Fusing Equipment
Catalog Data
CA132017EN

Effective June 2015
Supersedes 240-33 July 2011

COOPER POWER SERIES

Two- and three-phase MagneX™ interrupter

General

Eaton protects distribution transformers from damaging overloads and secondary faults with its Cooper Power™ series MagneX™ interrupter, an overcurrent protective device, also used for switching the transformer "on" or "off." As a transformer protective device, the MagneX interrupter combines safety and efficiency with economic operation.

It is an integral assembly, which does not use a troublesome linkage or require calibration, making installation and operation fast and trouble free.

The housing is made of an ultraviolet stabilized, high-strength, glass-filled thermoplastic material. The operating shaft is sealed against leakage with a double-Viton® O-ring seal.

Application

The three-phase MagneX interrupter combines the functionality of three Bay-O-Net fuses and one three-phase on/off loadbreak switch into one protective device. This allows transformer manufacturers more flexibility in application of the product and potentially reduces the space required to install the device on the transformer front plate. This product is ideal for three-phase pad-mounted transformer applications.

The two-phase MagneX interrupter is designed for single-phase applications where disconnecting both primary coil leads is desirable. This feature is ideal for two-bushing transformers, where a fault on either leg of the transformer may cause activation of the protective device.

Secondary faults and overloads will trip the MagneX interrupter "open." However, the device can be reset once the condition is corrected. The MagneX interrupter, in coordination with either an isolation link or current-limiting fuse, also clears primary faults.

The MagneX interrupter can also be used as a primary switch to disconnect the transformer windings–not just the load. This eliminates core (no-load) losses on transformers not in service. Residual voltage problems associated with secondary breakers during banking of transformers are also eliminated.

Powering Business Worldwide

Electrical ratings

Table 1. Voltage Ratings and Characteristics

	kV	Amps
Impulse 1.2 x 50 Microsecond Wave	150	–
60 Hz, 1 Minute Voltage Withstand	50	–
Continuous Current Rating	–	42
Switching Load Currents	–	42

Table 2. Interrupting Rating

Voltage kV-LG (A)	RMS Symmetric (A)	RMS Asymmetric (A)
8.3	2800	4200
15.5	1500	2250
23.0	500	750

Three-phase MagneX interrupter operation

Figure 1 demonstrates the circuit diagram for the three-phase MagneX interrupter with single-phase sense, single-phase trip. The three-phase MagneX interrupter with single-phase sense, single-phase trip contains one sensors per phase. It reacts to fault currents on one phase and will cause tripping of that phase only. The MagneX interrupter then can be reset via the single operating handle by opening all three phases and closing all phases back in simultaneously.

Figure 2 demonstrates the circuit diagram for the three-phase MagneX interrupter with single-phase sense, three-phase trip, containing one sensor in two of the three phases. This product should only be applied to delta-connected primary transformers, where any fault current flow in one phase will also flow in an adjacent phase. It reacts to fault currents on one phase and will cause tripping of all three phases. The MagneX interrupter then can be reset via the single operating handle by opening all three phases and closing all phases back in simultaneously.

The three-phase MagneX interrupter with single-phase sense, three-phase trip should always be used in series with at least one backup current-limiting fuse in each of the three-phases.

The backup current limiting fuses (see ELSP catalog section CA132013EN) provide high-current interruption capability.

Figure 3 shows the circuit diagram for the two-phase MagneX interrupter. The two-phase MagneX interrupter was specifically designed for single-phase, two bushing transformers, where disconnection of both bushings is desired following fault/overload detection. The MagneX interrupter will react to a fault sensed in either leg of the transformer primary. Interruption takes place in both interruption chambers simultaneously, disconnecting both legs of the transformer from the circuit.

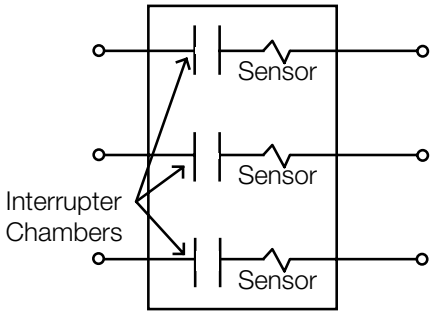

Figure 1. Three-phase MagneX interrupter, single-phase sense, single-phase trip.

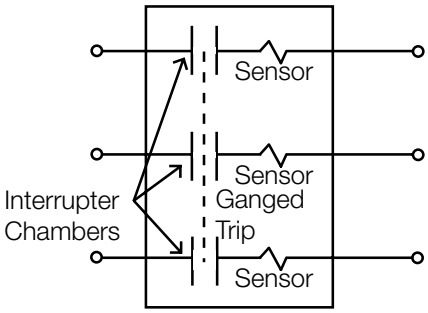

Figure 2. Three-phase MagneX interrupter, single-phase sense three-phase trip.

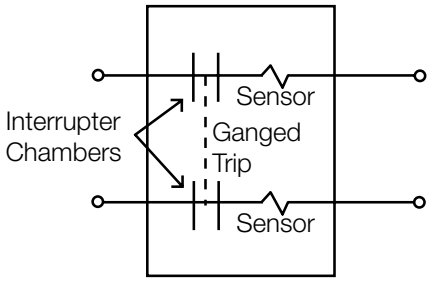

Figure 3. Two-phase MagneX interrupter.

Optional handle assemblies

A standard handle, as shown in Figures 5, is typically used in overhead pole-type transformers. It is also used in underground pad-mounted transformer applications. The MagneX interrupter handle is reversible to enhance functionality and provide for optimal orientation of the handle in pad-mounted transformer applications. It is made of an ultraviolet stabilized high-strength, glass-filled thermoplastic material. The lower slotted portion of the handle is made of a flexible ultraviolet stabilized elastomeric material. The handle requires five pounds (2.27 kg) of force to operate manually. It allows flexibility for excessive force during operation.

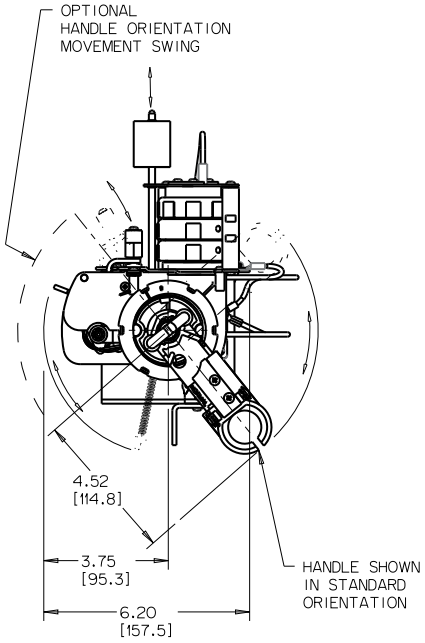

Figure 4. Open/Closed handle positions (Standard positions shown).

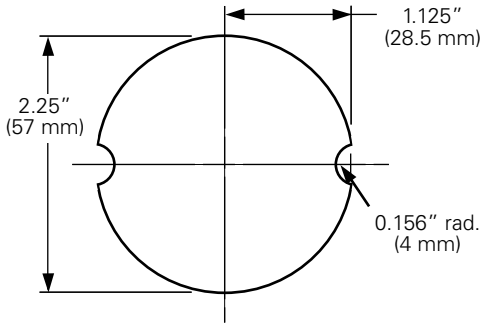

Figure 6. Tank mounting hole detail.

Note: Exterior mounting surface extending $^1/_2$" outward from the tank hole outer edge shall be flat and clear of surface obstructions.

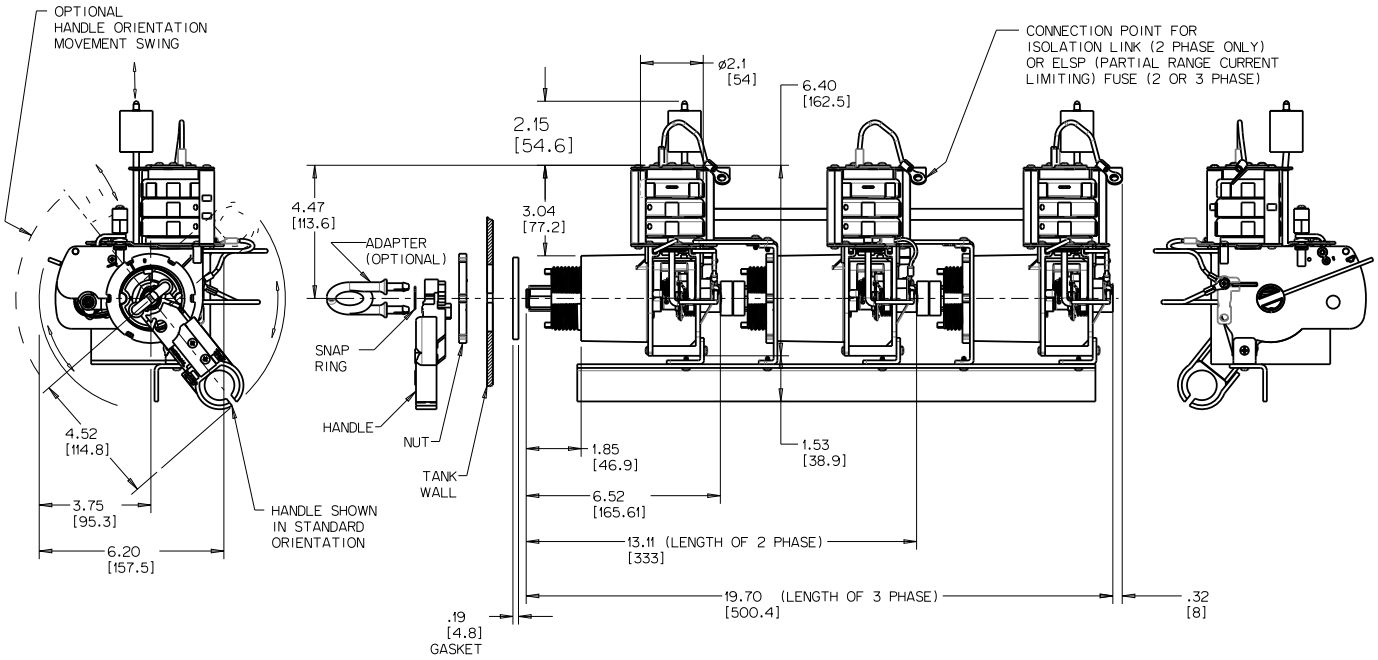

Figure 5. MagneX interrupter assembly — front/side/back views (with standard handle hardware kit).

Note: Dimensions given are for reference only, inches (mm)

Installation

The MagneX interrupter is mounted under-oil on the primary side of the transformer. No special tools are required. The MagneX interrupter assembly is mounted through the transformer wall. The incoming high voltage lead is connected first to the isolation link or to the current-limiting fuse and then to the MagneX interrupter. The coil lead is then connected to the lower MagneX interrupter connection point (See Figure 7). Refer to *Service Information MN132005EN Two- and Three-Phase MagneX Interrupter Installation Instructions* for details.

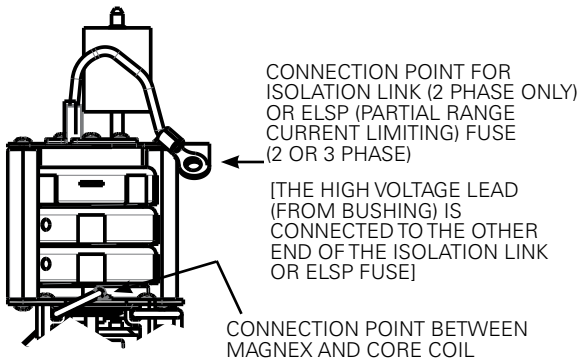

Figure 7. Lead connection points.

Production tests

Tests are conducted in accordance with Eaton requirements.

- 100% Physical Inspection
- 100% Electrically Tested to Meet Minimum Trip and Maximum Trip Clear TCC Curves
- Periodic Fluoroscopic Analysis

Ordering information

The three-phase MagneX interrupter is available in two design variations.

The first is a single-phase sense, single-phase trip version, for wye-connected transformers. This design is ideal for applications where customers desire fault sensing on one phase and tripping on that phase only. This option can be used with either an isolation link4(recommended as a minimum) or backup current- limiting fuse.

The second three-phase MagneX interrupter design option is a single-phase sense, three-phase trip version, for delta connected transformers. This design is well suited for three-phase delta connected transformer applications (this design should NOT be used on wye-connected transformer primaries). **The three-phase MagneX interrupter with single-phase sense, three-phase trip should always be used with backup current-limiting fusing.**

For three-phase delta primary connected transformers, use Table 3 to determine the correct MagneX interrupter sensor size and the appropriate ELSP backup current-limiting fuse required for the application. Use Table 7 to determine the exact MagneX interrupter catalog number.

For three-phase wye primary connected transformers, use Table 4 to determine the correct MagneX interrupter sensor size and the appropriate ELSP backup current-limiting fuse required for the application, or refer to Table 6 for the appropriate isolation link. Use Table 7 to determine the exact MagneX interrupter catalog number.

For the two-phase MagneX interrupter, refer to Table 5 to determine the correct MagneX interrupter sensor size for the application. Use Table 6 to determine the appropriate isolation link, or Table 9 to determine the appropriate ELSP backup current-limiting fuse for the application. Use Table 7 to determine the exact MagneX interrupter catalog number.

Note: When ordering a MagneX interrupter, the standard handle kit and hardware must be ordered separately. See Table 8 for the appropriate handle and hardware kit catalog number.

Table 3. 3-Phase MagneX Interrupter Recommendations for Transformers with Delta Connected Primary Windings (Single-Phase Sense, Three-Phase Trip)

Transformer kVA Rating	Primary Voltage	Assumed Minimum Impedance	Recommended MagneX Sensor	ELSP Rating without Emergency Overload
45	4.16	1.60	E10	65
75		1.60	E18	100
112.5		1.80	E25	125
150		2.00	E30	150
225		3.00	E50	150
300		3.50	E50	165
45	7.2-7.96	1.60	E06	40
75		1.60	E10	65
112.5		1.80	E12	80
150		2.00	E18	100
225		3.00	E25	100
300		3.50	E30	125
500		4.00	E50	150

Table 3. 3-Phase MagneX Interrupter Recommendations for Transformers with Delta Connected Primary Windings (Single-Phase Sense, Three-Phase Trip) (continued)

Transformer kVA Rating	Primary Voltage	Assumed Minimum Impedance	Recommended MagneX Sensor	ELSP Rating without Emergency Overload
45	12-12.47	1.60	E03	30
75		1.60	E06	40
112.5		1.80	E10	50
150		2.00	E12	65
225		3.00	E18	80
300		3.50	E25	80
500		4.00	E30	100
750		5.75	E50	150
45	13.2	1.60	E03	30
75		1.60	E06	40
112.5		1.80	E10	50
150		2.00	E10	50
225		3.00	E12	65
300		3.50	E18	80
500		4.00	E30	100
750		5.75	E40	125
1000		5.75	E50	150
45	20	1.80	E06	40
75		2.00	E10	50
112.5		2.00	E10	50
150		3.00	E12	65
225		4.00	E18	80
300		4.00	E25	80
500		4.00	E30	100
750		5.75	E40	100
1000		5.75	E50	100
1250		5.75	E50	150
45	22	1.80	E06	40
75		2.00	E06	40
112.5		2.00	E10	50
150		3.00	E12	65
225		4.00	E18	80
300		4.00	E18	80
500		4.00	E25	80
750		5.75	E30	100
1000		5.75	E40	100
1250		5.75	E50	125

Notes:
MagneX interrupter recommendations based on

- Minimum trip curves, and Maximum trip and clear curves, R240-91-302.
- Deration factor of 0.5% per degree C above ambient (25° C).
- Allowable loading greater than 140% for four hours in accordance with IEEE Std C57.91™-1981 standard "Guide for Loading Distribution Transformers", Table 6.

MagneX/ELSP coordinations based on coordination requirements of single-phase sense, three-phase trip version MagneX interrupter. Proper coordination requires delta connected transformer primary.

Proper protection requires that a backup current-limiting fuse be used in series with each MagneX interruption chamber. **DO NOT USE AN ISOLATION LINK WITH THE THREE-PHASE MAGNEX INTERRUPTER.** Failure to use backup current-limiting fuse in series with the MagneX interrupter can result in an unprotected phase.

Backup current limiting fuse may be rated for line-to-neutral voltage, as the three-phase MagneX interrupter is three-phase rated. Added backup protection can be achieved using phase-to-phase rated backup current-limiting fuse.

Table 4. 3-Phase MagneX Interrupter Recommendations for Transformers with WYE Connected Primary Windings (Single-Phase Sense, Single-Phase Trip)

Transformer kVA Rating	Primary Voltage	Assumed Minimum Impedance	Recommended MagneX Sensor	ELSP Rating without Emergency Overload
45	4.16	1.60	E10	50
75		1.60	E18	80
112.5		1.80	E25	100
150		2.00	E30	125
225		3.00	E40	150
300		3.50	E50	150
45	7.2-7.96	1.60	E06	30
75		1.60	E10	50
112.5		1.80	E12	80
150		2.00	E18	80
225		3.00	E25	100
300		3.50	E30	100
500		4.00	E50	150
45	12-12.47	1.60	E03	30
75		1.60	E06	30
112.5		1.80	E10	40
150		2.00	E12	50
225		3.00	E18	80
300		3.50	E25	80
500		4.00	E30	100
750		5.75	E50	125
45	13.2	1.60	E03	30
75		1.60	E06	30
112.5		1.80	E10	40
150		2.00	E10	40
225		3.00	E12	50
300		3.50	E18	80
500		4.00	E30	100
750		5.75	E40	100
45	20.8	1.60	E06	30
75		1.60	E06	30
112.5		1.80	E10	30
150		2.00	E12	40
225		3.00	E18	80
300		3.50	E25	80
500		4.00	E25	80
750		5.75	E40	100
1000		5.75	E50	100
45	22.86	1.60	E03	30
75		1.60	E06	30
112.5		1.80	E06	30
150		2.00	E10	40
225		3.00	E12	50
300		3.50	E18	80
500		4.00	E40	100
750		5.75	E40	100
1000		5.75	E50	125

Table 4. 3-Phase MagneX Interrupter Recommendations for Transformers with WYE Connected Primary Windings (Single-Phase Sense, Single-Phase Trip) (continued)

Transformer kVA Rating	Primary Voltage	Assumed Minimum Impedance	Recommended MagneX Sensor	ELSP Rating without Emergency Overload
45	24.94	1.60	E01	30
75		1.60	E03	30
112.5		1.80	E03	30
150		2.00	E06	30
225		3.00	E10	40
300		3.50	E12	40
500		4.00	E18	80
750		5.75	E25	80
1000		5.75	E30	80
1500		5.75	E50	125
2000		5.75	E50	150
45	27.6	1.60	E01	30
75		1.60	E03	30
112.5		1.80	E03	30
150		2.00	E06	30
225		3.00	E06	30
300		3.50	E10	30
500		4.00	E18	80
750		5.75	E25	80
1000		5.75	E30	80
1500		5.75	E40	100
2000		5.75	E50	125
45	34.5	1.60	E01	30
75		1.60	E03	30
112.5		1.80	E03	30
150		2.00	E06	30
225		3.00	E06	30
300		3.50	E10	30
500		4.00	E12	40
750		5.75	E18	80
1000		5.75	E25	80
1500		5.75	E40	100
2000		5.75	E50	125
2500		5.75	E50	125

Notes:
Line-to-neutral rated fuses can be used on Gnd Y-Gnd Y transformers with less than 50% delta loading

MagneX Interrupter recommendations based on

- Minimum trip curves, and Maximum trip and clear curves, R240-91-310.
- Deration factor of 0.5% per degree C above ambient (25° C).
- Allowable loading greater than 140% for four hours in accordance with IEEE Std C57.91™ -1981 standard Guide for Loading Distribution Transformers, Table 6.

MagneX/ELSP coordinations based on coordination requirements of single-phase sense, single-phase trip version of the MagneX interrupter. Proper coordination requires WYE connected transformer primary.

Backup current limiting fuses may be rated for line-to-neutral voltage for Gnd Y-Gnd Y connections, with less than 50% delta loading ONLY. If this guideline is not followed, recovery voltages exceeding the backup current-limiting fuse may cause fuse failure.

In all other cases, voltage rating of the backup current-limiting fuse must be line-to-line rated.

Note: The MagneX Interrupter recommendations above 22 kV are for Gnd Y-Gnd Y transformers with less than 50% delta loading ONLY.

Table 5. Two-Phase MagneX Interrupter Recommendations

Primary Voltage kV					
kVA/kV	**2.4**	**4.16-4.8**	**6.9-8.0**	**12.00-14.4**	**19.92**
10	E06	E03	E03	E01	E01
15	E10	E06	E03	E03	E01
25	E18	E10	E06	E03	E03
37.5	E18	E12	E10	E06	E03
50	E30	E18	E12	E06	E03
75	E40	E25	E18	E10	E06
100	E50	E40	E18	E12	E06
167	-	E50	E40	E18	E12

Notes:
Recommendations are based on:

- Minimum trip curves, and Maximum trip and clear curves, **R240-91-310**.
- Deration factor of 0.5% per °C above 25 °C.
- Allowable loading greater than 140% for four hours in accordance with IEEE Std C57.91™-1981 standard, "Guide for Loading Distribution Transformers", Table 6.

Table 6. Isolation Link — MagneX Interrupter Correlation Chart

Sensor Number	Isolation Link
E01	3637803B01
E03	3637803B08
E06	3637803B02
E10	3637803B09
E12	3637803B10
E18	3637803B03
E25	3637803B03
E30	3637803B05
E40	3637803B05
E50	3637803B05

Table 7. Hardware Kit

Description	Catalog Number
Standard Handle Kit & Hardware, w/o Emergency Overload	3638535A09
Hotstick Adapter	3639585A01

- Two- and three-phase MagneX interrupter is not yet available with emergency overload feature.

Table 8. MagneX Interrupter Significant Digit Catalog Number System

Example: To order a three-phase MagneX Interrupter with single-phase sense, three-phase trip, with float and E12 sensor, the catalog number would be **MX3BN1MDE12**

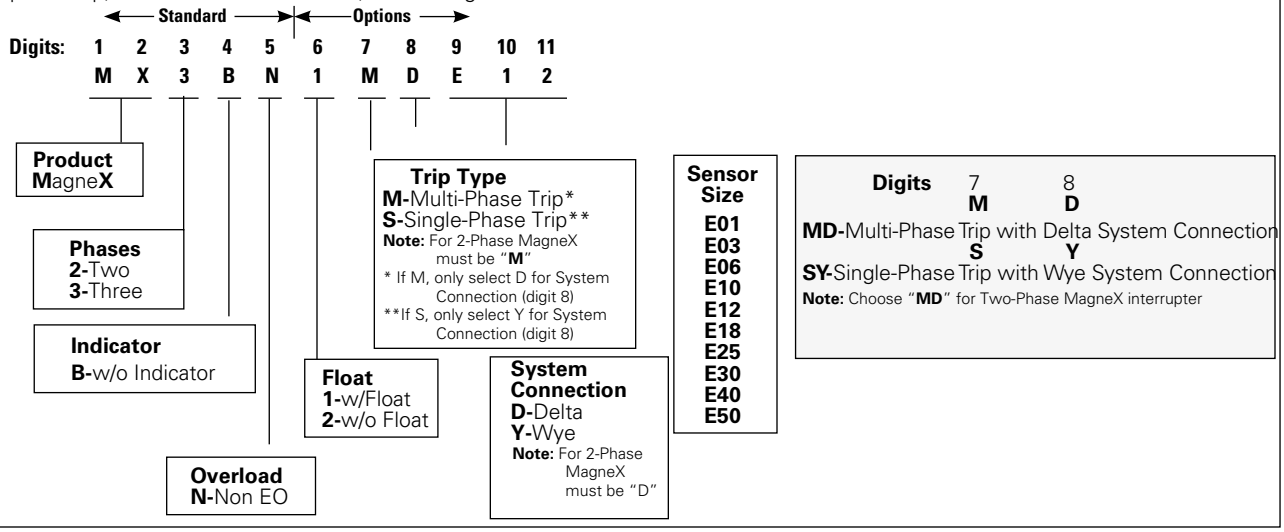

Table 9. Recommended Two-Phase MagneX Interrupter and ELSP Current-Limiting Fuse Combinations

Nominal Single Phase (kV Phase-to-ground)	8.3 kV		15.5 kV			23 kV
	2.4	4.16-4.8	6.9-8.0	12.0-14.4	16.34	19.92
10 kVA						
ELSP Rating w/o Emergency Overload	30	30	30	30	30	30
ELSP Rating w Emergency Overload	30	30	30	30	30	30
MagneX Element	E06	E03	E03	E01	E01	E01
15 kVA .						
ELSP Rating w/o Emergency Overload	40	30	30	30	30	30
ELSP Rating w Emergency Overload	50	30	30	30	30	30
MagneX Element	E10	E06	E03	E03	E01	E01
25 kVA						
ELSP Rating w/o Emergency Overload	80	40	30	30	30	30
ELSP Rating w Emergency Overload	80	50	30	30	30	30
MagneX Element	E18	E10	E06	E03	E03	E03
37.5 kVA						
ELSP Rating w/o Emergency Overload	100	65	40	30	30	30
ELSP Rating w Emergency Overload	100	80	50	30	30	30
MagneX Element	E18	E12	E10	E06	E03	E03
50 kVA						
ELSP Rating w/o Emergency Overload	150	80	50	30	30	30
ELSP Rating w Emergency Overload	150	100	50	30	30	30
MagneX Element	E30	E18	E12	E06	E06	E03
75 kVA						
ELSP Rating w/o Emergency Overload	150	100	80	40	30	30
ELSP Rating w Emergency Overload	150	125	100	40	30	30
MagneX Element	E40	E25	E18	E10	E06	E06
100 kVA						
ELSP Rating w/o Emergency Overload	180	150	100	50	40	30
ELSP Rating w Emergency Overload	250	165	100	50	40	30
MagneX Element	E50	E40	E18	E12	E10	E06
167 kVA						
ELSP Rating w/o Emergency Overload	–	165	125	80	80	50
ELSP Rating w Emergency Overload		180	150	80	80	50
MagneX Element		E50	E40	E18	E18	E12

Notes:
Table shows minimum recommended ELSP Fuse ratings. Recommended ELSP backup fuse (described in Catalog Section 240-50) will coordinate with the MagneX interrupter and melt on internal transformer faults. The MagneX interrupter recommendations are based on:

- Minimum trip curves, and Maximum trip and clear curves **R240-91-310**.
- Deration factor of 0.5% per °C above 25°C.
- Allowable loading greater than 140% for four hours in accordance with IEEE Std C57.91™-1981 standard, "Guide for Loading Distribution Transformers", Table 6.

Eaton
1000 Eaton Boulevard
Cleveland, OH 44122
United States
Eaton.com

Eaton's Cooper Power Systems Division
2300 Badger Drive
Waukesha, WI 53188
United States
Eaton.com/cooperpowerseries

© 2015 Eaton
All Rights Reserved
Printed in USA
Publication No. CA132017EN

Eaton, Cooper Power, and MagneX are valuable trademarks of Eaton in the U.S. and other countries. You are not permitted to use these trademarks without the prior written consent of Eaton.
IEEE Std C57.91™-1981 standard is a trademark of the Institute of Electrical and Electronics Engineers, Inc., (IEEE). This publication is not endorsed or approved by the IEEE.
Viton® is a registered trademark of the E. I. DuPont Demours and Company.

For Eaton's Cooper Power series MagneX interrupter product information call 1-877-277-4636 or visit: www.eaton.com/cooperpowerseries.

Powering Business Worldwide