

PNR

Resin Impregnated Paper Bushings
52 to 170 kV

An Alstom Grid entity today, Passoni & Villa has, for more than 80 years, been synonymous with excellence, quality and competence in the field of high voltage.

PASSONI & VILLA
AN ALSTOM COMPANY

A company you can trust to harness your power

Passoni & Villa began producing capacitance-graded bushings in 1924. Today it is acknowledged as one of the world's most reputable manufacturers. Its accumulated experience and expertise have been applied to the design and manufacture of PNR bushings.

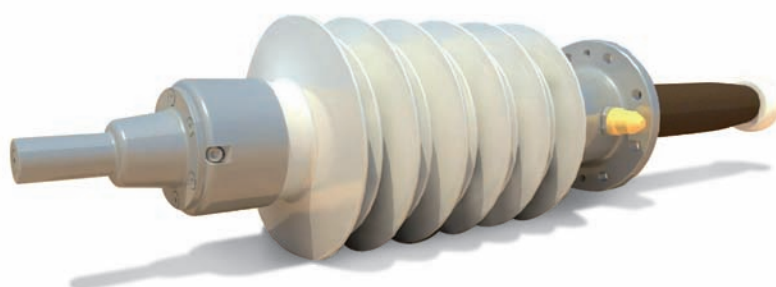
A wealth of benefits

The design, components and manufacturing technology of RIP bushings add up to an average lifetime in excess of 30 years under normal operating conditions.

RIP bushings offer an array of benefits over conventional bushings (oil, gas, etc.), including:

□ Superior design for increased efficiency

- Compact, robust and reliable dry design. RIP solutions suitable for all transformer types and installation configurations are available.
- Partial discharge-free up to double rated voltage
- Excellent mechanical strength
- High thermal strength (class E, 120 °C)
- Low dielectric losses (tg delta < 0.35%)



□ Increased safety for staff, the substation and the environment

RIP bushings are fire and explosion-proof. No oil and no SF₆ mean no environmental costs on end-of-life disposal and no leakage issues. No porcelain on the transformer side

□ Installation flexibility

Ease of transport, handling, storage and installation. Installation, transport and operation are possible in any position.

□ Seismic solution

RIP bushings offer flexible retrofitting possibilities without concern for seismic withstand. They are built with a composite insulator to maximize seismic resistance.

□ Maintenance free

Passoni & Villa RIP bushings are 100% oil and pressure-free, so no specific maintenance or on-site verification are needed.

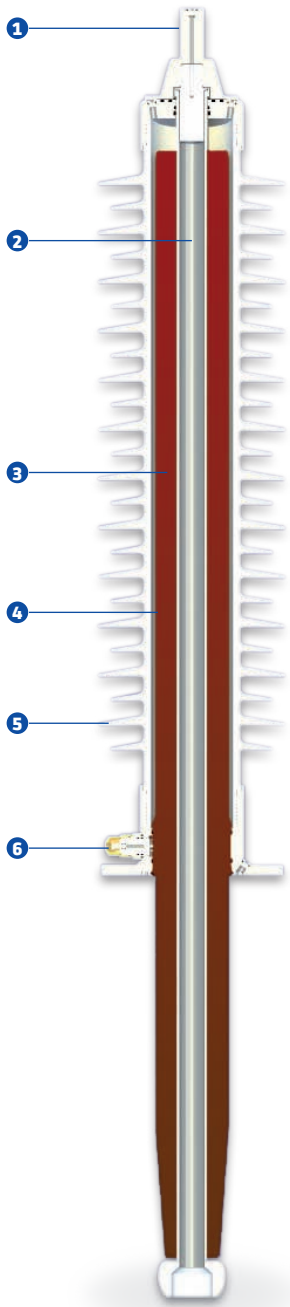
RIP bushings offer an array of benefits over conventional bushings.

Customer Benefits

- Longer lifetime and higher reliability
- Easy transport, handling, storage and installation
- Operational security
- Maintenance-free and environmentally friendly
- Tailored to customer needs
- IEC60137 and IEEE C57.19.01-2000 electrically compliant

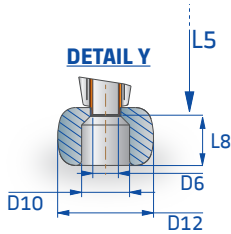
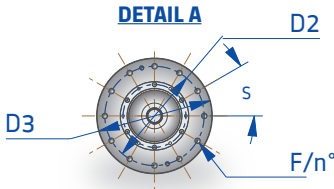
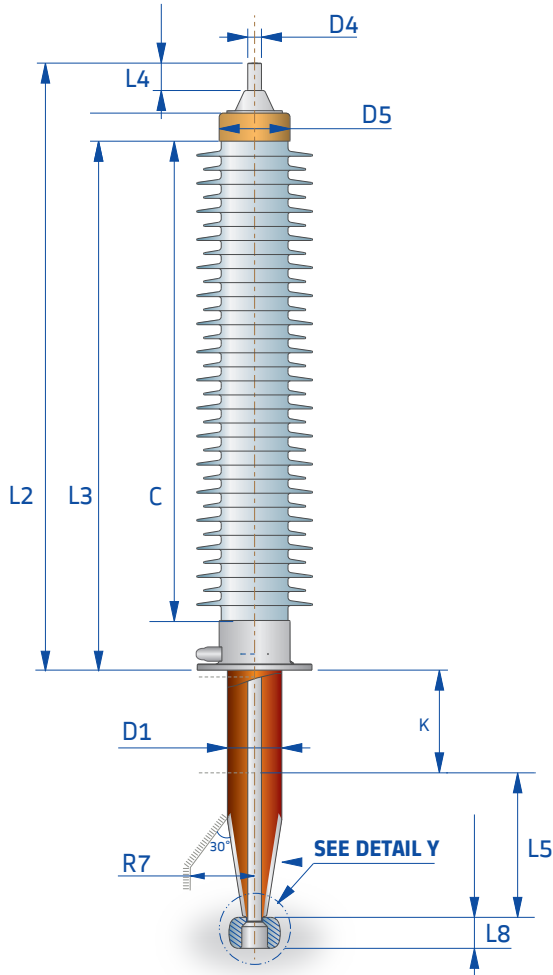
PNR Bushings


Longer life time and higher reliability



- 1. HV Terminal
- 2. Conductor
- 3. RIP insulation
- 4. Polyurethane filling
- 5. Composite insulator
- 6. Test tap

Bushing 52 to 170 kV PNR



Dimensions							
PNR Type		52 kV RIP	72.5 kV RIP	123 kV RIP	145 kV RIP	170 kV RIP	
Rated voltage Um	kV	52	72.5	123	145	170	
Dimensions	C	mm	405	630	1005	1297	1400
	L2	mm	778	1003	1378	1670	1773
	L3	mm	550	775	1150	1442	1545
	L4	mm	80	80	80	80	80
	L5	mm	154	189	324	374	436
	L8	mm	46	46	46	77	77
	K*	mm	0/300	0/300	0/300	0/300	0/300
	D1	mm	87	87	119	129	159
	D2	mm	185	185	250	290	290
	D3	mm	225	225	290	335	335
	D4	mm	40	40	40	40	40
	D5	mm	135	135	167	177	207
	F/n°	mm/n°	16/6	16/6	16/8	16/12	16/12
	D6	mm	40	40	40	40	40
	D10	mm	65	65	65	75	75
D12	mm	109	109	109	150	150	
S		60	60	45	30	30	
R7	mm	80	100	160	200	230	
Weight	kg	25	30	65	92	150	

*Standard

Technical characteristics							
Phase to ground voltage	IEC	kV	30	42	71	84	98
	IEEE	kV	29	44	73	88	102
Test voltage 1 min dry/wet	IEC	kV	105/95	155/140	255/230	305/275	355/325
	IEEE	kV	105/95	160/140	260/230	310/275	365/315
Lightning impulse voltage	IEC	kV	250	325	550	650	750
	IEEE	kV	250	350	550	650	750
Colour of insulator	RAL		7040	7040	7040	7040	7040
Creepage distance	mm		≥ 1720	≥ 2280	≥ 3880	≥ 4510	≥ 5340
Arcing distance	mm		485	690	1060	1225	1475
Cantilever test load 1 min.	N		1600	2000	3150	3150	4000
Partial discharge at double rated voltage	pC		< 5	< 5	< 5	< 5	< 5
Installation			Vertical up to horizontal	Vertical up to horizontal	Vertical up to horizontal	Vertical up to horizontal	Vertical up to horizontal
Test voltage of P.F. tap	kV		1 min. 3 kV	1 min. 3 kV	1 min. 3 kV	1 min. 3 kV	1 min. 3 kV
Installation altitude	m		≤ 1000 m	≤ 1000 m	≤ 1000 m	≤ 1000 m	≤ 1000 m
Operation Temperature	C		-25 °C up + 80 °C	-25 °C up + 80 °C	-25 °C up + 80 °C	-25 °C up + 80 °C	-25 °C up + 80 °C
Rated current ⁽¹⁾							
- Draw-lead	A		1000	1000	800	800	800
- Draw-rod ⁽²⁾	A		2000	1600	1600	1250	1250

(1) Higher ratings available on request / (2) Details will be provided upon request

Alstom Grid dry bushings: they last and last

Flange

The flange is made of aluminum and equipped with lifting holes and a Power Factor tap (tested at 3 kV for 60 s) and/or voltage tap, on request.

Polyurethane filling

The hollow space between the RIP core and the housing is dry-filled with polyurethane. Dry filling totally removes the risk of pollution (as in SF₆ filling) and is totally leakage proof should any damage exceptionally occur. Polyurethane was chosen for its high mechanical and electrical properties. High compressibility polyurethane makes the bushings more resistant to mechanical stress caused by thermal variation.

Top terminal

The standard bushing top terminal is made of aluminum with no surface treatment. On request, it can be supplied in tinned or silvered copper. Draw-lead or draw-rod type bushings (rated current up to 2000 A) have a removable top terminal. This terminal is connected to the copper inner terminal lug or the draw rod by means of multi-blade contacts and is screwed to the bushing head. In bottom-connected bushings, the inner non-removable rod also acts as the top terminal.

Power Factor measuring tap

The PF tap is the connection to outer conducting layer of a capacitance-graded bushing. It is accessible from outside the bushing, insulated from the flange or other fixing device, and measures the dissipation factor, capacitance and partial discharge while the bushing flange is earthed. A suitable fully mounted PF measuring tap is supplied with all RIP bushings.



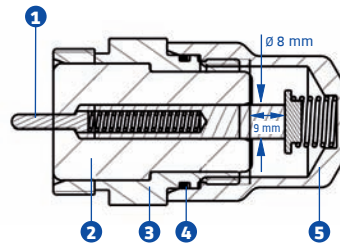
Packing & transportation

After testing and before packing, the bushing is cleaned of any dust. Dry insulated bushings are easy to transport and handle. There is no risk of oil or gas leakage during handling.

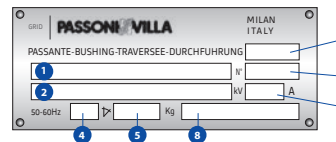
Nameplate

Each bushing is provided with a nameplate containing complete electrical data and its serial number, in accordance with IEC/IEEE standards requirements.

The stainless steel nameplate is secured to the flange with rivets and carries the following information:



1. Measurement electrode
2. Insulating bushing
3. Tap body
4. Gasket
5. Closing and grounding cap



Identification name plate

1. Bushing type
2. Insulating voltages
3. Rated current
4. Maximum mounting angle
5. Weight
6. Serial number
7. Month and year of production
8. (available space)



Test name plate (rated voltage > 100 kV only)



Following the acquisition of PASSONI & VILLA, Alstom Grid now offers a large portfolio of condenser bushings for AC or DC operation. If you require any further information, please address your queries to

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GRID



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