

APPROVED FOR EXTERNAL USE



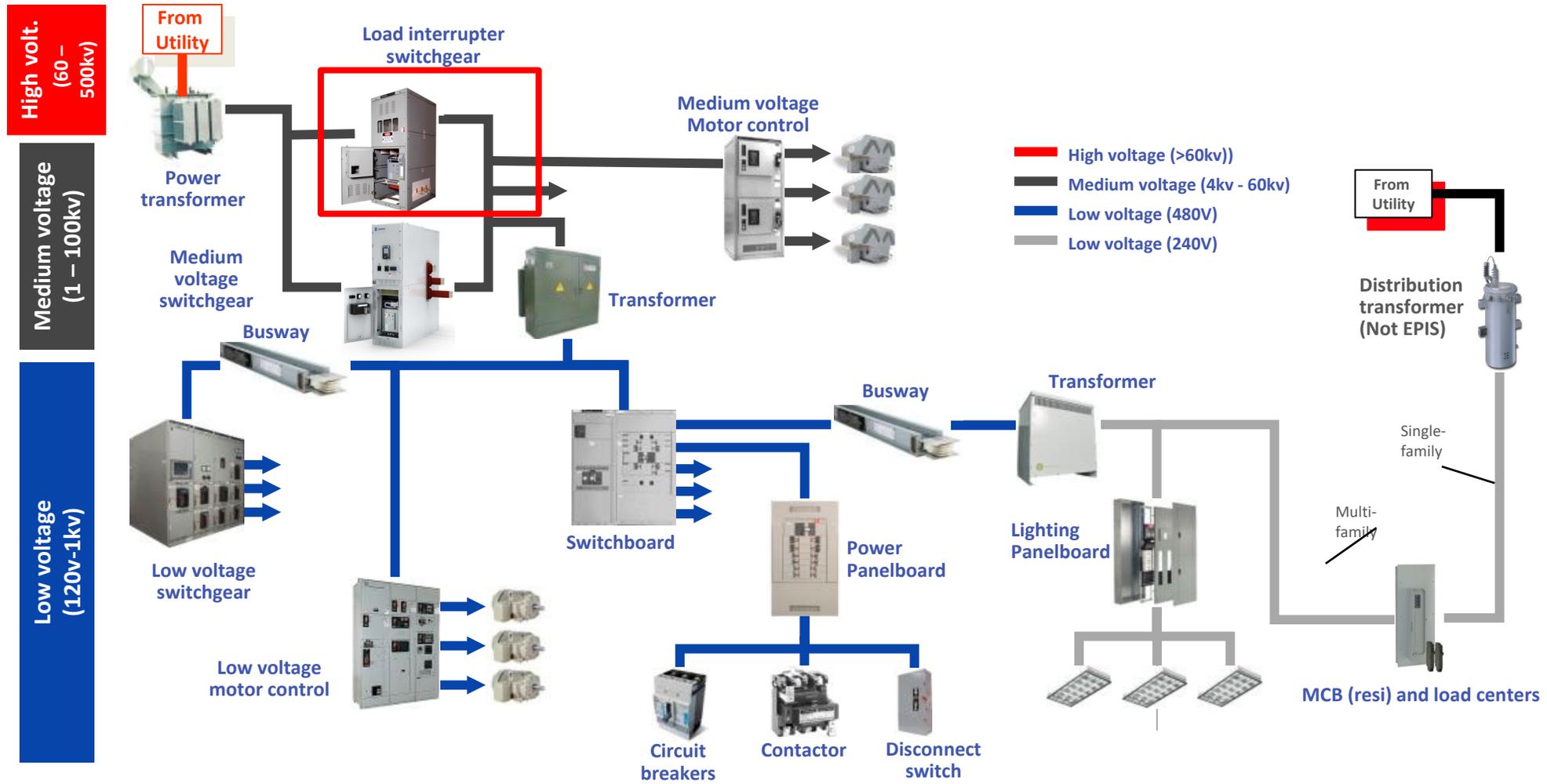
NOVEMBER 2023

# BreakMaster™ LIS and BreakMaster™ V

## Load interrupter switchgear features and benefits

### Customer presentation

# Typical electrical distribution system



---

# BreakMaster™ LIS and BreakMaster™ V

MV metal-enclosed load interrupter switchgear

## Definition

---

Load Interrupter Switchgear (LIS) consists of an air insulated disconnect switch mounted in a metal enclosure. BreakMaster™ LIS is used to provide safe switching and circuit protection where an infrequent means of disconnecting is required.

A LIS can provide fault current protection by using various types of fuses. It is commonly used in a single circuit for on/off control of a transformer, duplex switching, and selector switch applications.

A switch can also be grouped in a lineup configuration with other medium voltage distribution equipment.





# Product Overview

# BreakMaster™ LIS and BreakMaster™ V

## Main features and ratings

- Product built in Monterrey, Mexico, since 2001
- IEEE C37.20.3, C37.20.4, C37.22
- 5-15 KV, 600 A and 1200 A, 40 kA and 61 kA asymmetrical short circuit
- ASCE 7-10, IBC 2021, CBC 2022 and IEEE-693 seismic certification, (Ip 1.5)
- HCAi (formerly, OSHPD) certification for some configurations
- Single, duplex, selector, lineup, lineup with utility, ATS, single-VCB, lineup-VCB offerings
- UL/cUL option available
- NEMA 1, 2 or 3R enclosures available
- Available with SwitchgearMD™ temperature & PD monitoring solution
- Transition available to Advance MV Switchgear
- Segments/industries: oil and gas, pulp and paper, automotive, industrial processes, wastewater, petrochemical



BreakMaster LIS



BreakMaster V

Additional information available for [BreakMaster LIS](#) and [BreakMaster V](#)

# BreakMaster LIS and BreakMaster V

## Ratings

	BM LIS		BM V	
Switching/Interrupting component	VR 40kA (Asymm)	VR 61kA (Asymm)	VR 40kA VD4/VM1 31.5kA (Symm)	VR 61kA VD4 40kA (Symm)
Maximum Rated Voltage	15kV	15kV	15kV	15kV
Maximum rated lightning impulse withstand voltage	95kV	95kV	95kV	95kV
Maximum rated power-frequency withstand voltage	36kV rms	36kV rms	36kV rms	36kV rms
Rated frequency	60Hz	60Hz	60Hz	60Hz
Rated current	600A	1200A	600A	1200A
Maximum rated bus bar current	2000A	2000A	2000A	2000A
Max peak withstand current (Main Bus & Ground Bus)	65kA peak	130kA peak	65kA peak	130kA peak
Max rated short time withstand current (Main Bus & Ground Bus)	25kA rms (Symm)	50kA rms (Symm)	25kA rms (Symm)	50kA rms (Symm)
Rated duration of short-circuit	2s	2s	2s	2s
C2 class capacitive switching			1200A	1200A
Interrupting time			≤ 50 ms	≤ 50 ms



REQ. NO.	<input type="text"/>
FACTORY ORDER NO.	<input type="text"/>
SWITCH SERIAL NO.	<input type="text"/>
MANUFACTURE DATE	<input type="text"/>

RATED MAXIMUM VOLTAGE	KV	<input type="text"/>
IMPULSE WITHSTAND (BIL)	KV	<input type="text"/>
NORM. FREQ. WITHSTAND	KV	<input type="text"/>
FREQUENCY	HZ	<input type="text"/>
CONTINUOUS CURRENT	A SYM	<input type="text"/>
LOAD INTERRUPTING CURRENT	A SYM	<input type="text"/>
MOMENTARY CURRENT	KA ASYM	<input type="text"/>
SHORT TIME - CURRENT	KA SYM	<input type="text"/>
-TIME	SEC	<input type="text"/>
FAULT CLOSING CURRENT	KA ASYM	<input type="text"/>

FUSE RATING	<input type="text"/>
FUSE CATALOG NO.	<input type="text"/>
INTEGRATED SWITCH AND FUSE SHORT CIRCUIT CURRENT	KA ASYM <input type="text"/>

MAIN BUS AMPACITY	A	<input type="text"/>
MAIN BUS BRACING	KA ASYM	<input type="text"/>
ENCLOSURE TYPE	CATEGORY B	<input type="text"/>

**BREAKMASTER LOAD INTERRUPTER SWITCH**

190B9965P1 **ASSEMBLED IN MEXICO**



REQ. NO.	<input type="text"/>
FACTORY ORDER NO.	<input type="text"/>
SWITCH SERIAL NO.	<input type="text"/>
MANUFACTURE DATE	<input type="text"/>

RATED MAXIMUM VOLTAGE	KV	<input type="text"/>
IMPULSE WITHSTAND (BIL)	KV	<input type="text"/>
NORM. FREQ. WITHSTAND	KV	<input type="text"/>
FREQUENCY	HZ	<input type="text"/>
CONTINUOUS CURRENT	A SYM	<input type="text"/>
LOAD INTERRUPTING CURRENT	A SYM	<input type="text"/>
MOMENTARY CURRENT	KA ASYM	<input type="text"/>
SHORT TIME - CURRENT	KA SYM	<input type="text"/>
-TIME	SEC	<input type="text"/>
FAULT CLOSING CURRENT	KA ASYM	<input type="text"/>

VCB RATED VOLTAGE	<input type="text"/>
VCB CATALOG NO.	<input type="text"/>
VCB SHORT TIME-CURRENT	KA SYM <input type="text"/>
VCB-MOMENTARY CURRENT	KA ASYM <input type="text"/>
VCB-FAULT CLOSING CURRENT	KA ASYM <input type="text"/>

MAIN BUS AMPACITY	A	<input type="text"/>
MAIN BUS BRACING	KA ASYM	<input type="text"/>
ENCLOSURE TYPE	CATEGORY B	<input type="text"/>

**BREAKMASTER V LOAD INTERRUPTER SWITCH**

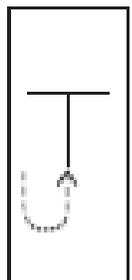
190B9106P1 **ASSEMBLED IN MEXICO**

# BreakMaster LIS and BreakMaster V

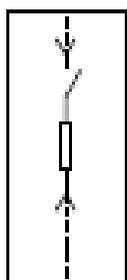
## Product configurations

Currently with Powercon switches only

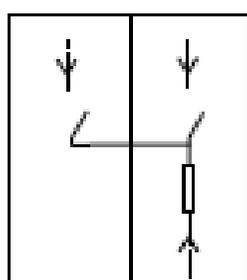
Standard Configuration Features	Single	Duplex	Selector	Line-up	ATS
35" width	•		•		
70" width		•			
115" width					•
90" indoor height, 99" outdoor height	•	•	•	•	
50" depth standard (includes arrester if required), 60" depth available	•	•		•	
60" depth standard					•
90" depth (requires rear access to equipment)			•		
Available section widths: 55" mains/tie; 35" branches; 20" / 35" incoming terminal compartments; 20" / 35" / 40" auxiliary sections				•	
Extension required for oil-filled transformers only (18" wide)	•	•	•	•	
Dry type and cast coil transformers require 3" in throat for outdoor enclosure	•	•	•	•	
Key interlocking standard between switches and fuse compartment		•	•		



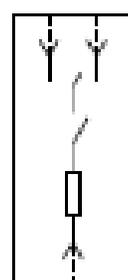
Incoming



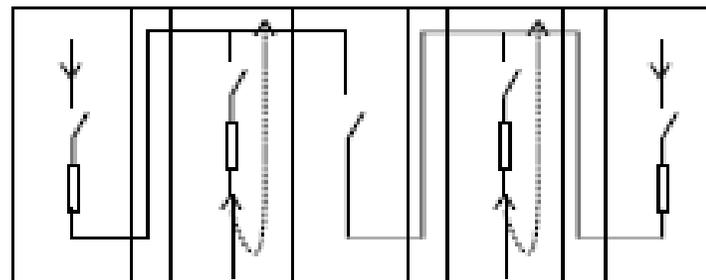
Single



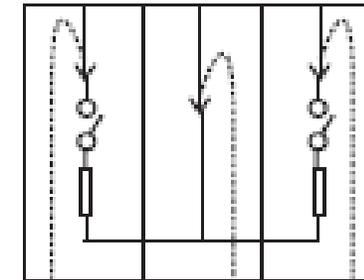
Duplex



Selector



Line-up (main-tie-main)



Automatic transfer

---

# BreakMaster LIS and BreakMaster V

MV metal-enclosed load interrupter switchgear

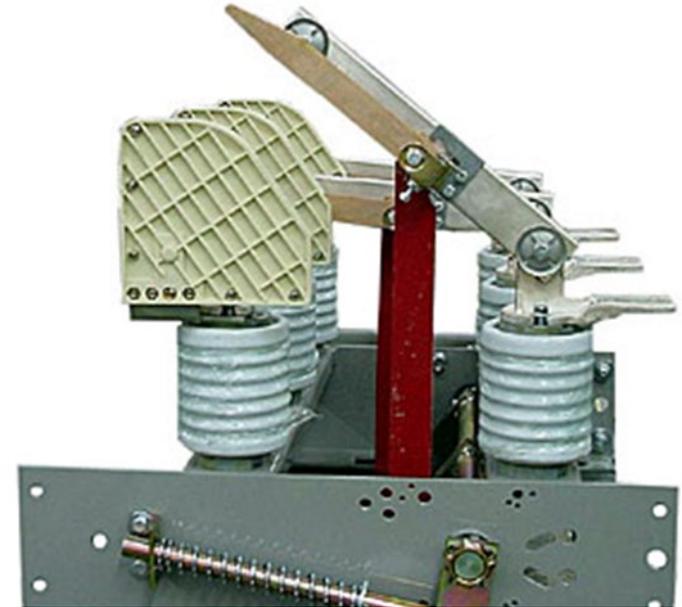
## Operation

---

A load interrupter switch consists of a two-position (open/closed), three-pole switch. The switch utilizes a quick make/quick break spring-charged mechanism for both opening and closing. The speed at which the switch opens or closes is independent of the speed at which the operator handle is moved.

The load interrupter switch is operated externally from the front of the switch enclosure. The switch is connected to the power source on one side and to the load on the other side.

When the switch is actuated, the switch blades disengage and interrupt the flow of electricity.



---

# BreakMaster LIS and BreakMaster V

MV metal-enclosed load interrupter switchgear

## Construction

BreakMaster LIS load interrupter switchgear consists of a rigid, bolted frame construction enclosure. This enclosure is constructed of 11-gauge sheet steel, including the doors, back panels, and side panels.

All steel doors have concealed hinges and captive screw, or quarter-turn latches as standard. A foot operated doorstop is also included. Each switch compartment and the fuse compartment are provided with individual or “split” doors.

The standard indoor depth on the enclosure is 50 inches. An optional 60-inch enclosure is available for special applications or for mounting additional devices. Each standard switch section is 35 inches wide. The split rear and side covers provide easy access. Also, the top access covers are removable for easy access.



---

# BreakMaster LIS and BreakMaster V

MV metal-enclosed load interrupter switchgear

## Interlocks

BreakMaster LIS includes a mechanical switch and door interlock as standard features. These prevent the opening of the doors when the switch is in the “ON” position. They also prevent switch from closing when the door is open

Additionally, each switch comes with provisions for up to six optional key interlocks. These interlocks provide a mechanical method to interlock two or more devices, utilizing a removable key which can only be inserted in one location at a time

For example, BreakMaster LIS can be key interlocked with the main circuit breaker of a switchboard on the secondary side of a transformer



---

# BreakMaster LIS

MV metal-enclosed load interrupter switchgear

## Transformer disconnect

The standard orientation has the BreakMaster LIS on the left side of the transformer when facing the front of the transformer. A reverse orientation, with the switch on the right side, is also available

**Note:** If the switch is a secondary switch, that is, on the low voltage side of a transformer, it should be specified as a line-up with a low voltage transition section

The switch is used to isolate the transformer from the incoming service or to isolate the load circuits from the transformer. This configuration is available in single, duplex, and selector switch configurations



---

# BreakMaster LIS

MV metal-enclosed load interrupter switchgear

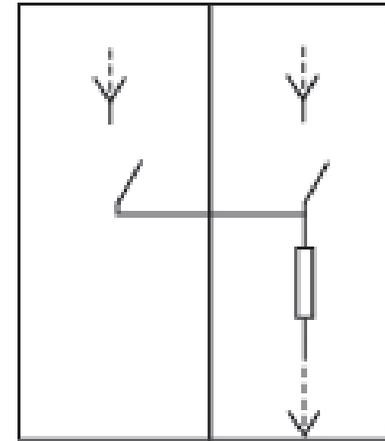
## Duplex switch

The duplex switch provides on/off switching, utilizing two load break switch sections (one fused, one unfused) connected to a common load. Mechanical interlocks (key interlocks) prevent both switches from being closed at the same time

The duplex switch functions as a switch between two power sources, such as a primary and auxiliary power source

The features of a duplex switch include:

- Two sections 35-inches wide, connected together
- One set of power fuses
- Four key interlocks included as standard



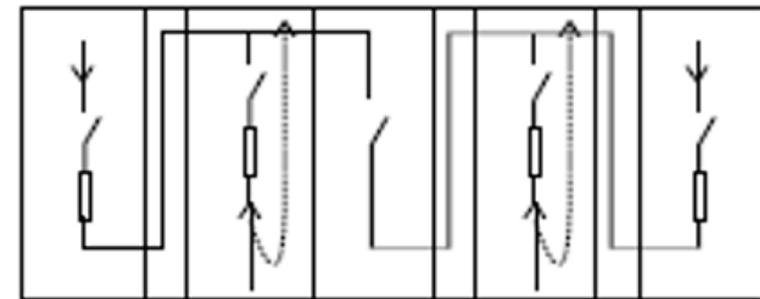
# BreakMaster LIS

MV metal-enclosed load interrupter switchgear

## Line-ups

Features of a line-up include:

- 600 A, 1200 A, and 2000 A horizontal through bus
- Incoming line sections, main, tie (non-fused), branch switches, auxiliary (both bused and un-bused), and transitions to other equipment are available
- Utility metering compartments are available as a factory-priced item
- All sections are front, and rear aligned. Main sections are always 35 inches wide and require a 20-inch transition to branch switches
- It offers a low-cost alternative to other types of switchgear



Line-up (main-tie-main)

---

# BreakMaster V

MV metal-enclosed load interrupter switchgear

## Key value points

---

Breakmaster V provides reduced arc flash incident energy levels using a fixed-mount vacuum circuit breaker in the fused compartment of enclosure. This offering provides a new arc flash mitigating solution designed in response to Arc Flash Safety Standards.

- Reduced arc flash levels from the transformer down to the LV system
- Safe and fast interruption of power.
- Selectivity through protection relay.
- Same footprint as the fusible BreakMaster switch (BreakMaster LIS)
- Protection provided via the latest relay technology including bus and transformer differential options
- Field retrofits available to replace existing fused switch with circuit breaker

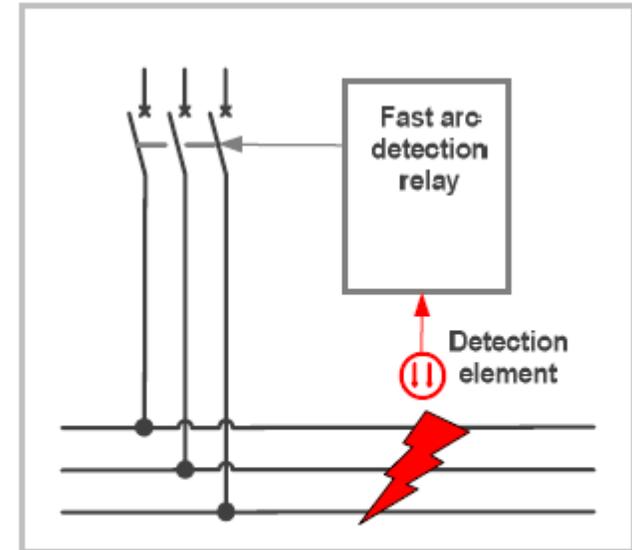


# BreakMaster V

## Active internal arc breaking

### Application of fast arc protection relay

- Operation independently of protective relay(s)
- **Fast detection** of an internal arc fault typically by means of:
  - Light sensing
  - Current sensing (Instantaneous current)
- Adjustable threshold levels
- Arc breaking time ~ 60...80 ms
- (Detection time + CB switching operation + CB arcing time)



### Principle

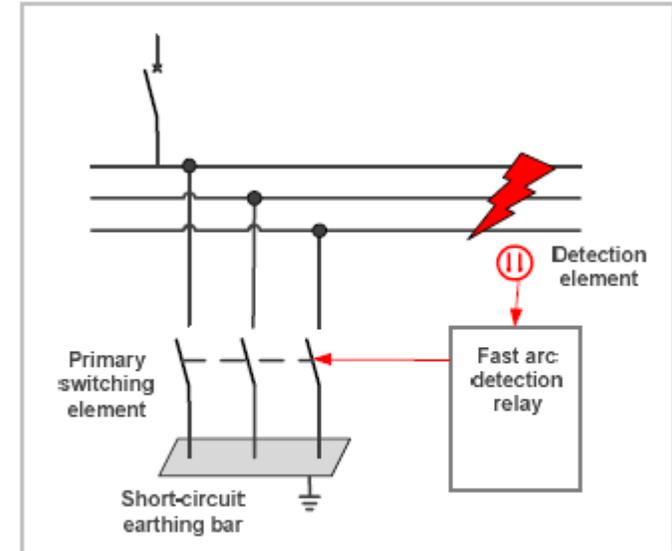
Fast relay with CB combination

# UFES™ (Ultra-Fast Earthing Switch)

Active arc elimination

## Application of an Ultra-Fast Earthing Switch

- Operation independently of protective relay(s)
- **Fast detection** of an internal arc fault typically by means of:
  - Light sensing
  - Instantaneous current sensing
- Adjustable threshold levels
- **Arc elimination** by means of ultra-fast short-circuit earthing with specific primary switching elements
- Max. time for arc elimination: ~ 4ms after detection!

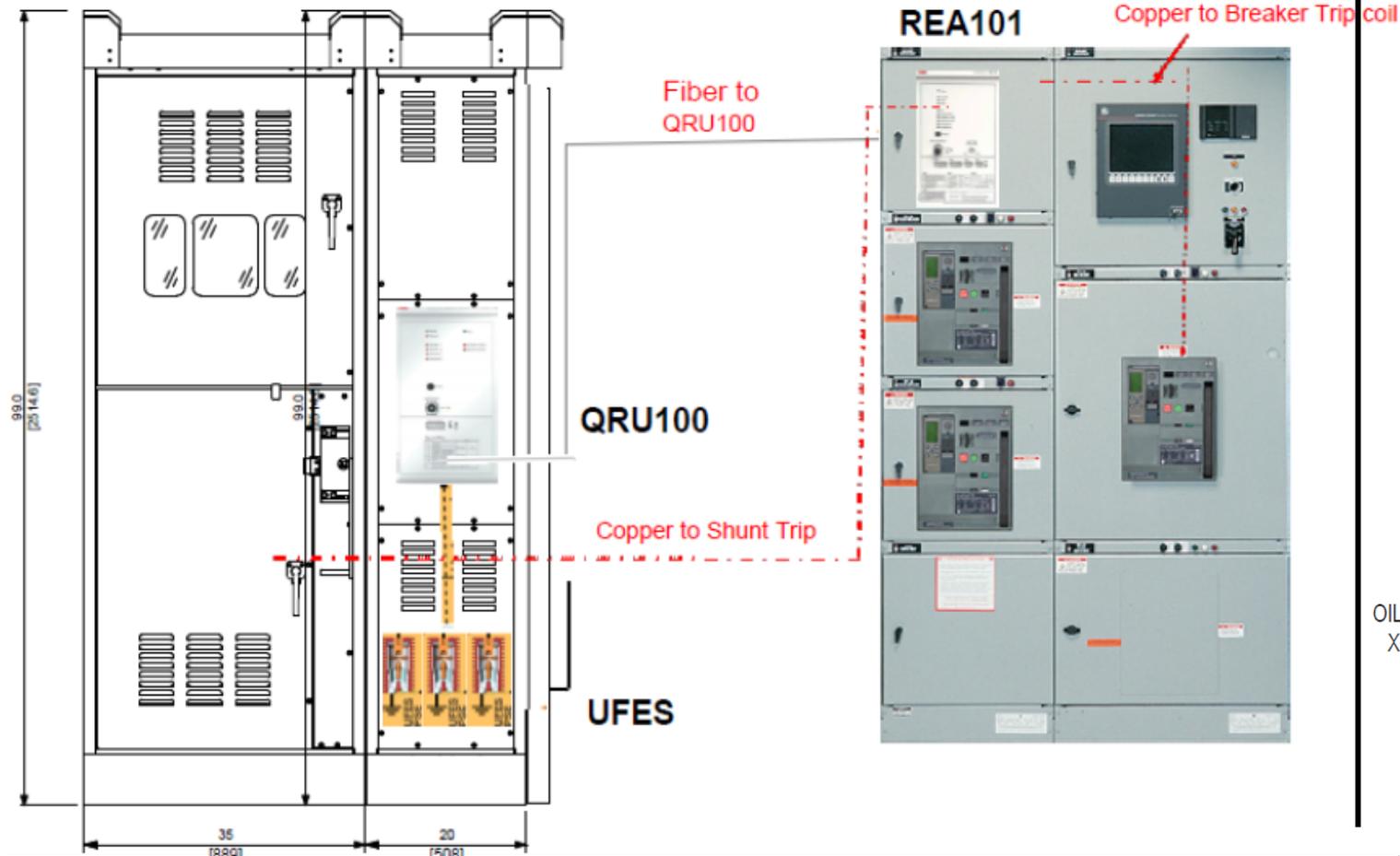


## Principle

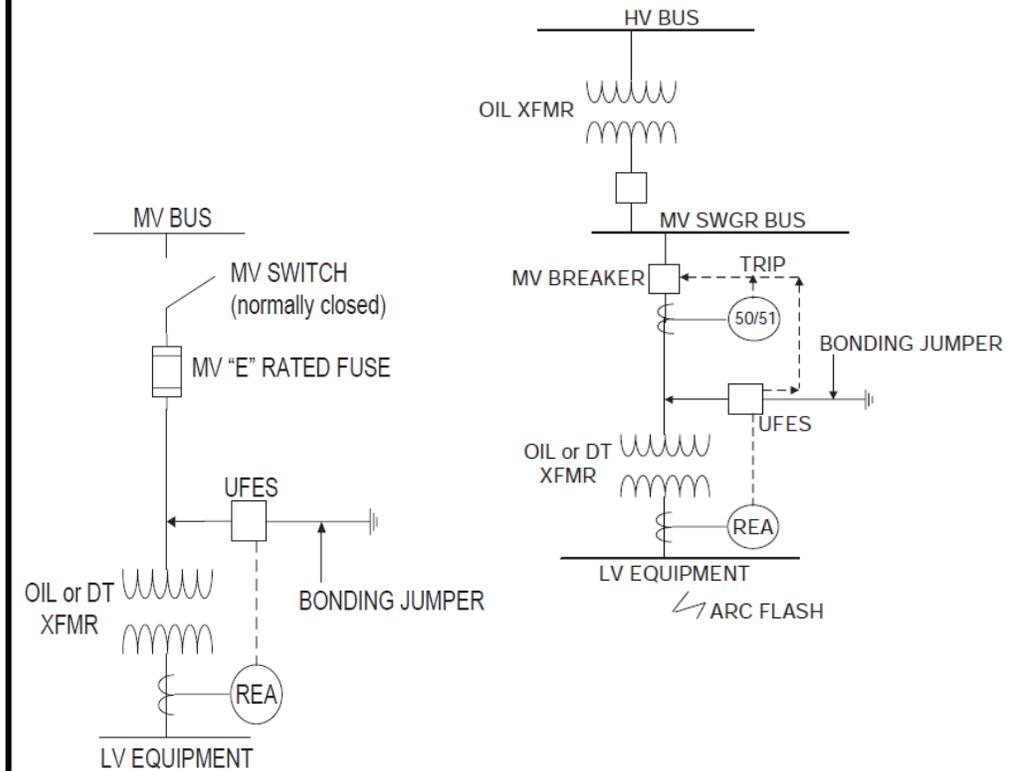
Ultra-Fast Earthing Switch

# MV Metal-Enclosed Load Interrupter Switchgear

## ArcLimiter™ LIS-UFES Application



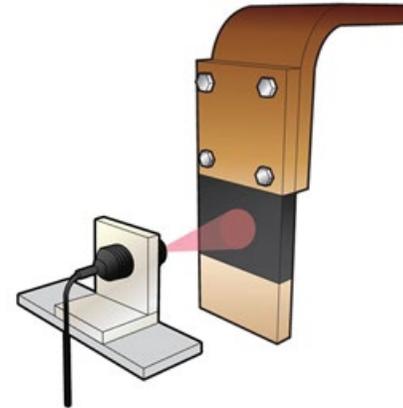
### Example distribution system configurations



# SwitchgearMD™

## Asset health monitoring

- SwitchgearMD™ is our monitoring and diagnostic solution
- 24x7 data availability and remote monitoring capability adds value through reduced total cost of ownership & enhanced personnel safety
- SwitchgearMD is available with the following sensor packages:
  - Wireless solution for temperature and PD monitoring
    - SAW sensors
    - UHF measurements
  - Wired solution for temperature monitoring
    - IR sensors
  - Wired solution for humidity monitoring
- SwitchgearMD is available for new gear as well as for retrofit applications



Infrared (IR) sensor



Surface Acoustic Wave (SAW) sensor

---

# MV Metal-Enclosed Load Interrupter Switchgear

BreakMaster

## Utility Metering Cabinet (UMC)

We are designing and building UMCs in-house. This allows us to offer much lower lead times than competition.

We can provide any UMC. If a UMC design does not exist it can be designed on the project. It adds **four** weeks to the engineering lead time and at least **four** weeks to obtain utility approval.

All UMCs, where preapproved designs do not exist, need to pass through a Prints for Approval process so we can make sure we are in compliance with the latest Utility requirements.

Lineup with Utility works the same as Lineup configuration but start by selecting the appropriate UMC.

---

# BreakMaster LIS

MV metal-enclosed load interrupter switchgear

## 20-inch-wide incoming line

- Can have top or bottom cable entry
- Arresters are available to be installed only for Top Entry configuration
- This meets front access only and front and rear access
- Can be 50”D or 60”D and configured to feed to left or to right side

## 35-inch-wide incoming line

- Can be configured as center tap (bus provisions to extend to both sides) or feed specific side (left or right)
- Can have top or bottom cable entry
- Arresters are available on both options
- CTs, PTs and CPTs available to be installed (PT and CPT can’t be installed at the same time)
- 50”D available, 60”D required for PT or CPT installation
- LV box with meter or relay can be provided. This option allows more space for lugs for cable entry due to bigger lug strap included

# BreakMaster LIS

MV metal-enclosed load interrupter switchgear

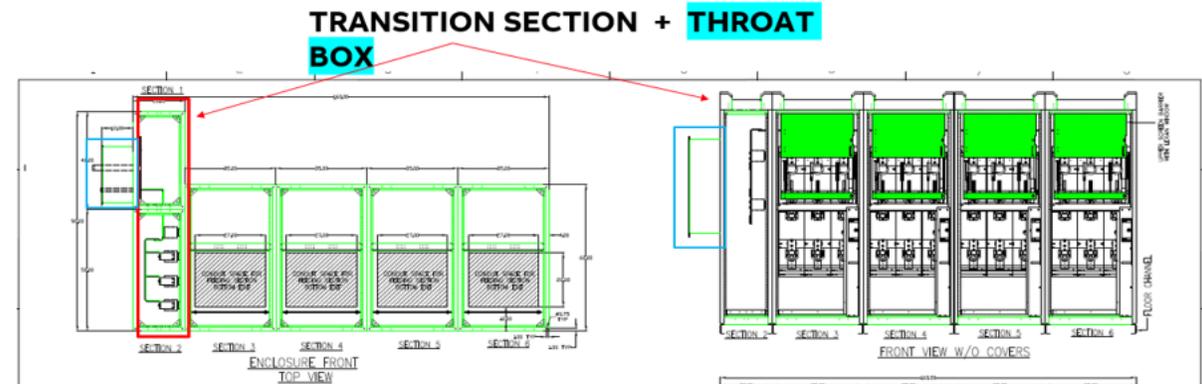
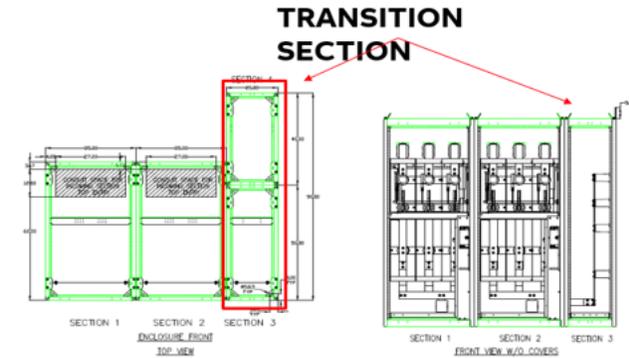
## Transition to Advance switchgear

### Indoor applications

- Transition section will be supplied with BreakMaster product

### Outdoor applications

- Transition section and throat box will be supplied with BreakMaster
- A small adapter box is required on the Advance switchgear for ODNWI applications.



# BreakMaster LIS

MV metal-enclosed load interrupter switchgear

## Fuse ratings

BreakMaster is available with a variety of different fuses to meet specific application needs.

A phase loss detection relay and PTs are installed on load side of fuses and wired to terminal blocks to provide blown fuse indication. For blown fuse trip option, a shunt trip is installed in addition to the components above and wired to terminal blocks for external power source, provided by others. Capacitive trip device can be provided but it is a manual selection and factory must quote.

Fuse	Fuse type	Voltage class	Ampere range	
Current		5 kV	25 A - 900 A	} Mersen
Limiting Fuses	EJO 1	15 kV	20 A - 300 A	
	RBA200	5 kV - 15 kV	40 E - 200 E	} Eaton
Expulsion	RBA400	5 kV - 15 kV	20 E - 300 E	
Fuses	RBA800	5 kV - 15 kV	450 E - 720 E	

# MV metal-enclosed load interrupter switchgear

## Application considerations

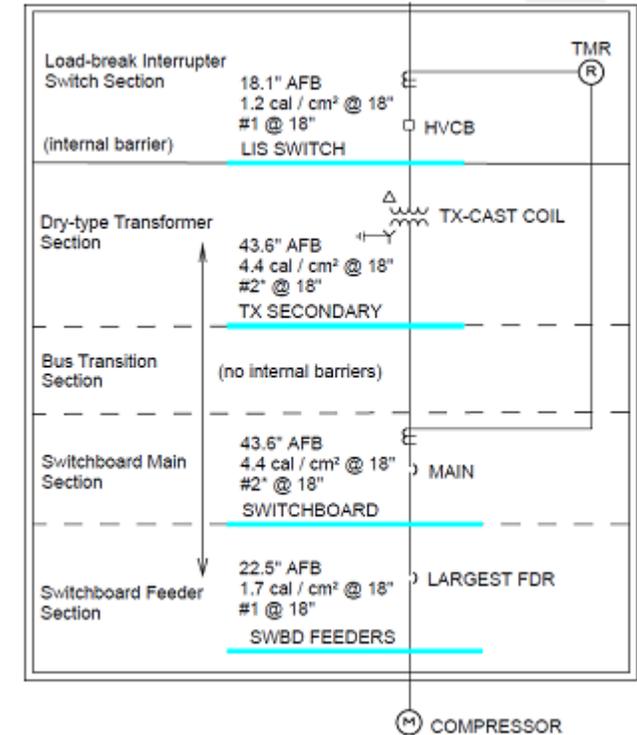
Snubbers – BreakMaster V close-coupled to transformer or remote

- To find whether snubber is needed or not, a study is required to evaluate the system. Rule of thumb is that a snubber is not required at a minimum of 200 feet or more from a VCB.

Breakmaster V with protective relay that includes **transformer differential protection** with any substation style transformer 5MVA or smaller - secondary AF Energy will be less than 12 calories.

CPT is available in lineup configuration only in the Main Switch or in an Auxiliary compartment. If CPT in main switch, then it must be top entry configuration and without Arresters installed.

PTs are available in lineup configuration only with Bottom Exit on the Feeder Switches. PTs can be connected on the line side directly connected to the main bus at the top front of the switch section. This is a manual configuration, so please contact Factory.





# VersaRupter switch overview

# VersaRupter switch overview

Modular design

Puffer type arc extinguishing system

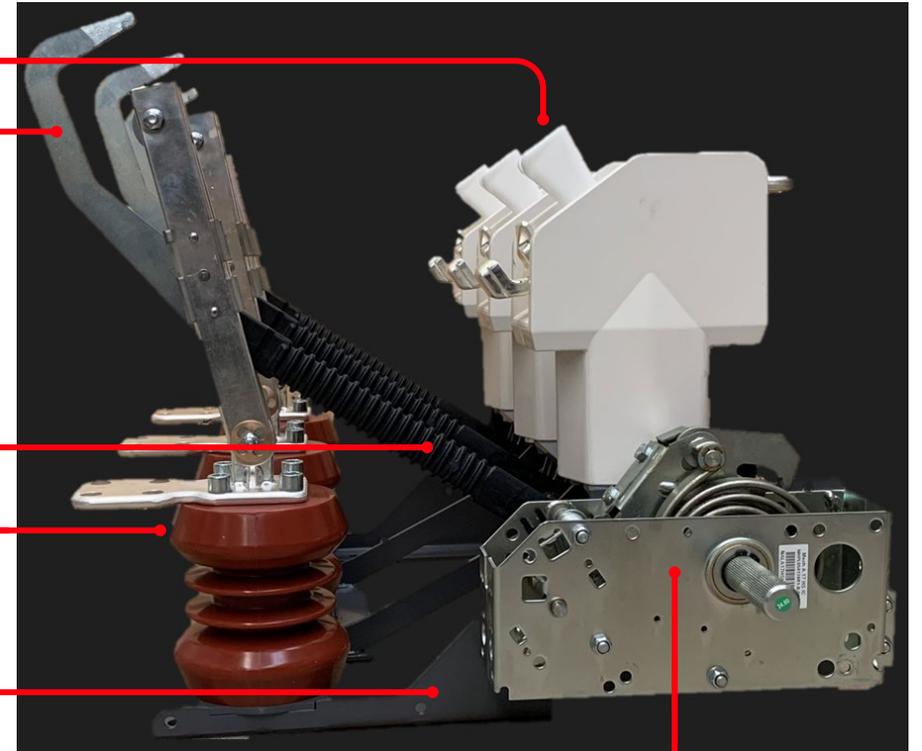
Current carrying components

Polyamide pushrods

Stand-off insulators

Heavy duty steel frame

Operating mechanism



---

# VersaRupter switch mechanisms

Two options

## K-Mechanism

- Single spring snap action device
- Operates when shaft is rotated past dead center
- Clockwise to open, counter-clockwise to close
- Compatible with all operating handles
- Can be operated remotely by motor



## A-Mechanism

- Dual spring stored energy device
- Clockwise to charge spring, counter-clockwise to close
- Minimal rotation clockwise to open switch
- Pair with HE or HM handles only (we will use HM handle)
- Can be operated remotely by motor
- Required for shunt and fuse tripping



---

# VersaRupter switch operating handles

## Front chain drive

- Kirk Key provisions for Lock Open
- Cannot have Kirk Key provision for Lock in Closed position (must use direct drive)
- Padlock provisions
- Door interlock
- K-mech only



## HM Front direct drive

- Padlock provisions
- Kirk Key provisions (mandatory for motor operator)
- Door interlock
- K-mech or A-mech



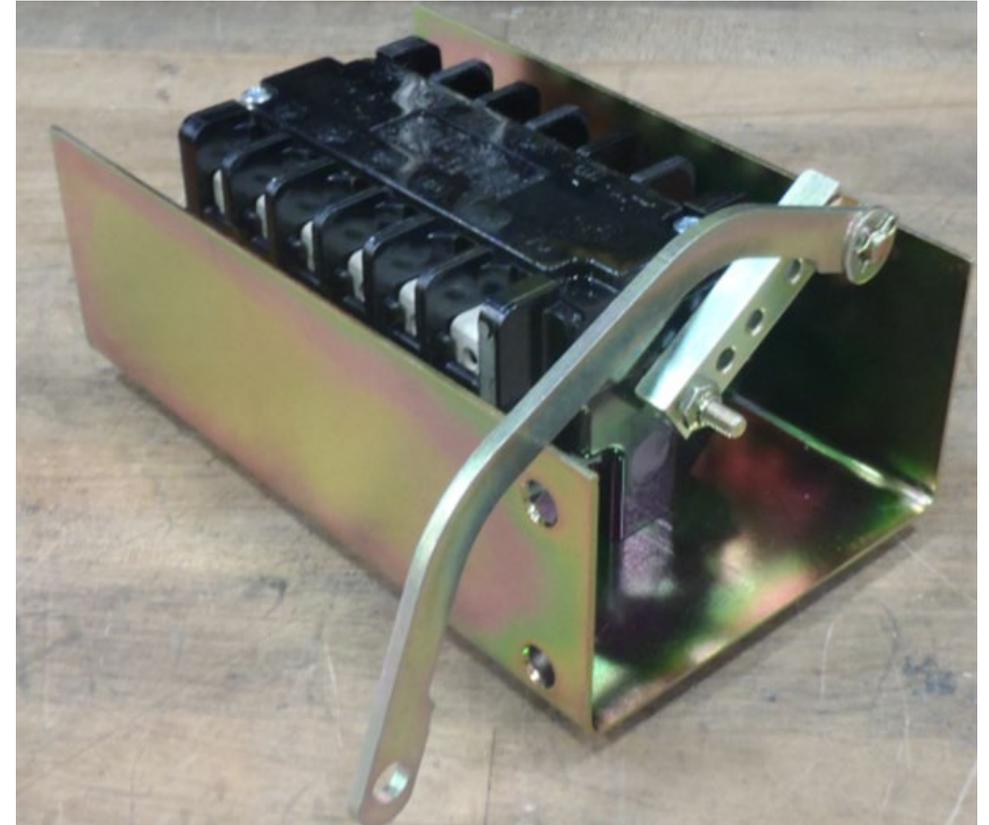
---

# VersaRupter switch overview

## Accessories

### Auxiliary switch

- Changes state when the VersaRupter changes state via a mechanical linkage connected to the jack shaft
- Can be installed on all VersaRupter ratings
- Shipped with an equal number of NO and NC contacts which can be reconfigured in the field
- Must be ordered and wired in series for shunt trip applications
- Available with 6 contacts (3 NO/3NC)



# VersaRupter switch overview

## Accessories

### Shunt trip

- Actuates the trip latch on the A-mech
- Can only be used on A mech
- Activate by local push button or remote
- Intermittent duty coil
- Auxiliary switch must be ordered and installed in series to remove power after VersaRupter change of state
- Can be used on all VersaRupter ratings with A mech
- Only 110 VAC or 125 VDC available on BreakMaster product



Technical Data Shunt Trip Device

Nominal coil voltage	Voltage range	Average current (amps)		Power (VA)
		IN	Istart	
24 VDC	-15% to +10%	10.0	10.0	240
48 VDC	-15% to +10%	2.4	2.4	115
125 VDC	-15% to +10%	1.4	1.4	155
220 VDC	-15% to +10%	1.5	0.5	110
110 VAC	-15% to +10%	2.7	5.0	300
220 VAC	-15% to +10%	1.5	2.8	320

# VersaRupter switch overview

## Accessories

### NM motor operator

- Provides remote or local electrical opening of the VersaRupter
- Installed directly on the operating shaft of the VersaRupter
- Mounted on left side of switch and comes with shaft extension
- Can be used with either A-mech or K-mech
- Must use HM handle if manual operation is desired
- Motor mechanically disconnects after every operation to manually operate the VersaRupter if necessary
- Spacer mounting bracket is ordered separately dependent upon switch rating and desired mounting location
- Only 110V AC/DC available on BreakMaster product



Voltage AC/DC $\pm 10\%$	24 V	48 V	110 V	220 V
Current (A)	3	3	0.8	0.4
Power Consumption (W)	70	140	85	90
Operating time (sec)	~4	~4	~4	~4
Operating temperature ( $^{\circ}$ F)	-40 to 131	-40 to 132	-40 to 134	-40 to 135
Signaling time (sec)	0.5 – 2.0	0.3 – 1.0	0.5 – 2.0	0.5 – 2.0
Weight (lbs) (kg)	13.2 (6)	13.2 (6)	13.2 (6)	13.2 (6)
Operating voltage AC (V)	17-26	34-52	77-137	154-242
Operating voltage DC (V)	22-28	43-57	99-150	198-264

---

# VersaRupter switch

## Location of accessories



- 1. Motor drive**  
For automatic charge and operating VersaRupter switch
- 2. Auxiliary switch**  
Shows position of VersaRupter switch (open/close)
- 3. Spring mechanism**  
For operating VersaRupter switch
- 4. Shunt trip**  
For releasing charged spring mechanism and opening the VersaRupter switch



# Summary

# BreakMaster™ V

Now with VD4 and VM1 vacuum circuit breakers

## Key message(s)

BreakMaster V provides load switching and protection for MV applications – up to 15 kV, 2000 A load current and 40 kA short circuit rating. It is commonly used on the primary side of the transformer in a unit substation.

BreakMaster V is used to safely disconnect power and provide fault current protection. For arc flash mitigation, it is a superior solution to a switch-fuse combination. Configurable as a line-up of multiple sections including utility metering compartments, it is a cost-effective alternative to metal-clad switchgear and currently has much shorter lead times.

The BreakMaster V is now available with ABB's world-class VD4 and VM1 circuit breakers. The VD4 is the world's best-selling breaker. It is compact and low-maintenance and with recyclable embedded poles for superior protection against humidity, shocks and dust. The magnetically actuated VM1 breaker sets the benchmark for simplicity and low maintenance.

## Segments/Industries

- Commercial and industrial buildings (including Healthcare)
- Utility (Distribution)
- Transportation (EV charging infrastructure)



### CONTACT INFORMATION

**Harsh Karandikar**  
Global Product Manager, ANSI MV  
Switchgear  
[harsh.m.karandikar@us.abb.com](mailto:harsh.m.karandikar@us.abb.com)

**Fabian Estrada**  
Factory Project Manager  
(contact for quotation support  
for LIS)  
[fabian.estrada@mx.abb.com](mailto:fabian.estrada@mx.abb.com)

**Ahmed Algara**  
Product Marketing Manager, ANSI  
Switchgear, NAM  
[ahmed.algara@us.abb.com](mailto:ahmed.algara@us.abb.com)

# BreakMaster™ LIS

With 40 & 61 kA VersaRupter® interruption switch rating

## Key message(s)

- BreakMaster LIS provides load switching and protection for MV applications – up to 15 kV, 600 A and 1200 A load current and 40 kA and 61 kA interruption ratings
- It is commonly used on the primary side of the transformer in a unit substation and features the advanced interrupting technology of the VersaRupter® switch

BreakMaster LIS is used to safely disconnect power and provide fault current protection. It can be used to select power between two primary sources and is configurable as a line-up of multiple sections including utility metering compartments. It is a cost-effective alternative to metal-clad switchgear and currently has much shorter lead times.

BreakMaster LIS is available with ABB's world-class VersaRupter switch. VersaRupter is a compact easy-to-use indoor load break switch capable of 100 electrical operations at full rated current. It offers a minimum of 1000 mechanical no load operations, well beyond the market standard.

## Segments/Industries

- Commercial and industrial buildings (including Healthcare)
- Utility (Distribution)
- Transportation (EV charging infrastructure)



## CONTACT INFORMATION

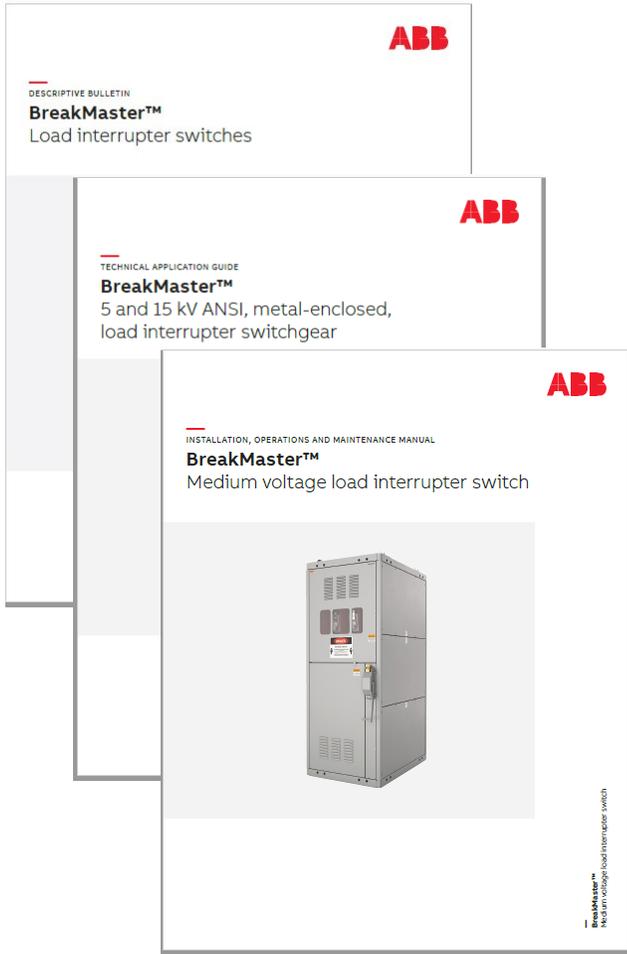
**Harsh Karandikar**  
Global Product Manager, ANSI MV Switchgear  
[harsh.m.karandikar@us.abb.com](mailto:harsh.m.karandikar@us.abb.com)

**Fabian Estrada**  
Factory Project Manager (contact for quotation support for LIS)  
[fabian.estrada@mx.abb.com](mailto:fabian.estrada@mx.abb.com)

**Ahmed Algara**  
Product Marketing Manager, ANSI Switchgear  
[ahmed.algara@us.abb.com](mailto:ahmed.algara@us.abb.com)

# BreakMaster LIS

## Publications



## Documents

- **BreakMaster LIS Brochure** – 1VAL107101-DB
- **BreakMaster LIS Technical Application Guide** – 1VAL107101-TG
- **BreakMaster LIS Installation, Operations, and Maintenance Manual** – 1VAL107101-MB
- **Customer Presentation** – upon request
- **BreakMaster V documentation** – coming soon

**ABB**