

## LV Bushing

5/8" Conductor - Integral Flange

1.0" Conductor - Integral Flange

## Bushings

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LV Bushings: 5/8", 1.0"

General Information and Ratings



**5/8" Integral Flange Bushing**



**1.0" Integral Flange Bushing**

## General Description

The ABB low voltage bushings are designed for use on pad or surface mounted distribution transformers. They serve to terminate the transformer's internal low voltage leads at the tank wall and to provide a standard threaded connection for the external low voltage circuit.

## Certification

To Certify the product ratings, production samples of the 5/8" and 1" diameter low voltage bushing rated through 600 volt were tested. The tests were conducted at the ABB Engineering Laboratories in Alamo, TN and Raleigh, NC. The tests were conducted in accordance with ANSI/IEEE.

## Design Tests

The design tests were divided into (3) three parts:

1. Dielectric Tests
  - Impulse test
  - Low Frequency 60 Hz Withstand test
2. Mechanical Strength Tests
  - Leak test
  - Stud Interface Strength test
  - Stud Torque Strength test
  - Cantilever test
  - Flange Torque test
3. Environmental Tests
  - Thermal Cycle test
  - Oil Compatibility test

### 1. Dielectric Tests

#### • Impulse Test

The purpose of this test is to verify the impulse withstand of the bushing. Sample bushings were subjected to two positive and two negative full wave impulses. The voltage impulse used was a standard 1.2 x 50  $\mu$ s wave having the crest value of the specified voltage. The voltage level attained was well above the BIL rating of 30 kV. Samples successfully passed 36 kV impulse test levels. Samples successfully passed chopped wave tests well above the rating of 36 kV.

#### • Low Frequency 60 Hz Withstand Test

The purpose of the low frequency withstand test is to verify the integrity of the insulation structure of the bushing at operating frequency. The samples were tested at 12 kV for one minute and then allowed to rest for one minute. They were then retested for another minute. All samples passed this test.

### 2. Mechanical Strength Tests

#### • Leak Test

The purpose of the leak test is to ensure that, over the life of the bushing, no leak will occur between the copper stud and the polyester resin. The bushings were tested using two methods. For the first method, sample bushings were tested by mounting them in a tank pressurized to 30 psi and submerging the tank in water for 1 minute. For the second method, the bushings were attached to a leak test fixture which mates the bushing to a Helium detector (Veeco Instruments). A vacuum is created around

the internal surfaces of the bushing. Any leak will be detected if Helium passes into the detector through the bushing. All bushings passed with no indication of leaking air when submerged in water or leaks faster than  $1 \times 10^{-9}$  atm cc/sec using the Helium detector.

#### • Stud Interface Strength Test

The purpose of this test is to verify that no damage will result when bushing terminals are connected or removed. With the bushings attached to simulate transformer mounting, a nut is threaded onto the threaded copper stud and torqued to 50 ft-lb twenty times. The bushings are then leak tested to verify that the seal between the copper stud and the polyester resin remained intact.

#### • Stud Torque Strength Test

The purpose of this test is to verify the strength of the copper stud. Two brass nuts separated by a steel washer are screwed onto the threaded portion of the bushing simulating the attachment of a standard H-spade. The nut is tightened until failure. The average torque value was 92 ft-lb for the 5/8" stud and 199 ft-lb for the 1" stud. In all cases either the threads stripped or the stud broke.

#### • Cantilever Test

This test demonstrates the ability of the bushing to withstand the stresses generated when attaching line leads to the conductor. With the bushings attached to simulate transformer mounting, an extension is threaded onto the bushing stud and a load applied until failure. With a configuration of one hole down on the integral flange, the average failure occurred at 172 ft-lb for the 5/8" stud, and 421 ft-lb for the 1" stud bushing.

#### • Flange Torque Test

The purpose of the flange torque test is to demonstrate the ability of the integral flange to withstand the stresses generated while being mounted to a transformer tank. The bushing is mounted to the test fixture with the mounting bolts tightened to the standard 90 in-lb. The bolts are sequentially tightened in increments of 25 in-lb until failure. The pads crushed at an average torque of 516 in-lb.

### 3. Environmental Tests

#### • Thermal Cycle Test

The purpose of the thermal cycle test is to verify the integrity of materials used in the bushing over the expected service life of the bushing. The sample bushings previously leak tested were subjected to 20 thermal cycles in air. One cycle consists of: a 2 hour transition to 135°C, 2 hours at 135°C, a 4 hour transition from 135°C to -40°C, then 2 hours at -40°C. After the thermal cycle test, the bushings were tested again with no bushing showing any indication of leaking.

#### • Oil Compatibility Test

The purpose of this test is to verify that the bushing will not degrade the transformer's oil as it ages. Samples of bushings are aged under controlled conditions in a test vessel containing transformer oil. At the conclusion of the test, the molding material is tested for degradation. The material passed the standard oil compatibility test. In addition, this bushing is molded from a thermoset polyester resin system which has essentially the same chemistry as that which has been used for insulators in other oil filled apparatus for over 30 years.

# ABB

CONDUCTOR MATERIAL	"A"	THREAD	BUSHING ONLY	BUSHING & GASKET	BUSHING & CONTACT NUT	BUSHING & GASKET & CONTACT NUT
COPPER	5/8"	STANDARD	609C10TG01	9820A48G01	9820A48G09	9820A48G05
COPPER	5/8"	EXTENDED	609C10TG11	9820A48G14	9820A48G23	9820A48G18
COPPER	1.0"	STANDARD	609C10TG07	9820A48G02	9820A48G12	9820A48G07
COPPER	1.0"	EXTENDED	609C10TG13	9820A48G15	9820A48G25	9820A48G21

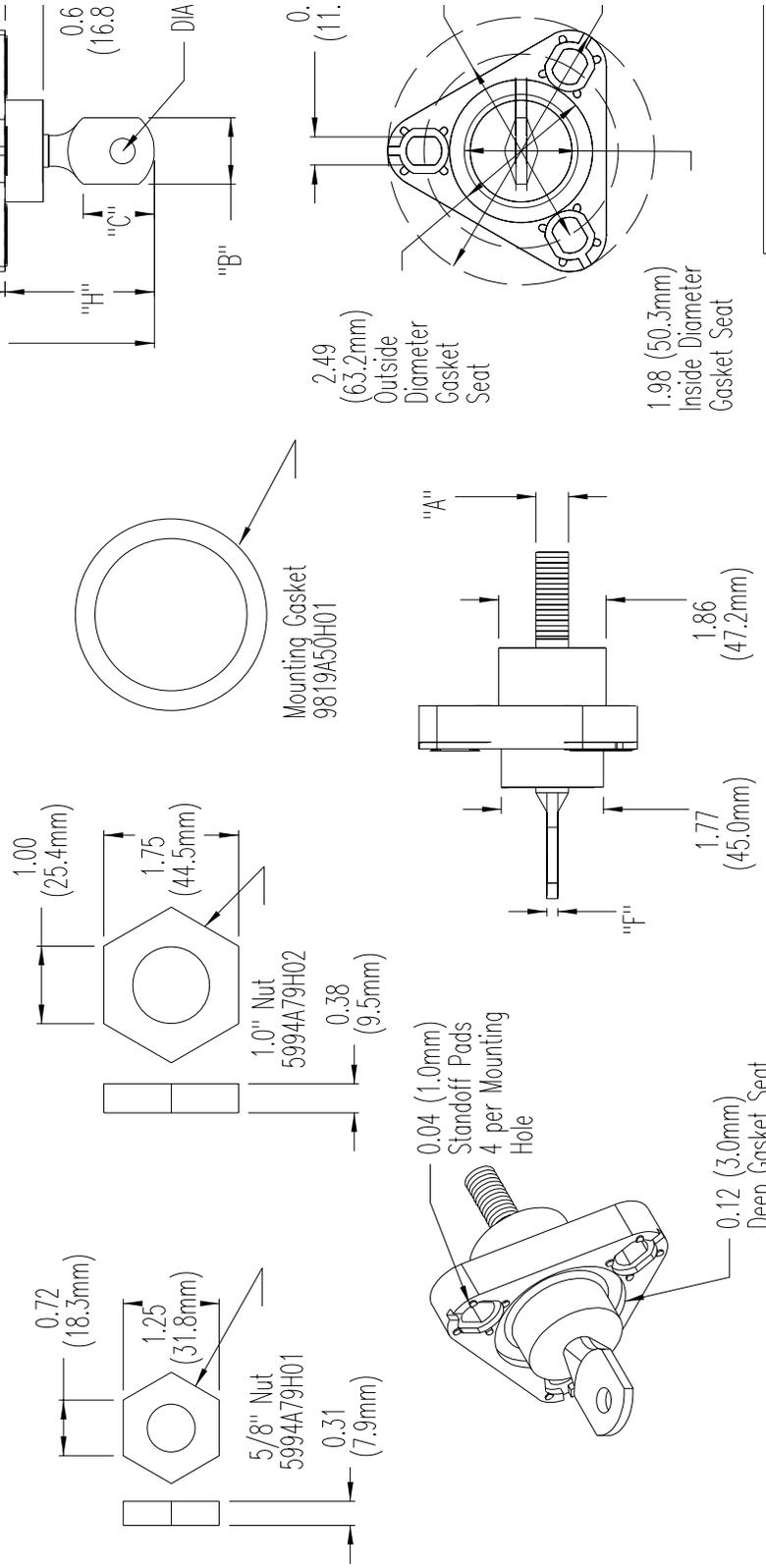


ABB Power T&D Cor
COMPONENTS DIV. ALAV
TITLE 5/8" & 1.0"
LOW VOLTAGE B
REVISION SHEET: 44-892
DIMENSIONS ARE IN

"A"	THREAD	THREADS PER INCH	"B"	"C"	"D"	"E"	"F"	"G"	"H"	"I"
5/8"	STANDARD	11	0.813	1.168	0.437	6.00	0.190	1.50	2.59	3.41
5/8"	EXTENDED	11	0.813	1.168	0.437	6.62	0.190	2.12	2.59	4.03
1.0"	STANDARD	14	1.380	1.250	0.437	6.75	0.430	1.98	2.68	4.05
1.0"	EXTENDED	14	1.380	1.250	0.437	7.50	0.430	2.75	2.68	4.82