

High Voltage Bushing Wells for Pad Mounted Distribution Transformers

Technical Guide



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1 Description

The ABB High Voltage Bushing Well is designed for use in oil filled pad or surface mounted transformers. The bushing well terminates the transformer's primary winding leads at the tank wall. On the air-side of the transformer, the bushing well mates with all bushing inserts which meet the applicable sections of ANSI/IEEE Standard 386. The bushing well is externally clamped to the sidewall of the transformer tank. The bushing well will operate properly in transformers which are filled with standard transformer oil or high temperature hydrocarbon fluids or natural or synthetic ester fluids.

2 Ratings

Conductor Type	Voltage Class	BIL Rating	Current Rating	Style Number
Integral	25 kV	150 kV	200 A	1ZUA276301-AEC
Removable	25 kV	150 kV	200 A	1ZUA276301-AED

3 Features and Advantages

3.1 Interchangeability

The ABB bushing well is interchangeable with the majority of bushing wells presently supplied to the distribution transformer market in North America. It is designed to fit into a 2.53 in. (64.3 mm) mounting hole and it will mate with all bushing inserts which conform to the appropriate sections of ANSI/IEEE Standard 386.



3.2 Optional Removable Stud Design

The ABB HV bushing well is available in a removable stud version. Use of the removable stud version of the bushing well allows simple field replacement of the bushing stud in cases where the stud becomes damaged. The stud can be removed with a standard 5/8 inch socket wrench.

3.3 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 the intended application in pad mounted distribution transformers.

3.4 Molded In-place Ground Shield

The ground shield is directly molded onto the bushing well body during the molding process.

3.5 Improved Appearance

The combination of the Zytel HTN resin system, the molding process and the ability to mold the ground shield in-place during the molding cycle significantly improves the appearance of the bushing well.

3.6 Compression Limited Gasket Designs

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.



3.7 Identification

Identification information is molded into the face of each bushing well. The following information is provided: ABB logo, BIL rating, Date code and mold cavity number. See the outline drawings for further details

4 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.

4.1 Design Tests

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

Dielectric Tests (Impulse test and 60 Hz Withstand test)

Mechanical Strength Tests (Leak test and Stud Torque Strength test)

Environmental Tests (Thermal Cycle test, Oil Compatibility test)

4.1.1 Dielectric Tests

Bushing wells are tested to the 25 kV Class requirements as defined in IEEE Standard 386.

Impulse Test

The purpose of this test is to verify the impulse withstand of the bushing. Sample bushings were subjected to 3 positive and 3 negative full wave impulses. The voltage impulse used was the standard 1.2 x 50 μ s wave having the crest value of the specified voltage. The withstand voltage level of the bushings was well above the BIL rating of 150 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. Bushing samples were tested at 45 kV for one minute and then allowed to rest for one minute. They were then retested for another minute. All samples passed this test. The required pass level is 40 kV.

Partial Discharge Test

The purpose of the partial discharge test is to verify that partial discharge activity is not detectable at the test voltage of 26 kV. Samples are energized at 60 Hz; the test voltage is raised until partial discharge is detected. The test voltage is then reduced until partial discharge is no longer detected – this must occur at 26 kV or higher.

4.1.2 Mechanical Strength Tests

Leak Test

The purpose of the leak test is to ensure that, over the life of the bushing, no leak will develop between the copper stud and the nylon resin body. The bushings were tested using a Helium leak detector. The bushings were attached to a leak test fixture which mates the bushing to the Helium leak detector. A vacuum is created around the internal surfaces of 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. The sensitivity of the Helium leak detector is 1×10^{-5} atm cc/sec.

Stud Torque Strength Test

The purpose of this test is to verify that no damage will result when bushing inserts are threaded onto the bushing well stud. The bushing well is mated to an appropriate bushing insert. The insert is tightened to 30 foot-pounds. The inserts are removed and the bushing is inspected for damage and then leak tested.

4.1.3 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 sample bushings previously leak tested were subjected to 20 thermal cycles in air. One cycle consists of a 1-hour transition to 140°C followed by a 2-hour hold period at this temperature followed by a 1-hour transition to -40°C followed by a 1-hour hold period at this temperature. 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 when submerged in transformer oil has no damaging effect on the properties of the oil. The bushing passed the standard oil compatibility test.

5 Accessories

The following accessories are available for purchase from ABB. They may be ordered at the time the order is placed for the bushing well or at any other time in accordance with ABB minimum order rules.

5.1 Tank Wall Gasket

One gasket style fits both the fixed stud and removable stud bushing well. The gasket style number is 3A23916H01.

5.2 Dust Cap

The flexible plastic dust cap fits over the well portion of the bushing well. It is used to prevent foreign material from contaminating the internal surfaces of the bushing well. The dust cap style number is 9820A26H01.

5.3 Mounting Flange

The mounting flange for the bushing well is fabricated from high tensile strength zinc plated steel. It has securing holes for attaching a bail clamp. Note that this mounting flange is only compatible with the bail clips used with load break type bushing inserts. The style number of this mounting flange is 9820A33H01.

5.4 Replacement Studs

Spare replacement studs may be purchased from ABB. The spare replacement style number is 1ZUA261107-AAF.

6 Installation to the Transformer

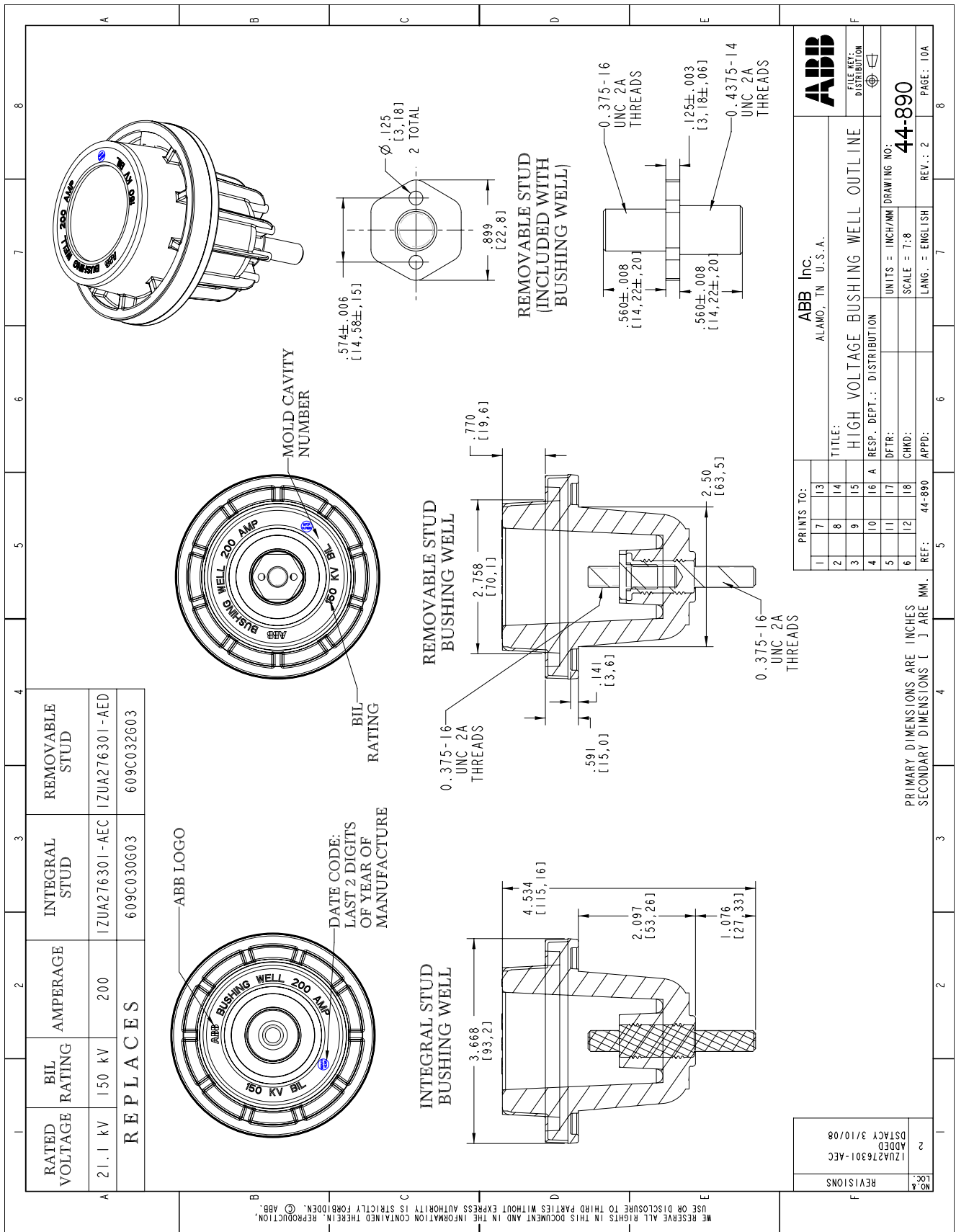
The bushing well is mounted on the air side surface of the transformer tank. Please refer to drawing 44-890, page 11A for mounting details. The hole through the tank wall should be 2.53 inches in diameter after painting. The tank must remain flat around the mounting hole for a diameter of 3.81 inches. This is necessary in order to provide a suitably flat surface for the mounting gasket to seal against.

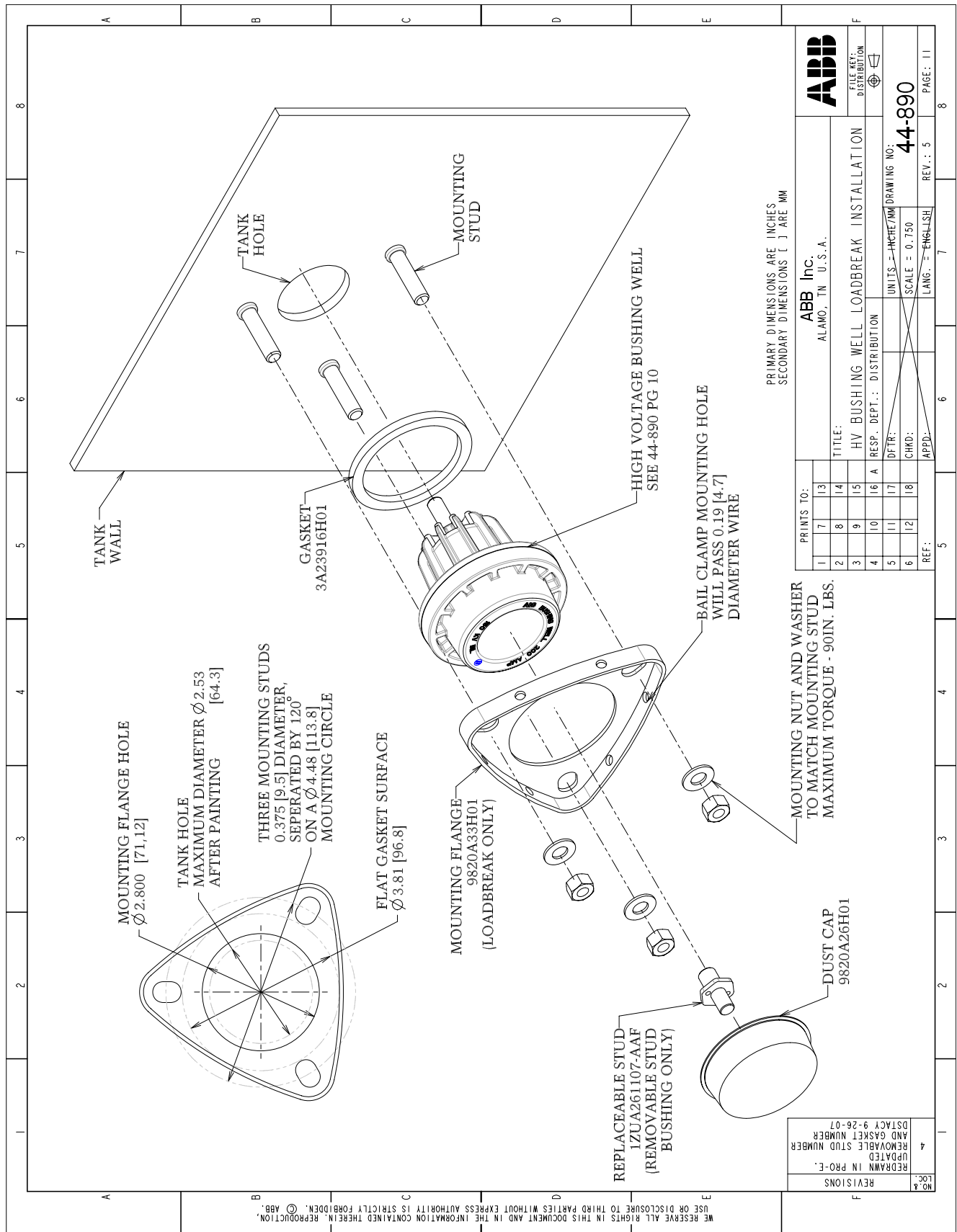
7 Outline Drawings and Installation Drawings

These drawings are contained on the next three pages:

7.1 Outline Drawing 44-890, pg 10A, HV bushing well, fixed & removable stud

7.2 Installation Instructions: 44-890, pg 11A





PRIMARY DIMENSIONS ARE INCHES
SECONDARY DIMENSIONS [] ARE MM



ABB Inc.
ALAMO, TN U.S.A.

TITLE:
HV BUSHING WELL LOADBREAK INSTALLATION

RES. DEPT.: DISTRIBUTION

UNITS: - INCHES/MM DRAWING NO:
SCALE: = 0.750

LANG.: - ENGLISH

REV.: 5

PAGE: 11

REF.: 11

NO.	REV.	DESCRIPTION
4		REDESIGNED IN PRO-E. REMOVED STUD NUMBER AND GASKET NUMBER DSTACY 9-26-07

PRINTS TO:

1	7	13
2	8	14
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5	11	17
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