



**POLE TRANSFORMER
STATIONS
(TYPES: STSRS-20/630, STN-20/630, STE-20/630)
WITH TRANSFORMERS UP TO 630 kVA
MOUNTED ON SINGLE POLES
MV FUSE BASES**



CERTIFICATES

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CHAPTER 1

STSRs-20/630 pole-mounted transformer stations

1. Subject and scope of the study

- a) The subject of this study is single-pole medium/low-voltage (MV/LV) pole-mounted transformer stations with a target transformer capacity of 630 kVA, supplied on the MV side by either an overhead or cable line, and featuring low-voltage cable outputs. The solutions used facilitate operation and increase the safety of operators, bystanders and the environment. The proposed solutions provide for the installation of a hermetically sealed transformer (without a conservator and air cushion under the cover) with a capacity of up to 630 kVA, as well as the use of currently manufactured equipment and apparatus. The stations meet the requirements of PN-E-05115.
- b) The scope of the developed solutions for the STSRs-20/630 single-pole transformer stations includes:
- transformer stations supplied on the medium-voltage (MV) side by an overhead line;
 - transformer stations supplied on the medium-voltage (MV) side by a cable line;
 - low-voltage connections from the transformer to a free-standing or wall-mounted LV switchboard are made using copper cables selected according to the transformer's maximum power rating;
 - only low-voltage cable circuits routing from the free-standing or wall-mounted LV switchboard.

2. Basic technical data

| | |
|-----------------------------|--|
| MV network nominal voltage: | 15 kV and 20 kV |
| Highest device voltage: | 17.5 kV and 24 kV on MV side and 1.0 kV on LV |
| MV station power supply: | <ul style="list-style-type: none"> - side - bare cables AFL 6 35, 50 and 70 mm² - covered conductors, 50 and 70 mm² - single-core cables with polyethylene insulation and sheath or conventional types |
| Transformer power: | up to 630 kVA - max. weight 2500 kg |
| Pole type: | spun prestressed poles type E with lengths of 8.2 m, 9 m, and 10.5 m and a strength of 10 kN, as well as lengths of 12 m and 13.5 m with strengths of 15, 17.5, 20, and 25 kN |
| Insulation on the MV side: | <ul style="list-style-type: none"> - post insulators LWP 8-24, LWZ 8-24 - suspension insulators LP 60/5U, LP 60/8U, CS70AA20, LP45/U, CS70AA30, H.24.405.E.E, CS 70/515EE, CS 70635 EE, CS70E17E17 - or selected individually |
| Degree of inclination: | 0°, 1°, 2° and 3° |
| Soil type: | medium and weak |
| Foundation type: | prefabricated, manhole with coils |
| Climate zone: | WI, WII - wind load SI, SII, S1a, S1a - ice load |
| Low-voltage LV switchboard: | cable cabinet on a foundation next to the station; wall-mounted LV switchboard at the station |
| Type of energy measurement: | three-system indirect |

3. Solution options and markings

The stations were designed for two main types, depending on the method of supply on the medium-voltage side:

- a) overhead [as an end pole in the overhead line],
- b) cable [as a pole with a cable termination head for the medium-voltage cable line].

The following markings have been adopted to define the type of station:

ad. a

STSRs 20/630 - I - 12/15 - 1 - OP3

| | |
|--|--|
| | <p>Additional equipment:</p> <ul style="list-style-type: none"> - without additional equipment, O - with disconnector or load break switch with earthing switch, P3 - with transformers for three-system energy measurement, OP3 - with a disconnector or load break switch with earthing switch and transformers for three-system energy measurement. |
| | <p>Placement solution for MV surge arresters</p> <ul style="list-style-type: none"> 1 - under the MV fuse bases, 2 - over MV fuse bases. |
| | <p>Pole strength [kN]</p> |
| | <p>Pole length [m]</p> |
| | <p>Option with supply via overhead MV line</p> <ul style="list-style-type: none"> I - on the opposite side of the transformer installation II - on the side of the transformer installation |
| | <p>Single pole transformer station</p> |

ad. b

STSRs 20/630 - KK1 - 10,5/10 - OP3

| | |
|--|---|
| | <p>Additional equipment:</p> <ul style="list-style-type: none"> - without additional equipment, O - with a disconnector or load break switch with earthing switch, P3 - with transformers for three-system energy measurement, - with a disconnector or load break switch with earthing switch and transformers for three-system energy measurement, |
| | <p>Pole strength [kN]</p> |
| | <p>Pole length [m]</p> |
| | <p>Supply via MV cable line KK1 - on an 8.2 m pole KK2 - on a 9 m pole K - on a 10.5 m pole</p> |
| | <p>Single pole transformer station</p> |

4. Scope of application of transformer stations

The transformer stations included in this album are designed to supply rural, urban, residential and industrial consumers from an overhead or cable network of nominal 15 kV or 20 kV medium voltage. The pole of the overhead transformer station acts as an end pole:

a) For bare cables:

- with a crossarm PSts-1 spaced at "b" = 1.2 m for a resultant tension up to 12 kN
- with a crossarm PSts-2 spaced at "b" = 1.8 m for a resultant tension up to 18.75 kN

b) For covered conductors:

- with a crossarm PSts-3 spaced at "b" = 0.7 m for a resultant tension up to 16.62 kN

For bare conductors, depending on the applied tension and line dimensions, the "b" spacing on the pole before the transformer station, the maximum span lengths for the dimensional span are given in Table 1.

For MV overhead lines with covered conductors, the span length before the station should be selected according to the Lysin catalogue published by PTPIREE

The power supply to the cable transformer stations is to be provided via single-core MV cables with cross-linked polyethylene insulation or traditional cables terminated with thermo or cold shrink heads mounted directly on silicone-isolated surge arresters. Cable heads, insulators, surge arresters, switches, and medium-voltage transformers should have appropriately selected creepage distances according to the pollution level at the installation site. The foundations of all station types are selected according to the allowable strength of the poles, as indicated on the catalogue cards.

Table 1.

Allowable span lengths of the dimensional MV overhead line from the station to the first pole (the line dimension "b" on the first pole with a triangular cable arrangement is adopted according to the LSN catalogues published by PTPIREE or STELEN).

| Cable type | Station crossarm type | Type of first MV line pole | Total tension of MV cables [kN] | Dimensional span length Climate zone | | | |
|--------------------------|--------------------------|-----------------------------------|-----------------------------------|---|----------|------|-----|
| | | | | SI | SIa, SII | SIIa | |
| AFL-6 35 mm ² | PSts-1 | P – " acc. to LSN 35(50) volume I | 12 | 118 | 101 | 83 | |
| | | | 10,5 | 108 | 92 | 79 | |
| | | | 8,5 | 95 | 81 | 67 | |
| | | P – " acc. to LSN 35(50) volume I | 12 | 115 | 97 | 80 | |
| | | | 10,5 | 105 | 89 | 74 | |
| | | | 8,5 | 92 | 79 | 65 | |
| AFL-6 50 mm ² | PSts-2 | P – " acc. to LSN 35(50) volume I | 14,5 | 142 | 123 | 104 | |
| | PSts-1 | | 13,65 | 138 | 119 | 100 | |
| | | | 12 | 105 | 91 | 77 | |
| | | | 10,5 | 98 | 84 | 71 | |
| | | | 8,5 | 87 | 75 | 64 | |
| | PSts-2 | P – " acc. to LSN 35(50) volume I | 14,5 | 134 | 116 | 97 | |
| | PSts | | 13,65 | 130 | 112 | 94 | |
| | | | 12 | 101 | 87 | 74 | |
| | | 10,5 | 93 | 81 | 69 | | |
| | | 8,5 | 83 | 72 | 61 | | |
| | AFL-6 70 mm ² | PSts-2 | P – " acc. to LSN 70(50) volume I | 18,75 | 146 | 128 | 110 |
| | | PSts-1 | | 12 | 96 | 85 | 73 |
| 10,5 | | | | 90 | 79 | 68 | |
| 8,5 | | | | 81 | 71 | 61 | |
| PSts-2 | | P – " acc. to LSN 70(50) volume I | 18,75 | 145 | 127 | 109 | |
| PSts-1 | | | 12 | 98 | 86 | 74 | |
| | | | 10,5 | 91 | 80 | 70 | |
| | | | 8,5 | 83 | 72 | 62 | |

5. Surge protection

Surge protection for the line must be implemented in accordance with the Regulation of the Ministry of Mining and Energy and the Ministry of Construction and Building Materials Industry dated March 12, 1969 (Construction Journal No. 6, item 21 of May 23, 1969), as well as the current guidelines "Protection of Power Networks Against Surges" (PTPiREE, 2005). Examples of selecting MV surge arresters for specific network voltages with an isolated neutral point or earth fault current compen-

sation and unknown fault clearing time are presented in Table 2. The selection includes surge arresters with a recommended discharge current of 10 kA, intended for use in pollution zones I, II, and III. For networks with a neutral point grounded through a resistor and a known earth fault clearing time, the selection of surge arresters should be based on the recommendations of individual manufacturers.

Table 2.

MV surge arresters – example of selection

| Rated line voltage U_n [kV] | Highest network voltage U [kV] | Rated voltage of arrester U_r [kV] | Continuous operating voltage of the arrester U_c [kV] | Type | Housing | Manufacturer (distributor) |
|-------------------------------|----------------------------------|--------------------------------------|---|------------|----------|----------------------------|
| 15 | 17,5 | 21 | 24,4 | INZP 21 10 | silicone | ETI-Polam |
| 20 | 24 | 30 | | INZP 30 10 | | |

On the LV side, the transformer is protected by gapless low-voltage surge arresters installed at the transformer's LV terminals. An example of the selection of surge arresters is shown in Table 3.

Table 3.

LV surge arresters – example of selection

| Arrester type | Continuous operating voltage of the network U_c [V] | Rated discharge current 8/20 μ s I_n [kA] | Maximum discharge current 8/20 μ s I_{max} [kA] | Voltage protection level U_p [V] | Manufacturer (distributor) |
|-----------------|---|---|---|------------------------------------|----------------------------|
| ETITEC A 500/5 | 500 | 5 | 10 | 1500 | ETI-Polam |
| ETITEC A 660/5 | 660 | | | 1750 | |
| ETITEC A 500/15 | 500 | 10 | 30 | 1500 | |
| ETITEC A 660/15 | 660 | | | 2000 | |

6. Transformer protection

The basic protection of transformers against the effects of faults and overloads is provided by high-voltage fuse links, with the selection criteria presented in Table 4, and their parameters in Table 5.

The aforementioned fuse links also provide protection for MV transformers installed at stations with indirect energy metering.

Table 4.

Fuse-link selection for transformer protection

| Rated network voltage U_n [kV] | Rated transformer power [kVA] | | | | | Notes |
|----------------------------------|-------------------------------|----------------------|--------------|-------------------------|------------|--|
| | 100 | 160 | 250 | 400 | 630 | |
| | Rated current | | I_n | [A] | | |
| | | of the transformer | I_{nb} | [A] | | |
| | | of the fuse | | | | |
| 15 | 3,9 10÷ 16 | 6,2 16÷20 | 9,6 20÷25 | 15,4 25÷ 31,5 | 24,2 50 | Numbers in bold are the recommended values |
| 20 | 2,9 6÷ 10 | 4,6 10÷ 16 | 7,2 16÷20 | 11,5 25 | 18,2 40 | |

Table 5.
HV fuse links

| Rate current [A] | Dimensions e/d [mm] | Catalogue number | Rated breaking current I_A [kA] | Minimum breaking current I_{min} [A] | Cold resistance R_k [mOhm] | Power loss P_v [W] | Weight [kg] | Manufacturer |
|------------------|---------------------|------------------|-----------------------------------|--|------------------------------|----------------------|-------------|--------------|
| 6,3 | 442/53 | 30 006 13 | 63 | 22 | 546 | 29 | 2,2 | SIBA Poland |
| 10 | | | | 34 | 347 | 52 | | |
| 16 | | | | 56 | 151 | 59 | | |
| 20 | | | | 70 | 83 | 46 | | |
| 25 | | | | 90 | 62 | 56 | | |
| 31,5 | | | | 110 | 52 | 72 | | |
| 40 | | | | 140 | 41 | 106 | | |
| 50 | 442/67 | 30 014 13 | 63 | 170 | 29 | 108 | 2,9 | |
| 63 | | | | 210 | 22 | 132 | | |
| 80 | | | | 280 | 16 | 174 | | |
| 100 | 442/85 | 30 022 13 | 40 | 320 | 13 | 234 | 5,4 | |
| 125 | | | | 390 | 11 | 320 | | |

7. Indirect energy measurement

Indirect energy measurement based on overhead current and MV transformers was solved in a three-system option (P3). Example wiring diagrams and implementation details are shown on page 11.

The parameters of the transformers are shown in Tables 6 and 7. They can be used in pollution zones I, II and III for networks with U_n - 15 and 20 kV.

Table 6.
Current transformer data

| Type | Um/Up/Upp insulation levels | Ipn/Isn transformer | Thermal current 1-s Ith | Dynamic current Idyn | Power Sn | Acc. class | Safety factor | Type of execution | Applic. |
|----------------------------|-----------------------------|---------------------|-------------------------|----------------------|----------|------------|---------------|-------------------|---------|
| | kV/kV/kV | | | | | | | | A/A |
| CTSO 17 or TPO 61.11 | 17,5/38/95 | 5/5 | 2 | 5 | 10 (15) | 0,5 | FS5 | P1-P2 S1-S2 | 15 |
| | | 10/5 | 4 | 10 | | | | | |
| | | 15/5 | 6,3 | 16 | | | | | |
| | | 20/5 | 6,3 | 16 | | | | | |
| | | 25/5 | 6,3 | 16 | | | | | |
| CTSO 25 or TPO 61.11 | 24/50/125 | 5/5 | 2 | 5 | | | | | |
| | | 10/5 | 4 | 10 | | | | | |
| | | 15/5 | 6,3 | 16 | | | | | |
| | | 20/5 | 6,3 | 16 | | | | | |
| CTSO 38 | 36/70/170 | 5/5 | 2 | 5 | | | | | |
| | | 10/5 | 4 | 10 | | | | | |
| | | 15/5 | 6,3 | 16 | | | | | |
| | | 20/5 | 6,3 | 16 | | | | | |
| | | 25/5 | 6,3 | 16 | | | | | |

NOTES:

- Current transformers with a rated power of 15 VA should be ordered for measurements with three induction meters.
- The transformers meet the required accuracy class within the range of 5% to 120% of the rated primary current Ipn.
- The Ith and Idyn current values given in Table 6 are maximum values, considering the current limited by the recommended fuse links selected according to Table 5.

Table 7.
Voltage transformer data

| Type | Insulation levels $U_m/U_p/U_{pp}$ | Transformer U_{nA}/U_{nA} | Power S_n | Acc. class | Type of execution | Application | |
|--------|---------------------------------------|--------------------------------|----------------|---------------------|-------------------|-----------------------------|----------------------------|
| | | | | | | Rated network voltage U_n | Type of measurement system |
| | kV/kV/kV | A/A | VA | | | kV | |
| TJO 6 | 17,5/38/95 | 15: 3/0,1: 3 | 10 (30) | 0,2 or 0,5 (0,5) | A - N a - n | 15 | Three-system P3 |
| | 25/50/125 | 20: 3/0,1: 3 | | | | 20 | |
| VTO 17 | 17,5/38/95 | 15: 3/0,1: 3 | 10 (30) | 0,2 or 0,5 (0,5) | | 15 | |
| VTO 38 | 25/50/125 | 20: 3/0,1: 3 | | | | 20 | |

NOTES:

1. Current transformers with a rated power of 30 VA should be ordered for measurements with induction meters.

Examples of orders for transformers:

- A) Current transformer type: – TPO 61.11 or: – CTSO 17
 – insulation level: – 17,5/38/95 – 17,5/38/95
 – transformer: – 20/5 – 20/5
 – accuracy class: – 0,5 – 0,5
 – instrument safety factor: – FS5 – FS5
 – power: – 10 VA – 10 VA
 – one-second thermal current I_{th1s} : – 6,3 kA – 6,3 kA
 – dynamic current: – 16 kA – 16 kA
 – implementation: – P1-P2/S1-S2 – P1-P2/S1-S2
 (1-core) (1-core)
- B) Voltage transformer type: – TJO 6 or: – VTO 17
 – insulation level: – 17,5/38/95 – 17,5/38/95
 – transformer: – 15:√3/0,1:√3 – 15:√3/0,1:√3
 – accuracy class: – 0,2 – 0,2
 – power: – 10 VA – 10 VA
 – implementation: – A-N/a-n – A-N/a-n
 (1-core) (1-core)

For stations with indirect energy measurement, it is recommended to use a set of current and voltage transformers from a single manufacturer.

The catalogue of pole-mounted transformer stations STSRS – 20/630, Volume V, published by STELEN / ELPROJEKT, includes example connection diagrams for indirect energy measurements with induction meters, operating within a temperature range of -30 °C to +65 °C, and electronic meters with an operating temperature range of -25 °C to +55 °C.

Energy meter cabinets, equipped according to individual requirements, can be mounted directly on the transformer station pole or as a free-standing unit placed near the station in an individual housing or a separate part of the cable cabinet with low-voltage circuits.

8. Steel structures

The steel structures for the element solutions presented in the catalogue are included in a separate volume. All steel components are protected against corrosion by hot-dip galvanizing, in accordance with EN ISO 1461:2011/P Zinc coats applied to steel by immersion (single-dip galvanizing) - Requirements and tests with Z/Zn 70 coating for structures and Z/Zn 52 coating for bolt articles. After the construction has been assembled on site, in aggressive environments, additional painting with protective paint in accordance with EN ISO 12944-S:2001 Paints, lacquers. Corrosion

protection of steel structures with protective paint systems. Part 5: Protective paint systems.

All steel components should be permanently marked with the manufacturer's mark and the symbols adopted in this study. The dimensions of the structure take into account the allowable distances of live parts from the structure and the pole elements in accordance with PN-E-05115:2002. The selection of insulators and accessories and other components not included in this study requires appropriate checking and adaptation.

9. Warning, identification and information signs

Warning, identification, and informational signs must be used in accordance with the requirements of standards PN-E-05100-1 and PN-88-E-08501 "Electrical equipment. Safety signs and plates". In order to comply with the above-mentioned standards, the following tables are provided in this catalogue:

- warning signs (2 pcs.)
- information signs

The location of the aforementioned signs, their selection and their attachment to the poles are shown in the drawings attached in this catalogue. The signs must be made of a material that allows them to be shaped to the type of pole and ensures a lifespan of at least 20 years.

10. Foundation

Before selecting the station foundations, the subsoil should first be assessed based on the principles recommended in the PN-81/B-03020 standard. Methods adopted universally in the construction of medium- and low-voltage power lines involving the determination of values of geotechnical parameters based on practical experience of construction in similar areas, assessed when determining the location of station foundations.

To facilitate the division of soil into medium, weak or very weak, Table 8 shows generalized soil properties. This album includes foundation designs for poles on medium and weak soils. In the case of very weak soils, the foundation of the station is to be designed individually.

Table 8.

Generalized soil properties

| Soil type and condition | | Generalized soil properties | | | | |
|-------------------------|---|-----------------------------|---------------------------|---------------------------------|------------------------|-------|
| | | ψ | c' kN/m ² | γ_0 kN/m ³ | C kN/m ³ | μ |
| Medium soil | Deposits, rubble, gravels, sandy gravels, dense and medium dense coarse sands, dense fine sands. | 37 | 0 | 18,5 | 40000 | 0,55 |
| | Silts, clays, stiff clays, silty soils, clayey gravels, gravel-sand mixtures, and semi-compacted to stiff-plastic sands | 20 | 25 | 20,0 | 40000 | 0,25 |
| Weak soil | Deposits, rubble, gravels, sandy gravels, coarse sands, loose fine sands, and medium-dense silty sands. | 32 | 0 | 17,5 | 25000 | 0,45 |
| | Silts, clays, firm clays, silty soils, clayey gravels, gravel-sand mixtures, and plastic clayey sands. | 15 | 20 | 19,0 | 25000 | 0,30 |
| Very weak soil | Fine and silty sands, loose, and humus-bearing sands of medium density. | 25 | 0 | 15,0 | 10000 | 0,35 |
| | Silts, clays, firm clays, silty clays, clayey gravels, gravel-sand mixtures, and soft-plastic clayey sands. | 10 | 5 | 18,0 | 5000 | 0,10 |

ψ – internal friction angle (in degrees), c' - effective cohesion, γ_0 – bulk unit weight (or unit weight of soil), C – subgrade reaction modulus, μ – coefficient of friction between soil and concrete foundation

Foundation calculations were carried out using the limit state method based on the PN-80/B-03322 standard, assuming generalized soil properties as specified in Table 8.

The designs of the pole foundations, including technical specifications, excavation volumes, and bills of materials necessary for their construction, are presented in this study on the catalogue sheets of the associated elements.

Protection of steel and concrete elements of the station founda-

tions against harmful effects shall be carried out in accordance with the PN-E-05100-1:1998 standard, clause 7.6.

Steel components and their connections in the underground part of the pole must be additionally protected against corrosion with varnish or asphalt compound. The underground concrete parts of the pole foundation should only be protected against damaging influences in very aggressive soil and the type of protection should be selected according to the risk involved.

11. Environmental protection

a) Disposal:

The station is made of elements intended for disposal after the end of their service life.

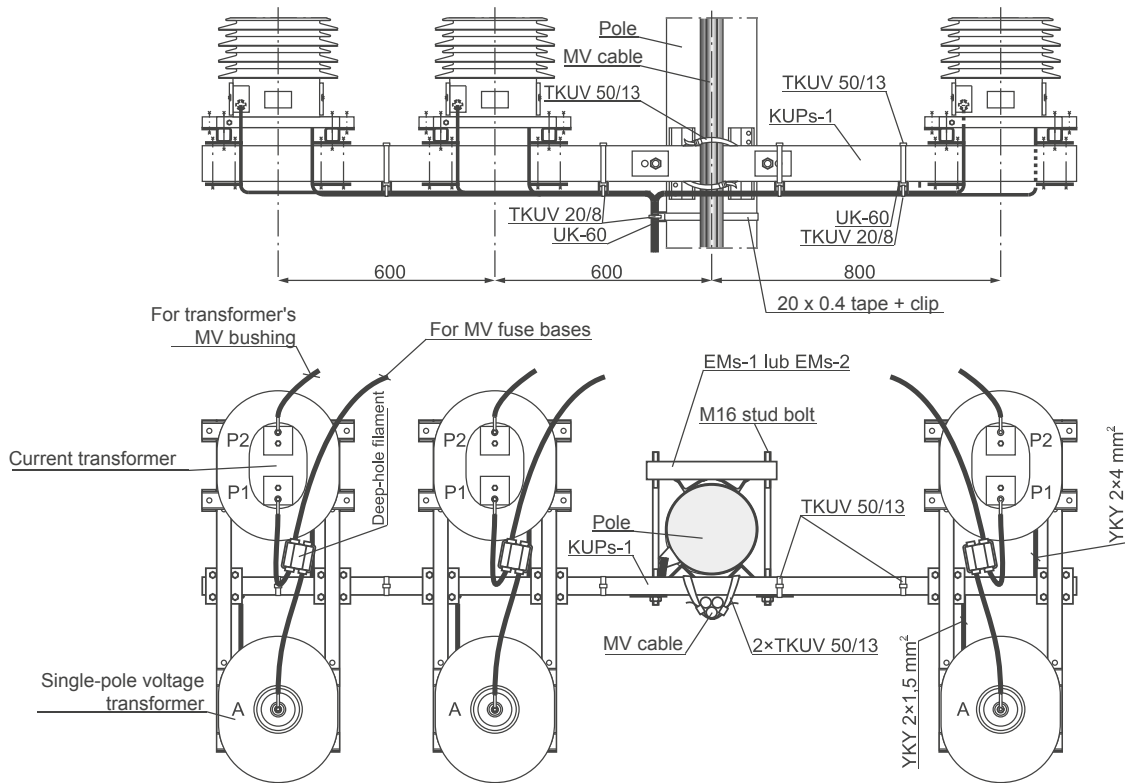
b) Oil leakage protection:

Current hermetic transformers with an output of 630 kVA and an upper voltage of 21 kV contain approximately 340 to 450 litres of oil, the danger of which is negligible due to their design and build quality.

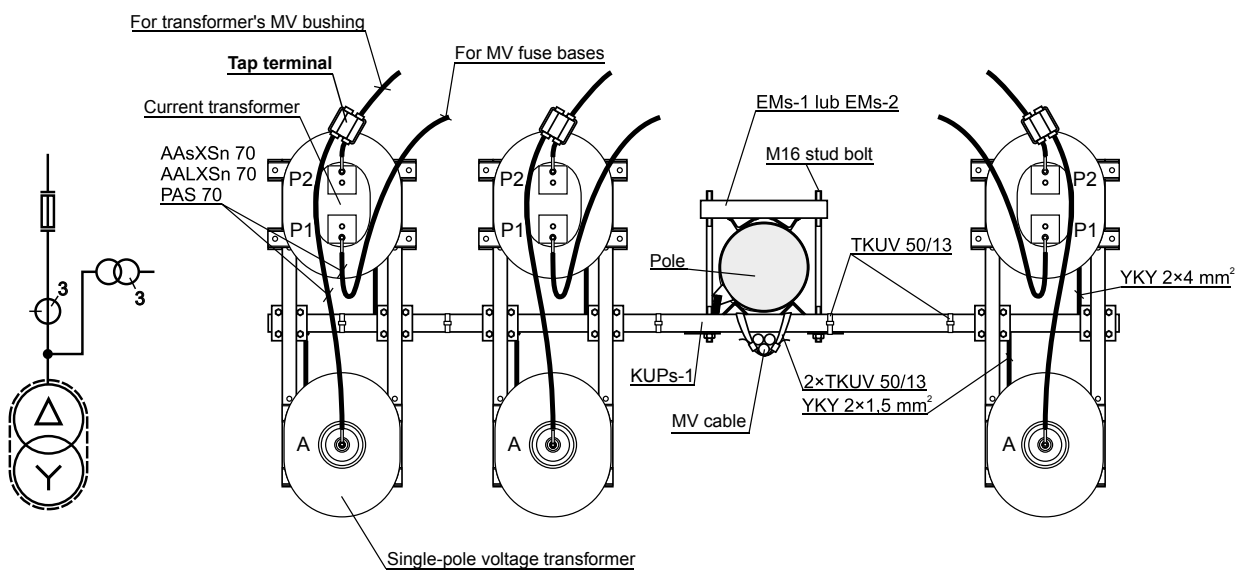
According to the PN-E-05115:2002 standard, clause 7.7.1, an oil containment basin is not required in overhead installations if the amount of oil in a single transformer is less than 1000 litres. However, it is recommended to provide a gravel bedding 20 cm thick on a 5 cm layer of compacted sand, with dimensions of 2 x 2 meters, designed to be replaced in case of a potential oil leak. The above shall not apply where local regulations provide otherwise. In such cases, according to clause 7.7.1.2 of the aforementioned standard, the oil containment basin must be individually designed, taking into account rainwater drainage and its separation from the oil.

12. Details of current and voltage transformer installation

For three-system energy measurement (P3)



Alternative connection of voltage transformers



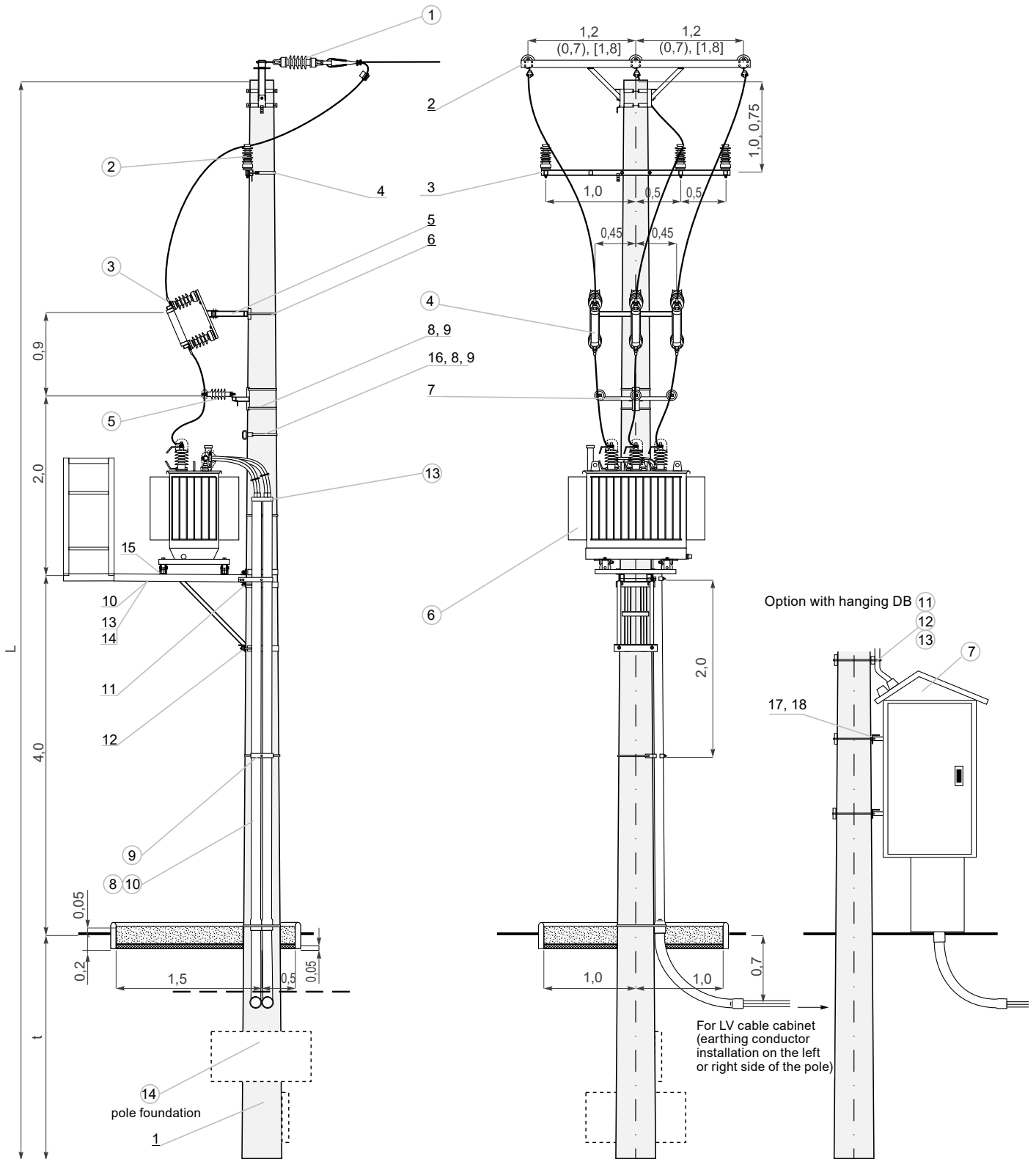
13. Station solutions

List of structures, accessories, apparatus for STSRs-20/630-I-.../...-1

| STRUCTURES | | | | | | |
|------------|---|----------------------------|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m |
| 2. | Station crossarm | PSts-1 PSts-2 PSts-3 | 1 | pcs. | ALPAR | PSts-1 to poles ≤ 15 kN for AFL PSts-2 to poles $\geq 17,5$ kN to AFL PSts-3 for PAS |
| 3. | Structure for surge arresters | KIs-9 | 1 | pcs. | ALPAR | – |
| 4. | Bracket | OB-34 | 1 | pcs. | ALPAR | For rod with top diameter = 263 mm |
| 5. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | – |
| 6. | Mounting bolts | M16x380+N+Po+Ps | 2 | set | ALPAR | For rod with top diameter = 263 mm |
| 7. | Attachment element for MV arresters | EO-22 | 1 | pcs. | ALPAR | – |
| 8. | Fastening tape | T207 | 5,5 | m | ALPAR | Sample quantities |
| 9. | Tape buckle | K207 | 4 | pcs. | ALPAR | Sample quantities |
| 10. | Transformer platform | PTrs-630 | 1 | pcs. | ALPAR | – |
| 11. | Transformer platform bracket | OPs-163 OPs-164 | 2 | pcs. | ALPAR | For poles E-12/... For poles E-13.5/... |
| 12. | Transformer platform bracket | OPs-203 OPs-204 | 1 | pcs. | ALPAR | For poles E-12/... For poles E-13.5/... |
| 13. | Transformer platform component | EPOs-1 | 1 | pcs. | ALPAR | Do not use with simplified stations |
| 14. | Transformer platform handrail | PPOs-1 | 1 | pcs. | ALPAR | |
| 15. | Element for attaching the transformer to the platform | EZTs-1 | 2 | pcs. | ALPAR | – |
| 16. | Fitter's safety element | EZs-1 | 1 | pcs. | ALPAR | – |
| 17. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Do not use with free-standing switchboard |
| 18. | Bracket | OB-12 | 2 | pcs. | ALPAR | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|------------------------------------|---|----------|------|------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 3 | set | ... / ALPAR | Single / double for bare line Single / double for PAS line |
| 2. | Supporting insulator | LWP-8/24 LWP-8/24S SGT 24-1/LS | 3 | pcs. | ALPAR | Porcelain for bare line Porcelain for PAS line Composite for bare and PAS line |
| 3. | Fuse base | PBNWMA-24/50 | 3 | pcs. | ALPAR | – |
| 4. | Fuse link | HH ... A 10/24 kV "e"=442 mm "e"=292 mm | 3 | pcs. | SIBA / ALPAR | The value of the insert amperage shall be determined by an authorised designer |
| 5. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 6. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 7. | LV switchboard | RS-... | 1 | pcs. | ALPAR | Hanging or free-standing |
| 8. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 9. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 10. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | Use when using a wall-mounted switchboard at the station |
| 11. | Protective tube | RW-1 | 1 | kpl | ... / ALPAR | |
| 12. | Conduit clamp | U110W | 2 | pcs. | ALPAR | Use when using a wall-mounted switchboard at the station |
| 13. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 14. | Foundation support structure set | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

STSR5-20/630-I-.../...-1



List of structures, accessories, apparatus for STSRs-20/630-I-.../...-2

| STRUCTURES | | | | | | |
|------------|---|----------------------------|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m |
| 2. | Station crossarm | PSts-1 PSts-2 PSts-3 | 1 | pcs. | ALPAR | PSts-1 to poles ≤ 15 kN for AFL PSts-2 to poles $\geq 17,5$ kN to AFL PSts-3 for PAS |
| 3. | Structure for surge arresters | KIs-9 | 1 | pcs. | ALPAR | Use square washers and M12x100 bolts 3 pcs. each to fasten the arresters |
| 4. | Bracket | OB-34 | 1 | pcs. | ALPAR | For rod with top diameter = 263 mm |
| 5. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | – |
| 6. | Mounting bolts | M16x380+N+Po+Ps | 2 | set | ALPAR | For rod with top diameter = 263 mm |
| 7. | Fastening tape | T207 | 5,5 | m | ALPAR | Sample quantities |
| 8. | Tape buckle | K207 | 4 | pcs. | ALPAR | Sample quantities |
| 9. | Transformer platform | PTrs-630 | 1 | pcs. | ALPAR | – |
| 10. | Transformer platform bracket | OPs-163 OPs-164 | 2 | pcs. | ALPAR | For poles E-12/... For poles E-13.5/... |
| 11. | Transformer platform bracket | OPs-203 OPs-204 | 1 | pcs. | ALPAR | For poles E-12/... For poles E-13.5/... |
| 12. | Transformer platform component | EPOs-1 | 1 | pcs. | ALPAR | Do not use with simplified stations |
| 13. | Transformer platform handrail | PPOs-1 | 1 | pcs. | ALPAR | |
| 14. | Element for attaching the transformer to the platform | EZTs-1 | 2 | pcs. | ALPAR | – |
| 15. | Fitter's safety element | EZs-1 | 1 | pcs. | ALPAR | – |
| 16. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Do not use with free-standing switchboard |
| 17. | Bracket | OB-12 | 2 | pcs. | ALPAR | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|------------------------------------|---|----------|------|------------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Insulator string | tO/1 tO2/1 tO/2 tO2/2 | 3 | set | ... / ALPAR | Single / double for bare line Single / double for PAS line |
| 2. | Fuse base | PBNWMA-24/50 | 3 | pcs. | ALPAR | – |
| 3. | Fuse link | HH ... A 10/24 kV "e"=442 mm "e"=292 mm | 3 | pcs. | SIBA / ALPAR | The value of the insert amperage shall be determined by an authorised designer |
| 4. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 5. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 6. | LV switchboard | RS-... | 1 | pcs. | ALPAR | Hanging or free-standing |
| 7. | Protective tube | BET10 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 8. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 9. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 10. | Protective tube | RW-1 | 1 | kpl | ... / ALPAR | Use when using a wall-mounted switchboard at the station |
| 11. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 12. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 13. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

List of structures, accessories, apparatus for STSRs-20/630-II-.../...-1

| STRUCTURES | | | | | | |
|------------|---|----------------------------|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m |
| 2. | Station crossarm | PSts-1 PSts-2 PSts-3 | 1 | pcs. | ALPAR | PSts-1 to poles ≤ 15 kN for AFL PSts-2 to poles $\geq 17,5$ kN to AFL PSts-3 for PAS |
| 3. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | – |
| 4. | Mounting bolts | M16x380+N+Po+Ps | 2 | set | ALPAR | For rod with top diameter = 263 mm |
| 5. | Attachment element for MV arresters | EO-22 | 1 | pcs. | ALPAR | – |
| 6. | Fastening tape | T207 | 5,5 | m | ALPAR | Sample quantities |
| 7. | Tape buckle | K207 | 4 | pcs. | ALPAR | Sample quantities |
| 8. | Transformer platform | PTrs-630 | 1 | pcs. | ALPAR | – |
| 9. | Transformer platform bracket | OPs-163 OPs-164 | 2 | pcs. | ALPAR | For poles E-12/... For poles E-13.5/... |
| 10. | Transformer platform bracket | OPs-203 OPs-204 | 1 | pcs. | ALPAR | For poles E-12/... For poles E-13.5/... |
| 11. | Transformer platform component | EPOs-1 | 1 | pcs. | ALPAR | Do not use with simplified stations |
| 12. | Transformer platform handrail | PPOs-1 | 1 | pcs. | ALPAR | |
| 13. | Element for attaching the transformer to the platform | EZTs-1 | 2 | pcs. | ALPAR | – |
| 14. | Fitter's safety element | EZs-1 | 1 | pcs. | ALPAR | – |
| 15. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Do not use with free-standing switchboard |
| 16. | Bracket | OB-12 | 2 | pcs. | ALPAR | |

| APPARATUS AND ACCESORIES | | | | | | |
|--------------------------|------------------------------------|---|----------|------|------------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 3 | set | ... / ALPAR | Single / double for bare line Single / double for PAS line |
| 2. | Fuse base | PBNWMA-24/50 | 3 | pcs. | ALPAR | – |
| 3. | Fuse link | HH ... A 10/24 kV "e"=442 mm "e"=292 mm | 3 | pcs. | SIBA / ALPAR | The value of the insert amperage shall be determined by an authorised designer |
| 4. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 5. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 6. | LV switchboard | RS-... | 1 | pcs. | ALPAR | Hanging or free-standing |
| 7. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 8. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 9. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 10. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use when using a wall-mounted switchboard at the station |
| 11. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 12. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 13. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

List of structures, accessories, apparatus for STSRs-20/630-II-.../...-2

| STRUCTURES | | | | | | |
|------------|---|----------------------------|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m |
| 2. | Station crossarm | PSts-1 PSts-2 PSts-3 | 1 | pcs. | ALPAR | PSts-1 to poles ≤ 15 kN for AFL PSts-2 to poles $\geq 17,5$ kN to AFL PSts-3 for PAS |
| 3. | Structure for surge arresters | KIs-10 | 1 | pcs. | ALPAR | Use square washers and M12x100 bolts 3 pcs. each to fasten the arresters |
| 4. | Bracket | OB-34 | 1 | pcs. | ALPAR | For rod with top diameter = 263 mm |
| 5. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | – |
| 6. | Mounting bolts | M16x380+N+Po+Ps | 2 | set | ALPAR | For rod with top diameter = 263 |
| 7. | Fastening tape | T207 | 5,5 | m | ALPAR | Sample quantities |
| 8. | Tape buckle | K207 | 4 | pcs. | ALPAR | Sample quantities |
| 9. | Transformer platform | PTrs-630 | 1 | pcs. | ALPAR | – |
| 10. | Transformer platform bracket | OPs-163 OPs-164 | 2 | pcs. | ALPAR | For poles E-12/... For poles E-13.5/... |
| 11. | Transformer platform bracket | OPs-203 OPs-204 | 1 | pcs. | ALPAR | For poles E-12/... For poles E-13.5/... |
| 12. | Transformer platform component | EPOs-1 | 1 | pcs. | ALPAR | Do not use with simplified stations |
| 13. | Transformer platform handrail | PPOs-1 | 1 | pcs. | ALPAR | |
| 14. | Element for attaching the transformer to the platform | EZTs-1 | 2 | pcs. | ALPAR | – |
| 15. | Fitter's safety element | EZs-1 | 1 | pcs. | ALPAR | – |
| 16. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Do not use with free-standing switchboard |
| 17. | Bracket | OB-12 | 2 | pcs. | ALPAR | |

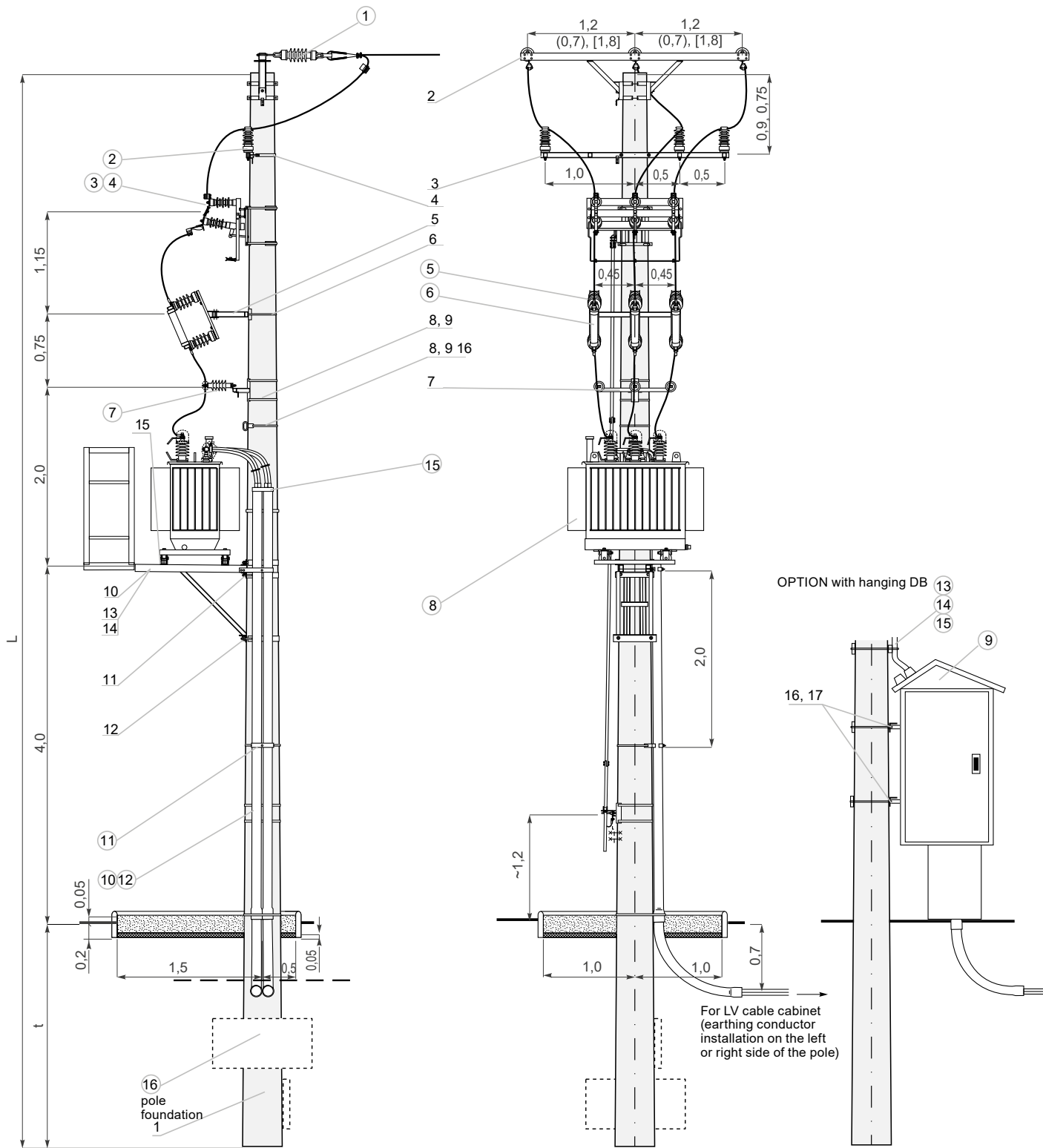
| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|------------------------------------|---|----------|------|------------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 3 | set | ... / ALPAR | Single / double for bare line Single / double for PAS line |
| 2. | Fuse base | PBNWMA-24/50 | 3 | pcs. | ALPAR | – |
| 3. | Fuse link | HH ... A 10/24 kV "e"=442 mm "e"=292 mm | 3 | pcs. | SIBA / ALPAR | The value of the insert amperage shall be determined by an authorised designer |
| 4. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 5. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 6. | LV switchboard | RS-... | 1 | pcs. | ALPAR | Hanging or free-standing |
| 7. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 8. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 9. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 10. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use when using a wall-mounted switchboard at the station |
| 11. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 12. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 13. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

List of structures, accessories, apparatus for STSRs-20/630-I-.../...-1-O

| STRUCTURES | | | | | | |
|------------|---|----------------------------|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m |
| 2. | Station crossarm | PSts-1 PSts-2 PSts-3 | 1 | pcs. | ALPAR | PSts-1 to poles ≤ 15 kN for AFL PSts-2 to poles $\geq 17,5$ kN to AFL PSts-3 for PAS |
| 3. | Structure for insulators | KIs-9 | 1 | pcs. | ALPAR | – |
| 4. | Bracket | OB-34 | 1 | pcs. | ALPAR | For rod with top diameter = 263 mm |
| 5. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | – |
| 6. | Mounting bolts | M16x380+N+Po+Ps | 2 | set | ALPAR | For rod with top diameter = 263 mm |
| 7. | Attachment element for MV arresters | EO-22 | 1 | pcs. | ALPAR | – |
| 8. | Fastening tape | T207 | 5,5 | m | ALPAR | Sample quantities |
| 9. | Tape buckle | K207 | 4 | pcs. | ALPAR | Sample quantities |
| 10. | Transformer platform | PTrs-630 | 1 | pcs. | ALPAR | – |
| 11. | Transformer platform bracket | OPs-163 OPs-164 | 2 | pcs. | ALPAR | For poles E-12/... For poles E-13.5/... |
| 12. | Transformer platform bracket | OPs-203 OPs-204 | 1 | pcs. | ALPAR | For poles E-12/... For poles E-13.5/... |
| 13. | Transformer platform component | EPOs-1 | 1 | pcs. | ALPAR | Do not use with simplified stations |
| 14. | Transformer platform handrail | PPOs-1 | 1 | pcs. | ALPAR | |
| 15. | Element for attaching the transformer to the platform | EZTs-1 | 2 | pcs. | ALPAR | – |
| 16. | Fitter's safety element | EZs-1 | 1 | pcs. | ALPAR | – |
| 17. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Do not use with free-standing switchboard |
| 18. | Bracket | OB-12 | 2 | pcs. | ALPAR | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|--|--|----------|------|------------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 3 | set | ... / ALPAR | Single / double for bare line Single / double for PAS line |
| 2. | Supporting insulator | LWP-8/24 LWP-8/24S SGT 24-1/LS | 3 | pcs. | ALPAR | Porcelain for bare line Porcelain for PAS line Composite for bare and PAS line |
| 3. | Disconnecter Disconnecter with earthing switch Load break switch Load break switch with earthing switch | ONp III SA 24/4 OUNp III SA 24/4 RNp III SA 24/4 RUNp III SA 24/4 | 1 | pcs. | ALPAR | Vertical-frame switches with insulation: porcelain, composite, silicone |
| 4. | Manual drive | NRA E-12 w.II/M NRAu E-12 w.II/M | 1 | set | ALPAR | For switch disconnecter without earthing switch For switch disconnecter with earthing switch |
| 5. | Fuse base | PBNWMA-24/50 | 3 | pcs. | ALPAR | – |
| 6. | Fuse link | HH ... A 10/24 kV "e"=442 mm "e"=292 mm | 3 | pcs. | SIBA / ALPAR | The value of the insert amperage shall be determined by an authorised designer |
| 7. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 8. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 9. | LV switchboard | RS-... | 1 | pcs. | ALPAR | Hanging or free-standing |
| 10. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 11. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 12. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 13. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use when using a wall-mounted switchboard at the station |
| 14. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 15. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 16. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

STSR5-20/630-I-.../...-1-O

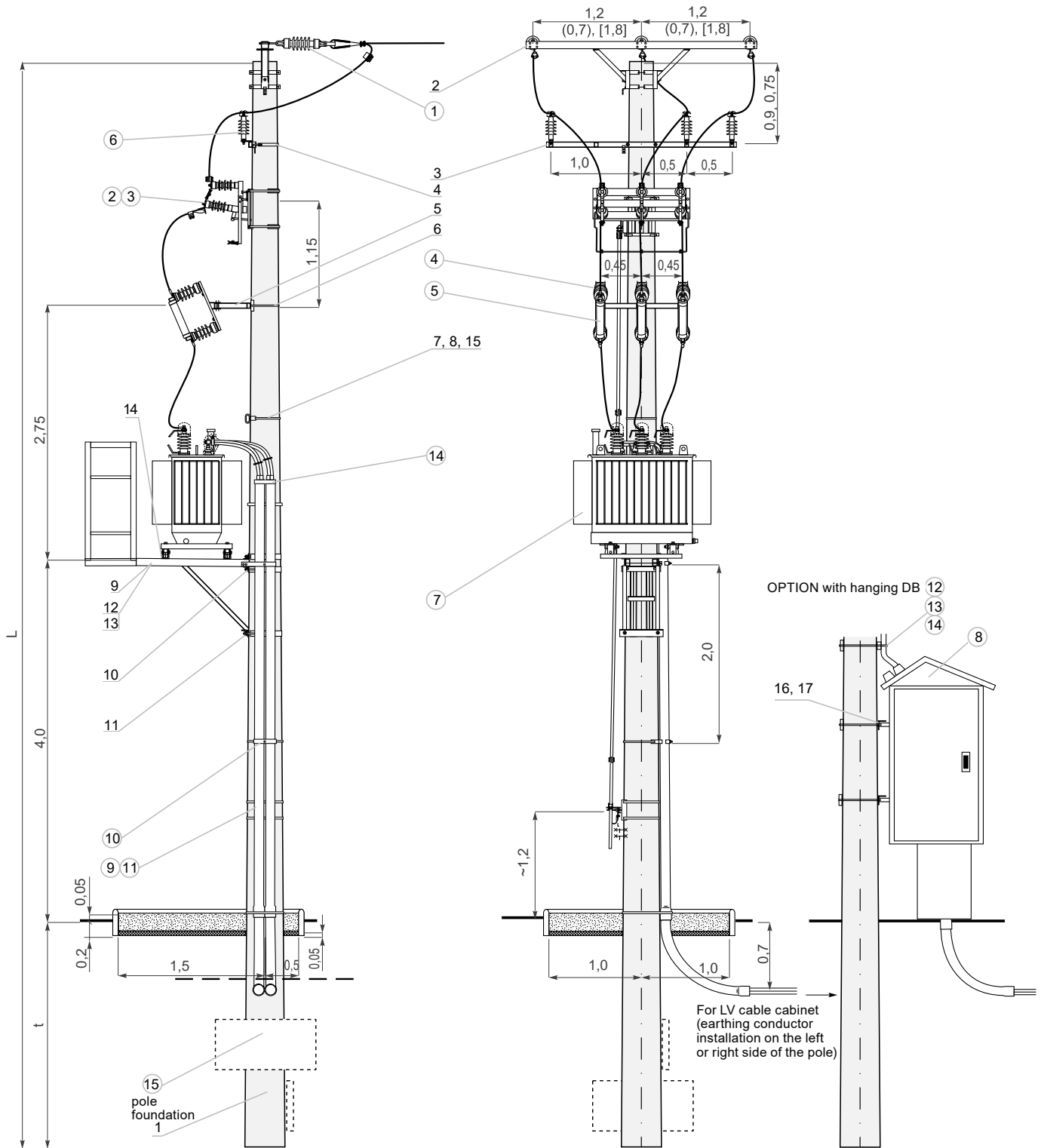


List of structures, accessories, apparatus for STSRs-20/630-1-.../...-2-O

| STRUCTURES | | | | | | |
|------------|---|----------------------------|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m |
| 2. | Station crossarm | PSts-1 PSts-2 PSts-3 | 1 | pcs. | ALPAR | PSts-1 to poles ≤ 15 kN for AFL PSts-2 to poles $\geq 17,5$ kN to AFL PSts-3 for PAS |
| 3. | Structure for surge arresters | KIs-9 | 1 | pcs. | ALPAR | Use square washers and M12x100 bolts 3 pcs. each to fasten the arresters |
| 4. | Bracket | OB-34 | 1 | pcs. | ALPAR | For rod with top diameter = 263 mm |
| 5. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | - |
| 6. | Mounting bolts | M16x380+N+Po+Ps | 2 | set | ALPAR | For rod with top diameter = 263 mm |
| 7. | Fastening tape | T207 | 5,5 | m | ALPAR | Sample quantities |
| 8. | Tape buckle | K207 | 4 | pcs. | ALPAR | Sample quantities |
| 9. | Transformer platform | PTrs-630 | 1 | pcs. | ALPAR | - |
| 10. | Transformer platform bracket | OPs-163 OPs-164 | 2 | pcs. | ALPAR | For poles E-12/... For poles E-13,5/... |
| 11. | Transformer platform bracket | OPs-203 OPs-204 | 1 | pcs. | ALPAR | For poles E-12/... For poles E-13,5/... |
| 12. | Transformer platform component | EPOs-1 | 1 | pcs. | ALPAR | Do not use with simplified stations |
| 13. | Transformer platform handrail | PPOs-1 | 1 | pcs. | ALPAR | |
| 14. | Element for attaching the transformer to the platform | EZTs-1 | 2 | pcs. | ALPAR | - |
| 15. | Fitter's safety element | EZs-1 | 1 | pcs. | ALPAR | - |
| 16. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Do not use with free-standing switchboard |
| 17. | Bracket | OB-12 | 2 | pcs. | ALPAR | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|--|--|----------|------|------------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 3 | set | ... / ALPAR | Single / double for bare line Single / double for PAS line |
| 2. | Disconnecter Disconnecter with earthing switch Load break switch Load break switch with earthing switch | ONp III SA 24/4 OUNp III SA 24/4 RNp III SA 24/4 RUNp III SA 24/4 | 1 | pcs. | ALPAR | Vertical-frame switches with insulation: porcelain, composite, silicone |
| 3. | Manual drive | NRA E-12 w.II/M NRAu E-12 w.II/M | 1 | set | ALPAR | For switch without earthing switch For switch with earthing switch |
| 4. | Fuse base | PBNWMA-24/50 | 3 | pcs. | ALPAR | - |
| 5. | Fuse link | HH ... A 10/24 kV "e"=442 mm "e"=292 mm | 3 | pcs. | SIBA / ALPAR | The value of the insert amperage shall be determined by an authorised designer |
| 6. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 7. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 8. | LV switchboard | RS-... | 1 | pcs. | ALPAR | Hanging or free-standing |
| 9. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 10. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 11. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 12. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use when using a wall-mounted switchboard at the station |
| 13. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 14. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 15. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

STSR5-20/630-I-.../...-2-O

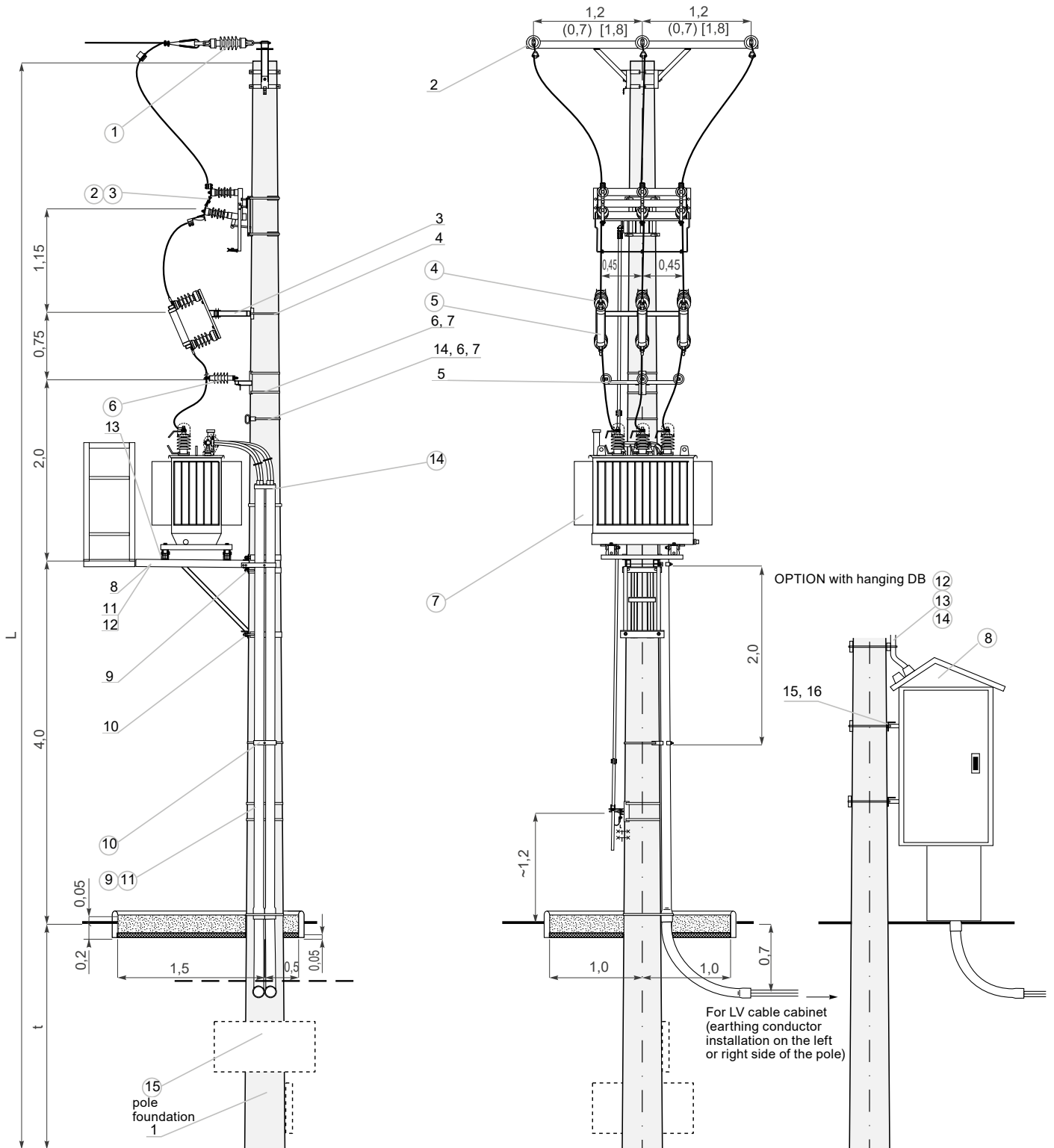


List of structures, accessories, apparatus for STSRs-20/630-II-.../...-1-0

| STRUCTURES | | | | | | |
|------------|---|----------------------------|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m |
| 2. | Station crossarm | PSts-1 PSts-2 PSts-3 | 1 | pcs. | ALPAR | PSts-1 to poles ≤ 15 kN for AFL PSts-2 to poles $\geq 17,5$ kN to AFL PSts-3 for PAS |
| 3. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | – |
| 4. | Mounting bolts | M16x380+N+Po+Ps | 2 | set | ALPAR | For rod with top diameter = 263 mm |
| 5. | Attachment element for MV arresters | EO-22 | 1 | pcs. | ALPAR | – |
| 6. | Fastening tape | T207 | 5,5 | m | ALPAR | Sample quantities |
| 7. | Tape buckle | K207 | 4 | pcs. | ALPAR | Sample quantities |
| 8. | Transformer platform | PTrs-630 | 1 | pcs. | ALPAR | – |
| 9. | Transformer platform bracket | OPs-163 OPs-164 | 2 | pcs. | ALPAR | For poles E-12/... For poles E-13,5/... |
| 10. | Transformer platform bracket | OPs-203 OPs-204 | 1 | pcs. | ALPAR | For poles E-12/... For poles E-13,5/... |
| 11. | Transformer platform component | EPOs-1 | 1 | pcs. | ALPAR | Do not use with simplified stations |
| 12. | Transformer platform handrail | PPOs-1 | 1 | pcs. | ALPAR | |
| 13. | Element for attaching the transformer to the platform | EZTs-1 | 2 | pcs. | ALPAR | – |
| 14. | Fitter's safety element | EZs-1 | 1 | pcs. | ALPAR | – |
| 15. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Do not use with free-standing switchboard |
| 16. | Bracket | OB-12 | 2 | pcs. | ALPAR | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|--|--|----------|------|------------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 3 | set | ... / ALPAR | Single / double for bare line Single / double for PAS line |
| 2. | Disconnecter Disconnecter with earthing switch Load break switch Load break switch with earthing switch | ONp III SA 24/4 OUNp III SA 24/4 RNp III SA 24/4 RUNp III SA 24/4 | 1 | pcs. | ALPAR | Vertical-frame switches with insulation: porcelain, composite, silicone |
| 3. | Manual drive | NRA E-12 w.II/M NRAu E-12 w.II/M | 1 | set | ALPAR | For switch without earthing switch For switch with earthing switch |
| 4. | Fuse base | PBNWMA-24/50 | 3 | pcs. | ALPAR | – |
| 5. | Fuse link | HH ... A 10/24 kV "e"=442 mm "e"=292 mm | 3 | pcs. | SIBA / ALPAR | The value of the insert amperage shall be determined by an authorised designer |
| 6. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 7. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 8. | LV switchboard | RS-... | 1 | pcs. | ALPAR | Hanging or free-standing |
| 9. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 10. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 11. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 12. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use when using a wall-mounted switchboard at the station |
| 13. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 14. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 15. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

STSRs-20/630-II-.../...-1-O

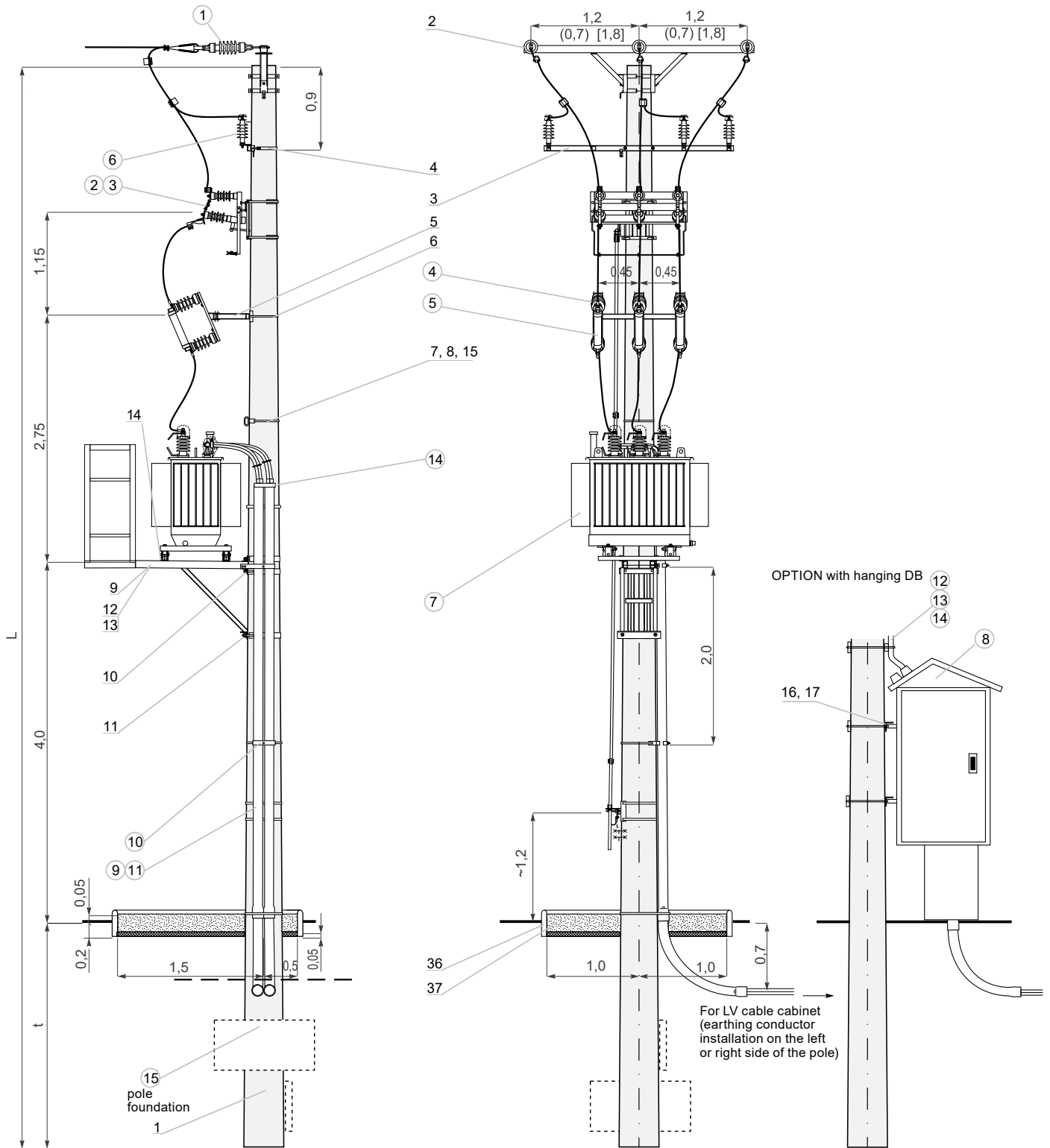


List of structures, accessories, apparatus for STSRs-20/630-II-.../...-2-O

| STRUCTURES | | | | | | |
|------------|---|----------------------------|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m |
| 2. | Station crossarm | PSts-1 PSts-2 PSts-3 | 1 | pcs. | ALPAR | PSts-1 to poles ≤ 15 kN for AFL PSts-2 to poles $\geq 17,5$ kN to AFL PSts-3 for PAS |
| 3. | Structure for surge arresters | KIs-9 | 1 | pcs. | ALPAR | Use square washers and M12x100 bolts 3 pcs. each to fasten the arresters |
| 4. | Bracket | OB-34 | 1 | pcs. | ALPAR | For poles top diameter = 263 mm |
| 5. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | – |
| 6. | Mounting bolts | M16x380+N+Po+Ps | 2 | set | ALPAR | For rod with top diameter = 263 mm |
| 7. | Fastening tape | T207 | 5,5 | m | ALPAR | Sample quantities |
| 8. | Tape buckle | K207 | 4 | pcs. | ALPAR | Sample quantities |
| 9. | Transformer platform | PTrs-630 | 1 | pcs. | ALPAR | – |
| 10. | Transformer platform bracket | OPs-163 OPs-164 | 2 | pcs. | ALPAR | For poles E-12/... For poles E-13,5/. |
| 11. | Transformer platform bracket | OPs-203 OPs-204 | 1 | pcs. | ALPAR | For poles E-12/... For poles E-13,5/... |
| 12. | Transformer platform component | EPOs-1 | 1 | pcs. | ALPAR | Do not use with simplified stations |
| 13. | Transformer platform handrail | PPOs-1 | 1 | pcs. | ALPAR | |
| 14. | Element for attaching the transformer to the platform | EZTs-1 | 2 | pcs. | ALPAR | – |
| 15. | Fitter's safety element | EZs-1 | 1 | pcs. | ALPAR | – |
| 16. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Do not use with free-standing switchboard |
| 17. | Bracket | OB-12 | 2 | pcs. | ALPAR | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|--|--|----------|------|------------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 3 | set | ... / ALPAR | Single / double for bare line Single / double for PAS line |
| 2. | Disconnecter Disconnecter with earthing switch Load break switch Load break switch with earthing switch | ONp III SA 24/4 OUNp III SA 24/4 RNp III SA 24/4 RUNp III SA 24/4 | 1 | pcs. | ALPAR | Vertical-frame switches with insulation: porcelain, composite, silicone |
| 3. | Manual drive | NRA E-12 w.II/M NRAu E-12 w.II/M | 1 | set | ALPAR | For switch without earthing switch For switch with earthing switch |
| 4. | Fuse base | PBNWMA-24/50 | 3 | pcs. | ALPAR | – |
| 5. | Fuse link | HH ... A 10/24 kV "e"=442 mm "e"=292 mm | 3 | pcs. | SIBA / ALPAR | The value of the insert amperage shall be determined by an authorised designer |
| 6. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 7. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 8. | LV switchboard | RS-... | 1 | pcs. | ALPAR | Hanging or free-standing |
| 9. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 10. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 11. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | Use when using a wall-mounted switchboard at the station |
| 12. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 13. | Conduit clamp | U110W | 2 | pcs. | ALPAR | Use when using a wall-mounted switchboard at the station |
| 14. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 15. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

STSR5-20/630-II-.../...-2-O

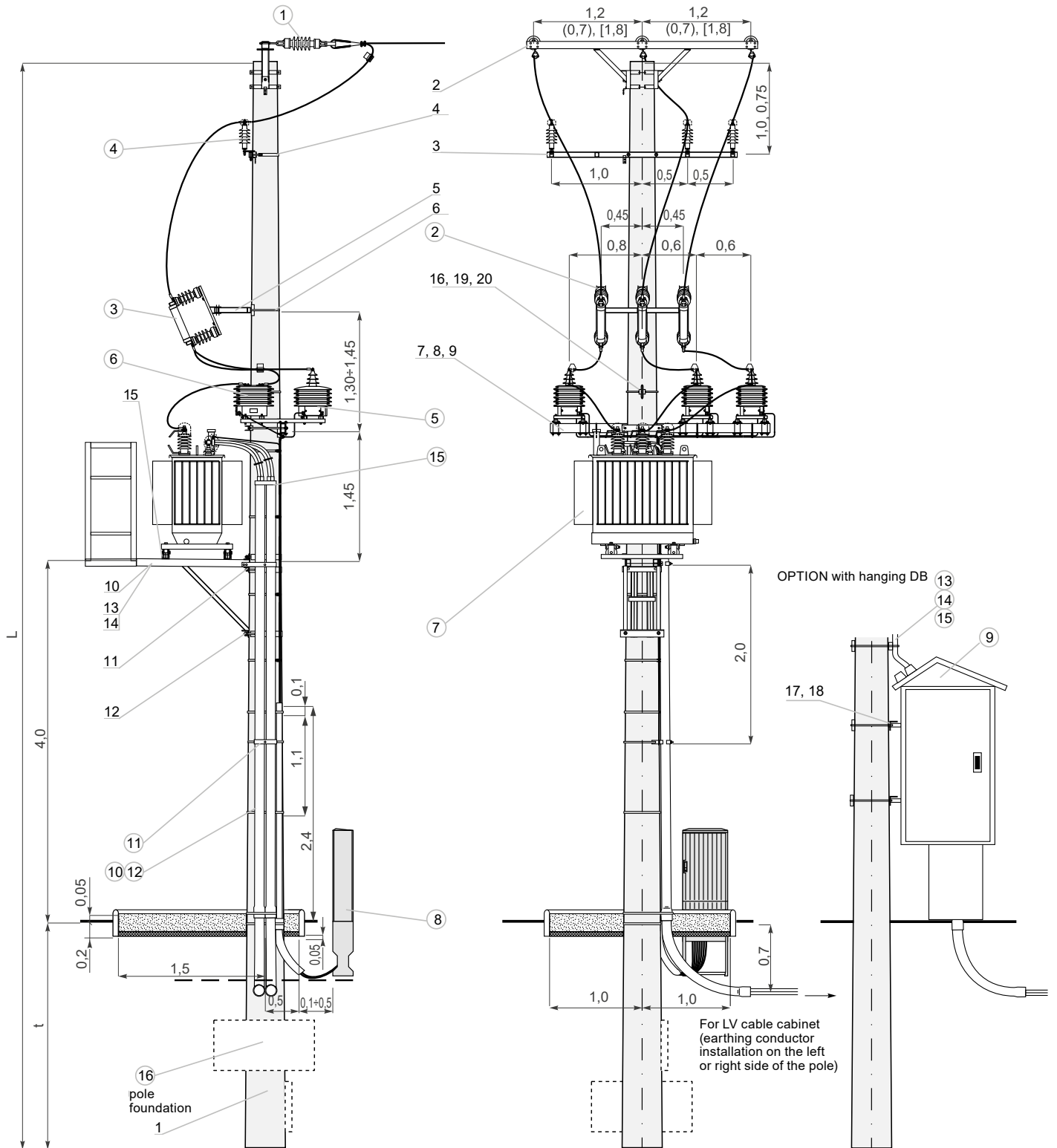


List of structures, accessories, apparatus for STSRs-20/630-1-.../...-2-P3

| STRUCTURES | | | | | | |
|------------|---|----------------------------|----------|------|-----------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m |
| 2. | Station crossarm | PSts-1 PSts-2 PSts-3 | 1 | pcs. | ALPAR | PSts-1 to poles ≤ 15 kN for AFL PSts-2 to poles $\geq 17,5$ kN to AFL PSts-3 for PAS |
| 3. | Structure for surge arresters | KIs-9 | 1 | pcs. | ALPAR | Use square washers and M12x100 bolts 3 pcs. each to fasten the arresters |
| 4. | Bracket | OB-34 | 1 | pcs. | ALPAR | For poles top diameter = 263 mm |
| 5. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | - |
| 6. | Mounting bolts | M16x380+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm |
| 7. | Structure for transformers | KUPs-1 | 1 | pcs. | ALPAR | - |
| 8. | Structure for transformers | EMs-2 | 1 | pcs. | ALPAR | For mounting KUPs-1 |
| 9. | Mounting bolts | M16x420+N+Po+Ps | 2 | set | ALPAR | For rods with top diameter = 263 mm for KUPs-1 |
| 10. | Transformer platform | PTrs-630 | 1 | pcs. | ALPAR | - |
| 11. | Transformer platform bracket | OPs-163 OPs-164 | 2 | pcs. | ALPAR | For poles E-12/... For poles E-13,5/... |
| 12. | Transformer platform bracket | OPs-203 OPs-204 | 1 | pcs. | ALPAR | For poles E-12/... For poles E-13,5/... |
| 13. | Transformer platform component | EPOs-1 | 1 | pcs. | ALPAR | Do not use with simplified stations |
| 14. | Transformer platform handrail | PPOs-1 | 1 | pcs. | ALPAR | |
| 15. | Element for attaching the transformer to the platform | EZTs-1 | 2 | pcs. | ALPAR | - |
| 16. | Fitter's safety element | EZs-1 | 1 | pcs. | ALPAR | - |
| 17. | Mounting structure for the switchboard | KSZ-8a | 2 (4) | pcs. | ALPAR | Do not use with free-standing switchboard |
| 18. | Bracket | OB-12 | 2 (4) | pcs. | ALPAR | |
| 19. | Fastening tape | T207 | 5,5 | m | ALPAR | Sample quantities |
| 20. | Tape buckle | K207 | 2 | pcs. | ALPAR | Sample quantities |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|------------------------------------|---|----------|------|------------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Insulator string | ±O/1 ±O2/1 ±O/2 ±O2/2 | 3 | set | ... / ALPAR | Single / double for bare line Single / double for PAS line |
| 2. | Fuse base | PBNWMA-24/50 | 3 | pcs. | ALPAR | - |
| 3. | Fuse link | HH ... A 10/24 kV "e"=442 mm "e"=292 mm | 3 | pcs. | SIBA / ALPAR | The value of the insert amperage shall be determined by an authorised designer |
| 4. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 5. | Voltage transformer | VTO | 3 | pcs. | ... / ALPAR | The value of the transformer shall be determined by an authorised designer |
| 6. | Current transformer | CTSO | 3 | pcs. | ... / ALPAR | The value of the transformer shall be determined by an authorised designer |
| 7. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 8. | Metering cabinet | ... | 1 | pcs. | ... / ALPAR | Hanging or free-standing according to individual requirements |
| 9. | LV switchboard | RS-... | 1 | pcs. | ALPAR | Hanging or free-standing |
| 10. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 11. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 12. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | Use when using a wall-mounted switchboard at the station |
| 13. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 14. | Conduit clamp | U110W | 2 | pcs. | ALPAR | Use when using a wall-mounted switchboard at the station |
| 15. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 16. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

STSRs-20/630-I-.../...-2-P3

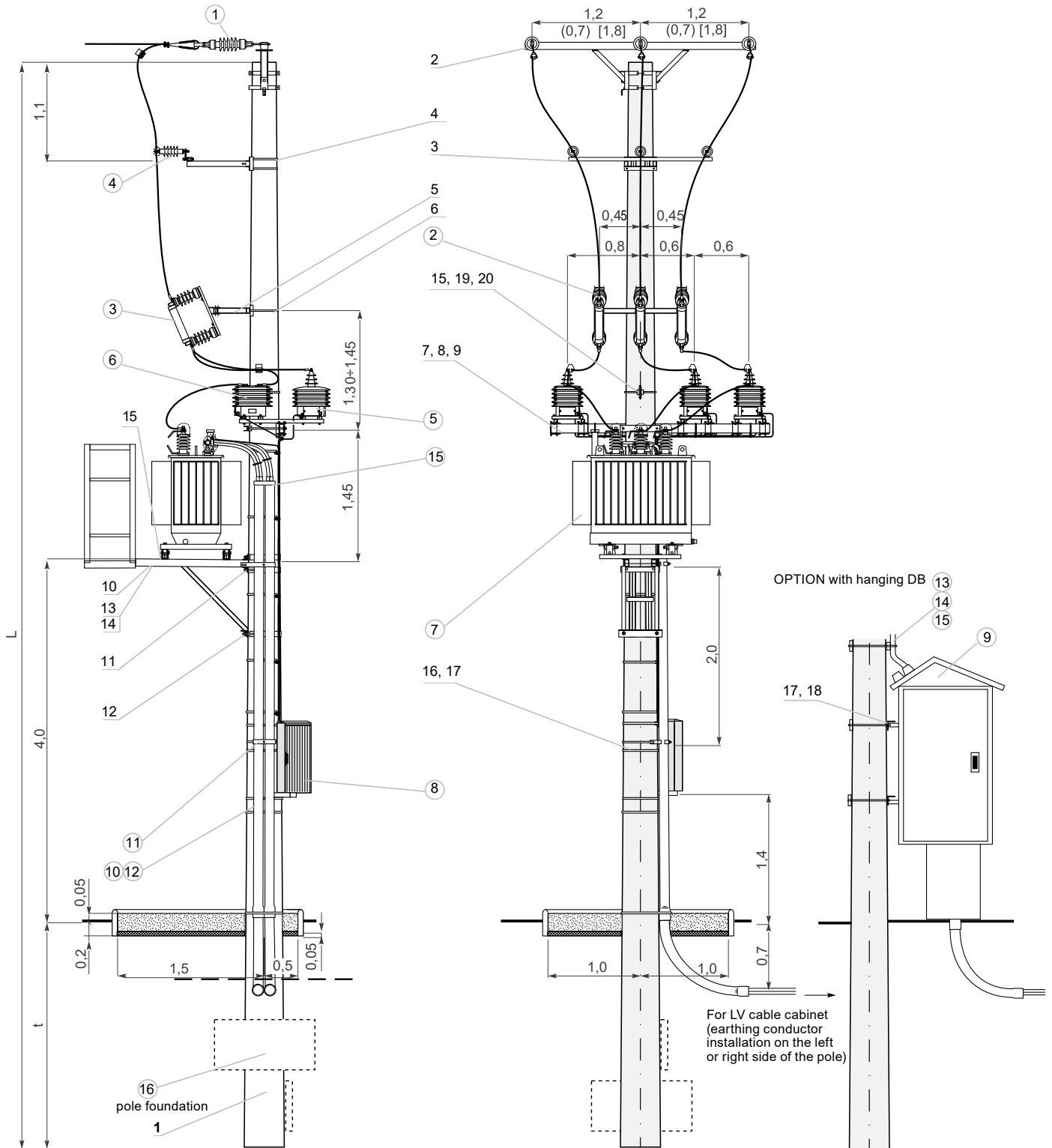


List of structures, accessories, apparatus for STSRs-20/630-II-.../...-2-P3

| STRUCTURES | | | | | | |
|------------|---|----------------------------|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m |
| 2. | Station crossarm | PSts-1 PSts-2 PSts-3 | 1 | pcs. | ALPAR | PSts-1 to poles ≤ 15 kN for AFL PSts-2 to poles $\geq 17,5$ kN to AFL PSts-3 for PAS |
| 3. | Structure for surge arresters | KIs-10 | 1 | pcs. | ALPAR | Use square washers and M12x100 bolts 3 pcs. each to fasten the arresters |
| 4. | Bracket | OB-34 | 1 | pcs. | ALPAR | For poles top diameter = 263 mm |
| 5. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | – |
| 6. | Mounting bolts | M16x380+N+Po+Ps | 2 | set | ALPAR | For rod with top diameter = 263 mm |
| 7. | Structure for transformers | KUPs-1 | 1 | pcs. | ALPAR | |
| 8. | Fastening element | Ems-2 | 1 | pcs. | ALPAR | For mounting KUPs-1 top diameter = 263 mm |
| 9. | Mounting bolts | M16x420+N+Po+Ps | 2 | set | ALPAR | For rods with top diameter = 263 mm for KUPs-1 and EMs-2 |
| 10. | Transformer platform | PTrs-630 | 1 | pcs. | ALPAR | – |
| 11. | Transformer platform bracket | OPs-163 OPs-164 | 2 | pcs. | ALPAR | For poles E-12/... For poles E-13,5/... |
| 12. | Transformer platform bracket | OPs-203 OPs-204 | 1 | pcs. | ALPAR | For poles E-12/... For poles E-13,5/... |
| 13. | Transformer platform component | EPOs-1 | 1 | pcs. | ALPAR | |
| 14. | Transformer platform handrail | PPOs-1 | 1 | pcs. | ALPAR | Do not use with simplified stations |
| 15. | Element for attaching the transformer to the platform | EZTs-1 | 2 | pcs. | ALPAR | – |
| 16. | Fitter's safety element | EZs-1 | 1 | pcs. | ALPAR | – |
| 17. | Mounting structure for the switchboard | KSZ-8a | 2 (4) | pcs. | ALPAR | |
| 18. | Bracket | OB-12 | 2 (4) | pcs. | ALPAR | Do not use with free-standing switchboard |
| 19. | Fastening tape | T207 | 5,5 | m | ALPAR | Sample quantities |
| 20. | Tape buckle | K207 | 4 | pcs. | ALPAR | Sample quantities |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|------------------------------------|---|----------|------|------------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 3 | set | ... / ALPAR | Single / double for bare line Single / double for PAS line |
| 2. | Fuse base | PBNWMA-24/50 | 3 | pcs. | ALPAR | – |
| 3. | Fuse link | HH ... A 10/24 kV "e"=442 mm "e"=292 mm | 3 | pcs. | SIBA / ALPAR | The value of the insert amperage shall be determined by an authorised designer |
| 4. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 5. | Voltage transformer | VTO | 3 | pcs. | ... / ALPAR | The value of the transformer shall be determined by an authorised designer |
| 6. | Current transformer | CTSO | 3 | pcs. | ... / ALPAR | The value of the transformer shall be determined by an authorised designer |
| 7. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 8. | Metering cabinet | ... | 1 | pcs. | ... / ALPAR | Hanging or free-standing according to individual requirements |
| 9. | LV switchboard | RS-... | 1 | pcs. | ALPAR | Hanging or free-standing |
| 10. | Protective tube | BE110 | 6 | m | ... / ALPAR | |
| 11. | Conduit clamp | U110W | 3 | pcs. | ALPAR | Use when using free-standing switchboard |
| 12. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 13. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 14. | Conduit clamp | U110W | 2 | pcs. | ALPAR | Use when using a wall-mounted switchboard at the station |
| 15. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 16. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer according to the Table on page 46. |

STSRs-20/630-II-.../...-2-P3

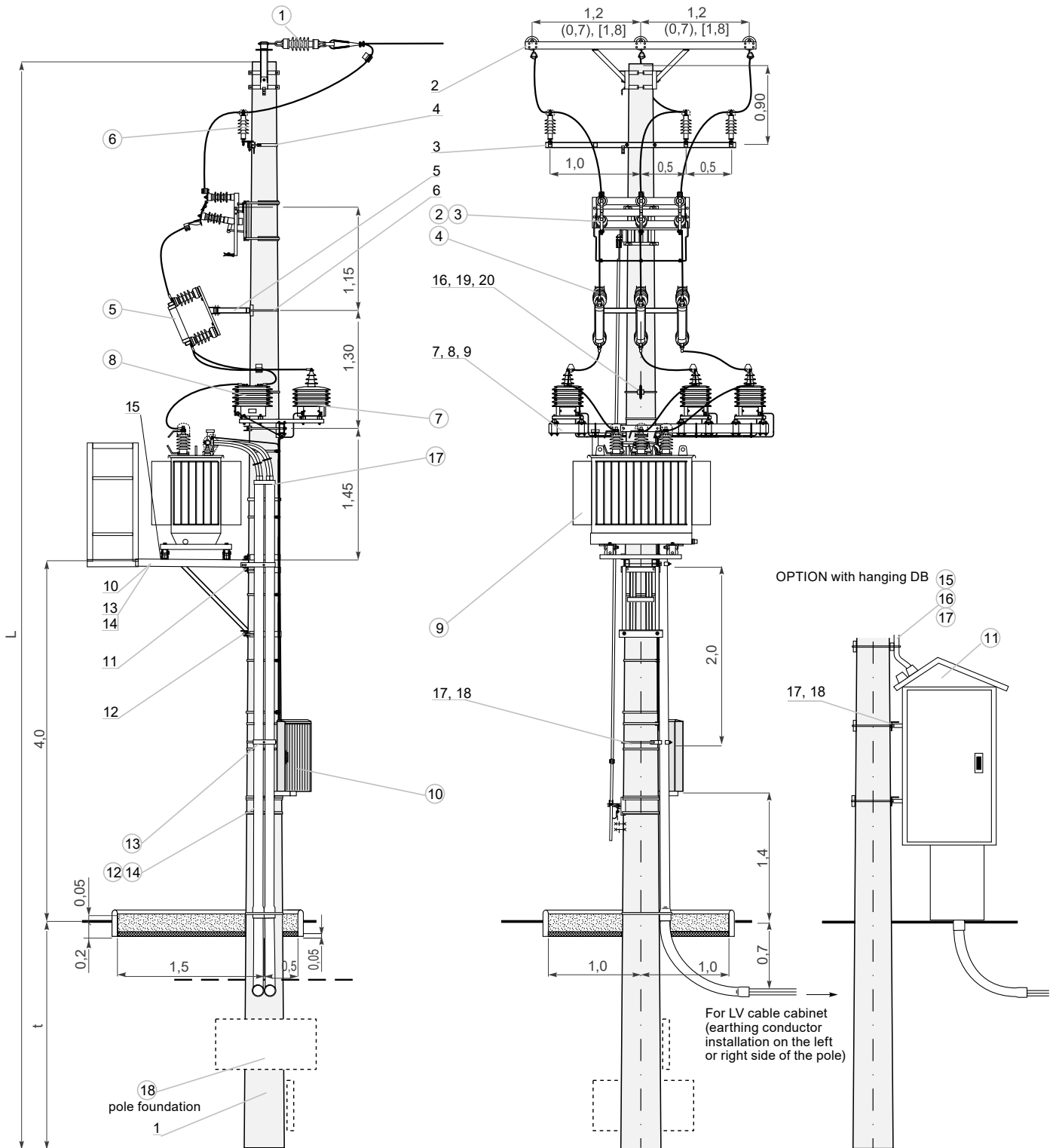


List of structures, accessories, apparatus for STSRs-20/630-I-.../...-2-OP3

| STRUCTURES | | | | | | |
|------------|---|----------------------------|----------|------|-----------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m |
| 2. | Station crossarm | PSts-1 PSts-2 PSts-3 | 1 | pcs. | ALPAR | PSts-1 to poles \leq 15kN for AFL PSts-2 to poles \geq 17,5kN to AFL PSts-3 for PAS |
| 3. | Structure for surge arresters | KIs-9 | 1 | pcs. | ALPAR | Use square washers and M12x100 bolts 3 pcs. each to fasten the arresters |
| 4. | Bracket | OB-34 | 1 | pcs. | ALPAR | For poles top diameter = 263 mm |
| 5. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | - |
| 6. | Mounting bolts | M16x380+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm |
| 7. | Structure for transformers | KUPs-1 | 1 | pcs. | ALPAR | |
| 8. | Fastening element | Ems-2 | 1 | pcs. | ALPAR | For mounting KUPs-1 |
| 9. | Mounting bolts | M16x420+N+Po+Ps | 2 | set | ALPAR | For rods with top diameter = 263 mm for KUPs-1 |
| 10. | Transformer platform | PTrs-630 | 1 | pcs. | ALPAR | - |
| 11. | Transformer platform bracket | OPs-163 OPs-164 | 2 | pcs. | ALPAR | For poles E-12/... For poles E-13,5/... |
| 12. | Transformer platform bracket | OPs-203 OPs-204 | 1 | pcs. | ALPAR | For poles E-12/... For poles E-13,5/... |
| 13. | Transformer platform component | EPOs-1 | 1 | pcs. | ALPAR | Do not use with simplified stations |
| 14. | Transformer platform handrail | PPOs-1 | 1 | pcs. | ALPAR | |
| 15. | Element for attaching the transformer to the platform | EZTs-1 | 2 | pcs. | ALPAR | - |
| 16. | Fitter's safety element | EZs-1 | 1 | pcs. | ALPAR | - |
| 17. | Mounting structure for the switchboard | KSZ-8a | 2 (4) | pcs. | ALPAR | Do not use with free-standing switchboard |
| 18. | Bracket | OB-12 | 2 (4) | pcs. | ALPAR | |
| 19. | Fastening tape | T207 | 5,5 | m | ALPAR | Sample quantities |
| 20. | Tape buckle | K207 | 4 | pcs. | ALPAR | Sample quantities |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|--|--|----------|------|------------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 3 | set | ... / ALPAR | Single / double for bare line Single / double for PAS line |
| 2. | Disconnecter Disconnecter with earthing switch Load break switch Load break switch with earthing switch | ONp III SA 24/4 OUNp III SA 24/4 RNp III SA 24/4 RUNp III SA 24/4 | 1 | pcs. | ALPAR | Vertical-frame switches with insulation: porcelain, composite, silicone |
| 3. | Manual drive | NRA E-12 w.II/M NRAu E-12 w.II/M | 1 | set | ALPAR | For switch without earthing switch For switch with earthing switch |
| 4. | Fuse base | PBNWMA-24/50 | 3 | pcs. | ALPAR | - |
| 5. | Fuse link | HH ... A 10/24 kV "e"=442 mm "e"=292 mm | 3 | pcs. | SIBA / ALPAR | The value of the insert amperage shall be determined by an authorised designer |
| 6. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 7. | Voltage transformer | VTO | 3 | pcs. | ... / ALPAR | The value of the transformer shall be determined by an authorised designer |
| 8. | Current transformer | CTSO | 3 | pcs. | ... / ALPAR | The value of the transformer shall be determined by an authorised designer |
| 9. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 10. | Metering cabinet | ... | 1 | pcs. | ... / ALPAR | Hanging or free-standing according to individual requirements |
| 11. | LV switchboard | RS-... | 1 | pcs. | ALPAR | Hanging or free-standing |
| 12. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 13. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 14. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | Use when using a wall-mounted switchboard at the station |
| 15. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 16. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 17. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 18. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

STSRs-20/630-I-.../...-2-OP3

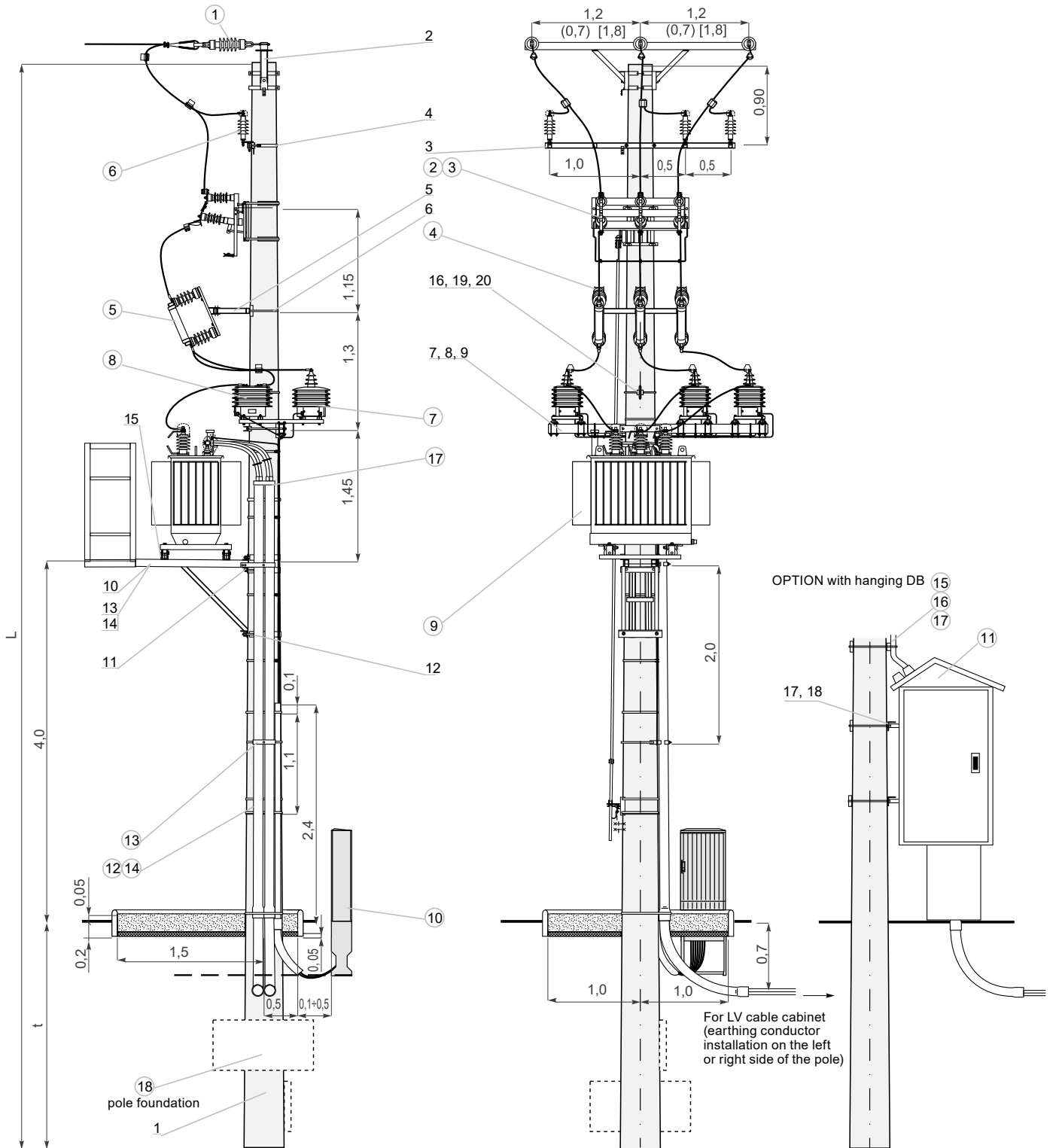


List of structures, accessories, apparatus for STSRs-20/630-II-.../...-2-OP3

| STRUCTURES | | | | | | |
|------------|---|----------------------------|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m |
| 2. | Station crossarm | PSts-1 PSts-2 PSts-3 | 1 | pcs. | ALPAR | PSts-1 to poles ≤ 15 kN for AFL PSts-2 to poles $\geq 17,5$ kN to AFL PSts-3 for PAS |
| 3. | Structure for surge arresters | KIs-9 | 1 | pcs. | ALPAR | Use square washers and M12x100 bolts 3 pcs. each to fasten the arresters |
| 4. | Bracket | OB-34 | 1 | pcs. | ALPAR | For poles top diameter = 263 mm |
| 5. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | – |
| 6. | Mounting bolts | M16x380+N+Po+Ps | 2 | set | ALPAR | For rod with top diameter = 263 mm |
| 7. | Structure for transformers | KUPs-1 | 1 | pcs. | ALPAR | |
| 8. | Fastening element | Ems-1 | 1 | pcs. | ALPAR | For mounting KUPs-1 |
| 9. | Mounting bolts | M16x420+N+Po+Ps | 2 | set | ALPAR | For rods with top diameter = 263 mm for KUPs-1 |
| 10. | Transformer platform | PTrs-630 | 1 | pcs. | ALPAR | – |
| 11. | Transformer platform bracket | OPs-163 OPs-164 | 2 | pcs. | ALPAR | For poles E-12/... For poles E-13,5/... |
| 12. | Transformer platform bracket | OPs-203 OPs-204 | 1 | pcs. | ALPAR | For poles E-12/... For poles E-13,5/... |
| 13. | Transformer platform component | EPOs-1 | 1 | pcs. | ALPAR | Do not use with simplified stations |
| 14. | Transformer platform handrail | PPOs-1 | 1 | pcs. | ALPAR | |
| 15. | Element for attaching the transformer to the platform | EZTs-1 | 2 | pcs. | ALPAR | – |
| 16. | Fitter's safety element | EZs-1 | 1 | pcs. | ALPAR | – |
| 17. | Mounting structure for the switchboard | KSZ-8a | 2 (4) | pcs. | ALPAR | Do not use with free-standing switchboard |
| 18. | Bracket | OB-12 | 2 (4) | pcs. | ALPAR | |
| 19. | Fastening tape | T207 | 5,5 | m | ALPAR | Sample quantities |
| 20. | Tape buckle | K207 | 4 | pcs. | ALPAR | Sample quantities |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|--|--|----------|------|------------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 3 | set | ... / ALPAR | Single / double for bare line Single / double for PAS line |
| 2. | Disconnector Disconnector with earthing switch Load break switch Load break switch with earthing switch | ONp III SA 24/4 OUNp III SA 24/4 RNp III SA 24/4 RUNp III SA 24/4 | 1 | pcs. | ALPAR | Vertical-frame switches with insulation: porcelain, composite, silicone |
| 3. | Manual drive | NRA E-12 w.II/M NRAu E-12 w.II/M | 1 | set | ALPAR | For switch disconnector without earthing switch For switch disconnector with earthing switch |
| 4. | Fuse base | PBNWMA-24/50 | 3 | pcs. | ALPAR | – |
| 5. | Fuse link | HH ... A 10/24 kV "e"=442 mm "e"=292 mm | 3 | pcs. | SIBA / ALPAR | The value of the insert amperage shall be determined by an authorised designer |
| 6. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 7. | Voltage transformer | VTO | 3 | pcs. | ... / ALPAR | The value of the transformer shall be determined by an authorised designer |
| 8. | Current transformer | CTSO | 3 | pcs. | ... / ALPAR | The value of the transformer shall be determined by an authorised designer |
| 9. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 10. | Metering cabinet | ... | 1 | pcs. | ... / ALPAR | Hanging or free-standing according to individual requirements |
| 11. | LV switchboard | RS-... | 1 | pcs. | ALPAR | Hanging or free-standing |
| 12. | Protective tube | BE110 | 6 | m | ... / ALPAR | |
| 13. | Conduit clamp | U110W | 3 | pcs. | ALPAR | Use when using free-standing switchboard |
| 14. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 15. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 16. | Conduit clamp | U110W | 2 | pcs. | ALPAR | Use when using a wall-mounted switchboard at the station |
| 17. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 18. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

STSR5-20/630-II-.../...-2-OP3



List of structures, accessories, apparatus for STSRs-20/630-KK1-8,2/10
STSRs-20/630-KK2-9,0/10

| STRUCTURES | | | | | | |
|------------|---|--------------------|----------|------|-----------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E-8,2/10 E-9/10 | 1 | pcs. | ALPAR | For STSRs-20/630-KK1-8.2/10 For STSRs-20/630-KK2-9/10 |
| 2. | Attachment element for MV arresters | EOs-22 | 1 | pcs. | ALPAR | – |
| 3. | Fastening tape | T207 | 5,5 | m | ALPAR | Sample quantities |
| 4. | Tape buckle | K207 | 4 | pcs. | ALPAR | Sample quantities |
| 5. | Structure for insulators | KIZ-7 | 1 | pcs. | ALPAR | For connection to KBs-1 |
| 6. | Structure for fuse bases | KBs-1 | 1 | pcs. | ALPAR | For connection to KIZ-7 |
| 7. | Mounting bolt | M20x320+N+Po+Ps | 1 | kpl | ALPAR | For poles with top diameter = 218 mm |
| 8. | Transformer platform | PTrs-630 | 1 | pcs. | ALPAR | – |
| 9. | Transformer platform bracket | OPs-161 | 2 | pcs. | ALPAR | For fastening the platform for poles with top diameter = 218 |
| 10. | Transformer platform bracket | OPs-201 | 1 | pcs. | ALPAR | For fastening the platform for poles with top diameter = 219 |
| 11. | Transformer platform component | EPOs-1 | 1 | pcs. | ALPAR | Do not use with simplified stations |
| 12. | Transformer platform handrail | PPOs-1 | 1 | pcs. | ALPAR | |
| 13. | Element for attaching the transformer to the platform | EZTs-1 | 2 | pcs. | ALPAR | – |
| 14. | Fitter's safety element | EZs-1 | 1 | pcs. | ALPAR | – |
| 15. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Do not use with free-standing switchboard |
| 16. | Bracket | OB-10 | 2 | pcs. | ALPAR | |

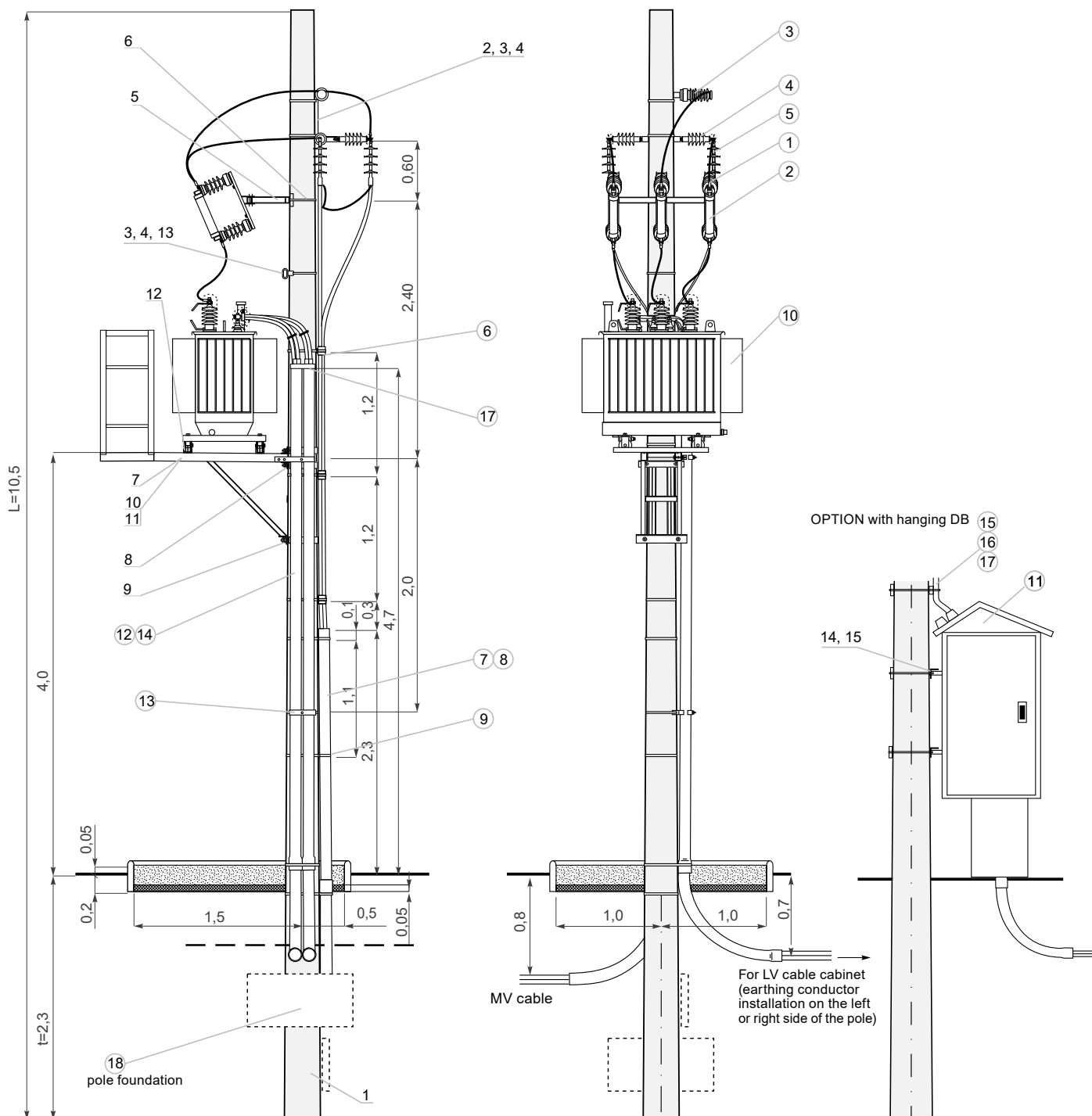
| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|-------------------------------------|---|----------|------|---------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Fuse base | PBNWMA-24/50 | 3 | pcs. | ALPAR | – |
| 2. | Fuse link | HH ... A 10/24 kV "e"=442 mm "e"=292 mm | 3 | pcs. | SIBA / ALPAR | The value of the insert amperage shall be determined by an authorised designer |
| 3. | Supporting insulator | LWP-8/24 M20x105 | 3 | pcs. | ALPAR | Use insulators with full thread |
| 4. | Surge arrester | --- | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 5. | Cable termination | CHE-F 24 kV 25-150 CHE-F 24kV 70-240 CHEP(H)-3F 24kV 50-150 CHEP(H)-3F 24kV 70-240 | 1 | set | CELLPACK / ALPAR | For 3 x 1-core cable For 3 x 1-core cable For 3-core cable type HAKnFtA For 3-core cable type HAKnFtA |
| 6. | MV cable clamp | U1032 | 3 | pcs. | ALPAR | Triple, for MV cable fastening |
| 7. | Protective tube | BE160 BE110 | 3 | m | ... / ALPAR | For MV cable shielding |
| 8. | Conduit clamp | U110W U160W | 3 | pcs. | ALPAR | |
| 9. | Heat-shrinkable three-core breakout | SEH-3_110 SEH-3_160 | 1 | pcs. | CELLPACK / ALPAR | |
| 10. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorized designer |
| 11. | LV switchboard | RS-... | 1 | pcs. | ALPAR | Hanging or free-standing |
| 12. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 13. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 14. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 15. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use when using a wall-mounted switchboard at the station |
| 16. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 17. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 18. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

List of structures, accessories, apparatus for STSRs-20/630-K-10.5/10

| STRUCTURES | | | | | | |
|------------|---|-----------------|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E-10,5/10 | 1 | pcs. | ALPAR | top diameter = 218 mm |
| 2. | Attachment element for MV arresters | EOs-25 | 1 | pcs. | ALPAR | – |
| 3. | Fastening tape | T207 | 5,5 | m | ALPAR | Sample quantities |
| 4. | Tape buckle | K207 | 4 | pcs. | ALPAR | Sample quantities |
| 5. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | – |
| 6. | Mounting bolt | M20x320+N+Po+Ps | 1 | set | ALPAR | For poles top diameter = 218 mm |
| 7. | Transformer platform | Ptrs-630 | 1 | pcs. | ALPAR | – |
| 8. | Transformer platform bracket | OPs-161 | 2 | pcs. | ALPAR | For fastening the platform For poles with top diameter = 218 |
| 9. | Transformer platform bracket | OPs-201 | 1 | pcs. | ALPAR | For fastening the platform For poles with top diameter = 218 |
| 10. | Transformer platform component | EPOs-1 | 1 | pcs. | ALPAR | Do not use with simplified stations |
| 11. | Transformer platform handrail | PPOs-1 | 1 | pcs. | ALPAR | |
| 12. | Element for attaching the transformer to the platform | EZTs-1 | 2 | pcs. | ALPAR | – |
| 13. | Fitter's safety element | EZs-1 | 1 | pcs. | ALPAR | – |
| 14. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Do not use with free-standing switchboard |
| 15. | Bracket | OB-12 | 2 | pcs. | ALPAR | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|-------------------------------------|--|----------|------|---------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Fuse base | PBNWMA-24/50 | 3 | pcs. | ALPAR | – |
| 2. | Fuse link | HH ... A 10/24 kV "e"=442 mm "e"=292 mm | 3 | pcs. | SIBA / ALPAR | The value of the insert amperage shall be determined by an authorised designer |
| 3. | Supporting insulator | LWP-8/24 M20x105 | 3 | pcs. | ALPAR | Use insulators with full thread |
| 4. | Surge arrester | --- | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 5. | Cable termination | CHE-F 24 kV 25-150 CHE-F 24 kV 70-240 CHEP(H)-3F 24 kV 50-150 CHEP(H)-3F 24 kV 70-240 | 1 | set | CELLPACK / ALPAR | For 3 x 1-core cable For 3 x 1-core cable For 3-core cable type HAKnFtA For 3-core cable type HAKnFtA |
| 6. | MV cable clamp | U1032 | 3 | pcs. | ALPAR | Triple, for MV cable fastening |
| 7. | Protective tube | BE160 BE110 | 3 | m | ... / ALPAR | For MV cable shielding |
| 8. | Conduit clamp | U110W U160W | 3 | pcs. | ALPAR | |
| 9. | Heat-shrinkable three-core breakout | SEH-3_110 SEH-3_160 | 1 | pcs. | CELLPACK / ALPAR | |
| 10. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 11. | LV switchboard | RS-... | 1 | pcs. | ALPAR | Hanging or free-standing |
| 12. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 13. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 14. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 15. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use when using a wall-mounted switchboard at the station |
| 16. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 17. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 18. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

STSRs-20/630-K-10,5/10

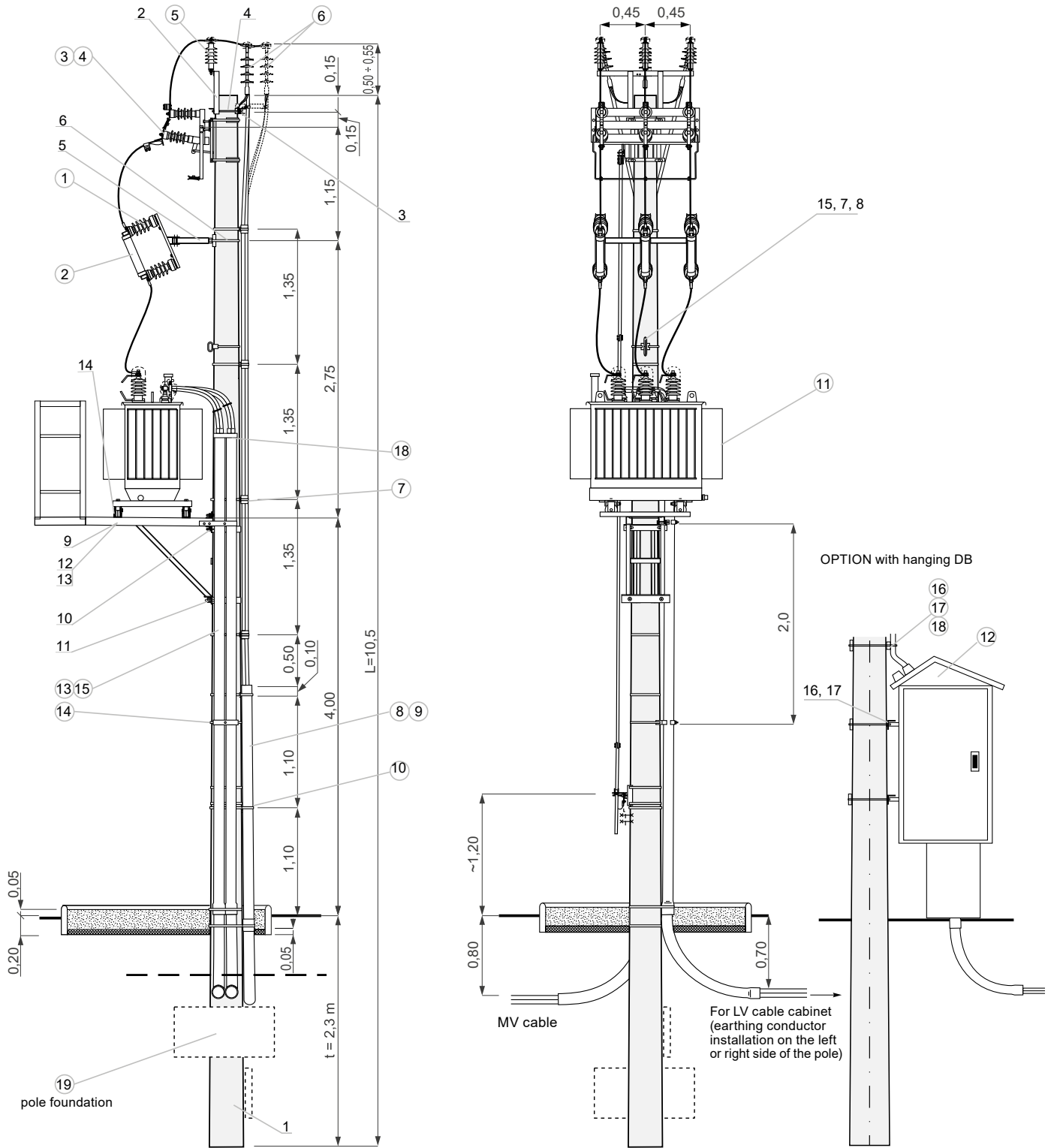


List of structures, accessories, apparatus for STSRs-20/630-K-10.5/10-O

| STRUCTURES | | | | | | |
|------------|---|-----------------|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E-10,5/10 | 1 | pcs. | ALPAR | top diameter = 218 mm |
| 2. | Attachment element for MV arresters | EOs-2 | 1 | pcs. | ALPAR | – |
| 3. | Structure for cable terminations | KGs-1 KGs-2 | 1 | pcs. | ALPAR | For one cable For two cables |
| 4. | Mounting bolts | M16x300+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 218 mm |
| 5. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | – |
| 6. | Mounting bolts | M20x320+N+Po+Ps | 1 | set | ALPAR | For poles top diameter = 218 mm |
| 7. | Fastening tape | T207 | 5,5 | m | ALPAR | Sample quantities |
| 8. | Tape buckle | K207 | 4 | pcs. | ALPAR | Sample quantities |
| 9. | Transformer platform | PTrs-630 | 1 | pcs. | ALPAR | – |
| 10. | Transformer platform bracket | OPs-161 | 2 | pcs. | ALPAR | For fastening the platform for poles with top diameter = 218 mm |
| 11. | Transformer platform bracket | OPs-201 | 1 | pcs. | ALPAR | For fastening the platform for poles with top diameter = 218 mm |
| 12. | Transformer platform component | EPOs-1 | 1 | pcs. | ALPAR | Do not use with simplified stations |
| 13. | Transformer platform handrail | PPOs-1 | 1 | pcs. | ALPAR | |
| 14. | Element for attaching the transformer to the platform | EZTs-1 | 2 | pcs. | ALPAR | – |
| 15. | Fitter's safety element | EZs-1 | 1 | pcs. | ALPAR | – |
| 16. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Do not use with free-standing switchboard |
| 17. | Bracket | OB-10 | 2 | pcs. | ALPAR | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|--|--|----------|------|------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Fuse base | PBNWMA-24/50 | 3 | pcs. | ALPAR | – |
| 2. | Fuse link | HH ... A 10/24 kV "e"=442 mm "e"=292 mm | 3 | pcs. | SIBA / ALPAR | The value of the insert amperage shall be determined by an authorised designer |
| 3. | Disconnecter Disconnecter with earthing switch Load break switch Load break switch with earthing switch | ONp III SA 24/4 OUNp III SA 24/4 RNp III SA 24/4 RUNp III SA 24/4 | 1 | pcs. | ALPAR | Vertical-frame switches with insulation: porcelain, composite, silicone |
| 4. | Manual drive | NRA E-10,5 w.II NRAu E-10,5 w.II | 1 | set | ALPAR | For switch without earthing switch For switch with earthing switch |
| 5. | Surge arrester | --- | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 6. | Cable termination | CHE-F 24 kV 25-150 CHE-F 24 kV 70-240 CHEP(H)-3F 24 kV 50-150 CHEP(H)-3F 24 kV 70-240 | 1 (2) | set | CELLPACK / ALPAR | For 3 x 1-core cable For 3 x 1-core cable For 3-core cable type HAKnFtA For 3-core cable type HAKnFtA |
| 7. | MV cable clamp | U1032 | 3 (6) | pcs. | ALPAR | Triple, for MV cable fastening (for 2 cables) |
| 8. | Protective tube | BE160 | 3 (6) | m | ... / ALPAR | For MV cable shielding (quantities in brackets refer to 2 sets of cables) |
| 9. | Conduit clamp | U160W | 3 (6) | pcs. | ALPAR | |
| 10. | Heat-shrinkable three-core breakout | SEH-3_160 | 1 (2) | pcs. | CELLPACK / ALPAR | |
| 11. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 12. | LV switchboard | RS-... | 1 | pcs. | ALPAR | Hanging or free-standing |
| 13. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 14. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 15. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 16. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use when using a wall-mounted switchboard at the station |
| 17. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 18. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 19. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

STSRs-20/630-K-10,5/10-O

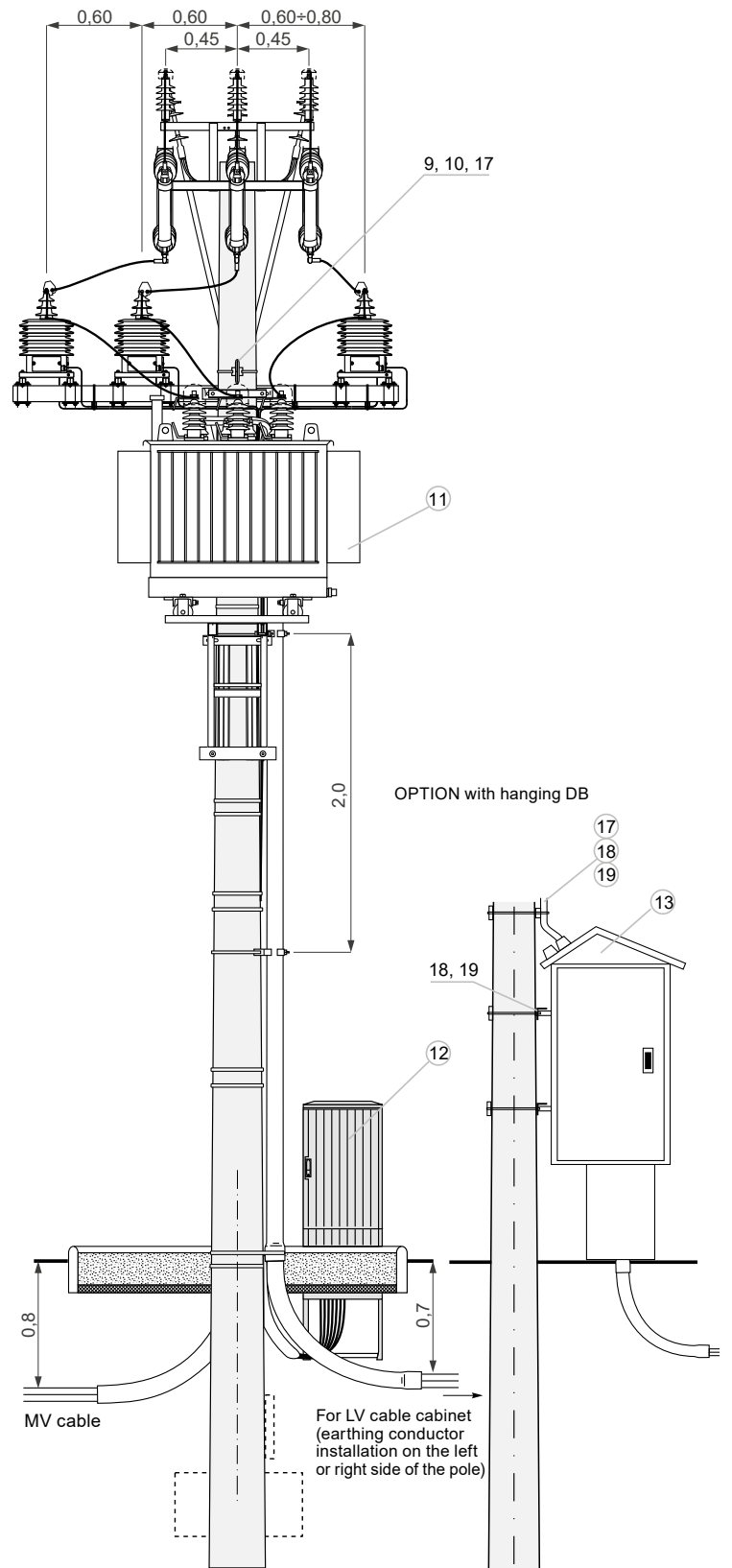
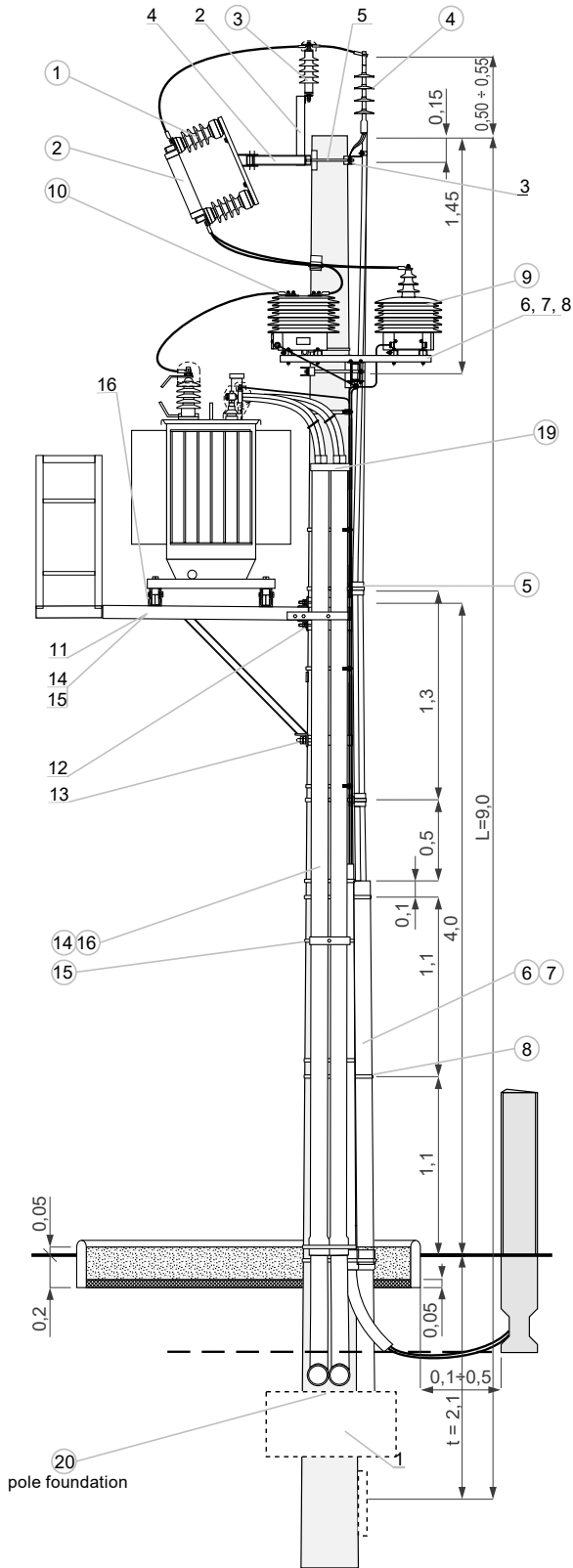


List of structures, accessories, apparatus for STSRs-20/630-KK2-9.0/10-P3

| STRUCTURES | | | | | | |
|------------|---|-----------------|----------|------|-----------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E-9/10 | 1 | pcs. | ALPAR | top diameter = 218 mm |
| 2. | Attachment element for MV arresters | EOs-1 | 1 | pcs. | ALPAR | To be installed with structures for cable terminations and fuse bases |
| 3. | Structure for cable terminations | KGs-1 | 1 | pcs. | ALPAR | To be installed with structures for surge arresters and fuse bases |
| 4. | Structure for fuse bases | KBs-1 | 1 | pcs. | ALPAR | To be installed with structures for surge arresters and cable terminations |
| 5. | Mounting bolts | M16x300+N+Po+Ps | 2 | set | ALPAR | For poles with top diameter = 218 mm |
| 6. | Structure for transformers | KUPs-1 | 1 | pcs. | ALPAR | - |
| 7. | Fastening element | Ems-1 | 1 | pcs. | ALPAR | For mounting KUPs-1 |
| 8. | Mounting bolts | M16x380+N+Po+Ps | 2 | set | ALPAR | For poles with top diameter = 218 mm for KUPs-1 |
| 9. | Fastening tape | T207 | 5,5 | m | ALPAR | Sample quantities |
| 10. | Tape buckle | K207 | 4 | pcs. | ALPAR | Sample quantities |
| 11. | Transformer platform | PTrs-630 | 1 | pcs. | ALPAR | - |
| 12. | Transformer platform bracket | OPs-161 | 2 | pcs. | ALPAR | For fastening the platform for poles with top diameter = 218 mm |
| 13. | Transformer platform bracket | OPs-201 | 1 | pcs. | ALPAR | For fastening the platform for poles with top diameter = 218 mm |
| 14. | Transformer platform component | EPOs-1 | 1 | pcs. | ALPAR | Do not use with simplified stations |
| 15. | Transformer platform handrail | PPOs-1 | 1 | pcs. | ALPAR | |
| 16. | Element for attaching the transformer to the platform | EZTs-1 | 2 | pcs. | ALPAR | - |
| 17. | Fitter's safety element | EZs-1 | 1 | pcs. | ALPAR | - |
| 18. | Mounting structure for the switchboard | KSZ-8a | 2 (4) | pcs. | ALPAR | Do not use with free-standing switchboard |
| 19. | Bracket | OB-10 | 2 (4) | pcs. | ALPAR | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|--|---|----------|------|------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Fuse base | PBNWMA-24/50 | 3 | pcs. | ALPAR | - |
| 2. | Fuse link | HH ... A 10/24kV "e"=442 mm "e"=292 mm | 3 | pcs. | SIBA / ALPAR | The value of the insert amperage shall be determined by an authorised designer |
| 3. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 4. | Cable termination | CHE-F 24 kV 25-150 CHE-F 24kV 70-240 CHEP(H)-3F 24kV 50-150 CHEP(H)-3F 24kV 70-240 | 1 | set | CELLPACK / ALPAR | For 3 x 1-core cable For 3 x 1-core cable For 3-core cable type HAKnFtA For 3-core cable type HAKnFtA |
| 5. | MV cable clamp | U1032 | 3 | pcs. | ALPAR | Triple, for MV cable fastening |
| 6. | Protective tube | BE160 | 3 | m | ... / ALPAR | For MV cable shielding |
| 7. | Conduit clamp | U160W | 3 | pcs. | ALPAR | |
| 8. | Heat-shrinkable three-core breakout | SEH-3_160 | 1 | pcs. | CELLPACK / ALPAR | |
| 9. | Voltage transformer | VTO | 3 | pcs. | ... / ALPAR | The value of the transformer shall be determined by an authorised designer |
| 10. | Current transformer | CTSO | 3 | pcs. | ... / ALPAR | The value of the transformer shall be determined by an authorised designer |
| 11. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 12. | Metering cabinet | ... | 1 | pcs. | ... / ALPAR | Hanging or free-standing according to individual requirements |
| 13. | LV switchboard | RS-... | 1 | pcs. | ALPAR | Hanging or free-standing |
| 14. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 15. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 16. | Black heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 17. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 18. | Conduit clamp | U110W | 2 | pcs. | ALPAR | Use when using a wall-mounted switchboard at the station |
| 19. | Black heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 20. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

STSRs-20/630-KK2-9,0/10-P3

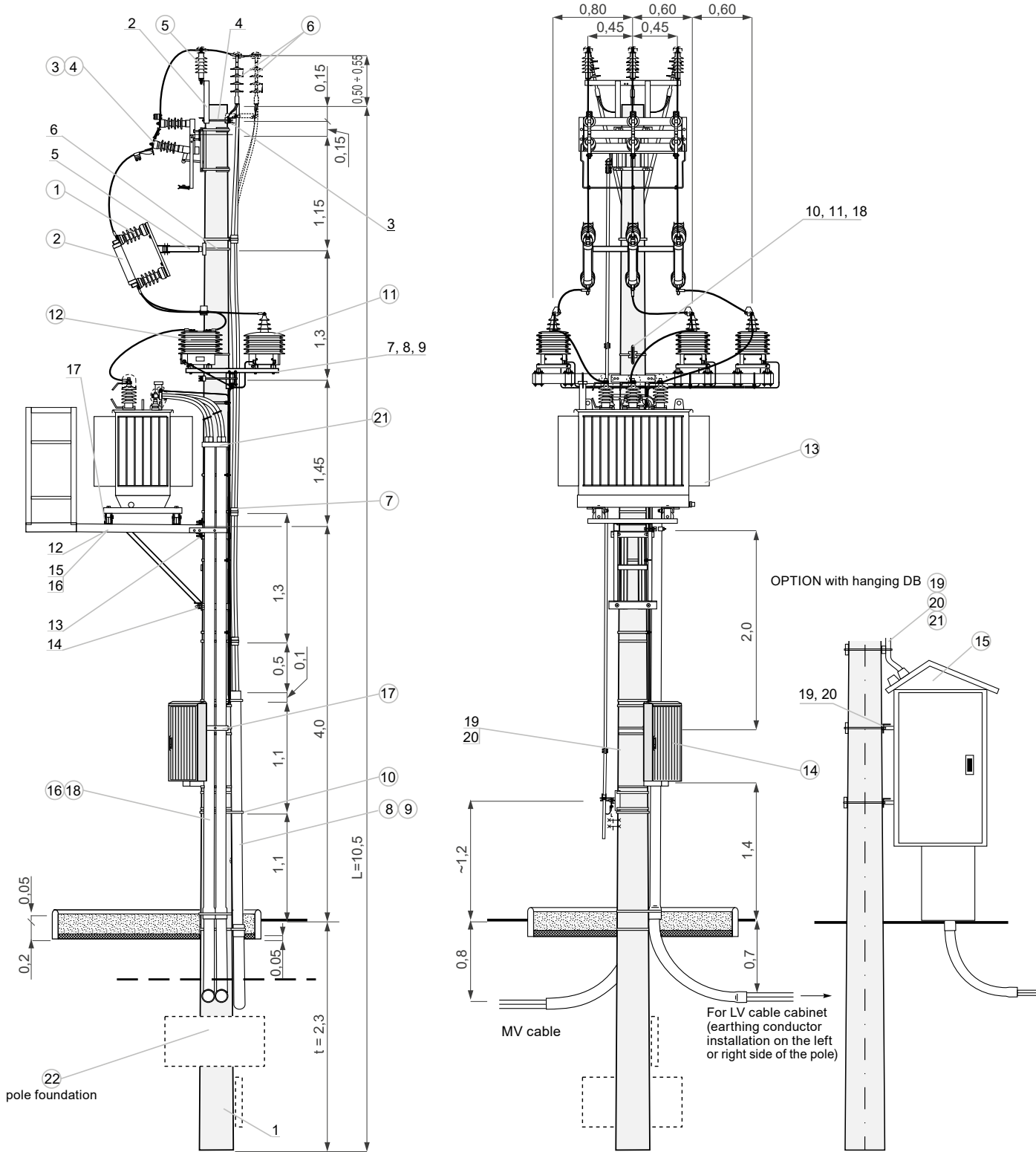


List of structures, accessories, apparatus for STSRs-20/630-K-10.5/10-OP3

| STRUCTURES | | | | | | |
|------------|---|-----------------|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E-10,5/10 | 1 | pcs. | ALPAR | top diameter = 218 mm |
| 2. | Attachment element for MV arresters | EOs-2 | 1 | pcs. | ALPAR | To be installed with a structure for the cable termination |
| 3. | Structure for cable terminations | KGs-1 KGs-2 | 1 | pcs. | ALPAR | For one cable For two cables |
| 4. | Mounting bolts | M16x300+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 218 mm |
| 5. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | – |
| 6. | Mounting bolts | M16x320+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 218 mm |
| 7. | Structure for transformers | KUPs-1 | 1 | pcs. | ALPAR | – |
| 8. | Fastening element | Ems-1 | 1 | pcs. | ALPAR | For mounting KUPs-1 |
| 9. | Mounting bolts | M16x380+N+Po+Ps | 2 | set | ALPAR | For poles with top diameter = 218 mm for KUPs-1 |
| 10. | Fastening tape | T207 | 5,5 | m | ALPAR | Sample quantities |
| 11. | Tape buckle | K207 | 4 | pcs. | ALPAR | Sample quantities |
| 12. | Transformer platform | PTrs-630 | 1 | pcs. | ALPAR | – |
| 13. | Transformer platform bracket | OPs-161 | 2 | pcs. | ALPAR | For fastening the platform for poles with top diameter = 218 mm |
| 14. | Transformer platform bracket | OPs-201 | 1 | pcs. | ALPAR | For fastening the platform for poles with top diameter = 218 mm |
| 15. | Transformer platform component | EPOs-1 | 1 | pcs. | ALPAR | Do not use with simplified stations |
| 16. | Transformer platform handrail | PPOs-1 | 1 | pcs. | ALPAR | |
| 17. | Element for attaching the transformer to the platform | EZTs-1 | 2 | pcs. | ALPAR | – |
| 18. | Fitter's safety element | EZs-1 | 1 | pcs. | ALPAR | – |
| 19. | Mounting structure for the switchboard | KSZ-8a | 2 (4) | pcs. | ALPAR | Do not use with free-standing switchboard |
| 20. | Bracket | OB-12 | 2 (4) | pcs. | ALPAR | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|--|--|----------|------|---------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Fuse base | PBNWMA-24/50 | 3 | pcs. | ALPAR | – |
| 2. | Fuse link | HH ... A 10/24kV "e"=442 mm "e"=292 mm | 3 | pcs. | SIBA / ALPAR | The value of the insert amperage shall be determined by an authorised designer |
| 3. | Disconnecter Disconnecter with earthing switch Load break switch Load break switch with earthing switch | ONp III SA 24/4 OUNp III SA 24/4 RNp III SA 24/4 RUNp III SA 24/4 | 1 | pcs. | ALPAR | Vertical-frame switches with insulation: porcelain, composite, silicone |
| 4. | Manual drive | NRA E-10,5 w.II NRAu E-10,5 w.II | 1 | set | ALPAR | For switch without earthing switch For switch with earthing switch |
| 5. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 6. | Cable termination | CHE-F 24kV 25-150 CHE-F 24kV 70-240 CHEP(H)-3F 24kV 50-150 CHEP(H)-3F 24kV 70-240 | 1 (2) | set | CELLPACK / ALPAR | For 3 x 1-core cable For 3 x 1-core cable For 3-core cable type HAKnFtA For 3-core cable type HAKnFtA |
| 7. | MV cable clamp | U1032 | 3 (6) | pcs. | ALPAR | Triple, for MV cable fastening (for 2 cables) |
| 8. | Protective tube | BE160 | 3 (6) | m | ... / ALPAR | For MV cable shielding (quantities in brackets refer to 2 sets of cables) |
| 9. | Conduit clamp | U160W | 3 (6) | pcs. | ALPAR | |
| 10. | Heat-shrinkable three-core breakout | SEH-3_160 | 1 (2) | pcs. | CELLPACK / ALPAR | |
| 11. | Voltage transformer | VTO | 3 | pcs. | ... / ALPAR | The value of the transformer shall be determined by an authorised designer |
| 12. | Current transformer | CTSO | 3 | pcs. | ... / ALPAR | The value of the transformer shall be determined by an authorised designer |
| 13. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 14. | Metering cabinet | ... | 1 | pcs. | ... / ALPAR | Hanging or free-standing according to individual requirements |
| 15. | LV switchboard | RS-... | 1 | pcs. | ALPAR | Hanging or free-standing |
| 16. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 17. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 18. | Black heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | Use when using a wall-mounted switchboard at the station |
| 19. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 20. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 21. | Black heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 22. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

STSRs-20/630-K-10,5/10-OP3



14. Selection of pole foundations for medium and weak soil

| Pole type | Pole length L | Pole strength Pn | Mounting height of hpT transformer platform | Type of pole foundation | Medium soil | | Weak soil | |
|--|------------------|---------------------|---|----------------------------|-------------|------|-----------|------|
| | | | | | t | hp | t | hp |
| | [m] | [kN] | [m] | [m] | | | | |
| E-9/2,5 (top diameter = 173) | 9,0 | 2,5 | - | Uo | 1,9 | 7,48 | 1,9 | 7,48 |
| E-10,5/2,5 (top diameter = 173) | 10,5 | | - | Uo | 2,1 | 8,78 | 2,1 | 8,78 |
| E-8,2/10 (top diameter = 218) | 8,2 | 10 | 3,5 | U2a | 2,1 | - | 2,1 | - |
| E-9/10 (top diameter = 218) | 9,0 | | 4,0 | U2a | 2,1 | - | 2,1 | - |
| E-10,5/10 (top diameter = 218) | 10,5 | | 4,0 | U2a | 2,3 | - | 2,3 | - |
| E-12/15 EM-12/15 (top diameter = 263) | 12 | 15 | 4,0 | U3a | 2,5 | 9,7 | - | - |
| | | | | Up-2a | 2,4 | 9,8 | 2,6 | 9,6 |
| | | | | FP11 | 2,4 | 9,8 | - | - |
| | | | | FP13 | - | - | 2,4 | 9,8 |
| | | | | SFP133 | - | - | 2,5 | 9,7 |
| | | | | Uos2 | 2,4 | 9,8 | 2,6 | 9,6 |
| | | | | Us3 | 2,5 | 9,7 | - | - |
| E-12/17,5 EM-12/17,5 (top diameter = 263) | 12 | 17,5 | 4,0 | U3a | 2,6 | 9,6 | - | - |
| | | | | Up-2a | 2,4 | 9,8 | 2,7 | 9,5 |
| | | | | FP11 | 2,4 | 9,8 | - | - |
| | | | | FP13 | - | - | 2,4 | 9,8 |
| | | | | SFP111 | 2,5 | 9,7 | - | - |
| | | | | SFP133 | - | - | 2,6 | 9,6 |
| | | | | Uos2 | 2,5 | 9,7 | 2,7 | 9,5 |
| E-12/20 EM-12/20 (top diameter = 263) | 12 | 20 | 4,0 | Us30 | 2,5 | 9,7 | - | - |
| | | | | Us10 | - | - | 2,5 | 9,7 |
| | | | | Up-2a | 2,5 | 9,7 | - | - |
| | | | | Up-3a | - | - | 2,7 | 9,5 |
| | | | | FP12 | 2,5 | 9,7 | - | - |
| | | | | FP13 | - | - | 2,5 | 9,7 |
| | | | | SFP122 | 2,5 | 9,7 | - | - |
| E-12/25 EM-12/25 (top diameter = 263) | 12 | 25 | 4,0 | SFP133 | - | - | 2,6 | 9,6 |
| | | | | Us10 | 2,5 | 9,7 | - | - |
| | | | | Us15 | - | - | 2,5 | 9,7 |
| | | | | Up-3a | 2,5 | 9,7 | 2,9 | 9,3 |
| | | | | FP12 | 2,5 | 9,7 | - | - |
| | | | | FP13 | - | - | 2,7 | 9,5 |
| | | | | SFP122 | 2,6 | 9,6 | - | - |
| E-13,5/15 EM-13,5/15 (top diameter = 263) | 13,5 | 15 | 4,0 | SFP133 | - | - | 2,8 | 9,4 |
| | | | | Us10 | 2,5 | 9,7 | - | - |
| | | | | Us15 | - | - | 2,5 | 9,7 |
| | | | | Up-3a | 2,5 | 9,7 | 2,9 | 9,3 |
| | | | | FP12 | 2,5 | 9,7 | - | - |
| | | | | FP13 | - | - | 2,7 | 9,5 |
| | | | | SFP122 | 2,6 | 9,6 | - | - |
| E-13,5/17,5 EM-13,5/17,5 (top diameter = 263) | 13,5 | 17,5 | 4,0 | U3a | 2,6 | 11,1 | - | - |
| | | | | Up-3a | 2,5 | 11,2 | 2,7 | 11,0 |
| | | | | SFP122 | 2,5 | 11,2 | - | - |
| | | | | SFP133 | - | - | 2,6 | 11,1 |
| | | | | Uos2 | 2,5 | 11,2 | 2,7 | 11,0 |
| | | | | Us34 | - | - | 2,6 | 11,1 |
| | | | | U3a | 2,7 | 11,0 | - | - |
| E-13,5/20 EM-13,5/20 (top diameter = 263) | 13,5 | 20 | 4,0 | Up-3a | 2,6 | 11,1 | 2,8 | 10,9 |
| | | | | SFP122 | 2,6 | 11,1 | - | - |
| | | | | SFP133 | - | - | 2,7 | 11,0 |
| | | | | Uos2 | 2,6 | 11,1 | 2,8 | 10,9 |
| | | | | Us15 | - | - | 2,5 | 11,2 |
| | | | | Up-3a | 2,7 | 11,0 | 2,9 | 10,8 |
| | | | | SFP133 | 2,5 | 11,2 | 2,8 | 10,9 |
| E-13,5/25 EM-13,5/25 (top diameter = 263) | 13,5 | 25 | 4,0 | Us10 | 2,5 | 11,2 | - | - |
| | | | | Us15 | - | - | 2,5 | 11,2 |
| | | | | Up-3a | 2,7 | 11,0 | - | - |
| | | | | SFP133 | 2,7 | 11,0 | 2,9 | 10,8 |
| | | | | Us10 | 2,5 | 11,2 | - | - |
| | | | | Us15 | - | - | 2,5 | 11,2 |
| | | | | U3a | 2,7 | 11,0 | - | - |

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Orzeczenie nr ŚB/2/4/EE/07

Opracowanie projektowe

„Album słupowych stacji transformatorowych STSRS-20/630. Tom V”

Poznań luty 2009r. autorstwa PPU ELprojekt Sp. z o.o

wydany nakładem SPKiUE „STELLEN” ul. Wołowska 92A, 60-167 Poznań

spełnia wymagania normy PN-E- 05115:2002 „Instalacje elektroenergetyczne prądu przemiennego o napięciu wyższym od 1 kV”, w części dotyczącej stacji słupowych, w zakresie potwierdzającym podstawowe dane techniczne.

Decyzję o wydaniu niniejszego orzeczenia podjęto w oparciu o następujące dokumenty:

- Ocena nr OTECH/LA/09/09 opracowania projektowego jw. wydana przez ZPBE Energopomiar-Elektryka,

Orzeczenie jest ważne do dnia 2012-07-31 pod następującymi warunkami:

- wszystkie komponenty wyposażenia stacji powinny spełniać wymagania aktualnych norm przedmiotowych,
- wszelkie zmiany opracowania projektowego, wprowadzone w okresie ważności świadectwa, będą zgłaszane do ZPBE Energopomiar-Elektryka Gliwice,
- ZPBE Energopomiar-Elektryka zastrzega sobie prawo wniesienia dodatkowych wymagań, jeżeli takie wynikną w okresie ważności świadectwa.

Podstawowe dane techniczne stacji STSRS-20/630:

| | | |
|--------------------------------|---|-------|
| Napięcie nominalne sieci | 15 kV | 20 kV |
| Najwyższe napięcie urządzenia | 17,5 kV | 24 kV |
| Zasilanie stacji SN: | przewody gołe AFL6 35, 50, 70 mm ² przewody niepełnoizolowane 50, 70 mm ² kable 1-żyłowe o izolacji i powłoce polietylenowej lub tradycyjne | |
| Moc transformatora | do 630 kVA | |
| Masa maksymalna | 2500 kg | |
| Typ żerdzi: | strunobetonowe wirowane typu E o długości 8.2; 9; 10.5 m i wytrzymałości 10 kN oraz o długości 12 i 13.5 m i wytrzymałości 15; 17.5; 20 i 25 kN | |
| Izolacja po stronie SN | izolatory stojące LWP 8-24, LWZ 8-24, LP 45/U izolatory wiszące LP 60/5U, LP 60/8U, CS70AA20, CS70AA30, H.24.405.E.E, CS70/515E, CS70/635E, CS70E17E17 lub dobrana indywidualnie | |
| Stopień obostrzenia | 0°, 1°, 2° i 3° | |
| Rodzaj gruntu | średni i słaby | |
| Rodzaj fundamentu | z prefabrykatów, studnia z kęgów | |
| Strefa klimatyczna | WI, WII – obciążenie wiatrem SI, SII, SIIa, SIIa – obciążenie sadią | |
| Obwody niskiego napięcia | kablone | |
| Rozdzielnica niskiego napięcia | szafa rozdzielcza kablona na fundamencie obok stacji | |
| Rodzaj pomiaru energii | pośredni trójsystemowy | |

Komponenty wyposażenia stacji wymienione w pkt 4.3 OTECH/LA/09/09 powinny posiadać dokumenty na zgodność z aktualnie obowiązującymi normami.

Orzeczenie nie obejmuje oceny płyt i belek ustojowych, płyt fundamentowych i płyty dennej, które powinny posiadać aprobaty Instytutu Techniki Budowlanej.

Orzeczenie wydano zgodnie z doświadczeniem i wiedzą o wymaganiach stawianych tego typu urządzeniom w energetyce.

Opracował:

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Zatwierdził:

inż. Daniel Pawłowski

Gliwice 2009-07-21

CHAPTER 2

***STN 20/630 and STNu 20/630
pole-mounted transformer stations***

1. Subject and scope of the study

This study presents a catalogue of STN and STNu pole-mounted transformer stations with transformers rated up to 630 kVA for 15 kV and 20 kV networks. The station is intended to supply rural and suburban consumers, as well as small industrial and commercial consumers, from medium-voltage overhead or cable lines. The documentation includes materials for the design and construction of the stations. Alternative design solutions for station components allow for optimal selection of equipment. Technical data and the selection of basic station elements are provided in section 4 and alongside each station variant on the following pages.

Detailed equipment selection should be carried out using the Catalogue of STN/STNu MV/LV pole-mounted transformer stations with transformers up to 630 kVA on spun poles, Volumes I and II, published by PTPIREE Poznań.

The station's supporting structure is designed to serve as a terminal pole for MV and LV overhead lines, or alternatively as a through pole, strain pole, or strain-angle pole for MV lines, and a terminal pole for LV lines. The station provides for the installation of a disconnecter (load break switch) or a disconnecter with an earthing switch.

The album was published by:
Polskie Towarzystwo Przesyłu
i Rozdziału Energii Elektrycznej PTPIREE



2. Station solutions

The stations included in this documentation essentially consist of two groups:

STN stations with complete MV and LV side equipment, with the option to omit the operating platform,

STNu stations with simplified MV side equipment (no fuse bases or operating platform).

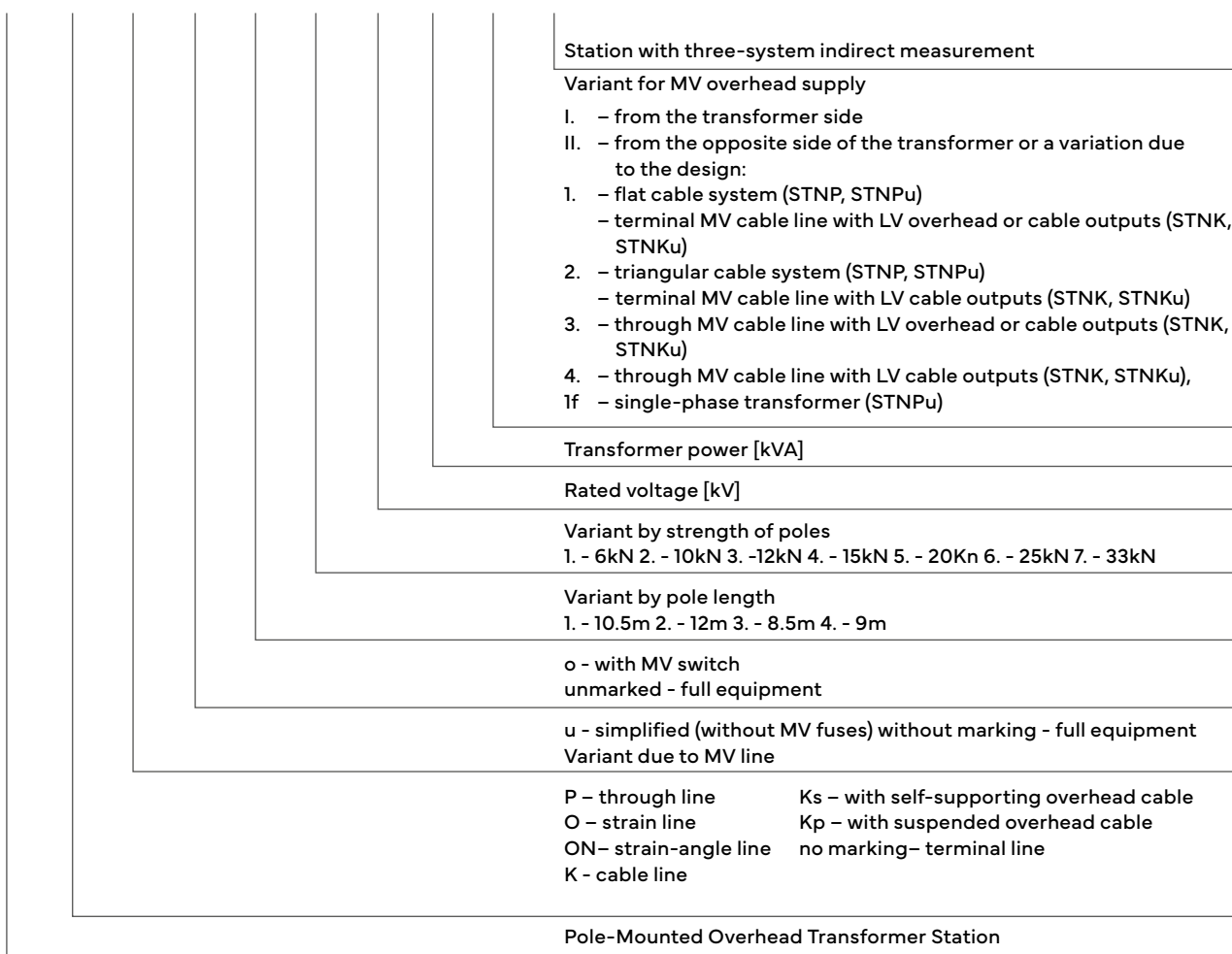
Due to the MV power supply, the following station solutions are envisaged:

| | | |
|-----|---|---|
| 1. | STN/I, STNu/I | MV overhead line power supply with bare wires or PAS type from the transformer side, terminal station |
| 2. | STN/II, STNu/II | power supply with an MV overhead line with bare cables or a PAS type from the side opposite to the transformer, terminal station |
| 3. | STNKs/I, STNKsu/I, STNKp/I, STNKpu/I | power supply with MV overhead cable line (self-supporting or suspended cable) from the transformer side, terminal station |
| 4. | STNKs/II, STNKsu/II, STNKp/II, STNKpu/II | supply with MV overhead cable line (self-supporting or suspended cable) from the side opposite to the transformer, terminal station |
| 5. | STNo, STNuO | supply with MV overhead line with bare cables or PAS type from the side opposite to the transformer, terminal station with disconnecter (load break switch) |
| 6. | STNKso, STNKsuo, STNKpo, STNKpuo | supply with MV overhead cable line (self-supporting or suspended cable) from the side opposite to the transformer, terminal station with disconnecter (load break switch) |
| 7. | STNP/1, STNpu/1 | MV overhead line power supply with bare or PAS cables, through station, flat cable system |
| 8. | STNP/2, STNpu/2 | MV overhead line power supply with bare cables, through station, triangular cables system |
| 9. | STNpu/1f | MV overhead line power supply with bare cables, through station with a 1-phase transformer with a power of 15-25 kVA, triangular cables system |
| 10. | STNpo/1, STNpuo/1 | MV overhead line power supply with bare or PAS cables, through station with disconnecter (load break switch), flat cable system |
| 11. | STNpo/2, STNpuo/2 | MV overhead line power supply with bare cables, through station with disconnecter (load break switch), triangular cable system |
| 12. | STNO, STNOu | MV overhead line power supply with bare or PAS cables, strain station |
| 13. | STNON, STNONu | power supply with MV overhead line with bare cables or PAS type, strain-angle station |
| 14. | STNK, STNKu | power supply with MV overhead line with bare cables or PAS type, strain-angle station |
| 15. | STNko, STNkuo | supply with terminal MV or through cable line, with disconnecter (load break switch) at the station |

3. Environmental conditions of station operation:

- operating temperature range: -25 °C to +40 °C,
- installation temperature range: -5 °C to +40 °C,
- altitude above sea level: up to 1 000 m,
- pollution zones I, II, III: selection according to volume II - p. 176 and recommendations of apparatus and equipment manufacturers,
- climate zones: WI, WII - wind loads,
SI, SII, SIIa, SIIa - ice loads.

STN _ _ _ _ -20 / _ / _ / PP3



4. Station characteristics

| No. | Station marking | STN, STNu - according to pt. 2 and 3. |
|-----|--------------------------------------|---|
| 1. | Rated station voltage | 15/0,42 kV, 20/0,42 kV |
| 2. | Rated insulation voltage | 24 kV |
| 3. | Transformer type | Overhead type TNOSCT |
| 4. | Transformer power and maximum weight | STN_-20/100 – to 100 kVA – 750 kg STN_-20/250 – 160-250 kVA – 1250 kg STN_-20/400 – 400 kVA – 1650 kg STND-20/630 – 630 kVA – 2150 kg |
| 5. | Supply of MV stations | 15 or 20 kV overhead line – with cables – AFL-6 35, 50, 70 – AAsXS _n , AALXS _n 50, 70 – with 12/20 (24) kV EXCEL 3x10/10, AXCES 3x70/25 self-supporting universal cables – with suspended overhead cables XnRaUHAKXS+Fe 3x50, 3x70, 3x120 Cable line at 15 or 20 kV: – with Al or Cu-core cables, e.g. YHAKXS, XHAKXS, XUHAKXS, XRUHAKXS, YHKXS, XHKXS, XUHKXS, XRUHKXS, HAKnFta, HKnFta |
| 6. | MV and LV connections at the station | Cables and wires - selection according to station wiring diagrams |
| 7. | Distribution of LV circuits | As required with application of: – LV switchboards, – LV cable connectors, – LV overhead disconnectors. |
| 8. | LV line circuits | Overhead lines with insulated or bare cables. Cable lines with YAKY, YAKXS, YKY, YKXS or other cables according to area standards |
| 9. | Static loads on stations | Selection according to load patterns |
| 10. | Types of poles | E-type spun poles, with length 8.2; 9.0; 10.5; 12.0 m and apex forces of 6 - 35.0 kN |
| 11. | MV insulation | Strain strings- t.O, t.O2, with insulators SDI-90.280, SDI-90.150, H.15.100.515.E.E., H.24.100.405.E.E., ISI-SLY, LCP 60/530, CS 70/450 EE, CS 70/515 EE, CS 70/635 EE, CS 70 AA 20 LP 45/5U, LP 60/5U, LP 60/8U Through suspensions - ZP, with insulators PI-7024KL-N, P24.12.5.275.F.O.02203, LWCP-8/24, LWCP-8/24 R, LWCP 12,5/24 R, LWP8-24, LWP8-24-S. |
| 12. | Degree of inclination | 0°, 1°, 2°, 3° |
| 13. | MV connectors | Disconnectors: ON III SA 24/4, ONp III SA 24/4, ON M III SA 24/4 Disconnectors: RN III SA 24/4, RNp III SA 24/4, RN M III SA 24/4 Disconnector with earthing switch: OUN III SA 24/4, OUNp III SA 24/4, OUN M III SA 24/4 Load break switches with earthing switch: RUN III SA 24/4, RUNp III SA 24/4, RUN M III SA 24/4 |
| 15. | Current transformers | TPO 61.11, APE |
| 16. | Voltage transformers | TJO 6, VPV1 |
| 17. | MV fuse bases | PBNVA-20/4, PBnWMA-24/50.. Fuse-link selection according to Table 4 - p. 7. |
| 18. | Cable terminations | CHE-F 24kV |
| 19. | MV surge arresters | INZP |
| 20. | LV surge arresters | ETITEC A |
| 21. | LV power capacitor | MKPg |
| 22. | Type of soil | Medium and weak - parameters according to point 11 of the description |
| 23. | Foundation of the station | UB concrete foundations, UP plate foundations, SFP prefabricated foundations, block foundations, shaft foundations |
| 24. | Station earthing | Protective and functional earthing combined – configuration 1 Protective and functional earthing separated – configuration 2 Tape and bar earthing systems for soil resistivities of 100, 200, 300, 400, 500 and 1000 Ωm. |
| 25. | Steel structures | With maximum use of cold-formed sections. |

Selection of MV and LV protection of stations

| No. | Specification | | Transformer power [kVA] | | | | | | | |
|-----|---|-----------|-------------------------|------|------------|------|-----------------|------|--------------|--------------|
| | | | 25 | 40 | 63 | 100 | 160 | 250 | 400 | 630 |
| 1. | Rated current [A] of the transformer on the MV side | 15 kV | 0,96 | 1,54 | 2,43 | 3,85 | 6,16 | 9,62 | 15,4 | 24,3 |
| | | 20 kV | 0,72 | 1,16 | 1,82 | 2,89 | 4,62 | 7,22 | 11,55 | 18,2 |
| 2. | Rated current [A] of MV fuse-links | 15 kV | 6 | 10 | 10 | 16 | 16 | 20 | 25 | 40 |
| | | 20 kV | 6 | 10 | 10 | 10 | 16 | 20 | 20 | 31,5 |
| 3. | Rated current [A] of the transformer on the LV side | 0,42 kV | 36 | 58 | 91 | 144 | 231 | 361 | 578 | 910 |
| 4. | Cross section [mm ²] of wires and LV cables transformer-LV switchboard connection | YAKY ALYd | 4 (3) x 35 | | 4 (3) x 95 | | 2 [4 (3) x 120] | | - | - |
| | | YAKXS | 4 (3) x 25 | | 4(3)x 70 | | 2 [4 (3) x 95] | | | |
| | | YKY | 4 (3) x 25 | | 4(3)x 70 | | 2 [4 (3) x 95] | | 8(6)x(1x150) | - |
| | | YKXS | | | 4 (3) x 50 | | 2 [4 (3) x 701] | | 8(6)x(1x120) | 8(6)x(1x240) |
| 5. | Cross section [mm ²] of neutral/protective cable transformer-circuit connection overhead LV lines | YAKY ALYd | 1 x35 | | 1 x50 | | 1 x 120 | | - | - |
| | | YAKXS | 1 x25 | | 1 x35 | | 1 x95 | | | |
| | | YKY | 1 x25 | | 1 x35 | | 1 x95 | | 1x150 | - |
| | | YKXS | | | 1 x25 | | 1 x70 | | 1x120 | 2x(1x120) |

NOTES:

- MV fuse links (No. 2) are selected for the rated power of the transformers according to the guidelines of the fuse-link manufacturers and provide protection for the transformer and MV transformers against the effects of short-circuits and overloads.
- During the construction of the station, cables should be installed (no. 4) at full power of the anticipated target transformer. Treat the specified low-voltage cable cross sections as minimum for the relevant transformer power.
- Select the fuse links for LV circuits according to the load conditions and the requirements for electric shock protection.
- Three-core connections shall be used when the protective-neutral cable (no. 5) is routed directly from the transformer to connect with the PEN cables of the LV overhead circuits.
- When selecting cable cross-sections, pay attention to the differences in current-carrying capacity of Y(A)KY, Y(A)KXS cables or others, in accordance with the standards applicable in the given region.
- The ends of LV cables exposed to sunlight must be protected with SFEX 1 or SFEX 4 outdoor cable terminations manufactured by Cellpack.
- It is recommended to use Cellpack products for sealing conduits with LV and MV cables:
 - for MV cables, type SEH3, with the colour and diameter appropriate to the conduit used,
 - for LV cables:
 - for 1 4-core cable, an EC-type sealing cap with a diameter appropriate to the conduit used,
 - for 4 1-core cables, a 4-conduit type SEH-4 with a diameter appropriate to the conduit used.

5. Station power supply:

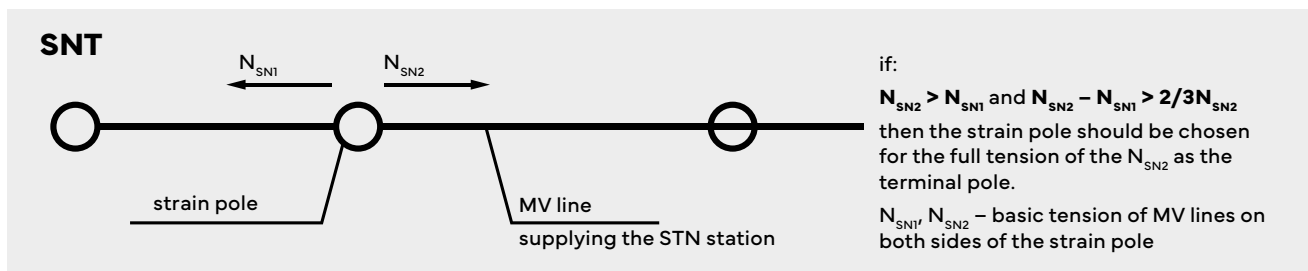
The MV supply to the station is designed to be provided via:

- overhead line with bare conductors – AFL-6 35, 50, 70 mm², overhead line with semi-insulated conductors – type AALXSn, AAsXSn, fully insulated conductors – universal cables type EXCEL, AXCES.
- with suspended overhead cables of type XnRaUHAKXS+Fe
- cable line with single-core single-sheath cables, three-core single-sheath or three-sheath cables with paper insulation impregnated with non-draining saturant, or cables with thermoplastic insulation and sheath (cable types according to point 4).

Allowable MV conductor tensions are presented on pages 124–129 and 133–138 in the catalogue of pole-mounted MV/LV transformer stations STN, STNu with transformers up to 630 kVA on spun poles, Volume I, published by PTPIREE Poznań. This catalogue includes LV overhead outputs as well as cases with LV outputs exclusively cable-based.

Pages 114–121 of this catalogue also provide the allowable overall span lengths of MV lines with bare cables, as well as the nominal span lengths of lines with semi-insulated or fully insulated conductors supplying the station.

For bare cables, nominal span lengths must be determined individually based on the cable clearance above ground, taking into account the cable height at the station and at the preceding line pole (terminal station), or at adjacent poles (through or strain station). In the case of using a strain pole before the station, where the tension difference on its two sides exceeds 2/3 of the tension calculated for the basic stress of the supply line cables, its load capacity should be considered as that of a terminal pole – according to the scheme below.



6. LV circuit output

LV circuit outputs are planned as overhead lines with insulated conductors and cable lines made with LV cables (cable types according to point 4). The number of LV circuits exiting the station depends on the type of outputs (overhead or cable) and the distribution of circuits within the station. The number and types of LV lines, as well as the directions of their outlets, must take into account conditions resulting from the station design choice, the selected MV line tension, and the transformer capacity at the station.

Allowable static loads of the station should be selected based on the diagrams contained on page 123 of the catalogue of pole-mounted MV/LV transformer stations STN, STNu with transformers up to 630 kVA on spun poles, Volume I, published by PTPIREE Poznań.

The span lengths of low-voltage lines should be determined based on the selected basic cable tension, which must be chosen so that the total tension of the LV line does not exceed the station loads according to the above-mentioned diagrams and the allowable load of the applied cable accessories.

7. Station equipment

Medium voltage side

At terminal, strain, or strain-angle stations, the MV overhead line with bare cables or PAS type cables is attached to the crossarm using guy strings, whereas at through stations, with the use of through suspensions. The MV overhead line made with self-supporting cable types EXCEL, AXCES, or with suspended cable XnRaUHAKXS+Fe is directly attached to the pole or the support structure of the disconnecter using appropriate cable accessories. At stations supplied by MV cable lines, the cable entering the station pole is terminated with cable terminations mounted on the support structure or with connector terminations directly connected to the transformer. The connection between the MV line and the transformer is made using AALXSn or AAsXSn type

cables, through fuse bases or additionally through a disconnecter (load break switch). The catalogue includes station solutions with indirect three-system energy measurement, using overhead MV current and voltage transformers. All the mentioned stations may be available in a simplified version, i.e., without MV fuse bases and operating platform, which in stations with fuse bases is provided as an option.

Basically, four station variants are planned based on transformer power and weight: up to 100 kVA, 160 to 250 kVA, 400 kVA and 630 kVA.

The MV equipment of the station will be protected against over-voltages by appropriately selected surge arresters.

Low voltage side

The station equipment on the LV side is determined by the nature of the LV circuit outputs. The distribution of LV circuits, depending on requirements, can be carried out using pole-mounted and freestanding LV switchboards, freestanding cable connectors, pole-mounted and freestanding lighting cabinets, as well as pole-mounted LV disconnectors. The detailed equipment of the LV switchboard is recommended to be agreed with its manufacturer. Connections between the transformer and the LV switchboard are planned with LV cables or alternatively with single-core ALYd cables.

Insulated conductors of the LV line may be directly introduced into the LV switchboard or the pole-mounted disconnecter.

Connections between the transformer and freestanding LV switchboards, connectors, and cabinets should be made using appropriately selected LV cables.

Wires and cables routed through the station can be installed on cable ladders or with brackets attached directly to the poles.

The connection of cables and wires to the transformer clamps depends on the transformer power and the cables used. Details of these connections are shown in the catalogue of MV/LV STN, STN pole-mounted transformer stations with transformers up to 630 kVA on spun poles, volume II issued by PTPIREE Poznań. On the LV side, a power capacitor for reactive power compensation can be installed and its selection depending on the transformer power is given in the aforementioned catalogue.

8. Station structure

The station's supporting structure consists of a single spun prestressed concrete pole of type E. Detailed selection of poles depending on the station type should be made according to load diagrams, in accordance with the assortment included in Volume II. Static loads on the supporting structure must not exceed the allowable forces specified in the load diagrams. Steel structures made of St3SY steel are primarily designed from cold-formed sections.

Steel structures are designated by a symbol consisting of letters derived from the name and a subsequent structure number.

All steel components are protected against corrosion by hot-dip galvanization in accordance with PN-93/E-04500 with a coating of Z/Zn 70 for the structure and Z/Zn 52 for the bolt elements.

After the structure has been assembled on site, in aggressive environments, additional painting with protective coating is rec-

ommended in accordance with EN ISO 12944-5:2001 Paints and varnishes. Protection of steel structures against corrosion by protective paint systems. Part 5: Protective paint systems. Screws, washers and pins used in structures should also be galvanized or cadmium-plated. All steel components shall be permanently marked with the manufacturer's mark and the symbols adopted in this study.

The dimensions of the structure take into account the allowable distances of live parts from the structure and the pole elements according to N SEP-E-003 and PN-E-05100-1:1998 Table 12. When making MV cable connections at stations, attention must be paid to the insulation clearances between cables and structures. The minimum insulation gap should be $R_{min} = 22$ cm. The selection of insulators and accessories and other components not included in this study requires appropriate checking and adaptation.

9. Station earthing

Volume II of the catalogue presents the implementation of the station's protective and functional earthing as a combined system. Earthing systems depending on the resistivity of the soil, as well as the requirements for station earthing and the principles for

its implementation are defined in the catalogue of pole-mounted MV/LV STN, STNu transformer stations with transformers up to 630 kVA on spun poles volume II issued by PTPIREE Poznań.

10. Surge protection

The station equipment on the MV side is protected from surges by MV surge arresters in a composite or silicon housing. Mounting and selection examples of MV surge arresters for individual voltages, for networks with isolated neutral point or earth fault current compensation with unknown short-circuit tripping time, are presented in Volume II of the catalogue pole-mounted

SN/LV STN, STNu transformer stations with transformers up to 630 kVA on spun poles Volume II issued by PTPIREE Poznań. For networks with a neutral point earthed through a resistor or inductive reactance, and with a known earth fault clearing time, the selection of surge arresters should be made based on the recommendations of individual manufacturers.

11. Foundation

Before selecting the station foundations, the subsoil should first be assessed based on the principles recommended in the PN-81/B-03020 standard. Methods adopted universally in the construction of medium- and low-voltage power lines involving the determination of values of geotechnical parameters based on practical experience of construction in similar areas, assessed when determining the location of station foundations.

To facilitate the classification of soil as medium, weak, or very weak, Table 1 presents generalized soil properties. This catalogue includes pole foundations designed for medium and weak soil conditions. In the case of very weak soils, the station foundation should be designed individually.

Table 1.
Generalized soil properties

| Soil type and condition | | Generalized soil properties | | | | |
|-------------------------|---|-----------------------------|---------------------------|---------------------------------|------------------------|-------|
| | | ψ | c' kN/m ² | γ_o kN/m ³ | C kN/m ³ | μ |
| Medium soil | Deposits, rubble, gravels, sandy gravels, dense and medium dense coarse sands, dense fine sands. | 37 | 0 | 18,5 | 40000 | 0,55 |
| | Silts, clays, stiff clays, silty soils, clayey gravels, gravel-sand mixtures, and semi-compacted to stiff-plastic sands | 20 | 25 | 20,0 | 40000 | 0,25 |
| Weak soil | Deposits, rubble, gravels, sandy gravels, coarse sands, loose fine sands, and medium-dense silty sands. | 32 | 0 | 17,5 | 25000 | 0,45 |
| | Silts, clays, firm clays, silty soils, clayey gravels, gravel-sand mixtures, and plastic clayey sands. | 15 | 20 | 19,0 | 25000 | 0,30 |
| Very weak soil | Fine and silty sands, loose, and humus-bearing sands of medium density. | 25 | 0 | 15,0 | 10000 | 0,35 |
| | Silts, clays, firm clays, silty clays, clayey gravels, gravel-sand mixtures, and soft-plastic clayey sands. | 10 | 5 | 18,0 | 5000 | 0,10 |

ψ – internal friction angle (in degrees), c' – effective cohesion, γ_o – bulk unit weight (or unit weight of soil), C – subgrade reaction modulus, μ – coefficient of friction between soil and concrete foundation

Foundation calculations were performed using the limit state method based on the PN-80/B-03322 standard, adopting the generalized soil properties given in Table 1.

The designs of the pole foundations, including technical specifications, excavation volumes, and bills of materials necessary for their construction, are presented in this study on the catalogue sheets of the associated elements.

Protection of steel and concrete foundation elements of the station against harmful effects shall be carried out in accordance with PN-E-05100-1:1998, point 7.6.

Steel components and their connections located in the underground part of the pole must be additionally protected against corrosion using paint or bituminous coating. The underground concrete parts of the foundations should be protected against harmful effects only in highly aggressive soil, with the type of protection selected according to the specific risk present.

12. Environmental protection

a) disposal:

The station is made of elements intended for disposal after the end of their service life.

b) oil leakage protection:

Current hermetic transformers with an output of 630 kVA and an upper voltage of 21 kV contain approximately 340 to 450 litres of oil, the danger of which is negligible due to their design and build quality.

According to the PN-E-05115:2002 standard, clause 7.7.1, an oil containment basin is not required in overhead installations if the amount of oil in a single transformer is less than 1000 litres. However, it is recommended to provide a gravel bedding 20 cm thick on a 5 cm layer of compacted sand, with dimensions of 2 x 2 meters, designed to be replaced in case of a potential oil leak. The above shall not apply where local regulations provide otherwise. In such cases, according to clause 7.7.1.2 of the aforementioned standard, the oil containment basin must be individually designed, taking into account rainwater drainage and its separation from the oil.

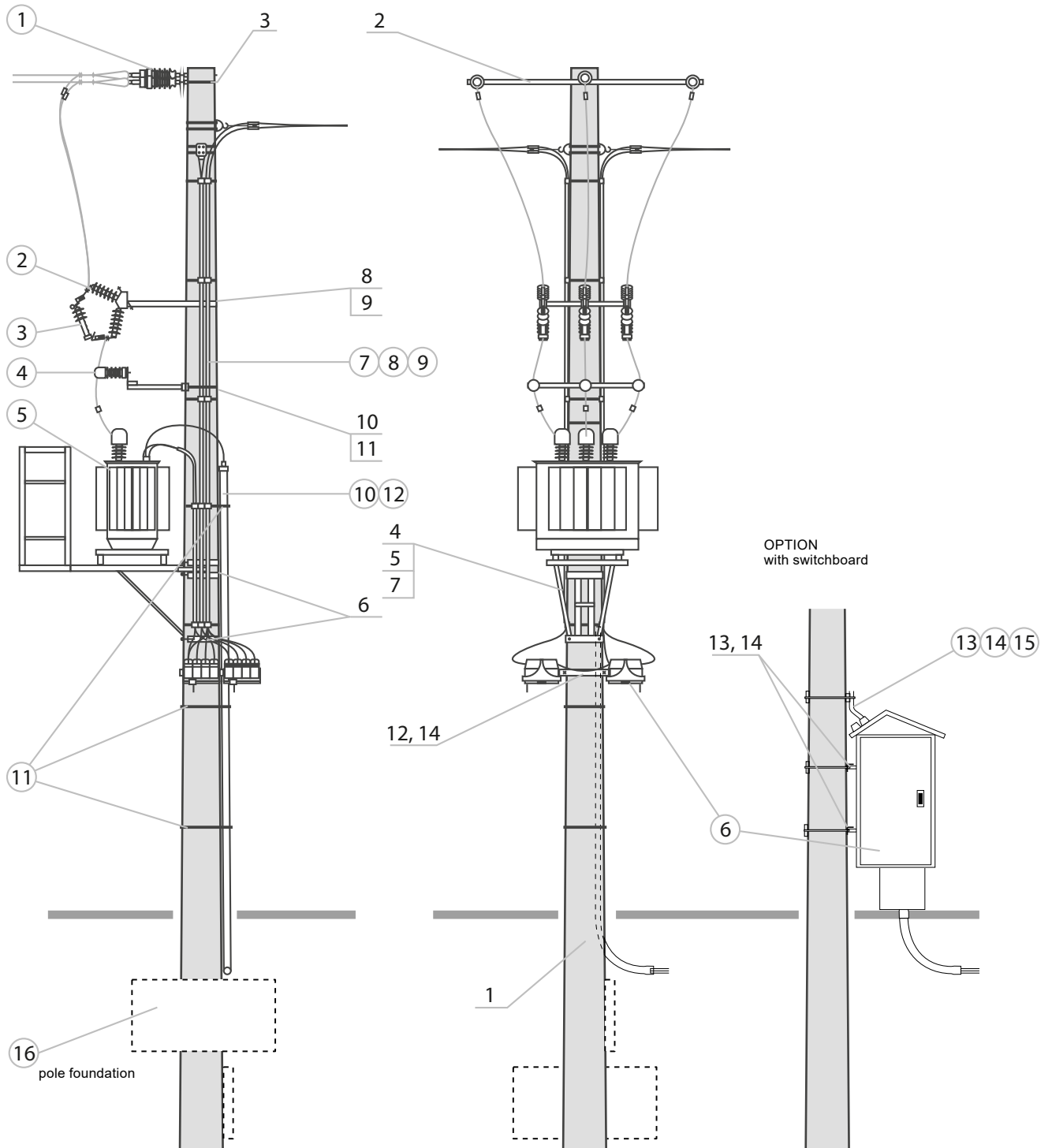
13. Station solutions

List of structures, accessories, apparatus for STN-20/630/.../.../1

| STRUCTURES | | | | | | | | | |
|------------|--|------------------------------------|----------|------|-----------------|--|--|--------------------|------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m | | | |
| 2. | Station crossarm | PK-12 | PK-3b | 1 | pcs. | ALPAR | N_{SN} line tension ≤ 20 kN ≤ 12 kN ≤ 20 kN ≤ 20 kN $\leq 13,5$ kN ≤ 9 kN | top diameter = 420 | PAS cables |
| | | PK-11a | PK-3a | | | | | top diameter = 263 | |
| | | PK-6a | PK-1a | | | | | top diameter = 218 | |
| | | PKZ-7 | | | | | | top diameter = 420 | |
| | | PKZ-6 | | | | | | top diameter = 263 | |
| | | PKZ-3b | PKZ-1c | | | | | top diameter = 420 | |
| | | PKZ-3a | PKZ-1b | | | | | top diameter = 263 | |
| | | PKZ-3 | PKZ-1a | | | | | top diameter = 218 | |
| 3. | Bracket | OG-20 OG-8 OG-2 | 1 | pcs. | ALPAR | For PKZ-1c, PK-3b For PKZ-1b, PK-3a For PKZ-1a, PK-1a | | | |
| 4. | Structure for the transformer | KTZ1a KTZ2a KTZ-3a KTZ-8 | 1 | pcs. | ALPAR | Transformer from 25 kVA to 100 kVA Transformer from 160 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | | | |
| 5. | Structure for OCTs | KPT-1 KPT-2 | 1 | pcs. | ALPAR | For KTZ-1a for pole with top diameter = 263 mm For KTZ-1a to KTZ-3a for pole with top diameter = 420 mm | | | |
| 6. | Bracket | OS-22; OS-23 | 2 | pcs. | ALPAR | For KTZ installation; OS-23 - top diameter = 263 mm | | | |
| 7. | Operating platform | POZ-1a | 1 | | ALPAR | Use for STN stations | | | |
| 8. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | Use for STN stations | | | |
| 9. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles with top diameter = 263 mm For poles with top diameter = 218 mm | | | |
| 10. | Structure for arresters | KOG-5 | 1 | pcs. | ALPAR | Not to be used when mounting bases with PBNVoA or PBNWMoA arresters | | | |
| 11. | Bracket | OB-9 OB-7 | 1 | pcs. | ALPAR | For KOG for poles with top diameter = 263 mm For KOG for poles with top diameter = 218 mm | | | |
| 12. | LV disconnecter structure | KRZ-3a | 1 | pcs. | ALPAR | For 2 to 5 LV disconnectors | | | |
| 13. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Structures for pole-mounted switchboards - not to be used for installation of LV disconnectors | | | |
| 14. | Bracket | OB-12 OB-10 | 2 (1) | pcs. | ALPAR | For KRZ or RS for poles with top diameter = 263 mm For KRZ or RS for poles with top diameter = 218 mm (1) - for LV disconnectors | | | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|------------------------------------|--|-------------|------|------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Insulator string | $\pm O/1$ $\pm O2/1$ $\pm O/2$ $\pm O2/2$ | 3 | set | ... / ALPAR | Single / double for bare line Single / double for PAS line - configuration 5 |
| 2. | Fuse base | PBNWMA-24/50 PBNWMoA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - |
| | | WBGn 17,5 | 3 | pcs. | ZRE / APLAR | - With integrated MV arrester |
| 3. | Fuse link | HH ... A 10/24 kV "e"=442 mm; "e"=292 mm | 3 | pcs. | SIBA / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | ... | 3 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 5. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 6. | LV disconnecter DB switchboard | ... | from 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 7. | Protective tube | RW-2 | 1 | set | ... / ALPAR | |
| 8. | Conduit clamp | U75W | 4 | pcs. | ALPAR | Use when using an LV overhead disconnecter |
| 9. | Heat-shrinkable four-core breakout | SEH-4_95-36 | 1 | pcs. | CELLPACK / ALPAR | |
| 10. | Protective tube | BE110 | 6 | m | ... / ALPAR | |
| 11. | Conduit clamp | U110W | 3 | pcs. | ALPAR | Use when using free-standing switchboard |
| 12. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 13. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 14. | Conduit clamp | U110W | 3 | pcs. | ALPAR | Use when using a wall-mounted switchboard at the station |
| 15. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 16. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

STN-20/630/.../.../1

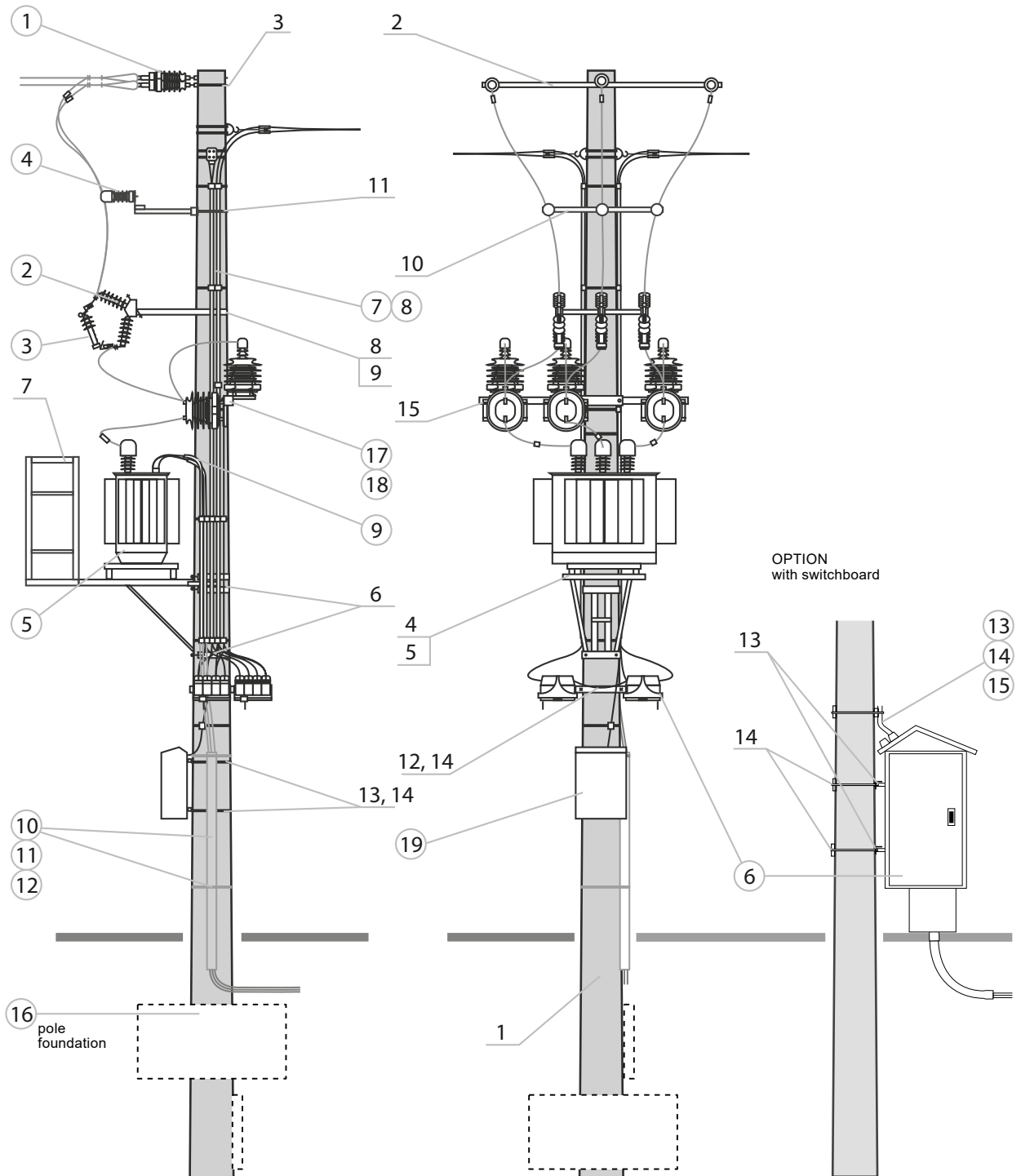


List of structures, accessories, apparatus for STN-20/630/.../.../1/PP3

| STRUCTURES | | | | | | | | | |
|------------|---|------------------------------------|----------|------|-----------------|--|--|--|------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m | | | |
| 2. | Station crossarm | PK-12 | PK-3b | 1 | pcs. | ALPAR | N_{SL} line tension ≤ 20 kN ≤ 12 kN ≤ 20 kN ≤ 20 kN $\leq 13,5$ kN ≤ 9 kN | top diameter = 420 top diameter = 263 top diameter = 218 top diameter = 420 top diameter = 263 top diameter = 420 top diameter = 263 top diameter = 218 | PAS cables |
| | | PK-11a | PK-3a | | | | | | |
| | | PK-6a | PK-1a | | | | | | |
| | | PKZ-7 | | | | | | | |
| | | PKZ-6 | | | | | | | |
| | | PKZ-3b | PKZ-1c | | | | | | |
| | | PKZ-3a | PKZ-1b | | | | | | |
| | | PKZ-3 | PKZ-1a | | | | | | |
| 3. | Bracket | OG-20 OG-8 OG-2 | 1 | pcs. | ALPAR | For PKZ-1c, PK-3b For PKZ-1b, PK-3a For PKZ-1a, PK-1a | | | |
| 4. | Structure for the transformer | KTZ1a KTZ2a KTZ-3a KTZ-8 | 1 | pcs. | ALPAR | Transformer from 25 kVA to 100 kVA Transformer from 160 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | | | |
| 5. | Structure for OCTs | KPT-1 KPT-2 | 1 | pcs. | ALPAR | For KTZ-1a for pole with top diameter = 263 mm For KTZ-1a to KTZ-3a for pole with top diameter = 420 mm | | | |
| 6. | Bracket | OS-22; OS-23 | 2 | pcs. | ALPAR | For KTZ installation; OS-23 - top diameter = 263 mm | | | |
| 7. | Operating platform | POZ-1a | 1 | | ALPAR | Use for STN stations | | | |
| 8. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | Use for STN stations | | | |
| 9. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm | | | |
| 10. | Structure for arresters | KOG-5 | 1 | pcs. | ALPAR | Do not use when installing bases with PBNVoA or PBNWMoA surge arresters | | | |
| 11. | Bracket | OB-9 OB-7 | 1 | pcs. | ALPAR | For KOG for poles with top diameter = 263 mm For KOG for poles with top diameter = 218 mm | | | |
| 12. | LV disconnecter structure | KRZ-3a | 1 | pcs. | ALPAR | For 2 to 5 LV disconnectors | | | |
| 13. | Mounting structure for the switchboard and installation cabinet | KSZ-8a | 4 | pcs. | ALPAR | Structures for pole-mounted switchboard - do not use when installing LV disconnectors | | | |
| 14. | Bracket | OB-12 OB-10 | 4 (3) | pcs. | ALPAR | For KRZ or RS for poles with top diameter = 263 mm For KRZ or RS for poles with top diameter = 218 mm (3) - for LV disconnectors | | | |
| 15. | Structure for transformers | KP-1 KP-2 | 1 | set | ALPAR | For poles with top diameter = 263 mm, top diameter = 218 mm For poles with top diameter = 420 mm | | | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|------------------------------------|---|-------------|------|-----------------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Insulator string | $\pm O/1$ $\pm O2/1$ $\pm O/2$ $\pm O2/2$ | 3 | set | ... / ALPAR | Single / double for bare line Single / double for PAS lines - configuration 5 |
| 2. | Fuse base | PBNWMA-24/50 PBNWMoA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - With integrated MV arrester |
| | | WBGn 17,5 HH ... A 10/24 kV "e"=442 mm; "e"=292 mm | 3 | pcs. | ZRE / APLAR SIBA / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| 4. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorized designer |
| 5. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | To be selected by an authorised designer |
| 6. | LV disconnecter DB switchboard | ... | from 5 1 | pcs. | ... / ALPAR | To be selected by an authorised designer |
| 7. | Protective tube | RW-2 | 1 | set | ... / ALPAR | |
| 8. | Conduit clamp | U75W | 4 | pcs. | ALPAR | Use when using an LV overhead disconnecter |
| 9. | Heat-shrinkable four-core breakout | SEH-4_95-36 | 1 | pcs. | CELLPACK / ALPAR | |
| 10. | Protective tube | BE110 | 6 | m | ... / ALPAR | |
| 11. | Conduit clamp | U110W | 3 | pcs. | ALPAR | Use when using free-standing switchboard |
| 12. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 13. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 14. | Conduit clamp | U110W | 3 | pcs. | ALPAR | Use when using a wall-mounted switchboard at the station |
| 15. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 16. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer |
| 17. | Voltage transformer | VTO | 3 | pcs. | ALPAR | The value of the transformer shall be determined by an authorised designer |
| 18. | Current transformer | CTSO | 3 | pcs. | ALPAR | The value of the transformer shall be determined by an authorised designer |
| 19. | Metering cabinet | ... | 1 | pcs. | ... / ALPAR | Hanging or free-standing according to individual requirements |

STN-20/630/.../.../1/PP3

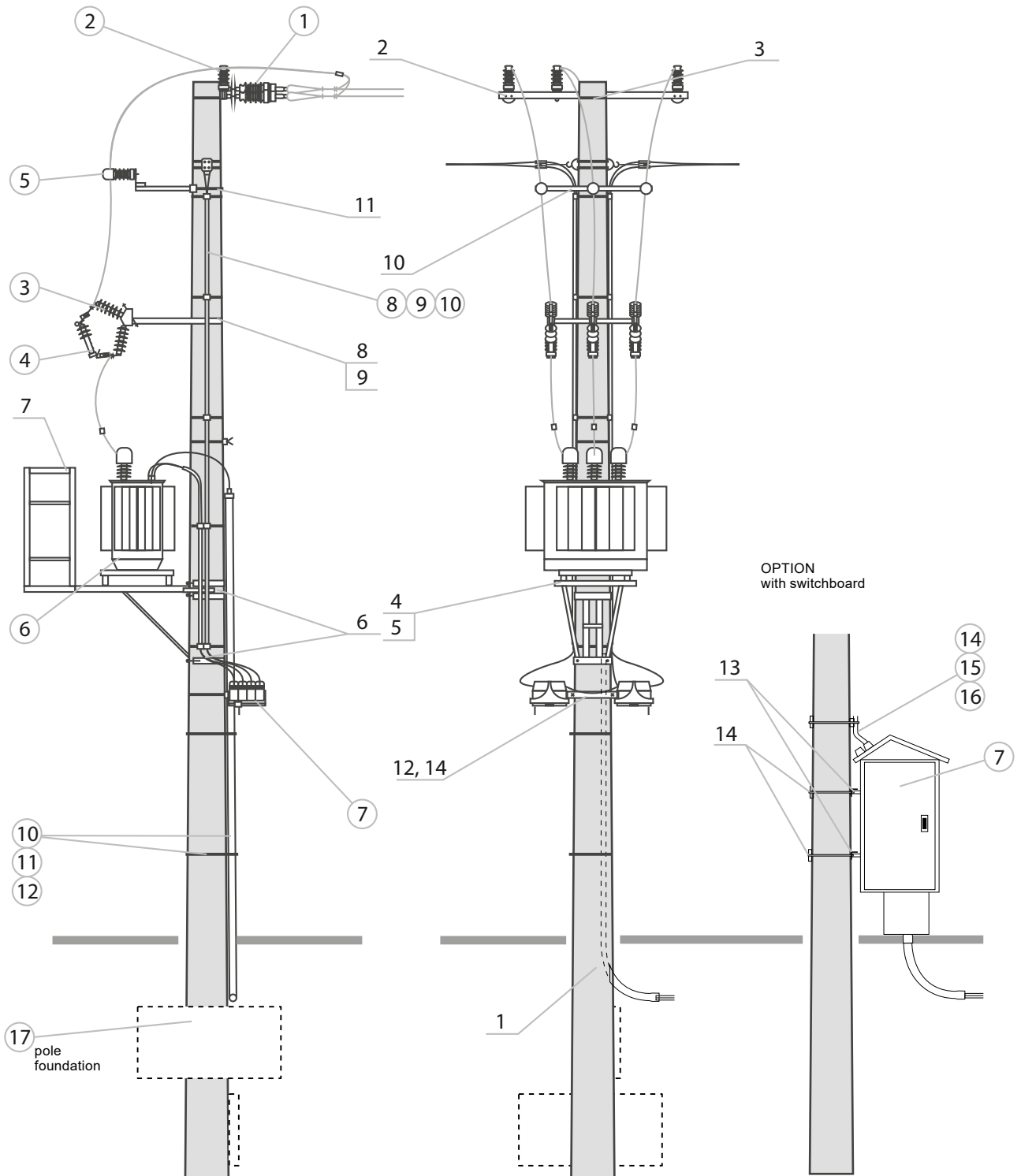


List of structures, accessories, apparatus for STN-20/630/.../.../II

| STRUCTURES | | | | | | | | | |
|------------|--|------------------------------------|----------|------|-----------------|--|--|--------------------|------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m | | | |
| 2. | Station crossarm | PK-12 | PK-3b | 1 | pcs. | ALPAR | N_{SN} line tension ≤ 20 kN ≤ 12 kN ≤ 20 kN ≤ 20 kN $\leq 13,5$ kN ≤ 9 kN | top diameter = 420 | PAS cables |
| | | PK-11a | PK-3a | | | | | top diameter = 263 | |
| | | PK-6a | PK-1a | | | | | top diameter = 218 | |
| | | PKZ-7 | | | | | | top diameter = 420 | |
| | | PKZ-6 | | | | | | top diameter = 263 | AFL Cables |
| | | PKZ-3b | PKZ-1c | | | | | top diameter = 420 | |
| | | PKZ-3a | PKZ-1b | | | | | top diameter = 263 | |
| | | PKZ-3 | PKZ-1a | | | | | top diameter = 218 | |
| 3. | Bracket | OG-20 OG-8 OG-2 | 1 | pcs. | ALPAR | For PKZ-1c, PK-3b For PKZ-1b, PK-3a For PKZ-1a, PK-1a | | | |
| 4. | Structure for the transformer | KTZ1a KTZ2a KTZ-3a KTZ-8 | 1 | pcs. | ALPAR | Transformer from 25 kVA to 100 kVA Transformer from 160 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | | | |
| 5. | Structure for OCTs | KPT-1 KPT-2 | 1 | pcs. | ALPAR | For KTZ-1a for pole with top diameter = 263 mm For KTZ-1a to KTZ-3a for pole with top diameter = 420 mm | | | |
| 6. | Bracket | OS-22 ; OS-23 | 2 | pcs. | ALPAR | For KTZ installation; OS-23 - top diameter = 263 mm | | | |
| 7. | Operating platform | POZ-1a | 1 | | ALPAR | Use for STN stations | | | |
| 8. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | Use for STN stations | | | |
| 9. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm | | | |
| 10. | Structure for arresters | KOG-5 | 1 | pcs. | ALPAR | Do not use when installing bases with PBNVoA or PBNWMoA surge arresters | | | |
| 11. | Bracket | OB-9 OB-7 | 1 | pcs. | ALPAR | For KOG for poles with top diameter = 263 mm For KOG for poles with top diameter = 218 mm | | | |
| 12. | LV disconnecter structure | KRZ-3a | 1 | pcs. | ALPAR | For 2 to 5 LV disconnectors | | | |
| 13. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Structures for pole-mounted switchboard - do not use when installing LV disconnectors | | | |
| 14. | Bracket | OB-12 OB-10 | 2 (I) | pcs. | ALPAR | For KRZ or DB for pole with top diameter = 263 mm For KRZ or DB for pole with top diameter = 218 mm (I) - for LV disconnectors | | | |

| APPARATUS AND ACESORIES | | | | | | |
|-------------------------|------------------------------------|--|-------------|------|------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 3 | set | ... / ALPAR | Single / double for bare line Single/ double for PAS lines - configuration 5 |
| 2. | Supporting insulator | LWP-8/24 LWP-8/24S SGT 24-1/LS | 3 | pcs. | ALPAR | Porcelain for bare line Porcelain for PAS line Composite for bare and PAS line |
| 3. | Fuse base | PBNWMA-24/50 PBNWMoA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - |
| 4. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / APLAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | HH ... A 10/24 kV "e"=442 mm; "e"=292 mm | 3 | pcs. | SIBA / ALPAR | |
| 5. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 6. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 7. | LV disconnecter DB switchboard | ... | from 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 8. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when using an LV overhead disconnecter |
| 9. | Conduit clamp | U75W | 4 | pcs. | ALPAR | |
| 10. | Heat-shrinkable four-core breakout | SEH-4_95-36 | 1 | pcs. | CELLPACK / ALPAR | |
| 11. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 12. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 13. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 14. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use when using a wall-mounted switchboard at the station |
| 15. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 16. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 17. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

STN-20/630/.../.../II

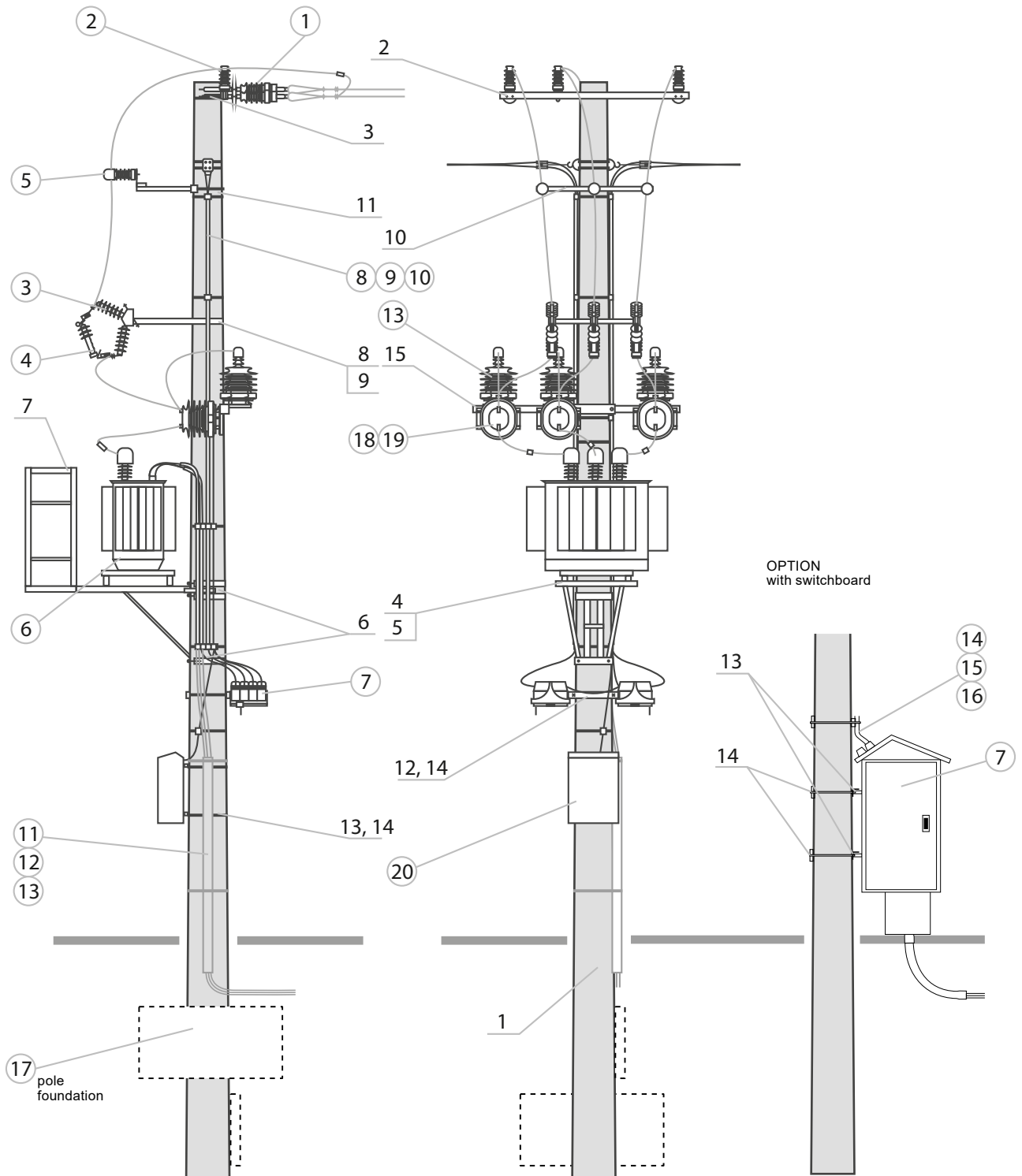


List of structures, accessories, apparatus for STN-20/630/.../.../II/PP3

| STRUCTURES | | | | | | | | |
|------------|---|------------------------------------|----------|------|-----------------|---|--|------------------------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m | | |
| 2. | Station crossarm | PK-12 | PK-3b | 1 | pcs. | ALPAR | N_{SN} line tension ≤ 20 kN ≤ 12 kN ≤ 20 kN ≤ 20 kN $\leq 13,5$ kN ≤ 9 kN top diameter = 420 top diameter = 263 top diameter = 218 top diameter = 420 top diameter = 263 top diameter = 420 top diameter = 263 top diameter = 218 | PAS cables AFL Cables |
| | | PK-11a | PK-3a | | | | | |
| | | PK-6a | PK-1a | | | | | |
| | | PKZ-7 | | | | | | |
| | | PKZ-6 | | | | | | |
| | | PKZ-3b | PKZ-1c | | | | | |
| | | PKZ-3a | PKZ-1b | | | | | |
| | | PKZ-3 | PKZ-1a | | | | | |
| 3. | Bracket | OG-20 OG-8 OG-2 | 1 | pcs. | ALPAR | For PKZ-1c, PK-3b For PKZ-1b, PK-3a For PKZ-1a, PK-1a | | |
| 4. | Structure for the transformer | KTZ1a KTZ2a KTZ-3a KTZ-8 | 1 | pcs. | ALPAR | Transformer from 25 kVA to 100 kVA Transformer from 160 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | | |
| 5. | Structure for OCTs | KPT-1 KPT-2 | 1 | pcs. | ALPAR | For KTZ-1a for pole with top diameter = 263 mm For KTZ-1a to KTZ-3a for pole with top diameter = 420 mm | | |
| 6. | Bracket | OS-22 ; OS-23 | 2 | pcs. | ALPAR | For KTZ installation; OS-23 - top diameter = 263 mm | | |
| 7. | Operating platform | POZ-1a | 1 | | ALPAR | Use for STN stations | | |
| 8. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | Use for STN stations | | |
| 9. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm | | |
| 10. | Structure for arresters | KOG-5 | 1 | pcs. | ALPAR | Not to be used when mounting bases with PB-NVoA or PBNW/MoA arresters | | |
| 11. | Bracket | OB-9 OB-7 | 1 | pcs. | ALPAR | For KOG for poles with top diameter = 263 mm For KOG for poles with top diameter = 218 mm | | |
| 12. | LV disconnecter structure | KRZ-3a | 1 | pcs. | ALPAR | For 2 to 5 LV disconnectors | | |
| 13. | Mounting structure for the switchboard and metering cabinet | KSZ-8a | 4 | pcs. | ALPAR | Structures for pole-mounted switchboard - do not use when installing LV disconnectors | | |
| 14. | Bracket | OB-12 OB-10 | 4 (3) | pcs. | ALPAR | For KRZ or RS for poles with top diameter = 263 mm For KRZ or RS for poles with top diameter = 218 mm (3) - for LV disconnectors | | |
| 15. | Structure for transformers | KP-1 KP-2 | 1 | set | ALPAR | For poles top diameter = 263 mm, top diameter = 218 mm For poles top diameter = 420 mm | | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|------------------------------------|---|-------------|------|------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 3 | set | ... / ALPAR | Single / double for bare line Single / double for PAS lines - configuration 5 |
| 2. | Supporting insulator | LWP-8/24 LWP-8/24S SGT 24-1/LS | 3 | pcs. | ALPAR | Porcelain to bare line Porcelain to PAS line Composite for bare and PAS line |
| 3. | Fuse base | PBNWMA-24/50 PBNW/MoA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - With integrated MV arrester |
| 4. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / APLAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | HH ... A 10/24 kV "e"=442 mm; "e"=292 mm | 3 | pcs. | SIBA / ALPAR | |
| 5. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 6. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | To be selected individually by an authorised designer |
| 7. | LV disconnecter DB switchboard | ... | from 5 1 | pcs. | ... / ALPAR | To be selected individually by an authorised designer |
| 8. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when using an LV overhead disconnecter |
| 9. | Conduit clamp | U75W | 4 | pcs. | ALPAR | |
| 10. | Heat-shrinkable four-core breakout | SEH-4_95-36 | 1 | pcs. | CELLPACK / ALPAR | |
| 11. | Protective tube | BE110 | 6 | m | ... / ALPAR | |
| 12. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 13. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 14. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 15. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 16. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 17. | Foundation support structure | ... | 1 | set | ALPAR | |
| 18. | Voltage transformer | VTO | 3 | pcs. | ALPAR | The value of the transformer shall be determined by an authorised designer |
| 18. | Current transformer | CTSO | 3 | pcs. | ALPAR | The value of the transformer shall be determined by an authorised designer |
| 20. | Metering cabinet | ... | 1 | pcs. | ... / ALPAR | Hanging or free-standing according to individual requirements |

STN-20/630/.../.../II/PP3

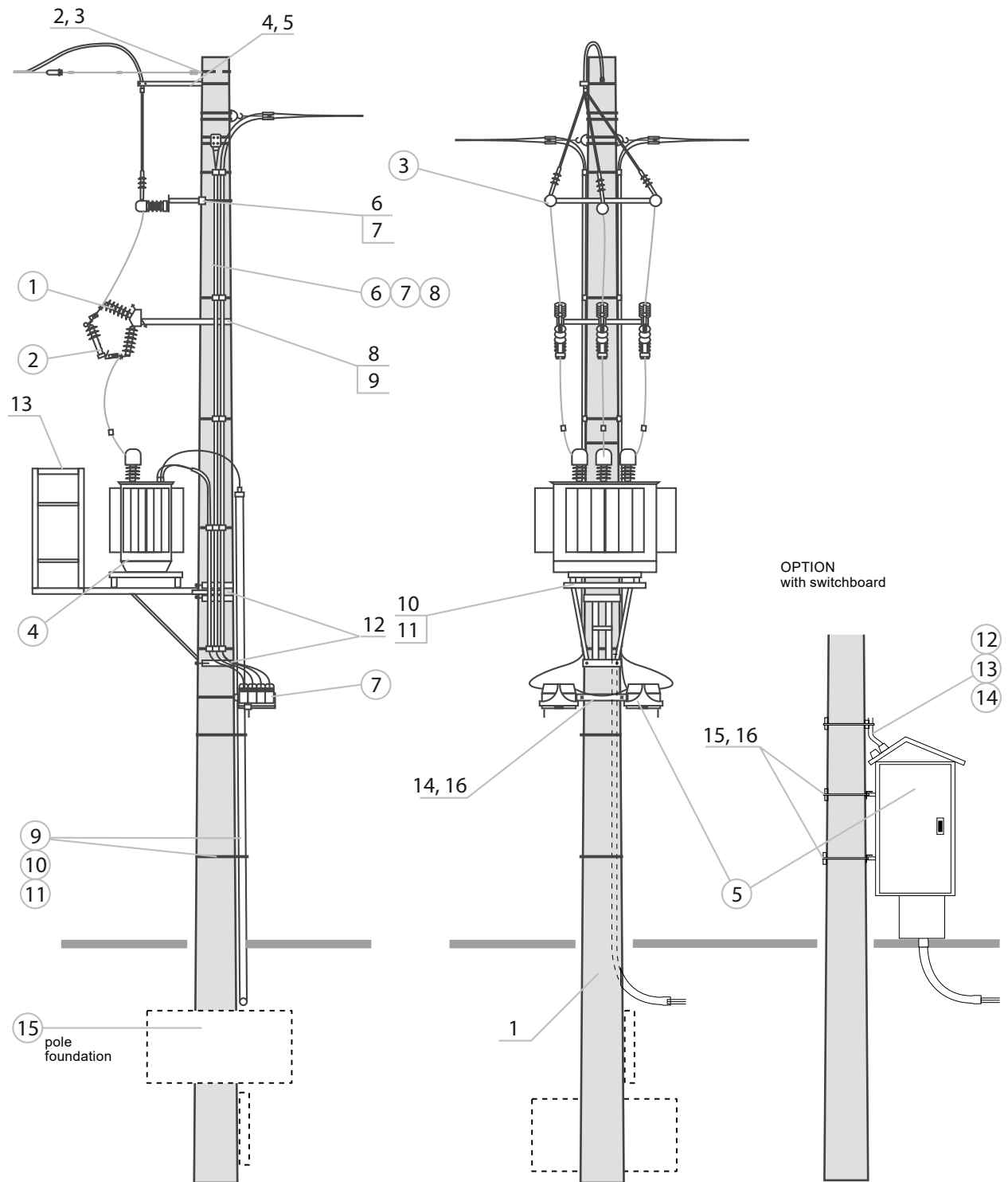


List of structures, accessories, apparatus for STNKs-20/630/.../.../1

| STRUCTURES | | | | | | |
|------------|--|-------------------------------------|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m |
| 2. | Strain bolt Strain structure | M24x240+N+Ps+Pk M24x300+N+Ps+Pk | 1 | pcs. | ALPAR | For poles with top diameter = 263 mm For poles with top diameter = 218 mm |
| | | KOD-1c KOD-1a | 1 | pcs. | ALPAR | For poles top diameter = 420 mm For poles top diameter = 218 mm; 263 mm |
| 3. | Bracket | OB-14 OB-7 OB-3 | 1 | pcs. | ALPAR | For KOD-1c for poles with top diameter = 420 mm For KOD-1a for poles with top diameter = 263 mm For KOD-1a for poles with top diameter = 218 mm |
| 4. | Spacer structure | KD-1b KD-1a | 1 | pcs. | ALPAR | For poles top diameter = 420 mm For poles top diameter = 218 mm; 263 mm |
| 5. | Bracket | OB-45 OB-43 OB-42 | 1 | pcs. | ALPAR | For KD-1b for poles with top diameter = 420 mm For KD-1a for poles with top diameter = 263 mm For KD-1a for poles with top diameter = 218 mm |
| 6. | Structure for arresters | KOG-14a | 1 | pcs. | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm |
| 7. | Bracket | OB-9 OB-6 | 1 | pcs. | ALPAR | For KOG for poles with top diameter = 263 mm For KOG for poles with top diameter = 218 mm |
| 8. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | Use for STN stations |
| 9. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm |
| 10. | Structure for the transformer | KTZ-1a KTZ-2a KTZ-3a KTZ-8 | 1 | pcs. | ALPAR | Transformer from 2 kVA to 100 kVA Transformer from 160 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA |
| 11. | Structure for OCTs | KPT-1 KPT-2 | 1 | pcs. | ALPAR | For KTZ-1a for pole with top diameter = 263 mm For KTZ-1a to KTZ-3a for pole with top diameter = 420 mm |
| 12. | Bracket | OS-22 ; OS-23 | 2 | pcs. | ALPAR | For KTZ installation; OS-23 - top diameter = 263 mm |
| 13. | Operating platform | POZ-1a | 1 | | ALPAR | Use for STN stations |
| 14. | LV disconnecter structure | KRZ-3a | 1 | pcs. | ALPAR | For 2 to 5 LV disconnectors |
| 15. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Structures for pole-mounted switchboard - do not use when installing LV disconnectors |
| 16. | Bracket | OB-12 OB-10 | 2 (1) | pcs. | ALPAR | For KRZ or RS for poles with top diameter = 263 mm For KRZ or RS for poles with top diameter = 218 mm (1) - for LV disconnectors |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|------------------------------------|---|-------------|------|---------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - |
| | | WBGn 17,5 | 3 | pcs. | ZRE / APLAR | With integrated MV arrester |
| 2. | Fuse link | HH ... A 10/24 kV "e"=442 mm; "e"=292 mm | 3 | pcs. | SIBA / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| 3. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 4. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 5. | LV disconnecter DB switchboard | ... | from 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 6. | Protective tube | RW-2 | 1 | set | ... / ALPAR | |
| 7. | Conduit clamp | U75W | 4 | pcs. | ALPAR | Use when using an LV overhead disconnecter |
| 8. | Heat-shrinkable four-core breakout | SEH-4_95-36 | 1 | pcs. | CELLPACK / ALPAR | |
| 9. | Protective tube | BE110 | 6 | m | ... / ALPAR | |
| 10. | Conduit clamp | U110W | 3 | pcs. | ALPAR | Use when using free-standing switchboard |
| 11. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 12. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 13. | Conduit clamp | U110W | 2 | pcs. | ALPAR | Use when using a wall-mounted switchboard at the station |
| 14. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 15. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

STNKs-20/630/.../.../1

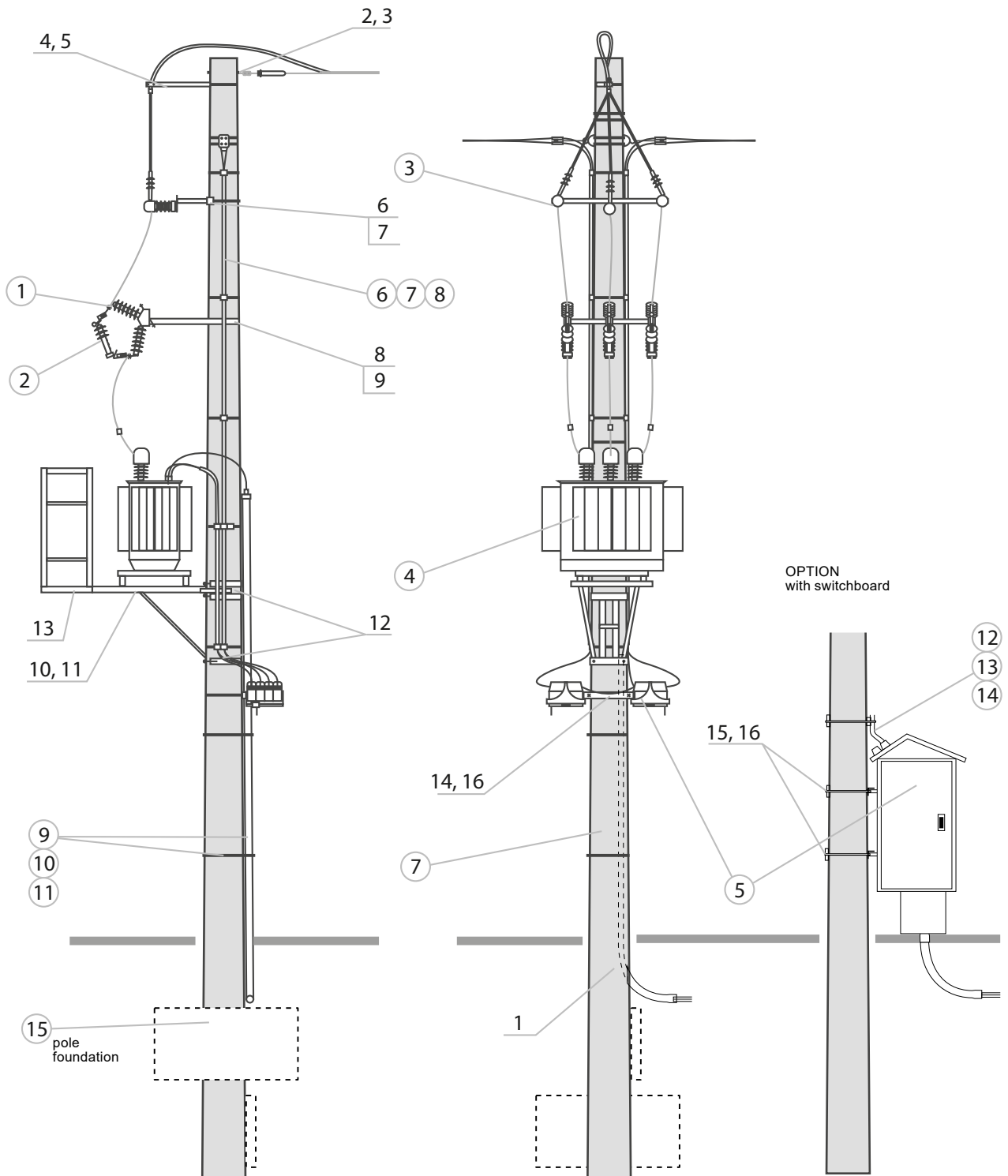


List of structures, accessories, apparatus for STNKs-20/630/.../.../II

| STRUCTURES | | | | | | |
|------------|--|-------------------------------------|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m |
| 2. | Strain bolt Strain structure | M24x240+N+Ps+Pk M24x300+N+Ps+Pk | 1 | pcs. | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm |
| | | KOD-1c KOD-1a | 1 | pcs. | ALPAR | For poles top diameter = 420 mm For poles top diameter = 218 mm; 263 mm |
| 3. | Bracket | OB-14 OB-7 OB-3 | 1 | pcs. | ALPAR | For KOD-1c for poles with top diameter = 420 mm For KOD-1a for poles with top diameter = 263 mm For KOD-1a for poles with top diameter = 218 mm |
| 4. | Spacer structure | KD-1b KD-1a | 1 | pcs. | ALPAR | For poles top diameter = 420 mm For poles top diameter = 218 mm; 263 mm |
| 5. | Bracket | OB-45 OB-43 OB-42 | 1 | pcs. | ALPAR | For KD-1b for poles with top diameter = 420 mm For KD-1a for poles with top diameter = 263 mm For KD-1a for poles with top diameter = 218 mm |
| 6. | Structure for arresters | KOG-14a | 1 | pcs. | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm |
| 7. | Bracket | OB-9 OB-6 | 1 | pcs. | ALPAR | For KOG for poles with top diameter = 263 mm For KOG for poles with top diameter = 218 mm |
| 8. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | Use for STN stations |
| 9. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm |
| 10. | Structure for the transformer | KTZ-1a KTZ-2a KTZ-3a KTZ-8 | 1 | pcs. | ALPAR | Transformer from 25 kVA to 100 kVA Transformer from 160 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA |
| 11. | Structure for OCTs | KPT-1 KPT-2 | 1 | pcs. | ALPAR | For KTZ-1a for pole with top diameter = 263 mm For KTZ-1a to KTZ-3a for pole with top diameter = 420 mm |
| 12. | Bracket | OS-22; OS-23 | 2 | pcs. | ALPAR | For KTZ installation; OS-23 - top diameter = 263 mm |
| 13. | Operating platform | POZ-1a | 1 | | ALPAR | Use for STN stations |
| 14. | LV disconnecter structure | KRZ-3a | 1 | pcs. | ALPAR | For 2 to 5 LV disconnectors |
| 15. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Structures for pole-mounted switchboard - do not use when installing LV disconnectors |
| 16. | Bracket | OB-12 OB-10 | 2 (1) | pcs. | ALPAR | For KRZ or RS for poles with top diameter = 263 mm For KRZ or RS for poles with top diameter = 218 mm (1) - for LV disconnectors |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|------------------------------------|--|-------------|------|---------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - With integrated MV arrester |
| 2. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / APLAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | HH ... A 10/24 kV "e"=442 mm; "e"=292 mm | 3 | pcs. | SIBA / ALPAR | |
| 3. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 4. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 5. | LV disconnecter DB switchboard | ... | from 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 6. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when using an LV overhead disconnecter |
| 7. | Conduit clamp | U75W | 4 | pcs. | ALPAR | |
| 8. | Heat-shrinkable four-core breakout | SEH-4_95-36 | 1 | pcs. | CELLPACK / ALPAR | Use when using free-standing switchboard |
| 9. | Protective tube | BE110 | 6 | m | ... / ALPAR | |
| 10. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 11. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | Use when using a wall-mounted switchboard at the station |
| 12. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 13. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 14. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 15. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

STNKs-20/630/.../.../II

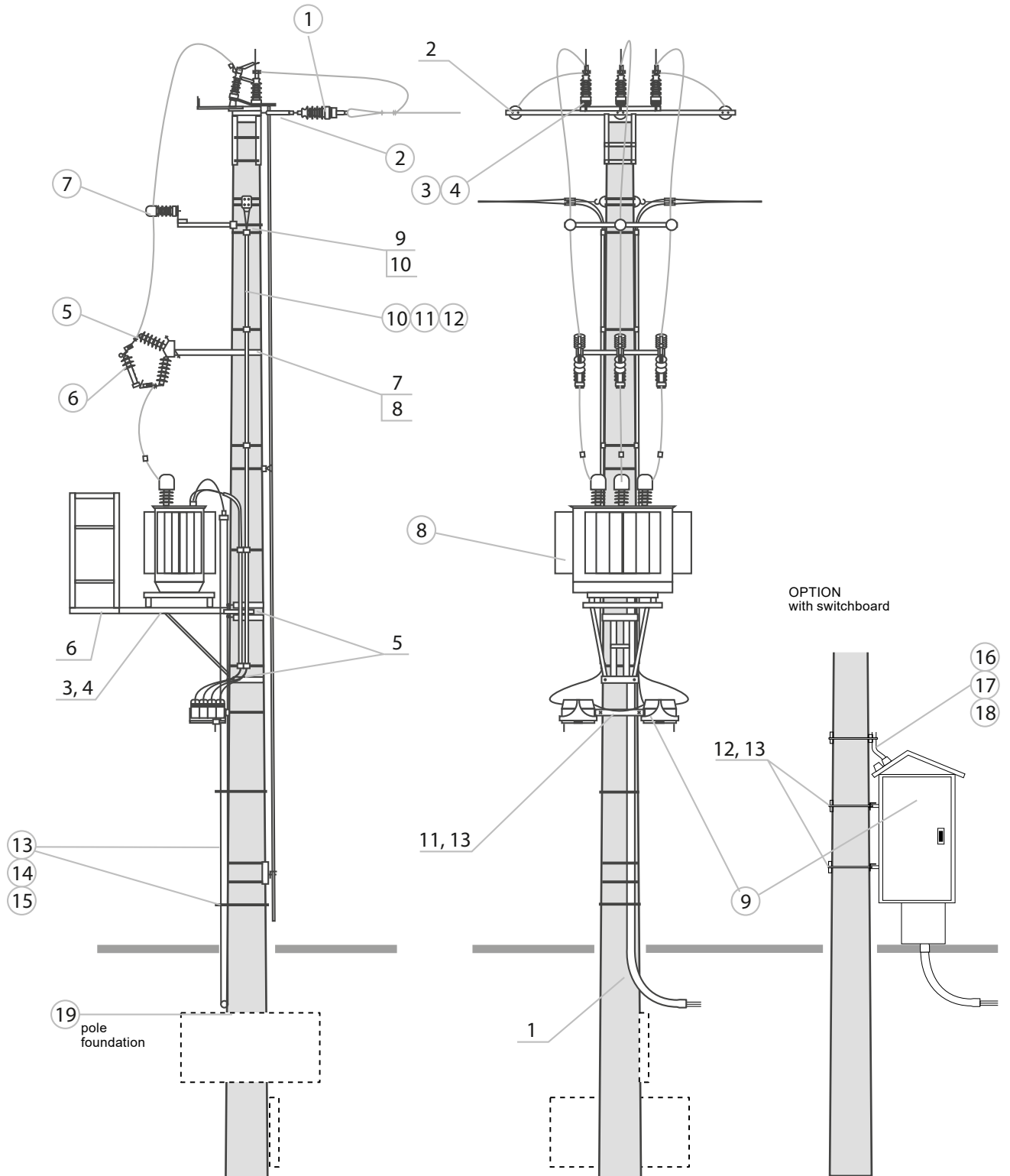


List of structures, accessories, apparatus for STNo-20/630/.../...

| STRUCTURES | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------|--------------------------------|------------------------------------|----------|------|-----------------|---|-------------------------------|---------|--------------------|--------------------|------------|--------------------|--------------------|--------------------|---------|--------|--------------------|------------|--------------------|--------------------|-----------|--------------------|--------------------|--------------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | | | | | | | | | | | | | | | | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m | | | | | | | | | | | | | | | | | | |
| 2. | Station crossarm | PK-12 | 1 | pcs. | ALPAR | <table border="1"> <tr> <td rowspan="6">N_{STN} line tension</td> <td rowspan="3">≤ 20 kN</td> <td rowspan="2">≤ 12 kN</td> <td>top diameter = 420</td> <td rowspan="6">PAS cables</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>≤ 12 kN</td> <td>top diameter = 218</td> </tr> <tr> <td rowspan="3">≤ 20 kN</td> <td rowspan="3">≤ 9 kN</td> <td>top diameter = 420</td> <td rowspan="6">AFL Cables</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>top diameter = 218</td> </tr> <tr> <td>≤ 13,5 kN</td> <td>top diameter = 420</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>top diameter = 218</td> </tr> </table> | N _{STN} line tension | ≤ 20 kN | ≤ 12 kN | top diameter = 420 | PAS cables | top diameter = 263 | ≤ 12 kN | top diameter = 218 | ≤ 20 kN | ≤ 9 kN | top diameter = 420 | AFL Cables | top diameter = 263 | top diameter = 218 | ≤ 13,5 kN | top diameter = 420 | top diameter = 263 | top diameter = 218 |
| | | N _{STN} line tension | | | | | | | | ≤ 20 kN | | ≤ 12 kN | top diameter = 420 | PAS cables | | | | | | | | | | |
| | | | | | | | | | top diameter = 263 | | | | | | | | | | | | | | | |
| | | | | | | | | ≤ 12 kN | top diameter = 218 | | | | | | | | | | | | | | | |
| | | | | | | | | ≤ 20 kN | ≤ 9 kN | top diameter = 420 | | AFL Cables | | | | | | | | | | | | |
| | | | | | | | | | | top diameter = 263 | | | | | | | | | | | | | | |
| | | | | | | | top diameter = 218 | | | | | | | | | | | | | | | | | |
| ≤ 13,5 kN | top diameter = 420 | | | | | | | | | | | | | | | | | | | | | | | |
| top diameter = 263 | | | | | | | | | | | | | | | | | | | | | | | | |
| top diameter = 218 | | | | | | | | | | | | | | | | | | | | | | | | |
| PK-11a | top diameter = 263 | | | | | | | | | | | | | | | | | | | | | | | |
| PK-6a | top diameter = 218 | | | | | | | | | | | | | | | | | | | | | | | |
| PKZ-7 | top diameter = 420 | | | | | | | | | | | | | | | | | | | | | | | |
| PKZ-6 | top diameter = 263 | | | | | | | | | | | | | | | | | | | | | | | |
| PKZ-3b | top diameter = 218 | | | | | | | | | | | | | | | | | | | | | | | |
| PKZ-3a | top diameter = 420 | | | | | | | | | | | | | | | | | | | | | | | |
| PKZ-3 | top diameter = 263 | | | | | | | | | | | | | | | | | | | | | | | |
| PKZ-3 | top diameter = 218 | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Structure for the transformer | KTZ1a KTZ2a KTZ-3a KTZ-8 | 1 | pcs. | ALPAR | Transformer from 25 kVA to 100 kVA Transformer from 160 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | | | | | | | | | | | | | | | | | | |
| 4. | Structure for OCTs | KPT-1 KPT-2 | 1 | pcs. | ALPAR | For KTZ-1a for pole with top diameter = 263 mm For KTZ-1a to KTZ-3a for pole with top diameter = 420 mm | | | | | | | | | | | | | | | | | | |
| 5. | Bracket | OS-22; OS-23 | 2 | pcs. | ALPAR | For KTZ installation; OS-23 - top diameter = 263 mm | | | | | | | | | | | | | | | | | | |
| 6. | Operating platform | POZ-1a | 1 | | ALPAR | Use for STN stations | | | | | | | | | | | | | | | | | | |
| 7. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | Use for STN stations | | | | | | | | | | | | | | | | | | |
| 8. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm | | | | | | | | | | | | | | | | | | |
| 9. | Structure for arresters | KOG-7 | 1 | pcs. | ALPAR | Do not use when installing bases with PBNVoA or PBNWMoA surge arresters | | | | | | | | | | | | | | | | | | |
| 10. | Bracket | OB-9 OB-7 | 1 | pcs. | ALPAR | For KOG for poles with top diameter = 263 mm For KOG for poles with top diameter = 218 mm | | | | | | | | | | | | | | | | | | |
| 11. | LV disconnecter structure | KRZ-3a | 1 | pcs. | ALPAR | For 2 to 5 LV disconnecters | | | | | | | | | | | | | | | | | | |
| 12. | Switchboard mounting structure | KSZ-8a | 2 | pcs. | ALPAR | Structures for pole-mounted switchboard - do not use when installing LV disconnectors | | | | | | | | | | | | | | | | | | |
| 13. | Bracket | OB-12 OB-10 | 2 (1) | pcs. | ALPAR | For KRZ or RS for poles with top diameter = 263 mm For KRZ or RS for poles with top diameter = 218 mm (1) - for LV disconnectors | | | | | | | | | | | | | | | | | | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|--|--|-----------|------|------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 3 | set | ... / ALPAR | Single / double for bare line Single/ double for PAS lines - configuration 5 |
| 2. | Single-clevis connector | 3842 L-300 | 1 | pcs. | ALPAR | For the middle phase |
| 3. | Disconnecter Disconnecter with earthing switch Load break switch Load break switch with earthing switch | ON III SA 24/4 OUN III SA 24/4 RN III SA 24/4 RUN III SA 24/4 | 1 | pcs. | ALPAR | Frame or module connectors in horizontal configuration with insulation: porcelain, composite, silicone |
| 4. | Manual drive | NRA E-12 w.l NRAu E-12 w.l | 1 | set | ALPAR | For switch disconnecter without earthing switch For switch disconnecter with earthing switch |
| 5. | Fuse base | PBNWMA-24/50 PBNWMoA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - With integrated MV arrester |
| | | WBGn 17,5 | | | | 3 |
| 6. | Fuse link | HH ... A 10/24kV "e"=442 mm; "e"=292 mm | 3 | pcs. | SIBA / ALPAR | |
| 7. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester is determined by an authorized designer |
| 8. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorized designer |
| 9. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ALPAR | To be individually selected by an authorised designer |
| 10. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when using an LV overhead disconnecter |
| 11. | Conduit clamp | U75W | 4 | pcs. | ALPAR | |
| 12. | Heat-shrinkable four-core breakout | SEH-4_95-36 | 1 | pcs. | CELLPACK / ALPAR | Use when using free-standing switchboard |
| 13. | Protective tube | BE110 | 6 | m | ... / ALPAR | |
| 14. | Conduit clamp | U110W | 3 | pcs. | ALPAR | Use when using a wall-mounted switchboard at the station |
| 15. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 16. | Protective tube | RW-1 | 1 | set | ALPAR | Use when using a wall-mounted switchboard at the station |
| 17. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 18. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 19. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

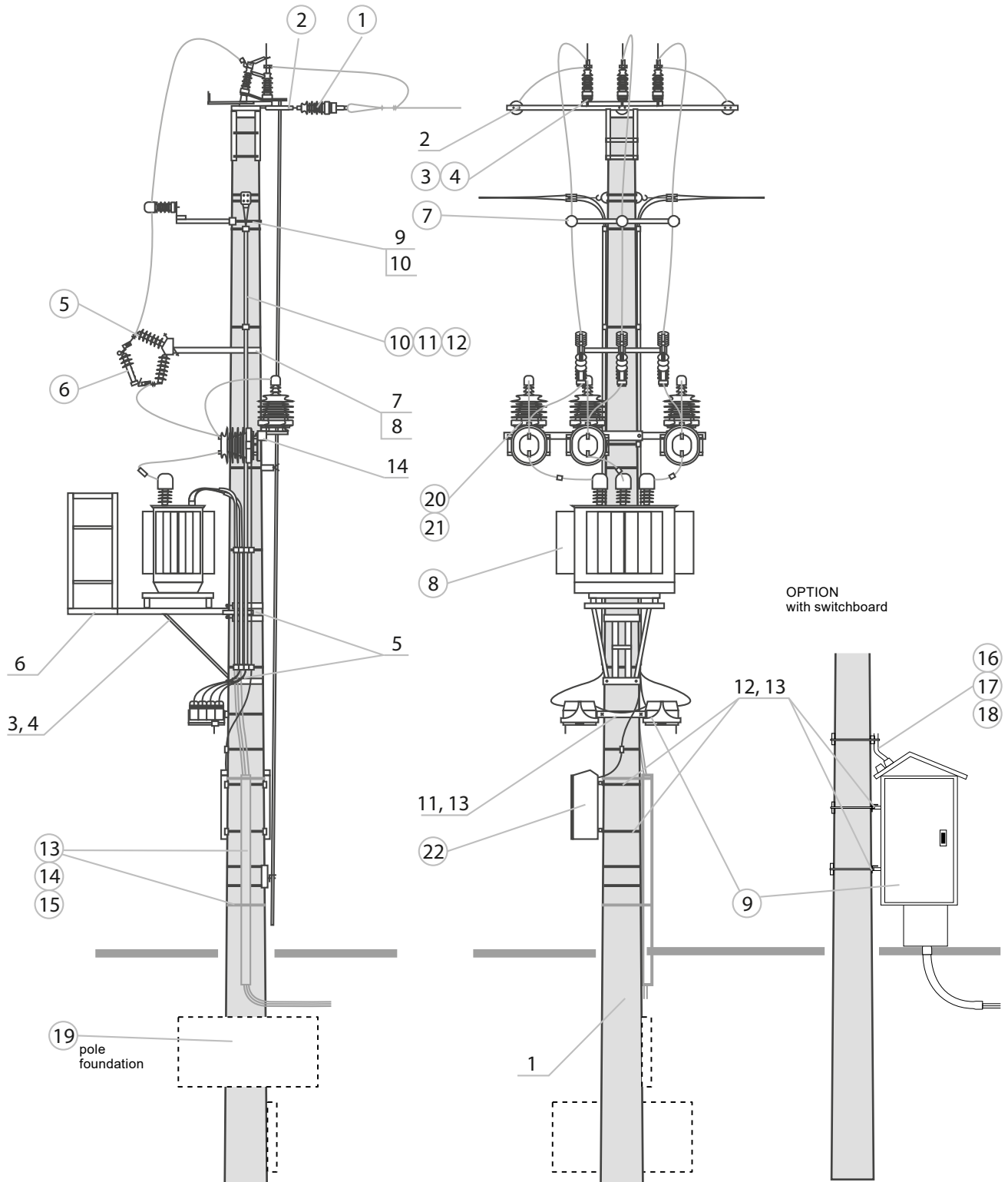
STNo-20/630/.../...



List of structures, accessories, apparatus for STNo-20/630/.../.../PP3

| STRUCTURES | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|--|--|------------|------|------------------|---|--|--------------------|---------|--------------------|------------|--------------------|--------------------|---------|---------|--------------------|--------------------|--------------------|-----------|--------|--------------------|------------|--------------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | | | | | | | | | | | | | | | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m | | | | | | | | | | | | | | | | | |
| 2. | Station crossarm | PK-12 | 1 | pcs. | ALPAR | <table border="1"> <tr> <td rowspan="6">N_{SN} line tension</td> <td rowspan="3">≤ 20 kN</td> <td rowspan="3">≤ 12 kN</td> <td>top diameter = 420</td> <td rowspan="6">PAS cables</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>top diameter = 218</td> </tr> <tr> <td rowspan="3">≤ 20 kN</td> <td rowspan="3">≤ 20 kN</td> <td>top diameter = 420</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>top diameter = 420</td> </tr> <tr> <td>≤ 13,5 kN</td> <td>≤ 9 kN</td> <td>top diameter = 263</td> <td>AFL Cables</td> </tr> <tr> <td>top diameter = 218</td> </tr> </table> | N _{SN} line tension | ≤ 20 kN | ≤ 12 kN | top diameter = 420 | PAS cables | top diameter = 263 | top diameter = 218 | ≤ 20 kN | ≤ 20 kN | top diameter = 420 | top diameter = 263 | top diameter = 420 | ≤ 13,5 kN | ≤ 9 kN | top diameter = 263 | AFL Cables | top diameter = 218 |
| | | N _{SN} line tension | | | | | | | | ≤ 20 kN | | ≤ 12 kN | top diameter = 420 | | | PAS cables | | | | | | | |
| | | | | | | | | | | | | | top diameter = 263 | | | | | | | | | | |
| | | | | | | | | top diameter = 218 | | | | | | | | | | | | | | | |
| | | | | | | | | ≤ 20 kN | ≤ 20 kN | top diameter = 420 | | | | | | | | | | | | | |
| | | | | | | | | | | top diameter = 263 | | | | | | | | | | | | | |
| | | | | | | | top diameter = 420 | | | | | | | | | | | | | | | | |
| ≤ 13,5 kN | ≤ 9 kN | top diameter = 263 | AFL Cables | | | | | | | | | | | | | | | | | | | | |
| top diameter = 218 | | | | | | | | | | | | | | | | | | | | | | | |
| PK-11a | | | | | | | | | | | | | | | | | | | | | | | |
| PK-6a | | | | | | | | | | | | | | | | | | | | | | | |
| PKZ-7 | | | | | | | | | | | | | | | | | | | | | | | |
| PKZ-6 | | | | | | | | | | | | | | | | | | | | | | | |
| PKZ-3b | | | | | | | | | | | | | | | | | | | | | | | |
| PKZ-3a | | | | | | | | | | | | | | | | | | | | | | | |
| PKZ-3 | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Structure for the transformer | KTZ1a KTZ2a KTZ-3a KTZ-8 | 1 | pcs. | ALPAR | Transformer from 25 kVA to 100 kVA Transformer from 160 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | | | | | | | | | | | | | | | | | |
| 4. | Structure for OCTs | KPT-1 KPT-2 | 1 | pcs. | ALPAR | For KTZ-1a for pole with top diameter = 263 mm For KTZ-1a to KTZ-3a for pole with top diameter = 420 mm | | | | | | | | | | | | | | | | | |
| 5. | Bracket | OS-22; OS-23 | 2 | pcs. | ALPAR | For KTZ installation; OS-23 - top diameter = 263 mm | | | | | | | | | | | | | | | | | |
| 6. | Operating platform | POZ-1a | 1 | | ALPAR | Use for STN stations | | | | | | | | | | | | | | | | | |
| 7. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | Use for STN stations | | | | | | | | | | | | | | | | | |
| 8. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm | | | | | | | | | | | | | | | | | |
| 9. | Structure for arresters | KOG-7 | 1 | pcs. | ALPAR | Do not use when installing bases with PBNVoA or PBNWMoA surge arresters | | | | | | | | | | | | | | | | | |
| 10. | Bracket | OB-9 OB-7 | 1 | pcs. | ALPAR | For KOG for poles with top diameter = 263 mm For KOG for poles with top diameter = 218 mm | | | | | | | | | | | | | | | | | |
| 11. | LV disconnecter structure | KRZ-3a | 1 | pcs. | ALPAR | For 2 to 5 LV disconnectors | | | | | | | | | | | | | | | | | |
| 12. | Switchboard mounting structure | KSZ-8a | 4 | pcs. | ALPAR | Structures for pole-mounted switchboard - do not use when installing LV disconnectors | | | | | | | | | | | | | | | | | |
| 13. | Bracket | OB-12 OB-10 | 4 (3) | pcs. | ALPAR | For KRZ or RS for poles with top diameter = 263 mm For KRZ or RS for poles with top diameter = 218 mm (3) - for LV disconnectors | | | | | | | | | | | | | | | | | |
| 14. | Structure for transformers | KP-1 KP-2 | 1 | set | ALPAR | For poles top diameter = 263 mm, top diameter = 218 mm For poles top diameter = 420 mm | | | | | | | | | | | | | | | | | |
| APPARATUS AND ACCESSORIES | | | | | | | | | | | | | | | | | | | | | | | |
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | | | | | | | | | | | | | | | |
| 1. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 3 | set | ... / ALPAR | Single / double for bare line Single / double for PAS lines - configuration 5 | | | | | | | | | | | | | | | | | |
| 2. | Single-clevis connector | 3842 L-300 | 1 | pcs. | ALPAR | For the middle phase | | | | | | | | | | | | | | | | | |
| 3. | Disconnector Disconnector with earthing switch Load break switch Load break switch with earthing switch | ON III SA 24/4 OUN III SA 24/4 RN III SA 24/4 RUN III SA 24/4 | 1 | pcs. | ALPAR | Frame or module connectors in horizontal configuration with insulation: porcelain, composite, silicone | | | | | | | | | | | | | | | | | |
| 4. | Manual drive | NRA E-12 w.l NRAu E-12 w.l | 1 | set | ALPAR | For switch disconnector without earthing switch For switch disconnector with earthing switch | | | | | | | | | | | | | | | | | |
| 5. | Fuse base | PBNWMA-24/50 PBNWMoA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - With integrated MV arrester | | | | | | | | | | | | | | | | | |
| 6. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link | | | | | | | | | | | | | | | | | |
| | | HH... A 10/24kV "e"=442 mm; "e"=292 mm | 3 | pcs. | SIBA / ALPAR | | | | | | | | | | | | | | | | | | |
| 7. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester is determined by an authorized designer | | | | | | | | | | | | | | | | | |
| 8. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorized designer | | | | | | | | | | | | | | | | | |
| 9. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ALPAR | To be individually selected by an authorised designer | | | | | | | | | | | | | | | | | |
| 10. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when using an LV overhead disconnector | | | | | | | | | | | | | | | | | |
| 11. | Conduit clamp | U75W | 4 | pcs. | ALPAR | | | | | | | | | | | | | | | | | | |
| 12. | Heat-shrinkable four-core breakout | SEH-4_95-36 | 1 | pcs. | CELLPACK / ALPAR | | | | | | | | | | | | | | | | | | |
| 13. | Protective tube | BE110 | 6 | m | ... / ALPAR | | | | | | | | | | | | | | | | | | |
| 14. | Conduit clamp | U110W | 3 | pcs. | ALPAR | Use when using free-standing switchboard | | | | | | | | | | | | | | | | | |
| 15. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | | | | | | | | | | | | | | | | | | |
| 16. | Protective tube | RW-1 | 1 | set | ALPAR | Use when using a wall-mounted switchboard at the station | | | | | | | | | | | | | | | | | |
| 17. | Conduit clamp | U110W | 3 | pcs. | ALPAR | | | | | | | | | | | | | | | | | | |
| 18. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | | | | | | | | | | | | | | | | | | |
| 19. | Foundation support structure | ... | 1 | set | ALPAR | | Selection of the type of pole foundation by an authorised designer | | | | | | | | | | | | | | | | |
| 20. | Voltage transformer | VTO | 3 | pcs. | ALPAR | The value of the transformer shall be determined by an authorised designer | | | | | | | | | | | | | | | | | |
| 21. | Current transformer | CTSO | 3 | pcs. | ALPAR | The value of the transformer shall be determined by an authorised designer | | | | | | | | | | | | | | | | | |
| 22. | Metering cabinet | ... | 1 | pcs. | ... / ALPAR | Hanging or free-standing according to individual requirements | | | | | | | | | | | | | | | | | |

STNo-20/630/.../.../PP3

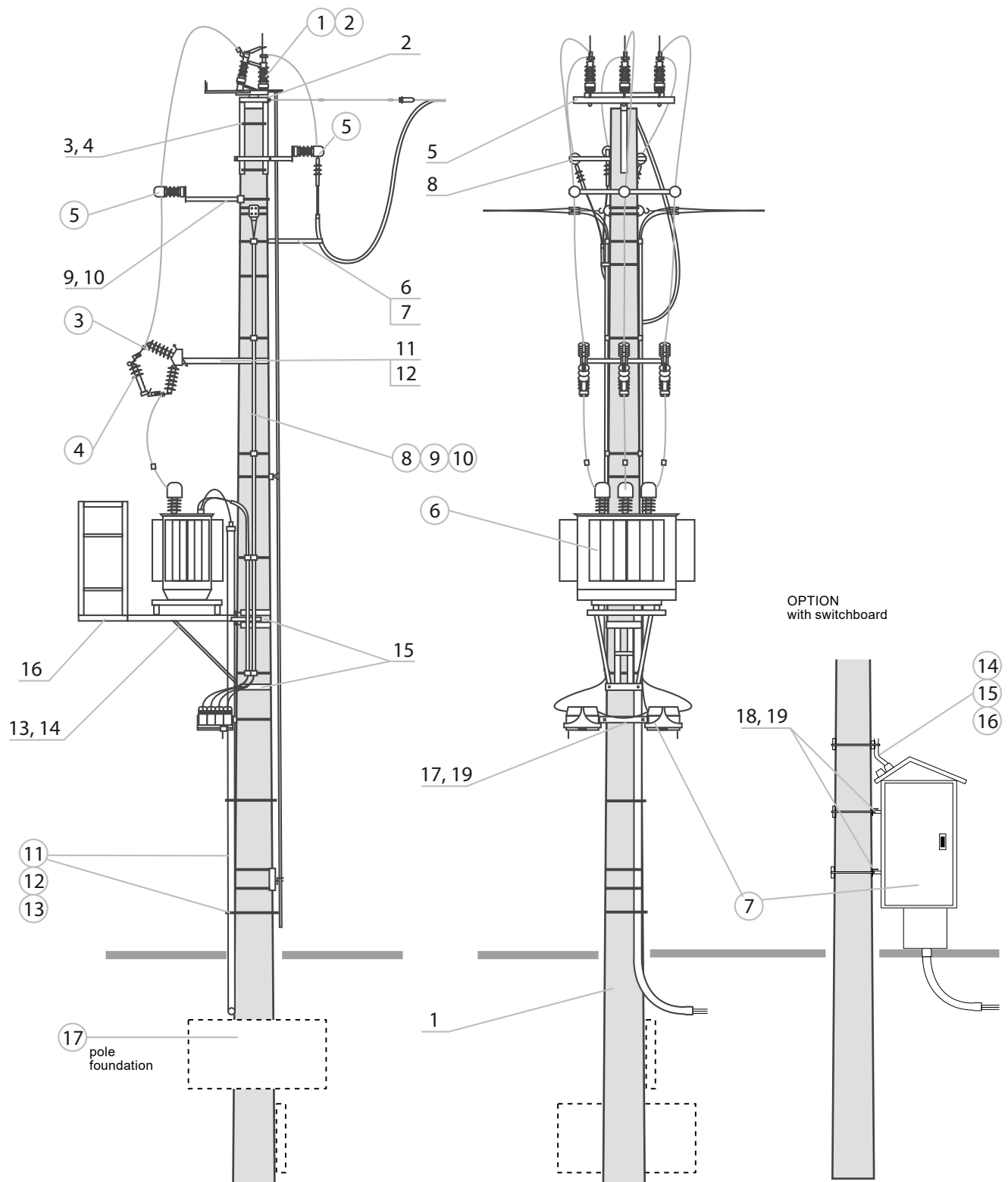


List of structures, accessories, apparatus for STNKso-20/630/.../...

| STRUCTURES | | | | | | |
|------------|--|---|----------|------|-----------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m |
| 2. | Strain hanger | 41111 | 1 | pcs. | ALPAR | For fastening with Gi |
| 3. | Pole head | Gi-5a Gi-3a Gi-2a | 1 | pcs. | ALPAR | For poles top diameter = 420 mm For poles top diameter = 263 mm For poles top diameter = 218 mm |
| 4. | Mounting bolts | M16x460+N+Po+Ps M16x310+N+Po+Ps M16x260+N+Po+Ps | 2 | set | ALPAR | To Gi-5a for poles with top diameter = 420 mm up to Gi-3a For poles with top diameter = 263 mm up to Gi-2a For poles with top diameter = 218 mm |
| 5. | Structure for the load break switch | KPO-30 | 1 | pcs. | ALPAR | For fastening with Gi With two M16x80 bolts |
| 6. | Spacer structure | KD-1b KD-1a | 1 | pcs. | ALPAR | For poles top diameter = 420 mm For poles top diameter = 218 mm; 263 mm |
| 7. | Bracket | OB-45 OB-43 OB-42 | 1 | pcs. | ALPAR | For KD-1b for poles with top diameter = 420 mm for KD-1a For poles with top diameter = 263 mm for KD-1a For poles with top diameter = 218 mm |
| 8. | Structure for arresters | KOG-61 KOG-60 KOG-17a | 1 | set | ALPAR | Poles: top diameter = 420 mm 2 xM16x480 +N+Po+Ps Poles: top diameter = 218, 263 2 xM16x480 +N+Po+Ps Set with KOG-61 or KOG-60 |
| 9. | Structure for arresters | KOG-5 | 2 | set | ALPAR | Not to be used when mounting bases with PB-NV _o A or PBNW _o A arresters |
| 10. | Bracket | OB-9 OB-6 | 1 | pcs. | ALPAR | For KOG for poles with top diameter = 263 mm For KOG for poles with top diameter = 218 mm |
| 11. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | Use for STN stations |
| 12. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm |
| 13. | Structure for the transformer | KTZ1a KTZ2a KTZ-3a KTZ-8 | 1 | pcs. | ALPAR | Transformer from 25 kVA to 100 kVA Transformer from 160 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA |
| 14. | Structure for OCTs | KPT-1 KPT-2 | 1 | pcs. | ALPAR | For KTZ-1a for pole with top diameter = 263 mm For KTZ-1a to KTZ-3a for pole with top diameter = 420 mm |
| 15. | Bracket | OS-22 ; OS-23 | 2 | pcs. | ALPAR | For KTZ installation; OS-23 - top diameter = 263 mm |
| 16. | Operating platform | POZ-1a | 1 | | ALPAR | Use for STN stations |
| 17. | LV disconnecter structure | KRZ-3a | 1 | pcs. | ALPAR | For 2 to 5 LV disconnectors |
| 18. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Structures for pole-mounted switchboard - do not use when installing LV disconnectors |
| 19. | Bracket | OB-12 OB-10 | 2 (1) | pcs. | ALPAR | For KRZ or KSZ for pole with top diameter = 263 mm For KRZ or KSZ for pole with top diameter = 218 mm (1) - for LV disconnectors |

| APPARATUS AND ACCESORIES | | | | | | |
|--------------------------|--|--|-----------|------|------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Disconnecter Disconnecter with earthing switch Load break switch Load break switch with earthing switch | ON III SA 24/4 OUN III SA 24/4 RN III SA 24/4 RUN III SA 24/4 | 1 | pcs. | ALPAR | Frame or module connectors in horizontal configuration with insulation: porcelain, composite, silicone |
| 2. | Manual drive | NRA E-12 w.l NRAu E-12 w.l | 1 | set | ALPAR | For switch disconnecter without earthing switch For switch disconnecter with earthing switch |
| 3. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - |
| 4. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | HH ... A 10/24kV "e"=442 mm; "e"=292 mm | 3 | pcs. | SIBA / ALPAR | |
| 5. | Surge arrester | ... | 6 | pcs. | ... / ALPAR | The value and type of arrester is determined by an authorized designer |
| 6. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorized designer |
| 7. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ALPAR | To be individually selected by an authorised designer |
| 8. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when using an LV overhead disconnecter |
| 9. | Conduit clamp | U75W | 4 | pcs. | ALPAR | |
| 10. | Heat-shrinkable four-core breakout | SEH-4_95-36 | 1 | pcs. | CELLPACK / ALPAR | Use when using free-standing switchboard |
| 11. | Protective tube | BE110 | 6 | m | ... / ALPAR | |
| 12. | Conduit clamp | U110W | 3 | pcs. | ALPAR | Use when using a wall-mounted switchboard at the station |
| 13. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 14. | Protective tube | RW-1 | 1 | set | ALPAR | Use when using a wall-mounted switchboard at the station |
| 15. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 16. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | Selection of the type of pole foundation by an authorised designer |
| 17. | Foundation support structure | ... | 1 | set | ALPAR | |

STNKso-20/630/.../...

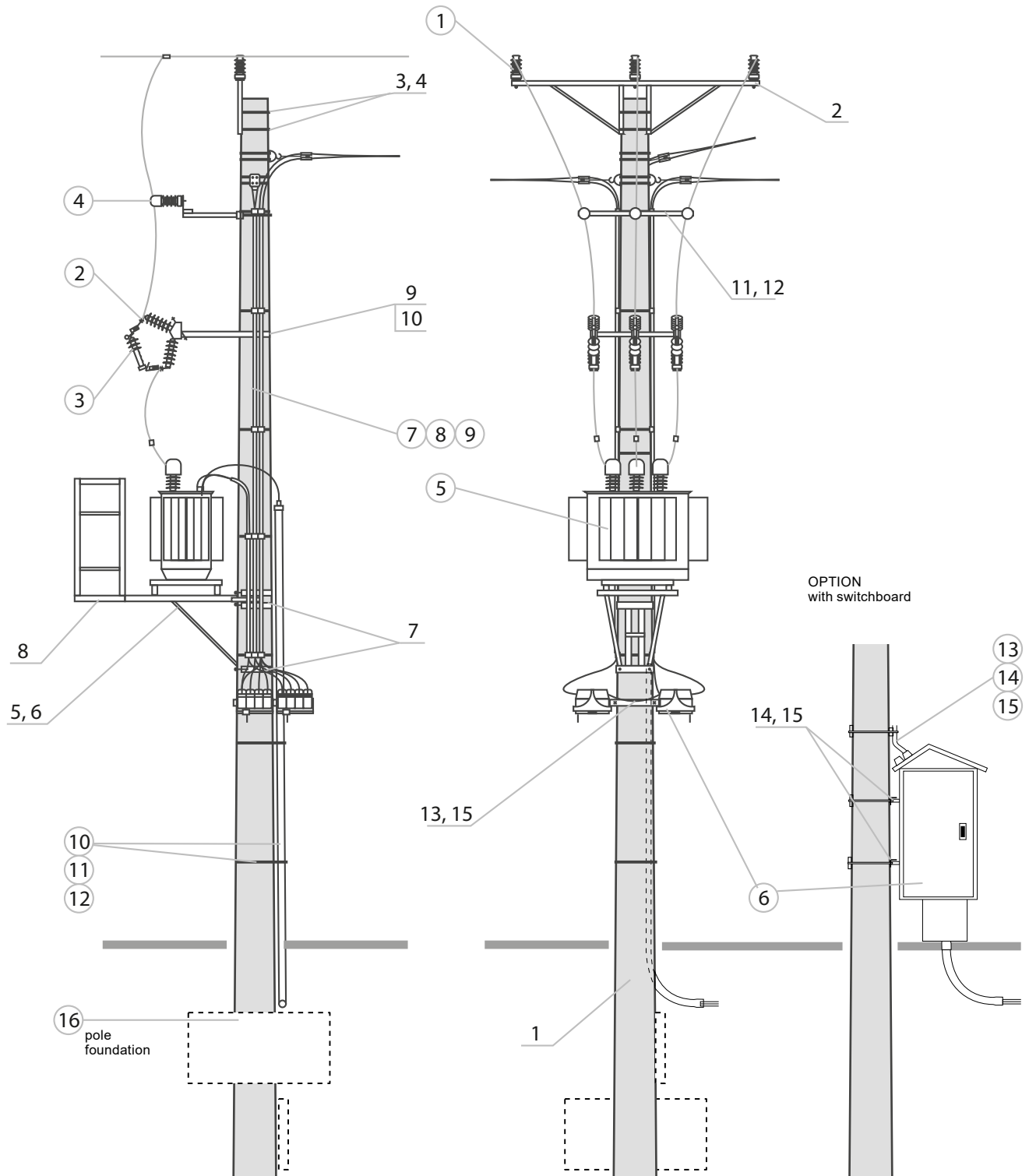


List of structures, accessories, apparatus for STNP-20/630/.../.../1

| STRUCTURES | | | | | | | | |
|------------|--|-------------------------------------|-----------------------|------|-----------------|--|--|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m | | |
| 2. | Through-type station crossarm | PP-3b | PP-2b | 1 | pcs. | ALPAR | inclination 1° 0° cross-section 35-50 50-70 top diameter = 420 top diameter = 263 top diameter = 218 top diameter = 420 top diameter = 263 top diameter = 218 PAS cables AFL Cables | |
| | | PP-3a | PP-2a | | | | | |
| | | PP-3a | PP-2a | | | | | |
| | | PPZ-3 | PP-51 | | | | | |
| | | PPZ-3 | PP-56 | | | | | |
| | | PPZ-3 | PP-57 | | | | | |
| 3. | Bracket | OG-13 OG-12 OG-5 | OB-14 OB-7 OB-3 | 2 | 1 | pcs. | ALPAR | To PPZ-3, PP-57 To PPZ-2, PP-56 To PPZ-1, PP-51 |
| 4. | Mounting bolts | M16x560 | M16x480 | 2 | 1 | set | ALPAR | To PP-3b and PP-2b To PP-3a and PP-2a For PP-3a and PP-2a PP-57 PP-56 PP-51 top diameter = 420 mm top diameter = 263 mm top diameter = 218 mm |
| | | M16x400 | M16x330 | | | | | |
| | | M16x350 | M16x280 | | | | | |
| 5. | Structure for the transformer | KTZ-1a KTZ-2a KTZ-3a KTZ-8 | 1 | pcs. | ALPAR | Transformer from 25 kVA to 100 kVA Transformer from 160 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | | |
| 6. | Structure for OCTs | KPT-1 KPT-2 | 1 | pcs. | ALPAR | For KTZ-1a for pole with top diameter = 263 mm For KTZ-1a to KTZ-3a for pole with top diameter = 420 mm | | |
| 7. | Bracket | OS-22, OS-23 | 2 | pcs. | ALPAR | For KTZ installation; OS-23 - top diameter = 263 mm | | |
| 8. | Operating platform | POZ-1a | 1 | | ALPAR | Use for STN stations | | |
| 9. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | Use for STN stations | | |
| 10. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm | | |
| 11. | Structure for arresters | KOG-5 | 1 | pcs. | ALPAR | Not to be used when mounting bases with PB-NVoA or PBNWMoA arresters | | |
| 12. | Bracket | OB-9 OB-7 | 1 | pcs. | ALPAR | For KOG for poles with top diameter = 263 mm For KOG for poles with top diameter = 218 mm | | |
| 13. | LV disconnecter structure | KRZ-3a | 1 | pcs. | ALPAR | For 2 to 5 LV disconnectors | | |
| 14. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Structures for pole-mounted switchboard - do not use when installing LV disconnectors | | |
| 15. | Bracket | OB-12 OB-10 | 2 (1) | pcs. | ALPAR | For KRZ or KSZ for pole with top diameter = 263 mm For KRZ or KSZ for pole with top diameter = 218 mm (1) - for LV disconnectors | | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|---------------------------------------|--|-------------|------|---------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Supporting insulator | LWP-8/24 M24x140 LWP-8/24S M24x105 | 3 | pcs. | ALPAR | Bare line — for 1° inclination, use 6 pcs. PAS line — for 1° inclination, use 6 pcs. |
| 2. | Fuse base | PBNWMA-24/50 PBNWMoA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - |
| | | WBGN 17,5 | 3 | pcs. | ZRE / APLAR | With integrated MV arrester |
| 3. | Fuse link | HH ... A 10/24 kV "e"=442 mm; "e"=292 mm | 3 | pcs. | SIBA / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGN fuse link |
| | | ... | 3 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 4. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 5. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 6. | LV disconnecter DB switchboard | ... | from 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 7. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when using an LV overhead disconnecter |
| 8. | Conduit clamp | U75W | 4 | pcs. | ALPAR | |
| 9. | Heat-shrinkable four-core breakout | SEH-4_95-36 | 1 | pcs. | CELLPACK / ALPAR | |
| 10. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 11. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 12. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 13. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use when using a wall-mounted switchboard at the station |
| 14. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 15. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 16. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

STNP-20/630/.../.../1

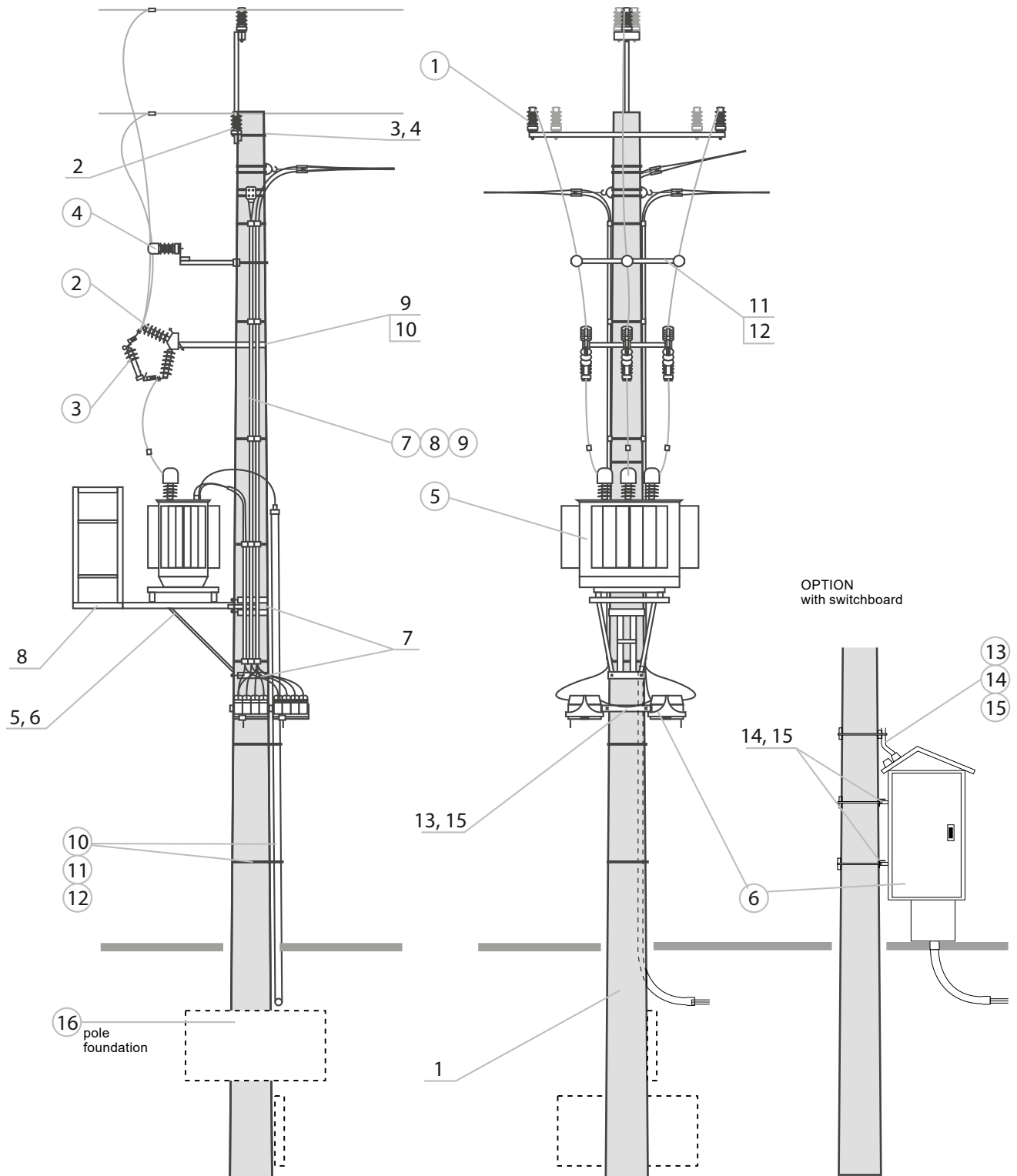


List of structures, accessories, apparatus for STNP-20/630/.../.../2

| STRUCTURES | | | | | | |
|------------|--|-------------------------------------|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m |
| 2. | Through-type station crossarm | PP-331d/2 | 1 | pcs. | ALPAR | inclination 1° top diameter = 420 top diameter = 263 top diameter = 218 0° top diameter = 420 top diameter = 263 top diameter = 218 |
| | | PP-331c/2 | | | | |
| | | PP-331b/2 | | | | |
| | | PP-311d/2 | | | | |
| | | PP-311c/2 | | | | |
| PP-311b/2 | | | | | | |
| 3. | Bracket | OB-14 | 1 | pcs. | ALPAR | For PP-311d/2 and PP-331d/2 For PP-311c/2 and PP-331c/2 For PP-311b/2 and PP-331b/2 top diameter = 420 top diameter = 263 top diameter = 218 |
| | | OB-7 | | | | |
| | | OB-3 | | | | |
| 4. | Mounting bolts | M16x560 | 1 | set | ALPAR | For PP-311d/2 and PP-331d/2 For PP-311c/2 and PP-331c/2 For PP-311b/2 and PP-331b/2 top diameter = 420 top diameter = 263 top diameter = 218 |
| | | M16x400 | | | | |
| | | M16x350 | | | | |
| 5. | Structure for the transformer | KTZ-1a KTZ-2a KTZ-3a KTZ-8 | 1 | pcs. | ALPAR | Transformer from 25 kVA to 100 kVA Transformer from 160 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA |
| 6. | Structure for OCTs | KPT-1 KPT-2 | 1 | pcs. | ALPAR | For KTZ-1a for pole with top diameter = 263 mm For KTZ-1a to KTZ-3a for pole with top diameter = 420 mm |
| 7. | Bracket | OS-22; OS-23 | 2 | pcs. | ALPAR | For KTZ installation; OS-23 - top diameter = 263 mm |
| 8. | Operating platform | POZ-1a | 1 | | ALPAR | Use for STN stations |
| 9. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | Use for STN stations |
| 10. | Mounting bolts | M16x380+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm |
| | | M16x340+N+Po+Ps | | | | For poles top diameter = 218 mm |
| 11. | Structure for arresters | KOG-5 | 1 | pcs. | ALPAR | Not to be used when mounting bases with PB-NVoA or PBNWMoA arresters |
| 12. | Bracket | OB-9 | 1 | pcs. | ALPAR | For KOG for poles with top diameter = 263 mm |
| | | OB-7 | | | | For KOG for poles with top diameter = 218 mm |
| 13. | LV disconnecter structure | KRZ-3a | 1 | pcs. | ALPAR | For 2 to 5 LV disconnectors |
| 14. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Structures for pole-mounted switchboard - do not use when installing LV disconnectors |
| 15. | Bracket | OB-12 | 2 (1) | pcs. | ALPAR | For KRZ or KSZ for pole with top diameter = 263 mm |
| | | OB-10 | | | | For KRZ or KSZ for pole with top diameter = 218 mm (1) - for LV disconnectors |

| APPARATUS AND ACCESORIES | | | | | | |
|--------------------------|---------------------------------------|--|-------------|------|---------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Supporting insulator | LWP-8/24 M24x140 | 3 | pcs. | ALPAR | Bare line, for 1° inclination, use 6 pcs. |
| 2. | Fuse base | PBNWMA-24/50 | 3 | pcs. | ALPAR | - |
| | | PBNWMA-24/50 PBNVA-20/4 PBNVoA-20/4 | | | | With integrated MV arrester |
| 3. | Fuse link | WBGN 17,5 | 3 | pcs. | ZRE / APLAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGN fuse link |
| | | HH ... A 10/24 kV "e"=442 mm; "e"=292 mm | 3 | pcs. | SIBA / ALPAR | |
| 4. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 5. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 6. | LV disconnecter DB switchboard | ... | from 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 7. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when using an LV overhead disconnecter |
| 8. | Conduit clamp | U75W | 4 | pcs. | ALPAR | |
| 9. | Heat-shrinkable four-core breakout | SEH-4_95-36 | 1 | pcs. | CELLPACK / ALPAR | |
| 10. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 11. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 12. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 13. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use when using a wall-mounted switchboard at the station |
| 14. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 15. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 16. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

STNP-20/630/.../.../2

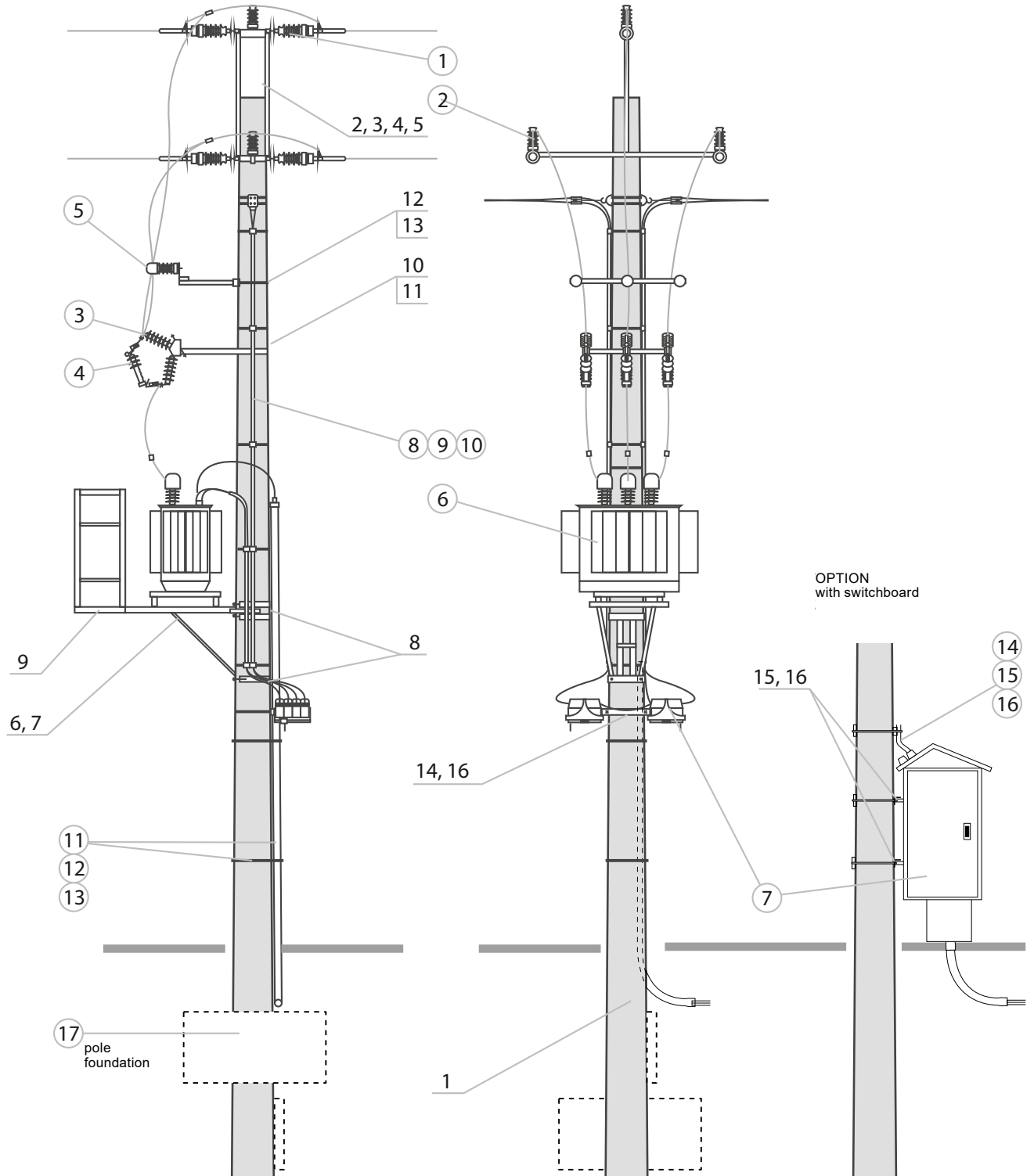


List of structures, accessories, apparatus for STNON-20/630/.../...

| STRUCTURES | | | | | | | | | | | | | | | | | | | | | | |
|--------------------|--|--|--------------------|------|-----------------|---|------------------------------|---|--|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------|-------|--------------------|--------------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | | | | | | | | | | | | | | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m | | | | | | | | | | | | | | | | |
| 2. | Station strain crossbar | PO-34/2 | 1 | pcs. | ALPAR | <table border="1"> <tr> <td rowspan="6">N_{SN} line tension</td> <td rowspan="3">≤ 21kN</td> <td rowspan="3">AFL cables</td> <td rowspan="3">50-70</td> <td>top diameter = 420</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>top diameter = 218</td> </tr> <tr> <td rowspan="3">≤ 26kN</td> <td rowspan="3">50-70</td> <td>top diameter = 420</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>top diameter = 420</td> </tr> <tr> <td>≤ 15kN</td> <td>35-50</td> <td>top diameter = 263</td> </tr> <tr> <td>top diameter = 218</td> </tr> </table> | N _{SN} line tension | ≤ 21kN | AFL cables | 50-70 | top diameter = 420 | top diameter = 263 | top diameter = 218 | ≤ 26kN | 50-70 | top diameter = 420 | top diameter = 263 | top diameter = 420 | ≤ 15kN | 35-50 | top diameter = 263 | top diameter = 218 |
| | | N _{SN} line tension | | | | | | | | | ≤ 21kN | AFL cables | 50-70 | | | top diameter = 420 | | | | | | |
| | | | | | | | | | | | | | | | | top diameter = 263 | | | | | | |
| | | | | | | | | top diameter = 218 | | | | | | | | | | | | | | |
| | | | | | | | | ≤ 26kN | 50-70 | top diameter = 420 | | | | | | | | | | | | |
| | | | | | | | | | | top diameter = 263 | | | | | | | | | | | | |
| | | | | | | | top diameter = 420 | | | | | | | | | | | | | | | |
| ≤ 15kN | 35-50 | top diameter = 263 | | | | | | | | | | | | | | | | | | | | |
| top diameter = 218 | | | | | | | | | | | | | | | | | | | | | | |
| PO-32/2 | | | | | | | | | | | | | | | | | | | | | | |
| PO-31a | | | | | | | | | | | | | | | | | | | | | | |
| PO-35 | | | | | | | | | | | | | | | | | | | | | | |
| PO-33a | | | | | | | | | | | | | | | | | | | | | | |
| PK-22 | | | | | | | | | | | | | | | | | | | | | | |
| PK-21 | | | | | | | | | | | | | | | | | | | | | | |
| PK-20a | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Bracket | OB-36 OB-34 OB-31 | 1 | pcs. | ALPAR | PK-22 PK-21 PK-20a top diameter = 420 top diameter = 263 top diameter = 218 | | | | | | | | | | | | | | | | |
| 4. | Mounting bolts | M16x560 M16x400 M16x350 | 1 | set | ALPAR | PK-22 PK-21 PK-20a top diameter = 420 top diameter = 263 top diameter = 218 | | | | | | | | | | | | | | | | |
| 5. | Mounting bolts | M16x650 | M20x650 | 3 | 1 | set | ALPAR | <table border="1"> <tr> <td rowspan="6">PO-35 PO-34/2 PO-33a PO-32/2 PO-31/a</td> <td>top diameter = 420</td> </tr> <tr> <td>top diameter = 420</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>top diameter = 218</td> </tr> </table> | PO-35 PO-34/2 PO-33a PO-32/2 PO-31/a | top diameter = 420 | top diameter = 420 | top diameter = 263 | top diameter = 263 | top diameter = 263 | top diameter = 218 | | | | | | | |
| | | PO-35 PO-34/2 PO-33a PO-32/2 PO-31/a | top diameter = 420 | | | | | | | | | | | | | | | | | | | |
| | | | top diameter = 420 | | | | | | | | | | | | | | | | | | | |
| | | | top diameter = 263 | | | | | | | | | | | | | | | | | | | |
| | | | top diameter = 263 | | | | | | | | | | | | | | | | | | | |
| | | | top diameter = 263 | | | | | | | | | | | | | | | | | | | |
| top diameter = 218 | | | | | | | | | | | | | | | | | | | | | | |
| M16x520 | M20x520 | 3 | | | | | | | | | | | | | | | | | | | | |
| M16x500 | M20x500 | 3 | | | | | | | | | | | | | | | | | | | | |
| M16x350 | M20x350 | 3 | | | | | | | | | | | | | | | | | | | | |
| M16x300 | M20x300 | 3 | | | | | | | | | | | | | | | | | | | | |
| 6. | Structure for the transformer | KTZ-1a KTZ-2a KTZ-3a KTZ-8 | 1 | pcs. | ALPAR | Transformer from 25 kVA to 100 kVA Transformer from 160 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | | | | | | | | | | | | | | | | |
| 7. | Structure for OCTs | KPT-1 KPT-2 | 1 | pcs. | ALPAR | For KTZ-1a for pole with top diameter = 263 mm For KTZ-1a to KTZ-3a for pole with top diameter = 420 mm | | | | | | | | | | | | | | | | |
| 8. | Bracket | OS-22; OS-23 | 2 | pcs. | ALPAR | For KTZ installation; OS-23 - top diameter = 263 mm | | | | | | | | | | | | | | | | |
| 9. | Operating platform | POZ-1a | 1 | | ALPAR | Use for STN stations | | | | | | | | | | | | | | | | |
| 10. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | Use for STN stations | | | | | | | | | | | | | | | | |
| 11. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm | | | | | | | | | | | | | | | | |
| 12. | Structure for arresters | KOG-5 | 1 | pcs. | ALPAR | Not to be used when mounting bases with PB-NVoA or PBNW/MoA arresters | | | | | | | | | | | | | | | | |
| 13. | Bracket | OB-9 OB-7 | 1 | pcs. | ALPAR | For KOG for poles with top diameter = 263 mm For KOG for poles with top diameter = 218 mm | | | | | | | | | | | | | | | | |
| 14. | LV disconnecter structure | KRZ-3a | 1 | pcs. | ALPAR | For 2 to 5 LV disconnectors | | | | | | | | | | | | | | | | |
| 15. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Structures for pole-mounted switchboard - do not use when installing LV disconnectors | | | | | | | | | | | | | | | | |
| 16. | Bracket | OB-12 OB-10 | 2 (1) | pcs. | ALPAR | For KRZ or KSZ for pole with top diameter = 263 mm For KRZ or KSZ for pole with top diameter = 218 mm (1) - for LV disconnectors | | | | | | | | | | | | | | | | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|------------------------------------|---|-------------|------|------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Insulator string | ±O/1 ±O2/1 ±O/2 ±O2/2 | 3 | set | ... / ALPAR | Single / double for bare line Single / double for PAS lines - configuration 5 |
| 2. | Supporting insulator | LWP-8/24 M24x140 | 3 | pcs. | ALPAR | Bare line, for 1° inclination, use 6 pcs. |
| 3. | Fuse base | PBNWMA-24/50 PBNW/MoA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - |
| | | WBGn 17,5 | 3 | pcs. | ZRE / APLAR | - With integrated MV arrester |
| 4. | Fuse link | HH ... A 10/24 kV "e"=442 mm; "e"=292 mm | 3 | pcs. | SIBA / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | ... | 3 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 5. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 6. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 7. | LV disconnecter DB switchboard | ... | from 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 8. | Protective tube | RW-2 | 1 | set | ... / ALPAR | |
| 9. | Conduit clamp | U75W | 4 | pcs. | ALPAR | Use when using an LV overhead disconnecter |
| 10. | Heat-shrinkable four-core breakout | SEH-4_95-36 | 1 | pcs. | CELLPACK / ALPAR | |
| 11. | Protective tube | BE110 | 6 | m | ... / ALPAR | |
| 12. | Conduit clamp | U110W | 3 | pcs. | ALPAR | Use when using free-standing switchboard |
| 13. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 14. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 15. | Conduit clamp | U110W | 3 | pcs. | ALPAR | Use when using a wall-mounted switchboard at the station |
| 16. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 17. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

STNON-20/630/.../...

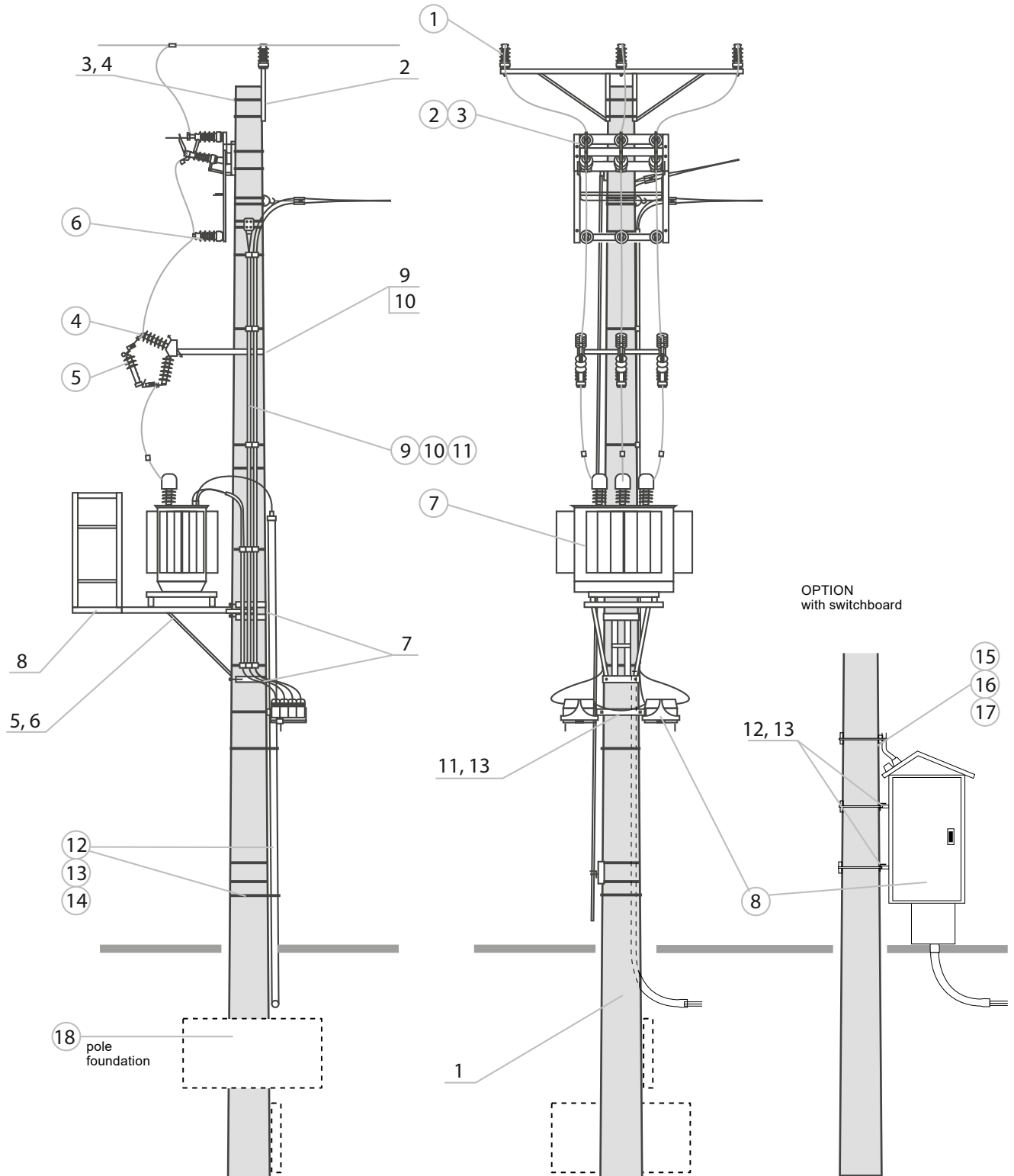


List of structures, accessories, apparatus for STN_{Po}-20/630/.../.../1

| STRUCTURES | | | | | | | | |
|------------|--|--------------------------------------|-----------------------|-------------|-----------------|--|--|--------------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m | | |
| 2. | Through-type station crossarm | PP-3b | PP-2b | 1 | pcs. | ALPAR | inclination 1° 0° cross-section 35-50 50-70 PAS cables AFL cables | |
| | | PP-3a | PP-2a | | | | | top diameter = 420 |
| | | PP-3a | PP-2a | | | | | top diameter = 263 |
| | | PPZ-3 | PP-51 | | | | | top diameter = 218 |
| | | PPZ-2 | PP-56 | | | | | top diameter = 420 |
| PPZ-1 | PP-57 | top diameter = 263 | | | | | | |
| PPZ-1 | PP-57 | top diameter = 218 | | | | | | |
| 3. | Bracket | OG-13 OG-12 OG-5 | OB-14 OB-7 OB-3 | 1 | pcs. | ALPAR | to PPZ-3, PP-57 to PPZ-2, PP-56 to PPZ-1, PP-51 | |
| 4. | Mounting bolts | M16x560 M16x480 M16x400 | 2 2 2 | 1 1 1 | set | ALPAR | to PP-3b and PP-2b to PP-3a and PP-2a to PP-3a and PP-2a PP-57 PP-56 PP-51 top diameter = 420 top diameter = 263 top diameter = 218 | |
| 5. | Structure for the transformer | KTZ-1a KTZ-2a KTZ-3a KSZ-8a | 1 | pcs. | ALPAR | Transformer from 25 kVA to 100 kVA Transformer from 160 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | | |
| 6. | Structure for OCTs | KPT-1 KPT-2 | 1 | pcs. | ALPAR | For KTZ-1a for pole with top diameter = 263 mm For KTZ-1a to KTZ-3a for pole with top diameter = 420 mm | | |
| 7. | Bracket | OS-22; OS-23 | 2 | pcs. | ALPAR | For KTZ installation; OS-23 - top diameter=263 mm | | |
| 8. | Operating platform | POZ-1a | 1 | | ALPAR | Use for STN stations | | |
| 9. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | Use for STN stations | | |
| 10. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm | | |
| 11. | LV disconnecter structure | KRZ-3a | 1 | pcs. | ALPAR | For 2 to 5 LV disconnectors | | |
| 12. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Structures for pole-mounted switchboard - do not use when installing LV disconnectors | | |
| 13. | Bracket | OB-12 OB-10 | 2 (1) | pcs. | ALPAR | For KRZ or KSZ for pole with top diameter = 263 mm For KRZ or KSZ for pole with top diameter = 218 mm (1) - for LV disconnectors | | |

| APPARATUS AND ACCESSORIES | | | | | | | |
|---------------------------|------------------------------------|--|-------------|------|------------------|---|-----------------------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | |
| 1. | Supporting insulator | LWP-8/24 M24x140 LWP-8/24S M24x105 | 3 | pcs. | ALPAR | Bare line, for 1° inclination, use 6 pcs. | |
| 2. | Disconnecter | ONp III SA 24/4o | 1 | pcs. | ALPAR | Frame or modular connectors in vertical design with insulation: porcelain, composite, silicone, with a mounting structure for surge arresters | |
| | Disconnecter with earthing switch | OUNp III SA 24/4o | | | | | |
| 3. | Manual drive | Load break switch | 1 | set | ALPAR | For switch disconnecter without earthing switch For switch disconnecter with earthing switch | |
| | | Load break switch with earthing switch | | | | | RUNp III SA 24/4o |
| 4. | Fuse base | NRA E-12 w.l NRAu E-12 w.l | 3 | pcs. | ALPAR | - | |
| | | PBNWMA-24/50 PBNWMA-24/50 | | | | | With integrated MV arrester |
| | | PBNVA-20/4 PBNVoA-20/4 | | | | | - |
| 5. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / APLAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link | |
| | | HH ... A 10/24 kV "e"=442 mm; "e"=292 mm | 3 | pcs. | SIBA / ALPAR | | |
| 6. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer | |
| 7. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer | |
| 8. | LV disconnecter DB switchboard | ... | from 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer | |
| 9. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when using an LV overhead disconnecter | |
| 10. | Conduit clamp | U75W | 4 | pcs. | ALPAR | | |
| 11. | Heat-shrinkable four-core breakout | SEH-4_95-36 | 1 | pcs. | CELLPACK / ALPAR | Use when using free-standing switchboard | |
| 12. | Protective tube | BE110 | 6 | m | ... / ALPAR | | |
| 13. | Conduit clamp | U110W | 3 | pcs. | ALPAR | Use when using a wall-mounted switchboard at the station | |
| 14. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | | |
| 15. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use when using a wall-mounted switchboard at the station | |
| 16. | Conduit clamp | U110W | 3 | pcs. | ALPAR | | |
| 17. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | | |
| 18. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer | |

STN Po-20/630/.../.../1

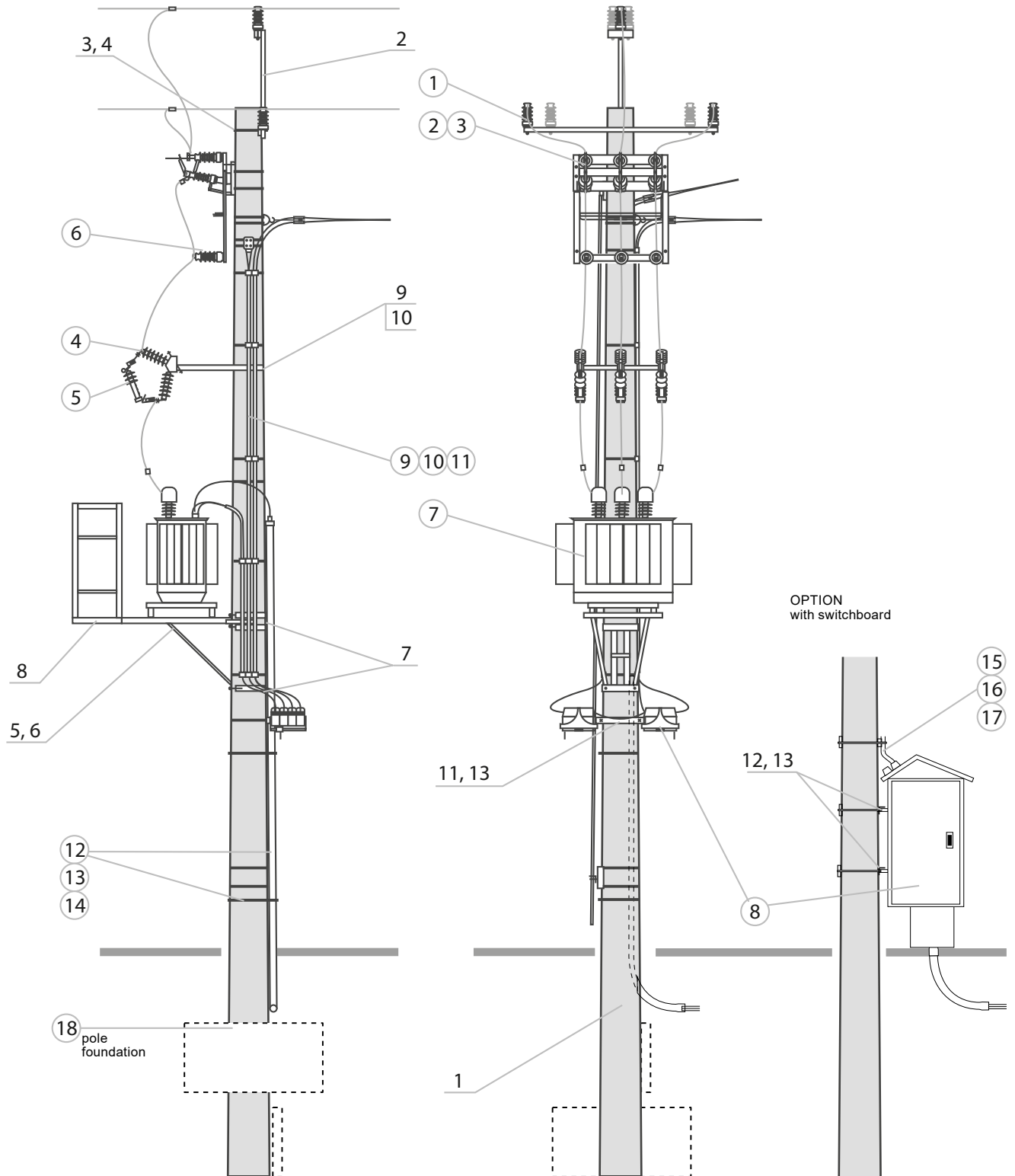


List of structures, accessories, apparatus for STN_{Po}-20/630/.../.../2

| STRUCTURES | | | | | | |
|------------|--|-------------------------------------|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m |
| 2. | Through-type station crossarm | PP-331d/2 | 1 | pcs. | ALPAR | inclination 1° top diameter = 420 top diameter = 263 top diameter = 218 0° top diameter = 420 top diameter = 263 top diameter = 218 |
| | | PP-331c/2 | | | | |
| | | PP-331b/2 | | | | |
| | | PP-311d/2 | | | | |
| | | PP-311c/2 | | | | |
| | | PP-311b/2 | | | | |
| 3. | Bracket | OB-14 | 1 | pcs. | ALPAR | To PP-331d/2 and PP-331d/2 To PP-331c/2 and PP-331c/2 To PP-331b/2 and PP-331b/2 top diameter = 420 top diameter = 263 top diameter = 218 |
| | | OB-7 | | | | |
| | | OB-3 | | | | |
| 4. | Mounting bolts | M16x480 M16x330 M16x280 | 1 | set | ALPAR | To PP-331d/2 and PP-331d/2 To PP-331c/2 and PP-331c/2 To PP-331b/2 and PP-331b/2 top diameter = 420 top diameter = 263 top diameter = 218 |
| 5. | Structure for the transformer | KTZ-1a KTZ-2a KTZ-3a KTZ-8 | 1 | pcs. | ALPAR | Transformer from 25 kVA to 100 kVA Transformer from 160 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA |
| 6. | Structure for OCTs | KPT-1 KPT-2 | 1 | pcs. | ALPAR | For KTZ-1a for pole with top diameter = 263 mm For KTZ-1a to KTZ-3a for pole with top diameter = 420 mm |
| 7. | Bracket | OS-22; OS-23 | 2 | pcs. | ALPAR | For KTZ installation; OS-23 - top diameter = 263 mm |
| 8. | Operating platform | POZ-1a | 1 | | ALPAR | Use for STN stations |
| 9. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | Use for STN stations |
| 10. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm |
| 11. | LV disconnector structure | KRZ-3a | 1 | pcs. | ALPAR | For 2 to 5 LV disconnectors |
| 12. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Structures for pole-mounted switchboard - do not use when installing LV disconnectors |
| 13. | Bracket | OB-12 OB-10 | 2 (1) | pcs. | ALPAR | For KRZ or KSZ for pole with top diameter = 263 mm For KRZ or KSZ for pole with top diameter = 218 mm (1) - for LV disconnectors |

| APPARATUS AND ACCESORIES | | | | | | |
|--------------------------|--|--|-------------|------|------------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Supporting insulator | LWP-8/24 M24x140 | 3 | pcs. | ALPAR | Bare line, for 1° inclination, use 6 pcs. |
| 2. | Disconnector | ON III SA 24/4o OUN III SA 24/4o RN III SA 24/4o RUN III SA 24/4o | 1 | pcs. | ALPAR | Frame or modular connectors in vertical design with porcelain, composite or silicone insulation, with a mounting structure for medium-voltage surge arresters |
| | Disconnector with earthing switch | | | | | |
| | Load break switch | | | | | |
| | Load break switch with earthing switch | | | | | |
| 3. | Manual drive | NRA E-12 w.l NRAu E-12 w.l | 1 | set | ALPAR | For switch disconnector without earthing switch For switch disconnector with earthing switch |
| 4. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - With integrated MV arrester |
| | | WBGn 17,5 | | | | |
| 5. | Fuse link | HH ... A 10/24 kV "e"=442 mm; "e"=292 mm | 3 | pcs. | SIBA / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | | | | | |
| 6. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 7. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 8. | LV disconnector DB switchboard | ... | from 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 9. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when using an LV overhead disconnector |
| 10. | Conduit clamp | U75W | 4 | pcs. | ALPAR | |
| 11. | Heat-shrinkable four-core breakout | SEH-4_95-36 | 1 | pcs. | CELLPACK / ALPAR | |
| 12. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 13. | Conduit clamp | U110W | 3 | 1 | ALPAR | |
| 14. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 15. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use when using a wall-mounted switchboard at the station |
| 16. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 17. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 18. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |

STNPo-20/630/.../.../2

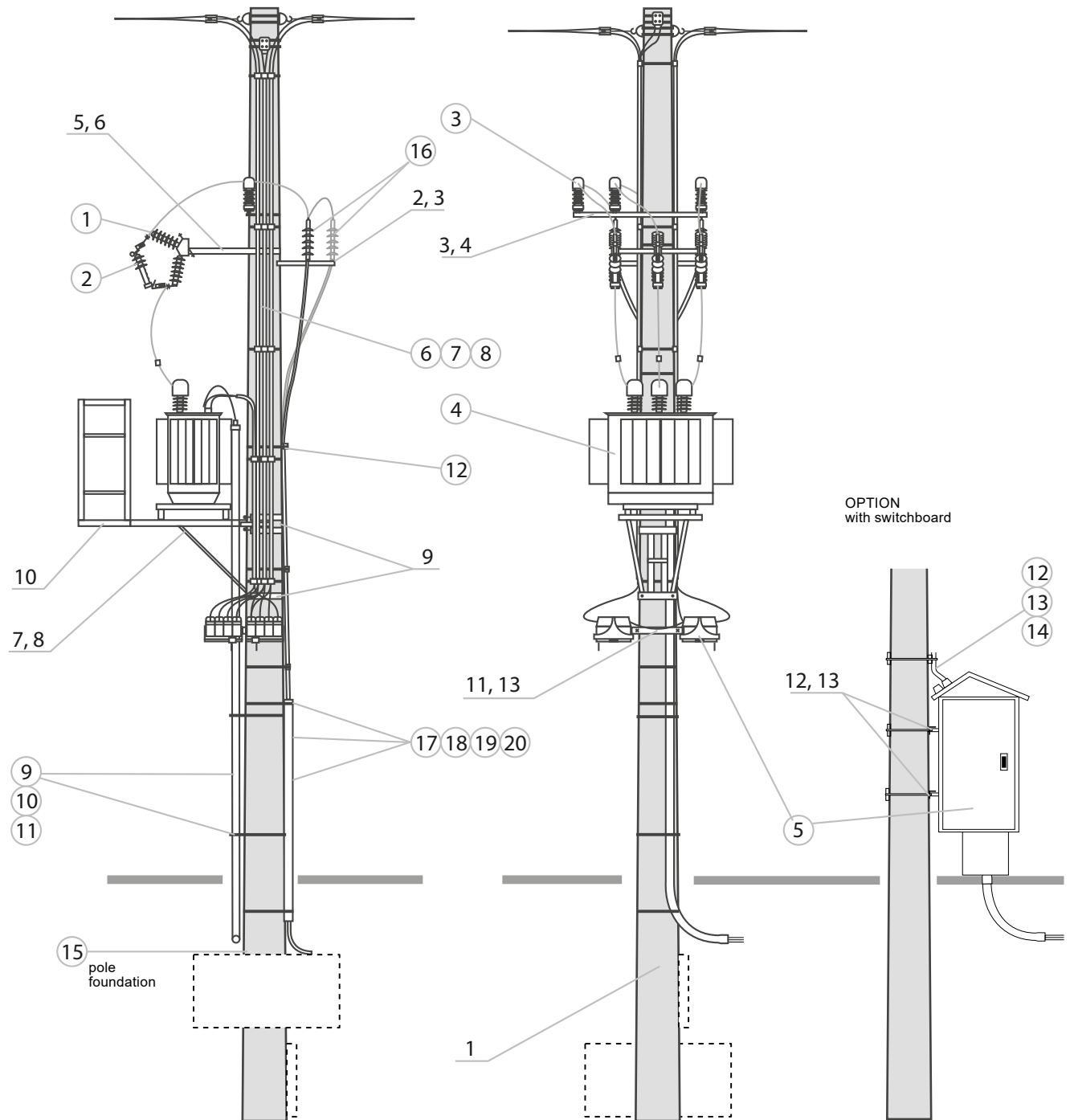


List of structures, accessories, apparatus for STNK-20/630/.../.../1(3)

| STRUCTURES | | | | | | | |
|------------|--|-------------------------------------|----------|------|-----------------|--|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m | |
| 2. | Structure for cable terminations | KGK-13 | 1 | pcs. | ALPAR | For one 3 x 1-phase cable | top diameter = 420 |
| | | KGK-12a | | | | | top diameter = 263 |
| | | KGK-11a | | | | | top diameter = 218 |
| | | KGK-113 | | | | For two 6 x 1-phase cables | top diameter = 420 |
| | | KGK-112a | | | | | top diameter = 263 |
| | | KGK-111a | | | | | top diameter = 218 |
| 3. | Bracket | OB-16 OB-10 OB-7 | 2 | pcs. | ALPAR | To KGK-13, KGK-113, KOG-54 To KGK-12a, KGK-112a, KOG-55 to KGK-11a, KGK-111a, KOG-54 | top diameter = 420 top diameter = 263 top diameter = 218 |
| 4. | Structure for arresters | KOG-54 KOG-55 | 1 | pcs. | ALPAR | For poles with top diameter = 218 mm and 263 mm For poles with top diameter = 420 mm | |
| 5. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | Use for STN stations | |
| 6. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm | |
| 7. | Structure for the transformer | KTZ-1a KTZ-2a KTZ-3a KTZ-8 | 1 | pcs. | ALPAR | Transformer from 25 kVA to 100 kVA Transformer from 160 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | |
| 8. | Structure for OCTs | KPT-1 KPT-2 | 1 | pcs. | ALPAR | For KTZ-1a for pole with top diameter = 263 mm For KTZ-1a to KTZ-3a for pole with top diameter = 420 mm | |
| 9. | Bracket | OS-22; OS-23 | 2 | pcs. | ALPAR | For KTZ installation; OS-23 - top diameter = 263 mm | |
| 10. | Operating platform | POZ-1a | 1 | pcs. | ALPAR | Use for STN stations | |
| 11. | LV disconnecter structure | KRZ-3a | 1 | pcs. | ALPAR | For 2 to 5 LV disconnectors | |
| 12. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Structures for pole-mounted switchboards - not to be used for installation of LV disconnectors | |
| 13. | Bracket | OB-12 OB-10 | 2 (1) | pcs. | ALPAR | For KRZ or KSZ for pole with top diameter = 263 mm For KRZ or KSZ for pole with top diameter = 218 mm (1) - for LV disconnectors | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|-------------------------------------|--|-------------|------|------------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - |
| 2. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / APLAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | HH ... A 10/24 kV "e"=442 mm; "e"=292 mm | 3 | pcs. | SIBA / ALPAR | |
| 3. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorized designer |
| 4. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 5. | LV disconnecter DB switchboard | ... | from 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 6. | Protective tube | RW-2 | 1 | set | ... / ALPAR | To be used when a low-voltage overhead disconnecter is applied |
| 7. | Conduit clamp | U75W | 4 | pcs. | ALPAR | |
| 8. | Heat-shrinkable four-core breakout | SEH-4_95-36 | 1 | pcs. | CELLPACK / ALPAR | |
| 9. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 10. | Conduit clamp | U110W | 3 | 1 | ALPAR | |
| 11. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 12. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use when using a wall-mounted switchboard at the station |
| 13. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 14. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 15. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |
| 16. | Cable termination | CHE-F 24kV 25-150 CHE-F 24kV 70-240 CHEP(H)-3F 24kV 50-150 CHEP(H)-3F 24kV 70-240 | 1 (2) | set | CELLPACK / ALPAR | For 3 x 1-core cable For 3 x 1-core cable For 3-core cable type HAKnFtA For 3-core cable type HAKnFtA |
| 17. | MV cable clamp | U1032 | 3 | pcs. | ALPAR | Triple, for MV cable fastening |
| 18. | Protective tube | BE110 | 3 | m | ... / ALPAR | For MV cable shielding |
| 19. | Heat-shrinkable three-core breakout | SEH-3_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 20. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |

STNK-20/630/.../.../1(3)

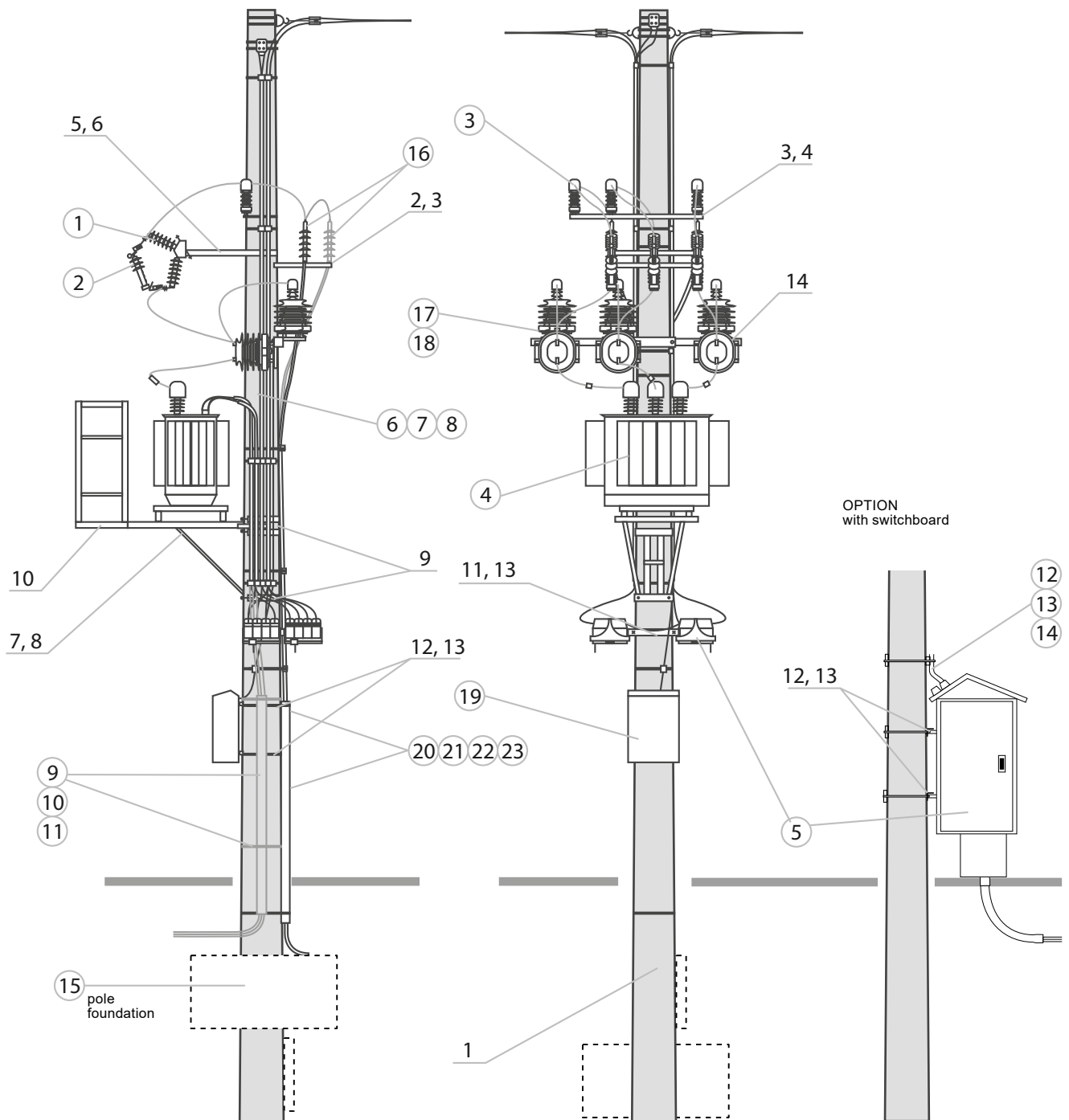


List of structures, accessories, apparatus for STNK-20/630/.../.../1(3)/PP3

| STRUCTURES | | | | | | | |
|------------|--|-------------------------------------|----------|------|-----------------|---|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m | |
| 2. | Structure for cable terminations | KGK-13 | 1 | pcs. | ALPAR | For one 3 x 1-phase cable | top diameter = 420 |
| | | KGK-12a | | | | | top diameter = 263 |
| | | KGK-11a | | | | | top diameter = 218 |
| | | KGK-113 | | | | For two 6 x 1-phase cables | top diameter = 420 |
| | | KGK-112a | | | | | top diameter = 263 |
| | | KGK-111a | | | | | top diameter = 218 |
| 3. | Bracket | OB-16 OB-10 OB-7 | 2 | pcs. | ALPAR | For KGK-13, KGK-113, KOG-54 For KGK-12a, KGK-112a, KOG-54 For KGK-11a, KGK-111a, KOG-55 | top diameter = 420 top diameter = 263 top diameter = 218 |
| 4. | Structure for arresters | KOG-54 KOG-55 | 1 | pcs. | ALPAR | For poles with top diameter = 218 mm and 263 mm For poles with top diameter = 420 mm | |
| 5. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | Use for STN stations | |
| 6. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm | |
| 7. | Structure for the transformer | KTZ-1a KTZ-2a KTZ-3a KTZ-8 | 1 | pcs. | ALPAR | Transformer from 25 kVA to 100 kVA Transformer from 160 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | |
| 8. | Structure for OCTs | KPT-1 KPT-2 | 1 | pcs. | ALPAR | For KTZ-1a for pole with top diameter = 263 mm For KTZ-1a to KTZ-3a for pole with top diameter = 420 mm | |
| 9. | Bracket | OS-22; OS-23 | 2 | pcs. | ALPAR | For KTZ installation; OS-23 - top diameter = 263 mm | |
| 10. | Operating platform | POZ-1a | 1 | pcs. | ALPAR | Use for STN stations | |
| 11. | LV disconnecter structure | KRZ-3a | 1 | pcs. | ALPAR | For 2 to 5 LV disconnectors | |
| 12. | Mounting structure for the switchboard | KSZ-8a | 4 (3) | pcs. | ALPAR | Structures for pole-mounted switchboards - not to be used for installation of LV disconnectors (3) - for LV disconnectors | |
| 13. | Bracket | OB-12 OB-10 | 4 (3) | pcs. | ALPAR | To KRZ or KSZ for poles with top diameter = 263 mm To KRZ or KSZ for poles with top diameter = 218 mm (3) - for LV disconnectors | |
| 14. | Structure for transformers | KP-1 KP-2 | 1 | set | ALPAR | For poles top diameter = 263 mm, top diameter = 218 mm For poles top diameter = 420 mm | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|-------------------------------------|--|-------------|------|------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - With integrated MV arrester |
| 2. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / APLAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | HH ... A 10/24 kV "e"=442 mm; "e"=292 mm | 3 | pcs. | SIBA / ALPAR | |
| 3. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 4. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 5. | LV disconnecter DB switchboard | ... | from 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 6. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when using an LV overhead disconnecter |
| 7. | Conduit clamp | U75W | 4 | pcs. | ALPAR | |
| 8. | Heat-shrinkable four-core breakout | SEH-4_95-36 | 1 | pcs. | CELLPACK / ALPAR | |
| 9. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 10. | Conduit clamp | U110W | 3 | 1 | ALPAR | |
| 11. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 12. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use when using a wall-mounted switchboard at the station |
| 13. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 14. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 15. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |
| 16. | Cable termination | CHE-F 24kV 25-150 CHE-F 24kV 70-240 CHEP(H)-3F 24kV 50-150 CHEP(H)-3F 24kV 70-240 | 1(2) | set | CELLPACK / ALPAR | For 3 x 1-core cable For 3 x 1-core cable For 3-core cable type HAKnFtA For 3-core cable type HAKnFtA |
| 17. | Voltage transformer | VTO | 3 | pcs. | ALPAR | The value of the transformer shall be determined by an authorised designer |
| 18. | Current transformer | CTSO | 3 | pcs. | ALPAR | The value of the transformer shall be determined by an authorised designer |
| 19. | Metering cabinet | ... | 1 | pcs. | ... / ALPAR | Hanging or free-standing according to individual requirements |
| 20. | MV cable clamp | U1032 | 3 | pcs. | ALPAR | Triple, for MV cable fastening |
| 21. | Protective tube | BE110 | 3 | m | ... / ALPAR | For MV cable shielding |
| 22. | Heat-shrinkable three-core breakout | SEH-3_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 23. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |

STNK-20/630/.../.../1(3)/PP3

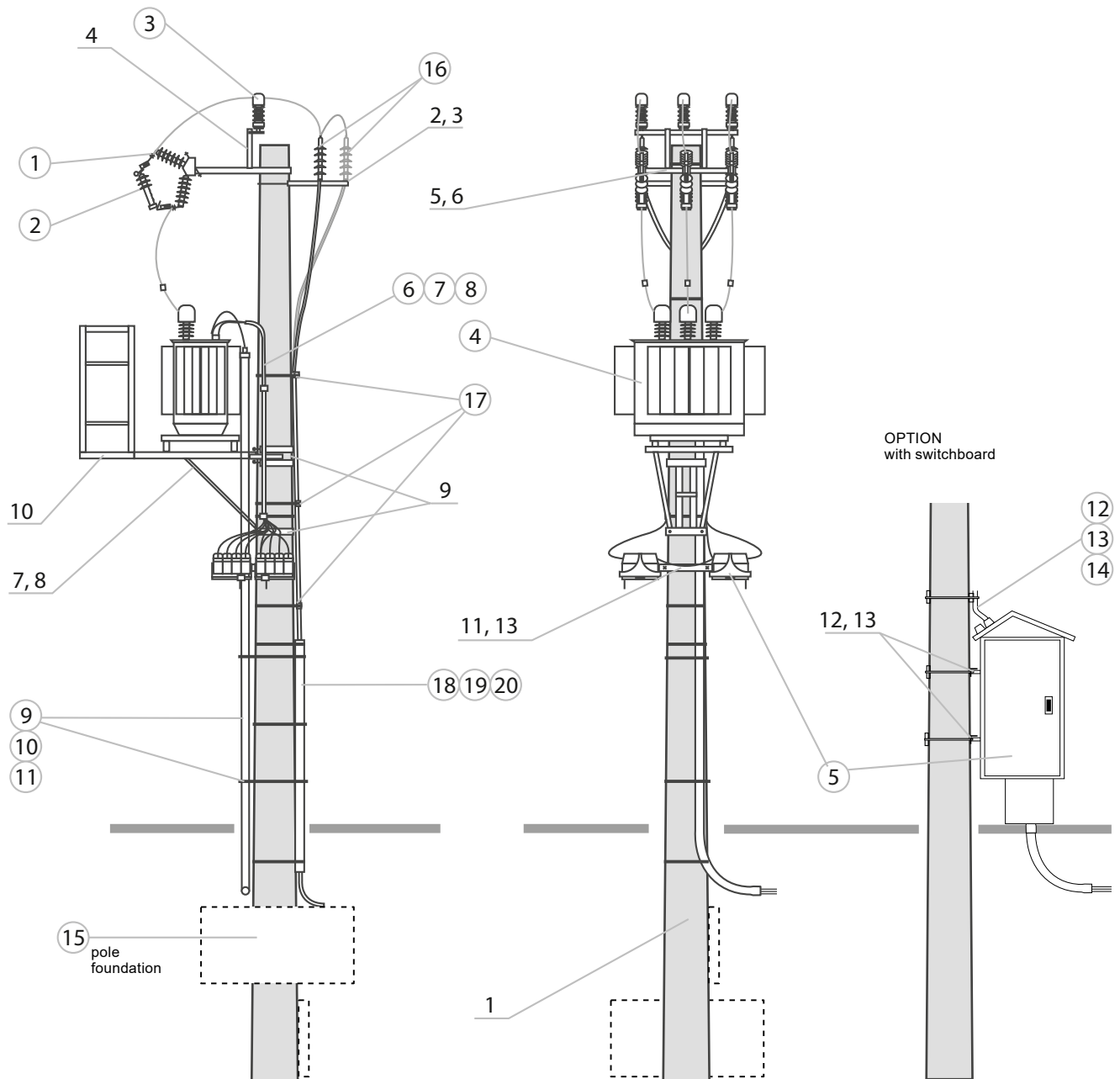


List of structures, accessories, apparatus for STNK-20/630/.../.../2(4)

| STRUCTURES | | | | | | | |
|------------|--|-------------------------------------|----------|------|-----------------|--|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer | |
| 2. | Structure for cable terminations | KGK-13 | 1 | pcs. | ALPAR | For one 3 x 1-phase cable | top diameter = 420 |
| | | KGK-12a | | | | | top diameter = 263 |
| | | KGK-11a | | | | | top diameter = 218 |
| | | KGK-113 | | | | For two 6 x 1-phase cables | top diameter = 420 |
| | | KGK-112a | | | | | top diameter = 263 |
| KGK-111a | top diameter = 218 | | | | | | |
| 3. | Bracket | OB-16 OB-10 OB-7 | 1 | pcs. | ALPAR | For KGK-13, KGK-113 For KGK-12a, KGK-112a For KGK-11a, KGK-111a | top diameter = 420 top diameter = 263 top diameter = 218 |
| 4. | Structure for arresters | KOG-56 | 1 | pcs. | ALPAR | To be mounted on a KBZA structure | |
| 5. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | Use for STN stations | |
| 6. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm | |
| 7. | Structure for the transformer | KTZ-1a KTZ-2a KTZ-3a KTZ-8 | 1 | pcs. | ALPAR | Transformer from 25 kVA to 100 kVA Transformer from 160 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | |
| 8. | Structure for OCTs | KPT-1 KPT-2 | 1 | pcs. | ALPAR | For KTZ-1a for pole with top diameter = 263 mm For KTZ-1a to KTZ-3a for pole with top diameter = 420 mm | |
| 9. | Bracket | OS-22; OS-23 | 2 | pcs. | ALPAR | For KTZ installation; OS-23 - top diameter = 263 mm | |
| 10. | Operating platform | POZ-1a | 1 | pcs. | ALPAR | Use for STN stations | |
| 11. | LV disconnecter structure | KRZ-3a | 1 | pcs. | ALPAR | For 2 to 5 LV disconnectors | |
| 12. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Structures for pole-mounted switchboard - do not use when installing LV disconnectors | |
| 13. | Bracket | OB-12 OB-10 | 2 (1) | pcs. | ALPAR | To KRZ or KSZ for poles with top diameter = 263 mm To KRZ or KSz for poles with top diameter = 218 mm (1) - for LV disconnectors | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|-------------------------------------|--|-------------|------|------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - |
| 2. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / APLAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | HH ... A 10/24 kV "e"=442 mm; "e"=292 mm | 3 | pcs. | SIBA / ALPAR | |
| 3. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 4. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 5. | LV disconnecter DB switchboard | ... | from 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 6. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when using an LV overhead disconnecter |
| 7. | Conduit clamp | U75W | 4 | pcs. | ALPAR | |
| 8. | Heat-shrinkable four-core breakout | SEH-4_95-36 | 1 | pcs. | CELLPACK / ALPAR | |
| 9. | Protective tube | BE110 | 6 | m | ... / ALPAR | |
| 10. | Conduit clamp | U110W | 3 | 1 | ALPAR | Use when using free-standing switchboard |
| 11. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 12. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use when using a wall-mounted switchboard at the station |
| 13. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 14. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 15. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |
| 16. | Cable termination | CHE-F 24kV 25-150 CHE-F 24kV 70-240 CHEP(H)-3F 24kV 50-150 CHEP(H)-3F 24kV 70-240 | 1(2) | set | CELLPACK / ALPAR | For 3 x 1-core cable For 3 x 1-core cable For 3-core cable type HAKnFtA For 3-core cable type HAKnFtA |
| 17. | MV cable clamp | U1032 | 3 | pcs. | ALPAR | Triple, for MV cable fastening |
| 18. | Protective tube | BE110 | 3 | m | ... / ALPAR | For MV cable shielding |
| 19. | Heat-shrinkable three-core breakout | SEH-3_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 20. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |

STNK-20/630/.../.../2(4)

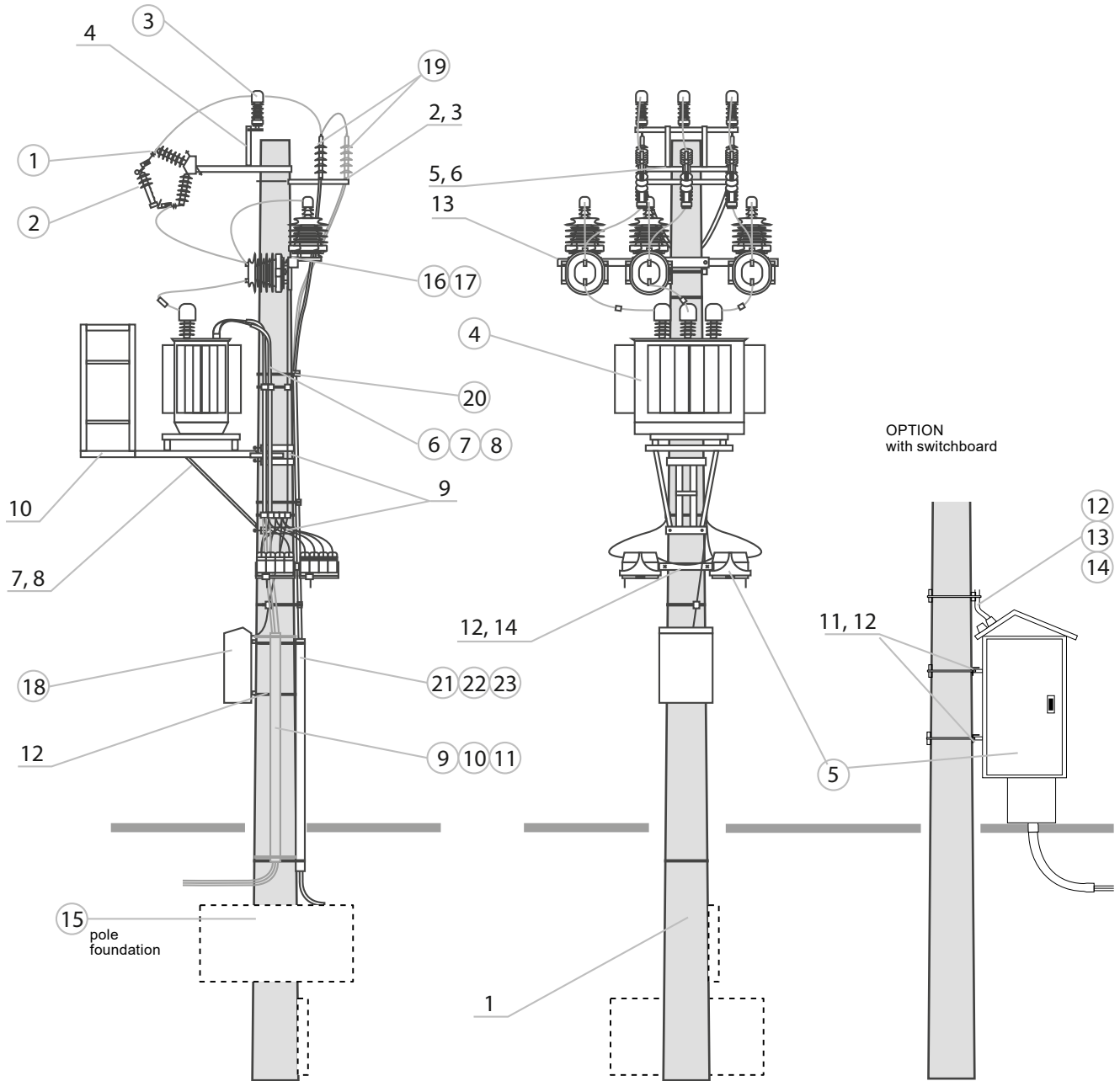


List of structures, accessories, apparatus for STNK-20//630...//2(4)/PP3

| STRUCTURES | | | | | | | |
|------------|--|-------------------------------------|----------|------|-----------------|--|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer | |
| 2. | Structure for cable terminations | KGK-13 | 1 | pcs. | ALPAR | For one 3 x 1-phase cable | top diameter = 420 |
| | | KGK-12a | | | | | top diameter = 263 |
| | | KGK-11a | | | | | top diameter = 218 |
| | | KGK-113 | | | | For two 6 x 1-phase cables | top diameter = 420 |
| | | KGK-112a | | | | | top diameter = 263 |
| | | KGK-111a | | | | | top diameter = 218 |
| 3. | Bracket | OB-16 OB-10 OB-7 | 1 | pcs. | ALPAR | For KGK-13, KGK-113 For KGK-12a, KGK-112a For KGK-11a, KGK-111a | top diameter = 420 top diameter = 263 top diameter = 218 |
| 4. | Structure for arresters | KOG-56 | 1 | pcs. | ALPAR | To be mounted on a KBZA structure | |
| 5. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | Use for STN stations | |
| 6. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm | |
| 7. | Structure for the transformer | KTZ-1a KTZ-2a KTZ-3a KTZ-8 | 1 | pcs. | ALPAR | Transformer from 25 kVA to 100 kVA Transformer from 160 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | |
| 8. | Structure for OCTs | KPT-1 KPT-2 | 1 | pcs. | ALPAR | For KTZ-1a for pole with top diameter = 263 mm For KTZ-1a to KTZ-3a for pole with top diameter = 420 mm | |
| 9. | Bracket | OS-22; OS-23 | 2 | pcs. | ALPAR | For KTZ installation; OS-23 - top diameter = 263 mm | |
| 10. | Operating platform | POZ-1a | 1 | pcs. | ALPAR | Use for STN stations | |
| 11. | Mounting structure for the switchboard | KSZ-8a | 4 | pcs. | ALPAR | Structures for pole-mounted switchboards - not to be used for installation of LV disconnectors | |
| 12. | Bracket | OB-12 OB-10 | 4 (3) | pcs. | ALPAR | For KRZ or KSZ for pole with top diameter=263 mm For KRZ or KSZ for pole with top diameter=218 mm (3) - for LV disconnectors | |
| 13. | Structure for transformers | KP-1 KP-2 | 1 | set | ALPAR | For poles top diameter = 263 mm, top diameter = 218 mm For poles top diameter = 420 mm | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|-------------------------------------|--|----------|------|------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - With integrated MV arrester |
| 2. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / APLAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | HH ... A 10/24 kV "e"=442 mm; "e"=292 mm | 3 | pcs. | SIBA / ALPAR | |
| 3. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 4. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 5. | LV disconnector DB switchboard | RS-1/ ... | 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 6. | Protective tube | RW-1 | 1 | set | ... / ALPAR | To be used when a low-voltage overhead disconnector is applied |
| 7. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 8. | Heat-shrinkable four-core breakout | SEH-4_95-36 | 1 | pcs. | CELLPACK / ALPAR | |
| 9. | Protective tube | BE110 | 6 | m | ... / ALPAR | |
| 10. | Conduit clamp | U110W | 3 | pcs. | ALPAR | Use when using free-standing switchboard |
| 11. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 12. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use when using a wall-mounted switchboard at the station |
| 13. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 14. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 15. | Foundation support structure | ... | 1 | set | ALPAR | |
| 16. | Voltage transformer | VTO | 3 | pcs. | ALPAR | The value of the transformer shall be determined by an authorised designer |
| 17. | Current transformer | CTSO | 3 | pcs. | ALPAR | The value of the transformer shall be determined by an authorised designer |
| 18. | Metering cabinet | ... | 1 | pcs. | ... / ALPAR | Hanging or free-standing according to individual requirements |
| 19. | Cable termination | CHE-F 24kV 25-150 CHE-F 24kV 70-240 CHEP(H)-3F 24kV 50-150 CHEP(H)-3F 24kV 70-240 | 1(2) | set | CELLPACK / ALPAR | For 3 x 1-core cable For 3 x 1-core cable For 3-core cable type HAKnFtA For 3-core cable type HAKnFtA |
| 20. | MV cable clamp | U1032 | 3 | pcs. | ALPAR | Triple, for MV cable fastening |
| 21. | Protective tube | BE110 | 3 | m | ... / ALPAR | For MV cable shielding |
| 22. | Heat-shrinkable three-core breakout | SEH-3_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 23. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |

STNK-20/630/.../.../2(4)/PP3

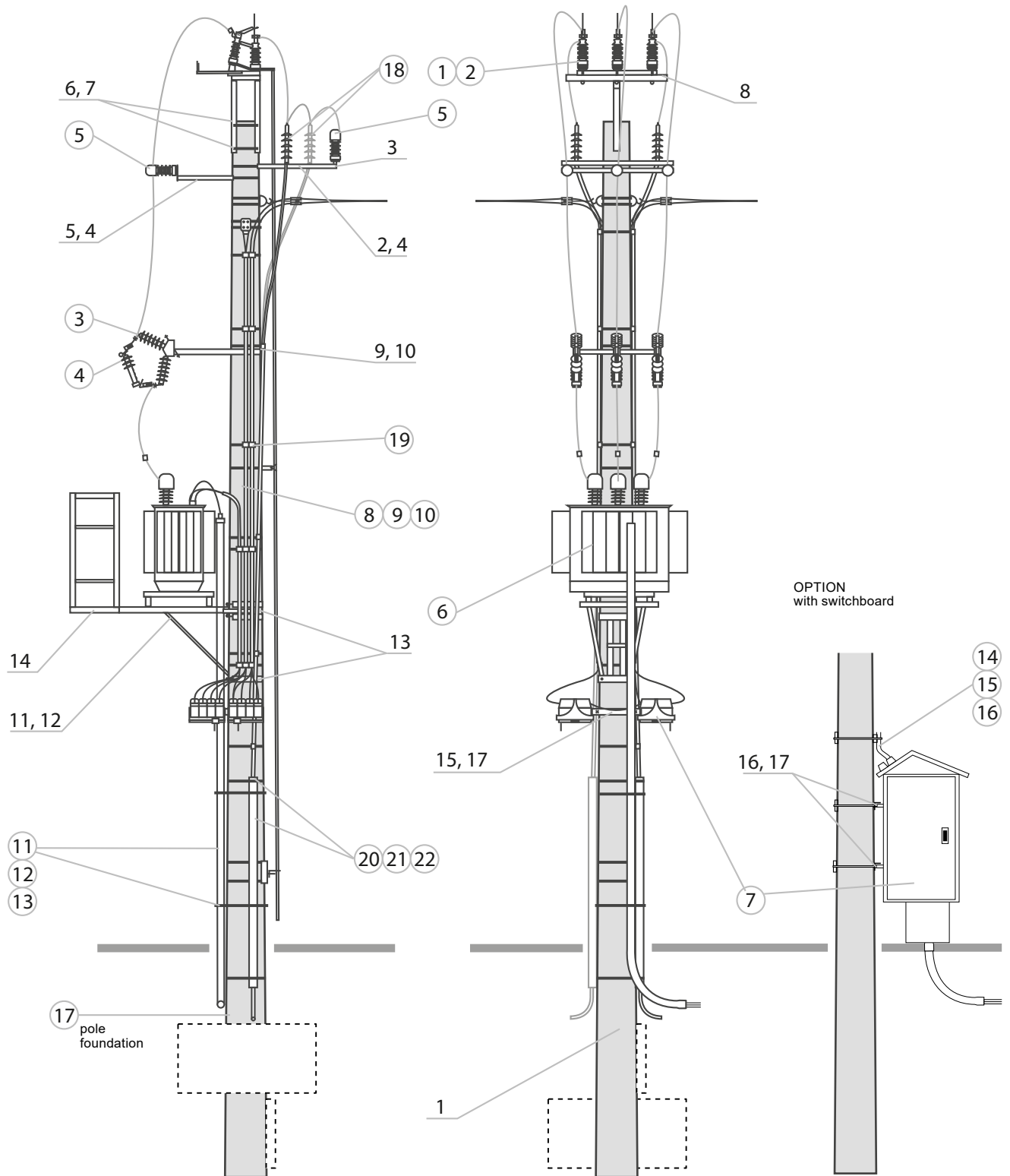


List of structures, accessories, apparatus for STN_{Ko}-20/630/.../.../1(3)

| STRUCTURES | | | | | | | |
|------------|--|---|----------|------|-----------------|--|--------------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m | |
| 2. | Structure for cable terminations | KGK-13 | 1 | pcs. | ALPAR | For one 3 x 1-phase cable | top diameter = 420 |
| | | KGK-12a | | | | | top diameter = 263 |
| | | KGK-11a | | | | | top diameter = 218 |
| | | KGK-113 | | | | For two 6 x 1-phase cables | top diameter = 420 |
| | | KGK-112a | | | | | top diameter = 263 |
| | | KGK-111a | | | | | top diameter = 218 |
| 3. | Structure for arresters | KOG-62 | 1 | pcs. | ALPAR | Use up to two cables, for structures KGK-11... | |
| 4. | Bracket | OB-16 OB-10 OB-7 | 2 | pcs. | ALPAR | For KGK-13, KGK-113, KOG-5/M For KGK-12a, KGK-112a, KOG-5 For KGK-11a, KGK-111a, KOG-5 | |
| 5. | Structure for disconnecter | KOG-5 KOG-5/M | 1 | pcs. | ALPAR | For poles with top diameter = 218 mm and 263 mm For poles with top diameter = 420 mm | |
| 6. | Structure for the load break switch | KON-2 KON-1 | 1 | pcs. | ALPAR | For poles with top diameter = 420 mm For poles with top diameter = 218 mm and 263 mm | |
| 7. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps M16x260+N+Po+Ps | 2 | set | ALPAR | top diameter = 420 mm top diameter = 263 mm top diameter = 218 mm | |
| 8. | Structure for the load break switch | KPO-30 | 1 | pcs. | ALPAR | For attachment to KON with two screws M16x80 | |
| 9. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | Use for STN stations | |
| 10. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm | |
| 11. | Structure for the transformer | KTZ-1a KTZ-2a KTZ-3a KTZ-8 | 1 | pcs. | ALPAR | Transformer from 25 kVA to 100 kVA Transformer from 160 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | |
| 12. | Structure for OCTs | KPT-1 KPT-2 | 1 | pcs. | ALPAR | For KTZ-1a for pole with top diameter = 263 mm For KTZ-1a to KTZ-3a for pole with top diameter = 420 mm | |
| 13. | Bracket | OS-22; OS-23 | 2 | pcs. | ALPAR | For KTZ installation; OS-23 - top diameter = 263 mm | |
| 14. | Operating platform | POZ-1a | 1 | pcs. | ALPAR | Use for STN stations | |
| 15. | LV disconnecter structure | KRZ-3a | 1 | pcs. | ALPAR | For 2 to 5 LV disconnectors | |
| 16. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Structures for pole-mounted switchboards - not to be used for installation of LV disconnectors | |
| 17. | Bracket | OB-12 OB-10 | 2 (1) | pcs. | ALPAR | to KRZ or KSZ for poles with top diameter = 263 mm to KRZ or KSZ for poles with top diameter = 218 mm (1) - for LV disconnectors | |

| APPARATUS AND ACESORIES | | | | | | |
|-------------------------|--|--|-------------|------|------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Disconnector Disconnector with earthing switch Load break switch Load break switch with earthing switch | ON III SA 24/4 OUN III SA 24/4 RN III SA 24/4 RUN III SA 24/4 | 1 | pcs. | ALPAR | Frame or module connectors in horizontal configuration with insulation: porcelain, composite, silicone |
| 2. | Manual drive | NRA E-12 w.l NRAu E-12 w.l | 1 | set | ALPAR | For switch disconnector without earthing switch For switch disconnector with earthing switch |
| 3. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - |
| 4. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / APLAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | HH ... A 10/24 kV "e"=442 mm; "e"=292 mm | 3 | pcs. | SIBA / ALPAR | |
| 5. | Surge arrester | ... | 3 (6) | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 6. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 7. | LV disconnecter DB switchboard | ... | from 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 8. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when using an LV overhead disconnector |
| 9. | Conduit clamp | U75W | 4 | pcs. | ALPAR | |
| 10. | Heat-shrinkable four-core break-out | SEH-4_95-36 | 1 | pcs. | CELLPACK / ALPAR | |
| 11. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 12. | Conduit clamp | U110W | 3 | 1 | ALPAR | |
| 13. | Heat-shrinkable four-core break-out | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 14. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use when using a wall-mounted switchboard at the station |
| 15. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 16. | Heat-shrinkable four-core break-out | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 17. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |
| 18. | Cable termination | CHE-F 24kV 25-150 CHE-F 24kV 70-240 CHEP(H)-3F 24kV 50-150 CHEP(H)-3F 24kV 70-240 | 1 (2) | set | CELLPACK / ALPAR | For 3 x 1-core cable For 3 x 1-core cable For 3-core cable type HAKnFTA For 3-core cable type HAKnFTA |
| 19. | MV cable clamp | U1032 | 3 | pcs. | ALPAR | Triple, for MV cable fastening |
| 20. | Protective tube | BE110 | 3 | m | ... / ALPAR | For MV cable shielding |
| 21. | Heat-shrinkable three-core breakout | SEH-3_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 22. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |

STNko-20/630/.../.../1(3)

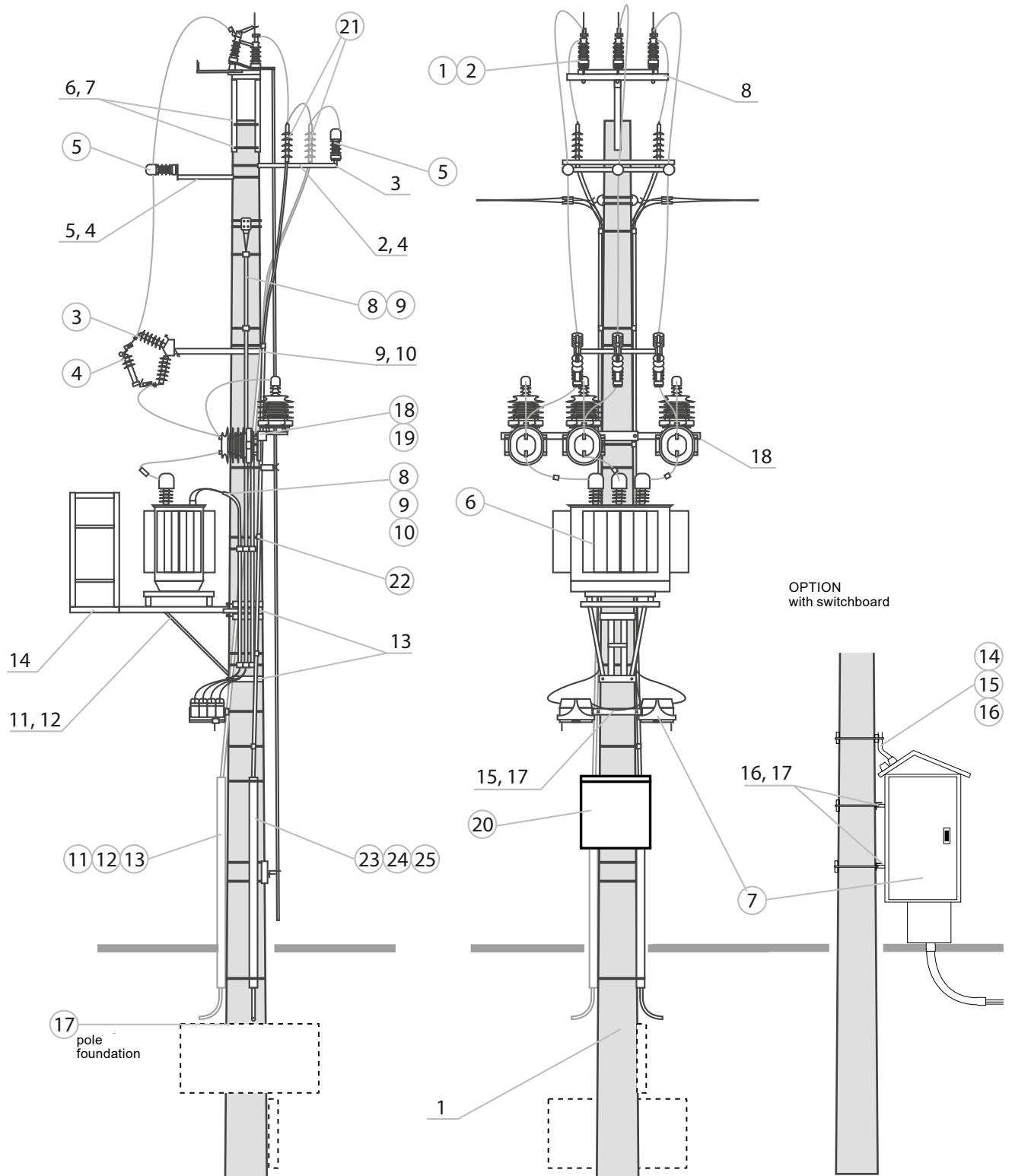


List of structures, accessories, apparatus for STNko-20/630/.../.../1(3)/PP3

| STRUCTURES | | | | | | | |
|------------|--|---|----------|------|-----------------|--|--------------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m | |
| 2. | Structure for cable terminations | KGK-13 | 1 | pcs. | ALPAR | For one 3 x 1-phase cable | top diameter = 420 |
| | | KGK-12a | | | | | top diameter = 263 |
| | | KGK-11a | | | | | top diameter = 218 |
| | | KGK-113 | | | | For two 6 x 1-phase cables | top diameter = 420 |
| | | KGK-112a | | | | | top diameter = 263 |
| KGK-111a | top diameter = 218 | | | | | | |
| 3. | Structure for arresters | KOG-62 | 1 | pcs. | ALPAR | Use up to two cables, for structures KGK-11... | |
| 4. | Bracket | OB-16 | 2 | pcs. | ALPAR | For KGK-13, KGK-113, KOG-5/M For KGK-12a, KGK-112a, KOG-5 For KGK-11a, KGK-111a, KOG-5 | top diameter = 420 |
| | | OB-10 | | | | | top diameter = 263 |
| | | OB-7 | | | | | top diameter = 218 |
| 5. | Structure for arresters | KOG-5 KOG-5/M | 1 | pcs. | ALPAR | For poles with top diameter = 218 mm and 263 mm For poles with top diameter = 420 mm | |
| 6. | Structure for disconnecter | KON-2 KON-1 | 1 | pcs. | ALPAR | For poles with top diameter = 420 mm For poles with top diameter = 218 mm and 263 mm | |
| 7. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps M16x260+N+Po+Ps | 2 | set | ALPAR | top diameter = 420 mm top diameter = 263 mm top diameter = 218 mm | |
| 8. | Structure for the load break switch | KPO-30 | 1 | pcs. | ALPAR | For attachment with KON with two M16x80 screws | |
| 9. | Structure for fuse bases | KBZA | 1 | pcs. | ALPAR | Use for STN stations | |
| 10. | Mounting bolts | M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm | |
| 11. | Structure for the transformer | KTZ-1a | 1 | pcs. | ALPAR | Transformer from 25 kVA to 100 kVA Transformer from 160 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | |
| | | KTZ-2a | | | | | |
| | | KTZ-3a | | | | | |
| | | KTZ-8 | | | | | |
| 12. | Structure for OCTs | KPT-1 | 1 | pcs. | ALPAR | For KTZ-1a for pole with top diameter = 263 mm For KTZ-1a to KTZ-3a for pole with top diameter = 420 mm | |
| | | KPT-2 | | | | | |
| 13. | Bracket | OS-22; OS-23 | 2 | pcs. | ALPAR | For KTZ installation; OS-23 - top diameter = 263 mm | |
| 14. | Operating platform | POZ-1a | 1 | pcs. | ALPAR | Use for STN stations | |
| 15. | LV disconnecter structure | KRZ-3a | 1 | pcs. | ALPAR | For 2 to 5 LV disconnectors | |
| 16. | Mounting structure for the switchboard | KSZ-8a | 2 | pcs. | ALPAR | Structures for pole-mounted switchboard - do not use when installing LV disconnectors To KRZ or KSZ for poles with top diameter = 263 mm | |
| 17. | Bracket | OB-12 OB-10 | 4 (3) | pcs. | ALPAR | To KRZ or KSZ for poles with top diameter = 218 mm (1) - for LV disconnectors | |
| 18. | Structure for transformers | KP-1 KP-2 | 1 | set | ALPAR | For poles top diameter = 263 mm, top diameter = 218 mm For poles top diameter = 420 mm | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|---|---|-------------|------|------------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Disconnector | ON III SA 24/4 | 1 | pcs. | ALPAR | Frame or module connectors in horizontal configuration with insulation: porcelain, composite, silicone |
| | Disconnector with earthing switch | OUN III SA 24/4 | | | | |
| | Load break switch Load break switch with earthing switch | RN III SA 24/4 RUN III SA 24/4 | | | | |
| 2. | Manual drive | NRA E-12 w.l | 1 | set | ALPAR | For switch disconnector without earthing switch For switch disconnector with earthing switch |
| | | NRAu E-12 w.l | | | | |
| 3. | Fuse base | PBNWMA-24/50 | 3 | pcs. | ALPAR | - |
| | | PBNWMA-24/50 | | | | With integrated MV arrester |
| | | PBNVA-20/4 | | | | - |
| | | PBNVoA-20/4 | | | | With integrated MV arrester |
| 4. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / APLAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | HH ... A 10/24 kV "e"=442 mm; "e"=292 mm | 3 | pcs. | SIBA / ALPAR | |
| 5. | Surge arrester | ... | 3 (6) | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 6. | Overhead transformer | 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 7. | LV disconnecter DB switchboard | ... | from 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 8. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when using an LV overhead disconnecter |
| 9. | Conduit clamp | U75W | 4 | pcs. | ALPAR | |
| 10. | Heat-shrinkable four-core breakout | SEH-4_95-36 | 1 | pcs. | CELLPACK / ALPAR | |
| 11. | Protective tube | BE110 | 6 | m | ... / ALPAR | Use when using free-standing switchboard |
| 12. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 13. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 14. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use when using a wall-mounted switchboard at the station |
| 15. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 16. | Heat-shrinkable four-core breakout | SEH-4_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 17. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of pole foundation by an authorised designer |
| 18. | Voltage transformer | VTO | 3 | pcs. | ALPAR | The value of the transformer shall be determined by the designer |
| 19. | Current transformer | CTSO | 3 | pcs. | ALPAR | The value of the transformer shall be determined by the designer |
| 20. | Metering cabinet | ... | 1 | pcs. | ... / ALPAR | Free-standing according to individual requirements |
| 21. | Cable termination | CHE-F 24kV 25-150 | 1 (2) | set | CELLPACK / ALPAR | For 3 x 1-core cable |
| | | CHE-F 24kV 70-240 | | | | For 3 x 1-core cable |
| | | CHEP(H)-3F 24kV 50-150 | | | | For 3-core cable type HAKnFTA |
| | | CHEP(H)-3F 24kV 70-240 | | | | For 3-core cable type HAKnFTA |
| 22. | MV cable clamp | U1032 | 3 | pcs. | ALPAR | Triple, for MV cable fastening |
| 23. | Protective tube | BE110 | 3 | m | ... / ALPAR | For MV cable shielding |
| 24. | Heat-shrinkable three-core breakout | SEH-3_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 25. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |

STNKO-20/630/.../.../1(3)/PP3



14. List of materials for pole foundations

| No. | Specification | Marking | Manufacturer No. of standard, drawing | Quantity | Unit | Weight [kg] | | Selection on p. * | Notes |
|-----|--------------------|----------|---------------------------------------|----------|------|-------------|-------|-------------------|------------------------|
| | | | | | | unit | total | | |
| I | Plate foundation | UP... | - | 1 | set | ... | ... | 139, 141 | |
| 1. | Foundation plate | U-85 | ... | ... | pcs. | 77 | ... | | |
| 2. | | U-130 | | ... | | 156 | ... | | |
| 3. | Bracket | OU-1 | 4-385-63 | ... | pcs. | 2,3 | ... | 139 | |
| 4. | | OU-2 | | | | 2,5 | ... | | |
| 5. | | OU-6 | | | | 2,7 | ... | | |
| 6. | | OU-7 | | | | 2,8 | ... | | |
| 7. | Foundation element | ES-2 | 4-385-65 | ... | pcs. | 25,0 | ... | 141 | |
| 8. | Base plate | 0,3x0,3m | - | ... | pcs. | 10 | ... | 139, 141 | |
| 9. | Portland cement | 32,5 | - | ... | pcs. | ... | ... | | For soil stabilisation |

| No. | Specification | Marking | Manufacturer No. of standard, drawing | Quantity | Unit | Weight [kg] | | Selection on p. * | Notes |
|-----|--------------------------|---------------|---------------------------------------|----------|------|---------------|-------|------------------------|-----------------|
| | | | | | | unit | total | | |
| II | Prefabricated foundation | SFPI..... | - | 1 | set | ... | ... | 144 | |
| | | SP..... | | ... | set | ... | ... | | |
| 1. | Foundation plate | PS-120 | ... | ... | pcs. | 400 | ... | | |
| 2. | | PS-160 | | ... | | 530 | ... | | |
| 3. | | PS-200 | | ... | | 660 | ... | | |
| 4. | Base plate | 0,3x0,3m | ... | 1 | pcs. | 10 | ... | | For medium soil |
| | Foundation plate | U-85 | | 77 | ... | For weak soil | | | |
| 5. | Twisted connection to | SFPI..... | 4-385-69 | 1 | set | 153,2 | ... | | |
| | | SFPI...../623 | | | | 178,4 | ... | | |
| 6. | Twisted connection to | SP..... | - | ... | set | ... | ... | | |
| 7. | Portland cement | 32,5 | - | ... | kg | ... | ... | For soil stabilisation | |

| No. | Specification | Marking | Manufacturer No. of standard, drawing | Quantity | Unit | Weight [kg] | | Selection on p. * | Notes |
|-----|---------------------|----------------|---------------------------------------|----------|------|----------------|-------|-------------------|-------|
| | | | | | | unit | total | | |
| III | Shaft foundations | Us..... | - | - | - | - | - | 142, 143 | |
| 1. | Concrete shaft ring | Ø ... / ... cm | BN-86/8971-08 | ... | pcs. | ... | ... | | |
| 2. | Concrete | B15 | | - | ... | m ³ | ... | | ... |

| No. | Specification | Marking | Manufacturer No. of standard, drawing | Quantity | Unit | Weight [kg] | | Selection on p. * | Notes |
|-----|-----------------|---------|---------------------------------------|----------|----------------|-------------|-------|-------------------|-------|
| | | | | | | unit | total | | |
| IV | Concrete | B15 | - | - | - | - | - | - | |
| 1. | Portland cement | 32,5 | - | 220 | kg | ... | ... | | |
| 2. | Sand | - | - | 0,42 | m ³ | ... | ... | | |
| 3. | Gravel | - | - | 0,83 | m ³ | ... | ... | | |
| 4. | Water | - | - | 0,2 | m ³ | ... | ... | | |

* Selection according to Volume II of the Pole-Mounted Transformer Station Catalogue (MV/LV STN, STNu types with transformers up to 630 kVA on spun concrete poles)

CHAPTER 3

STE 20/630 pole-mounted transformer stations



OŚWIADCZENIE

Polskie Towarzystwo Przesyłu i Rozdziału Energii Elektrycznej oświadcza,
iż firmie

ALPAR Artur i Piotr Kowalscy Sp. J.
z siedzibą w miejscowości Kozienice

zostało udzielone
zgodnie z zawartą umową licencyjną
(w myśl wymogów Ustawy o prawie autorskim i prawach pokrewnych)
prawo do produkcji konstrukcji stalowych
dla linii napowietrznych SN i nn oraz słupowych stacji transformatorowych
według rozwiązań zawartych w następującym albumie typizacyjnym:

Album słupowych stacji transformatorowych SN/nn
STN, STNu, STE
z transformatorami o mocy do 630 kVA
na żerdziach wirowanych
opracowany w 2016 roku

Polskie
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1. Subject and scope of the study

- This catalogue contains designs for STE pole-mounted transformer stations with transformers rated up to 630 kVA and nominal voltages of 15/0.4 kV and 20/0.4 kV. The station is intended to supply power to rural and urban-residential consumers, as well as small industrial and service facilities, from medium-voltage overhead or cable networks. The catalogue includes design materials and drawings necessary for the proper assembly of station components.
- The proposed station variants allow for optimal selection of equipment.
- Technical data and selection of basic station components are provided in section 4. Detailed selection of station equipment the respective albums available at: <https://energa-operator.pl/dokumenty-i-forms/instructions/standards/technical-standards>.
- The supporting structure of the station is designed to serve as a terminal pole for medium-voltage (MV) and low-voltage (LV) overhead lines, or as a through, tension, or angle tension pole for MV lines, and a terminal pole for LV lines. For replacement purposes only, the station provides for the installation of an MV load break switch or a combined load break switch with earthing switch (MV).
- As a rule, the MV switchgear should be installed on the pole located before the transformer station.

The catalogue was developed based on the following standards:

- **PN-EN 50341-1** *Overhead electrical lines exceeding AC 1 kV – Part 1: General requirements – Common specifications.*
- **PN-EN 50341-3-22** *Overhead electrical lines exceeding AC 45 kV – Part 3-22: National Normative Aspects (NNA) – Poland*
- **PN-EN 61936-1** *Power installations exceeding 1 kV AC – Part 1: Common rules*
- **PN-EN 50522** *Earthing of power installations exceeding 1 kV AC*
- **PN-HD 60364-4-41** *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock.*
- **PN-HD 60364-4-442** *Low-voltage electrical installations Part 4-442: Protection for safety – Protection of low-voltage installations against temporary overvoltages caused by earth faults in high-voltage systems.*

and the standards and recommendations given in the individual paragraphs of the technical description

2. Station solutions

The stations included in this documentation essentially consist of two groups:

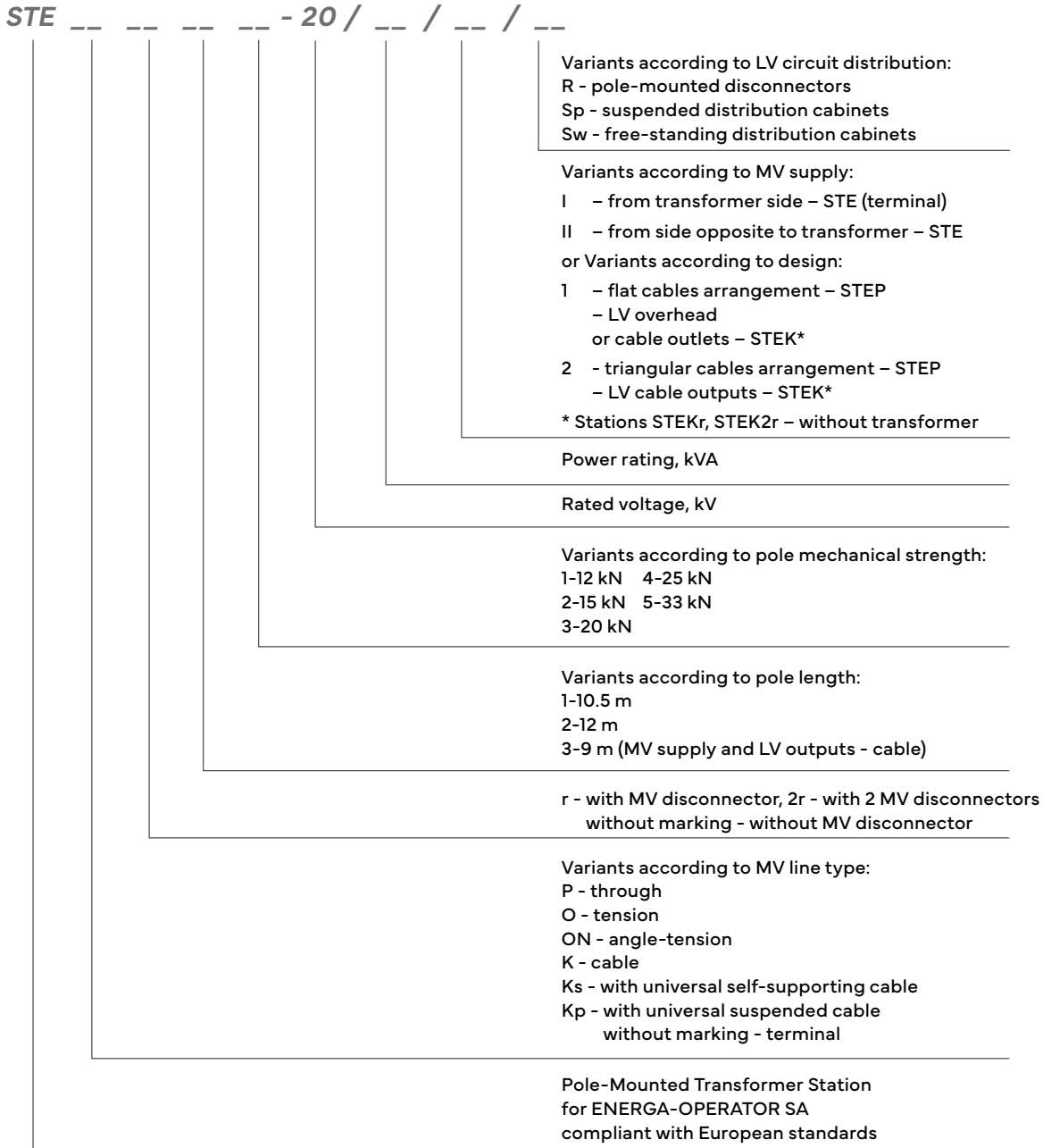
- STE stations up to 250 kVA - without MV fuses
- STE 400 and 630 kVA stations - with MV fuses.

There are no plans to install an operating platform at the stations.

Due to the medium-voltage supply, the following station configurations are provided

1. **STE/I** – MV overhead line supply with bare or PAS-type cables on the transformer side, terminal station,
2. **STE/II** – MV overhead line supply with bare or PAS-type cables on the side opposite to the transformer, terminal station,
3. **STEKs/I, STEKp/I** – MV overhead line supply with universal self-supporting or suspended cable on the transformer side, terminal station,
4. **STEKs/II, STEKp/II** – MV overhead line supply with universal self-supporting or suspended cable on the side opposite to the transformer, terminal station,
5. **STEr** – MV overhead line supply with bare or PAS-type cables on the side opposite to the transformer, terminal station with disconnector,
6. **STEKsr, STEKpr** – MV overhead line supply with bare or PAS-type cables on the side opposite to the transformer, terminal station with disconnector,
7. **STEP/1** – MV overhead line supply with bare or PAS-type cables, through station, flat cables arrangement,
8. **STEP/2** – MV overhead line supply with bare cables, through station, triangular cables arrangement,
9. **STEPr/1** – MV overhead line supply with bare or PAS-type cables, through station with disconnector, flat cables arrangement,
10. **STEPr/2** – MV overhead line supply with bare or PAS-type cables, through station with disconnector, triangular cables arrangement,
11. **STEO, STEON** – MV overhead line supply with bare or PAS-type cables, tension or angle-tension station,
12. **STEK** – MV cable line supply,
13. **STEKr** – MV cable line supply, station with disconnector,
14. **STEK2r** – MV cable line supply, station with 2 disconnectors.

3. Station markings



4. Station characteristics

Basic technical data of the station

| | | |
|-----|--------------------------------------|--|
| 1. | Rated station voltage | 15/0,4 kV, 20/0,4 kV |
| 2. | Rated insulation voltage | 24/1 kV |
| 3. | Transformer type | Overhead |
| 4. | Transformer power and maximum weight | STE-20/250- to 250 kVA - 1250 kg STE-20/400- 400 kVA - 1650 kg STE-20/630- 630 kVA - 2150 kg |
| 5. | Station supply | <ul style="list-style-type: none"> - an overhead line with a rated voltage of 15 or 20 kV: - with bare cables AFL-6 35, 50, 70 mm² or insulated conductors 50, 70 mm² (PAS system) - with self-supporting universal cables - with universal suspended cables - cable line with a rating of 8.7/15 or 12/20 kV - 1-core XLPE insulated earth cables - universal cables |
| 6. | MV and LV connections at the station | Wires and cables - selection according to station wiring diagrams and table- p. 104 |
| 7. | Distribution of LV circuits | As required with application of: <ul style="list-style-type: none"> - LV pole-mounted switchboard, - LV free-standing switchboard, - LV overhead fuse disconnectors. |
| 8. | LV line circuits | Overhead lines with self-supporting insulated conductors, cable lines |
| 9. | Static loads on stations | Selection according to load patterns |
| 10. | Types of poles | E- and EM-type spun poles in lengths of 9; 10.5 and 12 m with apex forces of 12, 15, 20, 25 and 33 kN |
| 11. | MV insulation | Strain strings ŁO, ŁO2 with composite insulators; through hangers ZP, ZPb, ZM with composite or porcelain insulators |
| 12. | Levels of inclination | I, II, III - according to the principles in the national annex of PN-EN 50341-1 |
| 13. | MV connectors | Disconnectors, disconnectors with earthing switch, overhead disconnectors with earthing switch |
| 14. | Power metering | Indirect on the LV side |
| 15. | MV fuse links | Full range - selection according to table - p. 104 |
| 16. | Surge protection | MV and LV surge arresters (SPD) |
| 17. | Type of soil | Of high, medium, and low load capacity - parameters according to point 17 of the description - p. 107 |
| 18. | Foundation of the station | Plate foundations UP, shaft foundations Us, prefabricated foundations SFP |
| 19. | Station earthing | Protective and functional earthing- common Tape and rod earthing electrodes for soil resistivities of 100, 200, 300, 400, 500, and 1000 Wm. |
| 20. | Steel structures | With maximum use of cold-formed sections |
| 21. | Environmental operating conditions | <p>Operating temperature range:</p> <ul style="list-style-type: none"> - for MV and LV lines: -25°C to +40°C, - for apparatus and equipment: according to manufacturers' recommendations, <p>Installation temperature range: -5 °C to +40 °C and according to the recommendations of the manufacturers of apparatus and equipment, altitude above sea level: up to 1000 m,</p> <p>Pollution zones: I, II, III, selection according to volume III and recommendations of manufacturers of MV apparatus and accessories,</p> <p>Climate zones: I, II - wind load S1, S2 - ice load</p> |

Selection of MV protection and station LV connections

| No. | Specification | | | Transformer capacity, kVA | | | | | | | |
|-----|---|-----------------|---------|---------------------------|------|------|------|------|------|------------|------------|
| | | | | 25 | 40 | 63 | 100 | 160 | 250 | 400 | 630 |
| 1. | Rated transformer current on MV side | A | 15 kV | 0,92 | 1,47 | 2,31 | 3,67 | 5,87 | 9,16 | 14,66 | 23,09 |
| | | | 20 kV | 0,69 | 1,1 | 1,73 | 2,75 | 4,4 | 6,87 | 11,00 | 17,32 |
| 2. | Rated current MV fuse-links | A | 15 kV | | | | | | | 25 | 40 |
| | | | 20 kV | | | | | | | 20 | 31,5 |
| 3. | Rated transformer current on the LV side | A | 0,42 kV | 35 | 55 | 87 | 138 | 220 | 344 | 550 | 866 |
| 4. | Cross-section of LV supply cables, transformer connection - LV switchboard (LV disconnectors) | mm ² | YAKXS | 2x4(3)x95 | | | | | | - | - |
| | | | YKXS | 2x4(3)x70 | | | | | | 8(6)x1x120 | 8(6)x1x240 |
| 5. | Cross-section of the protective-neutral cable, transformer connection - LV overhead line circuits | mm ² | YAKXS | 1x95 | | | | | | - | - |
| | | | YKXS | 1x70 | | | | | | 1x120 | 2x1x120 |

Notes:

- MV fuse links (pos. 2) have been selected for the rated capacities of the transformers according to the guidelines of the fuse link manufacturers and provide protection for the transformer against the effects of short circuits and overloads. Full range links should be used.
- Fuse-links for LV circuits are to be selected for long-term load capacity, overloads, short-circuit conditions and in accordance with the requirements of electric shock protection.
- 3-core connections are to be used when the protective-neutral cable (pos. 5) is taken directly from the transformer for connection with PEN cables of LV overhead circuits.

5. Station power supply

Power supply for the station is provided for:

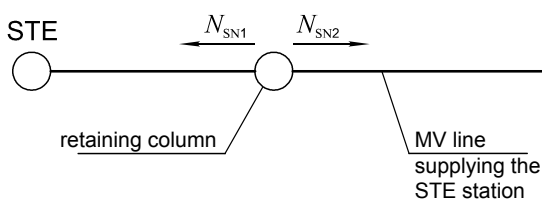
- MV overhead line with AFL-6 35, 50 and 70mm² bare cables,
- MV overhead line with 50 and 70 mm² sheathed cables (PAS type line),
- MV overhead line with universal self-supporting or overhead cables,
- MV cable line - 1-core earth cables with cross-linked polyethylene (XLPE) insulation and thermoplastic polyethylene sheath or universal cables.

In the catalogue, in the static load tables for stations (pages 75 to 100), the allowable tension of MV cables is specified for stations with overhead low-voltage outputs as well as for stations with exclusively cable LV outputs.

Page 74 also provides the method for verifying the minimum distance between cables in the middle of the span limited by an MV line pole and a pole-mounted station.

It is recommended, whenever possible, to design a tension pole withstanding the cable loads of the supply line a short distance before the station. This allows reducing the tension of cables suspended to the station crossarm.

In the case of using a tension pole before the station, where the difference between the maximum cable tensions on both sides of the pole exceeds 2/3, its load capacity should be considered as that of a terminal pole — according to the diagram below.



if;

$$N_{SN2} > N_{SN1} \text{ and } N_{SN2} - N_{SN1} > 2/3 N_{SN2}$$

the retaining pole should be sized for the full tension of the N_{SN2} terminal pole.

N_{SN1}, N_{SN2} – maximum tension of the MV line conductors on both sides of the retaining pole.

6. LV circuit output

Low-voltage circuits are to be routed using overhead lines with self-supporting insulated conductors and cable lines.

The number of low-voltage circuits routed from the station depends on the type of outgoing lines (overhead or cable) and the circuit distribution system applied at the station.

The number, type, and routing direction of LV lines must take into account the constraints resulting from the selected station

configuration, the assumed tension of the MV line, and the transformer's rated power.

The span length of low-voltage lines should be determined based on the assumed maximum cable tension, which must be selected so that the total tension of the LV lines does not exceed the station's load capacity as specified in the referenced diagrams, nor the permissible load of the installed accessories.

7. Station equipment

Medium voltage side

At terminal, tension, or angle-tension stations, MV overhead lines with bare or PAS-type cables are mounted to the cross-arm using strain strings with composite insulators. At through stations, overhead lines are supported using through-type suspension assemblies on porcelain or composite post insulators. MV overhead lines made with self-supporting or suspended cable are mounted directly to the pole or to the disconnect support structure using appropriate accessories.

At stations supplied by MV cable lines, the cable routed up the station pole is terminated with cable terminations mounted either on the supporting structure or with connector-type terminations directly connected to the transformer.

Three basic station types are provided based on the transformer's power rating and weight: up to 250 kVA, 400 kVA, and 630 kVA. Stations up to 250 kVA are not equipped with MV protection. 400 kVA and 630 kVA stations are fitted with MV fuse links. There are no plans to install an operating platform at the stations.

For replacement and maintenance purposes, stations with MV disconnectors are provided. In the case of new station installations, the MV disconnector should be mounted on the MV pole located before the station.

The connection between the supply line and the transformer is made with insulated conductors. MV conductors are connected to the MV insulator terminals on the transformer using cable lugs. At connection points between cables or wires and MV insulators or surge arresters, insulating covers must be used.

MV station equipment is protected against induced overvoltages by appropriately selected surge arresters mounted either on the transformer tank or on separate structures, which may also function as support insulators for cables or cable terminations (details – Volume II, pp. 75 ÷ 81).

Low voltage side

The station's low-voltage (LV) equipment depends on the method of routing the LV circuits, which—depending on the needs—may be implemented using pole-mounted or free-standing LV switchboards, or pole-mounted LV fuse disconnectors.

Energy metering at the station will be implemented using a balancing metering system located either in the LV distribution cabinet or in a separate LV metering cabinet.

The equipment of LV switchboards and metering cabinets, along with electrical diagrams, is provided in Volume III.

For stations with pole-mounted LV disconnectors, a semi-indirect metering system on the LV side is enabled by the use of overhead LV current transformers.

This metering solution is also intended for stations with switchboards where, due to installation constraints (e.g. in existing stations), internal mounting of measuring equipment is not possible.

The connection between the transformer and the pole-mounted or free-standing LV switchboard is made using appropriately selected XLPE-insulated LV cables, chosen according to the table on page 9.

Insulated LV overhead cables may be routed directly into the pole-mounted switchboard or fuse disconnector.

Cables and wires installed at the station may be fixed directly to the pole using cable clamps or routed on cable ladders.

The connection of LV cables and wires to the transformer is made using terminals installed on LV bushing insulators, adapted to the number and cross-section of connected cores and the transformer's rated power.

8. Station structure

Centrifugally spun prestressed concrete poles of type E or EM are used. Pole selection, depending on the station type, should be carried out according to the load diagrams on pages 75 to 100, in accordance with the assortment and requirements specified in Volume III. The static loads on the supporting structure must not exceed the allowable forces indicated in the load diagrams.

Steel structures meet the requirements of the Eurocodes for structural design. They are primarily made of cold-formed steel sections and are marked with symbols derived from their name and the structure number. All steel components of the station must meet the requirements of execution class EXC2, in accordance with the European Standard PN-EN 1090-1+A1 Execution of steel and aluminium structures – Part 1: Requirements for conformity assessment of structural components, and PN-EN 1090-2+A1

Construction of steel and aluminium structures - Part 2: Technical requirements for steel structures. Steel structures are protected against corrosion by hot-dip galvanizing, in accordance with EN ISO 1461. After the structure has been assembled on site, in aggressive environments, additional painting

with protective coating is recommended, in accordance with PN-EN ISO 12944-5 Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Part 5: Protective paint systems. If a paint coating (Duplex system) is to be factory-applied to the galvanized steel elements, the guidelines of PN-EN 50341-1, section 7.9.4 should be followed.

All steel components must be permanently marked with the manufacturer's mark and the symbols defined in this document.

The structural dimensions account for the allowable clearances between live MV components and structural parts or pole elements, in accordance with the standards listed in point 1.

When making MV cable connections at the station, proper insulation distances between cables and structures must be ensured. The minimum insulation clearance should be:

$D_{el} = 22 \text{ cm}$.

The selection of insulators and accessories and other components not included in this study requires appropriate checking and adaptation.

9. Station earthing

Earthing of the LV network neutral point and the connected PEN (PE) cables in an STE station is implemented as a common earthing system with the medium-voltage equipment. A common MV and LV earthing system may be used provided that the condition regarding the combined earthing resistance, as specified in standard PN-HD 60364-4-442, is met. If this condition is not fulfilled, the MV and LV earthing systems

must be implemented as separate (independent) systems, with a minimum distance of 20 m between the earth electrodes.

The method of earthing the station components and the earthing system layout, depending on soil resistivity, as well as detailed requirements for station earthing, are specified in Volume II.

10. Surge protection

The MV-side equipment of the station is protected against induced overvoltages by MV surge arresters in silicone housing. The mounting arrangement for the surge arresters is shown in Volume II.

The selection of surge arresters for specific voltage levels in networks with earth-fault current compensation and unknown fault clearing time is provided in Volume III. For networks equipped with single-phase fault automatic disconnection systems, where the earth fault clearing time is known, the surge

arrester selection must be based on the voltage-time characteristic provided by the manufacturer.

On the LV side, station equipment is protected by low-voltage surge protective devices (SPD), which are recommended to be installed directly on the transformer, between the phase terminals of the LV windings and protective earth. The mounting of SPDs is shown in Volume II, and selection criteria are provided in Volume III. Overhead LV line outputs should be protected by SPDs installed on the first pole of the LV line.

11. Station foundation

The foundation of the station was developed for soils with high, medium and low bearing capacity. In the case of soils with very low bearing capacity, the foundation should be designed individually.

The selection of station foundations depends on the assessment of the subsoil. Soil investigations must be carried out in accordance with the requirements of the PN-EN 1997-2 standard, Eurocode 7: Geotechnical design – Part 2: Ground investigation and testing.

Detailed rules for determining the geotechnical conditions for foundation are set out in the Regulation of the Minister of Transport, Construction and Maritime Economy of 25 April 2012

(Journal of Laws, item 463) on determining the geotechnical conditions for foundation of building structures.

Taking into account various execution technologies, the foundation of the station was solved using UP plate foundations, Us shaft foundations and SFP prefabricated foundations.

The station foundations were designed on the basis of geotechnical calculations carried out in accordance with EN 1997-1 Eurocode 7: Geotechnical design – Part 1: General principles.

The technical data for the foundations, their selection and the rules for implementing the foundations are detailed in Volume II.

Basic soil parameters

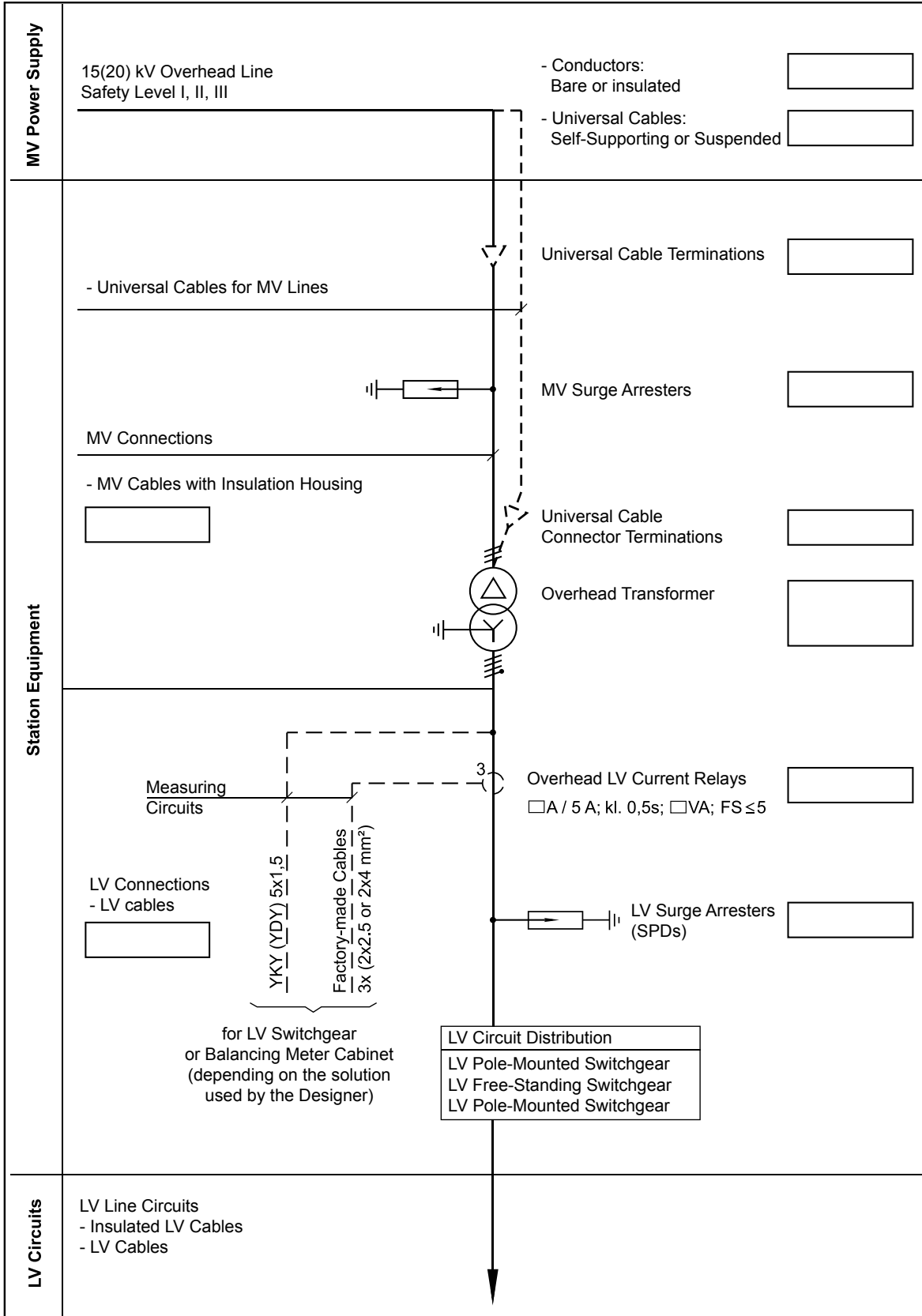
| Soil type | Soil name | Soil condition | Marking according to PN-B-02481:1998P | Marking according to PN-EN ISO 14688-1:2006P + A1:2014-02E / PN-EN ISO 14688-2:2006P + A1:2014-02E | generalized soil parameters | | | | | | | | | |
|---|-------------------|----------------|---------------------------------------|--|-----------------------------|-------------------|-------------------|-------------------|-------|----|----|------|-------|------|
| | | | | | Φ | c | γ | C | μ | | | | | |
| | | | | | ° | kN/m ² | kN/m ³ | kN/m ³ | | | | | | |
| Soils with high and medium bearing capacity | Gravel | very dense | Ż | Gr | 37 | 0 | 18,5 | 40000 | 0,55 | | | | | |
| | Gravel mix | | Po | siSa | | | | | | | | | | |
| | Coarse sand | dense | Pr | Sa, siSa | | | | | | | | | | |
| | Medium sand | | Ps | Sa, siSa | | | | | | | | | | |
| | Fine sand | medium dense | Pd | Sa, siSa | | | | | | | | | | |
| | Silt | very compact | II | saSi, saclSi, Si, clSi | 20 | 25 | 20 | 40000 | 0,25 | | | | | |
| | Clay | | G | saSiCl, sasiCl, clSi, siCl, cl | | | | | | | | | | |
| | Silt | | I | sasiCl, saCl, siCl, cl | | | | | | | | | | |
| | Clayey gravel mix | | Pog | Sasi, saCl, Si, siCl, Ci | | | | | | | | | | |
| | Clayey sand | | Pg | siSa, cisa, saSi | | | | | | | | | | |
| Soils with low bearing capacity | Gravel | loose | Ż | Gr | | | | | | 32 | 0 | 17,5 | 25000 | 0,45 |
| | Gravel mix | | Po | siSa | | | | | | | | | | |
| | Coarse sand | | Pr | Sa, siSa | | | | | | | | | | |
| | Fine sand | medium-dense | Pd | Sa, siSa | | | | | | | | | | |
| | Silt | plastic | II | saSi, saclSi, Si, clSi | | | | | | 15 | 20 | 19,0 | 25000 | 0,30 |
| | Clayey gravel mix | | G | saSiCl, sasiCl, clSi, siCl, cl | | | | | | | | | | |
| | Clayey sand | | I | sasiCl, saCl, siCl, cl | | | | | | | | | | |
| | Clayey sand | | Pog | Sasi, saCl, Si, siCl, Ci | | | | | | | | | | |
| | Clayey sand | | Pg | siSa, cisa, saSi | | | | | | | | | | |
| | Coarse sand | | Pg | siSa, cisa, saSi | | | | | | | | | | |
| Soils with very low bearing capacity | Fine sand | loose | Pr | Sa, siSa | 25 | 0 | 15,0 | 5000 | 0,10 | | | | | |
| | Silt | | Pd | Sa, siSa | | | | | | | | | | |
| | Clayey gravel mix | soft-plastic | II | saSi, saclSi, Si, clSi | 10 | 5 | 18,0 | 5000 | 0,10 | | | | | |
| | Clayey sand | | G | saSiCl, sasiCl, clSi, siCl, cl | | | | | | | | | | |
| | Silt | | I | sasiCl, saCl, siCl, cl | | | | | | | | | | |
| | Clayey gravel mix | | Pog | Sasi, saCl, Si, siCl, Ci | | | | | | | | | | |
| | Clayey sand | | Pg | siSa, cisa, saSi | | | | | | | | | | |

Legend:

- Φ – angle of internal friction in degrees
- c – cohesion
- γ – bulk density
- C – modulus of subsoil compliance
- μ – coefficient of friction between soil and concrete foundation

12. Station solutions

Electrical diagram of STE-20/..., STEKs-2station

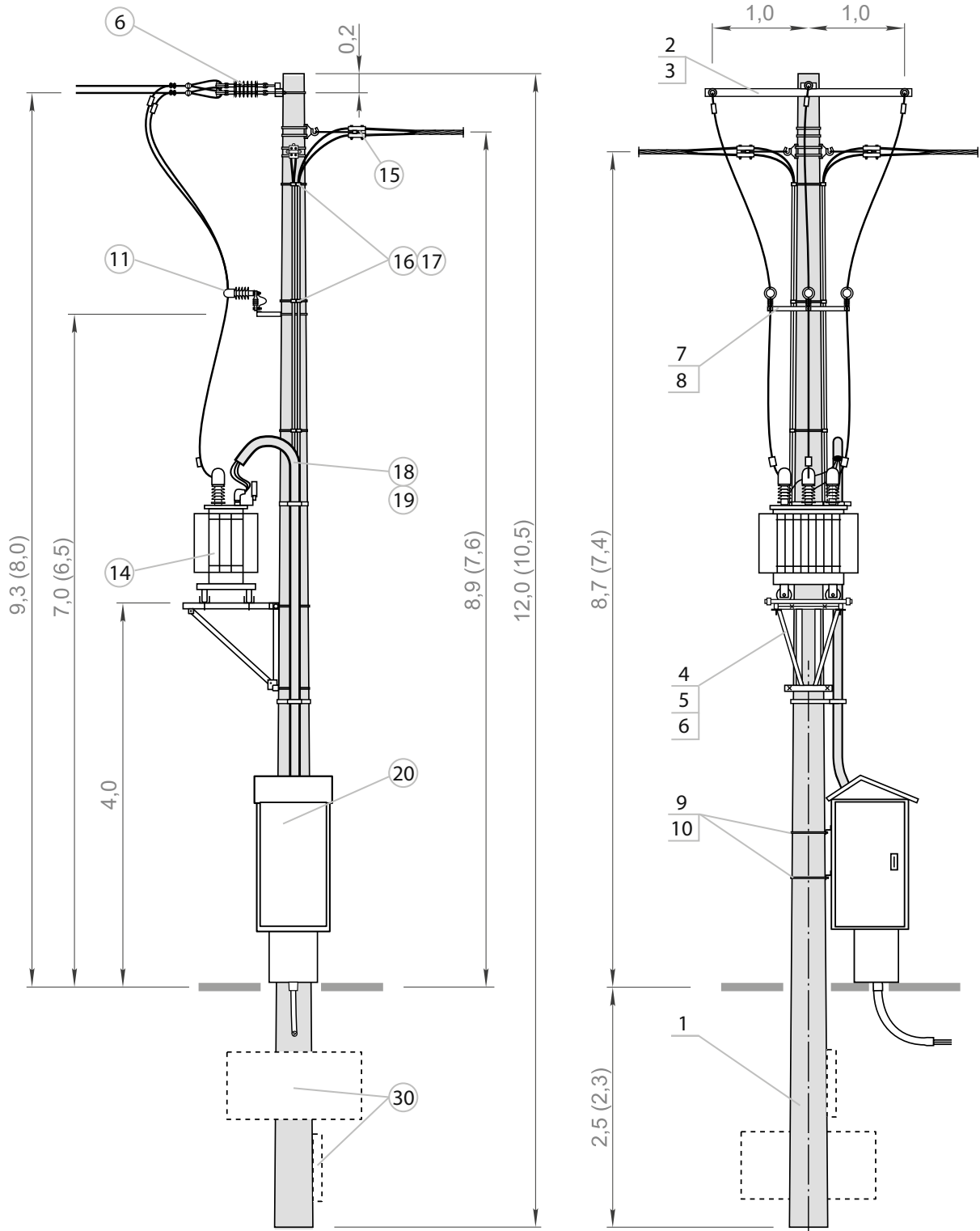


List of structures, accessories, apparatus for STE-20/.../I

| STRUCTURES | | | | | | | | | | | | | |
|------------|--|---------------------------------|----------|------|-----------------|--|---|---------------------|--|--|--|--|------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | | | | | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 | | | | | | | |
| 2. | Station crossarm | PK-12/E PK-3b/E | 1 | pcs. | ALPAR | N_{SN} line tension $\leq 20kN$ $\leq 12kN$ $\leq 20kN$ $\leq 13,5kN$ | $\leq 12kN$ top diameter = 420 top diameter = 263 top diameter = 218 | PAS cables | | | | | |
| | | PK-11a/E PK-3a/E | | | | | top diameter = 218 | | | | | | |
| | | PK-6a/E PK-1a/E | | | | | top diameter = 420 top diameter = 263 | | | | | | |
| | | | | | | | | PKZ-7/E | | | | top diameter = 420 top diameter = 263 | AFL cables |
| | | | | | | | | PKZ-6/E | | | | top diameter = 420 top diameter = 263 | |
| | | | | | | | | PKZ-3b/E PKZ-1c/E | | | | top diameter = 420 top diameter = 263 | |
| | | | | | | | | PKZ-3a/E PKZ-1b/E | | | | top diameter = 263 top diameter = 218 | |
| | | PKZ-3/E PKZ-1a/E | | | | | | | | | | | |
| 3. | Bracket | OG-20/E OG-8/E OG-2/E | 1 | pcs. | ALPAR | For PKZ-1c /E, PK-3b /E For PKZ-1b /E, PK-3a /E For PKZ-1a /E, PK-1a /E | | | | | | | |
| 4. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | | | | | | | |
| 5. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm | | | | | | | |
| 6. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 | | | | | | | |
| 7. | Structure for arresters | KOG-50/E | 1 | pcs. | ALPAR | top diameter = 218 top diameter = 263 top diameter = 420 | Do not use when mounting arresters directly on the transformer | | | | | | |
| | | KOG-51/E | | | | | | | | | | | |
| 8. | Bracket | OB-7/E OB-8/E OB-14 /E | 1 | pcs. | ALPAR | To KOG-50/E for poles with top diameter = 218 mm To KOG-50/E for poles with top diameter = 263 mm To KOG-51/E for poles with top diameter = 420 mm | | | | | | | |
| 9. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles with top diameter = 218 mm and 263 mm For poles with top diameter = 420 mm | | | | | | | |
| 10. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm | | | | | | | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|-----------------------------------|--------------------------|-----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 6. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 3 | set | ... / ALPAR | Single/double on porcelain insulators Single/double on silicone insulators |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester is determined by an authorized designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorized designer |
| 15. | Terminal clamp for AsXSn | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits - number of conduits depends on the number of circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use for station-mounted switchboard |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

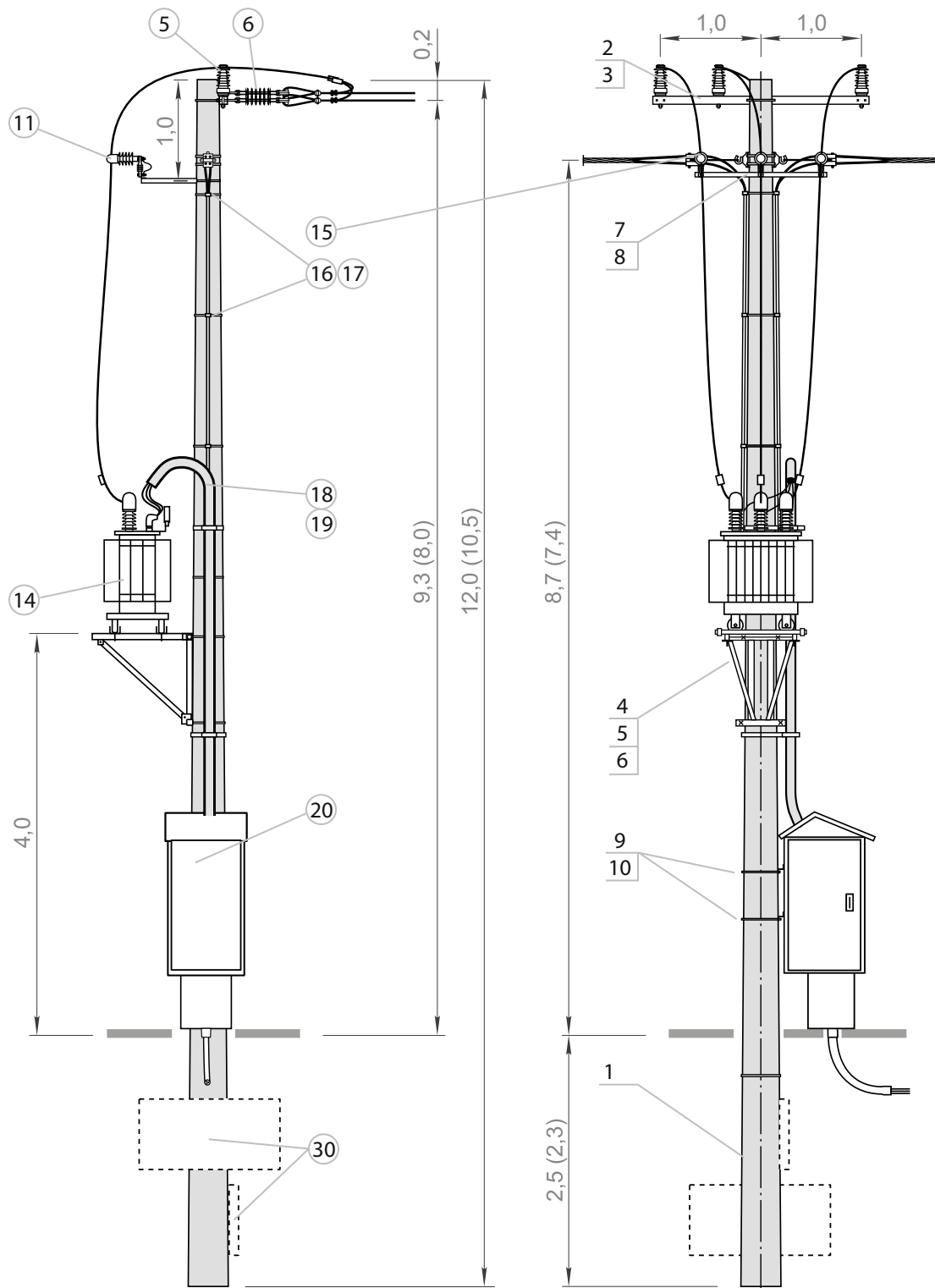
STE-20/.../I



List of structures, accessories, apparatus for STE-20/.../II

| STRUCTURES | | | | | | | | |
|--------------------------|--|---------------------------------|-----------|------|-----------------|--|--|------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 | | |
| 2. | Station crossarm | PK-12/E PK-3b/E | 1 | pcs. | ALPAR | N_{SN} line tension $\leq 20\text{kN}$ $\leq 12\text{kN}$ $\leq 20\text{kN}$ $\leq 13,5\text{kN}$ | top diameter = 420 | PAS cables |
| | | PK-11a/E PK-3a/E | | | | | top diameter = 263 | |
| | | PK-6a/E PK-1a/E | | | | | top diameter = 218 | |
| | | PKZ-7/E | | | | | top diameter = 420 | |
| | | PKZ-6/E | | | | | top diameter = 263 | AFL cables |
| | | PKZ-3b/E PKZ-1c/E | | | | | top diameter = 420 | |
| | | PKZ-3a/E PKZ-1b/E | | | | | top diameter = 263 | |
| | | PKZ-3/E PKZ-1a/E | | | | | top diameter = 218 | |
| 3. | Bracket | OG-20/E OG-8/E OG-2/E | 1 | pcs. | ALPAR | To PKZ-1c/E, PK-3b/E To PKZ-1b/E, PK-3a/E To PKZ-1a/E, PK-1a/E | | |
| 4. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | | |
| 5. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm | | |
| 6. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 | | |
| 7. | Structure for arresters | KOG-50/E | 1 | pcs. | ALPAR | top diameter = 218 top diameter = 263 top diameter = 420 | Do not use when mounting arresters directly on the transformer | |
| | | KOG-51/E | | | | | | |
| 8. | Bracket | OB-6/E OB-8/E OB-14/E | 1 | pcs. | ALPAR | To KOG-50/E for poles with top diameter = 218 mm To KOG-50/E for poles with top diameter = 263 mm To KOG-51/E for poles with top diameter = 420 mm | | |
| 9. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles top diameter = 218 mm and with top diameter = 263 mm For poles top diameter = 420 mm | | |
| 10. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm | | |
| APPARATUS AND ACCESORIES | | | | | | | | |
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | |
| 5. | Supporting insulator | LWP-8/24S M24x140 | 3 | pcs. | ALPAR | The type of insulator shall be specified by an authorised designer | | |
| 6. | Insulator string | ±O/1 ±O2/1 ±O/2 ±O2/2 | 3 | set | ... / ALPAR | Single / double on porcelain insulators Single / double on silicone insulators | | |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer | | |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer | | |
| 15. | Terminal clamp for AsXS _n | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required | | |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits - number of conduits depends on the number of circuits | | |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | | | |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use for station-mounted switchboard | | |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | | | |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer | | |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań | | |

STE-20/.../II

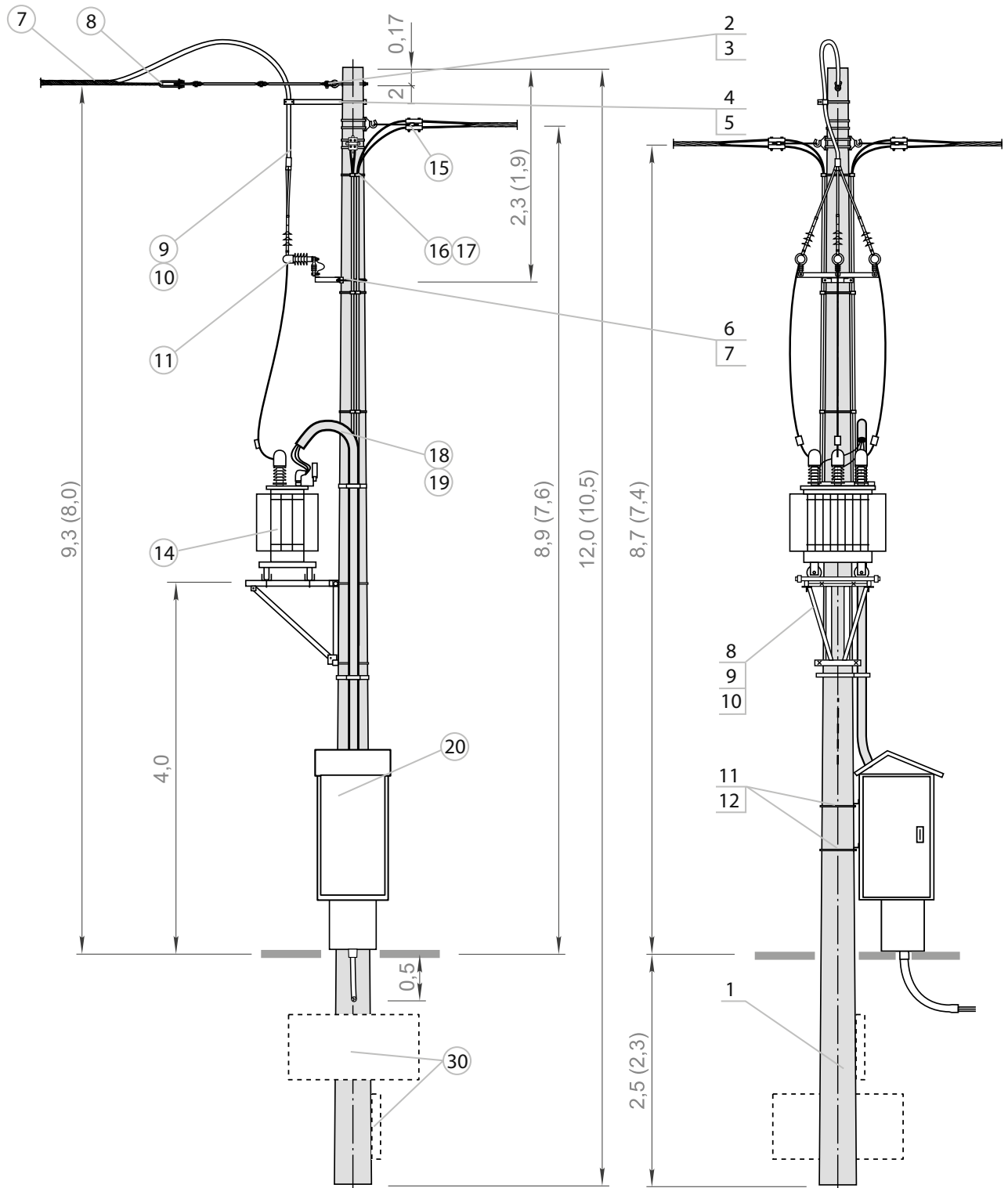


List of structures, accessories, apparatus for STEKs-20/.../I

| STRUCTURES | | | | | | |
|------------|--|------------------------------------|----------|------|-----------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / - | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 |
| 2. | Strain bolt | M24x240+N+Ps+Pk M24x300+N+Ps+Pk | 1 | pcs. | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm |
| | Strain structure | KOD-1c/E KOD-1a/E | 1 | pcs. | ALPAR | For poles top diameter = 420 mm For poles top diameter = 218 mm; 263 mm |
| 3. | Bracket | OB-14/E OB-7/E OB-3/E | 1 | pcs. | ALPAR | To KOD-1c/E for poles with top diameter = 420 mm To KOD-1a/E for poles with top diameter = 263 mm To KOD-1a/E for poles with top diameter = 218 mm |
| 4. | Spacer structure | KD-1b/E KD-1a/E | 1 | pcs. | ALPAR | For poles top diameter = 420 mm For poles top diameter = 218 mm; 263 mm |
| 5. | Bracket | OB-45/E OB-43/E OB-42/E | 1 | pcs. | ALPAR | To KD-1b/E for poles with top diameter = 420 mm To KD-1a/E for poles with top diameter = 263 mm To KD-1a/E for poles with top diameter = 218 mm |
| 6. | Structure for arresters | KOG-14a/E | 1 | pcs. | ALPAR | top diameter = 218 top diameter = 263 |
| | | KOG-53/E | | | | top diameter = 420 |
| 7. | Bracket | OB-6/E OB-9/E OB-15/E | 1 | pcs. | ALPAR | To KOG-14a/E for poles with top diameter = 218 mm To KOG-14a/E for poles with top diameter = 263 mm To KOG-53/E for poles with top diameter = 420 mm |
| 8. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA |
| 9. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm |
| 10. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 |
| 11. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles with top diameter = 218 mm, 263 mm For poles with top diameter = 420 mm |
| 12. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|------------------------------------|-----------------------|-----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 7. | Guy grip dead-end | ... | 1 | pcs. | ... / ALPAR | |
| 8. | Guy strain clamp | ŁO-001/SN | 1 | pcs. | ALPAR | |
| 9. | 3-phase overhead cable termination | ... | 1 | pcs. | ... / ALPAR | Adapt to cable cross section |
| 10. | Cable head termination | ... | 3 | pcs. | ... / ALPAR | Adapt to cable cross section |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Terminal clamp for AsXSn | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits - number of conduits depends on the number of circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use for station-mounted switchboard |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

STEKs-20/.../I

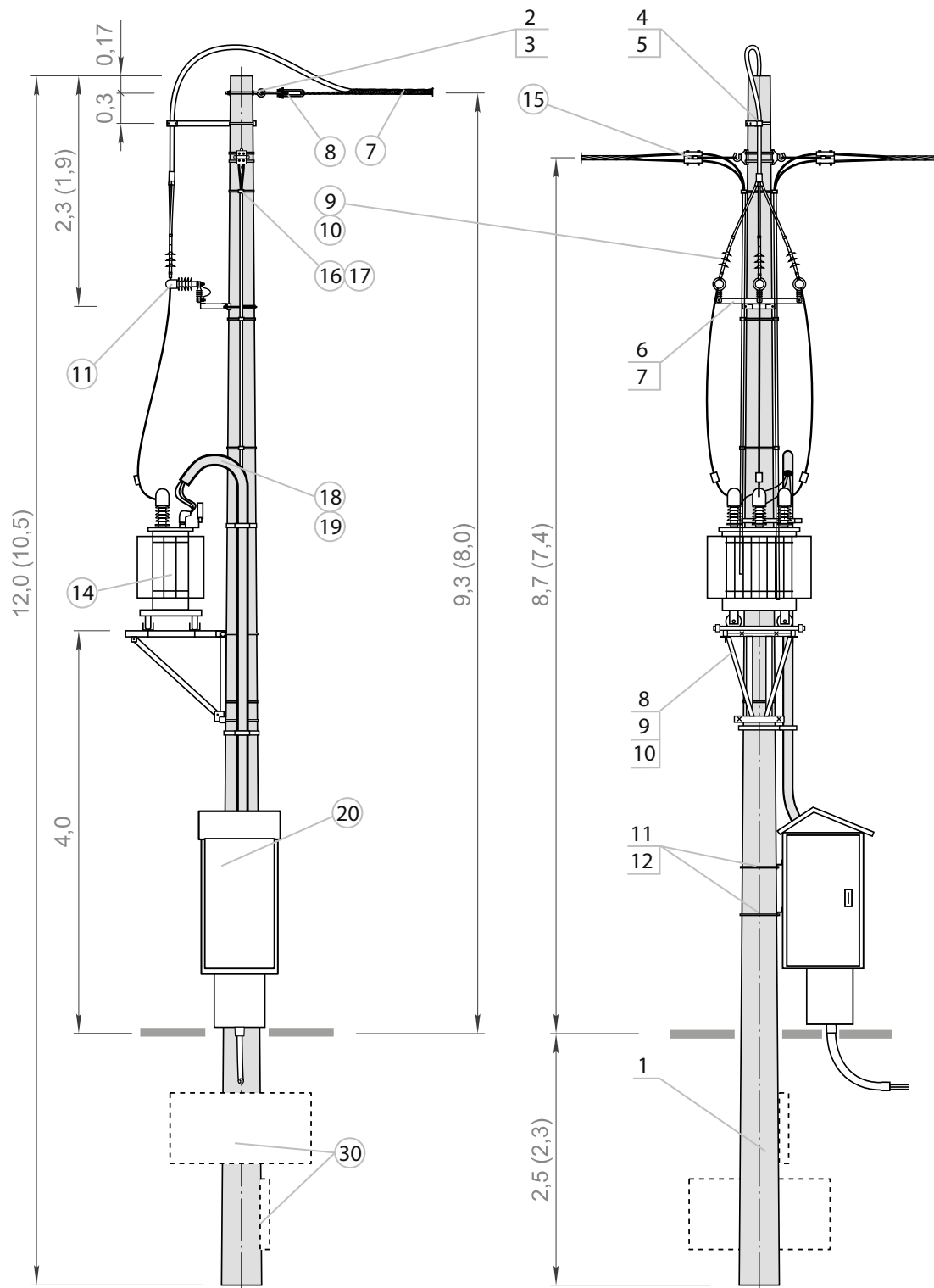


List of structures, accessories, apparatus for STEKs-20/.../II

| STRUCTURES | | | | | | |
|------------|--|------------------------------------|----------|------|-----------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / - | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 |
| 2. | Strain bolt | M24x240+N+Ps+Pk M24x300+N+Ps+Pk | 1 | pcs. | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm |
| | Strain structure | KOD-1c/E KOD-1a/E | 1 | pcs. | ALPAR | For poles top diameter = 420 mm For poles top diameter = 218 mm; 263 mm |
| 3. | Bracket | OB-14/E OB-7/E OB-3/E | 1 | pcs. | ALPAR | To KOD-1c/E for poles with top diameter = 420 mm To KOD-1a/E for poles with top diameter = 263 mm To KOD-1a/E for poles with top diameter = 218 mm |
| 4. | Spacer structure | KD-1b/E KD-1a/E | 1 | pcs. | ALPAR | For poles top diameter = 420 mm For poles top diameter = 218 mm; 263 mm |
| 5. | Bracket | OB-45/E OB-43/E OB-42/E | 1 | pcs. | ALPAR | To KD-1b/E for poles with top diameter = 420 mm To KD-1a/E for poles with top diameter = 263 mm To KD-1a/E for poles with top diameter = 218 mm |
| 6. | Structure for arresters | KOG-14a/E | 1 | pcs. | ALPAR | top diameter = 218 |
| | | KOG-53/E | | | | top diameter = 263 |
| 7. | Bracket | OB-6 /E OB-9/E OB-15/E | 1 | pcs. | ALPAR | To KOG-14a/E for poles with top diameter = 218 mm |
| | | | | | | To KOG-14a/E for poles with top diameter = 263 mm To KOG-53/E for poles with top diameter = 420 mm |
| 8. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA |
| 9. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm |
| 10. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 |
| 11. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles with top diameter = 218 mm, 263 mm For poles with top diameter = 420 mm |
| 12. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|------------------------------------|-----------------------|-----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 7. | Guy grip dead-end | ... | 1 | pcs. | ... / ALPAR | |
| 8. | Guy strain clamp | ŁO-001/SN | 1 | pcs. | ALPAR | |
| 9. | 3-phase overhead cable termination | ... | 1 | pcs. | ... / ALPAR | Adapt to cable cross section |
| 10. | Cable head termination | ... | 3 | pcs. | ... / ALPAR | Adapt to cable cross section |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Terminal clamp for AsXSn | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits - number of conduits depends on the number of circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use for station-mounted switchboard |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

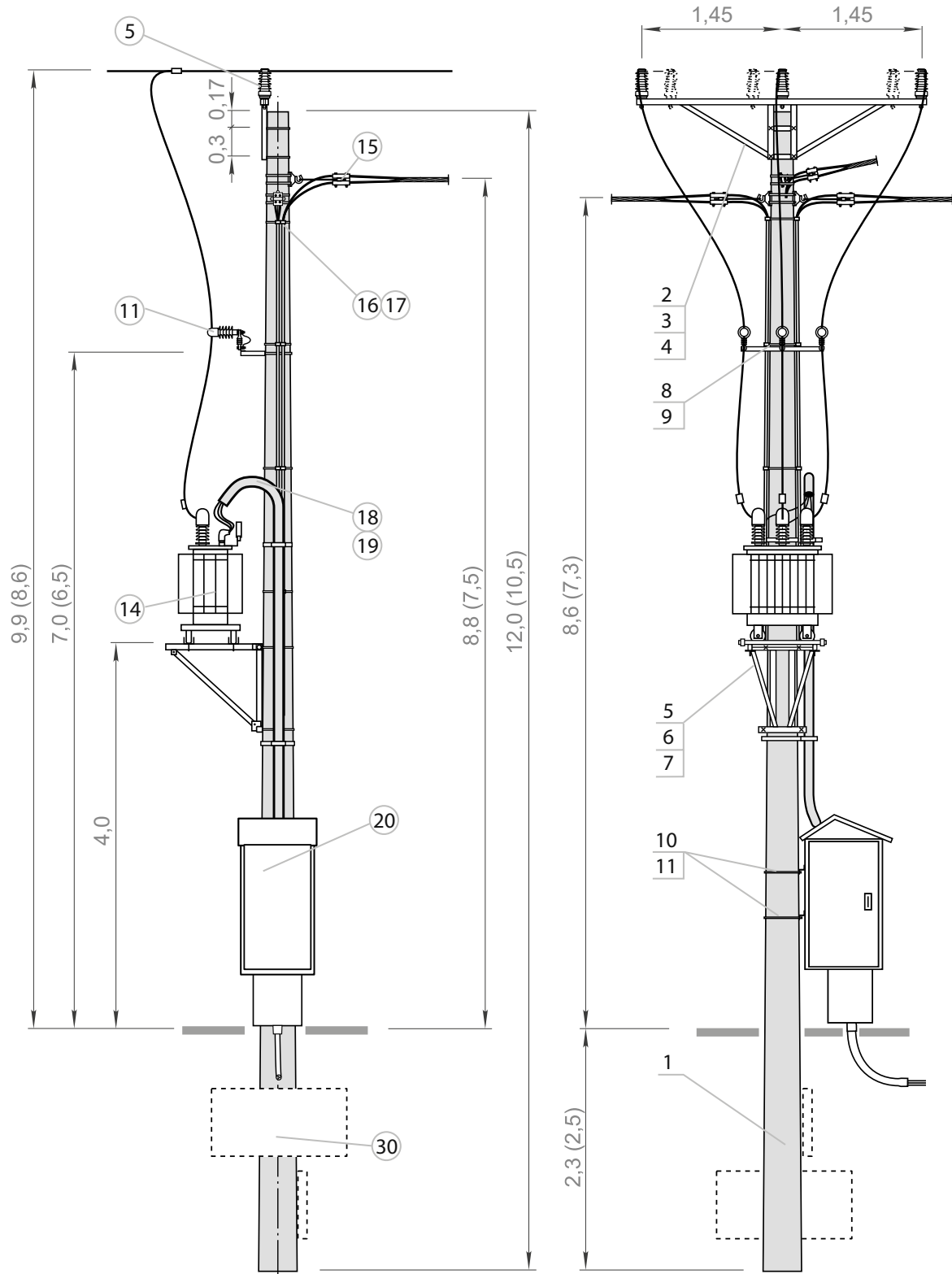
STEKs-20/.../II



List of structures, accessories, apparatus for STEP-20/.../1

| STRUCTURES | | | | | | | | | | |
|---------------------------|--|---|-------------------------|------|-----------------|--|--|-------|--------------------|------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 | | | | |
| 2. | Through-type station crossarm | PP-3b/E PP-2b/E | 1 | pcs. | ALPAR | inclination | 1° | 0° | top diameter = 420 | PAS cables |
| | | PP-3a/E PP-2a/E | | | | | | | top diameter = 263 | |
| | | PP-3a/E PP-2a/E | | | | | | | top diameter = 218 | |
| 2. | Through-type station crossarm | PPZ-3a/E PP-51a/E | 1 | pcs. | ALPAR | cross-section | 50-70 (for short spans) | 50-70 | top diameter = 420 | AFL cables |
| | | PPZ-2a/E PP-56a/E | | | | | | | top diameter = 263 | |
| | | PPZ-1a/E PP-57a/E | | | | | | | top diameter = 218 | |
| 3. | Bracket | OG-13/E OB-14/E OG-12/E OB-7/E OG-5/E OB-3/E | 2 1 | pcs. | ALPAR | To PKZ-1c/E, PK-3b/E To PKZ-1b/E, PK-3a/E To PKZ-1a/E, PK-1a/E | | | | |
| 4. | Mounting bolts | M16x560 M16x480 M16x400 M16x330 M16x350 M16x280 | 2 1 2 1 2 1 | set | ALPAR | For PP-3b/E and PP-2b/E PP-57a/E top diameter = 420 For PP-3a/E and PP-2a/E PP-56a/E top diameter = 263 For PP-3a/E and PP-2/E PP-51a/E top diameter = 218 | | | | |
| 5. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | | | | |
| 6. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm | | | | |
| 7. | Bracket | OS-22/E OS-23/E OS-24 /E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 | | | | |
| 8. | Structure for arresters | KOG-6a/E | 1 | pcs. | ALPAR | top diameter = 218 top diameter = 263 | Do not use when mounting arresters directly on the transformer | | | |
| | | KOG-52/E | | | | top diameter = 420 | | | | |
| 9. | Bracket | OB-7/E OB-9/E OB-16/E | 1 | pcs. | ALPAR | To KOG-6a/E for poles with top diameter = 218 mm To KOG-6a/E for poles with top diameter = 263 mm To KOG-52/E for poles with top diameter = 420 mm | | | | |
| 10. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles with top diameter = 218 mm, 263 mm For poles with top diameter = 420 mm | | | | |
| 11. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm | | | | |
| APPARATUS AND ACCESSORIES | | | | | | | | | | |
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | | |
| 5. | Supporting insulator | LWP-8/24 M24x105 LWP-8/24S M24x105 | 3 | set | ALPAR | Bare line — for 1° inclination, use 6 pcs. PAS line — for 1° inclination, use 6 pcs. | | | | |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester is determined by an authorized designer | | | | |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer | | | | |
| 15. | Terminal clamp for AsXS _n | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required | | | | |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits - number of conduits depends on the number of circuits | | | | |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | Use for station-mounted switchboard | | | | |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | | | | | |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | | | | | |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer | | | | |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań | | | | |

STEP-20/.../1

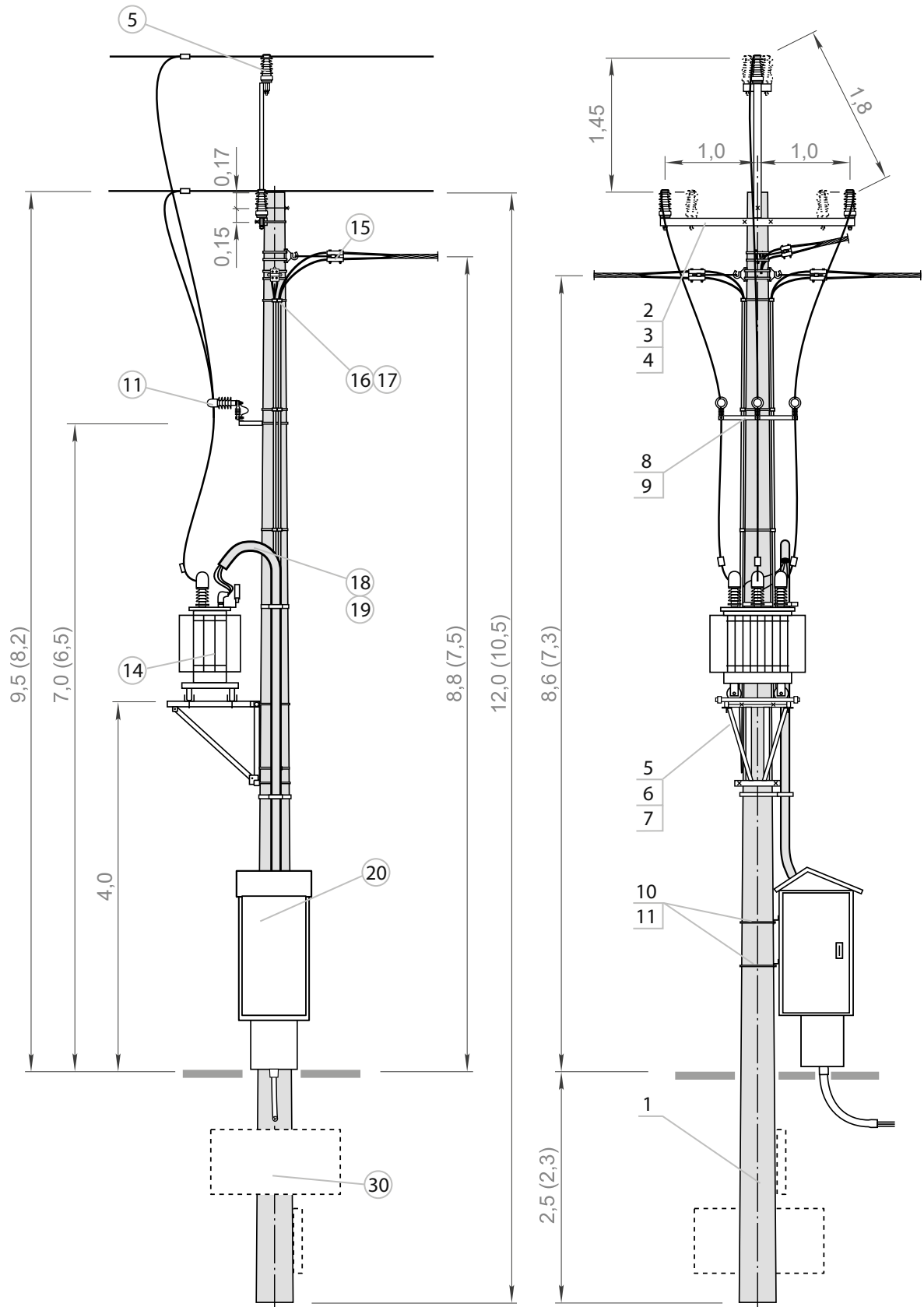


List of structures, accessories, apparatus for STEP-20/.../2

| STRUCTURES | | | | | | | | | |
|------------|--|---------------------------------|----------|------|-----------------|--|--|--------------------|--------------------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | |
| 1. | Spun pole | E- / - | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 | | | |
| 2. | Through-type station crossarm | PP-331d/2E | 1 | pcs. | ALPAR | inclination | 1° | top diameter = 420 | AFL cables 35, 50, 70 |
| | | PP-331c/2E | | | | | | top diameter = 263 | |
| | | PP-331b/2E | | | | | | top diameter = 218 | |
| | | PP-311d/2E | | | | | | top diameter = 420 | |
| | | PP-311c/2E | | | | | | top diameter = 263 | |
| PP-311b/2E | top diameter = 218 | | | | | | | | |
| 3. | Bracket | OB-14/E | 1 | pcs. | ALPAR | For PP-311d/2E and PP-331d/2E For PP-311c/2E and PP-331c/2E For PP-311b/2E and PP-331b/2E | top diameter = 420 mm | | |
| | | OB-7/E OB-3/E | | | | | top diameter = 263 mm top diameter = 218 mm | | |
| 4. | Mounting bolts | M16x480 | 1 | set | ALPAR | For PP-311d/2E and PP-331d/2E For PP-311c/2E and PP-331c/2E For PP-311b/2E and PP-331b/2E | top diameter = 420 mm | | |
| | | M16x330 | | | | | top diameter = 263 mm | | |
| | | M16x280 | | | | | top diameter = 218 mm | | |
| 5. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | | | |
| 6. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm | | | |
| 7. | Bracket | OS-22/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 | | | |
| | | OS-23/E | | | | | | | |
| | | OS-24/E | | | | | | | |
| 8. | Structure for arresters | KOG-6a/E | 1 | pcs. | ALPAR | top diameter = 218 top diameter = 263 top diameter = 420 | Do not use when mounting arresters directly on the transformer | | |
| | | KOG-52/E | | | | | | | |
| 9. | Bracket | OB-7/E OB-9/E OB-16/E | 1 | pcs. | ALPAR | To KOG-6a/E for poles with top diameter = 218 mm To KOG-6a/E for poles with top diameter = 263 mm To KOG-52/E for poles with top diameter = 420 mm | | | |
| 10. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles top diameter = 218 mm, 263 mm For poles top diameter = 420 mm | | | |
| 11. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm | | | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|-----------------------------------|---------------------------------------|-----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 5. | Supporting insulator | LWP-8/24 M24x105 LWP-8/24S M24x105 | 3 | set | ALPAR | Bare line, for a 1° inclination use 6 pcs. PAS line, for a 1° inclination use 6 pcs. |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester is determined by an authorized designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorized designer |
| 15. | Terminal clamp for AsXSn | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits - number of conduits depends on the number of circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use for station-mounted switchboard |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

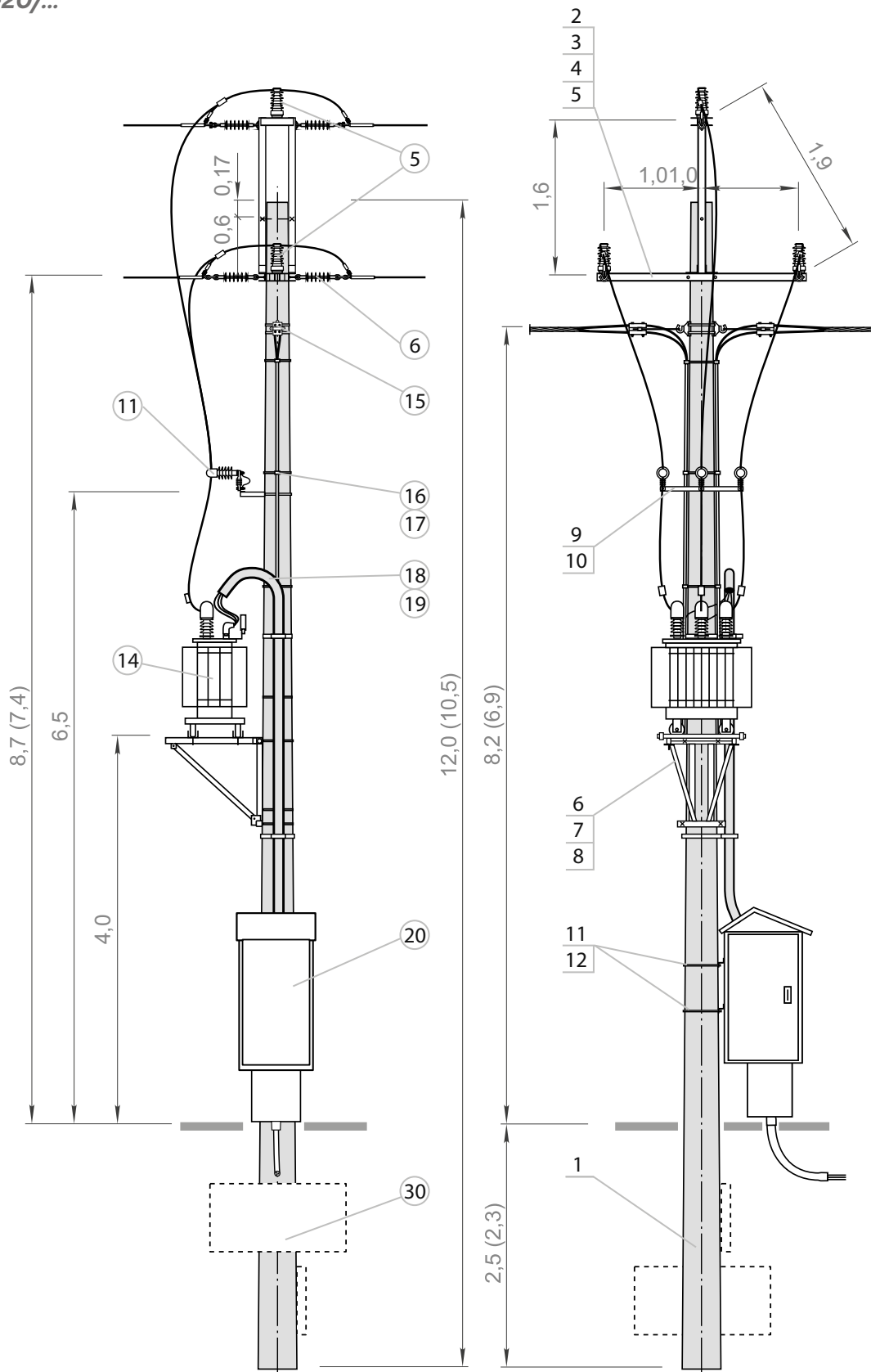
STEP-20/.../2



List of structures, accessories, apparatus for STEO-20/...

| STRUCTURES | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|--|---|-----------|------|-----------------|---|---------------------|--------------------|------------|-------|--------------------|--------------------|--------------------|--------|-------|--------------------|--------------------|--------------------|--------|-------|--------------------|--|--|--------------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | | | | | | | | | | | | | | | | |
| 1. | Spun pole | E- / - | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 | | | | | | | | | | | | | | | | | | |
| 2. | Through-type station crossarm | PO-34a/E | 1 | pcs. | ALPAR | <table border="1"> <tr> <td rowspan="3">MV / line tension N</td> <td rowspan="3">≤ 21kN</td> <td rowspan="3">AFL cables</td> <td rowspan="3">50-70</td> <td>top diameter = 420</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>top diameter = 218</td> </tr> <tr> <td rowspan="3">≤ 26kN</td> <td rowspan="3">50-70</td> <td>top diameter = 420</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>top diameter = 420</td> </tr> <tr> <td>≤ 15kN</td> <td>35-50</td> <td>top diameter = 263</td> </tr> <tr> <td></td> <td></td> <td>top diameter = 218</td> </tr> </table> | MV / line tension N | ≤ 21kN | AFL cables | 50-70 | top diameter = 420 | top diameter = 263 | top diameter = 218 | ≤ 26kN | 50-70 | top diameter = 420 | top diameter = 263 | top diameter = 420 | ≤ 15kN | 35-50 | top diameter = 263 | | | top diameter = 218 |
| | | MV / line tension N | | | | | | | | | ≤ 21kN | AFL cables | 50-70 | | | top diameter = 420 | | | | | | | | |
| | | | | | | | | | | | | | | | | top diameter = 263 | | | | | | | | |
| | | | | | | | top diameter = 218 | | | | | | | | | | | | | | | | | |
| | | ≤ 26kN | | | | | 50-70 | top diameter = 420 | | | | | | | | | | | | | | | | |
| | | | | | | | | top diameter = 263 | | | | | | | | | | | | | | | | |
| | | | | | | | | top diameter = 420 | | | | | | | | | | | | | | | | |
| ≤ 15kN | 35-50 | top diameter = 263 | | | | | | | | | | | | | | | | | | | | | | |
| | | top diameter = 218 | | | | | | | | | | | | | | | | | | | | | | |
| PO-32a/E | | | | | | | | | | | | | | | | | | | | | | | | |
| PO-31b/E | | | | | | | | | | | | | | | | | | | | | | | | |
| PO-35a/E | | | | | | | | | | | | | | | | | | | | | | | | |
| PO-33b/E | | | | | | | | | | | | | | | | | | | | | | | | |
| PK-22/E | | | | | | | | | | | | | | | | | | | | | | | | |
| PK-21/E | | | | | | | | | | | | | | | | | | | | | | | | |
| PK-20a/E | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Bracket | OB-36/E OB-34/E OB-31/E | 1 | pcs. | ALPAR | PK-22/E PK-21/E PK-20a/E top diameter = 420 top diameter = 263 top diameter = 218 | | | | | | | | | | | | | | | | | | |
| 4. | Mounting bolts | M16x480 M16x330 M16x280 | 1 | set | ALPAR | PK-22/E PK-21/E PK-20a/E top diameter = 420 top diameter = 263 top diameter = 218 | | | | | | | | | | | | | | | | | | |
| 5. | Mounting bolts | M16x650 M20x650 M16x520 M20x520 M16x500 M20x500 M16x350 M20x350 M16x300 M20x300 | 1 | set | ALPAR | PO-35a/E PO-34b/E PO-33b/E PO-32a/E PO-31b/E top diameter = 420 top diameter = 420 top diameter = 263 top diameter = 263 top diameter = 218 | | | | | | | | | | | | | | | | | | |
| 6. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | | | | | | | | | | | | | | | | | | |
| 7. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm | | | | | | | | | | | | | | | | | | |
| 8. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 | | | | | | | | | | | | | | | | | | |
| 9. | Structure for arresters | KOG-6a/E | 1 | pcs. | ALPAR | top diameter = 218 top diameter = 263 | | | | | | | | | | | | | | | | | | |
| | | KOG-52/E | | | | top diameter = 420 | | | | | | | | | | | | | | | | | | |
| 10. | Bracket | OB-7/E OB-9/E OB-16/E | 1 | pcs. | ALPAR | To KOG-6a/E for poles with top diameter = 218 mm To KOG-6a/E for poles with top diameter = 263 mm To KOG-52/E for poles with top diameter = 420 mm | | | | | | | | | | | | | | | | | | |
| 11. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles top diameter = 218 mm, 263 mm For poles top diameter = 420 mm | | | | | | | | | | | | | | | | | | |
| 12. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm | | | | | | | | | | | | | | | | | | |
| APPARATUS AND ACCESSORIES | | | | | | | | | | | | | | | | | | | | | | | | |
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | | | | | | | | | | | | | | | | |
| 5. | Supporting insulator | LWP-8/24 M24x105 | 3 | pcs. | ALPAR | | | | | | | | | | | | | | | | | | | |
| 6. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 6 | set | ... / ALPAR | Single / double on porcelain insulators Single / double on silicone insulators | | | | | | | | | | | | | | | | | | |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester is determined by an authorized designer | | | | | | | | | | | | | | | | | | |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer | | | | | | | | | | | | | | | | | | |
| 15. | Terminal clamp for AsXSn | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required | | | | | | | | | | | | | | | | | | |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits - number of conduits depends on the number of circuits | | | | | | | | | | | | | | | | | | |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | | | | | | | | | | | | | | | | | | | |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use for station-mounted switchboard | | | | | | | | | | | | | | | | | | |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | | | | | | | | | | | | | | | | | | | |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer | | | | | | | | | | | | | | | | | | |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań | | | | | | | | | | | | | | | | | | |

STEO-20/...

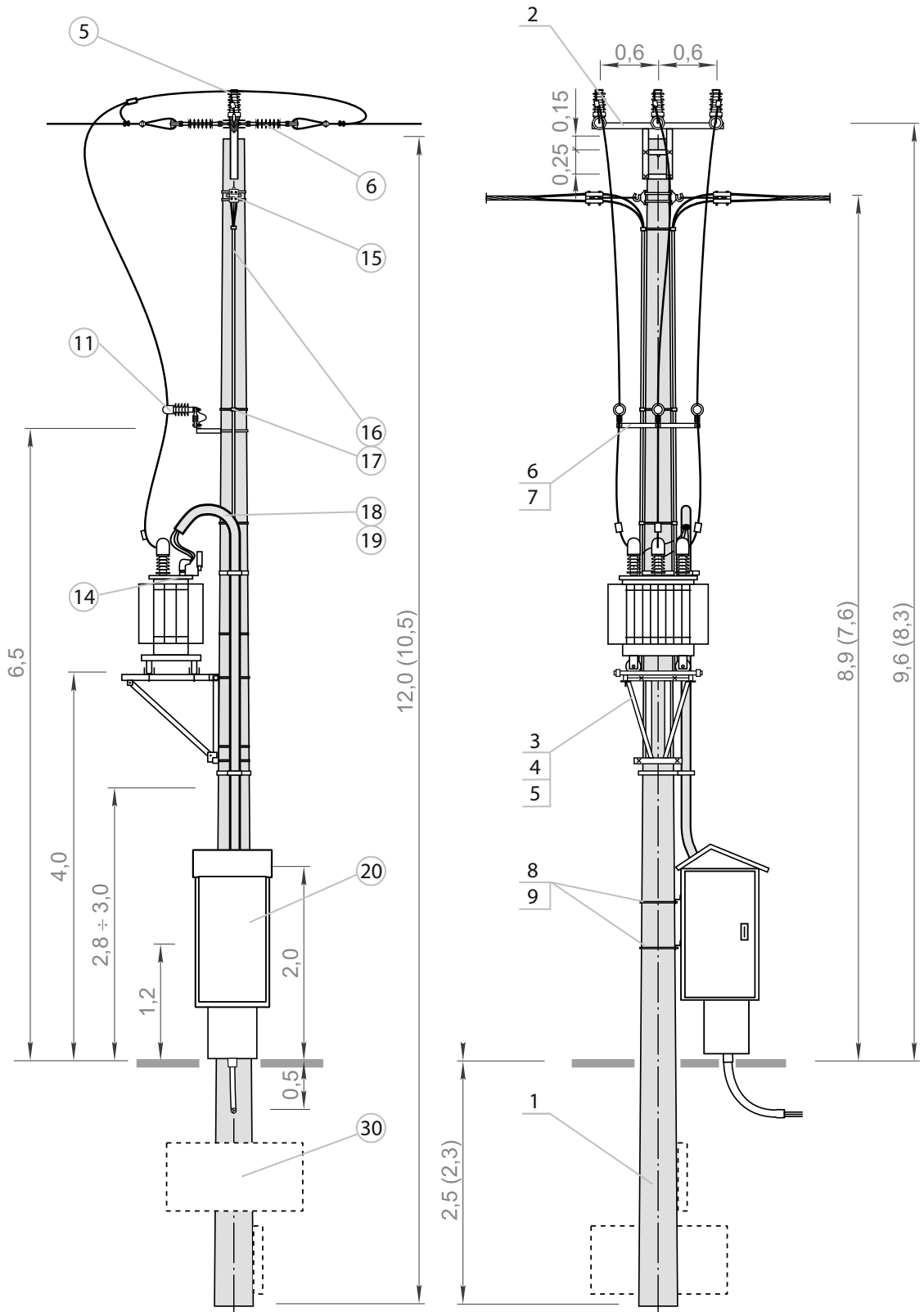


List of structures, accessories, apparatus for STEO-20/.../PAS

| STRUCTURES | | | | | | | | | | | | | | |
|--------------------|--|---------------------------------|----------|------|-----------------|---|----------------------|--|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | | | | | | |
| 1. | Spun pole | E- / - | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 | | | | | | | | |
| 2. | Terminal station crossarm | PK-12/E | 1 | pcs. | ALPAR | <table border="1"> <tr> <td rowspan="3">MV line tension N</td> <td rowspan="3">≤ 20kN</td> <td rowspan="3">PAS Cables</td> <td rowspan="3">50-120</td> <td>top diameter = 420</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>top diameter = 218</td> </tr> </table> | MV line tension N | ≤ 20kN | PAS Cables | 50-120 | top diameter = 420 | top diameter = 263 | top diameter = 218 | |
| | | MV line tension N | | | | | | | | | ≤ 20kN | PAS Cables | 50-120 | top diameter = 420 |
| | | | | | | | | | | | | | | top diameter = 263 |
| top diameter = 218 | | | | | | | | | | | | | | |
| PK-11a/E | | | | | | | | | | | | | | |
| PK-6a/E | | | | | | | | | | | | | | |
| 3. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | | | | | | | | |
| 4. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm | | | | | | | | |
| 5. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 | | | | | | | | |
| 6. | Structure for arresters | KOG-6a/E | 1 | pcs. | ALPAR | <table border="1"> <tr> <td>top diameter = 218</td> <td rowspan="3">Do not use when mounting arresters directly on the transformer</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>top diameter = 420</td> </tr> </table> | top diameter = 218 | Do not use when mounting arresters directly on the transformer | top diameter = 263 | top diameter = 420 | | | | |
| | | top diameter = 218 | | | | Do not use when mounting arresters directly on the transformer | | | | | | | | |
| top diameter = 263 | | | | | | | | | | | | | | |
| top diameter = 420 | | | | | | | | | | | | | | |
| KOG-52/E | | | | | | | | | | | | | | |
| 7. | Bracket | OB-7/E OB-9/E OB-16/E | 1 | pcs. | ALPAR | To KOG-6a/E for poles with top diameter = 218 mm To KOG-6a/E for poles with top diameter = 263 mm To KOG-52/E for poles with top diameter = 420 mm | | | | | | | | |
| 8. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles top diameter = 218 mm, 263 mm For poles top diameter = 420 mm | | | | | | | | |
| 9. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm | | | | | | | | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|--------------------------------------|--------------------------|-----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 5. | Supporting insulator | LWP-8/24 M24x105 | 3 | pcs. | ALPAR | |
| 6. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 6 | set | ... / ALPAR | Single / double on porcelain insulators Single / double on silicone insulators |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester is determined by an authorized designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Terminal clamp for AsXS _n | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | - number of conduits depends on the number of circuits |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use for station-mounted switchboard |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

STEO-20/.../PAS

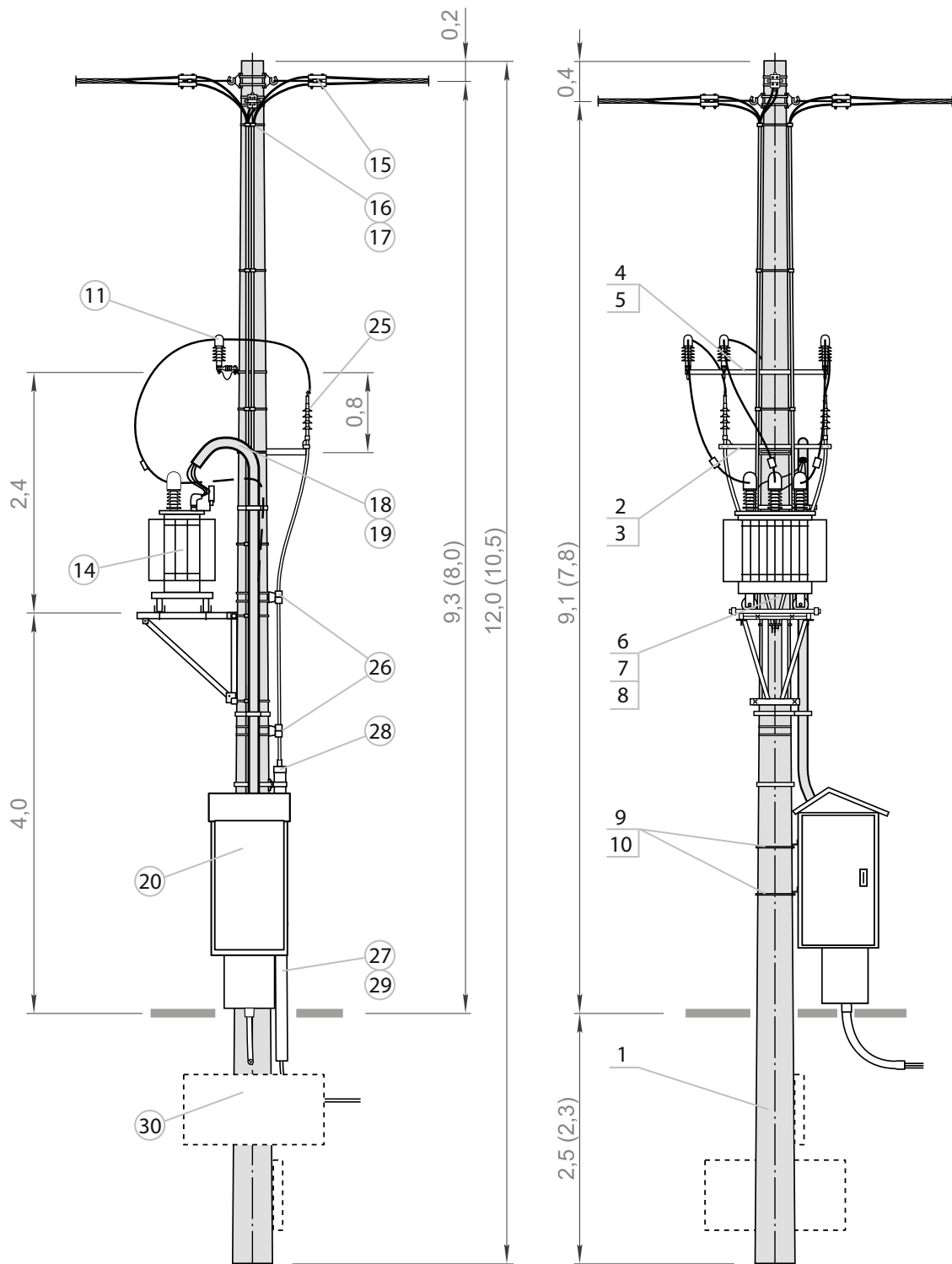


List of structures, accessories, apparatus for STEK-20/.../1

| STRUCTURES | | | | | | | |
|------------|--|---------------------------------|---------------|------|-----------------|--|--|
| No. | Name | Type | Qu- antity | Unit | Man. / Distrib. | Notes | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m | |
| 2. | Structure for cable terminations | KGK-13/E | 1 | pcs. | ALPAR | For 3 x 1-phase cable | top diameter = 420 |
| | | KGK-12a/E | | | | | top diameter = 263 |
| | | KGK-11a/E | | | | | top diameter = 218 |
| | | KGK-16a/E | | | | For 3-phase cable | top diameter = 420 |
| | | KGK-15a/E | | | | | top diameter = 263 |
| | | KGK-14a/E | | | | | top diameter = 218 |
| 3. | Bracket | OB-16/E OB-10/E OB-8/E | 1 | pcs. | ALPAR | For KGK-13/E, KGK-16a/E For KGK-12a/E, KGK-15a/E For KGK-11a/E, KGK-14a/E | top diameter = 420 top diameter = 263 top diameter = 218 |
| 4. | Structure for arresters | KOG-54/E KOG-55/E | 1 | set | ALPAR | For poles with top diameter = 218 mm and 263 mm For poles with top diameter = 420 mm | |
| 5. | Bracket | OB-7/E OB-10/E OB-16/E | 1 | pcs. | ALPAR | To KOG-54/E To KOG-54/E To KOG-55/E | top diameter = 218 top diameter = 263 top diameter = 420 |
| 6. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | |
| 7. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm | |
| 8. | Bracket | OS-22/E OS-23/E OS-24 /E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 | |
| 9. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles with top diameter = 218 mm, 263 mm For poles with top diameter = 420 mm | |
| 10. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm | |

| APPARATUS AND ACESORIES | | | | | | |
|-------------------------|-------------------------------------|--|---------------|------|------------------|---|
| No. | Name | Type | Qu- antity | Unit | Man. / Distrib. | Notes |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester is determined by an authorized designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Terminal clamp for AsXSn | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits - number of conduits depends on the number of circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | Use for station-mounted switchboard |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 25. | Cable termination | CHE-F 24kV 25-150 CHE-F 24kV 70-240 CHEP(H)-3F 24kV 50-150 CHEP(H)-3F 24kV 70-240 | 1 | set | CELLPACK / ALPAR | For 3 x 1-core cable For 3 x 1-core cable For 3-core cable type HAKnFtA For 3-core cable type HAKnFtA |
| 26. | MV cable clamp | U1032 | 2 | pcs. | ALPAR | Triple, for MV cable fastening |
| 27. | Protective tube | BE110 | 3 | m | ... / ALPAR | |
| 28. | Heat-shrinkable three-core breakout | SEH-3_110 | 1 | pcs. | CELLPACK / ALPAR | For MV cable shielding |
| 29. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

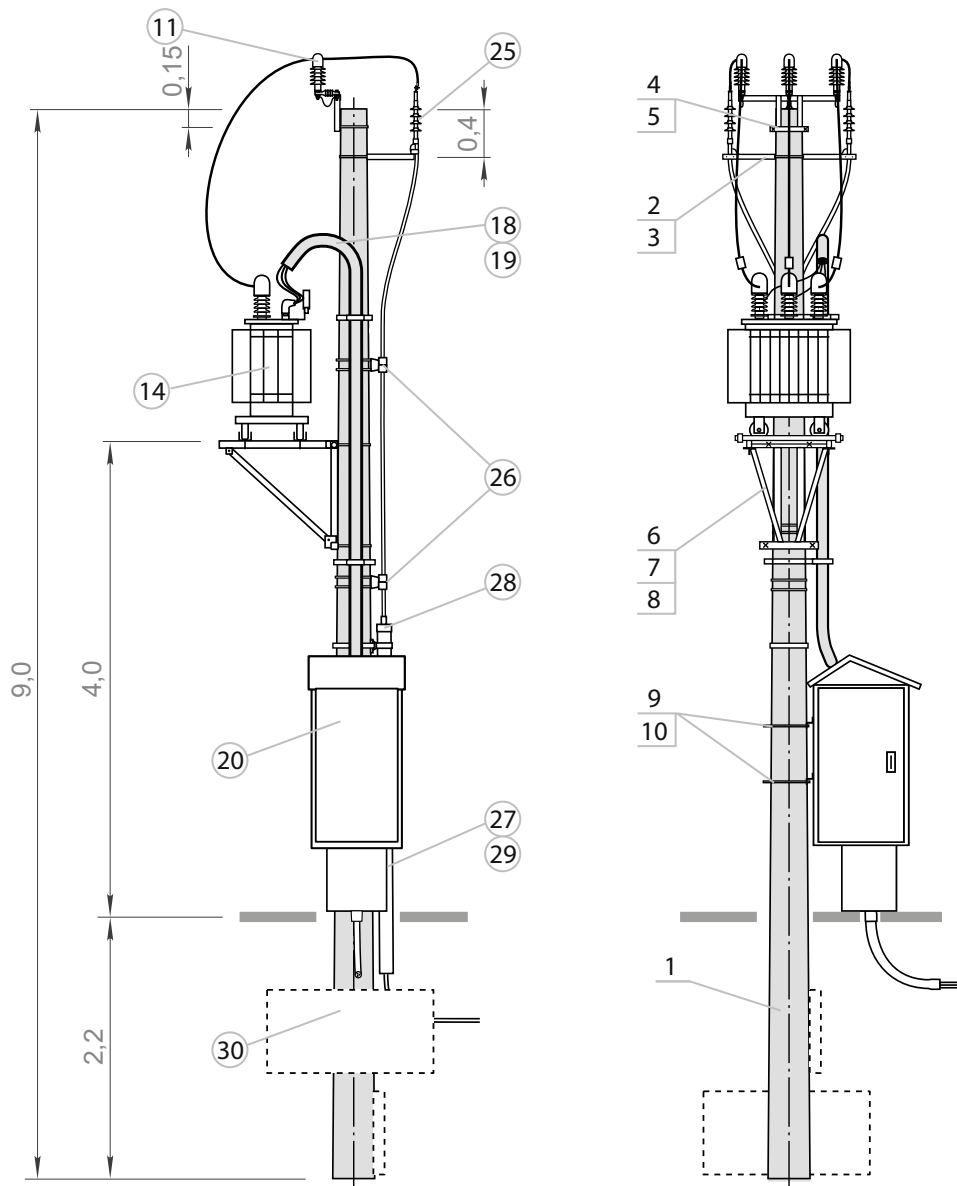
STEK-20/.../1



List of structures, accessories, apparatus for STEK-20/.../2

| STRUCTURES | | | | | | | |
|-------------------------|--|--|-----------|------|---------------------|---|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of the type of poles by an authorised designer. Minimum pole height is 12 m | |
| 2. | Structure for cable terminations | KGK-12a/E | 1 | pcs. | ALPAR | For 3 x 1-phase cable | top diameter = 263 |
| | | KGK-11a/E | | | | | top diameter = 218 |
| | | KGK-15a/E | | | | For 3-phase cable | top diameter = 263 |
| | | KGK-14a/E | | | | | top diameter = 218 |
| 3. | Bracket | OB-8/E OB-6/E | 1 | pcs. | ALPAR | To KGK-12a/E, KGK-15a/E To KGK-11a/E, KGK-14a/E | top diameter = 263 top diameter = 218 |
| 4. | Structure for arresters | KOG-58a/E | 1 | pcs. | ALPAR | For poles with top diameter = 218 mm and 263 mm | |
| 5. | Bracket | OB-7/E OB-3/E | 1 | pcs. | ALPAR | For KOG-58a/E | top diameter = 263 top diameter = 218 |
| 6. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | |
| 7. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm | |
| 8. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 | |
| 9. | Mounting structure for the switchboard | KSZ-8a/E | 2 | pcs. | ALPAR | For poles with top diameter = 218 mm and with top diameter = 263 mm | |
| 10. | Bracket | OB-10/E OB-12/E | 2 | pcs. | ALPAR | To DB for poles with top diameter = 218 mm To DB for poles with top diameter = 263 mm | |
| APPARATUS AND ACESORIES | | | | | | | |
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester is determined by an authorized designer | |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorized designer | |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use for station-mounted switchboard | |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | | |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer | |
| 25. | Cable termination | CHE-F 24kV 25-150 CHE-F 24kV 70-240 CHEP(H)-3F 24kV 50-150 CHEP(H)-3F 24kV 70-240 | 1 | set | CELLPACK / ALPAR | For 3 x 1-core cable For 3 x 1-core cable For 3-core cable type HAKnFtA For 3-core cable type HAKnFtA | |
| 26. | MV cable clamp | U1032 | 2 | pcs. | ALPAR | Triple, for MV cable fastening | |
| 27. | Protective tube | BE110 | 3 | m | ... / ALPAR | For MV cable shielding | |
| 28. | Heat-shrinkable three-core breakout | SEH-3_110 | 1 | pcs. | CELLPACK / ALPAR | | |
| 29. | Conduit clamp | U110W | 3 | pcs. | ALPAR | | |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań | |

STEK-20/.../2

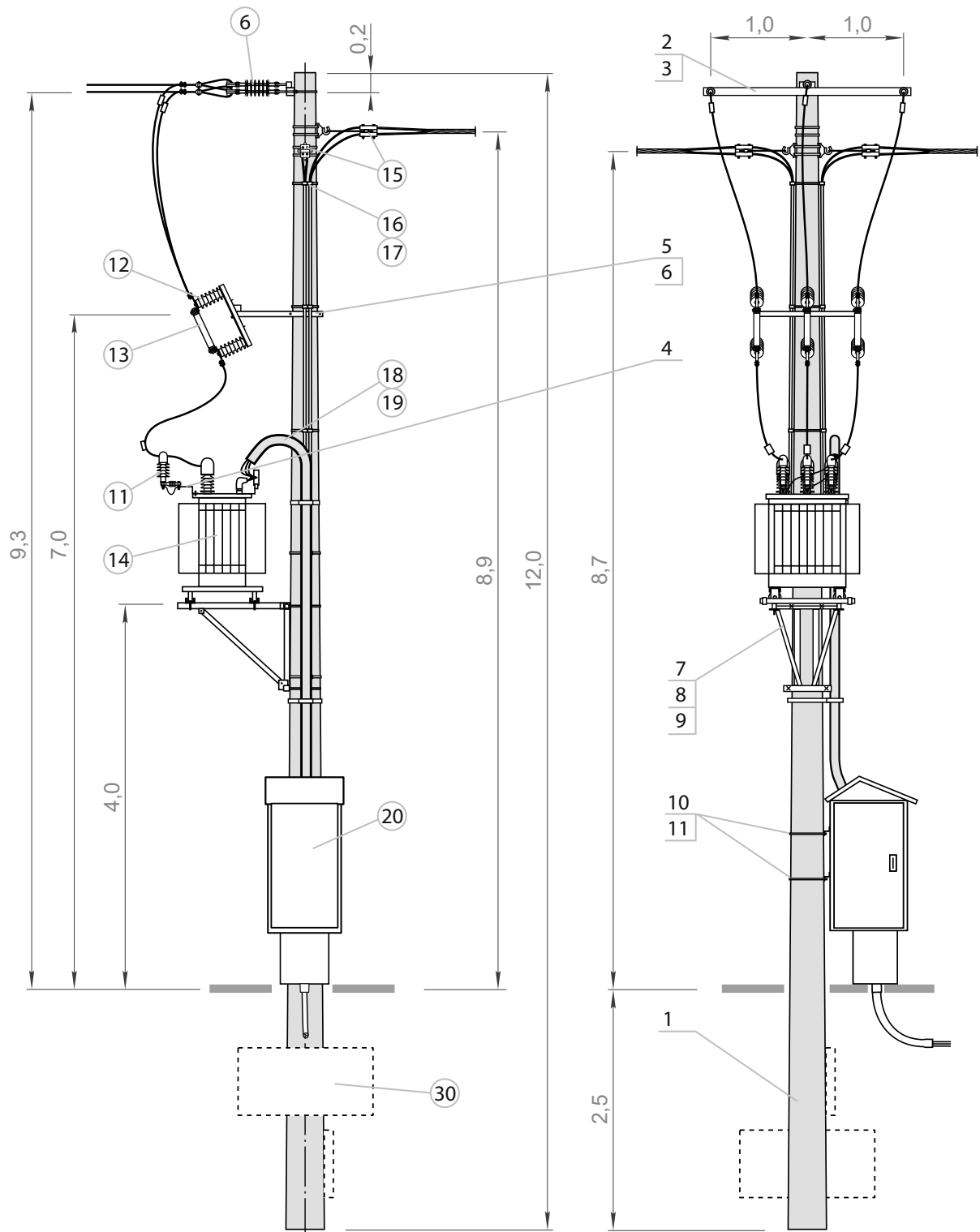


List of structures, accessories, apparatus for STE-20/.../If

| STRUCTURES | | | | | | | |
|------------|--|---------------------------------|----------|------------|-----------------|--|------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | |
| 1. | Spun pole | E- / - | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 | |
| 2. | Station crossarm | PK-12/E PK-3b/E | 1 | pcs. | ALPAR | MV line tension N ≤ 20kN ≤ 12kN top diameter = 420 ≤ 12kN top diameter = 263 ≤ 20kN top diameter = 218 ≤ 20kN top diameter = 420 top diameter = 263 ≤ 13,5kN ≤ 9kN top diameter = 420 top diameter = 263 top diameter = 218 | PAS cables |
| | | PK-11a/E PK-3a/E | | | | | |
| | | PK-6a/E PK-1a/E | | | | | |
| | | PKZ-7/E | | | | | |
| | | PKZ-6/E | | | | | |
| | | PKZ-3b/E PKZ-1c/E | | | | | |
| | | PKZ-3a/E PKZ-1b/E | | | | | |
| | | PKZ-3/E PKZ-1a/E | | AFL cables | | | |
| 3. | Bracket | OG-20/E OG-8/E OG-2/E | 1 | pcs. | ALPAR | To PKZ-1c/E, PK-3b/E To PKZ-1b/E, PK-3a/E To PKZ-1a/E, PK-1a/E | |
| 4. | Structure for arresters | KOG/T | 3 | pcs. | ALPAR | Direct attachment to the transformer | |
| 5. | Structure for fuse bases | KBZA/E | 1 | pcs. | ALPAR | | |
| 6. | Mounting bolts | M16x540+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 420 mm For poles top diameter = 263 mm For poles top diameter = 218 mm | |
| | | M16x380+N+Po+Ps | | | | | |
| | | M16x340+N+Po+Ps | | | | | |
| 7. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | |
| 8. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm | |
| 9. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 | |
| 10. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles with top diameter = 218 mm, 263 mm For poles with top diameter = 420 mm | |
| 11. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|-----------------------------------|---|-----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 6. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 3 | set | ... / ALPAR | Single/double on porcelain insulators Single/double on silicone insulators |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 12. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - |
| | | WBGn 17,5 | | | | |
| 13. | Fuse link | HH ... A 10/24kV "e"=442 mm | 3 | pcs. | ZRE / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | | 3 | pcs. | SIBA / ALPAR | |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Strain clamp for AsXS | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | - number of conduits depends on the number of circuits |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use for station-mounted switchboard |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

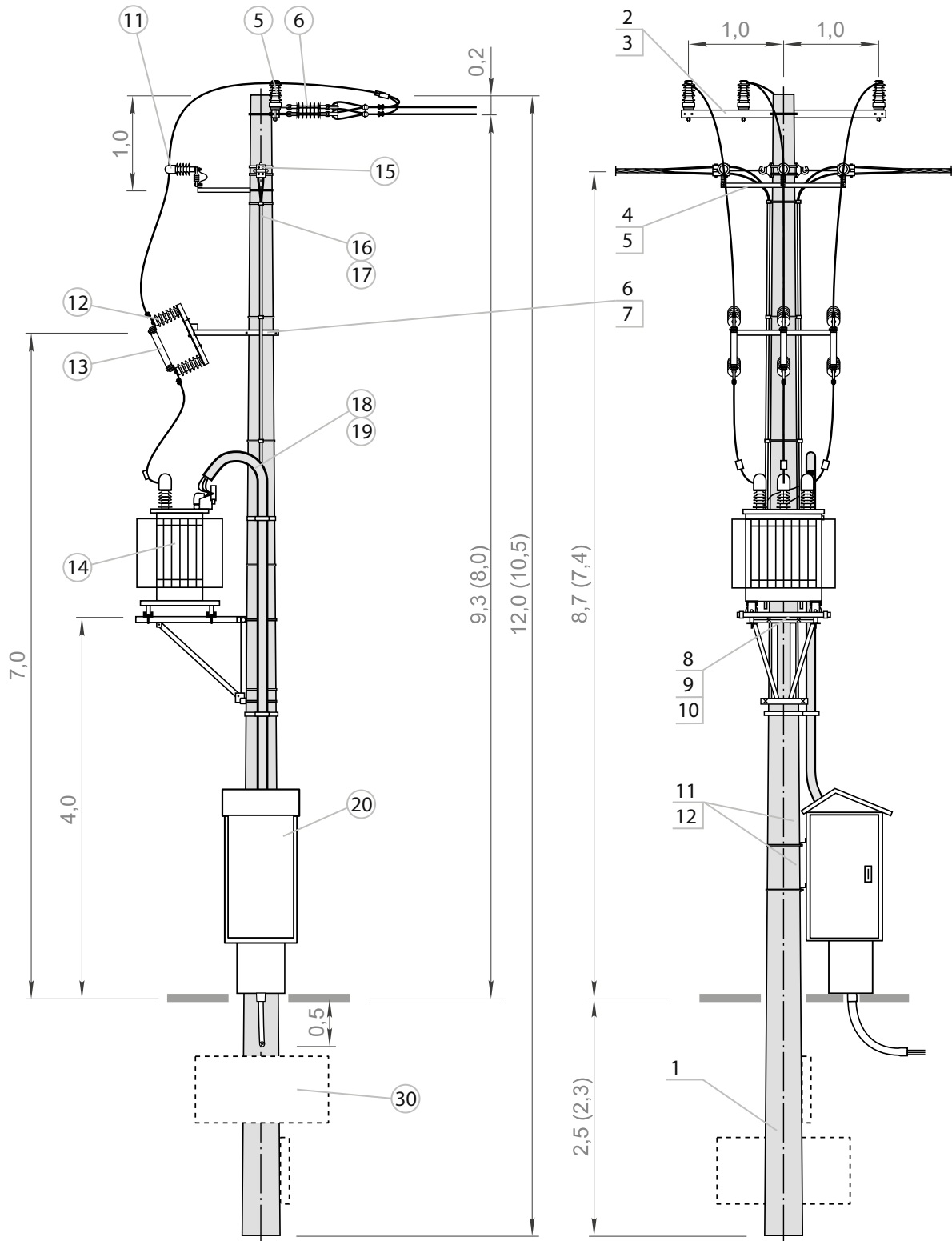
STE-20/.../lf



List of structures, accessories, apparatus for STE-20/.../IIIf

| STRUCTURES | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------|--|--|-----------|------|-----------------|---|--------------------|--|--------------------|--------------------|------------|--------------------|--------------------|--------------------|--------|--------|--------------------|------------|--------------------|----------|-------|--------------------|--|--|--------------------|--|--|--------------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | | | | | | | | | | | | | | | | | | | | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 | | | | | | | | | | | | | | | | | | | | | | |
| 2. | Station crossarm | PK-12/E PK-3b/E | 1 | pcs. | ALPAR | <table border="1"> <tr> <td rowspan="6">MV line tension N</td> <td rowspan="3">≤ 20kN</td> <td rowspan="2">≤ 12kN</td> <td>top diameter = 420</td> <td rowspan="6">PAS cables</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>≤ 12kN</td> <td>top diameter = 218</td> </tr> <tr> <td rowspan="3">≤ 20kN</td> <td rowspan="2">≤ 12kN</td> <td>top diameter = 420</td> <td rowspan="6">AFL cables</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>≤ 13,5kN</td> <td>≤ 9kN</td> <td>top diameter = 420</td> </tr> <tr> <td></td> <td></td> <td>top diameter = 263</td> </tr> <tr> <td></td> <td></td> <td>top diameter = 218</td> </tr> </table> | MV line tension N | ≤ 20kN | ≤ 12kN | top diameter = 420 | PAS cables | top diameter = 263 | ≤ 12kN | top diameter = 218 | ≤ 20kN | ≤ 12kN | top diameter = 420 | AFL cables | top diameter = 263 | ≤ 13,5kN | ≤ 9kN | top diameter = 420 | | | top diameter = 263 | | | top diameter = 218 |
| | | MV line tension N | | | | | | | | ≤ 20kN | | ≤ 12kN | top diameter = 420 | PAS cables | | | | | | | | | | | | | | |
| | | | | | | | | | top diameter = 263 | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | ≤ 12kN | top diameter = 218 | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | ≤ 20kN | ≤ 12kN | top diameter = 420 | | AFL cables | | | | | | | | | | | | | | | | |
| | | | | | | | | | | top diameter = 263 | | | | | | | | | | | | | | | | | | |
| | | | | | | | ≤ 13,5kN | | ≤ 9kN | top diameter = 420 | | | | | | | | | | | | | | | | | | |
| | | top diameter = 263 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | top diameter = 218 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PK-11a/E PK-3a/E | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PK-6a/E PK-1a/E | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PKZ-7/E | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PKZ-6/E | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PKZ-3b/E PKZ-1c/E | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PKZ-3a/E PKZ-1b/E | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PKZ-3/E PKZ-1a/E | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Bracket | OG-20/E OG-8/E OG-2/E | 1 | pcs. | ALPAR | To PKZ-1c/E, PK-3b/E To PKZ-1b/E, PK-3a/E To PKZ-1a/E, PK-1a/E | | | | | | | | | | | | | | | | | | | | | | |
| 4. | Structure for arresters | KOG-50/E | 1 | pcs. | ALPAR | <table border="1"> <tr> <td>top diameter = 218</td> <td rowspan="3">Do not use when mounting arresters directly on the transformer</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>top diameter=420</td> </tr> </table> | top diameter = 218 | Do not use when mounting arresters directly on the transformer | top diameter = 263 | top diameter=420 | | | | | | | | | | | | | | | | | | |
| | | top diameter = 218 | | | | Do not use when mounting arresters directly on the transformer | | | | | | | | | | | | | | | | | | | | | | |
| top diameter = 263 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| top diameter=420 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KOG-51/E | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. | Bracket | OB-3/E OB-8/E OB-14/E | 1 | pcs. | ALPAR | To KOG-50/E for poles with top diameter = 218 mm To KOG-50/E for poles with top diameter = 263 mm To KOG-51/E for poles with top diameter = 420 mm | | | | | | | | | | | | | | | | | | | | | | |
| 6. | Structure for fuse bases | KBZA/E | 1 | pcs. | ALPAR | | | | | | | | | | | | | | | | | | | | | | | |
| 7. | Mounting bolts | M16x540+N+Po+Ps M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 420 mm For poles top diameter = 263 mm For poles top diameter = 218 mm | | | | | | | | | | | | | | | | | | | | | | |
| 8. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | | | | | | | | | | | | | | | | | | | | | | |
| 9. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm | | | | | | | | | | | | | | | | | | | | | | |
| 10. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 | | | | | | | | | | | | | | | | | | | | | | |
| 11. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles with top diameter = 218 mm, 263 mm For poles with top diameter = 420 mm | | | | | | | | | | | | | | | | | | | | | | |
| 12. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm | | | | | | | | | | | | | | | | | | | | | | |
| APPARATUS AND ACCESORIES | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | | | | | | | | | | | | | | | | | | | | |
| 5. | Supporting insulator | LWP-8/24S M24x140 | 3 | pcs. | ALPAR | The type of insulator shall be specified by an authorised designer | | | | | | | | | | | | | | | | | | | | | | |
| 6. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 3 | set | ... / ALPAR | Single / double on porcelain insulators Single / double on silicone insulators | | | | | | | | | | | | | | | | | | | | | | |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester is determined by an authorized designer | | | | | | | | | | | | | | | | | | | | | | |
| 12. | Fuse base | PBNWMA-24/50 PBNWMoA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - | | | | | | | | | | | | | | | | | | | | | | |
| | | WBGn 17,5 | 3 | pcs. | ZRE / ALPAR | With integrated MV arrester | | | | | | | | | | | | | | | | | | | | | | |
| 13. | Fuse link | HH ... A 10/24kV "e"=442 mm | 3 | pcs. | SIBA / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link | | | | | | | | | | | | | | | | | | | | | | |
| | | | 3 | pcs. | | | | | | | | | | | | | | | | | | | | | | | | |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer | | | | | | | | | | | | | | | | | | | | | | |
| 15. | Strain clamp for AsXS | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required | | | | | | | | | | | | | | | | | | | | | | |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits | | | | | | | | | | | | | | | | | | | | | | |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | - number of conduits depends on the number of circuits | | | | | | | | | | | | | | | | | | | | | | |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | | | | | | | | | | | | | | | | | | | | | | | |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | Use for station-mounted switchboard | | | | | | | | | | | | | | | | | | | | | | |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer | | | | | | | | | | | | | | | | | | | | | | |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań | | | | | | | | | | | | | | | | | | | | | | |

STE-20/.../If

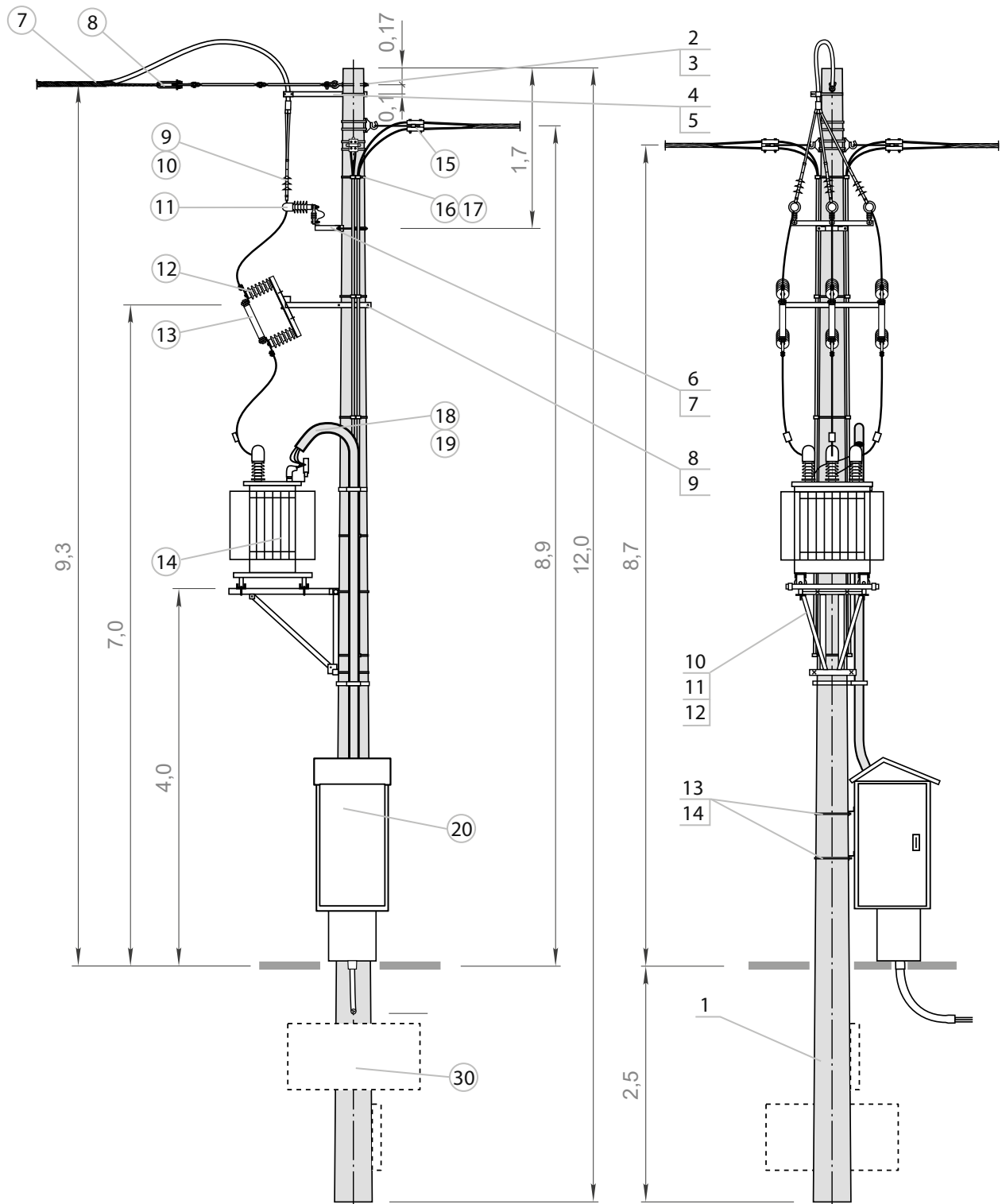


List of structures, accessories, apparatus for STEKs-20/.../If

| STRUCTURES | | | | | | |
|------------|--|---|----------|------|-----------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 |
| 2. | Strain bolt | M24x240+N+Ps+Pk M24x300+N+Ps+Pk | 1 | pcs. | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm |
| | Strain structure | KOD-1c/E KOD-1a/E | | | | For poles top diameter = 420 mm For poles top diameter = 218 mm; 263 mm |
| 3. | Bracket | OB-14/E OB-7/E OB-3/E | 1 | pcs. | ALPAR | To KOD-1c/E for poles with top diameter = 420 mm To KOD-1a/E for poles with top diameter = 263 mm To KOD-1a/E for poles with top diameter = 218 mm |
| 4. | Spacer structure | KD-1b/E KD-1a/E | 1 | pcs. | ALPAR | For poles top diameter = 420 mm For poles top diameter = 218 mm; 263 mm |
| 5. | Bracket | OB-45/E OB-43/E OB-42/E | 1 | pcs. | ALPAR | To KD-1b/E for poles with top diameter = 420 mm To KD-1a/E for poles with top diameter = 263 mm To KD-1a/E for poles with top diameter = 218 mm |
| 6. | Structure for arresters | KOG-14a/E | 1 | pcs. | ALPAR | top diameter = 218 top diameter = 263 |
| | | KOG-53/E | | | | top diameter = 420 |
| 7. | Bracket | OB-6/E OB-9/E OB-15/E | 1 | pcs. | ALPAR | To KOG-14a/E for poles with top diameter = 218 mm To KOG-14a/E for poles with top diameter = 263 mm To KOG-53/E for poles with top diameter = 420 mm |
| 8. | Structure for fuse bases | KBZA/E | 1 | pcs. | ALPAR | |
| 9. | Mounting bolts | M16x540+N+Po+Ps M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 420 mm For poles top diameter = 263 mm For poles top diameter = 218 mm |
| 10. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA |
| 11. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm |
| 12. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 |
| 13. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles with top diameter = 218 mm, 263 mm For poles with top diameter = 420 mm |
| 14. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|------------------------------------|---|-----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 7. | Guy grip dead-end | ... | 1 | pcs. | ... / ALPAR | |
| 8. | Guy strain clamp | ŁO-001/SN | 1 | pcs. | ALPAR | |
| 9. | 3-phase overhead cable termination | ... | 1 | pcs. | ... / ALPAR | Adapt to cable cross section |
| 10. | Cable head termination | ... | 3 | pcs. | ... / ALPAR | Adapt to cable cross section |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester is determined by an authorized designer |
| 12. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - |
| | | WBGN 17,5 HH ... A 10/24kV "e"=442 mm | | | | With integrated MV arrester |
| 13. | Fuse link | WBGN 17,5 | 3 | pcs. | ZRE / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGN fuse link |
| | | HH ... A 10/24kV "e"=442 mm | 3 | pcs. | SIBA / ALPAR | |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Strain clamp for AsXS | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | - number of conduits depends on the number of circuits |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use for station-mounted switchboard |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 20. | LV disconnectors DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

STEKs-20/.../lf

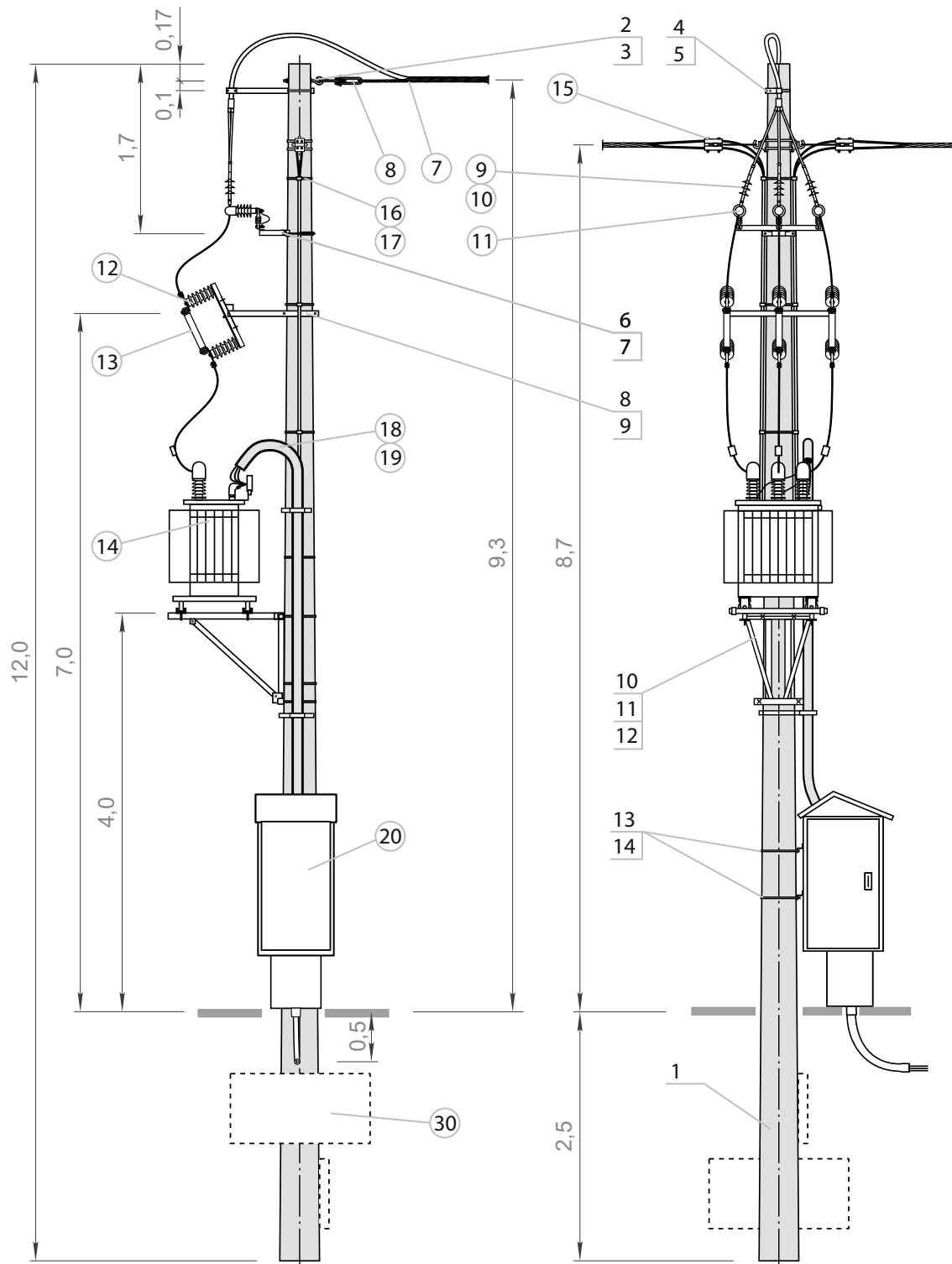


List of structures, accessories, apparatus for STEKs-20/.../IIIF

| STRUCTURES | | | | | | |
|------------|--|---|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 |
| 2. | Strain bolt | M24x240+N+Ps+Pk M24x300+N+Ps+Pk | 1 | pcs. | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm |
| | Strain structure | KOD-1c/E KOD-1a/E | | | | For poles top diameter = 420 mm For poles top diameter = 218 mm; 263 mm |
| 3. | Bracket | OB-14/E OB-7/E OB-3/E | 1 | pcs. | ALPAR | To KOD-1c/E for poles with top diameter = 420 mm To KOD-1a/E for poles with top diameter = 263 mm To KOD-1a/E for poles with top diameter = 218 mm |
| 4. | Spacer structure | KD-1b/E KD-1a/E | 1 | pcs. | ALPAR | For poles top diameter = 420 mm For poles top diameter = 218 mm; 263 mm |
| 5. | Bracket | OB-45/E OB-43/E OB-42/E | 1 | pcs. | ALPAR | To KD-1b/E for poles with top diameter = 420 mm To KD-1a/E for poles with top diameter = 263 mm To KD-1a/E for poles with top diameter = 218 mm |
| 6. | Structure for arresters | KOG-14a/E | 1 | pcs. | ALPAR | top diameter = 218 top diameter = 263 |
| | | KOG-53/E | | | | top diameter = 420 |
| 7. | Bracket | OB-6/E OB-9/E OB-15/E | 1 | pcs. | ALPAR | To KOG-14a/E for poles with top diameter = 218 mm To KOG-14a/E for poles with top diameter = 263 mm To KOG-53/E for poles with top diameter = 420 mm |
| 8. | Structure for fuse bases | KBZA/E | 1 | pcs. | ALPAR | |
| 9. | Mounting bolts | M16x540+N+Po+Ps M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 420 mm For poles top diameter = 263 mm For poles top diameter = 218 mm |
| 10. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA |
| 11. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm |
| 12. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 |
| 13. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles top diameter = 218 mm; 263 mm For poles top diameter = 420 mm |
| 14. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter 3-phase overhead cable termination = 420 mm |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|------------------------------------|---|-----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 7. | Guy grip dead-end | ... | 1 | pcs. | ... / ALPAR | |
| 8. | Guy strain clamp | ŁO-001/SN | 1 | pcs. | ALPAR | |
| 9. | 3-phase overhead cable termination | ... | 1 | pcs. | ... / ALPAR | Adapt to cable cross section |
| 10. | Cable head termination | ... | 3 | pcs. | ... / ALPAR | Adapt to cable cross section |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 12. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - |
| | | WBGN 17,5 | 3 | pcs. | ZRE / ALPAR | With integrated MV arrester |
| 13. | Fuse link | HH ... A 10/24kV "e"=442 mm | 3 | pcs. | SIBA / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGN fuse link |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Strain clamp for AsXS | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | - number of conduits depends on the number of circuits |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use for station-mounted switchboard |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

STEKs-20/.../IIlf

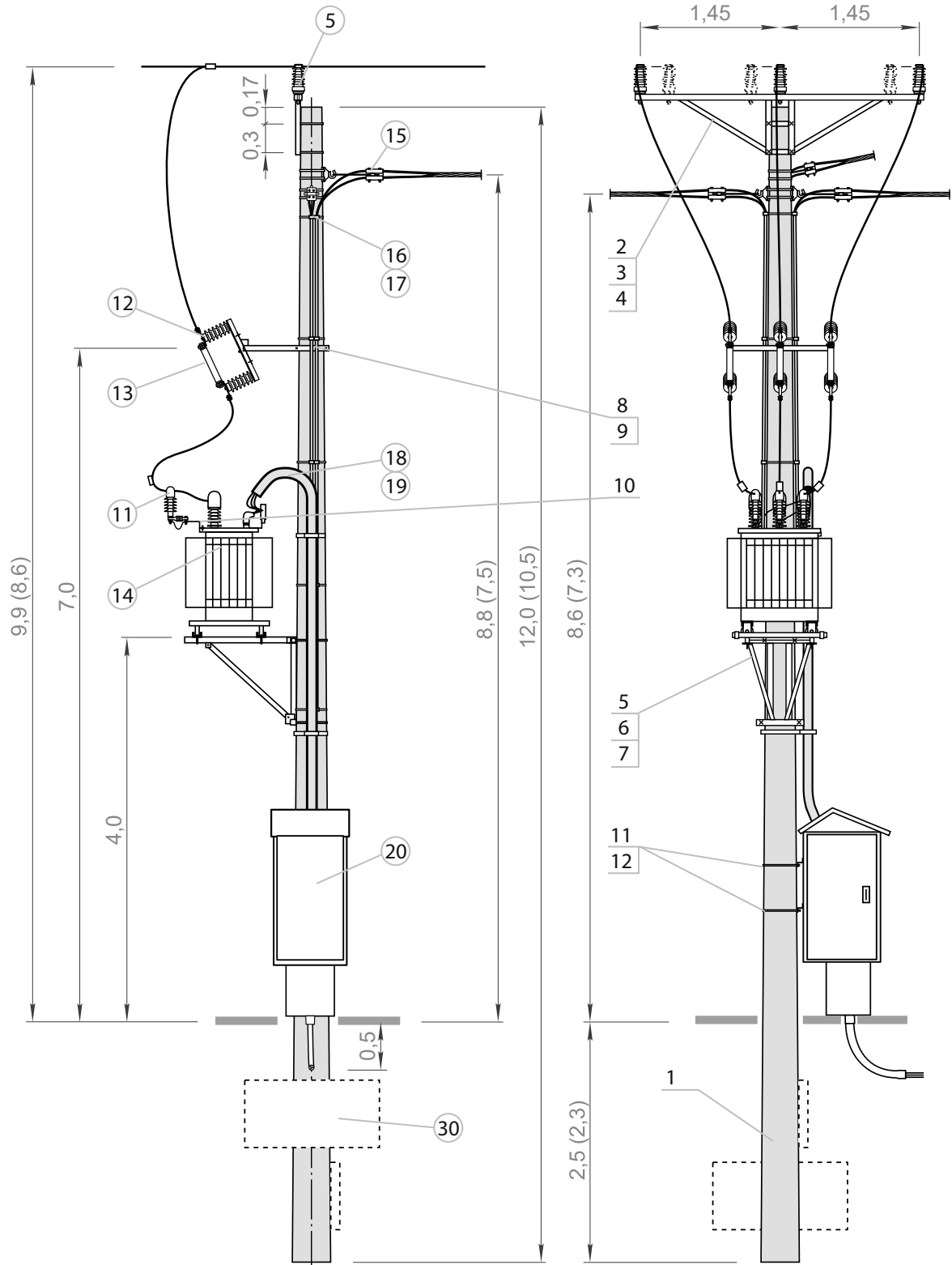


List of structures, accessories, apparatus for STEP-20/.../1f

| STRUCTURES | | | | | | | | |
|---------------------|--|---|-------------------------|------|-----------------|---|--------------------|------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 | | |
| 2. | Through-type station crossarm | PP-3b/E PP-2b/E | 1 | pcs. | ALPAR | inclination 1° 0° | top diameter = 420 | PAS cables |
| | | PP-3a/E PP-2a/E | | | | | top diameter = 263 | |
| | | PP-3a/E PP-2a/E | | | | | top diameter = 218 | |
| | | PPZ-3a/E PP-51a/E | | | | cross-section 50-70 (for short spans) 50-70 | top diameter = 420 | AFL cables |
| | | PPZ-2a/E PP-56a/E | | | | | top diameter = 263 | |
| PPZ-1a/E PP-57a/E | top diameter = 218 | | | | | | | |
| 3. | Bracket | OG-13/E OB-14/E OG-12/E OB-7/E OG-5/E OB-3/E | 2 1 | pcs. | ALPAR | To PPZ-3a/E, PP-57a/E To PPZ-2a/E, PP-56a/E To PPZ-1a/E, PP-51a/E | | |
| 4. | Mounting bolts | M16x560 M16x480 M16x400 M16x330 M16x350 M16x280 | 2 1 2 1 2 1 | set | ALPAR | For PP-3b/E and PP-2b/E PP-57a/E top diameter = 420 For PP-3a/E and PP-2a/E PP-56a/E top diameter = 263 For PP-3a/E and PP-2a/E PP-51a/E top diameter = 218 | | |
| 5. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | | |
| 6. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm | | |
| 7. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 | | |
| 8. | Structure for fuse bases | KBZA/E | 1 | pcs. | ALPAR | | | |
| 9. | Mounting bolts | M16x540+N+Po+Ps M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles with top diameter = 420 mm For poles with top diameter = 263 mm For poles with top diameter = 218 mm | | |
| 10. | Structure for arresters | KOG/T | 3 | pcs. | ALPAR | Direct attachment to the transformer | | |
| 11. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles top diameter = 218 mm, 263 mm For poles top diameter = 420 mm | | |
| 12. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm | | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|-----------------------------------|---|-----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 5. | Supporting insulator | LWP-8/24 M24x105 LWP-8/24S M24x105 | 3 | pcs. | ALPAR | Bare line — for 1° inclination, use 6 pcs. PAS line — for 1° inclination, use 6 pcs. |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester is determined by an authorized designer |
| 12. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - |
| | | With integrated MV arrester | | | | |
| 13. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | HH ... A 10/24kV "e"=442 mm | 3 | pcs. | SIBA / ALPAR | The value and type of arrester is determined by an authorized designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Terminal clamp for AsXSn | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | - number of conduits depends on the number of circuits |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use for station-mounted switchboard |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPiREE Poznań |

STEP-20/.../1f

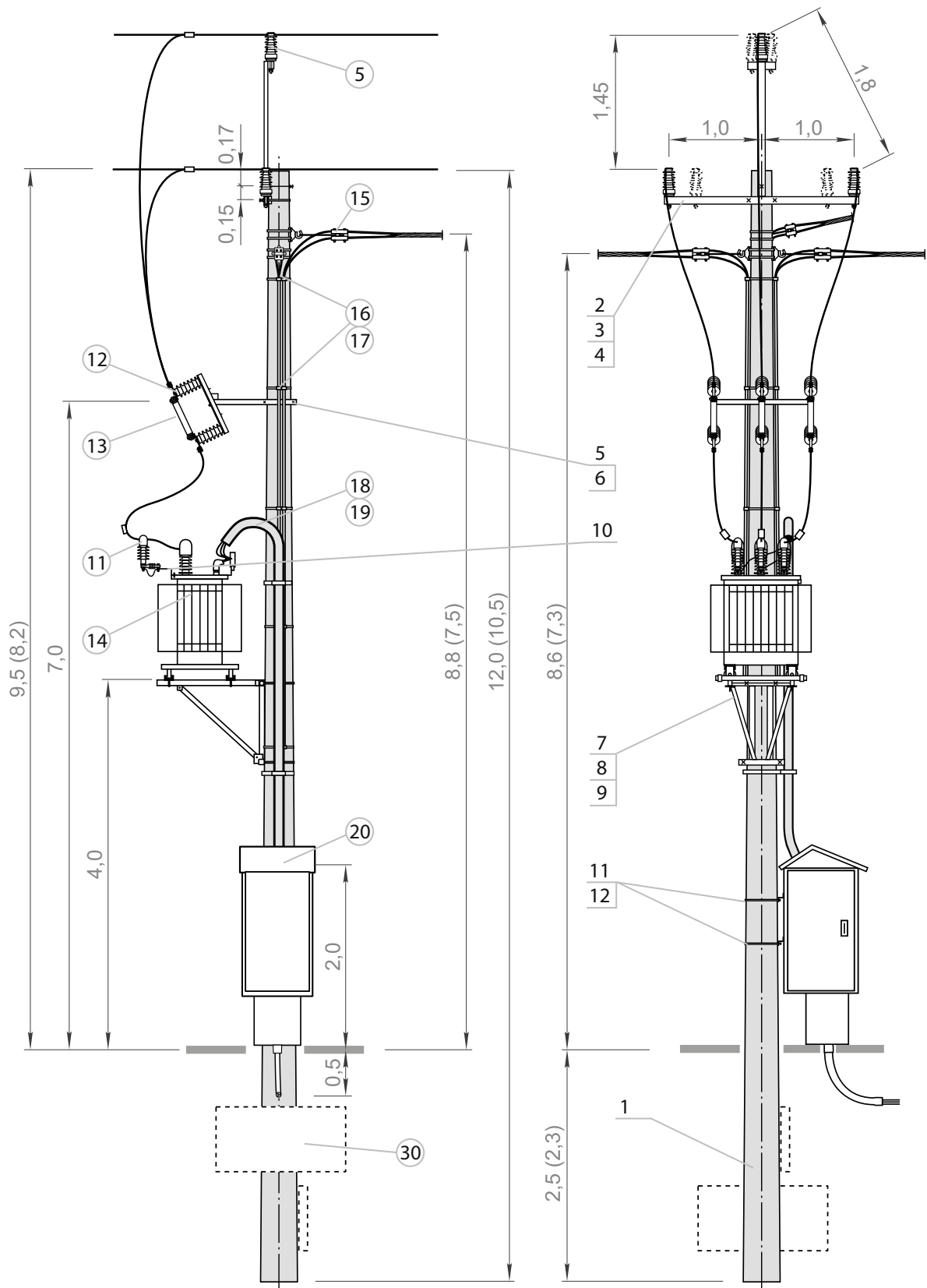


List of structures, accessories, apparatus for STEP-20/.../2f

| STRUCTURES | | | | | | |
|------------|--|---|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / - | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 |
| 2. | Through-type station crossarm | PP-331d/2/E | 1 | pcs. | ALPAR | inclination 1° top diameter = 420 top diameter = 263 top diameter = 218 0° top diameter = 420 top diameter = 263 top diameter = 218 AFL cables 35, 50, 70 |
| | | PP-331c/2/E | | | | |
| | | PP-331b/2/E | | | | |
| | | PP-311d/2/E | | | | |
| | | PP-311c/2/E | | | | |
| | | PP-311b/2/E | | | | |
| 3. | Bracket | OB-14/E OB-7/E OB-3/E | 1 | pcs. | ALPAR | For PP-311d/2/E and PP-331d/2/E For PP-311c/2/E and PP-331c/2/E For PP-311b/2/E and PP-331b/2/E top diameter = 420 mm top diameter = 263 mm top diameter = 218 mm |
| 4. | Mounting bolts | M16x480 M16x330 M16x280 | 1 | set | ALPAR | For PP-311d/2/E and PP-331d/2/E For PP-311c/2/E and PP-331c/2/E For PP-311b/2/E and PP-331b/2/E top diameter = 420 mm top diameter = 263 mm top diameter = 218 mm |
| 5. | Structure for fuse bases | KBZA/E | 1 | pcs. | ALPAR | |
| 6. | Mounting bolts | M16x540+N+Po+Ps M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles with top diameter = 420 mm For poles with top diameter = 263 mm For poles with top diameter = 218 mm |
| 7. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA |
| 8. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm |
| 9. | Bracket | OS-22/E OS-23/E OS-24 /E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 |
| 10. | Structure for arresters | KOG/T | 3 | pcs. | ALPAR | Direct attachment to the transformer |
| 11. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles top diameter = 218 mm, 263 mm For poles top diameter = 420 mm |
| 12. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|-----------------------------------|---|-----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 5. | Supporting insulator | LWP-8/24 M24x105 LWP-8/24S M24x105 | 3 | pcs. | ALPAR | Bare line — for 1° inclination, use 6 pcs. PAS line — for 1° inclination, use 6 pcs. |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester is determined by an authorized designer |
| 12. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - |
| | | | | | | With integrated MV arrester |
| 13. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | HH ... A 10/24kV "e"=442 mm | 3 | pcs. | SIBA / ALPAR | The value and type of arrester is determined by an authorized designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Terminal clamp for AsXSn | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits number of conduits depends on the number of circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use for station-mounted switchboard |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

STEP-20/.../2f



List of structures, accessories, apparatus for STEO-20/...f

| STRUCTURES | | | | | | |
|------------|--|---|---|------|-----------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 |
| 2. | Station strain crossbar | PO-34a/E | 1 | pcs. | ALPAR | MV N-line tension ≤ 21kN ≤ 26kN ≤ 15kN 50-70 50-70 35-50 top diameter = 420 top diameter = 263 top diameter = 218 top diameter = 420 top diameter = 263 top diameter = 420 top diameter = 263 top diameter = 218 |
| | | PO-32a/E | | | | |
| | | PO-31b/E | | | | |
| | | PO-35a/E | | | | |
| | | PO-33b/E | | | | |
| | | PK-22/E | | | | |
| | | PK-21/E | | | | |
| PK-20a/E | | | | | | |
| 3. | Bracket | OB-36/E OB-34/E OB-31/E | 1 | pcs. | ALPAR | PK-22/E PK-21/E PK-20a/E top diameter = 420 mm top diameter = 263 mm top diameter = 218 mm |
| 4. | Mounting bolts | M16x610 M16x450 M16x400 | 1 | set | ALPAR | PK-22/E PK-21/E PK-20a/E top diameter = 420 mm top diameter = 263 mm top diameter = 218 mm |
| 5. | Mounting bolts | M16x650 M20x650 M16x520 M20x520 M16x500 M20x500 M16x350 M20x350 M16x300 M20x300 | 3 1 3 1 3 1 3 1 3 1 | set | ALPAR | PO-35a/E PO-34b/E PO-33b/E PO-32a/E PO-31b/E |
| 6. | Structure for fuse bases | KBZA/E | 1 | pcs. | ALPAR | |
| 7. | Mounting bolts | M16x540+N+Po+Ps M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 420 mm For poles top diameter = 263 mm For poles top diameter = 218 mm |
| 8. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA |
| 9. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm |
| 10. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 |
| 11. | Structure for arresters | KOG/T | 3 | pcs. | ALPAR | Direct attachment to the transformer |
| 12. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles with top diameter = 218, 263 mm For poles with top diameter = 420 mm |
| 13. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm |

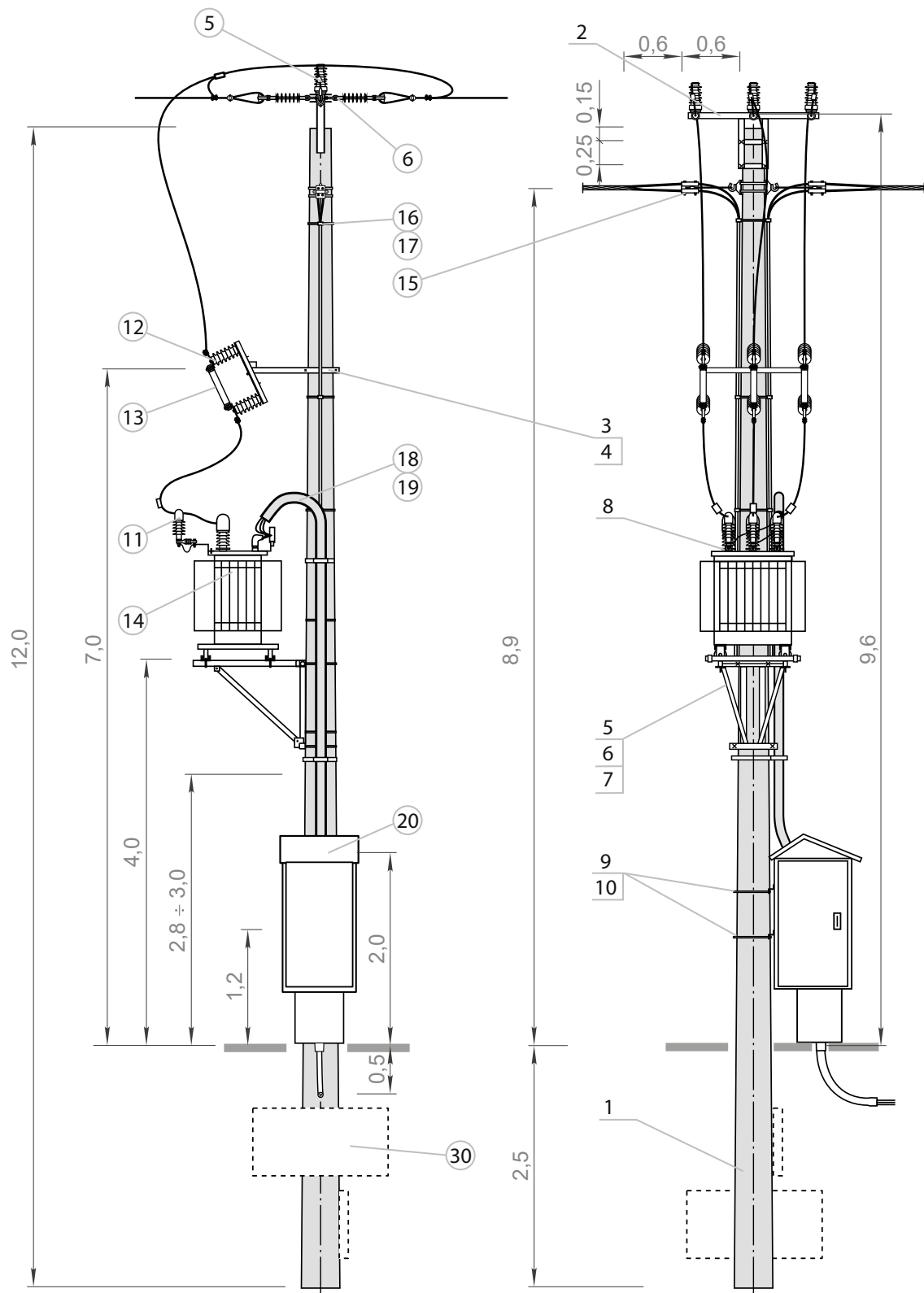
| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|--------------------------------------|---|-----------|------|-----------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 5. | Supporting insulator | LWP-8/24 M24x105 | 3 | pcs. | ALPAR | |
| 6. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 6 | set | ... / ALPAR | Single / double on porcelain insulators Single / double on silicone insulators |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 12. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - With integrated MV arrester |
| 13. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | HH ... A 10/24kV "e"=442 mm | 3 | pcs. | SIBA / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Terminal clamp for AsXS _n | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | To be used for the installation of overhead low-voltage circuit outputs – the number of conduits depends on the number of circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | Use for station-mounted switchboard |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

List of structures, accessories, apparatus for STEO-20/... / PASf

| STRUCTURES | | | | | | |
|------------|--|---|----------|------|-----------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 |
| 2. | Terminal station crossarm | PK-12/E | 1 | pcs. | ALPAR | MV N-line tension ≤ 20kN Cables PAS 50-120 top diameter = 420 top diameter = 263 top diameter = 218 |
| | | PK-11a/E | | | | |
| | | PK-6a/E | | | | |
| 3. | Structure for fuse bases | KBZA/E | 1 | pcs. | ALPAR | |
| 4. | Mounting bolts | M16x540+N+Po+Ps M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles with top diameter = 420 mm For poles with top diameter = 263 mm For poles with top diameter = 218 mm |
| 5. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA |
| 6. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm |
| 7. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 |
| 8. | Structure for arresters | KOG/T | 3 | pcs. | ALPAR | Direct attachment to the transformer |
| 9. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles with top diameter = 218 mm, 263 mm For poles with top diameter = 420 mm |
| 10. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|--------------------------------------|--|-----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 5. | Supporting insulator | LWP-8/24 M24x105 | 3 | pcs. | ALPAR | |
| 6. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 6 | set | ... / ALPAR | Single / double on porcelain insulators Single / double on composite insulators |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 12. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - |
| | | With integrated MV arrester | | | | |
| 13. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | HH ... A 10/24kV "e"=442 mm | 3 | pcs. | SIBA / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Terminal clamp for AsXS _n | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits - number of conduits depends on the number of circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | Use for station-mounted switchboard |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

STEO-20/... / PASf

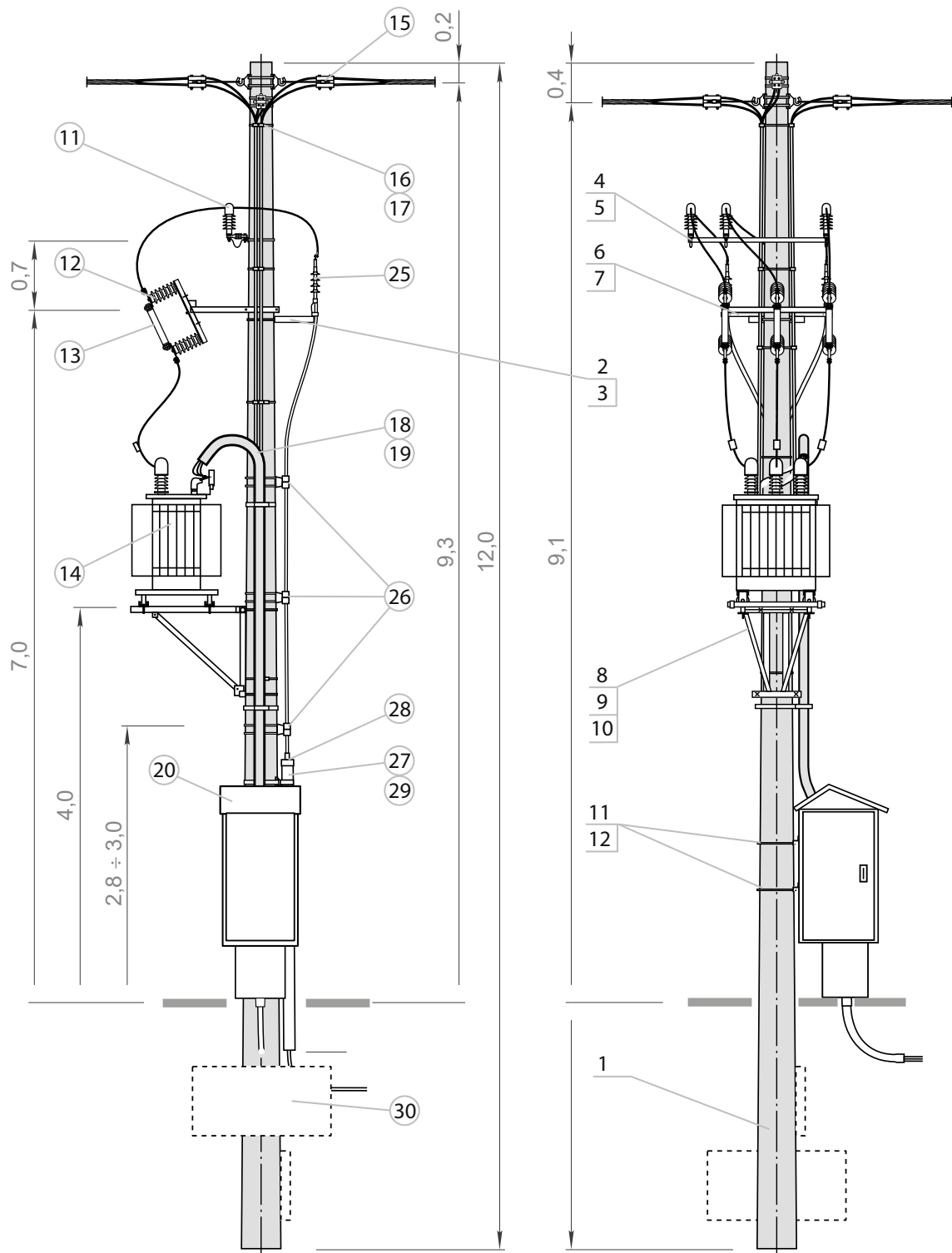


List of structures, accessories, apparatus for STEK-20/.../1f

| STRUCTURES | | | | | | | |
|------------|--|---|----------|------|-----------------|--|-----------------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 | |
| 2. | Structure for cable terminations | KGK-13/E | 1 | pcs. | ALPAR | For 3 x 1-phase cable | top diameter = 420 mm |
| | | KGK-12a/E | | | | | top diameter = 263 mm |
| | | KGK-11a/E | | | | | top diameter = 218 mm |
| | | KGK-16a/E | | | | For 3-phase cable | top diameter = 420 mm |
| | | KGK-15a/E | | | | | top diameter = 263 mm |
| KGK-14a/E | top diameter = 218 mm | | | | | | |
| 3. | Bracket | OB-16/E OB-10/E OB-8/E | 1 | pcs. | ALPAR | To KGK-13/E, KGK-16a/E To KGK-12a/E, KGK-15a/E To KGK-11a/E, KGK-14a/E | |
| 4. | Structure for arresters | KOG-54/E KOG-55/E | 1 | set | ALPAR | For poles with top diameter = 218 mm, 263 mm For poles with top diameter = 420 mm | |
| 5. | Bracket | OB-7/E OB-10/E OB-16/E | 1 | set | ALPAR | For poles with top diameter = 218 mm For poles with top diameter = 263 mm For poles with top diameter = 420 mm | |
| 6. | Structure for fuse | KBZA/E | 1 | pcs. | ALPAR | | |
| 7. | Mounting bolts | M16x540+N+Po+Ps M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles with top diameter = 420 mm For poles with top diameter = 263 mm For poles with top diameter = 218 mm | |
| 8. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | |
| 9. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm | |
| 10. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 | |
| 11. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles with top diameter = 218 mm, 263 mm For poles with top diameter = 420 mm | |
| 12. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|-------------------------------------|--|-----------|------|------------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 12. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - With integrated MV arrester |
| 13. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | HH ... A 10/24kV "e"=442 mm | 3 | pcs. | SIBA / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Terminal clamp for AsXSn | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits - number of conduits depends on the number of circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use for station-mounted switchboard |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 25. | Cable termination | CHE-F 24kV 25-150 CHE-F 24kV 70-240 CHEP(H)-3F 24kV 50-150 CHEP(H)-3F 24kV 70-240 | 1 | set | CELLPACK / ALPAR | For 3 x 1-core cable For 3 x 1-core cable For 3-core cable type HAKnFtA For 3-core cable type HAKnFtA |
| 26. | MV cable clamp | U1032 | 3 | pcs. | ALPAR | Triple, for MV cable fastening |
| 27. | Protective tube | BE110 | 3 | m | ... / ALPAR | |
| 28. | Heat-shrinkable three-core breakout | SEH-3_110 | 1 | pcs. | CELLPACK / ALPAR | For MV cable shielding |
| 29. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPiREE Poznań |

STEK-20/.../1f

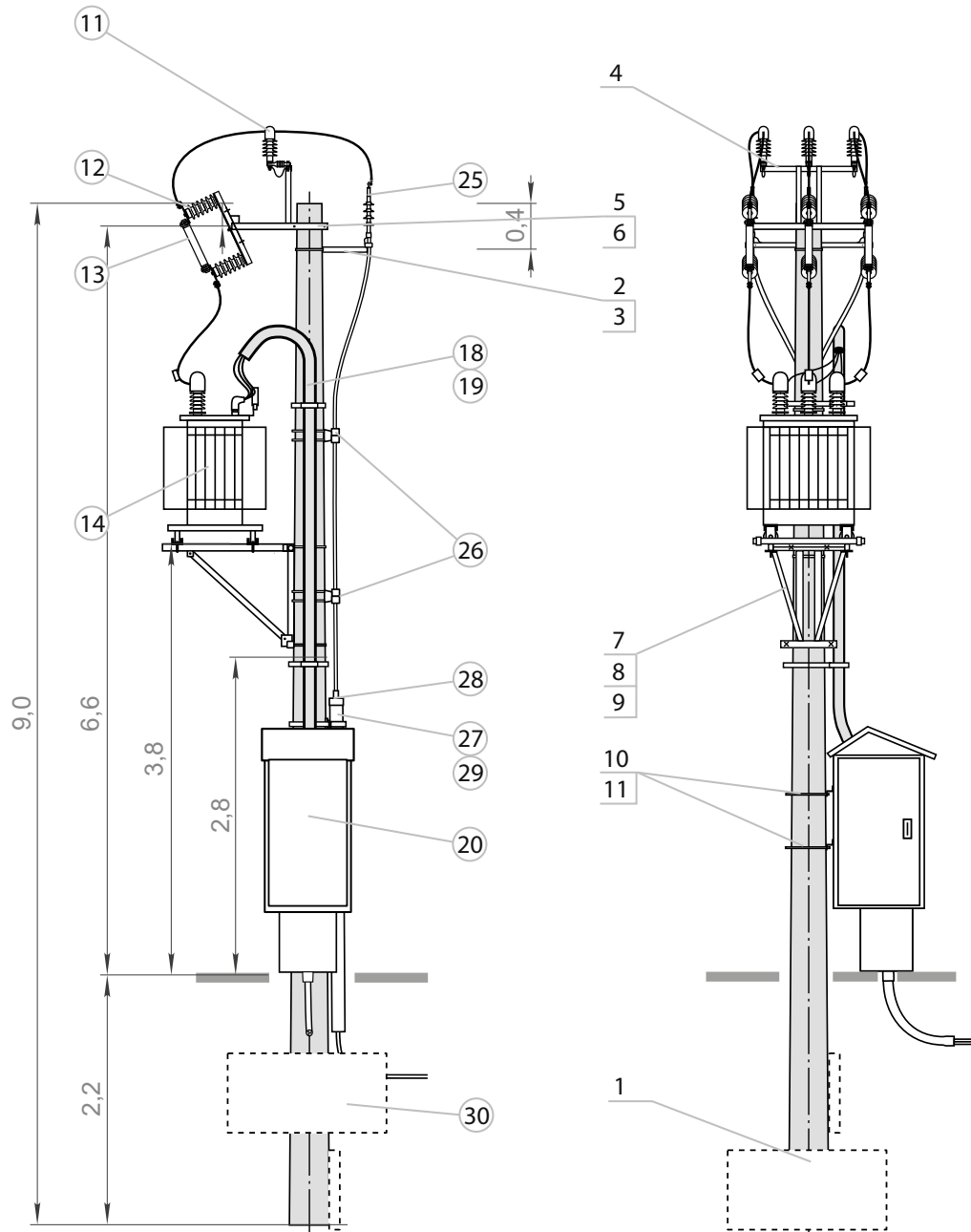


List of structures, accessories, apparatus for STEK-20/.../2f

| STRUCTURES | | | | | | | |
|------------|--|---------------------------------|----------|------|-----------------|---|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 | |
| 2. | Structure for cable terminations | KGK-13/E | 1 | pcs. | ALPAR | For 3 x 1-phase cable | top diameter = 420 |
| | | KGK-12a/E | | | | | top diameter = 263 |
| | | KGK-11a/E | | | | | top diameter = 218 |
| | | KGK-16a/E | | | | For 3-phase cable | top diameter = 420 |
| | | KGK-15a/E | | | | | top diameter = 263 |
| KGK-14a/E | top diameter = 218 | | | | | | |
| 3. | Bracket | OB-8/E OB-6/E | 1 | pcs. | ALPAR | To KGK-12a/E, KGK-15a/E To KGK-11a/E, KGK-14a/E | top diameter = 263 top diameter = 218 |
| 4. | Structure for arresters | KOG-56/E | 1 | pcs. | ALPAR | Fasten to KBZA | |
| 5. | Structure for fuse | KBZA/E | 1 | pcs. | ALPAR | | |
| 6. | Mounting bolts | M16x380+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 263 mm For poles top diameter = 218 mm | |
| | | M16x340+N+Po+Ps | | | | | |
| 7. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | |
| 8. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm | |
| 9. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 | |
| 10. | Mounting structure for the switchboard | KSZ-8a/E | 2 | pcs. | ALPAR | For poles with top diameter = 218 mm and with top diameter = 263 mm | |
| 11. | Bracket | OB-10/E OB-12/E | 2 | pcs. | ALPAR | To DB for poles with top diameter = 218 mm To DB for poles with top diameter = 263 mm | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|-------------------------------------|--|-----------|------|------------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 12. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - |
| | | WBGN 17,5 | | | | 3 |
| 13. | Fuse link | HH ... A 10/24kV "e"=442 mm | 3 | pcs. | SIBA / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| | | to 630 kVA ... / 0,42 | | | | 1 |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | Use for station-mounted switchboard |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 20. | LV disconnector DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 25. | Cable termination | CHE-F 24kV 25-150 CHE-F 24kV 70-240 CHEP(H)-3F 24kV 50-150 CHEP(H)-3F 24kV 70-240 | 1 | set | CELLPACK / ALPAR | For 3 x 1-core cable For 3 x 1-core cable For 3-core cable type HAKnFtA For 3-core cable type HAKnFtA |
| 26. | MV cable clamp | U1032 | 2 | pcs. | ALPAR | Triple, for MV cable fastening |
| 27. | Protective tube | BE110 | 3 | m | ... / ALPAR | For MV cable shielding |
| 28. | Heat-shrinkable three-core breakout | SEH-3_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 29. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

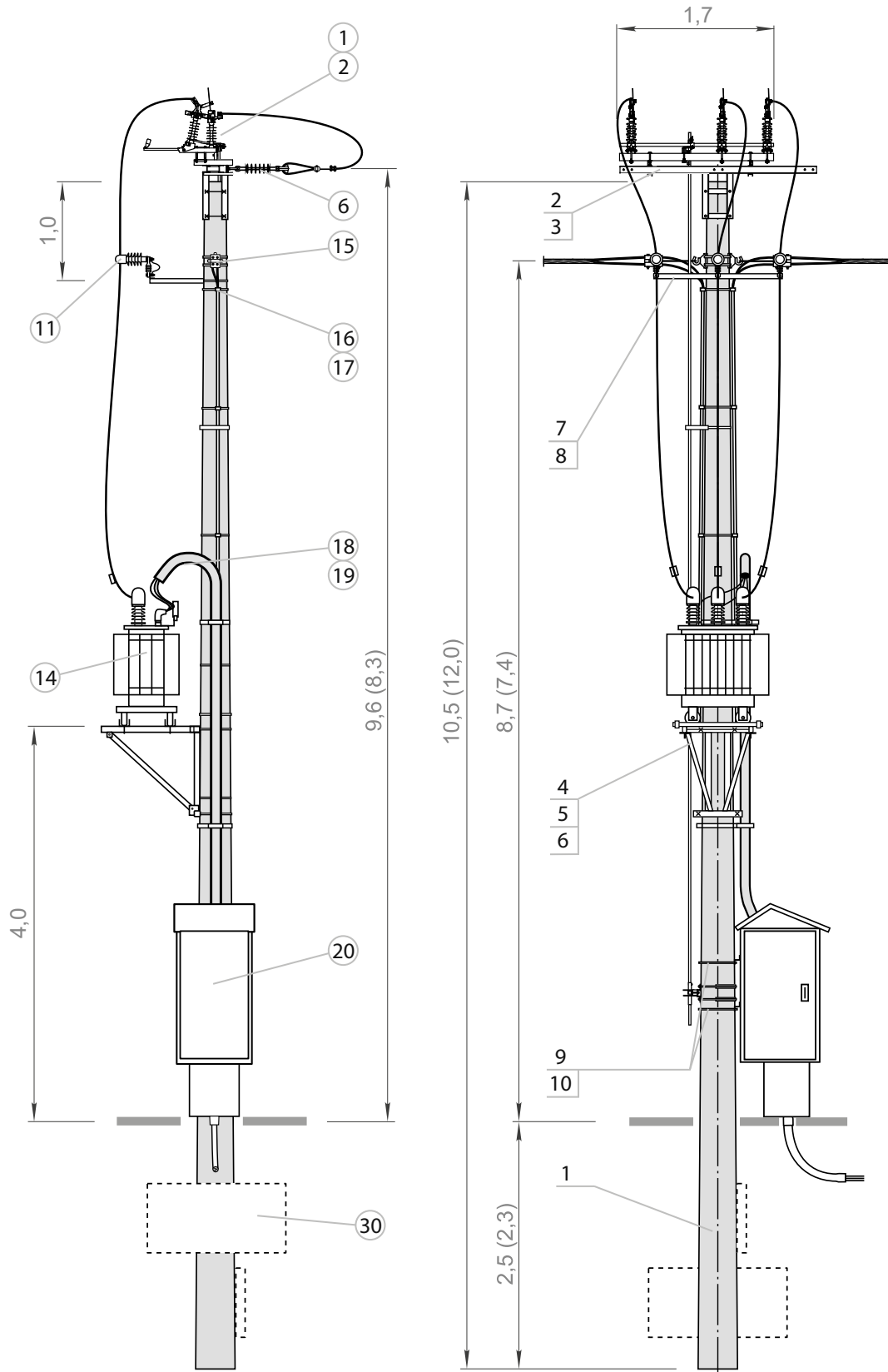
STEK-20/.../2f



List of structures, accessories, apparatus for STEr-20/...

| STRUCTURES | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|--|--|-----------|------|-----------------|--|--|--|--------------------|--------------------|--------------------|------------|--------------------|--------|--------------------|------------|--------------------|----------|--------------------|--------------------|--------------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | | | | | | | | | | | | | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 | | | | | | | | | | | | | | | |
| 2. | Terminal station crossarm | PK-12/E | 1 | pcs. | ALPAR | <table border="1"> <tr> <td rowspan="6">MV N-line tension</td> <td rowspan="3">≤ 20kN</td> <td>top diameter = 420</td> <td rowspan="6">PAS cables</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>≤ 12kN</td> <td>top diameter = 218</td> </tr> <tr> <td rowspan="3">≤ 20kN</td> <td>top diameter = 420</td> <td rowspan="6">AFL cables</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>≤ 13,5kN</td> <td>top diameter = 420</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>top diameter = 218</td> </tr> </table> | MV N-line tension | ≤ 20kN | top diameter = 420 | PAS cables | top diameter = 263 | ≤ 12kN | top diameter = 218 | ≤ 20kN | top diameter = 420 | AFL cables | top diameter = 263 | ≤ 13,5kN | top diameter = 420 | top diameter = 263 | top diameter = 218 |
| | | MV N-line tension | | | | | | | ≤ 20kN | | top diameter = 420 | PAS cables | | | | | | | | | |
| | | | | | | | | | | | top diameter = 263 | | | | | | | | | | |
| | | | | | | | | ≤ 12kN | | | top diameter = 218 | | | | | | | | | | |
| | | | | | | | | ≤ 20kN | top diameter = 420 | | AFL cables | | | | | | | | | | |
| | | | | | | | | | top diameter = 263 | | | | | | | | | | | | |
| | | | | | | | ≤ 13,5kN | | top diameter = 420 | | | | | | | | | | | | |
| top diameter = 263 | | | | | | | | | | | | | | | | | | | | | |
| top diameter = 218 | | | | | | | | | | | | | | | | | | | | | |
| PK-11a/E | | | | | | | | | | | | | | | | | | | | | |
| PK-6a/E | | | | | | | | | | | | | | | | | | | | | |
| PKZ-7/E | | | | | | | | | | | | | | | | | | | | | |
| PKZ-6/E | | | | | | | | | | | | | | | | | | | | | |
| PKZ-3b/E | | | | | | | | | | | | | | | | | | | | | |
| PKZ-3a/E | | | | | | | | | | | | | | | | | | | | | |
| PKZ-3/E | | | | | | | | | | | | | | | | | | | | | |
| 3. | Disconnecter structure | KO-7/P/E | 1 | set | ALPAR | To mount the modular disconnecter (mounting details for other disconnectors on linear crossarms is included in book 4) | | | | | | | | | | | | | | | |
| 4. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | | | | | | | | | | | | | | | |
| 5. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm | | | | | | | | | | | | | | | |
| 6. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 | | | | | | | | | | | | | | | |
| 7. | Structure for arresters | KOG-50/E | 1 | pcs. | ALPAR | <table border="1"> <tr> <td>top diameter = 218</td> <td rowspan="3">Do not use when mounting arresters directly on the transformer</td> </tr> <tr> <td>top diameter = 263</td> </tr> <tr> <td>top diameter = 420</td> </tr> </table> | top diameter = 218 | Do not use when mounting arresters directly on the transformer | top diameter = 263 | top diameter = 420 | | | | | | | | | | | |
| | | top diameter = 218 | | | | | Do not use when mounting arresters directly on the transformer | | | | | | | | | | | | | | |
| top diameter = 263 | | | | | | | | | | | | | | | | | | | | | |
| top diameter = 420 | | | | | | | | | | | | | | | | | | | | | |
| KOG-51/E | | | | | | | | | | | | | | | | | | | | | |
| 8. | Bracket | OB-6/E OB-8/E OB-14/E | 1 | pcs. | ALPAR | To KOG-50/E for poles with top diameter = 218 mm To KOG-50/E for poles with top diameter = 263 mm To KOG-51/E for poles with top diameter = 420 mm | | | | | | | | | | | | | | | |
| 9. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles top diameter = 218 mm, 263 mm For poles top diameter = 420 mm | | | | | | | | | | | | | | | |
| 10. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm | | | | | | | | | | | | | | | |
| APPARATUS AND ACCESSORIES | | | | | | | | | | | | | | | | | | | | | |
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | | | | | | | | | | | | | |
| 1. | Disconnecter Disconnecter with earthing switch Load break switch Load break switch with earthing switch | ONM III SA 24/4S OUNM III SA 24/4S RNM III SA 24/4S RUNM III SA 24/4S | 1 | pcs. | ALPAR | Modular switches in horizontal configuration with silicone insulation (optional alternatives: porcelain or composite) | | | | | | | | | | | | | | | |
| 2. | Manual drive | NRA E-... w.l NRAu E-... w.l | 1 | set | ALPAR | For switch without earthing switch / specify pole length For switch with earthing switch / specify pole length | | | | | | | | | | | | | | | |
| 6. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 6 | set | ... / ALPAR | Single/double on porcelain insulators Single/double on silicone insulators | | | | | | | | | | | | | | | |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer | | | | | | | | | | | | | | | |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer | | | | | | | | | | | | | | | |
| 15. | Terminal clamp for AsXSn | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required | | | | | | | | | | | | | | | |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits - number of conduits depends on the number of circuits Use for station-mounted switchboard | | | | | | | | | | | | | | | |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | | | | | | | | | | | | | | | | |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | | | | | | | | | | | | | | | | |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | | | | | | | | | | | | | | | | |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer | | | | | | | | | | | | | | | |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań | | | | | | | | | | | | | | | |

STEr-20/...

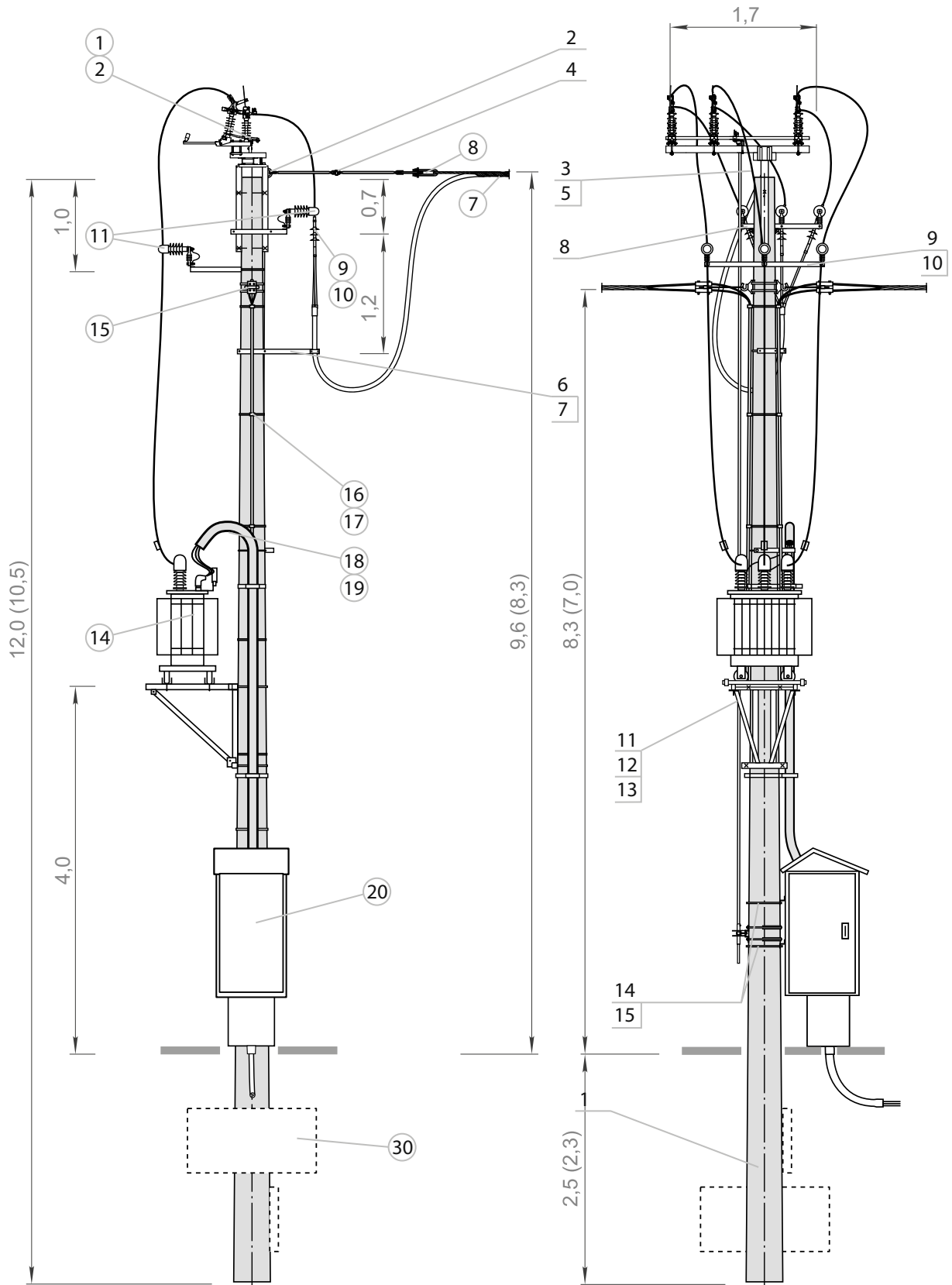


List of structures, accessories, apparatus for STEKsr-20/...

| STRUCTURES | | | | | | |
|------------|--|-----------------------------------|----------|------|-----------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / - | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 |
| 2. | Strain hanger | 41111/E | 1 | pcs. | ALPAR | For fastening with Gi |
| 3. | Pole head | Gi-5a/E Gi-3a/E Gi-2a/E | 1 | pcs. | ALPAR | For poles top diameter = 420 mm For poles top diameter = 263 mm For poles top diameter = 218 mm |
| 4. | Single-clevis connector L-450 | 38431/E | 2 | pcs. | ALPAR | |
| 5. | Mounting bolts | M16x100+N+Po+Ps | 2 | set | ALPAR | For mounting the modular disconnecter (details of mounting other disconnectors on line crossarms are provided in book 4) |
| 6. | Spacer structure | KD-1b/E KD-1a/E | 1 | pcs. | ALPAR | For poles top diameter = 420 mm For poles top diameter = 218 mm; 263 mm |
| 7. | Bracket | OB-45/E OB-43/E OB-42/E | 1 | pcs. | ALPAR | To KD-1b/E for poles with top diameter = 420 mm To KD-1a/E for poles with top diameter = 263 mm To KD-1a/E for poles with top diameter = 218 mm |
| 8. | Structure for arresters | KOG-61/E KOG-60/E KOG-17a/E | 1 | set | ALPAR | Poles: top diameter = 420 mm Poles: top diameter = 218 mm, 263 mm Supplied complete with KOG-61/E or KOG-60/E |
| 9. | Structure for arresters | KOG-51/E KOG-50/E | 1 | set | ALPAR | For poles top diameter = 420 mm For poles top diameter = 263 mm, 218 mm |
| 10. | Bracket | OB-14/E OB-8/E OB-6/E | 1 | pcs. | ALPAR | To KOG-51/E for poles with top diameter = 420 mm To KOG-50/E for poles with top diameter = 263 mm To KOG-50/E for poles with top diameter = 218 mm |
| 11. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA |
| 12. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm |
| 13. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 |
| 14 | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles top diameter = 218 mm, 263 mm For poles top diameter = 420 mm |
| 15. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|--|--|-----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Disconnecter Disconnecter with earthing switch Load break switch Load break switch with earthing switch | ONM III SA 24/4S OUNM III SA 24/4S RNM III SA 24/4S RUNM III SA 24/4S | 1 | pcs. | ALPAR | Modular switches in horizontal configuration with silicone insulation (other choices: porcelain, composite) |
| 2. | Manual drive | NRA E-... w.l NRAu E-... w.l | 1 | set | ALPAR | For switch without earthing switch / specify pole length For switch with earthing switch / specify pole length |
| 7. | Guy grip dead-end | ... | 1 | pcs. | ... / ALPAR | |
| 8. | Guy strain clamp | ŁO-001/SN | 1 | pcs. | ALPAR | |
| 9. | Cable termination | ... | 1 | pcs. | ... / ALPAR | Adapt to cable cross section |
| 10. | Cable head termination | ... | 3 | pcs. | ... / ALPAR | Adapt to cable cross section |
| 11. | Surge arrester | ... | 6 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Terminal clamp for AsXSn | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits - number of conduits depends on the number of circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | Use for station-mounted switchboard |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

STEKsr-20/...

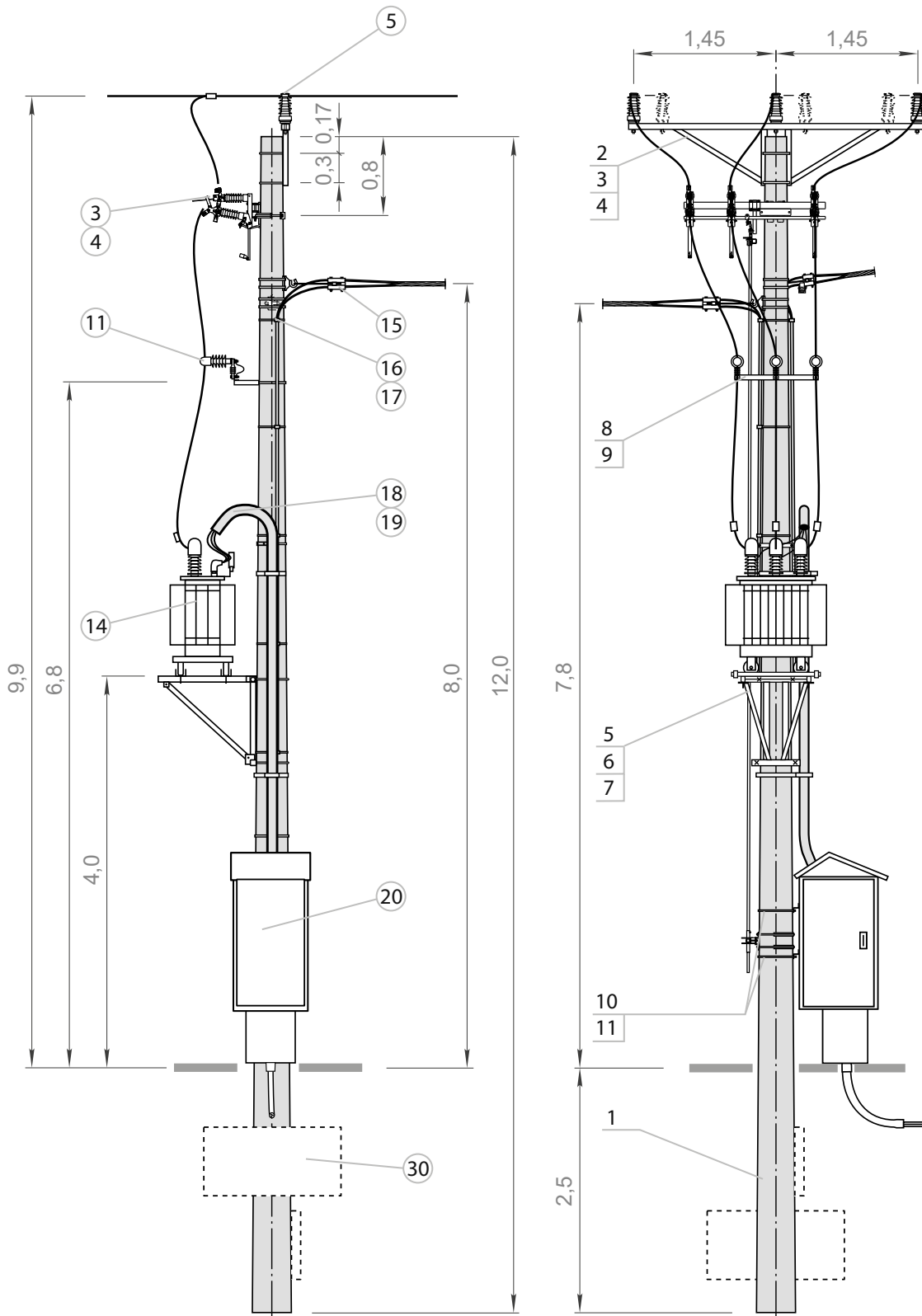


List of structures, accessories, apparatus for STEPr-20/.../1

| STRUCTURES | | | | | | | | | | |
|------------|--|--|----------|------|-----------------|--|----|--------------------|--|--------------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 | | | | |
| 2. | Through-type station crossarm | PP-3b/E PP-2b/E | 1 | pcs. | ALPAR | inclination | 1° | 0° | top diameter = 420 | PAS cables |
| | | PP-3a/E PP-2a/E | | | | | | | top diameter = 263 | |
| | | PP-3a/E PP-2a/E | | | | | | | top diameter = 218 | |
| | | PPZ-3a/E PP-51a/E | | | | | | | top diameter = 420 | |
| | | PPZ-2a/E PP-56a/E | | | | | | | top diameter = 263 | |
| | | PPZ-1a/E PP-57a/E | | | | | | top diameter = 218 | AFL cables | |
| 3. | Bracket | OG-13/E OB-14/E OG-12/E OB-7/E OG-5/E OB-3/E | 2 1 | pcs. | ALPAR | To PPZ-3a/E, PP-57a/E To PPZ-2a/E, PP-56a/E To PPZ-1a/E, PP-51a/E | | | | |
| 4. | Mounting bolts | M16x560 M16x480 | 2 1 | set | ALPAR | | | | PP-57a/E | top diameter = 420 |
| | | M16x400 M16x330 | 2 1 | | | | | | PP-56a/E | top diameter = 263 |
| | | M16x350 M16x280 | 2 1 | | | | | | PP-51a/E | top diameter = 218 |
| 5. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | | | | |
| 6. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm | | | | |
| 7. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 | | | | |
| 8. | Structure for arresters | KOG-50/E | 1 | pcs. | ALPAR | | | | Do not use when mounting arresters directly on the transformer | top diameter = 218 |
| | | KOG-51/E | | | | | | | | top diameter = 263 |
| 9. | Bracket | OB-7/E OB-9/E OB-16/E | 1 | pcs. | ALPAR | To KOG-6a/E for poles with top diameter = 218 mm To KOG-6a/E for poles with top diameter = 263 mm To KOG-52/E for poles with top diameter = 420 mm | | | | |
| 10. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles top diameter = 218 mm, 263 mm For poles top diameter = 420 mm | | | | |
| 11. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm | | | | |

| APPARATUS AND ACCESSORIES | | | | | | | | | |
|---------------------------|--|--|-----------|------|-----------------|---|--|--|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | |
| 3. | Disconnector Disconnector with earthing switch Load break switch Load break switch with earthing switch | ONMp III SA 24/4S OUNMp III SA 24/4S RNMP III SA 24/4S RUNMp III SA 24/4S | 1 | pcs. | ALPAR | Modular switches in horizontal configuration with silicone insulation (other choices: porcelain, composite) | | | |
| 4. | Manual drive | NRA E-... w.II NRAu E-... w.II | 1 | set | ALPAR | For switch without earthing switch / specify pole length For switch with earthing switch / specify pole length | | | |
| 5. | Supporting insulator | LWP-8/24 M24x105 LWP-8/24S M24x105 | 3 | pcs. | ALPAR | Bare line, for a 1° inclination use 6 pcs. PAS line, for a 1° inclination use 6 pcs. | | | |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer | | | |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer | | | |
| 15. | Terminal clamp for AsXSn | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required | | | |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits - number of conduits depends on the number of circuits | | | |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | Use for station-mounted switchboard | | | |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | | | | |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | | | | |
| 20. | LV disconnector DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer | | | |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań | | | |

STEPr-20/.../1

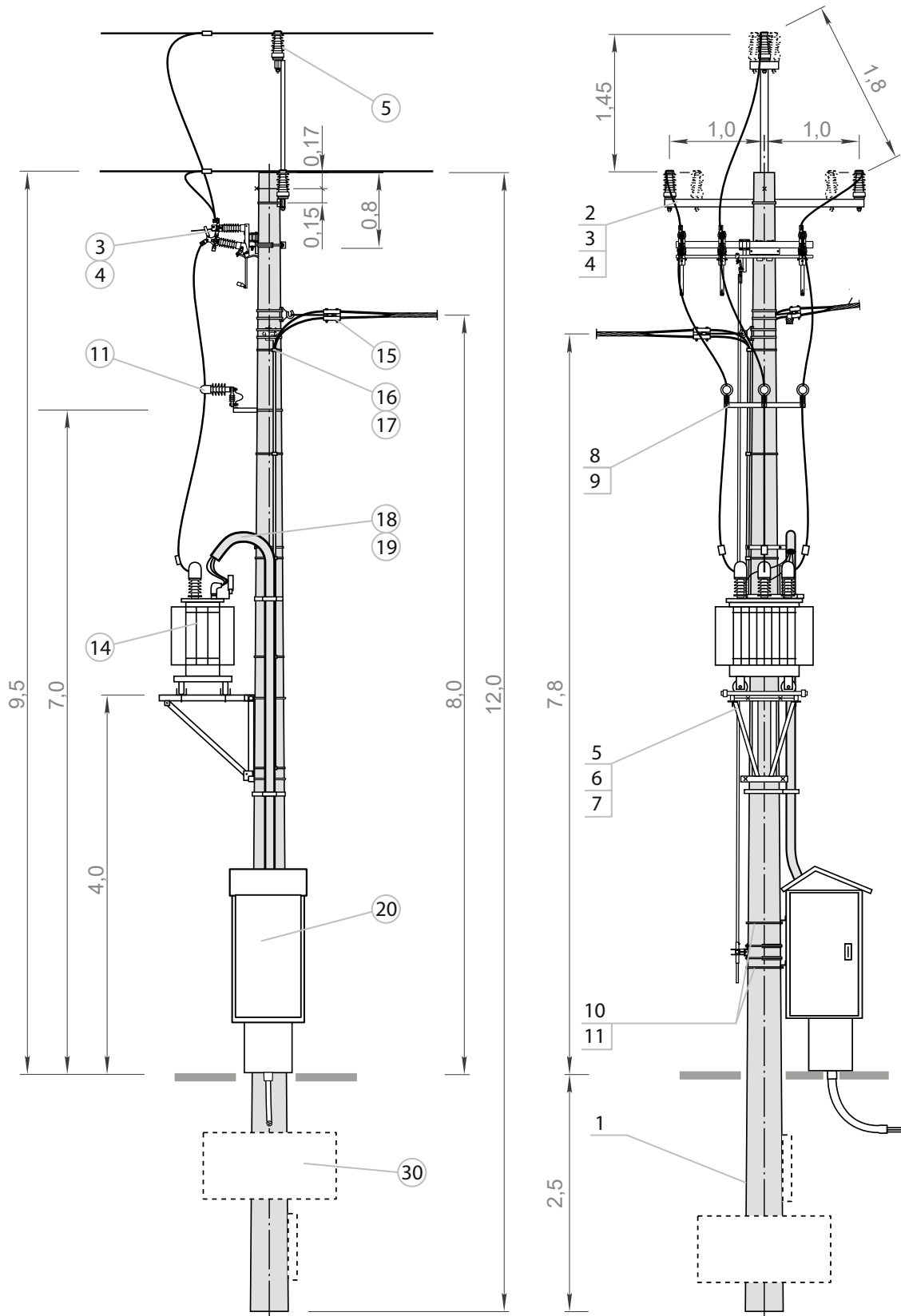


List of structures, accessories, apparatus for STEPr-20/.../2

| STRUCTURES | | | | | | |
|-------------|--|---------------------------------|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 |
| 2. | Through-type station crossarm | PP-331d/2/E | 1 | pcs. | ALPAR | inclination 1° top diameter = 420 top diameter = 263 top diameter = 218 0° top diameter = 420 top diameter = 263 top diameter = 218 |
| | | PP-331c/2/E | | | | |
| | | PP-331b/2/E | | | | |
| | | PP-311d/2/E | | | | |
| | | PP-311c/2/E | | | | |
| PP-311b/2/E | | | | | | |
| 3. | Bracket | OB-14/E OB-7/E OB-3/E | 1 | pcs. | ALPAR | For PP-311d/2/E and PP-331d/2/E For PP-311c/2/E and PP-331c/2/E For PP-311b/2/E and PP-331b/2/E top diameter = 420 top diameter = 263 top diameter = 218 |
| 4. | Mounting bolts | M16x480 M16x330 M16x280 | 1 | set | ALPAR | For PP-311d/2/E and PP-331d/2/E For PP-311c/2/E and PP-331c/2/E For PP-311b/2/E and PP-331b/2/E top diameter = 420 top diameter = 263 top diameter = 218 |
| 5. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA |
| 6. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm |
| 7. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 |
| 8. | Structure for arresters | KOG-6a/E | 1 | pcs. | ALPAR | top diameter = 218 top diameter = 263 top diameter = 420 |
| | | KOG-52/E | | | | Do not use when mounting arresters directly on the transformer |
| 9. | Bracket | OB-7/E OB-9/E OB-16/E | 1 | pcs. | ALPAR | To KOG-6a/E for poles with top diameter = 218 mm To KOG-6a/E for poles with top diameter = 263 mm To KOG-52/E for poles with top diameter = 420 mm |
| 10. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles top diameter = 218 mm, 263 mm For poles top diameter = 420 mm |
| 11. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm |

| APPARATUS AND ACCESORIES | | | | | | |
|--------------------------|--|--|-----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 3. | Disconnecter Disconnecter with earthing switch Load break switch Load break switch with earthing switch | ONMp III SA 24/4S OUNMp III SA 24/4S RNMp III SA 24/4S RUNMp III SA 24/4S | 1 | pcs. | ALPAR | Modular switches in horizontal configuration with silicone insulation (other choices: porcelain, composite) |
| 4. | Manual drive | NRA E-... w.l NRAu E-... w.l | 1 | set | ALPAR | For switch without earthing switch / specify pole length For switch with earthing switch / specify pole length |
| 5. | Supporting insulator | LWP-8/24 M24x105 LWP-8/24S M24x105 | 3 | pcs. | ALPAR | Bare line — for 1° inclination, use 6 pcs. PAS line — for 1° inclination, use 6 pcs. |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Terminal clamp for AsXSn | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits - number of conduits depends on the number of circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | Use for station-mounted switchboard |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

STEPr-20/.../2

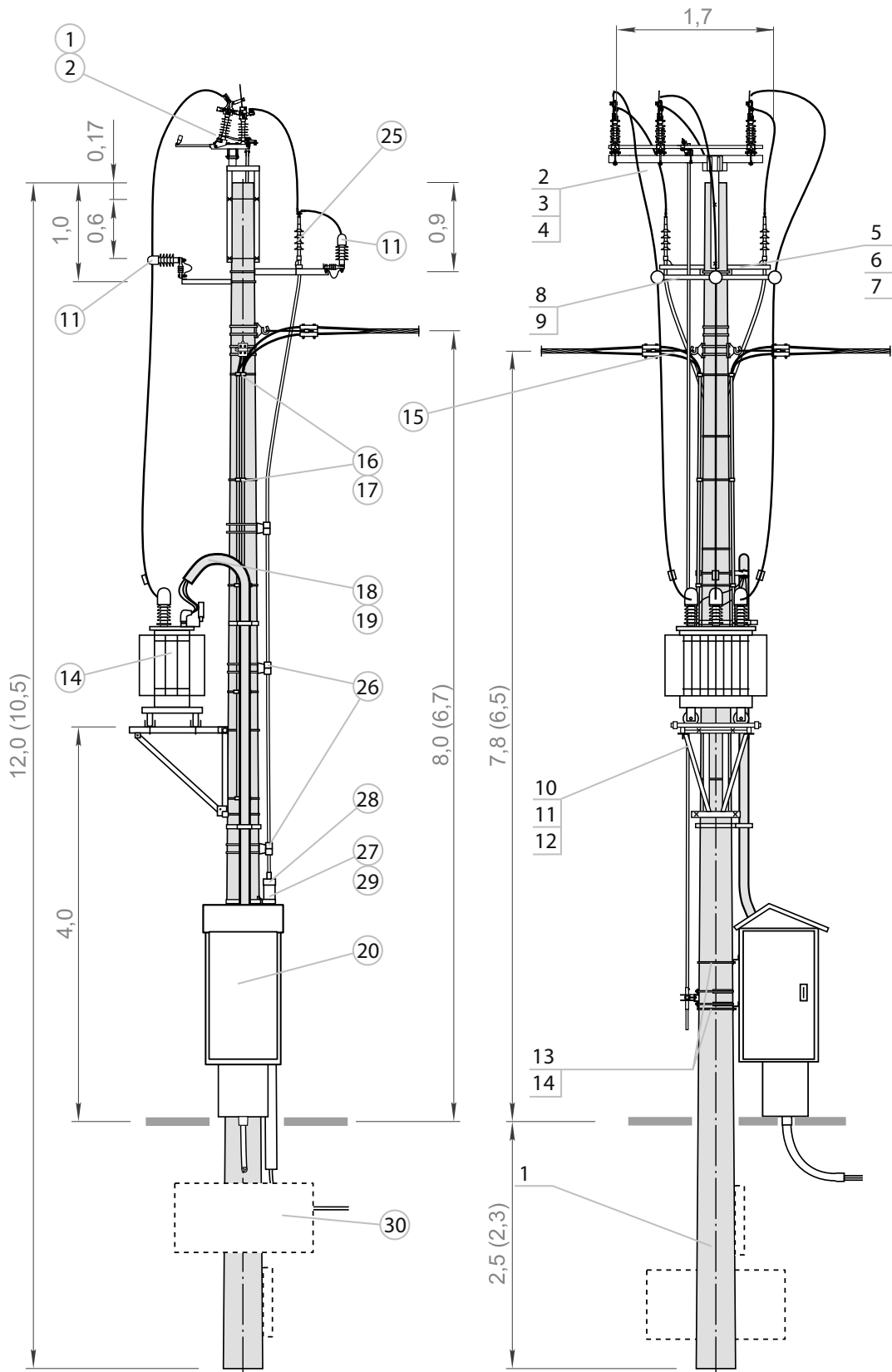


List of structures, accessories, apparatus for STEKr-20/...

| STRUCTURES | | | | | | | |
|------------|--|---|----------|------|-----------------|--|--------------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 | |
| 2. | Structure for the load break switch | KON-2/E KON-1/E | 1 | pcs. | ALPAR | For poles with top diameter = 420 mm For poles with top diameter = 218 mm and 263 mm | |
| 3. | Mounting bolts | M16x460+N+Po+Ps M16x310+N+Po+Ps M16x260+N+Po+Ps | 2 | set | ALPAR | top diameter = 420 mm top diameter = 263 mm top diameter = 218 mm | |
| 4. | Mounting bolts | M16x100+N+Po+Ps | 2 | set | ALPAR | To mount the modular disconnecter (mounting details for other disconnectors on linear crossarms is included in book 4) | |
| 5. | Structure for cable terminations | KGK-13/E | 1 | pcs. | ALPAR | For one 3 x 1-phase cable | top diameter = 420 |
| | | KGK-12a/E | | | | | top diameter = 263 |
| | | KGK-11a/E | | | | | top diameter = 218 |
| | | KGK-113/E | | | | For two 6 x 1-phase cables | top diameter = 420 |
| | | KGK-112a/E | | | | | top diameter = 263 |
| | | KGK-111a/E | | | | | top diameter = 218 |
| 6. | Bracket | OB-16/E OB-10/E OB-7/E | 1 | pcs. | ALPAR | For KGK-13/E, KGK-113/E For KGK-12a/E, KGK-112a/E For KGK-11a/E, KGK-111a/E | |
| 7. | Structure for arresters | KOG-62a/E | 1 | pcs. | ALPAR | Mounted to the KGK structure | |
| 8. | Structure for arresters | KOG-51/E KOG-50/E | 1 | pcs. | ALPAR | For poles with top diameter = 420 mm For poles with top diameter = 218 mm and 263 mm | |
| 9. | Bracket | OB-14/E OB-8/E OB-6/E | 1 | pcs. | ALPAR | For poles with top diameter = 420 mm For poles with top diameter = 263 mm For poles with top diameter = 218 mm | |
| 10. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | |
| 11. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm | |
| 12. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 | |
| 13. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles top diameter = 218 mm, 263 mm For poles top diameter = 420 mm | |
| 14. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|--|--|-----------|------|---------------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Disconnector Disconnector with earthing switch Load break switch Load break switch with earthing switch | ONM III SA 24/4S OUNM III SA 24/4S RNM III SA 24/4S RUNM III SA 24/4S | 1 | pcs. | ALPAR | Modular switches in horizontal configuration with silicone insulation (other choices: porcelain, composite) |
| 2. | Manual drive | NRA E-... w.l NRAu E-... w.l | 1 | set | ALPAR | For switch without earthing switch / specify pole length For switch with earthing switch / specify pole length |
| 11. | Surge arrester | ... | 6 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Terminal clamp for AsXSn | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | To be used for the installation of overhead low- voltage circuit outputs – the number of conduits depends on the number of circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | Use for station-mounted switchboard |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 20. | LV disconnector DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 25. | Cable termination | CHE-F 24kV 25-150 CHE-F 24kV 70-240 CHEP(H)-3F 24kV 50-150 CHEP(H)-3F 24kV 70-240 | 1 | set | CELLPACK / ALPAR | For 3 x 1-core cable For 3 x 1-core cable For 3-core cable type HAKnFtA For 3-core cable type HAKnFtA |
| 26. | MV cable clamp | U1032 | 3 | pcs. | ALPAR | Triple, for MV cable fastening |
| 27. | Protective tube | BE110 | 3 | m | ... / ALPAR | For MV cable shielding |
| 28. | Heat-shrinkable three-core breakout | SEH-3_110 | 1 | pcs. | CELLPACK / ALPAR | |
| 29. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

STEKr-20/...

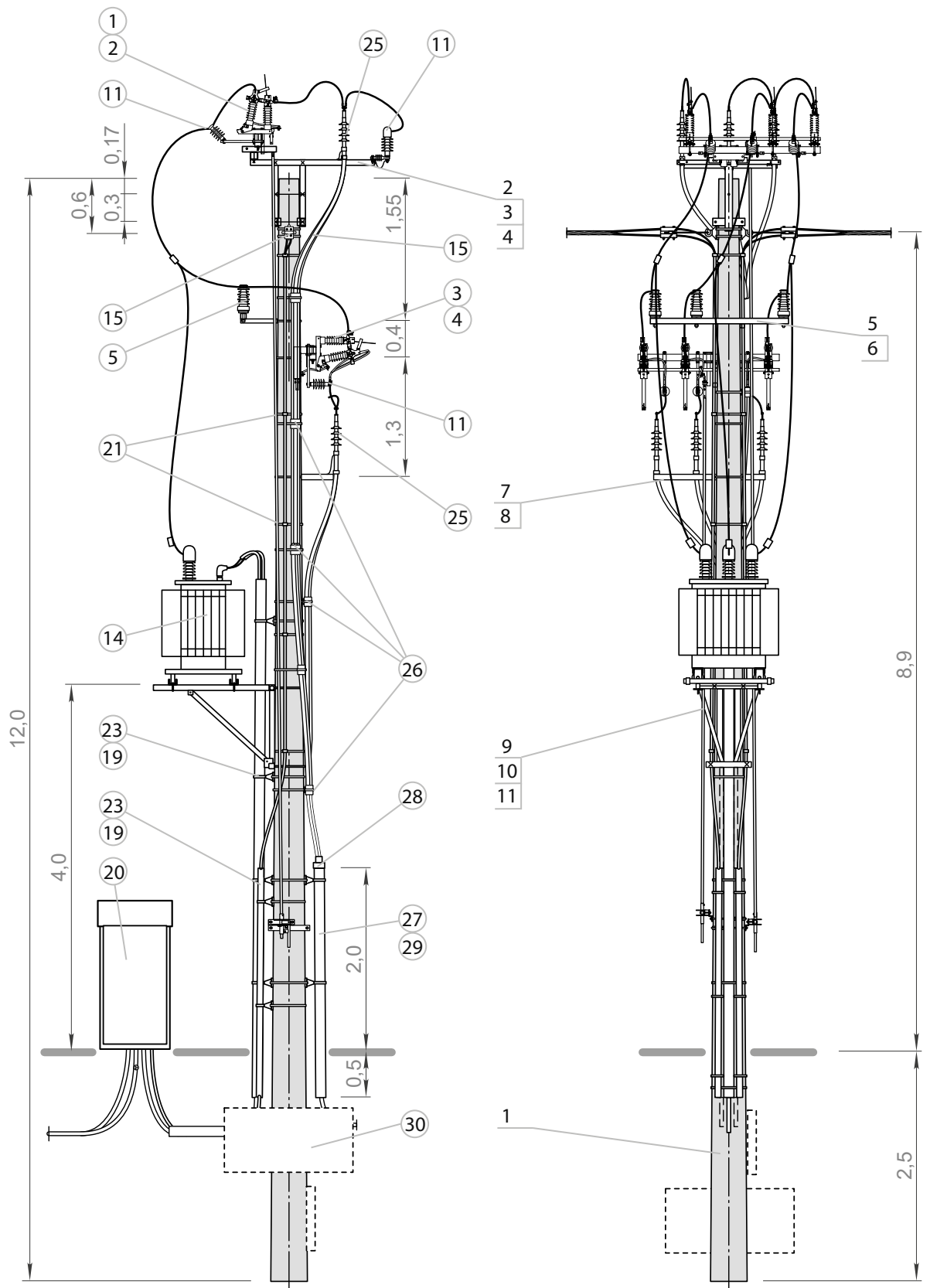


List of structures, accessories, apparatus for STEK2r-20/...

| STRUCTURES | | | | | | |
|------------|-------------------------------------|---|----------|------|-----------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 |
| 2. | Structure for the load break switch | KON-4/E KON-3/E | 1 | pcs. | ALPAR | For poles with top diameter = 420 mm For poles with top diameter = 218 mm and 263 mm |
| 3. | Mounting bolts | M16x480+N+Po+Ps M16x320+N+Po+Ps M16x280+N+Po+Ps | 2 | set | ALPAR | For KON-4/E with top diameter = 420 mm For KON-3/E with top diameter = 263 mm For KON-3/E with top diameter = 218 mm |
| 4. | Mounting bolts | M16x100+N+Po+Ps | 2 | set | ALPAR | To mount the modular disconnecter (mounting details for other disconnectors on linear crossarms is included in book 4) |
| 5. | Structure for insulators | KIZ-6b/E KIZ-6a/E | 1 | pcs. | ALPAR | For poles with top diameter = 420 mm For poles with top diameter = 218 mm and 263 mm |
| 6. | Bracket | OB-16/E OB-9/E OB-7/E | 1 | pcs. | ALPAR | To KIZ-6b/E for poles with top diameter = 420 mm To KIZ-6a/E for poles with top diameter = 263 mm To KIZ-6a/E for poles with top diameter = 218 mm |
| 7. | Structure for cable terminations | KG-2/A-420/E KG-2/A-263/E KG-2/A/E | 1 | pcs. | ALPAR | Structures adapted to modular connectors. For frame-type installations, KGK-1 must be ordered |
| 8. | Bracket | OB-14/E OB-8/E OB-7/E | 1 | pcs. | ALPAR | For poles with top diameter = 420 mm For poles with top diameter = 263 mm For poles with top diameter = 218 mm |
| 9. | Structure for the transformer | KTZ-2a/E KTZ-3a /E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA |
| 10. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm |
| 11. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 |

| APPARATUS AND ACESORIES | | | | | | |
|-------------------------|--|--|----------|------|---------------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Disconnector Load break switch | ONM III SA 24/4S o RNM III SA 24/4S o | 1 | pcs. | ALPAR | Modular switches in horizontal configuration with silicone insulation and a dedicated structure for MV surge arresters (other choices: porcelain, composite) |
| 2. | Manual drive | NRA E-... w.I | 1 | set | ALPAR | For a connector without an earthing switch mounted at the apex of the station / add the length of the pole |
| 3. | Disconnector Load break switch | ONMp III SA 24/4S o RNMP III SA 24/4S o | 1 | pcs. | ALPAR | Modular switches in horizontal configuration with silicone insulation (other choices: porcelain, composite) |
| 4. | Manual drive | NRA E-... w.II | 1 | set | ALPAR | For a connector without an earthing switch mounted directly to station poles / specify pole length |
| 5. | Supporting insulator | LWP-8/24 M24x105 LWP-8/24S M24x105 | 3 | pcs. | ALPAR | |
| 11. | Surge arrester | ... | 6 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Terminal clamp for AsXS _n | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 20. | DB switchboard | ... | 1 | pcs. | ... / ALPAR | Free-standing, to be selected individually by an authorised designer |
| 21. | Conduit clamp | U103T U203T | 4 | pcs. | ALPAR | Use when installing overhead LV branch circuits. The clamps should be selected according to the number of LV branch points. |
| 23. | Overhead conduit for low- voltage outputs | BE110 | 3 | m | ... / ALPAR | |
| 23. | LV outgoing cable protective tube | BE110 | 6 | m | ... / ALPAR | For routing LV cables to the switchboard |
| 25. | Cable termination | CHE-F 24kV 25-150 CHE-F 24kV 70-240 CHEP(H)-3F 24kV 50-150 CHEP(H)-3F 24kV 70-240 | 2 | set | CELLPACK / ALPAR | For 3 x 1-core cable For 3 x 1-core cable For 3-core cable type HAKnFtA For 3-core cable type HAKnFtA |
| 26. | MV cable clamp | U1032 | 5 | pcs. | ALPAR | Triple, for MV cable fastening |
| 27. | Protective tube | BE110 | 3 | m | ... / ALPAR | |
| 28. | Heat-shrinkable three-core breakout | SEH-3_110 | 1 | pcs. | CELLPACK / ALPAR | For MV cable shielding |
| 29. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

STEK2r-20/...

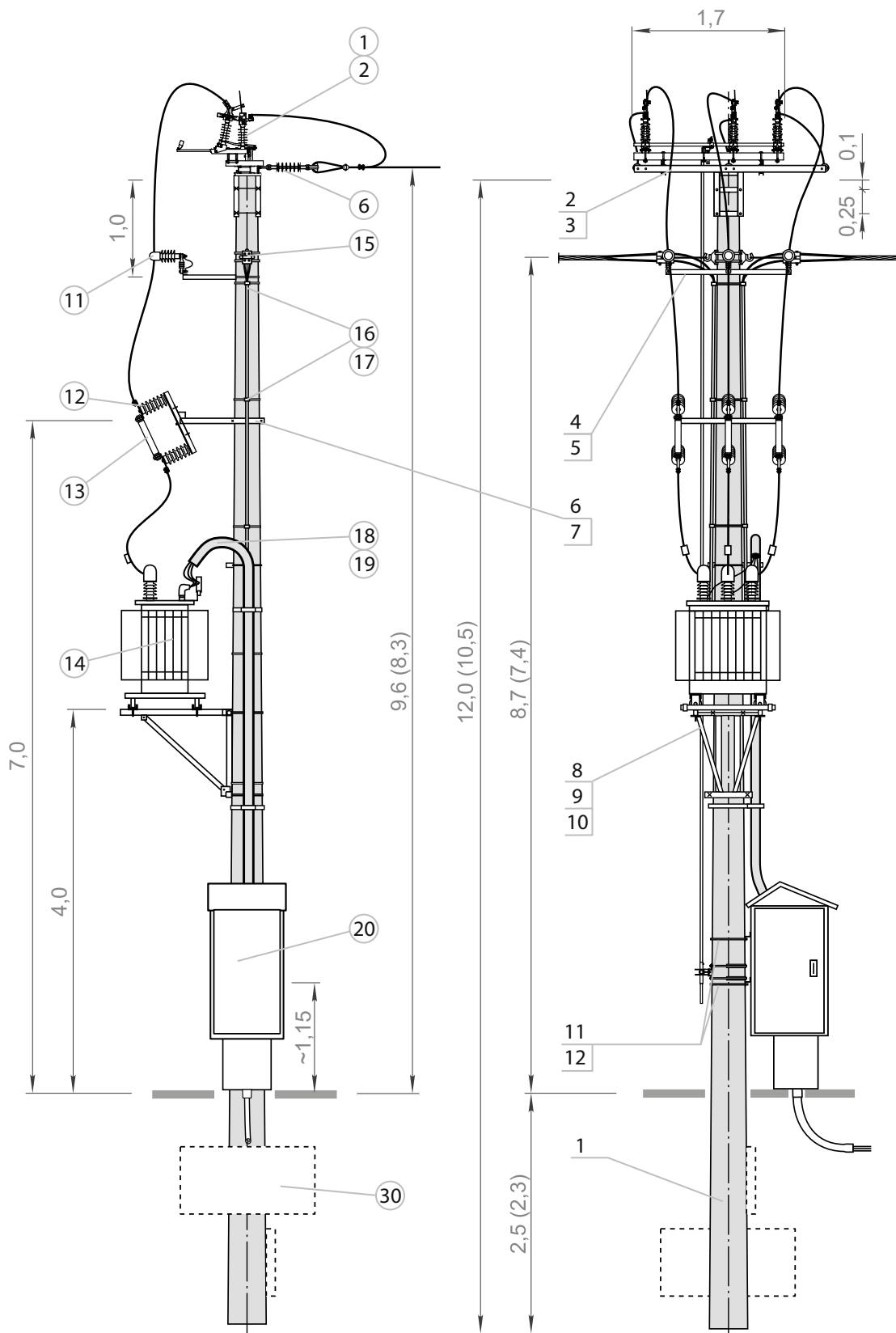


List of structures, accessories, apparatus for STEr-20/...f

| STRUCTURES | | | | | | |
|------------|--|---|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 |
| 2. | Station crossarm | PK-12/E | 1 | pcs. | ALPAR | MV N-line tension ≤ 20kN top diameter = 420 ≤ 12kN top diameter = 263 ≤ 20kN top diameter = 420 ≤ 13,5kN top diameter = 263 top diameter = 218 PAS cables AFL cables |
| | | PK-11a/E | | | | |
| | | PK-6a/E | | | | |
| | | PKZ-7/E | | | | |
| | | PKZ-6/E | | | | |
| | | PKZ-3b/E | | | | |
| | | PKZ-3a/E | | | | |
| 3. | Disconnecter structure | KO-7/P/E | 1 | pcs. | ALPAR | To mount the modular disconnecter (mounting details for other disconnectors on linear crossarms is included in book 4) |
| 4. | Structure for arresters | KOG-50/E | 1 | pcs. | ALPAR | top diameter = 218 top diameter = 263 top diameter = 420 Do not use when mounting arresters directly on the transformer |
| | | KOG-51/E | | | | |
| 5. | Bracket | OB-6/E OB-8/E OB-14/E | 1 | pcs. | ALPAR | To KOG-50/E for poles with top diameter = 218 mm To KOG-50/E for poles with top diameter = 263 mm To KOG-51/E for poles with top diameter = 420 mm |
| 6. | Structure for fuse bases | KBZA/E | 1 | pcs. | ALPAR | |
| 7. | Mounting bolts | M16x540+N+Po+Ps M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 420 mm For poles top diameter = 263 mm For poles top diameter = 218 mm |
| 8. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA |
| 9. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm |
| 10. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 |
| 11. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles top diameter = 218 mm, 263 mm For poles top diameter = 420 mm |
| 12. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm |

| APPARATUS AND ACCESORIES | | | | | | |
|--------------------------|--|--|-----------|------|-----------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Disconnecter Disconnecter with earthing switch Load break switch Load break switch with earthing switch | ONM III SA 24/4S OUNM III SA 24/4S RNM III SA 24/4S RUNM III SA 24/4S | 1 | pcs. | ALPAR | Modular switches in horizontal configuration with silicone insulation (other choices: porcelain, composite) |
| 2. | Manual drive | NRA E-... w.I NRAu E-... w.I | 1 | set | ALPAR | For switch without earthing switch / specify pole length For switch with earthing switch / specify pole length |
| 6. | Insulator string | ŁO/1 ŁO2/1 ŁO/2 ŁO2/2 | 6 | set | ... / ALPAR | Single / double on porcelain insulators Single / double on silicone insulators |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 12. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - |
| | | With integrated MV arrester | | | | |
| 13. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | HH ... A 10/24kV "e"=442 mm | 3 | pcs. | SIBA / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Terminal clamp for AsXS _n | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | To be used for the installation of overhead low-voltage circuit outputs – the number of conduits depends on the number of circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | Use for station-mounted switchboard |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

STEr-20/...f

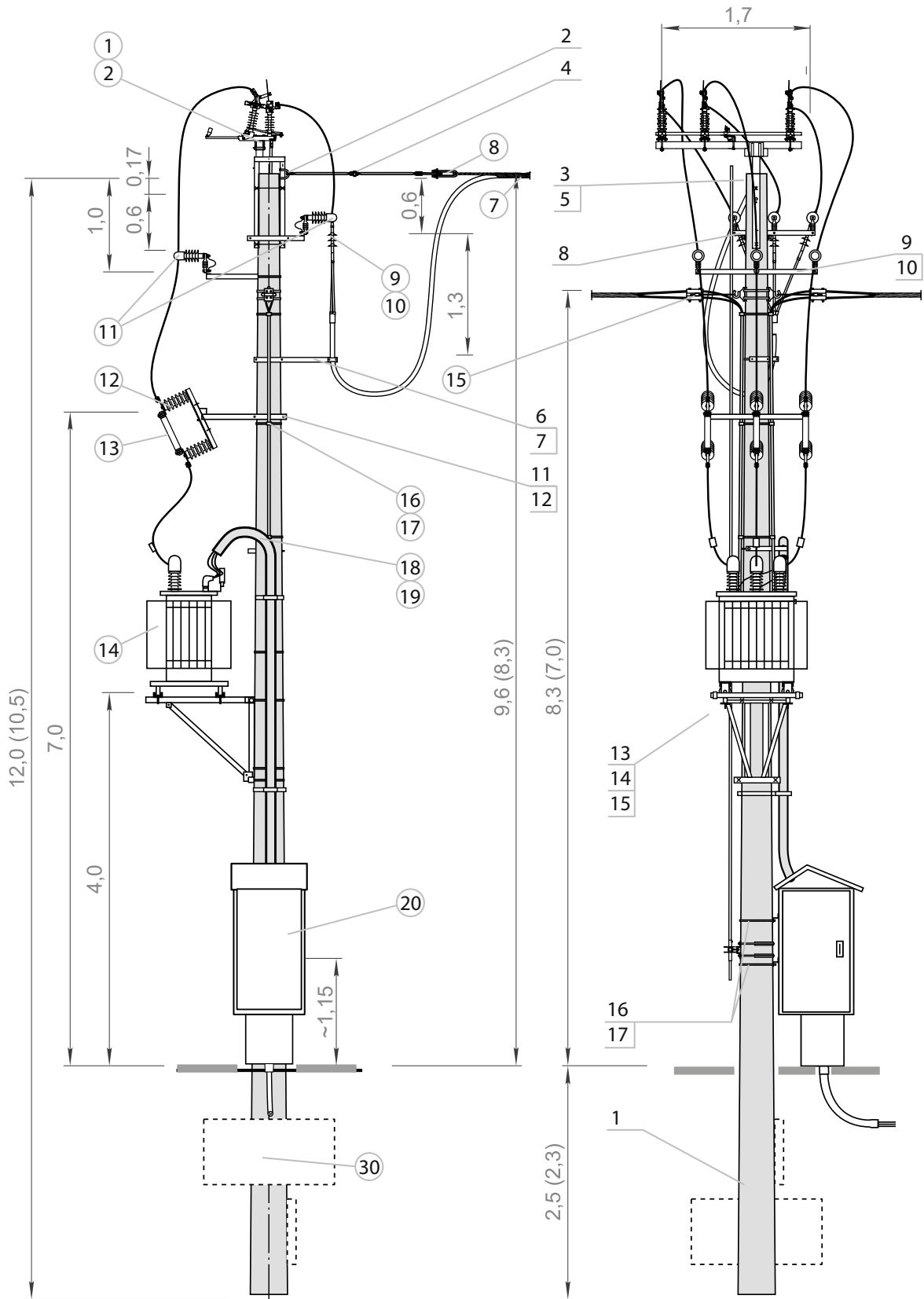


List of structures, accessories, apparatus for STEKsr-20/...f

| STRUCTURES | | | | | | |
|------------|--|---|----------|------|-----------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 |
| 2. | Strain hanger | 41111/E | 1 | pcs. | ALPAR | For fastening with Gi |
| 3. | Pole head | Gi-5a/E Gi-3a /E Gi-2a /E | 1 | pcs. | ALPAR | For poles top diameter = 420 mm For poles top diameter = 263 mm For poles top diameter = 218 mm |
| 4. | Single-clevis connector L-450 | 38431/E | 2 | pcs. | ALPAR | |
| 5. | Mounting bolts | M16x100+N+Po+Ps | 2 | set | ALPAR | For mounting the modular disconnector (details on mounting other disconnectors on line crossarms are provided in book 4) |
| 6. | Spacer structure | KD-1b/E KD-1a/E | 1 | pcs. | ALPAR | For poles top diameter = 420 mm For poles top diameter = 218 mm; 263 mm |
| 7. | Bracket | OB-45/E OB-43/E OB-42/E | 1 | pcs. | ALPAR | To KD-1b/E for poles with top diameter = 420 mm To KD-1a/E for poles with top diameter = 263 mm To KD-1a/E for poles with top diameter = 218 mm |
| 8. | Structure for arresters | KOG-61/E KOG-60/E KOG-17a/E | 1 | set | ALPAR | Poles: top diameter = 420 mm Poles: top diameter = 218.263 mm Supplied complete with KOG-61/E or KOG-60/E |
| 9. | Structure for arresters | KOG-51/E KOG-50/E | 1 | set | ALPAR | For poles top diameter = 420 mm For poles top diameter = 218 mm, 218 mm |
| 10. | Bracket | OB-6/E OB-8/E OB-14/E | 1 | pcs. | ALPAR | To KOG-50/E for poles with top diameter = 218 mm To KOG-50/E for poles with top diameter = 263 mm To KOG-51/E for poles with top diameter = 420 mm |
| 11. | Structure for fuse bases | KBZA/E | 1 | pcs. | ALPAR | |
| 12. | Mounting bolts | M16x540+N+Po+Ps M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 420 mm For poles top diameter = 263 mm For poles top diameter = 218 mm |
| 13. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA |
| 14. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm |
| 15. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 |
| 16. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles top diameter = 218 mm, 263 mm For poles top diameter = 420 mm |
| 17. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|--|--|-----------|--------------|-----------------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Disconnector Disconnector with earthing switch Load break switch Load break switch with earthing switch | ONM III SA 24/4S OUNM III SA 24/4S RNM III SA 24/4S RUNM III SA 24/4S | 1 | pcs. | ALPAR | Modular switches in horizontal configuration with silicone insulation (other choices: porcelain, composite) |
| 2. | Manual drive | NRA E-... w.l NRAu E-... w.l | 1 | set | ALPAR | For switch without earthing switch / specify pole length For switch with earthing switch / specify pole length |
| 7. | Guy grip dead-end | ... | 1 | pcs. | ... / ALPAR | |
| 8. | Guy strain clamp | ŁO-001/SN | 1 | pcs. | ALPAR | |
| 9. | Overhead cable termination 3-phase | ... | 1 | pcs. | ... / ALPAR | Adapt to cable cross section |
| 10. | Cable head termination | ... | 3 | pcs. | ... / ALPAR | Adapt to cable cross section |
| 11. | Surge arrester | ... | 6 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 12. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - With integrated MV arrester |
| 13. | Fuse link | WBGn 17,5 HH ... A 10/24kV "e"=442 mm | 3 3 | pcs. pcs. | ZRE / ALPAR SIBA / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link The value and type of arrester shall be determined by an authorised designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Terminal clamp for AsXSn | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | To be used when installing overhead LV circuit outputs - the number of conduits depends on the number of circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | Use for station-mounted switchboard |
| 20. | LV disconnector DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

STEKsr-20/...f

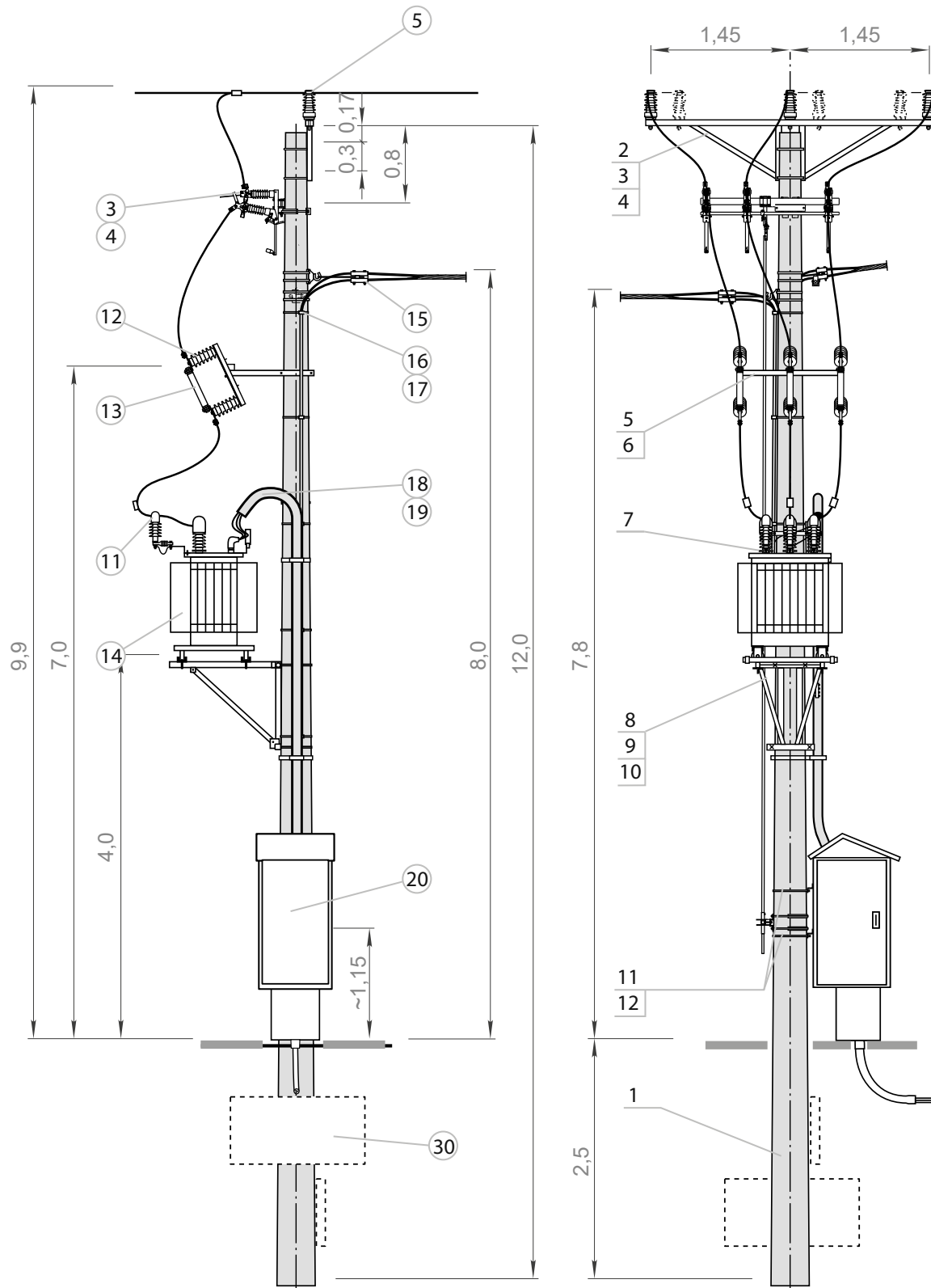


List of structures, accessories, apparatus for STEPr-20/.../1f

| STRUCTURES | | | | | | | | | |
|---------------------|--|---|-------------------------|------|-----------------|--|--------------------|------------|------------|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes | | | |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 | | | |
| 2. | Through-type station crossarm | PP-3b/E PP-2b/E | 1 | pcs. | ALPAR | inclin- ation 1° 0° cross- section 50-70 (for short spans) 50-70 | top diameter = 420 | PAS cables | |
| | | PP-3a/E PP-2a/E | | | | | top diameter = 263 | | |
| | | PP-3a/E PP-2a/E | | | | | top diameter = 218 | | |
| | | PPZ-3a/E PP-51a/E | | | | | top diameter = 420 | | AFL cables |
| | | PPZ-2a/E PP-56a/E | | | | | top diameter = 263 | | |
| PPZ-1a/E PP-57a/E | top diameter = 218 | | | | | | | | |
| 3. | Bracket | OG-13/E OB-14/E OG-12/E OB-7/E OG-5/E OB-3/E | 2 1 | pcs. | ALPAR | To PPZ-3a/E, PP-57a/E To PPZ-2a/E, PP-56a/E To PPZ-1a/E, PP-51a/E | | | |
| 4. | Mounting bolts | M16x560 M16x480 M16x400 M16x330 M16x350 M16x280 | 2 1 2 1 2 1 | set | ALPAR | For PP-3b/E and PP-2b/E For PP-3a/E and PP-2a/E For PP-3a/E and PP-2a/E PP-57a PP-56a PP-51a top diameter = 420 mm top diameter = 263 mm top diameter = 218 mm | | | |
| 5. | Structure for fuse bases | KBZA/E | 1 | pcs. | ALPAR | | | | |
| 6. | Mounting bolts | M16x540+N+Po+Ps M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 420 mm For poles top diameter = 263 mm For poles top diameter = 218 mm | | | |
| 7. | Structure for arresters | KOG/T | 3 | pcs. | ALPAR | Direct attachment to the transformer | | | |
| 8. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA | | | |
| 9. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a for poles with top diameter = 420 mm To KTZ-3a for poles with top diameter = 420 mm | | | |
| 10. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 | | | |
| 11. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles top diameter = 218 mm, 263 mm For poles top diameter = 420 mm | | | |
| 12. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm | | | |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|--|--|-----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 3. | Disconnecter Disconnecter with earthing switch Load break switch Load break switch with earthing switch | ONMp III SA 24/4S OUNMp III SA 24/4S RNMP III SA 24/4S RUNMp III SA 24/4S | 1 | pcs. | ALPAR | Modular switches in horizontal configuration with silicone insulation (other choices: porcelain, composite) |
| 4. | Manual drive | NRA E-... w.I NRAu E-... w.I | 1 | set | ALPAR | For switch without earthing switch / specify pole length For switch with earthing switch / specify pole length |
| 5. | Supporting insulator | LWP-8/24 M24x105 LWP-8/24S M24x105 | 3 | pcs. | ALPAR | Bare line — for 1° inclination, use 6 pcs. PAS line — for 1° inclination, use 6 pcs. |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 12. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - With integrated MV arrester |
| 13. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | HH ... A 10/24kV "e"=442 mm | 3 | pcs. | SIBA / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Terminal clamp for AsXSn | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits - number of conduits depends on the number of circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | Use for station-mounted switchboard |
| 20. | LV disconnecter DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

STEPr-20/.../1f

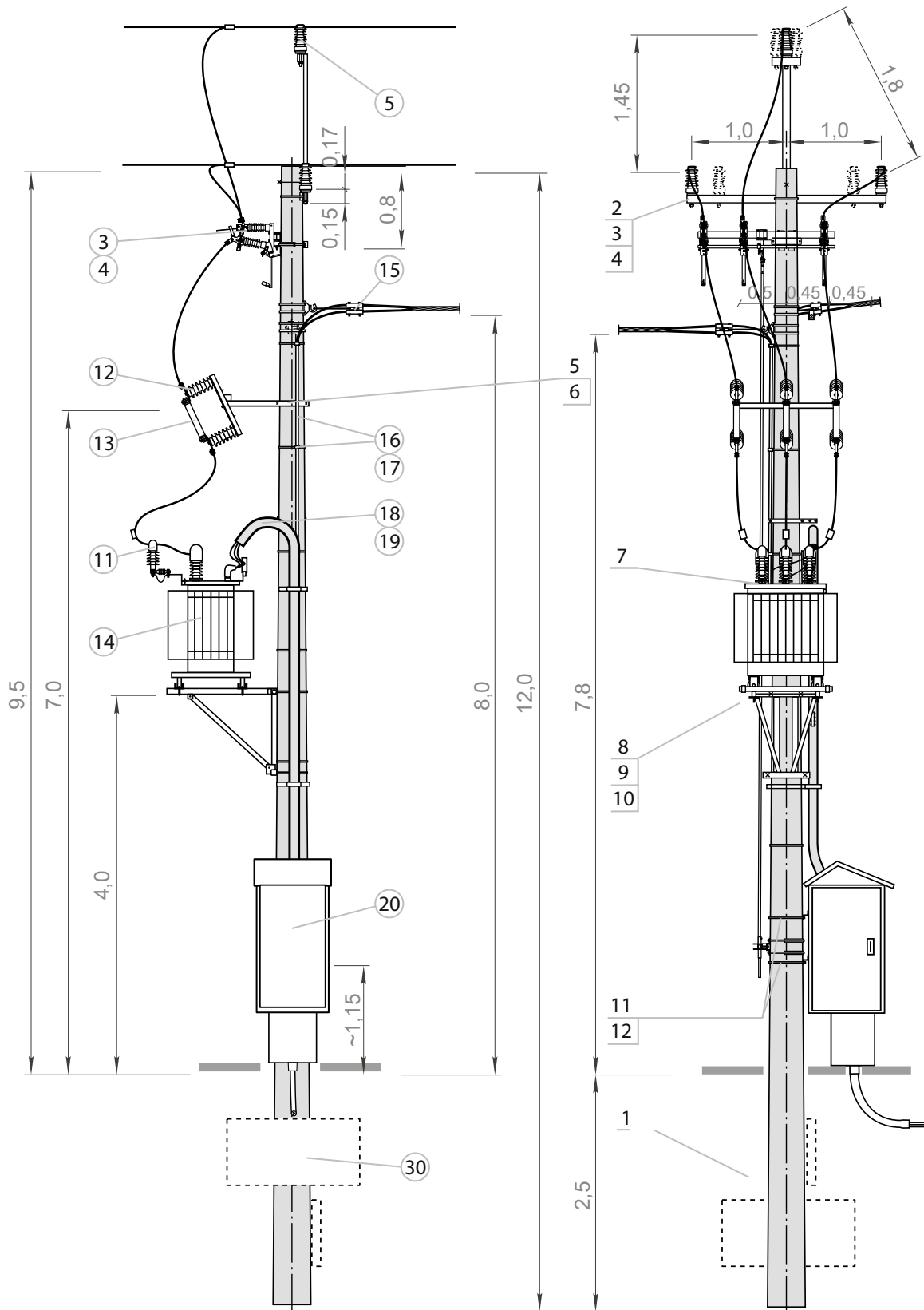


List of structures, accessories, apparatus for STEPr-20/.../2f

| STRUCTURES | | | | | | |
|-------------|--|---|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / - | 3 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 |
| 2. | Through-type station crossarm | PP-331d/2/E | 1 | pcs. | ALPAR | inclination 1° top diameter = 420 top diameter = 263 top diameter = 218 0° top diameter = 420 top diameter = 263 top diameter = 218 AFL cables 35, 50, 70 |
| | | PP-331c/2/E | | | | |
| | | PP-331b/2/E | | | | |
| | | PP-311d/2/E | | | | |
| | | PP-311c/2/E | | | | |
| PP-311b/2/E | | | | | | |
| 3. | Bracket | OB-14/E OB-7/E OB-3/E | 1 | pcs. | ALPAR | For PP-311d/2/E and PP-331d/2/E top diameter = 420 mm For PP-311c/2/E and PP-331c/2/E top diameter = 263 mm For PP-311b/2/E and PP-331b/2/E top diameter = 218 mm |
| 4. | Mounting bolts | M16x480 M16x330 M16x280 | 1 | set | ALPAR | For PP-311d/2/E and PP-331d/2/E top diameter = 420 mm For PP-311c/2/E and PP-331c/2/E top diameter = 263 mm For PP-311b/2/E and PP-331b/2/E top diameter = 218 mm |
| 5. | Structure for fuse bases | KBZA/E | 1 | pcs. | ALPAR | |
| 6. | Mounting bolts | M16x540+N+Po+Ps M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles top diameter = 420 mm For poles top diameter = 263 mm For poles top diameter = 218 mm |
| 7. | Structure for arresters | KOG/T | 3 | pcs. | ALPAR | Direct attachment to the transformer |
| 8. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA |
| 9. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm |
| 10. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 |
| 11. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles top diameter = 218 mm, 263 mm For poles top diameter = 420 mm |
| 12. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To RS for poles with top diameter = 218 mm To RS for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm |

| APPARATUS AND ACCESORIES | | | | | | |
|--------------------------|--|--|-----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 3. | Disconnector Disconnector with earthing switch Load break switch Load break switch with earthing switch | ONMp III SA 24/4S OUNMp III SA 24/4S RNMP III SA 24/4S RUNMp III SA 24/4S | 1 | pcs. | ALPAR | Modular switches in horizontal configuration with silicone insulation (other choices: porcelain, composite) |
| 4. | Manual drive | NRA E-... w.I NRAu E-... w.I | 1 | set | ALPAR | For switch without earthing switch / specify pole length For switch with earthing switch / specify pole length |
| 5. | Supporting insulator | LWP-8/24 M24x105 LWP-8/24S M24x105 | 3 | pcs. | ALPAR | Bare line — for 1° inclination, use 6 pcs. PAS line — for 1° inclination, use 6 pcs. |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 12. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - |
| | | With integrated MV arrester | | | | |
| 13. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / ALPAR | A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link |
| | | HH ... A 10/24kV "e"=442 mm | | | SIBA / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Terminal clamp for AsXSn | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits - number of conduits depends on the number of circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | Use for station-mounted switchboard |
| 20. | LV disconnector DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

STEPr-20/.../2f

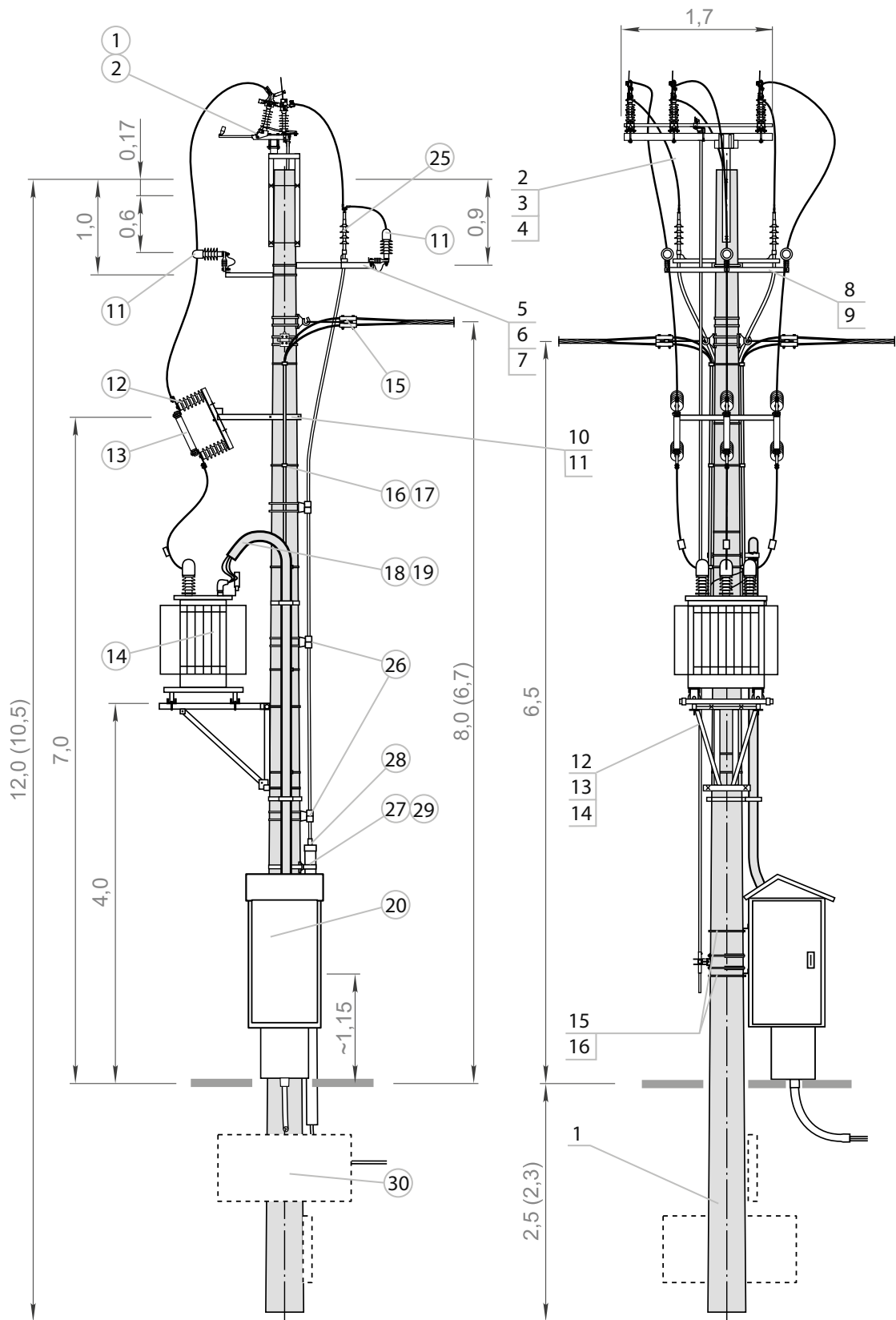


List of structures, accessories, apparatus for STEKr-20/...f

| STRUCTURES | | | | | | |
|------------|--|---|----------|------|-----------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 |
| 2. | Structure for the load break switch | KON-2/E KON-1/E | 1 | pcs. | ALPAR | For poles with top diameter = 420 mm For poles with top diameter = 218 mm and 263 mm |
| 3. | Mounting bolts | M16x460+N+Po+Ps M16x310+N+Po+Ps M16x260+N+Po+Ps | 2 | set | ALPAR | top diameter = 420 mm top diameter = 263 mm top diameter = 218 mm |
| 4. | Mounting bolts | M16x100+N+Po+Ps | 2 | set | ALPAR | To mount the modular disconnector (mounting details for other disconnectors on linear crossarms is included in book 4) |
| 5. | Structure for cable terminations | KGK-13/E | 1 | pcs. | ALPAR | For one 3 x 1-phase cable |
| | | KGK-12a/E | | | | top diameter = 420 mm |
| | | KGK-11a/E | | | | top diameter = 263 mm |
| | | KGK-113/E | | | | top diameter = 218 mm |
| | | KGK-112a/E | | | | For two 6 x 1-phase cables |
| | | KGK-111a/E | | | | top diameter = 420 mm top diameter = 263 mm top diameter = 218 mm |
| 6. | Bracket | OB-16/E OB-10/E OB-7/E | 1 | pcs. | ALPAR | For KGK-13/E, KGK-113/E top diameter = 420 mm For KGK-12a/E, KGK-112a/E top diameter = 263 mm For KGK-11a/E, KGK-111a/E top diameter = 218 mm |
| 7. | Structure for arresters | KOG-62a/E | 1 | pcs. | ALPAR | Mounted to the KGK structure |
| 8. | Structure for arresters | KOG-51/E KOG-50 /E | 1 | pcs. | ALPAR | For poles with top diameter = 420 mm For poles with top diameter = 218 mm and 263 mm |
| 9. | Bracket | OB-14/E OB-8/E OB-6/E | 1 | pcs. | ALPAR | For poles with top diameter = 420 mm For poles with top diameter = 263 mm For poles with top diameter = 218 mm |
| 10. | Structure for fuse bases | KBZA/E | 1 | pcs. | ALPAR | |
| 11. | Mounting bolts | M16x540+N+Po+Ps M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles o top diameter = 420 mm For poles o top diameter = 263 mm For poles o top diameter = 218 mm |
| 12. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA |
| 13. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm |
| 14. | Bracket | OS-22/E OS-23/E OS-24 /E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 |
| 15. | Mounting structure for the switchboard | KSZ-8a/E KSZ-9/E | 2 | pcs. | ALPAR | For poles top diameter = 218 mm, 263 mm For poles top diameter = 420 mm |
| 16. | Bracket | OB-10/E OB-12/E OB-18/E | 2 | pcs. | ALPAR | To DB for poles with top diameter = 218 mm To DB for poles with top diameter = 263 mm To RS for poles with top diameter = 420 mm |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|--|--|-----------|------|------------------|---|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Disconnector Disconnector with earthing switch Load break switch Load break switch with earthing switch | ONM III SA 24/4S OUNM III SA 24/4S RNM III SA 24/4S RUNM III SA 24/4S | 1 | pcs. | ALPAR | Modular switches in horizontal configuration with silicone insulation (other choices: porcelain, composite) |
| 2. | Manual drive | NRA E-... w.l NRAu E-... w.l | 1 | set | ALPAR | For switch without earthing switch / specify pole length For switch with earthing switch / specify pole length |
| 11. | Surge arrester | ... | 3 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 12. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 | 3 | pcs. | ALPAR | With integrated MV arrester |
| | | PBNVA-20/4 PBNVA-20/4 | | | | With integrated MV arrester |
| 13. | Fuse link | WBGn 17,5 | 3 | pcs. | ZRE / ALPAR | The WBGn fuse cover must be used with a Topik fuse of the appropriate amperage for the transformer |
| | | HH ... A 10/24kV "e"=442 mm | 3 | pcs. | SIBA / ALPAR | The value and type of arrester is determined by an authorized designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorized designer |
| 15. | Terminal clamp for AsXS _n | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 16. | Protective tube | RW-2 | 1 | set | ... / ALPAR | Use when installing overhead LV branch circuits - number of conduits depends on the number of circuits |
| 17. | Conduit clamp | U75W | 3 | pcs. | ALPAR | |
| 18. | Protective tube | RW-1 | 1 | set | ... / ALPAR | |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | Use for station-mounted switchboard |
| 20. | LV disconnector DB switchboard | ... | to 5 1 | pcs. | ... / ALPAR | To be individually selected by an authorised designer |
| 25. | Cable termination | CHE-F 24kV 25-150 CHE-F 24kV 70-240 CHEP(H)-3F 24kV 50-150 CHEP(H)-3F 24kV 70-240 | 1 | set | CELLPACK / ALPAR | For 3 x 1-core cable For 3 x 1-core cable For 3-core cable type HAKnFtA For 3-core cable type HAKnFtA |
| 26. | MV cable clamp | U1032 | 3 | pcs. | ALPAR | Triple, for MV cable fastening |
| 27. | Protective tube | BE110 | 3 | m | ... / ALPAR | |
| 28. | Heat-shrinkable three-core breakout | SEH-3_110 | 1 | pcs. | CELLPACK / ALPAR | For MV cable shielding |
| 29. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

STEKr-20/...f

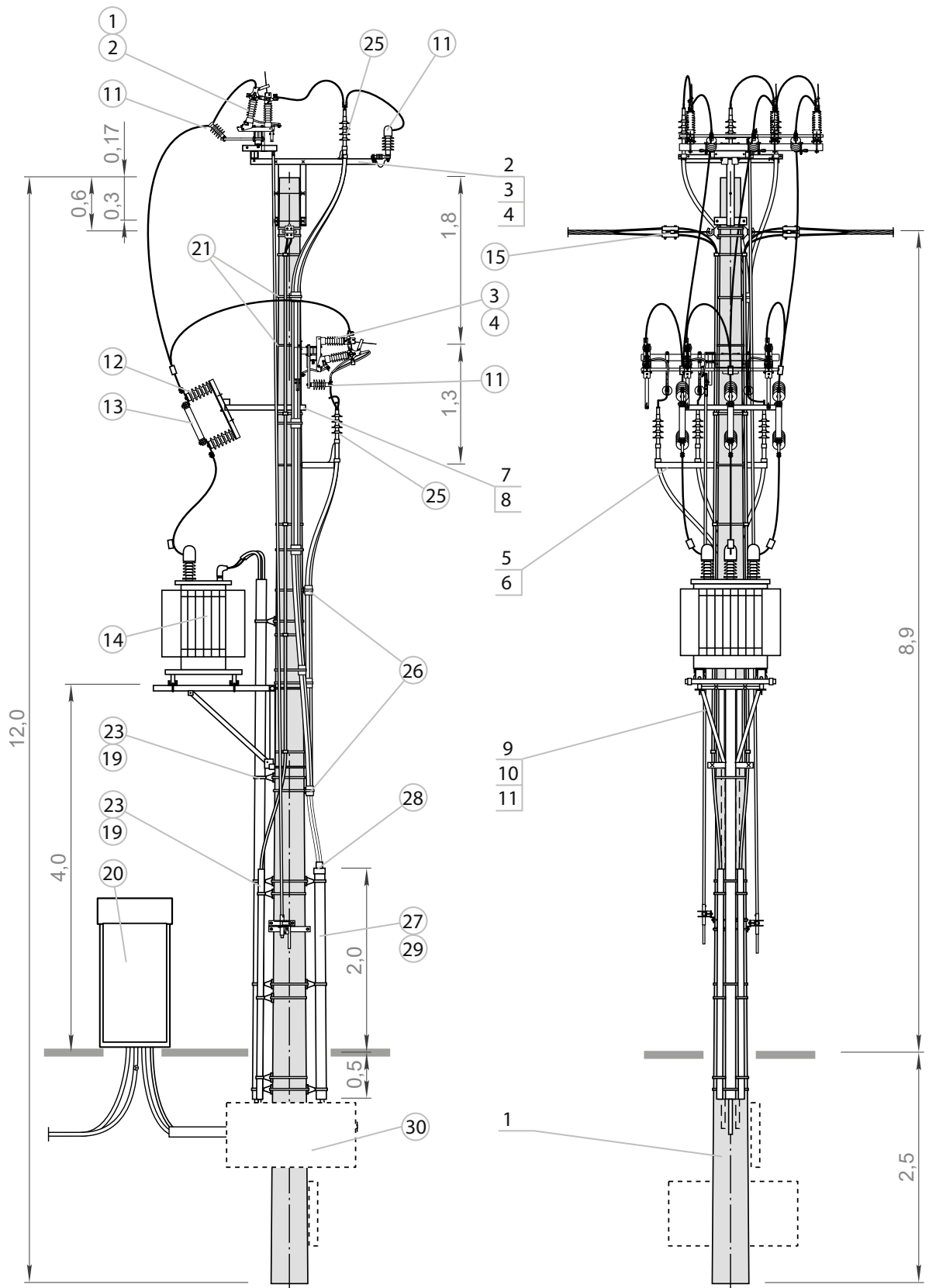


List of structures, accessories, apparatus for STEK2r-20/...f

| STRUCTURES | | | | | | |
|------------|-------------------------------------|---|----------|------|-----------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Spun pole | E- / _ | 1 | pcs. | ALPAR | Selection of pole type by an authorised designer - list of poles page 176 |
| 2. | Structure for the load break switch | KON-4 /E KON-3/E | 1 | pcs. | ALPAR | For poles with top diameter = 420 mm For poles with top diameter = 218 mm and 263 mm |
| 3. | Mounting bolts | M16x480+N+Po+Ps M16x320+N+Po+Ps M16x280+N+Po+Ps | 2 | set | ALPAR | For KON-4/E with top diameter = 420 mm For KON-3/E with top diameter = 263 mm For KON-3/E with top diameter = 218 mm |
| 4. | Mounting bolts | M16x100+N+Po+Ps | 2 | set | ALPAR | To mount the modular disconnector (mounting details for other disconnectors on linear crossarms is included in book 4) |
| 5. | Structure for cable terminations | KG-2/A-420/E KG-2/A-263/E KG-2/A/E | 1 | pcs. | ALPAR | Structures adapted to modular connectors. For frame-type installations, KGK-1 must be ordered |
| 6. | Bracket | OB-14/E OB-8/E OB-7/E | 1 | pcs. | ALPAR | For poles with top diameter = 420 mm For poles with top diameter = 263 mm For poles with top diameter = 218 mm |
| 7. | Structure for fuse bases | KBZA/E | 1 | pcs. | ALPAR | |
| 8. | Mounting bolts | M16x540+N+Po+Ps M16x380+N+Po+Ps M16x340+N+Po+Ps | 2 | set | ALPAR | For poles with top diameter = 420 mm For poles with top diameter = 263 mm For poles with top diameter = 218 mm |
| 9. | Structure for the transformer | KTZ-2a/E KTZ-3a/E KTZ-8/E | 1 | pcs. | ALPAR | Transformer from 25 kVA to 250 kVA Transformer 400 kVA Transformer 630 kVA |
| 10. | Structure for OCTs | KPT-2a/E KPT-2b/E | 1 | pcs. | ALPAR | To KTZ-2a/E for poles with top diameter = 420 mm To KTZ-3a/E for poles with top diameter = 420 mm |
| 11. | Bracket | OS-22/E OS-23/E OS-24/E | 2 | pcs. | ALPAR | Pole with top diameter = 218 for OCT assembly Pole with top diameter = 263 Pole with top diameter = 420 |

| APPARATUS AND ACCESSORIES | | | | | | |
|---------------------------|---|--|----------|--------------|-----------------------------|--|
| No. | Name | Type | Quantity | Unit | Man. / Distrib. | Notes |
| 1. | Disconnector Load break switch | ONM III SA 24/4S o RNM III SA 24/4S o | 1 | pcs. | ALPAR | Modular connectors in horizontal configuration with silicone insulation and dedicated structure for MV surge arresters (alternative options available: porcelain, composite) |
| 2. | Manual drive | NRA E-... w.I | 1 | set | ALPAR | For a connector without an earthing switch mounted on the apex of the station / specify the length of the pole |
| 3. | Disconnector Load break switch | ONMp III SA 24/4S o RNMP III SA 24/4S o | 1 | pcs. | ALPAR | Modular connectors in horizontal configuration with silicone insulation and their own structure for MV surge arresters (alternatives available: porcelain, composite) |
| 4. | Manual drive | NRA E-... w.II | 1 | set | ALPAR | For connector without earthing switch, directly mounted to station poles / specify pole length |
| 11. | Surge arrester | ... | 6 | pcs. | ... / ALPAR | The value and type of arrester shall be determined by an authorised designer |
| 12. | Fuse base | PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVoA-20/4 | 3 | pcs. | ALPAR | - With integrated MV arrester - With integrated MV arrester |
| 13. | Fuse link | WBGn 17,5 HH ... A 10/24kV "e"=442 mm | 3 3 | pcs. pcs. | ZRE / ALPAR SIBA / ALPAR | The WBGn fuse cover must be used with a Topik fuse of the appropriate amperage for the transformer The value and type of arrester shall be determined by an authorised designer |
| 14. | Overhead transformer | to 630 kVA ... / 0,42 | 1 | pcs. | ... / ALPAR | The value and type of transformer shall be determined by an authorised designer |
| 15. | Terminal clamp for AsXS _n | Z202 SPIN404 | ... | pcs. | ALPAR | Number and type of LV branch circuits as required |
| 19. | Conduit clamp | U110W | 2 | pcs. | ALPAR | |
| 20. | DB switchboard | ... | 1 | pcs. | ... / ALPAR | Free-standing, for individual selection by an authorised designer |
| 21. | Cable clamp | U103T U203T | 4 | pcs. | ALPAR | Use when installing overhead LV branch circuits. The clamps should be selected according to the number of LV branch points |
| 23. | Protective tube for overhead LV outputs | BE110 | 3 | m | ... / ALPAR | |
| 23. | LV outgoing cable protective tube | BE110 | 6 | m | ... / ALPAR | For routing LV cables to the switchboard |
| 25. | Cable termination | CHE-F 24kV 25-150 CHE-F 24kV 70-240 CHEP(H)-3F 24kV 50-150 CHEP(H)-3F 24kV 70-240 | 2 | set | CELLPACK / ALPAR | For 3 x 1-core cable For 3 x 1-core cable For 3-core cable type HAKnFtA For 3-core cable type HAKnFtA |
| 26. | MV cable clamp | U1032 | 2 | pcs. | ALPAR | Triple, for MV cable fastening |
| 27. | Protective tube | BE110 | 3 | m | ... / ALPAR | |
| 28. | Heat-shrinkable three-core breakout | SEH-3_110 | 1 | pcs. | CELLPACK / ALPAR | For MV cable shielding |
| 29. | Conduit clamp | U110W | 3 | pcs. | ALPAR | |
| 30. | Foundation support structure | ... | 1 | set | ALPAR | Selection of the type of foundation by an authorised designer according to STE Volume II, published by PTPIREE Poznań |

STEK2r-20/...f



CHAPTER 4

Overhead fuse bases

PBNVA-20/4

PBNVA-30/4

PBNWMA-24/50

PBNWMA-30/50

PBNVoA-20/4

PBNVoA-24/4

PBNVA-20/4 and PBNVA-30/4 overhead fuse bases

1. Characteristics and purpose

Fuse bases of type PBNVA-20/4, PBNVA-30/4 are designed for mounting of fuse-links of type WBGnp and OWBG. They are used in pole-mounted transformer stations as circuit protection.

The PBNVA bases can be equipped with an MV surge arrester with valid approval.

2. Types

*PBNVA-20/4
porcelain insulators*



*PBNVA-20/4K
composite insulators*



*PBNVA-20/4S
silicone insulators*



*PBNVA-30/4
porcelain insulators*



*PBNVA-30/4K
composite insulators*



*PBNVA-30/4S
silicone insulators*

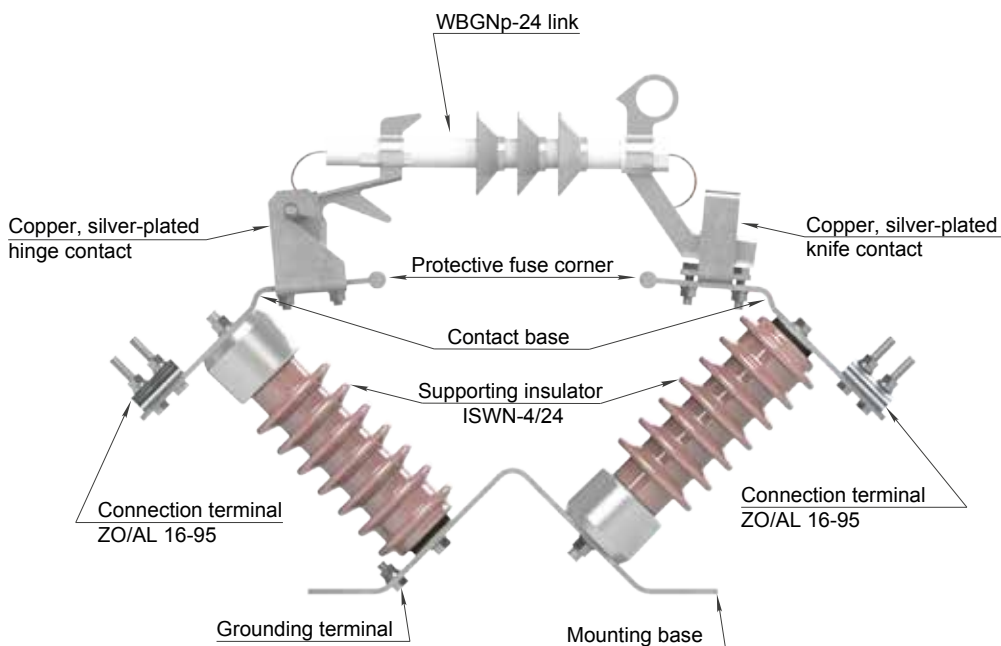


3. Application

PBNVA type bases are used as transformer protection in transformer stations.

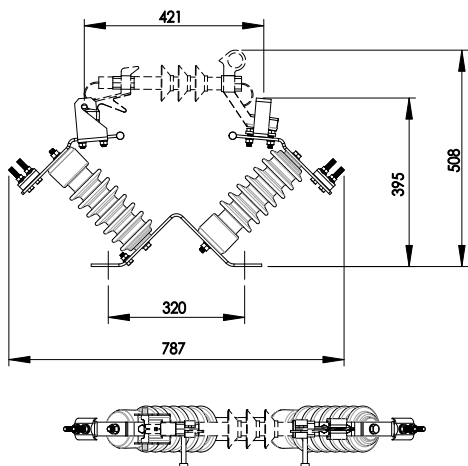


PBNVA-20/4
fuse base

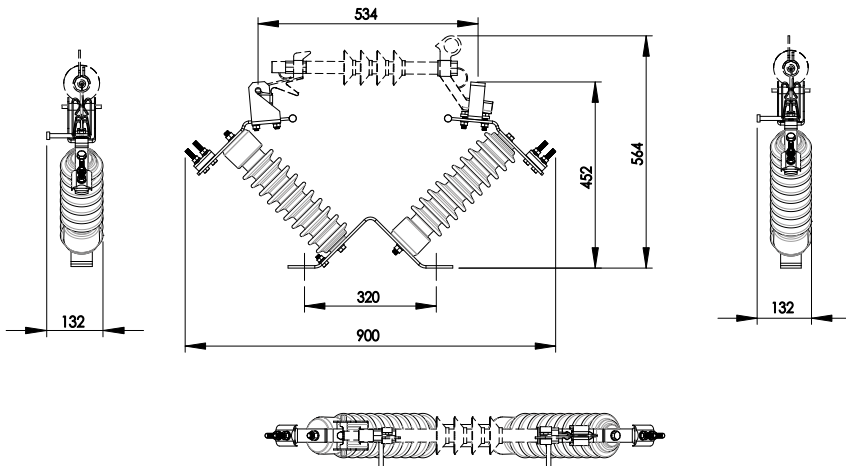


Basic dimensions

PBNVA-20/4 overhead fuse base



PBNVA-30/4 overhead fuse base



4. Technical data

| | | |
|--|---------|---------|
| 1. Rated voltage | 24 kV | 36 kV |
| 2. Rated frequency/number of phases | 50 Hz/3 | 50 Hz/3 |
| 3. Continuous rated current of the base | 25 A | 10 A |
| 4. Impulse withstand voltage of insulation: | | |
| ground / interground | 125 kV | 170 kV |
| inter-terminal | 145 kV | 190 kV |
| 5. Rated AC withstand voltage of insulation: | | |
| ground / interground | 50 kV | 70 kV |
| inter-terminal | 60 kV | 80 kV |

PBNWMA-24/50 and PBNWMA-30/50 overhead fuse bases

1. Characteristics and purpose

The PBNWMA 24/50 and PBNWMA 30/50 fuse bases are designed for mounting high-voltage cartridge fuses, e.g., HH type manufactured by SIBA. They are used in pole-mounted transformer stations as circuit protection devices.

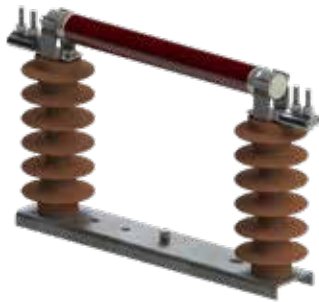
PBNWMA bases can be equipped with a medium-voltage surge arrester that holds a valid certificate.

2. Types

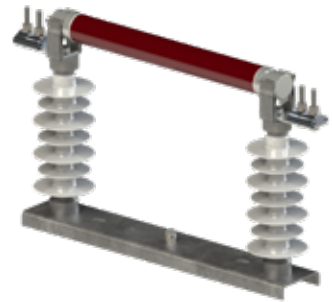
*PBNWMA-24/50
porcelain insulators*



*PBNWMA-24/50K
composite insulators*



*PBNWMA-24/50S
silicone insulators*



*PBNWMA-30/50
porcelain insulators*



*PBNWMA-30/50K
composite insulators*



*PBNWMA-30/50S
silicone insulators*

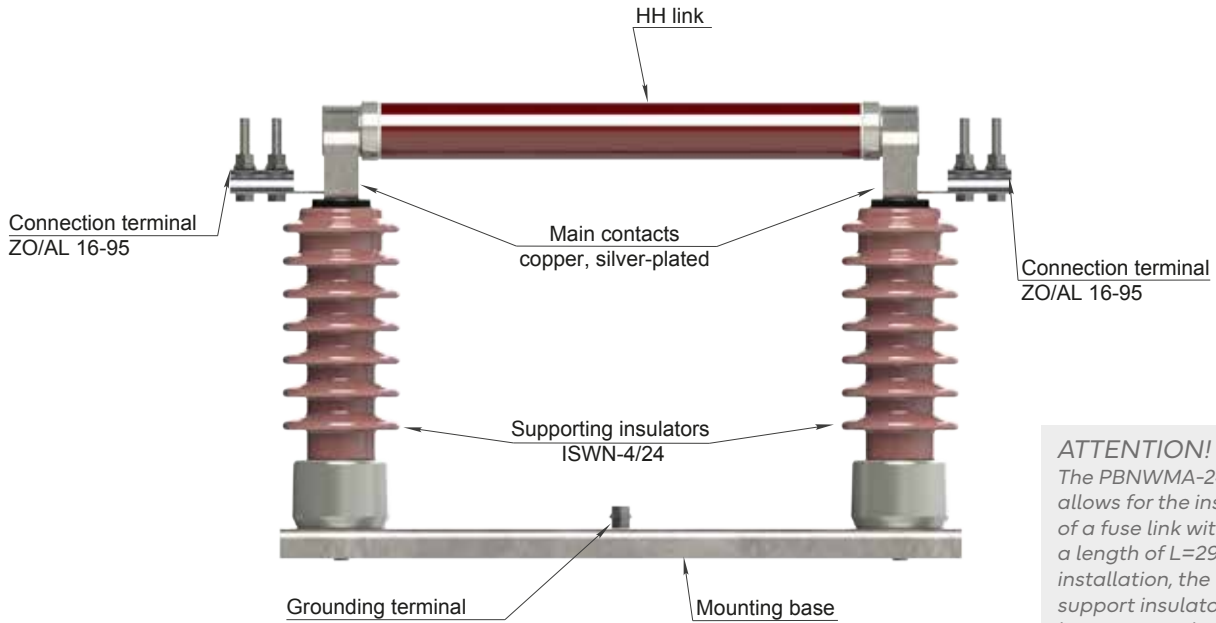


3. Application

PBNWMA-type bases are used to protect medium-voltage transformers and instrument transformers in transformer station.



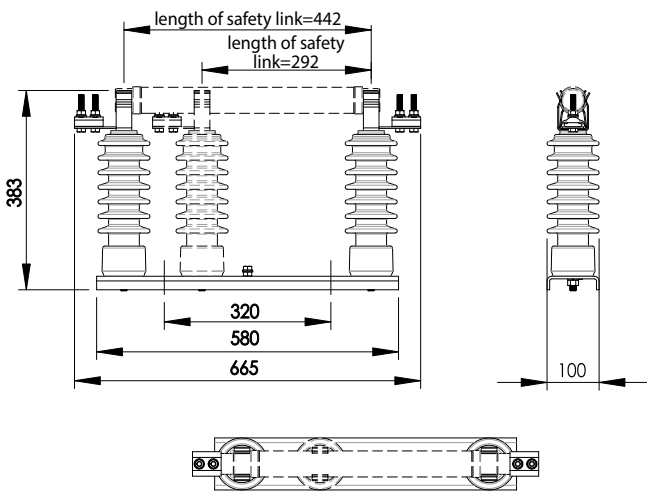
PBNWMA-24/50
fuse base



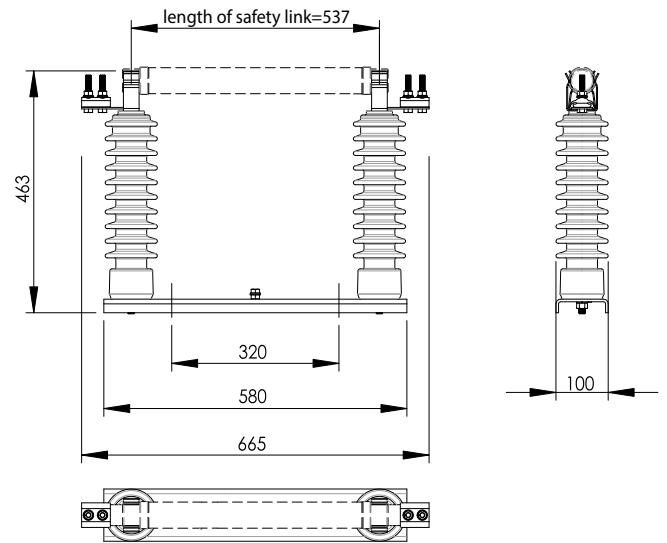
ATTENTION!
The PBNWMA-24/50 base allows for the installation of a fuse link with a length of $L=292$ mm. For installation, the left-hand support insulator must be unscrewed and screwed into the inner hole of the base using the same torsion elements.

Basic dimensions

PBNWMA-24/50 overhead fuse base



PBNWMA-30/50 overhead fuse base



4. Technical data

| | | |
|--|---------|---------|
| 1. Rated voltage | 24 kV | 36 kV |
| 2. Rated frequency/number of phases | 50 Hz/3 | 50 Hz/3 |
| 3. Continuous rated current of the base | 50 A | 50 A |
| 4. Impulse withstand voltage of insulation: | | |
| ground / interground | 125 kV | 170 kV |
| inter-terminal | 145 kV | 190 kV |
| 5. Rated AC withstand voltage of insulation: | | |
| ground / interground | 50 kV | 70 kV |
| inter-terminal | 60 kV | 80 kV |

PBNVoA-20/4 and PBNVoA-24/4 overhead fuse bases

1. Characteristics and purpose

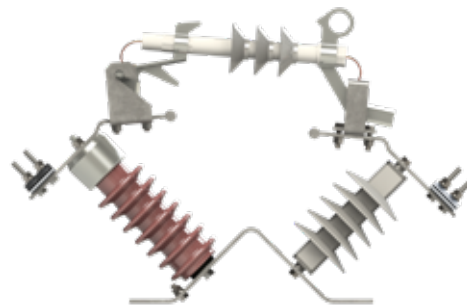
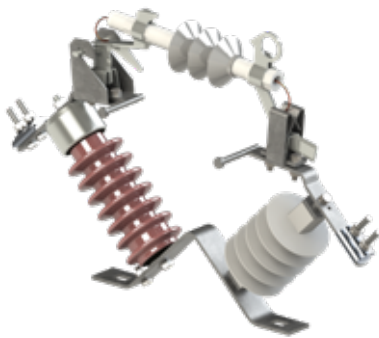
2. Types

PBNVoA-20/4

- porcelain/composite/silicone insulators
- fitted with a surge arrester for 15kV lines

PBNVoA-24/4

- porcelain/composite/silicone insulators
- fitted with a surge arrester for 20kV lines



3. Application

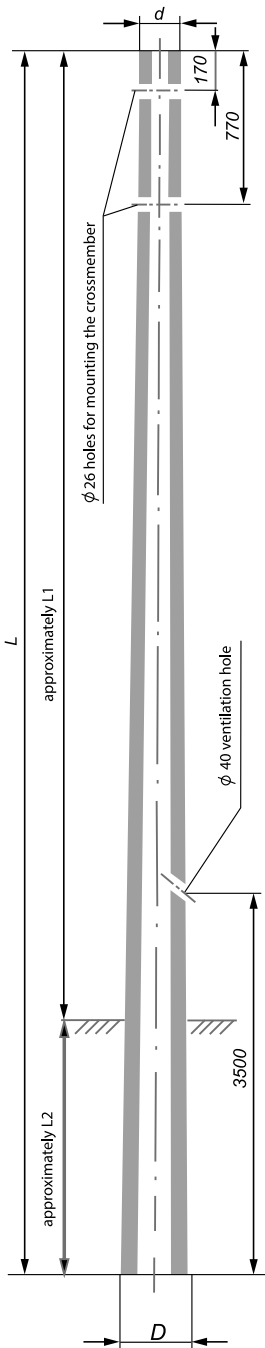
The PBNVoA type bases are used as transformer protection in transformer stations (they can be optionally equipped with a MV surge arrester in exchange for one of the support insulators)



CHAPTER 5

***Bill of supplementary materials for STRS,
STN and STE stations***

1. Spun poles type E



| No. | Pole type | Operating force kN | Weight in kg | Dimensions | | | | | Colour coding of forces |
|-----|-------------|--------------------|--------------|------------|------|-----|-----|-----|-------------------------|
| | | | | m | | | mm | | |
| | | | | L | L1 | L2 | d | D | |
| 1. | E 6,7/12 | 12,0 | 910 | 6,7 | 5,2 | 1,5 | 218 | 353 | yellow |
| 2. | E 7,5/12 | 12,0 | 1055 | 7,5 | 6,0 | 1,5 | 218 | 330 | yellow |
| 3. | E 7,5/15 | 15,0 | 1055 | 7,5 | 6,0 | 1,5 | 218 | 330 | green |
| 4. | E 8,2/4,3 | 4,3 | 990 | 8,2 | 6,7 | 1,5 | 218 | 341 | blue |
| 5. | E 8,2/6 | 6,0 | 990 | 8,2 | 6,6 | 1,6 | 218 | 341 | black |
| 6. | E 8,2/10 | 10,0 | 1100 | 8,2 | 6,6 | 1,6 | 218 | 341 | red |
| 7. | E 8,2/12 | 12,0 | 1150 | 8,2 | 6,6 | 1,6 | 218 | 341 | yellow |
| 8. | E 8,2/15 | 15,0 | 1150 | 8,2 | 6,6 | 1,6 | 218 | 341 | green |
| 9. | E 9/2,5 | 2,5 | 840 | 9,0 | 7,4 | 1,6 | 173 | 309 | white |
| 10. | E 9/4,3c | 4,3 | 930 | 9,0 | 7,4 | 1,6 | 173 | 309 | blue |
| 11. | E 9/4,3 | 4,3 | 1100 | 9,0 | 7,4 | 1,6 | 218 | 354 | black |
| 12. | E 9/6c | 6 | 990 | 9,0 | 7,4 | 1,6 | 173 | 309 | black |
| 13. | E 9/10 | 10 | 1300 | 9,0 | 7,2 | 1,8 | 218 | 354 | red |
| 14. | E 9/12 | 12 | 1300 | 9,0 | 7,2 | 1,8 | 218 | 354 | yellow |
| 15. | E 9/15 | 15 | 1300 | 9,0 | 7,2 | 1,8 | 218 | 354 | green |
| 16. | E 10,5/2,5 | 2,5 | 1100 | 10,5 | 8,7 | 1,8 | 173 | 330 | white |
| 17. | E 10,5/4,3c | 4,3 | 1100 | 10,5 | 8,5 | 2,0 | 173 | 330 | blue |
| 18. | E 10,5/4,3 | 4,3 | 1500 | 10,5 | 8,5 | 2,0 | 218 | 375 | blue |
| 19. | E 10,5/6c | 6,0 | 1100 | 10,5 | 8,5 | 2,0 | 173 | 330 | black |
| 20. | E 10,5/6 | 6,0 | 1500 | 10,5 | 8,5 | 2,0 | 218 | 375 | black |
| 21. | E 10,5/10 | 10,0 | 1600 | 10,5 | 8,3 | 2,2 | 218 | 375 | red |
| 22. | E 10,5/12 | 12,0 | 1600 | 10,5 | 8,3 | 2,2 | 218 | 375 | yellow |
| 23. | E 12/2,5 | 2,5 | 1400 | 12,0 | 10,0 | 2,0 | 173 | 375 | white |
| 24. | E 12/4,3c | 4,3 | 1450 | 12,0 | 9,8 | 2,2 | 173 | 353 | blue |
| 25. | E 12/4,3 | 4,3 | 1800 | 12,0 | 9,8 | 2,2 | 218 | 375 | blue |
| 26. | E 12/6c | 6,0 | 1450 | 12,0 | 9,8 | 2,2 | 173 | 353 | black |
| 27. | E 12/6 | 6,0 | 1800 | 12,0 | 9,8 | 2,2 | 218 | 398 | black |
| 28. | E 12/10 | 10,0 | 2000 | 12,0 | 9,5 | 2,5 | 218 | 398 | red |
| 29. | E 12/12 | 12,0 | 2050 | 12,0 | 9,5 | 2,5 | 218 | 398 | yellow |
| 30. | E 13,5/2,5 | 2,5 | 1650 | 13,5 | 11,3 | 2,2 | 173 | 375 | white |
| 31. | E 13,5/4,3c | 4,3 | 1700 | 13,5 | 11,1 | 2,4 | 173 | 375 | blue |
| 32. | E 13,5/4,3 | 4,3 | 2050 | 13,5 | 11,1 | 2,4 | 218 | 420 | blue |
| 33. | E 13,5/6 | 6,0 | 2050 | 13,5 | 11,0 | 2,5 | 218 | 420 | black |
| 34. | E 13,5/10 | 10,0 | 2500 | 13,5 | 10,8 | 2,7 | 218 | 420 | red |
| 35. | E 13,5/12 | 12,0 | 2500 | 13,5 | 10,8 | 2,7 | 218 | 420 | yellow |
| 36. | E 15/2,5 | 2,5 | 1900 | 15,0 | 12,5 | 2,5 | 173 | 398 | white |
| 37. | E 15/4,3c | 4,3 | 2100 | 15,0 | 12,3 | 2,7 | 173 | 398 | blue |
| 38. | E 15/4,3 | 4,3 | 2400 | 15,0 | 12,3 | 2,7 | 218 | 443 | blue |
| 39. | E 15/6 | 6,0 | 2400 | 15,0 | 12,2 | 2,8 | 218 | 443 | black |
| 40. | E 15/10 | 10,0 | 2900 | 15,0 | 12,0 | 3,0 | 218 | 443 | red |
| 41. | E 15/12 | 12,0 | 3000 | 15,0 | 12,0 | 3,0 | 218 | 443 | yellow |
| 42. | E 16,5/6 | 6,0 | 3250 | 16,5 | 13,5 | 3,0 | 218 | 465 | black |
| 43. | E 16,5/10 | 10,0 | 4190 | 16,5 | 13,5 | 3,0 | 263 | 511 | red |
| 44. | E 16,5/12 | 12,0 | 4350 | 16,5 | 13,5 | 3,0 | 263 | 511 | yellow |
| 45. | E 16,5/15 | 15,0 | 4350 | 16,5 | 13,5 | 3,0 | 263 | 511 | green |
| 46. | E 18/6 | 6,0 | 4100 | 18,0 | 15,0 | 3,0 | 218 | 488 | black |
| 47. | E 18/10 | 10,0 | 4750 | 18,0 | 15,0 | 3,0 | 263 | 533 | red |
| 48. | E 18/12 | 12,0 | 4950 | 18,0 | 15,0 | 3,0 | 263 | 533 | yellow |
| 49. | E 18/15 | 15,0 | 4950 | 18,0 | 15,0 | 3,0 | 263 | 533 | green |

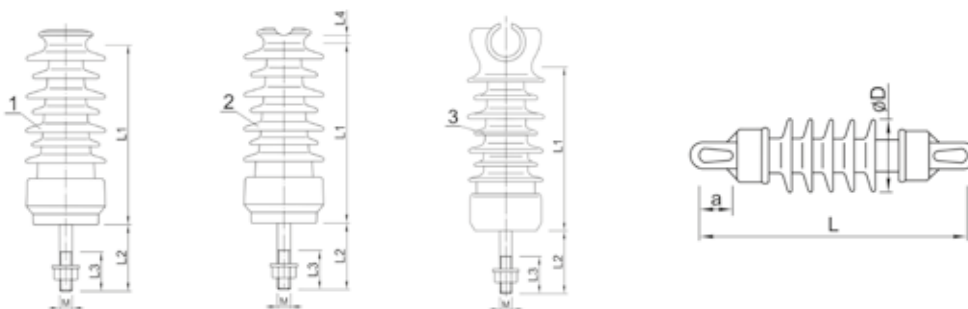
2. Spun poles type EM

| No. | Pole type | Operating force kN | Weight in kg | Dimensions | | | | | Colour coding of forces |
|-----|--------------|--------------------|--------------|------------|------|-----|-----|-------|-------------------------|
| | | | | m | | | mm | | |
| | | | | L | L1 | L2 | d | D | |
| 1. | EM 10,5/15 | 15,0 | 2150 | 10,5 | 8,3 | 2,2 | 263 | 420 | green |
| 2. | EM 10,5/17,5 | 17,5 | 2150 | 10,5 | 8,3 | 2,2 | 263 | 420 | yellow |
| 3. | EM 10,5/20 | 20,0 | 2150 | 10,5 | 8,3 | 2,2 | 263 | 420 | red |
| 4. | EM 10,5/25 | 25,0 | 2150 | 10,5 | 8,3 | 2,2 | 263 | 420 | purple |
| 5. | EM 10,5/35 | 35,0 | 4250 | 10,5 | 8,3 | 2,2 | 420 | 578 | white |
| 6. | EM 12/15 | 15,0 | 2600 | 12,0 | 9,5 | 2,5 | 263 | 443 | green |
| 7. | EM 12/17,5 | 17,5 | 2600 | 12,0 | 9,5 | 2,5 | 263 | 443 | yellow |
| 8. | EM 12/20 | 20,0 | 2600 | 12,0 | 9,5 | 2,5 | 263 | 443 | red |
| 9. | EM 12/25 | 25,0 | 2600 | 12,0 | 9,5 | 2,5 | 263 | 443 | purple |
| 10. | EM 12/33 | 33,0 | 5040 | 12,0 | 9,5 | 2,5 | 420 | 600 | white |
| 11. | EM 13,5/15 | 15,0 | 3080 | 13,5 | 10,8 | 2,7 | 263 | 465 | green |
| 12. | EM 13,5/17,5 | 17,5 | 3080 | 13,5 | 10,8 | 2,7 | 263 | 465 | yellow |
| 13. | EM 13,5/20 | 20,0 | 3200 | 13,5 | 10,8 | 2,7 | 263 | 465 | red |
| 14. | EM 13,5/25 | 25,0 | 3200 | 13,5 | 10,8 | 2,7 | 263 | 465 | purple |
| 15. | EM 13,5/31 | 33,0 | 5900 | 13,5 | 10,8 | 2,7 | 420 | 623 | white |
| 16. | EM 15/15 | 15,0 | 3610 | 15,0 | 12,0 | 3,0 | 263 | 488 | green |
| 17. | EM 15/17,5 | 17,5 | 3610 | 15,0 | 12,0 | 3,0 | 263 | 488 | yellow |
| 18. | EM 15/20 | 20,0 | 3710 | 15,0 | 12,0 | 3,0 | 263 | 488 | red |
| 19. | EM 15/25 | 25,0 | 3710 | 15,0 | 12,0 | 3,0 | 263 | 488 | purple |
| 20. | EM 16,5/15 | 15,0 | 4350 | 16,5 | 13,5 | 3,0 | 263 | 511 | green |
| 21. | EM 16,5/25 | 25,0 | 5235 | 16,5 | 13,5 | 3,0 | 263 | 555 | purple |
| 22. | EM 18/15 | 15,0 | 4950 | 18 | 14,8 | 3,2 | 307 | 533 | green |
| 23. | EM 18/25 | 25,0 | 6020 | 18,0 | 14,8 | 3,2 | 307 | 577,5 | purple |

3. Insulators

| No. | Pole type | Dimensions | | | | Rated crushing strength | Allowable cable tension load | Rated leakage path | Selection for pollution zone | | Weight |
|----------------------|-----------------|------------|---------------------------|----|----------|-------------------------|------------------------------|--------------------|------------------------------|-------|--------|
| | | L1 | L2/L3 | L4 | M | | | | 15kV | 20kV | |
| | | mm | | | | | | | kN | kN | |
| porcelain insulators | | | | | | | | | | | |
| 1. | LWP 8-24 | 283 | 62/55 105/60 140/90 | - | 20 24 | 8 | 4 | 480 | I,II | I | 6,8 |
| | LWZ 8-24 | 318 | | - | | 8 | 4 | 800 | I+IV | I+III | 9,5 |
| | LWP 12,5-24 | 283 | | - | | 12,5 | 6,25 | 480 | I,II | I | 6,7 |
| | LWP 6-36 | 363 | | - | | 6 | 3 | 600 | I+III | I,II | 8,1 |
| | LWZ 6-36 | 368 | | - | | 6 | 3 | 900 | I+IV | I+IV | 9,5 |
| 2. | LWP 8-24R | 283 | | 7 | | 8 | 4 | 480 | I,II | I | 7,5 |
| | LWZ 8-24R | 318 | | 11 | | 8 | 4 | 800 | I+IV | I+III | 9,5 |
| | LWP 12,5-24R | 283 | | 7 | | 12,5 | 6,25 | 480 | I,II | I | 7,5 |
| | R 12 5 ET 125 N | 270 | | 18 | | 12,5 | 6,25 | 400 | I,II | I | 7,4 |
| | R 12,5 125 L | 270 | | 18 | | 12,5 | 6,25 | 530 | I+III | I | 8,9 |
| | R 12,5 ET 170 N | 335 | | 18 | | 12,5 | 6,25 | 580 | I+III | I,II | 10,7 |
| | R 125 N-A | 269 | | 11 | | 12,5 | 6,25 | 450 | I,II | I | 7,9 |
| | S 125 R | 220 | | 18 | | 12,5 | 6,25 | 320 | I | | 5,6 |
| 3. | LWP 8-24S | 293 | | - | | 8 | 4 | 450 | I,II | I | 7,5 |
| | LWP 12,5-24S | 293 | | - | | 12,5 | 6,25 | 450 | I,II | I | 7,5 |
| | LWP 6-36S | 382 | - | 6 | 3 | 600 | I+III | I,II | 8,5 | | |
| | LWZ 6-36S | 378 | - | 6 | 3 | 900 | I+IV | I+IV | 9,5 | | |

| No. | Pole type | Dimensions | | | | Rated crushing strength | Allowable cable tension load | Rated leakage path | Selection for pollution zone | | Weight |
|----------------------|-----------|------------|-----|----|---|-------------------------|------------------------------|--------------------|------------------------------|-------|--------|
| | | L | ∅D | a | b | | | | 15kV | 20kV | |
| | | mm | | | | | | | kN | kN | |
| porcelain insulators | | | | | | | | | | | |
| 1. | LP 45/5U | 515 | 110 | 60 | - | 60 | 24 | 520 | I-III | I | 5,9 |
| 2. | LP 60/5U | 515 | 135 | | | | | 520 | I-III | I | 8,4 |
| 3. | LP 60/8U | 635 | 135 | | | | | 520 | I-IV | I-III | 11,0 |



4. List of overhead cable terminations type CHE-F from CELLPACK

Application

Terminations of type CHE-F are designed for termination of 1-core cables with polymeric insulation (PVC, PE, XLPE, EPR), e.g. X(R)(U)H(A)KXS, YH(A)KXS with different types of shielding on the insulation (graphitised, extruded or peelable) and with a copper wire or tape return conductor.

Properties

- Fast, easy and safe installation thanks to a combination of slip-on and heat-shrinkable components.
- A reliable method of controlling the electric field at the ends of the screens via a shaper made of elastic silicone material.
- Wide range of cross-sections suitable for all types of cable lugs.
- Unlimited storage time.

Equipment

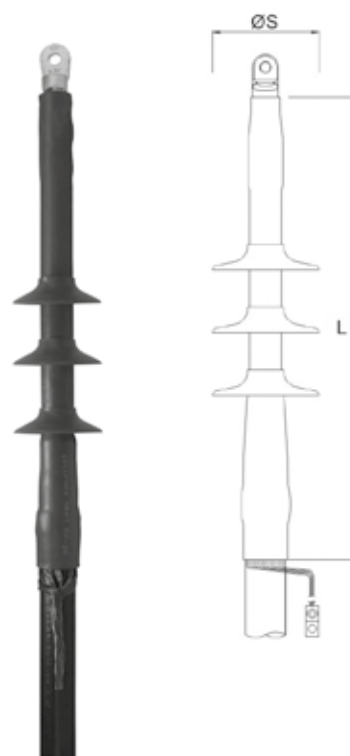
The single-phase termination set consists of the following components:

- Silicone control element
- Sealing mastic
- Creepage-resistant and weatherproof heat shrink tubing
- Silicone covers

Content

One set per three phases without cable lugs for cables with a wire return conductor.

Cable terminals should be ordered additionally.



| U _o /U (U _m) 12/20 (24) kV – 12.7/22 (24) kV | | | | | | |
|---|-------------|----------|--|--------|----------------------------|------------------------|
| Catalogue no. | Type | | Min. diameter on cable insulation after removal of outer semiconductive layer [mm] | L [mm] | Number of covers per phase | Cover diameter ØS [mm] |
| 193372 | CHE-F 24 kV | 10-35 | 12.6 | 500 | 3 | 85 |
| 193374 | CHE-F 24 kV | 25-150 | 17.3 | 500 | 3 | 85 |
| 194064 | CHE-F 24 kV | 70-240 | 19.9 | 500 | 3 | 85 |
| 194065 | CHE-F 24 kV | 120-300 | 23.1 | 500 | 3 | 85 |
| 194066 | CHE-F 24 kV | 240-500 | 27.3 | 500 | 3 | 115 |
| 194967 | CHE-F 24 kV | 630-1000 | 36.8 | 500 | 3 | 123 |

5. CHEP-3F, CHEP(H)-3F type overhead conductor heads from CELLPACK

Application

Overhead terminations for non-draining (non-drip) filled cables (e.g. H(A)KnFtA):

- type CHEP-3F - suitable for paper insulated core cables from 6 to 17.5 kV
- type CHEP(H)-3F - suitable for 24 to 36 kV shielded isolation cables (H-cables)

Note:

For cables with draining compound, please contact CELLPACK

Properties

- Quick, easy and safe installation
- Reliable method of controlling the electric field at the ends of the shields via a mould made of flexible silicone material
- Wide range of cross-sections suitable for all types of cable lugs
- Unlimited storage time

Content

- Heat shrink tubing resistant to creep currents and weathering
- Oil-resistant filler tape
- Heat-shrink finger sleeve
- Silicone covers

3-core insulated cable

1. Core insulation
2. Impregnated paper insulation
3. Operating core
4. Lead or aluminium sheathing
5. Impregnated paper layer
6. Steel armouring
7. External cover



3-core screen cable (H-cable)

1. Impregnated paper insulation
2. Impregnated semi-conductive paper
3. Operating core
4. Semi-conductive paper, screen on insulation (H-cable)
5. Aluminium or lead sheathing
6. Synthetic webbing wrap
7. Steel armouring
8. External cover



| Type | L [mm] | Number of Covers per phase | Cover diameter ØS [mm] | Nominal cross-section [mm ²] | | Cat. no. |
|--|--------|----------------------------|------------------------|--|---------|----------|
| | | | | do 12 kV | 17,5 kV | |
| Paper insulated core cables – U _o U (U _m) 6/10 (12) kV – 8,7/15 (17,5) kV | | | | | | |
| CHEP-3F 17kV | 16-50 | 500 | 2 | 80 | 16-50 | 197537 |
| | 25-240 | 500 | 2 | 85 | 70-240 | 197538 |
| | 95-300 | 500 | 2 | 85 | 120-400 | 197539 |

L - termination length. It is possible to make terminations in other lengths, e.g. 600, 800, 1000.

Note: The terminations listed above can be used on 3.6/6 (7.2) kV cables. Cable size discrepancy must be taken into account.

| Type | L [mm] | Number of Covers per phase | Cover diameter ØS [mm] | Nominal cross-section [mm ²] | | Cat. no. |
|--|---------|----------------------------|------------------------|--|---------|----------|
| | | | | 24 kV | 36 kV | |
| Hochsteadter shielded cable – U _o U (U _m) 12/20 (24) kV – 12,7/22 (24) kV | | | | | | |
| CHEP(H)-3F 24kV | 16-35 | 850 | 3 | 80 | 16-35 | 197543 |
| | 50-150 | 850 | 3 | 85 | 50-150 | 197544 |
| | 70-240 | 850 | 3 | 85 | 70-240 | 197545 |
| | 120-300 | 850 | 3 | 85 | 120-300 | 197546 |
| Shielded cable Hochsteadter – U _o U (U _m) 18/30 (36) kV – 19/33 (36) kV | | | | | | |
| CHEP(H)-3F 36kV | 35-70 | 850 | 4 | 85 | 35-70 | 197547 |
| | 50-240 | 850 | 4 | 85 | 50-240 | 197548 |

L - termination length. It is possible to make terminations in other lengths, e.g. 600, 800, 1000.

6. Heat shrinkable sealing cap type EC

For sealing of LV and MV conduit outputs, for use both in the ground and outdoors

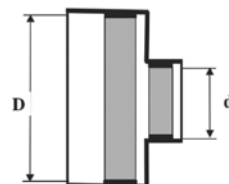
| Typ | D [mm] | | d [mm] | | L1* [mm] | L2* [mm] |
|-----|--------|-----|--------|-----|----------|----------|
| | max | min | max | min | | |
| EC | 50 | 72 | 19 | 30 | 65 | 40 |
| | 75 | 92 | 22 | 34 | 60 | 40 |
| | 90 | 110 | 25 | 40 | 55 | 35 |
| | 110 | 125 | 25 | 54 | 55 | 35 |
| | 125 | 140 | 35 | 66 | 55 | 35 |
| | 140 | 155 | 35 | 85 | 55 | 35 |
| 160 | 180 | 42 | 95 | 42 | 70 | 40 |

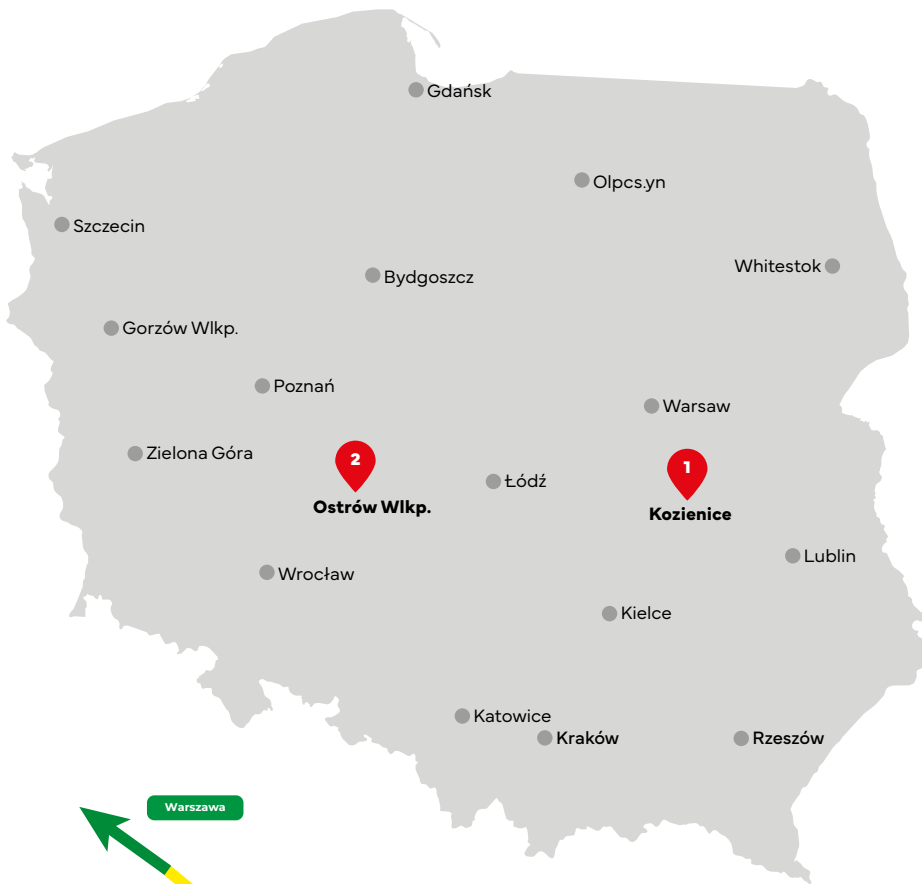
* L1 - length of the part with the larger diameter

L2 - length of the part with the smaller diameter

EC selection taking into account the cross-sections of the 4-core cables and the outer diameter of the conduits

| Outer diameter of protective tube Ø [mm] | Cable cross section [mm ²] (YAKY, YAKXS, NAYY, NAY2Y cable types considered) | | | | | | | | | |
|--|--|-------|-------|--------|--------|--------|--------|--------|--------|--|
| | 16-35 | 50 | 70 | 95 | 120 | 150 | 185 | 240 | 300 | |
| 32 | EC 50 | | | | | | | | | |
| 50 | EC 50 | EC 90 | EC 90 | EC 110 | EC 110 | EC 110 | EC 125 | | | |
| 75 | EC 75 | EC 90 | EC 90 | EC 110 | EC 110 | EC 110 | EC 125 | | | |
| 110 | | | | EC 110 | EC 110 | EC 110 | EC 125 | EC 125 | EC 125 | |
| 160 | | | | | | | EC 160 | EC 160 | EC 160 | |





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