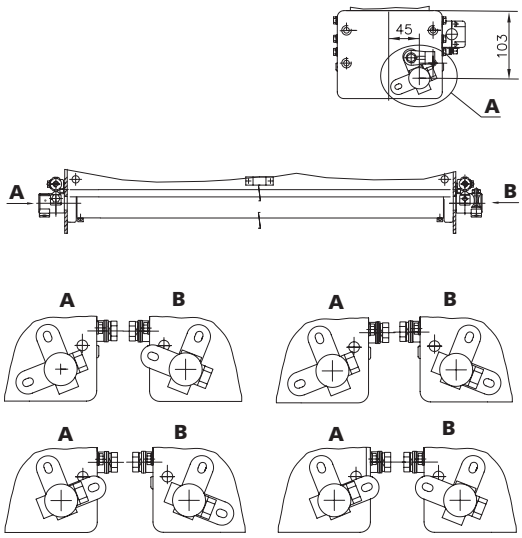


Figure 43

Possible connection variants of the interlocking levers (Figure 43).

Variant A:
One-side connection for single-phase-ISM
Variant A, B:
Two-side connection for three-phase-ISM

Secondary Connections of the ISM

Secondary connections for three-phase ISM

All three-phase ISM have the same terminals (Figure 44). Connected to the terminal blocks XT1 and XT2 are 13 auxiliary switches (6 “NO”- and 7 “NC”-contacts) and the magnetic actuator coils.

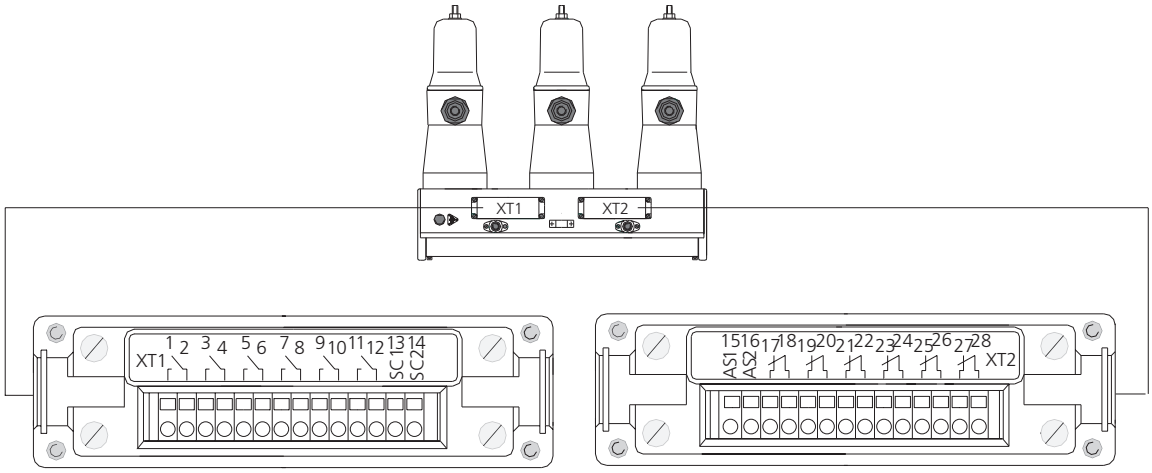


Figure 44

Terminal arrangement of the three-phase ISM

Terminal arrangement ISM (three-phase)

XT1		XT2	
Terminal No.	**Connection**	**Terminal No.**	**Connection**
1	Auxiliary switch S 1 (1)	15	Auxiliary switch S13 (AS1)
2	Auxiliary switch S 1 (4)	16	Auxiliary switch S 13 (AS2)
3	Auxiliary switch S 2 (1)	17	Auxiliary switch S 7 (1)
4	Auxiliary switch S 2 (4)	18	Auxiliary switch S 7(2)
5	Auxiliary switch S 3 (1)	19	Auxiliary switch S 8 (1)
6	Auxiliary switch S 3 (4)	20	Auxiliary switch S 8 (2)
7	Auxiliary switch S 4 (1)	21	Auxiliary switch S 9 (1)
8	Auxiliary switch S 4 (4)	22	Auxiliary switch S 9 (2)
9	Auxiliary switch S 5 (1)	23	Auxiliary switch S 10 (1)
10	Auxiliary switch S 5 (4)	24	Auxiliary switch S 10 (2)
11	Auxiliary switch S 6 (1)	25	Auxiliary switch S 11 (1)
12	Auxiliary switch S 6 (4)	26	Auxiliary switch S 11 (2)
13	Actuator coil (SC1)	27	Auxiliary switch S 12 (1)
14	Actuator coil (SC2)	28	Auxiliary switch S 12 (2)

Secondary connections for single-phase ISM

All single-phase ISM have the same terminals (Figure 45). Connected to the terminal block XT1 are 5 auxiliary switches (2 “NO”- and 3 “NC”contacts) and the magnetic actuator coil.

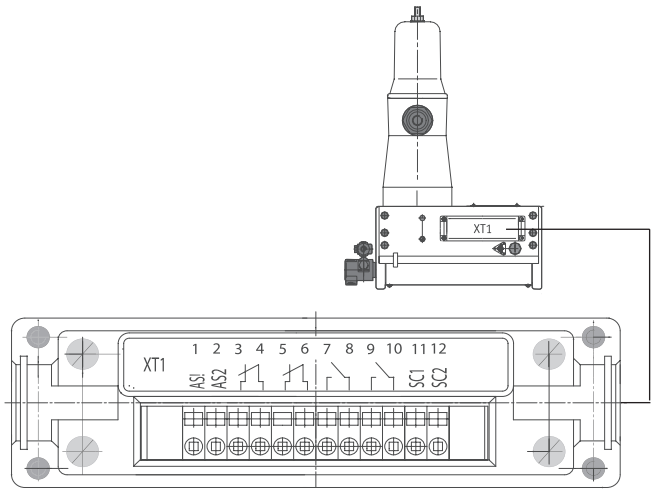


Figure 45

Terminal arrangement of the single-phase ISM

Terminal arrangement ISM (single-phase)

XT1	
Terminal No.	**Connection**
1	Auxiliary switch SF1 (AS1)
2	Auxiliary switch SF1 (AS2)
3	Auxiliary switch SF2
4	Auxiliary switch SF2
5	Auxiliary switch SF3
6	Auxiliary switch SF3
7	Auxiliary switch SF4
8	Auxiliary switch SF4
9	Auxiliary switch SF5
10	Auxiliary switch SF5
11	Actuator coil (SC1)
12	Actuator coil (SC2)

CM connections

The connections for basic and extended functions of all available CM can be seen from the following terminal arrangements (Figure 46, Figure 47, Figure 48, Figure 49, Figure 50).

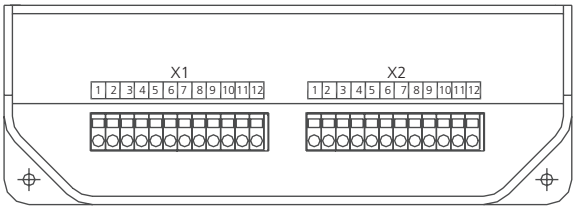


Figure 46

CM_12_1 Terminal arrangement

3

X1		X2	
Terminal No.	**Connection**	**Terminal No.**	**Connection**
1	Earth	1	Ready (com)
2	Free	2	Ready (NO)
3	Auxiliary power supply ~ (+)	3	Ready (NC)
4	Auxiliary power supply ~ (–)	4	Malfunction (com)
5	Free	5	Malfunction (NC)
6	Free	6	Malfunction (NO)
7	Free	7	Auxiliary switch ISM (AS1)
8	Free	8	Auxiliary switch ISM (AS2)
9	Dry contact “Close”	9	Output actuator coil (SC1)
10	Dry contact “Common”	10	Output actuator coil (SC2)
11	Dry contact “Common”	11	Free
12	Dry contact “Trip”	12	Earth

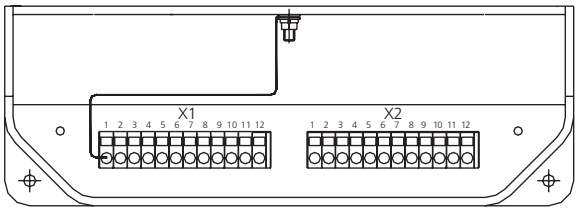


Figure 47

CM_14_1 Terminal arrangement

X1		X2	
Terminal No.	**Connection**	**Terminal No.**	**Connection**
1	Earth, internally used	1	Ready (com)
2	Free	2	Ready (NO)
3	Auxiliary power supply ~ (+)	3	Ready (NC)
4	Auxiliary power supply ~ (–)	4	Malfunction (com)
5	Free	5	Malfunction (NC)
6	Free	6	Malfunction (NO)
7	Free	7	Auxiliary switch ISM (AS1)
8	Free	8	Auxiliary switch ISM (AS2)
9	Dry contact “Close”	9	Output actuator coil (SC1)
10	Dry contact “Common”	10	Output actuator coil (SC2)
11	Dry contact “Common”	11	Free
12	Dry contact “Trip”	12	Earth

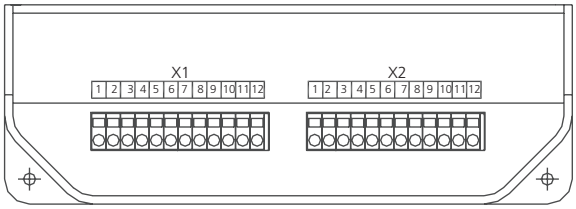


Figure 48

CM_12_2 Terminal arrangement

X1		X2	
Terminal No.	**Connection**	**Terminal No.**	**Connection**
1	Earth, internally used	1	Ready (com)
2	Free	2	Ready (NO)
3	Auxiliary power supply ~ (+)	3	Ready (NC)
4	Auxiliary power supply ~ (–)	4	Malfunction (com)
5	Free	5	Malfunction (NC)
6	Free	6	Malfunction (NO)
7	Free	7	Auxiliary switch ISM (AS1)
8	Free	8	Auxiliary switch ISM (AS2)
9	Dry contact “Close”	9	Output actuator coil (SC1)
10	Dry contact “Common”	10	Output actuator coil (SC2)
11	Dry contact “Common”	11	Free
12	Dry contact “Trip”	12	Earth

X3		X4	
Terminal No.	**Connection**	**Terminal No.**	**Connection**
1	Close command and supervision ~ (+)	1	Ready (com)
2	Close command and supervision ~ (–)	2	Ready (NO)
3	Simulation close coil	3	Free
4	Simulation close coil	4	Free
5	Free	5	Free
6	Trip command and supervision ~ (+)	6	Free
7	Trip command and supervision ~ (–)	7	Free
8	Simulation trip coil 1	8	Free
9	Simulation trip coil 1	9	Free
10	Trip coil 1 supervision	10	Free
11	Free	11	Free
12	Wipe contact trip operation (NO)	12	Free
13	Wipe contact trip operation (NO)	13	Free
14	Free	14	Free
15	Free	15	Free
16	Free	16	Free

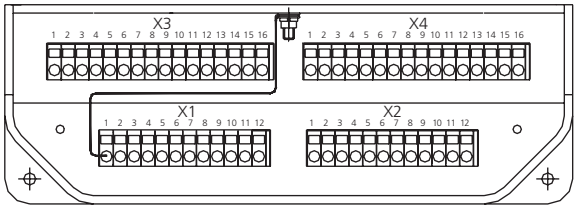


Figure 49

CM_12_3 Terminal arrangement

X1		X2	
Terminal No.	**Connection**	**Terminal No.**	**Connection**
1	Earth, internally used	1	Ready (com)
2	Free	2	Ready (NO)
3	Auxiliary power supply ~ (+)	3	Ready (NC)
4	Auxiliary power supply ~ (–)	4	Malfunction (com)
5	Free	5	Malfunction (NC)
6	Emergency power supply ~ (+)	6	Malfunction (NO)
7	Emergency power supply ~ (–)	7	Auxiliary switch ISM (AS1)
8	Free	8	Auxiliary switch ISM (AS2)
9	Dry contact “Close”	9	Output actuator coil (SC1)
10	Dry contact “Common”	10	Output actuator coil (SC2)
11	Dry contact “Common”	11	Free
12	Dry contact “Trip”	12	Earth

X3		X4	
Terminal No.	**Connection**	**Terminal No.**	**Connection**
1	Close command and supervision ~ (+)	1	Emergency signalling NO-contact
2	Close command and supervision ~ (–)	2	Emergency signalling contact (com)
3	Simulation close coil	3	Emergency signalling NC-contact
4	Simulation close coil	4	Free
5	Free	5	CT-Power supply mode
6	Trip command and supervision ~ (+)	6	CT-Power supply mode
7	Trip command and supervision ~ (–)	7	Free
8	Simulation trip coil 1	8	Trip command and supervision for trip coil 2 from alternative auxiliary power supply
9	Simulation trip coil 1	9	Trip command and supervision for trip coil 2 from alternative auxiliary power supply
10	Trip coil 1 supervision	10	Simulation trip coil 2
11	Free	11	Simulation trip coil 2
12	Emergency signalling NO-contact	12	Free
13	Emergency signalling NO-contact	13	Current transformer input 1
14	Free	14	Current transformer input 1
15	Reset input for emergency-signalling contacts	15	Current transformer input 2
16	Reset input for emergency-signalling contacts	16	Current transformer input 2

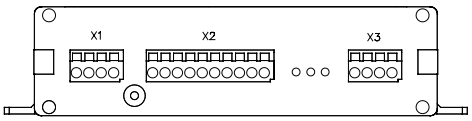


Figure 50

CM_1501_01 Terminal arrangement

X1		X2		X3	
Terminal No.	**Connection**	**Terminal No.**	**Connection**	**Terminal No.**	**Connection**
1	Auxiliary power supply input 1	1	Ready (NO)	1	Auxiliary switch ISM (AS1)
2	Auxiliary power supply input 1	2	Ready (COM)	2	Auxiliary switch ISM (AS2)
3	Auxiliary power supply input 2	3	Ready (NC)	3	Output actuator coil (SC1)
4	Auxiliary power supply input 2	4	Dry contact “Close”	4	Output actuator coil (SC2)
		5	Dry contact “Close”		
		6	Dry contact “Trip”		
		7	Dry contact “Trip”		
		8	Malfunction (NO)		
		9	Malfunction (COM)		
		10	Malfunction (NC)		

Warning

Power supply voltage can be applied between terminals X1:1,2 and X1:3,4 of CM_1501_01 only. Terminals X1:1, X1:2 short-circuited inside of CM_1501_01, and terminals X1:3, X1:4 also short-circuited inside of module.

Terminal arrangement for the basic functions

The control modules CM_12_1..2..3, and CM_14_1 have the same basic functions and the same terminal arrangements.

- Auxiliary power supply (terminals X1:3,4)
- Earth connection (terminal X2:12)
- Dry contact inputs (terminals X1:9,10,11,12)
- Output actuator coil (terminals X2:9,10)
- Dry contact input for ISM position (terminals X2:7,8)
- Dry contact output "Ready" (terminals X2:1,2,3)
- Dry contact output "Malfunction" (terminals X2:4,5,6)

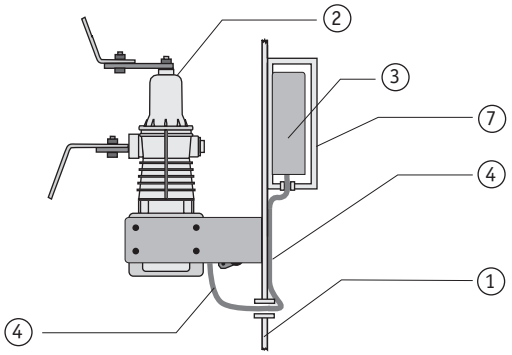


Figure 51

Fixed type installation

Installation of the CM

The installation of the CM is carried out according to the panel design either on the draw out unit or in the low voltage compartment of the switchboard. It must be separated from the high voltage compartment. The CM shall be installed in a earthed mild steel box with a thickness of not less than 1 mm. If interference suppressing filters F/TEL03 and F/TEL04 are applied, then it shall be installed also in the CM-steel box (Figure 51, Figure 52).

The CM can operate in any mounting position. Care must be taken for good access and visibility of the terminals, LEDs and setting elements for operation and maintenance. The ambient conditions as described in chapter "Regulations and ambient conditions"(page 77) shall apply.

① Steel plate
> 1 mm thick
② ISM
③ CM
④ Shielded cable
⑤ Secondary circuit plug
⑥ Secondary components
⑦ Closed steel box > 1 mm

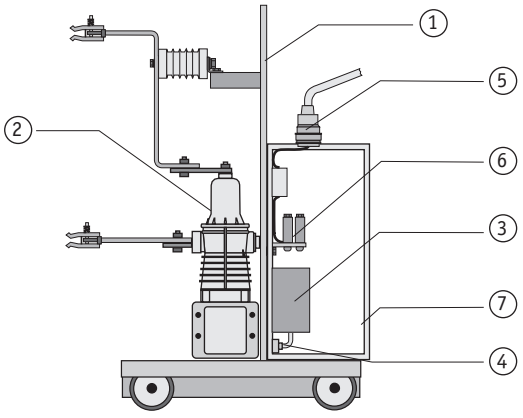


Figure 52

Draw out type installation

Installation of Secondary Cables Between ISM and CM

In the high voltage compartment it is recommended to install the secondary shielded cables between ISM and CM in an earthed metal hose or an enclosed metal duct.

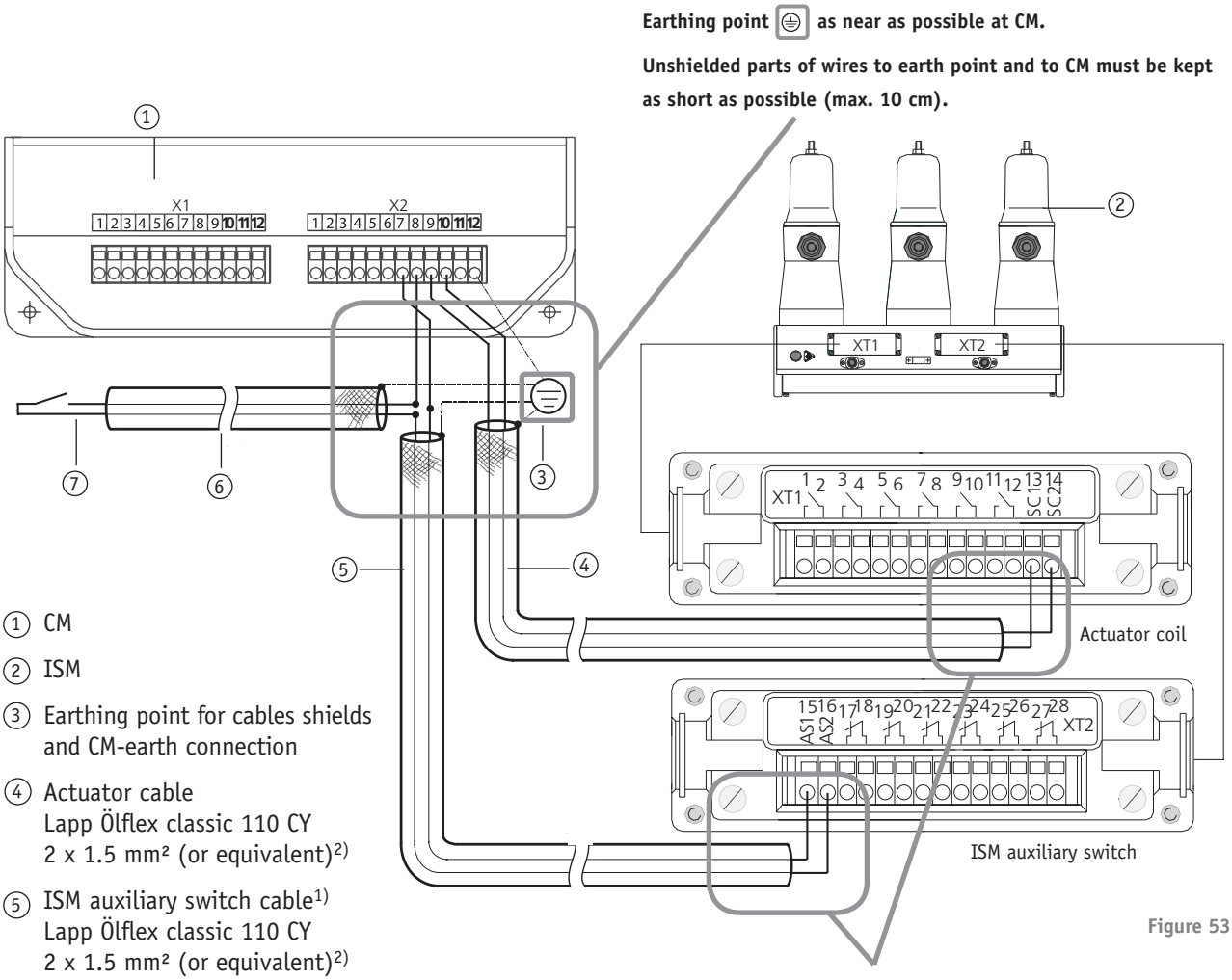


Figure 53

① CM

② ISM

③ Earthing point for cables shields and CM-earth connection

④ Actuator cable
Lapp Ölflex classic 110 CY
2 x 1.5 mm² (or equivalent)[2)]

⑤ ISM auxiliary switch cable[1)]
Lapp Ölflex classic 110 CY
2 x 1.5 mm² (or equivalent)[2)]

⑥ Closing lock-out contact cable[1)]
Lapp Ölflex classic 110 CY
2 x 1.5 mm² (or equivalent)[2)]

⑦ Closing lock-out contact (optional)

[1)] For ISM auxiliary switch cable and closing lock-out cable the cross section can be chosen smaller up to 0.5 mm².

[2)] The degree of coverage of the cable shield shall be not less than 85%.

The cables are fixed with a special screwdriver supplied with every ISM and CM (Figure 54). Solid or multi-wire cables with or without sleeves with a cross section of 0.5 to 2.5 mm² can be connected to the terminals. The bare ends of the cables shall be 8 to 9 mm.

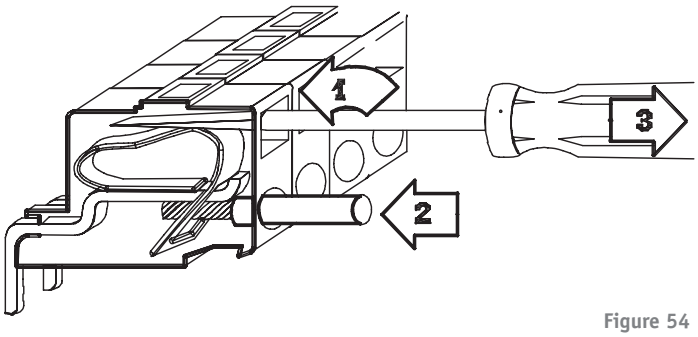


Figure 54

CM Auxiliary Power Supply

To ensure the functionality of the CM, it is recommended to connect the CM to the same auxiliary power supply as the protection relays and control devices. The CM/TEL ...-12-03A can optionally be operated by a 12-30 V DC emergency power supply or by current transformer power supply.

Auxiliary power supply and selection of MCB for CM/TEL...-12-01A, -02A, -03A, CM/TEL...-14-01 and CM_1501_01

(Figure 55)

Technical data of the MCB:

24 V DC :	4A, 1-pole, characteristic B or C
60 V DC :	2A, 2-pole, characteristic B or C
100/220 V AC :	1A, 2-pole, characteristic B or C
100/220 V DC :	1A, 2-pole, characteristic B or C

If the CM is connected with DC voltage please pay attention to the correct polarity.

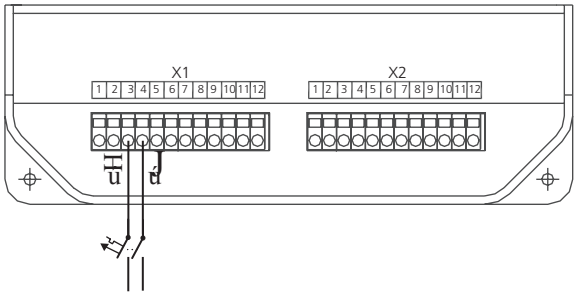


Figure 55

Auxiliary power supply for CM/TEL...-12-01A

Emergency power supply and protection of the CM/TEL...-12--03A

(Figure 56)

Technical data of the MCB:
30 V DC: 4A, 1-pole characteristic B or C

The CM/TEL...-12-03A can be operated simultaneously with the operating and the emergency voltage.
The functions of the CM are limited if it is operated with emergency power supply only.

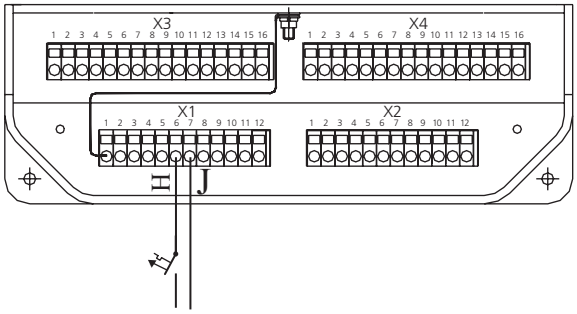


Figure 56

Emergency power supply

Current transformer power supply for CM/TEL...-12-03A

(Figure 57)

Current transformer power supply is recommended when the protection relays are also supplied with current transformer power supply. The CM functions are limited when operating with current transformer power supply.

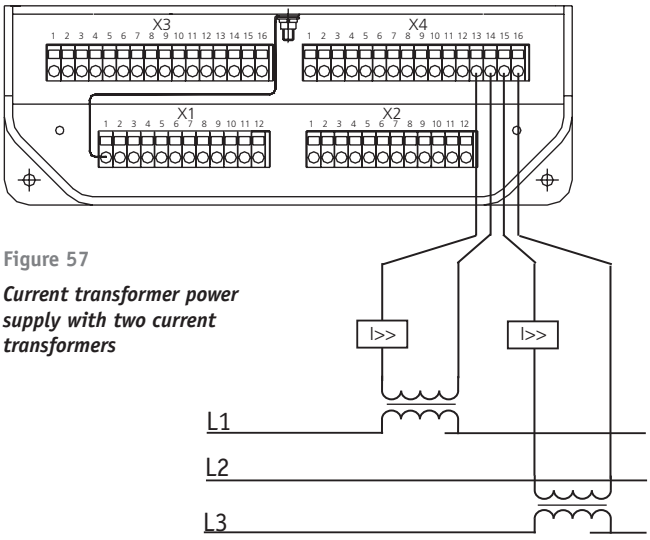


Figure 57

Current transformer power supply with two current transformers

Auxiliary Cables for CM and ISM

It is recommended to shield the feeder cables for the CM controls, the CM-signalling and the ISM auxiliary switch cables. If these cables need to be in the high voltage compartment they shall be protected by an enclosed metal duct.

Interference Suppressing Filters (optional, CM/TEL....12 and 14 Series Only)

Interference suppressing filters F/TEL-03 and F/TEL-04 shall be installed when CM works under severe electromagnetic conditions and the surge level is higher than the one specified in chapter „Technical data“ page 74.

Type of load	Rated voltage		
	6 kV	12 kV	up to 24 kV
Motor starting from 500 kVA	-	-	F/TEL-03, F/TEL-04
Generator starting from 500 kVA	-	-	F/TEL-03, F/TEL-04
Transformers loaded with motors starting from 500 kVA	F/TEL-03, F/TEL-04	F/TEL-03, F/TEL-04	F/TEL-03, F/TEL-04
Electric arc furnace up to 2000 kVA	-	-	F/TEL-03, F/TEL-04
Electric arc furnace starting from 2000 kVA	-	F/TEL-03, F/TEL-04	F/TEL-03, F/TEL-04
Inverter-fed drives starting from 500 kVA	F/TEL-03, F/TEL-04	F/TEL-03, F/TEL-04	F/TEL-03, F/TEL-04

The filter shall be bolted as near to the CM as possible on flat, earthed and good-conducting metal surfaces. Care must be taken that there is an electrical conducting connection between the filter housing and the metal plate. Any existing paint must be removed.

Interference suppressing filters F/TEL-03 and F/TEL-04 for CM/TEL...-12-01A, -02A, -03A

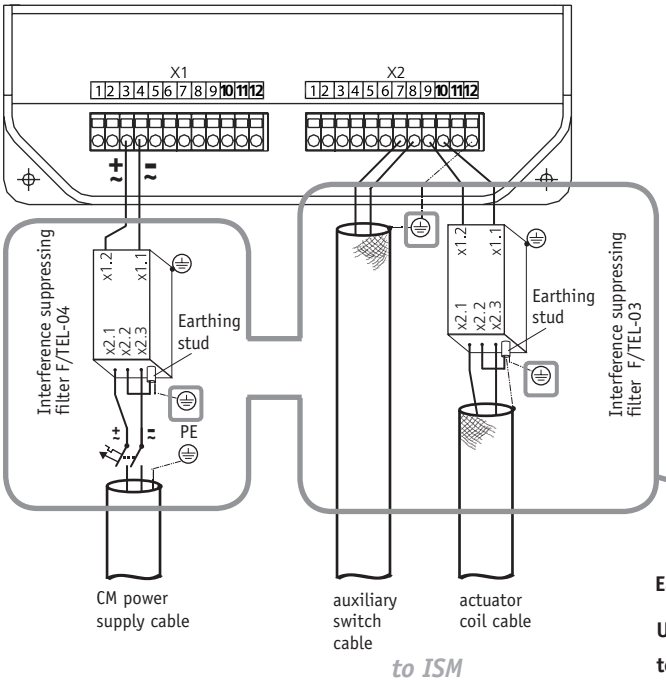
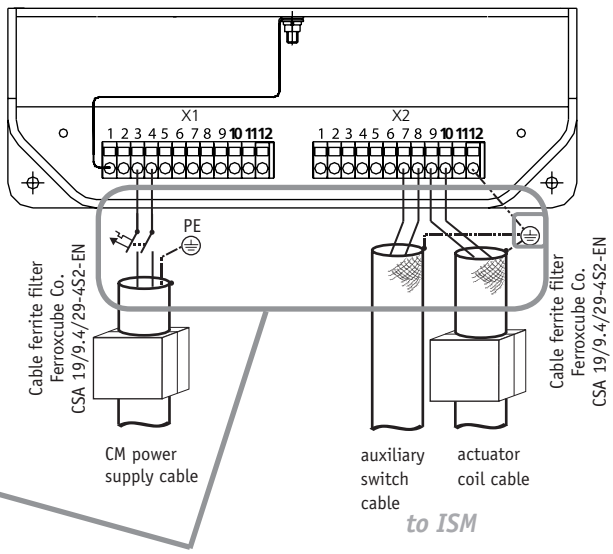


Figure 58

Cable ferrite filters for CM/TEL...-14-01 (in scope of supply)



Earthing points ⏚ as near as possible at CM respectively at filters.

Unshielded parts of wires to earthing point, to filters and to CM must be kept as short as possible (max. 10 cm).

Figure 59

4

Switching and Control Functions

Charging of the Capacitors

Closing and trip capacitors of the CM are charged when CM is applied to the auxiliary power supply. The charged closing capacitors correspond with the charged springs of a conventional circuit breaker. After the failure of auxiliary power supply any pending trip or any trip command arriving the CM up to 30s after failure of auxiliary power supply will be executed.

Ready-LED and Ready-Relay Output

While charging the capacitors, the Ready-LED blinks. When the capacitors are charged the Ready-LED flashes continuously and Ready-relay contact X2:1,2 is closed. With blinking or extinguished Ready-LED, the Ready-relay contact X2:1,2 is open. The Ready-relay output, for instance, can be used as release condition for switch control.

Malfunction-LED and Malfunction-Relay Output

If the CM detects an internal or external malfunction, the Malfunction-LED will blink according to the type of malfunction (see chapter: “Signalling”). At the same time the Malfunction-relay contact X2:4,5 will close.
In this way a collective CM-Malfunction can be transmitted to an alarm or SCADA system. In case of malfunction the Ready-LED is extinguished and the Ready-relay contact X2:1,2 is opened. The Malfunction-relay contact X2:4,5 is closed, if CM is powered off.

Switching the ISM On and Off via the Dry Contact Inputs of the CM

The ISM can only be switched on electrically via the CM. Dry contact inputs are available at all CMs for close and trip operations. Each of these inputs can be connected with one or more parallel-switched dry contacts. Under no circumstances shall external voltage be applied to these inputs as this will destroy the CM.

Electrical Closing Lock-out (optional)

Close conditions for the ISM, for instance:

- Earthing switch OFF
- Disconnector of the panel is in the “on-position”
- Draw out typ circuit breaker is in the “service-position”
- Release key switch is in the “operation-position”
- etc.

can be carried out according to the three following variants.

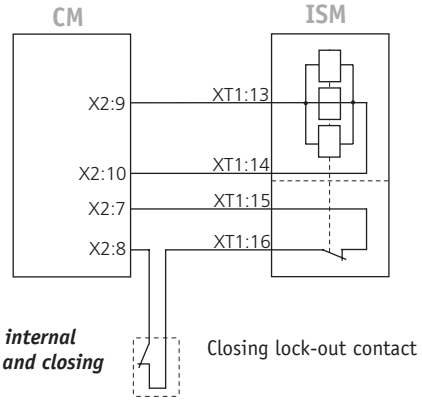


Figure 60

Circuit diagram for internal electrical interlock and closing lock-out

Variant 1 - In the CM close command circuit (e.g. use of the dry contact input X1:9, X1:10)
Variant 2 - In the ISM auxiliary switch circuit (between CM/X2:8 and ISM/XT1:16), Figure 59
Variant 3 - In the close command circuit (e.g. use of the dry contact input X1:9, X1:10) and in the ISM position switch circuit (between CM/X2:8 and ISM/XT1:16)

If despite effective electrical closing lock-out a close attempt is made, the Malfunction LED will blink 2 times (see malfunction indication table, page 49). The reason for the malfunction must be eliminated to abolish the electrical closing lock-out and to activate the close readiness.

ISM Forced Trip by an Undervoltage Relay

In case the ISM shall trip because the auxiliary power supply voltage drops below the minimum value an additional undervoltage relay is requested (not part of the scope of supply). The trip contact of the undervoltage relay shall be integrated into the dry contact trip command circuit. If the CM was ready for operation before the voltage dropped below the minimum value, tripping of the ISM is possible within 30 s (5 s with CM_14_1) after the voltage dropped below the minimum level (Figure 61).

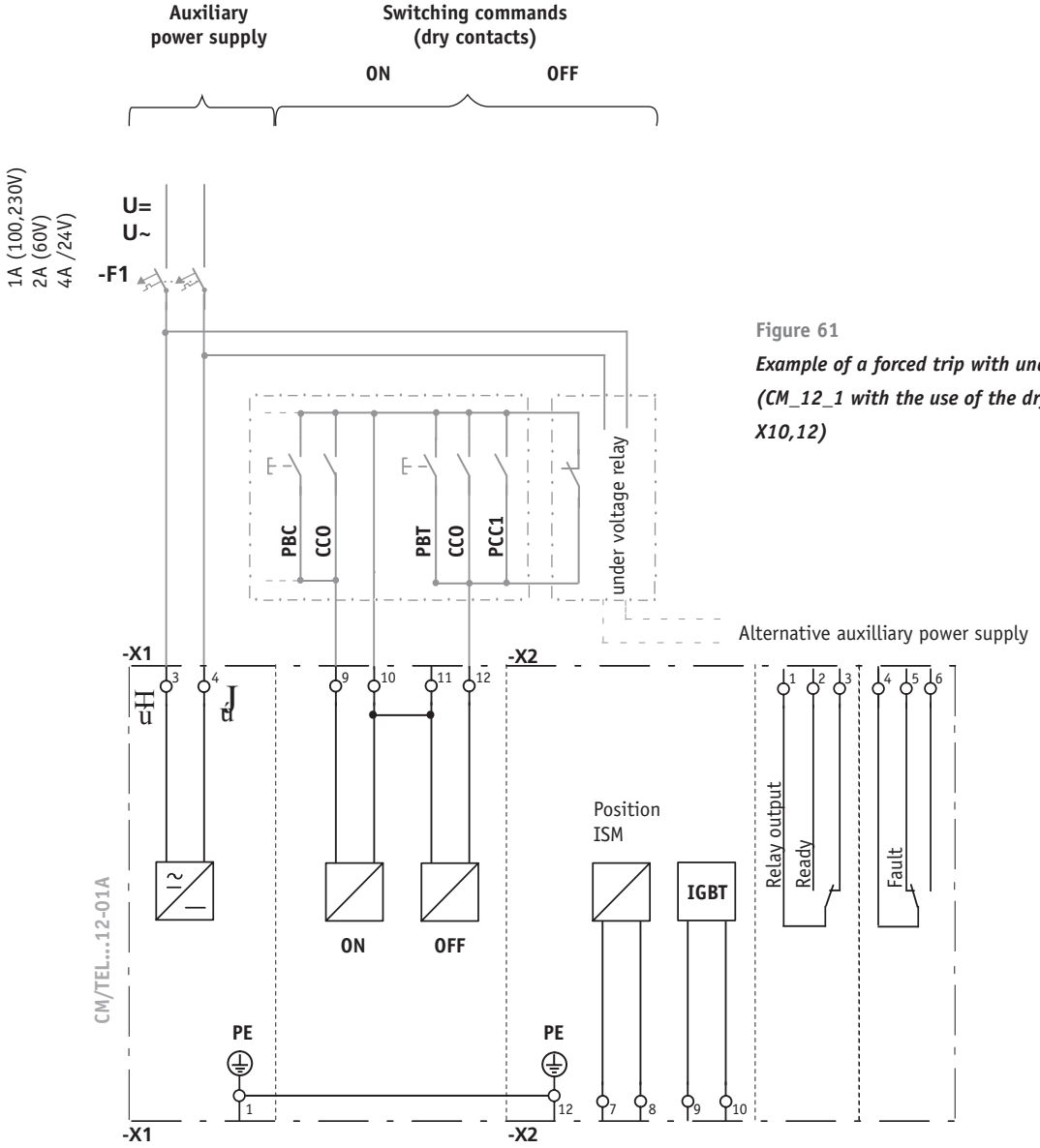


Figure 61
Example of a forced trip with undervoltage relays (CM_12_1 with the use of the dry contact input X10,12)

Antipumping Duty

For close and trip inputs the following rule is applicable: During close operation, if a trip instruction is received before the close instruction becomes passive then the close instruction will be blocked. For the next close operation the close instruction must be reapplied after the trip instruction has become passive (Figure 62).

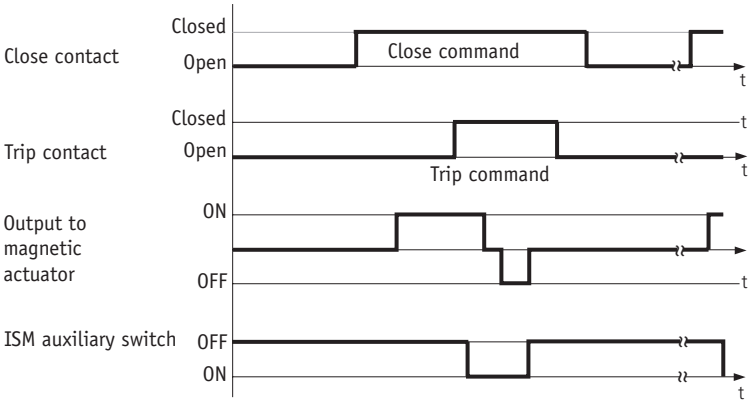


Figure 62

Blocking Duty

For close and trip inputs the following rule is applicable: If a close instruction is received whilst a trip instruction remains active then the close instruction is blocked. For the next close operation the close instruction must be reapplied after the trip instruction has become passive (Figure 63).

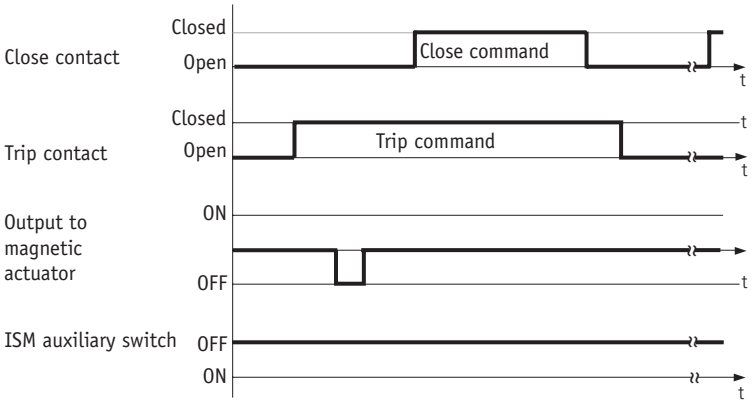


Figure 63

Combined Blocking and Antipumping Duty

A close command during a pending trip command is not executed (blocking duty) even it is pending longer than the trip command (antipumping duty) (Figure 64).

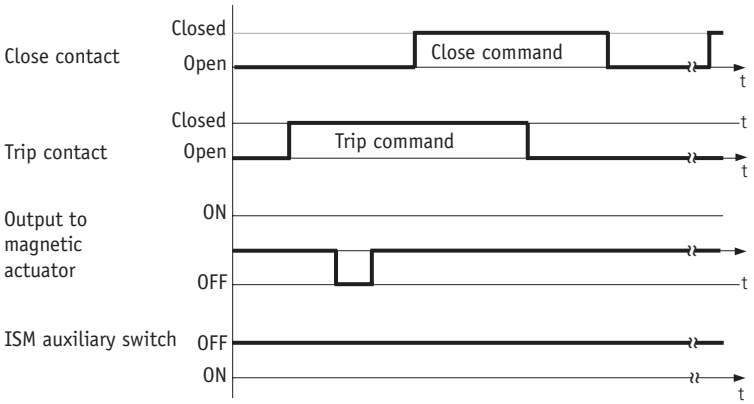


Figure 64

Output to Magnetic Actuator and Input for ISM Position Indication

The cables between the ISM and CM and the coils of the magnetic actuator are monitored permanently (see malfunction indication table, page 49). Internally at the auxiliary switch inputs of the CM 230 V DC is applied for the ISM auxiliary switch S13.

4

Wipe Signal Outputs (CM_12_2)

The CM X3 : 12,13 NO relay output closes 25 ± 5 ms after the ISM open operation and opens again after additional 50 ± 5 ms (trip wipe contact). The CM X4 : 1,2 NO relay output closes 25 ± 5 ms after the ISM close operation and opens again after additional 50 ± 5 ms (close wipe contact).

Operation with Emergency Power Supply (CM_12_3)

In case only the emergency power supply voltage is applied to the CM_12_3 all basic functions are available (dry contact inputs, actuator coil output, optional electrical closing lock-out, Ready output and Malfunction output).

The rated switching sequence O - 0.3 s - CO - 15 s - CO cannot be executed but the following sequence:

CO - max 40 s - CO - max 40 s - CO - max 40 s - CO - max 40 s - CO
11 min pause
CO - max 40 s - CO - max 40 s - CO - max 40 s - CO - max 40 s - CO
11 min pause
etc.

5

Commissioning, Operation, Maintenance

Safety

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

Caution Danger!

Insofar as installation, commissioning or retrofit is carried out on energized equipment, the relevant safety regulations must be adhered to.

When designing and mounting a panel for the first time an acceptance of the equipment must be carried out together with Tavrida Electric in order to ensure the installation conditions.

The ISM must always be tested and operated together with the CM. Individual testing is not possible and may lead to the destruction of the ISM.

Commissioning Primary Part

Tests at end of installation include at least:

- Check for damage
- Remove dirt
- Check bolted connections for fixing points, primary terminals and earthing (also torques)
- Test special functions such as moving function, mechanical interlocks and plug connections insofar as ISM is mounted on a draw-out unit
- Check that free air circulation at ISM is possible

Testing the rated insulation level to IEC 6094 and VDE 06701 Part 1000:

- For 15 kV ISM the rated power frequency test voltage is 36 kV (42 kV according to the Chinese Standard GB 1984-2003)
- For 27 kV ISM the rated power frequency test voltage is 60 kV

Commissioning Secondary Part

Preparation before testing the functionality include at least:

- Testing the availability of the CM auxiliary power supply. It is recommended to use the same auxiliary power supply as for protection and control devices.
- Checking whether the correct type of voltage, the correct voltage level and for direct current the correct polarity have been selected.
- Checking that the correct MCB has been installed.
- Checking that all secondary connections have been pulled up tight.
- Checking whether the optional interference suppressing filters have been installed and earthed (see chapter “Installation, Secondary part, Interference suppressing filters (optional)“).
- Checking that the shielding of the secondary cables and the earth connection of the CM have been properly connected to the earthing point nearby the CM or if applicable for actuator coil cable, to the earthing stud of filter F/TEL-03.
- Checking whether the CM, ISM and the optional filters are connected according to the circuit diagrams.

While testing the functionality, at first the ISM must be separated from high voltage.

· Turn on the CM auxiliary power supply and check the following operating indications:

  - The POWER LED must light up immediately.
  - The READY LED must blink during charging of capacitors and light up continuously within 15 s (90 s for CM_14_1 after switching on.
  - The READY relay contact must close within 15 s (90 s for CM_14_1).
  - The MALFUNCTION LED must not light up.

· Check of all basic and extended functions (if any) according to the chapters “Switching and Control Functions” and “Signalling”.

Caution Danger!

· During operation both CM close / trip outputs and internal auxiliary voltage for ISM auxiliary switch S13 can equal or exceed 230 V DC.

· After switching off the CM, there is still a voltage at the terminals of the capacitors. Only after the MALFUNCTION-LED is extinguished has the voltage dropped to a safe value.

In the factory the magnetic actuator coils are connected and tested according to the existing circuit diagram. If the actuator coil is connected with reversed polarity it is possible that the first operations cannot be performed successfully. This is no failure of the ISM and after a few switching operations this possible effect disappeared permanently (unless the polarity is changed again).

After above listed functionality tests were performed succesfully the ISM can be tested under high voltage and with load connected.

Maintenance

Under normal operating conditions (see chapter “Regulations and ambient conditions, Ambient conditions”, page 78) the ISM is maintenance free for a period of at least 25 years or until it has reached the permissible number of operating cycles. Nevertheless the surface of the ISM must be kept clean. Deposits of any kind must be removed.

Non-conformity

If during installation, commissioning, operation or maintenance any non-conformity occurs, action shall be taken in accordance with the non-conformity report on page 87.

6

Signalling

LED Indicators and Dry Contacts

Functionality	Results	LED indicators				Dry contacts			
		CM_12_1..2..3			CM_14_1	CM_12_1..2..3			CM_14_1
Switch on auxiliary power supply	Power supply On	•	•	•	•				
Switch on emergency power supply	Emergency power supply On			•					
CM is ready to carry-out control commands	Operational readiness	•	•	•	•	•	•	•	•
ISM close operation	Wipe contact close operation						•		
ISM trip operation	Wipe contact trip operation						•		
Unsupervised ISM trip operation	Emergency signalling contacts							•	
Malfunction CM or ISM	Malfunction	•	•	•	•	•	•	•	•

Functionality	Results	LED indicators	Dry contacts
		CM_1501_01	
Switch on auxiliary power supply	Power supply On	•	
Switch on emergency power supply	Emergency power supply On		
CM is ready to carry-out control commands	Operational readiness	•	•
ISM close operation	Wipe contact close operation		
ISM trip operation	Wipe contact trip operation		
Unsupervised ISM trip operation	Emergency signalling contacts		
Malfunction CM or ISM	Malfunction	•	•

LED indicators are situated at the front side of the CM (Figure 65, Figure 66).

Figure 65
Operating and malfunction indications for CM_12_1

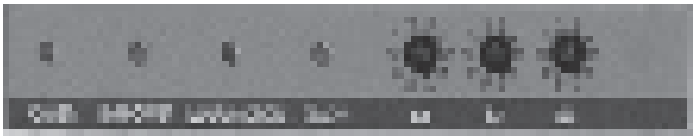


Figure 66
Operating and malfunction indications for CM_12_3

Malfunction Indication Table

The self-monitoring system inside the CM detects eventual malfunctions and report them via the MALFUNCTION LED with various blink signals. The meaning of the blink codes and the variations per type of malfunction are shown in the following table.

Error group	Malfunction LED blinks	Function, type of malfunction	Description of malfunction variants	Recommendation for malfunction elimination	Affected CM
External error	1 blink signal, then 1.5 s pause, periodic (about 4 min for CM/TEL...-12 series, about 10 min for CM/TEL...-14-01)	The power supply has failed for >1.5 s (> 3.5 s for CM/TEL...-14-01) or has been out-side the operating range.	The operating range of the power supply of the CM, depending on the type of voltage, its value and switch command, is between 65-70% and 125% (Trip commands) and 80-125% (Close commands) of the nominal voltage. With continuous failure of the power supply, the blink signals continue until the capacitors are unloaded.	- Switch on MCB - Check for cable break - Check terminal connections	All CM
	2 blink signals, then 1.5 s pause, periodic	The Close or Trip-command of the CM is carried out but the corresponding ISM position signal is missing.	**Malfunction variant 1:** The Close command of the CM is carried out by the ISM. The normally open ISM auxiliary switch S13 has been bridged already due to a malfunction before the Close command was given (despite the existing malfunction, the ISM can be switched off again by the CM. This deletes the malfunction indication although the malfunction still exists).	- Check for short circuit in the cable - Check for short circuited terminals - Check ISM position switch S13	All CM
			Malfunction variant 2: The Trip command of the CM is carried out by the ISM. The normally closed ISM auxiliary switch S13 has been interrupted due to a malfunction (the ISM can only be placed in the close position after the malfunction has been eliminated).	- Check for cable break - Check terminal connections - Check ISM position switch S13	
		The Close command of the CM is not carried out as the ISM is electrically locked in OFF position.	**Malfunction variant 3:** The Close command of the CM is not carried out by the ISM as the closing lock-out contact in ISM S13 auxiliary switch circuit is open. The malfunction indication has been purposely taken into account.	Closing of the ISM is only possible if closing lock-out contact is closed.	
		The Close or Trip command of the CM is not carried out by the ISM as the ISM is mechanically locked in the particular position.	**Malfunction variant 4:** The Close command of the CM is not carried out by the ISM as it is mechanically locked in the OFF position.	Delete malfunction with Trip command. The ISM can only be closed when the mechanical lock has been removed.	
			Malfunction variant 5: The Trip command of the CM is not carried out by the ISM as it is mechanically locked in the ON position.	Remove the mechanical lock of the ISM.	

Error group	Malfunction LED blinks	Function, type of malfunction	Description of malfunction variants	Recommendation for malfunction elimination	Affected CM
External error	3 blink signals, then 1.5 s pause, periodic	The magnetic actuator coil circuit is interrupted.	**Malfunction variant 1:** Possible causes: cable break, loose terminal connections, defect magnetic actuator coils.	- Check for cable break - Check terminal connections	All CM
		CM-internal malfunction.	**Malfunction variant 2:** CM-defect.	- CM must be replaced	
	4 blink signals, then 1.5 s pause, periodic	The magnetic actuator coil circuit is short circuited.	Possible causes: Short circuited cable strands, short circuited terminal connections.	- Check for short circuit in the cable - Check for short circuited terminals	All CM
	5 blink signals, then 1.5 s pause, periodic	without CM command, the ISM trips.	**Malfunction variant 1:** Mechanical emergency trip.	Delete the malfunction indication with the CM Trip command.	All CM
		ISM is closed, a trip is simulated.	**Malfunction variant 2:** The ISM was properly closed by the CM and the close position feedback exists. Then a malfunction occurres in the ISM auxiliary switch S13 circuit in which the normally open switch S13 is bridged (the ISM can still be tripped again via the CM despite the existing malfunction. This deletes the malfunction indication but the cause of the indication is still there).	- Check for short circuit in the cable - Check for short circuited terminals - Check ISM position switch S13	
Internal error	17 or more blink signals, then 1.5 s pause, periodic	Various internal malfunction of the CM.		- CM must be replaced	All CM

Explanatory notes to malfunction indications and operational readiness

· If the ISM is in OFF position and malfunction indications exist, ISM can be closed only after all malfunctions have been eliminated.

· If several malfunctions appear at the same time malfunctions regarding the magnetic actuator are indicated with priority otherwise the last malfunction that occurred.

· Usually failures need to be fixed to stop malfunction indication.
During several malfunction variants of 2- or 5- blink failures, the malfunction indication will disappear with a trip CM command.

· In case of internal CM failures please contact your nearest Tavrida Electric partner.

6

Product Line

Indoor switching modules (ISM)

Type	Former Product Code	Rated Voltage	Rated Short Circuit	Rated Continuous Current	Pole Center Distance
ISM15_LD_1(67)	ISM/TEL-15-20/1000-067	15 kV	20 kA	1000 A	150 mm
ISM15_LD_1(55)	ISM/TEL-15-20/1000-055	15 kV	20 kA	1000 A	210 mm
ISM15_LD_1(55F)	ISM/TEL-15-20/1000-055F	15 kV	20 kA	1000 A	210 mm
ISM15_LD_1(86)	ISM/TEL-15-20/1000-086	15 kV	20 kA	1000 A	210 mm
ISM15_LD_3(89)	ISM/TEL-15-20/1000-089	15 kV	20 kA	1000 A	Single Phase
ISM25_LD_1(210)	ISM/TEL-27-16/800-057	27 kV	16 kA	800 A	210 mm
ISM25_LD_1(275)	ISM/TEL-27-16/800-058	27 kV	16 kA	800 A	275 mm
ISM25_LD_3	ISM/TEL-27-16/800-053	27 kV	16 kA	800 A	Single Phase

Control modules (CM12, CM14 Series)

Type	Former Product Code	Rated Voltage	General Functionality
CM_12_1(60)	CM/TEL-24/60-12-01A	24 - 60 VDC	Basic functionality
CM_12_1(220)	CM/TEL-100/220-12-01A	100 - 270 VAC / VDC	
CM_12_2(60)	CM/TEL-24/60-12-02A	24 - 60 VDC	Basic functionality + additional supervised close / trip circuits, wipe signals
CM_12_2(220)	CM/TEL-100/220-12-02A	100 - 270 VAC / VDC	
CM_12_3(60)	CM/TEL-24/60-12-03A	24 - 60 VDC	Basic functionality + additional supervised close / trip circuits, emergency power supply, CT power supply
CM_12_3(220)	CM/TEL-100/220-12-03A	100 - 270 VAC / VDC	
CM_14_1(60)	CM/TEL-24/60-14-01A	24 - 60 VDC	Basic functionality + reclosing
CM_14_1(220)	CM/TEL-100/220-14-01A	100 - 270 VAC / VDC	

Control modules (CM15 Series)

Type	Former Product Code	Rated Voltage	General Functionality
CM_1501_01(12)	N/A	100 - 270 VAC / VDC	Basic functionality, 12 ms trip delay time
CM_1501_01(4)	N/A	100 - 270 VAC / VDC	Basic functionality, 4 ms trip delay time[1)]

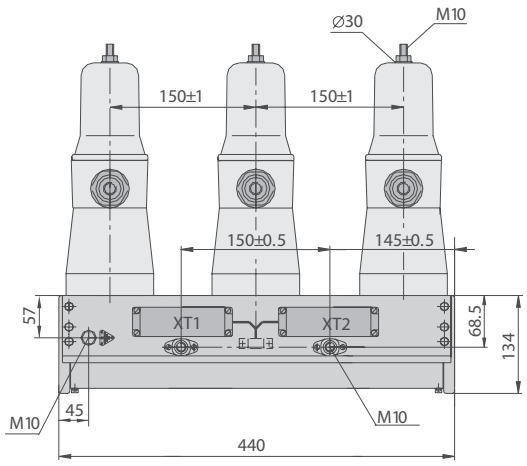
[1)] Faster operating control modules of the CM15 series can be ordered for special applications. Consult Tavrida Electric for de-rating of interrupting ability of ISM's for the higher DC component that may result.

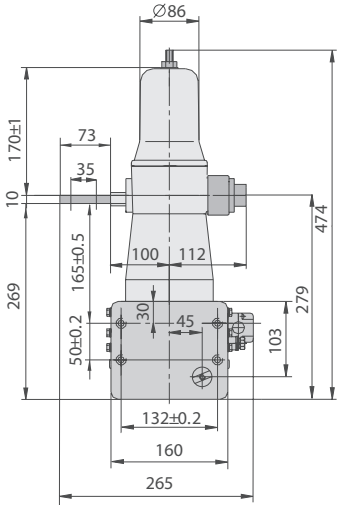
7

Dimensions and Weights

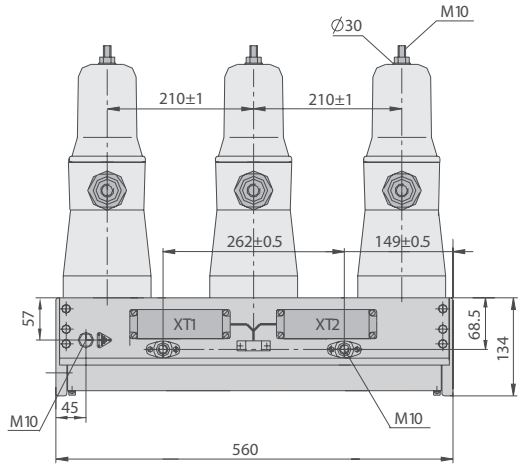
Dimensions and Weights of ISM

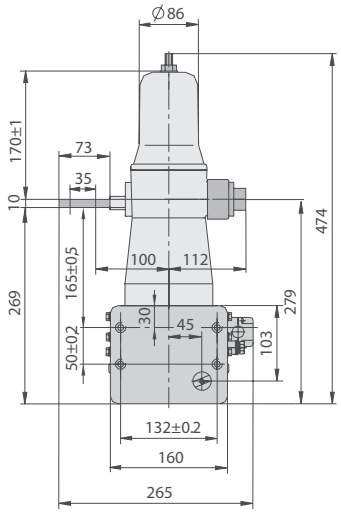
Dimensions and weights of the three-phase ISM





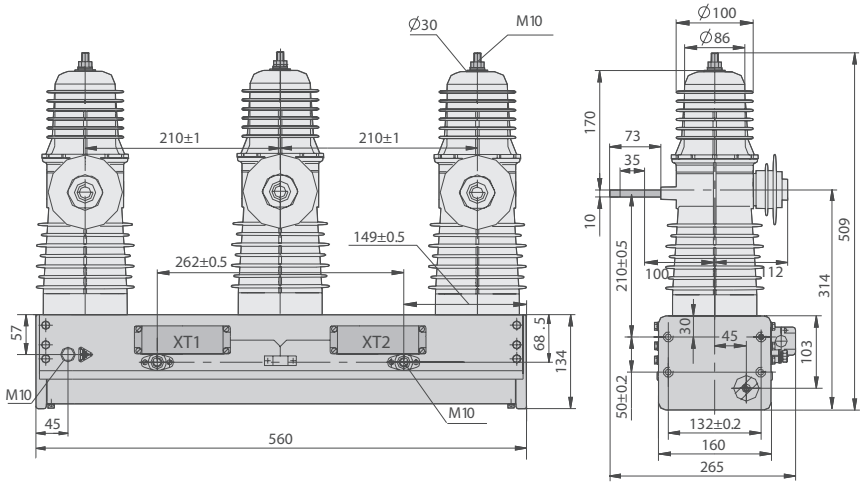
15 kV VCB,
PCD 150 mm
Weight: 34 kg ISM15_LD_1(67)



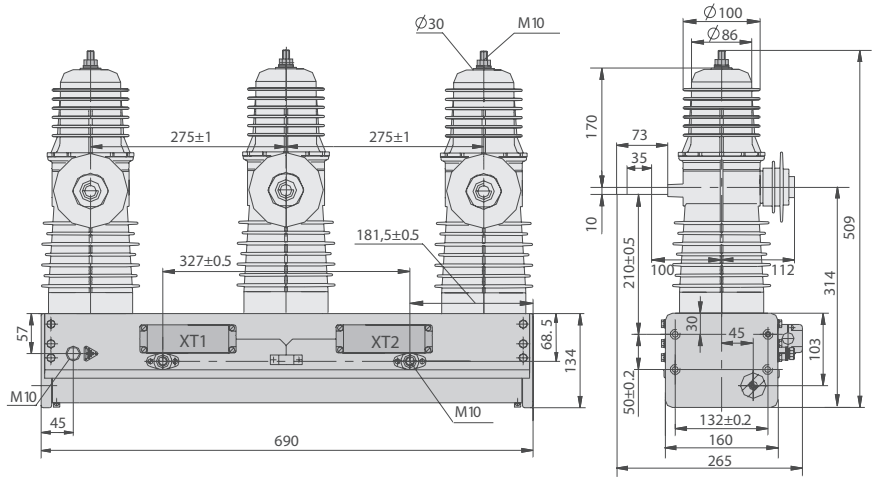


15 kV VCB,
PCD 210 mm
Weight: 36 kg ISM15_LD_1(55)

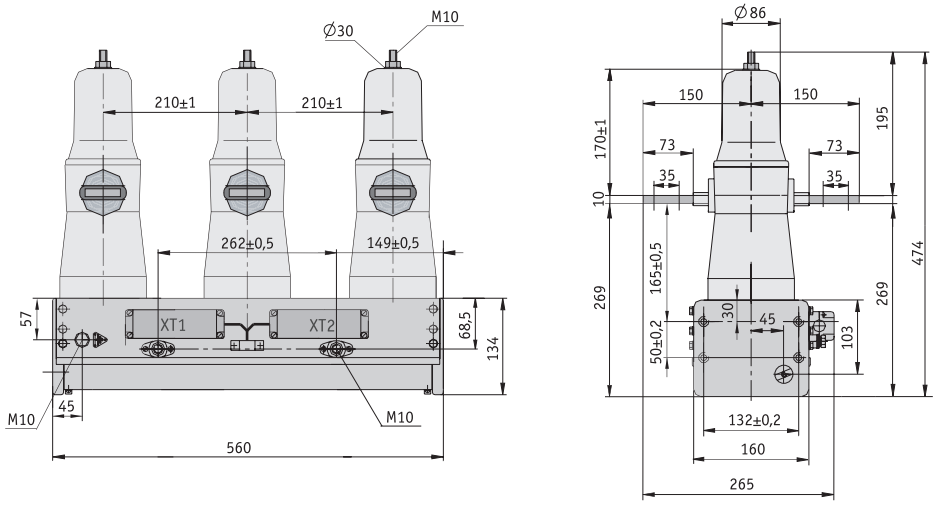
15 kV high frequency-VCB,
PCD 210 mm
Weight: 36 kg ISM15_LD_1(55F)



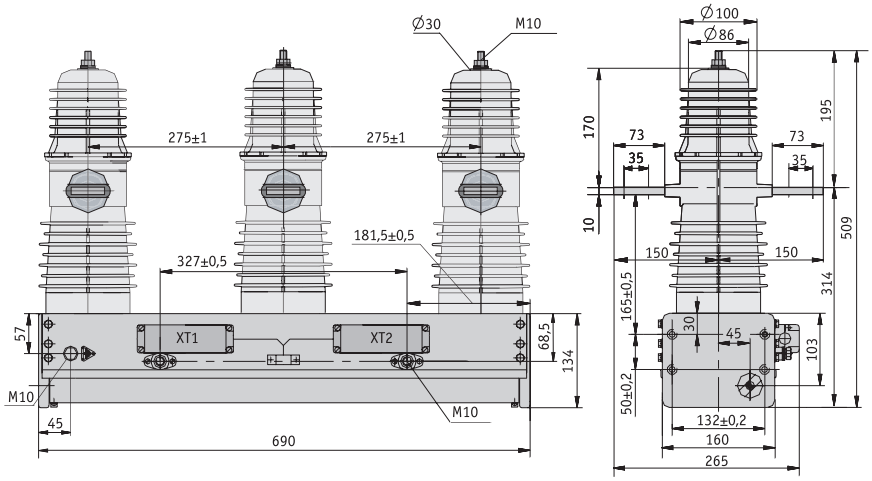
27 kV VCB, PCD 210 mm
Weight: 36 kg ISM25_LD_1(210)



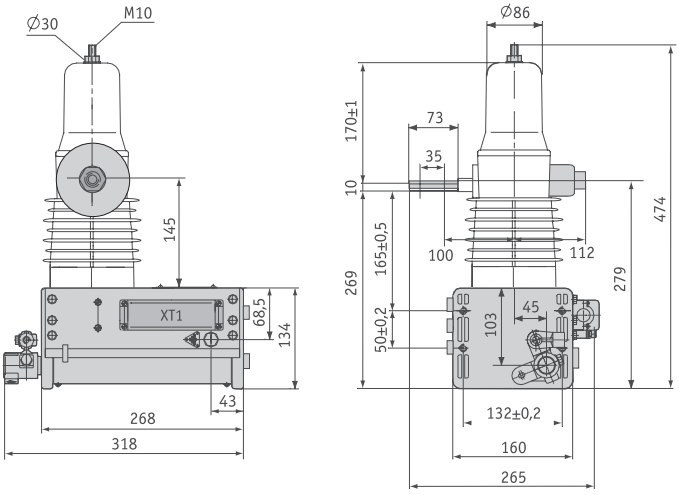
27 kV VCB, PCD 275 mm
Weight: 38 kg ISM25_LD_1(275)



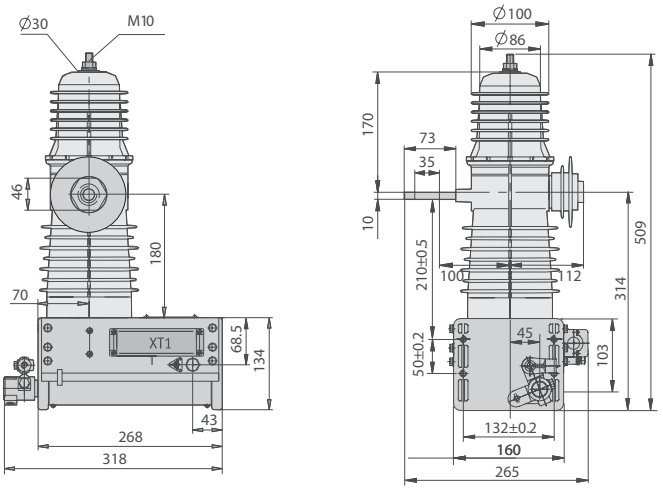
15 kV VCB, continuous busbar,
PCD 210 mm
Weight: 37 kg ISM15_LD_1(86)



27 kV VCB, continuous busbar,
PCD 275 mm
Weight: 39 kg By Special Order Only

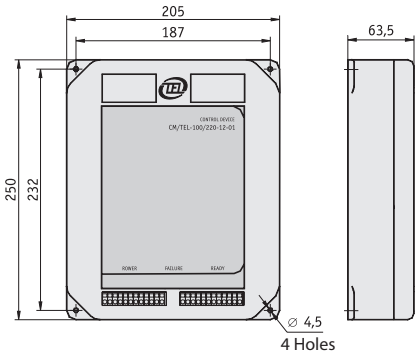


15 kV single-phase VCB, Weight: 13 kg ISM15_LD_3(89)

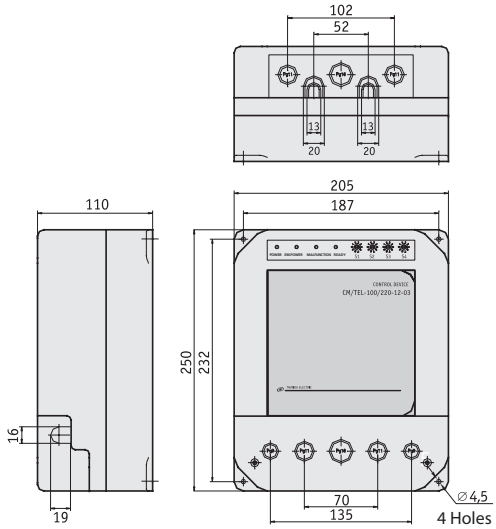


27 kV single-phase VCB, Weight: 13.5 kg ISM25_LD_3

Dimensions and Weights of the CM

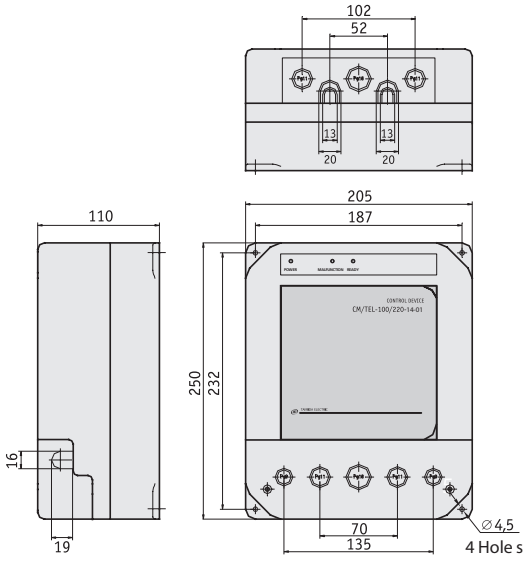


CM_12_1
Weight: 1.8 kg
CM_12_1(60)
CM_12_1(220)

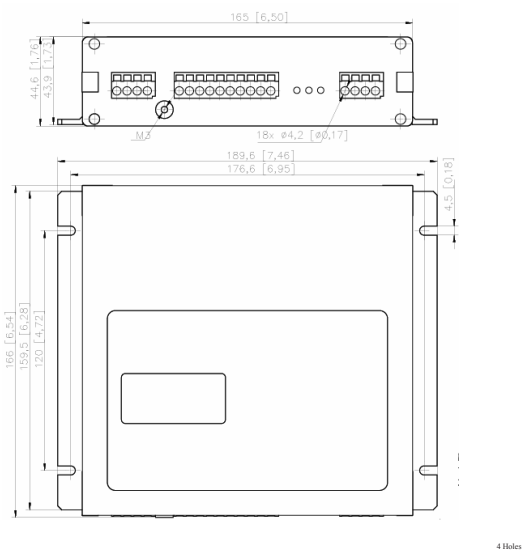


CM_12_2
Weight: 2.8 kg
CM_12_2(60)
CM_12_2(220)

CM_12_3
Weight: 3.2 kg
CM_12_3(60)
CM_12_3(220)



CM_14_1
Weight: 3 kg
CM_14_1(60)
CM_14_1(220)

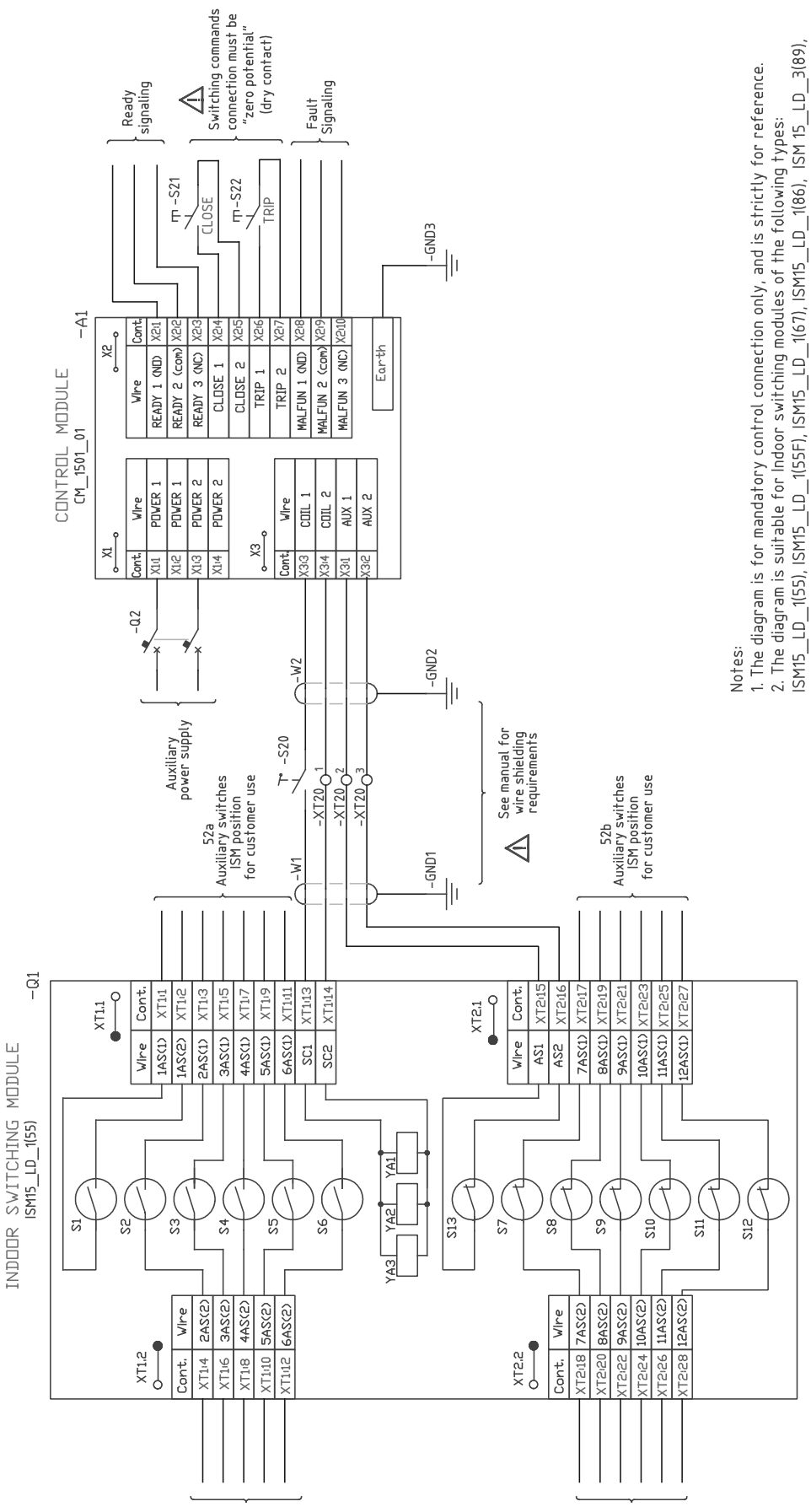


CM_1501_01
Weight: 1.5 kg
CM_1501_01(12)
CM_1501_01(4)

8

Circuit Diagrams

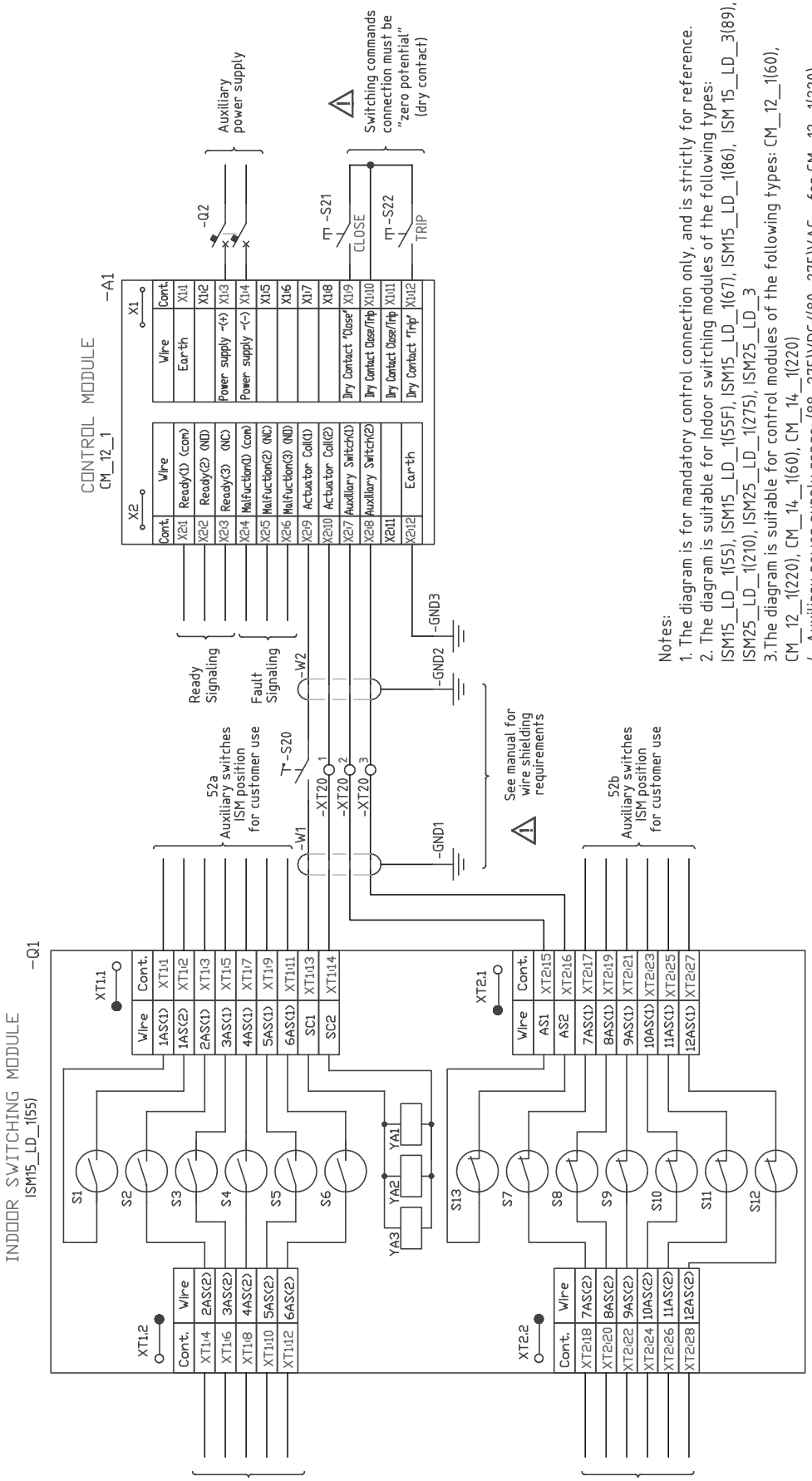
ISM_LD with CM_1501_01 Control Module



Notes:
1. The diagram is for mandatory control connection only, and is strictly for reference.
2. The diagram is suitable for Indoor switching modules of the following types:
ISM15_LD_1(55), ISM15_LD_1(55F), ISM15_LD_1(67), ISM15_LD_1(86), ISM15_LD_3(89), ISM25_LD_1(210), ISM25_LD_1(275), ISM25_LD_3
3. Auxiliary power supply range: (85...270)VDC/(85...265)VAC
4. For further technical details see the appropriate technical manuals.

Explanation of designations:
YA1, YA2, YA3 – magnetic actuator coils.
S13 – 52b reserved for control module feedback.
XT20:1, XT20:2, XT20:3 – terminal blocks. Supplied by customer.
Q2 – miniature circuit breaker. Recommended rating: 1A, class C or B. Supplied by customer.
S20 – auxiliary switches for electrical interlock. Supplied by customer.
S21 – push button close. Supplied by customer.
S22 – push button trip. Supplied by customer.

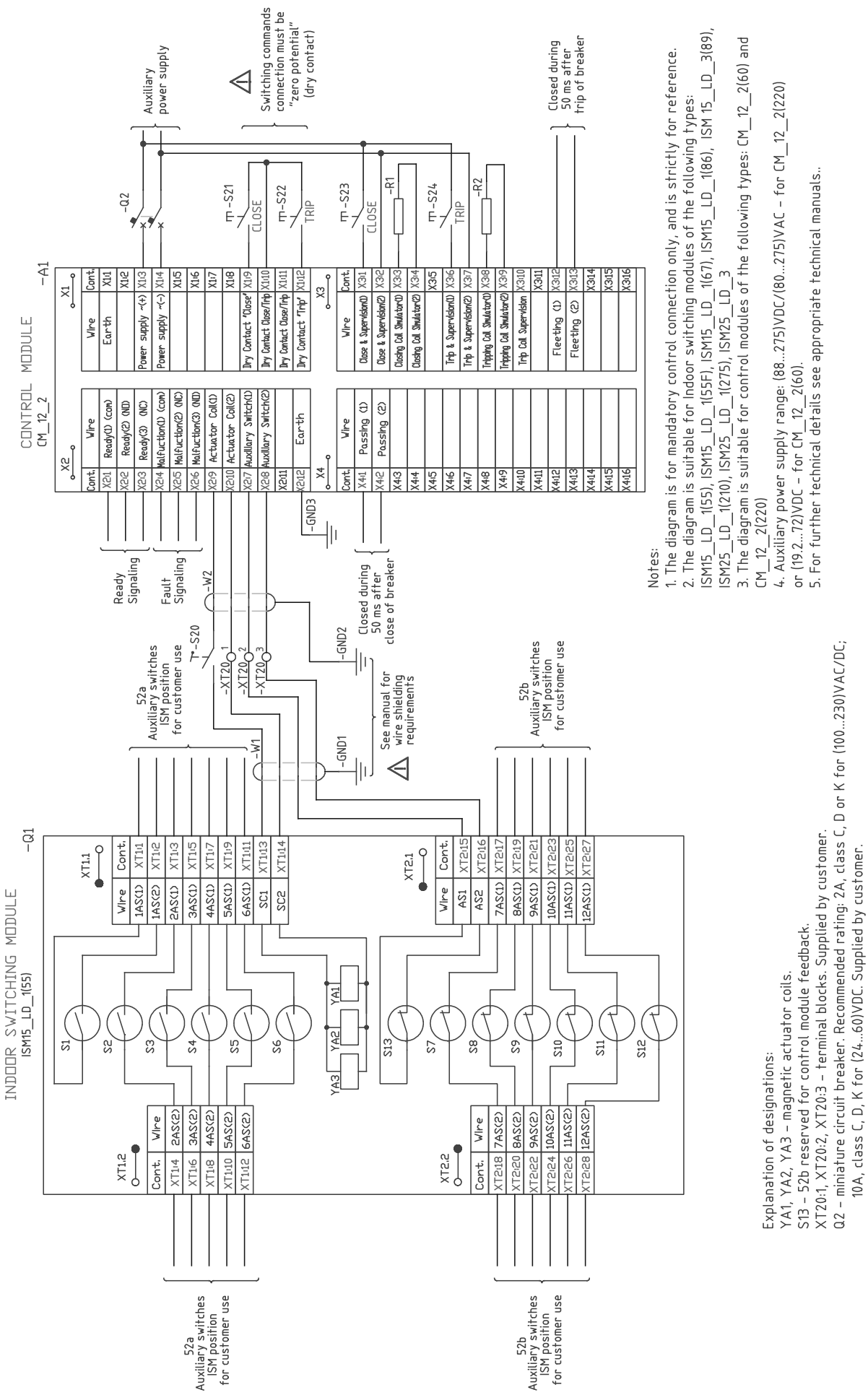
ISM_LD with CM_12..14_1 Control Module



Notes:
1. The diagram is for mandatory control connection only, and is strictly for reference.
2. The diagram is suitable for Indoor switching modules of the following types: ISM15_LD_1(55), ISM15_LD_1(55F), ISM15_LD_1(67), ISM15_LD_1(86), ISM 15_LD_3(89), ISM25_LD_1(210), ISM25_LD_1(275), ISM25_LD_3
3. The diagram is suitable for control modules of the following types: CM_12_1(60), CM_12_1(220), CM_14_1(60), CM_14_1(220)
4. Auxiliary power supply range: (88...275)VDC/(80...275)VAC - for CM_12_1(220) and CM_14_1(220) or (19.2...72)VDC - for CM_12_1(60) and CM_14_1(60).
5. For further technical details see appropriate Manuals.

Explanation of designations:
YA1, YA2, YA3 – magnetic actuator coils.
S13 – 52b reserved for control module feedback.
XT20:1, XT20:2, XT20:3 – terminal blocks. Supplied by customer.
Q2 – miniature circuit breaker. Recommended rating: 2A, class C, D or K for (100...230)VAC/DC; 10A, class C, D, K for (24...60)VDC. Supplied by customer.
S20 – auxiliary switches for electrical interlock. Supplied by customer.
S21 – push button close. Supplied by customer.

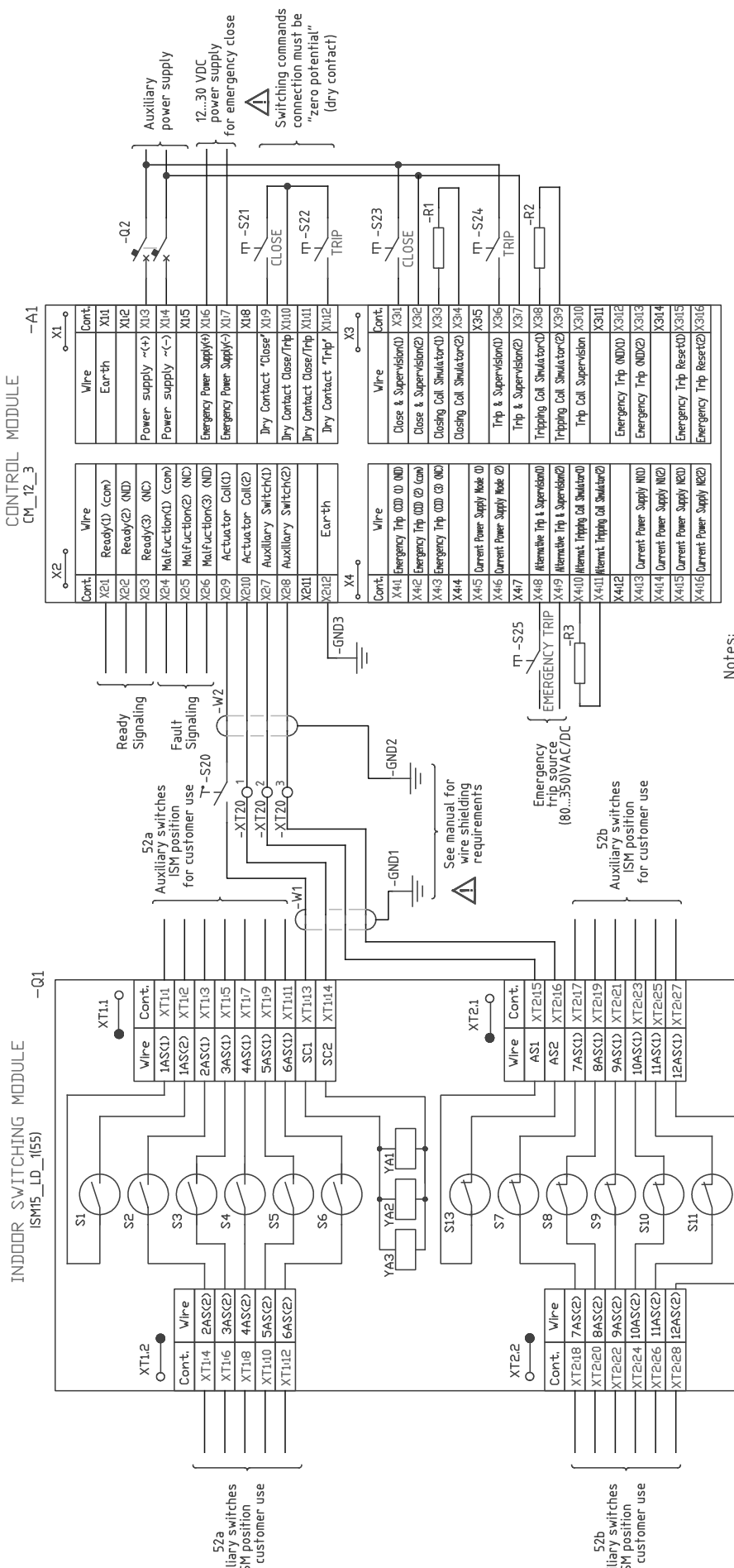
ISM_LD with CM_12_2 Control Module



Notes:
1. The diagram is for mandatory control connection only, and is strictly for reference.
2. The diagram is suitable for Indoor switching modules of the following types: ISM15_LD_1(55), ISM15_LD_1(55F), ISM15_LD_1(67), ISM15_LD_1(86), ISM 15_LD_3(89), ISM25_LD_1(210), ISM25_LD_1(275), ISM25_LD_3
3. The diagram is suitable for control modules of the following types: CM_12_2(60) and CM_12_2(220)
4. Auxiliary power supply range: (88...275)VDC/(80...275)VAC - for CM_12_2(220) or (19.2...72)VDC - for CM_12_2(60).
5. For further technical details see appropriate technical manuals..

Explanation of designations:
YA1, YA2, YA3 – magnetic actuator coils.
S13 – 52b reserved for control module feedback.
XT20:1, XT20:2, XT20:3 – terminal blocks. Supplied by customer.
Q2 – miniature circuit breaker. Recommended rating: 2A, class C, D or K for (100...230)VAC/DC; 10A, class C, D, K for (24...60)VDC. Supplied by customer.

ISM_LD with CM_12_3 Control Module



Explanation of designations:
YA1, YA2, YA3 – magnetic actuator coils.
S13 – 52b reserved for control module feedback.
XT20:1, XT20:2, XT20:3 – terminal blocks. Supplied by customer.
Q2 – miniature circuit breaker. Recommended rating: 2A, class C, D or K for (100...230)VAC/DC; 10A, class C, D, K for (24...60)VDC. Supplied by customer.
R1, R2, R3 – resistors. Supplied by customer.
S20 – auxiliary switches for electrical interlock. Supplied by customer.

Notes:
1. The diagram is for mandatory control connection only, and is strictly for reference.
2. The diagram is suitable for Indoor switching modules of the following types: ISM15_LD_1(55), ISM15_LD_1(55F), ISM15_LD_1(67), ISM15_LD_1(86), ISM 15_LD_3(89), ISM25_LD_1(210), ISM25_LD_1(275), ISM25_LD_3
3. The diagram is suitable for control modules of the following types: CM_12_3(220) and CM_12_3(60).
4. Auxiliary power supply range: (88...275)VDC/(80...275)VAC – for CM_12_3(220) or (19.2...72)VDC – for CM_12_3(60).
5. For further technical details see appropriate technical manuals.

Technical Data

9

Indoor Switching Modules (ISM)

	Type	ISM15_LD_1 ISM15_LD_2 ISM15_LD_3	ISM25_LD_1 ISM25_LD_3
Rated Data	Rated voltage (U_r)	15 kV	27 kV
	Rated current (I_r)	to 1000 A	to 800 A
	Rated power frequency withstand voltage (U_d)	36 kV	60kV
	Rated lightning impulse withstand voltage (peak) (U_p)	95 kV	125 kV
	Rated short-circuit breaking current (I_{sc})	to 20 kA [6]	to 16 kA [6]
	Rated peak withstand current (I_p)	to 52 kA	to 42 kA
	Rated short-time withstand current (I_k)	to 20 kA	to 16 kA
	Rated duration of short circuit (t_k)	4 s	
	Rated frequency (f_r)	50 / 60 Hz	
Switching Performance	Mechanical life [5] (CO-cycles)	50000/150000[2]	30000
	Operating cycles [5], rated current (CO-cycles)	50000/150000[2]	30000
	Maximum number of CO-cycles per hour	refer to CM	
	Operating cycles [5], rated–short circuit breaking current	100	
	Closing time [3], with CM_1501_01 - not more than	30 ms	35 ms
	Opening time [3], with CM_1501_01 - not more than	15 ms	
	Break time [3], with CM_1501_01 - not more than	23 ms	
	Rated operating sequence (CM_1501_01)	O-0.3s-CO-10s-CO	
	Rated operating sequence (CM_14_1)	O-0.1s-CO-1s-CO-1s-CO-80s-CO-0.1s-CO-1s-CO-60s	
Standards	Design class with regard to severity of service conditions in accordance with IEC 932	Class 1	Class 0
	Standards	IEC 62271-100, GB 1984-2003 ANSI C37.04, C37.06, C37.09, C37.09a	
	Mechanical vibration withstand capability according to IEC 721-3-4	Class 4M4	
	Other data		
	Resistance of main circuit	< 40 µOhm	
	Weight (depending on PCD) for three-phase ISM	34, 36, 37 kg	33, 36, 38, 39 kg
	Weight for single phase ISM	13 kg	14 kg
	Type of driving mechanism	Monostable magnetic actuator	
Design, Switching Capacity of Auxiliary Contacts	Number of available auxiliary contacts for three-phase ISM	6 NO + 6 NC	
	Number of available auxiliary contacts for single-phase ISM	2 NO + 2 NC	
	Minimum current for 12 V AC / DC, ohmic load	100 mA	
	Minimum current for 12 V AC / DC, inductive load (t=20 ms, cosj =0,3)	100 mA	
	Maximum current for 30 V DC, ohmic load	5 A [4]	
	Maximum current for 30 V DC, inductive load (t=20 ms)	3 A	
	Maximum current for 60 V DC, ohmic load	0.9 A	
	Maximum current for 60 V DC, inductive load (t=20 ms)	0.9 A	
	Maximum current for 125 V DC, ohmic load	0.5 A	
	Maximum current for 125 V DC, inductive load (t=20 ms)	0.03 A	
	Maximum current for 250 V DC, ohmic load	0.2 A	
	Maximum current for 250 V DC, inductive load (t=20 ms)	0.03 A	
	Maximum current for 125 V AC, ohmic load	5 A [4]	
	Maximum current for 125 V AC, inductive load (cosj =0,3)	5 A	
	Maximum current for 250 V AC, ohmic load	5 A [4]	
	Maximum current for 250 V AC, inductive load (cosj =0,3)	5 A	

Control Modules

Type	CM_12_1...2...3	CM_14_1	CM_1501_01
Type of operation			
Rated operating sequence	O-0.3s-CO-15s-CO	O-0.1s-CO-1s-CO-1s-CO	O-0.1s-CO-10s-CO-10s-CO
Maximum CO operating cycles per hour	100	60	100
Auxiliary power supply 24/60			
Auxiliary power supply	24 V DC to 60 V DC		N/A
Operating range (80-125%)	19.2 V DC to 75 V DC		N/A
Auxiliary power supply 100/220			
Auxiliary power supply	110 V DC to 220 V DC		85 V DC to 370 V DC
Operating range (80-125%)	88 V DC to 275 V DC for close operations		
Operating range (70-125%)	77 V DC to 275 V DC for trip operations		
Auxiliary power supply	100 V AC to 220 V AC		
Operating range (80-125%)	80 V AC to 275 V AC for close operations		85 V AC to 265 V AC
Operating range (65-125%)	65 V AC to 275 V AC for trip operations		
Power consumption			
Charging the close and trip capacitors	≤50 W/70 VA		≤20 W/25 VA
Permanent power consumption (standby)	≤10 W/15 VA	≤5 W	≤5 W/8 VA
Reaction times			
Preparation time for the operation of the CM after switching on the auxiliary power supply, not more than	15 s	90 s	15 s
Preparation time for the close operation of the CM after a previous close operation, at most	9 s	1 s	10 s
Preparation time for the trip operation of the CM after switching on the auxiliary power supply , not more than	0.5 s		
Trip capability after failure of the auxiliary power supply, at least	30 s	5 s	60 s
Preparation time for the close operation of CM after switching on the emergency power supply, not more than (CM/TEL...12-03A)	50 s	N/A	N/A
Electric strength			
Power-frequency withstand voltage, 1 min (to IEC 60 255-5)	2 kV		
Lightning impulse withstand voltage, 1.2 µs/ 50 µs/ 0.5 J (according to IEC 60 255-5)	5 kV		
Insulation resistance at 1000 V DC at most 1 min at 2000 V DC (according to IEC 60 255-5)	> 5 MOhm		

Note

[2] ISM15_LD_2(55) available with 150.000 CO cycles

[3] Excluding CM processor acceptance time. See CM technical specifications or contact Tavrida NA for detailed operation timing.

[4] 10 A current is permissible for 5 minutes

[5] See Figure 67 / page 75

[6] At 40% d. c. component

	CM_12_1...2...3	CM_14_1	CM_1501_01
Electromagnetic compatibility			
Interference immunity to voltage dips short inter-ruptions and voltage swings in accordance with IEC 61000-4-11, Class V (A)	Voltage oscillations of 15% for a period of 2 to 3 s, periodic for 5 to 10 s		
Interference immunity to fast electrical transi-ents/bursts to IEC 61 000-4-4, Class IV (A)	4 kV		
Interference immunity to periodic oscillations to IEC 61 000-4-12 and taking into account IEC 60 255-22-1, Class III (A)	2.5 kV 1 MHz to earth 1 kV 1 MHz between the inputs		
Surge immunity to IEC 61 000-4-5, Class IV (A)	4 kV 1.2/50 µs to earth 2 kV 1.2/50 µs between the inputs		
Interference immunity to magnetic fields to IEC 61 000-4-8, Class V (A)	100 A/m for duration of 60 s 1000 A/m for duration of 2 s		
Interference immunity to pulsed magnetic fields to IEC 61 000-4-9, Class V (A)	1000 A/m		
Interference immunity to damped oscillations of the magnetic fields to IEC 61 000-4-10, Class V (B)	100 A/m 0.1 MHz 100 A/m 1 MHz, Class V (B)		100 A/m 0.1 MHz 100 A/m 1 MHz, Class V (A)
Other data			
Weight	1.8...2.8...3.2 kg	3.0 kg	1.5 kg
Degree of protection	IP40		
Life cycle of CM close and trip capacitors	see Figure 68 / page 75		
Switching capacity of output relay contacts			
Minimum current at 12 V	≥10 mA		
Maximum breaking direct current at 250 V DC and t = 1 ms	≤0.12 A		≤0.35 A
Maximum breaking alternative current at 250 V AC and cosj = 0.3	≤2A		≤16 A
Inputs for dry type close and trip commands			
Control command (close or trip) acceptance time	15 ± 2 ms		≤12 ms
CM generated voltage at the dry type inputs	≥30 V		
Current at the time of closing the input current circuit	≥100 mA		
Time constants for power failure	≥10 ms		
Continuous current value	≥5 mA		

	CM_12_2
Wipe contact outputs (CM/TEL...-12-02A)	
Close wipe contact (X4: 1, 2)	
Delay time from closing the main ISM contact (opening the ISM auxiliary switch S13) up to closing the close wipe contact	25 ± 5 ms
Closing time of the close wipe contact (close wipe signal length)	50 ± 5 ms
Trip wipe contact (X3: 12, 13)	
Delay time from opening the main ISM contact (closing the ISM auxiliary switch S13) up to closing to trip wipe contact	25 ± 5 ms
Closing time of the trip wipe contact (trip wipe signal length)	50 ± 5 ms

	CM_12_2...3
Inputs for potential-loaded close and trip commands (X3: 1, 2, 3, 4 and X3 : 6, 7, 8, 9) and alternative potential-loaded trip command inputs (X4: 8, 9, 10, 11) as well as supervision of these switching command circuits	
Voltage range (close, trip)	20,4 - 275 V AC or DC
Rated current IN setting with external resistances and selection switches	0.5/ 1/ 1.5/ 2/ 2.5/ 3/ 4/ 5 A
Minimum trip command current	0.65 x I_N
Minimum close command current	0.8 x I_N
Maximum sustained supervision current	0.3 x IN but not more than 0.2 A
Control command (close or trip) acceptance time	25 ± 5 ms
Input resistance in the low impedance mode	Equal to the external resistor
Input resistance in the high impedance mode, not less than	500 kOhm

	CM_12_3
Input for supervision of the trip coil (X3: 10)	
Resistance in the low impedance mode	Equal to the external resistor
Resistance in the high impedance mode, not less than	500 kOhm
Reset input for emergency signalling contacts (X3: 15, 16)	
Voltage range	20.4 - 275 V AC/DC
Resistance	36 ± 15% kOhm
Emergency power supply (X1: 6, 7)	
Voltage range	12-30 V DC
Power consumption while charging the close capacitors for close operation	35 W
Standby power input	15 W
Preparation time for the close operation of the CM after switching on the emergency power supply, not more than	50 s

	CM_12_3
Input for CT power supply	
Operating current range	2-300 A
Power consumption per phase during charging trip capacitors	
- at 2 A	5 VA
- at 5 A	12 VA
- at 10 A	25 VA
- at 30 A	120 VA
- at 300 A	8 kVA
Preparation time for trip operation (charging of the trip capacitor [1]), not more than	
- at 2 A	1000 ms
- at 5 A	400 ms
- at 10 A	150 ms
- at 30 A	110 ms
- at 300 A	100 ms
Current carrying capacity, not less	
- at 5 A	∞
- at 10 A	100 s
- at 30 A	10 s
- at 150 A	1 s
- at 300 A	0.1 s

Remarks [1] Charging times apply for charging the capacitors over both CT power supply inputs

Life cycle of ISM

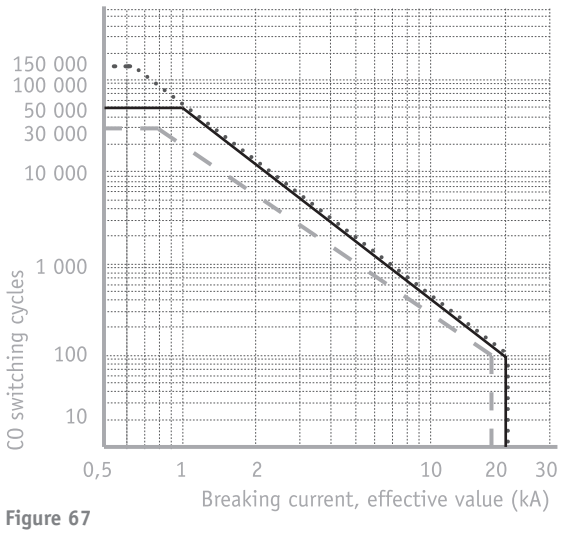


Figure 67

Standard ISM 15 kV
High frequency ISM 15 kV
Standard ISM 27 kV

Life cycle of CM close and trip capacitors

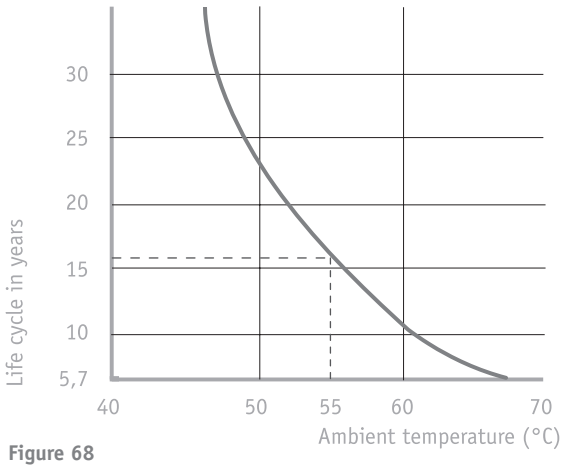


Figure 68

Regulations and Ambient Conditions

Regulations

The ISM fulfils the requirements of the following standards:

· DIN VDE 0670, Teil 1000	Germany
· IEC 60056	International standard
· IEC 62 271-100	International standard
· IEC 60 694	International standard
· GB 1984-2003	China
· GOST 687-78	Russian Federation
· ANSI C37.09	North American Standards
· ANSI C37.09a	North American Standards

CE The EMC Directive 89/336/EEC
The Low Voltage Directive 73/23/EEC.

Ambient Conditions

Highest value ambient temperature	+ 55 °C
Average temperature over 24 hours	+ 35 °C
Lowest ambient temperature	- 40 °C
Relative humidity in 24 hours	max 98%
Relative humidity over 1 month	max 90%
Average water vapour pressure over 24 hours	max 2,2 kPa
Average water vapour pressure over 1 month	max 1,8 kPa

Installation altitude

Up to an installation altitude of 1000 m above sea level, the acceptance need not take the dielectric strength of the air into account. Above 1000 m, the external insulation measurement of the ISM must be increased by the atmospheric correction factor Ka according to IEC 60 684 compared to the insulation measurement at sea level (Figure 69).

Example:

Installation altitude:	2500 m
Operating voltage:	12 kV
Rated power frequency withstand voltage:	28 kV
Rated impulse withstand voltage	75 kV
Ka factor from diagram	1.2

At sea level the installation must resist the following test voltage values:

Corrected rated power frequency withstand voltage: 28 kV x 1.2 = 33.6 kV
Corrected rated impulse withstand voltage: 75 kV x 1.2 = 90 kV

Because of the corrected voltage values, it is necessary to select a 24 kV ISM.

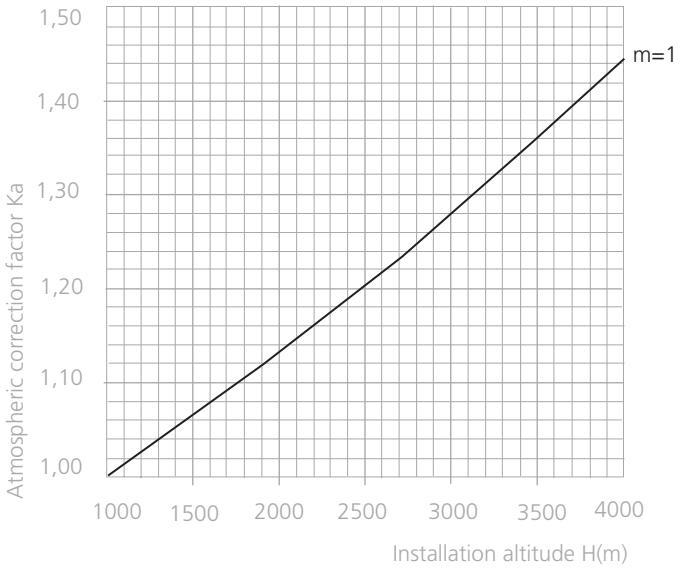


Figure 69

Correction factor (Ka) for installation altitude (H) m = 1 correction curve for the rated power frequency withstand voltage and rated lightning impulse voltage.

Legal Information

11

Warranty

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

a) … the warranty period having run out during the period of storage with the customer.
b) … the operating conditions, ambient conditions, transport and storage conditions have not been adhered to according to the application description or the Installation and Operating Instructions.
c) … an 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.

Quality Regulations

All manufacturing facilities of the company have been certified by KEMA in the Netherlands and comply with (DIN EN) ISO 9001:2000.

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 test are carried out:

- 1000 C-O cycles
- Insulation strength of the primary and auxiliary circuits at operating frequency
- Measurement of the resistance of the main circuit
- All test results are automatically stored

KEMA

CERTIFICATE

Number: 75954

The management system of:

Industrial Group Tavrida Electric
Moscow, Russian Federation
Sevastopol, Ukraine

including the implementation meets the requirements of the standard:

ISO 9001:2000

Scope:
the general management, design, projecting, production, sales, retrofitting and service of indoor and outdoor medium voltage switchgear, vacuum circuit breakers, surge arresters, low voltage vacuum circuit breakers (max. 1kV) and retrofit kits and control devices for switchgear, including components parts for this equipment, in the organisations as listed in the addendum

The file that forms the basis of this certificate:
75954-QUA

This certificate is valid until: January 1, 2007

Issued for the first time: February 1, 1998

drs. ing. E.J. Duim
managing director

Integral publication of this certificate and adjoining reports is allowed.

MEMBER OF THE INTERNATIONAL NETWORK FOR MANAGEMENT SYSTEM ASSESSMENT AND CERTIFICATION "IQNET".

KEMA Quality B.V.
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P.O. Box 5185, 6802 ED Arnhem, The Netherlands
Telephone +31 26 356 20 00, Telefax +31 26 352 58 00

ACCREDITED BY
THE DUTCH COUNCIL
FOR ACCREDITATION

Complaints and Transport Damage

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

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 maximum 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.

IQNet

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

IQNet and KEMA
hereby certify that the organization

Industrial Group Tavrida Electric
Moscow, Russian Federation
Sevastopol, Ukraine

for the following field of activities

the general management, design, projecting, production, sales, retrofitting and service of indoor and outdoor medium voltage switchgear, vacuum circuit breakers, surge arresters, low voltage vacuum circuit breakers (max. 1kV) and retrofit kits and control devices for switchgear, including components parts for this equipment, in the organisations as listed in the addendum

has implemented and maintains a

Management System

which fulfills the requirements of the following standard

ISO 9001:2000

Issued on : 01-02-1998
Validity date : 01-01-2007

Registration Number : 75954

IQNet — *Dr. Fabio Roversi*
President of IQNet

drs. ing. E.J. Duim KEMA

Members of IQNet (registered association):
AENOR *Spain* AFAQ *France* AIB-Vincotte International *Belgium* APCER *Portugal* CISQ *Italy* CQC *China* CQM *China* CQS *Czech Republic* DQS *Germany* DS *Denmark* ELOT *Greece* FCAV *Brazil* FONDONORMA *Venezuela* HKQAA *Hong Kong* ICONTEC *Colombia* IRAM *Argentina* JQA *Japan* KEMA *Netherlands* KFQ *Korea* MSZT *Hungary* Nemko Certification *Norway* NSAI *Ireland* ÖQS *Austria* PCBC *Poland* PSB Certification *Singapore* SFS *Finland* SII *Israel* SIQ *Slovenia* SQS *Switzerland*
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* The list of IQNet partners is valid at the time of issue of this certificate.
Updated information is available under www.iqnet-certification.com

Environmental Friendliness

The modules are manufactured from environmentally benign and recyclable material. No special disposal is required.

Non-Conformity Report

In order to be able to exchange or repair the device, we kindly ask you to fill the accompanied “Non-conformity report” and send it to our regional representative or directly to us.

Please note:
Your request can only be handled if the accompanying report is properly filled including the name and address as well as a copy of the invoice.
For queries please contact your Tavrida Electric partner.

TAVRIDA ELECTRIC NA

Service Department
1105 Cliveden Ave
Delta, BC, Canada
V3M 6G9

Phone: (604)-540-6600
Fax: (604)-540-6604

E-Mail: info@tavrida-na.com
Web: www.tavrida-na.com

Liability

Damages and demands for reimbursement of expenses incurred by the customer (in the following: compensation) for what-ever 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.

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

TAVRIDA ELECTRIC NA

Service Department
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Delta, BC, Canada
V3M 6G9
E-Mail: info@tavrida-na.com
Web: www.tavrida-na.com

NON-CONFORMITY REPORT

To:	TAVRIDA ELECTRIC NA Service Department	From:	
Phone:	(604)-540-6600	Address:	
Fax:	(604)-540-6604		
E-Mail:	info@tavrida-na.com	Name:	
Web:	www.tavrida-na.com		
		Phone:	
		Fax:	
		E-Mail:	

Type designation:	Serial No.:
ISM/TEL -	
CM/TEL -	

Date of commissioning:	Date when non-conformity was noticed:
When did the non-conformity occur: ○ Incoming inspection ○ Installation/Commissioning ○ Service	Place of installation of CM/TEL: ○ Low voltage compartment of panel ○ High voltage compartment of panel ○ Separate control cubicle ○ Draw-out unit

Description of non-conformity:

How many blinks occured on Malfunction-LED of CM?

○ 1x ○ 2x ○ 3x ○ 4x ○ 5x ○ ≥17x

Non-conformity report issued by:

Date:	Name:	Signature:

Please note:
Your warranty claim can only be handled if this non-conformity report is filled in completely including your name and address.

Date: _____

TAVRIDA ELECTRIC

Tavrida Electric North America

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