

# Technical documentation

## Walk-in UF type block transformer stations BETONBAU system



*Illustration photograph of a type UF station*

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## 1 General

Technical information contained in this technical documentation corresponds to the state of the art achieved as at the date of this documentation.

We reserve the right for technical changes in the scope of the product (station) development in the course of production preparation and execution of the order.

All obligations follow from a particular purchase agreement or order and are not extended or restricted by this technical documentation.

We provide no guarantee for damage or defects caused due to operator error, failure to adhere to this technical documentation and/or instructions for maintenance and operation of the built-in technology or due to improper assembly by other persons, improper repair or use of improper components and operation equipment.

## 2 Safety notices

### 2.1 Warnings

The walk-in station or transformer station, respectively, is electrical equipment that may be dangerous to life, health or property due to electric current or voltage.

Access of unauthorized persons is prohibited!

Hazards may arise due to improper handling and use; these hazards can only be recognized by qualified personnel!

Any working activities (operation and work) may only be performed by qualified personnel!

All safety rules and regulations must be observed and the prescribed work and protective equipment must be used unconditionally when performing any activities in the walk-in transformer station and at all individual operating equipment!

Local operational and safety regulations must be observed in all activities; the station operator is required to prepare such regulations (as per Sections 101 and 102 of Act No. 262/2006 Coll., the Labour Code)!

Technical and safety information is identified with the following symbol in this documentation:



**Hazard symbol; persons, property and the environment may be endangered if adequate precautions are not observed (safety regulations and instructions, operating instructions, etc.).**



**Applicable technical standards, legal regulations and instructions provided herein or in the documentation of the built-in technology must be observed when performing all activities, i.e. assembly work, commissioning, operation, maintenance and repairs of the station.**

### 2.2 Proper use

*Betonbau electric stations and block transformer stations may only be operated (attended to, maintained, inspected and repaired) by qualified (see Section 2.3) and authorized personnel. Proper and safe operation requires:*

- Adherence to this technical documentation;
- Appropriate transport and specialized storage;
- Specialized assembly (installation) at the destination;
- Specialized subassemblies (if performed);
- Specialized commissioning;
- Gentle attendance to and operation by qualified personnel;
- Adherence to applicable technical and safety standards and regulations at the installation site (e.g. ČSN EN 50110-1 ed. 3 (and/or PNE 33 0000-6)).

### 2.3 Qualified personnel

Qualified personnel is defined as persons who:

- Have education and practice required by relevant regulations;
- Are trained and re-examined in the prescribed scope and time periods;
- Have read and understood this technical documentation and the documentation of the built-in technology;
- Are trained in proper care and use of protective and work equipment;
- Are trained in first aid for the event of any injuries;
- Have been acquainted with (and re-examined in) local safety regulations prepared by the station operator;
- Have knowledge of the transport, assembly and installation of transformer stations and/or their commissioning – applies only to persons who perform such activities.



**The walk-in electric transformer station is electrical equipment that contains both low- and high-voltage devices. ČSN EN 50110-1 ed. 3 (Operation of electrical installations) and/or PNE 33 0000-6 (Operation of electrical installations for the production, transmission and distribution of electricity) apply.**

## 2.4 Standards and regulations

Among others, block transformer stations comply with the following standards, regulations and laws + updated list attached hereto as Appendix G:

ČSN EN 62271-202 ed.2	High-voltage switchgear and controlgear – Part 202: High-voltage / low-voltage prefabricated substations
ČSN EN 61936-1 ČSN EN 50522	Power installations exceeding AC 1 kV – Part 1: General rules Earthing of power installations exceeding AC 1 kV
ČSN 33 2000 series standards, as amended	Low-voltage electrical installations
ČSN EN 50110-1 ed.3	Operation of electrical installations – general requirements
ČSN EN 50110-2 ed.2+Z1 (ed. 3)	Operation of electrical installations – national annexes
ČSN EN 60076, series standards, as amended	Power transformers
ČSN EN 50464 series standards	Three-phase oil-immersed distribution transformers 50 Hz, from 50 kVA to 2,500 kVA with highest voltage for equipment not exceeding 36 kV
ČSN EN 62271-200 ed.2	High-voltage switchgear and controlgear – Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV
ČSN EN 62271-1 ed. 2	High-voltage switchgear and controlgear – Part 1: Common specifications for alternating current switchgear and controlgear
ČSN EN 61439 series standards, as amended	Low-voltage switchgear and controlgear assemblies – parts 0 to 7
ČSN EN 60529 +A1, A2, Opr.1	Degrees of protection provided by enclosures (IP Code)
ČSN EN 206+A2	Concrete – Specification, performance, production and conformity
ČSN EN 1991-1-1 + Opr.1, Z1, Z2	Eurocode 1: Actions on structures – Part 1-1: General actions – densities, self-weight, imposed loads for buildings
ČSN EN 13369 ed. 2	Common rules for precast concrete products
ČSN EN 13501-1	Fire classification of construction products and building elements – Part 1: Classification using test data from reaction to fire tests
ČSN EN ISO 9001 (2016) + Opr.1	Quality management systems – Requirements
Government Regulation 291/2015 Coll.	Government regulation “on the protection of health from ionizing radiation“
Act No. 254/2001 Coll.	Act on waters and amendments to some acts (the Water Act)

### 3 Specification and description of the station

#### 3.1 General

The building object of walk-in transformer stations consists of a modular cell of the BETONBAU UF modular series.

Electrical technology is mounted in this cell – transformer(s), low- and high-voltage switchboards with internal cable connections, an internal earthing circuit, lighting and/or other technological components.

The modular cell consists of the body (the bottom and walls) and of a separate and dismountable roof. An access door, ventilation elements and construction elements to connect an external earthing system and external cabling are built in the body casing.

The standard delivery includes assembly into a construction bed prepared in advance. External connections including sealing of cable passages into the station, the external earthing circuit, groundwork and commissioning are not provided by Betonbau s.r.o.

#### 3.2 The body

The concrete body (the bottom and enclosing walls) is produced as a single seamless cast piece.

In order to achieve the strength, impermeability (without cracks) and service life corresponding to environmental impact degrees XC4, XD3, XF1, XA1 for the exterior parts and XC1 for the interior parts according to ČSN EN 206+A2 and/or ČSN EN 13369 ed. 2, C35/C45 strength class concrete is used for the necessary reinforcing of concrete according to the design statics. A cell produced in this manner is impermeable for water and other substances.

The modular cell of the station utilizes design statics.

The cell does not require classic foundations – it is installed on a layer of gravel of the foundation bed.

The intermediate floor in the switchboard area is made of concrete or plywood, laid on a steel-aluminium structure. Transformer(s) in vaults are placed on steel sections (HEA – rails). The catch tank under the transformer is equipped with special coating resistant against petroleum substances.

The body is handled either with the roof included (the manufacturing drawing should be followed in all cases) or separately – without the roof. The weight of the entire object including the technology needs to be taken into account.

#### 3.3 The roof

The roof is formed by a separate concrete tank slab. Rainwater is carried away using spout(s) to which a downlead is connected, ended with an above-ground discharge piece to discharge the water to the surrounding ground or into drainage.

The roof slab is laid onto the body using sliding installation and can be removed from the body – however, this is not necessary – the standard installation allows for electrical technology replacement via the door.

The roof is covered with a layer of gravel / pea gravel (included in standard delivery).

### 3.4 The foundation and oil-retaining tank

The foundation and oil-retaining tank is impermeable to water and oil even without an additional coating (although it is usually applied) and complies with the Water Act.

The oil-retaining tank of the vault is dimensioned for oil volume of a standard oil-cooled transformer of appropriate power and thus it supports the installation of this type of transformers, as well.

The standard delivered station is designed for installation without the presence of aggressive groundwater. The underground station shall be equipped with special isolation if aggressive groundwater is present.



#### **Handling of hazardous substances**

### 3.5 The door and ventilation elements

The station door is made of aluminium with a three-point locking mechanism. The door lock is ready for insertion of a lock cylinder and includes an emergency opening mechanism, i.e. it can be opened from the inside using the handle even if the door is locked (ČSN EN 179). Ventilation and depressurization elements made of aluminium can be built in the door or be installed as separate elements in the walls. The surfaces of the door and ventilation and depressurization elements are anodized and include no other colour treatment in the standard version.



**The door of the station forms part of the escape route and therefore the design, function, inspection and maintenance of their fittings (locks) must comply with ČSN EN 179.**

### 3.6 Passages for cables, building site power and earthing

Cable bushings fitted in the cable basement are used as bushings for lead-in high-voltage cables and lead-out low-voltage cables.

System heads, shrinking tubes, sealing rubber inserts and stoppers are delivered with the station (as additional equipment based on the customer's request).

The opening to lead in the building site power cable is equipped with a dismountable cover and is situated in the above-ground part of the body.

Earthing bushings (2 pieces in the standard delivery) lead out the internal earthing circuit of the station into the external area in an insulated manner and allow for the connection of an external earthing system of the station. The bushings are located in the underground part in the standard delivery.

### 3.7 Surface treatments

External walls are equipped with structured plaster. External surfaces of the roof and of the body base are coated with water-repellent masonry paint. Internal walls are coated with indoor paint. The oil-retaining tank of the transformer area is treated with an oil-resistant coat.

The external surface of the underground part may but need not be treated with a protective bituminous coat.

### 3.8 Design with dimensions and weights

Supporting documents including drawings and certification(s) with information on dimensions and weights are available for the supplied station.

## 4 Electrical equipment

Possible electrical components of the station such as the transformer, high-voltage switchboard, low-voltage switchboard, USM and internal connections are supplied according to technical specifications of each individual station.

In the standard delivery, the components are built in the station, connected and secured for transport at the production plant.



**Rated parameters and station safety are related to the supplied configuration of the station.**



**The safety and rated parameters of the station remain unaffected only if repaired by replacement using the same type of electrical equipment with parameters identical to the supplied configuration!!!**



**Any change of the configuration of the building parts of the station (e.g. replacement of the door, ventilation elements, floor in switch rooms) have an impact on the station's safety and rated parameters!!!**

The electrical installation – in the scope delivered by the station manufacturer – undergoes an inspection at the production plant.



**After the electrical installation is completed (external high- and low-voltage cabling is connected to external earthing) at the station installation site, the customer / station operation must perform an initial inspection of the electrical installation.**

#### **4.1 High- and low-voltage switchboards, USM box**

The stations may be equipped with the following:

- High-voltage switchboards with SF6 or air insulation
- Low-voltage switchboards
- Measuring box (USM)

If included in the station, the measuring box (USM) is embedded in the station or mounted from the outside (depending on configuration of the station). The USM box is accessible from the outside via a separate and lockable door.



**Station safety (arcing fault resistance according to ČSN EN 62271-202, ed. 2) is related to the delivered type of the high-voltage switchboard.**



**The housing class (temperature conditions of the technology during operation in the station) is related to the delivered type of the high-voltage switchboard. Betonbau stations provide housing class 20 in standard delivery.**



**Switchboard manufacturers' instructions for operation and maintenance must be observed during commissioning, operation and maintenance!**



**If the high- or low-voltage switchboard type is changed, the intermediate floor must be adapted (replaced), as well!**



**In the event of a failure – arcing fault, poisonous products may be formed or suffocating gas – SF6, heavier than air, may escape among others (emission of hot gases, noise, a light flash). After a failure of this type, ventilation and detoxification of the station areas must thus be performed before initiating any work and activities!**

### 4.2 The transformer and warming up of the station

Applies to stations where a transformer is included in electrical equipment.

In standard delivery, the stations support the use of three-phase oil-immersed transformers, hermetically sealed with natural cooling (ONAN). It is possible to use dry transformers of a suitable type (with respect to losses and noise).

The transformer is fixed on steel sections (HEA) in the transformer area of the station and is secured for transport in the station (this securing equipment must be demounted after setting the station at the installation site!).

Cooling of the transformer in the station is ensured through natural air exchange. The air exchange occurs through ventilation elements of the transformer chamber. The delivered configuration of the station (ventilation elements and low-voltage connections) is dimensioned for the given type of the transformer!

Transformer loading during operation should be in harmony with the station housing class (which expresses the impact of station configuration on cooling of the transformer).

In general, each transformer in the station (housing) is cooled more poorly than a free installed (outside the housing) one and thus in the housing (station), it may be loaded only with certain power restrictions. It is also important to take into account the weather impact at the given locality and/or average monthly temperature.

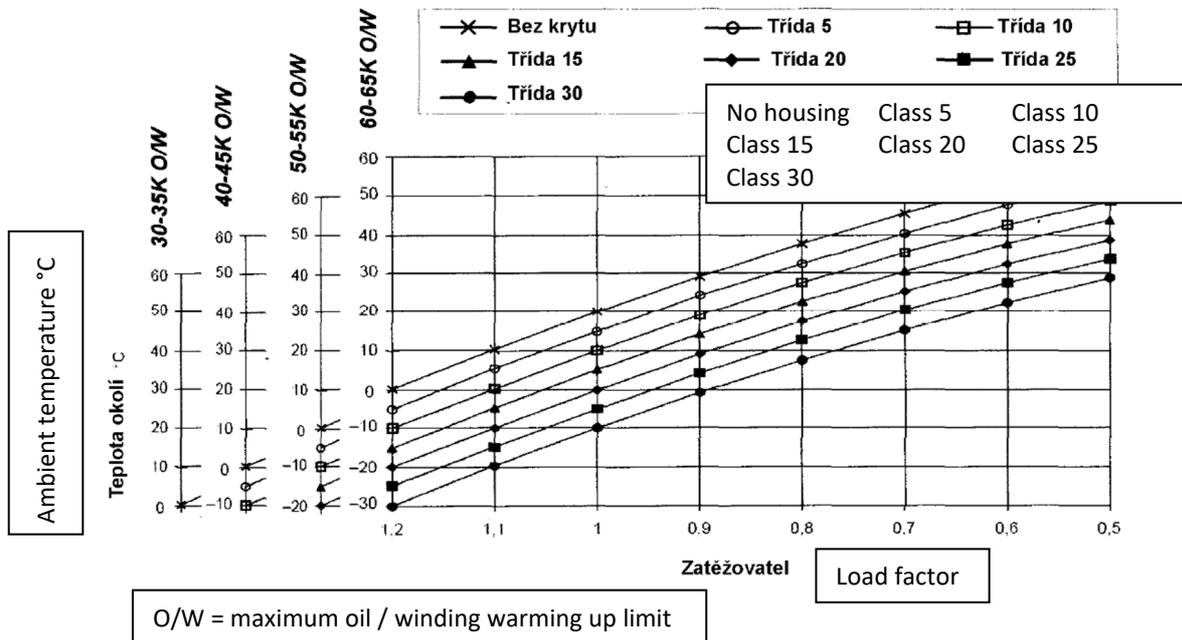
For example, Appendix D of ČSN EN 62271-202 ed. 2 can be used to determine the transformer load factor depending on average temperature of the surroundings.

The low-voltage switchboard is another important aspect of warming up in the transformer station and needs to be included in the calculation (typical low voltage losses amount to 1 kW; however, the value must always be verified with the manufacturer).

The highest rated power of the station is given by the highest rated power and total losses (IEC 60075-1:2011 or IEC 60076-11:2004) of the transformer(s) for which the station is designed.

The rated housing class (e.g. 20 K) corresponds to the highest value of the difference in warming up of the transformer.

The figure below shows the load factor curve for a liquid-filled transformer in the housing. For a standard “Ecodesign“ transformer, maximum warming up of the oil and winding is 60 K and 65 K. For example, with the ambient temperature of 30°C and housing class 20 K, the value of the transformer load factor is 0.63. If exceeded, the service life of the transformer is significantly reduced.



**In standard delivery, Betonbau stations provide housing class 20 K for the delivered configuration (losses of the transformer and low-voltage switchboard, and the design of low-voltage connections are decisive factors). Ventilation elements must not be obstructed in any way and must be cleaned (with respect to dustiness of the environment)!!!**

### 4.3 Power cabling

The transformer is connected with the high- and low-voltage switchboard using internal cable connections.

The cable routes are designed to make sure that the cables do not touch those parts of the equipment that carry electrical current or are heated. Cables are connected to connection points of the transformer and the high- and low-voltage switchboard and are attached to the body using cable clamps. The shielding of high-voltage cables is always attached at both ends – on the side of the high-voltage switchboard and on the side of the transformer.

Low-voltage cabling is dimensioned according to the power of the supplied transformer or according to the rated power of the transformer station.

### 4.4 Internal earthing

The equipment below (if included in the station) is visibly earthed using a green and yellow cable H07V-K (CYA) 1x50mm<sup>2</sup> to the internal earthing conduit inside the station.

- High-voltage switchboard
- Transformer (the node, the structure)
- Low-voltage switchboard
- USM

Door leaves are connected to the door frame using green and yellow cables 1x16 mm<sup>2</sup>. The door frame, ventilation elements and building site power covers, as well as the station rails and metal floor structures are electrically connected to the reinforcement structure of the cell. The reinforcement structure of the roof is connected to that of the cell. The reinforcement structure of the entire object is connected to the internal earthing conduit.

The internal earthing conduit is formed by an earth strip FeZn 30x4 along the circumference of the station with two measuring terminals above the floor level. The rated short-time withstand current of this internal earthing conduit is 10 kA/1 s.

Internal earthing is led out to the external area using insulated earthing bushings (in the underground part of the station in standard delivery).

External earthing shall be connected to these bushings (using the attachment bolts M12 and four-wire connectors enclosed in the station package).

## 5 Accessories

### 5.1 General

The following accessories according to the specifications are supplied with the station in standard delivery:

- Documentation holder (pocket)
- ČSN warning tables on the outer side of the station door
- Universal cylinder locks and keys for transport
- ČSN safety tables (enclosed)
- 2 sets of the attachment bolt + four-wire connector for earthing bushings (enclosed)
- System heads of cable bushings and flanged packings / rubber sealing inserts and stoppers if ordered by the customer.

Suspension equipment for handling the station is not included in the delivery!

The following accessories are not supplied with the station in standard delivery:

- Low-voltage lead-out fuses
- Manual extinguishers

- Personal protective equipment (dielectric insulating mats, short-circuit sets, etc.).

### 5.2 Accompanying and technical documentation

- Station drawing including
  - Main dimensions and weights of the station
  - Layout of areas and technology
  - Indication of the positions of bushings and construction holes
- Initial inspection report including single-pole diagram of the station
- Accompanying technical documentation for major components (transformers, high- and low-voltage switchboards)
  - Wiring diagrams
  - Assembly drawings
  - Operating instructions
  - Single-part test reports

## 6 Transport, installation, assembly instructions

### 6.1 Transport and installation

The station should be transported using a suitable transport vehicle. It should be seated at the installation site using a mobile crane.

These activities require specific specialized knowledge and means (e.g. suspension and tying elements) and are performed by the manufacturer (Betonbau s.r.o.).

### 6.2 Foundations (bedding) at the installation site

The station should be seated into the bedding by direct positioning of the entire area of the station bottom onto gravel.

The shape and parameters of the bedding are defined in relevant design documentation (e.g. construction documentation) for the specific station and for the specific construction site. Methodological recommendations are provided by the station manufacturer for this documentation.

Normally, the station manufacturer (Betonbau s.r.o.) does not provide such bedding – in standard delivery, bedding is a condition of constructional readiness for station assembly.

### **6.3 Handling the station or the roof**

In principle, the structure of the station allows for relocating the station to other than original installation site and/or for separating the roof from the station body for a temporary period. Related activities require specific specialized knowledge and means (e.g. suspension and tying elements) and can be performed by the manufacturer (Betonbau s.r.o.) if necessary.

## **7 External connection of the station**

The station should be connected to external high- and low-voltage distributions using cables, through cable bushings in the underground part of the station. Normally, these connections are not done by the station manufacturer (Betonbau s.r.o.). Among others, particular attention should be paid to proper sealing of cable passages when cabling is installed – by using proper system lids and cuffs and by observing proper technological procedures of making cable passages and backfilling the cable routes.

Connection to the external earthing conduit is made via insulated earthing bushings in the underground part of the station. Attachment bolts and clamps for both earthing bushings are enclosed in the station package.

The design of external cabling (types, numbers of cables) is determined, as well as the design of the external earthing conduit, in appropriate project documentation (e.g. in the construction documentation).

The “building site power“ should be connected via the building site power bushing in the above-ground part of the station. This bushing is an opening covered with a metal plate (the plate can be demounted from within the station).

## **8 Station safety and health protection with respect to fire, noise and non-ionizing radiation**

### **8.1 Fire safety solution**

The fire safety solution (FSS) of the designed station is contained in relevant project documentation of the given station. FSS takes into account the properties of the station itself and of the built-up area and nature of its surroundings (e.g. adjacent buildings, access roads, etc.).

In standard delivery, the station itself is a single fire section with fully open fire areas – the door and ventilation elements. These open areas give rise to fire risk areas, characterized by separation distances. Fire resistance of the walls and of the coping slab of the station is REI 30 or REI 90 (as per ČSN EN 1992-1-2, Eurocode 2, Part 1-2), and zero separation distances apply at places where no open areas are found (no fire risk area is formed on the given sides of the station).



**Rated parameters and safety of the station are related to the delivered station configuration. Any change of the built-in electrical technology (e.g. transformer) or changes of construction parameters of the station (e.g. adjustment or addition of openings) result in a change of the fire safety solution!!!**

A proper and safe procedure to be taken in case of fire and its extinguishing are determined by the operator's regulations.

The stations do not require any fire safety equipment (EFS – electronic fire signalling, SEE (stable extinguishing equipment) or emergency lighting).

The number and type(s) of portable extinguishers are determined by FSS. Normally, the manufacturer (Betonbau s.r.o.) does not deliver these extinguishers with the station.

### 8.2 Noise protection

Transformers are a source of noise in the station (the noise level is given as L<sub>pa</sub> in dB at the distance of 1 m from the transformer). The noise level decreases with the distance from these sources and is substantially attenuated by concrete walls. However, the door and especially the ventilation elements (in the door or in the walls) constitute an acoustic short circuit of the concrete building, and therefore noise levels need to be verified at those sides of the object where such elements are found or the station position needs to be modified with respect to the protected outside area to make sure that the limits of applicable hygiene regulations are not exceeded (Government Regulation No. 272/2011 Coll. – 35 dB in the night).

The characteristic attenuation values are as follows:

- For building wall thickness 10 cm – R'<sub>w</sub> 47 dB
- For building wall thickness 12 cm – R'<sub>w</sub> 50 dB

- Standard door without ventilation elements – min. 18 dB

Besides its own structure, the station includes no other (non-standard) anti-noise measures (e.g. noise dampers of the ventilation elements or soundproofing of the vault door).

The noise protection solution of the designed station is contained in relevant project documentation (e.g. in the construction documentation) of the given station – by the choice of appropriate transformers and situation of the station on the land.



**Rated parameters and health protection from station noise are related to the delivered station configuration.**

**Any change of the built-in electrical technology (e.g. transformer) or changes of construction parameters of the station (e.g. adjustment or addition of openings) result in a change of the situation of noise protection!!!**

### 8.3 Protection from non-ionizing radiation

All types of electrical equipment are sources of an electrical and magnetic field in the station. Fields with the frequency of 50 Hz are important. The electrical field at stations with high voltage is insignificant in terms of hygiene limits considering the operating voltage (standard: 22 kV or 35 kV) and electrical technology design (shielded switchboards and high-voltage cables, all connected to the earthing system) and building skeletal structure design (internal reinforcing of the concrete walls constitutes a Faraday cage) both in the external surroundings of the station area and in the internal area (provided that separation distances are observed).

The situation of magnetic fields, occurring predominantly around connections from the low-voltage side of transformers to low-voltage switchboards, is different (high currents in single-core cables). Therefore stations achieve the highest values of magnetic induction with rated power, at those places of the station where these connections are found. However, as shown by measurements in practice, the magnetic field value decreases very rapidly with increasing distance from the field source, and thus hygiene limits are not exceeded in the external environment around the station or inside the station (according to Government Regulation No. 291/2015 Coll. – the reference level for the population is 100  $\mu\text{T}$ , and according to ČSN EN 50499 ed. 2, the reference level for employees is 500  $\mu\text{T}$ ).



**A change in the built-in electrical technology (e.g. spatial layout of low-voltage cabling) or incompetent interventions in the station configuration (e.g. earthing) may have a substantial impact on the solution of protection from non-ionizing radiation!!!**

## 9 Operation and commissioning

### 9.1 General

The transformer station or switching station is designed and manufactured according to ČSN EN 62271-202 ed. 2 and subsequent electrotechnical and construction standards, laws and regulations. It may be opened, operated, supervised and maintained only by qualified electrical personnel.

The supplied station is ready for connection. Installations of power supply (high-voltage) and lead-out (low-voltage) cables of the station are found in enclosing walls. In order to connect the cables, the high- and low-voltage switchboard housings need to be demounted according to assembly and operating instructions for the switchboards. The housings should be replaced after the connections are made. In standard delivery, the manufacturer (Betonbau s.r.o.) does not perform commissioning.

The means used to fasten the transformer during transport and handling of the station must be demounted after seating the station!

In standard delivery, the station is not equipped with protective equipment (e.g. earthing and short-circuit sets, insulation mats and barriers, high-voltage indicators) and personal protective equipment (e.g. shields). This protective equipment must be obtained by the operator(s) themselves.

The station is only equipped with a set of safety tables.



**The manufacturer (Betonbau s.r.o.) has performed an initial inspection according to relevant applicable ČSN standards before dispatching from the production plant.**



**According to ČSN 332000 series, as amended, and ČSN EN 50110-1 ed. 3, the operator shall ensure that a proper condition of electrical equipment and means be re-examined (inspected) after any change or repair.**



**The station provides demonstrated personal protection (safety) as per applicable standards (i.e. protection against mechanical injury and burning due to hot gases) in the case of an arcing fault and with the chamber door closed – for attending personnel in the switch room (switch room door open) and for the public in the entire surroundings of the station (also station doors closed)!!**



**Safety in terms of other risks – e.g. protection from noise and poisonous gases or products of an arcing fault or against mechanical injury, burning or poisonous gases or products in the case of a transformer failure – is not determined in any way by the declared station safety in the case of an arcing fault, and therefore these risk need to be included in risk assessment!!!**

## 9.2 Assembly and replacement of the transformer

ČSN EN 50110-1 ed. 3 provisions and instructions provided in the safety table (located in the station) must be observed in assembly and replacement of the transformer.

Before commencing the assembly work, the electrical conductors leading from the outside to the high- and low-voltage switchboards must be free of voltage, earthed and short-circuited.

The assembly and/or replacement of the transformer shall be performed through the door of the vaults without lifting the station roof.



**The supplied transformer can be replaced with a new one with the same parameters (dimensions, power, losses, noise, oil volume) without any problems.**

**The use of a different new transformer should be consulted with the station manufacturer. The use of such a transformer may result in changes of basic values and functions of the station and/or changes or setting (e.g. high- / low-voltage fuses, setting of triggers / protection devices) or adjustment of cable connections.**

## 9.3 Switchboard replacement

ČSN EN 50110-1 ed. 3 provisions must be observed in assembly or replacement of a high- or low-voltage switchboard. Before commencing the assembly work, the electrical conductors leading to the transformer and high-voltage switchboard and/or low-voltage switchboard must be free of voltage, earthed and short-circuited.

The assembly and/or replacement of the switchboard(s) shall be performed through the door of the station.

In any case, the intermediate floor of the switchboard must always be adjusted or replaced when the high-voltage switchboard is replaced with a different type!



**The supplied high- or low-voltage switchboard can be replaced with a new one with the same parameters (dimensions, type (manufacturer), losses, short-circuit resistance, type of pressure relieve, connection points, etc.).**

**The use of a different new switchboard should be consulted with the station manufacturer. The use of such a switchboard may lead to changes in basic values and functions of the station, including arcing fault resistance, and/or to changes or setting of other electrical equipment (e.g. cable connections).**

## 9.4 High-voltage fuse replacement

The fuses should be replaced using a procedure described in technical documentation of the high-voltage switchboard.



**All three fuses should be replaced in each case – i.e. including those that did not blow.**



**Used fuses must provide the value (rated current) and type defined by the high-voltage switchboard manufacturer for the installed transformer.**

## 9.5 Checking SF6 pressure; switchboard disposal

The pressure of the insulating medium in the high-voltage switchboard – SF6 should be checked according to its indicator on the switchboard. If the pressure decreases below a defined limit (see technical documentation of the switchboard), stop using the defective switchboard for any switching tasks and have it repaired (replaced).



**If gas leakage is detected, ventilate especially underground parts of the station. SF6 is a suffocating gas and the products of its decomposition are poisonous!!!**

**Switchboards must be disposed of by a specialized company!!!**

## 10 Instructions for maintenance, disposal and environmental impact

According to ČSN EN 50110-1 ed. 3, the operator shall ensure that the proper condition of electrical equipment and means be inspected in relevant time intervals determined by the operator.

The inspection of construction parts (visual inspection to detect any damage, corrosion, leaks, contamination, oil spills, inspection of ventilation and depressurizing elements, doors and locks, proper function) shall be performed by the operator. Also, the operator shall ensure that the areas of the station be clean and dry.

The instructions for operation and maintenance of mounted electrical equipment can be derived from their instructions for attendance – see technical documentation of individual manufacturers.

The instructions for operation and maintenance of the construction part of the station are provided in Appendices C to F to this manual.

The supplied electrical equipment and the entire building of the transformer station can be recycled. Applicable legal regulations must be observed in the course of proper and ecological disposal.

Special attention should be paid to specialized disposal of high-voltage switchboards with SF<sub>6</sub> insulation (greenhouse gas) and oil-cooled transformers (protection of water and soil from oil contamination).

### 10.1 Maintenance of doors and their fittings

Appendix C to ČSN EN 179 applies to maintenance of doors and their fittings. This means that common maintenance of doors and their fittings should be inspected in intervals not longer than 1 month.

In particular, the station manufacturer recommends checking the following during this inspection:

- Inspection of the condition of the door leaves and hinges (no mechanical and functional impairment)
- Inspection of rubber sealing – its position and any damage (may have a negative impact on the lock function)
- Cleanliness of the hinges, sealing elements and locks.

***The lock itself does not require any lubrication and greasing. The lock body must not be opened / demounted!***

Appropriate products (causing no damage to the anodized surface of aluminium parts) must be used for door and lock cleaning. It is not allowed to use any products with abrasive additives!

Also, see Appendix D to this manual.

### 10.2 Maintenance of surfaces

In the course of their regular inspections of the station, the operator shall check the condition of external plasters, external visible coatings, internal coatings and floors.

Measures that may include the following are based on findings of these inspections:

- Cleaning of surfaces
- Repairs (including new overall coatings)

When implementing these measures, it should be proceeded in accordance with recommendations in Appendices C and F to this manual.

If the station is equipped with a contact overcladding system with an external walk-in sill of the entrance door, it is covered with a protective foil to protect its surface during

finishing work. It shall be removed by the customer / operator within 3 months from work acceptance unless agreed otherwise.

### **10.3 Maintenance of the high-voltage switchboard**

According to accompanying technical documentation of the manufacturer.  
In the scope of regular inspections of the station, it is recommended to check whether the screws of cable connection connectors are tightened.

### **10.4 Maintenance of the low-voltage switchboard, USM box**

According to accompanying technical documentation of the manufacturer.  
In the scope of regular inspections of the station, it is recommended to check whether the screws of cable clamps are tightened.

### **10.5 Transformer maintenance**

According to accompanying technical documentation of the manufacturer.  
In the scope of regular inspections of the station, it is recommended to check whether the screws of cable clamps are tightened.

### **10.6 Description of environmental impact**

According to Act No. 100/2001 Coll. on the environmental impact assessment and amending some related acts, as amended by Act No. 93/2004 Coll., the structure and composition of reinforced concrete block transformer stations have no impact on the environment.

Such materials are used to manufacture reinforced concrete block stations which, after application during production, are inert to subsequent weather effects. No emissions are produced with any effect on animals, plants, ecosystems, soil, rock, water, air, climate and the landscape.

### **10.7 Waste categories**

The production of reinforced concrete block transformer stations (used materials) is in accordance with Act No. 541/2020 Coll. Waste produced from the used materials have a catalogue number assigned according to Decree No. 8/2021 Coll.

Specifically, they include waste No. 15 01 03 (wooden waste), 17 04 05 (iron and steel), 17 04 01 (copper, bronze, brass), 17 04 02 (aluminium), 15 01 02 (plastic packaging), 15 01 01 (paper and cardboard packaging), 20 03 01 (mixed municipal

waste), 17 01 01 (concrete), 17 09 04 (mixed construction and demolition waste), 15 01 06 (mixed waste), 20 03 07 (large waste), 20 01 38 (wood).

## 11 Servicing and identification of the station

Any questions or suggestions regarding the assembly, spare parts, complaints or servicing of the manufacturer should be addressed to the responsible person of the business department (contact details can be found in the agreement or at [www.betonbau.cz](http://www.betonbau.cz)) or to the following general contact address of the manufacturer:

Betonbau s.r.o.  
 Průmyslová 698/5a  
 108 00 Praha 10  
 Tel: +420 281 034 111  
 E-mail: [betonbau@betonbau.cz](mailto:betonbau@betonbau.cz)

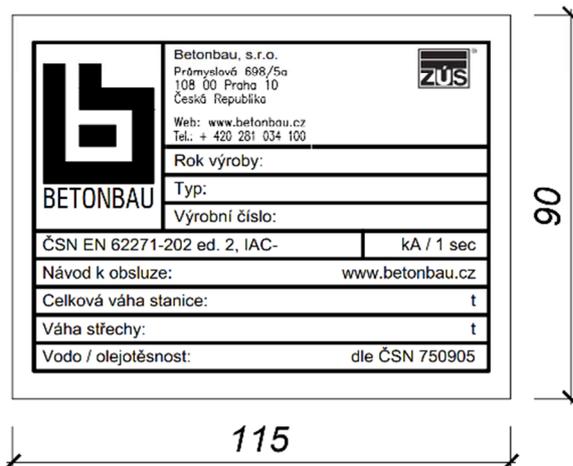
Each station is identified with two plates – the name plate and the rating plate. The name plate is located on the door outside the station and includes this data:

- Production plant
- Production year
- Cell type
- Serial number



The rating plate, located on the door inside the station, includes this data:

- Production plant
- Production year
- Cell type
- Serial number
- Applicable standard
- Arcing fault resistance
- Total station weight (without technology)
- Roof weight
- Impermeability for water / oil



Please, provide identification data of these plates in the event of any questions or if requesting servicing or spare parts.

## Appendix A: Installation instructions for the walk-in station

### **General instructions:**

Before commencing assembly work, it should be checked at each building site whether the undertaken construction measures for the foundation of the station comply with recommendations of the station manufacturer and project documentation. In the event of any deviations of the local foundation conditions from the specified minimum requirements, the foundations may need to be reassessed and/or modified.

Relevant safety regulations for the use of cranes and lifting equipment must be observed during assembly.

The transports to be undertaken, suspensions and transport of loads may only be planned by personnel with appropriate qualifications. Transport anchors embedded in concrete in the transformer station are suitable for use multiple times during assembly, which is understood as a single assembly step. A different type of the transport system must be used for embedding in concrete for any future repeated assembly. This fact should be specified in the inquiry in advance.

Chains, ropes, lifting devices and other parts must comply with locally applicable regulations.

Before using the transport anchor systems embedded in concrete, all load effects must be considered such as, for example, allowed load capacity of the anchors, diagonal and transverse tension, the effect of braces, use of cross beams, and the dynamic coefficient.

A safe and proper function of the transport anchor systems is guaranteed only if consistent threaded systems are used in the anchors and lifting devices as determined by ČBS (Czech Concrete Society) technical rules according to TP06, translated from the German directive VDI/BV-BS 6205. Furthermore, the Machinery Directive 2006/42/EC and the technical report CEN/TR 15728 must be complied with. Only proper anchoring and suspension devices may be used for suspension. Any defective transport anchors and suspension devices, visibly deformed, previously damaged, strongly corroded or with a damaged thread may not be used.

The placement of transport anchors depends on the station type. Please, contact the manufacturer if you have any questions.

Loading and unloading, and transport and assembly (seating) of the station may be done with the roof in position and bolted on only if the transport system is constructed for this purpose. The length of suspension ropes (chains) should be consulted with the manufacturer or with the transport company.

After the assembly, the means used to fix the transformer for station handling and transport activities need to be demounted.

Betonbau provides no guarantee for improper handling during transport or assembly unless these activities are included in its delivery.



*Example of station suspension on the crane*

## **Appendix B: Assembly / disassembly of the tank block roof**

### **General instructions:**

Relevant safety regulations for the use of cranes and lifting devices must be observed during the assembly / disassembly of tank block roofs.

The chains, ropes, lifting devices and other parts must comply with nationally applicable regulations.

The transports to be undertaken, suspensions and transport of loads may only be planned by personnel with appropriate qualifications. Transport anchors embedded in concrete in the roof are suitable for use multiple times during assembly, which is understood as a single assembly step.

Before using the transport anchor systems embedded in concrete, all load effects must be considered such as, for example, allowed load capacity of the anchors, diagonal and transverse tension, the braces, use of cross beams, and the dynamic coefficient.

A safe and proper function of the transport anchor systems is guaranteed only if consistent threaded systems are used in the anchors and lifting devices as determined by ČBS (Czech Concrete Society) technical rules according to TP06, translated from the German directive VDI/BV-BS 6205. Furthermore, the Machinery Directive 2006/42/EC and the technical report CEN/TR 15728 must be complied with.

Only proper anchoring and suspension devices may be used for suspension. Any defective transport anchors and suspension devices, visibly deformed, previously damaged, strongly corroded or with a damaged thread may not be used.

The placement of transport anchors depends on the station type. Please, contact the manufacturer if you have any questions.

Betonbau provides no guarantee for improper handling during transport or assembly unless these activities are included in its delivery.

### **Appendix C: General instructions for station maintenance**

#### **Basic information:**

According to ČSN EN 13306: preventive maintenance means “maintenance performed in predetermined intervals or according to prescribed criteria and is focused on reducing the probability of a failure or degradation of the function of an object”; and an inspection means “conformity assessment by measurement, observation or testing of important characteristics of an object”.

According to Section 167 of Act No. 283/2021 Coll., the “Building Act”, the construction owner is obliged to:

- (a) Perform maintenance of the construction or equipment throughout its existence.

Maintenance is not included in the construction (modular cell) delivery.

Proper and specialized operation is conditioned by maintenance and proper use of the equipment, cells and structures by the operator. These instructions are designed for this purpose. If the buyer is not the operator, the buyer must hand over these instructions to the operator.

Functional failures or damage caused by insufficient maintenance thus are not any defects of the manufacturer. This also applies to damage caused by improper use.

These instructions for the operator – maintenance must be used with respect to the given type of the construction part and also with respect to the period of use envisaged by the operator so as to ensure sustainability, usability and durability. Static conditions of the object (cell) must be taken into account when performing repairs, in particular.

If these instructions recommend replacing a construction product after a certain period of use – in the scope of defined maintenance – such recommendations cannot be a reason for guarantee claims and warranty with respect to such construction products.

As regards the maintenance measures listed herein, it must be verified whether the measures may need to be performed by companies with relevant qualifications or relevant authorizations, respectively.

Occupational safety regulations must be observed and personal protective equipment must be used during maintenance.

### Definitions according to ČSN EN 13306

- **Inspection:**

Conformity assessment by measurement, observation or testing of important characteristics of an object

- **Preventive maintenance:**

Maintenance performed in predetermined intervals or according to prescribed criteria, focused on reducing the probability of a failure or degradation of the function of an object

- **Repair:**

Physical intervention performed in order to regain the required function of an object where a failure has occurred

### Inspection documents and intervals

The below described intervals for inspections or repairs (renovations) are related to normal conditions of use. These intervals must be adapted by the operator to specific conditions, specific impacts on service life and type of use.

Under extraordinary circumstances such as storms, freezing of the object, floods, etc., extraordinary inspections must be carried out.

The above applies to the following essential construction parts and structures that may form part of UF type stations:

- **Tank block roof**
  - Inspection interval (roof slab from the inside / outside, the edges and the spout with the downlead, etc.): 12 months
  - Repair (renovation) interval for external surfaces (architectural concrete): 5–10 years
  - Inspection interval for a location under trees / in the forest: 6 months
- **Outer wall / inner wall structures and floors**
  - Inspection interval: 12 months
  - Repair (renovation) interval for external facade surfaces: 10–20 years
- **Ventilation elements (in walls or doors)**
  - Inspection interval: 12 months
    - Cleaning including: ventilation strips to ensure ventilating and depressurizing functions
- **Intermediate floors**
  - Inspection interval: 12 months
- **Sloping roofs**
  - Inspection interval: 12 months
- **Equipment with instruments for air conditioning / heating / ventilation / sanitation, etc.**
  - **Inspection interval:** see the instrument and equipment documents or 12 months at the minimum

### Appendix D: Assembly, use and maintenance of TAM 3 doors

***Please, read carefully and observe the following information during the assembly, operation and maintenance.***

All necessary measures to ensure operation readiness (e.g. setting of the proper position, function testing, etc.) are usually implemented in doors installed in Betonbau stations. Any lock cylinder of the customer shall be mounted by the customer (operator). Betonbau supplies a universal building lock cylinder with a key for the operation of the manufacturer's locking system before fitting the customer's lock cylinder. The door is arrested in an open position using a mechanical tumbler. When replacing an existing door in a Betonbau station, it should be checked whether the

existing door includes any plate. If so, the plate should be detached and attached to the new door.

### Door position adjustment

This applies to a gap of 7 mm along the entire circumference, between the door leaves and the door case. The position can be adjusted if needed (see Figs. 1 and 2). 13mm wrench is needed for this purpose. The screws should be tightened again after adjusting the door position.



Fig. 1: TAM3 door hinge configuration



Fig. 2: Configuration of fastening screw union of the TAM3 door case

### Maintenance



In order to ensure proper function of the door and its parts in the long term, adequate follow-up measures must be taken, see below.

Maintenance intervals depend on the particular installation place of the station. It is recommended to perform maintenance in the scope of regular maintenance of the station; however, for example, if it is detected that the ventilation elements become heavily obstructed with impurities, the maintenance interval needs to be changed.

Note: The lock body must not be opened! Lubrication (using grease or oil) is not acceptable unless expressly stated otherwise!

Any defects found must be professionally repaired.

### **Regular inspections (Betonbau instructions and recommendations)**

- Check the adjusted position of the door leaves.
- Check the packing rubber in the door leaves in terms of proper position and for any damage. Damaged packing rubber may have a negative impact on the function of the locking system and ingress protection rating (IP code).
- Remove gross impurities from the locking system.
- If the door is equipped with ventilation elements / strips, these must be kept clean to guarantee a proper and sufficient ventilating function.
- Betonbau valves that open under excess pressure (EE06) and that close under excess pressure (EV06) should be checked for proper operation (free movement).

### **Cleaning and other maintenance**

The use of high-strength and weather-resistant materials ensures minimum demands for maintenance. Appropriate cold acting cleansing agents, available on the market, should be used for anodized surfaces. Painted doors should be cleaned with special caution and gently, for example, using detergents or their aqueous solutions for households. Avoid using cleansing agents with abrasive additives!

### **Servicing**

Any questions about the assembly, spare parts, maintenance tasks and warranty complaints should be addressed to Betonbau s.r.o.

Betonbau s.r.o.  
Průmyslová 698/5a  
108 00 Praha 10  
Tel: +420 281 034 111  
E-mail: betonbau@betonbau.cz

### **Appendix E: Station body maintenance**

#### **Outer walls and the bottom of the body**

The following measures need to be taken with respect to maintenance of the facade and of the body including its bottom:

### Inspection

- Inspection of the plaster of facade coat for damage due to weather effects, soiling and wearing
- Visual inspection of the interior and exterior of the body to detect any cracks wider than 0.3 mm, efflorescences and other signs of concrete degradation, and inadequate moisture.

### Preventive maintenance measures

- Facade cleaning: remove any plants, moss, etc. and blast the surface areas with water using a high-pressure washer ("WAP" with adequate pressure and/or using non-aggressive cleansing agents)
- Cleaning inside: remove impurities, brush efflorescences and vacuum clean.

### Repair measures

- Apply bonding plaster using a paint brush or roller
- Apply base paint to the base
- Areas with structured plaster:  
Use a stainless steel trowel to apply plaster to damaged areas in the thickness of the plaster grain, and use a PU scraper to create the plaster structure  
Apply 2 coats of an appropriate facade paint to the entire facade.

## Appendix F: Maintenance of UF station roofs

### Coated attics of the tank block roof of UF stations

The following measures are needed during maintenance of tank block roofs; applicable laws, regulations and rules must be observed due to the risk of falls:

### Inspection

- Inspection of wearing and pollution of the roof coats
- Visual inspection of the interior and exterior of the roof to detect any cracks with the width over 0.3 mm;  
Efflorescences and other signs of concrete degradation, and inadequate moisture.
- Inspection of the function of steel parts used to fasten the roof / wearing / galvanization / corrosion

- Inspection of whether the spout and the download are not obstructed
- And/or undertake maintenance or repair measures.

### Preventive maintenance measures

- External cleaning: remove all moss, lichen and impurities
- Cleaning of the spout and download: remove any obstacles (leaves, conifer needles, etc.)
- Cleaning from the outside: blast the surface areas with water using a high-pressure washer (“WAP” with adequate pressure and/or using non-aggressive cleansing agents)
- Cleaning from the inside: remove impurities, brush efflorescences and vacuum clean dust and impurities
- Rusty steel parts used to fasten the roof should be treated with anticorrosion agents and/or replaced depending on the corrosion level.

### Outside coat repair measures

- Remove any loosened areas of the coat
- Dry (observe appropriate temperature)
- Apply a deep penetrating agent by spraying or painting
- Apply the roof paint once as a primer, diluted 1:1
- Apply two layers of undiluted roof paint.

### Appendix G: Updated list of standards for BETONBAU station assessment

ČSN EN 60038 “CENELEC standard voltages“

ČSN EN 60445 ed.5 “Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors“

ČSN 33 0165, ed.2 + O1 “Identification of conductors by colours or numerals – Procedure provisions“

ČSN EN 60529 + Amendment A1, A2, O1 “Degrees of protection provided by enclosures (IP code)“

ČSN 33 0360, ed.2 “Protective conductor terminals for electric items“

ČSN 33 0600 “Classification of electrical and electronic equipment with regard to against electric shock and protective provisions“

ČSN EN 61140, ed.3 “Protection against electric shock – Common aspects for installations and equipment“

ČSN 33 1500, Z1-Z4 “Inspection and testing of electrical installations“

ČSN 33 2000-1, ed.2 “Low-voltage electrical installations: Fundamental principles, assessment of general characteristics, definitions“

ČSN 33 2000-4-41, ed.3 “Low-voltage electrical installations: Protection for safety – Protection against electric shock“

TNI 33 2000-4-41\_2020 “Low-voltage electrical installations: Protection for safety – Protection against electric shock“ – comments on ČSN 33 2000-4-41 ed.3

ČSN 33 2000-4-42, ed.2 + Z1 “Low-voltage electrical installations – Part 4-42: Protection for safety – Protection against thermal effects“

ČSN 33 2000-4-43, ed.2 “Low-voltage electrical installations – Part 4-43: Protection for safety – Protection against overcurrent“

ČSN 33 2000-4-444 “Low-voltage electrical installations – Part 4-444: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances“

ČSN 33 2000-4-46, ed.3 “Low-voltage electrical installations – Part 4-46: Protection for safety – Isolation and switching“

- ČSN 33 2000-5-51, ed.3 + Z1 "Low-voltage electrical installations: Selection and erection of electrical equipment: common rules"
- TNI 33 2000-5-51/2011 "Low-voltage electrical installations – Selection and erection of electrical equipment – Common rules – External effects, their determination and the external effects determination protocol" – Comments on ČSN 33 2000-5-51 ed.3:2010
- ČSN 33 2000-5-52, ed.2 "Low-voltage electrical installations: Selection and erection of electrical equipment: wiring systems"
- ČSN 33 2000-5-53, ed.2 "Low-voltage electrical installations – Part 5-53: Selection and erection of electrical equipment – Switchgear and controlgear"
- ČSN 33 2000-5-534 ed.2 "Low-voltage electrical installations – Part 5-53: Selection and erection of electrical equipment – Isolation, switching and control – Clause 534: Devices for protection against transient voltages"
- ČSN 33 2000-5-537, ed.2 "Low-voltage electrical installations – Part 5-53: Selection and erection of electrical equipment – Devices for protection, isolation, switching, control and monitoring – Clause 537: Isolation and switching"
- ČSN 33 2000-5-54, ed.3 + Z1 "Low-voltage electrical installations: Selection and erection of electrical equipment – Earthing arrangements and protective conductors"
- ČSN 33 2000-5-559, ed.2 "Low-voltage electrical installations – Part 5-559: Selection and erection of electrical equipment – Luminaires and lighting installations"
- ČSN 33 2000-5-56, ed.3 + O1 "Low-voltage electrical installations – Part 5-56: Selection and erection of electrical equipment – Safety services"
- ČSN 33 2000-5-57 "Low-voltage electrical installations – Part 5-57: Co-ordination of electrical equipment for protection, isolation, switching and control"
- ČSN 33 2000-6, ed.2 + Z1, Z2 "Low-voltage electrical installations – Part 6: Verification"
- TNI 33 2000-6 "Low-voltage electrical installations – Part 6: Verification – comments on ČSN 33 2000-6 ed.2"
- ČSN 33 2000-7-729, ed.2 "Low-voltage electrical installations – Part 7-729: Requirements for special installations or locations – Operating or maintenance gangways"
- ČSN 33 2160, Z1-Z2 "Rules for the protection of telecommunication lines and equipment against dangerous influences of three-phase high voltage, very high voltage and ultra high voltage lines"
- ČSN 33 2180 + Change a "Rules for connection of electrical devices and appliances"
- ČSN 33 2190 "Rules for connection of electrical machinery and drives with electric motors"
- ČSN EN 60909-0, ed.2 "Short-circuit currents in three-phase a.c. systems – Part 0: Calculation of currents"
- ČSN EN 60865-1, ed.2 "Short-circuit currents – Calculation of effects – Part 1: Definitions and calculation methods"
- ČSN EN 61936-1 +A1, O1-O3 "Power installations exceeding 1 kV a.c. – Part 1: Common rules"
- ČSN EN 50522 "Earthing of power installations exceeding 1 kV a.c."
- ČSN EN 50341-1, ed.2 "Overhead electrical lines exceeding 1 kV – Part 1: General requirements – Common specifications"
- ČSN IEC 60840 "Power cables with extruded insulation and their accessories for rated voltages above 30 kV ( $U_m=36$  kV) up to 150 kV ( $U_m=170$  kV) – Test methods and requirements"
- ČSN EN 50 110-1, ed.3 "Operation of electrical installations – Part 1: General requirements" and associated and related standards and regulations
- ČSN EN 50 110-2, ed.2 "Operation of electrical installations" (national amendments)
- TNI 34 3100/2016 "Operation of electrical installations – Comments on ČSN EN 50110-1 ed.3"
- ČSN 34 2300, ed.2 "Regulations for internal distribution networks of communication lines"
- File ČSN EN 60060-1 "High-voltage test techniques – Part 1: General definitions and test requirements"
- File ČSN EN 60422, ed.2 "Mineral insulating oil in electrical equipment – Supervision and maintenance guidance"
- ČSN EN 50565-1 "Electric cables – Guide to use for cables with a rated voltage not exceeding 450V/750V ( $U_0/U$ ) – Part 1: General guidance"
- ČSN 34 7411 "Electric cables of rated voltage 450/750 V with PVC thermoplastic insulation and sheath for fixed installation"
- ČSN EN 61537, ed.2 "Cable management – Cable tray systems and cable ladder systems"

ČSN EN 62208 ed.2 "Empty enclosures for low-voltage switchgear and controlgear assemblies – General requirements"  
ČSN IEC/TR 61439-0 "Low-voltage switchgear and controlgear assemblies, Part 0: Guidance to specifying assemblies"  
ČSN EN 61439-1, ed.2 + O1 "Low-voltage switchgear and controlgear assemblies – Part 1: General rules"  
ČSN EN 61439-2, ed.2 + O1 "Low-voltage switchgear and controlgear assemblies – Part 2: Power switchgear and controlgear assemblies"  
ČSN EN 61439-5, ed.2 "Low-voltage switchgear and controlgear assemblies – Part 5: Switchgear and controlgear assemblies for public distribution lines"  
ČSN EN 50274 + O1 "Low-voltage switchgear and controlgear assemblies – Protection against electric shock – Protection against unintentional direct contact with hazardous live parts"  
ČSN 73 0810/2016 + O1 "Fire protection of buildings – General requirements"  
ČSN 73 0848/2009 + Z1, Z2 "Fire protection of buildings – Cable line"  
ČSN 73 6005/2020 "Space arrangement of conduit of technical equipment"  
ČSN 73 6006/2003 "Warning devices for identification of underground conduction"  
ČSN 83 9061/2006 "Vegetation technology in landscaping – Protection of trees, plantations and vegetation areas during construction work"  
PNE 18 4311, ed.2 "Principles of uniform graphic, literal and colour coding of electrical elements and electrical grid equipment"  
PNE 33 0000-1 ed.6 "Protection against electric shock in distribution systems and in the power transmission system"  
PNE 33 0000-2 ed.6 "Determination of basic characteristics of external effects acting on distribution equipment of the distribution and transmission system"  
PNE 33 0000-3 ed.4 + Z1 "Inspections of electrical equipment of the transmission and distribution system"  
PNE 33 0000-4 ed.4 "Examples of calculations of earthing systems in distribution and transmission systems of the electricity supplier"  
PNE 33 0000-6 ed.3 + Z1-Z3 "Operation of electrical equipment for the production, transmission and distribution of electricity"  
PNE 33 3201 "Electrical stations – Design and construction of electrical stations exceeding 1 kV a.c. for distribution and transmission systems"  
PNE 33 3301 ed.4 + O1 "Overhead electricity lines with voltage exceeding 1 kV a.c. up to 45 kV (incl.)"  
PNE 33 3301-1 "Earthing of high-voltage lines and high-/low-voltage DTS (distribution and transmission systems)"  
PNE 34 1050 ed.3 + Z1 "Low-, high-voltage and 110kV cable laying in power distribution systems"  
PNE 35 7031 "Low-voltage switchgear and controlgear assemblies – Electricity meter switchgear and controlgear assemblies for indirect electricity measurement (ERNM) and related measuring devices at consumption and transfer sites connected from high-voltage and very high-voltage distribution systems"  
PNE 35 7041 "Safety marking of permanent nature, fitted in distribution systems and in the transmission system"  
PNE 35 9700 ed.5 "Dielectric working aids for common use in the distribution and transmission system"  
PNE 38 1981 ed.4 "Personal protective equipment and working aids for electrical stations of distribution systems and of the transmission system"  
PNE 38 2157 ed.2 "Cable channels, floors and shafts"

EP EŠČ 00.01.12 "First aid in electric shock"  
PN KA203 ver.3 "Earthing of switching stations and transformer stations including distribution ones"  
PN KT203 ver.6 "Principles for the design of built-in distribution transformer stations"  
Act No. 22 of 24 January 1997 "on technical requirements for products", as amended  
Decree 48 of 15 April 1982 "Requirements for the safety of work and technical equipment"  
Act No. 90/2016 Coll. "on conformity assessment of specified products when made available on the market"  
Act No. 91/2016 Coll. "on technical requirements for products"

Government Regulation No. 117/2016 Coll. “on conformity assessment of products in terms of electromagnetic compatibility when made available on the market“

Government Regulation No. 118/2016 Coll. “on conformity assessment of electrical equipment intended for use within certain voltage limits when made available on the market“

**Act No. 183/2006 Coll.** “on town and country planning and the building code (the Building Act), as amended“

Act No. 185/2001 Coll. “on waste“, as amended

Government Regulation No. 215/2016 Coll. “on technical requirements for selected construction products“

**Decree No. 237/2002 Coll.** “on details of the method of take-back procedure of certain products“

Decree of the Ministry of Regional Development No. 268/2009 Coll. “on technical requirements for buildings“

Government Regulation No. 362/2005 Coll. “on detailed requirements on the safety and health at work in workplaces with the risk of falling from a height or depth“

Act No. 458/2000 Coll. “on business conditions and public administration in the energy sectors and amending certain laws (**the Energy Act**)“, as amended

Decree of the Ministry of Regional Development No. 499/2006 Coll. “on construction documentation“, as amended by Decree No. 62/2013 Coll.

Government Regulation No. 591/2006 Coll. “on detailed minimum requirements for safety and health during work on construction sites“