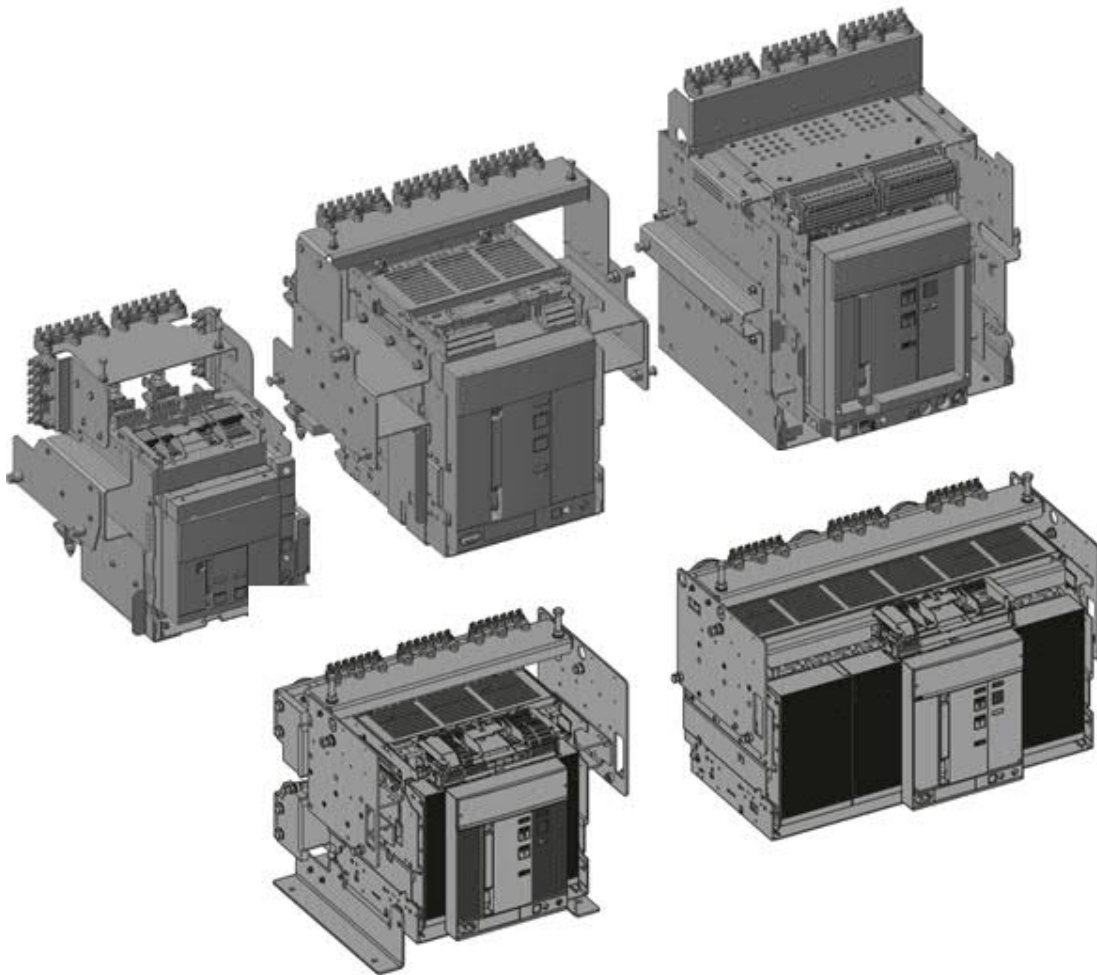


# Emax 2 Retrofill Circuit Breakers Direct/CiC Replacement of Legacy GE AK 600A - 4000A Circuit Breakers Used in AKD-5 & Substructures



- General Electric AKD-5 Low Voltage Switchgear is a free-standing assembly of metal-enclosed ANSI power circuit breakers. It may be a part of a single-ended or double-ended load center unit substation.
- It uses AK/AKJ/AKJT/AKS/AKST Breaker.
- This manual applies to both Emax 2 Retrofill breakers for AKD-5 switchgear and OEM substructures

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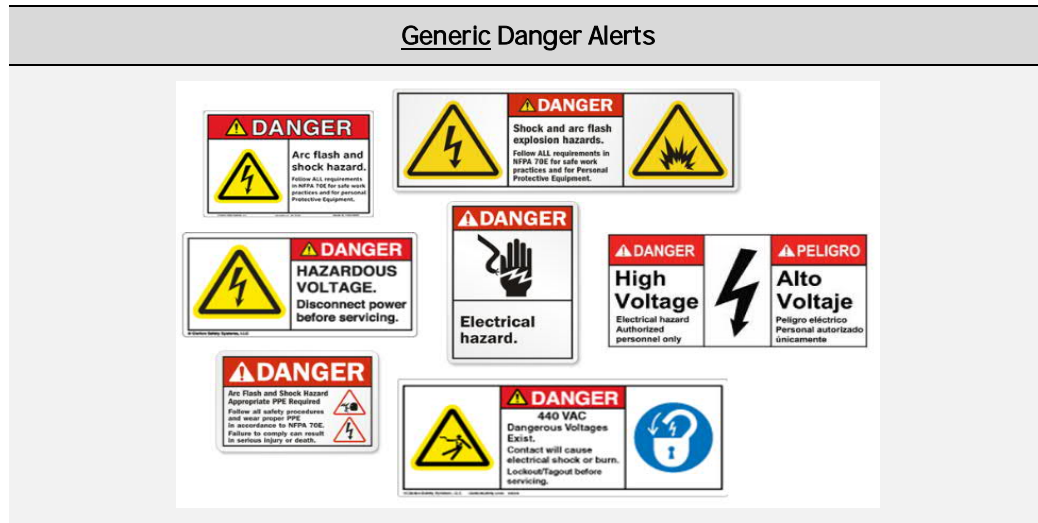
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1 - Hazards

**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.

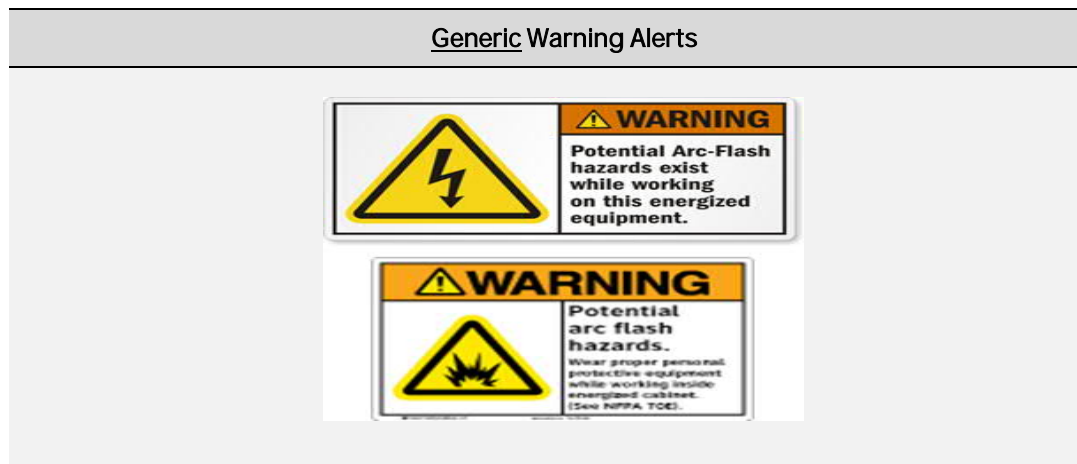
**Danger** This indicates a hazardous situation which, if not avoided, results in death or serious injury. A variety of electrical hazards warnings are displayed here & are applied to installation manuals. These are standard or generic alerts & labels that must be taken quite seriously when installing Retrofill circuit breakers in AKD & other OEM's 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 AKD & other OEMs 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	
	
Symbol Panel	Word message _____ _____ _____ _____

---

**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

Word message _____ _____ _____ _____

---

## 2 - Warranty

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**Warranty requirements** This document is based on information available at the time of its publication. While efforts 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 Email: [eppc.support@us.abb.com](mailto:eppc.support@us.abb.com), Phone: 888-385-1221, if further information is required concerning any aspect of Emax 2 Retrofill Circuit breaker operation or maintenance.

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## 3 - Trademarks and Patents

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- Details**
- Emax 2 Retrofill
  - Emax 2 Retrofill TU, Ekip DIP, Ekip Touch
  - Emax 2 Retrofill Trip Unit
  - Emax 2
- 

## 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
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 / Cradle in Cradle Full Door Kits AKD-5, 6, 8 & 10	2TSA451007P0000
Accessory Retrofill Direct Replacement / Cradle in Cradle Door Adaptor Kits AKD-5, 6, 8 & 10	2TSA451008P0000
Accessory OEM Direct Replacement Adaptor kits AKD8 & 10	2TSE431967R1000
Accessory OEM Direct Replacement Door Adaptor kits, AKD8 & 10, AKR 75/100, B&F TYPE	2TSE431968R1000
Accessory OEM Direct Replacement Door Adaptor kits, AKD8 & 10, only for AKR30S	2TSE431996R1000
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
E1.2 Breakers Installation, Operation & Maintenance Manual	1SDH000999R0002
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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It takes about 20 minutes to install a feature-for-feature LSI assembly. This includes racking out the old breaker, racking in the new breaker, and replacing the door. If new options are desired, or if it's a 4-wire LSI circuit or modifications are needed to the cubicle, then additional time is required. Time also does not include wiring the secondary disconnect on the Retrofill

---

## 9 - Product Specs

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GE AKD-5 Low Voltage Switchgear (LVS) is a free-standing assembly of metal-enclosed ANSI power circuit breakers. It may also be a part of a single-ended or double-ended load center unit substation. AK25/AK50 Retrofill are based on Cradle in Cradle (CiC) solution whereas for AKT50 is a Backless Cradle in Cradle (BCiC) solution using EGR cassette.

**Views** Typical Emax 2 Retrofill circuit breakers for GE AKD-5 & OEM switchgear are shown below. All circuit breakers are drawout types. Each Retrofill is constructed by permanently joining an Emax 2 circuit breaker in a steel frame, installing primary and secondary disconnects and driving drawout racking cams thru what look the Emax 2 Cassette's front dashboard. With least modifications to be made to existing switchgear, Emax 2 Retrofill breakers are cost effective solution to upgrade the existing electrical system. Direct Replacement is the solution where the moving part of 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 Range.

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

Figure 1 & 2

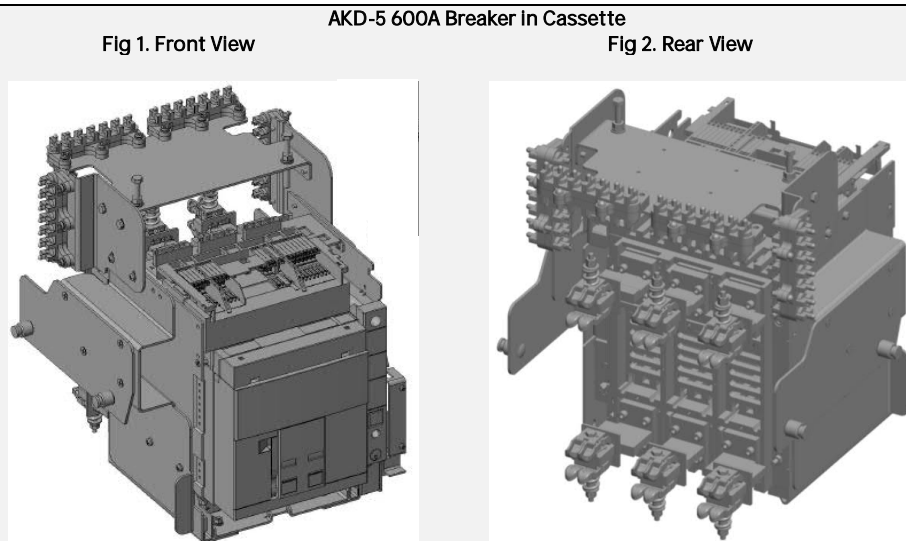


Figure 3 & 4

AKD-5 1600A Breaker In Cassette

Fig 3. Front View



Fig 4. Rear View

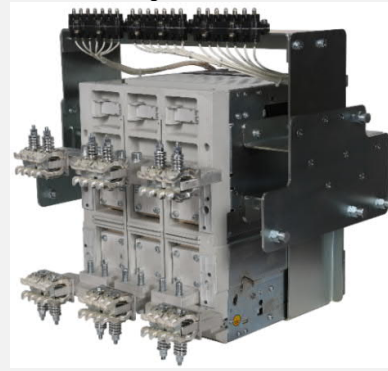


Figure 5 & 6

AKD-5 2000A Breaker In Cassette

Fig 5. Front View

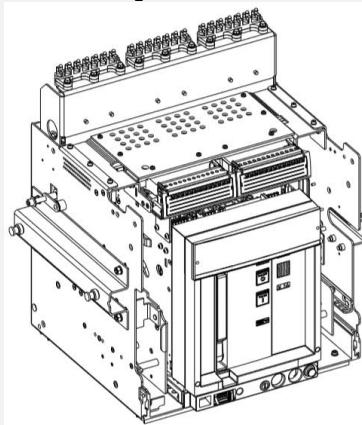


Fig 6. Rear View

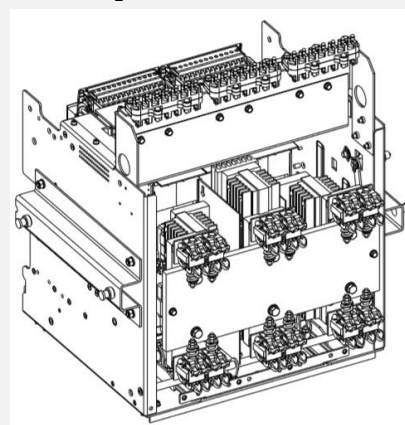


Figure 7 & 8

AKD-5 3000A Breaker In Cassette

Fig 7. Front View

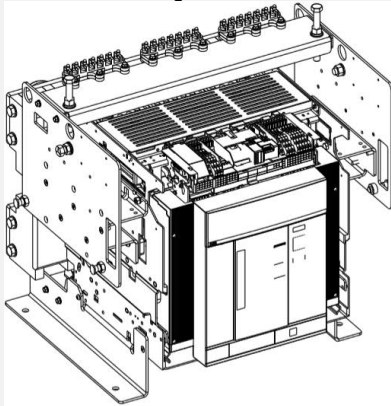


Fig 8. Rear View

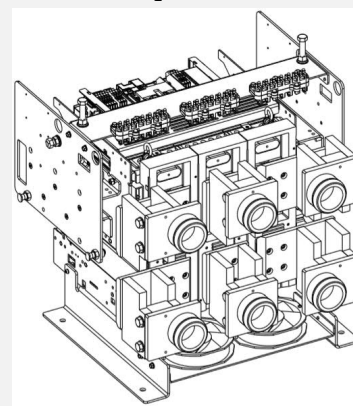


Figure 9 & 10

AKD-5 4000A Breaker In Cassette

Fig 9. Front View

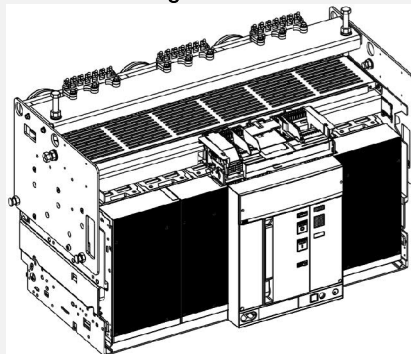
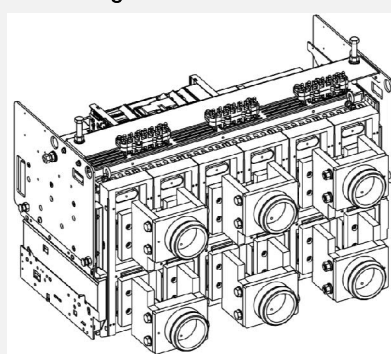


Fig 10. Rear View



### 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.

- 
- 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 un-plated (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.

None of the Emax 2 Retrofill breakers utilize fans except for 3000A rating only.

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.

None of the Emax 2 Retrofill breakers utilize fans except for 4000A rating only.

---

**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 MicroVersaTrip 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 "F". "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 & W2 Catalog numbers on legacy WavePro breakers designate additional dead front shields)

---

## 11 - AKD-5, Breaker Models

The following figures depicts the AKD5 Retrofill breakers (600-4000A)

### AKD5 AK25 , Emax 1.2 600A CIC (Cradle in Cradle) Retrofill Kit

Figure 11 & 12

Fig 11. Emax 1.2 Circuit Breaker (Moving Portion)

Fig 12. Circuit Breaker Projected from Cassette



Figure 13

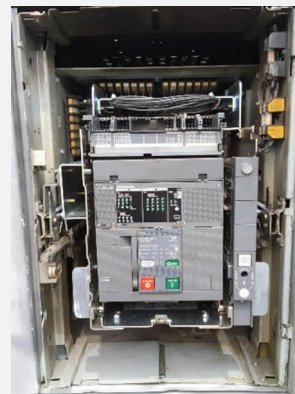
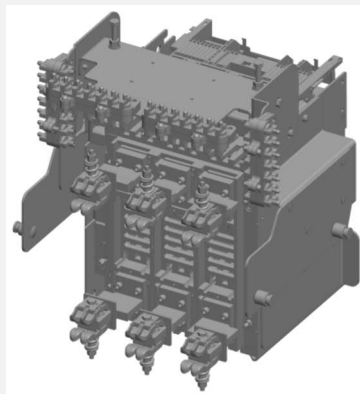
Retrofill Kit



Figure 14 & 15

Fig 14. Rear View of Retrofill Kit

Fig 15. Front view inside SwitchGear



AKD5 AK50, Emax 2.2 1600A CIC (Cradle in Cradle ) Retrofill Kit

Figure 16 & 17

Fig 16. Emax 2.2 Circuit Breaker (Moving Portion)

Fig 17. Circuit Breaker Projected from Cassette

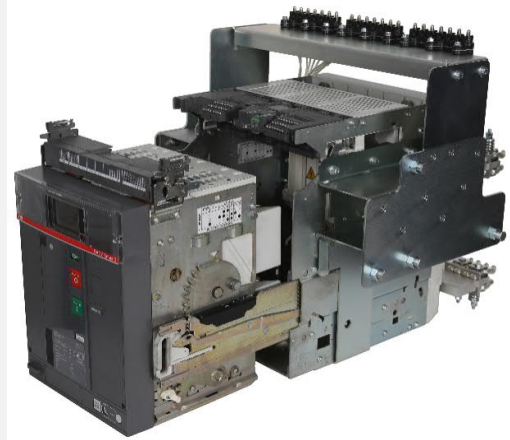


Figure 18

Retrofill Kit

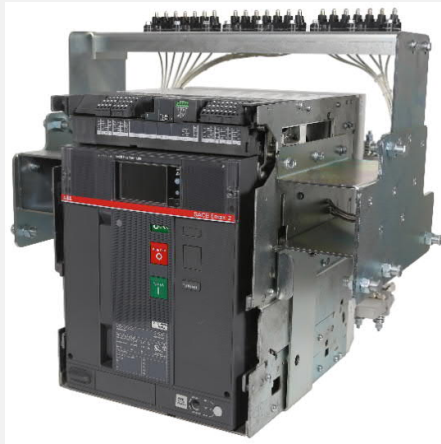
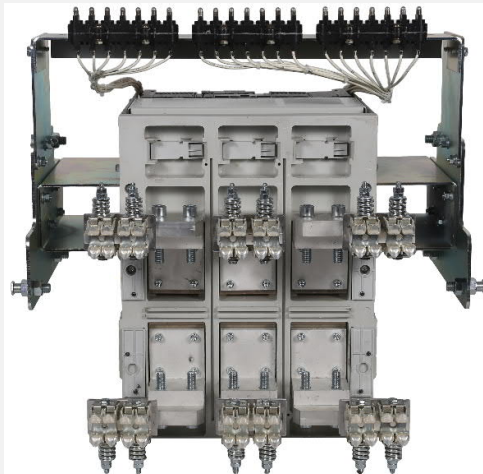


Figure 19 & 20

Fig 19. Rear View of Retrofill Kit

Fig 20. Front View of Retrofill Kit



## AKD5 AKT50, Emax 2.2 2000A DR (Direct Replacement) Retrofill Kit

Figure 21 & 22

Fig 21. Emax 2.2 Circuit Breaker Front view



Fig 22. Emax 2.2 Circuit Breaker Rear view

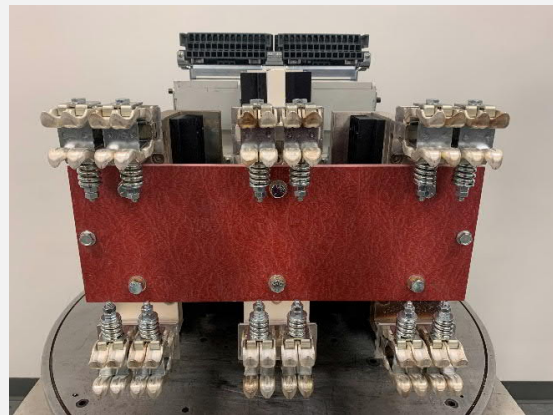


Figure 23

Circuit Breaker Projected from Cassette



Figure 24 & 25

Fig 24. Rear View of Retrofill Kit

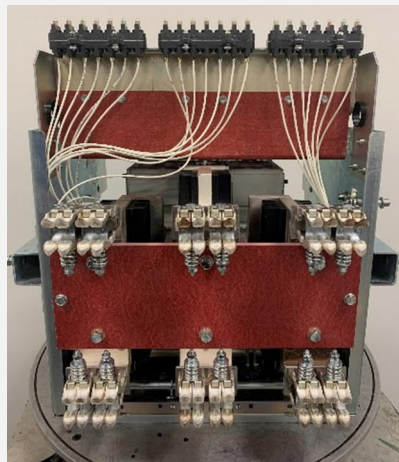


Fig 25. Front View of Retrofill Kit



The Emax 1.2 & Emax 2.2 Circuit Breaker is suitable for application on power systems up to 600 VAC 50/60 Hz.

AK75, Emax 4.2 , 3000A Cradle in Cradle Retrofill Breaker

Figure 26 & 27

Fig 26. Emax 4.2 Circuit Breaker (Moving Portion)

Fig 27. Circuit Breaker Projected from Cassette

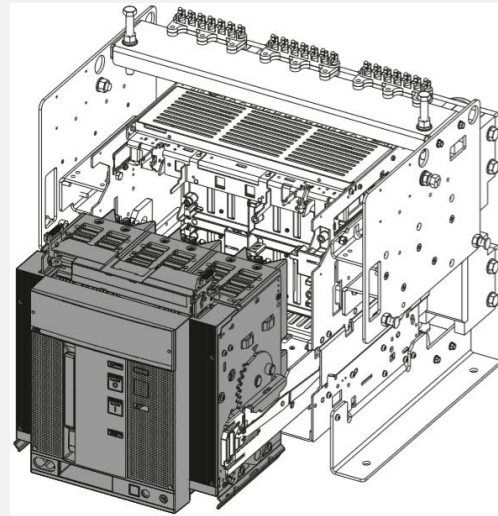
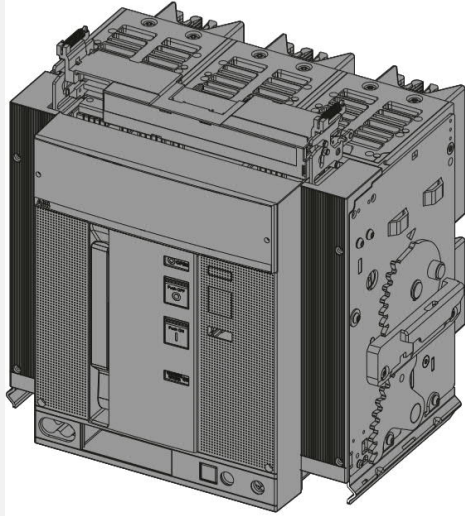


Figure 28

Retrofill Kit

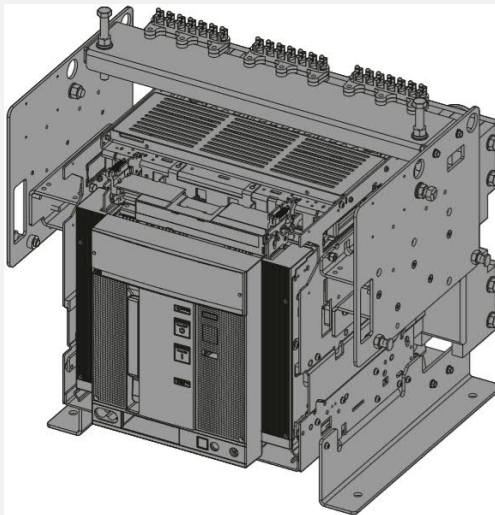
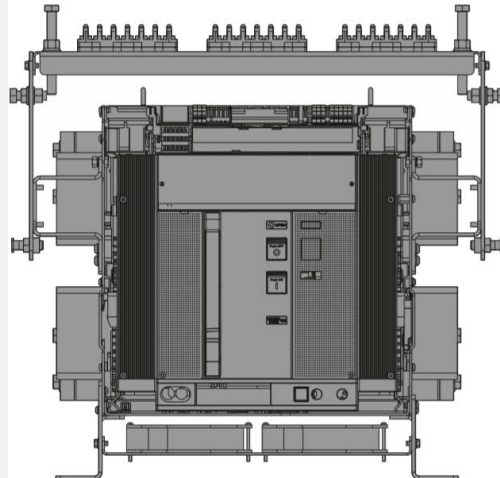
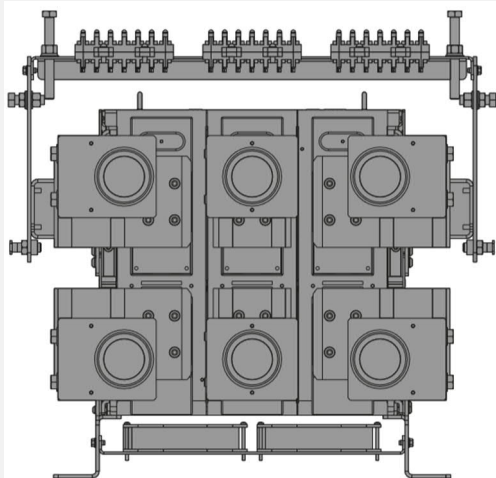


Figure 29 & 30

Fig 29. Rear View of Retrofill Kit

Fig 30. Front View of Retrofill Kit



AK100, Emax 6.2 , 4000A Cradle in Cradle Retrofill Breaker

Figure 31 & 32

Fig 31. Emax 6.2 Circuit Breaker (Moving Portion)

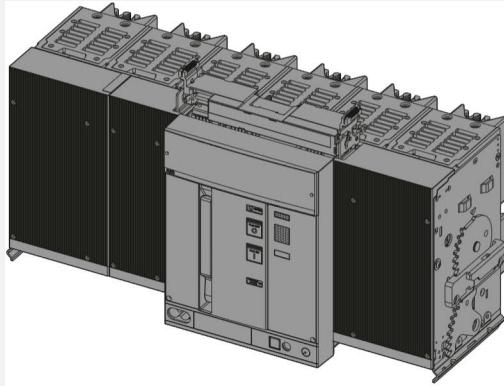


Fig 32. Circuit Breaker Projected from Cassette

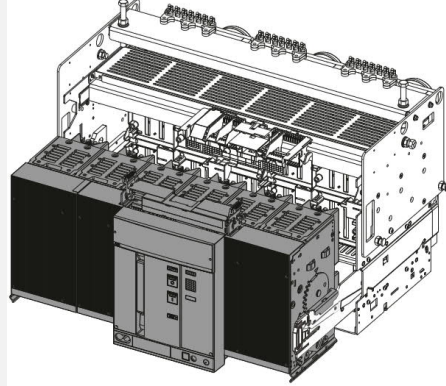


Figure 33

Retrofill Kit

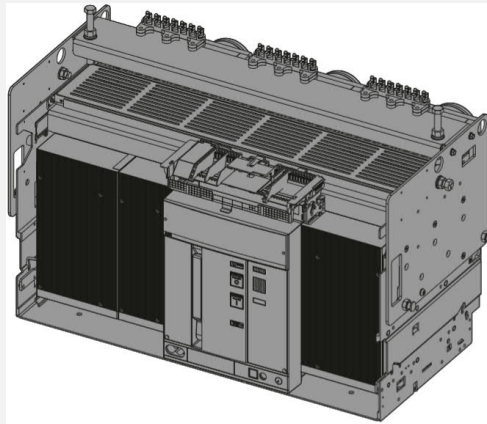


Figure 34 & 35

Fig 34. Rear View of Retrofill Kit

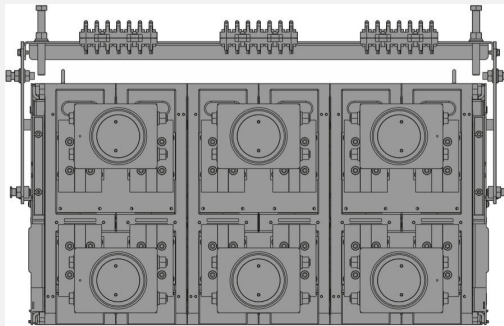
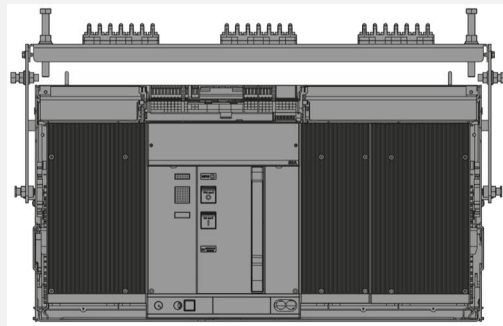


Fig 35. Front View of Retrofill Kit



## 12 - AKD5 Mechanical drawings

The following engineering or assembly drawings describe the layout and dimensions of the AKD-5 Retrofill breaker.

Figure 36

AK25, Emax 1.2 600A

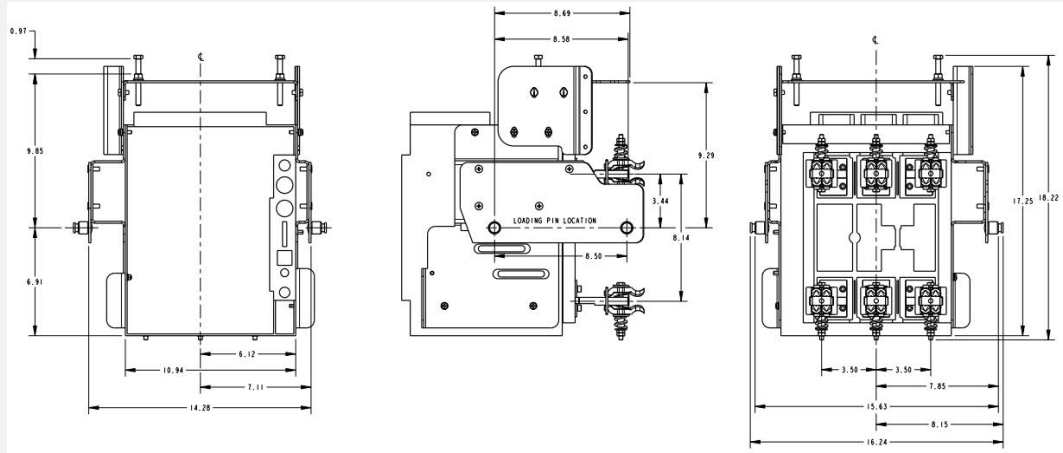


Figure 37

AK50, Emax 2.2 1600A

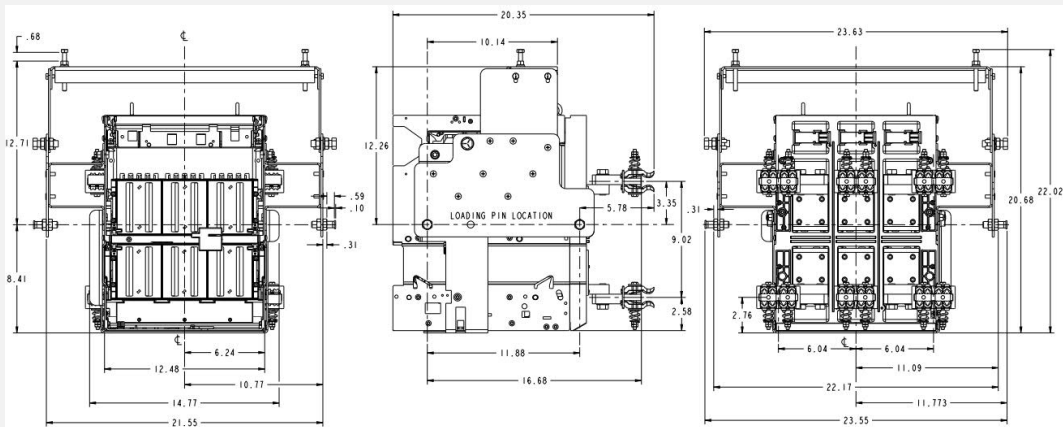


Figure 38

AKT50, Emax 2.2 2000A

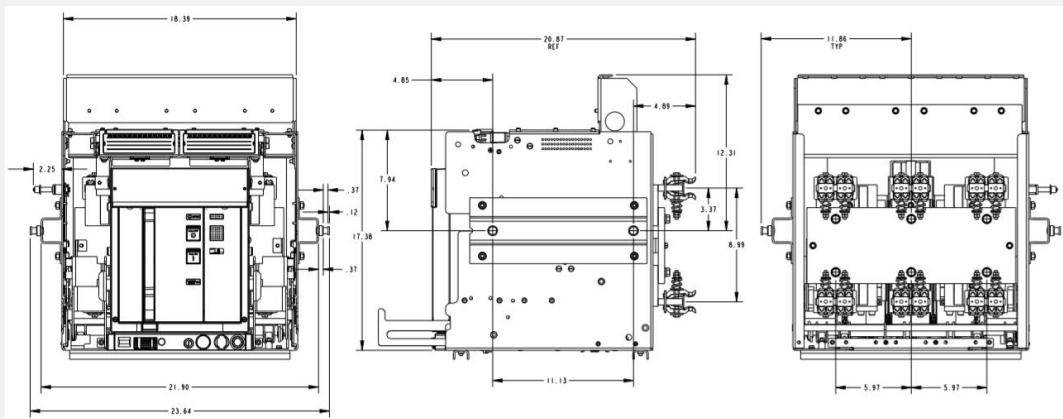


Figure 39

AK75, Emax 4.2 3000A

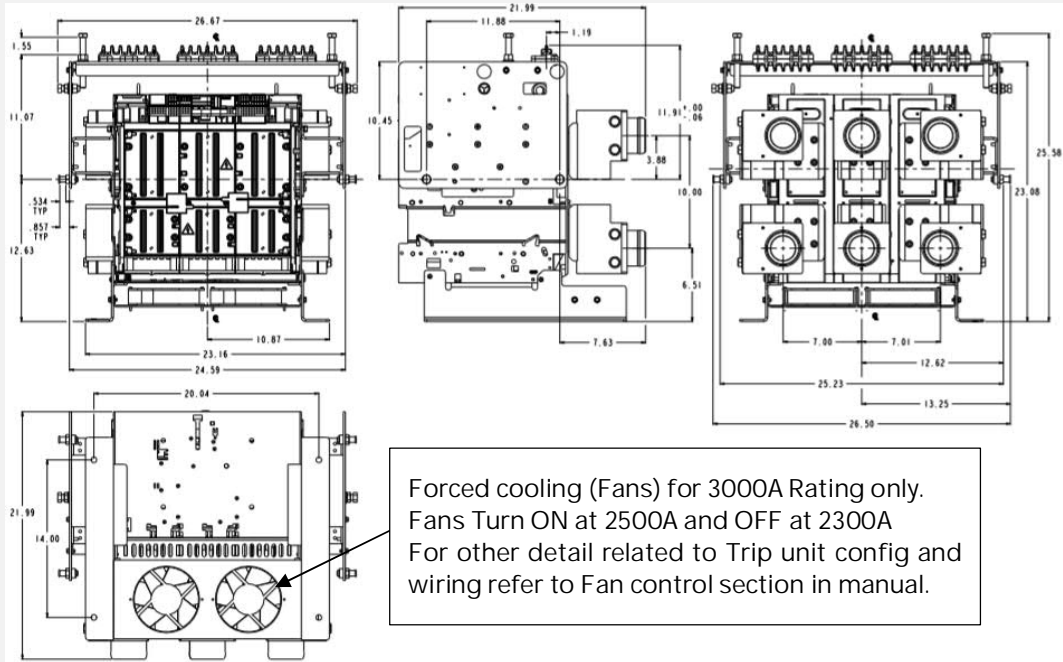
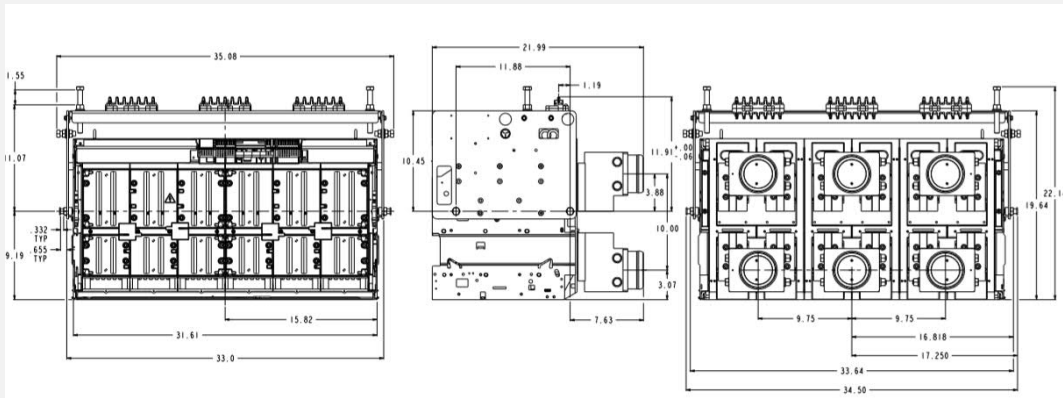


Figure 40

AK100, Emax 6.2 4000A





## Modify AKD-5, Switchgear Compartment

### 13 - Turn OFF/OPEN the legacy circuit breaker

#### Danger



- It must be ensured that the supply power to the compartment is turned off/ compartment is de-energized 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. Discharge the closing spring before removing the breaker from the switchgear.

### 14 - Rack Out legacy circuit breaker

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

### 15 - Empty compartment legacy breaker removed

The following figures (Figure 41, 42 & 43) show a legacy breaker removed from enclosure or compartment.

Figure 41 & 42

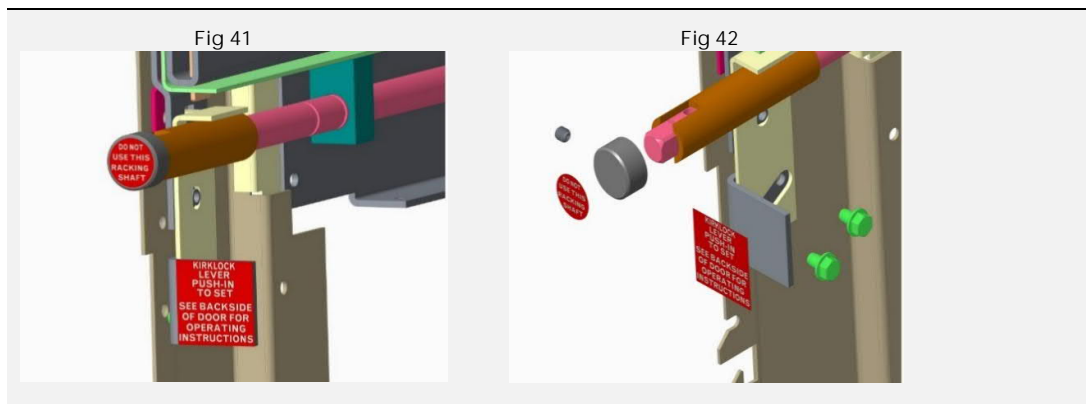


Figure 43

AKD5 - 600A



Figure 44

AKD5 - 1600A / 2000A



Figure 45

AKD5 - 3000A / 4000A



---

## 16 - Check, Clean and Grease Compartment

---

1. Inspect the compartment for damage or rework.
2. Check the orientation of primary finger clusters match the switchgear stabs.
3. Check the secondary disconnect integrity & mounting supports for any damage or cracks .
4. If switchgear parts show cracks or damage contact ABB post sales service 888-437-3765.
5. Check each breaker compartment for bolted joints in the primary disconnect bars. Where such joints exist, check the bolts for tightness.
6. 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.
7. Be sure to apply a thin film of red Mobilgrease 28 to the primary disconnect contact areas for better electrical connections inside the compartment.
8. After removing the original AK breaker from the compartment, install the AKD-5 retrofill cassette. (Note: If compartment has a position switch and a position switch actuator will be added to the cassette, see Install Position Switch Actuator below.
9. Locate and replace Kirk key slide return spring on left side of compartment. Supplied with the cassette assembly as a retrofill kit. Inspect the Kirk key slide mechanism, grease with Mobilgrease #28) if required.
10. Install the cap, label and ¼-20 set screw to disable old racking mechanism. Also assemble Kirk key side bracket, label and (2) ¼-20 Thread forming screws, see figure 41 & 42. Supplied with the cassette assembly as a retrofill kit.

# Unpack Retrofill Circuit Breaker

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

## 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

A blue rectangular sign with a white border, featuring the word 'NOTICE' in white capital letters.

### 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.

---

## 17 -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 assembled by ABB Inc USA (Senatobia,ms) and is inspected using some of the same master gauges used on the legacy AK, AKR breakers to confirm electrical and mechanical performance, including rejections-feature

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## 18 - 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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## 19 - Product and Catalog Serial Numbers

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Product and catalog serial numbers should be kept handy when communicating about the circuit breaker. Each circuit breaker has a unique serial number located on the front side of the fascia.

---

## 20 - 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 off the top cover.
4. Remove all packaging material.
5. Remove all product documentation and store properly.

Unscrew the mounting screws that fasten the circuit breaker to the bottom of the shipping pallet and remove the circuit breaker or cassette.

### Use Lifting Device

1. Use a lifting device to lift and mount the cassettes and circuit breakers to avoid personal injury or damaging the devices.  
**NOTE:** Emax 2 frame 1.2 has no lifting bar. Lift with 2 people to install into cassette.
2. Contact the nearest sales office for availability of a hoisting device or contact ABB post sales service 888-437-3765.  
**2000A Breakers : Lifting Bar 2TSE431929R1000**
3. Lifting bars are available from ABB Inc USA.
  - AK Retrofill breakers use the Emax 2 & Emax 2 Retrofill lifting device.
4. Position the lifting plates on the Emax 2 drawout circuit breaker making sure that tongue of the plates is latched properly as shown (Figure 46).
5. Extract the rails for loading the circuit breaker using appropriate levers in figure 47.
6. Position the breaker on the rails as shown in figure 48.
7. After dropping the circuit breaker on to the guides unlatch the tongue and remove the lifting plates as shown in figure 49.

For detail procedure to Rack in and Rack out Emax 2 breakers refer operating instruction document 1SDH001330R0002 provided in the box

Figure 46

Emax2.2/4.2/6.2 Moving Portion Lifting Plates

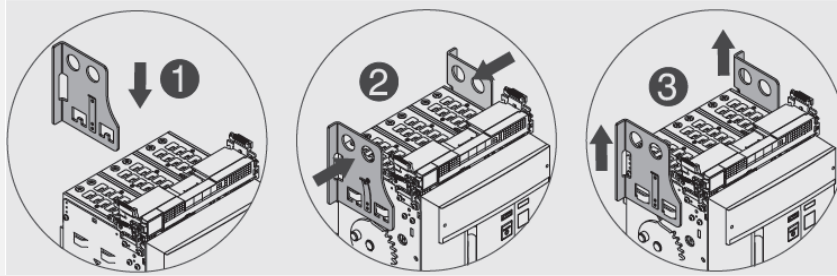


Figure 47

Emax2.2/4.2/6.2 Loading Rails

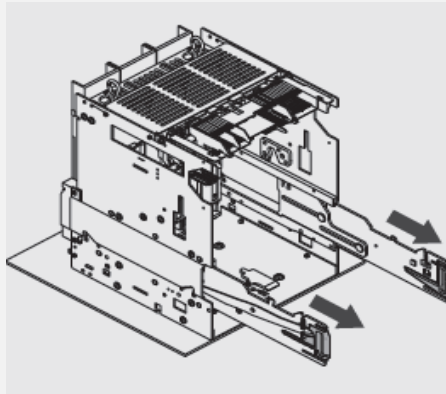


Figure 48

Loading Emax2 Breaker Into the Cradle

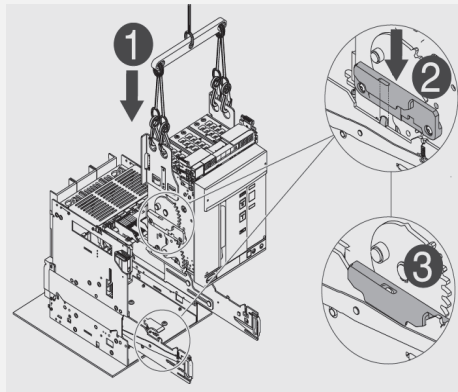
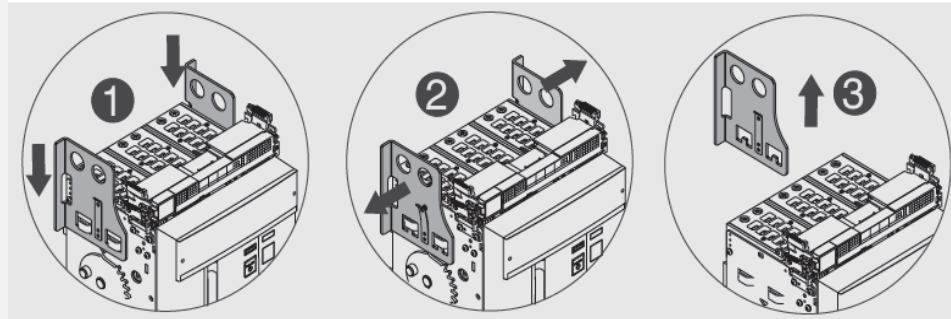



Figure 49

Disengagement of Lifting Plates from Emax2 Breaker



## Store Circuit Breaker

### Notice

	<p><b>PRODUCT DAMAGE</b></p> <ul style="list-style-type: none"><li>• Do not store circuit breaker in corrosive environments above LC1 (sea salt mist) and G1 as per ANSI/ISA-S71.04-1985.</li><li>• Ensure circuit breakers and cassettes are stored in a clean, dry location, in their original packaging.</li><li>• Failure to comply with these instructions may result in product damage.</li></ul>
---	---

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 damaging any of the breaker parts. Do not remove any protective grease until the breaker is ready to be installed. Cover to prevent dust from settling on the breakers if they are not left in their original containers.
3. If breakers are not to be placed in service immediately, remove them from their shipping cartons and thoroughly inspect them.
4. If everything is in satisfactory condition, replace the breakers into their shipping cartons for storage. If it is necessary to store the equipment for any length of time, follow these precautions to prevent corrosion or deterioration.
5. Uncrate the equipment and check thoroughly for damage.
6. Store in a clean, dry, rodent-free location with moderate temperature and provide protective coverings to prevent dirt, water, or other foreign substances from entering the breaker.
7. If dampness or condensation is encountered in the storage location, heaters can be used to prevent moisture damage.
8. 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 Emax2 1SDH001000R0002 manual for maintenance section on page 68-72.

## Check Before Installing

### Danger



- It must be ensured that the supply power to the compartment is turned off/ compartment is de-energized 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 Emax 2 Retrofill breakers are of two types. AK 25 & 50 circuit breakers are replaced by standard Emax 2 drawout breaker for a Cradle in Cradle (CiC) solution & AKT 50 has a hollow back EntelliGuard R Cradle and uses a customized Emax 2 circuit breaker. The AK 25 & 50 uses the existing Emax 2 cassette racking arrangement to rack in and out the breakers while AKT 50 has special EntelliGuard cassette equipped with AK style 7 point bullet connectors which interface with the original AKD-5 secondary disconnect blocks. The cassette also has a new racking mechanism. Two cams in this cassette engage pins on the new breaker to pull it into the cassette. The new breaker has primary disconnect fingers which will directly connect to the primary stab tips in the AKD-5 switchgear.
- Check to see that the breaker or breakers match their respective compartments.
- Read the front view drawings, breaker nameplate, and the identification card on the breaker shipping carton.
- To match the breaker to its proper compartment, refer to the breaker location list on the front view drawing.
- If applicable, the neutral disconnect assembly block and bracket within the compartment must be removed. Removing this item should be done only after the breaker, is removed from the compartment, **and** the compartment has been completely de-energized of primary and control power.

**Note:** Cassette = Cradle = Substructure



## Clean and Grease Breaker

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- Before installing or operating a breaker, refer to the Emax 2 Breaker installation manual 1SDH001330R0002 for pre-operation inspecting and testing.
  - Check thoroughly for any damaged or loose parts and for any dirt or foreign matter which may be on the breaker.
  - Clean those areas if necessary with a clean, lint-free rag and isopropyl alcohol or acetone.
  - Be sure to apply a thin film of Mobilgrease #28 to the primary disconnect fingers for better electrical connections on the breaker, and lower racking force.
-

## Customize retrofill secondary wiring

---

Notice

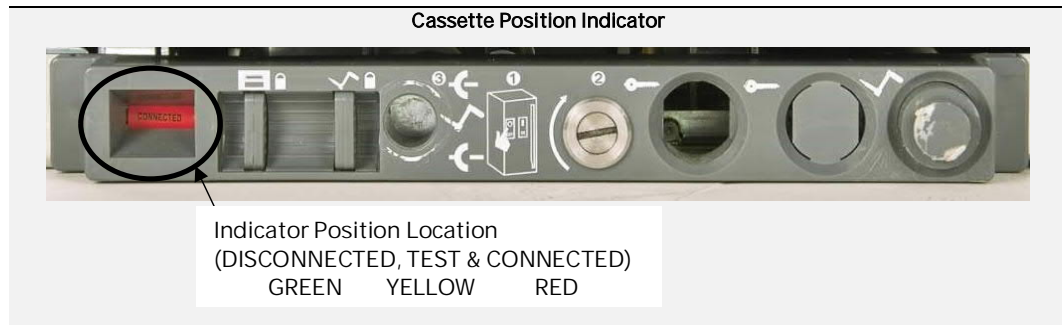


### WIRING

- Before installing the breaker, the secondary disconnects must be wired to the Emax 2 Retrofill Breaker.
- Wires with wire markers are provided on the Retrofill. 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.

## Install Position Switch Actuator, AKT Breaker Retrofill Only

Figure 50

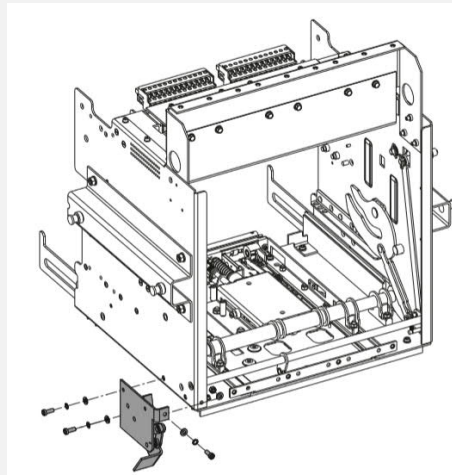


1. Make sure that the cassette is in the disconnected state. This can be verified by checking racking position status on window located at Left side window on frame of AKT 50 Retrofill cassette. The position switch actuator kit of AKD5 – AKT 50 retrofits must be installed on the rear side, right-side sheet of the AKT 50 retrofill cassette.
2. Place the cassette on a work table. The cassette should be positioned such that there is enough overhang of its side to insert the position switch actuator assembly in the bottom of the cassette. Alternately, the installation can also be done by placing the cassette assembly on the telescopic rails of the AKD5 compartment, being retrofitted.
3. To install the position switch actuator, slide the assembly up from the bottom of the cassette.
4. Line up the holes on the cassette side sheet with the holes provided on the actuator assembly.
5. Fasten the 3 M6 bolts and 6mm washers provided with the actuator assembly to the three holes on the cassette side sheet. Two holes are placed on the side and one hole on the rear of the cassette assembly. The position switch actuator on the cassette is now installed and ready to be activated as soon as the breaker is racked into the compartment.
6. Mount the cassette assembly on the rails of the AKD-5 LVS and rack the cassette into the compartment using the legacy racking system.

Note: As the Emax 2 Retrofill breaker is racked into the cassette, and the position indicator window reads “connected” the retrofill Position Switch actuator should activate the compartment mounted position switch in the AKD-5 LVS.

Figure 51

AKD-5, AKT 50, Actuator for Position Switch Assembly (Exploded View)



## Racking-Lock Bracket Installation (AK-25/AK50/AKT50 Cabinet only)

Danger



- It must be ensured that the supply power to the compartment is turned off/ compartment is de-energized 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.

1. Remove existing indicator assembly system from AKD-5 cabinet rails (Figure 46)
2. Clean the area of the moving frame assembly of any dirt or debris.
3. Unpack the racking lock kit for the AKD-5.
4. Use this bracket as a template for drilling the holes in the frame (Figure 47).
5. Slide the bracket up to its fixing location as shown in illustration (Figure 63).
6. Line up the guiding holes (Figure 49).
7. Mark the bottom two holes using the bracket as a template.
8. Take the bracket out and drill 0.18-in diameter pilot holes in the frame.

# Install Cassette (Landed Wires)

Danger



- It must be ensured that the supply power to the compartment is turned off/ compartment is de-energized 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.

Fig 53 shows the front view of the AKD-5 cassette, ready for installation

Figure 52 & 53

AKD-5, AK50  
 Fig 52. Cassette Projected from Switchgear Fig 53. Cassette racking on Switchgear rails

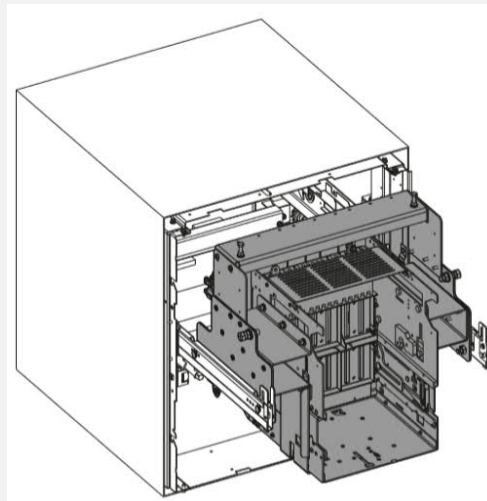
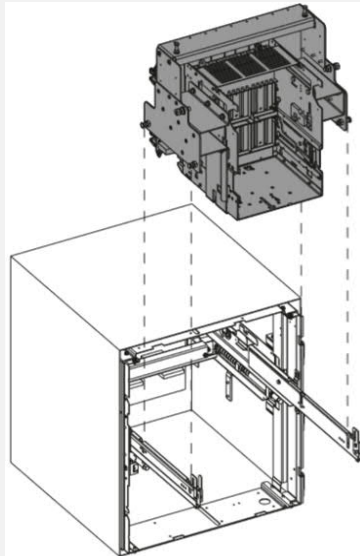


Figure 54

Switchgear and Cassette assembly (Front View)

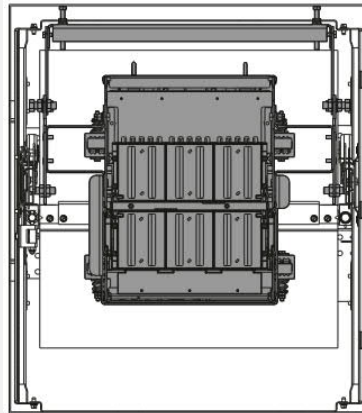


Figure 55 & 56

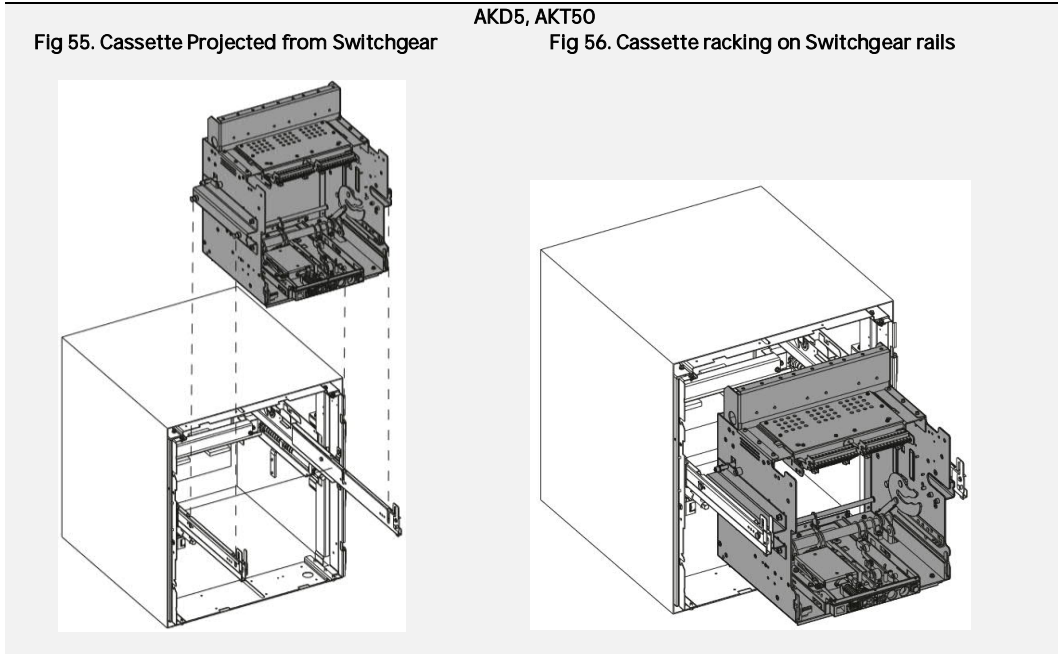
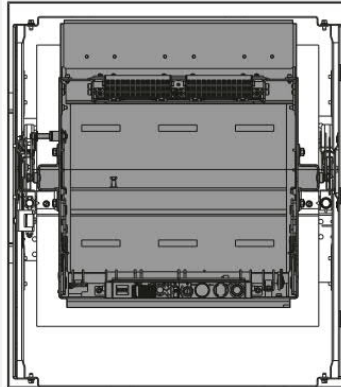


Figure 57

Switchgear and Cassette assembly (Front View)



1. Install the pre-wired cassette in the enclosure as demonstrated in the photos, below.
2. Place the cassette on the rails for racking into the switchgear cabinet figure 55 & 56.
3. Slide the retrofit cassette into the compartment till dead-stop.
4. Lock the rails of the legacy compartment to ensure inner and outer rail movement.
5. Use legacy (old or original) AKR racking handle for inserting the retrofit cassette.
6. Fix legacy (old or original) racker-lock on the compartment side frame to block slide back of sleeve.

The following photos show how the cassette is racked in and secured figure 60, rails extended figure 58, racking in (figure 59)

Figure 58 & 59

AKD-5, AK25 Cassette To Be Racked In

Fig 58



Fig 59

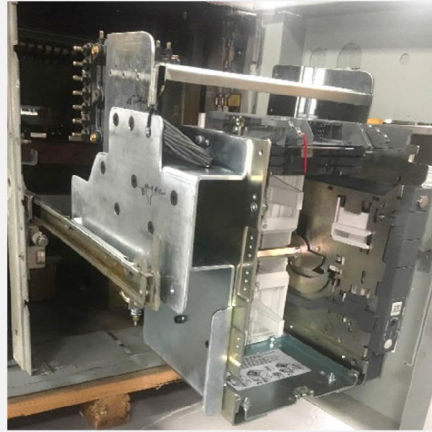


Figure 60 & 61

AKD-5, AK 25 Cassette or Substructure, Rails Extended

Fig 60



Fig 61

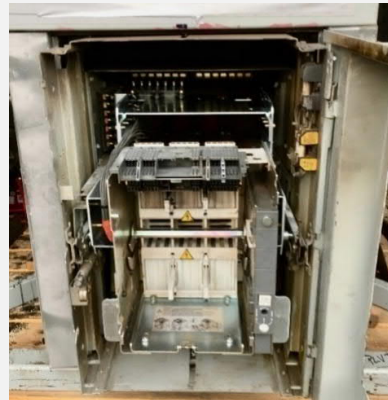
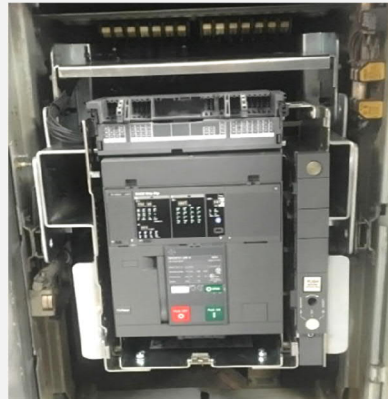


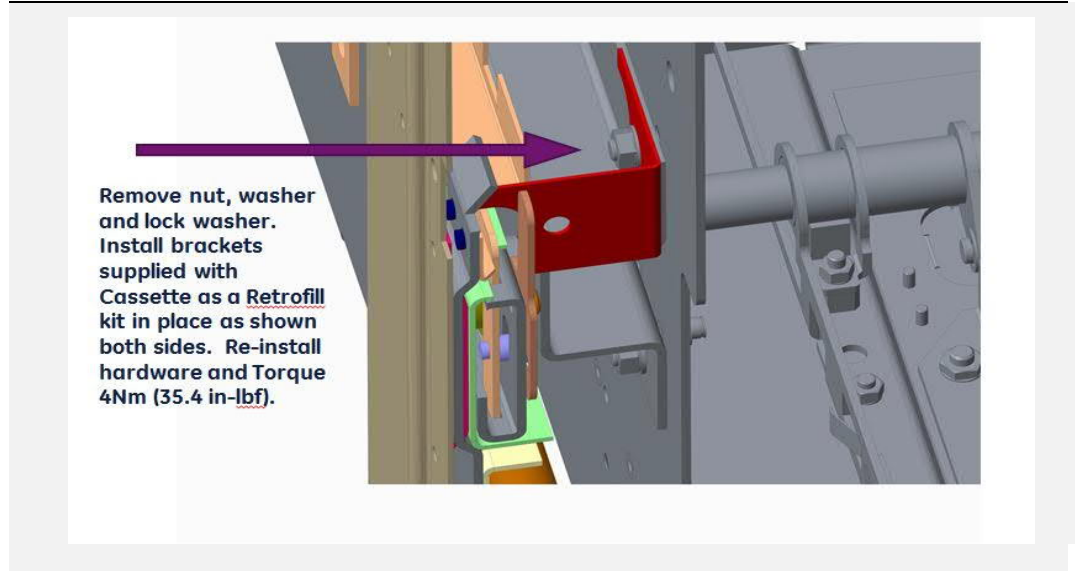
Figure 62

AKD-5, AK25 Cassette or Substructure, Now Racked In



## Install Cassette Rail Lever Lockout Brackets AK/AKT50 Compt's only

Figure 63



Install lock bracket (AK-25/AK50 + cabinet only)



- It must be ensured that the supply power to the compartment is turned off/ compartment is de-energized 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.

1. Check that the retrofitted Emax 2 cassette has been completely racked into the cabinet.
2. Slide the bracket back into position as shown in the image below (Figure 46) and line up the holes previously drilled with the holes on the locking bracket (figure 47).
3. Secure the bracket to side frame by using two self-tapping screws provided with the kit (figure 48 & 49) .

Tools required: Spanner, 0.2-inch drill bit, hand drill.



# Install AKD5 Retrofill Breaker

## Danger



- It must be ensured that the supply power to the compartment is turned off/ compartment is de-energized 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.

1. Before inserting the retrofit breaker into the cabinet, make sure that the breaker is switched off. If the spring indicator shows that it is charged, the assembly needs to be discharged, by first switching on the breaker and then switching it off.

After racking in the cassette, get ready to install the AKD-5 breaker assembly by installing lifting plates). Use a tool or screwdriver to keep them up, if necessary (figure 64).

Figure 64

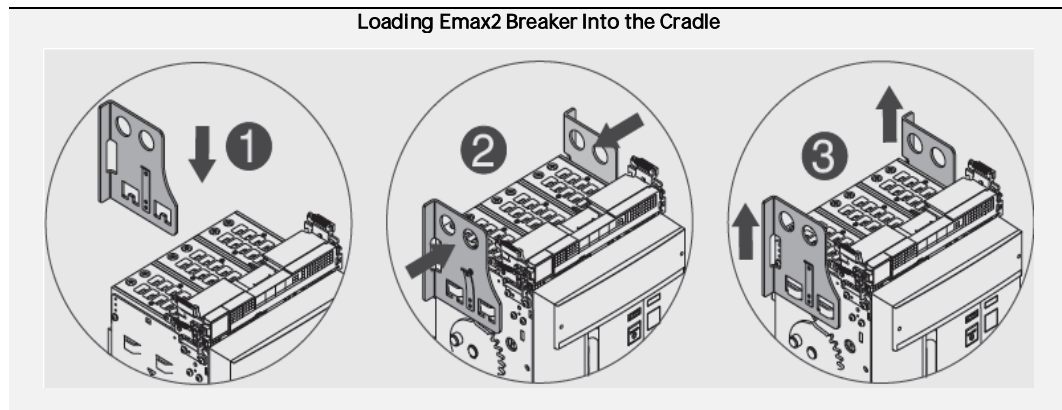
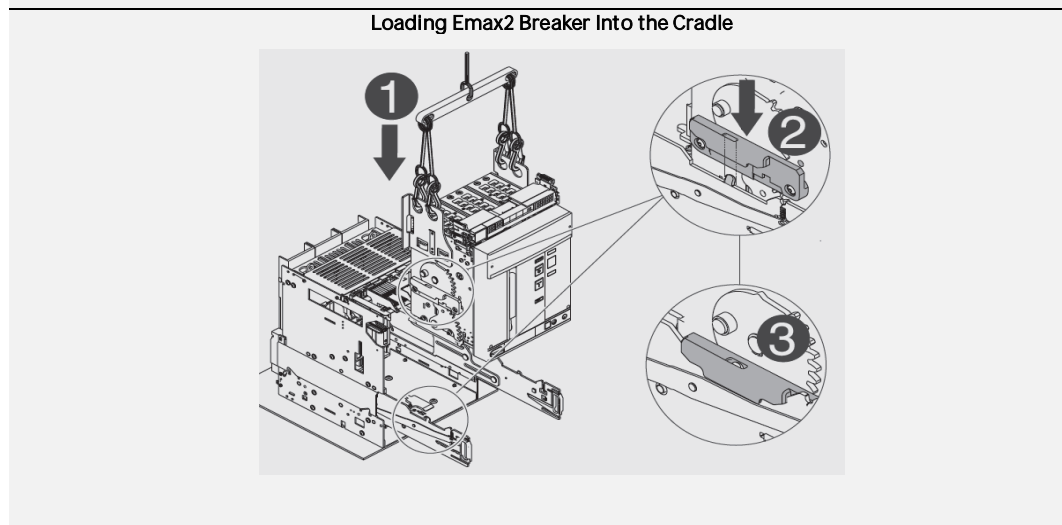


Figure 65



2. Use an appropriate lifting device to install the breaker. See figure 65.
3. Make sure that the lifting plates are secured and locked in place on the breaker.
4. Put the breaker in front of the unit where it is to be installed, leaving enough clearance to swing the compartment door open to access the enclosure (figure 66).
5. When the breaker is lined up with the compartment, raise the breaker only slightly higher than the compartment floor, keeping it at a slight angle.
6. Open the compartment door, to install the breaker in the cassette (figure 67).

Figure 66

Cabinet with Compartment, Door Closed



Figure 67

Cabinet with Compartment, Door Open

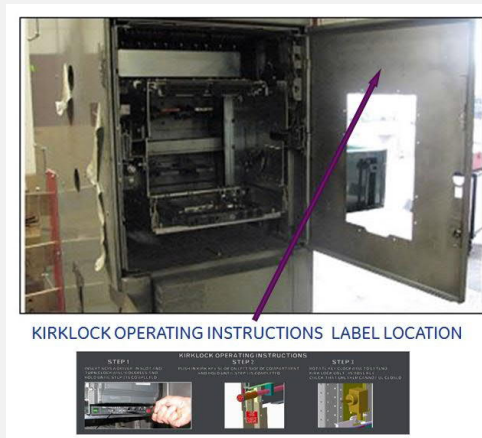
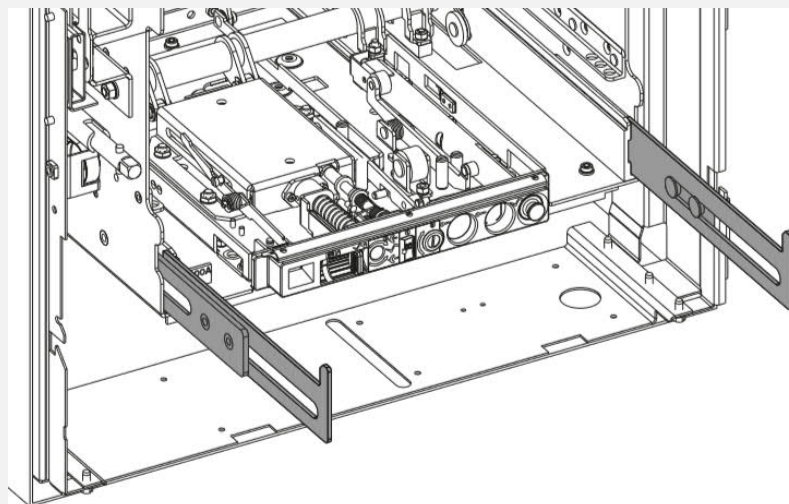


Figure 68

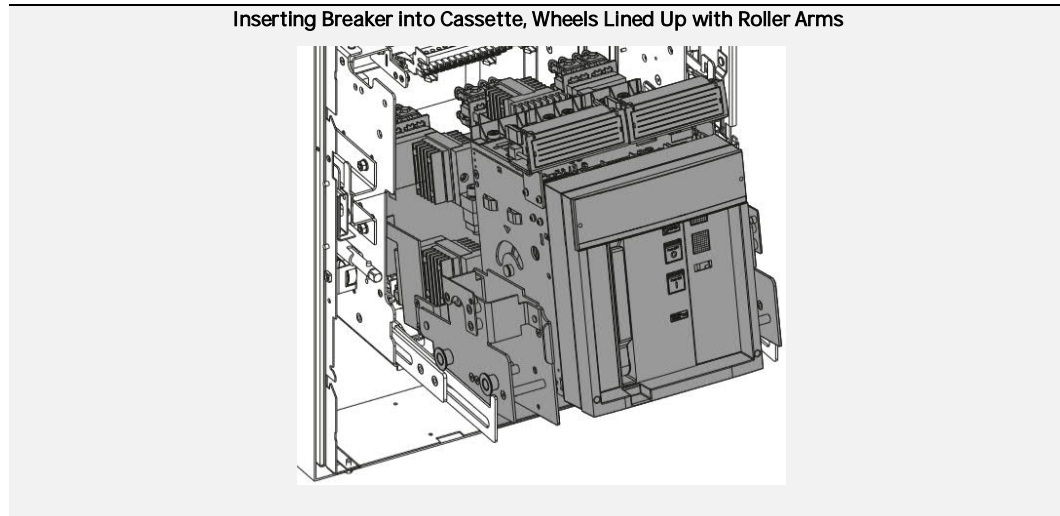
Racking Arms / Loading Rails, Extended



Check that the cassette is free from obstruction. (Figure 69) displays the racking assembly, supporting the new retrofit breaker and Kirk Lock Information Label supplied with **AK-50** & **AKT-50** Retrofit Cassettes.

7. If the racking panel of the cassette is padlocked, it may need to be opened to access the racking mechanism.
8. Verify that the cassette position indicator shows **DISCONNECTED** and the racking handle is disengaged.
9. **Ensure that the cassette racking cams on both side walls of the cassette are in the completely racked-out position. (Only for AKT 50 and show the image for the racking cams position)**
10. Pull out the two cassette Loading Rails to their full extent, horizontal to ground (Figure 69).

Figure 69



11. Lower the circuit breaker gradually, at an angle, so that the rollers drop over the rails. Make sure that the grooves in all rollers straddle the rails as shown in Figure 69.

This might need a two-man effort: one to carefully and slowly lower the suspended breaker and the other to guide the breaker into the cassette enclosure. See Figure 69.

12. Keep the breaker steady. Continue to guide the breaker, while checking both sides and underneath the assembly, so that both sets of wheels can be lowered easily on the cassette rails (Figure 70). Check that the grooves in all rollers straddle the rails.

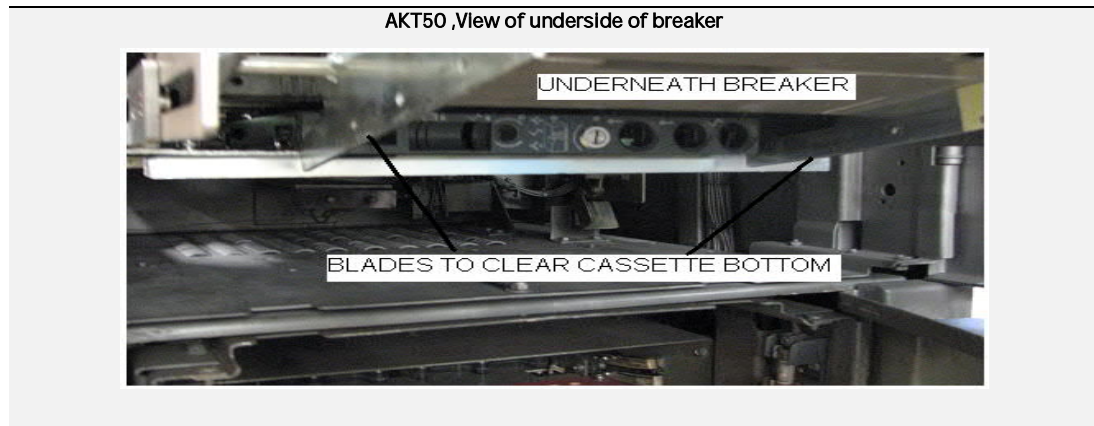
Figure 70



13. Peer underneath the breaker, as you maneuver it in, to make sure that the dual blades clear the bottom of cassette (Figure 71).

Refer Emax 2 installation manual (1SDH001000R0002) for installing Emax 1.2, 2.2, 4.2 & 6.2 MP (Moving Portion) into the AKD5 compartment.

Figure 71



14. Using the hand grips on either side, move or push the circuit breaker into the cassette until it reaches a positive stop (the rollers on circuit breaker are engaged with the racking cams of the cassette on both sides).The circuit breaker is now in the DISCONNECTED position (figure 72).
15. Push back both the extended rails of the cassette to the stowed position.
16. If the circuit breaker is ON and the springs are charged, to turn the breaker off, press the OPEN button on the circuit breaker fascia and ensure the circuit breaker contacts are open.
17. Remove racking tool (figure 73) from the storage location on the cassette right front panel

Figure 72

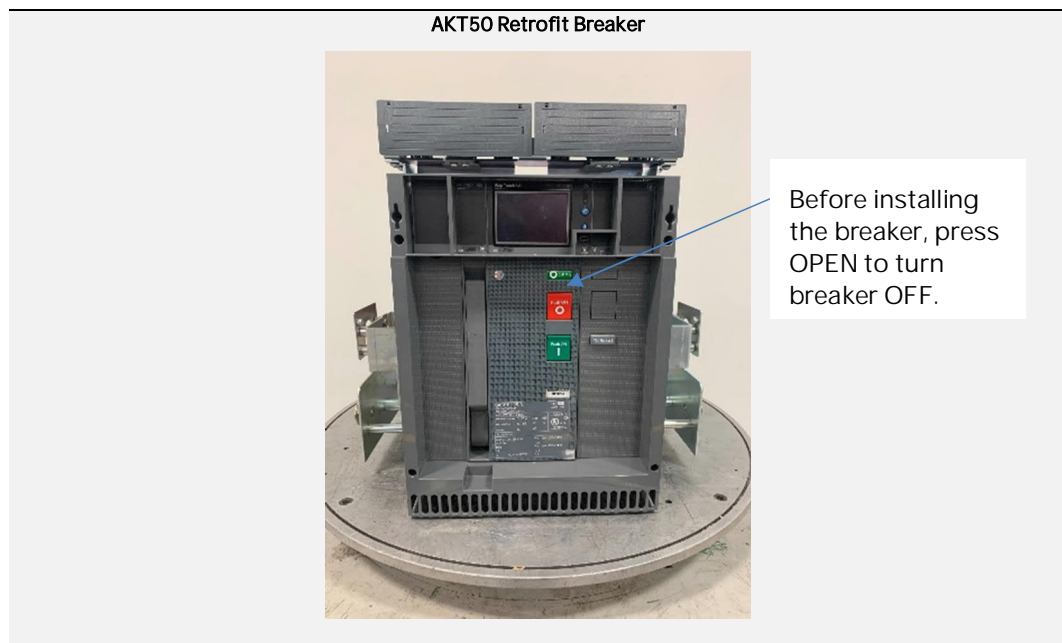
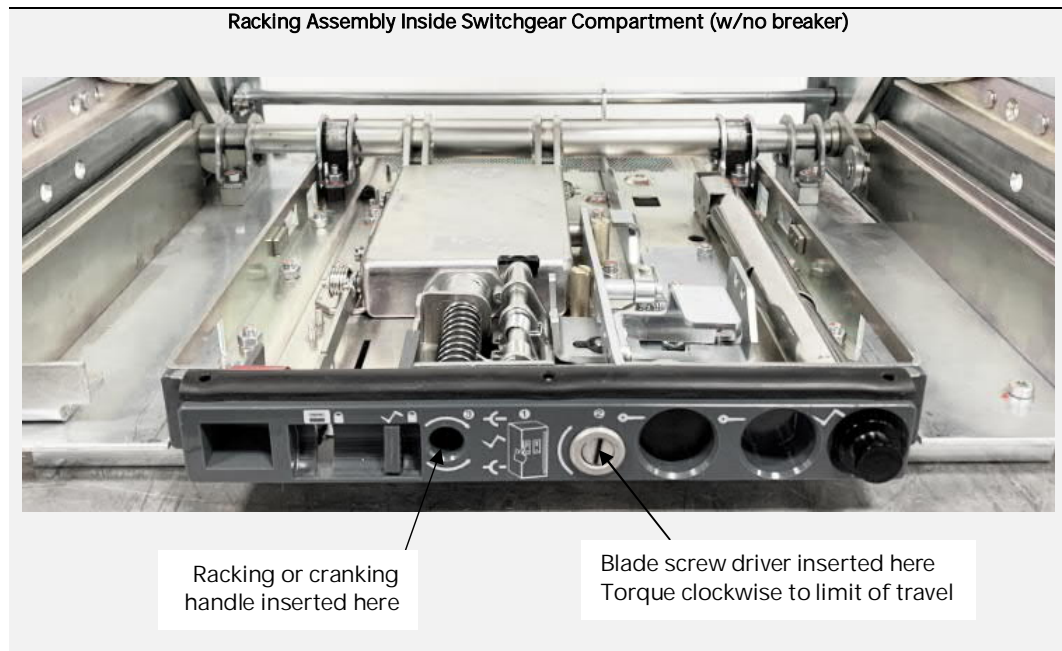


Figure 73



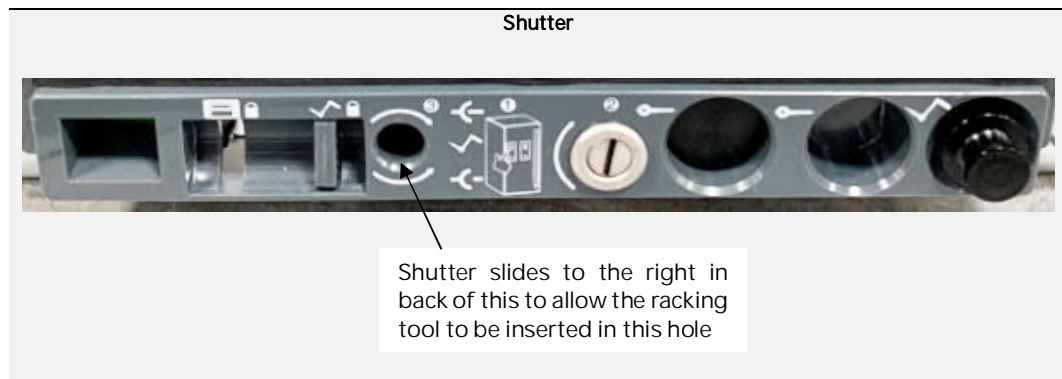
18. Extend the racking tool to create a cranking device (figure 76) shows the racking tool extended.

Figure 74



19. Insert a screwdriver in slot or rack-out lock, and turn it clockwise 90° so that racking handle shutter opens and insert racking tool. (It resembles a vehicle ignition lock. See figure 76)

Figure 75



20. Insert the tool so it engages the racking mechanism inside the hole.
21. Then, crank clockwise so that the breaker starts to move in, slowly sliding forward. Rotating clockwise ~ 37 turns racks the circuit breaker all the way into the cassette.

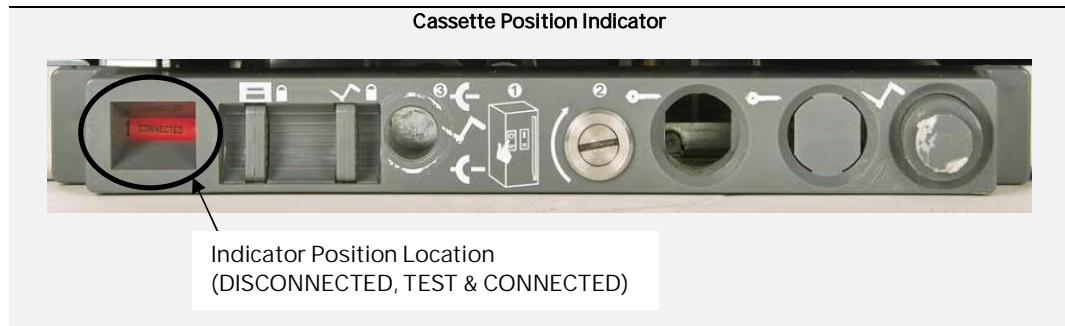
Figure 76



22. As the breaker approaches the TEST position, check the alignment of the fixed and moving parts of the secondary disconnect contacts. (If a motor-spring charge or under-voltage release is installed, the device may operate when approaching the TEST position)
23. Continue rotating the racking handle clockwise until the position indicator first shows TEST, then CONNECTED.

NOTE 1: When approaching the CONNECTED position, effort to turn the racking handle increases as the primary finger clusters engage with the AKD-5 bus stabs.

Figure 77



24. Keep cranking until reaching a positive stop. Full travel is about 37 turns and about 3 turns after the indicator first shows Connected. At this point, the fingers at the back of the circuit breaker should be properly engaged on the bus stabs of the AKD-5 switchgear.
25. Using a light and mirror try to make an observation of the primary disconnect fingers to be sure they are making good contact on the flat portions of the switchgear bus stabs.
26. Remove and store the racking handle in its storage location.

Note that the circuit breaker is now ready for normal operation

## 21 - AK/AKT50 Kirkey Interlock

The Emax 2.2 Retrofill circuit breakers provided as replacements for AK/AKR circuit breakers have a trip interlock feature which will function using the AKT-50 compartment mounted Key Interlock. A label is provided with full instructions on how to operate the Legacy Key Interlock. It is suggested to apply label on inside of the compartment door (figure 67). 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 cassette 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.

For detail instructions for AKD-5 , 600A & 1600A for CiC solution refer Kir Key installation & operation manual 2TSA451013P0000

## 22 - Secondary Disconnects, Bullets

AK 25 & 50 Emax 2 is Retrofill with CiC solution, so secondary disconnects are pre-installed with the breaker (mounted on the breaker). Figure 78 & 79 shows the AKR disconnects installed on the AK 25 Emax 2 Retrofill cassette. Max up to 4 blocks of secondary disconnects can be installed on AK 25 Emax 2 retrofill cassette (28 points)

The wiring harness for the secondary disconnects, located on the AKD-5 retrofill cassette, has 21 wire connections (grouped in three blocks (A, B, C)) for AK50 or 28 wire connections (grouped in 4 blocks (A, B, C, D)) for AK25, with seven wire connections for each block. Each wire is clearly labeled, or identified, with wire markers or tags. Each wire on the 21-wire harness is connected to a bullet. Each bullet, when the cassette is racked in, engages with its respective points in the switchgear. The wires for Block A are identified as A1, A2,...A7. Block B wiring is likewise labeled as B1, B2, B3,...B7. Block C contains C1, C2,...C7. The end, opposite of the bullets, maps or connects to the Emax 2 Retrofill Cassette 78-point, secondary-disconnect. For example, if bullets A1 and A4 are reserved for the motor, they connect to points A1 and A2 on the cassette's 78-point, secondary-disconnect for a motor. Each breaker needs to be landed in the field based on the specifics breakers wiring diagram and modifications made in the field.

Figure 78

AK25 Retrofill Breaker Cassette Assembly (Rear View)



Figure 79

AK25 Retrofill Breaker Cassette Assembly (Front View)



Figure 80 is a photo of the AKD-5, AK25 harness & Figure 81 is an AKD-5—AK25 C-block photo.

Figure 80

AK25 Harness, Side View

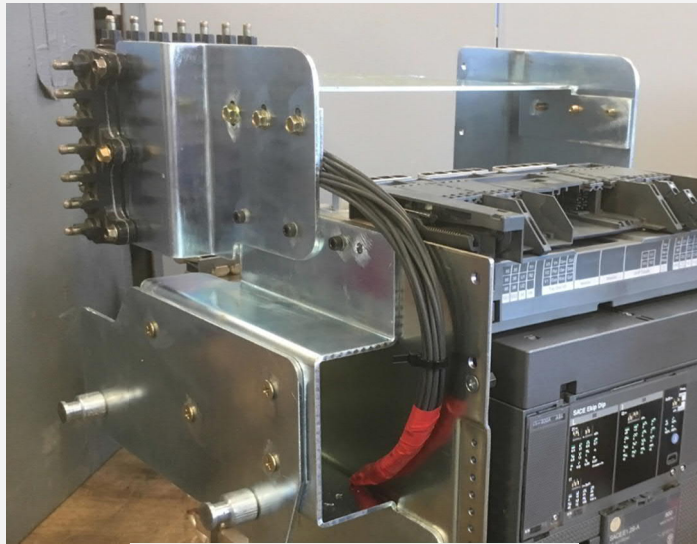
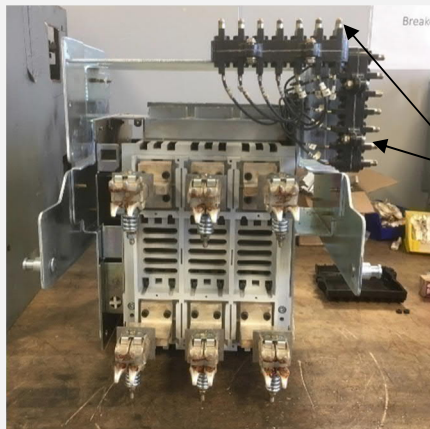


Figure 81

AK25 C-Block Harness



Top and side mounted secondary disconnect wiring / connections

## 23 - Wiring diagram and Block info (AK25)

Additional wire markers, cable ties, spade terminals, and sticky pads are provided. Refer to the AK wiring scheme Figure 82 and land the wires on EG-fixed secondary-disconnects. Wires are cut to size and crimped with the terminal lugs, and provided with wire markers. Harness by cable ties is completed and overhanging wires are checked. Similar to the AKD-5 AK25, the AKD-5 AK50 breaker roll-in replacement uses a similar wire harness and is mounted on the cassette.

Get these tools needed for task: Philips head screw driver, wire strippers, crimps & tiewraps.

1. Identify each bullet using the legacy wiring diagram and any changes that were made to the legacy compartment. Four-wire ground fault CTs are wired through a dedicated neutral disconnect vs. the secondary bullets.
2. With each bullet identified, land the non-bullet side to the corresponding feature on the Emax 2 secondary disconnects

If a wire is too long, cut the wire, crimp a new connector, and install the provided wire markers on the bullets.



Figure 82

Example wiring diagram for AK25 secondary disconnects

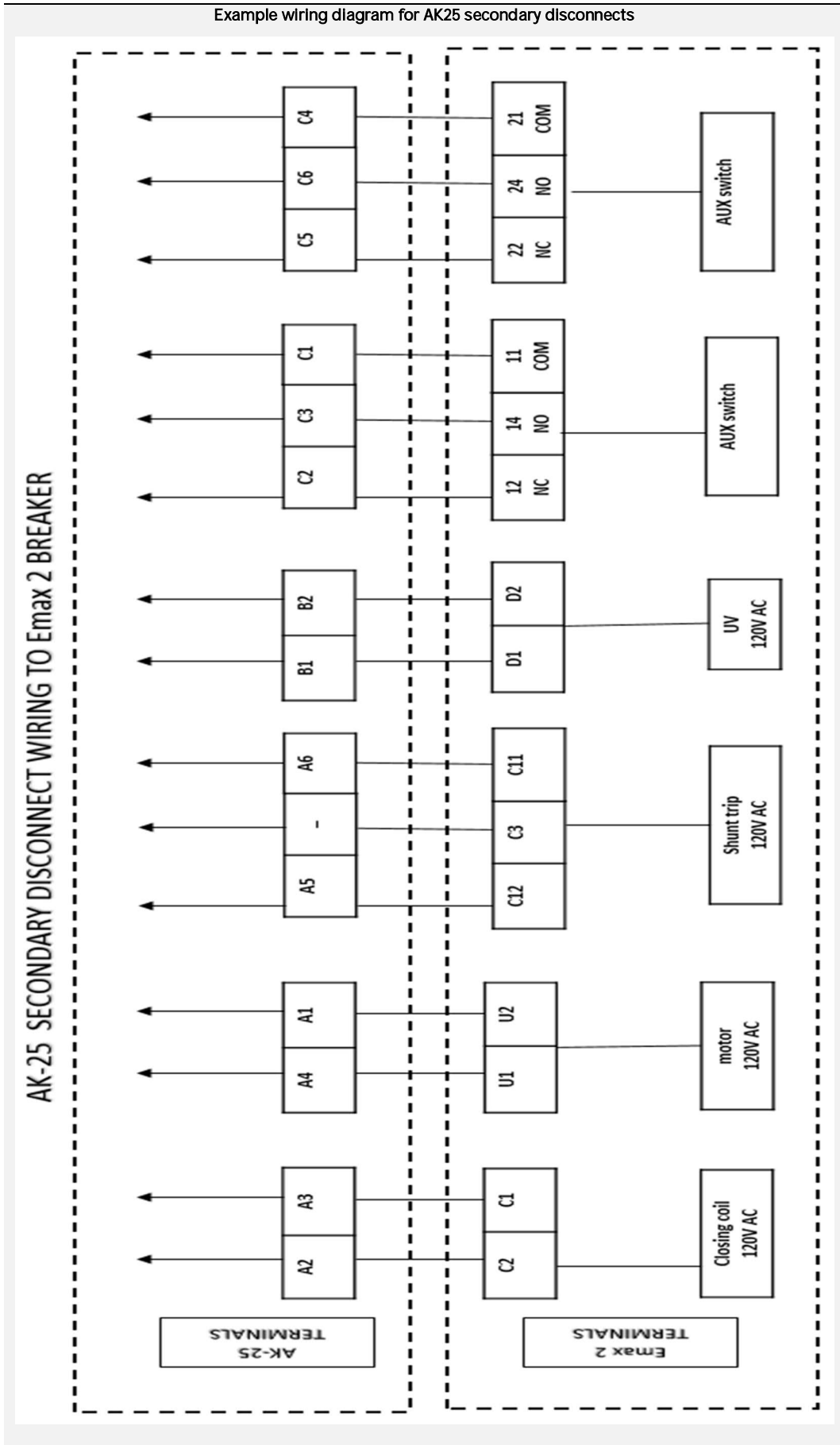
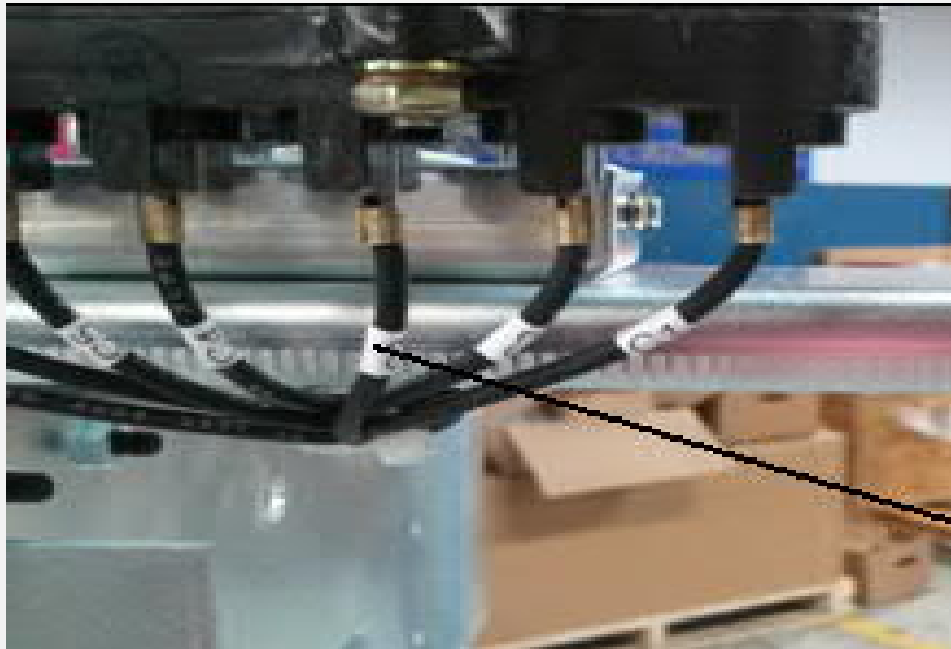


Figure 83

Example of AK25 Secondary Disconnects (Images)



Figure 84



Below are tables :

- Table 5 for for Emax 2 AKT50 Retrofill
- Table 6 & 7 featuring the two 39-blocks (A and B). They make up the 78-point secondary-disconnects.

Table 5 & 6

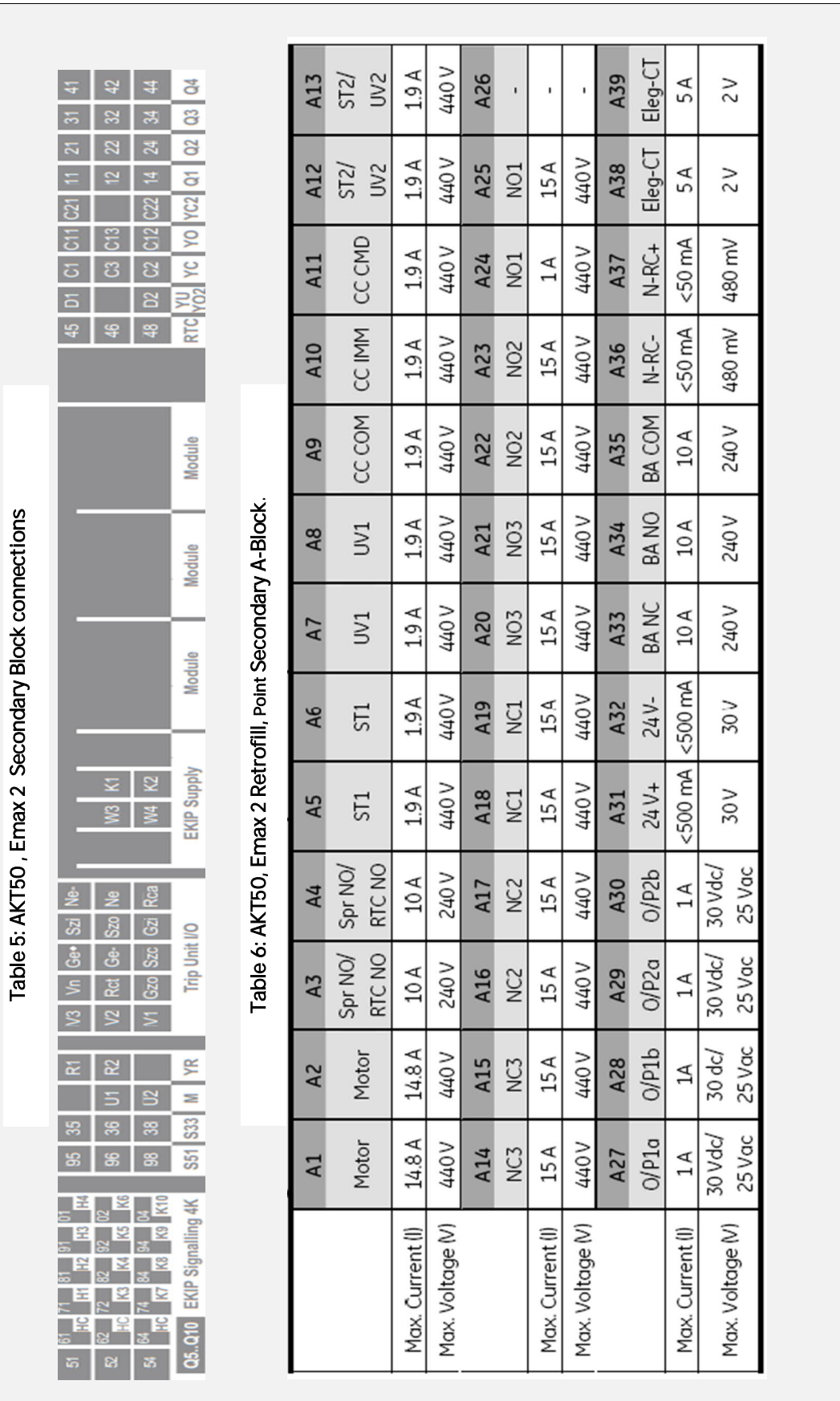


Table 7

AKT50, Emax 2 Retrofill, Point Secondary B-Block

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13
	INPUT1	INPUT2	I/P COM	ST1 NO/ NC8	ST1 COM/ NC8	UV1 NO/ NC7	UV1 COM/ NC7	NC6	NC6	NC5	NC5	NC4	NC4
Max. Current (I)	<50 mA	<50 mA	<50 mA	10 A/15 A	10 A/15 A	10 A/15 A	10 A/15 A	15 A	15 A	15 A	15 A	15 A	15 A
Max. Voltage (V)	30 Vdc/ 25 Vac	30 Vdc/ 25 Vac	30 Vdc/ 25 Vac	240 V/ 440 V	240 V/ 440 V	240 V/ 440 V	240 V/ 440 V	440 V	440 V	440 V	440 V	440 V	440 V
	B14	B15	B16	B17	B18	B19	B20	B21	B22	B23	B24	B25	B26
	RELT INPUT	COM	-	CC NO/ NO8	CC COM/ NO8	ST2 NO/ UV2 NO/ NO7	ST2 COM/ UV2 COM/ NO7	NO6	NO6	NO5	NO5	NO4	NO4
Max. Current (I)	<50 mA	<500 mA	-	10 A/ 15 A	10 A/ 15 A	10 A/ 15 A	10 A/ 15 A	15 A	15 A	15 A	15 A	15 A	15 A
Max. Voltage (V)	5 V	0.1V	-	240 V/ 440 V	240 V/ 440 V	240 V/ 440 V	240 V/ 440 V	440 V	440 V	440 V	440 V	440 V	440 V
	B27	B28	B29	B30	B31	B32	B33	B34	B35	B36	B37	B38	B39
	ZSI out+	ZSI out-	ZSI in+	ZSI in-	ISO GND	5V ISO	TX EN 1	RX	TX	GND Volt-IN	Volt-A	Volt-B	Volt-C
Max. Current (I)	<50 mA	<50 mA	<50 mA	<50 mA	<500 mA	<500 mA	<50 mA	<50 mA	<50 mA	<500 mA	<50 mA	<50 mA	<50 mA
Max. Voltage (V)	28 Vdc	28 Vdc	30 Vdc	30 Vdc	0.1 V	5 V	5 V	5 V	5 V	0.1 V	1.76 V	1.76 V	1.76 V

Photo in Figure 85 shows you the B-block harness and Figure 86 is a close-up photo of the harness Figure 87 shows you the secondary bullets.

Figure 85

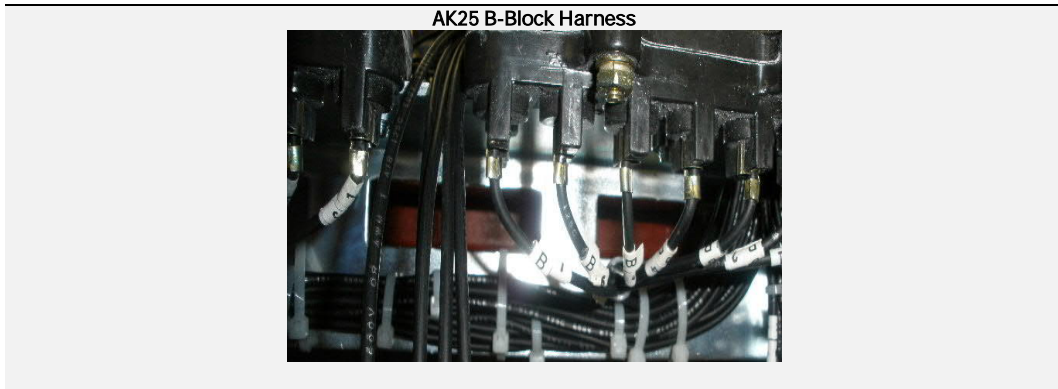


Figure 86



Figure 87

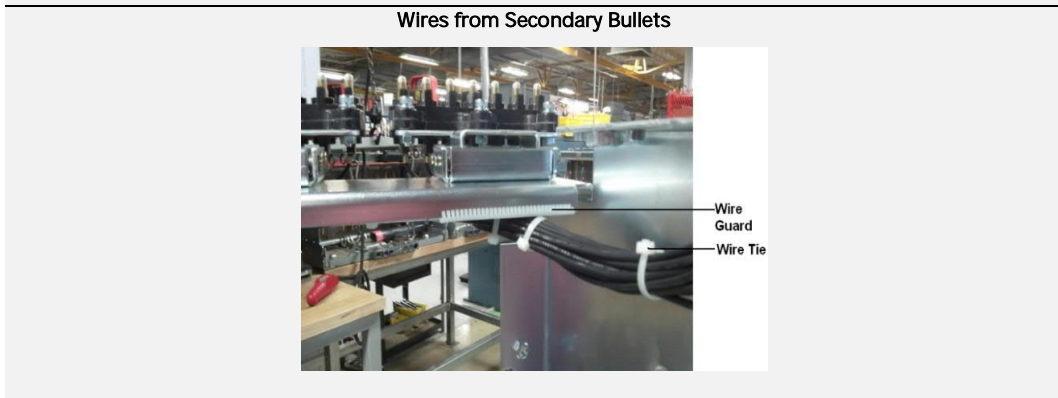
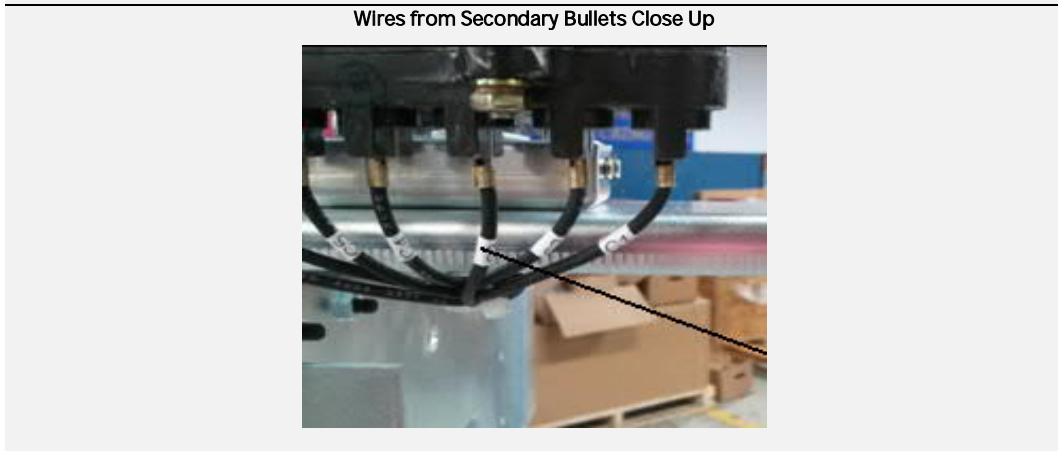


Figure 88



# Install Door Interlock Accessory

Refer the below table for detailed installation instructions for all AKD5 door interlocks.

Table 8	Retrofit Breaker	Installation Manual Number
	AKD5-AK25/Emax 1.2	2TSA451017P0000
	AKD5-AK50/Emax 2.2	1SDH001000R0709
	AKD5-AKT50/Emax 2.2	DEH-41304

Below representations are provided only to show the overview of the interlock assemblies.

Figure 89

Components that make up AKD-5, AK25 Retrofit Door Interlock assembly

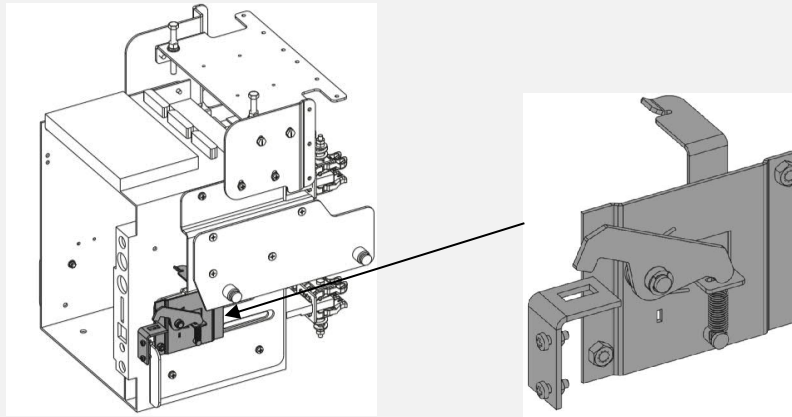


Figure 90

Components that make up AKD-5, AK50 Retrofit Door Interlock assembly

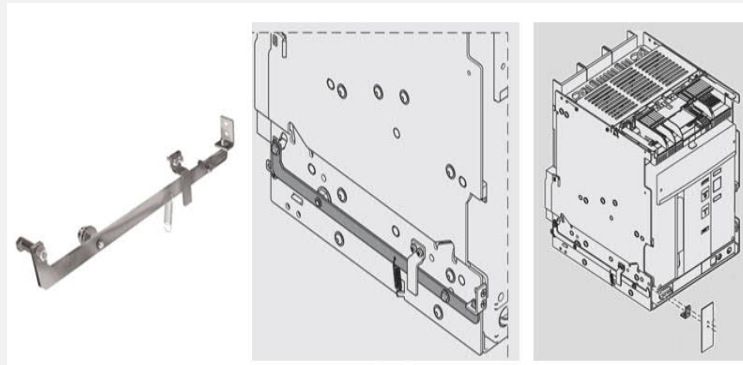
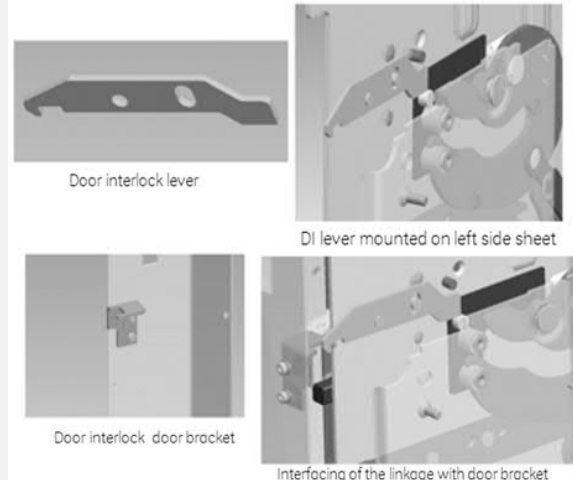


Figure 91

Components that make up AKD-5, AK50T Retrofit Door Interlock assembly



# New Door Installation



Refer 2TSA451007P0000 for detailed installation instructions for all AKD5 Doors/**Door Adapters**

Table 9

Retrofill Breaker	Installation Manual Number
AKD5-AK25/Emax 1.2	1SXU200040C0201
AKD5-AK50/Emax 2.2	1SXU200040C0201
AKD5-AKT50/Emax 2.2	1SXU200040C0201

Below representations are provided only to show the overview of the interlock assemblies.

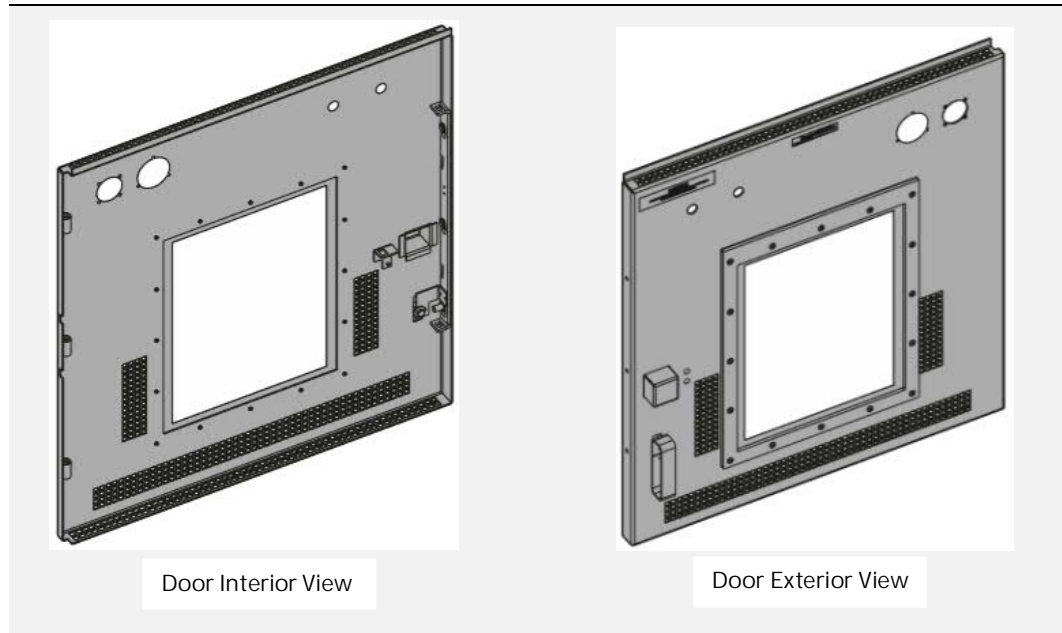
## Danger

	<ul style="list-style-type: none"> <li>It must be ensured that the supply power to the compartment is turned off/ compartment is de-energized for all the incoming and outgoing circuits of the LVS prior to any work being conducted on it.</li> <li>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.</li> </ul>
	
<ul style="list-style-type: none"> <li>Ensure only qualified personnel install, operate, service &amp; maintain all electrical equipment.</li> </ul>	

## Install New Door Or Door adaptor

- Remove existing compartment door(s) and remove hinge block using #2 Phillips headed screw driver.
- 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 new door depending on door size and door cutouts for accommodating lamps, ammeters & detail procedure refer to document 2TSA451007P0000

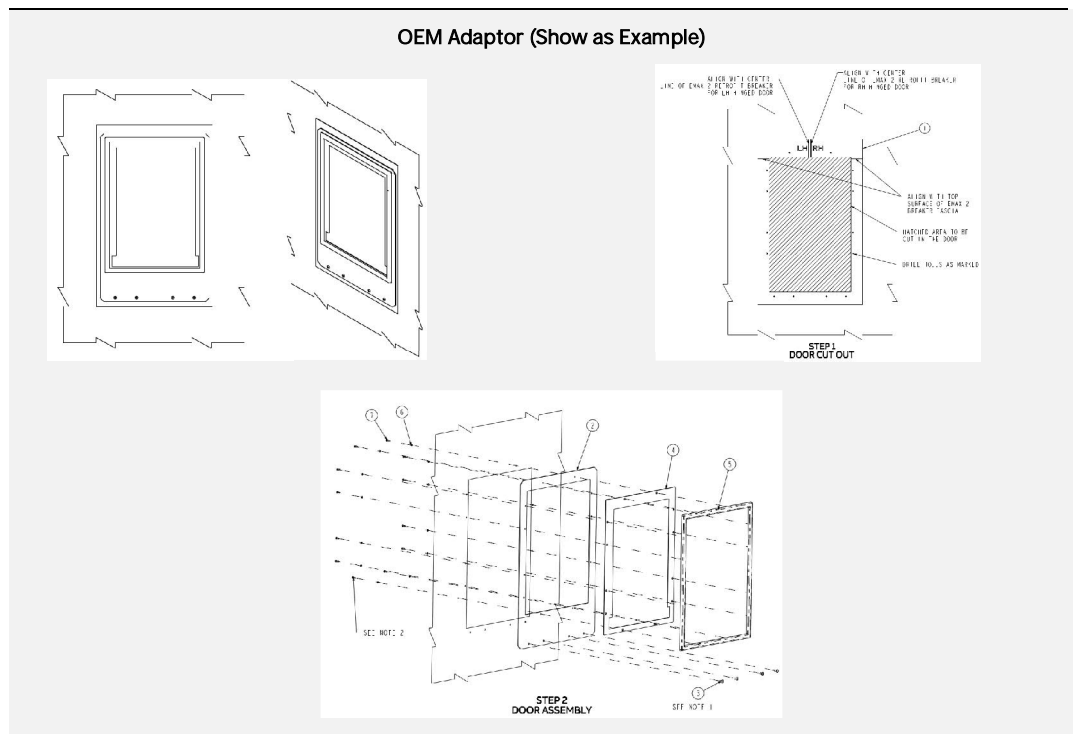
Figure 92



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 AK/AKR 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 93






## Install AKD-5, Neutral Sensing for 4 Wire Ground Fault


Danger



**⚠ DANGER**

Shock and arc flash explosion hazards.  
Follow ALL requirements in NFPA 70E for safe work practices and for Personal Protective Equipment.





- 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.

### 25 - AKD-5, Neutral Disconnect Assembly

Refer 2TSA451018P0000 Installation Manual for Neutral Disconnect Assembly

### 26 - AKD-5, Neutral Disconnect Assembly, Bus Compartment

AKD-5 Emax 2 Retrofill Circuit Breaker uses an air-core Rogowski Current sensor to measure current level. Legacy AK and AKR breakers used iron core CTs. For the Retrofill breaker to calculate the current levels on a 4-wire circuit, the Neutral Iron Core CT in the cable compartment needs to be replaced with a Rogowski style CT.

The Rogowski CT comes mounted on copper bars matching the same hole-pattern as the existing neutral bar. Neutral CT wires from the Rogowski coil to the AKD-5 grey terminal blocks must be run as a "twisted pair".

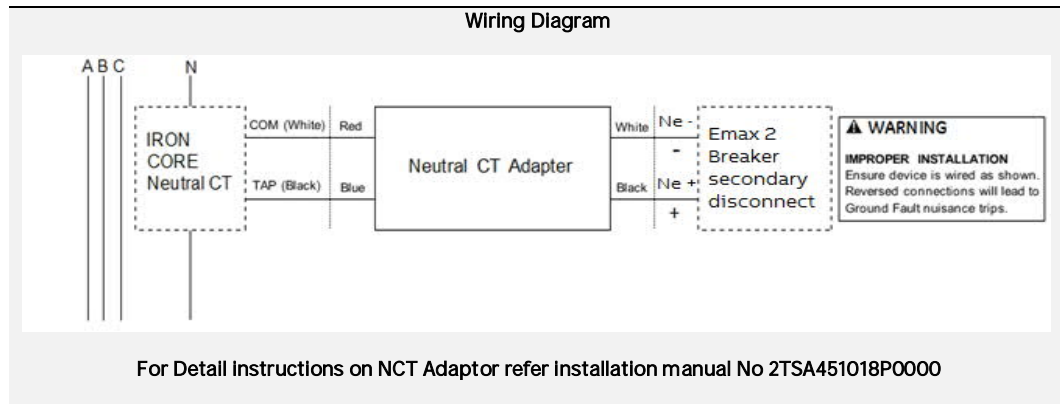
### 27 - AKD-5, Neutral CT Adapter upto 5000A

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, MVT Plus & PM, 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 95



## 28 - Procedures

Notice

	<p><b>NEUTRAL CT ORIENTATION</b></p> <ul style="list-style-type: none"> <li>Write down the orientation of the existing Iron core CT and the polarity of the connections. The orientation and polarity needs to be matched when the air core Rogowski is assembled in the cable compartment.</li> </ul>
---	--

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 from the compartment neutral disconnect to the Rogowski CT. In case of damaged wire, the same must be replaced with new ones as already mentioned.
9. Check for continuity from the CT leads to the plungers on the neutral disconnect assemblies within the LVS compartment. Be sure to orient the CT and wires for proper polarity.
  - The new Rogowski assemblies are installed and ready for use.
  - Tools required: Wrenches, wire stripper, wire cutter, continuity tester.

---

## 29 - AKD-5, Multi-Source Ground Fault

---

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

For 4 wire multi-source Ground Fault systems, the Retrofill should be ordered with a neutral CT adapter. These neutral CT adapters are compatible with MVT style neutral sensors. This will allow the new breaker to operate with the existing Neutral CT in most cases.

Example: Neutral sensor Cat numbers beginning with TSVG & CT part #'s 139C4970G#'s.

**Please note that these neutral CT adapters are not compatible with Power Sensor or SST style neutral sensors. Replace an SST Neutral CT with a TSVG...BK iron core sensor which will be compatible with the Neutral CT Adapter.**

Note: For 4 wire multi-source Ground Fault systems using Rogowski sensors is more difficult and requires that an external GF summing CT scheme must be implemented. This applies to Main—Tie—Main systems or systems with a Main source and then a back-fed generator source.

---

# AK 75 - 3000A, 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**
  - Refer 2TSE432074P1000 and 2TSE432048R1000 for the wire length and lug details.

Figure 96

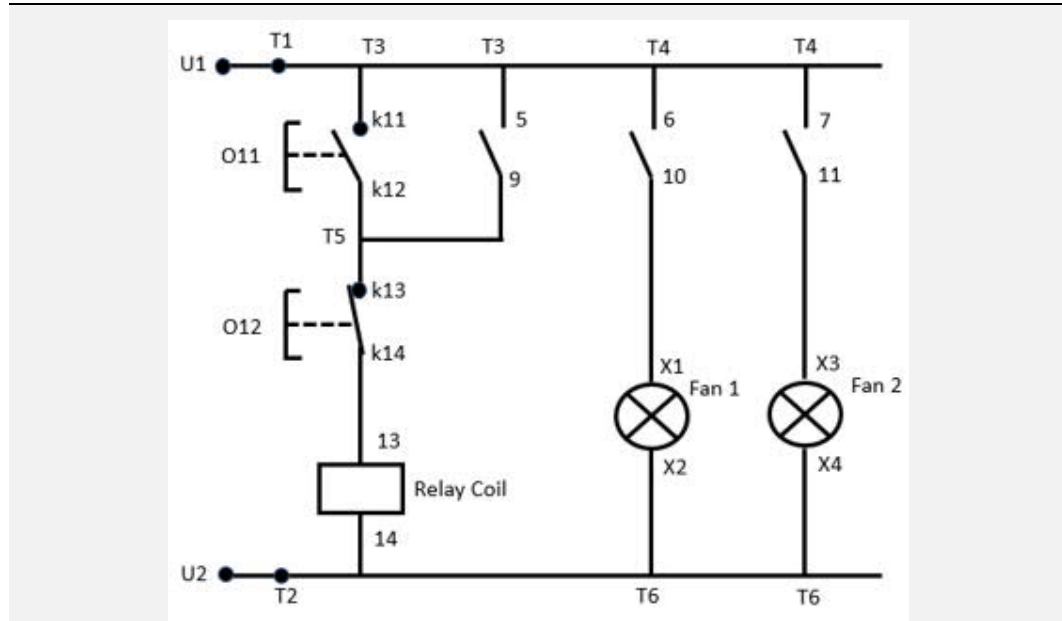


Figure 97

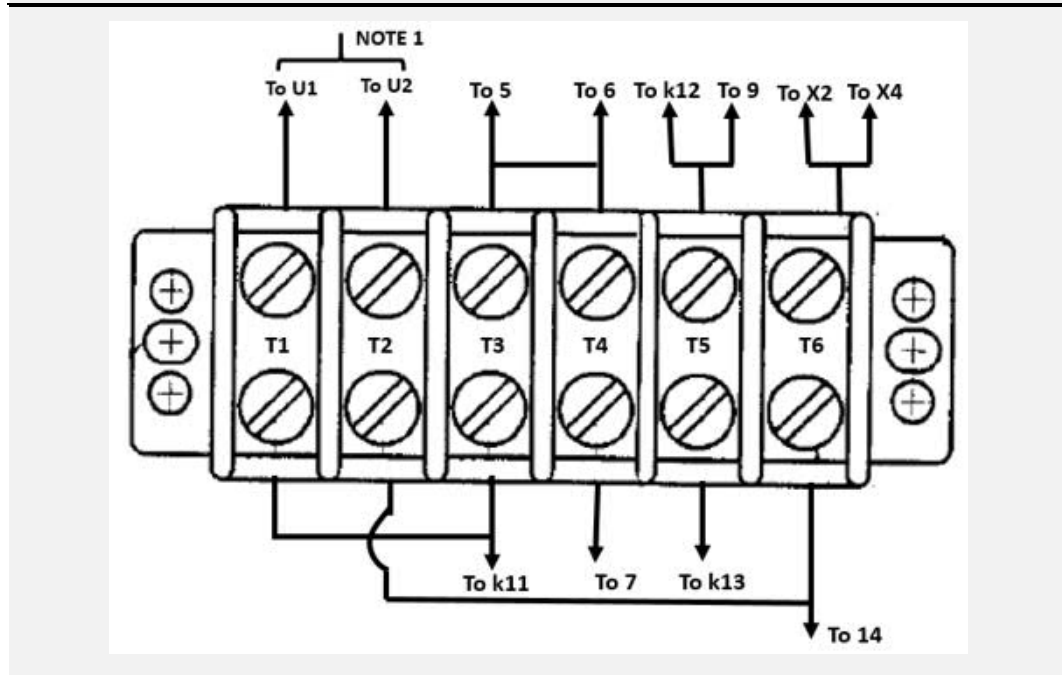
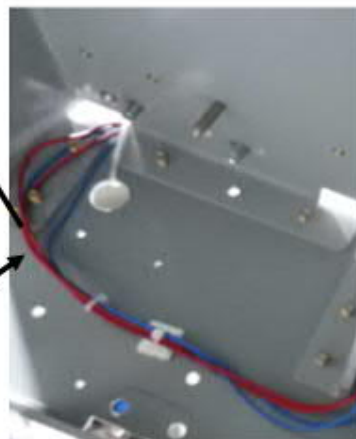


Figure 98

Wiring of WP 4000A Breaker with Fan Control Unit



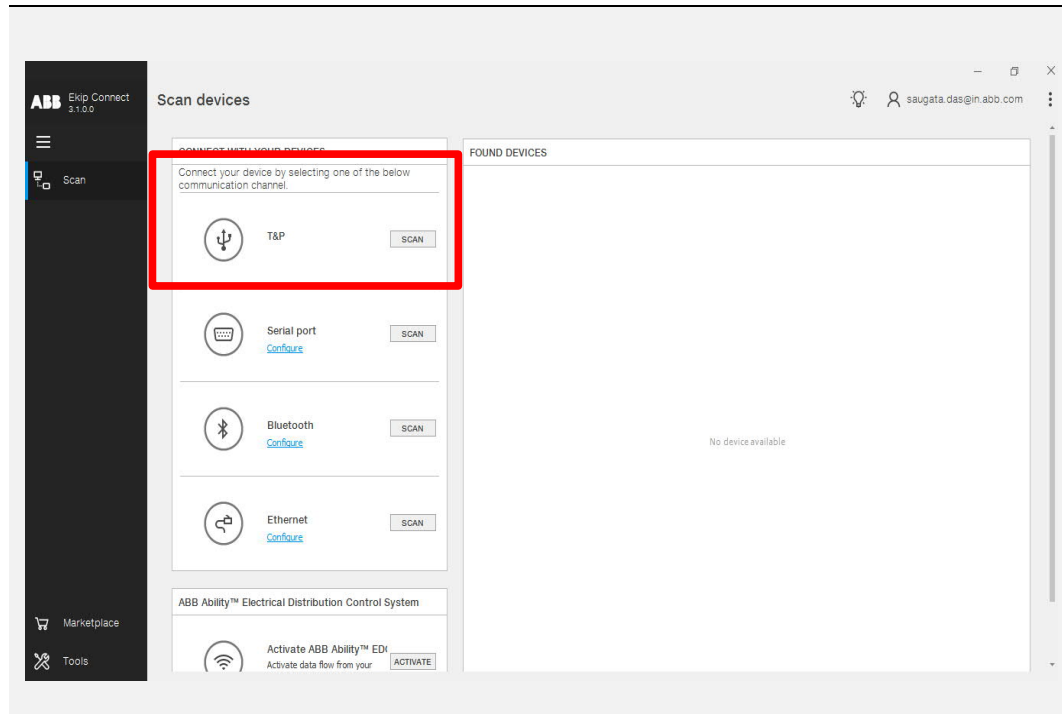
Routing wire to the fans

# Configuring Ekip Touch, Hi Touch Trip unit

## 30 - 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.

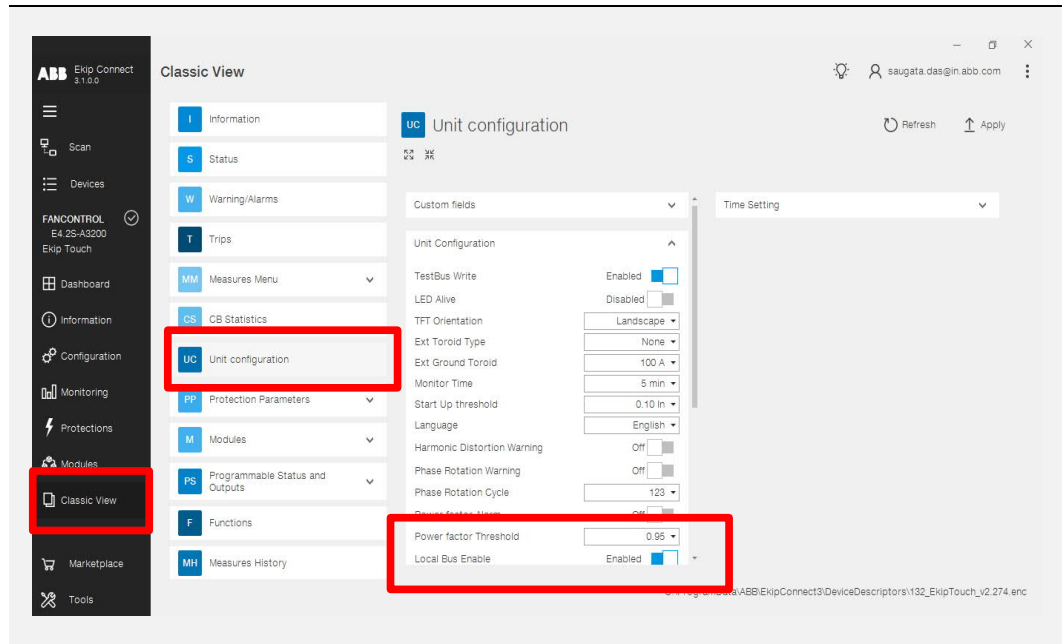
Figure 99



## 31 - Synchronizing 2K-1 signalling modul with the trip unit

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

Figure 100



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

**Check the following for synchronization status.**

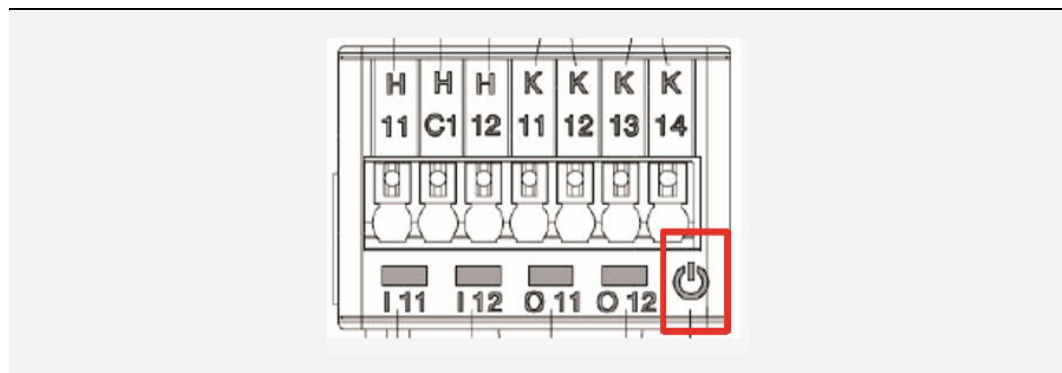
Power LED reports ON status and correct communication with Ekip Touch :

- 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 101



## 32 - Configuring threshold currents

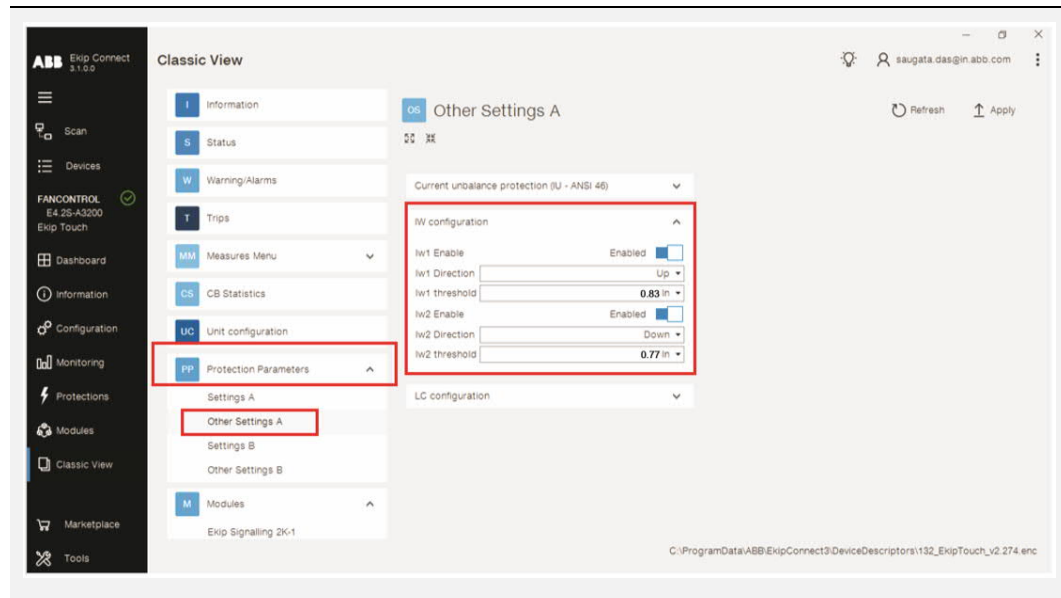
The current thresholds allow you to set controls on current lines, to be combined with the programmable contacts of the Ekip Signalling modules.

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 Iw1 and Iw2.

Figure 102



For AKD5, considering 3000A as a rated current (In), fans will activate when the current crosses 2500 amps & will stop if the current drops below 2300 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 (In), settable in a range: 0.1 In .. 10 In, with 0.01 step In	3 In
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 (In), settable in a range: 0.1 In .. 10 In, with 0.01 step In	3 In



## 33 - Programming 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 103

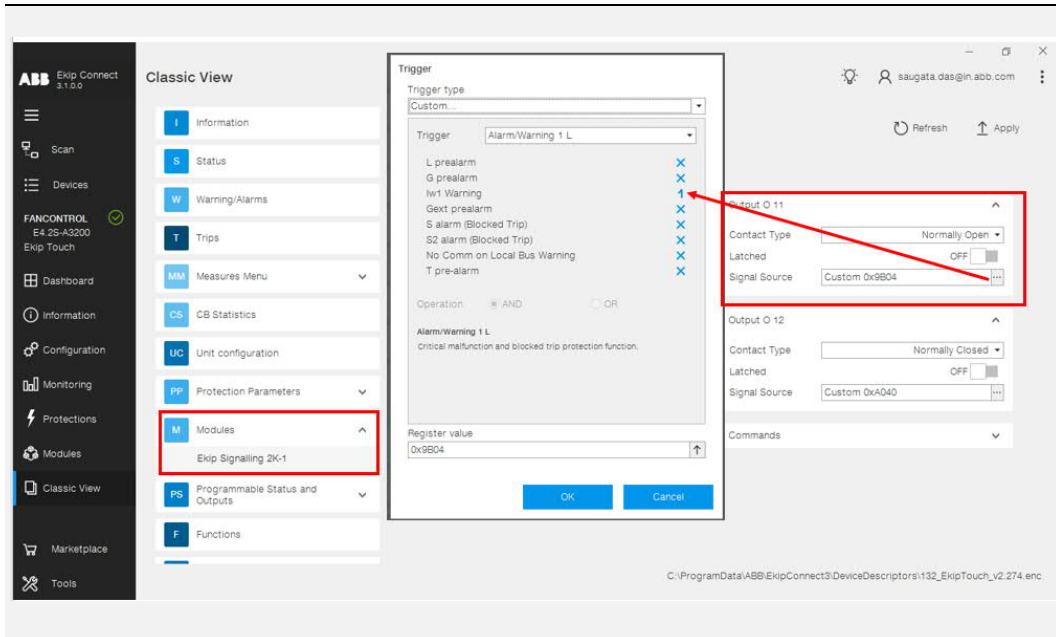
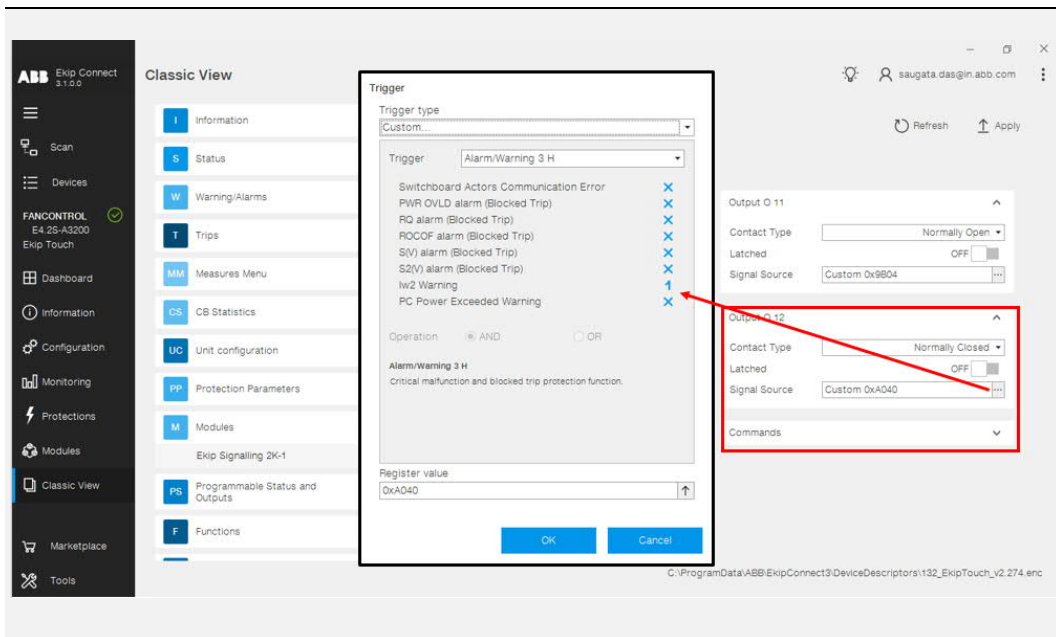


Figure 104



## 34 - 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 105

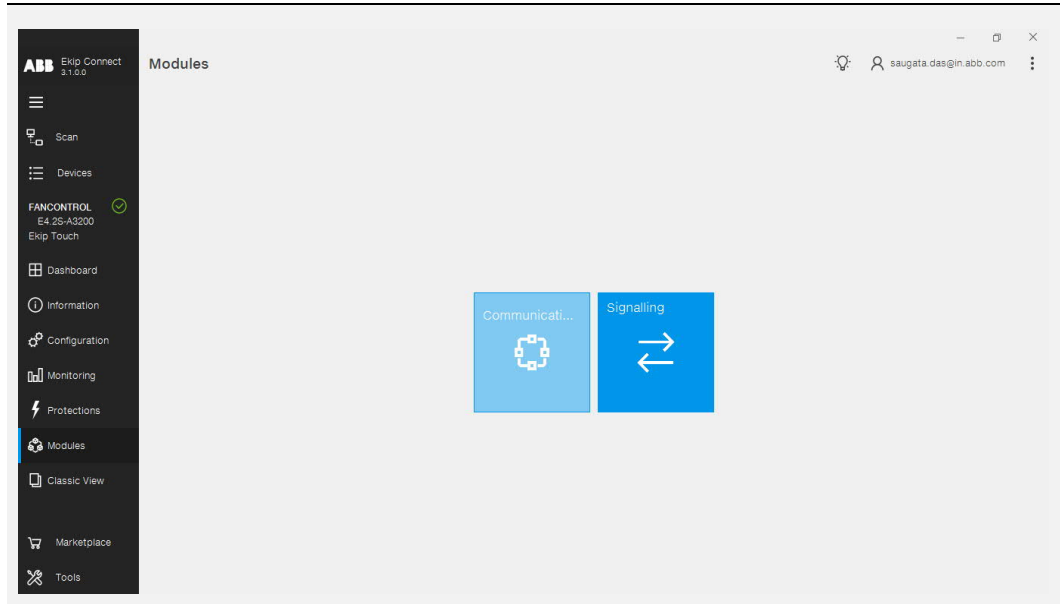
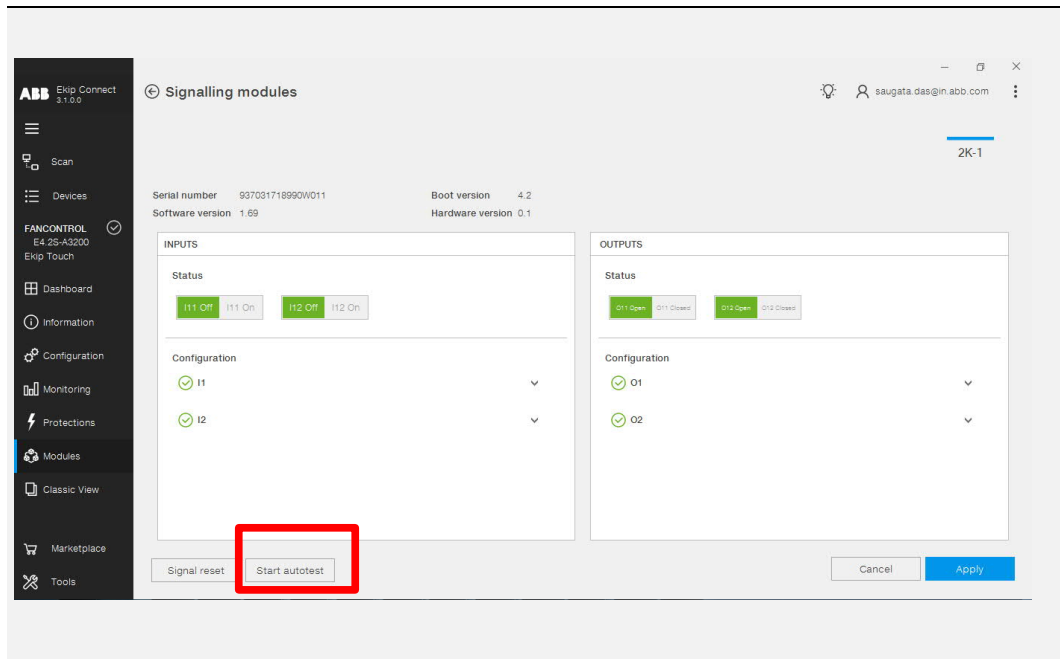


Figure 106



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

## Revisions

Overhaul	ECN	Description
B	ECN000122590	Second version



**ABB**  
**Electrification Smart Power**  
905 Shands Bottom Road,  
City: Senatobia, Zip: 38668  
United States (US)

You can find the address of your local  
Sales organisation on the ABB home page.



<http://new.abb.com/low-voltage/service/service-breakers-switches>

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