

INSTALLATION, OPERATIONS AND MAINTENANCE MANUAL

BreakMaster™ LIS

Medium voltage load interrupter switchgear



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Safety measures and classifications

Read the following hazard classifications carefully, and fully inspect the equipment for any identifiable hazards prior to installation, operation, or maintenance. The following classifications listed below will appear throughout this document or on labels located on the equipment. These are standard symbols defined by ANSI Z535.4-2011 which were established for recognition of potential hazards which pose risk to life and property. The classification is based on the probability and severity of injury if the hazard is not avoided. Please follow instructions, warnings, labels, and codes for proper installation, operation, and maintenance of equipment and devices. Only Qualified Persons, as defined by NFPA 70, should provide installation, operation, and maintenance on this equipment and devices.

Danger symbol/Warning symbol

The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists that will result in personal injury if the instructions are not followed.



This is the **safety alert symbol**. It is used to alert you to potential physical injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.



Danger indicates a hazardous situation which, if not avoided, will result in death or serious injury.



Warning indicates a hazardous situation which, if not avoided, could result in death or serious injury.



Caution indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



Notice is used to address practices not related to physical injury.

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 assumes no obligation of notice to holders of this document with respect to changes subsequently made.

ABB 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.

Introduction

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01
BreakMaster LIS

This publication provides guidelines for installation, operation and maintenance of the BreakMaster™ LIS load interrupter switchgear, as shown in Figure 01. The information provided does not cover all details or variations in this product offering, nor does it address all possible contingencies to be met in connection with installation, operation, or maintenance.

Should further information be desired, contact Post-Sales Support: 1-888-437-3765 Refer to the order number found on the data nameplate located at the front of the equipment when calling for assistance.

General description

BreakMaster LIS consists of an air insulated, three pole, gang-operated, quick-make, quick-break, load interrupter switch in a floor mounted metal enclosure.

It can be applied with power fuses and many other protective devices to provide safe, economical switching and circuit protection where infrequent disconnecting means is required. The BreakMaster is designed for medium voltage circuit applications ranging from 2.4 kV through 15 kV from 600 to 1200 load ampere interrupting ratings.

The switch is operated externally from the front of the cubicle and is equipped with a quick make, quick break mechanism to open and close the switch independent of the speed with which the operating handle is moved, manually or power operated.

The switchgear meets or exceeds all applicable ANSI, NEMA and IEEE standards. UL listed switches are available as an option.



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01

Receiving, handling and storage

Receiving

Before leaving the factory, the load interrupter switchgear is given a final mechanical and electrical inspection and is packed in accordance with the best practices for electrical equipment.

On receipt of any apparatus, make an immediate inspection for any damage or loss of equipment in transit. Should damage or missing material be noted, file a claim immediately with the carrier and notify the nearest ABB sales office. Information such as a description of the damage, the order number, serial number, and drawing number are located on this nameplate and should be given to the ABB representative whenever identification of the assembly is required.

Equipment packages

Every package leaving the factory is marked with the customer's order number. If the equipment has been split for shipment, the section numbers of the equipment enclosed in each shipping package are identified.

NOTICE

Notice: To avoid the loss of any parts when unpacking, the contents of each container should be carefully checked against the packing list before discarding the packing material. The contents of each shipping package are listed on the Master Packing List.

Handling

Load interrupter switchgear sections are always shipped in an upright position, in single or group sections. Sections must be maintained in an upright position during all handling. Removable lifting plates are provided on the top of the BreakMaster LIS structure for insertion of hooks to lift the complete structure. This is the only recommended method of moving the BreakMaster LIS structure. Extreme care should be used not to damage or deform the unit if other moving methods are employed.

Storage

If it is necessary to store the equipment before installation, keep it in a clean, dry location with ample air circulation and heat to prevent condensation. Like all electrical apparatus, these units contain insulation that must be protected against dirt and moisture.

NOTICE

Notice: Outdoor units may be stored outside only if roof caps are installed, space heaters energized and any openings are covered.

LIS enclosure lifting

It is preferable to leave the shipping skids in place under the LIS until it reaches its final location. The equipment should be installed in its final location. The LIS sections are best handled by lifting with a crane as shown in Figure 03. Removable lifting plates are provided, as standard equipment, on the top of each LIS shipping section. To preserve the external appearance of the equipment, it is suggested that the lifting plates be left in place except where adjacent equipment must be bolted together, i.e. shipping splits, etc.

CAUTION

Caution: Utilize two/four equal length cables and an overhead crane, each with a minimum load rating of twice the weight of the LIS. Estimated weights for shipping splits appear on the Front View drawings.

NOTICE

Notice: The angle between the cables and the top of the equipment must be at least 45 degrees. If this is not possible because of lack of headspace, spreader bars must be used. Also, lift cables with greater load capability may be necessary, depending upon the angle between the cables and the crane hook.

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02
Using standard lifting angles or lifting eyes to hoist the LIS

Connect a cable from the crane to the two/four lifting plates located on the top-front/rear of the LIS as shown in Figure 02.

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03
Angle 45° between Equipment Lifting hook and cables

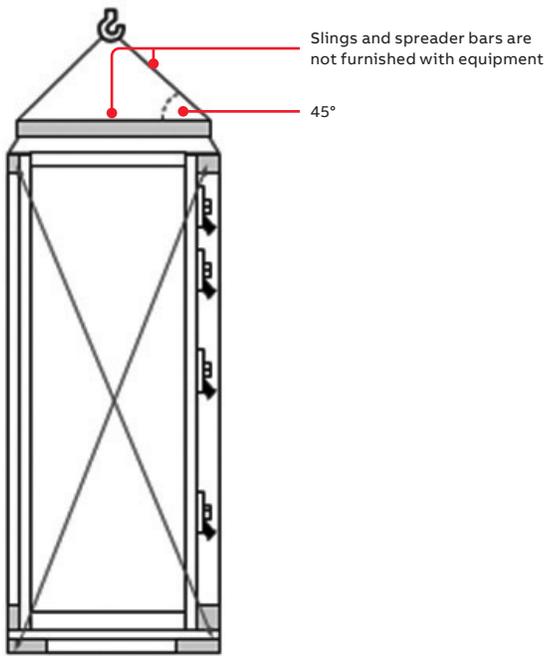
Observe the following points when lifting the equipment:

- Do not pass cables or ropes through support holes
- Always use load-rated, inspected, and approved shackles or safety hooks to attach hoisting equipment to the lifting points

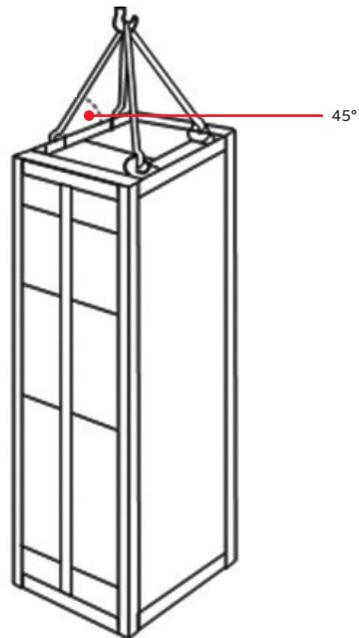
- Rig slings so that the legs are no less than 45° from horizontal, as shown in Figure 03
- Take up the slack in the lifting device very carefully and manually stabilize the LIS to prevent it from rotating

NOTICE

Notice: The weight of the load interrupter switchgear can vary. Check the weight of the section against the capacity of the crane when lifting.



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02



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03

Installation

Access to BreakMaster LIS vertical sections containing switches

Each BreakMaster LIS load interrupter switchgear is shipped from the factory in the closed position to maintain alignment during shipping and handling. The safety interlocking prevents opening of the door of the vertical section when the switch is closed. In order to gain access to the interior, be sure the switchgear is on a true and level surface. To open a manually operated BreakMaster LIS switch, rotate the handle to the open position. When handling the BreakMaster enclosure and moving switches, be sure the switches are in the closed position. Do not operate switches unless they are setting on true and level surfaces.

Identification of shipping splits

Refer to the front view drawing. Below this drawing, shipping splits will be identified in relation to group numbers for each cubicle. Normally shipping sections will not exceed 90 inches in width.

Procedures for joining Breakmaster enclosures at shipping splits

The joining of sections consists of two bolted connections on the top and bottom of each depth frame member. In addition, two bolted connections are made on each vertical frame member. The vertical connections are located 1/3 and 2/3 up from the bottom of the BreakMaster LIS load interrupter switchgear (if 90-inch high switch, then connections are made at 30 inches and 60 inches off the ground).

Make any main and ground bus connections using splice plates and hardware furnished. Bus bars are usually tin or silver-plated. To ensure a proper electrical connection, care should be taken to protect the plating from damage. **DO NOT** use joint compound.

NOTICE

Notice: Cleaning bus joints with abrasive or chemical cleansers may remove plating, which may cause joint overheating.

Connection of switchgear to transformer

Indoor assemblies: Holes are pre-drilled in the side of the BreakMaster LIS structure to match holes provided in the transformer.

Outdoor throat connection

- Switch and transformer should be brought together to give spacing of 1/2 inch between throat flanges
- Apply double bead of caulking material supplied with BreakMaster LIS switchgear to outside surfaces of both flanges
- Move switch and transformer together to compress caulking material

Bolting torque values

BreakMaster LIS is furnished with medium carbon steel hardware having a high tensile strength of 120,000 psi. SAE 5 or better hardware should be used for any additional bolting. The use of a torque wrench is recommended to assure the following torques. The torque values shown in Table 1 apply to aluminum or copper connections. When torquing bolts, the following values are nominal. Flat washers and lock washers should be used for all connections. Washers should not be included under the heads of carriage bolts.

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Table 1: Bolt torques

Bolt Size (Inches)	Torque (lb. ft.)
1/4"	4
5/16"	9
3/8"	16
1/2"	39
5/8"	80

Electrical clearances

Table 2 shows the minimum clearances that should be maintained after field modifications.

Table 2: Minimum clearance for field modification

	2.4 kV - 5kV	7.2 kV - 15kV
Between live parts of adjacent phases:		
Through air:	3 1/2"	5 3/4"
Over Surface:	3 1/2"	5 3/4"
Between live parts and Grounded metal through air over surface:		
	3 1/2"	5 3/4"

Grounding

The ground bus is bolted to the uprights of the frame structure. It is arranged so that connections to the station ground can be made in any unit. A ground bus is included in each section for connecting the BreakMaster equipment to the station ground.



Warning: It is very important that the equipment be adequately grounded to ensure that all parts of the equipment, other than live parts, need to be at ground potential.

Medium voltage electrical connections

Connection by cable supplied with BreakMaster LIS

Cables are not factory pre-cut to proper length. Installer must cut to fit

- Since factory cables are unshielded, they must be properly separated from each other, from all grounded metal parts, and from transformer bushing/terminals of other phases
- BreakMaster LIS conforms to ANSI standards concerning phasing. Phases are arranged A, B, C, front to rear, top to bottom, and left to right at connection points unless otherwise noted on the drawings. The installer is responsible for maintaining continuity of phasing throughout the system

- Lugs are provided with the switchgear for terminating cable to the transformer bushings/terminals

Connection by Bus Bar

- Flexible bus straps or splice plates and hardware are furnished with the BreakMaster LIS
- Copper bus bar is tin, or silver plated connections to metal-clad switchgear assembly

Indoor switchgear

Holes are predrilled in the side of the BreakMaster LIS load interrupter switchgear structure to match holes provided in metal-clad switchgear. Bolt together using hardware furnished with BreakMaster LIS.

Outdoor switchgear

- Position units side by side. Holes in BreakMaster LIS side sheet around bus cutout will match holes in metal clad switchgear flange
- Press weather stripping putty on to flange for weather-tight seal
- Join enclosures using bolts supplied with BreakMaster LIS. Opposite side of metal clad switchgear flange has nuts welded in place for ease of connection

Connection of customer power cables

Cable termination space is provided in the cubicle for top or bottom cable entry as shown on the outline drawings. Adequate electrical clearance must be maintained between cables, energized parts, and grounded metal parts. It is also the installer's responsibility to adequately support cables such that insulators or bus bars do not carry the strain of the cables.

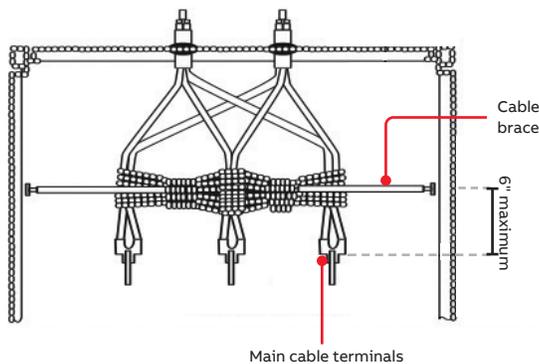
Tin-plated aluminum clamp type terminals are suitable for acceptance of copper or aluminum cable. If potheads or other special terminations are supplied, termination should be made according to the terminator manufacturer's instructions.

Ambient temperature and circuit loading

BreakMaster LIS is designed for installation where the average ambient temperature does not exceed 40°C (104°F). For higher temperatures, derating is required. The conductor temperatures within the enclosure may be as high as 90°C (194°F). Some parts of the switches and fuses may run hotter. Make sure you follow the load requirements for each device in the LIS.

Installation procedure for main cables when cable brace is provided

Align conduit holes in a linear orientation directly over or as close as possible to the braces. Consideration should be given to installing conduits or sleeves which might be required for future connections. Run and bend the main cable in a most convenient orientation, making sure the main cable has been located directly up against the cable braces before it connects to the main cable terminals. Lash the main cable according to Figure 4 below, using a 3/8" nominal nylon rope, or a polyester braided rope having a tensile strength of 2000 lbs. minimum, making 6 revolutions around the "A" and "B" phase main cables and 6 revolutions around the "B" and "C" phase main cables. Continue wrapping the cord around the main cable lashing and around the cable braces (if applicable), in between the phases, tying a knot to the cable brace or cable as you complete your last revolution. All revolutions should be made as tight as possible so as to prevent whipping during short circuits. The nylon rope is not provided.

**Field taping of electrical connections****Materials**

- Filler – insulation putty – ABB Part #: 55A213957
- Insulating tape – black, linerless H.V. EPR tape – ABB Part # MMC#130C1 (1") or MMC#130C2 (2")

Procedure

- Clean area of dirt and foreign matter per the Maintenance Section of this manual
- Apply filler – installation putty – over bare conductor and hardware to cover and smooth out the surface. Blend contour into pre-insulation surfaces. Cover conductors and hardware with at least 1/8" of filler
- Apply insulating tape, lapping, and layering as specified in Table 3. Tape must overlap factory installed insulation by one inch. Elongate insulating tape 10 to 25 percent during application to ensure a smooth, tight fit. Should a tape roll be used up, start the new roll by overlapping any previous end by 1/2 turn

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Table 3: Insulation requirements for field taped connections

	Lap of Tape	No. of Layers
Up to 5kV	1/2	1
Over 5 kV to 15 kV	2/3	2

Securing switchgear to foundations

All anchoring hardware and necessary devices are to be supplied by the installer. Indoor and outdoor units can be secured to the foundation using 1/2" diameter anchor bolts (SAE Grade 5 or stronger).

The four 5/8" holes in the base for these bolts are shown on the floor plan included with the drawings.

Connection of space heaters to customer source
Space heaters, when supplied, must be energized to prevent condensation. Heaters are supplied for 120 or 240 volt sources as shown on drawings. For lineups or units with heater control devices, heaters will be internally wired and brought to a terminal block. A wiring diagram will be furnished with the drawings showing connection points for power.

Switch inspection before setup

The following procedure should be performed to ensure proper operation of the switch. Open and close the switch 2-5 times in succession. Do not attempt to grind the blades with powdered emery or other abrasives. Such practice inevitably results in poor contact and overheating.

Switch contact adjustment should be checked as follows:

1. Operate the switch several times checking for main blade and arcing blade alignment with the stationary contacts and arc chute.
2. Check switch resistance by using a low resistance ohm meter connected between the jaw spade terminal and the hinge spade terminals. Do this measurement of each pole of the assembly.

Any low resistance meter capable of measurements in the micro-ohm range may be used. Suitable meters include:

- Valhalla Scientific, Inc.
 - Model 4150 ATC
 - Digital Ohmmeter
- Biddle Instruments
 - Cat. No. 247350
 - Digital Low
 - Resistance Ohmmeter

Operation

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05
Switch interlock

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06
Door interlock
Cable bracing



Mechanical safety interlocks

BreakMaster LIS is equipped with switch interlocks and door interlocks as well as provisions for padlocking in either the open or closed position.

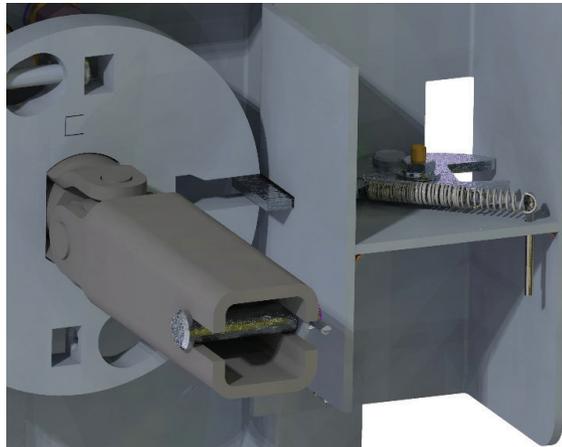
Danger: Ensure all power sources are deenergized before attempting any maintenance.



Warning: Do not defeat or disengage any safety interlocks. Defeating or disengaging safety interlocks on a BreakMaster switchgear that is connected to a power source may result in property damage, bodily injury or death.

Switch interlock

This interlock prevents inadvertent closure of switch if the enclosure door is open. When the door is closed, the catch plate on the door moves the safety latch out of the blocking position. See Figure 05.



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05

Door interlock

This interlock prevents the door of the enclosure from being opened when the switch is closed. When the switch is closed, the door catch plate is captured by the locking cam, preventing the door from being opened. See Figure 06.

Upper door interlock



Danger: Ensure all power sources are deenergized before attempting any maintenance.

The lower switch access door has a metal interlock which forces the upper door to be closed in order to close the lower door.



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06

Key interlock



Warning: Key interlocks, when supplied from the factory, will have a key for each lock; however, for correct sequence of operation, one or more of the keys must be eliminated. These excess keys must either be destroyed or locked away where they will not be accessible to operating personnel. Failure to do so may result in severe injury or death.



Caution: Operating BreakMaster LIS with a key interlock bolt extended will result in equipment damage and may also expose a person to bodily injury or death. The key must be inserted into the interlock and rotated to retract the locking bolt before operating a BreakMaster LIS.

Key interlocks are supplied when specified. Certain BreakMaster LIS configurations require key interlocks and they are therefore included. Standard schemes are available for locking the switch in the open position or the closed position as well as locking the main door closed. Numerous other schemes are available for special requirements, which can coordinate with upstream or downstream devices supplied by ABB or other equipment manufacturers.

Switch operation



Danger: Ensure all power sources are de-energized before attempting any maintenance.



Warning: 'OPEN' and 'CLOSE' or 'I' & 'O' labels on the switch handle operators are to indicate only the DIRECTION to open or close the switch. **DO NOT RELY ON THE LABELS AS SWITCH POSITION INDICATORS**



Caution: Before and after each operation, visually check through the BreakMaster LIS upper door windows, that all poles of the switch have opened properly and are completely disengaged from the upper terminals.



Danger: Do not open the upper or lower doors if the switch blades are not completely disengaged from the upper contacts of the switch.



Caution: Disengage any padlocks or key interlocks required to operate the switch (if equipped).

Switches equipped with a chain drive

To manually close or open the switch, rotate the handle up or down as appropriate. This charges the compression spring, and as the spring lever goes over center, the stored energy of the spring is transferred to the shaft which snaps the switch open or closed. The blades thus move at a predetermined speed that is independent of the operator.

Switches equipped with a direct drive

To open the switch:

1. Ensure all enclosure doors are closed.
2. Engage the removable operating handle with the splined shaft of the manual drive.
3. Rotate the handle counterclockwise till the switch snaps open (Switches equipped with a shunt trip will trip open in the first 20° of rotation).
4. Continue to rotate the handle counterclockwise till it hits the hard stop. (This action also charges the opening spring of switches equipped with a shunt trip. Prematurely stopping handle rotation will prevent the switch from closing operation and keep the door interlock engaged)
5. Remove the operating handle and store it.
6. Visually check that all poles of the switch have opened completely.

To close the switch:

1. Ensure all enclosure doors are closed.
2. Engage the removable operating handle with the splined shaft of the manual drive.
3. Now rotate the handle in the clockwise direction till it hits the hard stop, to close the switch.
4. Remove the operating handle and store it.

NOTICE

Notice: In certain configurations such as units placed close to a wall or in outdoor front extensions, space may be limited to operate the handle in one single rotation. In such cases, the operating handle can be removed in an intermediate position and reengaged to complete the rotation to the hard stop.

In both Chain and Direct drives, the quick-make mechanism provides power to overcome blowout forces that occur if the switch is closed into a fault. However, these forces are not transmitted to the operating handle since it is not rigidly connected to the blades. Therefore, the switch can be safely closed under short circuit conditions within its fault-close rating.

Load interruption is accomplished by arcing blade and engaging contact fingers located inside an arc chute. On opening the switch, the main blades open first, and all current is shunted through the spring-loaded arcing blades. Further travel of the main blades causes the arcing blades to snap out of their contact fingers where associated arcing takes place within the arc chutes.

Fuse replacement steps

Danger: When accessing fuses, failure to assure that the fuses are de-energized may result in equipment damage, bodily injury or death.

Ensure all power sources are de-energized before attempting to access the fuses.

1. All upstream devices that could energize the fuse should be opened, padlocked, and tagged so that inadvertent closure cannot create a hazard.
2. BreakMaster LIS is opened by rotating the handle downward. (or counterclockwise for direct drive handles)
3. Before opening the door look through the viewing window to visually verify that all blades are disengaged from their stationary contacts. Use a flashlight if necessary.
4. After opening the door, an appropriate medium voltage-sensing device, such as a TIC tracer rated up to 15 kV, should be used to determine if voltage is present. An example would be TIC brand, TIF320HV.
5. If no voltage is present, a suitable grounding device should be attached to the fuse terminals to discharge any static charge and assure that the fuse terminals remain at ground potential.

6. Remove fuse by pulling fuse forward until it is clear of the fuse clips. Install new fuse by inserting it into the fuse clips. Make sure the clips fully contact the fuse ferrules. See Figure 07.



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07

Shunt trip operation

Shunt trip option is available only with the direct drive configuration.

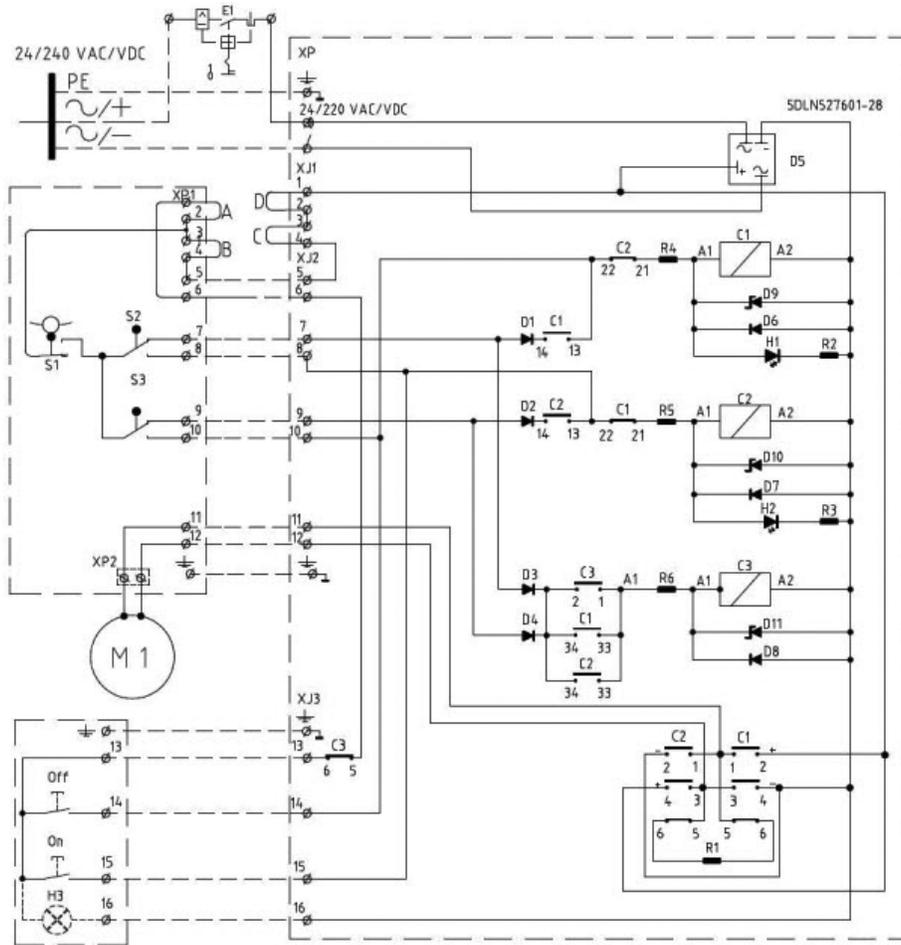
Motor operator

Motor operator option is available only with the direct drive configuration. The motor operated LIS units are also equipped with co-ordinated key interlocking on the operating handle and the Lower Door. Operation of the motor is disabled when the switch is locked in open position and key interlock of the door is open.



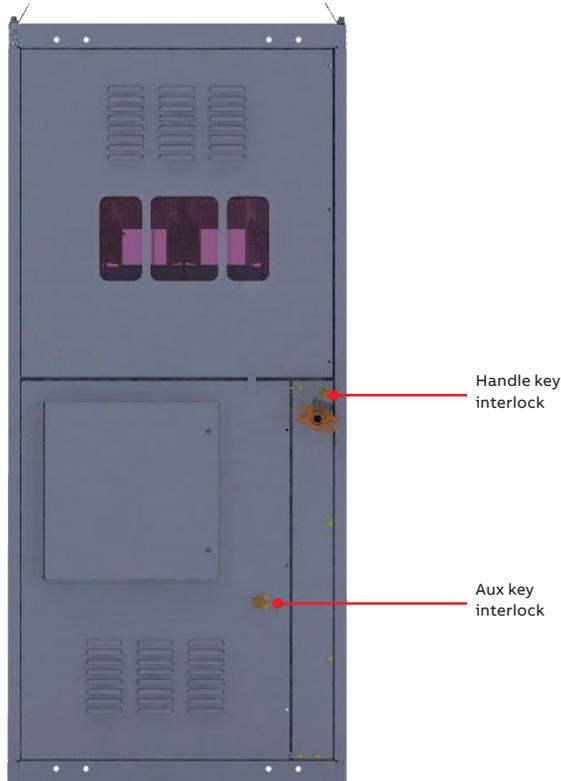
Caution: Ensure all padlocks and keyed interlocks are withdrawn before the motor is operated. Failure to do so may overload and damage the motor, control board and mechanical operators.

08
Motor operator
circuit diagram



- | | | | |
|---------|---------------------------------------|-------|--|
| C1-C2 | CONTACTOR WITH AUXILIARY CONTACTS | S1 | MICRO SWITCH, START POSITION |
| C3 | CONTACTOR | S2-S3 | MICRO SWITCH, END POSITION |
| R2-R6 | RESISTOR | PB1 | PUSHBUTTON ON/OFF |
| D1-D4 | DIODE | PB2 | PUSHBUTTON ON/OFF |
| D5 | DIODE BRIDGE (not for 24v) | E1 | MINI CIRCUIT BREAKER |
| D6-D8 | DIODE | H1/H2 | LIGHT DIODES |
| D9-D11 | ZENIDIODE | (H3 | CONTROL LAMP "DEVICE OK") |
| XP1/XP2 | TERMINATIONS FOR MOTOR | A | CONNECTION FOR AUXILIAR SWITCH FOR FUSE INTERRUPTION |
| XJ1-XJ3 | TERMINATIONS FOR CONTACTOR UNIT | | |
| M1 | MOTOR | | |
| B,C,D | CONNECTIOIN FOR CUSTOMER INTERLOCKING | | |

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09
Motor operator interlock



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08

When supplied, the duplex configuration consists of two BreakMaster LIS load interrupter switchgear connected by a common load side bus. If fusing is included, it normally consists of only one set of fuses located in one of the switch compartments between the load side bus and outgoing terminals. This arrangement allows the selection of either of two incoming lines. As standard, this arrangement is supplied with key interlocking for safe operation. Key interlocking normally consists of a lock on each switch and a lock on each door.

Each of the locks is keyed alike and only one key should be available to operating personnel. Since the key is retained in its lock when a switch is closed or when a door is opened, two things are assured:

1. Only one switch may be closed at a time to prevent paralleling of incoming lines.
2. Both switches must be locked in the open position to unlock either main door, preventing access to energized load side bus or fuses.

Duplex switchgear configuration



Caution: Only one key should be available to operating personnel for this interlock scheme.

When shipped from the factory, each lock will have a separate key. All extra keys must be destroyed or otherwise made inaccessible to operating personnel. Failure to do so could result in severe injury or death.

Maintenance

General requirements

**DANGER**

Danger: Only trained and qualified personnel should carry out maintenance procedures. This Manual covers only routine maintenance.

Ensure all power sources are deenergized before attempting any maintenance. There may be voltage present within the equipment from remote sources, even though all main- and branch-circuit disconnects have been opened at the equipment. Failure to observe this precaution can result in serious injury or death.

**CAUTION**

Caution: Only qualified ABB Service personnel or ABB trained, and qualified service personnel are authorized to perform overhaul or service of the load break switch and associated accessories. Contact ABB services.

**CAUTION**

Caution: Ensure proper ventilation and other precautions are taken when using any chemical cleaner.

Periodic checking

The customer should prepare a maintenance program consisting of a schedule and checklist matrix listing items to be periodically examined on the installed equipment.

Load break switches should be examined and checked at least once a year or sooner when conditions require it (such as numerous operations, polluted atmosphere or overloading of the switch). All switches should annually be opened and closed 2-5 times in succession, not exceeding their rated duty.

Cleaning

**NOTICE**

Notice: DO NOT USE any type of alcohol-based cleaners on the VersaRupter load break switch. This results in weakening of the mechanical properties of tension rods and can cause them to crack.

All switches, including insulators and operating arms, should be thoroughly cleaned periodically by wiping with a clean cloth to prevent accumulations of dust. Strong solvents and alcoholic fluids must not be used. For cleaning, water with soap can be used.

Lubrication

**NOTICE**

Notice: Arcing knives, piston, and cylinder of the VersaRupter load break switch must not be greased.

After cleaning, the contact area of the main blades and the fixed contacts of the VersaRupter load break switch must be greased with ISOFLEX TOPAS NCA 52. If the VersaRupter is placed in a very humid and polluted area, which will reduce the tracking resistance, it is recommended to polish the insulators and insulated components with Silicon Type DC200 Fluid 100 cst.

Other bearing points and sliding surfaces in the BreakMaster LIS load interrupter switchgear should be lubricated at the regular inspection periods (annually) with a thin film of low temperature lubricant

Insulators

It is necessary that the insulators surfaces be kept clean. This is essential, particularly when the switches are located where cement dust, metallic dust, salt spray, acid fumes and other unfavorable environmental conditions exist. A light detergent is recommended for cleaning the insulator parts. Discard and replace any insulators showing signs of tracking.

Insulation check

When making an annual check, all insulation should be carefully examined for tracking. Special attention must be given to areas where the conductor passes through an insulator or lays near a barrier. Examine the surface for cracks or streaked discoloration. When tracking is found, the insulation involved must be replaced. In such a case, contact your local ABB sales office for replacement parts.

Bus and conductor (switch blade) check

Inspect the buses and connections carefully every year for evidence of overheating or damage. It is desirable to measure the resistance to ground and between phases of the insulation of buses and connections with a meter (or use a megger of proper voltage. A record should be kept of this reading. Weakening of the insulation from one maintenance period to the next can be recognized from the recorded readings. At recording time, the record should include the temperature, the humidity, and the date.

Inspect main and vertical bus joints and main bus supports and tighten, if necessary. Refer to Table 01 for torque specifications.

Chain drive

The chain drive assembly connects the operating mechanism to the operating handle on the front of the housing. It consists of a length of roller type chain fastened in a loop by two adjustable turnbuckles with locking nuts. Ensure sure turnbuckles and locking nuts are tight. No adjustments are necessary.

Direct drive

The direct drive assembly connects the operating mechanism to the operating handle on the front of the housing. It consists of a hollow tube connecting the bevel gears to the manual drive operator. Inspect the locking pins. No adjustments are necessary.

Pushrods

Each main blade of the switch is connected to the throw arms or the main operating shaft by an insulated pushrod. These pushrods should be examined during each normal maintenance procedure for signs of damage to either end. If a damaged pushrod is encountered, replacement parts are needed.

Operating mechanisms

The chain or direct drive operating mechanisms consists of a housing with a one-piece crank sprocket assembly supported by bearings and a spring assembly. These units are factory adjusted and should need no adjustment in the field.

Wiring and instruments

Check all unit wiring for deterioration of insulation and tighten all connections. Visually check meters and instruments. Check critical instrument calibrations. Check all indicating lights and replace, as required.

Interlocks

Check all unit door interlocks for proper operation.

Fuse replacement

If fuse replacement is necessary, always install the same type and rating as the fuses furnished with the load interruption switchgear. Fuse designs may be mechanically equivalent but not electrically equivalent. They may not have the same short-circuit withstand and current-limiting ability.

**CAUTION**

Caution: Only qualified ABB Service personnel or ABB trained, and qualified service personnel are authorized to perform overhaul or service of the load break switch and associated accessories. Spare parts shown below for purchasing reference only. Contact ABB services for installation support.

Table 4: Recommended spare parts

Description	Order code
Aux switch	244006519
Shunt trip 125 VDC	186873007
Shunt trip 110 VAC	186873002
NM Motor & control board (110VAC/DC)	245869003
Chain kit (Chain drive)	247100503
Removable handle	183786001
Contact knife assembly 15 kV 600 A	245847501
K-mechanism, 40 kA	186041001
A-mechanism, 40 kA	186872002
K-mechanism, 61 kA	2RFA018256A0008
A-mechanism, 61 kA	2RFA018257A0005
VersaRupter 15 kV 600 A w/ K-mech	VK3M1564U000000000
VersaRupter 15 kV 600 A w/ A-mech	VA3M1564U000000000
VersaRupter 15 kV 1200 A w/ K-mech	VK3L1516U000000000
VersaRupter 15 kV 1200 A w/ A-mech	VA3L1516U000000000

Reference document numbers

VersaRupter® MV indoor switch 4.76-38 kV, 200-1200 A, 40 and 61 kA Installation, Operations, and Maintenance Manual is available at library.abb.com.

Post shipment service is dedicated to customers using ABB Electrical Distribution products. Contact ABB Service at 1-888-437-3765.

Typical reasons for calling ABB Service:

- Need help installing a product
- Incomplete or damaged shipment
- Wrong product in shipment
- Product failure



Product end-of-life

ABB products are manufactured to meet or exceed the standards of compliance for quality, in accordance with ISO 9001.

Methods of disposal

Disposal can be carried out in a manner of ways depending upon material of product. Below is the recommended method of disposal for various raw materials.

During disposal of the product, it is always necessary to act in accordance with local legal requirements in force.

Table 5: Recommended methods of disposal based on the raw material

Raw material	Recommended method of disposal
Metal material (Fe, Cu, Al, Ag, Zn, W, etc.)	Separation and recycling
Thermoplastics	Recycling or disposal
Epoxy resin	Separation of metal and disposal of remains
Rubber	Disposal
Oil (transformer oil)	Draining and recycling or proper disposal
Packing material	Recycling or disposal



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