

TRANSFORMADORES DE DISTRIBUIÇÃO TRIFÁSICOS TIPO PEDESTAL



**INSTRUÇÕES PARA INSTALAÇÃO,
OPERAÇÃO E MANUTENÇÃO**

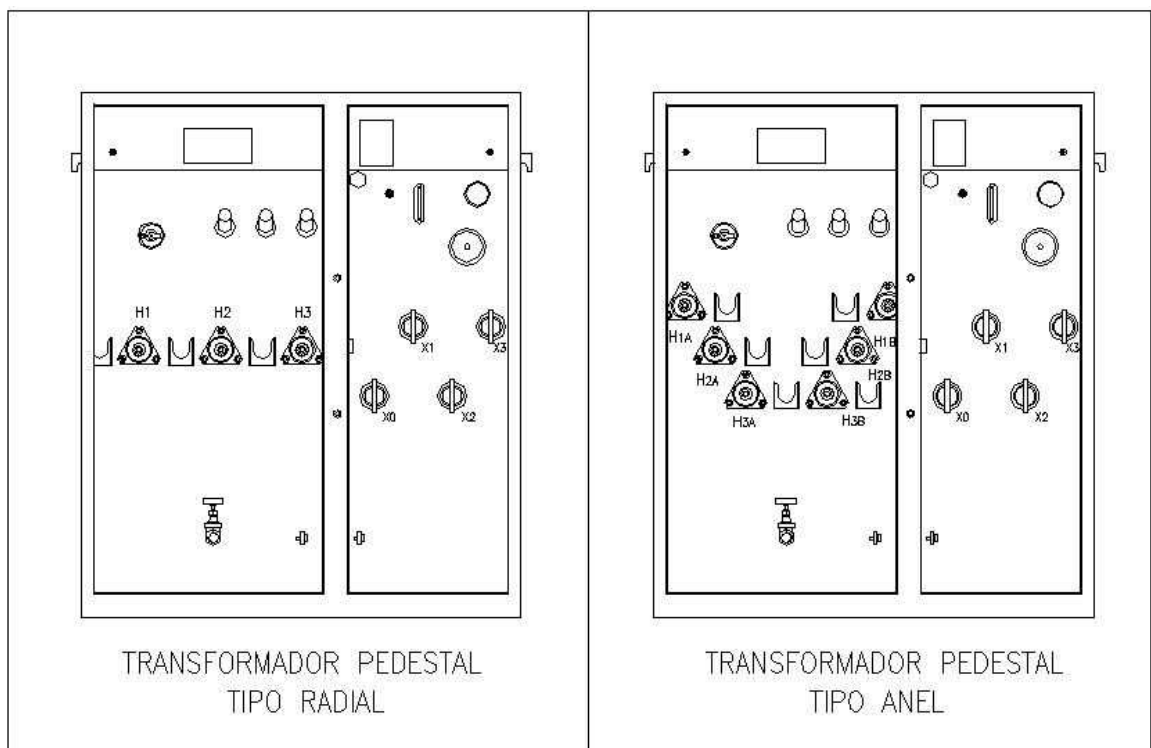
INSTRUÇÕES PARA INSTALAÇÃO, OPERAÇÃO E MANUTENÇÃO DE TRANSFORMADORES DE DISTRIBUIÇÃO TRIFÁSICOS TIPO PEDESTAL (*PAD – MOUNTED*)

1 Objetivo

Este manual tem como objetivo proporcionar ao cliente instruções para instalação, operação e manutenção do equipamento, que se atendidas darão condições de obter a máxima eficiência do equipamento, prolongar sua vida útil, bem como evitar situações que possam colocar em risco a integridade física do usuário.

ATENÇÃO: *Este manual deve ser utilizado em conjunto com todas as normas técnicas, normas regulamentadoras, especificações e procedimentos existentes, observando as normas técnicas oficiais estabelecidas pelos órgãos competentes e, na ausência ou omissão destas, as normas internacionais cabíveis.*

2 Desenho Ilustrativo



3 Informações de Segurança

O transformador deve ser instalado por pessoal técnico capacitado, habilitado e autorizado pela empresa de energia local, obedecendo às suas especificações técnicas de instalação e normas de segurança. Não se deve conectar nenhuma fonte de tensão no lado de baixa tensão, procedimento este que pode induzir tensões elevadas no lado de alta tensão, podendo levar as pessoas a envolverem-se em acidentes graves, com risco de morte. No manuseio do transformador as pessoas responsáveis devem utilizar materiais de proteção individual, tais como vestimenta isolante apropriada, luvas, óculos de proteção, capacete, vara de manobra, etc.

PERIGO: *Antes de fazer qualquer trabalho certifique-se de que o tanque do transformador tenha sido aterrado.*

PERIGO: *Quando os terminais de alta tensão não estiverem sendo utilizados, estes devem permanecer protegidos por uma capa de proteção isolante, RIB – Receptáculo Isolante Blindado*

*(insulated protective cap). **Recomendação: “Elastimold K150DR (deadbreak 15/25 kV)”, “Cooper LPC215 (loadbreak 15kV)” ou “Cooper LPC225 (loadbreak 25kV)”*

Medição: O transformador deve ser energizado sem carga, ou seja, sem nenhum equipamento conectado ao seu secundário. Depois, se faz necessária uma inspeção final com medição da tensão secundária, utilizando-se para isso um instrumento de medição compatível com a classe de tensão do terminal de baixa tensão do transformador.

PERIGO: *Os transformadores devem trabalhar somente com a potência especificada na placa de características. Uma operação em sobrecarga prolongada irá diminuir a vida útil do transformador.*

CUIDADO: *Antes de operar o comutador de derivações, certifique-se de que o transformador esteja desenergizado e aterrado.*

4 Informações do Produto

4.1 - Inspeções de Recepção

ATENÇÃO: *Antes de prosseguir com a inspeção, certifique-se de que o transformador esteja desenergizado e aterrado.*

4.1.1 - Verificar “externamente” os seguintes itens:

- a. Se as características de placa de identificação estão de acordo com o pedido;
- b. Se há fissuras na base fusível e nos terminais, ou danos externos no tanque e acessórios;
- c. A quantidade e integridade dos terminais, acessórios e eventuais partes sobressalentes;
- d. Se existem sinais de perda de líquido isolante através dos terminais, tampa, acionamento do comutador, soldas ou acessórios;
- e. Sinais de corrosão ou danos na pintura do tanque;
- f. Integridade da embalagem.

4.1.2 - Verificação “interna” do transformador:

- a. Verificações internas podem ser dispensadas se não foi encontrada nenhuma avaria externa no transformador.
- b. Verificações internas devem ser evitadas pois pode haver contaminação do óleo isolante durante a abertura do transformador.
- c. No caso de abertura da tampa (**ver procedimento no item 7.4 - a**) verificar substâncias estranhas no lado de baixo da tampa, componentes internos faltantes, conexões frouxas ou quebradas, líquido isolante contaminado por objetos estranhos ou com bolhas de ar ou sujeira em suspensão no mesmo.
- d. Se danos internos forem constatados abaixo do nível do líquido isolante este precisará ser drenado do tanque (**ver procedimento relacionado no item 7.5.4 – Seção de Manutenção**).
- e. Se impurezas forem encontradas imersas no líquido isolante quando o tanque for aberto e houver evidências de que este possa ter sido contaminado, uma amostra deve ser retirada para análise. (**ver procedimento relacionado no item 7.5.1 - Seção de Manutenção**)

4.2 - Manuseio e Movimentação

O transformador deve ser movido pelos ganchos de suspensão, e nunca pelos radiadores ou pelos compartimentos de proteção dos terminais, tomando-se cuidado para não danificar a pintura, o que pode trazer problemas de corrosão depois da instalação. Antes de mover o transformador certifique-se que a capacidade do equipamento de suspensão suporte o peso do mesmo. Em um transformador tipo pedestal, a maior parte de seu peso encontra-se no tanque principal que contém o núcleo, os enrolamentos e o líquido isolante, portanto, quando for içado por meio de guincho, os dispositivos de içamento do tanque do transformador devem estar o mais alinhados possível em relação ao gancho do guin-

cho. Não se devem usar cabos ou correias de içar desgastadas para içar o transformador, bem como levantá-lo dando voltas com os cabos ou correias de içar em seu redor ou seus ganchos de içamento.

4.3 - Armazenagem

O transformador deve, preferencialmente, ser armazenado de maneira que não fique exposto a intempérie, a grandes variações de temperatura e a gases corrosivos de modo que não sofra danos mecânicos. Tampouco deve ficar em contato direto com o solo. As portas dos compartimentos também devem permanecer fechadas de modo a prevenir danos aos isoladores ou outros acessórios.

5 Instalação

A instalação na rede de energia elétrica deverá ser feita por técnico autorizado, o qual realizará a supervisão necessária à instalação com a devida segurança. Quando não for especificado pelo cliente, a tensão de expedição é a nominal. Caso seja necessária a mudança da derivação de tensão, esta deverá ser executada conforme as instruções da placa de características, com o transformador sem tensão e longe da fonte de tensão. Deve-se tomar cuidado para que todas as conexões sejam bem executadas. Todos os isoladores, terminais e pontos de conexão devem ser limpos antes de fazer as conexões.

Estes transformadores foram construídos para operar em altitudes não superiores a 1000 metros acima do nível do mar, a temperaturas médias de 30° C e máximas de 40° C.

Antes de conectar o transformador ao sistema, e depois da inspeção interna e externa (**item 4.1.1 e 4.1.2**), limpe os isoladores e terminais removendo graxa ou pó de maneira a evitar falhas nas conexões.

Certifique-se também que os cabos de conexão tenham flexibilidade adequada para que não se ocasionem falhas prematuras nos isoladores.

Certifique-se também que o transformador esteja conectado a um ponto de terra permanente e de baixa resistência. No transformador, existem dois terminais de aterramento dentro dos compartimentos. Um está localizado no compartimento primário (alta tensão) e outro no compartimento secundário (baixa tensão).

No momento de fazer as conexões, faça-as de acordo com os diagramas indicados na placa de características. Terminais que não estiverem sendo utilizados devem ser isolados da terra e também dos outros condutores.

ATENÇÃO - Risco de Incêndio. Instalação do transformador em desnível pode provocar incêndios e causar ferimentos graves ou morte. Prepare a base do transformador de modo que este não fique com desnível maior que dois (2.0) graus com relação a horizontal.

PERIGO - O condutor de aterramento do neutro deve ser conectado ao tanque do transformador antes de todas as outras conexões.

PERIGO - Somente faça as conexões primárias do transformador depois que todas as outras conexões tenham sido feitas.

6 Acessórios e Componentes

ATENÇÃO: Quando necessárias, as comutações devem ser feitas com o transformador desconectado (sem tensão).

6.1 - Comutador de derivações sem tensão (quando aplicável)

A manopla de acionamento do comutador de tensões está localizada na parede do tanque, dentro do compartimento de alta tensão. Para operá-lo os seguintes procedimentos devem ser seguidos:

- a. Verifique se o tanque está aterrado. Desconecte o transformador. Aterre todos os terminais e isoladores antes de operar a manopla de mudança de derivações;
- b. Desenrosque o parafuso de trava de posição até que o indicador de posições fique livre;
- c. Mude para a posição de derivação desejada;
- d. Aperte o parafuso da trava de posição.

6.2 - Proteções

CAUIDADO - Para Manutenção dos dispositivos de proteção, desenergize o transformador, e verifique a ausência de tensão. Aterre o transformador seguindo as normas de aterramento seguras e utilizadas pela empresa de energia local.

CAUIDADO - Não opere o transformador se houver suspeita de falta por curto-circuito – Risco de Explosão.

CAUIDADO - Use sempre vara de manobra e equipamentos de proteção individual para executar operações sob carga, conforme NR-10.

6.2.1 - Fusível Baioneta (*Bay-o-net fuse*)

Para instruções de instalação e manutenção do porta fusível e fusível baioneta, consultar os manuais da **Cooper Power Systems n^{os} MN132002EN e MN132003EN**, entregues junto com este manual.

6.2.2 - Fusível Limitador de Corrente (interno)

O fusível limitador de corrente é utilizado em transformadores para proteger e isolar falhas originadas no equipamento. Quando é conectado em série com dispositivos de proteção de corrente primária de baixa intensidade, este passa a compor um sistema de proteção combinado que proporciona uma ampla faixa de proteção contra defeitos.

Se o fusível limitador de corrente operar devido a uma corrente de falta (curto) elevada este não será substituível no campo. O transformador e o fusível devem retornar ao fabricante ou serem enviados para uma oficina especializada para que sejam reparados / substituídos.

6.2.3 - Fusível NH (quando aplicável)

O fusível NH é utilizado para proteção secundária contra sobrecorrente.

6.3 - Válvula de Alívio de Pressão (quando aplicável)

Esta atua se a pressão interna do tanque excede a pressão para a qual ela foi calibrada. Uma vez que esta atue, retornará automaticamente a sua posição inicial.

6.4 – Bucha (plug) de inserção (**Bushing insert**) (quando aplicável)

A bucha (plug) de inserção fornecida com o transformador pode ser do “Deadbreak” ou “Load-break”.

Para instruções de instalação e manutenção da bucha de inserção tipo “deadbreak”, consultar o manual da **Elastimold n^o IS-K1501A1**, entregue junto com este manual.

Para instruções de instalação e manutenção da bucha de inserção tipo “loadbreak”, consultar o manual da **Cooper Power Systems n^o MN650013EN**, entregue junto com este manual.

6.5 – Indicador do nível do líquido isolante (quando aplicável)

Do tipo visor, com indicação do nível mínimo, máximo e a 25 °C.

6.6 – Termômetro (quando aplicável)

Graduado de 0 a 120 °C, indica a temperatura próximo ao topo do líquido isolante, com ponteiro de arraste para indicação da temperatura máxima, com recurso externo para retorno.

6.7 – Manovacuômetro (quando aplicável)

Graduado de – 1 a + 1 kgf/cm², posicionado acima do nível do óleo, indica pressão, positiva ou negativa, no interior do tanque, com ponteiro de arraste para indicação da pressão mínima/máxima atingida, com recurso externo para retorno.

6.8 – Chave trifásica de abertura em carga (quando aplicável)

Chave trifásica de abertura em carga, com interrupção no óleo isolante, operada por bastão de manobra, localizada entre os terminais de AT e os fusíveis de expulsão e limitador de corrente.

Para instruções de instalação e operação da chave trifásica de abertura sob carga, consultar o manual da **Cooper Power Systems nº MN80004EN**, entregue junto com este manual.

7 Manutenção

7.1 Manutenção Externa

Com uma frequência anual, inspecionar todas as superfícies externas do equipamento verificando a existência de violações, avarias no metal, perfurações, deformações, etc. Riscos ou desgastes na pintura por agentes climáticos devem ser retocados apropriadamente. Mantenha a área ao redor do transformador livre de obstáculos e não a utilize para depósito de materiais.

7.2 Compartimentos - Manutenção do Interior

CAUIDADO - Alta Tensão. Antes de abrir os compartimentos desenergize o transformador de um ponto remoto. Verifique se todos os terminais e isoladores estão sem tensão e aterre o transformador conforme normas de segurança apropriadas.

Inspeccione periodicamente os terminais no interior dos compartimentos e verifique se os controles e dispositivos estão operando apropriadamente. Substitua aqueles que estiverem defeituosos.

Verifique também plugs, fusíveis e demais chaves em busca de vazamentos de líquido isolante. Procure evidências de líquido isolante ao longo da parede do tanque, nas juntas, etc. Efetue reparos se necessário.

Em caso de necessidade de qualquer reparo o transformador deve ser desenergizado, e em caso de substituição das juntas, o líquido isolante deve ser retirado do transformador – Instruções para este procedimento podem ser encontradas no **item 7.5.4 da Seção de Manutenção**.

7.3 Tanque

7.3.1 - Manutenção Interna

CAUIDADO - Alta Tensão. Antes de abrir o compartimento ou fazer manutenção interna do tanque desenergize o transformador de um ponto remoto. Verifique se todos os terminais e isoladores estão sem tensão e aterre o transformador conforme as normas de segurança apropriadas.

CAUIDADO - Pressão Elevada. Antes de fazer qualquer manutenção interna no tanque, iguale a pressão interna deste acionando a válvula de alívio de pressão.

Manutenções em isoladores ou outros equipamentos internos ao tanque requerem que este seja aberto e o líquido isolante drenado ao nível apropriado. Para tal procedimento leia sobre **Manutenção do Líquido Isolante no item 7.5**, nesta mesma Seção do manual. Precauções devem ser tomadas para que o líquido isolante não seja contaminado durante este procedimento.

7.3.2 – Remoção e Instalação da Tampa

Antes de remover a tampa veja as instruções de segurança na parte de **Manutenção Interna do Tanque – item 7.3.1**.

Quando na remoção da tampa se constata que a hermeticidade do transformador possa estar comprometida, deve ser efetuado um teste para averiguar a estanqueidade do mesmo. Neste teste uma pressão de até 7 psi deve ser aplicada através do orifício onde está a válvula de alívio de pressão, retirando-se esta. A pressão aplicada deve permanecer estável por ao menos 1 hora para assegurar-se de que não há vazamento.

**Para remoção da tampa:

a. Verifique que o tanque esteja aterrado, assim como os isoladores e terminais, e que o transformador esteja desenergizado;

- b. Limpe a tampa externamente para prevenir contaminação do líquido isolante por graxa, pó ou umidade;
 - c. Pelo interior dos compartimentos retire as porcas de fixação da sobretampa de proteção e remova-a;
 - d. Iguale a pressão interna do tanque acionando a válvula de alívio de pressão. Neste momento os parafusos que fixam a tampa de inspeção ao tanque podem ser removidos;
 - e. Retire cuidadosamente a tampa de maneira a não permitir que suas juntas entrem em contato com o líquido isolante e que tal fato dificulte sua recolocação posterior visto que esta poderá ficar escorregadiça. A remoção da tampa deve ser no sentido vertical de maneira a evitar danos aos parafusos de fixação e a própria tampa.
- **Para recolocação da tampa:**
- a. Recoloque as juntas;
 - b. Reinstale a tampa e aperte os parafusos;
 - c. Remova a válvula de alívio de pressão e faça novo teste de estanqueidade para certificar-se de que não há vazamentos;
 - d. Reinstale a sobretampa;
 - e. Reinstale a válvula de alívio de pressão.

Nota: Em caso de tampa soldada, a remoção da mesma quando necessária para eventuais manutenções deverá ser feita somente em fábrica ou oficina especializada.

7.4 Buchas - Remoção e Substituição

CAUIDADO - Antes de qualquer procedimento: Verifique se o tanque está aterrado. Desenergize o transformador desde um ponto remoto e aterre todos os isoladores e terminais.

Para substituição dos isoladores o transformador deve ser levado para uma oficina especializada e os seguintes procedimentos devem ser seguidos:

- a. Abra o tanque removendo a tampa principal conforme **procedimento de remoção da tampa – item 7.3.2**, já descrito neste manual;
- b. Retire o líquido isolante conforme o **procedimento de drenagem do líquido isolante - item 7.5.4** de modo que os isoladores sejam expostos completamente;
- c. Desconecte todos os cabos e fios internos e externos. Verifique a posição de todos os parafusos, arruelas lisas e de pressão de modo que estes sejam reinstalados na mesma posição original;
- d. Remova todas as peças de fixação dos isoladores. Verifique a posição de todos os parafusos, arruelas lisas e de pressão de modo que estes sejam reinstalados na mesma posição original;
- e. Remova todas as peças de fixação externas, os isoladores e suas juntas;
- f. Instale novos isoladores e juntas. Posicione corretamente os isoladores e juntas de modo a obter vedação efetiva. Instale as peças de fixação externas e os demais mecanismos de fixação dos isoladores;
- g. Reconecte todos os cabos e fios internos e externos.
- h. Recoloque todos os parafusos, arruelas lisas e de pressão, etc. em suas posições originais;
- i. Recoloque o líquido isolante o seu nível original conforme descrito no item **Reposição do líquido isolante – item 7.5.5**, descrito neste manual. Reponha a tampa do tanque conforme **item 7.3.2**.

7.5 Manutenção do Líquido Isolante

Cuidado especial deve ser tomado com o líquido isolante para evitar contaminação. Os tanques dos transformadores são selados de modo a evitar contato com a atmosfera ambiente e outros agentes contaminantes. Não se deve abrir o mesmo em condições de chuva ou alta umidade relativa do ar (>80%).

Durante o processo de drenagem e enchimento do transformador deve-se tomar cuidado de maneira a evitar a formação de bolhas, já que estas podem reduzir a rigidez dielétrica do líquido isolante.

De modo a referenciar as condições para o líquido isolante fornecido originalmente com o transformador, este foi ensaiado conforme os parâmetros definidos na norma ABNT NBR 15422.

ATENÇÃO - Caso seja necessária manutenção interna e a tampa necessite ser removida para serviços internos, o tempo de exposição com o ar deve ser minimizado. Evite tempos de exposição maiores que 4 horas. Imediatamente após concluir o serviço, recoloque a tampa.

7.5.1 - Tomada de Amostra de Líquido Isolante

CUIDADO - Alta Tensão. Antes de retirar amostra do líquido isolante desenergize o transformador desde um ponto remoto. Verifique se todos os terminais e isoladores estão sem tensão e aterre o transformador de acordo com normas de segurança apropriadas.

A norma de referência para técnicas de retirada de amostra deve ser a ASTM D923 “Procedimentos Padrão para Retirada de Amostras de Líquidos Isolantes Elétricos”.

A amostra do líquido isolante deve ser coletada quando a temperatura do mesmo for igual ou maior que a do ambiente de maneira a evitar-se condensação por umidade no líquido.

Os recipientes utilizados para tomada de amostra do líquido devem ser frascos de vidro de boca larga e seca. Suficiente quantidade deve ser drenada de maneira a garantir que a amostra seja a do fundo do tanque, e não do líquido armazenado na zona de onde se retira a amostra.

7.5.2 - Teste do Líquido Isolante

Para o teste de rigidez dielétrica do líquido isolante, siga a norma ASTM D877, “Procedimento Padrão para Teste de Rigidez Dielétrica de Líquidos Isolantes utilizando Discos de Eletrodos”. Se a rigidez dielétrica do líquido for inferior a 26 kV este deve ser filtrado até que os testes dêem valores em torno de 26 kV ou melhores.

7.5.3 - Filtragem do Líquido Isolante

A filtragem deve ser realizada em bomba termovácuo até que os testes de rigidez dielétrica produzam valores iguais ou superiores a 26 kV.

7.5.4 - Drenagem do Líquido Isolante (Precauções)

- Verifique se o tanque está aterrado, desenergize o transformador, aterre todos os isoladores e terminais;
- Se a remoção da tampa for necessária, remova a mesma conforme instruções descritas no **item 5.4 – a**, deste manual.
- Prepare um recipiente limpo e seco, que não seja de plástico, para receber o líquido.
- Use bombas ou mangueiras que não tenham sido contaminadas com líquidos não similares.
- Use mangueira de metal ou de material compatível com o líquido isolante. Se for utilizada uma mangueira de borracha não compatível com o líquido isolante, este dissolverá o enxofre encontrado na borracha, o qual poderá danificar o material condutor.
- Conecte o bocal da mangueira no fundo do tanque. Não permita que o líquido drenado seja projetado no dispositivo de recepção, pois o jorro irá introduzir ar e umidade no líquido.
- Não drene o líquido isolante a um nível inferior ao topo do núcleo a menos que seja absolutamente necessário. A exposição dos enrolamentos pode fazer com que a umidade contamine a isolação dos enrolamentos.

7.5.5 - Restaurando o Nível do Líquido Isolante

Se for necessário drenar e reencher o transformador, cuidado especial deve ser tomado de maneira a evitar a formação de bolhas no sistema. Deve ser dado tempo suficiente entre o enchimento e a energização de modo que se assegure que as possíveis bolhas formadas tenham se dissipado.

Recomendações:

- Bombeie do fundo do tanque de armazenamento temporário. Não permita que a entrada da bomba sucione ar, já que as bolhas de ar reduzirão a integridade dielétrica do sistema de isolação.
- Para prevenir aeração na saída da mangueira, faça com que esta fique debaixo da superfície do líquido

CUIDADO: Pode ser necessário adicionar líquido extra ao tanque desde uma fonte de reserva para substituir a pequena quantidade perdida na bomba e nas conexões, e também prevenir aeração durante a reposição do líquido isolante.

- Bombeie lentamente. Se a tampa do tanque não está fixada ao mesmo, encha com o líquido até a marca de nível localizada na parede interna do tanque.

Observações finais: Para o bom funcionamento e conservação do transformador se aconselha:

- Cada cinco anos devem ser realizados os seguintes ensaios com o transformador desconectado e longe da fonte de tensão: resistência do isolamento e retirada de amostra do líquido isolante para análise em laboratório.

8 Normas Aplicáveis

NBR 5356 – Transformadores de potência
Norma Regulamentadora Número 10 – NR10 – Segurança em instalações e serviços em Eletricidade.

9 Partes Sobressalentes e Assistência Técnica

Quando for necessário solicitar ao fabricante peças para reposição ou informações de um determinado transformador por gentileza especifique com clareza alguns dados indicados na placa de identificação, tais como: número de série, potência e data de fabricação.

Para solicitar peças ou esclarecer dúvidas, entre em contato conosco:

ROMAGNOLE PRODUTOS ELÉTRICOS S.A.

Rodovia BR 376 km 394 – Mandaguari – Paraná

<http://www.romagnole.com.br>

Fone: (55)-44-3233-8155 ou (55)-44-3233-8028

E-mail: romagnole@romagnole.com.br ou luizr@romagnole.com.br

ANEXOS

MN132002EN – Instruções para manutenção do fusível baioneta

MN132003EN – Instruções para montagem do fusível baioneta

IS-K150A1 – Instrução para montagem da bucha de inserção deadbreak

MN650013EN – Instrução para montagem da bucha de inserção loadbreak

MN800004EN – Instrução para montagem da chave de abertura sob carga

23 and 38 kV Bay-O-Net fuse re-fusing installation instructions



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Safety for life



Eaton meets or exceeds all applicable industry standards relating to product safety with 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.

G122.3

Product Information

Introduction

Eaton protects transformers and distribution systems with its Cooper Power™ series Bay-O-Net fuse assemblies. They are designed for use in pad-mounted or subsurface distribution transformers filled with transformer oil or approved equivalent. The assemblies combine the ease of hotstick operation with the safety of deadfront construction.

Removal of the fuse holder from the assembly indicates that the apparatus is electrically disconnected. It also allows convenient fuse element inspection and replacement. When typical safety practices are followed, the assemblies can be loadbreak-operated for working on the transformer secondary; changing distribution voltage with dual voltage switches or tap changers; or disconnecting the apparatus from the line.

Eaton's optional Cooper Power series Flapper™ valve Bay-O-Net fuse assembly (available as sidewall-mounted only) includes a flapper valve inside the housing which closes when the fuse holder is removed, thus minimizing oil spillage.

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 representative.

Acceptance and Initial Inspection

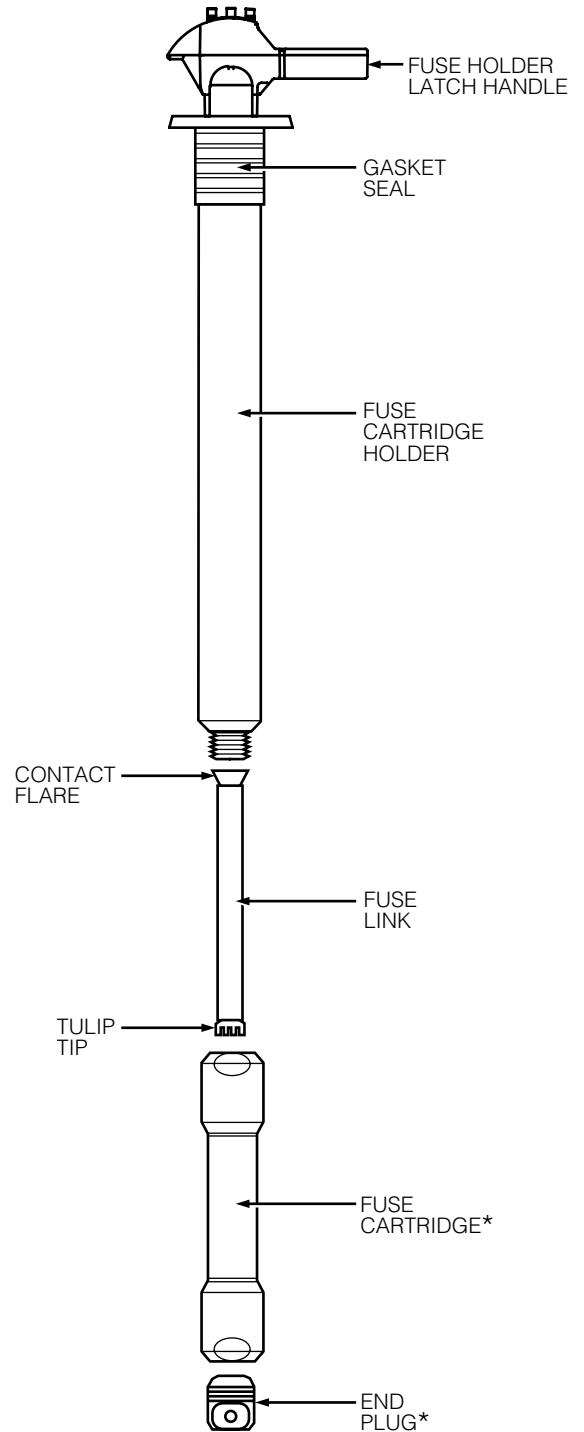
Each fuse is in good condition when accepted by the carrier for shipment. Upon receipt, inspect the shipping container for signs of damage. Unpack the fuse and inspect it thoroughly for damage incurred during shipment. If damage is discovered, file a claim with the carrier immediately.

Handling and Storage

Be careful during handling and storage of the fuse to minimize the possibility of damage. If the fuse 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



* Separate fuse link, fuse cartridge and end plug apply for all Eaton's Cooper Power series Bay-O-Net fuses except catalog numbers for 23 kV 4000358C16CB and C18CB, 4038361C03CB, C04CB, C05CB, along with solid link 4038361C10CB and 38 kV 4000380C06CB, C08CB, C10CB, C11CB, C12CB, C14CB, which are an integral assembly including the link, cartridge and end plug.

Figure 1. Sidewall-mounted Bay-O-Net fuse.

General considerations apply to both cover- and sidewall-mounted Bay-O-Net assemblies

WARNING

Bay-O-Net Fuse is not recommended for fault closing. Serious personal injury may result if attempted. Internal fault conditions can cause transformer to rupture or cover to blow off. Always energize transformer from remote location to be safe. This device was designed and intended for under-oil application only. Refer to Step 10 for correct oil level.

CAUTION

Do not re-energize suspected failed equipment. When replacing a blown fuse, the feed circuit should be opened and closed from a remote location. The Bay-O-Net fuse should be replaced using the procedure described below and re-energized from a remote location. If equipment is re-fused while energized, the fuse could close in on the system's maximum fault current. Any equipment that has a suspected failure should not be closed in with this fuse.

The Bay-O-Net fuse is designed to be operated in accordance with normal safe operating procedures. These instructions are not intended to supersede or replace existing or utility specific safety and operating procedures. The Bay-O-Net fuse should be installed and serviced only by personnel familiar with good safety practices and the handling of high voltage electrical equipment.

WARNING

Bay-O-Net Fuses can be used to turn transformers off or on, within the ratings listed below. Attempts to switch current in excess of those ratings can cause rupture of the transformer tank or cause the cover to blow off. Fire, injury or death may result.

Voltage	Amps	Maximum kV Rating
10 kV	160 A	23 kV Housing
15.5 kV	150 A	
26.7 kV	80 A	
34.5 kV	50 A	38 kV Housing
38 kV	50 A	

WARNING

Bay-O-Net fuses are operated manually and proper use requires skill and practice on the part of the user. Before using the Bay-O-Net to turn an energized transformer off, the operator should be experienced in removing the Bay-O-Net from its holder when it is mounted to the transformer. Improper operation can result in a failure to switch and could require the transformer to be replaced or result in a fire.

WARNING

Before operating the Bay-O-Net, carefully assess the condition of the transformer. Check for any audible sounds of arcing occurring inside the tank. Check for bulging of the tank or any signs of oil leakage or spillage. Check the tank in the proximity of the pressure relief device for any signs of oil leakage, spillage, or for black carbon smudges. If any of these conditions are present, do not attempt to switch the transformer on or off with the Bay-O-Net. Conditions within a transformer with these external signs could cause the transformer tank to rupture or cause the cover to blow off the transformer. Fire, injury or death may result.

CAUTION

Before operating the Bay-O-Net inspect the area around the unit to make sure the ground is level and the footing is sound. These conditions represent a significant risk of injury due to a fall. Failure to properly operate the Bay-O-Net, could result in personal injury due to a fire or explosion.

WARNING

If the transformer is in an enclosed building or vault, or if the operator is positioned directly over the transformer, Bay-O-Net fuse assemblies should not be used to turn the transformer on or off. In such instances, an operator may be prevented from properly operating the Bay-O-Net or from safely leaving the area in the event of an improper operation.

Sidewall-mounted Bay-O-Net fuse re-fusing procedure

Remove Fuse Holder

Step 1

Relieve tank pressure

- If transformer tank has a pressure relief valve, use hotstick and complete the following steps to relieve tank pressure.
 - Pull pressure relief valve open, keeping it held open for 30 seconds after pressurized air can no longer be heard evacuating audibly through the valve.
 - Close pressure relief valve and wait 30 seconds.
 - Pull pressure relief valve open. Keep it open until audible pressure stops and hold it open for an additional 5 seconds. Pulling the valve open again allows any residual pressure to be removed from the tank.

WARNING

Transformer tank pressure must be relieved prior to Bay-O-Net operation. Failure to properly vent the transformer tank pressure can result in violent ejection of the Bay-O-Net stab assembly along with hot oil. This can cause impact injury, burns and environmental contamination.

Step 2

Unlock fuse holder

- Standing to one side of the transformer, attach hotstick to fuse holder eye and twist hotstick to unlock fuse holder.

Step 3

Break seal

- Turn fuse holder 90° in the Bay-O-Net housing to break the seal between the seal gasket and the Bay-O-Net housing. (See Figure 2.)

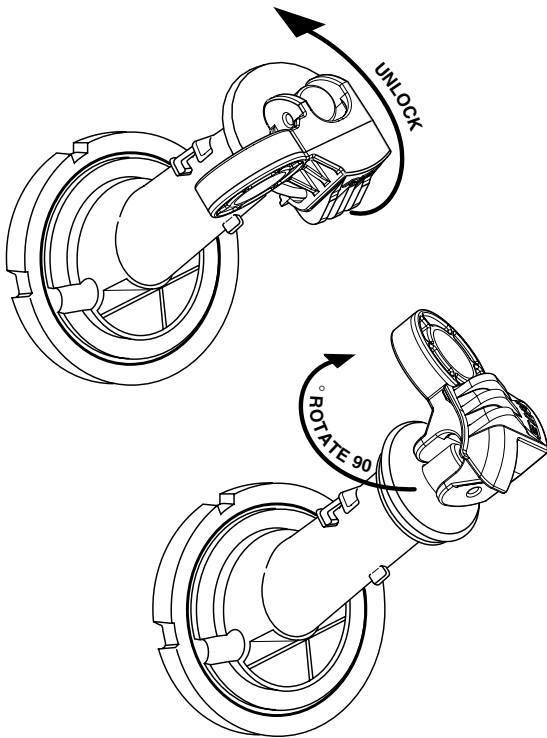


Figure 2. Unlock and turn fuse holder 90° in the Bay-O-Net housing.

Step 4

Draw fuse holder out

- Draw the fuse holder out rapidly in one motion 6 to 8 inches (152 to 203 mm) to interrupt transformer load. (See Figure 3.)

WARNING

Moving the fuse holder the first 6 to 8 inches (152 to 203 mm) rapidly is critical to the Bay-O-Net successfully switching the transformer off. Movement in this region should be as fast and smooth as possible. If the movement is slow or interrupted, the current may continue in the form of an arc, which could damage the transformer, requiring its replacement. A fire could result, as could death or moderate injury.

- Wait several seconds for fluid to drain into tank.

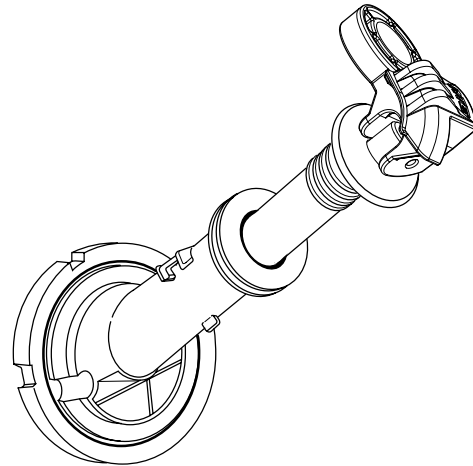


Figure 3. Draw fuse holder out 6 to 8 inches (152 to 203 mm).

Step 5

Remove fuse holder from Bay-O-Net housing

- Remove fuse holder from Bay-O-Net housing.

Note: If a drip guard (metal or plastic) is present, it is recommended to rest the Bay-O-Net holder on the drip guard for 30 seconds to 1 minute to minimize the potential of oil spillage onto rubber terminators.

- Wipe off fuse cartridge holder and fuse cartridge using a clean cloth. (See Figure 4.)

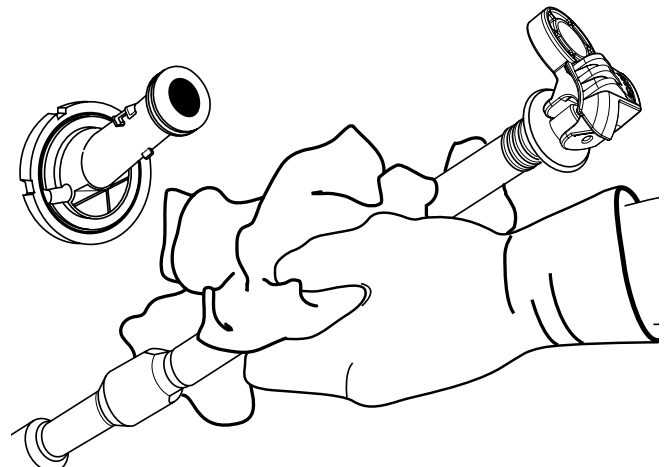


Figure 4. Remove fuse holder from Bay-O-Net housing and wipe clean of insulating fluid.

Note: If any fluid is coming out of Bay-O-Net Assembly, pull pressure relief valve again to equalize pressure inside the tank. (Refer to Step 1 for instructions.)

Replace Fuse Link

For all Eaton's Cooper Power series Bay-O-Net fuses except 23 kV 4000358C16CB and C18CB, 4038361C03CB, C04CB, C05CB, solid link 4038361C10CB, 38 kV 4000380C06CB, C08CB, C10CB, C11CB, C12CB, and C14CB follow steps 6 through 9. For the above listed integral cartridge fuses follow Step 6 and then tighten new cartridge/fuse/end plug against fuse holder using 50-70 in-lbs (5.65-7.9 Nm) of torque.

CAUTION

Prior to installing the new cartridge verify that the kV rating and length matches the cartridge being replaced. Failure to use the correct length integral cartridge will result in poor electrical contact between the cartridge and Bay-O-Net housing terminals, resulting in possible equipment damage.

Step 6

Remove fuse cartridge

- Use a 3/4 inch (19 mm) wrench to remove fuse cartridge from fuse cartridge holder. (See Figure 5.)
- Carefully inspect the fuse cartridge. (See Caution below.)

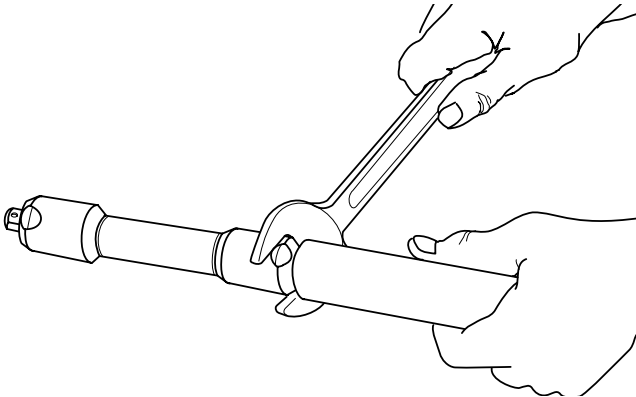


Figure 5. Remove fuse cartridge from fuse cartridge holder.

WARNING

Damage to the cartridge (such as severe erosion of the brass end piece, or burning on the interior or exterior surface of the insulation) may prevent the fuse from proper operation. Inspect the cartridge carefully to ensure there is no erosion greater than small pitting on any of the brass pieces, or blackening or burning of the insulating members longer than 1/2" (13 mm). If damage exceeds this level, the damaged cartridge should be replaced with a new one. If large amounts of melting of the brass have occurred, or burning extends more than half the length of the cartridge, the Bay-O-Net holders should also be replaced. This should be done in a transformer repair facility by qualified and trained personnel. If the assemblies are damaged, a failure to interrupt a later fault could result. This may cause injury to the operator or to the public.

Step 7

Remove end plug and fuse link from fuse cartridge

- Use 3/4 inch (19 mm) and 1/2 inch (13 mm) wrenches to remove end plug. (See Figure 6.)
- Use screwdriver or other tool to straighten the tulip tip end of fuse link and push fuse link out of fuse cartridge.

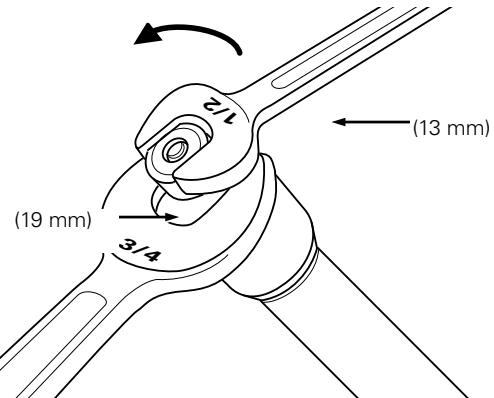


Figure 6. Remove end plug from fuse cartridge.

Step 8

Insert replacement fuse link into fuse cartridge (Figure 7.)

- A slight resistance may occur when inserting fuse link into cartridge (Refer to Figure 7A and 7B).
- If the catalog number of the fuse being replaced is not known or is illegible on the fuse, consult equipment specifications or manufacturer.

WARNING

Using a Bay-O-Net link with a higher amp rating could result in improper coordination with the backup current-limiting fuse inside the transformer or elsewhere on the system. This may result in a much larger outage in the event of failure within the transformer or a fire or explosion of the transformer. Installing a Bay-O-Net link with a smaller than recommended amp rating may cause an unnecessary fuse operation and service interruption. Always follow the equipment specifications when replacing a fuse link.

Step 9

Tighten cartridge to fuse cartridge holder

- Tighten fuse contact flare end against fuse cartridge holder using 50-70 in-lbs (5.65-7.9 Nm) of torque (Refer to Figure 7C).
- Replace end plug on other end of fuse cartridge and tighten to 50-70 in-lbs (5.65-7.9 Nm) torque (Refer to Figure 7D and 7E).
- Remove end plug and ensure that leaves of tulip tip have spread uniformly (Refer to Figure 7F).
- Replace end plug applying 50-70 in-lbs (5.65-7.9 Nm) torque to both connections (Refer to Figure 7D and 7E).

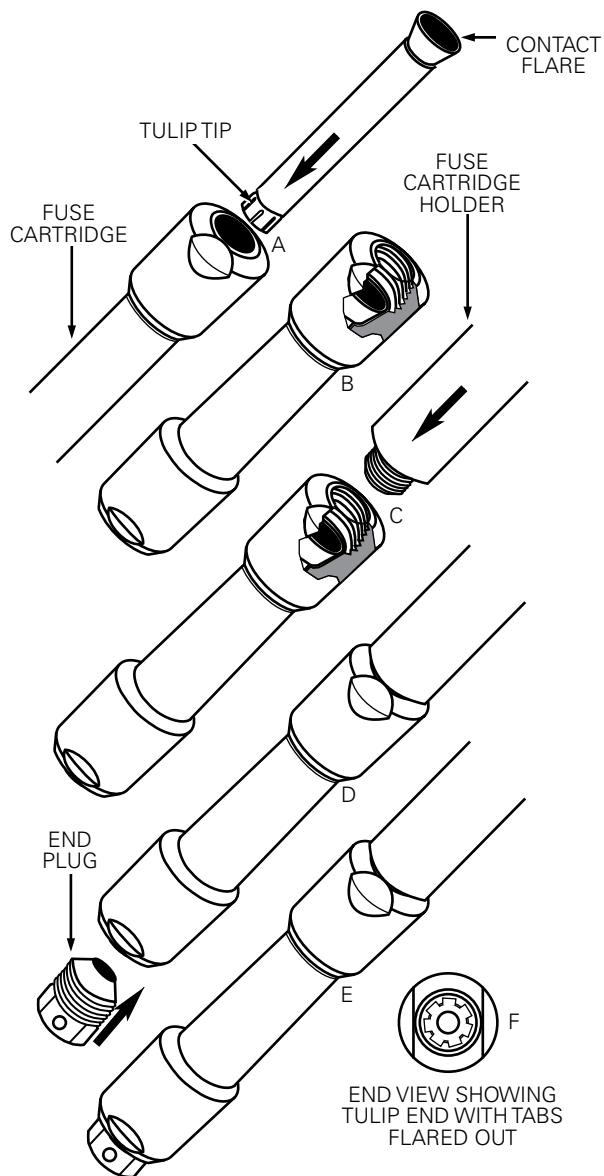


Figure 7. Fuse link replacement.

CAUTION

Failure to properly tighten the fuse cartridge holder and the end plug to the fuse cartridge will result in a poor electrical connection, resulting in damage to the Bay-O-Net and the transformer. The steps detailed in Figure 7 should be followed in proper order to ensure a good electrical connection.

Step 10

Check fluid level

- Refer to the equipment manufacturer's instruction book for correct oil level.
- The fluid level in the transformer should be approximately at the base of the protruding plastic threads of the Bay-O-Net housing at 25° C (77° F) with the transformer on a level surface. (See Figure 8.)

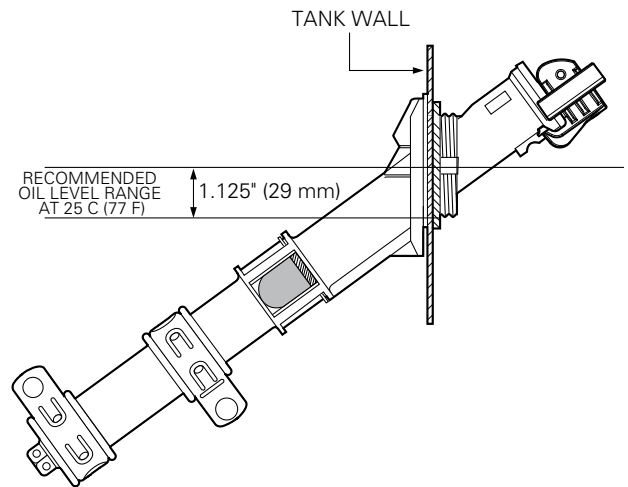


Figure 8. Check fluid level.

WARNING

Inadequate oil in the tank can result in a dielectric failure of the transformer causing an outage, damage to the transformer, fire or explosion. If the transformer has excess oil, spillage may result when the Bay-O-Net fuse holder is removed.

Step 11

Install fuse holder

- Pull pressure relief valve, keeping it held open until audible pressure evacuation stops and then hold open for another 5 seconds.
- Attach end of fuse holder assembly to hotstick and insert holder assembly firmly into the Bay-O-Net housing.

- Twist the locking handle so that the latch engages the Bay-O-Net housing's shoulder and the steel washer seats tightly on the end of the tube of the Bay-O-Net holder assembly. (See Figure 8.)

⚠ CAUTION

The last 6 to 8 inches (152 to 203 mm) of movement are critical to the Bay-O-Net successfully switching the transformer on. Movement in this region should be as fast and smooth as possible. If the movement is slow or interrupted, damage to the Bay-O-Net assembly could result.

⚠ CAUTION

Visually inspect the entire fuse holder assembly to be sure it is installed correctly. Ensure that the fingers of the latch are entirely under the latch ring of the housing. This ensures that the contacts inside the assembly are fully engaged. If the contacts are not fully engaged, damage and eventual failure of the fuse holder and cartridge will result.

Cover-mounted Bay-O-Net fuse (23 kV maximum) re-fusing procedure

Remove fuse holder

⚠ WARNING

Bay-O-Net fuse assemblies should not be used to turn on or off a transformer if the transformer is in an enclosed building or vault, or with the operator being positioned directly over the transformer. In such instances, an operator may be prevented from properly operating the Bay-O-Net or from safely leaving the area in the event of an improper operation.

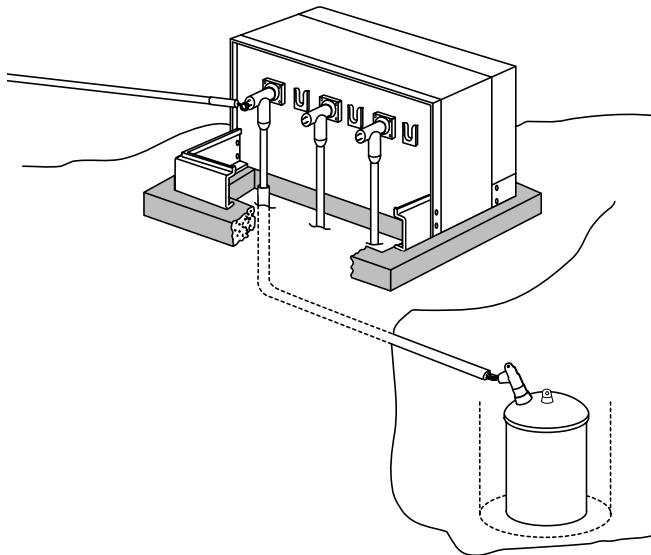


Figure 9. De-energize transformer from remote location.

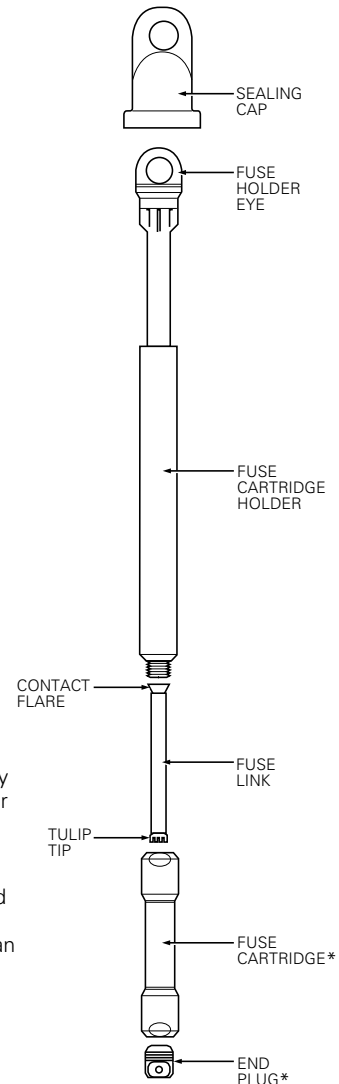
Step 1

De-energize Transformer

- It is recommended that the transformer be de-energized from a remote location. (See Figure 9.) This is especially true when the transformer is located in a vault, room or in a position requiring the operator to operate the Bay-O-Net while standing directly over the transformer. If the transformer has a pressure relief valve, use a hotstick to relieve the tank pressure. (Refer to Step 1 on page 3.)

⚠ WARNING

Transformer tank pressure must be relieved prior to Bay-O-Net operation. Failure to properly vent the transformer tank pressure can result in violent ejection of the Bay-O-Net stab assembly along with hot oil. This can cause impact injury, burns and environmental contamination.



*Separate fuse link, fuse cartridge and end plug apply for all Eaton's Cooper Power series Bay-O-Net fuses except catalog numbers 4000358C16C and C18C, 4038361C03CB, C04CB and C05CB along with solid link 4038361C10CB which are an integral assembly including the link cartridge and end plug.

Figure 10. Cover-mounted Bay-O-Net Fuse.

⚠ WARNING

Manufacturer does not recommend using Bay-O-Net fuse to break load in submersed transformers. In such instances, an operator may be prevented from properly operating the Bay-O-Net or from safely leaving the area in the event of an improper operation. Violent ejection of the stab along with hot oil can result. This can cause impact injury, burns and environmental contamination.

Step 2

Unscrew sealing cap

- Standing in a safe position, use hotstick to unscrew sealing cap from apparatus. (See Figure 11.)

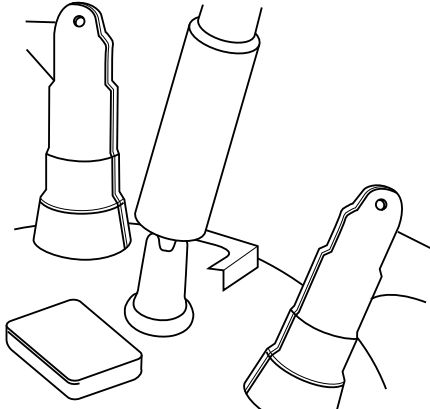


Figure 11. Unscrew sealing cap from apparatus.

Step 3

Clamp with hotstick

- Clamp exposed fuse holder eye with a hotstick and quickly withdraw fuse holder 6 to 8 inches (152 to 203 mm). Wait several seconds for fluid to drain into tank. (See Figure 12.)

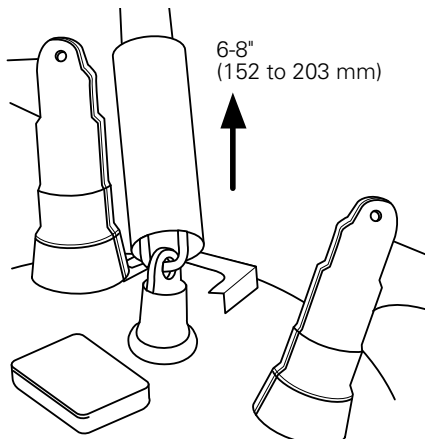


Figure 12. In one motion, rapidly withdraw fuse holder 6 to 8 inches (152 to 203 mm).

⚠ WARNING

The first 6 to 8 inches (152 to 203 mm) of movement are critical to the Bay-O-Net successfully switching the transformer off. Movement of the fuse holder should be in one rapid motion. If the movement is slow or interrupted, the current may continue in the form of an arc, which could damage the transformer, requiring its replacement. A fire could result, as could a burn injury.

Step 4

Remove fuse holder

- Remove fuse holder from Bay-O-Net housing and wipe off fuse cartridge holder and fuse cartridge using a clean cloth.

Note: If a drip guard (metal or plastic) is present, it is recommended to rest the Bay-O-Net holder on the drip guard for 30 seconds to 1 minute to minimize the portion of oil spillage onto rubber terminators.

- Replace sealing cap using a hotstick, standing at a safe distance from the apparatus. (See Figure 13.)

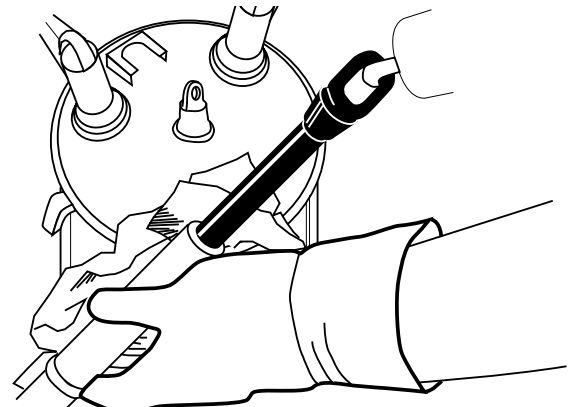


Figure 13. Remove fuse holder from Bay-O-Net housing, replace cap.

Replace fuse link

For all Cooper Bay-O-Net fuses except 4000358C16CB and C18CB, 4038361C03CB, C04CB and C05CB along with solid link 4038361C10CB follow Steps 5 through 7. For the above mentioned integral cartridge fuses follow Step 5, then tighten new cartridge/fuse/end plug against fuse holder using 50-70 in-lbs (5.65-7.9 Nm) of torque.

Step 5

Remove fuse cartridge

- Use a 3/4 inch (19 mm) wrench to remove fuse cartridge from fuse cartridge holder. (See Figure 14.)

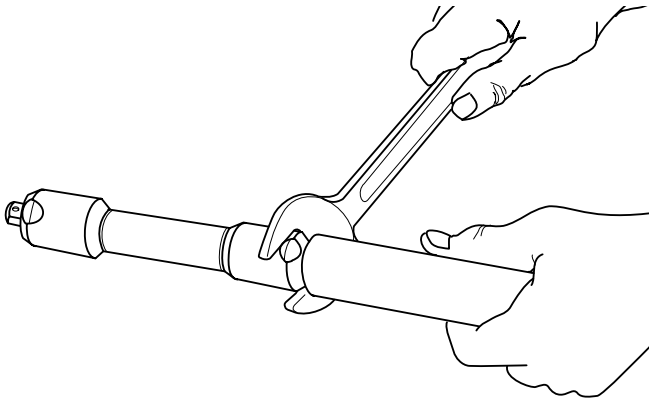


Figure 14. Remove fuse cartridge.

Step 6

Remove end plug and fuse link from fuse cartridge

- Use $\frac{3}{4}$ inch (19 mm) and $\frac{1}{2}$ inch (13 mm) wrenches to remove end plug. (See Figure 15.)

CAUTION

Damage to the cartridge such as severe erosion of the brass end piece, or burning on the interior or exterior surface of the insulation could prevent the fuse from proper operation. Inspect the cartridge carefully to ensure there is no erosion greater than small pitting on any of the brass pieces, blackening or burning of the insulating members longer than $\frac{1}{2}$ " (13 mm). If damage exceeds this level, the damaged cartridge should be replaced with a new one. If large amounts of melting of the brass have occurred, or burning extends more than half the length of the cartridge, the Bay-O-Net holders should also be replaced. This should be done in a transformer repair facility by qualified and trained personnel. If the assemblies are damaged, a failure to interrupt a later fault could result. This could cause injury to the operator or to the public.

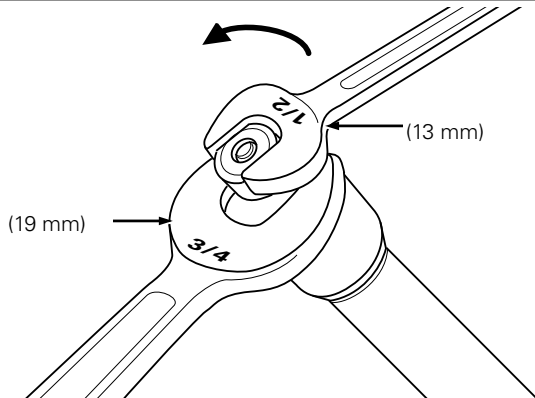


Figure 15. Remove end plug from fuse cartridge.

- Use screwdriver or other tool to straighten the tulip tip end of fuse link and push fuse link out of fuse cartridge.

Step 7

Insert replacement fuse link into fuse cartridge. (Figure 16.)

- A slight resistance may occur when inserting fuse link into cartridge.
- If the catalog number of the fuse being replaced is not known or is illegible on the fuse, consult equipment specifications or manufacturer.

CAUTION

Failure to properly tighten the cartridge will result in a loose connection, resulting in damage to the Bay-O-Net and the transformer. Damaged equipment must be removed from service to perform necessary repairs.

WARNING

Using a Bay-O-Net link with a higher amp rating could result in improper coordination with the backup current-limiting fuse inside the transformer or elsewhere on the system. This may result in a much larger outage in the event of failure within the transformer or a fire or explosion of the transformer. Installing a Bay-O-Net link with a smaller than recommended amp rating may cause an unnecessary fuse operation and service interruption. Always follow the equipment specifications when replacing a fuse link.

- Tighten cartridge (fuse contact flare end) against fuse cartridge inner holder using 50-70 in-lbs (5.65-7.9 Nm) of torque.
- Replace end plug on other end of fuse cartridge and tighten to 50-70 in-lbs (5.65-7.9 Nm) torque.
- Remove end plug and ensure that leaves of tulip tip have spread uniformly.
- Replace end plug applying 50-70 in-lbs (5.65-7.9 Nm) torque to both connections.

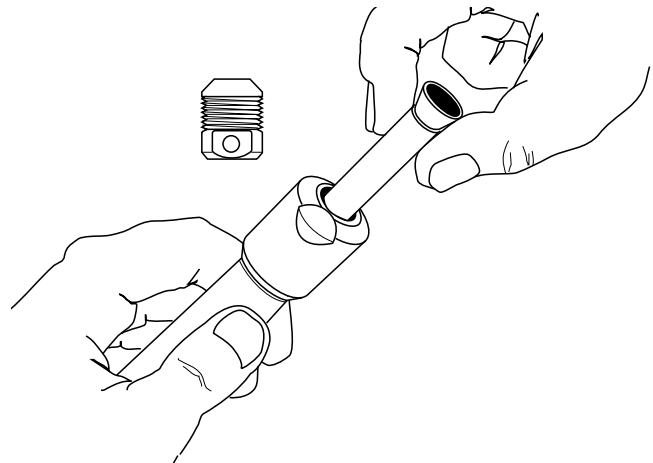


Figure 16. Insert replacement fuse link into fuse cartridge.

Step 8

Check fluid level

- Refer to manufacturer's instruction book for correct oil level. (See Figure 17.)

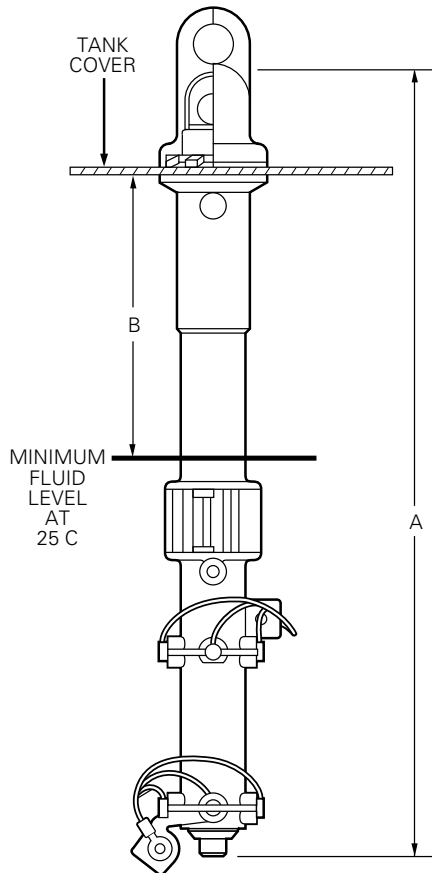


Figure 17. Check fluid level.

- To determine if a long or short Bay-O-Net assembly is used, measure the length of the entire fuse holder assembly (Dimension A). Dimension B in the drawing is the required fluid level. (See Table 1.)

Table 1. Fuse Lengths

Size	A	B
Short	15.0 in. (381 mm)	4.19 in. (106 mm)
Long	17.75 in. (450 mm)	6.94 in. (176 mm)

Step 9

Relieve tank pressure

- Pull pressure relief valve, keeping it held open until audible pressure evacuation stops and then hold open for another 5 seconds.

Remove sealing cap

- Standing in a safe position, use hotstick to unscrew sealing cap from apparatus. (See Figure 11.)

Replacing fuse holder using a hotstick.

- Clamp exposed fuse holder eye with a hotstick and with one rapid motion, insert assembly fully into the housing. (See Figure 18.)

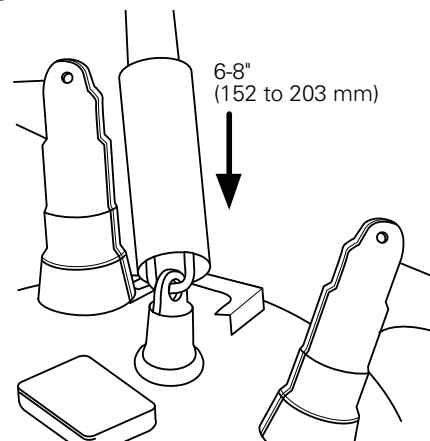


Figure 18. In one motion, rapidly replace the fuse holder.

CAUTION

The last 6 to 8 inches (152 to 203 mm) of movement are critical to the Bay-O-Net successfully switching the transformer on. Movement in this region should be as fast and smooth as possible. If the movement is slow or interrupted damage to the Bay-O-Net assembly could result.

Step 10

Reinstall sealing cap

- Standing in a safe position, use hotstick to reattach the sealing cap by screwing it onto the threads of the Bay-O-Net housing until tight. (See Figure 19.)

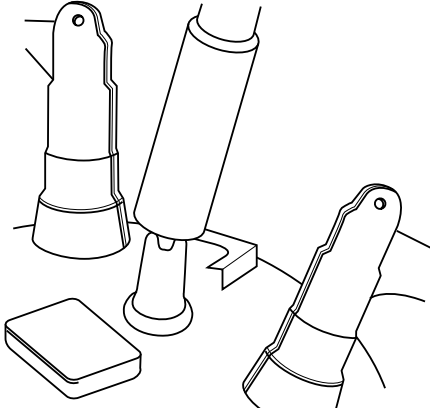


Figure 19. Screw on sealing cap from apparatus.



CAUTION

Visually inspect the entire fuse holder assembly to be sure it is installed correctly. Pay close attention to be sure the cap is fully tightened in place. This ensures that the contacts inside the assembly are fully engaged. If the contacts are not fully engaged, burning of the fuse holder and cartridge will result.

If the transformer has been de-energized remotely, re-energize apparatus from the remote location.

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1-877-277-4636 or visit:
www.cooperpower.com.

23 and 38 kV sidewall-mounted and 23 kV cover-mounted
Bay-O-Net fuse assembly installation instructions



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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.

G122.3

⚠ WARNING

The sidewall-mounted and cover-mounted Bay-O-Net Assembly should be installed only by personnel familiar with good safety practice and the handling of high voltage equipment.

Product Information

Introduction

Eaton protects transformers and distribution systems with its Cooper Power™ series Bay-O-Net fuse assemblies. They are designed for use in pad-mounted or subsurface distribution transformers filled with transformer oil or approved equivalent. The assemblies combine the ease of hotstick operation with the safety of deadfront construction.

Removal of the fuse holder from the assembly indicates that the apparatus is electrically disconnected. It also allows convenient fuse element inspection and replacement. When typical safety practices are followed, the assemblies can be loadbreak-operated for working on the transformer secondary; changing distribution voltage with dual voltage switches or tap changers; or disconnecting the apparatus from the line.

Eaton's optional Cooper Power series Flapper™ valve Bay-O-Net fuse assembly (available as sidewall-mounted only) includes a flapper valve inside the housing which closes when the fuse holder is removed, thus minimizing oil spillage.

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 representative.

Acceptance and Initial Inspection

Each fuse is in good condition when accepted by the carrier for shipment. Upon receipt, inspect the shipping container for signs of damage. Unpack the fuse 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 fuse to minimize the possibility of damage. If the fuse 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

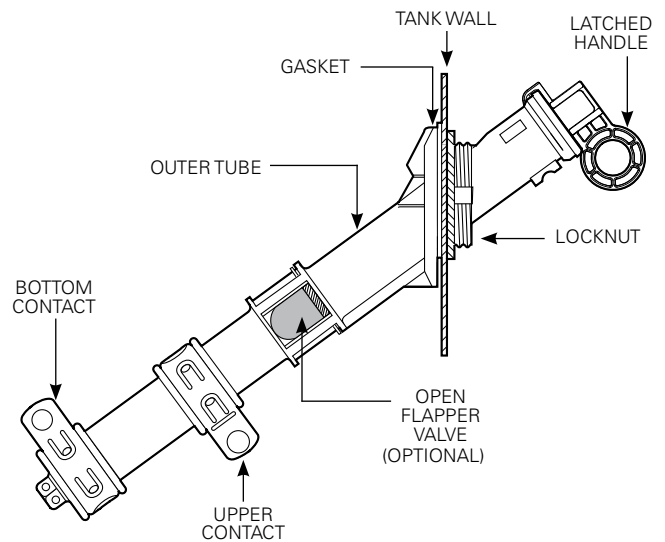


Figure 1. Line illustration of sidewall-mount assembly with optional Flapper valve.

Installation procedure

Installation instructions

The 23 kV Bay-O-Net assembly is designed for use inside the transformer tank at maximum operating temperatures (in oil) at 130 °C, and (air exposure) at 65 °C through 34.5 Grd Y/21.1 kV. The 38 kV Bay-O-Net assembly is designed for use inside the transformer tank at maximum temperature (in oil) at 130 °C, and (air exposures) at 65 °C above 23 kV line-line with a maximum of 38 kV line-line voltage. The housing will have a yellow 38 kV decal near the top of the housing. The sidewall-mounted assembly uses a 2 1/4" (57 mm) hole with keyed slot, Figure 2, and the cover-mounted assembly uses a 1 3/8" (35 mm) hole with slot, Figure 3. All assemblies use a gasket inside the tank and an external lock nut. All inner gasket surfaces of the tank must be free of burrs.

Dimensional information for the assemblies is shown in Figures 4 and 5. Adequate mechanical clearance is required for shotgun stick operation. Refer to Table 2 for dielectric clearances.

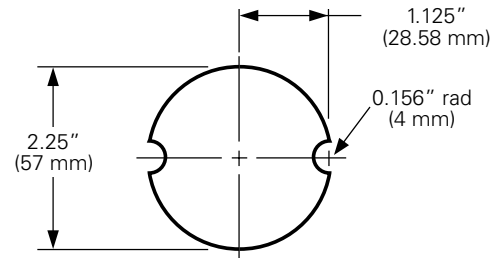


Figure 2. Tank mounting hole for sidewall-mounted assembly.

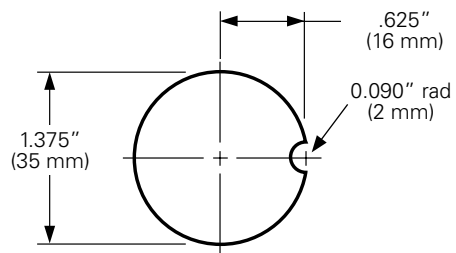


Figure 3. Tank mounting hole for cover-mounted assembly.

Table 1. Ratings and Characteristics 23 kV Assembly

kV	Electrical Ratings
150	BIL and Full Wave Crest
50	60 Hz, AC, 1 minute withstand
kV	Maximum Single-Phase Interrupting Ratings in Mineral Oil*
8.3	3,500 A rms symmetrical Cover Mount 3,500 A rms symmetrical Sidewall Mount
15.5	2,500 A rms symmetrical Cover Mount 2,500 A rms symmetrical Sidewall Mount**
23.0	1,000 A rms symmetrical Cover Mount 1,000 A rms symmetrical Sidewall Mount
kV	Loadbreak Ratings (at 80% pf)
10.0	160 A
15.5	150 A
26.7	80 A
34.5	50 A

* With Eaton's Cooper Power series Bay-O-Net fuse links only. Check Bay-O-Net fuse catalog sections for ratings in Envirotemp™ FR3™ fluid.

** Except with high ampere overload Bay-O-Net links, which is 2000 A rms symmetrical.

Table 3. Dielectric Clearances

kV	Clearance to Ground or Between Phases	Clearance Behind Lower End of Housing
95	1.1" (27.9 mm)	3" (76.2 mm)
125	1.5" (38.1 mm)	3" (76.2 mm)
150	2.5" (63.5 mm)	3" (76.2 mm)
200	3.0" (76.2 mm)	3.5" (88.9 mm)

Table 2. Ratings and Characteristics 38 kV Assembly

kV	Electrical Ratings
200	BIL and Full Wave Crest
70	60 Hz, AC, 1 minute withstand
kV	Maximum Single-Phase Interrupting Ratings
38	900 A rms symmetrical for 10-40 A Integral Cartridge Link 1000 A rms symmetrical for 65 A Integral Cartridge Link
kV	Loadbreak Ratings (at 80% pf)
38	50 A

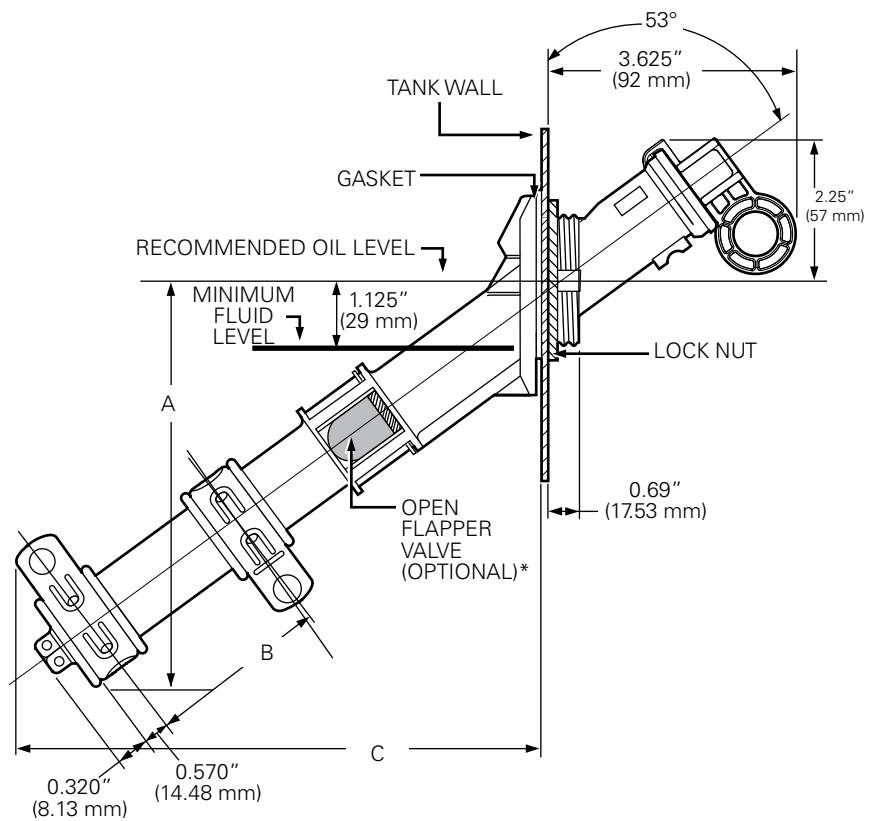


Figure 4. Sidewall-mounted assembly dimensions and fluid level.

Note: Dimensions are for reference only. Optional Flapper Valve assembly is shown, dimensions for the sidewall-mounted assembly without a Flapper valve are the same.

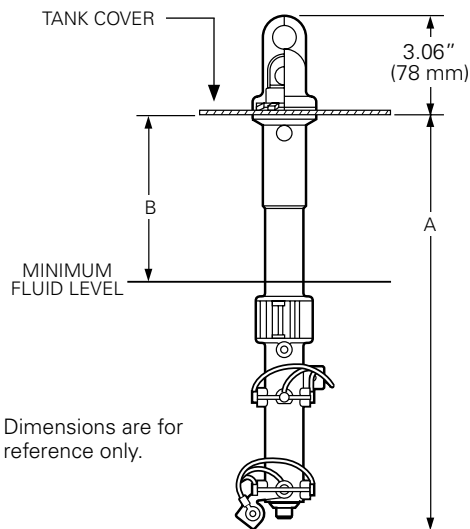


Figure 5. Cover-mounted assembly dimensions are fluid level (23 kV maximum line-line voltage).

Table 4. Sidewall-Mounted Assembly Dimensional Information (Figure 4)

kV Rated Assembly	Length in./ (mm)		
	A	B	C
23	7.07 (180)	3.125 (80)	9.125 (232)
38	7.66 (195)	4.125 (105)	9.95 (253)

Table 5. Cover-Mounted Assembly Dimensional Information (Figure 5)

Type	Length in./ (mm)	
	A	B
Short	13.62 (346)	4.19 (107)
Long	16.37 (416)	6.94 (177)

⚠ CAUTION

It is recommended that the accompanying decals be prominently displayed at or near location of Bay-O-Net as a warning to service personnel. *Failure to do so will constitute a waiver of all warranty and indemnity obligations which may be attributable to Eaton.*

Installation of assembly

Tightening requirements to seal

- Sidewall-Mounted Assembly: It is recommended that a Bay-O-Net locknut wrench (catalog #0838983B01) be used with a standard 3/8" drive socket wrench to tighten the locknut. Sealing requirements are attained by first hand-tightening the locknut and then continuing an additional 1/4 to 1/2 revolution (180-220 in-lb). The locknut has two grooved lines on each side (180 apart) to help determine the relative rotation that the locknut has been turned. The two sides of the locknut have been labeled "A" and "B" to ensure proper engagement. When installing the Bay-O-Net assembly on tanks with wall thickness of 1/4" or greater, the "A" side of the lock should face out from the tank. For tank wall thicknesses less than 1/4", either side "A" or "B" can face out from the tank.
- Cover-Mounted Assembly: Sealing requirements are attained by first hand-tightening the locknut and then continuing an additional 1/4 - 1/3 revolution.

Lead training

- Connect voltage source to bottom contact of the Bay-O-Net Assembly through isolation link or energy limiting fuse, as shown in Figure 6, with 1/4" x 20 stud on the isolation link. Recommended Bay-O-Net fuse and isolation link combinations are listed in Table 4. Connect upper contact of the Bay-O-Net Assembly to the transformer coil.

⚠ CAUTION

All leads should remain below the oil level.

⚠ CAUTION

The Bay-O-Net fuse element is designed to interrupt internal and external faults and overloads as well as switching transformer load current. It must be used in series with an isolation link or energy limiting fuse.

⚠ CAUTION

The 38 kV Bay-O-Net fuse element is designed to interrupt internal and external faults and overloads as well as switching transformer load current. It must be installed in a 38 kV rated Bay-O-Net housing assembly and must be used in series with a 38 kV rated energy limiting fuse.

Table 6. Bay-O-Net Fuse and Isolation Link Combination (23 kV Maximum Line-Line Voltage)

Bay-O-Net Fuse	Isolation Link*
Current Sensing Type	
4000353C04	3001861A01M
4000353C06	3001861A02M
4000353C08	3001861A02M
4000353C10	3001861A03M
4000353C12	3001861A03M
4000353C14	3001861A05M
4000353C16	3001861A05M
4000353C17	3001861A05M
Dual Sensing Type	
4000358C03	3001861A01M
4000358C05	3001861A02M
4000358C08	3001861A03M
4000358C10	3001861A05M
4000358C12	3001861A06M
4000358C14	3001861A07M
4000358C16CB	3001861A07M
4000358C18CB	3001861A07M
Dual Element Type	
4038108C03	3001861A01M
4038108C04	3001861A01M
4038108C05	3001861A02M
4038108C06	3001861A02M
4038108C07	3001861A02M
4038108C09	3001861A03M
4038108C11	3001861A03M
4038108C12	3001861A03M
4038108C14	3001861A03M
High Ampere Overload Type	
4038361C03CB	3001861A05M
4038361C04CB	3001861A05M
4038361C05CB	3001861A06M

* Isolation link is not required if the Bay-O-Net fuse is used in series with a back-up energy limiting fuse.

Retrofitting Equipment

- If retrofitting and equipment tank with a Bay-O-Net fuse assembly, follow normal installation procedures. However, if the tank does not have a pressure relief device, one should be installed.

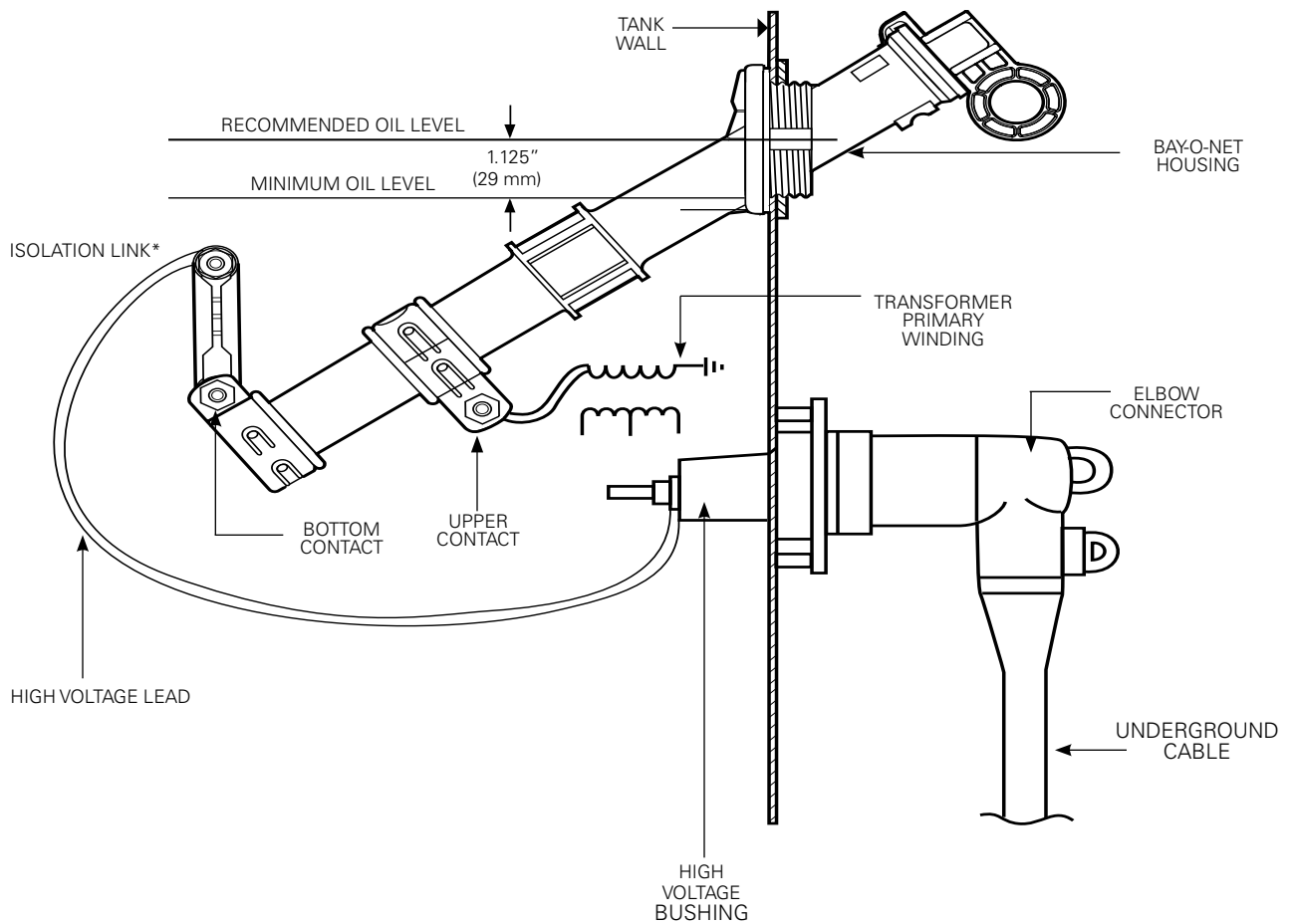


Figure 6. Line illustration of Bay-O-Net assembly with isolation link.**

* For 23 kV maximum rated application 23 kV maximum Bay-O-Net link, cartridge, and housing assembly must be used. Isolation Link is not required if the Bay-O-Net fuse is used in series with a 23 kV maximum back-up energy limiting fuse.

** For 38 kV maximum rated, 38 kV Bay-O-Net integral fuse cartridge must be used in a 38 kV Bay-O-Net housing in series with a 38 kV maximum rated ELSP back-up energy limiting fuse.

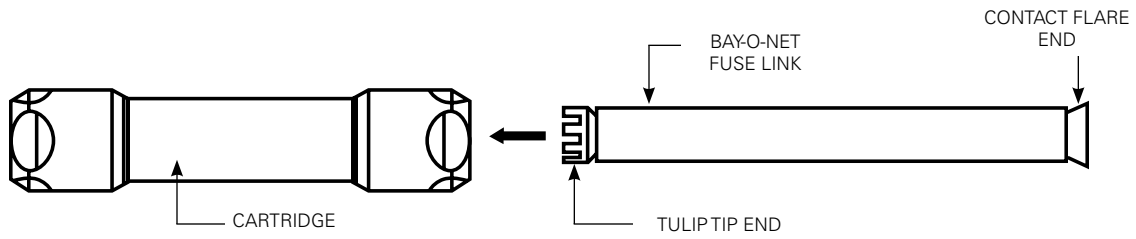


Figure 7. Insertion of Bay-O-Net link into cartridge.

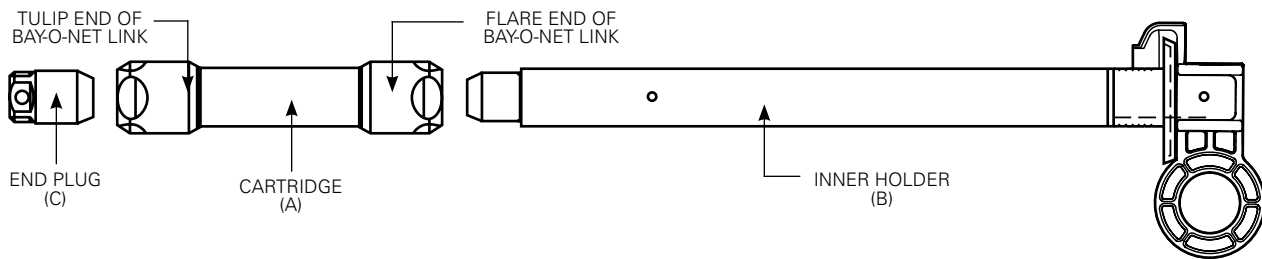


Figure 8. Assembly of cartridge with fuse onto inner holder.

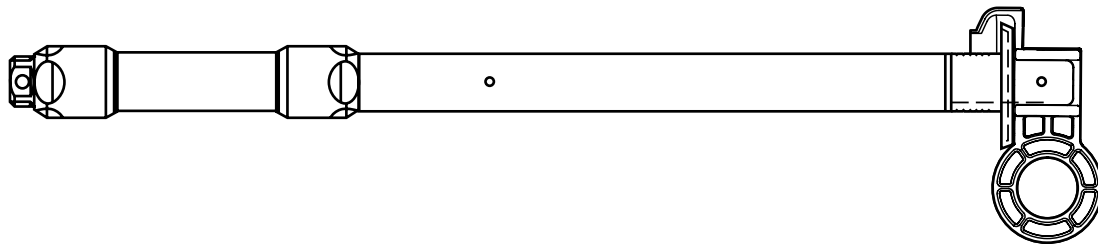


Figure 9. Inner holder with fuse link, cartridge and end plug assembly.

Installation of fuse element

For ALL Bay-O-Net Fuse Links, except for 23 kV maximum rated 4000358C16CB, 4000358C18CB, 4038361C03B, 4038361C04CB, 4038361C05CB, 4038361C10CB, and for 38 kV maximum rated 4000380C06CB, 4000380C08CB, 4000380C10CB, 400038C11CB, 4000380C12CB and 4000380C14CB

- Insert new fuse link (element) into cartridge from either end (a slight resistance may occur). (Refer to Figure 7.)
- Be sure contact flare end is secured in place between fuse cartridge (a) and the inner holder (b) and tighten cartridge against the inner holder applying 50 to 70-in-lbs of torque. (Refer to Figure 8.)
- Spread tulip tip of fuse link and place end plug (c) on the end of the fuse cartridge by tightening to 50 to 70 in-lbs of torque. Remove end plug and ensure the leaves of tulip tip have spread uniformly. Failure to do so can cause malfunction. Replace end plug applying 50 to 70 in-lbs torque to both connections. (Refer to Figure 9.)

For Bay-O-Net Fuse Links, 400358C16CB, 4000358C18CB, 4038361C03CB, 4038361C04CB, 4038361C05CB, Solid Link 4038361C10CB, 4000380C06CB, 4000380C08CB, 4000380C10CB, 400038C11CB, 4000380C12CB and 4000380C14CB

- For 23 kV rated fuse links 4000358C16CB, 4000358C18CB, 4038361C03CB, 4038361C04CB, 4038361C05CB and solid link 4038361C10CB are a pre-assembled link/cartridge/end plug.
- For 38 kV rated fuse links 4000380C06CB, 4000380C08CB, 4000380C10CB, 400038C11CB, 4000380C12CB and 4000380C14CB are a pre-assembled link/cartridge/end plug.
- For installation, tighten cartridge against the holder applying 50 to 70 in-lbs of torque.

Latching fuse holder

To latch and seal, the holder shall be completely inserted before latching the handle. Fingers of handle must be under the top ledge of housing.



CAUTION

Remove end plug and ensure the leaves of tulip tip have spread uniformly. Failure to do so can cause malfunction.

CAUTION

Equipment damage. For 23 kV integral cartridge. The length (including end plug) will be 4.72" long.

For 38 kV integral cartridge the length (including end plug) will be 5.73" long.

Failure to use the correct length integral cartridge will result in poor electrical contact between the cartridge and the Bay-O-Net housing terminals, resulting in possible equipment damage.



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For Eaton's Cooper Power series Bay-O-Net fuse assembly product information call 1-877-277-4636 or visit: www.cooperpower.com.

Installation Instructions K1501A1 Deadbreak Bushing Plug Insert

CONTENTS: Deadbreak Bushing Plug Insert, Lubricant, Installation Instructions.

The ELASTIMOLD K1501A1 deadbreak bushing plug inserts are designed for use as apparatus bushing interfaces and must be installed in the following ELASTIMOLD universal bushing wells:

K1601PC-T1(R), K1601PC-S1(R), K1601PC-L15(R)

DANGER

All apparatus must be de-energized during installation or removal of part(s). For loadbreak products follow operating instructions. All deadbreak connectors must be de-energized before operating and must be mechanically secured with bails when connected.

All apparatus must be installed and operated in accordance with individual user, local, and national work rules. These instructions do not attempt to provide for every possible contingency.

Do not touch or move energized products by hand.

Excess distortion of the assembled product may result in its failure.

Contact with solvents, transformer oil, motor oil and similar substances will degrade jacket conductivity and insulation level if not immediately wiped off.

FOR MORE INFORMATION ON PARTS, INSTALLATION RATINGS AND COMPATIBILITY, CALL THE NEAREST ELASTIMOLD OFFICE.

Inspect parts for damage, rating and compatibility with mating parts.

This product should be installed only by competent personnel trained in good safety practices involving high voltage electrical equipment. These instructions are not intended as a substitute for adequate training or experience in such safety practices.

Failure to follow these instructions will result in damage to the product and serious or fatal injury.

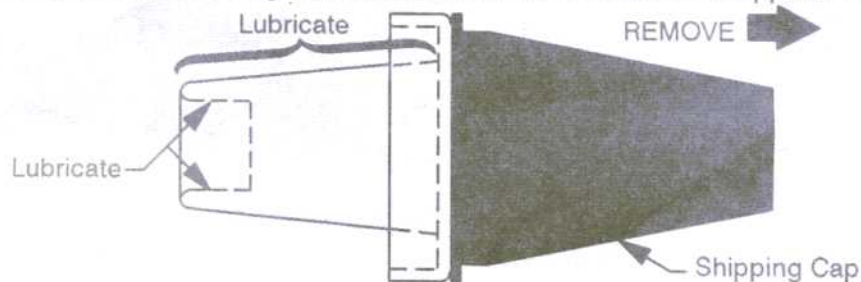
If this product is supplied with a protective shipping cover(s), remove this shipping cover(s) and replace with the appropriate HV insulated cap(s) or connector(s) before submerging or energizing the circuit.

IMPORTANT

1. Check contents of package to insure they are complete and undamaged.
2. Check all components to insure proper fit with cable and/or mating products.
3. Read entire installation instructions before starting.
4. Have all required tools at hand and maintain cleanliness throughout the procedure.

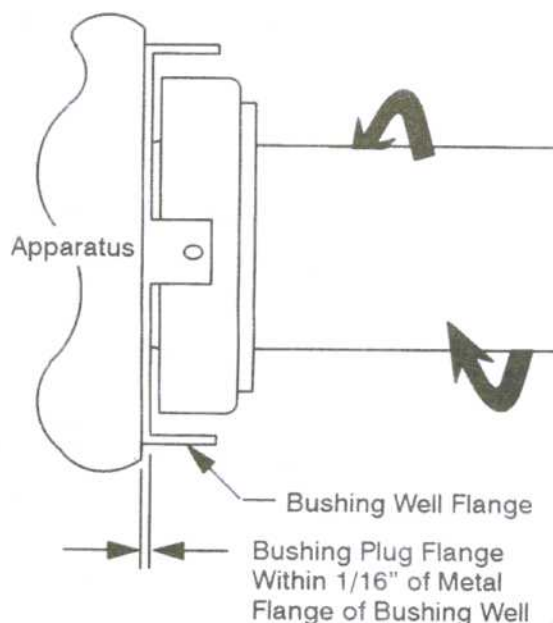
STEP 1

Inspect the apparatus bushing well to make sure it is dry and clear of all contaminants. Remove the protective shipping cap of the bushing insert and lubricate the bushing well interface area with the lubricant supplied. **DO NOT SUBSTITUTE.**



STEP 2

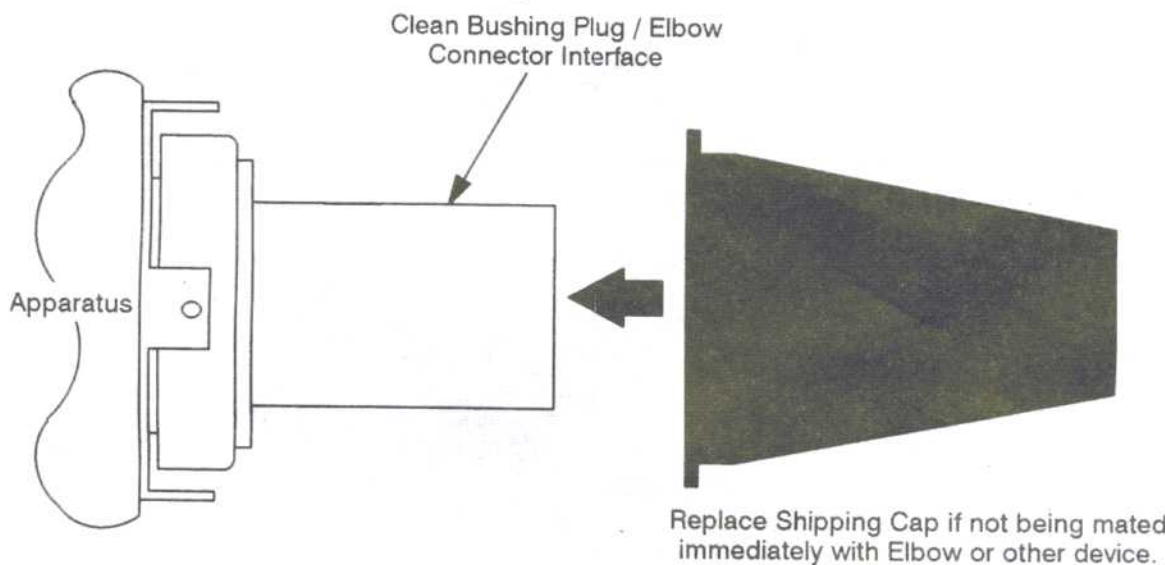
Place the lubricated portion of the bushing plug insert in the apparatus bushing well. Rotate the bushing plug insert in a clockwise direction until the conductive flange of the bushing plug insert is within 1/16" of the metal flange of the bushing well.



STEP 3

Thoroughly wipe the bushing plug/elbow connector interface clean of any contaminants. Mate the deadbreak elbow connector or other appropriate device to the bushing plug following the instructions packed with the mating device.

CAUTION: If the bushing plug is not to be immediately mated with the elbow connector or other mating device, replace the protective shipping cap. **This is a protective cap only, not an insulating receptacle. Do not energize the apparatus with the shipping cap on the bushing.**



ELASTIMOLD

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A Unit of Thomas & Betts Corporation

200 A, 15 and 25 kV class loadbreak bushing insert installation instructions



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In no event will Eaton be responsible to the purchaser or user in contract, in tort (including negligence), strict liability or otherwise 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.

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OPERATING INSTRUCTIONS

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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 loadbreak bushing insert threads into a universal bushing well to provide the same function as an integral loadbreak bushing. Using bushing inserts makes field installation and replacement possible and efficient. Bushing inserts and elbow connectors comprise the essential components of all loadbreak connections.

The bushing insert meets all the requirements of IEEE Std 386™-2006 standard and is completely interchangeable with mating products that also meet IEEE Std 386™-2006 standard. When mated with a comparably rated component, the bushing insert provides a fully shielded and submersible connection for loadbreak operation.

WARNING

All associated apparatus must be de-energized during any hands-on installation or maintenance. Failure to comply may result in death, severe personal injury, and equipment damage.

CAUTION

The 200 A loadbreak bushing insert is designed to be operated in accordance with normal safe operating procedures. These instructions are not intended to supersede or replace existing safety and operating procedures. The elbow connector should be installed and serviced only by personnel familiar with good safety practices and the handling of high-voltage electrical equipment.

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 loadbreak bushing insert is in good condition when accepted by the carrier for shipment. Upon receipt, inspect the shipping container for signs of damage. Unpack the loadbreak bushing insert 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 loadbreak bushing insert to minimize the possibility of damage. If the loadbreak bushing insert 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

Installation instructions

Step 1.

Clean and lubricate

- Remove red shipping cap. Do not energize bushing with shipping cap installed.
- Clean bushing well and apply a thin uniform coating of silicone lubricant. (See Figure 1.)
- Clean mating interface of bushing insert and apply a thin, uniform coating of silicone lubricant. (See Figure 2.)

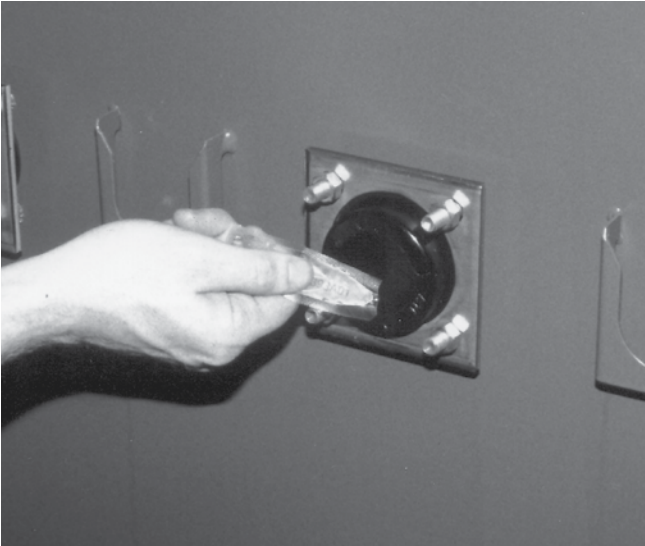


Figure 1. Clean and lubricate interfaces of bushing well.

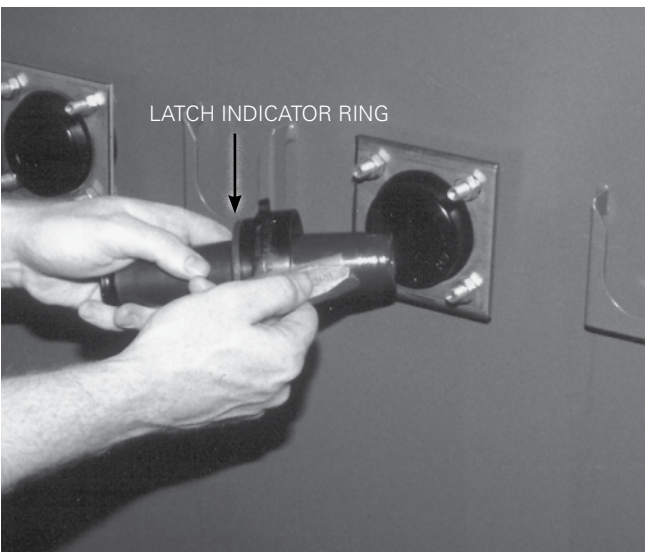


Figure 2. Clean and lubricate interface of bushing insert (15 kV version shown).

Step 2A.

Install using installation torque tool (LBITOOL)

- Insert torque tool (LBITOOL) into bushing insert, turning tool slightly to engage hex-broach.
- Place threaded end of bushing insert into bushing well.
- Turn clockwise until torque tool makes an audible "click." The torque tool tightens the bushing insert to approximately 15 ft-lbs. (See Figure 3.)

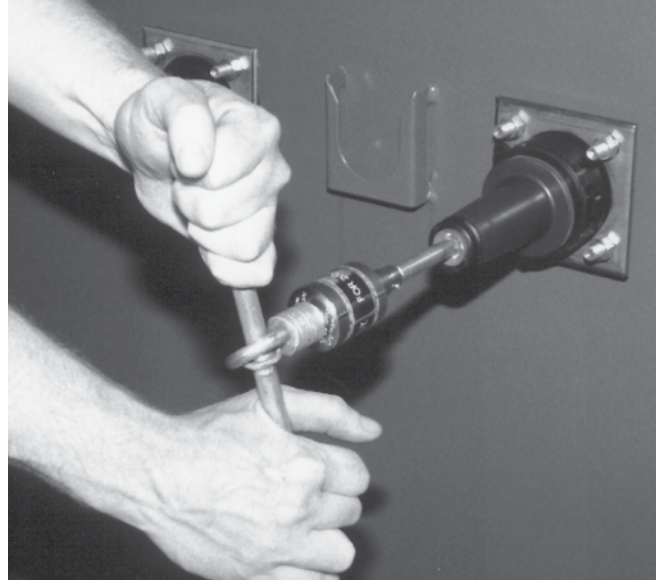


Figure 3. Insert torque tool and tighten to bushing well (15 kV version shown).

Step 2B.

Install without using installation torque tool (LBITOOL)

- Place threaded end of bushing insert into bushing well.
- If installing using a torque tool other than the LBITOOL, the torque setting should be set for 15 ft-lbs.
- If installing without a torque tool, turn the insert clockwise until it bottoms on the bushing well stand (approximately 7 to 7-1/2 turns).

Step 3.

Ground

- Attach one end of a #14 AWG copper wire to one of the ground tabs of the bushing insert.
- Attach other end of wire to ground. (See Figure 4.)



Figure 4. Attach ground lead (15 kV version shown).

Step 4.

Cover interface

- Do not leave bushing interface exposed.
- Cover with an appropriate mating product using the instructions supplied. **DO NOT USE SHIPPING CAP.**

ATTENTION: This bushing is equipped with Eaton's exclusive latch indicator ring, that serves as a visual indicator to verify that the mating component is properly seated on the bushing insert.

Once the mating component has been properly installed on the bushing, the yellow ring should be completely covered.

If any yellow is visible, the elbow or protective cap must be completely installed or "latched" before energizing to assure a quality connection.

Removal instructions

- De-energize apparatus and verify apparatus is de-energized.
- Remove mating products and place in stand-off device or in a clean, dry location.
- Remove ground wire.
- Use either a 5/16" hex drive tool, torque tool or a strap wrench to remove.
 - If a hex-drive tool is used, insert drive into insert, turning tool slightly to engage hex-broach. Turn counter-clockwise to remove.
 - If a strap wrench is used, wrap around the collar of the bushing insert. Turn counter-clockwise to remove. Take care not to damage bushing interface during this procedure.

Fault close

1. It is not recommended that operations be made on known faults.
2. If a fault is experienced, both the elbow connector and the bushing must be replaced.

Loadbreak operation

1. Securely fasten a clampstick to the pulling eye of the mating loadbreak elbow.
2. Without exerting any pulling force, slightly rotate the elbow clockwise to break surface friction between the elbow and bushing.
3. Withdraw the elbow from the bushing with a fast, firm, straight motion, being careful not to place the connector near a ground plane.
4. Place the elbow on an appropriate accessory device, following the operating instructions for that accessory.
5. Place an insulated protective cap with drain wire attached to system ground on any exposed energized bushing using a clampstick.

 **WARNING**

The operator should always use personal protective equipment (insulated gloves, clampstick and eye protection) whenever operating the elbow. The operator should always be in the best possible operating position, providing firm footing and enabling a secure grasp of the clampstick, while maintaining positive control of the elbow before, during and immediately after operation. If there is any question regarding the operator's operating position, de-energize the elbow before operation. The operator should not be looking directly at the connector during the moment of circuit interruption or connection. Failure to comply may result in death, personal injury and equipment damage.

Operating instructions

Do not connect two different phases of a multiple-phase system. Before closing a single-phase loop, make certain both ends of the loop are the same phase.

Loadmake operation

1. Area must be clear of obstructions or contaminants that would interfere with the operation of the loadbreak elbow.
2. Securely fasten a clampstick to the pulling eye.
3. Place the loadbreak elbow over the bushing, inserting the white arc follower of the probe into the bushing approximately 2-1/2" until a slight resistance is felt.
4. Immediately thrust the elbow onto the bushing with a fast, firm, straight motion, with sufficient force to latch the elbow to the bushing.
5. Push again on the elbow with the clampstick, and then pull gently to make sure that it is secure.



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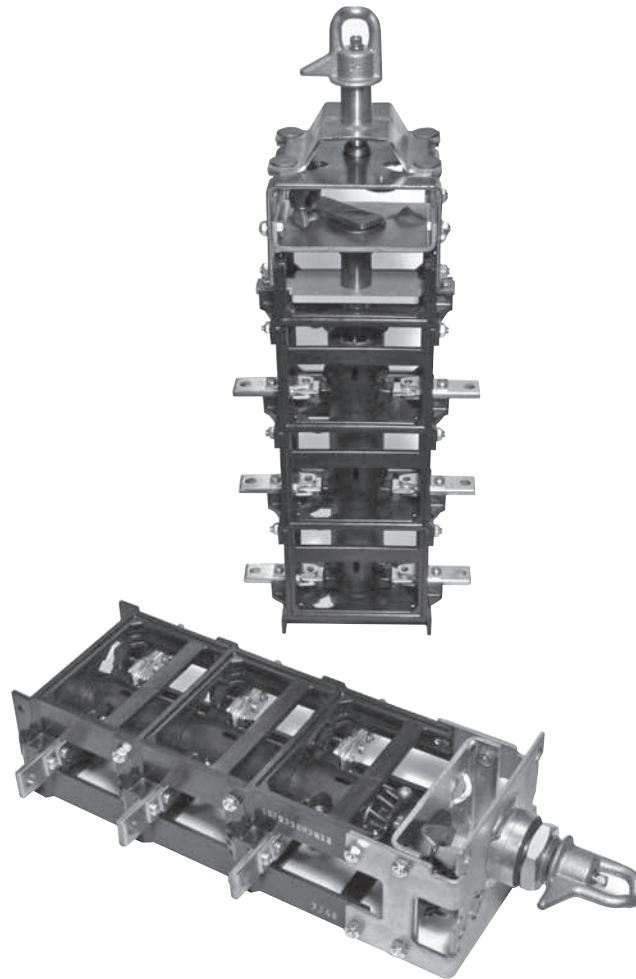
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For Eaton's Cooper Power series product information call 1-877-277-4636 or visit: www.eaton.com/cooperpowerseries.

Two-position sidewall (horizontal) and cover (vertical) mounted loadbreak switches installation instructions



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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.

G122.3

⚠ WARNING

Loadbreak Switch should be installed only by personnel familiar with good safety practice and handling of high voltage electrical equipment. Failure to comply can result in death, severe personal injury, and equipment damage.

Product information

Introduction

Eaton's Cooper Power™ series compact two-position mounted loadbreak/loadmake switch is designed for use in transformer oil, Envirotemp™ FR3™ fluid, or an approved equivalent fluid-filled "Class 1" pad-mounted transformers, submersible distribution transformers, or distribution switchgear.

The two-position switch is hook stick operable and requires minimal input torque to operate. The switch mechanism uses a manually charged, over-toggle, stored energy spring assembly, which is independent of operator speed. The mechanism ensures quick loadbreak or loadmake operation in less than one cycle. Also incorporated into the switch mechanism are internal stops which restrict the handle orientation to only two positions, approximately 90° apart.

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 representative.

Acceptance and initial inspection

Each switch is in good condition when accepted by the carrier for shipment. Upon receipt, inspect the shipping container for signs of damage. Unpack the switch 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 switch to minimize the possibility of damage. If the loadbreak switch 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

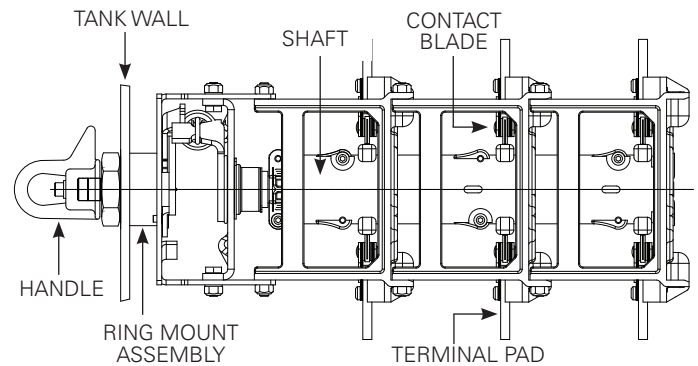


Figure 1. Line illustration of loadbreak switch with ring mount assembly.

Electrical ratings

Table 1. Ratings and Characteristics

Description	Units	Ratings			
Rated Voltage					
Maximum rating phase-to-phase	kV	15.5	27.6	38	46
Maximum rating phase-to-ground	kV	8.9	15.6	21.9	26.5
Power Frequency	Hz	60	60	60	60
Current Rating (Continuous)	A	550	400	300	65
Switching Current	A	550	400	300	65
Magnetizing Interrupting Current	A	21	21	10.5	10.5
Cable Charging Current	A	10	25	20	15
Fault Withstand Current (Momentary)					
10 cycle symmetric rms	kA	12	12	12	12
10 cycle asymmetric rms	kA	19.2	19.2	19.2	19.2
45 cycles symmetric rms	kA	16	16	16	16
1 second symmetric rms	kA	12	12	12	12
2 second symmetric rms	kA	8	8	8	8
3 second symmetric rms	kA	7	7	7	7
Fault Close and Latch					
10 cycle symmetric rms	kA		12	12	12
10 cycle asymmetric rms	kA		19.2	19.2	19.2
15 cycle symmetric rms	kA	12			
15 cycle asymmetric rms	kA	19.2			
Impulse Withstand Voltage (1.2/50 μs)					
To ground and between phases	kV	200	200	200	200
Across open contacts	kV	235	235	235	235
Power Frequency Withstand (1 minute)					
To ground and between phases	kV	70	70	70	70
Across open contacts	kV	95	95	95	95
DC Withstand (15 minutes)					
To ground, between phases and across	kV	103	103	103	103
Contacts					
Corona (Extinction)	kV	26	26	26	26
Mechanical Life (Minimum Operations)	2,000	2,000	2,000	2,000	2,000

Installation procedure

All parts should be inspected for damage before using. If there is evidence of physical damage, the unit should not be installed unless approved by your Eaton representative.

Weld-in assembly (horizontal and vertical mount)



WARNING

The portion of the switch that is inside the tank does not contain user adjustable parts and should not be altered during installation. Failure to comply can result in death, severe personal injury, and equipment damage.

Note: The tank wall should have a 1.00"± .010" hole, (25.4 mm). Switch should be located to ensure recommended clearances in Figure 5 are maintained.

1. Remove the weld-in bracket assembly from the switch and insert the bracket assembly through the tank hole (from inside). (Refer to Figure 2.)
2. Position the bracket as desired and weld completely around the outside of the bracket neck.

3. Bracket should be located to insure recommended clearances in Figure 5 are maintained.
4. After welding process has been completed, the I.D. of the bracket neck should be checked with a .629" (16 mm) plug gauge to assure proper clearances have been maintained for acceptance of switch shaft.
5. Align the switch into the bracket and onto the welded threaded studs (insure correct orientation) and re-install the 3/8" lock nuts (supplied). Tighten nuts to the recommended torque in Table 3.
6. Install handle onto the switch shaft with the stainless steel hex socket cap screw and lockwasher supplied and tighten to recommended torque in Table 3.
7. It is recommended that a sealing test be performed to ensure the integrity of the weld joint.

Table 2. Recommended Torque (WELD-IN)

Part	Torque Level
Mounting Nuts (3/8" Lock):	35-100 in-lbs (4-11 Nm)
Switch Handle Bolt:	40-60 in-lbs (5-7 Nm)

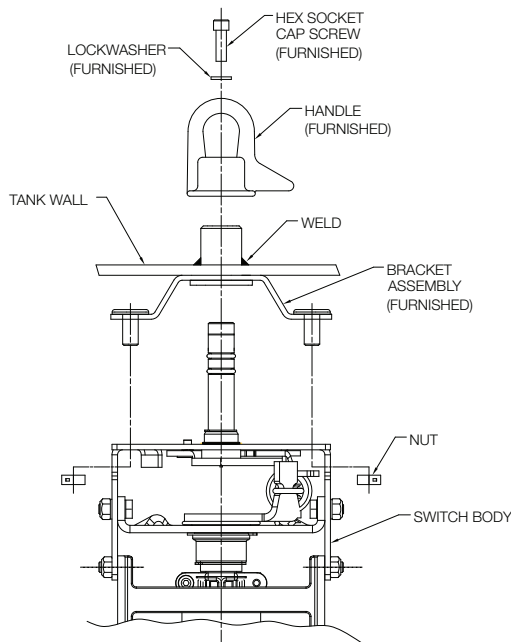


Figure 2. 2-position weld-in mount offset loadbreak switch.

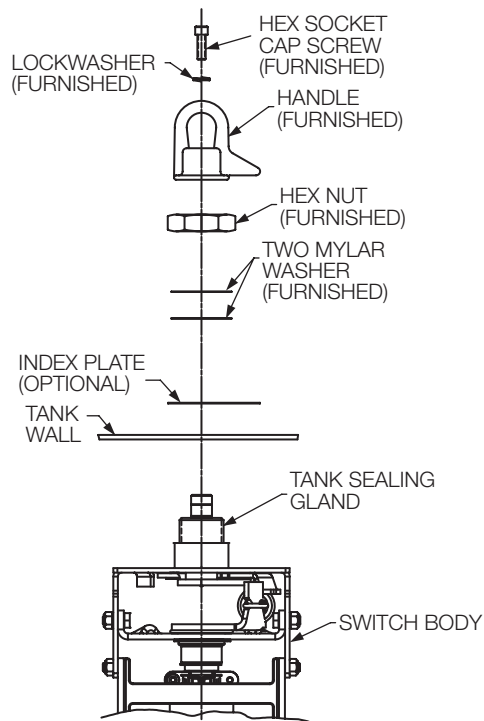


Figure 3. Two-position ring mount offset loadbreak switch.

Ring mount assembly (horizontal and vertical mount)

Note: The tank wall should have a 1.320" (33.5 mm) diameter hole with an anti-rotation key. Switch should be located to ensure recommended clearances in Figure 5 are maintained.

Note: Recommended socket for securing the locking nut is a 1-3/4" socket with 1-1/2" (38 mm) minimum socket depth.

1. Install the gasket over the threaded switch boss (with integral sealing gland) and insert the switch assembly through the tank hole (Refer to Figures 3 and 4).

Note: Make sure the gasket is properly seated in its proper location.

2. Position the switch with the stamping "TOP" visible at the top of the switch.
3. (Optional) Install indicator plate over the protruding threaded boss.
4. Install Mylar® polyester film washers (2) over the protruding threaded boss.
5. Assemble and tighten furnished locking hex nut to recommended torque in Table 4.
6. Install handle onto the switch shaft with the stainless steel hex socket cap screw and lock washer supplied and tighten to recommended torque in Table 4.

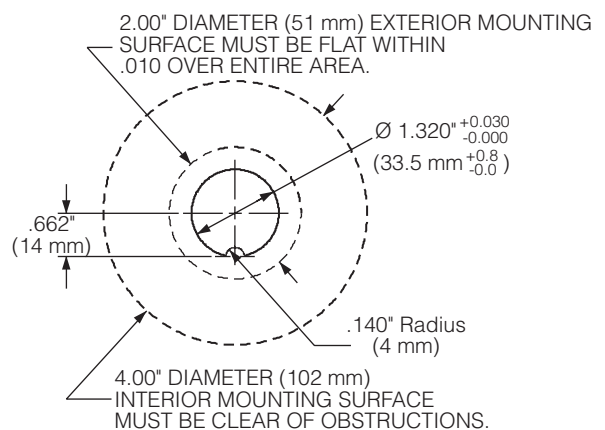


Figure 4. Hole detail (required for ring mount design).

Table 3. Recommended Torque (RING MOUNT)

Part	Torque Level
Locking Nut	40-60 ft-lbs (54-82 Nm)
Switch Handle Bolt	40-60 in-lbs (5-7 Nm)

Connect internal leads

1. Connect internal leads to the switch contacts with 3/8" or M10 hardware, (not supplied). (Max. cable connections 300 MCM or 125 mm²). Use torque values recommended by fastener manufacturers. Apply torque to the fasteners, not to the switch terminals.

WARNING

All leads, connections and contact blades must remain under oil. Failure to do so could cause arcing which may result in component failure, property damage or possible severe personal injury.

Recommended clearances

Mechanical

- External handle must be clear of obstruction. Clearances are also required for hook-stick operation.

Dielectric (under-oil)

- Clouds of gas rise during switch operation, so it is not recommended that other components be located above the switch, unless they are outside the arc clearance zone and have an insulated barrier between them that will deflect gas bubbles from switch operation away from the component above the switch.

The outline drawing shown in Figure 5 describes the switch and its application to oil-filled apparatus. This information should be used only by trained personnel familiar with the design requirements for oil-filled apparatus. This information is not intended as a substitute for adequate training and experience in such design. Should clarification or further information be required for the user's purposes, contact your Eaton representative.

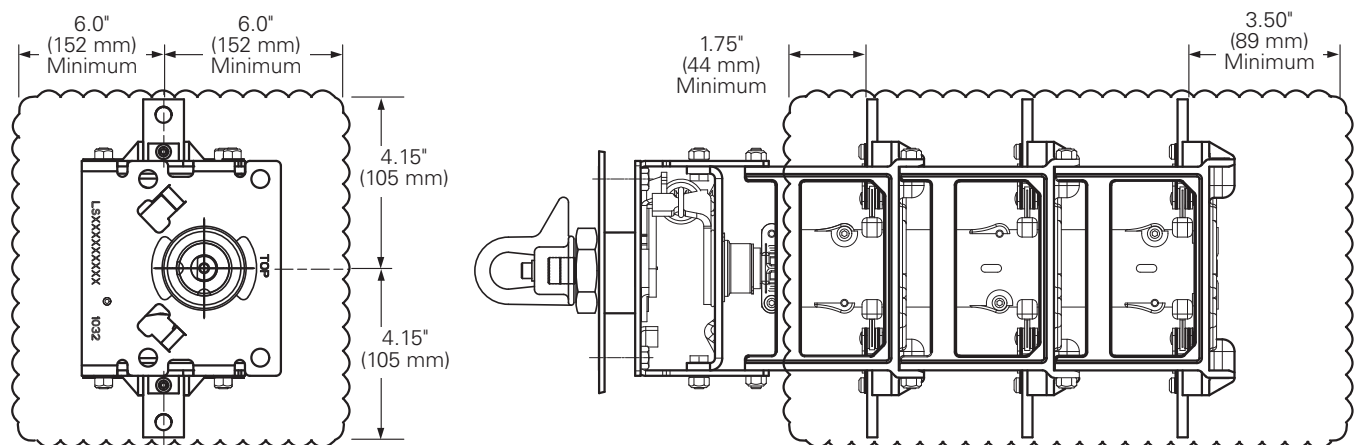


Figure 5. Arc clearance zone.

WARNING

Recommended (minimum) under-oil clearances must be followed to avoid internal arcing which could result in component failure, property damage or possible severe personal injury.

All energized parts of the switch must be under oil and spaced away from other energized parts or ground with sufficient distance to withstand all operating and test voltages. In order for proper switch operation to occur, an arc clearance zone is required around the switch. This zone should be under oil and free of all foreign materials. The boundaries of this zone are defined in this outline drawing.

Dimensional information

Table 4. Dimensional Information for Figure 6

Number of Decks or Phases	Dimensions w/Standard Configuration (No Extensions) Inches/(mm)		Dimensions w/Short (1/2) Deck Extension Inches/(mm)		Dimensions w/Full Deck Extension Inches/(mm)		Dimensions w/Short (1/2) Deck + Full Deck Extension Inches/(mm)	
	"A"	"B"	"A"	"B"	"A"	"B"	"A"	"B"
1	8.14 (207)		10.2 (259)		12.0 (305)		14.0 (356)	
2	11.95 (303)	6.75 (171)	14.0 (356)	8.8 (224)	15.8 (400)	10.6 (269)	17.8 (452)	12.6 (321)
3	15.75 (400)		17.8 (452)		19.6 (497)		21.6 (549)	

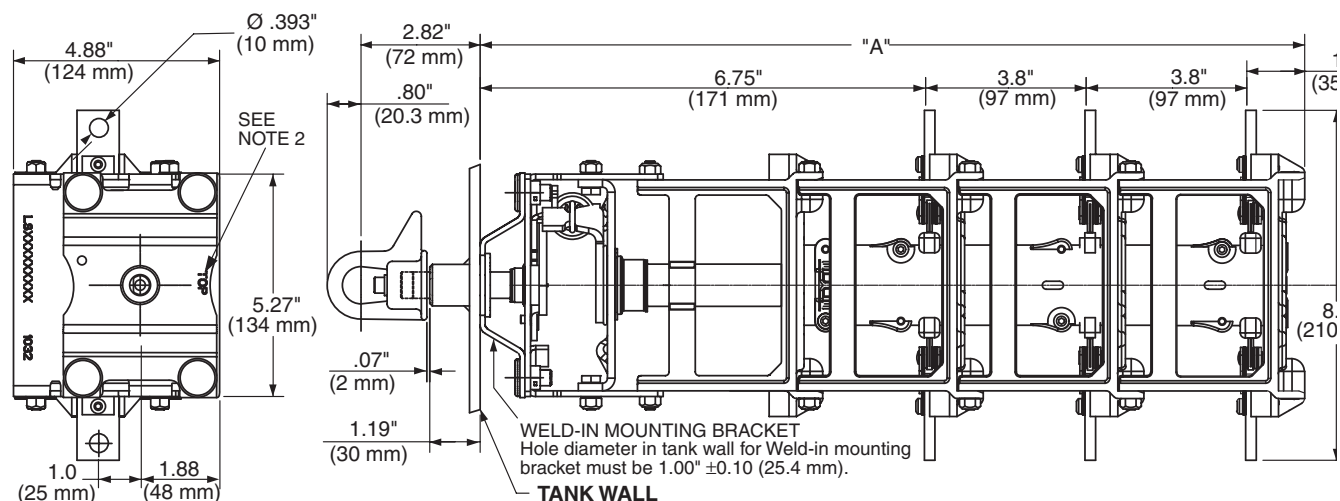


Figure 6. Line Illustration with dimensions of loadbreak switch with "Weld-in System" for horizontal or vertical mounting.

Notes:

1. Dimensions given are for reference only.
2. Switch shown with contacts "CLOSED" and flat of shaft on "BOTTOM" to position cast handle pointer to 9 o'clock when looking at switch with side marked "TOP" up. Handle is rotated approximately 90° CCW when it is in the "OPEN" position.
3. Handle can be used on 14 gauge .075 inch (1.9 mm) to .25 inch (6.4 mm) thick frontplate. 14 gauge shown.
4. Optional padlock handle and index plate are available. See catalog section CA800019EN.
5. See catalog section CA800019EN for switch types, number of phases, and catalog numbers.

Table 5. Dimensional Information for Figure 7

Ring Mount w/Standard Configuration (No Extensions) Inches/(mm)			Ring Mount w/Full Deck Extension Inches/(mm)		
Number of Decks or Phases	"A"	"B"	Number of Decks or Phases	"A"	"B"
1	7.83 (198 mm)		1	11.6 (295 mm)	
2	11.64 (296 mm)	6.4 (163 mm)	2	15.4 (391 mm)	10.2 (259 mm)
3	15.44 (392 mm)		3	19.3 (490 mm)	
Ring Mount w/ 1/2 Deck Extension Inches/(mm)			Ring Mount with 1/2 Deck + Full Deck Extension Inches/(mm)		
Number of Decks or Phases	"A"	"B"	Number of Decks or Phases	"A"	"B"
1	9.9 (251 mm)		1	13.7 (347 mm)	
2	13.7 (34.7 mm)	8.5 (215 mm)	2	17.5 (444 mm)	12.3 (312 mm)
3	17.5 (444 mm)		3	21.3 (541 mm)	

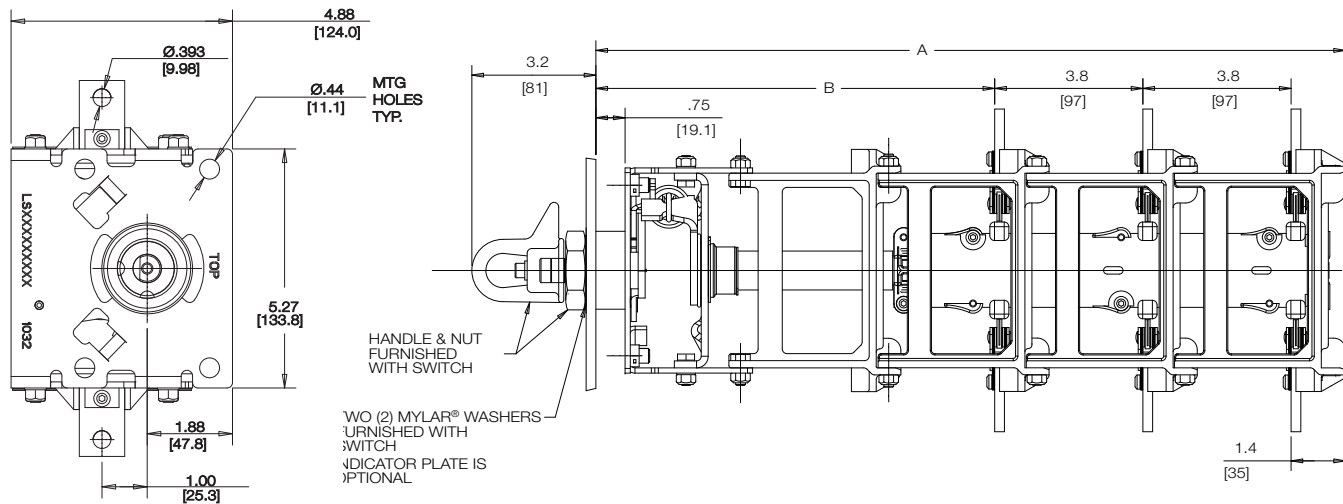


Figure 7. Line Illustration with dimensions of loadbreak switch with "Ring Mount System" for horizontal or vertical mounting.

Notes:

1. Dimensions given are for reference only.
2. Switch shown with contacts "CLOSED" and flat of shaft on "BOTTOM" to position cast handle pointer to 9 o'clock when looking at switch with side marked "TOP" up. Handle is rotated approximately 90° CCW when it is in the "OPEN" position.
3. Handle can be used on 14 gauge .075 inch (1.9 mm) to .25 inch (6.4 mm) thick frontplate. 14 gauge shown.
4. Optional padlock handle and index plate are available. See catalog section CA800019EN.
5. See catalog section CA800019EN for switch types, number of phases, and catalog numbers.

Operation

The operating torque is approximately 7-14 ft-lbs (9.5-19 Nm). During transformer assembly, it is recommended to operate the switch one complete cycle, after oil fill, (one cycle consists of open-close-open).

It is recommended that remote energization be used whenever possible, however, when operating loadbreak switches, use a hotstick tool. (Recommended tool - External Rod Clampstick with a Universal Fit-On head together with Leverage Bar CS125UFLTOOL. Refer to Catalog Section 325-30.) After loadbreak switch is switched to "open" position, verify that transformer secondary terminals have zero voltage and then ground the secondary terminals to prevent transformer backfeed energization.

Rotate the switch in one quick, continuous motion until the Loadbreak Switch handle has completed its movement from either the "Open" to "Close" position or the "Close" to "Open" position. After the desired position of the handle is reached, the operator should attempt to rotate the switch handle further, in the same direction, to ensure that it has completed its operation. If the switch handle has already fully completed its operation from the initial rotation of the handle, the operator will not be able to turn the handle further. At this point, the operator will know that the switch handle is fully in the desired position. If it is possible to move the handle further in the intended direction, then the rotation of the switch handle has not yet been completed and the operator should rotate the handle further until the switch handle operation has been completed.

The secondary voltage of the transformer should always be measured prior to doing any work on the secondary. If the switch has not operated properly or if there is an alternate source of power to the bushings, contact with the still energized bushings can result in burns or electrocution.

WARNING

The misapplication of the switch constitutes a potential hazard to life and property. Accordingly, the user must exercise due care in utilizing these instructions to assure that the switch is properly applied.

WARNING

Hazardous voltage.

- **Do not operate loadbreak equipment if a fault condition is suspected. Doing so can cause an explosion or fire.**
- **Use a hotstick to operate transformer loadbreak equipment.**
- **After operating transformer loadbreak equipment, check that voltages at transformer terminals are the expected values. Checking voltages verifies that loadbreak equipment operated properly and the electrical circuit conditions are as expected.**
- **Before servicing transformer secondary connected equipment, verify that all transformer secondary terminals have zero voltage and ground the transformer secondary terminals following industry accepted safe grounding practices. Grounding secondary terminals protects against situations such as a standby generator energizing transformer from the secondary circuit.**
- **Follow industry accepted safety practices. Utilize protective clothing and equipment when working with loadbreak equipment.**
- **These recommendations are in addition to any utility, end user, federal, state, local, or municipal regulations which may apply.**
- **Failure to follow this warning could result in component failure, property damage, severe injury, or death.**

WARNING

Transformers use conventional transformer oil or Envirotemp™ FR3™ fluid for an insulating liquid. When the insulating liquid temperature is less than -20 °C (-4 °F) for conventional transformer oil or less than 0 °C (32 °F) for Envirotemp™ FR3™ fluid, the increase in fluid viscosity may reduce make and break capabilities of loadbreak devices. Below these temperatures, under-oil loadbreak accessories should not be used to make or break a load (no more than two operations). Instead, de-energize transformer from a remote upstream source before operating under-oil loadbreak devices. Failure to comply may result in equipment damage, severe injury, or death.

WARNING

Enclosed "Warning" decal (Cooper P/N 1139596B02) must be displayed at or near operating handle of switch as a warning to service personnel. Failure to do so will constitute a waiver of all warranty and indemnity obligations which may be attributable to Eaton.



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