1.2 kV class secondary bushing installation instructions

Powering Business Worldwide

DISCLAIMER OF WARRANTIES AND LIMITATION OF LIABILITY

The information, recommendations, descriptions and safety notations in this document are based on Eaton Corporation's ("Eaton") experience and judgment and may not cover all contingencies. If further information is required, an Eaton sales office should be consulted. Sale of the product shown in this literature is subject to the terms and conditions outlined in appropriate Eaton selling policies or other contractual agreement between Eaton and the purchaser.

THERE ARE NO UNDERSTANDINGS, AGREEMENTS, WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY, OTHER THAN THOSE SPECIFICALLY SET OUT IN ANY EXISTING CONTRACT BETWEEN THE PARTIES. ANY SUCH CONTRACT STATES THE ENTIRE OBLIGATION OF EATON. THE CONTENTS OF THIS DOCUMENT SHALL NOT BECOME PART OF OR MODIFY ANY CONTRACT BETWEEN THE PARTIES.

In no event will Eaton be responsible to the purchaser or user in contract, in tort (including negligence), strict liability or other-wise for any special, indirect, incidental or consequential damage or loss whatsoever, including but not limited to damage or loss of use of equipment, plant or power system, cost of capital, loss of power, additional expenses in the use of existing power facilities, or claims against the purchaser or user by its customers resulting from the use of the information, recommendations and descriptions contained herein. The information contained in this manual is subject to change without notice.

Contents

Safety for life

Eaton meets or exceeds all applicable industry standards relating to product safety in its Cooper Power™ series products. We actively promote safe practices in the use and maintenance of our products through our service literature, instructional training programs, and the continuous efforts of all Eaton employees involved in product design, manufacture, marketing, and service.

We strongly urge that you always follow all locally approved safety procedures and safety instructions when working around high voltage lines and equipment, and support our "Safety For Life" mission.

Safety information

The instructions in this manual are not intended as a substitute for proper training or adequate experience in the safe operation of the equipment described. Only competent technicians who are familiar with this equipment should install, operate, and service it.

A competent technician has these qualifications:

- Is thoroughly familiar with these instructions.
- Is trained in industry-accepted high and low-voltage safe operating practices and procedures.
- Is trained and authorized to energize, de-energize, clear, and ground power distribution equipment.
- Is trained in the care and use of protective equipment such as arc flash clothing, safety glasses, face shield, hard hat, rubber gloves, clampstick, hotstick, etc.

Following is important safety information. For safe installation and operation of this equipment, be sure to read and understand all cautions and warnings.

Hazard Statement Definitions

This manual may contain four types of hazard statements:

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in equipment damage only.

Safety instructions

Following are general caution and warning statements that apply to this equipment. Additional statements, related to specific tasks and procedures, are located throughout the manual.

DANGER

Hazardous voltage. Contact with hazardous voltage will cause death or severe personal injury. Follow all locally approved safety procedures when working around high- and low-voltage lines and equipment. G103.3

WARNING

Before installing, operating, maintaining, or testing this equipment, carefully read and understand the contents of this manual. Improper operation, handling or maintenance can result in death, severe personal injury, and equipment damage. G101.0

WARNING

This equipment is not intended to protect human life. Follow all locally approved procedures and safety practices when installing or operating this equipment. Failure to comply can result in death, severe personal injury and equipment damage. G102.1

WARNING

Power distribution and transmission equipment must be properly selected for the intended application. It must be installed and serviced by competent personnel who have been trained and understand proper safety procedures. These instructions are written for such personnel and are not a substitute for adequate training and experience in safety procedures. Failure to properly select, install or maintain power distribution and transmission equipment can result in death, severe personal injury, and equipment damage. G122.2

Product information

Introduction

Eaton's Cooper Power™ series secondary bushings are designed for external mounting (and removal) on distribution transformers filled with transformer oil, Envirotemp™ FR3™ fluid or an approved equivalent. They are designed for use inside cubicles in fluid-filled transformers. Secondary bushings are used for connecting low-voltage cables outside of the tank on pad-mounted transformers to the secondary coil winding leads inside the tank.

Read this manual first

Read and understand the contents of this manual and follow all locally approved procedures and safety practices before installing or operating this equipment.

Additional information

These instructions cannot cover all details or variations in the equipment, procedures, or process described nor provide directions for meeting every possible contingency during installation, operation, or maintenance. For additional information, contact your Eaton representative.

Acceptance and initial inspection

Each secondary bushing is in good condition when accepted by the carrier for shipment. Upon receipt, inspect the shipping container for signs of damage. Unpack the secondary bushing and inspect it thoroughly for damage incurred during shipment. If damage is discovered, file a claim with the carrier immediately.

Handling and storage

Be careful during handling and storage of the secondary bushing to minimize the possibility of damage. If the fuse cutout combination is to be stored for any length of time prior to installation, provide a clean, dry storage area.

Standards

ISO 9001 Certified Quality Management System

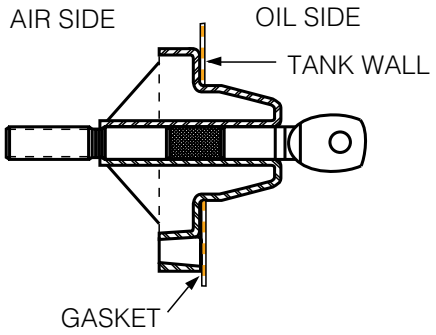

Figure 1. 600-1400 A, 1.2 kV class one-piece molded tri-clamp secondary bushing.

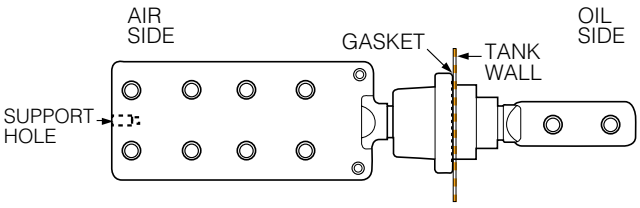

Figure 2. 1210-2410 A, 1.2 kV class secondary bushing with clamping flange.

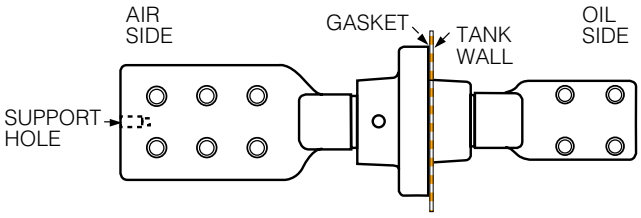

Figure 3. 3010-4515 A, 1.2 kV class secondary bushing with clamping flange (in-line version shown).

Table 1. Electrical Ratings

Description	Value
Standard Voltage Class	1.2 kV
AC 60 Hz, 1 Minute Withstand	10 kV
BIL and Full Wave Crest (45 kV for all 3010-4515 A bushings)	30 kV
Maximum Curent Ratings*	
5/8" (.625 Dia.) Copper Stud	600 A rms
1" Copper Stud	1400 A rms
Aluminum 6-, 8-, or 12-Hole External Spade w/ 2-Hole Internal Spade	1210 A rms
Copper 6-, 8-, or 12-Hole External Spade w/ 2-Hole Internal Spade	2410 A rms
Aluminum Spade Bushings 6- thru 12-Hole External, Internal Block Connection	3010 A rms
Copper Spade Bushings 6- thru 20-Hole External, Internal Block Connection	4515 A rms
Aluminum Spade Bushings with 4-Hole Internal Spade and External Spade w/6-, 12-, 16-, or 20-Hole	3010 A rms
Copper Spade Bushings with 4-Hole Internal Spade and Extermal Spade w/4-, 6-, 12-, 16-, or 20-Hole	4515 A rms

* When installed per Eaton recommended methods (see Table 3).

Table 2. 4-Stud Square Clamp Tank Hole

	Inches (mm)		
Description	**A Dim. Hole Size**	**B Dim. C-C Studs**	**3/8"-16 Stud Length**
All 600-2410 A LV Bushings			
With 1.75" Diameter Shanks	1.875 (47.62)	3.250 (82.55)	1.625 (41.27)
With 2.20" Diameter Shanks	2.250 (57.15)	3.250 (82.55)	1.625 (41.27)
All 3010-4515 A LV Bushings	3.06 (77.72)	4.50 (114.3)	2.00 (50.80)

Table 3. 3-Stud Round Body Bushing Clamp or One-piece Tri-clamp Bushing Tank Hole

	Inches (mm)	
Description	**A Dim. Hole Size**	**3/8"-16 Stud Length**
All 600-2410 A LV Bushings		
With 1.75" Diameter Shanks	1.875 (47.62)	1.625 (41.27)
With 2.20" Diameter Shanks	2.250 (57.15)	1.625 (41.27)
One Piece Tri-clamp Bushing	–	1.625 (41.27)

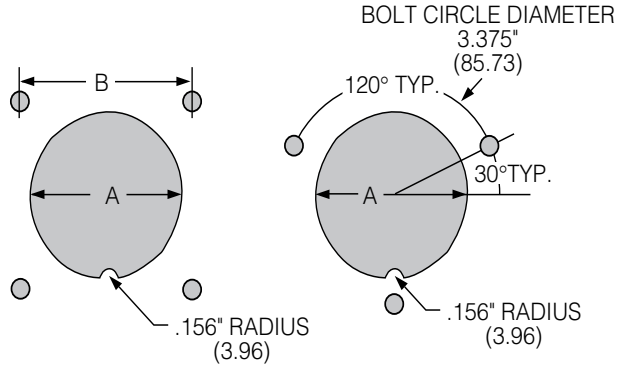

Figure 4. Tank mounting hole for 3- and 4-hole stud configuration.

Note: For additional dimensional information, see Table 2.

Mounting requirements

Bushings are sidewall mounted with the internal end completely immersed under oil. All parts should be inspected for damage before using. Clamping studs must be welded around the bushing hole to accommodate either a 3-hole or 4-hole clamp. Install the gasket over the bushing shank on the bushing gasket surface. Insert the bushing assembly through the tank hole and place the bushing clamp* over the welded tank studs and against the bushing flange. Install a plated lock washer and nut on to each stud and tighten to recommended torque. Connect internal lead to the internal bushing stud or spade using the recommended torque and procedure.

Note: *One-piece molded tri-clamp bushings have the clamp molded into the bushing.

Installation of assembly

Dielectric clearances

There shall be a minimum of 1/2" clearance between phases, conductor to ground and under-oil clearance.

CAUTION

All leads should remain below the oil level.

Torque requirements

Clamping flange and molded tri-clamp bushing

- 3010-4515 A Bushings, 4-hole clamps should be tightened to 70-80 in-lbs torque.
- All other 3- and 4-hole clamps should be tightened to 40-60 in-lbs torque.
- Molded (one-piece) tri-clamp bushing should be tightened to 40-60 in-lbs torque.

Hold clamping flange against the bushing and tighten all nuts by hand against the lockwashers. Using a torque wrench, tighten nuts down gradually, alternating in increments until the recommended torque is obtained. On 4-stud clamps, tighten nuts in a diagonal sequence.

Mounting studs should be free of nicks, paint, dirt and weld splatter. They must also be correctly positioned to avoid binding on the clamping flange.

Internal bushing stud connections

- 3010-4515 A Bushing Clamp Block, 1/2" Hardware Steel Bolt — 110 ft-lbs
- 3010-4515 A Bushing with Internal Spade, 3/8"-16 Grade 8 bolt, Heavy Flat Washers and Belleville Washers — 50 ft-lbs
- 5/8"-11 Brass Nuts — 75 ft-lbs
- 1"-14 Brass Nuts — 121 ft-lbs
- Internal Spade Connections 1/2" Steel Hardware — 50 ft-lbs
- Internal Spade Connections 3/8" Steel (Grade 8) Hardware — 50 ft-lbs

Mechanical strength

All 1210-2410 bushings are provided with a 1/4"-20 x .75" deep threaded hole at the outboard end of the spade. This hole can be used for additional bushing support for heavy weighted cables.

All 3010-4515 A bushings are provided with a 3/8"-16 x .75" deep threaded hole at the outboard end of the spade. This hole can be used for additional bushing support for heavy weighted cables.

Tri-clamp stud placement should be as shown in Figure 4. Two studs at the top and one at the bottom provide maximum cantilever strength.

Table 4. Recommended Internal Spade (Oil Side) Connections

Nominal Current Rating (Amperes)	Maximum Current (Amperes)	Number of Holes	Sides of Spade
600	420	1	1
	600	1	2
1400	835	1	1
	1400	1	2
1210	910	1	1
	1210	2	1
2410	1390	1	1
	2410	2	2
3010	2780	4	1
	3010	4	2
4515	3610	4	1
	4515	4	2

Eaton
1000 Eaton Boulevard
Cleveland, OH 44122
United States
Eaton.com

Eaton's Cooper Power Systems Division
2300 Badger Drive
Waukesha, WI 53188
United States
Eaton.com/cooperpowerseries

Powering Business Worldwide

Printed in USA
Publication No. MN800006EN Rev 00
(Replaces S800161 Rev 00)

For Eaton's Cooper Power series product information call 1-877-277-4636 or visit: www.eaton.com/cooperpowerseries.