



PTHR

High Current Condenser Bushing 25 kV Oil-to-Air - Resin Impregnated Paper



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.

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.

Standards

- ANSI/IEEE C57.19.00-1991
- ANSI/IEEE C37.23.1987

Key Benefits

- Bushings with longer lifetime and higher reliability
- Possibility to use bushings under extreme weather condition
- No performance reduction with age
- Partial discharge free
- Installation in any position



PTHR Bushings Main Features

Resin Impregnated Paper High current ANSI Standards

- 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

Bushing Designation 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")

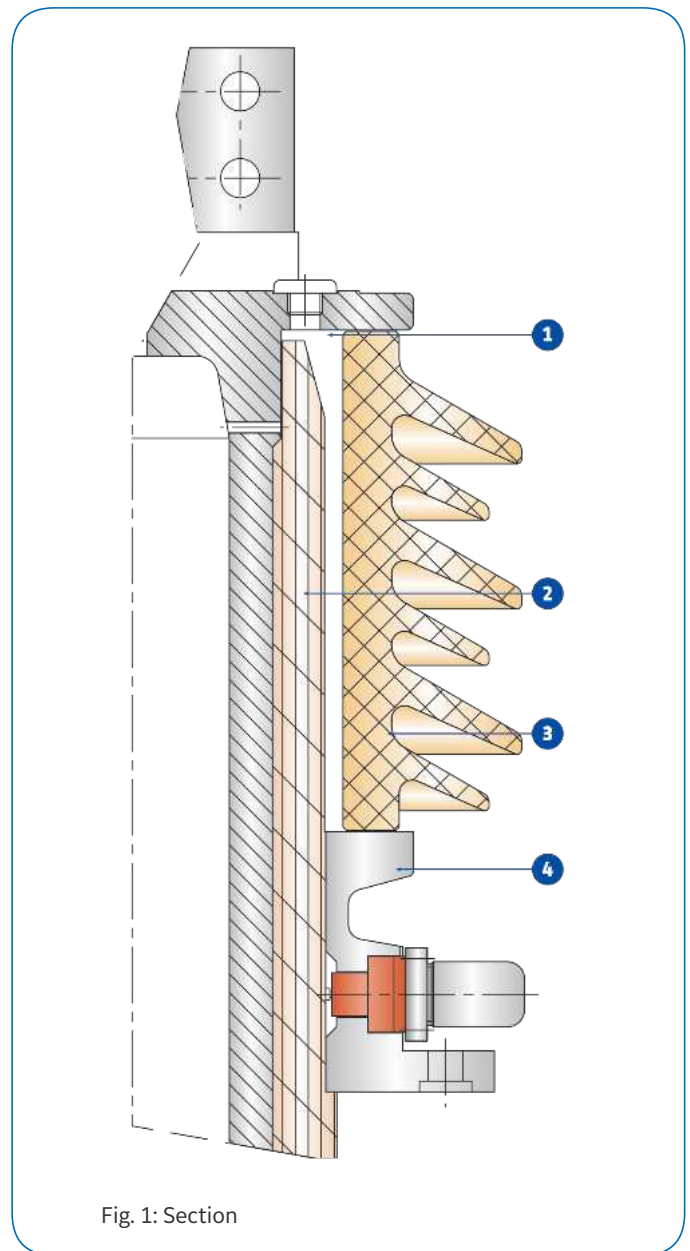


Fig. 1: Section

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 MUNSELL 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.

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. 2: Air-side porcelain profile

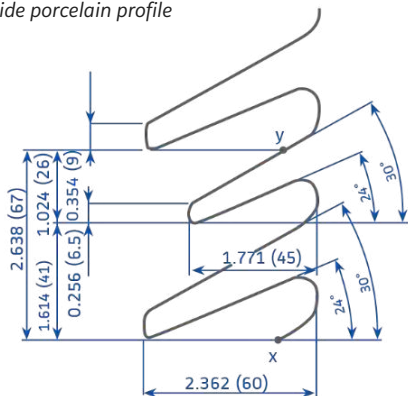
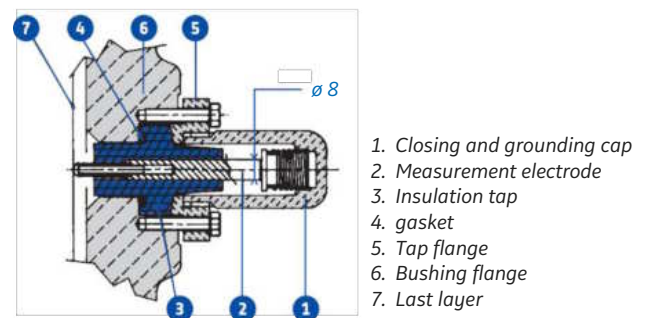


Fig. 3: Power Factor Tap



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.

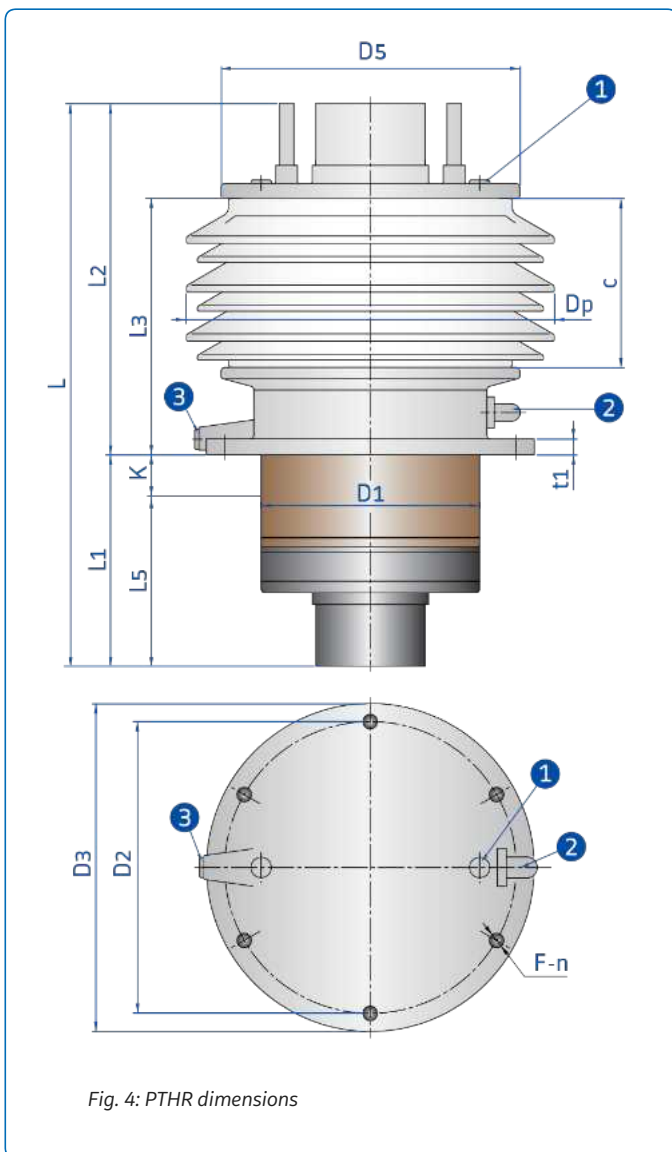


Fig. 4: PTHR dimensions

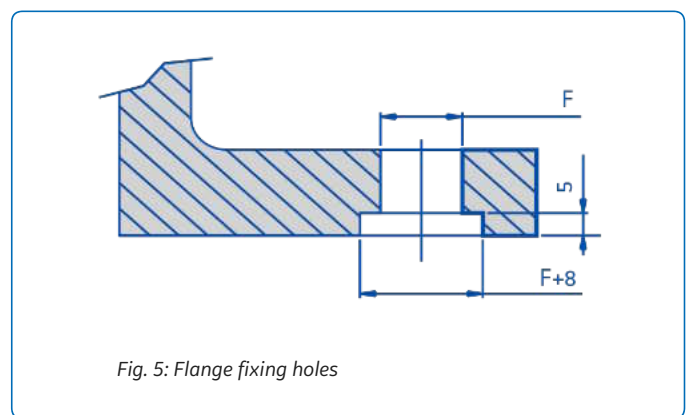


Fig. 5: Flange fixing holes

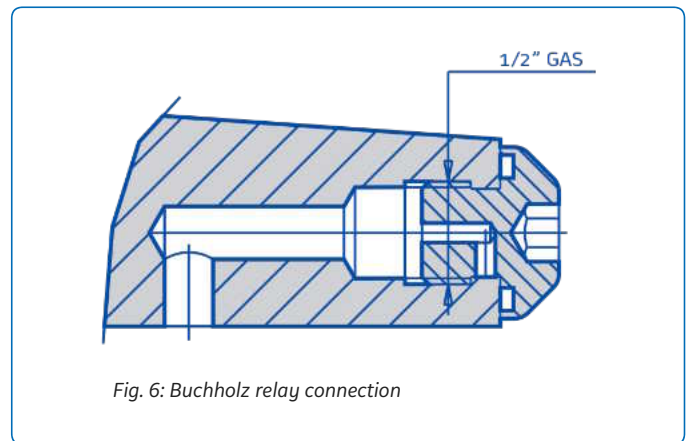


Fig. 6: Buchholz relay connection

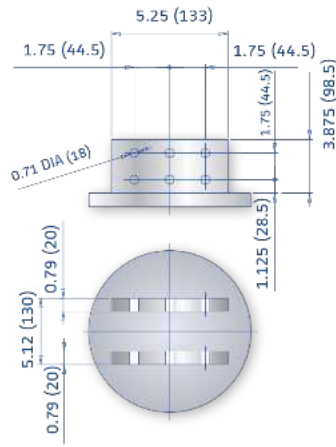
PTHR 25 kV: Ratings / Dimensions

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

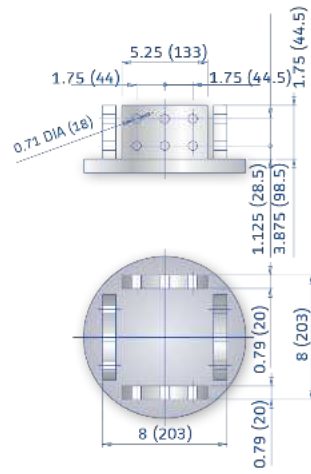
Type	L	L1	L2	L3	L5	D1	D2	D3	D5	Dp	n	F	t1	Top Palm	Bottom Palm
Type	inch (mm)	inch (mm)	inch (mm)	inch (mm)	inch (mm)	inch (mm)	inch (mm)	inch (mm)	inch (mm)	inch (mm)	n°	inch (mm)	inch (mm)	Fig.	Fig.
25.150.5000 S	34.91 (887)	16.01 (407)													
25.150.5000 M	42.91 (1090)	24.01 (610)	18.90 (480)	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 L	51.91 (1318)	33.01 (838)													
25.150.7000 S	34.91 (887)	16.01 (407)													
25.150.7000 M	42.91 (1090)	24.01 (610)	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 L	51.91 (1318)	33.01 (838)													
25.150.10000 S	34.91 (887)	16.01 (407)													
25.150.10000 M	42.91 (1090)	24.01 (610)	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 L	51.91 (1318)	33.01 (838)													
25.150.14000 S	34.91 (887)	16.01 (407)													
25.150.14000 M	42.91 (1090)	24.01 (610)	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 L	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

Top Palms

T1

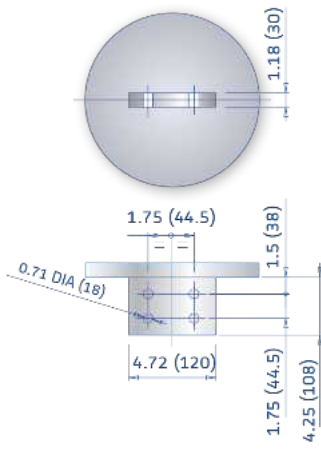


T2



Bottom palms

T1



T2

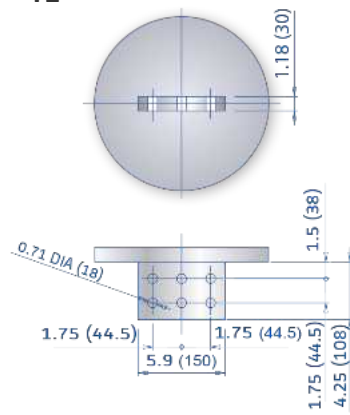
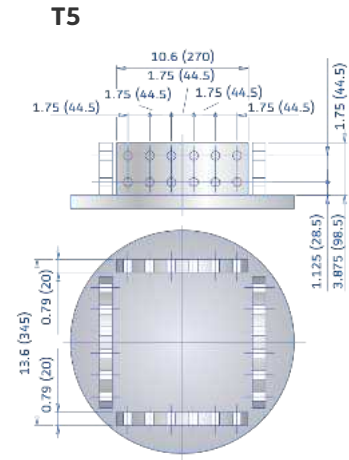
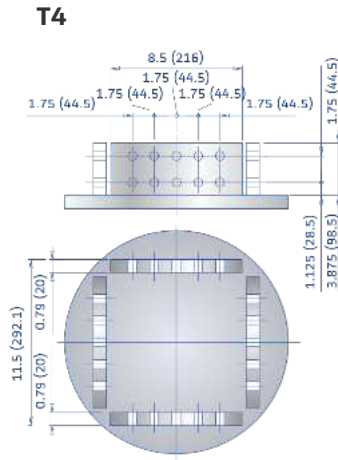
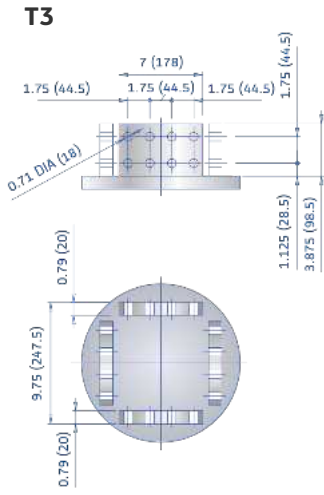
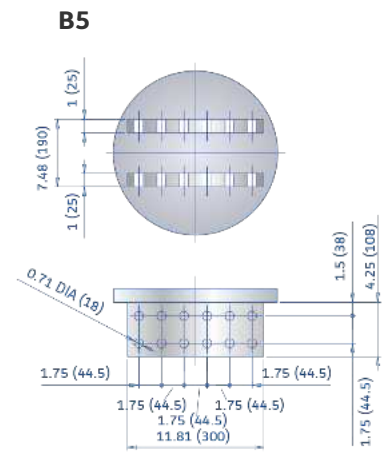
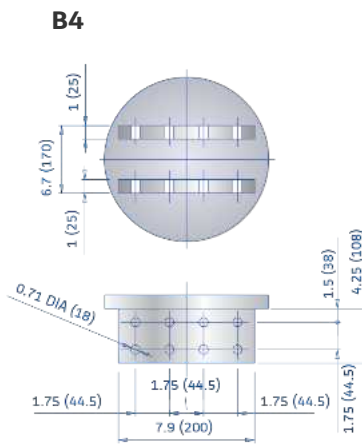
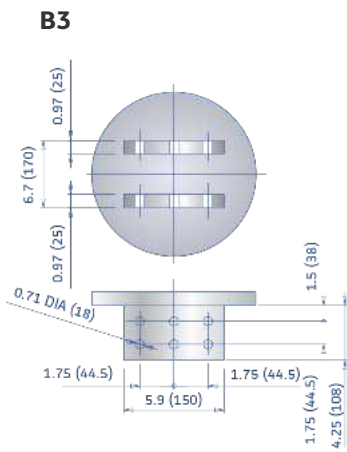


Fig. 7: Top and bottom palms

Top Palms



Bottom palms



Nameplate

Each bushing is provided with a name plate, (fig. 19) with all the electrical data and serial number, in accordance with the prescription of IEC standards. The aluminium plate is placed on the flange by rivets.

Name plate detail

PASSONIVILLA	MILAN ITALY	SERIAL NR.	<input type="text"/>	<input type="text"/>
PASSANTE-BUSHING-TRAVERSEE-DURCHFUEHRUNG				
TYPE <input type="text"/>				
<input type="radio"/>	STD REF.	<input type="text"/>	50-60Hz	<input type="radio"/>
Um	<input type="text"/> kV	BIL/SIL/AC	<input type="text"/> kV	Ir <input type="text"/> A
C1	<input type="text"/> pF	C2	<input type="text"/> pF	P.F. <input type="text"/> % AT 10kV/20°C
<input type="checkbox"/>	°>	<input type="text"/> kg	<input type="text"/>	

Fig. 19: Name Plate

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Imagination at work