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Low voltage switchgears

Low voltage switchgears

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Low Voltage switchgear

1 / RN-W

INTRODUCTION

The subject of this document is an RN-W type low voltage switchgear intended to supply LV electrical devices. This type of switchgear is widely used in municipal transformer stations, in industrial plants, department stores and other facilities.

CHARACTERISTICS

- possibility of visual inspection of the condition of cable connections without opening the switchgear,
- all cable connections are made in the lower part of the switchgear,
- small dimensions, compact construction,
- possibility of metering the current at the outgoing circuits,
- possibility of safe replacement of a damaged switch disconnector without having to de-energise the switchgear,
- possibility of expanding the unit while live,
- cable connections without crimping of cable terminals,
- may operate with TN–S, TN–C, TN–C–S, TT and IT type low voltage cable grids,
- possibility of feeding the outgoing cables upwards,
- fuse slot powered ahead of the switching device installed on the enclosure of the incoming unit.

SYSTEM OF INTERLOCKS

High level of safety was achieved by:

- an interlock which allows the replacement of fuses only in a dead state, after circuit disconnection, without having to use a special grip,
- secure grounding of lower switch disconnector terminals (outgoing feeders) by installation of earthing devices,
- rapid de-energising of the entire switchgear under full load through the use of a quick-acting visible gap switch disconnector,
- possibility of locking the switch disconnector in an open state, preventing accidental energisation,
- the use of an interlock between the doors and the main switch disconnector (when an INP-1250 switch disconnector is used), enabling the opening of doors only when the switch disconnector is off.

SWITCHGEAR DESIGN

The switchgear enclosure is made with bent zinc aluminium sheet elements riveted together, ensuring equipotential bonding.

The switchgear is configured using independent modules (incoming, outgoing, metering, etc.), enabling easy expansion of existing units and design of new units.

ELECTRICAL EQUIPMENT

- The incoming module may use the following devices:
  - INP-1250, INP-1600 or INP-2000 switch disconnectors – as standard,
  - or others on arrangement with the manufacturer,
  - MCCB 630 to 1600 A circuit breakers,
  - ACB 630 to 1600 A circuit breakers,
- the outgoing bays may use the following devices:
  - ARS size 00 to 3 manufactured by Apator S.A. – as standard,
  - BTVC size 00 to 3 manufactured by Pronutec – as standard,
  - 3 NSL-E size 00 to 3 manufactured by EFEN – as standard,
  - or others on arrangement with the manufacturer.
- Additionally the switchgear may be equipped with:
  - current and voltage control metering,
  - semi-indirect energy metering system,
  - area lighting module,
  - capacitor bank,
  - capacitor for transformer no-load compensation.
- Busbar connections are made with copper flat bars with a cross-section adapted to rated currents,
- In case of ARS, BTVC, NSL-E type switch disconnectors it is possible to install two size 00 switch disconnectors instead of a single size 1 to 3 switch disconnector with no changes to the switchgear design.

BASIC TECHNICAL DATA

Compliance with standards:
The RN-W type switchgear meets the requirements of the following standards:

- **PN-EN 61439-1** - „Low-voltage switchgear and controlgear assemblies. General
- **PN-EN 61439-2** - „Low-voltage switchgear and controlgear assemblies. Power switchgear and controlgear
- **PN-EN 61439-5** - „Low-voltage switchgear and controlgear assemblies. Assemblies for power distribution in public
- **PN-EN 50274** - „Low-voltage switchgear and controlgear assemblies. Protection against electric shock. Protection unintentional direct contact with hazardous live parts",
- **PN-EN 62262** - „Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK

- **PN-EN 60529** - „Degrees of protection provided by enclosures (IP Code)",

Electrical data	
Rated insulation voltage	1000 V
Rated switching voltage	400 V / 690V / 800V
Test impulse withstand voltage	8 kV
Rated frequency	50 Hz
Rated current of the switchgear	1250 A / 1600 A / 2000 A
Rated short-time withstand current	35 kA (1s)
Rated peak withstand current	do 77 kA

Mechanical data	
Dimensions	Width depending on the configuration Height from 1275 up to 2075 mm Depth 270 / 320 / 400 mm
IP protection rating	IP2X / IP4X
IK protection rating	up to IK 10
Surface protection	framework: Aluzinc or painted steel sheet covers: Aluzinc or painted steel sheet front panels: plastic
Powder painting (option):	standard - RAL 7035 other colours on request
Plastic components	Halogen-free, self-extinguishing, fire-resistant, CFC-free

Service conditions:	
Ambient temperature - Lower limit of ambient temperature - Upper limit of ambient temperature - Average daily temperatures over 24 hours	Ambient temperature -5°C (-25°C)[1)] +40°C -5°C do +35°C
Relative humidity	up to 50% (at a temp. of 40°C)
installation altitude	up tp 1000 m n.p.m.
atmosphere at the place of installation	free from chemically aggressive and conducting dust, fumes and gases

At the customer's request it is possible to design a switchgear adapted to other conditions.

NOTE:
[1)] Depending on the devices used.

FUNCTIONAL MODULES OF THE SWITCHGEAR

The switchgear is composed of independent elements (modules) which may be assembled into various sets. The basic modules of the RN-W switchgear include:

- outgoing module,
- incoming module,
- metering module,
- other modules, e.g. area lighting, installation devices, automation, etc.

Design options of individual elements are presented in tables.

OUTGOING (CONNECTION) MODULE

Between 5 and 12 fuse switch disconnectors of various manufacturers can be installed in the outgoing module, size 1 to 3 with transformers. Outgoing modules can be combined into sets.

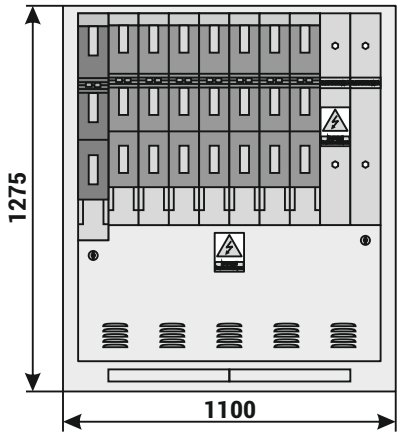
Outgoing module			
Module name	Number of disconnectors for installation, size 1 to 3 (size 00)	Dimensions [mm] [width x height x depth]	Notes
Standard design			
CO-5	5 (10)	550 x 1275 x 400 (320)	For ARS, BTVC and NSL switch disconnectors it is possible to install two size 00 switch disconnectors instead of one size 1 to 3 switch disconnector.
CO-10	10 (20)	1100 x 1275 x 400 (320)	
Wykonanie specjalne			
CO-6	6 (12)	700 x 1275 x 400 (320)	For ARS, BTVC and NSL switch disconnectors it is possible to install two size 00 switch disconnectors instead of one size 1 to 3 switch disconnector.
CO-7	7 (14)	800 x 1275 x 400 (320)	
CO-8	8 (16)	900 x 1275 x 400 (320)	
CO-9	9 (18)	1000 x 1275 x 400 (320)	
CO-12	12 (24)	1300 x 1275 x 400 (320)	
CZO-1	9 (18)	1100 x 1275 x 400 (320)	The incoming/outgoing module adapted to the installation of an NH – latr 910 type switch disconnector and size 1 to 3 disconnectors. Details, **see figure 1.**
CZO-2	10 (20)	1650 x 1275 x 400 (320)	The incoming/outgoing module adapted to the installation of an INP-1250 switch disconnector and size 1 to 3 outgoing switch disconnectors. Details, **see figure 2.**
CO-...XX	0	XXX x 1275 x 400 (320)	Outgoing module adapted to the installation of 2 or 3 compact circuit breakers from 250 to 630 A. Details, **see figure 3.** Module name and dimensions depend on the type and number of installed switch disconnectors.

Sizes of the used fuse links and cables when cable connections are used. V-klema type depends on the device type:

Device group	Current ranges of the fuse links	Max. cable cross-section
GR. 00	6 ÷ 160 A	up to 95 mm^2 (depending on the device type)
GR. 1	6 ÷ 250 A	240 mm^2 (300 mm^2 – in case of a wire with a sector cross-section)
GR. 2	63 ÷ 400 A	
GR. 3	250 ÷ 630 A	

EXAMPLES OF CUSTOM DESIGNS

Figure 1 – CZO-1 incoming/outgoing module with an NH – latr 910 switch disconnector



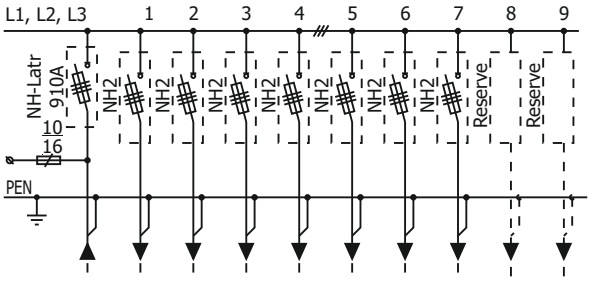
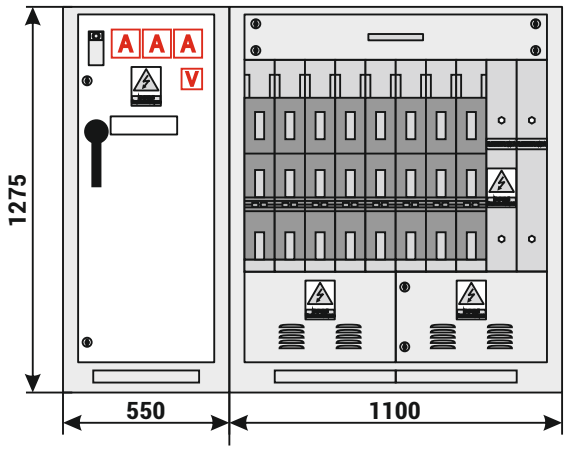
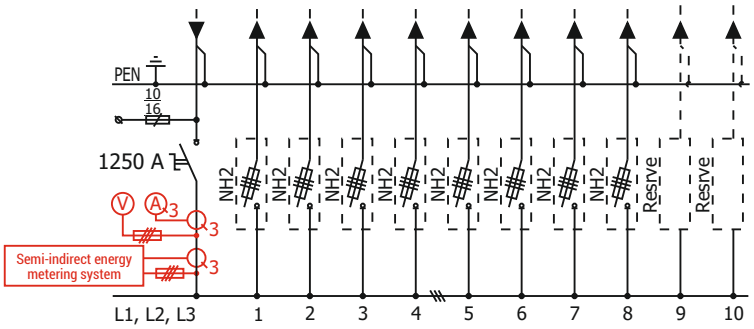


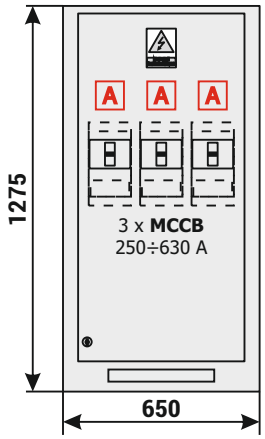
Figure 2 – CZO-2 incoming/outgoing module with a switch disconnector

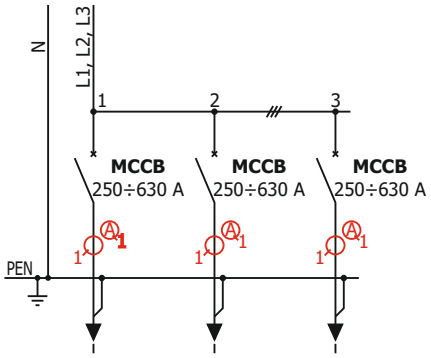




Additional equipment is marked **with red**

Figure 3 – CO-3 Outgoing module with switch disconnectors





Additional equipment is marked **with red**

INCOMING COMPARTMENT (INCOMING MODULE)

In the incoming module, an INP 1000–2000 switch disconnector or other manufacturer's switch disconnector (after consultation) or compact circuit breaker with rated current (630 – 1600 A) can be installed. The circuit breaker or switch disconnector can be equipped with a motor-drive mechanism. It is also possible to install ammeters, voltmeters or a network analyser.

Incoming module			
Module name	Installed device	Dimensions [mm] [width x height x depth]	Notes
Standard design			
CZ-1	INP 1250 or other switch disconnector	550 x 675 x 400 (320)	The possibility of installation of current transformers, ammeters, voltmeter and transformers for semi-indirect energy metering
Custom design			
CZ-4	630–1600 A compact circuit-breaker	550 x 675 x 400 (320)	Drive on the doors, current transformers may not be installed
CZ-5	630–1600 A compact circuit-breaker*)	550 x 800 x 400 (320)	As for standard design
CZ-6	INP 1250 or other switch disconnector*)	1100 x 1275 x 400 (320)	As for standard design, additionally installation circuit interlocks may be installed for the station's auxiliary circuits. **Details, see figure 4.**
CZ-9	630–1600 A compact circuit-breaker*)	550 x 1275 x 400 (320)	As above. **Details, see figure 5.**

*) - the devices used in the switchgear can be equipped with a motor drive, after prior consultation with the manufacturer.

EXAMPLES OF CUSTOM DESIGNS

Figure 4 – CZ-6 incoming/outgoing module with a switch disconnector

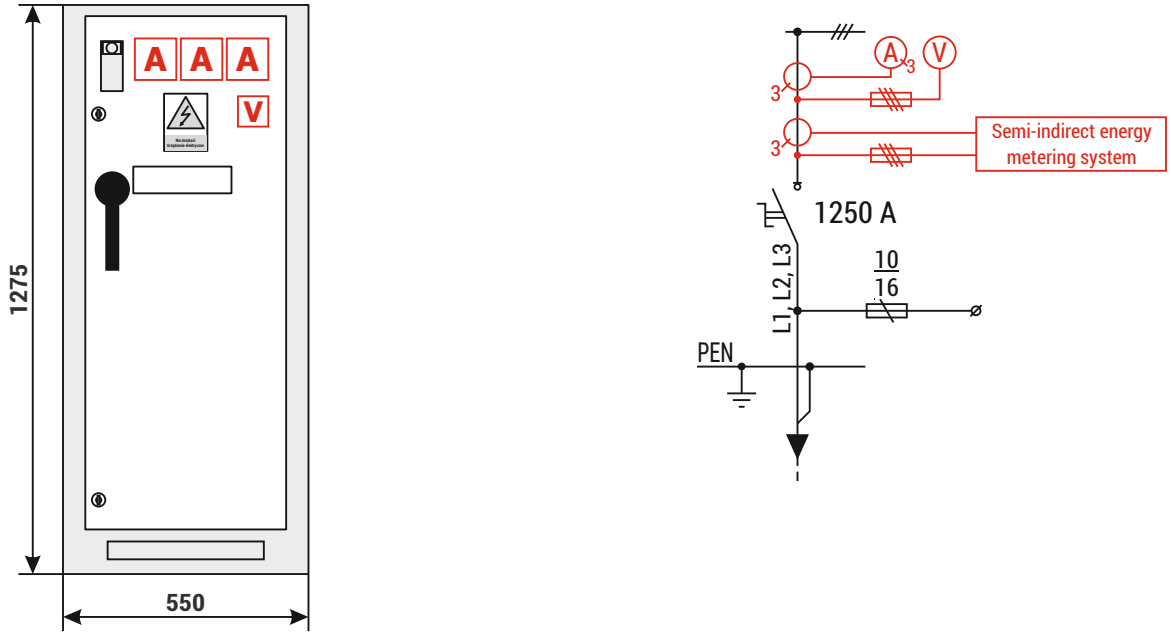
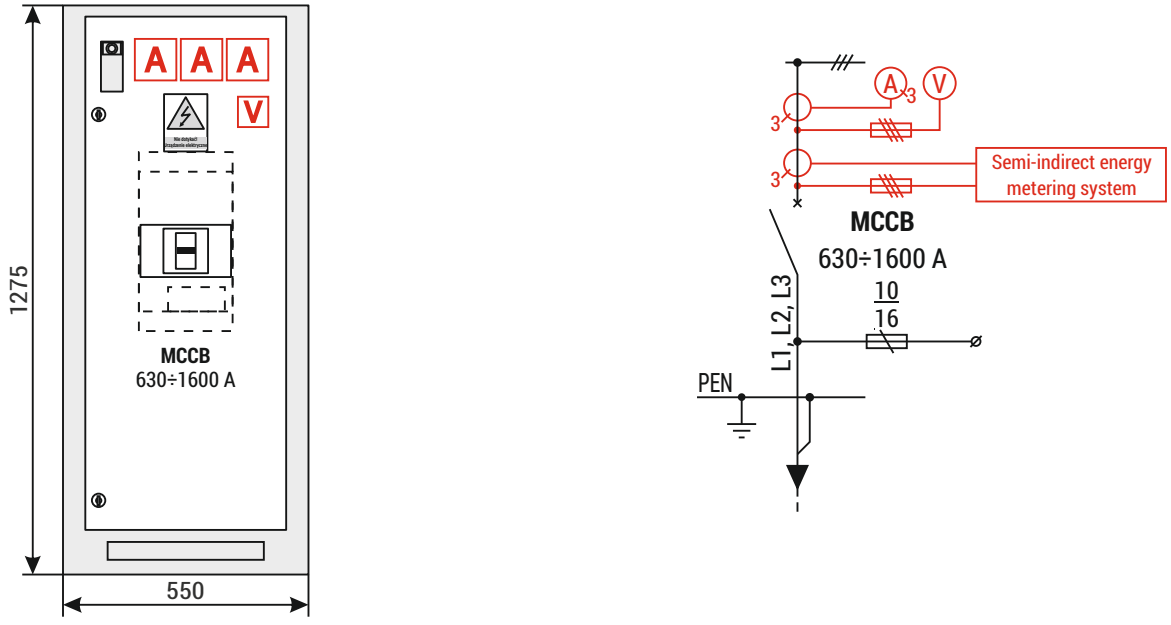


Figure 5 – CZ-9 incoming/outgoing module with compact circuit breakers

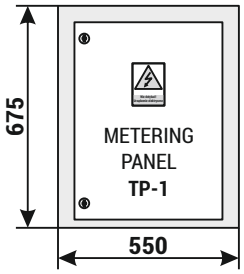


METERING COMPARTMENT (METERING MODULE)

The metering module is used to install an energy meter for billing purposes, designed as a panel for installation of one to four meters. The metering system is also equipped with a metering terminal block, e.g. SKa, and voltage circuits protection.

Metering module			
Module name	Installed device	Dimensions [mm] [width x height x depth]	Notes
Standard design			
TP-1	1 or 2 electricity meters	550 x 675 x 400 (320)	**Details, see figure 6.**
Custom design			
TP-2	3 electricity meters	750 x 675 x 400 (320)	**Details, see figure 7.**
TP-3	3 or 4 electricity meters	1100 x 675 x 400 (320)	**Details, see figure 8.**

Figure 6 – TP-1 metering panel



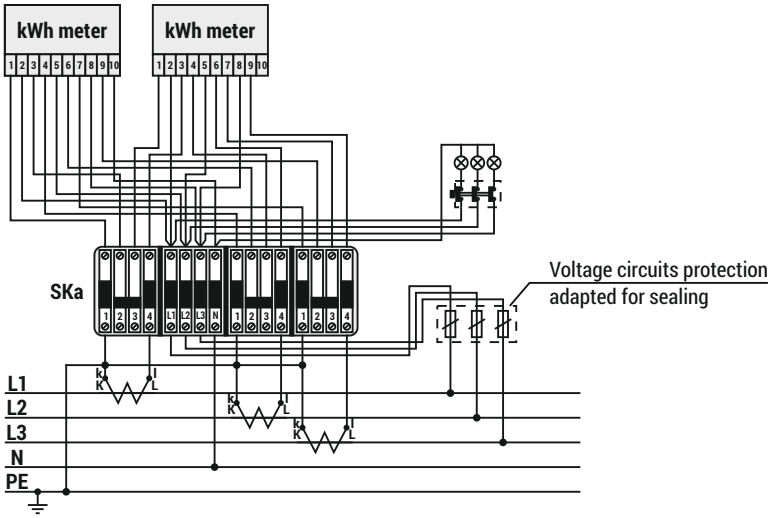
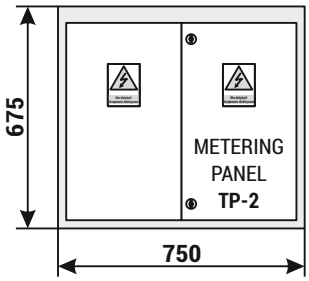


Figure 7 - TP-2 metering panel



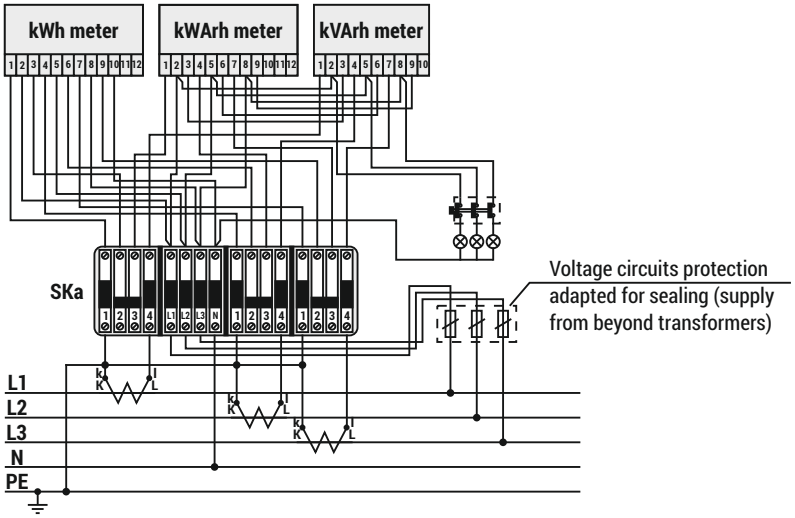
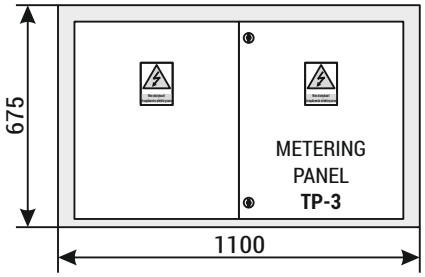
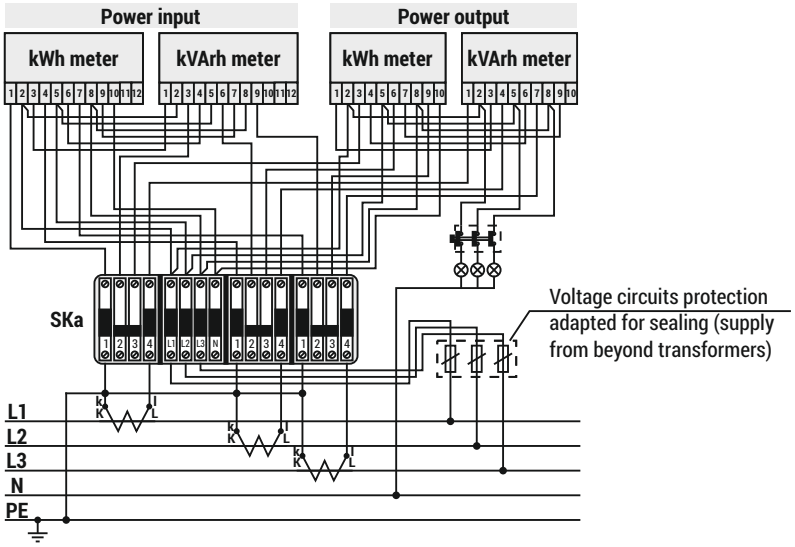


Figure 8 - TP-3 metering panel





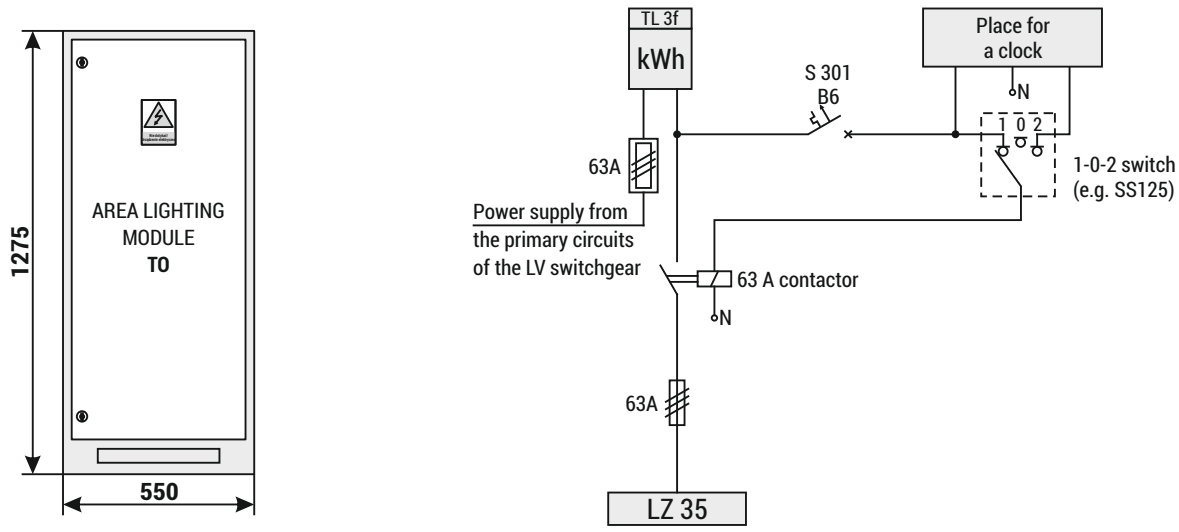
OTHER COMPARTMENTS AND ADDITIONAL ELEMENTS

In the RN-W switchgear other modules may be installed in standard dimension cabinets, e.g.:

- area lighting module,
- installation outgoing feeders
- automation
- ATS system
- others

Other modules			
Module name	Equipment	Dimensions [mm] [width x height x depth]	Notes
Standard design			
TO	Area lighting module	550 x 1275 x 400 (320)	Installed device. **Details, see figure 9.**
Custom design			
TI-1	Installation switch disconnectors or circuit breaker	550 x 675 x 400 (320)	2 rows of modular devices Each row can be equipped with 22 devices with a width of 18 mm
TI-2	Wyłącznik lub rozłączniki instalacyjne	550 x 1275 x 400 (320)	4 rows of modular devices Each row can be equipped with 22 devices with a width of 18 mm
TA-1 TA-2	Automation system	550 x 675 x 400 (320) 550 x 1275 x 400 (320)	The design of the system to be agreed upon with the manufacturer
TSZR	Automatic transfer switching system	550 x 1275 x 400 (320)	The design of the system to be agreed upon with the manufacturer
TX	Other systems	550 x 675 x 400 (320) 550 x 1275 x 400 (320)	To be agreed with the manufacturer

Figure 9 – TO area lighting module

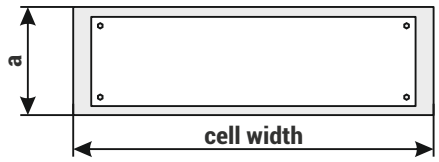


ADDITIONAL EQUIPMENT OF THE RN-W SWITCHGEAR

Busbar bridge cover

A cover for leading the busbar power supply out of the switchgear. Provides an IP20 protection rating and protects the personnel against touching of live elements.

Cable frame



A frame enabling the feeding of cables into the switchgear in rooms without cable trays. The cable frame height “a” depends on the bending radius of the cables.

PLACEMENT OF THE SWITCHGEAR AND INSTALLATION OF CONNECTIONS

The RN-W switchgears are designed for indoors installation. They can be placed directly on concrete flooring of the facility. Regardless of the type of foundation, switchgears must be placed exactly horizontally (maximum deviation may not exceed 2mm over 1 m of base length). The switchgear should be fixed to the foundation with 4 M8 bolts in locations shown on **figure 11.** The power supply is provided at the top of the switchgear with busbars.

NOTE: Busbar connections to the switchgear must be protected from direct contact (using the original cover or one made by the installer), minimum IP20 protection rating.

Phase cables are connected directly to devices' terminals. The connection height is shown on **figure 12.**

The devices are adapted to connection of cables up to 95 mm^2 for size 00 devices (depending on the type of device) and to connect cables with a cross-section up to 240 mm^2 (300 mm^2 conductor with a sector cross-section) for size 1–3 devices.

Figure 11 - Arrangement of holes in the foundation for the installation of RN-W switchgear

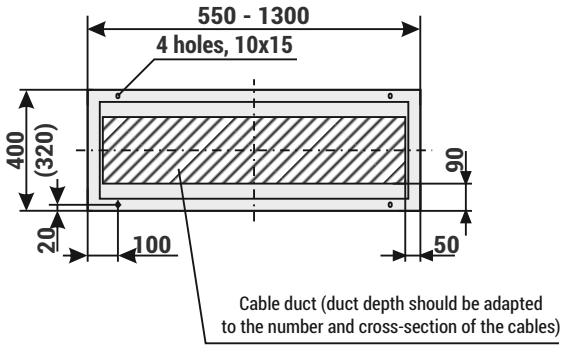
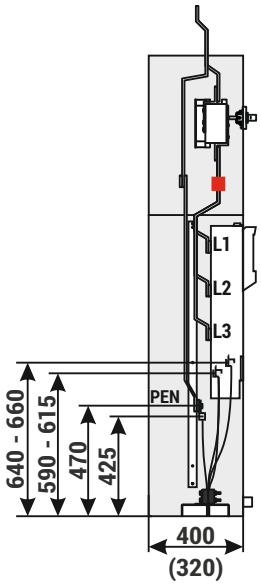


Figure 12 - Height of the cable connection terminals



Low Voltage switchgear

2 / ZR-W

INTRODUCTION

The ZR-W system switchgears are designed for distribution of electricity at each level, as well as control and protection of electrical devices against short-circuit and overload effects. They can be used as primary switchgears, sub-distribution boards, or as control cabinets.

Their universal configuration enables the use of ZR-W switchgears in the following branches of industry:

- chemical / petr
-
- power plants and CHP
- heavy industry: mines, steel plants, coking
- light industry: paper, textile, domestic appliances manufacturing.

And in infrastructure:

- data centr
- airpor
- office
- shopping centr
- hospitals.

CHARACTERISTICS

- Simple installation system, which does not require the use of complicated manufacturing processes and tools, which significantly shortens manufacturing time,
- thoughtful design composed of repeatable elements, which enables mass manufacturing of switchgear
- ease of modification (reconstruction and expansion), which allows the adaptation of the device to changing
- depending on the requirements, it is possible to manufacture switchgears with primary busbars at the top or in the rear of the cabinets, which enables the feeding of cables both from the top and from the bottom of the switchgear
- withdrawable module technology ensures rapid replacement of devices without having to shut down entire switchgear
- easy servicing and maintenance, possibility of placing various functional modules in the cabinet
- the switchgear has been thoroughly tested according to the newest PN-EN 61439-1/2 standard, which focuses on operator safety
- 30 years of experience in switchgear design and development has resulted in the introduction of a wide range of safety improv
- only high-quality materials and devices (meeting the requirements of European standards) are used.

BASIC TECHNICAL DATA

Compliance with standards:

The ZR-W type switchgear meets the requirements of the following standards:

- **PN-EN 61439-1** - „Low-voltage switchgear and controlgear assemblies. General rules",
- **PN-EN 61439-2** - „Low-voltage switchgear and controlgear assemblies. Power switchgear and controlgear assemblies.",
- **PN-EN 60529** - „Degrees of protection provided by enclosur
- **PN-EN 62262** - „Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)"

Electrical data:	
Rated insulation voltage	690 V / 1000 V / 1500 V[1)]AC up to 1500 V DC
Rated connection voltage	400 V / 500 V / 690 V / 1000 V[2)]AC do 1200 V DC
Test impulse withstand voltage	8 kV
Rated frequency	50 Hz
Rated current of the switchgear	from 1000 to 6300 A
Rated short-time withstand current	up tp 105 kA (1s)
Rated peak withstand current	up to 231 kA
Resistance to internal arcing	105 kA / 1s
Mechanical data:	
Dimensions	Width from 400 to 1200 mm Height 1900 / 2200 mm Depth 600 / 800 / 1000 mm
IP degree of protection	from IP20 to IP54
IK degree of protection	up to IK 10
Form of compartments (depending on bay type)	from 2A to 4B
Surface protection	Framework: 2.5 mm zinc and galvanized steel sheet Covers (doors): 1.5/2 mm painted sheet [3)] Font panels: 1.5 mm painted steel sheet
Powder painting	RAL 7035 as standard, other colours on request
Plastic components	Halogen-free, self-extinguishing, fire-resistant, CFC-free
Service conditions	
Ambient temperature - Lower limit of ambient temperature - Upper limit of ambient temperature - Average daily temperatures over 24 hours	-5°C (- 25°C)[4)] + 40°C from -5°C to 35°C
Relative humidity	up to 50% (at a temp. 40°C)
Installation altitude	up tp 1000 m a.s.l.
Atmosphere at the place of installation	free from chemically aggressive and conducting dust, fumes and gases

At the customer's request it is possible to design a switchgear adapted to other conditions

Note:

[1)] Up to 1500 V AC in custom design.
[2)] Up to 1000 V AC in custom design.
[3)] Other design technology to be agreed with the manufacturer.
[4)] Depending on the devices used.

SWITCHGEAR DESIGN

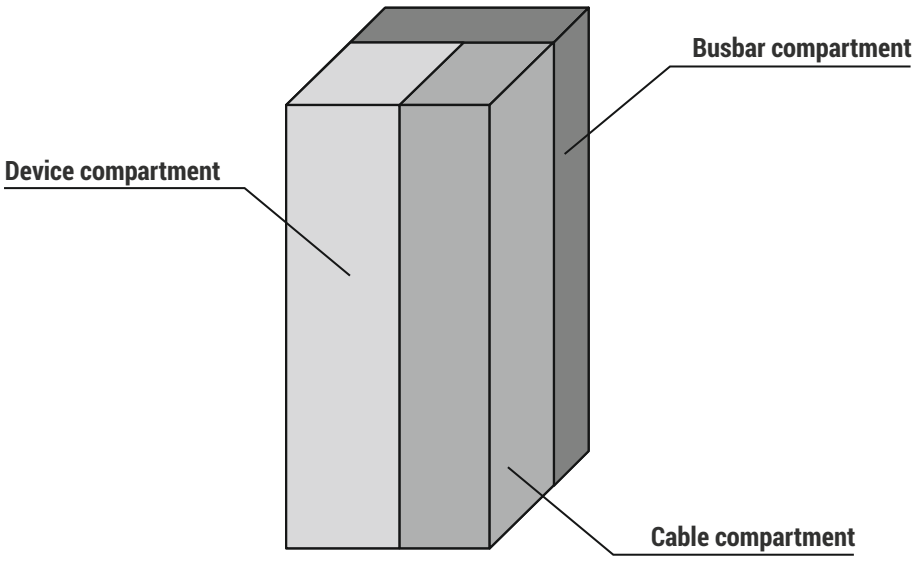
Main mechanical design of the switchgear consists of:

- framework made of zinc-coated pr
- functional compartment divider elements, such as vertical and horizontal par
- external covers (doors/side and back walls/roof/floor).

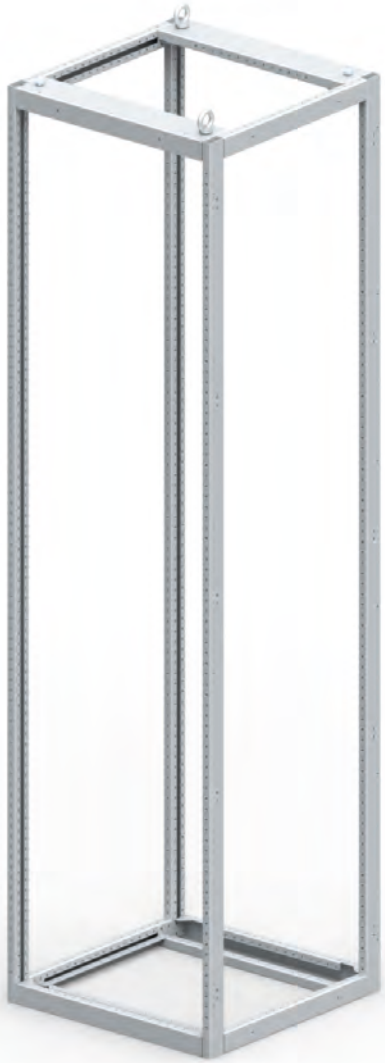
Depending on the method of production, cells can be partially or entirely covered. The door, front covers and back walls can be equipped with ventilation grilles. Inspection windows installed on the door are made from multi-layered glass or plastics.

Framework	Internal partitions	External covers

Depending on the requirements and switchgear design cells are divided into three functional compartments.



BAY DIMENSIONS



Structure dimensions

Height (mm)	Width (mm)	Depth (mm)
1900 / 2200	400	600 / 800 / 1000
	500	
	600	
	700	
	800	
	900	
	1000	
	1100	
	1200	

BUSBARS

Classification of busbars in the ZR-W switchgear according to their function:

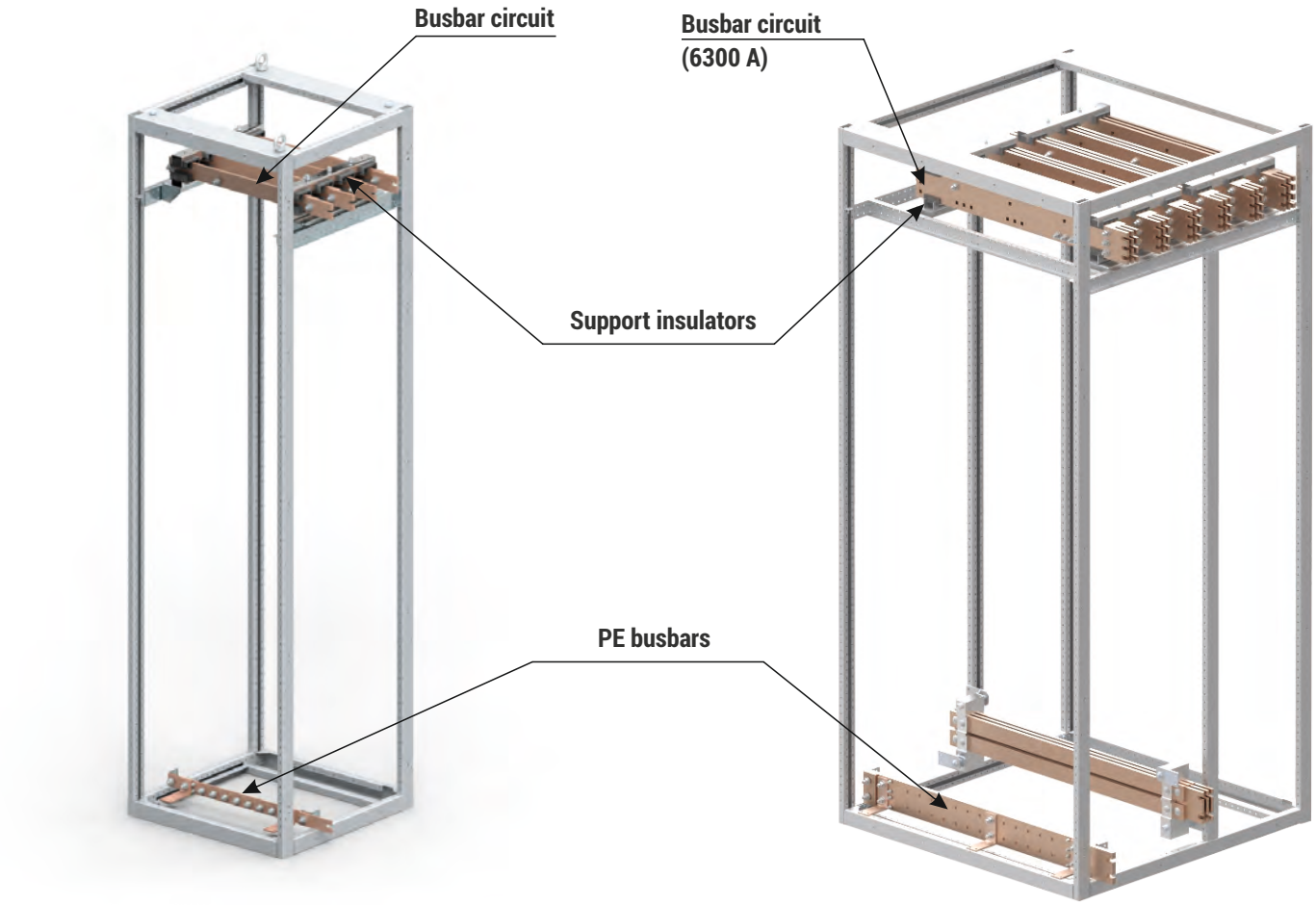
- primar
- distribution busbars,
- protective earth and neutral busbars (PE+N/PEN)

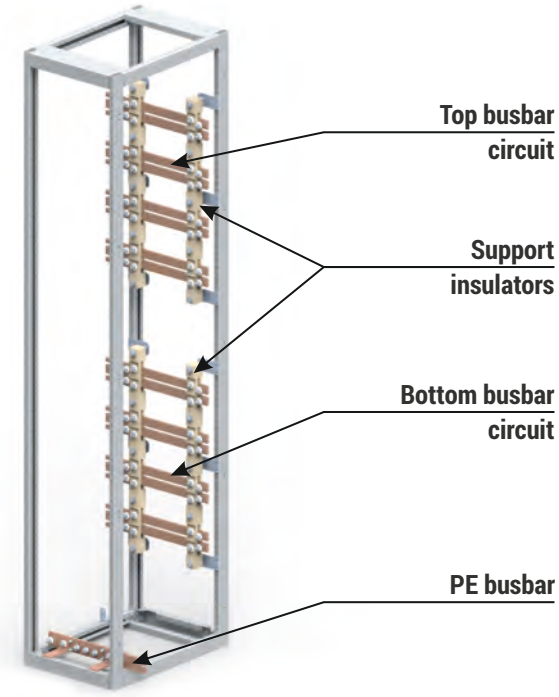
PRIMARY BUSBARS

Primary busbars located at the top of the cabinet

Primary phase busbars and primary neutral N busbars (protective earth-neutral PEN for 4-wire system) are located in the busbar compartment at the top of the switchgear. Primary protective earth PE busbars (for 5-wire system) are located in the front in the lower part of the cabinet along its face.

Primary busbars in a top mounted system



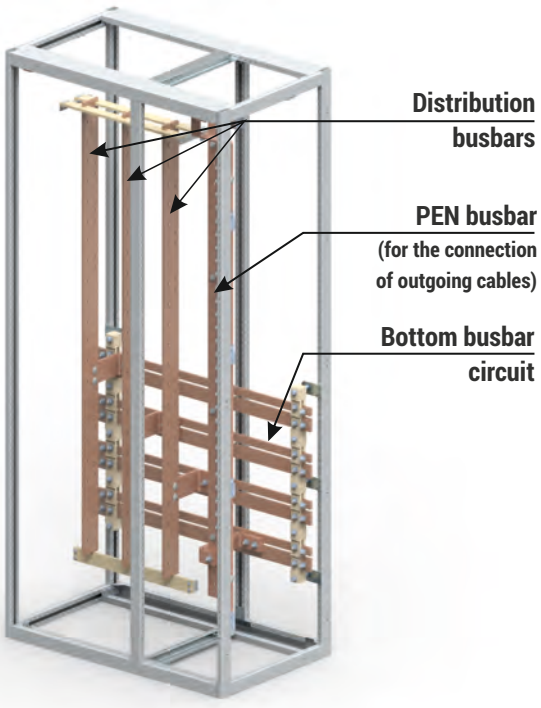


Primary busbars located at the rear of the cabinet

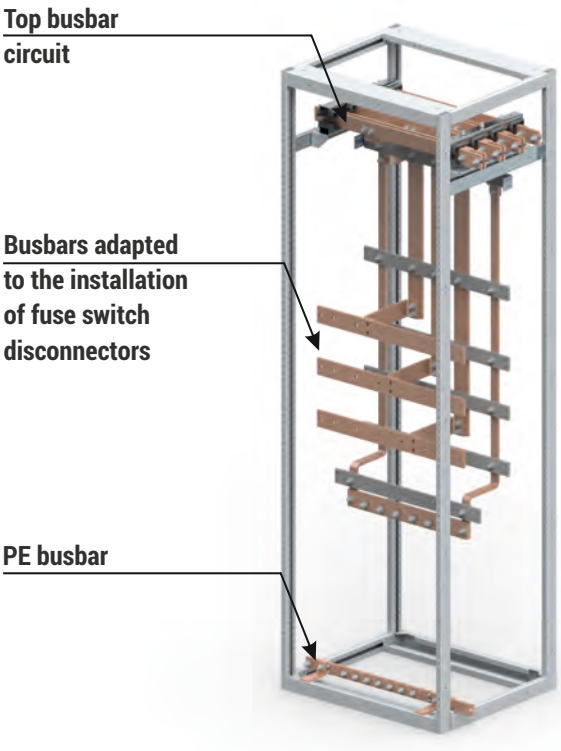
Primary phase busbars and primary neutral N busbars (protective earth-neutral PEN for 4-wire system) are located in the busbar compartment at the rear of the switchgear.

Depending on the configuration, they are placed in its bottom or its top part. Primary protective earth PE busbars (for 5-wire system) are located in the front in the lower part of the cabinet along its face.

DISTRIBUTION BUSBARS



Vertical distribution busbars are located in the busbar compartment, on the left side of the switchgear cabinet. They are used for connecting fixed, plug-in and withdrawable outgoing units. A neutral N busbar and protective earth PE busbar (for 5-wire cable system) or a protective earth neutral PEN (for 4-wire cable system) are then arranged vertically in the connection compartment.



Busbars adapted to strip-type fuse switch disconnectors installation

Busbars located at the front of the switchgear cabinet are used for direct installation of strip-type fuse switch disconnectors.

TYPES OF BAYS

The ZR-W type switchgear is composed of a combination of 9 bay types

- Circuit breaker bay
- Bus coupler bay
- Bay with vertical fuse switch disconnect
- Bay with horizontal fuse switch disconnect
- Outgoing bay
- Free installation bay
- Cassette bay
- Capacitor bank bay
- Corner bay.

CIRCUIT BREAKER BAY

Technical data of the circuit breaker bay

Area of application	Incoming feeder Outgoing feeder		
Ingress protection rating	Ventilated up to IP41 Non-ventilated up to IP54		
Bay dimensions	Wysokość Szerokość Głębokość	1900 / 2200 mm 400*) / 500 / 600 / 700 / 800 / 900/ 1000 / 1100 / 1200 mm 600 / 800 / 1000 mm	
Possibility of installing devices	Air circuit breaker up to 6300 A Compact circuit breaker up to 1600 A		
Form of compartments	Form 2B / 3A / 4B		
Bay construction method			
Primary busbars placed at the top	Bay depth 600	Connection: - busbar: side / rear / bottom - bus duct: bottom - cable: bottom, up to 12 cables of 240 mm^2	
Primary busbars placed at the top	Bay depth 800 / 1000	Connection: - busbar: side / rear / bottom - bus duct: bottom - cable: top, up to 12 cables of 240 mm^2	
Primary busbars placed at the back	Bay depth 600	Connection: - busbar: side / bottom - bus duct: bottom - cable: top, up to 12 cables of 240 mm^2	
Primary busbars placed at the back	Bay depth 800 / 1000	Connection: - busbar: side / top / bottom - bus duct: bottom - cable: top, up to 12 cables of 240 mm^2	

*) Solution only for bays with busbars at the back.

Minimum bay dimensions depending on the installed devices

Device type	Rated current	Bay width (3-pole devices)	Bay width (4-pole devices)	Bay depth
Fixed or withdrawable compact circuit breaker	Up to 1600 A	400*) / 500 mm	600 mm	600 mm
Fixed or withdrawable power circuit breaker	Up to 1600 A	600 mm	800 mm	600 mm
Stationary compact circuit breaker	From 2000 to 3200 A	600*) / 700 mm	800 mm	600 mm
Withdrawable compact circuit breaker	From 2000 to 2500 A	600*) / 700 mm	800 mm	600 mm
Stationary compact circuit breaker	4000 A	800 mm	900 mm	800 mm
Withdrawable compact circuit breaker	From 3200 to 4000 A	800 mm	900 mm	800 mm
Fixed or withdrawable power circuit breaker	From 5000 to 6300 A	1000 mm	1200 mm	1000 mm

***) Solution only for bays with busbars at the back.**

BUS COUPLER BAY

Technical data of the bus coupler bay

Area of application	Coupler between sections	
Ingress protection rating	Ventilated up to IP41 Non-ventilated up to IP54	
Bay dimensions	Height Width Depth	1900 / 2200 mm 600*) / 700*) / 800 / 900 / 1000 / 1100 / 1200 mm 600 / 800 / 1000 mm
Possibility of installing devices	Air circuit breaker up to 6300 A Compact circuit breaker up to 1600 A	
Form of compartments	Form 2B / 3A / 4B	
Bay construction method		
Primary busbars placed at the top	Bay depth depends on the incoming bay depth	Busbar connection of two upper circuits using a riser compartment
Primary busbars placed at the back	Bay depth depends on the incoming bay depth	Connection of the upper busbar circuit with the bottom busbar circuit

*) **Solution only for bays with busbars at the back.**

Minimum bay dimensions depending on the installed devices

Device type	Rated current	Bay width (3-pole devices)	Bay width (4-pole devices)	Bay depth
Fixed or withdrawable compact circuit breaker	Up to 1600 A	600 mm	700 mm	600 mm
Fixed or withdrawable power circuit breaker	Up to 1600 A	700*) / 800 mm	800 mm	600 mm
Stationary power circuit breaker	From 2000 to 3200 A	900 mm	1000 mm	600 mm
Withdrawable power circuit breaker	From 2000 to 2500 A	900 mm	1000 mm	600 mm
Stationary power circuit breaker	4000 A	1100 mm	1200 mm	800 mm
Withdrawable power circuit breaker	From 3200 to 4000 A	1100 mm	1200 mm	800 mm
Fixed or withdrawable power circuit breaker	From 5000 to 6300 A	1200 mm	———	1000 mm

*) **Solution only for bays with busbars at the back.**

BAY WITH VERTICAL FUSE SWITCH DISCONNECTORS

Technical data of the bay with vertical fuse switch disconnectors

Area of application	Outgoing on fuse switch disconnectors		
Protection rating	Ventilated up to IP2X Non-ventilated up to IP54		
Bay dimensions	Height Width Depth	1900 / 2200 mm 400*) / 500 / 600 / 700 / 800 / 900/ 1000 / 1100 / 1200 mm 600 / 800 / 1000 mm	
Possibility of installing devices	Strip-type fuse switch disconnectors, size 00 up to 3 Twin switch disconnector installation (size 3) 800 A / 1000 A / 1250 A		
Form of compartments	2B form		
Bay construction method			
Primary busbars placed at the top	Bay depth 600	Connection: - cables from the bottom, up to 3 cables to each switch disconnector, cable cross-sections according to the manufacturer's catalogue	
Primary busbars placed at the back	Bay depth 600	Connection: - cables from the bottom or top, up to 3 cables to each switch disconnector, cable cross-sections according to the manufacturer's catalogue	
Every placement of primary busbars	Bay depth 800 / 1000	Connection: - cables from the bottom or top, up to 3 cables to each switch disconnector, cable cross-sections according to the manufacturer's catalogue	

*) Solution only for bays with busbars at the back.

Minimum bay dimensions depending on the installed devices

Bay width	400*)	500	600	700	800	900	1000	1100	1200
Number of 00 size devices	6	8	10	12	14	16	18	20	22
Number of 1 size devices	3	4	5	6	7	8	9	10	11
Number of 2 size devices	3	4	5	6	7	8	9	10	——
Number of 3 size devices	3	4	5	6	7	——	——	——	——

*) Minimum bay dimensions depending on the installed devices.

BAY WITH HORIZONTAL FUSE SWITCH DISCONNECTORS

Technical data of the bay with vertical fuse switch disconnectors

Area of application	Outgoing on fuse switch disconnectors	
Ingress protection rating	Ventilated up to IP2X Non-ventilated up to Ip54	
Bay dimensions	Height Width Depth	1900 / 2200 mm 1100 / 1200 mm 600 / 800 / 1000 mm
Possibility of installing devices	Strip-type fuse switch disconnectors, size 00 up to 3	
Form of compartments	2B / 3B / 4B form	
Bay construction method		
Primary busbars placed at the top	Bay depth 600	Connection: - cables from the bottom, up to 3 cables to each switch disconnector, cable cross-sections according to the manufacturer's catalogue
Primary busbars placed at the back	Bay depth 600	Connection: - cables from the bottom or top, up to 3 cables to each switch disconnector, cable cross-sections according to the manufacturer's catalogue
Every placement of primary busbars	Bay depth 800 / 1000	Connection: - cables from the bottom or top, up to 3 cables to each switch disconnector, cable cross-sections according to the manufacturer's catalogue

Minimum bay dimensions depending on the installed devices

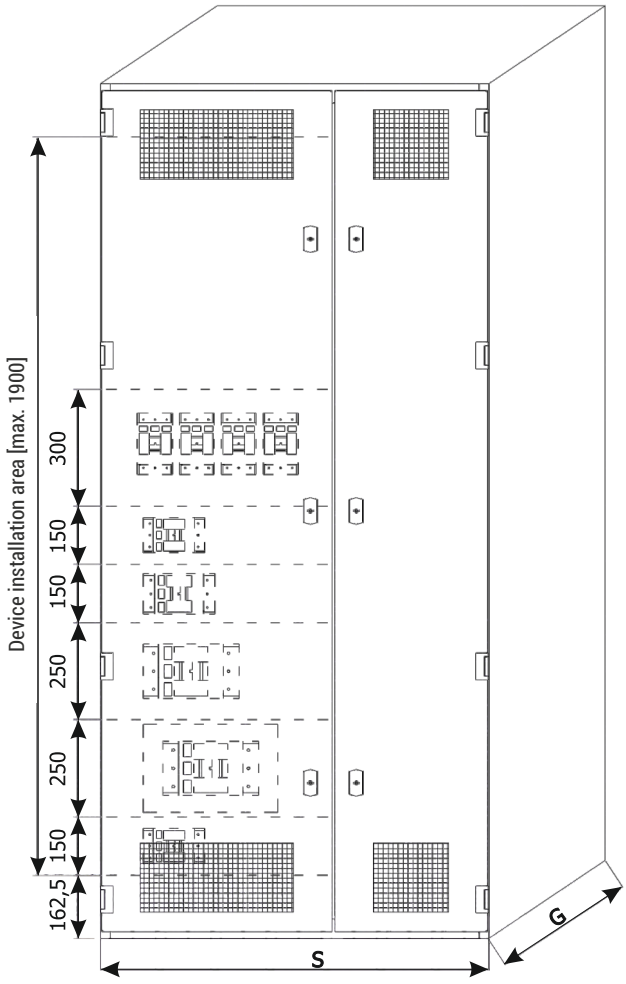
Bay width	1000 mm	1200 mm
Number of 00 size devices	up to 15	up to 19
Number of 1 size devices	up to 10	up to 15
Number of 2 size devices	up to 9	up to 11
Number of 3 size devices	up to 6	up to 7

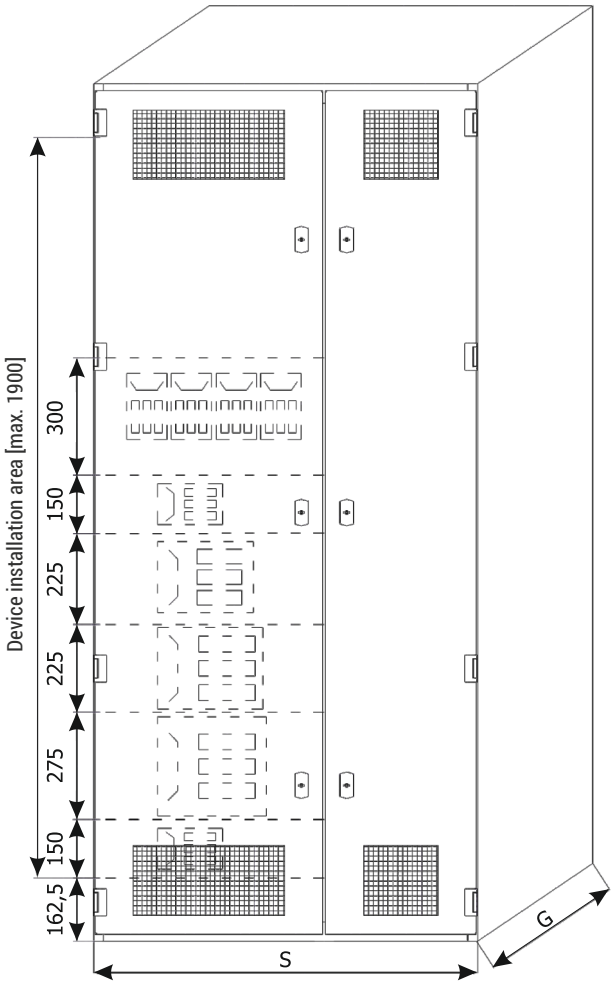
*) Minimum bay dimensions depending on the installed devices.

OUTGOING BAY

Technical data of the outgoing bay

Area of application	Outgoings on box fuse switch disconnectors, compact circuit breakers or motor modules	
Protection rating	Ventilated up to IP2X Non-ventilated up to IP54	
Bay dimensions	Height Width Depth	1900 / 2200 mm 1000 / 1200 mm 600 / 800 / 1000 mm
Possibility of installing devices	Box fuse switch disconnectors Compact circuit breakers up to 800 A Motor power supply systems (protection/contactor) Modular device	
Form of compartments	2B / 3B / 4B form	
Bay construction method		
Primary busbars placed at the top	Bay depth 600	Connection: - cables from the bottom, up to 2 cables to each device, cable cross-sections according to the manufacturer's catalogue
Primary busbars placed at the back	Bay depth 600	Connection: - cables from the bottom or top, up to 2 cables to each switch disconnector, cable cross-sections according to the manufacturer's catalogue
Every placement of primary busbars	Bay depth 800 / 1000	Connection: - cables from the bottom or top, up to 2 cables to each switch disconnector, cable cross-sections according to the manufacturer's catalogue





Possibility of installing devices

Bay height	The device may be installed in a unit
150 mm	Stationary compact circuit breaker up to 160 A Box fuse switch disconnector up to 160 A Modular device
200 mm	Plug-in compact circuit breaker up to 160 A Plug-in stationary compact circuit breaker up to 250 A
250 mm	3-pole stationary compact circuit breaker up to 630 A 3-pole plug-in or withdrawable compact circuit breaker up to 400 A 3-pole box fuse switch disconnector up to 400 A
300 mm	Four fuse switch disconnectors or compact circuit breakers installed vertically (current ≤ 160 A) Plug-in stationary compact circuit breaker up to 800 A 3-pole plug-in or withdrawable compact circuit breaker up to 630 A Electrical energy meters Various devices

In a cabinet with a height of 2200 mm the device installation area is 1900 mm
In a cabinet with a height of 1900 mm the device installation area is 1500 mm

FREE INSTALLATION BAY

Technical data of the free instalation bay

Area of application	The bay to be equipped by the customer	
Protection rating	Ventilated up to Ip41 Non-ventilated up to IP54	
Bay dimensions	Height Width Depth	1900 / 2200 mm 400*) / 500 / 600 / 700 / 800 / 900 / 1000 / 1100 / 1200 mm 600 / 800 / 1000 mm
Possibility of installing devices	The bay is designed for the installation of customer's devices, such as: frequency converters, softstarts, non-typical control instrumentation, etc.	
Form of compartments	2A form	
Bay construction method		
Primary busbars placed at the top	Bay depth 600 mm	Connection: - cables from the bottom, cable cross-sections according to the client specification
Primary busbars placed at the back	Bay depth 600 mm	Connection: - cables from the bottom or top, cable cross-sections according to the client specification
Every placement of primary busbars	Bay depth 800 / 1000 mm	Connection: - cables from the bottom or top, cable cross-sections according to the client specification

*) Solution only for bays with busbars at the back.

MCC TYPE CASSETTE BAYS

Cassette type ZR-W switchgear is intended for installation in industrial plants and facilities where ensuring the continuity of power supply and minimisation of time needed for equipment inspection is a priority. Examples include technological lines for steel manufacturing and processing, glass casting processes, assembly lines for cars, TVs, washing machines etc., generally all applications where the failure of a single device causes the entire line to stop and the company to bear losses. The use of cassette type solutions eliminates the need to de-energise the switchgear when one device fails, and minimises the time needed for the inspection, upgrade or expansion of the switchgear.

MAIN ADVANTAGES

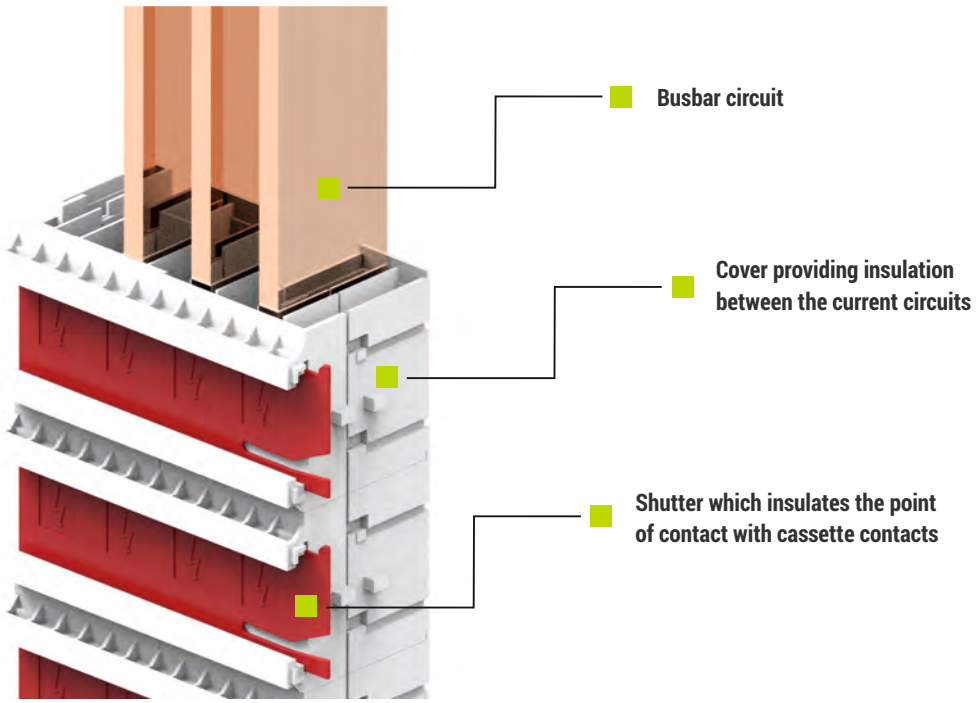
High flexibility of solutions

The possibility of using 3-pole or 4-pole devices by various manufacturers, such as: ABB, Eaton, Siemens, Schneider, Socomec.

The ZR-W cassette solution is proprietary to our company and is independent from any manufacturer of electric devices, which enables the use of devices by any manufacturer within the cassettes' design capacities.

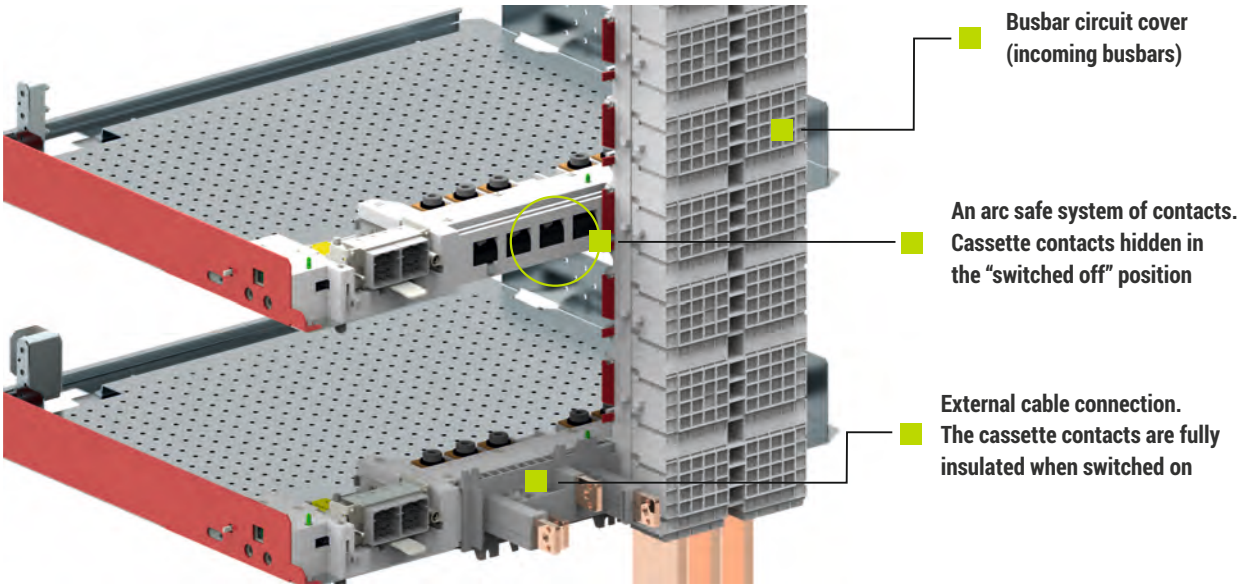
Arc safe vertical electricity distribution system.

The construction of the vertical busbar circuit ensures that the current circuits are insulated from each other, the power distribution elements are protected against touch, and elements which supply cassettes are equipped with shutters which are automatically closed after the cassette is removed from the bay, which prevents any objects that could cause a short circuit from entering the busbar circuit, while simultaneously ensuring complete safety of the user even with the cassette removed from the bay.

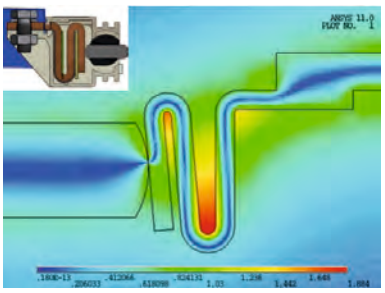


An arc safe system of contacts

Main contacts of the cassette system are insulated, and their connection to vertical incoming busbars only occurs when the cassette is inserted into the bay and locked, which prevents an arc short when the contacts are moving.



Innovative system of contacts which increase contact force during closure



Pressure contact system

It was designed in cooperation with the Fraunhofer Institute and causes an increase in the contacts' pressure force during closure as a result of electrodynamic force, which ensures a constant contact pressure even with worn contact elements.

TECHNICAL DATA OF THE CASSETTE BAY

Compliance with standards.
Sets of switchgears verified in accordance with the standards:

- **PN-EN 61439-1**
- **PN-EN 61439-2**

ELECTRICAL DATA

Rated impulse

Rated insulation voltage Ui	
- main circuits	1000 V AC
- auxiliary circuits	500 V
Rated connection voltage Ue	do 690 V AC
Rated impulse withstand voltage Uimp	8 kV
Overvoltage category	III / IV
Level of contamination	3
Rated frequency	50 / 60 Hz

Rated current

Distribution busbars	Rated current Ie	1250 A
	Rated short-time withstand current Icw	65 kA
	Rated peak withstand current Ipk	150 kA

Resistance to electric arc effects

“Arc fault free” design prevents the occurrence of an arc fault.

MECHANICAL DATA

Dimensions

Support cabinet and construction	Height	2200 mm
	Height of cassettes installation space	1650 mm
	Widht	1000, 1100, 1200 mm
	Depth	600, 800, 1000 mm

Surface protection

Supporting structures (profiles)	Zinc or Aluzinc coated

Ingress protection rating

Depending on installation conditions	up to IP30

Plastic components

Halogen-free, self-extinguishing, fire-resistant, CFC-free

Form of compartments

Depends on the solution adopted	from 3B to 4 B

Cable compartment

Cable connection	right side of the bay
Cable outlet	bottom or top

OPTIONAL ADDITIONS		
Painting	Special colour on request	Standard RAL 7035

SERVICE CONDITIONS		
Normal		
Ambient temperature	lower limit of ambient temperature	-5°C
Ambient temperature	lower limit of ambient temperature	+40°C

WARNING!

At the customer's request it is possible to design a switchgear adapted to other service conditions than specified in the table.

CASSETTE BAY DESIGN

The structural module of the cassettes is a size of 1M=75 mm, imposed by the spacing of connections in the distribution busbars, available installation area is 1650 mm – 22 M

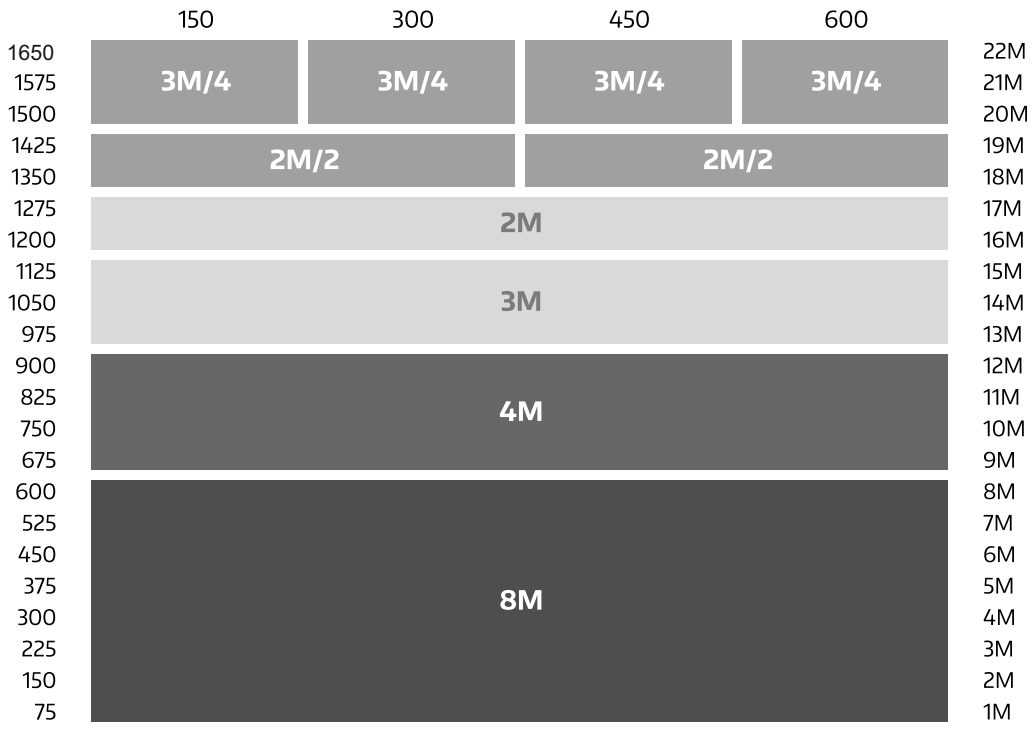
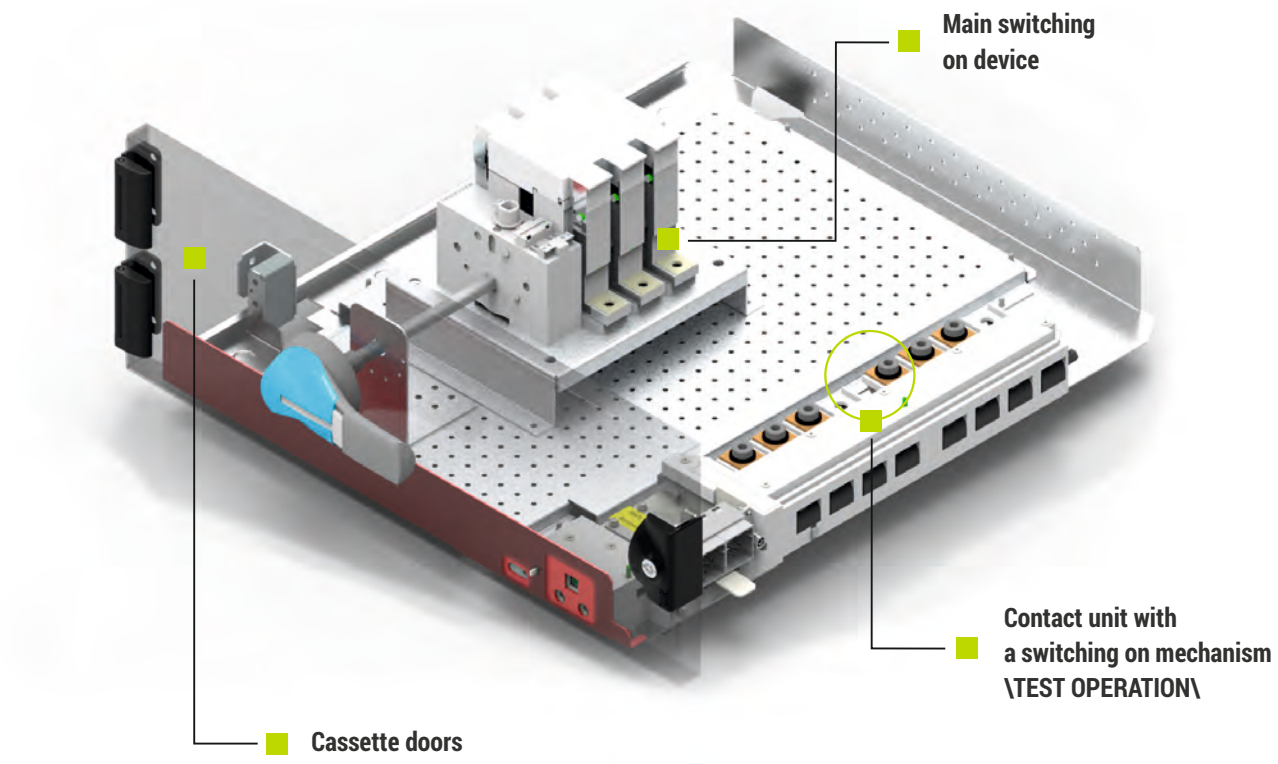


Table of full cassette dimensions				
Cassette dimension	Cassette height [mm]	Cassette power contacts used		
2M	150	160 A		
3M	225	160 A		
4M	300	160 A	315 A	
5M	375	160 A	315 A	
6M	450	160 A	315 A	630 A
7M	525		315 A	630 A
8M	600		315 A	630 A

FULL-SIZE CASSETTE DESIGN

The cassette is composed of a cassette body and installation plate, on which devices are installed, cassette doors which are connected to the frame structure and a mechanism which activates the cassette contacts.



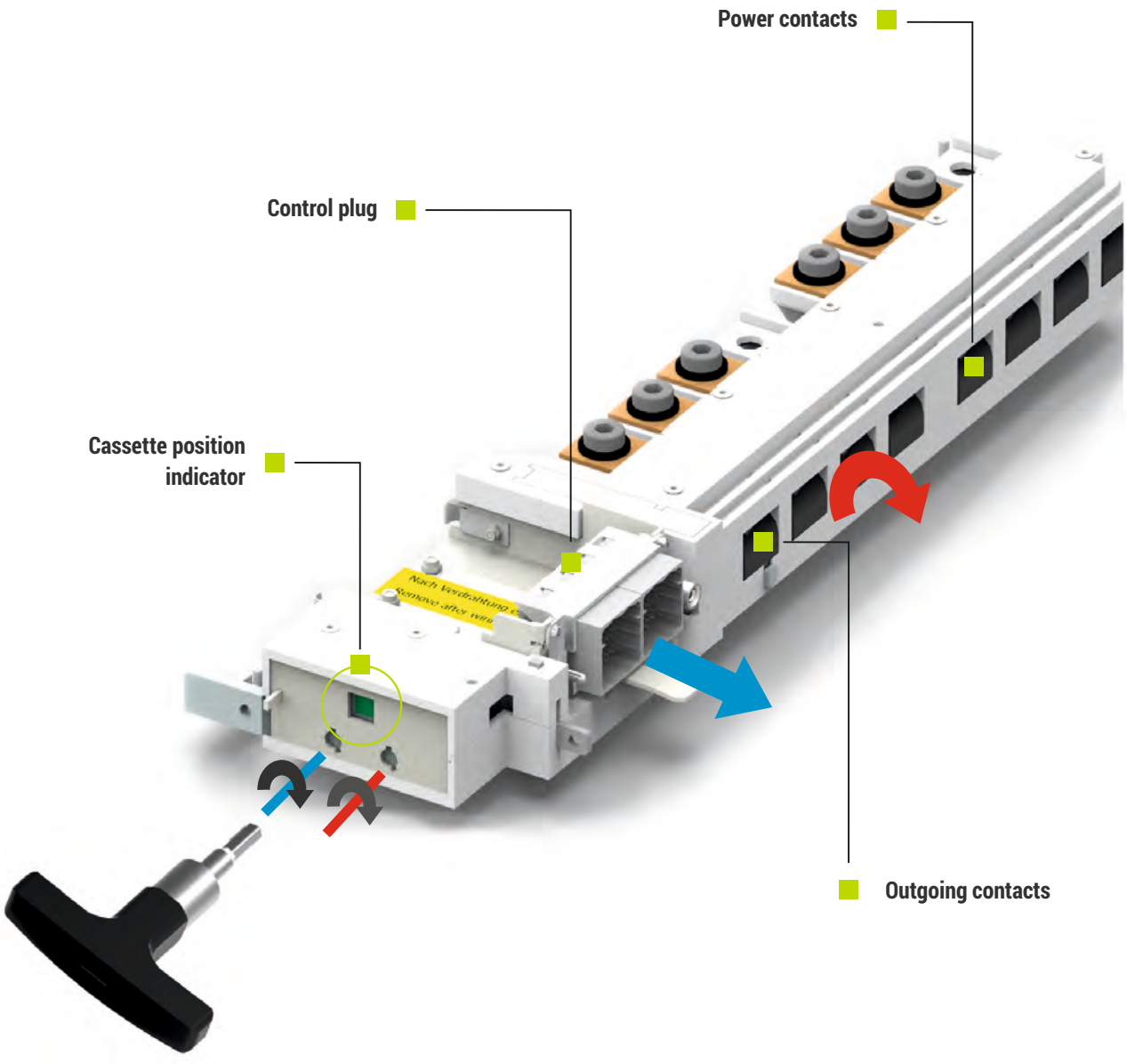
Operation of switching on cassette contacts is performed with a special key, used to switch on control or power contacts:

“TEST” position

By inserting the key in the opening on the left side and turning it control contacts are switched on, and the cassette position indicator changes colour from green to blue.

“OPERATION” position

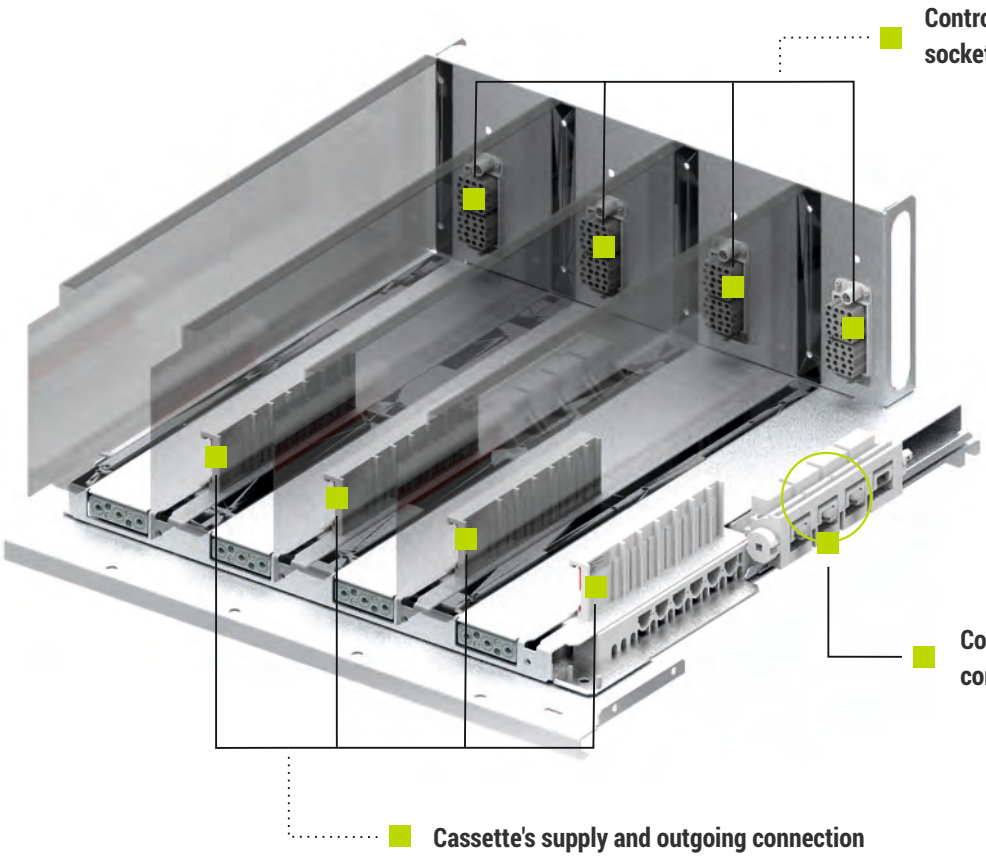
By inserting the key in the opening on the right side and turning it control and power contacts are switched on and the cassette position indicator changes colour from green to red.

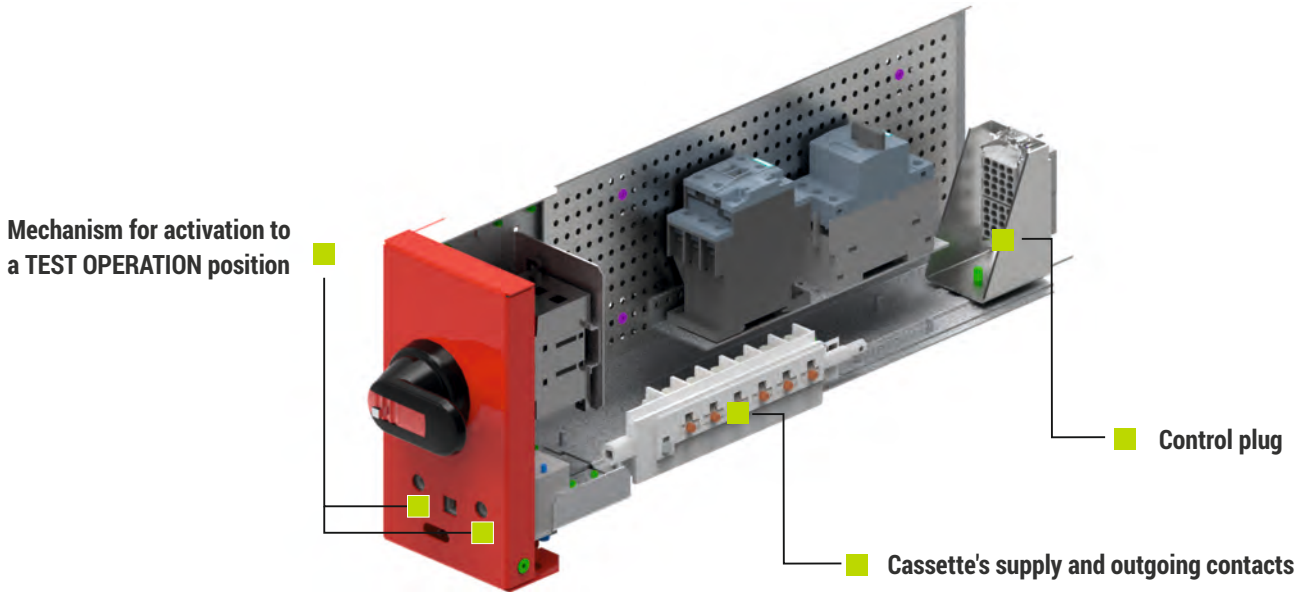


CONSTRUCTION OF HALF-SIZE AND QUARTER-SIZE CASSETTES

The switchgear may use “quarter-size” 3M/4 cassettes — 4 cassettes in a single row, and “half-size” 2M/2 or 3M/2 cassettes — 2 cassettes in a single row.

In order to install half-size or quarter-size cassettes in place of a full-size cassette, a half-size or quarter-size cassette adapter should be inserted and connected with busbars using a power supply connector.





TYPICAL SOLUTIONS FOR CASSETTES

The size of a cassette appropriate for a given solution depends on the type of consumer, equipment and power (or current) of the consumer supplied from the cassette.

Type of consumer

Cassettes are used to supply the following types of consumers:	
CP - (Cable protection)	cassette intended to supply a non-inductive consumer, such as another switchgear, plug sockets, heaters, lighting etc.
DOL – (Direct on line)	cassette intended to supply direct start motor feeders
RS – (reverese starter)	cassette intended to supply bidirectional motor feeders
DSS – (Delta – Star starter)	cassette intended to supply motors with a star delta starting system
SOFT – (sofstarter)	cassette equipped with a soft-starter
FC – (frequency converter)	cassette equipped with a frequency converter

Equipment

Cassettes may be equipped with fuse switch disconnectors with rotary drive, compact circuit-breakers, motor circuit-breakers, power contactors and thermal relays. Current transformers may be installed for metering purposes.

The standard equipment of a DOL type full cassette is:

Fuse switch disconnector + Contactor + Thermal relay **or** circuit breaker + contactor

In half-size and quarter-size cassettes additional equipment includes an operational switch for design considerations.

Manufacturers

Devices made by the following manufacturers may be used in cassettes manufactured by ZPUE S.A.: ABB, Eaton, Siemens, Schneider, Socomec.

Cassette power/current

If the cassette is of a CP type it is adapted based on cassette current, for other solutions it is adapted according to the power of the connected motor.

Additional equipment

Cassettes may be additionally equipped with:

- Coding element – prevents the possibility of placing the cassette on a different shelf than planned;
- Electrical signalling of the cassette position (OPERATION and TEST position signalling contacts);
- Interlock preventing the activation of the cassette contacts with an active main device;
- Ammeters;
- Network parameter meters etc.

CONTROL OPTIONS

All cassettes are equipped with modular control plugs which enable connection of cables in PROFIBUS / MODBUS / ETHERNET standard, due to availability of space putting controllers in a cassette is possible only in full-size cassettes.

Quarter-size cassette with two signalling lamps

Due to size, in a quarter-size cassette in addition to the activating switch disconnector the placement of only two signalling lamps / buttons is possible, 22 mm hole diameter.

As standard, ZPUE S.A. uses illuminated **green** / **red** buttons. Buttons are used to activate and deactivate cassettes, illumination of the green button means a readiness for activation of a contactor-equipped cassette, and illumination of the red button means a failure.

Half-size cassette with three signalling lamps

Due to size, in a half-size cassette in addition to the activating switch disconnector the placement of only three signalling lamps / buttons is possible, 22 mm hole diameter.

As standard ZPUE S.A uses **green** / **red** buttons and an integrated signalling lamp with "readiness", "operation" and "failure" LEDs.

Full-size cassette with network analyser

In a full-size cassette on the left size there is a space for the installation of any lamp-based signalling system, an ammeter, a network analyser etc.

SELECTION OF CASSETTES FOR CONSUMER POWERS

Standard cassette size is 1M=75 mm module.

Half-size and quater-size cassettes

Power [kW]	Power [A]	CP		DOL		RS	
		Rozł.	Wył.	Rozł.	Wył.	Rozł.	Wył.
0,37	0,7	3M/4	3M/4	3M/4	3M/4	3M/4	3M/4
0,55	1,0	3M/4	3M/4	3M/4	3M/4	3M/4	3M/4
0,75	1,5	3M/4	3M/4	3M/4	3M/4	3M/4	3M/4
1,10	2,0	3M/4	3M/4	3M/4	3M/4	3M/4	3M/4
1,50	3,0	3M/4	3M/4	3M/4	3M/4	3M/4	3M/4
2,20	4,0	3M/4	3M/4	3M/4	3M/4	3M/4	3M/4
3,00	6,0	3M/4	3M/4	3M/4	3M/4	3M/4	3M/4
4,00	8,0	3M/4	3M/4	3M/4	3M/4	3M/4	3M/4
5,50	10,0	3M/4	3M/4	3M/4	3M/4	3M/2	3M/2
7,50	15,0	3M/4	3M/4	3M/4	3M/4	3M/2	3M/2
11,00	20,0	3M/4	3M/4	3M/4	3M/4	3M/2	3M/2
15,00	32,0	2M/2	2M/2	3M/2	3M/2	3M/2	3M/2
18,50	40,0	2M/2	2M/2	3M/2	3M/2	BRAK	BRAK
22,00	50,0	BRAK	2M/2	BRAK	3M/2	BRAK	BRAK

Full-size cassettes

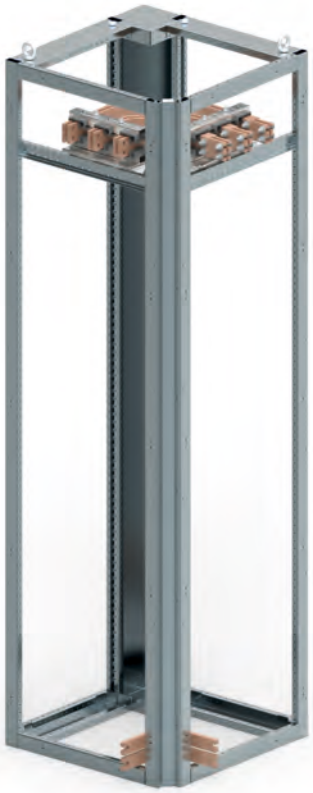
Moc [kW]	Prąd [A]	CP		DOL		RS	
		Rozł.	Wył.	Rozł.	Wył.	Rozł.	Wył.
0,37	6	2M	2M	2M	2M	2M	2M
0,55	6	2M	2M	2M	2M	2M	2M
0,75	6	2M	2M	2M	2M	2M	2M
1,10	6	2M	2M	2M	2M	2M	2M
1,50	10	2M	2M	2M	2M	2M	2M
2,20	16	2M	2M	2M	2M	2M	2M
3,00	16	2M	2M	2M	2M	2M	2M
4,00	20	2M	2M	2M	2M	2M	2M
5,50	32	2M	2M	2M	2M	2M	2M
7,50	40	2M	2M	2M	2M	3M	3M
11,00	50	2M	2M	2M	2M	3M	3M
15,00	63	3M	3M	3M	3M	3M	3M
18,50	80	3M	3M	3M	3M	3M	3M
22,00	100	3M	3M	3M	3M	4M	4M
30,00	125	3M	3M	4M	4M	4M	4M
37,00	160	3M	3M	4M	4M	4M	4M
45,00	200	2M	2M	4M	4M	6M	6M
55,00	250	4M	4M	4M	4M	6M	6M
75,00	315	4M	4M	6M	6M	BRAK	BRAK
90,00	400	4M	4M	6M	6M	BRAK	BRAK
110,00	250	4M	4M	8M	8M	BRAK	BRAK
132,00	400	6M	6M	8M	8M	BRAK	BRAK

CAPACITOR BANK BAY

Technical data of the capacitor bank bay

Area of application	A capacitor or reactor bank with a power of 160 to 600 kvar - from 160 kvar to 460 kvar adjusted every 20 kvar - 500 / 550 / 600 kVA adjusted every 25 kvar	
Ingress protection rating	Ventilated up to IP31	
Bay dimensions	Height	1900 / 2200 mm
	Width	600 / 800 / 1000 / 1200 mm
	Depth	600 / 800 / 1000 mm
The possibility of installing capacitor stages or capacitor and reactor stages.	Using various sizes of bank stages	
	Reactor-free	**Reactor-based**
	5 kvar	10 kvar
	10 kvar	15 kvar
	15 kvar	20 kvar
	20 kvar	25 kvar
	30 kvar	30 kvar
	40 kvar	40 kvar
	50 kvar	50 kvar
		60 kvar
Form of compartments	2A form	
Bay construction method		
The bank is connected in series with the main switchgear	Busbar connection from the main busbars of the switchgear Cable connection fed in from the top or from the bottom	
Separately standing bank	Cable connection fed in from the top or from the bottom	

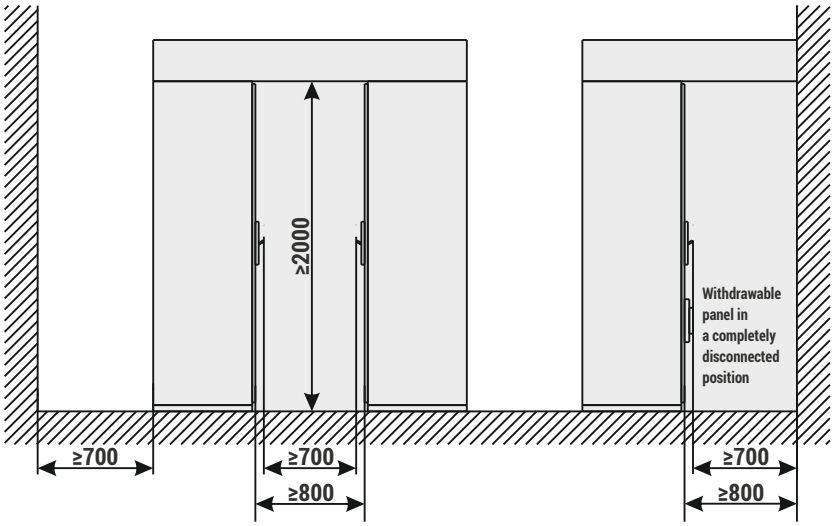
CAPACITOR BANK BAY

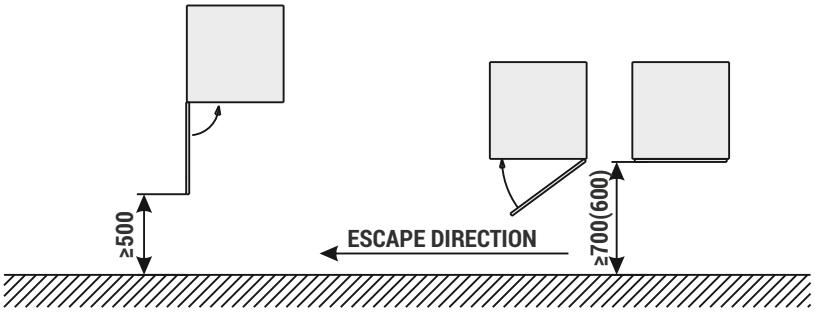


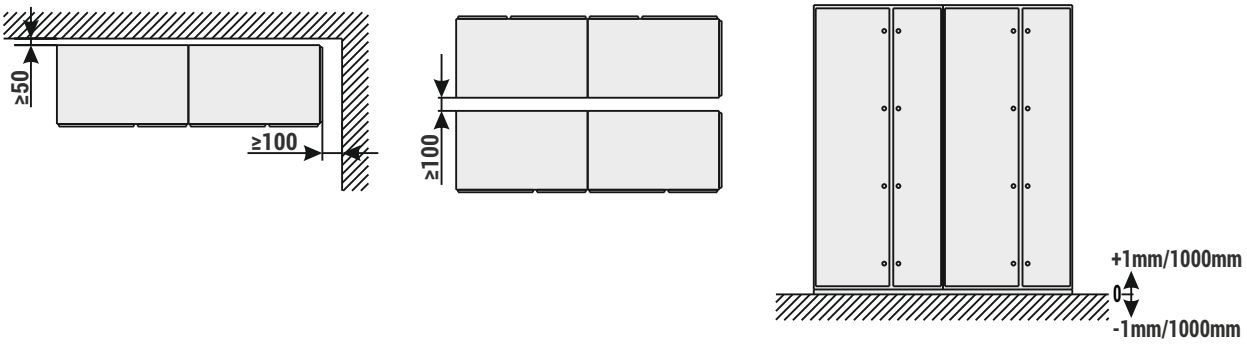
Technical data of the corner bay		
Area of application	Connection bay of the switchgear cabinet in an L-shape	
Ingress protection rating	Ventilated up to IP31 Non-ventilated up to IP54	
Bay dimensions	Height	1900 / 2200 mm
	Width	700 / 900 / 1100 mm
	Depth	700 / 900 / 1100 mm
Connection of busbar circuits in a top-mounted and rear-mounted system	Upper busbar circuit 1600 / 2000 / 2500 / 3200 /4000 / 5000 / 6300 A Busbar circuit on the back 1600 / 2000 / 2500 / 3200 /4000 / 5000 / 6300 A	
Forma wygrodzenia	1 form	
Cable connection	Not applicable	

GENERAL CONDITIONS FOR LOCATION AND PLACEMENT OF THE SWITCHGEAR

Guidelines for switchgear location







Placement

The foundation must be level, and its unevenness may not exceed 1 mm / 1000 mm.

The switchgear may be placed directly on the floor, on duct frame or on steel structure of the facility.

External feed-ins. Usable space for feeding the cables from the bottom of the cabinet

Fig. Cabinet without a connection compartment

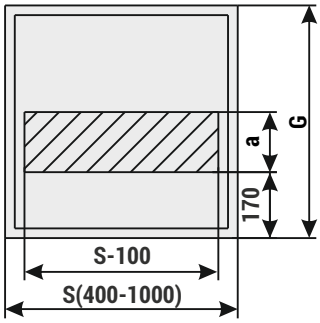
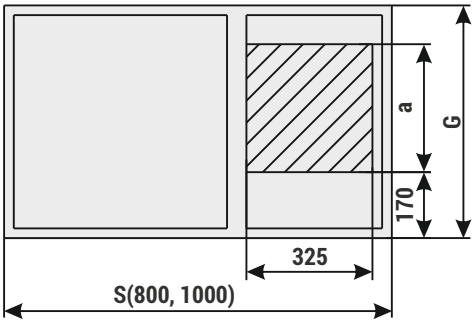
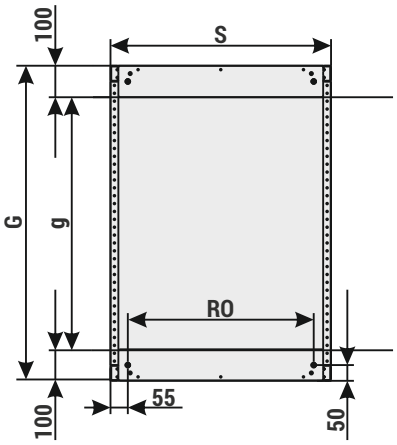


Fig. Cabinet with a connection compartment



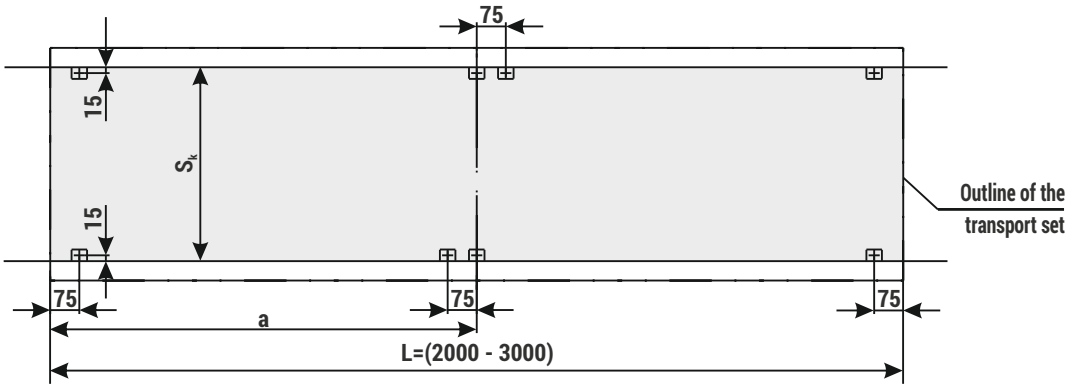
G	a
600	330
800	430
1000	530

Fig. Required width of the duct under the switchgear and position of the switchgear mounting holes on the duct frame compared to the transport sets.



Bay width	Spacing of mounting holes
S	RO
400	290
500	390
600	490
700	590
800	690
900	790
1000	890
1100	990
1200	1090

Bay depth	Width of the cable duct
G	g
600	400
800	600
1000	800

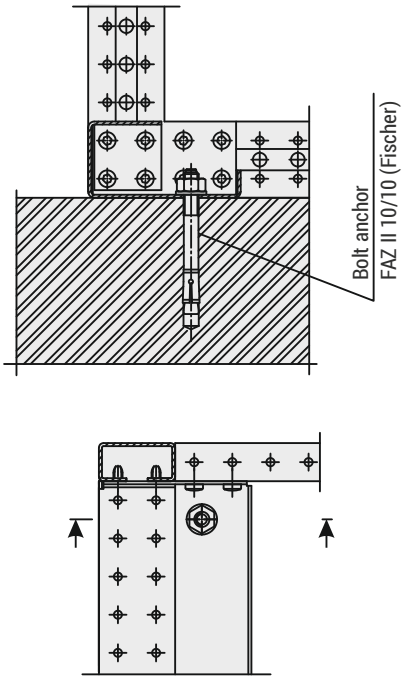


L	a
2000 2200	1000
2400 2600	1200
2800 3000	1200

L - length of the transport set (400-3000)
S_k - duct width S_k =(G-100)
G - depth of the switchgear cage (600, 800, 1000)

Fig. Switchgear placement without a load-bearing frame

On the floor



On a duct

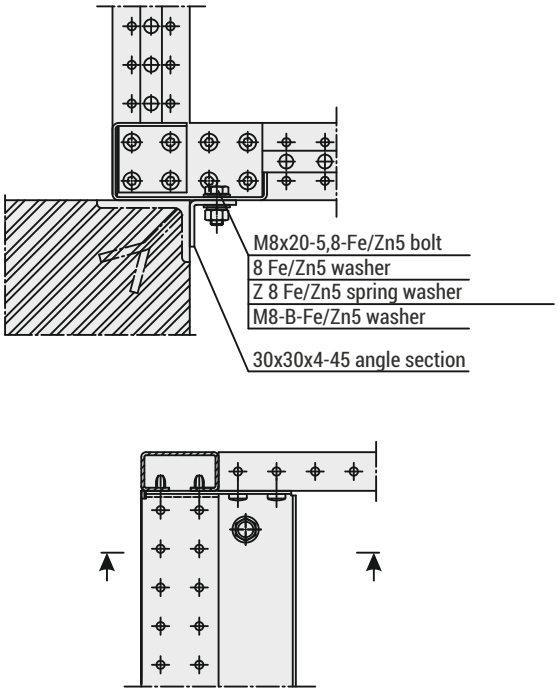
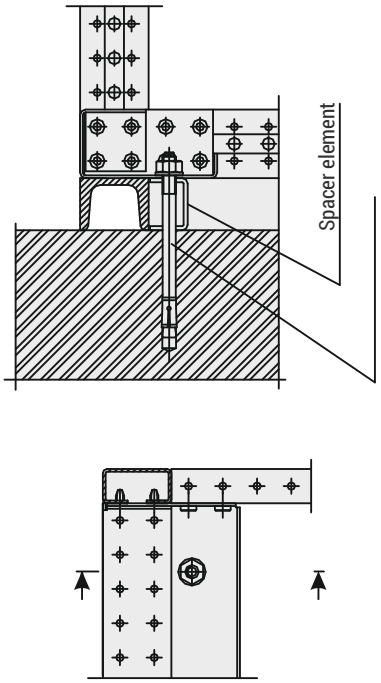
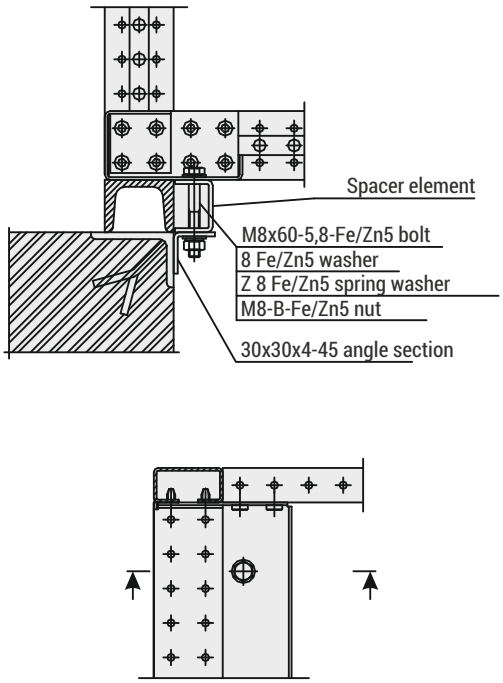


Fig. Switchgear placement with a load-bearing frame

On the floor



On a duct



Low Voltage switchgear

3 / INSTAL-BLOK

INTRODUCTION

The INSTAL-BLOK indoor cabinet system manufactured by ZPUE S.A. is a state of the art, modular solution based on a framework design with maintenance-free bolt fasteners, which enable simple and flexible installation of low voltage controlgear, switchgear and protection devices and other accessories in order to meet power engineering, industrial automation and other industry needs.

CHARACTERISTICS

- Enclosure made of 1.5 mm thick steel sheet. IK10 mechanical impact resistance,
- removable side and back walls, and the possibility of using an enclosure with front panels without a door,
- possibility of combining cabinets in sets,
- protection rating from IP20 to IP66 with the use of appropriate seals,
- possibility of manufacturing of cabinets from stainless steel (solutions for the food industry),
- three-point locking system, which assures good fit of the door to the cabinet and adequate tightness. The lock can be equipped with a door lock cylinder or padlock attachment.

BUSBAR SYSTEM

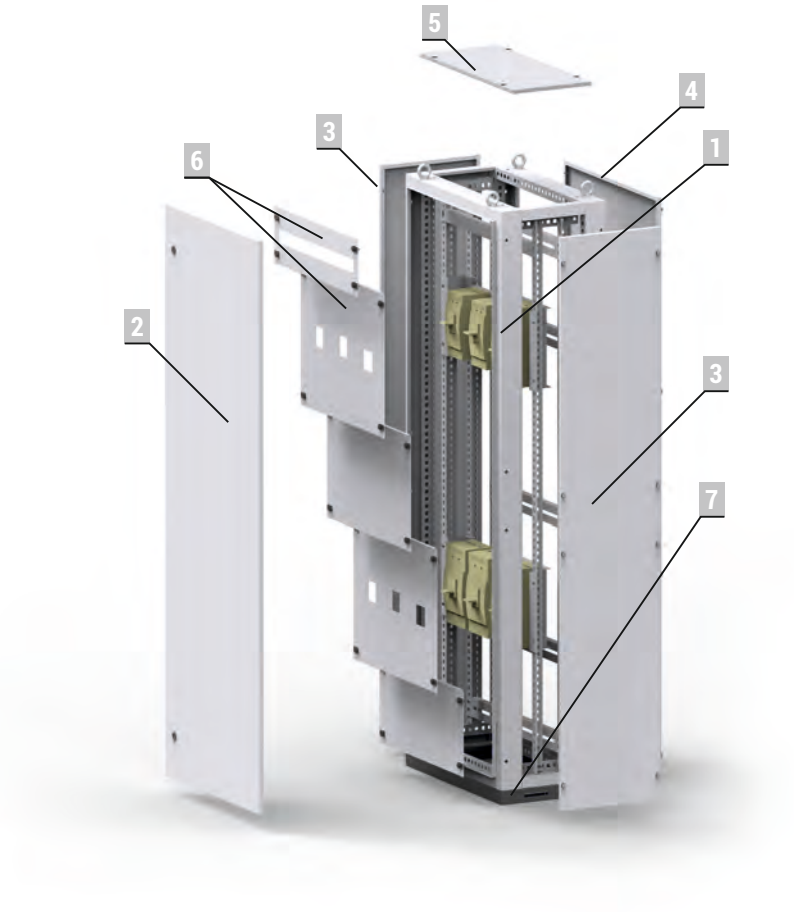
INSTAL-BLOK is designed for the installation of busbars from 250 to 1600 A (other currents after agreement with the manufacturer).

SWITCHGEAR PURPOSE

INSTAL-BLOK is designed for the use as:

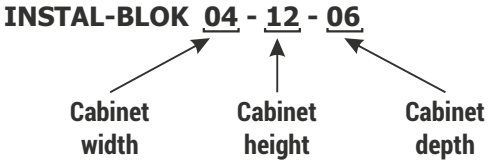
- industrial switchgears for demanding conditions of operation (pollution, high IP rating),
- switchgear for office buildings, public facilities and others, due to the possibility of front panel installation,
- auxiliary switchgear for alternating and direct current,
- control cabinets with installed inverters, soft-starters, etc.

SWITCHGEAR DESIGN



1 - framework
2 - doors
3 - side wall
4 - back wall
5 - roof
6 - front panels
7 - pedestal

Cabinet type is marked with a code for cabinet dimensions:



Width [mm]	
Value	**Designation**
400	04
500	05
600	06
700	07
800	08
900	09
1000	10
1100	11
1200	12

Height [mm]	
Value	**Designation**
1000	10
1200	12
1400	14
1600	16
1800	18
2000	20

Depth [mm]	
Value	**Designation**
400	04
600	06
800	08
1000	10

Note:
At the customer's request it is possible manufacture a cabinet with other dimensions.

BASIC TECHNICAL DATA

Compliance with standards:
The RN-W type switchgear meets the requirements of the following standards:

- **PN-EN 61439-1** - „Low-voltage switchgear and controlgear assemblies. General rules",
- **PN-EN 60529** - „Degrees of protection provided by enclosures (IP Code)",
- **PN-EN 62262** - „Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)".

Electrical data

Rated insulation voltage	690 V / 1000 V AC[1] up to 1500 V DC
Rated connection voltage	400 V / 500 V / 690 V AC[2] up to 1200 V DC
Test impulse withstand voltage	8 kV
Rated frequency	50 Hz
Rated current of the switchgear	from 250 to 1600 A[3]
Rated short-time withstand current	up to 30 kA (1s)
Rated peak withstand current	up to 63 kA

Mechanical data

Dimensions	Width - from 400 to 1200 mm Height - from 1000 to 2000 mm Depth - from 400 to 1000 mm
IP protection rating	from IP20 to IP66
IK protection rating	up to IK 10
Surface protection	Framework: 1.5 mm Aluzinc or painted steel sheet in special design from stainless steel Covers: 1.5 mm Aluzinc or painted steel sheet in special design from stainless steel - Front panels: plastic
Powder painting	standard - RAL 7035 other colours on request
Plastic components	Halogen-free, self-extinguishing, fire-resistant, CFC-free

Service conditions:

Ambient temperature - Lower limit of ambient temperature - Upper limit of ambient temperature - Average daily temperatures over 24 hours	Ambient temperature -5°C (-25°C)[4] +40°C -5°C to +35°C
Relative humidity	up to 50% (at a temp. 40°C)
Installation altitude	up to 1000 m a.s.l.
Atmosphere at the installation place	free from chemically aggressive and conducting dust, fumes and gases

At the customer's request it is possible to design a switchgear adapted to other conditions

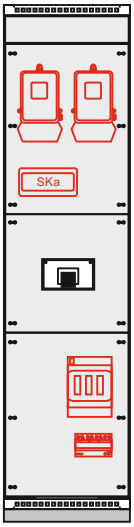
UWAGA!

[1] Up to 1500 V AC in custom design.
[2] Up to 1000 V AC in custom design.
[3] Other design technology to be agreed with the manufacturer.
[4] Depending on the devices used.

DEVICES THAT MAY BE INSTALLED IN THE INSTAL-BLOK SWITCHGEAR BAYS

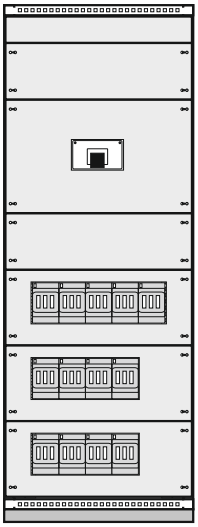
Due to the very wide range of possible applications of the INSTAL-BLOK switchgear, the catalogue presents only the most frequently used solution.

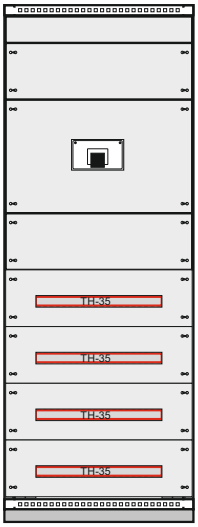
BAYS WITH COUPLER OR POWER CIRCUIT BREAKER, FROM 630 TO 1600 A



Area of application	Incoming bay Outgoing bay Bus coupler bay
Ingress protection rating	IP20 without doors Up to IP66 with doors
Bay dimensions	Height: from 1800 to 2000 mm Width: from 500 to 1000 mm Depth: from 400 to 800 mm (depending on the device type)
Possibility of installing devices	- stationary or withdrawable power circuit breaker from 630 to 1600 A - stationary or withdrawable compact circuit breaker, with manual or motor drive from 630 to 1600 A - box fuse switch disconnector from 630 to 1600 A - snap action disconnector from 630 to 1600 A
Additional devices	- place for installation of metering panel - drive control automation - surge arrester etc.
Connection	From the top: bus duct / busbar / cable From the bottom: bus duct / busbar / cable
Others	The possibility of installation of small modular devices

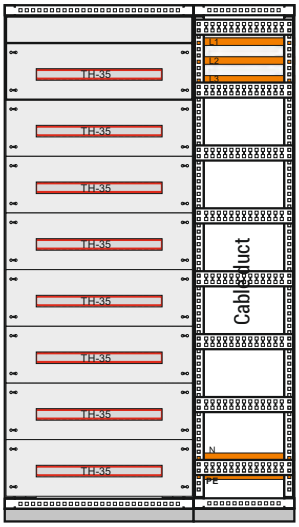
INCOMING/OUTGOING BAYS

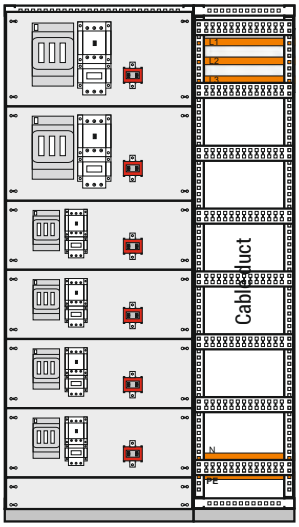




Area of application	Incoming bay, Outgoing bay
Ingress protection rating	Ip20 without doors Up to IP66 with doors
Bay dimensions	Height: from 1800 to 2000 mm Width: from 500 to 1000 mm Depth: from 400 to 800 mm (depending on the device type)
Possibility of installing devices	**Incoming feeders:** - stationary or withdrawable compact circuit breaker, with manual or motor drive from 630 to 1600 A - box fuse switch disconnector from 630 to 1600 A - snap action disconnector from 630 to 1600 A **Outgoing feeders:** - fuse switch disconnectors up to 630 A - compact circuit breakers up to 630 A - modular devices
Additional devices	The possibility of installing of terminal strips in various configurations
Connection	From the top: busbar / cable From the bottom: busbar / cable

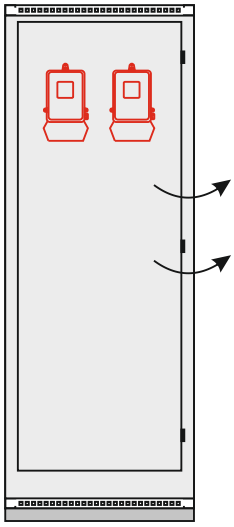
CABLE DUCT BAYS





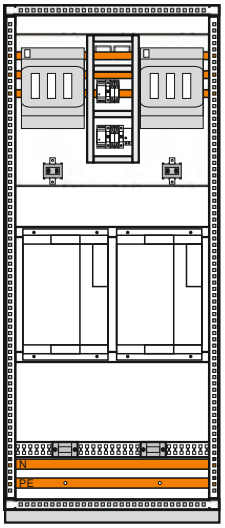
Area of application	Outgoing bay with cable duct
Ingress protection rating	Ip20 without doors Up to IP66 with doors
Bay dimensions	Height: from 1800 to 2000 mm Width: from 800 to 1200 mm Depth: from 400 to 800 mm (depending on the device type)
Possibility of installing devices	- compact circuit breakers up to 630 A - box fuse switch disconnectors up to 630 A - modular devices - motor blocks (protection, contactor, relay) up to 250 A - reversing motor blocks - star delta motor blocks - frequency converters
Additional devices	Instrumentation & Control devices
	From the top: cable From the bottom: cable

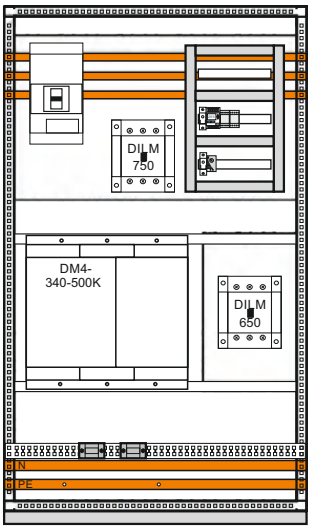
SWING FRAME BAYS



Area of application	Bays for the installation of meters or control instrumentation
Ingress protection rating	Ip20 without doors Up to IP66 with doors
Bay dimensions	Height: from 1800 do 2000 mm Width: from 600 do 1000 mm Depth: from 400 do 800 mm (depending on the device type)
Possibility of installing devices	**Devices installed on a mounting plate:** - fuse switch disconnectors up to 160 A - compact circuit breakers up to 160 A - metering and ordinary terminal strips - programmable controllers **Devices installed on a swing frame:** - full-size and TH35 rail mounted electricity meters - network analysers - ammeters - voltmeters - other instrumentation and control equipment
Additional devices	The possibility of installing terminal strips in various configurations
Connection	From the top: cable From the bottom: cable
Others	A cable duct can be attached to the bay

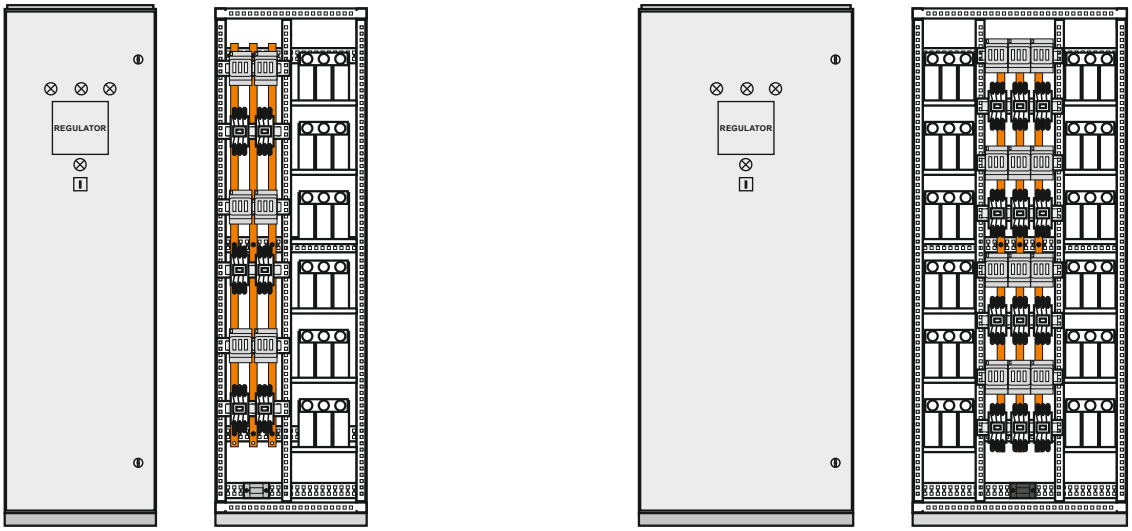
FREE INSTALLATION BAYS





Area of application	Bays for the installation of large-sized equipment structures
Ingress protection rating	IP20 without doors Up to IP66 with doors
Bay dimensions	Height: from 1800 to 2000 mm Width: from 400 to 1000 mm Depth: from 400 to 800 mm (depending on the device type)
Possibility of installing devices	- frequency converters - soft-starts - high-mass transformers - direct current batteries - 19” (rack) devices, after installation of guide bars
Connection	From the top: cable From the bottom: cable
Others	A cable duct can be attached to the bay An air conditioning system may be provided for the bay

CAPACITOR BANK BAYS



Area of application	A bank for compensation of capacitive reactive power: - capacitor - capacitor and reactor
Ingress protection rating	From IP20 to IP54
Bay dimensions	Height: 2000 mm Width: from 500 to 800 mm Depth: from 400 to 600 mm
Possibility of installing devices	- 3 to 6 capacitor stages with a power of 60 to 200 kvar or capacitor and reactor stages from 60 to 100 kvar - 4 to 12 capacitor stages with a power of 120 to 260 kvar or up to 8 capacitor and reactor stages with a power up to 160 kvar
Connection	From the top: cable From the bottom: cable
Others	Bays with reactors are equipped with fans depending on the power of installed reactors

NOTE!

- provided dimensions apply only to a protection rating up to IP31
- higher protection ratings require larger enclosure sizes
- more information on capacitor banks can be found in chapter BK, BKD — Capacitor banks

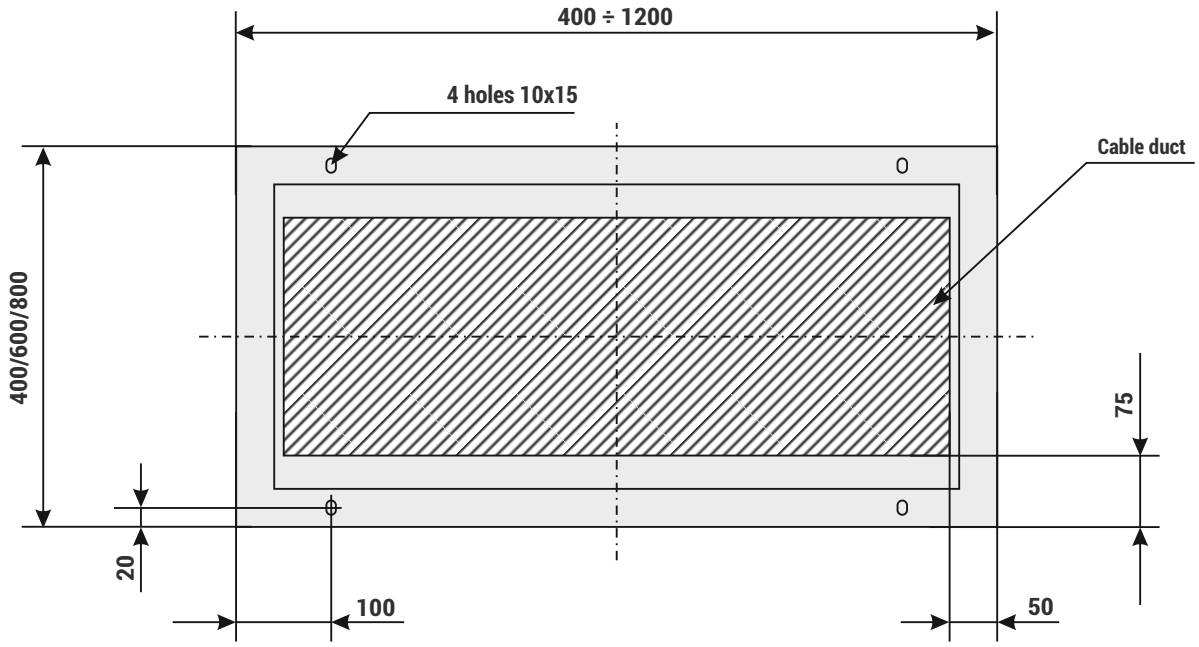
PLACEMENT OF THE SWITCHGEAR AND INSTALLATION OF CONNECTIONS

The INSTAL-BLOK switchgears are designed for indoors installation. They can be placed directly on concrete flooring of the facility. Regardless of the type of foundation, switchgears must be placed exactly horizontally (maximum deviation may not exceed 2 mm over 1 m of base length). The switchgear (single cell) should be fixed to the foundation with 4 M8 bolts in locations shown on Fig. 1. When placing the switchgear appropriate spacing should be maintained between the switchgear and other elements in the room in accordance with the regulations in force.

External connections are made as:

- cables from the bottom to the supply bay and outgoing bays from a cable duct
- busbars or cables from the top to the supply bay
- cable from the top to outgoing bays

Fig. 1 – arrangement of holes in the foundation for the installation of the switchgear



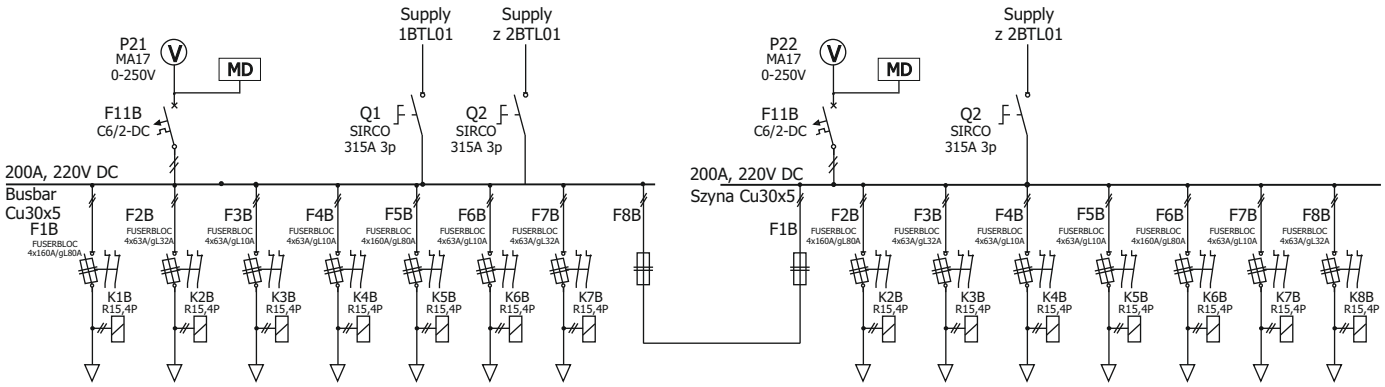
NOTE!

Duct depth should be adapted to the number and cross-section of the cables

CUSTOM DESIGNS – SWITCHGEARS FOR MAIN POWER SUPPLY STATIONS

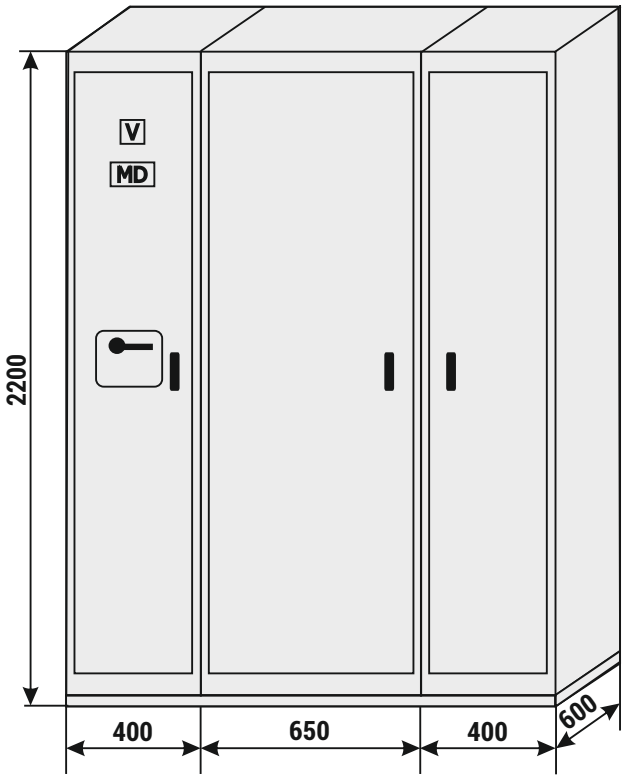
LV SWITCHGEAR 220 V DC

Electrical diagram

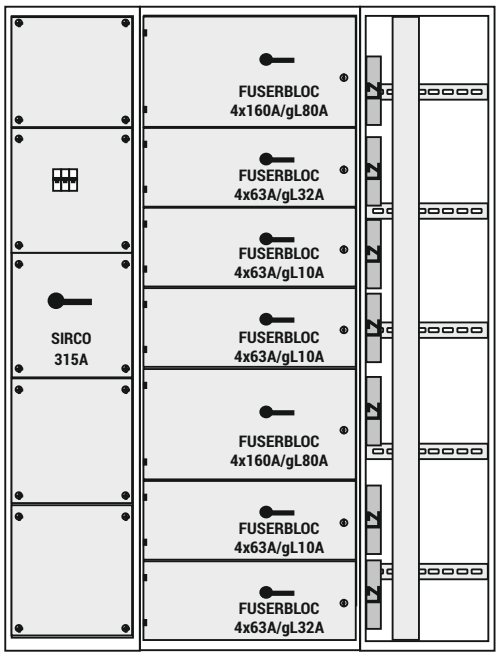


Outgoings **Outgoings**

External appearance of the switchgear

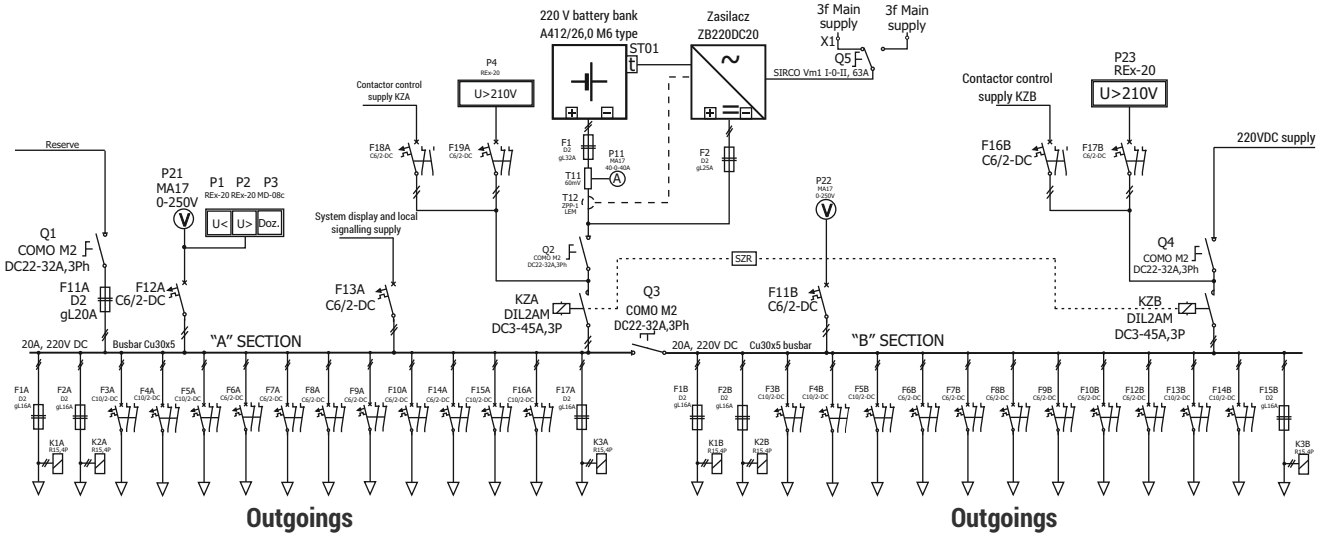


Arrangement of devices



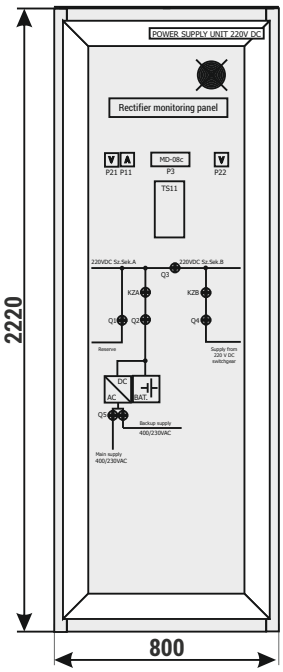
LV SWITCHGEAR 220 V DC

Electrical diagram

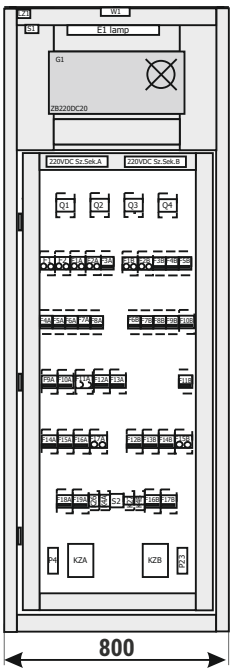


Arrangement of the switchgear

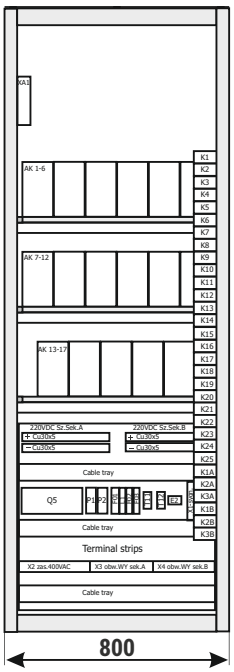
FRONT PANEL



SWING FRAME

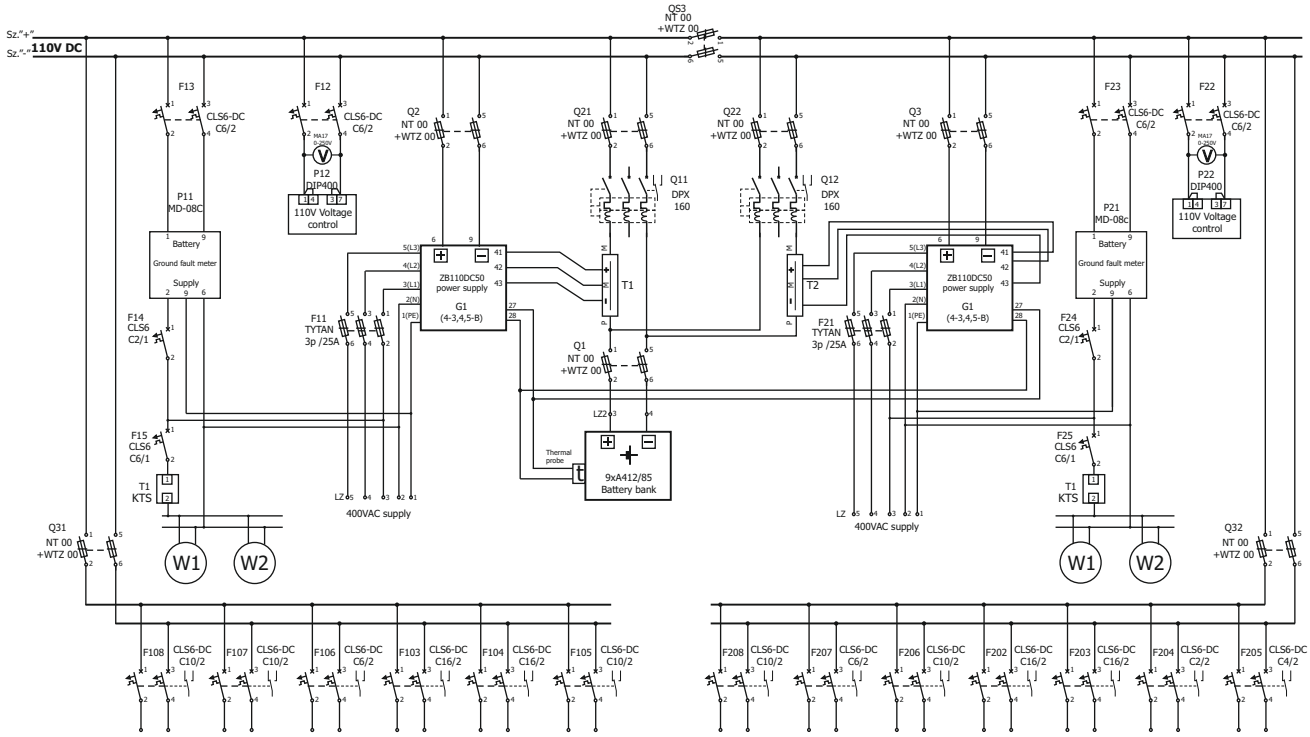


REAR OF THE CABINET – INSTALLATION PLATE

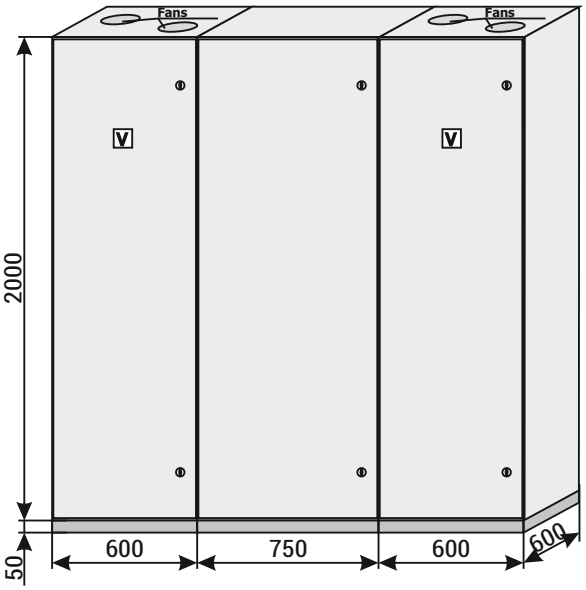


LV SWITCHGEAR 110 V DC

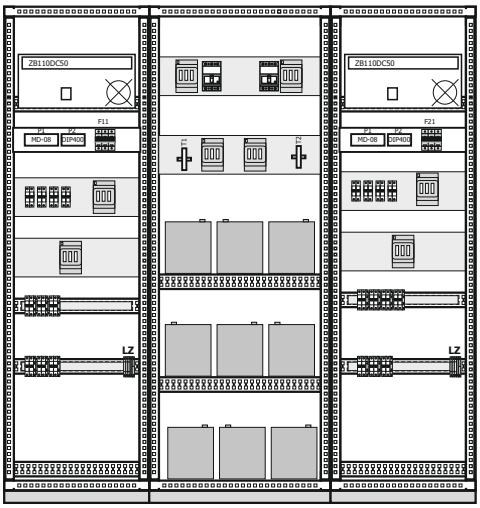
Electrical diagram



External appearance of the switchgear

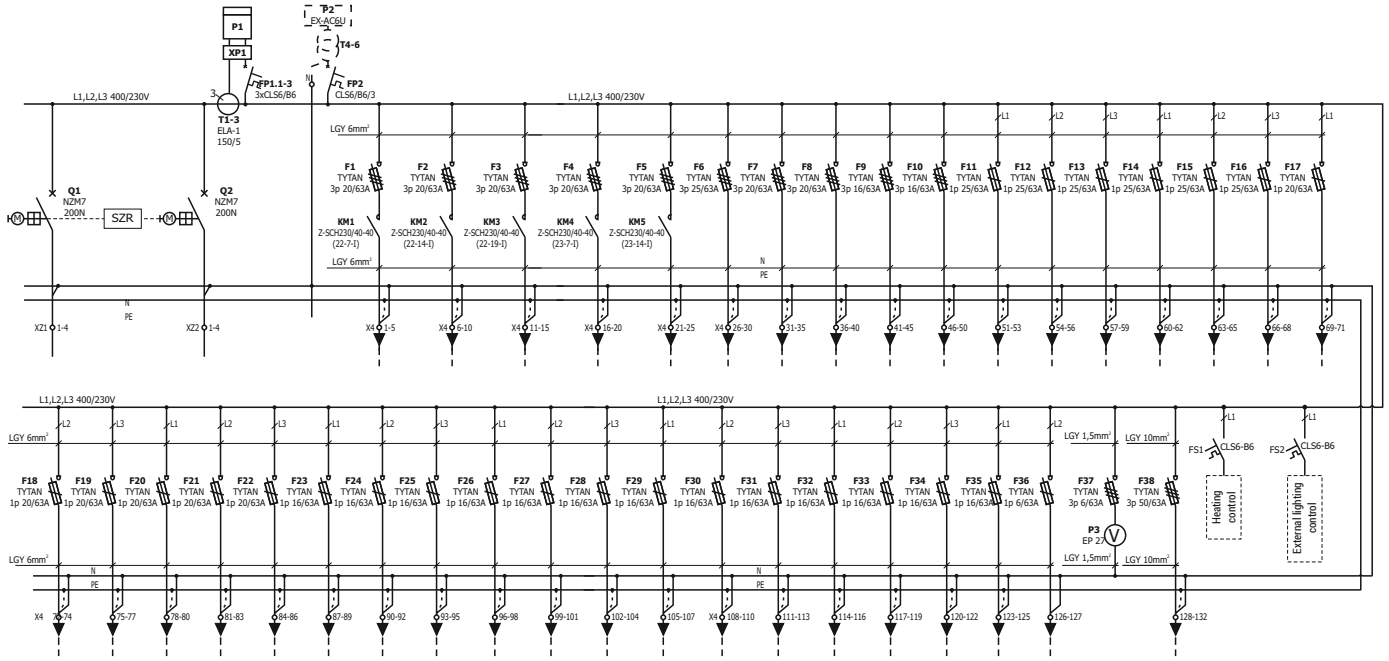


Arrangement of devices

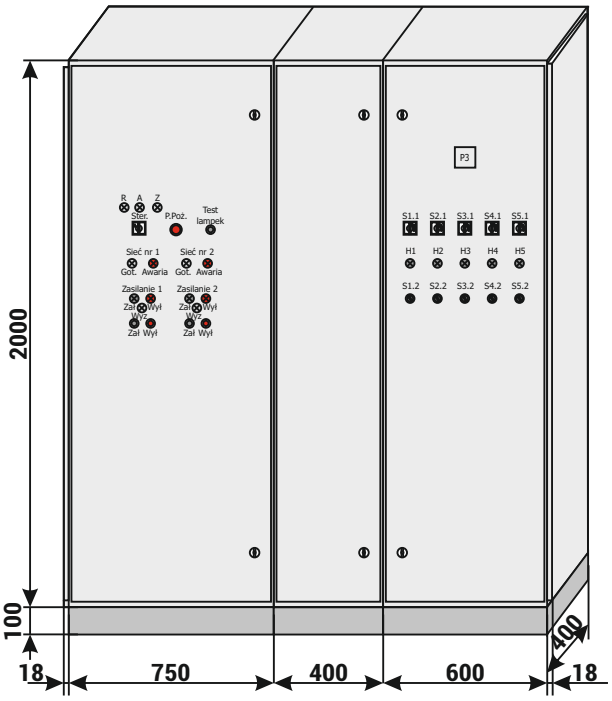


LV SWITCHGEAR 400/230 V AC

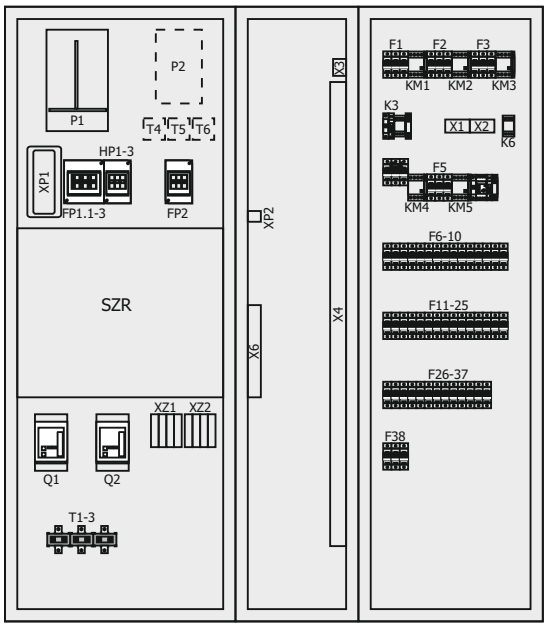
Electrical diagram



External appearance of the switchgear

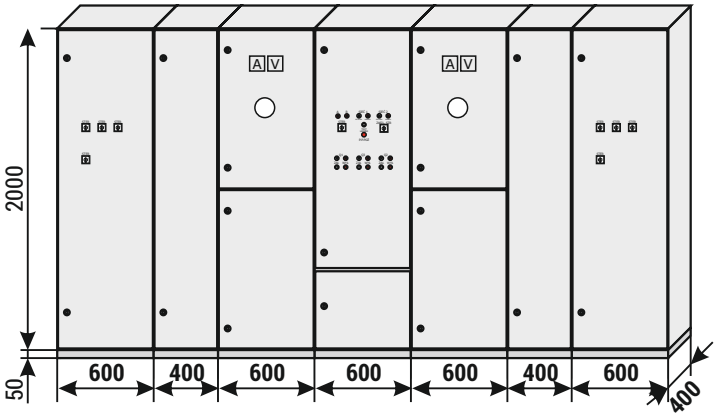


Arrangement of devices

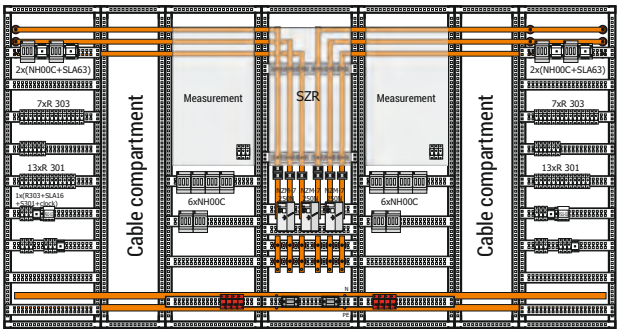


LV SWITCHGEAR nN 400/230 V AC

External appearance of the switchgear

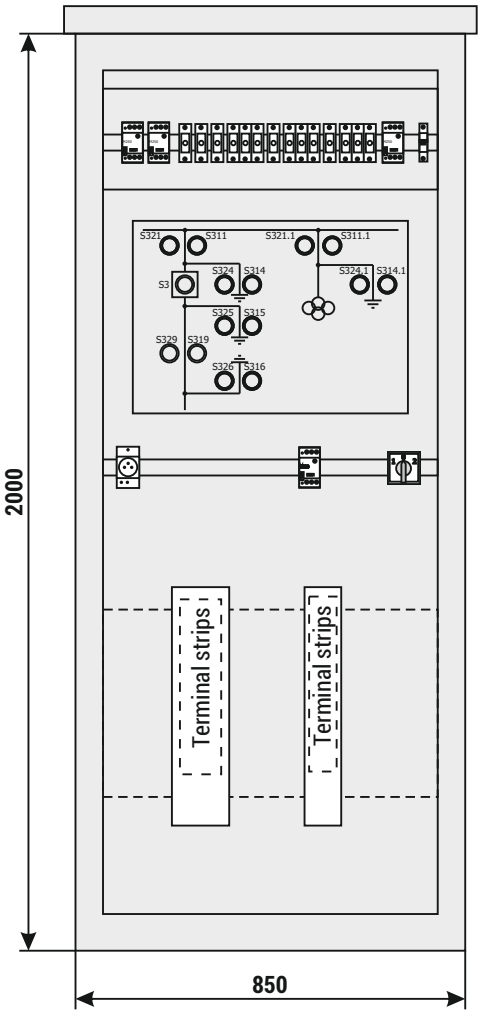


Arrangement of devices

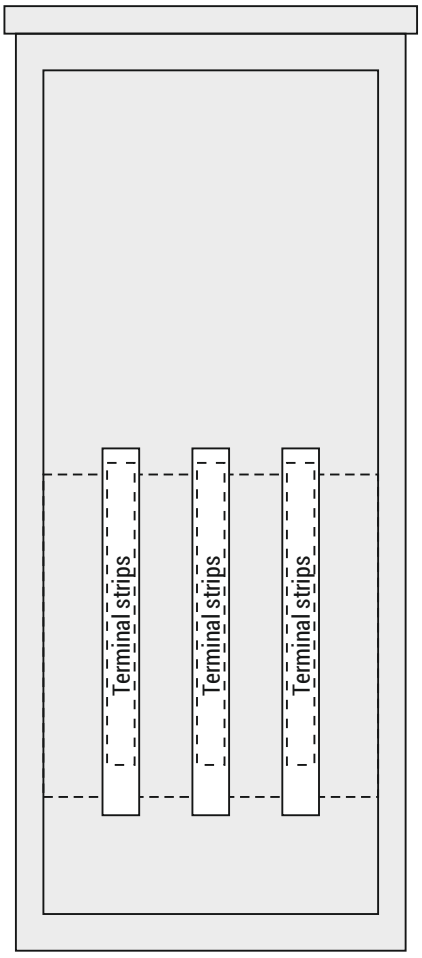


Z1 TYPE CABLE CABINET

Front



Back



Low Voltage switchgear

4 / BK, BKD - Capacitor banks

INTRODUCTION

The transmission of reactive power in a power grid system reduces the quality of power grid parameters and increases payments for electricity. The ZPUE S.A. company provides solutions for inductive and capacitive reactive power compensation, such as:

- capacitor banks,
- capacitor banks with protective reactors,
- inductive banks (to be agreed with the manufacturer, after analysis of electrical grid parameters at the facility).

REACTIVE POWER COMPENSATION IN AN ELECTRIC POWER SYSTEM

There are three levels of reactive power compensation:

1. Central compensation

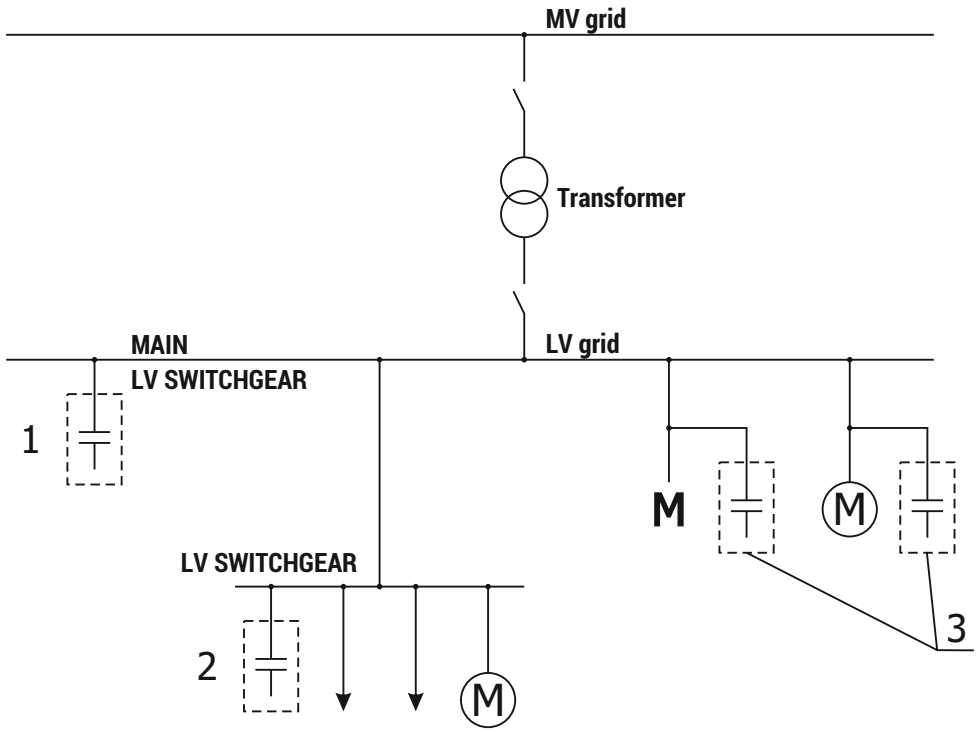
The bank is installed at the main switchgear (most frequent use).

2. Group compensation

The bank is installed at the sub-switchgear or near a group of consumers (wide cable grid, distributed consumers).

3. Individual compensation

Capacitors installed at individual consumers (high power consumers).



Technical data of the capacitor battery

Rated power	from 40 to 600 kvar [1)]
Rated power per stage	from 5 to 60 kvar
Number of compensation stages	from 4 to 15
Rated operating voltage of the bank	400 V [2)]
Rated insulation voltage	690 V [3)]
Rated frequency	50 (60) Hz
Busbar rated short-time withstand current	up to 40 kA
Ingress protection rating	IP3X [4)]
Cooperation with current transformers	xx/5
Feeding in power supply cables	from the top or from the bottom

UWAGA!

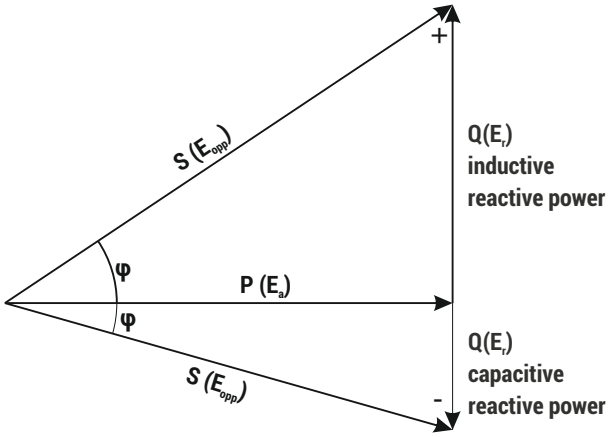
[1)] The banks may be connected into bigger sets.
[2)] The banks may constructed in 500 V and 690 V versions.
[3)] In case of 690 V banks the insulation voltage is 750 V.
[4)] May be constructed up to IP54.

GENERAL PRINCIPLES FOR CAPACITOR BAY SELECTION

The share of reactive power in total power consumption is determined by two coefficients. The first is the power coefficient cosφ, which is presented in the relationship **(1.1)**	**1.1**	$\cos\varphi = \frac{P(kW)}{S(kVA)}$
The closer to one cosφ is, the smaller is the share of reactive power. Energy suppliers usually use power factor tgφ in their settlement contracts. A power factor tgφ was received from the relationship **(1.2)**	**1.2**	$tg\varphi = \frac{E_r(kvarh)}{E_a(kWh)}$
The closer to 0 tgφ is, the smaller is the transmission of reactive power. Based on the obtained tgφ and the demand for active power an approximate capacitor bank power may be obtained. The QBat bank power is established from the relationship **(1.3)**	**1.3**	$Q_{Bat} = P\,(tg\varphi - tg\varphi_{dop})$

Where tgφ — power factor required by the energy company.

Power and energy diagram



P.	active power [kW]
E_a	active energy [kWh]
Q	reactive power [kvar]
E_r	reactive energy [kvarh]
S	apparent power [kVA]
E_{opp}	apparent energy [kVAh]

NOTE!

For the correct selection of a capacitor bank it is necessary to perform electrical grid measurements at the facility.

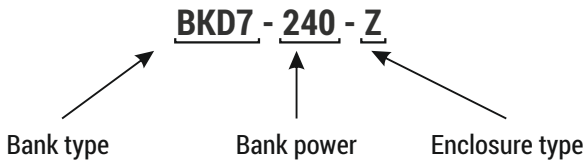
Protecting the capacitor bank against adverse impact of harmonics.

The use of rectifiers, inverters and frequency converters in state of the art electricity consuming devices often causes deformation of voltage and current, which changes their waveform so that it is no longer a sine wave. They include numerous harmonics, which are an undesirable phenomenon, shortening the lifetime of electrical devices. This phenomenon is particularly dangerous in a capacitor bank. Capacitor reactance decreases when frequency increases, which results in a high intensity current flowing through the capacitor and destroying it. In order to protect the capacitor bank against adverse impact of harmonics, protective reactors connected in series with capacitors are used.

The degree to which distortions are present in the grid (the amount of harmonics) is specified by THD (Total Harmonic Distortion). The type of capacitor bank protection is selected depending on THD value.

THD ≤ 15%	Capacitor bank with normal capacitors ($U_{n\,Kond}$ = 400 V)
15% ≤ THD ≤ 25%	Capacitor bank with heavy duty capacitors ($U_{n\,Kond}$ = 440 V)
25% ≤ THD ≤ 50%	Capacitor banks with compensating reactors
THD ≤ 50%	Semiconductor-based tracking compensator

Capacitor banks made by ZPUE S.A. are identified by bank type symbol and enclosure type symbol



Bank type	
BI	Inductive bank
BK	Normal capacitor bank ($U_{n\ Kond}$ = 400V)
BKW	Heavy duty capacitor bank ($U_{n\ Kond}$ = 440V)
BKD7	Capacitor bank with reactors 7%
BKD14	Capacitor bank with reactors 14%

Enclosure type	
R	RN-W type enclosure
I	INSTAL-BLOK type enclosure
Z	ZR-W type enclosure

R - RN-W type enclosure

I - INSTAL-BLOK type enclosure

Z - ZR-W type enclosure

CAPACITOR BANK PRODUCT RANGE

Normal capacitor banks (U_n capacitors 400V)

Nominal bank power [kvar]	Enclosure type	Adjustment step	Number of steps	Example dimensions [mm] [width x height x depth]
40	R	5	4	550 x 1275 x 400
45	R	5	4	550 x 1275 x 400
50	R	5	5	550 x 1275 x 400
55	R	5	4	550 x 1275 x 400
60	R / I	10	3	550 x 1275 x 400
70	R / I / Z	10	3	550 x 1275 x 400
80	R / I / Z	10	4	550 x 1275 x 400
90	R / I / Z	10	4	550 x 1275 x 400
100	R / I / Z	10	5	550 x 1275 x 400
110	R / I / Z	10	4	850 x 1275 x 400
120	R / I / Z	10	5	850 x 1275 x 400
140	I / Z	20	4	550 x 1950 x 400
160	I / Z	20	5	550 x 1950 x 400
180	I / Z	20	5	750 x 1950 x 400
200	I / Z	20	6	750 x 1950 x 400
220	I / Z	20	6	750 x 1950 x 400
240	I / Z	20	7	750 x 1950 x 400
260	I / Z	20	7	750 x 1950 x 400
280	Z	20	8	800 x 2200 x 600
300	Z	20	8	800 x 2200 x 600
320	Z	20	9	800 x 2200 x 600
340	Z	20	9	800 x 2200 x 600
360	Z	20	10	800 x 2200 x 600
380	Z	20	10	1000 x 2200 x 600
400	Z	20	11	1000 x 2200 x 600
420	Z	20	11	1000 x 2200 x 600
440	Z	20	12	1200 x 2200 x 600
460	Z	25	12	1200 x 2200 x 600
500	Z	25	11	1200 x 2200 x 800
550	Z	25	12	1200 x 2200 x 800
600	Z	25	13	1200 x 2200 x 800

We can manufacture a bank with different parameters at the customer's request.

Capacitor bank with reactors 7%

Nominal bank power [kvar]	Enclosure type	Adjustment step	Number of steps	Example dimensions [mm] [width x height x depth]
40	R	5	4	850 x 1275 x 400
45	R	5	4	850 x 1275 x 400
50	R	5	4	850 x 1275 x 400
55	R	5	5	850 x 1275 x 400
60	R / I	5	5	850 x 1275 x 400
70	I	10	4	550 x 1950 x 400
80	I	10	4	550 x 1950 x 400
90	I	10	4	550 x 1950 x 400
100	I	10	5	550 x 1950 x 400
110	I	10	5	750 x 1950 x 400
120	I	10	5	750 x 1950 x 400
140	I	20	5	750 x 1950 x 400
160	I / Z	20	5	750 x 1950 x 400
180	Z	20	6	1000 x 2200 x 600
200	Z	20	6	1200 x 2200 x 600
220	Z	20	7	1200 x 2200 x 600
240	Z	20	7	1200 x 2200 x 600
260	Z	20	8	1200 x 2200 x 600
280	Z	20	9	1200 x 2200 x 600
300	Z	25	8	1200 x 2200 x 600
320	Z	25	8	1200 x 2200 x 600
340	Z	25	8	1200 x 2200 x 600
360	Z	25	9	2 x (800 x 2200 x 600)
380	Z	25	9	2 x (800 x 2200 x 600)
400	Z	25	10	2 x (800 x 2200 x 600)
420	Z	25	10	2 x (800 x 2200 x 600)
440	Z	25	11	2 x (800 x 2200 x 600)
460	Z	25	11	2 x (800 x 2200 x 600)
500	Z	25	12	2 x (1000 x 2200 x 600)
550	Z	25	13	2 x (1000 x 2200 x 600)
600	Z	25	14	2 x (1000 x 2200 x 600)

We can manufacture a bank with different parameters at the customer's request.

Capacitor bank with reactors 14%

Nominal bank power [kvar]	Enclosure type	Adjustment step	Number of steps	Example dimensions [mm] [width x height x depth]
40	R	5	4	850 x 1275 x 400
45	R	5	4	850 x 1275 x 400
50	R	5	5	850 x 1275 x 400
55	R	5	5	850 x 1275 x 400
60	R / I	5	4	850 x 1275 x 400
70	I	10	4	550 x 1950 x 400
80	I	10	5	550 x 1950 x 400
90	I	10	4	550 x 1950 x 400
100	I	10	5	550 x 1950 x 400
110	I	10	4	750 x 1950 x 400
120	I	10	5	750 x 1950 x 400
140	I	20	5	750 x 1950 x 400
160	I / Z	20	6	750 x 1950 x 400
180	Z	20	6	1000 x 2200 x 600
200	Z	20	7	800 x 2200 x 600
220	Z	20	7	1200 x 2200 x 600
240	Z	20	8	1200 x 2200 x 600
260	Z	25	7	1200 x 2200 x 600
280	Z	25	8	1200 x 2200 x 600
300	Z	25	8	1200 x 2200 x 600
320	Z	25	9	1200 x 2200 x 600
340	Z	25	9	1200 x 2200 x 600
360	Z	25	10	2 x (800 x 2200 x 600)
380	Z	25	10	2 x (800 x 2200 x 600)
400	Z	25	11	2 x (800 x 2200 x 600)
420	Z	25	11	2 x (800 x 2200 x 600)
440	Z	25	12	2 x (800 x 2200 x 600)
460	Z	25	12	2 x (800 x 2200 x 600)
500	Z	25	13	2 x (1000 x 2200 x 600)
550	Z	25	14	2 x (1000 x 2200 x 600)
600	Z	25	16	2 x (1000 x 2200 x 600)

We can manufacture a bank with different parameters at the customer's request.

Low Voltage switchgear

5 / LV cable boxes

INTRODUCTION

Cable boxes manufactured by ZPUE S.A. are based on the company's SKR fibreglass reinforced plastic enclosures and metal enclosures. They form the basic elements of cable-based LV power grids. Depending on intended requirements, they are used for the electricity distribution, electricity metering and to protect against the effects of overloads and short-circuits in low voltage cable grids. They allow feeding out from a low voltage cable route and supplying of consumers with an internal power line. They function as final or intermediate connections.

The offer of ZPUE S.A. includes a varied range of connection boxes: cabling, metering, cabling & metering, which were constructed in close cooperation with power distribution companies. Cabling, metering and cabling & metering connection boxes constructed with thermosetting plastic enclosures and metal enclosures may be installed outdoors in a free-standing version with foundations, as wall-mounted or as part of a building façade.

CHARACTERISTICS

- modular design enabling the replacement of faulty parts,
- a design which enables easy expansion of the existing connection box,
- a design which enables both vertical and horizontal partitioning into power distribution company's section and recipient's section,
- optimum depth of the cabinet enabling the installation of strip-mounted switch disconnectors,
- the possibility of using access windows and access doors,
- IP44 / IP54 protection rating in thermosetting plastic enclosures with the possibility of increasing to IP66 in metal enclosures,
- excellent UV resistance,
- possibility of manufacturing connection boxes with any layout and dimensions (does not require expenditures for the purchase of moulds),
- environmentally friendly material,
- effective labyrinth ventilation prevents condensation from forming,
- high impact resistance obtained by definition of controlled breaking point,
- plasticity of aluminium enclosures results in the enclosure deforming instead of cracking.

Low Voltage switchgear

5.1 / Cable connection boxes in thermosetting plastic enclosures

Compliance with standards:
ZPUE S.A. certifies that the manufactured LV switchgears and connection boxes meet the requirements of the Directives of the European Parliament and of the Council: RoHS Directive No 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment and Low Voltage Directive (LVD) No 2014/35/EU on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits and meet the requirements and standards in question.

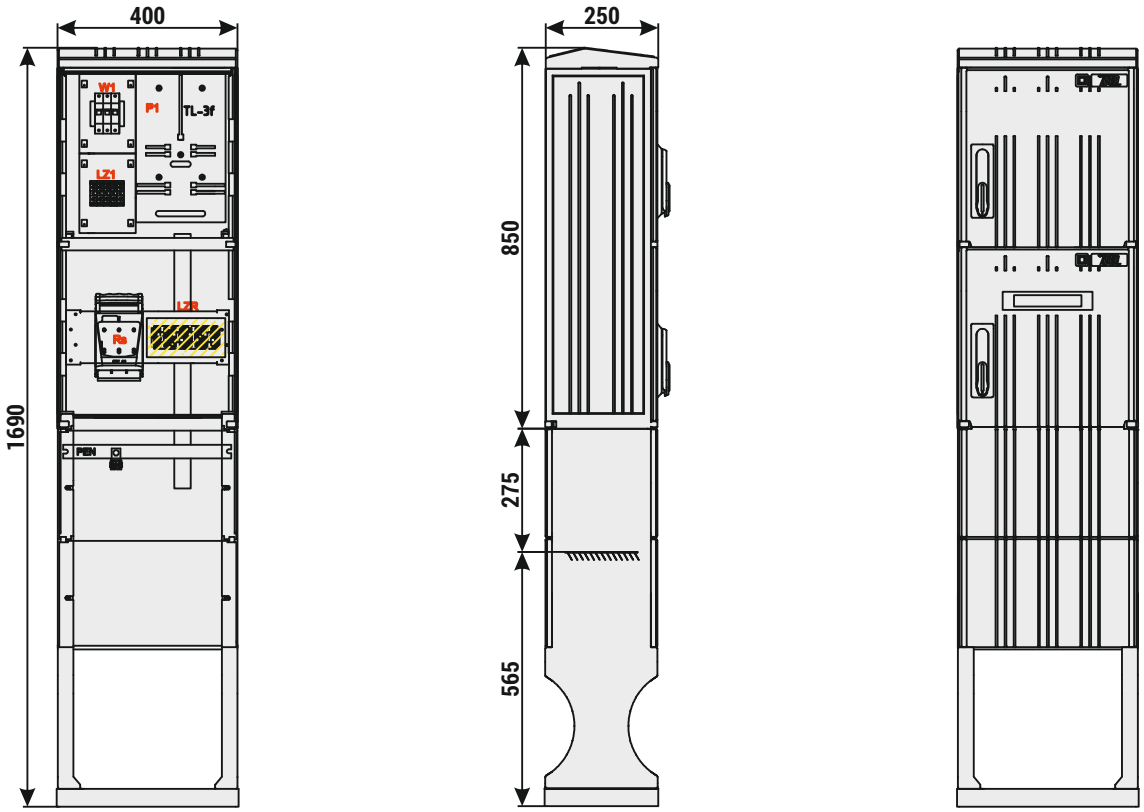
The compliance of the marked products with the aforementioned directives is ensured by meeting the requirements of the following standards:

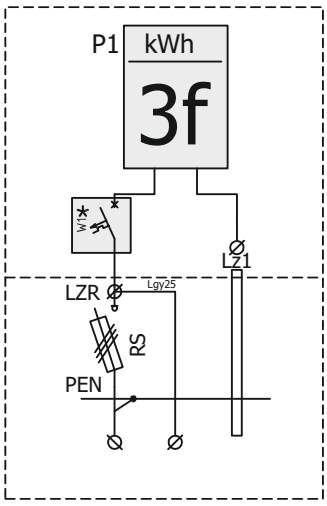
- **PN-EN 61439-1:2011** - "Low-voltage switchgear and controlgear assemblies. General rules",
- **PN-EN 61439-2:2011** - "Low-voltage switchgear and controlgear assemblies. Power switchgear and controlgear assemblies",
- **PN-EN 61439-3:2012** - "Low-voltage switchgear and controlgear assemblies. Distribution boards intended to be operated by ordinary persons (DBO)",
- **PN-EN 61439-5:2015-02** - "Low-voltage switchgear and controlgear assemblies. Assemblies for power distribution in public networks",
- **PN-EN 60529:2003, PN-EN 60529:2003/A2:2014-07** - "Degrees of protection provided by enclosures (IP Code)",
- **PN-EN 62262:2003** - "Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)"
- **PN-EN 62208:2011** - "Empty enclosures for low-voltage switchgear and controlgear assemblies. General requirements",
- **PN-E-05163:2002** - "Enclosed low-voltage switchgear and controlgear assemblies. Guide for testing under conditions of arcing due to internal fault",
- **PN-EN 50274:2004** -"Low-voltage switchgear and controlgear assemblies. Protection against electric shock. Protection against unintentional direct contact with hazardous live parts"
- **PN-EN 60695-2-11:2015-02** - "Fire hazard testing. Test methods. Glowing/hot-wire based test methods. Glow-wire flammability test method for end-products (GWEPT)",
- **PN-EN 60695-11-10:2014-02** - „Fire hazard testing. Test flames. 50 W horizontal and vertical flame test methods".
- **PN-EN 60112:2003, PN-EN 60112:2003/A1:2010** - "Method for the determination of the proof and the comparative tracking indices of solid insulating materials".

Basic technical data:	
Rated impulse	230V / 400V
Rated insulation voltage	690V
Rated current	630A
Ingress protection rating	IP44 / IP54
Mechanical impact resistance	IK 10
Device protection class	II class
Flammability class	V0
Comparative tracking index	CTI 600
Standard colour	RAL 7035

EXAMPLE SOLUTIONS ACC. TO ENERGA STANDARDS

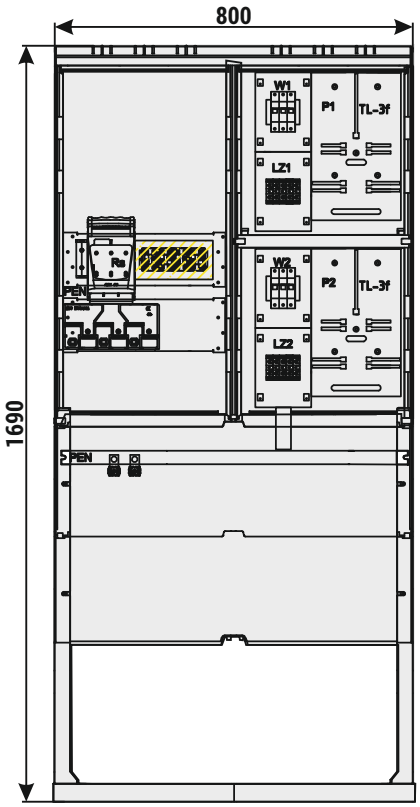
P1-RS/LZR/F catalogue number EN-5

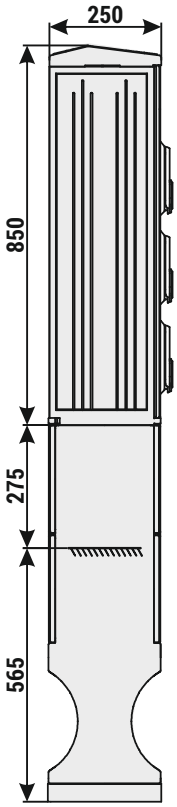


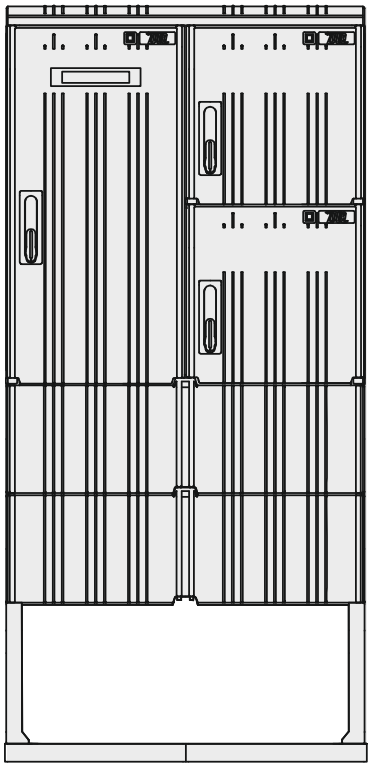


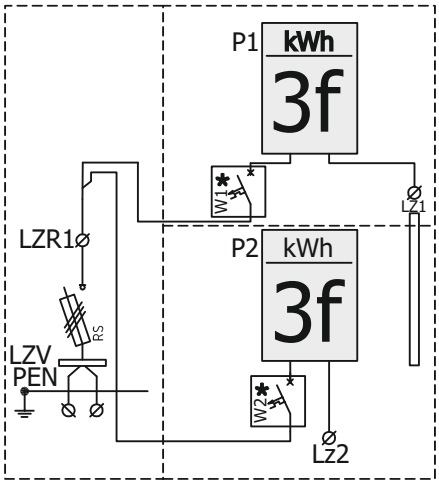
Basic technical parameters	
Rated current	up to 160 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

P2-RS/LZV/LZR/F catalogue number EN-12



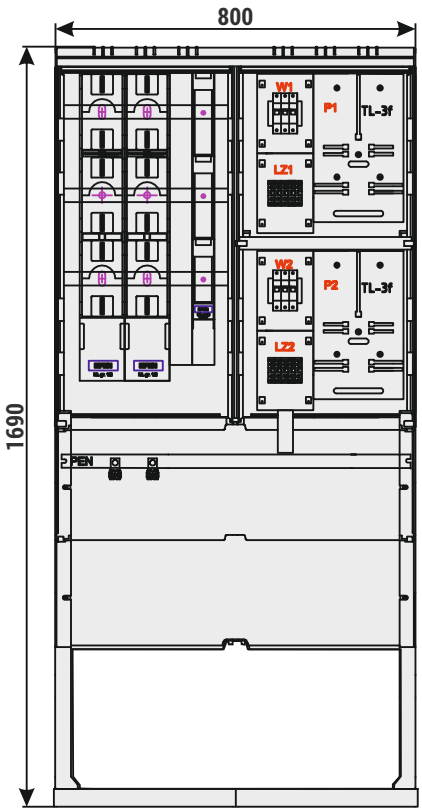


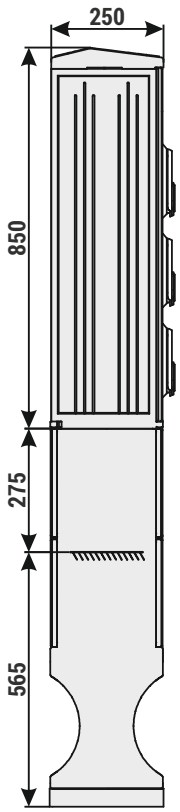


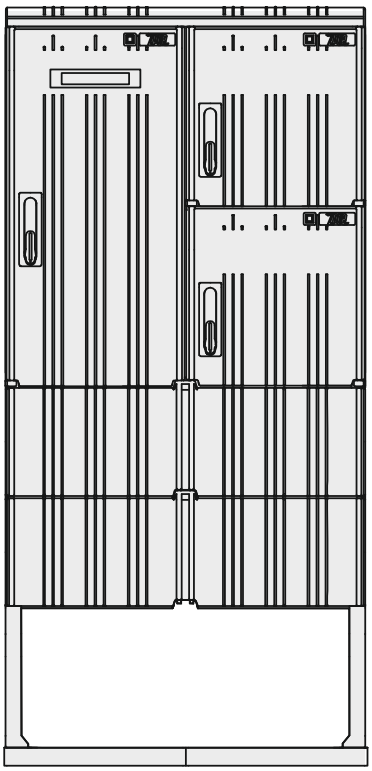


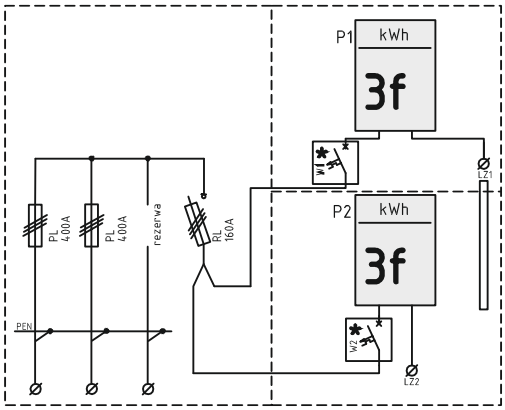
Basic technical parameters	
Rated current	up to 160 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

KRSN-P2/2F-NH2/2R-NH00/F catalogue number EN-19



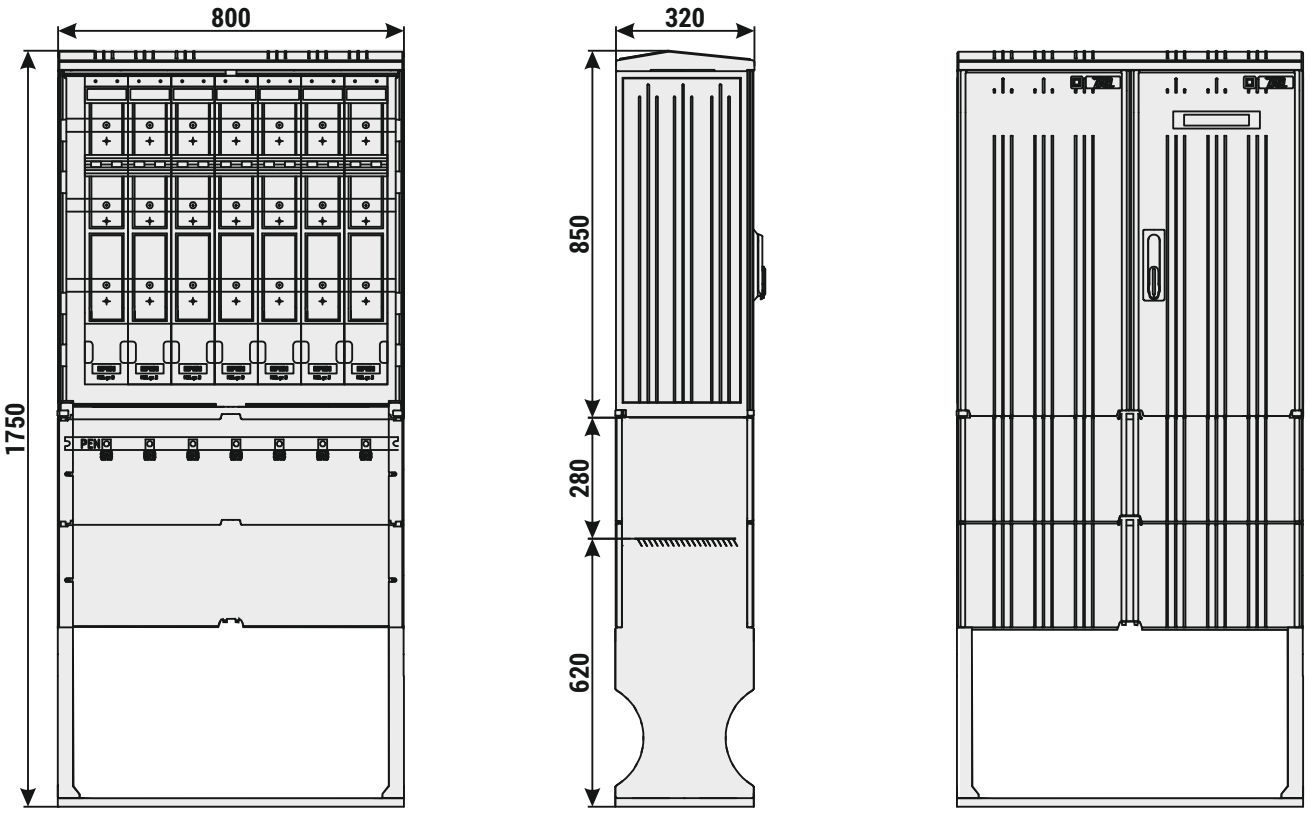


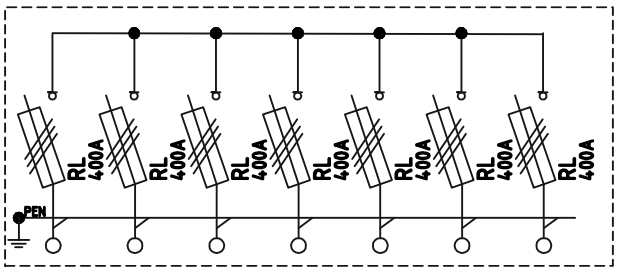




Basic technical parameters	
Rated current	up to 630 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

KRSN-1/7R-NH-2/F catalogue number EN-32

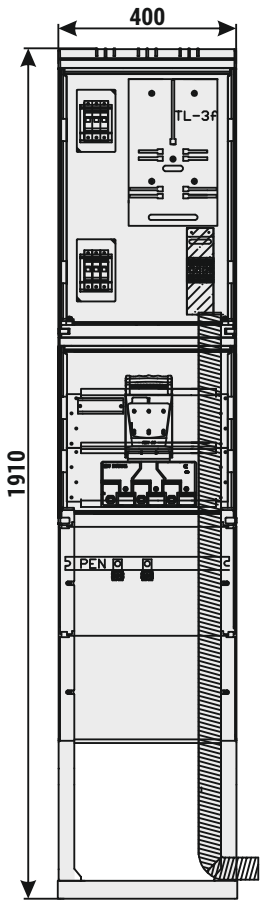


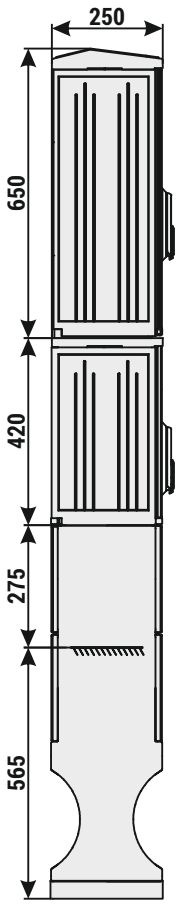


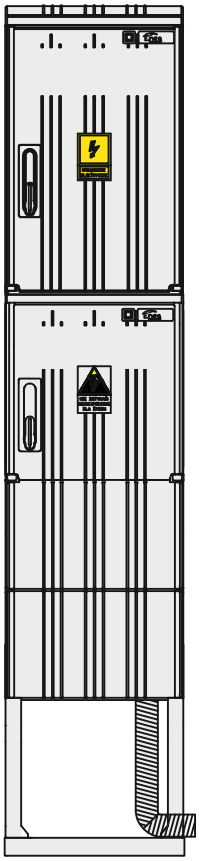
Basic technical parameters	
Rated current	up to 630 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

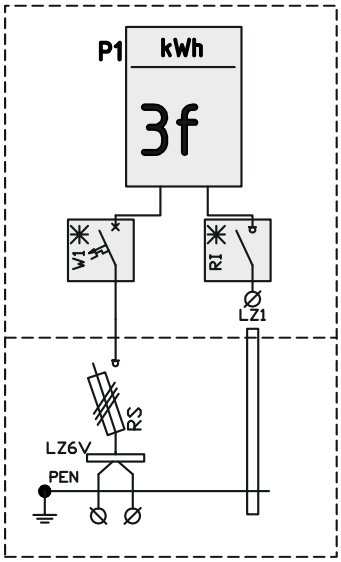
EXAMPLE SOLUTIONS ACC. TO ENEA STANDARDS

ZK1x-1P catalogue number E-2



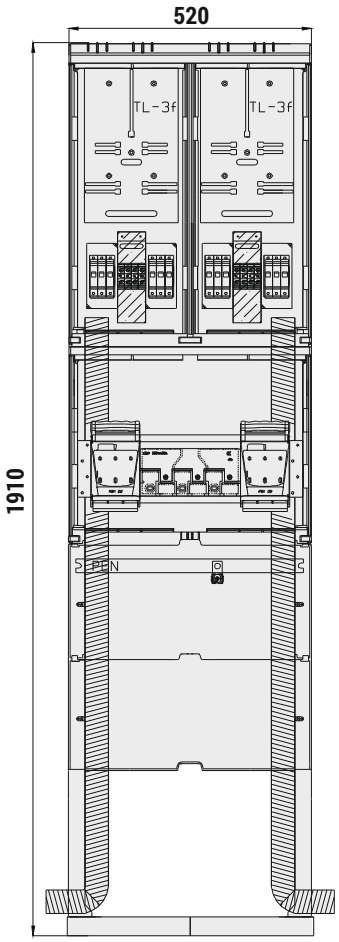


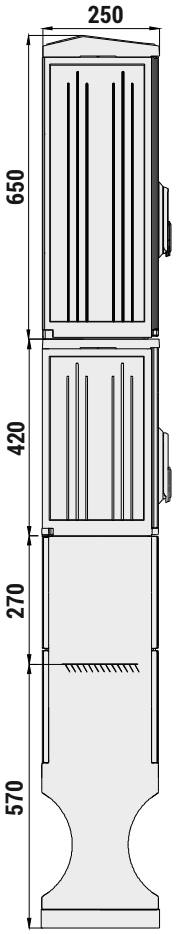


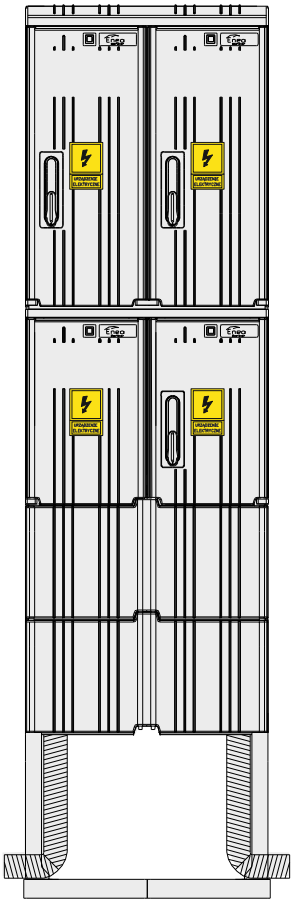


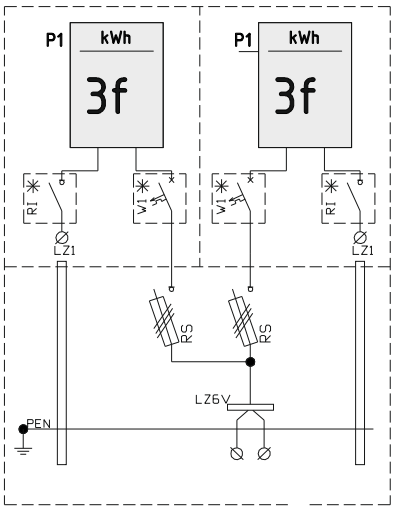
Basic technical parameters	
Rated current	up to 160 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

ZK2-2Px catalogue number E-4





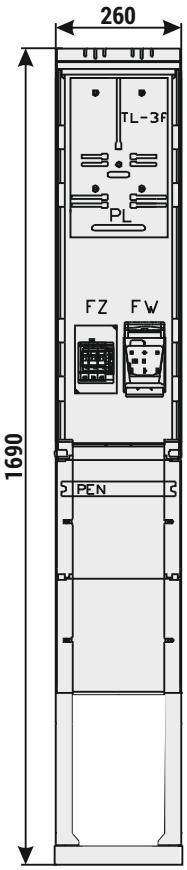


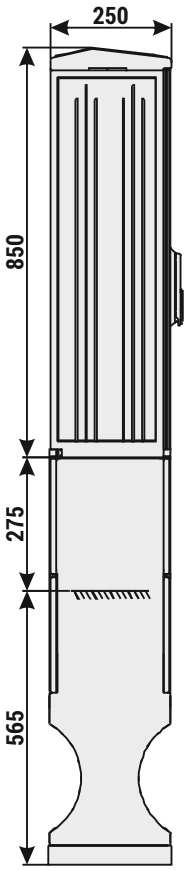


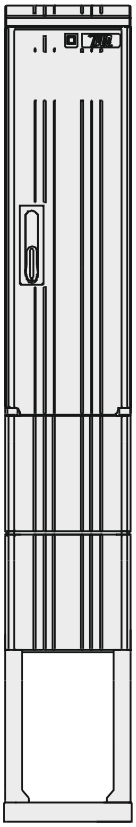
Basic technical parameters	
Rated current	up to 160 A
Rated impulse	up to 400 V
Rated insulation voltage	690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

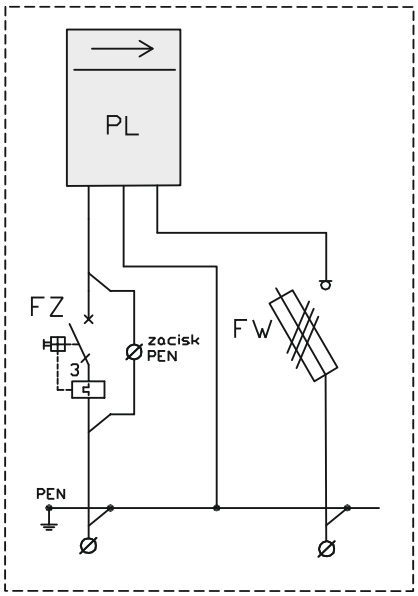
EXAMPLE SOLUTIONS ACC. TO TAURON STANDARDS

ZK1e-1P catalogue number T-58



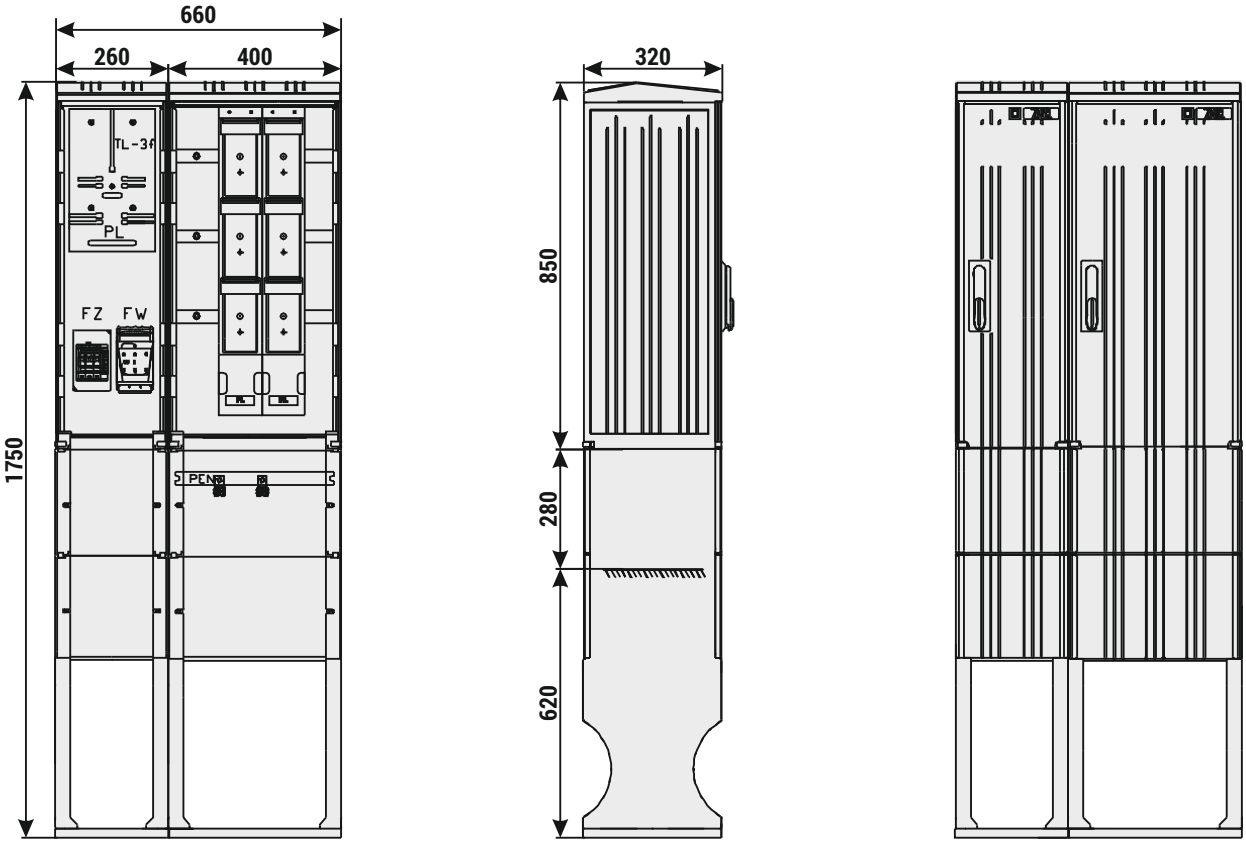


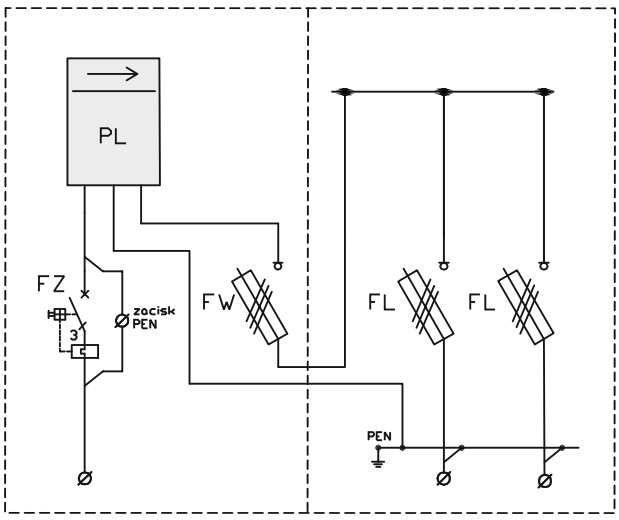




Basic technical parameters	
Rated current	100 / 160 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

ZK2a-1P catalogue number T-1

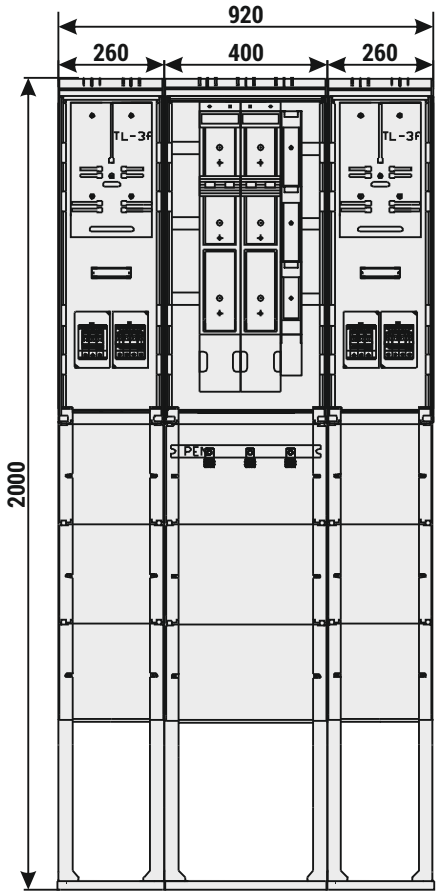


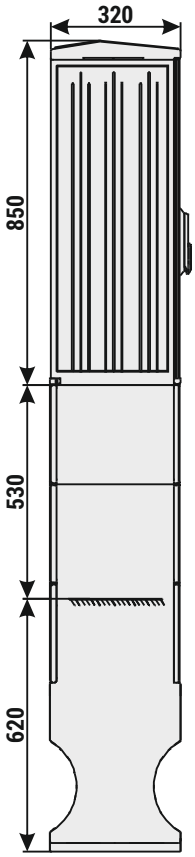


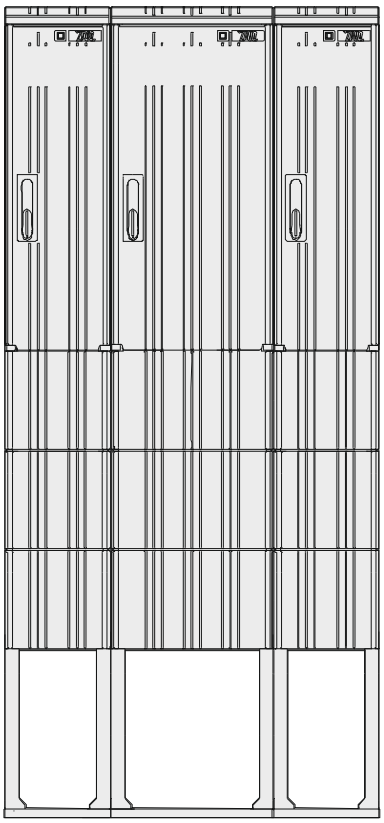
Basic technical parameters	
Rated current	up to 630 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

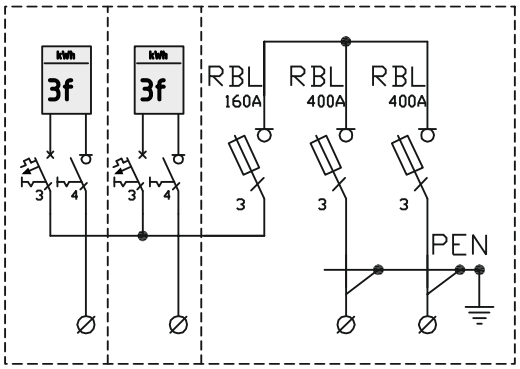
EXAMPLE SOLUTIONS ACC. TO PGE STANDARDS

ZK3 RBL 2x400A+1x160A/2P KK catalogue number PGE-66



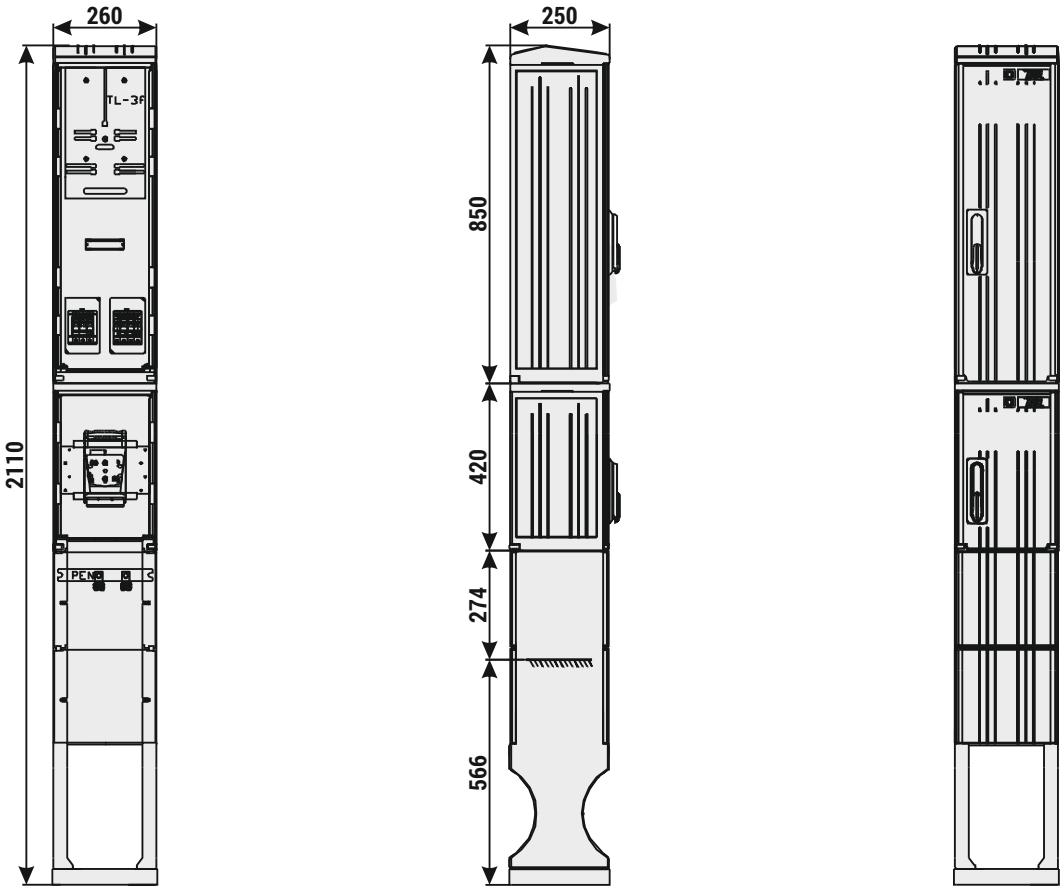


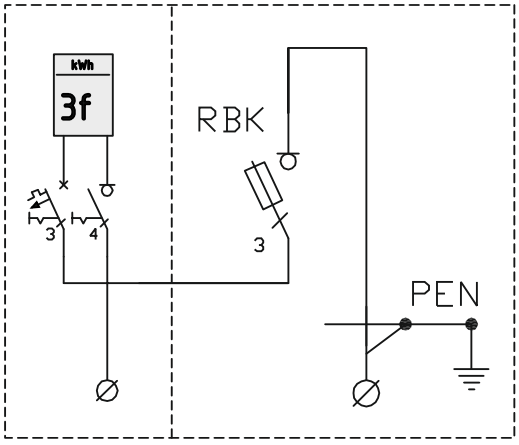




Basic technical parameters	
Rated current	up to 630 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

Zk1 RBK 160A/1P catalogue number PGE-40

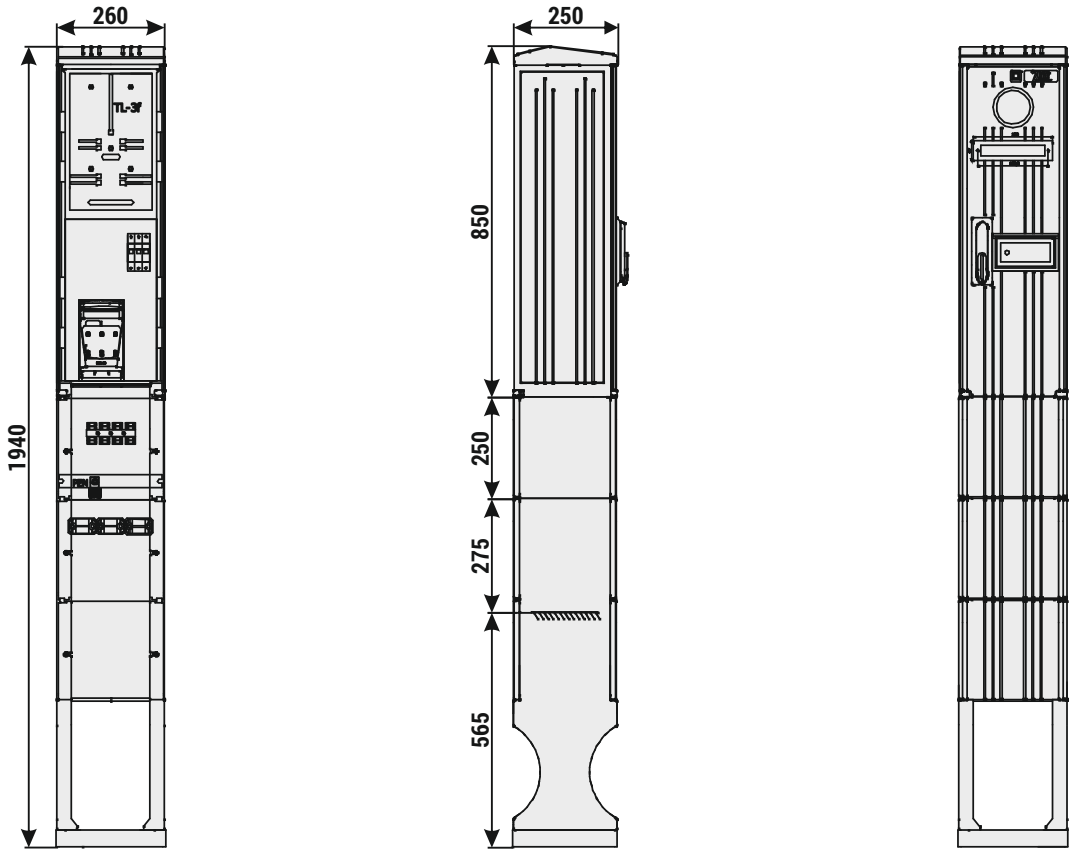


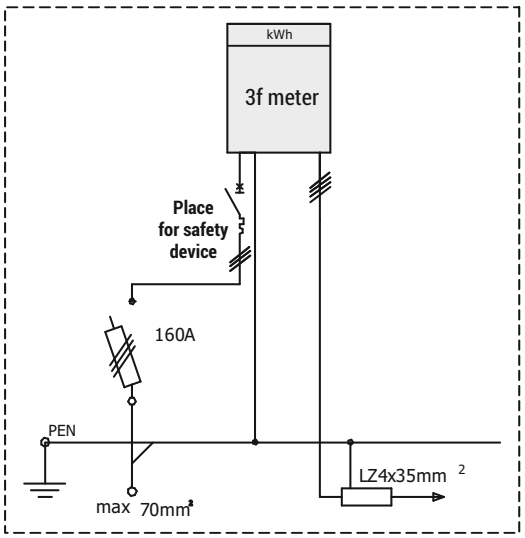


Basic technical parameters	
Rated current	up to 160 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

EXAMPLE SOLUTIONS ACC. TO INNOGY STANDARDS

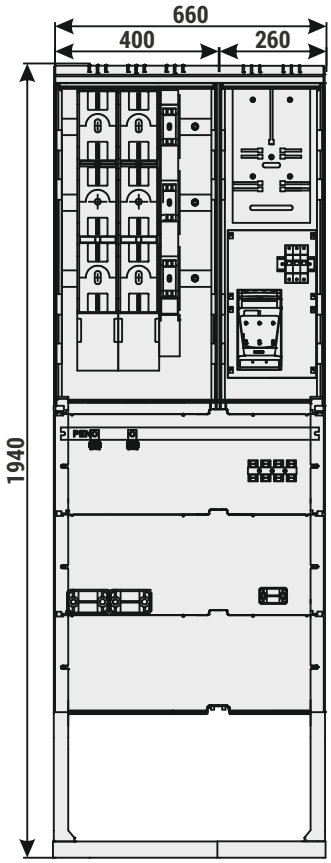
Sz-1 catalogue number R-1

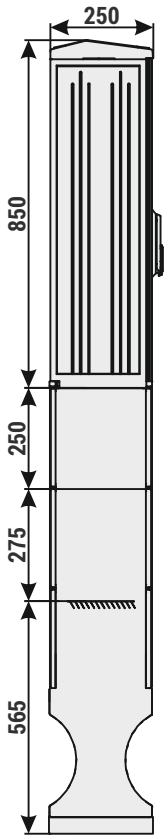


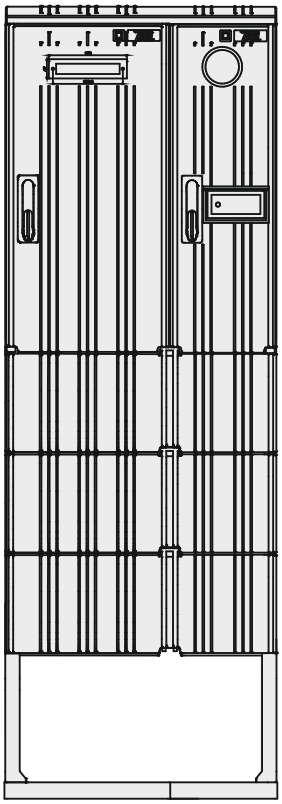


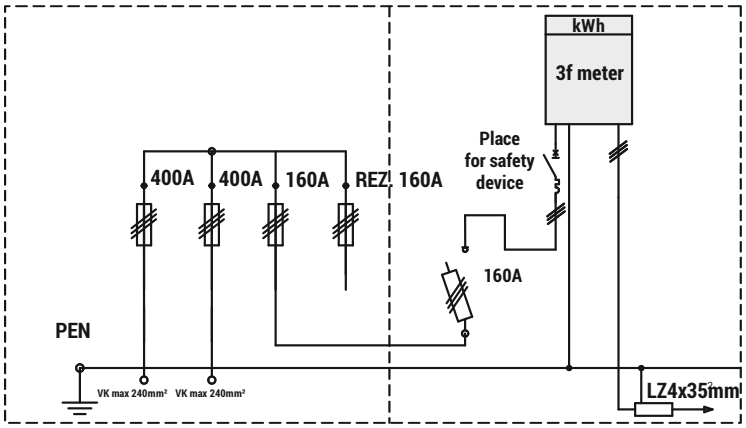
Basic technical parameters	
Rated current	up to 160 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

ZZ-1 catalogue number R-7



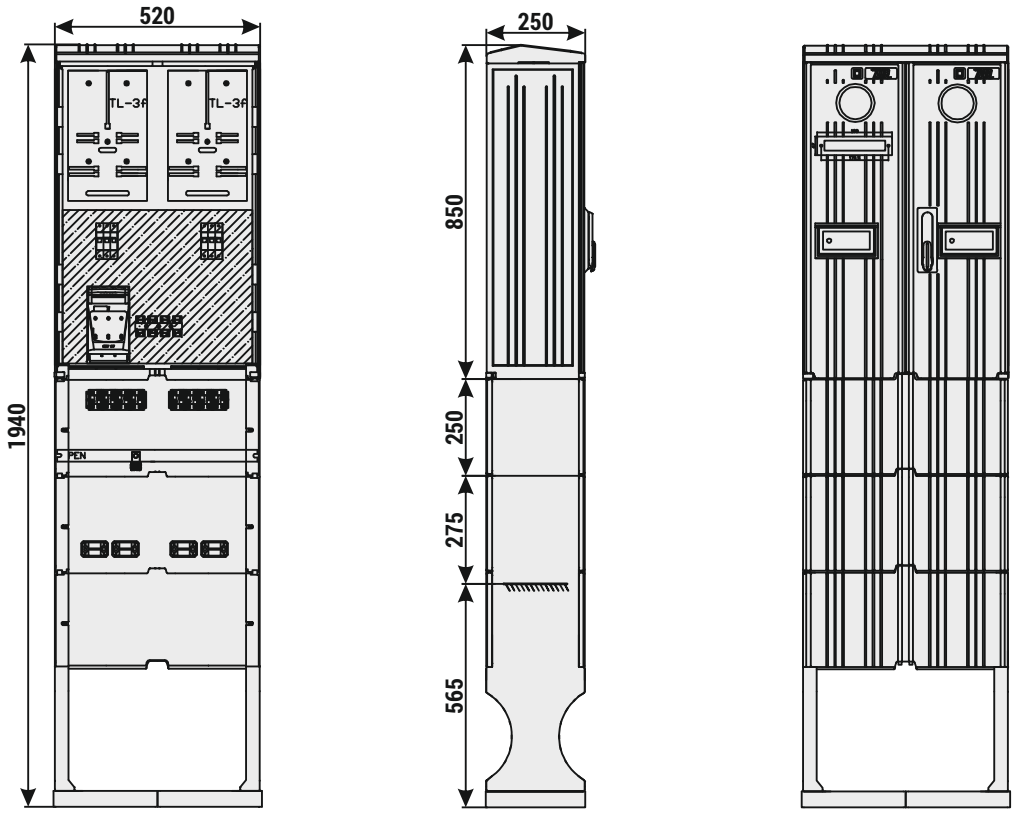


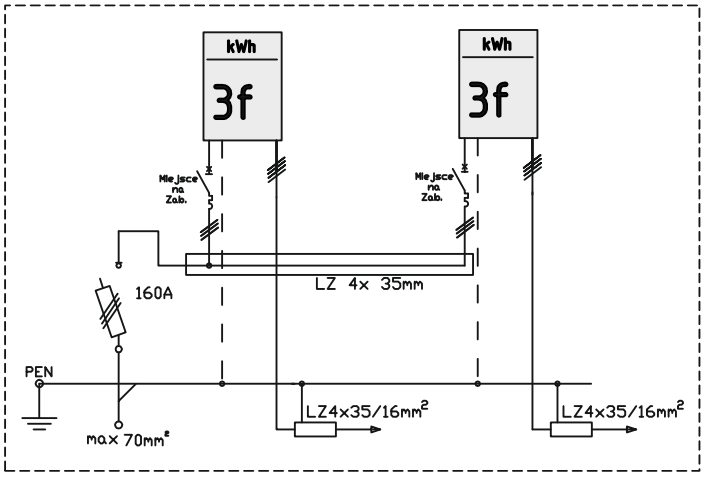




Basic technical parameters	
Rated current	up to 400 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

SZ-2 catalogue number R-2

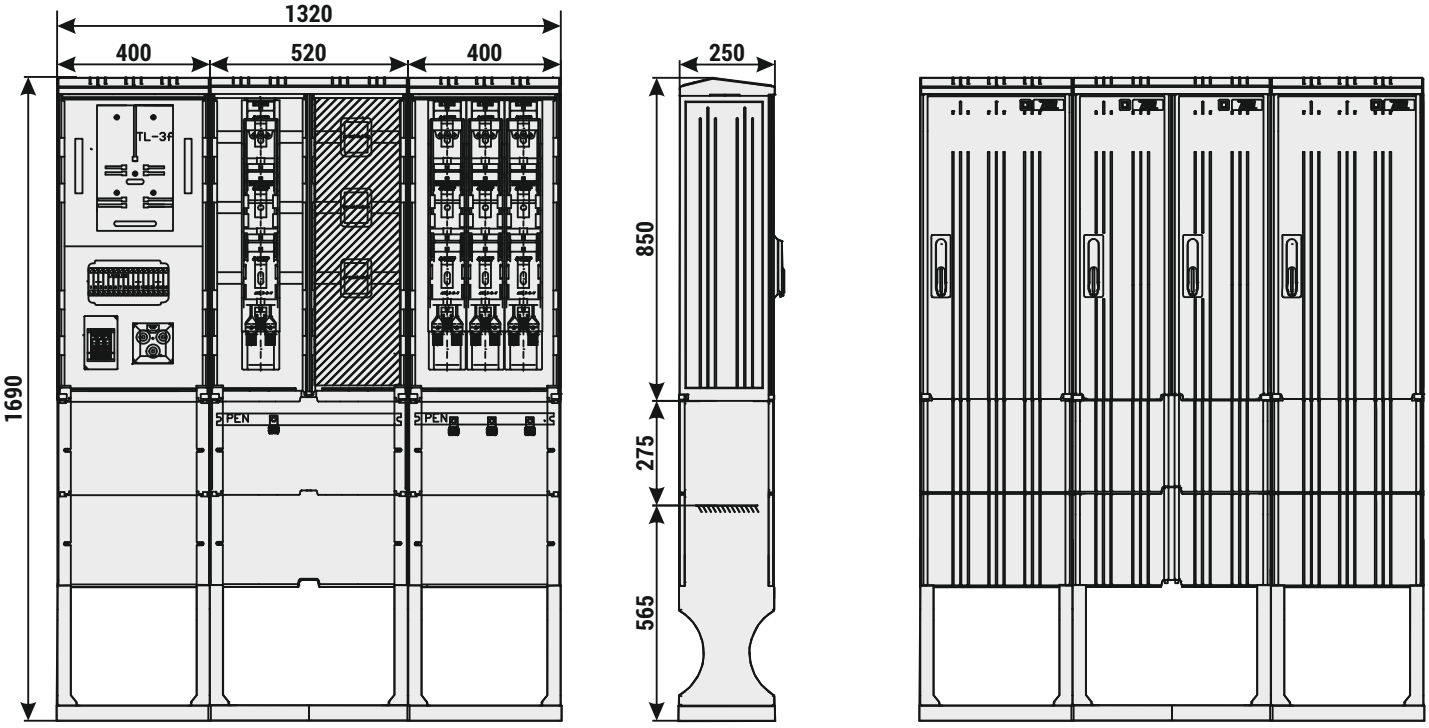


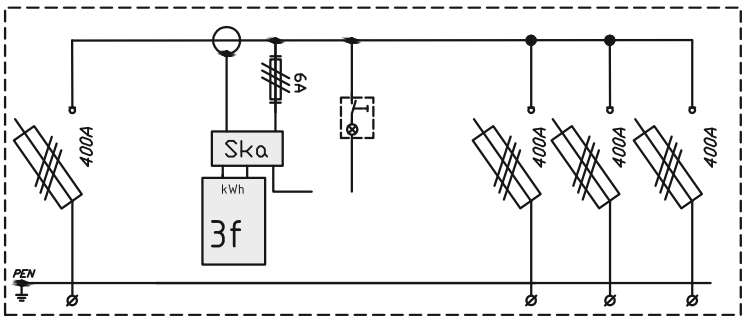


Basic technical parameters	
Rated current	up to 160 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

EXAMPLE SOLUTIONS ACC. TO ZPUE S.A. STANDARDS

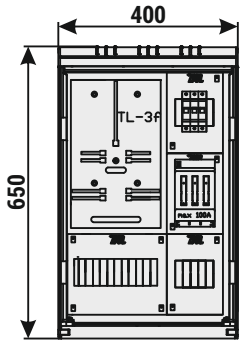
ZK1/3PP catalogue number 30/10

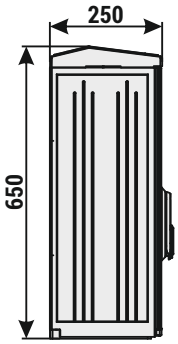


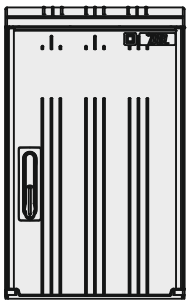


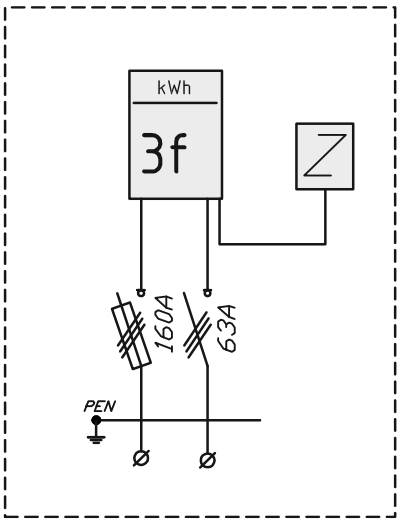
Basic technical parameters	
Rated current	up to 630 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

ZP-1 catalogue number 17/10



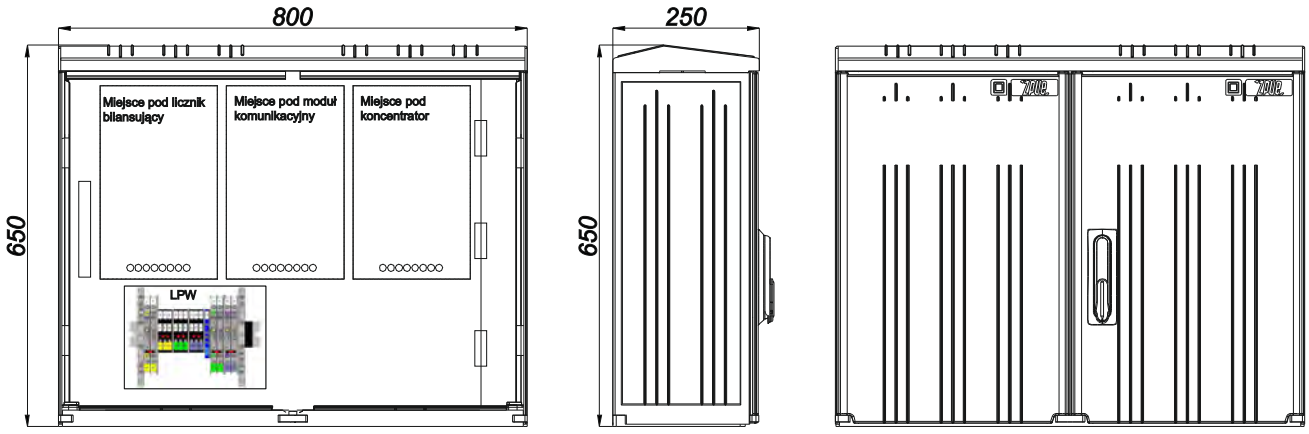


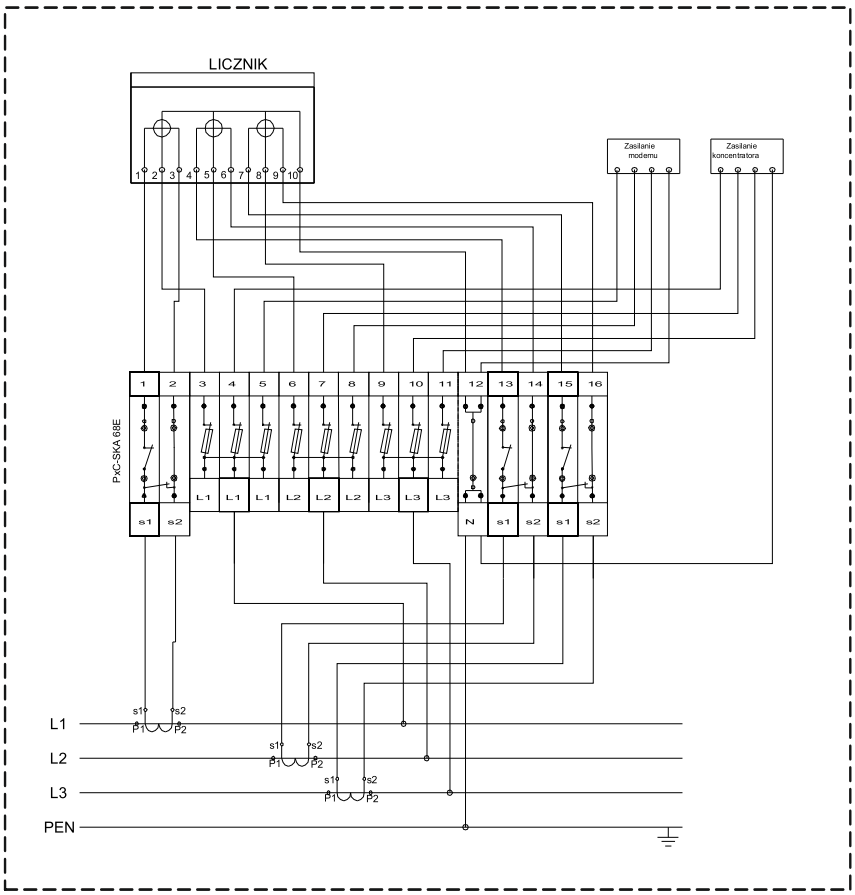




Basic technical parameters	
Rated current	up to 160 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

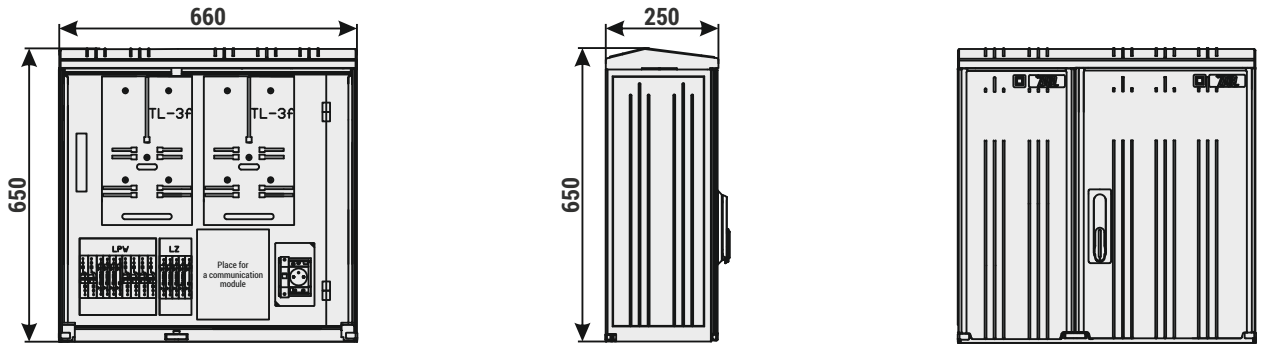
ZKPP catalogue number AMI TAURON T-84

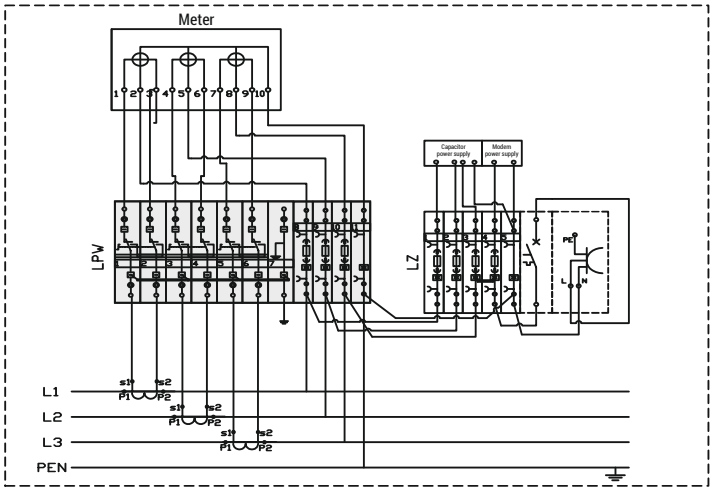




Basic technical parameters	
Rated current	up to 100 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

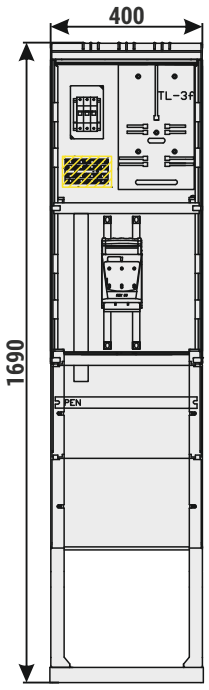
ZKPP catalogue number AMI PGE-121

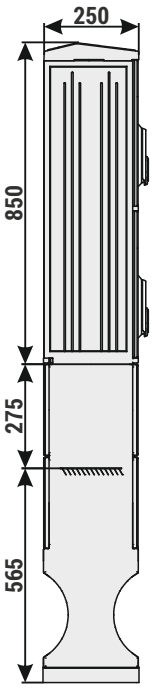


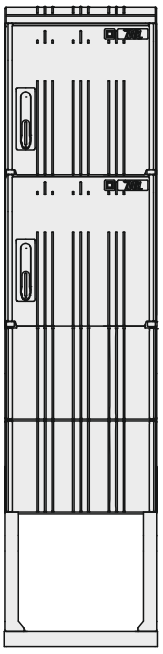


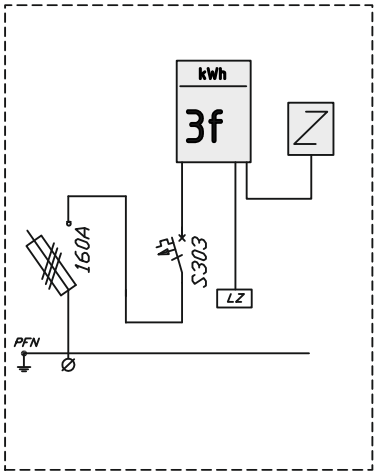
Basic technical parameters	
Rated current	up to 63 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

ZK1+1P catalogue number 23/10





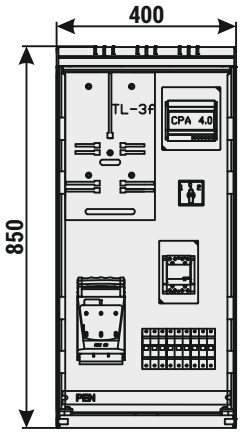


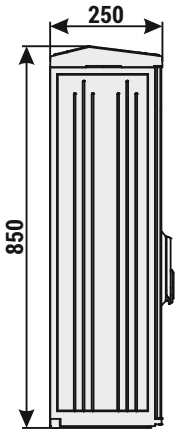


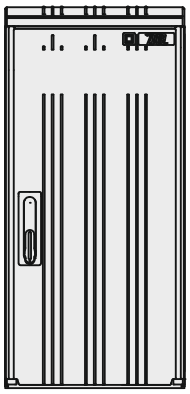
Basic technical parameters	
Rated current	up to 160 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

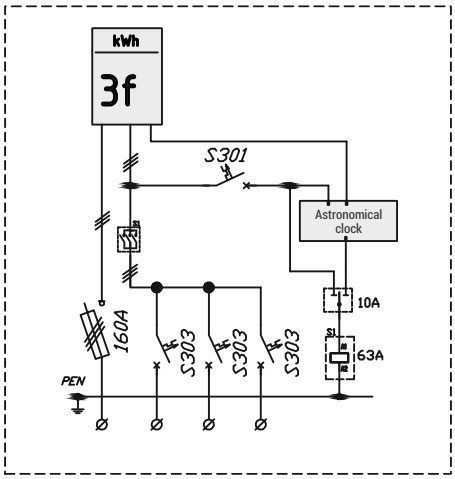
RSOU STREET LIGHTING CABINETS

RSOU 1 catalogue number 32/10





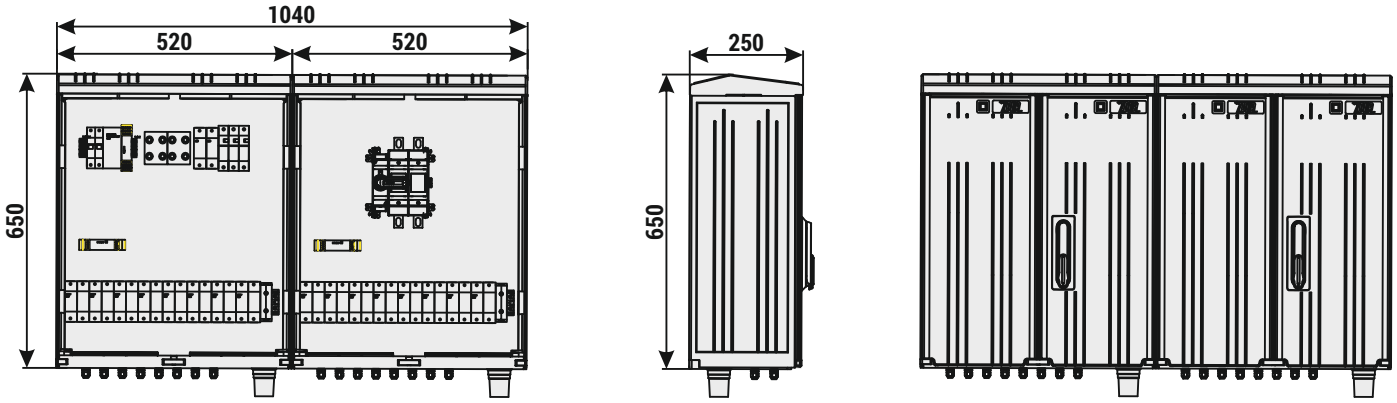


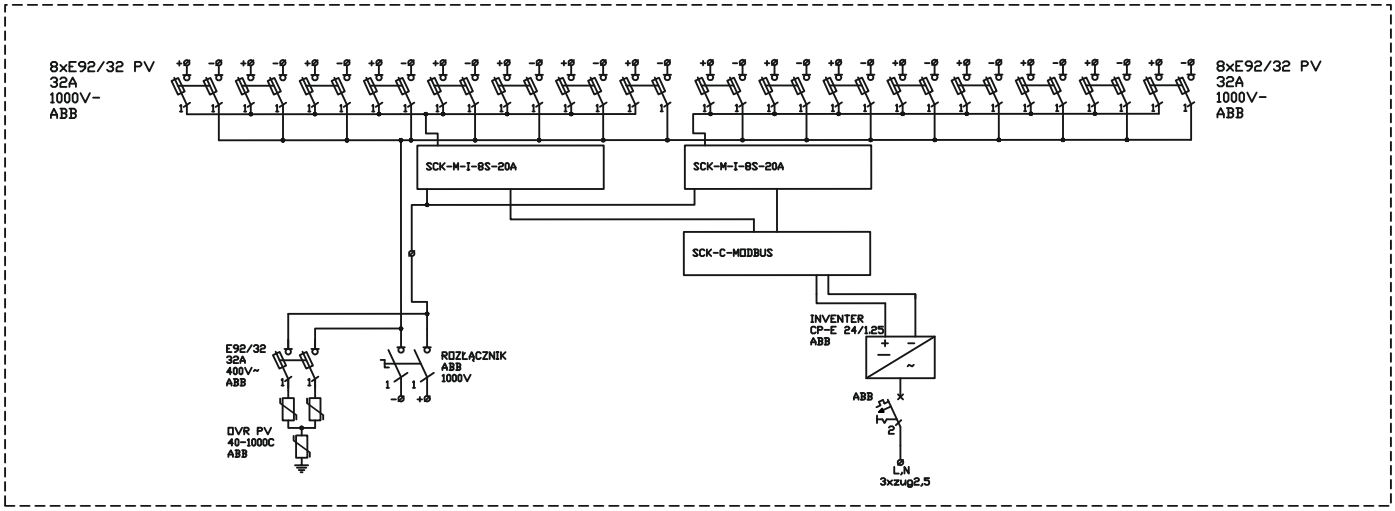


Basic technical parameters

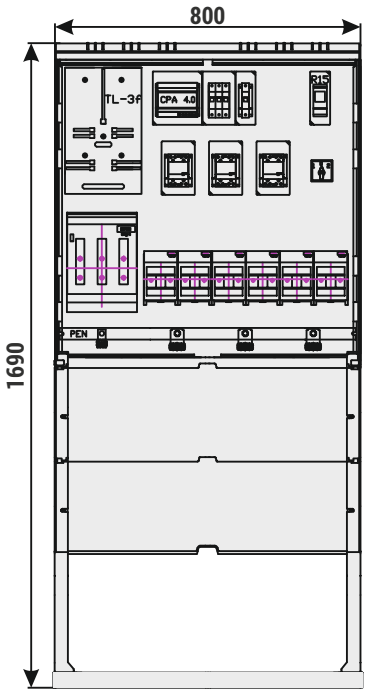
Rated current	up to 160 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

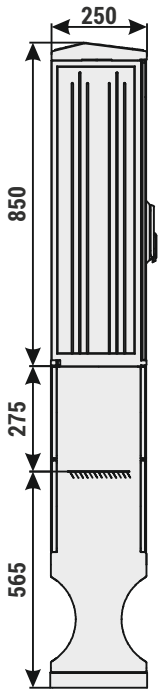
String BOX - SCK switchgear

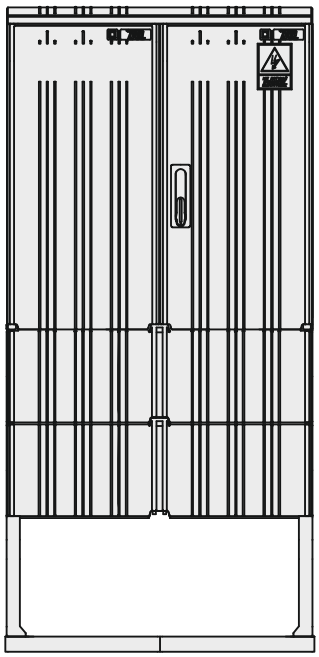


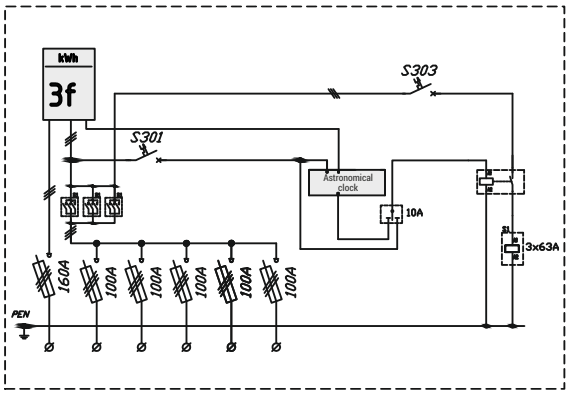


RSOU 6 catalogue number 36/10





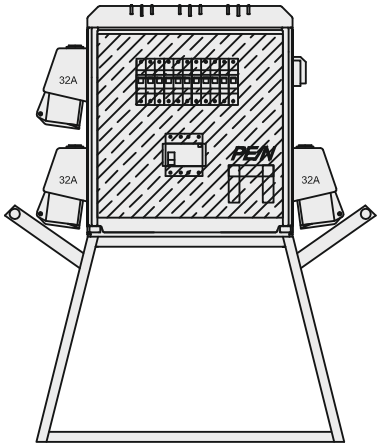


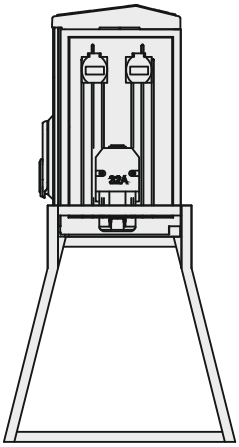


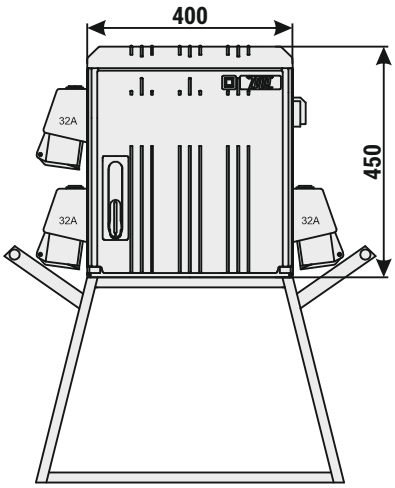
Basic technical parameters	
Rated current	up to 160 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

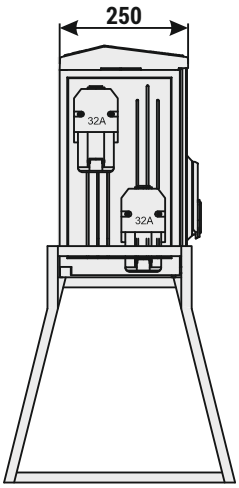
RB construction switchgear

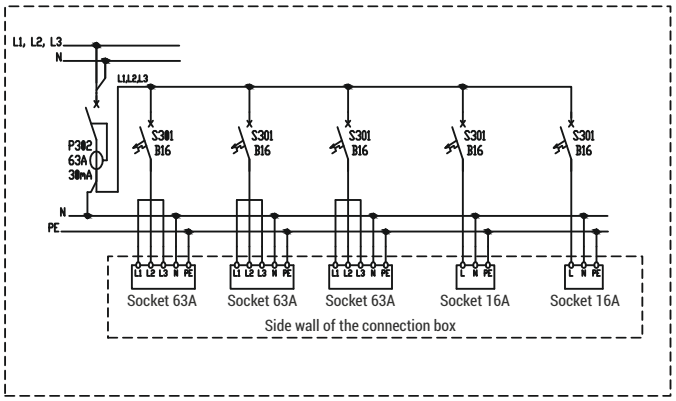
Rb1 catalogue number 38/10







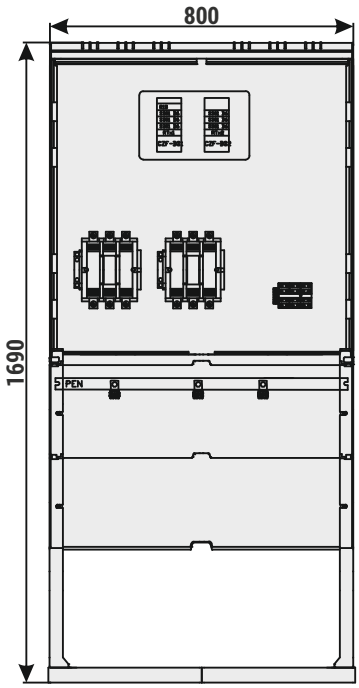


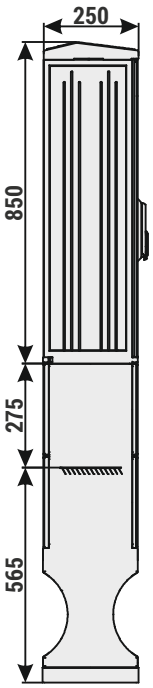


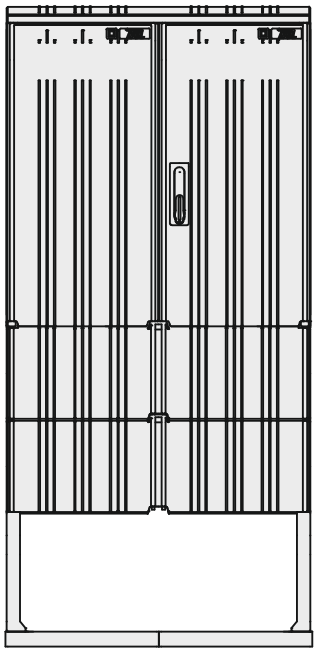
Basic technical parameters	
Rated current	up to 63 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

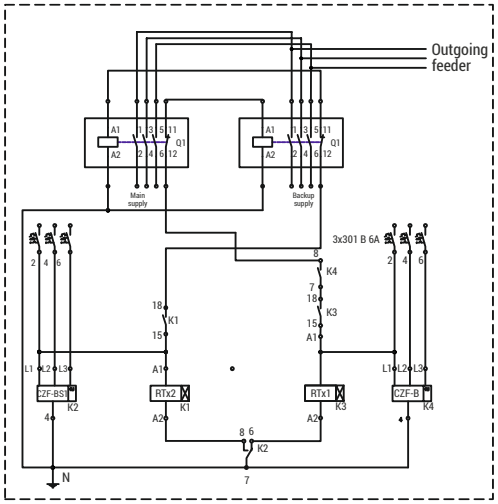
ATS SYSTEM

SZR 220A catalogue number 40/20









Basic technical parameters	
Rated current	up to 220 A
Rated impulse	230 / 400 V
Rated insulation voltage	500 / 690 V
Rated frequency	50 Hz
Ingress protection rating	IP44
Device protection class	Class II

BASIC TECHNICAL PARAMETERS

Rated impulse	230 V / 400 V
Rated insulation voltage	1000 V
Rated current	250 - 630 A
Continuous rated current of the meter part	up to 100 A
Rated frequency	50 Hz
Ingress protection rating	IP44 - IP54 [1]
Number of outgoing bays	unlimited (1-...)
Number of metering bays	unlimited (1-...)

Dimensions and weights of standard connection boxes

ZK connection boxes

Design	120				240			
External dimensions	**Width [mm]**	**Height [mm]**	**Depth [mm]**	**Weight [kg]**	**Width [mm]**	**Height [mm]**	**Depth [mm]**	**Weight [kg]**
ZK-1a, ZK-1b	400	660	250	11,0	400	860	250	14,5
ZK-2a ZK-2b, ZK-2c, ZK-2d	600	660	250	22,5 20,0	600	860	250	29,0 26,5
ZK-3a ZK-3b, ZK-3e ZK-3c ZK-3d	850	660	250	25,0 25,5 23,5 25,0	850	860	250	31,5 32,5 30,5 32,0
Maximum cross-sections of connection cables	120 mm^2				240 mm^2			

- connection boxes may be made in three versions: free-standing, wall-mounted and recess-mounted,
- in case of a recess-mounted connection box, the dimension of the recess should be increased by 10 mm compared to the connection box dimensions (as in the drawing of the ZK-1 connection box),
- it is possible to manufacture connection boxes with different dimensions, adapted to the needs at the location.

Dimensions and weights of standard connection boxes

ZKP cabling & metering connection boxes

Design	120				240			
External dimensions	**Width [mm]**	**Height [mm]**	**Depth [mm]**	**Weight [kg]**	**Width [mm]**	**Height [mm]**	**Depth [mm]**	**Weight [kg]**
ZKP 1/1L	400	1260	250	22,0	400	1460	250	25,5
ZKP 2/2L	600	1260	250	32,5	600	1460	250	39
ZKP 3/2L, ZKP 3/3L	850	1260	250	44,5	850	1460	250	51,5
Maximum cross-sections of connection cables - power supply - internal power supply line	120 mm^2 acc. to customer's needs				240 mm^2 acc. to customer's needs			

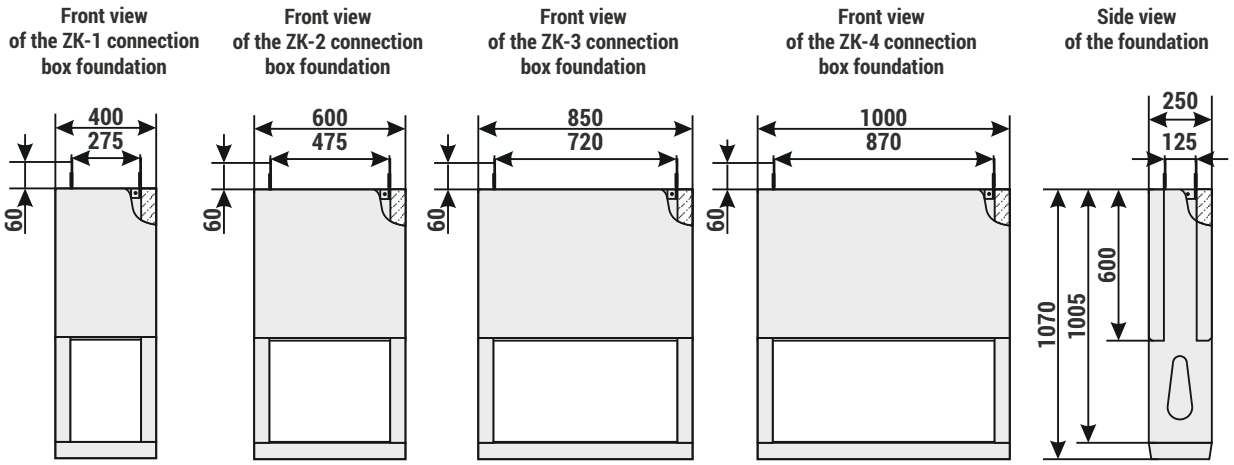
NOTE!

[1] On agreement with the manufacturer it is possible to construct the enclosure with IP66 protection rating

Foundation

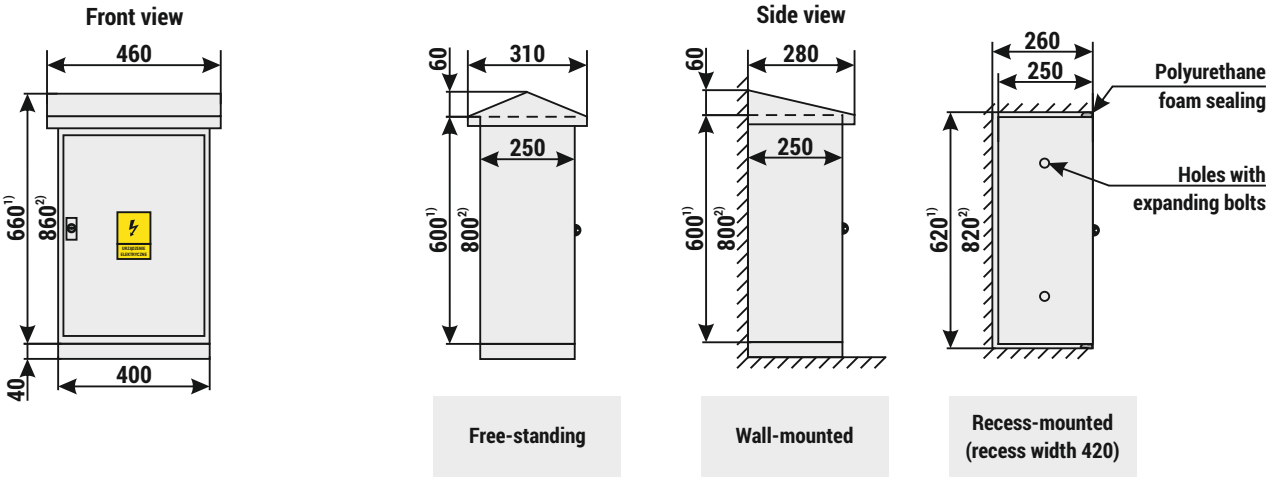
Free-standing connection boxes are installed on prefabricated concrete foundations. These foundations enable feeding in of cables from four directions. The view, dimensions and example foundations of cable connection boxes was presented on figures below.

View and dimensions of prefabricated foundations

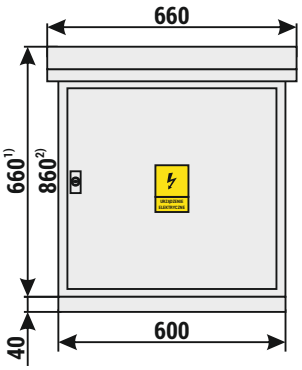


Example solutions for cabling and cabling & metering connection boxes

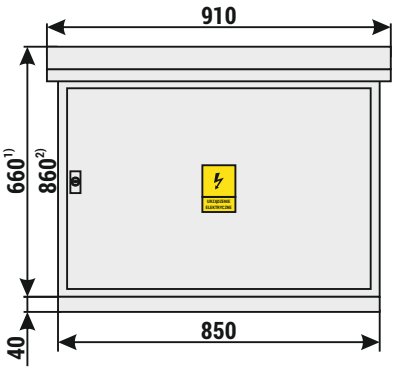
ZK-1 cable boxes



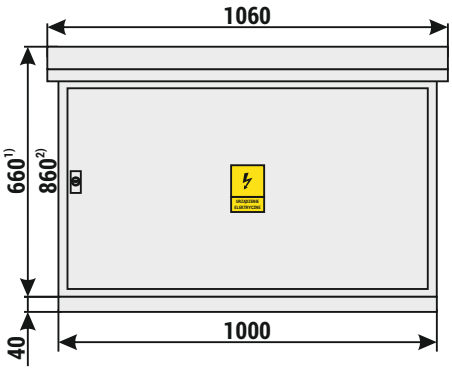
ZK-2 cable boxes



ZK-3 cable boxes

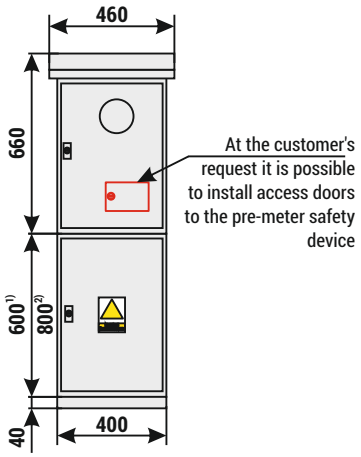


ZK-4 cable boxes

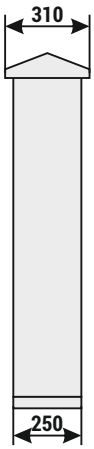


ZKP1/1L cabling & metering connection box

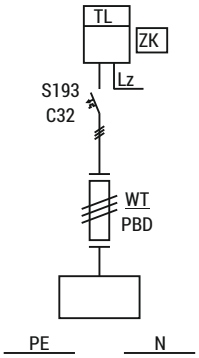
Front view



Side view

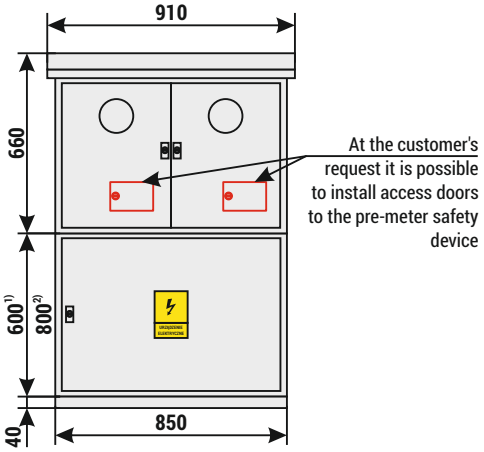


Schematic diagram of the connection box

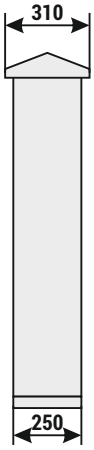


ZKP3/2L cabling & metering connection box

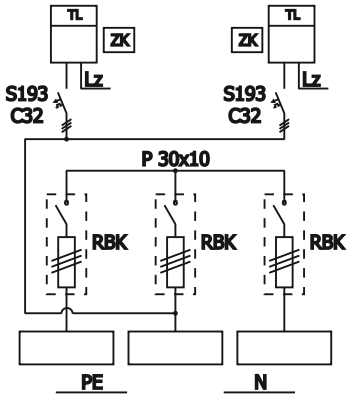
Front view



Side view

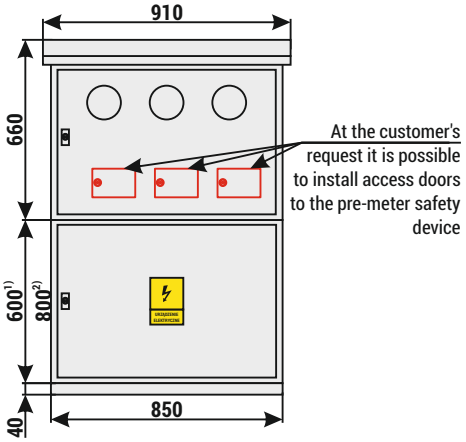


Schematic diagram of the connection box

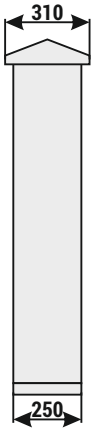


ZKP3/3L cabling & metering connection box

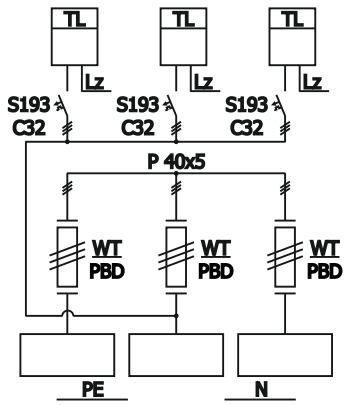
Front view



Side view



Schematic diagram of the connection box



[1] - for a version supplied with a max. 120 mm^2 cable
[2] - for a version supplied with a max. 240 mm^2 cable

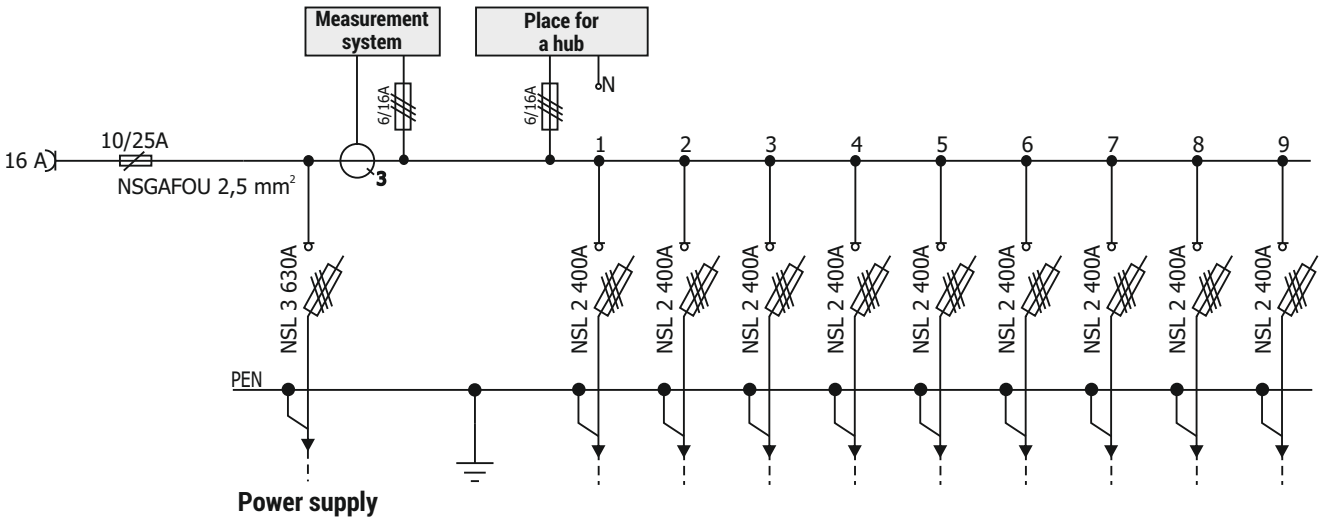
NOTE!

At the customer's request it is possible to manufacture a connection box in any configuration.

EXAMPLE SOLUTIONS FOR CABLE CABINETS

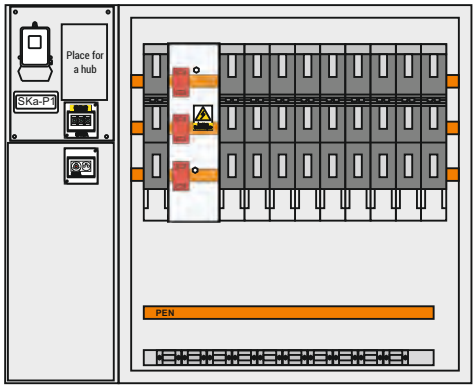
ZK-nN 1z cable cabinet

Electrical diagram



View

Arrangement of devices

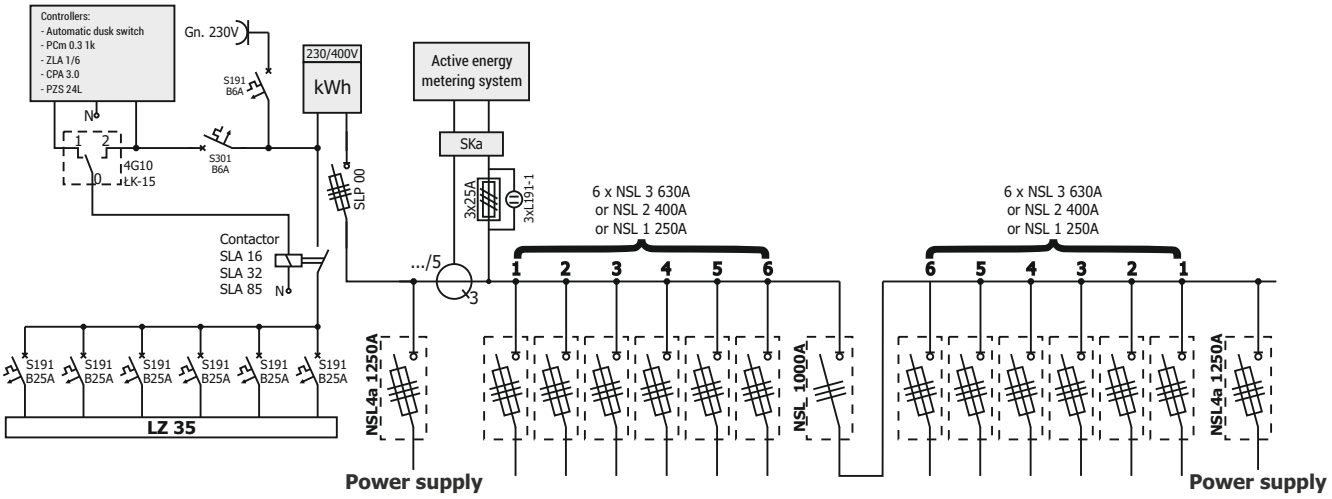


NOTE!

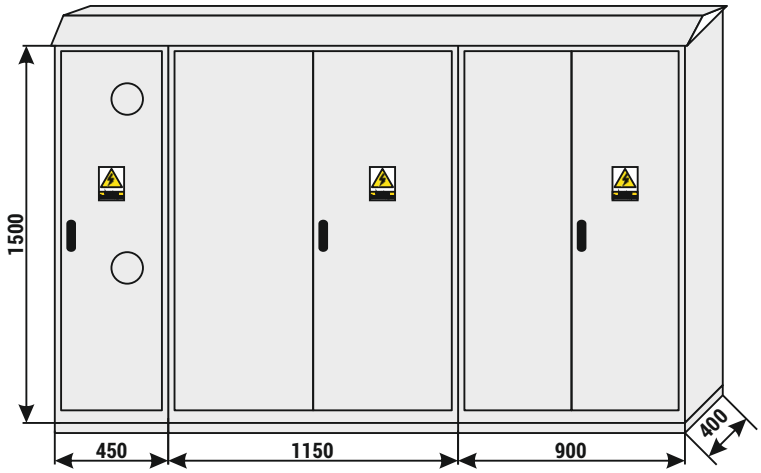
At the customer's request it is possible to manufacture a cabinet in any configuration.

ZK-nN 2z cable cabinet

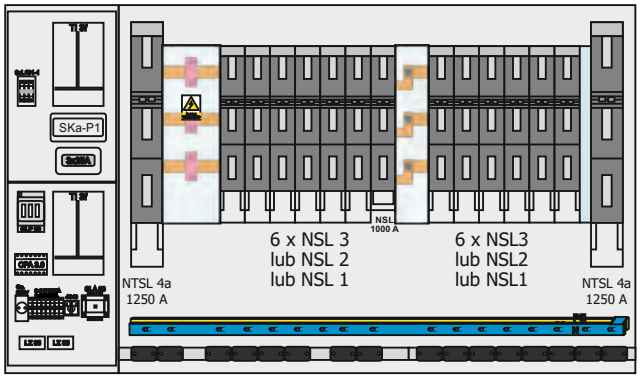
Electrical diagram



View



Arrangement of devices



NOTE!

At the customer's request it is possible to manufacture a cabinet in any configuration.

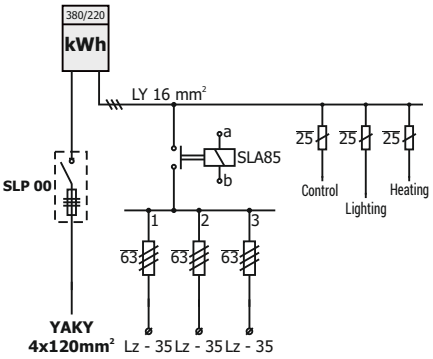
Low Voltage switchgear

5.3 / SOU, RSOU – street lighting cabinets

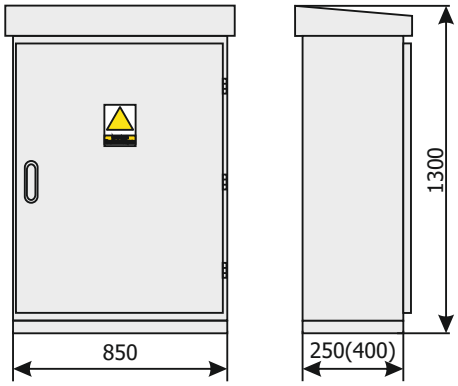
The cabinet enclosure is made of bent aluminium sheet, which is previously degreased, phosphated and powder-painted in any colour or of plastic (fibreglass reinforced thermosetting polyester). Cabinets made of aluminium sheet have a double roof to prevent condensation of water vapour. The structure is mounted on a concrete foundation (views and dimensions of prefabricated concrete foundations were presented in the "Cable connection boxes in aluminium enclosures" chapter in section 5.2). A lightweight enclosure of aluminium sheet facilitates transportation and placement. Manufacturing technology and advantages of plastic cabinets are described in the "Cabling, metering and cabling & metering connection boxes constructed with plastic enclosures" chapter.

Examples of SOU street lighting cabinets (in an aluminium enclosure)

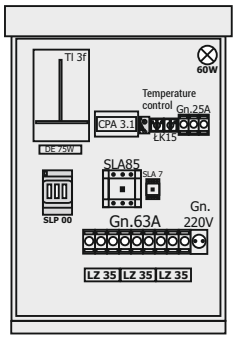
Electrical diagram



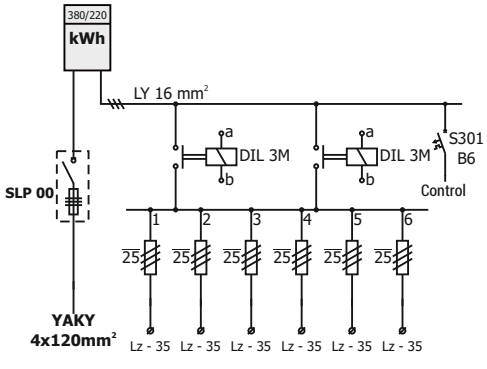
View



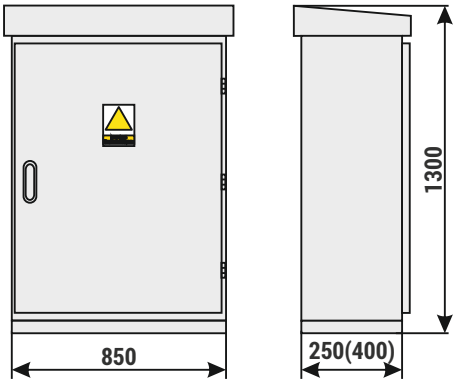
Arrangement of devices



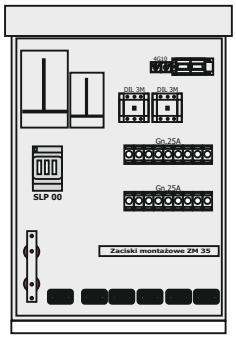
Electrical diagram



View



Arrangement of devices



Low Voltage switchgear

7 / Thermosetting plastic enclosures

INTRODUCTION

Responding to the needs of customers for the supply of high quality cable cabinet enclosures constructed with SMC fibreglass reinforced thermosetting polyester ZPUE S.A., having at its disposal appropriate machinery and human resources, manufactures high quality SKRD and SKRF type thermosetting plastic enclosures. By considering the feedback provided by our customers concerning the existing technical solutions and suggestions of changes to the solutions currently available on the market, we have created a product range of SKR cabling & distribution cabinets, adapted to the requirements of national energy distribution companies. Our company, as the leading manufacturer in the sector continuously improves manufacturing technology, resulting in the highest quality of our products. Our products have appropriate certificates.

Manufacturing technology

The used material is a key element in ensuring high quality of manufacturing and long service life of the cabinets. The ZPUE S.A. company has used its long-term relationships with the best industrial chemical manufacturers in Europe, and the knowledge and experience of personnel who has been working in the field of SMC plastic processing for years. The material used for the manufacturing of our cabinets consists of multiple components, which guarantee meeting the requirements of mechanical and thermal strength and restricting the harmful impact of UV radiation on the used material, which guarantees long life and excellent appearance of our cabinets.

Area of application

Enclosures of thermosetting plastic are widely used in power engineering, industry and telecommunications due to their universality. They are manufactured from insulating, self-extinguishing and flame retardant composite (polyester + fibre glass – SMC) with high weather resistance (UV). Modular construction enables any combination of the enclosure with foundation, extension or cable compartment, and combining of enclosures in either a vertical or horizontal layout. Varying dimensions enable the adaptation of the enclosure to the customer's requirements or to the used equipment. The specially developed internal design of the enclosure, integrated with additional elements ensures quick and convenient installation of equipment and devices inside the enclosure. The enclosures are painted as standard with RAL 7035 and at the customer's request they may be coated with plastic varnish in any colour in the RAL palette.

Characteristics and advantages of SKR enclosures

Made of highest quality self-extinguishing SMC material. Excellent durability and appearance, for many years. Resistance to UV radiation and changing weather conditions. Very high mechanical strength. Ventilation for ensuring the removal of excess moisture. Modular design enabling the replacement of faulty parts. Due to modular design it is possible to divide the enclosures vertically and horizontally. Possibility of configuring any connection box or expanding an existing one. Possibility of equipping with strip-type switch disconnectors (in 320 mm version enables parking) Three-point door locking mechanism made of plastic or metal. Possibility of simple and quick tool-less removal of doors and foundation covers, facilitating the work of installers. External surface is ribbed, improving appearance and hindering placement of posters on the cabinet.

BASIC TECHNICAL DATA

Insulation / protection class	II
Ingress protection rating	IP44 / IP54
Mechanical impact protection	IK 10
Flammability class	V0
UV resistance	YES
Heat resistance	960°C
Colour	RAL 7035
Operating conditions	-50°C ÷ + 55°C
Rated impulse	230V / 400V / 500V
Rated insulation voltage	500V / 690V
Comparative tracking index	CTI 600
Rated current	up to 630A
Dimensional tolerance	± 3mm

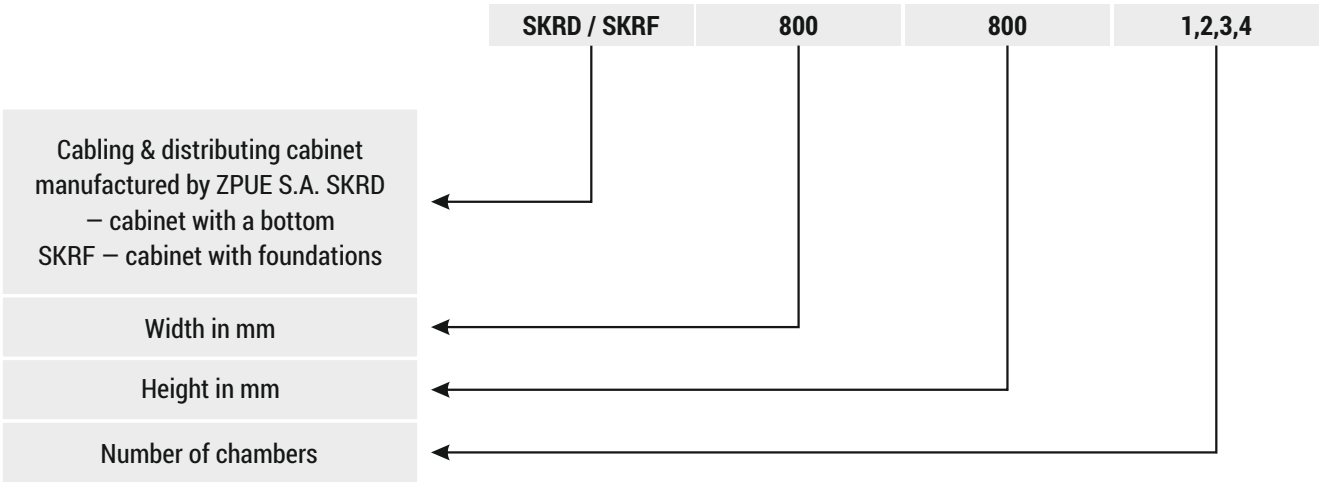
SKRD and SKRF type insulating enclosures with equipment meet the requirements of the Directives of the European Parliament and of the Council: RoHS Directive No 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment and Low Voltage Directive (LVD) No 2014/35/EU on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits and meet the requirements and standards in question.

The products presented herein were tested by IEL (Institute of Electrical Engineering) in Warsaw and BBJ-SEP (Quality Testing Office of the Association of Polish Electrical Engineers) in Lublin and meet the safety requirements of the following standards:

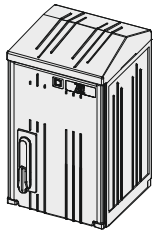
- **PN-EN 62208:2011** - „Empty enclosures for low-voltage switchgear and controlgear assemblies. General requirements",
- **PN-EN 60529:2003, PN-EN 60529:2003/A2:2014-07** - „Degrees of protection provided by enclosures (IP Code)",
- **PN-EN 62262:2003** - „Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)",
- **PN-EN 60695-2-11:2015-02** - „Fire hazard testing. Test methods. Glowing/hot-wire based test methods. Glow-wire flammability test method for end-products (GWEPT)",
- **PN-EN 60695-11-10:2014-02** - „Fire hazard testing. Test flames. 50 W horizontal and vertical flame test methods".
- **PN-EN 60112:2003, PN-EN 60112:2003/A1:2010** - „Method for the determination of the proof and the comparative tracking indices of solid insulating materials".
- **PN-EN ISO 4892-2:2013-06** - Plastics. Methods of exposure to laboratory light sources. Xenon-arc lamps".

Based on the obtained certificates and approvals, our products were provided with B and CE marking, which confirm the high quality of our goods, guarantee safety of use, repeatability of parameters and satisfaction of customers.

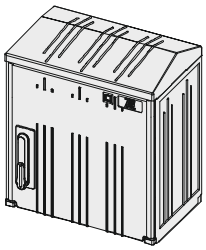
Explanation of enclosure markings



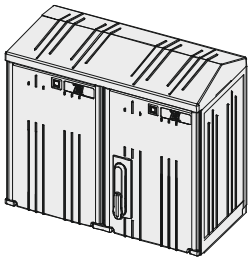
SKRD CABINET PRODUCT RANGE



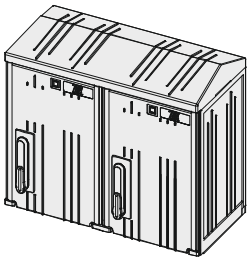
SKRD 260/400/1



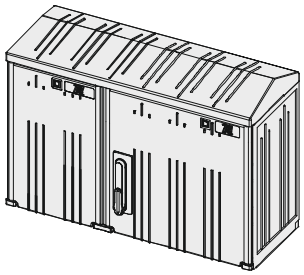
SKRD 400/400/1



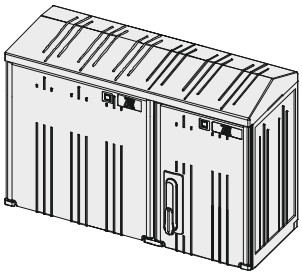
SKRD 520/400/1



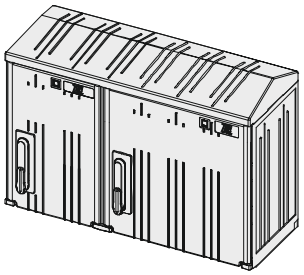
SKRD 520/400/2



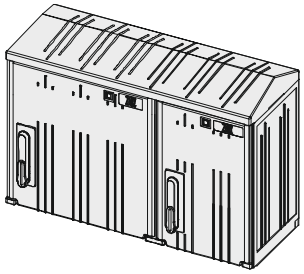
SKRD 660/400/1



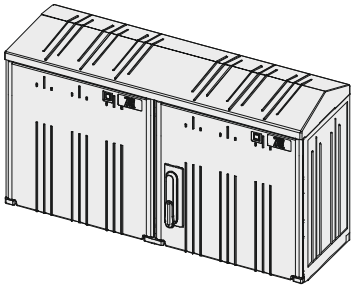
SKRD 660/400/1



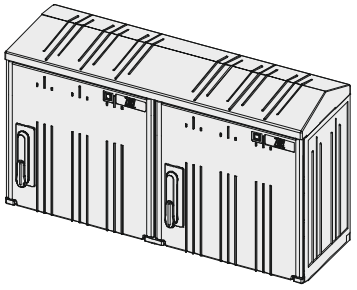
SKRD 660/400/2



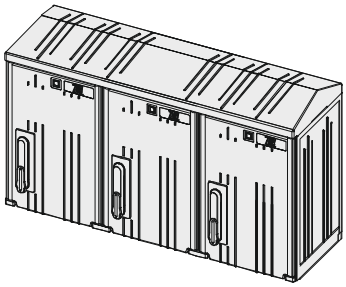
SKRD 660/400/2



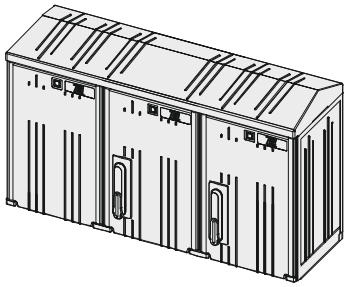
SKRD 800/400/1



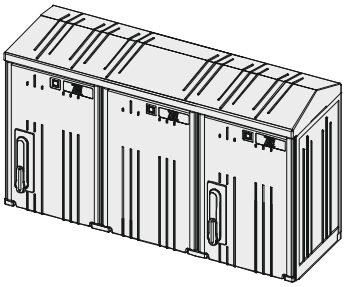
SKRD 800/400/2



SKRD 3x26/40



SKRD 52+26/40



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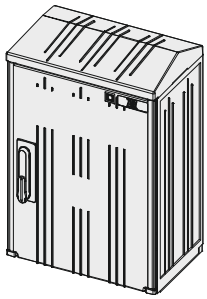

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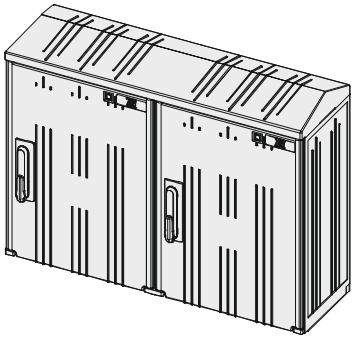

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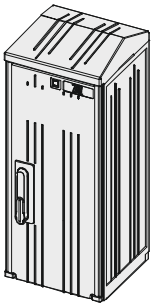

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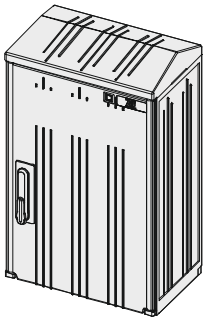

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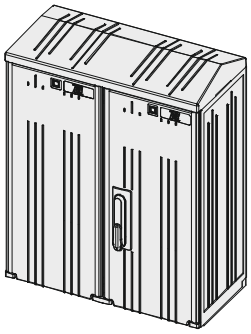

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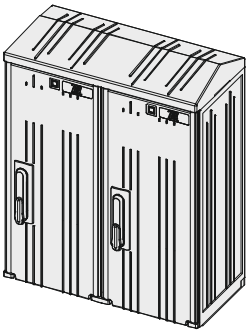

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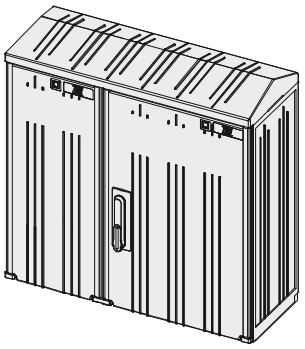

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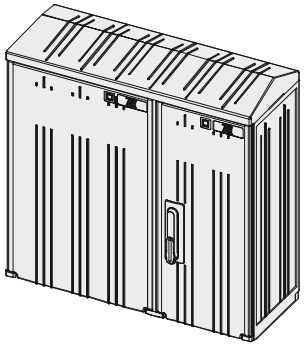

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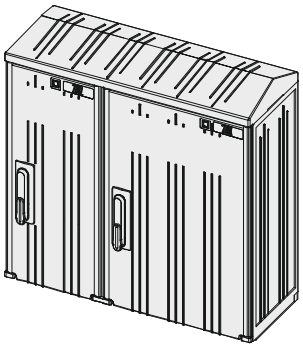

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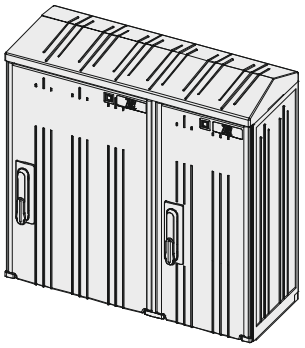

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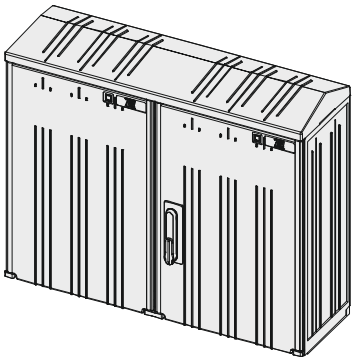

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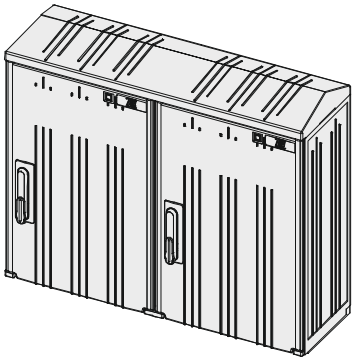

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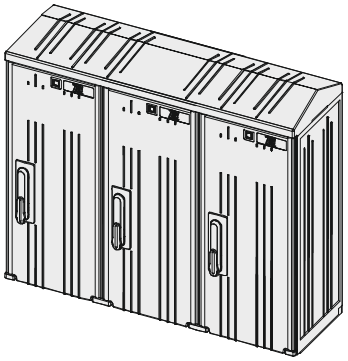
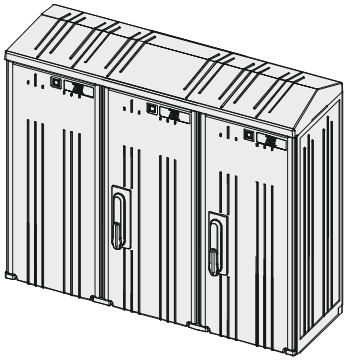


SKRD 3x26/60



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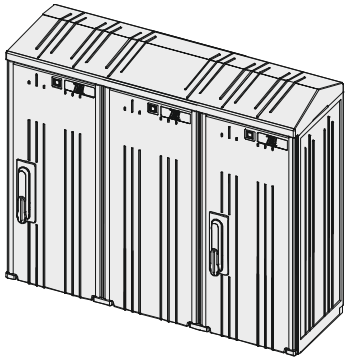

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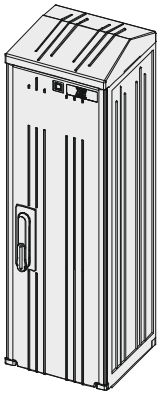

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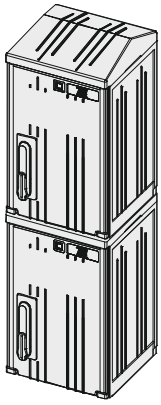

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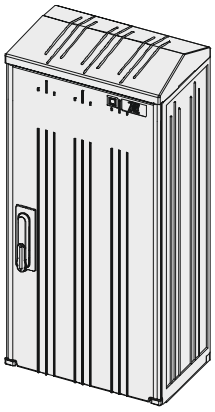

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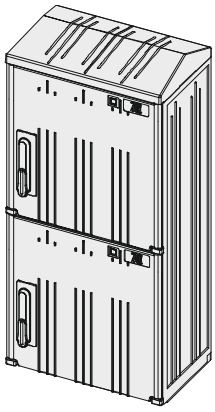

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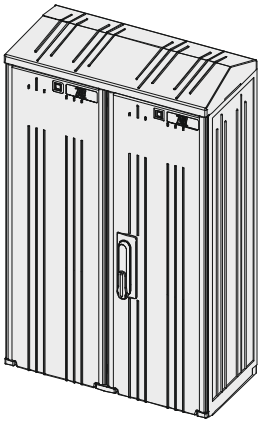

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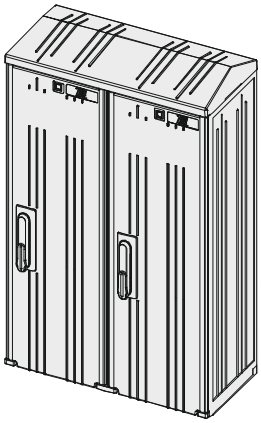

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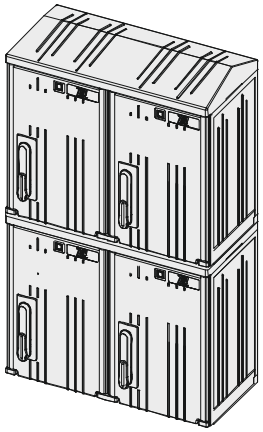

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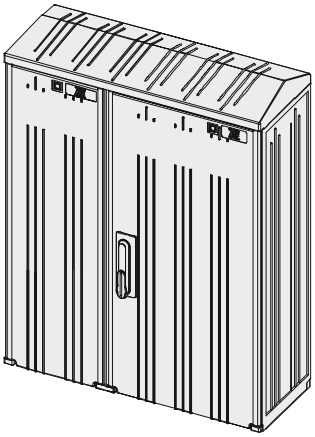

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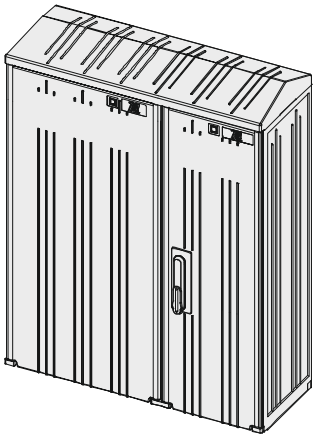

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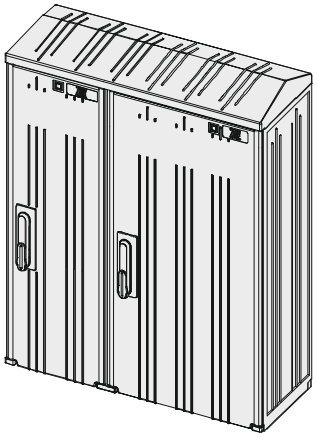

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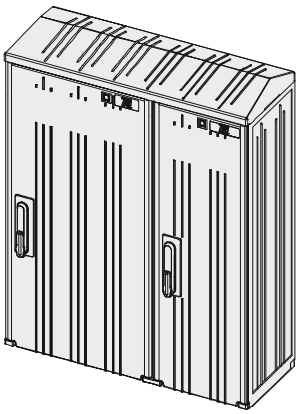

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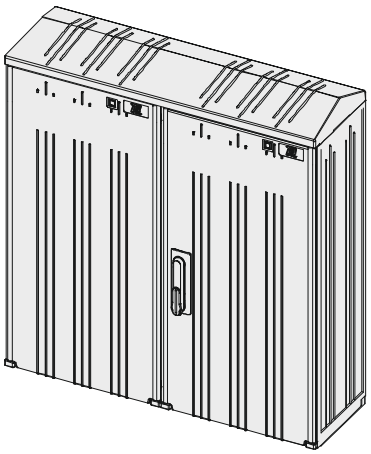

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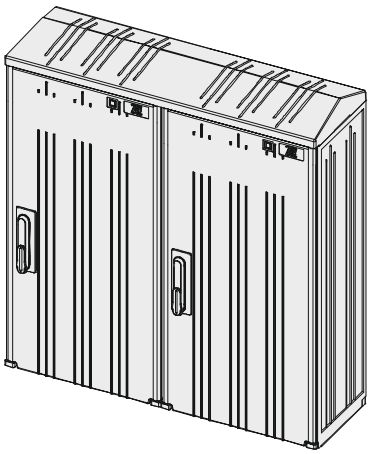
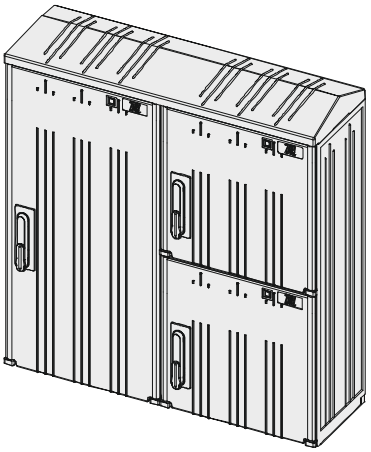
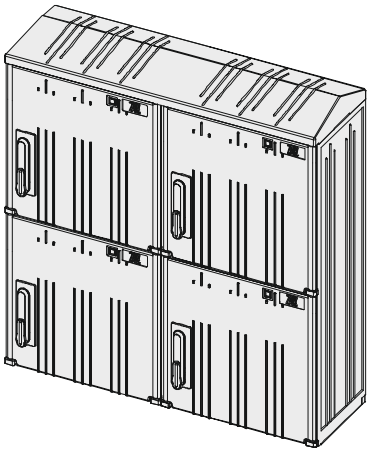


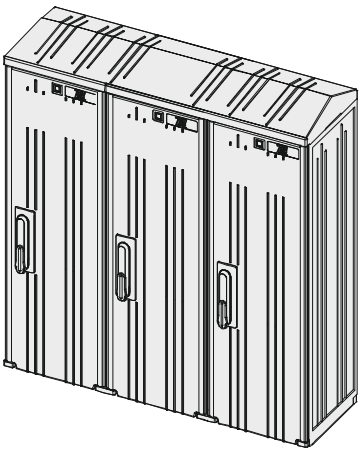
SKRD 800/800/2



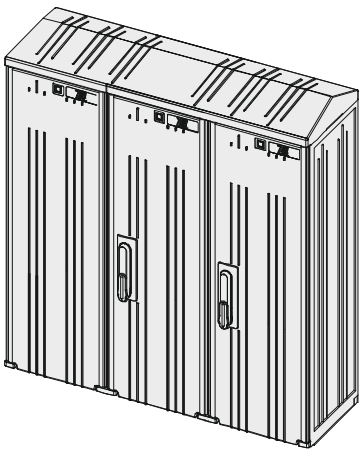
SKRD 800/800/3



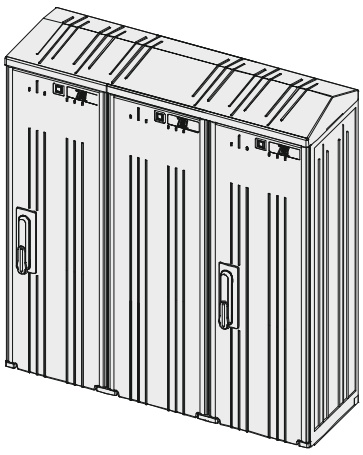
SKRD 800/800/4



SKRD 3x26/80

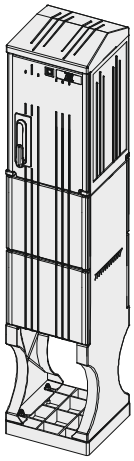


SKRD 52+26/80

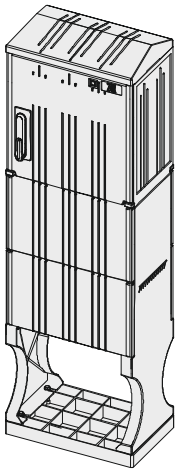


SKRD 26+52/80

SKRD CABINET PRODUCT RANGE



SKRF 260/400/1



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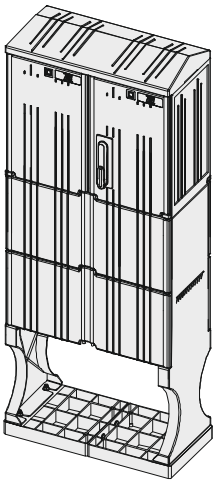

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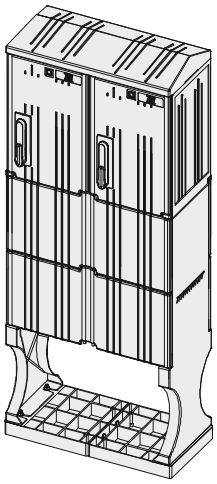

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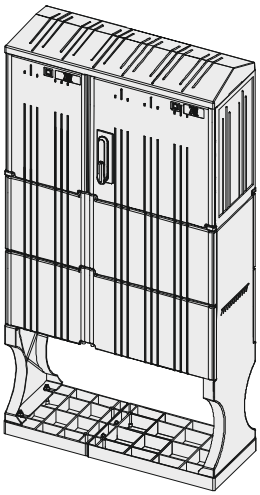

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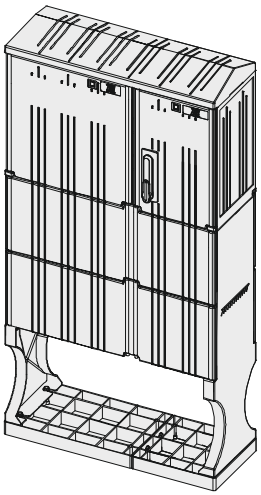

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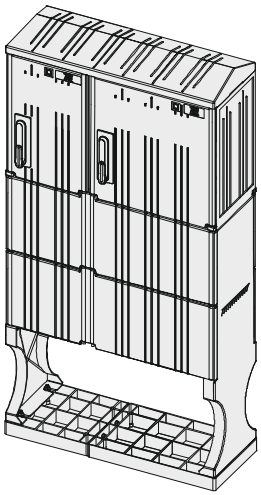

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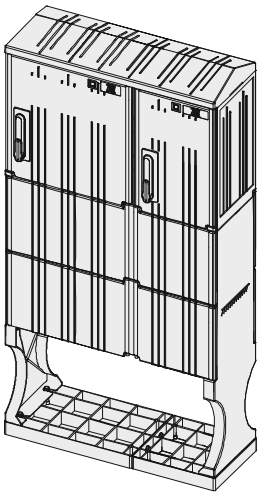

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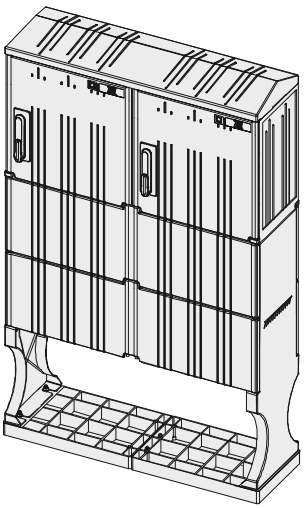

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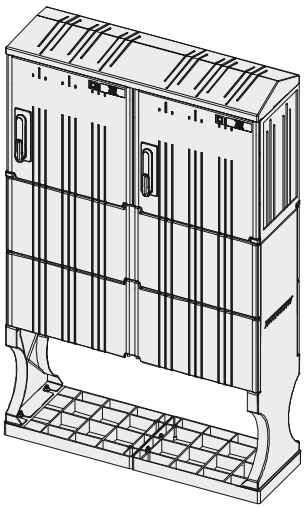

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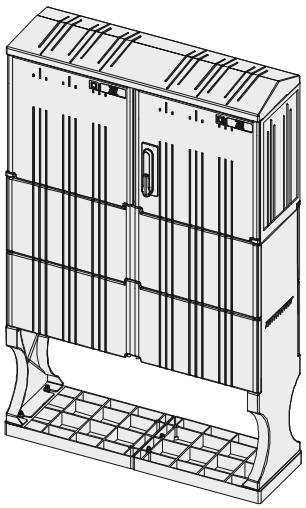

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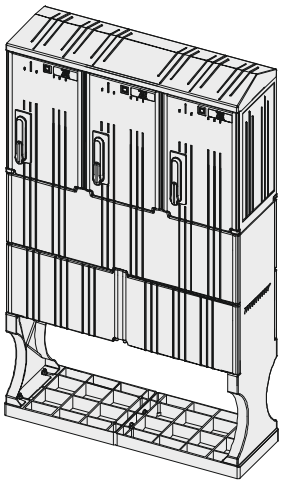
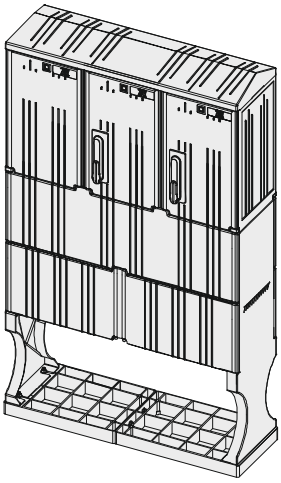
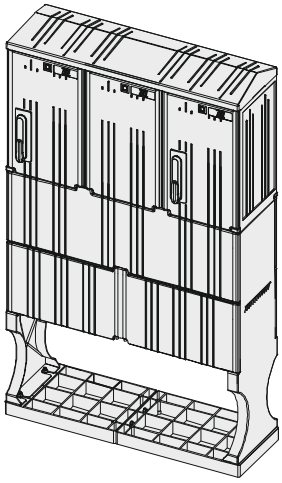


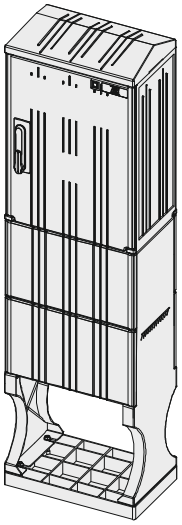
SKRF 3x26/40



SKRF 52+26/40



SKRF 26+52/40



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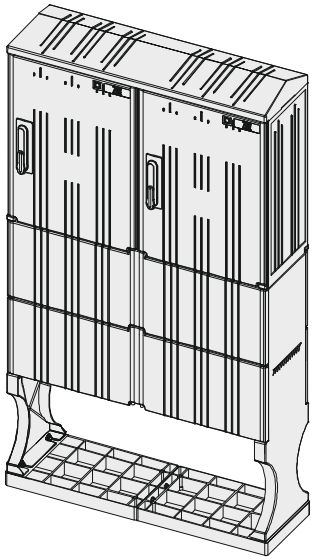

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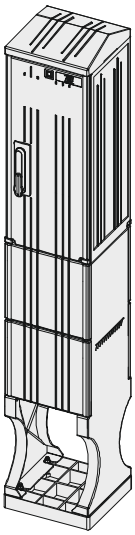

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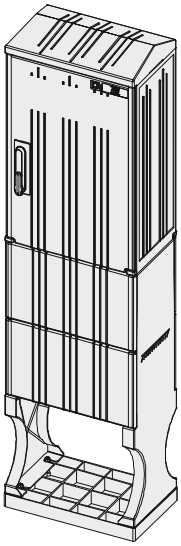

SKRF 400/600/1

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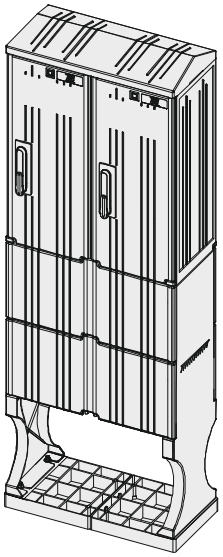

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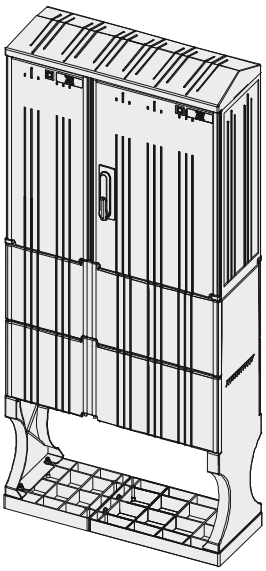

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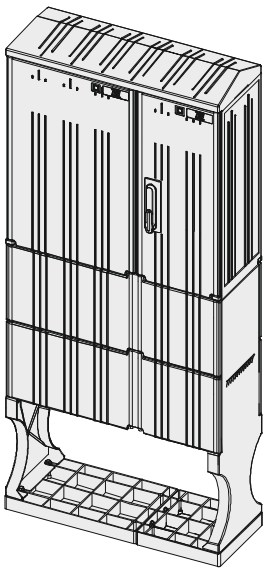

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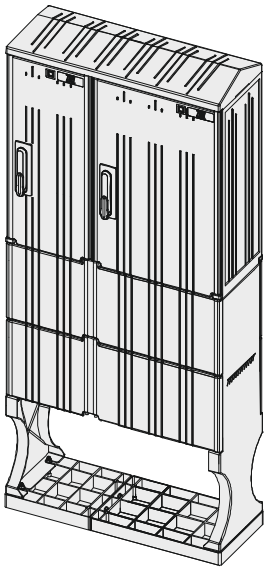

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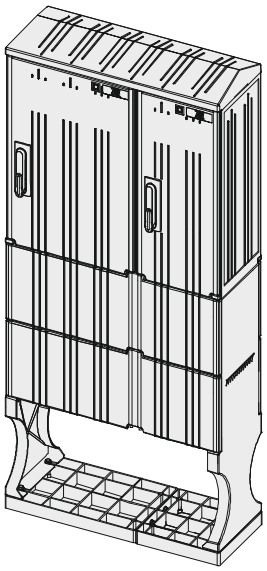

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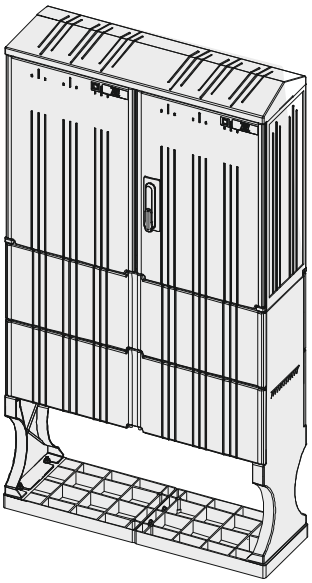

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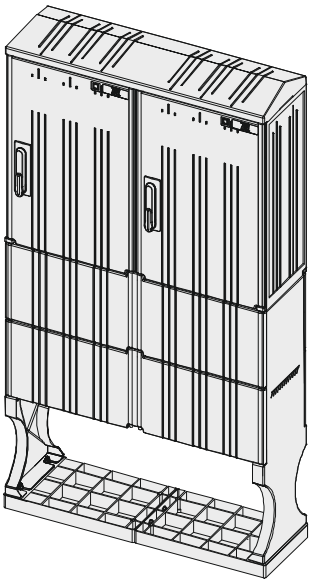

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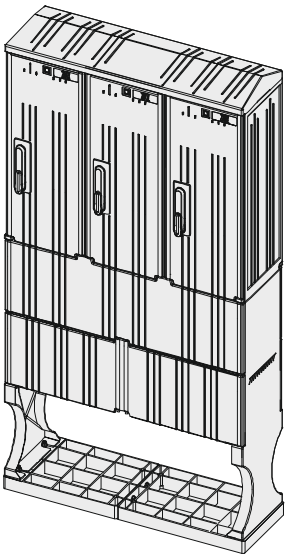
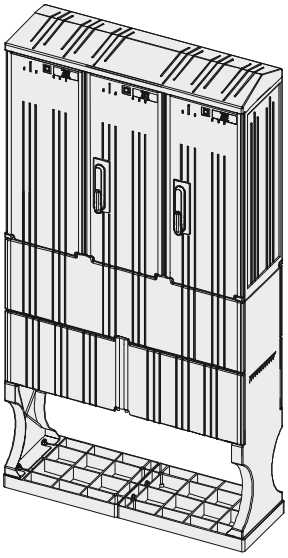
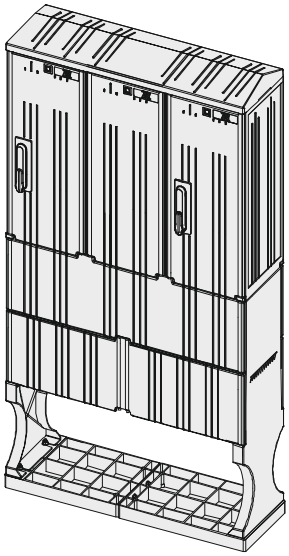


SKRF 3x26/60



SKRF 52+26/60



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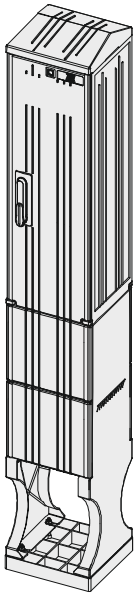

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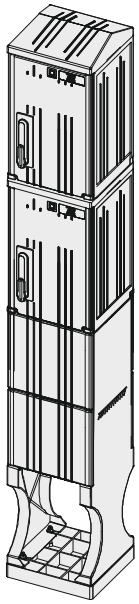

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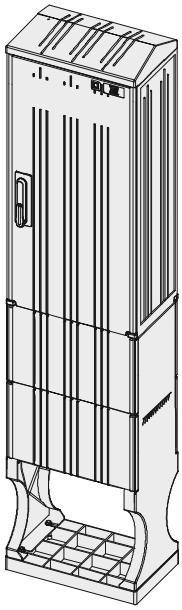

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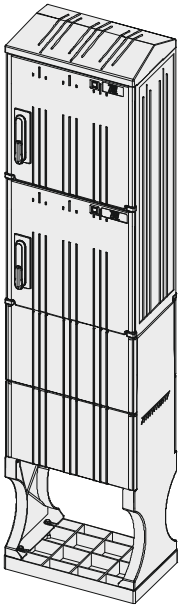

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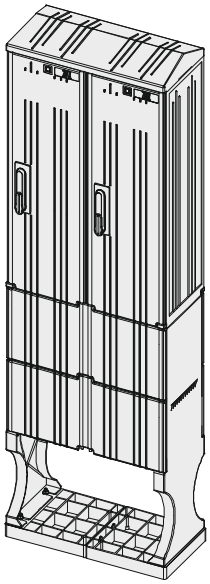

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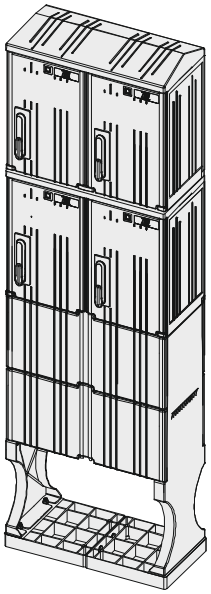

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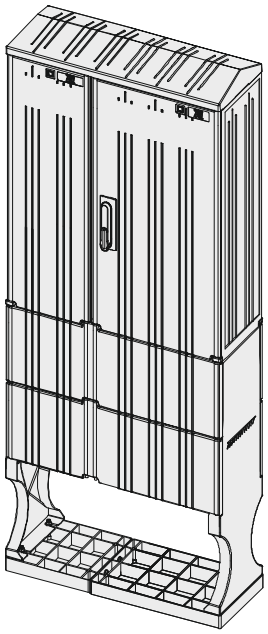

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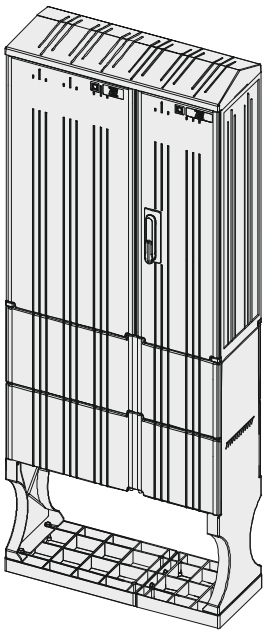

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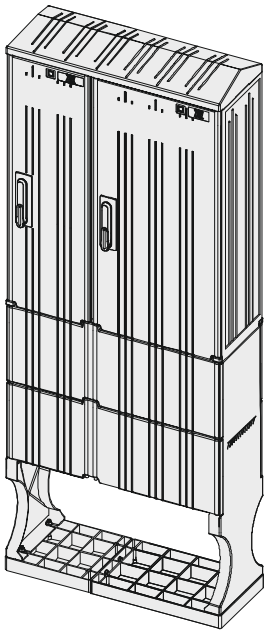

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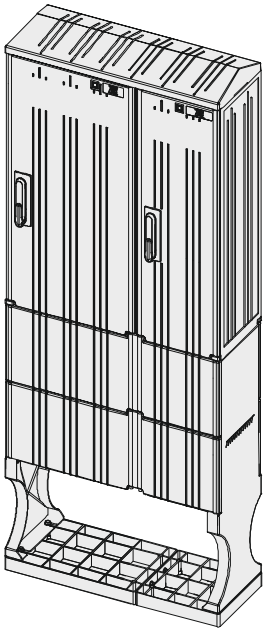

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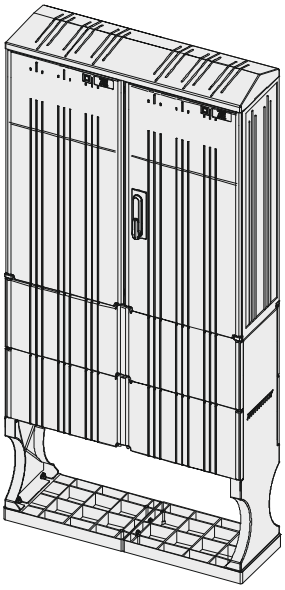

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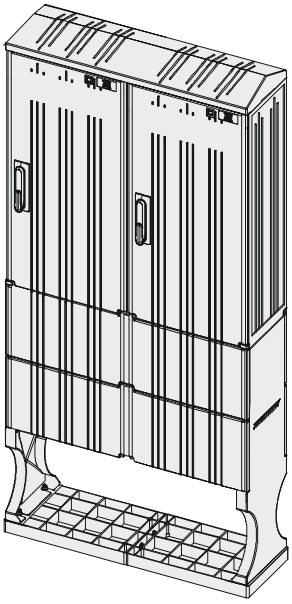

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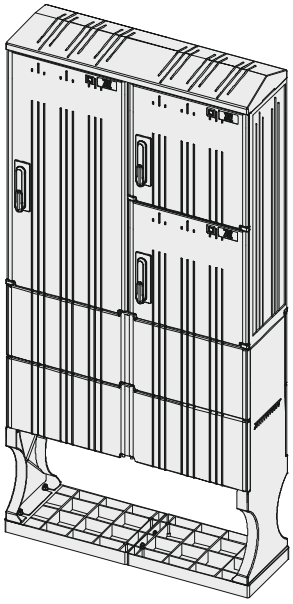

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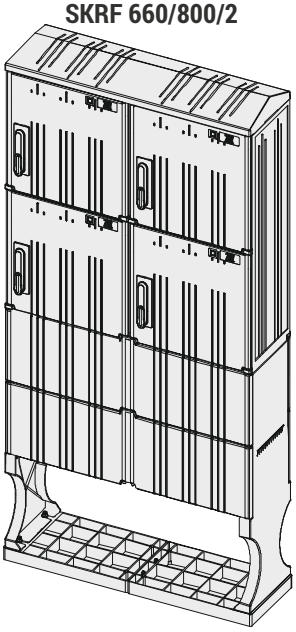

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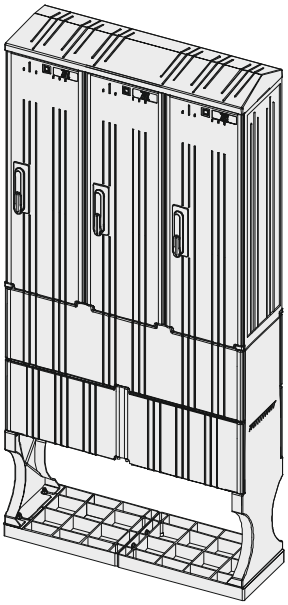

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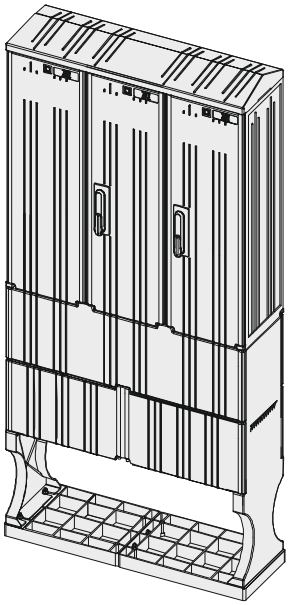

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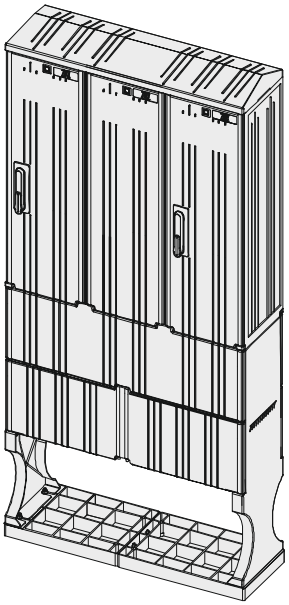
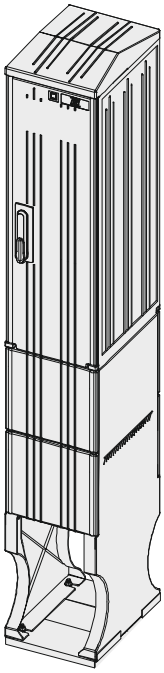
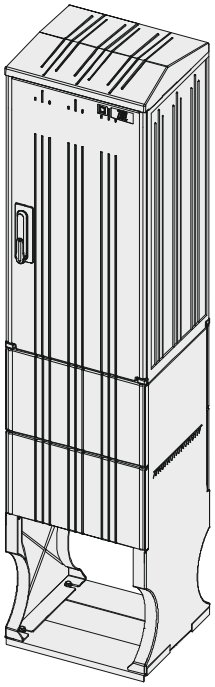


SKRF 26+52/80

SKRF CABINET WITH FOUNDATIONS PRODUCT RANGE – DEPTH OF 320 mm



SKRF 260/800/1-320



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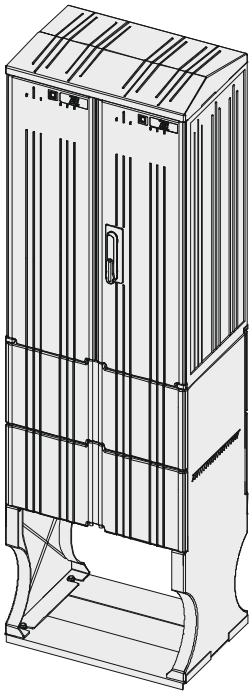

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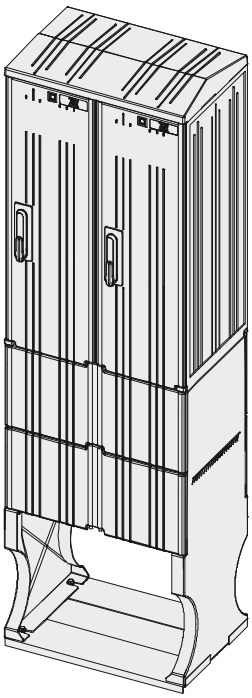

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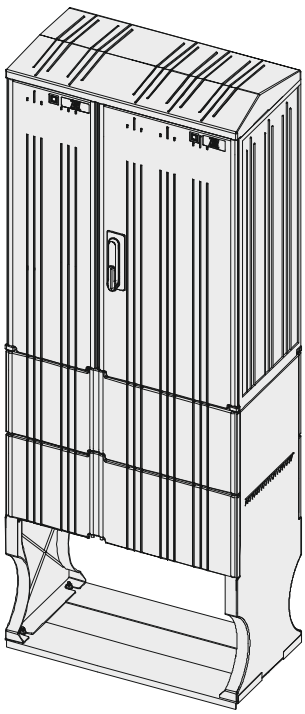

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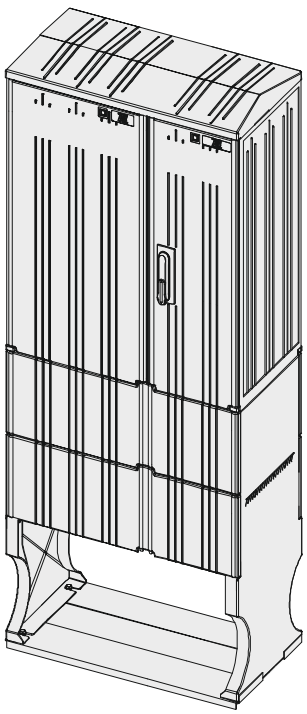

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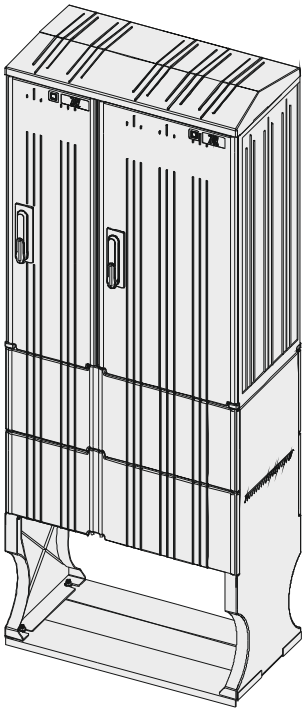
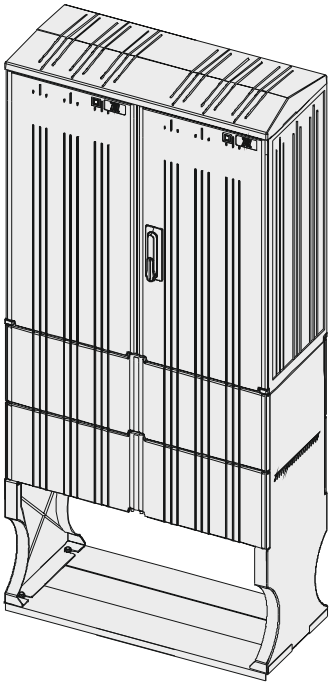


SKRF 260/800/2-320

SKRF 660/800/2-320



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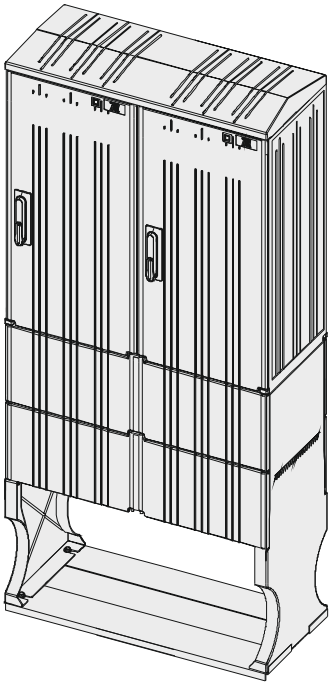
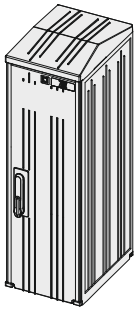
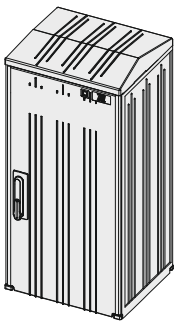


SKRF 800/800/2-320

SKRF CABINET WITH A BOTTOM – DEPTH OF 320 mm



SKRD 260/800/1-320



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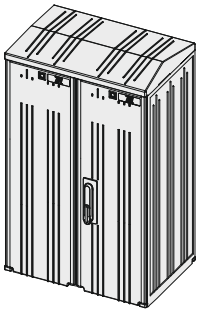

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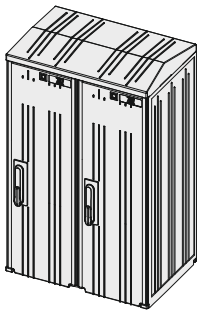

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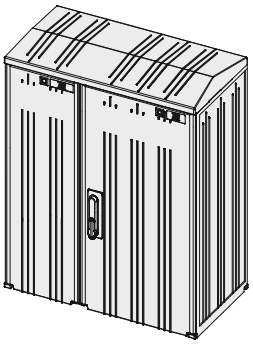
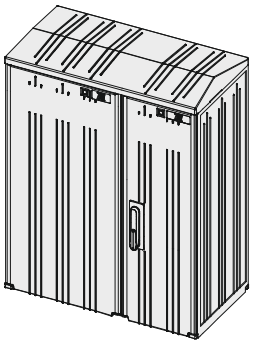


SKRD 660/800/1-320A



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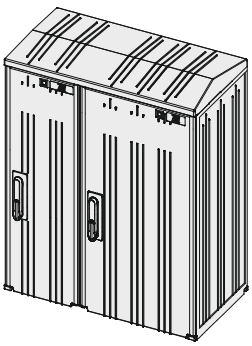

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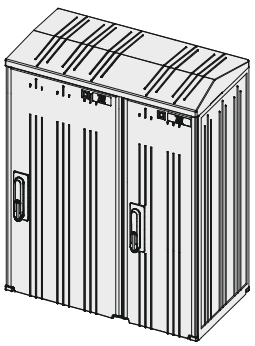

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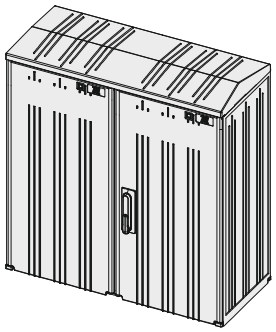
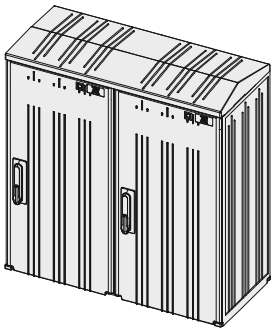
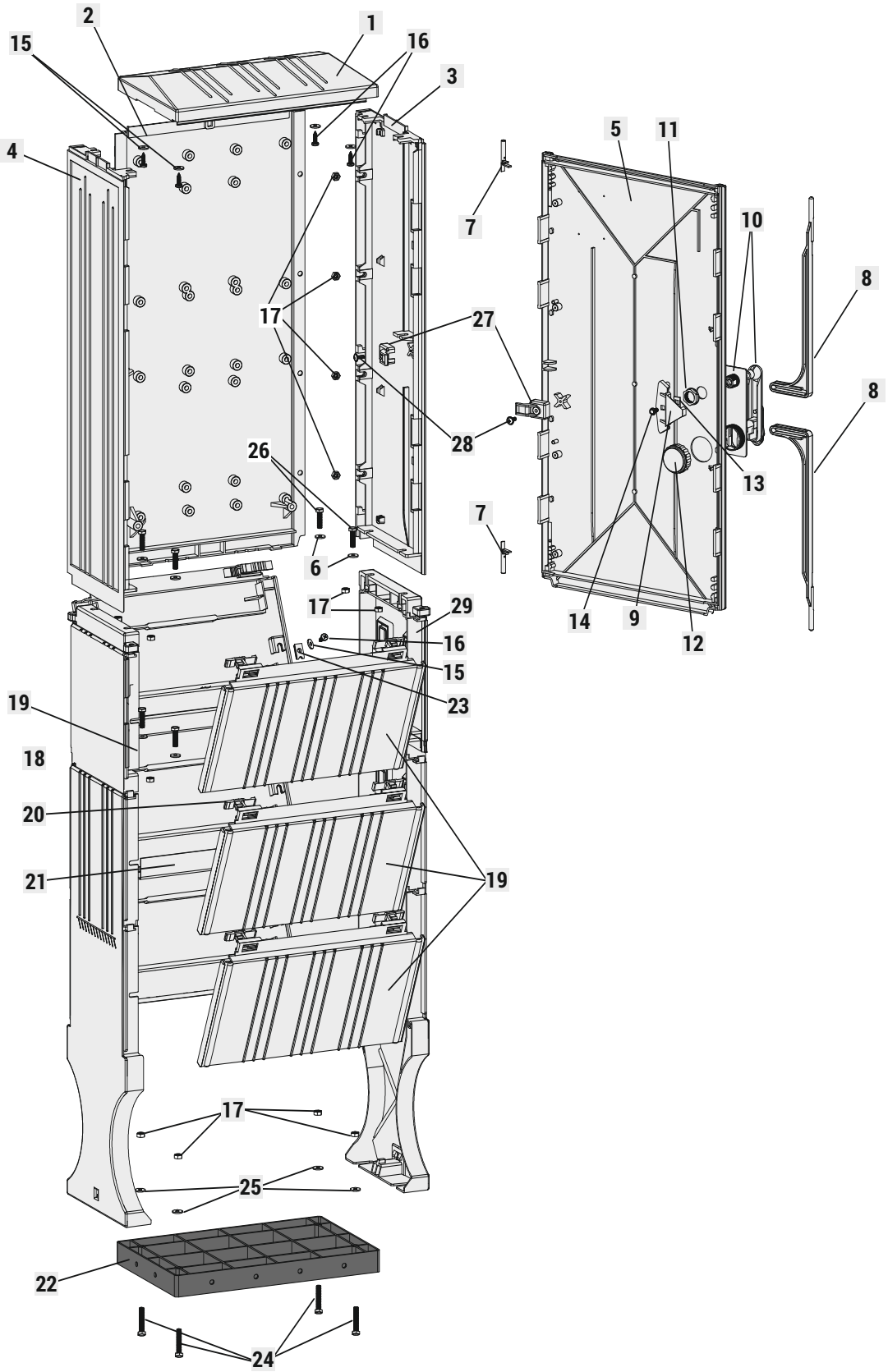


SKRD 800/800/1-320

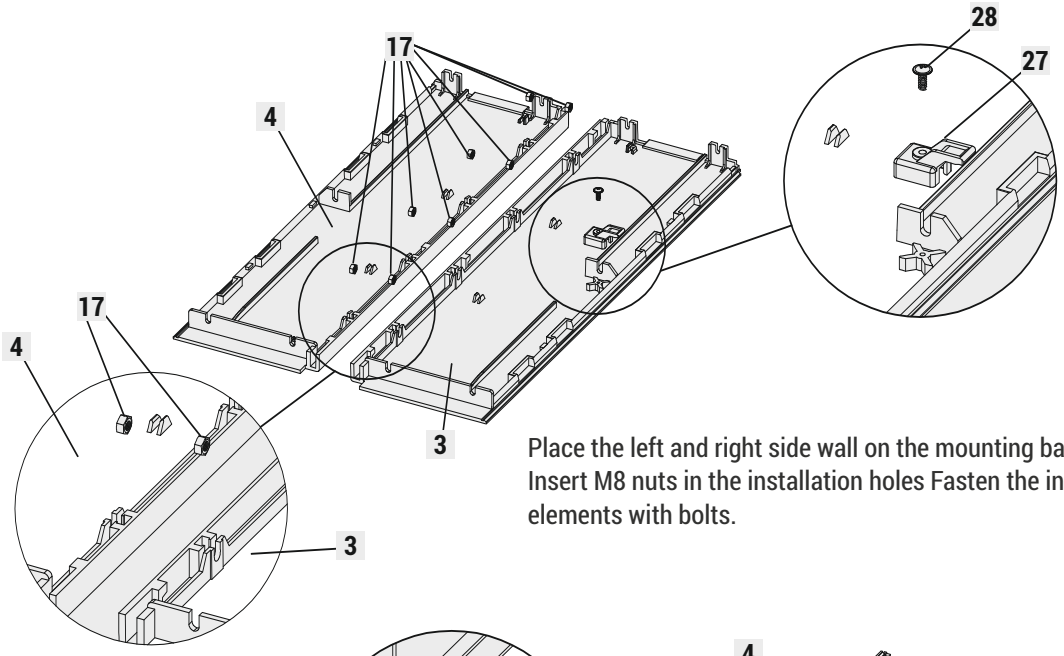


SKRD 800/800/2-320

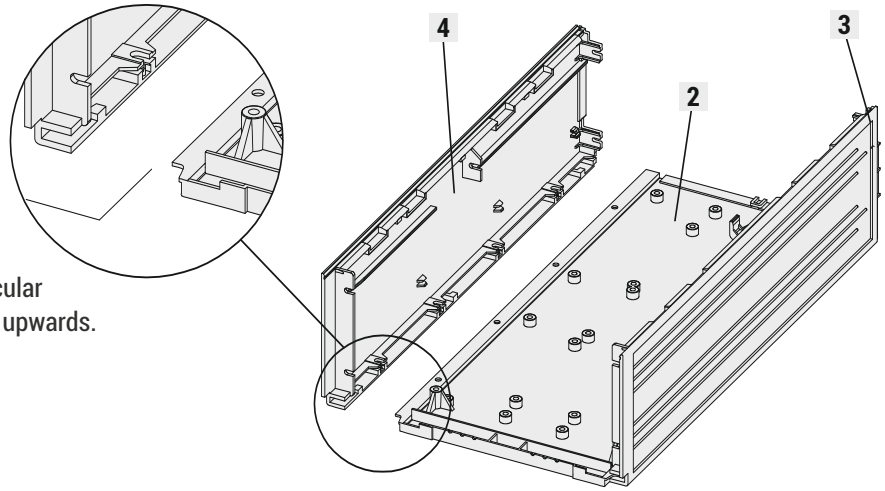
ASSEMBLY INSTRUCTIONS FOR SKR-400/800-1 + NDC CABLING & DISTRIBUTING CABINET



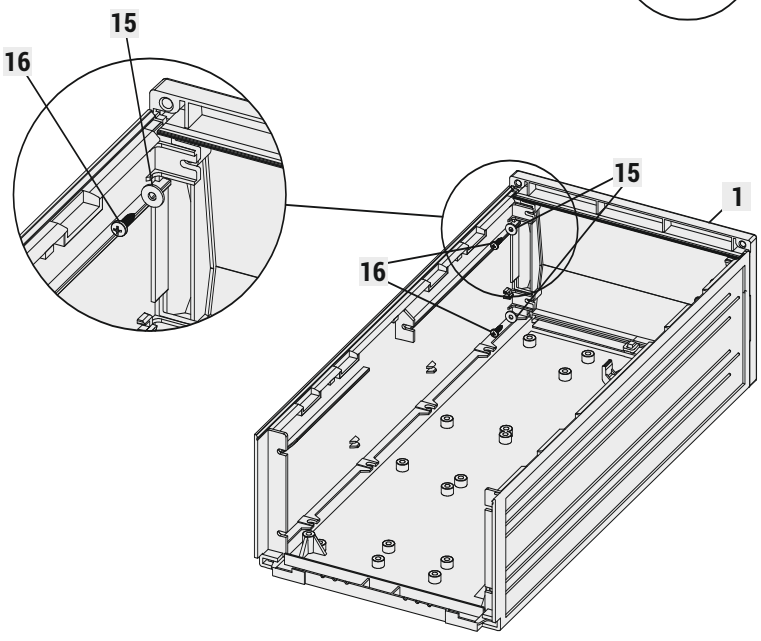
ENCLOSURE ASSEMBLY



Place the left and right side wall on the mounting base. Insert M8 nuts in the installation holes Fasten the interlock elements with bolts.



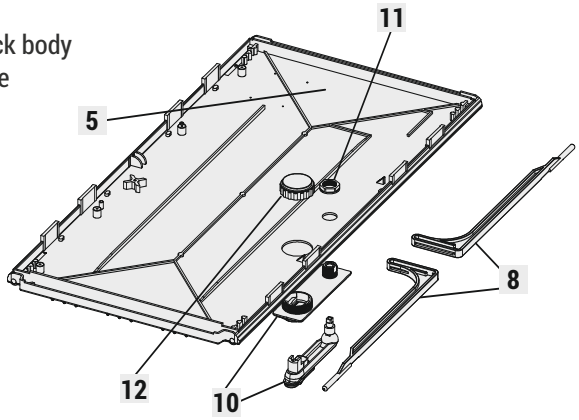
Place the rear wall on the mounting base. Place the left and right side wall perpendicular to the rear wall. Press and move upwards.

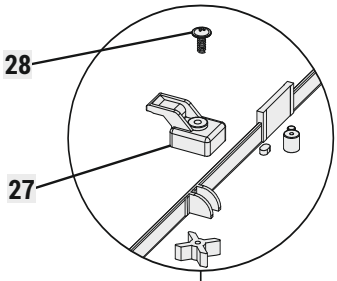


Place the roof and fasten it with four 60x20 bolts inserted through the protrusions.

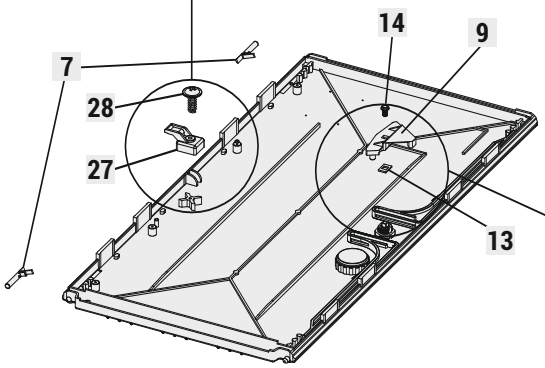
DOOR ASSEMBLY

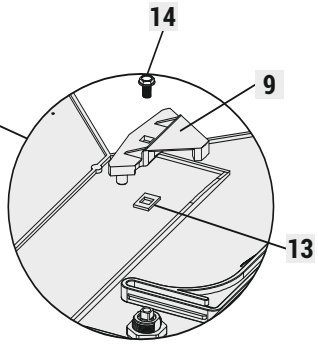
Place the door on the mounting base, internal side up. Place the lock body with handle side down in the openings in the doors. Fasten the large lock nut and a small hexagonal nut in the handle rotation point. Place the upper and lower rods in the openings in the doors.





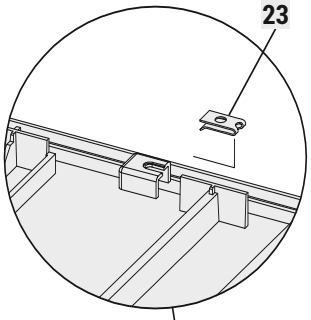
Remove the M6 bolt from the rotating element of the handle. Place the rectangular metal washer in the rotating lock bolt. Put the rotating lock bolt on the rotating element of the lock, fit the spline to the slide blocks of the lock rods and fasten the M6 bolt. Bolt the interlock element. Insert the hinges in the door openings.

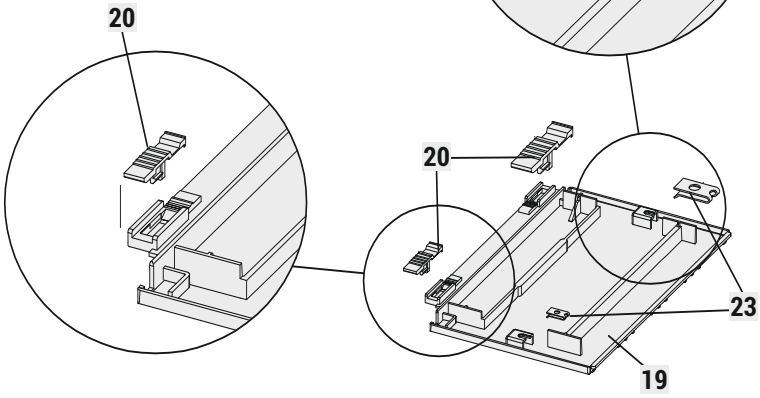


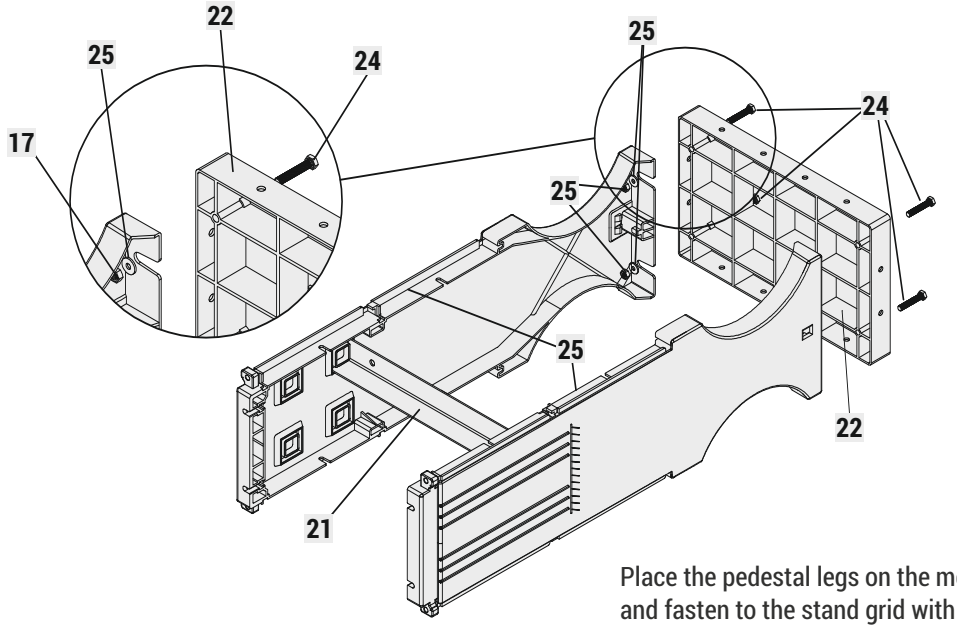


PEDESTAL INSTALLATION

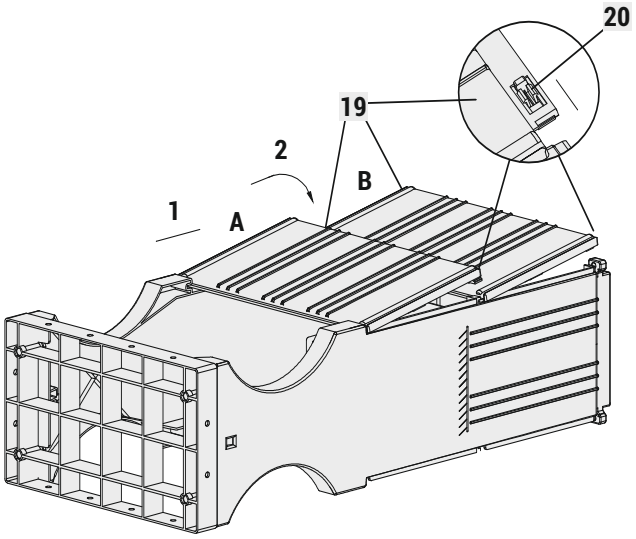
Place 2 covers of the pedestal on the mounting base, push in the sliders and insert fasteners (these covers will be used first during the installation). In the remaining 2 covers just push in the sliders.



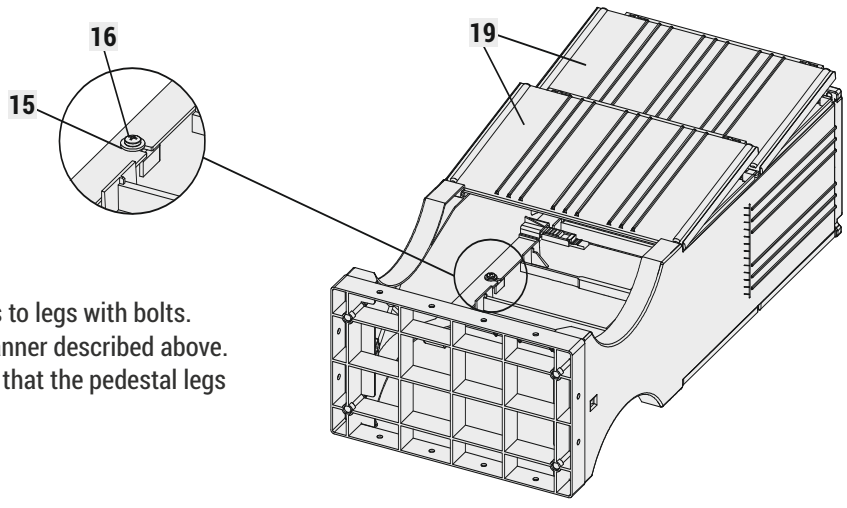




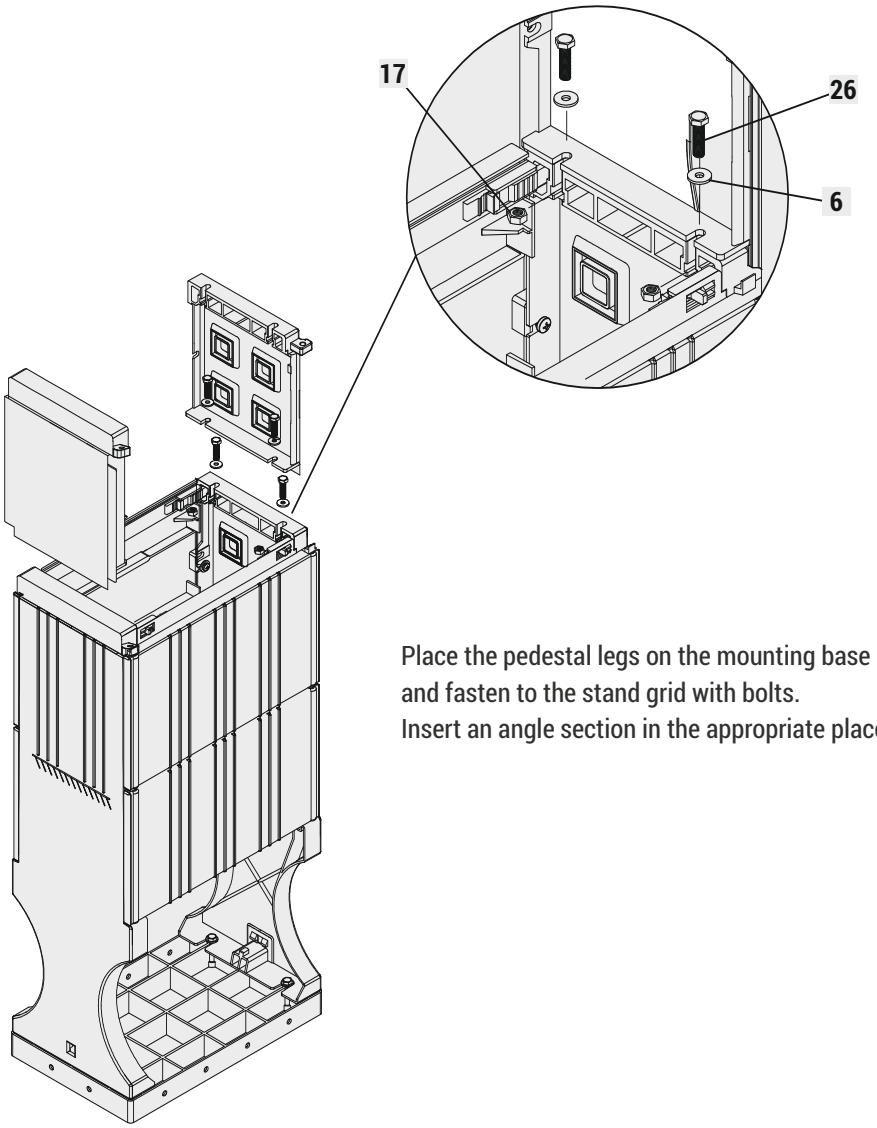
Place the pedestal legs on the mounting base
and fasten to the stand grid with bolts.
Insert an angle section in the appropriate place.



Place the pedestal A cover according to the
sequence of arrows and lock with sliders.
Do the same with the B cover.

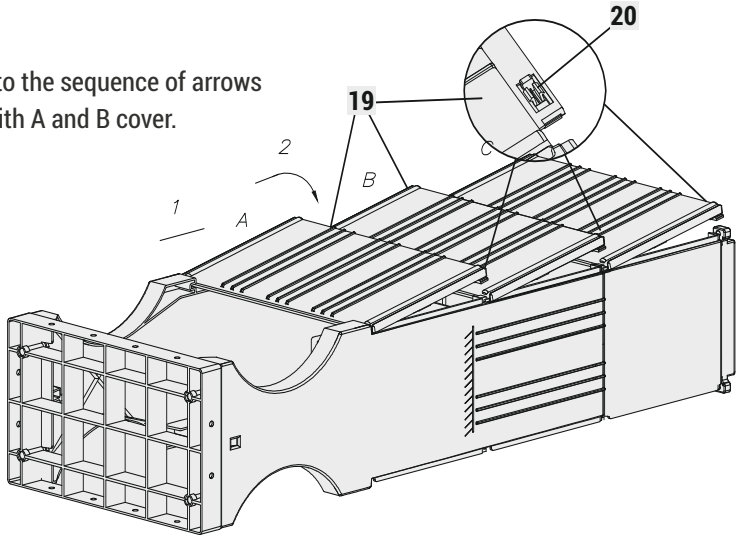


Rotate the pedestal and fasten covers to legs with bolts.
Mount the remaining covers in the manner described above.
Tighten the stand grid bolts, ensuring that the pedestal legs
remain parallel.

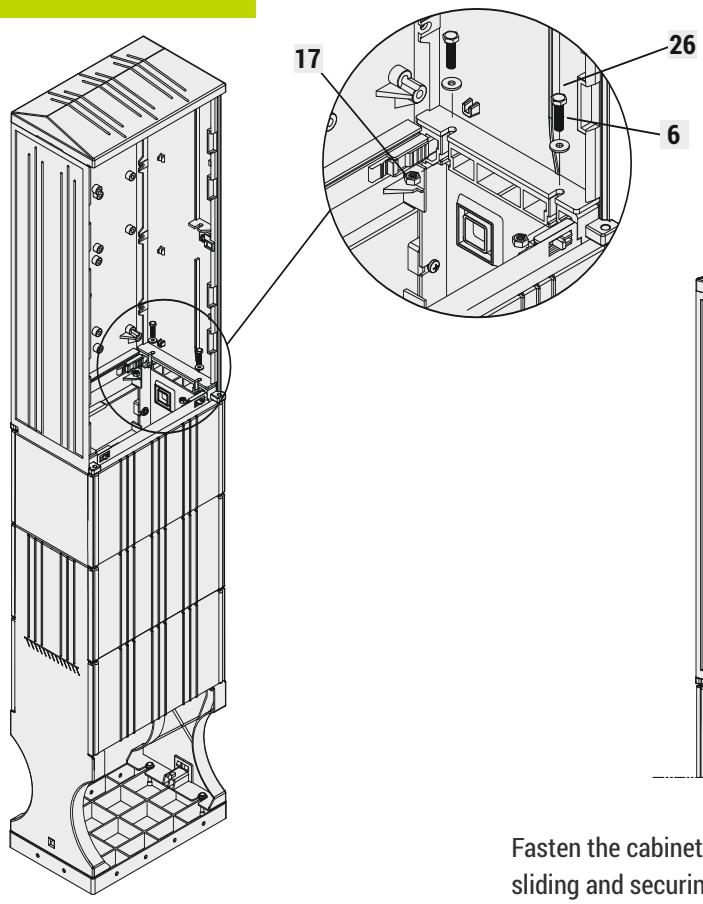


Place the pedestal legs on the mounting base
and fasten to the stand grid with bolts.
Insert an angle section in the appropriate place.

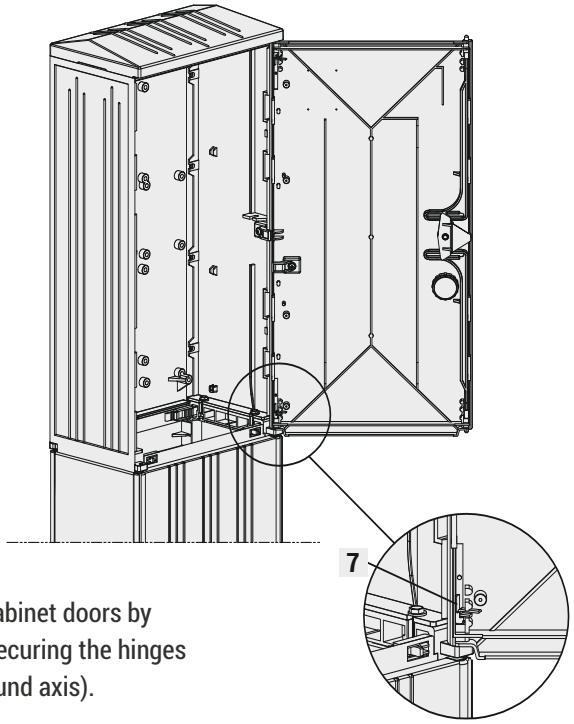
Place the pedestal C cover according to the sequence of arrows
and proceed in the same manner as with A and B cover.



CABINET ASSEMBLY



Place the enclosure on the standing pedestal ensuring that the angle section is in the rear part of the cabinet. Fasten the cabinet together with a set of M8x50 bolts.



Fasten the cabinet doors by sliding and securing the hinges (rotation around axis).

LIST OF MATERIALS

Item	Part name	Pcs	KTM/Catalogue number
1.	Roof	1	D 400 250 000
2.	Back wall	1	ST 400 800 888
3.	Right side wall	1	PSB 250 800 000
4.	Left side wall	1	LSB 250 800 000
5.	Door	1	DR 400 800 000
6.	09 washer	4	...
7.	Hinges	2	Z
8.	Rods	1+1	CZ800
9.	Rotating lock bolt	1	ZOZ
10.	Lock body with handle	1	K
11.	Small lock nut	1	...
12.	Large lock nut	1	...
13.	Square washer	1	...
14.	M6 bolt	1	...
15.	07 washer	8	...
16.	60x20 bolt	8	...
17.	M8 nut	16	...
18.	Pedestal leg	2	NC 250 800 000
19.	Pedestal cover	6	PC 400 240 000
20.	Pedestal cover latch	8	ZPC
21.	Angle section for cables	1	KK 400
22.	Stand grid	1	KU 250 400
23.	Fastening element	2	...
24.	Śruba M8x80	4	...
25.	Podkładka 09 duża	4	...
26.	M8x50 bolt	4	...
27.	Interlock element	2	EB
28.	Bolt	2	...
29.	Pedestal extension	2	NDC

We reserve the right to introduce technical changes.

power your future

SIVACON S8

The low-voltage switchgear
that sets new standards

SIVACON
Technology
Partner

SIEMENS

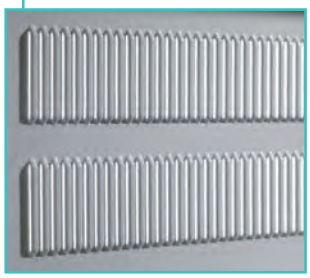
www.siemens.com

www.zpue.com

Table of contents

Labeling system

Ventilation roof



Ventilation holes

Hinge/locking system

Base

Design side panel

All elements of the new generation of switchgears fit together in shape and functionality.

Many advantages, numerous features

- Maximum system safety thanks to standard modules with construction verification.
- Maximum personnel safety thanks to the electric arc resistant locking system.
- High-quality industrial design that perfectly matches the modern style of the rooms.
- Space-saving erection surfaces, from 400 x 500 mm.
- Variable, top or rear position of the main busbars.
- Combinations of different installation systems in one cell.
- Flexible adaptation of the internal separation form to different requirements.
- Simple subsequent changes of door opening direction thanks to universal hinges.
- The ventilation system characterized by a high degree of performance and maintenance advantages.
- Cable / busbar connections from the top, bottom or rear.

SIVACON S8 - features

	1 Circuit breaker system	2 Universal Installation system
Mounting systems	Fixed-mounted design Withdrawable design	Fixed-mounted design with compartment doors Plug in 3NJ6 in-line design Withdrawable unit design, plug-in unit design
Functions	Incoming feeder Outgoing feeder Coupler	Cable feeders Motor feeders
Rated current I_n	Up to 6300 A	Up to 630 A Up to 250 kW
Connection position	Front & Rear	Front & Rear
Cell width (mm)	400/600/800/1000/1400	600*/1000/1200
Internal separation	Form 1, 2b, 3a, 4b, 4 type 7 (BS)	Form 2b, 3b, 4a, 4b, 4 type 7 (BS)
Main busbar position	Rear/Top	Rear/Top * not for 3NJ6

3 Fixed mounted system	4 3NJ6 in-ilne system	5 3NJ4 in-ilne system	6 Reactive power compensation
Fixed-mounted design with front covers	Plug-in 3NJ6 in-line design	Fixed-mounted design	Fixed-mounted design
Cable feeders	Cable feeders	Cable feeders	Central reactive power compensation
Up to 630 A	Up to 630 A	Up to 630 A	Non-chocked up to 600 kvar Chocked up to 500 kvar
Front	Front	Front	Front
1000/1200	1000/1200	600/800/1000	800
Form 1, 2b, 3b, 4a, 4b	Form 1, 3b, 4b	Form 1, 2b	Form 1, 2b
Rear/Top	Rear/Top	Rear	Rear/Top/Without

SIVACON S8 - features

1. Position of the main busbars at the top up to 6300 A
2. Variable rear busbar position up to 7000 A (top and/or bottom)

3. Plug-in busbar system with contact protection, cover (IP 20B) for quick and easy replacement of fuse switch disconnectors
4. Optimal connection conditions in the busbar connection compartment

5. Multi-profile busbars allow easy assembly of modular installation devices
6. Cells with reactive power compensation with design verification according to PN-EN 61439 reduce transmission losses

7. Overview of power distribution thanks to a standardized labeling system for sections and feeders
8. A modern look with design elements like the side panel and optionally extendable base

Circuit breaker system

Extremely friendly operation

SIVACON
Technology Partner
SIEMENS

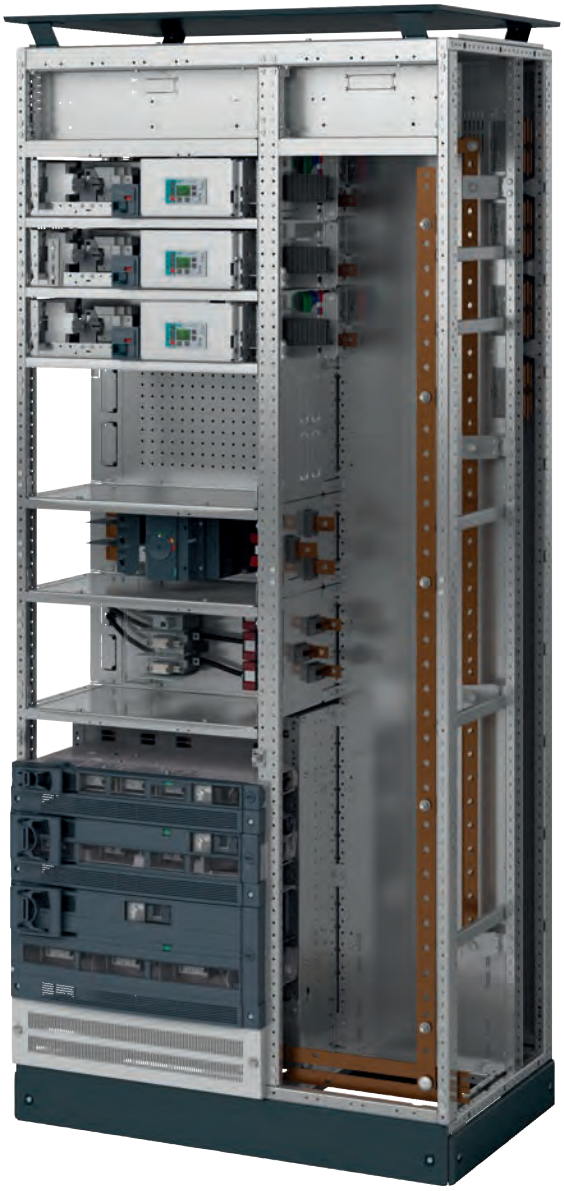
Space saving thanks to the installation of up to 3 air circuit breakers in one bay.

With its compact form, where the cell width is only 400 mm, the SENTRON 3WL is installed in S8 switchgears for the rated current range up to 1600 A.

Supply, outgoing and coupling cells are equipped with SENTRON® 3WL air circuit breakers in stationary and withdrawable technology, or alternatively, with SENTRON 3VL compact circuit breakers. Because many receivers are generally installed on the line downstream these circuit breakers, they are extremely important in ensuring long-term operational safety of the switchgear and personnel safety. SIVACON compactly and safely meets the above requirements through the components of the circuit breaker system.

Universal installation system

Individual configuration options (withdrawable, plug-in technology)



Universal mounting system with withdrawable units in combination with fixed-mounted outgoing feeders and plug-in 3NJ6 in-line unit design.

Because many applications require a space-optimized assembly of the power distribution switchgears, different installation systems must be integrated in one cell. For such applications, the universal SIVACON assembly system ensures high performance, safety and diversity due to the combination of outgoing feeders in withdrawable, plug-in, stationary techniques and outgoing feeders in the 3NJ6 pin strip technology. What's more, the withdrawable technique provides significant flexibility with often varying requirements such as variable motor parameters or connecting new receivers. In addition, this technique also meets ergonomic requirements and facilitates simple and safe operation, as well as short set-up times for maximum system availability.

Rear plug-in busbar system

Optional with shutter

Plug-in busbar system

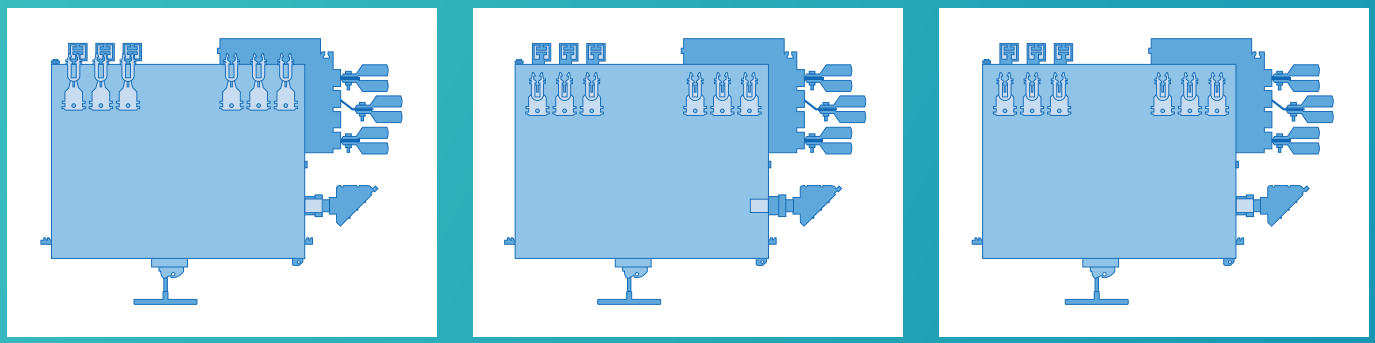
The plug-in busbar system is located at the back of the cell. It provides touch protection without any additional covers for active parts.

- Installation resistant to electric arc
- Phase separation
- 3- and 4-pole technique
- Touch protection (IP20B)
- Connection holes in the 50 mm modular grid for mounting standard withdrawable units

Optional

- Double-action shutters for standard withdrawable units

SIVACON withdrawable units ensure safety in operation and maintenance



I

„Connected" position

Moving from „connected" position to „diconnected" and vice versa

0

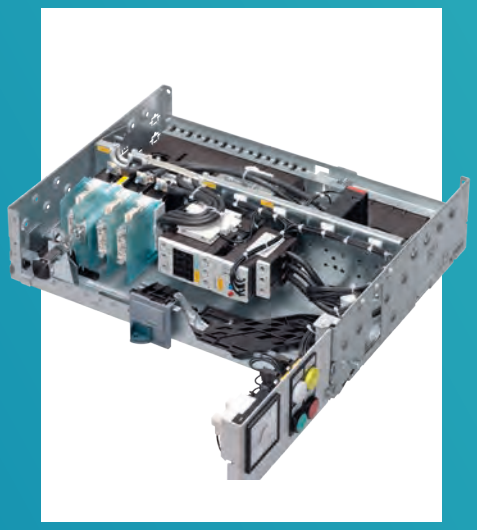
„Withdrawn" position

Moving from the „diconnected" position to the „test" position, and vice versa

TEST

„Test" position

- Maximum system security thanks to standard modules with type testing.
- Identical operation of all withdrawable unit sizes.
- Sizes of withdrawable units matched to power parameters.
- All parts are installed inside the withdrawable unit - protection against accidental damage.
- Integrated protection against switching errors for all withdrawable units.
- Clear indication of the position of the withdrawable units.
- Separate operation of the main switch and withdrawable unit position.
- „Test" and „disconnected" position with the door closed without reducing the degree of protection of the switchgear.
- Lockable in „diconnected" position.
- Patented slow wearing contact system of withdrawable unit ensuring long life.
- Optional mechanical coding of withdrawable units to avoid mistake with withdrawable units of the same size.
- Hinged panel for mounting control and signaling devices.
- Standard withdrawable units for cable and motor outgoing feeders up to 630 A.
- Fuse and circuit breaker technology.



Hinged panel for mounting control and signalling devices in order to perform service works during work.

Standard withdrawable units

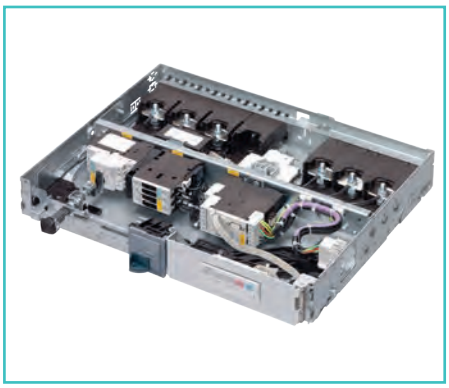
- Height 100 mm to 700 mm up to 18 (withdrawable units in one cell)

Optionally to standard withdrawable units a similar plug-in design

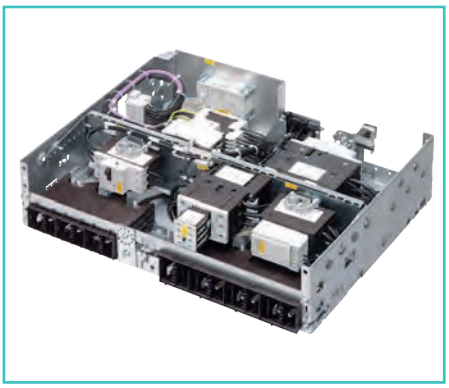
- Supply and outgoing contact systems permanently attached to the plug-in segment.
- „Connected" and „diconnected" position (no „test" position).
- Integrated protection against switching errors.

Lockable in „disconnected" position

Standard withdrawable unit, 100 mm high



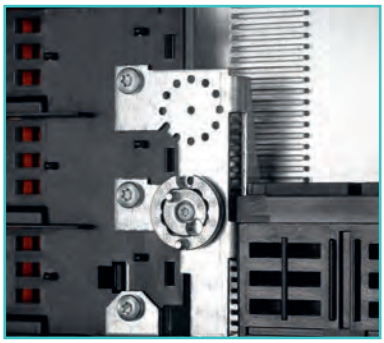
Standard withdrawable unit, 150 mm high (rear view)



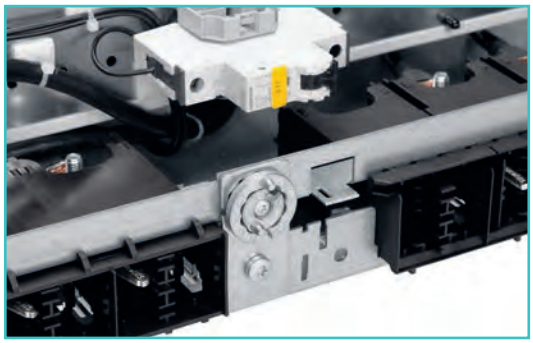
Flexibility and safety when making changes in the configuration of the cell

- Simple conversion or modernization of compartments with withdrawable units without disconnecting the voltage of the cell.
- Does not require connection work in the compartment with withdrawable units.
- Main and control circuit cable connectors in separate connection compartments.
- Cable compartment 400 mm or 600 mm width with operation from the front.
- Cable compartment with rear operation 600 mm width with 600 mm width cell.
- Control connectors in screw or spring technology.

Simple operation of the withdrawable unit without the need to overcome resistance

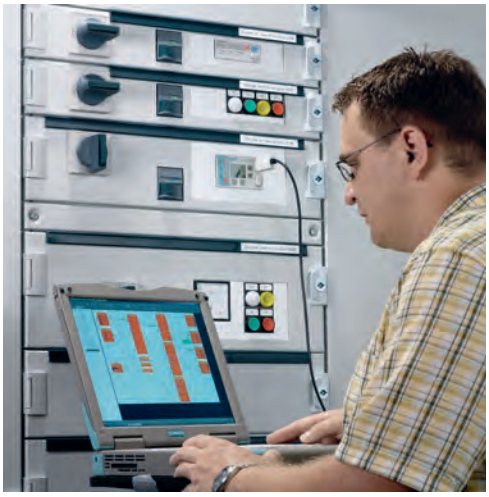


Coding element in compartment of the withdrawable unit



Coding element in the withdrawable unit

Coding of withdrawable units mechanically prevents mistakes in mounting withdrawable units of the same size (up to 9216 combinations).



Communication with SIMOCODE pro via PROFIBUS DP

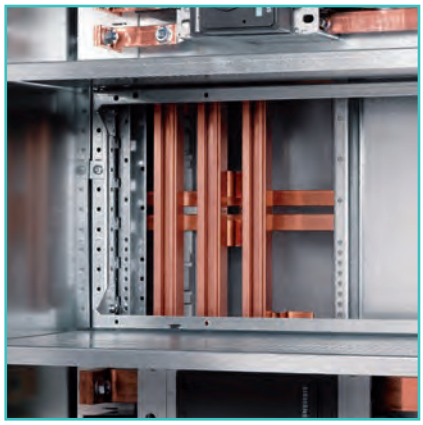
- Integrated full motor protection.
- Extensive control functions.
- Convenient diagnostic options.
- Autonomous handling of each outgoing feeder via the operator panel.
- Reduced cost of equipment and cabling.

Universal Installation System

Individual Combination Options (Fixed-Mounted Design with compartment doors, Plug-In 3NJ6 In-Line Design)

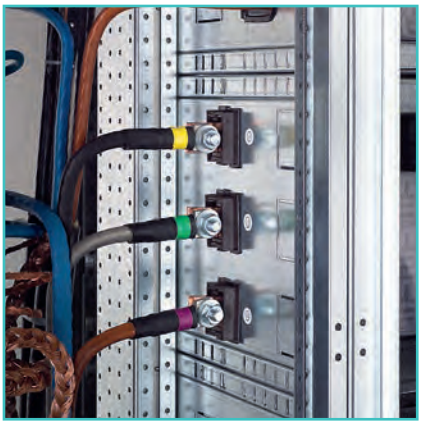
A cell with universal mounting space in fixed+mounted design (individual doors for each compartment) in combination with plug-in 3NJ6 in-line design.

Many applications require different solutions suitable for different protection systems, therefore different installation systems must be integrated in one cell. For such applications, the universal SIVACON mounting system ensures high performance, safety and flexibility due to the combination of outgoing feeders in fixed-mounted design and in plug-in 3NJ6 in-line system.



Vertical distribution bars

Separation of functional compartments according to user requirements



Patented connection terminals

- High system security due to standard modules with type testing,
- Cable feeders up to 630 A with and without current measurement,
- Combination of various installation techniques (fixed-mounted, plug-in base and plug-in 3NJ6 in-line design),
- Expansion modules when functional separation of compartments is required (up to form 4b),
- Doors about the height of the entire cell or individual for each functional compartment,
- Cable connection compartment 400 mm or 600 mm width.

Compartments

- Expansion modules to ensure individual ease of use and meet safety requirements.

Patented connection terminals

- Internal separation to form 4b.

Fixed-Mounted System with Front Covers

Wide integration options

Cell in stationary technique with covers, installed in one plane to ensure uniform handling of all manoeuvring elements.

- High system safety due to standard modules with type testing.
- Cable feeders up to 630 A with and without current measurement.
- Modularly combined functional groups.
- The innovative quick fastening system allows easy mounting of the cover.
- Hinged frame with covers for easier supervision and ease of maintenance.
- Expansion modules when functional separation of compartments is required (up to form 4b).
- Front control panel with covers, optionally with full cell door height.
- Doors with an inspection window enabling integration with modern interiors.
- Cable connection compartment 400 mm or 600 mm width.

Some applications do not require component replacement under operating conditions or short downtimes are allowed. In these cases, the SIVACON system in fixed-mounted system covers ensures maximum performance, safety and flexibility.

Quick mounting system of the front cover

Outgoing feeders set with SENTRON 3VL circuit breakers

Hinged frame with covers

Possibility to mount installation devices

Quick assembly system or hinged frame with covers

- The innovative quick fastening system allows simple and quick assembly of the cover.
- Hinged frame with covers for easier supervision and ease of maintenance.

Single or multiple feeders

- Smoothly adjustable mounting plate installation depth to achieve a homogeneous front operating plane.
- Operation of devices from the front cover.
- Feeders with or without a plug-in base.

Solutions for installation devices

- Durable aluminium mounting rail ensuring simple and durable installation of installation devices.

Fixed-Mounted 3NJ4 In-Line System

Efficient assembly

Fixed-mounted 3NJ4 in-line system.
Fuse disconnector and quick assembly kits for installation devices.

- High system safety due to standard modules with type testing.
- Cable feeders up to 630 A with and without current measurement.
- Possibility of installing up to 14 feeders in one cell.
- Fuse replacement with the receiver switched off.
- Door optionally with a cut-out or without a cut-out.
- Optional installation of quick assembly kits or mounting plates for individual equipment.
- Cell widths: 600 mm and 800 mm.

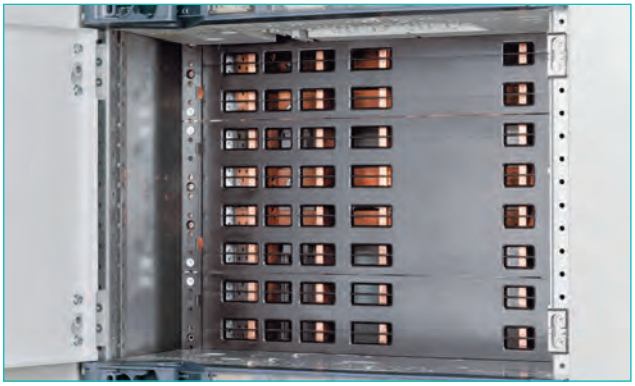
The cells designed for cable feeders in fixed-mounted system are equipped with fuse switch disconnectors, whose compact and modular design ensures optimal performance, especially in the case of applications in infrastructure.

Plug-In 3NJ6 In-Line System

Quick modernization

Cell with 3NJ6 switch disconnector with fuses

3NJ6 switch disconnector with fuses



Distribution busbar system, protected against accidental contact (IP20B)

- High system safety due to standard modules with type testing.
- Switch disconnector with double break for cable feeders up to 630 A.
- Integrated replaceable current transformer.
- Manual or motor drive with stored energy mechanism.
- Possibility of upgrading the accessories by the user.
- High packing density - up to 35 feeders in one cell.
- Cable connection compartment: 400 mm or 600 mm width.
- Degree of protection up to IP41.
- Replacement of outgoing feeders possible with powered switchgear busbars.

Strip-type disconnectors with a plug-in power connector are an economical alternative to the withdrawable system and provide simple and quick modernization, as well as - thanks to their modularity - measurement activities in working conditions. For such applications, SIVACON guarantees high efficiency, safety and flexibility.

Arc resistance

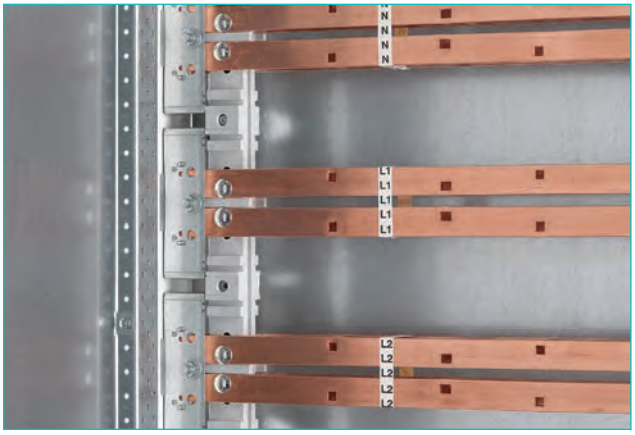
Optimal protection

The LV switchgear test for arc faults is considered a special test in accordance with IEC 61641 and VDE 0660 Part 500, Appendix 2. This test is used to assess the hazards to which personnel may be exposed in the event of an arc. Thanks to these tests, already standard SIVACON versions have a personnel safety certificate.

Top plate with pressure release in the event of an arc fault

Assessment criteria

- There can be no spontaneous opening of the doors and covers.
- Parts must not fall off.
- There may not form any opening in the housing.
- Control indicators may not ignite.
- The PE conductor circuit on the touched distribution cabinet parts must function.

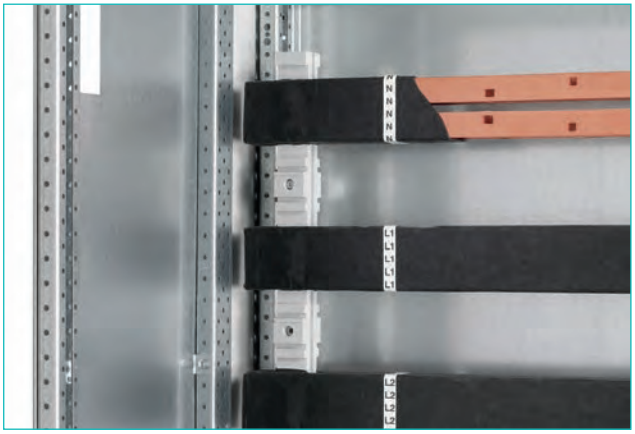


Arc barriers

Elements of additional protection

In order to limit the effects of arc faults in the switchgear, the following can be additionally used:

- Arc barriers limiting the occurrence of arc faults to one cell.
- Isolating the main busbars of the switchgear to prevent the initiation of an arc fault.



Isolated main busbars

Perfect for your needs

SIVACON Technology Partner SIEMENS

Modular technology - both for individual cells and entire systems - ensures optimal adaptation of SIVACON switchgears to your individual needs.

Optimal adjustment to spatial conditions

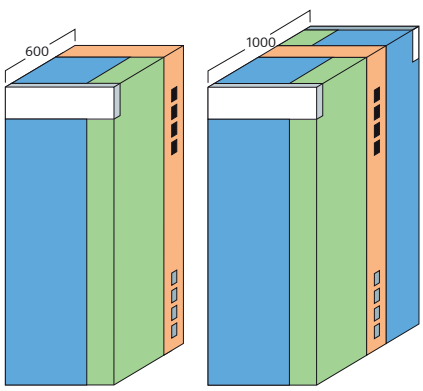
- Optional wall-mounted, free-standing or double-front mounting.
- Optional cable or busbar connections from the top or bottom.
- System height optionally 2000 mm or 2200 mm.
- Additional base 100 mm or 200 mm.

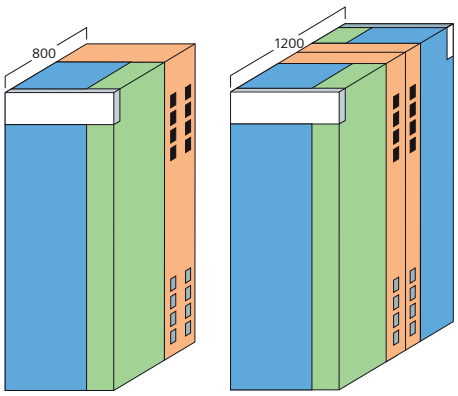
Quick adjustment to new power distribution requirements

- Simple replacement or extension of funcional units.
- Easy and safe access to the distribution busbars.
- Simple ordering process and short delivery times thanks to the modular system.
- Optimal position of the main busbars at the top or rear of the switchgear.
- Individual equipment of the compartments, independent of the position of the main busbars and the depth of the cell.
- Internal separation suitable to customer requirements from form 1 to form 4b (PN-EN 61439-2).
- Withdrawable, plug-in and fixed-mounted units that can be combined in one cell (universal installation system).

Rear main busbar position (top and / or bottom)

Up to 4000 A

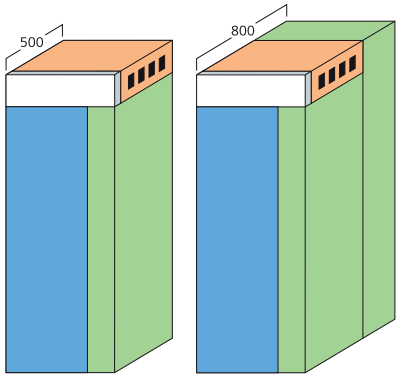


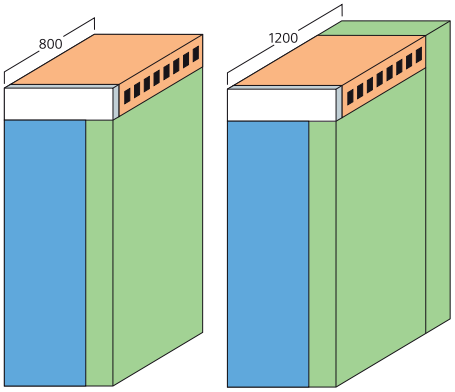


Up to 7000 A

Top main busbars position

Up to 3270 A





Up to 6300 A

Divice compartment

Main busbars compartment

Cross-wiring compartment

Cable / busbar connection compartment

Frame and enclosure

Embedded protection

The frame containing all elements of the cell structure consists of stable screw-fastened sheet-steel profiles.

- Rows of holes in the form of a raster placed along the entire height and width of the frame with a spacing of 25 mm, which allow individual configuration.
- Patented lock and hinge system to ensure staff safety.
- Doors with individual or central locking.
- Universal hinge system that allows easy change of the direction of door opening.
- Door opening angle up to 125° (180° for free-standing assembly).
- Doors with a two-position lock or with a rotary lever lock.
- Top plates with pressure relief system.
- Frame heights: optionally 2000 mm or 2200 mm.
- Additional base 100 mm or 200 mm.
- Standard separation partitions between cells.

Surface treatment

- Cubicle parts, bases, back panels and bottom plates galvanized with the use of Sendzimir method.
- Easy and safe access to distribution busbars.
- Doors, enclosures and covers painted / powder coated in light grey RAL 7035; construction elements in blue-green.

Material

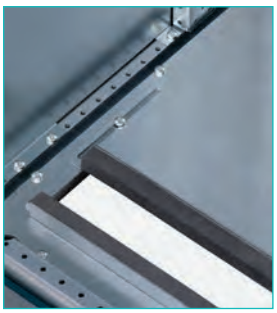
The frame and enclosure are made of sheet steel with the following thicknesses:

- Frame, base 2.5 mm.
- Covers: 2.0 mm.
- Doors: 2.0 mm.

Locking system

Hinge

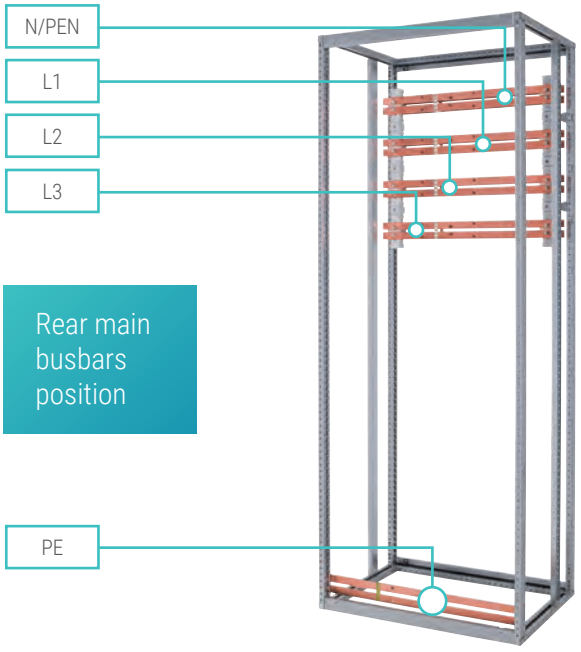
Top plate

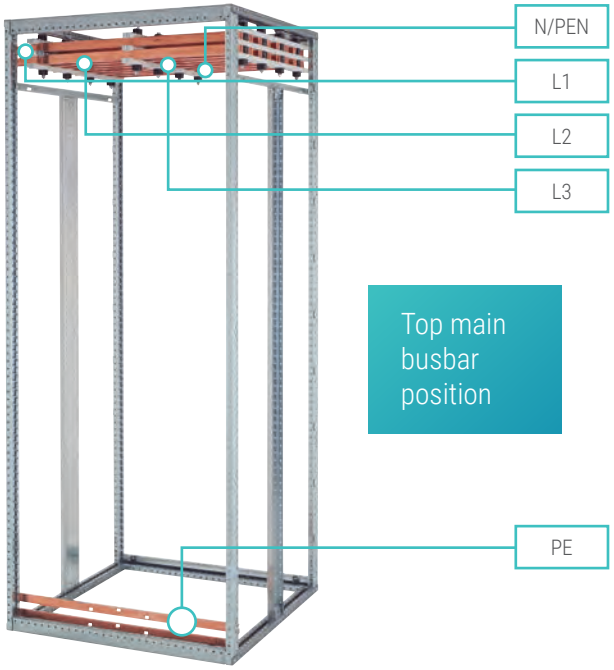


Bottom plate with sliding sheet

Location of the main busbars

Variety of solutions





Various switching tasks require individual solutions: Whether "simple" systems or complex networks with transversal and longitudinal couplings: SIVACON combines efficient design with the highest quality.

- The top or rear position of the main busbars.
- Main busbar systems for rated currents up to 7000 A.
- Rated peak withstand current (Ipk) up to 330 kA.
- Integrity of two main busbar systems in one switchgear.
- Connection points of transport units easily accessible from the front and top.
- Maintenance-free main busbar connections.

Additional elements

- Arc barriers limiting the occurrence of arc faults to one cell.
- Isolating the main busbars of the switchgear to prevent the initiation of an arc fault.

The vertical PE and N busbars are located on the right side of the cable compartment.

Connection points of the main busbar are accessible from the front of the switchgear.

SIVACON S8 – structure verification by testing in accordance with PN-EN 61439

Necessary to demonstrate compliance with standard PN-EN 61439

Requirements of the PN-EN 61439 standard

Low voltage switchgears should be designed, manufactured and tested in accordance with the requirements of PN-EN 61439-1 / -2 (VDE0660 part 600-1 / -2). To determine switchgear compliance with these standards, two main verification methods are required - structure verification and routine inspections. The structure verification includes tests performed at the product development stage and should be carried out by the original manufacturer. Routine inspections should be carried out by the prefabricator on the finished switchgear before delivery.

Structure verification

The SIVACON S8 switchgear ensures the safety of personnel and devices thanks to type tests in accordance with PN-EN 61439-2. Its physical properties have been checked in a test chamber, in both operating and emergency conditions. This guarantees the highest safety of people and the system. Structural verification and routine inspections are an important element of quality assurance and are a prerequisite for CE marking in accordance with EU regulations and directives.

Benefits

- Safety of people and the system thanks to type tests in accordance with PN-EN 61439-2.
- Highest quality guaranteed thanks to structure verification and routine inspections.
- Tests are always carried out at a complete switchboard with all devices installed.

Structure verification

	Verification by tests	Verification by calculations	Verification by following design principles
1. Strength of materials and parts	✓	---	---
2. Degree of protection	✓	---	✓
3. Isolation gaps	✓	✓	✓
4. Protection against electric shock and continuity of protective conductors	✓	✓[1]	✓[1]
5. Installation of devices	---	---	✓
6. Internal electrical circuits and connections	---	---	✓
7. Terminals for external conductors	---	---	✓
8. Insulating properties	✓	---	✓[2]
9. Thermal restrictions	✓	Up to 1600 A	Up to 630 A[3]
10. Short-circuit strength	✓	Conditionally[3]	Conditionally[3]
11. Electromagnetic Compatibility (EMC)	✓	---	✓
12. Mechanical operation	✓	---	---

[1] Effectiveness of protection devices in the event of a failure
[2] Only impulse withstand voltage
[3] Comparison with the design already tested

Technical data

Norms and standards	Low Voltage Switchgear and Control gear	PN-EN 61439-2 DIN EN 61439-2 (VDE 0660 Część 600-2)	
	Testing of response to internal faults (arcing faults)	IEC 61641, VDE 0660 Część 500, Suplement 2	
	Protection against electric shock	DIN EN 50274, VDE 0660 Część 514	
Rated insulation voltage (Ui) Rated operating voltage (Ue)	Main circuit Main circuit	1000 V Up to 690 V	
Direct and indirect distances between active elements	Rated impulse withstand voltage Uimp Overvoltage category Pollution degree rating	 8 kV III 3	
Busbar bridges (3-pole and 4-pole)	Main busbar horizontal	Rated Current Reated peak withstand current (Ipk) Rated short-time withstand current (Icw)	Up to 7000 A Up to 330 kA Up to 150 kA
	Vertical busbar bridges in switching technology	Rated Current Reated peak withstand current (Ipk) Rated short-time withstand current (Icw)	Up to 6300 A Up to 220 kA Up to 100 kA
	Vertical busbar bridges in the universal assembly technology and stationary technique	Rated Current Reated peak withstand current (Ipk) Rated short-time withstand current (Icw)	Up to 1600 A Up to 143 kA Up to 65 kA *
	Vertical busbar bridges in 3NJ4 fuse strip technology	Rated Current Rated short-time withstand current (Icw)	Up to 1600 A Up to 50 kA
	Vertical busbar bridges in 3NJ6 plug strip technology	Rated Current Reated peak withstand current (Ipk) Rated short-time withstand current (Icw)	Up to 2100 A Up to 110 kA Up to 50 kA *
Rated currents of devices	3WL / 3VL circuit breakers Cable outgoing feeders Motor outgoing feeders	3WL / 3VL circuit breakers Cable outgoing feeders Motor outgoing feeders	Up to 6300 A Up to 630 A Up to 250 kW
Internal separation	Form 1 to 4b Type 7 for form 4	IEC 61439-2, Sekcja 8.101, VDE 0660 Part 600-2, 8.101 BS EN 61439-2	
Surface treatment	(Coating according to DIN 43656) Frames and bases Doors Side panels Rear panels, top plates Ventilated roof Standard colour of powder coated elements (coating thickness 100 ± 25 um)	 Sendzimir-galvanized Powder-coated Powder-coated Sendzimir-galvanized Powder-coated RAL 7035, light gray Design parts: blue green basic	
Degree of protection IP	In accordane with IEC 60529, EN 60529	IP30, IP31, IP40, IP41, IP42, IP54	
Dimensions	Preferred dimensions in accordance with DIN 41488	Height (without base): Width: Depth (wall-mounted, freestanding): Depth (double-front):	2000, 2200 mm 200, 350, 400, 600, 800, 850, 1000, 1200 mm 500, 600, 800 mm 1000, 1200 mm

* I_{cc} = 100 kA