



Apparatus Bushings

CRC (Capacitive-Resin-Core)

PIEDMONT CRC BUSHINGS WITH A SILICONE-RUBBER HOUSING HAVE



Comparable Features to Porcelain, Oil-Filled Bushings

- Meet ANSI/IEEE Standards
- Transformer/Breaker Interchangeable
- Power Factor Test Tap
- Capacitance-graded Core
- Name Plate Data

UNIQUE ADVANTAGES OVER PORCELAIN, OIL-FILLED BUSHINGS

- OIL-FREE •
- STRONGER BARRIER AGAINST MOISTURE-INGRESS
- INCREASED RELIABILITY FOR TRANSFORMER OVERLOADING
- BUSHING MOUNTING IN ANY POSITION
- LIGHTNING STRIKE COLLATERAL DAMAGE PROOF
- MORE SEISMIC, VANDAL PROOF
- HUMAN SAFETY ADVANTAGE
- LIGHTER WEIGHT
- MORE HANDLING DAMAGE PROOF
- ACCIDENTAL DAMAGE PROOF
- BUSHING STORAGE IN ANY POSITION
- PROVEN PERFORMANCE OF SILICONE-RUBBER:
 - EXCELLENT WEATHERING
 - EXCELLENT CONTAMINATION SERVICE
 - EXCELLENT MECHANICAL EROSION RESISTANCE
- EASIER ANIMAL GUARD INSTALLATION
- MORE VERSATILE MANUFACTURE OF INTERCHANGEABLE REPLACEMENT BUSHINGS
(NO ADAPTORS REQUIRED)

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PBI capacitance-graded bushings for transformer and oil circuit breaker applications are a proven design based on a series capacitor core using aluminum foils and high dielectric paper impregnated with epoxy resin. PBI CRC bushings meet all ANSI/IEEE standards for outdoor apparatus bushings. Inherent in the design of PBI CRC bushings, as well as being demonstrated in design testing, is superior thermal performance. These bushings will carry the short term overloads specified by ANSI / IEEE transformer standards and those generated by greater transformer peak loading.

Design Features

1. Silicone-Rubber Housing

The outdoor silicone-rubber housing has flexible, durable sheds to provide required leakage and strike distance.

2. Name Plate Data

The name plate located on the mounting flange identifies the bushing by catalog number, serial number, and year of manufacture with electrical ratings and factory measurement data.

3. Power Factor Test Tap

15 through 69 KV bushings have a power factor test tap. The test tap is connected to the ground layer of the capacitor core. An aluminum cap covers the insulated test tap assembly and grounds the tap to the flange when energized.

4. Mounting Flange And Metal Sleeve Assembly

The mounting flange and metal sleeve assembly is made of aluminum for a non-magnetic, corrosion-resistant, high strength service.

5. Paper-Foil Capacitor Core

Conductive layers of aluminum foil with high dielectric paper are wound around the conductor and into the bushing core to produce uniformly valued capacitors in series. This capacitance grading distributes the voltage and the electrical field uniformly throughout the core. The core is vacuum-dried and impregnated with high dielectric epoxy resin.

Operational Features

6. OIL-FREE Bushing

The CRC bushing with a top housing of silicone-rubber is free of oil. No need to worry about oil leaks as with oil-filled apparatus bushings.

7. Fewer Gasket And O-ring Joints With Strong Rubber-To-Resin Bond

The strong bond of silicone-rubber to the core's resin surface, as well as, fewer gasket and o-ring joints eliminate worry of moisture ingress.

8. Increased Reliability

Without the downtime due to bushings with oil leaks and moisture ingress, the electrical system and its equipment have on-line time and revenue generation maximized. PBI CRC bushings with a Silicone-Rubber housing:

- have superior thermal performance, as demonstrated in pilot design testing for thermal cycles from -60°C to 150°C
- are design tested for standard thermal cycles from -55°C to 120°C .
- support the severe demands placed on power transformers, which are continually overloaded today to satisfy greater peak-loads

9. Bushing Mounting Independent Of Orientation

CRC bushing with a silicone-rubber housing can be mounted in any orientation, since it is oil-free. No need for an oil reservoir (and its complications) as required with oil-filled apparatus bushings.

10. Lightning Strike Collateral Damage Proof

A lightning strike can cause an oil-free CRC bushing with a silicone-rubber housing and an oil-filled bushing with a porcelain housing to explode.

- The exploding bushing with a porcelain housing produces flying porcelain fragments that can damage adjacent bushings with a porcelain housing, but these same flying fragments do NOT damage adjacent bushings with a silicone-rubber housing.

Operational Features

- The exploding bushing with a silicone-rubber housing does NOT produce any flying damaging debris for adjacent bushings.

11. More Seismic, Vandal Proof

The silicone-rubber housing with its flexible sheds is much less susceptible to seismic and vandal damage than a brittle porcelain housing with its sheds.

12. Human Safety Advantage

In the event of a violent failure, the CRC bushing with a Silicone Rubber housing will produce NO flying debris of dangerous porcelain fragments, unlike oil-filled bushings with porcelain housings.

13. Lighter Weight And More Easily Handled

CRC bushing with a Silicone-Rubber housing relative to the equivalent oil-filled, graded bushing with a porcelain housing:

- weighs about 20% less
- is less susceptible to handling damage, especially in the field

14. Accidental Damage Proof

The silicone-rubber housing with its silicone-rubber sheds is much less susceptible to accidental damage while in service and during a maintenance outage, as compared to a brittle porcelain housing with its sheds.

15. Excellent Performance In Contaminated Environment

The housing with its sheds made of Silicone-Rubber has:

- a smooth, hydrophobic surface that performs better than a porcelain surface with contamination, such as sea salt, coastal fog, industrial pollution, agricultural dust, chemicals, cooling tower effluent, etc.
- excellent tracking and erosion resistance under electrical stress and pollution
- nearly twice the creepage required for a voltage class, making silicone-rubber more effective in contamination performance

16. Excellent Weathering

Silicone-rubber has excellent weathering performance in sunlight and its ultra violet rays.

17. Excellent Mechanical Abrasion Resistance

The type of silicone rubber used in CRC bushings has proven resistance to mechanical surface erosion caused by solid particles (e.g., sand) impinging on the silicone rubber surface.

18. Proven Performance Of Silicone-Rubber

Over the last twenty years, transmission insulators made with Silicone-Rubber have proven themselves to be very reliable in service and have become the preferred insulator for nearly all Utilities.

19. Easier Animal Guard Installation

Plastic animal guards are more easily installed over a smaller, uniform diameter on the top of CRC bushings as compared to a larger, non uniform diameter on the top of other bushings with oil sight glasses.

Important Features Of PBI CRC Bushing Core

- Vacuum-impregnated with epoxy resin to provide a solid, void-free structure not subject to layer separation and, therefore, internal partial discharge as are resin-bonded cores.
- Core design proven by over 40 years of excellent field service.
- Totally encapsulated resin core that is impervious to harmful conductive particle intrusion (i.e., water, carbon, etc.) unlike the surfaces of varnished paper cores, which crack due to aging.

Application Notes

The PBI CRC bushing is available for voltage classes from 15KV through 69KV. Refer to the table on pages 5, 7 and 9. If the bushing you desire does not appear in the table, contact the factory.

These PBI CRC bushings are fully interchangeable for use in transformers and oil circuit breakers, an outdoor air-to-oil application. For other applications of the PBI CRC bushing in an oil-to-oil, indoor air-to-indoor air, outdoor air-to-indoor air, outdoor air-to-outdoor air, contact the factory.

The current ratings for CRC bushings are shown in the table on pages 5, 7 and 9. The bushing rated at 400 amperes from 25KV through 69KV is drawlead connected. 400/1200 interchangeable bushings have a dual current rating: 400 amperes when drawlead connected and 1200 amperes when bottom connected.

The standard drawlead is a brazing type. The size (current carrying capacity) of the drawlead cable from the transformer winding limits the bushing current rating up to 400 amperes.

Standard CRC bushings, which are OIL-FREE, can be mounted in any orientation.

Grey is the standard color for the silicone-rubber housing and its sheds.

The silicone-rubber housing and its sheds of the standard CRC bushings have:

- The required strike distance to meet ANSI/IEEE electrical requirements up through 10,000 feet above sea level
- Nearly twice the required creepage distance for a voltage class

For more details and technical assistance on CRC bushings, contact the Factory.

Legend

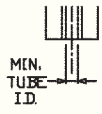
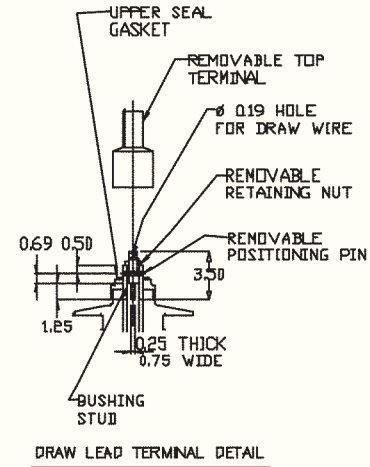
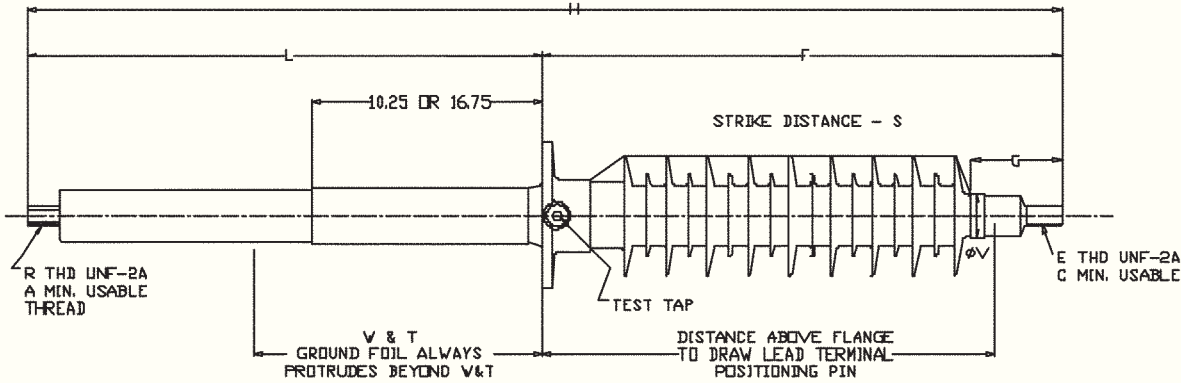


FIGURE #1

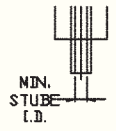


FIGURE #2

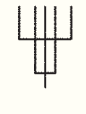


FIGURE #3

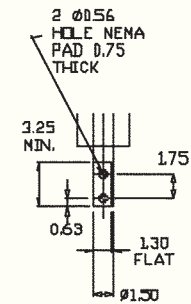


FIGURE #4

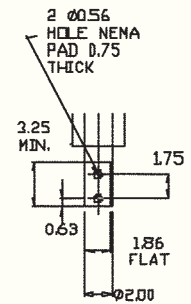


FIGURE #5

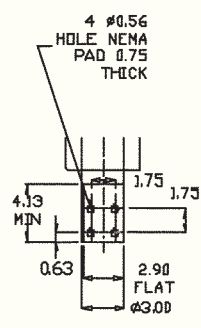
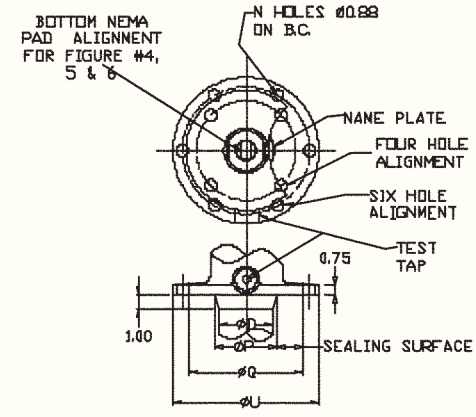


FIGURE #6

BOTTOM TERMINAL VARIATIONS



MOUNTING FLANGE DETAIL

BUSHING CATALOG Number	Voltage Class (KV)	BIL (KV)	Current Rating (Amps)	Min. Oil Level Or CT Pocket Length ("W&T" (in))	Min. Creep (in)	Min. Stike ("S" (in))	Overall Length ("H" (in))	Above Flange ("F" (in))	Below Flange ("L" (in))	Max. Dia. 1" Below Flange ("D" (in))	Length Above Flange To Draw Lead Pin (in)	Live Part		Top Terminal		Bottom Terminal			Min. Tube I.D. ("in")	Sealing and Gasket Surface		Flange Detail			Net Weight (EST) (lbs)
												"G" (in)	"V" (in)	"E" (in)	"C" (in)	"R" (in)	"A" (in)	See Fig.		"P" (in)	"Q" (in)	"N" (in)	B.C. (in)	"U" (in)	
23161	15	110	600	10.00	27	10	31.88	18.38	13.50	3.13	13.50	6.25	2.88	1 1/8-12	2.50	-----	-----	1	1.50	3.38	5.12	4	6.00	8.50	24
23162	15	110	600	16.50	27	10	38.38	18.38	20.00	3.13	13.50	6.25	2.88	1 1/8-12	2.50	-----	-----	1	1.50	3.38	5.12	4	6.00	8.50	26
23163	15	110	600	21.00	27	10	42.88	18.38	24.50	3.13	13.50	6.25	2.88	1 1/8-12	2.50	-----	-----	1	1.50	3.38	5.12	4	6.00	8.50	27
23111	15	110	1200	10.00	28	10.75	31.63	15.13	16.50	2.50	-----	3.38	2.00	1 1/8-12	2.12	1 1/8-12	2.12	3	-----	2.75	5.12	4	6.00	8.50	25
23112	15	110	1200	16.50	28	10.75	38.13	15.13	23.00	2.50	-----	3.38	2.00	1 1/8-12	2.12	1 1/8-12	2.12	3	-----	2.75	5.12	4	6.00	8.50	28
23113	15	110	1200	21.00	28	10.75	42.63	15.13	27.50	2.50	-----	3.38	2.00	1 1/8-12	2.12	1 1/8-12	2.12	3	-----	2.75	5.12	4	6.00	8.50	29
23121	15	110	2000	10.00	27	10	32.75	15.75	17.00	3.13	-----	3.63	2.88	1 1/2-12	2.50	1 1/2-12	2.12	3	-----	3.38	6.38	4	7.25	8.50	37
23121-20	15	110	2000	10.00	27	10	34.75	15.75	19.00	3.13	-----	3.63	2.88	1 1/2-12	2.50	NEMA	-----	4	-----	3.38	6.38	4	7.25	8.50	37
23122	15	110	2000	16.50	27	10	39.25	15.75	23.50	3.13	-----	3.63	2.88	1 1/2-12	2.50	1 1/2-12	2.12	3	-----	3.38	6.38	4	7.25	8.50	43
23122-20	15	110	2000	16.50	27	10	41.25	15.75	25.50	3.13	-----	3.63	2.88	1 1/2-12	2.50	NEMA	-----	4	-----	3.38	6.38	4	7.25	8.50	44
23123	15	110	2000	21.00	27	10	43.75	15.75	28.00	3.13	-----	3.63	2.88	1 1/2-12	2.50	1 1/2-12	2.12	3	-----	3.38	6.38	4	7.25	8.50	47
23123-20	15	110	2000	21.00	27	10	45.75	15.75	30.00	3.13	-----	3.63	2.88	1 1/2-12	2.50	NEMA	-----	4	-----	3.38	6.38	4	7.25	8.50	47
23131	15	110	3000	10.00	22	10.5	34.00	16.00	18.00	4.75	-----	4.25	4.63	3-12	3.00	3-12	3.00	3	-----	5.12	8.38	6	9.25	10.62	103
23131-30	15	110	3000	10.00	22	10.5	36.00	16.00	20.00	4.75	-----	4.25	4.63	3-12	3.00	NEMA	-----	6	-----	5.12	8.38	6	9.25	10.62	101
23131-40	15	110	3000	10.00	22	10.5	36.00	16.00	20.00	4.75	-----	4.25	4.63	2-12	3.00	NEMA	-----	6	-----	5.12	8.38	6	9.25	10.62	97
23132	15	110	3000	16.50	22	10.5	40.50	16.00	24.50	4.75	-----	4.25	4.63	3-12	3.00	3-12	3.00	3	-----	5.12	8.38	6	9.25	10.62	123
23132-30	15	110	3000	16.50	22	10.5	42.50	16.00	26.50	4.75	-----	4.25	4.63	3-12	3.00	NEMA	-----	6	-----	5.12	8.38	6	9.25	10.62	121
23132-40	15	110	3000	16.50	22	10.5	42.50	16.00	26.50	4.75	-----	4.25	4.63	2-12	3.00	NEMA	-----	6	-----	5.12	8.38	6	9.25	10.62	117
23133	15	110	3000	21.00	22	10.5	45.00	16.00	29.00	4.75	-----	4.25	4.63	3-12	3.00	3-12	3.00	3	-----	5.12	8.38	6	9.25	10.62	135
23133-30	15	110	3000	21.00	22	10.5	47.00	16.00	31.00	4.75	-----	4.25	4.63	3-12	3.00	NEMA	-----	6	-----	5.12	8.38	6	9.25	10.62	133
23133-40	15	110	3000	21.00	22	10.5	47.00	16.00	31.00	4.75	-----	4.25	4.63	2-12	3.00	NEMA	-----	6	-----	5.12	8.38	6	9.25	10.62	129
23201	25	150	400	10.00	40	14	38.13	21.63	16.50	3.13	16.75	6.25	2.88	1 1/8-12	2.50	-----	-----	1	1.19	3.38	6.38	4	7.25	8.50	29
23202	25	150	400	16.50	40	14	44.63	21.63	23.00	3.13	16.75	6.25	2.88	1 1/8-12	2.50	-----	-----	1	1.19	3.38	6.38	4	7.25	8.50	32
23293	25	150	400/1200	21.00	40	14	51.13	21.63	29.50	3.13	16.75	6.25	2.88	1 1/2-12	2.50	1 1/2-12	2.12	2	0.88	3.38	6.38	4	7.25	8.50	48
23211	25	150	1200	10.00	40	14	36.00	19.00	17.00	3.13	-----	3.63	2.88	1 1/2-12	2.50	1 1/2-12	2.12	3	-----	3.38	6.38	4	7.25	8.50	41
23211-20	25	150	1200	10.00	40	14	38.00	19.00	19.00	3.13	-----	3.63	2.88	1 1/2-12	2.50	NEMA	-----	4	-----	3.38	6.38	4	7.25	8.50	42
23212	25	150	1200	16.50	40	14	42.50	19.00	23.50	3.13	-----	3.63	2.88	1 1/2-12	2.50	1 1/2-12	2.12	3	-----	3.38	6.38	4	7.25	8.50	48
23212-20	25	150	1200	16.50	40	14	44.50	19.00	25.50	3.13	-----	3.63	2.88	1 1/2-12	2.50	NEMA	-----	4	-----	3.38	6.38	4	7.25	8.50	48
23213	25	150	1200	21.00	40	14	48.50	19.00	29.50	3.13	-----	3.63	2.88	1 1/2-12	2.50	1 1/2-12	2.12	3	-----	3.38	6.38	4	7.25	8.50	53
23213-20	25	150	1200	21.00	40	14	50.50	19.00	31.50	3.13	-----	3.63	2.88	1 1/2-12	2.50	NEMA	-----	4	-----	3.38	6.38	4	7.25	8.50	53

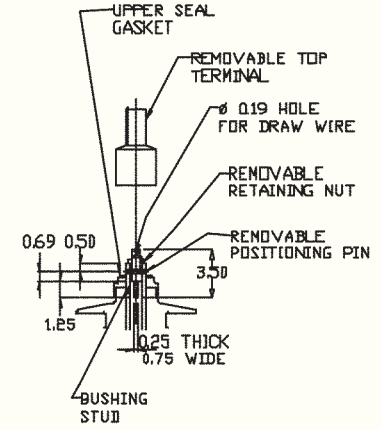
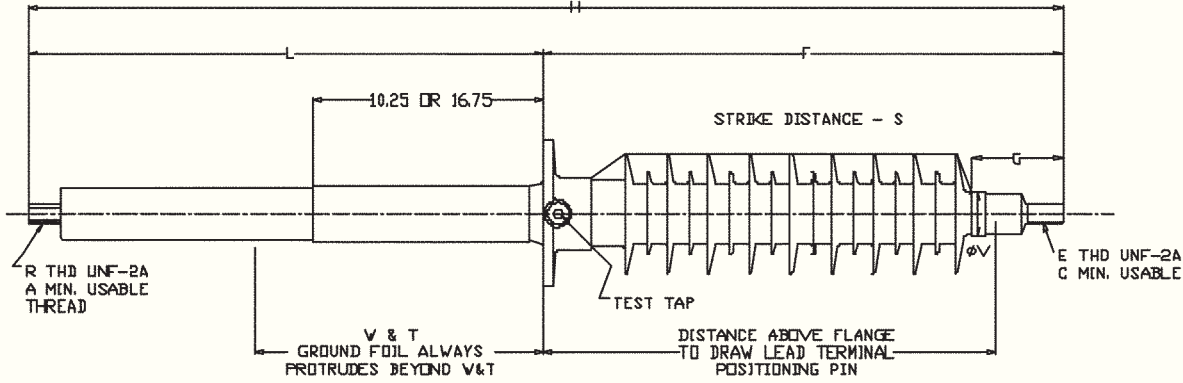
EXAMPLE: 2 3 2 1 3 - 2 0 = 25KV, 150 BIL, 1200DAMPS WITH 21" MIN. OIL LEVEL OR CT POCKET LENGTH, TWO HOLE NEMA PAD AT BOTTOM AND 1 1/2-12 THREAD AT TOP FROM DATA SHEET, THE DETAIL OF ITS BOTTOM TERMINAL IS AS SHOWN IN FIGURE 4

NO.	KV	BIL	NO.	CURRENT RATING, A	NO.	MIN. OIL LEVEL OR CT POCKET LENGTH	NO.	
1	15	110	0	400 (DRAW LEAD)	1	10	NONE	STANDARD BUSHING
2	25	150	1	1200	2	16.5	10	TWO HOLE NEMA PAD AT BOTTOM AND 2-12 THREAD AT TOP
3	34.5	200	2	2000	3	21	20	TWO HOLE NEMA PAD AT BOTTOM AND 1 1/2-12 THREAD AT TOP
4	46	250	3	3000			30	FOUR HOLE NEMA PAD AT BOTTOM AND 3-12 THREAD AT TOP
5	69	350	6	600 (DRAW LEAD)			40	FOUR HOLE NEMA PAD AT BOTTOM AND 2-12 THREAD AT TOP
			9	400/1200 (DRAW LEAD/BOTTOM CONNECTION)				

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Legend



DRAW LEAD TERMINAL DETAIL

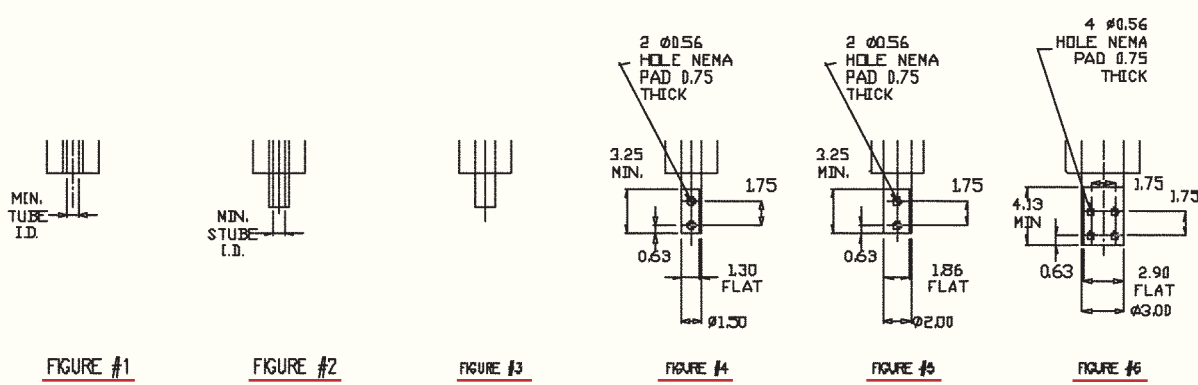
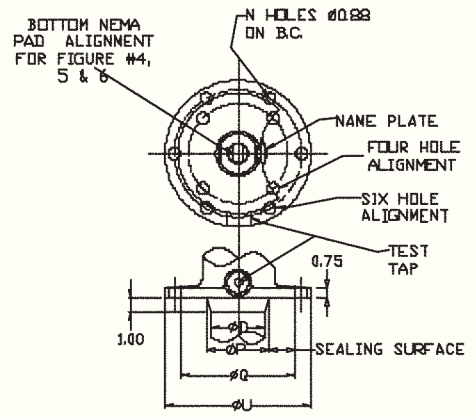


FIGURE #1 FIGURE #2 FIGURE #3 FIGURE #4 FIGURE #5 FIGURE #6

BOTTOM TERMINAL VARIATIONS



MOUNTING FLANGE DETAIL

BUSHING CATALOG Number	Voltage Class	BIL	Current Rating	Min. Oil Level Or CT Pocket Length	Min. Creep	Min. Stike	Overall Length	Above Flange	Below Flange	Max. Dia. 1" Below Flange	Length Above Flange To Draw Lead Pin	Live Part		Top Terminal		Bottom Terminal			Min. Tube I.D.	Sealing and Gasket Surface		Flange Detail			Net Weight (EST)
												"G"	"V"	"E"	"C"	"R"	"A"	See Fig.		"P"	"Q"	"N"	B.C.	"U"	
23221	25	150	2000	10.00	30	14	35.50	18.50	17.00	4.00	-----	3.75	2.88	2-12	2.50	2-12	2.12	3	-----	4.50	6.38	4	7.25	10.62	64
23221-10	25	150	2000	10.00	30	14	37.50	18.50	19.00	4.00	-----	3.75	2.88	2-12	2.50	NEMA	-----	5	-----	4.50	6.38	4	7.25	10.62	64
23221-20	25	150	2000	10.00	30	14	37.50	18.50	19.00	4.00	-----	3.75	2.88	1 1/2-12	2.50	NEMA	-----	5	-----	4.50	6.38	4	7.25	10.62	63
23222	25	150	2000	16.50	30	14	42.50	18.50	24.00	4.00	-----	3.75	2.88	2-12	2.50	2-12	2.12	3	-----	4.50	6.38	4	7.25	10.62	75
23222-10	25	150	2000	16.50	30	14	44.50	18.50	26.00	4.00	-----	3.75	2.88	2-12	2.50	NEMA	-----	5	-----	4.50	6.38	4	7.25	10.62	75
23222-20	25	150	2000	16.50	30	14	44.50	18.50	26.00	4.00	-----	3.75	2.88	1 1/2-12	2.50	NEMA	-----	5	-----	4.50	6.38	4	7.25	10.62	74
23223	25	150	2000	21.00	30	14	48.00	18.50	29.50	4.00	-----	3.75	2.88	2-12	2.50	2-12	2.12	3	-----	4.50	6.38	4	7.25	10.62	83
23223-10	25	150	2000	21.00	30	14	50.00	18.50	31.50	4.00	-----	3.75	2.88	2-12	2.50	NEMA	-----	5	-----	4.50	6.38	4	7.25	10.62	84
23223-20	25	150	2000	21.00	30	14	50.00	18.50	31.50	4.00	-----	3.75	2.88	1 1/2-12	2.50	NEMA	-----	5	-----	4.50	6.38	4	7.25	10.62	82
23231	25	150	3000	10.00	30	13.5	38.50	19.00	19.50	4.75	-----	4.25	4.63	3-12	3.00	3-12	3.00	3	-----	5.12	8.38	6	9.25	10.62	117
23231-30	25	150	3000	10.00	30	13.5	40.50	19.00	21.50	4.75	-----	4.25	4.63	3-12	3.00	NEMA	-----	6	-----	5.12	8.38	6	9.25	10.62	115
23231-40	25	150	3000	10.00	30	13.5	40.50	19.00	21.50	4.75	-----	4.25	4.63	2-12	3.00	NEMA	-----	6	-----	5.12	8.38	6	9.25	10.62	111
23232	25	150	3000	16.50	30	13.5	45.00	19.00	26.00	4.75	-----	4.25	4.63	3-12	3.00	3-12	3.00	3	-----	5.12	8.38	6	9.25	10.62	136
23232-30	25	150	3000	16.50	30	13.5	47.00	19.00	28.00	4.75	-----	4.25	4.63	3-12	3.00	NEMA	-----	6	-----	5.12	8.38	6	9.25	10.62	134
23232-40	25	150	3000	16.50	30	13.5	47.00	19.00	28.00	4.75	-----	4.25	4.63	2-12	3.00	NEMA	-----	6	-----	5.12	8.38	6	9.25	10.62	130
23233	25	150	3000	21.00	30	13.5	49.50	19.00	30.50	4.75	-----	4.25	4.63	3-12	3.00	3-12	3.00	3	-----	5.12	8.38	6	9.25	10.62	148
23233-30	25	150	3000	21.00	30	13.5	51.50	19.00	32.50	4.75	-----	4.25	4.63	3-12	3.00	NEMA	-----	6	-----	5.12	8.38	6	9.25	10.62	146
23233-40	25	150	3000	21.00	30	13.5	51.50	19.00	32.50	4.75	-----	4.25	4.63	2-12	3.00	NEMA	-----	6	-----	5.12	8.38	6	9.25	10.62	142
23301	34.5	200	400	10.00	51	17	43.63	25.13	18.50	3.13	20.25	6.25	2.88	1 1/8-12	2.50	-----	-----	1	1.19	3.38	6.38	4	7.25	8.50	32
23302	34.5	200	400	16.50	51	17	50.13	25.13	25.00	3.13	20.25	6.25	2.88	1 1/8-12	2.50	-----	-----	1	1.19	3.38	6.38	4	7.25	8.50	35
23393	34.5	200	400/1200	21.00	51	17	56.63	25.13	31.50	3.13	20.25	6.25	2.88	1 1/2-12	2.50	1 1/2-12	2.12	2	0.88	3.38	6.38	4	7.50	8.50	53
23311	34.5	200	1200	10.00	51	17	41.50	22.50	19.00	3.13	-----	3.63	2.88	1 1/2-12	2.50	1 1/2-12	2.12	3	-----	3.38	6.38	4	7.25	8.50	47
23311-20	34.5	200	1200	10.00	51	17	43.50	22.50	21.00	3.13	-----	3.63	2.88	1 1/2-12	2.50	NEMA	-----	4	-----	3.38	6.38	4	7.25	8.50	48
23312	34.5	200	1200	16.50	51	17	52.00	22.50	29.50	3.13	-----	3.63	2.88	1 1/2-12	2.50	1 1/2-12	2.12	3	-----	3.38	6.38	4	7.25	8.50	57
23312-20	34.5	200	1200	16.50	51	17	54.00	22.50	31.50	3.13	-----	3.63	2.88	1 1/2-12	2.50	NEMA	-----	4	-----	3.38	6.38	4	7.25	8.50	57
23313	34.5	200	1200	21.00	51	17	54.00	22.50	31.50	3.13	-----	3.63	2.88	1 1/2-12	2.50	1 1/2-12	2.12	3	-----	3.38	6.38	4	7.25	8.50	59
23313-20	34.5	200	1200	21.00	51	17	56.00	22.50	33.50	3.13	-----	3.63	2.88	1 1/2-12	2.50	NEMA	-----	4	-----	3.38	6.38	4	7.25	8.50	59
23321	34.5	200	2000	10.00	38	17	43.00	22.50	20.50	4.00	-----	3.75	3.25	2-12	2.50	2-12	2.12	3	-----	4.50	6.38	4	7.25	10.62	77
23321-10	34.5	200	2000	10.00	38	17	45.00	22.50	22.50	4.00	-----	3.75	3.25	2-12	2.50	NEMA	-----	5	-----	4.50	6.38	4	7.25	10.62	77
23321-20	34.5	200	2000	10.00	38	17	45.00	22.50	22.50	4.00	-----	3.75	3.25	1 1/2-12	2.50	NEMA	-----	5	-----	4.50	6.38	4	7.25	10.62	76
23322	34.5	200	2000	16.50	38	17	48.50	22.50	26.00	4.00	-----	3.75	3.25	2-12	2.50	2-12	2.12	3	-----	4.50	6.38	4	7.25	10.62	86
23322-10	34.5	200	2000	16.50	38	17	50.50	22.50	28.00	4.00	-----	3.75	3.25	2-12	2.50	NEMA	-----	5	-----	4.50	6.38	4	7.25	10.62	86
23322-20	34.5	200	2000	16.50	38	17	50.50	22.50	28.00	4.00	-----	3.75	3.25	1 1/2-12	2.50	NEMA	-----	5	-----	4.50	6.38	4	7.25	10.62	85
23323	34.5	200	2000	21.00	38	17	54.00	22.50	31.50	4.00	-----	3.75	3.25	2-12	2.50	2-12	2.12	3	-----	4.50	6.38	4	7.25	10.62	94
23323-10	34.5	200	2000	21.00	38	17	56.00	22.50	33.50	4.00	-----	3.75	3.25	2-12	2.50	NEMA	-----	5	-----	4.50	6.38	4	7.25	10.62	94
23323-20	34.5	200	2000	21.00	38	17	56.00	22.50	33.50	4.00	-----	3.75	3.25	1 1/2-12	2.50	NEMA	-----	5	-----	4.50	6.38	4	7.25	10.62	93
23331	34.5	200	3000	10.00	39	17	44.50	23.00	21.50	4.75	-----	4.25	4.63	3-12	3.00	3-12	3.00	3	-----	5.13	8.38	6	9.25	10.62	133
23331-30	34.5	200	3000	10.00	39	17	46.50	23.00	23.50	4.75	-----	4.25	4.63	3-12	3.00	NEMA	-----	6	-----	5.13	8.38	6	9.25	10.62	131
23331-40	34.5	200	3000	10.00	39	17	46.50	23.00	23.50	4.75	-----	4.25	4.63	2-12	3.00	NEMA	-----	6	-----	5.13	8.38	6	9.25	10.62	127
23332	34.5	200	3000	16.50	39	17	51.00	23.00	28.00	4.75	-----	4.25	4.63	3-12	3.00	3-12	3.00	3	-----	5.13	8.38	6	9.25	10.62	153
23332-30	34.5	200	3000	16.50	39	17	53.00	23.00	30.00	4.75	-----	4.25	4.63	3-12	3.00	NEMA	-----	6	-----	5.13	8.38	6	9.25	10.62	151
23332-40	34.5	200	3000	16.50	39	17	53.00	23.00	30.00	4.75	-----	4.25	4.63	2-12	3.00	NEMA	-----	6	-----	5.13	8.38	6	9.25	10.62	147
23333	34.5	200	3000	21.00	39	17	55.50	23.00	32.50	4.75	-----	4.25	4.63	3-12	3.00	3-12	3.00	3	-----	5.13	8.38	6	9.25	10.62	165
23333-30	34.5	200	3000	21.00	39	17	57.50	23.00	34.50	4.75	-----	4.25	4.63	3-12	3.00	NEMA	-----	6	-----	5.13	8.38	6	9.25	10.62	164
23333-40	34.5	200	3000	21.00	39	17	57.50	23.00	34.50	4.75	-----	4.25	4.63	2-12	3.00	NEMA	-----	6	-----	5.13	8.38	6	9.25	10.62	160



BUSHING CATALOG Number	Voltage Class (kV)	BIL (kV)	Current Rating (Amps)	Min. Oil Level Or CT Pocket Length "W&T" (in)	Min. Creep (in)	Min. Stike "S" (in)	Overall Length "H" (in)	Above Flange "F" (in)	Below Flange "L" (in)	Max. Dia. 1" Below Flange "D" (in)	Length Above Flange To Draw Lead Pin (in)	Live Part		Top Terminal		Bottom Terminal			Min. Tube I.D. "in"	Sealing and Gasket Surface		Flange Detail			Net Weight (EST) (lbs)
												"G" (in)	"V" (in)	"E" (in)	Min. Thd. "C" (in)	Thread Size OR Other "R" (in)	Min. Thd "A" (in)	See Fig.		"P" (in)	"Q" (in)	No. of Holes "N"	B.C. (in)	"U" (in)	
23401	46	250	400	10.00	49	21	50.13	29.63	20.50	4.00	24.75	6.38	3.25	1 1/8-12	2.50	-----	-----	1	1.19	4.50	7.62	4	8.50	10.62	45
23402	46	250	400	16.50	49	21	56.63	29.63	27.00	4.00	24.75	6.38	3.25	1 1/8-12	2.50	-----	-----	1	1.19	4.50	7.62	4	8.50	10.62	53
23493	46	250	400/1200	21.00	49	21	60.50	27.00	33.50	4.00	24.75	6.38	3.25	1 1/2-12	2.50	1 1/2-12	2.12	2	0.88	4.50	7.62	4	8.25	10.62	77
23411	46	250	1200	10.00	49	21	49.50	27.00	22.50	4.00	-----	3.75	3.25	1 1/2-12	2.50	1 1/2-12	2.12	3	-----	4.50	7.62	4	8.25	10.62	65
23411-20	46	250	1200	10.00	49	21	51.50	27.00	24.50	4.00	-----	3.75	3.25	1 1/2-12	2.50	NEMA	-----	4	-----	4.50	7.62	4	8.25	10.62	66
23412	46	250	1200	16.50	49	21	58.50	27.00	31.50	4.00	-----	3.75	3.25	1 1/2-12	2.50	1 1/2-12	2.12	3	-----	4.50	7.62	4	8.25	10.62	79
23412-20	46	250	1200	16.50	49	21	60.50	27.00	33.50	4.00	-----	3.75	3.25	1 1/2-12	2.50	NEMA	-----	4	-----	4.50	7.62	4	8.25	10.62	79
23413	46	250	1200	21.00	49	21	60.50	27.00	33.50	4.00	-----	3.75	3.25	1 1/2-12	2.50	1 1/2-12	2.12	3	-----	4.50	7.62	4	8.25	10.62	81
23413-20	46	250	1200	21.00	49	21	62.50	27.00	35.50	4.00	-----	3.75	3.25	1 1/2-12	2.50	NEMA	-----	4	-----	4.50	7.62	4	8.25	10.62	81
23421	46	250	2000	10.00	49	21	49.50	27.00	22.50	4.00	-----	3.75	3.25	2-12	2.50	2-12	2.12	3	-----	4.50	7.62	4	8.25	10.62	87
23421-10	46	250	2000	10.00	49	21	51.50	27.00	24.50	4.00	-----	3.75	3.25	2-12	2.50	NEMA	-----	5	-----	4.50	7.62	4	8.25	10.62	88
23421-20	46	250	2000	10.00	49	21	51.50	27.00	24.50	4.00	-----	3.75	3.25	1 1/2-12	2.50	NEMA	-----	5	-----	4.50	7.62	4	8.25	10.62	86
23422	46	250	2000	16.50	49	21	57.00	27.00	30.00	4.00	-----	3.75	3.25	2-12	2.50	2-12	2.12	3	-----	4.50	7.62	4	8.25	10.62	99
23422-10	46	250	2000	16.50	49	21	59.00	27.00	32.00	4.00	-----	3.75	3.25	2-12	2.50	NEMA	-----	5	-----	4.50	7.62	4	8.25	10.62	100
23422-20	46	250	2000	16.50	49	21	59.00	27.00	32.00	4.00	-----	3.75	3.25	1 1/2-12	2.50	NEMA	-----	5	-----	4.50	7.62	4	8.25	10.62	98
23423	46	250	2000	21.00	49	21	60.50	27.00	33.50	4.00	-----	3.75	3.25	2-12	2.50	2-12	2.12	3	-----	4.50	7.62	4	8.25	10.62	104
23423-10	46	250	2000	21.00	49	21	62.50	27.00	35.50	4.00	-----	3.75	3.25	2-12	2.50	NEMA	-----	5	-----	4.50	7.62	4	8.25	10.62	105
23423-20	46	250	2000	21.00	49	21	62.50	27.00	35.50	4.00	-----	3.75	3.25	1 1/2-12	2.50	NEMA	-----	5	-----	4.50	7.62	4	8.25	10.62	104

EXAMPLE: 2 3 2 1 3 - 20 = 25kV, 150 BIL, 120DAMPS WITH 21" MIN. OIL LEVEL OR CT POCKET LENGTH,
TWO HOLE NEMA PAD AT BOTTOM AND 1 1/2-12 THREAD AT TOP
FROM DATA SHEET, THE DETAIL OF ITS BOTTOM TERMINAL IS AS SHOWN IN FIGURE 4

NO.	KV	BIL	NO.	CURRENT RATING, A	NO.	MIN. OIL LEVEL OR CT POCKET LENGTH	NO.	
1	15	110	0	400 (DRAW LEAD)	1	10	NONE	STANDARD BUSHING
2	25	150	1	1200	2	16.5	10	TWO HOLE NEMA PAD AT BOTTOM AND 2-12 THREAD AT TOP
3	34.5	200	2	2000	3	21	20	TWO HOLE NEMA PAD AT BOTTOM AND 1 1/2-12 THREAD AT TOP
4	46	250	3	3000			30	FOUR HOLE NEMA PAD AT BOTTOM AND 3-12 THREAD AT TOP
5	69	350	6	600 (DRAW LEAD)			40	FOUR HOLE NEMA PAD AT BOTTOM AND 2-12 THREAD AT TOP
			9	400/1200 (DRAW LEAD/BOTTOM CONNECTION)				

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PBI
Apparatus Bushings
CRC (Capacitive-Resin-Core)



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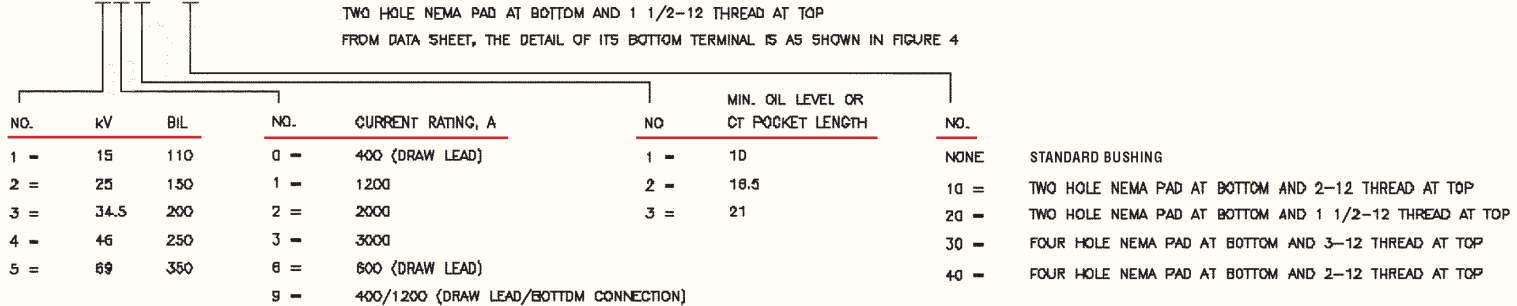
BUSHING CATALOG Number	Voltage Class (kV)	BIL (kV)	Current Rating (Amps)	Min. Oil Level Or CT Pocket Length ("W&T" (in))	Min. Creep (in)	Min. Stike ("S" (in))	Overall Length ("H" (in))	Above Flange ("F" (in))	Below Flange ("L" (in))	Max. Dia. 1" Below Flange ("D" (in))	Length Above Flange To Draw Lead Pin (in)	Live Part		Top Terminal		Bottom Terminal			Min. Tube I.D. ("in")	Sealing and Gasket Surface		Flange Detail			Net Weight (EST) (lbs)
												"G" (in)	"V" (in)	Thread Size "E"	Min. Thd. "C" (in)	Thread Size OR Other "R"	Min. Thd "A" (in)	See Fig.		"P" (in)	"Q" (in)	No. of Holes "N"	B.C. (in)	"U" (in)	
23501	69	350	400	10.00	70	30	61.88	37.88	24.00	4.00	33.00	6.38	3.25	1 1/8-12	2.50	-----	-----	1	1.19	4.50	8.38	6	9.25	10.62	58
23502	69	350	400	16.50	70	30	68.38	37.88	30.50	4.00	33.00	6.38	3.25	1 1/8-12	2.50	-----	-----	1	1.19	4.50	8.38	6	9.25	10.62	62
23593	69	350	400/1200	21.00	70	30	75.38	37.88	37.50	4.00	33.00	6.38	3.25	1 1/2-12	2.50	1 1/2-12	2.12	2	0.88	4.50	8.38	6	9.25	10.62	88
23511	69	350	1200	10.00	70	30	61.75	35.25	26.50	4.00	-----	3.75	3.25	1 1/2-12	2.50	1 1/2-12	2.12	3	-----	4.50	8.38	6	9.25	10.62	84
23511-20	69	350	1200	10.00	70	30	62.75	35.25	27.50	4.00	-----	3.75	3.25	1 1/2-12	2.50	NEMA	-----	4	-----	4.50	8.38	6	9.25	10.62	84
23512	69	350	1200	16.50	70	30	68.75	35.25	33.50	4.00	-----	3.75	3.25	1 1/2-12	2.50	1 1/2-12	2.12	3	-----	4.50	8.38	6	9.25	10.62	93
23512-20	69	350	1200	16.50	70	30	70.75	35.25	35.50	4.00	-----	3.75	3.25	1 1/2-12	2.50	NEMA	-----	3	-----	4.50	8.38	6	9.25	10.62	93
23513	69	350	1200	21.00	70	30	72.75	35.25	37.50	4.00	-----	3.75	3.25	1 1/2-12	2.50	1 1/2-12	2.12	3	-----	4.50	8.38	6	9.25	10.62	99
23513-20	69	350	1200	21.00	70	30	74.75	35.25	39.50	4.00	-----	3.75	3.25	1 1/2-12	2.50	NEMA	-----	4	-----	4.50	8.38	6	9.25	10.62	99
23521	69	350	2000	10.00	70	30	61.75	35.25	26.50	4.75	-----	3.75	3.25	2-12	2.50	2-12	2.12	3	-----	5.13	8.38	6	9.25	10.62	115
23521-10	69	350	2000	10.00	70	30	63.75	35.25	28.50	4.75	-----	3.75	3.25	2-12	2.50	NEMA	-----	5	-----	5.13	8.38	6	9.25	10.62	115
23521-20	69	350	2000	10.00	70	30	63.75	35.25	28.50	4.75	-----	3.75	3.25	1 1/2-12	2.50	NEMA	-----	5	-----	5.13	8.38	6	9.25	10.62	114
23522	69	350	2000	16.50	70	30	68.75	35.25	33.50	4.75	-----	3.75	3.25	2-12	2.50	2-12	2.12	3	-----	5.13	8.38	6	9.25	10.62	128
23522-10	69	350	2000	16.50	70	30	70.75	35.25	35.50	4.75	-----	3.75	3.25	2-12	2.50	NEMA	-----	5	-----	5.13	8.38	6	9.25	10.62	128
23522-20	69	350	2000	16.50	70	30	70.75	35.25	35.50	4.75	-----	3.75	3.25	1 1/2-12	2.50	NEMA	-----	5	-----	5.13	8.38	6	9.25	10.62	127
23523	69	350	2000	21.00	70	30	72.75	35.25	37.50	4.75	-----	3.75	3.25	2-12	2.50	2-12	2.12	3	-----	5.13	8.38	6	9.25	10.62	135
23523-10	69	350	2000	21.00	70	30	74.75	35.25	39.50	4.75	-----	3.75	3.25	2-12	2.50	NEMA	-----	5	-----	5.13	8.38	6	9.25	10.62	135
23523-20	69	350	2000	21.00	70	30	74.75	35.25	39.50	4.75	-----	3.75	3.25	1 1/2-12	2.50	NEMA	-----	5	-----	5.13	8.38	6	9.25	10.62	134



EXAMPLE: 2 3 2 1 3 - 20 = 25kV, 150 BIL, 12DDAMPS WITH 21" MIN. OIL LEVEL OR CT POCKET LENGTH,

TWO HOLE NEMA PAD AT BOTTOM AND 1 1/2-12 THREAD AT TOP

FROM DATA SHEET, THE DETAIL OF ITS BOTTOM TERMINAL IS AS SHOWN IN FIGURE 4



Replacement Bushings

Finding a replacement for ANSI bushings is intended to be straight forward, since the ANSI/IEEE standards define the dimensions from the mounting flange to the bottom terminal. Therefore, electrical and dimensional interchangeability are ensured for ANSI standard bushings made by different manufacturers such as General Electric, Locke, Ohio Brass, ABB, Westinghouse, McGraw, Lapp, and others.

Finding a replacement for a bushing NOT made to the ANSI/ IEEE standard is much more difficult. PBI uses a bushing analysis system to document and guarantee dimensional and electrical interchangeability between the old bushing and the replacement bushing. Use of flange and terminal adapters is minimized by the flexibility of the Piedmont manufacturing process.

The completed bushing analysis with prints of the replacement bushing and any required adapters is sent to the customer for review.

If changes to the suggested replacement bushing are desired, such as a silicone-rubber housing with a longer strike distance, a specific request should be made. This customer request will be reviewed and resolved.

Top level data (e.g., bushing and adapter catalog numbers) will be taken from each individual bushing analysis and compiled by bushing manufacturer into a Bushing Replacement Reference. The Bushing Replacement Reference will be available in hard copy and in electronic copy.

For over thirty years, manufacturing of high quality dielectric products has occurred in the factory located in Woodruff, South Carolina, during which time affiliations were had with ITE and ABB.

Now our quality management system is certified to be in compliance with the International Quality System Standard ISO 9001 and Q9001-2000.

Besides apparatus bushings, other dielectric products include:

- Entrance bushings
- Polykeram insulators
- Line sensors
- Instrument transformers

For more details and technical assistance on these dielectric products, contact the Factory.

PBI Commitment

PBI is committed to becoming a major supplier of capacitance-graded bushings to transformer manufacturers for new equipment and to end-users for replacement requirements. For more details and technical assistance on CRC bushings, contact the **Factory**, or **first**, visit us on-line at www.pb-i.com at any time of the day to obtain:

- an indepth presentation
- catalog and prints as well as, to order CRC bushings from our on-line catalog using our **secure** shopping cart ordering system.



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