

# Tuf Ex-Mount

Secondary Pad Mount Bushing

Central Moloney, Inc.  
Components Operation  
An Arkansas Owned Company

## Product Data Sheet

### "Tuf Ex-Mount" Low Voltage Bushings For Pad Mounted Transformers

*Central Moloney's Tuf Ex-Mount sets standards through the industry. . . For both the user & OEM. . .*

Central Moloney Components is pleased to, once again, announce a product which sets new quality standards in the components industry. This new standard is Central Moloney's Tuf Ex-Mount Secondary Bushing for pad mount distribution transformers.

Through extensive R & D and testing, Components has engineered a new generation of low voltage bushings which employ state of the art design, materials, and manufacturing techniques. The strength of new material, coupled with an improved flange design, has resulted in a significantly stronger Ex-Mount, therefore, we have appropriately named it the "Tuf Ex-Mount".

Improved materials and advanced geometry have allowed us to achieve the optimum combination of strength and flexibility. This new bushing can withstand up to (4) times the irregularity of sealing surface that our old thermoset bushing could, but as confirmed through extensive testing, we did not sacrifice

strength to achieve the increased flexibility. This virtually eliminates bushing breakage in house and in transit.

The Tuf Ex-Mount bushing is yet another in a long line of components which improve the reliability of distribution transformers without increasing the cost.

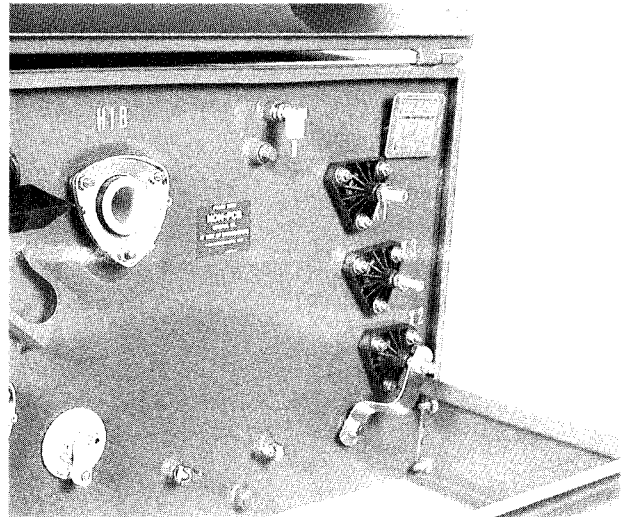


Fig. 1 1 5/8" & 1" Tuf Ex-Mount L. V. Bushings

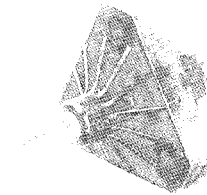


Fig. 2 5/8" Tuf Ex-Mount

#### "Tuf Ex-Mount" Low Voltage Bushing Advantages

**Fully Captive & Retained Gasketing**

**Superior Cantilever Strength**

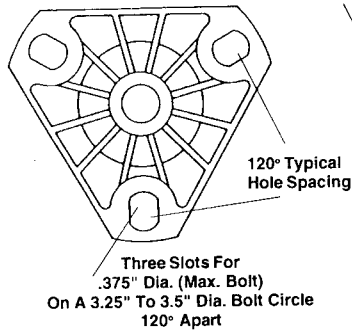
**Resilient to Cable Dig-Ins**

**Extended Stud Availability**

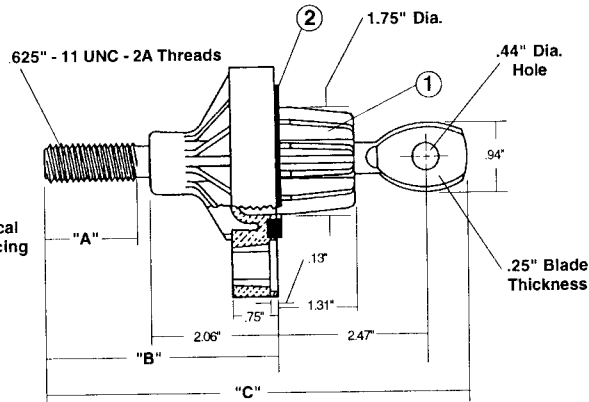
**Tolerance to Irregular Mounting Surfaces**

# Mechanical Characteristics

## 5/8" TufEx-Mount



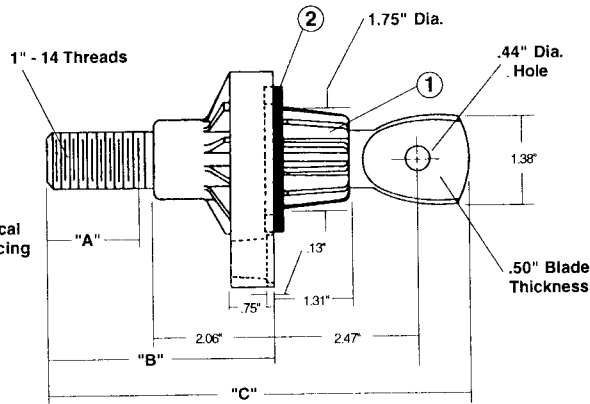
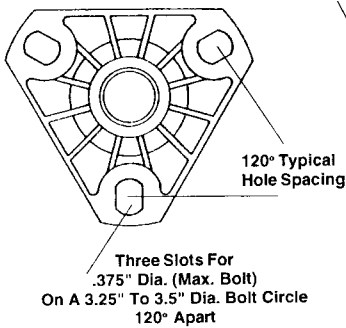
Now Available With Longer External Studs For Use With Multi - Cable Connectors



Mounting Hole Dia. - 1.81"

Part #	Item	Description	Item Part #	'A' Dim.	'B' Dim.	'C' Dim.
701314-52	1	Bushing (Copper Stud) (Typical 600 Amps)	701314-51	1.375	3.70	6.88
	2	Gasket (Buna "N")	321618-04			
701324-52	1	Bushing (Aluminum Stud) (Typical 420 Amps)	701324-51	1.375	3.70	6.88
	2	Gasket (Buna "N")	321618-04			
701314-58	1	Bushing (Extended Copper Stud) (Typical 600 Amps)	701314-57	2.13	4.39	7.57
	2	Gasket (Buna "N")	321618-04			

## 1" TufEx-Mount



Mounting Hole Dia. - 1.81"

Part #	Item	Description	Item Part #	'A' Dim.	'B' Dim.	'C' Dim.
701334-52	1	Bushing (Copper Stud) (Typical 1500 Amps)	701334-51	1.75	4.00	7.13
	2	Gasket (Buna "N")	321618-04			
701344-52	1	Bushing (Aluminum Stud) (Typical 1100 Amps)	701344-51	1.75	4.00	7.13
	2	Gasket (Buna "N")	321618-04			
701334-57	1	Bushing (Extended Copper Stud) (Typical 1500 Amps)	701334-56	3.00	5.25	8.42
	2	Gasket (Buna "N")	321618-04			

## Electrical Characteristics/Certified Test Results

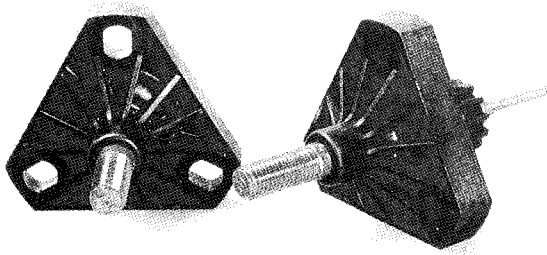


Fig. 2

Tuf Ex-Mount Family of Bushings

### CERTIFIED TEST RESULTS

#### 5/8" Tuf Ex-Mount Bushing Tests, P/N 701314-xx, 5/8" Stud

The tests listed below were performed to determine the suitability of "Tuf" Ex-Mount Low Voltage Bushings, injection molded from Polyethylene Terephthalate (PET), for use on Pad Mounted Distribution Transformers. Parts were made on production tooling. Mechanical tests on Ex-Mount Bushing #701312-xx (Thermoset) are included for direct comparison.

#### AC Withstand (10 KV Required)

Ten bushings withstood 12 KV, 60 Hz, for one minute without failure. At 500 volts per second rate of rise, flashover occurred at 29 KV.

#### Impulse Withstand (30 KV Required)

Ten bushings withstood three positive polarity and three negative polarity impulses at 36 KV. Flashover occurred from the bushing stud to the mounting bolt at 38 KV.

#### Ultraviolet Exposure

Although these bushings will not be exposed to ultraviolet in service, the material was tested in a QUV Radiation/Condensation cabinet. There was no noticeable change in appearance after 1000 hours of testing.

#### Stud Pushout Test

With the bushings mounted on a 3/4" steel plate, force was applied to the end of the studs on ten bushings until the stud slipped in the

body. Slippage occurred at 3211 to 3616 pounds, average 3474 pounds.

Thermoset parts broke at 3700 to 4600 pounds.

#### Torsional Loading Test

Ten bushings were tested by torsional loading to determine the torque necessary to turn the stud in the body.

Studs twisted at 95 to 100 foot pounds torque with no slippage in the body.

Studs in thermoset bushings also twisted without slipping.

#### Cantilever Test

With bushings mounted on a 12 gauge plate and spade terminal installed on the studs, force was applied at a point 4" from the mounting plate. Bushings cracked at 911 to 1055 pounds (304 to 352 foot pounds). Thermoset parts broke at 656 to 731 pounds (219 to 244 foot pounds).

#### Tolerance To Irregular Mounting Surface

Tuf Ex-Mount and Thermoset Ex-Mount bushings were tightened to 100 inch pounds with wires of .035", .093", .125", .139" and .156" diameter across the gasket surface. Flanges of the Tuf Ex-Mount deformed around the wire to .139", broke at .156". By comparison, the ear broke off thermoset part with a .035" wire across the gasket surface.

#### Impact Test

Bushings were mounted to a vertical plate and a 5 pound copper bar was dropped from varying heights (6" increments) to strike the stud 3" from the plate. Three Tuf Ex-Mount and three standard (Thermoset) Ex-Mount

bushings were tested at -40° C, at 25° C, and at +140° C, with results as follows (drop to damage bushing).

Impact Results		
Temperature	TUF Ex-Mount	Standard Ex-Mount
-40 C	3 Feet	2 Feet
25 C	3.5 Feet	2 Feet
140 C	5 Feet	2 Feet

#### Thermal Cycle Test

Twenty four bushings were thermal cycled, 10 cycles, 3 hours at - 40° C and 2 hours at 140° C. Twelve were mounted on 12 gauge plates with standard gaskets and clamping hardware for this test; the other 12 were tested as bushings only. Leak tests were performed after the second, fifth, and tenth cycle. At the completion of testing, no leaks or cracks were found.

Gaskets remained fully compressed, with gasket stops on the bushing flanges firmly against the plates.

Stud pushout and torsional loading tests were repeated after thermal cycling with no degradation in performance found.

#### Oil Compatibility

Test bars were tested by immersion in transformer oil for two weeks at 105° C. Oil properties were not adversely affected and no change in the condition of the bars was noted.

### Conclusions:

The Tuf Ex-Mount meets electrical requirements for Pad Mounted Distribution Transformer Secondary Bushings, 30 KV impulse level.

The material is compatible with transformer oil, and does not exhibit excessive creep at elevated temperature.

Studs will not slip in the bushings due to normal tightening torque of terminals or cable tension.

The Tuf Ex-Mount is more tolerant to mechanical forces, particularly impact at temperature extremes, than the thermoset bushing.

## Electrical Characteristics/Certified Test Results Cont.

### *CERTIFIED TEST RESULTS*

#### **1" TufEx-Mount Bushing Tests, P/N 701334-xx, 1" Stud**

The tests listed below were performed to determine the suitability of "Tuf" Ex-Mount low voltage bushings, injection molded from polyethelene terephthalate (PET), with 1" studs, for use on pad mounted distribution transformers. Tests on Ex-Mount bushing #701332-xx (thermoset) are included for comparison.

#### **AC Withstand (10 KV Required)**

Ten bushings withstood 10 KV for one minute without failure. At 500 volts per second rate of rise, flashover occurred from the conductor to the bushing mounting stud at 38 KV. Thermoset parts flashed over at 39 KV.

#### **Impulse Withstand (30 KV Required)**

Ten bushings withstood three positive polarity and three negative polarity impulses at 36 KV. All passed 39 KV negative wave. Flashover occurred from a conductor to a mounting stud at 41.5 KV.

Thermoset parts passed 39 KV negative wave, with flashover at 40 KV.

#### **Stud Pushout Test**

With bushings mounted on a 3/4" steel plate, force was applied to the end of the studs on ten bushings until the stud slipped in the body. Slippage occurred at 7704 to 9068 pounds, average 8190 pounds.

Thermoset parts slipped at 7011 to 9465 pounds.

#### **Torsional Loading Test**

Three bushings were tested by torsional loading to determine the torque necessary to turn the studs in the body. All withstood torque in excess of 175 foot pounds, as did the thermoset parts.

#### **Cantilever Test**

With bushings mounted on a 1/2" steel plate, force was applied at a point 6" from the mounting plate. Bushings cracked at 640 to 800 pounds average 741 pounds.

Thermoset parts broke at 1020 to 1072 pounds.

#### **Impact Test**

Ten bushings were mounted on a vertical plate and a 5 pound copper bar was dropped from varying heights (6" increments) to strike the stud 3" out from the plate. Parts broke at 2.5 to 3 feet, average 2.8 feet.

#### **Thermal Cycle Test**

Ten bushings were thermal cycled, ten cycles, 3 hours at - 40° C and 2 hours at 140° C. Leak tests were performed after the second, fifth and tenth cycle. At the completion of the test, no leaks or cracks were found.

#### **CONCLUSIONS:**

**The Tuf Ex-Mount with 1" stud meets all electrical and mechanical requirements for pad mounted distribution transformers secondary bushings, 30 KV impulse level.**

**The material is compatible with transformer oil, and does not exhibit excessive creep at elevated temperature.**

**Studs will not slip in the bushings due to normal tightening torque of terminals or cable tension.**

**The Tuf Ex-Mount is more tolerant to mechanical forces, particularly impact at temperature extremes, than the thermoset bushing.**

  
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