



**IZOLYATOR**

Centuries-old traditions — state-of-the-art technologies

# AIR — OIL HIGH-VOLTAGE BUSHINGS FOR POWER TRANSFORMERS AND SHUNT REACTORS

«AIR — OIL»

Rated Voltage 10–1150 kV  
Alternating current 315–3500 A

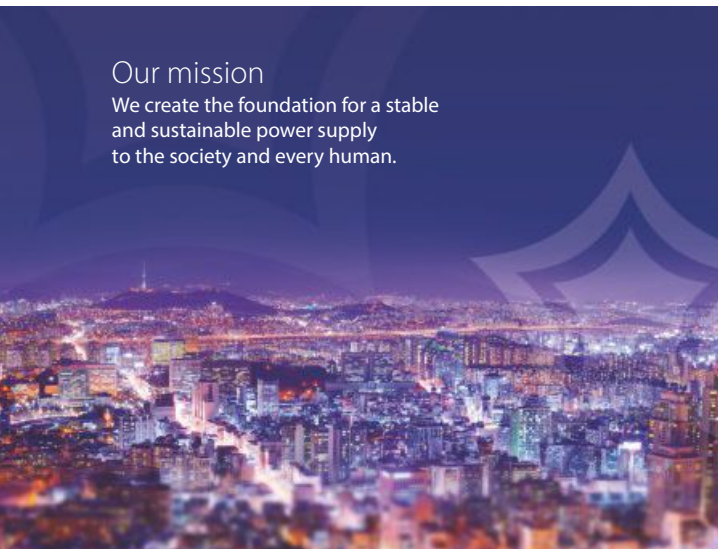
WE CREATE THE FOUNDATION  
FOR A SUSTAINABLE  
POWER SUPPLY



## MISSION. VISION. SOCIAL RESPONSIBILITY.

### Our mission

We create the foundation for a stable and sustainable power supply to the society and every human.



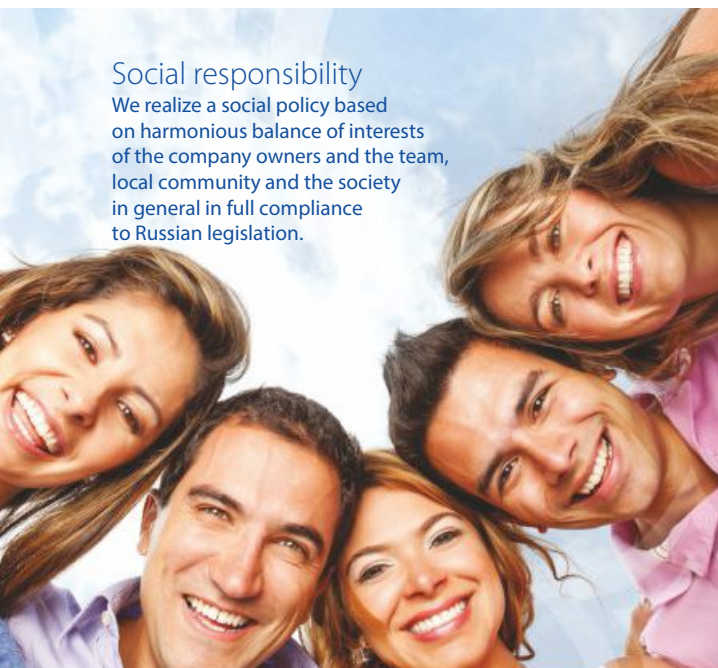
### Our Vision

We aim at being a global leader in development, manufacture and implementation of modern technologies in power industry.



### Social responsibility

We realize a social policy based on harmonious balance of interests of the company owners and the team, local community and the society in general in full compliance to Russian legislation.



The history of high-voltage bushings development in Russia is inseparably connected with Izolyator. In its more than a century-long history, the plant has produced more than 620 thnd HV bushings that are operating in the overwhelming majority of power facilities in Russia and the CIS countries as well as 30 more countries of the world.

All Izolyator achievements were only possible thanks to a well-coordinated work of our highly professional team and the all-round support of our partners. We will continue to make every effort in order to prove our clients' trust by timely fulfilling our obligations in high-voltage bushings production and technical support of our customers.

**"Century-long traditions, state-of-the-art technologies" — these words became a motto for those, who work at the plant, rightly believed a global leader in development and production of high-voltage bushings.**

A handwritten signature in blue ink, appearing to read 'Slavinsky'.

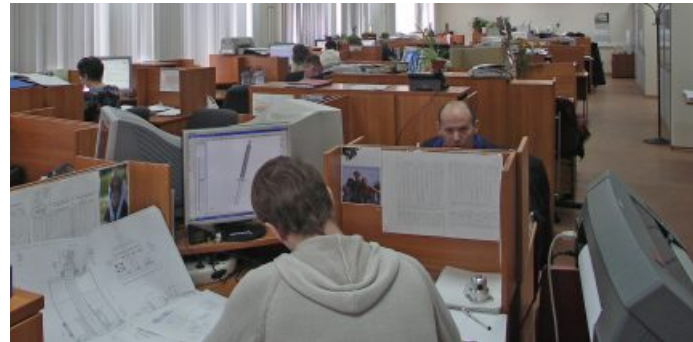
Alexander Slavinsky,  
Chairman of the Board of Directors  
Izolyator  
Vice-President AES RF,  
Vice-President TRAVEK Association,  
Russia's Representative at CIGRE SC D1  
Doctor of Technical Science



# COMPANY STRUCTURE

## Special design bureau

- creation of new designs of high-voltage bushings
- development of advanced production technologies
- research activities and development engineering
- serial items modernization



## Production

- the most advanced process equipment from the world's best OEMs
- patented technology of RIP insulation production
- patented technology of external polymer insulation production
- manufacture of internal insulation up to 12 m long and up to 750 mm diameter



## Test Center

- alternating current voltage testing up to 1200 kV
- direct current voltage testing up to +1600 kV
- 1.2/50 ms full and chopped lightning impulse testing
- 250/2500 ms switching impulse testing
- testing of insulating materials and prototypes



## SVN-Service Center

- highly qualified technical service
- complex diagnostics
- warranty and post-warranty service of bushings
- consulting engineering staff of customers



**COMPLETE  
RANGE OF  
SERVICES**



**Design  
Manufacture  
Testing warranty and  
Post warranty service**

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## Transformer and reactor bushings

Reliability and security of the processes of electric energy generation, transmission and distribution to the end consumer depends upon quality of special power equipment, such as high-voltage bushings.

Being a component of power transformers and shunt reactors, the bushings are the most important connecting element in power plant — power line — transformer substation loop.

Hence, operability of the entire power system and the stable supply to consumers with quality electric energy depend on the reliable performance of bushings of the type.

From the design point of view, bushings are pass-through insulators intended for high voltage lead-out (lead-in) from the transformer or reactor tank and are separate pieces of equipment.

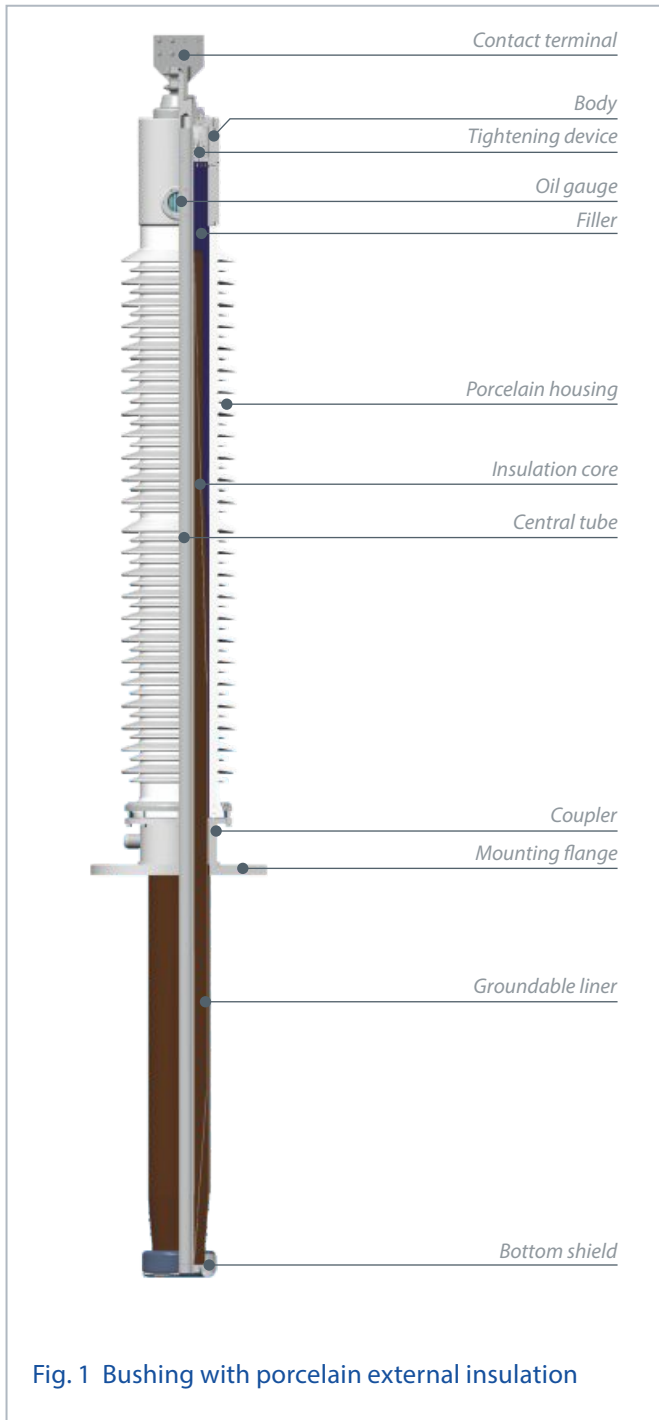


Fig. 1 Bushing with porcelain external insulation

## RIP bushing design

**Contact terminal** is intended for connecting high potential to it, made of copper alloy (Fig. 1)

**Body contains** the following bushing's elements:

- **gas cushion\*** compensates temperature-caused changes of liquid filler volume, being a free air volume;
- **tightening device** that ensures required mechanical strength and leaktightness of a bushing;
- **oil gauge\*** — for control of oil level (liquid filler) in the bushing.

**Filler** — a dry, gaseous or liquid substance, protecting the bushing's internal space against moistening.

**Porcelain housing** — an external insulation of the bushing that ensures required arcing distance and creepage distance along its outer surface.

**Insulation core** is an internal insulation of the bushing, equalizing electric field in radial and axial directions using condenser liners.

**Central tube** is intended for winding internal insulation on.

**Coupler** contains measuring tap and mounting flange of the bushing.

**Mounting flange** is used for securing the bushing on the equipment.

**Groundable liner** — the last layer of insulation core staying in permanent electric contact with the measuring tap.

**Bottom shield** equalizes external electric field in the bottom part of the bushing.

*\* only for bushings with liquid filler.*

**Top shield** is used in designs of bushings with polymer external insulation for equalizing electric field in the top part of the bushing (Fig. 2). In bushings with porcelain housing the top shield function is performed by the body.

**Polymer insulation** is used on bushings with internal RIP insulation as alternative to porcelain housing and performs the same functions.

Bushings with polymer external insulation have the following advantages:

- absolutely dry, explosion and fire safe service-free design
- stability of insulating properties throughout entire operation;
- high tracking resistance;
- hydrophobicity of external insulation that decreases flashover probability even on moist dirty insulation surface;
- elasticity of external insulation, decreasing damage risks at transportation and installation;
- absence of installation angle restrictions on equipment;
- seismic load withstand;
- minimal weight;
- ecological safety.

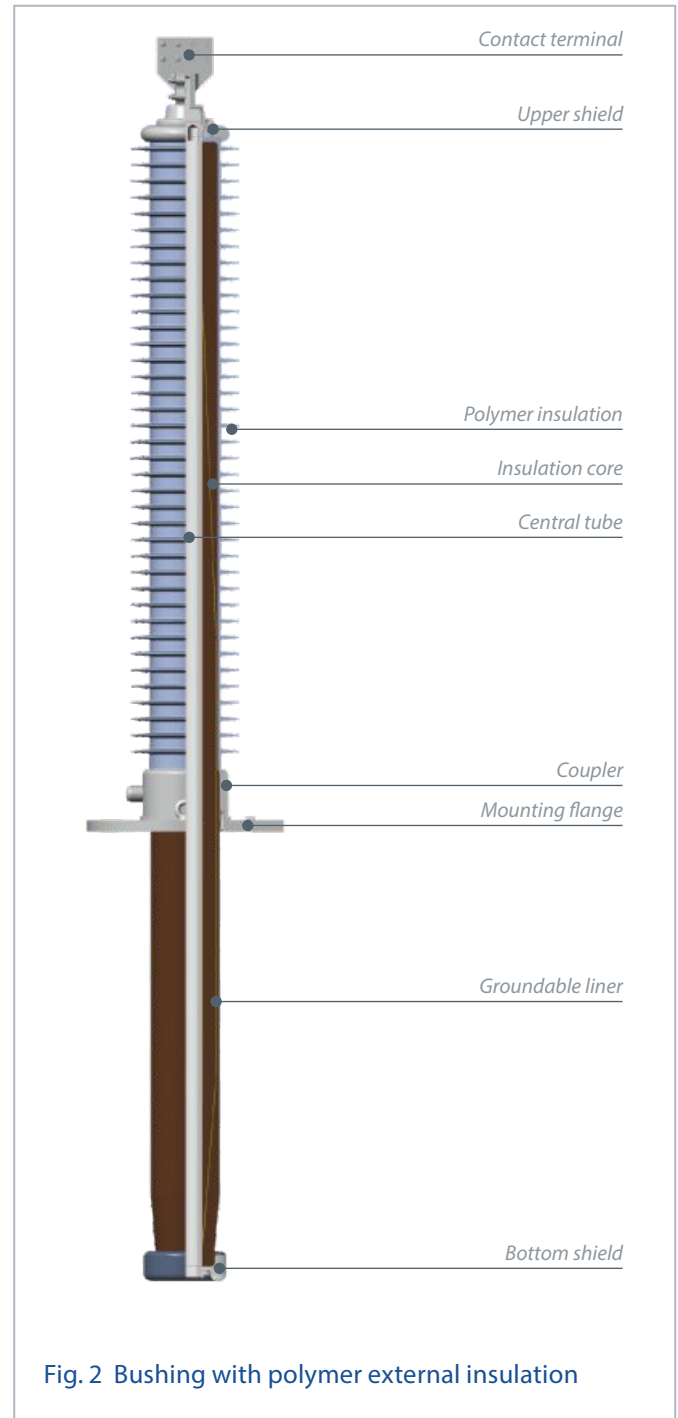


Fig. 2 Bushing with polymer external insulation



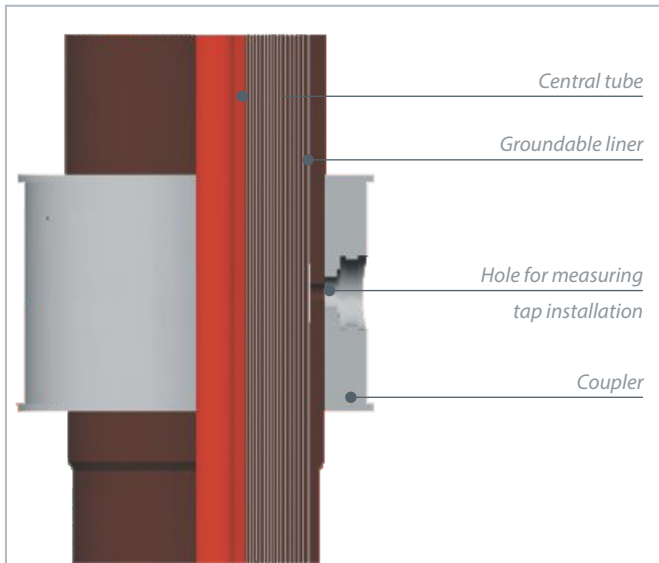


Fig. 3 Internal RIP insulation



Fig. 4 Porcelain housing

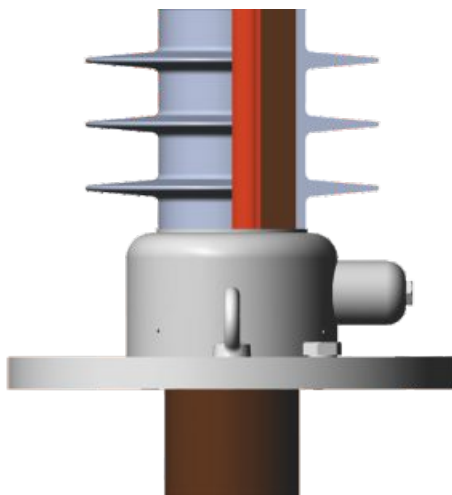


Fig. 5 Polymer insulation

## Assemblies and parts of RIP bushing

### Solid internal RIP insulation

Internal RIP insulation is the main constructional part of a bushing (Fig. 3). It has a high reliability and operation life due to low dielectric loss and level of partial discharges in the insulation, as well as heat resistance. This insulation allows to eliminate usage of transformer oil as insulating component greatly improving convenience of operation.

Condenser liners are used to equalize the electric field and evenly distribute potential inside the insulation core. The nearest to the central tube liner is in electric contact with it and the last one is in permanent electric contact with the pin of the measuring tap. The materials used for making insulation core ensure required mechanical strength and crack resistance of the insulation. This fact is verified by mechanical, climatic and seismic tests and long term operation of RIP bushings in the field.

### External insulation

External insulation covers the upper part of the insulation core, located outside a transformer or reactor, and is made of porcelain (Fig. 4) or polymer (Fig. 5).

It also protects the internal insulation against moistening and provides the required length of external surface creepage path.



## Pressure compensator

Pressure compensator is intended for compensating volume changes of liquid filler caused by temperature variations. It is used only in the bushings with external porcelain insulation filled with transformer oil. The compensator presents a gas cushion located in the upper part of the bushing (Fig. 6). For 220 kV and higher bushings sufficient filler level is checked visually through the oil level indicator glass located in the bushing's upper body. The gas cushion volume is calculated so that the level of filler should be above the glass at all times (Fig. 7).

When the level falls below the calculated value, vertical notch marks become visible (Fig. 8), a signal to contact Izolator plant immediately. In the bushings with the voltages below 220 kV the gas cushion is located in the upper part of the porcelain housing, and no direct control of the oil level is possible. The bushing oil is not an insulating material, so it is not necessary to control its condition in operation.

## Tightening device

It is located inside the pressure compensator body and is used to compensate the difference between elongations of the central tube and external porcelain insulation caused by different thermal linear expansion coefficients.

## Contact pin

In the upper part of the central tube of the bushing, there is a contact pin, which is intended for soldering-in transformer taps. During a bushing assembly, the pin with soldered-in taps is drawn through the bushing's central tube and fixed in the central tube upper part with a pin or special nut.

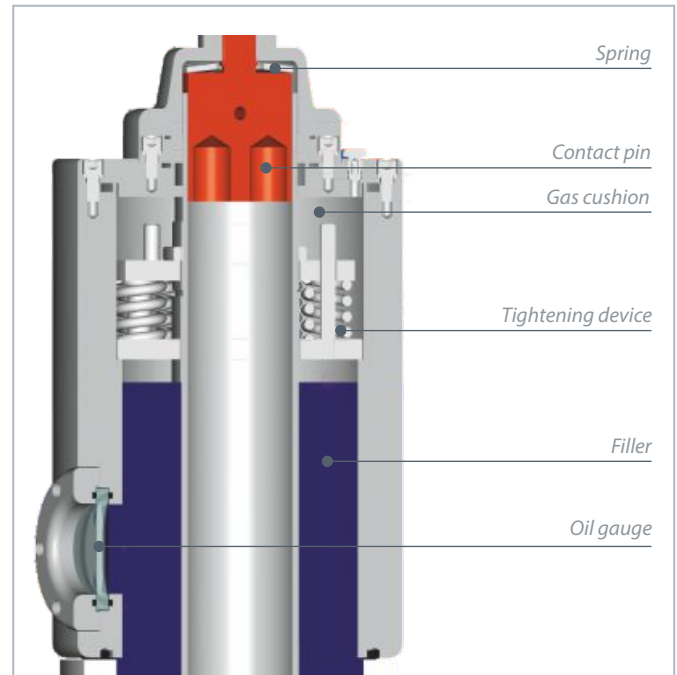


Fig. 6 Upper part of 220 kV and higher bushings with RIP insulation and liquid filler



Fig. 7 Normal level of liquid filler

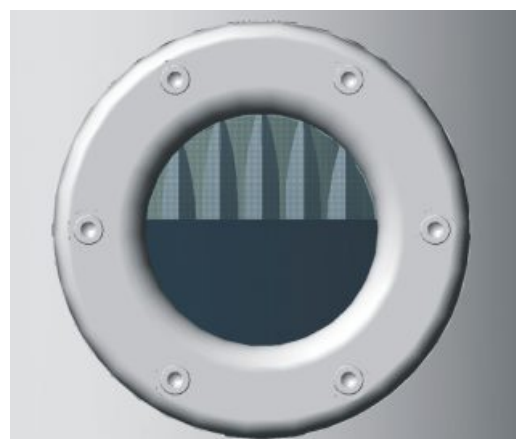


Fig. 8 Low level of liquid filler

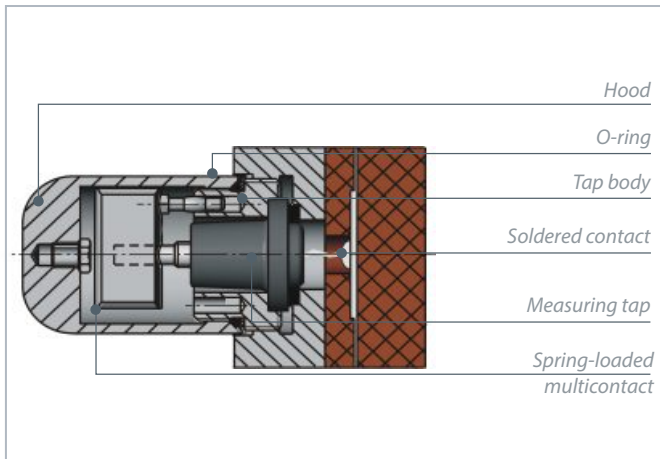


Fig. 9 Measuring tap with grounded multicontact



Fig. 10 Sensor for protection of the measuring tap

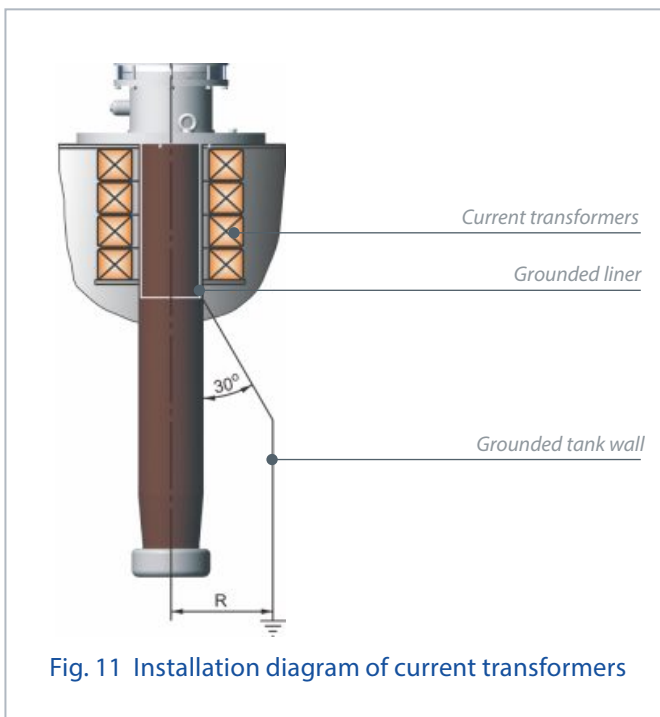


Fig. 11 Installation diagram of current transformers

## Assemblies and parts of RIP bushing

### Measuring tap

Measuring tap from the last equalizing liner of the insulation core serves to control the condition of the internal insulation and must be grounded when measurements are not performed.

Fig. 9 shows a measuring tap, made since 2014. To unground the tap, it is necessary to unscrew the hood and take off the spring-loaded multicontact. After the measurements are made on a bushing, the multicontact is to be put back by placing the pin in the hole of the measuring tap body and setting the multicontact on the pin of the measuring tap. The hood is used to seal the cavity of the measuring tap. It is required to screw on the hood by hand to pressing on the rubber O-ring on the measuring tap body.

### External diagnostic tools

External diagnostic tools connected to the measuring tap provide a possibility to monitor the condition of the bushing under operating voltage.

Herewith, for protection of the measuring tap against long-lasting occurrence of unacceptably high voltage, a special sensor with protection against cable break (Fig. 10) shall be installed on the measuring tap. The cable is connected not to the measuring tap, but to the sensor contact.

The sensor is included in the delivery set of all bushings with rated voltage of 330 kV and higher. For the bushings with other voltage the sensor can be ordered additionally.

## Bottom part of the bushing

Bottom part of the bushing is made suitable for installing current transformers, as shown in Fig. 11. In addition, the current transformers shall be located within the grounded liner, while the distance from the bushing axis to the grounded parts of the transformer must be not less than R.

Depending on the bushing type and rated voltage, its bottom part may be installed both without the shield (Fig.12) and with the shield for electric field equalizing.

The shields may be installed either at Izolyator plant (Fig. 13) or on the installation site with the use of screws (Fig. 14) or a bayonet lock (Fig. 15) according to the operation manual, supplied with each bushing.

In the standard design, up to 0.5 mm layer of electric insulating coating is applied on the shield using powder paint. If necessary, bushings can be completed with up to 12 mm thick insulating paper covering. In this case, the shield is shipped inside a separate tank filled with transformer oil in the bushing packing.

Since the structure of the RIP insulation contains cellulose, the insulation core is subject to moistening during long-term storage without special measures taken against moistening. It is not recommended to store the bushing for longer than 6 months in the standard factory packing.

Should the bushings be purchased for emergency reserve storage exceeding 6 month period, we recommend to set the bushing in a special long-term storage case, filled with transformer oil. The bushing can be stored for unlimited time there.

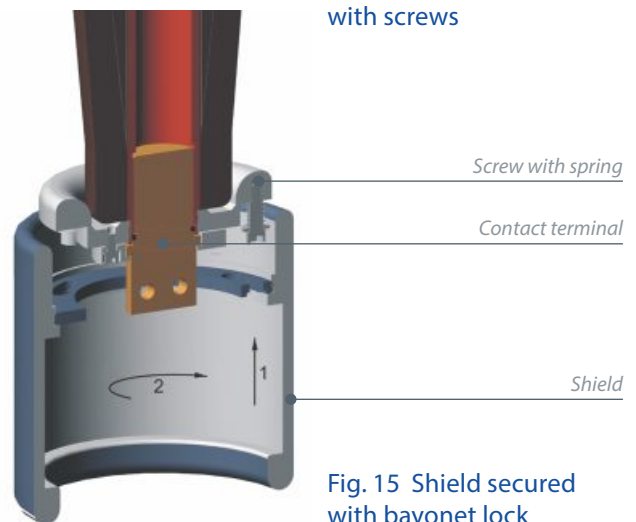
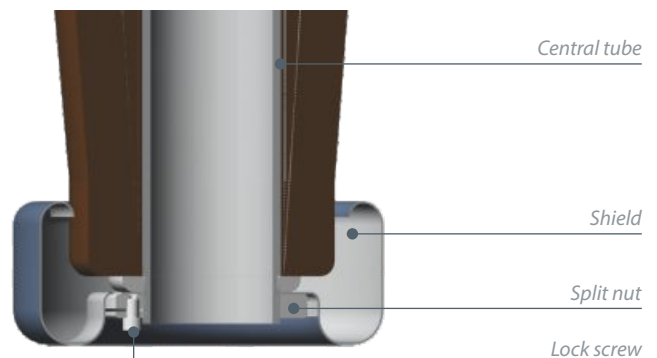
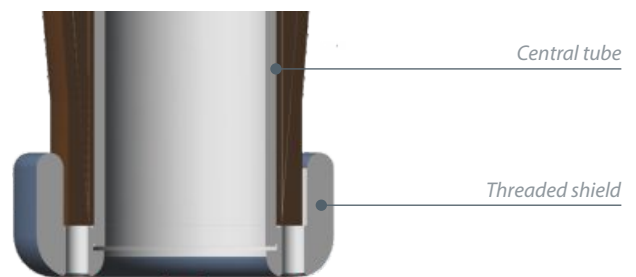
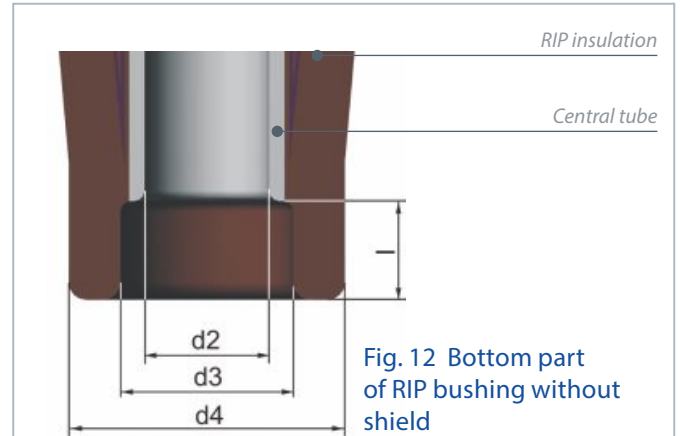






Fig. 16 Highly automated paper winding machine for 220 - 1150 kV bushings



Fig. 17 Hubers machine for vacuum impregnation of insulation at Izolyator plant



Fig. 18 Lathe turning of 500 kV RIP-insulation at Izolyator plant

## Production of RIP bushings

### Making of internal insulation

The main insulation presents a core, which is formed by winding a high quality Weidmann crepe paper on a central tube (Fig. 16).

The paper winding is divided into layers by conductive equalizing liners, which serve to optimize electric field distribution in radial and axial directions. It helps ensure the highest values of dielectric strength of both internal and external insulations and specifically along the open bottom part of the bushings located in transformer oil.

The wound insulation undergoes thermal vacuum drying in order to eliminate residual moisture, and then is impregnated with epoxy compound consisting of ingredients supplied by the best world manufacturers (Fig. 17). Subsequent solidification under pressure completely removes gaseous inclusions from the insulation. The epoxy compound formulation and technological parameters of RIP-insulation manufacturing process are intellectual property of Izolyator.

As the result, the insulating body forms a solid core, which undergoes mechanical processing (Fig. 18).

## Assembly of bushings

After mechanical processing and external surface varnishing, a coupler is mounted on the insulation core by the press fit method. Then, the porcelain housing (Fig. 19) is mounted or external polymer insulation is applied on the insulation core.

Stable tightening of the gaskets is performed by a tightening spring assembly compensating temperature changes of the insulation core length and housing within the range  $-60^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ .

The space between the insulation core and the porcelain housing is filled with a dry or liquid filler for protection against moistening. Unigel compression gel is used as dry filler (Fig. 20), for liquid filler — transformer oil, which in this case is used as a cooling agent, not a part of bushing insulation.

Leaktightness between the central tube and upper flange of the bushing is provided by a seal system. Such design provides reliable transformer leaktightness even in case of a damage of the bushing porcelain housing.

Polymer insulation is molded from elastic material based on original Wacker organosilicon compositions of RTV-2 type (Fig. 21).

Molding and polymerization take place directly on the insulation core according to “direct molding” technology in special forms developed at Izolator.



Fig. 19 500 kV and 330 kV bushings in assembly racks at Izolyator plant



Fig. 20 Unit for degassing and metering feed of compression gel at Izolyator plant



Fig. 21 Molding machines Hilger and Kern for manufacturing of external polymer insulation at Izolyator plant



## Testing

Every new bushing type passes acceptance tests for compliance with GOST R 55187-2012 and IEC 60137 (Fig.22 and 23).

Each mass-produced serial bushing undergoes acceptance tests for checking conformity thereof with appropriate type and manufacturing quality, including tests with measurement of the partial discharge level and  $\text{tg}\delta$  of the insulation according to the above mentioned documents.

## Transportation and Storage

Having passed the tests, the bushings are packed into wooden boxes or metal frames cased with wood (750 kV and higher), are completed with mounting parts, spare parts tools and accessories and documents according to design documentation (Fig. 24). A packaged bushing is stored in the finished goods warehouse.

Transportation and storage is performed with protection of the bottom part against moisture and mechanical damage. Polyethylene cover with silica gel dessicant and tin cylinder is used for this purpose.

Transportation and storage is performed with protection of the bottom part against moisture and mechanical damage. Polyethylene cover with silica gel dessicant and tin cylinder is used for this purpose.



Fig. 22 220 - 1150 kV bushings test station at Izolyator plant



Fig. 23 Electrical tests of 110 kV bushings at Izolyator plant



Fig. 24 Packing bushings at Izolyator plant



## Connection

Bushings differ by the type of connection to transformer winding.

1. Draw-lead type bushings that have transformer tap lead as current-conducting element. The connection is performed by drawing a cable with soldered contact pin through the central tube of the bushing. The following cable cross-section values are recommended depending on the maximum transformer current (see table 1).

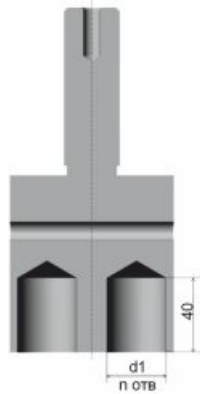


Fig. 25 Contact pin

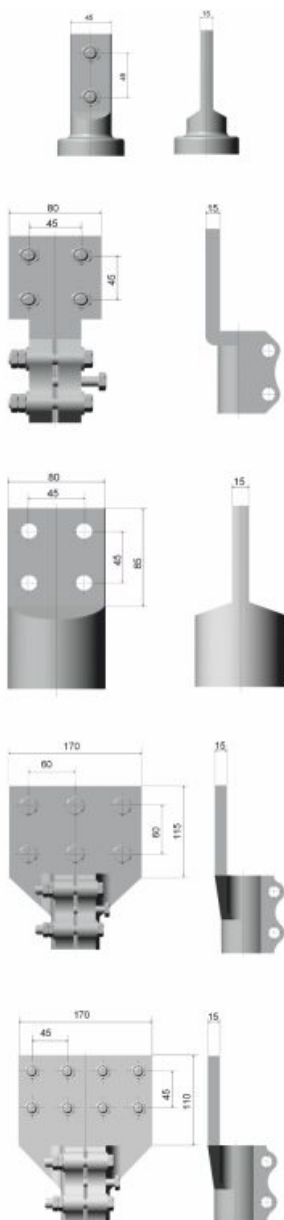


Fig. 26 Contact terminals

**Table 1**

Rated current, A	Cable cross-section, mm <sup>2</sup>
400	1x150
500	1x185
630	1x300
800	1x300
1000	1x500
	2x300
	3x185
1250	3x240
1600	4x300
2000	4x400
2500	4x500
	7x240

The contact pin (Fig. 25) is supplied with the bushing and is soldered to the transformer tap lead at the installation site.

2. Bottom terminal bushing type that use the central tube of the bushing as current conductive element.

In this case, transformer tap lead is connected to the contact tip at the bottom part of the bushing executed as a flat or square contact terminal, smooth or threaded plug.

They put a contact terminal (Fig. 26) on the top contact pin for connection of the bus bar lead.

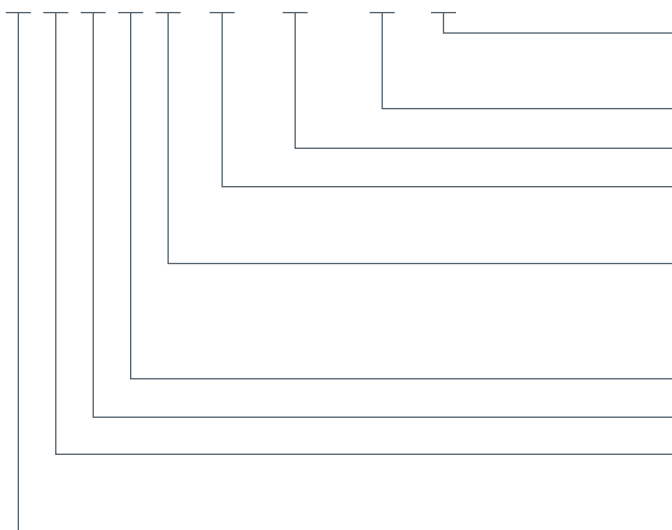
## Operation

Transformer oil is used as filler in some RIP bushings and is not intended for active insulation. Therefore, periodic checks of oil condition are not required.

RIP bushings maintenance provides for merely periodic measurement of insulation  $\text{tg}\delta$ , main insulation capacity C1 and insulation resistance of the measuring tap.

## Key to Bushing Designation Code

Г К Т П X – 90 – 126 / 800 01



## Interchangeability of bushings

Izolyator high-voltage bushings are installed both on new transformers and reactors and as replacement to spent bushings of obsolete design. For that reason, equivalence of the submerged bushing part and the length of the drawn lead as well as fitting dimensions of the mounting flange, are observed. If necessary, these characteristics may be coordinated with the manufacturer of particular power equipment where the bushings need to be substituted.

Type of climate execution and location environmental class GOST 15150-69

Rated current, A

Maximum operating voltage, kV

Limit angle of vertical orientation, angular degree

Category of external insulation depending on the pollution level at installation area according to GOST 9920-89 and IEC 60137

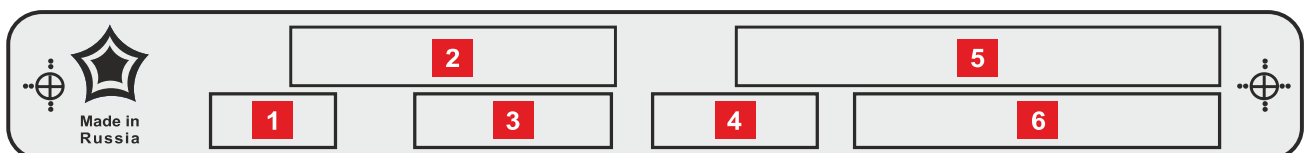
Polymer external insulation

Transformer

Compound impregnation of paper core (RIP insulation)

Leaktight execution

## Izolyator nameplate on bushings



**1** Bushing weight

**2** Drawing number

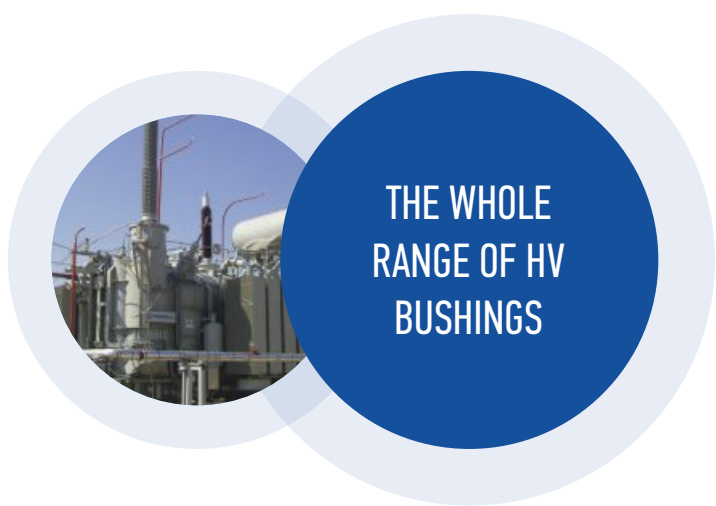
**3** Serial number

**4** Production date

**5** Bushing type

**6** State technical standard number

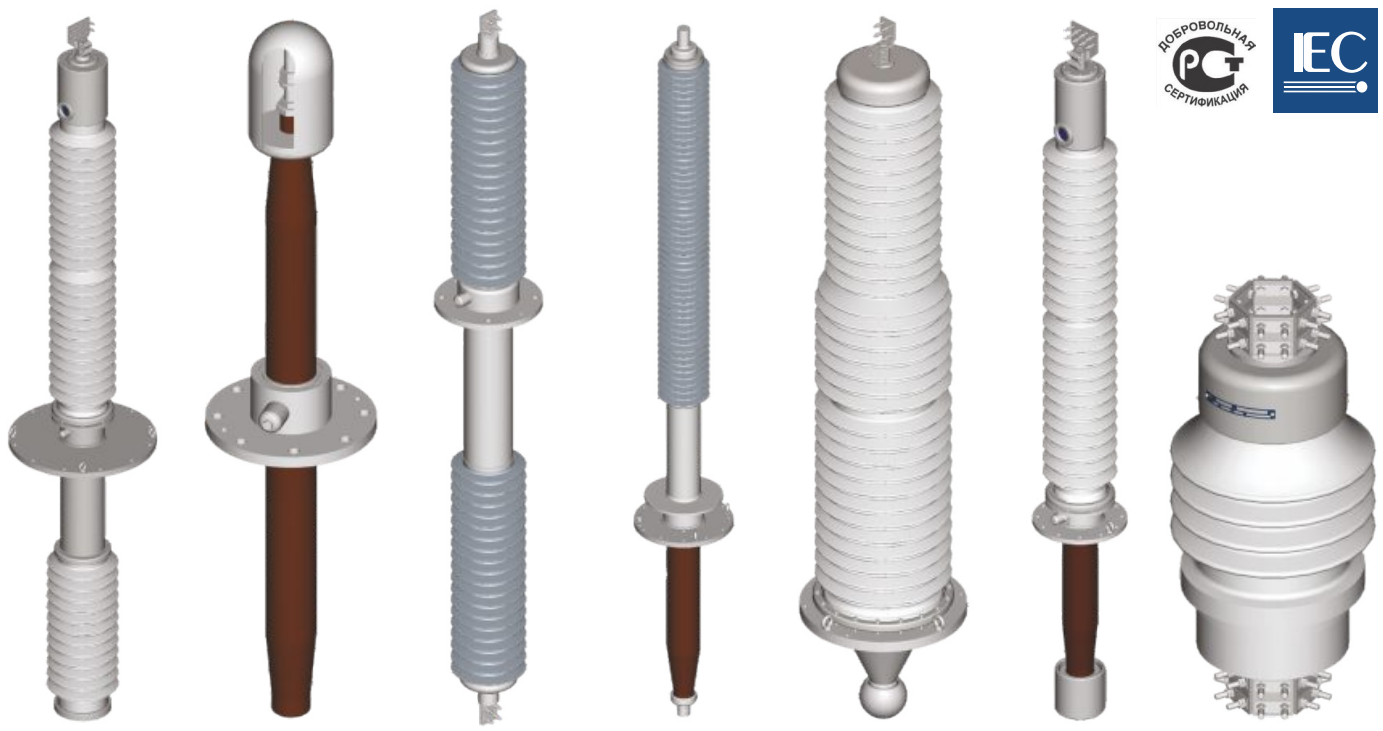
Full range of HV bushings  
12–1200 kV available



THE WHOLE  
RANGE OF HV  
BUSHINGS

Izolyator designs, manufactures, services and repairs high-voltage AC and DC bushings for up to 1200 kV rated voltage for power transformers, shunt reactors, oil switches, SF6 switchgear and wall HV bushings.

12 to 800 kV AC bushings and all DC bushings come with solid internal RIP insulation of own design that has a high reliability and long operation life.



Air — Oil bushing for oil circuit breakers  
Voltage: 35–220 kV  
Current: 1000–3150 A

Oil — Oil bushing for cable connection of transformers  
Voltage: 110–500 kV  
Current: 630–1000 A

Air — Air wall bushing  
Voltage: 66–220 kV  
Current: 2000–4000 A

DC bushings  
Voltage: ±126–800 kV  
Current: 1800–5400 A

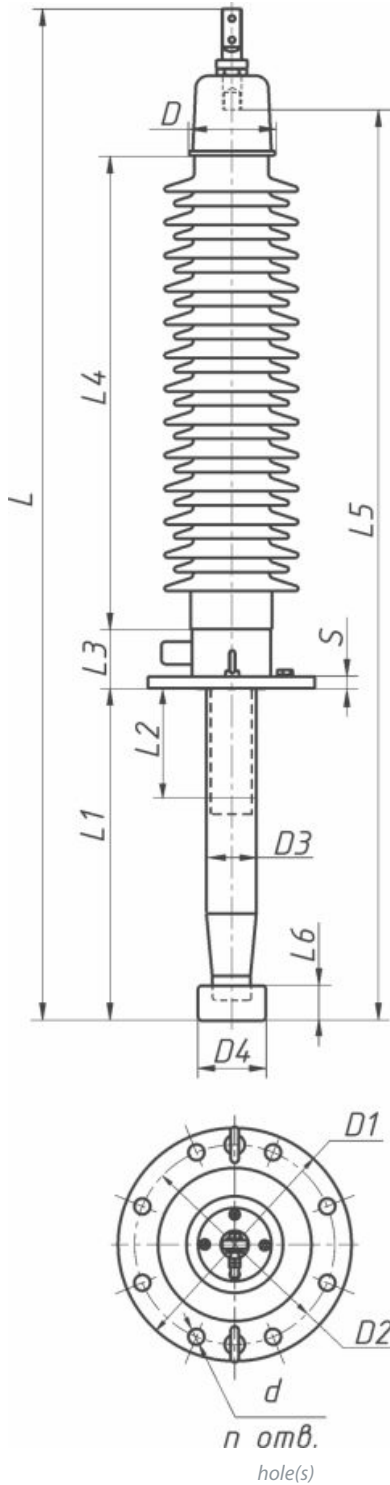
Air — SF6 bushings for switchgear  
Voltage: 220 kV  
Current: 2000–3150 A

Air — Oil bushing for power transformers and shunt reactors  
Voltage: 12–1200 kV  
Current: 315–2500 A

Air — Oil detachable bushings for power transformers  
Voltage: 20–35 kV  
Current: 6–20 kA

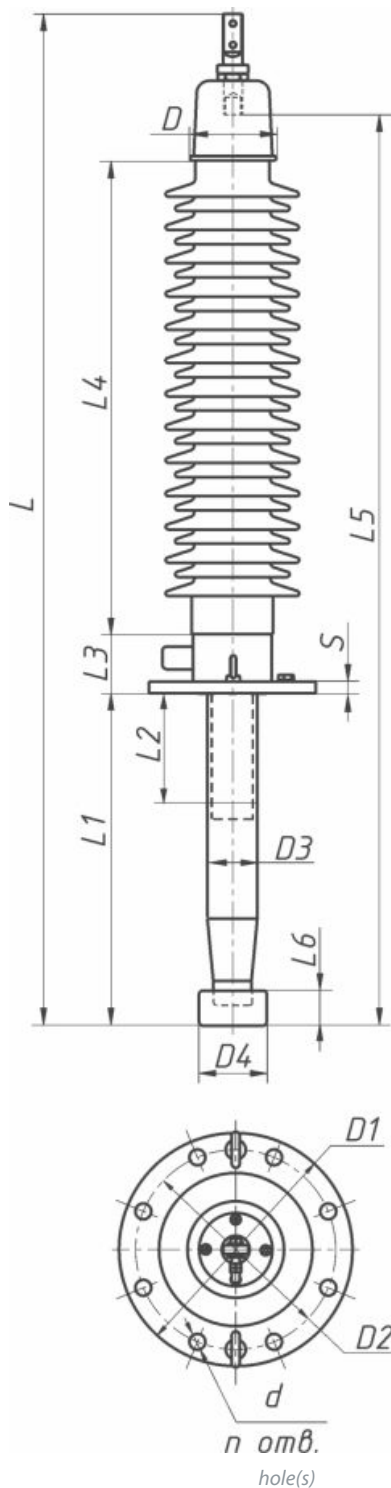


## Specifications power transformer and shunt reactor bushings



Bushing type	Drawing No.	Type of internal insulation	Maximum operating voltage, effective value, kV	Phase-to-ground voltage, effective value, kV	Rated current, A	Test voltage, kV			Creepage distance, mm	Test cantilever load, N	Weight, kg
						1 minute, 50 Hz, effective value	Switching impulse, 250/2500 ms	Lightning impulse full wave, 1.2/50 ms			
<b>12 kV bushings</b>											
ГКТПІV-90-12/1000 (0)	ІВУЕ.686351.279	RIP	12	7	1000	34		80	540	625	16,8
ГКТПІV-90-12/1000 (100)	ІВУЕ.686351.279-01	RIP	12	7	1000	34		80	540	625	18,8
ГКТПІV-90-12/1000 (200)	ІВУЕ.686351.279-02	RIP	12	7	1000	34		80	540	625	20,2
ГКТПІV-90-12/1000 (300)	ІВУЕ.686351.279-03	RIP	12	7	1000	34		80	540	625	21,5
ГКТПІV-90-12/1000 (400)	ІВУЕ.686351.279-04	RIP	12	7	1000	34		80	540	625	23,3
ГКТПІV-90-12/1000 (500)	ІВУЕ.686351.279-05	RIP	12	7	1000	34		80	540	625	24,5
ГКТПІV-90-12/1000 (600)	ІВУЕ.686351.279-06	RIP	12	7	1000	34		80	540	625	26,5
ГКТПІV-90-12/2500 (0)	ІВУЕ.686351.280	RIP	12	7	2500	34		80	540	1000	22,8
ГКТПІV-90-12/2500 (100)	ІВУЕ.686351.280-01	RIP	12	7	2500	34		80	540	1000	24,7
ГКТПІV-90-12/2500 (200)	ІВУЕ.686351.280-02	RIP	12	7	2500	34		80	540	1000	26,6
ГКТПІV-90-12/2500 (300)	ІВУЕ.686351.280-03	RIP	12	7	2500	34		80	540	1000	28,5
ГКТПІV-90-12/2500 (400)	ІВУЕ.686351.280-04	RIP	12	7	2500	34		80	540	1000	30,4
ГКТПІV-90-12/2500 (500)	ІВУЕ.686351.280-05	RIP	12	7	2500	34		80	540	1000	32,3
ГКТПІV-90-12/2500 (600)	ІВУЕ.686351.280-06	RIP	12	7	2500	34		80	540	1000	34,2
<b>24 kV bushings</b>											
ГКТПІІІ-90-24/5000(0)	ІВУЕ.686351.274	RIP	24	15	5000	65		125	750	3150	85
ГКТПІІІ-90-24/5000(100)	ІВУЕ.686351.274-01	RIP	24	15	5000	65		125	750	3150	93
ГКТПІІІ-90-24/5000(200)	ІВУЕ.686351.274-02	RIP	24	15	5000	65		125	750	3150	101
ГКТПІІІ-90-24/5000(300)	ІВУЕ.686351.274-03	RIP	24	15	5000	65		125	750	3150	109
ГКТПІІІ-90-24/5000(400)	ІВУЕ.686351.274-04	RIP	24	15	5000	65		125	750	3150	117
ГКТПІІІ-90-24/5000(500)	ІВУЕ.686351.274-05	RIP	24	15	5000	65		125	750	3150	125
ГКТПІІІ-90-24/5000(600)	ІВУЕ.686351.274-06	RIP	24	15	5000	65		125	750	3150	133
ГКТПІІІ-90-24/1000(0)	ІВУЕ.686351.277	RIP	24	15	1000	65		125	680	625	18,3
ГКТПІІІ-90-24/1000(100)	ІВУЕ.686351.277-01	RIP	24	15	1000	65		125	680	625	20,5
ГКТПІІІ-90-24/1000(200)	ІВУЕ.686351.277-02	RIP	24	15	1000	65		125	680	625	21,8
ГКТПІІІ-90-24/1000(300)	ІВУЕ.686351.277-03	RIP	24	15	1000	65		125	680	625	23,2
ГКТПІІІ-90-24/1000(400)	ІВУЕ.686351.277-04	RIP	24	15	1000	65		125	680	625	25
ГКТПІІІ-90-24/1000(500)	ІВУЕ.686351.277-05	RIP	24	15	1000	65		125	680	625	26,2
ГКТПІІІ-90-24/1000(600)	ІВУЕ.686351.277-06	RIP	24	15	1000	65		125	680	625	28,2
ГКТПІІІ-90-24/2500(0)	ІВУЕ.686351.278	RIP	24	15	2500	65		125	680	1000	24,2
ГКТПІІІ-90-24/2500(100)	ІВУЕ.686351.278-01	RIP	24	15	2500	65		125	680	1000	26,1
ГКТПІІІ-90-24/2500(200)	ІВУЕ.686351.278-02	RIP	24	15	2500	65		125	680	1000	28
ГКТПІІІ-90-24/2500(300)	ІВУЕ.686351.278-03	RIP	24	15	2500	65		125	680	1000	29,9
ГКТПІІІ-90-24/2500(400)	ІВУЕ.686351.278-04	RIP	24	15	2500	65		125	680	1000	31,8

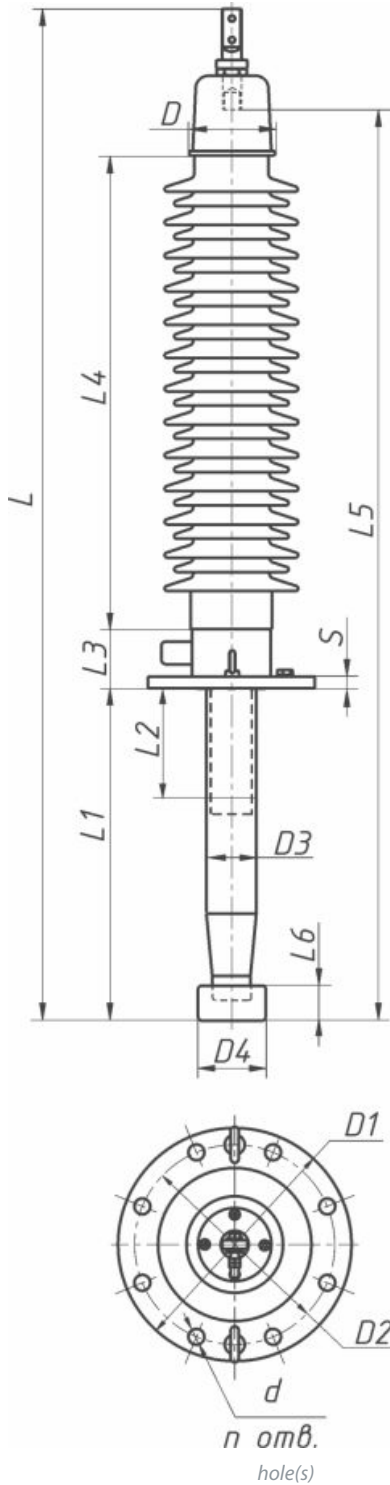
Fitting and connecting dimensions, mm																			
L	L1	L2	L3	L4	L5	D	D3	D1	D2	d/n hole(s)	S	L6	D4	d1/n1 hole(s)	d2	d3	d4	I	R
765	135	0	100	200	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
865	235	100	100	200	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
965	335	200	100	200	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1065	435	300	100	200	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1165	535	400	100	200	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1265	635	500	100	200	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1365	735	600	100	200	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
785	240	0	100	200	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
885	340	100	100	200	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
985	440	200	100	200	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1085	540	300	100	200	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1185	640	400	100	200	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1285	740	500	100	200	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1385	840	600	100	200	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
970	160	0	100	250	—	220	164	275	235	14/8	15	—	—	—	—	—	—	—	—
1070	260	100	100	250	—	220	164	275	235	14/8	15	—	—	—	—	—	—	—	—
1170	360	200	100	250	—	220	164	275	235	14/8	15	—	—	—	—	—	—	—	—
1270	460	300	100	250	—	220	164	275	235	14/8	15	—	—	—	—	—	—	—	—
1370	560	400	100	250	—	220	164	275	235	14/8	15	—	—	—	—	—	—	—	—
1470	660	500	100	250	—	220	164	275	235	14/8	15	—	—	—	—	—	—	—	—
1570	760	600	100	250	—	220	164	275	235	14/8	15	—	—	—	—	—	—	—	—
845	265	0	100	250	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
945	365	100	100	250	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1045	465	200	100	250	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1145	565	300	100	250	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1245	665	400	100	250	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1345	765	500	100	250	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1445	865	600	100	250	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
860	160	0	100	250	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
960	260	100	100	250	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1060	360	200	100	250	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1160	460	300	100	250	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1260	560	400	100	250	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—



Bushing type	Drawing No.	Type of internal insulation	Maximum operating voltage, effective value, kV	Phase-to-ground voltage, effective value, kV	Rated current, A	Test voltage, kV			Creepage distance, mm	Test cantilever load, N	Weight, kg
						1 minute, 50 Hz, effective value	Switching impulse, 250/2500 ms	Lightning impulse full wave, 1.2/50 ms			
ГКТPIII-90-24/2500(500)	ИВУЕ.686351.278-05	RIP	24	15	2500	65		125	680	1000	32,7
ГКТPIII-90-24/2500(600)	ИВУЕ.686351.278-06	RIP	24	15	2500	65		125	680	1000	35,6
ГКТPIV-60-24/2000 01	ИВУЕ.686351.703	RIP	24	15	2000	65	—	125	840	1000	50
<b>40.5 kV bushings</b>											
ГКТPIII-60-40,5/3500	ИВУЕ.686351.154	RIP	40,5	25	3500	95	—	190	1160	3150	95
ГКТPIII-90-40,5/1000(0)	ИВУЕ.686351.275	RIP	40,5	25	1000	110	—	200	1220	625	19,5
ГКТPIII-90-40,5/1000 (100)	ИВУЕ.686351.275-01	RIP	40,5	25	1000	110	—	200	1220	625	22,1
ГКТPIII-90-40,5/1000 (200)	ИВУЕ.686351.275-02	RIP	40,5	25	1000	110	—	200	1220	625	23,4
ГКТPIII-90-40,5/1000 (300)	ИВУЕ.686351.275-03	RIP	40,5	25	1000	110	—	200	1220	625	24,7
ГКТPIII-90-40,5/1000 (400)	ИВУЕ.686351.275-04	RIP	40,5	25	1000	110	—	200	1220	625	26
ГКТPIII-90-40,5/1000 (500)	ИВУЕ.686351.275-05	RIP	40,5	25	1000	110	—	200	1220	625	27,3
ГКТPIII-90-40,5/1000 (600)	ИВУЕ.686351.275-06	RIP	40,5	25	1000	110	—	200	1220	625	28,6
ГКТPIV-60-40,5/1250	ИВУЕ.686351.168	RIP	40,5	24	1250	70	—	170	1290	1250	70
ГКТPIV-90-40,5/800 01	ИВУЕ.686351.606	RIP	40,5	24	800	110	—	200	1160	1000	30
ГКТPIV-60-40,5/800 01	ИВУЕ.686351.706	RIP	40,5	25	800	110	—	200	1400	1250	30
ГКТPIV-60-40,5/800 01	ИВУЕ.686351.706-01	RIP	40,5	25	800	110	—	200	1400	1250	33
<b>52 kV bushings</b>											
ГКТPIV-60-52/630	ИВУЕ.686351.167	RIP	52	30	630	95	—	250	1900	1600	60
ГКТPIV-60-52/630	ИВУЕ.686351.367	RIP	52	30	630	95	—	250	1900	1600	50
ГКТPIV-60-52/800	ИВУЕ.686351.167-01	RIP	52	30	800	100	—	250	1900	1250	48
ГКТPIV-60-52/800	ИВУЕ.686351.367-01	RIP	52	30	800	100	—	250	1900	1250	48
ГКТPIV-90-52/2000	ИВУЕ.686351.257	RIP	52	30	2000	70	—	170	1650	1250	50
ГКТPIV-60-52/1250 01	ИВУЕ.686351.701	RIP	52	32	1250	110	—	250	1650	1600	72
TCSIV-90-52/3150	ИВУЕ.686351.601	RIP	52	32	3150	105	—	305	2000	3150	80
TCSIV-90-52/2000	686351,614	RIP	52	32	2000	105	—	250	1650	2000	50
<b>72.5 kV bushings</b>											
ГКТPIII-60-72,5/630	ИВУЕ.686351.101	RIP	72,5	42	630	140	—	325	1810	1000	62
ГКТPIII-90-72,5/630	ИВУЕ.686351.201	RIP	72,5	44	630	140	—	325	1800	2000	29,5
ГКТPIII-60-72,5/2000	ИВУЕ.686351.102	RIP	72,5	44	2000	140	—	325	1810	3150	110
ГКТPIII-90-72,5/2000	ИВУЕ.686351.202	RIP	72,5	44	2000	140	—	325	1800	3150	83
ГКТPIII-90-72,5/5000 01	ИВУЕ.686351.609	RIP	72,5	44	5000	155	—	325	1824	3150	120
TCSIV-90-72,5/800	ИВУЕ.686351.611	RIP	72,5	42	800	155	—	325	2250	2000	100
TCSIV-90-72,5/2000	686351,619	RIP	72,5	44	2000	160	—	350	2250	3150	85
<b>100 kV bushings</b>											
TCSIV-90-100/800	686351,607	RIP	100	60	800	185	—	450	3150	1250	37
TCSIV-90-100/800	686351.607-01	RIP	100	60	800	185	—	450	3150	1250	40
TCNSIII-90-100/2500	686351,617	RIP	100	60	2500	185	—	450	2550	3150	50
<b>126 kV bushings</b>											
ГКТPIII-60-126/800	ИВУЕ.686352.103	RIP	126	73	800	230	—	550	3150	1250	89



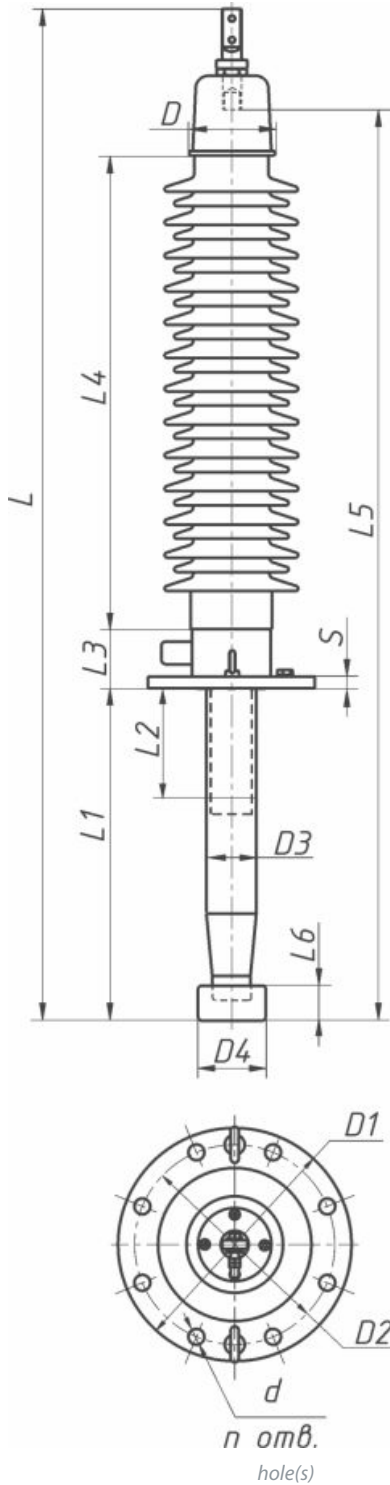
Fitting and connecting dimensions, mm																			
L	L1	L2	L3	L4	L5	D	D3	D1	D2	d/n hole(s)	S	L6	D4	d1/n1 hole(s)	d2	d3	d4	l	R
1360	660	500	100	250	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1460	760	600	100	250	—	128	78	225	180	14/6	15	—	—	—	—	—	—	—	—
900	160	—	—	310	—	183	106	225	200	15/6	25	—	—	—	—	—	—	—	—
1645	670	400	125	460	—	183	106	270	225	20/6	25	—	—	—	—	—	—	—	—
1055	170	0	100	450	—	225	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1155	270	100	100	450	—	225	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1255	370	200	100	450	—	225	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1355	470	300	100	450	—	225	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1455	570	400	100	450	—	225	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1555	670	500	100	450	—	225	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1655	770	600	100	450	—	225	78	225	180	14/6	15	—	—	—	—	—	—	—	—
1480	470	300	125	460	—	183	106	290	250	15/8	25	—	—	—	—	—	—	—	80
1230	490	300	105	450	1020	133	78	225	180	14/6	15	—	—	—	36	50	—	30	—
1290	490	300	—	450	1080	160	78	225	180	14/6	15	—	—	—	36	50	—	30	90
1490	690	500	—	450	1280	160	78	225	180	14/6	15	—	—	—	36	50	—	30	90
1645	550	300	125	620	1365	186	106	290	250	15/8	25	—	—	—	36	50	80	30	80
1635	550	300	125	620	1365	186	106	290	250	15/8	25	—	—	—	36	50	80	30	80
1400	315	0	125	620	1130	186	106	290	250	15/8	25	—	—	—	36	50	80	30	80
1400	315	0	125	620	1130	186	106	290	250	15/8	25	—	—	—	36	50	80	30	80
1385	500	250	115	560	—	—	106	225	200	15/6	25	—	—	—	—	—	—	—	—
1530	470	300	—	620	—	183	106	225	200	15/6	25	—	—	—	—	—	—	—	—
1505	475	200	225	550	—	210	108	335	290	15/12	25	—	—	—	—	—	—	—	250
1370	430	260	—	550	—	148	106	240	200	22/6	25	—	—	—	—	—	—	—	—
1360	315	100	125	620	1130	186	106	350	300	20/8	25	—	—	30	36	50	80	30	120
1235	315	100	125	607	970	148	106	350	300	20/8	25	—	—	30	36	50	80	30	120
1980	785	500	125	620	1643	255	175	528	480	24/9	25	60	165	32/4	89	—	—	—	165
1825	785	500	125	598	1470	220	175	528	480	24/9	25	60	165	32/4	89	—	—	—	165
1410	250	—	—	600	—	220	164	275	235	14/8	30	—	—	—	—	—	—	—	—
2130	695	300	225	1010	—	210	108	225	185	15/6	25	—	—	—	—	—	—	—	—
1825	695	300	225	650	—	210	108	335	290	15/12	25	—	—	—	—	—	—	—	300
1720	330	100	—	1055	1470	148	108	225	185	16/6	20	—	—	—	—	—	—	—	130
1920	530	300	—	1055	1670	148	108	225	185	16/6	20	—	—	—	—	—	—	—	130
1660	530	300	—	850	—	—	108	240	200	22/6	25	—	—	—	—	—	—	—	—
2080	660	200	125	1000	1850	186	106	350	300	24/8	25	—	—	30	36	50	80	30	155



Bushing type	Drawing No.	Type of internal insulation	Maximum operating voltage, effective value, kV	Phase-to-ground voltage, effective value, kV	Rated current, A	Test voltage, kV			Creepage distance, mm	Test cantilever load, N	Weight, kg
						1 minute, 50 Hz, effective value	Switching impulse, 250/2500 ms	Lightning impulse full wave, 1.2/50 ms			
ГКТПШ-90-126/800	ИВУЕ.686352.203	RIP	126	73	800	230	—	550	3150	1250	42
ГКТШ-60-126/800	ИВУЕ.686352.303	RIP	126	73	800	230	—	550	3150	1250	86
ГКТШ-60-126/800	ИВУЕ.686352.103-01	RIP	126	73	800	230	—	550	3150	1250	87
ГКТПШ-90-126/800	ИВУЕ.686352.203-01	RIP	126	73	800	230	—	550	3150	1250	40
ГКТШ-60-126/800	ИВУЕ.686352.303-01	RIP	126	73	800	230	—	550	3150	1250	85
ГКТШ-60-126/800	ИВУЕ.686352.103-02	RIP	126	73	800	230	—	550	3150	1250	92
ГКТПШ-90-126/800	ИВУЕ.686352.203-02	RIP	126	73	800	230	—	550	3150	1250	44
ГКТШ-60-126/800	ИВУЕ.686352.303-02	RIP	126	73	800	230	—	550	3150	1250	88
ГКТШ-60-126/800	ИВУЕ.686352.103-03	RIP	126	73	800	230	—	550	3150	1250	102
ГКТПШ-90-126/800	ИВУЕ.686352.203-03	RIP	126	73	800	230	—	550	3150	1250	55
ГКТШ-60-126/800	ИВУЕ.686352.303-03	RIP	126	73	800	230	—	550	3150	1250	98
ГКТIV-60-126/800	ИВУЕ.686352.103-04	RIP	126	73	800	230	—	550	3900	1250	112
ГКТIV-60-126/800	ИВУЕ.686352.303-04	RIP	126	73	800	230	—	550	3900	1250	100
ГКТIV-60-126/800	ИВУЕ.686352.103-06	RIP	126	73	800	230	—	550	3900	1250	115
ГКТШ-60-126/800	ИВУЕ.686352.103-07	RIP	126	73	800	230	—	550	3900	1250	96
ГКТIV-60-126/800	ИВУЕ.686352.103-08	RIP	126	73	800	230	—	550	3900	1250	130
ГКТПШ-90-126/800	ИВУЕ.686352.203-05	RIP	126	73	800	230	—	550	3150	1250	41
ГКТПШ-90-126/800	ИВУЕ.686352.203-06	RIP	126	73	800	230	—	550	3150	1250	39
ГКТPIV-90-126/800	ИВУЕ.686352.203-07	RIP	126	73	800	230	—	550	3900	1250	48
ГКТIV-60-126/800	ИВУЕ.686352.303-05	RIP	126	73	800	230	—	550	3900	1250	98
ГКТIV-60-126/800	ИВУЕ.686352.303-06	RIP	126	73	800	230	—	550	3900	1250	110
ГКТПШ-90-126/800	ИВУЕ.686352.248	RIP	126	76	800	230	—	550	3150	3150	40
ГКТPIV-90-126/1250	ИВУЕ.686352.208	RIP	126	73	1250	230	—	550	3900	2500	100
ГКТШ-60-126/2000	ИВУЕ.686352.104	RIP	126	73	2000	230	—	550	3150	4000	155
ГКТПШ-90-126/2000	ИВУЕ.686352.204	RIP	126	73	2000	230	—	550	3150	4000	85
ГКТШ-60-126/2000	ИВУЕ.686352.104-01	RIP	126	73	2000	230	—	550	3150	4000	165
ГКТПШ-90-126/2000	ИВУЕ.686352.204-01	RIP	126	73	2000	230	—	550	3150	4000	92
ГКТIV-60-126/2000	ИВУЕ.686352.104-02	RIP	126	73	2000	230	—	550	3900	4000	200
ГКТPIV-90-126/2000	ИВУЕ.686352.204-02	RIP	126	73	2000	230	—	550	3900	4000	94
ГКТIV-60-126/2000	ИВУЕ.686352.104-03	RIP	126	73	2000	230	—	550	3900	4000	205
ГКТPIV-90-126/2000	ИВУЕ.686352.204-03	RIP	126	73	2000	230	—	550	3900	4000	100
ГКТIV-60-126/2000	ИВУЕ.686352.104-04	RIP	126	73	2000	230	—	550	3900	4000	202
ГКТPIV-90-126/2000	ИВУЕ.686352.204-04	RIP	126	73	2000	230	—	550	3900	4000	95
ГКТШ-60-126/2000	ИВУЕ.686352.104-05	RIP	126	73	2000	230	—	550	3150	4000	172
ГКТШ-60-126/2000	ИВУЕ.686352.104-06	RIP	126	73	2000	230	—	550	3150	4000	182
ГКТШ-60-126/2000	ИВУЕ.686352.106	RIP	126	73	2000	230	—	550	3150	4000	143
ГКТШ-60-126/2000	ИВУЕ.686352.150	RIP	126	73	2000	230	—	550	3150	2500	170
ГКТШ-60-126/2000	ИВУЕ.686352.107	RIP	126	73	2000	230	—	550	3150	1600	125
ГКТПШ-90-126/2500	ИВУЕ.686352.207	RIP	126	76	2500	230	—	550	3150	4000	75
ГКТШ-60-126/2000	ИВУЕ.686352.107-01	RIP	126	73	2000	230	—	550	3150	1600	130
ГКТПШ-90-126/2500	ИВУЕ.686352.207-01	RIP	126	76	2500	230	—	550	3150	4000	78

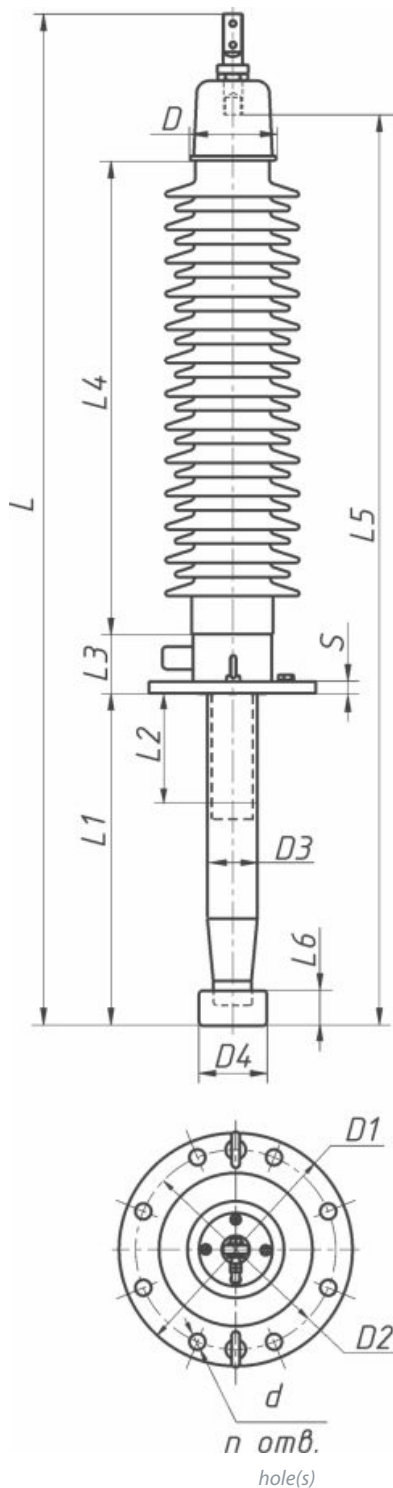
Fitting and connecting dimensions, mm																			
L	L1	L2	L3	L4	L5	D	D3	D1	D2	d/n hole(s)	S	L6	D4	d1/n1 hole(s)	d2	d3	d4	l	R
2030	660	200	125	1055	1770	148	106	350	300	24/8	25	—	—	30	36	50	80	30	155
2080	660	200	125	1000	1850	186	106	350	300	24/8	25	—	—	30	36	50	80	30	155
2190	770	300	125	1000	1960	186	106	290	250	15/8	25	—	—	30	36	50	80	30	155
2140	770	300	125	1055	1880	148	106	290	250	15/8	25	—	—	30	36	50	80	30	155
2190	770	300	125	1000	1960	186	106	290	250	15/8	25	—	—	30	36	50	80	30	155
2390	970	500	125	1000	2160	186	106	290	250	15/8	25	—	—	30	36	50	80	30	155
2340	970	500	125	1055	2080	148	106	290	250	15/8	25	—	—	30	36	50	80	30	155
2390	970	500	125	1000	2160	186	106	290	250	15/8	25	—	—	30	36	50	80	30	155
2390	970	200	125	1000	2160	186	106	535	480	24/9	25	—	—	30	36	50	80	30	155
2340	970	200	125	1055	2080	148	106	535	480	24/9	25	—	—	30	36	50	80	30	155
2390	970	200	125	1000	2160	186	106	535	480	24/9	25	—	—	30	36	50	80	30	155
2390	770	300	125	1200	2160	186	106	290	250	15/8	25	—	—	30	36	50	80	30	155
2390	770	300	125	1200	2160	186	106	290	250	15/8	—	—	—	30	36	50	80	30	155
2590	970	500	125	1200	2360	186	106	290	250	15/8	25	—	—	30	36	50	80	30	155
2310	890	500	125	1000	2080	186	106	490	445	20/12	25	—	—	30	36	50	80	30	155
2680	1070	700	125	1200	2460	186	106	290	250	15/8	25	—	—	30	36	50	80	30	155
1980	610	300	125	1055	1715	148	106	290	250	15/8	25	—	—	30	36	50	80	30	155
1845	475	170	125	1055	1630	148	106	290	250	15/8	25	—	—	30	36	50	80	30	155
2280	660	200	125	1305	2020	148	106	350	300		25	—	—	30	36	50	80	30	155
2280	660	200	125	1200	2050	186	106	350	300	24/8	25	—	—	30	36	50	80	30	155
2280	970	500	125	1200	2360	186	106	290	250	18/8	25	—	—	30	36	50	80	30	155
2175	805	400	125	1055	1915	148	106	400	350	24/6	25	60	120	30	36	60	—	—	155
2540	840	400	125	1300	2300	220	175	400	350	24/6	25	—	—	46	56	70	130	30	170
2275	720	400	125	960	1920	260	175	420	380	22/12	25	60	165	32/4	89	—	—	—	200
2210	720	400	125	1045	1890	220	175	420	380	22/12	25	60	165	32/4	89	—	—	—	200
2575	1020	400	125	960	2220	260	175	420	380	22/12	25	60	165	32/4	89	—	—	—	200
2510	1020	400	125	1045	2190	220	175	420	380	22/12	25	60	165	32/4	89	—	—	—	200
2620	720	400	125	1305	2265	260	175	420	380	22/12	25	60	165	32/4	89	—	—	—	200
2460	720	400	125	1295	2140	220	175	420	380	22/12	25	60	165	32/4	89	—	—	—	200
2920	1020	400	125	1305	2565	260	175	420	380	22/12	25	60	165	32/4	89	—	—	—	200
2760	1020	400	125	1295	2440	220	175	420	380	22/12	25	60	165	32/4	89	—	—	—	200
2670	770	400	125	1305	2315	260	175	420	380	22/12	25	60	165	32/4	89	—	—	—	200
2510	770	400	125	1295	2190	220	175	420	380	22/12	25	60	165	32/4	89	—	—	—	200
2575	1020	400	125	960	2220	260	175	528	480	24/9	25	60	165	32/4	89	—	—	—	200
2575	1020	400	125	960	2220	260	175	690	650	24/12	25	60	165	32/4	89	—	—	—	200
2155	620	300	125	960	1820	260	175	420	380	22/12	25	60	165	32/4	89	—	—	—	200
2680	1130	810	145	960	2365	260	175	420	380	22/12	25	60	165	32/4	89	—	—	—	200
2422	925	300	125	1000	—	186	106	290	250	15/8	25	210	190	—	—	—	—	—	250
2360	925	300		1055	—	148	106	290	250	15/8		210	190	—	—	—	—	—	250
2515	1020	500	125	1000	—	186	106	290	250	15/8	25	210	190	—	—	—	—	—	250
2455	1020	500	125	1055	—	148	106	290	250	15/8	25	210	190	—	—	—	—	—	250





Bushing type	Drawing No.	Type of internal insulation	Maximum operating voltage, effective value, kV	Phase-to-ground voltage, effective value, kV	Rated current, A	Test voltage, kV			Creepage distance, mm	Test cantilever load, N	Weight, kg
						1 minute, 50 Hz, effective value	Switching impulse, 250/2500 ms	Lightning impulse full wave, 1.2/50 ms			
ГКТИV-90-126/2000 01	ИВУЕ.686352.702	RIP	126	73	2000	230	—	550	3900	4000	110
ГКТПIII-90-126/800 01	ИВУЕ.686352.610	RIP	126	76	800	230	—	550	3000	1250	35
TCSIV-90-126/800	686352.616	RIP	126	73	800	255/230	—	550	3900	3150	44
TCSIV-90-126/800	686352.616-01	RIP	126	73	800	255/230	—	550	3900	3150	50
TCSIV-90-126/800	686352.616-02	RIP	126	73	800	255/230	—	550	3900	3150	57
ГКТИV-90-126/800 01	ИВУЕ.686352.708	RIP	126	76	800	265	—	550	3900	3150	99
ГКТИV-90-126/800 01	ИВУЕ.686352.708-01	RIP	126	76	800	265	—	550	3900	3150	102
ГКТИV-90-126/800 01	ИВУЕ.686352.708-02	RIP	126	76	800	265	—	550	3900	3150	104
ГКТИV-90-126/800 01	ИВУЕ.686352.708-03	RIP	126	76	800	265	—	550	3900	3150	115
ГКТИV-90-126/800 01	ИВУЕ.686352.708-04	RIP	126	76	800	265	—	550	3900	3150	113
ГКТИV-90-126/800 01	ИВУЕ.686352.708-05	RIP	126	76	800	265	—	550	3900	3150	105
ГКТИV-90-126/800 01	ИВУЕ.686352.708-06	RIP	126	76	800	265	—	550	3900	3150	104
ГКТИV-90-126/800 01	ИВУЕ.686352.708-07	RIP	126	76	800	265	—	550	3900	3150	96
<b>145 kV bushings</b>											
ГКТИV-60-145/630	ИВУЕ.686352.166	RIP	145	84	630	275	—	650	4495	3150	190
<b>172 kV bushings</b>											
ГКТПIII-60-172/800	ИВУЕ.686352.109	RIP	172	100	800	275	—	650	3900	1250	190
ГКТПIII-60-172/800	ИВУЕ.686352.109-01	RIP	172	100	800	275	—	650	3900	1250	195
ГКТПIII-90-172/800	ИВУЕ.686352.209	RIP	172	104	800	275	—	550	4250	4000	100
ГКТПIII-60-172/1000	ИВУЕ.686352.111	RIP	172	104	1000	275	—	650	4250	4000	240
ГКТПIII-90-172/1000	ИВУЕ.686352.211	RIP	172	104	1000	275	—	650	4250	4000	124
ГКТПIII-60-172/1000	ИВУЕ.686352.111-01	RIP	172	104	1000	275	—	650	4250	4000	230
ГКТПIII-90-172/1000	ИВУЕ.686352.211-01	RIP	172	104	1000	275	—	650	4250	4000	115
ГКТПIII-60-172/1000	ИВУЕ.686352.112	RIP	172	104	1000	275	—	650	4250	4000	220
ГКТПIII-60-172/2000	ИВУЕ.686352.110	RIP	172	104	2000	275	—	650	4320	5000	280
ГКТПIII-90-172/2000	ИВУЕ.686352.210	RIP	172	104	2000	275	—	650	4250	5000	160
ГКТПIII-60-172/1250	ИВУЕ.686352.710	RIP	172	104	1250	275	—	650	4250	4000	250
TCSIV-90-172/800	ИВУЕ.686352.604	RIP	172	88	2000	305	—	650	5800	4000	130
TCSIV-90-172/800 01	686352.608	RIP	172	104	800	355	—	750	5350	4000	120
TCSIV-90-172/800 01	686352.608-01	RIP	172	104	800	355	—	750	5350	4000	130
TCSIII-90-172/800	686352.615	RIP	172	100	800	355/325	—	750	4800	4000	115
TCSIII-90-172/800	686352.615-01	RIP	172	100	800	355/325	—	750	4800	4000	128
TCSIII-90-172/800	686352.615-02	RIP	172	100	800	355/325	—	750	4800	4000	137
<b>252 kV bushings</b>											
ГКТПIV-90-252/800	ИВУЕ.686353.249	RIP	252	146	800	460	—	1050	7900	4000	282
ГКТПIII-60-252/1000	ИВУЕ.686353.115	RIP	252	153	1000	460	—	1050	6300	1600	292
ГКТПIII-60-252/1000	ИВУЕ.686353.115-01	RIP	252	153	1000	460	—	1050	6300	1600	300
ГКТПIII-60-252/1000	ИВУЕ.686353.115-02	RIP	252	153	1000	460	—	1050	6300	1600	296
ГКТПIV-90-252/1600	ИВУЕ.686353.223	RIP	252	153	1600	460	—	1050	7900	4000	190
ГКТПIII-60-252/2000	ИВУЕ.686353.114	RIP	252	146	2000	460	—	1050	6300	5000	455
ГКТПIII-60-252/2000	ИВУЕ.686353.314	RIP	252	146	2000	460	—	1050	6300	4000	435

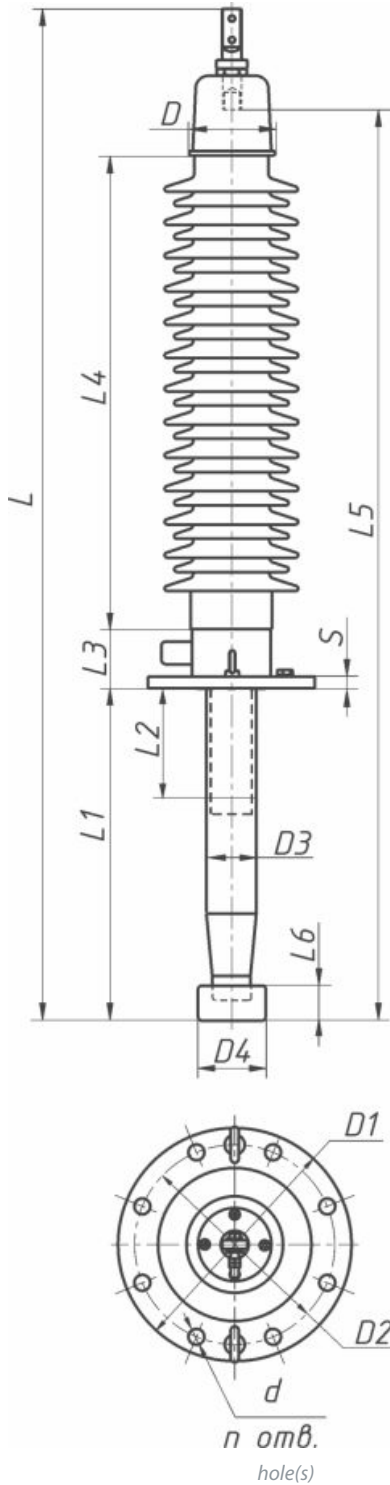
Fitting and connecting dimensions, mm																			
L	L1	L2	L3	L4	L5	D	D3	D1	D2	d/n hole(s)	S	L6	D4	d1/n1 hole(s)	d2	d3	d4	l	R
2250	390	60	—	1100	—	222	106	330	302	14/8	25	—	—	14/2	—	—	—	—	—
1630	310	30	—	1005	1415	148	108	290	250	15/8	25	—	—	—	37	50	80	30	—
1950	310	30	—	1305	1580	148	108	290	250	16/8	25	—	—	—	37	50	80	30	145
2250	610	300	—	1305	1880	148	108	290	250	16/8	25	—	—	—	37	50	80	30	145
2450	810	500	—	1305	2080	148	108	290	250	16/8	25	—	—	—	37	50	80	30	145
2190	660	200	—	1100	1850	222	108	350	300	24/8	25	—	—	—	36	50	80	30	155
2300	770	300	—	1100	1960	222	108	290	250	15/8	25	—	—	—	36	50	80	30	155
2500	970	500	—	1100	2160	222	108	290	250	15/8	25	—	—	—	36	50	80	30	155
2500	970	200	—	1100	2160	222	108	535	480	24/9	25	—	—	—	36	50	80	30	155
2430	890	500	—	1100	2210	222	108	490	445	20/12	25	—	—	—	36	50	80	30	155
2600	1070	700	—	1100	1390	222	108	290	250	15/8	25	—	—	—	36	50	80	30	155
2500	970	600	—	1100	2290	222	108	290	250	15/8	25	—	—	—	36	50	80	30	155
1840	310	30	—	1100	1630	222	108	290	250	15/8	25	—	—	—	36	50	80	30	155
2640	800	300	125	1380	2385	260	175	350	310	16/12	25	—	—	5	56	70	130	30	180
2695	850	300	125	1363	2435	260	175	350	310	22/12	25	—	—	30	56	70	130	30	180
2695	850	400	125	1363	2435	260	175	400	350	24/6	25	—	—	30	56	70	130	30	180
2575	850	300	125	1400	2265	220	175	350	310	22/12	25	—	—	30	56	70	130	30	180
2920	1075	300	125	1380	2670	260	175	670	620	24/9	25	—	—	19/4	56	70	130	40	180
2870	1075	300	125	1400	2670	220	168	670	620	24/9	25	—	—	19/4	56	70	130	40	
2920	1075	450	125	1380	2670	260	175	530	480	24/9	25	—	—	19/4	56	70	130	40	180
2870	1075	450	125	1400	2670	220	175	530	480	24/9	25	—	—	19/4	56	70	130	40	180
3030	1180	300	125	1325	2770	260	175	670	620	24/9	25	—	—	28/3	56	85	130	40	180
3125	1000	500	125	1475	2765	300	210	420	380	22/12	25	60	165	32/4	89	—	—	—	230
2960	1000	500	125	1450	2460	270	210	420	380	22/12	25	60	165	32/4	89	—	—	—	230
2725	820	500	—	1380	2405	225	175	420	380	22/12	25	—	—	—	69	—	—	—	195
2885	800	300	—	1540	—	196	150	355	290	15/12	22	160	165	—	—	—	—	—	250
2680	520	100	—	1800	2440	170	175	335	290	16/12	25	—	—	—	—	—	—	—	225
2880	720	300	—	1800	2640	170	175	335	290	16/12	25	—	—	—	—	—	—	—	225
2380	420	30	—	1600	2140	170	165	290	250	16/8					56	70	107	40	225
2680	720	300	—	1600	2440	170	165	290	250	16/8					56	70	107	40	225
2880	920	500	—	1600	2640	170	165	290	250	16/8					56	70	107	40	225
4990	1880	1045	125	2600	4690	270	210	550	500	24/12	35	120	251	30	89	—	—	—	325
3805	1025	400	185	1960	3490	238	175	450	400	22/12	25	60	165	30	56	—	—	—	330
4105	1325	700	185	1960	3790	238	175	450	400	22/12	25	60	165	30	56	—	—	—	330
3905	1125	500	185	1960	3590	238	175	450	400	22/12	25	60	165	30	56	—	—	—	330
4880	1880	750	125	2605	4650	220	175	550	500	24/12	25	60	165	46	56	—	—	—	300
4800	1905	1140	195	2025	4470	276	210	760	720	24/16	35	90	251	32/4	89	—	—	—	325
4515	1905	1140	195	2025	4185	276	210	760	720	24/16	35								325



Bushing type	Drawing No.	Type of internal insulation	Maximum operating voltage, effective value, kV	Phase-to-ground voltage, effective value, kV	Rated current, A	Test voltage, kV			Creepage distance, mm	Test cantilever load, N	Weight, kg
						1 minute, 50 Hz, effective value	Switching impulse, 250/2500 ms	Lightning impulse full wave, 1.2/50 ms			
ГКТIII-90-252/2000	ИВУЕ.686353.214	RIP	252	146	2000	460	—	1050	6300	5000	270
ГКТIV-60-252/2000	ИВУЕ.686353.114-01	RIP	252	146	2000	460	—	1050	7900	5000	500
ГКТIV-60-252/2000	ИВУЕ.686353.314-01	RIP	252	146	2000	460	—	1050	7900	5000	480
ГКТIII-60-252/2000	ИВУЕ.686353.114-02	RIP	252	146	2000	460	—	1050	6300	5000	434
ГКТIII-60-252/2000	ИВУЕ.686353.314-02	RIP	252	146	2000	460	—	1050	6300	5000	415
ГКТIII-60-252/2000	ИВУЕ.686353.113	RIP	252	146	2000	460	—	1050	6300	4000	400
ГКТIII-90-252/2000	ИВУЕ.686353.213	RIP	252	146	2000	460	—	1050	6300	5000	230
ГКТIV-90-252/2000	ИВУЕ.686353.213-02	RIP	252	146	2000	460	—	1050	7900	5000	255
ГКТIII-60-252/2000	ИВУЕ.686353.313	RIP	252	146	2000	460	—	1050	6300	4000	380
ГКТIII-60-252/2000	ИВУЕ.686353.113-01	RIP	252	146	2000	460	—	1050	6300	4000	427
ГКТIII-90-252/2000	ИВУЕ.686353.213-01	RIP	252	146	2000	460	—	1050	6300	5000	250
ГКТIII-60-252/2000	ИВУЕ.686353.313-01	RIP	252	146	2000	460	—	1050	6300	4000	402
ГКТIII-60-252/2000	ИВУЕ.686353.113-02	RIP	252	146	2000	460	—	1050	6300	4000	384
ГКТIII-60-252/2000	ИВУЕ.686353.313-02	RIP	252	146	2000	460	—	1050	6300	4000	384
ГКТIII-60-252/2000	ИВУЕ.686353.113-03	RIP	252	146	2000	460	—	1050	6300	4000	397
ГКТIII-60-252/2000	ИВУЕ.686353.313-03	RIP	252	146	2000	460	—	1050	6300	4000	397
ГКТIII-60-252/2000	ИВУЕ.686353.116	RIP	252	153	2000	460	—	1050	6300	2500	370
ГКТIII-90-252/2000	ИВУЕ.686353.216	RIP	252	146	2000	460	—	1050	6300	5000	190
ГКТIII-60-252/2000	ИВУЕ.686353.117	RIP	252	153	2000	460	—	1050	6300	5000	390
ГКТIII-60-252/2000	ИВУЕ.686353.118	RIP	252	146	2000	460	—	1050	6300	4000	320
ГКТIII-60-252/2000	ИВУЕ.686353.119	RIP	252	146	2500	460	—	1050	6300	4000	310
ГКТIII-60-252/2000	ИВУЕ.686353.119-01	RIP	252	146	2500	460	—	1050	6300	4000	315
ГКТIV-60-252/2000	ИВУЕ.686353.119-02	RIP	252	146	2500	460	—	1050	7900	4000	365
ГКТIII-60-252/2000	ИВУЕ.686353.119-03	RIP	252	146	2500	460	—	1050	6300	4000	320
ГКТIII-60-252/2000	ИВУЕ.686353.122	RIP	252	146	2000	460	—	1050	6300	4000	375
ГКТIV-60-252/2000	ИВУЕ.686353.121	RIP	252	146	2000	460	—	1050	7900	5000	450
ГКТIV-60-252/2000	ИВУЕ.686353.121-01	RIP	252	146	2000	460	—	1050	7900	5000	450
ГКТIII-60-252/2000	ИВУЕ.686353.164	RIP	252	146	2000	460	—	1050	6300	4000	310
ГКТIII-60-252/2000	ИВУЕ.686353.164-01	RIP	252	146	2000	460	—	1050	6300	4000	315
ГКТIV-60-252/2000	ИВУЕ.686353.164-02	RIP	252	146	2000	460	—	1050	7900	4000	365
ГКТIII-60-252/2000	ИВУЕ.686353.164-03	RIP	252	146	2000	460	—	1050	6300	4000	320
ГКТIII-60-252/3150	ИВУЕ.686353.153	RIP	252	152	3150	425	—	950	6300	4000	490
TCSIV-90-252/2000	ИВУЕ.686353.602	RIP	252	153	2000	505	850	1050	8400	5000	240
TCSIV-90-252/1250	ИВУЕ.686353.605	RIP	252	153	1250	505	850	1050	8400	4000	230
TCSIV-90-252/1250	ИВУЕ.686353.612	RIP	252	153	1250	505	850	1050	11000	4000	280
TCSIV-90-252/800	686353.613	RIP	252	153	800	505/460	750	1050	7900	4000	200
TCSIV-90-252/800	686353.613-01	RIP	252	153	800	505/460	750	1050	7900	4000	217
TCSIV-90-252/800	686353.613-02	RIP	252	153	800	505/460	750	1050	7900	4000	217
ГКТIII-60-252/800 01	ИВУЕ.686353.707-01	RIP	252	153	800	460	—	1050	7900	4000	350
ГКТIII-60-252/800 01	ИВУЕ.686353.199	RIP	252	146	800	460	—	1050	6300	4000	420

Fitting and connecting dimensions, mm																			
L	L1	L2	L3	L4	L5	D	D3	D1	D2	d/n hole(s)	S	L6	D4	d1/n1 hole(s)	d2	d3	d4	l	R
4530	1905	1140	205	2100	4025	270	210	760	720	24/16	35	91	251	32/4	89	—	—	—	325
5175	1905	1140	195	2400	4845	276	210	760	720	24/16	35	90	251	32/4	89	—	—	—	325
4890	1905	1140	195	2400	4560	276	210	760	720	24/16	35	90	251	32/5	89	—	—	—	325
4585	1690	900	195	2025	4255	276	210	760	720	24/16	35	90	251	32/6	89	—	—	—	325
4300	1690	900	205	2025	3970	265	210	760	720	24/16	35	90	251	32/7	89	—	—	—	325
4275	1380	600	195	2025	3945	276	210	600	560	24/16	35	90	251	32/4	89	—	—	—	325
4005	1380	600	195	2100	3500	270	210	600	560	24/16	35	90	251	32/4	89	—	—	—	325
4505	1380	700	195	2600	4000	270	210	600	560	24/16	35	90	251	32/4	89	—	—	—	325
3990	1380	710	205	2025	3670	265	210	600	560	24/16	35	90	251	32/4	89	—	—	—	325
4275	1380	600	195	2025	3765	276	210	760	720	24/16	35	90	251	32/4	89	—	—	—	325
4005	1380	600	195	2100	3500	270	210	760	720	24/16	35	90	251	32/4	89	—	—	—	325
3990	1380	710	205	2025	3490	265	210	760	720	24/16	35	90	251	32/4	89	—	—	—	325
3990	1380	710	195	2025	3390	265	210	600	560	24/16	35	90	251	32/4	89	—	—	—	325
3990	1380	710	205	2025	3390	265	210	600	560	24/16	35	90	251	32/4	89	—	—	—	325
3990	1380	710	195	2025	3390	265	210	760	720	24/16	35	90	251	32/4	89	—	—	—	235
3990	1380	710	205	2025	3390	265	210	760	720	24/16	35	90	251	32/4	89	—	—	—	235
4155	1535	600	195	1960	—	238	175	670	620	24/16	35	70	175	—	—	—	—	—	330
4025	1535	600	195	2145	—	238	175	670	620	24/16	35	70	175	—	—	—	—	—	330
3965	1070	400	195	2025	3625	276	210	600	560	24/16	35	90	251	32/4	89	—	—	—	325
3845	1225	300	195	1960	—	238	175	450	400	22/12	35	230	239	—	—	—	—	—	350
3760	1030	300	195	1960	—	238	175	450	400	22/12	25	230	240	—	—	—	—	—	350
3860	1130	400	195	1960	—	238	175	450	400	22/12	25	230	240	—	—	—	—	—	350
4260	1130	400	195	2360	—	238	175	450	400	22/12	25	230	240	—	—	—	—	—	350
3960	1230	500	195	1960	—	238	175	450	400	22/12	25	230	240	—	—	—	—	—	350
3765	870	200	195	2025	3425	276	210	600	560	24/16	35	90	251	32/4	89	—	—	—	325
4730	1460	600	195	2400	4390	276	210	600	560	24/16	35	90	251	32/4	89	—	—	—	325
4730	1460	600	195	2400	4390	276	210	600	560	24/16	35	90	251	32/4	89	—	—	—	325
3655	1030	300	195	1960	—	238	175	450	400	22/12	25	230	240	—	—	—	—	—	350
3755	1130	400	195	1960	—	238	175	450	400	22/12	25	230	240	—	—	—	—	—	350
4155	1130	400	195	2360	—	238	175	450	400	22/12	25	230	240	—	—	—	—	—	350
3855	1230	500	195	1960	—	238	175	450	400	22/12	25	230	240	—	—	—	—	—	350
4330	1380	710	195	2025	—	276	210	400	350	22/8	35	230	240	—	—	—	—	—	370
4005	1161	300	—	2200	—	292	175	450	400	20/12	25	255	230	—	—	—	—	—	175
3915	1130	300	—	2200	—	292	175	450	400	20/12	22	100	200	—	—	—	—	—	370
4705	1060	300	—	3000	—	292	175	450	400	20/12	25	255	239	—	—	—	—	—	390
3495	685	30	—	2200	3150	292	175	450	400	22/12	—	—	—	56	80	119	50	—	300
3795	985	300	—	2200	3450	292	175	450	400	22/12	—	—	—	56	80	119	50	—	300
3995	1185	500	—	2200	3650	292	175	450	400	22/12	—	—	—	56	80	119	50	—	300
4265	1380	710	—	2360	3945+40	225	175	760	720	24/16	—	100	200	—	—	—	—	—	250
4020	1145	500	—	1990	3590	296	260	450	400	22/12	36	—	—	30/2	89	120	180	200	—





Bushing type	Drawing No.	Type of internal insulation	Maximum operating voltage, effective value, kV	Phase-to-ground voltage, effective value, kV	Rated current, A	Test voltage, kV			Creepage distance, mm	Test cantilever load, N	Weight, kg
						1 minute, 50 Hz, effective value	Switching impulse, 250/2500 ms	Lightning impulse full wave, 1.2/50 ms			
<b>300 kV bushings</b>											
TCNSIII-90-300/3150	686353,618	RIN	300	220	3150	520	960	1175	7500	500	400
<b>363 kV bushings</b>											
ГКТIII-60-363/1000	ИВУЕ.686354.171	RIP	363	210	1000	510	950	1175	9050	2500	650
ГКТPIII-90-363/1000	ИВУЕ.686354.224	RIP	363	210	1000	510	950	1175	9050	2500	960
ГКТIV-60-363/1000	ИВУЕ.686354.171-01	RIP	363	210	1000	510	950	1175	11200	2500	550
ГКТPIII-90-363/1000	ИВУЕ.686353.224-01	RIP	363	210	1000	510	950	1175	9050	2500	320
ГКТIII-60-363/1250	ИВУЕ.686354.147	RIP	363	210	1250	510	950	1175	9050	2500	600
ГКТIII-60-363/1250	ИВУЕ.686354.147-01	RIP	363	210	1250	510	950	1175	9050	2500	612
ГКТIII-60-363/2500	ИВУЕ.686354.125	RIP	363	210	2500	510	950	1175	8000	3150	620
ГКТPIII-90-363/2500	ИВУЕ.686354.225	RIP	363	210	2500	510	950	1175	9000	3150	300
<b>420 kV bushings</b>											
TCSIV-90-420/1250	ИВУЕ.686354.603	RIP	420	255	1250	695	1050	1425	14740	4000	650
<b>550 kV bushings</b>											
ГКТIII-60-550/800	ИВУЕ.686355.128	RIP	550	334	800	680	1230	1550	13150	4000	1200
ГКТIII-60-550/1250	ИВУЕ.686355.146	RIP	550	334	1250	680	1230	1550	15125	4000	1200
ГКТIII-60-550/1250	ИВУЕ.686355.146-01	RIP	550	334	1250	680	1230	1550	15125	4000	1180
ГКТIII-60-550/1600	ИВУЕ.686355.146-02	RIP	550	334	1600	680	1230	1550	15125	4000	1200
ГКТIII-60-550/1600	ИВУЕ.686355.173	RIP	550	300	1600	680	1230	1550	13150	4000	1350
ГКТIII-60-550/2500	ИВУЕ.686355.172	RIP	550	303	2500	680	1230	1550	13150	2500	1230
ГКТIII-60-550/2500	ИВУЕ.686355.172-01	RIP	550	303	2500	680	1230	1550	13150	2500	1230
ГКPIII-30-550/315	ИВУЕ.686355.129	RIP	550	303	315	680	1230	1550	13735	2500	1150
<b>600 kV bushings</b>											
ГКТPIII-90-600/800	ИВУЕ.686355.262	RIP	600	347	800	748	1175	1550	15000	4000	1000
<b>800 kV bushings</b>											
ГМТII-30-750/1000	ИВЕЮ.686345.009	БМИ	800	455	1000	975	1550	2400	15750	2500	2700
ГМТII-30-750/1000	ИВЕЮ.686345.011	БМИ	800	462	1000	975	1550	2400	15750	2500	2750
ГМТII-30-750/1000	ИВЕЮ.686345.009-01	БМИ	800	455	1000	975	1550	2400	15750	2500	2790
ГМТII-30-750/1000	ИВЕЮ.686345.011-01	БМИ	800	462	1000	975	1550	2400	15750	2500	2840
ГМТII-30-800/1000	ИВУЕ.686346.145	БМИ	800	486	1000	900	1550	2250	18800	1000	2800
ГМТII-30-800/1000	ИВУЕ.686346.145-01	БМИ	800	486	1000	900	1550	2250	18800	1000	2800
ГМТII-30-750/1250	ИВЕЮ.686345.010	БМИ	800	462	1250	950	1550	2400	17700	2500	2800
ГМТII-30-750/1250	ИВЕЮ.686345.013	БМИ	800	462	1250	975	1550	2400	17700	2500	2580
ГКPII-30-800/315	ИВУЕ.686356.165	RIP	800	486	315	950	1550	2100	15750	4000	2110
ГКТII-30-800/1000 01	ИВУЕ.686356.705	RIP	800	486	1000	970	1550	2400	15750	4000	1950
ГКТIII-30-800/1250 01	ИВУЕ.686356.148	RIP	800	486	1250	970	1550	2400	20700	4000	1890
<b>1200 kV bushings</b>											
ГМТ-20-1150/1250	2ШЦ.800.119	БМИ	1200	694	1250	1150	1900	2700	18000	2500	11690

Fitting and connecting dimensions, mm																			
L	L1	L2	L3	L4	L5	D	D3	D1	D2	d/n hole(s)	S	L6	D4	d1/n1 hole(s)	d2	d3	d4	l	R
4325	1205	400	220	2520	—	—	260	560	500	23/12	35	245	240	—	—	—	—	—	—
5815	2160	600	205	2770	5220	296	260	818	770	24/16	35	90	251	30/2	69	—	—	—	380
5673	2160	600	205	2970	5220	270	260	818	770	24/16	35	90	251	30/2	89	—	—	—	380
5450	1490	600	205	3070	5150	296	260	500	450	24/12	35	90	251	30/2	69	—	—	—	380
5000	1490	600	220	2965	4550	270	260	450	400	22/12	35	90	251	30/2	89	—	—	—	380
4685	1155	300	205	2770	—	296	260	450	400	22/12	35	230	239	—	—	—	—	—	400
4885	1355	500	205	2770	—	296	260	450	400	22/12	35	230	239	—	—	—	—	—	400
5290	1620	600	205	2770	4970	296	260	600	560	24/16	35	90	251	32/2	89	—	—	—	380
5140	1615	600	220	2970	4820	270	260	600	560	24/16	35	90	250	32/4	89	—	—	—	380
6055	1640	400	—	3745	—	410	320	720	660	24/12	35	245	275	—	—	—	—	—	515
6462	1790	600	237	3670	—	296	320	720	660	24/12	36	330	296	—	—	—	—	—	520
7515	2080	900	237	4240	6980	296	320	720	660	24/12	36	190	290	20/4	69	—	—	—	520
7215	1780	600	237	4240	6680	296	320	720	660	24/12	36	190	290	20/4	69	—	—	—	520
7515	2080	900	237	4240	6980	296	320	720	660	24/12	36	190	290	24/4	69	—	—	—	520
7665	2750	1000	237	3955	—	296	320	1200	1130	24/16	36	285	490	—	—	—	—	—	—
7470	2600	1000	237	3670	6520	296	320	1200	1130	24/16	36	175	282	28/4	89	—	—	—	520
7540	2670	1000	237	3670	6520	296	320	1200	1130	24/16	36	280	400	28/4	89	—	—	—	520
7330	2205	700	237	3970	6625	296	320	1200	1130	24/16	36	—	—	30	60	—	—	—	—
6150	1500	350	—	4172	5900	900	350	720	660	24/12	36	190	290	20/4	69	—	—	—	650
9430	2720	810	160	4900	7690	580	590	820	740	24/12	35	280	400	28/3	69	—	—	—	700
9430	2720	810	160	4900	7690	580	590	820	740	24/12	35	280	400	28/3	69	—	—	—	700
9430	2720	810	160	4900	7690	580	590	1200	1130	24/16	35	280	400	28/3	69	—	—	—	700
9430	2720	810	160	4900	7690	580	590	1200	1130	24/16	35	280	400	28/3	69	—	—	—	700
9600	2600	810	160	5525	8840	580	590	1200	1130	24/16	35	360	420	28/3	69	—	—	—	700
9600	2600	1110	160	5525	8840	580	590	1200	1130	24/16	35	360	420	28/3	69	—	—	—	700
10080	2720	810	160	5525	—	580	590	820	740	32/12	35	280	400	—	—	—	—	—	700
9640	2410	810	160	5525	—	580	590	820	740	32/12	35	280	400	—	—	—	—	—	700
8515	2605	750	280	4900	7910	415	405	1200	1130	24/16	36	—	—	30	72	—	—	—	—
7780	2130	600	—	4900	7100	415	440	720	660	24/16	36	280	400	30	69	—	—	—	700
7850	2200	610	—	4900	—	415	440	720	660	24/16	36	420	420	—	—	—	—	—	700
11815	2855	800	230	7500	11063	530	850	1200	1130	25/16	31	—	—	28/4	85	—	—	—	—

## FAQ

### **What is the lead time for delivery of your products?**

The lead time depends on the voltage class of the ordered bushings. For example, 110 kV serial bushings are delivered in 45 days, 220 kV – in 60 days, etc.

**What warranty period is set for the bushings produced by you?** The warranty period is subject to agreement with the customer, and is determined in course of signing the purchase-and-sale contract.

### **What should be done if an obsolete bushing needs replacement?**

Please get in touch with our aftersales department SVN-Service, or with sales department – contact details are listed on our website [www.mosizolyator.com](http://www.mosizolyator.com), or use our corporate number +7 (495) 727 3311, or e-mail address: [mosizolyator@mosizolyator.ru](mailto:mosizolyator@mosizolyator.ru)

### **What are the advantages of the bushings with solid RIP insulation as compared to their predecessors with oil-in-paper insulation?**

The bushings with solid RIP insulation have higher electric characteristics, and feature the following advantages:

- simple design, hence – shorter delivery time;
- less weight;
- no maintenance is required during operation.

### **How to protect the bottom part of the bushing with RIP insulation during long-term storage?**

Taking into consideration the hygroscopic properties of the insulation core material, it is recommended to install a special sealed case filled with transformer oil on the bottom part of the bushing.

It is possible to order a bushing with already installed sealed case, or to order the sealed case for a previously supplied bushing.

### **What are the advantages of the bushings with polymer external insulation as compared to porcelain insulation?**

The key advantages of the bushings with polymer external insulation:

- fire safety and explosion safety of the bushings due to oil-free design;
- tracking erosion resistance;
- high pollution resistance due to high hydrophobic properties of the polymer;
- high dielectric strength of contaminated insulation, 15-20% higher than that of porcelain insulators;
- high shock resistance and seismic resistance due to elasticity of the material;
- no limitations in regard to bushing installation angle;
- less weight.

### **How to clean the polymer external insulation?**

The polymer external insulation should be cleaned using soft cloth soaked with white spirit or acetone; do not use abrasive cleaning agents. For detailed information please get in touch with Izolyator, and appropriate instruction will be sent to you in case of necessity.

**If you have other questions, or need more detailed information, please visit our website [www.mosizolyator.com](http://www.mosizolyator.com) or contact Izolyator directly:**

**tel: +7 (495) 727 3311**

**fax: +7 (495) 727 2766**

**e-mail: [mosizolyator@mosizolyator.ru](mailto:mosizolyator@mosizolyator.ru)**

## Terms and Acronyms

**Autotransformer** — a transformer in which two or more windings share a common part (GOST 30830-2002).

**Bushing** — a device used for passing one or several live conductors through a barrier (e.g., wall, transformer tank, reactor tank etc.) and insulating the conductors from the barrier. The bushing is furnished with a fastening part (flange or fixing) which is an integral part of the bushing attaching it to the barrier.

**GOST 55187-2012** — Russian technical standard for bushings.

**Dielectric losses** — energy dissipated in electric insulating material under the impact of electric field.

**Creepage distance** — the shortest distance on the surface of external insulation between two conducting zones. Creepage distance is selected pursuant to GOST 9920-89, it depends upon the contamination of the environment where the bushing operation is planned and is designated by digits from I to IV. The higher the level of contamination of the environment, the higher the category of external insulation of the bushing should be selected. For our bushings, the minimal category of external insulation is category III.

**IEC 60137:2017** — International standard for bushings.

**Main capacitance of the bushing C1** — capacitance between the high-voltage central conductor and the measuring tap of the bushing.

**Acceptance tests** are performed for each bushing at release from the plant.

**Development acceptance tests** are performed for each new bushing type during launch of mass production.

**Shunt reactor** — reactor connected in parallel intended for compensation of capacitive current (GOST 18624-73).

**Reactor bushing** — a bushing which bottom part is inside the reactor tank, in transformer oil, in alternating magnetic field with induction not over 0,35 T for bushings with rated voltage up to 550 kV inclusive, and not over 0,4 T for bushings with rated voltage 787 kV. The upper part of the bushing is in the open air.

**Power transformer** — a static device having two or more windings, designed for transformation (by means of electromagnetic induction) of one or several systems of alternating voltage and current into other, one or several, systems of alternative voltage and current, usually of different values at the same frequency, for the purpose of transfer of power (GOST 30830-2002).

**Dielectric loss tangent ( $\text{tg}\delta$ )** is the ratio of active component of insulation leakage current to its reactive component. If alternating voltage is applied, this value is an important characteristic of the insulation of high-voltage transformers and bushings.

**Transformer bushing** — a bushing which bottom part is inside the transformer tank, in transformer oil, while the upper part is in the open air. In addition, the conductor either may be a part of the bushing (bottom connection type bushing), or may be drawn through the central tube of the bushing (draw-lead type bushing).

The bushing for cable connection of transformers is a bushing with both ends designed for submerging into insulating medium other than ambient air (e.g., oil or gas). The insulating medium may be homogeneous (oil-oil, gas-gas) or heterogeneous (oil-gas).

**RIP** — Resin Impregnated Paper. A type of solid internal insulation of high-voltage bushings.

**RTV-2** (Room Temperature Vulcanization) — a polymer compound solidified at room temperature.



120+1



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#### **Izolyator sales department contacts:**

##### **Izolyator Company**

(Massa LLC)

77, Lenina Street

Pavlovskaya Sloboda, Istra district, Moscow Region

Russia, 143581

For details about our products and services — [www.mosizolyator.com](http://www.mosizolyator.com)

Tel. +7 495 727 33 11

Fax. +7 495 727 27 66

Email: [mosizolyator@mosizolyator.ru](mailto:mosizolyator@mosizolyator.ru)

