

ROS
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ENERGO



HIGH-FREQUENCY COMMUNICATION EQUIPMENT

VZ SERIES HIGH-FREQUENCY TRAPS

FPM-RS COUPLING FILTERS

RF SEPARATION FILTERS

COUPLING CAPACITORS

HIGH-FREQUENCY COMMUNICATION EQUIPMENT

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PURPOSE

HF-communication equipment is intended to provide high-frequency channels for the purposes of communication, relay protection and remote tripping via high-voltage power transmission lines with voltage of 35–750 kV.

APPLICATION

The equipment is used as an integral part of power stations, substations, power facilities of industrial enterprises for installation and upgrading of overhead power lines.

FUNCTIONS

- Providing the efficient transmission of high-frequency signals between HF-communication equipment and a high-voltage line.
- Providing the electric insulation between high-voltage line circuits and communication equipment input circuits.
- Protection of communication equipment and maintenance personnel against overvoltage occurring in high-voltage lines during switching and due to lightning.

ADVANTAGES

- Ready-to-use equipment;
- High-quality signal;
- Highly reliable communication channels;
- Stop band stability in a specified range;
- Minimum maintenance costs;
- Minimum resistive loss;
- Long period of use;
- Certified equipment, GOST R and the Eurasian Economic Union TR conformity certificates available;
- Recommended for use at the Russian enterprises within import substitution practice.

VZ SERIES HIGH-FREQUENCY COMMUNICATION TRAPS

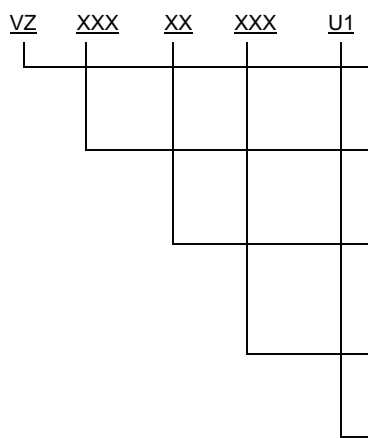
PURPOSE AND APPLICATION

VZ series high-frequency traps with natural air cooling are intended to set up high-frequency communication channels via high-voltage power transmission lines.



Figure 1. Trap general view

DESIGNATION STRUCTURE:



High-frequency trap

Nominal current, A

100, 200, 400, 630, 1250, 2000, 2500, 4000

Inductance, mH:

0.1; 0.25; 0.5; 1.0; 1.5; 2.0; 2.5

Trap frequency band ENU, kHz:

E. g. for **VZ-630-0.5**: 40–48; 47–60; 59–82; 74–118; 100–200; 160–1000

Climatic version:

U, HL – for moderate and cold climate; T – for tropical climate

SPECIFICATIONS

Main specifications, weight and dimensions are given in Appendices A and B (pages 15–23).

The traps are intended for use in the following conditions: environmental exposure, continuous operation – version U, HL or T of category 1 according to GOST 15150 and GOST 15543, atmosphere type II according to GOST 15150.

Maximum installation height is 2000 meters above sea level. The unit is installed in a non-explosive environment free from the aggressive gases and vapours in the concentrations destroying metals and insulation, not saturated with current-conducting dust.

All high-frequency traps produced by Rosenergoservis conform to the TU 314-005-46569277-2000 specifications and design documentation. Depending on climatic and environmental factors according to GOST 15543.1-89 and GOST 15150-69, high-frequency traps U, HL and T are distinguished.

There is a standard limitation of temperature range applicable to each type of traps:

Standard limitation of operating temperature range:

- for U: -50 °C to +50 °C;
- for HL: -60 °C to +60 °C;
- for T: -10 °C to +60 °C.

The traps with anti-bird protection may be manufactured at the customer's request (see Figure 1). Type of protection – OPN (surge suppressor). Optionally, at the customer's request the traps can be fitted with dischargers.

MULTI-PURPOSE ADJUSTING ELEMENT

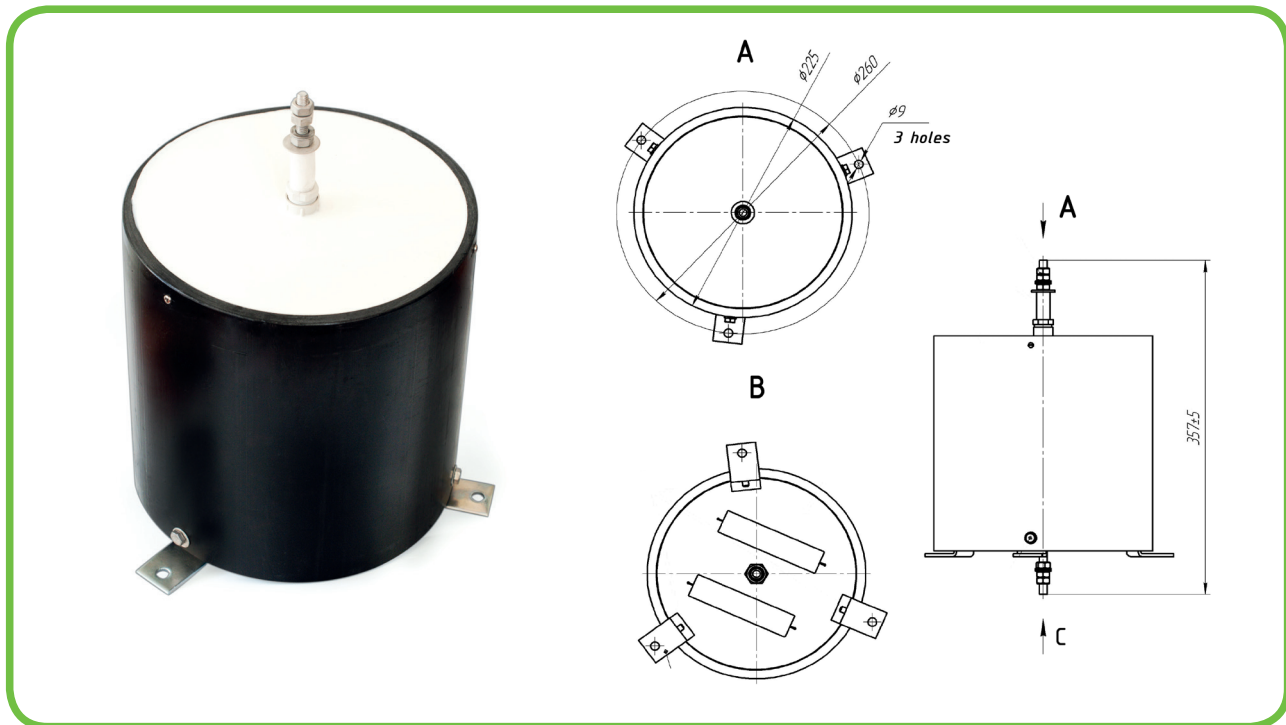


Figure 2. General view and dimensions of multi-purpose adjusting element

PURPOSE AND APPLICATION

Multi-purpose adjusting elements ENU-0.1-40, ENU-0.25-40, ENU-0.5-40, ENU-1.0-40, ENU-1.5-40, ENU-2.0-40 are intended to supplement smoothing reactors with inductance of 0.1–2.5 mH rated for currents of 100, 200, 400, 630, 1250, 2000 A and 4000 A.

Multi-purpose adjusting elements in conjunction with traps are used for high-frequency processing of high-voltage transmission lines with the purpose to mitigate the shunting effect of substation buses on the baseband transmission path of the high-frequency channel created in a HV-line. Stop band is the range of frequency over which the shunting effect is mitigated.

Multi-purpose adjusting element is a proprietary design of Rosenergoservis. The design is based on domestic and foreign counterparts.

DESIGN

Multi-purpose adjusting elements ENU-0.1-40, ENU-0.25-40, ENU-0.5-40, ENU-1.0-40, ENU-1.5-40, ENU-2.0-40 are manufactured in cylindrical water-tight thermally insulated polypropylene enclosure.

Multi-purpose adjusting element is fastened to the reactor with three brackets. It is connected to the reactor with a flexible wire through the lead-in insulators to the current carrying pin-shaped outputs. Protection rating is IP 54.

Table 1. Trap frequency range

Trap type	VZ-100-0.25 VZ-200-0.25 VZ-400-0.25 VZ-630-0.25	VZ-100-0.5 VZ-200-0.5 VZ-400-0.5 VZ-630-0.5	VZ-100-1.0 VZ-200-1.0 VZ-400-1.0 VZ-630-1.0	VZ-1250-0.25	VZ-1250-0.5	VZ-1250-1.0	VZ-2000-0.25 VZ-4000-0.25	VZ-2000-0.5 VZ-4000-0.5	VZ-2000-1.0 VZ-4000-1.0	
Minimum active impedance, Ohm	630	630	630	470	470	470	440	440	440	
Trap frequency range, kHz	100-140 120-180 140-200 150-260 200-400 300-600 380-1000	36-42 40-48 47-60 59-82 74-118 100-200 160-1000*	24-31 28-38 32-46 40-66 52-110 72-256 84-500 92-1000	100-145 125-205 155-290 230-520 300-1000	36-44 43-57 50-70 60-95 80-164 145-1000	37-43 42-50 49-60 59-81 74-115 100-200 160-1000	24-31 28-38 30-42 42-70 70-240 70-1000	100-145 125-205 155-290 230-520 300-1000	36-47 45-65 50-77 60-95 80-164 145-1000	24-36 36-66 50-146 70-1000

* within the range of 160-1000 kHz at frequencies of 160 to 175 kHz the active impedance may be decreased to 500 Ohm.

COUPLING FILTERS

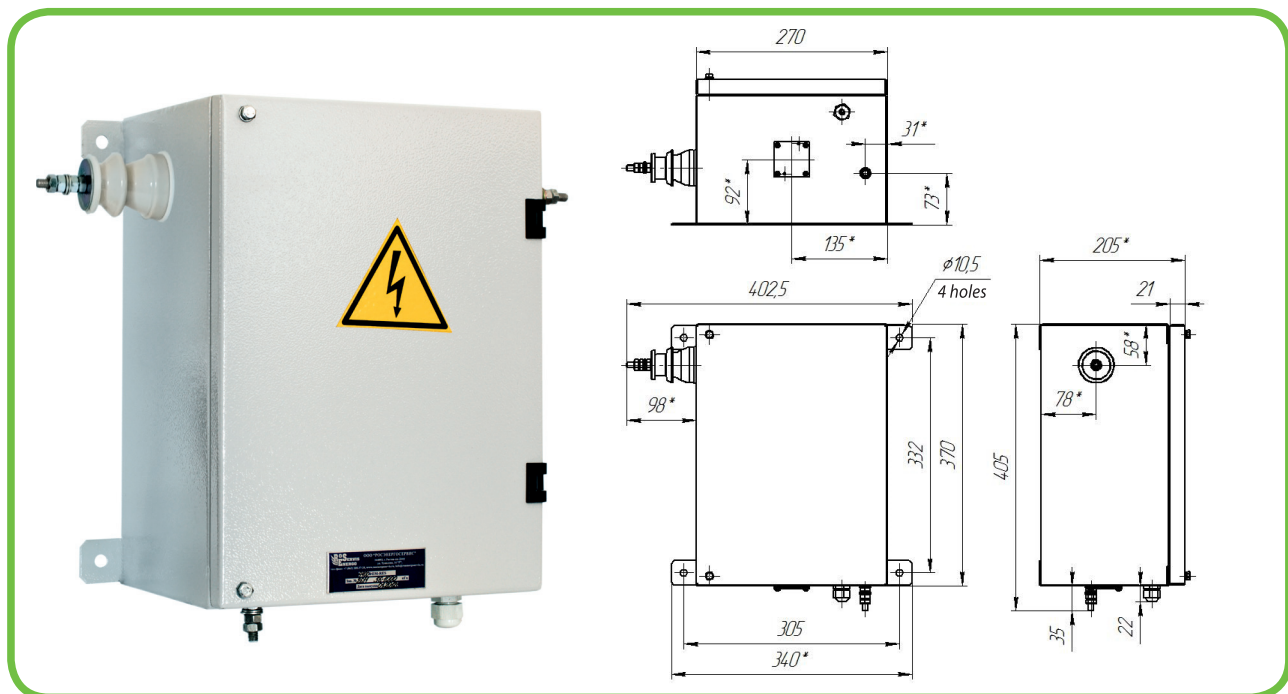


Figure 3. General view and dimensions of FPM-Rs coupling filter

PURPOSE AND APPLICATION

FPM-Rs coupling filters are intended to connect high-frequency communication and telemechanics equipment to high-voltage lines, set up channels of the telephone communication, telemechanics, relay protection, emergency automatics via air power transmission lines rated for voltage of 35 kV to 750 kV, as well as to overhead ground wires, by “phase-to-earth” or “wire-to-wire” configuration. The effective pass-band of FPM-Rs depends on the type of air line, capacity of coupling capacitor and nominal impedance on the line side.

FPM-Rs coupling filter ensures efficient transmission of high-frequency signals between HF-communication equipment and high-voltage line, protection of HF-communication equipment low-voltage circuits from the power-line frequency and overvoltage effects associated with transients.

FUNCTIONS

- Transmission of high-frequency signals from the high-frequency channel integration equipment to/from a high-voltage (HV) line.
- Power-line frequency signal suppression.
- High-voltage line and communication equipment impedance matching.
- Electric isolation between high-voltage line circuits and communication equipment input circuits.
- Protection of communication equipment and maintenance personnel against overvoltage occurring in high-voltage lines during switching and due to lightning.

ADVANTAGES OF FPM-Rs

Ready-to-use equipment.

Enhanced resilience to overvoltage pulses (occurring in lines due to lightning and during switching).

Efficient transmission of high-frequency signals between HF-communication equipment and high-voltage (HV) line.

The filter design prevents non-linear signal distortion.

Extended range of operating frequencies.

Easy to adjust, allows a 180° phase shift at the filter output.

Advanced protective features.

SPECIFICATIONS

Operating filter attenuation in the pass-band does not exceed 1.3 dB, while mismatch attenuation at the line side is not less than 12 dB. Nominal impedance is 450 Ohm at the line side and 75 Ohm at the HF-cable side. Allowed peak power of high-frequency signal that may be transmitted through the filter does not exceed 200 W.

Electric insulation resistance between transformer coils is not less than 100 mOhm in normal conditions. Insulation between transformer coils may withstand 5 kV AC voltage for one minute without breakdown. Electric resistance of the filter at industrial frequency is 20 Ohm at the line side. Filter layout and design provide for a possibility to turn high-frequency voltage phase by 180°.

Operating conditions of coupling filters according to GOST 15150-69, corresponding to category II, with stationary external installation:

- operating air temperature: -50 °C to +60 °C;
- relative air humidity up to 80 % at 25 °C;
- air pressure: $8.4 \cdot 10$ Pa to $10.7 \cdot 10$ Pa (630 to 800 mm Hg);
- maximum height 2000 meters above sea level.

Dimensions: 402×370×205 mm

Maximum filter weight: 9 kg.

General view and installation dimensions of FPM-Rs are given in Figure 3.

Main types and parameters of FPM-Rs are given in Table 2.

Table 2. Operating frequency range of FPM-Rs filters

Filter code	Line voltage, kV	Capacity of coupling capacitor, pF	Pass-band, kHz	Nominal resistance at line side, Ohm
FPM-Rs-4400/20-28	35	4400	20–28	450
FPM-Rs-4400/26-40	35	4400	26–40	450
FPM-Rs-4400/36-80	35	4400	36–80	450
FPM-Rs-4400/70-350	35	4400	70–350	450
FPM-Rs-4400/120-1000	35	4400	120–1000	450
FPM-Rs-4400/200-1000	35	4400	200–1000	450
FPM-Rs-4400/55-1000	35	4400	55–1000	450
FPM-Rs-2200/74-120	110	2200	74–120	450
FPM-Rs-2200/110-300	110	2200	110–300	450
FPM-Rs-2200/200-1000	110	2200	200–1000	450
FPM-Rs-6400/20-38	110	6400	20–38	450
FPM-Rs-6400/24-56	110	6400	24–56	450
FPM-Rs-6400/36-140	110	6400	36–140	450
FPM-Rs-6400/36-255	110	6400	36–255	450
FPM-Rs-6400/50-400	110	6400	50–400	450
FPM-Rs-6400/48-1000	110	6400	48–1000	450
FPM-Rs-6400/110-1000	110	6400	110–1000	450
FPM-Rs-6400/160-1000	110	6400	160–1000	450
FPM-Rs-6400/200-1000	110	6400	200–1000	450
FPM-Rs-3200/20-26	220	3200	20–26	450
FPM-Rs-3200/24-34	220	3200	24–34	450
FPM-Rs-3200/28-42	220	3200	28–42	450
FPM-Rs-3200/36-63	220	3200	36–63	450
FPM-Rs-3200/50-124	220	3200	50–124	450
FPM-Rs-3200/76-1000	220	3200	76–1000	450
FPM-Rs-3200/120-1000	220	3200	120–1000	450
FPM-Rs-3200/200-1000	220	3200	200–1000	450
FPM-Rs-4650/20-26	500	4650	20–26	310
FPM-Rs-4650/24-34	500	4650	24–34	310
FPM-Rs-4650/28-42	500	4650	28–42	310
FPM-Rs-4650/36-63	500	4650	36–63	310
FPM-Rs-4650/50-127	500	4650	50–127	310
FPM-Rs-4650/75-1000	500	4650	75–1000	310

SEPARATION FILTERS



Figure 4. General view of separation filter

PURPOSE AND APPLICATION

RF-Rs separation filter is intended to set up a relay protection channel (or remote tripping) on a common base with the communication channels and at a frequency within the range of 36–1000 kHz at 1 kHz interval.

SPECIFICATIONS

All the specifications below will apply to filter operation in certain climatic conditions:

- climatic conditions according to GOST 15150-69 applicable to UHL version of category 4.2;
- +1° to + 45 °C under relative air humidity of 80 %;
- air pressure: $8.4 \cdot 10 \text{ Pa}$ to $10.7 \cdot 10 \text{ Pa}$ (630 to 800 mm Hg).

Separation filter estimated capacity: 200 VA of high-frequency current in the pass-band.

Loss induced by the separation filter when it is connected in the high-frequency path serially with load of 75 Ohm is not more than 1 dB in the band of filter adjustment frequencies $\pm 2 \text{ kHz}$, where

F is filter adjustment frequency.

Insulation resistance of input circuits of the separation filter relative to the case is 720 mOhm.

Electric insulation between the case and the terminal PZ (PS) withstands 1500 V of (effective) alternating current with the frequency of $50 \pm 3 \text{ Hz}$ for 1 minute.

Maximum weight of the separation filter is 0.8 kg.

Dimensions: 225×113×105 mm.

RF-Rs separation filters have TS TR conformity certificates.

DISCONNECTORS



Figure 5. General view and dimensions of disconnector

PURPOSE AND APPLICATION

Disconnectors are intended to:

Disable and enable voltage-carrying sections of high-voltage electric circuit in the absence of load current and to change the connection pattern.

Ensure safe operations at a disabled section.

Enable and disable charge currents of air filters and cable lines, transformer idle currents and small load currents.

SPECIFICATIONS

Disconnectors are available in UHL climatic version, category 2 according to GOST 15150-69.

Operating conditions:

- recommended operating temperature: $-60\text{ }^{\circ}\text{C}$ to $+40\text{ }^{\circ}\text{C}$;
- maximum installation height 2000 meters above sea level.

It is recommended to install the disconnectors in the premises where the temperature and humidity fluctuations unessentially differ from outdoor fluctuations, with relatively free access of free air, e. g. in tents, car bodies, trailers, uninsulated metal premises, as well as in a casing of a complete device or under a shelter.

General view and installation dimensions of disconnector are given in Figure 5.

COUPLING CAPACITORS

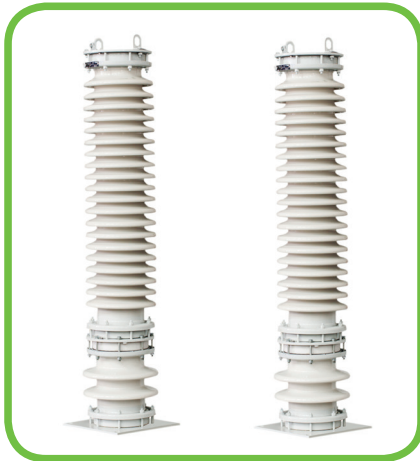


Figure 6. General view of coupling capacitors

PURPOSE AND APPLICATION

Coupling capacitors are intended for separation of communication equipment from the transmission line current at frequency of 50 Hz. In this case high-frequency signal continue to transmit via HF-lines without interference.

Coupling capacitor is an essential element of power takeoff devices and measuring instruments such as voltage dividers and transformers.

Along with high-frequency trap and coupling filter, the coupling capacitor forms one circuit, thus each element, including the capacitor, shall be adjusted to the mains rated voltage.

Today new technology provides a possibility to connect high-frequency traps, coupling capacitors and coupling filters to HF-lines by inductive excitation and data reception.

At the transmitting side an excitation element is located at a safe distance and at the receiving side a reception element which properties are similar to the excitation element is located.

Coupling capacitors of SM, SMB, SMP, SMPB, SMV, SMPBV, SMA(V), SMAP(V) series are intended to ensure communication at high frequencies of 24–1500 kHz in the overhead power lines with nominal voltage of 35–500 kV and frequency of 50 and 60 Hz. Today capacitors are available in a metal case, as well as in porcelain reinforced case. The latter have got some noticeable advantages over SM:

- high-frequency communication is provided at a wider frequency range of 24 to 1500 kHz;
- insulation leakage path of coupling capacitors is extended;
- weight and dimensions of capacitors have decreased;
- dielectric loss has been reduced significantly.

SMM coupling capacitors (in a metal case) are necessary for connection of communication equipment to 6–35 kV electricity transmission lines and overhead ground wires.

Coupling capacitors have certificates of conformity and approval by OJSC "FSK EES".

Table 3. Specifications of coupling capacitors

Part type	Voltage, kV	Capacity, nano-farad	Climatic version and placement category according to GOST 15150-69	Loss angle tangent	GOST, TU
Coupling capacitors impregnated with capacitor oil					
SM-66/√3-4.4 U1	66/√3	4.4	U1	3.0*10 ⁻³	15581-80
SM-66/√3-4.4 HL1	66/√3	4.4	HL1		
SM-66/√3-4.4 T1	66/√3	4.4	T1		
SM-110/√3-6.4 U1	110/√3	6.4	U1		
SM-110/√3-6.4 T1	110/√3	6.4	T1		
SM-110/√3-6.4 HL1	110/√3	6.4	HL1		
Coupling capacitors impregnated with capacitor oil, with category B of electric equipment of external insulation					
SMB-66/√3-4.4 U1	66/√3	4.4	U1	3.0*10 ⁻³	15581-80
SMB-110/√3-6.4 U1	110/√3	6.4	U1		
SMB-110/√3-6.4 T1	110/√3	6.4	T1		
Coupling capacitors impregnated with capacitor oil, combined with insulation support					
SMP-66/√3-4.4 U1	66/√3	4.4	U1	3.0*10 ⁻³	15581-80
SMP-110/√3-6.4 U1	110/√3	6.4	U1	3.0*10 ⁻³	15581-80
Coupling capacitors impregnated with capacitor oil, with category B of electric equipment of external insulation combined with insulation support					
SMPB-66/√3-4.4 U1	66/√3	4.4	U1	3.0*10 ⁻³	15581-80
SMPB-110/√3-6.4 U1	110/√3	6.4	U1	3.0*10 ⁻³	15581-80
Coupling capacitors impregnated with capacitor oil, with output					
SMV-66/√3-4.4 U1	66/√3	4.4	U1	3.0*10 ⁻³	15581-80
SMV-66/√3-4.4 HL1	66/√3	4.4	HL1		
SMV-66/√3-4.4 T1	66/√3	4.4	T1		
SMV-110/√3-6.4 U1	110/√3	6.4	U1		
SMV-110/√3-6.4 T1	110/√3	6.4	T1		
SMV-110/√3-6.4 HL1	110/√3	6.4	HL1		
Coupling capacitors impregnated with capacitor oil, with category B of electric equipment of external insulation, with output					
SMBV-66/√3-4.4 U1	66/√3	4.4	U1	3.0*10 ⁻³	15581-80
SMBV-110/√3-6.4 U1	110/√3	6.4	U1		
SMBV-110/√3-6.4 T1	110/√3	6.4	T1		
Coupling capacitors impregnated with capacitor oil combined with insulation support, with output					
SMPV-66/√3-4.4 U1	66/√3	4.4	U1	3.0*10 ⁻³	15581-80
SMPV-110/√3-6.4 U1	110/√3	6.4	U1	3.0*10 ⁻³	15581-80

Table 3. Specifications of coupling capacitors (continued)

Part type	Voltage, kV	Capacity, nanofarad	Climatic version and placement category according to GOST 15150-69	Loss angle tangent	GOST, TU		
Coupling capacitors impregnated with capacitor oil, with category B of electric equipment of external insulation combined with insulation support, with output							
SMPBV-66/√3-4.4 U1	66/√3	4.4	U1	3.0*10 ⁻³	15581-80		
SMPBV-110/√3-6.4 U1	110/√3	6.4	U1				
Coupling capacitors impregnated with capacitor oil, in porcelain reinforced case							
SMA-66/√3-4.4 HL1	66/√3	4.4	HL1	2.5*10 ⁻³	TU 63 RK-00213457-AO-034-2003		
SMA-110/√3-6.4 UHL1	110/√3	6.4	UHL1				
SMA-166/√3-14 UHL1	166/√3	14	UHL1				
Coupling capacitors impregnated with capacitor oil, in porcelain reinforced case, with output							
SMAV-66/√3-4.4 HL1	66/√3	4.4	HL1	2.5*10 ⁻³	TU 63 RK-00213457-AO-034-2003		
SMAV-110/√3-6.4 UHL1	110/√3	6.4	UHL1				
SMAV-166/√3-14 UHL1	166/√3	14	UHL1				
Coupling capacitors impregnated with capacitor oil, in porcelain reinforced case, combined with insulation support							
SMAP-66/√3-4.4 HL1	66/√3	4.4	HL1	2.5*10 ⁻³	TU 63 RK-00213457-AO-034-2003		
SMAP-110/√3-6.4 UHL1	110/√3	6.4	UHL1				
Coupling capacitors impregnated with capacitor oil, in porcelain reinforced case, combined with insulation support, with output							
SMAPV-66/√3-4.4 UHL1	66/√3	4.4	UHL1	2.5*10 ⁻³	TU 63 RK-00213457-AO-034-2003		
SMAPV-110/√3-6.4 UHL1	110/√3	6.4	UHL1				
Coupling capacitors in metal case							
SMM series coupling capacitors intended for connection of communication equipment to 6–35 kV electricity transmission lines and overhead ground wires.							
Part type	Voltage, kV	Capacity, nanofarad	Climatic version	Loss angle tangent	GOST, TU	Dimensions L (length)× W (width)× H (height)	Weight, kg, max
Coupling capacitors impregnated with capacitor oil, in metal case							
SMM-20/√3-35 U1	20/√3	35	U1	2.5*10 ⁻³	TU 647 RK-	305×135×345	8.8
SMM-20/√3-107 U1	20/√3	107	U1	2.5*10 ⁻³	00213457-025-01	305×135×440	15.4

Table 4. Insulation supports

Part type	mm	mm	mm	mm	mm	mm	Number of holes	Weight, kg, max	Used to complete	GOST, TU
PI-1 U1, 1HL1, 1T1		280	254	19	350X350	310	8	50	SM-66/√3-4.4 U1, T1	GOST 15581-80
PI-2 U1, 2HL1, 2T1	430	330	300	24	400X400	352	8	66	SM-110/√3-6.4 U1, T1	
PI-4 UHL1		240	215	19	280X280	240	6	24	SMA-66/√3-4.4 UHL1	TU 63 10 RK-00213457-AO-034-2003
PI-5 UHL1	445	313	283	24	350X350	302	8	65	SMA-110/√3-6.4 UHL1	
PI-6 UHL1	510	485	445	28	510X510	354	6	138	SMA-166/√3-14 UHL1	

VOLTAGE TAKEOFF CABINETS

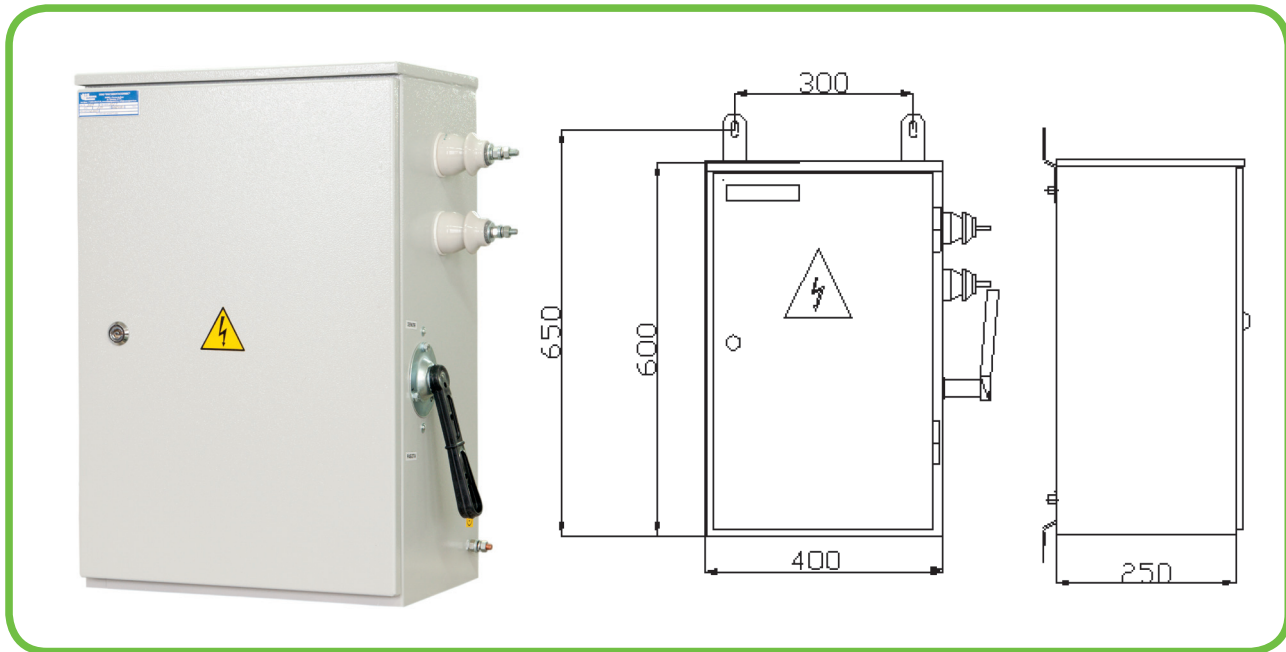


Figure 7. General view and dimensions of voltage takeoff cabinet SHON

PURPOSE AND APPLICATION

Voltage takeoff cabinet SHON is intended for voltage takeoff from the coupling capacitors in existing and projected power transmission lines with nominal voltage 35 to 750 kV AC at frequency of 50 and 60 Hz, as well as for transmission of measuring data signals to automatic circuit reclosers and synchronizing devices.

SPECIFICATIONS

Main technical data and specifications meets TU 3433-005-46569277-2002 and the design documentation developed by Rosenergoservis.

Small cabinets are intended for work in the weather and climatic conditions according to GOST 15543.1-89 and GOST 15150-69 of category II (U1 and HL1).

Operating conditions:

Recommended operating temperature: $-50\text{ }^{\circ}\text{C}$ to $+40\text{ }^{\circ}\text{C}$, operating temperature limits: $-60\text{ }^{\circ}\text{C}$ to $+45\text{ }^{\circ}\text{C}$.

SHON shall be placed at maximum height of 2000 meters above sea level, all the factors decreasing dielectric insulation strength shall be eliminated to the maximum extent possible.

The environment shall be non-explosive and free from current-conducting dust and the concentrated aggressive vapours that destroy metal.

Cabinet protection rating: IP54

General view and dimensions of voltage takeoff cabinets are given in Figure 7.

APPENDIX A

Main specifications of high-frequency traps

VZ-100

Parameter	VZ-100-0.1	VZ-100-0.25	VZ-100-0.5	VZ-100-1.0	VZ-100-1.5	VZ-100-2.0
Nominal continuous current, A	100	100	100	100	100	100
Voltage class of power transmission lines, kV	6–35	6–35	6–35	6–35	6–35	6–35
Nominal short-term short-circuit current for 1 s, kA	2.5	2.5	2.5	2.5	2.5	2.5
Shock short-circuit current, kA	6.5	6.5	6.5	6.5	6.5	6.5
Minimum active impedance, Ohm	650	650	650	650	650	650
Nominal reactor inductance, mH	0.10	0.25	0.50	1.00	1.50	2.00
Reactor inductance at 100 kHz, mH	0.11	0.26	0.52	1.05	1.52	2.06
Climatic version and placement category according to GOST 15150	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1
Adjusting element	ENU-0.1-40	ENU-0.25-40	ENU-0.5-40	ENU-1.0-40	ENU-1.5-40	ENU-2.0-40

VZ-200

Parameter	VZ-200-0.1	VZ-200-0.25	VZ-200-0.5	VZ-200-1.0	VZ-200-1.5	VZ-200-2.0
Nominal continuous current, A	200	200	200	200	200	200
Voltage class of power transmission lines, kV	6–110	6–110	6–110	6–110	6–110	6–110
Nominal short-term short-circuit current for 1 s, kA	4.7	4.7	4.7	4.7	4.7	4.7
Shock short-circuit current, kA	12	12	12	12	12	12
Minimum active impedance, Ohm	650	650	650	650	650	650
Nominal reactor inductance, mH	0.1	0.25	0.50	1.00	1.50	2.00
Reactor inductance at 100 kHz, mH	0.11	0.26	0.52	1.04	1.52	2.05
Climatic version and placement category according to GOST 15150	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1
Adjusting element	ENU-0.1-40	ENU-0.25-40	ENU-0.5-40	ENU-1.0-40	ENU-1.5-40	ENU-2.0-40

VZ-400

Parameter	VZ-400-0.1	VZ-400-0.25	VZ-400-0.5	VZ-400-1.0	VZ-400-1.5	VZ-400-2.0
Nominal continuous current, A	400	400	400	400	400	400
Voltage class of power transmission lines, kV	10–110	10–110	10–110	10–110	10–110	10–110
Nominal short-term short-circuit current for 1 s, kA	10	10	10	10	10	10
Shock short-circuit current, kA	25.5	25.5	25.5	25.5	25.5	25.5
Minimum active impedance, Ohm	650	650	650	650	650	650
Nominal reactor inductance, mH	0.10	0.25	0.50	1.00	1.50	2.00
Reactor inductance at frequency 100 kHz, mH	0.1	0.254	0.51	1.08	1.52	2.05
Climatic version and placement category according to GOST 15150	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1
Adjusting element	ENU-0.1-40	ENU-0.25-40	ENU-0.5-40	ENU-1.0-40	ENU-1.5-40	ENU-2.0-40

VZ-630

Parameter	VZ-630-0.1	VZ-630-0.25	VZ-630-0.5	VZ-630-1.0	VZ-630-1.5	VZ-630-2.0
Nominal continuous current, A	630	630	630	630	630	630
Voltage class of power transmission lines, kV	35–220	35–220	35–220	35–220	35–220	35–220
Nominal short-term short-circuit current for 1 s, kA	16	16	16	16	16	16
Shock short-circuit current, kA	41	41	41	41	41	41
Minimum active impedance, Ohm	650	650	650	650	650	650
Nominal reactor inductance, mH	0.10	0.25	0.50	1.00	1.50	2.00
Reactor inductance at 100 kHz, mH	0.11	0.252	0.53	1.02	1.51	2.02
Climatic version and placement category according to GOST 15150	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1
Adjusting element	ENU-0.1-40	ENU-0.25-40	ENU-0.5-40	ENU-1.0-40	ENU-1.5-40	ENU-2.0-40

VZ-1250

Parameter	VZ-1250-0.1	VZ-1250-0.25	VZ-1250-0.5	VZ-1250-1.0	VZ-1250-1.5	VZ-1250-2.0
Nominal continuous current, A	1250	1250	1250	1250	1250	1250
Voltage class of power transmission lines, kV	110–330	110–330	110–330	110–330	110–330	110–330
Nominal short-term short-circuit current for 1 s, kA	31.5	31.5	31.5	31.5	31.5	31.5
Shock short-circuit current, kA	80	80	80	80	80	80
Minimum active impedance, Ohm	470	470	470	470	470	470
Nominal reactor inductance, mH	0.10	0.25	0.50	1.00	1.50	2.00
Reactor inductance at 100 kHz, mH	0.11	0.26	0.512	1.04	1.53	2.06
Climatic version and placement category according to GOST 15150	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1
Adjusting element	ENU-0.1-40	ENU-0.25-40	ENU-0.5-40	ENU-1.0-40	ENU-1.5-40	ENU-2.0-40

VZ-2000

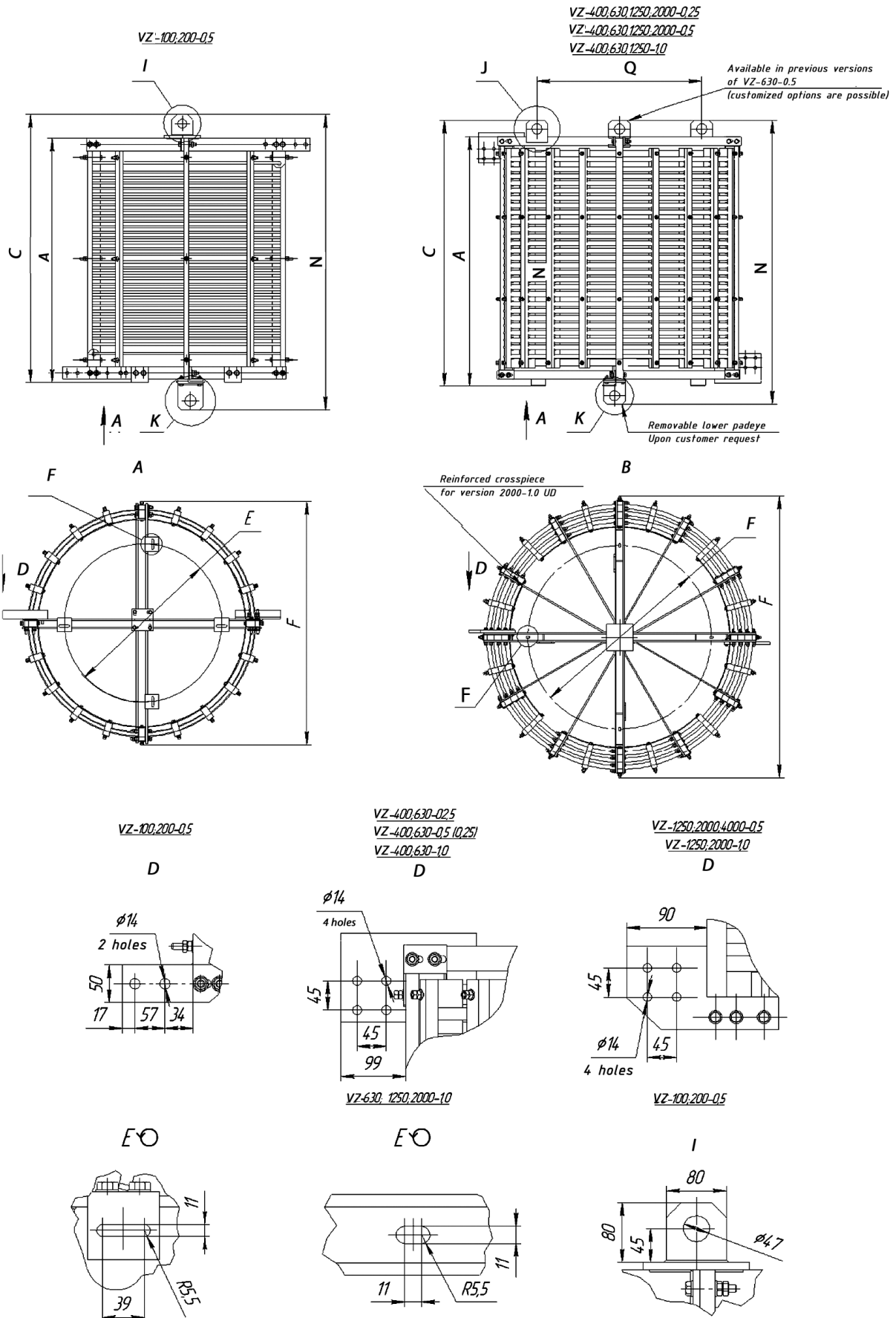
Parameter	VZ-2000-0.1	VZ-2000-0.25	VZ-2000-0.5	VZ-2000-1.0	VZ-2000-1.5	VZ-2000-2.0
Nominal continuous current, A	2000	2000	2000	2000	2000	2000
Voltage class of power transmission lines, kV	330–750	330–750	330–750	330–750	330–750	330–750
Nominal short-term short-circuit current for 1 s, kA	40	40	40	40	40	40
Shock short-circuit current, kA	102	102	102	102	102	102
Minimum active impedance, Ohm	440	440	440	440	440	440
Nominal reactor inductance, mH	0.10	0.25	0.50	1.00	1.50	2.00
Reactor inductance at 100 kHz, mH	0.11	0.260	0.497	0.97	1.51	2.02
Climatic version and placement category according to GOST 15150	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1
Adjusting element	ENU-0.1-40	ENU-0.25-40	ENU-0.5-40	ENU-1.0-40	ENU-1.5-40	ENU-2.0-40

VZ-4000

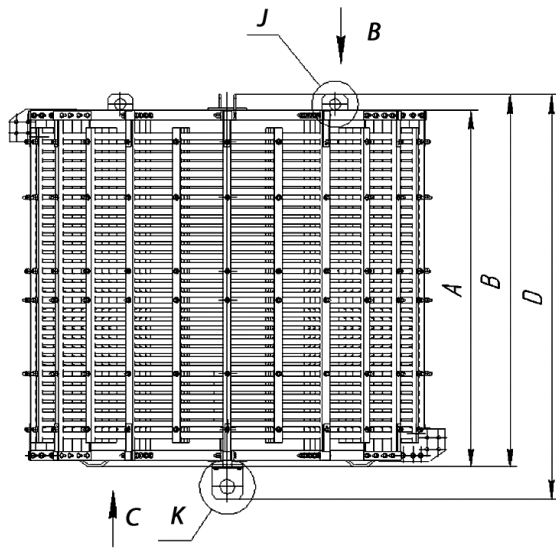
Parameter	VZ-4000-0.1	VZ-4000-0.25	VZ-4000-0.5	VZ-4000-1.0	VZ-4000-1.5	VZ-4000-2.0
Nominal continuous current, A	4000	4000	4000	4000	4000	4000
Voltage class of power transmission lines, kV	500–750	500–750	500–750	500–750	500–750	500–750
Nominal short-term short-circuit current for 1 s, kA	63	63	63	63	63	63
Shock short-circuit current, kA	161	161	161	161	161	161
Minimum active impedance, Ohm	440	440	440	440	440	440
Nominal reactor inductance, mH	0.10	0.25	0.50	1.00	1.50	2.00
Reactor inductance at 100 kHz, mH	0.11	0.26	0.51	1.03	1.52	2.04
Climatic version and placement category according to GOST 15150	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1	U, HL, T1
Adjusting element	ENU-0.1-40	ENU-0.25-40	ENU-0.5-40	ENU-1.0-40	ENU-1.5-40	ENU-2.0-40

APPENDIX B

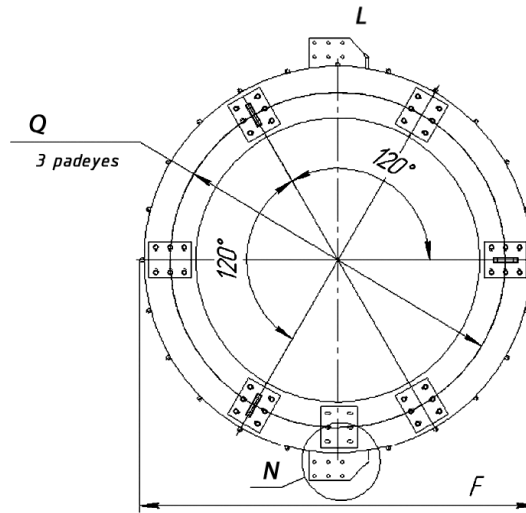
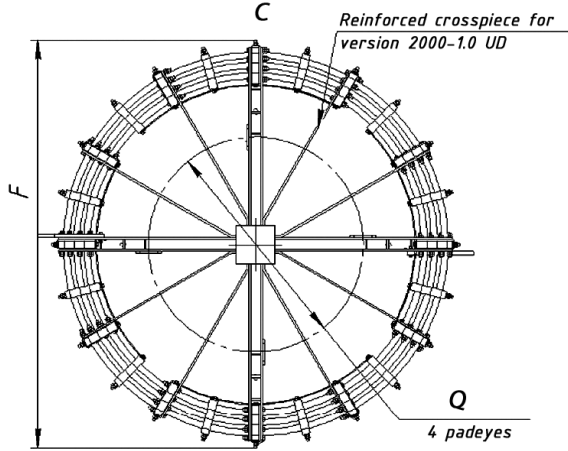
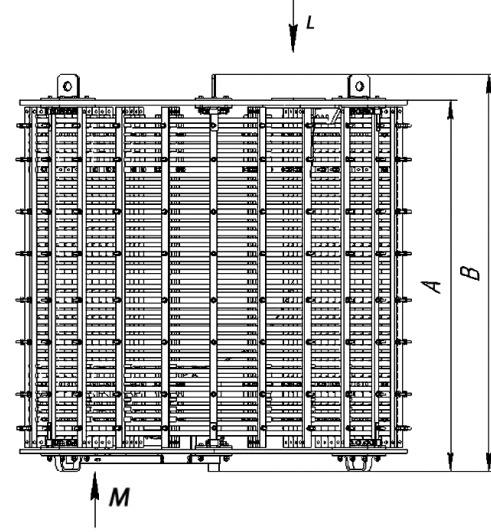
Dimensions and weight of high-frequency traps



VZ-2000-10

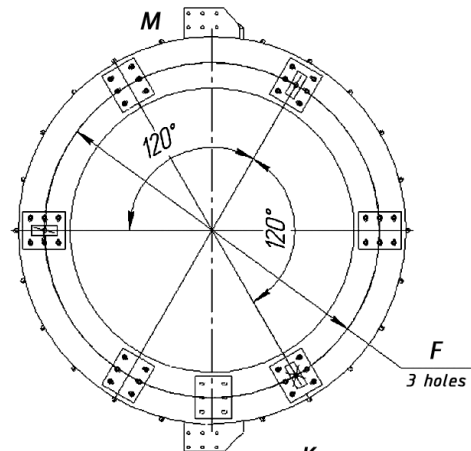
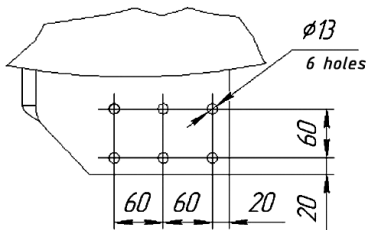


VZ-4000-10



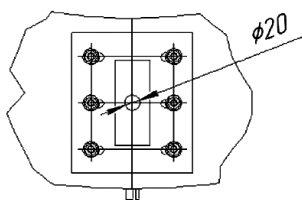
VZ-4000-10

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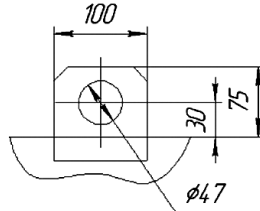


VZ-4000-10

E0



J



K

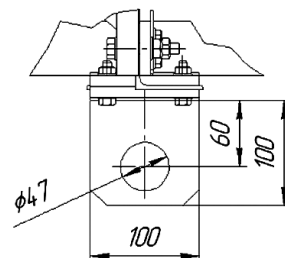


Table 5. Dimensions and weight of high-frequency traps

VZ type	A, mm	B, mm	C, mm	D, mm	E, mm	F, mm	Weight, kg
VZ-100-0.5	942	1032	-	1139	359	819	44
VZ-200-0.5							62
VZ-400-0.25	991	1066	545	1157	390	935	106
VZ-630-0.25							116
VZ-630-0.25UD							138
VZ-400-0.5	1103	1210	750	1210	733	1123	130
VZ-630-0.5							144
VZ-630-0.5UD							168
VZ-630-0.1	600	745	-	820	470	830	60
VZ-400-1.0	1420	1490	835	1566	900	1406	231
VZ-630-1.0							265
VZ-1250-0.25	1000	1080	600	1170	389	1023	201
VZ-1250-0.25UD							235
VZ-1250-0.5	1102	1218	750	1300	774	1189	280
VZ-1250-0.5UD							315
VZ-1250-1.0	1406	1490	920	1576	930	1509	465
VZ-2000-0.25	1000	1065	550	1159	386	1117	335
VZ-2000-0.5	1363	1435	750	1523	782	1242	470
VZ-4000-0.5							1100
VZ-4000-1.0	1506	1692	1428	1782	1428	1684	2400
VZ-2000-1.0	1398	1458	840	1486	1040	1596	652
VZ-2000-1.0UD							710

Dimensional drawings of high-frequency traps in package

VZ-100;200-0,5

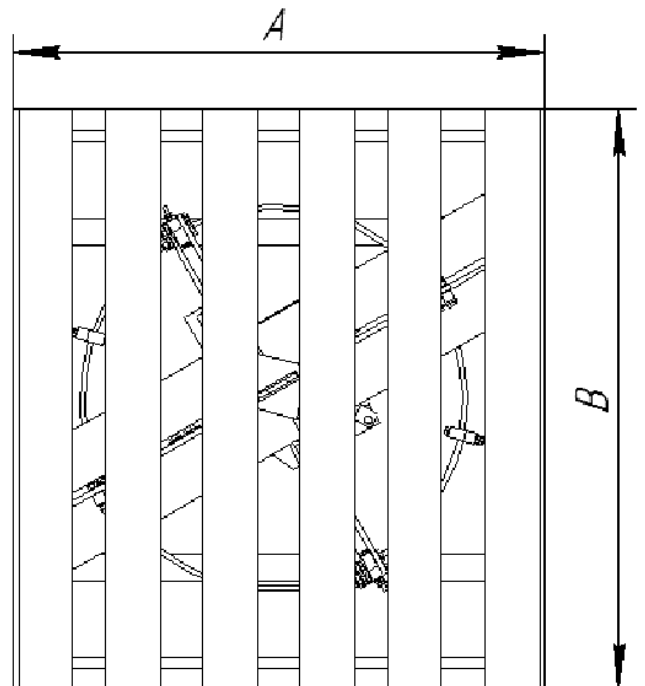
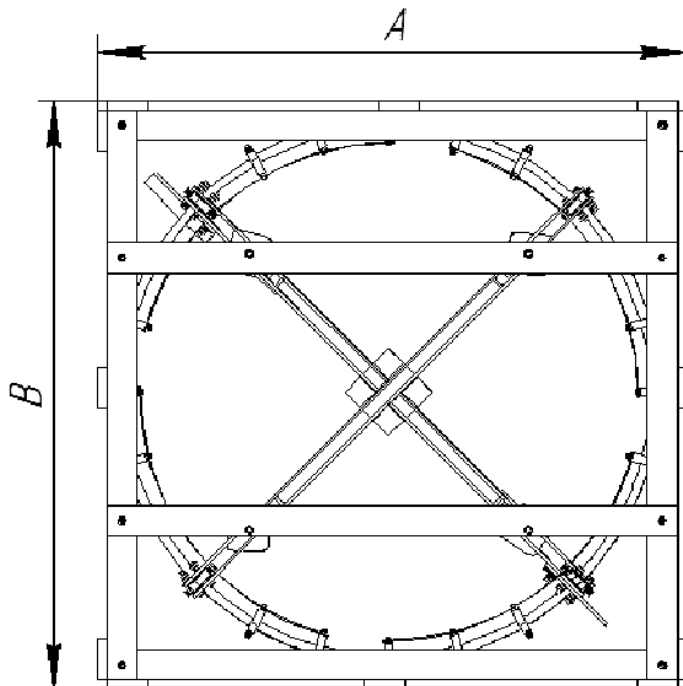
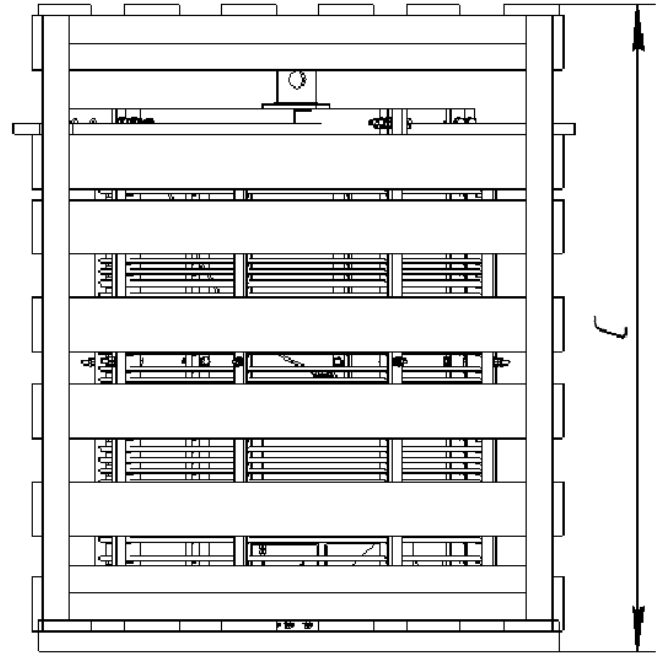
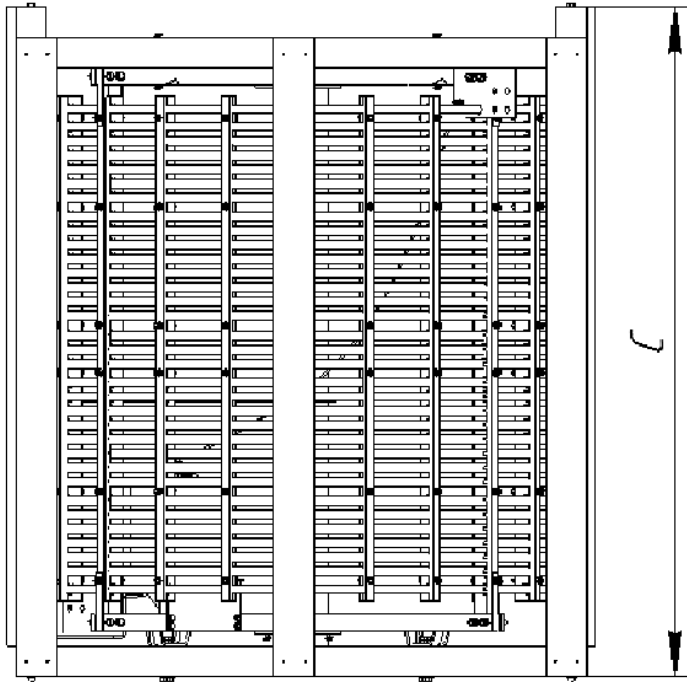
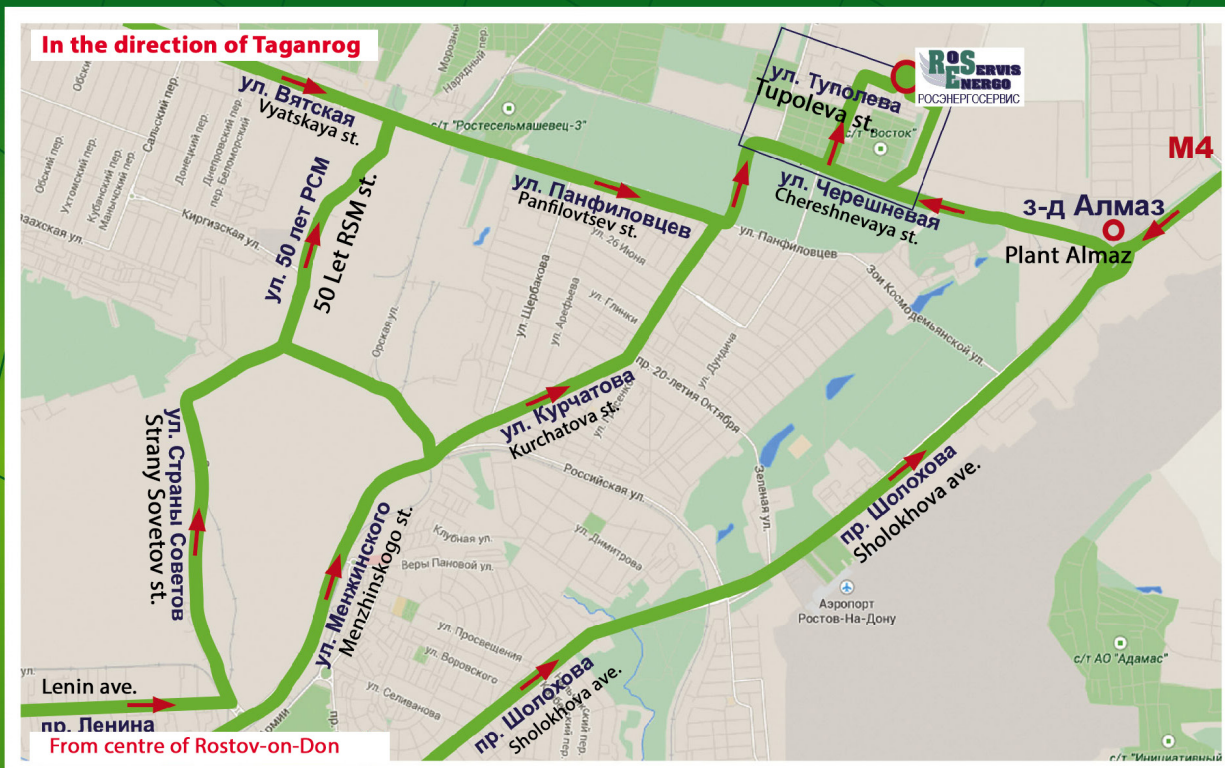


Table 6. Dimensions and weight of high-frequency traps in package

VZ type	A, mm	B, mm	C, mm	Weight, kg
VZ-100-0.5	1195	960	1070	96
VZ-200-0.5				114
VZ-400-0.25	1140	1140	1230	161
VZ-630-0.25				171
VZ-630-0.25UD				193
VZ-400-0.5	1194	1194	1376	189
VZ-630-0.5				203
VZ-630-0.5UD				227
VZ-400-1.0	1440	1440	1660	302
VZ-630-1.0				336
VZ-1250-0.25	1194	1194	1244	259
VZ-1250-0.25UD				293
VZ-1250-0.5	1260	1260	1370	340
VZ-1250-0.5UD				375
VZ-1250-1.0	1695	1695	1650	545
VZ-2000-0.25	1260	1260	1245	396
VZ-2000-0.5	1440	1440	1600	541
VZ-4000-0.5				1171
VZ-4000-1.0	-	-	-	Without package
VZ-2000-1.0	1744	1744	1640	733
VZ-2000-1.0UD				791



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