LOW-VOLTAGE SWITCHBOARDS
rated up to 1000 V

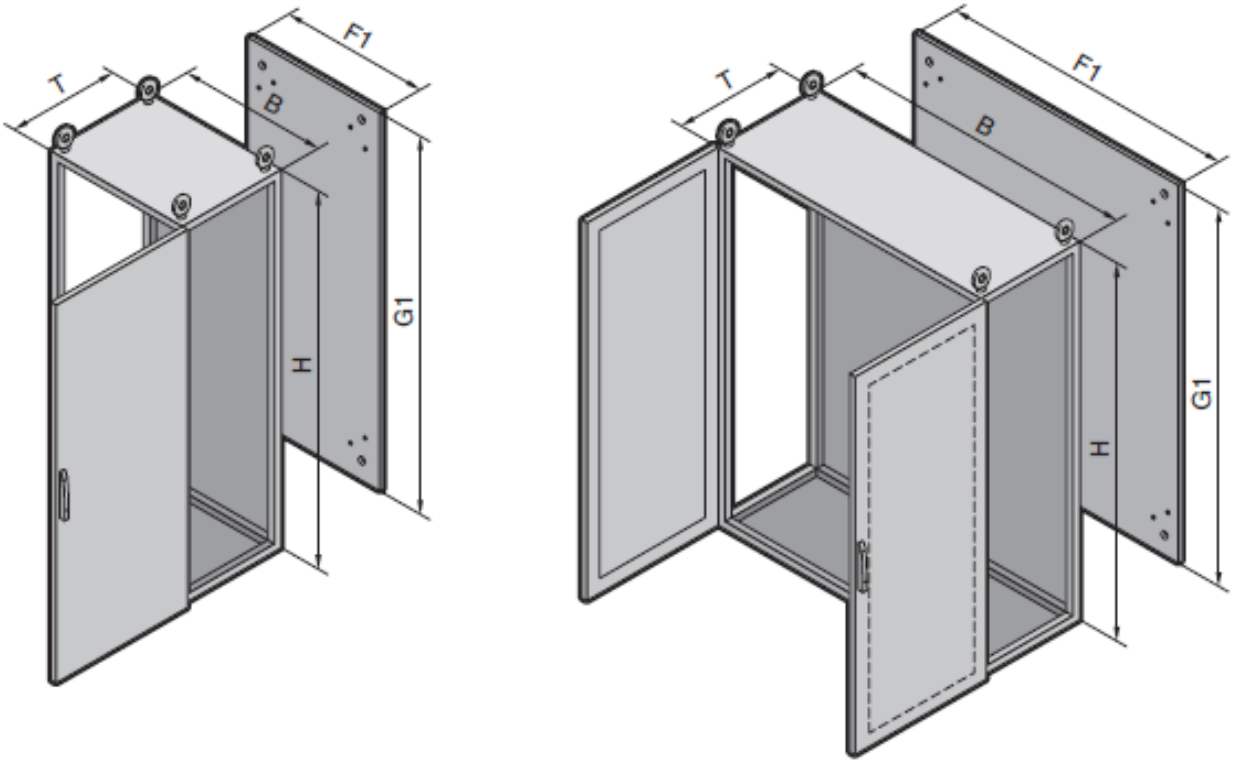
Assembly, operation and maintenance instructions

VX25 cabinet switchboards
(cubicle-type ASSEMBLY)

CONTENTS:

1. Switchboard design

The switchboard skeleton is a welded structure. Inner parts such as installation frames, supporting trusses and attachment consoles are made of galvanized metal sheets without any additional surface finish.
Transport units with one or two fields are assembled at the manufacturing plant. Switchboards are assembled from transport units only at the construction site by an installation / assembly company.
Edge fields are always fitted with side covers. Other covers, panels and doors are delivered based on customer requirements. Panels and covers are attached with screws, doors are attached with hinges and equipped with spacing lock with four-point central locking mechanism - for single-wing doors, and with three-point locking mechanism - for double-wing doors.



The lower section of the switchboard (**bottom)** is equipped according to technical documentation. If the bottom is not covered, make sure that it is covered in order to maintain the required protection class. The bottom is to be covered only at the construction site after cables are installed and connected by the installation company. The bottom may be also covered in the manufacturing plant if the customer requires so.

In situations when connecting busbars are installed in fields, they are fitted with **covers** to prevent accidental contact/touch as required by ČSN EN 50274 (idt EN 50274:2002/Cor.:2009-07).

2. Labelling

Switchboard fields are **numbered** according to standards on the front side, and from the left side to the right side using ascending number sequence. In addition to this number, two-field switchboards have this number added with the letter A - front side, and with the letter B - rear side (unless the project specifies otherwise).
Each switchboard is fitted with a **product specification label** as required by ČSN (EN, IEC, HD), located inside on doors in the first field in the corner opposite to the door lock.

3. Basic technical data

Delivered switchboards **comply** with technical specifications provided by the Client for each individual order. Power grid of individual and delivered switchboards complies with the relevant order and with ČSN 33 2000-1 ed. 2 (idt HD 60364-1:2008, mod IEC 60364-1:2005).
All **basic information** relevant to a particular switchboard are available in the technical /manufacturing documentation on the **relevant drawing** - front view and in a summarized table providing information about interface and about basic parameters of the switchboard (type of the switchboard, protection class, dimensions, paint specification, power grid, electrical current, insulation voltage, safety, environment, and possibly also additional information).

4. Equipment description

Individual switchboards are assembled according to project documentation. **Instrument layout** in relevant fields was designed in order to allow connection of inlet and outlet cables. Cables run through the upper wall or bottom - based on requirements.
Delivered switchboards comply with **protection class** IP40 or IP55 (based on specifications), and after doors are open with protection class IP00 or IP20.

Capacitive / capacitor switchboards are fitted with control regulators. Individual branches are equipped with safety features, a switching element, and if compensation is protected with chokes, with own capacitor and with discharge resistors.

5. Equipment, control elements

Complete specification of used instruments is available in the technical / manufacturing documentation of individual switchboards - on diagrams depicting individual fields.

6. Important features

Great emphasis has been put on **correct operation** of safety circuits in order to ensure trouble-free operation and safety of operating personnel. Correct functions of safety circuits were tested in the manufacturing plan. It is recommended to repeat these tests before putting the switchboard in operation.

7. Mode adjustment

Selectivity of individual circuits must be tested and adjusted before switchboards are put into operation by the installation company.
Electrical current value settings on safety elements (if such setting applies) must be adjusted by the installation company according to special needs.

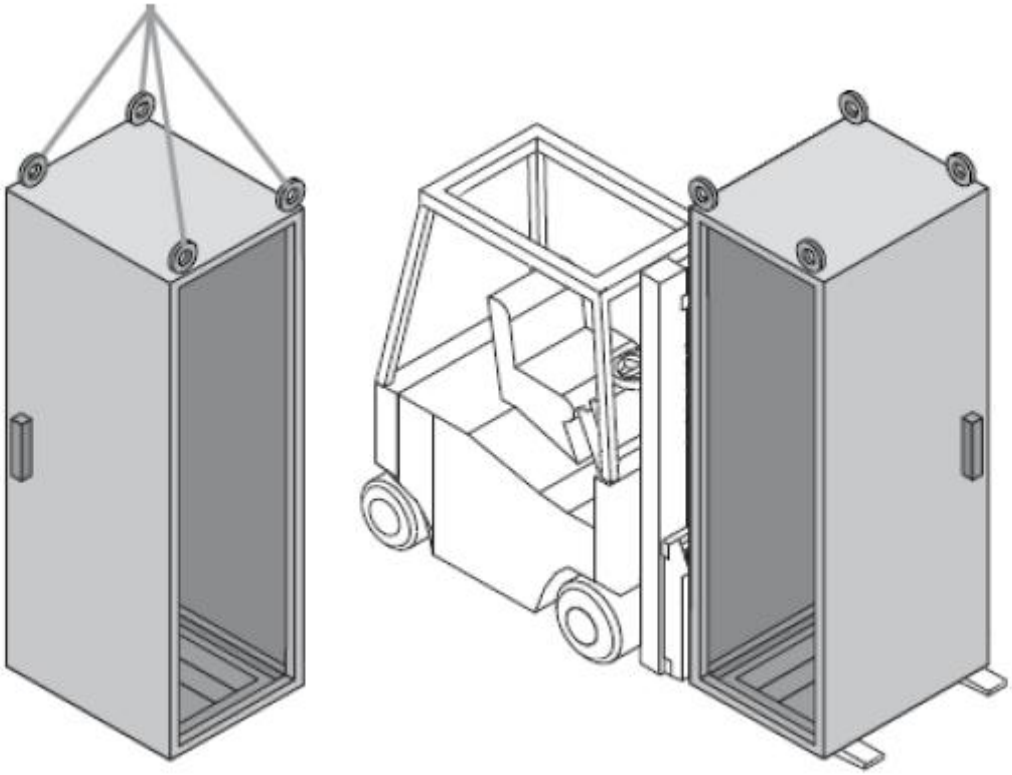
Before **compensating switchboards** are put into operation, the reactive power of the control regulator must be set first according to operator's requirements. When adjusting control regulator, instructions specified in the attached manual must be observed.

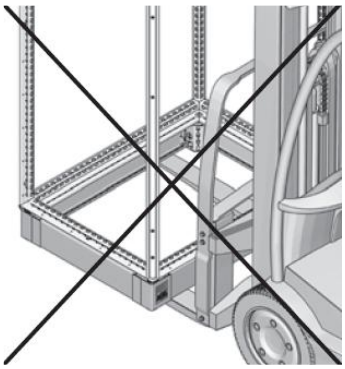
All above settings or any other settings must be tested during a test operation and corrections must be applied if necessary.

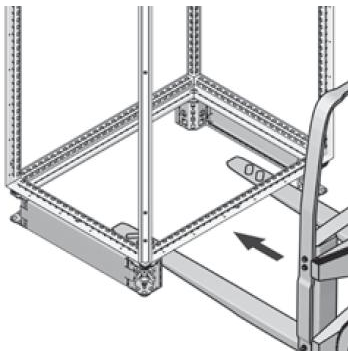
8. Packing, Transport, Storage

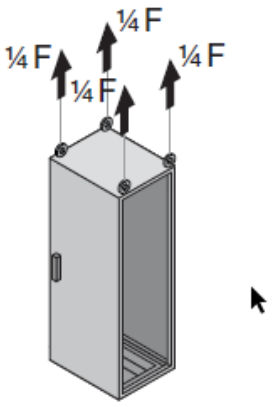
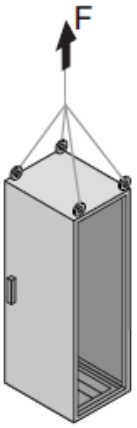
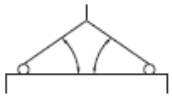
Switchboards are **wrapped** with a transparent PVC foil. This packaging method does not provide any protection against harmful weather conditions. When shipped via trucks or railroad, switchboard must always be covered by canvas. Sea shipment requirements or any other packaging requirements may be done after an agreement.

Unloading from a truck may be done either by a crane **(4 points must be used to lift/lower the load**) or by a forklift.







			
			
∠	90°	45°	60°
F	13.600 N	4.800 N	6.400 N

Equipment may be set down only on an even surface.

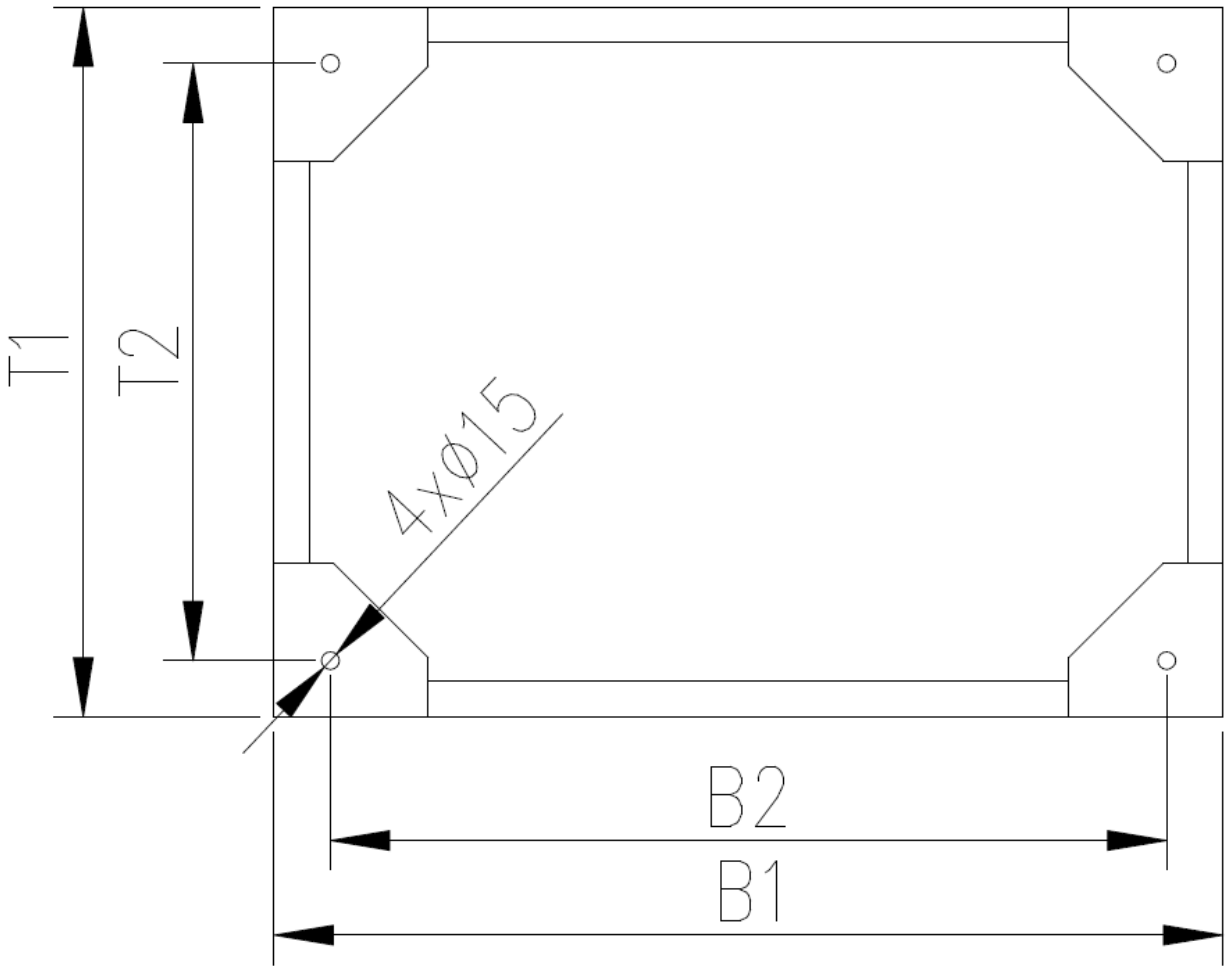
Forklift, lifting and moving equipment, or rollers may be used to **transport load over a surface**. Switchboards may be transported **only in vertical position.** Avoid tilting or rough handling during transport and installation.

Switchboards must be **stored** in dry and dust free rooms and protected from incidental damages. Temperature between -10 °C and +35 °C, relative humidity up to 80 % at 21 °C. Switchboards cannot be stored in humid rooms or spaces which are still under construction.

9. Switchboard installation

Switchboards shall be installed in dry and clean rooms, free of any construction works. To ensure proper attachment to the floor, to avoid deformation of transportation units and to make installation easier, it is recommended to attach the switchboard to a steel frame buried in a concrete screed.

Steel frame should be made from "U5" beams with horizontal tolerance 1 mm/1m of length. **Steel frame is not included in the switchboard delivery.**
After the switchboard has been adjusted on the floor, it should be anchored with screws to the frame.



For enclosure width or depth mm	Width dimensions mm		Depth dimensions mm	
	B1	B2	T1	T2
600	599	505	599	505
800	799	705	799	705
1000	----	----	999	905

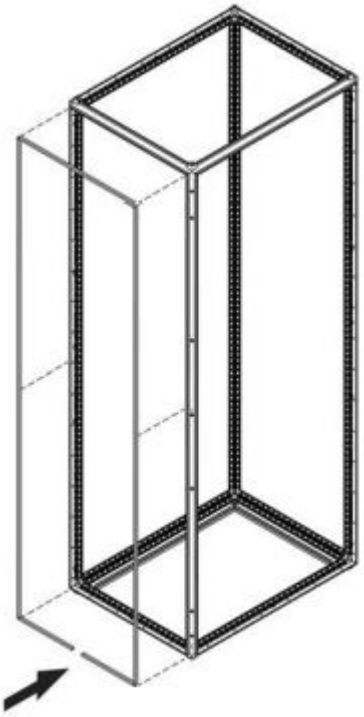
Switchboard is assembled from transportation units which must be done according to technical documentation (front view drawing).

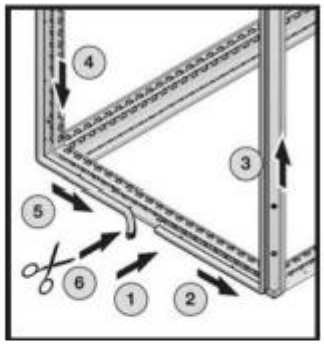
Each transportation unit is fitted with a white label attached to the rear cover which shows the weight. Double-sided switchboards have the label on side.

Assembly of transportation units is done with coupling materials packed in a bag attached to each switchboard (separately or in the power feed field). For list of coupling materials and fastening torques see tables on pages 10/14, 11/14.

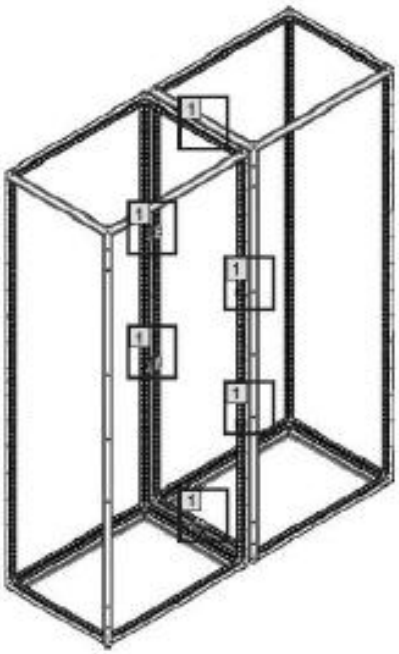
To connect connection belts **(busbars)** use flat washer under each bolt head (up to coupling thickness <20 mm) and spring washer (for coupling thickness ≥20mm). Also use flat or spring washer under each nut (pressure washers may be used instead of spring washers). Contact surfaces of connection belts must be free of any dirt and lubricated with contact grease before coupling (grease is not included in the delivery).

Skeletons (after gluing) are coupled in six contact points – using clamps for in-line layout type 8617.500.





Bolts must be tightened using the appropriate torque - see table on page 11/14.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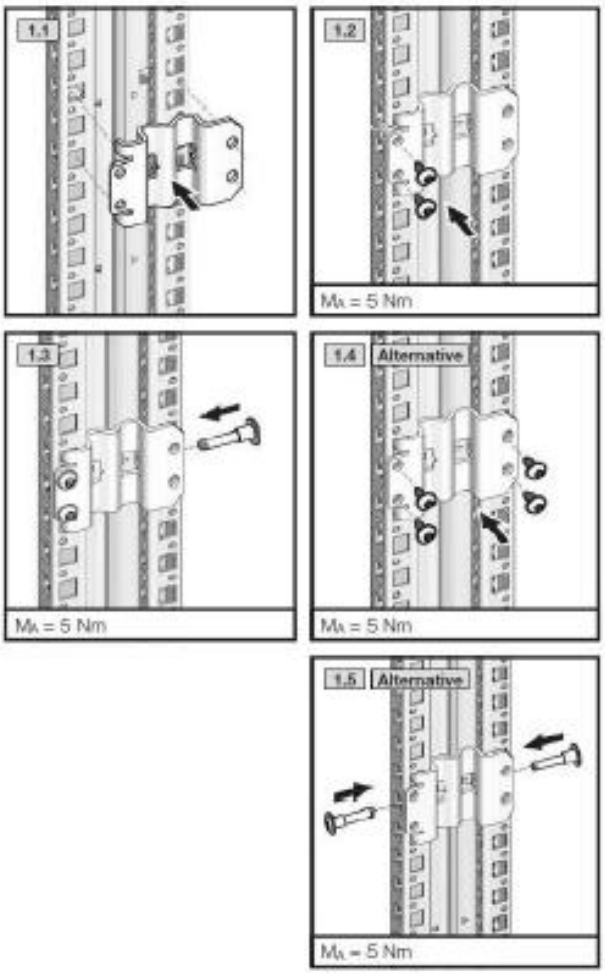
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MA = 5 Nm
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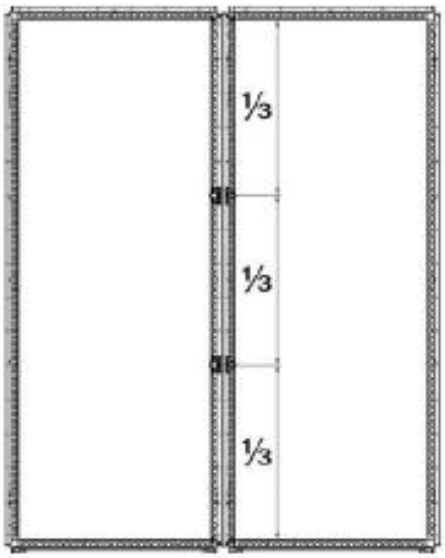
MA = 5 Nm
1.4 Alternative
MA = 5 Nm
1.5 Alternative
MA = 5 Nm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LIST OF COUPLING MATERIALS ATTACHED TO SWITCHBOARDS USED TO CONNECT TWO TRANSPORTATION UNITS

COUPLING SYSTEM

	SIZE	BOLT WITH FLAT AND SPRING WASHER	BOLD WITH PRESSURE WASHER (DIN 6796, ISO 10670)	Pcs
L1, L2, L3	1 x 30/10	M10 x 45	M10 x 40	6
	1 x 40/10	M12 x 45	M12 x 40	6
	1 x 80/10	M12 x 45	M12 x 40	12
	1 x 100/10	M12 x 45	M12 x 40	12
	2 x 80/10	M12 x 70	M12 x 60	12
	2 x 100/10	M12 x 70	M12 x 60	12
	3 x 80/10	M12 x 90	M12 x 80	12
	3 x 100/10	M12 x 90	M12 x 80	12
PEN, N, PE	1 x 30/5	M10 x 40	M10 x 30	2
	1 x 30/10	M10 x 45	M10 x 40	2
	1 x 40/10	M12 x 45	M12 x 40	2
	1 x 50/10	M12 x 45	M12 x 40	2
	1 x 60/10	M12 x 45	M12 x 40	2
	1 x 80/10	M12 x 45	M12 x 40	4

SKELETON ASSEMBLY

Clamp for in-line coupling 8617.500 - 1 package

When assembling several transportation units the number of couplings is multiplied.

TIGHTENING TORQUES FOR COUPLING BOLTS
HEX-HEAD BOLTS

BOLT	METAL – METAL [Nm]	Cu BELTS [Nm]
M5	2.5	4.5
M6	5	8
M8	10	20
M10	20	40
M12	35	70
M16	70	90

Tightening torques for instruments are specified in manuals provided by manufacturers of the relevant instruments.

Width of corridors and access spaces must be sufficient to perform the relevant work, to allow operation, to provide access in case of emergencies and to accommodate transportation as specified (for example in ČSN 33 2000-7-729, mod IEC 60364-7-729:2007, idt HD60364-7-729:2009).
After transportation units are assembled, disconnected circuits must be reconnected. Protection clamps on transportation units must be connected. **All screw / bolt couplings must be properly tightened.**

When connecting the external cabling, always pay attention to the correct fastening and arrangement of the cables leading into the switchboard and perform their routing and forming in the switchboard so as not to obstruct the access to the PEN, PE, and N conductor bars, which must remain freely accessible for inspections and controls of the external cabling connection points on those conductor bars.

Before a switchboard is put into operation it must be tested pursuant to (EN, IEC, HD) and according to instructions specified in this manual.

10. Operation and Maintenance

Safe operation of switchboard requires operators and maintenance personnel to observe valid norms and regulations (including requirements of suppliers of individual instruments). Persons authorized to operate and maintain the equipment must learn about these standards and regulation - especially provisions specified in ČSN EN 50110-1 ed. 3 (EN 50110-1:2013).
Unauthorized persons cannot be allowed to use or handle switchboards.
Qualification requirements for persons operating switchboards are specified under ČSN EN 50110-1 ed. 3 (EN 50110-1:2013) and protection classes (protection class applies to the entire switchboard and when switchboard doors are opened). If there are different qualification

requirements on operating personnel, they must be described in the local operation guideline. Under **no circumstances** the qualification level may be lower than the qualification level for which the switchboard was ordered and manufactured.
Switchboards may be operated **only when doors are closed** (if switchboard is fitted with doors).

11. Inspections

Switchboards must be regularly inspected and revised. This applies mostly to main and control circuits. Special attention must be paid to **protection / safety circuits.**
Visual inspection must be performed after one week of operation. **Additional inspections** shall be done based on maintenance plan prepared according to valid regulations.

Switchboard manufacturer recommends performing inspection using **thermal imaging** at least once a year **and once every 4 years** inspection of couplings, unless the manufacturer of installed instruments recommends more frequent inspections.
Additional inspection dates shall be specified in the inner regulations of the operator.
Compensation switchboard power couplings suffer impact loads and therefore it is recommended to inspect power couplings before the switchboard is put into operation and then again **once a year**.

Inspections must also include **visual checks** focusing on conditions of individual instruments as well as cleaning of inner sections of the switchboard. During a revision inner spaces must be cleaned.
In case of continuous and long operation regular **measurements** must be performed and surface **temperature** on circuit breaker cover above switching contacts must be recorded.
When performing revisions, it is necessary **to turn ON and OFF** several times switching elements, which have been in one position for long time, in order to break possible oxidation layers which may have accumulated on contacts.
Detected defects must be removed properly and in timely manner.

12. Service inspections

Service inspections and checks focusing on functionality of safety and protection elements (circuit breakers, motor starters, covers etc.) should be done by qualified service technician.
Service inspections may be ordered at the manufacturer.

13. Maintenance plan

The operator is obligated to produce a **maintenance plan,** which must be properly introduced to authorized employees (within the scopes of their authorities).
Performed inspections, maintenance services, shutdown of protection elements due to short-circuits done by maintenance personnel, fuse and instrument replacements must be recorded in a **maintenance book**. These records must be presented to component suppliers or switchboard manufacturer upon request.
The above specified inspections/checks do not replace regular inspection plan applicable to individual switchboards produced by the operator.

14. Surrounding environment

Basic characteristics of supplied switchboards comply with ČSN 33 2000-5-51 ed. 3+Z1+Z2 (idt HD 60364-5-51:2009 + idt HD 60364-5-51:2009/A11:2013 + idt HD 60364-5-51:2009/A12:2017, mod IEC 60364-5-51:2005) AA4, which means that temperature of the **surrounding air cannot** exceed 40 °C, and average temperature during 24 hours cannot exceed 35 °C. Operational conditions of the switchboard comply with ČSN EN 61439-1 ed.3 Article 7.1.2 (idt IEC 61439-1:2020 + IEC 61439-1:2020/Cor1:2021-12) and corresponds with the level of pollution specified in manufacturing documentation.

15. Turning OFF a circuit using a safety element

When a circuit is turned off by a fuse or a safety element the cause for this situation must be determined and repaired. Only then the switchboard may be turned ON again. The same requirement applies to a situation when overload is detected. Contacts of safety and protection elements which were turned OFF by overcurrent or by short-circuit must be inspected.

16. Reserves

Reserves which are installed in individual switchboards are based on project requirements and may be used up to the values their equipped with. Pursuant to item 17 of these instructions, reserves **canno**t be replaced with instruments with higher values.

17. Defective instruments

Defective instruments must be replaced with perfect instruments with the same parameters (new or repaired by the manufacturer of the relevant instrument).

18. Operation interruption and switchboard shutdown

When switchboard is **shut down** and before it may be turned ON back again it is necessary to inspect the entire switchboard (conditions of individual instruments, their settings, coupling conditions, and in particular status of protection circuits, etc.).
During short-term interruptions (for example when a defect is being removed) the switchboard may be turned ON again after the performed work is properly inspected and after protection circuits are checked.

19. Prohibited tampering and handling

No instruments in switchboards may be **added,** and **no** defective instruments may be repaired**,** in particular fuses and safety elements. Instruments may only be replaced with a new one or repaired by the manufacture of the relevant instruments.
Used instruments **cannot be replaced with instruments with higher values/ratings.**

Switchboards cannot be operated under different conditions than for which they have been designed (other voltage and electrical current values, surrounding temperatures, other environment in terms of protection class, mechanical damages).
If a switchboard is under current, no metal or wet tools/objects may be used or handled inside the switchboard.
Requirements specified in ČSN 33 2000-4-41 ed.3 (eqv HD 60364-4-41:2007 apply to switchboard access restrictions and mod IEC 60364-4-41:2005 + mod IEC 60364-4-41:2005/A1:2017) applies to protection against injury by electric shock.

20. Switchboard accessories

1 key for door lock type DOPPELBART 5 mm, or 3524 for safety insert (key is located in the upper eye at the rightmost side of the switchboard).

Instruction and maintenance manuals for installed components (standard delivery provided by manufacturers of the relevant components, which includes safety elements, frequency inverters, power circuit breakers, contactors, ... etc.

Bag with bolts and screws is attached to switchboard with more than one transportation unit.