



Power Line Carrier Devices

Catalog 2018

KEY FACTS

- “Electronic Information Systems” (EIS) was founded in 1992
- More than 100 highly qualified employees
- The quality management system is certified according to ISO 9001:2008
- There are five modern production departments with the area of 3000 sq.m. and ten divisions at our company including design bureau and IT department. Additionally, the company rents an area of 1000 sq m (mounting-assembly production and testing laboratory).

DIRECTIONS:

One of the key EIS' working directions is development and manufacture of **the PLC equipment** (line traps, tuning devices for line traps, coupling and decoupling devices), intended to transmit the telemetry signals through PLC lines. The company plays an important role in the Russian market of PLC equipment, manufacturing 60 different customized line traps, being the only Russian manufacturer of the tuning devices of new generation.

Moreover EIS develops **SCADA and Data Acquisition Systems** to monitor and control the technological processes in the following industries: power, oil and gas, chemicals, petrochemicals and metallurgy.

The company designs and **manufactures a wide spectrum of devices** for the monitoring and regulation of electric and non-electric values (temperature, pressure, flow rate etc), rating transducers, supply units, flame monitoring devices, and temperature sensors.

HISTORY (PLC DIRECTION):

1998 – EIS began to develop **PLC direction** with manufacture of the line traps.

2005 – **Coupling devices FP** were first produced at EIS. Absolutely new modern technologies and solutions were used in development of the coupling devices. The coupling devices could be used in PLC network either with typical coupling capacitor or with customized coupling capacitor or phase transformer.

2009 Automatic long-distance communication equipment for energy systems ADASE-BK was first produced. New modern hardware and software solutions were used in development of the device. It is used to provide the full reservation (including power reservation) of the telephone channels.

2010 EIS began to produce **the terminal boxes ShON**.

In 2013-2014 we developed and implemented the systems for remote monitoring and control of the objects such as water pump stations, the stations for cathodic protection of the pipelines using the transmission lines (6-10 kV).

Since 2014 the Filter ShON has been manufactured. The new product performs the functions of the filter as well as the voltage arrester equipment.

OUR ADVANTAGES

EIS specializes in providing turn-key automation and monitoring solutions. The areas of focus include: automation and control solutions for the oil and gas industry and control solutions utilizing the transmission of data over high voltage power lines:

exploratory design;
research and design work;
environmental survey;
engineering;
manufacture and delivery;
assembly and commissioning;
after-sale service;
overhaul.

CUSTOMER BENEFITS:

The new patented constructive-technological solutions are used while developing the equipment.

We are constantly working to modify the existing equipment and to develop the new types.

The complex systems are built thanks to our successful development and joint work with our partners.

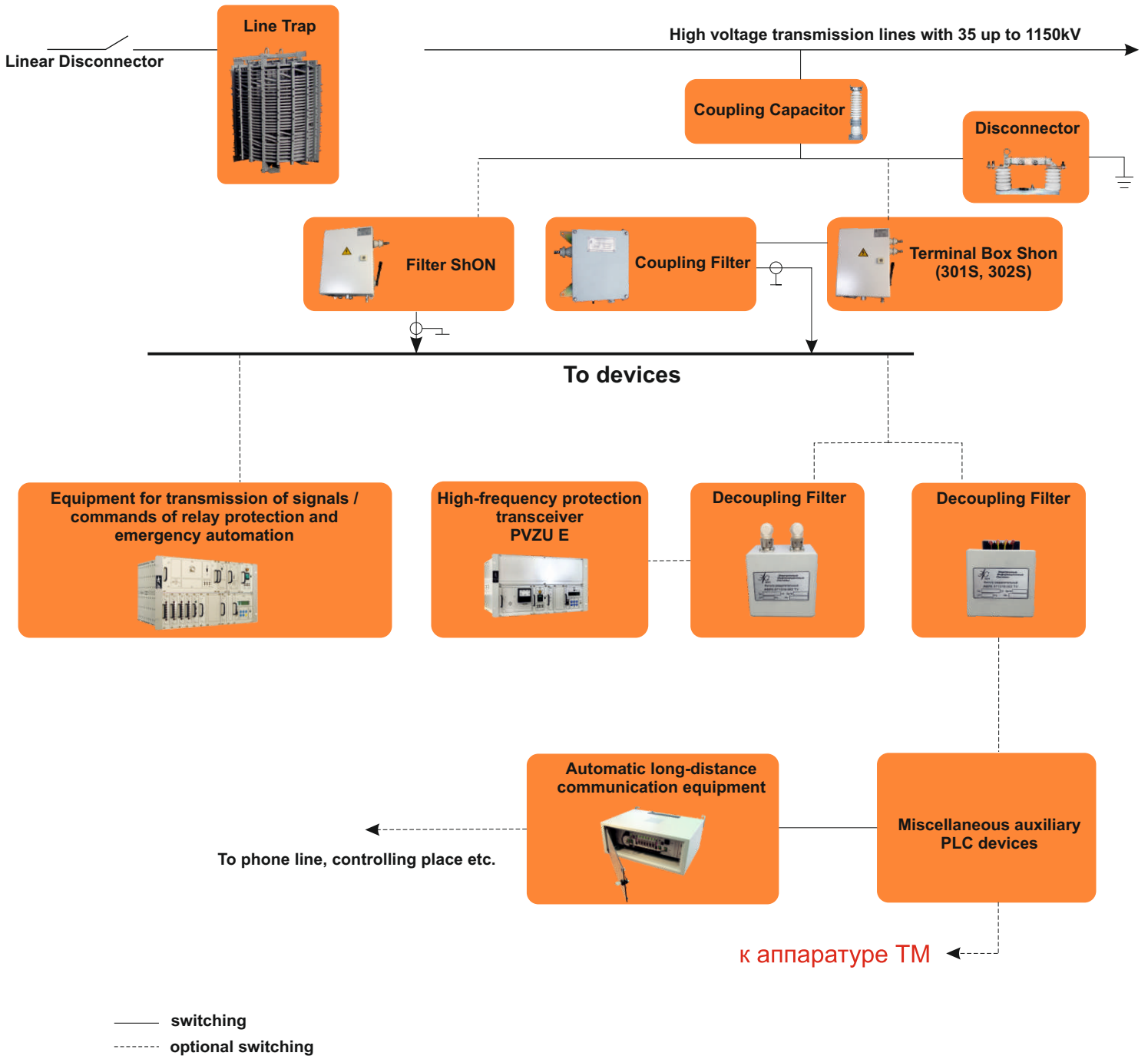
Packaged supply of PLC equipment is the important area of our activity. We have more than a 25 year history of delivering fully integrated projects for our clients.

Our PLC equipment has the best ratio of price and quality in Russia.

Our engineering and technology solutions are well proven, meet the European quality standards and certified according to GOST-R (voluntary Russian state certification) and to the standards of PJSC Rosseti, the Russian energy operator.

We have a broad portfolio of customizable solutions, which includes the Russian largest companies such as PJSC Gazprom, PJSC “Rosseti”, **PJSC “RusHydro”, JSC “Concern Rosenergoatom”**

PLC Diagram (example)



LINE TRAPS SERIES VZ

Purpose

The line traps are used to attenuate the switching effects of high-voltage lines and equipment as well as to prevent signal losses (signals for remote control, voice communication, remote metering) transmitted along high-voltage lines (6-1150kV).

The line traps are filter-barriers, mounted in-line on phase conductors and could be configured for certain attenuation band range (16-1000 kHz).

Line traps can also be used to ground the cables in case PLC channels use stand-alone lightning protection cables.

Line traps characteristics

Main parameters of the line traps are as follows:

- class of transmission lines;
- frequency bandwidth;
- continuous rated current;
- rated short-time current;
- emergency overload current;
- blocking impedance;
- main coil inductance.

IEC 60353 and STO 56947007 (Russian Standard) have set the following values for transmission lines resistance, blocking impedance, continuous rated current.

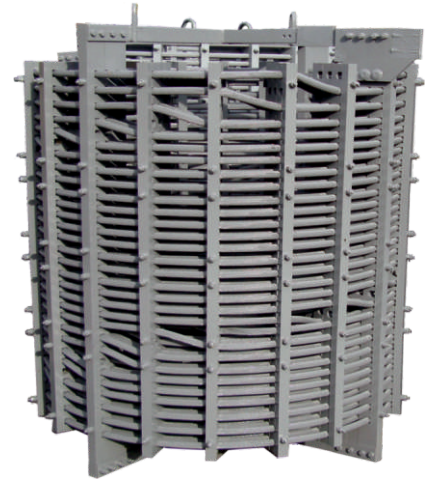


Table 1

Transmission lines' rated voltage, kV	Transmission lines' resistance, Ohm	Continuous rated current of line traps (recommended IEC, STO), A
	Line trap blocking impedance, not less than, Ohm	
	Phase-to-Earth	
35	450\635	100 200 400 630
110	450\635	400 630 800 1000 1250
220	450\635	1000 1250 1600
330	330\465	1600 2000 2500
500	310\437	2000 2500 3150
750	280\395	2000 2500 3150 4000

IEC and STO recommend the following values of the main coil inductance (mH)

0,2 - 0,25 - 0,315 - 0,4 - 0,5 - 1,0 - 2,0

IEC and STO recommend the following values for the short-time current and emergency overload current

Table 2

Rated continuous current of the line trap	Rated continuous current, kA r.m.s.		Emergency overload current, kA (peak value)	
	Series 1	Series 2	Series 1	Series 2
100	2,5	5	6,38	12,75
200	5	10	12,75	25,5
400	10	16	25,5	40,8
630	16	20	40,8	51
800	20	25	51	63,75
1000	25	31,5	63,75	80,33
1250	31,5	40	80,33	102
1600	40	50	102	127,5
2000	40	50	102	127,5
2500	40	50	102	127,5
3150	40	50	102	127,5
4000	63	80	160,65	204

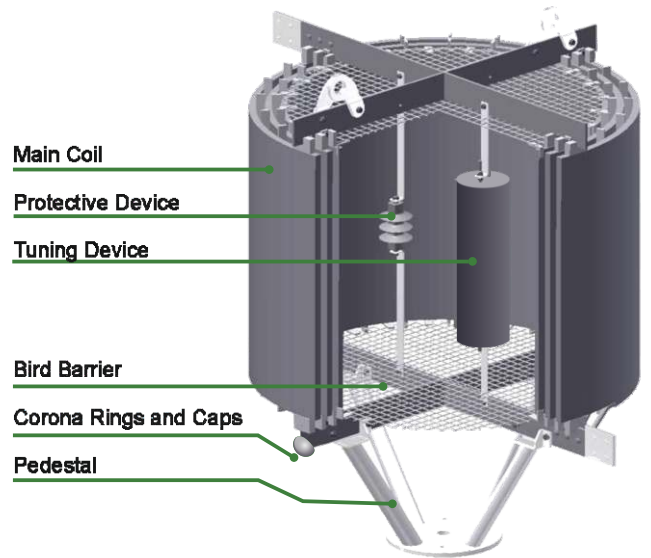
Construction

Main components:

- Main Coil is used to carry rated continuous power frequency currents of transmission lines with the line trap.
- Protective Device is used to protect the main coil and tuning device from over voltages occurring on lines and distribution devices of substations (atmospheric and switching over voltages, from short circuits);
- Tuning Device (together with the main coil) is used to adjust the blocking frequency or bandwidth i.e. the frequency range over which the line trap can provide a certain specified minimum blocking impedance or resistance.
- Sometimes the line traps are supplied without the tuning devices depending upon the special requirements.

Accessories:

- Bird Barrier;
- Corona Rings and Corona Caps;
- Pedestal for vertical mounting.



Main Coil

The main coil (single-layer or multi-layer) is an inductor coil, its winding (typically aluminum or copper) is placed on the frame (rack-based, cylindrical, etc.) from the well-proved insulating material. The main coil has high mechanical strength withstanding the short circuit currents (maximum values are indicated in Table 2), working reliably during the long-term life cycle (up to 30 and more years) under harsh weather conditions.

The reactor coil is made from good insulating and high mechanical strength material.

Being an outdoor equipment the line trap should be designed to withstand the climatic and other environmental conditions (temperature, humidity, salt fog, ice, solar radiation, air pollution etc.)

The frame of the coil is made of composite materials.

The main coil the special surface (usually multi-layer) protecting from bypassing happened due to the ice coating, active (particularly contaminated) atmospheric precipitation, metal items accidentally fell on the coil conducting surface .



TUNING DEVICE

Tuning Device is used to adjust together with the main coil the necessary blocking frequency or bandwidth. The tuning device, depending on the desired frequency bandwidth could be either damped single frequency, double frequency or wide band tuned.

The manufacturer calculates and sets the frequency range individually for each customer .

According to the customer's specifications the tuning device can be made for any frequency range, with an accuracy of 0.5 kHz in frequency range from 16 to 1000 kHz.

Due to the unique scheme, design, types of materials, components and technologies of the tuning device the line trap could withstand the overvoltage caused by:

- the nominal short-term current see item 19.3.2 IEC 60353;
- atmospheric impacts (lightning) see item 19.3.1 IEC 60353;
- other effects see items C 4.3 and C 5.2 IEC 60353.

The warranty period for the tuning devices is 5 years.

Lifespan is 20 years.

The main technical characteristics of the tuning device are shown in Table 4.

"Electronic Information Systems" is ready to produce the customizable tuning devices (their specifications are available upon request):

- to ensure the blocking frequency for two, three or more bands;

**universal, for the line traps of different classes and manufacturers;
tunable, with possibility to change the blocking frequency range;
universal and tunable, combined product;**

- for all kinds of the line traps utilized in Russia at the moment.

Protective Device

As a protective device we use the non-linear surge arresters.

Non-linear polymer housed surge arresters are designed to protect the tuning device against atmospheric (lightning) and switching over voltages.

Hermetically-sealed polymer housed varistors are the main elements of the surge arresters.

Its operation is based on a highly nonlinear current-voltage characteristic of the varistors.

The varistors have an electrical resistance that varies with the applied voltage: at operating voltage the active currents flowing through the varistors do not exceed 1 mA, while at overvoltage they could reach hundreds or thousands of amperes.

Operating Conditions

The line traps could operate under the following conditions:

- Climatic conditions for long stable operation "U" (moderate) and "UHL" (moderate cold) climatic versions according to GOST 15150-69, GOST 15543-70; type of atmosphere N according to GOST 15150-69; atmospheric type II according to GOST 15150-69;
- altitude up to 2000 m above sea-level;
- seismic resistance according MSK-64 macroseismic intensity scale is up to the 9th degree

Customer Benefits

Many types of the line traps are produced (about 60) which have:

- different rated current;
- various inductance;
- different rated short-time current values.

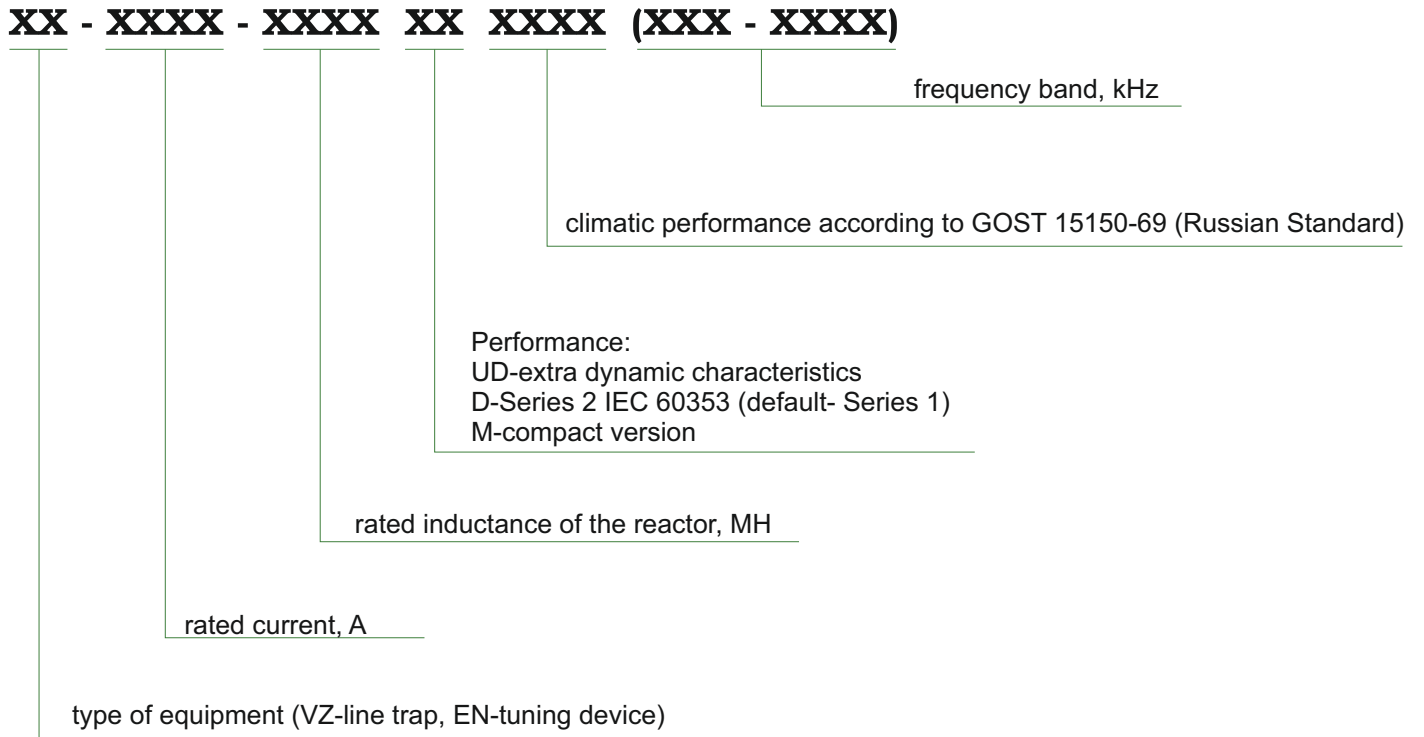
Relatively small dimensions and light weight give:

- great opportunities to install the line traps directly on the coupling capacitors and switchgears;
- advantages during overhaul and repair when the old line traps could be replaced by the new ones without changing the whole PLC system.

Line traps with non-standard frequency band

- including the range from 16 to 24 kHz;
- two-, three- and multi-frequency bandwidth;
- Bandwidth Ranges $R_a > 1000 \text{ Ohm}$.

Rating plate of the line trap, tuning device



Examples for ordering

VZ-2000-0.1 D UH11 (470-1000)

EN-630-0.5 UD UH11 (160-00)

Table 3 Specification of the line traps

No.	Line trap classification	Dimensions of the main coil		Weight of the line trap incl. the tuning device and surge arrester, not more than, kg	Class of transmission lines	Rated short-time current, kA (r.m.s.)	Short-time current, kA (peak value)			
		Height, mm	Diameter, mm							
1	VZ-100-0,1 UHL1	474	316	13	6-35	2,5	6,5			
2	VZ-100-0,25 UHL1	618		17						
3	VZ-100-0,5 UHL1	824		25						
4	VZ-100-1,0 UHL1	853	500	40						
5	VZ-100-1,5 UHL1	1006		54						
6	VZ-100-2,0 UHL1	1186		97						
7	VZ-200-0,1 UHL1	474	316	18	6-110	5	12,7			
8	VZ-200-0,25 UHL1	618		25						
9	VZ-200-0,5 UHL1	824		40						
10	VZ-200-1,0 UHL1	853	500	70						
11	VZ-200-1,5 UHL1	1006		98						
12	VZ-200-2,0 UHL1	1436	1060	200						
13	VZ-200-2,5 UHL1	1436		250						
14	VZ-400-0,1 UHL1	690	500	33				10-110	10	25,5
15	VZ-400-0,25 UHL1	1001		60						
16	VZ-400-0,5 UHL1	1650		98						
17	VZ-400-1,0 UHL1	2100		210						
18	VZ-630-0,05 UHL1	859	510	50				35-220	16	40
19	VZ-630-0,1 UHL1	480	1060	65						
20	VZ-630-0,25 UHL1	1000		110						
21	VZ-630-0,5 UHL1	1456		167						
22	VZ-630-0,5 D UHL1	1456		178						
23	VZ-630-1,0 M UHL1*	763		170						
24	VZ-630-1,0 UHL1	1640	1390	268	16	40				
25	VZ-630-1,5 UHL1	1070	1060	206						
26	VZ-630-2,0 UHL1	1436	1060	280	35-220	16	40			
27	VZ-630-0,1 UD UHL1	580	980	88						
28	VZ-630-0,25 UD UHL1	847		169						
29	VZ-630-0,5 UD UHL1	1178	980	202	35-220	40	102			
30	VZ-630-0,5 M UHL1	721	1060	221						

* ВЗ используется для заграждения в диапазоне 16-600 кГц

Table 3. Part 2

No.	Line trap classification	Dimensions of the main coil		Weight of the line trap incl. the tuning device and surge arrester, not more than, kg	Class of transmission lines	Rated short-time current, kA (r.m.s.)	Short-time current, kA (peak value)		
		Height, mm	Diameter, mm						
31	VZ-1250-0,1 UHL1	1045	950	167	110-330	31,5	80		
32	VZ-1250-0,25 UHL1	1326	1070	224					
33	VZ-1250-0,5 UHL1	1465	1205	306					
34	VZ-1250-0,25 D UHL1	1326	1070	280		110-330	40	102	
35	VZ-1250-0,5 D UHL1	1608	1205	340					
36	VZ-1250-1,0 UHL1	1718	1540	363			31,5	80	
37	VZ-1250-1,0 M UHL1	1000	1195	313					
38	VZ-1250-1,0 D UHL1	1718	1540	610					
39	VZ-1250-1,5 UHL1	2300	1205	538			110-330	40	102
40	VZ-1250-2,0 UHL1	1680	1415	775					
41	VZ-1600-0,5 UHL1	1608	1205	424	110-330	40	102		
42	VZ-1600-0,5 D UHL1	1660	1540	629		50	128		
43	VZ-2000-0,1 UHL1	1056	1060	260	330-750	50	128		
44	VZ-2000-0,25 UHL1	920	1205	347		40	102		
45	VZ-2000-0,5 UHL1	1608		424					
46	VZ-2000-0,5 UHL1	1660	1540	629		50	128		
47	VZ-2000-1,0 UHL1	1718		610		40	102		
48	VZ-2000-1,0 D UHL1	2060	1770	720		50	128		
49	VZ-2000-1,5 UHL1	1738	1850	720		40	102		
50	VZ-2000-2,0 UHL1	3400	1540	1220					
51	VZ-2500-0,5 UHL1	1660	1540	863	330-750	40	102		
52	VZ-2500-1,0 UHL1	2060	1596	900		40	102		
53	VZ-3150-0,1 UHL1	1065	1200	360		40	102		
54	VZ-3150-0,5 UHL1	1660	1540	863		50	128		
55	VZ-3150-1,0 UHL1	2060	1770	1483		40	102		
56	VZ-3150-2,0 UHL1	4100		2966		40	102		
57	VZ-4000-0,1 UHL1		1540	360	500-750	63	161		
58	VZ-4000-0,5 UHL1	1660		863					
59	VZ-4000-1,0 UHL1	2060	1770	1483					
60	VZ-4000-2,0 UHL1	4100		2966					

ЗАО «НПП «ЭИС» изготавливает, в том числе, высокочастотные заградители, характеристики которых не приведены в таблице 3, на номинальные токи от 3 до 4000 А, с индуктивностью реактора от 0,1 до 2,5 мГн и кратковременным номинальным током (1 сек.) от 0,01 до 80 кА.

Table 4 Main technical characteristics of the tuning device

Types of the main coils	B3-100	B3-200	B3-400	B3-600	B3-630	B3-1000	B3-1250	B3-2000	B3-2500	B3-3150	B3-4000
Inductance of the main coil, MH	0,1-2,0	0,1-2,0	0,1-2,0	0,25	0,1-2,0	0,6	0,1-2,0	0,1-2,0 1,2	0,5;1,0	0,5;1,0;2,0	0,1;0,5;1,0;2,0
Blocking impedance Ohm, not less than	650	650	650	650	650	650/470	650/470	470	470	470	470
Bandwith Ranges	Bandwith ranges can be selected in accordance with Appendices 1.1- 1.13 and/or calculated using the equations given in Appendix 1.1										

We can also manufacture tailor-made tuning devices based on the customer's specifications

UNIVERSAL PEDESTAL

Purpose

The universal pedestal is intended for vertical mounting of the line traps with rated current from 630 to 4000 A

The pedestals are installed:

on any kind of the bearing construction;

on the insulated coupling capacitor for line traps connected to 35 and 110 kV transmission lines ;

on the 220 kV coupling capacitor column, consisting of two coupling capacitors and the insulating support, in case the line traps are connected to 220 kV transmission line;

on all existing types of bus-bar supports, consisting of one or more supporting insulators;

on other supporting constructions upon customer's request.



Marking

Universal pedestal (PVZ)-XXXX UHL1 (moderate cold climatic modification), where:

XXXX-nominal current frequency of the line trap, for which the pedestal is mounted.

Overall dimensions are shown in Figure. 3.4.

COUPLING FILTER FP

Purpose

MAIN FUNCTIONS:

- tuning, designed to compensate for the reactive component of the coupling capacitor(s) impedance
- galvanic isolation between high voltage overhead lines and input circuits of communication equipment;
- impedance matching between the power line and the carrier frequency connection;
- earthing the coupling capacitor bottom plate.

In combination with the coupling capacitor, the coupling device makes up a transformer (autotransformer) bandpass filter. The filter can be supplied in different configurations, each designed to operate within a specific frequency band and in conjunction with a specific coupling capacitor.

The difference between our coupling filter and the devices of other manufacturers is that it employs new protective devices in its input circuits. Protective devices such as transmission line arrester OPN (instead of the valve dischargers). on the line side and the varistor cable (instead of the gas discharger) on the HF side.

For application in a phase to phase circuit, design of the FP coupling device allows for 180 degree input (output) signal phase shift. You can do it by shifting connection of the terminals on the secondary winding of the transformer.

TECHNICAL SPECIFICATIONS:

The key electric parameters of the device are in accordance with IEC No. 60481, GOST 15150:

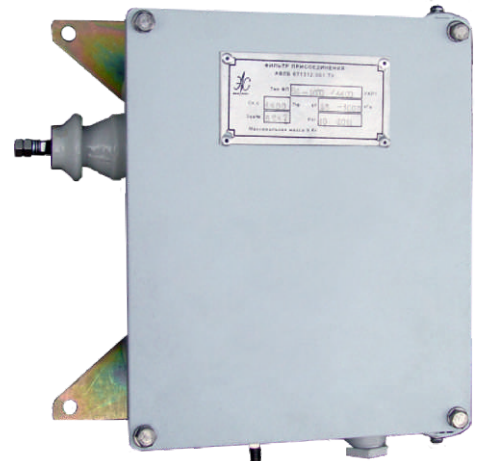
Composite loss within passband		Not more than 1.5 d
Return loss within passband		Not less than 12 dB
Nominal impedance PLC equipment-side	coaxial cable version (unbalanced)	75 Ω
	symmetrical cable version (balanced)	150 Ω
Impedance to utility frequency current transmission line side		4 Ω
Nominal peak power P.E.P.		Not more than 400 W
Non-linear distortion, intermodulation 2nd and 3rd order regarding to the acceptable HF signal power		Not more than minus 80 dB
Dimensions, mm		328x304x163

DESIGN

Elements of the filter are installed in a cast silumin enclosure under an aluminum cover with a rubber sealant held together by stainless steel connecting screws. There is a coaxial cable inlet hole and a ventilation device on the bottom panel of the enclosure.

Application

FP coupling device is designed for connection of PLC relay protection equipment, emergency control automatics and telephone communication devices to 6.3 – 1150 kV overhead lines and lightning protection cables.



SEPARATING FILTERS



APPLICATION

Separating filters RF are designed to reduce the bypass action of apparatus on various HF channels operating via a common coupling filter.

Separating filters must be integrated:

- into the circuit of each channel where devices on dedicated HF protection channels or dedicated relay protection and emergency control automatics channels are connected in parallel;
- into the communication equipment circuit where devices on dedicated HF protection channels or dedicated relay protection and emergency control automatics channels are connected in parallel.

For application in HF channels with bypass of substations, where several channels are connected to one phase in parallel, we recommend to integrate a decoupling filter in the HF bypass. Such filter will pass signals at transit channel frequencies and block signals at the frequencies of the channels that terminate at the bypass.



TECHNICAL SPECIFICATIONS:

Rated values of the key technical parameters shown here apply under nominal climatic conditions as per GOST 1515069:

Temperature	+1o to +45o C, indoor
Relative humidity	45 to 80 %
Atmospheric pressure	84 to 107 kPa (630 to 800 mm Hg)
Maximum weight	Not more than 3,5 kg
Dimensions, mm	100 x 100 x 328 mm



The separating filter is rated for 250 VA high frequency current within the passband.

Attenuation produced by the separating filter when connected in parallel to the HF circuit under the load of 75 Ohm is 0.8 dB within the frequency band of ± 2 kHz in reference to the filter adjustment frequency.

Attenuation produced by the separating filter when connected in series to the HF circuit under the load of 75 Ohm is 0.8 dB at the frequencies at least 10% higher or lower than the filter adjustment frequency.

We can supply RF filters with other stop band and pass band parameters at the customer's individual request.

Output circuit insulation resistance in reference to the enclosure – 100 Mohm

Electric strength of insulating strength between the enclosure and the terminal is such as to withstand 1500 V AC (effective value) with the frequency of (50 ± 3) Hz within 1 minute.



DESIGN

Steel enclosure and steel cover. All units inside the filter are installed on the housing base. The cover is attached to the base with screws.

Designed and manufactured in accordance with requirements and recommendations of IEC 60481, GOST 15150-69.

COUPLING CAPACITOR



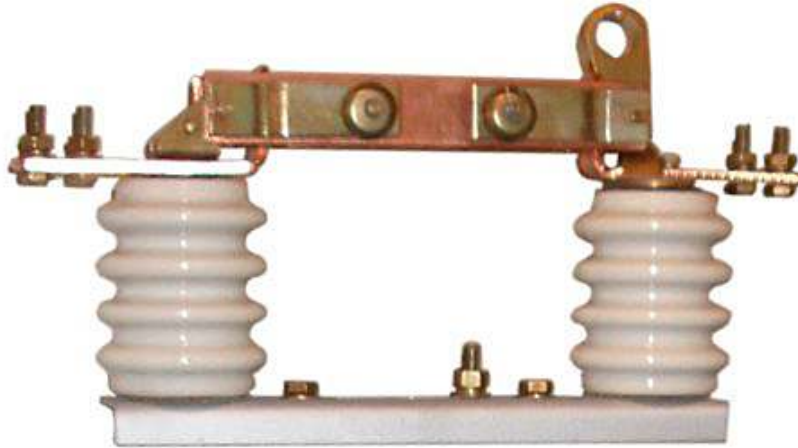
APPLICATION

Coupling capacitors provide high- frequency communication within the following range of frequencies 24 till 1500 kHz at 35, 110,150,220,330,500 kV AC transmission lines for frequency 50hz or 60 Hz.

The devices are usually used to connect PLC equipment directly to transmission lines 6 to 35 kV and overhead lightning cables.

Designation	Loss angle tangent	Dimensions, mm		Weight, kg	Нормативный документ		
		diameter	height				
СМ-66/√3-4,4 У1,ХЛ1,Т1*	3,0x10 ⁻³	280	890	68±7	ГОСТ 15581-80		
СМБ-66/√3-4,4У1*				83±8			
СМП-66/√3-4,4 У1*			1300	106±12			
СМПБ-66/√3-4,4 У1*				122±13			
СМВ-66/√3-4,4 У1,ХЛ1,Т1*			935	68±7			
СМБВ-66/√3-4,4 У1*				83±8			
СМПВ-66/√3-4,4 У1*			1345	106±12			
СМПБВ-66/√3-4,4 У1*				122±13			
СМ-110/√3-6,4 У1,Т1*		330	1170	140±14			
СМ-110/√3-6,4 ХЛ1*				1380		180±18	
СМВ-110/√3-6,4 У1,Т1*				1215		140±14	
СМВ-110/√3-6,4 ХЛ1*				1425		180±18	
СМБ-110/√3-6,4 У1,Т1*			1380				
СМБВ-110/√3-6,4 У1 ,Т1 *			1425	190±20			
СМП-110/√3-6,4 У1*			1580				
СМПВ-110/√3-6,4 У1*			1625	230±24			
СМПБ-110/√3-6,4 У1*			1790				
СМПБВ-110/√3-6,4 У1*			1835				
СМА-66/√3-4,4 УХЛ1*			2,5x10 ⁻³			240	917
СМАВ-66/√3-4,4УХЛ1*				950			
СМАП-66/√3-4,4 УХЛ1*	1353			56±5			
СМАПВ-66/√3-4,4 УХЛ1*	1386						
СМА-110/√3-6,4 УХЛ1*	313			1272	130±10		
СМАВ-110/√3-6,4УХЛ1*						1305	
СМАП-110/√3-6,4УХЛ1*		1705		172±10			
СМАПВ-110/√3-6,4 УХЛ1*					1738		
СМА-166/√3-14 УХЛ1*	485	1454		330±30			
СМА-133/√3-18,6 УХЛ1*					1486		
СМАВ-166/√3-14УХЛ1*		1454					
СМАВ-133/√3-18,6УХЛ1*					1486		
СМАБ-166/√3-14 УХЛ1*		1454					
СМАБВ-166/√3-14УХЛ1*			1486				
СМА-166/√3-18 УХЛ1*		1454					
СМАВ-166/√3-18 УХЛ1*			1486				
СМАБ-166/√3-18 УХЛ1*		1454					
СМАБВ-166/√3-18 УХЛ1*			1486				

INDOOR DISCONNECTORS TYPE RVZ, RVFZ, RVO, RVF



AC indoor single-pole disconnectors are used for 10kV.

Purpose

1. Indoor disconnectors are used:

- to close and open the electrical circuits in currentless state, and to modify the circuit diagram.
- to ensure safety of the staff on off-load areas;
- to enable and disable the charging currents of air and cable lines, idling current of the transformers and light load currents.

2. Disconnectors are manufactured for UHL 2 (moderate cold) climatic conditions for working at a height of up to 1000 m above sea level; in rooms where indoor temperature and humidity fluctuations do not differ much from outdoor values and have relatively free access of outside air, e.g. in tents, trailers, trailers, metal rooms without thermal insulation, as well as housed in the complete device or under a porch to avoid direct exposure and fall.

3. Technical Data

Disconnector Type	Voltage, kV		Rated current, A	Rated short-withstand current, kA		
	Rated	Peak		Current amplitude	Peak current	
					For main knives, 4s	For earthing knives, 1s
Disconnector RVO	10	12	400	41	16	-

4. Disconnector nameplate

Disconnector RVO-10/400 UHL2

R-disconnector

V-indoor use

O-single pole

10-rated voltage, kV

400-rated current, A

UHL - moderate cold climatic version as per GOST 15150,

2- mounting according to GOST 15150.

5. Overall and mounting dimensions of disconnectors and actuator are given in Figure 1.

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