ABB low voltage bushings terminate a transformer’s internal low voltage leads at the tank wall and provide a standard threaded stud for connections to the external low voltage circuit.

**Description**
ABB low voltage bushings are molded from a high temperature, glass-reinforced nylon resin system (Dupont Zytel HTN™). The nylon body is molded around a copper stud. The copper stud is terminated at one end with a spade terminal which is used to make the internal transformer connections. The other end of the stud is threaded to accept various connectors which are used to connect to the external low voltage circuit. The bushings are available in two stud sizes: 0.625 inch diameter and 1.00 inch diameter.

**Ratings**

<table>
<thead>
<tr>
<th>Conductor Diameter (inches)</th>
<th>Voltage Rating (volts)</th>
<th>BIL Rating (kV)</th>
<th>Current Rating (amperes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.625</td>
<td>600</td>
<td>30</td>
<td>600</td>
</tr>
<tr>
<td>1.00</td>
<td>600</td>
<td>30</td>
<td>1400</td>
</tr>
</tbody>
</table>

In addition to the design testing, the following routine production tests are done on an audit basis:
1) Dimension check
2) Visual inspection
3) Leak test

**Interchangeable**
The ABB low voltage bushings have been designed to be dimensionally interchangeable with the majority of similar bushings available on the market. Included in these interchangeable dimensions are: the bolt circle for the integral mounting flange, the tank wall hole size, the conductor stud diameter, and the external thread size.

**Compact design**
The bushings have been designed to minimize the space required inside of the transformer. For both bushings, the dimension from the inside surface of the tank wall to the end of the stud has been reduced. This reduction may allow the transformer designer to reduce the volume of the transformer tank to save both oil and steel.

**Test proven quality and reliability**
The ABB low voltage bushings have passed a series of design tests which were designed to verify ratings, suitability for use on pad-mounted distribution transformers, and long term reliability. 
1) Seal integrity test
2) Full wave impulse test
3) Low frequency voltage withstand test
4) Conductor stud torque test
5) Cantilever load test
6) Thermal cycle test
7) Temperature rise test
Technical information

Integral flange
The mounting flange on the bushings is molded as an integral part of the bushing. This eliminates the need for a separate mounting flange and, in the case of a metal mounting flange, the associated electrical losses created by the induced current in the flange.

Compression limited gasket designs
The integral flange of the bushing has a molded-in gasket seat to ensure proper gasket location and compression during mounting. The gasket surfaces provide controlled compression and containment of the highly resilient Buna-N gasket.

Conductor length
Bushings are available with a standard or extended length thread design.

Proven nylon body
These ABB bushings are molded from a glass-reinforced, high temperature nylon resin (Dupont Zytel HTN). The Zytel HTN resin is a highly reliable thermoplastic that fulfills the required application needs for strength, temperature stability and low moisture absorption. The resin system retains its mechanical and electrical properties in the high temperature environment associated with pad-mounted distribution transformer applications.

Certification
To certify the product ratings, production samples of the bushings were tested. The tests were conducted in accordance with ANSI/IEEE standards where applicable.

Design tests
The design tests were divided into (3) three categories:
1) Dielectric tests (impulse test and 60 Hz withstand test)
2) Mechanical strength tests (leak test, stud interface strength test and cantilever test)
3) Environmental tests (thermal cycle test, oil compatibility test)

Dielectric tests
Impulse test
The purpose of this test is to verify the impulse withstand of the bushing. Sample bushings were subjected to three positive and three negative full wave impulses. The voltage impulse used was the standard 1.2 x 50 µs wave having the crest value of the specified voltage. The withstand voltage level of the bushings are well above the BIL rating of 30 kV. Samples successfully passed 36 kV test levels. Samples also successfully passed chopped wave tests well above the rating of 36kV.

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. Bushing 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.

Mechanical strength tests
Leak tests
The purpose of the leak test is to ensure that, over the life of the bushing, no leak will develop between the copper stud and the nylon resin body. The bushings were tested using a helium leak detector. The sensitivity of the helium leak detector is 1 x 10-5 atm cc/sec. The bushings were attached to a leak test fixture which mates the bushing such that any leak will be detected if helium passes into the detector through the bushing. All bushings passed with no indication of leaks.

Stud interface strength test
The purpose of this test is to verify that no damage will result when terminals are connected or removed from the bushings. The bushings were mounted in a manner simulating a typical transformer installation, then a nut was threaded onto the copper stud and 50 foot-pounds of torque was applied. For the 0.625 inch diameter copper stud bushing, the stud will fail before the 50 foot-pound level is reached. For the 1.00 inch diameter copper stud bushing, the 50 foot-pound torque test was repeated 20 times.

Finally, the bushings were leak tested to verify that the seal between the copper stud and the nylon resin body was not damaged. Both the 0.625 and 1.00 inch low voltage bushings successfully passed this test.

Cantilever test
This test demonstrates the ability of the bushing to withstand the stresses generated when attaching a lead to the conductor. With the bushings mounted in a manner to simulate its application on a transformer, an extension was threaded onto the bushing stud and a load applied until failure.

The 0.625 inch bushing was mounted so that one of the mounting holes is at the 6 o’clock position. Then a cantilever load was applied, resulting in the stud yielding before the bushing body failed.

The 1.00 inch bushing withstood 280 foot-pounds when mounted with one of mounting holes in the 12 o’clock position and withstood 375 foot-pounds when mounted with one of the mounting holes in the 6 o’clock position.
Technical information

Environmental test
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 previously leak tested bushings were subjected to 20 thermal cycles in air. Each thermal cycle consists of the following:
1) 1-hour transition to 140 °C
2) 2-hour hold at 140 °C
3) 1-hour transition to -40 °C
4) 1-hour hold at -40 °C

Oil compatibility test
The purpose of this test is to verify that the bushing does not have any damaging effects on the properties of the oil when the bushing is submerged in the transformer oil. The bushing passes the standard oil compatibility test.
For more information please contact:

ABB Inc.
1128 South Cavalier Drive
Alamo, Tennessee 38001, USA
Phone: +1 731 696 5561
Main: +1 800 955 8399
Fax: +1 731 696 5377
Email: alamo.customer_service@us.abb.com

www.abb.com/electricalcomponents

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TANK WALL

TANK HOLE
MAXIMUM DIAMETER
1.875 [47.6]
AFTER PAINTING

THREE MOUNTING STUDS
APPROXIMATELY 0.375 [9.5]
DIAMETER, SEPERATED BY
120° ON A 3.38 [85.9]
BOLT HOLE CIRCLE

2.50 [63.5]
DIAMETER FLAT
GASKET SURFACE

GASKET FOR—
5/8" - 3A21596H01
1" - 3A24052H01

EXTERNAL CONNECTION
SPADE

BRASS CONTACT NUT—
5/8" - 5994A79H01
1" - 5994A79H02

LOW VOLTAGE BUSHING—
5/8" SEE DS 44-892 PG 10A
1" SEE DS 44-892 PG 10B

MOUNTING NUT AND WASHER
TO MATCH MOUNTING STUD
MAXIMUM TORQUE - 90IN. LBS.

TANK WALL

MOUNTING STUD
APPROXIMATELY
0.375 [9.5]
DIAMETER

PRIMARY DIMENSIONS ARE INCHES
SECONDARY DIMENSIONS ; 1 ARE MM

ABB Inc.
Components & Insulation Material

TITLE
LV BUSHING
INSTALLATION INSTRUCTIONS

DIMENSION SHEET
44-892 FIRST EDITION 01
DIMENSIONS ARE IN INCHES.