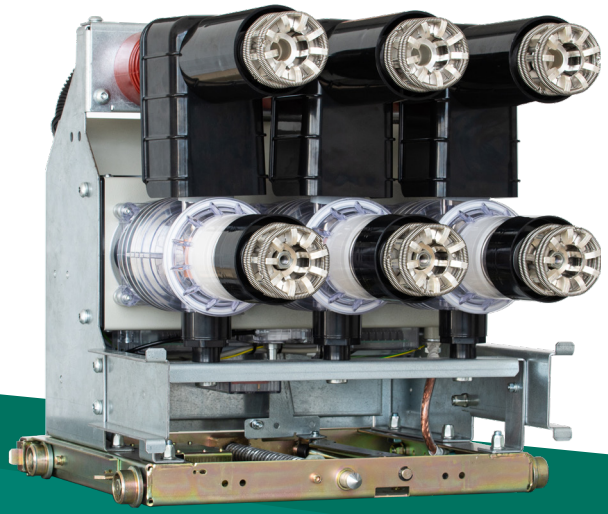
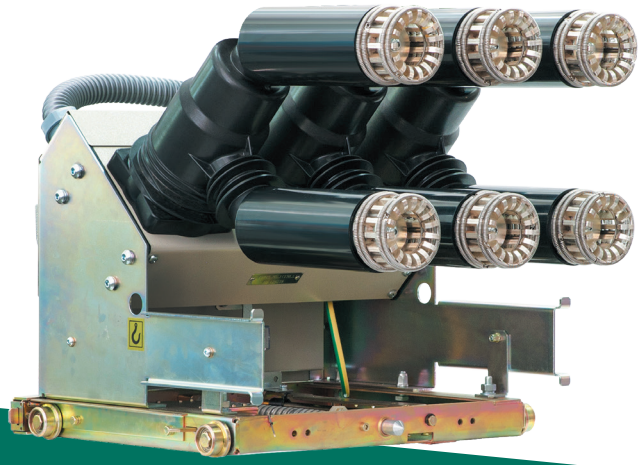
TAVRIDA ELECTRIC
Excellence in Engineering

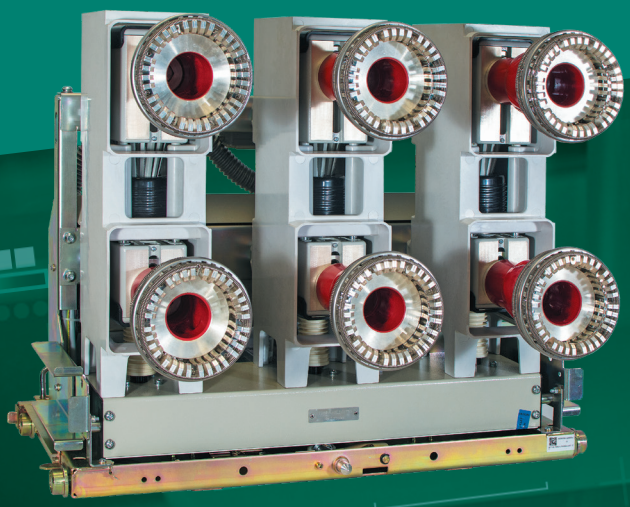
WITHDRAWABLE VCB

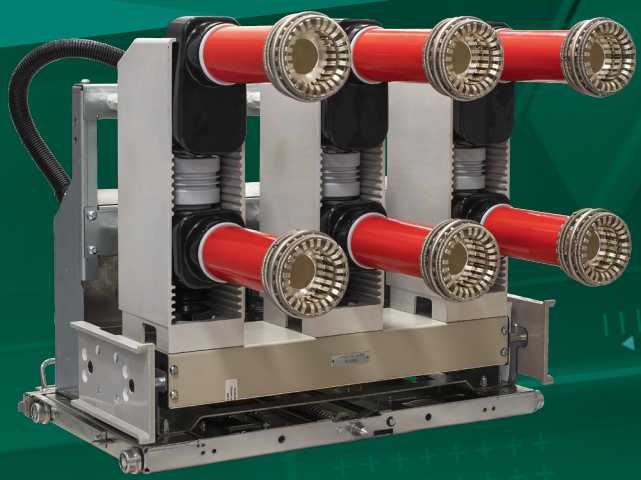
VACUUM CIRCUIT BREAKER

17,5 kV, ...31,5 kA, ...3150 A
24 kV, ...25 kA, ...2500 A









PRODUCT GUIDE

VERSION 6

Contents

1. Introduction

This Product Guide describes the withdrawable vacuum circuit breakers manufactured by Tavrida Electric.

Tavrida Electric circuit breakers are designed for rated voltages up to 24 kV.

Withdrawable vacuum circuit breakers are designed for indoor installation in air-insulated switchgear panels and are intended to perform switching operations in network rated and faulty modes.

The breakers consist of the following main components:

- Indoor Switching Module (ISM) - The air-insulated ISM incorporates Tavrida Electric vacuum interrupters incorporated in solid dielectric insulator controlled by per phase monostable magnetic actuators. No SF-6 or oil insulation is used in the ISM.

- Control Module (CM) - The CM is a microprocessor-based controller that provides ISM operation, protection and data logging functions.

This guide contains information about the circuit breaker's technical parameters, functionality and operating principles. The purpose of the document is to provide necessary product information for application engineers and technical personnel utilizing the equipment.

Other technical documents which cover the product:

Document name	Target audience	Purpose of the document
User Guide	Users providing installation, commissioning and utilizing installed equipment	Provide information on switching operations, required checkups and maintenance, as well as service and disposal procedures.
Routine Test Certificate	Customer procurement service	Provide information on supplied equipment serial numbers.

1.1 Abbreviations

AC	Actuator coil
AS	Auxiliary switch
BIL	Basic Insulation Level
EMC	Electromagnetic compatibility
CM	Control Module
CO	Close - Open operations cycle
DOU	Draw-Out Unit
Com	Common point of contact
I/O	Input / Output
ISM	Indoor Switching Module
LED	Light emitting diode
(P)MCB	Protective miniature circuit breaker
PS	Position switch
NA	Not applicable
NC	Normally closed contact
NO	Normally open contact
PCD	Phase center distance
USB	Universal Serial Bus
VCB	Vacuum Circuit Breaker
VI	Vacuum interrupter

1.2 Definitions

Closing Time

The closing time is the time period from the moment the close command is applied to the CM to the time when all ISM poles make contact.

Opening Time

The opening time is the time period from the moment the trip command is applied to the CM to the time when all ISM poles are separated.

Break Time

The break time is the time period from the moment the trip command is applied to the CM to the time when the arcs in all phases are extinguished.

1.3 Disclaimers

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.

The Product Guide contains information necessary for the installation, commissioning and operation of the withdrawable vacuum circuit breakers. Please read the Product Guide carefully before starting and to adhere the instructions and the relevant regulations to ensure the proper use of the withdrawable vacuum circuit breakers. Tavrida Electric will not accept any claims for damages caused by improper usage of the withdrawable vacuum circuit breakers. In case of special configurations, please contact Tavrida Electric prior to usage of the withdrawable vacuum circuit breakers.

1.4 Precautions

- Before selecting the circuit breaker, please check whether the installation place (Contact interfaces, pole centre and terminal centre distances, fixed contact shutters operating mechanism, and the surroundings) is suitable for the withdrawable vacuum circuit breakers.

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

- During installation, commissioning, operation and maintenance of the equipment the relevant legal regulations (such as DIN/VDE/IEC), accident prevention regulations and the connecting conditions of the electric utilities shall be followed.

- Take note that during operation of the withdrawable 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 the Product Guide.

- The operating conditions of the withdrawable vacuum circuit breakers shall comply with the technical data specified in the Product Guide.

- Personnel installing, operating and maintaining the equipment shall be familiar with the Product Guide and its contents.

1.5 Warranty

Unless otherwise stated in the contract, the warranty period is stated in Standard Warranty Policy. If otherwise agreed to, the contract conditions apply. No warranty is given in the following cases:

a) The warranty period has 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 of supply voltage of auxiliary circuits.

2. Presentation

2.1 Product Application Field

The circuit breaker is usually installed in radial or loop cable or overhead distribution systems. The main applications are:

- Switching different types of load in normal and fault modes.
- Isolating faults in the cable or overhead network.

Due to their short closing and opening times (see "Technical Parameters" on page 23), Tavrida Electric circuit breakers can bring significant benefits to the following applications:

- Arc flash protection;
- Automatic backfeed restoration.

2.2 Key Benefits

Tavrida Electric circuit breakers provide the following competitive advantages:

- **Environmentally friendly**

  The ISM does not use SF-6 insulation materials.
  The CM and ISM modules are manufactured from environmentally friendly materials.

- **Lightweight**

  The total weight of the withdrawable vacuum circuit breakers with a rated current of 1250 A and a CM does not exceed 88 kg, making it the most lightweight indoor circuit breaker on the market. The total weight of the withdrawable vacuum circuit breakers with a rated current of 3150 A and a CM does not exceed 165 kg, making it the most lightweight indoor circuit breaker on the market.

- **High reliability**

  30,000 CO operations at rated current and 50 full rated short-circuit operations without any maintenance make it the most reliable circuit breaker on the market.

- **Fastest operation time**

  The withdrawable circuit breakers described in this product guide are based on Tavrida Electric ISMs, which provide extremely fast operation timing and can be successfully utilized for such demanding applications as fast transfer switch, fast internal arc clearance and other applications.

- **High operator safety**

  The open design of the draw-out unit provides visual control of its main circuit's disconnection when it is in the test position.
  In case of auxiliary supply loss, manual charging of the circuit breaker is performed by connecting to the CM in the low voltage compartment, excluding the necessity of operating inside the high-voltage compartment.

2.3 Compliance

Tavrida Electric withdrawable vacuum circuit breakers have been tested by world-renowned testing laboratories. A list of test reports is presented in "Appendix 1. Type Tests".

3. Product Coding

3.1 Circuit Breaker Coding

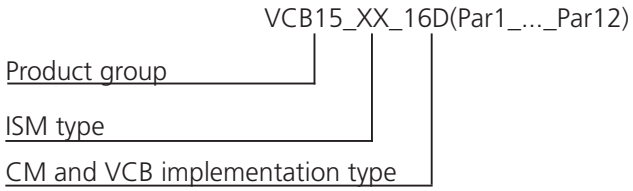


Table 1 - Product Group Description

Code	Description
VCB15	Vacuum Circuit Breaker with rated voltage up to 17.5 kV
VCB25	Vacuum Circuit Breaker with rated voltage up to 24 kV

Table 2 - ISM Type Description

Code XX	Description
LD8	Three-phase Light duty Indoor Switching Module with rated normal current up to 800 A
MD1	Three-phase Medium duty Indoor switching module with rated normal current up to 1250 A
Shell2	Three-phase Medium duty Indoor switching module with rated normal current up to 2500 A
HD1	Three-phase Heavy duty Indoor switching module with rated normal current up to 3150 A

Table 3 - CM and VCB Implementation Type Description

Code	Description
16D	The 16th series of Control Module and Draw-Out type VCB

Table 4 - Circuit Breaker Parameters Description

Parameter	Parameter description	Applicable options	Code
Par1	Customization	Default	0 [1]
		With IP2X front cover without slots	1
Par2	Rated voltage	17.5 kV	17.5 [2]
		24 kV with 370 mm depth of movable part of cassette [3]	24-1
		24 kV with 420 mm depth of movable part of cassette [3]	24-2
Par3	Rated short circuit breaking current	25 kA	25
		31.5 kA	31.5
Par4	Rated normal current	630 A	630
		800 A	800
		1250 A	1250
		2500 A	2500
		3150 A	3150

Table 4 - Circuit Breaker Parameters Description

Parameter	Parameter description	Applicable options	Code
Par5	Phase center distance	150 mm	150
		210 mm	210
		275 mm	275
Par6	Terminal centre distance	205 mm	205
		310 mm	310
Par7	Lower terminal height	260 mm	260
		280 mm	280
		325 mm	325
		345 mm	345
Par8	CM settings	Basic circuit breaker functionality	1
		Without CM	NA
Par9	Rated auxiliary supply voltage	24-60 V DC	60
		110-220 V AC/DC	220
		Without CM	NA
Par10	Auxiliary plug	Plastic plug	1
		Metal plug	3
Par11	Optional interlock	Without optional interlock	0
		Electrical interlock preventing DOU racking in/out without auxiliary voltage -220 V AC/DC	1
		Mechanical interlock preventing disconnection of auxiliary circuits plug with end switch actuator	2 [4]
		Electrical interlock preventing DOU racking in/out without auxiliary voltage -220 V AC/DC AND Mechanical interlock preventing disconnection of auxiliary circuits plug with end switch actuator	3 [4]
Par12	Language	English	EN
		Spanish	ES
		Portuguese	PT

1) Please contact your local sales representative for information.
2) 95 kV BIL.
3) The depth of movable part of cassette is shown in the overall drawings in Appendix 3.
4) Not applicable for the VCB with the metal auxiliary plug.

Each VCB has an electrical data label which contains the circuit breaker's serial number:

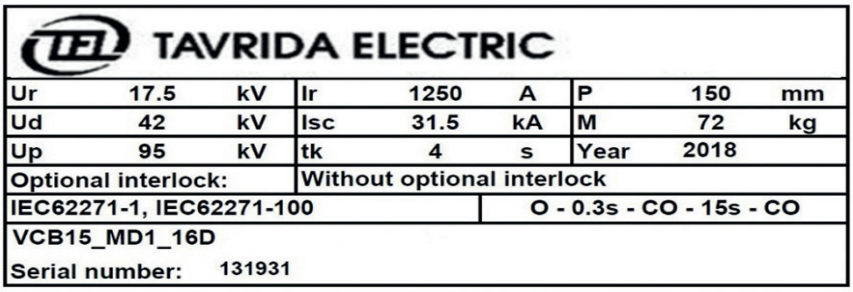
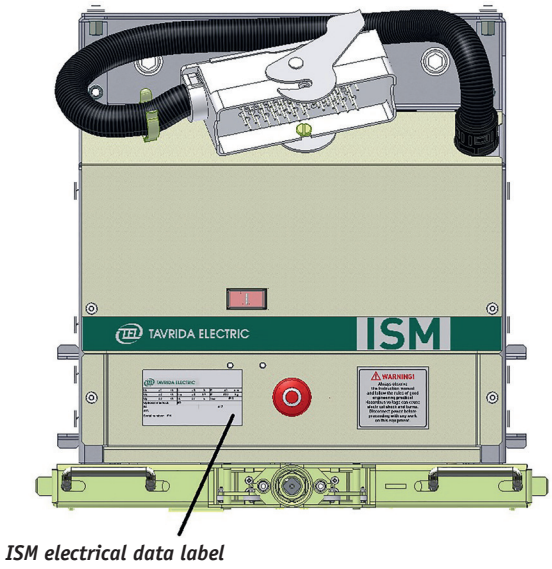
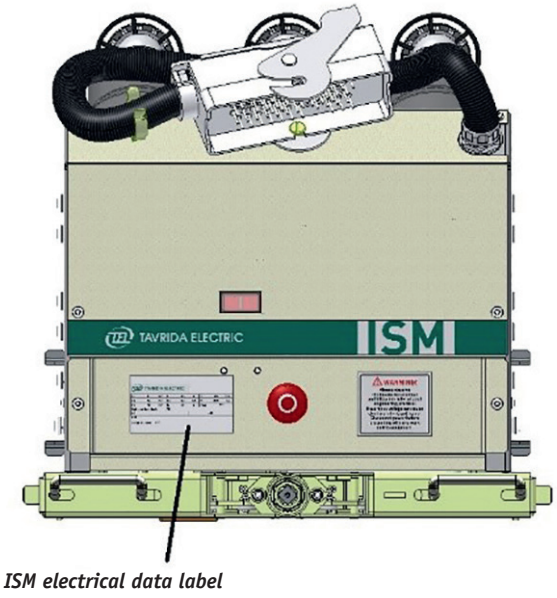


Figure 1
VCB electrical data label with serial number

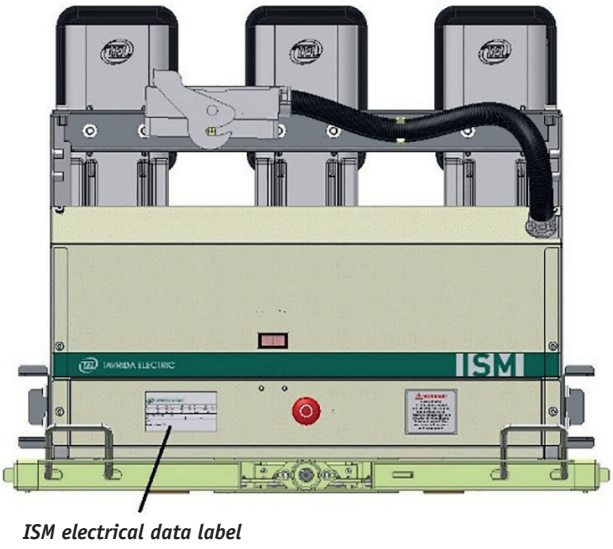
The nameplate contains information about the VCB type, the VCB technical parameters and the serial number. The placement of the electrical data label is shown below.



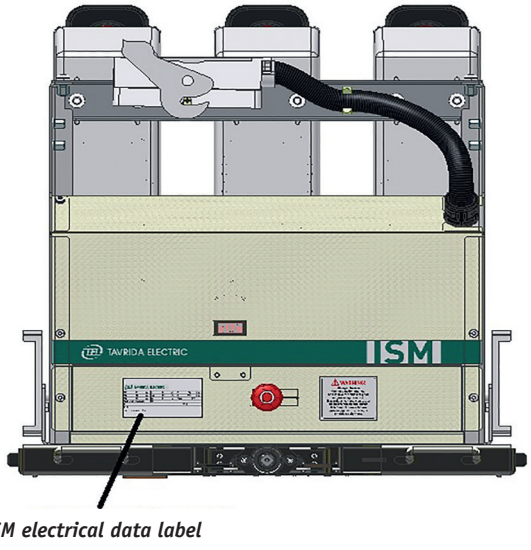
a) VCB15_LD8_16D labeling



b) VCB15_MD1_16D labeling



c) VCB15_HD1_16D labeling



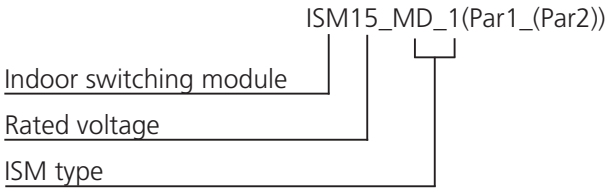
d) VCB25_Shell2_16D labeling

Figure 2

Electrical data label placement

3.2 Circuit Breaker Component Coding

3.2.1 ISM Coding



The following ISM types are available:

- ISM15_LD_8(Par1_Par2) – Three-phase Light duty Indoor switching module with rated normal current up to 800 A.
- ISM15_MD_1(Par1_Par2) – Medium duty indoor switching module with rated normal current up to 1250 A.
- ISM15_HD_1(Par1) – Heavy duty indoor switching module with rated normal current up to 3150 A.
- ISM25_Shell_2(Par1) – Three-phase medium duty Indoor switching module with rated normal current up to 2500 A

ISM15 – Indoor switching module with rated voltage up to 17.5 kV

ISM25 – Indoor switching module with rated voltage up to 24 kV.

See Table 2 for description of ISM types.

Table 5 - ISM Parameters Description

Parameter	Applicable ISM	Parameter description	Applicable options	Code
Par1	ISM15_LD_8	Phase centre distance	150 mm	150
			210 mm	210
	ISM15_MD_1		150 mm	150
			210 mm	210
	ISM15_HD_1		210 mm	210
			275 mm	275
	ISM25_Shell_2		210 mm	210
			275 mm	275
Par2	ISM15_LD_8	Design code of ISM	Low terminal with two 10 mm holes. The terminal and interlock outlets have contra directions	1
	ISM15_MD_1	Side of position indicator connection to ISM	Left side (between phases A and B)	L

3.2.2 CM Coding

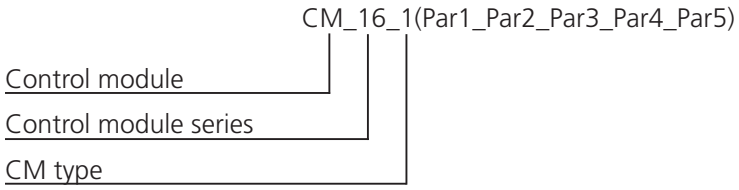


Table 6 - CM Parameters Description

Parameter	Parameter description	Applicable options	Code
Par1	Language	English	EN
		Spanish	ES
		Portuguese	PT
Par2	Rated supply voltage and CM hardware version	24-60V DC, version 2	60.2
		110-220 V AC/DC, version 2	220.2
Par3	Firmware functionality	Basic circuit breaker functionality	1
Par4	ISM driver firmware used in CM[1)] and Protection setting	ISM15_LD_8 and Without protection	15LD8-000
		ISM15_MD_1 and Without protection	15MD1-000
		ISM15_HD_1 and Without protection	15HD1-000
		ISM25_Shell_2 and Without protection	25Shell2-000
Par5	Factory configurable settings	Relay 1 - Switching module position functionality; Relay 2 - Ready functionality; Relay 3 - Malfunction or Loss of auxiliary supply functionality; Trip by dry contacts close command Close by dry contacts close command	A.A

1) This parameter describes the ISM type(s) that the CM can control. To optimize the operation of each ISM, corresponding settings are used in the CM firmware. Usage of the CM with the incorrect type of the ISM can lead to a violation of declared VCB parameters.

Each CM has the following labels:

Figure 3
Serial number label

Figure 4
Label with applicable ISM designation

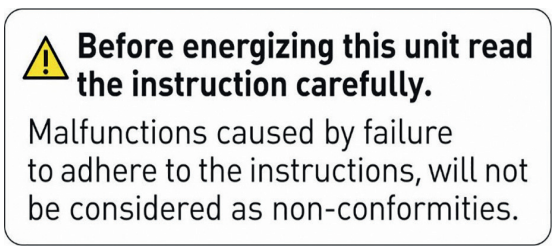


Figure 5
Warning label

Figure 6
Firmware version label

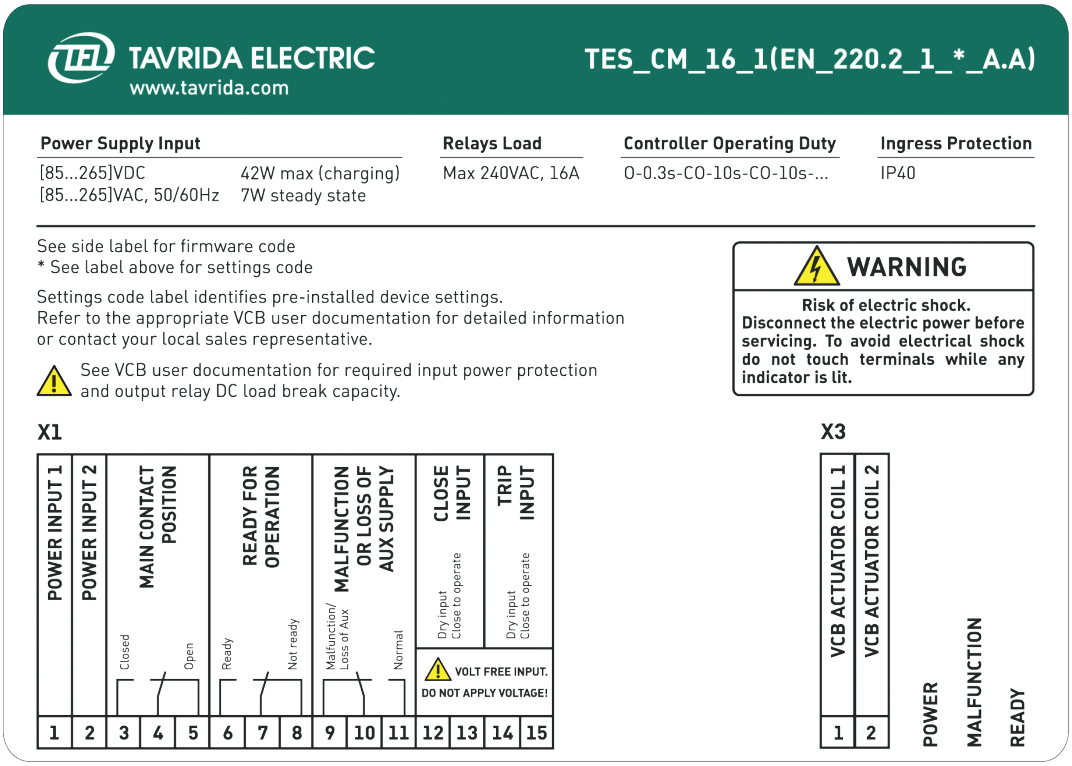
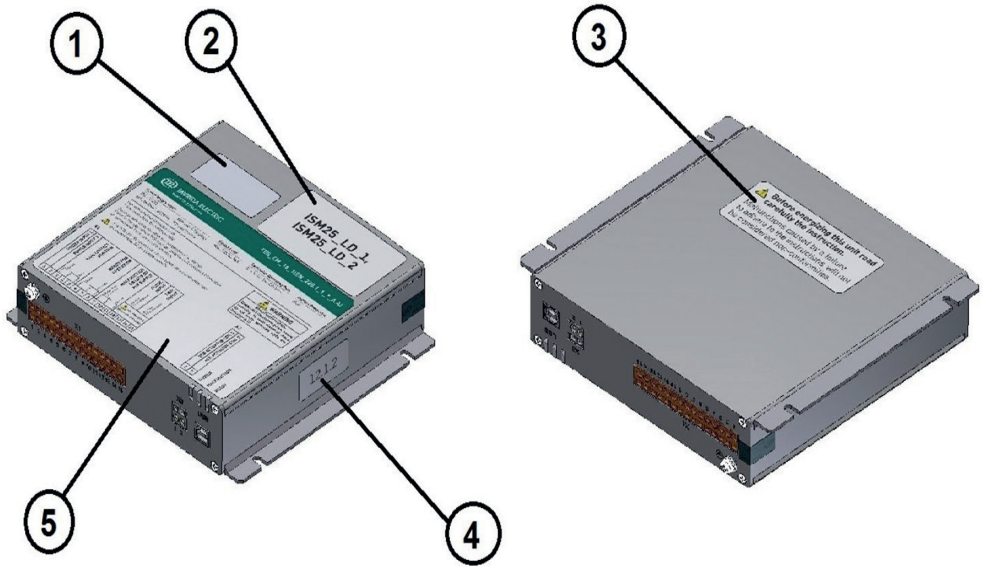


Figure 7

Information label with terminals connections and main parameters

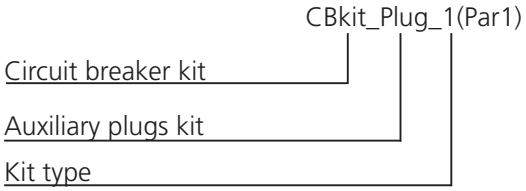


1. Serial number label
2. Label with applicable ISM designation
3. Warning label
4. Firmware version label
5. Information label with terminals connections and main parameters

Figure 8

CM labels arrangement

3.2.3 Auxiliary Plugs Kit Coding



CBkit_Plug_1 is used to provide a counterpart for the DOU auxiliary circuits connector in the switchgear panel.

Table 7 - Circuit Breaker Kit Parameters Description

Parameter	Parameter description	Applicable options	Code
Par1	Auxiliary plug	Plastic plug	1
		Metal plug	3

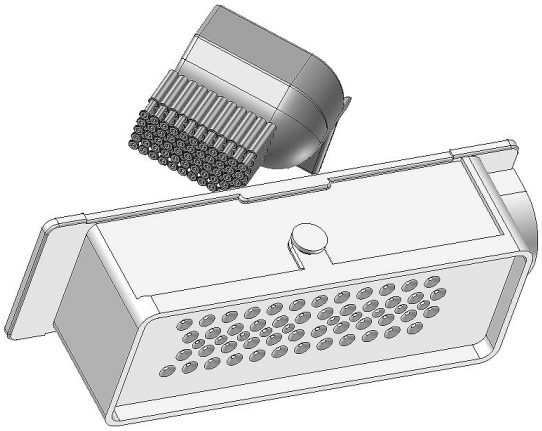


Figure 9
CBkit_Plug_1(1) scope of supply

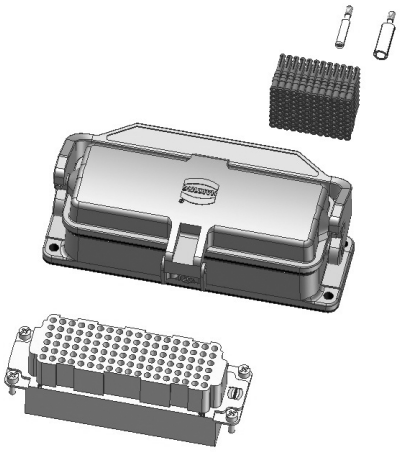
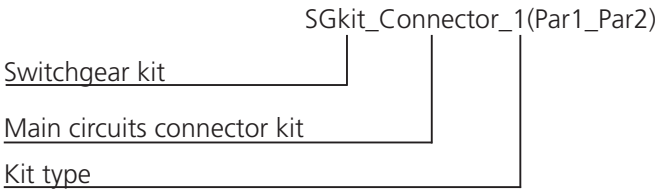


Figure 10
CBkit_Plug_1(3) scope of supply

3.2.4 Optional Main Circuits Connectors Kit Coding



The SGkit_Connector_1 is used to provide the switchgear fixed contact counterpart for the DOU main circuits connection.

Table 8 - Switchgear Kit Parameters Description

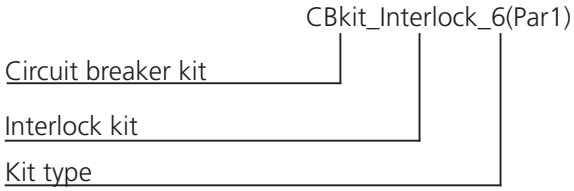
Parameter	Parameter description	Applicable options	Code
Par1	Rated voltage	≤ 17.5 kV	17.5
		≤ 24 kV	24
Par2	Rated normal current	1250 A	1250
		2000 A	2000
		3150 A	3150

Figure 11
SGkit_Connector_1(17.5_2000) scope of supply

The main circuits connectors kits applicability:

- SGkit_Connector_1(17.5_1250) - for VCB15_LD8_16D, VCB15_MD1_16D;
- SGkit_Connector_1(24_1250) - for VCB25_Shell2_16D;
- SGkit_Connector_1(17.5_2000) - for VCB15_HD1_16D and VCB25_Shell2_16D;
- SGkit_Connector_1(17.5_3150) - for VCB15_HD1_16D.

3.2.5 Optional Circuit Breaker Interlock Kit Coding



The CBkit_Interlock_6 is used with the DOU to provide it with optional interlock in case this interlock is required after DOU production. The interlock blocks the DOU rack in/out functionality in case auxiliary voltage (provided for solenoid installed on DOU plate) is unavailable.

Table 9 - Circuit Breaker Kit Parameters Description

Parameter	Parameter description	Applicable options	Code
Par1	Rated supply voltage	220 V AC/DC	220U

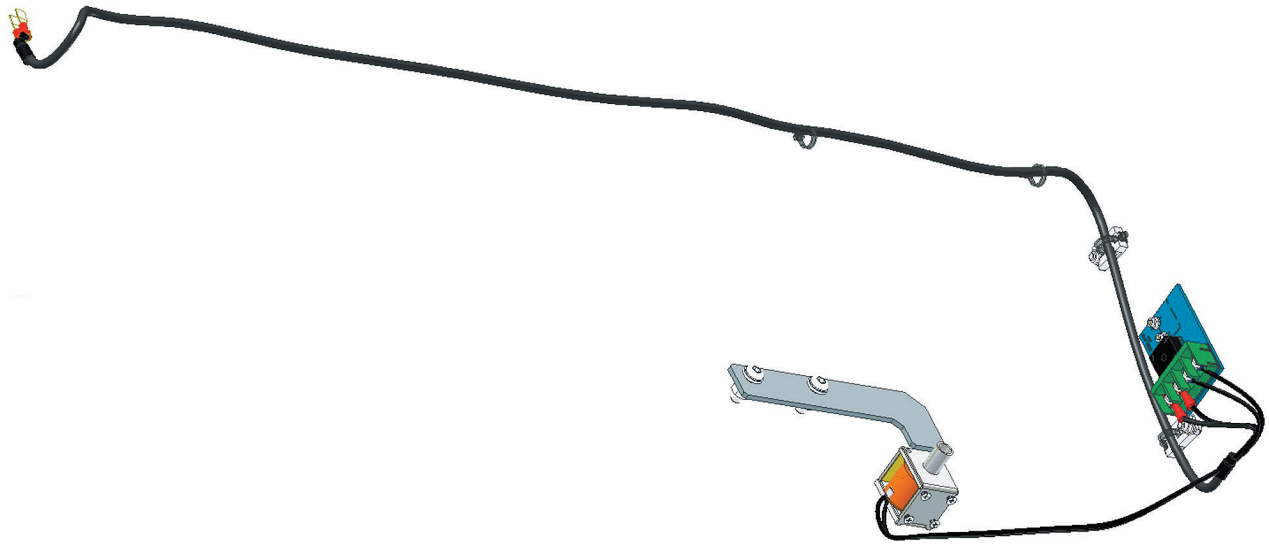


Figure 12
CBkit_Interlock_6(220U)

3.2.6 Optional Kit for Control Module Installation on a DIN Rail

CBmount_CM_1

Circuit breaker mounting kit

Control module

Kit type

The CBmount_CM_1 is used to mount CM_16_1 on DIN rail.

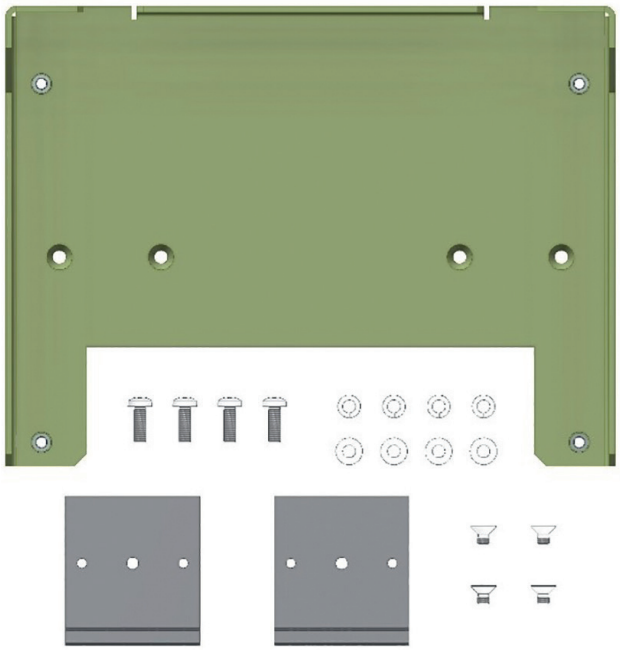
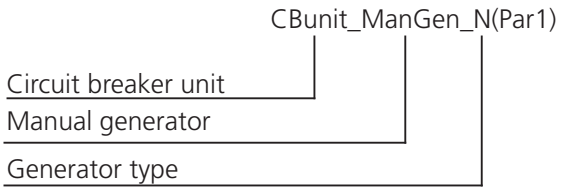


Figure 13

CBmount_CM_1

3.2.7 Optional Manual Generator Coding



CBunit_ManGen is used to charge the CM_16_1 in cases where the main auxiliary power supply is not available.

Table 10 - Generator Type Description

Code N	Description
1	Manual generator for use with CM_16_1(Par1_220.2_Par3_Par4_Par5)
2	Manual generator for use with CM_16_1(Par1_60.2_Par3_Par4_Par5)

Table 11 - CBunit_ManGen Parameters Description

Parameter	Parameter description	Applicable options	Code
Par1	Plug	Generator has wire with auxiliary plug and counterpart	1

Figure 14

CBunit_ ManGen_1 (CBunit_ ManGen_2)

Figure 15

Designation label

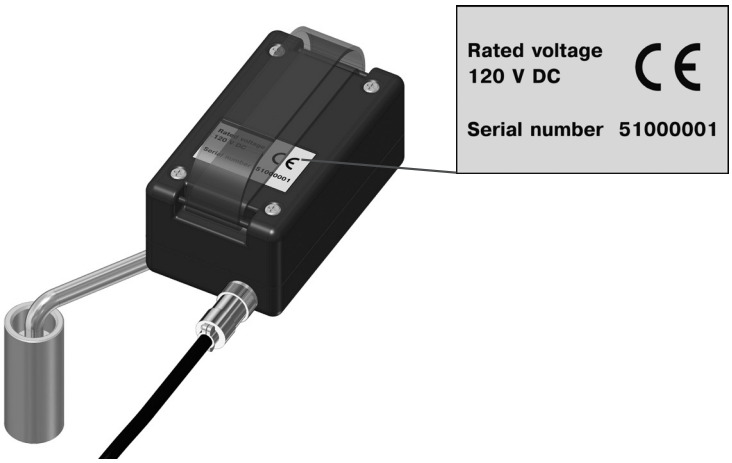


Figure 16

Serial number label

4. Technical Parameters

Main technical data and circuit breaker technical parameters are presented in the tables below.

Table 12 - VCB15 Technical Parameters

Type	VCB15_LD8		VCB15_MD1		VCB15_HD1	
Rated voltage (Ur)	17.5 kV		17.5 kV		17.5 kV	
Phase centre distance (PCD), mm	150	210	150	210	210/275	275
Rated normal current (Ir)	800 A		1250 A		2500 A [1]	3150 A
Rated power frequency withstand voltage (Ud)	38 (42) [2] kV		38 (42) [2] kV		38 (42) [2] kV	
Rated lightning impulse withstand voltage (peak) (Up)	95 kV		95 kV		95 kV	
Rated short-circuit breaking current (Isc)	25 kA [3]		31.5 kA [4]		31.5 kA [4]	
Rated peak withstand current (Ip)	65 kA		82 kA		82 kA	
Rated short-time withstand current (Ik)	25 kA		31.5 kA		31.5 kA	
Rated duration of short circuit (tk)	4 s		4 s		4 s	
Rated frequency (fr)	50/60 Hz					
Mechanical life (CO-cycles)	30 000		30 000		30 000	
Number of operated-isolated operations	500 cycles		500 cycles		500 cycles	
Maximum number of CO-cycles per hour	60					
Operating cycles, rated–short circuit breaking current	50		50		50	
Closing time	≤ 60 ms [5]					
Opening time	≤ 35 ms [5]					
Break time	≤ 45 ms [5]					
Resistance of main circuit	≤ 55 µOhm		≤ 31 µOhm		≤ 25 µOhm	≤ 20 µOhm
Rated operating sequence at rated normal current	O-0.3s-CO-10s-CO-10s-CO [6]					
Rated operating sequence at rated short-circuit breaking current	O-0.3s-CO-15s-CO					
Auxiliary Circuits Insulation Strength [7]						
Power frequency test voltage (1 min) in accordance with IEC62271-100, IEC60255-27	2 kV					
Lightning impulse 1.2ms/50ms/0.5 J in accordance with IEC60255-27	5 kV					
Insulation resistance of 1000V DC in accordance with IEC60255-27	≥ 5 MOhm					
Design class of switching module with regard to severity of service conditions in accordance with IEC 60932	Class 0		Class 0		Class 0	
Standards	IEC 62271-100, GB 1984-2003					
Mechanical vibration withstand capability according to IEC 60721-3-4	Class 4M4					
Weight (depending on Phase Centre Distance)	70-81 kg		72-88 kg		128-165 kg	

Table 12 - VCB15 Technical Parameters

Type	VCB15_LD8	VCB15_MD1	VCB15_HD1
Altitude above sea level	1000 m [8]		
Relative humidity in 24 hours	≤ 95 %		
Relative humidity over 1 month	≤ 90 %		
Temperature Range	-25 °C ... +55 °C		
Degree of protection of main circuit terminals in accordance with IEC 60529	IP00		
Degree of protection of actuators compartment in accordance with IEC 60529	IP40		
Type of driving mechanism	Monostable magnetic actuator		
Weight of CM	1 kg		
Overall dimensions of CM [9]	190x165x45 mm		
Design/Switching Capacity of ISM Auxiliary Contacts			
Number of available auxiliary contacts for three-phase ISM	6 NO + 6 NC	6 NO + 6 NC	6 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	10 A [10]		
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	0.25 A		
Maximum current for 250 V DC, inductive load (t=20 ms)	0.03 A		
Maximum current for 125 V AC, ohmic load	10 A [10]		
Maximum current for 125 V AC, inductive load (cosj =0,3)	5 A		
Maximum current for 250 V AC, ohmic load	10 A [10]		
Maximum current for 250 V AC, inductive load (cosj =0,3)	5 A		
Design/Switching Capacity of DOU Plate Auxiliary Contacts			
Number of available auxiliary contacts	5 NO + 5 NC	5 NO + 5 NC	5 NO + 5 NC
Maximum current for voltage up to 660 V AC	10 A		
CM Reaction Times			
Preparation time for the operation of the CM after switching on the auxiliary power supply	≤ 15 s		

Table 12 - VCB15 Technical Parameters

Type	VCB15_LD8	VCB15_MD1	VCB15_HD1
Preparation time for the close operation of the CM after a previous close operation	≤ 10 s		
Preparation time for the trip operation of the CM after switching on the auxiliary power supply	≤ 0.1 s		
Trip capability after failure of the auxiliary power supply	≥ 60 s [11)]		
CM Supply Voltage			
Rated range of supply voltage of CM_16_1(Par1_60.2_Par2_Par3_Par4_Par5)	24 V to 60 V DC		
Rated range of supply voltage of CM_16_1(Par1_220.2_Par3_Par4_Par5)	110 V to 220 V AC/DC		
Operating range (80-120%) of CM_16_1(Par1_60.2_Par3_Par4_Par5)	19 V to 72 V DC		
Operating range (80-120%) of CM_16_1(Par1_220.2_Par3_Par4_Par5)	85 V to 265 V AC/DC		
CM Power Consumption			
Charging the close and trip capacitors of CM_16_1(Par1_60.2_Par3_Par4_Par5)	≤ 25 W		
Charging the close and trip capacitors of CM_16_1(Par1_220.2_Par3_Par4_Par5)	≤ 42 W AC [12)] ≤ 37 W DC		
Permanent power consumption (standby) of CM_16_1(Par1_60.2_Par3_Par4_Par5)	≤ 5 W		
Permanent power consumption (standby) of CM_16_1(Par1_220.2_Par3_Par4_Par5)	≤ 7 W AC [13)] ≤ 5 W DC		
Inrush current of CM_16_1(Par1_60.2_Par3_Par4_Par5) with discharged capacitors	≤ 120 A		
Inrush current of CM_16_1(Par1_220.2_Par3_Par4_Par5) with discharged capacitors	≤ 18 A		
Inrush time constant of CM_16_1(Par1_60.2_Par3_Par4_Par5) with discharged capacitors	≤ 0.5 ms		
Inrush time constant of CM_16_1(Par1_220.2_Par3_Par4_Par5) with discharged capacitors	≤ 4 ms		
Design/Switching Capacity of CM Inbuilt Relays			
Number of relays in CM	3		
Number of available contacts for one relay	1 NO + 1 NC with common point		
Rated voltage	240 V		
Rated current AC	16 A		
Maximum breaking power AC	4000 VA		
Maximum switching current 250 V DC	0.35 A		
Maximum switching current 125 V DC	0.45 A		
Maximum switching current 48 V DC	1.3 A		
Maximum switching current 24 V DC	12 A		
Switching time	5 ms		

Table 12 - VCB15 Technical Parameters

Type	VCB15_LD8	VCB15_MD1	VCB15_HD1
"Close" and "Trip" Dry Contacts Inputs of the CM			
Output voltage	≥ 30 V		
Contacts closed current	≥ 50 mA		
Steady state current	≥ 5 mA		

1) The rating depends on the metal-enclosed switchgear ventilation. Temperature rise type test at 2500 A in Cradle was successfully passed in KEMA.
2) The information in brackets refers to the national Chinese standards GB1984-2003 at an installation altitude of 1000 m maximum.
3) At 34% DC component.
4) At 40% DC component.
5) Smaller timing on request.
6) The number of sequential Close-Trip operations with a 10 second interval should not exceed 10. The number of Close-Trip operations should not exceed 60 per hour. Sequence of 10s Close-Trip operations can be repeated only after 260 s pause.
7) Isolation resistance check is not applicable for "Actuator Coil" circuits of CM.
8) Up to an installation altitude of 1000 m above sea level. Above 1000m, the external insulation measurement of the ISM must be increased by the atmospheric correction factor Ka according to IEC 62271-1 compared to the insulation measurement at sea level. The maximum allowed altitude is 2000 m above sea level.
9) Overall dimensions of VCB are provided in "Appendix 3. Overall Drawings".
10) At 5 min short-term duty. Continuous current – 5 A.
11) In case of dry contacts "close" and "trip" are open.
12) At Cos j >0.66.
13) At Cos j >0.33.

Table 13 - VCB25 Technical Parameters

Type	VCB25_Shell2	
Rated voltage (Ur)	24 kV	
Phase centre distance (PCD), mm	210/275	275
Rated normal current (Ir)	630 A 1250 A	2500 A
Rated power frequency withstand voltage (Ud)	60 kV	
Rated lightning impulse withstand voltage (peak) (Up)	125 kV	
Rated short-circuit breaking current (Isc)	25 kA [1.]	
Rated peak withstand current (Ip)	65 kA	
Rated short-time withstand current (Ik)	25 kA	
Rated duration of short circuit (tk)	4 s	
Rated frequency (fr)	50/60 Hz	
Mechanical life (CO-cycles)	30 000	
Number of operated-isolated operations	500 cycles	
Maximum number of CO-cycles per hour	60	
Operating cycles, rated–short circuit breaking current	50	
Closing time	≤ 60 ms [2.]	
Opening time	≤ 35 ms [2.]	
Break time	≤ 45 ms [2.]	
Resistance of main circuit	≤ 35 µOhm (for Ir 630 A) ≤ 30 µOhm (for Ir 1250 A) ≤ 22 µOhm (for Ir 2500 A)	
Rated operating sequence at rated normal current	O-0.3s-CO-10s-CO-10s-CO [3.]	
Rated operating sequence at rated short-circuit breaking current	O-0.3s-CO-15s-CO	
Auxiliary Circuits Insulation Strength [4.]		
Power frequency test voltage (1 min) in accordance with IEC62271-100, IEC60255-27	2 kV	
Lightning impulse 1.2ms/50ms/0.5 J in accordance with IEC60255-27	5 kV	
Insulation resistance of 1000V DC in accordance with IEC60255-27	≥ 5 MOhm	
Design class of switching module with regard to severity of service conditions in accordance with IEC 60932	Class 0	
Standards	IEC 62271-100, GB 1984-2003	
Mechanical vibration withstand capability according to IEC 60721-3-4	Class 4M4	

Table 13 - VCB25 Technical Parameters

Type	VCB25_Shell2
Weight (depending on Phase Centre Distance)	101-190 kg
Altitude above sea level	1000 m [5.]
Relative humidity in 24 hours	≤ 95 %
Relative humidity over 1 month	≤ 90 %
Temperature Range	-25 °C ... +55 °C
Degree of protection of main circuit terminals in accordance with IEC 60529	IP00
Degree of protection of actuators compartment in accordance with IEC 60529	IP40
Type of driving mechanism	Monostable magnetic actuator
Weight of CM	1 kg
Overall dimensions of CM [6.]	190x165x45 mm
Design/Switching Capacity of ISM Auxiliary Contacts	
Number of available auxiliary contacts for three-phase ISM	6 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	10 A [7.]
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	0.25 A
Maximum current for 250 V DC, inductive load (t=20 ms)	0.03 A
Maximum current for 125 V AC, ohmic load	10 A [7.]
Maximum current for 125 V AC, inductive load (cosj =0,3)	5 A
Maximum current for 250 V AC, ohmic load	10 A [7.]
Maximum current for 250 V AC, inductive load (cosj =0,3)	5 A
Design/Switching Capacity of DOU Plate Auxiliary Contacts	
Number of available auxiliary contacts	5 NO + 5 NC
Maximum current for voltage up to 660 V AC	10 A
CM Reaction Times	

Table 13 - VCB25 Technical Parameters

Type	VCB25_Shell2
Preparation time for the operation of the CM after switching on the auxiliary power supply	≤ 15 s
Preparation time for the close operation of the CM after a previous close operation	≤ 10 s
Preparation time for the trip operation of the CM after switching on the auxiliary power supply	≤ 0.1 s
Trip capability after failure of the auxiliary power supply	≥ 60 s [8.]
CM Supply Voltage	
Rated range of supply voltage of CM_16_1(Par1_60.2_Par2_Par3_Par4_Par5)	24 V to 60 V DC
Rated range of supply voltage of CM_16_1(Par1_220.2_Par3_Par4_Par5)	110 V to 220 V AC/DC
Operating range (80-120%) of CM_16_1(Par1_60.2_Par3_Par4_Par5)	19 V to 72 V DC
Operating range (80-120%) of CM_16_1(Par1_220.2_Par3_Par4_Par5)	85 V to 265 V AC/DC
CM Power Consumption	
Charging the close and trip capacitors of CM_16_1(Par1_60.2_Par3_Par4_Par5)	≤ 25 W
Charging the close and trip capacitors of CM_16_1(Par1_220.2_Par3_Par4_Par5)	≤ 42 W AC [9.] ≤ 37 W DC
Permanent power consumption (standby) of CM_16_1(Par1_60.2_Par3_Par4_Par5)	≤ 5 W
Permanent power consumption (standby) of CM_16_1(Par1_220.2_Par3_Par4_Par5)	≤ 7 W AC [10.] ≤ 5 W DC
Inrush current of CM_16_1(Par1_60.2_Par3_Par4_Par5) with discharged capacitors	≤ 120 A
Inrush current of CM_16_1(Par1_220.2_Par3_Par4_Par5) with discharged capacitors	≤ 18 A
Inrush time constant of CM_16_1(Par1_60.2_Par3_Par4_Par5) with discharged capacitors	≤ 0.5 ms
Inrush time constant of CM_16_1(Par1_220.2_Par3_Par4_Par5) with discharged capacitors	≤ 4 ms
Design/Switching Capacity of CM Inbuilt Relays	
Number of relays in CM	3
Number of available contacts for one relay	1 NO + 1 NC with common point
Rated voltage	240 V
Rated current AC	16 A
Maximum breaking power AC	4000 VA
Maximum switching current 250 V DC	0.35 A
Maximum switching current 125 V DC	0.45 A
Maximum switching current 48 V DC	1.3 A
Maximum switching current 24 V DC	12 A

Table 13 - VCB25 Technical Parameters

Type	VCB25_Shell2
Switching time	5 ms
"Close" and "Trip" Dry Contacts Inputs of the CM	
Output voltage	≥ 30 V
Contacts closed current	≥ 50 mA
Steady state current	≥ 5 mA

1. At 34 % DC component.
2. Smaller timing on request.
3. The number of sequential Close-Trip operations with a 10 second interval should not exceed 10. The number of Close-Trip operations should not exceed 60 per hour. Sequence of 10s Close-Trip operations can be repeated only after 260 s pause.
4. Isolation resistance check is not applicable for "Actuator Coil" circuits of CM.
5. Up to an installation altitude of 1000 m above sea level. Above 1000m, the external insulation measurement of the ISM must be increased by the atmospheric correction factor Ka according to IEC 62271-1 compared to the insulation measurement at sea level. The maximum allowed altitude is 2000 m above sea level.
6. Overall dimensions of VCB are provided in "Appendix 3. Overall Drawings".
7. At 5 min short-term duty. Continuous current – 5 A.
8. In case of dry contacts "close" and "trip" are open.
9. At Cos j >0.66.
10. At Cos j >0.33.

Table 14 - CM EMC Parameters

Parameter	Applicable standard	Rated Value
Electromagnetic Compatibility (EMC) Requirements [1]		
Electrostatic discharge	IEC 60255-26 IEC 61000-4-2	8 kV contact 15 kV air
Radiated EM field Immunity	IEC 60255-26 IEC 61000-4-3	80 MHz – 3 GHz Sweep & spot AM 1 kHz 80% 10 V/m
Fast transient burst Immunity	IEC 60255-26 IEC62271-1 IEC 61000-4-4	4 kV common mode
Surge Immunity	IEC 60255-26 IEC 61000-4-5	4 kV common mode 2 kV differential mode
Conducted disturbance induced by Radio frequency fields	IEC 60255-26 IEC 61000-4-6	150 kHz – 80 MHz AM 1 kHz 80% 10 V
Power Frequency Magnetic Field	IEC 60255-26 IEC 61000-4-8	100 A/m continuously 1000 A/m 1 sec
Pulse Magnetic Field	IEC 61000-4-9	1000 A/m
100 kHz Damped Oscillatory Magnetic Field	IEC 61000-4-10	100 A/m
1 MHz damped oscillatory magnetic field	IEC 61000-4-10	100 A/m
AC Voltage Dips and Interruptions	IEC 60255-26 IEC 61000-4-11	ΔU 30% 1 period ΔU 60% 50 periods ΔU 100% 5 periods ΔU 100% 50 periods
Power Frequency Disturbance Voltage	IEC 60255-26 IEC 61000-4-16	300 V common mode 150 V differential mode [2]
100 kHz and 1 MHz Damped Oscillatory Wave Immunity	IEC 60255-26 IEC 62271-1 IEC 61000-4-18	2.5 kV common mode 1 kV differential mode
Ripple on DC Power Supply	IEC 60255-26 I IEC 61000-4-27	10% of Supply voltage, 100 Hz
DC Voltage Dips and Interruptions	IEC 60255-26 IEC 62271-100 IEC 61000-4-29	ΔU 30% 2 sec ΔU 60% 2 sec ΔU 100% 0,3 sec ±20 % 10 sec

1) Cable from electronic relay to connector block should be shielded and the case grounded near the connector. The total length of unshielded wires from connector block to CM WAGO connector should not exceed 200 mm. Electromagnetic compatibility requirements are not applicable for the CM USB port as this port is used only for CM programming during production and not used under service conditions.

2) Test influence is not applicable for CM "Close" and "Trip" dry contacts.

5. Design and Operation

5.1 Design

5.1.1 Draw-Out Unit

The draw-out plate, with its racking mechanism, allows the VCB to be racked into or out of the service position to test positions inside the switchgear. The main position indicating device is mechanically joined with the synchronizing shaft of the ISM to reliably indicate the status of the ISM. The manual tripping device provides mechanical tripping for the ISM.

A series of interlocks are provided to prevent malfunctions and to ensure maximum operator safety.

The spring-loaded contact system contains insulated contact arms which create an electrical connection between the VCB main terminals and fixed contacts of the switchgear when the draw-out unit is in the service position.

The open design of the draw-out unit provides visual control of the main circuit's disconnection when it is in the test position. The IP2X front cover of the VCB can be provided as a design option.

The auxiliary circuit cable contains ISM and DOU auxiliary circuit switches and optional interlock wiring. The auxiliary multi-pin connector provides interconnection between the draw-out circuit breaker's secondary wiring and the switchgear's auxiliary circuits compartment. The CM is installed in the switchgear's auxiliary circuits compartment to provide all control, and the indication wiring is grouped in the low-voltage compartment of the switchgear. In case of auxiliary supply loss, manual charging of the circuit breaker can be performed by connecting to the CM in the low voltage compartment, excluding the necessity of operating inside the high-voltage compartment.

Withdrawable VCB

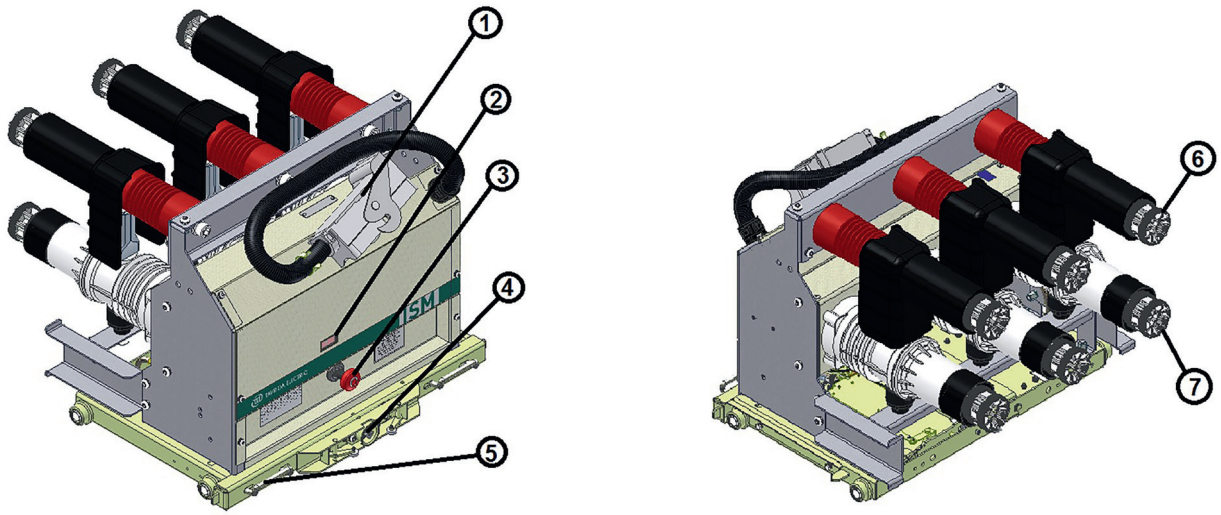


Figure 17
VCB15_LD8_16D 800 A, PCD 210 mm

1. Control wiring plug
2. Main contacts position indication
3. Manual trip button
4. Racking mechanism of draw-out plate
5. Fixing mechanism of draw-out plate
6. Main contact upper terminal
7. Main contact lower terminal

The draw-out plate auxiliary switches module is not shown in the Figure 17.

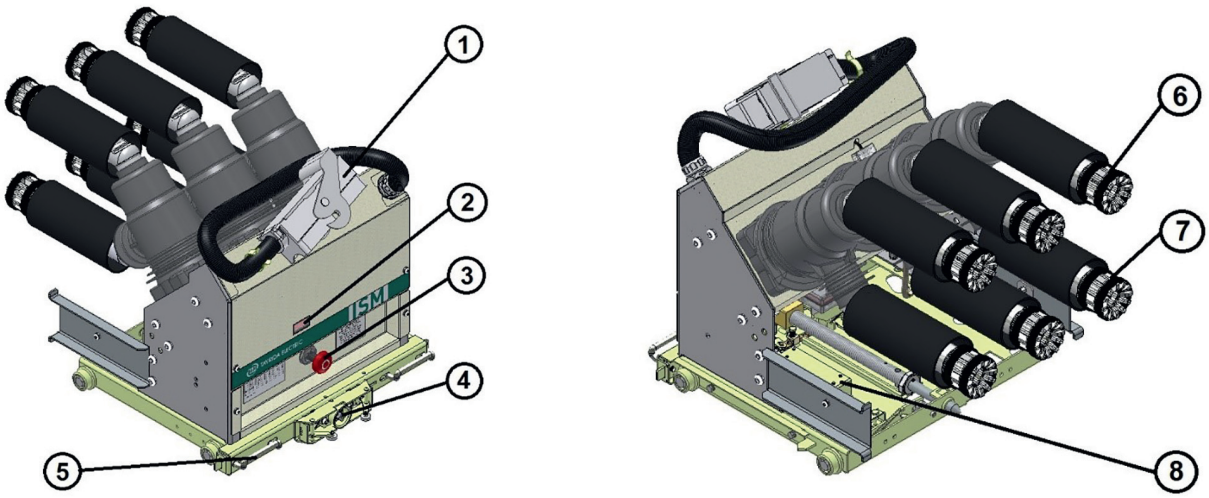


Figure 18
VCB15_MD1_16D PCD 150 mm

1. Control wiring plug
2. Main contacts position indication
3. Manual trip button
4. Racking mechanism of draw-out plate
5. Fixing mechanism of draw-out plate
6. Main contact upper terminal
7. Main contact lower terminal
8. Draw-out plate auxiliary switches module

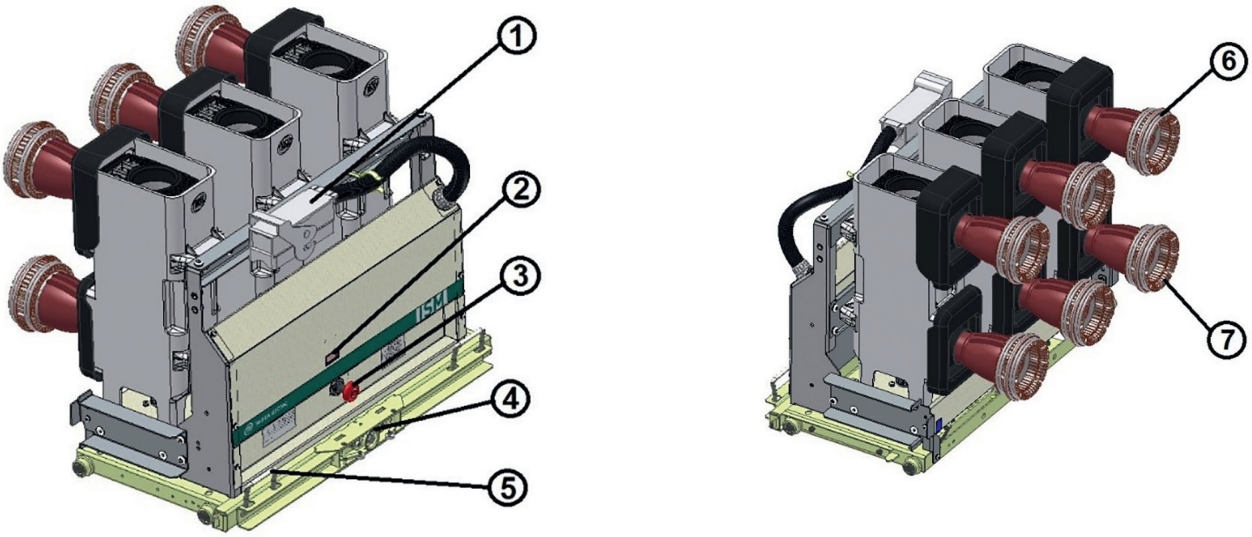


Figure 19
VCB15_HD1_16D 3150 A, PCD 275 mm

1. Control wiring plug
2. Main contacts position indication
3. Manual trip button
4. Racking mechanism of draw-out plate
5. Fixing mechanism of draw-out plate
6. Main contact upper terminal
7. Main contact lower terminal

The draw-out plate auxiliary switches module is not shown in the Figure 19.

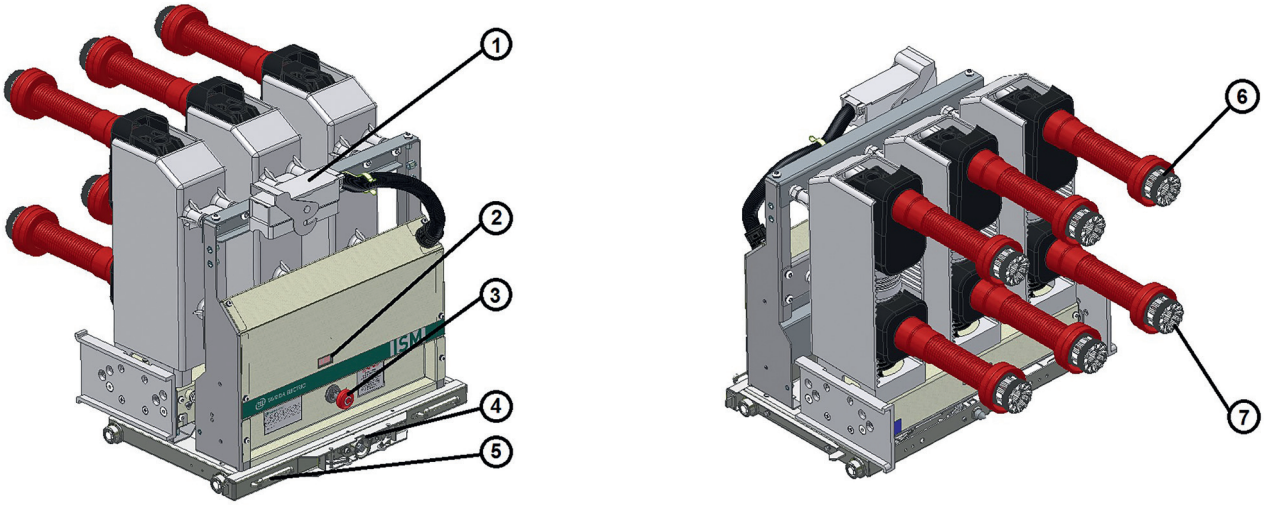


Figure 20
VCB25_Shell2_16D 1250 A, PCD 210 mm

1. Control wiring plug
2. Main contacts position indication
3. Manual trip button
4. Racking mechanism of draw-out plate
5. Fixing mechanism of draw-out plate
6. Main contact upper terminal
7. Main contact lower terminal

The draw-out plate auxiliary switches module is not shown in the Figure 20.

5.1.2 Indoor Switching Module

The Tavrida Electric vacuum circuit breaker consists of two main components:

- The ISM (ISM15_LD_8 - Figure 21; ISM15_MD_1 – Figure 22; ISM15_HD_1 – Figure 23; ISM25_Shell_2 - Figure 24);
- The CM for controlling and monitoring of ISM (Figure 25).

Figure 21
ISM15_LD_8

Figure 22
ISM15_MD_1

Figure 23
ISM15_HD_1

Figure 24
ISM25_Shell_2

Figure 25
CM_16_1

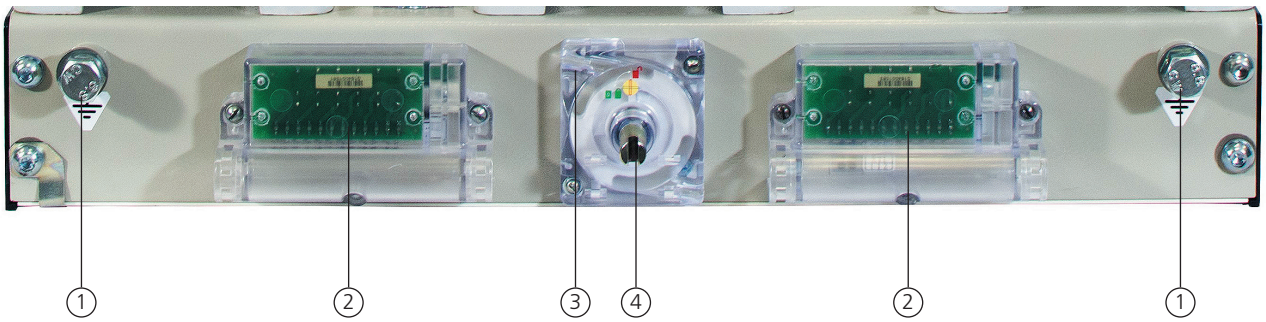
The Tavrida Electric indoor switching module has a simplified mechanical structure. It uses three single-coil magnetic actuators, one per pole. All switching elements are assembled along a single axis. All mechanical operations, are therefore, direct and linear. Three actuators are installed in a steel frame and mechanically linked by a synchronizing plate.

This design eliminates failure modes caused by components in conventional technology such as gears, charging motors, and trip/closing coils.

Tavrida Electric manufactures vacuum interrupters which combine small dimensions with an extraordinarily long mechanical and electrical lifespan. The use of a specially designed axial magnetic field distribution provides even current density distribution over the contact surface, and consequently a substantial improvement in vacuum interrupting performance.

The result is up to 30,000 CO cycles at rated current or up to 50 operations at maximum short-circuit breaking current without replacing or adjusting any parts of the circuit breaker. Tavrida Electric vacuum circuit breakers are completely maintenance-free over a total life expectancy of at least 30 years.

The ISM15_LD_8, ISM15_MD_1, ISM15_HD_1 and the ISM25_Shell_2 possess the following parts: an interface for auxiliary circuits, a main contacts position indication and an interlocks connection.



1. Earthing studs
2. ISM auxiliary switches modules (each has 3 NO and 3 NC contacts)
3. Interlocking cables interface (up to 2 cables can be connected)
4. Interlocking shaft

Figure 26

ISM15_LD_8, ISM15_MD_1, ISM15_HD_1 and ISM25_Shell_2 interface

5.1.3 Control Module

Tavrida Electric Control modules provide the following advantages:

Low Power Consumption

Low energy required to close or trip the ISM, no energy consumption by the ISM in its closed or open state and optimization of the CM electrical diagrams leads to low CM power consumption – not more than 42 watts while CM capacitors are charging and no more than 7 watts in standby mode.

Optimal ISM Control

One CM can drive several different ISM types, but is programmed for use with a particular ISM type. The result is optimal ISM close and trip through a wide range of temperatures.

Self-Diagnostic Functionality

The CM has an internal self-diagnostic system that monitors ISM connection, power supply level and internal states of the CM. As a result, the CM can indicate issues through the use of LEDs and built-in relays. Unlikely malfunctions are indicated by the number of corresponding LED blinks.

Wiring Optimization

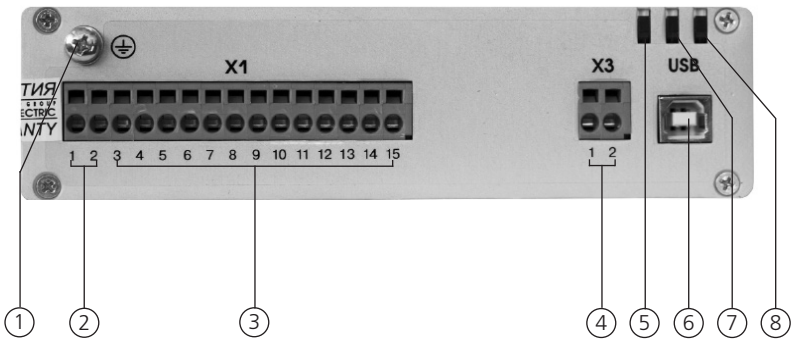
The CM controls the ISM main contact state via the same circuit used to close or trip the ISM. Therefore, only one circuit connection between the ISM and the CM is required. The CM can provide external circuits with information about the ISM main contacts state through the use of built-in relays, which simplifies the switchgear secondary wiring signifcantly [1)].

Compact Dimensions and Small Weight of CM

The compact size and small weight of the CM (190x165x45 mm, 1 kg) simplifies the installation. The aluminum housing of the CM provides a high EMC level (“Table 14 - CM EMC Parameters”).

The CM is delivered with mounting brackets for mounting on fat surfaces. The LED indicators are visible from two directions.

1) The position indication of ISM provided by the CM can be incorrect if the CM is not operable due to an absence of auxiliary supply. The relay keeps its state after the CM power supply disconnection. For demanding applications, conventional mechanical microswitches located at the ISM can be used.



1. Earthing stud
2. Terminals for power supply
3. Terminals for I/O (control and indication)
4. Terminals for Switching Module
5. "Power" LED indicator
6. USB port (for CM programming during production, not used under service conditions)
7. "Malfunction" LED indicator
8. "Ready" LED indicator

Figure 27
CM_16_1

5.2 Operation

5.2.1 VCB Racking In and Out of the Switchgear

To change the VCB position from test to service and vice versa, the DOU plate is equipped with a racking mechanism. To operate it, a handle is used. The VCB movement is provided by handle rotation in a clockwise direction for moving to the service position and a counterclockwise direction for moving to the test position.

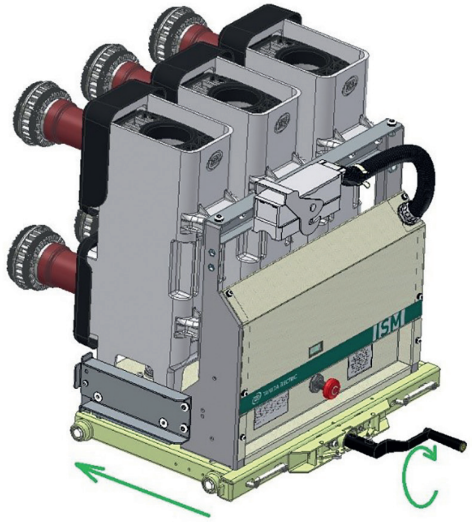


Figure 28
VCB moving in service position

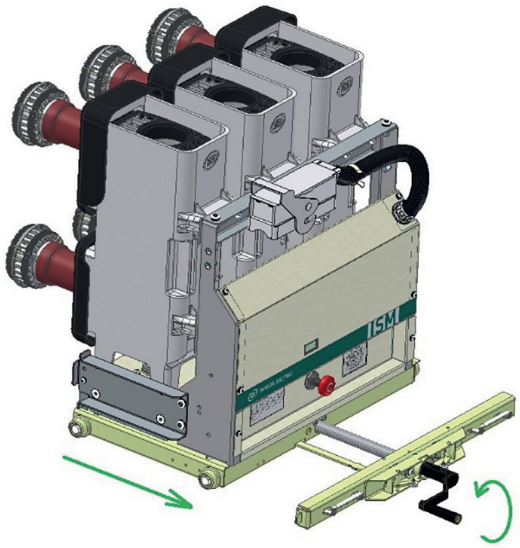


Figure 29
VCB moving in test position

5.2.2 ISM Closing

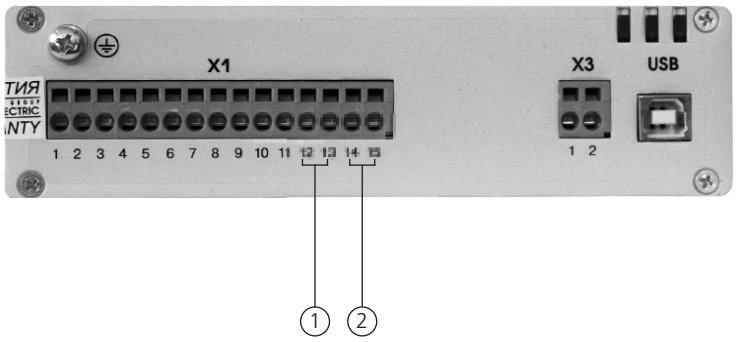
To close the ISM main contacts, the CM close command should be applied. It is a "dry contact" input; no external voltage is required.

The close command will be accepted in the following cases:
- The CM state is "Ready" (Ready LED flashes green).
- No Trip command is applied.
- Mechanical and electrical interlock is unlocked.

If the "Close" command is applied and held before the CM is in a "Ready" state, the Close command will not be accepted.

If auxiliary power is unavailable, the manual generator CBunit_ManGen should be used to charge the CM capacitors prior to applying the "Close" command to the ISM.

If manual generators CBunit_ManGen are used to charge the CM, the manual generator handle shall be rotated until the Ready LED of the CM flashes green (approximately 30 seconds). Then the ISM close command can be applied to the CM.



1. Close command input
2. Trip command input

Figure 30
CM_16_1 close and trip inputs

5.2.3 ISM Opening

To open the ISM main circuits, a trip command should be applied to the CM trip command input. It is a "dry contact" input, so no external voltage should be applied.

The trip command will be accepted if CM state is "Ready" (Ready LED flashes green), even up to 60 seconds after a loss of auxiliary power supply.

If the trip command is applied and kept before the CM is in a "Ready" state, the trip command will be accepted after the CM is in a "Ready" state. Holding the "Trip" command will block the "Close" command execution.

5.2.4 ISM Emergency Opening

The ISM can also be opened manually. To open the ISM manually, apply force to the manual trip button. See Figure 31 below.

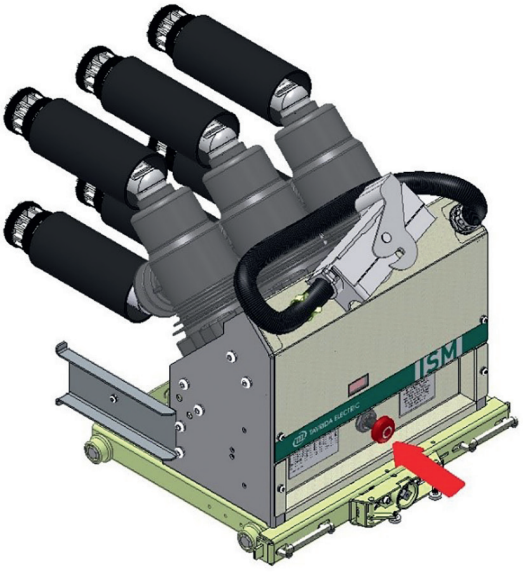


Figure 31

ISM manual trip execution

The button moves the ISM synchronization plate. When the synchronizing plate is moved, a force exceeding the magnetic attraction forces of the ring magnet is applied to the ISM armature, which subsequently starts to move. As the air gap increases, the opening springs and the contact pressure springs exceed the magnetic holding force and the vacuum interrupter opens.

6. Functionality

6.1 Interlocks

The VCB provides all the interlocks required to provide high level of safety and reliability during installation, commissioning and operation.

Standard safety interlocks included:

- The draw-out unit can only be moved in case the ISM is open and locked against closing.
- The ISM can only be unlocked and operated in case the draw-out unit is exactly in the test or service position.
- The interlocks can only be unlocked and operated if the draw-out unit is in the test or service position.

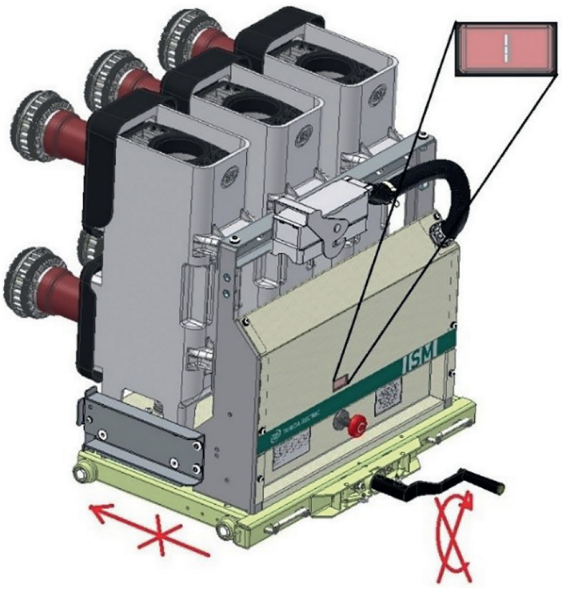


Figure 32

The DOU cannot be moved while the ISM is closed.

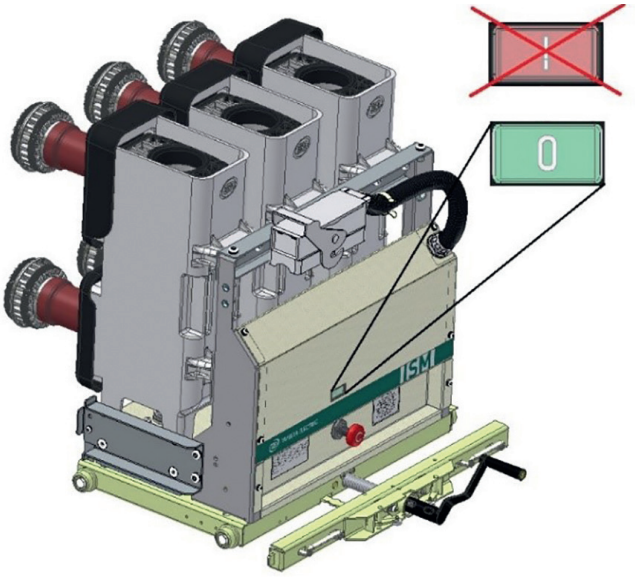


Figure 33

The ISM cannot be closed while the DOU is in the intermediate position.

Interlocks related to the draw-out unit located inside the switchgear:

- The draw-out unit can only be moved when the earthing switch is open.
- The earthing switch can only be closed when the draw-out unit is in the test position.
- The draw-out unit can only be moved to the service position when the switchgear circuit breaker's compartment door is closed.
- The draw-out unit can only be removed from the switchgear when the draw-out unit is in the test position.

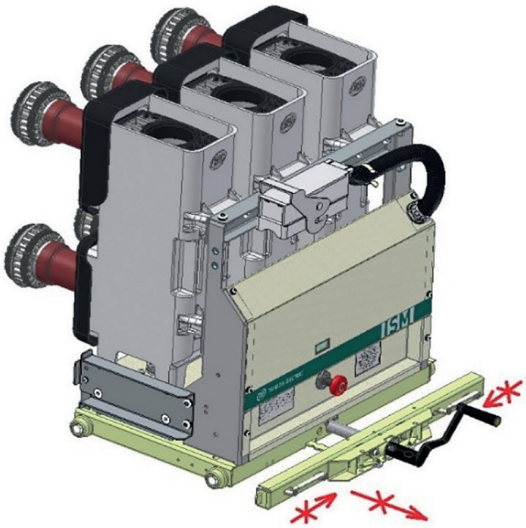


Figure 34

The DOU cannot be removed from the switchgear when the DOU is not in the test position.

6.2 Optional interlocks

Optionally the VCB can be equipped with the following interlocks (in any combination):

- The Interlock preventing VCB auxiliary circuits plug connection to the switchgear if the VCB is not in the test position. The interlock is available when the VCB has plastic auxiliary circuits plug. In case the VCB has IP2X front cover it is already equipped with this interlock;
- The interlock preventing the draw-out unit racking in/out in case locking solenoid is not energized.

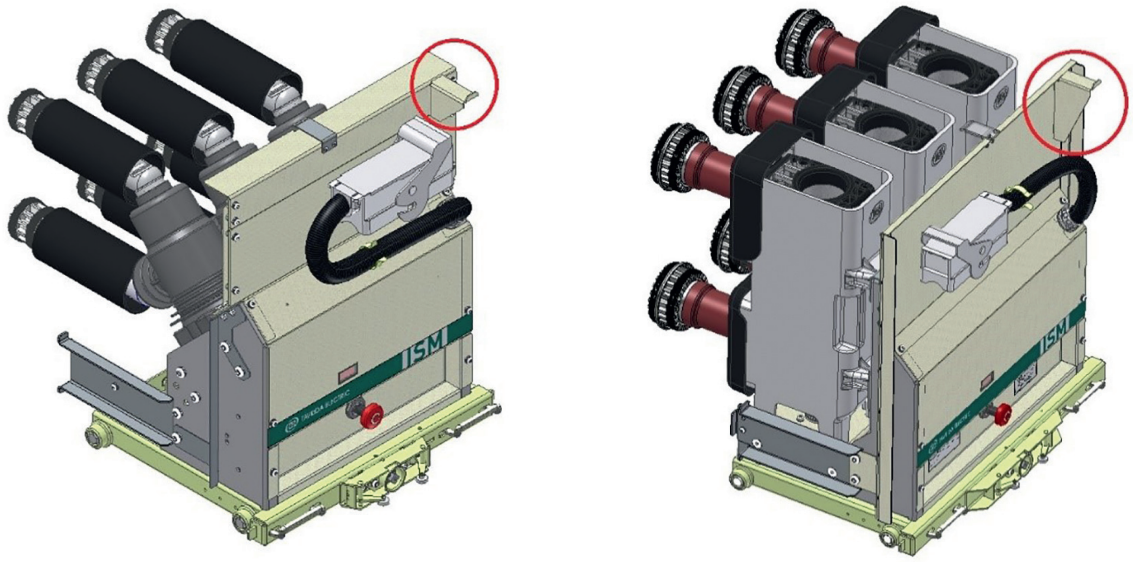


Figure 35
Auxiliary circuits plug interlock

6.3 Indication

The VCB has the following indication functionality:

- indication provided by the DOU plate:
  - DOU plate position – DOU plate auxiliary switches (5 NO+5 NC switches).

- indication provided by the ISM:
  - ISM main contacts position (visual indication);
  - ISM main contacts position (electrical indication) – ISM auxiliary switches (6 NO+6 NC switches).

- indication provided by the CM:
  - ISM main contacts position (electrical indication) – one [1)] built-in CM relay (1 NO + 1 NC with common point);
  - CM "Power" indication – LED indicator;
  - CM "Ready" state indication – LED indicator and one built in CM relay (1 NO + 1 NC with common point);
  - CM "Malfunction" state indication – LED indicator and one built-in CM relay (1 NO + 1 NC with common point).

Technical data for the ISM and the DOU plate auxiliary switches load and built-in and CM relays is provided in Chapter 4.

1) The number of CM relays indicating ISM main circuits position can be increased for certain applications, please contact your nearest sales representative for details.

The self-diagnostic system inside the CM detects possible malfunctions and reports them via the Malfunction LED blink signals and "Malfunction or Loss of auxiliary supply" relay state. Detailed explanations of the blink codes are provided in the Table 15.

Table 15 - CM Self-Diagnostic Indication

CM State	Type of Indication	Indication				
		LED Power	LED Ready	LED Malfunction	Relay Ready	Relay Malfunction or Loss of auxiliary supply
Power supply voltage is absent more than 3 minutes	Warning and Loss of auxiliary supply	off	off	off	O	C
"Close" operation is preparing	Normal	continuous	off	off	O	O
CM is ready and operable	Normal	continuous	continuous	off	C	O
Power supply voltage is absent for more than 1.5 seconds	Warning and Loss of auxiliary supply	off	continuous	1 blink	C	C
Excessive trip or close time	Malfunction	continuous	off	2 blinks	O	C
Actuator coil isolated	Malfunction	continuous	off	3 blinks	O	C
Short circuit of Actuator coil	Malfunction	continuous	off	4 blinks	O	C
Manual Trip and Lock	Warning	continuous	off	5 blinks	O	O
Out of temperature range	Warning	continuous	off	6 blinks	O	O
ISM state is open without command from the CM	Malfunction	continuous	off	7 blinks	O	C
Internal fault of the CM	Malfunction	continuous	off	continuous	O	C

The following information is provided in Table 15:

1. The number of blinks in a series followed by 1.5 s intervals, continuous light or off state are shown for the LED indicators.
2. State of relay contact groups (C – closed, O – opened) is indicated for the NC Ready Relay and the Malfunction or Loss of Auxiliary Supply relay.
3. Period of checking the actuator coil state (short-circuit / isolated) – 10 s.

Priority of the fault indication (from highest to lowest priority):

1. CM is out of temperature range
2. The ISM state is open without a command from the CM
3. Excessive trip or close time
4. Manual trip and lock
5. Short-circuit of actuator coil
6. Actuator coil isolated
7. Power supply voltage is absent more than 1.5 seconds

The CM performs the checkup of ISM main contacts position and updates the "ISM Main Contacts Position" relay status in the following cases:

- If the Close command was applied from the CM. In this case, the update is performed within 150 ms after the ISM main contacts closing.
- If the Trip command was applied from the CM. In this case the update is performed not later than in 70 ms after ISM main contacts opening.
- Periodically every 10 s if no Close or Open command was applied from the CM.

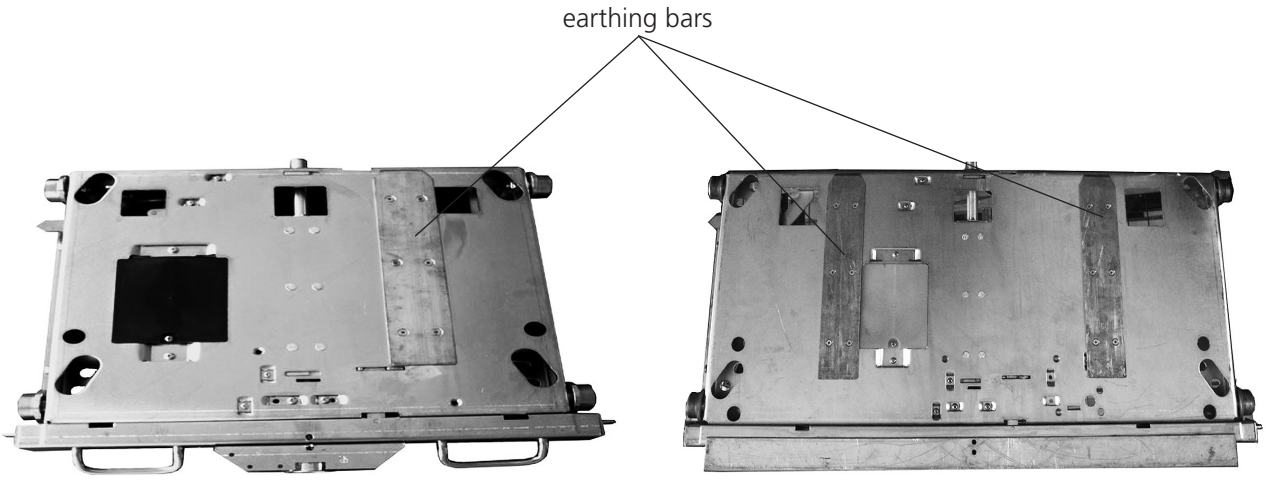
If the application project requires you to define the main contacts position faster than the timing mentioned above, please use the auxiliary switches installed in the ISM.

7. Application Notes

7.1 Protective Earthing

The draw-out unit is earthed by the truck wheels.

Optionally the earthing can be arranged via the earthing bar connected to the bottom of the truck. In this case, corresponding earthing must be made in the switchgear (not as part of the delivery).



a) Standard Draw-Out plate

b) The Draw-Out plate for VCB with PCD of 275 mm only

Figure 36

DOU earthing bars

7.2 Primary Connections

Before the first VCB installation in the service position, it is essential to verify the actual dimensions of the fixed contacts installed in the switchgear. In the service position, the connection of the VCB's flexible contacts with the fixed contacts of the switchgear should be in accordance with the requirements shown in Figure 37. Otherwise, it can lead to overheating and other severe problems

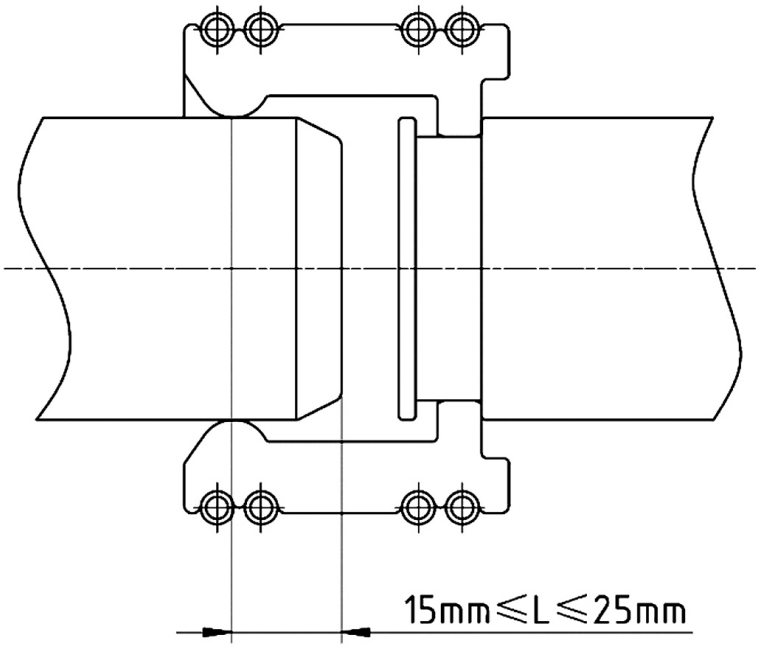


Figure 37

Connection of the VCB removable contacts with switchgear fixed contacts.

7.3 Secondary Equipment

7.3.1 VCB Secondary Connections

The secondary circuits cable of the VCB can either be equipped by a plastic (58 pins) or a metal (108 pins) plug. The arrangement of the secondary plugs is presented in Table 16 (Plastic Plug Arrangement) and in Table 17 (Metal Plug Arrangement). See "Appendix 3. Secondary Schemes" for the auxiliary circuits details.

Table 16 - Plastic Plug Arrangement

Pin No	Connection	Pin No	Connection
1	-	30	-
2	-	31	ISM auxiliary switch XT3.12
3	DOU plate position switch SQ1.3	32	DOU plate position switch SQ2.5
4	ISM auxiliary switch XT2.1	33	DOU plate position switch SQ2.7
5	ISM auxiliary switch XT2.3	34	DOU plate position switch SQ2.9
6	ISM auxiliary switch XT2.5	35	-
7	ISM auxiliary switch XT2.7	36	ISM auxiliary switch XT3.3
8	ISM auxiliary switch XT2.9	37	ISM auxiliary switch XT3.5
9	ISM auxiliary switch XT2.11	38	ISM auxiliary switch XT3.7
10	DOU plate position switch SQ1.10	39	ISM auxiliary switch XT3.9
11	DOU plate position switch SQ1.12	40	Earthing
12	ISM auxiliary switch XT3.1	41	ISM auxiliary switch XT3.11
13	-	42	DOU plate position switch SQ1.11
14	DOU plate position switch SQ1.4	43	DOU plate position switch SQ1.9
15	ISM auxiliary switch XT2.2	44	DOU plate position switch SQ2.3
16	ISM auxiliary switch XT2.4	45	DOU plate position switch SQ1.8
17	ISM auxiliary switch XT2.6	46	DOU plate position switch SQ2.2
18	ISM auxiliary switch XT2.8	47	DOU plate position switch SQ1.7
19	ISM auxiliary switch XT2.10	48	DOU plate position switch SQ2.1
20	ISM auxiliary switch XT2.12	49	-
21	DOU plate position switch SQ2.4	50	DOU plate position switch SQ1.5
22	DOU plate position switch SQ2.6	51	DOU plate position switch SQ1.6
23	DOU plate position switch SQ2.8	52	Optional interlock (solenoid) XP3.1
24	DOU plate position switch SQ2.10	53	Optional interlock (solenoid) XP3.2
25	ISM auxiliary switch XT3.2	54	Actuator coil XT1.1
26	ISM auxiliary switch XT3.4	55	Actuator coil (via interlock switch) XT1.2
27	ISM auxiliary switch XT3.6	56	-
28	ISM auxiliary switch XT3.8	57	-
29	ISM auxiliary switch XT3.10	58	-

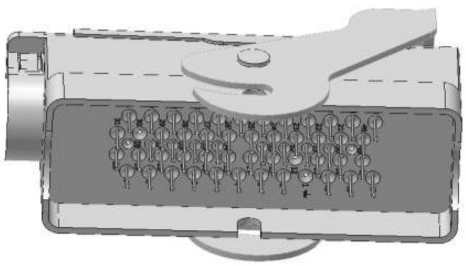


Figure 38

The plastic plug with 58 pins

Table 17 - Metal Plug Arrangement

Pin No	Connection	Pin No	Connection
1	ISM auxiliary switch XT2.7	45	-
2	ISM auxiliary switch XT2.9	46	-
3	ISM auxiliary switch XT2.11	47	-
4	ISM auxiliary switch XT3.7	48	-
5	ISM auxiliary switch XT3.9	49	Actuator coil XT1.1
6	ISM auxiliary switch XT3.11	50	-
7	ISM auxiliary switch XT2.1	51	-
8	ISM auxiliary switch XT2.3	52	-
9	ISM auxiliary switch XT2.5	53	-
10	ISM auxiliary switch XT3.1	54	-
11	-	55	ISM auxiliary switch XT3.3
12	-	56	ISM auxiliary switch XT3.5
13	-	57	DOU plate position switch SQ2.1
14	-	58	DOU plate position switch SQ2.2
15	-	59	DOU plate position switch SQ2.3
16	-	60	DOU plate position switch SQ2.4
17	-	61	DOU plate position switch SQ2.5
18	-	62	DOU plate position switch SQ2.6
19	ISM auxiliary switch XT2.8	63	DOU plate position switch SQ2.7
20	ISM auxiliary switch XT2.10	64	DOU plate position switch SQ2.8
21	ISM auxiliary switch XT2.12	65	-
22	ISM auxiliary switch XT3.8	66	Actuator coil (via interlock switch) XT1.2
23	ISM auxiliary switch XT3.10	67	-
24	ISM auxiliary switch XT3.12	68	Optional interlock (solenoid) XP3.2
25	ISM auxiliary switch XT2.2	69	-
26	ISM auxiliary switch XT2.4	70	-
27	ISM auxiliary switch XT2.6	71	-
28	ISM auxiliary switch XT3.2	72	-
29	-	73	ISM auxiliary switch XT3.4
30	-	74	ISM auxiliary switch XT3.6
31	-	75	DOU plate position switch SQ2.9
32	Optional interlock (solenoid) XP3.1	76	DOU plate position switch SQ2.10
33	-	77	DOU plate position switch SQ1.3
34	-	78	DOU plate position switch SQ1.4
35	-	79	DOU plate position switch SQ1.5
36	-	80	DOU plate position switch SQ1.6
37	-	81	DOU plate position switch SQ1.7
38	-	82	DOU plate position switch SQ1.8
39	-	83	-
40	-	84	-
41	-	85	-
42	-	86	-
43	-	87	-
44	-	88	-

Table 17 - Metal Plug Arrangement

Pin No	Connection	Pin No	Connection
89	-	100	-
90	-	101	-
91	-	102	-
92	-	103	-
93	DOU plate position switch SQ1.9	104	-
94	DOU plate position switch SQ1.10	105	-
95	DOU plate position switch SQ1.11	106	-
96	DOU plate position switch SQ1.12	107	-
97	-	108	-
98	-	GND	Earthing
99	-		

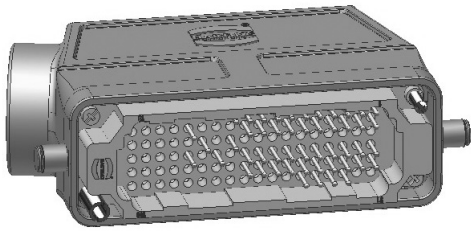


Figure 39

The metal plug with 108 pins

7.3.2 CM Secondary Connections

The CM_16_1 has secondary connectors (as shown below).

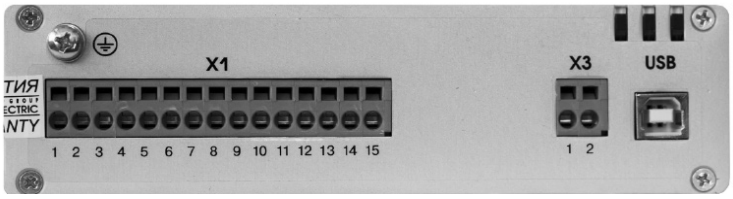


Figure 40

Terminal arrangement of the CM

Table 18 - CM Terminal Arrangement

XT1		XT3	
Terminal No.	Connection	Terminal No.	Connection
1	Power supply input (+)	1	Actuator coil output
2	Power supply input (-)	2	Actuator coil output
3	Relay output 1 NO		
4	Relay output 1 Com		
5	Relay output 1 NC		
6	Relay output 2 NO		
7	Relay output 2 Com		
8	Relay output 2 NC		
9	Relay output 3 NO		
10	Relay output 3 Com		
11	Relay output 3 NC		
12	Close dry input		
13	Close dry input		
14	Trip dry input		
15	Trip dry input		

CM relay functionality:

- Relay 1 - “ISM main contact position” relay;
- Relay 2 - “Ready” relay;
- Relay 3 - “Malfunction or Loss of Auxiliary Supply” relay

The “ISM main contact position“ relay maintains its state (1 NO and 1 NC contacts with common point) after the CM power supply disconnection.

Relay functionality and the number of relays which share the same functionality can be changed upon request.

Please contact the nearest Tavrida Electric sales representative for more information.

The CM is connected only to the ISM actuator coil circuits. The position of the ISM main contacts is determined by detecting the ISM coil inductance level. The CM “ISM main contact position” relay indicates the result.

7.3.3 Auxiliary supply

Connection of CM_16_1 to power supply is shown below.

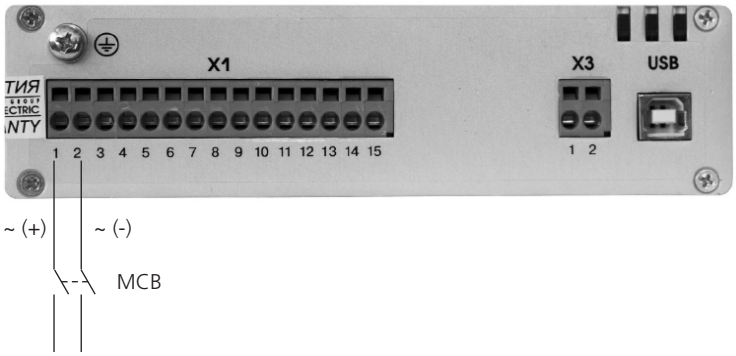


Figure 41
CM_16 power supply connection

The type of MCB shall be selected according to the CM consumption data given in Chapter 4.

If the manual generator CBunit_ManGen is used for charging, its DC voltage outputs should be connected to power supply inputs of CM_16_1.

Appendix 1.
Type Tests

Type Tests of ISM15_MD

Standard	Chapter	Test name	Test center name	Test report
IEC 62271-100	6.2.6.1	Power-frequency withstand voltage test	KEMA	KEMA 1398-18
IEC 62271-100	6.2.6.2	Lightning impulse withstand voltage test	KEMA	KEMA 1398-18
IEC 62271-100	6.2.9	Partial discharge tests	KEMA	KEMA 1398-18
IEC 62271-100 IEC 60255-27	6.2.10 10.6.4.2	Dielectric tests on auxiliary and control circuits	KEMA	KEMA 1398-18
IEC 62271-100	6.10.3	Electrical continuity of earthed metallic parts test	KEMA	KEMA 1398-18
IEC 62271-100	6.4	Measurement of the resistance of the main circuit	KEMA	KEMA 1399-18
IEC 62271-100	6.5	Temperature-rise tests on the main circuits	KEMA	KEMA 1399-18
IEC 62271-100	6.5.5	Temperature-rise tests on auxiliary and control equipment	KEMA	KEMA 1399-18
IEC 62271-200	6.102.2	Mechanical and electromechanical inter-locks tests	KEMA	KEMA 2221-18
IEC 62271-100	6.6	Short-time withstand current and peak withstand current tests	KEMA	KEMA 2222-18
IEC 62271-100	6.102-6.106	Short-circuit current making and breaking tests	KEMA	KEMA 2085-19
IEC 62271-100	6.102-6.105, 6.108	Single-phase earth fault test	KEMA	KEMA 2222-18
IEC 62271-100	6.102-6.105, 6.108	Double-earth fault test	KEMA	KEMA 2222-18
IEC 62271-100	6.102-6.105, 6.112	Making and breaking tests on class E2	KEMA	KEMA 2085-19
IEC 62271-100	6.101.2	Mechanical operation test at ambient temperature	KEMA	KEMA 2324-18
IEC 62271-100	6.101.3	Low and high temperature tests	KEMA	KEMA 2324-18
IEC 62271-100	6.111.5.1	Line-charging and cable-charging current switching tests	KEMA	KEMA 2269-18
IEC 62271-1	6.11 7.11	X-radiation test for vacuum interrupters	CESI	CESI B8012097

Type Tests of ISM15_HD

Standard	Chapter	Test name	Test center name	Test report
IEC 62271-100	6.2.6.1	Power-frequency withstand voltage test	KEMA	KEMA 1656-18 KEMA 1717-18
IEC 62271-100	6.2.6.2	Lightning impulse withstand voltage test	KEMA	KEMA 1656-18 KEMA 1717-18
IEC 62271-100	6.2.9	Partial discharge tests	KEMA	KEMA 1656-18 KEMA 1717-18
IEC 62271-100 IEC 60255-27	6.2.10 10.6.4.2	Dielectric tests on auxiliary and control circuits	KEMA	KEMA 1656-18
IEC 62271-100	6.10.3	Electrical continuity of earthed metallic parts test	KEMA	KEMA 1656-18 KEMA 1717-18
IEC 62271-100	6.4	Measurement of the resistance of the main circuit	KEMA	KEMA 1719-18 KEMA 1721-18
IEC 62271-100	6.5	Temperature-rise tests on the main circuits	KEMA	KEMA 1719-18 KEMA 1721-18
IEC 62271-100	6.5.5	Temperature-rise tests on auxiliary and control equipment	KEMA	KEMA 1719-18 KEMA 1721-18
IEC 62271-200	6.102.2	Mechanical and electromechanical interlocks tests	KEMA	KEMA 2355-18 KEMA 2370-18
IEC 62271-100	6.6	Short-time withstand current and peak withstand current tests	KEMA	KEMA 2351-18
IEC 62271-100	6.102-6.106	Short-circuit current making and breaking tests	KEMA	KEMA 2351-18
IEC 62271-100	6.102-6.105, 6.108	Single-phase earth fault test	KEMA	KEMA 2351-18
IEC 62271-100	6.102-6.105, 6.108	Double-earth fault test	KEMA	KEMA 2351-18
IEC 62271-100	6.102-6.105, 6.112	Making and breaking tests on class E2	KEMA	KEMA 2351-18
IEC 62271-100	6.101.2	Mechanical operation test at ambient temperature	KEMA	KEMA 2343-18
IEC 62271-100	6.101.3	Low and high temperature tests	KEMA	KEMA 2343-18
IEC 62271-100	6.111.5.1	Line-charging and cable-charging current switching tests	KEMA	KEMA 2353-18
IEC 62271-1	6.11 7.11	X-radiation test for vacuum interrupters	CESI	CESI B8012097

Type Tests of CM_16

Standard	Test name	Test center name	Test report
IEC 60255-26 IEC 61000-4-2	Electrostatic discharge immunity test	KEMA	KEMA TIC 1371-14
IEC 60255-26 IEC 61000-4-3	Radiated electromagnetic field immunity test	KEMA	KEMA TIC 1371-14
IEC 60255-26 IEC 62271-1 IEC 61000-4-4	Fast transient burst immunity test	KEMA	KEMA TIC 1371-14
IEC 60255-26 IEC 61000-4-5	Surge immunity test	KEMA	KEMA TIC 1371-14
IEC 60255-26 IEC 61000-4-6	Conducted disturbance induced by radio frequency fields immunity test	KEMA	KEMA TIC 1371-14
IEC 60255-26 IEC 61000-4-8	Power frequency magnetic field immunity test	KEMA	KEMA TIC 1371-14
IEC 61000-4-9	Pulse magnetic field immunity test	KEMA	KEMA TIC 1371-14
IEC 61000-4-10	100 kHz damped oscillatory magnetic field immunity test	KEMA	KEMA TIC 1371-14
IEC 61000-4-10	1 MHz damped oscillatory magnetic field immunity test	KEMA	KEMA TIC 1371-14
IEC 60255-26 IEC 61000-4-11	AC voltage dips and interruptions immunity test	KEMA	KEMA TIC 1371-14
IEC 60255-26 IEC 61000-4-16	Power frequency disturbance voltage immunity test	KEMA	KEMA TIC 1371-14
IEC 60255-26 IEC 62271-1 IEC 61000-4-18	100 kHz damped oscillatory wave immunity test	KEMA	KEMA TIC 1371-14
IEC 60255-26 IEC 62271-1 IEC 61000-4-18	1 MHz damped oscillatory wave immunity test	KEMA	KEMA TIC 1371-14
IEC 60255-26 IEC 61000-4-27	Ripple on DC power supply immunity test	KEMA	KEMA TIC 1371-14
IEC 60255-26 IEC 62271-100 IEC 61000-4-29	DC voltage dips and interruptions immunity test	KEMA	KEMA TIC 1371-14
IEC 60255-27 IEC 62271-100	Power frequency withstand voltage test	KEMA	KEMA TIC 1371-14
IEC 60255-27	Insulation resistance test	KEMA	KEMA TIC 1371-14
IEC 60255-27	Impulse withstand voltage test	KEMA	KEMA TIC 1371-14

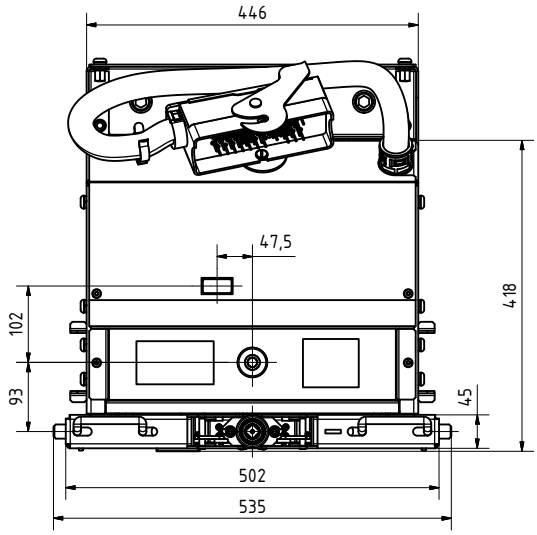
Appendix 2. Withdrawable VCB Package Dimensions

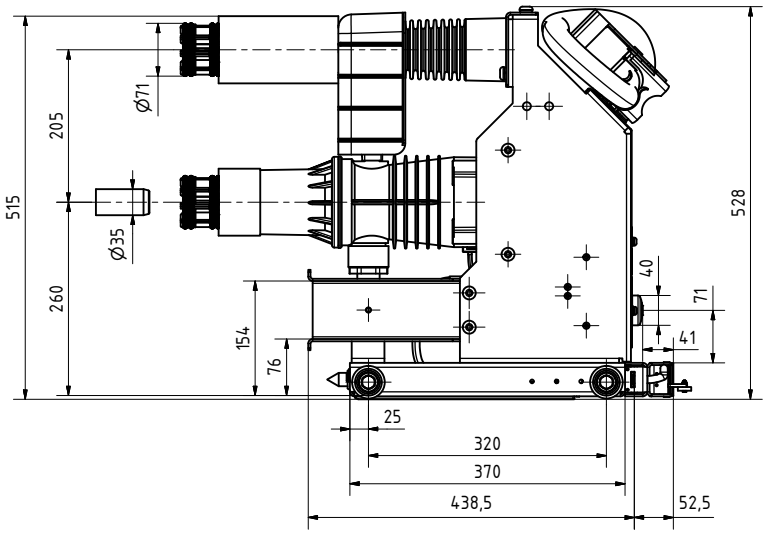
Withdrawable VCB Package Dimensions

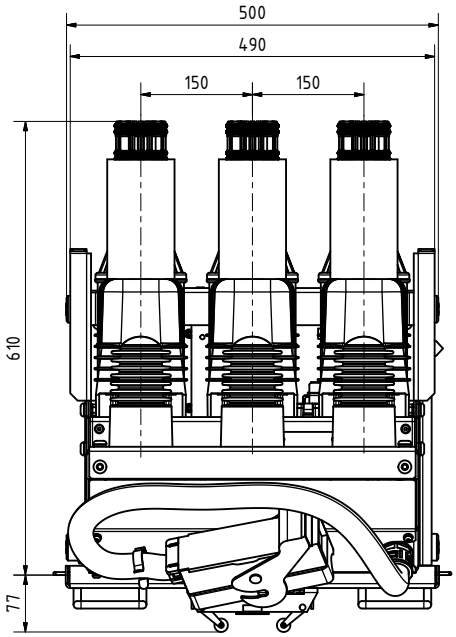
Withdrawable VCB	PCD	Package Dimensions, not more than (LxWxH), mm
VCB15_LD8_16D	150	780x780x937
	210	780x780x937
VCB15_MD1_16D	150	780x780x937
	210	780x780x937
VCB15_HD1_16D	210	780x780x937
	275	1150x990x997
VCB25_Shell2_16D	210	905x805x997
	275	1150x990x997

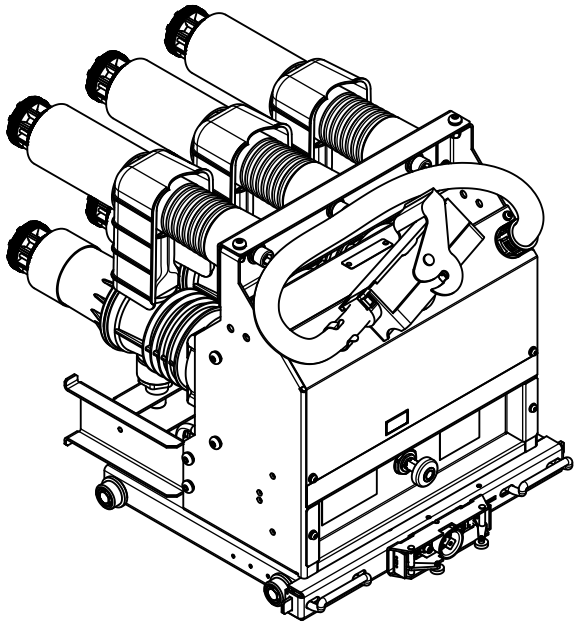
Appendix 3.
Overall Drawings

VCB15_LD8_16D



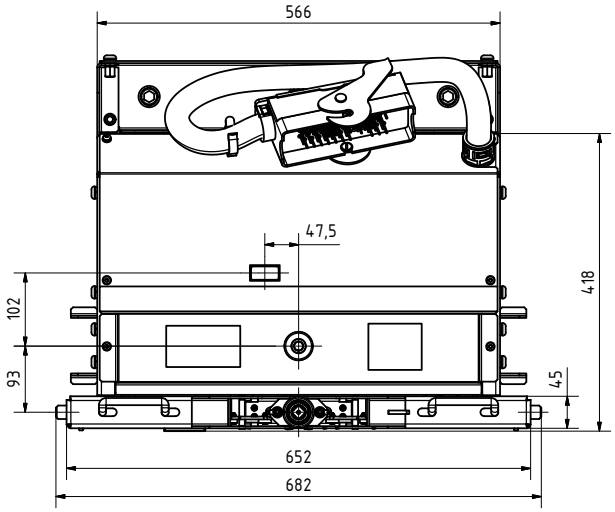


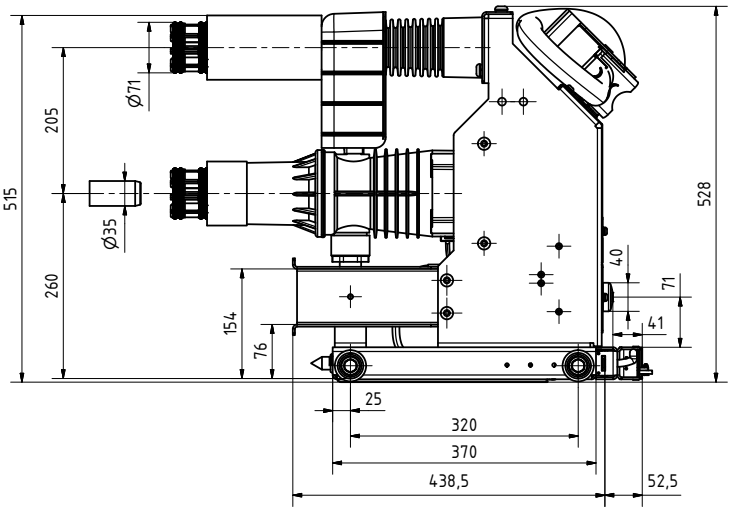


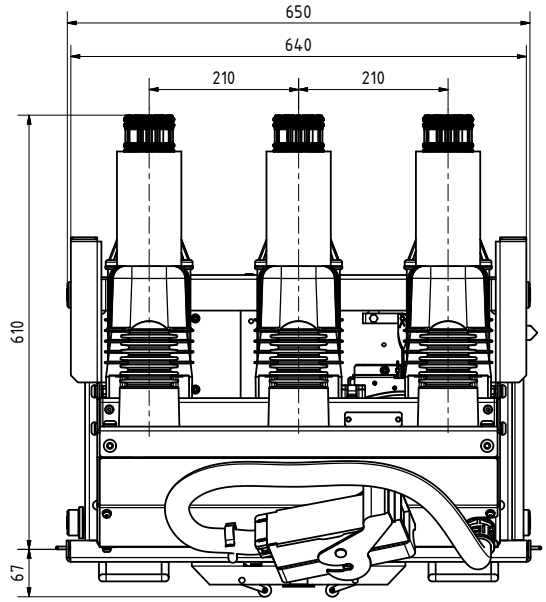


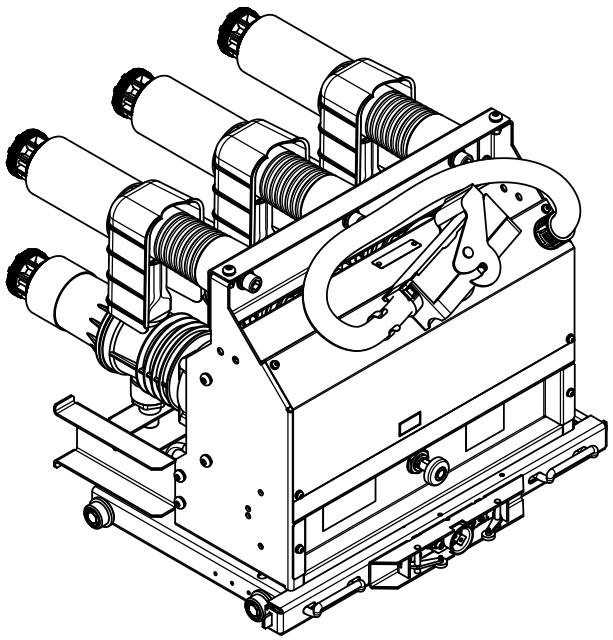
VCB15_LD8_16D
17.5kV, 800 A, PCD: 150 mm,
weight: 70 kg

L_{max} = 687 mm
W_{max} = 535 mm
H_{max} = 528 mm



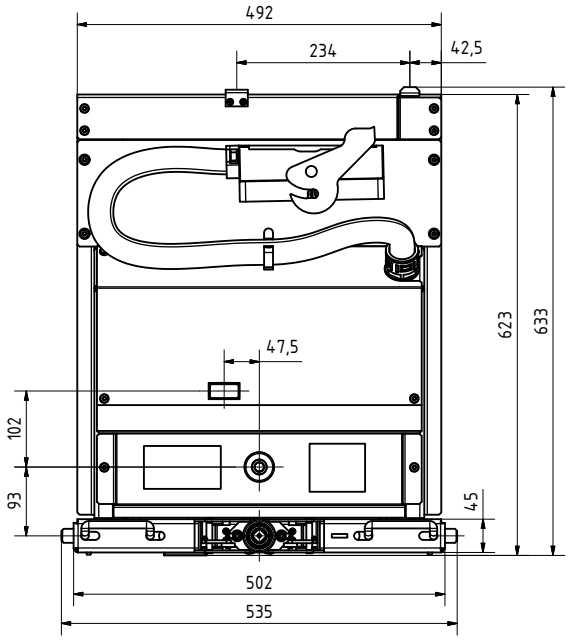


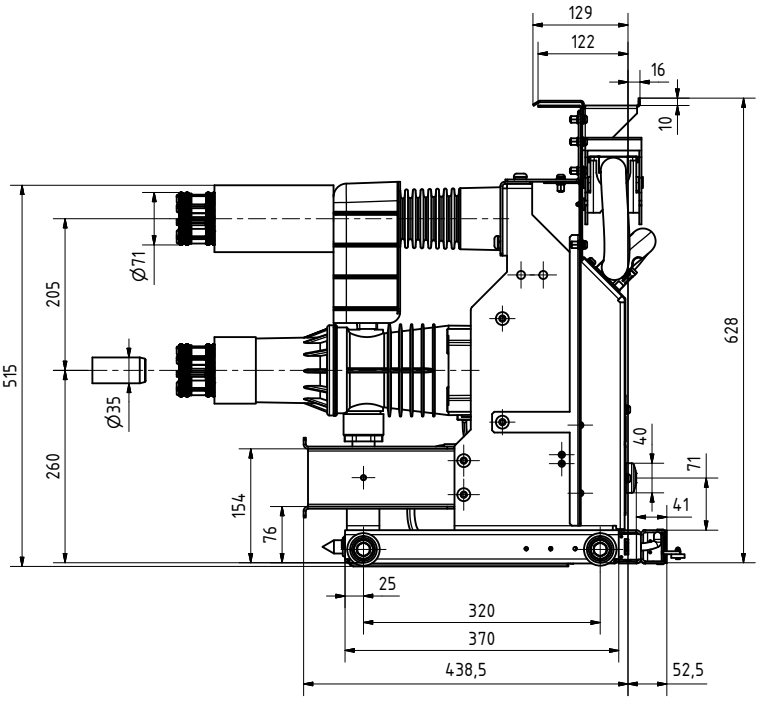


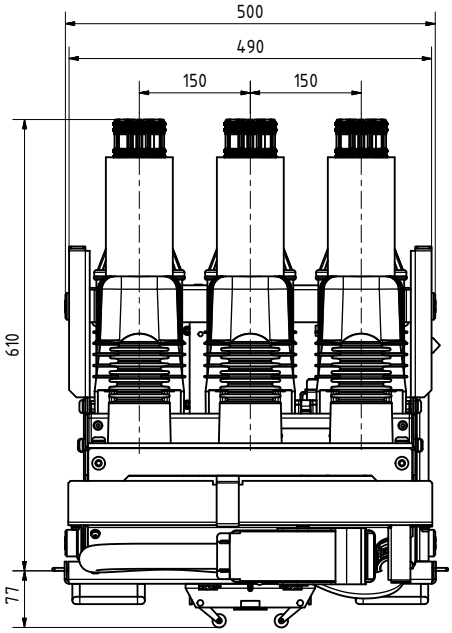


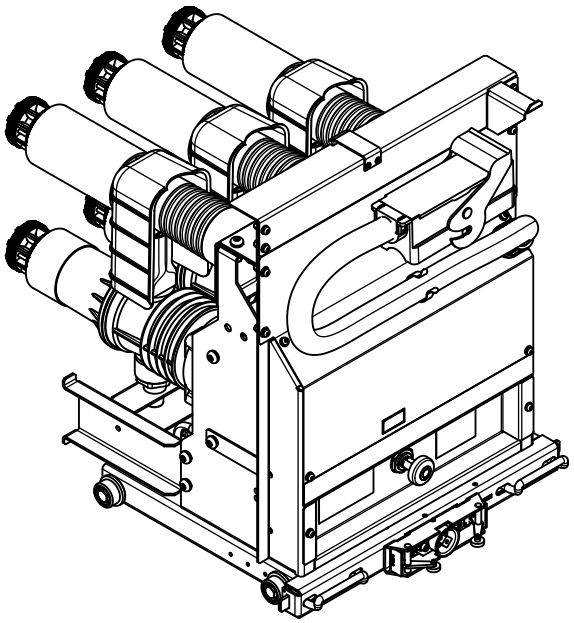
VCB15_LD8_16D
17.5kV, 800 A, PCD: 210 mm,
weight: 76 kg

L_{max} *= 677 mm*
W_{max} *= 682 mm*
H_{max} *= 528 mm*



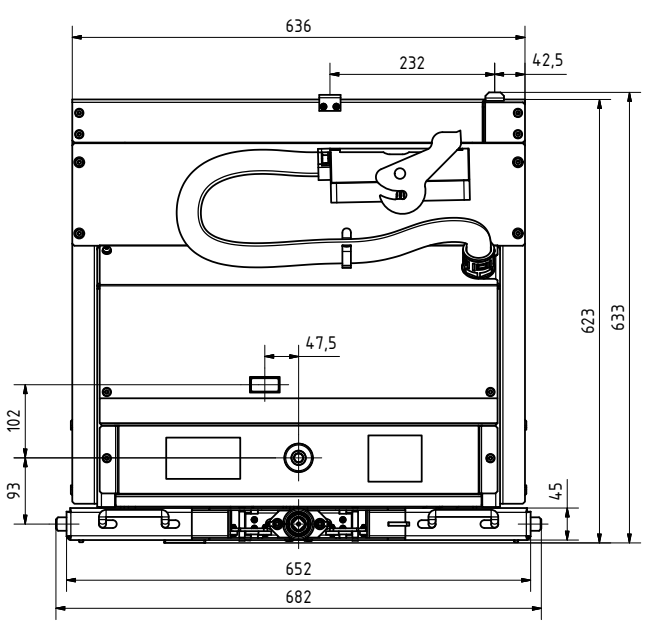


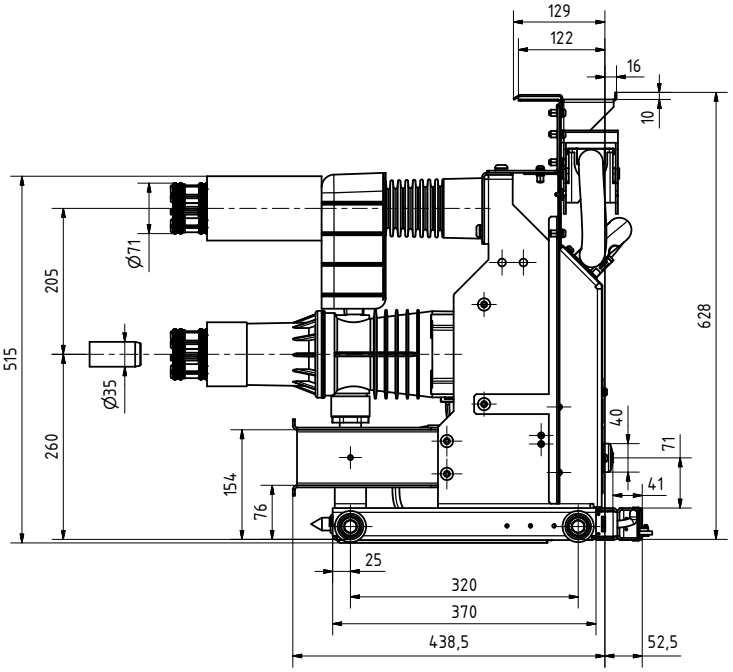


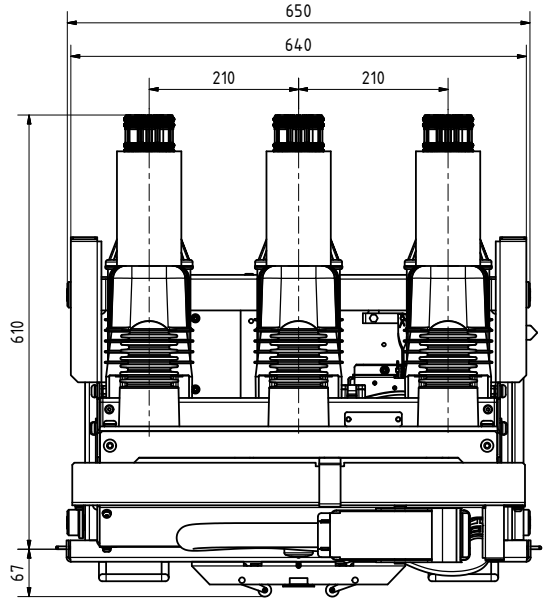


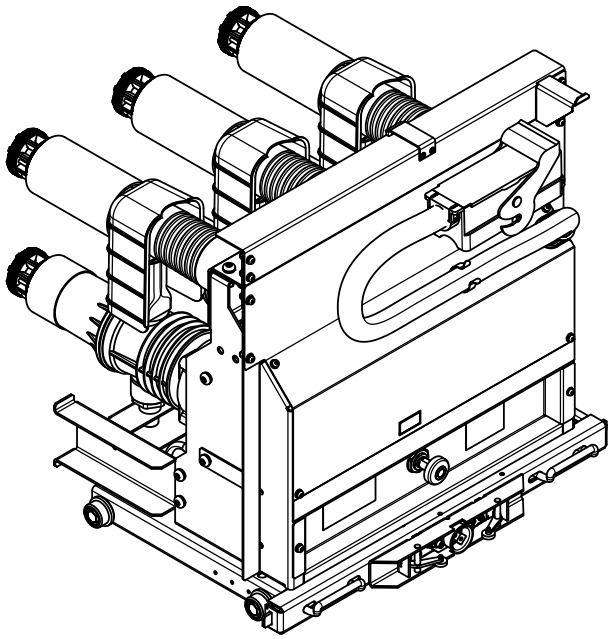
VCB15_LD8_16D
17.5kV, 800 A, PCD: 150 mm, with IP2X front cover, weight: 74 kg

L_{max} = 687 mm
W_{max} = 535 mm
H_{max} = 633 mm





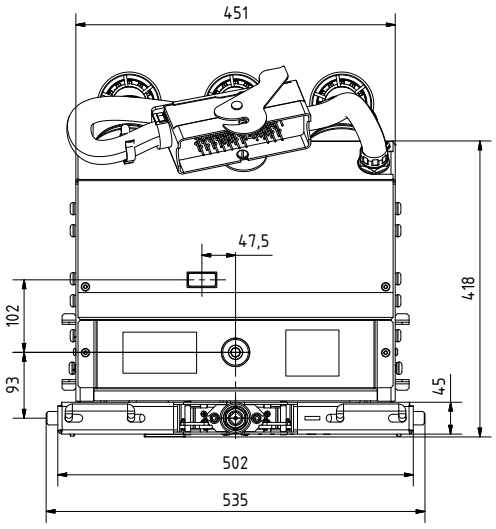


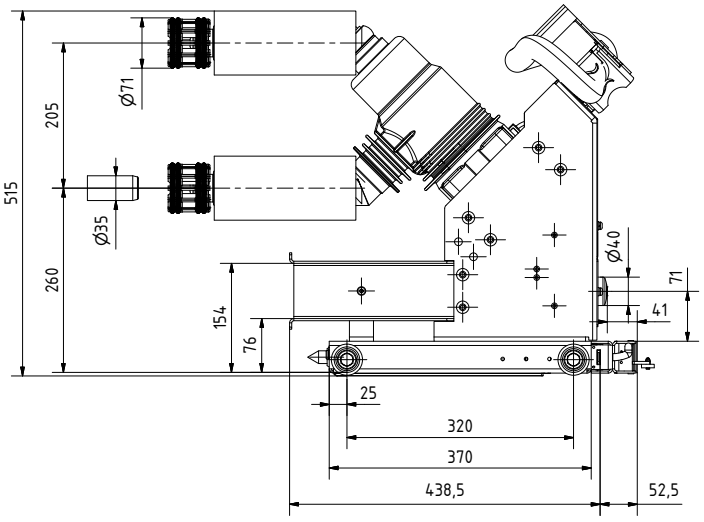


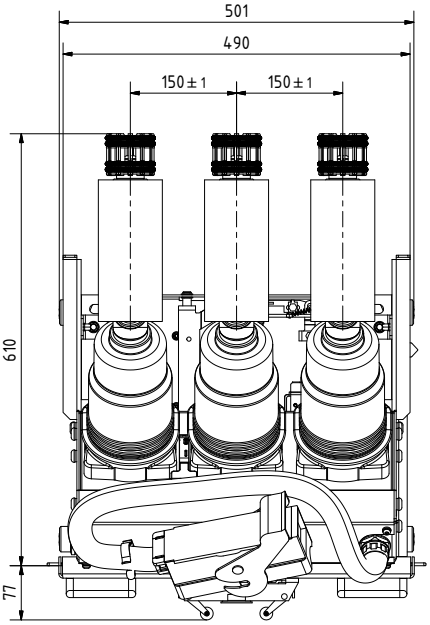
VCB15_LD8_16D
17.5kV, 800 A, PCD: 210 mm, with IP2X front cover, weight: 81 kg

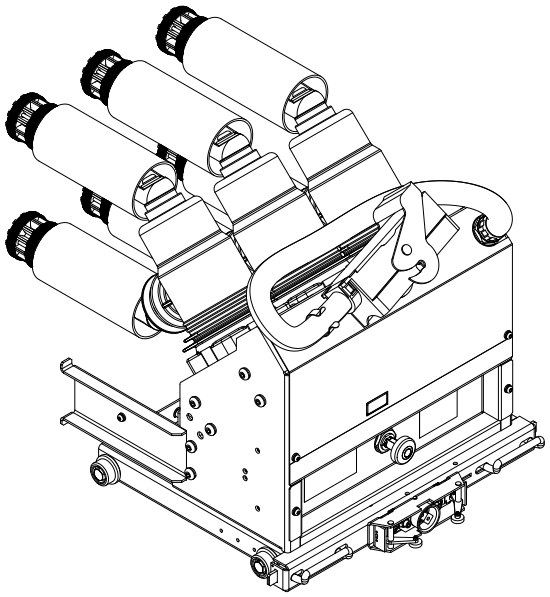
L_{max} = 677 mm
W_{max} = 682 mm
H_{max} = 633 mm

VCB15_MD1_16D



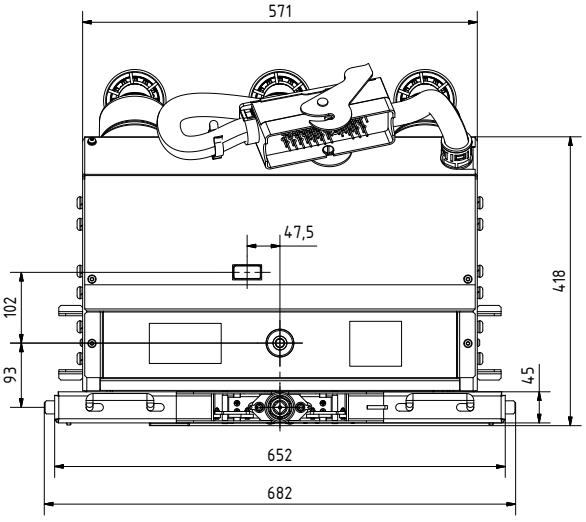


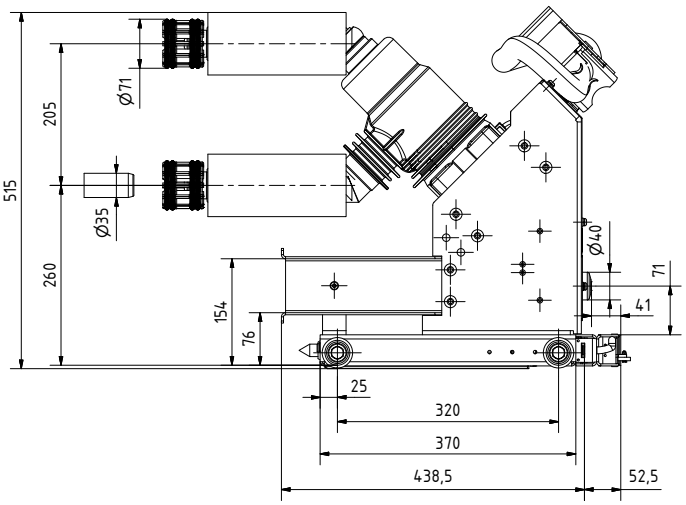


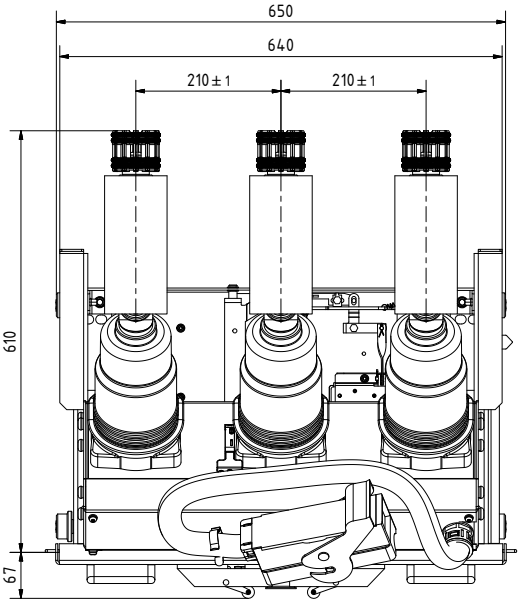


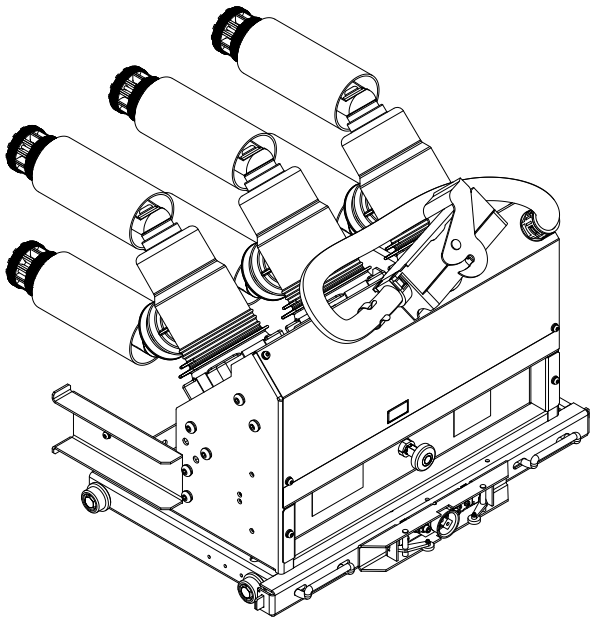
VCB15_MD1_16D
17.5kV, 1250 A, PCD: 150 mm,
weight: 72 kg

L_{max} = 677 mm
W_{max} = 535 mm
H_{max} = 515 mm



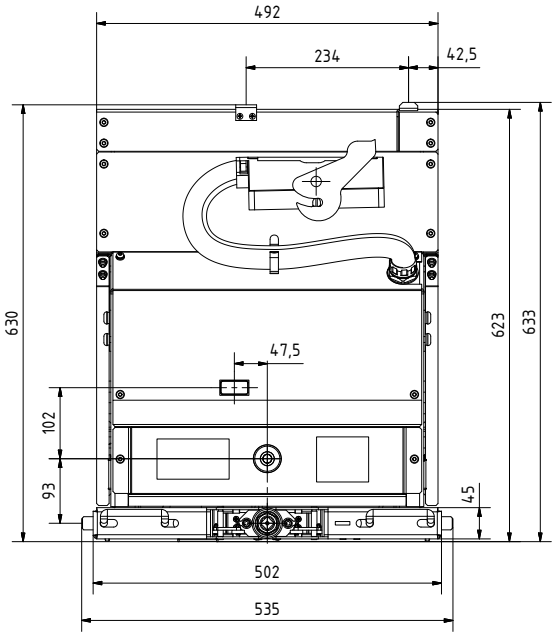


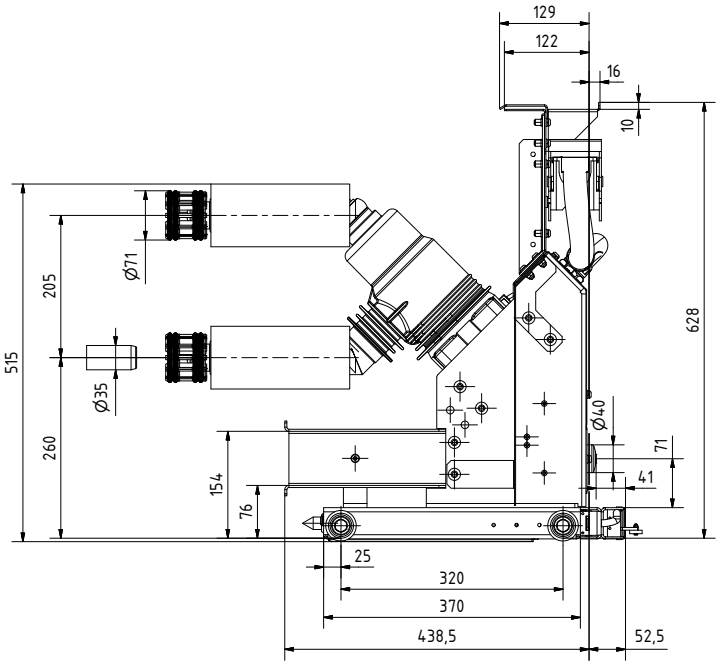


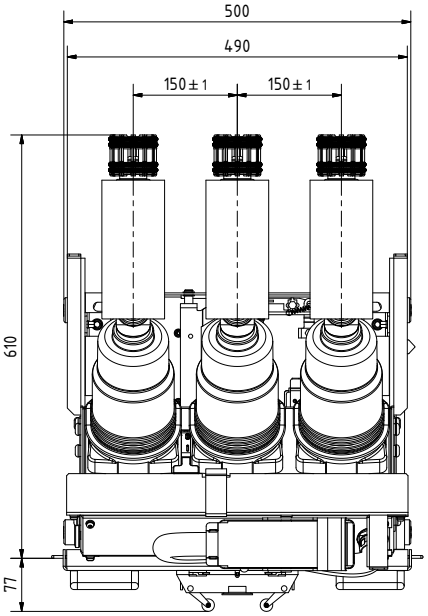


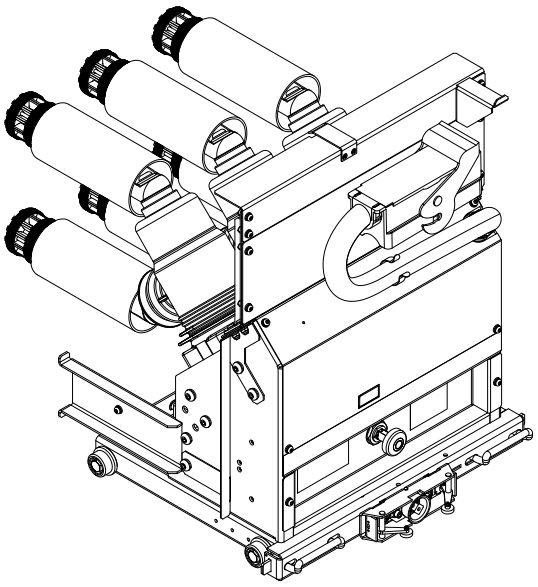
VCB15_MD1_16D
17.5kV, 1250 A, PCD: 210 mm,
weight: 74 kg

L_{max} = 677 mm
W_{max} = 682 mm
H_{max} = 515 mm



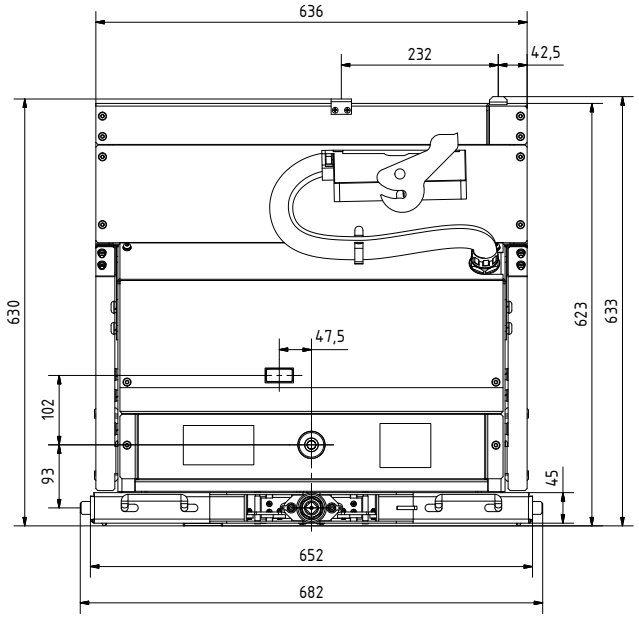


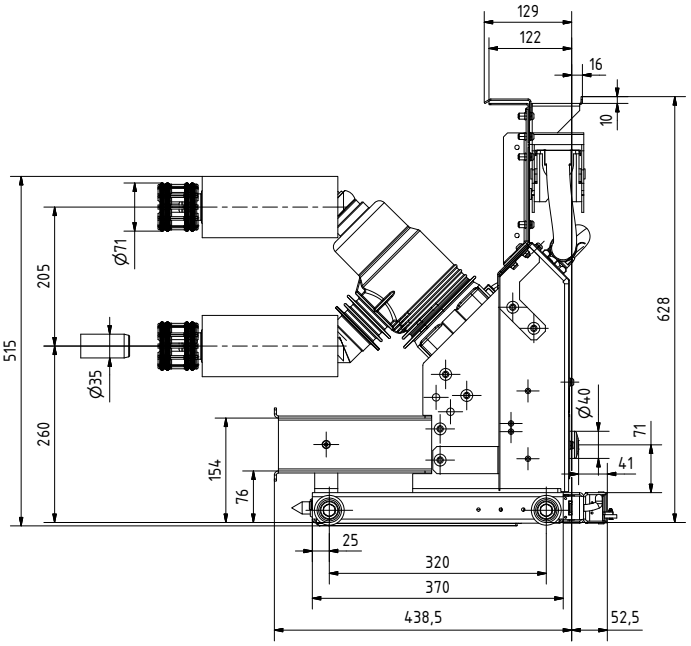


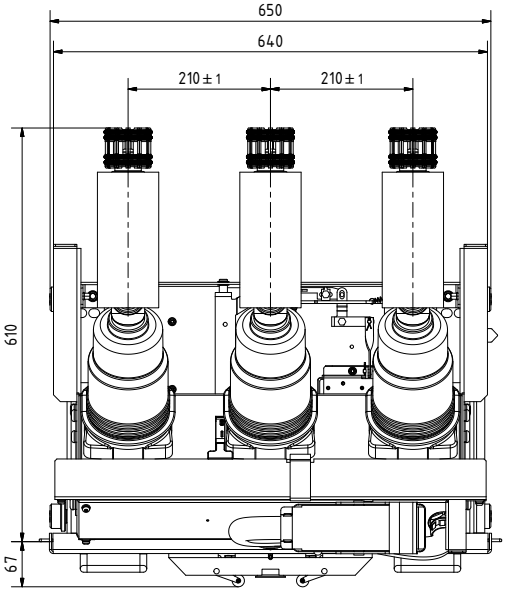


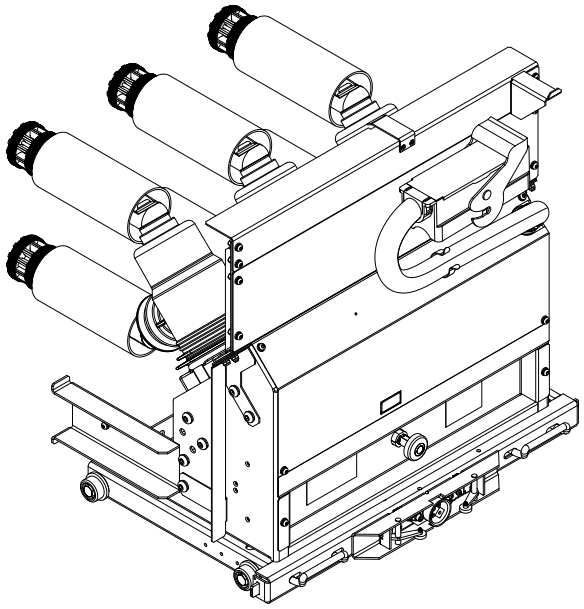
VCB15_MD1_16D
17.5kV, 1250 A, PCD: 150 mm, with IP2X front cover, weight 76 kg

L_{max} = 677 mm
W_{max} = 535 mm
H_{max} = 633 mm





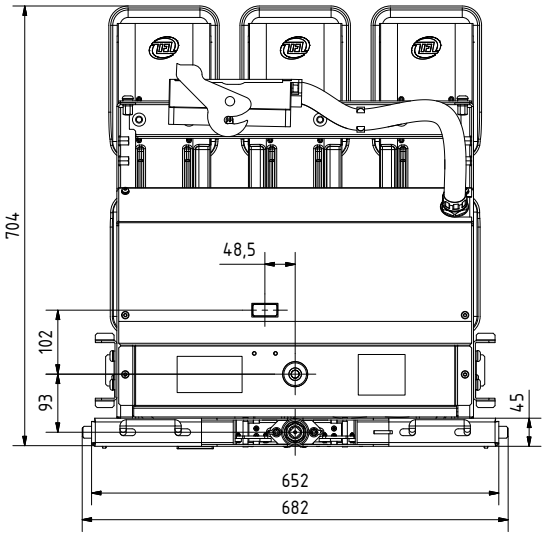


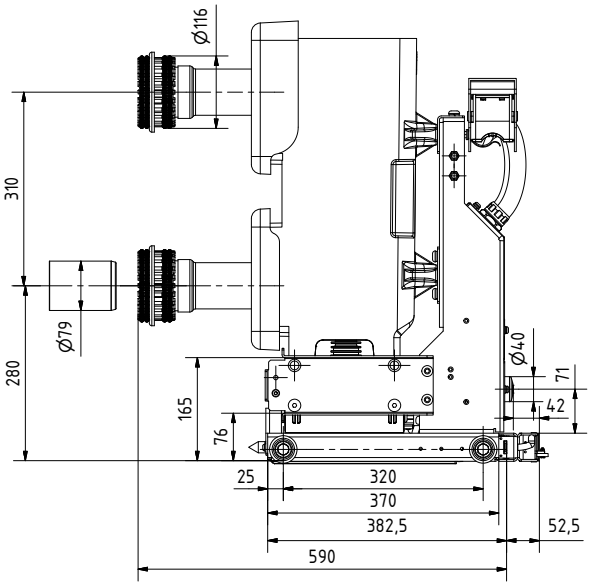


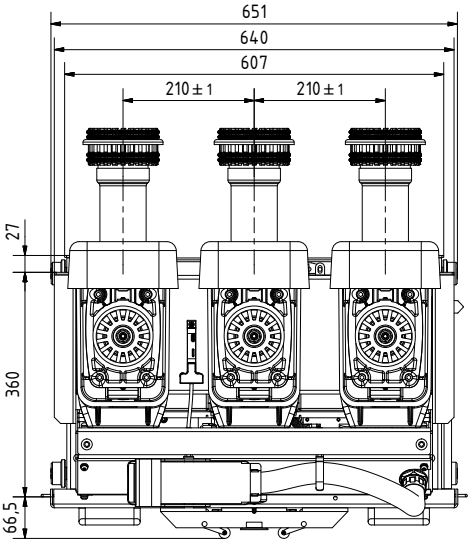
VCB15_MD1_16D
17.5kV, 1250 A, PCD: 210 mm, with IP2X front cover, weight 88 kg

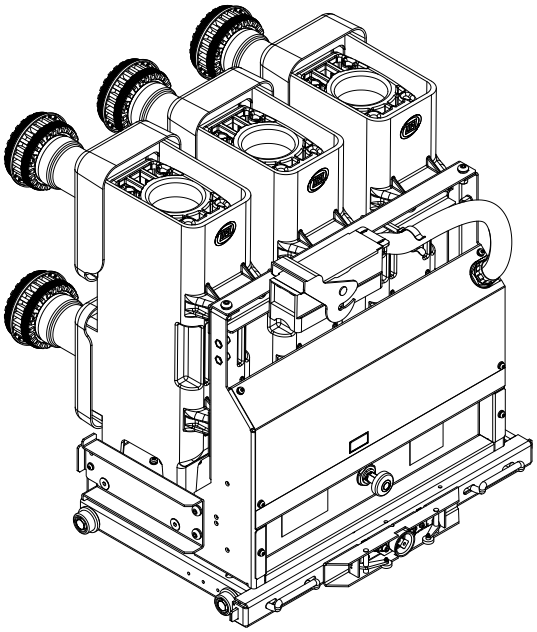
L_{max} = 677 mm
W_{max} = 682 mm
H_{max} = 633 mm

VCB15_HD1_16D



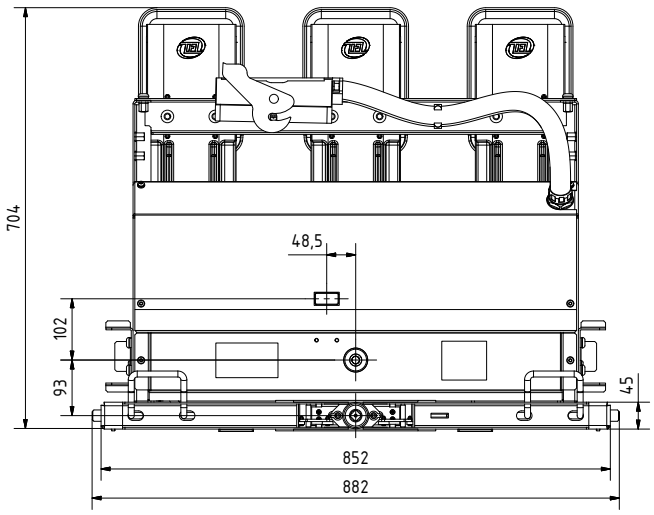


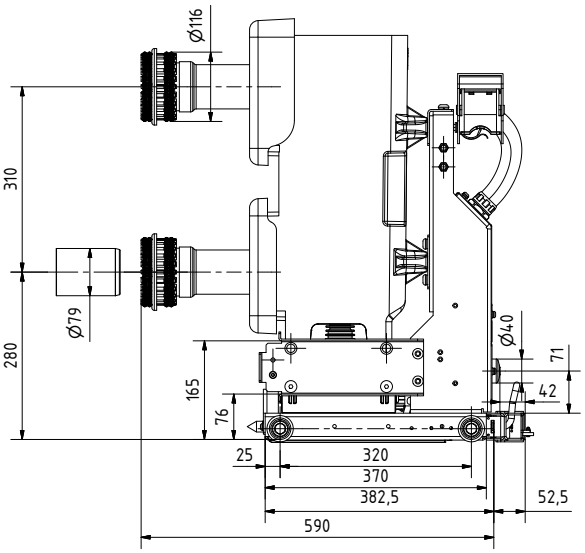


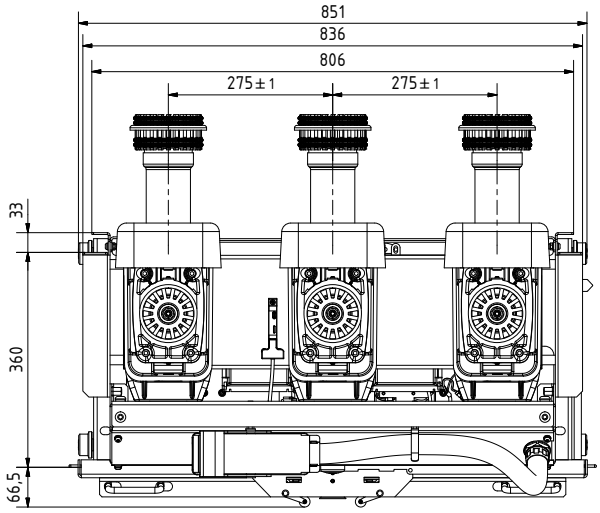


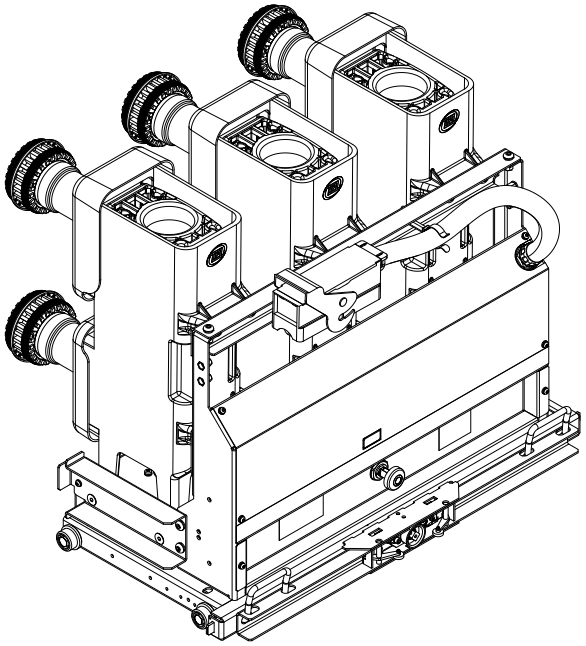
VCB15_HD1_16D
17.5kV, 2500 A, PCD: 210 mm,
weight: 128 kg

L_{max} = 656.5 mm
W_{max} = 682 mm
H_{max} = 704 mm



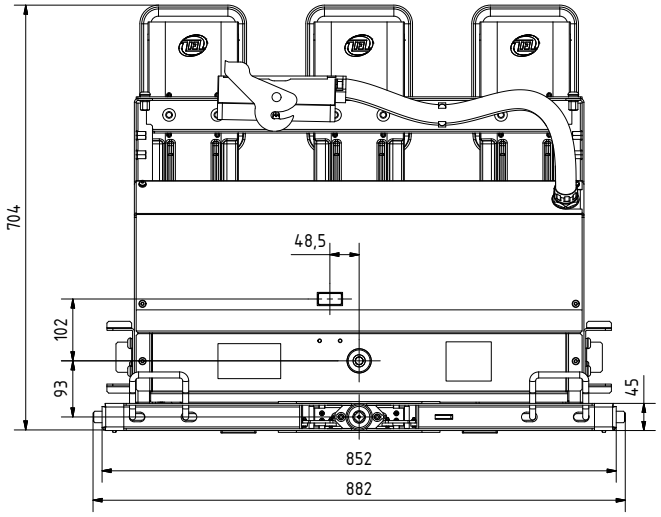


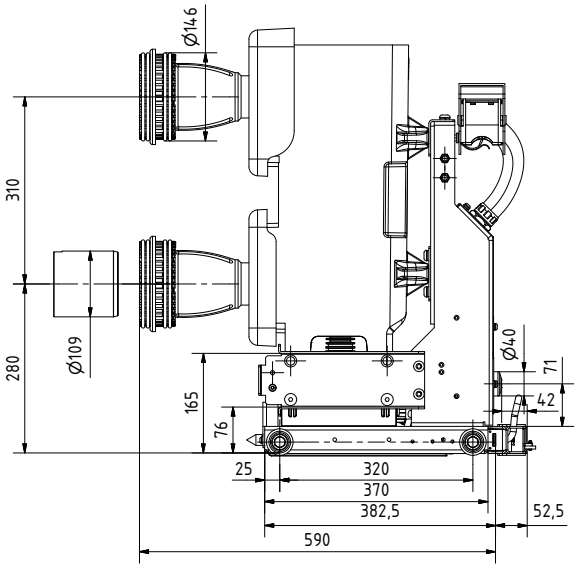


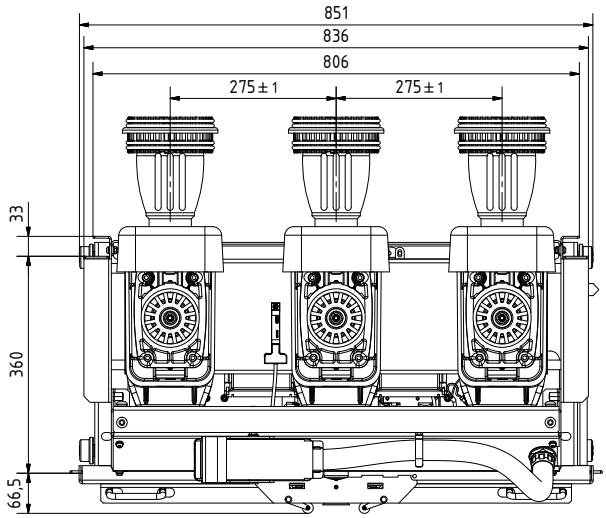


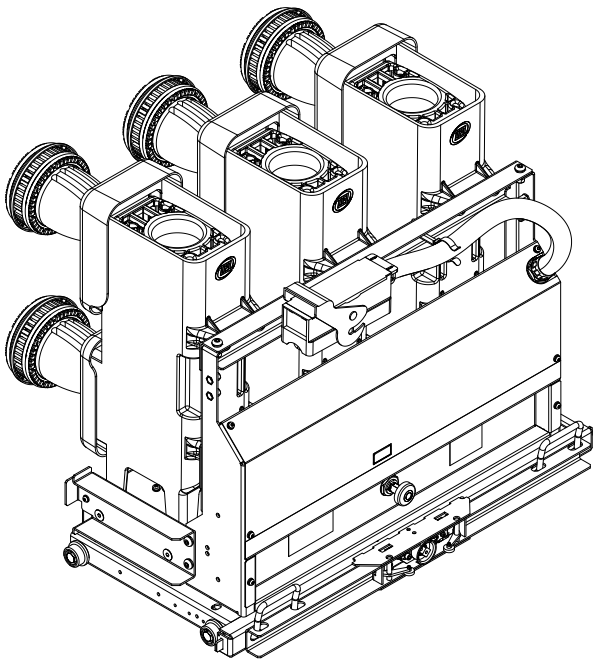
VCB15_HD1_16D
17.5kV, 2500 A, PCD: 275 mm,
weight: 140 kg

L_{max} = 656.5 mm
W_{max} = 882 mm
H_{max} = 704 mm



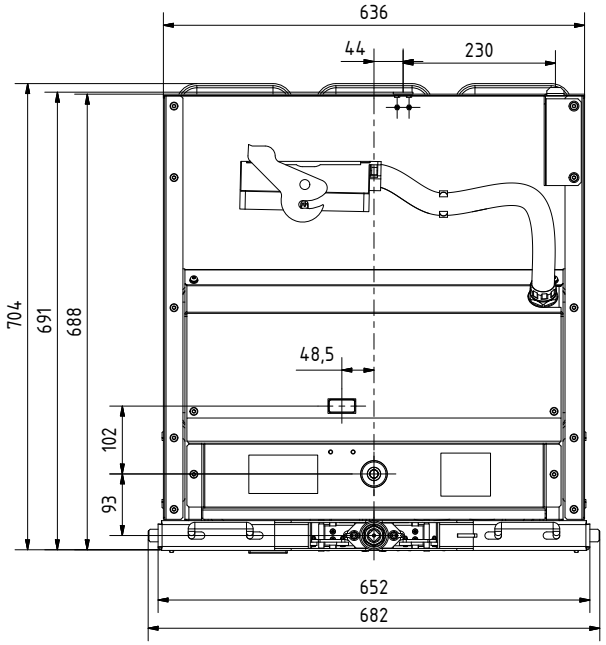


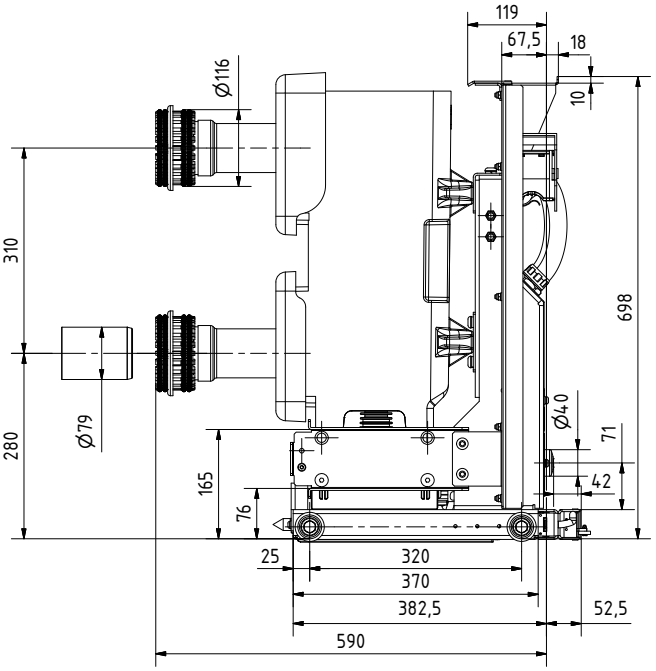


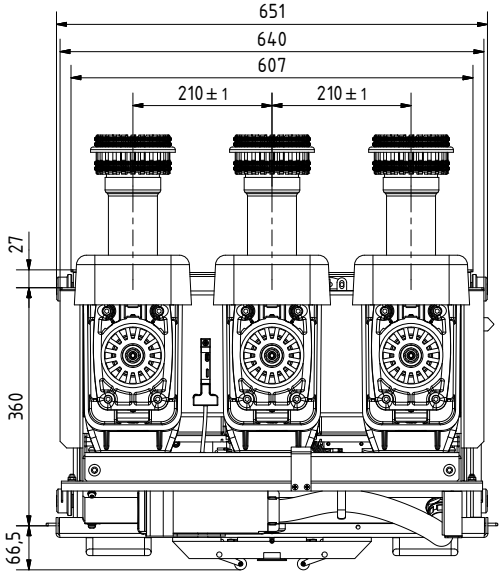


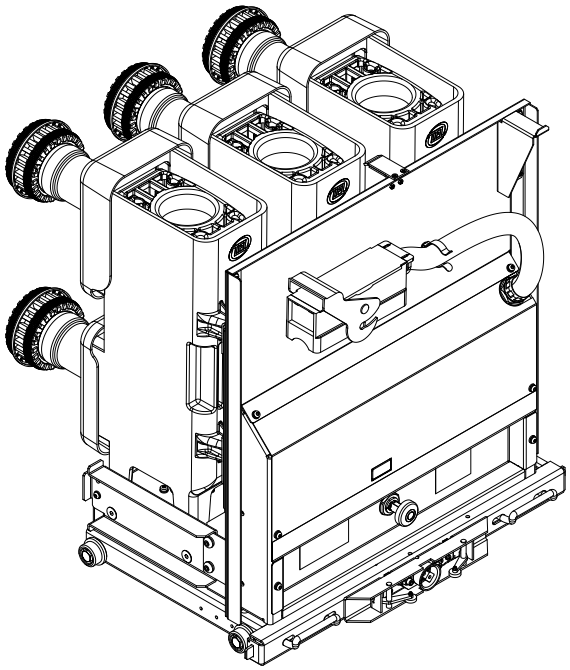
VCB15_HD1_16D
17.5kV, 3150 A, PCD: 275 mm,
weight: 158 kg

L_{max} = 656.5 mm
W_{max} = 882 mm
H_{max} = 704 mm



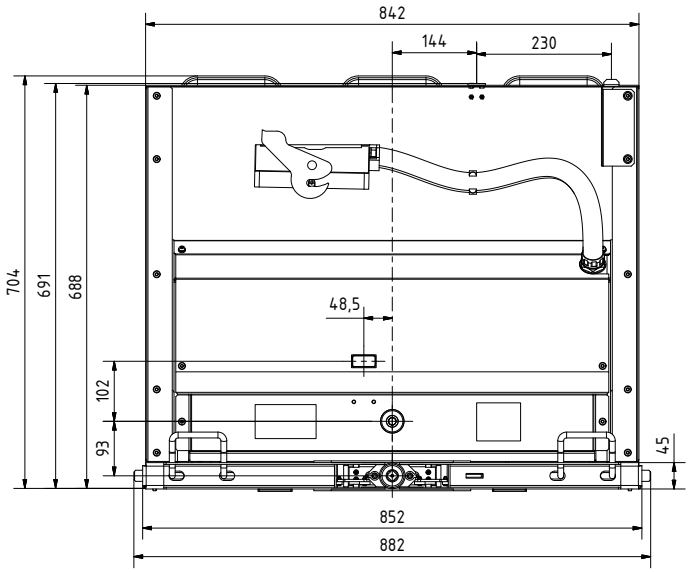


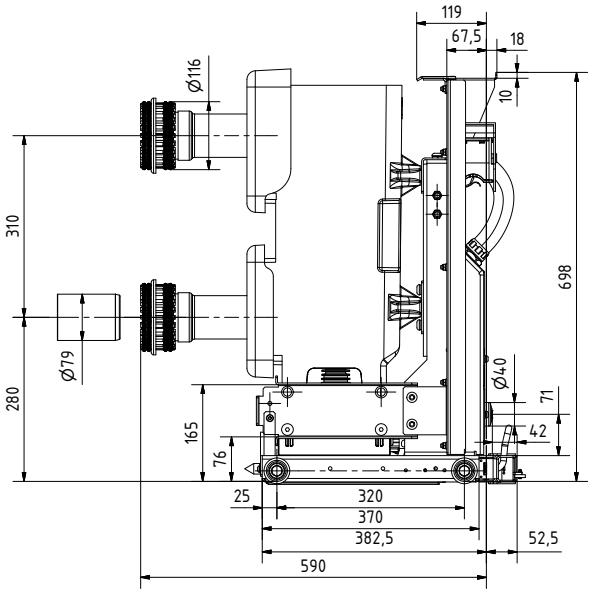


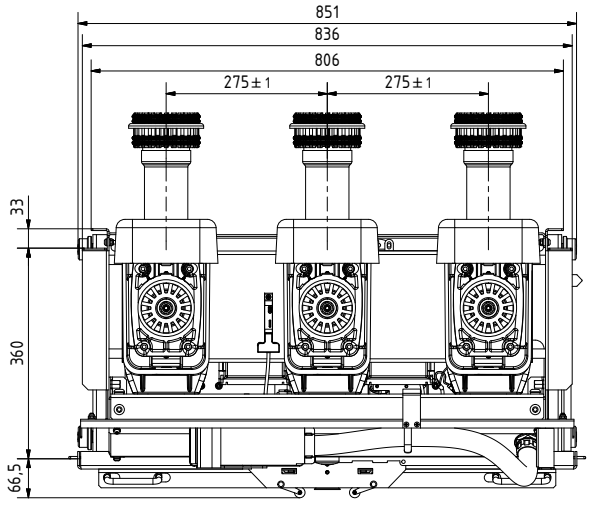


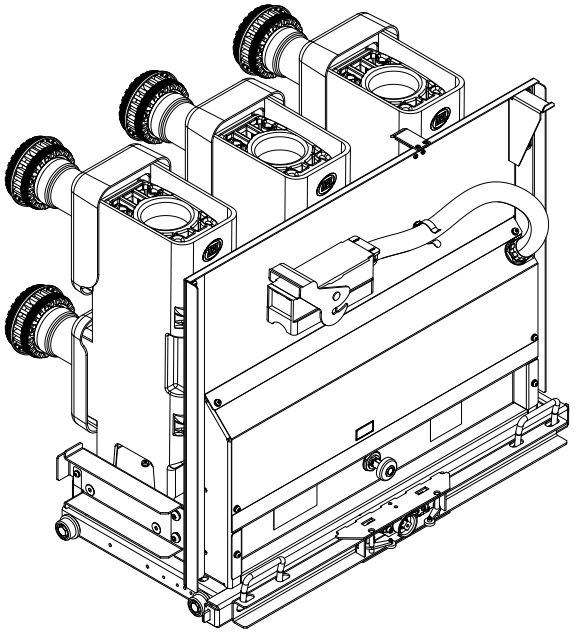
VCB15_HD1_16D
17.5kV, 2500 A, PCD: 210 mm, with IP2X front cover, weight 133 kg

L_{max} = 656.5 mm
W_{max} = 682 mm
H_{max} = 704 mm



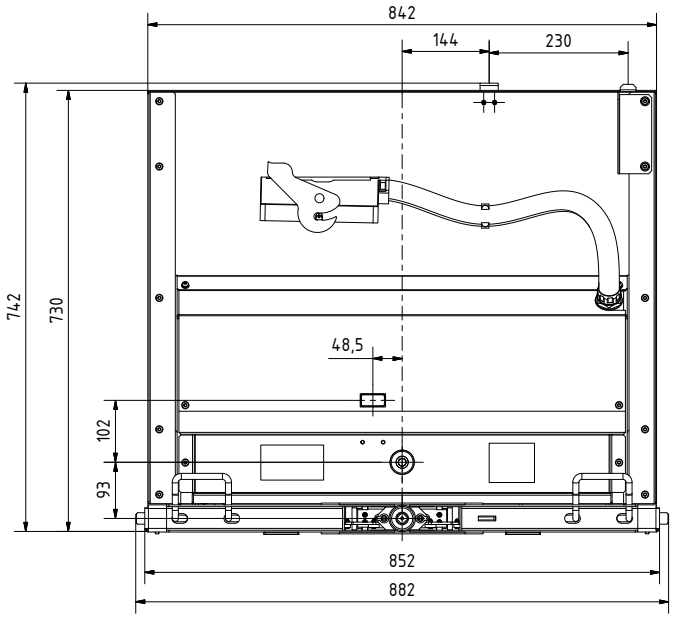


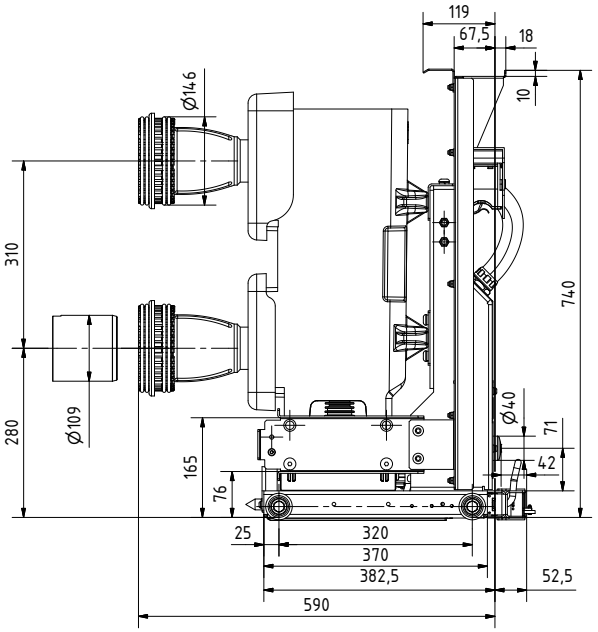


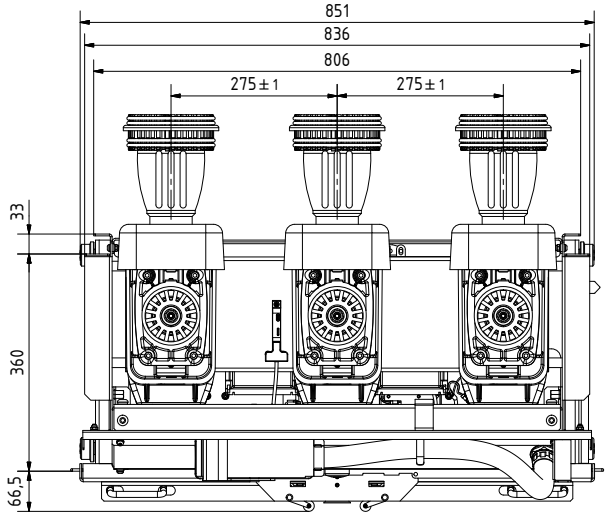


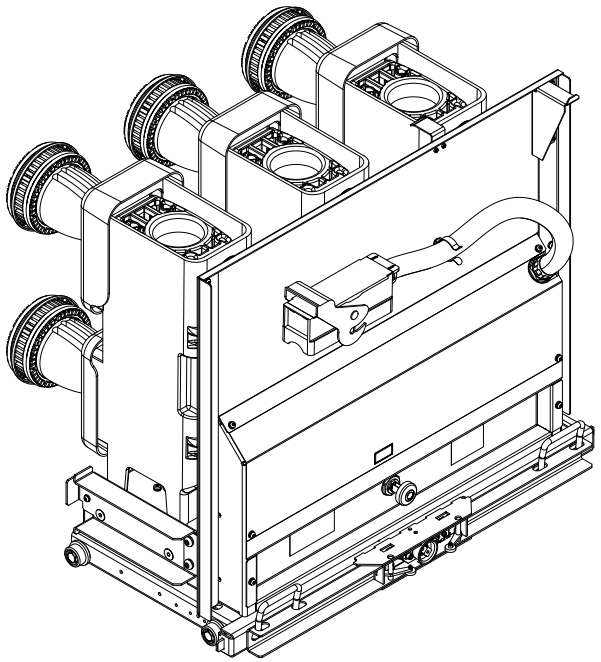
VCB15_HD1_16D
17.5kV, 2500 A, PCD: 275 mm, with IP2X front cover, weight 147 kg

L_{max} = 656.5 mm
W_{max} = 882 mm
H_{max} = 704 mm





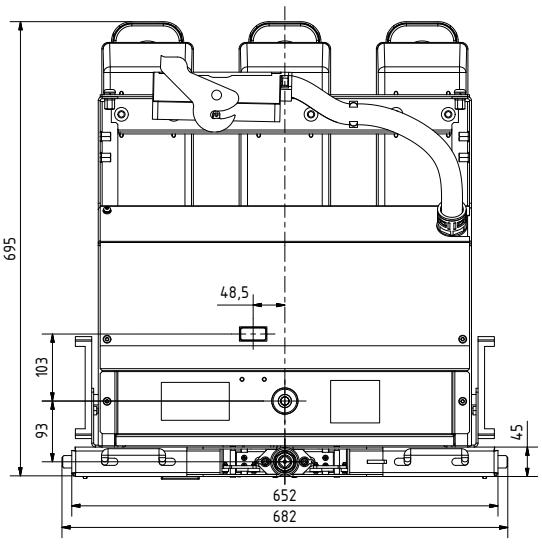


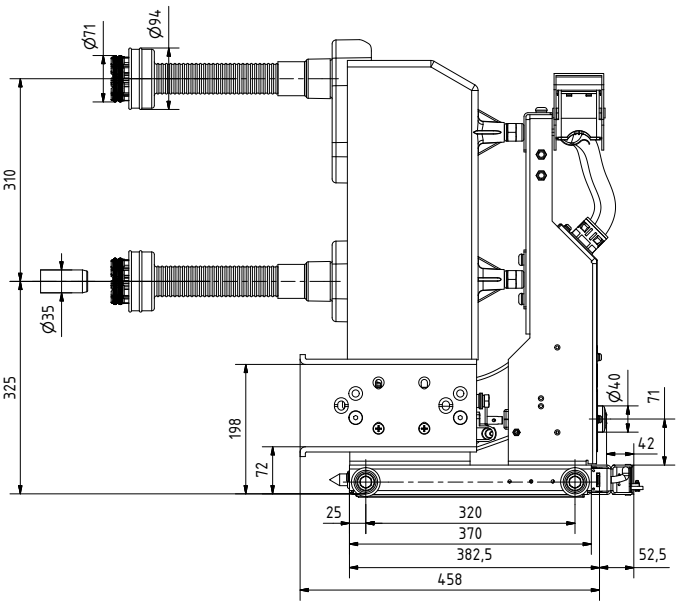


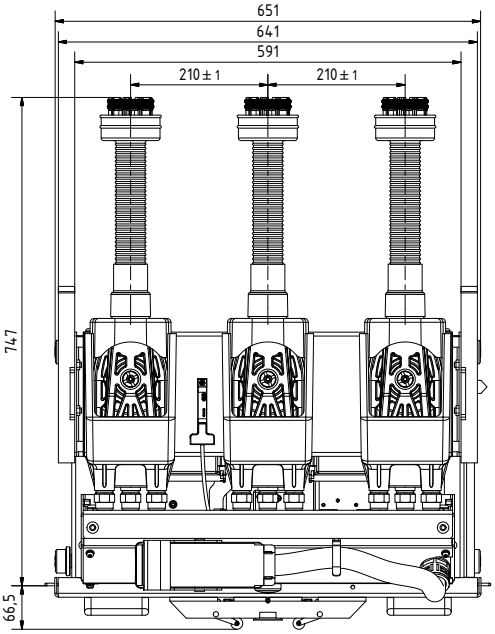
VCB15_HD1_16D
17.5kV, 3150 A, PCD: 275 mm, with IP2X front cover, weight 165 kg

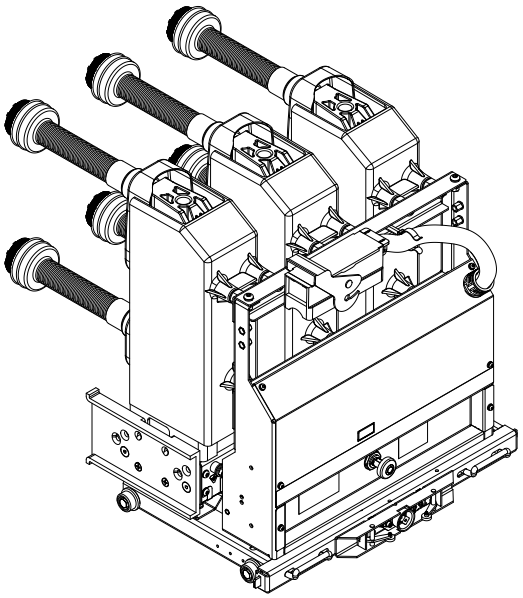
L_{max} = 656.5 mm
W_{max} = 882 mm
H_{max} = 742 mm

VCB25_Shell2_16D



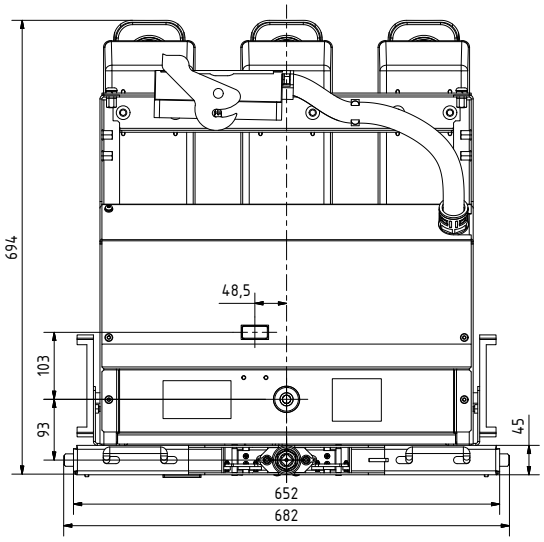


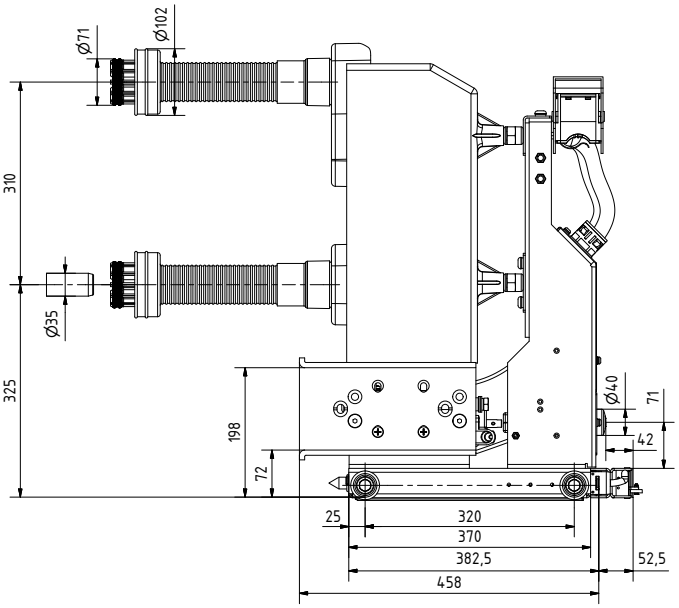


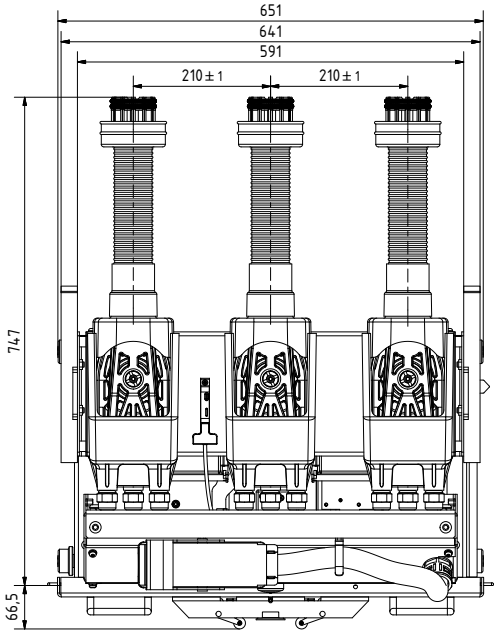


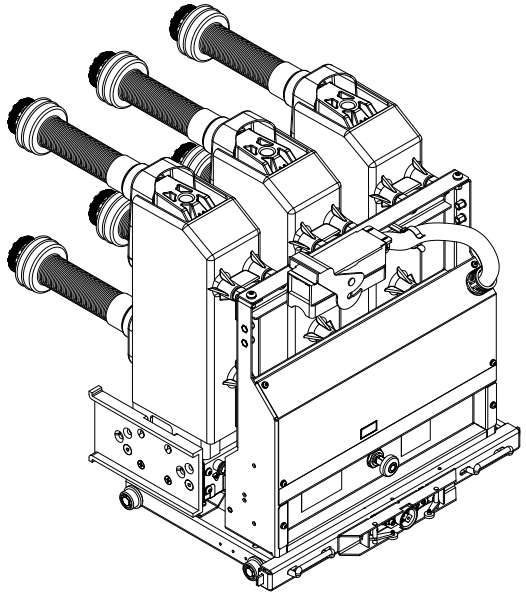
VCB25_Shell2_16D
24kV, 630 A, PCD: 210 mm, 370 mm depth of movable part of cassette, weight: 101 kg

L_{max} = 813.5 mm
W_{max} = 682 mm
H_{max} = 695 mm



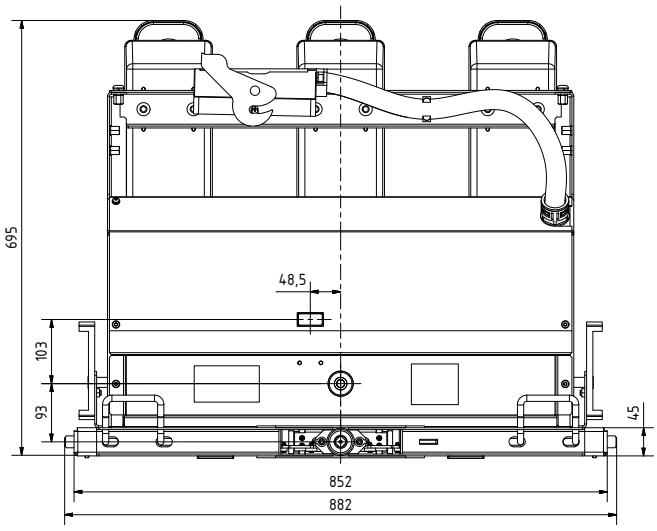


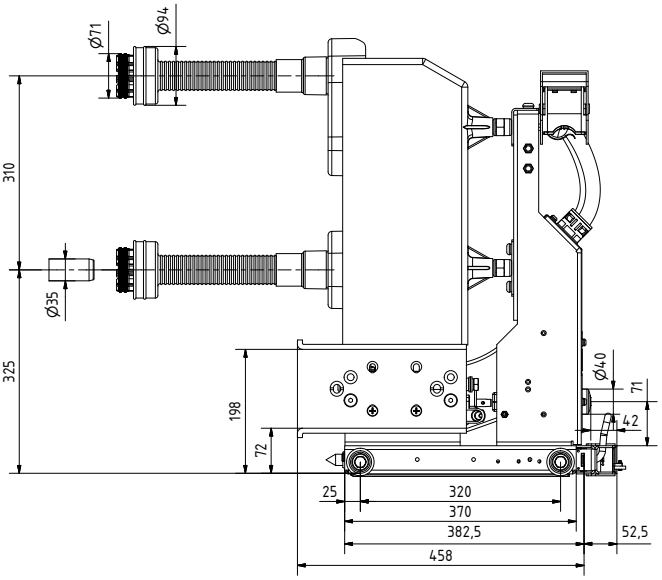


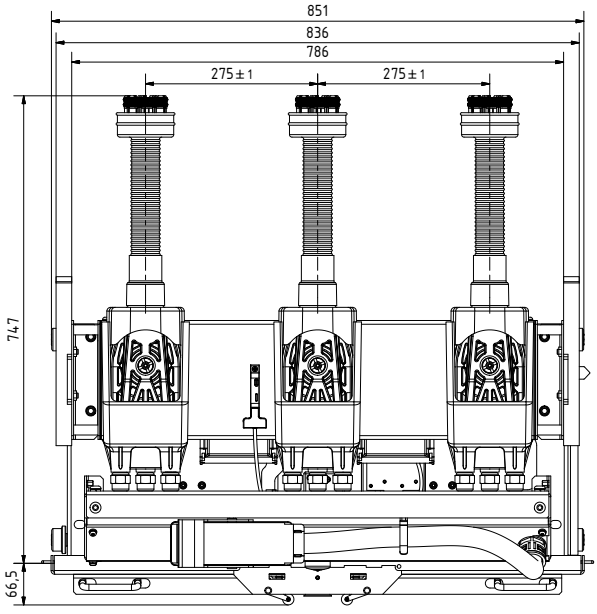


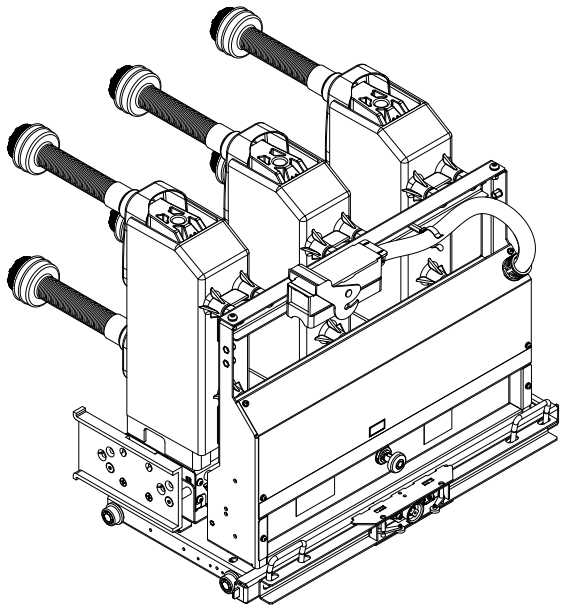
VCB25_Shell2_16D
24kV, 1250 A, PCD: 210 mm, 370 mm depth of movable part of cassette, weight: 112 kg

L_{max} = 813.5 mm
W_{max} = 682 mm
H_{max} = 694 mm



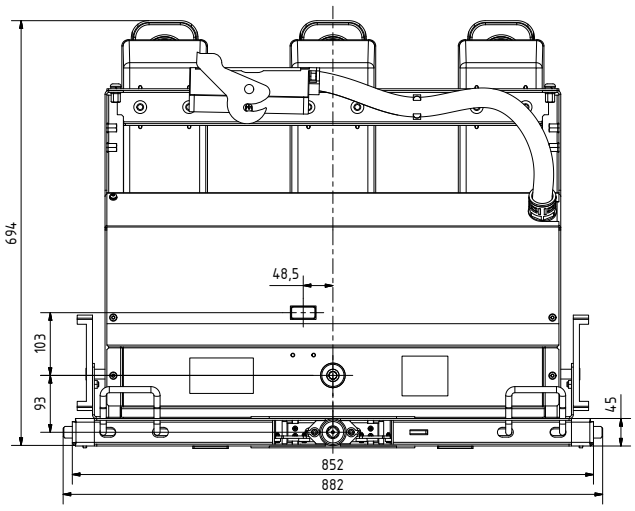


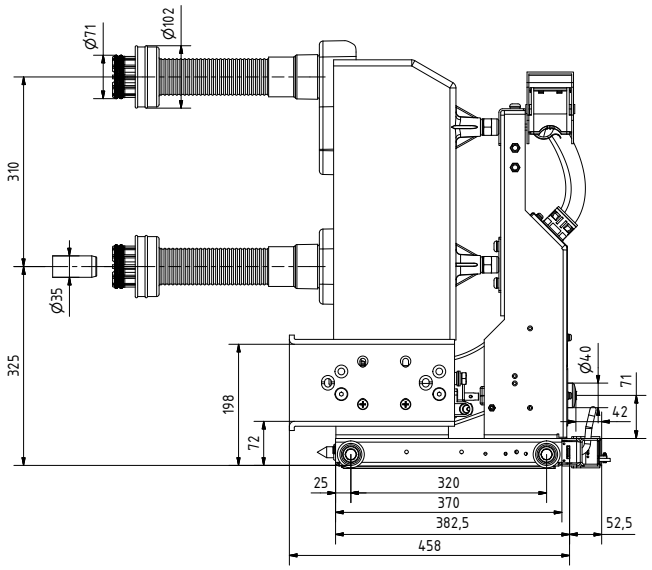


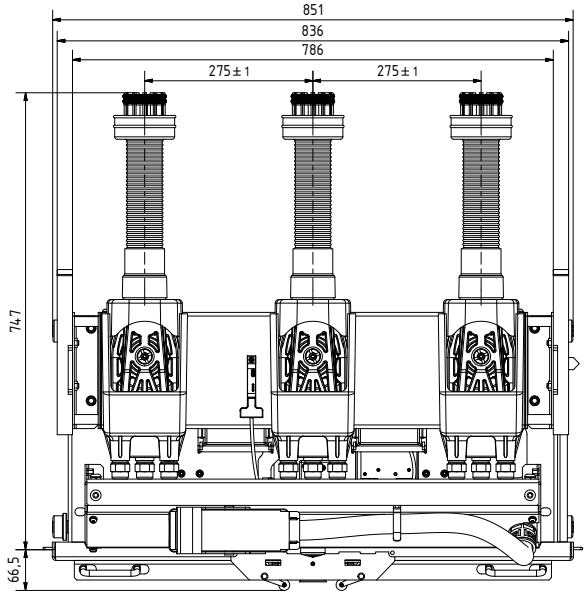


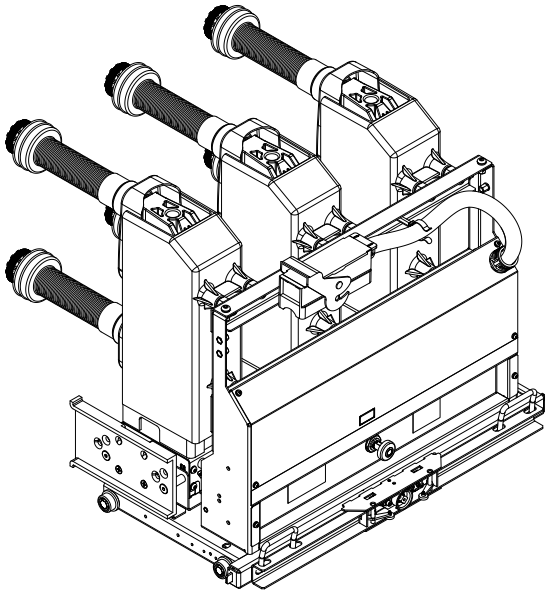
VCB25_Shell2_16D
24kV, 630 A, PCD: 275 mm, 370 mm depth of movable part of cassette, weight: 115 kg

L_{max} = 813.5 mm
W_{max} = 882 mm
H_{max} = 695 mm



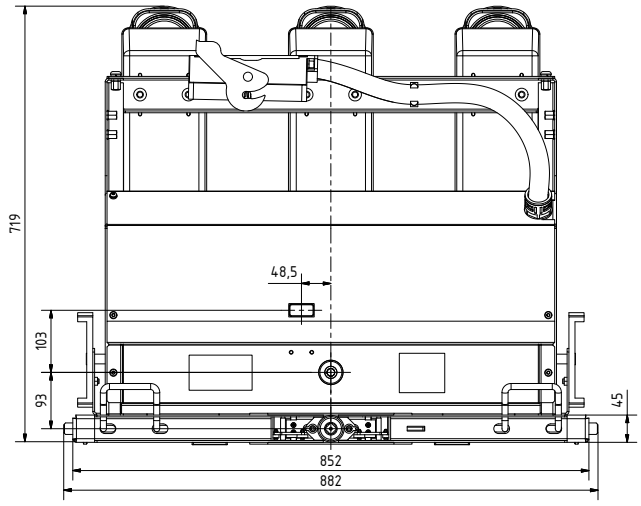


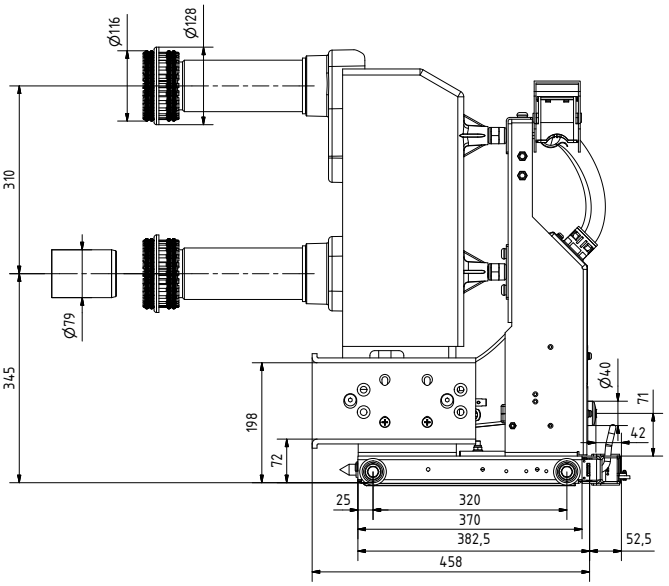


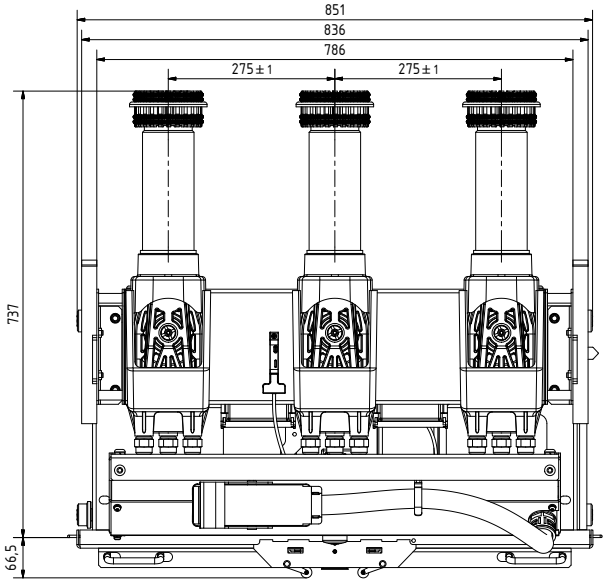


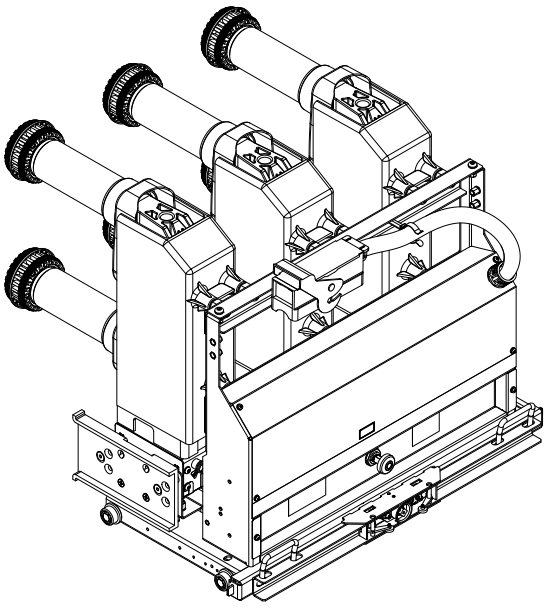
VCB25_Shell2_16D
24kV, 1250 A, PCD: 275 mm, 370 mm depth of movable part of cassette, weight: 126 kg

L_{max} = 813.5 mm
W_{max} = 882 mm
H_{max} = 694 mm



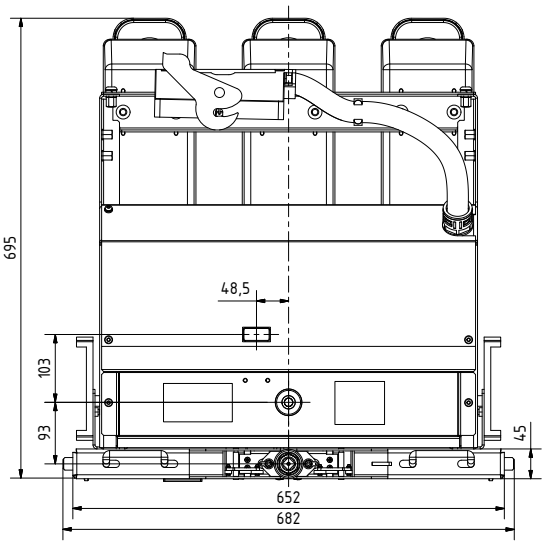


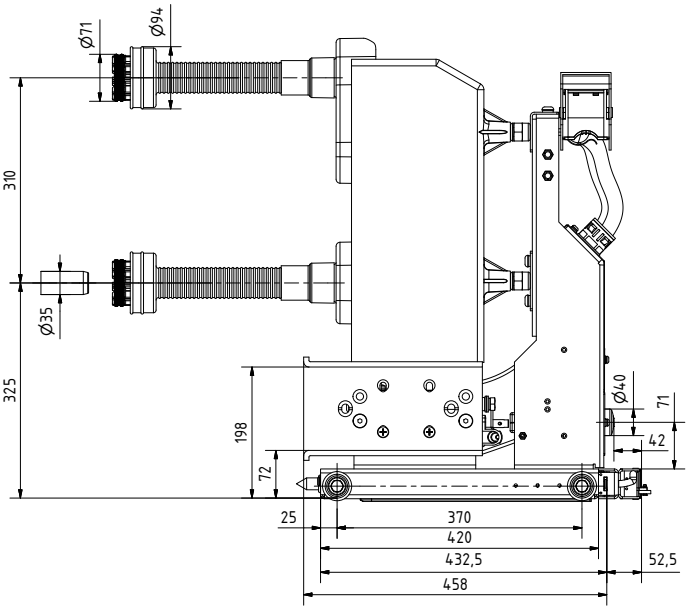


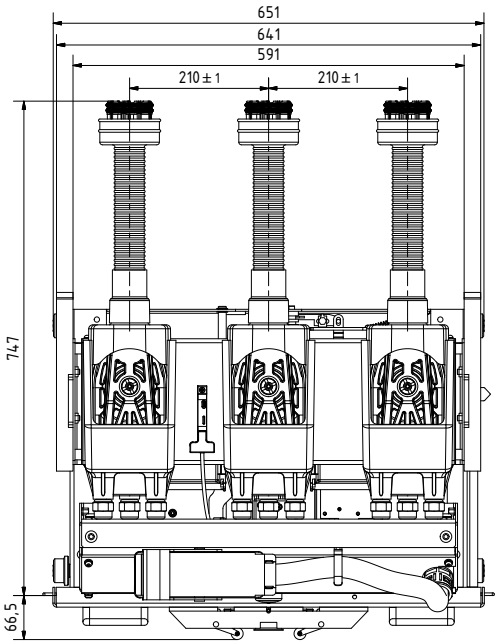


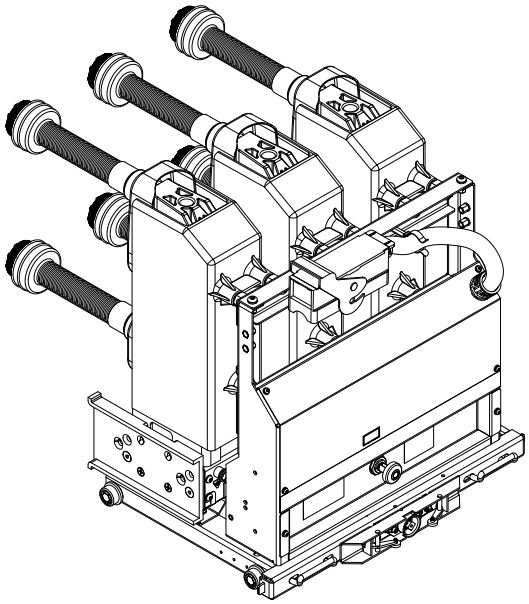
VCB25_Shell2_16D
24kV, 2500 A, PCD: 275 mm, 370 mm depth of movable part of cassette, weight: 180 kg

L_{max} = 803.5 mm
W_{max} = 882 mm
H_{max} = 719 mm



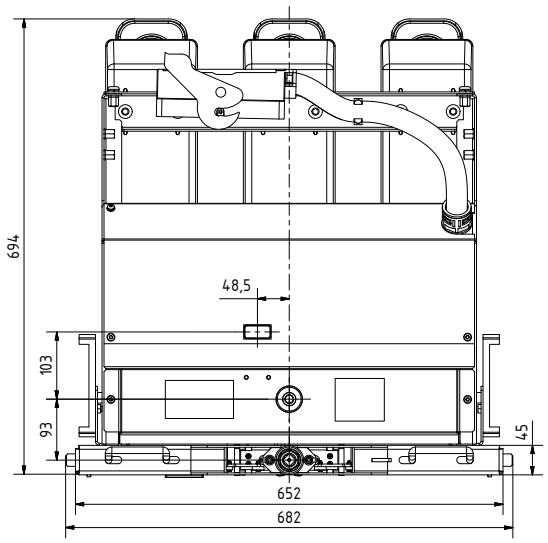


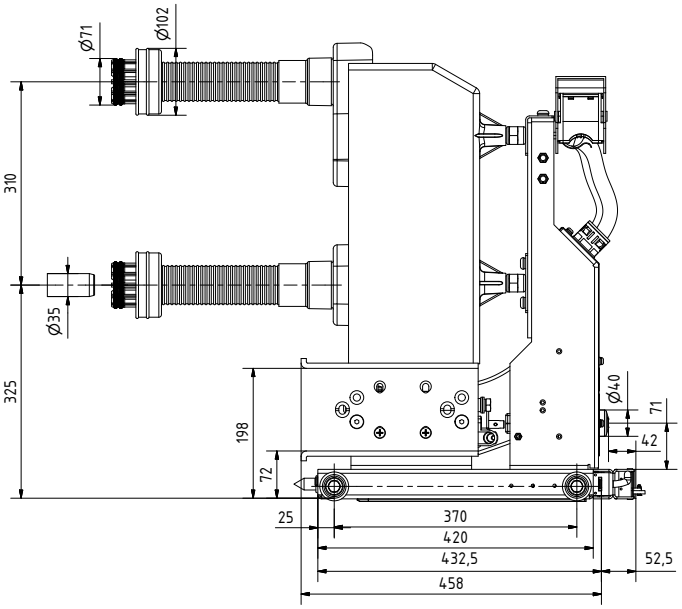


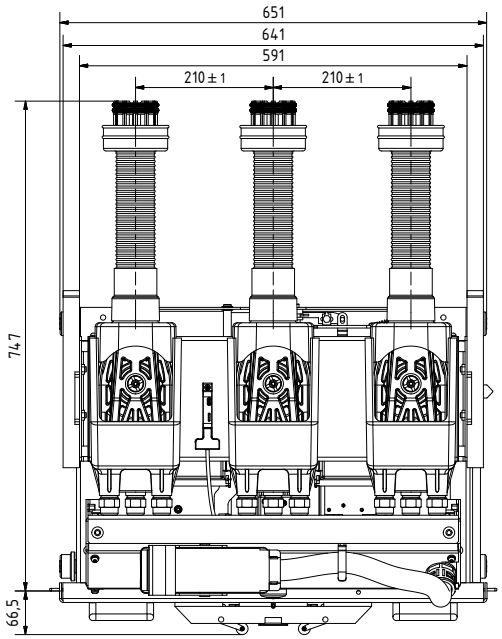


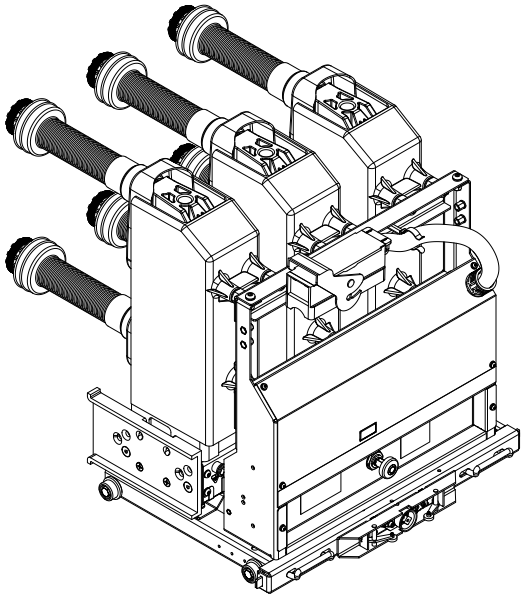
VCB25_Shell2_16D
24kV, 630 A, PCD: 210 mm, 420 mm depth of movable part of cassette, weight: 102 kg

L_{max} *= 813.5 mm*
W_{max} *= 682 mm*
H_{max} *= 695 mm*



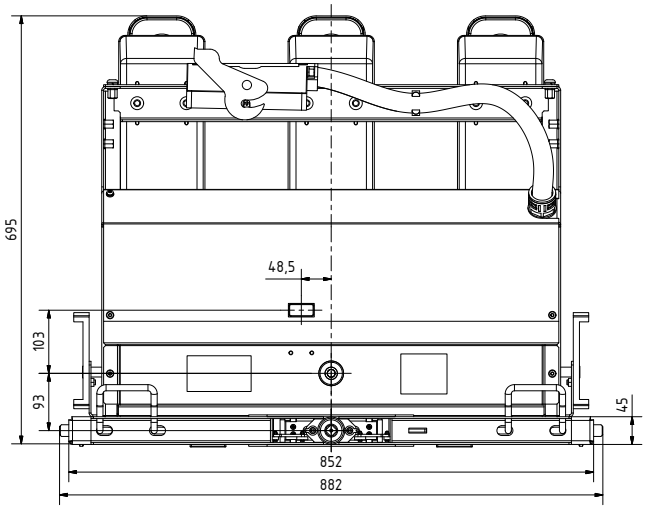


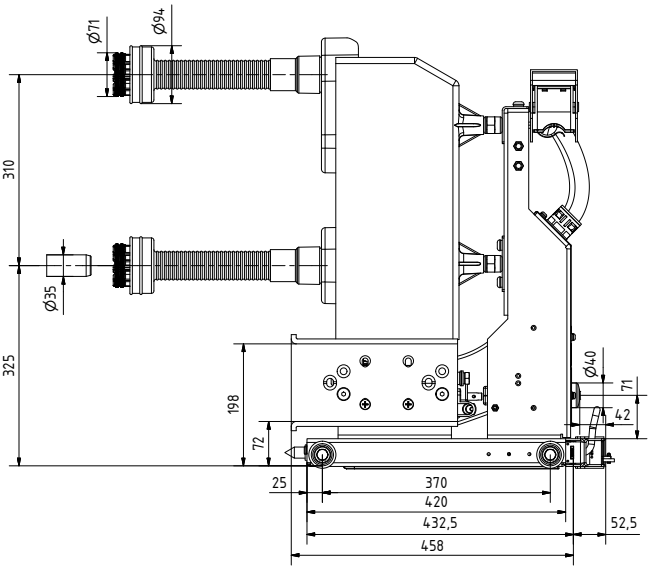


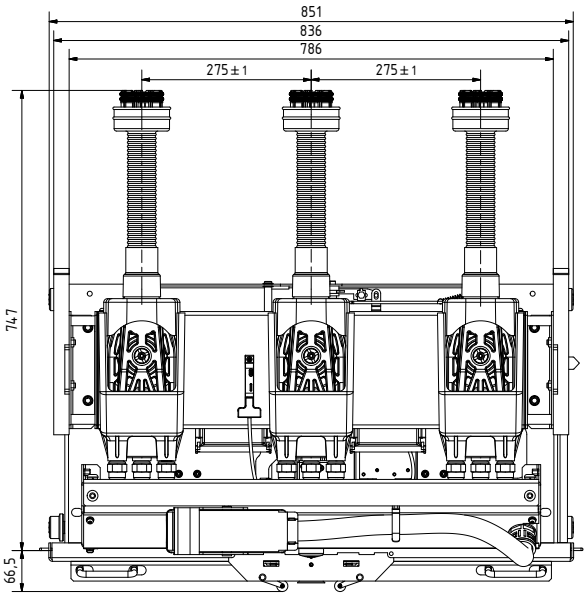


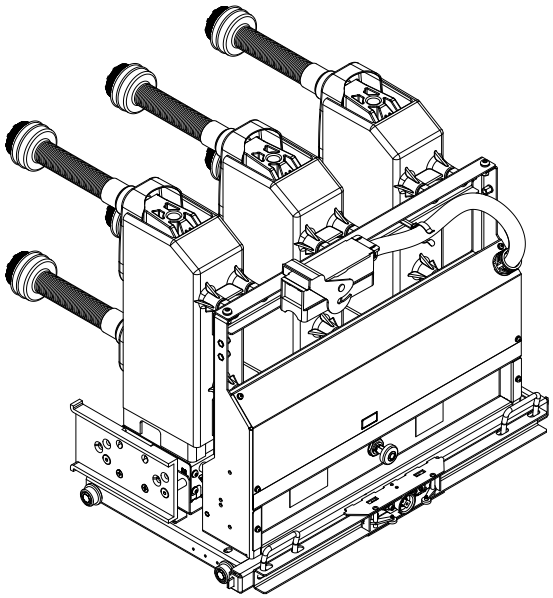
VCB25_Shell2_16D
24kV, 1250 A, PCD: 210 mm, 420 mm depth of movable part of cassette,
weight: 113 kg

L_{max} = 813.5 mm
W_{max} = 682 mm
H_{max} = 694 mm



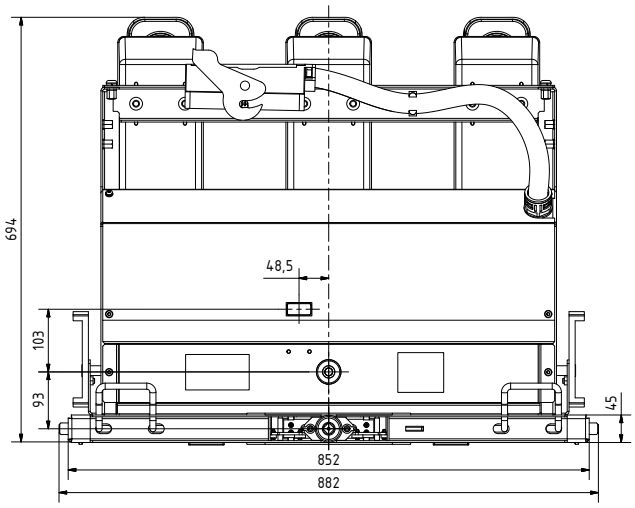


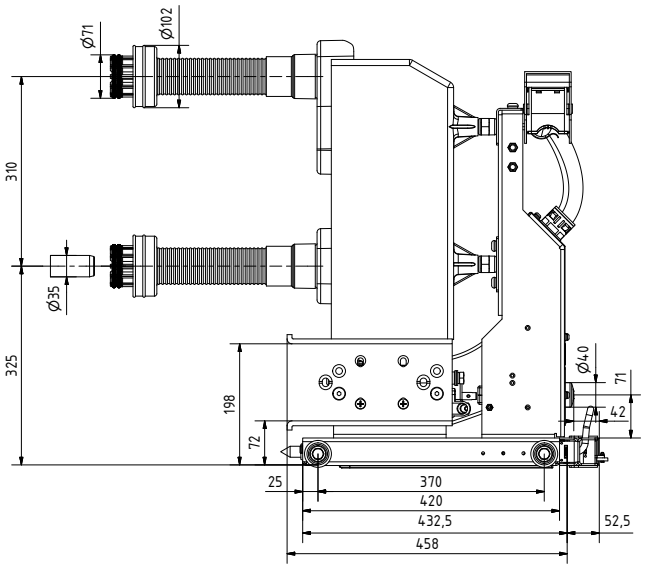


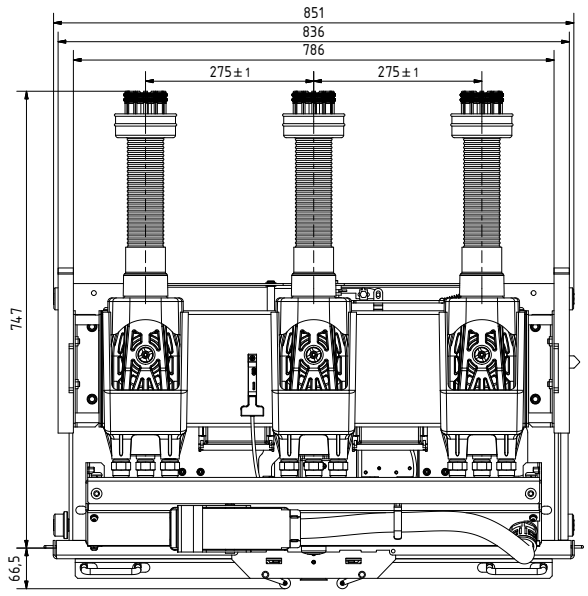


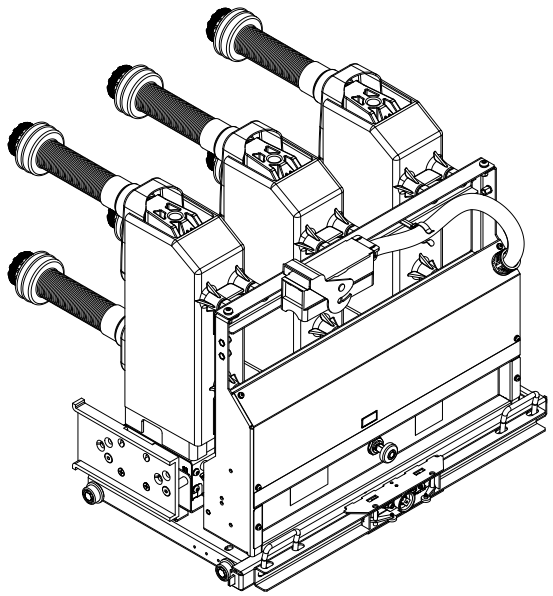
VCB25_Shell2_16D
24kV, 630 A, PCD: 275 mm, 420 mm depth of movable part of cassette, weight: 117 kg

L_{max} = 813.5 mm
W_{max} = 882 mm
H_{max} = 695 mm



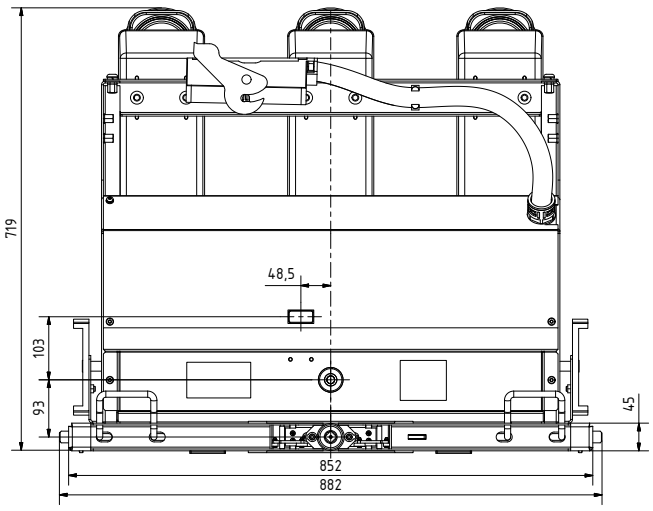


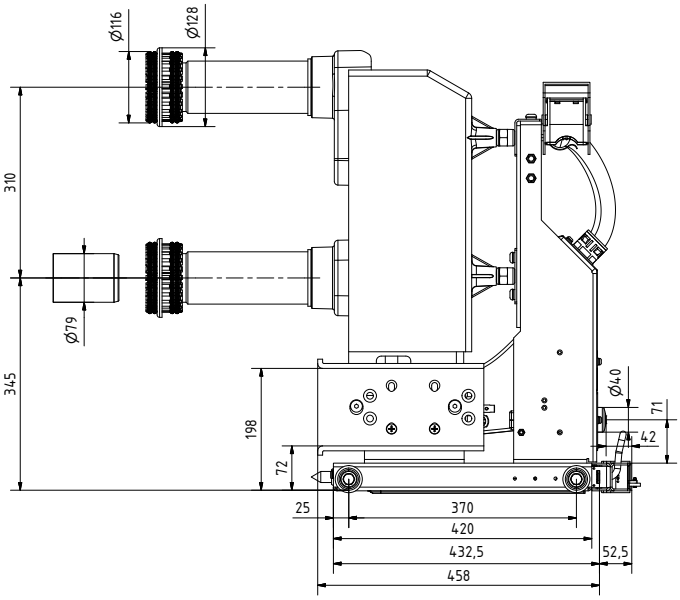


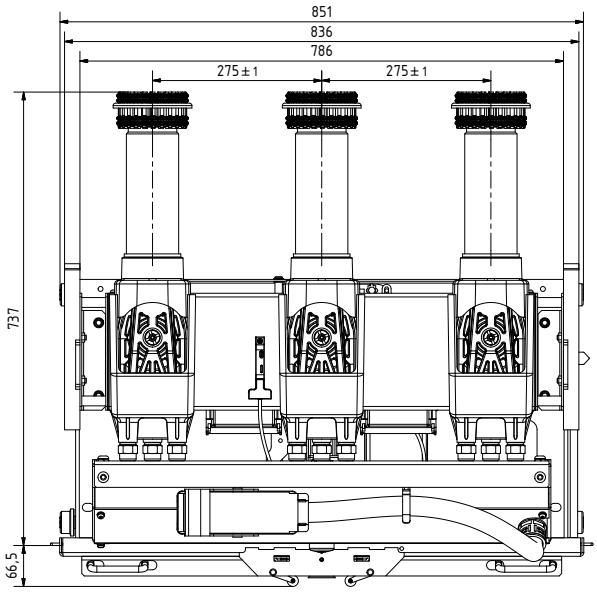


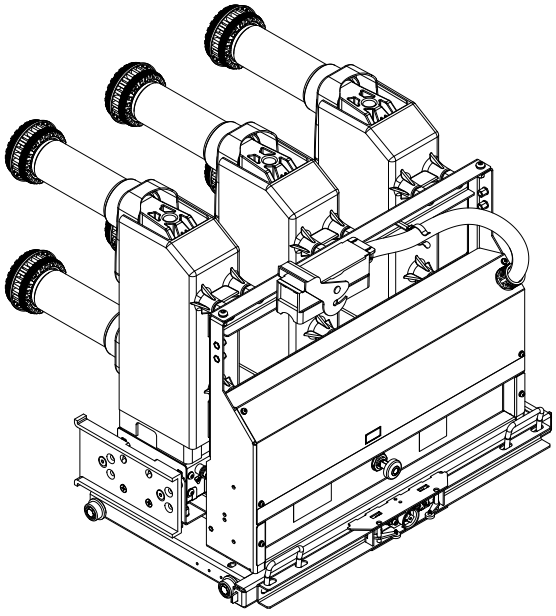
VCB25_Shell2_16D
24kV, 1250 A, PCD: 275 mm, 420 mm depth of movable part of cassette,
weight: 128 kg

L_{max} = 813.5 mm
W_{max} = 882 mm
H_{max} = 694 mm



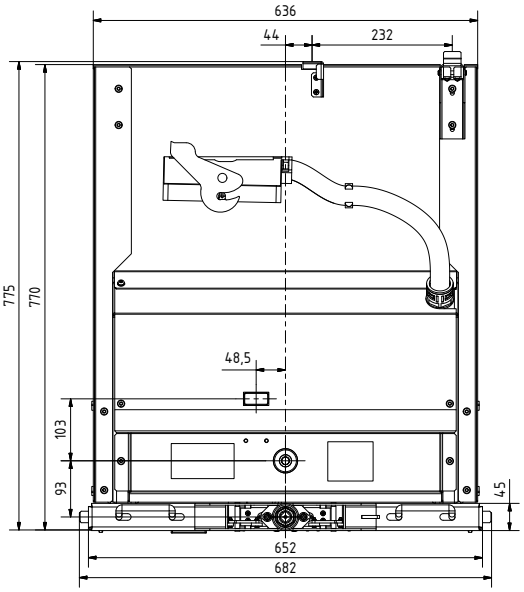


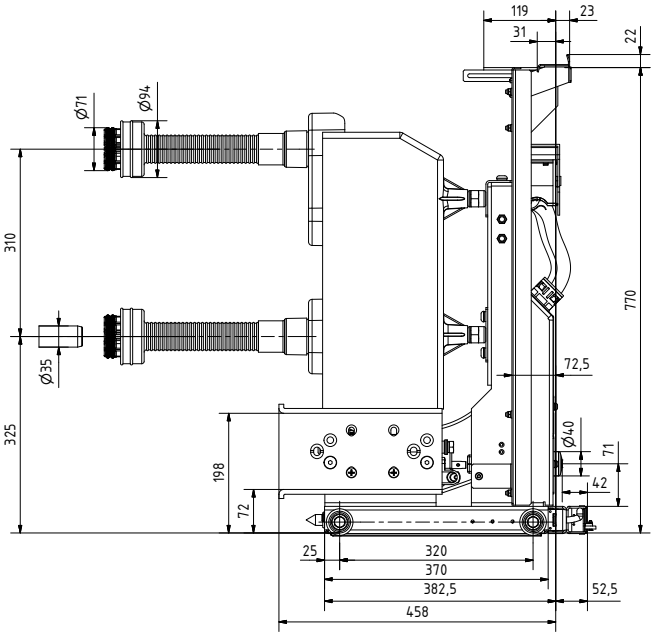


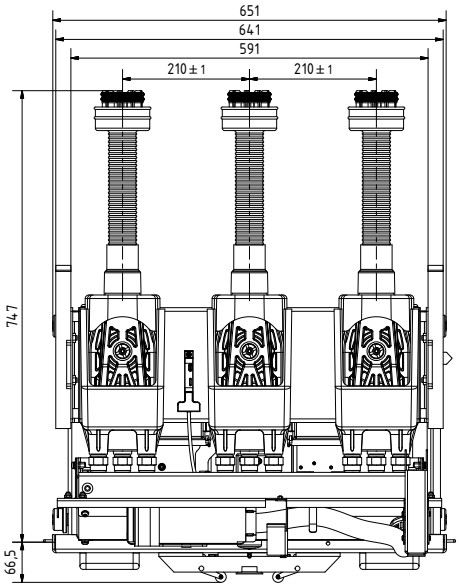


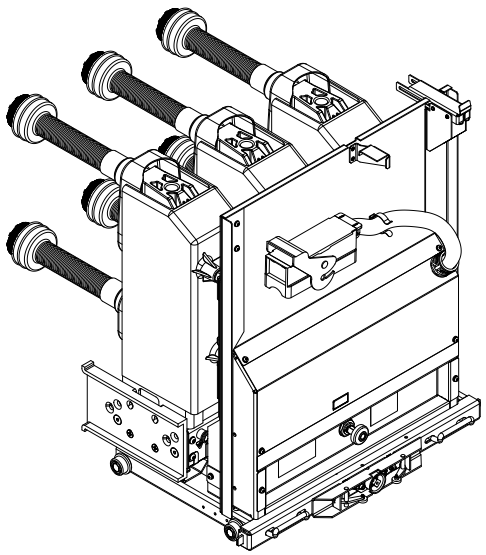
VCB25_Shell2_16D
24kV, 2500 A, PCD: 275 mm, 420 mm depth of movable part of cassette,
weight: 163 kg

L_{max} = 803.5 mm
W_{max} = 882 mm
H_{max} = 719 mm



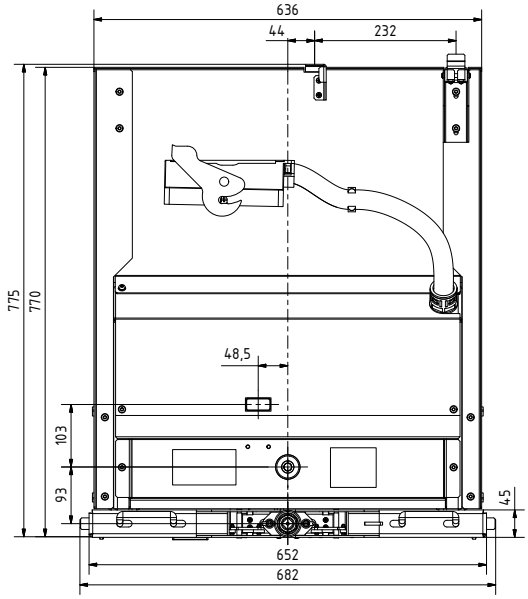


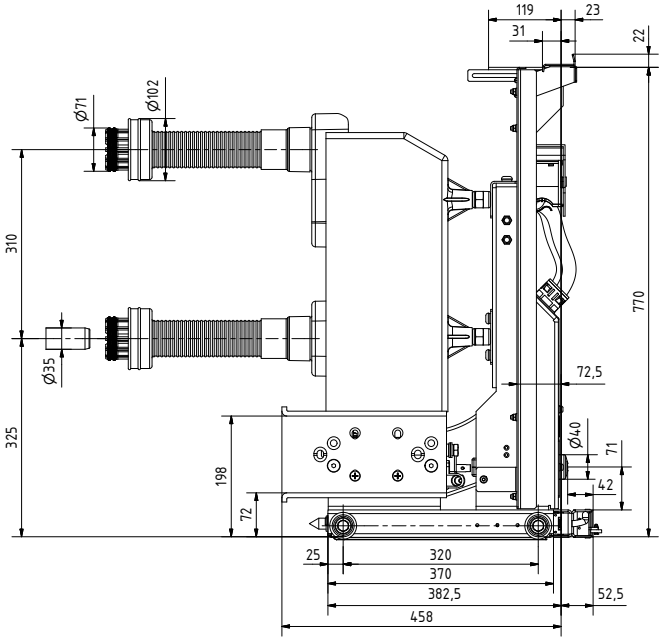


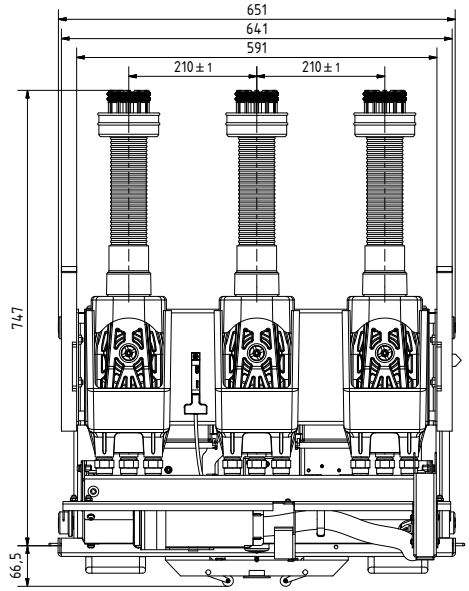


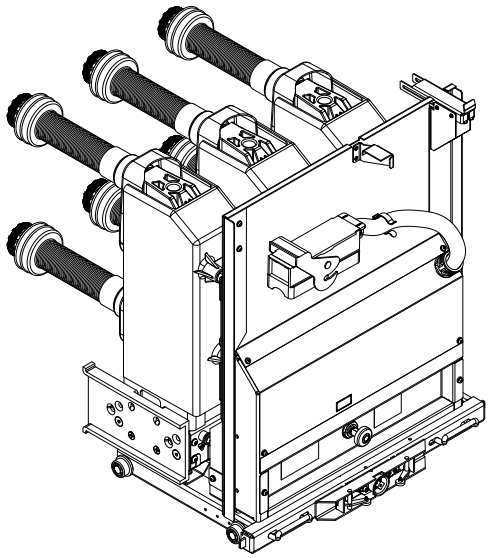
VCB25_Shell2_16D
24kV, 630 A, PCD: 210 mm, 370 mm depth of movable part of cassette, with IP2X front cover, weight: 109 kg

L_{max} = 813.5 mm
W_{max} = 682 mm
H_{max} = 792 mm



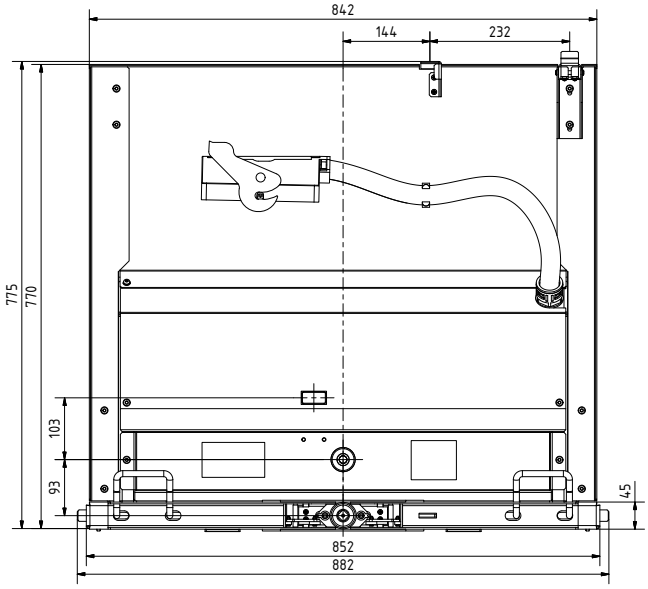


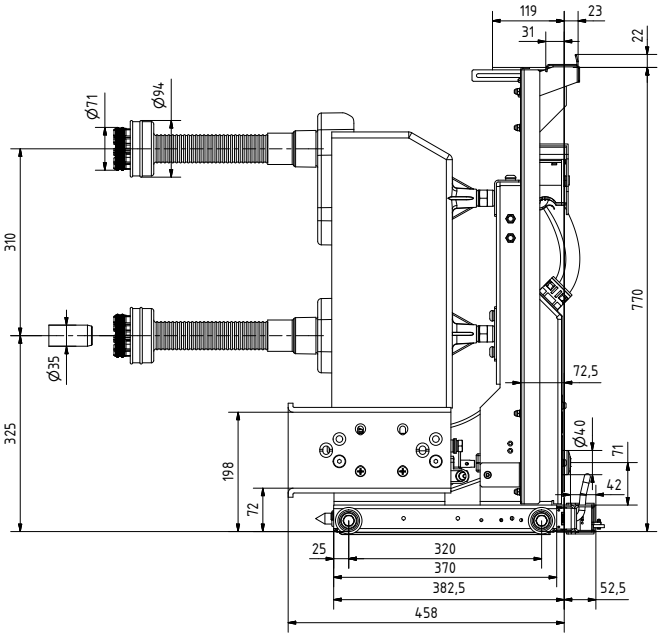


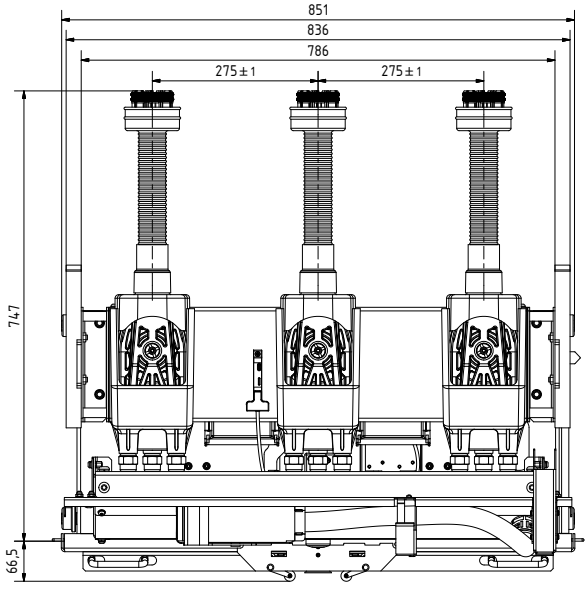


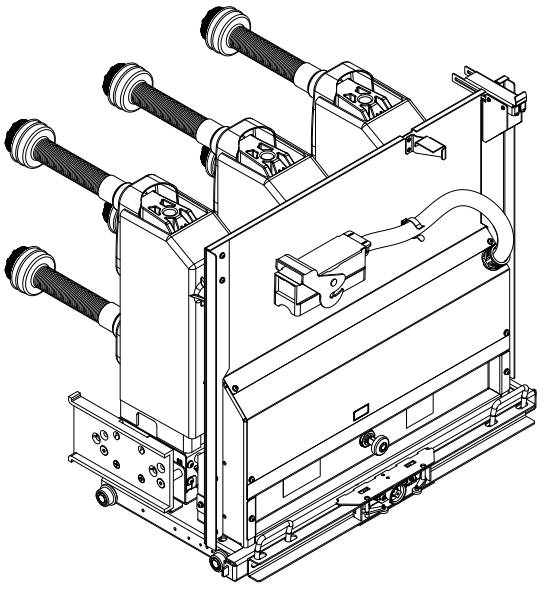
VCB25_Shell2_16D
24kV, 1250 A, PCD: 210 mm, 370 mm depth of movable part of cassette, with IP2X front cover, weight: 120 kg

L_{max} = 813.5 mm
W_{max} = 682 mm
H_{max} = 792 mm



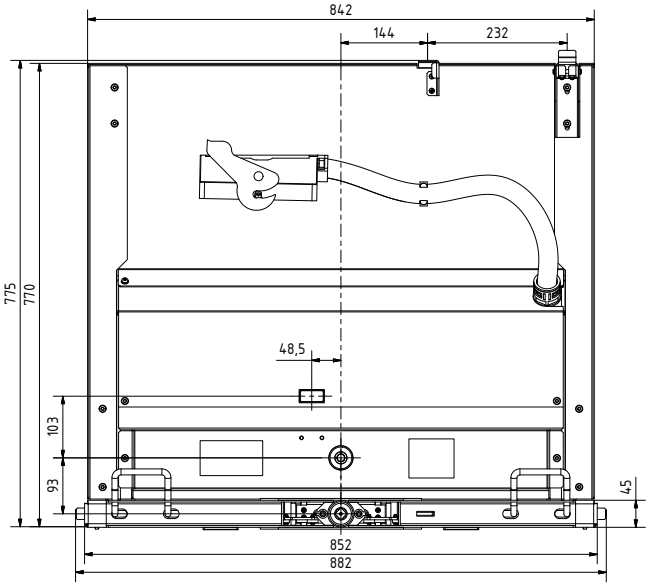


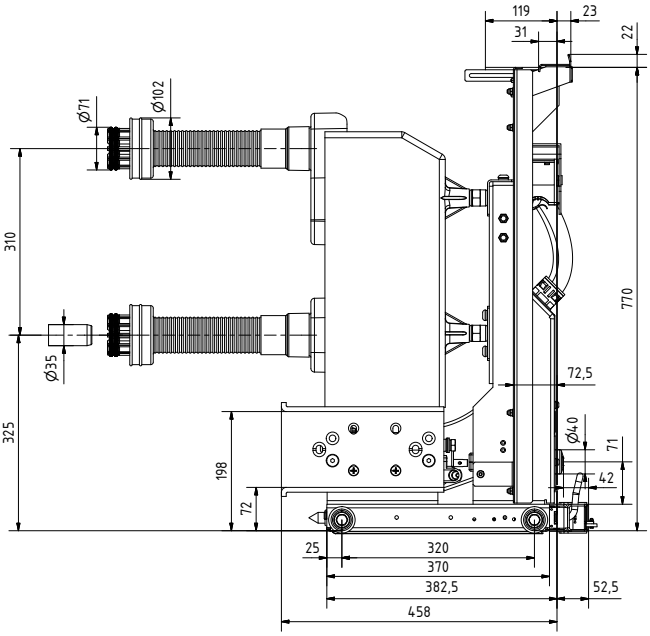


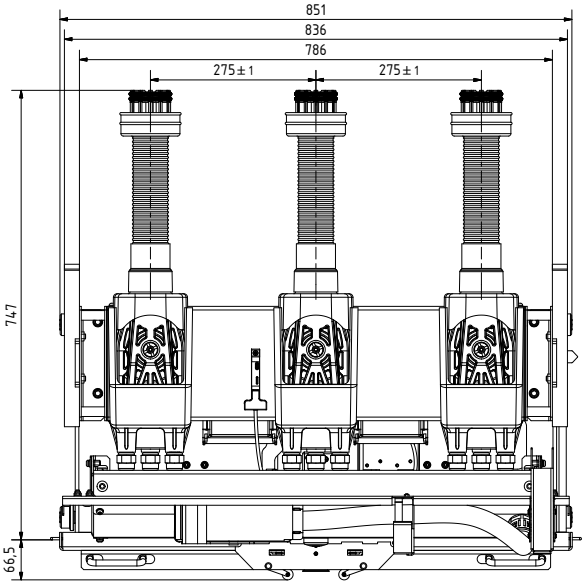


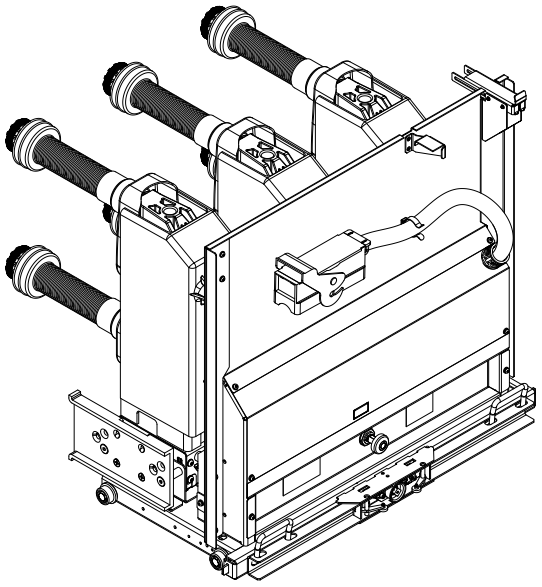
VCB25_Shell2_16D
24kV, 630 A, PCD: 275 mm, 370 mm depth of movable part of cassette, with IP2X front cover, weight: 124 kg

L_{max} = 813.5 mm
W_{max} = 882 mm
H_{max} = 792 mm



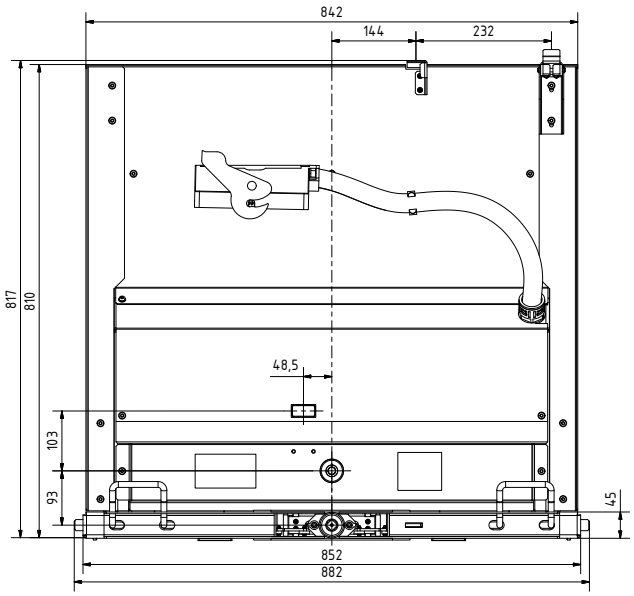


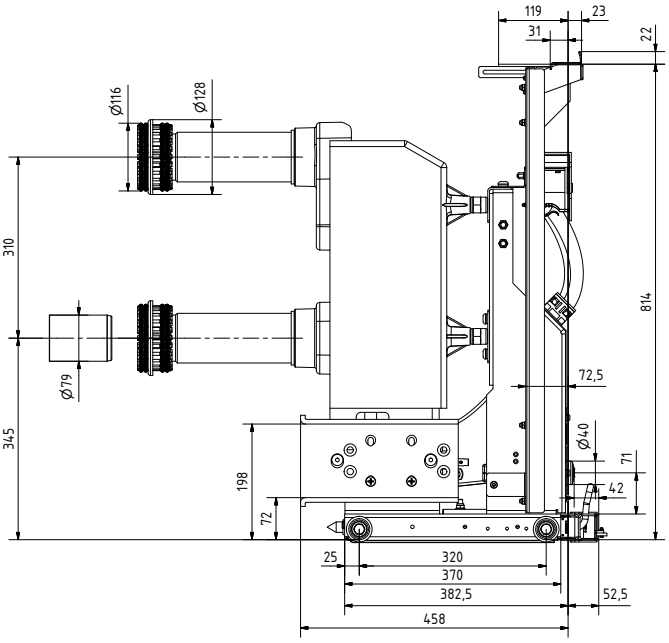


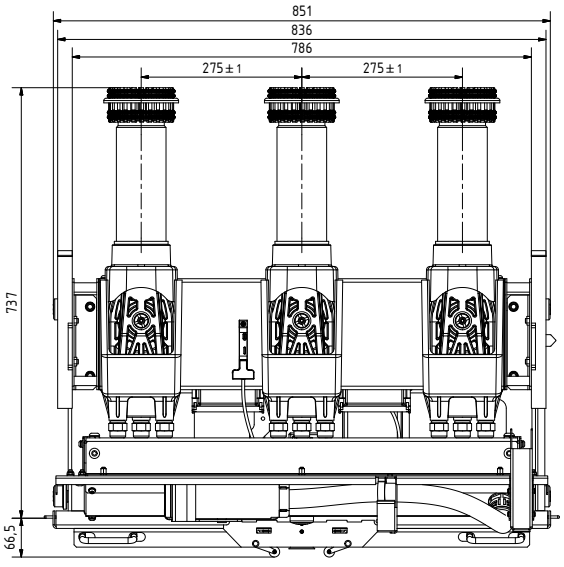


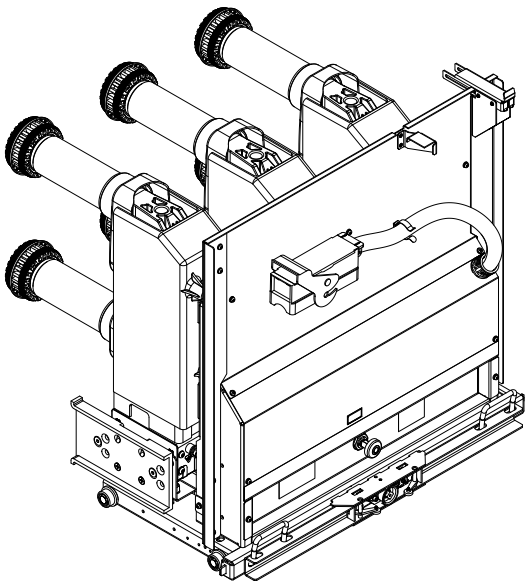
VCB25_Shell2_16D
24kV, 1250 A, PCD: 275 mm, 370 mm depth of movable part of cassette, with IP2X front cover, weight: 135 kg

L_{max} = 813.5 mm
W_{max} = 882 mm
H_{max} = 792 mm



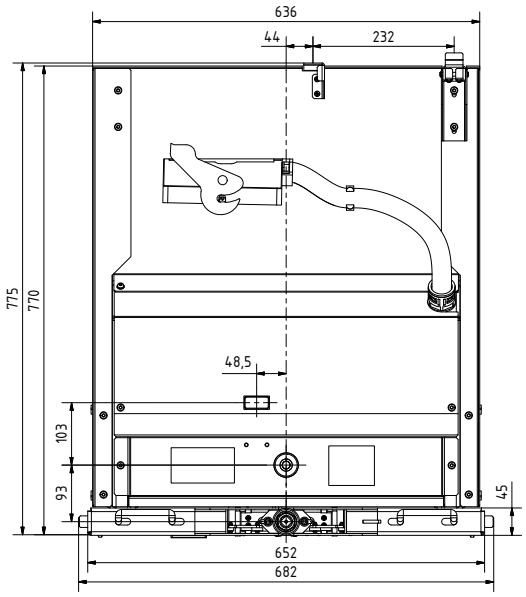


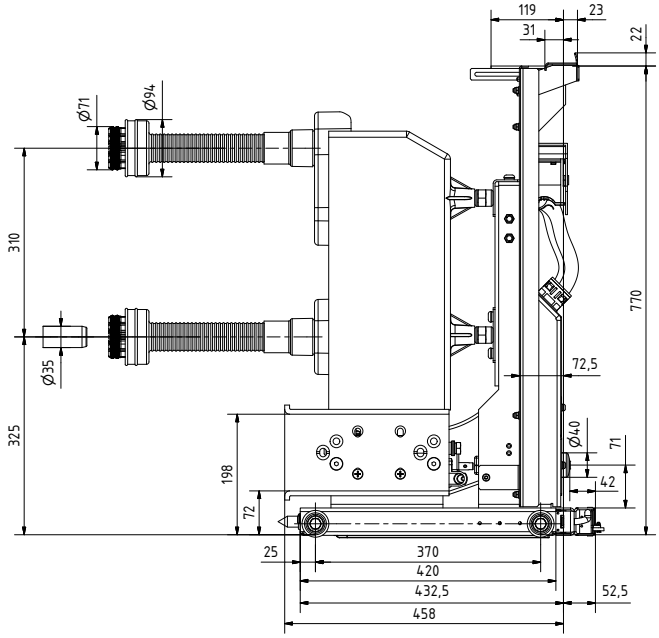


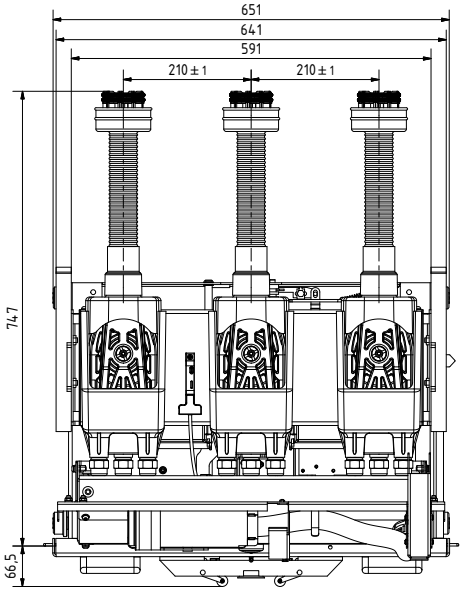


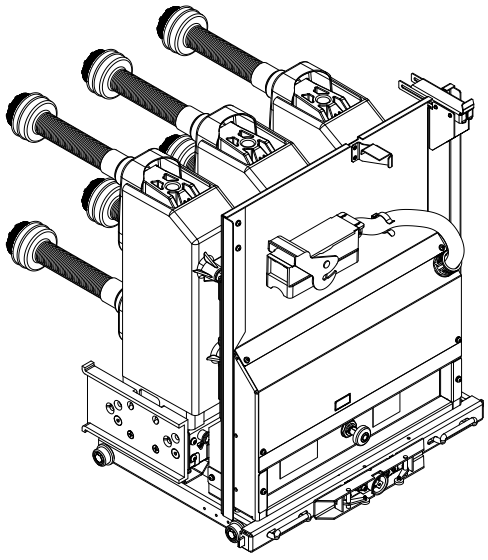
VCB25_Shell2_16D
24kV, 2500 A, PCD: 275 mm, 370 mm depth of movable part of cassette, with IP2X front cover, weight: 190 kg

L_{max} = 803.5 mm
W_{max} = 882 mm
H_{max} = 836 mm



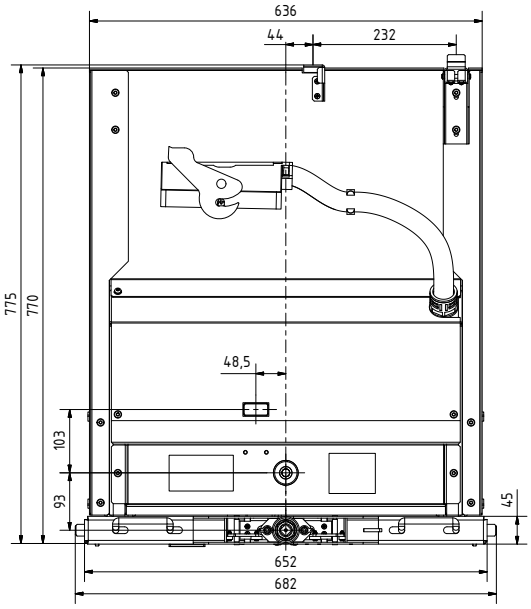


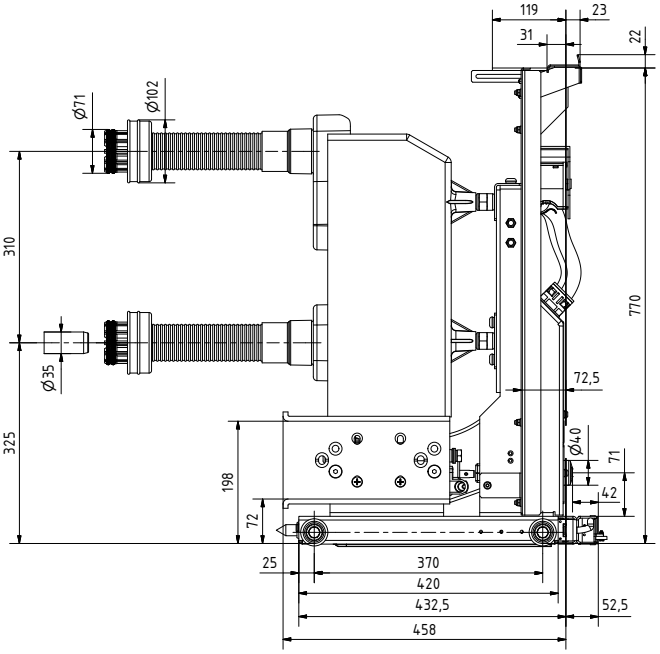


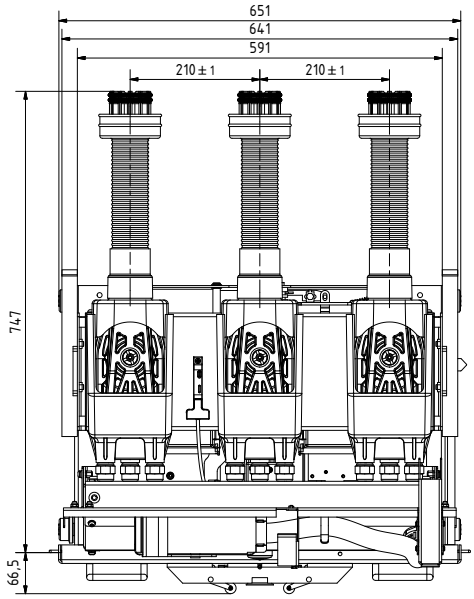


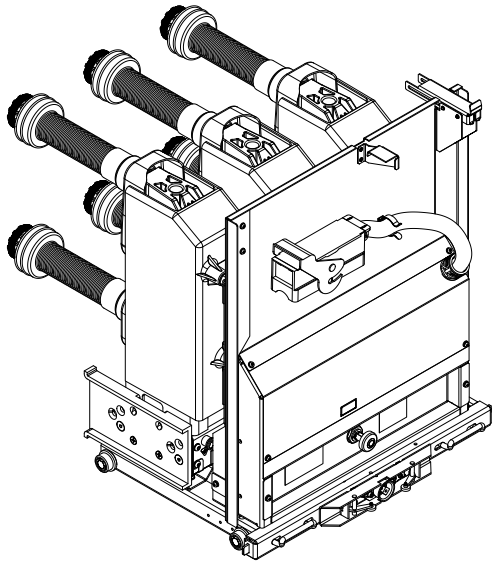
VCB25_Shell2_16D
24kV, 630 A, PCD: 210 mm, 420 mm depth of movable part of cassette, with IP2X front cover, weight: 110 kg

L_{max} = 813.5 mm
W_{max} = 682 mm
H_{max} = 792 mm



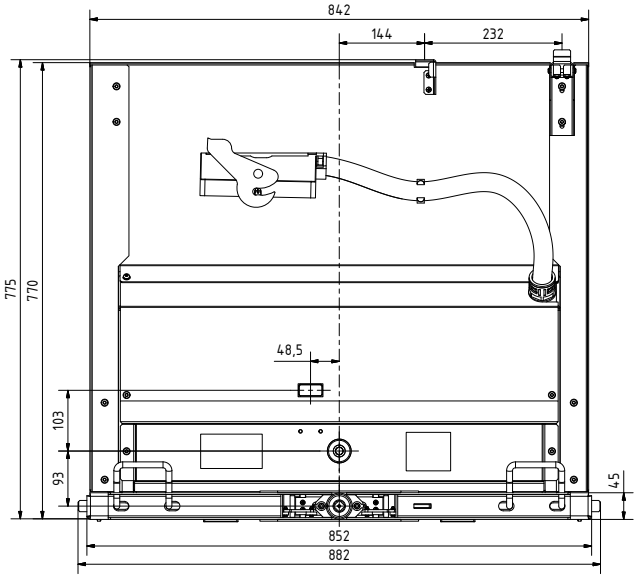


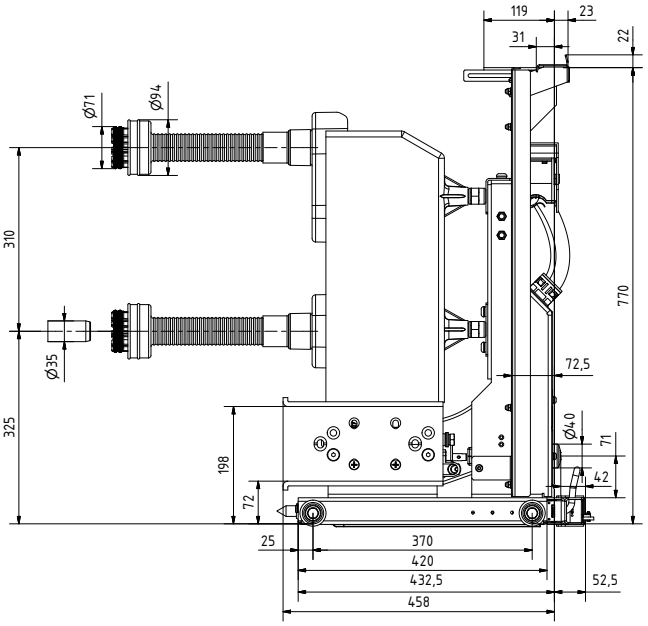


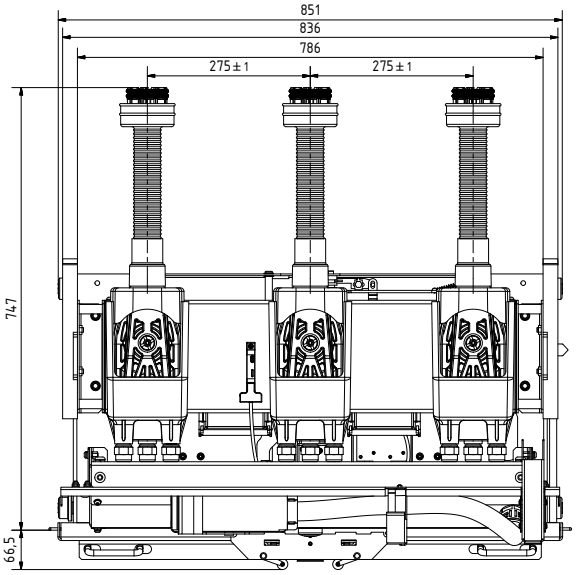


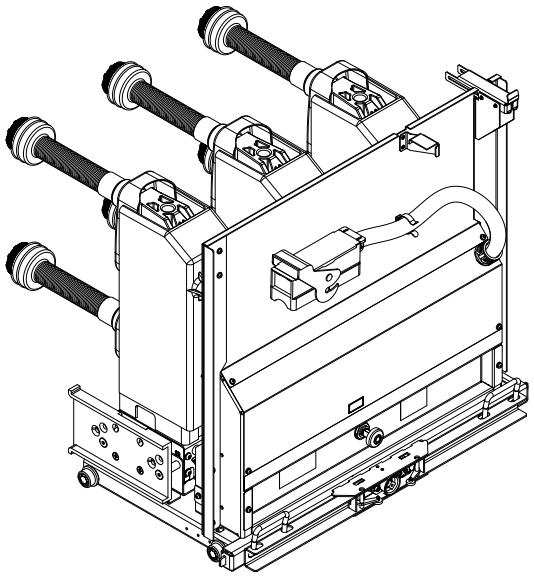
VCB25_Shell2_16D
24kV, 1250 A, PCD: 210 mm, 420 mm depth of movable part of cassette, with IP2X front cover, weight: 121 kg

L_{max} = 813.5 mm
W_{max} = 682 mm
H_{max} = 792 mm



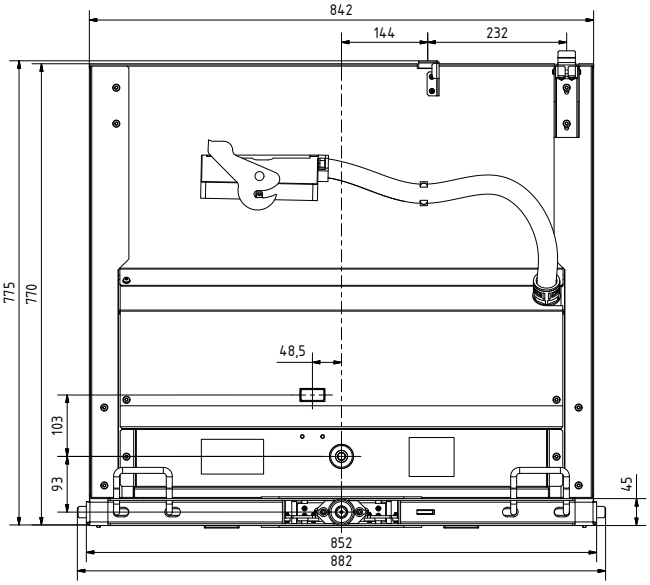


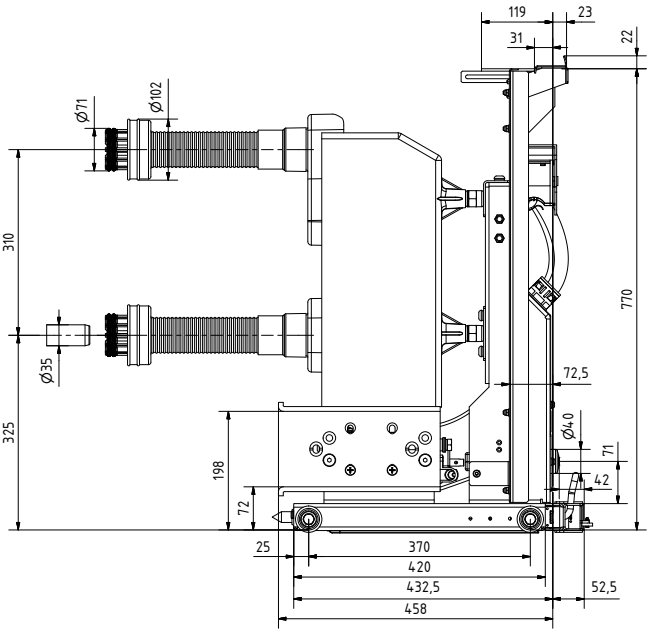


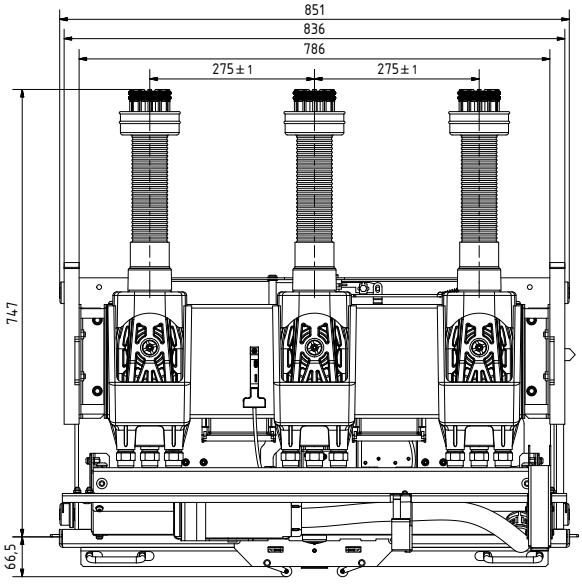


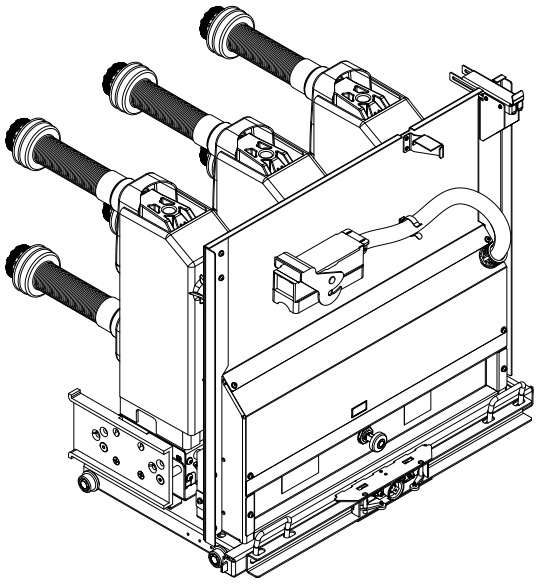
VCB25_Shell2_16D
24kV, 630 A, PCD: 275 mm, 420 mm depth of movable part of cassette, with IP2X front cover, weight: 126 kg

L_{max} = 813.5 mm
W_{max} = 882 mm
H_{max} = 792 mm



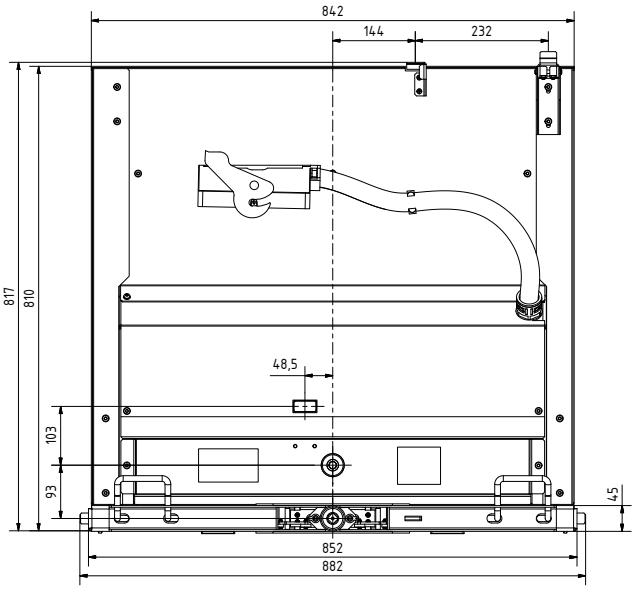


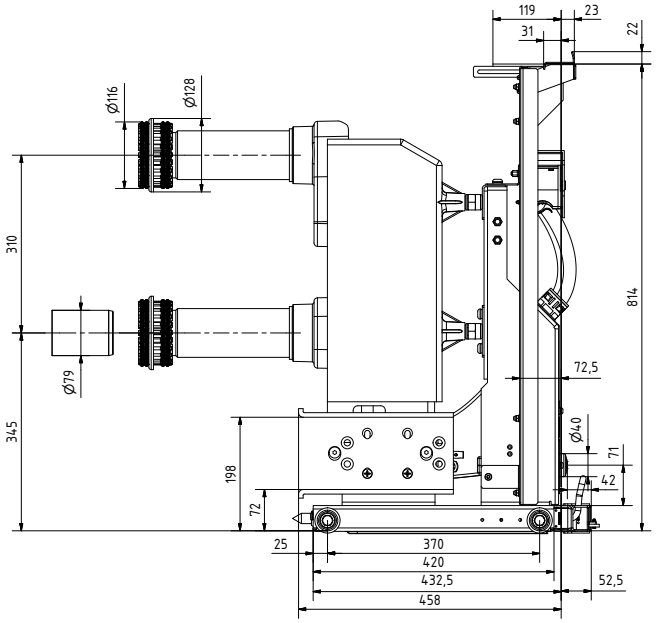


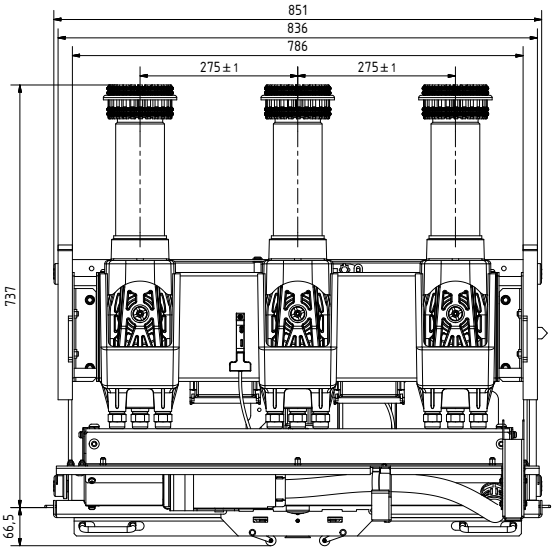


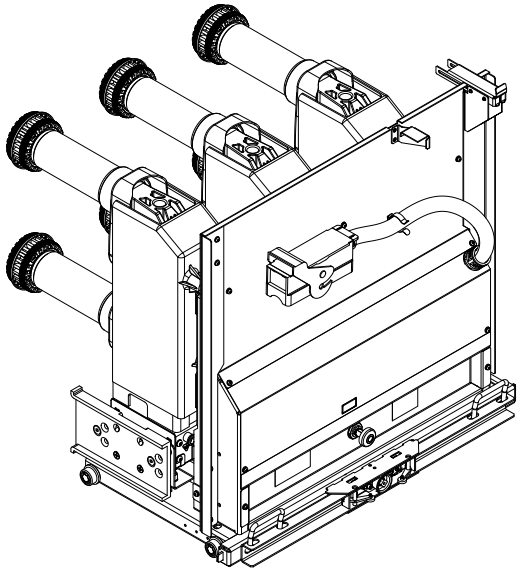
VCB25_Shell2_16D
24kV, 1250 A, PCD: 275 mm, 420 mm depth of movable part of cassette, with IP2X front cover, weight: 137 kg

L_{max} = 813.5 mm
W_{max} = 882 mm
H_{max} = 792 mm





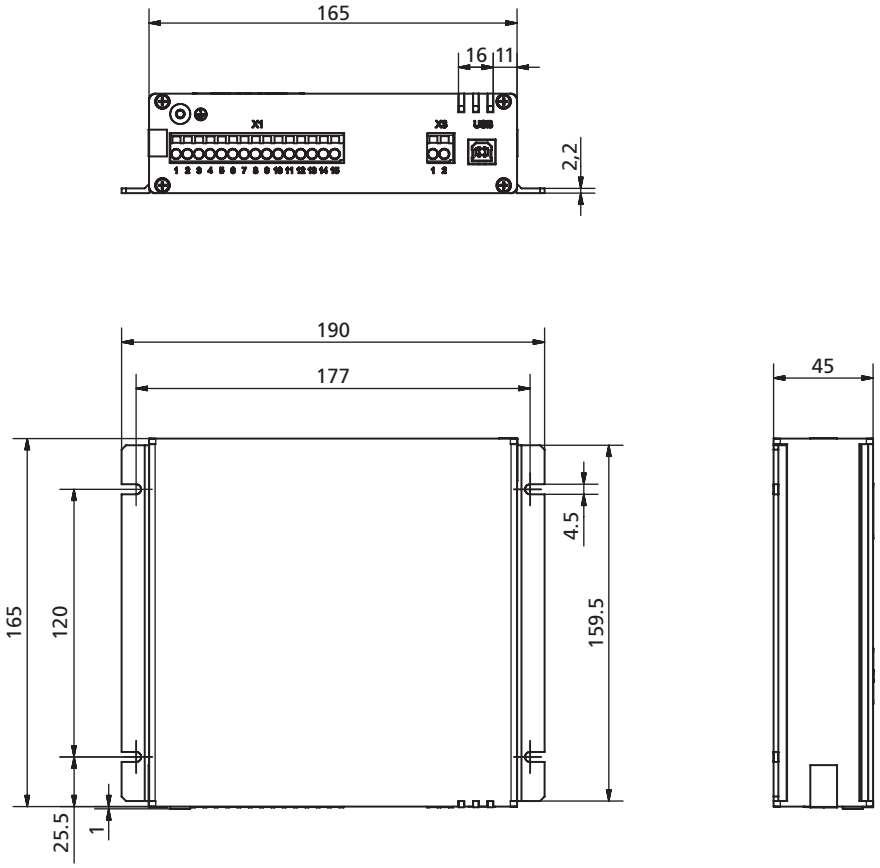




VCB25_Shell2_16D
24kV, 2500 A, PCD: 275 mm, 420 mm depth of movable part of cassette, with IP2X front cover, weight: 173 kg

L_{max} = 803.5 mm
W_{max} = 882 mm
H_{max} = 836 mm

Dimensions of Control Module

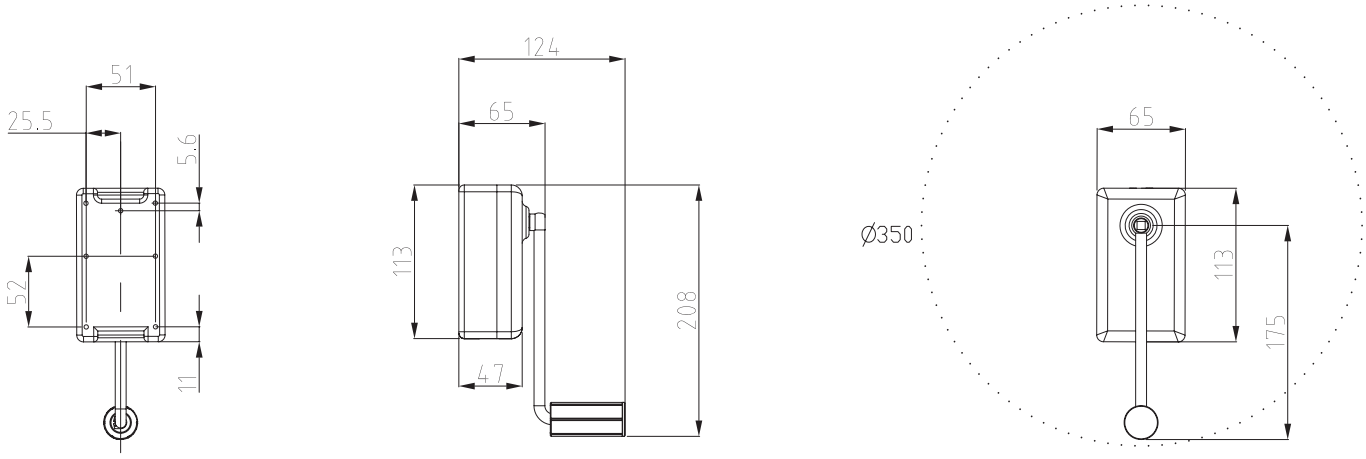


CM_16_1(Par1_Par2_Par3_Par4_Par5)
Weight: 1 kg

L_{max} = 165 mm
W_{max} = 190 mm
H_{max} = 45 mm

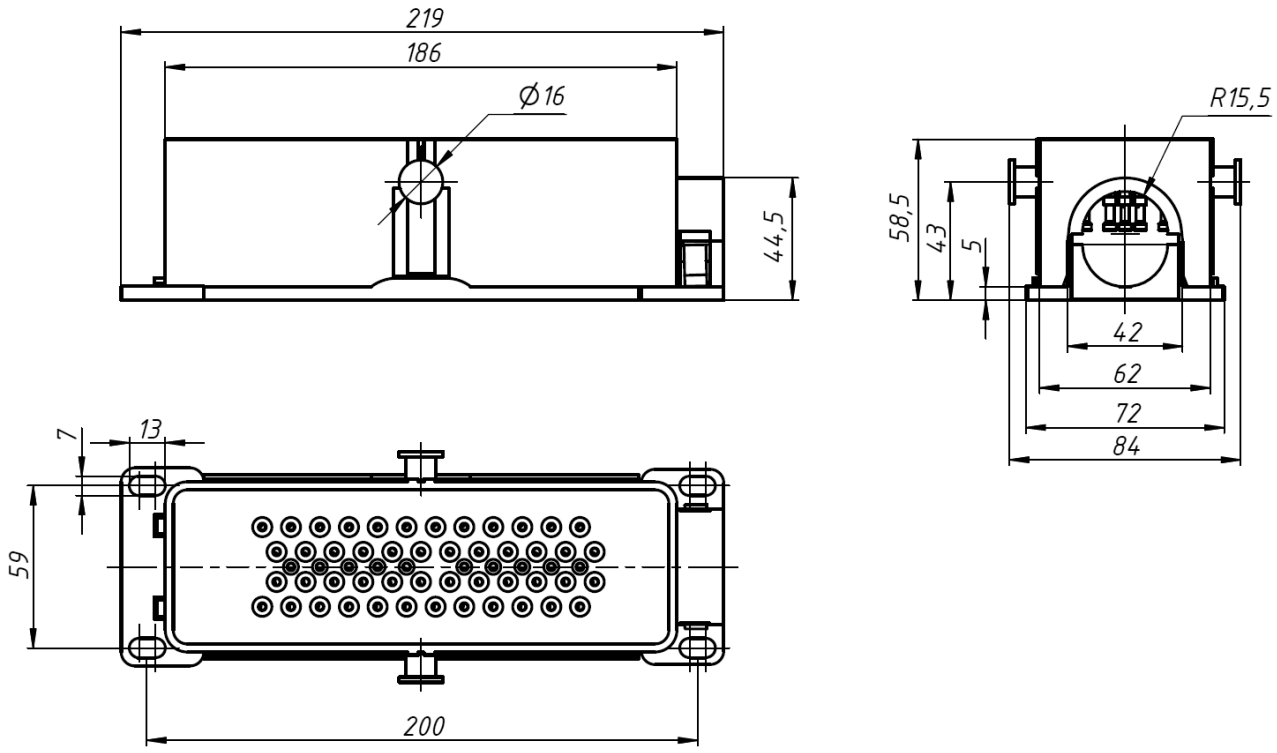
Dimensions of the Accessories

Dimensions of Manual Generator

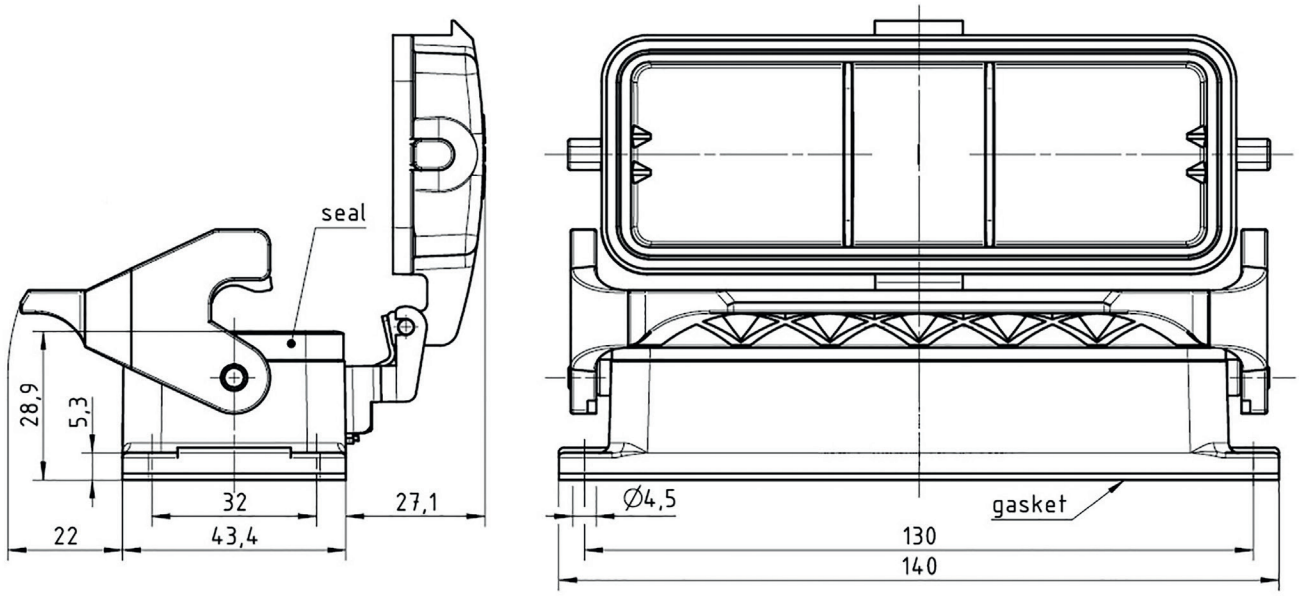


CBunit_ManGen_1, CBunit_ ManGen_2
Control wiring plastic plug counterpart

Control Wiring Plug Counterparts

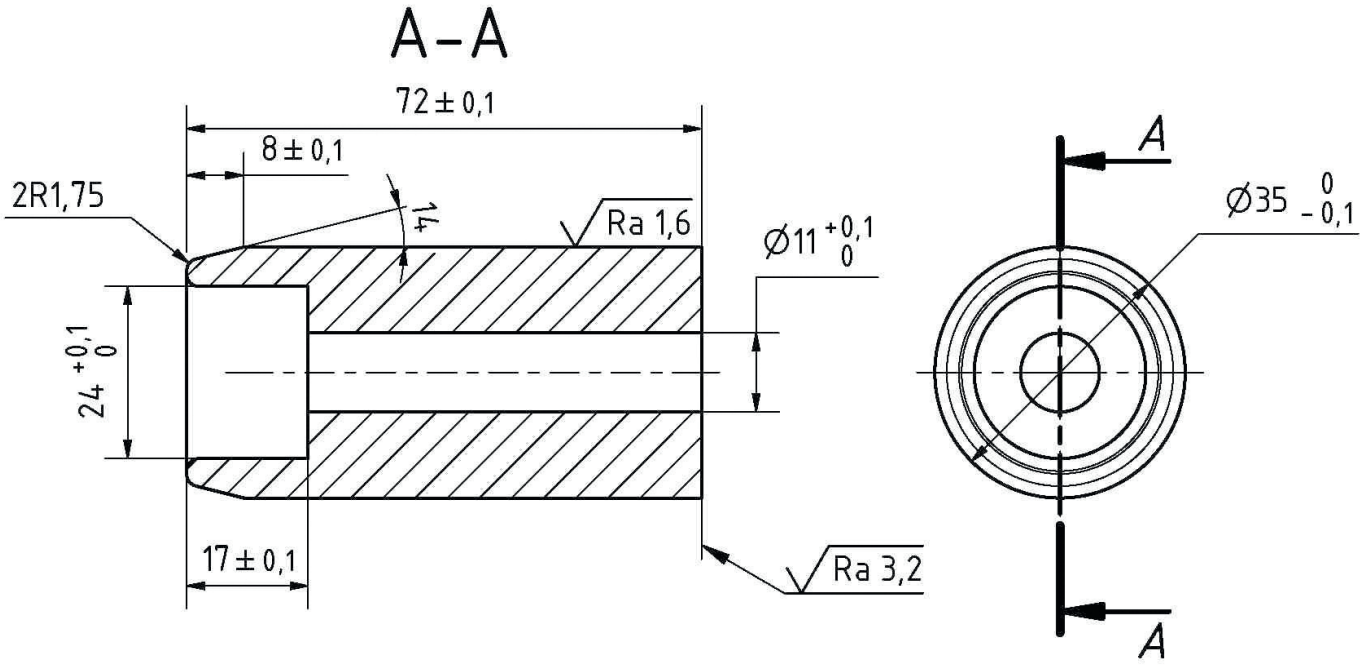


Control wiring plastic plug counterpart

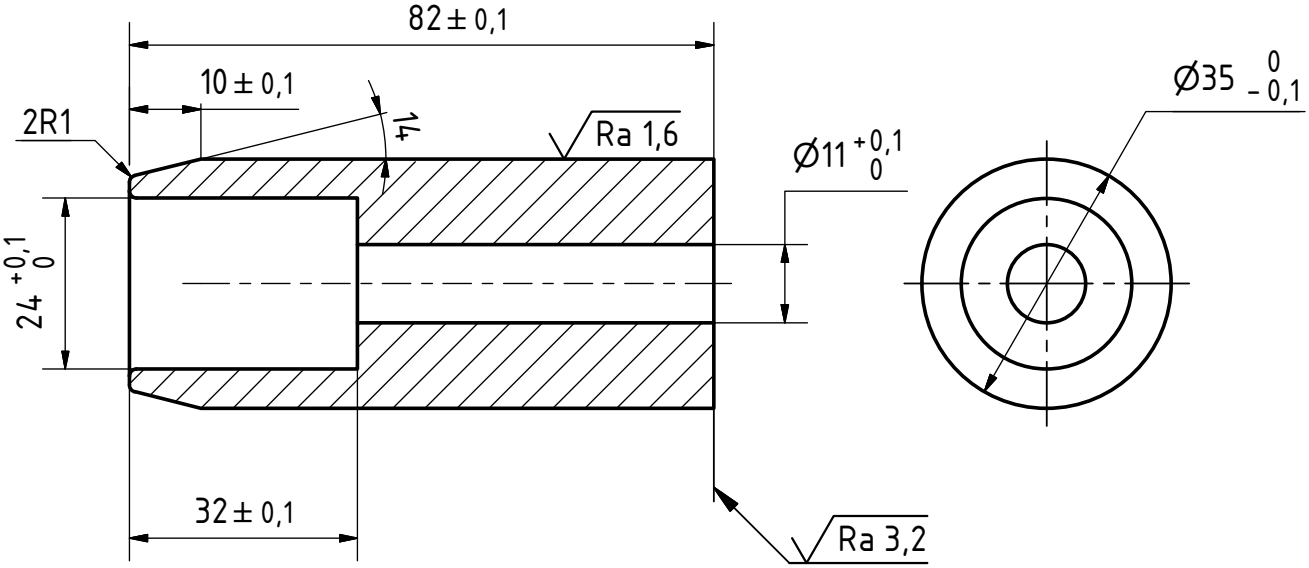


Control wiring metal plug counterpart

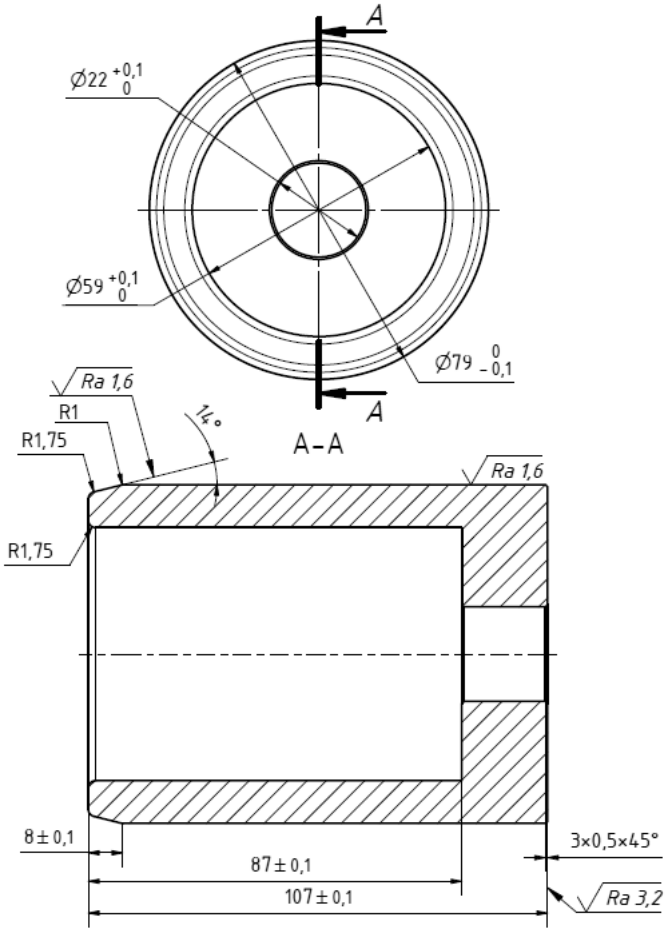
Switchgear Fixed Contact Counterparts



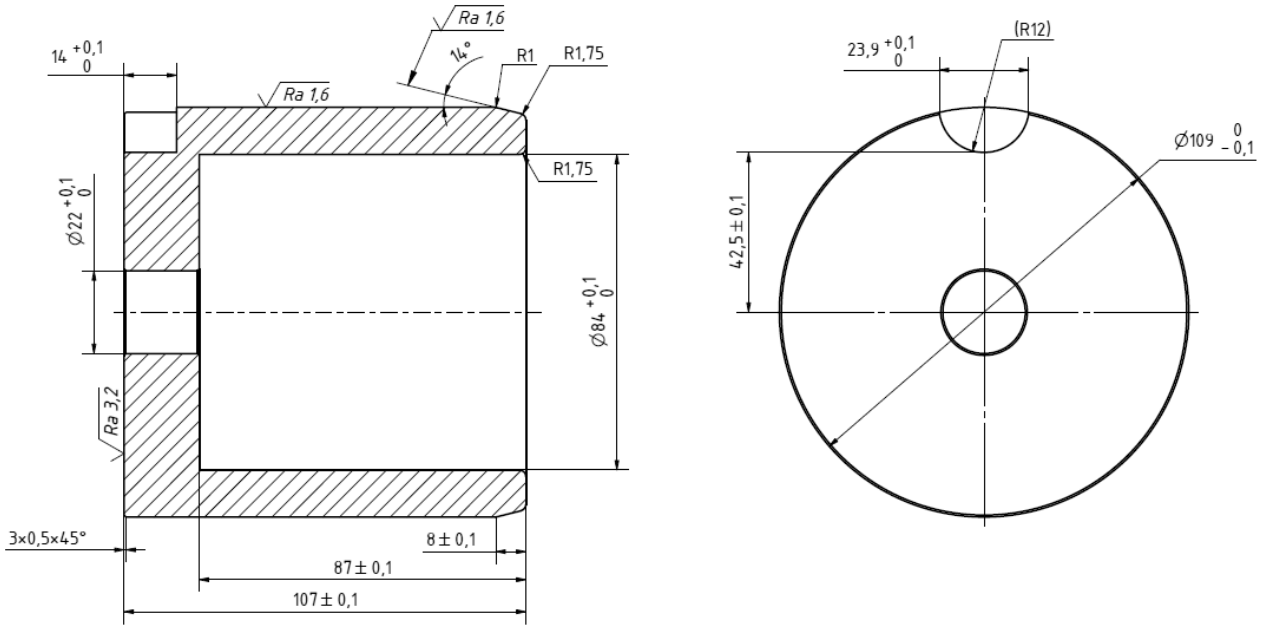
17,5 kV, 1250 A fixed contact



24 kV, 1250 A fixed contact



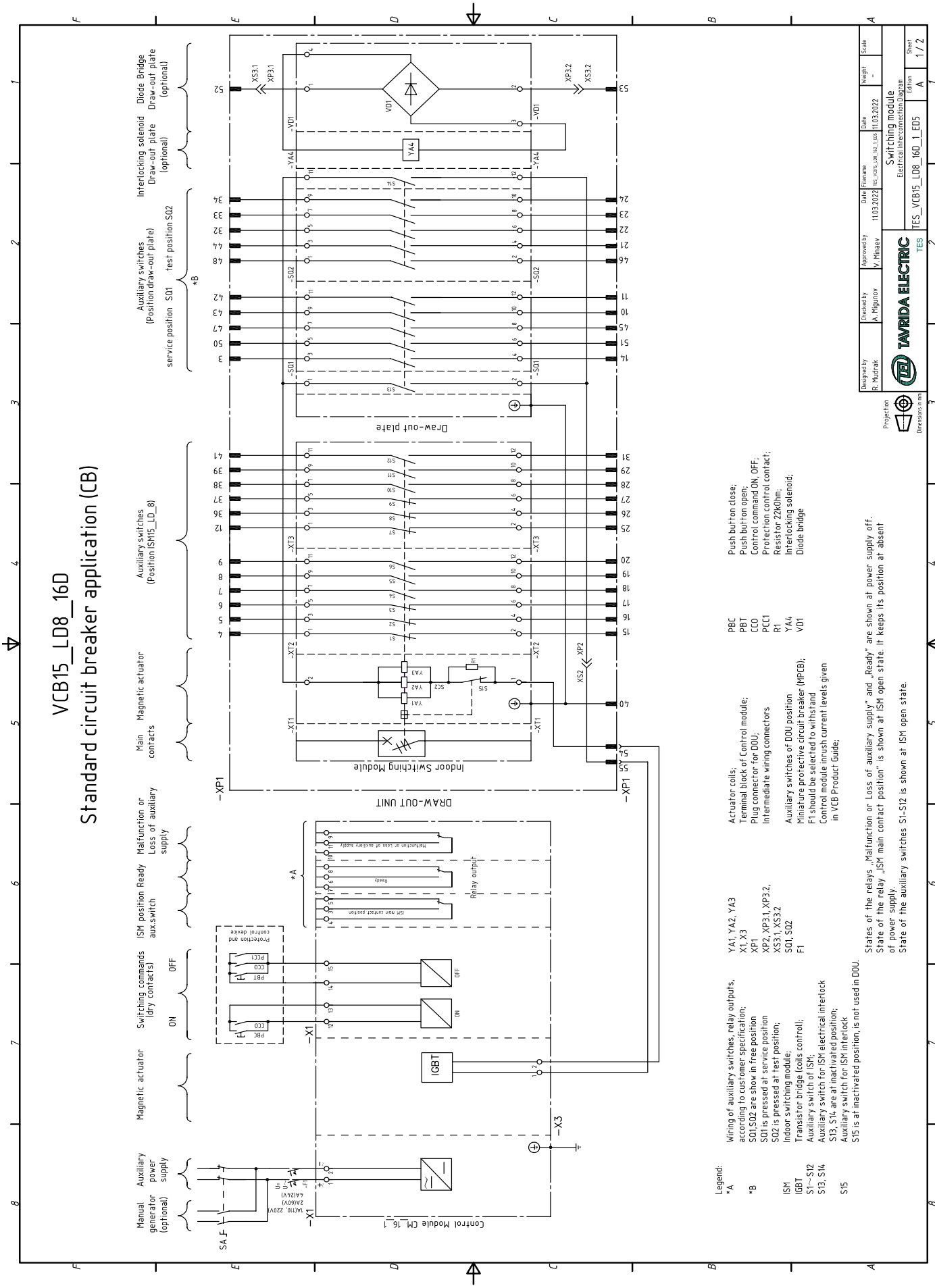
2000 A fixed contact



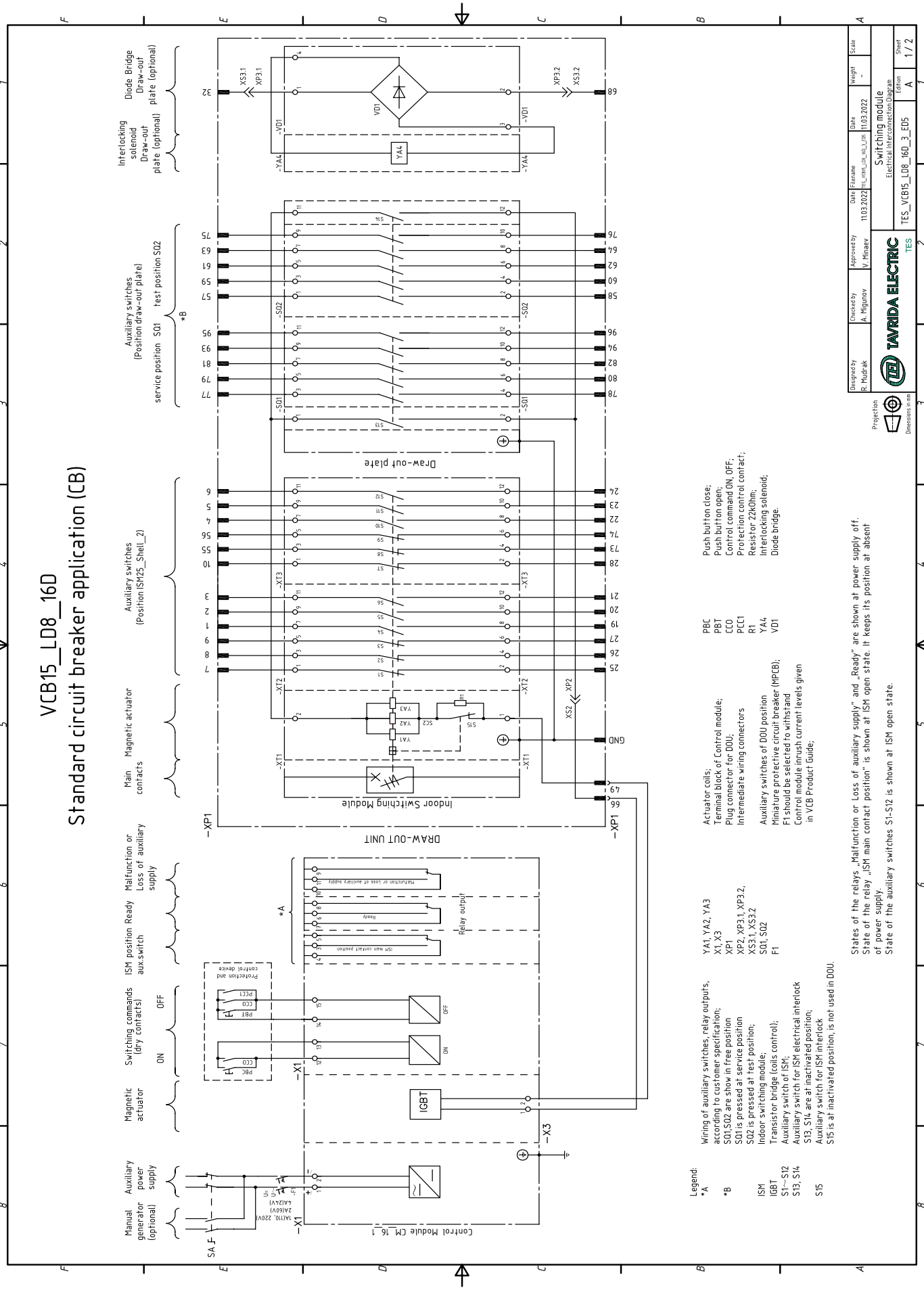
3150 A fixed contact

Appendix 4.
Secondary Schemes

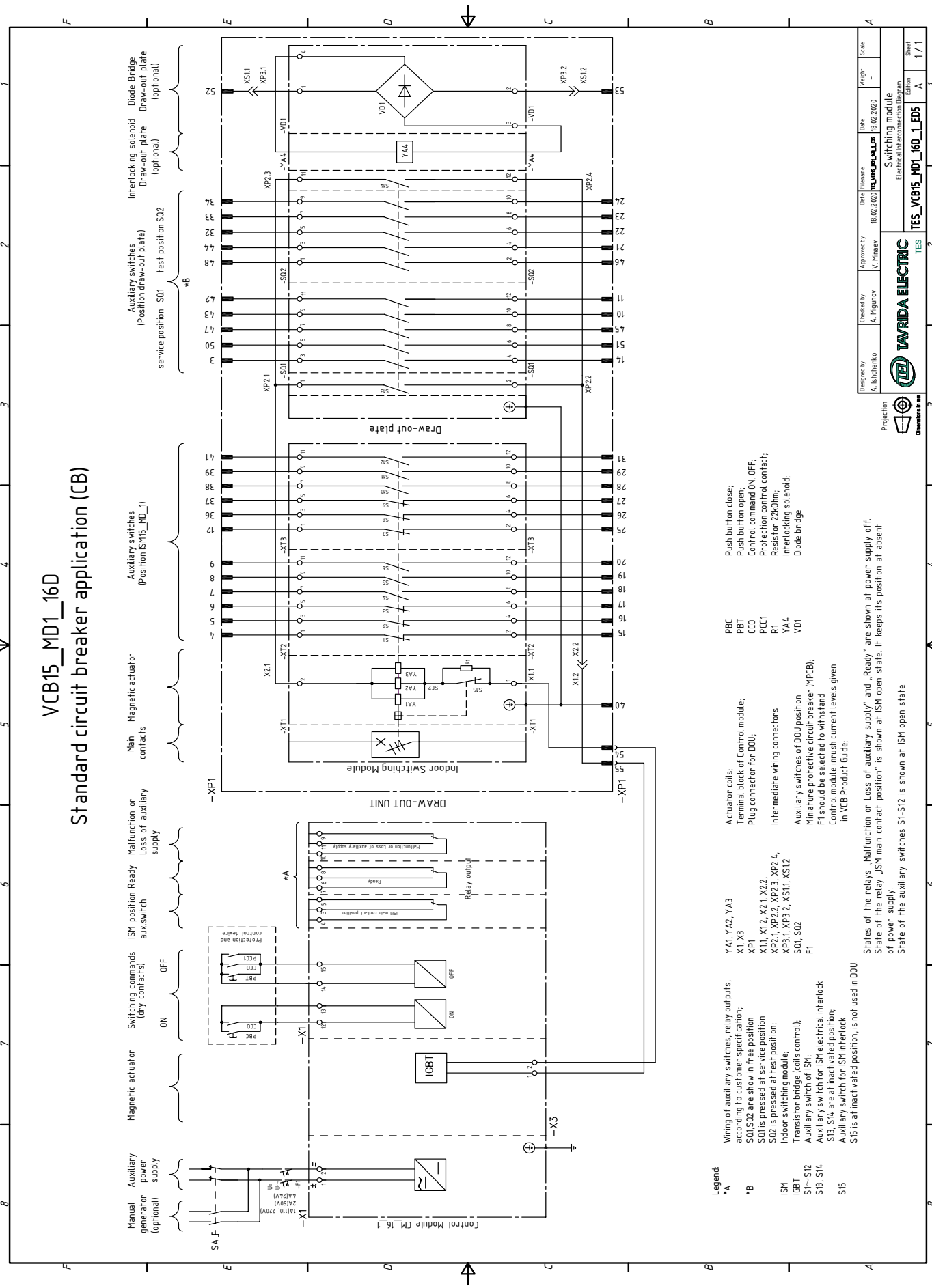
VCB15_LD8_16D with Plastic Plug



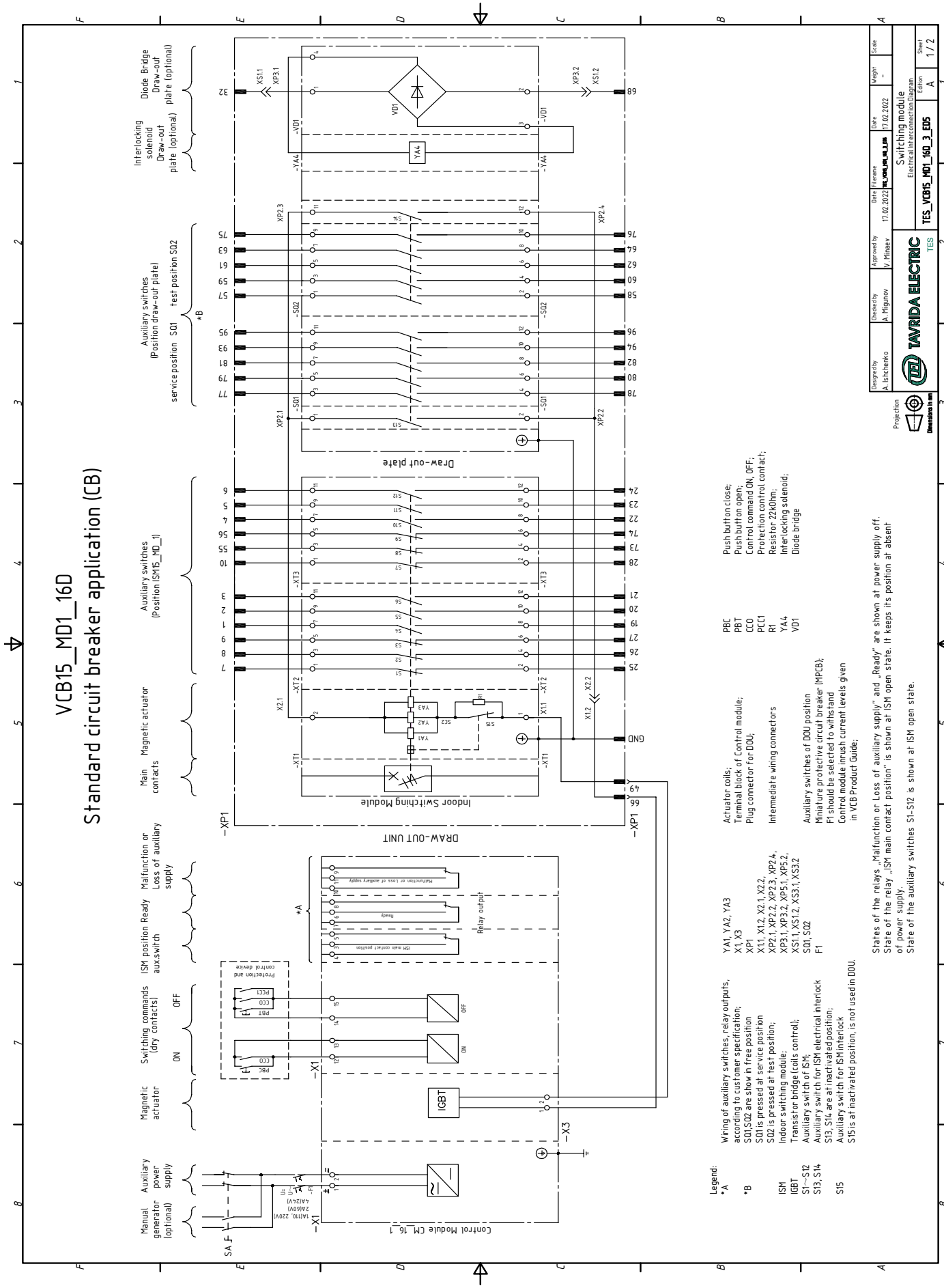
VCB15_LD8_16D with Metal Plug



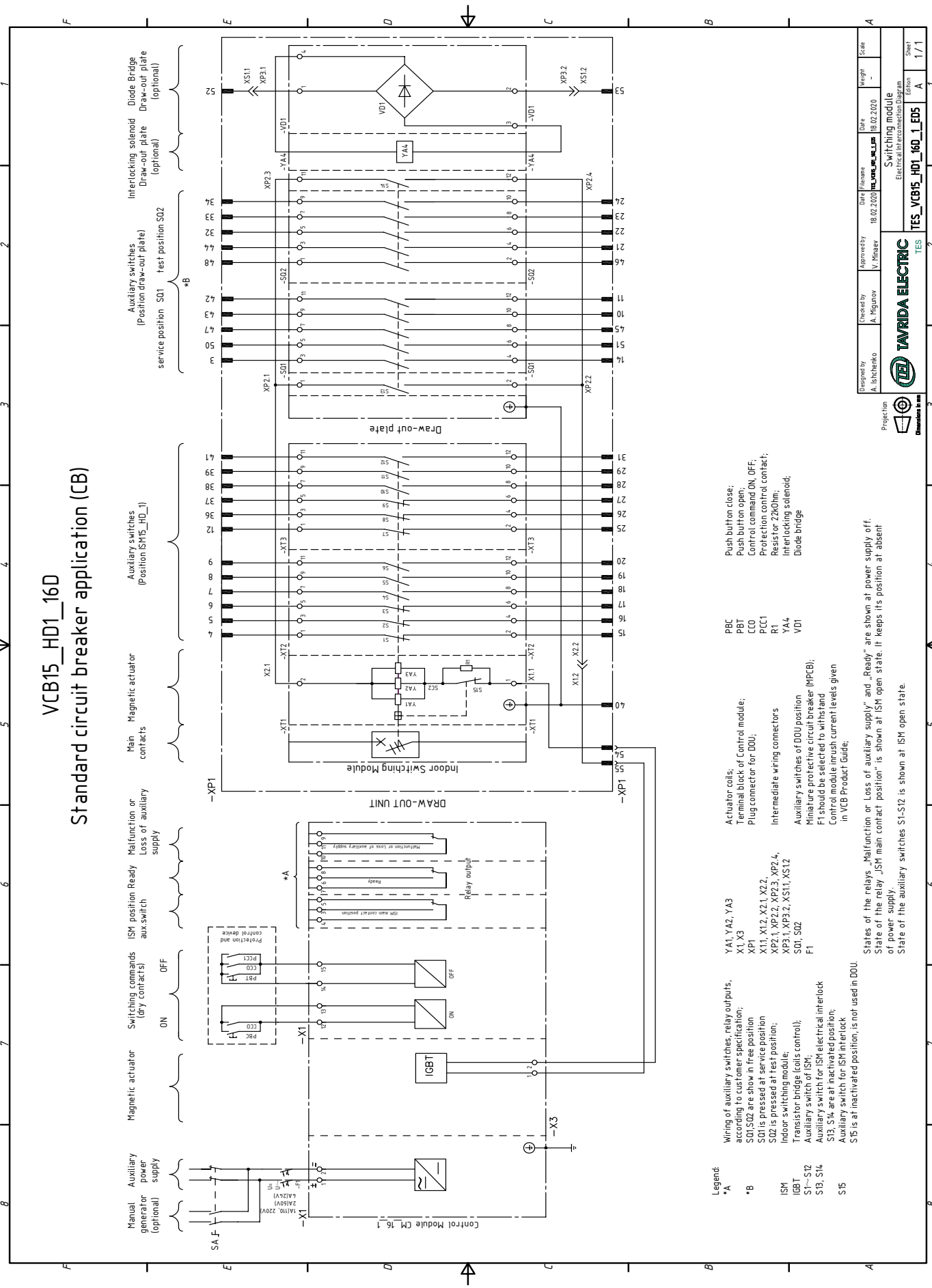
VCB15_MD1_16D with Plastic Plug



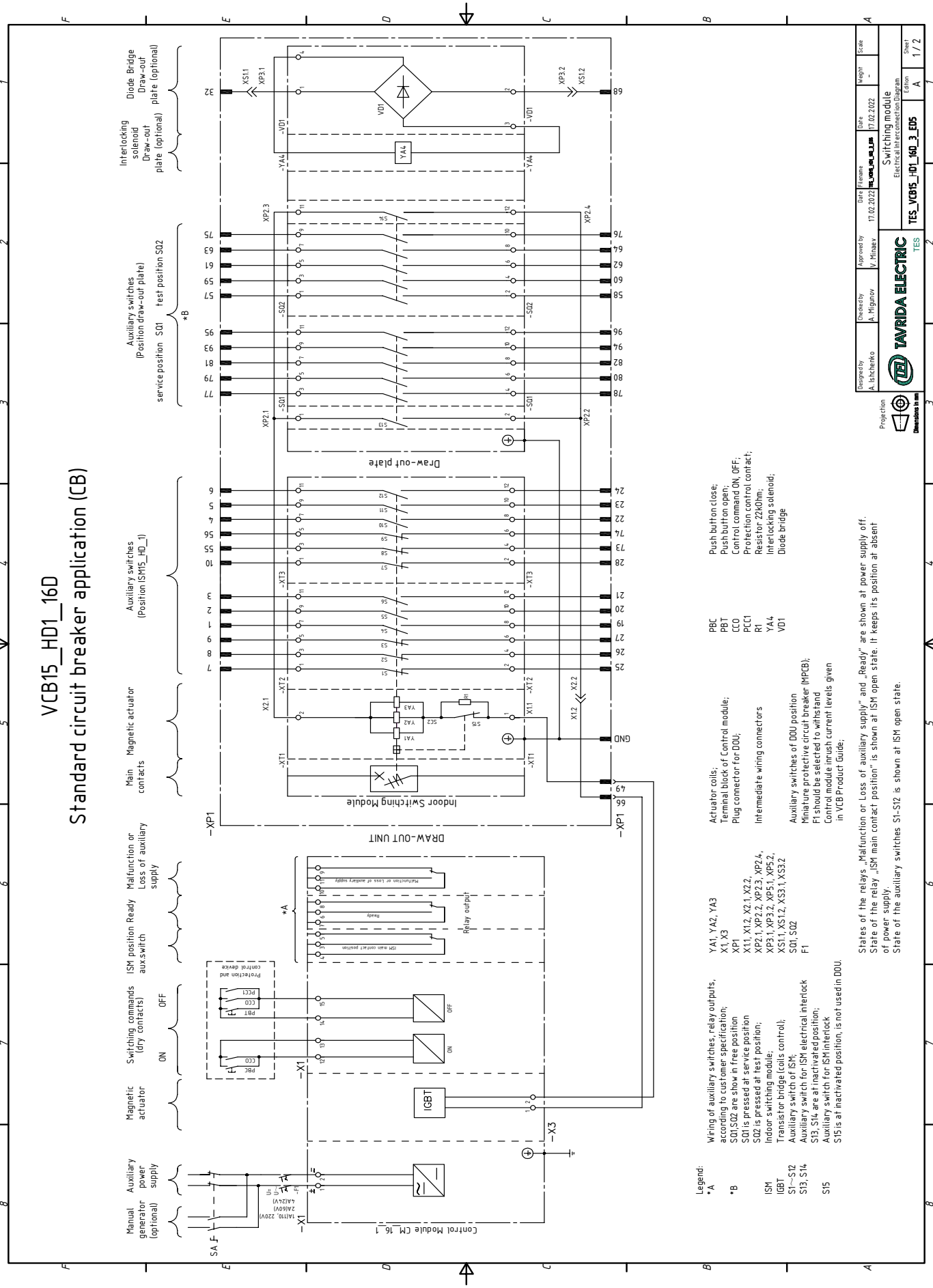
VCB15_MD1_16D with Metal Plug



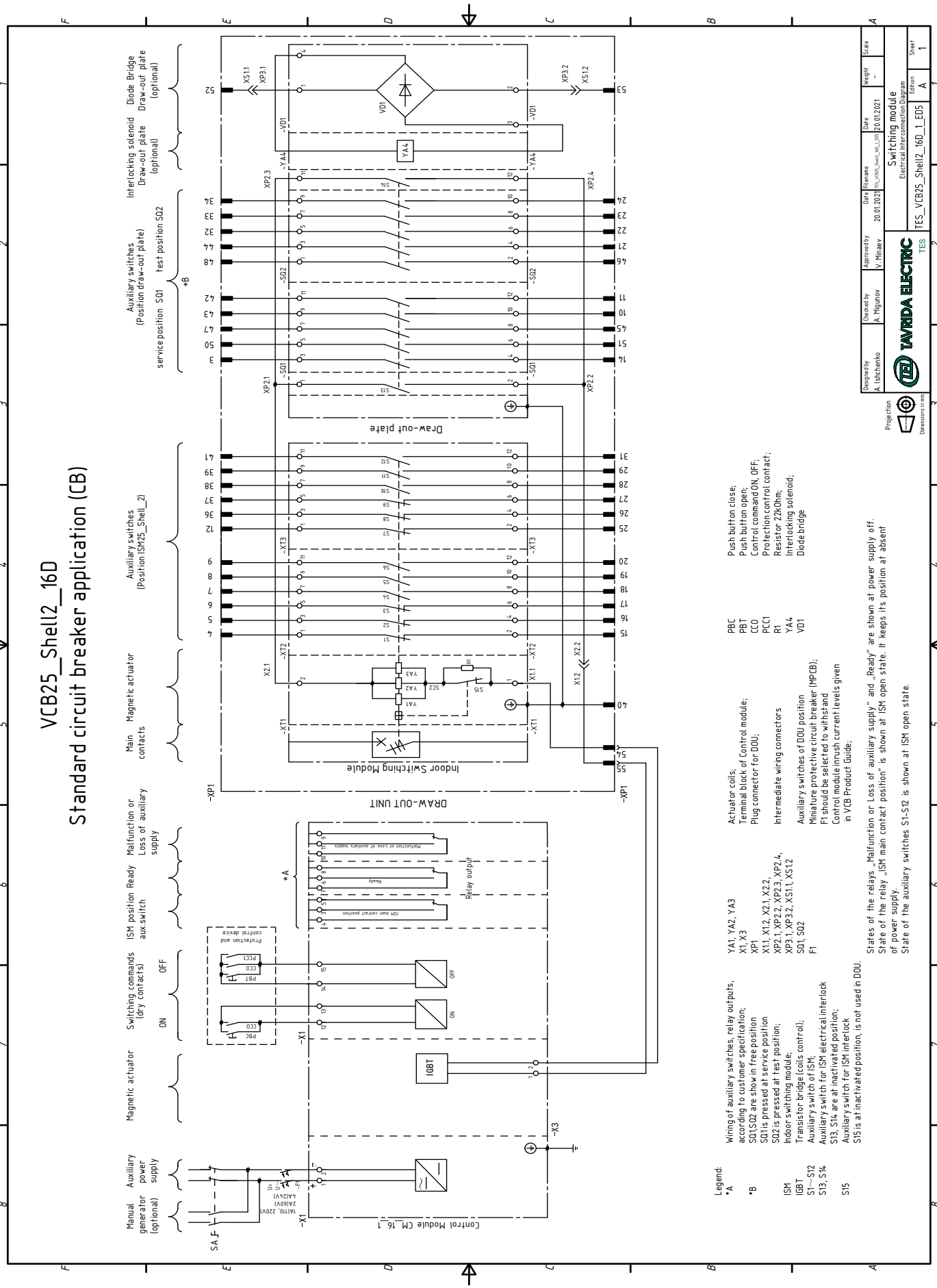
VCB15_HD1_16D with Plastic Plug



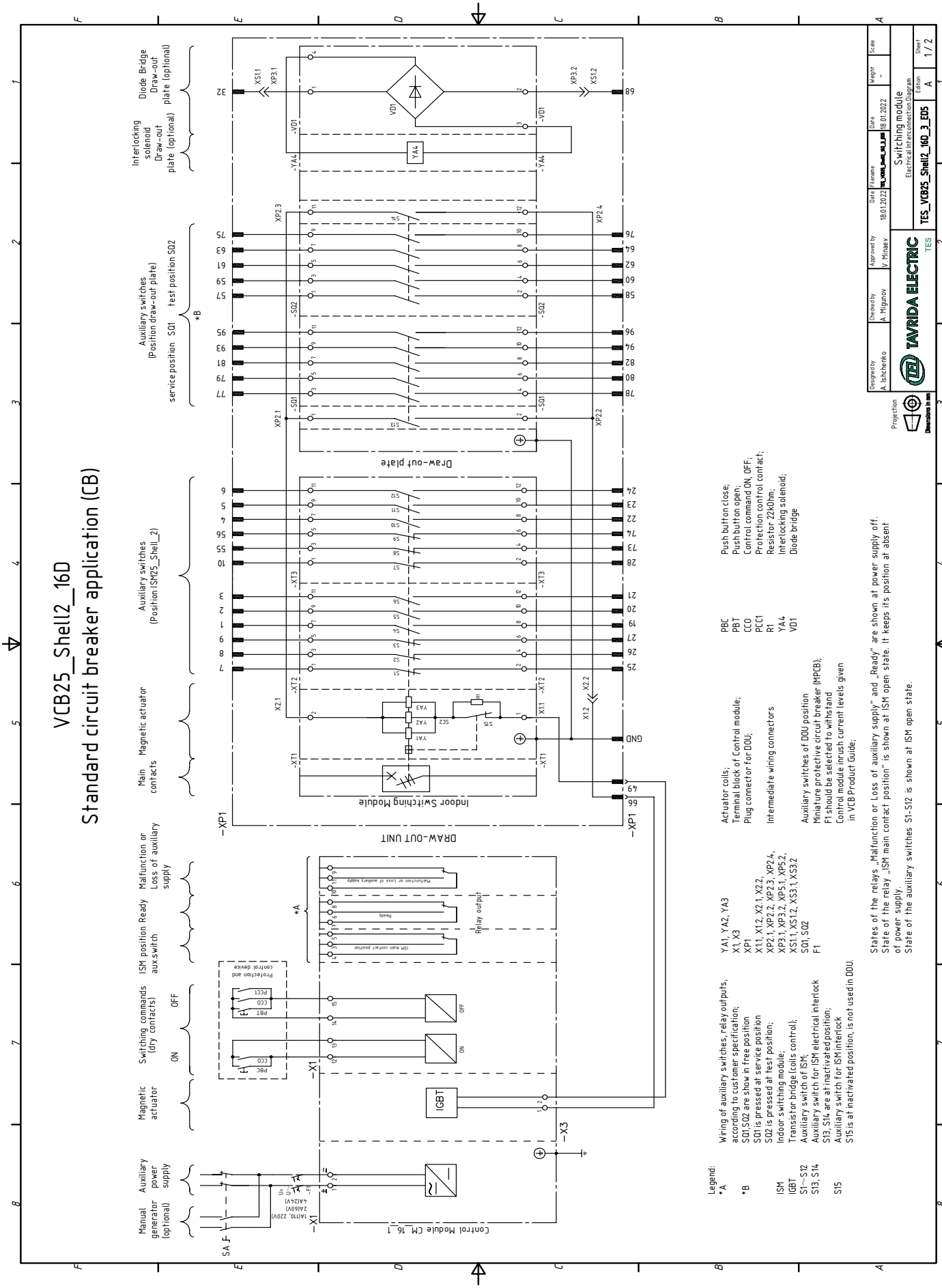
VCB15_HD1_16D with Metal Plug



VCB25_Shell2_16D with Plastic Plug



VCB25_Shell2_16D with Metal Plug



List of Changes

Documents version	Change Date	Scope of change	Reason of change	Version author
1	16.10.2018	Document creation	Products development	may
2	21.02.2019	Mistypes correction	Document elaboration	may
3	09.10.2019	Change of VCB, ISM and CM classification.	Product range change	may
4	29.10.2019	Adding of the CBmount_CM_1	Product range change	may
5	21.05.2020	Adding of the new options	Product range change	may
6	12.08.2022	Adding of VCB15_LD8_16D and VCB25_Shell2_16D	Product range chang	may mariy

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