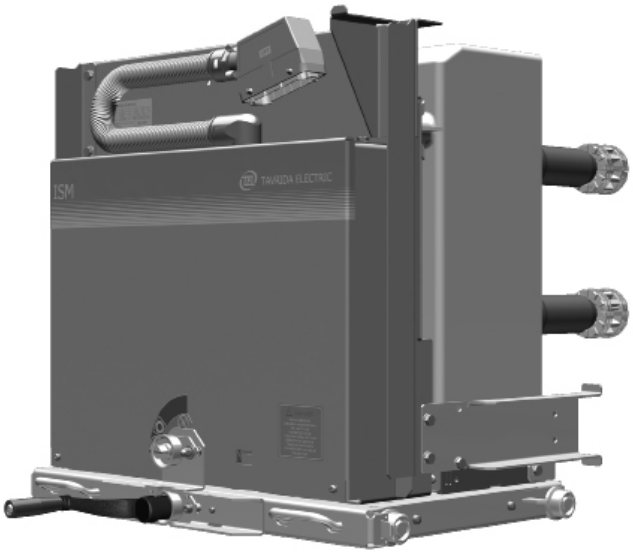
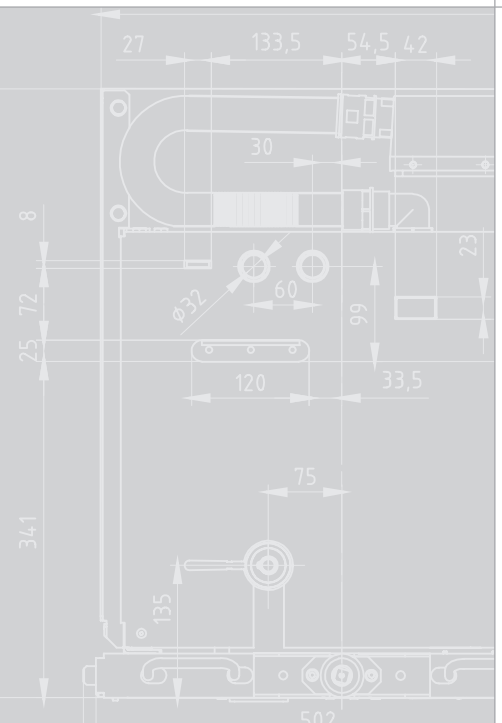
TAVRIDA ELECTRIC



ISMD Series

Withdrawable Vacuum Circuit Breakers
5 kV, ...31.5 kA, ...1200A
5 kV, ...31.5 kA, ...2000A
15 kV, ...29 kA, ...1200A
15 kV, ...20 kA, ...800A



User Manual MAN5002204
Revision 0B

MAN5002203 is superceded by this manual.

This technical manual contains information necessary for the installation, commissioning and operation of the Tavrida ISMD series of draw-out circuit breakers. It is absolutely necessary for the proper use of the vacuum circuit breakers to read this technical manual carefully before starting and to adhere to the instructions as well as the relevant regulations.

Safety first

- Installation, operation and maintenance shall only be carried out by trained and experienced personnel who are familiar with the equipment and the electrical safety requirements.

- During installation, commissioning, operation and maintenance of the equipment the relevant legal regulations (such as OSHA, NFPA70E, and the CEC), 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, which may also be 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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5. Commissioning, operation, maintenance

6. Signalling

7. Product line

8. Dimensions

9. Circuit diagrams

10. Technical data

11. Regulations and ambient conditions

12. Legal information

Introduction 1

Definitions

The following abbreviations are used in this 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 acquisition
VCB:	Vacuum circuit breaker
VI:	Vacuum interrupter

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 made 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.

General

The draw-out version of the ISM is intended for indoor installations in air-insulated switchgear. It is equipped with the innovative VCBs from Tavrida Electric and is available with various ratings and PCDs.

Figure 1

Figure 2

Figure 3

Design and method of operation of the ISM

In comparison to conventional circuit breakers, the Tavrida Electric vacuum circuit breakers are comprised of two components:

· The ISM (Figure 1 and Figure 2)

· The CM for control and monitoring of the ISM (Figure 3)

Compact design

Tavrida Electric develops and manufactures all critical components of the circuit breakers. Intensive in-house fundamental and material research has led to extremely compact vacuum interrupters and magnetic actuators. Optimal selection of all components makes these the most compact and lightest weight vacuum circuit breakers in the world.

Long life

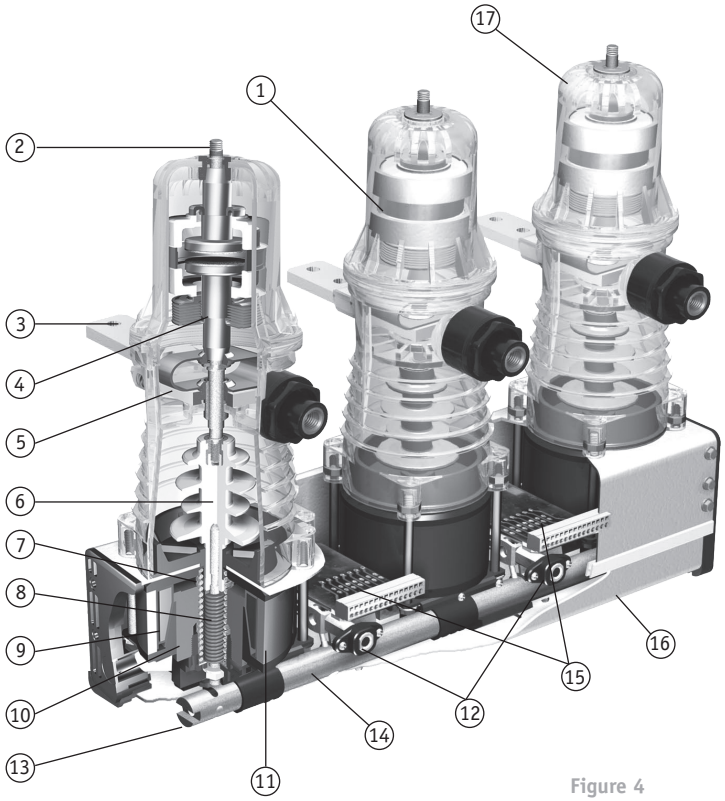
Contact erosion is minimised through use of an axial magnetic field. All the switching elements are assembled along a single axis; all mechanical movements are therefore direct and linear. This has resulted in up to 150,000 C-O cycles at rated current or up to 100 operations at full short circuit breaking current without the need to replace or adjust any part of the ISM.

Maintenance free

The ISM is maintenance-free over the expected life of at least 25 years.

Highest availability

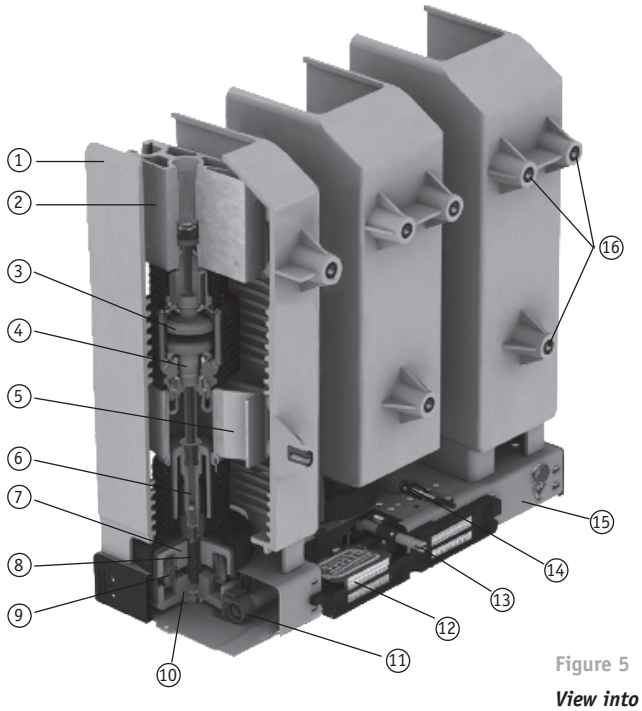
In addition to minimizing the number of failure-critical components, the Tavrida Electric circuit breaker monitors its status continuously. In the unlikely event of failure, an indication signal is generated by the control module. A failure can be rectified before an unsuccessful switching attempt is made. This results in greater uptime of the electric power supply system, with drastically reduced scheduled maintenance and costs.



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 4

View into the ISM for $I_r \leq 800A$, $I_{SC} \leq 20kA$



1. Support insulator
2. Upper terminal
3. VI
4. Movable contact with bellows
5. Lower terminal
6. Drive insulator
7. Actuator stator
8. Opening springs
9. Actuator coil
10. Actuator armature
11. Synchronizing shaft
12. Auxiliary contacts
13. Interlocking shaft
14. Position indicator link
15. Frame
16. Fixing points

Figure 5

View into the ISM for $I_r \leq 2000A$, $I_{SC} \leq 31.5kA$

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, while 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 even in case of a failure of the auxiliary power supply (Figure 6).

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 6).

Manual-Emergency-Tripping

The ISM can be tripped mechanically without auxiliary power supply (emergency trip). It may be opened manually by means of the interlocking shaft rotating counter-clockwise. The interlocking cam of the interlocking shaft acts on the armature, which then starts to move (refer to chapter “Installation/Primary part/ Mechanical interlocking”, page 21). As the air gap increases, the opening springs and contact pressure springs overcome any magnetic holding force and the module opens.

Manual Closing

The ISM can only be closed electrically via the CM. In the case of a failure of the 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.

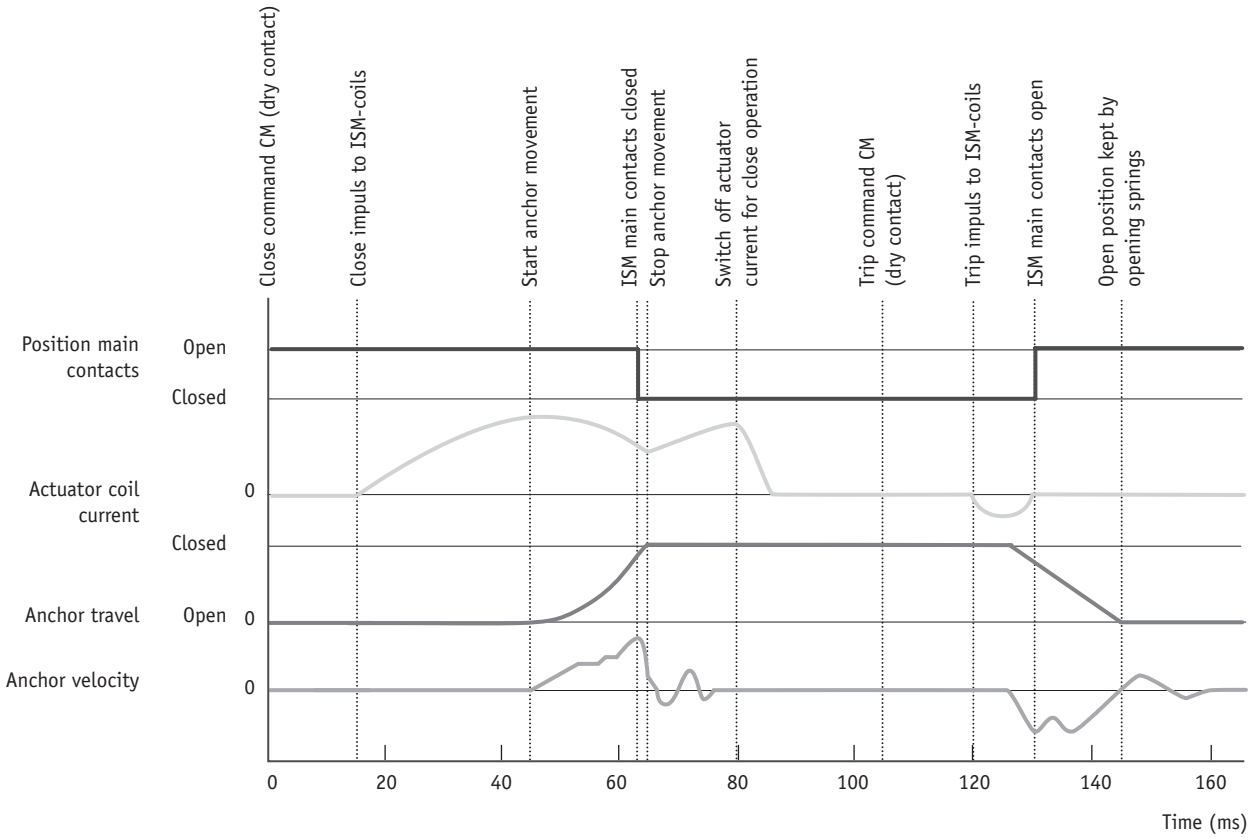


Figure 6

Typical oscillogram of ISM operation

Design and Method of Operation of the CM

The CM-12 and 14 series are encapsulated in an ABS-housing; CM-15 series are housed in an aluminum housing. Each of them have four holes for fixing on flat surfaces. Terminals, LED indicators and operating elements are placed on the front side of CM-12 and 14 series and on the side face of the CM-series (Figure 25). The control and monitoring functions are performed by microprocessors. Based on its extended functions the CM/TEL-X/X-14-01 is equipped with threefold capacitance of close capacitors compared with CM/TEL-X/X-12-01A and CM/TEL-100/220-15-01. The capacitors are charged as soon as the CM is connected to the auxiliary power supply.

Control Module (CM)

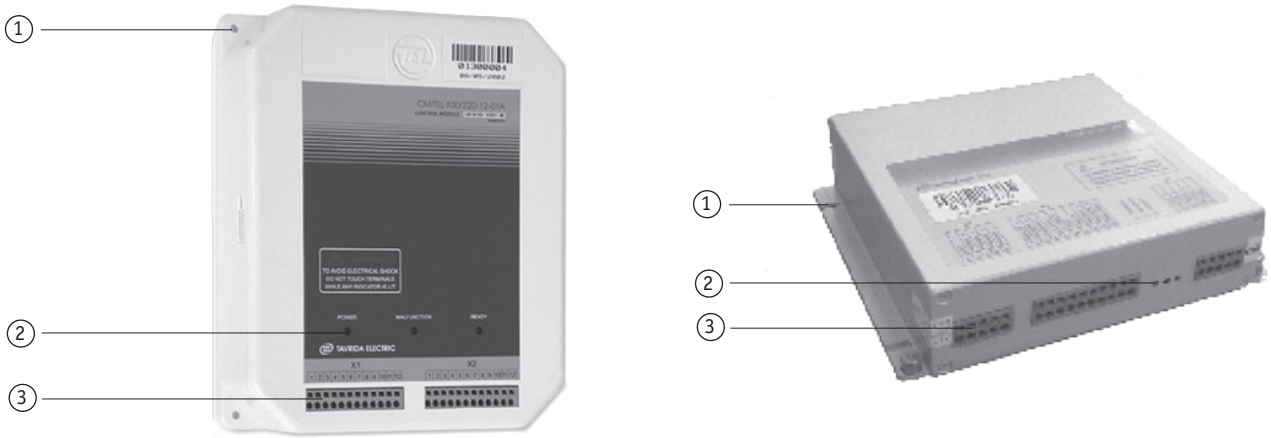


Figure 25

CM/TEL...-12-01A (left) and CM/TEL...-15-01 (right)

1. Fastening holes
2. LED indicators
3. Terminals

Design and Method of Operation of the Draw-out unit

· The draw-out plate with its racking mechanism allows the ISM to be racked into or out of the switchgear.

· The main position indicating device is mechanically joined with the synchronizing shaft of the ISM for reliable indication of the status.

· The manual tripping and locking device provides electromechanical tripping and locking of the ISM in its OPEN position.

· A series of interlocks are provided to avoid incorrect operation and to ensure maximum operator safety.

· Insulated contact arms with a spring charged contact system makes the electrical connection between the ISM main terminals and fixed contacts of the switchgear when the draw out unit is in the service position.

· The auxiliary circuit connection box provides auxiliary circuit wires, accessories installation and their connection to the CM, switchgear relay protection and control system via a cable with multi-pole control wiring plug.

Draw-out unit

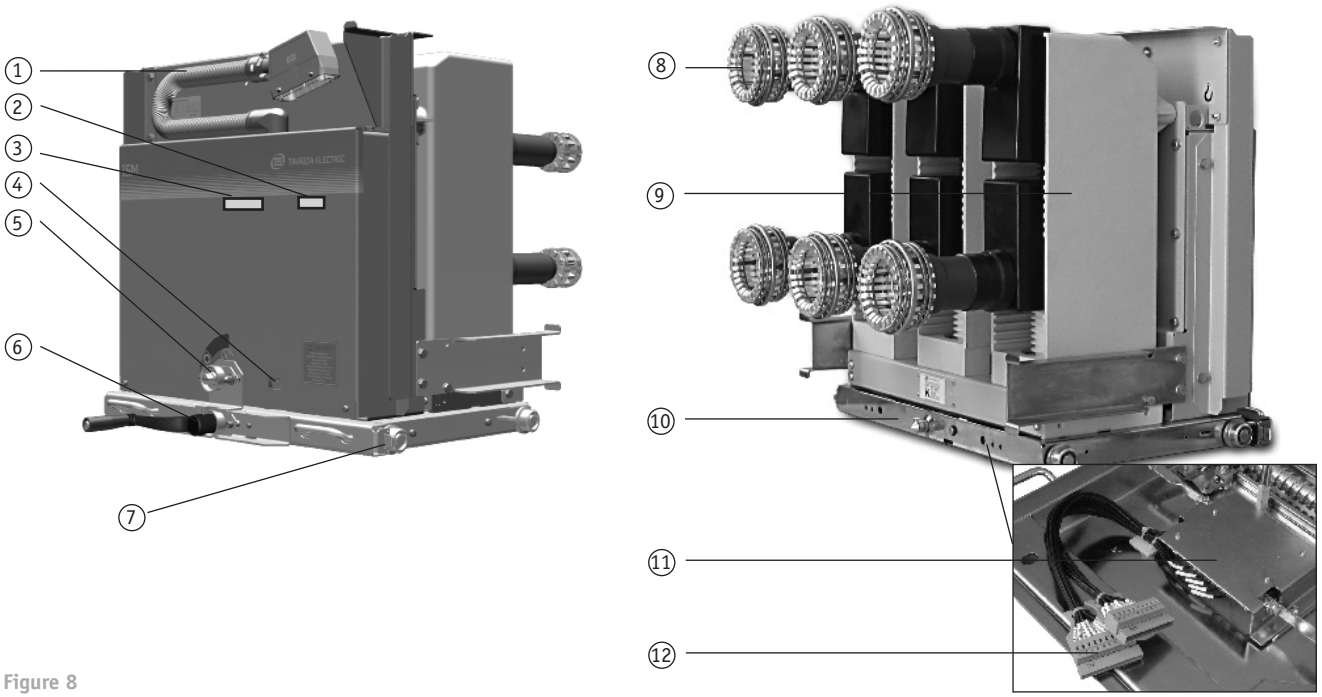


Figure 8

1. Control wiring plug
2. Operating counter
3. Main contacts position indicating device
4. DOU position indication
5. Mechanical trip and interlocking device integrated in the interlocking system
6. Racking mechanism of draw-out plate
7. Fixing mechanism of draw-out plate
8. Main contact terminals
9. Vacuum circuit breaker, ISM
10. Draw-out plate
11. Auxiliary switches SQ1, SQ2
12. Wires and plugs XP2, XP3

Goods entry 2

Packing

The following information is provided on the wooden boxes (Figure 9):

· Handling symbols for transport and storage of the delivery unit (Figure 12)

· Label 1 for manufacturers´ and product information

· Label 2 for logistics data (Figure 10)

TAVRIDA ELECTRIC

Mark:	**TEG-C-000111** ***Place of delivery:***
Consignee:	***Address*** ***Address*** ***Address*** ***Address*** ***Address*** ***Phone:*** ***Contact person***
P/O Number:	***Customer reference***
Article:	***Article description***
Serial Number:	**50509**

TAVRIDA ELECTRIC AG, Wetterkreuz 3, 91058 Erlangen, Germany, Phone: 0049-9131-972079-0

Figure 10

Label 2 Logistics data

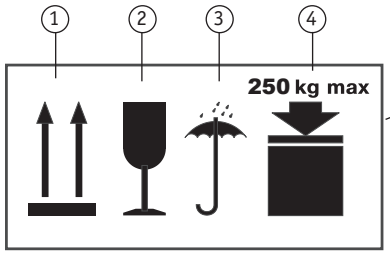


Figure 12

Handling symbols

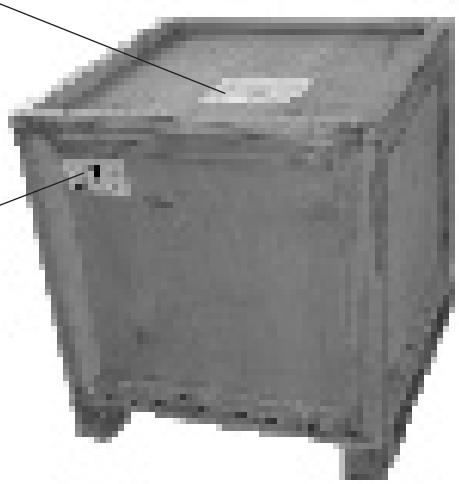


Figure 9

Wooden box

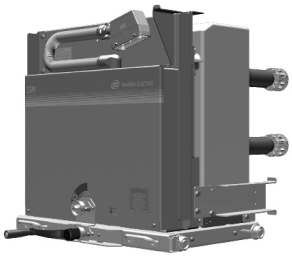
Transport

The withdrawable ISM shall be transported in the original packing only. The packed goods shall be handled in accordance with the handling symbols. Loading procedures for the packing units shall be carried out only with fork lifts or cranes. Lifting gear must not be attached to the support insulators. During transportation the crates must not be hit or dropped.

Unpacking, incoming inspection

Before unpacking, please check the wooden box for damage. Removal of the products from the original packing must be carried out with due care. Every withdrawable ISM shall be subject to an incoming inspection.

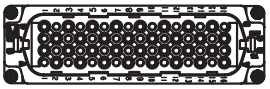
Scope of delivery:



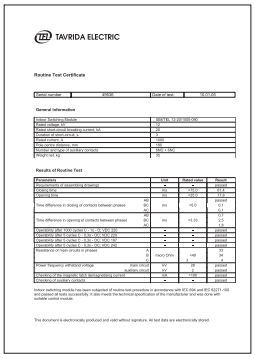
Withdrawable ISM

Screwdriver

Hand crank



Mating connector and pins



TAVRIDA ELECTRIC

Routine Test Certificate

General Information

Results of Routine Test

Routine test certificate

Figure 13

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 14):

VCB Type: ISMD 5-31.5/2000-114-120VUC SN42000872			
Max. Voltage	5 kV	PCD	210 mm
Dielectric Withstand	42 kV	Weight	125 kG
Lightning Impulse	75 kV	Manual	MAN5002204
Continuous Current	2000 A	Wiring Diag.	0TES.362.011
Short Circuit Current	31.5 kA	Aux. Voltage	120 VAC
Close and Latch	82 kA	Frequency	50 / 60 Hz
Short Time Current 4s	31.5 kA	C-O Sequence	0.1s-CO-10s-CO
Interrupting Time	<37 ms	Manufactured	2010
Tavrida Electric NA, Delta, Canada 1-866-551-8362 Made in China			

Figure 14

Rating plate

Arrangement of the labels (Figures 15, 16, 17):

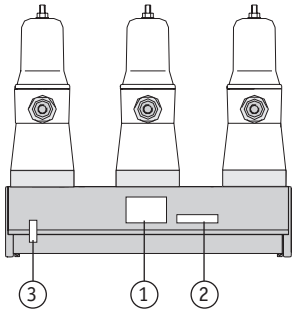


Figure 15

Labelling ISM, LD Type

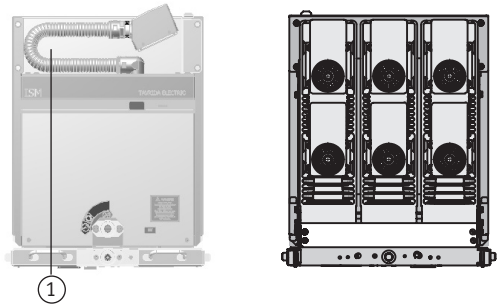


Figure 16

Labelling Draw-out unit

ISM

1. Rating plate
2. Serial number
3. Seal

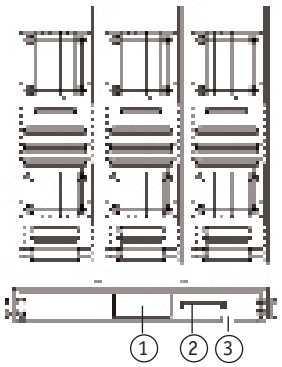


Figure 17

Labelling ISM, HD Type

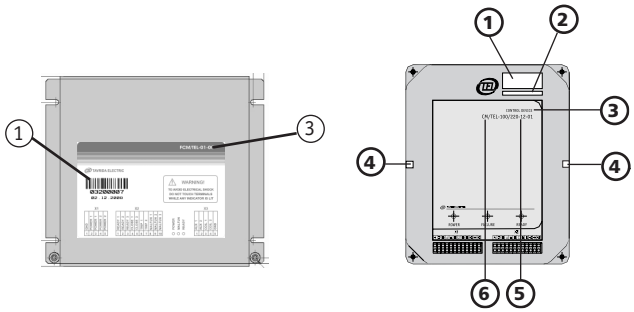


Figure 18

Labelling of the CM...-1501, CM....-12-01A

CM

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

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

Storage

Should immediate installation not be possible, the withdrawable ISM 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 crates are stacked a maximum of two vertical layers is permitted.

If the withdrawable ISMs are stored longer than one year, the built-in capacitors of the CM 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 local and national electrical codes must be adhered to during installation, commissiong and operation of this device, by only trained and certified personnel

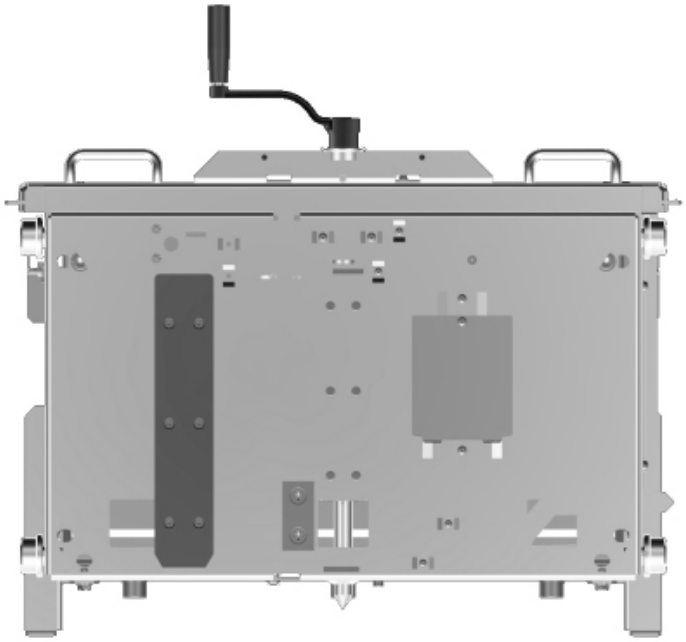
Wearing of gloves for handling the parts during installation is recommended.

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.

Protective earthing

The withdrawable ISM is earthed by means of the truck wheels.
Optionally the earthing can be arranged via the earthing bar which is connected to the bottom of the truck.
In this case the corresponding earthing is made in the switchgear.



Mechanical interlocking

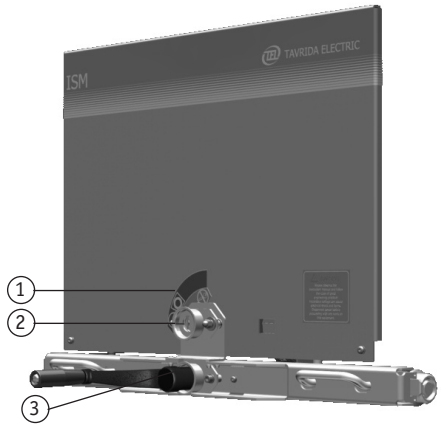
The withdrawable ISM provides all the interlocks needed to guarantee the high level of safety and reliability required for installation and for the operators.

Standard safety interlocks

- The draw-out unit can only be moved if the ISM is open and locked.
- The ISM can only be unlocked and operated if the draw-out unit is precisely in the test or service position.
- Connection and disconnection of the control wiring plug is only possible in the test/disconnected position.

Optional set of interlocks

- Draw-out unit can only be moved, when the control wiring plug is inserted and control voltage is applied.



The mechanical interface of the base set of interlocks includes:

- Interlocking knob (Fig. 19) that can be operated manually or by the racking handle via turning.
- Sticker “Turn to open and lock ISM” (red colour) counterclockwise and “Turn to unlock ISM” (green colour) clockwise

Figure 19

1. Sticker
2. Interlocking knob
3. Racking handle

There are effectively two stages of the interlocking system: “Locked” and “Unlocked”

- When the interlocking knob is in locked position (Fig.20, Fig21) the interlocking system is in “Locked” position. In this position the ISM can not be closed (electromechanical interlocks) and the draw-out unit can be moved.
- When the interlocking knob is in unlocked position (Fig. 22) the interlocking system is in “Unlocked” position. In this position the ISM can be operated (opened and closed) and the draw-out unit can not be moved.

There are three positions of the interlocking system when the draw-out plate is inserted into the the switchgear cubicle:

Position A (Fig. 20)

- Draw-out plate is locked
- Draw-out unit is in test position
- ISM is open
- Interlocking knob is in locked position.
- Rotation of the racking screw is unblocked.

It is possible to move the draw-out unit.
It is possible to unlock the draw-out plate.
It is possible to unlock the ISM.

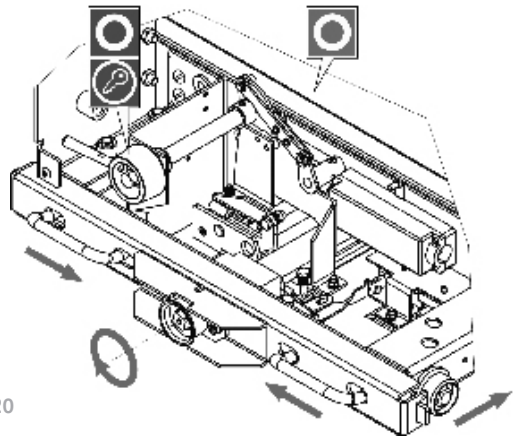


Figure 20

Position B (Fig. 21)

- Draw-out plate is locked
- Draw-out unit is in intermediate position
- ISM is open
- Interlocking knob is in locked position.
- Rotation of the racking screw is unblocked.

It is possible to move the draw-out unit.
It is impossible to unlock the draw-out plate.
It is impossible to unlock the ISM.

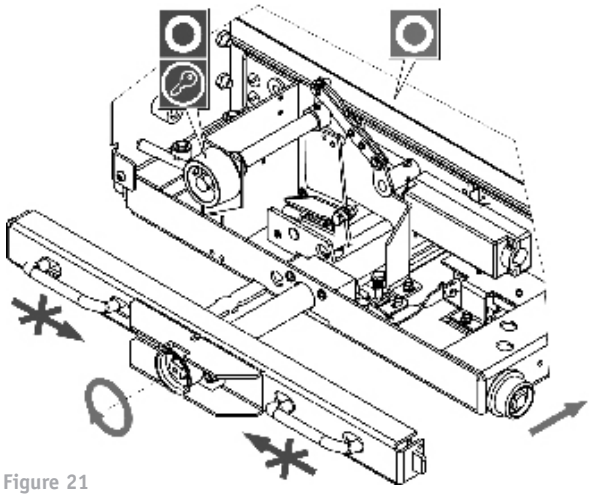


Figure 21

Position C (Fig. 22)

- Draw-out plate is locked
- Draw-out unit is in the service position
- ISM is closed
- Interlocking knob is in unlocked position.
- Rotation of the racking screw is blocked.

It is impossible to move the draw-out unit.
It is impossible to unlock the draw-out plate.
It is possible to open and lock the ISM.

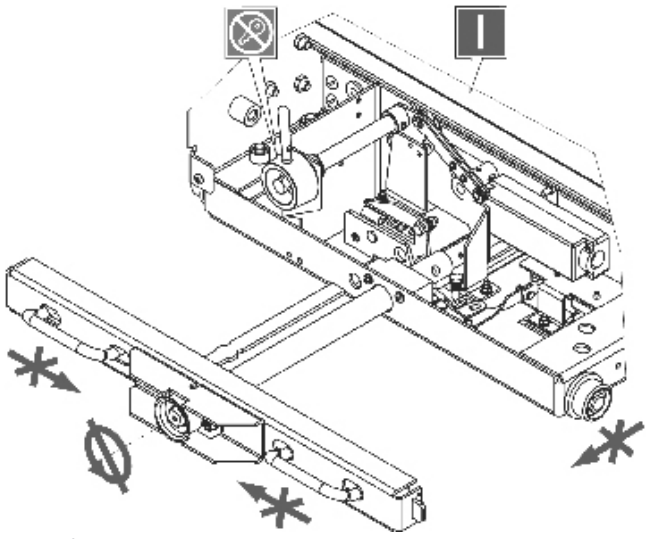


Figure 22

Optional set of interlocks

- ISM manual tripping and locking device operable when the circuit breaker compartment door is closed (see Fig. 23, 24). Compared with the base version this device includes an additional supporting bracket mounted onto the fixed part of the draw-out plate.
- The draw-out unit locked in its test/disconnected position cannot be moved into the service position if the control wiring plug is not inserted in the socket or control voltage is not applied (See Fig. 23, 24).
  This function is realised by electromagnet Y1 mounted onto the interlocking bridge. If the electromagnet is not energized (the control wiring plug does is inserted in the socket or control voltage is not applied) rotation of the racking screw is blocked and the draw-out unit can not be moved. In case of power failure during the racking process the electromagnet will be deenergized but it is possible to move draw-out unit to service or test position after which it will be blocked.

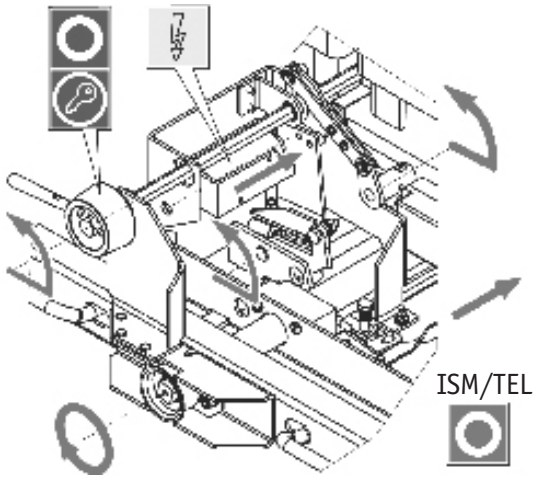


Figure 23

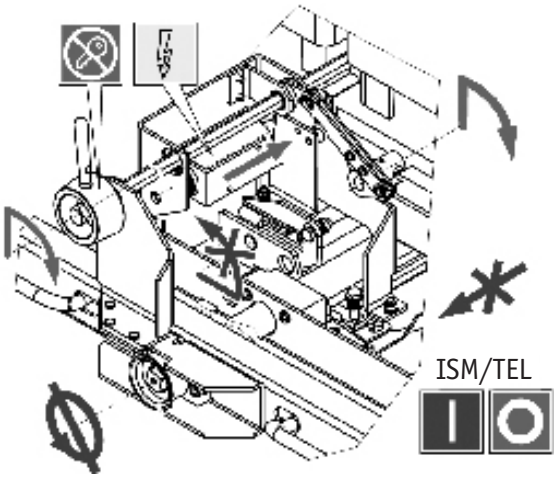


Figure 24

Secondary connections

Auxiliary circuits

The auxiliary circuits contain the following components (See Fig. 25):

- Control modules CM/TEL-12-01A or CM/TEL-15-01. Mounted in the LV compartment, these control the breaker and interface with the relay protection system.
- Auxiliary switches of ISM QS1.S1 to Q1.S13. Used to signal the ISM contact status.
- Internal interlocking switch of draw-out unit. Provides interlock of ISM operation if draw-out unit is in the intermediate position.
- Actuator coils of ISM YA1, YA2, YA3. These drive the main contacts of the ISM.
- Electrical operation impulse counter PC1. Counts the number of close / open operations of the ISM.
- Auxiliary switches of draw-out plate, 3NO and 3NC contacts each SQ1, SQ2 (See Fig. 8, page 13). Signal draw-out unit position.
- Electrical closing-lock-out relay KV1. It is intended to provide external closing lock-out function if deenergized.
- Terminal blocks XT20, XT21. Connect auxiliary circuits of the draw-out unit .
- Plug, male XS1. Provides connection of draw-out unit auxiliary circuits to auxiliary circuits of relay protection compartment.
- Plugs XS2, XS3, XP2, XP3. Provide connection of auxiliary switches SQ1, SQ2 installed at the draw-out plate to the other auxiliary circuits of draw-out unit.
- Plugs XS4, XP4 (optional, interlocking coil Y1).
- Interlocking electromagnet Y1 (optional). Provides mechanical interlocking of the draw-out unit against racking in and racking-out operations if deenergized.

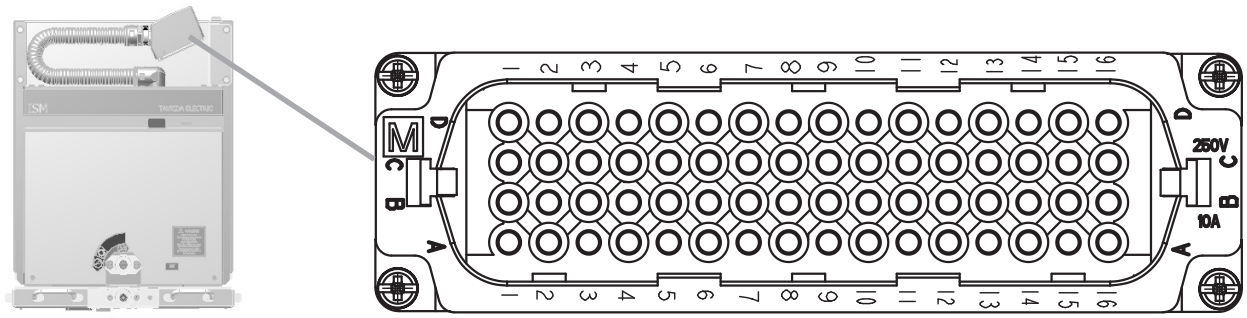


Figure 25

Terminal pin arrangement XP1

Terminal arrangement

A		B	
Terminal No.	**Connection**	**Terminal No.**	**Connection**
1	Pulse counter (PC1) XS5	1	Auxiliary switch (S4) XT1.8
2	Auxiliary switch (S7) XT2.18 (PC1)	2	Auxiliary switch (S5) XT1.9
3	Service position (SQ1.6) XS2.11	3	Auxiliary switch (S5) XT1.10
4	Actuator coil (SC2) XT1.13	4	Auxiliary switch (S6) XT1.11
5	Service position (SQ1.6) XS2.12	5	Auxiliary switch (S6) XT1.12
6	Position switch (S13) XT2.15	6	FREE
7	Test position (SQ2.6) XS3.11	7	FREE
8	Position switch (S13) XT2.16	8	Auxiliary switch (S8) XT2.19
9	Test position (SQ2.6) XS3.12	9	Auxiliary switch (S8) XT2.20
10	Actuator coil (SC2) XT1.14	10	Auxiliary switch (S9) XT2.21
11	FREE	11	Auxiliary switch (S9) XT2.22
12	Auxiliary switch (S2) XT1.3	12	Auxiliary switch (S10) XT2.23
13	Auxiliary switch (S2) XT1.4	13	Auxiliary switch (S10) XT2.24
14	Auxiliary switch (S3) XT1.5	14	Auxiliary switch (S11) XT2.25
15	Auxiliary switch (S3) XT1.6	15	Auxiliary switch (S11) XT2.26
16	Auxiliary switch (S4) XT1.7	16	FREE

C		D	
Terminal No.	**Connection**	**Terminal No.**	**Connection**
1	FREE	1	Test position (SQ2.3) XS3.6
2	Service position (SQ1.1) XS2.1	2	Test position (SQ2.4) XS3.7
3	Service position (SQ1.1) XS2.2	3	Test position (SQ2.4) XS3.8
4	Service position (SQ1.2) XS2.3	4	Test position (SQ2.5) XS3.9
5	Service position (SQ1.2) XS2.4	5	Test position (SQ2.5) XS3.10
6	Service position (SQ1.3) XS2.5	6	Interlocking coil Y1 (optional) XT21.27
7	Service position (SQ1.3) XS2.6	7	Interlocking coil Y1 (optional) XT21.28
8	Service position (SQ1.4) XS2.7	8	FREE
9	Service position (SQ1.4) XS2.8	9	FREE
10	Service position (SQ1.5) XS2.9	10	FREE
11	Service position (SQ1.5) XS2.10	11	FREE
12	Test position (SQ2.1) XS3.1	12	FREE
13	Test position (SQ2.1) XS3.2	13	FREE
14	Test position (SQ2.2) XS3.3	14	FREE
15	Test position (SQ2.2) XS3.4	15	FREE
16	Test position (SQ2.3) XS3.5	16	FREE

Auxiliary power supply for CM and other control equipment

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.

Auxiliary power supply and selection of MCB for CM/TEL...-12-01A
(Figure 26)

Technical data of the MCB:
30 V DC : 4A, 1-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.

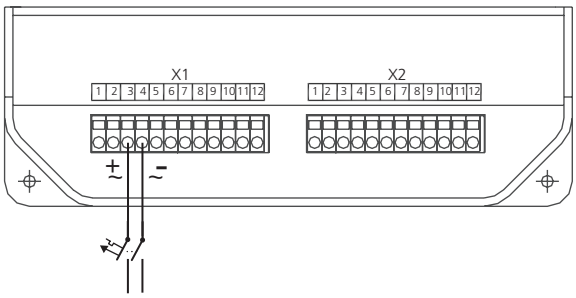
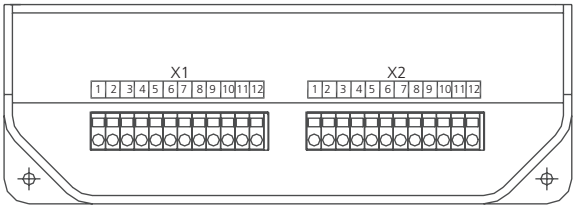


Figure 26
Auxiliary power supply for CM/TEL...-12-01A

Connections of the CM

The connections for basic and extended functions of all available CM can be seen from the following terminal arrangements.



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 OSM (1AS1)
8	Free	8	Auxiliary switch OSM (1AS2)
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

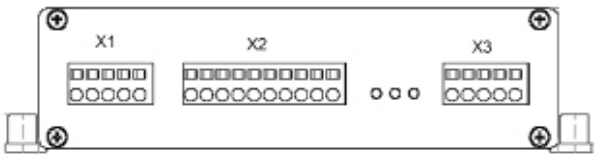


Figure 27

CM/TEL...-15-01 Terminal arrangement

X1		X2		X3	
Terminal No.	**Connection**	**Terminal No.**	**Connection**	**Terminal No.**	**Connection**
1	Earth, internally used	1	Ready (NO)	1	Auxiliary switch
2	Auxiliary power supply input 1	2	Ready (com)	2	Auxiliary switch
3	Auxiliary power supply input 1	3	Ready (NC)	3	Output actuator coil (SC1)
4	Auxiliary power supply input 2	4	Dry contact “Close”	4	Output actuator coil (SC2)
5	Auxiliary power supply input 2	5	Dry contact “Close”	5	Earth, internally used
		6	Dry contact “Trip”		
		7	Dry contact “Trip”		
		8	Ready (NO)		
		9	Ready (com)		
		10	Ready (NC)		

Warning

Power supply voltage can be only applied between terminals X1:2,3 and X1:4,5 of the CM...-15-01. Terminals X1:2, X1:3 are connected inside of the CM...-15-01; terminals X1:4, X1:5 likewise are connected inside the module.

Installation of the CM

The CM shall be installed in a control cubicle together with the protection relay and control push buttons where applicable. The material of the box shall be mild steel with a thickness of not less than 1 mm.

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. Control cubicle shall provide IP65 degree of protection.

Switching and control functions

Charging of the capacitors

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

Ready-LED and Ready-relay output

While charging the capacitors, the Ready-LED flashes (CM-12 and 14 series) or is off (CM15-01 series). When the capacitors are charged the Ready-LED is on continuously and Ready-relay contact is closed. With flashing or extinguished Ready-LED, the Ready-relay contact is open.

Malfunction-LED and Malfunction-relay output

If the CM detects an internal or external malfunction, the Malfunction-LED will flash according to the type of malfunction (CM12 and 14 series, see Chapter 6) or stay on continuously (CM15 series). At the same time the Malfunction-relay contact 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 is opened. The Malfunction-relay contact is closed if the 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 on 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.

Internal electrical interlock

The opened electrical interlock contact causes a malfunction signal (Refer to chapter 6 “Signalling/Malfunction indication table” page 39).

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 type 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.

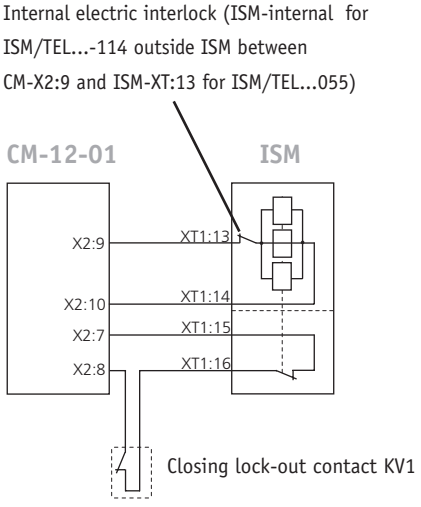


Figure 28

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)
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 38, 39). 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 (optional)

In case the ISM must trip because the auxiliary power supply voltage drops below a minimum value, an additional undervoltage relay is required. The trip contact of the undervoltage relay is integrated into the dry contact trip command circuit per figure 29 (CM12-01 shown, others similar). If the CM was ready for operation before the voltage dropped below the minimum value, tripping of the ISM is possible within 30 s after the voltage dropped below the minimum level.

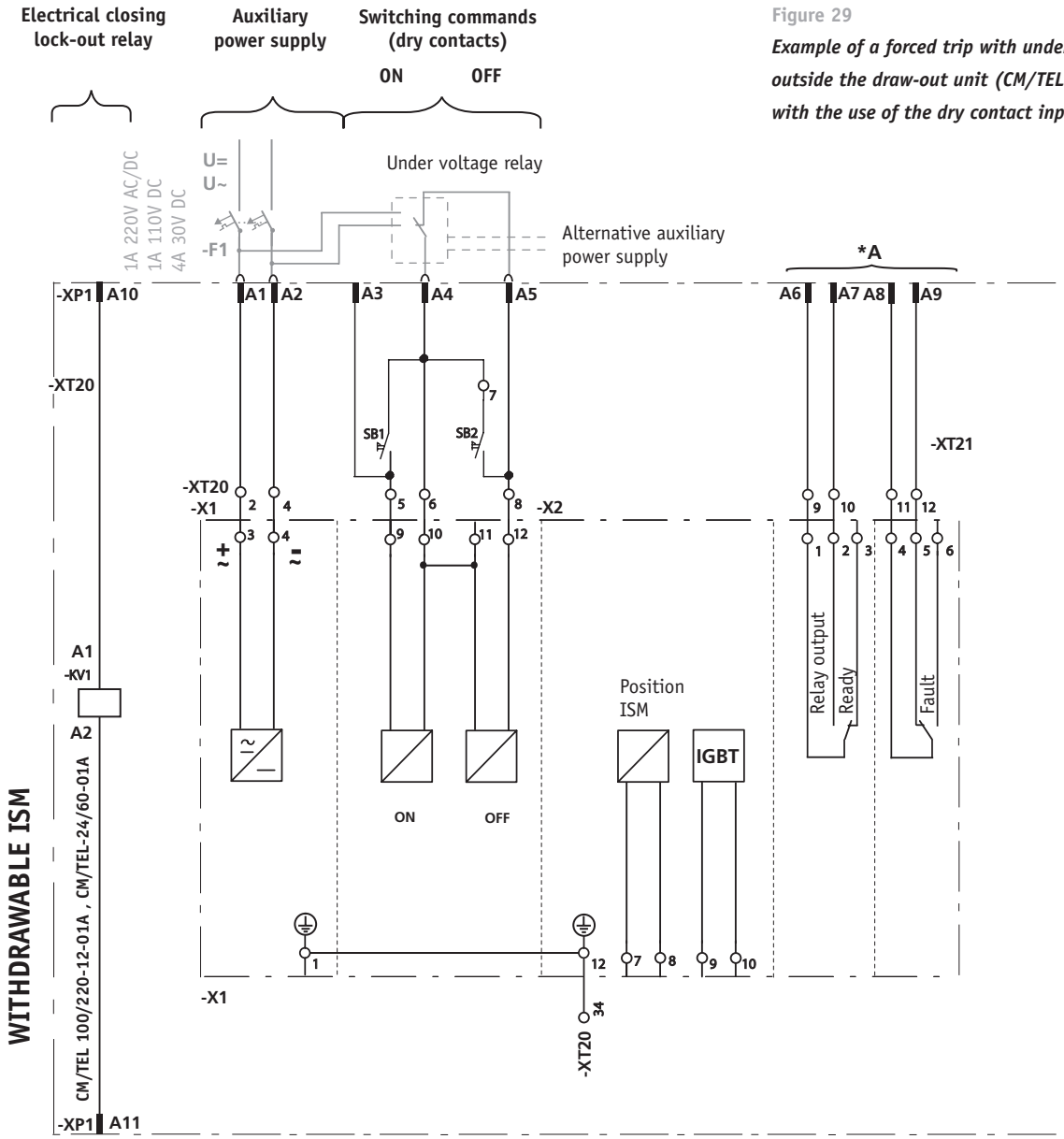


Figure 29
Example of a forced trip with undervoltage relay outside the draw-out unit (CM/TEL...-12-01A with the use of the dry contact input X10,12)

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 30).

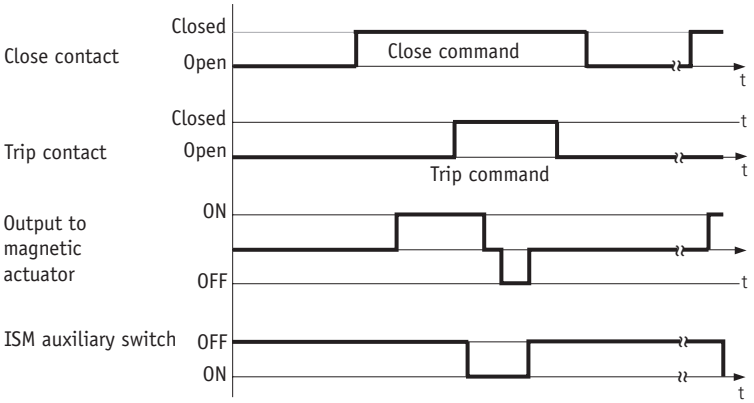


Figure 30

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 31).

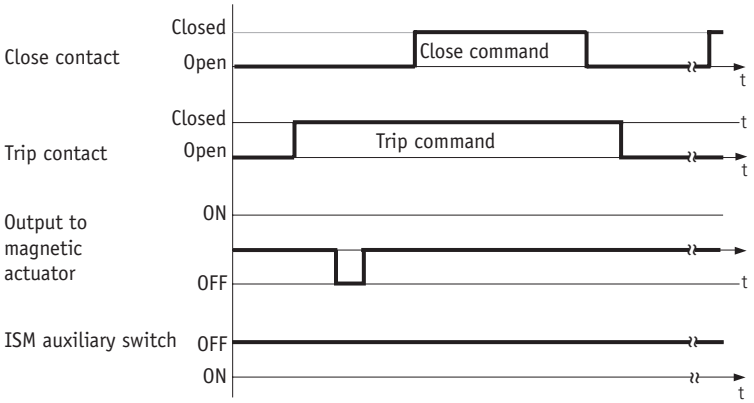


Figure 31

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 32).

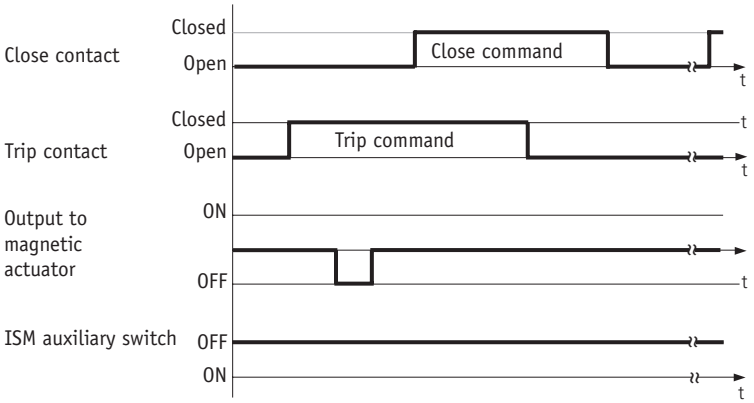


Figure 32

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 continuously (see malfunction indication table, pages 39 and 40).

Commissioning, operation, maintenance

General

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, including but not limited to relevant sections of OSHA, NFPA70E, or the CEC.

Commissioning primary part

Tests shall include at minimum:

- Check for damage
- Check for surface deposits (dust, oil etc)
- Test special functions including racking, mechanical interlocks and plug connections
- Check that free air circulation is possible

Testing the rated insulation level to ANSI C37.54:

For 5 kV ISMD the rated power frequency test voltage is 19 kV
For 15 kV ISMD the rated power frequency test voltage is 36 kV

Commissioning secondary part

Preparation before testing the functionality should include at minimum:

- Testing the availability of auxiliary power supply. It is recommended to use the same auxiliary power supply as the 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 withdrawable ISM is connected according to the circuit diagrams.

Operating test

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 indicators, with the breaker in the test position and interlock in the unlocked position:
  - The POWER LED must light up immediately.
  - The READY LED must blink during charging of capacitors and light up continuously within 15 s.
  - The READY relay contact must close within 15 s.
  - The MALFUNCTION LED should be extinguished after 15 s.
- Check all basic and extended functions (if any) according to the chapters “Switching and Control Functions” and “Signalling”.

Caution Danger!

- During operation both CM-actuator voltage and internal auxiliary voltage for ISM auxiliary switch S13 amounts to approximately 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 the voltage has dropped to a safe value.

After the above listed functionality tests have been performed succesfully the ISM can be tested under high voltage.

Operation

Note: The following shows a single type of lifting device. The manfuacturer of the swtichgear may also have developed a customized lifting device or ramp for your location. IEC truck version shown.

Transportation for approaching and engagement with switchgear panel (Fig. 33, Fig. 34)

After the door of the circuit breaker compartment has been opened and the service truck has been engaged with the switchgear panel (Fig. 34) the draw-out unit shall be released by moving the sliding handles (Fig. 34) inwards. After that the draw-out unit can be inserted into the test/disconnected position. The draw-out unit shall be fixed in this position by moving the sliding handles (Fig. 34) sideways.

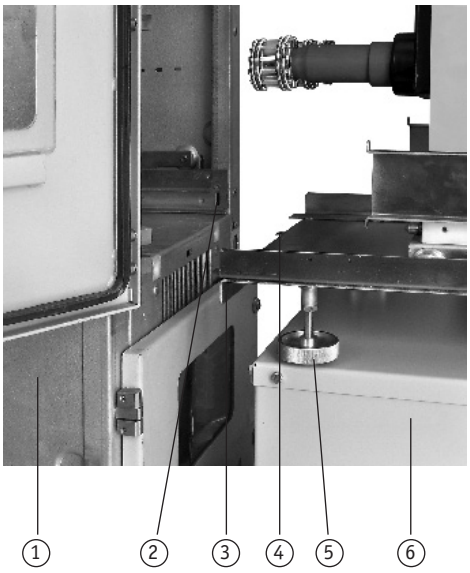


Figure 33

Figure 34

1. Switchgear panel
2. Appropriate slots
3. Guide pins
4. Catch
5. Height adjuster
6. Service truck
7. Fixative pins
8. Sliding handles
9. Socket head
10. Square spigot
11. Spindle
12. Hand crank

Insertion from the test/disconnected position to the service position (Fig. 35)

Before insertion the control wiring plug shall be connected to the switchgear panel socket (Fig. 36); for draw-out units with interlocking electromagnet Y1 it shall be energized; the circuit breaker compartment door shall be closed and the ISM shall be opened.

Racking mechanism is operated by fitting the hand crank on the square spigot (Fig. 34) and turning the crank clockwise until the stop is reached and the draw-out unit is in the service position.

Caution!

Do not force the draw-out unit to move. (max. torque 25 Nm)!

After that press against the hand crank and remove it.

Note: When removing the crank, it is essential that the springloaded socket head (Fig. 34) slides into the untensioned front position. Spindle is thus locked in place, preventing inadvertent turning of the spindle. Turning of the spindle opens auxiliary switches SQ1, SQ2 and thus signals position of draw-out plate.

Note: The draw-out unit shall not be stopped at any position in the travel range between the service position and the test/disconnected position!

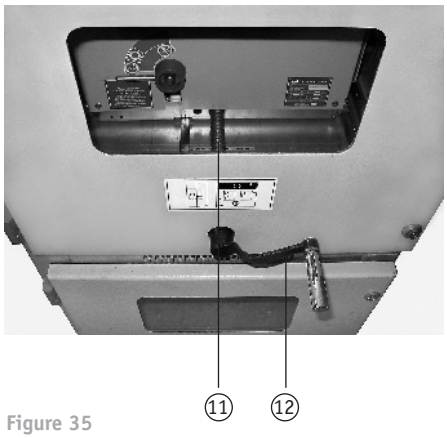


Figure 35

Withdrawal from the service position into the test/disconnected position (Fig. 35)

Before withdrawal the ISM shall be opened electrically or manually. Withdrawal shall be done in the reverse of the procedure described above for insertion into the service position.

Note: Draw-out unit with interlocking electromagnet Y1 shall not be forcibly moved during power failures. In such a case it is blocked in the service and test positions. For deblocking, see section «Deblocking of interlocking electromagnet Y1» of this manual.

Withdrawal from the test/disconnected position onto the service truck (Fig. 36)

Before withdrawal the door of the circuitbreaker compartment shall be opened, control wiring plug shall be released and engaged in its storage position on the draw-out unit.
After the service truck is engaged with the switchgear panel, the draw-out unit shall be released by moving sliding handles inwards against the springs, withdrawn onto the service truck and secured on it using catches.

Deblocking of interlocking electromagnet Y1 (Fig. 33, Fig. 34)

In case of power failure the interlocking electromagnet Y1 might need to be released. To accomplish this, after removing the draw-out unit front panel disengage the electromagnet by pulling its armature. While doing so, turn hand crank about one half turn (either direction of rotation is permissible).

ISM operations

ISM manual «Trip» and locking operation (Fig. 36)

ISM manual «Trip» and locking operation is activated by turning interlocking knob counterclockwise manually according to the sticker when the circuit breaker compartment door is open (Fig. 36) or using the hand crank (the same with the racking mechanism crank fitted on square spigot of the interlocking knob through the hole) when the circuit breaker compartment door is closed (Fig. 37).
After that the ISM is locked electrically and mechanically and can not be closed.

ISM unlocking operation (Fig. 36)

The ISM manual unlocking operation is activated by turning the interlocking knob clockwise manually according to the sticker when the circuit breaker compartment door is open (Fig. 36) or using hand crank fitted on square spigot of the interlocking knob through the hole when the circuit breaker compartment door is closed (Fig. 37).
After that the ISM is unlocked electrically and mechanically and can be closed.

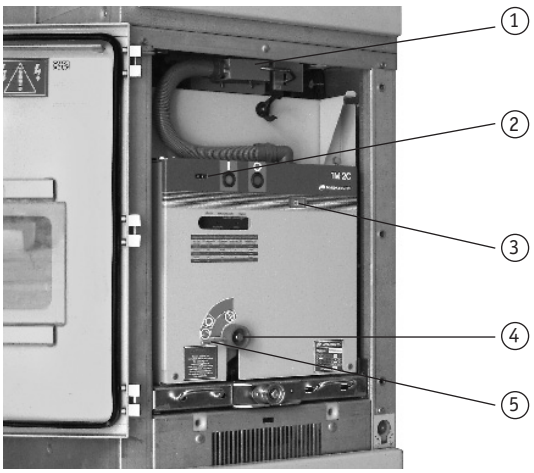


Figure 36

1. Control wiring plug
2. Operating counter
3. Main contacts position indicating device
4. Mechanical trip and interlocking device integrated in the interlocking system
5. Interlocking knob

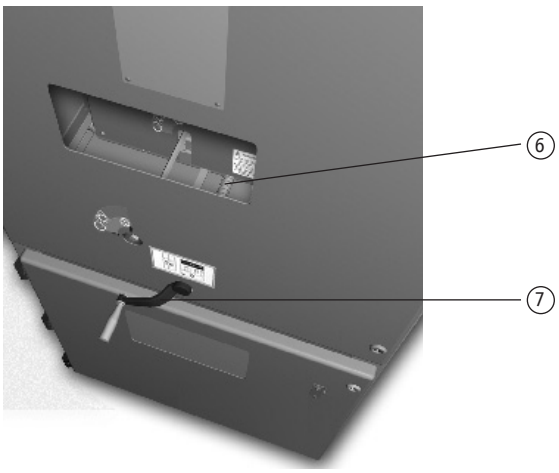


Figure 37

6. Spindle
7. Hand crank

ISM electrical «Close» operation (Fig. 36)

Before electrical «Close» operation the ISM unlocking operation should be performed. «Close» operation is activated by pushing the electrical pushbutton installed in the switchgear LV compartment. «Close» operation is possible only if no interlocks are applied. Maximum current on Dry contact «Close» circuit is about 100mA and limited by internal circuits of the CM.

ISM electrical «Trip» operation (Fig. 36)

«Trip» operation is activated by pushing the electrical pushbutton installed in the switchgear LV compartment. Maximum current on «Dry contact «Trip» circuit is about 100mA and limited by internal circuits of the CM.

ISM main contacts position indication (Fig. 36)

ISM main contacts position indication is provided mechanically by the indicating device with symbol ○ for ISM «Open» status and symbol | for ISM «Closed» status.

Maintenance

Under normal operating conditions (see chapter “Regulations and ambient conditions, Ambient conditions”, page 61) 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 70.

Signalling

LED Indicators and Dry Contacts

Functionality	Results	LED indicators			Dry contacts of Ready and Malfunction relays		
		CM/TEL... -12 -01A	CM/TEL... -14 -01	CM/TEL... -15 -01	CM/TEL... -12 -01A	CM/TEL... -14 -01	CM/TEL... -15 -01
Switch on auxiliary power supply	Power supply On	•	•	•			
CM is ready to carry out control commands	Operational readiness	•	•	•	•	•	•
Malfunction CM or ISM	Malfunction	•	•	•	•	•	•

LED indicators are situated on the front face of CMs of 12 and 14 series, and on the connection face of the CMs of 15 series (Figure 31).

Figure 31

Operating and malfunction indications for CMs of 12, 14 and 15 series

Malfunction Indication Table

The monitoring system inside the CM detects potential malfunctions and reports them via the MALFUNCTION LED. The CM12 and 14 series indicate the nature of the fault through a flashing sequence; the CM15 series lights continuously for all faults.

Error group	Malfunction LED state CM15	Malfunction LED state CM12 and 14	Function, type of malfunction	Description of malfunction variants	Recommendation for malfunction elimination
External error	Continuously lit	1 blink signal, then 1.5 s pause, periodic (about 4 min for CM/TEL...-12 series and about 10 min for CM/TEL...-14-01)	The power supply has failed for >1.5s (> 3.5s 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
	Continuously lit	2 blink signals, then 1.5s 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 closed 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
				Malfunction variant 2: The Trip command of the CM is carried out by the ISM. The 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

Error group	Malfunction LED state CM15	Malfunction LED state CM12 and 14	Function, type of malfunction	Description of malfunction variants	Recommendation for malfunction elimination
External error	Continuously lit	2 blink signals, then 1.5s pause, periodic	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 interlock is in the locked position.	Turn interlock on the ISMD to the unlocked position
	Continuously lit	3 blink signals, then 1.5s pause, periodic	The magnetic actuator coil circuit is interrupted	**Malfunction variant 1:** Possible causes: cable break, loose terminal connections, defect (open) internal electrical interlock contact at unlatched position of interlocking shaft, defect magnetic actuator coils.	- Check for cable break - Check terminal connections - Check internal electrical inter-locking contact
				Malfunction variant 2: In ISM position „opened and mechanically locked" the internal electrical interlock contact is opened.	Turn interlock on the ISMD to the unlocked position
			CM-internal malfunction	**Malfunction variant 3:** CM-defect.	- CM must be replaced
	Continuously lit	4 blink signals, then 1.5s 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
	Continuously lit	5 blink signals, then 1.5s pause, periodic	ISM was tripped without CM command	**Malfunction variant 1:** Mechanical emergency trip via manual trip device.	Reset the malfunction indication with the CM Trip command
			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 occurs in the ISM auxiliary switch circuit in which the normally closed switch 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
Internal Error	Continuously lit	17 or more blink signals, then 1.5s pause, periodic	Various internal malfunction of the CM.		- CM must be replaced

Explanatory notes for malfunction indications and operational readiness

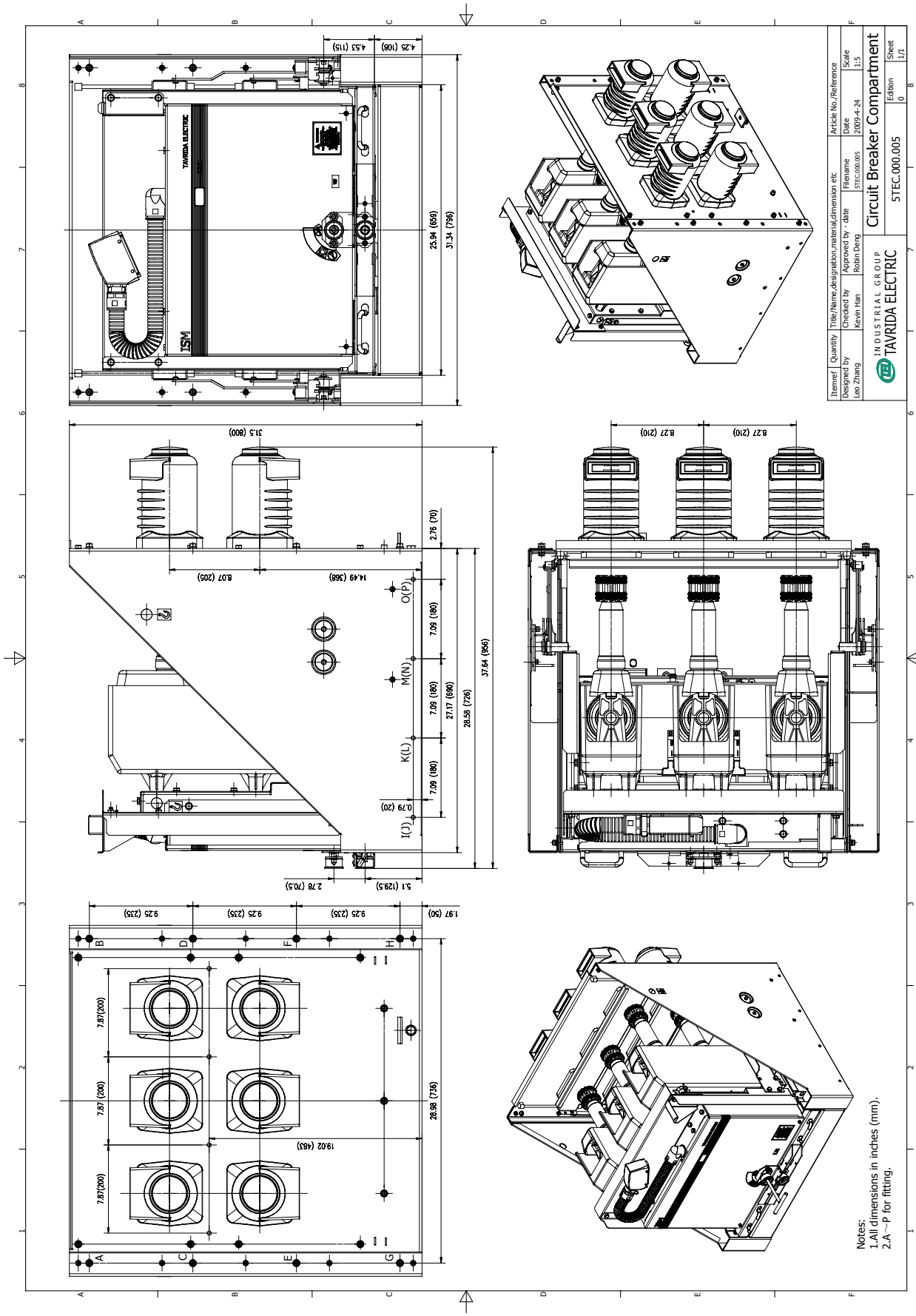
- If the ISM is in the OFF position and malfunction indications exist, the ISM can be closed only after all malfunctions have been eliminated.
- If several malfunctions appear at the same time malfunctions regarding the magnetic actuator are indicated with priority otherwise the last malfunction that occurred will be displayed.
- Several malfunction variants with 2- or 6- blink indications can be eliminated by issuing a trip command.
- In case of internal CM failures please contact your nearest Tavrida Electric partner.

Product line

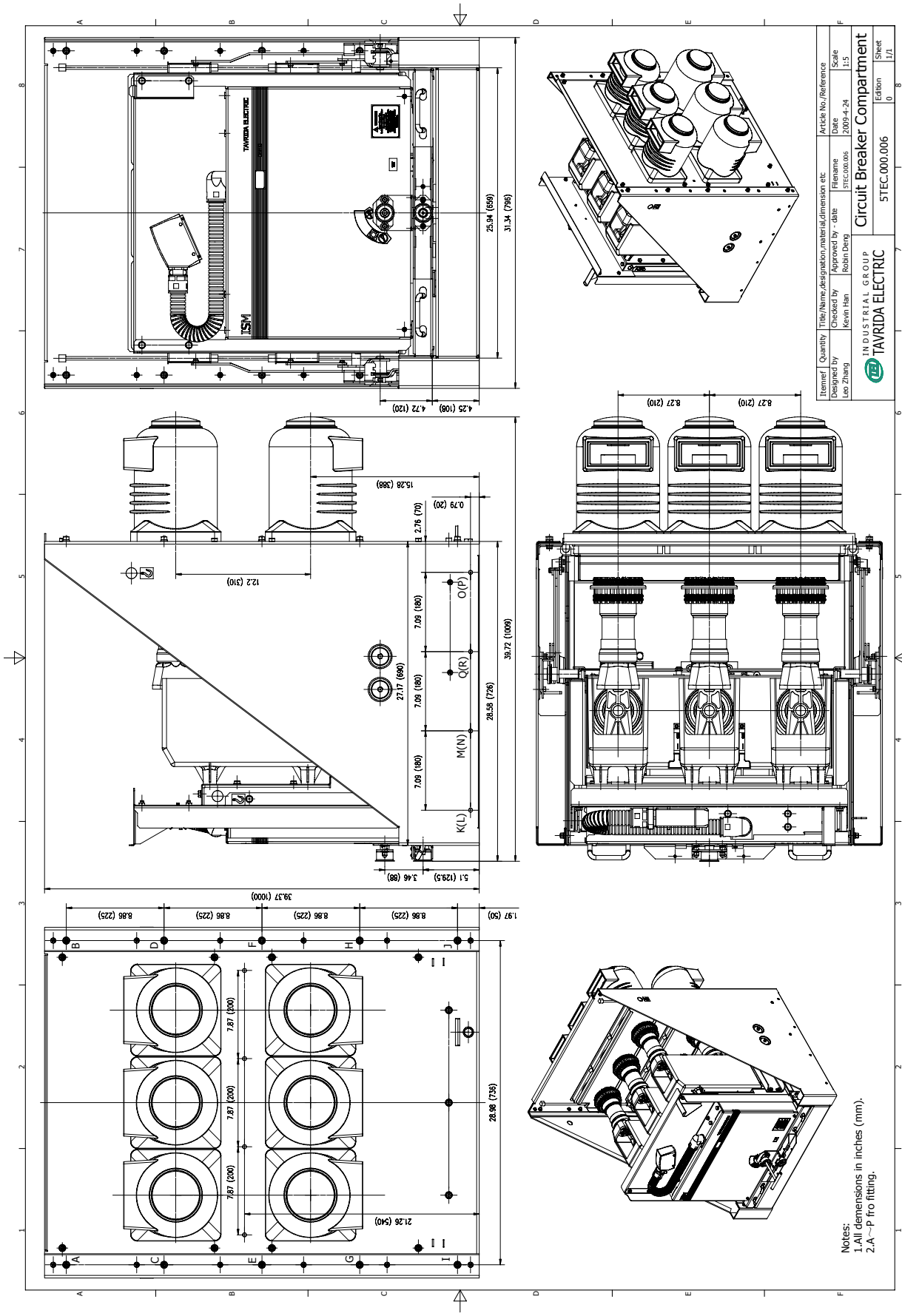
Pole Center Distance	Rated voltage	Rated short-circuit breaking current	Rated current	Rated auxiliary voltage	Type designation
mm	kv	kA	A		
210	5	31.5	1200	220VAC	ISMD 5-31.5/1200-114 (D - 220AC)
				220VDC	ISMD 5-31.5/1200-114 (D - 220DC)
				120VAC	ISMD 5-31.5/1200-114 (D - 120AC)
				125VDC	ISMD 5-31.5/1200-114 (D - 125DC)
				48VDC	ISMD 5-31.5/1200-114 (D - 48DC)
			2000	220VAC	ISMD 5-31.5/2000-114 (D - 220AC)
				220VDC	ISMD 5-31.5/2000-114 (D - 220DC)
				120VAC	ISMD 5-31.5/2000-114 (D - 120AC)
				125VDC	ISMD 5-31.5/2000-114 (D - 125DC)
				48VDC	ISMD 5-31.5/2000-114 (D - 48DC)
210	15	29	1200	220VAC	ISMD 15-29/1200-114 (D - 220AC)
				220VDC	ISMD 15-29/1200-114 (D - 220DC)
				120VAC	ISMD 15-29/1200-114 (D - 120AC)
				125VDC	ISMD 15-29/1200-114 (D - 125DC)
				48VDC	ISMD 15-29/1200-114 (D - 48DC)
210	15	20	800	220VAC	ISMD 15-20/800-055 (D - 220AC)
				220VDC	ISMD 15-20/800-055 (D - 220DC)
				120VAC	ISMD 15-20/800-055 (D - 120AC)
				125VDC	ISMD 15-20/800-055 (D - 125DC)
				48VDC	ISMD 15-20/800-055 (D - 48DC)

Dimensions

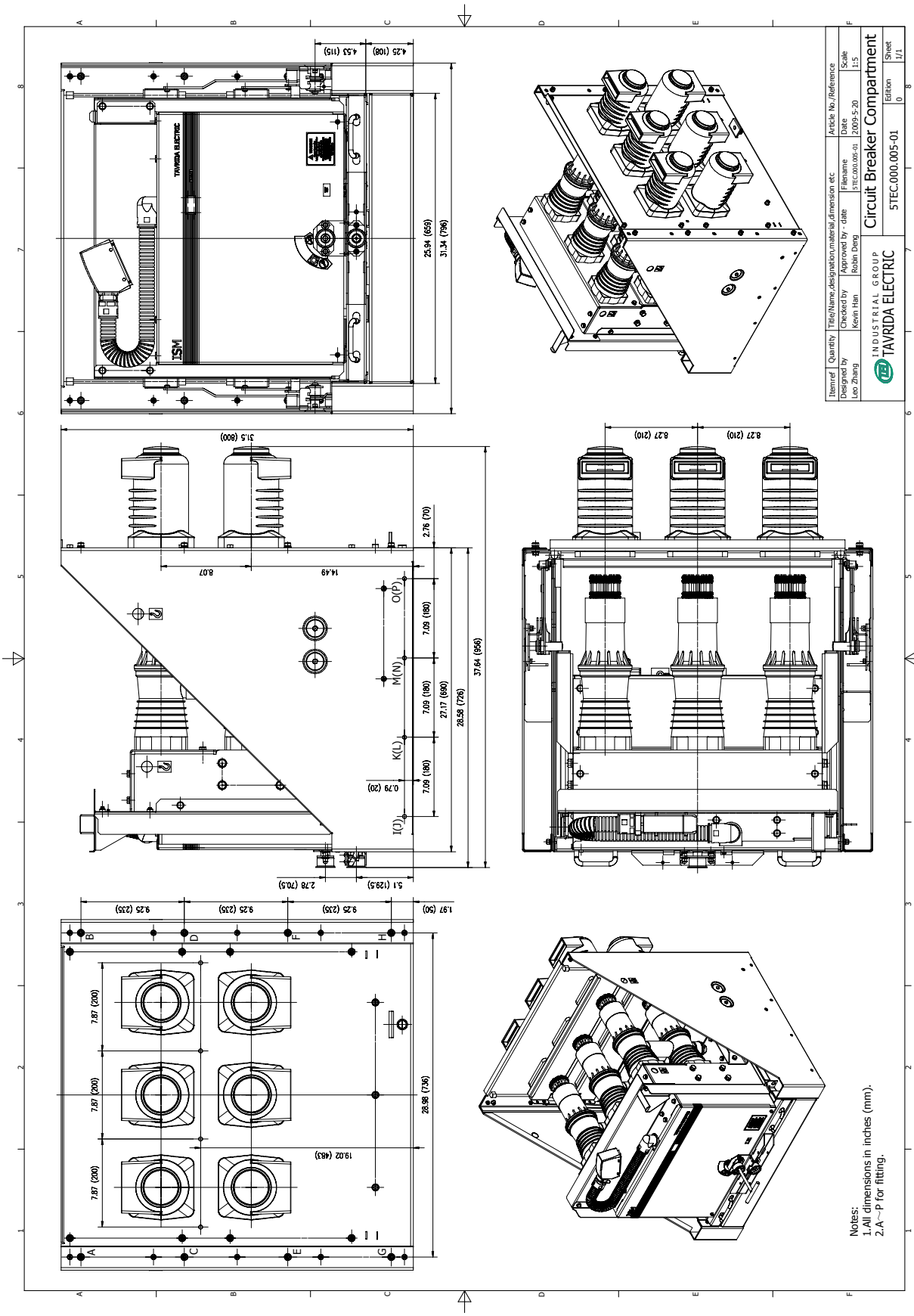
Dimensions - ISMD-5-31.5/1200-114; ISMD-15-29/1200-114



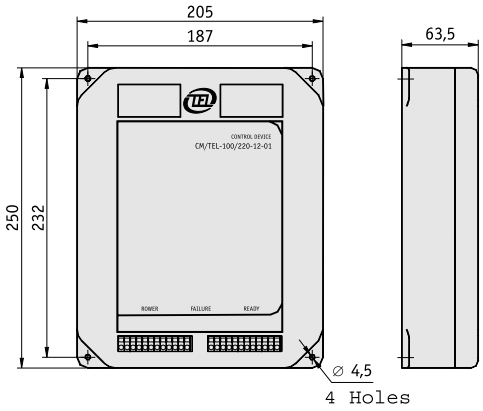
Dimensions - ISMD-5-31.5/2000-114



Dimensions - ISMD-15-20/800-055 (-055F)

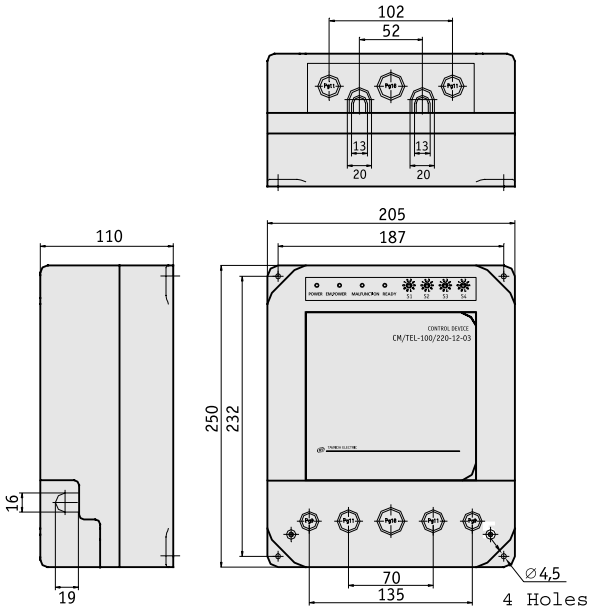


Dimensions and Weights of the CM



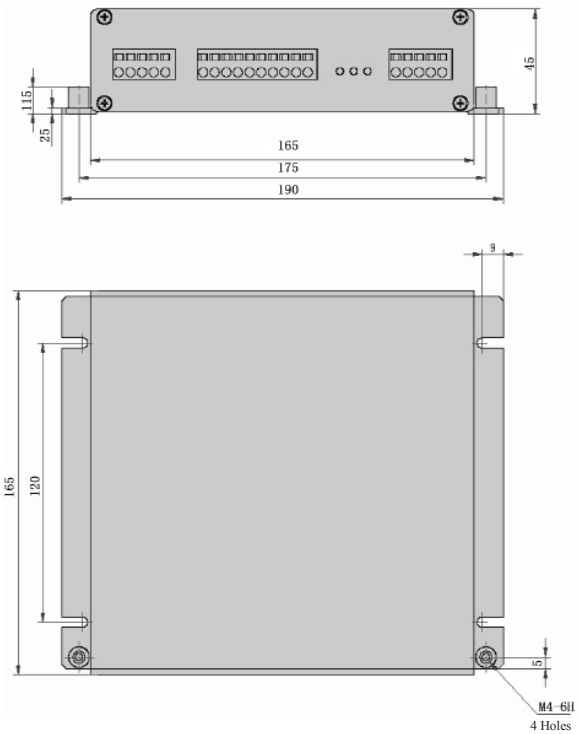
CM/TEL...-12-01A
Weight: 1.8 kg

CM/TEL 24/60-12-01A
CM/TEL 100/220-12-01A



CM/TEL...-14-01
Weight: 3 kg

CM/TEL 24/60-14-01
CM/TEL 100/220-14-01



CM/TEL...-15-01
Weight: 1.5 kg

CM/TEL-15-01-220

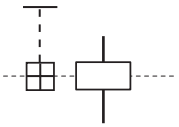
Circuit diagrams 9

Explanation of the switching symbols used

Draw-out unit

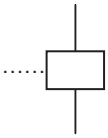
VCB, three phase

VCB, single phase

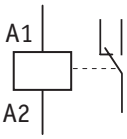


Mechanical interlock

Magnetic actuator coil with mechanical coupling to the VCB



Interlocking coil



Interstage relay with change-over contact

Counter

Auxiliary power supply unit / invertor

IGBT transistor bridge

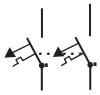
Signal converter

Normally open contact (NO)

Normally closed contact (NC)

Change-over contact

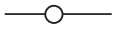
External devices



MCB

Push button with closing contact

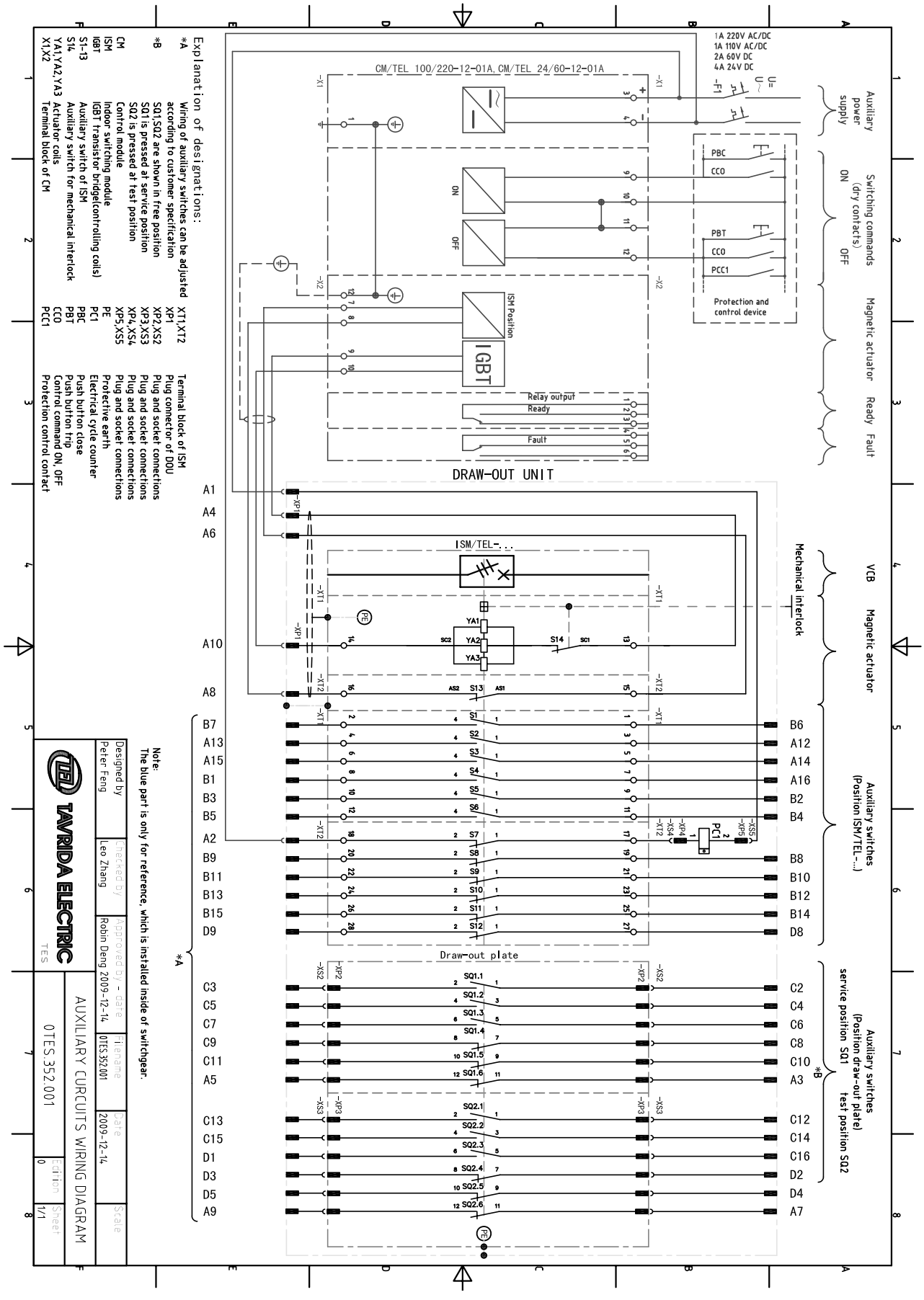
Plug connection



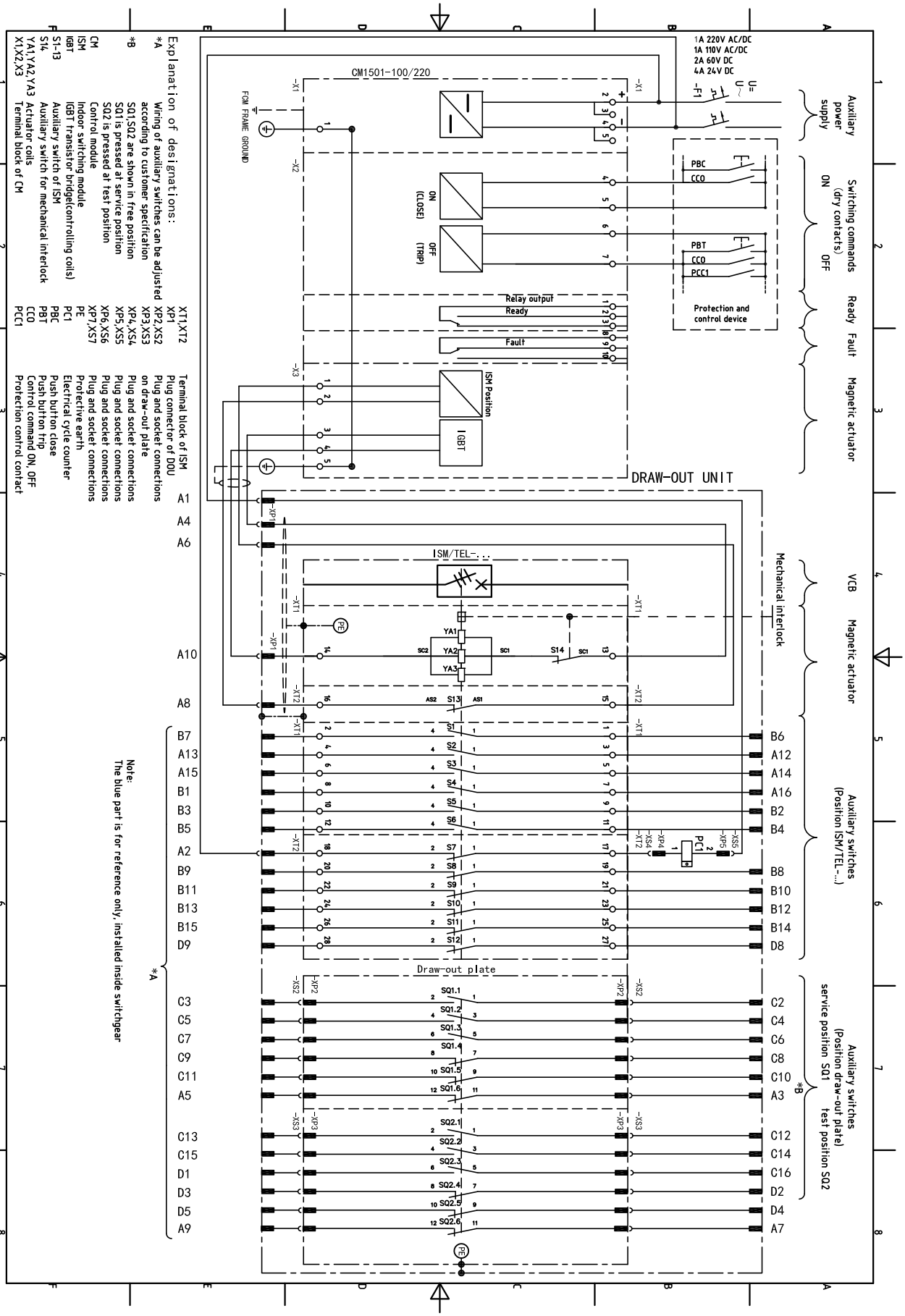
Terminal connection

The following wiring diagrams show standard wiring of the withdrawable ISM. Depending on your order the corresponding wiring diagrams may look different. The specific wiring diagrams for your order are attached to the order documents.

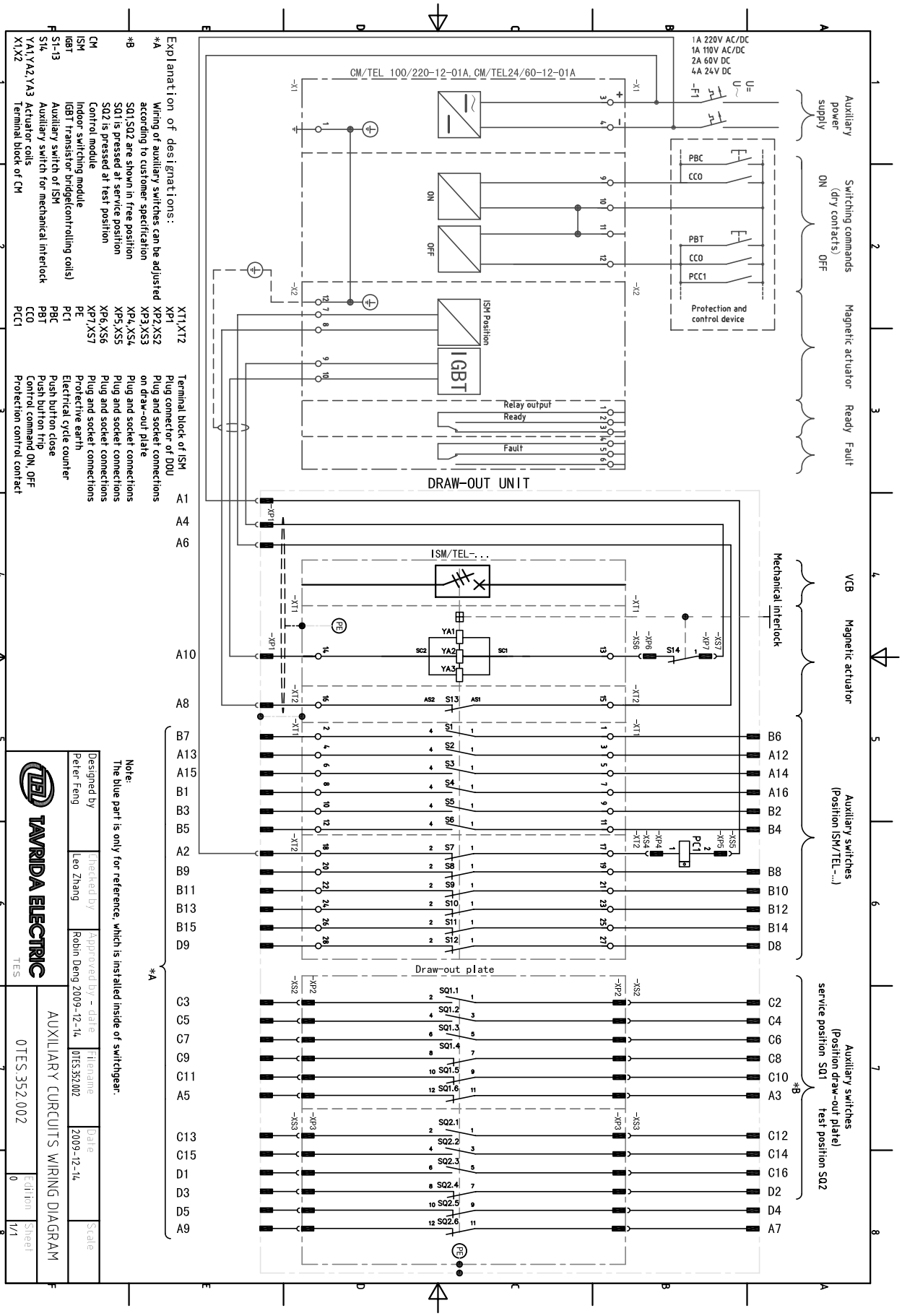
Circuit Diagram: CM-12-01A / CM-14-01A with ISMD-114



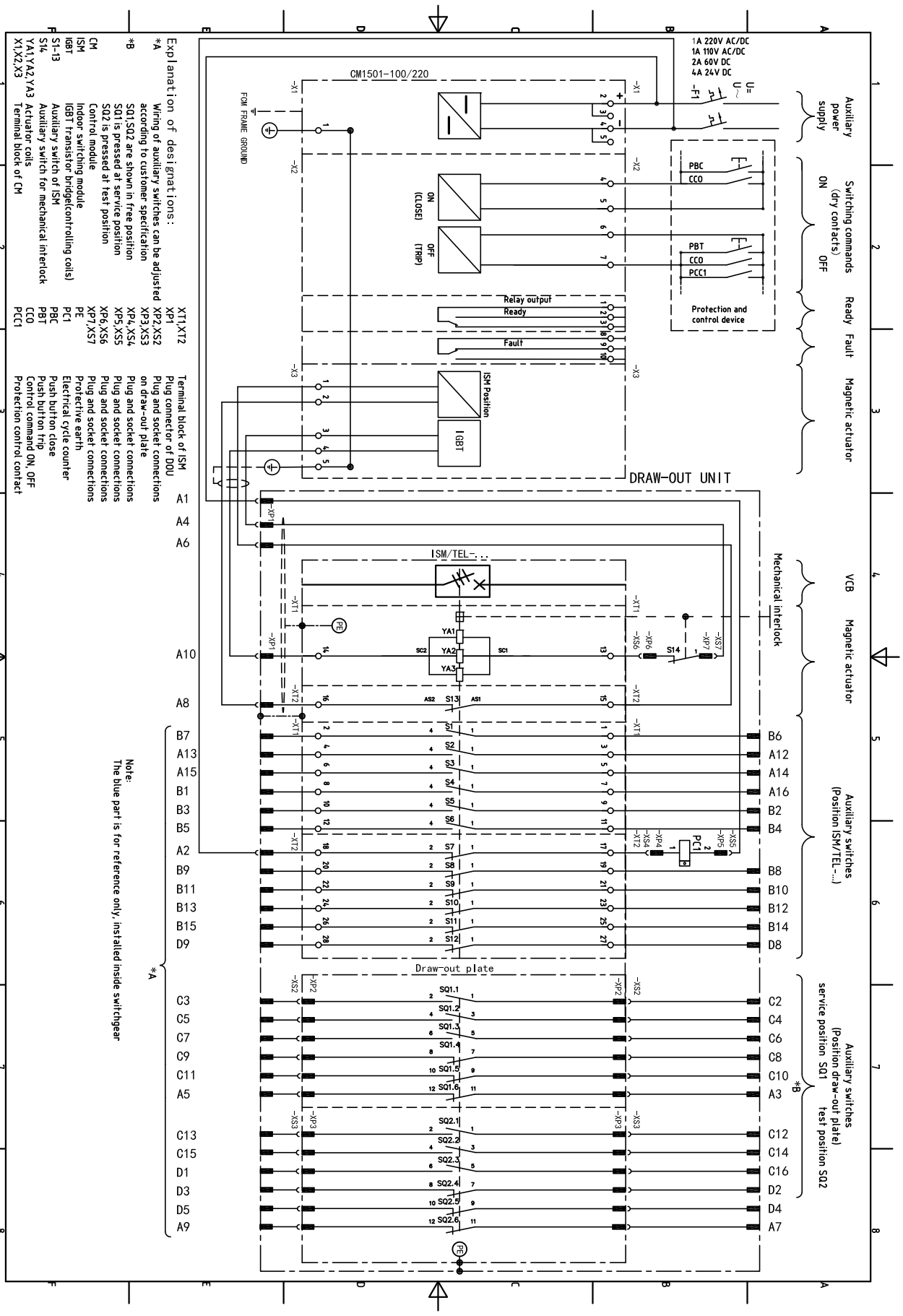
Circuit Diagram: CM-15-01 with ISMD-114



Circuit Diagram: CM-12-01A / CM-14-01A with ISMD-055 (055F)



Circuit Diagram: CM-15-01 with ISMD-055 (055F)



Technical data 10

Indoor switching modules (ISM)

Type	...-055, ...-055F	-114	-114
Rated data			
Rated voltage (U_r)	15 kV	5 kV	15 kV
Rated current (I_r)	to 800 A	to 2000 A	to 1200 A
Rated power frequency withstand voltage (U_d)	36 kV	19 kV	36 kV
Rated lightning impulse withstand voltage (peak) (U_p)	95 kV	75 kV [6]	95 kV
Rated short-circuit breaking current (I_{sc})	to 20 kA [5]	to 31.5 kA [5]	to 29 kA [5]
Rated peak withstand current (I_p)	to 52 kA	to 82 kA	to 82 kA
Rated short-time withstand current (I_k)	to 20 kA	to 31.5 kA	to 29 kA
Rated duration of short circuit (t_k)	4 s		
Rated frequency (f_r)	50/60 Hz		
Switching performance			
Mechanical life [4] (CO-cycles)	50 000 [1]	30 000	30 000
Operating cycles [4], rated current (CO-cycles)	50 000 [1]	30 000	30 000
Maximum number of CO-cycles per hour	please refer to CM		
Number of O-operations [4], rated–short circuit breaking current	100	50	50
Closing time [2], not more than (CM12,14 / CM15)	44 ms / 65 ms		
Opening time [2], not more than (CM12,14 / CM15)	27 ms / 32 ms		
Break time [2], not more than (CM12,14 / CM15)	37 ms / 42 ms		
Rated operating sequence	0-0.3s-CO-15s-CO (CM-12-01) 0-0.1s-CO-10s-CO (CM-15-01)		
Standards			
Standards	C37.54, C37.20.2		
Other data			
Resistance of main circuit	< 50 µOhm	< 40 µOhm	< 40 µOhm
Design, switching capacity of ISM auxiliary contacts			
Number of available auxiliary contacts	5 NO + 6 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 [3]		
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	0.5 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 [3]		
Maximum current for 125 V AC, inductive load (cosj =0,3)	5 A		
Maximum current for 250 V AC, ohmic load	5 A [3]		
Maximum current for 250 V AC, inductive load (cosj =0,3)	5 A		
Design, switching capacity of draw-out plate auxiliary contacts			
Number of available auxiliary contacts	3NO, 3NC (TEST) 3NO, 3NC (CONNECTED)		
Rated current for 660 V AC	15 A		

Control Modules (CM)

Basic Operating Parameters	CM/TEL...-12-01A	CM/TEL...-14-01	CM/TEL...-15-01
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	60	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		
Operating range	88 V DC to 275 V DC for close operations		85 V DC to 370 V DC
	77 V DC to 275 V DC for trip operations		
Auxiliary power supply	100 V AC to 220 V AC		
Operating range	80 V AC to 275 V AC for close operations		85 V AC to 265 V AC
	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, no more than	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
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		
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 transients/bursts to IEC 61 000-4-4, Class IV (A)	4 kV		
Interference immunity to periodic oscillations to IEC 61000-4-12, Class IV (A) 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		

Note

[1] ISM/TEL..-055F and -067F available with 150.000 CO cycles

[2] In combination with the associated CM

[3] 10 A current is permissible for 5 minutes

[4] See Figure 40 / page 60

[5] At 40% d. c. component

[6] 95kV on request

Control Modules (CM)

Basic Operating Parameters	CM/TEL...-12-01A	CM/TEL...-14-01	CM/TEL...-15-01
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 kg	3.0 kg	1.5 kg
Degree of protection	IP40		
Life cycle of CM close and trip capacitors	see Figure 63		
Switching capacity of output relay contacts			
Minimum current at 12 V AC/DC	≥10 mA		
Maximum breaking at 250 V DC and t = 1 ms	≤0.12 A		≤0.35 A
Maximum breaking at 250 V AC and cosφ = 0.3	≤2 A		≤16 A
Inputs for dry type close and trip commands (X1: 9, 10, 11, 12)			
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 constant of reducing current	≥10 ms		
Continuous current value	≥5 mA		

Life cycle of ISM

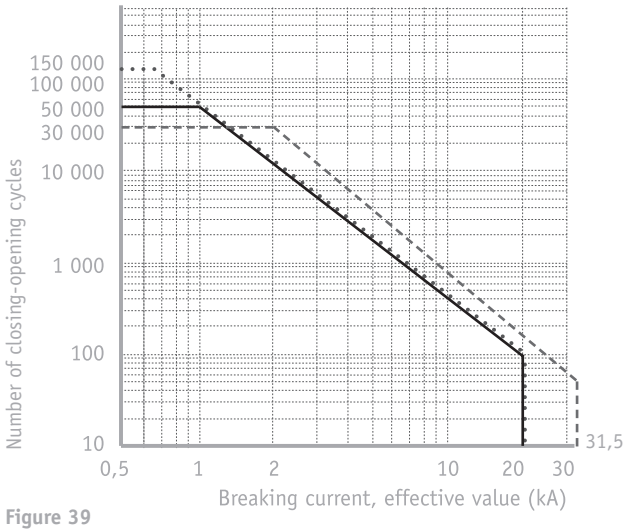


Figure 39

ISM ...-055,
ISM ...-055F
ISM ...-114

Life cycle of CM close and trip capacitors

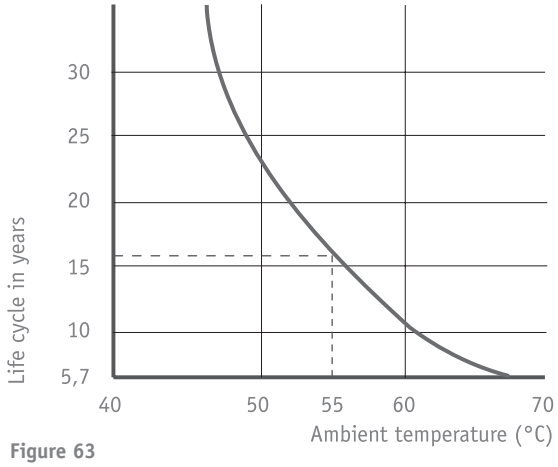


Figure 63

10

Regulations and ambient conditions

11

Regulations

The ISM fulfils the requirements of the following standards:

· DIN VDE 0670, Teil 1000	Germany
· IEC 60056	International standard
· IEC 62271-200	International standard
· IEC 60694	International standard
· GB 1984-2003, GB 3906	China
· GOST 687-78	Russian Federation
· C37.54	ANSI/IEEE North America

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

Ambient conditions

Highest value ambient temperature	+ 40 °C
Average temperature over 24 hours	+ 35 °C
Lowest ambient temperature	- 25 °C
Relative humidity in 24 hours	max 95%
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
Altitude	≤ 1000 m

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 withdrawable ISM must be increased by the atmospheric correction factor Ka according to IEC 60 684 compared to the insulation measurement at sea level (Figure 41).

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

Please coordinate the necessary actions with Tavrida Electric NA.

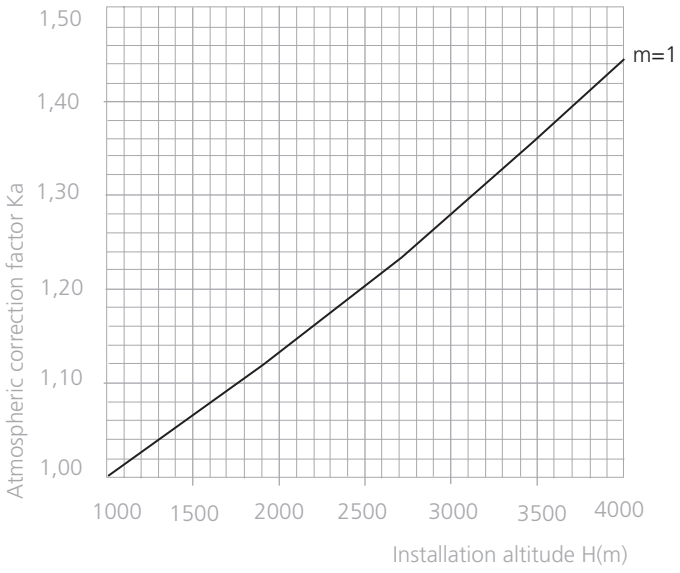


Figure 41

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 12

Warranty

Unless otherwise stated in the contract, the warranty period is 2 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 Technical Manual.
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, testing, 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, 2010

Issued for the first time: February 1, 1998

KEMA Quality B.V.

ir. P.J.J.G. Nabuurs
Managing Director

A.J.M. van Outheusden
Certification Manager

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KEMA Quality B.V. Utrechtseweg 310, 6812 AR Arnhem. P.O. Box 5185, 6802 ED Arnhem. The Netherlands
T +31 26 3 56 20 00 F +31 26 3 52 58 00 customer@kema.com www.kema.com Registered Arnhem 09085396

Experience you can trust.

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.

Environmental friendliness

The modules are manufactured from environmentally friendly material. Therefore, special disposal is not 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 Avenue
Delta, BC, Canada

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

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

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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

TAVRIDA ELECTRIC AG

Service Department
1105 Cliveden Avenue
Delta, BC, Canada
E-Mail: info@tavrida-na.com
Web: www.tavrida-na.com

NON-CONFORMITY REPORT

From:		To:	TAVRIDA ELECTRIC NA Service Department
Address:		Address:	1105 Cliveden Avenue
			Delta, BC, Canada
Name:			
Phone:		Phone:	604-540-6600
Fax:		Fax:	604-540-6604
E-Mail:		E-Mail:	service@tavrida-na.com

Type designation ISM/TEL:	Serial No.:
Date when non-conformity was noticed:	Date of commissioning:
When did the non-conformity occur: ○ Incoming inspection ○ Installation/Commissioning ○ Service	

Does your installation comply with the requirements of the Installation and Operating Instructions, ISM?	
Primary Part (ISM): ○ Operating conditions of ISM comply with technical data specified in Technical Manual	Secondary part (CM): ○ Type of voltage and voltage level according to selected CM-type ○ Polarity of auxiliary power supply selection of MCB (page 26)

Description of non-conformity:

How many blinks occured on Malfunction-LED of CM?

○ 1x ○ 2x ○ 3x ○ 4x ○ 5x ○ ≥17x ○ No blink signal ○ Undefined signal

Did you investigate the reason of malfunction blink signal with the help of malfunction indication table (page 38, 39)?

○ Yes ○ No

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.

TAVRIDA ELECTRIC

TAVRIDA ELECTRIC NA

Service Department
1105 Cliveden Avenue
Delta, BC, Canada
E-Mail: info@tavrida-na.com
Web: www.tavrida-na.com

NON-CONFORMITY REPORT

From:		To:	TAVRIDA ELECTRIC NA Service Department
Address:		Address:	1105 Cliveden Avenue
			Delta, BC, Canada
Name:			
Phone:		Phone:	604-540-6600
Fax:		Fax:	604-540-6604
E-Mail:		E-Mail:	service@tavrida-na.com

Type designation ISM/TEL:	Serial No.:
Date when non-conformity was noticed:	Date of commissioning:
When did the non-conformity occur: ○ Incoming inspection ○ Installation/Commissioning ○ Service	

Does your installation comply with the requirements of the Installation and Operating Instructions, ISM?	
Primary Part (ISM): ○ Operating conditions of ISM comply with technical data specified in Technical Manual	Secondary part (CM): ○ Type of voltage and voltage level according to selected CM-type ○ Polarity of auxiliary power supply selection of MCB (page 26)

Description of non-conformity:

How many blinks occured on Malfunction-LED of CM?

○ 1x ○ 2x ○ 3x ○ 4x ○ 5x ○ ≥17x ○ No blink signal ○ Undefined signal

Did you investigate the reason of malfunction blink signal with the help of malfunction indication table (page 38, 39)?

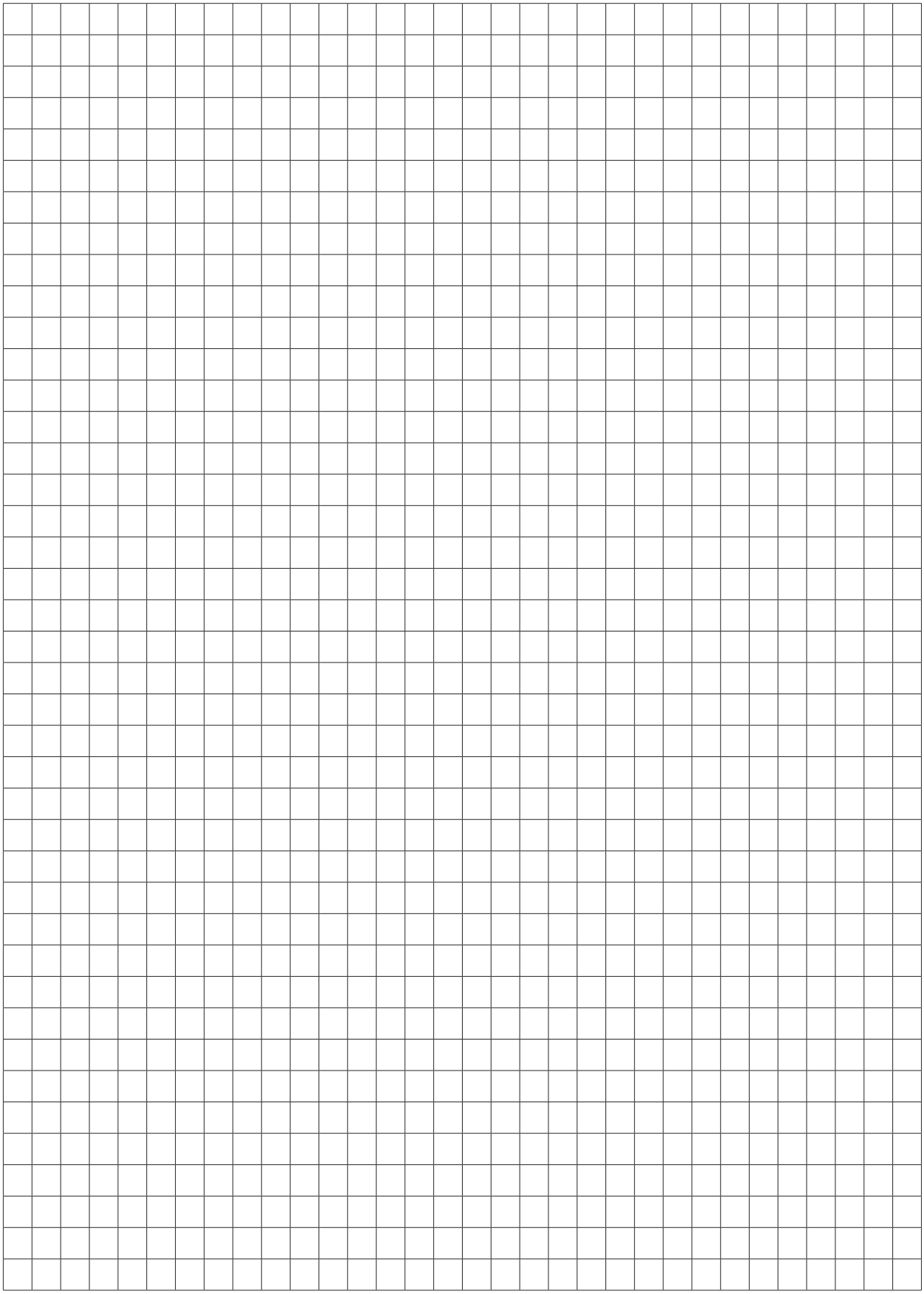
○ Yes ○ No

Report issued by:

Date:	Name:	Signature:

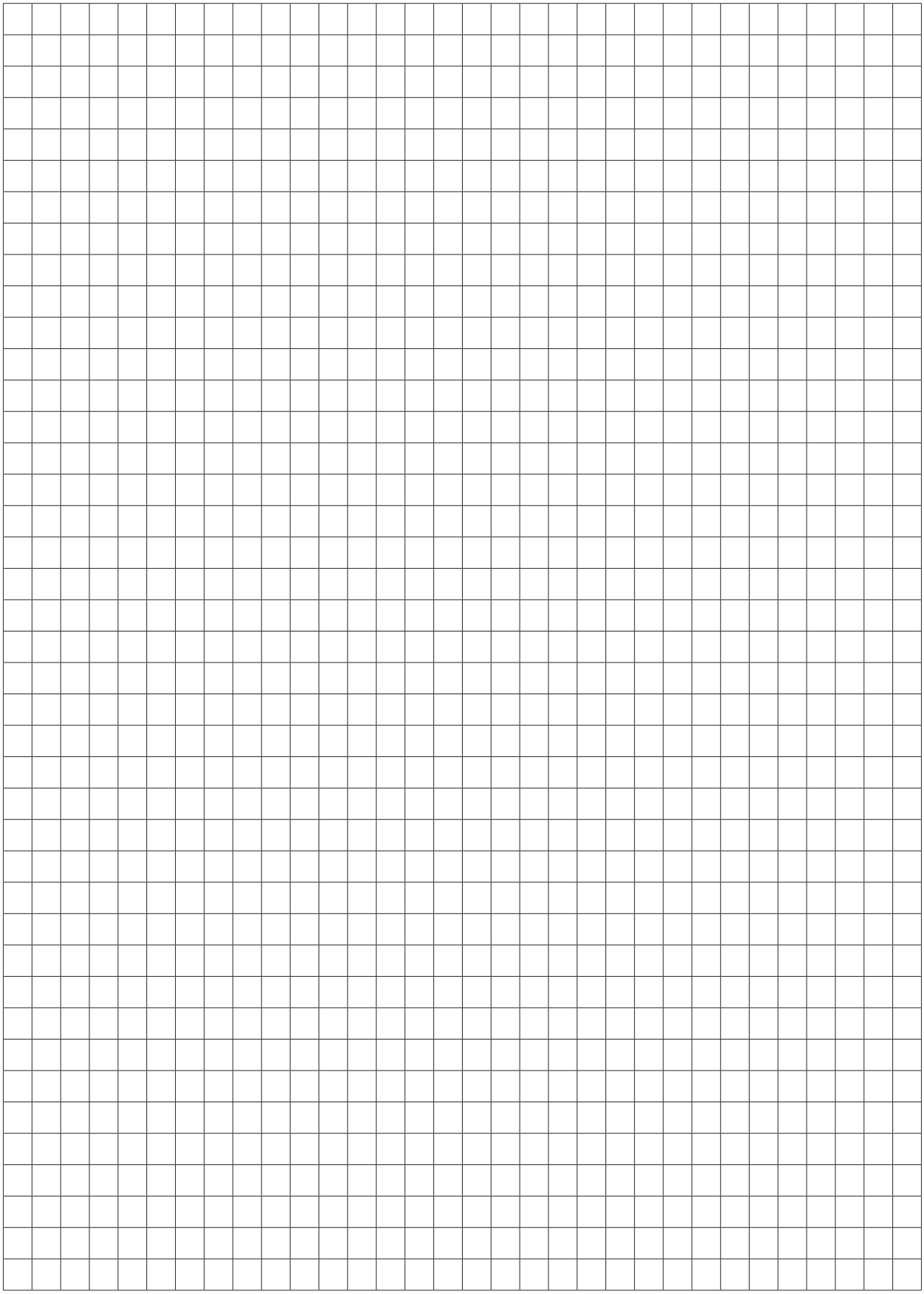
Please note:
Your warranty claim can only be handled if this non-conformity report is filled in completely including your name and address.

Date: _____



Date: _____

Date: _____



TAVRIDA ELECTRIC

Valid for following types:

ISMD ...-114 (D - xxxUC)
ISMD ...-055 (D - xxxUC)
ISMD ...-055F (D - xxxUC)

North America

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