# COOPER POWER SERIES

# MagneX<sup>™</sup> single-phase interrupter



#### General

Eaton's Cooper Power<sup>TM</sup> series MagneX<sup>TM</sup> interrupter is an overcurrent protective device that protects distribution transformers from damaging overloads and secondary faults, and is 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 designed for use in transformer (mineral) oil or Envirotemp<sup>TM</sup> FR3<sup>TM</sup> fluid-filled transformers.

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.



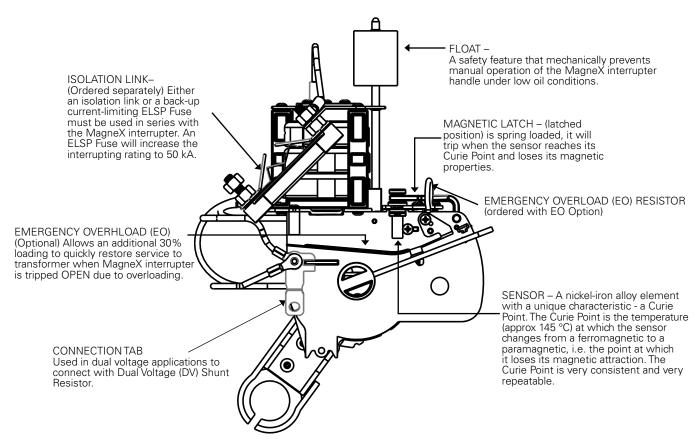


Figure 1. MagneX interrupter - back view.

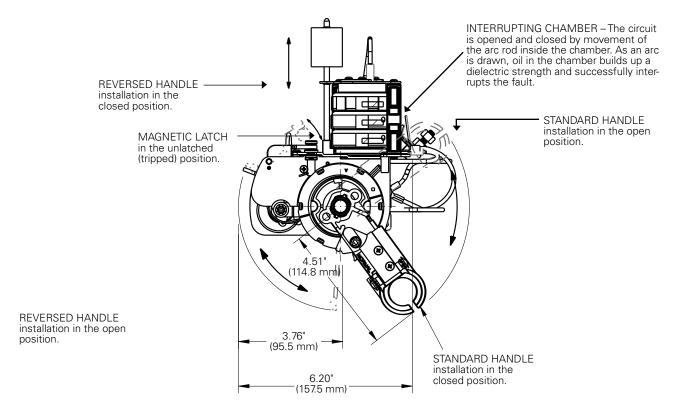


Figure 2. MagneX interrupter showing handle swing - front view with standard handle.

Note: Dimensions given are for reference only. See ordering information on Page 4.

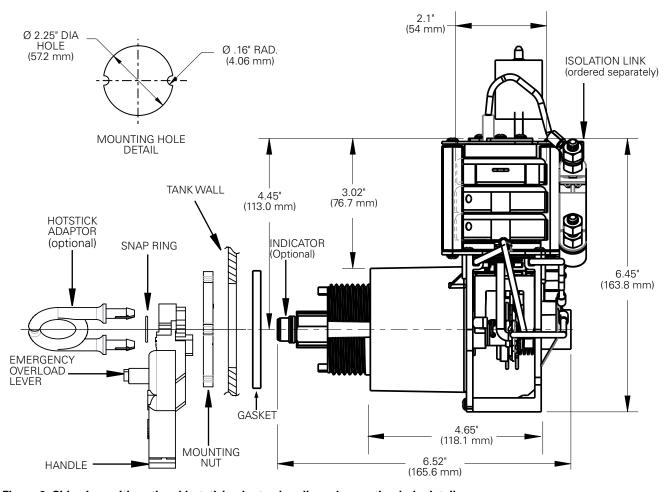


Figure 3. Side view with optional hotstick adaptor, handle and mounting hole detail.

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



Figure 4. Reversed installation of the handle in the OPEN position.

Figure 5. Reversed installation of the handle in the CLOSED position.

## **Application**

The single-phase MagneX interrupter combines the functionality of one Bay-O-Net fuse and one single-phase on/off loadbreak switch in one protective device. This allows transformer manufactures 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 single-phase pad- and pole-mounted transformer applications.

Secondary faults and overloads will trip the MagneX interrupter "open"; however, the device can be reset once the condition is corrected.

Primary faults are cleared by the MagneX interrupter in coordination with either an isolation link or current-limiting fuse.

The MagneX interrupter can be ordered with an optional Emergency Overload (EO) feature. When the transformer is tripped due to overloading, the EO feature can allow an additional 30% loading to quickly restore service. Losses with the MagneX interrupter during normal and overload conditions are negligible compared to those of a secondary breaker. (Refer to Table 5.)

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.

#### Optional handle assemblies

A standard handle, as shown in Figure 2, is typically used in overhead pole-type transformers. If operating space is available it is also used in underground 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 of force to operate manually. It allows flexibility during excessive force during operation.

An optional hotstick adaptor as shown in Figure 3, is used in underground pad-mounted transformer applications. It allows for hotstick operation directly without requiring wide arc angles in cabinets where operating space is limited due to cable training and other components.

#### **Optional indicator**

An optional indicator as shown in Figure 3 is used to indicate that the MagneX interrupter has tripped due to an overload condition or a secondary fault. During normal conditions, the indicator lens is clear. When the MagneX interrupter has tripped, a highly visible orange fluorescent flag appears in the lens area. The clear lens is made of Xylex<sup>TM</sup> giving the exposed lens a tamperproof, and scratch-resistant protection. When the MagneX interrupter is reset, the lens becomes clear again.

#### Installation

The MagneX interrupter is mounted under-oil in 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 to the isolation link on the MagneX interrupter, or to the current-limiting fuse and then to the MagneX interrupter. The coil lead and then to the MagneX interrupter. The coil lead is then connected to the other MagneX interrupter lead. Refer to Service Information MN132006EN, Single-Phase MagneX Interrupter Installation Instructions for details.

#### **Production tests**

Tests are conducted in accordance with Eaton requirements.

- Physical inspection
- Electrically tested to meet Minimum Trip and Maximum Trip Clear TCC Curves
- Periodic Fluoroscopic Analysis (X-ray)

## Ordering information MagneX interrupter

**Table 1. Voltage Ratings and Characteristics** 

Description	Rating
Impulse 1.2x50 Microsecond Wave	150 kV
60 Hz-1 Minute Voltage Withstand	50 kV
Continuous Current Rating	42 A
Switching Load Currents, 200 Times	42 A
Magnetizing Current Switching	200 Times

Continuous current ratings and dielectric testing are in accordance with ANSI/IEEE Std C57.12.00™.

Switching and Fault Close IEEE Std C37.41™-1988 standard. Emergency Overload Protection ANSI/ IEEE Std C57.91™-1981 standard.

Table 2. Interrupting Rating

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

Use Table 6 to determine the correct MagneX interrupter suffix (sensor number) for the application.

Use Table 3 to determine the catalog number.

When ordering a MagneX interrupter with a standard handle, a hardware kit must be ordered separately. Use Table 7 to determine the hardware kit catalog number.

To select the correct isolation link, use Table 4 to cross reference the isolation link to the selected MagneX interrupter. An isolation link is recommended if the MagneX interrupter is not in series with a current-limiting fuse.

Table 3. MagneX Interrupter Significant Digit Catalog Number System

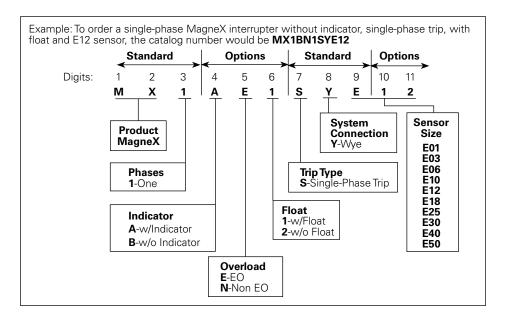


Table 4. Isolation Link - MagneX Interrupter Correlation Chart

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



Figure 6. MagneX interrupter with hotstick adaptor and indicator.

Effective July 2015

Table 5. MagneX Interrupter Losses for Single-Phase Transformer (Phase-to-Ground) Applications (WATTS)

Primary Voltage kV

kVA/kV	2.4	4.16	4.8	6.9	7.2	7.62	7.97	8.32	12.00	12.47	13.2	13.8	14.4	16.34	19.92
10	1.32	0.44	0.61	0.30	0.27	0.24	0.22	0.20	0.33	0.31	0.28	0.24	0.23	0.18	0.12
15	0.96	0.99	0.74	0.67	0.61	0.55	0.50	0.46	0.22	0.21	0.18	0.17	0.15	0.41	0.27
25	2.13	0.84	0.63	0.99	0.91	0.82	0.75	0.68	0.62	0.57	0.51	0.46	0.43	0.33	0.22
37.5	4.63	1.59	1.32	0.69	0.63	0.56	0.52	0.47	0.74	0.68	0.61	0.55	0.51	0.75	0.50
50	7.96	2.83	2.13	1.14	1.04	1.00	0.85	0.84	1.32	1.21	1.09	0.98	0.91	0.71	0.48
75	15.11	5.96	4.63	2.32	2.12	1.89	1.74	1.59	0.91	0.84	0.75	0.68	0.63	0.49	1.08
100	28.87	9.15	7.96	3.98	3.78	3.37	3.09	2.82	1.50	1.38	1.24	1.12	1.04	1.12	0.59
167	-	24.92	18.73	9.27	8.52	7.61	6.95	7.34	3.80	3.52	3.14	2.87	2.64	2.05	1.52
250	_	-	_	20.31	18.65	16.66	15.23	13.92	7.96	7.34	6.58	6.01	5.53	4.44	3.08
333	-	-	_	_	_	_	_	24.76	12.20	11.29	10.08	9.20	8.47	7.61	5.13
500	_	-	-	_	_	_	_	_	26.87	24.88	22.2	20.27	18.65	14.49	9.98

Note:

Losses are calculated at operating voltage for typical MagneX interrupter protected transformers at room temperature (25°C) using the selected element in the Correlation Chart, Table 6.

Table 6. Single-phase Transformer (Phase-to-Ground) Applications Correlation Chart

kVA/kV	2.4	4.16	4.8	6.9	7.2	7.62	7.97	8.32	12.00	12.47	13.2	13.8	14.4	16.34	19.92
10	E06	E06	E03	E03	E03	E03	E03	E03	E01	E01	E01	E01	E01	E01	E01
15	E10	E06	E06	E03	E03	E03	E03	E03	E03	E03	E03	E03	E03	E01	E01
25	E18	E10	E10	E06	E06	E06	E06	E06	E03	E03	E03	E03	E03	E03	E03
37.5	E25	E18	E12	E10	E10	E10	E10	E10	E06	E06	E06	E06	E06	E03	E03
50	E30	E18	E18	E12	E12	E12	E12	E10	E06	E06	E06	E06	E06	E06	E06
75	E50	E30	E25	E18	E18	E18	E18	E18	E10	E10	E10	E10	E10	E06	E06
100	E50	E40	E30	E25	E18	E18	E18	E18	E12	E12	E12	E12	E12	E10	E10
167	-	E50	E50	E40	E40	E40	E40	E30	E18	E18	E18	E18	E18	E18	E12
250	-	_	_	E50	E50	E50	E50	E50	E30	E30	E30	E30	E30	E25	E18
333	-	_	-	-	_	_	_	E50	E40	E40	E40	E40	E40	E30	E25
500	-	_	_	_	_	_	_	_	E50	E50	E50	E50	E50	E50	E40

#### 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 (4) hours in accordance with ANSI/IEEE Std C57.91.1981™ standard Guide for Loading Distribution Transformers, Table 6.

#### MagneX interrupter with current-limiting fuse

To order a MagneX interrupter and current-limiting fuse combination, see Table 8.

Example – MagneX interrupter with an Emergency Overload, indicator, and a float in series with an ELSP Current-Limiting Fuse for a single-phase, 7.2 kV phase-to-ground, 25 kVA transformer, specify:

- 1 40 A ELSP Fuse CBUC08030C100
- 1 MagneX interrupter MX1AE1SYE06
- 1 Hardware Kit (with Emergency Overload, indicator, and no adaptor) 3638535A05

See the following Catalog Sections for further information:

ELSP Fuse Holder CA132029EN

ELSP Current-Limiting Backup Fuse CA132013EN

Table 7. Hardware Kits

Description	Catalog Number
Without emergency overload	3638535A04
With emergency overload	3638535A05
With adaptor without emergency overload	3638535A07
With adaptor with emergency overload	3638535A08
Hotstick adaptor only	3639585A01

#### Using TCC curves

To determine or confirm the MagneX interrupter will coordinate with upstream and down stream system requirements, use the time-current characteristic curves (See R240-91-310). For full size TCC curves, contact your Eaton representative.

Table 8. Recommended MagneX Interrupter and ELSP Current-Limiting Fuse Combinations

Naminal Cinala Phase	8.3 kV			15.5 kV		23 kV	
Nominal Single-Phase (kV Phase-to-ground)	2.4	4.16-4.8	6.9-8.0	12.0-14.4	16.34	19.92	
10 kVA ELSP Rating without Emergency Overload ELSP Rating with Emergency Overload MagneX Element	30 30 E06	30 30 E03	30 30 E03	30 30 E01	30 30 E01	30 30 E01	
15 kVA . ELSP Rating without Emergency Overload ELSP Rating with Emergency Overload MagneX Element	40 50 E10	30 30 E06	30 30 E03	30 30 E03	30 30 E01	30 30 E01	
25 kVA ELSP Rating without Emergency Overload ELSP Rating with Emergency Overload MagneX Element	80 80 E18	40 50 E10	30 30 E06	30 30 E03	30 30 E03	30 30 E03	
37.5 kVA ELSP Rating without Emergency Overload ELSP Rating with Emergency Overload MagneX Element	100 100 E18	65 80 E12	40 50 E10	30 30 E06	30 30 E03	30 30 E03	
50 kVA ELSP Rating without Emergency Overload ELSP Rating with Emergency Overload MagneX Element	150 150 E30	80 100 E18	50 50 E12	30 30 E06	30 30 E06	30 30 E03	
75 kVA ELSP Rating without Emergency Overload ELSP Rating with Emergency Overload MagneX Element	150 150 E40	100 125 E25	80 100 E18	40 40 E10	30 30 E06	30 30 E06	
100 kVA ELSP Rating without Emergency Overload ELSP Rating with Emergency Overload MagneX Element	180 250 E50	150 165 E40	100 100 E18	50 50 E12	40 40 E10	30 30 E06	
167 kVA ELSP Rating without Emergency Overload ELSP Rating with Emergency Overload MagneX Element		165 180 E50	125 150 E40	80 80 E18	80 80 E18	50 50 E12	
250 kV ELSP Rating without Emergency Overload ELSP Rating with Emergency Overload MagneX Element			165 165 E50	100 100 E40	80 80 E18	80 80 E18	
333 kVA ELSP Rating without Emergency Overload ELSP Rating with Emergency Overload MagneX Element				100 100 E40	80 80 E25	80 80 E25	
500 kVA ELSP Rating without Emergency Overload ELSP Rating with Emergency Overload MagneX Element				150 150 E50	100 100 E40	100 100 E40	

Table shows minimum recommended ELSP Fuse ratings. Recommended ELSP Backup Fuse (described in Catalog Section CA132013EN) 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 (4) hours in accordance with ANSI/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. CA132016EN

Eaton, Cooper Power, and MagneX are valuable trademarks of Eaton in the U.S. and variable talget in the Strict standards are trademarks of the Institute of Electrical and Electronics Engineers, Inc., (IEEE). This publication is not endorsed or approved by the IEEE. Viton<sup>®</sup> is a registered trademark of E.I. du Pont de Nemours & Company or its affiliates. Xylex<sup>TM</sup> is a trademark of General Electric. Envirotemp<sup>TM</sup> and FR3<sup>TM</sup> are licensed trademarks of Cargill, Incorporated. ANSI<sup>®</sup> is a registered trademark of the American National Standards Institute.



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