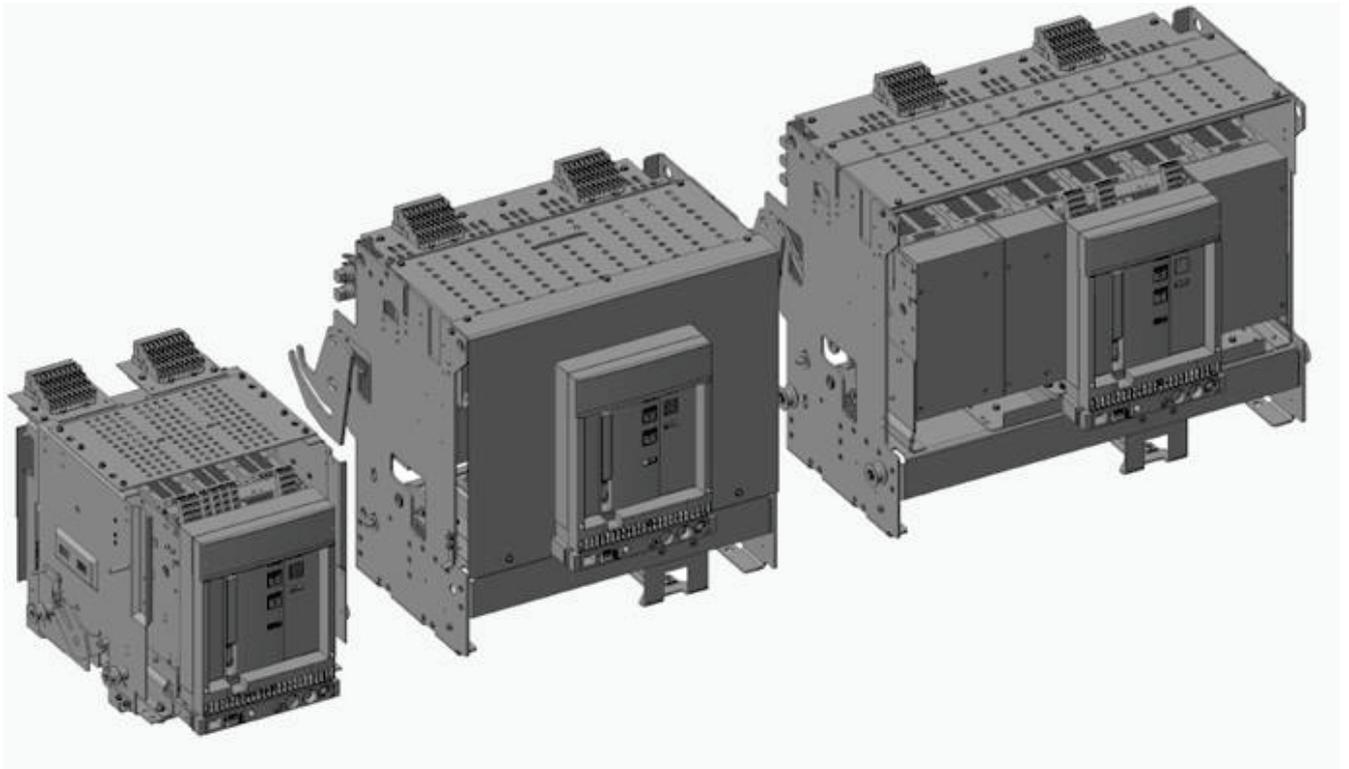


Installation and maintenance guide

# **Emax 2 Retrofill Circuit Breakers**

## **Direct Replacement Replacing legacy GE WavePro™ 800A - 5000A, WavePro integrally fused 800A -1600A Circuit Breakers used in AKD-10 & Substructures**



- General Electric AKD-10 Low Voltage Switchgear is a free-standing assembly of metal enclosed power circuit breakers. It may also be a part of a single-ended or double-ended load center unit substation.
- It uses WavePro type ANSI Low Voltage Power Circuit Breakers. This manual applies to both Emax 2 Retrofill breakers for AKD-10 switchgear and OEM substructures.

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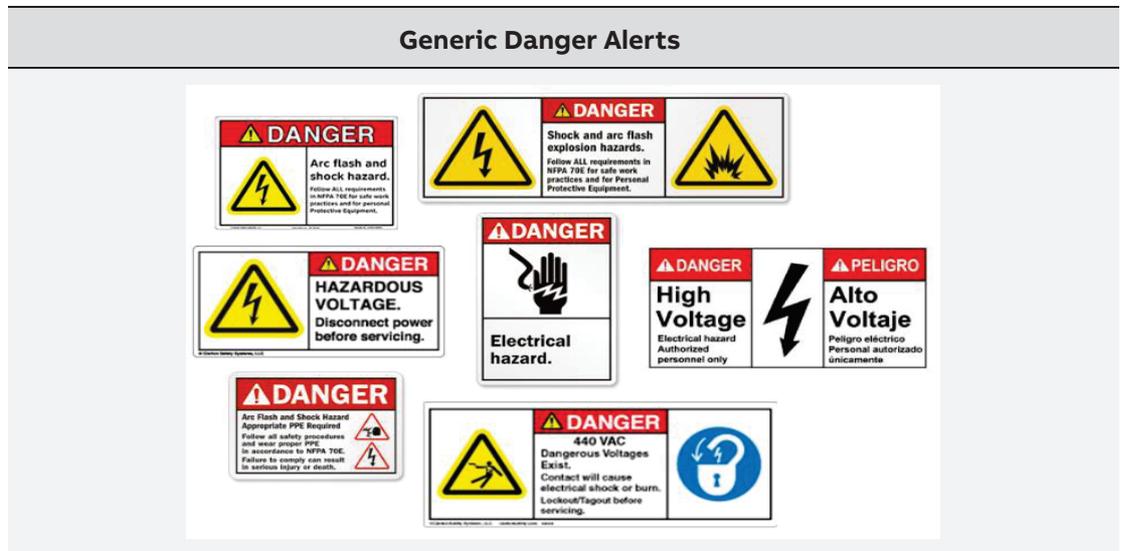
# Preface

## 1 - Hazards

**Overview** The following important highlighted information appears throughout this document to warn of potential hazards or to call attention to information that clarifies a procedure. Carefully read all instructions and become familiar with the devices before trying to install, operate, service, or maintain this equipment.

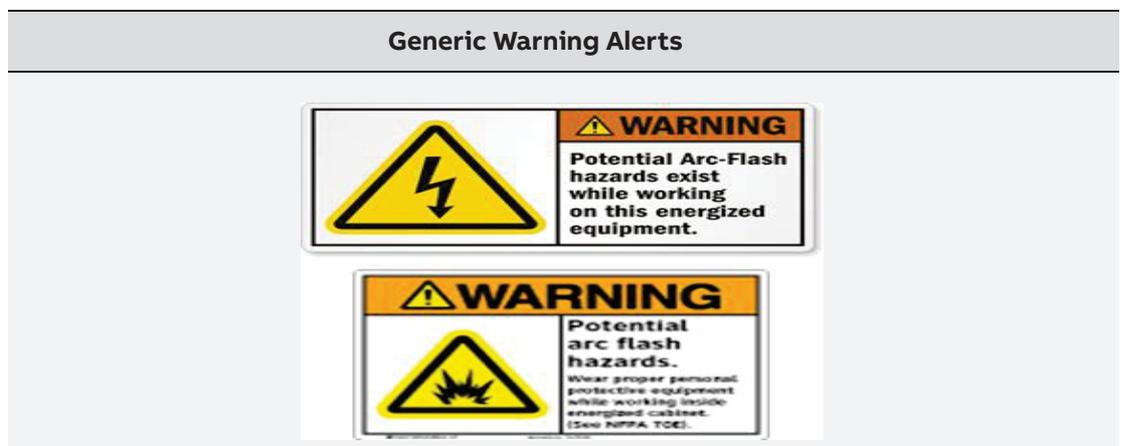
**Danger** This indicates a hazardous situation which, if not avoided, results in death or serious injury. A variety of electrical hazards warnings are displayed here and are applied to installation manuals. These are standard or generic alerts and labels that must be taken quite seriously when installing Retrofill circuit breakers in GE & OEM switchgear and when working with potentially dangerous electrical equipment (Table 1).

Table 1



**Warning** This indicates a hazardous situation, which, if not avoided, would result in death or serious injury. A variety of electrical hazards warnings are displayed here and are applied to installation manuals. These are standard or generic alerts and labels that must be taken quite seriously when installing Retrofill circuit breakers in GE & OEM switchgear and when working equipment that can cause injury, but may not be necessarily fatal (Table 2).

Table 2



**Caution** This pertains to a hazard that has a low level of risk, which means that if not avoided, it could result in minor or moderate injury. It also indicates that failure to comply with instructions may result in product damage. (Table 3).

**Table 3**

Custom Caution Alerts	
 <b>CAUTION</b>	
<b>Symbol Panel</b>	<b>Word message</b> _____ _____ _____ _____

**Notice or Note** This indicates important information in that it aids in job performance, that is, a notice or note is used to notify practices not related to personal injury (Table 4).

**Table 4**

Custom Notice Alerts
Not considered a safety label
 <b>NOTICE</b>
<b>Word message</b> _____ _____ _____ _____

---

## 2 - Warranty

---

**Warranty requirements** This document is based on information available at the time of its publication. While efforts requirements have been made to ensure accuracy, the information contained herein does not cover all details or variations in hardware and software, nor does it provide for every possible contingency in connection with installation, operation, and maintenance.

Features may be described herein that are not present in all hardware and software systems. ABB Inc USA assumes no obligation of notice to holders of this document with respect to changes subsequently made. ABB Inc USA makes no representation or warranty, expressed, implied, or statutory, with respect to, and assumes no responsibility for the accuracy, completeness, sufficiency, or usefulness of the information contained herein. No warranties of merchantability or fitness for purpose shall apply.

Contact your local sales office if further information is required concerning any aspect of Emax 2 Retrofill Circuit Breaker operation or maintenance.

---

## 3 - Trademarks and Patents

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- Details**
- Emax 2 Retrofill
  - Emax 2 Retrofill TU, Ekip DIP, Ekip Touch, Ekip Hi-Touch, Ekip G Touch, Ekip G Hi-Touch, Kip Measuring, Ekip Measuring Pro
  - Emax 2 Retrofill Trip Unit
  - Emax2

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## 4 - Standards

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**Agency Certification**

Standard Number	Title
ANSI C37.13,16,17,20.1,50,51,59	Low-Voltage AC Power Circuit Breakers & switchgears
NEMA SG 3,5	Low-Voltage Power Circuit Breakers
NEMA AB1	--
UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures

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## 5 - Document Conventions

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**Details** Topics and text are divided into primary, secondary, and tertiary paragraph headings.

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## 6 - Related Publications

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Publication	Publication Number
Installation Manual AKD 10	2TSA451010P0000
Installation Manual AKD 8	2TSA451009P0000
Installation Manual AKD 6	2TSA451014P0000
Installation Manual AKD 5	2TSA451011P0000
Accessory: Door Interlock (Door Interlock Kit)	2TSA451017P0000
Accessory: Kirk Key installation Manual	2TSA451013P0000
Accessory Retrofill Direct Replacement / CiC Full Door Kits AKD-5, 6, 8 & 10	2TSA451007P0000
Accessory Retrofill Direct Replacement / CiC Door AdaptorsKits AKD-5, 6, 8 &10	2TSA451008P0000
Accessory OEM Direct Replacement Adaptor kits AKD8 & 10	2TSA431967R1000
Accessory OEM Direct Replacement Adaptor kits, AKD8 &10, AKR 75/100, B&F TYPE	2TSA431968R1000
Accessory OEM Direct Replacement Adaptor kits, AKD8 &10, only for AKR30S	2TSA431996R1000
Accessory: Position Switch Plate, Assembly & Wiring	2TSA451019P0000
Accessory: Neutral CT Adapters Installation Instructions	2TSA451018P0000
Accessory: Programmer Disconnects Installation Instructions	2TSA451012P0000
Accessory: Primary Disconnects Installation Instructions	2TSA451015P0000
Accessory: Secondary Disconnects, Installation Instructions	2TSA451016P0000
E2.2, 4.2, 6.2 Breakers Installation, Operation & Maintenance Manual	1SDH001000R0002
Instructions for using Ekip touch protection releases & accessories	1SDH001316R0002
Emax 2 Family Trip units Engineering manual	1SDH001330R0002

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## 7 - Service and Support

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Service and support are available from ABB Inc USA.

**Email: [eppc.support@us.abb.com](mailto:eppc.support@us.abb.com)**

**Phone: 888-385-1221**

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## 8 - Estimated Time to Complete Tasks

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Verify the secondary disconnects and match the switchgear cubicle which may take up to 1Hr depending on the complexity of the original breaker. Once the retrofill breaker is fully prepared, it should take about 20 minutes to swap out the old breaker and rack in the new Emax 2 Retrofill circuit breaker if the proper lifting bar and hoist are available, it may take an additional 30 min to replace the door.

The Emax 2 Retrofill, when ordered with 4 wire ground fault, will be equipped with a Neutral CT adapter. The adapter will modify the GE MicroVersaTrip type Neutral CT output to a Rogowski sensor output compatible with the Emax 2 Retrofill Trip Unit. With this device, it will not be necessary to change the neutral CT in the switchgear to a Rogowski sensor.

## 9 - Product Specs

### Weight (lbs)

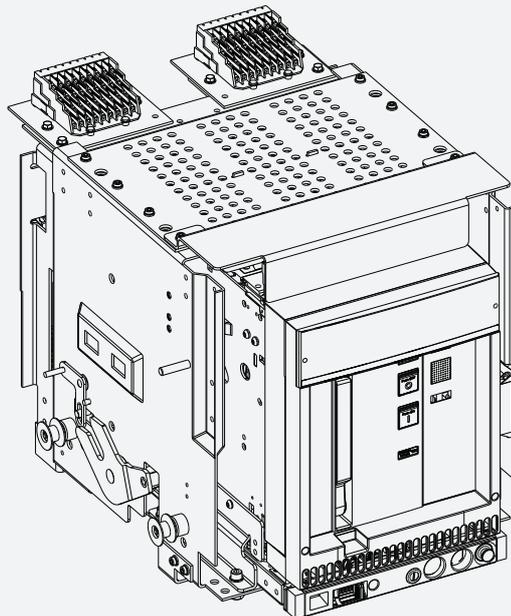
Retrofill Breaker, which replaces	Weight	Box Wt	Pallet Wt	Accessories Wt	Total Wt
WPS-08, WPH-08	230	11	24	2	267
WPX-08, WPS-16 WPH-16, WPS-20	270	11	24	2	307
WPS-32, WPH-32 WPX-32	600	15	30	2	647
WPS-40, WPX-40 (>3600A) w/o Fans	625	15	30	2	672
WPS-40, WPX-40 w/Fans	627	15	30	2	675
WPS-50, WPX-50	700	15	38	2	759

**Views** AKD-10 Low Voltage Switchgear is a free-standing assembly of metal-enclosed units of power circuit breakers and other auxiliary power circuit protective devices. It may also be a part of a single-ended or double-ended load center unit substation. The AKD-10 Emax 2 Retrofill breaker is defined as a draw-out breaker. With least modifications to be made to existing switchgear, Emax 2 Retrofill breakers are a cost-effective solution to upgrade the existing electrical system. Direct Replacement is the solution where the legacy WavePro circuit breaker is removed and a new circuit breaker is provided, which racks into the existing Switchgear Compartment. The direct replacement retrofitting kit allows a reliable upgrade of the old GE legacy breakers to new Emax 2 Retrofill Breakers.

Below figures (front and back views with finger clusters) present Emax 2 Retrofill breakers, which can replace WavePro breakers.

**Figure 1**

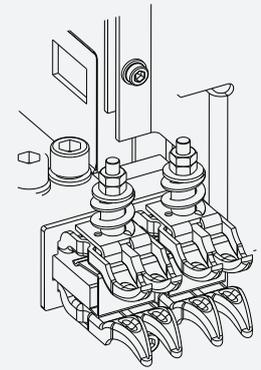
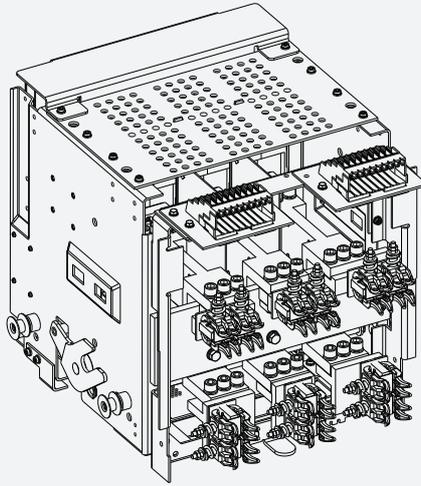
**AKD-10 800A to 2000A WPX-08, WPS-16, WPH-16 & WPS-20 Front View**



**Figure 2**

**AKD-10 800A to 2000A WPX-08, WPS-16, WPH-16 & WPS-20 Back View**

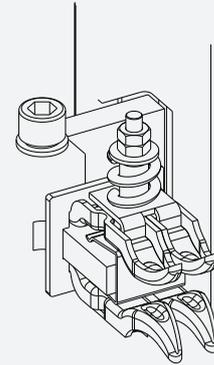
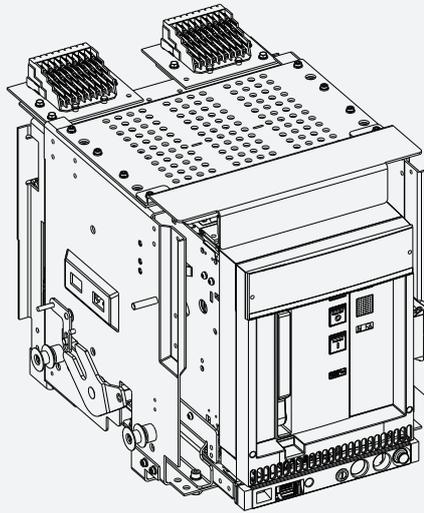
**Primary Finger Clusters**



**Figure 3**

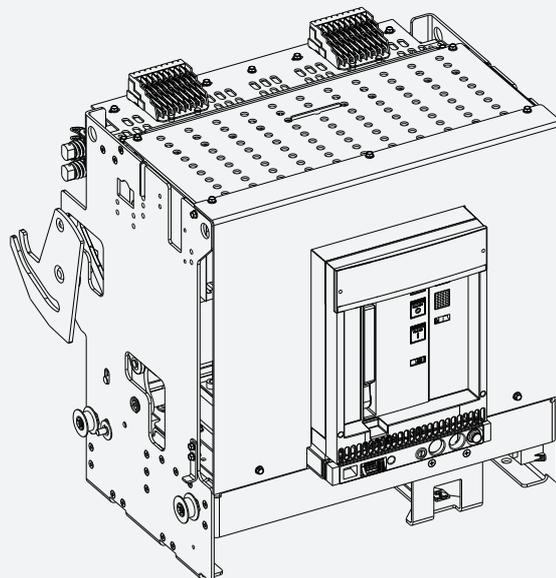
**AKD: 10 800A WPS- 08 & WPH-08 Front View**

**Primary Finger Clusters**



**Figure 4**

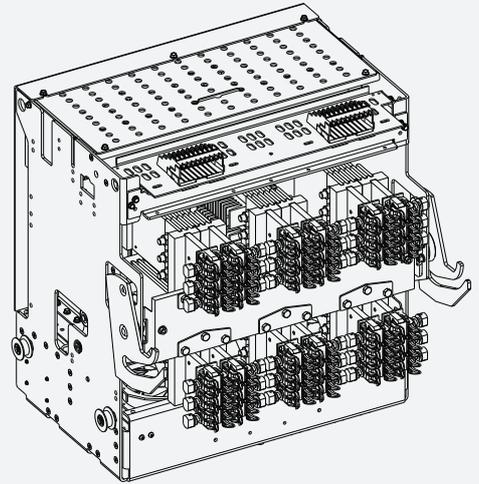
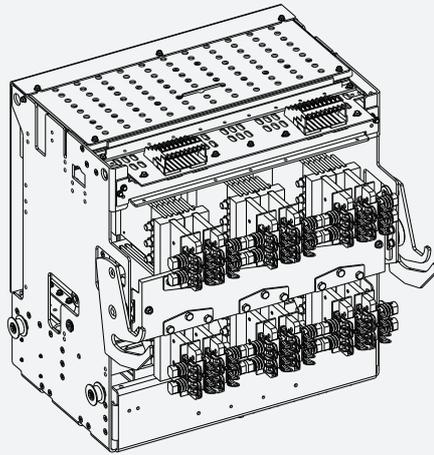
**AKD-10 3200A WPS-32, WPH 32 , WPX-32, , WPS-40 & WPX- 40 Front view**



**Figure 5 & 6**

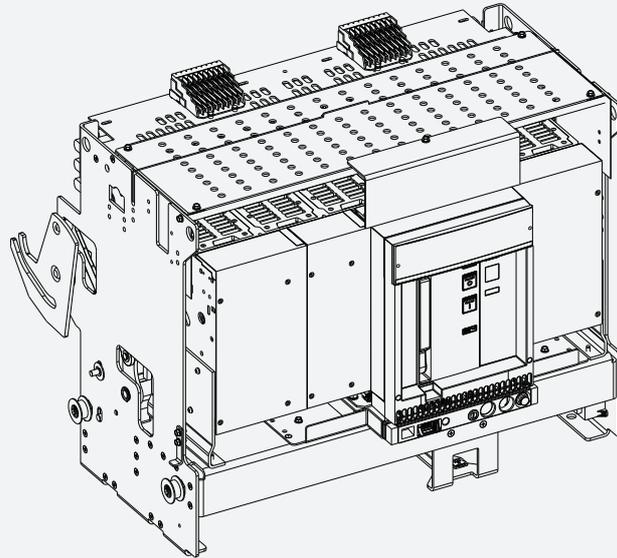
**AKD-10 3200A WPS-32, WPH-32 & WPX32 Back view**

**AKD-10 4000A WPS-40 & WPX-40 Back View**



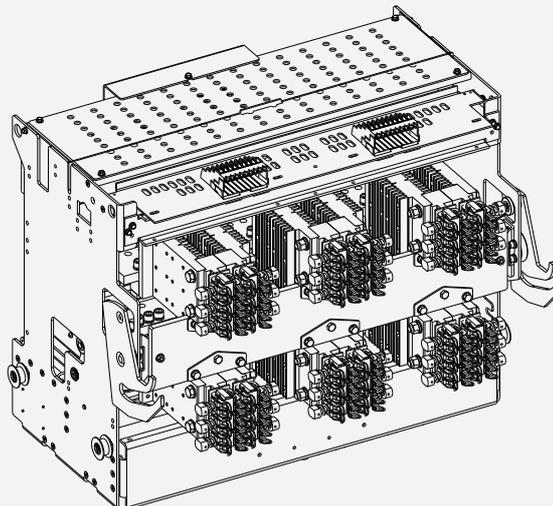
**Figure 7**

**AKD-10 5000A WPS-50 & WPX-50 Front View**



**Figure 8**

**AKD-10 5000A WPS-50 & WPX-50 Back View**



Emax 2 Retrofill Circuit Breaker is suitable for application on power systems up to 635 VAC 50/60 Hz.

## History and Types

### 10 - History of AKD

---

#### AK - Power Circuit Breaker Equipment

##### D - Drawout circuit breaker construction

Manufactured from 1951 to 1975, all bolted, copper bus design, all drawout breakers AK- 1,2,3,-15 /25 / 50 /75 / 100; the 4000A-max bus rating. Breakers had a ratcheting drawout mechanism, with an open-door drawout. Breakers were painted ANSI61, light gray,manufactured in Philadelphia from 1951 to the mid-60s and in Burlington, Iowa from the mid-60s to 1975.

The breaker compartment was a welded assembly, and the equipment frame was bolted. Breaker boxes were stacked to make a vertical section with equipment frame around the breaker boxes. There were no bus compartment barriers, just an open bus design. Ring silver-plating was applied to bolted connections.

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- AKD - 5** Manufactured from 1960 until 1977, the aluminum bus had copper that was “flash-butt welded’ to the aluminum at bolted connections. During that time, AK-2A, 3A -25 / 50 /T50/75 / 100 (“A” signifies AKD-5 drawout) were produced. Breakers up to 2000A had primary finger clusters. 3000 & 4000A breakers had a circular primary finger cluster arrangement in the switchgear compartment. Pull-lanyard drawout mechanism in the switchgear on early designs was replaced by a single jackscrew mechanism and then later replaced by a double jack-screw mechanism. Featured is a closed-door, drawout with inner house breaker compartment, where door moves with the breaker as it is racked in or out. Two bus levels are available with a ring bus used at 4000A. Particulars include: welded/riveted frame, bus compartment barriers, line/load separation barriers on mains and ties, isolation barriers on transformer transitions, copper runbacks on feeder breakers, ring silver-plating on copper, and aluminum bus unplated (welded connections). The switchgear is painted sand-gray (beige), with some instrument doors painted blue. AKR-30/50 in 22"-wide sections were introduced in AKD-5 construction, early 70s. AK25s and AK50s were also available as substructure kits for OEMs to build around customer gear.

Note: All legacy AK & AKR breakers have a draw out letter code “A”.

---

- AKD - 6** AKD-6 was manufactured in Salisbury, NC from 1977 to 1981. Some AKD-5s, which were built in Salisbury from 1975 until 1977, got name-plated as AKD-6. There is no “flash-butt” welded aluminum to copper. Aluminum bus is tin-plated and bolted at shipping splits (but welded everywhere else). Copper bus design has ring silver plating at bolted joints. AKR-75 / 100s were introduced during this time. Stab-and-finger connections on 3200A and 4000A breakers were improvements, versus the round the primary disconnects on the AKD-5, The 4000A breaker was also narrowed to same width and phase-phase spacing as the 3200A.

The AKD-6 uses inner-house drawout breaker compartments on the 800 - 2000A breaker compartments. They are painted ANSI 61 light gray and breakers have ECS or SST trip units.

AKD-6 should mark a shift away from all AK breakers and to AKR breakers. The AKR-30/50/50H/T50 breakers used in AKD6 have a shallow 1” steel front escutcheon are drawout letter code “A” i.e. AKR-4A-30. The AKR-30/50/50H/T50/75/100 breakers sold to OEMs for their switchgear have a 5” deep plastic front escutcheon & spring loaded sliding “picture frame”.

These are draw out letter code “B” i.e. AKR-4B-30.The AKR-75/100 breakers used in AKD-6 have a shallow 1” steel front escutcheon and vertical primary fingers. They are drawout letter code”C” i.e. AKR-4C-75.

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**AKD - 8** The AKD-8 was manufactured in Salisbury, NC from 1980 to 1984 and in Burlington, Iowa from 1984 to 1999. It was mostly replaced by AKD-10 in 1999 to 2000 but was available thru 2015.

Model 1 and 2 have extruded vertical bus. Model 2 was introduced in 1983 to accommodate revised wire harness routing. Model 3 was introduced in 1991, using a flat bar vertical bus. AKR breakers use Micro VersaTrip 9, MVT RMS9, EPIC, MVT Plus, MVT PM or EntelliGuard TU. Aluminum bus was removed from the design in 1996 in favor of the standard tin-plated copper bus (silver plated optional).

The AKR-30/50/50H/T50 breakers used in AKD8 have 5" deep plastic front escutcheon & spring loaded sliding "picture frame". They are drawout letter code "D" i.e. AKR-7D-30. In AKD-8, most 800-2000A breakers are "feeder" breakers with vertical lower stud & primary disconnect fingers clusters, but 800-2000A breakers designated as "Main" breakers, have horizontal lower finger clusters, which is the same as "D" letter code breakers sold to OEM's. A lower stud rejection bracket differentiates between lower stud orientations.

AKR-75/100/125 circuit breakers used in AKD-8 switchgear have a 5" deep plastic front escutcheon & spring loaded sliding "picture frame" similar to the small frame breakers. The positions DISC/TEST/CONN are shown on the side of the front escutcheon by position of the sliding "picture frame". The GE AKD-8 breakers have a drawout letter code "D". OEM versions are drawout letter code "B" and GE Switchboard versions are drawout letter code "FP", "B" & "F" breakers only differed by appearance items. All Primary disconnect stabs are vertically oriented.

The AKR-125 is a 5000A breaker that had (2) cooling fans. It was release in 1995. None of the Emax 2 Retrofill breakers utilize fans except for 4000A rating only.

---

**AKD - 10** AKD-10 was manufactured in Burlington, IA from 1999 thru 2015. The switchgear compartment sizes and main & vertical bus arrangements are the same as AKD-8 Model 3. The compartments have pull-out rails. AKD-10 uses WavePro \* drawout-only style breakers. All breakers have 4 rollers which align with the compartment rails.

The secondary control wiring for all functions is connected thru either one or two 36 point secondary disconnects with gold plated contacts. Secondary control wiring terminates at fixed standard locations on the 36 point disconnects. Each breaker has a pump style manual charging handle and manual push OPEN and Push CLOSE buttons. The front escutcheon is 5" deep with a sliding picture frame, but is wide enough so the trip unit and new style bell alarm are visible thru the front door of the switchgear.

Note GE Switchboard plants initially shipped "WS" style breakers and later shifted to "WE" style breakers to be consistent with GE Switchgear from Burlington, Iowa. The 5000A breaker had cooling fans. None of the Emax 2 Retrofill breakers utilize fans except the 4000A fully rated breaker.

(W1 & We Catalog numbers on legacy WavePro breakers designate additional dead front shields)

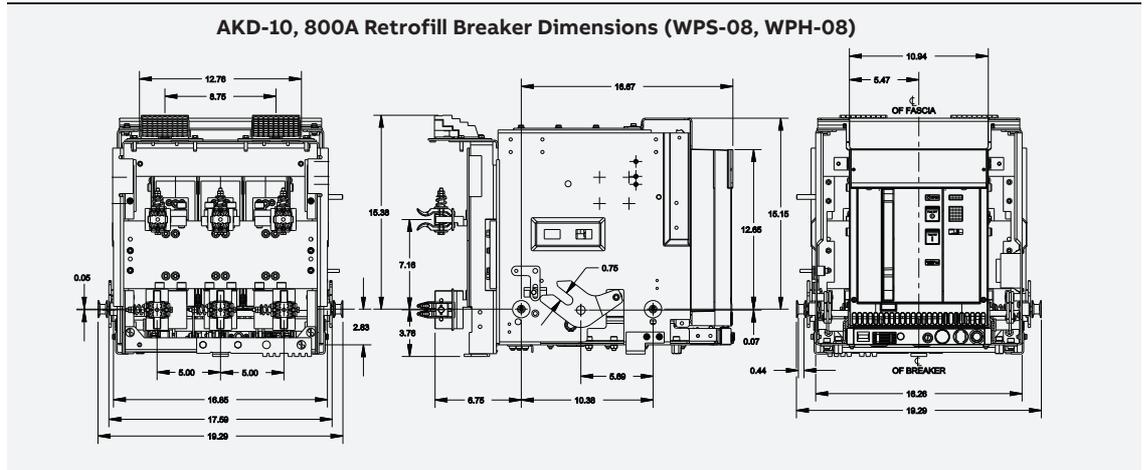
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# AKD-10: Retrofill Breaker

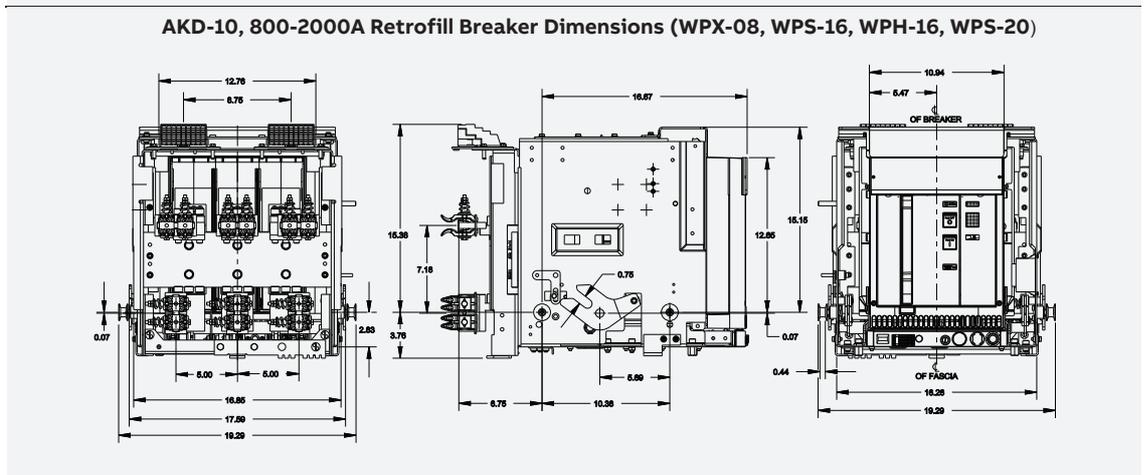
## 11 - AKD -10 :Mechanical Drawings

The following engineering or assembly drawings describe the layout and dimensions of the AKD-10 Retrofill breaker.

**Figure 9**



**Figure 10**



**Figure 11**

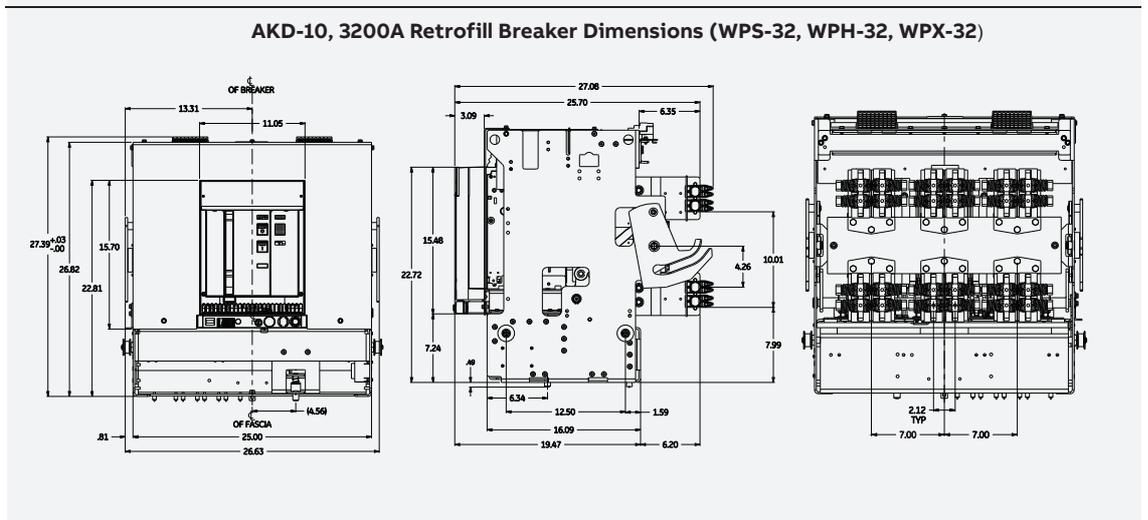
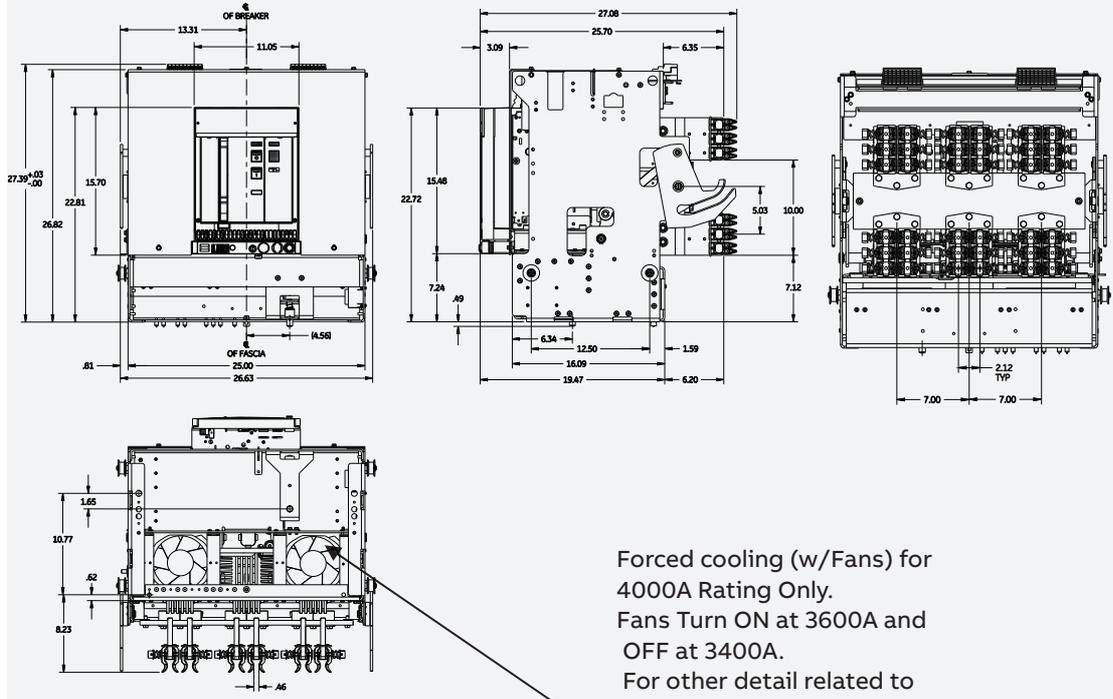


Figure 12

AKD-10, 4000A with forced cooling (w/fans) Retrofill Breaker Dimensions (WPS-40, WPX-40)

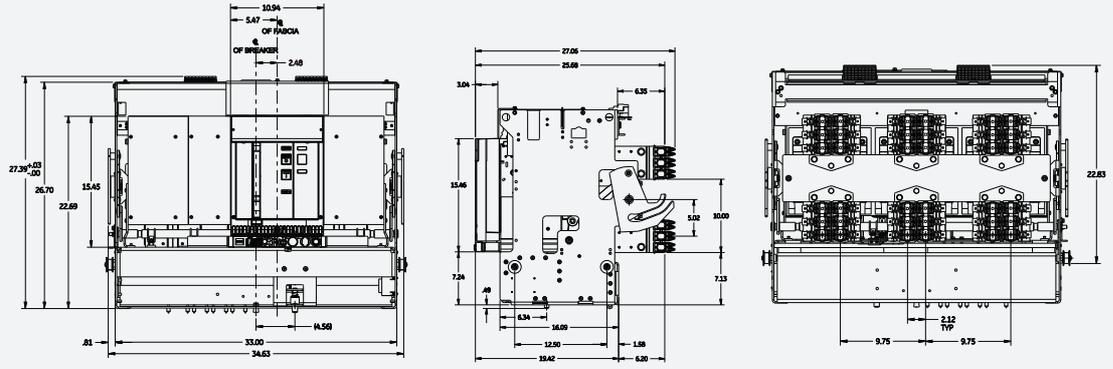


Forced cooling (w/Fans) for 4000A Rating Only.  
 Fans Turn ON at 3600A and OFF at 3400A.  
 For other detail related to Trip unit config and wiring refer to Fan control section

Breakers ordered with a 3600A Rating plug for max 90% load do not require fans.

Figure 13

AKD-10, 5000A Retrofill Breaker Dimensions (WPS-50, WPX-50)



The legacy WavePro 5000A breaker was equipped with fans. The Emax 2 5000A retrofill does NOT require fans.

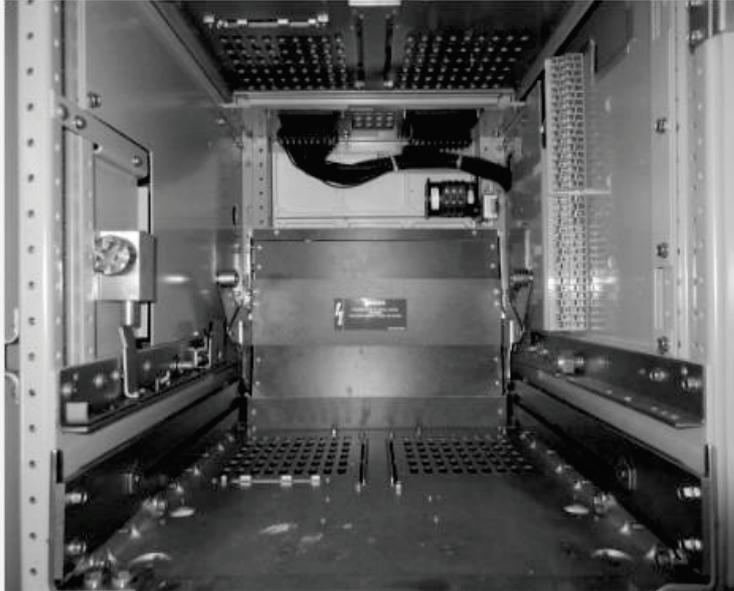
# AKD-10 : Compartment

## 12 - Interior View

The figures below present a new AKD-10 compartment, with one photo showing the rails extended.

**Figure 14**

**AKD-10: Empty Compartment with Shutters**  
**NOTE: Section width 22"-800-2000A**



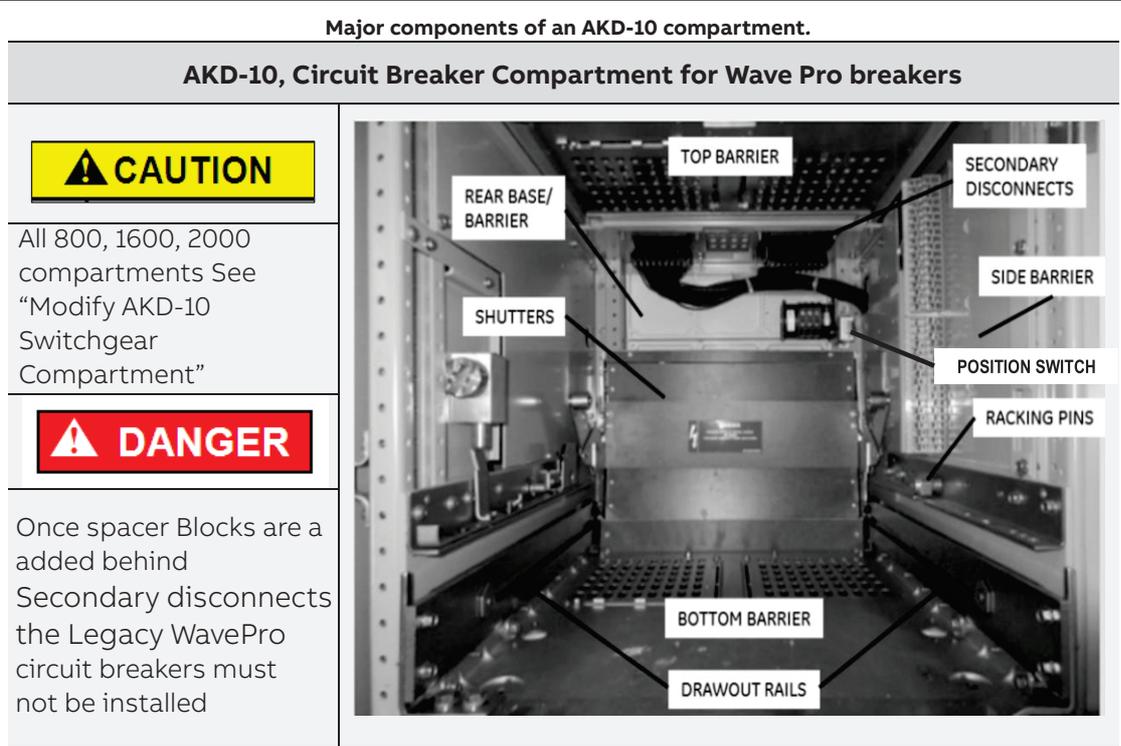
**Figure 15**

**AKD-10: Empty Compartment with Racks/Rails Extended**



## 13 - Interior Components

Figure 16



## 14 - Interior View

The figures below present a new AKD-10 compartment, with one photo showing the rails extended.

Figure 17

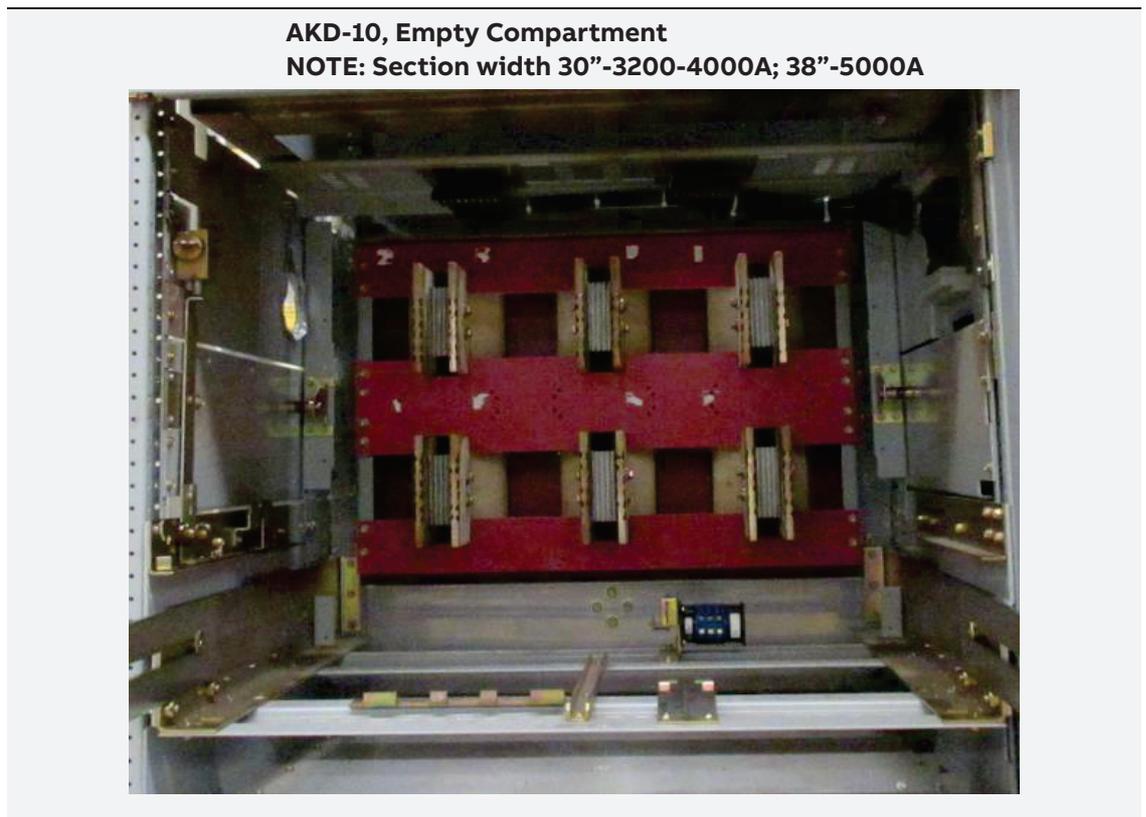
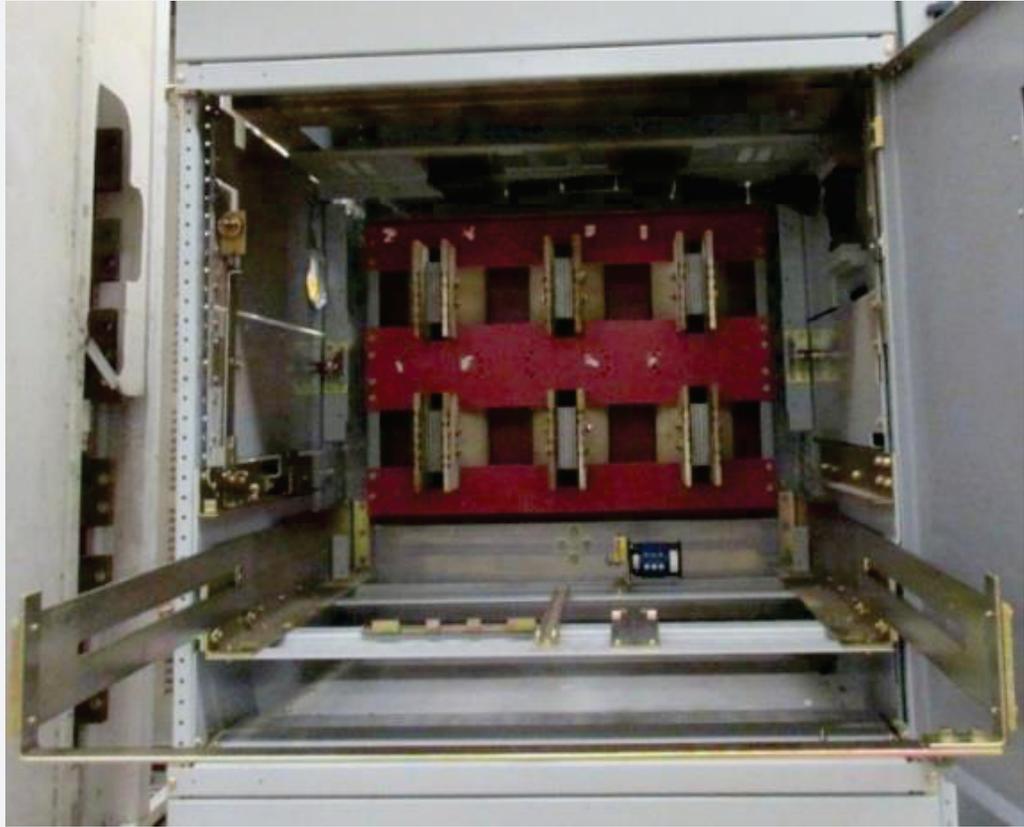


Figure 18

AKD-10, Empty Compartment with Racks/Rails Extended

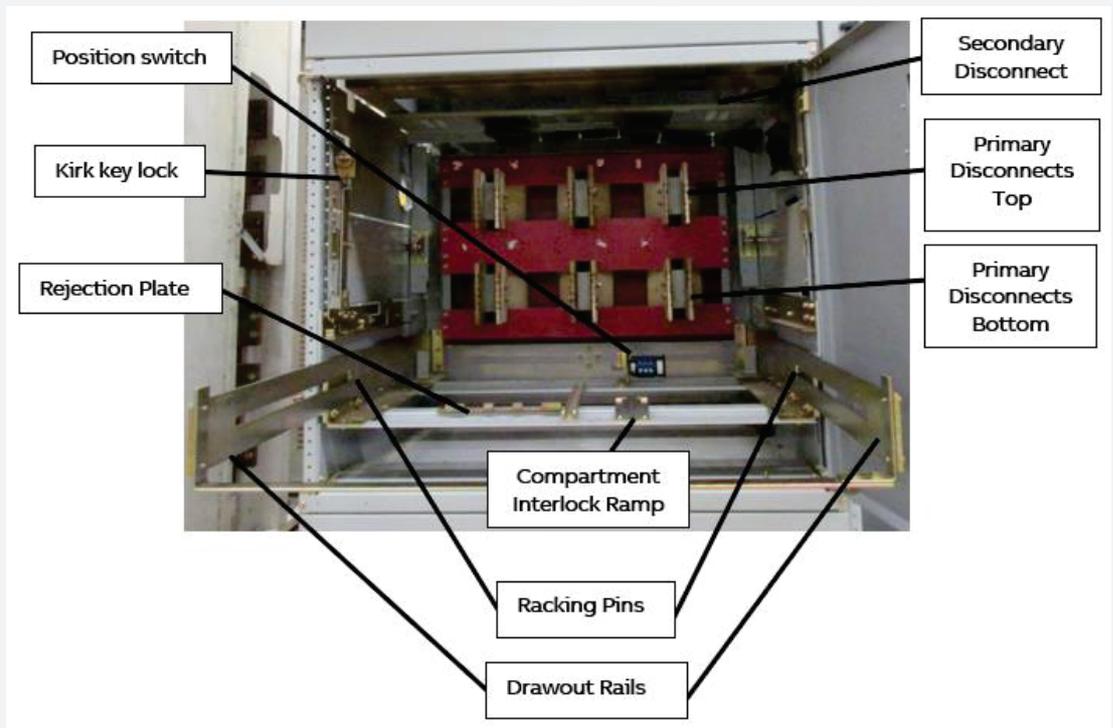


## 15 - Interior Components

Figure 19

Major components of an AKD-10 compartment.

AKD-10, Circuit Breaker Compartment for WPS-32/WPH-32/WPX-32/WPS-40/WPX-40/WPS-50/WPX-50 Breakers



## Modify AKD-10 , Switchgear Compartment

### 16 - Cut Power to AKD-10 Switchgear

#### Danger



- It must be ensured that the supply power to the Shack and Saad compartment is turned off/ compartment is deenergized for all the incoming and outgoing circuits of the LVS prior to any work being conducted on it.
- During the installation and related work on the equipment, it must be ensured that the operator is using the prescribed PPE for the specified tasks

- Ensure only qualified personnel install, operate, service, and maintain all electrical equipment.

Before modifying the switchgear compartment, de-energize/switch off the breaker. If the circuit breaker is ON and the springs are charged, to turn it off, press the OPEN button on the circuit breaker fascia, and ensure that the circuit breaker contacts are open.

### 17 - Rack Out AKD-10 Legacy/Existing CB

To rack-out legacy old breaker from compartment, refer to your legacy breaker's manual on how to remove the existing breaker.

### 18 - Check,Clean,Grease AKD-10 Compartment

1. Inspect the compartment for damage or signs of overheating.
2. Check the orientation of primary finger clusters match the switchgear stabs.
3. Check racking pin diameters agree with breaker racking cam slots (AKD-10 has a large diameter pin and cam slot on right side).
4. Check the secondary disconnect integrity & their mounting supports for any damage or cracks .
5. If switchgear parts show cracks or damage contact ABB post sales service 888-437-3765.
6. Check each breaker compartment for bolted joints in the primary disconnect bars. Where such joints exist, check the bolts for tightness.
7. Inside the compartment, check the contact areas on each primary disconnect bar for foreign matter that may have accumulated. Clean those areas if necessary with a clean, lint-free rag and isopropyl alcohol or acetone.
8. Be sure to apply a thin film of red Mobilgrease 28 to the primary disconnect contact areas for better electrical connections inside the compartment.

---

## 19 - Install Secondary Disconnect Spacer Block (800A-2000A ONLY)

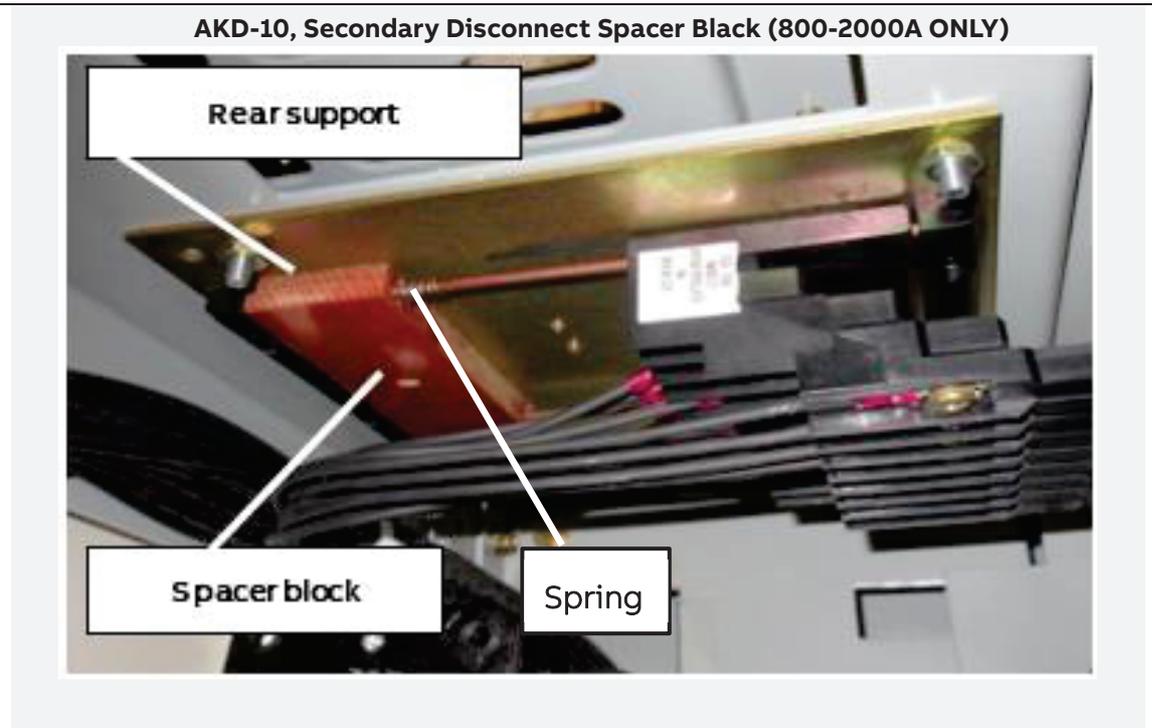
---

Install the spacer block provided as shown in Figure 20, below. Remove the protective tape on the block and stick it on the secondary disconnect mounting plate as shown in Figure 20. Be sure the spring is moved to the front of the spacer block.

Optional: The hole in the spacer block can be used to add a #10-32 screw, 3/4" inch long. **Drill** a 0.177"(4.5mm) hole in the steel plate above and install 10-32 taptite thread forming screw (ABB part: N722P16012B6)

**Note:** Use a #16 Std (@.177") or 4.5mm metric drill bit Use 5/16" hex to install screw to 45-50 in-lbs Torque.

Figure 20



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## 20 - Quality

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All Emax 2 Retrofill circuit breakers have been designed and manufactured to ANSI standards. The design was based on the original requirements of the legacy switchgear and breaker. The product is manufactured in ABB Inc USA, Senatobia, Missisipi (MS) and is inspected using some of the same master gauges used on the legacy WavePro breakers to confirm electrical and mechanical performance, including rejection-features.

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## 21 - Information Label

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On the front of each circuit breaker there is a factory-assembled label that details all electrical accessories included on the circuit breaker.

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## 22 - Product and Catalog Serial Numbers

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Product catalog and serial numbers should be kept handy when communicating about the circuit breaker. Each circuit breaker has a unique serial number (S/N) located on the front fascia.

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## 23 - Remove Circuit Breaker from Container

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- Inspect and Prepare**
1. Inspect the shipping container for obvious signs of rough handling and/or external damage incurred during transportation.
  2. Record any observed damage for reporting to the carrier. Ensure all recorded reports and claims include the order number and name plate information.
  3. Remove the banding straps and lift the top cover.
  4. Remove all packaging material.
  5. Remove all product documentation and store properly.
  6. Unscrew the mounting screws that fasten the circuit breaker to the bottom of the shipping pallet and remove the circuit breaker.
  7. Reverse the orientation of two shipping plates with flanges inward and reinstall on breaker (3200A, 4000A & 5000A only). These flanges will keep the breaker from resting on the rejection pins and centering guide pin whenever it is placed on a flat surface.
- 

- Use Lifting Device**
1. Use a lifting device for moving circuit breaker in order to avoid personal injury and damaging the breaker.
  2. Use a proper overhead lifting device to mount breaker into the switchgear. Contact the nearest sales office for availability of a hoisting device.
-

# Unpack Circuit Breaker

## Danger



- Turn off all power to switchgear. Tagout and lockout main source, up-stream or main breaker.
- Failure to comply with these instructions will result in death or serious injury from severe burns caused by arc flashing that has exceedingly high temperatures.
- Always wear personal protection equipment according to OSHA standards and appropriate to the severity of potential burns.

- Ensure only qualified personnel install, operate, service, and maintain all electrical equipment.

## Caution



Falling Object

- Do not walk or remain under any heavy assembly while hoisted above head as the chains securing the assembly may give way.

- Ensure lifting equipment has capability for device being lifted.
- Wear hard hat, gloves, and safety shoes.
- Failure to comply with these instructions could result in serious injury.

## Notice



### PRODUCT DAMAGE

- Ensure circuit breaker and its accessories are always used within their designated ratings.
- Do not allow the circuit breaker to hit a hard surface while handling.
- Do not drag or slide the circuit breaker across a hard or rough surface.

- A factory-installed rejection feature prevents mismatching circuit breakers and cassettes/ substructure, preventing the insertion of a circuit breaker with a lower rating into a higher rated cassette/substructure, or the insertion of a higher rated circuit breaker into a lower rated cassette/substructure.

By following the procedures below, you should be able to install the breaker with minimum effort and time.

## Clean and Grease Breaker

1. Before installing or operating a breaker, refer to the breaker instruction manual for pre-operation inspection and test.
2. Check thoroughly for any damaged or loose parts and for any dirt or foreign matter which may be in the breaker.
3. Clean those areas if necessary with a clean, lint-free rag and isopropyl alcohol or acetone.
4. Be sure to apply a thin film of electrical grease (Mobilgrease 28) to the primary disconnect fingers (Figure 21 and 22).

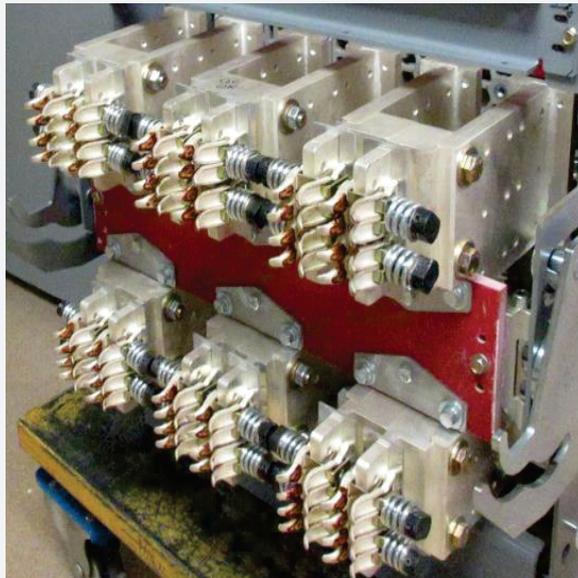
**Figure 21**

**Primary Contacts or “Fingers” (Apply Grease to sliding surfaces)**



**Figure 22**

**Primary Contacts or “Fingers” (Apply Grease to sliding surfaces)**



## Check Before Installing

### Danger



- It must be ensured that the supply power to the Shack and Saad compartment is turned off/ compartment is deenergized for all the incoming and outgoing circuits of the LVS prior to any work being conducted on it.
- During the installation and related work on the equipment, it must be ensured that the operator is using the prescribed PPE for the specified tasks

- Ensure only qualified personnel install, operate, service, and maintain all electrical equipment.

These breakers are supported on two extendable rails; each breaker has four rollers. Racking arms on both sides of the breaker frame engage the drawout mechanism pins fastened to both sides of the compartment.

## Store Circuit Breaker

### Notice



#### PRODUCT DAMAGE

- Do not store circuit breaker in corrosive environments above LC1 (sea salt mist) and G1 as per ANSI/ISA-S71.04-1985.
- Ensure circuit breakers are stored in a clean, dry location, in their original packaging.
- Failure to comply with these instructions may result in product damage.

If you decide not to install the Retrofill breaker until a later time, then you can store it away for installing it later.

1. Store the circuit breakers in a clean, dry location in an upright position.
2. Make sure that the breakers are properly supported to prevent bending of the studs or damage to any of the breaker parts. Do not remove any protective grease until the assemblies are ready to be installed. Cover to prevent dust from settling on the breakers.
3. If breakers are not to be placed in service at once, remove them from their shipping cartons and thoroughly inspect them for damage.
4. If everything is in satisfactory condition, replace the breakers in their shipping cartons for storage. If it is necessary to store the equipment for any length of time, use the following precautions to prevent corrosion or deterioration.
5. Store in a clean, dry, rodent-free location with moderate temperature & provide protective coverings to prevent dirt, water, or other foreign substances from entering the breaker.
6. If dampness or condensation is encountered in the storage location, heaters installed in the switchgear can be used to prevent moisture damage.
7. After prolonged storage, Level 1 maintenance is needed under two years of storage. While Level 2 maintenance is needed over two years of storage. Refer to circuit breaker manual in maintenance L1-L2 descriptions.  
Refer to Emax2 Installation, Operation and Maintenance Instructions — Publication #1SDHOO1000RO002 pages 99-112.

# Install AKD-10 & Substructure type 800, 1600 & 2000 Retrofill Breaker

## Danger



- It must be ensured that the supply power to the Shack and Saad compartment is turned off/ compartment is deenergized for all the incoming and outgoing circuits of the LVS prior to any work being conducted on it.
- During the installation and related work on the equipment, it must be ensured that the operator is using the prescribed PPE for the specified tasks

- Ensure only qualified personnel install, operate, service, and maintain all electrical equipment.

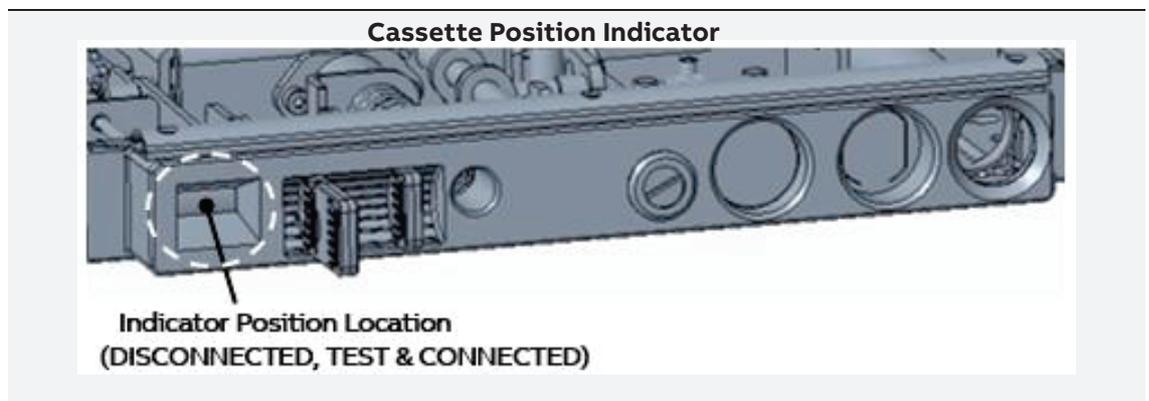
After the existing breaker is removed, the compartment modified and secondary wiring verified, the Retrofill breaker can now be installed in the AKD-10 switchgear, OEM switchgear or switchboard.

Note : the preferred lifting method is always to use proper ABB lifting (spreader) bar. It will provide the best chance of installing breakers, especially into the upper compartments, without damaging the breakers. The WavePro small frame lifting bar had a 3rd lifting hook at the front and it will not fit on the retrofill breaker. Any time eye bolts (small frame breakers) or large diameter holes (large Frame breakers) and generic lifting chains are used, caution must be used to keep the chains to no less than 45 degree angle from horizontal to avoid damaging the breaker side frames)

800A - 2000A Breakers : ABB Lifting Bar #2TSE431929R1000, old GE #0247B8961G002  
3200A— 4000A Breakers : ABB Lifting Bar #2TSE431931R1000, old GE #0247B8961G001  
5000A Breakers : ABB Lifting Bar #2TSE431932R1000, old GE #0247B8961G003

1. Verify that the breaker is in the DISCONNECTED and OPEN position before mounting it on the rails. Refer to figure 23.

Figure 23



2. Using the chosen lifting method, raise the breaker to a height slightly above the rails.
3. Pull out the two rails being cautious not to position anyone underneath the suspended load. Pulling from the middle of the tie bar connecting the two rails and lifting up slightly will help the rails to slide out more easily.

- Carefully lower the breaker onto the rails, making sure both rollers on each side land centrally on each rail such that the full weight of the breakers is fully supported by the rails.
- Remove the lifting bar, any lifting eye hooks and chains.

**Figure 24**

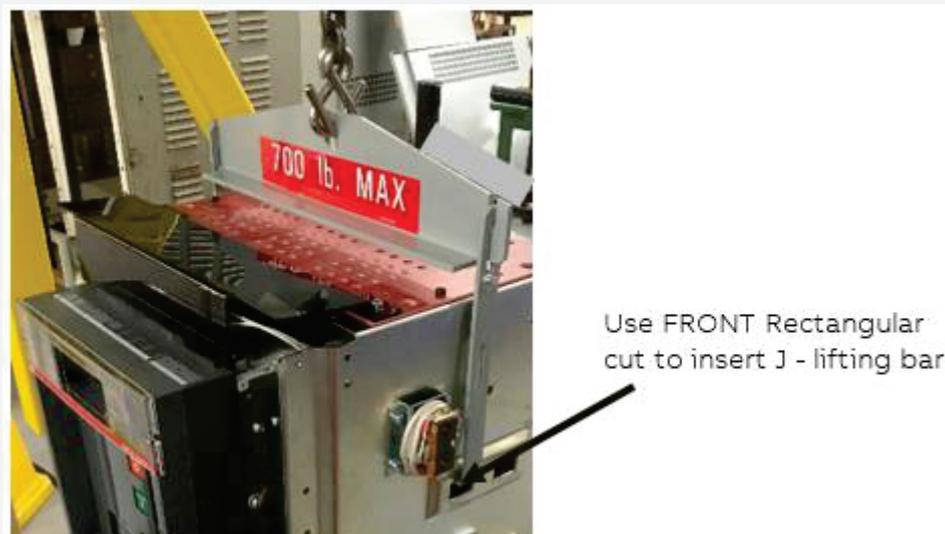
**AKD-10, Using ABB Lifting bar and hoist**



Note 1: Make sure the J hook of the lifting bar is secured in the front window on both Side sheets of the breaker as shown in fig 25. This will ensure the breaker is better balanced when lifted.

**Figure 25**

**AKD-10, Using ABB Lifting bar and hoist**



- Note 2: The size of the slot at the top of the lifting bar is 0.7" wide and 1" high. Hooks used in the hoist should be suitable to engage with this slot size. After loading on rails of fully withdrawn position remove the eye bolts or lifting means.
- Note 3: Use of Lifting bar or spreader bar allows to reach the top most switchgear Compartment easily, so it is the recommended method.
- Note 4: As an alternate to above lifting process, eye bolts, chain attached to eye bolts through S hook, and connector can be used to lift the WavePro Retrofill Breaker. Examples of an eye bolt and connector are shown in fig's 26 and 27. Insert M10

eyebolts of rating minimum 250lbs in the eye bolt weld nuts as shown in Figure 28. Use four eye bolts, chain and suitable “S” hooks or chain connectors to safely lift the breaker onto the rails. “S” hooks with a locking feature as shown in Figure 28 are preferred to basic “S” hooks. Each chain should be rated minimum 500lbs. Mount a connector to join both chains in the center. Connector should be rated minimum 1000lbs. The connector is then attached to a hoist hook as shown in Fig 28 to lift the breaker.

Note: Eye bolts, chain & connectors are not supplied. If used, remove before installing breaker into the compartment.

**Figure 26**

**Eye bolt Ex: McMaster CARR Part # 3107T43**



**Figure 27**

**Chain connector Ex: Lowes item #184600 Reese Model : 74602HD**



**Figure 28**

**AKD-10: Using eye bolts, chain and connector**



6. Check that the breaker is free from obstruction while pushing it inside the compartment, especially the rejection features below the breaker.
7. Check the secondary disconnects are aligning while pushing the breaker into the compartment from fully withdrawn to DISCONNECT position
8. Push the breaker in until the compartment racking pins engage with the breaker racking cams.
9. Remove the racking tool from the storage location on the breaker front panel and extend the torque bar from inside the handle.

**Figure 29**

**AKD-10, Racking Tool & storage location**

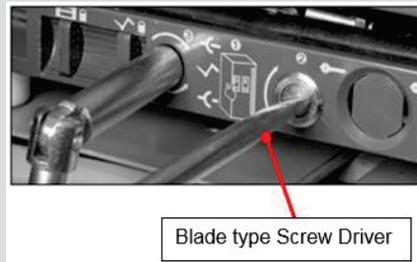


**Racking handle tool storage location**



10. Use a blade-type screwdriver in the slot or rack out lock of the breaker (Figure 30), and turn it clockwise to the right so that the racking handle shutter opens.

**Figure 30**



**AKD-10, Racking Tool and Screwdriver Inserted**

Inserting the racking handle:

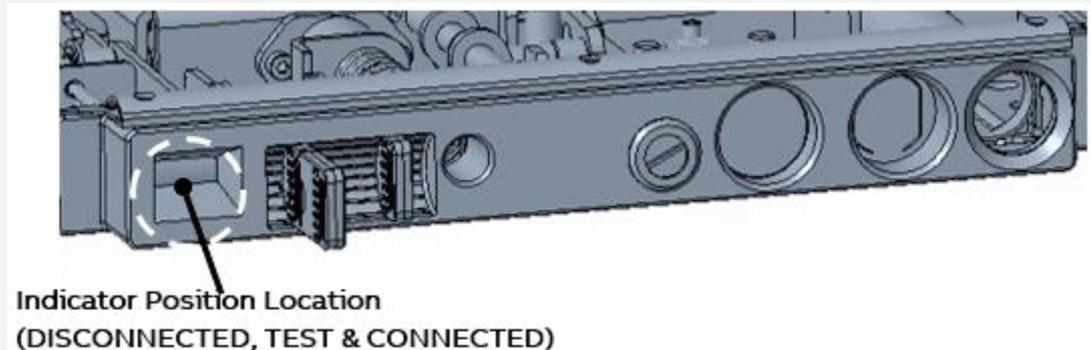
- First, insert a blade screwdriver in the right-hand slot and rotate it to the right.
- Then, while holding the screwdriver torqued to the right, insert the racking tool in the left slot until it engages with the mechanism inside.

After the racking tool engages, remove the Inserted screwdriver.

11. While turning the screwdriver to the right with the shutter open, insert the racking tool in the handle insertion hole so that it engages with the racking mechanism, and remove the screwdriver (Figure 30).
12. With the racking tool inserted, crank clockwise so that the Retrofill starts to move in, slowly sliding forward into the compartment.
13. Rotating clockwise ~37 turns racks the circuit breaker all the way into the enclosure.

**Figure 31**

#### **Cassette Position Indicator**



14. As the breaker approaches the TEST position, check the alignment of the fixed and moving parts of the secondary disconnect contacts. If a spring charging motor or under voltage-release is installed, these may operate when approaching the TEST position. Fig 31
15. Continue rotating the racking handle clockwise until the position indicator first shows TEST, then CONNECTED. Fig 31.

NOTE: When approaching the CONNECTED position, more torque for turning the racking handle is normal as the primary finger clusters engage with the AKD- 10 primary bus stabs.

NOTE: At the end of 37 rotations, the breaker is in its maximum travel position. At this point, the primary disconnect fingers have completely engaged with the primary bus stabs.

16. Remove and store the racking handle in its storage location. Fig 29.

Figure 32

Emax 2 Retrofill 800, 1600 & 2000A Frames



Emax 2 Retrofill , AKD-10,Connect Position



# Install AKD-10 & Substructure type 3200, 4000 & 5000 Retrofill Breaker

## Danger



- It must be ensured that the supply power to the Shack and Saad compartment is turned off/ compartment is deenergized for all the incoming and outgoing circuits of the LVS prior to any work being conducted on it.
- During the installation and related work on the equipment, it must be ensured that the operator is using the prescribed PPE for the specified tasks

- Ensure only qualified personnel install, operate, service, and maintain all electrical equipment.

To remove the existing breaker follow instructions provide with the legacy breaker and or switchgear/ switchboard. Notice how the rejection plates on the floor of the switchgear compartment align with rejection pins on the circuit breaker. Verify the correct breaker is being used. Compare the rejection pin arrangement on the new breaker to those on the old breaker.

After the existing breaker is removed and the compartment updated with any added features, the pre-wired breaker can be installed in GE AKD-10 Switchgear, GE Switchboard or OEM Equipment.

1. Verify that the new breaker is in the DISCONNECTED and OPEN position.
2. For WPS-32/WPH-32/WPX-32/WPS-40/WPX-40/WPS-50/WPX-50 Retrofill Breaker.
  - a. It is best to use ABB Lifting Bar Part number 2TSE431931R1000 for 3200-4000A and 2TSE431932R1000 for 5000A and a suitable hoist to lift from above as shown in Figure 34. (These lifting bars have been tested to 200% of their 700 lb ratings.)
  - b. Use of Lifting (Spreader) bar allows to reach the top most switchgear compartment easily, so it is the recommended method.
  - c. Alternate method, use a lifting chain and hooks rated at least 1400 lbs to lift the breaker from above as shown in Figure 33. (chains must not be at an angle less than 45 degrees from the horizontal plane.) Installation in upper compartments may not be possible with limited overhead space or the GE switchgear hoist.

Figure 33

### AKD-10 Location of Lifting Holes for Alternate Method

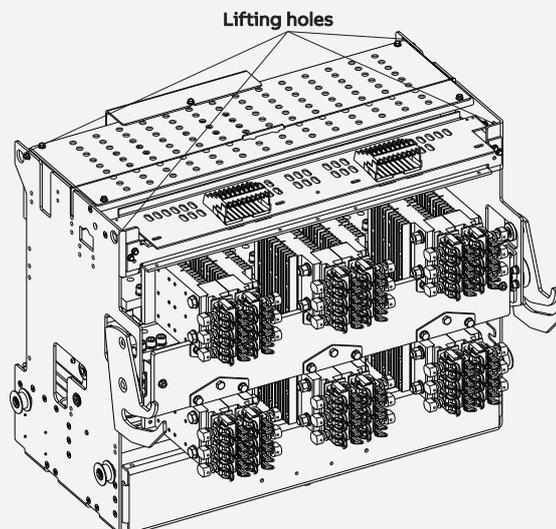
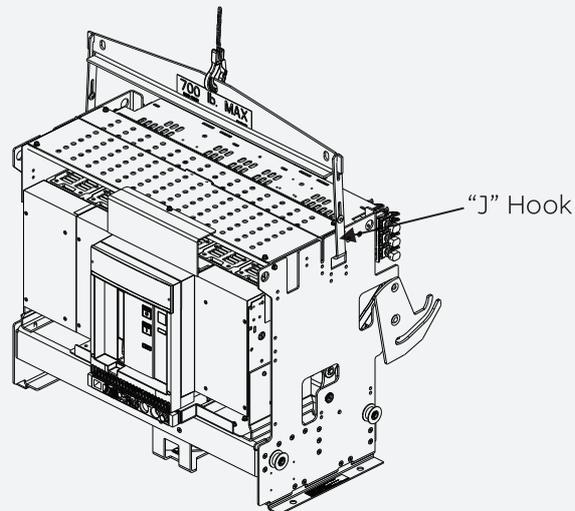


Figure 34

### AKD-10 Using ABB Lifting bar and hoist



3. Make sure that the lifting bar “J” hooks or generic chain-hooks are secured and locked in place.

**⚠ DANGER** Dropping a breaker can result in injury or death.

4. Line up the breaker in front of the compartment where it will be installed; then raise it slightly above the height of the drawout Rail assembly.
5. Pull out the two rails being cautious not to position anyone underneath the suspended load. Pulling from the middle of the tie bar connecting the two rails and lifting up slightly will help the rails to slide out more easily.
6. Lower the breaker down on the Rails.
7. Remove the lifting bar and or chains.
8. Push the breaker into the compartment slowly while observing the alignment of the rejection pins, secondary disconnects and opening of the optional shutter. A compartment interlock rod in the right front will ride over a cam and drop into position in the DISCONNECT position.
9. When fully installed to the DISCONNECT position, the racking cams will stop on the racking pins in the compartment and the breaker will be ready to rack in.
10. Remove the racking tool. (Figure 29) from the storage location on the breaker front panel and extend the torque bar from inside the handle.
11. Use a blade-type screwdriver in the slot or rack-out-lock of the breaker (Figure 30), and turn it clockwise (to the right) so that the racking handle shutter opens.
12. While turning the screwdriver to the right with the shutter open, insert the racking tool in the handle insertion hole so that it engages with the racking mechanism, and remove the screwdriver (Figure 30).
13. Rotating clockwise ~37 turns racks the circuit breaker all the way into the compartment.
14. As the breaker approaches the TEST position, a spring charging motor or under-voltage release if installed may operate. (~ 9 racking turns).
15. Continue rotating the racking handle clockwise until the position indicator first shows TEST; then CONNECTED.
16. When approaching the CONNECTED position, more torque for turning the racking handle is normal as the primary finger clusters engage with the primary bus stabs.
17. At the end of 37 to 37-1/2 rotations, the breaker is in its maximum travel position. At this point the primary disconnect fingers have completely engaged with the primary bus stabs.
18. Remove and store the racking handle in its storage location.

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## 25 - AKD-10: Retrofill Breaker Racked -In

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The photo below shows an example of a racked-in AKD-10 Retrofill.

**Figure 35**

**Emax 2 Retrofill ,AKD-10, CONNECT POSITION**



## AKD-10: Install Accessories

### Notice

**NOTICE**

### WIRING

- Before installing the breaker, the secondary disconnects must be wired to the Emax 2 Retrofill Breaker.
- Wires with wire markers are provided on the breaker. Make sure that the switchgear wiring connection points match up with the original wiring of the cubicle. This ensures that all wiring connections are properly made.
- Wrong connections will cause the breaker to malfunction.

## 26 - AKD-10: Secondary Disconnects

This section deals with installing and wiring the legacy secondary disconnect assemblies onto the Emax 2 Retrofill breaker. Installing the secondary disconnect assembly consists of doing these tasks:

- Installing the secondary disconnect assembly (Figure 36, Figure 37, and Figure 38).
- Wiring the secondary disconnect assembly (Table 6 shows the WavePro secondary disconnect terminals).

The Emax 2 Retrofill Breaker has these three options:

- One secondary disconnect installed
- Two secondary disconnects installed
- No secondary disconnects installed

NOTE: Wires shall be routed below the vented cover (Fig. 36) and wire tied to the side frames, do not route wires over arcchutes, allow slack in wires so secondary disconnect sits level and lifted by the spring washer (Fig. 38).

Figure 36

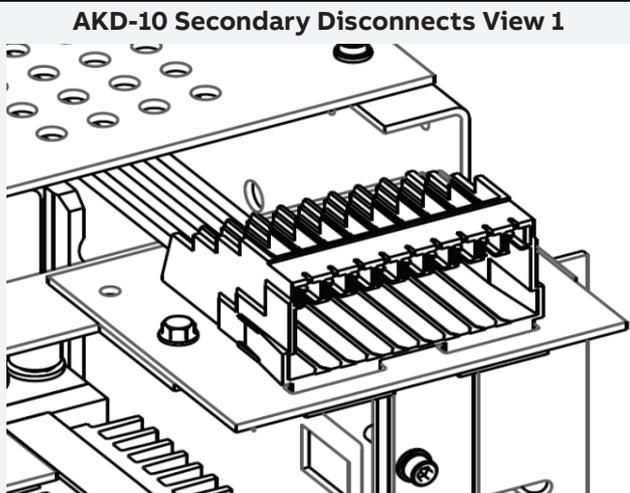


Figure 37

AKD-10 Secondary Disconnects View 2

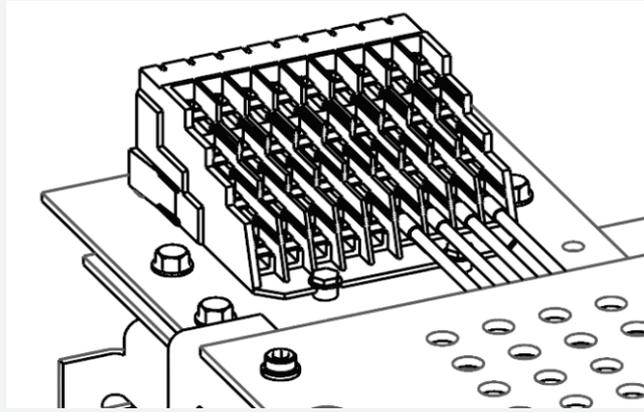
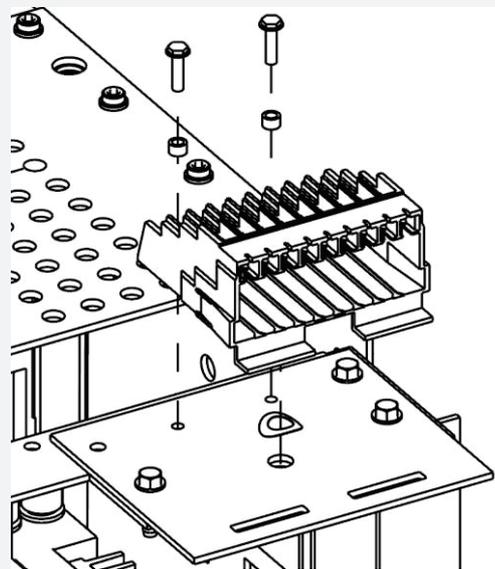


Figure 38

AKD-10 Secondary Disconnects Exploded View 3



Inputs and outputs to the circuit breaker are wired through secondary disconnects located on the top of the breaker. The plug-style secondary disconnects engage mating disconnects in the breaker cubicle when the breaker is in the TEST or CONNECT position. Up to 72 dedicated points are available so that all breaker accessories can be wired to dedicated disconnect points. Refer to Table 5 for the secondary disconnect kit catalog numbers.

**AKD-10 Secondary Disconnect Kit Catalog Numbers**

Table 5

	<b>WP -08/ 16 /20</b>
Breaker side	WPSDSUBF1
Cell side	WPSDSUBM1

**Available from GEXPRO**

Table 6 shows the WavePro secondary disconnect terminals and standard connections. Refer to Table 7 for an example showing wiring from AKD-10 to the Emax 2 Retrofill breaker

**Legacy Wave-Pro secondary disconnect terminals and standard connections.**

**Table 6**

**A-Disc Block (left side from front)**

10 1	Aux Switch (NO contact) Aux Switch	
2 11	Aux Switch Aux Switch (NC contact)	
12 3	Aux Switch (NO contact) Aux Switch	
4 13	Aux Switch Aux Switch (NC contact)	
5 6 7	Aux Switch (NO contact) Aux Switch (NC contact) (Note 1) AUX Switch (common)	
5 6 7	Shunt Trip (NO contact) Shunt Trip (NC contact) (Note 1) Shunt Trip (common)	
14 15 16	Bell Alarm (NO contact) Bell Alarm (NC contact) Bell Alarm (common)	
19 20 21	Bell Alarm (NO contact) Bell Alarm (NC contact) Bell Alarm (common)	
8 17	Closing spring charging motor Closing spring charging motor	
9 18	Close Circuit (electric bkr)* Close Circuit	
22 23	Undervoltage or Electric Lockout Undervoltage or Electric Lockout	
24 25	Neutral Sensor - Tap(+) Neutral Sensor - Common(-)	
26 27 28 29 30 31 32 33 34 35 36	Modbus (+) comment (+) Modbus (-) comment (-) Zone Selectivity Interlock (In+) Zone Selectivity Interlock (In-) Zone Selectivity Interlock (Out+) Zone Selectivity Interlock (Out-) Va (Voltage Conditioner) Vb (Voltage Conditioner) Vc (Voltage Conditioner) (Note2) Trip Unit Aux Power (24 Vdc+) (Note2) Trip Unit Aux Power (24 Vdc-)	

**C-Disc Block (right side from front)**

10 1	Aux Switch (NO contact) Aux Switch	
2 11	Aux Switch Aux Switch (NC contact)	
12 3	Aux Switch (NO contact) Aux Switch	
4 13	Aux Switch Aux Switch (NC contact)	
14 5	Second Shunt Trip (Note 1) Second Shunt Trip	
OR		
14 5	Aux Switch (NO contact) (Note 1) Aux Switch	
6 15	Aux Switch Aux Switch (NC contact)	
8 17	Remote charge Indicator** Remote charge Indicator**	
16 7	WPS-50 Fan Motor - 120Vac (H) WPS-50 Fan Motor - 120Vac (N)	
9 18 19 20 21	Remote Charge NC Remote Charge NC Spare Spare Spare	 (Note 4)
22 23	OFLO (phase A) OFLO (phase A)	
24 25	OFLO (phase B) OFLO (phase B)	
26 27	OFLO (phase C) OFLO (phase C)	
29 30 31 32	Spare Spare Spare Spare	
33 34	Output+ /RELT / GFA Output- /RELT / GFA	
35 36	Input+ (RELT) Input- (RELT)	

\* Remote Close Accessory on manual breaker  
\*\* Remote Charge Indicator (closing springs) applies to E/O breakers only

Notes  
1. Auxiliary switch contacts are wired out if shunt trip is not provided.  
2. 24VDC auxiliary power required for RELT.  
3. This drawing shows all breaker accessories. Refer to breaker catalog number for accessories included with the breaker.  
4. A small number of specially wired WavePro breakers had a Normally Closed Remote Charge Indicator switch contact wired out to WavePro 36 Pt secondary disconnect points C9 & C18 for use in a motor protection circuit in AKD-10 switchgear. This functionality is not required by the Retrofill breaker. The NMICV timer and MC control relay's 4 parallel contacts in the switchgear should be eliminated from the circuit. 120VAC continuous power should be applied to WavePro/ AKD-10 36-point secondary disconnect terminals A8 & A17.

Emax 2 & Wave-Pro secondary disconnect terminals and standard connections.

Table 7

A - Disconnect Block (left side from front)

Emax2	WP		
11 14	10 1	Aux Switch (NO contact) Aux Switch	
22 21	2 11	Aux Switch Aux Switch (NC contact)	
31 34	12 3	Aux Switch (NO contact) Aux Switch	
42 41	4 13	Aux Switch Aux Switch (NC contact)	
C11 - C12	5 6 7	Aux Switch (NO contact) Aux Switch (NC contact) Aux Switch (common) <sup>2</sup>	 
OR			
C11 - C12	5 6 7	Shunt Trip (NO contact) Shunt Trip (NC contact) Shunt Trip (common) <sup>2</sup>	 
98 96 95	14 15 16	Bell Alarm (NO contact) Bell Alarm (NC contact) Bell Alarm (common)	 
38 36 35	19 20 21	Bell Alarm (NO contact) Bell Alarm (NC contact) Bell Alarm (common)	 
U2 U1	8 17	Closing Spring Charging Motor Closing Spring Charging Motor	 
C2 C1	9 18	Close Circuit <sup>1</sup> Close Circuit <sup>1</sup>	 
D1 D2	22 23	Undervoltage or Electric Lockout Undervoltage or Electric Lockout	 
Ne + Ne -	24 25	Neutral Sensor – tap (+) Neutral Sensor – common (-)	 
W1 W2 SZi GZi SZo GZo V1 <sup>5</sup> V2 <sup>5</sup> V3 <sup>5</sup> K1 K2	26 27 28 29 30 31 32 33 34 35 36	Modbus TX (+) Modbus RX (-) Zone Selective Interlock (In+) Zone Selective Interlock (In-) Zone Selective Interlock (Out+) Zone Selective Interlock (Out-) Va (voltage conditioner) Vb (voltage conditioner) Vc (voltage conditioner) Trip Unit Aux Pwr (24 Vdc+) Trip Unit Aux Pwr (24 Vdc-)	

C - Disconnect Block (right side from front)

Emax2	WP		
51 54	10 1	Aux Switch (N.O. contact) Aux Switch	
62 61	2 11	Aux Switch Aux Switch (NC contact)	
71 74	12 3	Aux Switch (NO contact) Aux Switch	
82 81	4 13	Aux Switch Aux Switch (NC contact)	
91 94	14 5	Second Shunt Trip Second Shunt Trip2	
OR			
48 45	14 5	Aux Switch (NO contact) Aux Switch2	
02 01	6 15	Aux Switch Aux Switch (N.C. contact)	
45 48	8 17	Remote Charge Indicator Remote Charge Indicator	
- -	16 7	Emax2 4000A-Fans 120 VAC (H) <sup>4</sup> Emax2 4000A-Fans 120 VAC (N) <sup>4</sup>	 
R1 -	9 18	CMD PH NI Set	 
R2	19	NI Set	
54 51	20 21	Emax2 Bell Alarm Remote Reset Emax2 Bell Alarm Remote Reset	 
- <sup>6</sup> - <sup>6</sup>	22 23	OFLO (phase A) OFLO (phase A)	 
- <sup>6</sup> - <sup>6</sup> - <sup>6</sup>	24 25 26	OFLO (phase B) OFLO (phase B) OFLO (phase C)	  
- <sup>6</sup>	27	OFLO (phase C)	
-	28	Output 2	
-	29	NI NO	
-	30	NI COMM	
-	31	Input <sup>2</sup>	
-	32	Output <sup>2</sup>	
-	33	Output1/ RELT/GFA <sup>3+</sup>	
-	34	Output1/ RELT/GFA <sup>3-</sup>	
-	35	Input 1/RELT <sup>3+</sup>	
-	36	Input COMM <sup>3-</sup>	

<sup>1</sup> operated breaker; Remote Close accessory on manually operated breaker.

<sup>2</sup> Auxiliary Switch contacts are wired out if Shunt Trip is not provided.

<sup>3</sup> 33, 34, 35 & 36 – If RELT is optioned, then 33, 34, 35 & 36 are permanently assigned as RELT Output and Input.

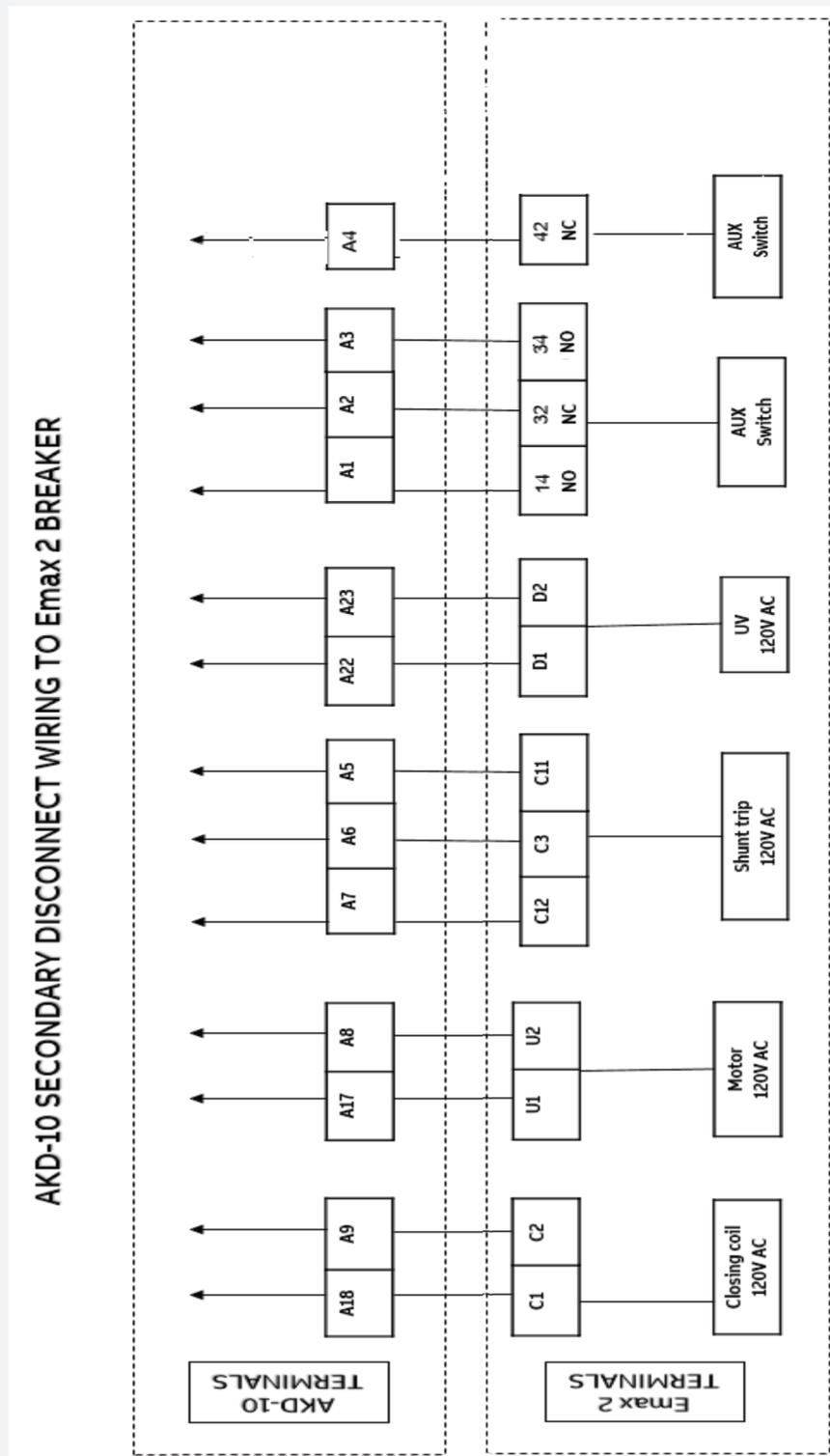
<sup>4</sup> WP 40 for 4000A is provided with fans that need to be supplied: If 16-7 are not connected to 120Vac, connect to 8-17 Motor (if 110 – 60 Hz). The 5000A Emax 2 Retrofill does NOT require fans.

<sup>5</sup> Not an input for Emax 2, install Ekip voltage modulation breaker.

<sup>6</sup> Open Fuse Lock Out not supported for Emax2 Retrofill.

**Note :** A small number of specially wired WavePro breakers had a Normally Closed Remote Charge Indicator switch contact wired out to WavePro 36 Pt secondary disconnect points C9 & C18 for use in a motor protection circuit in AKD-10 switchgear. This functionality is not required by the Retrofill breaker. The NMICV timer and MC control relay's 4 parallel contacts in the switchgear should be eliminated from the circuit. 120VAC continuous power should be applied to WavePro/ AKD-10 36-point secondary disconnect terminals A8 & A17.

Table 8



- **RELT:** It requires a dedicated RELT-Signaling 2K-3 module + Relt blu switch “GTUTRSK” [1SDHO01000R0524](#)
- **IGF:** will require NCT adapter [1SDHO01000R0530](#)
- **Zone selectivity:** Reuse of external existing wiring by rewiring the internal ZSi, “Legacy zone selectivity is **not compatible with Emax2**. In case the functions is used, it is necessary to replace all legacy breakers connected with Emaxe retrofit” [1SDCO007100G0205](#)
- **Dialogue Module:** “ Emax2 offers multiple communication modules, like Ekip Com Modbus TCP, Ekip Com EtherNet/IP™, Ekip Com Profinet, Ekip Com IEC 61850, Ekip Com Modbus RTU, Ekip Com Profibus DP, Ekip Com DeviceNet™; integration with Emax2 integrated communication modules with different protocols requires the adaptation of existing supervision system to accept new connections with dedicated new system interfaces refer the following document for details [1SDH001140R00001](#)

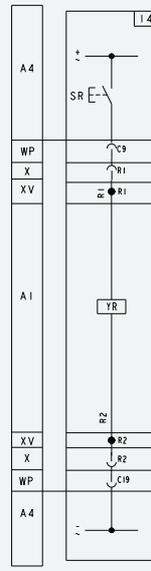
51	61	71	81	91	01
HC	HI	H2	H3	H4	
52	62	72	82	92	02
HC	K3	K4	K5	K6	
54	64	74	84	94	04
HC	K7	K8	K9	K10	
05..Q10/EKIP Signalling 4K					

95	35		R1
96	36	U1	R2
98	38	U2	
S51	S33	M	YR

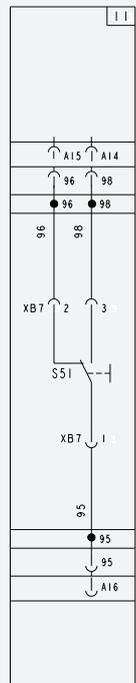
V3	Vn	Ge+	Szi	Ne-		K2	W4
V2	Rct	Ge-	Szo	Ne+		K1	W3
V1	Gzo	Szc	Gzi	Rca			
Trip Unit I/O						EKIP Supply	

95	35		R1
96	36	U1	R2
98	38	U2	
S51	S33	M	YR

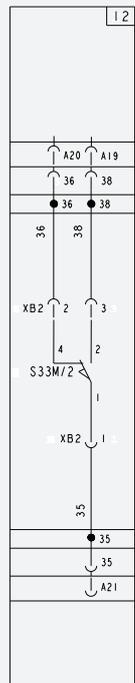
BOBINA DI RESET CONTATTO DI TRIP - YR  
TRIP CONTACT RESET COIL - YR



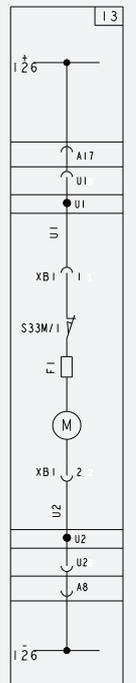
CONTATTO DI SEGNALAZIONE DI TRIP - S51  
TRIP SIGNALLING CONTACT - S51



\* D)  
CONTATTO DI SEGNALAZIONE POSIZIONE MOLLE CARICHE - S33  
CONTACT FOR SIGNALLING POSITION OF LOADED SPRINGS - S33



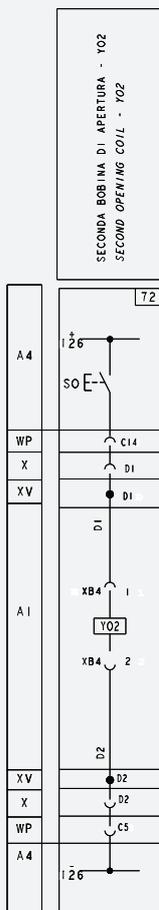
MOTORE PER LA CARICA DELLE MOLLE DI CHIUSURA - M  
MOTOR FOR LOADING CLOSING SPRINGS - M



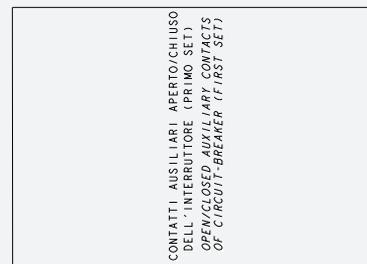
Module	Module	Module

45	D1	C1	C11	C21	I1	21	31	41
46		C3	C13		I2	22	32	42
48	D2	C2	C12	C22	I4	24	34	44
RTC	YU YO2	YC	YO	YC2	Q1	Q2	Q3	Q4

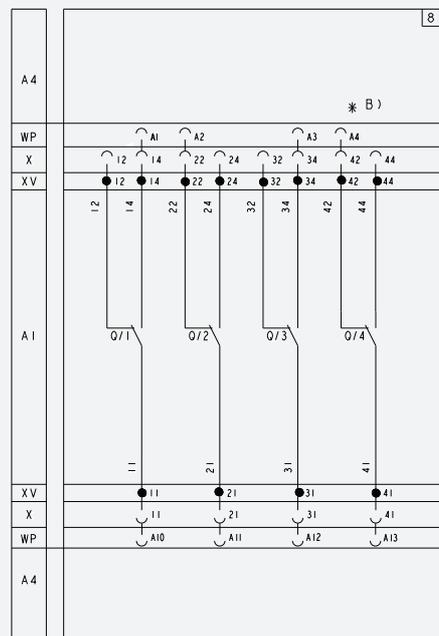
I1	21	31	41
I2	22	32	42
I4	24	34	44
Q1	Q2	Q3	Q4



SECONDA BOBINA DI APERTURA - YO2  
SECOND OPENING COIL - YO2



CONTATTI AUSILIARI APERTO/CHIUSO  
DELL'INTERRUTTORE (PRIMO SET)  
OPEN/CLOSED AUXILIARY CONTACTS  
OF CIRCUIT-BREAKER (FIRST SET)



**NOTES:**

- 1, WP -WavePro fixed connection point
2. "\*B" refers to the mixed Auxilliary Contacts, like Q1 & Q2 are of 400 V while Q3 & Q4 are of 24V.
3. This is a sample wiring diagram. for exact connection points on the fixed side, refer the wiring diagram supplied with original breaker. refer emax 2 catalogue for all other available connection schemes.

**Note: To refer all the other/different option connections refer Emax 2 manual 1SDH001000R0002 page no 48-50.**

51	61	71	81	91	01
HC	H1	H2	H3	H4	
52	62	72	82	92	02
HC	K3	K4	K5	K6	
54	64	74	84	94	04
HC	K7	K8	K9	K10	
Q5...Q10/EKIP Signalling 4K					

95	35		R1
96	36	U1	R2
98	38	U2	
S51	S33	M	YR

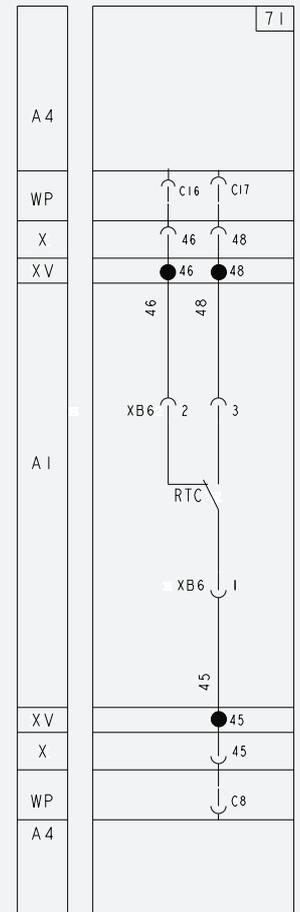
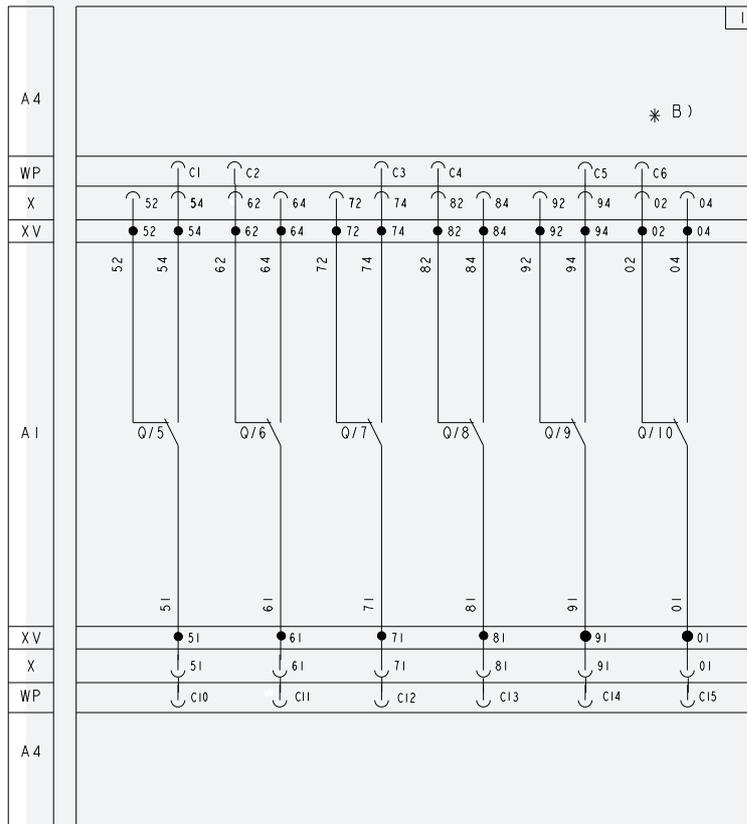
V3	Vn	Ge+	Szi	Ne-		K2	W4
V2	Rc+	Ge-	Szo	Ne+		K1	W3
V1	Gzo	Szc	Gzi	Rca			
Trip Unit I/O						EKIP Supply	

A  
M  
N  
H

51	61	71	81	91	01
HC	H1	H2	H3	H4	
52	62	72	82	92	02
HC	K3	K4	K5	K6	
54	64	74	84	94	04
HC	K7	K8	K9	K10	
Q5...Q10/EKIP Signalling 4K					

CONTATTI AUSILIARI APERTO/CHIUSO  
SUPPLEMENTARI DELL'INTERRUTTORE  
(SECONDO SET)  
SUPPLEMENTARY OPEN/CLOSED  
AUXILIARY CONTACTS OF THE  
CIRCUIT BREAKER (SECOND SET)

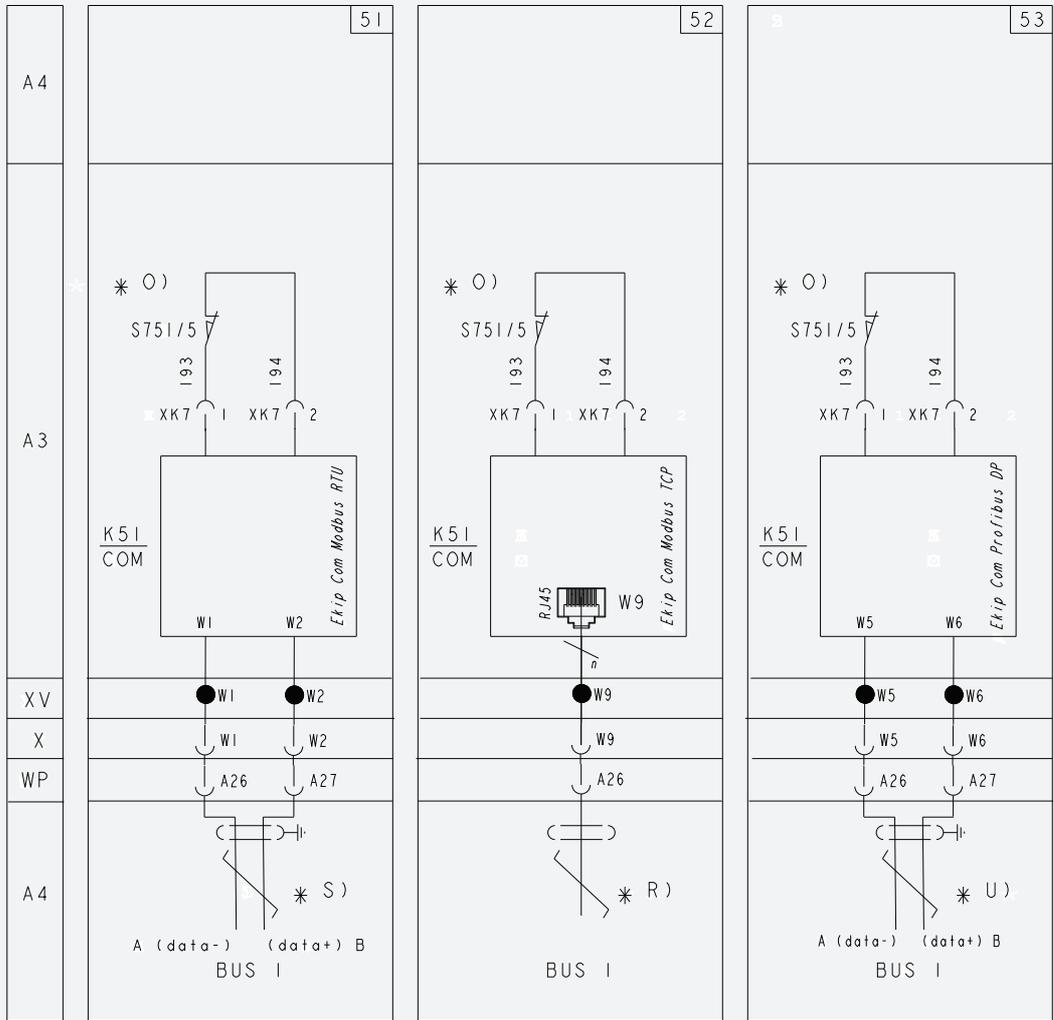
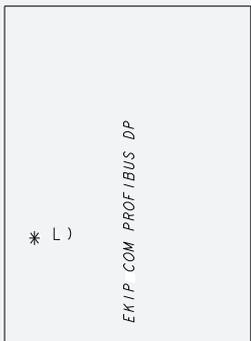
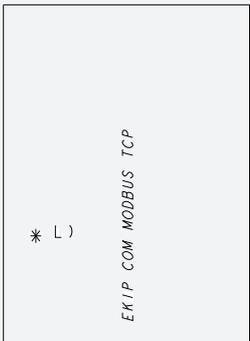
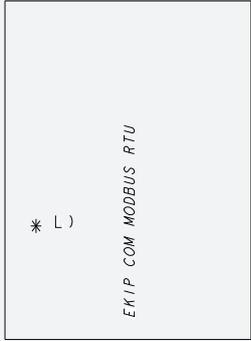
CONTATTO PRONTO A CHIUDERE - RTC  
READY TO CLOSE CONTACT - RTC



**NOTES:**

1. WP -WavePro fixed connection point
2. "\*B)" refers to the mixed Auxilliary Contacts, like Q5, Q6 & Q7 are of 400 V while Q8, Q9 & Q10 are of 24V.

■ Module	■ Module	Module

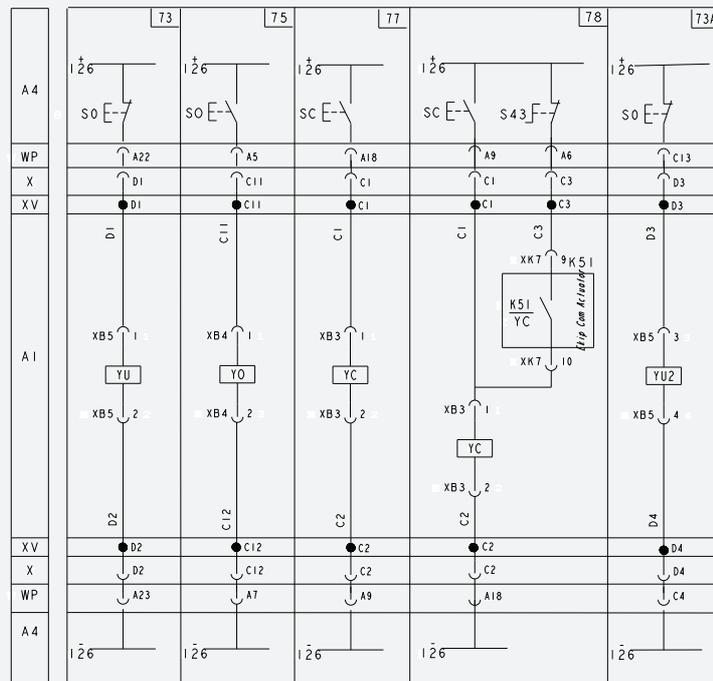


- NOTES:**
- WP - WavePro fixed connection point
  - 51. EKIP COM MODBUS RS-485
  - 52. EKIP COM MODBUS TCP
  - 53. EKIP COM PROFIBUS

45	D1	C1	C11	C21	I1	21	31	41
46		C3	C13		I2	22	32	42
48	D2	C2	C12	C22	I4	24	34	44
RTC	YU YO2	YC	YO	YC2	Q1	Q2	Q3	Q4

45	D1	C1	C11	D3
46		C3	C13	
48	D2	C2	C12	D4
RTC	YU	K51	YO	YC2

PRIMA BOBINA DI MINIMA TENSIONE - YU FIRST UNDERVOLTAGE COIL - YU
PRIMA BOBINA DI APERTURA - YO FIRST OPENING COIL - YO
PRIMA BOBINA DI CHIUSURA - YC FIRST CLOSING COIL - YC
PRIMA BOBINA DI CHIUSURA CON COMANDO DA SGANCIAIORE ELETTRONICO DI PROTEZIONE - YC, EKIP COM ACTUATOR FIRST CLOSING COIL WITH CONTROL FROM ELECTRONIC TRIP UNIT - YC, EKIP COM ACTUATOR
SECONDA BOBINA DI MINIMA TENSIONE - YU2 SECOND UNDERVOLTAGE COIL - YU2



**NOTES:**

1. 77(YC)-78(YC,EKIP COM ACTUATOR) as an alternative to each other
2. 73A(YU2 or YO2) out of 2 only one can be supplied
3. "M\*" indicates when the circuit breaker has two or three applications but only one can be supplied.
4. Emax 2 standard offering ST1, UVR1,CC or CCC &UV2
5. This is a sample wiring points diagram.

For exact connection points on the fixed side, refer the wiring diagram supplied with original breaker.

A  
B  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P  
Q  
R  
S  
T  
U  
V  
W  
X  
Y  
Z

51	61	71	81	91	01
HC	HI	H2	H3	H4	
52	62	72	82	92	02
HC	K3	K4	K5	K6	
54	64	74	84	94	04
HC	K7	K8	K9	K10	

Q5..Q10/EKIP Signalling 4K

95	35		R1
96	36	U1	R2
98	38	U2	
S51	S33	M	YR

V3	Vn	Ge+	Szi	Ne-
V2	Rct	Ge-	Szo	Ne+
V1	Gzo	Szc	Gzi	Rca

Trip Unit I/O

V3	Vn	Ge+	Szi	Ne-
V2	Rct	Ge-	Szo	Ne+
V1	Gzo	Szc	Gzi	Rca

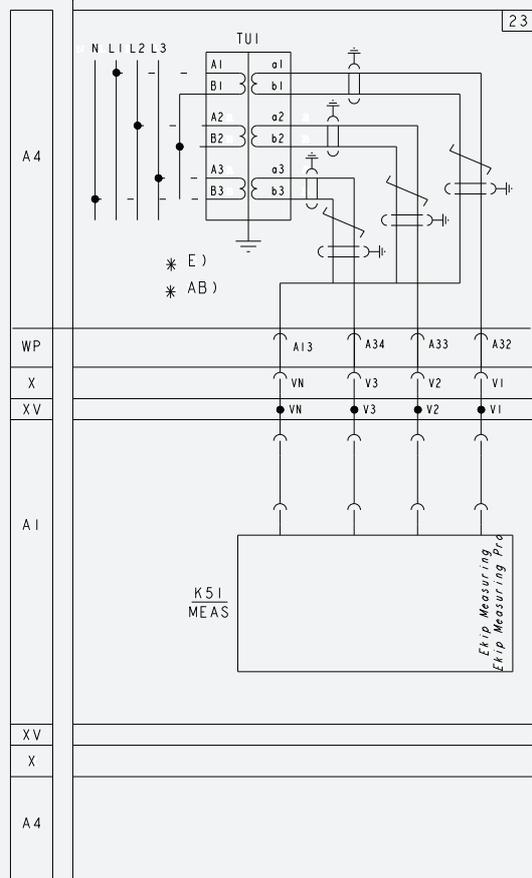
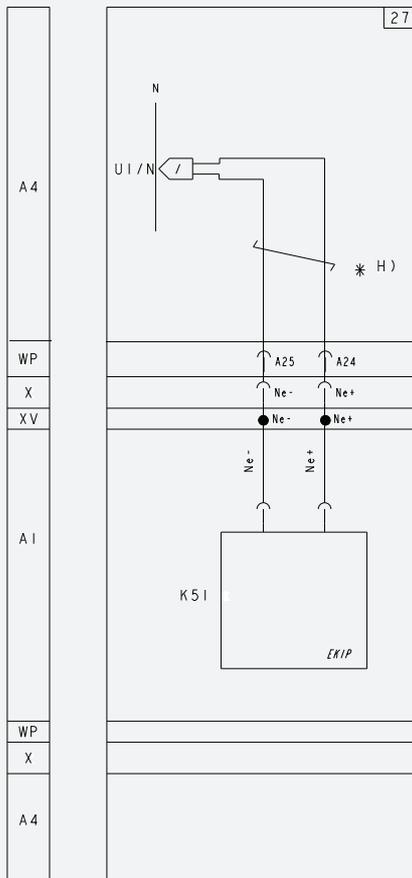
Trip Unit I/O

V3	Vn	Ge+	Szi	Ne-
V2	Rct	Ge-	Szo	Ne+
V1	Gzo	Szc	Gzi	Rca

Trip Unit I/O

INGRESSO SENSORE DI  
 CORRENTE SUL NEUTRO  
 ESTERNO (SOLO PER  
 INTERRUTTORI TRIPOLARI)  
 CURRENT SENSOR INPUT  
 ON EXTERNAL NEUTRAL  
 (ONLY FOR 3-POLE  
 CIRCUIT-BREAKER)

EKIP MEASURING/MEASURING PRO  
 CON TRASFORMATORE  
 VOLTMETRICO ESTERNO  
 EKIP MEASURING/MEASURING PRO  
 WITH EXTERNAL VOLTAGE  
 TRANSFORMER



**NOTES:**

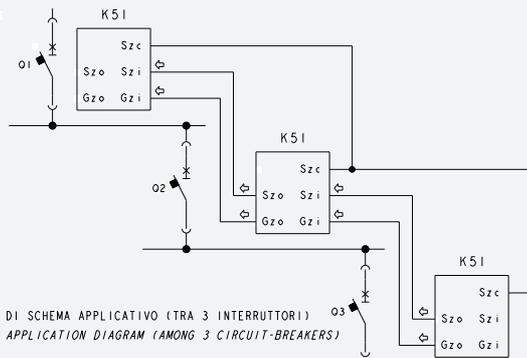
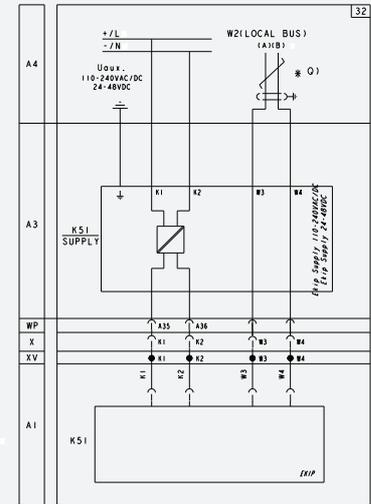
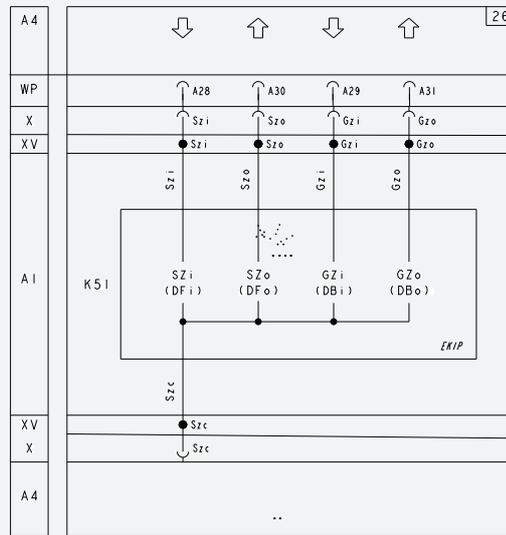
1. WP - WavePro fixed connection point

V3	Vn	Ge+	Szi	Ne-	K2	W4			
V2	Rci	Ge-	Szo	Ne+	K1	W3			
VI	Gzo	Szc	Gzi	Rco					
Trip Unit I/O		EKIP Supply		Module	Module	Module			

45	D1	C1	C11	C21	I1	21	31	41
46		C3	C13		I2	22	32	42
48	D2	C2	C12	C22	I4	24	34	44
RTC	YU	YC	YO	YC2	Q1	Q2	Q3	Q4

\* A)  
\* AB)  
SELETTIVITA' DI ZONA  
ZONE SELECTIVITY

\* A)  
\* I)  
ALIMENTAZIONE NELL'AREA  
D'INNESTO DEI MODULI EKIP  
NELL'AREA SUPPLY THROUGH  
24-48VDC AND LOCAL BUS



ESEMPIO DI SCHEMA APPLICATIVO (TRA 3 INTERRUITORI)  
EXAMPLE FOR APPLICATION DIAGRAM (AMONG 3 CIRCUIT-BREAKERS)

- NOTES
- AUXILIARY SUPPLY THROUGH MODULE 110-240V AC/DC OR 24-48V DC AND LOCAL BUS - EKIP SUPPLY
  - WIRE SPECIFICATION: AWG #16 WIRE GAUGE WHITE COLOR UL AWM STYLE 3271, XLPE UL, CSA:125, 600 VOLT VW-1 FLAMMABILITY RATING, TINNED COPPER
  - THIS IS A SAMPLE WIRING DIAGRAM. FOR EXACT CONNECTION POINTS ON THE FIXED SIDE, REFER THE WIRING DIAGRAM SUPPLIED WITH ORIGINAL BREAKER. REFER EMAX 2 CATALOGUE FOR ALL OTHER AVAILABLE CONNECTION SCHEMES.

- NOTES:
- WP -WavePro fixed connection point

Notice



WIRING

- Do not pinch/damage the wires while installing the secondary disconnect blocks.

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## 27 - AKD-10: Primary Disconnects (Contacts) or “Fingers”

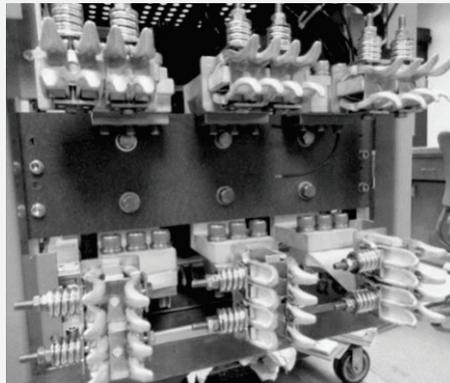
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The Finger Clusters Accessory Manual 2TSA451012PO000 covers the primary disconnects. The primary disconnects are flexible connections between the breaker line and load terminals and between the equipment line and load terminals. All primary disconnect fingers are factory-installed and are assembled on Emax 2 Retrofill circuit breakers.

Use this instruction sheet if damaged fingers need to be replaced. It takes about 5 minutes to install a finger cluster, defined as a double pair of fingers on a breaker. Figure 38 shows finger clusters or primary disconnects on a Retrofill circuit breaker. Figure 39 details the finger-cluster assembly.

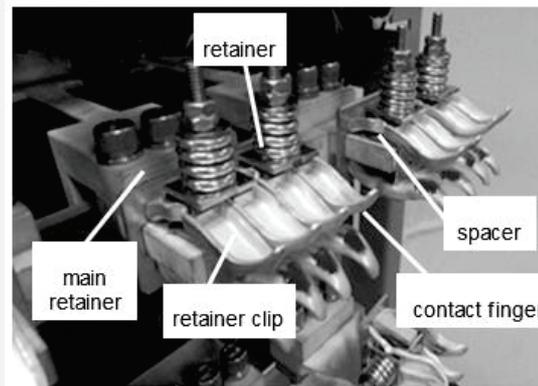
**Figure 38**

**Circuit Breaker Removed, Featuring Primary Disconnects “Fingers” (Contacts)**



**Figure 39**

**Circuit Breaker ,Fingers Details**



**Remove and Replace**

The primary disconnect assembly is factory adjusted with a gage to apply a 95 + 10 lb. force to a 1/2-inch thick copper bar, inserted between the upper and lower fingers. Set this force range, in the field, by tightening the nuts to set the spring dimension shown in Figure 40. Note that this dimension is measured between the top of the retainer and the underside of the washer. Also note that no bar is inserted between the fingers when setting this dimension. Figure 41 shows the cluster components.

Figure 40

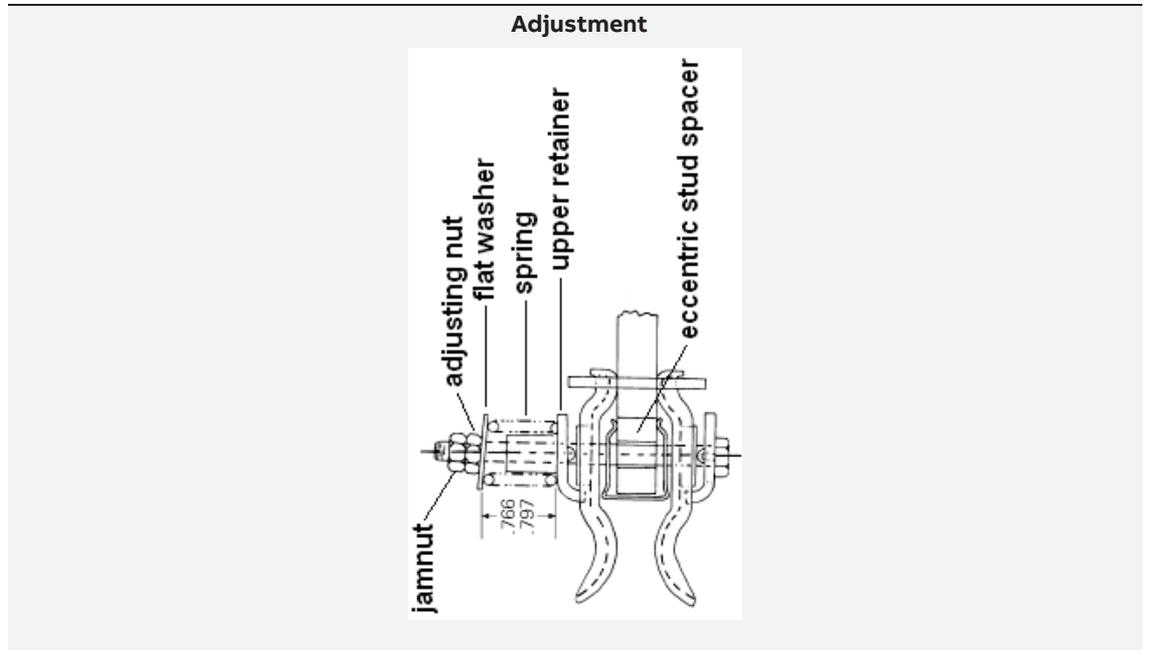
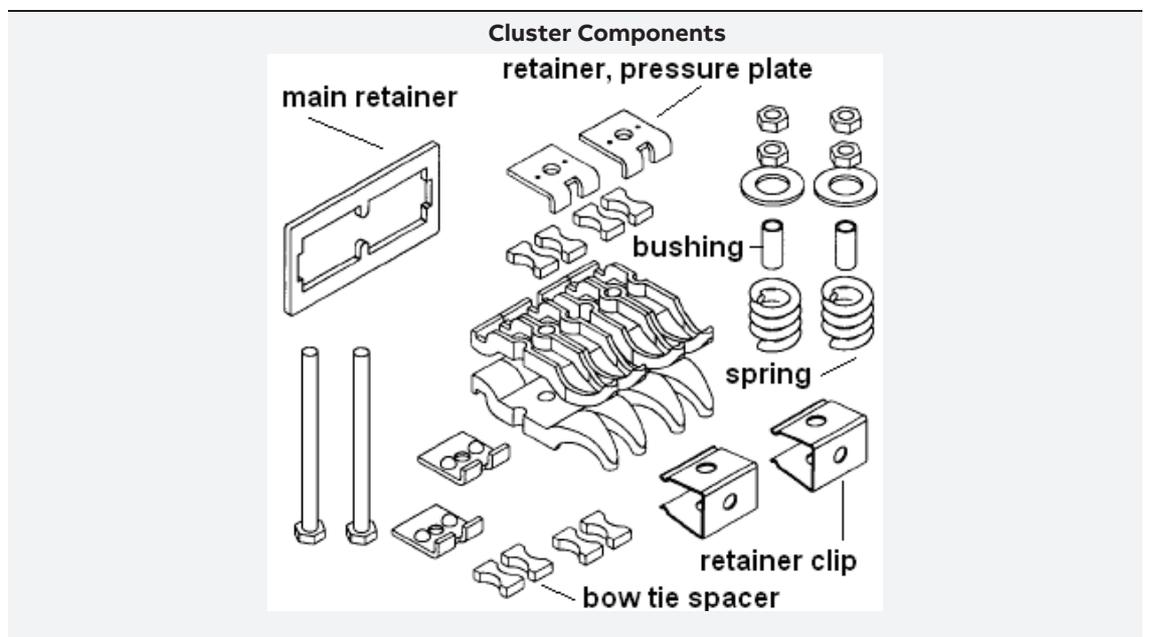


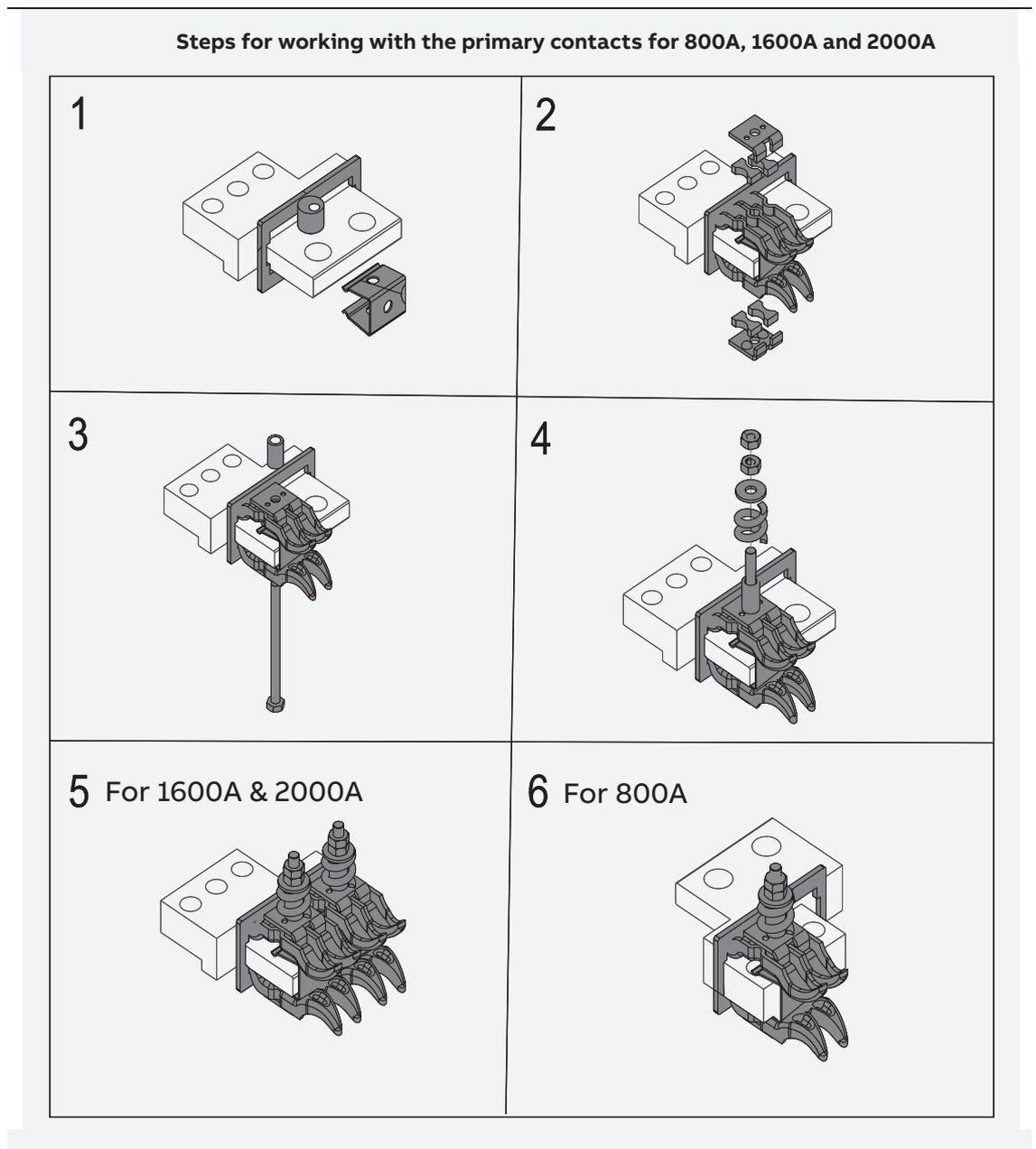
Figure 41



1. Using proper safety procedures and wearing required Personal Protective Equipment (PPE), remove breaker from compartment, and place it on a solid work surface in a well-lit location.
2. To uninstall the primary disconnects, remove the two nuts from one of the long bolts holding the primary disconnect assembly together.
3. Carefully slide out the bolt while removing the flat washer, spring, bushing, upper retainer, bow-tie spacers, lower retainer, and fingers from the bottom of the assembly.
4. Do the same for the other assembly bolt and components.
5. Slide off the retainer clips.
6. Take off the main retainer from the stud.
7. Slide the main retainer over the stud.
8. Install eccentric spacer and position spring clips on the stud.
9. Set a pair of bow-tie spacers into a pair of fingers, place a pressure plate retainer over the spacers to hold them in position, and then turn the subassembly over. Hook them into the main retainer.
10. Slide a long bolt through the hole in the retainer, between the finger, and then through the clip and eccentric stud spacer.

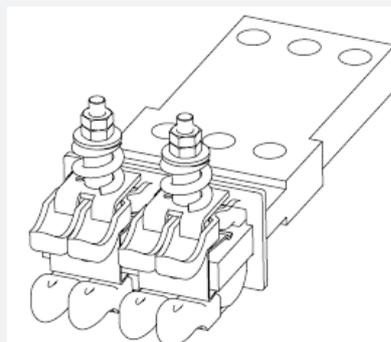
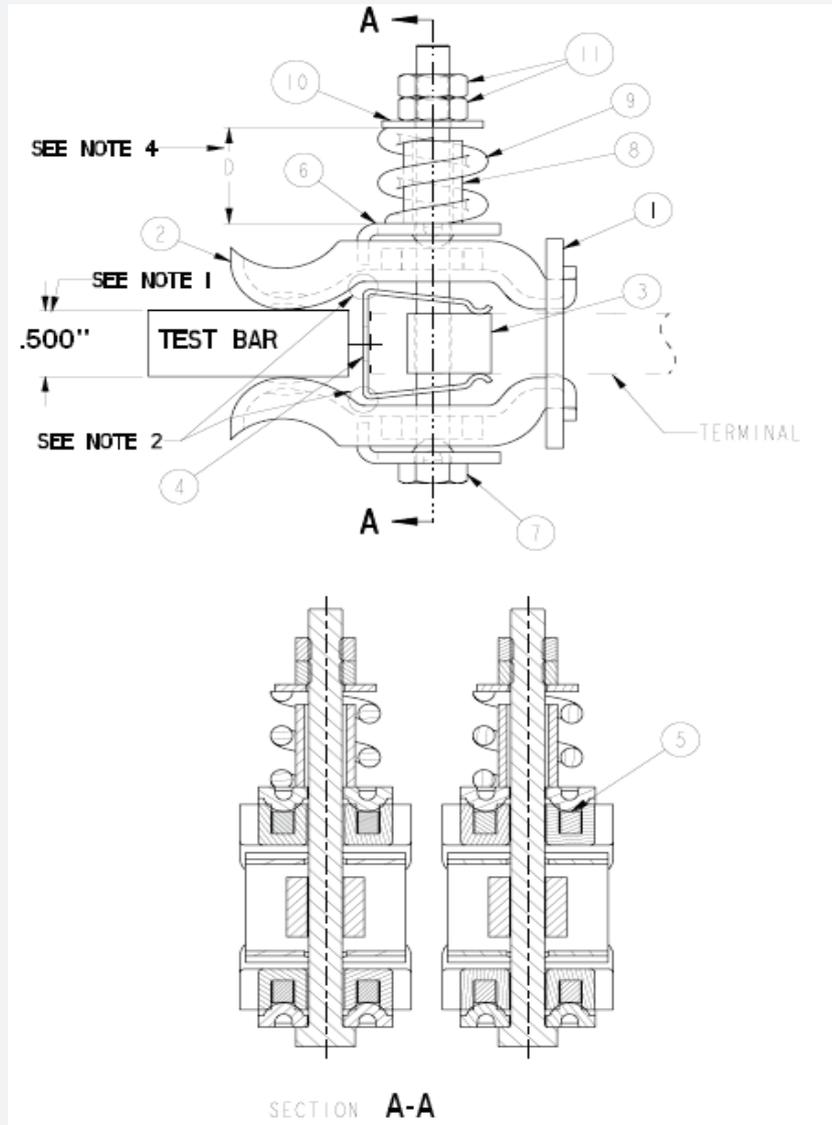
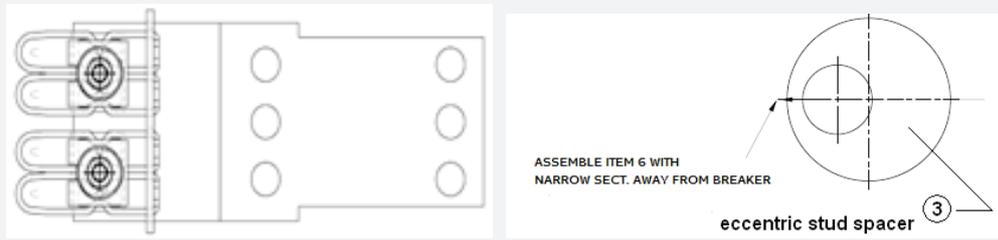
11. Hold the bottom finger subassembly in place.
12. Place two fingers around the bolt from the top, hooking the fingers into the main retainer. Then place a bow-tie spacer in each finger and hold them in position with a pressure plate retainer.
13. Place a spring, bushing, and flat washer over the bolt, then secure with the two nuts.
14. Repeat Steps 7 through 13 for each set of fingers.
15. Adjust the nut to get a spacing of 0.766 - 0.797 inch between the top of the upper retainer and the bottom of the flat washer.
16. Tighten the jam nut to lock in the adjustment.
17. Clean finger assemblies, if necessary, with a clean, lint-free rag and isopropyl alcohol or acetone.
18. Be sure to apply a thin film of Mobilgrease 28 to the contact areas which slide onto the switchgear stabs (See Figure 42, Step 2).

**Figure 42**



**Mechanical Views** Below pictures provide further details

**Figure 43**

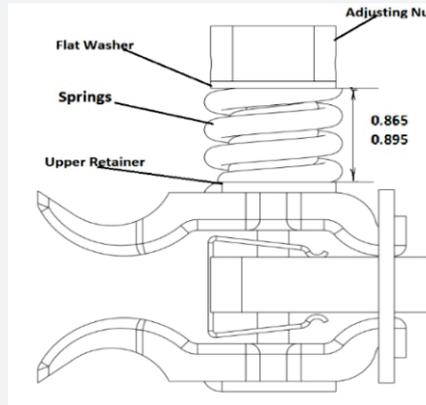


**Remove and Replace - WPS-32/WPH-32/WPX-32/WPS-40/ WPX-40/WPS-50/WPX-50**

The primary disconnect assembly is factory-adjusted to apply a 95 + 10 lb. force to a 1/2-inch thick copper bar, inserted between the upper and lower fingers. Set this force range, in the field, by tightening the nuts to set the spring dimension shown in Figure 44/45. Note that this dimension is measured between the top of the retainer and the underside of the washer. **Also note that no bar is inserted between the fingers when setting this dimension.** Figure 46/47 shows the cluster components.

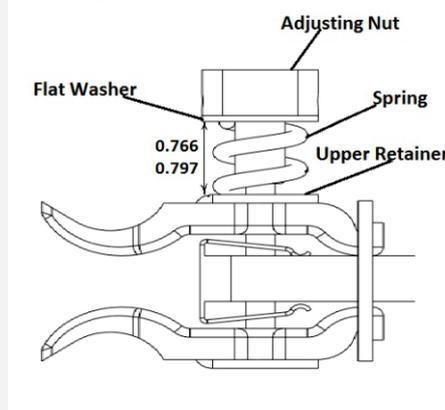
**Figure 44**

**Adjustment - 3200A (Double Spring)**



**Figure 45**

**Adjustment - 4000A & 5000A**



**Figure 46**

**Cluster Components - 3200A**

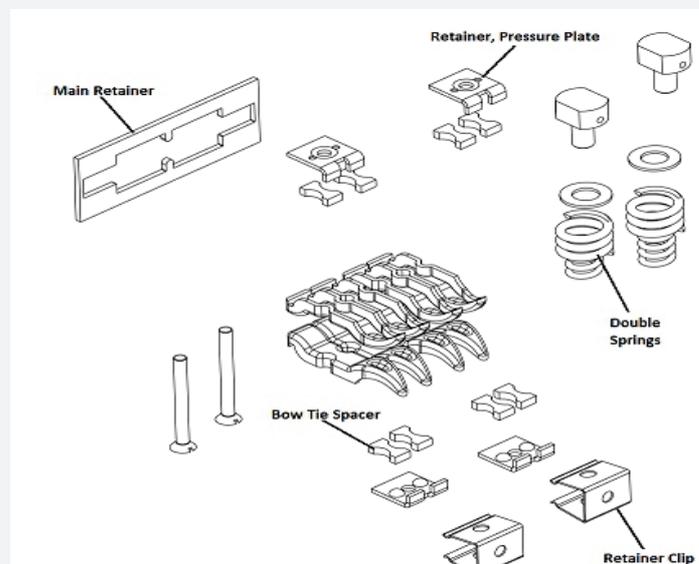
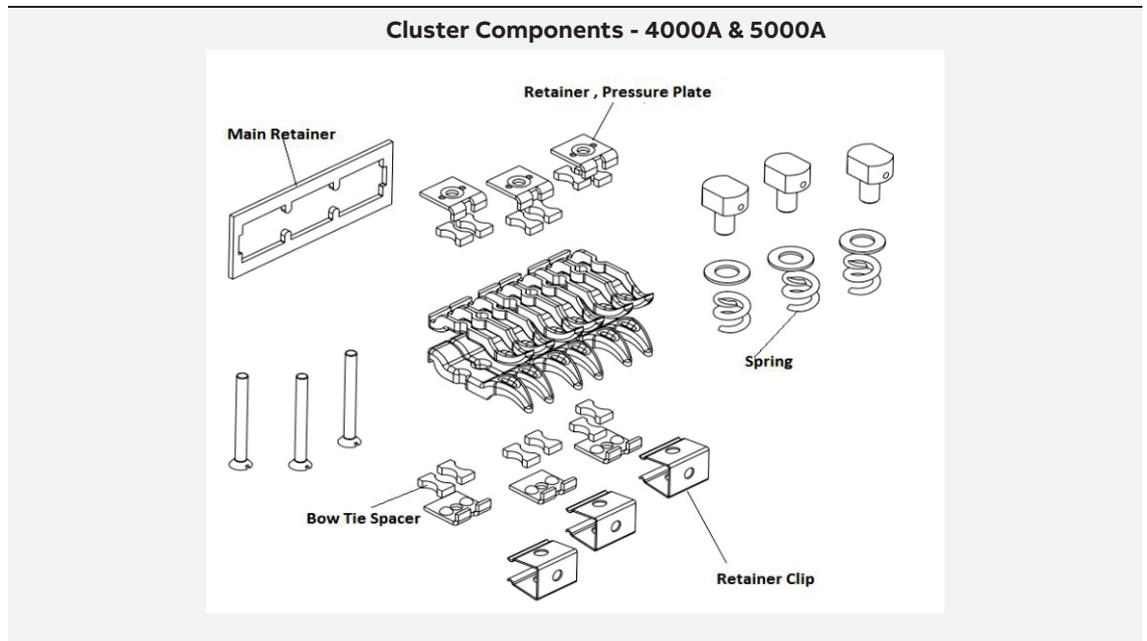


Figure 47



1. Using proper safety procedures and wearing required Personal Protective Equipment (PPE), remove breaker from compartment, and place it on a solid work surface in a welllit location.
2. To uninstall the primary disconnects, remove the Adjusting nut from one of the long bolts holding the primary disconnect assembly together
3. Carefully slide out the bolt while removing the flat washer, spring, upper retainer, bowtie spacers, lower retainer, and fingers from the bottom of the assembly.
4. Do the same for the other assembly bolt and components.
5. Slide off the retainer clips.
6. Take off the main retainer from the stud.
7. Slide the main retainer over the stud.
8. Set a pair of bow-tie spacers into a pair of fingers, place a pressure plate retainer over the spacers to hold them in position, and then turn the subassembly over. Hook them into the main retainer.
9. Slide a long bolt through the hole in the retainer, between the finger, and then through the clip and stud spacer.
10. Hold the bottom finger subassembly in place.
11. Place two fingers around the bolt from the top, hooking the fingers into the main retainer. Then place a bow-tie spacer in each finger and hold them in position with a pressure plate retainer.
12. Place a spring, bushing, and flat washer over the bolt, then secure with the Adjusting nut.
13. Repeat Steps 7 through 13 for each set of fingers.
14. Adjust the nut to get a spacing of 0.865-0.895 inch for WPS-32/WPH-32/WPX-32/ WPS-40/ WPX-40 with Double springs and 0.766—0.797 inch for WPS-50/WPX-50 between the top of the upper retainer and the bottom of the flat washer.
15. Clean finger assemblies, if necessary, with a clean, lint-free rag and isopropyl alcohol or acetone.
16. Be sure to apply a thin film of Mobilgrease 28 (DS50HD38) to the contact areas which slide onto the switchgear stabs (See Figure 48/49, Step 2). This product is available in a 1-Oz tube, ABB Part #193A1751P1.
17. Figure 48 (WPS-32/WPH-32/WPX-32), Figure 49(WPS-40/ WPX-40) and figure 50 (WPS-50/WPX-50) summarizes the steps for working with the primary contacts

Figure 48

Steps in Exploded Views for 3200A (WPS-32/WPH-32/WPX-32)

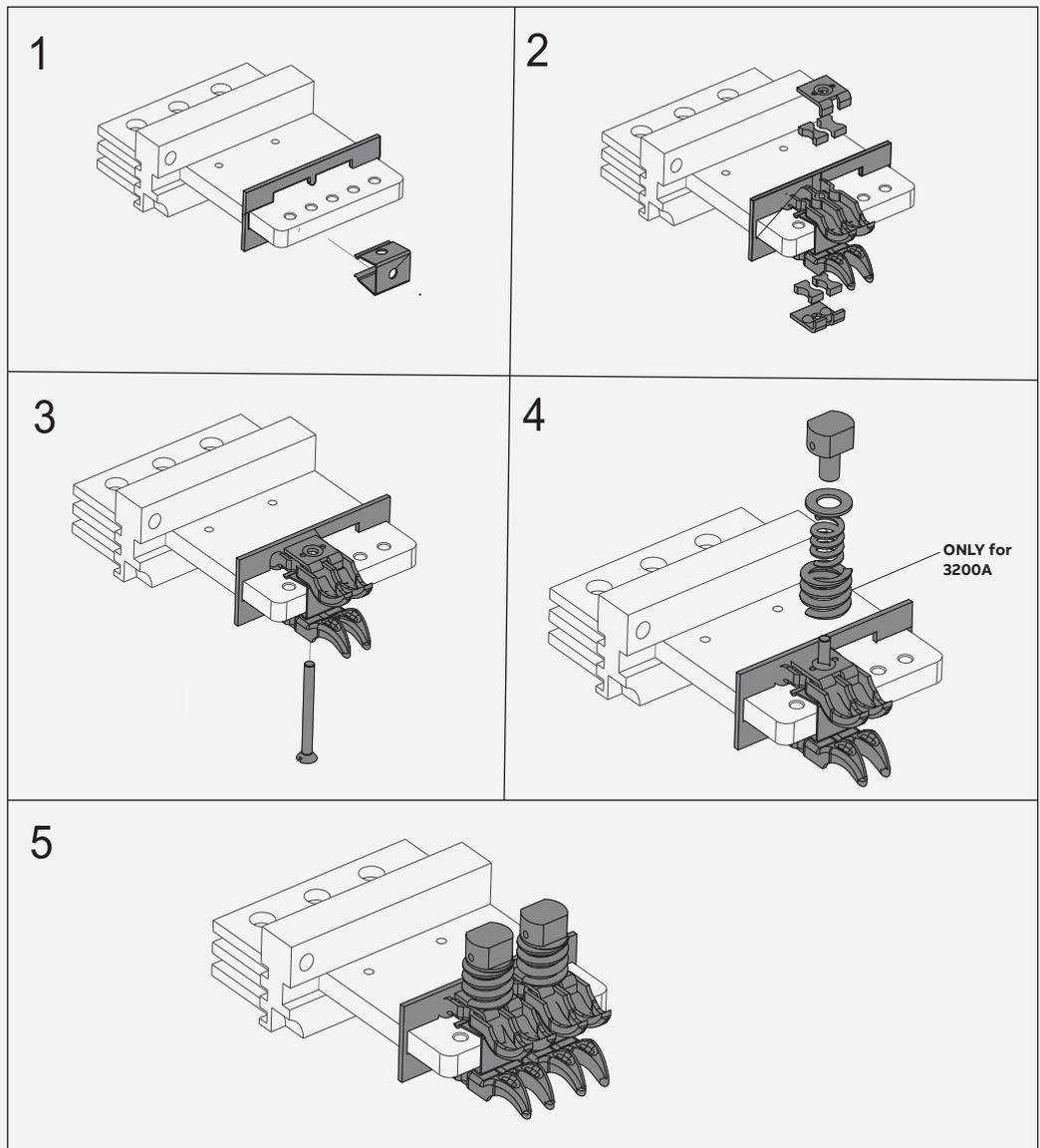


Figure 49

Steps in Exploded Views for 4000A (WPS-40/WPX-40)

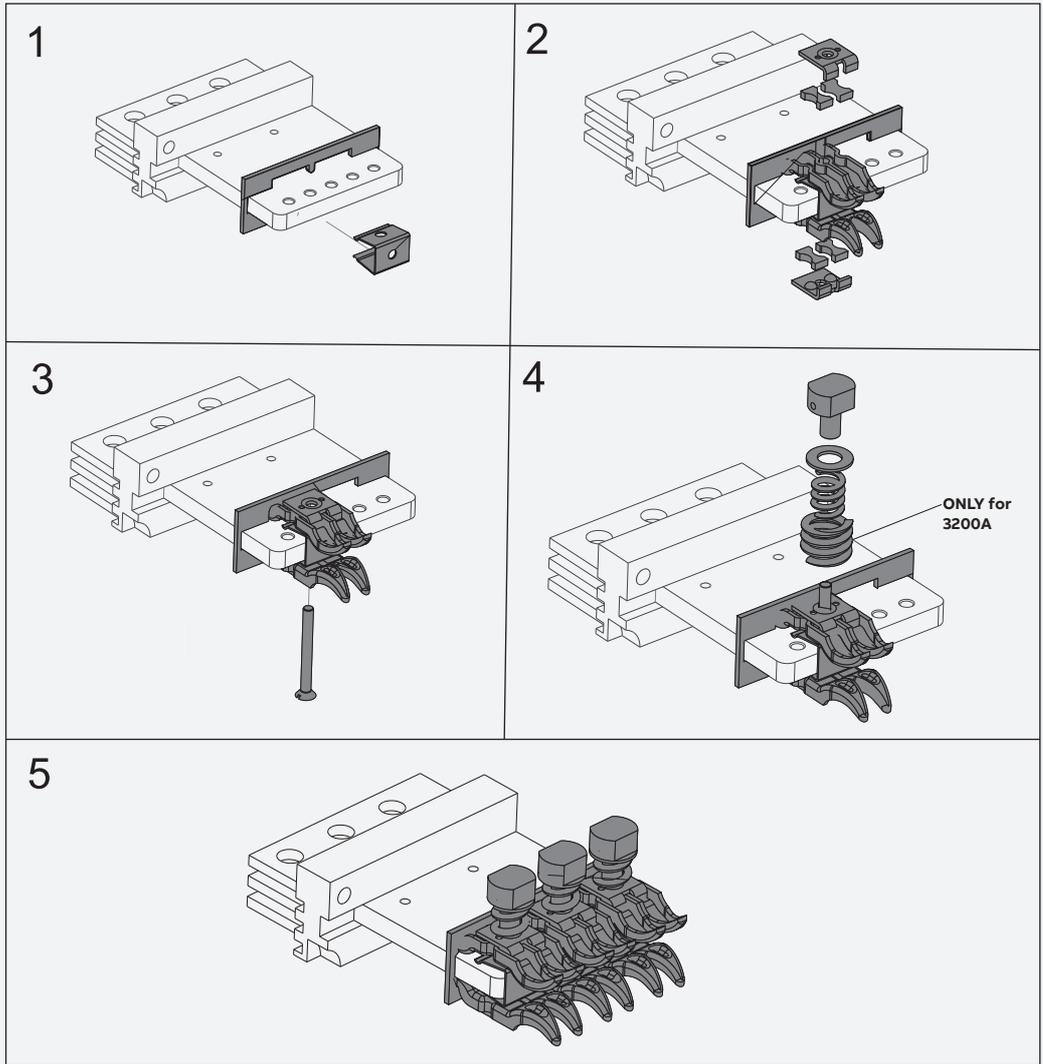
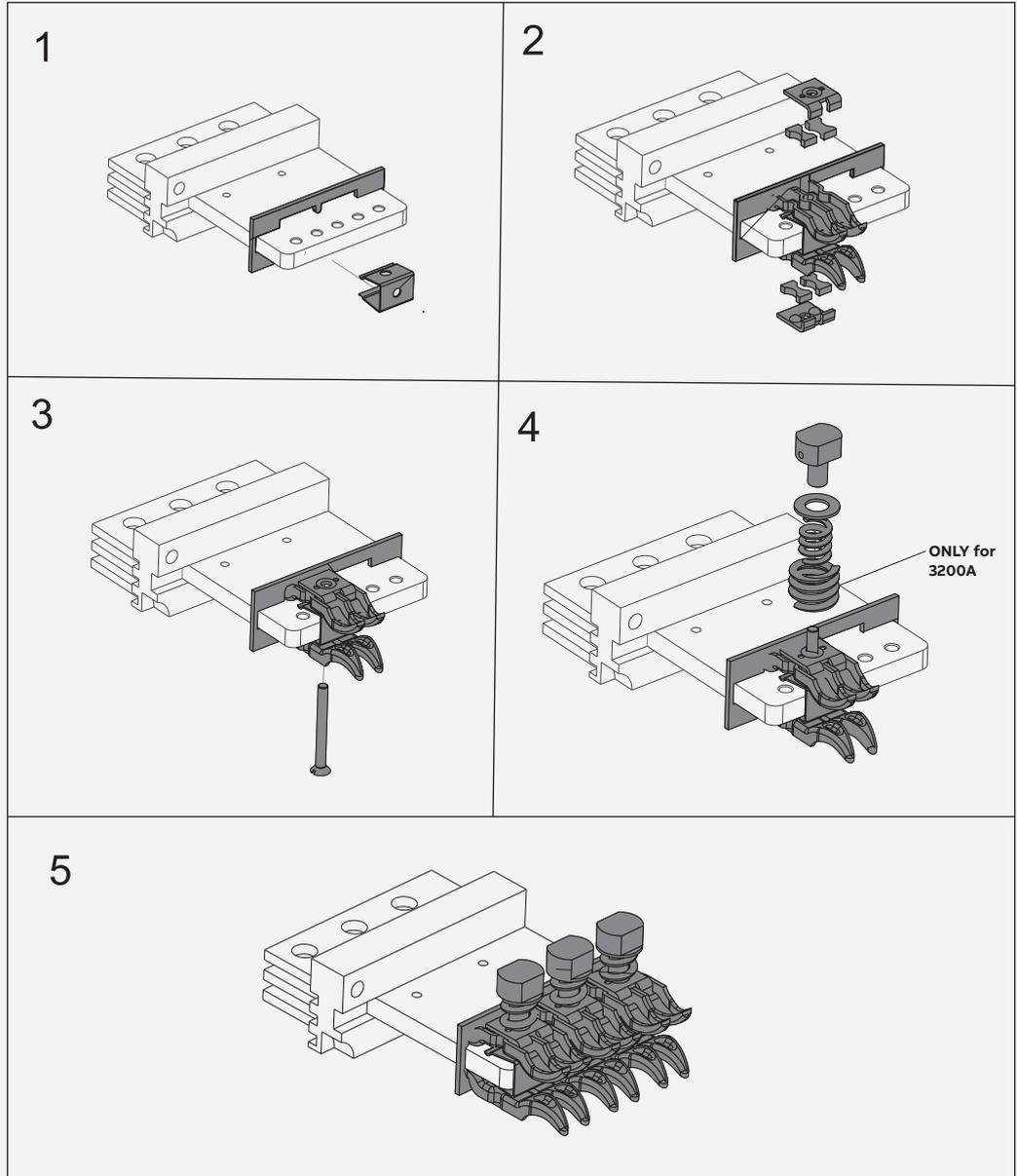


Figure 50

Steps in Exploded Views for 5000A (WPS-50/WPX-50)

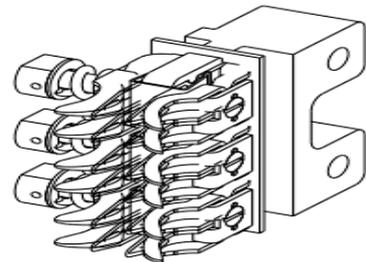
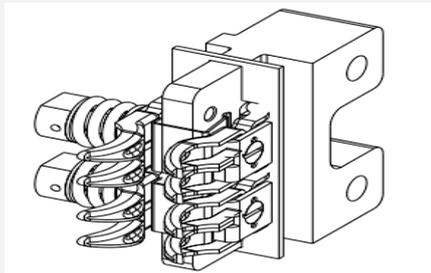
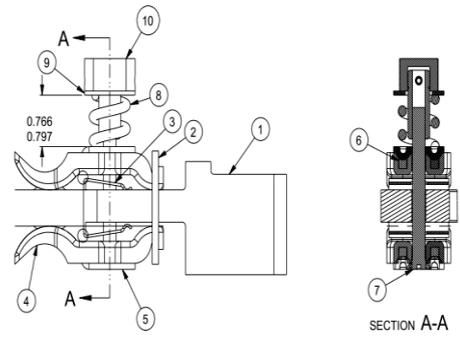
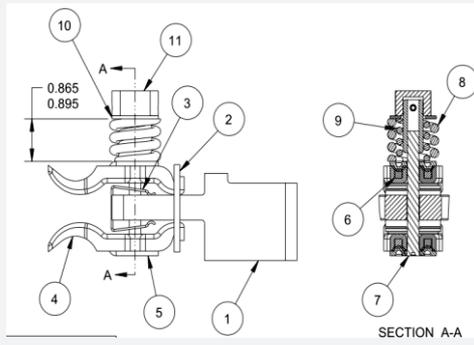
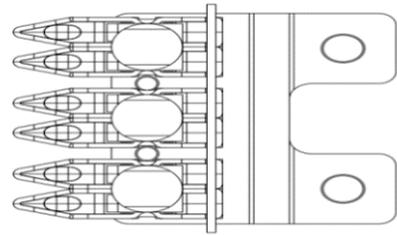
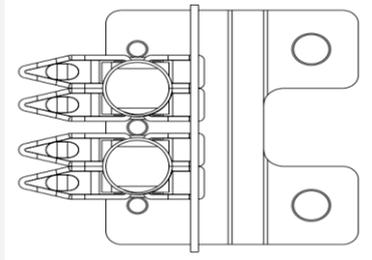


Below pictures provide further details on (Fingers or Clusters, Mechanical views)

Figure 51

WPS-32/WPH-32/WPX-32

WPS-40/WPX-40/WPS-50/WPX-50



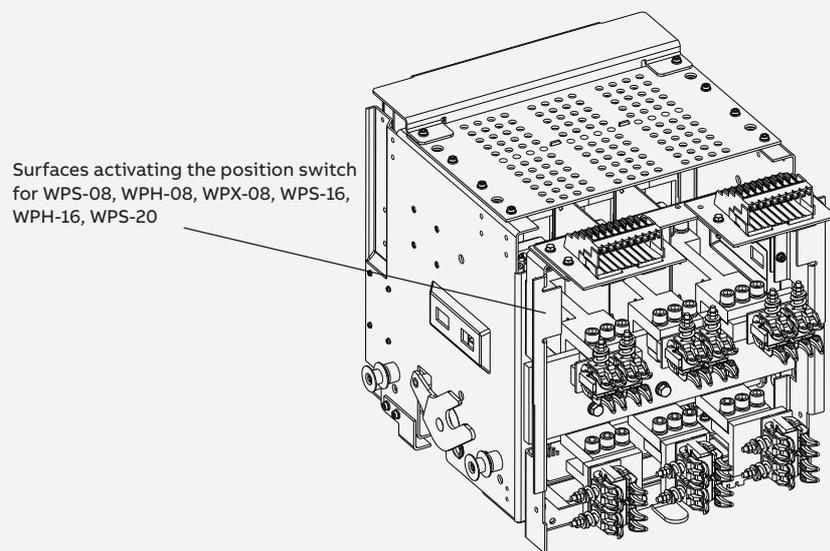
## 28 - AKD-10: Position Switch Actuator

Position switch actuator comes preinstalled on all versions of Emax 2 Retrofill ACB. Hence, no installation is required. Retrofills provide same electrical indication scheme as WavePro breaker.

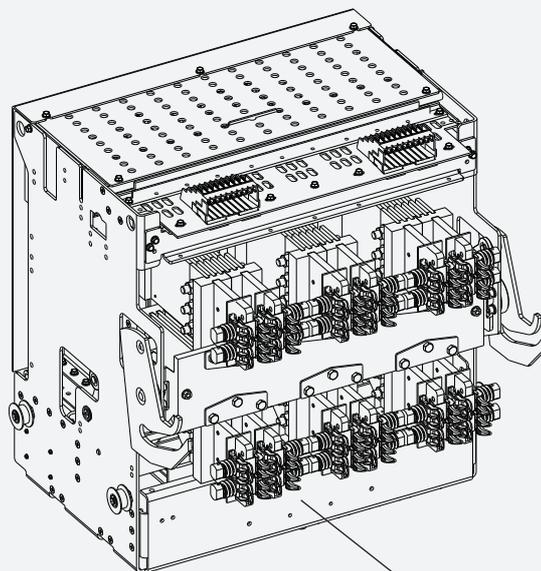
- A customer can choose to install a position switch if it's not already installed or if the existing assembly is damaged.
- Figure 52 & 53 shows the surface on the Retrofill which activates the position switch.

**Figure 52**

**AKD-10, Breaker Surfaces Activate Position Switch**



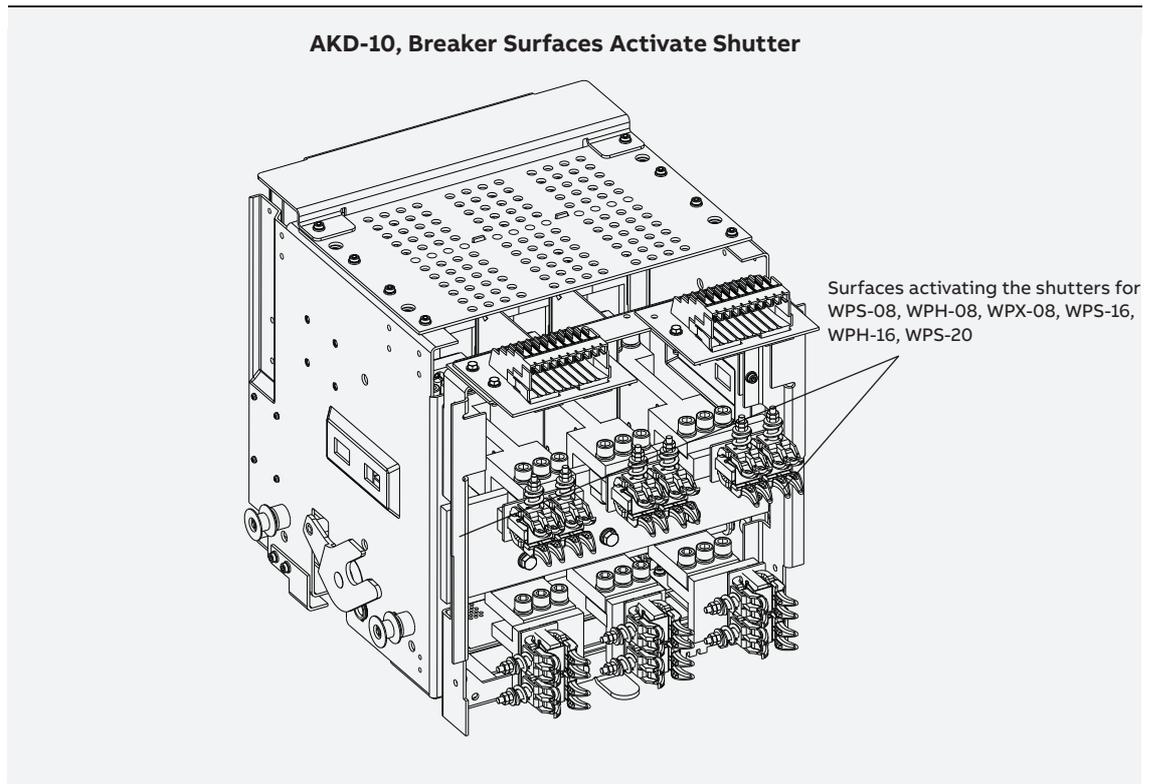
**Figure 53**



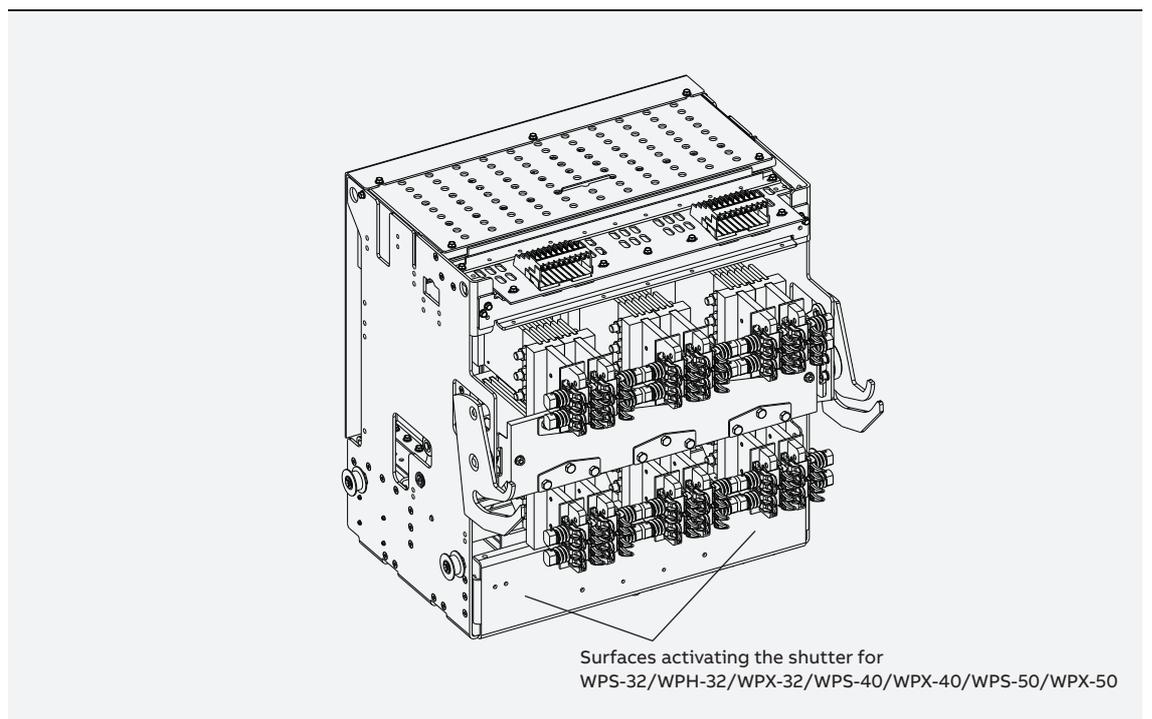
## 29 - AKD-10: Shutter Actuation

AKD-10 LVS may be equipped with optional shutter assemblies for protection of the live bus bars. Emax 2 Retrofill circuit breakers come with pre-installed shutter actuators which operate the opening of the shutters as shown in Figure 54 & 55.

**Figure 54**



**Figure 55**



# Door Interlock System

## Danger

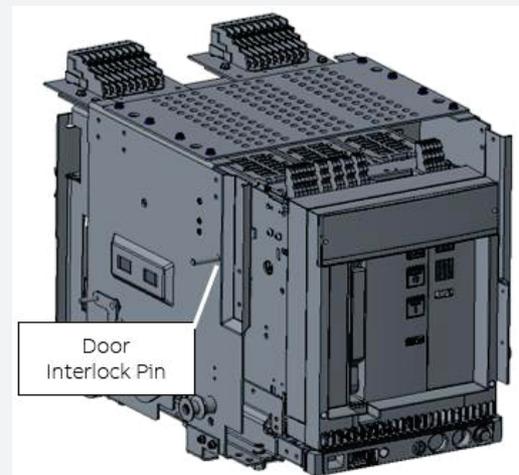
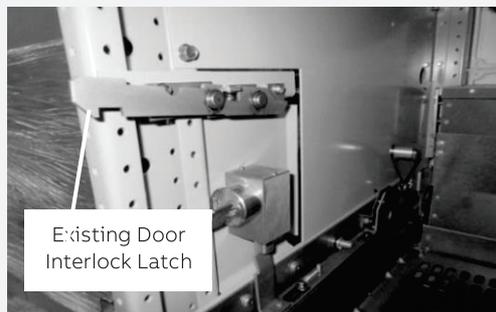


- It must be ensured that the supply power to the Shack and Saad compartment is turned off/ compartment is deenergized for all the incoming and outgoing circuits of the LVS prior to any work being conducted on it.
- During the installation and related work on the equipment, it must be ensured that the operator is using the prescribed PPE for the specified tasks

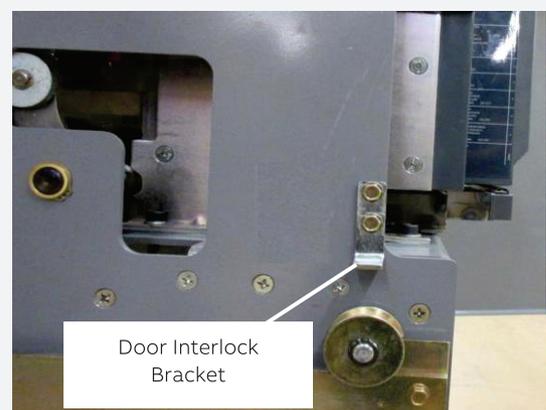
- Ensure only qualified personnel install, operate, service, and maintain all electrical equipment.

Details regarding installation of door interlock system are shown in Figure 56 & 57.

**Figure 56** AKD-10, Door Interlocking Components for WPS-08/ WPH-08/WPX-08/WPS-16/WPH-16/WPS-20 Breaker



**Figure 57** AKD-10, Door Interlocking Components for WPS-32/WPH-32/WPX-32/WPS-40/ WPX-40/WPS-50/ WPX-50 Breaker.



The Emax 2 Retrofill circuit breakers provided as replacements for WavePro 800- 5000A frame circuit breakers have a trip interlock feature which will function using the AKD-10 compartment mounted Key Interlock. A label is provided with full instructions on how to operate the Legacy Key Interlock. It is suggested to apply the label on the inside of the compartment door. Following is a brief summary of how the Key Interlock system is operated.

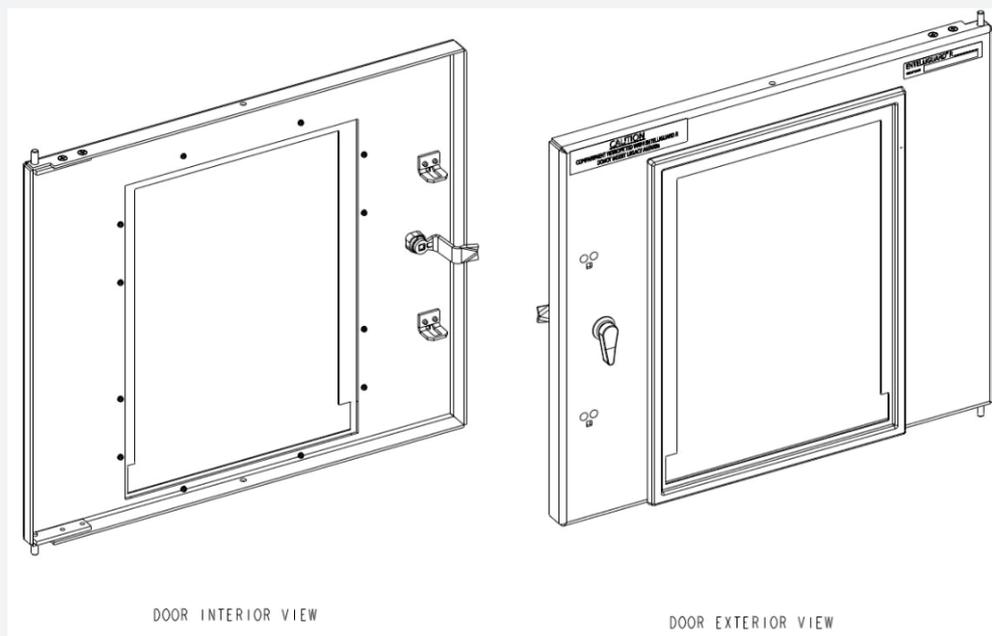
To activate the key interlock:

1. OPEN the breaker.
  2. Rotate the screw on the lower front panel of the breaker which normally allows access to the racking screw. This will hold the breaker trip free.
  3. While the screw is held rotated Clockwise, the Key Interlock slide in the switchgear is pushed inward, elevating a pin on the left side of the breaker.
  4. Turn the key to the key removal position, extending the bolt and lock the breaker in the OPEN position.
-

## Install New Door or Door Adaptor

1. Remove existing compartment door(s) and remove hinge block using #2 Phillips headed screw driver.
2. To install new door follow the instructions below:
  - De-energize/switch off the LVS section that is to be retrofitted
  - Open the compartment door that is to be retrofitted.
  - Rack out the existing legacy AKR breaker from the LVS.
  - Keep the door open for accessing the door mounting pads placed on the right side wall in the LVS compartment.
  - Loosen the screws holding the mounting pads to the compartment frame.
  - Note that this will provide access for removing the old door from the LVS compartment.
  - Unpack the new door assembly and mount it on the compartment and secure via placing the hinges and tightening the screws.
  - Insert the new retrofitted Emax 2 Retrofill circuit breaker into the compartment and slide the breaker into the disconnected condition.
  - Close the new door and secure it to the compartment.
  - Rack-in the new retrofitted Emax 2 Retrofill circuit breaker.
  - For ordering the new door depending on door size refer to document 2TSA451008P0000

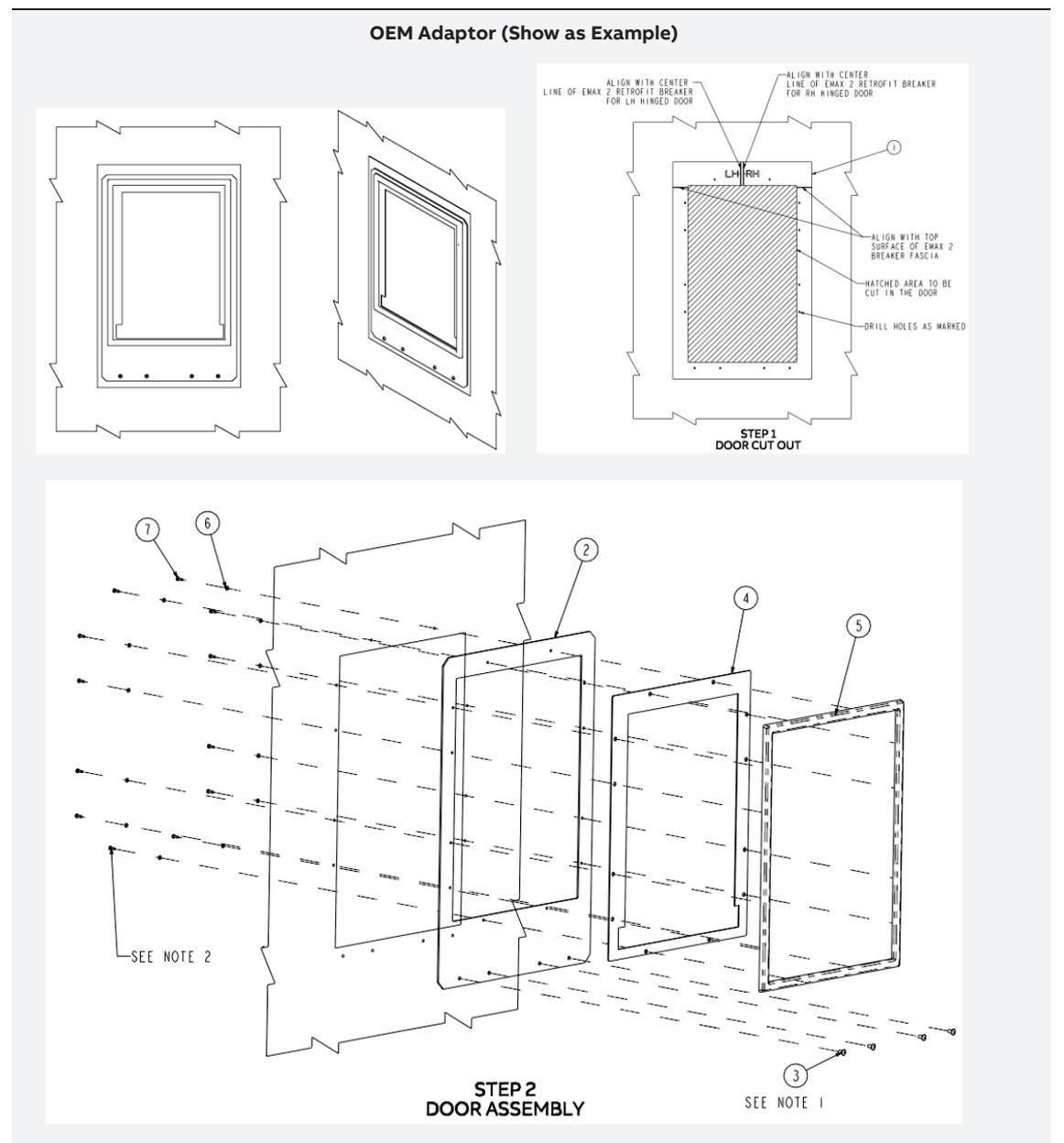
**Figure 58**



3. To install OEM Door Adaptor Follow the instructions below:
  - De-energize/switch off the LVS section that is to be retrofitted.
  - Open the compartment door that is to be retrofitted.

- Rack out & Remove the existing legacy WavePro breaker from the LVS.
- Unpack the new door Adaptor kit assembly
- Modify the door cut out as per the new door cutout template.
- Check the through-door racking with the new door assembly.
- Insert the new retrofitted Emax 2 Retrofill circuit breaker into the compartment and slide the breaker into the disconnected condition.
- Close the door and secure it to the compartment.
- Rack-in the new retrofitted Emax 2 Retrofill Breaker.
- For detail instructions refer document 2TSE431967R1000, 2TSE431968R1000 & 2TSE431996R1000

**Figure 59**



# Install AKD-10 , Neutral Sensing for 4 Wire Ground Fault

## Danger



- Turn off all power to switchgear. Tagout and lockout main source, up-stream or main breaker.
- Failure to comply with these instructions will result in death or serious injury from severe burns caused by arc flashing that has exceedingly high temperatures.
- Always wear personal protection equipment according to OSHA \_ standards and appropriate to the severity of potential burns.

- Ensure only qualified personnel install, operate, service, and maintain all electrical equipment.

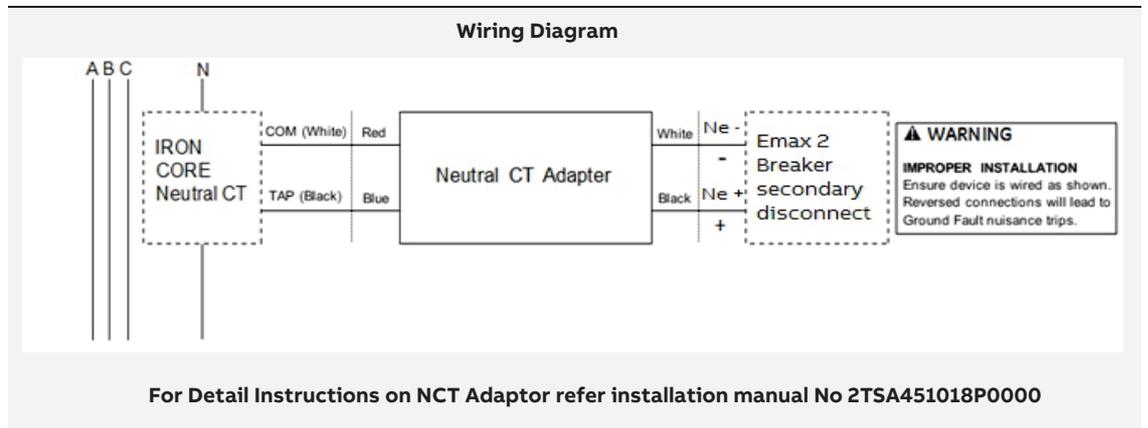
## 31 - Neutral CT Adapter upto 5000A

This is a miniature Rogowski coil. It mounts on the breaker between the breaker's Neutral Disconnect and the breaker trip unit. It converts the signal from an iron Core Neutral sensor to a Rogowski voltage output which is wired to the Breaker's Trip Unit Neutral input connections.

The Neutral CT Adapter supports iron core Neutral sensors compatible with MicroVersa Trip, MVT RMS-9, Power Plus, Pro Trip, Emax 2 TU rated from 250 to 5000 Amps as used in GE switchboards and switchgear from 1979-2015. It is available in seven variations (shown in table below).

Kit Number	Supported Neutral CT ratings	Supported T.U
ENCTA0250	250A	Ekip
ENCTA0800	400A,800A	Ekip
ENCTA1200	600A,1200A	Ekip
ENCTA1000	1000A	Ekip
ENCTA3200	1600A,3200A	Ekip
ENCTA4000	2000A,4000A	Ekip
ENCTA5000	2500A,5000A	Ekip

Figure 60



## 32 - Procedures

### Notice



### NEUTRAL CT ORIENTATION

- Write down the orientation of the existing Iron core CT and the polarity of the connections. The orientation and polarity NOTICE needs to be matched when the air core Rogowski is assembled in the cable compartment.

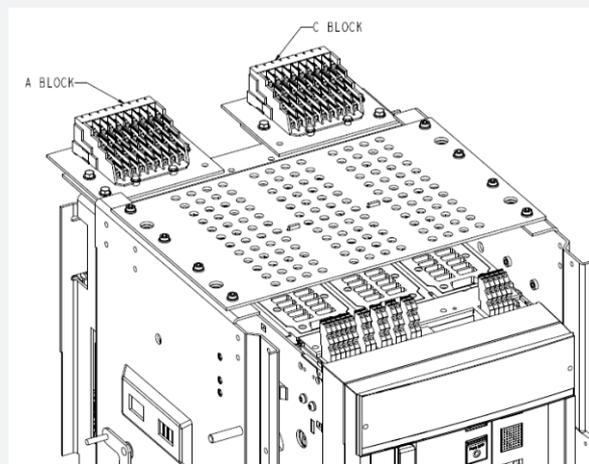
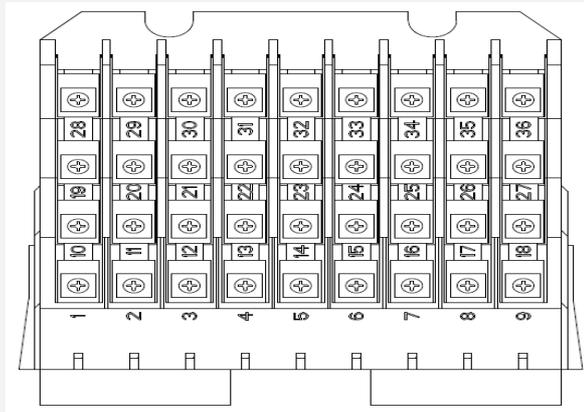
1. Ensure that the LVS has been de-energized and the breaker in the compartment being retrofit is switched off and removed from the LVS.
  2. Open the door on the rear of compartment to access the Cable/ Bus compartment of the LVS
  3. Note that the existing neutral CT assemblies are usually mounted vertically on two copper bus bars placed horizontally.
  4. Disconnect the wires that are attached to the existing CT assemblies and place them such that they do not interfere with the replacement of the CT assemblies.
  5. Unfasten and remove the bolts that hold the neutral disconnect assemblies to the horizontal bus bars. Keep the hardware in a secure location for reassembly.
  6. Be careful while handling the CT assemblies such that they do not fall down or damage other components within the LVS.
  7. Replace the old CT assembly with the new Rogowski assembly on the horizontal bus bars and fasten it using the hardware previously removed.
  8. Connect a twisted pair of wires back to the Rogowski CT assembly leads.
  9. Check for continuity from the CT leads to the A24 and A25 secondary disconnect screw terminal within the LVS compartment. NEVER push probes into the front of the secondary disconnect.
- The new Rogowski assemblies are installed and ready for use.
  - Tools required: Wrenches, wire stripper, wire cutter, continuity tester.

Retrofills can be used in the following ground fault applications:

- Single Source Feeder breakers, 3 wire or 4 wire
- Main Circuit breakers, 3 wire or 4 wire
- Main or Tie breakers 3 or 4 wire multi source ground fault scheme-using original iron core neutral CT and the neutral CT adapter on each Retrofill breaker.

**Figure 61**

**Wiring with pin number diagram for Wave-Pro Retrofill**



# WavePro 4000A, Fan Control Unit Wiring & Trip unit Programming instructions

- Wiring Diagram**
- Follow the below circuit diagram to make the connections between the 2k-1 signalling unit, relay and fans.
  - Refer Relay diagram & 1SDH001000R0524 to identify the terminal marking in circuit diagram.
  - Note: U1 & U2 Emax 2 motor operator (120 V~) terminal.
  - **NOTE 1: In the absence of motor or if motor voltage rating is different than 120 V~, connect 120 V\* directly to T1 and T2**

Figure 62

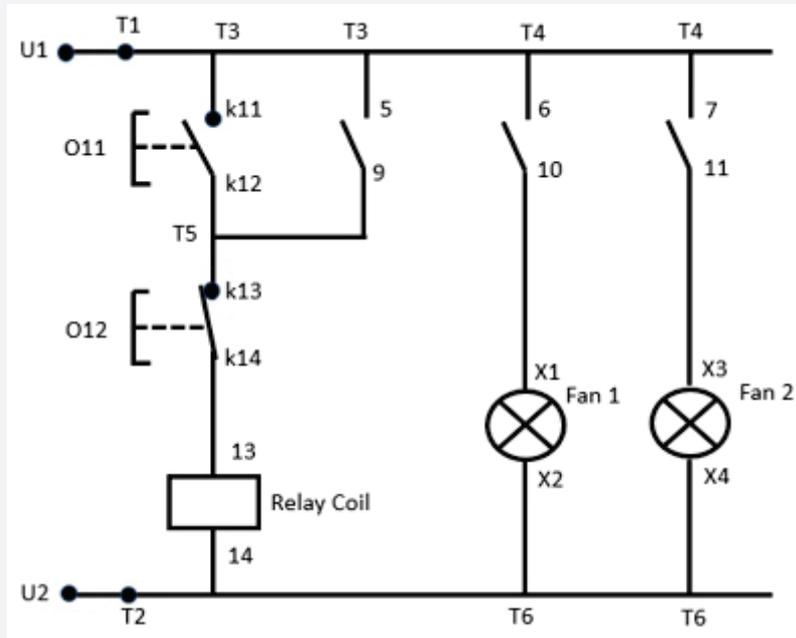


Figure 63

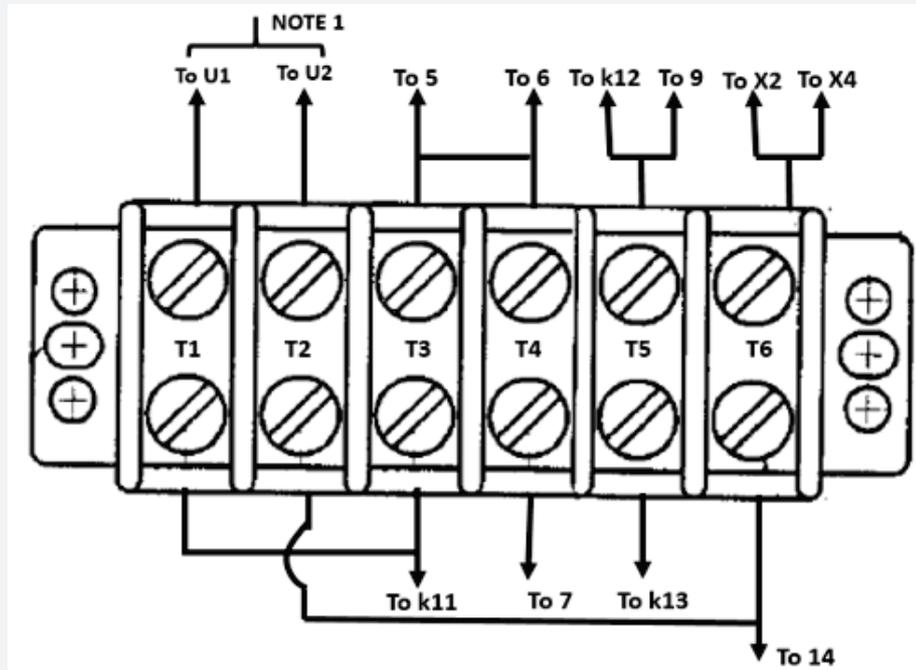
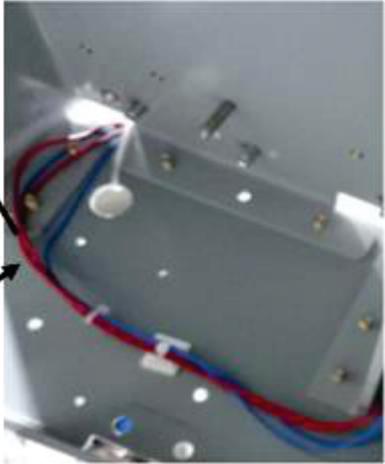


Figure 64

Wiring of WP 4000A breaker with FAN control unit



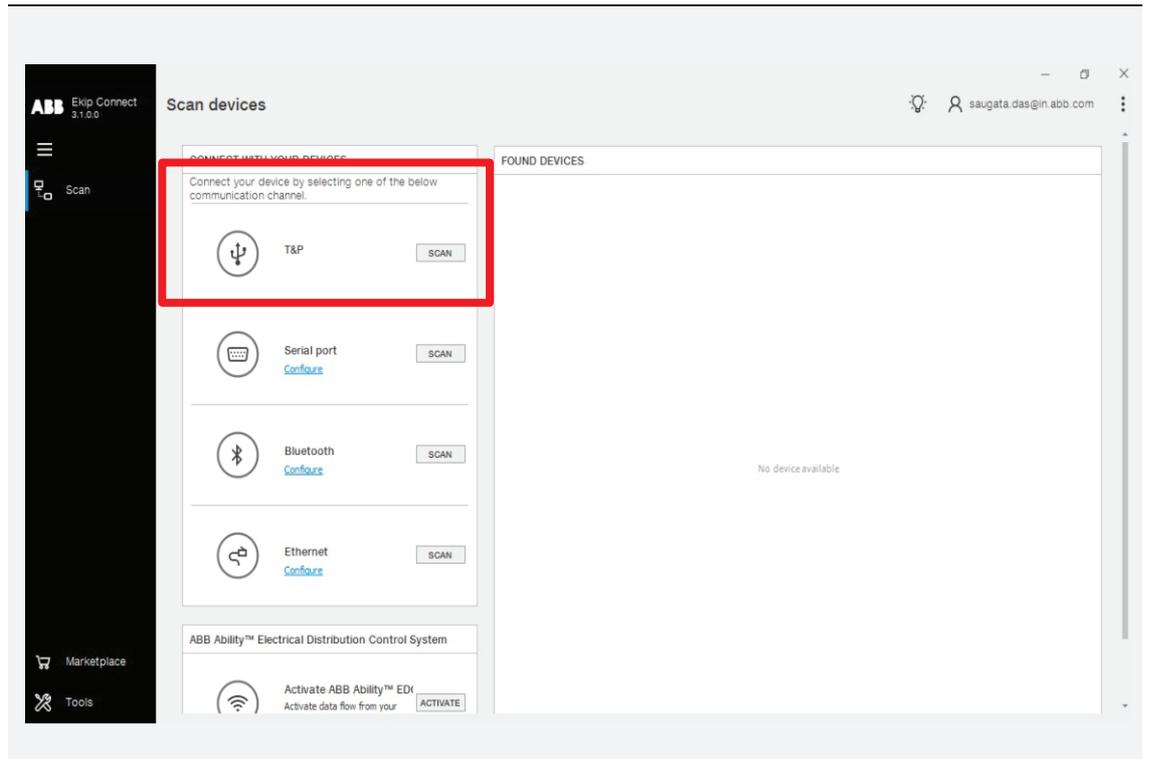
Routing wire to the fans

# Configuring Ekip Touch, Hi Touch Trip unit for Fan control

## 34 - Connecting Ekip Touch

Connect Ekip Touch or Hi Touch Trip unit using Ekip connect 3.0.357 9 (or later) software and Ekip T&P unit.

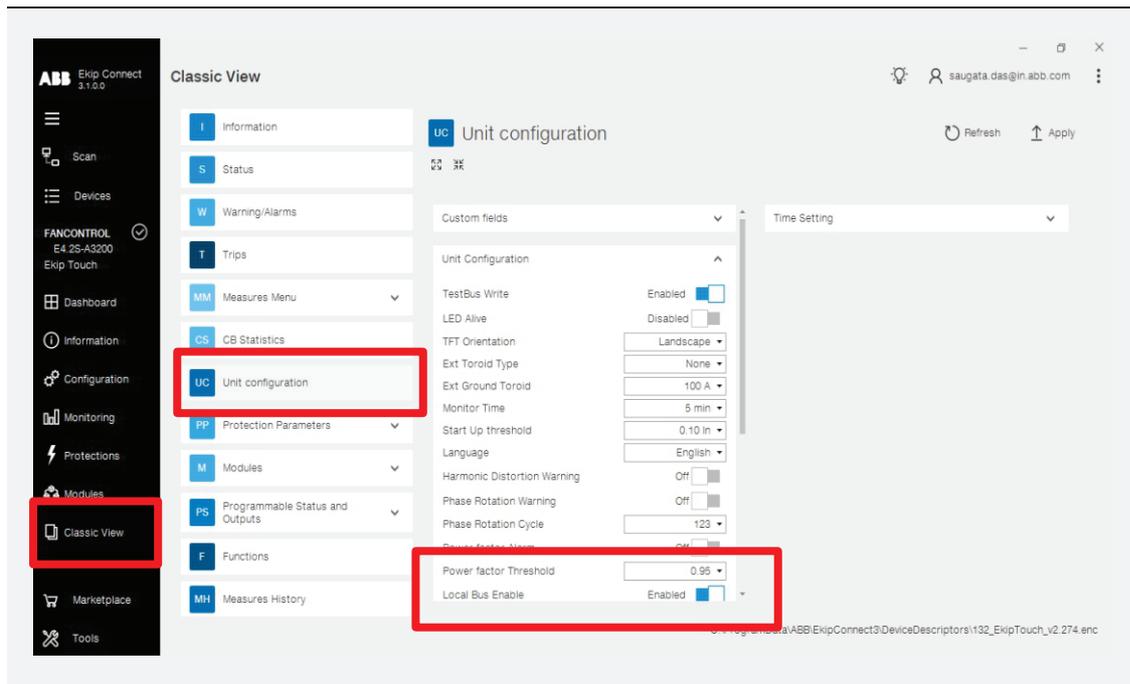
Figure 65



## 35 - Synchronizing 2K-1 signalling module with the trip unit

- The activation of local bus — essential to start the communication between the module and the Trip unit

Figure 66



- Once the local bus is activated 2k module should synchronize with the Ekip touch trip unit.

### Check the following for synchronization status.

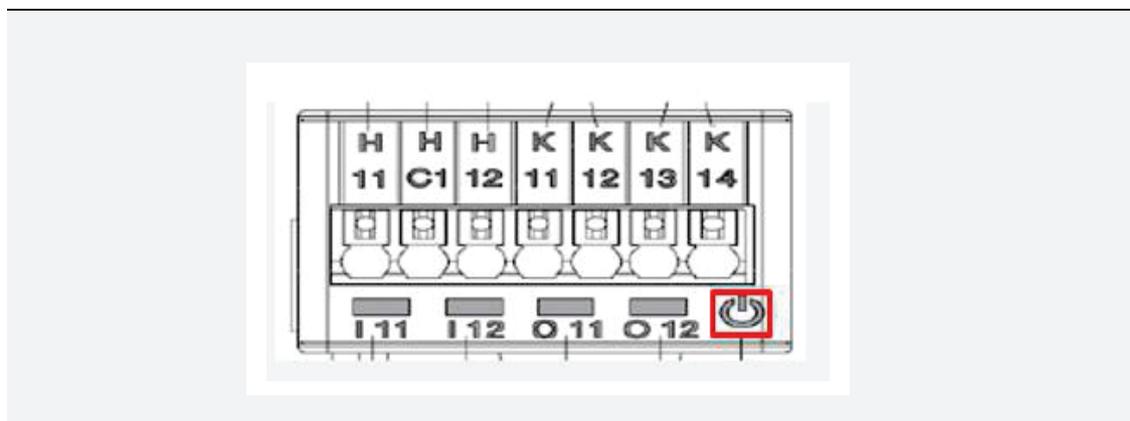
Power LED reports ON status and correct communication with Ekip Touch :

- Off: module off
- Fixed or flashing light synchronized on power LED of Ekip Touch: module ON and communication with Trip unit present
- Flashing not synchronized with power LED of Ekip Touch (two fast flashes per second): module ON and communication with Trip unit absent

If the Ekip Signalling 2K module is detected correctly by Ekip Touch the specific configuration area in the Modules Settings menu is activated.

For each Ekip Signalling 2K module detected by Ekip Touch, a specific menu is available containing the submenus of all the available and configurable inputs and outputs.

Figure 67



## 36 - Configuring threshold currents for Fan control

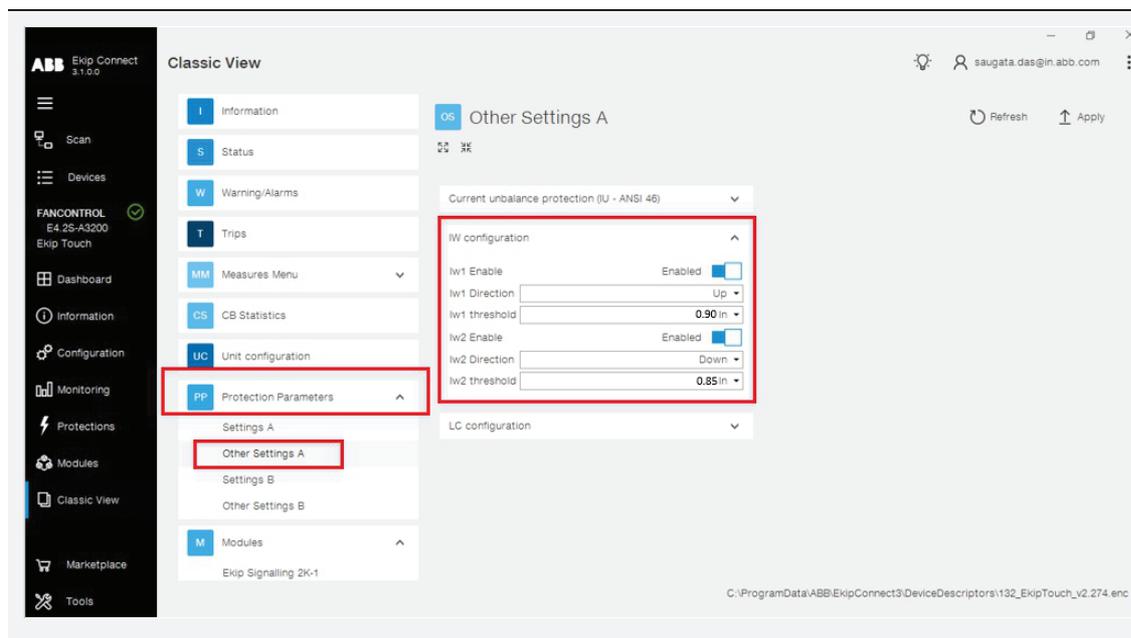
The current thresholds allow you to set controls on current lines, to be combined with the programmable contacts of the Ekip Signalling modules.

Two pairs of programmable contacts are available:

- Threshold 1 I1 and Threshold 2 I1, with control referred to I1
- Threshold Iw1 and Threshold Iw2, with control referred to In

For Fan control configure Iwi and Iw.

Figure 68



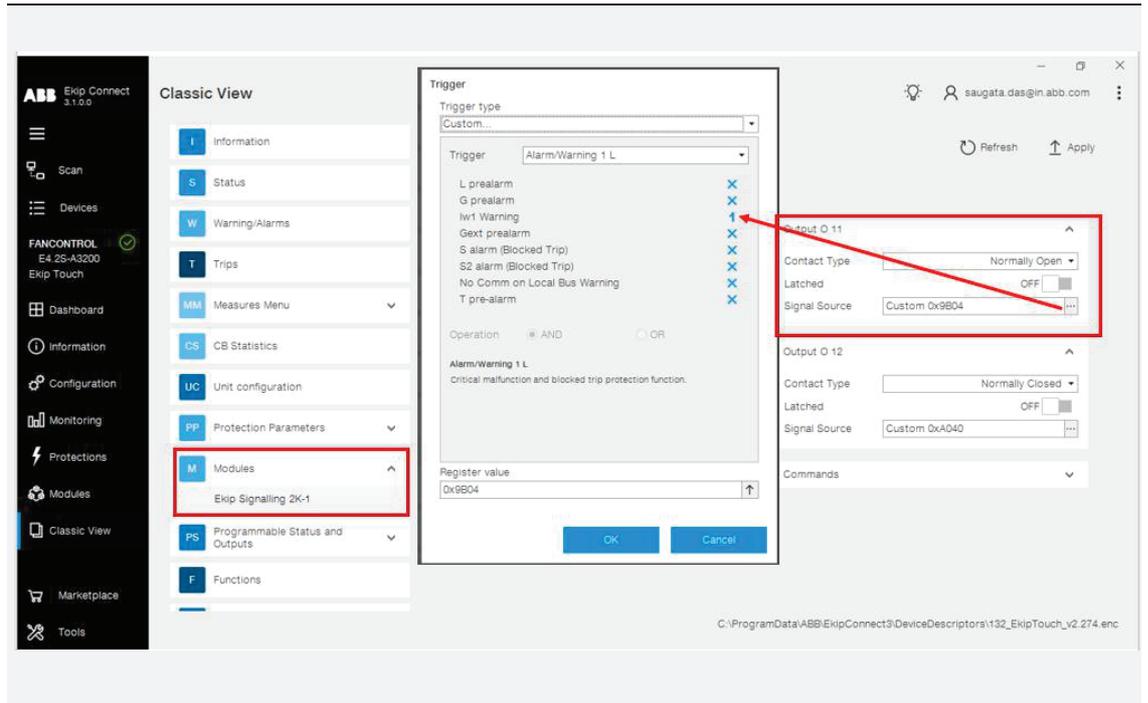
Considering 4000A as a rated current ( $I_n$ ), fans will activate when the current crosses 3600 amps & will stop if the current drops below 3400 amps.

Threshold Iw1	<i>Enable:</i> Activate protection and availability of protection threshold on menu	OFF
	<i>Direction:</i> enables you to choose to have the signal when the current is higher ( <b>Up</b> ) or lower ( <b>Down</b> ) than the threshold.	Down
	<i>Threshold:</i> The value is expressed both as an absolute value (Ampere) and as a relative value ( $I_n$ ), settable in a range: 0.1 $I_n$ .. 10 $I_n$ , with 0.01 step $I_n$	3 $I_n$
Threshold Iw2	<i>Enable:</i> Activate protection and availability of protection threshold on menu	OFF
	<i>Direction:</i> enables you to choose to have the signal when the current is higher ( <b>Up</b> ) or lower ( <b>Down</b> ) than the threshold.	Up
	<i>Threshold:</i> The value is expressed both as an absolute value (Ampere) and as a relative value ( $I_n$ ), settable in a range: 0.1 $I_n$ .. 10 $I_n$ , with 0.01 step $I_n$	3 $I_n$

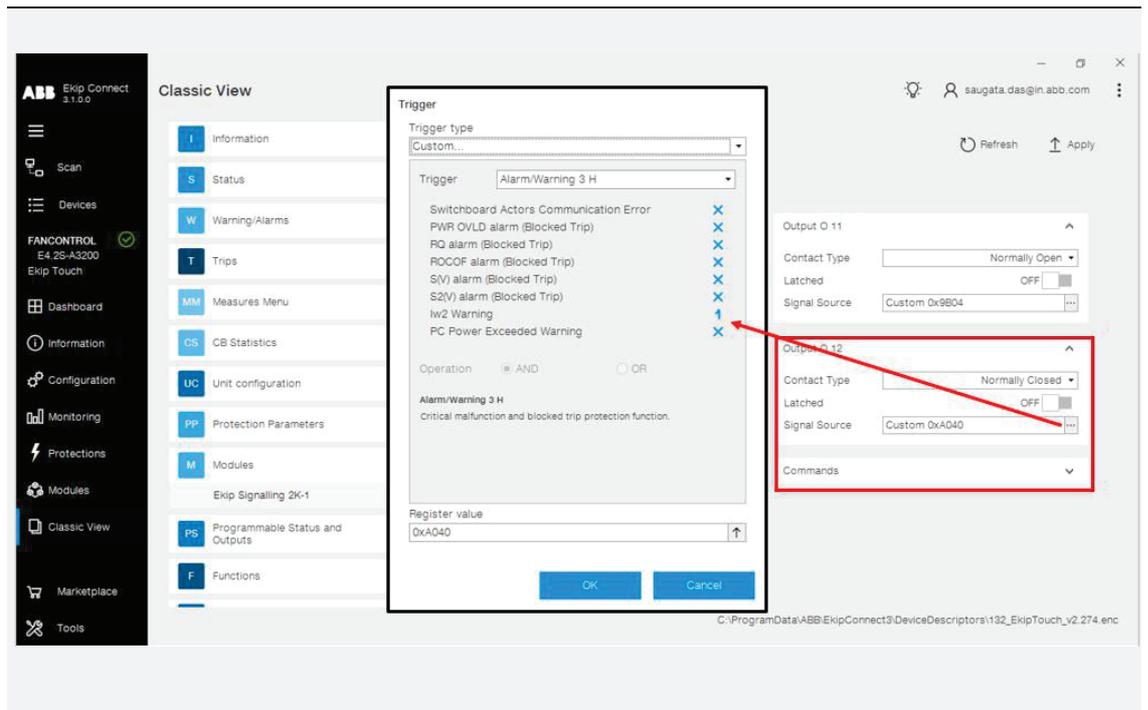
# 37 - Programing 2K-1 signaling contacts output

The output of 2K-1 module consists of 2 contacts K11-K12 and K13-K14. Configure these two output contacts as per following to control the fans.

**Figure 69**



**Figure 70**



## 38 - Contact readiness Auto Test

The output of 2K-1 module consists of 2 contacts K11-K12 and K13-K14. Configure these two output contacts as per following to control the fans.

Figure 71

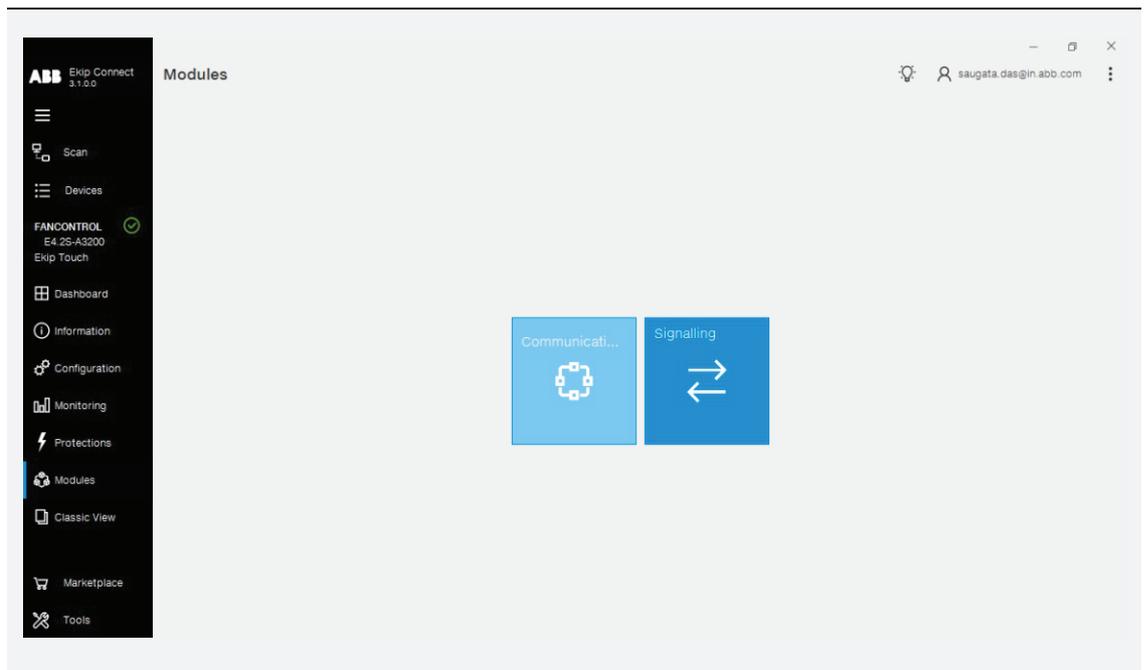
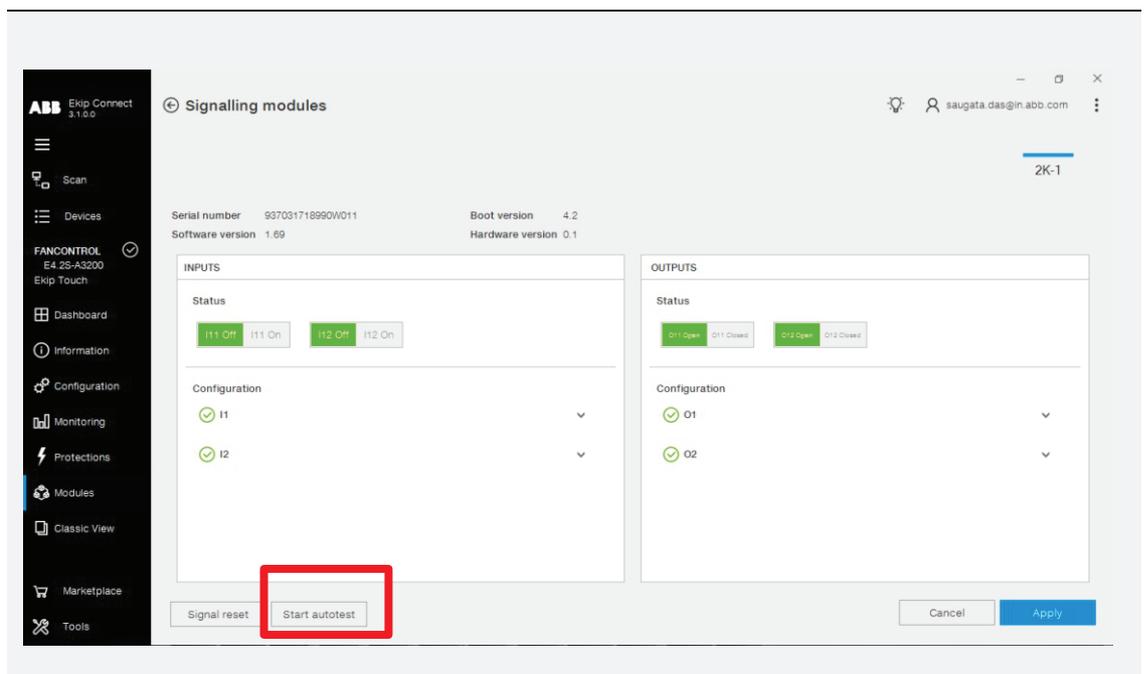


Figure 72



Autotest command that activates the automatic sequence of output tests (contacts and LEDs) and input test (LED), and includes the following operations:

1. Reset output contacts (= open) and LEDs (= off).
2. Turn on all the LEDs in sequence (output and input)
3. Closure and shutdown of the two output contacts in sequence, switching on the relative LEDs.
4. Restore initial conditions

The Autotest command closes the contacts regardless of the configuration set by the user

# Fused Retrofill Breaker

## Danger



- It must be ensured that the supply power to the compartment is turned off/ compartment is deenergized for all the incoming and outgoing circuits of the LVS prior to any work being conducted on it..
- During the installation and related work on the equipment, it must be ensured that the operator is using the prescribed PPE for the specified tasks

- Ensure only qualified personnel install, operate, service, and maintain all electrical equipment.

There are two types of fused breakers; WPF-08, 800 ampere frame and WPF-16, 1600 ampere frame. Except for the open fuse lockout device and the integrally mounted fuses on the upper studs, the WPF-08 and WPF-16 breakers are identical to the unfuse WP-08 and WP-16 models. Overcurrent trip devices are the same for both types.

## 39 - Fuse size and mounting

Figure 73

TYPICAL MOUNTING CLASS L FUSES

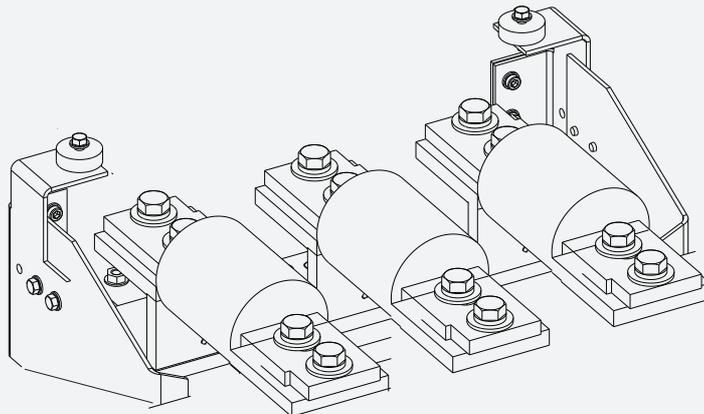


Table 6 lists the range of fuse sizes available for these breakers. The Class L fuses are mounted as shown in Fig.51. Other than the 800A size, which has a single mounting hole per tang, each Class L fuse tang has two holes sized for one-half inch diameter bolts. Class J fuses rated 300 thru 600A have one mounting hole per tang. The 300, 350 and 400A sizes require copper adapter bars per Fig. 52. All 1/2-13 fuse mounting bolts should be torqued to 200-350 in.-lb. The 5/8-11 bolts which attach the C shaped fuse adapters to the breaker studs should be torqued to 300-525 in.-lb.

**Table 9**

**Fuses For WPF Breakers**

SwitchGear	Breaker Type	Frame Size	Sensor Rating	Rating Plug	Fuse Sizes (Amps)																
					300	350	400	450	500	600	800	1000	1200	1600	2000	2500	3000	4000	5000		
AKD-10	WPF-08	800	Below 150A	Below 150A																	
			150	150																	
			225	225																	
			300	300																	
			400	400																	
			600	600																	
			700	700																	
			800	800																	
	WPF-16	1600	400A and Below	400A and Below																	
			500	500																	
			600	600																	
			700	700																	
			800	800																	
			1000	1000																	
			1200	1200																	
			1600	1600																	
	WPF-20	2000A	2000A and below	2000A and below																	
	WPF-32	3200A	3200A and below	3200A and below																	
	WPF-40	4000A	4000A and below	4000A and below																	
	WPF-50	5000A	5000A and below	5000A and below																	

**40 - Special 2500A Fuse for WPF-16**

This fuse provides a melting time-current characteristic that coordinates with 1600A trip devices. Compared physically with a 2500A NEMA Class L fuse, the special fuse is more compact (shorter); its tangs are specially configured and offset to achieve the required pole-to-pole fuse spacing; a special primary disconnect assembly mounts directly on the outboard tang of the fuse. Considering their unique mounting provisions, when replacing these fuses the following procedure should be adhered to (Refer to Fig. 53):

a) Using proper safety procedures and wearing required Personal Protective Equipment (PPE), remove breaker from compartment, and place it on a solid work surface in a well lit location.

**b) Procedure to uninstall Primary Disconnects:**

1. To uninstall the primary disconnects, remove the Adjusting nut from one of the long bolts holding the primary disconnect assembly together
2. Carefully slide out the bolt while removing the flat washer, spring, upper retainer, bowtie spacers, lower retainer, and fingers from the bottom of the assembly.
3. Do the same for the other assembly bolt and components.
4. Slide off the retainer clips.
5. Take off the main retainer from the stud.
6. Slide the main retainer over the stud.
7. Set a pair of bow-tie spacers into a pair of fingers, place a pressure plate retainer over the spacers to hold them in position, and then turn the subassembly over. Hook them into the main retainer.
8. Slide a long bolt through the hole in the retainer, between the finger, and then through the clip and stud spacer.
9. Hold the bottom finger subassembly in place.
10. Place two fingers around the bolt from the top, hooking the fingers into the main retainer. Then place a bow-tie spacer in each finger and hold them in position with a pressure plate retainer.
11. Place a spring, bushing, and flat washer over the bolt, then secure with the Adjusting nut.
12. Repeat Steps 7 through 13 for each set of fingers.
13. Adjust the nut to get a spacing of 0.766—0.797 inch for AKRU-50 between the top of the upper retainer and the bottom of the flat washer.

14. Clean finger assemblies, if necessary, with a clean, lint-free rag and isopropyl alcohol or acetone.
  15. Be sure to apply a thin film of Mobilgrease 28 (DS50HD38) to the contact areas which slide on to the switchgear stabs . This product is available in a 1-Oz tube, ABB Part #193A1751P1. Refer manual 2TSA451015P0000
- c) Remove the upper barrier.
  - d) Detach the inboard end of the fuse by removing the two 1/2 inch - 13 bolts. A ratchet and socket with a short extension will be required.
  - e) Remove the fuse.
  - f) Install the new fuse by reversing the disassembly procedure. Ensure that the mating faces of the fuse are clean.

**Figure 74**

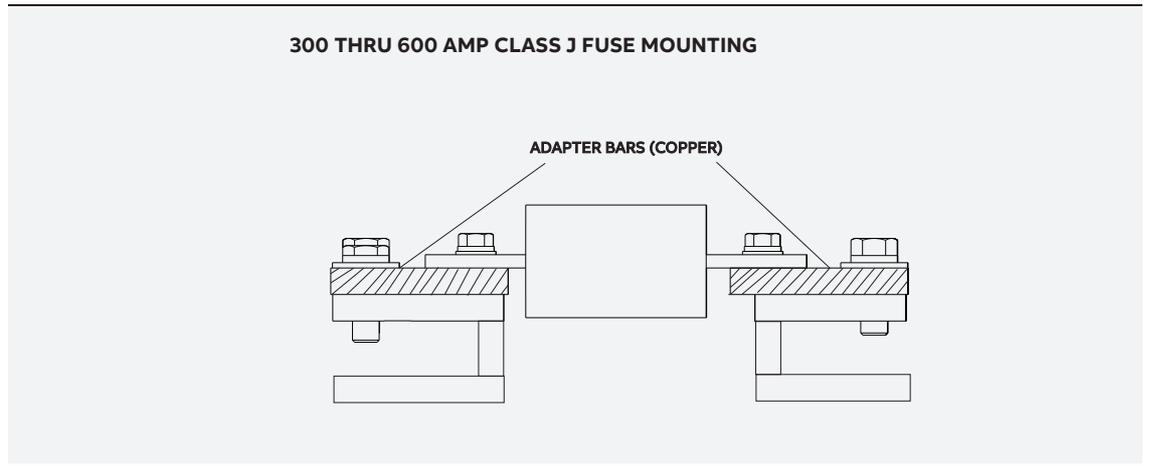


Figure 75

WPF-16 with special 2500A Fuse

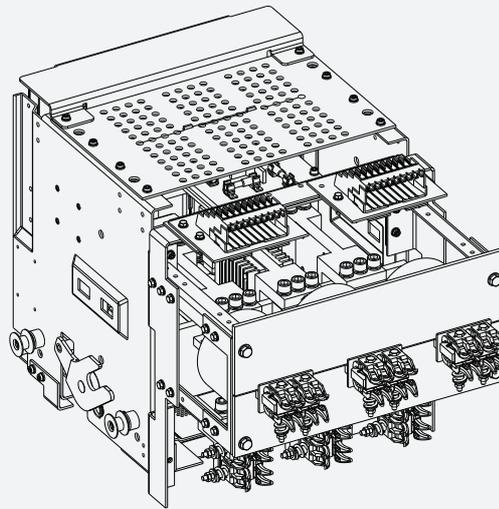
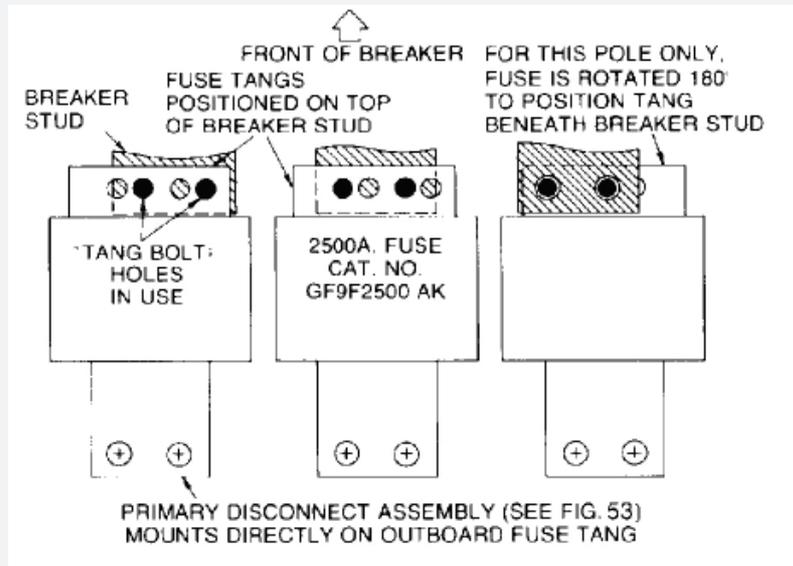


Figure 76

WPF-16-2500A Fuse Tang Positions



## Open Fuse Lockout Device

This device automatically trips the fuse breaker if one of the fuses opens. When this happens, the breaker is locked open until the reset button of the phase involved is pushed. The breaker should not be reclosed, of course, until the opened fuse is replaced.

1. Six UL recognized #18 awg, 150 degree C minimum, 600V control wires. One is connected at each end of the Class "L" fuse mounting busbars. Each wire is attached to a ring terminal which is attached with a screw to the busbar.
  2. This accessory is meant to work with a pin-wheel style Blown Fuse Detector equipped with 3 trigger fuses. Wiring of the Retrofill Breakers with UL recognized high temperature control wire is provided with the kit.
  3. All these wirings are installed at factory.
- Refer manual 2TSE432409P1000 , 2TSE432408P1000 , 2TSA1028P0000.
4. For Fused breakers Above 1600a(2000A-5000A) fuses are mounted in a separate fuse roll-out element. Breakers can be used in series with the fuse roll out element when OFLO (Open Fuse Lock Out) is installed on breaker.

Figure 77

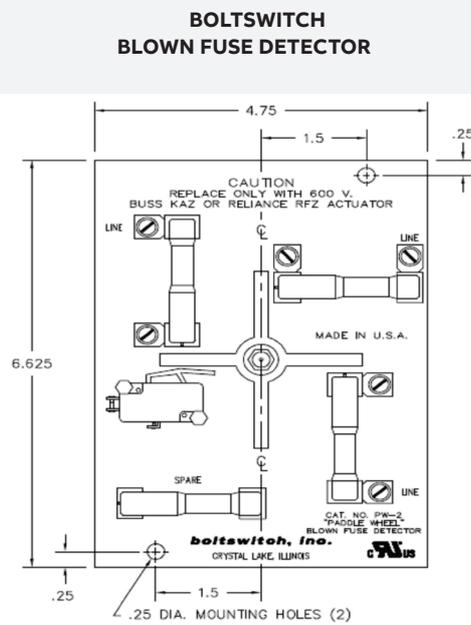


Figure 78

AKD10 WPF-08 WITH 800A FUSES

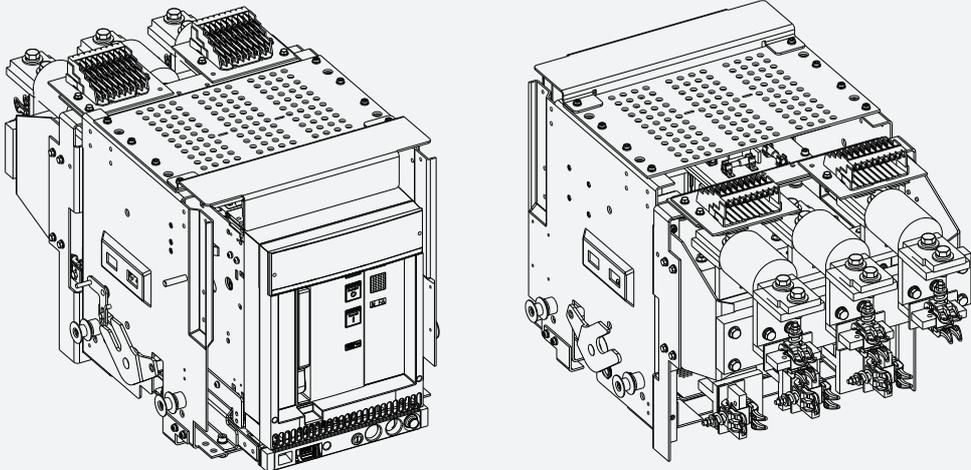


Figure 79

AKD10 WPF-16 WITH 1600A FUSES

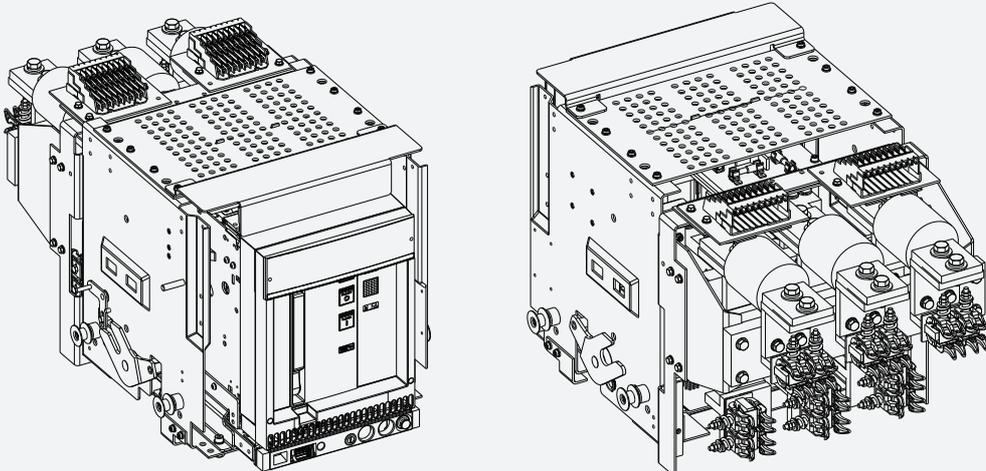
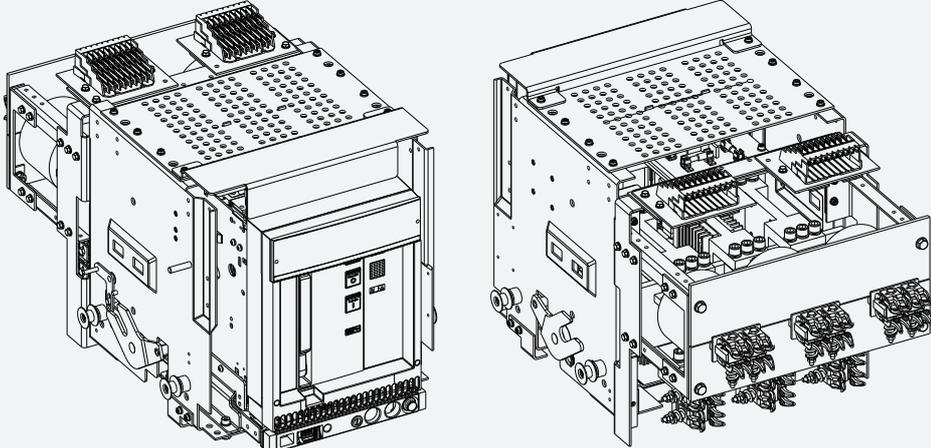


Figure 80

AKD10 WPF-16 WITH 2500A FUSES





**ABB**

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