IZOLYATOR
group

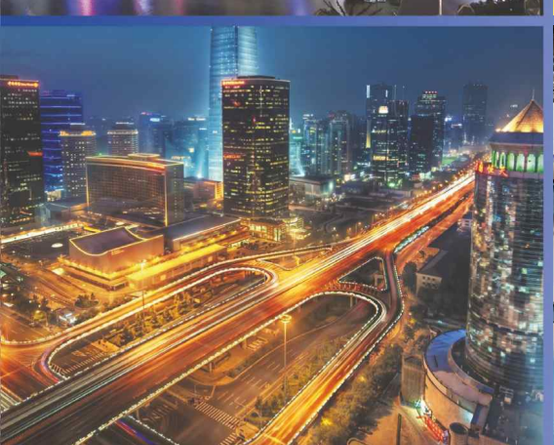
HIGH-VOLTAGE BUSHINGS FOR GAS INSULATED SWITCHGEARS AND CABLE CONNECTION OF TRANSFORMERS

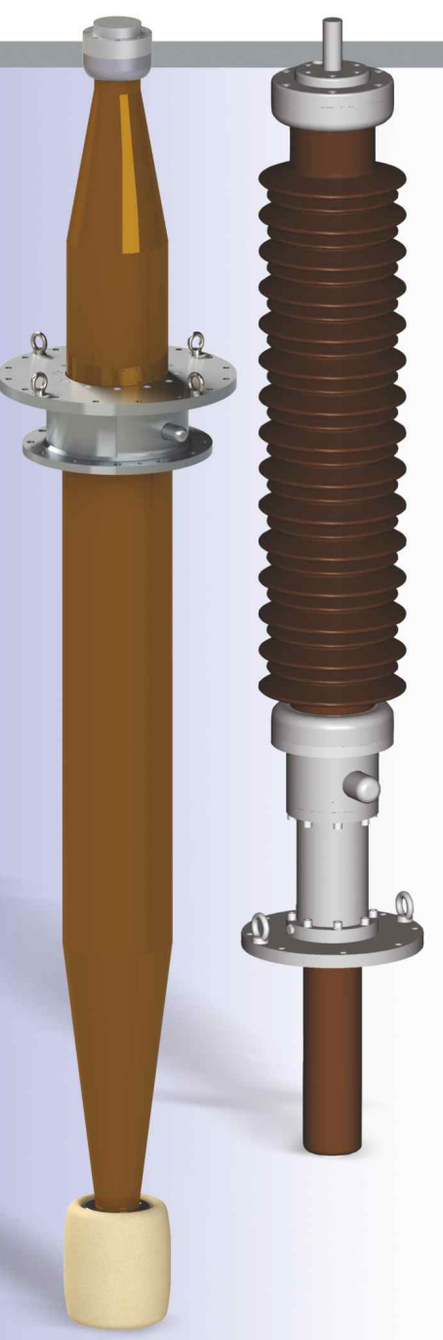
SF6 — AIR, OIL — SF6, OIL — OIL RIP

RIP AND SF6-INSULATION

Voltage 72.5 - 550 kV
Rated current 630 - 3150 A

WE CREATE THE FOUNDATION
FOR A SUSTAINABLE POWER SUPPLY





2022 Edition

MISSION. VISION. SOCIAL RESPONSIBILITY

Mission

Participating in a stable and reliable energy supply, we help everyone to realize their potential.

Vision

We aim to be a global leader of the industry and help to fill the world with energy and light, creating a high-quality charge in various parts of the planet with smart and advanced solutions in the electric power industry.

Social responsibility

We build our social policy on the basis of a harmonious combination of the interests of the company owners, employees, the local community and society with strict observance of the laws of the Russian Federation.

The history of high-voltage bushings development in Russia is inseparably associated with Izolyator plant. In its century-long history, the plant has produced over 620 thousand high-voltage bushings, operating at the overwhelming majority of power facilities in Russia and neighboring countries as well as 30 more countries in the world.

One of the key events for Izolyator was receipt of the leading science and technology partner to the Russian National Committee (RNC) of the International Council on Large Electric Systems — CIGRE (Conseil International des Grands Réseaux Électriques) status. That is the largest international nongovernment and noncommercial organization in power industry.

Today Izolyator has become a research base for CIGRE National Study Committee D1 “Materials and Emerging Test Techniques”. Collaboration with RNC CIGRE allows us to bring Izolyator's work to a whole new level in the interests of all global market players and for Russia's energy system development in general.

All Izolyator's success became possible thanks to the well-coordinated work of our highly professional team and a strong support from our partners. We shall do our best to fulfill the obligations in high-voltage bushings production and after sales support of our customers.

Century-old traditions — state-of-the-art technologies — these words have become a motto for those employed at the plant, which is justly considered a global leader in development and production of high-voltage bushings.

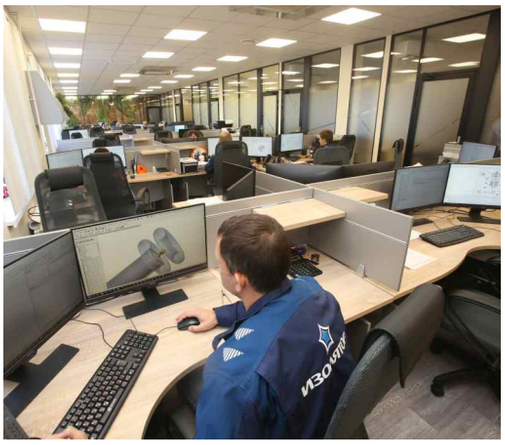
Dr. Alexander Slavinsky

Chief Executive Officer of Zavod Izolyator LLC
Chairman of Board of Massa Izolyator Mehru Pvt. Ltd.
Head of CIGRE National Study Committee D1
Vice-President of AES RF

DESIGNING. PRODUCTION. MAINTENANCE

R&D Center

- creation of new designs of insulating equipment
- development of new production technologies
- carrying out research activities and prototyping
- serial products upgrades
- highly qualified technical service
- complex diagnostics
- warranty and post-warranty repair
- consulting technical services of customers



Production of Bushings

- the most technologically advanced production equipment from the top OEMs of the world
- patented production technology of RIP and RIN insulation
- patented technology of polymer external insulation making
- making of the internal insulation up to 12 m long and 750 mm in diameter

High-Voltage Cable Accessories Production

- proprietory design of stress cones and actuating bodies of cable accessories
- modern hi-tech equipment from the leading global OEMs
- complete cycle including production, testing, training in installation and maintenance of cable accessories
- manufacture of cable accessories for a wide range of copper and aluminum cables for 185 to 2500 mm^2 conductor cross-section

Test Center

- testing under alternating current up to 1200 kV
- testing under direct current up to ±1600 kV
- testing by full and chopped lightning impulse 1.2/50 μs
- testing by switching impulse 250/2500 μs
- testing of insulation materials and prototypes

CONTENTS

Bushings for switchgear and cable connection of transformers

Reliability and security of production, transmission and supply of electric power to consumers are inseparably connected with the quality of special power equipement, including high-voltage bushings.

High-voltage bushing for gas-insulated switchgear or cable connection of transformer is intended for leading-in or out high voltage from a tank of electric apparatus and is a feedthrough insulator of elaborate design.

Both ends of such a bushing are immersed in either homogeneous - different from air - medium (oil - oil) or heterogenous (oil - SF6) insulating medium.

Izolyator makes condenser type solid internal RIP (Resin Impregnated Paper) or gas-insulated bushings for switchgear and cable connection of transformers.

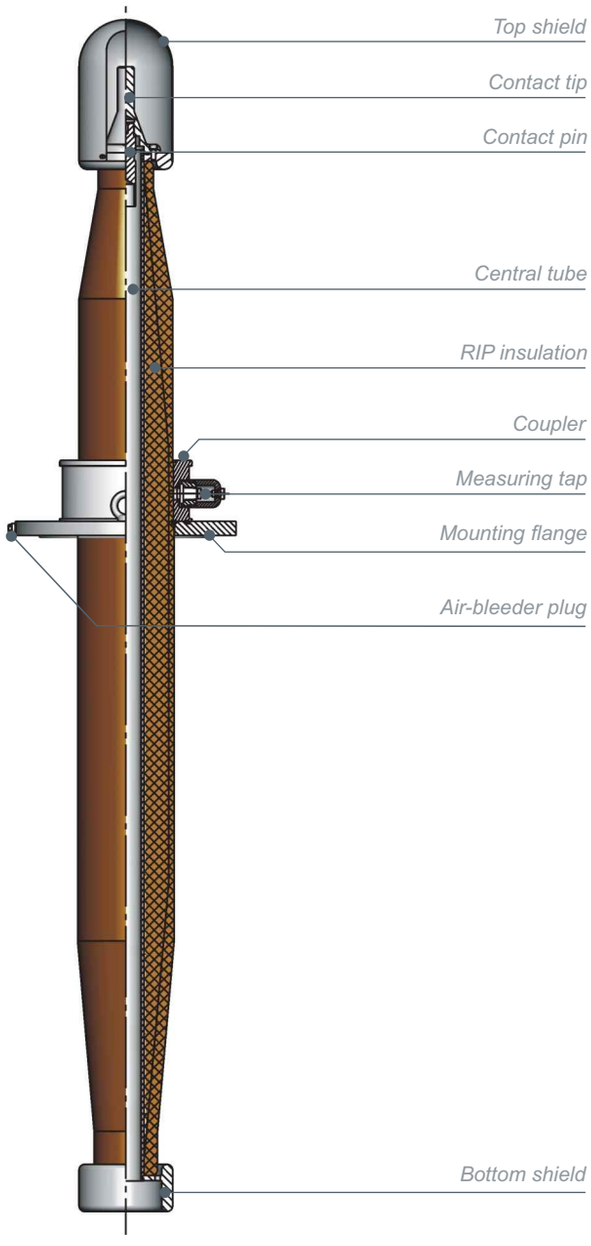


Fig. 1 Oil - Oil bushing for cable connection of transformer

Construction design of Oil - Oil bushing for cable connection of transformers

The bushing is intended for connecting a transformer lead with a cable end sleeve (Fig. 1).

The bushing is installed so that its bottom part (to the mounting flange of the couple) is placed inside a transformer, while the top part - in the cablegland housing, i.e. the bushing operates in a different from air homogeneous insulating medium Oil - Oil. There is no external insulation on such bushings.

Top shield equalizes the external electric field in the top part of the bushing.

Central tube is used for winding bushing insulation on it.

RIP insulation with condenser conductive liners is the main constructional part of the bushing.

Coupler contains measuring tap and mounting flange.

Measuring tap serves to monitor condition of the internal insulation. In operating conditions, it is connected with an extended measuring tap, positioned on the plate of the cablegland.

Mounting flange is used for securing the bushing on transformer. There is a stopper for air outlet from the transformer tank.

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

Assemblies and Components of Oil - Oil bushing for cable connection of transformers

Solid RIP insulation

Solid RIP insulation (Fig. 2) has a high reliability and long service 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.

Measuring tap

Measuring tap from the last groundable equalizing liner of the insulation core serves to control the dielectric loss tangent (tgδ) and capacitance of the main insulation (C1) and must be grounded when measurements are not performed.

Fig. 3 shows construction design of measuring taps, 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.

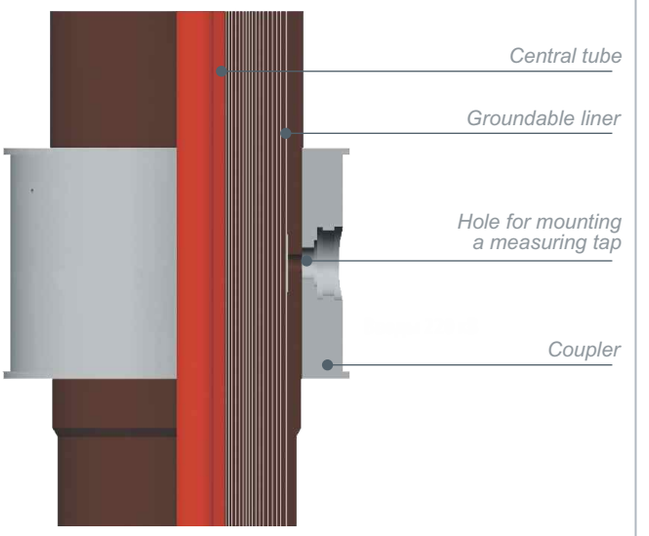


Fig. 2 Internal RIP insulation

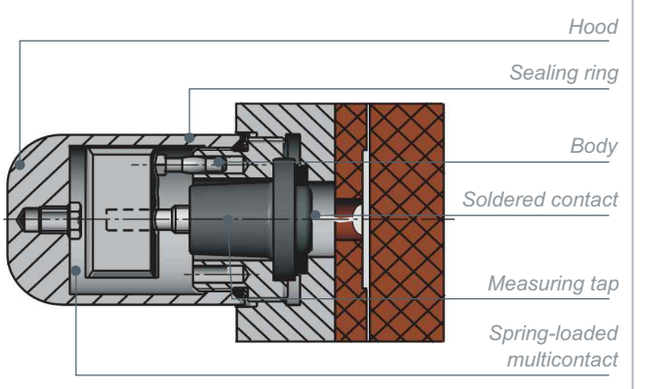


Fig. 3 Measuring tap with grounded multicontact

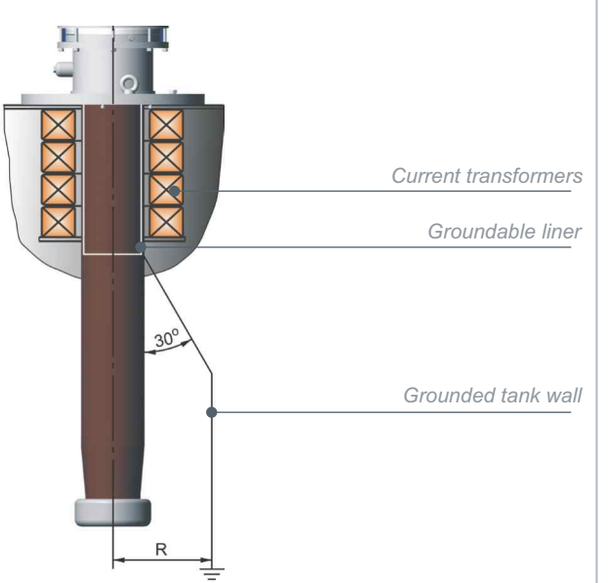


Fig. 4 Current transformers layout

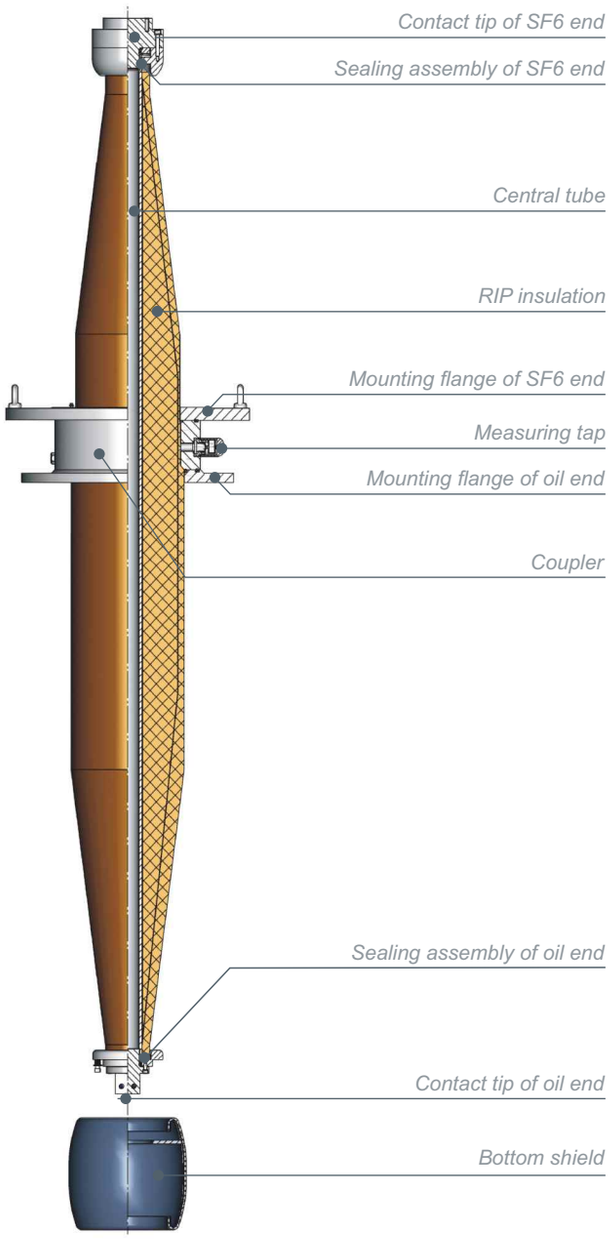


Fig. 5 Oil - SF6 bushing for switchgear connection

Construction design of Oil - SF6 bushing for switchgear connection

Bushings of this type are intended for separating current conducting parts in transformer with direct connection to switchgear, i.e. the bushing operates in a different from air heterogenous insulating media Oil – SF6 (Fig. 5). External insulation on such bushings is not used.

The contact tip of SF6 end is used for connecting switchgear and has threaded holes. It is made of brass.

Sealing assembly of SF6 end ensures required leak-tightness even at very low temperatures and consists of several O-rings, made of SF6 gas-resistant material. Central tube is used for winding insulation on it.

RIP insulation with condenser conducting liners is the main constructional part of the bushing.

Coupler is intended for placing a mounting flange of the gas-insulated end for fastening the bushing on the housing of the GIS compartment and a mounting flange of the oil end for attaching the bushing to a transformer, also - measuring tap and a stopper of the hole for air bleed from transformer tank.

Sealing assembly of the oil end prevents from transformer oil ingress inside the central tube of the bushing and is made as a rubber seal.

Contact tip of the oil end is used for connection of transformer tap and is made as a contact plate with two or four holes.

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

Assemblies and components of Oil - SF6 bushing for switchgear connection

Solid RIP insulation

Solid RIP insulation (Fig. 6) has a high reliability and long service 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.

Measuring tap

Measuring tap from the last groundable equalizing liner of the insulation core serves to control the dielectric loss tangent (tgδ) and capacitance of the main insulation (C1) and must be grounded when measurements are not performed.

Fig. 7 shows construction design of measuring taps, 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.

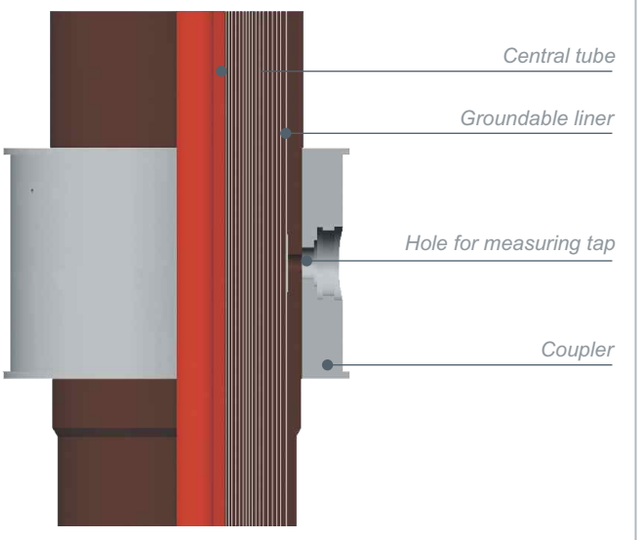


Fig. 6 Internal RIP insulation

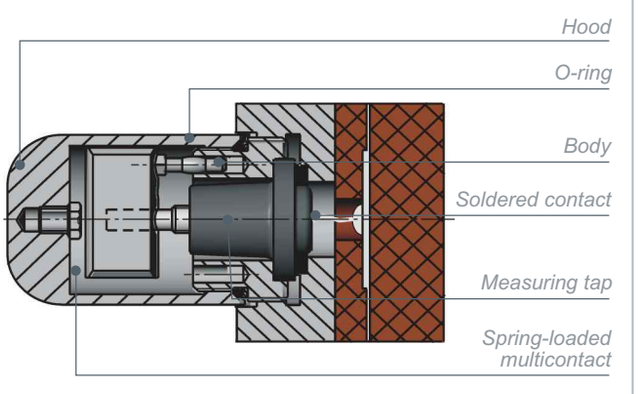


Fig. 7 Measuring tap with groundable multicontact

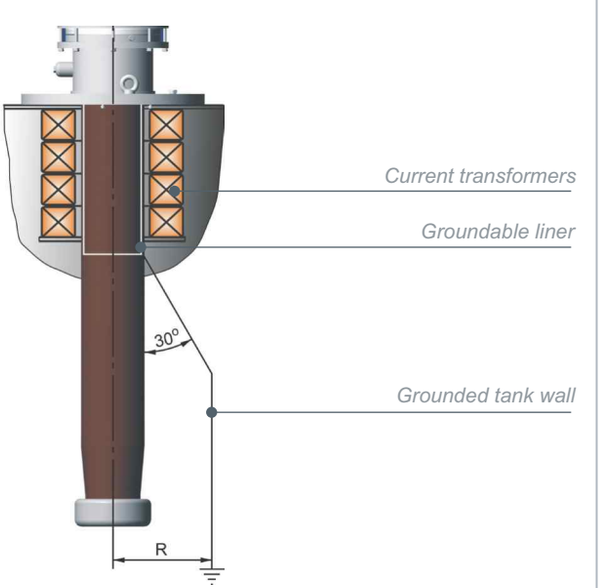


Fig. 8 Current transformers layout

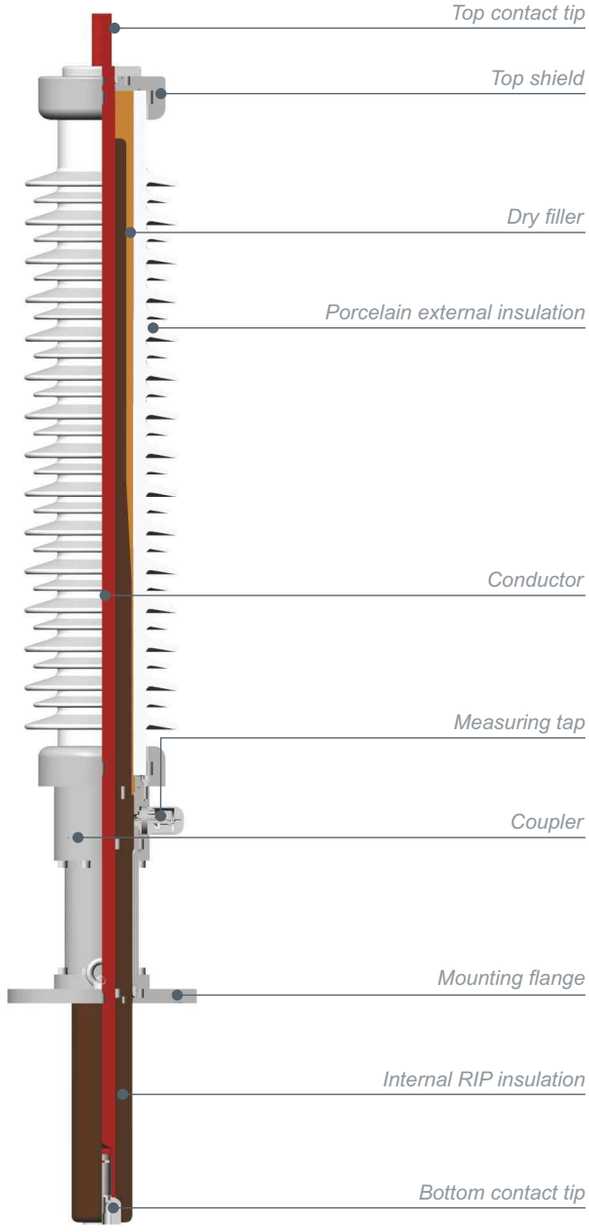


Fig. 9 SF6 - Air RIP bushing for switchgear

Construction design of SF6 - Air RIP bushings for switchgear

Bushing is intended for connection of switchgear to power transmission line (Fig. 9).

When in operation, the bottom part of the bushing is inside the switchgear, in electric gas medium, and the top part is in the open air.

Top contact tip is used for installing a contact terminal.

Top shield equalizes the external electric field in the top part of the bushing.

Conductor is used for nominal current transfer.

Internal RIP insulation with condenser conductive liners is the main constructional part of the bushing.

Porcelain external insulation ensures required arching distance and creepage distance along its outer surface.

Dry filler is an insulating gel that protects the internal cavity from moistening.

Coupler is meant for placing measuring tap and mounting flange on it.

Measuring tap serves to control condition of the main insulation.

Mounting flange is used for fastening the bushing to switchgear and has sealings between the insulation core and coupler.

Bottom contact tip is used for electric connection to switchgear.

Assemblies and Components of SF6 - Air RIP bushing for switchgear

Solid RIP insulation

Solid RIP insulation (Fig. 10) has a high reliability and long service 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.

Measuring tap

Measuring tap from the last groundable equalizing liner of the insulation core serves to control the dielectric loss tangent (tgδ) and capacitance of the main insulation (C1) and must be grounded when measurements are not performed.

Fig. 11 shows construction design of measuring taps, 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.

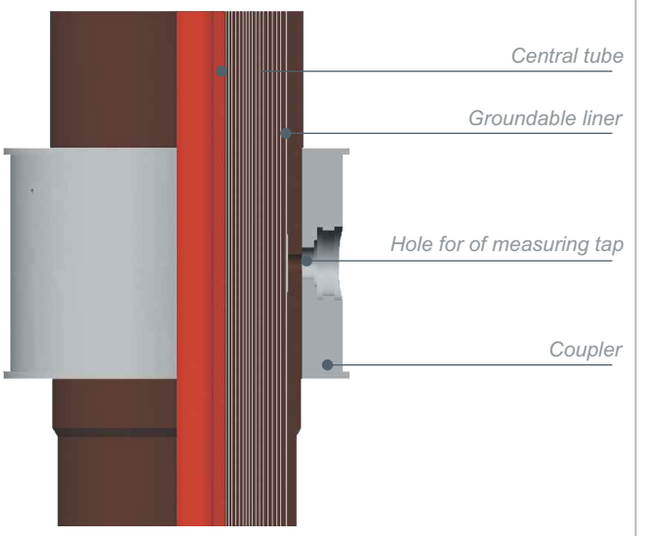


Fig. 10 Internal RIP insulation

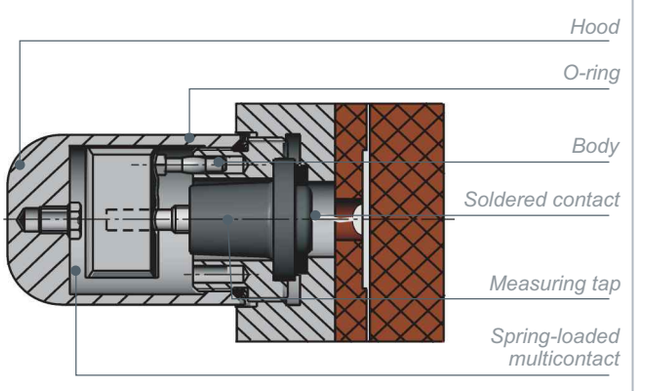


Fig. 11 Measuring tap with groundable multicontact

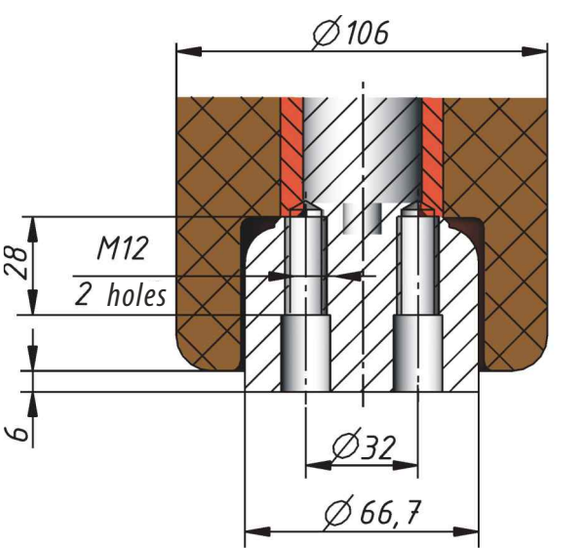


Fig. 12 Bottom part of the bushing with contact tip

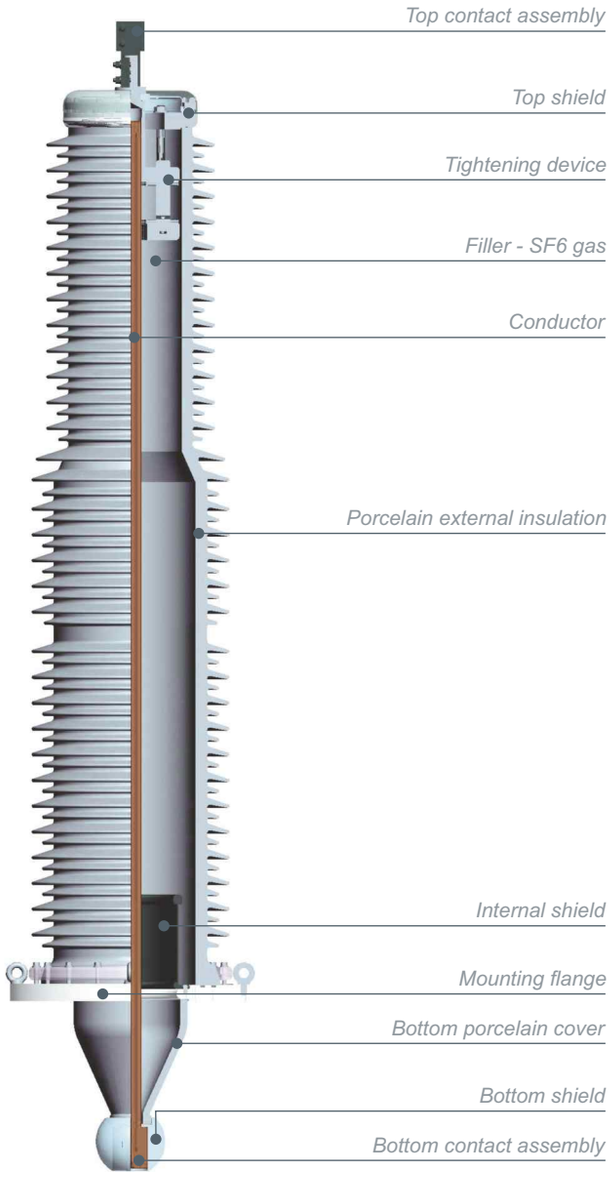


Fig. 13 SF6 - Air gas-insulated bushing for switchgear

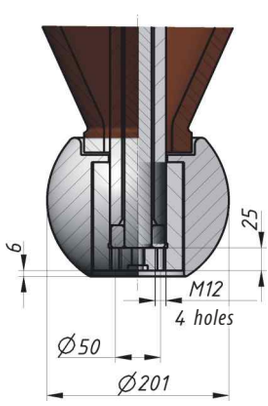


Fig. 14 Bottom assembly of SF6 - Air gas-insulated bushing

Construction design of SF6 - Air gas-insulated bushings for switchgear

The bushing is intended for switchgear connection to power line (Fig. 13).

When in operation, the bottom part of the bushing is inside the switchgear in SF6 medium, and the top one - in the open air. The internal cavity of the bushing is filled with SF6 gas through the holes in the mounting flange at switchgear compartment charging.

Top contact assembly serves for connection to power line.

Top shield equalizes the external electric field in the top part of the bushing.

Tightening device ensures required mechanical strength and leak-tightness of the bushing.

Conductor is used for transfer of nominal current.

Porcelain external insulation ensures required arching distance and creepage distance along its outer surface.

Internal shield is used for equalizing the electric field inside the bushing in the area of the mounting flange.

Mounting flange is intended for fastening the bushing to the switchgear.

Bottom porcelain housing is used to create enclused volume.

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

Bottom contact assembly is intended for electric connection to switchgear (Fig. 14).

IZOLYATOR
group

HIGH-VOLTAGE
BUSHINGS FROM
12 TO 1200 KV

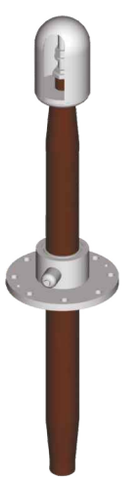
COMPLETE RANGE OF
BUSHINGS

Innovative products

Izolyator designs, makes, services and repairs high voltage bushings on alternating and direct currnent in the voltage range 12–1200 kV with Air — Oil, Oil — Oil, Air — Air, Air — SF6, SF6 — Oil, Air — Liquid nitrogen applications.

The solid internal insulation, which has a higher reliability and durability, is used in the majority of produced bushings.
There are bushings with two types of solid insulation: RIP and RIN.
The RIN insulation possesses extremely high hydrophobicity and resistance to atmospheric moisture, virtually elmiminating any moistening of insulation. Porcelain sheds, polymer insulation directly applied on the internal insulation, composite housing with external silicone ribbing are used for external insulation.

Air–Oil bushings for oil switches
Voltage: 40.5–252 kV
Current: 1000–3150 A
Insulation: RIP or RIN



Oil–Oil bushings for cable connection of tranformers
Voltage: 72.5–550 kV
Current: 630–1000 A
Insulation: RIP or RIN

Oil–Oil bushings for cable connection of tranformers
Voltage: 72.5–550 kV
Current: 630–1000 A
Insulation: RIP or RIN

Air–Air wall bushings
Voltage: 72.5–252 kV
Current: 2000–4000 A

Air–Oil bushings for power transformers and shunt reactors
Voltage: 12–1200 kV
Current: 315–5000 A
Insulation: RIP or RIN (up to 550 kV)

Air–SF6 bushings for switchgear
Voltage: 252 kV
Current: 2000–3150 A

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

Air–Oil detachable bushings for power transformers
Voltage: 20–40.5 kV
Current: 6–20 kA

Fig. 15 Highly automated paper winding machine for 220 - 1150 kV bushings

Fig. 16 Hubers machine for vacuum impregnation of insulation at Izolyator plant

Fig. 17 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. 15). 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 to ensure the highest values of dielectric strength of insulation.

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. 16). 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. 17).

Assembly of bushings

After mechanical processing and external surface varnishing, a coupler is mounted on the insulation core by the press fit method (Fig. 18).

Testing

Every new bushing type passes acceptance tests for compliance with GOST R 55187-2012 and IEC 60137 (Fig. 19).

Each serial bushing undergoes acceptance tests for checking conformity there of with appropriate type and manufacturing quality, including tests with measurement of the pa tial discharge level and tgδ of the insulation according to the above mentioned documents.

Fig. 18 330 kV Oil - SF6 bushing (center) at the assembly shop of Izolyator plan

Transportation and Storage

Having passed the tests, the bushings are packed into wooden boxes, are completed with mounting parts, spare parts and accessories and documents according to design documentation (Fig. 20). 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.

For long-term storage, a bushing may be completed with special leak-tight cases for placing bottom and top (Oil - Oil bushings) or only bottom (Oil - SF6 bushings) parts of bushings with subsequent filling with transformer oil. Cases are not provided in the standard set and can be ordered if necessary.

Fig. 19 SF6 - Air RIP bushing at testing

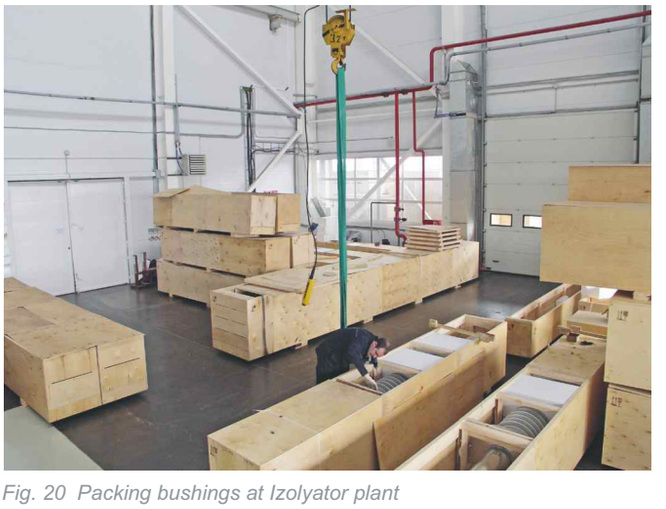


Fig. 20 Packing bushings at Izolyator plant

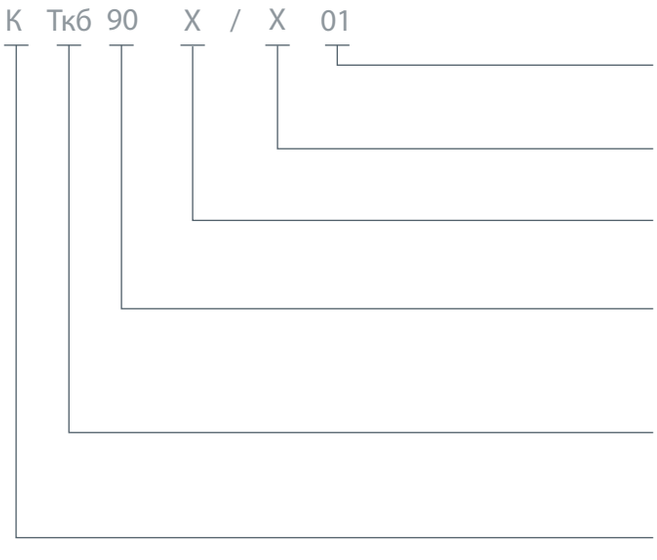
Operation

Maintenance of high-voltage bushings with solid RIP insulation is only required for merely periodic measurement of insulation tgδ, main insulation capacity C1 and insulation resistance of the measuring tap.

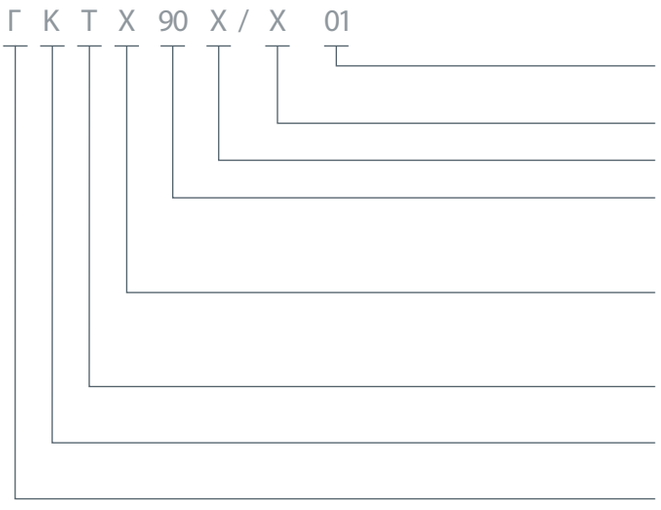
Interchangeability of bushings

Izolyator high-voltage bushings are installed both on new transformers and switchgear and as replacement to spent bushings of obsolete design. For that reason, equivalence of the submerged bushing parts 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.

Key to Designation Code of Oil - Oil and Oil - SF6 Bushings



Key to Designation Code of SF6-Oil RIP Bushings for switchgear

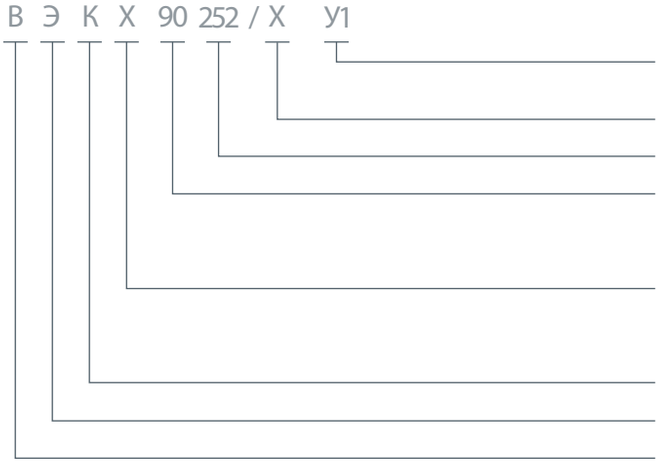


Type of climate execution and location environmental class GOST 15150-69
Rated current, A
Maximum operating voltage, kV
Limit angle of vertical oreintation, angular degree

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

Transformer
Compound impregnation of paper core (RIP insulation)
Leaktight execution

Key to Designation Code of SF6-Air gas-insulated Bushings for switchgear

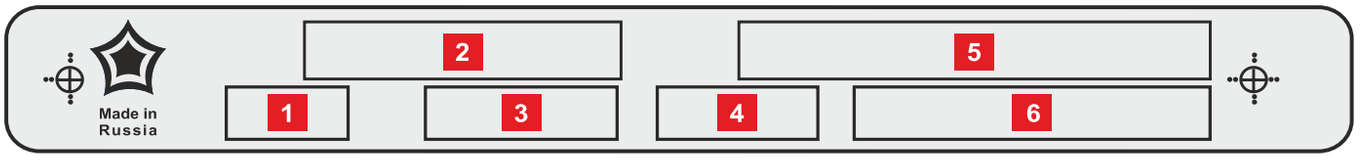


Type of climate execution and location environmental class GOST 15150-69
Rated current, A
Maximum operating voltage, kV
Limit angle of vertical oreintation, angular degree

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

Switchgear
Gas-insulated bushing

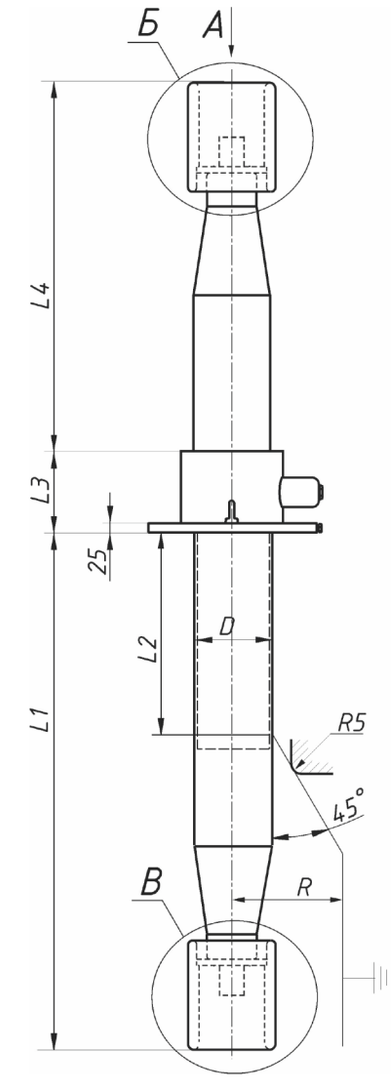
Izolyator nameplate on bushings

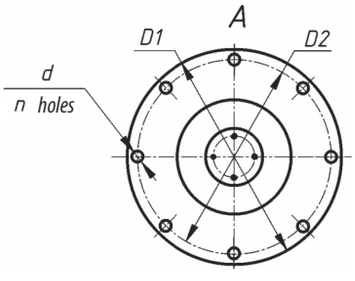


1 Bushing weight
2 Drawing number
3 Serial number
4 Production date
5 Bushing type
6 State technical standard number

Specifications of Oil - Oil bushings for cable connection of transformers

The table presents serial bushings. Custom bushings with any requested features can be designed and manufactured according to special requirements of clients.

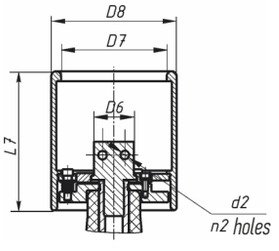




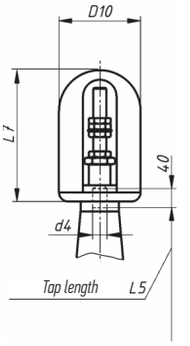
Bushing type	Drawing No.	Type of connection		Type of connection		B view drawing	C view drawing	L1	L2
		Draw-lead	Bottom	Top shield	Bottom shield				
72.5 kV									
КТк6-90-72.5/630 0	ИВУЕ.686351.084		Yes	Yes	Yes	1	1	490	0
	ИВУЕ.686351.084-01		Yes	Yes	Yes	1	1	710	300
126 kV									
КТк6-90-126/630 0	ИВУЕ.686352.036	Yes		Yes	No	2	2	670	200
	ИВУЕ.686352.036-01	Yes		Yes	No	2	2	670	200
	ИВУЕ.686352.036-02	Yes		Yes	No	2	2	670	200
	ИВУЕ.686352.036-03	Yes		Yes	No	2	2	820	500
	ИВУЕ.686352.036-04	Yes		Yes	No	2	2	1020	700
КТк6-90-126/2000 0	ИВУЕ.686352.088	Yes		Yes	Yes	1	3	820	500
172 kV									
КТк6-90-172/1250 0/	ИВУЕ.686352.089		Yes	Yes	Yes	1	1	920	300
КТк6-90-172/2000 0	ИВУЕ.686352.093		Yes	Yes	Yes	1	1	940	300
252 kV									
КТк6-90-252/1000 0	ИВУЕ.686353.037	Yes		No	Yes	—	3	1380	615
КТк6-90-252/800 0	ИВУЕ.686353.038		Yes	No	No	—	—	510	0
КТк6-90-252/1600 0	ИВУЕ.686353.070		Yes	Yes	Yes	1	1	1230	300
КТк6-90-252/800 0	ИВУЕ.686353.405-03	Yes	No	Yes	Yes	1	1	1220	600
550 kV									
КТк6-90-550/1000 0	ИВУЕ.686353.037		Yes	Yes	Yes	1	1	2750	800

	Fitting and connecting dimensions, mm																		
	L3	L4	L5	L6	L7	D	D1	D2	D3	D4	D5	D6	D7	D8	d/n holes	d1/n1 holes	d2/n2 holes	d3/n3 holes	d4	R
	125	465	—	210	210	106	290	250	190	160	60	60	160	190	15/8	13/2	13/2	—	—	200
	125	465	—	210	210	106	290	250	190	160	60	60	160	190	15/8	13/2	13/2	—	—	200
	125	815	1400	—	275	106	350	300	—	—	—	—	—	170	24/8	—	—	30/1	36	155
	125	815	1400	—	315	106	350	300	—	—	—	—	—	170	24/8	—	—	30/1	36	155
	125	815	1400	—	315	106	350	300	—	—	—	—	—	170	24/8	—	—	30/1	36	155
	125	815	1550	—	275	106	290	250	—	—	—	—	—	170	15/8	—	—	30/1	36	155
	125	815	1750	—	275	106	290	250	—	—	—	—	—	170	15/9	—	—	30/1	36	155
	150	700	1380	60	230	175	420	380	165	—	—	30	190	240	22/12	—	—	32/4	89	155
	150	705	—	230	230	175	350	310	240	190	50	30	190	240	20/12	13/2	—	—	—	280
	150	760	—	230	230	175	350	310	240	190	50	30	190	240	20/12	13/3	—	—	—	280
	156	1039	2325	60	—	175	600	560	165	—	—	M30x2	—	—	24/16	—	—	19/4	56	330
	150	1358	345	—	—	345	910	870	—	—	—	20	—	—	20/18	—	—	M24/1	—	330
	160	1020	—	230	230	198	600	560	240	190	50	30	190	240	24/16	13/2	—	—	—	300
	150	787	1825	85	282	175	400	350	170	130	—	30	—	170	20/12	—	—	30/1	56	330
	263	2002	—	277	305	320	1200	1130	424	166	M60x2	42	—	170	24/16	—	—	—	—	560

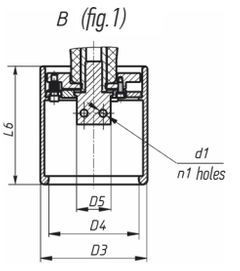
Б (fig.1)



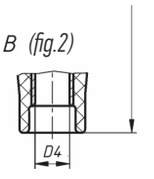
Б (fig.2)



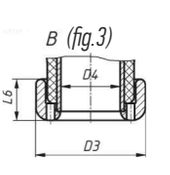
В (fig.1)



В (fig.2)

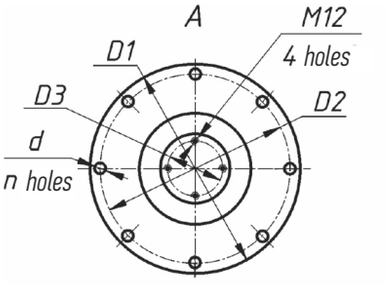


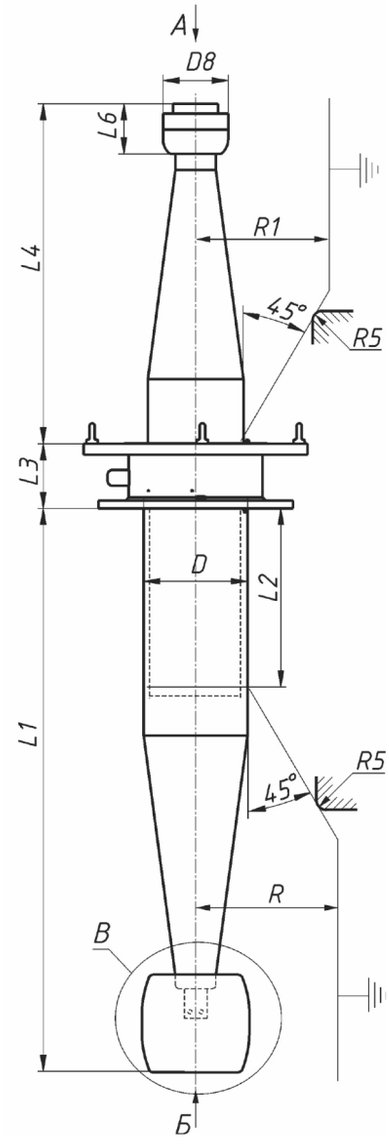
В (fig.3)



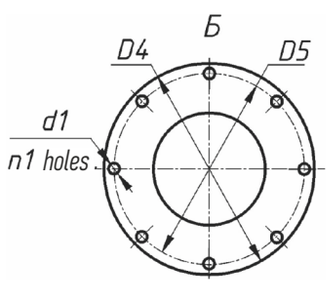
Specifications of Oil - SF6 bushings for switchgear connection

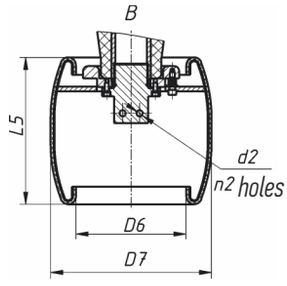
The table presents serial bushings. Custom bushings with any requested features can be designed and manufactured according to special requirements of clients.





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			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		
126 kV										
КТк6-90-126/1000 О	ИВУЕ.686352.401	RIP	126	73	1000	230	—	550	3150	61
172 kV										
КТк6-90-172/800 О	ИВУЕ.686352.092	RIP	172	104	800	275	—	650	2000	86
252 kV										
КТк6-90-252/1600 О	ИВУЕ.686353.085	RIP	252	153	1600	460	—	1050	4000	100
КТк6-90-252/2000 О	ИВУЕ.686353.403	RIP	252	153	2000	505	—	1050	—	160
363 kV										
КТк6-90-363/3150 О	ИВУЕ.686354.055	RIP	363	210	3150	510	950	1175	5000	150
550 kV										
КТк6-90-550/1250 О	ИВУЕ.686355.402	RIP	550	318	1250	680	1175	1675	5000	350
КТк6-90-550/1250 О	ИВУЕ.686355.402-01	RIP	550	318	1250	680	1175	1675	5000	350
КТк6-90-550/1000 О	ИВУЕ.686355.404	RIP	550	318	1000	750	1175	1550	—	480

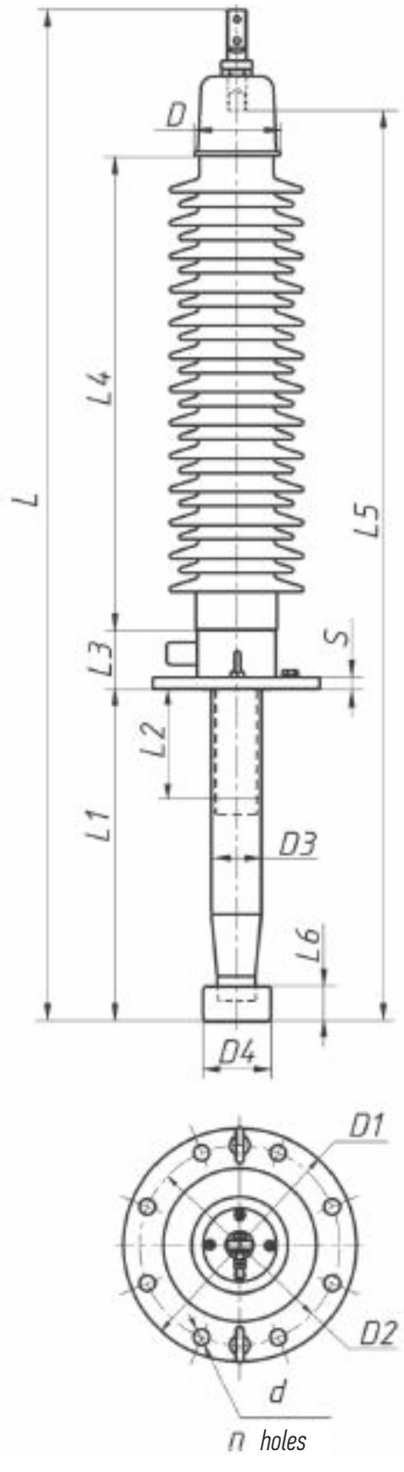




	Fitting and connecting dimensions, mm																	
	L1	L2	L3	L4	L5	D	D1	D2	D3	D4	D5	D6	D7	d/n отв.	d1/n1 отв.	d2/n2 отв.	R	R1
	1010	500	150	520	210	106	335	305	70	290	250	160	190	16/8	15/8	13/2	250	150
	735	0	220	575	230	175	335	305	70	450	400	190	240	16/16	22/12	13/2	270	150
	1060	300	220	745	230	210	570	535	110	450	400	190	240	16/16	20/12	13/2	350	225
	1900	1000	220	770	230	210	565	535	110	450	400	190	240	16/16	24/12	13/2	350	225
	1295	400	200	1050	290	260	690	640	110	500	450	190	240	20/16	23/12	13/2	400	270
	1647	500	200	1050	302	320	690	640	110	600	520	252	352	20/16	25/16	13/4	520	300
	1647	600	200	1050	302	320	690	640	110	600	520	252	352	20/16	25/16	13/4	520	300
	2590	1000	230	1050	330	320	690	640	110	550	500	240	295	20/16	24/12	13/2	520	300

Specifications of SF6 - Air RIP bushings for switchgear

The table presents serial bushings. Custom bushings with any requested features can be designed and manufactured according to special requirements of clients.

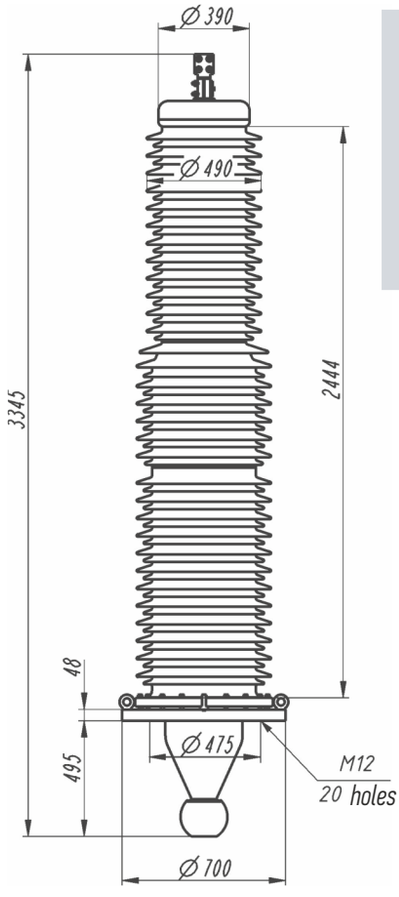


Bushing type	Drawing No.	Type of internal insulation	Maximum operating voltage, effective value, kV	Phase-to-ground voltage, effective value, kV	Rated current, A	Test voltage, kV			Creepage distance, mm	Test cantilever load, N
						1 minute, 50 Hz, effective value	Switching impulse, 250/2500 ms	Lightning impulse full wave, 1.2/50 ms		
ГКТІV-90-126/2000 01	ИВУЕ.686352.702	RIP	125	76	2000	230	—	550	3900	4000

Weight, kg	Fitting and connecting dimensions, mm																		
	L	L1	L2	L3	L4	L5	D	D3	D1	D2	d/n отв.	S	L6	D4	d1/n1 отв.	d2	d3	d4	l
110	2250	390	0	370	1100	—	222	106	330	302	14/8	25	—	—	—	—	—	—	—

Specifications of SF6 - Air RIP gas-insulated bushings for switchgear

The table presents serial bushings. Custom bushings with any requested features can be designed and manufactured according to special requirements of clients.



Bushing type	Drawing No.	Packing. Dimensions (L*W*H), mm	Weight Netto Gross	Type (Drawing No.) of bushing of obsolete design	Type of internal insulation
ВЭКIII-90-252/2000	ИВУЕ.686353.169	4012x1050x980	620/1052	Э(2,8)С-90-220/2000 (ИВЕЮ.686362.001-04)	Sf6 gas
ВЭКIII-90-252/3150	ИВУЕ.686353.169-01	4012x1050x980	623/1055	Э(2,8)С-90-220/2000 (ИВЕЮ.686362.001-04)	Sf6 gas

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	Fitting and connecting dimensions, mm
			1 minute, 50 Hz, effective value	Switching impulse, 250/2500 ms	Lightning impulse full wave, 1.2/50 ms				
252	153	2000	395	—	950	7200	3150	420	specified in the drawing
252	153	3150	395	—	950	7200	5000	423	specified in the drawing

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, 126 kV serial bushings are delivered in 45 days, 252 kV — in 60 days, etc.

What waranty 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, or use our corporate number +7 (495) 727 3311, or email address mosizolyator@mosizolyator.ru

Why bushings with internal RIN-insulation are better than their RIP-insulated predecessors?
Bushings with RIN-insulation, keeping all the properties of their analogs with RIP-insulation, have the following advantages due to new materials and technologies:
- higher reliability and stability of parameters;
- increased service life;
- operation both at extremely low and at extremely high temperatures;
- transportation and storage of bushings without moisture protection measures;
- shortened delivery time of products.

Is moisture protection required for the bottom part of the bushing with RIN insulation during long-term storage?
No, no protective measures are required. This is due to the absence of cellulose in the structure of the RIN-insulation, as a result of which the insulation core is not subject to moistening.
Therefore, a RIN bushing can be stored in factory packing indefinitely.

What are the advantages of the bushings with polymer external insulation as compared to porcelain insulation?
The key advantages of bushings with polymer external insulation:
- fire safety and explosion safety of bushings due to oil-free design;
- tracking erosion resistance;
- high pollution resistance due to high hydrophobic properties of polymers;
- dielectric stregth 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 in white spirit or acetone; do not use abrasive cleaning agents. For detailed information, please get in touch with Izolyator, and appropriate instructions 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 or contact Izolyator directly:
phone: **+7 (495) 727-33-11**
e-mail: **mosizolyator@mosizolyator.ru**

Terms and Acronyms

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 R 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 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 he 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 voltage up to 550 kV inclusive and not over 0.4 T for bushings with voltage 800 kV. The upper part of bushings 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 or current to one or several other systems of alernating voltage and current, usually of different values at the same frequency, for the purpose of transfer of power (GOST 30830-2002).

Dielectric loss tangent (tg) 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 end 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).

RIN (Resin Impregnated Nonwoven) — a polymer nonwoven fabric, impregnated with epoxy compound followed by curing. A type of internal insulation of high-voltage bushings.

RIP (Resin Impregnated Paper) — crape paper, impregnated with epoxy compound with subsequent curing. A type of internal insulation of high-voltage bushings.

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

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We will arrange for an informative plant tour to show all production stages to you.

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