

PTHR

Condenser Bushings 25 kV

OIL-TO-AIR - Resin-Impregnated Paper
High current - ANSI Standards

PASSONI VILLA
AN ALSTOM COMPANY

PTHR bushings are capacitance graded bushings with a resin impregnated paper core and meet ANSI/IEEE C57.19.00-1991: IEEE STANDARD general requirements and test procedures for outdoor power apparatus bushings and ANSI/IEEE C37.23.1987, guide for metal-enclosed bus and calculating losses in isolated-phase bus.

They are designed to be installed in any orientation on a step-up transformer for connection of the transformer windings to a segregate or non-segregate bus-duct. Design, components and manufacturing technology promote an average lifetime in excess of 30 years under normal operation conditions.

The bushing is designated as follows:
PTHR.25.150.14000.X

PTHR	ANSI type Condenser bushings, Resin-Impregnated Paper (RIP) oil-to-air application
25	Insulation class in kV
150	BIL in kV
14000	Rated current in A
X	CT pocket length: S = short (4") M = medium (12") L = long (21")

Customer Benefits

- Bushings with longer lifetime and higher reliability
- Possibility to use bushings under extreme weather condition (lower pour-point value)
- No performance reduction with age
- PD free

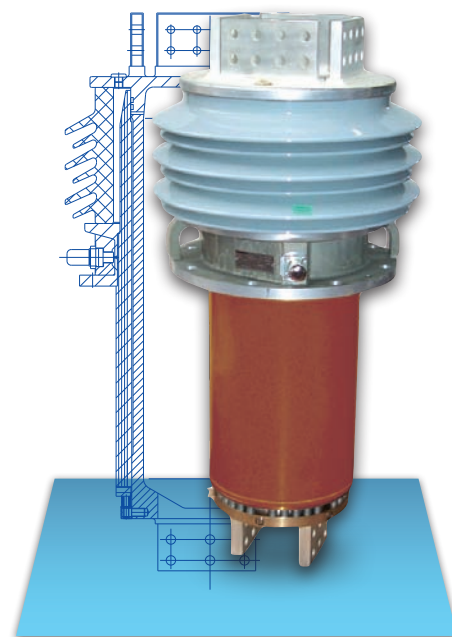


Voltage and current ratings

Standard rated voltage range is 25 kV at 50-60 Hz. Rated current is 5000 A through 14,000 A, and is guaranteed to the following conditions:

- Maximum, hot spot, enclosure and support structure temperature $T_b = 176^\circ\text{F}$ (80°C)
- Maximum transformer oil temperature $T_o = 203^\circ\text{F}$ (95°C)
- Maximum, hot spot, bushing conductor temperature $T_b = 221^\circ\text{F}$ (105°C)
- Maximum silver plated terminal temperature 221°F (105°C)
- Maximum ambient air temperature 104°F (40°C)

Respecting the above conditions, PTHR bushings will function properly regardless of the surrounding air temperature inside the bus-duct.

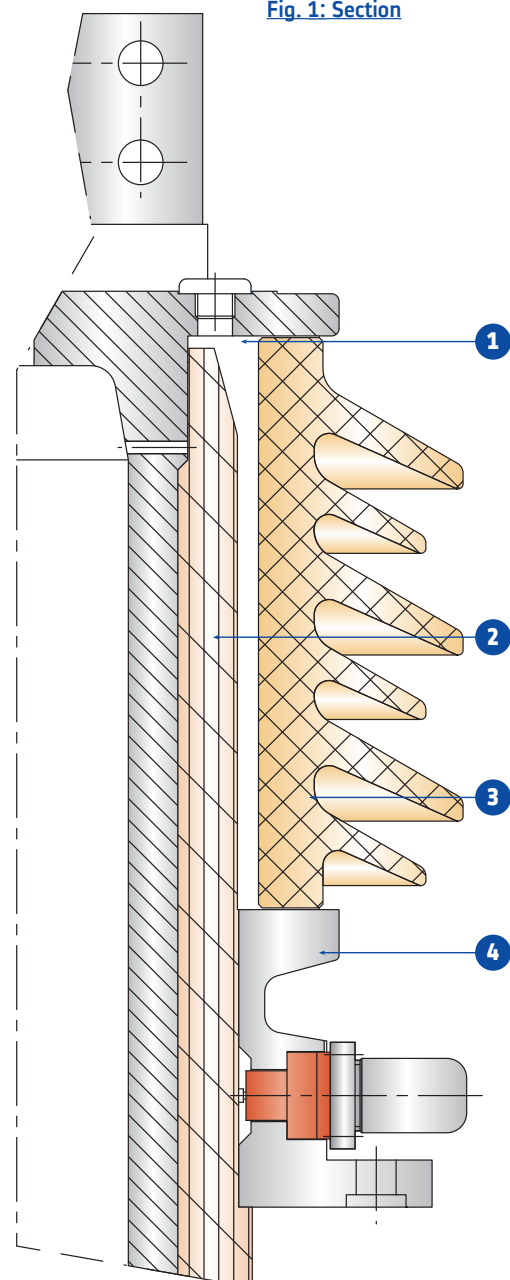


Main features

- Rated voltage 25 kV
- Maximum current rating up to 14,000 A
- Air side: porcelain insulator
- Inner conductor made of aluminum casting
- Dry filling of the interspace between porcelain and condenser body
- Installation in any position
- Flange of cast aluminum alloy
- Flange provided with power factor tap and Buchholz relay connection

Fig. 1: Section

1. Dry filling
2. Condenser
3. Porcelain housing
4. Flange



Manufacturing

The main electrical component is the condenser body that is manufactured using resin-impregnated paper technology. This technology utilizes a continuous sheet of pure crepe paper, wound around a support tube. During the winding process, the first step is to reduce its water content to 1% maximum by drying the paper with heated cylinders and infrared rays. During winding, a series of aluminum foils are coaxially inserted between the layers of the paper in order to grade the best possible distribution of radial and longitudinal electrical gradients between the central conductor and the grounded flanges. The winding and foil placement is made by computer-controlled machines. After winding, each condenser core is placed into an autoclave for resin impregnation under vacuum. Each core is then machined to achieve the final shape.

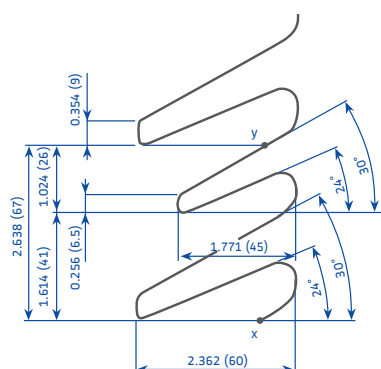
Top and bottom terminals

Both sides of the conductor and the terminals are manufactured by a unique casting of aluminum alloy, which has a conductivity IACS 55%. The air-side surface of the terminals is protected with silver plated coating.

Air side

The air-side insulator is made of light grey MUNSSELL 5B4 7.0/0.4 (ASA 70) porcelain. The typical creepage distance is suitable for a highly polluted atmosphere (VHP) equivalent to 31 mm/kV (1,22"/kV). The shed configuration is alternating-type (short-long sheds), which salt spray testing has proven to be the most effective solution in highly contaminated environments.

Fig. 2: Air-side porcelain profile



The shed profile complies with the IEC 60815 recommendations (fig. 2). The air extremity of the inner conductor of the bushing is provided by two or more palms for the bus bars connection, which are normally enclosed in a metal clad duct.

Flange

The flange is made of an aluminum casting, equipped with following accessories:

- Lifting holes
- Power factor tap (tested at 2 kV for 60 s)
- Buchholz relay connection (1/2" gas outlet plug)

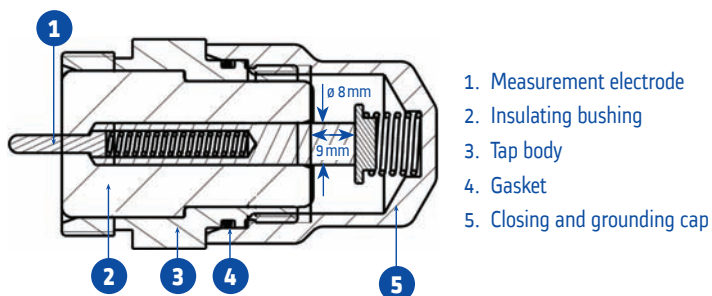
Oil side

The condenser body is immersed in the transformer oil, which stabilizes its temperature, and is hermetically tightened to the flange. The under flange sleeve for the CT pocket is provided in accordance with ANSI/IEEE standards. The oil extremity of the inner conductor is provided with one or more palms for the connection to the transformer winding (fig. 7).

Assembling

Springs located in the bottom end of the oil side provide mechanical coupling of all the parts of the bushing and prevent shifting due to thermal variations.

Fig. 3: Power factor tap



Dry filling

PTHR bushings can be installed in any position, because the internal spaces between porcelain and condenser body are filled with a dry material. This material provides:

- Possibility to install the bushing in any position
- Protection from moisture entrance and condensation

The dry filling improves the reliability in comparison with the oil filled type and makes the installation simpler: no oil leakage and, if horizontally installed, no oil reservoir.

Gaskets

O-ring type gaskets are made of fluorurate elastomer and are compatible with the transformer oil.

The air-side gaskets are carefully protected by a seal, against the influence of pollution and weather.

Tests

All the bushings have electrical characteristics and are tested in compliance with latest edition of ANSI/IEEE C57.19.00-1991: IEEE standard general requirements and test procedure for outdoor power apparatus bushings.

Fig. 5: Flange fixing holes

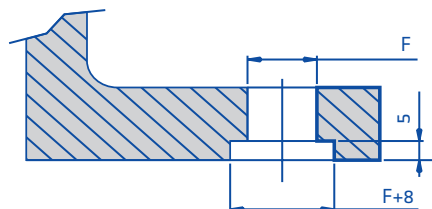


Fig. 6: Buchholz relay connection

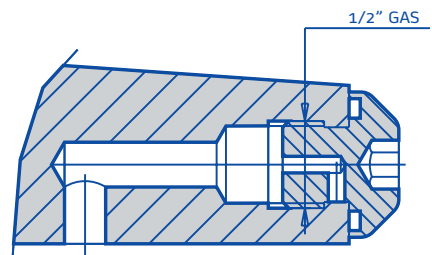
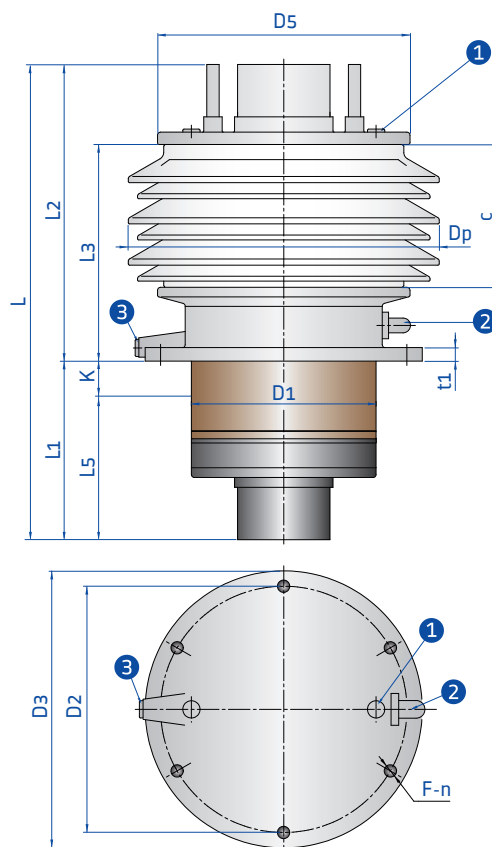


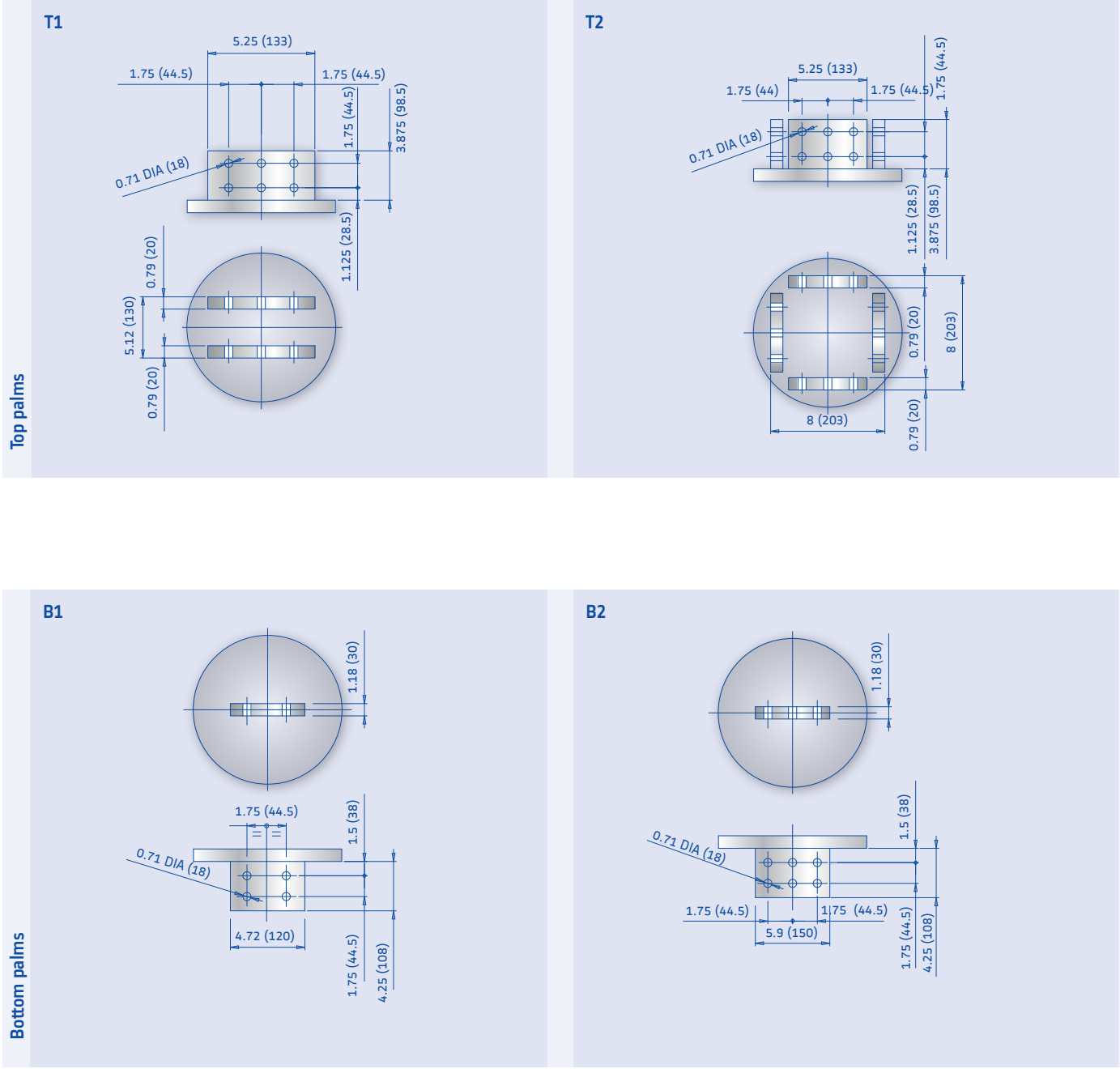
Fig. 4: PTHR dimensions



DIMENSIONS			Nominal system voltage	Rated line-to-earth voltage	Dry power frequency withstand voltage (60")	Wet power frequency withstand voltage (10")	BIL (Dry lightning impulse withstand voltage)	Rated current	K min. (CT pocket)	Min. nominal creepage distance	Free insulation length in air	Pair of sheds (small + large)	Weight	Max. operating altitude
Catalogue number	Type		kV	kV	kV	kV	kV	A	inch (mm)	inch (mm)	inch (mm)	n°	lb (kg)	ft (m)
25.150.5000	S	25.150	5000	25	14	60	50	150	4 (102)	32.5 (826)	9.06 (230)	3	135 (62)	9090 (3000)
25.150.5000	M	25.150							12 (305)				155 (70)	
25.150.5000	L	25.150							21 (533)				170 (78)	
25.150.7000	S	25.150	7000	25	14	60	50	150	4 (102)	32.5 (826)	9.06 (230)	3	165 (75)	9090 (3000)
25.150.7000	M	25.150							12 (305)				187 (85)	
25.150.7000	L	25.150							21 (533)				210 (95)	
25.150.10000	S	25.150	10000	25	14	60	50	150	4 (102)	32.5 (826)	9.06 (230)	3	300 (130)	9090 (3000)
25.150.10000	M	25.150							12 (305)				320 (145)	
25.150.10000	L	25.150							21 (533)				350 (160)	
25.150.14000	S	25.150	14000	25	14	60	50	150	4 (102)	32.5 (826)	9.06 (230)	3	470 (214)	9090 (3000)
25.150.14000	M	25.150							12 (305)				517 (235)	
25.150.14000	L	25.150							21 (533)				572 (260)	

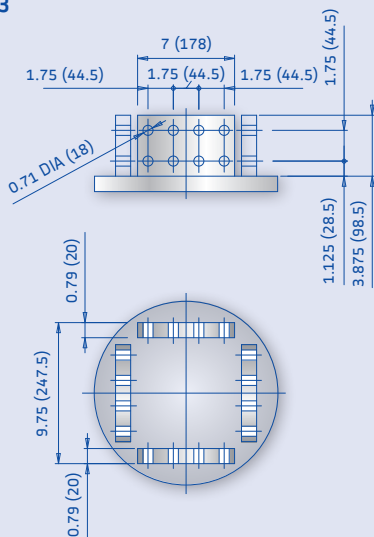
DIMENSIONS																	Top palms - air side (fig. 7)	Bottom palms - oil side (fig. 7)
			L	L1	L2	L3	L5	D1	D2	D3	D5	Dp	n	F	t1			
Catalogue number	Type		inch (mm)	inch (mm)	inch (mm)	inch (mm)	inch (mm)	inch (mm)	inch (mm)	inch (mm)	inch (mm)	inch (mm)	nr	inch (mm)	inch (mm)	type.	type.	
25.150.5000	S	25.150	5000	34.91 (887)	16.01 (407)	18.90 (480)	13.78 (350)	12.01 (305)	7.48 (190)	11.25 (286)	12.75 (324)	10.24 (260)	14.17 (360)	6	0.87 (22)	0.75 (19)	T1	B1
25.150.5000	M	25.150		42.91 (1090)	24.01 (610)													
25.150.5000	L	25.150		51.91 (1318)	33.01 (838)													
25.150.7000	S	25.150	7000	34.91 (887)	16.01 (407)	18.90 (480)	13.78 (350)	12.01 (305)	8.58 (218)	12.25 (311)	13.78 (350)	13.58 (345)	18.16 (445)	6	0.87 (22)	0.75 (19)	T2	B2
25.150.7000	M	25.150		42.91 (1090)	24.01 (610)													
25.150.7000	L	25.150		51.91 (1318)	33.01 (838)													
25.150.10000	S	25.150	10000	34.91 (887)	16.01 (407)	18.90 (480)	13.78 (350)	12.01 (305)	11.81 (300)	15.75 (400)	17.25 (438)	16.14 (410)	19.88 (505)	8	0.87 (22)	0.83 (21)	T3	B3
25.150.10000	M	25.150		42.91 (1090)	24.01 (610)													
25.150.10000	L	25.150		51.91 (1318)	33.01 (838)													
25.150.14000	S	25.150	14000	34.91 (887)	16.01 (407)	18.90 (480)	13.78 (350)	12.01 (305)	14.17 (360)	18.5 (470)	20 (508)	18.11 (460)	21.85 (555)	12	0.87 (22)	0.83 (21)	T4	B4
25.150.14000	M	25.150		42.91 (1090)	24.01 (610)													
25.150.14000	L	25.150		51.91 (1318)	33.01 (838)				17.13 (435)	21.06 (535)	23.23 (590)	20.86 (529.8)	24.6 (625)			0.91 (23)	T5	B5

Fig. 7: Top and bottom palms

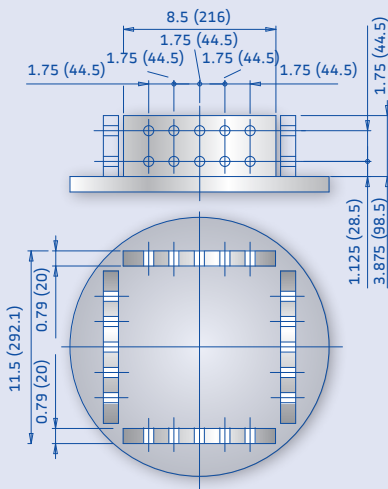


Top palms

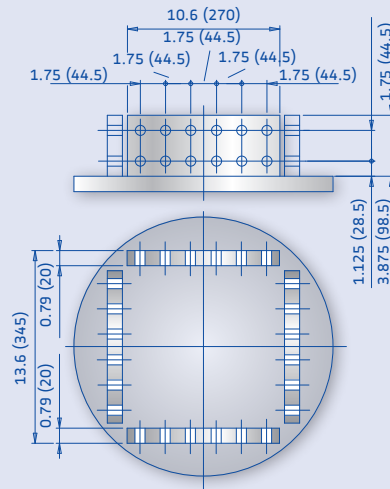
T3



T4

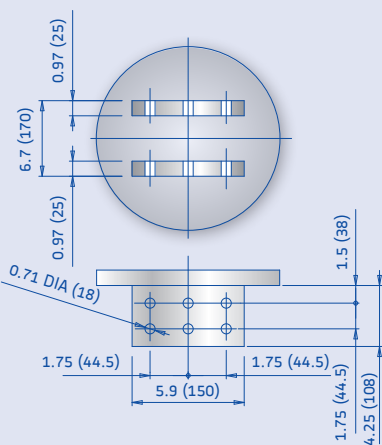


T5

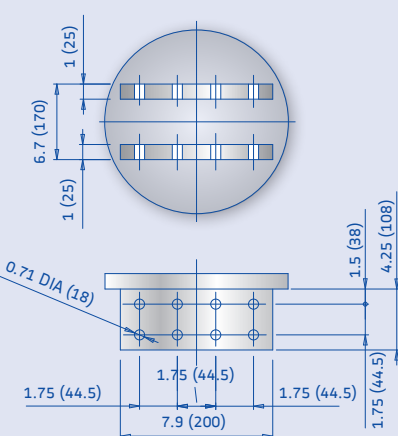


Bottom palms

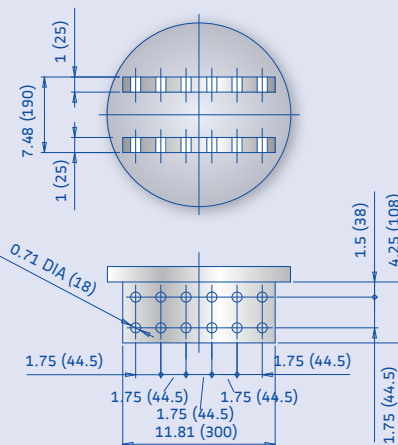
B3



B4



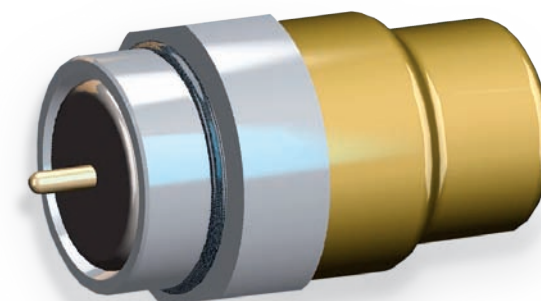
B5



Nameplate

Each bushing is provided with a nameplate which reports its electrical data and serial number, in accordance with the requirements of ANSI Standards. The plate is made of stainless steel and is secured to the flange with rivets (fig. 8-9).

Fig. 8: Nameplate



1. Identification number
2. Bushing code
3. Insulating class
4. Rated maximum line to ground voltage
5. Rated impulse withstand voltage (BIL)
6. Non applicable
7. Rated continuous current
8. Serial number
9. Month and year of final tests
10. Standard references
11. Length below mounting surface
12. Weight
13. Capacitance C1
14. Capacitance C2
15. Power factor value at 20°C (68°F)

Fig. 9: Test nameplate

PASSONI & VILLA
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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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