

**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



CERTYFIKAT



ALPAR
A i P Kowalscy

ISO 9001:2015

DEKRA Certification Sp. z o.o. niniejszym potwierdza, że przedsiębiorstwo
ALPAR Artur i Piotr Kowalscy Spółka Jawna

zakres certyfikacji:
 Produkcja osprzętu instalacji linii napowietrznych, osprzętu instalacji odgromowych
 oraz handel osprzętem elektroinstalacyjnym.

certyfikowana siedziba:
 PL – 26-900 Kozienice, Łuczynów 98

wdrożyło system zarządzania jakością zgodnie z ww. normą i skutecznie go realizuje. Wynik audytu
 udokumentowano w raporcie numer W-A322512/A11/P/9001.

Certyfikat ważny od 2018-09-15 do 2021-09-14

Nr rejestracyjny certyfikatu: 511031283/6






DEKRA Certification Sp. z o.o. Wrocław, 2018-09-04

QMS

DEKRA Certification Sp. z o.o. • ul. Logistyczna 4B II • 54-202 Wrocław • www.dekra-certification.com.pl
 07008 1 x 1





JEDNOSTKA NOTYFIKOWANA NR 2330
DEKRA Certification Sp. z o.o.
 Plac Solny 20, 50-063 Wrocław, POLSKA

CERTYFIKAT

ZGODNOŚCI
 ZAKŁADOWEJ KONTROLI PRODUKCJI
 Nr 2330-CPR-PL41

Zgodnie z Rozporządzeniem Parlamentu Europejskiego i Rady (UE) Nr 305/2011 z dnia
 9 marca 2011 r. (Rozporządzenie CPR), niniejszy certyfikat odnosi się do wyrobu budowlanego:

Spawane stalowe elementy konstrukcyjne oraz zestawy
 Wytwarzanie elementów i zestawów konstrukcji stalowych
 wg klasy wykonania EXC1, EXC2
 w odniesieniu do wymagań zawartych w EN 1090-2:2009+A1:2011
 Deklaracja właściwości użytkowych: ZA.3.4 (Metoda 3a)

wprowadzonego do obrotu pod nazwą lub znakiem firmowym producenta:

ALPAR
Artur i Piotr Kowalscy Spółka Jawna
 Łuczynów 98; 26-900 Kozienice
 i produkowanego na terenie budowy / zakładu:
ALPAR Artur i Piotr Kowalscy Spółka Jawna
 Łuczynów 98; 26-900 Kozienice

Niniejszy certyfikat potwierdza, że wszystkie postanowienia dotyczące oceny i weryfikacji stałości
 właściwości użytkowych, określone w załączniku ZA normy (norm):

EN 1090-1:2009+A1:2011
 w ramach systemu 2+ są stosowane oraz że

zakładowa kontrola produkcji
 spełnia mające zastosowanie wymagania.

Niniejszy certyfikat został wydany po raz pierwszy w dniu 26.03.2018 i pozostaje ważny, dopóki zharmonizowana
 norma, metody oceny i weryfikacji stałości właściwości użytkowych, sam wyrob budowlany i warunki jego
 wytwarzania nie ulegną istotnej zmianie oraz pod warunkiem, że nie zostanie zawieszony lub cofnięty przez
 jednostkę certyfikującą zakładową kontrolę produkcji.

Wrocław, 26.03.2018





Filip Wesolowski
Dyrektor Operacyjny

DEKRA Certification Sp. z o.o. • Plac Solny 20 • 50-063 Wrocław • www.dekra-certification.com.pl

CHAPTER 1

STSRs-20/630 pole-mounted transformer stations

1. Subject and scope of the study.....	4
2. Basic technical data	4
3. Solution options and markings	5
4. Scope of application of transformer stations	6
5. Surge protection	7
6. Transformer protection	7
7. Indirect energy metering.....	8
8. Steel structures.....	9
9. Warning, identification and information signs	10
10. Foundation.....	10
11. Environmental protection	10
12. Details of current and voltage transformer installation.....	11
13. Station solutions.....	12
14. Selection of pole foundations for medium and weak soil	46

CHAPTER 2

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

1. Subject and scope of the study.....	50
2. Station solutions.....	50
3. Environmental conditions of station operation	51
4. Station characteristics	52
5. Station power supply	54
6. LV circuit output.....	54
7. Station equipment	55
8. Station structure	55
9. Station earthing	56
10. Surge protection	56
11. Foundation.....	56
12. Environmental protection	57
13. Station solutions.....	58
14. Bill of materials for supports and foundations	98

CHAPTER 3

STE 20/630 pole-mounted transformer stations

1. Subject and scope of the study.....	101
2. Station solutions.....	101
3. Station markings.....	102
4. Station characteristics	103
5. Station power supply	104
6. LV circuit output.....	105
7. Station equipment.....	105
8. Station structure	106
9. Station earthing.....	106
10. Surge protection	106
11. Station foundation	106
12. Station solutions	108

CHAPTER 4

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

1. Characteristics and purpose.....	176
2. Types.....	176
3. Application.....	176
4. Technical data.....	177

PBNWMA-24/50 and PBNWMA-36/50 overhead fuse bases

1. Characteristics and purpose.....	178
2. Types.....	178
3. Application.....	178
4. Technical data.....	179

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

1. Characteristics and purpose.....	180
2. Types.....	180
3. Application.....	180

CHAPTER 5

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

1. Spun poles type E.....	182
2. Spun poles type EM	183
3. Insulators.....	184
4. List of CHE-F type overhead cable terminations by CELLPACK.....	185
5. Overhead cable terminations type CHEP-3F, CHEP(H)-3F by CELLPACK	186
6. Heat-shrink sealing cap type EC.....	186

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:	– 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:	– 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, SIIa, SIIa - 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:

- overhead [as an end pole in the overhead line],
- 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

				Additional equipment:
				– 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.
				Placement solution for MV surge arresters
			1	– under the MV fuse bases,
			2	– over MV fuse bases.
				Pole strength [kN]
				Pole length [m]
				Option with supply via overhead MV line
			I	– on the opposite side of the transformer installation
			II	– on the side of the transformer installation
				Single pole transformer station

ad. b

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

				Additional equipment:
				– 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,
				Pole strength [kN]
				Pole length [m]
				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
				Single pole transformer station

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 mm²	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 mm²	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 mm²	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 opera- ting 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	of the transformer	I_n	[A]		
		of the fuse	I_{nb}	[A]		
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		170	29	108	2,9	
63				210	22	132		
80				280	16	174		
100	442/85	30 022 13		320	13	234	5,4	
125			40	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 I-s Ith	Dynamic current Idyn	Power Sn	Acc. class	Safety factor	Type of execution	Applic. Rated network voltage Un
	kV/kV/kV	A/A	kA	kA	VA				kV
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					20
		10/5	4	10					
		15/5	6,3	16					
		20/5	6,3	16					
CTSO 38	36/70/170	5/5	2	5					30
		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	
	kV/kV/kV	A/A	VA			Rated network voltage U _n	Type of measurement system
						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_{thls} :	– 6,3 kA			– 6,3 kA
– dynamic current:	– 16 kA			– 16 kA
– implementation:	– P1-P2/S1-S2 (1-core)			– P1-P2/S1-S2 (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 (1-core)			– A-N/a-n (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.

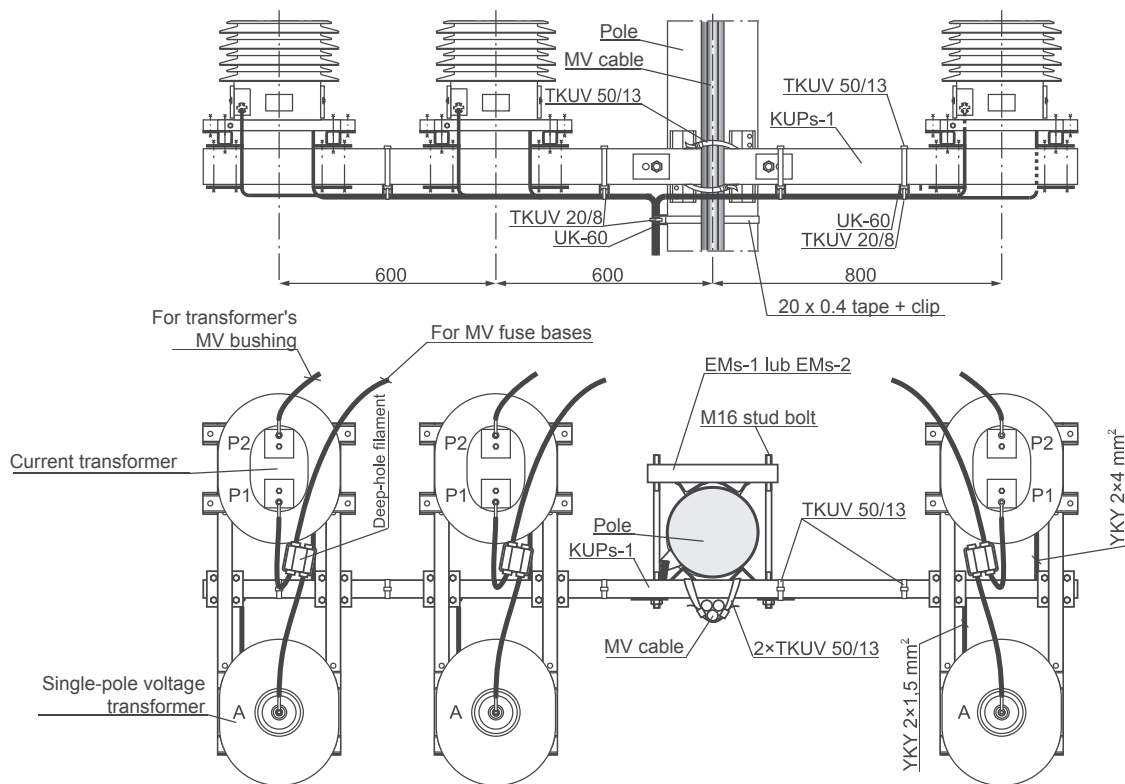
b) Oil leakage protection:

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.

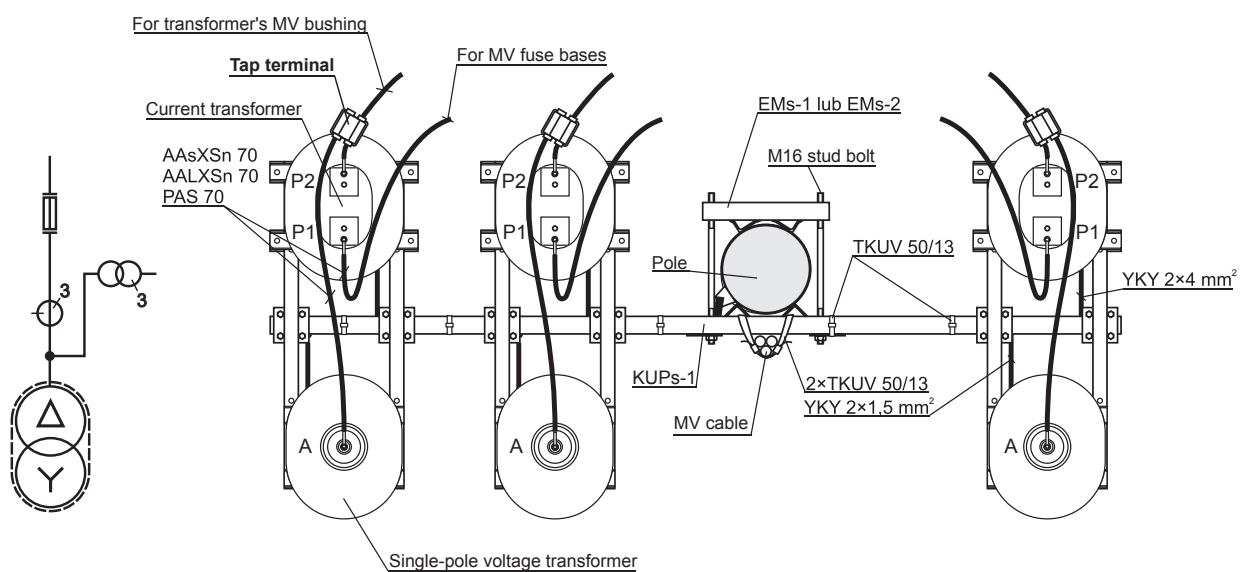
According to the PN-E-05115:2002 standard, clause 7.7.1, an oil containment basin is not required in overhead installations if the amount of oil in a single transformer is less than 1000 litres. However, it is recommended to provide a gravel bedding 20 cm thick on a 5 cm layer of compacted sand, with 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



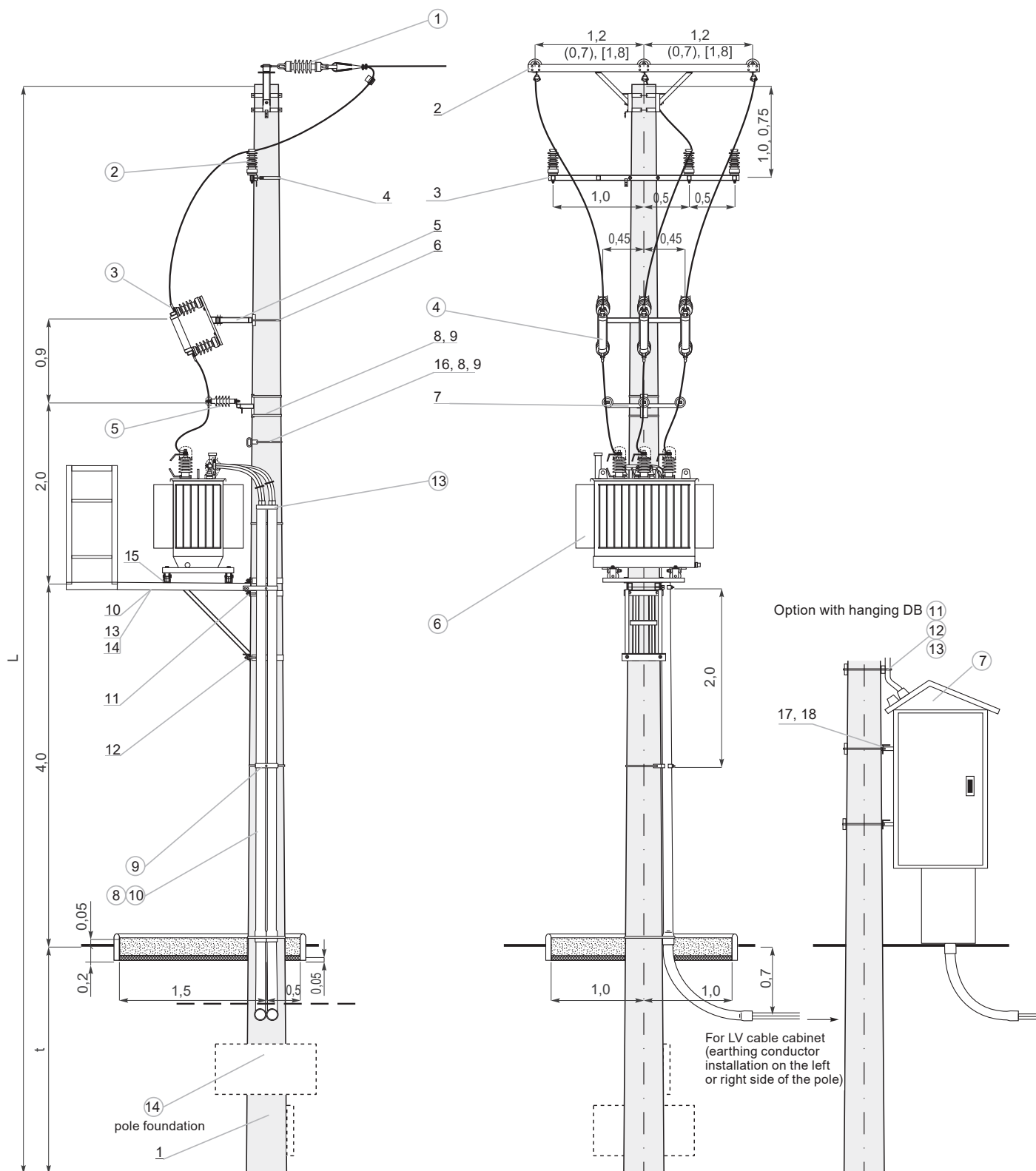
13. Station solutions

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	
11.	Protective tube	RW-1	1	kpl	... / ALPAR	Use when using a wall-mounted switchboard at the station
12.	Conduit clamp	U110W	2	pcs.	ALPAR	
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

STSRs-20/630-I-.../...-1

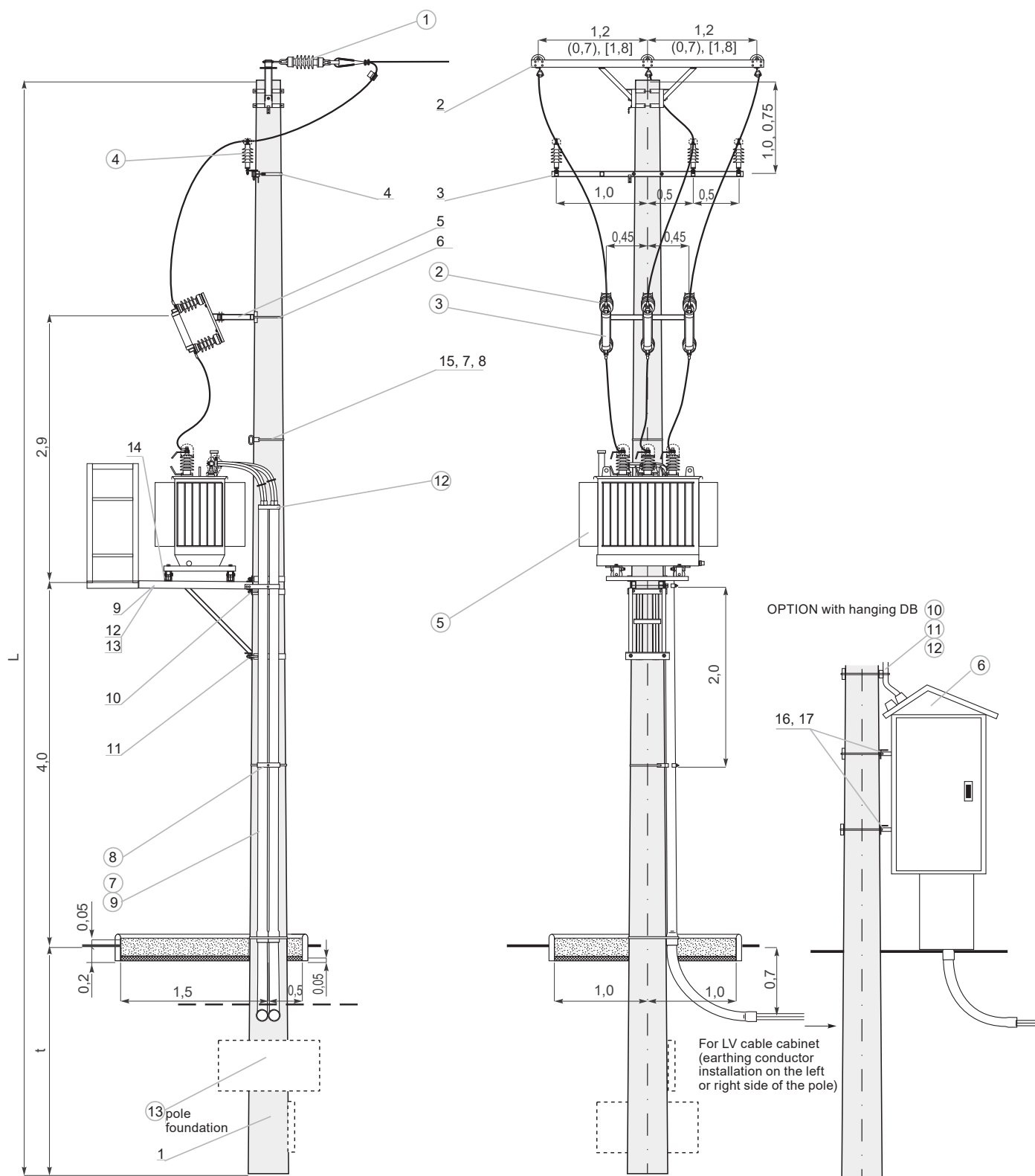


List of structures, accessories, apparatus for STSRs-20/630-I-.../...-2

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 ≤ 15kN for AFL PSts-2 to poles ≥ 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 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	±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.	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	Selection of the type of pole foundation by an authorised designer
13.	Foundation support structure	...	1	set	ALPAR	

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

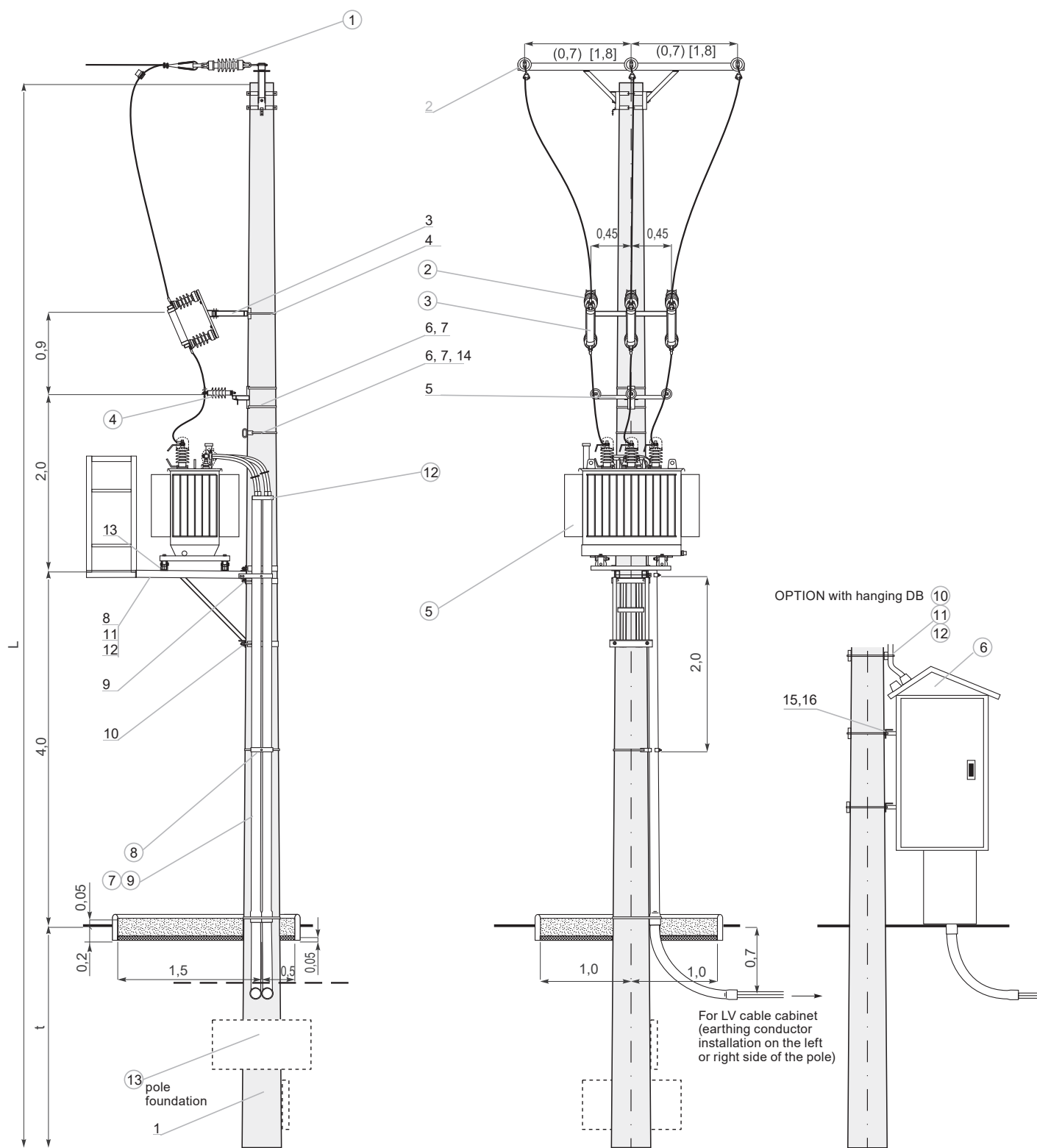


List of structures, accessories, apparatus for STSRs-20/630-II-.../...-1

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 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

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

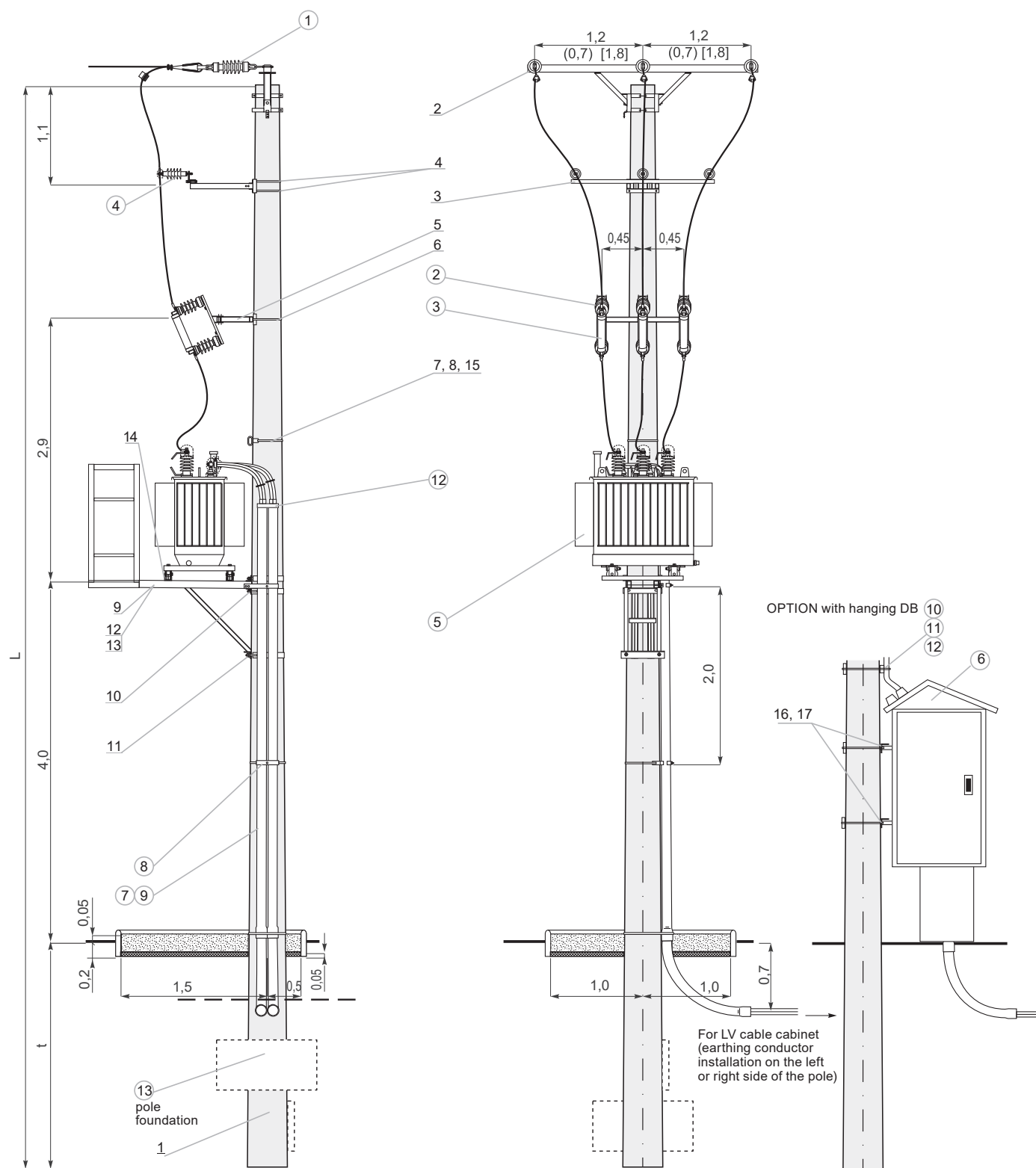


List of structures, accessories, apparatus for STSRs-20/630-II-.../...-2

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 $\leq 15\text{kN}$ for AFL PSts-2 to poles $\geq 17,5\text{kN}$ 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

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

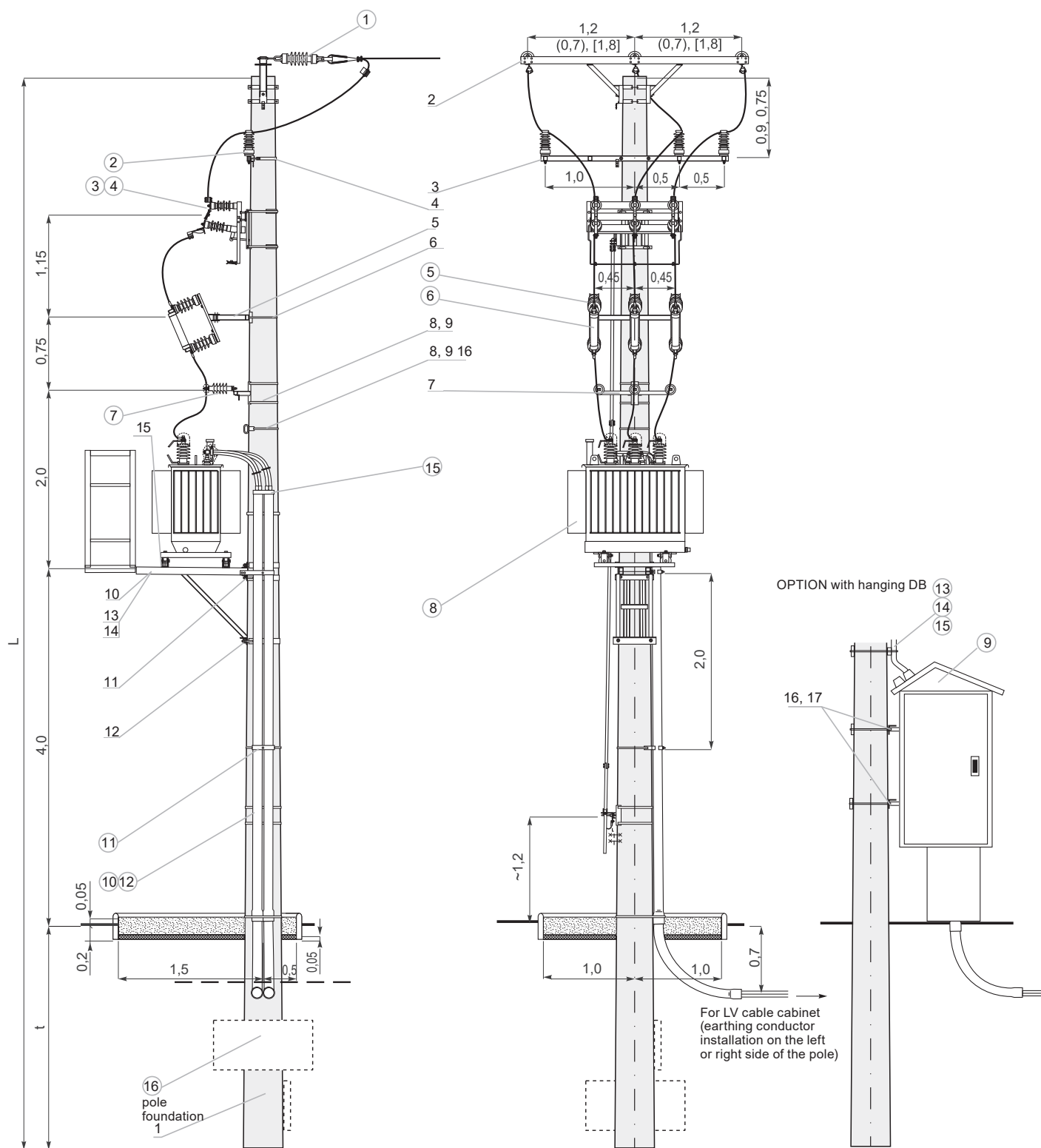


List of structures, accessories, apparatus for STSRs-20/630-I-.../...-1-O

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 $\leq 15\text{kN}$ for AFL PSts-2 to poles $\geq 17,5\text{kN}$ 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	LO/1 LO2/1 LO/2 LO2/2	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

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

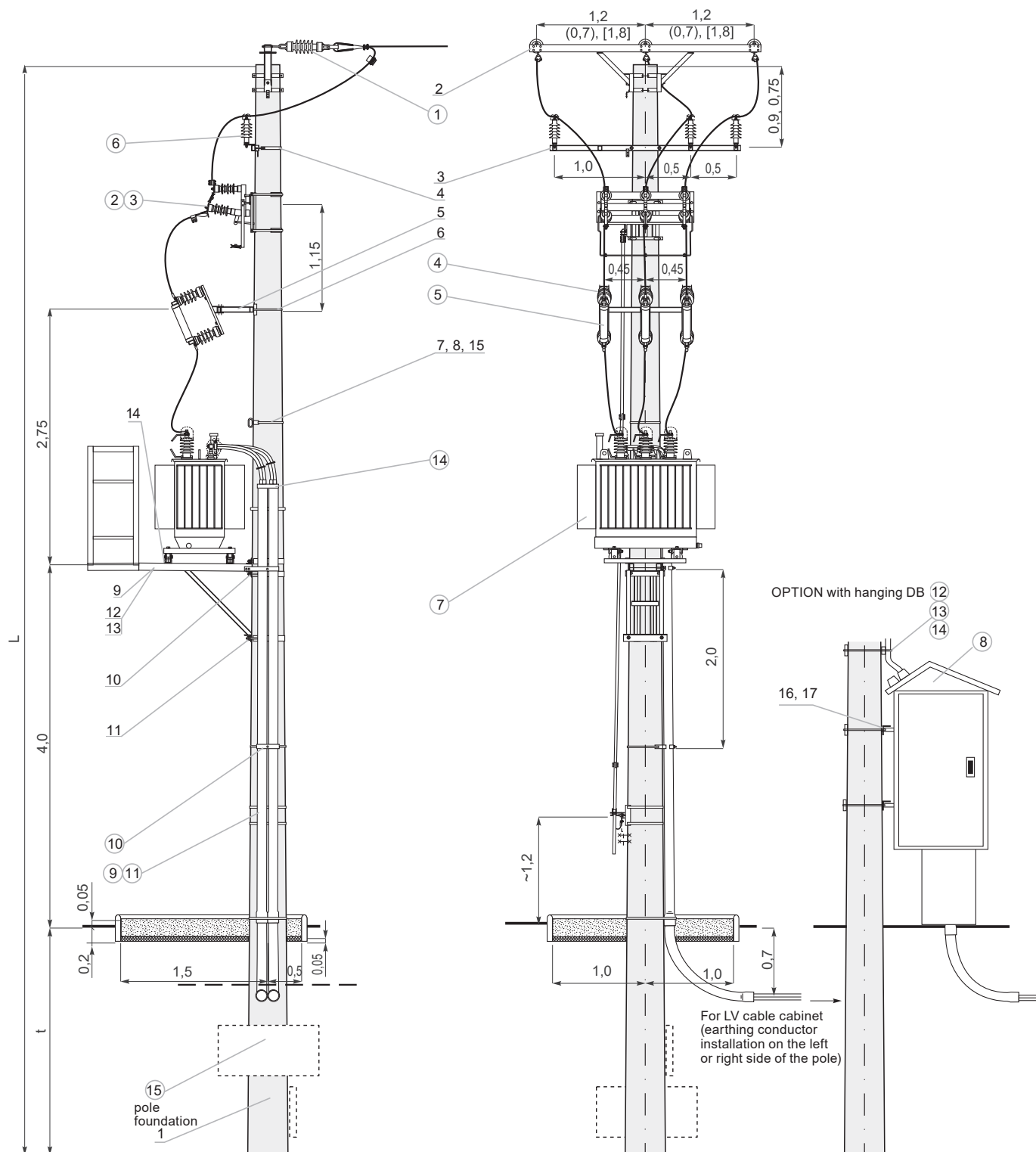


List of structures, accessories, apparatus for STSRs-20/630-I-.../...-2-O

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 $\leq 15\text{kN}$ for AFL PSts-2 to poles $\geq 17,5\text{kN}$ 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

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

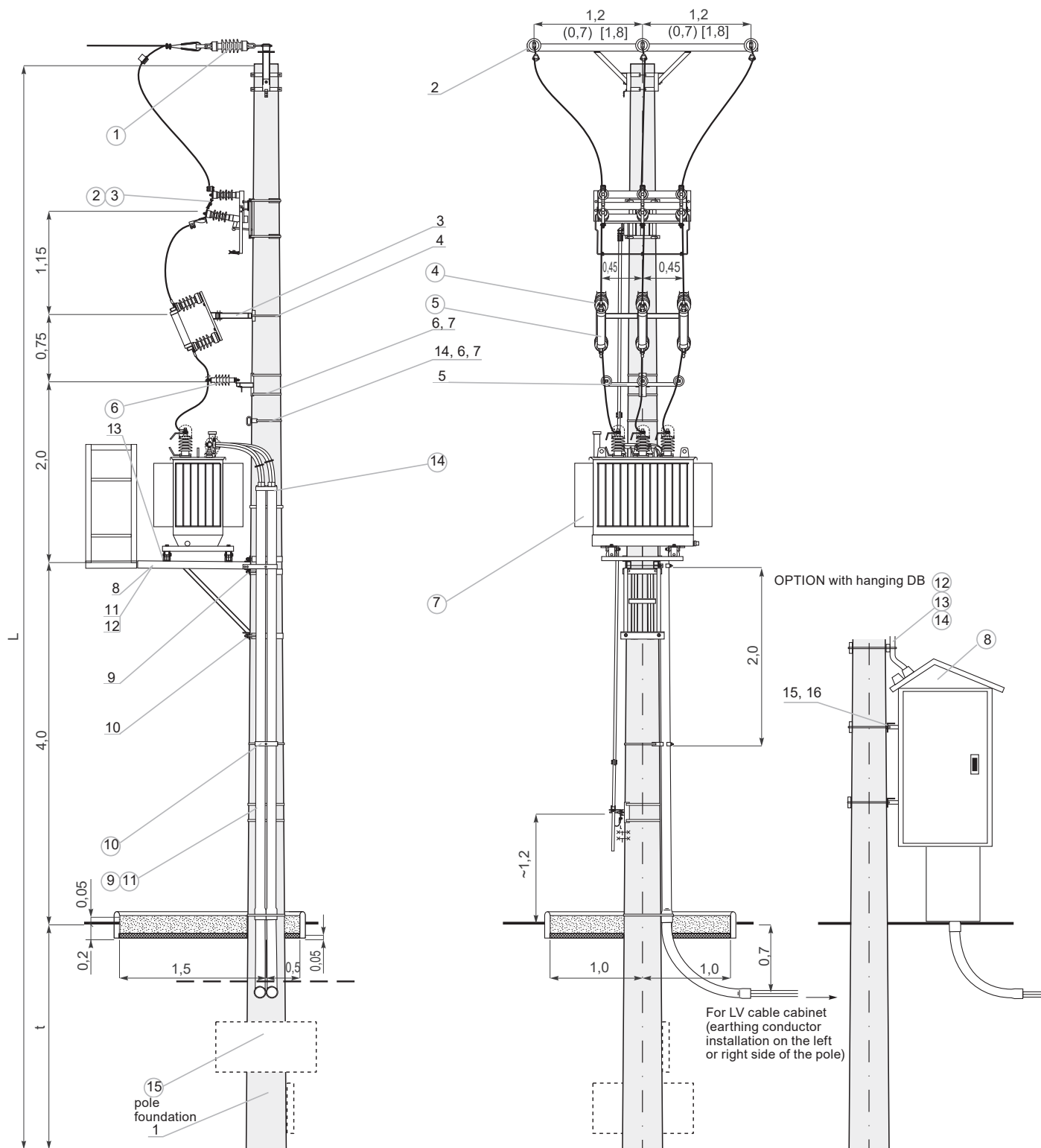


List of structures, accessories, apparatus for STSRs-20/630-II-.../...-1-O

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 ≤ 15kN for AFL PSts-2 to poles ≥ 17,5kN 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.	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 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

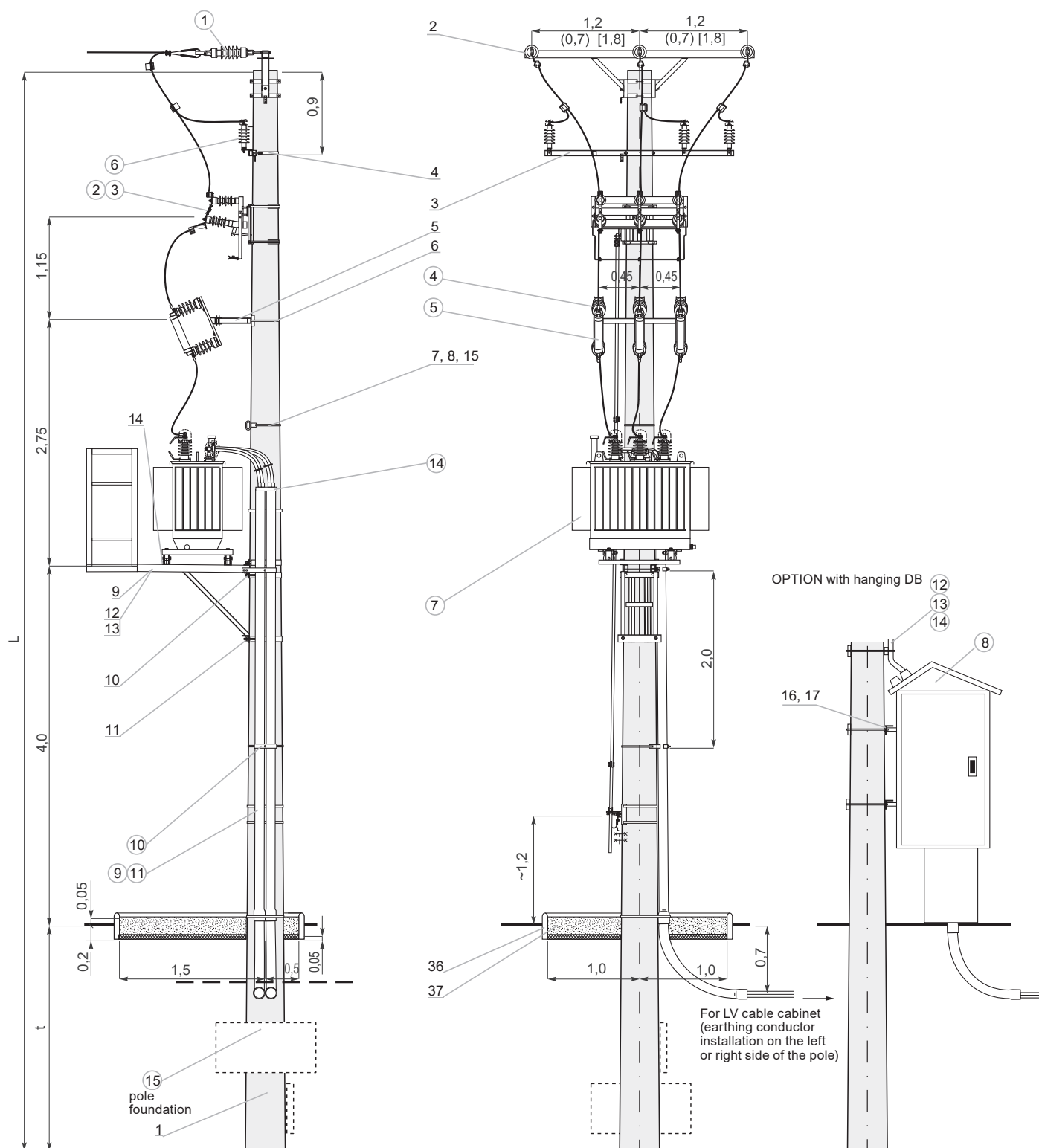


List of structures, accessories, apparatus for STSRs-20/630-II-.../...-2-O

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 $\leq 15\text{kN}$ for AFL PSts-2 to poles $\geq 17,5\text{kN}$ 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

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

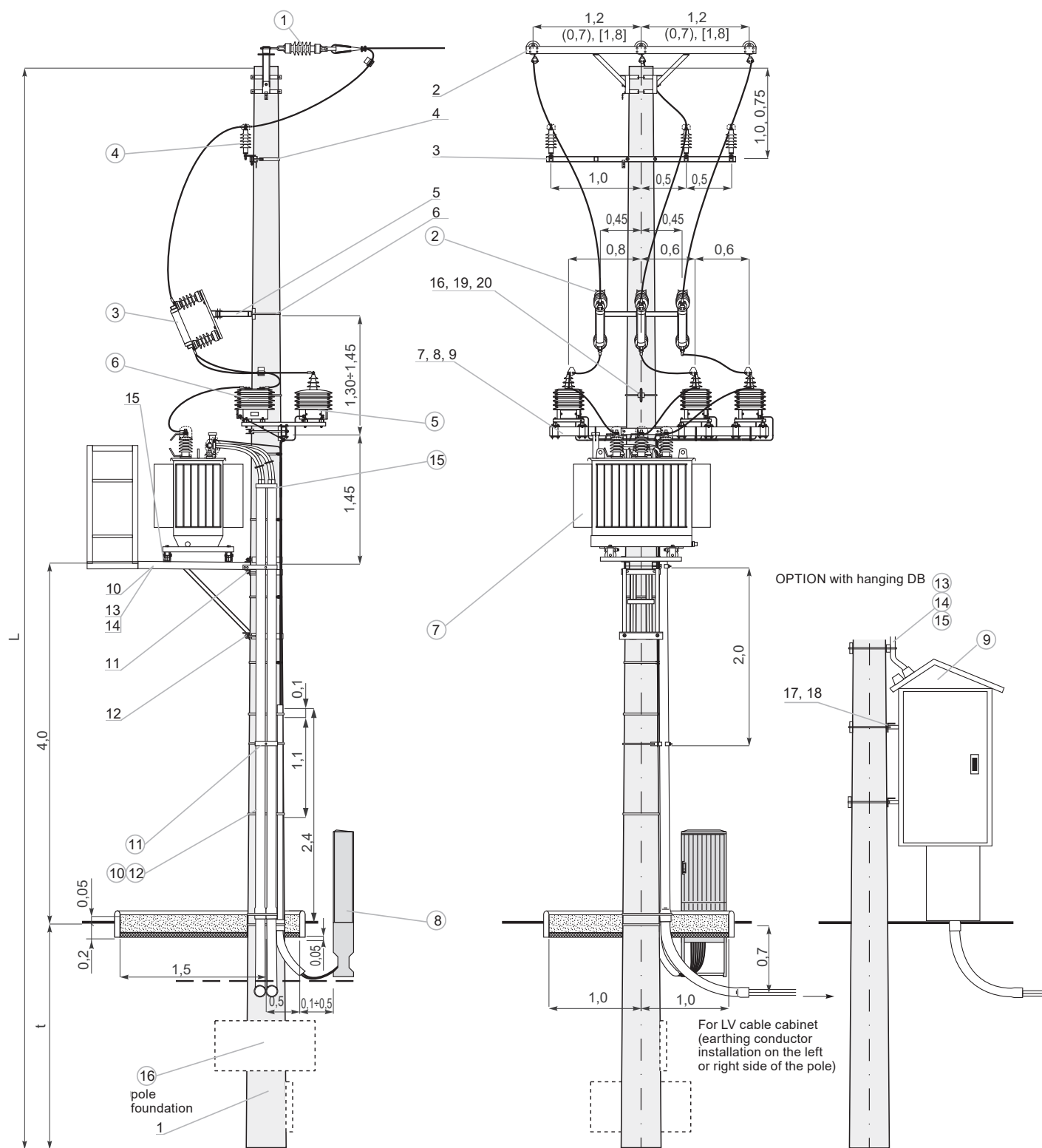


List of structures, accessories, apparatus for STSRs-20/630-I-.../...-2-P3

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

STSR5-20/630-I-.../...-2-P3

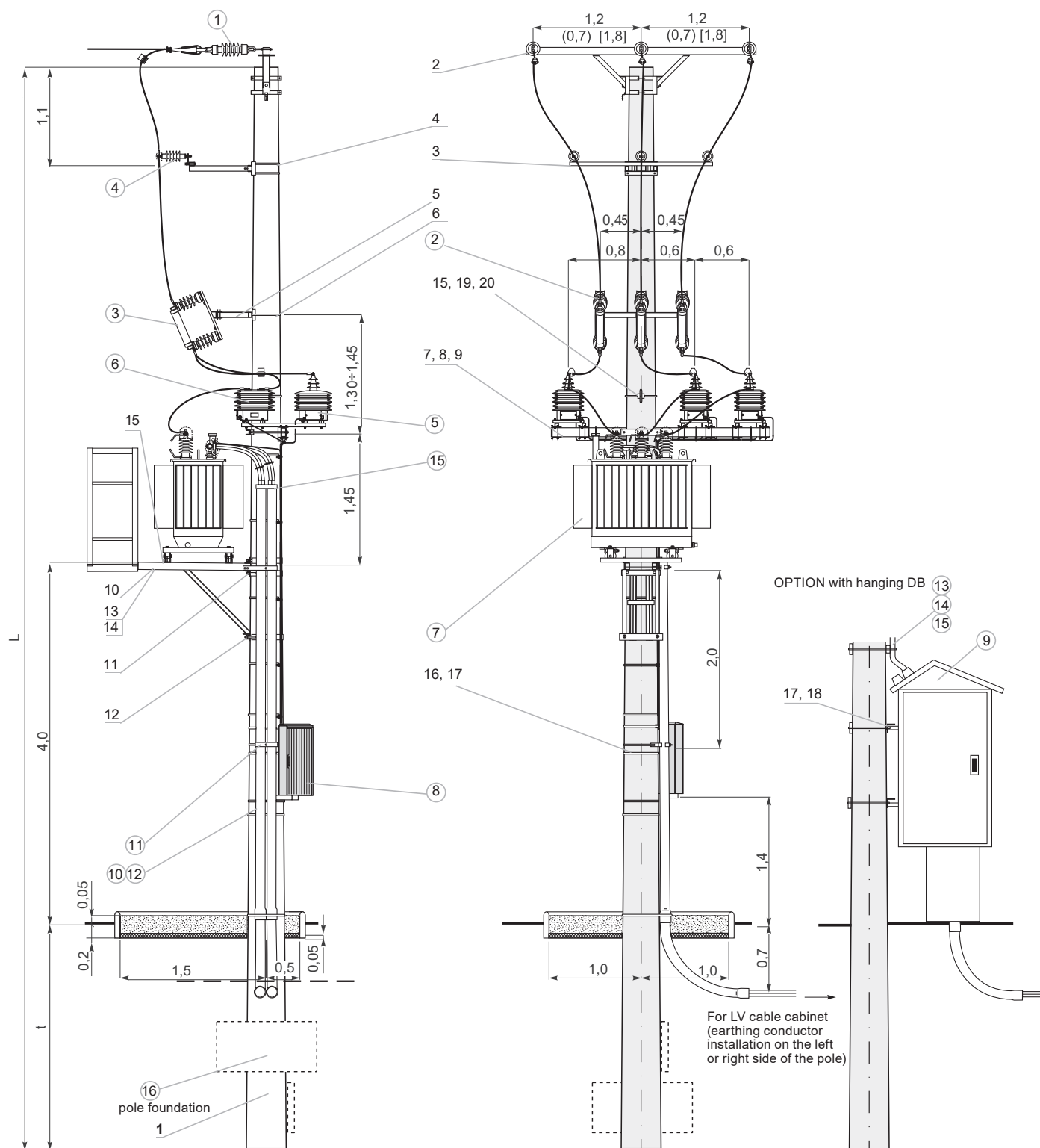


List of structures, accessories, apparatus for STSRs-20/630-II-.../...-2-P3

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	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.	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	
15.	Heat-shrinkable four-core breakout	SEH-4_110	1	pcs.	CELLPACK / ALPAR	Selection of the type of pole foundation by an authorised designer according to the Table on page 46.
16.	Foundation support structure	...	1	set	ALPAR	

STSR5-20/630-II-.../...-2-P3

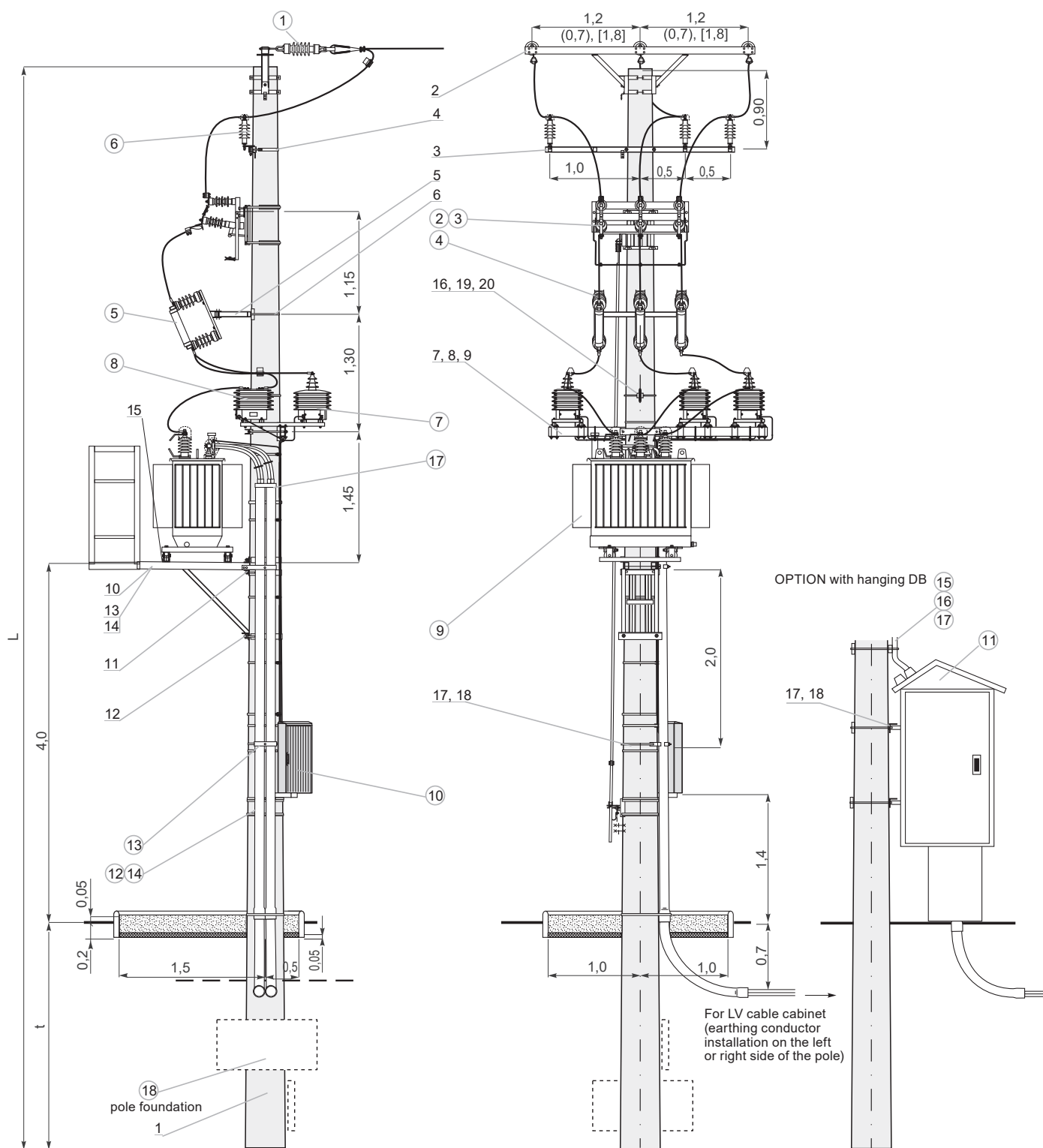


List of structures, accessories, apparatus for STSRs-20/630-I-.../...-2-OP3

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 ≤ 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.	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	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

STSRs-20/630-1-.../...-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	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	Selection of the type of pole foundation by an authorised designer
18.	Foundation support structure	...	1	set	ALPAR	

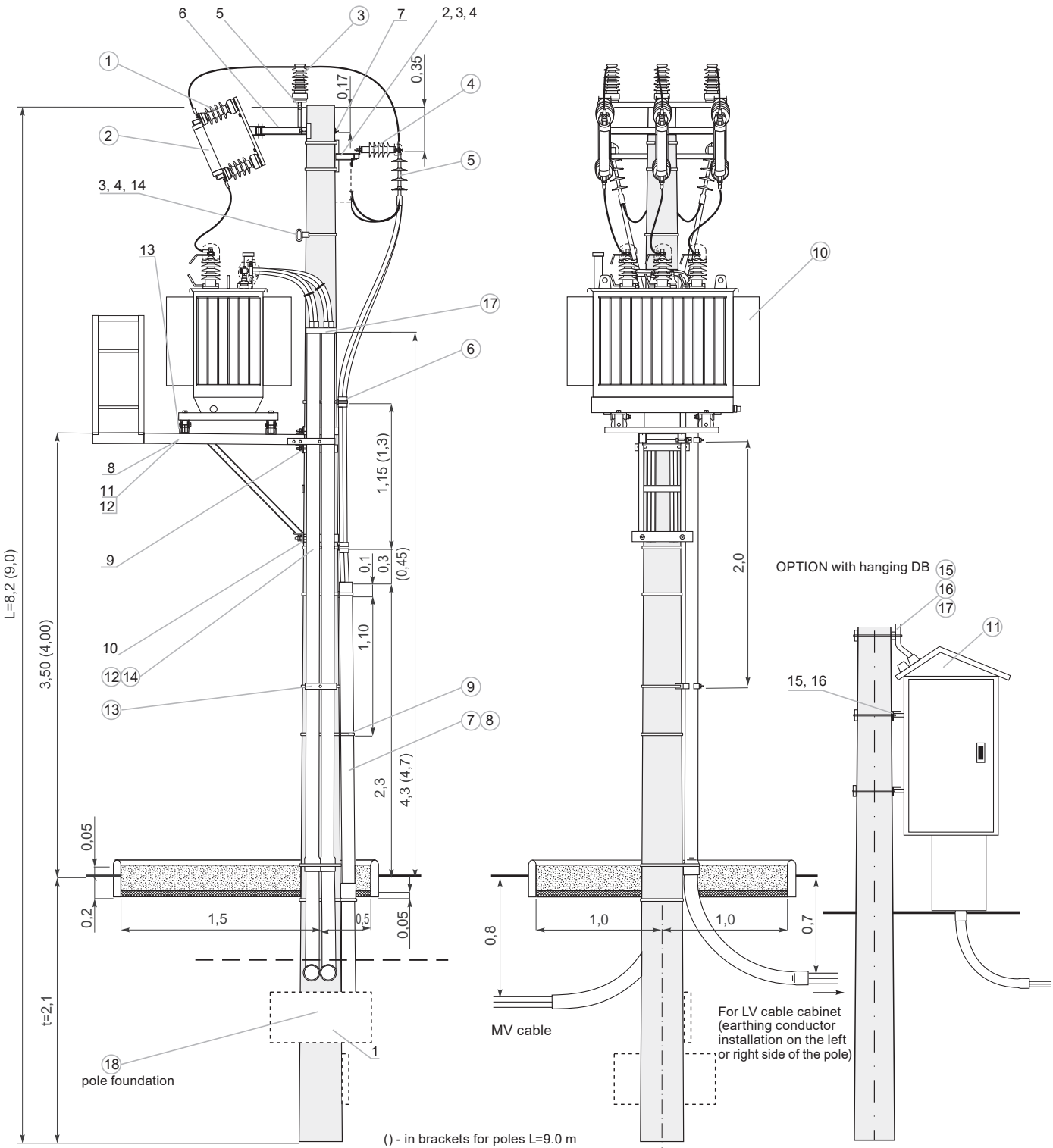


*List of structures, accessories, apparatus for STSRs-20/630-KK1-8,2/10
STSRs-20/630-KK2-9,0/10*

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 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 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

STSRS-20/630-KK1-8,2/10
STSRS-20/630-KK2-9,0/10

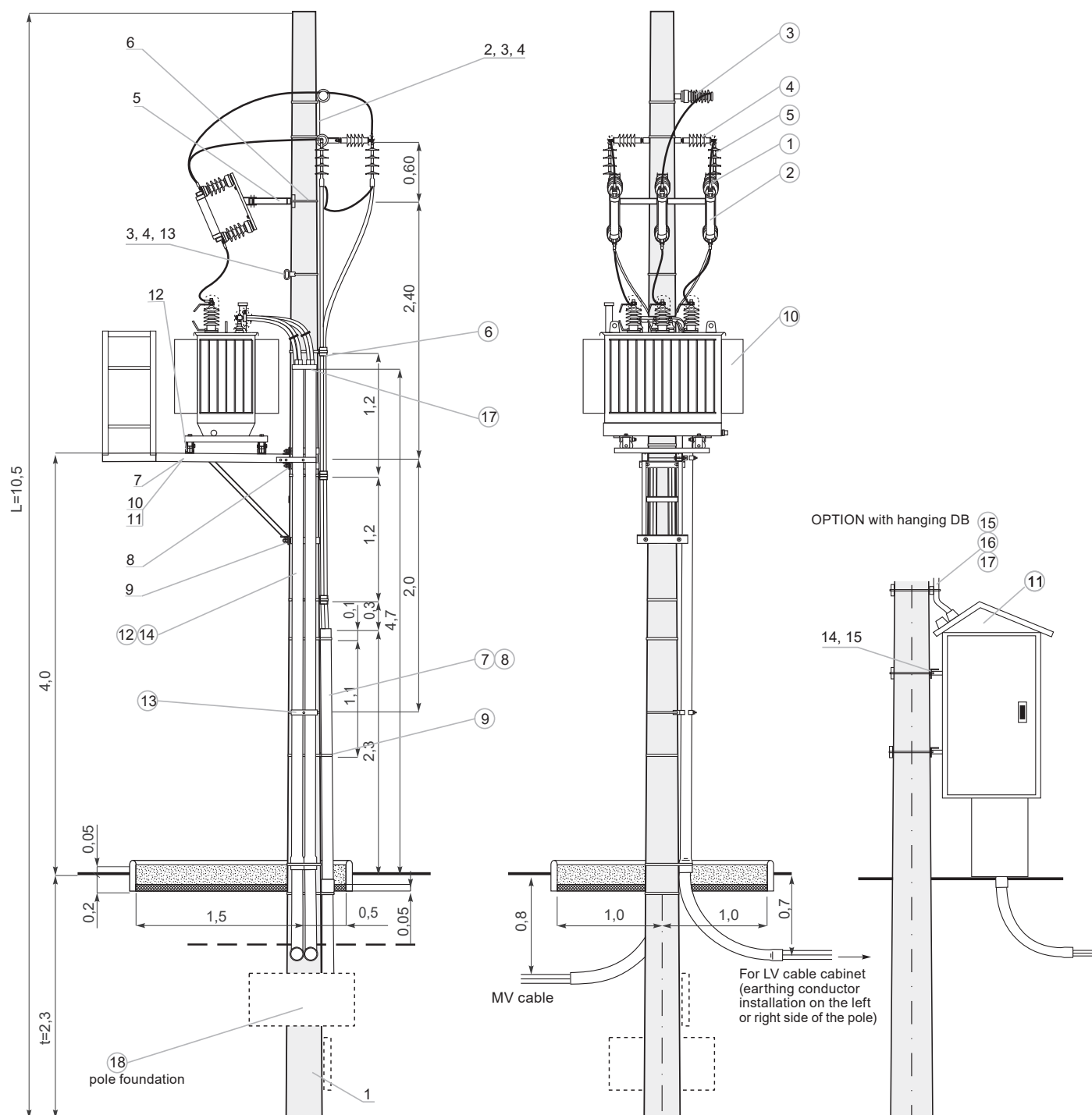


List of structures, accessories, apparatus for STSRs-20/630-K-10.5/10

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

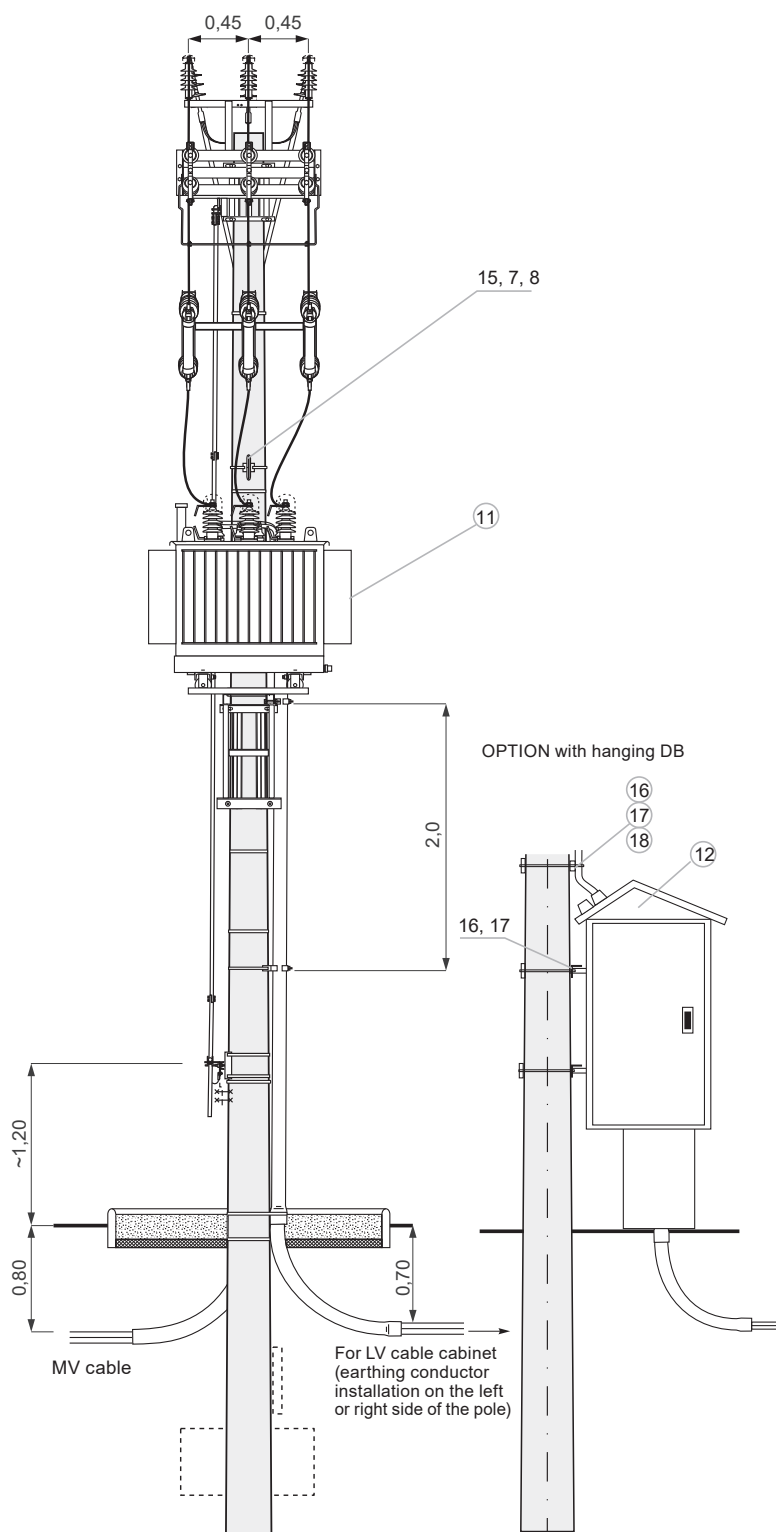
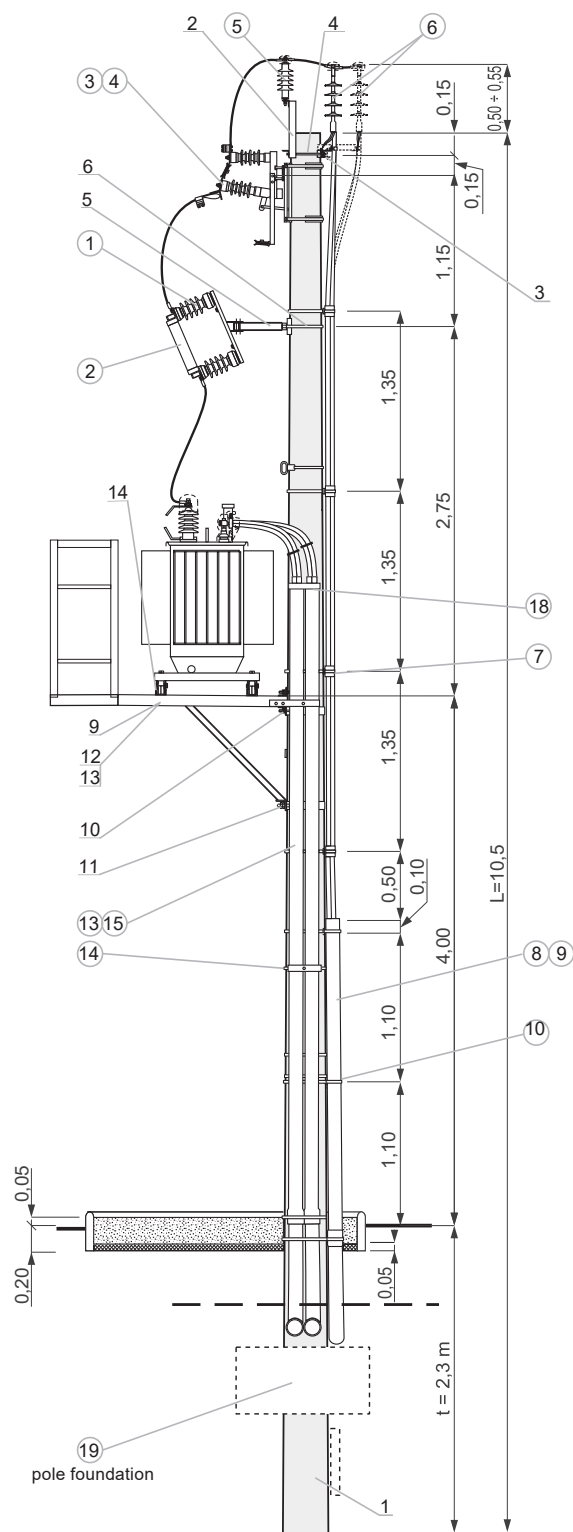


List of structures, accessories, apparatus for STSRs-20/630-K-10.5/10-O

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	The value and type of transformer shall be determined by an authorised designer
11.	Overhead transformer	630 kVA ... / 0,42	1	pcs.	... / ALPAR	
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	Use when using a wall-mounted switchboard at the station
16.	Protective tube	RW-1	1	set	... / ALPAR	
17.	Conduit clamp	U110W	2	pcs.	ALPAR	Use when using a wall-mounted switchboard at the station
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

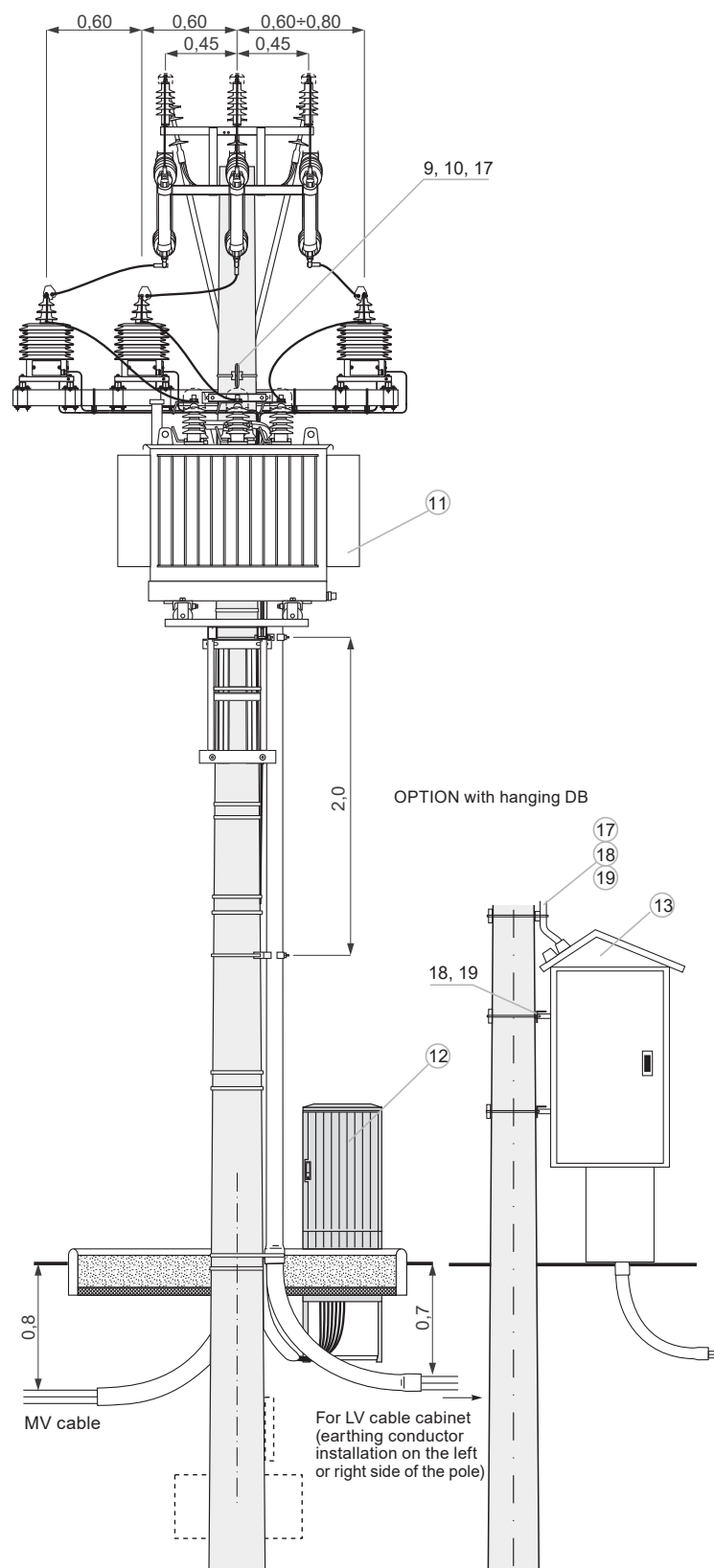
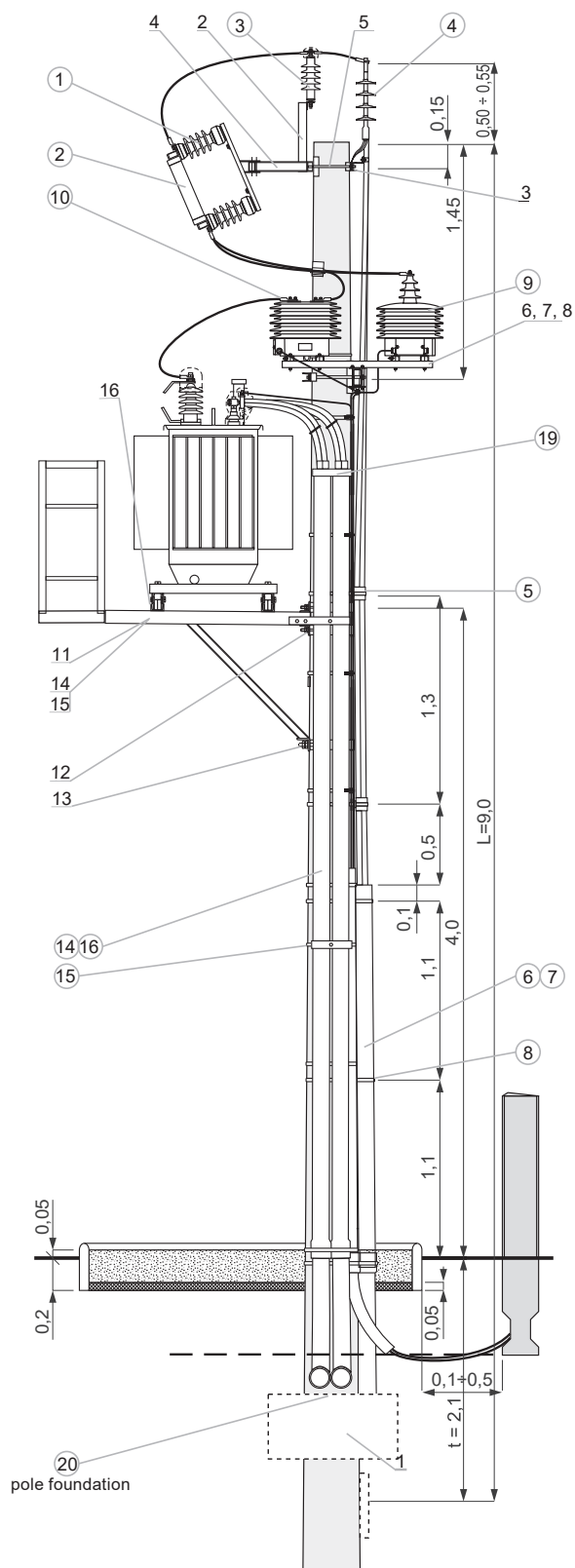


List of structures, accessories, apparatus for STSRs-20/630-KK2-9.0/10-P3

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 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
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	Use when using a wall-mounted switchboard at the station
18.	Conduit clamp	U110W	2	pcs.	ALPAR	
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

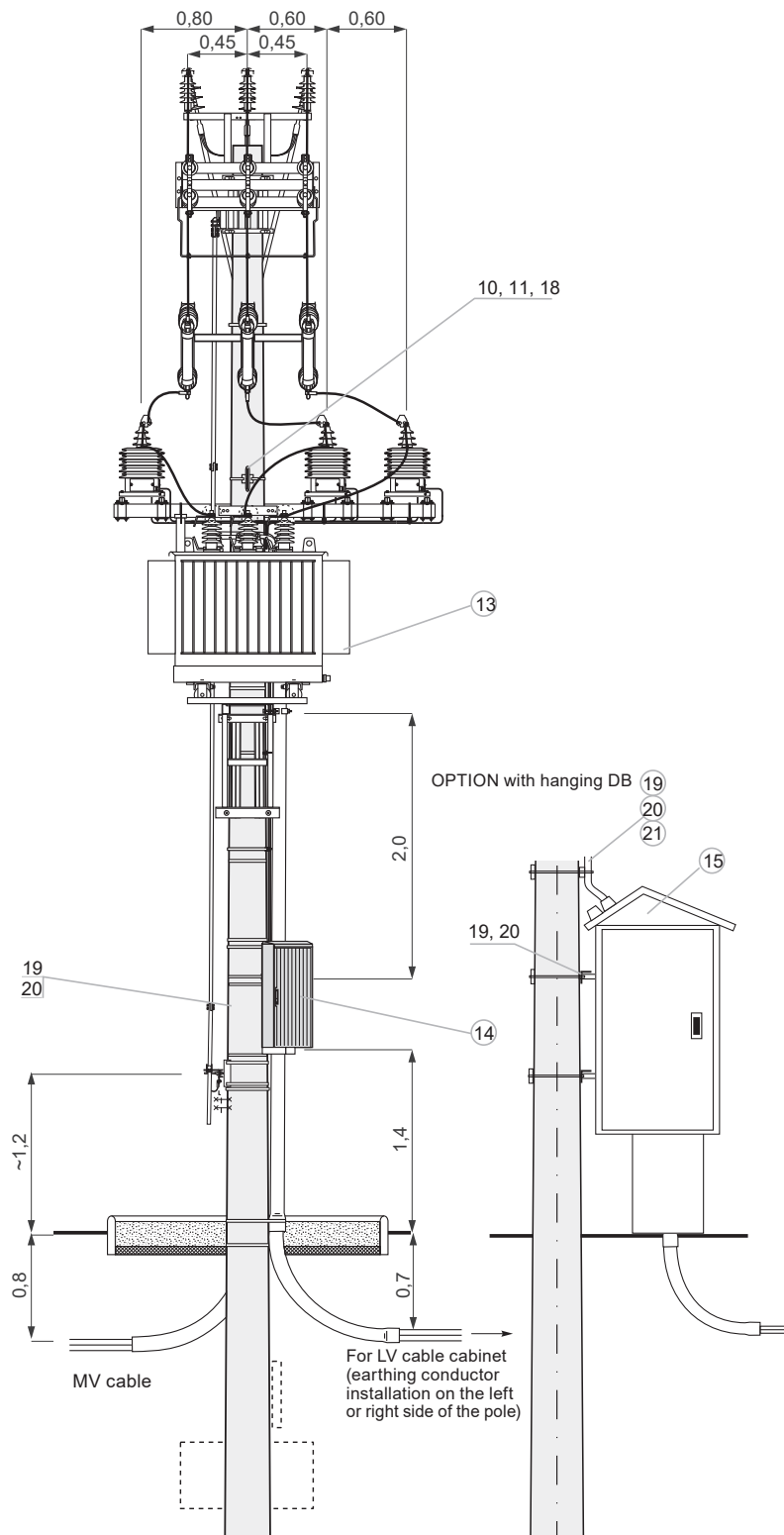
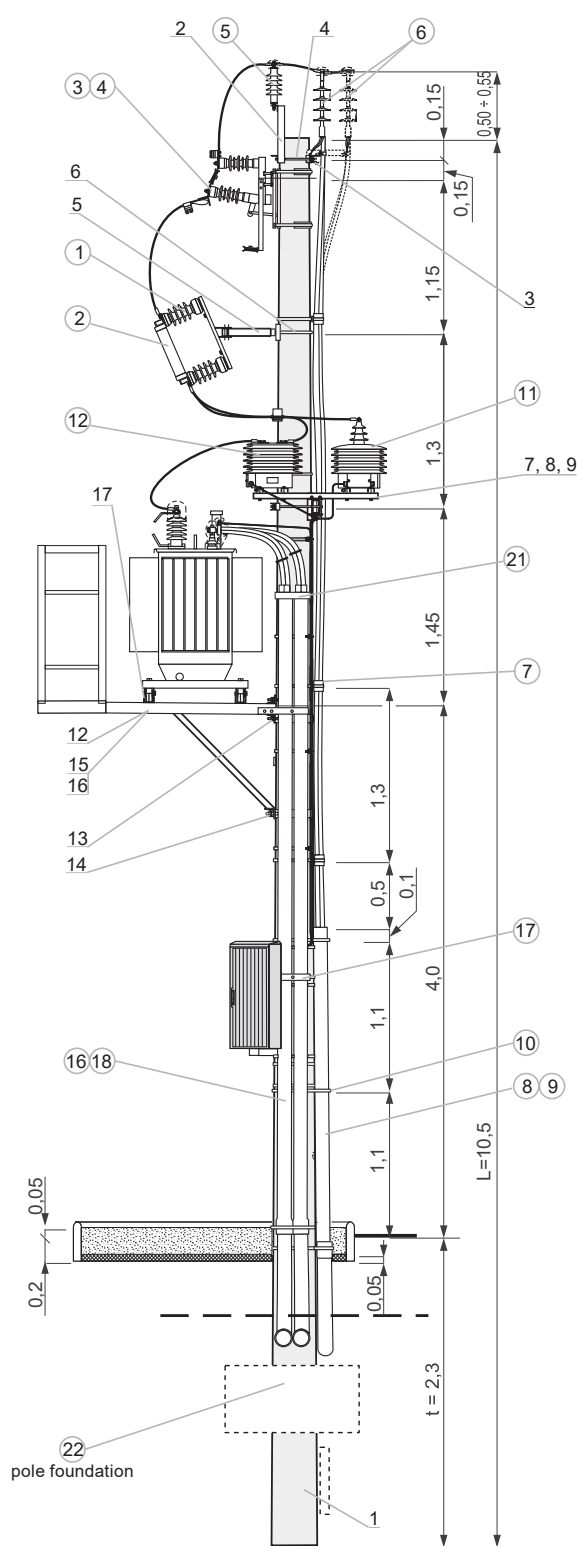


List of structures, accessories, apparatus for STSRs-20/630-K-10.5/10-OP3

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 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.	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	–	–
				Us7	–	–	2,5	9,7
E-12/17,5 EM-12/17,5 (top diameter = 263)		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
				Us30	2,5	9,7	–	–
Us10		–	–	2,5	9,7			
E-12/20 EM-12/20 (top diameter = 263)		20	4,0	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	–	–
				SFP133	–	–	2,6	9,6
				Us10	2,5	9,7	–	–
				Us15	–	–	2,5	9,7
E-12/25 EM-12/25 (top diameter = 263)		25	4,0	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	–	–
	SFP133			–	–	2,8	9,4	
	Us10			2,5	9,7	–	–	
Us15	–	–	2,5	9,7				
E-13,5/15 EM-13,5/15 (top diameter = 263)	13,5	15	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
E-13,5/17,5 EM-13,5/17,5 (top diameter = 263)		17,5	4,0	U3a	2,7	11,0	–	–
				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
E-13,5/20 EM-13,5/20 (top diameter = 263)		20	4,0	Up-3a	2,7	11,0	2,9	10,8
				SFP133	2,5	11,2	2,8	10,9
				Us10	2,5	11,2	–	–
				Us15			2,5	11,2
E-13,5/25 EM-13,5/25 (top diameter = 263)		25	4,0	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

Zakład Pomiarowo-Badawczy Energetyki
ENERGOPOMIAR-ELEKTRYKA Sp. z o.o.
 tel. 237 06 15, fax: 2310870
 ul. Świętokrzyska 2
 44-101 Gliwice



Zakład Pomiarowo-Badawczy Energetyki
ENERGOPOMIAR-ELEKTRYKA spółka z o.o.
 44-101 Gliwice ul. Świętokrzyska 2, tel. (032) 2376615

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 „STELEN” 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	kablówce	
Rozdzielnica niskiego napięcia	szafa rozdzielcza kablów 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:

inż. Mieczysław Krajewski

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 disconnector (load break switch) or a disconnector 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, STNu0	supply with MV overhead line with bare cables or PAS type from the side opposite to the transformer, terminal station with disconnector (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 disconnector (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 disconnector (load break switch), flat cable system
11.	STNPo/2, STNPuo/2	MV overhead line power supply with bare cables, through station with disconnector (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 disconnector (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, SIa, SIIa - ice loads.

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

								Station with three-system indirect measurement
								Variant for MV overhead supply
								I. – from the transformer side
								II. – from the opposite side of the transformer or a variation due to the design:
								1. – flat cable system (STNP, STNPu)
								– terminal MV cable line with LV overhead or cable outputs (STNK, STNKu)
								2. – triangular cable system (STNP, STNPu)
								– terminal MV cable line with LV cable outputs (STNK, STNKu)
								3. – through MV cable line with LV overhead or cable outputs (STNK, STNKu)
								4. – through MV cable line with LV cable outputs (STNK, STNKu),
								1f – single-phase transformer (STNPu)
								Transformer power [kVA]
								Rated voltage [kV]
								Variant by strength of poles
								1. - 6kN 2. - 10kN 3. -12kN 4. - 15kN 5. - 20Kn 6. - 25kN 7. - 33kN
								Variant by pole length
								1. - 10.5m 2. - 12m 3. - 8.5m 4. - 9m
								o - with MV switch
								unmarked - full equipment
								u - simplified (without MV fuses) without marking - full equipment
								Variant due to MV line
								P – through line
								O – strain line
								ON – strain-angle line
								K - cable line
								Ks – with self-supporting overhead cable
								Kp – with suspended overhead cable
								no marking – terminal line
								Pole-Mounted Overhead Transformer Station

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- tO, tO2, 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	or according to the catalogue of pole-mounted MV/NV transformer stations STN, STNu with transformers up to 630 kVA on spun poles Volume I published by PTPIREE Poznań
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 [mm²] 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 70]		8(6)x(1x120)	8(6)x(1x240)
5.	Cross section [mm²] 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:

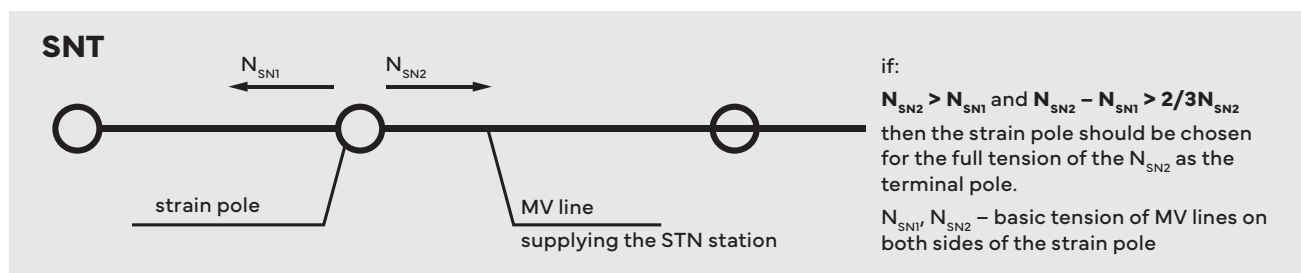
The MV supply to the station is designed to be provided via:

- 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 disconnector 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 disconnector (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 disconnector.

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 recommended

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 $R_{min} = 22 \text{ cm}$. 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_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 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/.../.../I

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	top diameter = 420	PAS cables
		PK-11a	PK-3a					top diameter = 263			
		PK-6a	PK-1a					top diameter = 218			
		PKZ-7						≤ 20 kN	top diameter = 420	AFL Cables	
		PKZ-6						≤ 20 kN	top diameter = 263		
		PKZ-3b	PKZ-1c					≤ 13,5 kN	≤ 9 kN		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 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	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					

 $\leq 13,5$ kN

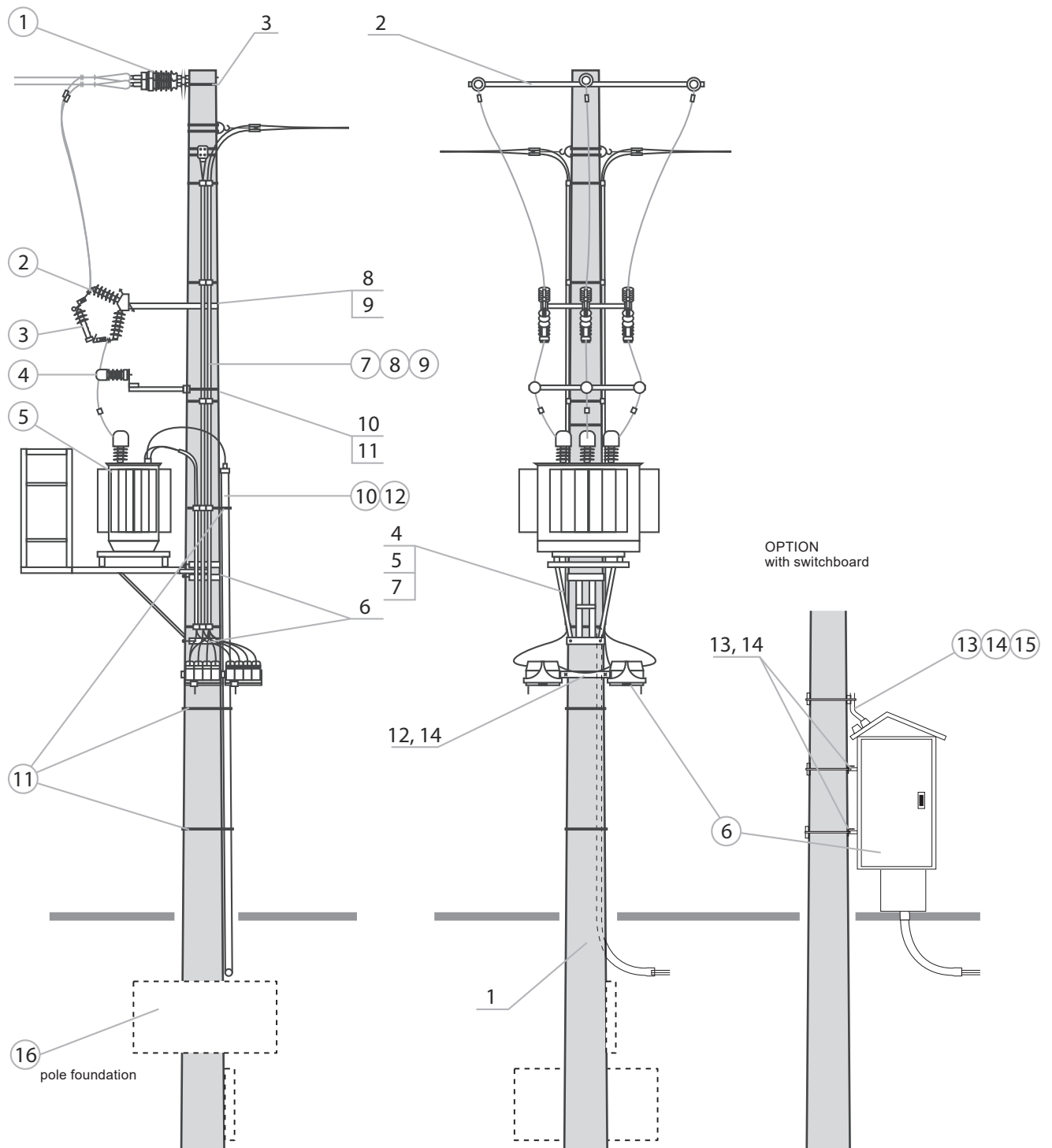
 ≤ 9 kN

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

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 – configuration 5
2.	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
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
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

STN-20/630/.../.../I

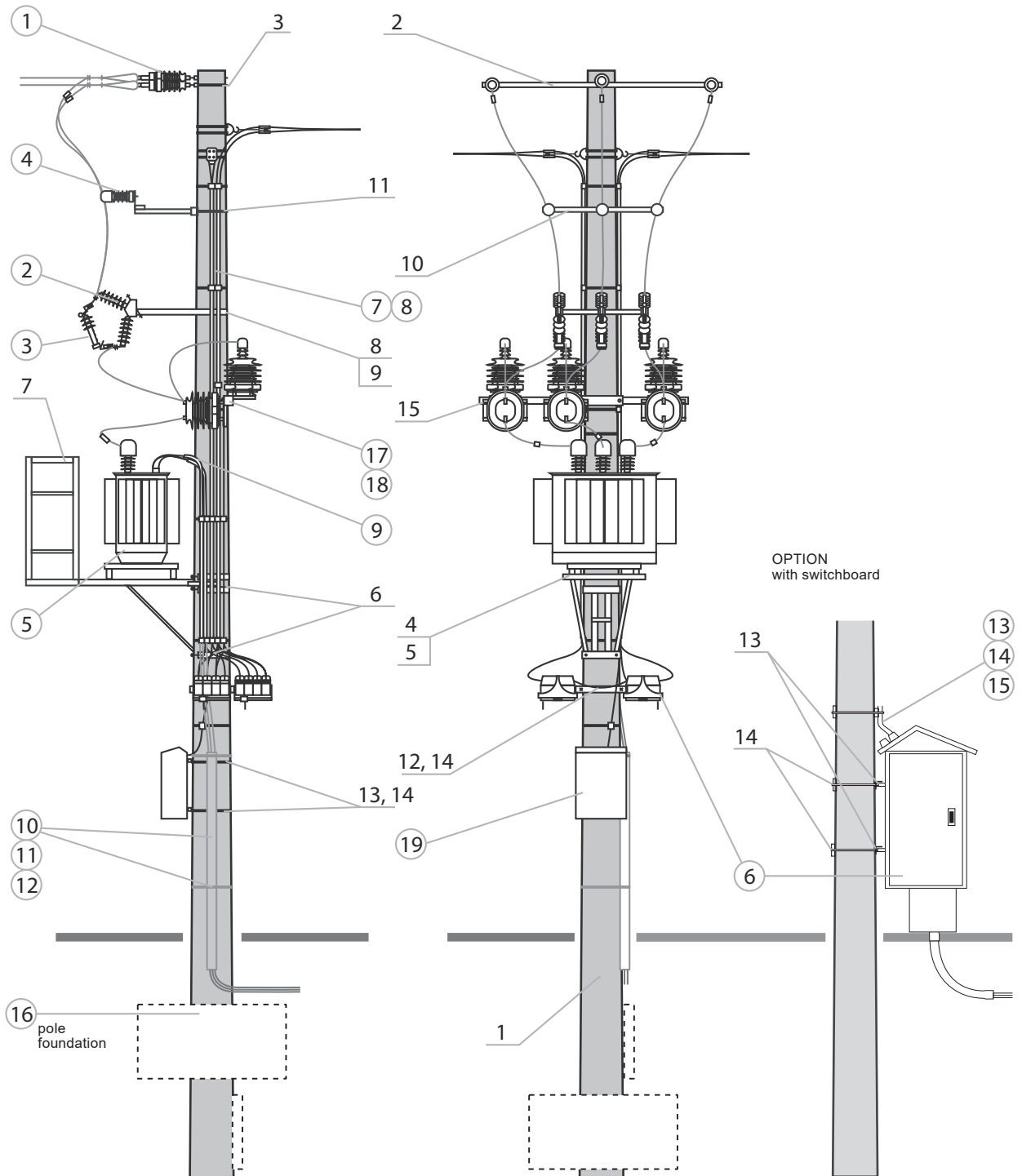


List of structures, accessories, apparatus for STN-20/630/.../.../I/PP3

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	top diameter = 420	PAS cables
		PK-11a	PK-3a							top diameter = 263	
		PK-6a	PK-1a					top diameter = 218			
		PKZ-7						≤ 20 kN	top diameter = 420	AFL Cables	
		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 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 disconnector 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 ACCESORIES									
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.	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		
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 authorized designer		
5.	Overhead transformer	630 kVA ... / 0,42		1	pcs.	... / ALPAR	To be selected by an authorised designer		
6.	LV disconnector DB switchboard	...		from 5	pcs.	... / ALPAR	To be selected by an authorised designer		
7.	Protective tube	RW-2		1	set	... / ALPAR	Use when using an LV overhead disconnector		
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 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/.../.../I/PP3

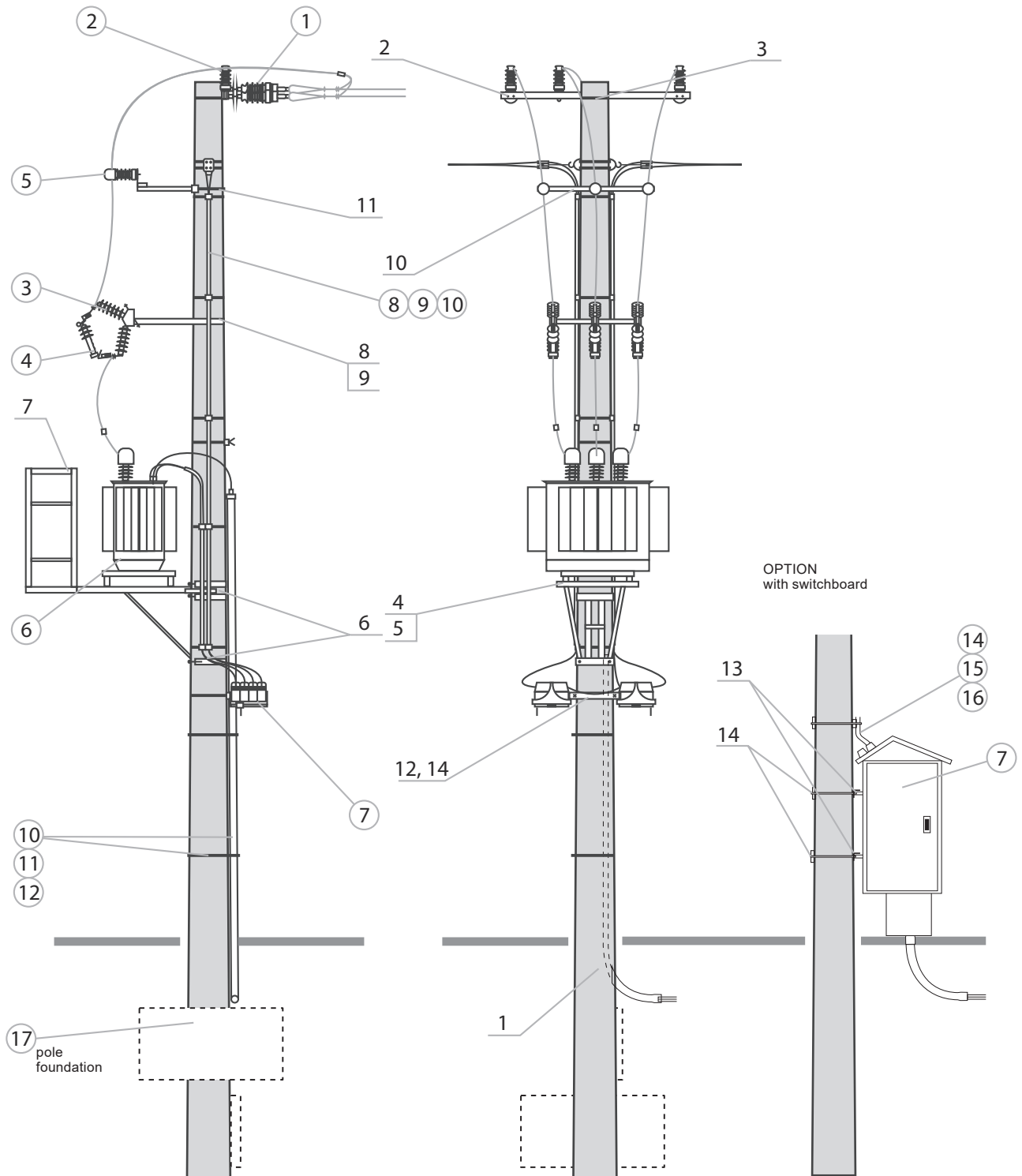


List of structures, accessories, apparatus for STN-20/630/.../.../II

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	top diameter = 420	PAS cables
		PK-11a	PK-3a							top diameter = 263	
		PK-6a	PK-1a					top diameter = 218			
		PKZ-7						≤ 20 kN	top diameter = 420	AFL Cables	
		PKZ-6							top diameter = 263		
		PKZ-3b	PKZ-1c					top diameter = 420			
		PKZ-3a	PKZ-1b					top diameter = 263			
		PKZ-3	PKZ-1a					≤ 13,5 kN	≤ 9 kN		top diameter = 420
top diameter = 263											
			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 (1)	pcs.	ALPAR	For KRZ or DB for pole with top diameter = 263 mm For KRZ or DB for pole with top diameter = 218 mm (1) - for LV disconnectors				

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 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 PBNWMA-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 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			

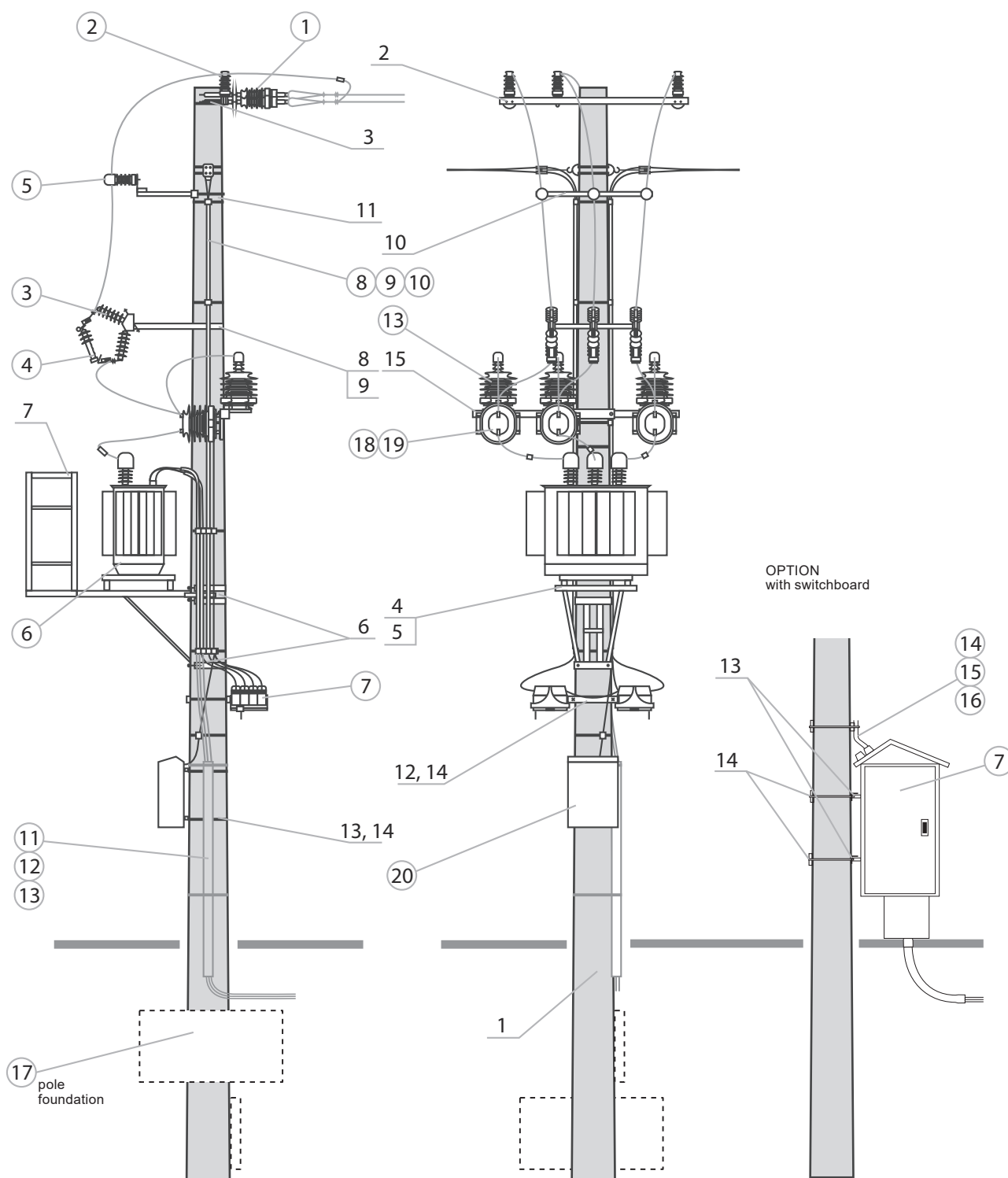
STN-20/630/.../.../II



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	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 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 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 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 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 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 PBNWMoA-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	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 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

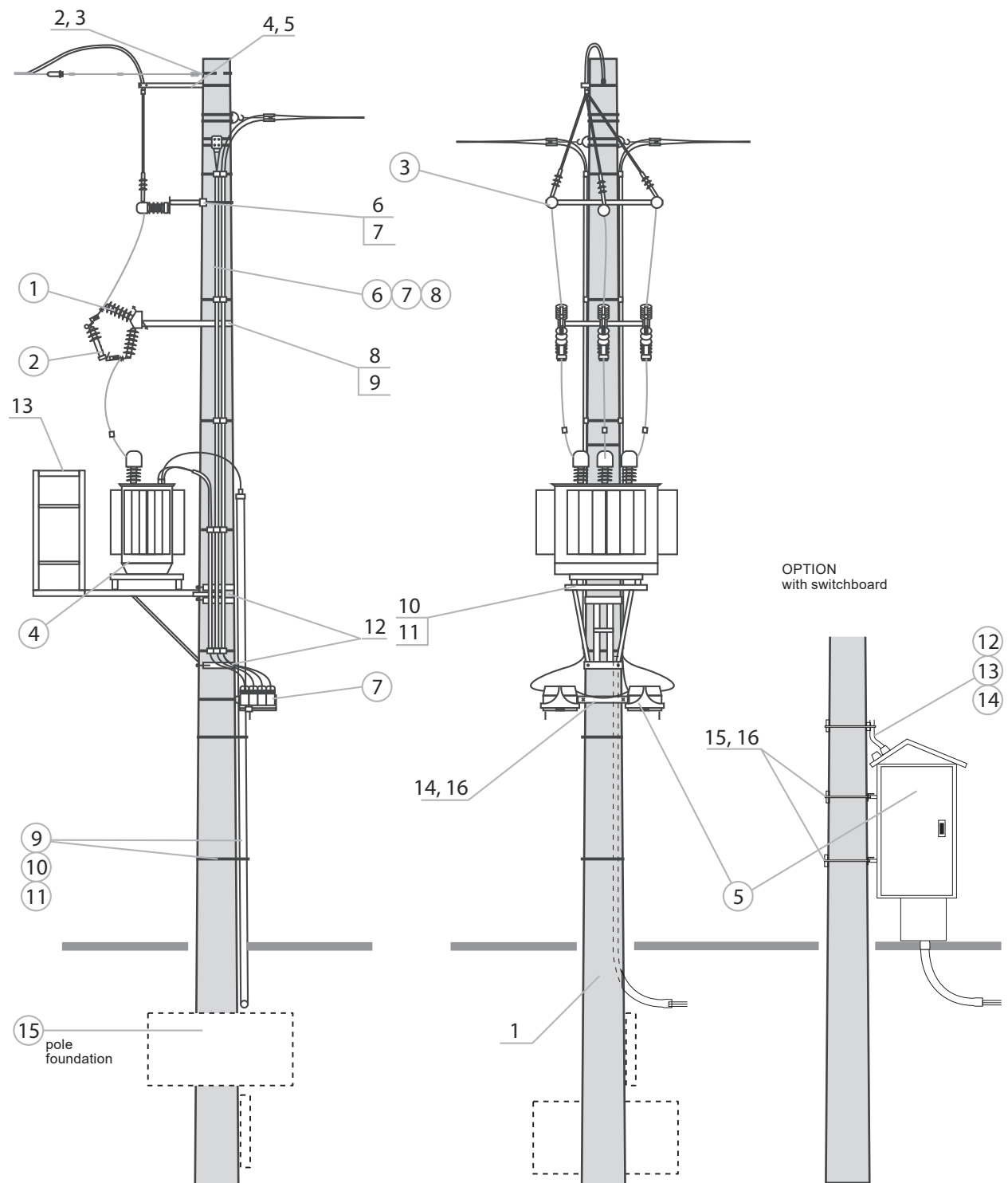


List of structures, accessories, apparatus for STNKs-20/630/.../.../I

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 -
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	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

STNKs-20/630/.../.../I

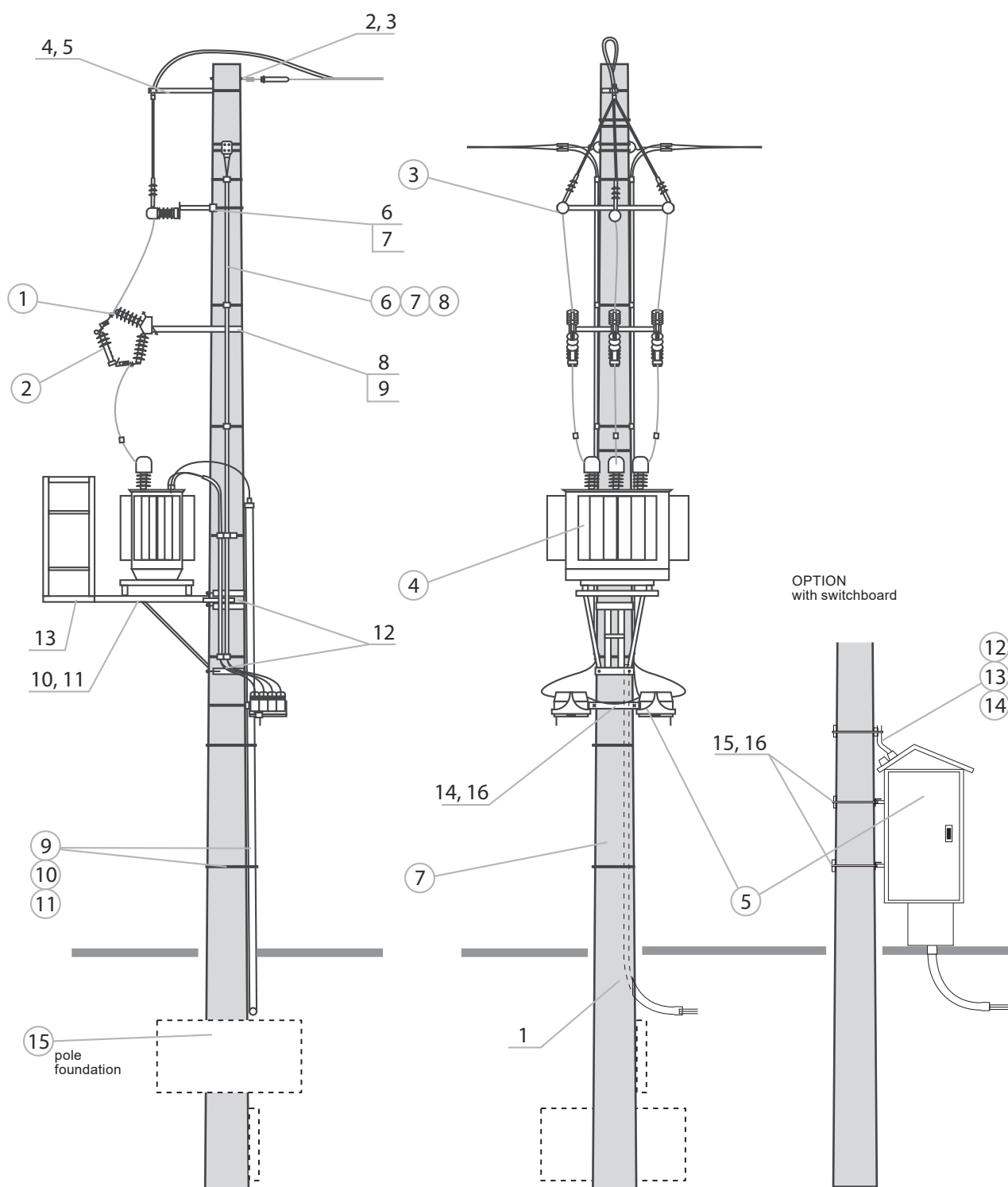


List of structures, accessories, apparatus for STNKs-20/630/.../.../II

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	
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	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

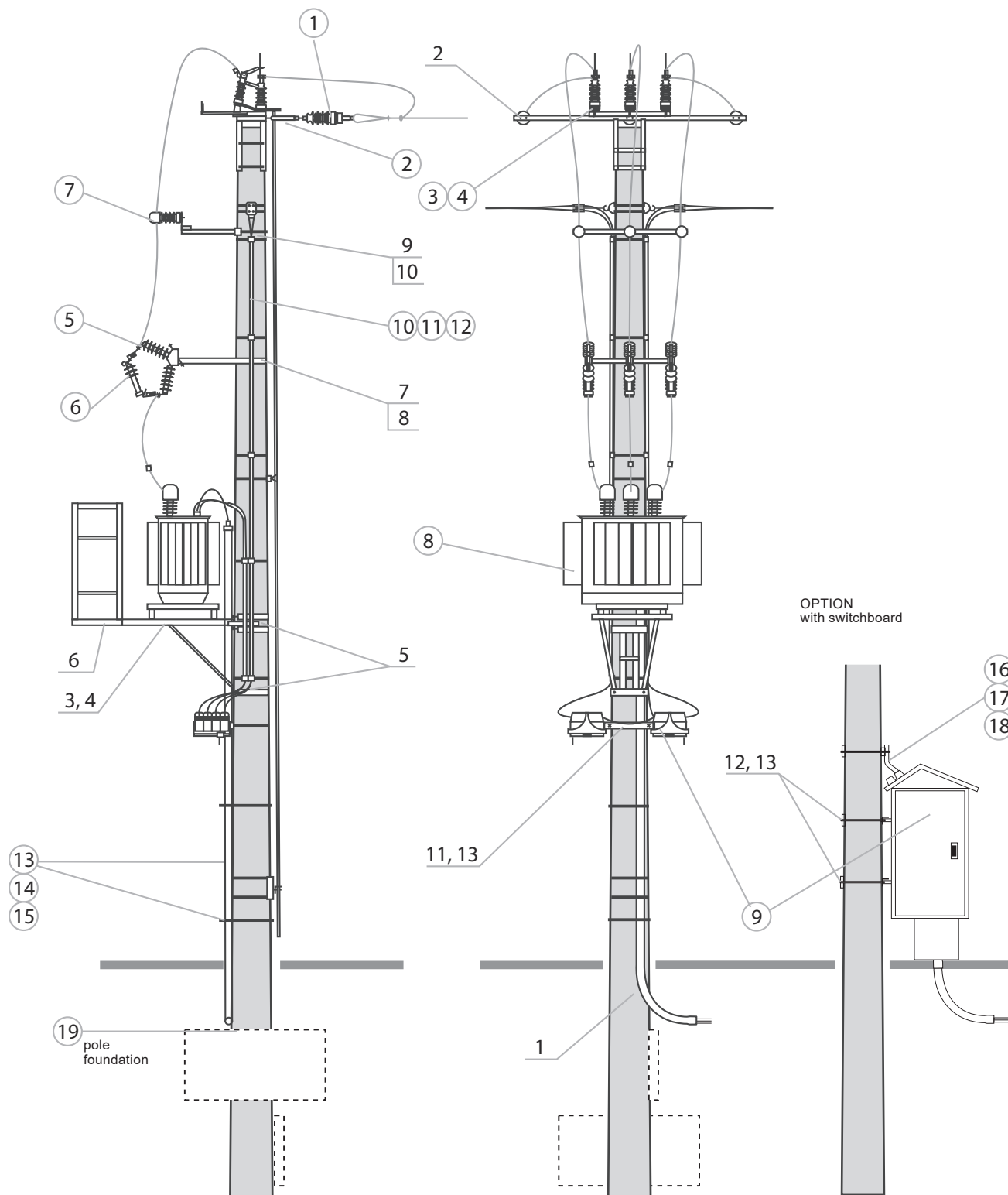


List of structures, accessories, apparatus for STNo-20/630/.../...

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	N _{SN} line tension	≤ 20 kN	≤ 12 kN	top diameter = 420	PAS cables	
		top diameter = 263									
		≤ 12 kN						top diameter = 218			
								≤ 20 kN	≤ 20 kN		top diameter = 420
		top diameter = 263									
		≤ 13,5 kN					≤ 9 kN		top diameter = 420		
									top diameter = 263		
		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 disconnectors					
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
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 disconnecter
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	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	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

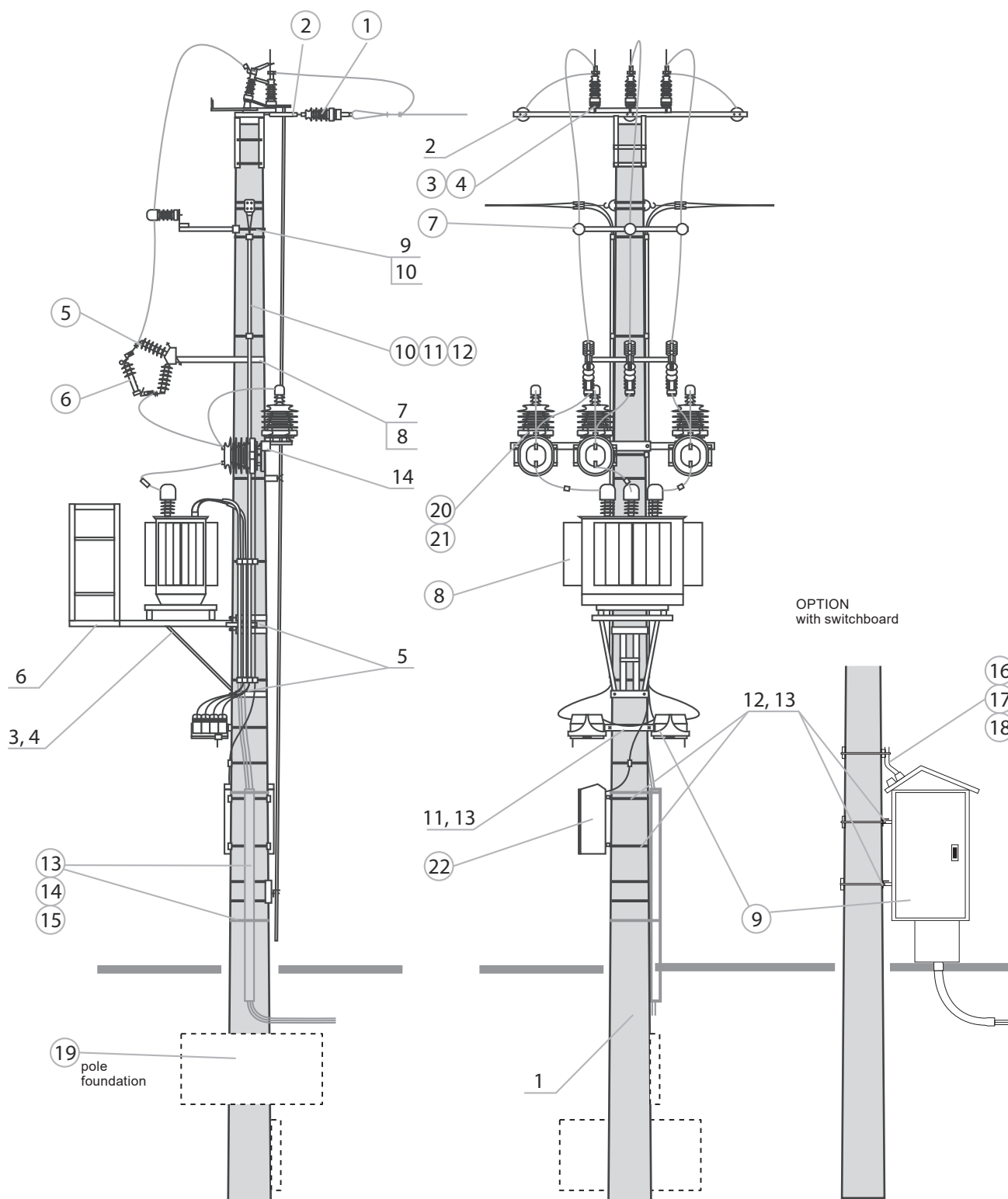
STNo-20/630/.../...



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	N _{SN} line tension	≤ 20 kN	≤ 12 kN	top diameter = 420	PAS cables	
		top diameter = 263									
		PK-11a						top diameter = 218			
		PK-6a									
		PKZ-7					≤ 20 kN		top diameter = 420	AFL Cables	
		PKZ-6							top diameter = 263		
		PKZ-3b						≤ 20 kN			top diameter = 420
		PKZ-3a									top diameter = 263
PKZ-3	≤ 13,5 kN	≤ 9 kN	top diameter = 420	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 disconnector 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.	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 disconnector without earthing switch For switch disconnector with earthing switch					
5.	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					
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 disconnector 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	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	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

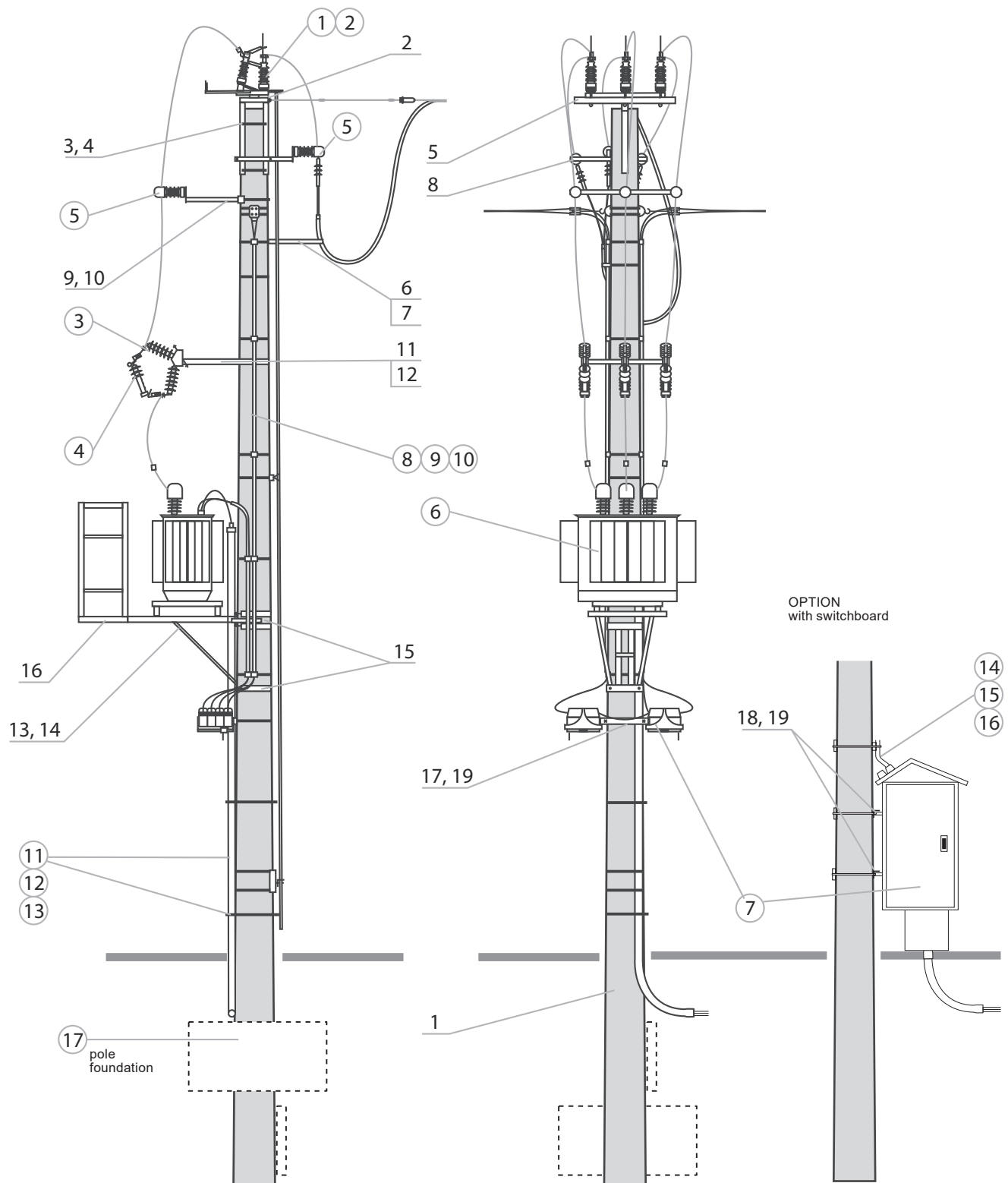


List of structures, accessories, apparatus for STNKso-20/630/.../...

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 Poles: top diameter = 218, 263 Set with KOG-61
9.	Structure for arresters	KOG-5	2	set	ALPAR	Not to be used when mounting bases with PB-NV0A or PBNWMOA 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 disconnector 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 ACCESSORIES						
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 PBNWMOA-24/50 PBNVA-20/4 PBNVoA-20/4	3	pcs.	ALPAR	- With integrated MV arrester -
4.	Fuse link	WBGn 17,5 HH ... A 10/24kV "e"=442 mm; "e"=292 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
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 disconnector 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 disconnector
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

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

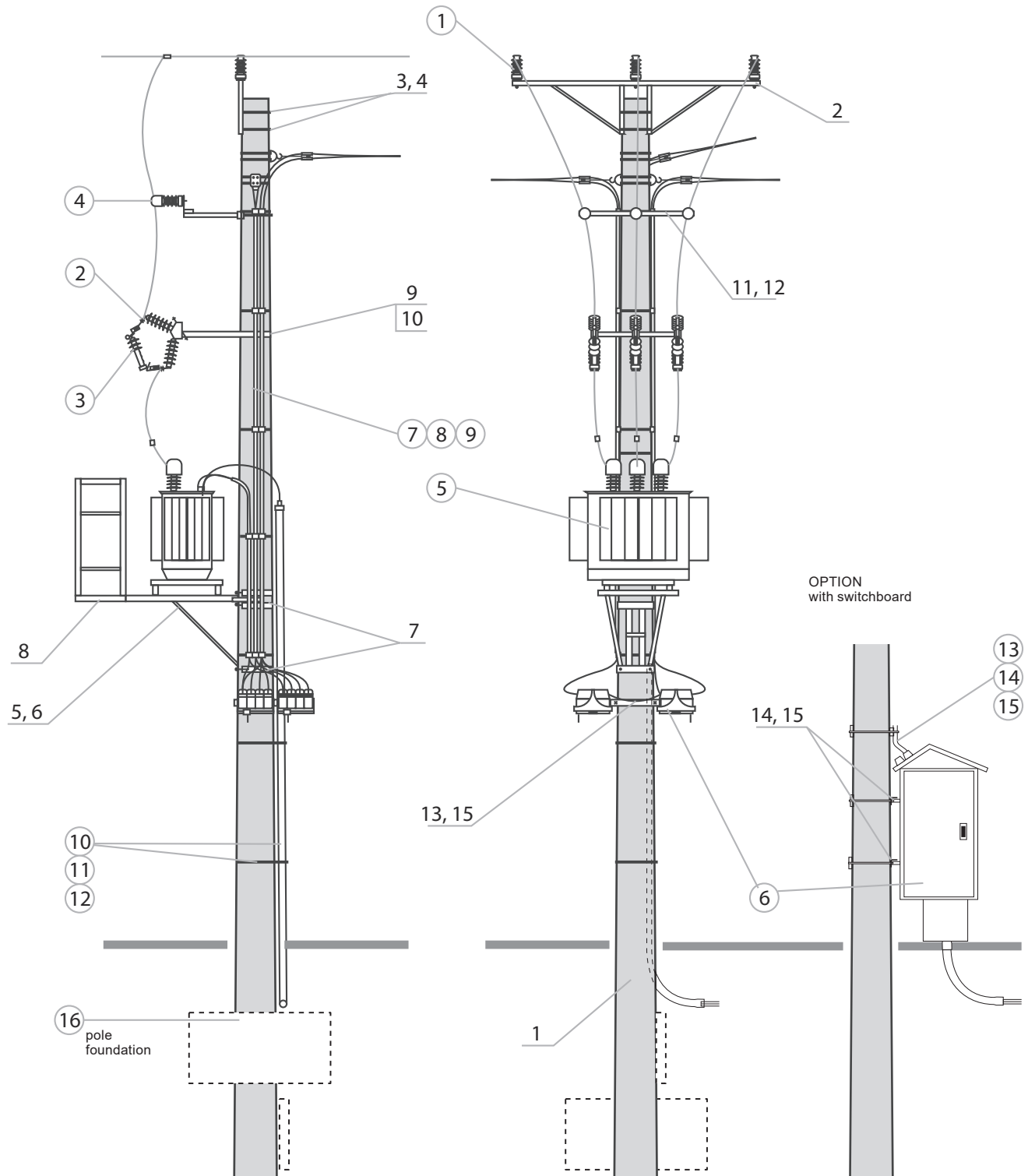


List of structures, accessories, apparatus for STNP-20/630/.../.../1

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°	top diameter = 420		PAS cables
		PP-3a	PP-2a							top diameter = 263		
		PP-3a	PP-2a							top diameter = 218		
		PPZ-3	PP-57				cross-section	35-50	50-70	top diameter = 420		AFL Cables
		PPZ-2	PP-56							top diameter = 263		
		PPZ-1	PP-51							top diameter = 218		
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	
		M16x400	M16x330								top diameter = 263 mm	
		M16x350	M16x280								top diameter = 218 mm	
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 PBNWMA 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 PBNWMA-24/50 PBNVA-20/4 PBNVoA-20/4	3	pcs.	ALPAR	With integrated MV arrester 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 disconnect 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

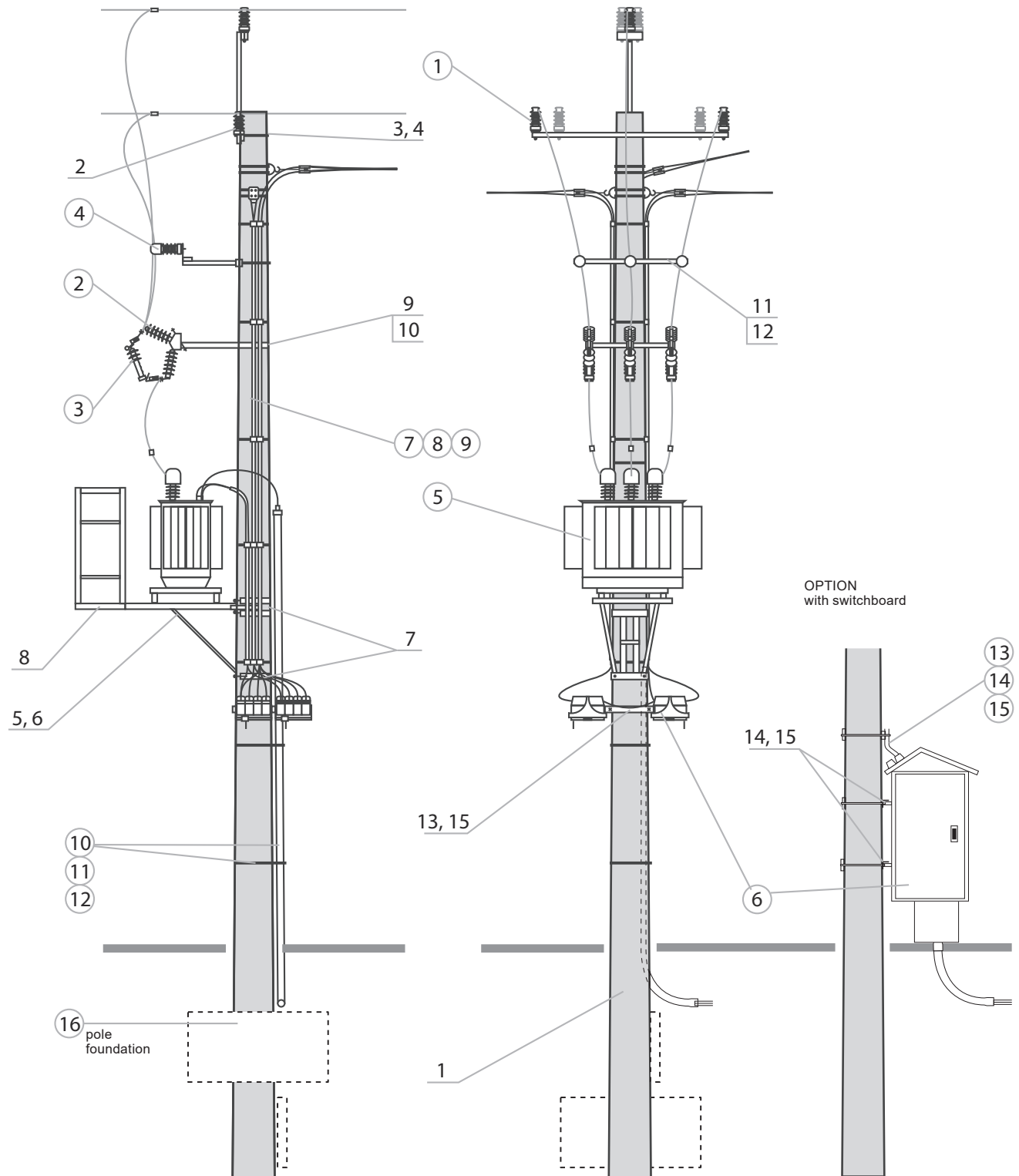


List of structures, accessories, apparatus for STNP-20/630/.../.../2

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 AFL cables
		PP-331c/2				
		PP-331b/2				
		PP-311d/2				
		PP-311c/2				
		PP-311b/2				
3.	Bracket	OB-14 OB-7 OB-3	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
4.	Mounting bolts	M16x560 M16x400 M16x350	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
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 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 PBNWMoA-24/50	3	pcs.	ALPAR	- With integrated MV arrester
		PBNVA-20/4 PBNVoA-20/4	3	pcs.	ALPAR	- 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

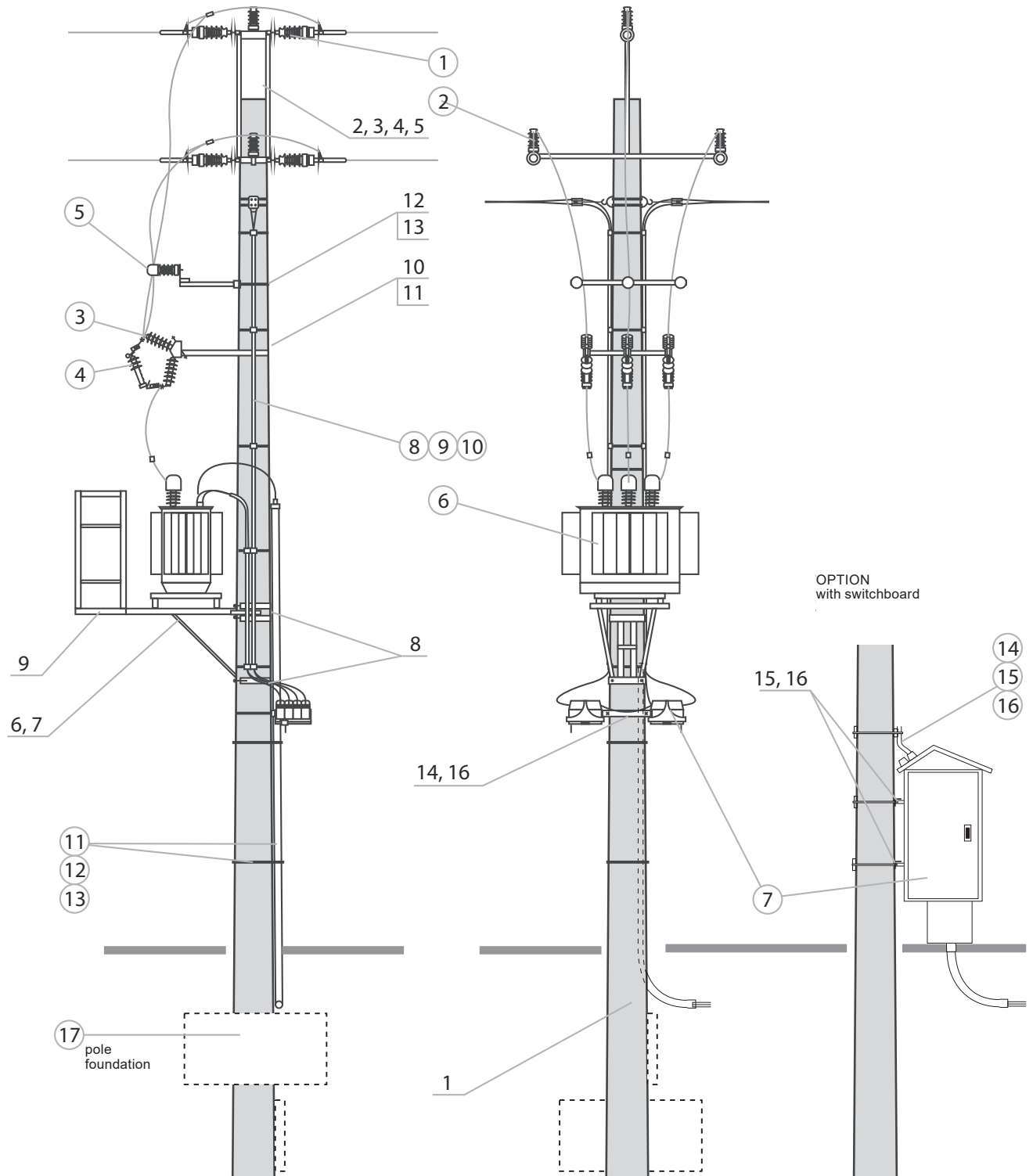


List of structures, accessories, apparatus for STNON-20/630/.../...

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	N _{SN} line tension	≤ 21kN	AFL cables	50-70	top diameter = 420						
		PO-32/2								top diameter = 263							
		PO-31a								top diameter = 218							
		PO-35														50-70	top diameter = 420
		PO-33a														top diameter = 263	
		PK-22														top diameter = 420	
		PK-21														35-50	top diameter = 263
PK-20a									top diameter = 218								
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 M16x520 M20x520 M16x500 M20x500 M16x350 M20x350 M16x300 M20x300	3 3 3 3 3	1 1 1 1 1	set	ALPAR	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 = 218								
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 PBNWMoA 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	ŁO/1 ŁO2/1 ŁO/2 ŁO2/2	3	set	... / ALPAR	Single / double for bare line			
2.	Supporting insulator	LWP-8/24 M24x140	3	pcs.	ALPAR	Single/ double for PAS lines - configuration 5			
3.	Fuse base	PBNWMA-24/50	3	pcs.	ALPAR	Bare line, for 1° inclination, use 6 pcs.			
		PBNWMA-24/50				With integrated MV arrester			
4.	Fuse link	PBNVA-20/4	3	pcs.	ZRE / APLAR	With integrated MV arrester			
		PBNVoA-20/4				A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGn fuse link			
5.	Surge arrester	HH ... A 10/24 kV	3	pcs.	SIBA / ALPAR	The value and type of transformer shall be determined by an authorised designer			
		"e"=442 mm;				To be individually selected by an authorised designer			
6.	Overhead transformer	"e"=292 mm	3	pcs.	... / ALPAR	To be individually selected by an authorised designer			
		630 kVA ... / 0,42				To be individually selected by an authorised designer			
7.	LV disconnect DB switchboard	...	from 5	pcs.	... / ALPAR	To be individually selected by an authorised designer			
8.	Protective tube	RW-2	1	set	... / ALPAR	Use when using an LV overhead disconnect			
9.	Conduit clamp	U75W	4	pcs.	ALPAR	Use when using free-standing switchboard			
10.	Heat-shrinkable four-core breakout	SEH-4_95-36	1	pcs.	CELLPACK / ALPAR	Use when using a wall-mounted switchboard at the station			
11.	Protective tube	BE110	6	m	... / ALPAR	Use when using a wall-mounted switchboard at the station			
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	Use when using a wall-mounted switchboard at the station			
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	Use when using a wall-mounted switchboard at the station			
16.	Heat-shrinkable four-core breakout	SEH-4_110	1	pcs.	CELLPACK / ALPAR	Use when using a wall-mounted switchboard at the station			
17.	Foundation support structure	...	1	set	ALPAR	Selection of the type of pole foundation by an authorised designer			

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

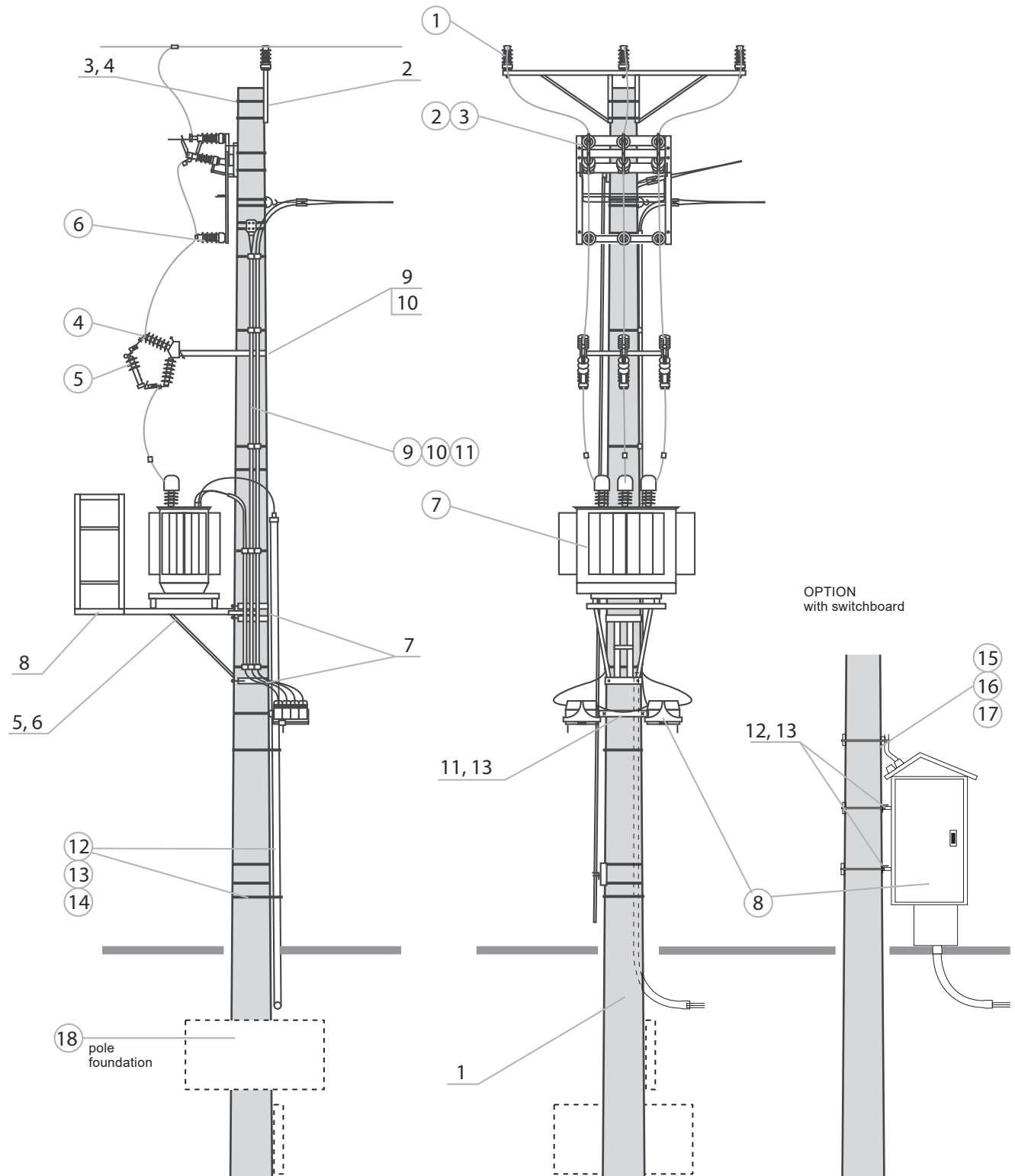


List of structures, accessories, apparatus for STN_{PO}-20/630/.../.../1

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°	top diameter = 420	PAS cables
		PP-3a	PP-2a							top diameter = 263	
		PP-3a	PP-2a							top diameter = 218	
		PPZ-3	PP-51				cross-section	35-50	50-70	top diameter = 420	AFL cables
		PPZ-2	PP-56							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.	Disconnector Disconnector with earthing switch Load break switch Load break switch with earthing switch	ONp III SA 24/4o OUNp III SA 24/4o RNp III SA 24/4o RUNp 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				
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				
5.	Fuse link	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				
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	Selection of the type of pole foundation by an authorised designer				
18.	Foundation support structure	...	1	set	ALPAR					

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

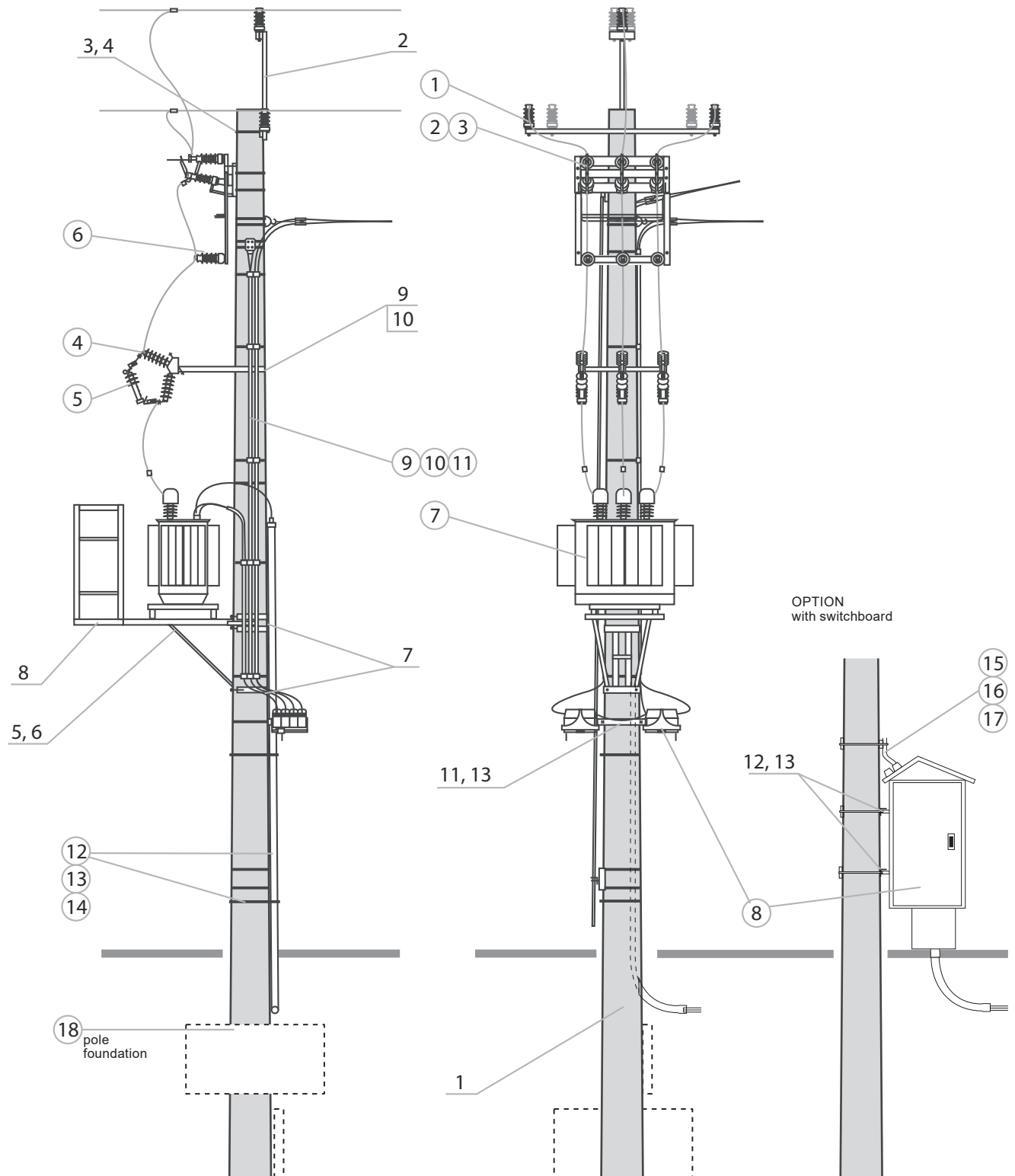


List of structures, accessories, apparatus for STN_{Po}-20/630/.../.../2

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 AFL cables
		PP-331c/2				
		PP-331b/2				
		PP-311d/2				
		PP-311c/2				
		PP-311b/2				
3.	Bracket	OB-14 OB-7 OB-3	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
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 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 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.	Disconnecter Disconnecter with earthing switch Load break switch Load break switch with earthing switch	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
3.	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
4.	Fuse base	PBNWMA-24/50 PBNWMA-24/50 PBNVA-20/4 PBNVoA-20/4 WBGn 17,5	3	pcs.	ALPAR	- With integrated MV arrester - With integrated MV arrester
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 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	
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

STN Po-20/630/.../.../2

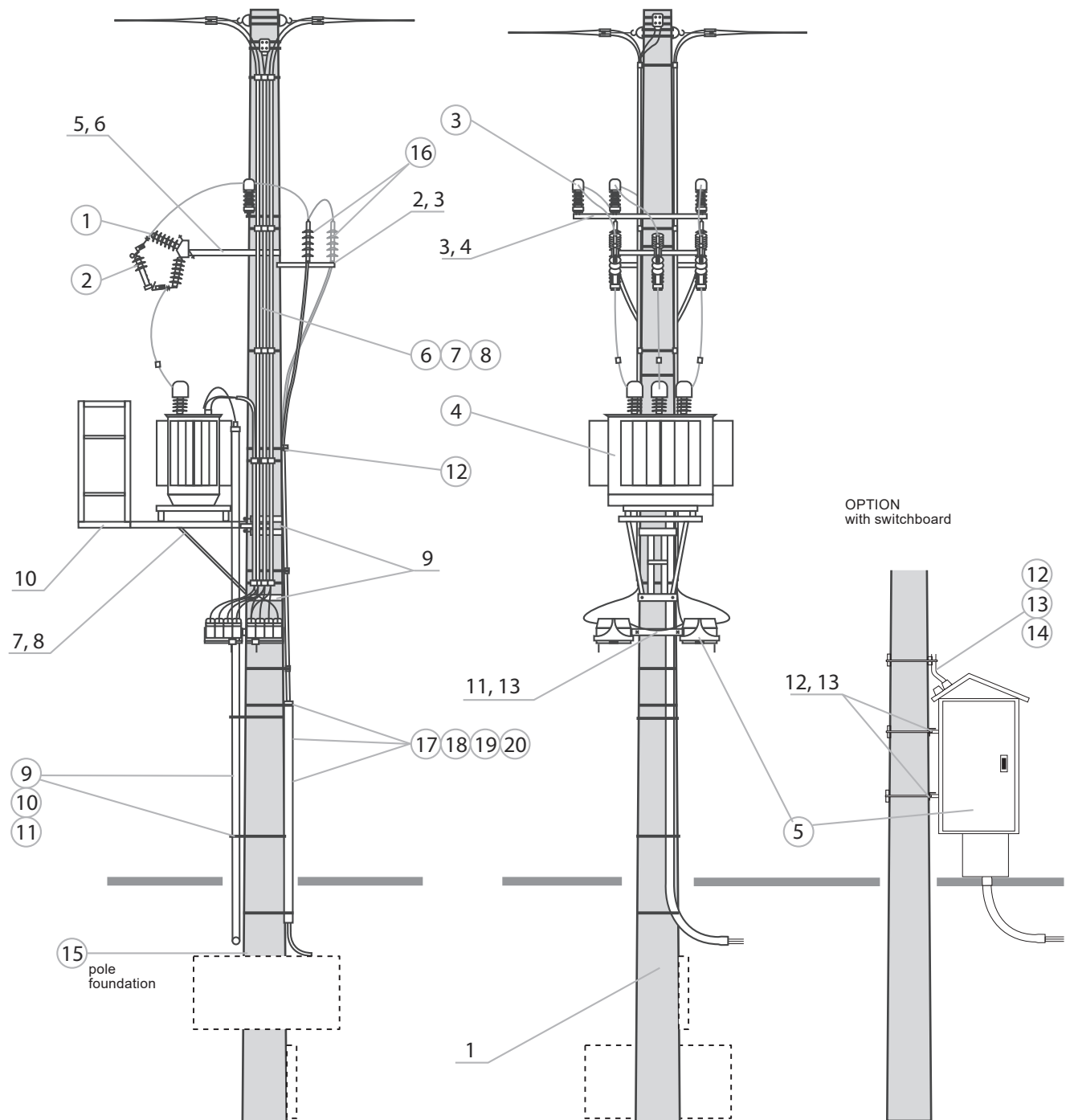


List of structures, accessories, apparatus for STNK-20/630/.../.../1(3)

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
		KGK-12a				top diameter = 420
		KGK-11a				top diameter = 263
		KGK-113				top diameter = 218
		KGK-112a				For two 6 x 1-phase cables
		KGK-111a				top diameter = 420
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
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	Use when using free-standing switchboard
9.	Protective tube	BE110	6	m	... / ALPAR	
10.	Conduit clamp	U110W	3	1	ALPAR	Use when using a wall-mounted switchboard at the station
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	Selection of the type of pole foundation by an authorised designer
15.	Foundation support structure	...	1	set	ALPAR	
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	

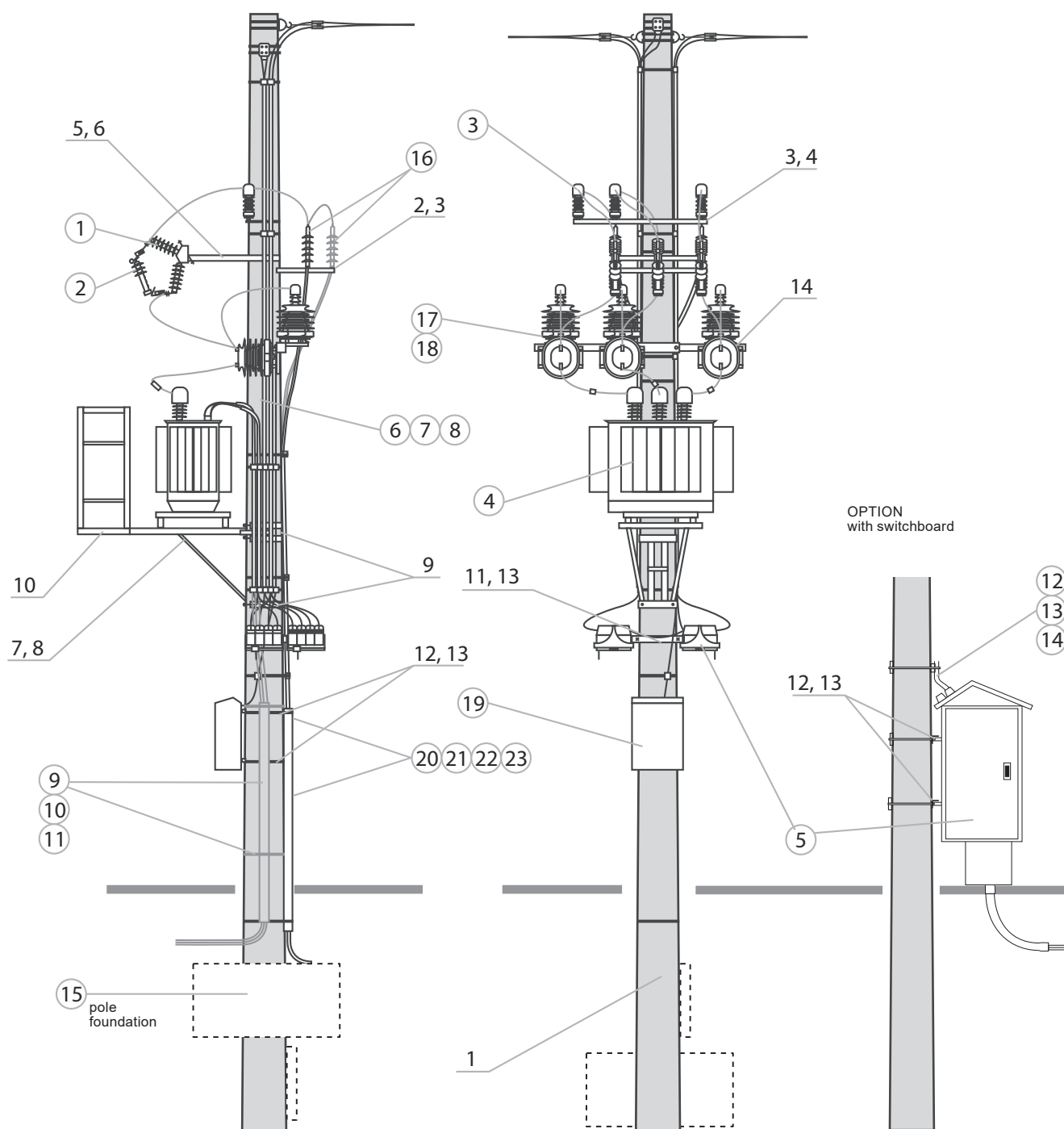
STNK-20/630/.../.../1(3)



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				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 top diameter = 420 For KGK-12a, KGK-112a, KOG-54 top diameter = 263 For KGK-11a, KGK-111a, KOG-55 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 disconnector 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 ACCESORIES						
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 - 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	...	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 disconnector
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

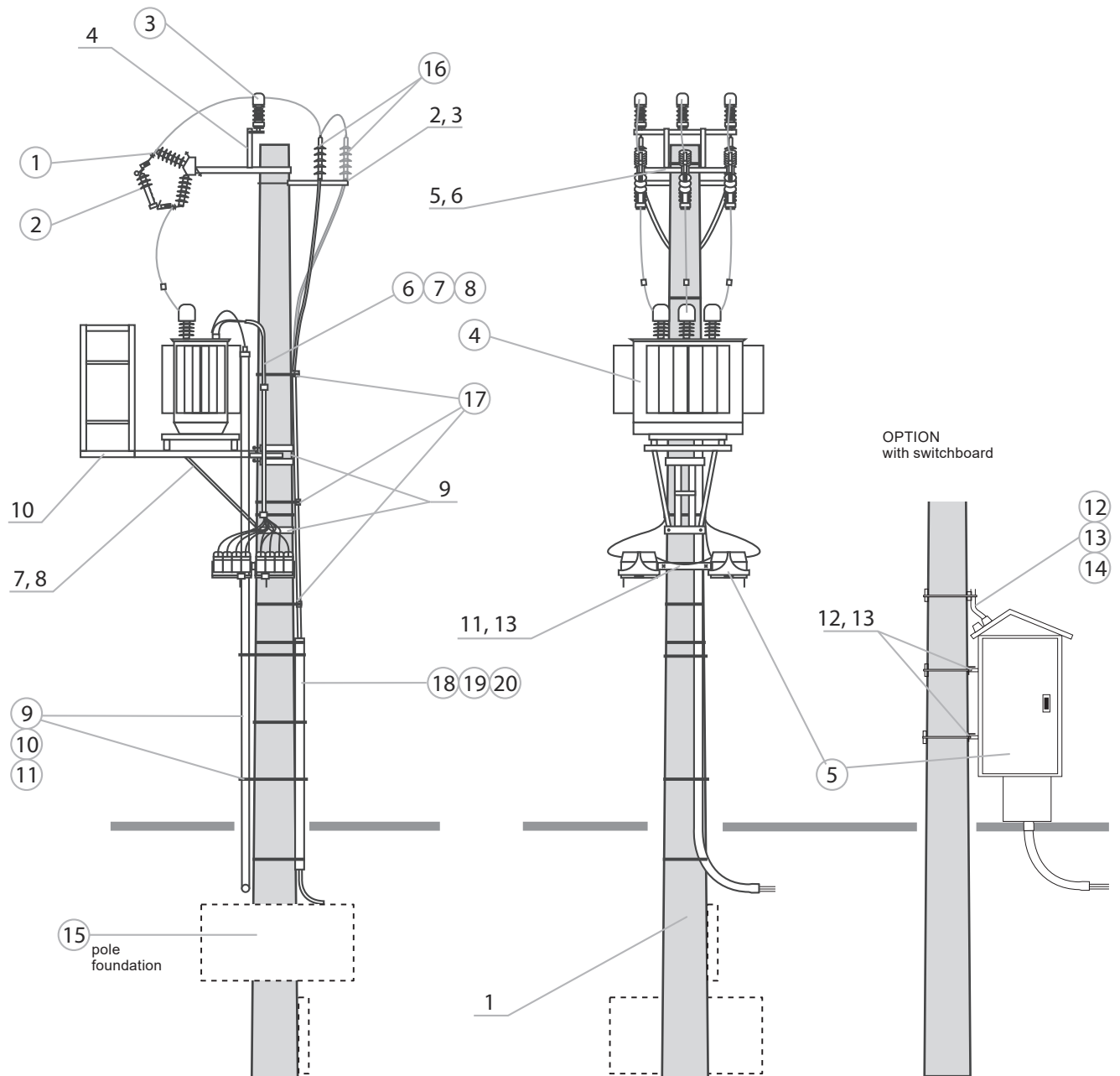


List of structures, accessories, apparatus for STNK-20/630/.../.../2(4)

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
		KGK-12a				top diameter = 420
		KGK-11a				top diameter = 263
		KGK-113				top diameter = 218
		KGK-112a				For two 6 x 1-phase cables
		KGK-111a				top diameter = 420
3.	Bracket	OB-16	1	pcs.	ALPAR	For KGK-13, KGK-113
		OB-10				For KGK-12a, KGK-112a
		OB-7				For KGK-11a, KGK-111a
4.	Structure for arresters	KOG-56	1	pcs.	ALPAR	top diameter = 420 top diameter = 263 top diameter = 218
5.	Structure for fuse bases	KBZA	1	pcs.	ALPAR	To be mounted on a KBZA structure
6.	Mounting bolts	M16x380+N+Po+Ps M16x340+N+Po+Ps	2	set	ALPAR	Use for STN stations
7.	Structure for the transformer	KTZ-1a	1	pcs.	ALPAR	For poles top diameter = 263 mm
		KTZ-2a				For poles top diameter = 218 mm
		KTZ-3a				Transformer from 25 kVA to 100 kVA
		KTZ-8				Transformer from 160 kVA to 250 kVA
						Transformer 400 kVA Transformer 630 kVA
8.	Structure for OCTs	KPT-1	1	pcs.	ALPAR	For KTZ-1a for pole with top diameter = 263 mm
		KPT-2				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	2 (1)	pcs.	ALPAR	To KRZ or KSZ for poles with top diameter = 263 mm
		OB-10				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	3	pcs.	ALPAR	-
		PBNWMA-24/50				With integrated MV arrester
2.	Fuse link	PBNVA-20/4	3	pcs.	SIBA / ALPAR	-
		PBNVA-20/4				With integrated MV arrester
3.	Surge arrester	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				
4.	Overhead transformer	...	3	pcs.	... / ALPAR	The value and type of transformer shall be determined by an authorised designer
5.	LV disconnecter DB switchboard	630 kVA ... / 0,42	1	pcs.	... / ALPAR	To be individually selected by an authorised designer
6.	Protective tube	...	from 5	pcs.	... / ALPAR	To be individually selected by an authorised designer
7.	Conduit clamp	RW-2	1	set	... / ALPAR	
8.	Heat-shrinkable four-core breakout	U75W	4	pcs.	ALPAR	Use when using an LV overhead disconnecter
9.	Protective tube	SEH-4_95-36	1	pcs.	CELLPACK / ALPAR	
10.	Conduit clamp	BE110	6	m	... / ALPAR	
11.	Heat-shrinkable four-core breakout	U110W	3	1	ALPAR	Use when using free-standing switchboard
12.	Protective tube	SEH-4_110	1	pcs.	CELLPACK / ALPAR	
13.	Conduit clamp	RW-1	1	set	... / ALPAR	
14.	Heat-shrinkable four-core breakout	U110W	3	pcs.	ALPAR	Use when using a wall-mounted switchboard at the station
15.	Foundation support structure	SEH-4_110	1	pcs.	CELLPACK / ALPAR	
16.	Cable termination	...	1	set	ALPAR	Selection of the type of pole foundation by an authorised designer
17.	MV cable clamp	CHE-F 24kV 25-150	1(2)	set	CELLPACK / ALPAR	For 3 x 1-core cable
18.	Protective tube	CHE-F 24kV 70-240				For 3 x 1-core cable
19.	Heat-shrinkable three-core breakout	CHEP(H)-3F 24kV 50-150				For 3-core cable type HAKnFtA
20.	Conduit clamp	CHEP(H)-3F 24kV 70-240				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	
19.	Heat-shrinkable three-core breakout	SEH-3_110	1	pcs.	CELLPACK / ALPAR	For MV cable shielding
20.	Conduit clamp	U110W	3	pcs.	ALPAR	

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

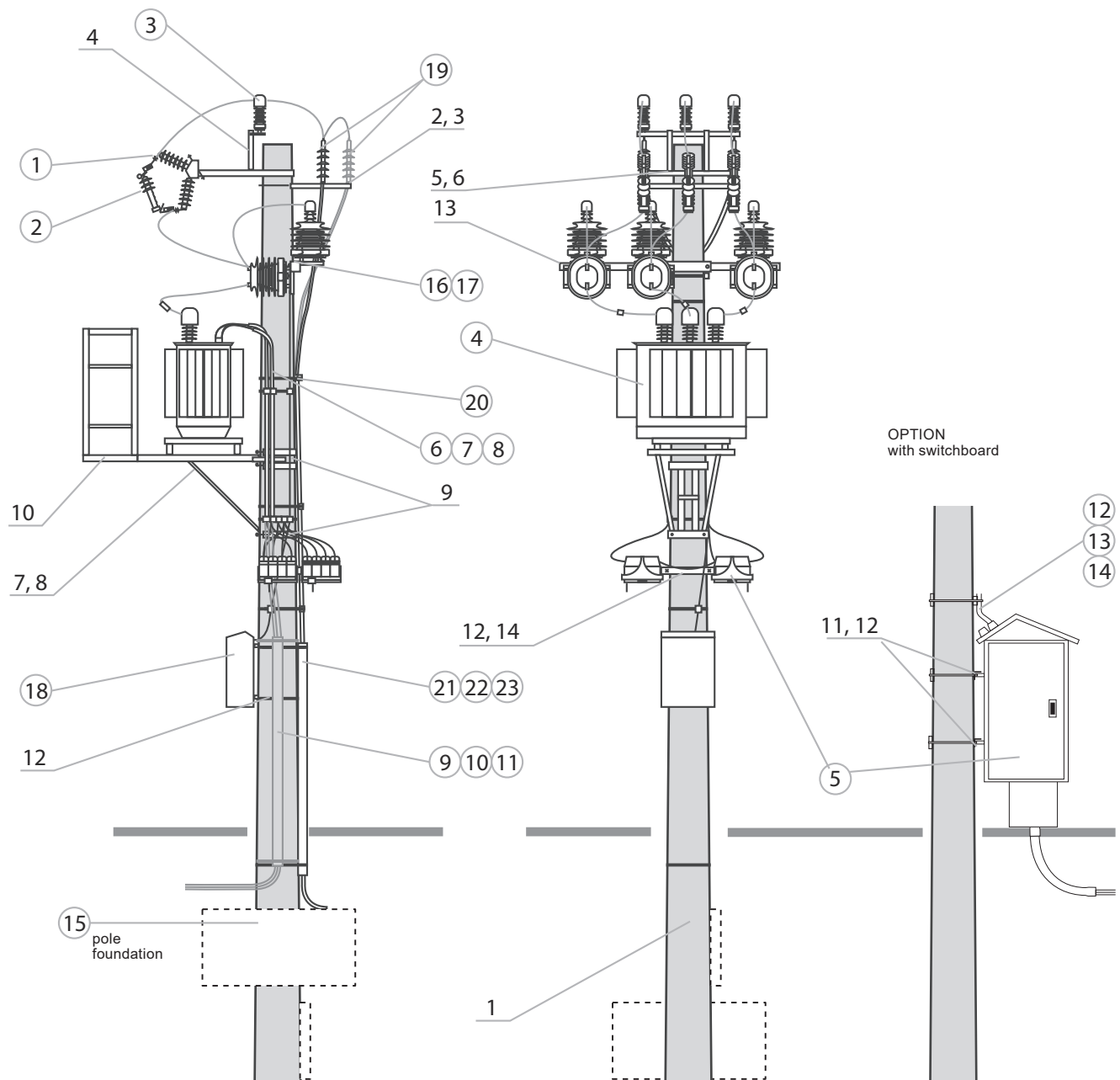


List of structures, accessories, apparatus for STNK-20//630...//2(4)/PP3

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 PBNWMoA-24/50 PBNVA-20/4 PBNVoA-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	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	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.	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

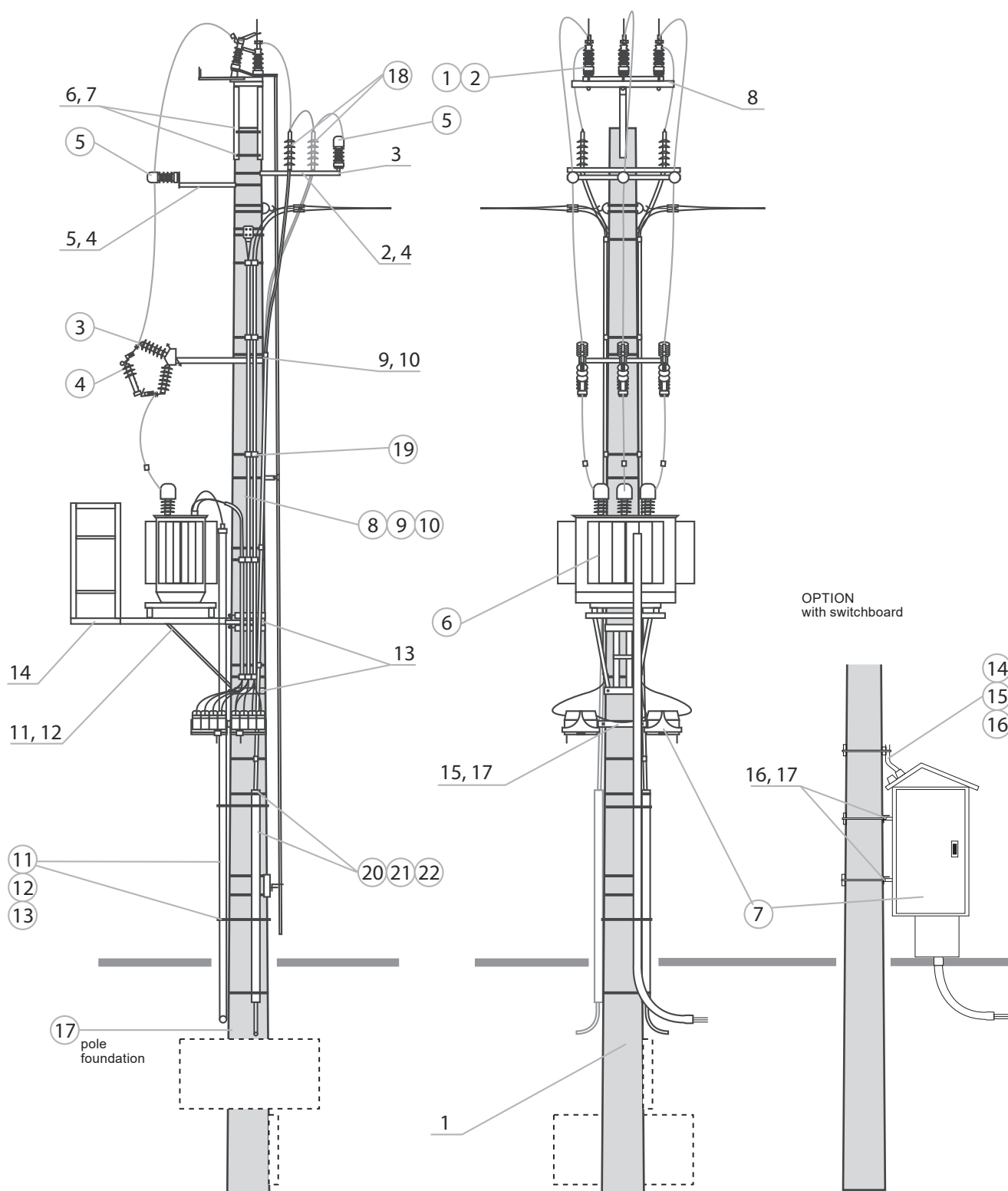


List of structures, accessories, apparatus for STN_{Ko}-20/630/.../.../1(3)

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 top diameter = 420 For KGK-12a, KGK-112a, KOG-5 top diameter = 263 For KGK-11a, KGK-111a, KOG-5 top diameter = 218
5.	Structure for disconnector	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 disconnector 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 ACCESORIES						
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 - With integrated MV arrester
4.	Fuse link	WBGN 17,5 HH ... A 10/24 kV "e"=442 mm; "e"=292 mm	3 3	pcs. pcs.	ZRE / APLAR SIBA / ALPAR	A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGN fuse link
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 disconnector 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 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	1	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.	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)

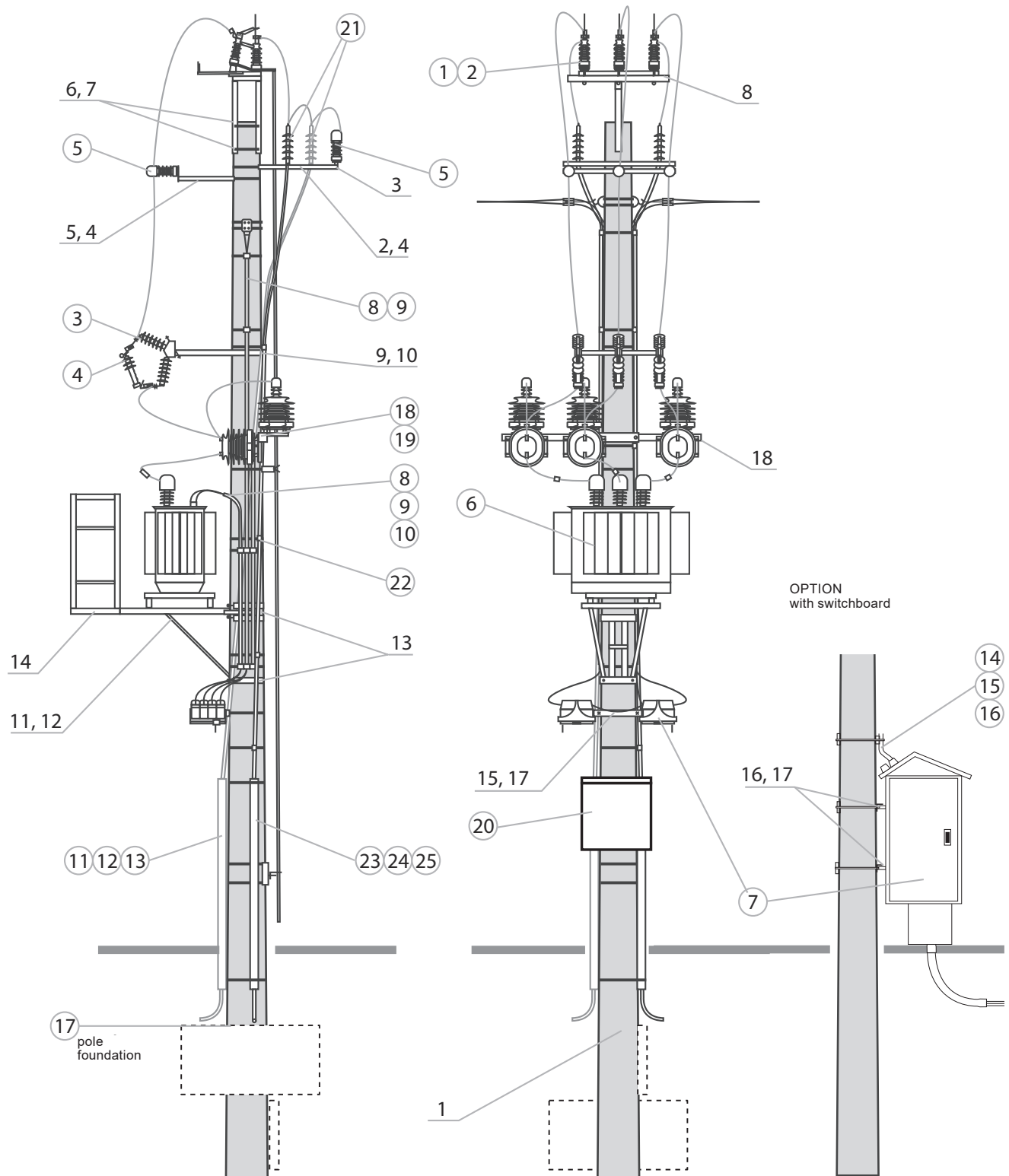


List of structures, accessories, apparatus for STNko-20/630/.../.../1(3)/PP3

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	top diameter = 420
		OB-10				For KGK-12a, KGK-112a, KOG-5	top diameter = 263
		OB-7				For KGK-11a, KGK-111a, KOG-5	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 disconnector	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	
		KTZ-2a				Transformer from 160 kVA to 250 kVA	
		KTZ-3a				Transformer 400 kVA	
		KTZ-8				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 disconnector 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	
17.	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 (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 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 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 (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 disconnector 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 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 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
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	SFP1.....	–	1	set		...	144	
		SP.....		...	set		...		
1.	Foundation plate	PS-120	...	...		400	...		
2.		PS-160		...	pcs.	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	SFP1.....	4-385-69	1	set	153,2	...		
		SFP1...../623				178,4			
6.	Twisted connection to	SP.....		...	set		...		
7.	Portland cement	32,5		–	...	kg			...

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	–	...	m³	...	...		

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	m³	...	...		
3.	Gravel	–	–	0,83	m³	...	...		
4.	Water	–	–	0,2	m³	...	...		

* 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
Towarzystwo Przesyłu i Rozdziału
Energii Elektrycznej
60-637 Poznań, ul. Wolińska 22
tel. 61 846-02-00, fax 61 846-02-09
NIP: 777-00-04-090

Sebastian Brzozowski
Biuro PTPIREE

POLSKIE TOWARZYSTWO PRZESYŁU I ROZDZIAŁU ENERGII ELEKTRYCZNEJ
UL. WOLIŃSKA 22, 60-637 POZNAŃ
TEL. +48 61 846-02-00, FAKS +48 61 846-02-09
WWW.PTPIREE.PL PTPIREE@PTPIREE.PL

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

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

3. Station markings

STE _ _ _ _ - 20 / _ _ / _ _ / _ _			
			Variants according to LV circuit distribution: R - pole-mounted disconnectors Sp - suspended distribution cabinets Sw - free-standing distribution cabinets
			Variants according to MV supply: I - from transformer side - STE (terminal) II - from side opposite to transformer - STE or Variants according to design: 1 - flat cables arrangement - STEP - LV overhead or cable outlets - STEK* 2 - triangular cables arrangement - STEP - LV cable outputs - STEK* * Stations STEKr, STEK2r - without transformer
			Power rating, kVA
			Rated voltage, kV
			Variants according to pole mechanical strength: 1-12 kN 4-25 kN 2-15 kN 5-33 kN 3-20 kN
			Variants according to pole length: 1-10.5 m 2-12 m 3-9 m (MV supply and LV outputs - cable)
			r - with MV disconnector, 2r - with 2 MV disconnectors without marking - without MV disconnector
			Variants according to MV line type: P - through O - tension ON - angle-tension K - cable Ks - with universal self-supporting cable Kp - with universal suspended cable without marking - terminal
			Pole-Mounted Transformer Station for ENERGA-OPERATOR SA compliant with European standards

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	– 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: – 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	Operating temperature range: – for MV and LV lines: -25°C to +40°C, – for apparatus and equipment: according to manufacturers' recommendations, 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, Pollution zones: I, II, III, selection according to volume III and recommendations of manufacturers of MV apparatus and accessories, Climate zones: I, II - wind load S1, S2 - ice load

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:

1. 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.
2. 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. 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:

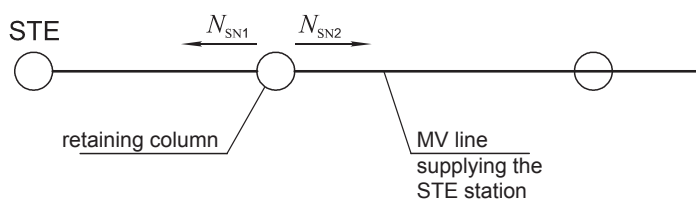
- MV overhead line with AFL-6 35, 50 and 70mm² bare cables,
- MV overhead line with 50 and 70 mm² sheathed cables (PAS type line),
- MV overhead line with universal self-supporting or overhead cables,
- MV cable line – 1-core earth cables with cross-linked polyethylene (XLPE) insulation and thermoplastic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

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

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.

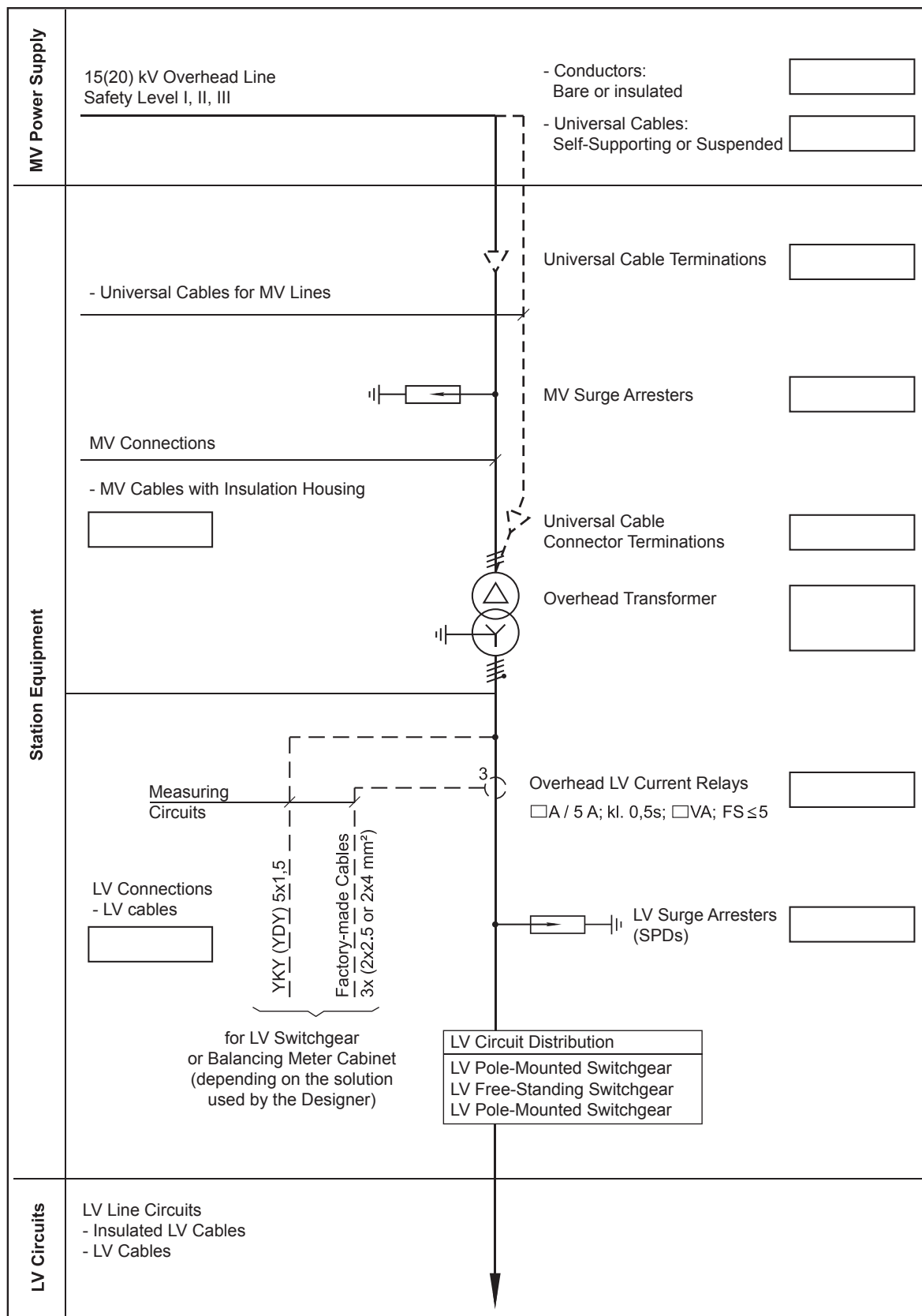
The technical data for the foundations, their selection and the rules for implementing the foundations are detailed in Volume II.

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/m²	kN/m³	kN/m³	
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	very dense dense	Pd	Sa, siSa					
	Silt	very compact	II	saSi, sacI Si, Si, cI Si	20	25	20	40000	0,25
	Clay		G	saSiCl, sasiCl, cI Si, siCl, cl					
	Silt	compact	I	sasiCl, saCl, siCl, cl					
	Clayey gravel mix	hard-plastic	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	15	20	19,0	25000	0,30
	Silt	plastic	II	saSi, sacI Si, Si, cI Si					
	Clayey gravel mix		G	saSiCl, sasiCl, cI Si, siCl, cl					
	Clayey sand		I	sasiCl, saCl, siCl, cl					
	Clayey sand		Pog	Sasi, saCl, Si, siCl, Ci					
	Coarse sand		Pg	siSa, cisa, saSi					
	Soils with very low bearing capacity	Fine sand	loose	Pr	Sa, siSa	25	0	15,0	5000
Silt		Pd		Sa, siSa					
Clayey gravel mix		soft-plastic	II	saSi, sacI Si, Si, cI Si	10	5	18,0	5000	0,10
Clayey sand			G	saSiCl, sasiCl, cI Si, 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-2 station

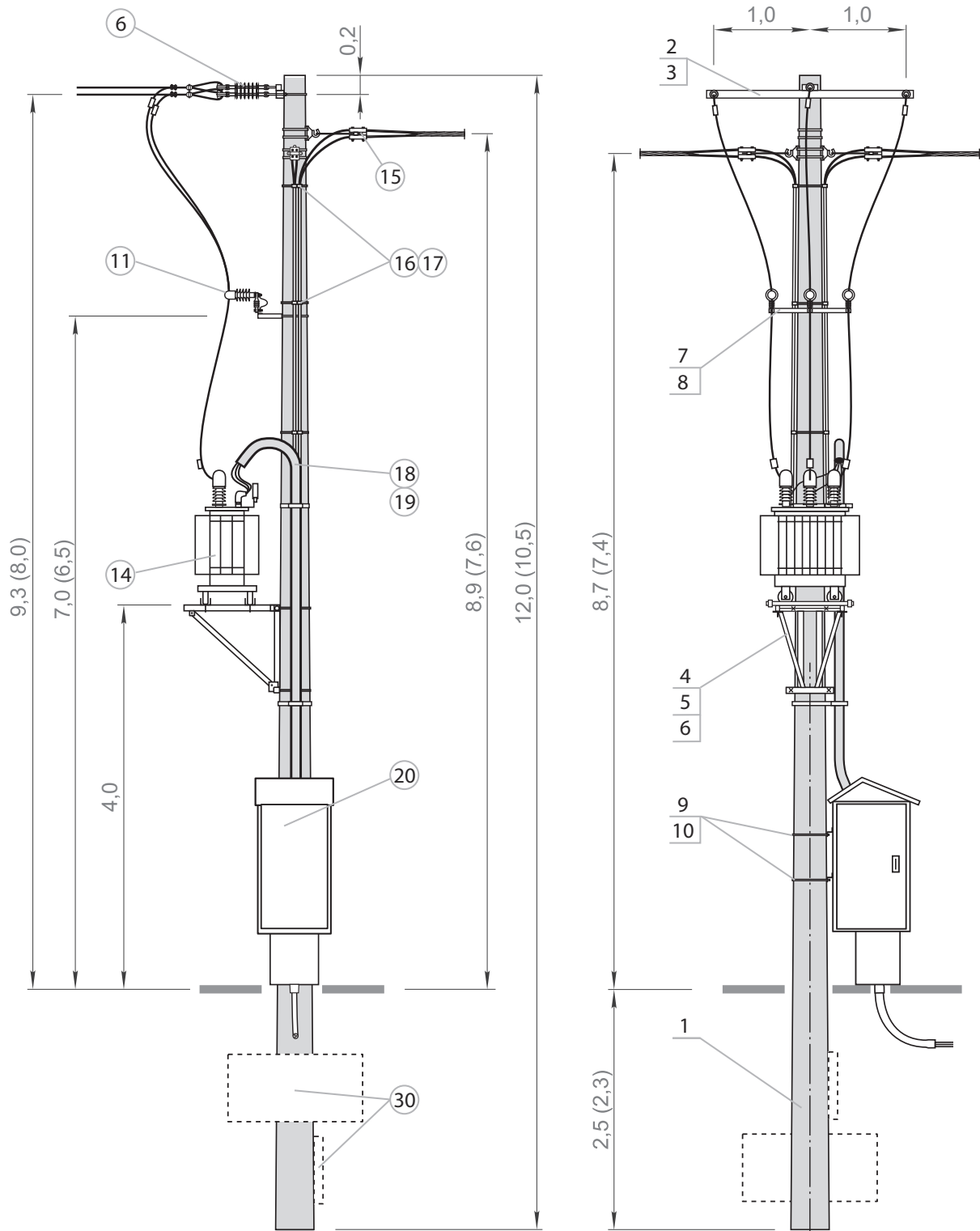


List of structures, accessories, apparatus for STE-20/.../I

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	≤ 20kN	≤ 12kN	top diameter = 420	PAS cables	
								top diameter = 263			
		≤ 12kN						top diameter = 218			
								≤ 20kN		top diameter = 420	AFL cables
										top diameter = 263	
		≤ 13,5kN					≤ 9kN	top diameter = 420			
								top diameter = 263			
		top diameter = 218									
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	Do not use when mounting arresters directly on the transformer				
		KOG-51/E			top diameter = 420						
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 ACCESORIES									
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

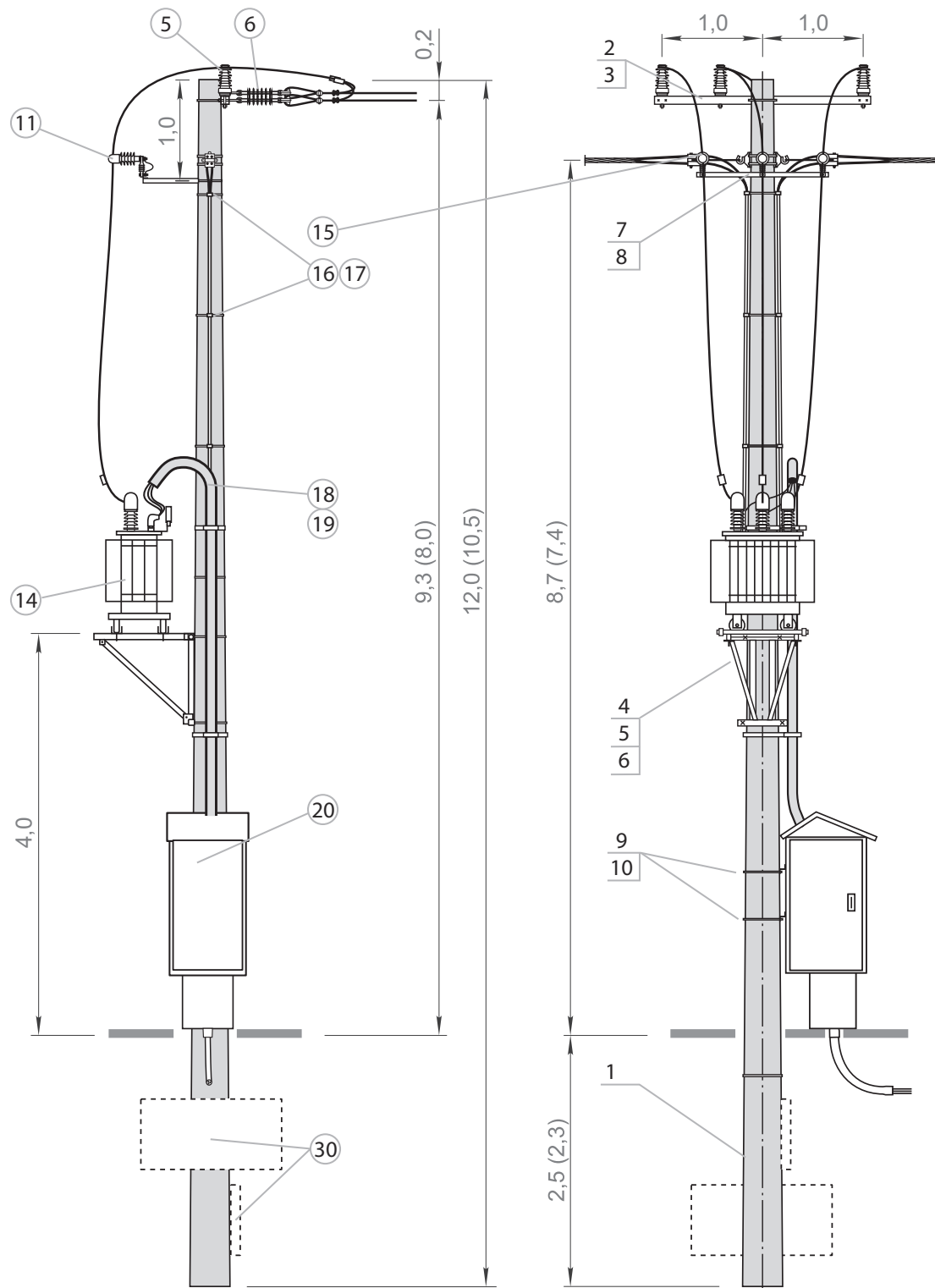


List of structures, accessories, apparatus for STE-20/.../II

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	≤ 20kN	≤ 12kN	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								
		PKZ-6/E						top diameter = 420	AFL cables	
		PKZ-3b/E PKZ-1c/E						top diameter = 263		
		PKZ-3a/E PKZ-1b/E					≤ 13,5kN	≤ 9kN		top diameter = 420
		PKZ-3/E PKZ-1a/E								top diameter = 263
			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	Do not use when mounting arresters directly on the transformer			
		KOG-51/E			top diameter = 420					
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 ACCESSORIES									
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 disconnect 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

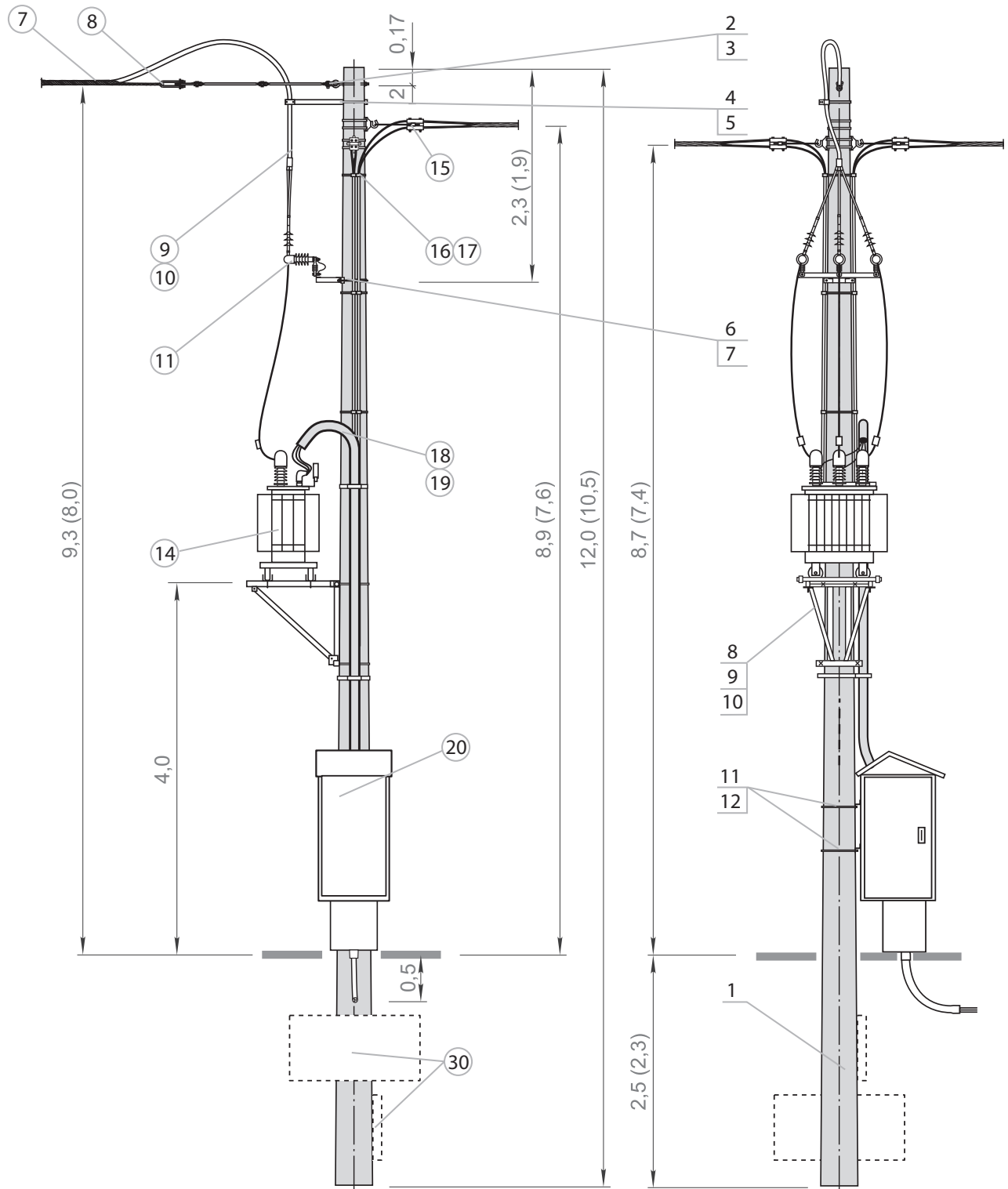


List of structures, accessories, apparatus for STEKs-20/.../I

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 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 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

STEKs-20/.../I

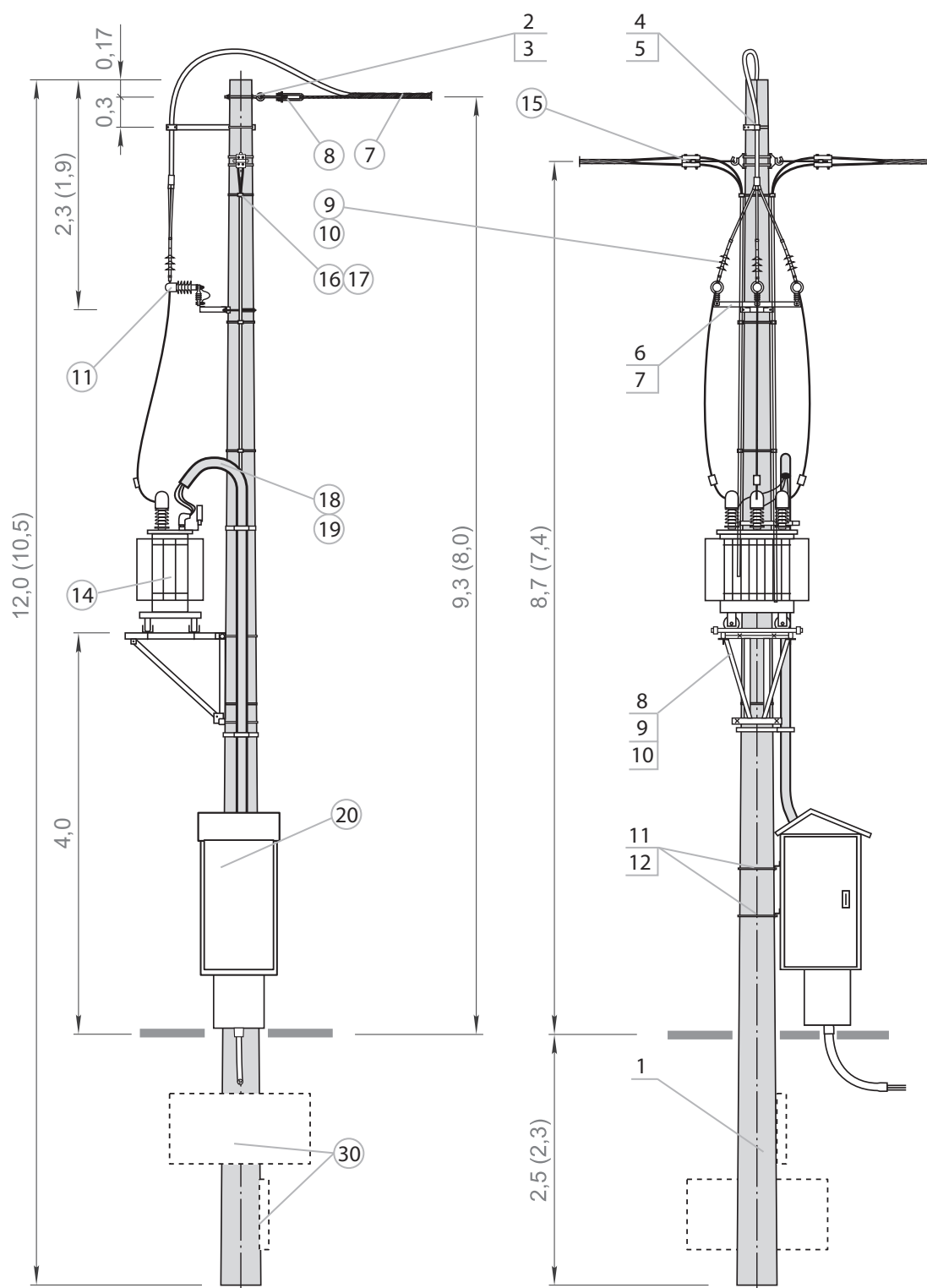


List of structures, accessories, apparatus for STEKs-20/.../II

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 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
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

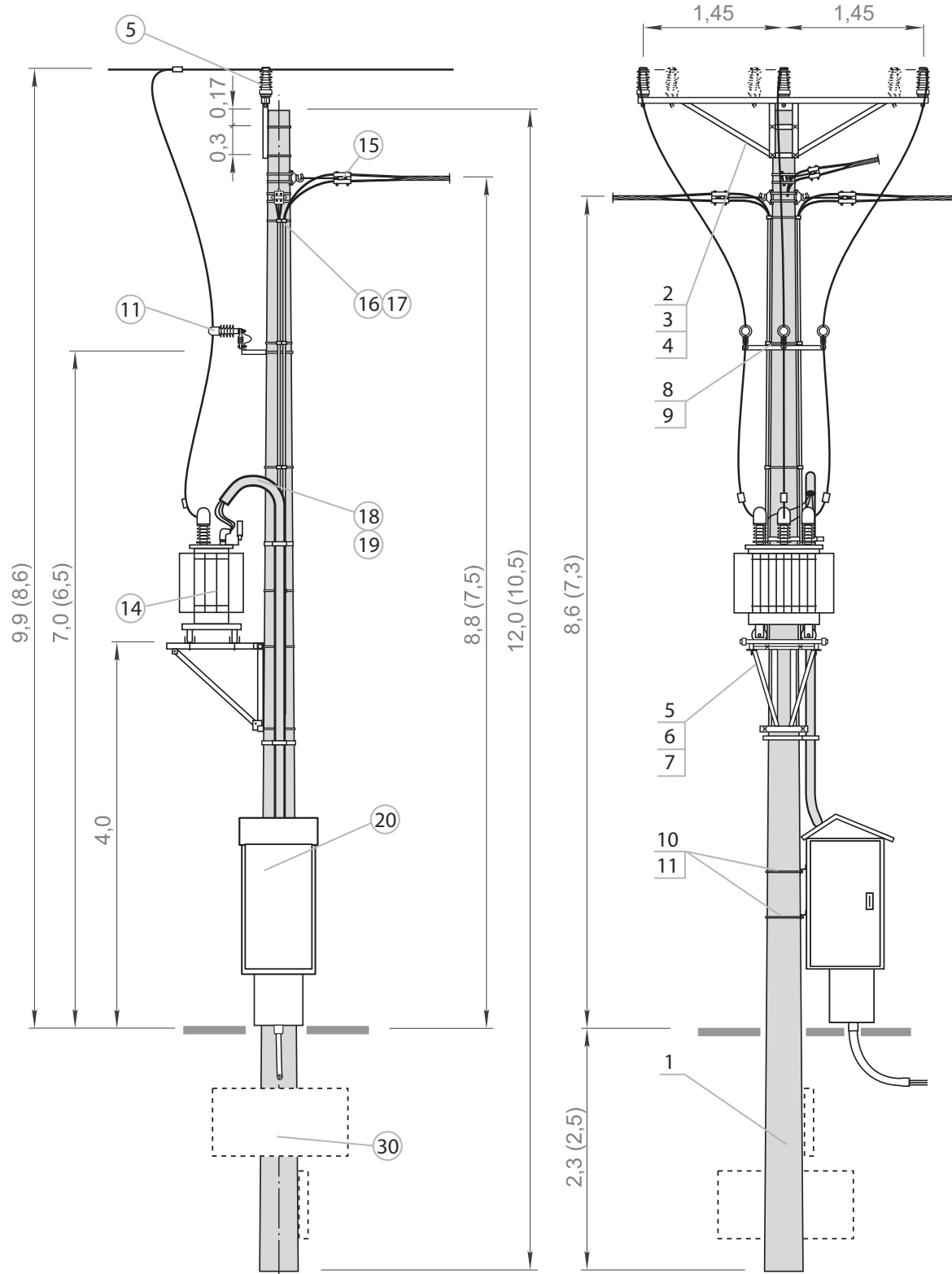
STEKs-20/.../II



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	
		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 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 ACCESORIES										
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					
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				

STEP-20/.../1

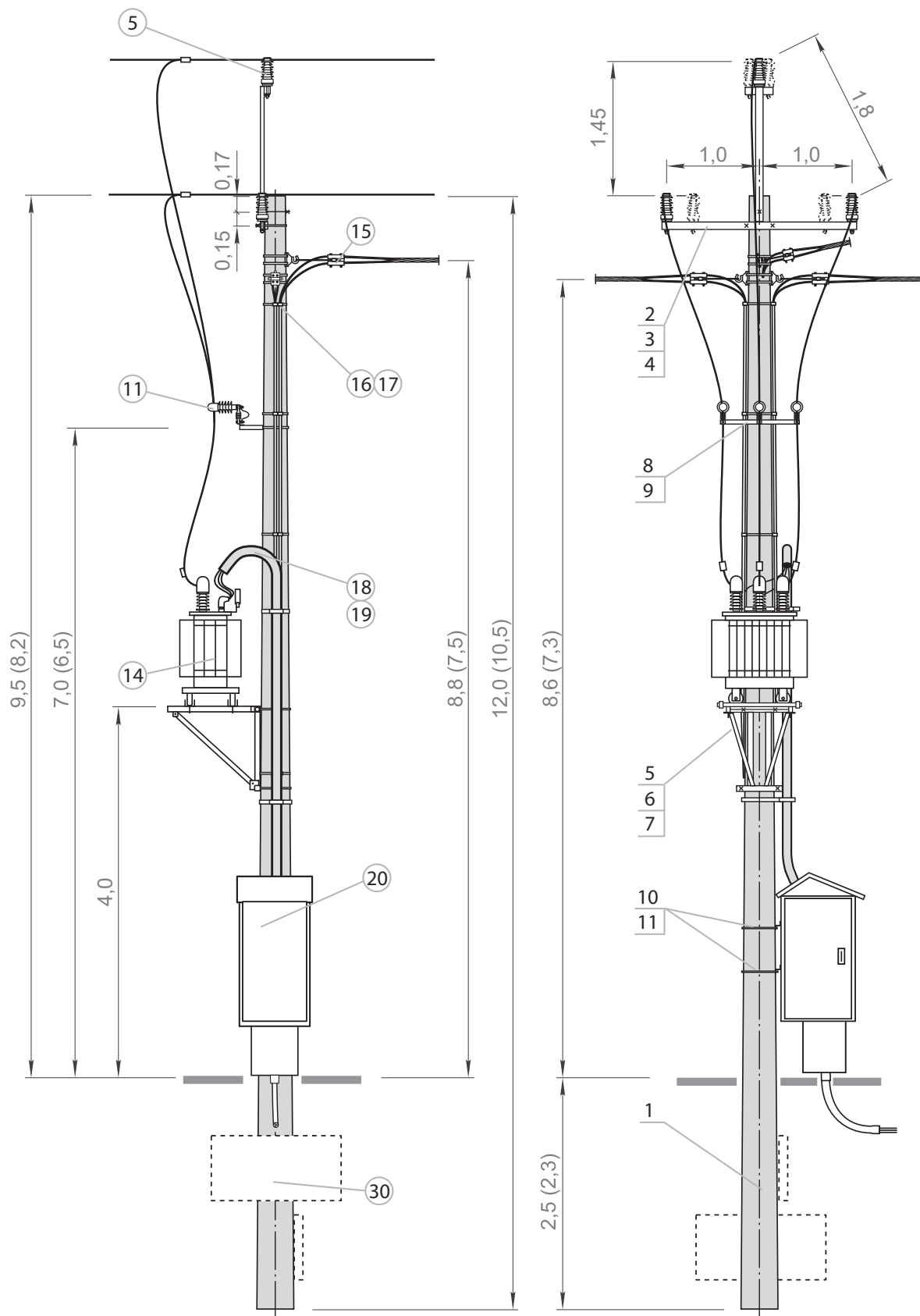


List of structures, accessories, apparatus for STEP-20/.../2

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 OB-7/E OB-3/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 top diameter = 263 mm top diameter = 218 mm	
4.	Mounting bolts	M16x480 M16x330 M16x280	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 top diameter = 263 mm 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-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 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
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 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

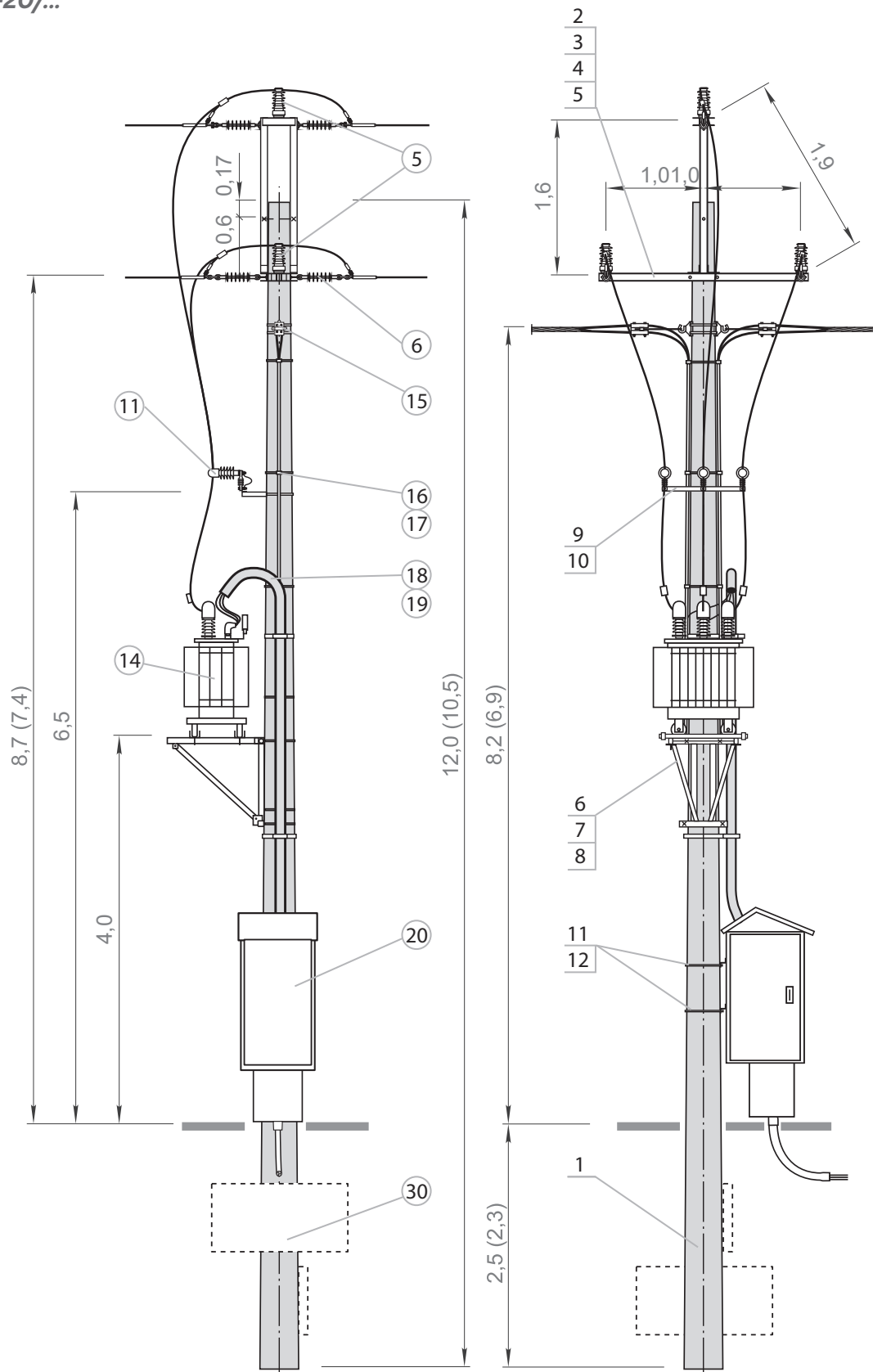
STEP-20/.../2



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	MV line tension N	≤ 21kN	AFL cables	50-70	top diameter = 420
		PO-32a/E							top diameter = 263	
		PO-31b/E							top diameter = 218	
		PO-35a/E							top diameter = 420	
		PO-33b/E							top diameter = 263	
		PK-22/E							top diameter = 420	
		PK-21/E							top diameter = 263	
		PK-20a/E							top diameter = 218	
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		Do not use when mounting arresters directly on the transformer		
		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/...

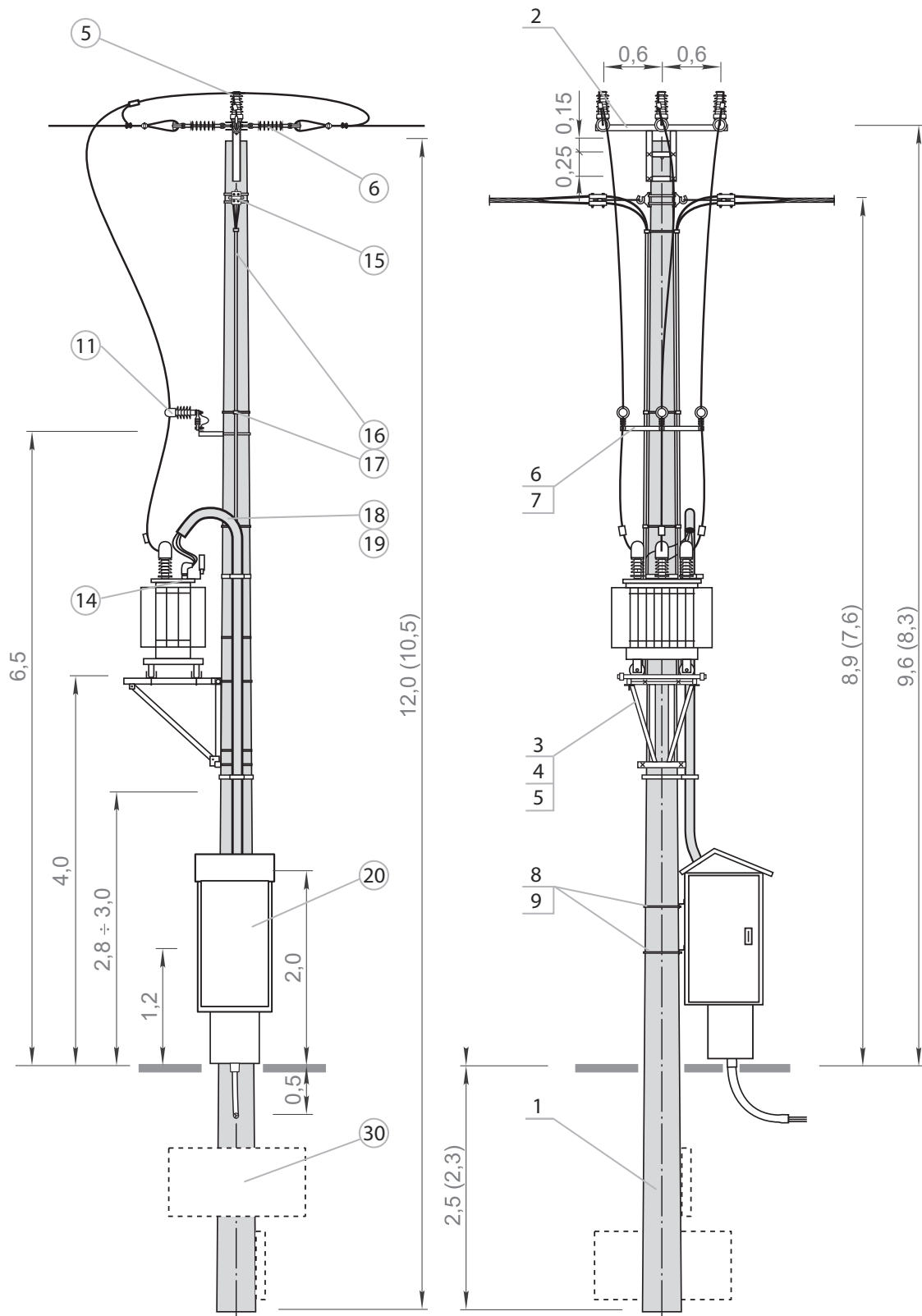


List of structures, accessories, apparatus for STEO-20/.../PAS

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	MV line tension kV	≤ 20kN	PAS Cables	50-120	top diameter = 420
		PK-11a/E								top diameter = 263
		PK-6a/E								≤ 12kN
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	top diameter = 218 top diameter = 263		Do not use when mounting arresters directly on the transformer		
		KOG-52/E				top diameter = 420				
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 - 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/.../PAS

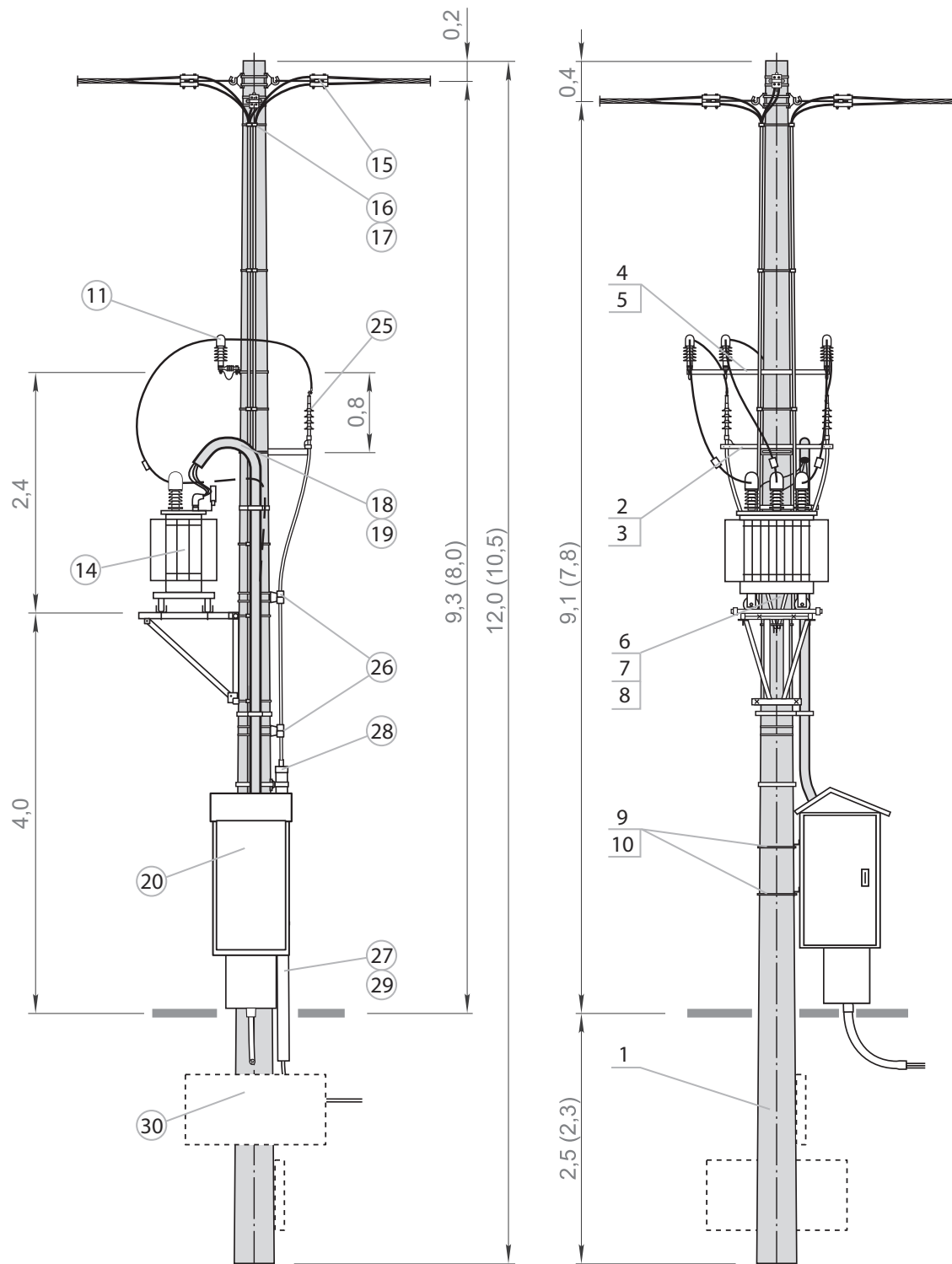


List of structures, accessories, apparatus for STEK-20/.../1

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.	Structure for cable terminations	KGK-13/E	1	pcs.	ALPAR	For 3 x 1-phase cable
		KGK-12a/E				top diameter = 420
		KGK-11a/E				top diameter = 263
		KGK-16a/E				top diameter = 218
		KGK-15a/E				For 3-phase cable
		KGK-14a/E				top diameter = 420
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
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
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 ACCESSORIES						
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 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 disconnect 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/.../1

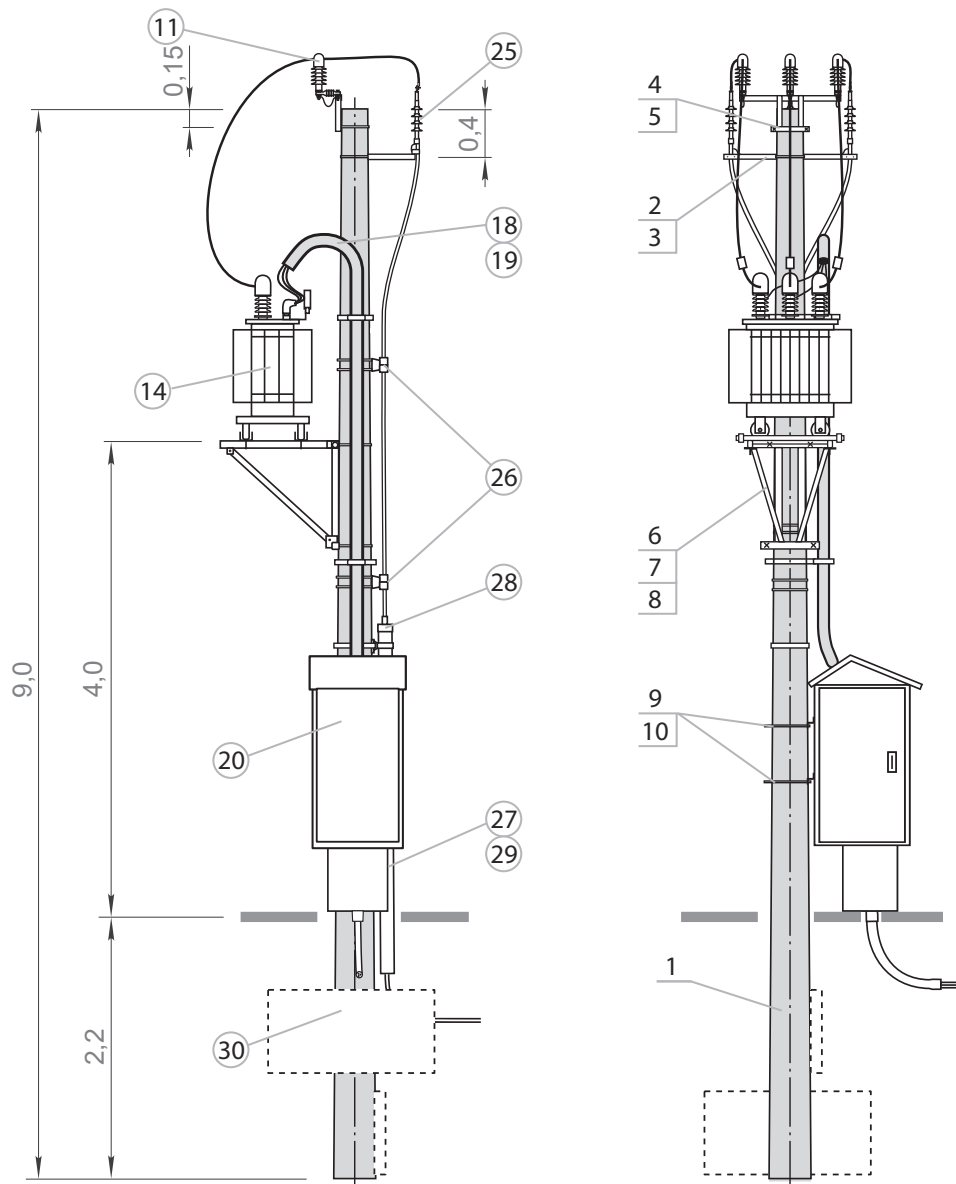


List of structures, accessories, apparatus for STEK-20/.../2

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 ACCESORIES						
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

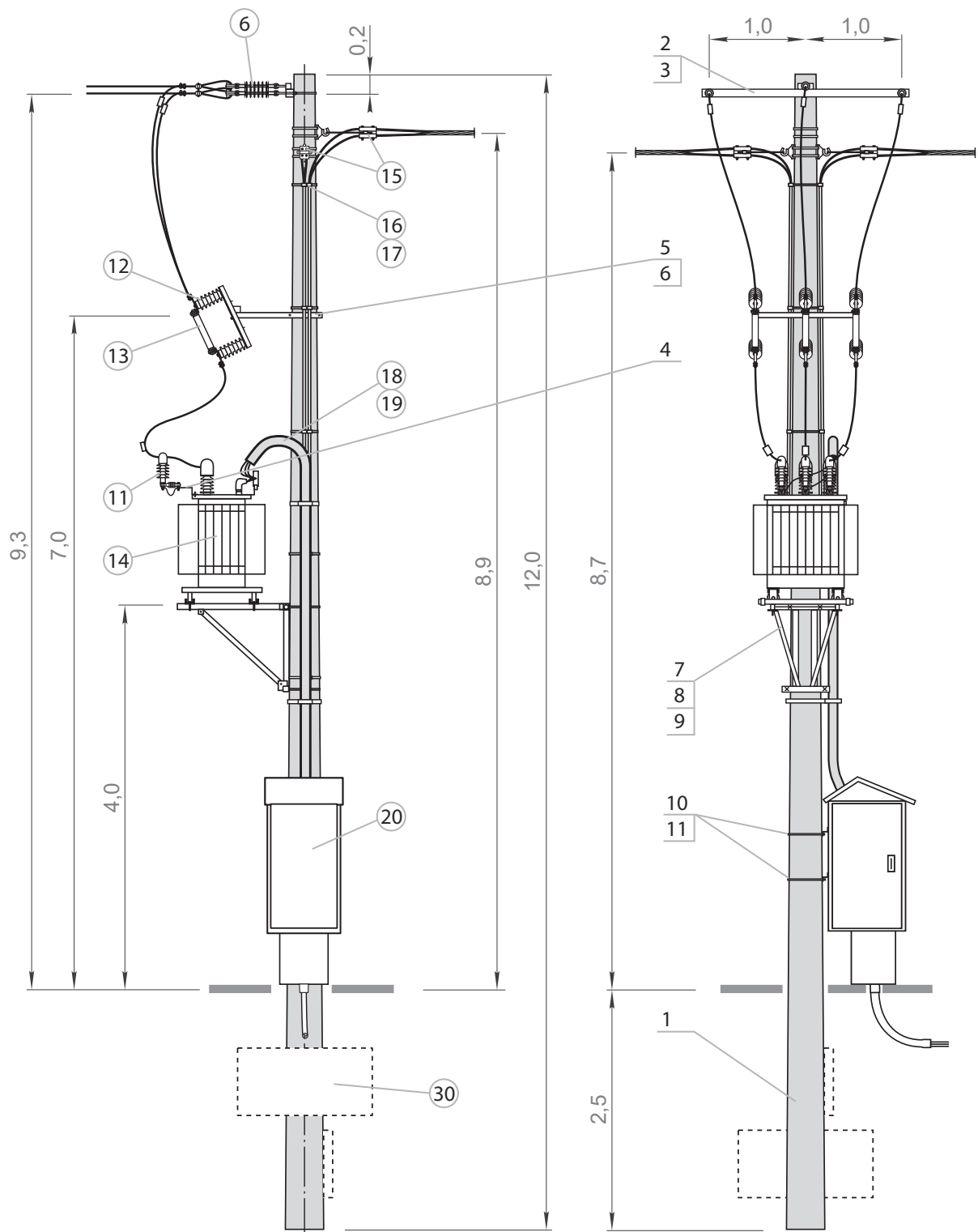


List of structures, accessories, apparatus for STE-20/.../If

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	PAS cables
		top diameter = 263								
		≤ 12kN						top diameter = 218		
		≤ 20kN					top diameter = 420	AFL cables		
							top diameter = 263			
		≤ 13,5kN					≤ 9kN		top diameter = 420	
							top diameter = 263			
		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 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 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 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 - 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			
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

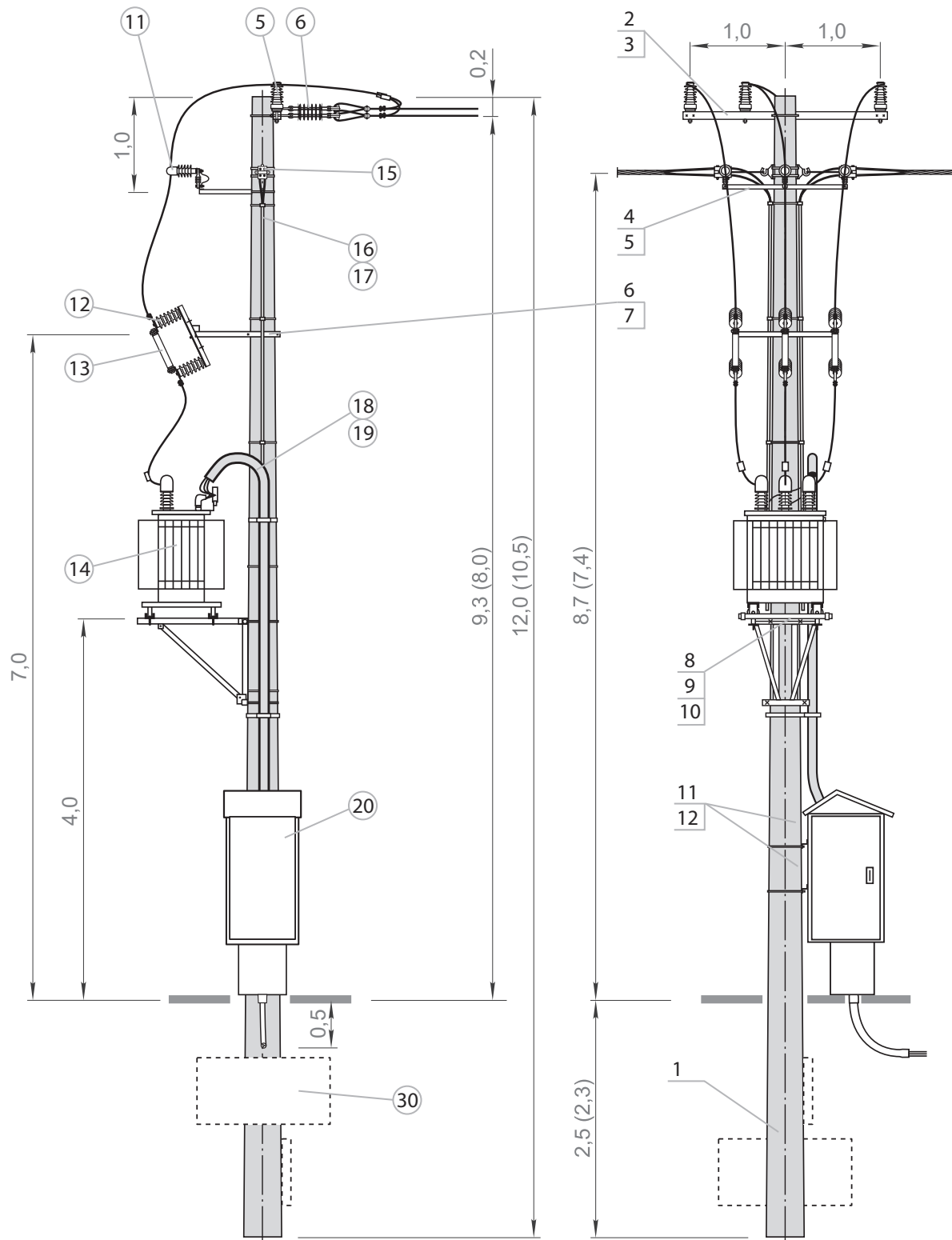


List of structures, accessories, apparatus for STE-20/.../II

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	MV line tension N	≤ 20kN	≤ 12kN	top diameter = 420	PAS cables
		top diameter = 263								
		≤ 12kN						top diameter = 218		
		≤ 20kN						top diameter = 420		
		top diameter = 263								
		top diameter = 420								
		≤ 13,5kN					≤ 9kN	top diameter = 263		
		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 arresters	KOG-50/E	1	pcs.	ALPAR	top diameter = 218 top diameter = 263	Do not use when mounting arresters directly on the transformer			
		KOG-51/E				top diameter=420				
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	±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 is determined by an authorized 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				
		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	
13.	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 - 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 disconnect 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

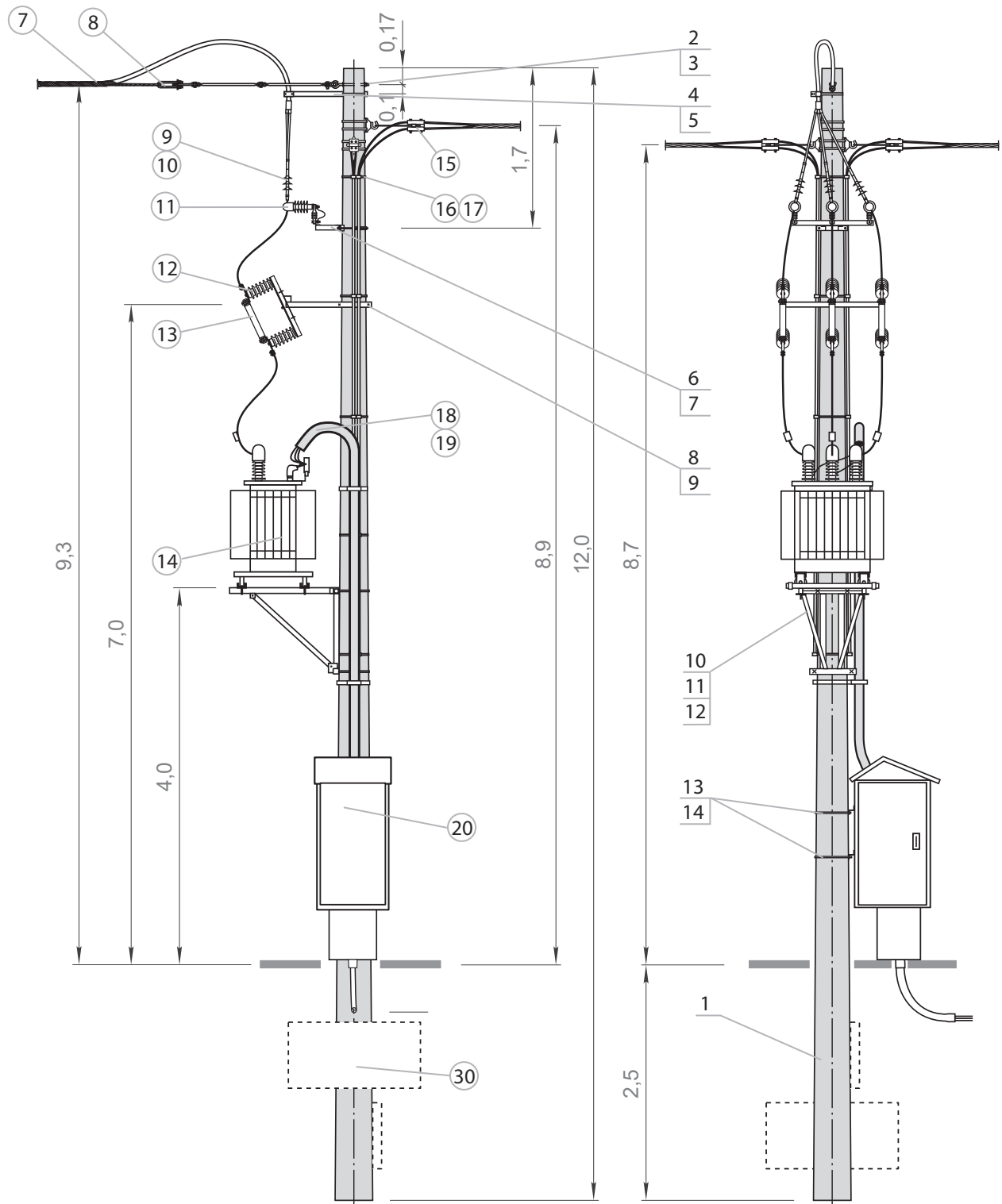


List of structures, accessories, apparatus for STEKs-20/.../If

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 - 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
					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

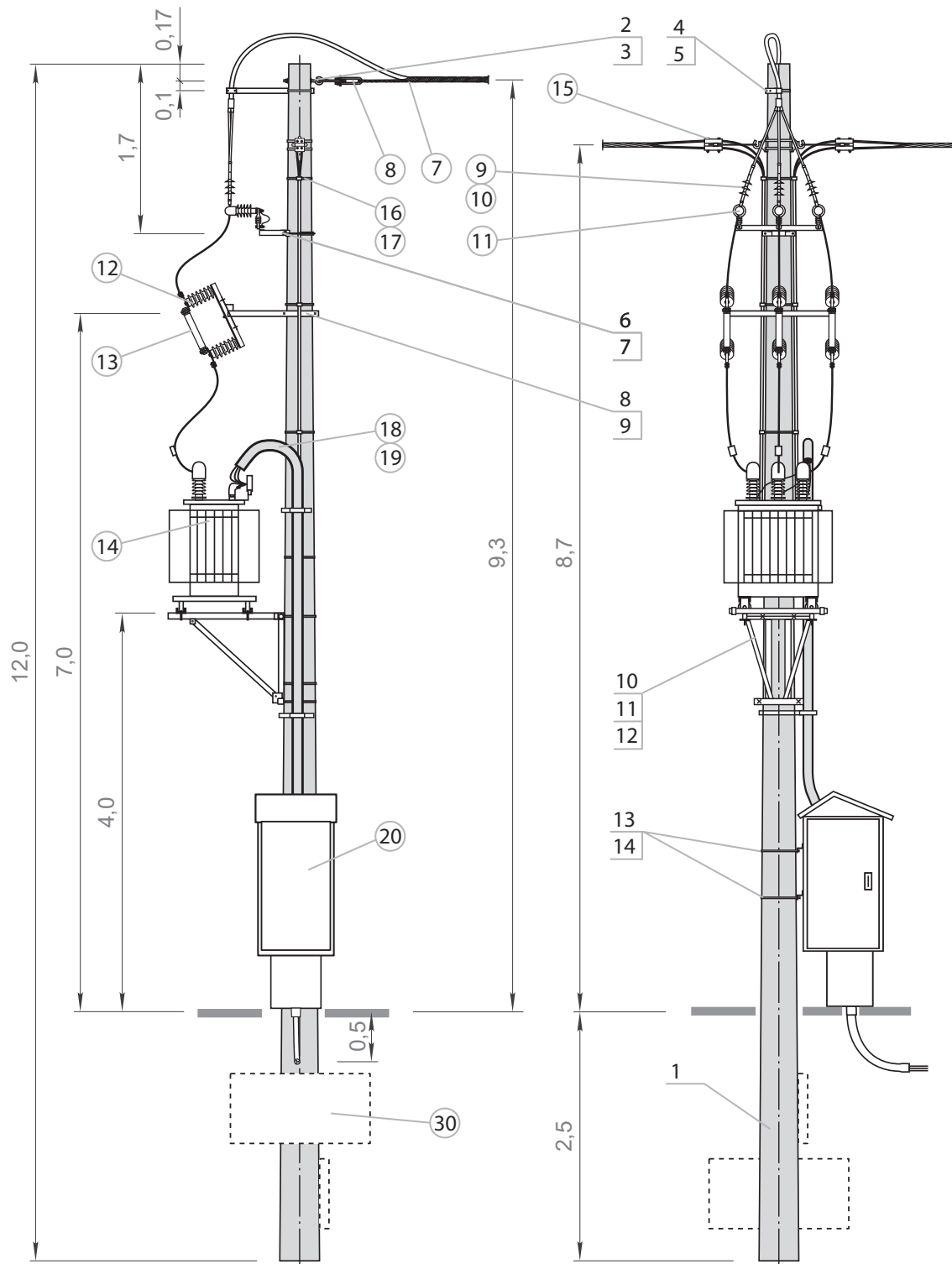
STEKs-20/.../lf



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

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 PBNVA-20/4	3	pcs.	ALPAR	- With integrated MV arrester -
		WBGn 17,5				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 - 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 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/.../IIIf

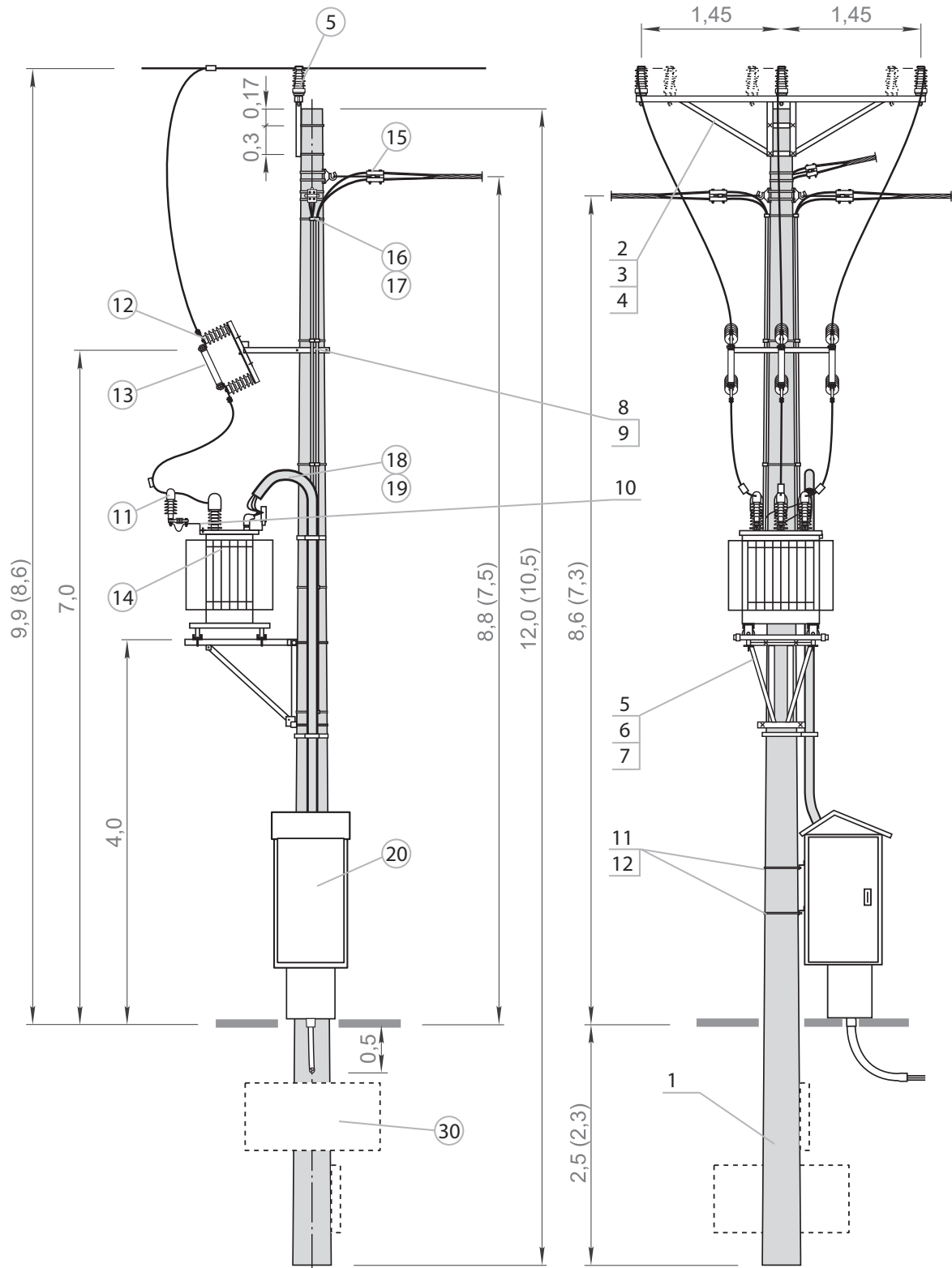


List of structures, accessories, apparatus for STEP-20/.../1f

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 For PP-3a/E and PP-2a/E For PP-3a/E and PP-2a/E		PP-57a/E PP-56a/E PP-51a/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 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 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			

STEP-20/.../1f

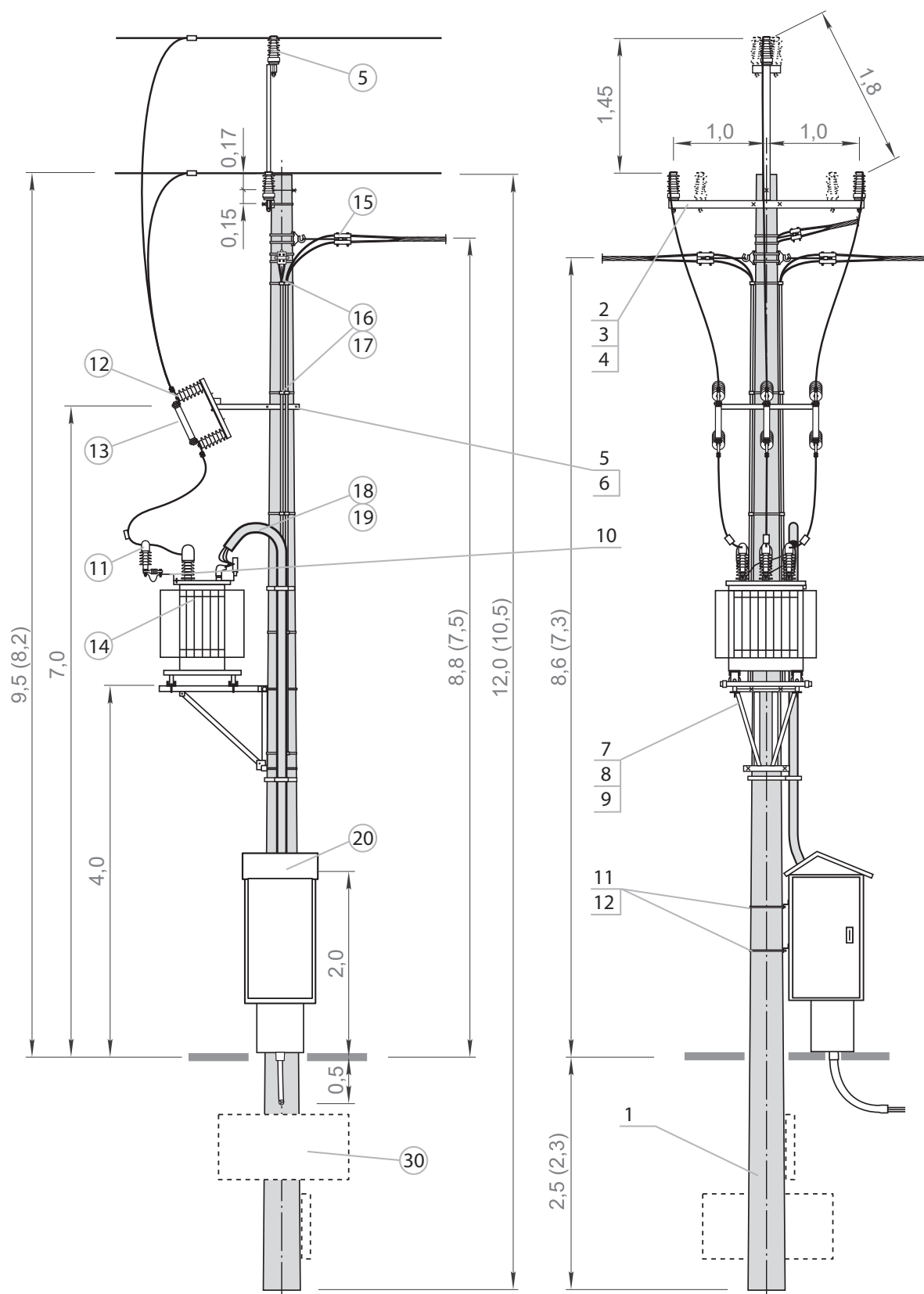


List of structures, accessories, apparatus for STEP-20/.../2f

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	AFL cables 35, 50, 70
		PP-331c/2/E						top diameter = 263	
		PP-331b/2/E						top diameter = 218	
		PP-311d/2/E					0°	top diameter = 420	
		PP-311c/2/E						top diameter = 263	
		PP-311b/2/E						top diameter = 218	
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			
		WBGN 17,5				A Topik fuse with an amperage appropriate for the transformer should be used to protect the WBGN fuse link			
13.	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			
		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

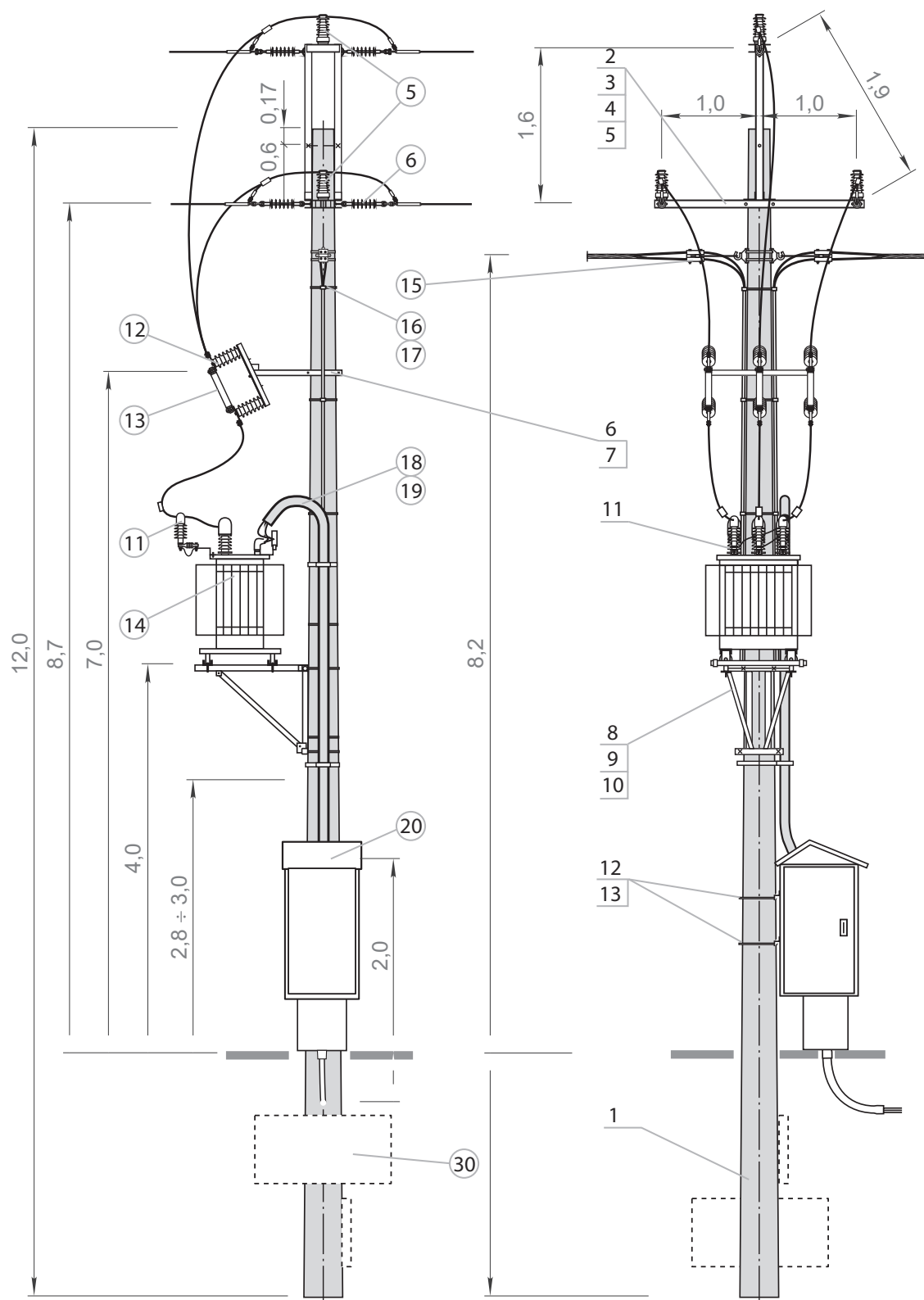


List of structures, accessories, apparatus for STEO-20/...f

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	50-70	top diameter = 420
		PO-32a/E							top diameter = 263
		PO-31b/E							top diameter = 218
		PO-35a/E					≤ 26kN	50-70	top diameter = 420
		PO-33b/E							top diameter = 263
		PK-22/E					≤ 15kN	35-50	top diameter = 420
		PK-21/E							top diameter = 263
		PK-20a/E							top diameter = 218
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 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	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 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			

STEO-20/...f

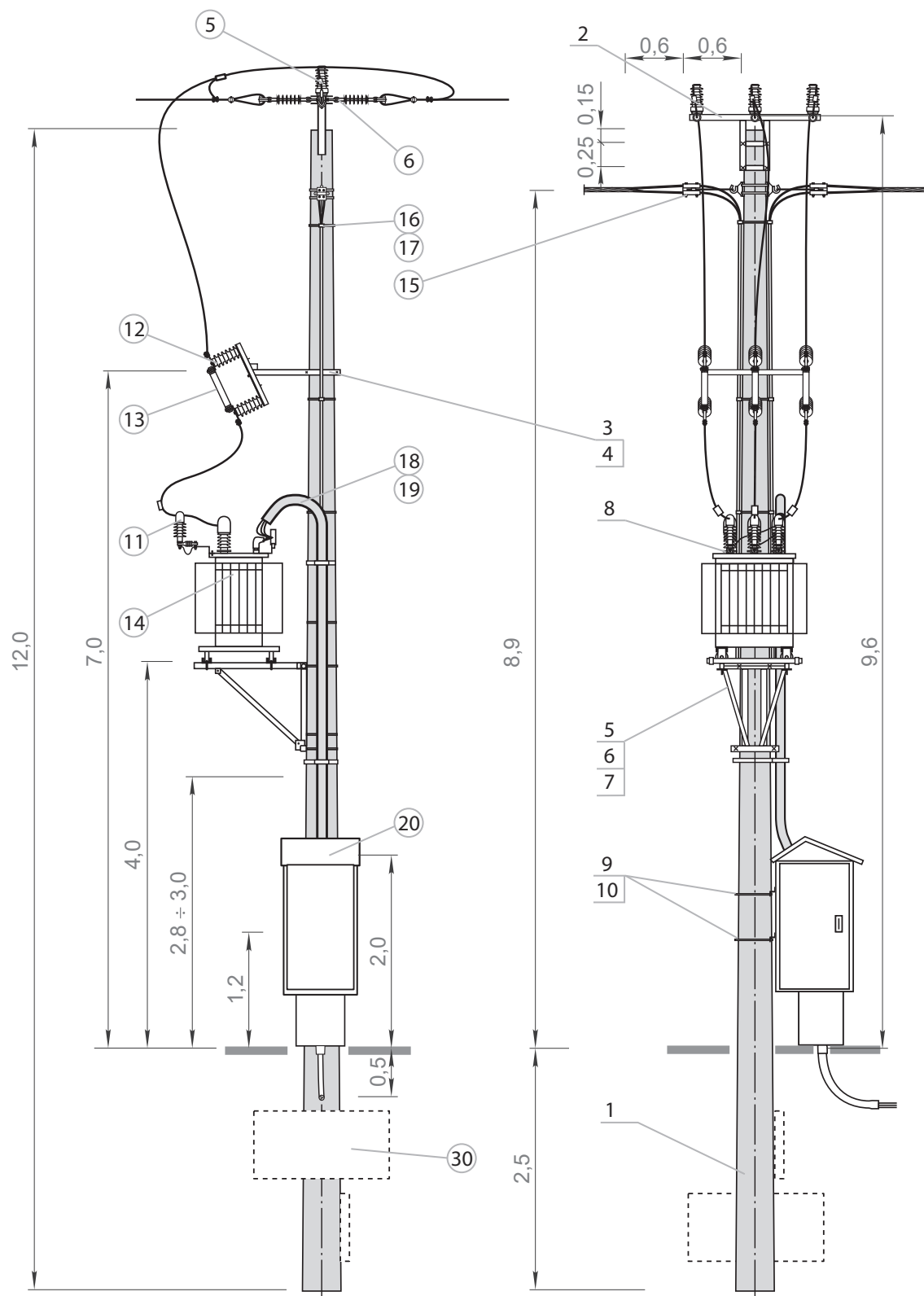


List of structures, accessories, apparatus for STEO-20/... / PASf

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
		PK-11a/E								top diameter = 263
		PK-6a/E					≤ 12kN			top diameter = 218
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

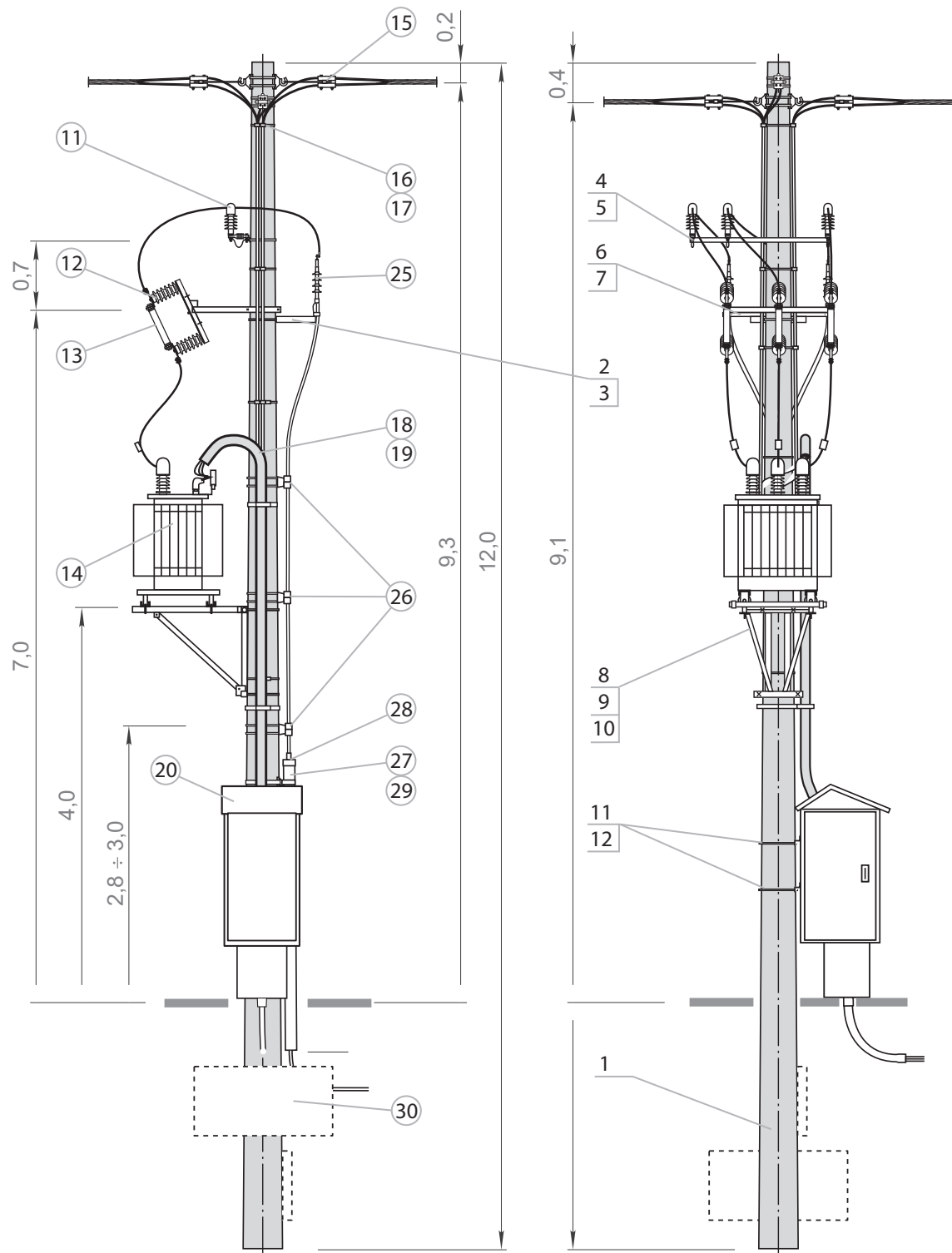


List of structures, accessories, apparatus for STEK-20/.../1f

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 top diameter = 420 mm top diameter = 263 mm top diameter = 218 mm
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 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 disconnectors 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

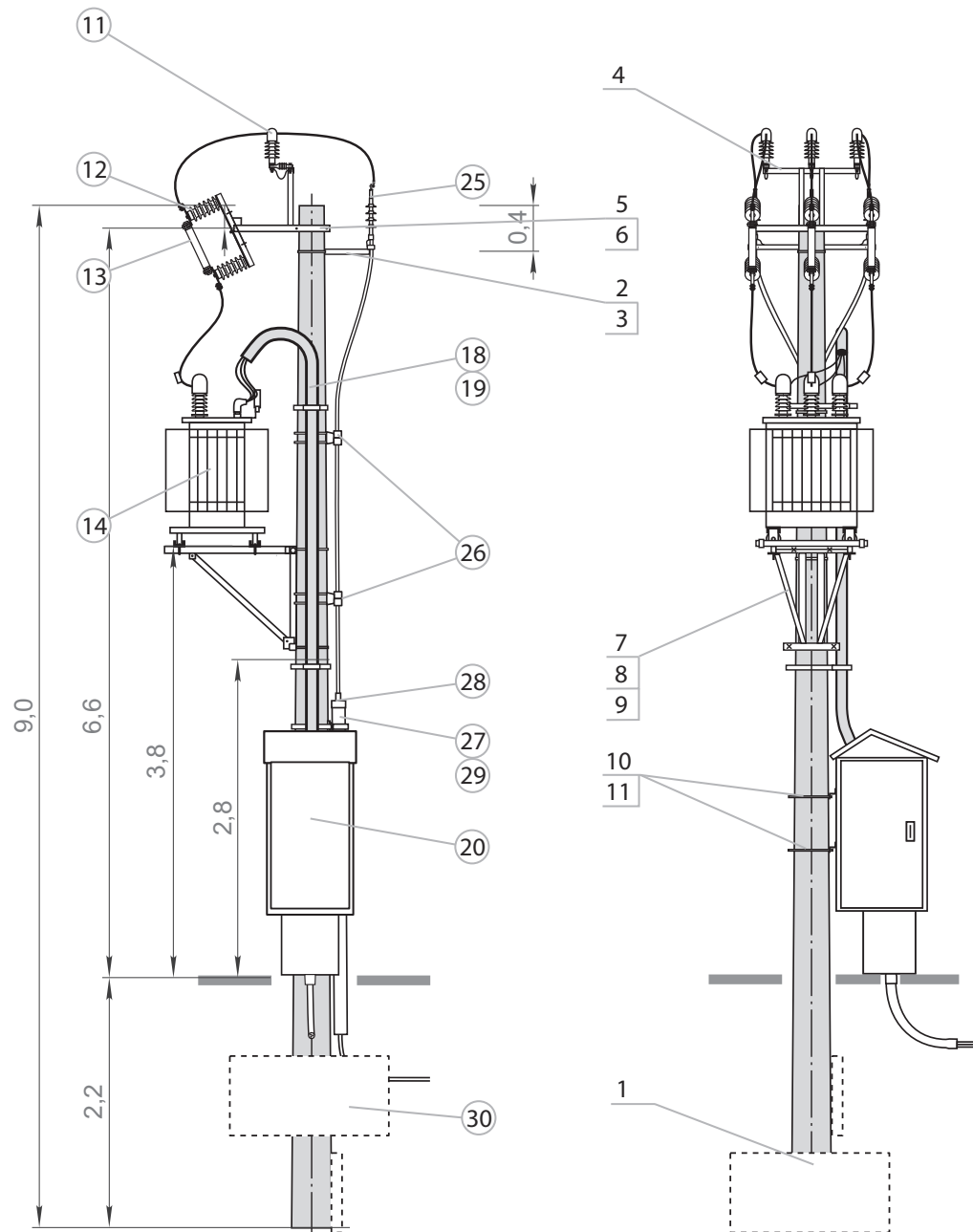


List of structures, accessories, apparatus for STEK-20/.../2f

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 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-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 - 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
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	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

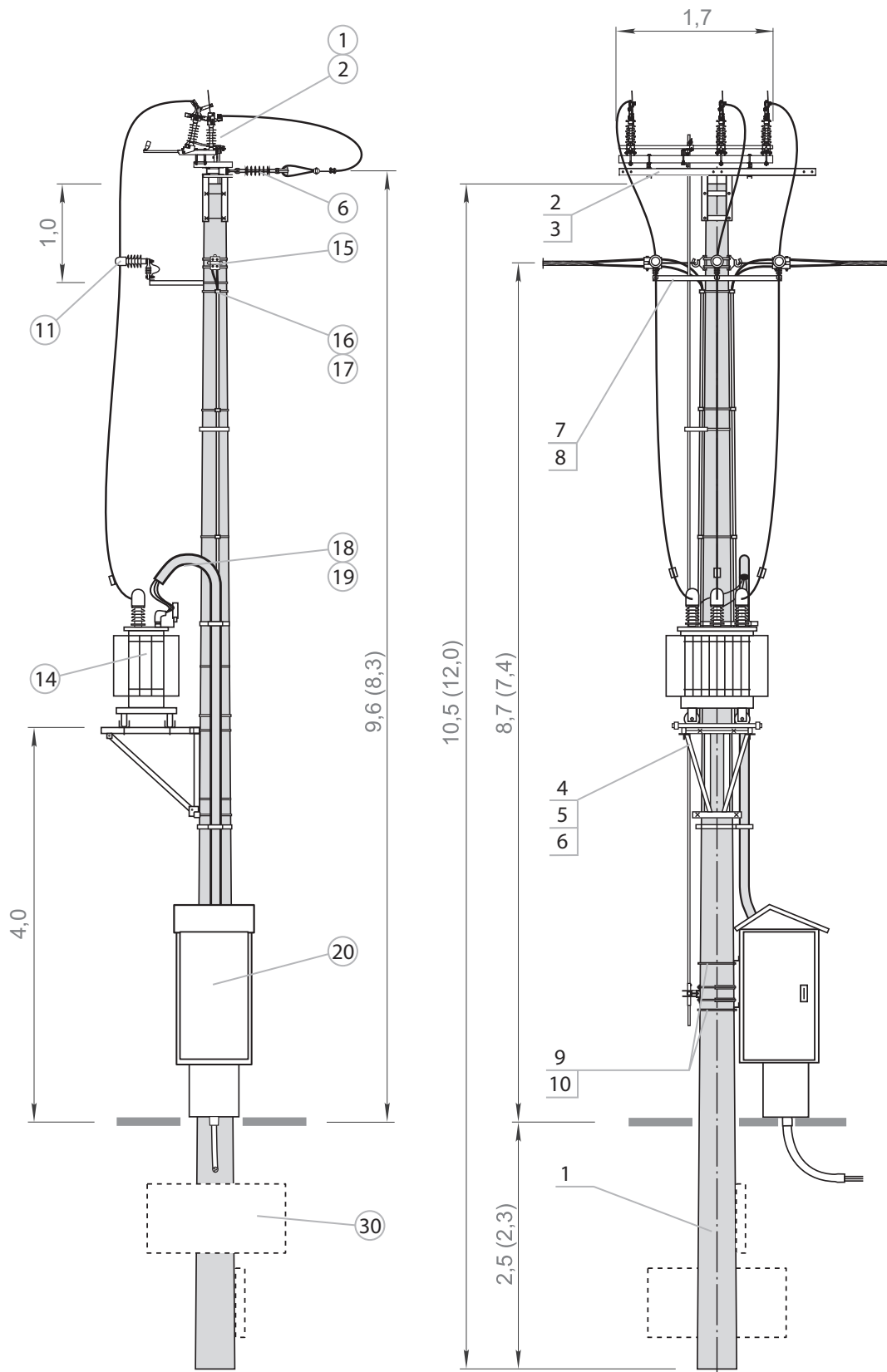
STEK-20/.../2f



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	MV N-line tension	≤ 20kN	top diameter = 420	PAS cables
		PK-11a/E						top diameter = 263	
		PK-6a/E						top diameter = 218	
		PKZ-7/E						top diameter = 420	
		PKZ-6/E					top diameter = 263	AFL cables	
		PKZ-3b/E					top diameter = 420		
		PKZ-3a/E					top diameter = 263		
		PKZ-3/E					top diameter = 218		
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	top diameter = 218 top diameter = 263	Do not use when mounting arresters directly on the transformer		
		KOG-51/E				top diameter = 420			
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 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 (optional alternatives: porcelain or 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			
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			

STEr-20/...

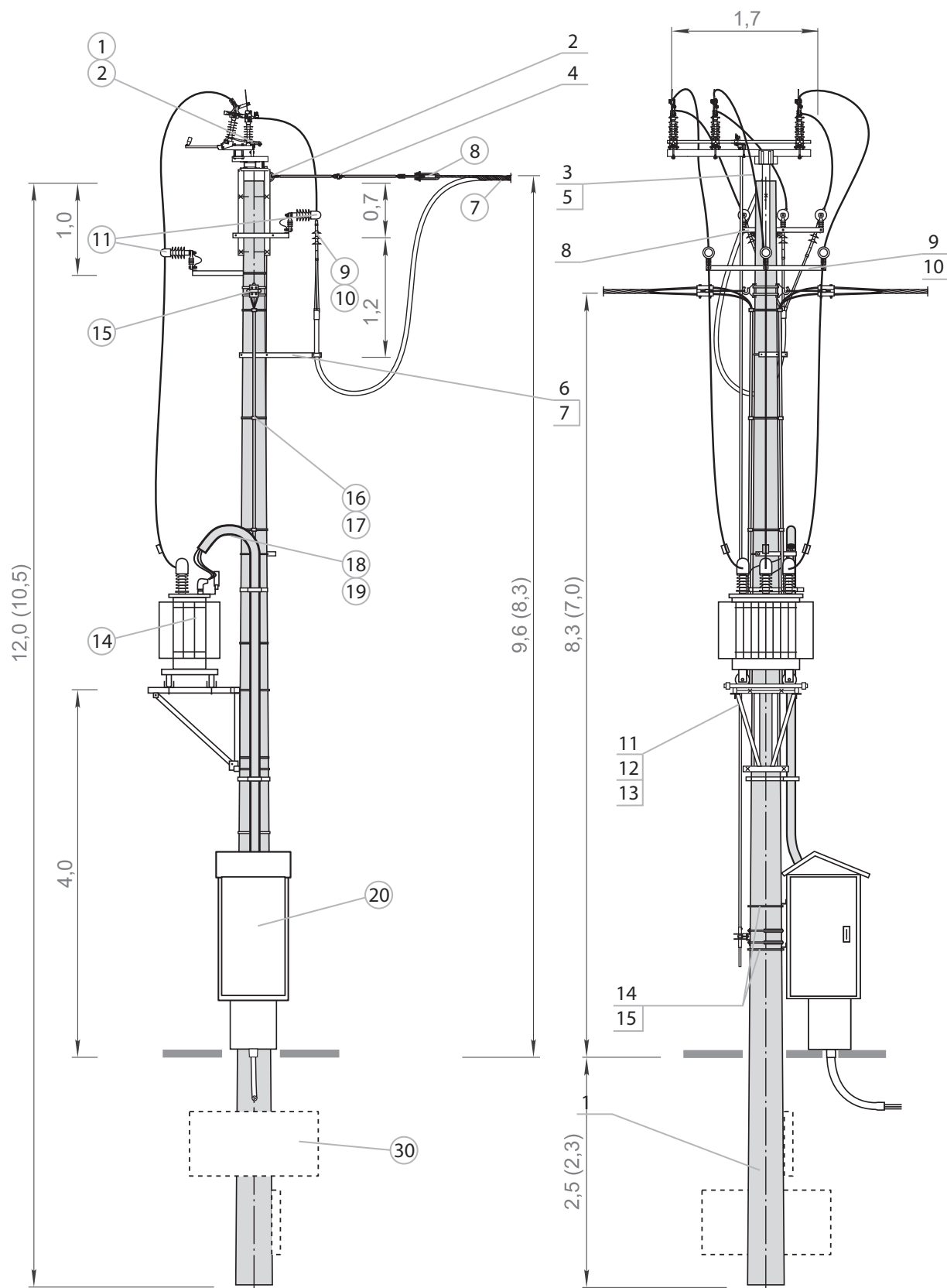


List of structures, accessories, apparatus for STEKsr-20/...

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 disconnector (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.	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.I NRAu E-... w.I	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 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/...

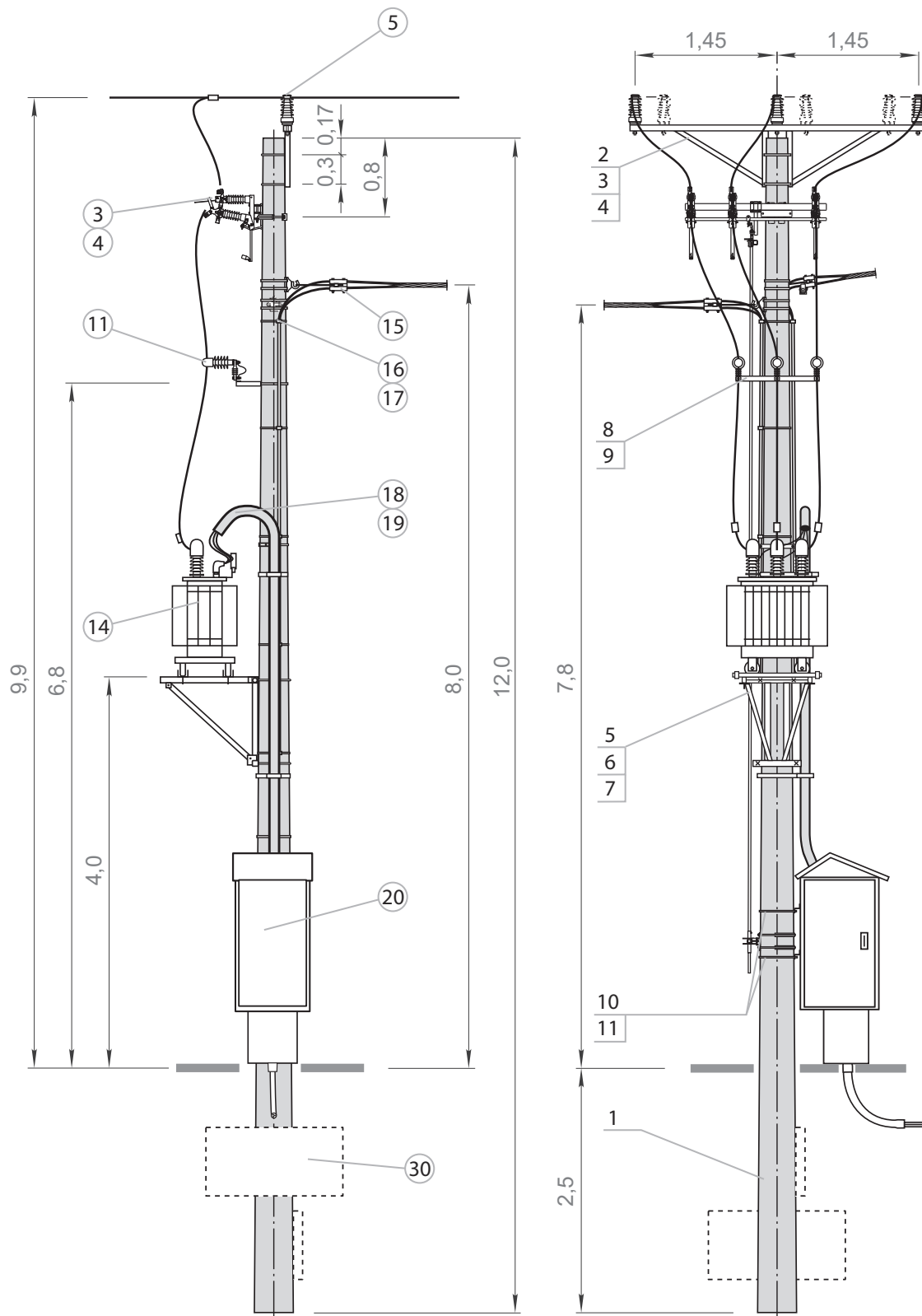


List of structures, accessories, apparatus for STEPr-20/.../1

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				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 For PP-3a/E and PP-2a/E For PP-3a/E and PP-2a/E		PP-57a/E PP-56a/E PP-51a/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-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								
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				
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			
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			

STEPPr-20/.../1

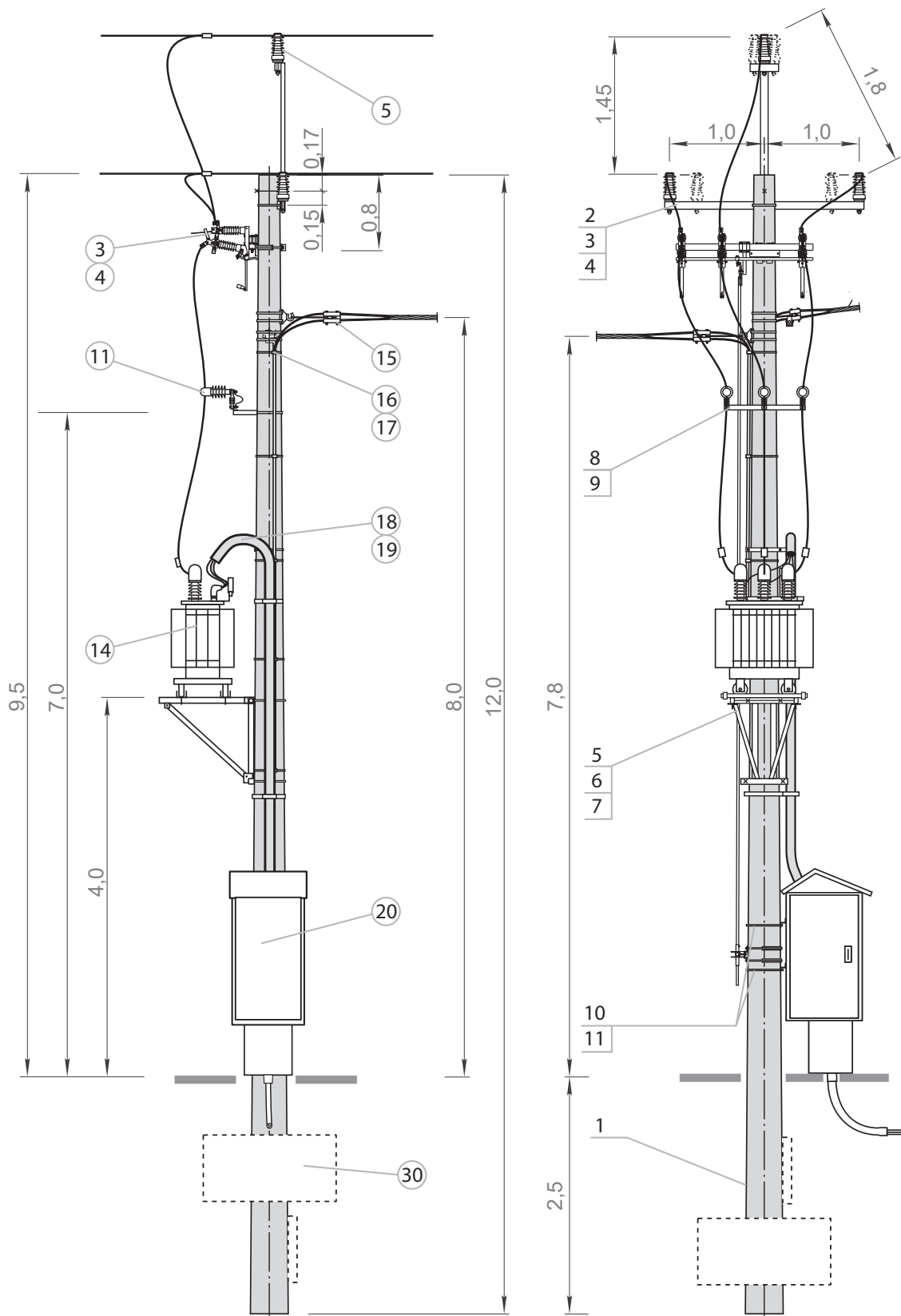


List of structures, accessories, apparatus for STEPr-20/.../2

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	AFL cables 35, 50, 70
		PP-331c/2/E						top diameter = 263	
		PP-331b/2/E						top diameter = 218	
		PP-311d/2/E					0°	top diameter = 420	
		PP-311c/2/E						top diameter = 263	
		PP-311b/2/E						top diameter = 218	
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	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 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.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	
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	To be individually selected by an authorised designer	
20.	LV disconnector DB switchboard	...	to 5 1	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	

STEPr-20/.../2

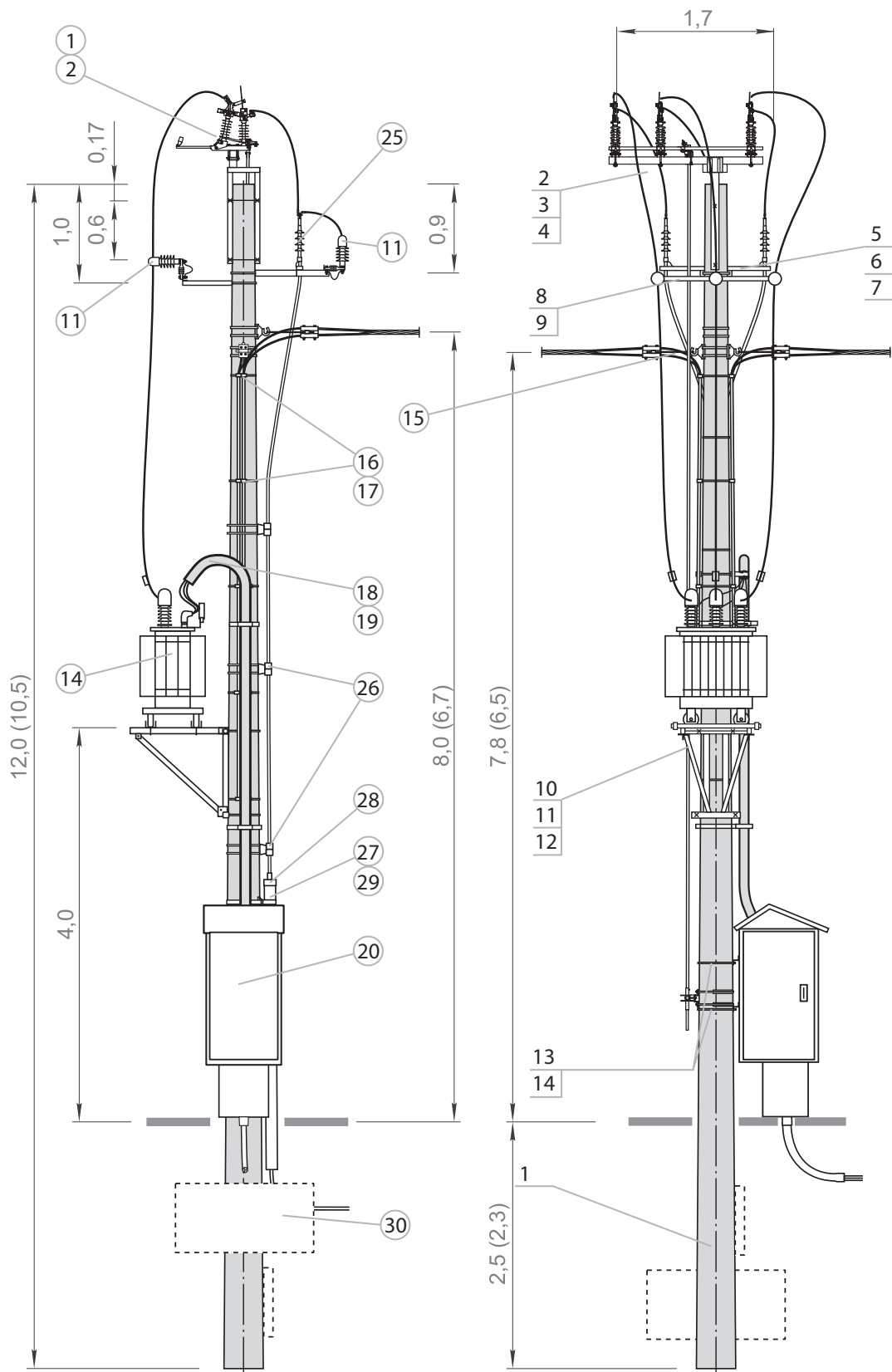


List of structures, accessories, apparatus for STEKr-20/...

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 disconnectors (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
		KGK-11a/E				top diameter = 263
		KGK-113/E				top diameter = 218
		KGK-112a/E				For two 6 x 1-phase cables
		KGK-111a/E				top diameter = 420
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.	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
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	To be individually selected by an authorised designer
20.	LV disconnector DB switchboard	...	to 5 1	pcs.	... / ALPAR	
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/...

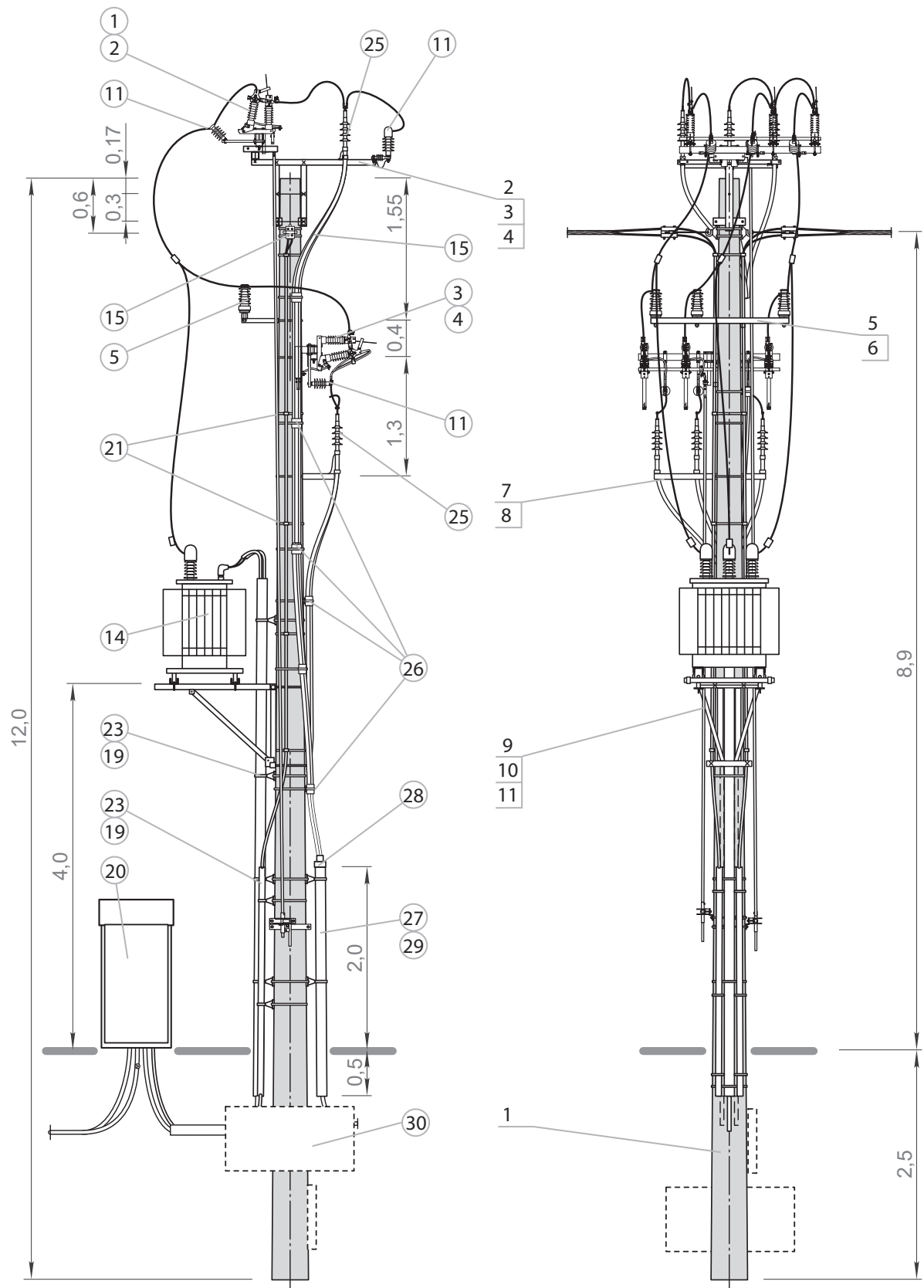


List of structures, accessories, apparatus for STEK2r-20/...

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 disconnector (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 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 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/...

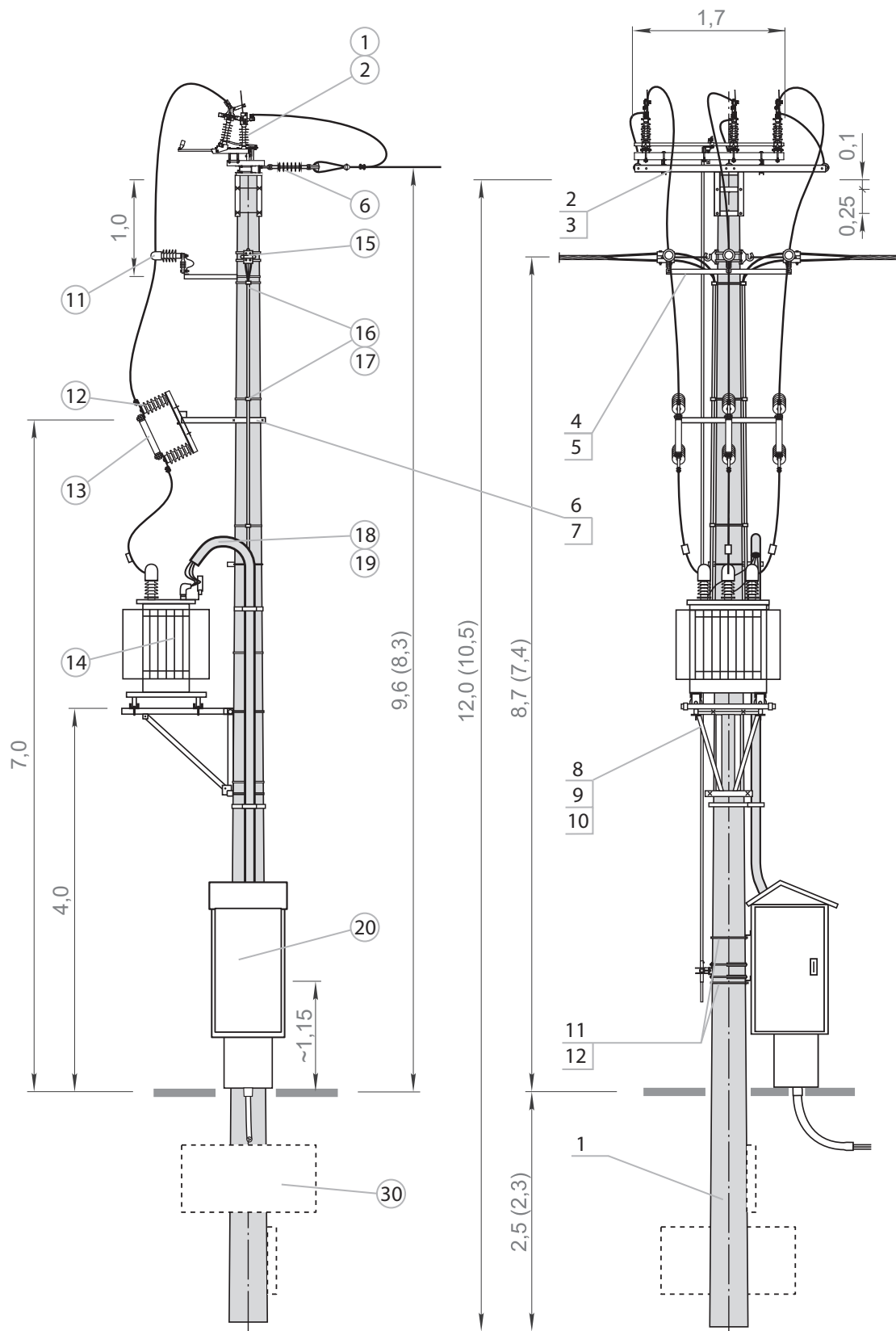


List of structures, accessories, apparatus for STEr-20/...f

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	≤ 20kN top diameter = 420 ≤ 12kN top diameter = 263 PAS cables
		PK-11a/E				
		PK-6a/E				
		PKZ-7/E				
		PKZ-6/E				≤ 20kN top diameter = 420 ≤ 13,5kN top diameter = 263 AFL cables
		PKZ-3b/E				
		PKZ-3a/E				
		PKZ-3/E	1	pcs.	ALPAR	≤ 13,5kN top diameter = 218
		PKZ-3/E				
3.	Disconnecter structure	KO-7/P/E	1	pcs.	ALPAR	To mount the modular disconnector (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 Do not use when mounting arresters directly on the transformer
		KOG-51/E				top diameter = 420
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 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 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	To be individually selected by an authorised designer
20.	LV disconnector DB switchboard	...	to 5 1	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

STEr-20/...f

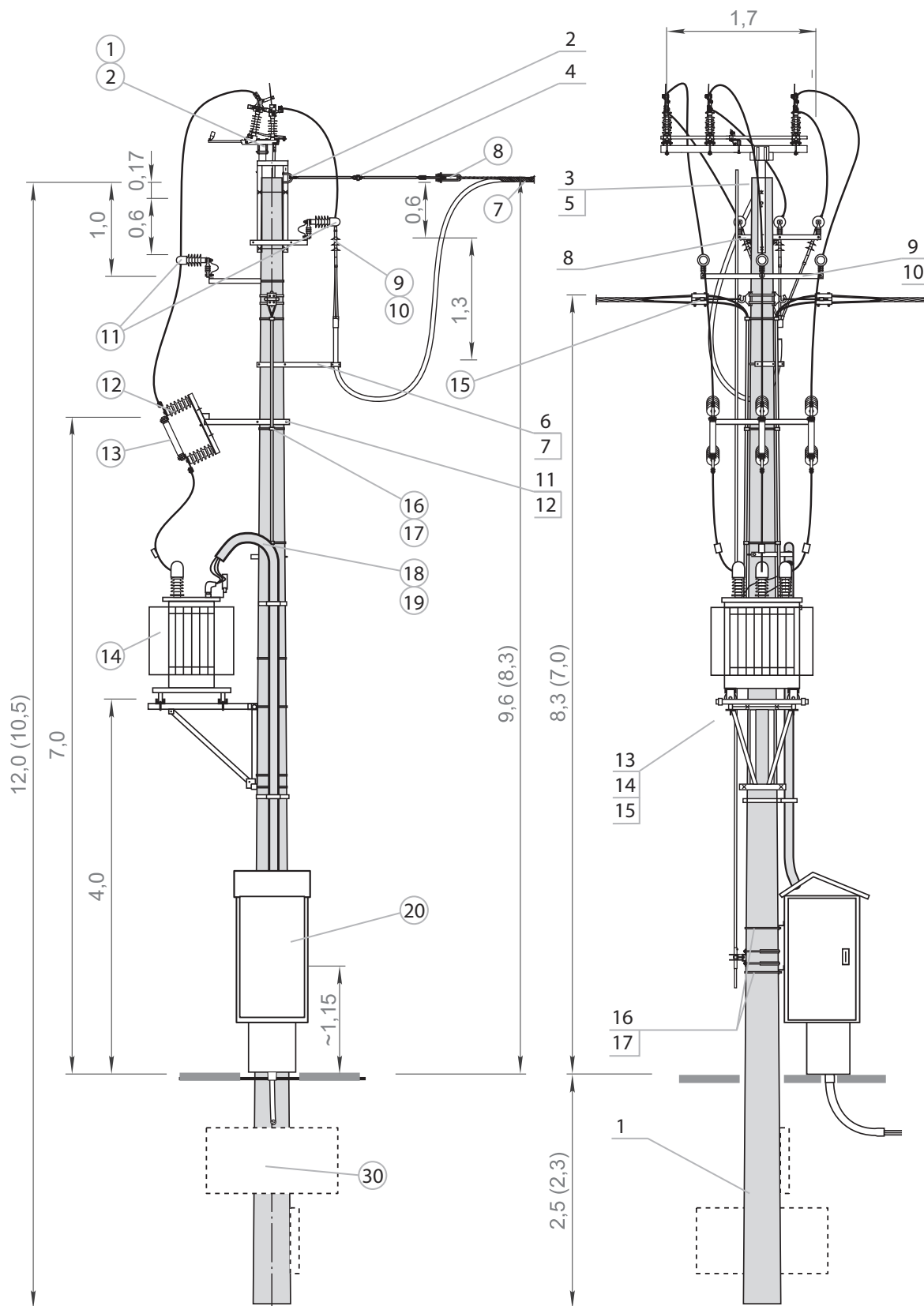


List of structures, accessories, apparatus for STEsr-20/...f

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 = 218.263 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

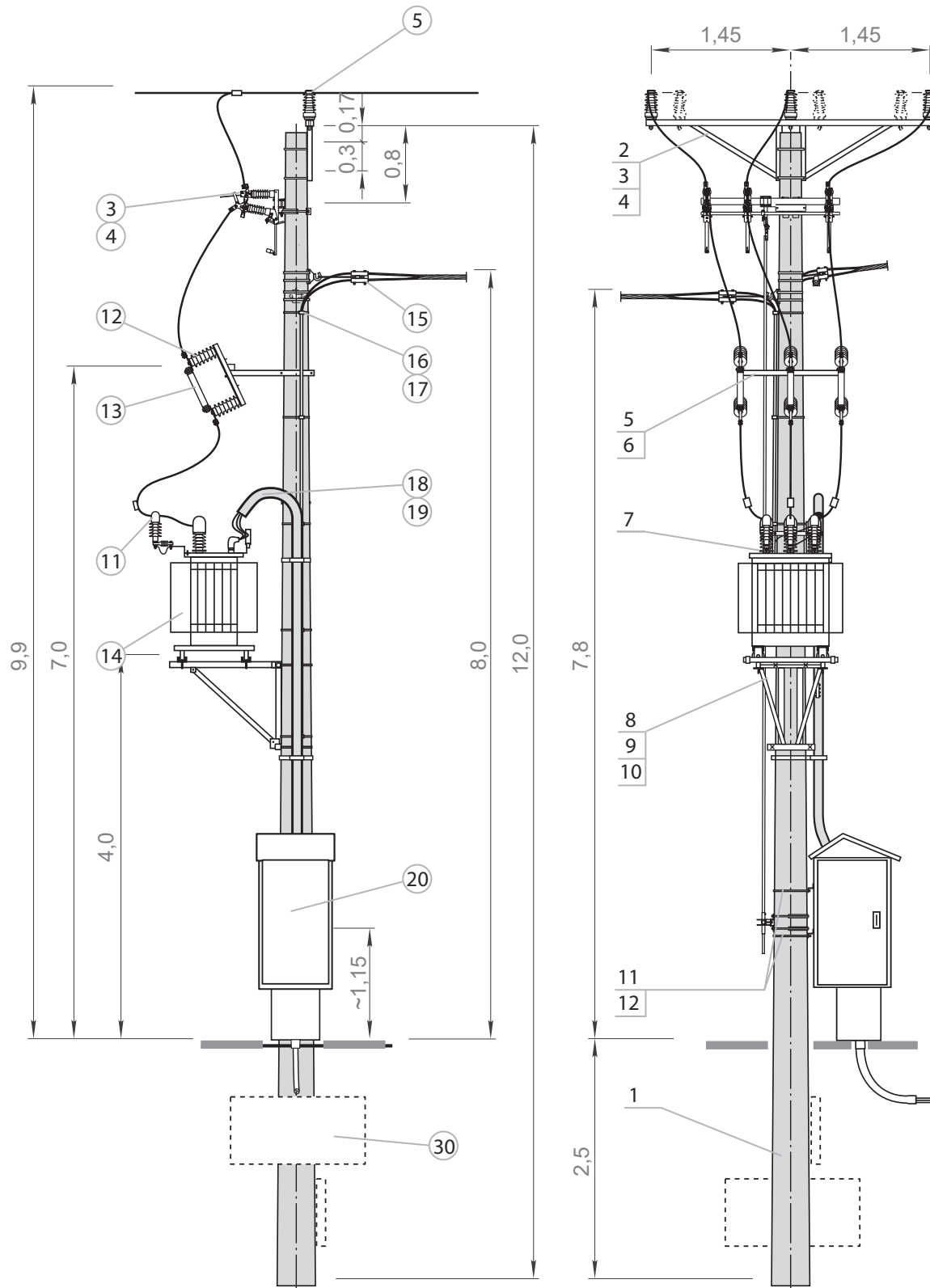


List of structures, accessories, apparatus for STEPr-20/.../1f

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	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 (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 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.	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.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			
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 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 PTPIRE Poznań			

STEP-20/.../1f

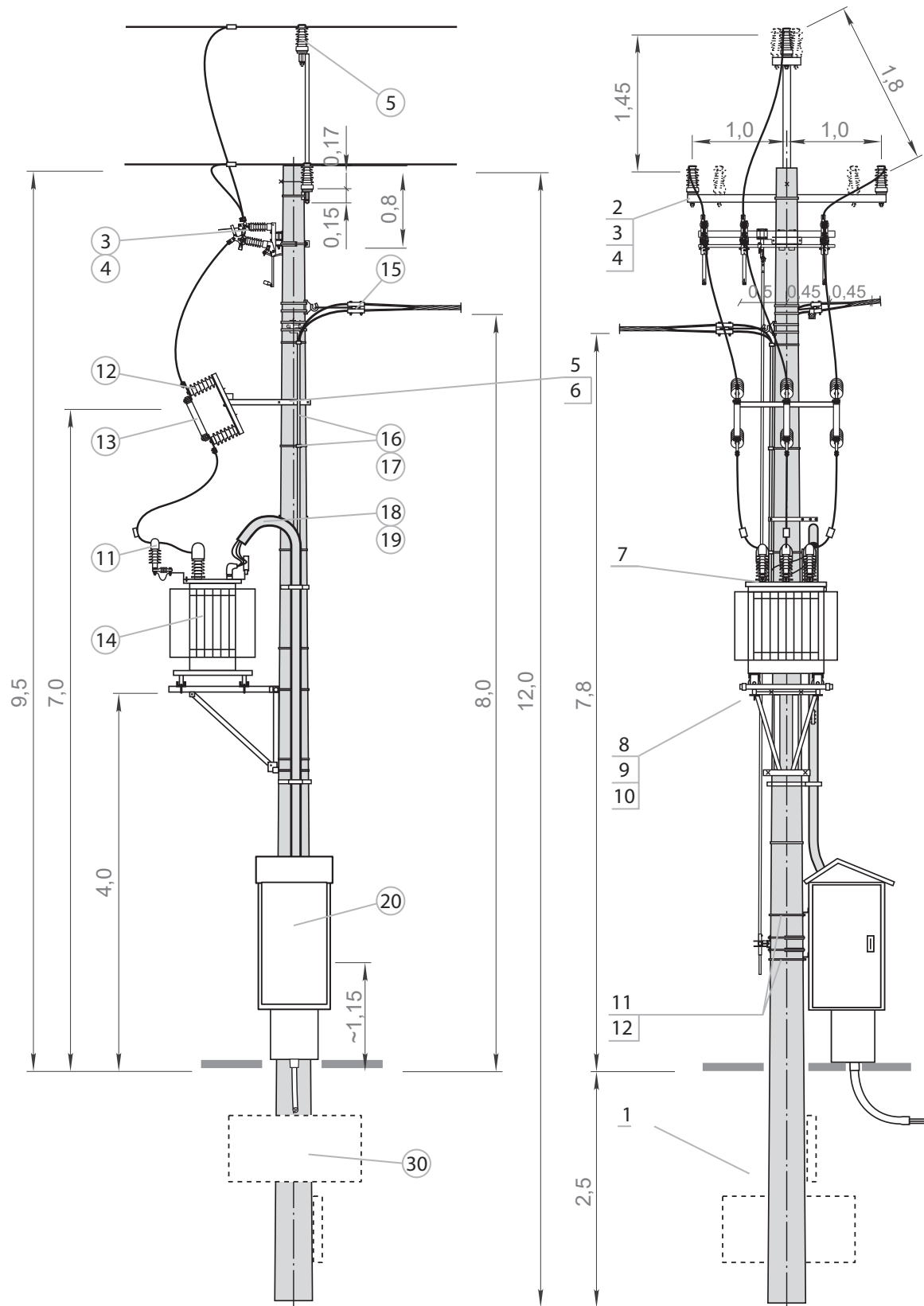


List of structures, accessories, apparatus for STEPr-20/.../2f

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	AFL cables 35, 50, 70
		PP-331c/2/E						top diameter = 263	
		PP-331b/2/E						top diameter = 218	
		PP-311d/2/E					0°	top diameter = 420	
		PP-311c/2/E						top diameter = 263	
		PP-311b/2/E						top diameter = 218	
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 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 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.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	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			
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			

STEPPr-20/.../2f

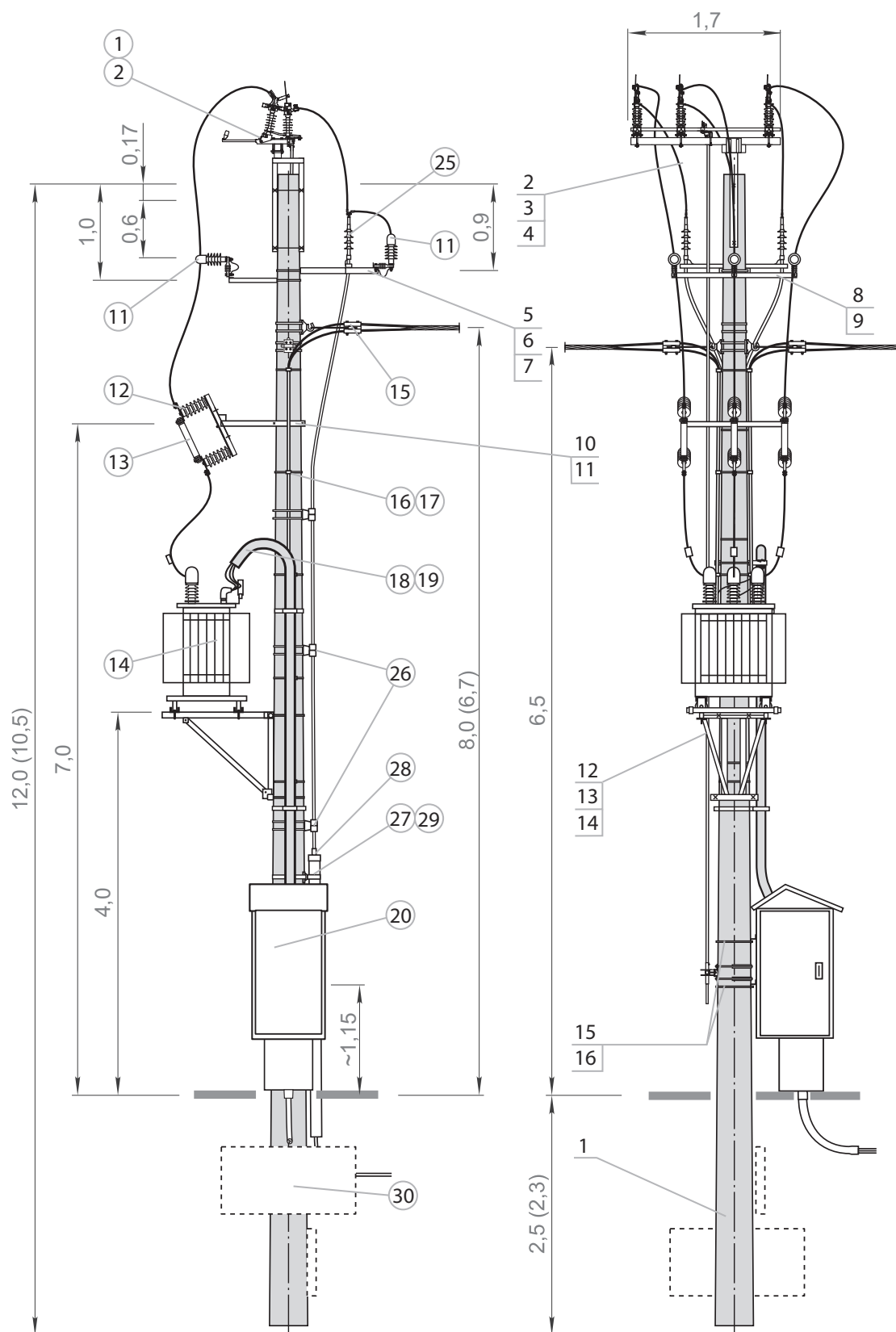


List of structures, accessories, apparatus for STEKr-20/...f

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	top diameter = 420 mm
		KGK-12a/E				top diameter = 263 mm
		KGK-11a/E				top diameter = 218 mm
		KGK-113/E				top diameter = 420 mm
		KGK-112a/E				top diameter = 263 mm
		KGK-111a/E				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 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 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 PBNVA-20/4 PBNVA-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 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

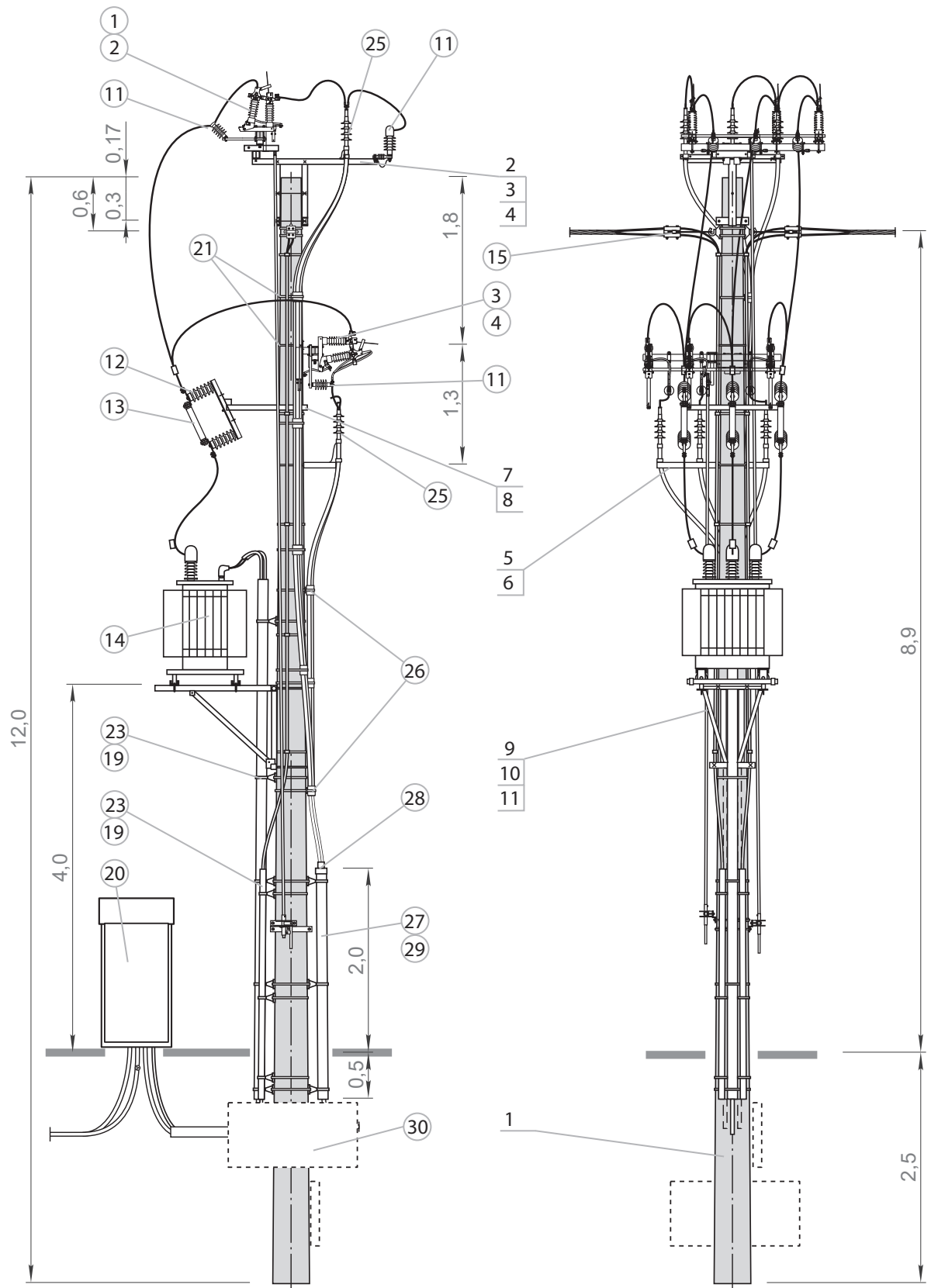


List of structures, accessories, apparatus for STEK2r-20/...f

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-I 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 PTPIRE 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

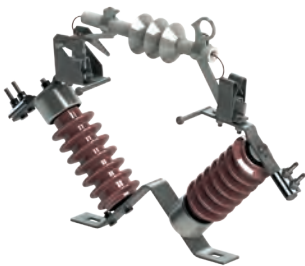
1. Characteristics and purpose

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*

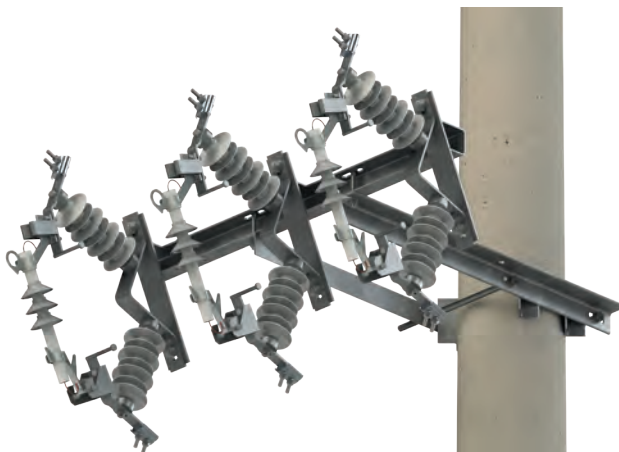


*PBNVA-30/4S
silicone insulators*

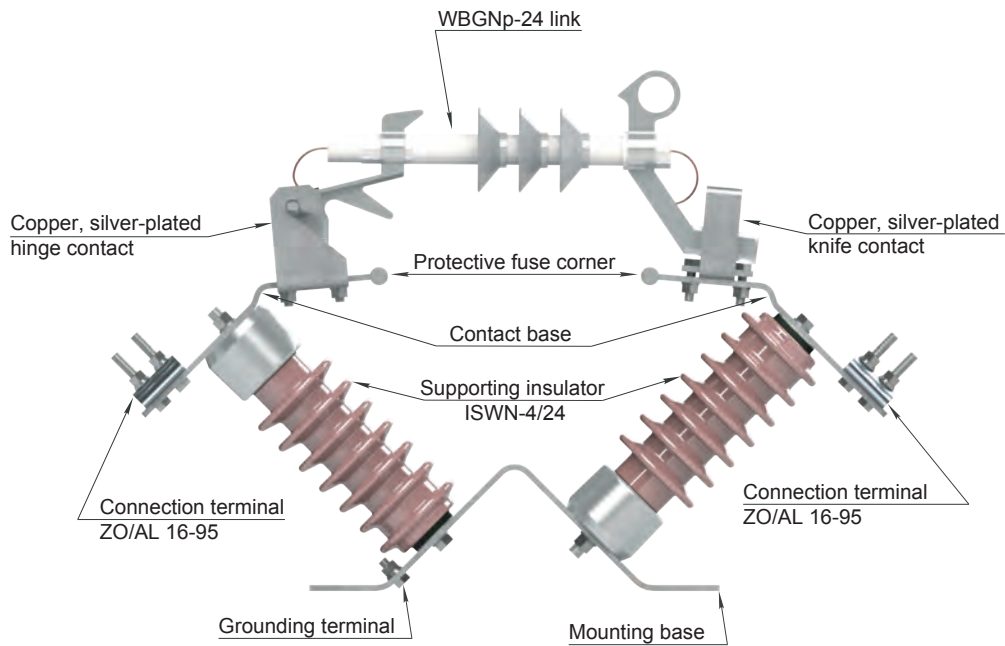


3. Application

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

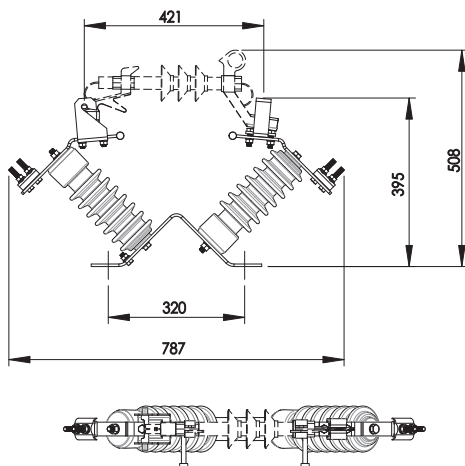


PBNVA-20/4
fuse base

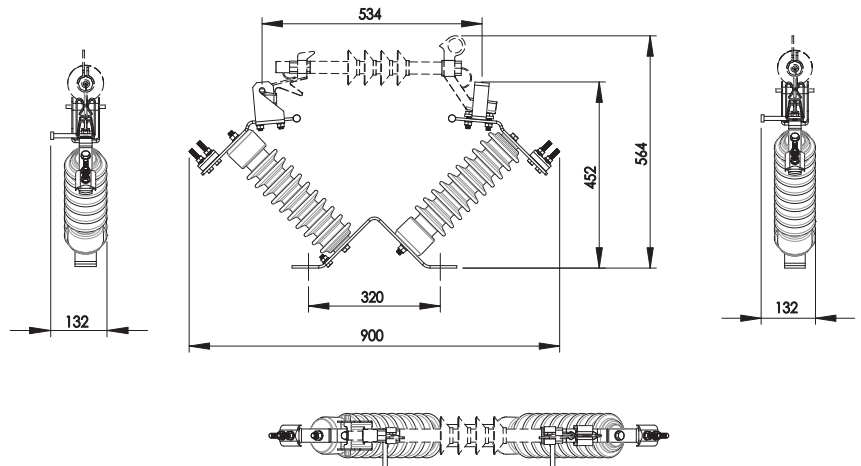


Basic dimensions

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

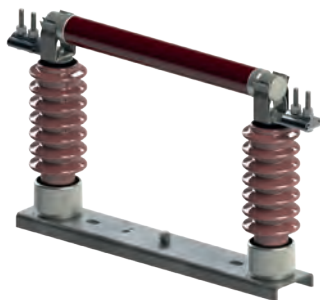
1. Characteristics and purpose

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.

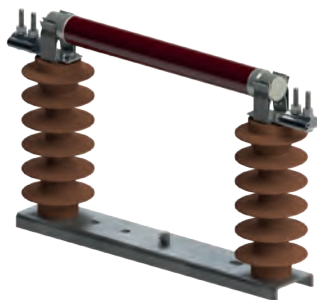
PBNWMA bases can be equipped with a medium-voltage surge arrester that holds a valid certificate.

2. Types

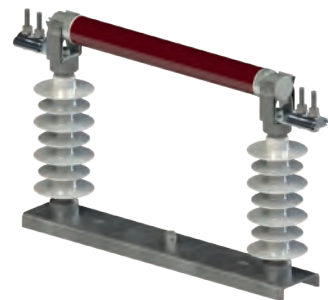
*PBNWMA-24/50
porcelain insulators*



*PBNWMA-24/50K
composite insulators*



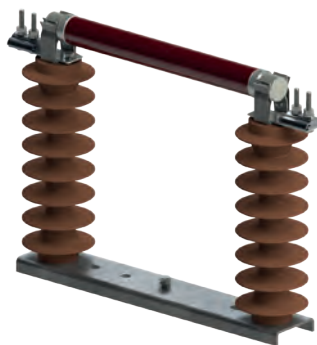
*PBNWMA-24/50S
silicone insulators*



*PBNWMA-30/50
porcelain insulators*



*PBNWMA-30/50K
composite insulators*

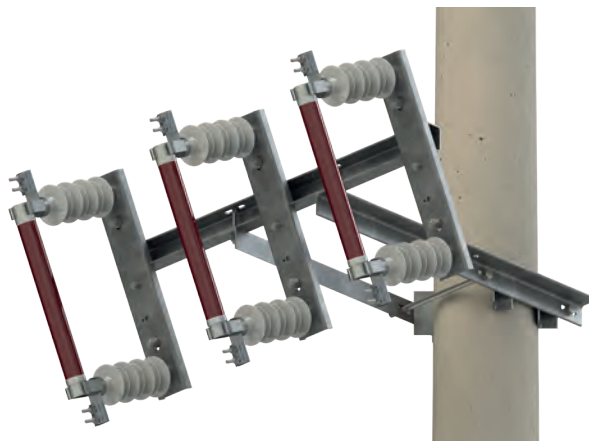


*PBNWMA-30/50S
silicone insulators*

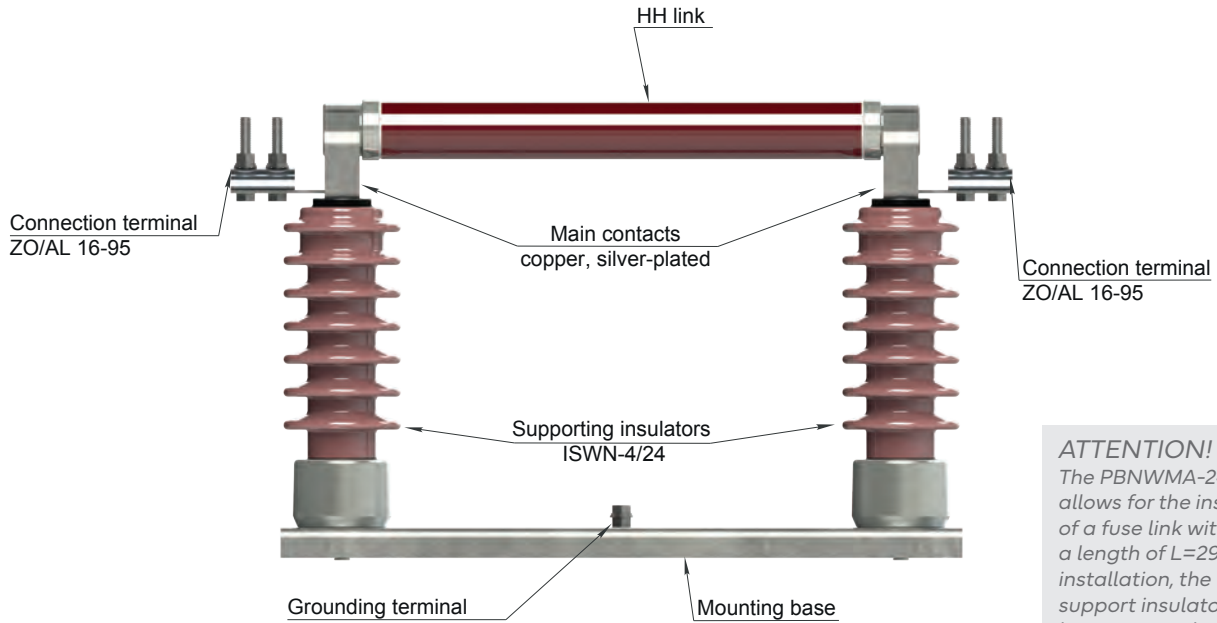


3. Application

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



PBNWMA-24/50
fuse base

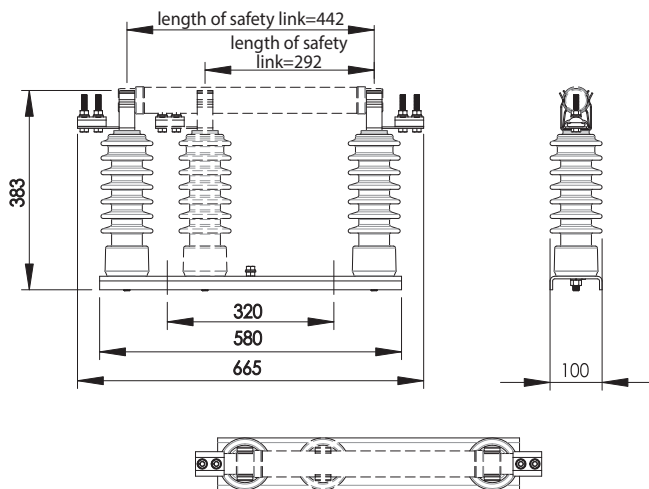


ATTENTION!

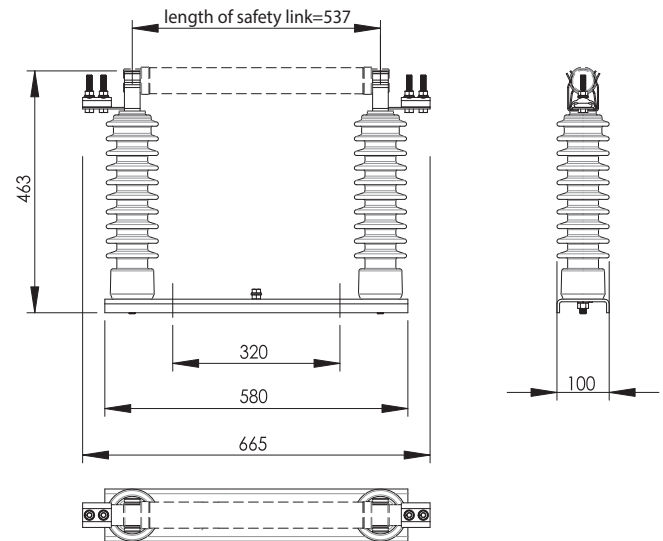
The PBNWMA-24/50 base allows for the installation of a fuse link with a length of $L=292$ mm. For installation, the left-hand support insulator must be unscrewed and screwed into the inner hole of the base using the same torsion elements.

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

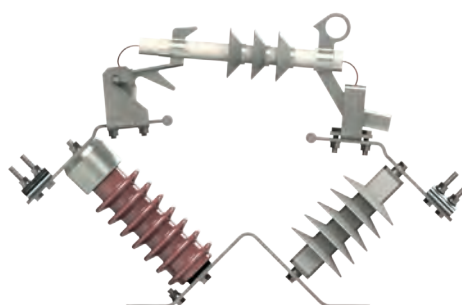
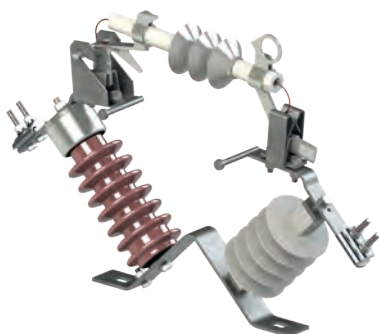
2. Types

PBNVoA-20/4

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

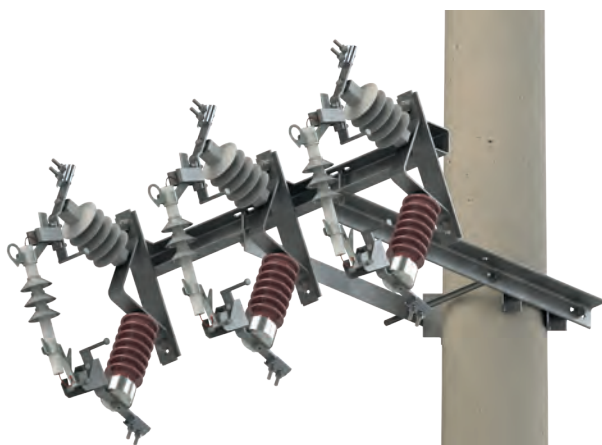
PBNVoA-24/4

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



3. Application

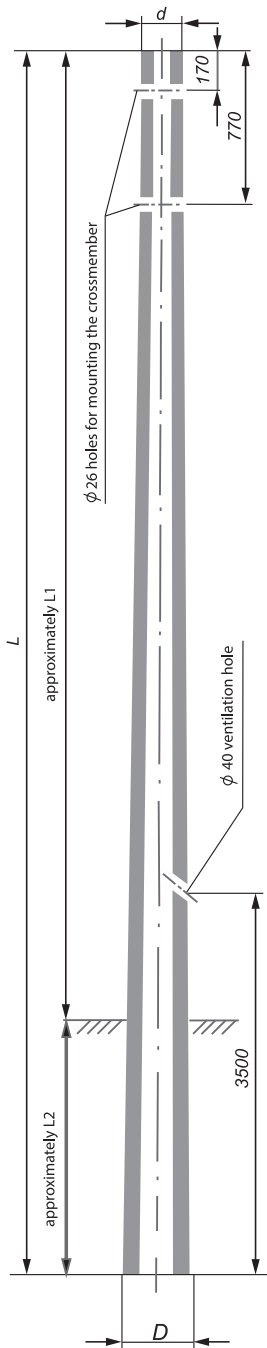
The PBNVoA type bases are used as transformer protection in transformer stations (they can be optionally equipped with a MV surge arrester in exchange for one of the support insulators)



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

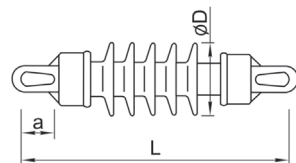
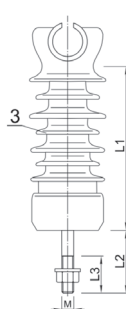
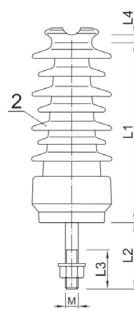
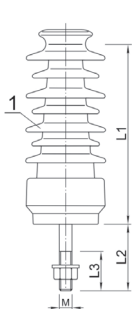
2. Spun poles type EM

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						
		mm									
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						
		mm									
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

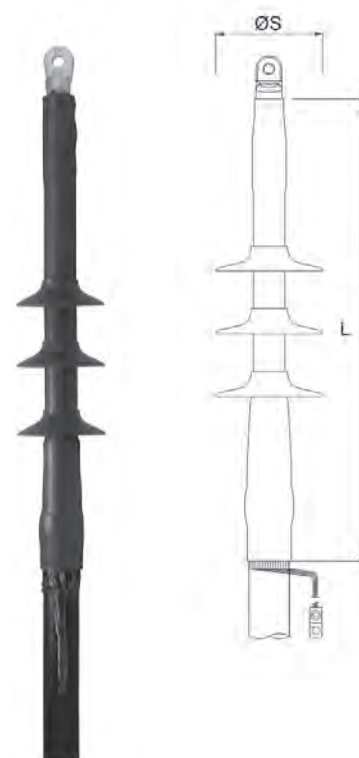
The single-phase termination set consists of the following components:

- 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 [mm²]		Cat. no.
					24 kV	36 kV	
Hoechstadder 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 Hoechstadder – 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

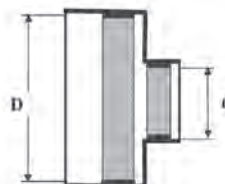
Typ		D [mm]		d [mm]		L1* [mm]	L2* [mm]
		max	min	max	min		
EC	50	72	19	30	19	65	40
	75	92	22	34	22	60	40
	90	110	25	40	25	55	35
	110	125	25	54	25	55	35
	125	140	35	66	35	55	35
	140	155	35	85	35	55	35
	160	180	42	95	42	70	40

* L1 - length of the part with the larger diameter

L2 - length of the part with the smaller diameter

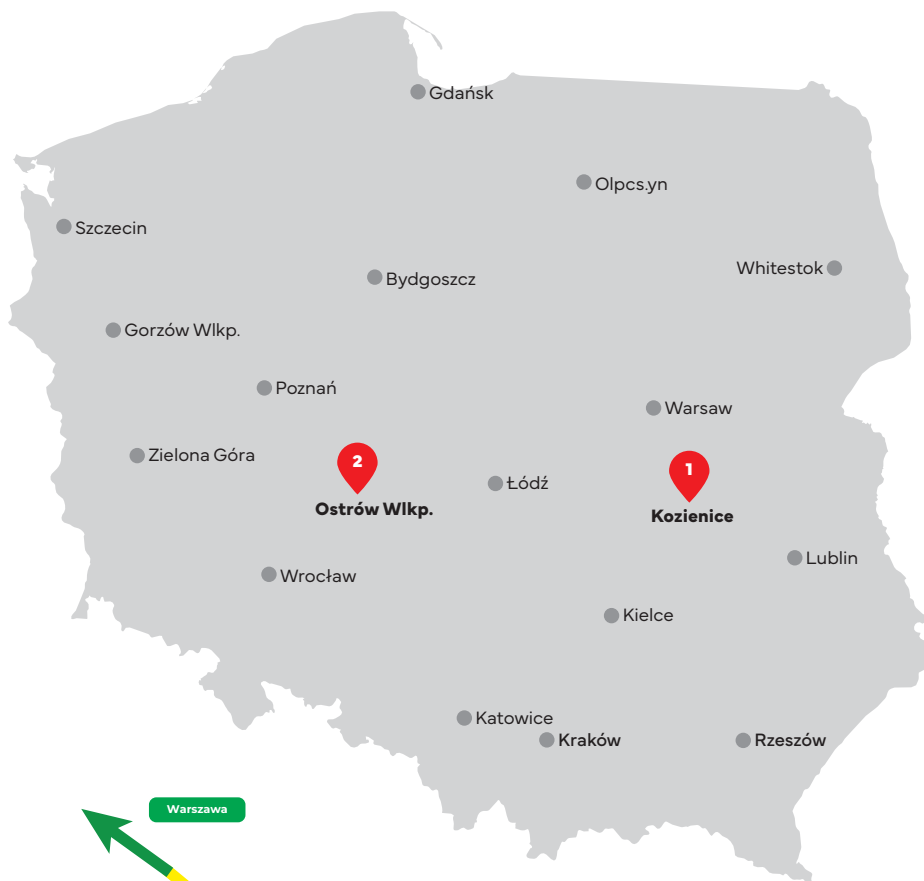
EC selection taking into account the cross-sections of the 4-core cables and the outer diameter of the conduits

Outer diameter of protective tube Ø [mm]	Cable cross section [mm²] (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



NOTES

NOTES



1

ALPAR - HEADQUARTERS

Łuczynów 98
26-900 Kozienice, Poland
phone: +48 48 614 61 14

2

ALPAR - SALES OFFICE

ul. Nowa 8A
63-400 Ostrów Wielkopolski, Poland
phone: 530 906 662 | 530 244 868





HEADQUARTERS:

Łuczynów 98 | 26-900 Kozienice, Poland
phone: +48 48 614 61 14

SALES OFFICE:

ul. Nowa 8A | 63-400 Ostrów Wielkopolski, Poland
phone: 530 906 662 | 530 244 868

www.alpar.pl

email: sekretariat@alpar.pl