Elastimold® Molded Reclosers, Switches & Switchgear

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Elastimold® Molded Reclosers, Switches & Switchgear

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Overview

Use Switchgear Building Blocks to create standard configurations and custom designs that improve your distribution system’s reliability.

- All switchgear components are fully sealed and submersible — EPDM molded rubber construction with stainless steel hardware and mechanism boxes
- Vacuum-switching and vacuum interrupting components are maintenance free and require no gas or oil
- Deadfront construction insulates, shields and eliminates exposed live parts
- Small footprint enables components to fit in tight padmount, subsurface, vault or riser pole installations
- Non-position sensitive — can be installed almost anywhere and in any position (e.g. hanging from ceilings, wall mounted, mounted at an angle, riser pole mounted)
- Modular construction allows for any combination of fused, switched and interrupter ways on one piece of switchgear up to 35kV
- Electronic controls for protection and automatic source transfer applications
- Self-powered controls and customized protection curves enable flexibility of settings and operation in different locations throughout the distribution system
- Motor operators for remote/local open/close operation of three-phase switched or interrupter ways enable remote configuration of loops, sectionalizing of feeders and automatic or manual source transfer with a wide variety of RTUs and communication devices

Whether it is a standard or a custom application, Thomas & Betts has the right combination of components and expertise to fit your needs. The modularity and flexibility of Elastimold® Switchgear enable the user to combine the different individual components into products that improve the reliability and performance of distribution systems.

Two basic components form the basis of Elastimold® Switchgear:
- Single-Phase and Three-Phase Molded Vacuum Switches (MVS)
- Single-Phase and Three-Phase Molded Vacuum Interrupters (MVI)

These components — combined with electronic controls, motor operators and SCADA-ready controls — enable you to improve your distribution system’s reliability.
Overview

Configure Switchgear Building Blocks to solve challenges in your distribution system.

Elastimold® Switchgear products are classified in three different categories according to the function they perform:

- Switching and Sectionalizing Equipment
- Automatic Source Transfer Equipment
- Overcurrent Protection Equipment

Switchgear products can be used in padmount, subsurface/wet or dry vaults and riser pole installations. The switching or manual sectionalizing of loads can be accomplished with the use of Molded Vacuum Switch (MVS) modules. The simplest manual sectionalizer is a single MVS switch, which can be installed in a vault, on a pole or inside a padmount enclosure. One of the most popular applications of this sectionalizer is as a replacement for existing oil fuse cutouts. Two-, three- and four-way units are also available in vault and padmount styles. Switches also aid in the manual reconfiguration of distribution loops by installing them at the open point in the circuit.

Overcurrent protection is accomplished using Molded Canister Fuse (MCAN) or Molded Vacuum Interrupter (MVI) modules. These can be used in combination with MVS modules. The simplest product is a single MVI unit, which can be installed in a vault, on a pole or inside a padmount enclosure. A common application for this configuration is as a replacement for existing oil fuse cutouts. Two-, three- and four-way units are also available in any combination of MVI, MCAN and MVS modules, and in vault and padmount styles. Fuses and interrupters are applied in underground loops to aid in the sectionalizing of the main feeder, and by providing protection to the loads along the loop. For more information on canister fuses, see pages H-75–H-82.

### Underground Distribution Switchgear Applications

![Diagram of Underground Distribution Switchgear Applications](image)

**NOTE:** NC = normally closed  
NO = normally opened

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*Power & High Voltage — Elastimold® Molded Reclosers, Switches & Switchgear*
Overview

Load switching is required when:

- A load needs to be isolated to perform maintenance
- A load needs to be isolated to repair a fault
- A loop needs to be reconfigured to feed a certain load from a different substation and isolate the faulted portion of the loop

In any case, the use of a manual sectionalizer contributes to reduce the length of time that unaffected or unfaught portions of the system are exposed to an outage. This results in improved reliability of the system as the duration of outages is reduced (i.e. the SAIDI and CAIDI reliability indices). Switching products can be applied as replacements for existing oil fuse cutouts or as manual sectionalizers for loops or radial feeders. Depending on the application, these sectionalizers may be installed in a vault or inside a padmount enclosure. Pole installations are also available.

![Without Manual Sectionalizing](Image)

**Without Manual Sectionalizing**

**S1**

Breaker 500 Users 500 Users 500 Users

No Manual Sectionalizing Unit

Permanent Faults F1 and F2

Interruption Duration: F1 = 1 hr.; F2 = 2 hr.

Evaluation Period = 1 yr.

\[
\text{SAIDI} = \frac{(1 \text{ hr.}) \times (1000) + (2 \text{ hr.}) \times (1000)}{1000} = 3 \text{ hr./yr.}
\]

\[
\text{SAIFI} = \frac{1000 + 1000}{1000} = 2 \text{ interruptions/yr.}
\]

In this example, a radial feeder is exposed to two failures in one year. Without any manual sectionalizing, all customers are subject to both failures and are out of power until failures are restored. Assuming that the duration of outage one (F1) is 1 hour, and outage two (F2) is 2 hours, the calculation of SAIDI shows 3 hours of interruption duration per year.

![With MVS Manual Sectionalizing — Improved Reliability!](Image)

**With MVS Manual Sectionalizing — Improved Reliability!**

**S1**

Breaker 500 Users 500 Users 500 Users

MVS Manual Sectionalizing Unit = Shorter restoration time for 500 customers

Permanent Faults F1 and F2

Interruption Duration: F1 = 1 hr.; F2 = 2 hr. for 500 users; F2 = 1 hr. for 500 users

Evaluation Period = 1 yr.

\[
\text{SAIDI} = \frac{(1 \text{ hr.}) \times (1000) + (2 \text{ hr.}) \times (500) + (1 \text{ hr.}) \times (500) + (2 \text{ hr.}) \times (500)}{1000} = 2.5 \text{ hr./yr.}
\]

\[
\text{SAIFI} = \frac{1000 + 1000}{1000} = 2 \text{ interruptions/yr.}
\]

With the use of an MVS at the midpoint of the feeder, the restoration time is reduced. Once the fault is located, the MVS is open to isolate the faulted portion of the feeder. At this point, the other half of the feeder can be energized, reducing the outage duration or SAIDI from 3 hours to 2.5 hours per year (16.6%).

Similar application of MVS switches in loop configurations contribute to significantly reduce the outage duration. In these cases, single- or multi-way switch configurations can be applied.
## Overview

Fault interrupting devices are used on:

- Feeders to sectionalize, so that if there is a fault, only a small section of the load is affected.
- Radial taps deriving from a main feeder or loop, so that a fault on a tap is isolated from the main circuit.
- Network transformers to isolate the devices in case of overcurrent, excessive pressure/temperature, etc.

While a switching device contributes to decrease the duration of outages, fault interrupters contribute to decrease the duration AND frequency of outages (i.e. SAIDI, CAIDI, SAIFI, CAIFI reliability indices).

### Without Manual or Automatic Sectionalizing

**No Automatic Sectionalizing Unit**

Permanent Faults F1 and F2

**Interruption Duration:** F1 = 1 hr.; F2 = 2 hr.

**Evaluation Period = 1 yr.**

S1

**SAIDI** = [(1 hr.) x (1000)] + [(2 hr.) x (1000)]/1000 = 3 hr./yr.

S1

**SAIFI** = [(1000 + 1000)/1000] = 2 interruptions/yr.

In this example, a radial feeder is exposed to two failures in one year. Without any automatic sectionalizing (overcurrent protection), all customers are subject to both failures and are out of power until failures are restored. Assuming that the duration of outage one (F1) is 1 hour, and outage two (F2) is 2 hours, the calculation of SAIDI shows 3 hours of interruption duration per year. The calculation of the frequency of interruptions (SAIFI) shows two interruptions per year.

### With MVI Automatic Sectionalizing — Improved Reliability!

**MVI Automatic Sectionalizing Unit = Eliminate one interruption for 500 users**

Permanent Faults F1 and F2

**Interruption Duration:** F1 = 1 hr.; F2 = 2 hr. for 500 users

**Evaluation Period = 1 yr.**

S1

**SAIDI** = [(1 hr.) x (1000)] + [(2 hr.) x (500)]/1000 = 2 hr./yr.

S1

**SAIFI** = [(1000 + 500)/1000] = 1.5 interruptions/yr.

With the use of an MVI overcurrent fault interrupting device at the midpoint of the feeder, failure F2 only affects half of the load. Proper protection coordination between the MVI and the substation breaker enables the MVI to clear the fault before any customers between the MVI and the breaker are affected. Frequency and duration of interruption are significantly reduced. SAIDI is reduced from 3 to 2 hours of interruption per year (33%), and SAIFI is reduced from 2 to 1.5 interruptions per year (25%).

### Automatic Sectionalizing Switchgear

Similar improvements can be accomplished with the use of MVIs in loop systems. A typical example of the use of radial protection off the main feeder to improve reliability is the use of single-phase MVIs in sectionalizing cabinets. These cabinets can be installed with no tap protection at the beginning of a construction project, and MVIs can be added as the loads come online.
Tighter reliability, efficiency and loading requirements of the power system result in the need to keep costs at a minimum. Bringing more automation and intelligence to the power grid network to address numerous power utility concerns — ranging from reducing operational expenses to meeting new regulatory requirements — has prompted migration toward the next generation of distribution and substation automation.

Elastimold® Distribution Automation products provide automation solutions for real-time monitoring of critical feeders, reducing outage duration and supporting the shifting of loads between sources to alleviate overload conditions. These products offer a complete solution package, including Elastimold® Switchgear and Schweitzer Engineering Laboratories (SEL) controls such as the SEL 451-5, for interoperability and rapid automation implementation. Elastimold® Distribution Automation Solutions include:

- Automatic Source Transfer (Preferred/Alternate)
- Loop Automation (Fault Detection, Isolation and Restoration — FDIR)

**Automatic Source Transfer Systems**

The main application of source transfer packages is to transfer a load from one power source to another. In some cases, when the load is not critical, this is done manually with a switching device. In the case of critical loads for hospitals, financial institutions, manufacturing facilities and other loads involving computerized equipment, a fast transfer is required between the main (preferred) source and backup (alternate) source. It is important that the automatic source transfer not affect load operation because any interruption of the business process translates into costly production loss and setup time. The preferred and backup sources are normally utility feeders, but in some instances may be a generator.

Elastimold® Switchgear offers automatic transfer (AT) packages with motor operators and voltage sensors capable of performing a full transfer in less than two seconds. For even faster transfer requirements, the fast transfer option using a magnetic actuator mechanism enables switching in 6¹⁄₂ cycles, or approximately 110 milliseconds. In either case, the system monitors voltage on the preferred source and initiates a transfer when voltage drops below the acceptable level for the customer. At this point, the preferred source is disconnected and the alternate source is connected.

Under normal operating conditions, the critical load is connected to the Preferred Source through S2. If power from the Preferred Source is lost due to an upline fault, the Automatic Source Transfer unit detects the loss of voltage on S2. It automatically opens S2 and closes S1 to energize the critical load from the Alternate Source. With fast transfer, switching can be accomplished in 6¹⁄₂ cycles — or about 110 milliseconds.

**Loop Automation Systems**

In the case of underground loops, the switching devices along the loop can be used to reconfigure the loop to perform automatic fault detection, isolation and service restoration (FDIR). Thus, regardless of fault location, the switches will isolate the faulted portion of the loop and restore service to the remaining customers.

**Elastimold® Switchgear Combined with SEL Controls**

The opportunity to drop in a complete automation package enables utility companies to create highly reliable commercial and industrial parks in locations subject to frequent and possibly extended outages. The FDIR scheme allows restoration in only a few seconds, minimizing traditional restoration issues and associated loss of productivity and revenue, and provides the following key benefits:

- Automatic detection of open point of the loop
- Automatic reconfiguration of the loop to restore power to the load
- Ability to enable or disable the automatic network restoration scheme from any unit
- Infinite expandability — no limit to the number of units that can be installed
- No need for overcurrent protection coordination upon reconfiguration
- SCADA system interface: fiber optic, Ethernet and radio
### Overview

#### Operational scenario examples — Set-up and system normal state
- Loop automation scheme with two or more Elastimold® multi-way switchgear units
- Loop is fed from two different sources
- One piece of switchgear serves as the normally open point in the loop
- Each multi-way switchgear is automated with the SEL451-5
- Source switches have overcurrent fault-protection capabilities
- Each multi-way switchgear senses:
  - Current on all phases and on all ways
  - Voltage on both sides of the gear on the main loop

#### Operation Scenario 1
**Loss of voltage on one source due to an upstream fault**
1. Normal state
2. SWG1-1 opens on loss of source voltage after time delay
3. Search for closest downline switch
4. SWG2-1 closes to restore load
5. FDIR scheme disables itself

#### Operation Scenario 2
**Fault located between two automated switchgear units**
1. Normal state
2. SWG1-2 times to trip; SWG1-1 tripping is momentarily blocked
3. Search for next downline switch
4. If switch is open, FDIR scheme disables itself, OR — if switch is closed, switch opens to isolate fault, searches for next downline open switch to restore load and FDIR scheme disables itself

#### Operation Scenario 3
**Bus fault within the switchgear**
1. Normal state
2. SWG1-1 and SWG1-2 open
3. Close SWG2-1 to restore load between SWG1 and SWG2
4. FDIR scheme disables itself

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### Operational scenario examples — Set-up and system normal state

#### Operation Scenario 1
**Loss of voltage on one source due to an upstream fault**
1. Normal state
2. SWG1-1 opens on loss of source voltage after time delay
3. Search for closest downline switch
4. SWG2-1 closes to restore load
5. FDIR scheme disables itself

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**Fault located between two automated switchgear units**
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2. SWG1-2 times to trip; SWG1-1 tripping is momentarily blocked
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#### Operation Scenario 3
**Bus fault within the switchgear**
1. Normal state
2. SWG1-1 and SWG1-2 open
3. Close SWG2-1 to restore load between SWG1 and SWG2
4. FDIR scheme disables itself
Overview

Network Transformer Protection

The reliability of conventional radial or looped underground distribution circuits is measured in terms of the number and/or frequency of interruptions. These measurements cannot be directly applied to a network system. A typical network system has built-in redundancy. During most events, the continuity of power supplied to the end user is not affected by fault conditions on the high side of the network transformers. So, from the point of view of customer interruptions, network systems are reliable.

However, transformer failures have been known to result in catastrophic fires, explosions and even loss of lives. The failure or overload of multiple transformers within a network may ultimately result in the interruption of service to the end user.

Loss of Redundancy

<table>
<thead>
<tr>
<th>Loss of Redundancy is a method that highlights the increased vulnerability of the system every time a network transformer is lost. Loss of redundancy indices are calculated as follows:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of Loss of Redundancy (hours/year) = (S x No. of Transformers in the Circuit) / No. of Transformers in the Circuit</td>
</tr>
<tr>
<td>Frequency of Loss of Redundancy (times/year) = Total No. of Transformer De-Energizations / No. of Transformers in the Circuit</td>
</tr>
</tbody>
</table>

The number of transformers in the circuit is the number of transformers energized by the same feeder.

The loss of redundancy indices are calculated in the following example.

Example 1: No High-Side Transformer Protection

Consider one substation breaker and one exclusive feeder out to the network. Five transformers are energized by the same feeder. Assume one permanent fault on one transformer in one year. Also assume the faulted transformer is de-energized for six hours:

\[ \text{Duration of Loss of Redundancy (hours/year)} = \frac{6 \times 5}{5} = 6 \text{ hours/year} \]

\[ \text{Frequency of Loss of Redundancy (times/year)} = \frac{5}{5} = 1 \text{ time/year} \]

Because there is only one breaker for five transformers, a failure in one transformer translates to the interruption of power to five transformers for six hours.

Loss of redundancy can occur as a consequence of:

- Transformer fire
- Transformer overheating
- Transformer pressure build-up
- Overcurrent condition

Benefits of such a setup to the network system and the end users include:

- Minimization of fire damage
- Reduction or elimination of transformer damage due to pressure or temperature build-up
- Longer transformer life
Overview

The following example calculates the loss of redundancy to the same system used in Example 1, but adding protection to the primary side of the transformers.

Example 2: High-Side Transformer Protection

There is one substation breaker and one exclusive feeder out to the network. Five transformers are energized by the same feeder. Each transformer is equipped with a fault interrupter installed on the high side. Assume one permanent fault on one transformer in one year. Assume the transformer is de-energized for six hours:

\[
\text{Duration of Loss of Redundancy (hours/year)} = \frac{(6 \times 1)}{5} = 1.2 \text{ hour/year}
\]

\[
\text{Frequency of Loss of Redundancy (times/year)} = \frac{1}{5} = 0.2 \text{ time/year}
\]

A failure in one transformer translates to the interruption of power to only one transformer for six hours.

Once an MVI is installed, remote operation from the entrance of the vault or via SCADA is possible with the addition of a motor operator and control. Installation of panic/emergency push buttons at the entrance of the vault is also possible; pressing this emergency switch will instantaneously trip open one or all of the interrupters in a vault and isolate the transformers.

Elastimold® Switchgear Network Package (NMVI3)

Elastimold® Switchgear Solutions

- Solid dielectric
- Vacuum interruption
- No maintenance — no oil or gas
- Fully automated from the factory or fully field upgradeable for automation
- Ability to add new units to existing automated loops
Molded Vacuum Switches and Interrupters

Spring-energy, load-switching devices that make, carry and interrupt load currents through 600A on 5 to 38kV distribution systems.

MVS Molded Vacuum Switches

- EPDM molded rubber insulation — MVSs are fully sealed and submersible
- Vacuum switching and vacuum interruption components are maintenance-free and require no gas or oil
- Small footprint enables MVSs to fit in tight padmount, subsurface, vault or riser pole installations

MVS Molded Vacuum Switches include molded-in elbow connection interfaces and spring-energy mechanisms. Available in both single- and three-phase models, units are manually operated with a hotstick. Motor operator, SCADA and auto-transfer control options are available.

Single-Phase Switches Approximate Weight: 30 lbs.

Available with 600A one-piece bushings or 200A wells on either/both terminals.
Molded Vacuum Switches and Interrupters

Three-Phase Switches Approximate Weight: 135 lbs.

Available with 600A one-piece bushings or 200A wells on either/both terminals.

**Ratings**

<table>
<thead>
<tr>
<th></th>
<th>15.5kV</th>
<th>27kV</th>
<th>38kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Design Voltage (kV)</td>
<td>15.5</td>
<td>27</td>
<td>38</td>
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<tr>
<td>Frequency (Hz)</td>
<td>50/60</td>
<td>50/60</td>
<td>50/60</td>
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<tr>
<td>BIL Impulse (kV)</td>
<td>95</td>
<td>125</td>
<td>150</td>
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<tr>
<td>One-Minute AC Withstand (kV)</td>
<td>35</td>
<td>60</td>
<td>70</td>
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<tr>
<td>Fifteen-Minute DC Withstand (kV)</td>
<td>53</td>
<td>78</td>
<td>103</td>
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<tr>
<td>Load Interrupting &amp; Loop Switching (Amp)</td>
<td>600</td>
<td>600</td>
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<tr>
<td>Transformer Magnetizing Interrupting (Amp)</td>
<td>21</td>
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<tr>
<td>Capacitor or Cable Charging Interrupting (Amp)</td>
<td>10</td>
<td>15</td>
<td>20</td>
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<tr>
<td>Asymmetrical Momentary and 3-Operation Fault Close (Amp)</td>
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<tr>
<td>Symmetrical One-Second Rating (Amp)</td>
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<tr>
<td>Continuous Current (Amp)</td>
<td>600</td>
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<tr>
<td>Eight-Hour Overload Current (Amp)</td>
<td>900</td>
<td>900</td>
<td>900</td>
</tr>
</tbody>
</table>

**Application Information**

Construction: Submersible, corrosion resistant, fully shielded

Ambient Temperature Range: -40° C to 65° C

**Certified Tests**

MVS loadbreak switches have been designed and tested per applicable portions of IEEE, ANSI, NEMA and other industry standards, including:

- IEEE C37.74 Standard for Subsurface, Vault and Padmounted Load-Interrupting Switches
- IEEE 386 Standard for Separable Connectors and Bushing Interfaces
- IEC 265 International Standards for Load-Interrupting Switches
- ANSI C57.12.28 Standard for Padmount Enclosures

**Dimensions**

- **Open Position**: 43°
- **Closed Position**: 189/16" (483mm)
- **Insulated Drive Rod Assembly**: 19" (483mm)
- **Molded EPDM Rubber Insulation and Shielding**: 21° (533mm)
- **Cable Connection Bushings**: 18° (470mm)
- **Spring Operating Mechanism Contained within 304 Stainless Steel Housing**: 18° (483mm)
- **Patented Silicone Rubber Diaphragm Separates Line and Ground Potential**: 9° (241mm)

**Technical Specifications**

- **Electrical Ratings**
  - **Maximum Design Voltage (kV)**: 15.5, 27, 38
  - **Frequency (Hz)**: 50/60, 50/60, 50/60
  - **BIL Impulse (kV)**: 95, 125, 150
  - **One-Minute AC Withstand (kV)**: 35, 60, 70
  - **Fifteen-Minute DC Withstand (kV)**: 53, 78, 103
  - **Load Interrupting & Loop Switching (Amp)**: 600, 600, 600
  - **Transformer Magnetizing Interrupting (Amp)**: 21, 21, 21
  - **Capacitor or Cable Charging Interrupting (Amp)**: 10, 15, 20
  - **Asymmetrical Momentary and 3-Operation Fault Close (Amp)**: 20,000, 20,000, 20,000
  - **Symmetrical One-Second Rating (Amp)**: 12,500, 12,500, 12,500
  - **Continuous Current (Amp)**: 600, 600, 600
  - **Eight-Hour Overload Current (Amp)**: 900, 900, 900

**Material Information**

- **Molded EPDM Rubber Insulation and Shielding**: Suitable for submersible and corrosion-resistant applications.

**Installation Considerations**

- **Ambient Temperature**: -40° C to 65° C
- **Operational Range**: 43° for open and 189/16" (483mm) for closed position

**Contact Us**

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www.tnb.com
Molded Vacuum Switches and Interrupters

Make, carry and automatically interrupt currents through 25,000A symmetrical on 5 to 38kV distribution systems.

MVI Molded Vacuum Fault Interrupters

- Vacuum interrupters, programmable, electronic, self-powered controls and EPDM rubber insulation provide compact, lightweight and submersible overcurrent protection
- Field programmable with a wide range of time-current characteristic (TCC) curves and trip settings
- TCC curves provide predictable tripping for ease of coordination with upstream and/or downstream protective devices
- Control monitors the circuit condition — when the programmed parameters are exceeded, a signal is sent to the tripping mechanism
- Available motor operators and controls enable radial feeders or loops to be reconfigured, either manually or via SCADA

MVI Molded Vacuum Fault Interrupters include molded-in elbow connection interfaces and trip-free mechanisms. They are available in single- and three-phase models. Units are self-powered and include current-sensing and electronic control.

Front View Single-Phase

200A Wells

600A Bushings

Conforms to ANSI Std. 366

Front View Three-Phase

600A T Elbow Interface

Programmable Control & Current Transformer
Molded Vacuum Switches and Interrupters

Ratings

<table>
<thead>
<tr>
<th>Voltage Class (kV)</th>
<th>15.5</th>
<th>15.5</th>
<th>15.5</th>
<th>27</th>
<th>35</th>
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<tbody>
<tr>
<td>Maximum Design Voltage (kV)</td>
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<td>17</td>
<td>15.5</td>
<td>29</td>
<td>38</td>
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<tr>
<td>Frequency (Hz)</td>
<td>50/60</td>
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<td>50/60</td>
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<tr>
<td>BIL Impulse Withstand (kV)</td>
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<td>125</td>
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<td>One-Minute AC Withstand (kV)</td>
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<td>50</td>
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<tr>
<td>Five-Minute DC Withstand (kV)</td>
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<td>53</td>
<td>78</td>
<td>103</td>
<td>103</td>
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<td>Continuous Current (Amp)</td>
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<td>Load Interrupting &amp; Loop Switching (Amp)</td>
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<tr>
<td>Capacitor or Cable Charging Interrupting (Amp)</td>
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<td>25</td>
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<tr>
<td>Symmetrical/Asymmetrical Interrupting Capability (kA)</td>
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<td>16/25.6</td>
<td>20/32</td>
<td>12.5/20</td>
<td>12.5/20</td>
<td>25/40</td>
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<td>Current Sensor Ratio</td>
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<td>1,000:1</td>
<td>1,000:1</td>
<td>1,000:1</td>
<td>1,000:1</td>
<td>1,000:1</td>
</tr>
</tbody>
</table>

Application Information

Meets ANSI C37.60 requirements

Ambient Temperature Range: -40° C to 65° C

Certified Tests

MVI Molded Vacuum Fault Interrupters have been designed and tested per applicable portions of IEEE, ANSI, NEMA and other industry standards, including:

- ANSI C37.60 Standard for Fault Interrupters
- IEEE 386 Standard for Separable Connectors and Bushing Interfaces
- ANSI C57.12.28 Standard for Padmounted Enclosures
Molded Vacuum Switches and Interrupters

Choose from five electronic control options to interrupt faults.

MVI Molded Vacuum Interrupter Controls

- Self-powered electronic control packages — no batteries or external power are required
- Controls send a signal to the vacuum interrupters to trip open and interrupt the fault when an overcurrent condition is detected
- Field-selectable fuse or relay curves and trip settings — one device for many protection schemes

Molded Vacuum Interrupters are provided with self-powered electronic control packages requiring no batteries or external power. Depending on the application, six electronic control options are available for the MVI — see below and on following page.

**Internal Control**

This control is integral to the unit (no separate control box). It is accessible via a computer connection to view or modify settings. This control is used on ganged three-phase or single-phase MVI interrupters. Phase and ground trip, as well as inrush restraint, are available. The E-Set software enables the user to connect to the internal control, either in the shop or in the field, to program or change settings. An MVI-STP-USB programming connector is required to connect between the PC and the MVI. With a computer connected to the MVI control, the user can view real-time currents, the number of overcurrent protection operations, current magnitude of the last trip and the phase/ground fault targets. This is the standard control option.

**Note:** E-Set can be downloaded from www.elastimoldswitchgear.com.

**External Control with Single-/Three-Phase Trip Selection (Style 10)**

This control is mounted externally to the mechanism and provides the ability to select TCCs by setting DIP switches on the front panel. Each phase can be assigned a different minimum trip setting by means of manual rotary switches. This control may be used on one, two or three single-phase MVI mechanisms.

**External Control with Single-Phase Trip Only (Style 5)**

This control is mounted externally to the mechanism and provides the ability to select phase minimum trip by means of a manual rotary switch. It also has an RS-232 port for connection to a PC to view the last trip data. This control is used on single-phase MVI mechanisms.

**External Control with Phase and Ground Trip (Style 20)**

This control is mounted externally to the mechanism and provides the ability to select phase minimum trip (one for all three phases), time delay for phase tripping, ground trip as a percent of phase minimum trip and ground trip delay by means of manual rotary switches. This control may be used on ganged three-phase or three single-phase MVI mechanisms.
Molded Vacuum Switches and Interrupters

External Control with Three-Phase Trip Only (Style 30)

This control is mounted externally to the mechanism and provides the ability to select phase minimum trip (one for all three phases) by means of a manual rotary switch. It also has an RS-232 port for connection to a PC to view the last trip data. This control is used on ganged three-phase or three single-phase MVI mechanisms.

External Control with Selectable Single-/Three-Phase Trip Function (Style 80)

This control is mounted externally to the mechanism of the interrupter and provides the ability to select between a single-phase trip and a three-phase trip. The 80 and 380 Control can be used with one three-phase interrupter or with three single-phase interruptors. For three-phase applications, the ground trip function can be blocked from the front panel. Manual trip and reset target buttons are also located on the front panel. This control uses the E-Set software, which enables programming via a computer using the MVI-STP-USB adapter. E-Set features custom TCC curves and provides access to the last fault event information, as well as real-time current per phase.

Curves

<table>
<thead>
<tr>
<th>CURVE NO.</th>
<th>CURVE REFERENCE NO.</th>
<th>CURVE TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relay Curves (minimum trip 30–600A)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>MVI-TCC-01</td>
<td>E Slow</td>
</tr>
<tr>
<td>02</td>
<td>MVI-TCC-02</td>
<td>E Standard</td>
</tr>
<tr>
<td>03</td>
<td>MVI-TCC-03</td>
<td>Oil Fuse Cutout</td>
</tr>
<tr>
<td>04</td>
<td>MVI-TCC-04</td>
<td>K</td>
</tr>
<tr>
<td>05</td>
<td>MVI-TCC-05</td>
<td>Kearney QA</td>
</tr>
<tr>
<td>06</td>
<td>MVI-TCC-06</td>
<td>Cooper EF</td>
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<tr>
<td>07</td>
<td>MVI-TCC-07</td>
<td>Cooper NX-C</td>
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<td>08</td>
<td>MVI-TCC-08</td>
<td>CO-11-1</td>
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<td>09</td>
<td>MVI-TCC-09</td>
<td>CO-11-2</td>
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<tr>
<td>10</td>
<td>MVI-TCC-10</td>
<td>T</td>
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<td>11</td>
<td>MVI-TCC-11</td>
<td>CO-9-1</td>
</tr>
<tr>
<td>12</td>
<td>MVI-TCC-12</td>
<td>CO-9-2</td>
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<td>13</td>
<td>MVI-TCC-13</td>
<td>Cooper 280ARX</td>
</tr>
<tr>
<td>14</td>
<td>MVI-TCC-14</td>
<td>F</td>
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<tr>
<td>16</td>
<td>MVI-TCC-16</td>
<td>Kearney KS</td>
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<td>17</td>
<td>MVI-TCC-17</td>
<td>GE Relay</td>
</tr>
<tr>
<td>18–23</td>
<td>MVI-TCC-18–23</td>
<td>CO-8-1–CO-8-6</td>
</tr>
<tr>
<td>Fuse Curves (minimum trip 10–2000A)</td>
<td></td>
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</tr>
<tr>
<td>54</td>
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<td>E Slow</td>
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<td>55</td>
<td>MVI-TCC-55</td>
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<td>58</td>
<td>MVI-TCC-58</td>
<td>Kearney QA</td>
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<td>59</td>
<td>MVI-TCC-59</td>
<td>Cooper NX-C</td>
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<tr>
<td>60</td>
<td>MVI-TCC-60</td>
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</table>
Elastimold® Molded Vacuum Switches and Interrupters

The following diagram shows how to construct a catalog number for Molded Vacuum Switches and Interrupters. Catalog numbers are shown below and on the following page.

EXAMPLE: The catalog number for a Molded Vacuum Interrupter on a three-phase, 27kV system, with 600A terminal and parking stands between bushings is MV3-21-27-66-PS.

Controls and Accessories

<table>
<thead>
<tr>
<th>CAT. NO.</th>
<th>SUFFIX</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td></td>
<td>External 20 Control with Phase and Ground Trip (to be used on ganged three-phase MVI mechanism)</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td>External 30 Control with Phase and Ground Trip Only (to be used on ganged three-phase MVI mechanism)</td>
</tr>
<tr>
<td>80</td>
<td></td>
<td>External 80 Control with Selectable Single-/Three-Phase Trip Function (to be used on ganged three-phase MVI mechanism)</td>
</tr>
<tr>
<td>110</td>
<td></td>
<td>External 10 Control with Single-Phase Trip Selection (to be used on one single-phase MVI mechanism)</td>
</tr>
<tr>
<td>310</td>
<td></td>
<td>External 10 Control with Single-/Three-Phase Trip Selection (to be used on one single-phase MVI mechanism)</td>
</tr>
<tr>
<td>320</td>
<td></td>
<td>External 20 Control with Phase and Ground Trip (to be used on single-phase MVI mechanism)</td>
</tr>
<tr>
<td>330</td>
<td></td>
<td>External 30 Control with Phase and Ground Trip (to be used on single-phase MVI mechanism)</td>
</tr>
<tr>
<td>380</td>
<td></td>
<td>External 80 Control with Selectable Single-/Three-Phase Trip Function (to be used on single-phase MVI mechanism)</td>
</tr>
<tr>
<td>MO120A</td>
<td></td>
<td>120VAC Motor Operator and Controller for MVS3 or MVI3 Units</td>
</tr>
<tr>
<td>MO12D</td>
<td></td>
<td>12–24VDC Motor Operator and Controller for MVS3 or MVI3 Units</td>
</tr>
<tr>
<td>PS</td>
<td></td>
<td>Parking Stand for MVS or MVI (between bushings for single- or three-phase units)</td>
</tr>
<tr>
<td>MPS</td>
<td></td>
<td>Parking Stand for MVS3, MVI3 or RMI3 on Mechanism Cover</td>
</tr>
<tr>
<td>PS6</td>
<td></td>
<td>Double Parking Stand for MVS3, MVI3 or RMI3 (between bushings and on mechanism cover)</td>
</tr>
<tr>
<td>BT</td>
<td></td>
<td>Bail Tab Plate Installed for Three-Phase Units Only</td>
</tr>
<tr>
<td>P</td>
<td></td>
<td>Customer Settings to Be Programmed at the Factory</td>
</tr>
</tbody>
</table>

Note: Leave suffix blank for internal (self-contained) control.

Elastimold® MVS Molded Vacuum Switches

<table>
<thead>
<tr>
<th>CAT. NO.</th>
<th>DESCRIPTION</th>
<th>WIDTH IN. (MM)</th>
<th>HEIGHT IN. (MM)</th>
<th>DEPTH IN. (MM)</th>
<th>WEIGHT LB. (KG)</th>
<th>DIAGRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVS1-21-15-XX</td>
<td>15kV 2-Way 1-Phase Switch</td>
<td>6 (152)</td>
<td>24 (610)</td>
<td>14 (356)</td>
<td>30 (14)</td>
<td>*</td>
</tr>
<tr>
<td>MVS1-21-15-6EX</td>
<td>15kV 2-Way 1-Phase Switch — Elbow Interface</td>
<td>6 (152)</td>
<td>24 (610)</td>
<td>15 (381)</td>
<td>30 (14)</td>
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</tr>
<tr>
<td>MVS1-21-27-XX</td>
<td>25kV 2-Way 1-Phase Switch</td>
<td>6 (152)</td>
<td>24 (610)</td>
<td>14 (356)</td>
<td>30 (14)</td>
<td>*</td>
</tr>
<tr>
<td>MVS1-21-27-6EX</td>
<td>25kV 2-Way 1-Phase Switch — Elbow Interface</td>
<td>6 (152)</td>
<td>24 (610)</td>
<td>15 (381)</td>
<td>30 (14)</td>
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</tr>
<tr>
<td>MVS1-21-38-XX</td>
<td>35kV 2-Way 1-Phase Switch</td>
<td>6 (152)</td>
<td>24 (610)</td>
<td>14 (356)</td>
<td>30 (14)</td>
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</tr>
<tr>
<td>MVS3-21-15-XX</td>
<td>15kV 2-Way 3-Phase Switch</td>
<td>21 (533)</td>
<td>26 (660)</td>
<td>19 (483)</td>
<td>135 (61)</td>
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</tr>
<tr>
<td>MVS3-21-27-XX</td>
<td>25kV 2-Way 3-Phase Switch</td>
<td>21 (533)</td>
<td>26 (660)</td>
<td>19 (483)</td>
<td>135 (61)</td>
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<tr>
<td>MVS3-21-38-XX</td>
<td>38kV 2-Way 3-Phase Switch</td>
<td>21 (533)</td>
<td>26 (660)</td>
<td>19 (483)</td>
<td>135 (61)</td>
<td>*</td>
</tr>
</tbody>
</table>

* Height includes handle. ** 3-Phase Vacuum Switches are motor-ready.
# Molded Vacuum Switches and Interrupters

## Elastimold® MVI Molded Vacuum Interrupters

<table>
<thead>
<tr>
<th>CAT. NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVi-STP-USB</td>
<td>Adapter for Connection between MVI Units with Internal Control and a Computer for Programming/Viewing Settings</td>
</tr>
<tr>
<td>MVI1PMB</td>
<td>Pole-Mounting Bracket for 1-Phase Units Only</td>
</tr>
<tr>
<td>MVI3PMB</td>
<td>Pole-Mounting Bracket for 3-Phase Units Only</td>
</tr>
<tr>
<td>MVI3HPMB</td>
<td>Horizontal Pole-Mounting Bracket for 3-Phase Units Only</td>
</tr>
<tr>
<td>MVI3PMB</td>
<td>Pole-Mounting Bracket for Three 1-Phase Units Only</td>
</tr>
<tr>
<td>3SAL-11</td>
<td>Connector Bare Wire Type 3/4&quot;–16 Rod for Riser Pole Units; Qty. of 1 Needed per Phase</td>
</tr>
<tr>
<td>3SAL-12</td>
<td>Connector 2-Hole Spade Type 3/4&quot;–16 Rod for Riser Pole Units; Qty. of 1 Needed per Phase</td>
</tr>
</tbody>
</table>

### Notes:
- Weights and dimensions are approximate.
- X = 6 for 600A or 2 for 200A or 6E for 600A T Interface.
- Y = 10, 20, 30, 80 for different electronic controls.
- Leave blank for internal (self-contained) control.
- Accessories should be added as suffix to the main catalog number unless otherwise noted.
- Other configurations are available. Please consult your local representative on configurations not shown here.
- The 3-Phase Vacuum Interrupters are motor-ready.