



Master Break LIS (Load Interrupter Switchgear) & Master Break LIS with VD4 Evolution Breaker

Integration of 40 kA Master Break switch

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MV Load Interrupter Switchgear

Master Break LIS & Master Break LIS with VD4 Evolution Breaker

Main features/ratings

- Product built in Monterrey, Mexico since 2001
- ANSI C37.20.3, C37.20.4, C37.22
- 5-38 KV, 600 and 1200 A, 40 kA and 61 kA short circuit
- ASCE 7-10, IBC 2018, CBC 2019, and IEEE-693-2018 seismic certification
- Single, duplex, selector, lineup, ATS, lineup with utility, single-VCB, lineup-VCB offerings
- UL/cUL option available
- NEMA 1, 2 or stainless steel 3R & 4x enclosures available
- Available from Field Services or direct from the factory

Additional information

- Segments/industries: oil and gas, pulp and paper, automotive, industrial processes, wastewater, petro-chemical

Current product lines



Master Break LIS



Master Break LIS with
VD4 Evolution Breaker

Metal-enclosed Load Interrupter Switchgear

Master Break LIS & Master Break LIS with VD4 Evolution Breaker

Definition

A load interrupter switchgear consists of an air insulated disconnect switch mounted on a metal gear enclosure. The Master Break LIS is used to provide safe switching and circuit protection where an infrequent means of disconnecting is required

A load interrupter switchgear 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 switchgear can also be grouped in a lineup configuration with other medium voltage distribution equipment



Metal-enclosed Load Interrupter Switchgear

Master Break LIS & Master Break LIS with VD4 Evolution Breaker

Operation

A load interrupter switchgear 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

View motion video:



Versarupter Open.avi



Metal-enclosed Load Interrupter Switchgear

Master Break LIS & Master Break LIS with VD4 Evolution Breaker

Construction

The Master Break LIS load interrupter switch consists of a rigid, combination welded & 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



Metal-enclosed Load Interrupter Switchgear

Master Break LIS & Master Break LIS with VD4 Evolution Breaker

Interlocks

The Master Break LIS load interrupter switch 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, the Master Break LIS load interrupter switch can be key interlocked with the main circuit breaker of a switchboard on the secondary side of a transformer



Metal-enclosed Load Interrupter Switchgear

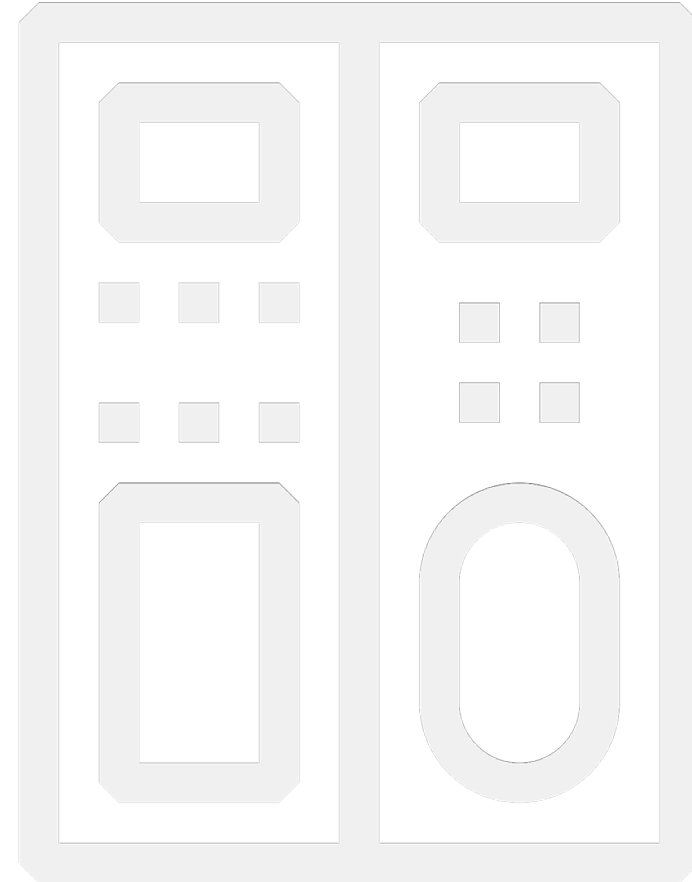
Master Break LIS

Transformer Disconnect

The standard orientation has the Master Break LIS load interrupter switch 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



Metal-enclosed Load Interrupter Switchgear

Master Break LIS

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



Metal-enclosed Load Interrupter Switchgear

Master Break LIS

Line-ups

Features of a line-up include:

- 600, 1200, 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
- Unlimited custom configurations available



Metal-enclosed Load Interrupter Switchgear

Phase 1 integration of Master Break switch

Master Break Integration

- 15 kV Master Break switch for 40 kA ratings
 - 5/15 kV, 600 A, 40 kA 9.25" (235mm) pole spacing, 110 kV BIL, 25 kA sym (2 sec)
- Multiple configurations – single, duplex, lineup
- Cover currently offered fuse types
 - Mersen current-limiting EJO Type
 - Eaton Expulsion RBA Type
 - S&C SM4, SM5 Type
 - Driescher Clip Type
- Match existing footprint (35-inch W, 50-inch/60-inch D)
- Schweitzer SEL-781 Relion protective relays – Multilin replacement
- Replace with Spike Electric Controls CTs, CPTs, PTs



Metal-enclosed Load Interrupter Switchgear

Phase 1 integration of Master Break switch

Master Break Integration

- Master Break switch is silver-plated or Tin Plated
 - Silver plated switch with tin-plated main bussing and connections is available
- Ground switch implementation to be offered as an additional option
- Available with breaker and Powercon switch
- Available at 60 Hz

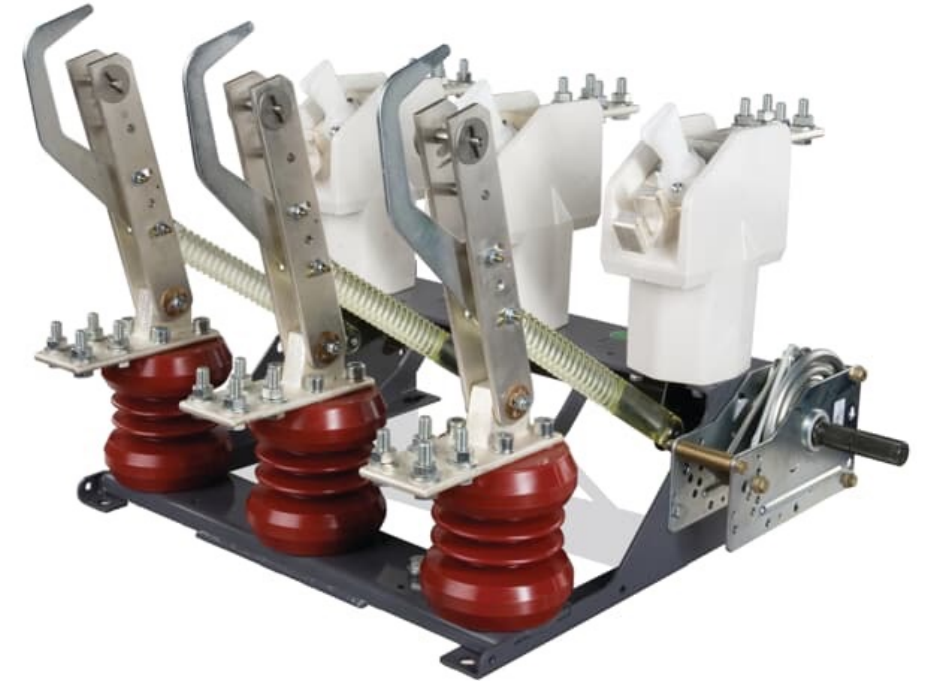


Metal-enclosed Load Interrupter Switchgear

Phase 1 integration of Master Break switch

Master Break Switch Overview

- Master Break is an indoor load break switch
- “Indoor” defined in ANSI C37.20.4: The term “indoor” is intended to indicate that the enclosure provides a degree of protection to the switch and the enclosure may be suitable for indoor, outdoor, or other service conditions and complies with the requirements of switchgear assemblies as defined by IEEE C37.20.2-1999 or IEEE C37.20.3-2001
- Must protect from water and sunlight (UV)
- Harsh environments may require more frequent inspections/maintenance
- Usual service conditions:
 - Ambient air temperature within -30 and +40 °C
 - Altitude not to exceed 1000 m
- Master Break capable of:
 - 1000 mechanical no load operations
 - 100 electrical operations at full rated current
 - May require overhaul of switch components after reaching rated number of operations



Metal-enclosed Load Interrupter Switchgear

Phase 1 integration of Master Break switch

Standards and Certifications

ANSI C37.20.4

– Standard for indoor AC switches (1 – 38 kV) for use in metal-enclosed switchgear

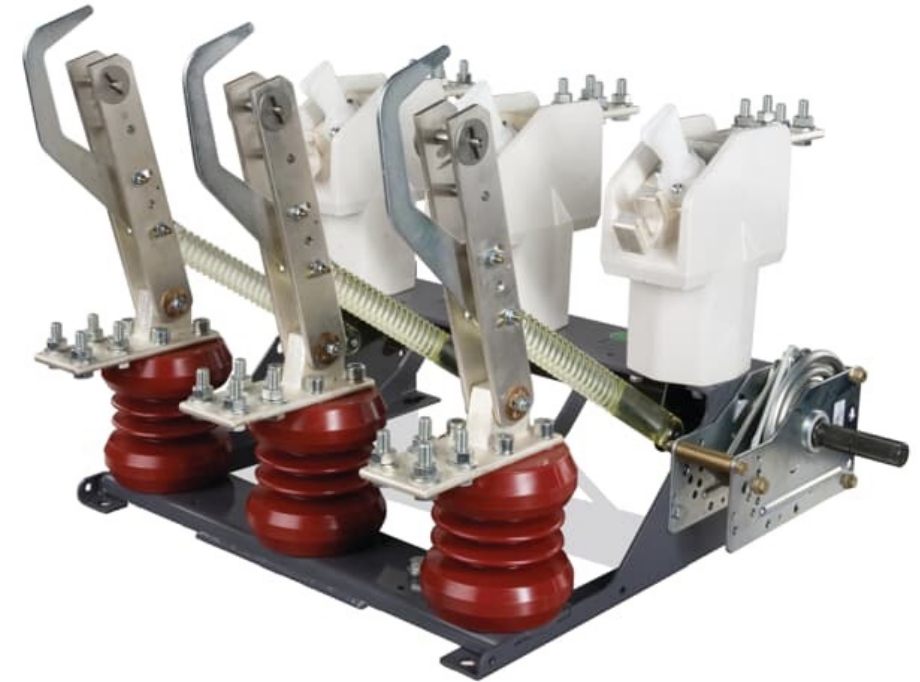
- Required ratings (max voltage, cont. current, etc.)
- Tests (design, production)
- Construction
- Application

CSA C22.2 No. 193-M1983 high voltage full-load interrupter switches

- K-mech and A-mech
- 15 kV : 600 A : 40 kA

UL

- K-mech and A-mech
- 15 kV : 600 A : 40 kA



Master Break Switch Overview

Modular Design

Various accessories

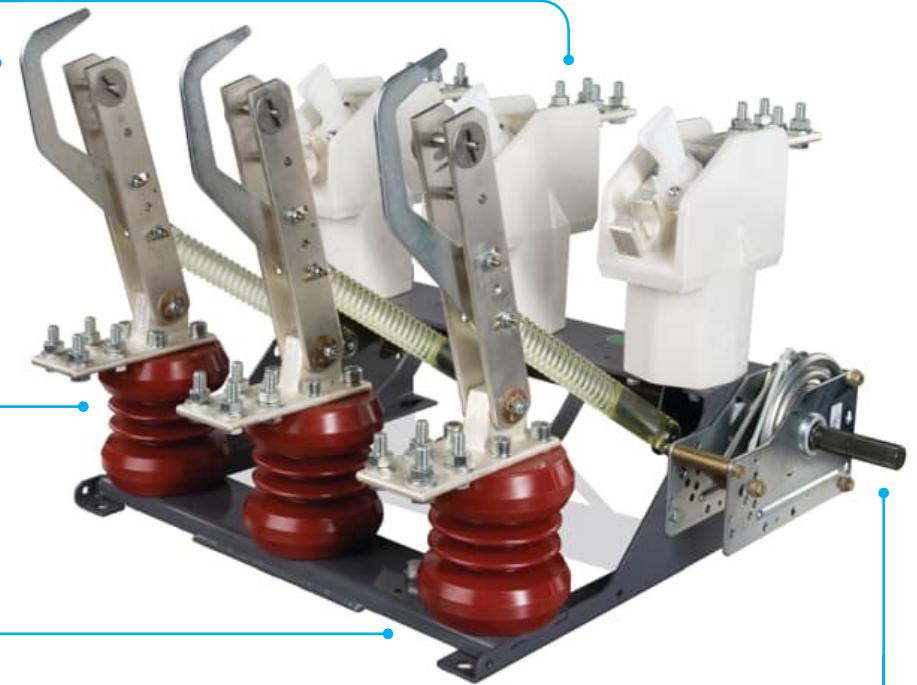
Puffer type arc extinguishing system

Current carrying components

Stand-off insulators

Heavy duty steel frame

Operating mechanism



Master Break Switch Overview

Function

Arcing blade

Gas blast

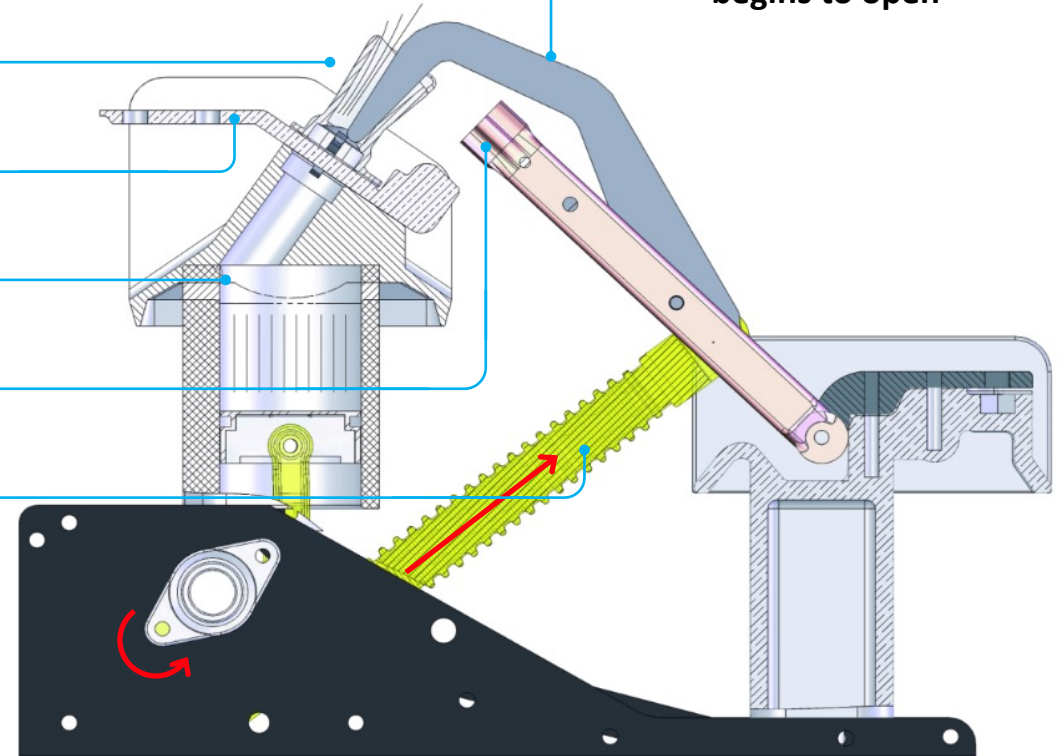
Main stationary contact

Air blast

Main movable contact

Operating rod

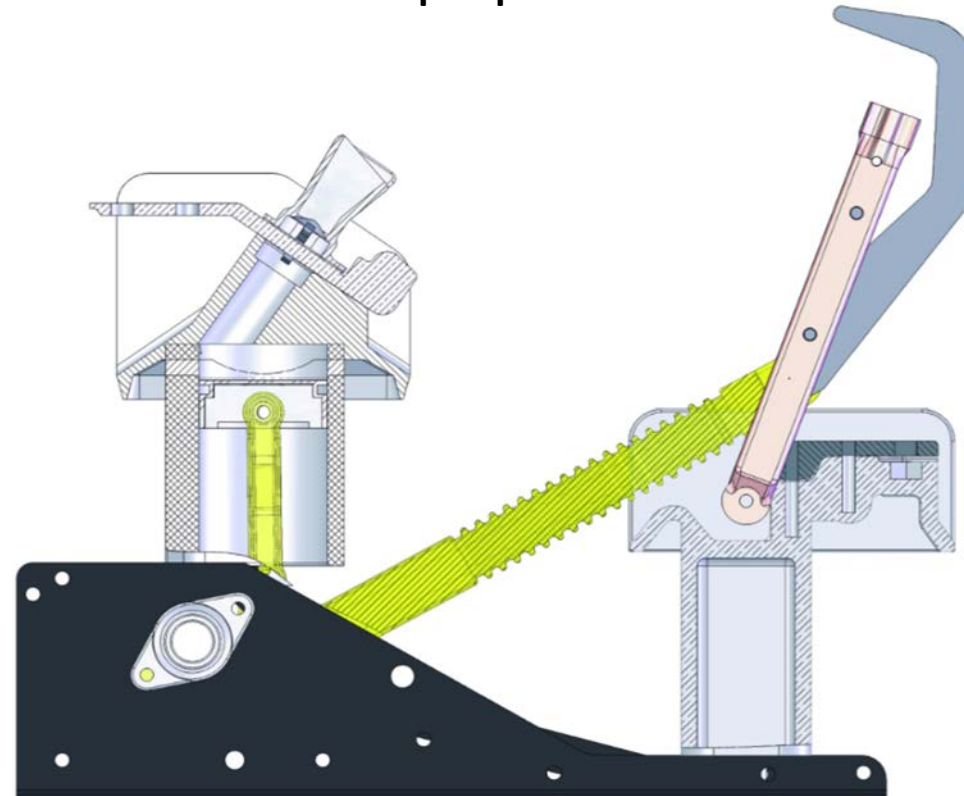
Interruption when switch begins to open



Master Break Switch Overview

Function

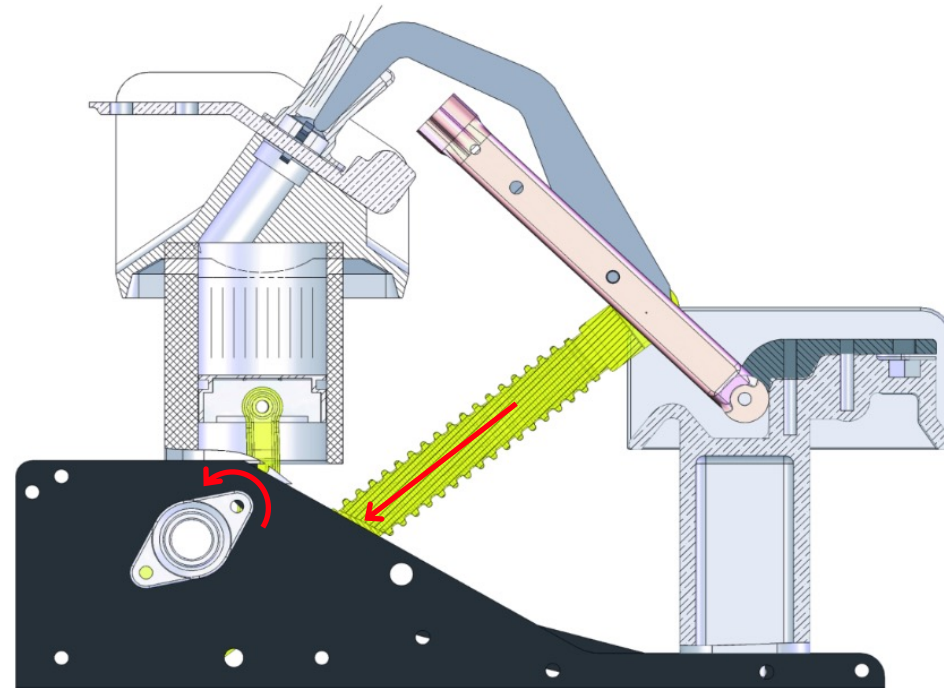
Switch in open position



Master Break Switch Overview

Function

Switch closing

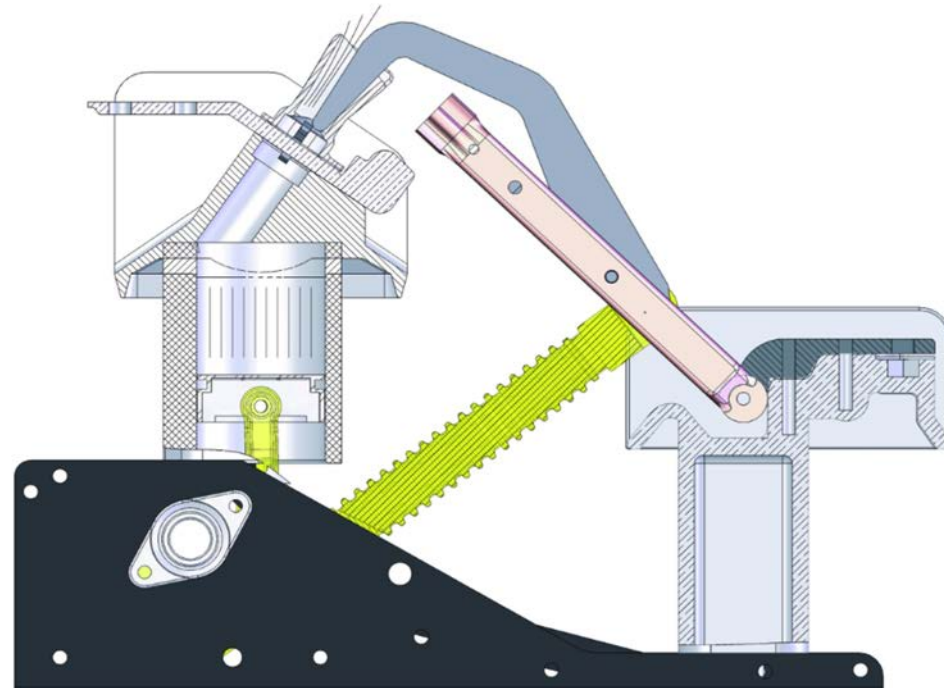


Moving contact makes contact before arcing blade

Master Break Switch Overview

Function

Switch in closed position



Master Break Switch Mechanisms

Phase 1 integration of Master Break switch

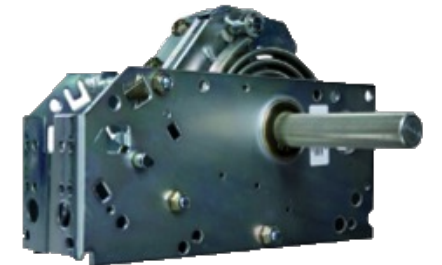
K-Mechanism

- 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



Master Break Switch Overview

Phase 1 integration of Master Break switch

Arc extinguishing puffer system

- Ablative arc chutes react to quench the arc
- A balanced combination of air and gas reliably extinguish the arc
- Extended operations at full rated current
 - 100 operation at full rated current vs. 10-20 when relying on ablative chutes only
- Less maintenance required due to reduced wear on arc chutes
- Eliminates the need for interphase barriers on most ratings



Master Break Switch Overview

Phase 1 integration of Master Break switch

Arc blades

- Draws arc within arc chute after main contact separates
- Motion dependent on movement of main contact
- Main contact in open position = arc blade in open position
 - Safer visual inspection (visible disconnect)



Master Break Switch Operating Handles

Phase 1 integration of Master Break switch

Front chain drive- Standard Offering

- Kirk Key provisions
- Padlock provisions
- Door interlock optional
- K-mech only



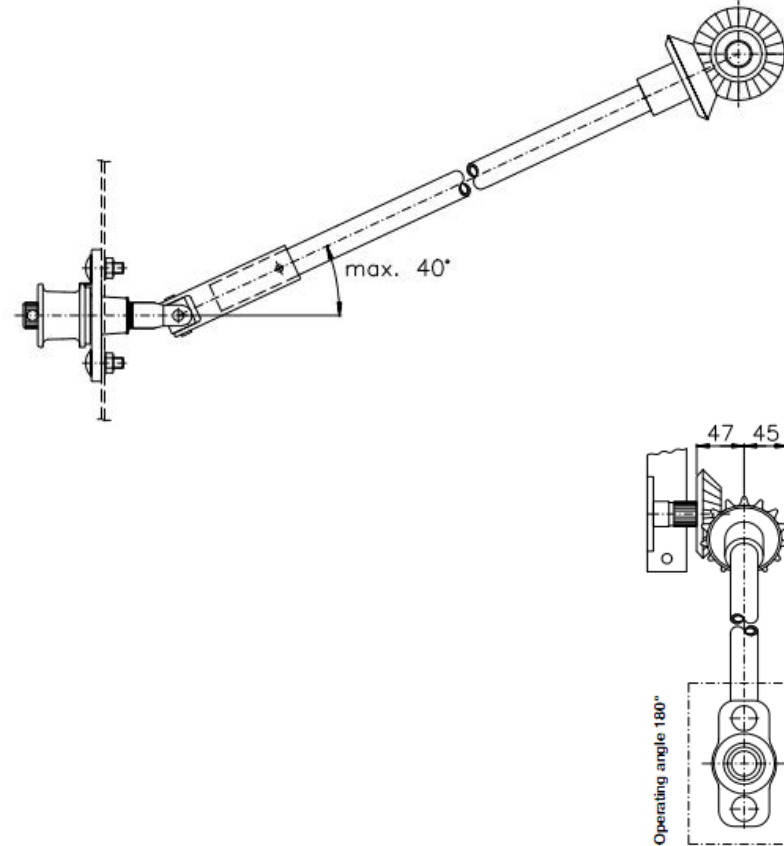
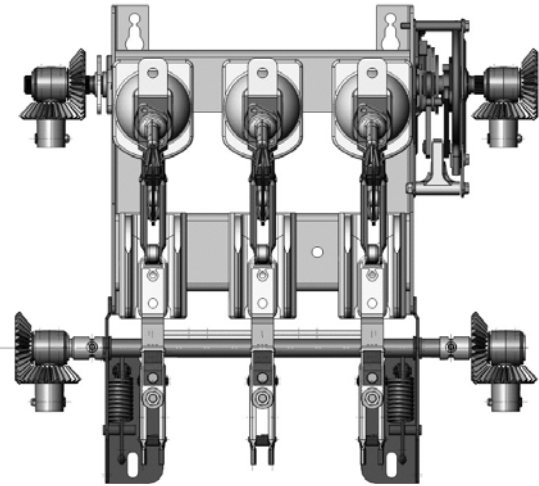
HM Front direct drive (motor) for custom & compact switchgear line ups

- Padlock provisions
- Kirk Key and door interlock optional
- K-mech or A-mech



Master Break Switch Overview

HM Handle

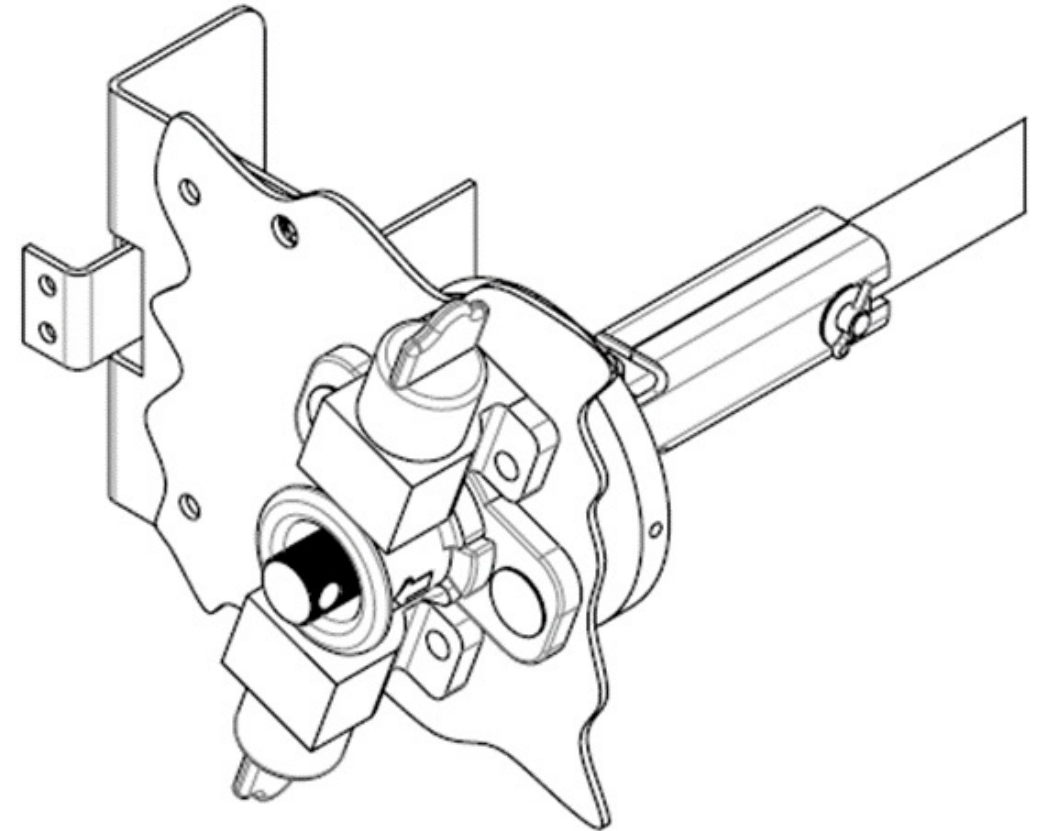


Master Break Switch Overview

HM door and key interlock

Safety

- HM handles will now be available with provisions for Kirk Key interlocks and/or mechanical door interlock. This was previously only available on the chain drive handle
- Kirk Key interlocks
 - Lock switch in open, closed, or open and closed positions
- Mechanical door interlock
 - Prevents door from opening while switch is closed
 - Prevents switch from closing if door is open



Accessories

Auxiliary contact

Shows position of switch disconnecter (open/close)

Motor drive NM

For automatic charge and operating switch disconnecter

Earthing switch shaft

For operating earthing switch or for mechanical inter-locking

Quick earthing switch type E

Earth main circuit of switch disconnecter

Spring mechanism

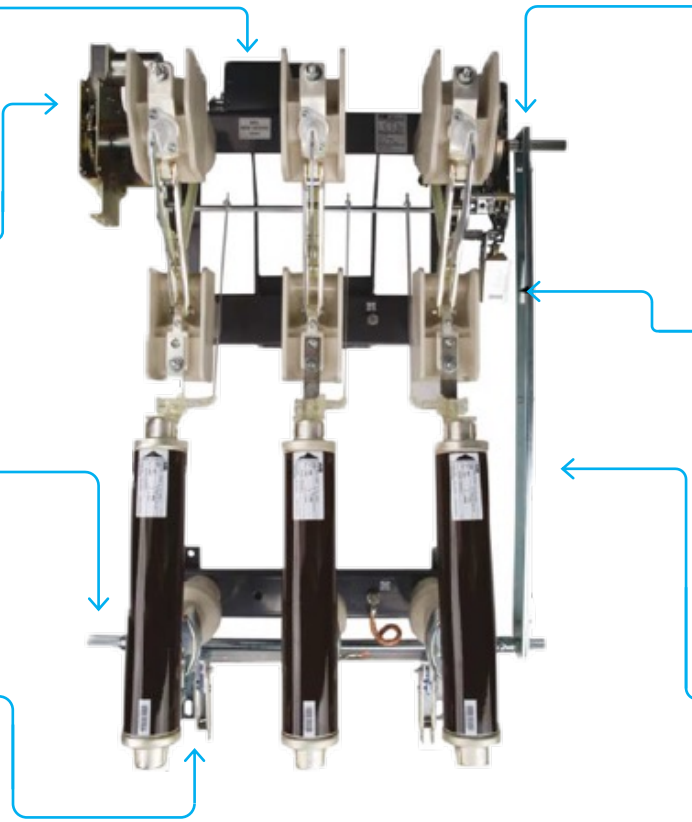
For operating switch disconnecter

Shunt trip

Release charged spring mechanism, opens the switch disconnecter

Mechanical interlocking

Interlocks switch disconnecter when operating with earthing

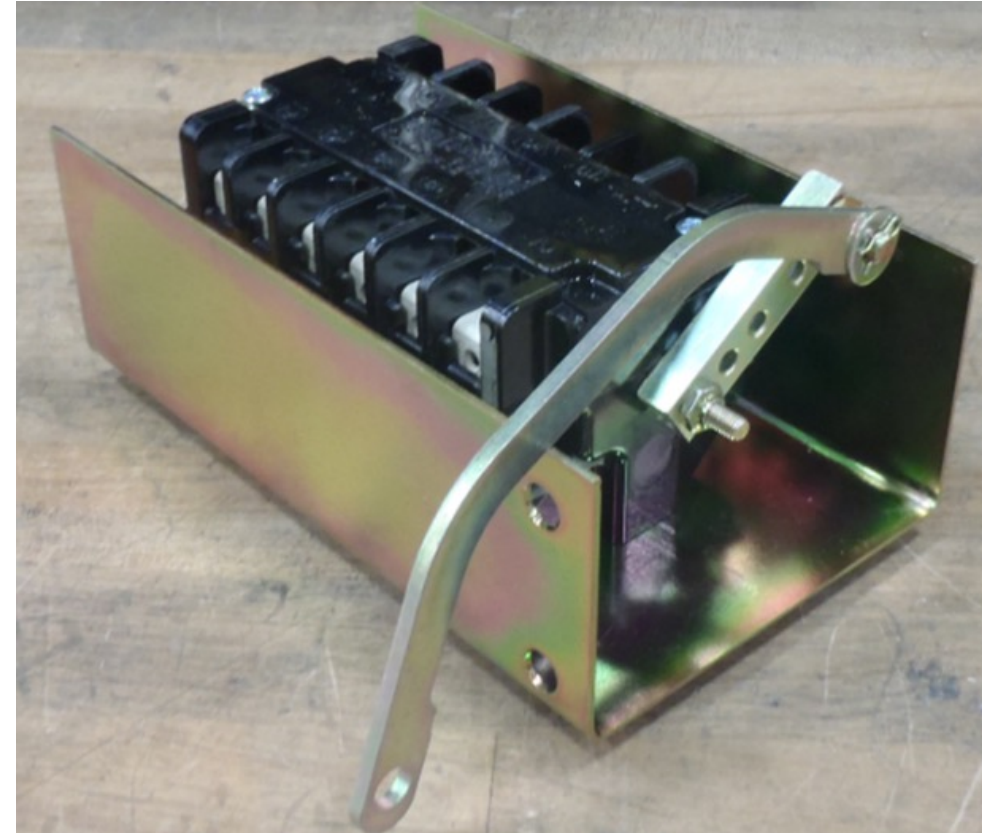


Master Break Switch Overview

Accessories

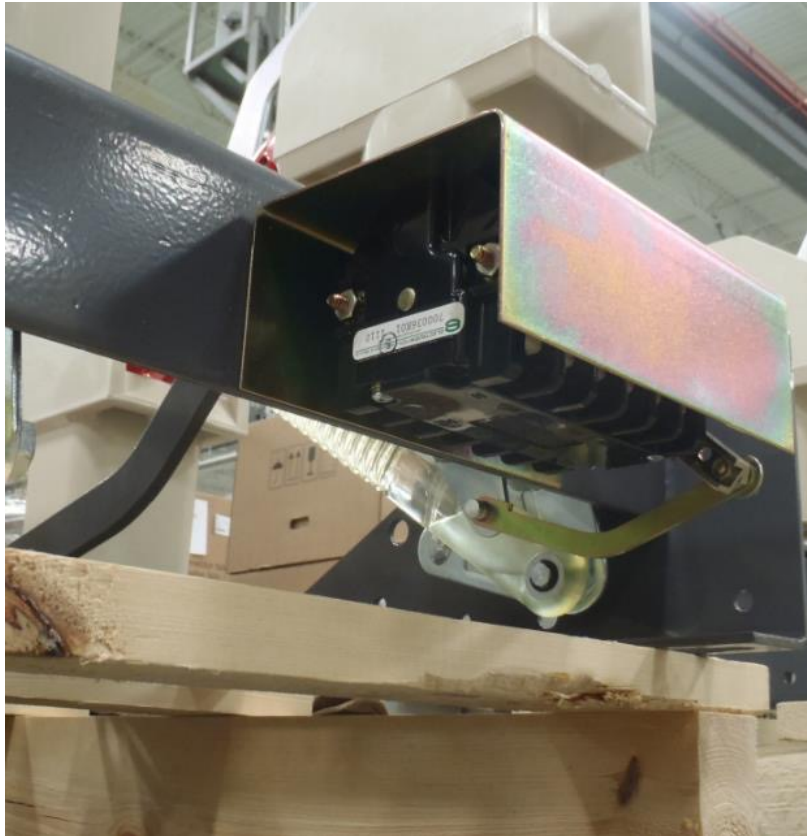
Auxiliary switch

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



Master Break Switch Overview

Auxiliary switch

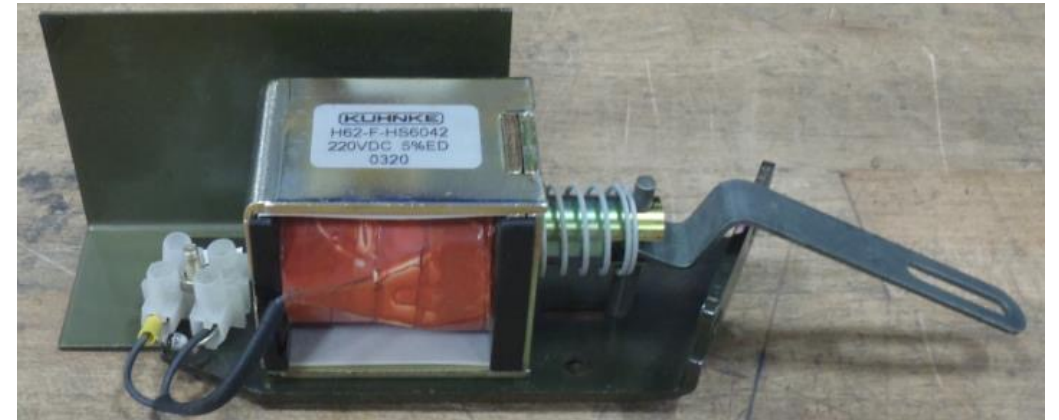


Master Break Switch Overview

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 Master Break change of state
- Can be used on all Master Break ratings with A mech
- Only 110 VAC or 110 VDC available on LIS Load Interrupter Switchgear 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
110 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

Master Break 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 Master Break if necessary
- Spacer mounting bracket must be ordered separately dependent upon switch rating and desired mounting location
- Only 110V AC/DC available on LIS Load Interrupter Switchgear product



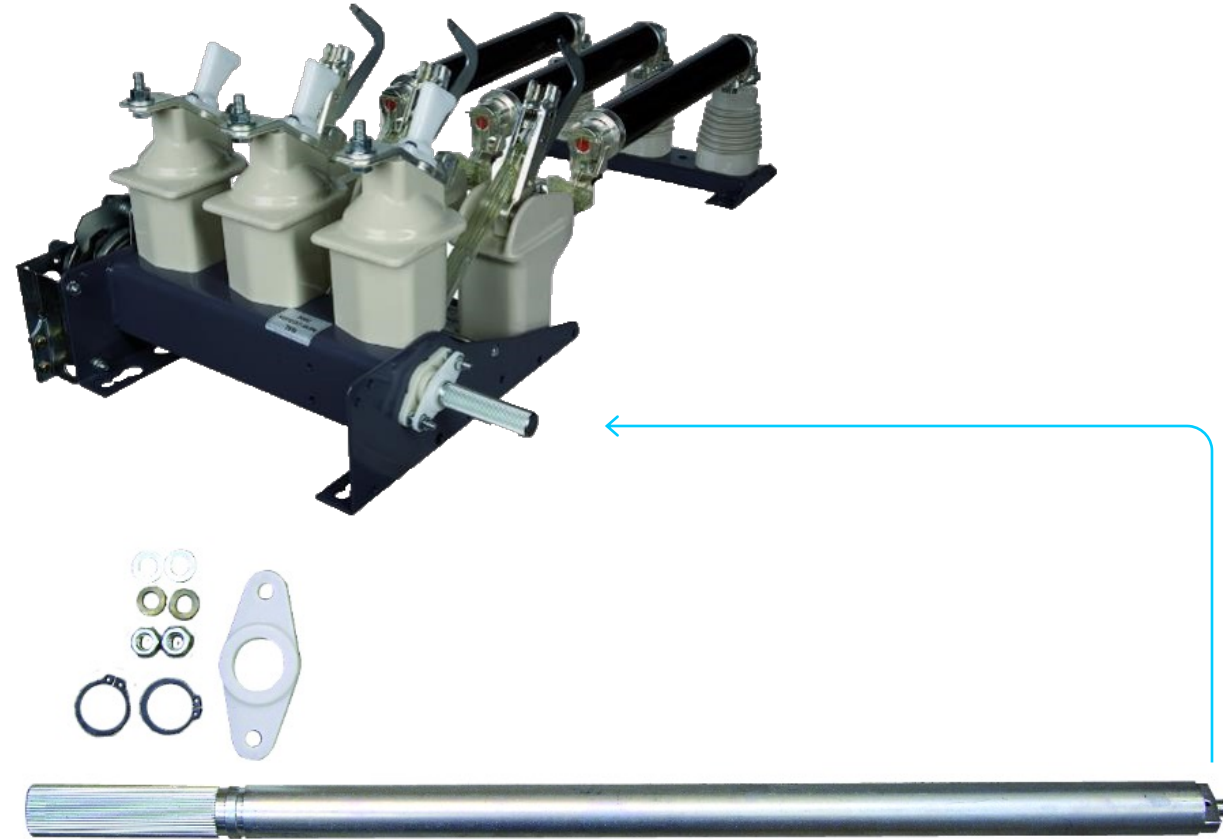
Voltage AC/DC \pm 10%	24 V	48 V	110 V	220 V
Current (A)	3	3	0.8	0.4
Power Consumption (W)	70	140	85	90
Operating time (sec)	~4	~4	~4	~4
Operating temperature ($^{\circ}$ F)	-40 to 131	-40 to 132	-40 to 134	-40 to 135
Signaling time (sec)	0.5 – 2.0	0.3 – 1.0	0.5 – 2.0	0.5 – 2.0
Weight (lbs) (kg)	13.2 (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

Master Break Switch Overview

Accessories

Left hand shaft extension

- Allows operation of the VR from the left side
- Use with motor operators or manual operator handles
- Different lengths respective to different switch ratings/pole spacing



Master Break Switch Overview

Accessories

Configurations

Operating mechanism		Handle operator (right side)		Aux switch	Shunt trip		NM motor (left side)
K-mech	A-mech	Chain drive	HM direct drive	6 contact	110 VDC	110 VAC	110VAC/DC
X		X					
X			X				
X		X		X			
X			X	X			
	X		X	X	X		
	X		X	X		X	
X			X				X
	X		X	X	X		X
	X		X	X		X	X
X			X	X			X

Master Break Switch Overview

Overview

Maintenance

- NEVER use alcohol-based solvents for cleaning
- Inspection once a year
- Under normal conditions
 - Mechanical overhaul after 1000 operations or 15 years in service
 - Electrical overhaul after 100 operations at full rated current
 - Main contacts, arcing contacts, and arc chamber need to be inspected and replaced if necessary
- Grease contacts with ISOFLEX TOPAS NCA52 after cleaning
- Operating mechanisms do not require greasing



MV Load Interrupter Switchgear

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Lead times (+ 3-5 weeks DFA)

Short	5-6 weeks
Mid	8-10 weeks
Mid +	12 weeks
Normal	16-18 weeks
Normal +	22-24 weeks

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