Electronic Trip Molded Case Circuit Breakers

LE, LX, LXI, ME, MX, NE, NX, PE and PX Circuit Breakers Only

Class 602 Catalog

Merlin Gerin
Modicon
Square D
Telemecanique

Schneider Electric Brands

CONTENTS

SQUARE D
Schneider Electric

TABLE OF CONTENTS

SECTION 1—GENERAL INFORMATION

INTRODUCTION

Note: This manual includes information about LE, LX, LXI, ME, MX, NE, NX, PE and PX circuit breakers only. For information on new P and R-frame circuit breakers with new style MICROLOGIC® trip units, see the class 0612 catalog.

These electronic trip molded case circuit breakers are designed to protect electrical systems from damage caused by overloads, short circuits and ground faults. All circuit breakers are designed to open and close a circuit by nonautomatic means, and to open the circuit automatically on a predetermined overcurrent. Electronic trip circuit breakers can also:

— Enhance coordination by their adjustability
— Provide integral ground-fault protection
— Provide capacity for future growth
— Provide zone-selective interlocking for increased selectivity in the electrical system

Electronic trip molded case circuit breakers manufactured by Square D use the MICROLOGIC® electronic trip system to sense overcurrents and trip the circuit breaker. Square D makes two types of electronic trip units: full-function trip systems and standard-function trip systems.

- **Section 1—General Information,** provides an overview of electronic trip molded case circuit breakers.
- **Section 2—MICROLOGIC Trip Systems Based On LE, LX, LXI, ME, MX, NE, NX, PE and PX Circuit Breakers**, provides information about the electronic trip systems used in LE, LX, LXI, ME, MX, NE, NX, PE and PX circuit breakers only.
- **Section 3—Circuit Breaker Specifics**, provides application information about electronic trip circuit breakers by catalog prefix.
- **Section 4—Accessories**, lists the accessories available for use with electronic trip circuit breakers.
- **Appendix A—Dimensions**.
- **Appendix B—Trip Curves**.

Table 1. MICROLOGIC Trip Unit Features

Standard-Function Circuit Breakers	Full-Function Circuit Breakers
• 80% rated	• 100% rated
• True root-mean-square (rms) sensing	• True root-mean-square (rms) sensing
• 100-2500 A continuous current ratings	• 100-2500 A continuous current ratings
• LSI, LSIG trip configurations	• LI, LIG, LS(I), LS(I)G trip configurations
• Interchangeable rating plugs	• Interchangeable rating plugs
• Overload indicating light	• Overload indicating light
• Integral ground-fault protection and testing option	• Short-time withstand rating
• Local electronic trip indicator option	• Defeatable instantaneous feature option (on LS trip only)
• Local current meter option	• Integral ground-fault protection and testing option
• Universal test set available	• Integral ground-fault alarm (no trip) option
• Neutral current transformer for 4-wire systems available	• Zone-selective interlocking
	• Local electronic trip indicator
	• Local current meter
	• Universal test set available
	• Neutral current transformer for 4-wire systems available
	• POWERLOGIC® communications

Also See . . . For information on other types of molded case circuit breakers manufactured by Square D, See *Thermal-Magnetic and Magnetic Only Molded Case Circuit Breakers* Catalog 0601CT9101.

Standards

Square D electronic trip molded case circuit breakers are manufactured and tested in accordance with the following standards:

- UL 489
- NEMA AB-1-1993
- CSA Standard 22.5
- IEC 60947-2
- Federal Specification W-C-375B/GEN as Class 11a, 11b, 12a, 12b, and 13a, 13b

Circuit breakers are applied according to guidelines detailed in the National Electrical Code (NEC) and other local electrical wiring codes.

Why Use Electronic Trip Molded Case Circuit Breakers?

MICROLOGIC® electronic trip circuit breakers provide the same basic functions as standard thermal-magnetic circuit breakers. Both type of circuit breakers:

- provide overload and short-circuit protection.
- are true rms sensing devices.
- provide means to manually disconnect power to the circuit.
- meet UL, CSA, NEMA and IEC standards.

However, MICROLOGIC electronic trip circuit breakers offer a variety of benefits in addition to these basic functions. MICROLOGIC circuit breakers can:

- provide adjustability for enhanced coordination.
- provide integral ground fault protection or alarm.
- measure and report inherent ground-fault leakage.
- provide capacity for future growth using:
  - — rating plugs.
  - — long-time pickup switch.
  - — 100% rated full-function trip system.
- be provided with zone-selective interlocking to reduce fault stress on the electrical system.
- be provided with power monitoring communications.

What Do These Benefits Mean to a Customer?

MICROLOGIC® circuit breakers give the customer more versatility to achieve coordination with features such as adjustable pickup and delay points, interchangeable rating plugs and withstand ratings.

Features such as universally interchangeable rating plugs, adjustable long-time pickups and 100% ratings provide capacity for future growth. Integral ground-fault sensing capabilities mean that there are fewer parts and pieces to buy, mount and wire.

Square D offers products with integral ground-fault protection which trip when a ground-fault is detected as well as products with integral ground-fault alarm which do not trip but send an alarm when a ground fault is detected.

MICROLOGIC full-function circuit breakers also offer the customer true power management system solutions through communications. The full-function trip units can communicate with other circuit breakers in the system and also with a power monitoring system.

Communication between circuit breakers allows zone-selective interlocking (ZSI) between circuit breakers at different levels in the system. ZSI reduces fault stress by allowing the upstream circuit breaker closest to the fault to ignore its preset delay time and trip without any intentional delay on a short circuit or ground fault. For more information on ZSI, see Application Guide 0600SC9102, Reducing Fault Stress with Zone-selective Interlocking.

Communication with a power monitoring system through a POWERLOGIC® communications link allows a ground fault to be reported without interrupting power to the system. It also allows the power monitoring system to remotely report power usage, current flow and trip history. For more information on POWERLOGIC system capabilities, See publication 3050IM9101, *POWERLOGIC Product Interface for MICROLOGIC Circuit Breakers*.

SPECIFICATIONS

Electronic trip molded case circuit breakers have a molded case made of a glass-reinforced insulating material that provides high dielectric strength. These circuit breakers:

- Share common tripping of all poles
- Can be mounted and operated in any position
- Meet the requirements of NEC Section 240-6 by providing a means to seal the rating plug and trip unit adjustments
- Are equipped with an externally accessible test port for use with a Universal Test Set
- Are fully tested, UL Listed and CSA certified for reverse connection without restrictive LINE or LOAD markings. The L-, M-, N-, and P-frame circuit breakers are also IEC certified

CIRCUIT BREAKER RATINGS

Voltage Ratings

Voltage ratings indicate the maximum voltage for the electrical system on which the circuit breaker can be applied. All Square D electronic trip molded case circuit breakers are designed to be applied on systems rated 600 Vac or less. They are not designed for use on dc systems.

Ampere Ratings

The ampere rating of an electronic trip circuit breaker is the maximum current that a circuit breaker can carry. It is determined by the mathematical equation:

Ampere Rating (P) = Sensor Size (S) × Rating Plug (%)

- The circuit breaker sensor size is the maximum ampere rating possible for a *specific* circuit breaker. This value is based on the size of the current sensor inside the circuit breaker. (Current sensors are an integral part of the circuit breaker and cannot be removed or replaced.)
- The rating plug varies the circuit breaker ampere rating as a function of its sensor size. (The rating plug catalog number is ARPXXX, with XXX being the multiplier value.) This multiplier value is printed on the faceplate of the rating plug along with the mathematical equation used to obtain the ampere rating.

Note: The maximum ampere rating a circuit breaker family can carry is called the frame size. Sensor size is less than or equal to frame size.

Continuous Current Rating

The continuous current rating of an electronic trip circuit breaker is determined by the equation:

Continuous Current Rating = Ampere Rating (P) × Long-time Setting

- The circuit breaker ampere rating (P) is found by multiplying the circuit breaker sensor size by the rating plug multiplier.
- The long-time pickup switch varies the circuit breaker continuous current rating as a multiple of the ampere rating. Switch positions are adjustable from 0.5 to 1.0.

Frequency Rating

Square D circuit breakers can be applied on 50 and 60 Hz systems without rerating. Electronic trip circuit breakers are recommended for applications only on systems at 50/60 Hz. These circuit breakers have not been evaluated at any other frequency.

Interrupting Rating

The interrupting rating is the highest current at rated voltage the circuit breaker is designed to safely interrupt under standard test conditions. Circuit breakers must be selected with interrupting ratings equal to or greater than the available short-circuit current at the point where the circuit breaker is applied to the system (unless it is a branch device in a series rated combination). Interrupting ratings are shown on the faceplate of the circuit breaker.

Table 2. Interrupting Ratings

Circuit Breaker	UL/CSA			IEC 947-2 Rating 415/240 Vac	
	240 Vac	480 Vac	600 Vac	Icu	Ics
LE, LEL, LX, LXL	100 kA	65 kA	35 kA	65 kA	65 kA
LXI, LXIL	200 kA	200 kA	100 kA	65 kA	65 kA
ME, MEL, MX, MXL	65 kA	65 kA	25 kA	65 kA	33 kA
NE, NEL, NX, NXL	65 kA	65 kA	25 kA	50 kA	50 kA
PEF, PXF	125 kA	100 kA	65 kA	70 kA	53 kA

Withstand Rating

The short-time withstand rating of a circuit breaker is the level of rms symmetrical current that a circuit breaker can carry with the contacts in a closed position for a stated period of time (usually 30 cycles).

The withstand rating is used to improve coordination by maximizing the current level at which the circuit breaker trips with no intentional delay. For more information on coordination using withstand ratings, See Data Bulletin 0600DB0105, *Circuit Breaker Characteristic Trip Curves and Coordination*.

Note: It is recommended that a system coordination study be done for optimum circuit breaker coordination.

100% Rating

Full-function electronic trip circuit breakers (except the 2500 A PE and 600 A LE circuit breakers) are UL Listed to be applied at up to 100% of their continuous current rating.

Because of the additional heat generated when applying circuit breakers at 100% of continuous current rating, the use of specially designed enclosures and 90°C rated wire is required.

Table 3. Circuit Breaker Enclosure Sizes

Circuit Breaker	Enclosure Size (H × W × D)
LE	52 × 20 × 7-1/2 in (1321 × 508 × 190 mm)
ME	52 × 22-1/2 × 14-1/2 in (1321 × 572 × 368 mm)
NE	52 × 22-1/2 × 14-1/2 in (1321 × 572 × 368 mm)
PE	45 × 36 × 24 in (1143 × 914 × 610 mm)

Markings on the circuit breaker indicate minimum enclosure size and ventilation specifications required. The 90°C wire must be sized according to the ampacities of the 75°C wire column in the NEC. Circuit breakers with 100% ratings can also be used in applications requiring only 80% continuous loading.

Ambient Temperature Rating

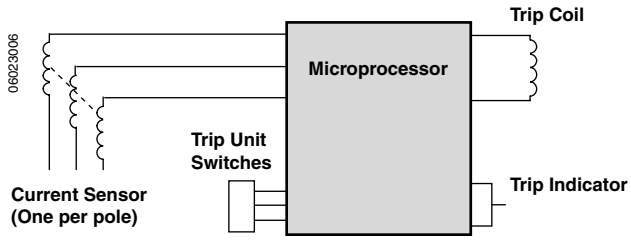
To meet the requirements of UL Standard 489, molded case circuit breakers are designed, built and calibrated for use on 50/60 Hz ac systems in a 40°C ambient environment. Electronic trip circuit breakers, however, are designed to react only to the magnitude of the current flowing through the circuit breaker. MICROLOGIC® electronic trip circuit breakers are inherently ambient insensitive in the range of -10°C to +60°C.

OTHER FEATURES

Trip System

The trip system causes the circuit breaker to open automatically under overload, short-circuit or ground-fault conditions. The MICROLOGIC trip system consists of the current sensors, a microprocessor-based trip unit, and a tripping coil. The tripping coil is a flux transfer solenoid which requires no external power source. All MICROLOGIC protective functions are completely fault powered. The trip system operation and adjustments are described on **page 15**.

Figure 1. MICROLOGIC Trip System



Internal Operating Mechanism

Square D circuit breakers have a single operating handle that acts directly through the operating mechanism against the contact arms. Multi-pole circuit breakers have a common trip bar for positive action of all poles on manual and automatic operation.

These circuit breakers have a trip-free mechanism that allows them to trip even though the operating handle may be restricted (by a handle operating mechanism or a motor operator) in the ON position. If not restricted, the operating handle moves to a position between ON and OFF when the circuit breaker is tripped.

The face of the circuit breaker is marked with standard ON/OFF and international I/O markings to indicate handle position.

Push-to-trip Button

The push-to-trip button located on the face of each circuit breaker is a standard feature of all Square D molded case circuit breakers. This allows the user to manually trip the circuit breaker without risking exposure to live parts. During normal on-off operation, the handle opens and closes the circuit breaker contacts but does not exercise the tripping mechanism. Using the push-to-trip button exercises the tripping mechanism.

Use the push-to-trip button to check:

- ❑ Alarm circuits
- ❑ Emergency circuits
- ❑ Motor sequencing operations

It is recommended that the circuit breaker tripping mechanism be exercised at least annually.

Instantaneous OFF Feature

Full-function circuit breakers with adjustable long-time, short-time and instantaneous (LS[I]) trip units provide the ability to turn the instantaneous tripping function OFF. Turning OFF the instantaneous trip function increases the current level at which the circuit breaker will trip with no intentional delay to the level of the short-time withstand rating. This current level is typically much higher than any of the pickup levels provided by the adjustable instantaneous feature.

In other words, using the “Instantaneous OFF” feature improves coordination by allowing the user to take advantage of the circuit breaker withstand rating.

Circuit Breaker Mounting

L-, M-, and N-family unit-mount electronic trip circuit breakers (frame sizes through 1200 A) are supplied with four mounting screws. These mounting screws are inserted through mounting holes molded into the circuit breaker base and threaded into the enclosure. To properly support the circuit breaker, all four mounting screws must be used.

P-family electronic trip circuit breakers (frame sizes above 1200 A) are supported with mounting brackets attached to each circuit breaker or with a terminal pad kit.

Table 4. Terminal Pad Usage

Circuit Breaker	Connections	Terminal Pads Required
600-1600 A PE 600-2000 A PX	Bus	No
	Cable	Use terminal pad kit PALTB or equivalent bus structure.
1800-2500 A PE 2500 A PX	Cable or Bus	Use terminal pad kit supplied with circuit breaker or equivalent bus structure.

See **page 23** for frame-specific mounting information.

Circuit Breaker Connections

L-, M-, and N-family circuit breakers (frame sizes through 1200 A) are available in unit-mount construction for cable or bus connections; or with plug-on connectors for I-LINE applications. P-family circuit breakers (frame sizes 1200 A and above) are available in unit-mount construction only, using either cable or bus connections.

Unit-mount circuit breakers can be ordered with mechanical line and load side lugs. The standard lugs can be removed for the installation of compression-type lugs or for bus connections.

All lugs are UL Listed for their proper application and marked for use with aluminum and copper (Al/Cu) or copper only (Cu) conductors. Lugs suitable for copper and aluminum conductors are generally made of tin-plated aluminum. Lugs suitable for use with copper conductors only are made of copper.

Plug-on circuit breakers are available through the 1200 A frame size for easy installation and removal in Square D exclusive I-LINE panelboards and switchboards. I-LINE circuit breakers use “blow-on” type connectors. In case of a short circuit, increased magnetic flux causes the plug-on connectors of the circuit breaker to tighten their grasp on the panelboard or switchboard bus bars.

The I-LINE connectors are integral parts of I-LINE circuit breakers, and cannot be removed or replaced.

See **page 23** for frame-specific connection information.

TESTING REQUIREMENTS

Overview

The UL label on a Square D molded case circuit breaker indicates that the circuit breaker meets the requirements of UL Standard 489 and that the manufacturer's production procedure is monitored by UL inspectors to ensure continuing conformance to UL performance requirements. These requirements include the following tests:

Limited Available Fault Current Tests

- 200% Overload Calibration—each pole of the circuit breaker must trip within a specified time limit when carrying 200% of its continuous current rating.
- 135% Overload Calibration—with all poles connected in series, the circuit breaker must trip within a specified time limit while carrying 135% of its continuous current rating.
- Overload—the circuit breaker must make and break 600% of its continuous current rating at rated voltage. Circuit breaker frame sizes through 1600 A must perform 50 operations at 600%. Circuit breaker frame sizes 1600 A through 3000 A must perform 25 operations at 600%.
- Temperature Rise—while carrying 100% of rated current and mounted in open air, temperature rise on a wiring terminal must be within specified limits. For 100% rating, the circuit breaker is mounted in an enclosure.
- Endurance—the circuit breaker must complete the following number of operations:

Table 5. Endurance Testing Operations

Frame Size (A)	Number of Operations	
	With Current	Without Current
255	4000	4000
400	1000	5000
600	1000	5000
800	500	3000
1200–2500	500	2000

- Calibration Retest—both the 200% and 135% overload calibration tests are repeated.
- Short Circuit—the circuit breaker must interrupt the current while maintaining the integrity of the circuit breaker.

For circuit breaker frames 1200 A and below, two short-circuit tests per pole and one test with all poles connected in common are performed. (A 3-pole circuit breaker receives seven short-circuit tests.)

For circuit breaker frames above 1200 A, a minimum of two short-circuit tests per pole and two tests with all poles connected in common are performed. (A 3-pole circuit breaker receives eight short-circuit tests.)

- Trip Out—the 200% thermal calibration test is repeated following the short-circuit tests.
- Dielectric—the circuit breaker must withstand, for one minute, twice its rated voltage plus 1000 V:
  - — Between line and load terminals with the circuit breaker in the tripped and in the OFF positions.
  - — Between terminals of different potential with the circuit breaker closed.
  - — Between live parts and the overall enclosure with the circuit breaker both open and closed.

No conditioning of the circuit breaker can take place during or between tests. There can be no failure of functional parts at the conclusion of the sequences.

High Available Fault Current Tests

After qualifying a set of circuit breakers to the standard tests, a manufacturer can have additional circuit breaker samples tested on higher than standard available fault currents. The following performance requirements apply:

- 200% Overload Calibration – each pole of the circuit breaker must trip within a specified time limit when carrying 200% of its continuous current rating.
- Short-circuit Test – with the load side terminals connected by 10-inch lengths of specified cable (or a shorting bar), the circuit breaker is exposed to a short-circuit current for a set time interval. After safe interruption, the circuit breaker is reset and closed again on the short circuit.
- 250% Overload Calibration – each pole of the circuit breaker must trip within a specified time limit when carrying 250% of its continuous current rating.
- Dielectric Withstand – the circuit breaker is subjected to twice its rated voltage, but not less than 900 V.

When the sample circuit breakers pass these tests, circuit breakers of the same construction can be marked or labeled with the higher current interrupting rating.

MAINTENANCE AND TESTING

Molded case circuit breakers require little maintenance, but an inspection and maintenance procedure should be established from the time of installation. The service life of electronic trip molded case circuit breakers depends on proper application, correct installation, suitable environmental conditions, and preventative maintenance. The guide most frequently used as a basis for field testing requirements is NEMA Standard AB4, *Guidelines for Inspections and Preventive Maintenance of Molded Case Circuit Breakers used in Commercial and Industrial Applications.*

Square D recommends that molded case circuit breakers be inspected and tested during the normal annual maintenance of electrical systems. If operating or environmental conditions are severe, more frequent inspections are recommended.

The circuit breaker case is sealed and must not be opened for any reason. Opening the circuit breaker case voids all warranties and the UL Listing. No serviceable parts are located inside the molded case.

Inspection and Preventative Maintenance

Inspection procedures check items that may indicate a potential problem. For information on inspection and preventative maintenance, See Data Bulletin 0600DB9901 *Field Testing and Maintenance Guide for MICROLOGIC® Electronic Trip and Thermal-magnetic Molded Case Circuit Breaker*s.

Performance and Verification Testing

Performance tests such as insulation resistance tests, watts loss tests and electronic tripping function trip tests can be performed to verify that the circuit breaker is able to perform its basic functions.

Use secondary injection testing or primary injection testing to check the trip system. A Square D Universal Test Set (Cat. No. UTS3) is available for secondary injection testing.

For additional information or assistance, contact Square D at 1-888-SquareD (1-888-778-2733).

For on-site service, contact the Square D Technical Services Division, 24 hours a day, at 1-800-634-2003.

SECTION 2—MICROLOGIC TRIP SYSTEMS BASED ON LE, LX, LXI, ME, MX, NE, NX, PE AND PX CIRCUIT BREAKERS

Square D electronic trip molded case circuit breakers are equipped with either the MICROLOGIC Standard-function Trip System or the MICROLOGIC Full-function Trip System. Both trip systems provide adjustable tripping functions and characteristics using true root-mean-square (rms) current sensing.

MICROLOGIC trip systems use a set of current transformers (called CTs or sensors) to sense current, either a standard-function or full-function trip unit to evaluate the current, and a tripping solenoid to trip the circuit breaker. Adjustable rotary switches on the trip unit allow the user to set the proper overcurrent or ground current protection required in the electrical system. If current exceeds a set value for longer than its set time delay, the trip system trips the circuit breaker.

Circuit breakers are shipped with the long-time pickup switch set at 1.0 and all other trip unit adjustments set at their lowest settings. Actual settings required for a specific application must be determined by a qualified consultant or plant engineer. A coordination study is recommended to provide coordination between all circuit breakers in the distribution system.

Standard-Function Trip Unit

Full-Function Trip Unit

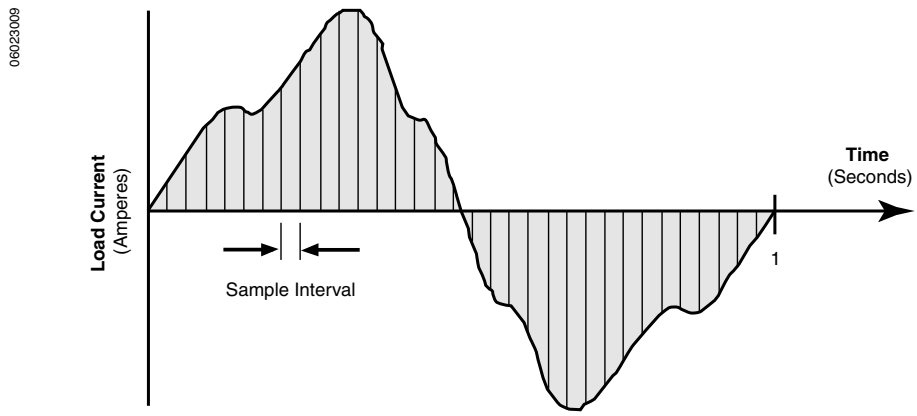
RMS SENSING

The sensing system on an electronic trip molded case circuit breaker responds to the flow of current through the circuit breaker. Electronic trip circuit breakers are limited to ac systems because the electronic trip system uses current transformers to sense the current.

The MICROLOGIC trip system samples the current waveform 33 times per cycle on a 60 Hz system. It then uses this data to calculate the true rms current through the 13th harmonic. This true rms sensing gives accurate values for the magnitude of a non-sinusoidal waveform. Therefore, the heating effects of harmonically distorted waveforms are accurately evaluated.

Electronic trip circuit breakers with MICROLOGIC trip systems can be used on 50/60 Hz systems with alternating current (ac) to direct current (dc), dc to ac, and ac to ac converters. This includes applications that use silicon-controlled rectifiers (SCRs) and adjustable frequency controls.

Figure 2. Trip System Current Sensing



RATING PLUGS

Rating plugs are used to determine the circuit breaker ampere rating (P) according to the following equation: **Ampere Rating (P) = Sensor Size (S) × Rating Plug %.** The ampere rating and the long-time pickup switch are then combined to determine the circuit breaker continuous current rating.

For example:

$$\text{Continuous Current Rating} = (\text{Sensor Size (S)}) \times (\text{Rating Plug \%}) \times (\text{Long-time Setting})$$
$$225 = (600) \times (0.75) \times (0.5)$$

Multiplier

Rating plugs are available with multiplier values ranging from 0.40 to 1.00. If the rating plug is not installed, the circuit breaker will operate safely, but the trip unit will default to a multiplier of 0.40.

Rating plugs and ammeter/trip indicators are subject to damage from static charge. Internal damage can result if these devices are handled by their contacts. If either device is removed from the trip unit, it must be held against grounded metal, such as the metal circuit breaker enclosure, for at least two seconds before reinstalling.

Each MICROLOGIC circuit breaker is shipped with a rating plug factory installed. The label on the circuit breaker marked “Configuration as Shipped” gives the circuit breaker configuration as it left the factory. Field-installable rating plug kits are also available. See **Section 4—Accessories** for available field-installable rating plug kits. Ground-fault pickup values are based on the sensor size of the circuit breaker and are not affected by changing the rating plug.

AMMETER/TRIP INDICATOR

Overview

The ammeter/trip indicator is a troubleshooting tool used to identify the type of fault if an overcurrent condition occurs, and to find potential overcurrent situations.

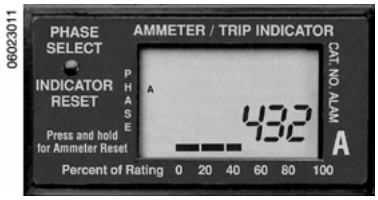
The ammeter/trip indicator displays current in phases A, B and C, and the peak ground-fault current flowing in the circuit. Each value can be viewed one at a time using the phase select/indicator reset button. (Phase values are displayed in true rms. Ground-fault current values are displayed in calculated rms based on measured peak current.) A bar graph is provided indicating the level of operating current as a percentage of the programmed ampere rating of the circuit breaker.

The ammeter/trip indicator window displays “OVERLOAD,” “SHORT CIRCUIT,” or “GROUND FAULT” when the circuit breaker trips from an overcurrent. The indicator must be manually reset by pushing the phase select/indicator reset button.

The ammeter can also be used as a rough guide when setting the ground-fault pickup when a coordination study is not available. Selecting the GF screen under normal operating conditions will display the ground-fault leakage current under those conditions. In order to protect against abnormal conditions, the ground-fault pickup should be set somewhat higher than the GF value displayed on the screen.

The phase select/indicator reset button can be pressed at any time to test the ammeter/trip indicator battery condition. The window will display a battery symbol. If this does not occur, contact Square D for a replacement ammeter/trip indicator.

The ammeter/trip indicator is factory installed on the full-function circuit breaker and is available as a field-installable option on the standard-function circuit breaker. It can be installed in or removed from the trip unit without tripping the circuit breaker.



Memory Feature

MICROLOGIC trip systems feature a memory circuit for intermittent overload or ground-fault conditions. This allows the circuit breaker to respond to a series of ON and OFF overload or ground-fault conditions which could cause conductor overheating, but go undetected in a conventional electronic trip device.

If the circuit breaker trips due to an overcurrent condition, wait at least one minute before resetting the circuit breaker. This allows the memory to clear itself sufficiently for the circuit breaker to be turned ON. If checking trip times, wait fifteen minutes after the circuit breaker trips before resetting to allow memory to reset completely to zero (or use a memory reset module, Cat. No. MTMB).

Ground-Fault Detection

Standard-function and full-function circuit breakers are available with integral ground-fault detection to provide either ground-fault protection (trip) or alarm (no trip) on grounded systems. These circuit breakers utilize a residual sensing scheme for ground-fault detection.

Both standard-function and full-function circuit breakers are available with integral equipment ground-fault protection.

Full-function circuit breakers are also available with integral ground-fault alarm (no trip) to monitor the flow of ground-fault current and signal an alarm condition through the POWERLOGIC® system, or with additional components described in Data Bulletin 0502DB0001: *Ground-fault Alarm for LE, ME, NE, PE and SE MICROLOGIC Electronic Trip Circuit Breakers using RIM32 and AROMA*T® relay.

This feature meets NEC Sections 700-7(d) and 700-26 for emergency systems. Circuit breakers with the ground-fault alarm trip system DO NOT provide ground-fault protection (do not trip on ground-fault).

Ground-fault protection trip units include both ground-fault pickup and delay adjustments. Ground-fault alarm (no trip) trip units include only ground-fault pickup adjustments.

Circuit breakers with either ground-fault protection or alarm (no trip) trip systems are equipped with an internal ground-fault push-to-test feature. The ground-fault push-to-test is built into the circuit breaker and eliminates the need for any additional test equipment. The ground-fault push-to-test requires 120 Vac control power.

Trip Characteristics

MICROLOGIC trip units provide a full range of adjustable tripping characteristics using a microcomputer that constantly monitors the line currents. The overcurrent or ground-fault current pickup and delay levels are set using adjustable rotary switches on the face of the trip unit. If the load current exceeds the trip settings, the microcomputer signals the circuit breaker to trip.

Table 6. Adjustable Tripping Characteristics for Electronic Trip Circuit Breakers

Standard-Function Trip Unit	Full-Function Trip Unit
• Long-time pickup • Long-time delay • Short-time pickup • Short-time delay (I^2t IN only) • Instantaneous pickup • Ground-fault pickup • Ground-fault delay (I^2t OUT only)	• Long-time pickup • Long-time delay • Short-time pickup • Short-time delay (I^2t IN and I^2t OUT) • Instantaneous pickup • Instantaneous OFF • Ground-fault pickup • Ground-fault delay (I^2t IN and I^2t OUT) • Ground-fault alarm

I^2t IN delay is an “inverse time” characteristic in that the delay time decreases as the current increases.

I^2t OUT delay is a “constant-time” characteristic, the delay time does not change as the current increases.

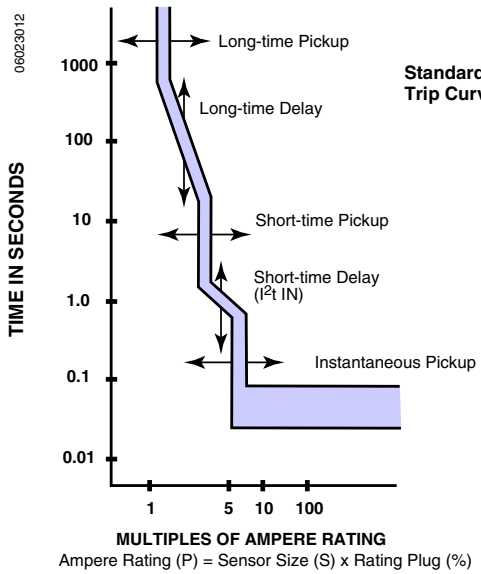
Trip settings are used to obtain a coordinated system in which a downstream circuit breaker will trip before an upstream circuit breaker. Properly adjusting the MICROLOGIC® trip settings will result in a circuit breaker trip curve that falls above and to the right of the branch circuit breaker trip curve. Under overcurrent conditions, the branch circuit breaker will trip first. Square D recommends that a system coordination study be done to find the proper trip unit settings to optimize coordination with other devices.

STANDARD-FUNCTION TRIP UNIT

Overview

The standard-function trip unit trip curve drawing shows the various parts of a typical trip curve affected by the adjustments on a standard-function trip unit. Adjusting the trip unit switches will shift that area of the trip curve.

Note: The switch settings shown in the following explanation of trip functions are examples only. The pictures are not representative of all frames and sensors. For specific switch settings, see the trip curve for the particular circuit breaker type, frame, and sensor.



Standard-function Trip Unit Trip Curve

Long-time Trip Functions

Long-time Pickup

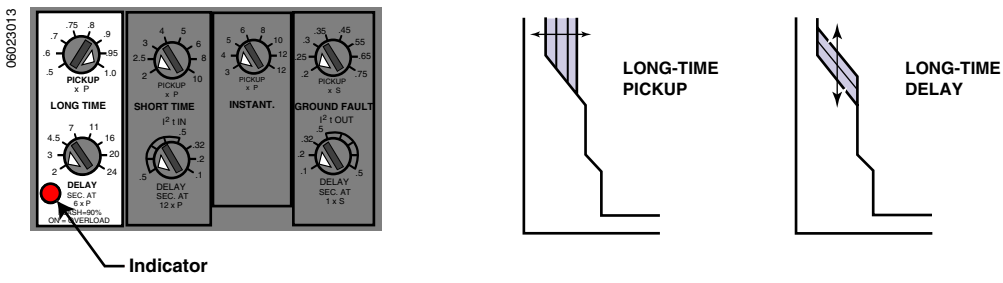
The long-time pickup switch value (multiplied by the ampere rating) sets the maximum current level which the circuit breaker will carry continuously. If the current exceeds this value for longer than the set delay time, the circuit breaker will trip.

Long-time Delay

The long-time delay switch value sets the length of time that the circuit breaker will carry a sustained overload before tripping. Delay bands are labeled in seconds of overcurrent at six times the ampere rating. For maximum coordination, eight delay bands are available. Long-time delay is an “inverse time” characteristic in that the tripping time decreases as the current increases.

The trip unit includes an indicator that will flash when the current reaches 90% of the LONG-TIME PICKUP setting and will be lit continuously when the current is above 100% of the pickup setting.

Figure 3. Long-time Pickup and Long-time Delay Switches



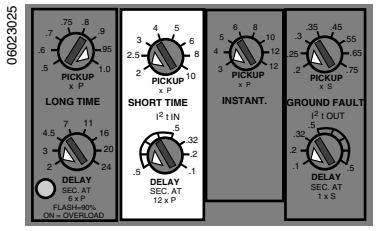
Short-time Trip Functions

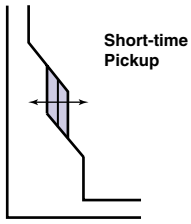
Short-time Pickup

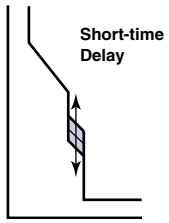
The short-time pickup switch value (multiplied by the ampere rating) sets the short-circuit current level at which the circuit breaker will trip after the set SHORT-TIME DELAY.

Short-time Delay

The short-time delay switch value sets the length of time the circuit breaker will carry a short circuit within the short-time pickup range. The delay (based on 12 times the ampere rating, P) can be set to four positions of I^2t ramp operation (I^2t IN).



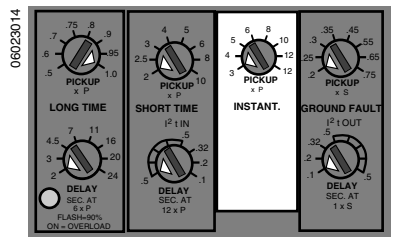


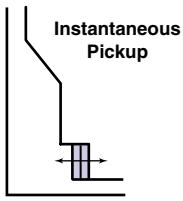


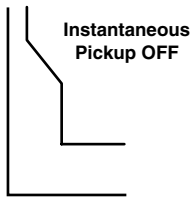
Instantaneous Trip Function

Instantaneous Pickup

The instantaneous pickup switch value (multiplied by the ampere rating) sets the short-circuit current level at which the circuit breaker will trip with no intentional time delay.







The instantaneous function will override the short-time function if the INSTANTANEOUS PICKUP is adjusted at the same or lower setting than the SHORT-TIME PICKUP.

Ground-fault Trip Functions

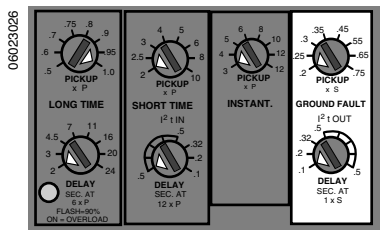
Ground-Fault Pickup

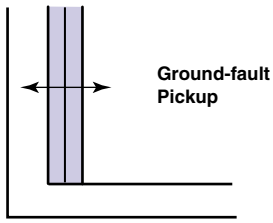
The ground-fault pickup switch value (multiplied by the sensor size) sets the current level at which the circuit breaker will trip after the set GROUND-FAULT DELAY.

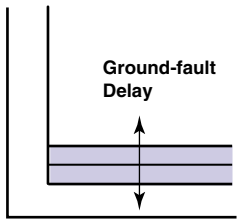
Ground-fault pickup values are based on the circuit breaker sensor size only, not the rating plug multiplier. Changing the rating plug multiplier has no effect on ground-fault pickup values.

Ground-Fault Delay

The ground-fault delay switch value sets the length of time the circuit breaker will carry ground-fault current which exceeds the GROUND-FAULT PICKUP level before tripping. Delay can be adjusted with four positions of fixed time delays (I^2t OUT).





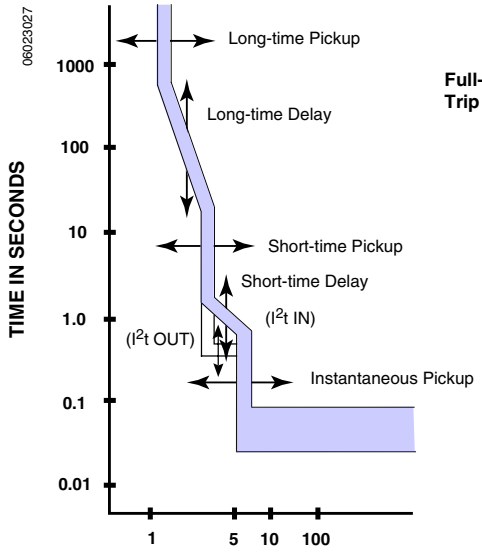


FULL-FUNCTION TRIP UNIT

Overview

The full-function trip unit trip curve drawing, below, shows the various parts of a typical trip curve affected by the adjustments on a full-function trip unit.

Adjusting the trip unit switches will shift that area of the trip curve.



Full-function Trip Unit Trip Curve

Ampere Rating (P) = Sensor Size (S) x Rating Plug (%)

Long-Time Trip Functions

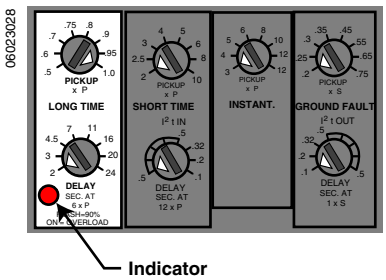
Long-time Pickup

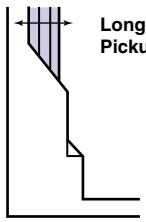
The long-time pickup switch value (multiplied by the ampere rating) sets the maximum current level which the circuit breaker will carry continuously. If the current exceeds this value for longer than the set delay time, the circuit breaker will trip.

Long-time Delay

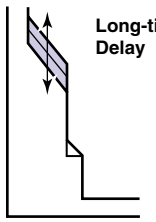
The long-time delay switch value sets length of time that the circuit breaker will carry a sustained overload before tripping. Delay bands are labeled in seconds of overcurrent at six times the ampere rating. For maximum coordination, there are eight delay bands.

Long-time delay is an “inverse time” characteristic in that the delay time decreases as the current increases.





Long-time Pickup



Long-time Delay

The trip unit includes an **Indicator** that will flash when the current reaches 90% of the LONG-TIME PICKUP setting and will be lit continuously when the current is above 100% of the pickup setting.

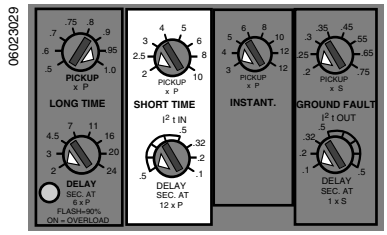
Short-Time Trip Functions

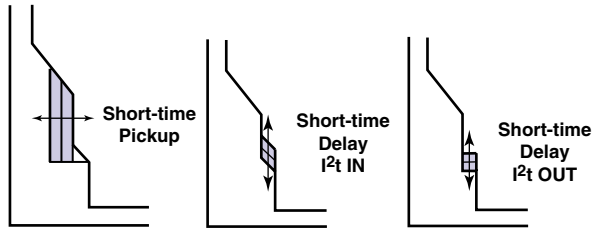
Short-time Pickup

The short-time pickup switch value (multiplied by the ampere rating) sets the short-circuit current level at which the circuit breaker will trip after the set SHORT-TIME DELAY.

Short-time Delay

The short-time delay switch value sets length of time the circuit breaker will carry a short circuit within the short-time pickup range. The delay (based on 12 times the ampere rating, P) can be adjusted to four positions of I^2t ramp operation (I^2t IN) or four positions of fixed time delays (I^2t OUT).





Instantaneous Trip

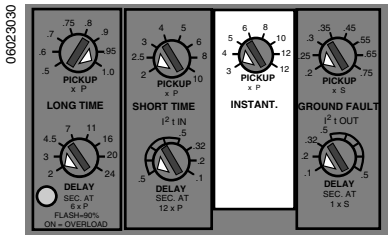
Instantaneous Pickup

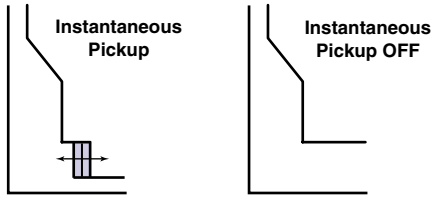
The instantaneous pickup switch value (multiplied by the ampere rating) sets the short-circuit current level at which the circuit breaker will trip with no intentional time delay.

The instantaneous function will override the short-time function if the instantaneous pickup is adjusted at the same or lower setting than the short-time pickup.

Instantaneous Pickup OFF

In full-function trip units with both adjustable short-time and instantaneous trip functions, the adjustable instantaneous trip can be disabled by setting instantaneous pickup to OFF. Even when the instantaneous pickup is turned OFF, an instantaneous override occurs above the circuit breaker short-time withstand rating.





Ground-Fault Trip

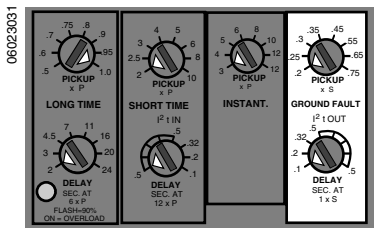
Ground-fault Pickup

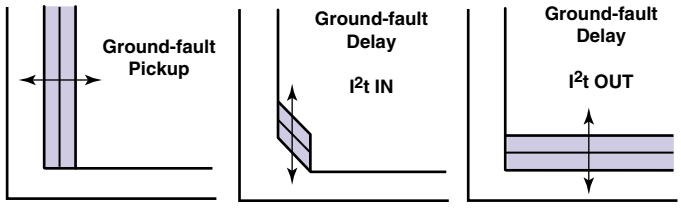
The ground-fault pickup switch value (multiplied by the sensor size) sets the current level at which the circuit breaker will trip after the set ground-fault delay.

Ground-fault pickup values are based on circuit breaker sensor size only, not on the rating plug multiplier. Changing the rating plug multiplier has no effect on ground-fault pickup values.

Ground-fault Delay

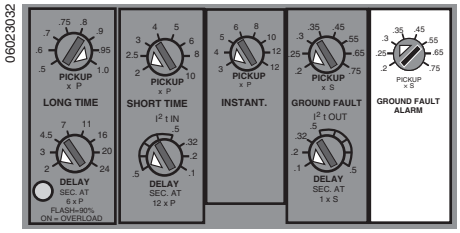
The ground-fault delay switch value sets length of time the circuit breaker will carry ground-fault current which exceeds the ground-fault delay level before tripping. Delay can be adjusted to four positions of I^2t ramp operation (I^2t IN) or four positions of fixed time delays (I^2t OUT).

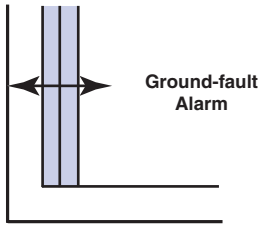




Ground-fault Alarm

The ground-fault alarm switch value (multiplied by the sensor size) sets the current level at which the circuit breaker will signal the POWERLOGIC® system or remote monitoring provided with additional components described in Data Bulletin 0502DB0001, *Ground-fault Alarm for LE, ME, NE, PE and SE MICROLOGIC Electronic Trip Circuit Breakers using RIM32 and AROMAT® Relay*.





ADDITIONAL SETTINGS

Settings to Approximate Thermal-Magnetic Circuit Breakers

The table below shows electronic trip unit settings which result in a trip curve similar to the trip curve of a thermal-magnetic circuit breaker of the same ampere rating. The short-time and instantaneous pickup levels are presented in ranges that approximate the “Lo” to “Hi” magnetic adjustment ranges supplied on thermal-magnetic circuit breakers.

Settings to Approximate Zero-Sequence Ground-fault Protection Systems

Zero-sequence sensing ground-fault protection systems are used with thermal-magnetic circuit breakers or fusible switches for equipment ground-fault protection. The ground-fault pickup and delay settings on the electronic trip circuit breaker can be used to achieve trip curves similar to the Square D GC ground-fault relay.

Table 7. Trip Unit Settings to Approximate Thermal-Magnetic Circuit Breakers[1]

Thermal-Magnetic Circuit Breaker Prefix	Electronic Circuit Breaker Prefix	Frame Size	Long-Time Trip	Long-Time Delay	Short-Time Pickup	Short-Time Delay	Instantaneous Pickup
LA, LH	LE, LX, LXI	400 A	1.0	14	8	.5 I^2t IN	5 to 8
LC, LI		600 A		14	8		5 to 8
MA, MH	ME, MX	400 A 800 A		20 24	10 10		5 to 10 5 to 10
NH, NA, NC	NE, NX	600 A 1200 A		7 4.5	10 10		6 to 12 4 to 8
PA, PH	PE, PX	1200 A 1600 A 2000 A		4.5 4.5 7	8 8 6		3 to 8 3 to 6 4 to 6
PC		1600 A 2000 A 2500 A		7 7 4.5	8 6 5		4 to 8 3 to 6 3.5 to 5

1. Thermal-magnetic circuit breakers do not have short-time tripping characteristics. To approximate the characteristics of a thermal-magnetic circuit breaker, the short-time pickup level should be equal to the instantaneous pickup level.

SECTION 3—CIRCUIT BREAKER SPECIFICS

This section provides application information on electronic trip circuit breakers available from Square D. The information is organized by catalog prefix.

Table 8. Available Circuit Breakers

Catalog Prefix	Frame Sizes (A)
LE, LX (page 24)	600
ME, MX (page 26)	800
NE, NX (page 28)	1200
PE, PX (page 30)	2500

CATALOG NUMBERING SYSTEM

When ordering Square D electronic trip circuit breakers, include circuit breaker family, poles, voltage rating, ampere rating and trip unit suffix.

Table 9. Catalog Numbering System for Circuit Breakers with MICROLOGIC® Trip Systems

Number Segment	Character(s)	Description	ME	L	3	6	800	LSG
Circuit Breaker Family	LE, ME, NE, PE	Circuit breakers with full-function trip systems						
	LX, MX, NX, PX	Circuit breakers with standard-function trip systems						
	LXI	Current-limiting circuit breakers with standard-function trip systems						
Connection Type	No Letter	I-LINE						
	L	Lugs on both ends						
	F	Terminal pads only (PE, PX)						
	P	Lugs OFF end						
Poles	3	3-pole						
Voltage	6	600 Vac						
Ampere Rating	800	800 Ampere Rating						
Trip Unit Option	LI	Adjustable long-time ampere rating and delay Adjustable Instantaneous pickup						
	LS	Adjustable long-time ampere rating and delay Adjustable Instantaneous pickup						
	LIG	Adjustable long-time ampere rating and delay Adjustable Instantaneous pickup Adjustable ground-fault pickup and delay						
	LSG	Adjustable long-time ampere rating and delay Adjustable short-time ampere rating and delay Adjustable Instantaneous pickup Adjustable ground-fault pickup and delay						
	LIA	Adjustable long-time ampere rating and delay Adjustable Instantaneous pickup Adjustable ground-fault alarm pickup (no delay, no trip)						
	LSA	Adjustable long-time ampere rating and delay Adjustable short-time ampere rating and delay Adjustable Instantaneous pickup Adjustable ground-fault alarm pickup (no delay, no trip)						
	No Letter[1]	LS configuration						
	G[1]	LSG configuration						

1. Standard-function trip unit

LE, LX AND LXI 600 A FRAME CIRCUIT BREAKERS

This section provides specific information on LE, LX and LXI electronic trip circuit breakers.

Table 10. LE, LX, and LXI Circuit Breaker Catalog Numbers[1]

Sensor Size	Ampere Rating	Features						Rating Plug Installed
		• Long-Time • Instantaneous	• Long-Time • Short-Time • Instantaneous	• Long-Time • Instantaneous w/Ground-Fault Protection	• Long-Time • Short-Time • Instantaneous w/Ground-fault Protection	• Long-Time • Instantaneous w/Ground-fault Alarm	• Long-Time • Short-Time • Instantaneous w/Ground-fault Alarm	
LE Circuit Breaker with MICROLOGIC® Full-Function Trip System[2]								
250	100	LE(L)36100LI	LE(L)36100LS	LE(L)36100LIG	LE(L)36100LSG	LE(L)36100LIA	LE(L)36100LSA	ARP040
	125	LE(L)36125LI	LE(L)36125LS	LE(L)36125LIG	LE(L)36125LSG	LE(L)36125LIA	LE(L)36125LSA	ARP050
	150	LE(L)36150LI	LE(L)36150LS	LE(L)36150LIG	LE(L)36150LSG	LE(L)36150LIA	LE(L)36150LSA	ARP060
	175	LE(L)36175LI	LE(L)36175LS	LE(L)36175LIG	LE(L)36175LSG	LE(L)36175LIA	LE(L)36175LSA	ARP070
	200	LE(L)36200LI	LE(L)36200LS	LE(L)36200LIG	LE(L)36200LSG	LE(L)36200LIA	LE(L)36200LSA	ARP080
	225	LE(L)36225LI	LE(L)36225LS	LE(L)36225LIG	LE(L)36225LSG	LE(L)36225LIA	LE(L)36225LSA	ARP090
	250	LE(L)36250LI	LE(L)36250LS	LE(L)36250LIG	LE(L)36250LSG	LE(L)36250LIA	LE(L)36250LSA	ARP100
400	300	LE(L)36300LI	LE(L)36300LS	LE(L)36300LIG	LE(L)36300LSG	LE(L)36300LIA	LE(L)36300LSA	ARP075
	350	LE(L)36350LI	LE(L)36350LS	LE(L)36350LIG	LE(L)36350LSG	LE(L)36350LIA	LE(L)36350LSA	ARP088
	400	LE(L)36400LI	LE(L)36400LS	LE(L)36400LIG	LE(L)36400LSG	LE(L)36400LIA	LE(L)36400LSA	ARP100
600 [3]	450	LE(L)36450LI	LE(L)36450LS	LE(L)36450LIG	LE(L)36450LSG	LE(L)36450LIA	LE(L)36450LSA	ARP075
	500	LE(L)36500LI	LE(L)36500LS	LE(L)36500LIG	LE(L)36500LSG	LE(L)36500LIA	LE(L)36500LSA	ARP083
	600	LE(L)36600LI	LE(L)36600LS	LE(L)36600LIG	LE(L)36600LSG	LE(L)36600LIA	LE(L)36600LSA	ARP100
LX Circuit Breaker and LXI Current-Limiting Circuit Breaker with MICROLOGIC® Standard-Function Trip System[1]								
250	100	—	LX(I)(L)36100	—	LX(I)(L)36100G	—	—	ARP040
	125	—	LX(I)(L)36125	—	LX(I)(L)36125G	—	—	ARP050
	150	—	LX(I)(L)36150	—	LX(I)(L)36150G	—	—	ARP060
	175	—	LX(I)(L)36175	—	LX(I)(L)36175G	—	—	ARP070
	200	—	LX(I)(L)36200	—	LX(I)(L)36200G	—	—	ARP080
	225	—	LX(I)(L)36225	—	LX(I)(L)36225G	—	—	ARP090
	250	—	LX(I)(L)36250	—	LX(I)(L)36250G	—	—	ARP100
400	300	—	LX(I)(L)36300	—	LX(I)(L)36300G	—	—	ARP075
	350	—	LX(I)(L)36350	—	LX(I)(L)36350G	—	—	ARP088
	400	—	LX(I)(L)36400	—	LX(I)(L)36400G	—	—	ARP100
600	450	—	LX(I)(L)36450	—	LX(I)(L)36450G	—	—	ARP075
	500	—	LX(I)(L)36500	—	LX(I)(L)36500G	—	—	ARP083
	600	—	LX(I)(L)36600	—	LX(I)(L)36600G	—	—	ARP100

1. The (L) indicates that the letter L is optional.
—If no L is used, the circuit breaker is I-LINE® configuration and is shipped with standard mechanical lugs on the OFF end.
—If no L is used, the circuit breaker is shipped with standard mechanical lugs at both ends.

2. For non-standard lugs, See “Circuit Breaker Terminations” on page 37.

3. 600 A sensor is 80% rated.

Interrupting Ratings

Table 11. LE, LX, and LXI Circuit Breaker Interrupting Ratings

Circuit Breaker	UL/CSA Rated			IEC 947-2 415/240 Vac	
	240 Vac	480 Vac	600 Vac	I_{cu}	I_{cs}
LE, LX	100 kA	65 kA	35 kA	65 kA	65 kA[1]
LXI	200 kA	200 kA	100 kA	65 kA	65 kA[1]

1. I_{CS} = 50 kA on 600 Ampere sensor.

Lug Information

Unit-mount circuit breakers have mechanical lugs standard on both ends. I-LINE® circuit breakers have lugs standard on the OFF end. These lugs accept aluminum or copper wire. Square D has other terminations available as accessories for non-standard applications. For additional lug information, See “Circuit Breaker Terminations” on page 37.

Continuous Current Ratings

LE circuit breakers marked “100% Rated” can be continuously loaded to 100% of their rating. Because of the additional heat generated when applying circuit breakers at 100% of continuous current rating, the use of specially designed enclosures and 90°C rated wire is required.

Table 12. LE, LX, and LXI Circuit Breaker Continuous Current Ratings

Circuit Breaker	Trip System	Sensor Size	Max. Continuous Current Rating
LX, LXI	Standard-Function MICROLOGIC® trip system	250 A 400 A 600 A	80%
LE	Full-Function MICROLOGIC® trip system	250 A 400 A	100%
		600 A	80%

Markings on the circuit breaker indicate minimum enclosure size and ventilation specifications required. The 90°C wire must be sized according to the ampacities of the 75°C wire column in the NEC.

Circuit breakers with 100% rating can also be used in applications requiring only 80% continuous loading.

Accessories

Accessories are available either factory installed or field installable. They can be installed in accessory slots on either side of the circuit breaker handle. For additional accessory information,
See “Section 4—Accessories” on page 33.

Table 13. LE, LX, and LXI Circuit Breaker Accessories

Description	Field Installable		Factory Installed	
	LE	LX, LXI	LE	LX, LXI
Shunt Trip	×	×	×	×
Undervoltage Trip	×	×	×	×
Auxiliary Switches	×	×	×	×
Alarm Switch	—	—	×	×
Handle Padlock Attachment	×	×	—	—
Electrical Trip Indicator	S [1]	×	S [1]	—
Local Current Meter	S [1]	×	S [1]	—
Neutral Current Transformer[2]	×	×	—	—
Electrical Operator	—	—	—	—
Trip Unit Seal	×	×	—	—
CIM3F communications Adapter	×	—	—	—

1. Standard item shipped with circuit breaker.

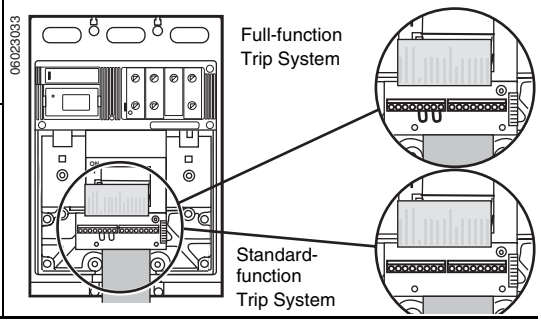
2. External Accessory: only needed when a neutral is associated with the load on a ground fault circuit breaker.

Control Wiring

Control wiring is connected to terminals located under the circuit breaker access cover.

Table 14. Control Wiring and Terminal Block Wiring Terminals[1]

Full-Function Trip System		Standard-Function Trip System	
Number	Terminal Name	Number	Terminal Name
1	Neutral CT (to X1)	1	Neutral CT (to X1)
2	Neutral CT (to X2)	2	Neutral CT (to X2)
3	Ground-Fault Test 120 Vac	3	Ground-Fault Test 120 Vac
4	Ground-Fault Test 120 Vac	4	Ground-Fault Test 120 Vac
5	ST Restraint IN	5–16	Reserved
6	ST Restraint OUT		
7	GF Restraint IN or Reserved (GF Alarm)		
8	GF Restraint OUT or Reserved (GF Alarm)		
9	Restraint COM		
10	CIM3F-RED		
11	CIM3F-BLACK		
12	Reserved		
13	CIM3F-BLUE		
14	CIM3F-ORANGE		
15–16	Reserved		



1. Torque wire binding screws to 5–10 lb-in (0.6–1.1 N•m). Use (1) #14 AWG or (1 or 2) #18 AWG wires.

ME AND MX 800 A FRAME CIRCUIT BREAKERS

This section provides specific information on ME and MX electronic trip circuit breakers.
For additional trip unit information, see page 15.

Table 15. ME and MX Circuit Breaker Catalog Numbers

Sensor Size	Ampere Rating	Features						Rating Plug Installed
		• Long-Time • Instantaneous	• Long-Time • Short-Time • Instantaneous	• Long-Time • Instantaneous w/Ground-Fault Protection	• Long-Time • Short-Time • Instantaneous w/ Ground-fault Protection	• Long-Time • Instantaneous w/Ground-fault Alarm	• Long-Time • Short-Time • Instantaneous w/Ground-fault Alarm	
ME Circuit Breaker with MICROLOGIC® Full-Function Trip System[1]								
	100	ME(L)36100LI	ME(L)36100LS	ME(L)36100LIG	ME(L)36100LSG	ME(L)36100LIA	ME(L)36100LSA	ARP040
	125	ME(L)36125LI	ME(L)36125LS	ME(L)36125LIG	ME(L)36125LSG	ME(L)36125LIA	ME(L)36125LSA	ARP050
	150	ME(L)36150LI	ME(L)36150LS	ME(L)36150LIG	ME(L)36150LSG	ME(L)36150LIA	ME(L)36150LSA	ARP060
250	175	ME(L)36175LI	ME(L)36175LS	ME(L)36175LIG	ME(L)36175LSG	ME(L)36175LIA	ME(L)36175LSA	ARP070
	200	ME(L)36200LI	ME(L)36200LS	ME(L)36200LIG	ME(L)36200LSG	ME(L)36200LIA	ME(L)36200LSA	ARP080
	225	ME(L)36225LI	ME(L)36225LS	ME(L)36225LIG	ME(L)36225LSG	ME(L)36225LIA	ME(L)36225LSA	ARP090
	250	ME(L)36250LI	ME(L)36250LS	ME(L)36250LIG	ME(L)36250LSG	ME(L)36250LIA	ME(L)36250LSA	ARP100
	300	ME(L)36300LI	ME(L)36300LS	ME(L)36300LIG	ME(L)36300LSG	ME(L)36300LIA	ME(L)36300LSA	ARP075
400	350	ME(L)36350LI	ME(L)36350LS	ME(L)36350LIG	ME(L)36350LSG	ME(L)36350LIA	ME(L)36350LSA	ARP088
	400	ME(L)36400LI	ME(L)36400LS	ME(L)36400LIG	ME(L)36400LSG	ME(L)36400LIA	ME(L)36400LSA	ARP100
	450	ME(L)36450LI	ME(L)36450LS	ME(L)36450LIG	ME(L)36450LSG	ME(L)36450LIA	ME(L)36450LSA	ARP056
	500	ME(L)36500LI	ME(L)36500LS	ME(L)36500LIG	ME(L)36500LSG	ME(L)36500LIA	ME(L)36500LSA	ARP063
800	600	ME(L)36600LI	ME(L)36600LS	ME(L)36600LIG	ME(L)36600LSG	ME(L)36600LIA	ME(L)36600LSA	ARP075
	700	ME(L)36700LI	ME(L)36700LS	ME(L)36700LIG	ME(L)36700LSG	ME(L)36700LIA	ME(L)36700LSA	ARP088
	800	ME(L)36800LI	ME(L)36800LS	ME(L)36800LIG	ME(L)36800LSG	ME(L)36800LIA	ME(L)36800LSA	ARP100
MX Circuit Breaker with MICROLOGIC® Standard-Function Trip System[1]								
	100	—	MX(L)36100	—	MX(L)36100G	—	—	ARP040
	125	—	MX(L)36125	—	MX(L)36125G	—	—	ARP050
	150	—	MX(L)36150	—	MX(L)36150G	—	—	ARP060
250	175	—	MX(L)36175	—	MX(L)36175G	—	—	ARP070
	200	—	MX(L)36200	—	MX(L)36200G	—	—	ARP080
	225	—	MX(L)36225	—	MX(L)36225G	—	—	ARP090
	250	—	MX(L)36250	—	MX(L)36250G	—	—	ARP100
	300	—	MX(L)36300	—	MX(L)36300G	—	—	ARP075
400	350	—	MX(L)36350	—	MX(L)36350G	—	—	ARP088
	400	—	MX(L)36400	—	MX(L)36400G	—	—	ARP100
	450	—	MX(L)36450	—	MX(L)36450G	—	—	ARP056
	500	—	MX(L)36500	—	MX(L)36500G	—	—	ARP063
800	600	—	MX(L)36600	—	MX(L)36600G	—	—	ARP075
	700	—	MX(L)36700	—	MX(L)36700G	—	—	ARP088
	800	—	MX(L)36800	—	MX(L)36800G	—	—	ARP100

1. The (L) indicates that the letter L is optional
—If no L is used, the circuit breaker is I-LINE® configuration and is shipped with standard mechanical lugs on the OFF end.
—If L is used, the circuit breaker is shipped with standard mechanical lugs at both ends.
—For non-standard lugs, page 33.

Interrupting Ratings

Table 16. ME and MX Circuit Breaker Interrupting Ratings

Circuit Breaker	UL Listed/CSA Certified			IEC 60947-2 Rated (415/240 Vac)	
	240 Vac	480 Vac	600 Vac	I_{cu}	I_{cs}
ME	65 kA	65 kA	25 kA	65 kA	33 kA
MX	65 kA	65 kA	25 kA	65 kA	33 kA

Continuous Current Ratings

All ME circuit breakers are marked “100% Rated” and can be continuously loaded to 100% of their rating. Because of the additional heat generated when applying circuit breakers at 100% of continuous current rating, the use of specially designed enclosures and 90°C rated wire is required.

Table 17. ME and MX Circuit Breaker Continuous Current Ratings

Circuit Breaker	MICROLOGIC Trip System	Sensor Size	Max. Continuous Current Rating
MX	Standard-Function	250 A 400 A 800 A	80%
ME	Full-Function	250 A 400 A 800 A	100%

Markings on the circuit breaker indicate minimum enclosure size and ventilation specifications required. The 90°C wire must be sized according to the ampacities of the 75°C wire column in the NEC. Circuit breakers with 100% rating can also be used in applications requiring only 80% continuous loading.

Lug Information

Unit-mount circuit breakers have mechanical lugs standard on both ends. I-LINE® circuit breakers have lugs standard on the OFF end. These lugs accept aluminum or copper wire. Other terminations are available as accessories for non-standard applications. See Circuit Breaker Terminations on page 37.

Accessories

Electrical accessories are available factory installed only. Other accessories are available either factory installed or field installable. Accessories are installed in accessory slots on either side of the circuit breaker. See Section 4—Accessories on page 33.

Table 18. ME and MX Circuit Breaker Accessories

Description	Field Installable		Factory Installed	
	ME	MX	ME	MX
Shunt Trip	—	—	×	×
Undervoltage Trip	—	—	×	×
Auxiliary Switches	—	—	×	×
Alarm Switch	—	—	×	×
Handle Padlock Attachment	×	×	—	—
Electrical Trip Indicator	S [1]	×	S [1]	—
Local Current Meter	S [1]	×	S [1]	—
Neutral Current Transformer [2]	×	×	—	—
Electrical Operator	—	—	—	—
Trip Unit Seal	×	×	—	—
CIM3F Communications Adapter	×	—	—	—

1. Standard item shipped with circuit breaker.

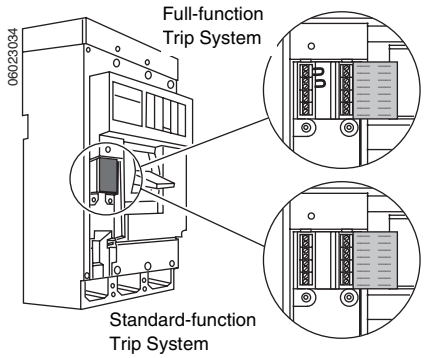
2. External Accessory: needed only when a neutral is associated with the load on a ground-fault circuit breaker.

Control Wiring

Control wiring is connected to terminals located under the circuit breaker access cover.

Table 19. Control Wiring and Terminal Block Wiring Terminals

Full-Function Trip System		Standard-Function Trip System	
Number	Terminal Name	Number	Terminal Name
1	Neutral CT (to X1)	1	Neutral CT (to X1)
2	Neutral CT (to X2)	2	Neutral CT (to X2)
3	Ground-Fault Test 120 Vac	3	Ground-Fault Test 120 Vac
4	Ground-Fault Test 120 Vac	4	Ground-Fault Test 120 Vac
5	ST Restraint IN	5–16	Reserved
6	ST Restraint OUT		
7	GF Restraint IN or Reserved (GF Alarm)		
8	GF Restraint OUT or Reserved (GF Alarm)		
9	Restraint COM		
10	CIM3F-RED		
11	CIM3F-BLACK		
12	Reserved		
13	CIM3F-BLUE		
14	CIM3F-ORANGE		
15–16	Reserved		



1. Torque wire binding screws to 5–10 lb-in (0.6–1.1 Nm). #14 AWG (1) or #18 AWG (1 or 2) wire.

NE AND NX 1200 A FRAME CIRCUIT BREAKER

This section provides specific information on NE and NX electronic trip circuit breakers. For general information, see page 7. For additional trip unit information, see page 15.

Table 20. NE and NX Circuit Breaker Catalog Numbers

Sensor Size	Ampere Rating	Features						Rating Plug Installed
		• Long-Time • Instantaneous	• Long-Time • Short-Time Instantaneous	• Long-Time • Instantaneous w/Ground-Fault Protection	• Long-Time • Short-Time • Instantaneous w/Ground-fault Protection	• Long-Time • Instantaneous w/Ground-fault Alarm	• Long-Time • Short-Time • Instantaneous w/Ground-fault Alarm	
NE Circuit Breaker with MICROLOGIC Full-Function Trip System[1]								
1200	600	NE(L)36600LI	NE(L)36600LS	NE(L)36600LIG	NE(L)36600LSG	NE(L)36600LIA	NE(L)36600LSA	ARP050
	700	NE(L)36700LI	NE(L)36700LS	NE(L)36700LIG	NE(L)36700LSG	NE(L)36700LIA	NE(L)36700LSA	ARP0583
	800	NE(L)36800LI	NE(L)36800LS	NE(L)36800LIG	NE(L)36800LSG	NE(L)36800LIA	NE(L)36800LSA	ARP067
	900	NE(L)36900LI	NE(L)36900LS	NE(L)36900LIG	NE(L)36900LSG	NE(L)36900LIA	NE(L)36900LSA	ARP075
	1000	NE(L)361000LI	NE(L)361000LS	NE(L)361000LIG	NE(L)361000LSG	NE(L)361000LIA	NE(L)361000LSA	ARP083
	1200	NE(L)361200LI	NE(L)361200LS	NE(L)361200LIG	NE(L)361200LSG	NE(L)361200LIA	NE(L)361200LSA	ARP100
NX Circuit Breaker with MICROLOGIC Standard-Function Trip System[1]								
1200	600	—	NX(L)36600	—	NX(L)36600G	—	—	ARP050
	700	—	NX(L)36700	—	NX(L)36700G	—	—	ARP0583
	800	—	NX(L)36800	—	NX(L)36800G	—	—	ARP067
	900	—	NX(L)36900	—	NX(L)36900G	—	—	ARP075
	1000	—	NX(L)361000	—	NX(L)361000G	—	—	ARP083
	1200	—	NX(L)361200	—	NX(L)361200G	—	—	ARP100

1. The (L) indicates that the letter L is optional
   —If no L is used, the circuit breaker is I-LINE® configuration and is shipped with standard mechanical lugs on the OFF end.
   —If L is used, the circuit breaker is shipped with standard mechanical lugs at both ends.
   —For non-standard lugs, See Circuit Breaker Terminations on page 37.

Interrupting Ratings

Table 21. NE and NX Interrupting Ratings

Circuit Breaker	UL/CSA Rated			IEC 947-2 415/240 Vac	
	240 Vac	480 Vac	600 Vac	I_{cu}	I_{cs}
NE	125 kA	100 kA	65 kA	–	–
NX	125 kA	100 kA	65 kA	–	–

Continuous Current Ratings

All NE circuit breakers are marked “100% Rated” and can be continuously loaded to 100% of their rating. Because of the additional heat generated when applying circuit breakers at 100% of continuous current rating, the use of specially designed enclosures and 90°C rated wire is required.

Table 22. Continuous Current Ratings

Circuit Breaker	MICROLOGIC Trip System	Sensor Size	Max. Continuous Current Rating
NX, NXL	Standard-Function	1200 A	80%
NE, NEL	Full-Function	1200 A	100%

Markings on the circuit breaker indicate minimum enclosure size and ventilation specifications required. The 90°C wire must be sized according to the ampacities of the 75°C wire column in the NEC. Circuit breakers with 100% rating can also be used in applications requiring only 80% continuous loading.

Lug Information

Unit-mount circuit breakers have mechanical lugs standard on both ends. I-LINE® circuit breakers have lugs standard on the OFF end. These lugs accept aluminum or copper wire.

Square D has other terminations available as accessories for non-standard applications. See “Circuit Breaker Terminations” on page 37.

Accessories

Accessories are available either factory installed or field installable. They can be installed in accessory slots on either side of the circuit breaker. For additional accessory information, see page 33.

Table 23. NE and NX Circuit Breaker Accessories

Description	Field Installable		Factory Installed	
	NE	NX	NE	NX
Shunt Trip	×	×	×	×
Undervoltage Trip	×	×	×	×
Auxiliary Switches	×	×	×	×
Alarm Switch	×	×	×	×
Handle Padlock Attachment	×	×	—	—
Electrical Trip Indicator	S [1]	×	S [1]	—
Local Current Meter	S [1]	×	S [1]	—
Neutral Current Transformer [2]	×	×	—	—
Electrical Operator	—	—	—	—
Trip Unit Seal	×	×	—	—
CIM3F Communications Adapter	×	—	—	—

1. Standard item shipped with circuit breaker.

2. External Accessory: needed only when a neutral is associated with the load on a ground-fault circuit breaker.

Note: To ensure accurate current sensing in neutral conductor, a neutral bus wider than three inches must be notched. see Bus-Bar Notching for Neutral Current Transformer on page 45.

Control Wiring

Control wiring is connected to terminals located under the circuit breaker access cover.

Figure 4. Control Wiring for NE and NX Circuit Breakers

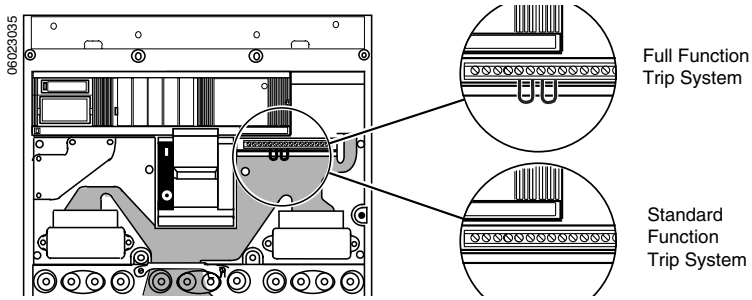


Table 24. Terminal Block Wiring Terminals

Full-Function Trip System		Standard-Function Trip System	
Number	Terminal Name	Number	Terminal Name
1	Neutral CT (to X1)	1	Neutral CT (to X1)
2	Neutral CT (to X2)	2	Neutral CT (to X2)
3	Ground-Fault Test 120 Vac	3	Ground-Fault Test 120 Vac
4	Ground-Fault Test 120 Vac	4	Ground-Fault Test 120 Vac
5	ST Restraint IN	5–16	Reserved
6	ST Restraint OUT		
7	GF Restraint IN or Reserved (GF Alarm)		
8	GF Restraint OUT or Reserved (GF Alarm)		
9	Restraint COM		
10	CIM3F-RED		
11	CIM3F-BLACK		
12	Reserved		
13	CIM3F-BLUE		
14	CIM3F-ORANGE		
15–16	Reserved		

1. Torque wire binding screws to 5–10 lb-in (0.6–1.1 Nm). (1) #14 AWG or (1 or 2) #18 AWG wires.

PE AND PX 2500 A FRAME CIRCUIT BREAKERS

This section provides specific information on PE and PX electronic trip circuit breakers. For general information, see page 7. For trip unit information, on page 15.

Table 25. PE and PX Circuit Breaker Catalog Numbers

Sensor Size	Ampere Rating	Features						Rating Plug Installed
		• Long-Time • Instantaneous	• Long-Time • Short-Time Instantaneous	• Long-Time • Instantaneous w/Ground-Fault Protection	• Long-Time • Short-Time • Instantaneous w/Ground-fault Protection	• Long-Time • Instantaneous w/Ground-fault Alarm	• Long-Time • Short-Time • Instantaneous w/Ground-fault Alarm	
PE Circuit Breaker with MICROLOGIC® Full-Function Trip System[1]								
1200 A	600	PEF36600LI	PEF36600LS	PEF36600LIG	PEF36600LSG	PEF36600LIA	PEF36600LSA	ARP050
	700	PEF36700LI	PEF36700LS	PEF36700LIG	PEF36700LSG	PEF36700LIA	PEF36700LSA	ARP058
	800	PEF36800LI	PEF36800LS	PEF36800LIG	PEF36800LSG	PEF36800LIA	PEF36800LSA	ARP067
	900	PEF36900LI	PEF36900LS	PEF36900LIG	PEF36900LSG	PEF36900LIA	PEF36900LSA	ARP075
	1000	PEF361000LI	PEF361000LS	PEF361000LIG	PEF361000LSG	PEF361000LIA	PEF361000LSA	ARP083
	1200	PEF361200LI	PEF361200LS	PEF361200LIG	PEF361200LSG	PEF361200LIA	PEF361200LSA	ARP100
1600 A	1400	PEF361400LI	PEF361400LS	PEF361400LIG	PEF361400LSG	PEF361400LIA	PEF361400LSA	ARP088
	1600	PEF361600LI	PEF361600LS	PEF361600LIG	PEF361600LSG	PEF361600LIA	PEF361600LSA	ARP100
2000 A	1800	PEF361800LI	PEF361800LS	PEF361800LIG	PEF361800LSG	PEF361800LIA	PEF361800LSA	ARP090
	2000	PEF362000LI	PEF362000LS	PEF362000LIG	PEF362000LSG	PEF362000LIA	PEF362000LSA	ARP100
2500 A	2500	PEF362500LI	PEF362500LS	PEF362500LIG	PEF362500LSG	PEF362500LIA	PEF362500LSA	ARP100
PX Circuit Breaker with MICROLOGIC® Standard-Function Trip System								
1200 A	600	–	PFX36600	–	PFX36600G	–	–	ARP050
	700	–	PFX36700	–	PFX36700G	–	–	ARP058
	800	–	PFX36800	–	PFX36800G	–	–	ARP067
	900	–	PFX36900	–	PFX36900G	–	–	ARP075
	1000	–	PFX361000	–	PFX361000G	–	–	ARP083
	1200	–	PFX361200	–	PFX361200G	–	–	ARP100
1600 A	1400	–	PFX361400	–	PFX361400G	–	–	ARP088
	1600	–	PFX361600	–	PFX361600G	–	–	ARP100
2000 A	1800	–	PFX361800	–	PFX361800G	–	–	ARP090
	2000	–	PFX362000	–	PFX362000G	–	–	ARP100
2500 A	2500	–	PFX362500	–	PFX362500G	–	–	ARP100

1. For non-standard lugs, See “Circuit Breaker Terminations” on page 37.

Interrupting Ratings

Table 26. PE and PX Circuit Breaker Interrupting Ratings

Circuit Breaker	UL/CSA Rated/Certified			IEC 60947-2 Rated (415/240 Vac)	
	240 Vac	480 Vac	600 Vac	I_{cu}	I_{cs}
PE	125 kA	100 kA	65 kA	70 kA	53 kA
PX	125 kA	100 kA	65 kA	70 kA	53 kA

Continuous Current Ratings

PE circuit breakers marked “100% Rated” can be continuously loaded to 100% of their rating. Because of the additional heat generated when applying circuit breakers at 100% of continuous current rating, the use of specially designed enclosures and 90°C rated wire is required.

Table 27. Continuous Current Ratings

Circuit Breaker	MICROLOGIC Trip System	Sensor Size	Max. Continuous Current Rating
PX	Standard-Function	1200 A 1600 A 2000 A 2500 A	80%
PE	Full-Function	1200 A 1600 A 2000 A	100%
		2500 A	80%

Note: Markings on the circuit breaker indicate minimum enclosure size and ventilation specifications required. The 90°C wire must be sized according to the ampacities of the 75°C wire column in the NEC.

Note: Circuit breakers with 100% rating can be used in applications requiring only 80% continuous loading.

Terminations

Table 28. Lug Kits for PE and PX Circuit Breakers

Catalog Number	Type	Conductors	
		No.	Size
AL2500PA	Mechanical	1	1/0 AWG–750 kcmil (50–400 mm^2)
		2	1/0 AWG–300 kcmil (50–150 mm^2)
VC2500PA7	Compression	1	50–750 kcmil (240–400 mm^2)
VC2000PA5	Compression	1	2/0 AWG–500 kcmil (70–240 mm^2)

Note: If mounting circuit breaker in other than Square D equipment, terminal pads may be required to provide electrical spacing for bus or lugs and mounting hardware. Square D equipment provides the necessary spacing.

Terminal Pad Usage

Table 29. Terminal Pad Usage Requirements

Circuit Breaker	Connections	Terminal Pads Required
PE 600–1600 A PX 600–2000 A	Bus	No
	Cable	Use terminal pad kit PALTB or equivalent bus structure.
PE 1800–2500 A PX 2500 A	Cable or Bus	Use terminal pad kit supplied with circuit breaker or equivalent bus structure.

Note: For bus structure dimensions, refer to dimensional drawings on page 43.

Accessories

Accessories are available either factory installed or field installable. They can be installed in accessory slots on either side of the circuit breaker. (Suffix numbers are specific to left or right side of circuit breaker.)

Field-installable electrical accessories are mounted externally. Factory installed electrical accessories can be mounted externally or internally. Consult the factory for specific customer mounting requirements. For additional accessory information, See Section 4—Accessories.

Table 30. PE and PX Circuit Breaker Accessories

Description	Field Installable		Factory Installed	
	PE	PX	PE	PX
Shunt Trip	×	×	×	×
Undervoltage Trip	×	×	×	×
Auxiliary Switches	×	×	×	×
Alarm Switch	—	—	×	×
Handle Padlock Attachment	—	—	S [1]	S [1]
Electrical Trip Indicator	S [1]	×	S [1]	—
Local Current Meter	S [1]	×	S [1]	—
Neutral Current Transformer [2]	×	×	—	—
Electrical Operator	×	×	×	×
Trip Unit Seal	×	×	—	—
CIM3F Communications Adapter	×	—	—	—

1. Standard item shipped with circuit breaker.

2. External Accessory: needed only when a neutral is associated with the load on a ground-fault circuit breaker.

Control Wiring

Control wiring is connected to terminals located under the circuit breaker access cover.

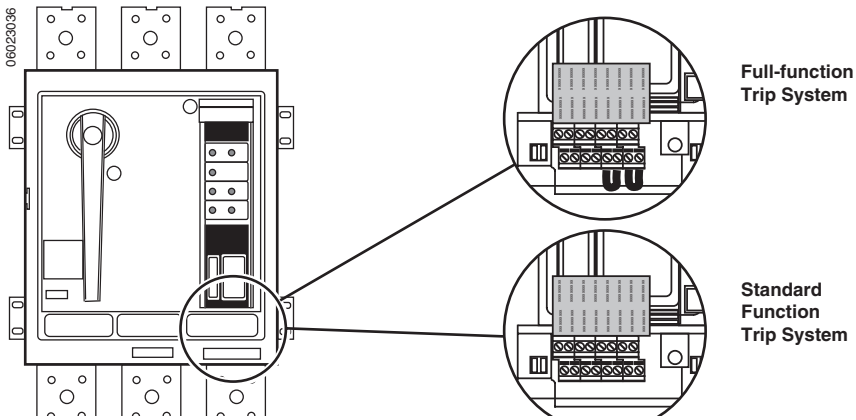


Table 31. Terminal Block Wiring Terminals[1]

Full-Function Trip System		Standard-Function Trip System	
Number	Terminal Name	Number	Terminal Name
1	Neutral CT (to X1)	1	Neutral CT (to X1)
2	Neutral CT (to X2)	2	Neutral CT (to X2)
3	Ground-Fault Test 120 Vac	3	Ground-Fault Test 120 Vac
4	Ground-Fault Test 120 Vac	4	Ground-Fault Test 120 Vac
5	ST Restraint IN	5–16	Reserved
6	ST Restraint OUT		
7	GF Restraint IN or Reserved (GF Alarm)		
8	GF Restraint OUT or Reserved (GF Alarm)		
9	Restraint COM		
10	CIM3F-RED		
11	CIM3F-BLACK		
12	Reserved		
13	CIM3F-BLUE		
14	CIM3F-ORANGE		
15–16	Reserved		

1. Torque wire binding screws to 5–10 lb-in (0.6–1.1 N•m) #14 AWG (1) or #18 AWG (1 or 2) wire.

SECTION 4—ACCESSORIES

Square D electronic trip molded case circuit breakers can be used with a variety of internal and external accessories to increase application versatility and meet the demands of modern electrical distribution systems.

Circuit breaker internal accessories are available either factory installed or field installable. External accessories are field installed.

FACTORY-INSTALLED ACCESSORIES

Factory-installed accessories are internally mounted by the factory. Accessories available as factory-installed only cannot be removed or repaired in the field. Order factory-installed accessories by adding the correct suffix number to the standard circuit breaker catalog number.

For example:

- Circuit breaker: MXL36800
- Circuit breaker with 1021 shunt trip: MXL368001021

FIELD-INSTALLED ACCESSORIES

Field-installable accessories can be installed or replaced in the field without affecting the circuit breaker UL Listing or interrupting ratings. These accessories cannot be installed in a mounting location or pole that has a factory-installed accessory installed in it.

Field-installable accessories are shipped separately from the circuit breakers. Install and wire field-installable accessories according to the instructions supplied with them. Field-installable accessories can be installed at the factory for an installation surcharge. Order field-installable accessories by adding (1) and the correct suffix number to the circuit breaker family.

For example:

- Circuit breaker: LEL36600LSG
- Circuit breaker with 1021 shunt trip: LC11021

Table 32. Electrical Accessories for Electronic Trip Molded Case Circuit Breakers

Description	LE, LX, LXI Series 1	ME, MX All Series	NE, NX Series 1, 2 and 3	PE, PX Series 4, 5 and 6
Shunt Trip	Field Installable	Factory Installed Only	Field Installable	Field Installable
Ground-Fault Shunt Trip[1]	Not Available	Not Available	Not Available	Not Available
Undervoltage Trip	Field Installable	Factory Installed Only	Field Installable	Field Installable
Auxiliary Switches	Field Installable	Factory Installed Only	Field Installable	Field Installable
Alarm Switch	Factory Installed Only	Factory Installed Only	Field Installable	Factory Installed Only

1. Ground fault shunt trip for use with obsolete GP Ground-Sensor® System. Not used with MICROLOGIC® integral ground-fault trip system.

Shunt Trip

The shunt trip provides a means of tripping the circuit breaker electrically from a remote location using an external voltage source. A coil clearing contact opens the shunt trip coil circuit when the circuit breaker opens.

A 120 Vac shunt trip operates at 55% or more of rated voltage [1]. All other shunt trips operate at 75% or more of rated voltage.

Table 33. Shunt Trip Clearing Times

Circuit Breaker	Average Clearing Time
LX, LXI, LE	26 ms
MX, ME	33 ms
NX, NE	35 ms
PX, PE	40 ms

Figure 5. Shunt Trip Wiring Diagram

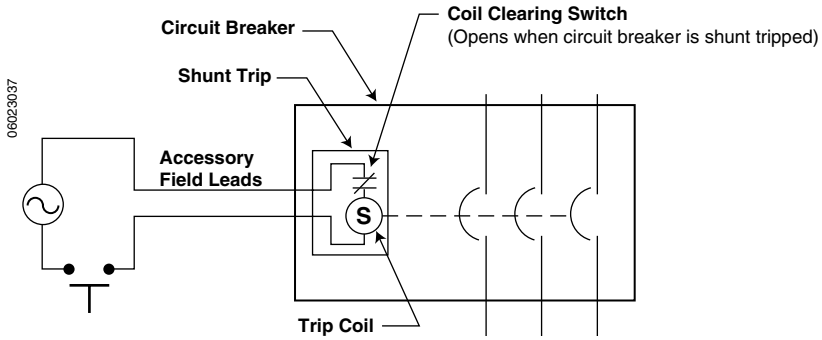


Table 34: Shunt Trip Electrical Specifications.

Control Voltage	Suffix	UL Listed	Max. Current—mA (rms)			Coil Burden—Max. VA			Min. Supply Transformer (VA)
			L	M, N	P	L	M, N	P	
24 Vac 50/60 Hz	1042	Yes	1250	850	3650	30	20.4	88	25
48 Vac 50/60 Hz	1048	Yes	—	540	540	—	26	26	50
120 Vac 50/60 Hz	1021[1]	Yes	280	240	4000	30	29	54	50
208 Vac 50/60 Hz	1021[2]	Yes	596	515	500	124	107	104	50
240 Vac 50/60 Hz	1021[2]	Yes	715	740	740	172	154	154	50
277 Vac 50/60 Hz	1037[2]	Yes	791	50	50	219	13.9	13.9	25
480 Vac 50/60 Hz	1037[2]	Yes	1658	93	93	796	44.6	44.6	50
600 Vac 50/60 Hz	1026	No	—	93	93	—	44.6	44.6	—
6 Vdc	1040	Yes	—	1714	6000	—	10.3	36	—
12 Vdc	1039	Yes	—	800	6000	—	9.6	72	—
24 Vdc	1027	Yes	1230	1500	460	30	35	11	—
48 Vdc	1028	Yes	2380	750	920	114	36	44	—
72 Vdc	1038	Yes	—	200	208	—	14.4	15	—
125 Vdc	1029	Yes	6360	350	80	795	43.7	10	—
250 Vdc	1030	Yes	—	60	160	—	15	40	—

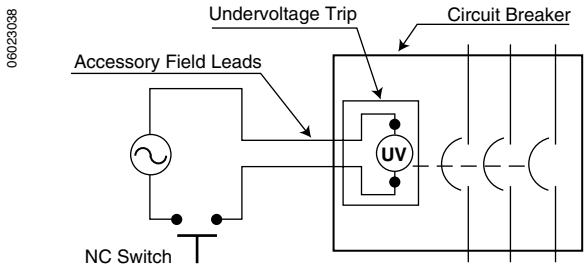
1. LE, LX, LXI 1021 shunt trip operates at 75% or more of 120 Vac.

2. Use Suffix 1086 for PE, PX circuit breakers.

Undervoltage Trip

The undervoltage trip accessory trips the circuit breaker when the voltage drops below a preset level. The preset level is 35% to 70% of the control voltage. The undervoltage trip prevents the circuit breaker from being reset until 85% of the control voltage is restored. The monitored circuit voltage can be wired in series with an externally-mounted normally-closed contact which opens the circuit breaker from a remote location.

Figure 6. Undervoltage Trip Wiring Diagram and Average Clearing Times



Circuit Breaker	Average Clearing Time
LX, LXI, LE	26 ms
MX, ME	33 ms
NX, NE	35 ms
PX, PE	40 ms

Figure 7. Undervoltage Trip Operation

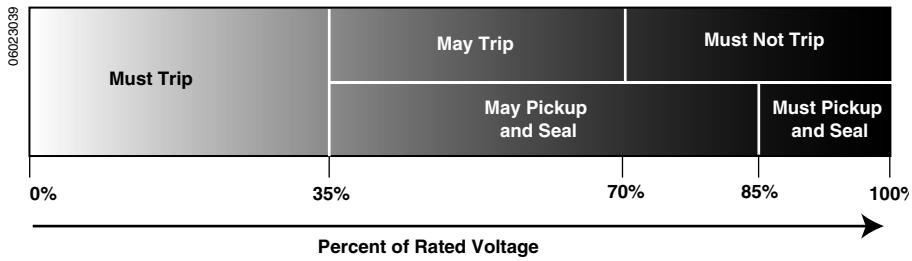


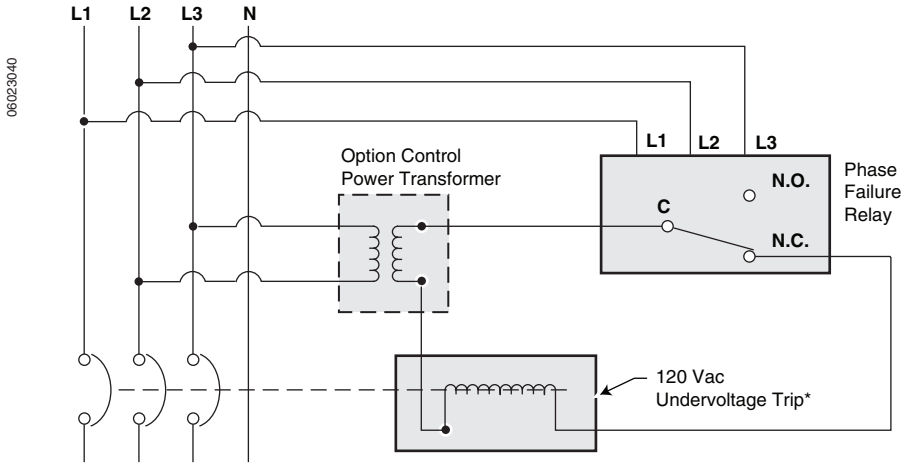
Table 35. Undervoltage Trip Electrical Specifications

Control Voltage	Suffix	UL Listed	Max. Current mA (rms)	Max. Inrush	Coil Burden (VA) Sealed	Min. Supply Transformer (VA)
24 V 50/60 Hz	1143	Yes	170	4.1	3.4	25
48 V 50/60 Hz	1157	No	—	7.6	5.4	25
120 V 50/60 Hz	1121	Yes	63 [20][1]	7.6 [3.4][1]	5.4 [2.4][1]	25
208 V 50/60 Hz	1122	Yes	30	6.2	4.1	25
240 V 50/60 Hz	1124	Yes	32	7.6	5.4	25
277 V 50/60 Hz	1142	No	63	7.6	5.4	25
380 V 50/60 Hz	1148	No	63	7.6	5.4	25
415 V 50/60 Hz	1149	No	63	7.6	3.4	25
440 V 50/60 Hz	1134	No	63	7.6	5.4	25
480 V 50/60 Hz	1125	No	63	7.6	5.4	25
600 V 50/60 Hz	1126	No	63	7.6	5.4	25
6 Vdc	1136	Yes	400	2.4	2.4	—
12 Vdc	1133	Yes	185	2.2	2.2	—
24 Vdc	1127	Yes	69	1.6	1.6	—
48 Vdc	1128	For P only	64 [50][1]	3.1 [2.4][1]	3.1 [2.4][1]	—
72 Vdc	1135	For P only	45	3.2	3.2	—
125 Vdc	1129	For P only	40	5	5	—
250 Vdc	1130	For P only	21	5.2	5.2	—

[1] [ ] are values for L-frame circuit breaker accessories

A Class 8430 phase failure relay used with a circuit breaker with an undervoltage trip provides undervoltage protection on all three phases.

Figure 8. Undervoltage Trip/Phase Relay Wiring Diagram



* For supply voltages other than 120 Vac, a control power tranformer must be used to power up the 120 Vac undervoltage trip

Undervoltage Trip Time-Delay Unit

An optional adjustable time delay unit, Cat. No. 690UVTD or 690UVDTI, provides a time delay to avoid nuisance circuit breaker opening due to momentary dips in the monitored voltage source. The time delay is adjustable from 0.1 seconds to 0.6 seconds.

The time delay unit works only with the 120 Vac undervoltage trip accessory.

Note: On PE and PX circuit breaker time delay, time-delay unit only works with internal 1121.

Auxiliary Switch

An auxiliary switch is a single-pole double-throw switch operated by the movable contact arm assembly. It is used to remotely indicate the position of the circuit breaker contacts, whether open or closed. Auxiliary switches can be used to operate indicator lights, relays, or other accessories.

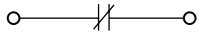
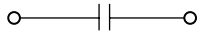
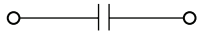
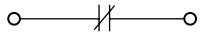
Figure 9. Auxiliary Switch Contact Indication

Selection		Ratings
Type of Contacts	Suffix Number	
1A1B 2A2B 3A3B	1212 1352 1364	120 or 240 Vac 10 A (1/3 hp) 120 Vac lamp load 4 A 125 Vdc 1/2 A 250 Vdc 1/4 A

Alarm Switch

An alarm switch indicates that a circuit breaker has tripped. An alarm switch is actuated by the tripping mechanism, and is reset automatically when the circuit breaker is reset. It is not actuated when the circuit breaker is manually opened or closed. Maximum ratings are 7 A at 120 Vac or 240 Vac.

Table 36. Alarm Switch Contact Indication

Contact Type	Suffix	Circuit Breaker Status	
		Tripped	Open or Closed
Normally Open (N.O.) Contact	2100		
Normally Closed (N.C.) Contact	2103		

CIRCUIT BREAKER TERMINATIONS

The L-, M- and N-frame circuit breakers have mechanical lugs standard on both ends of unit-mounted circuit breakers and on the OFF end of I-LINE® mounted circuit breakers. These lugs accept aluminum or copper wire. Square D has optional terminations available for use in nonstandard applications.

The P-frame circuit breakers have terminal pads only (no lugs) standard for bus connections on both ends. Terminal pad kits are required for the use of lugs. For additional information on terminal pad requirements, See “Terminations” on page 31, and “Appendix A—Dimensions” on page 43.

Mechanical Lugs

Optional copper mechanical lugs are available for use with copper wire only.

Table 37. Circuit Breaker Lug Information

Catalog Number	Used On	Number of Lugs Per Kit	Conductors			Screw Torque			
			No. per Lug	Range(1)		Wire Binding		Lug Mounting	
				AWG/kcmil	Metric	lb-in	N•m	lb-in	N•m
Aluminum Mechanical Lugs									
AL600LI35	LE, LX, LXI	1	2	#1 AWG–350 kcmil	50–185 mm²	300	34	80	9
AL600LI5	LE, LX, LXI	1	2	4/0 AWG–500 kcmil	95–240 mm²	300	34	80	9
AL600LI7	LE, LX, LXI	1	1	500–750 kcmil	240–400 mm²	350	39	80	9
AL800MA7	ME, MX	1	2	500–750 kcmil	240–400 mm²	300	34	180	21
AL900MA	ME, MX	1	3	3/0 AWG–500 kcmil	95–240 mm²	300	34	180	21
AL1200NE6	NE, NX	1	4	3/0 AWG–600 kcmil	95–300 mm²	330	37	225	25
AL2500PA	PE, PX	2	1	1/0 AWG–750 kcmil	50–400 mm²	(2)	(2)	(3)	(3)
			2	1/0 AWG–300 kcmil	50–150 mm²	(2)	(2)	(3)	(3)
Copper Mechanical Lugs									
CU600LI35	LE, LX, LXI	1	2	#2 AWG–350 kcmil Cu	35–185 mm² Cu	300	34	80	9
CU600LI5	LE, LX, LXI	1	2	4/0 AWG–500 kcmil Cu	95–240 mm² Cu	300	34	80	9
CU600LI7	LE, LX, LXI	1	1	500–750 kcmil Cu	240–400 mm² Cu	350	39	80	9
CU1000MA	ME, MX	1	3	3/0 AWG–500 kcmil Cu	95–240 mm² Cu	300	34	300	21
CU1200NE6	NE, NX	1	4	3/0 AWG–600 kcmil Cu	95–300 mm² Cu	330	37	330	37
Aluminum Compression Lugs									
VC600LI3(4)	LE, LX, LXI	2	1	#4 AWG–300 kcmil	25–150 mm²	—	—	180	21
VC600LI5(4)	LE, LX, LXI	2	1	2/0 AWG–500 kcmil	70–240 mm²	—	—	370	42
VC600LI7(4)	LE, LX, LXI	1	1	500–750 kcmil	240–400 mm²	—	—	370	42
VC600MA5	ME, MX	2	1	2/0 AWG–500 kcmil	70–240 mm²	—	—	300	34
VC800MA7	ME, MX	2	1	500–750 kcmil Al	240–400 mm² Al	—	—	300	34
			1	500 kcmil Cu	240 mm² Cu	—	—	300	34
VC1200NE5	NE, NX	4	1	2/0 AWG–500 kcmil	70–240 mm²	—	—	600	68
VC1200NE7	NE, NX	4	1	500–750 kcmil Al	240–400 mm² Al	—	—	600	68
			1	500 kcmil Cu	240 mm² Cu	—	—	600	68
VC2000PA5	PE, PX	1	1	2/0 AWG–500 kcmil	70–240 mm²	—	—	(3)	(3)
VC2500PA7	PE, PX	2	1	500–750 kcmil Al	240–400 mm² Al	—	—	(3)	(3)
			1	500 kcmil Cu	240 mm² Cu	—	—	(3)	(3)
Copper Compression Lugs									
CVC600LI5(4)	LE, LX, LXI	1	1	250–500 kcmil Cu	120–240 mm² Cu	—	—	370	42
CVC600MA5	ME, MX	2	1	250–500 kcmil Cu	120–240 mm² Cu	—	—	300	34
CVC1200NE5	NE, NX	4	1	2/0 AWG–500 kcmil Cu	70–240 mm² Cu	—	—	600	68
CVC1200NE7	NE, NX	4	1	500–750 kcmil Cu	240–400 mm² Cu	—	—	600	68
Power Distribution Connectors									
PDC6MA20	ME, MX	1	6	#12–2/0 AWG Cu	2.5–70 mm² Cu	(1)	(1)	300	34
PDC12MA4	ME, MX	1	12	#14–4 AWG Cu	2.5–25 mm² Cu	(1)	(1)	300	34

1. Unless otherwise specified, wire sizes apply to both aluminum and copper conductors.
2. See instructions with lug for information.
3. PE and PX circuit breakers require use of terminal pads for lug mounting.
4. Lug cannot be used on I-LINE® circuit breakers.

Compression Lugs

Square D offers exclusive VERSA-CRIMP® compression lugs in either copper or aluminum.

Figure 10. VERSA-CRIMP® Compression Lugs

Power Distribution Connectors

Power distribution connectors are available for ME and MX circuit breakers as field-installable kits. They can be used for multiple load wire connections on one circuit breaker. Each is UL Listed for copper wire only. Power distribution connectors are for use on the OFF end of the circuit breaker only, and the OFF end must be connected to the load.

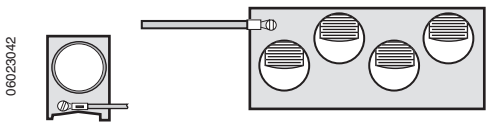
CBA I-LINE® Jaw Configuration

Standard 3-pole I-LINE® circuit breakers are supplied with an ABC phase jaw configuration. In applications where the jaw configuration must be reversed, specify a CBA jaw configuration by adding CBA at the end of the circuit breaker catalog number.

Control Wire Termination

Mechanical lug kits (except for PE/PX circuit breaker lug kits) are available with provisions for control wire terminations. The lug body accepts a #6-32 screw included in the kit. The control wire is crimped to a standard wire crimp terminal (not included) and secured to the lug using the screw provided. These lugs are UL Recognized as a circuit breaker component.

Figure 11. Mechanical Lugs with Control Wire Terminations



OTHER ACCESSORIES

Electric Joint Compound

I-LINE® circuit breakers, I-LINE busway plug-on units, and I-LINE panelboards and switchboards are supplied with factory-applied joint compound on the plug-on connectors. The compound is especially formulated for I-LINE connections and contributes to the overall performance of the connections.

If the joint compound is removed, it must be reapplied. A 2-ounce container of joint compound (Cat. No. PJC7201) is available from Square D.

Rating Plugs

Rating plugs are used on electronic trip circuit breakers to establish the circuit breaker ampere rating. The rating plug varies the circuit breaker ampere rating as a function of the circuit breaker sensor size. Rating plugs are factory installed and are also available in field-installable kits.

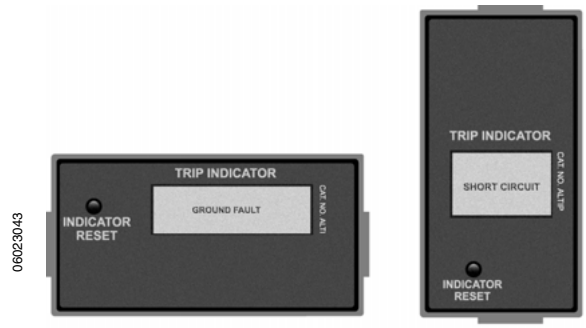
Table 38. Rating Plugs

Catalog Number	Multiplier	Catalog Number	Multiplier
ARP040	0.400	ARP070	0.707
ARP050	0.500	ARP075	0.757
ARP056	0.563	ARP080	0.807
ARP058	0.583	ARP083	0.833
ARP060	0.600	ARP088	0.880
ARP063	0.630	ARP090	0.900
ARP067	0.670	ARP100	1.000

Trip Indicator

The trip indicator, Cat. No. ALTI (ALTIP for PE/PX circuit breakers), displays “OVERLOAD,” “SHORT CIRCUIT,” or “GROUND FAULT” when the circuit breaker has experienced a trip condition. After the circuit breaker has cleared the fault and is reset, the trip indicator must be manually reset by pushing the indicator reset button.

Figure 12. ALTI and ALTIP Trip Indicators



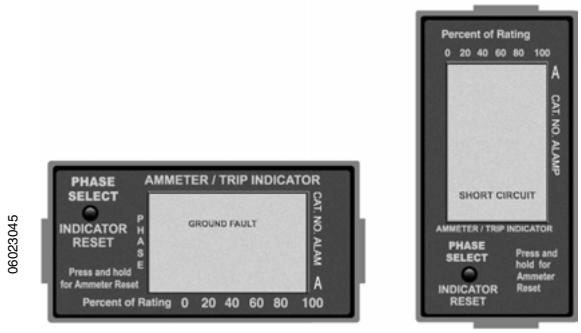
Ammeter/Trip Indicator

The ammeter/trip indicator, Cat. No. ALAM (ALAMP for PE/PX circuit breakers), is provided with every full-function trip unit and is available as an option for the standard-function trip unit. It monitors current in phases A, B and C, and ground-fault current flowing in the circuit. Each value can be viewed one at a time using the phase select/indicator reset button. (Phase values are displayed in true rms. Ground-fault current values are displayed in calculated rms based on measured peak current.) A bar graph is provided indicating the level of operating current as a function of the programmed ampere rating of the circuit breaker.

Figure 13. ALAM and ALAMP Ammeter/Trip Indicators

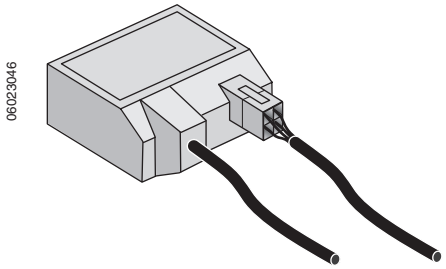
The ammeter/trip indicator displays “OVERLOAD,” “SHORT CIRCUIT,” or “GROUND FAULT” when the circuit breaker has experienced a trip condition. After the circuit breaker has cleared the fault and is reset, the ammeter/trip indicator must be manually reset by pushing the phase sect/indicator reset button.

Figure 14. Trip Condition Displays on ALAM and ALAMP Ammeter/Trip Indicators



Communications Adapter

Figure 15. Communications Adapter



The field-installable communications adapter, Cat. No. CIM3F, allows a full function circuit breaker trip unit to communicate with a Square D POWERLOGIC® Communications Network. This allows full function circuit breakers to be networked in a POWERLOGIC® system. The communications adapter cannot be used with standard-function circuit breakers.

Note: The communications adapter cannot be used with standard-function circuit breakers.

Electrical Operators

Electrical operators provide ON, OFF and RESET control from remote locations for electronic-trip molded case circuit breakers. When remote indication of the circuit breaker status is required, use of a circuit breaker with a 1A1B auxiliary switch for on-off indications or with an alarm switch for trip indication is necessary.

The PAM02 is an electronically-controlled operating mechanism that installs to the top surface of a PX/PE electronic trip circuit breaker. It requires momentary, continuous, or solid state contacts and the correct control voltages.

Figure 16. PAM02 Wiring Diagram

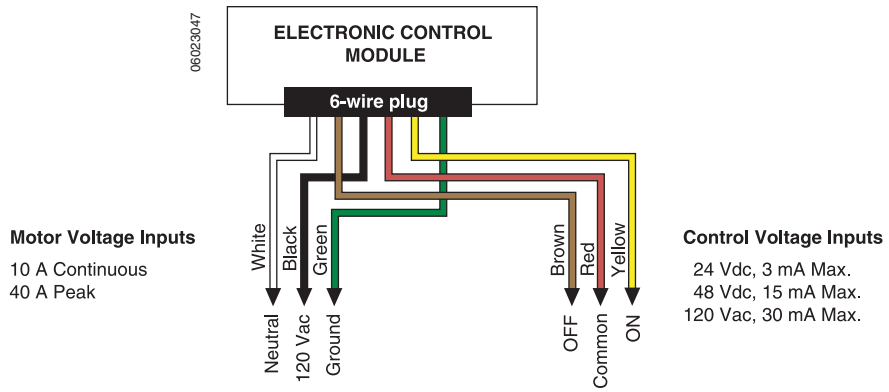


Table 39. PAM02 Electrical Operator Characteristics[1]

Closing Time (sec.)	Current		Endurance (minimum operations)
	Inrush (peak)	Continuous (rms)	
0.20	40 A	10 A	5000

1. Values are based on 120 Vac 60 Hz control voltage. A 50 Hz supply voltage increases the operating times by approximately 20%.

For electrical operator dimensions, see page 51.

Note: There are no electrical operators available for the LE/LX/LXI, ME/MX or NE/NX circuit breakers.

HANDLE ACCESSORIES

Handle Extensions

A handle extension is available for the LX/LE, MX/ME and NX/NE frame circuit breakers. It fits over the existing handle to ease movement. Handle extensions are not available for PX/PE circuit breakers.

Handle Interlocking

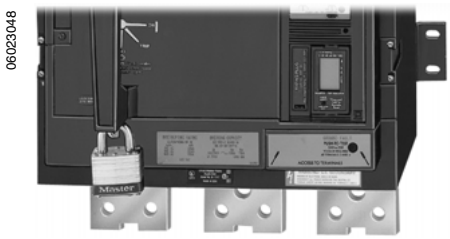
A handle accessory is available for PX/PE circuit breakers which allows mechanical interlocking with a key interlock (not included in kit). The assembly kit (Cat. No. PAKK) includes hardware to mount the accessory on the circuit breaker handle.

Handle Padlocks

A handle padlock is available for LX/LE, MX/ME and NX/NE electronic trip molded case circuit breakers to lock the circuit breaker handle in the ON or OFF position with the use of a padlock.

A field-installable handle padlock attachment is available for the LX/LXI/LE, MX/ME and NX/NE frame circuit breakers. PX/PE circuit breakers have a built-in (factory installed) padlocking feature for locking OFF only. An additional hinge over hasp feature is available on PX/PE to meet EUSERC requirements—add PL suffix.

Figure 17. PX and PE Circuit Breaker Handle Padlock Attachment



Neutral Current Transformers

Current transformers are available for applications requiring ground-fault protection on three-phase, four-wire loads. Neutral current transformers are not required on non-ground fault circuit breakers, or on three-phase, three-wire loads.

Table 40. Neutral Current Transformers

Circuit Breaker	Circuit Breaker Sensor Size	Neutral Current Transformer Catalog Number
LX, LXI, LE	250 A 400 A 600 A	LE2CT2 LE4CT2 LE6CT2
MX, ME	250 A 400 A 800 A	ME25CT2 ME4CT2 ME8CT2
NX, NE	1200 A	NE12CT2
PX, PE	1200 A 1600 A 2000 A 2500 A	PE12CT2 PE16CT2 PE20CT2 PE25CT2

Restraint Interface Modules

A restraint interface module is required for zone-selective interlocking when:

- The distance between any two circuit breakers in the restraint system exceeds 1000 ft. (305 m) and/or
- Trip units of the circuit breakers and/or ground-fault modules to be interlocked are not the same series

Note: The restraint interface module cannot be used with standard-function circuit breakers.

Figure 18. Restraint Interface Modules

Cat. No.
RIM32

Cat. No.
S48890—120 Vac/24 Vdc
S48895—240 Vac/24 Vdc

The restraint interface module (catalog numbers S48890 and S48895) is used to allow zone-selective interlocking communications between circuit breakers with Series B to 5.0x and 6.0x MICROLOGIC, MERLIN GERIN, or FEDERAL PIONEER trip units and GC Series ground-fault relays.

Trip Unit Seals

The NEC allows electronic trip circuit breakers to be used with cable up to the adjusted continuous current rating as long as the circuit breaker has a removable and sealable cover over the trip unit adjustments. Square D trip unit seals are available for all electronic trip molded case circuit breakers: Cat. No. TUSEAL designates a quantity of 100 plastic seals that cannot be removed without being destroyed. Seals installed in posts on the circuit breaker limit access to both the rating plug and the trip unit adjustments. The rating plug and the clear plastic cover over the switches each have one sealing location.

Universal Test Set

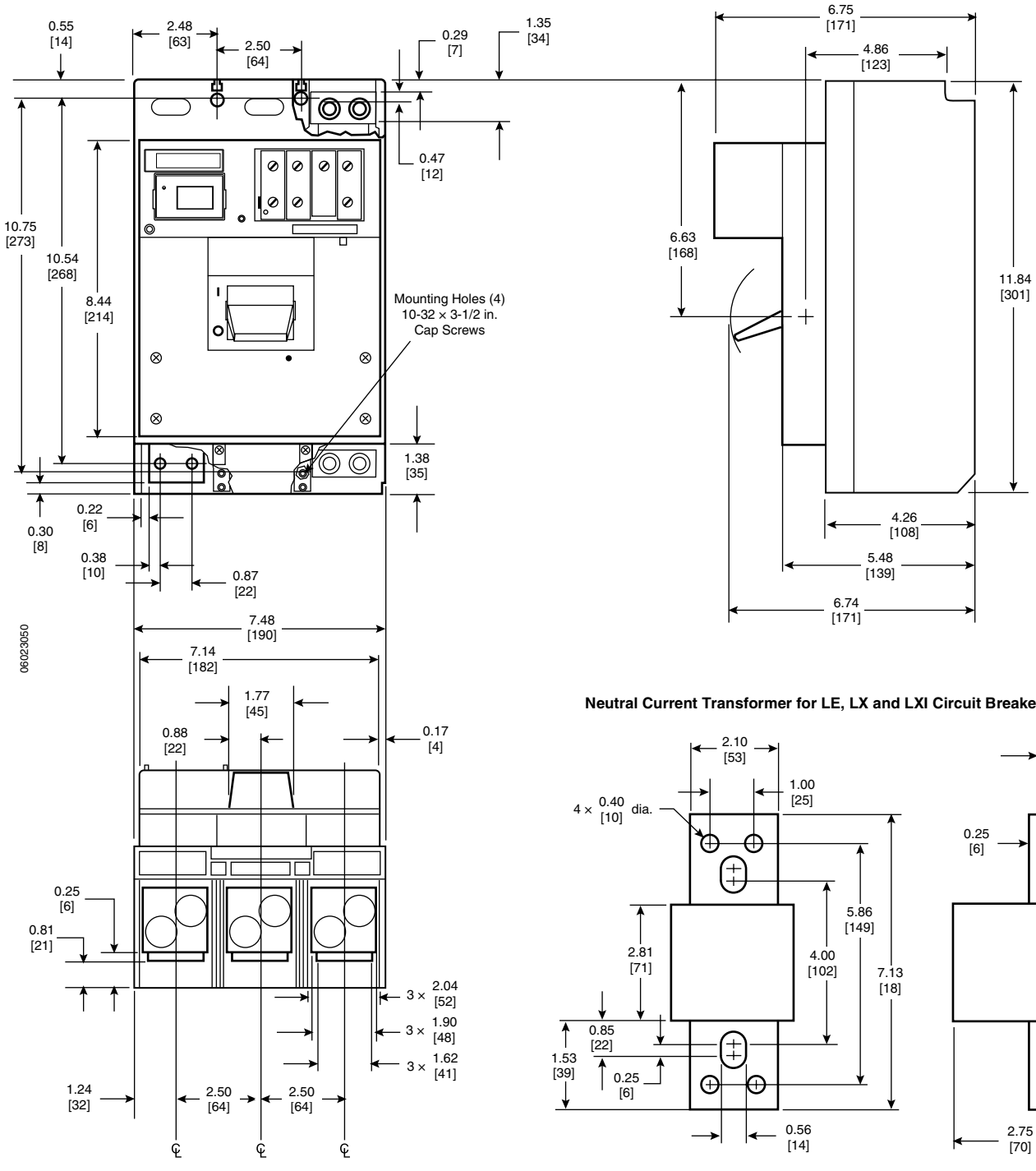
The Universal Test Set, Cat. No. UTS3, is available to test Square D circuit breakers with MICROLOGIC® trip units. It runs trip unit test automatically or manually with prompts to the user for initial information. Testing can be done with the circuit breaker installed in the switchboard, following the directions shipped with the test set.

A test module stores data necessary for automatic test for each frame. MICROLOGIC® Series 3B trip units require test module CBTMB, which is included with the Universal Test Set. If an older Universal Test Set is used that does not contain a CBTMB test module, a CBTMB test module must be obtained.

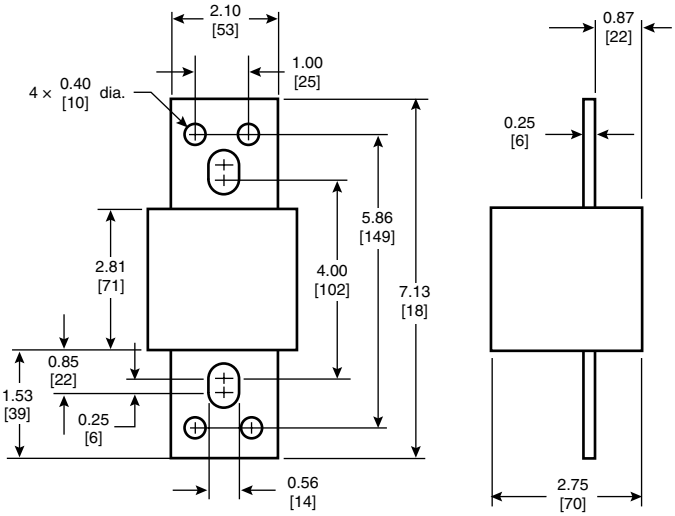
Figure 19. Universal Test Set

APPENDIX A—DIMENSIONS

LE, LX AND LXI CIRCUIT BREAKERS

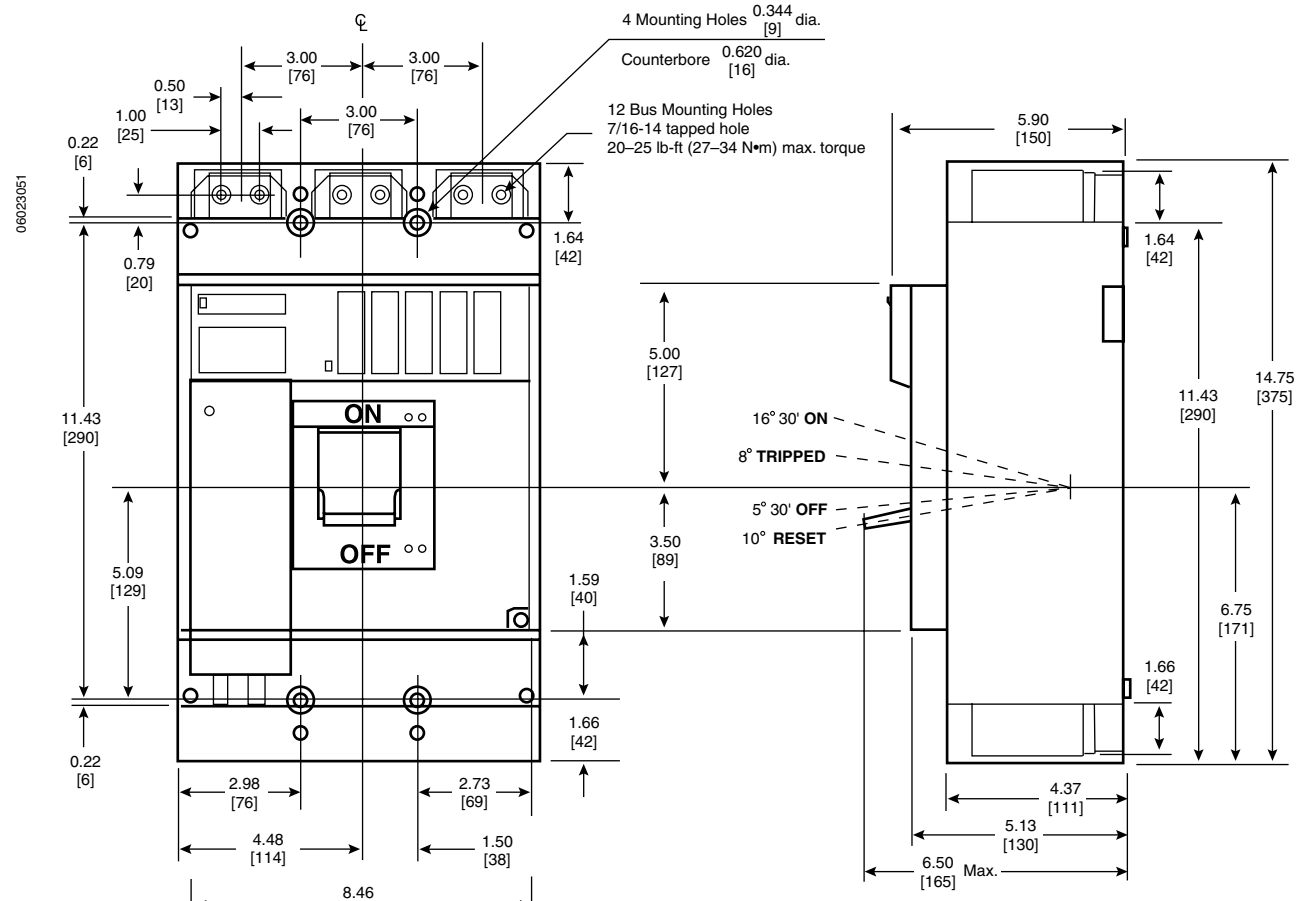


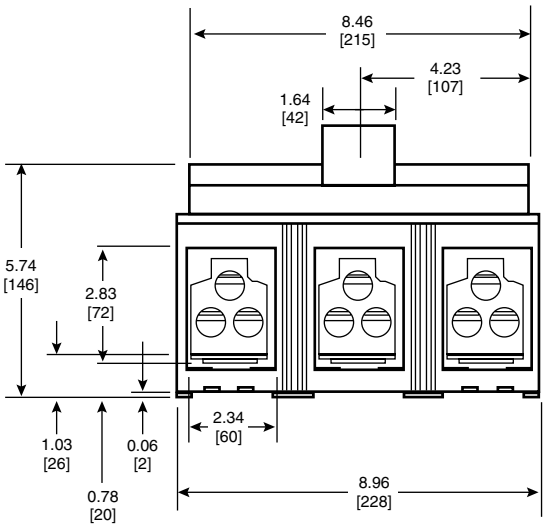
Neutral Current Transformer for LE, LX and LXI Circuit Breakers



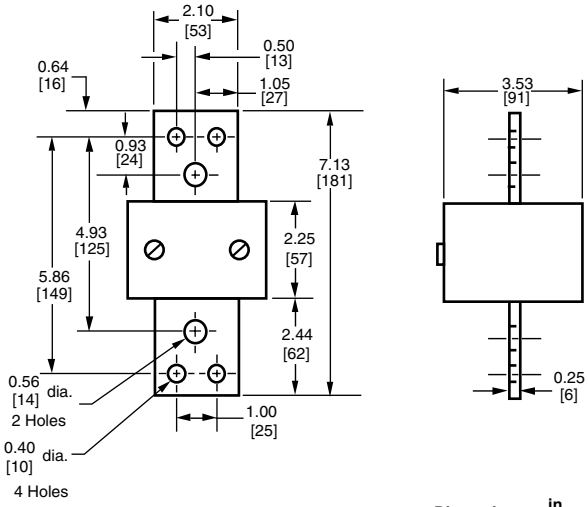
Dimensions: in. [mm]

ME AND MX CIRCUIT BREAKERS



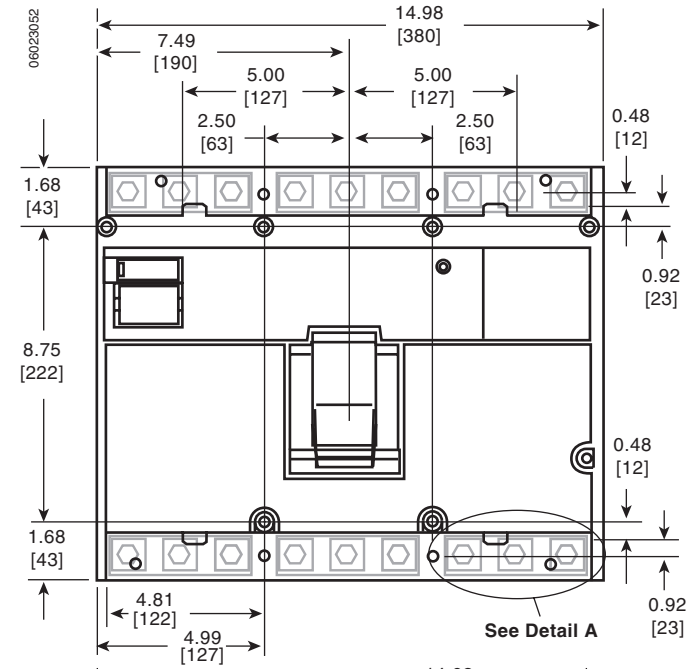


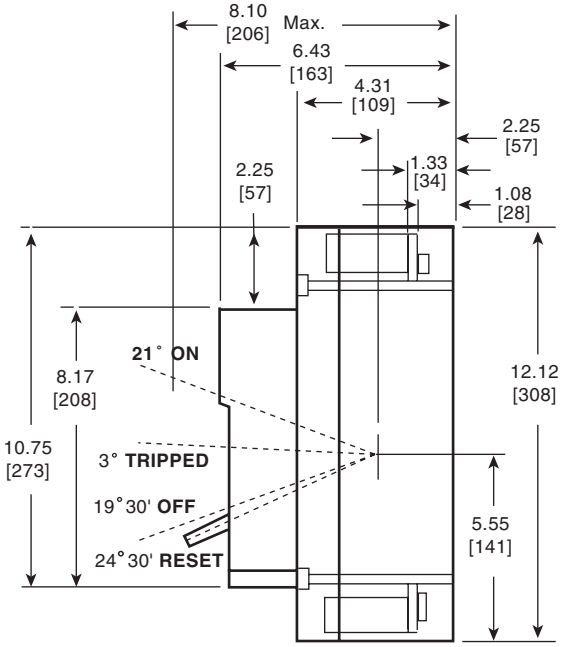
Neutral Current Transformer for ME and MX Circuit Breakers

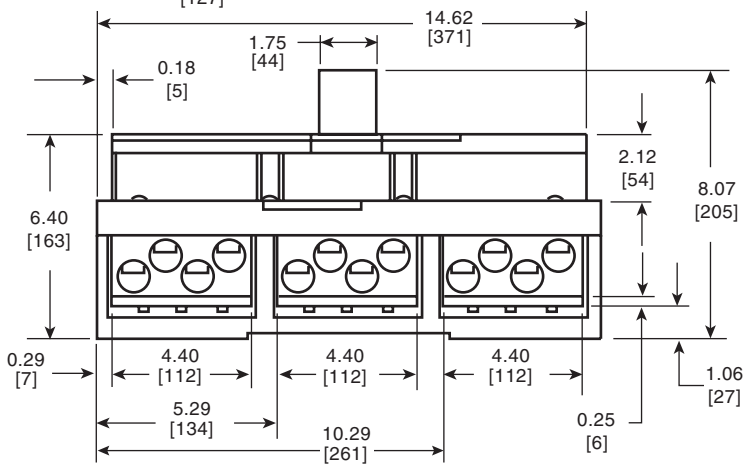


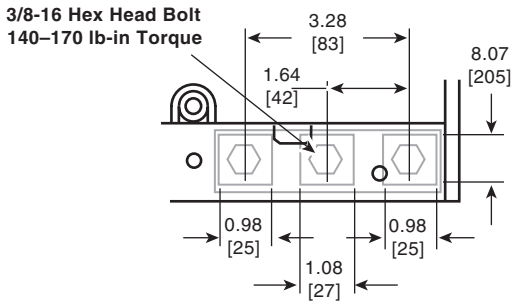
Dimensions: in. [mm]

NE AND NX CIRCUIT BREAKERS



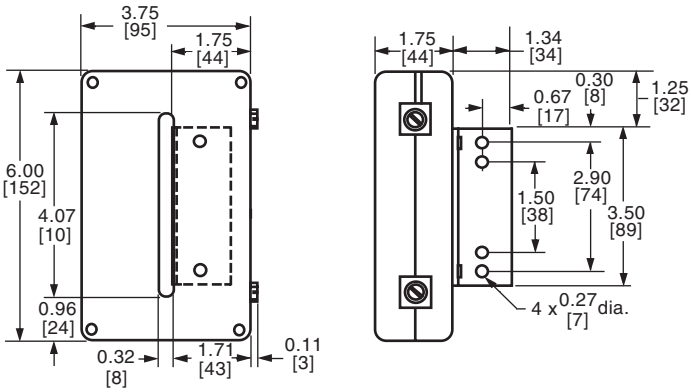




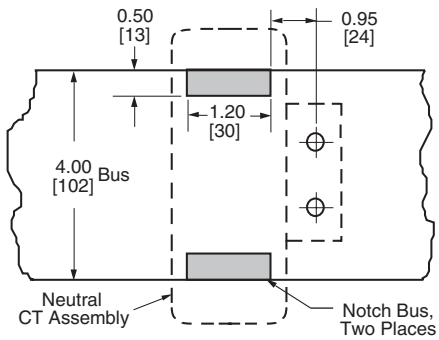


Detail A
Bus Mounting Holes
6 places

Neutral Current Transformer for NE and NX Circuit Breakers

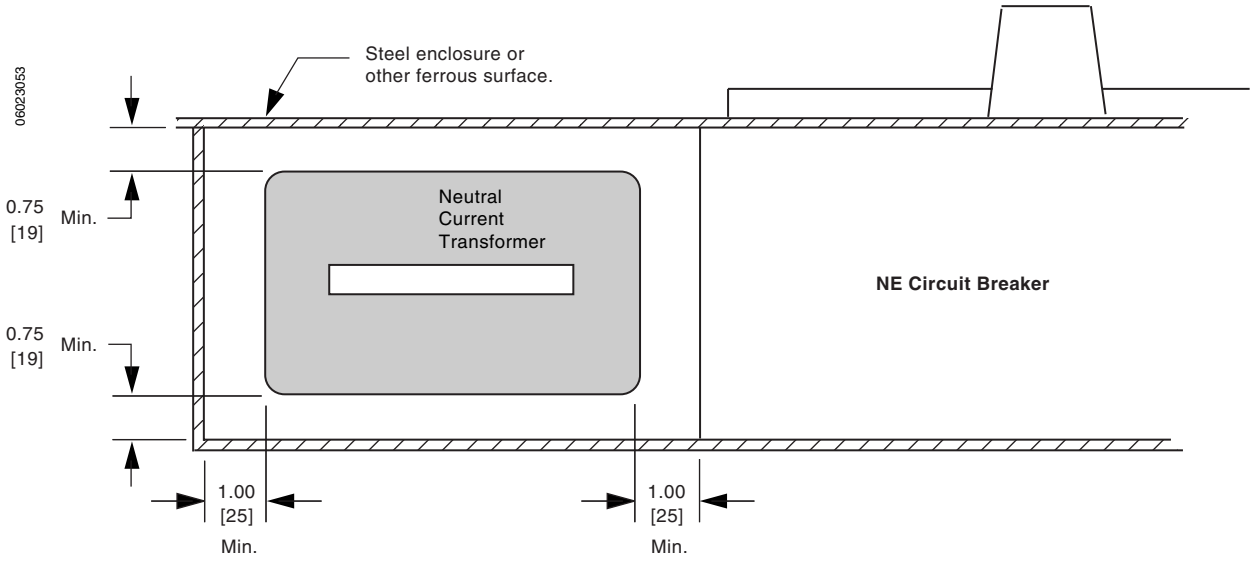


Bus Bar Notching for Neutral Current Transformer



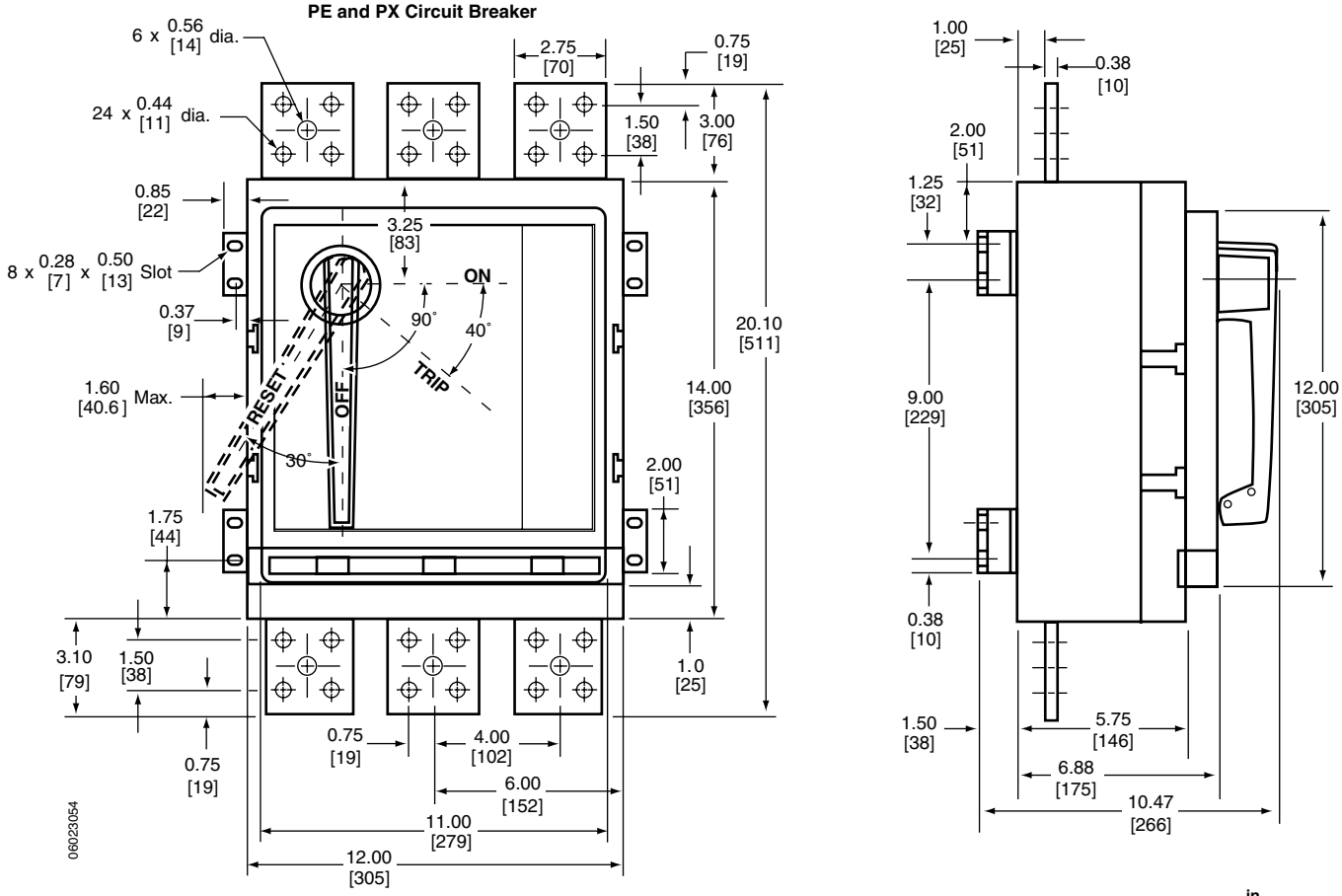
Dimensions: in. [mm]

Neutral Current Transformer Clearance Requirements for NE and NX Circuit Breakers



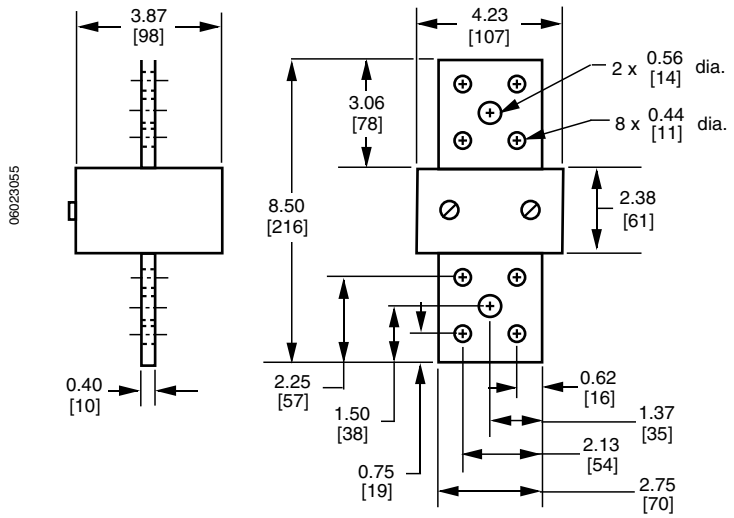
PE AND PX CIRCUIT BREAKERS

PE and PX Circuit Breaker



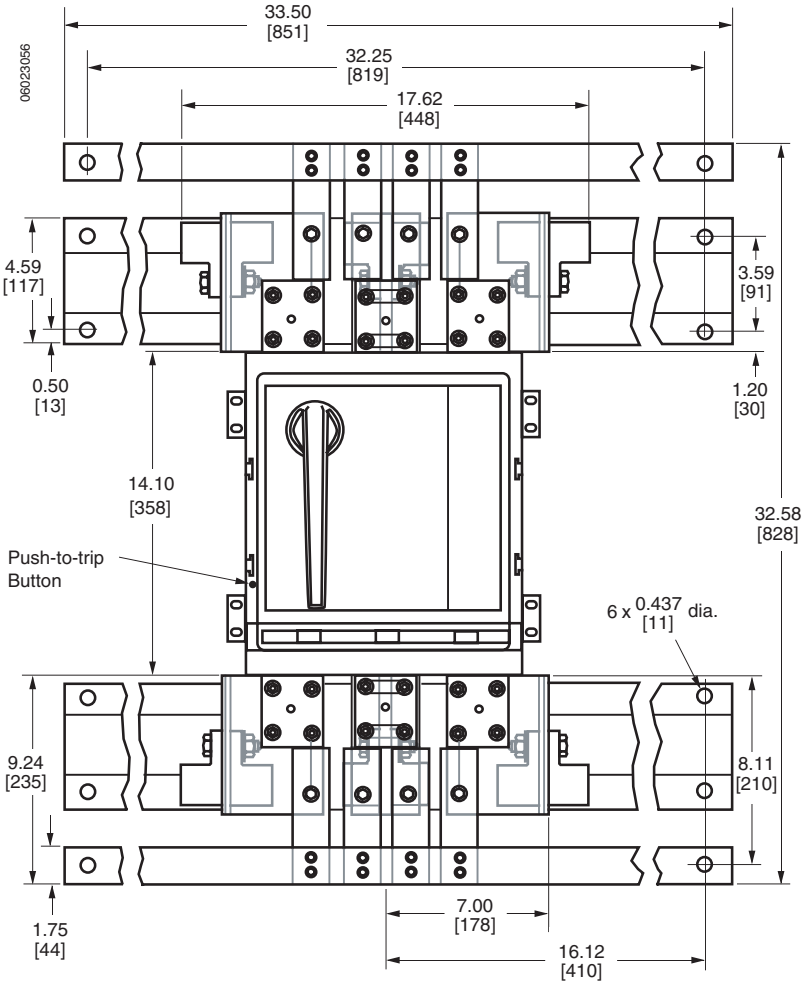
Dimensions: in. [mm]

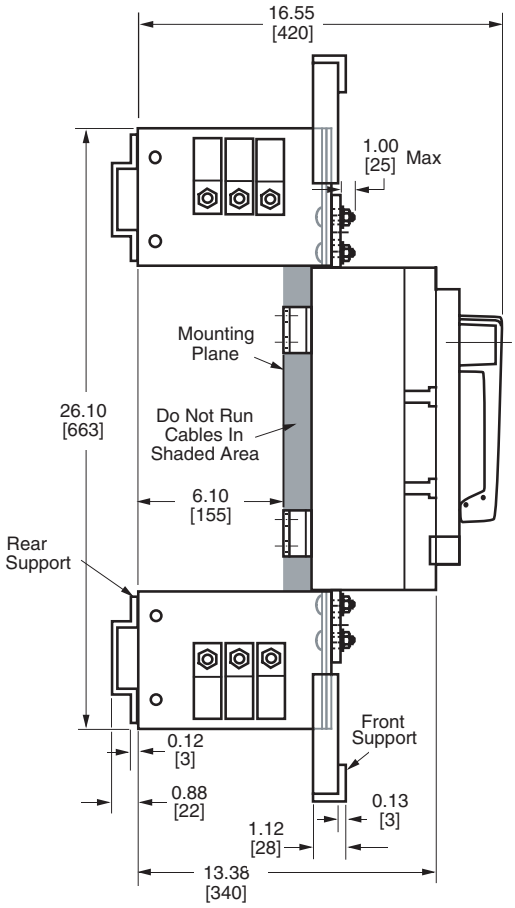
Neutral Current Transformer for PE and PX Circuit Breakers



Dimensions: in. [mm]

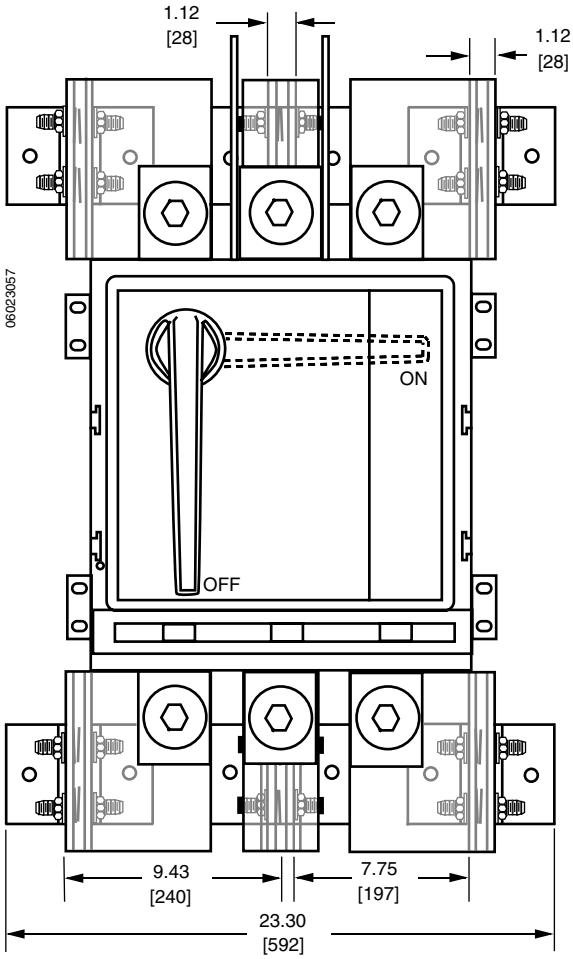
600–1600 A PE and 600–2000 A PX Circuit Breaker with Terminal Pads

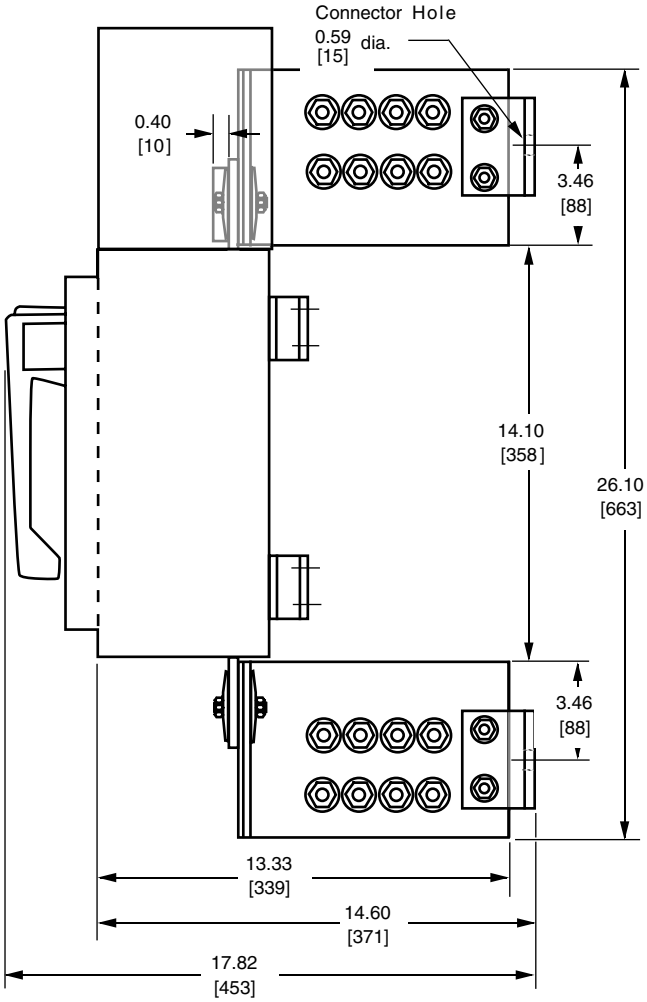


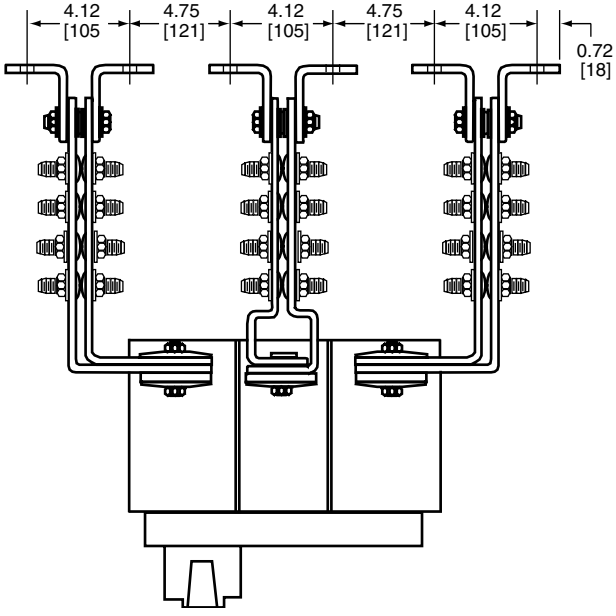


Dimensions: in. [mm]

1800–2500 A PE and 2500 A PX Circuit Breaker with Terminal Pads

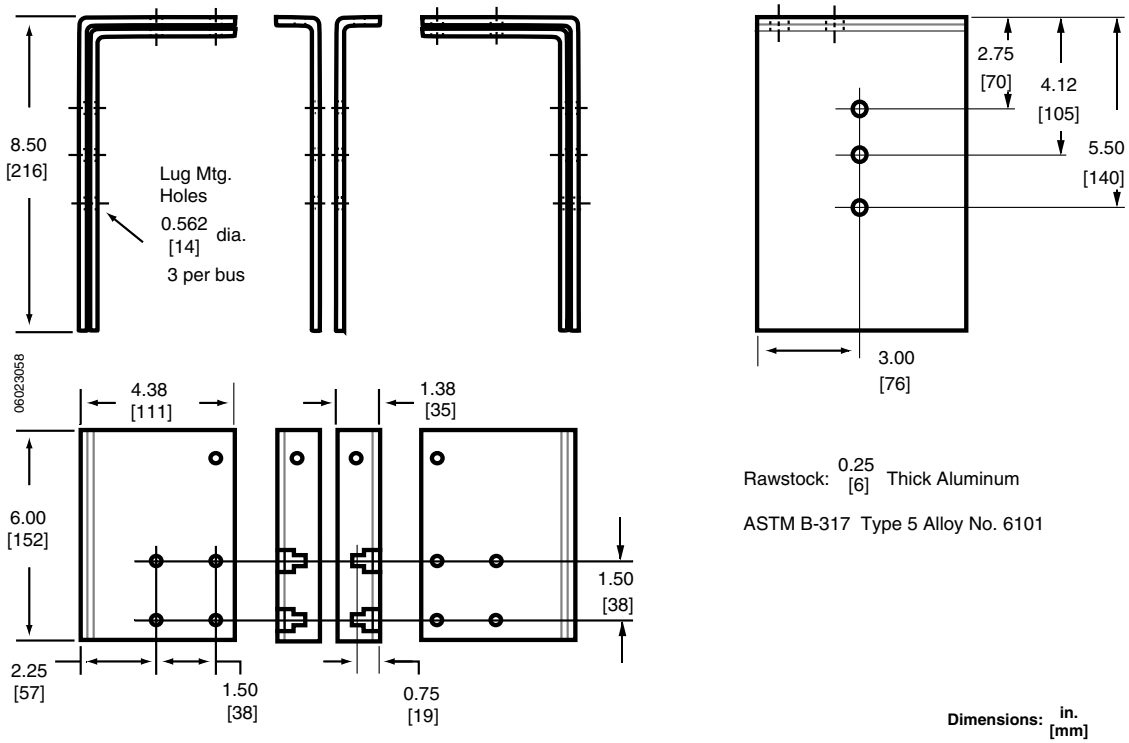






Dimensions: in. [mm]

PALTB Terminal Pad Bus for 600–1600 A PE and 600–2000 A PX Circuit Breakers

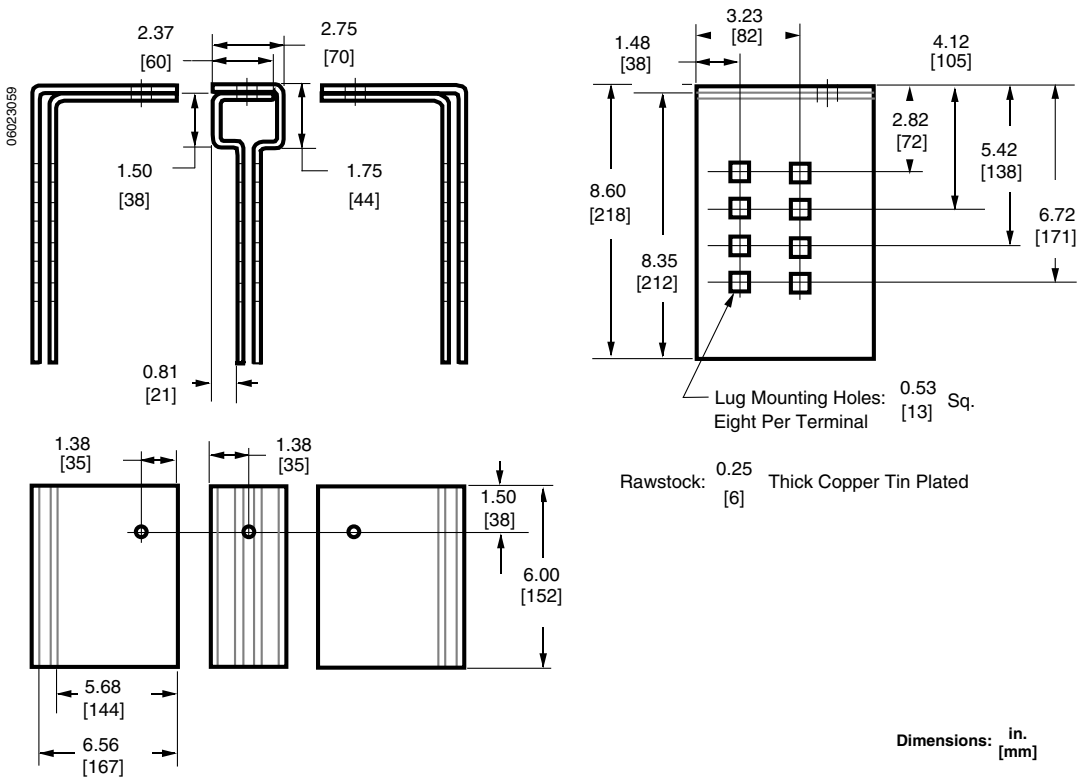


Rawstock: 0.25 [6] Thick Aluminum

ASTM B-317 Type 5 Alloy No. 6101

Dimensions: in. [mm]

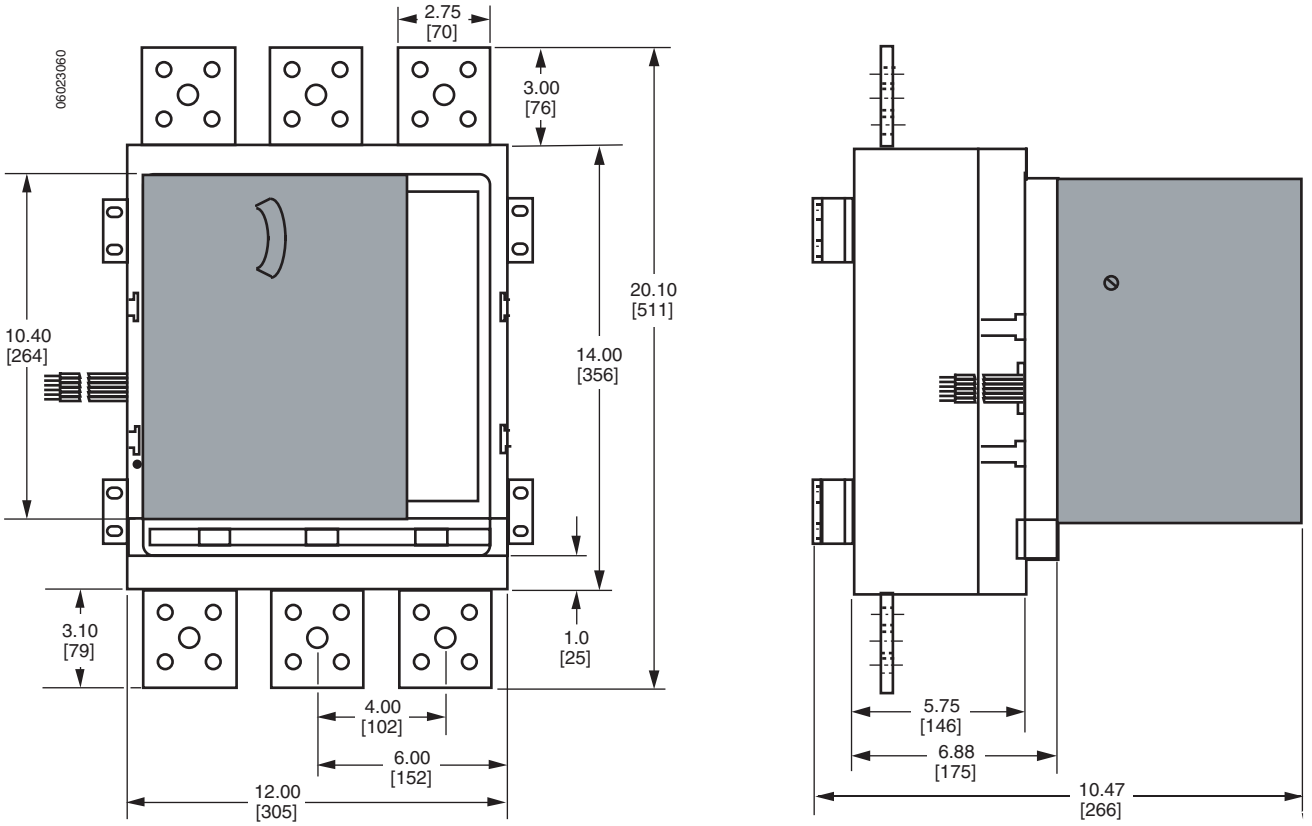
Terminal Pad Bus for 1800-2500 A PE and 2500 A PX Circuit Breakers



Rawstock: 0.25 [6] Thick Copper Tin Plated

Dimensions: in. [mm]

Electrical Operator for PX and PE Circuit Breakers



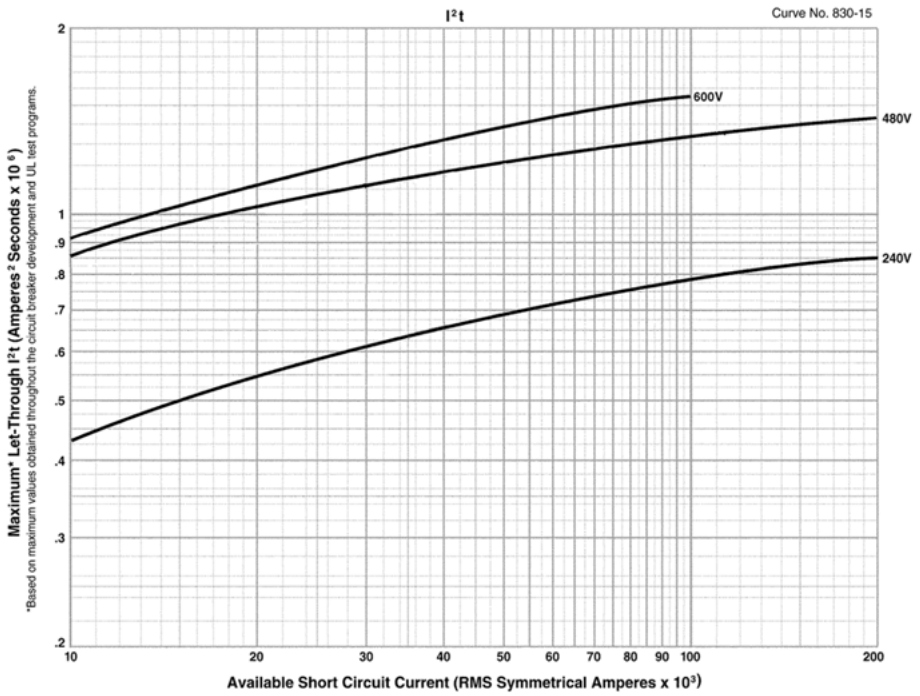
Dimensions: in. [mm]

APPENDIX B—TRIP CURVES

Trip curve drawings show the tripping characteristics for electronic trip molded case circuit breakers for the various trip unit settings. Properly adjusted trip unit settings will result in the upstream circuit breaker trip curve falling above and to the right of the downstream (branch) circuit breaker trip curve. This will result in the downstream circuit breaker tripping first, under overload, inrush and low-level short-circuit conditions.

LE, LX AND LXI CIRCUIT BREAKERS

Figure 20. LXI Series 2B 250 A and 400 A Sensor Current Limiting Let-through Curves



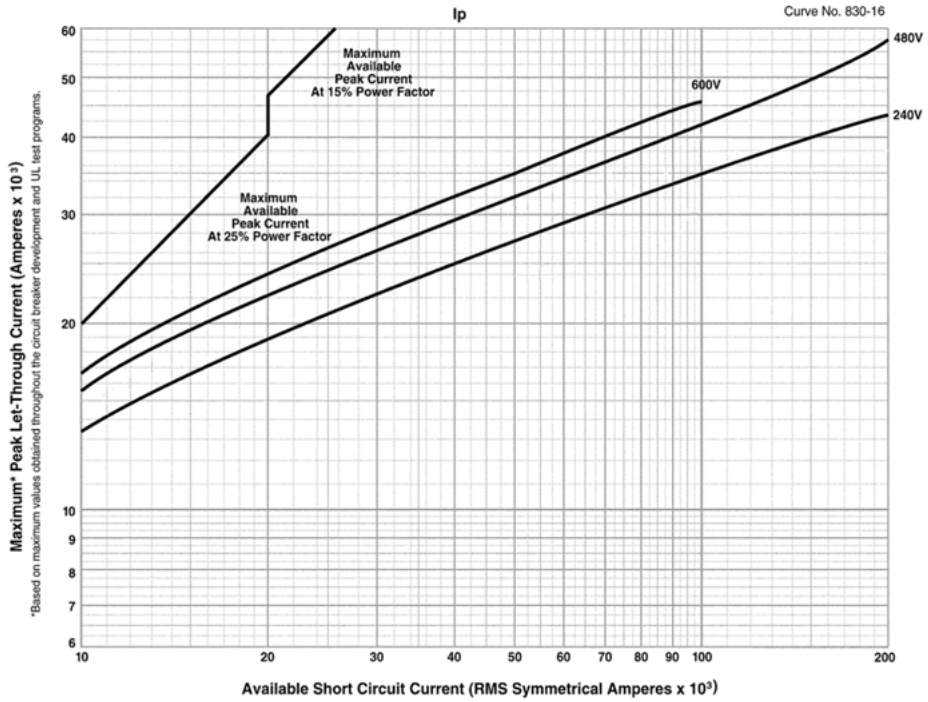


Figure 21. LXI Series 2B 600 A Sensor Current Limiting Let-through Curves

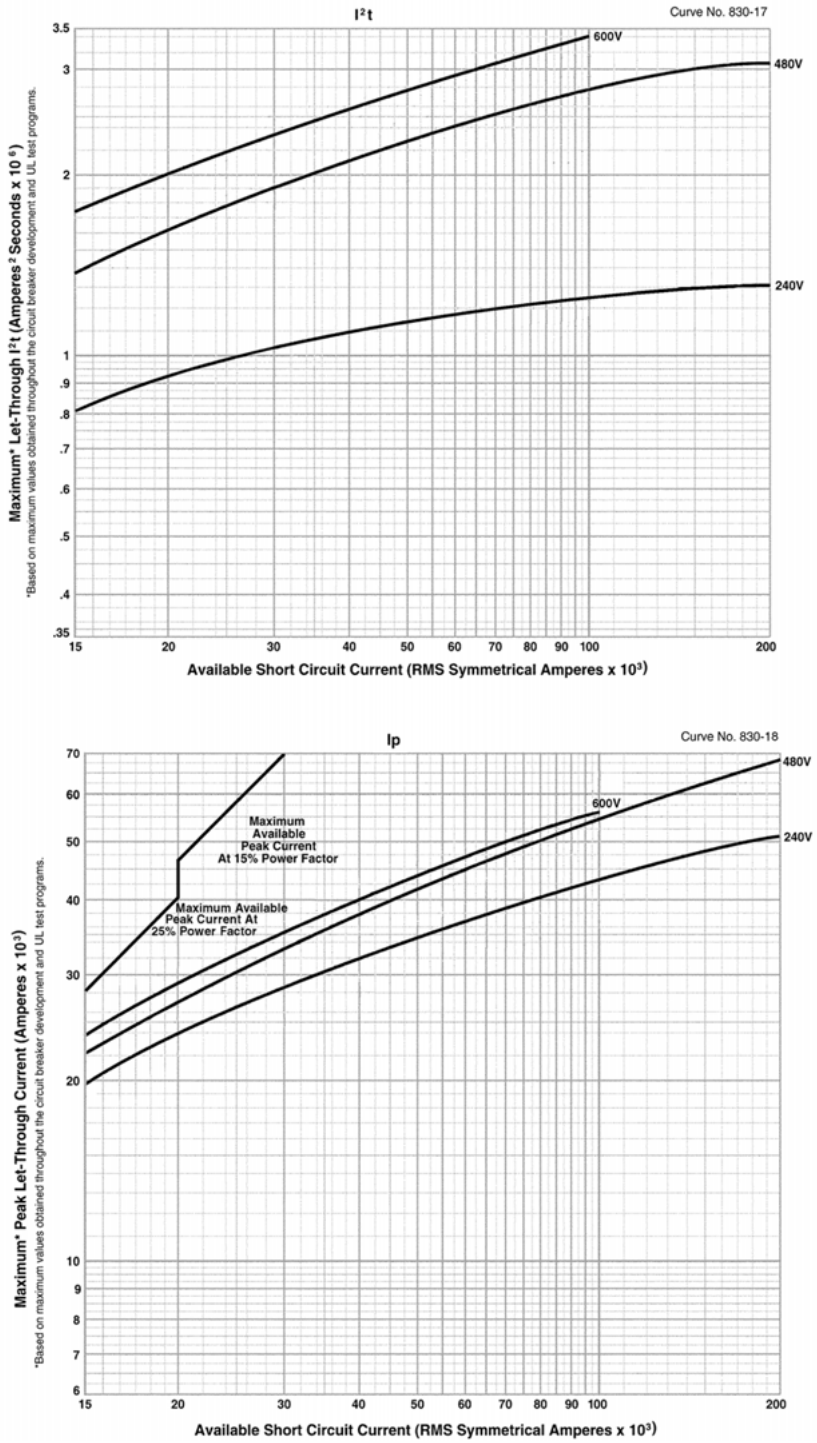
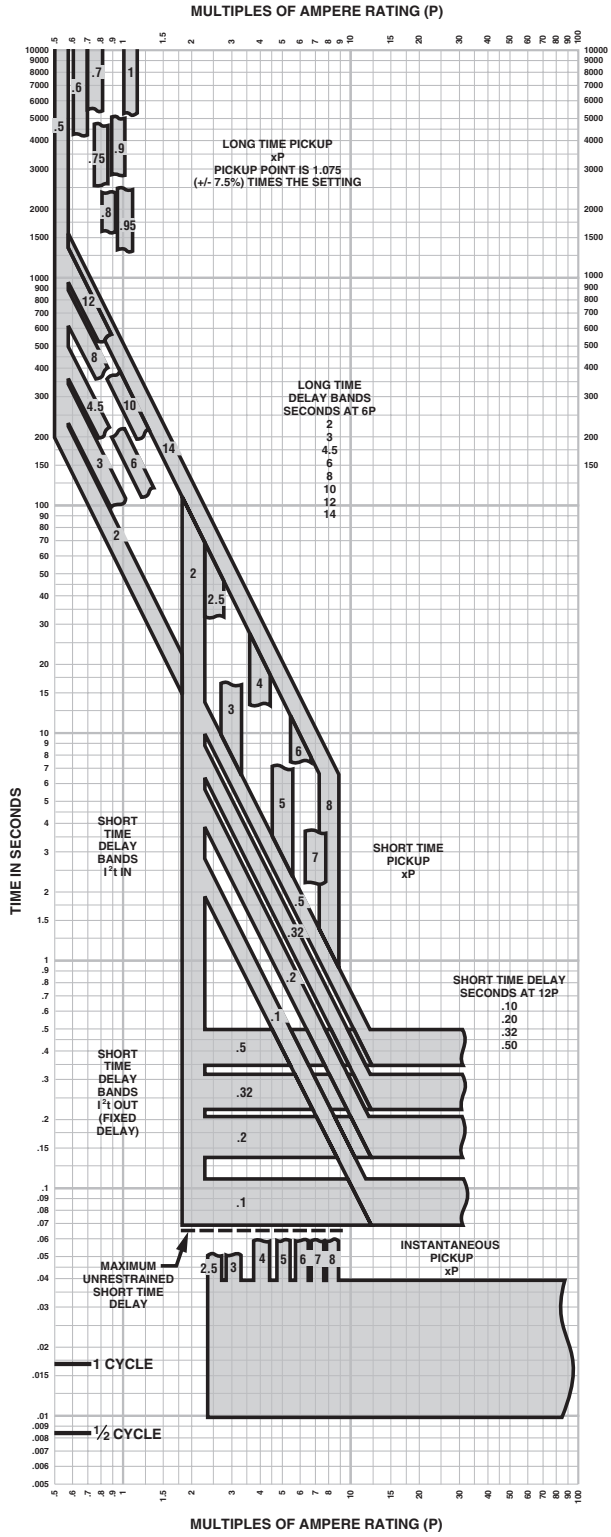


Figure 22. LE 250 A, 400 A and 600 A Sensor LS Circuit Breaker Trip Curve



LE ELECTRONIC TRIP MOLDED CASE CIR CUIT BREAKERS
LS (LSI) CHARACTERISTIC TRIP CURVE NO. 661-1

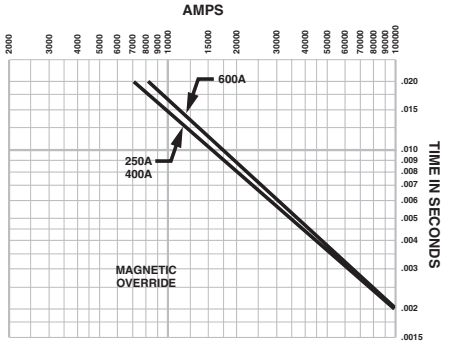
MICROLOGIC® Full Function trip unit with adjustable long time pickup and delay; short time pickup and delay; instantaneous pickup and instantaneous of f.

For withstand breaker, turn instantaneous off.

CIRCUIT BREAKER INFORMA TION

Sensor (S)	Ampere Rating (P)	Suitable Rating Plug Catalog No.	Multiplier (%)
250	100	ARP040	40
	125	ARP050	50
	150	ARP060	60
	175	ARP070	70
	200	ARP080	80
	225	ARP090	90
	250	ARP100	100
400	300	ARP075	75
	350	ARP088	88
	400	ARP100	100
600	450	ARP056	56
	500	ARP063	63
	600	ARP100	100

NOTE:
(1) Ampere rating (P) = Sensor (S) x rating plug multiplier
(2) Rating plugs shown reflect those supplied factory installed in the circuit breaker. Circuit breakers using other appropriate rating plugs shall use this trip curve also.



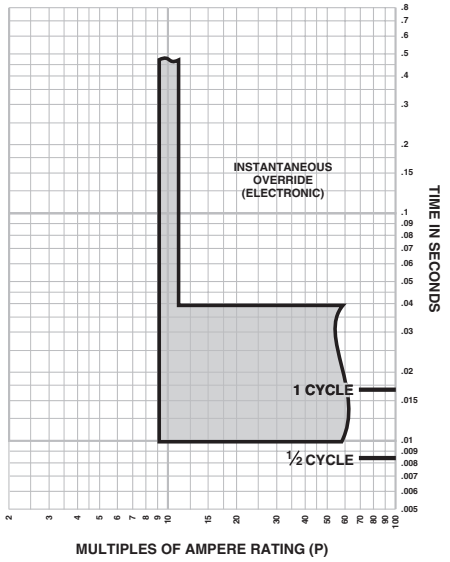
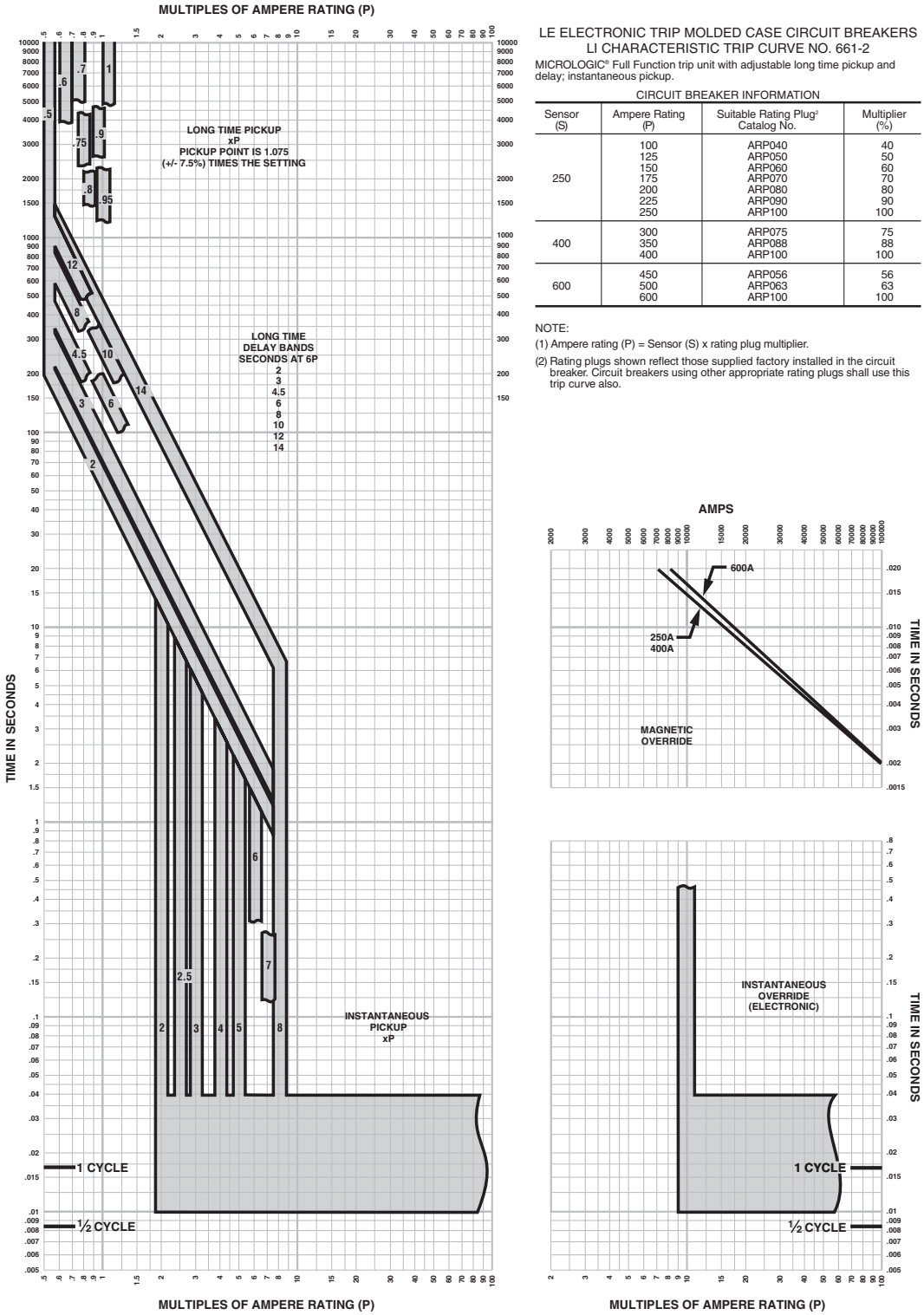


Figure 23. LE 250 A, 400 A and 600 A Sensor LI Circuit Breaker Trip Curve



LE ELECTRONIC TRIP MOLDED CASE CIRCUIT BREAKERS
LI CHARACTERISTIC TRIP CURVE NO. 661-2

MICROLOGIC® Full Function trip unit with adjustable long time pickup and delay; instantaneous pickup.

CIRCUIT BREAKER INFORMATION

Sensor (S)	Ampere Rating (P)	Suitable Rating Plug[2] Catalog No.	Multiplier (%)
250	100	ARP040	40
	125	ARP050	50
	150	ARP060	60
	175	ARP070	70
	200	ARP080	80
	225	ARP090	90
	250	ARP100	100
400	300	ARP075	75
	350	ARP088	88
	400	ARP100	100
600	450	ARP056	56
	500	ARP063	63
	600	ARP100	100

NOTE:

(1) Ampere rating (P) = Sensor (S) x rating plug multiplier.

(2) Rating plugs shown reflect those supplied factory installed in the circuit breaker. Circuit breakers using other appropriate rating plugs shall use this trip curve also.

Figure 24. LE 250 A, 400 A and 600 A Sensor Ground-Fault Circuit Breaker Trip Curve

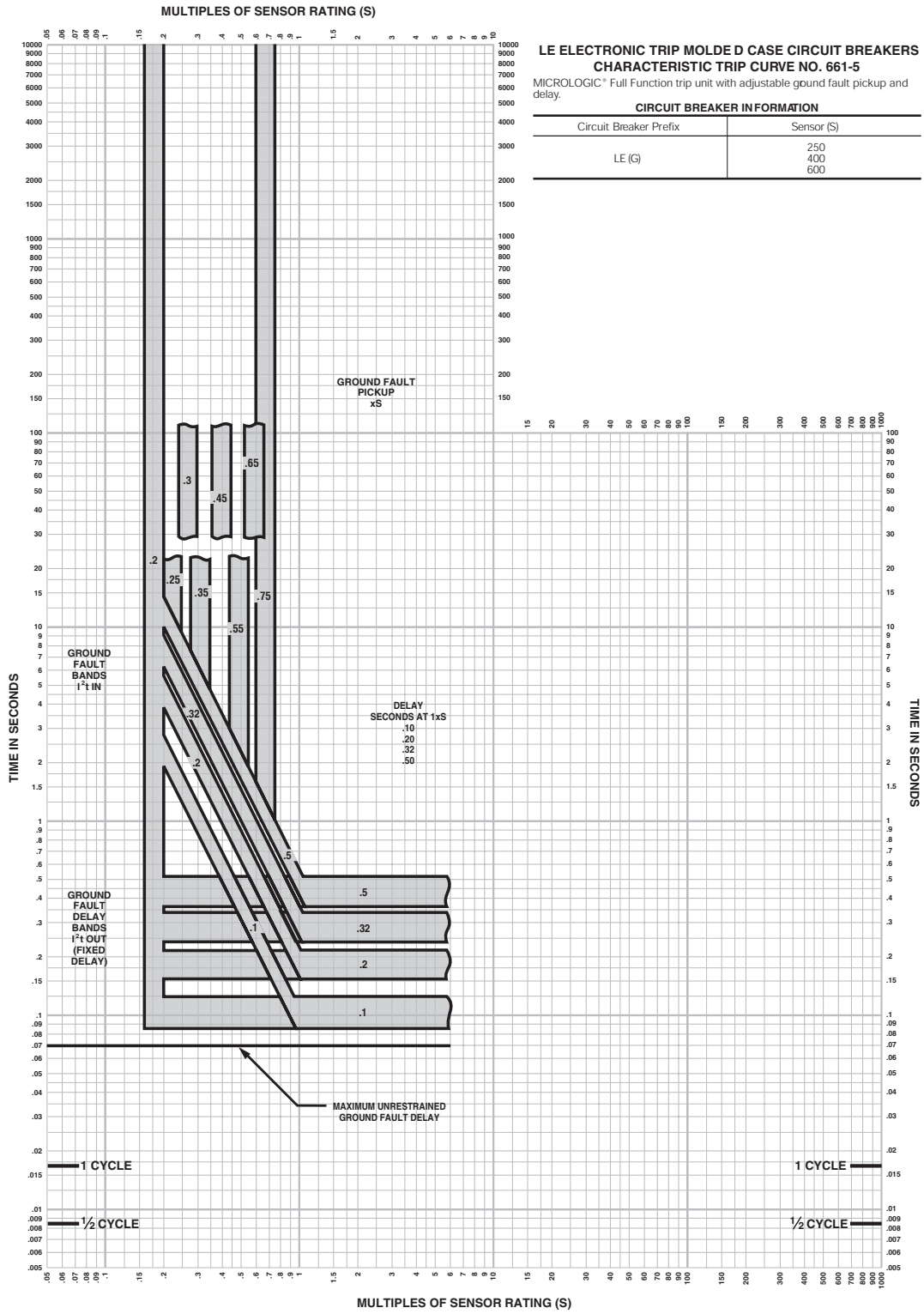
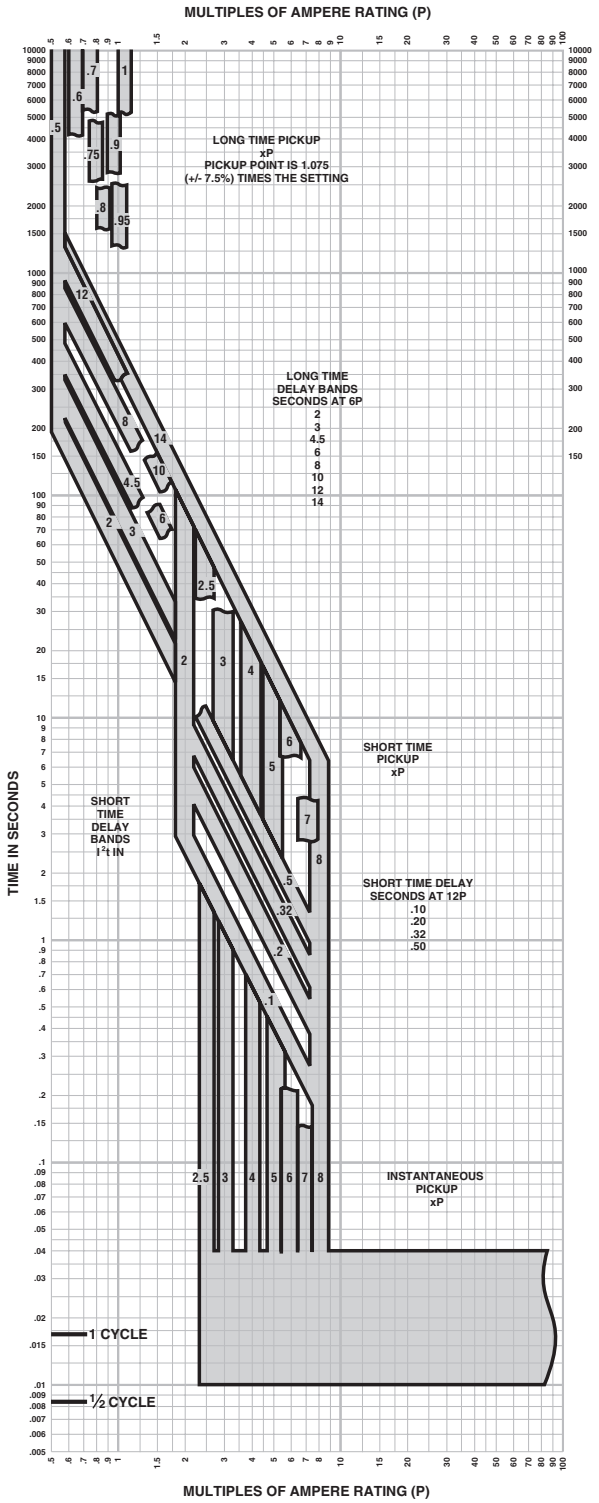


Figure 25. LX AND LXI 250 A, 400 A and 600 A Sensor Circuit Breaker Trip Curve



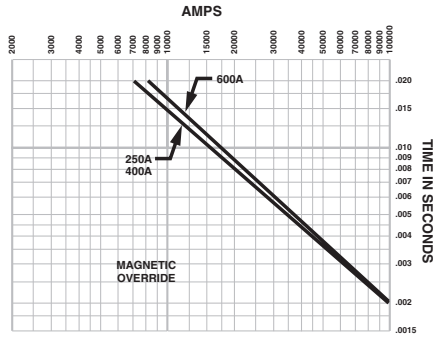
LX AND LXI ELECTRONIC TRIP
MOLDED CASE CIRCUIT BREAKERS
CHARACTERISTIC TRIP CURVE NO. 661-3

MICROLOGIC® Standard Function trip unit with adjustable long time pickup and delay; short time pickup and delay; instantaneous pickup.

CIRCUIT BREAKER INFORMATION

Sensor (S)	Ampere Rating (P)	Suitable Rating Plug Catalog No.	Multiplier (%)
250	100	ARP040	40
	125	ARP050	50
	150	ARP060	60
	175	ARP070	70
	200	ARP080	80
	225	ARP090	90
	250	ARP100	100
400	300	ARP075	75
	350	ARP088	88
	400	ARP100	100
600	450	ARP100	56
	500	ARP063	63
	600	ARP100	100

NOTE:
(1) Ampere rating (P) = Sensor (S) x rating plug multiplier.
(2) Rating plugs shown reflect those supplied factory installed in the circuit breaker. Circuit breakers using other appropriate rating plugs shall use this trip curve also.



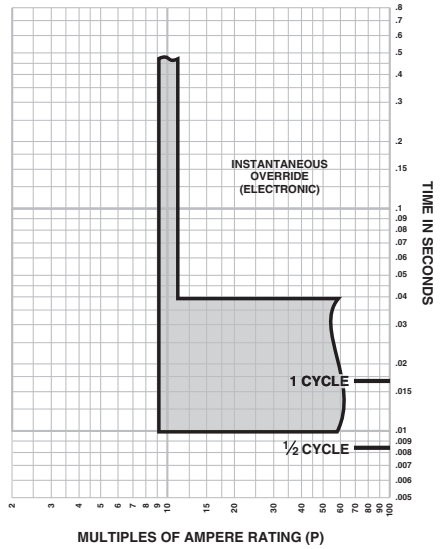
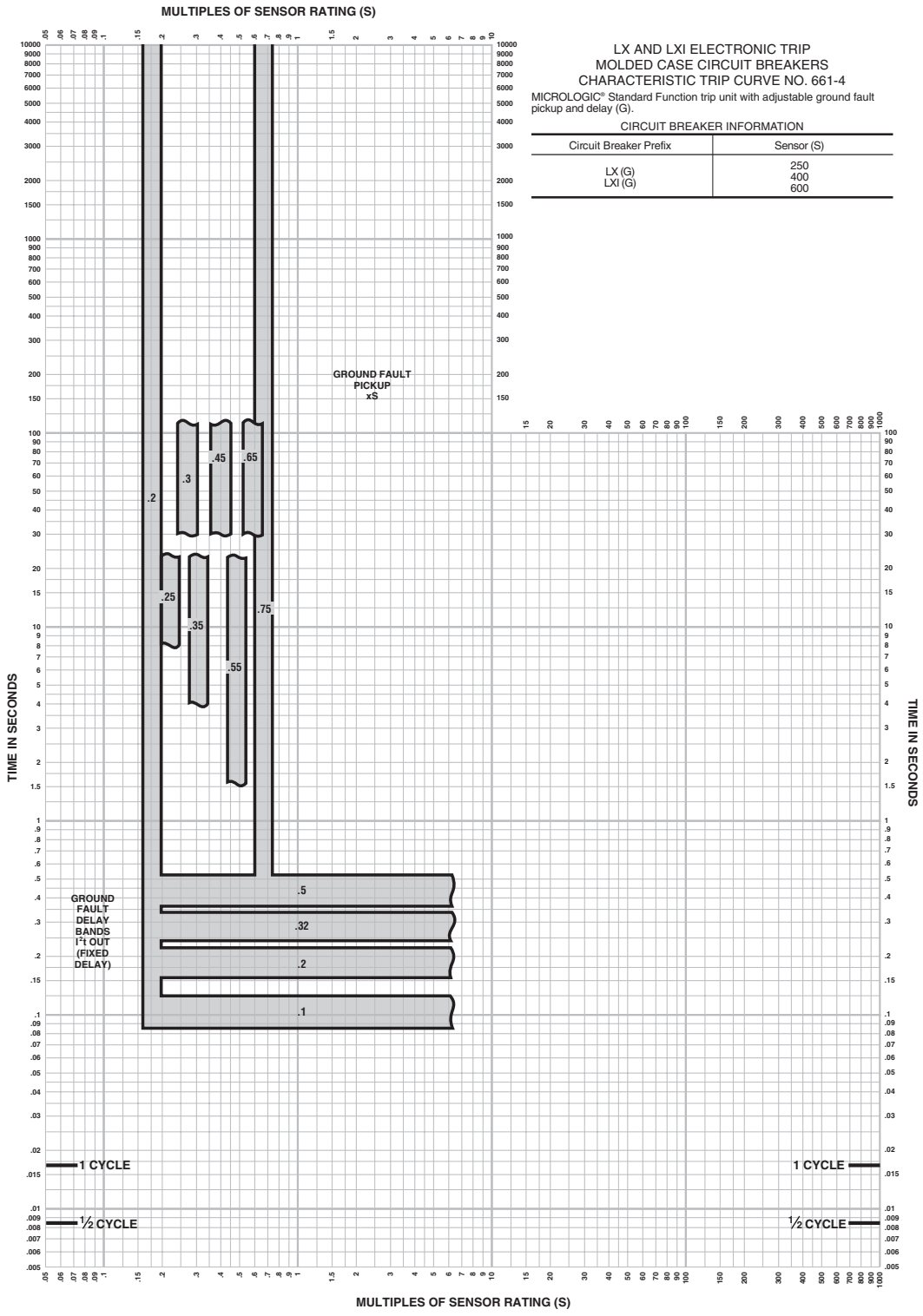
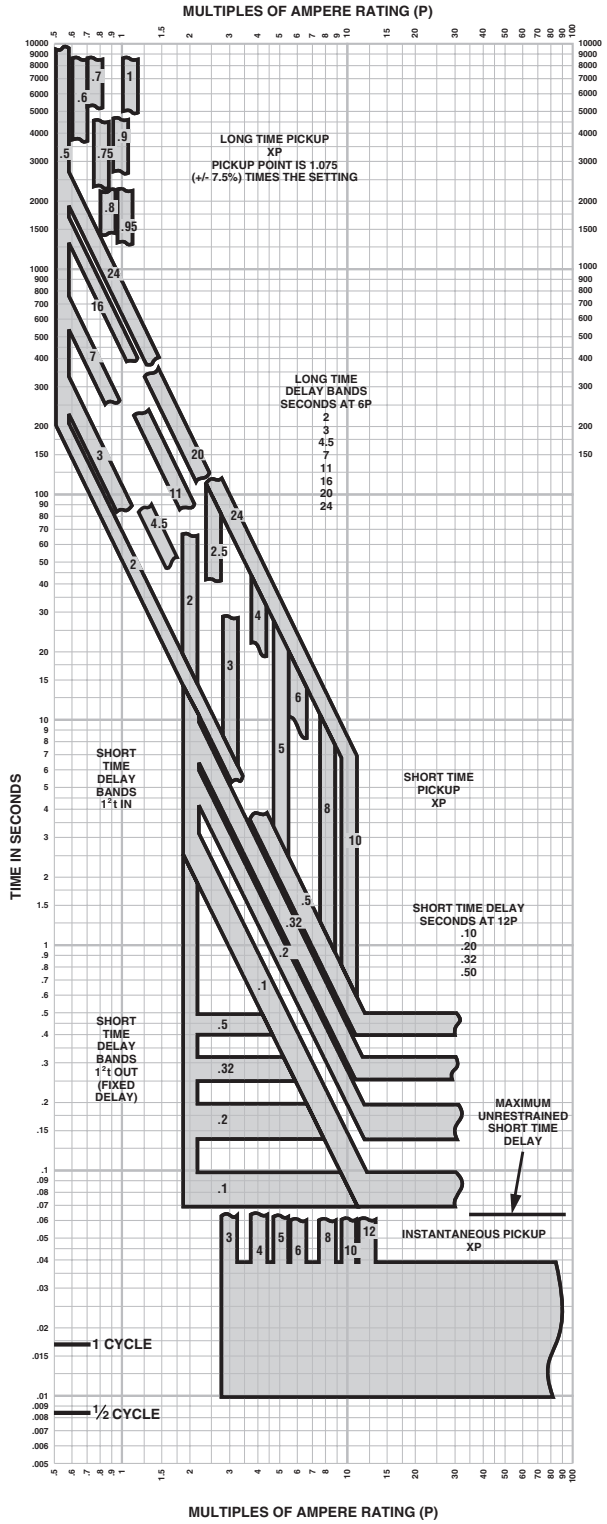


Figure 26. LX AND LXI 250 A, 400 A and 600 A Sensor Ground-Fault Circuit Breaker Trip Curve



ME AND MX CIRCUIT BREAKERS

Figure 27. ME 250 A, 400 A and 800 A Sensor LS Circuit Breaker Trip Curve



ME ELECTRONIC TRIP MOLDED CASE CIRCUIT BREAKERS
LS (LSI) CHARACTERISTIC TRIP CURVE NO. 666-7

MICROLOGIC® trip unit with adjustable long time pickup and delay; short time pickup and delay; instantaneous pickup and instantaneous off.

For withstand breaker instantaneous is off.

CIRCUIT BREAKER INFORMATION

Sensor (S)	Ampere Rating (P)	Suitable Rating Plug Cat. No.	Multiplier (%)
250	100	RP040	40
	125	RP050	50
	150	RP060	60
	175	RP070	70
	200	RP080	80
	225	RP090	90
	250	RP100	100
400	300	RP075	75
	350	RP088	88
	400	RP100	100
800	450	RP056	56
	500	RP063	63
	600	RP075	75
	700	RP088	88
	800	RP100	100

NOTE: Ampere rating (P) = Sensor (S) x rating plug multiplier (%)

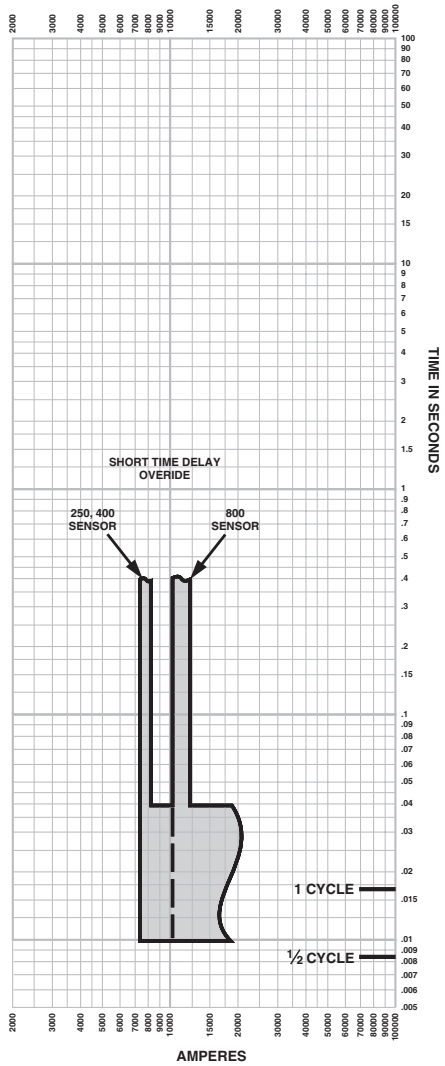
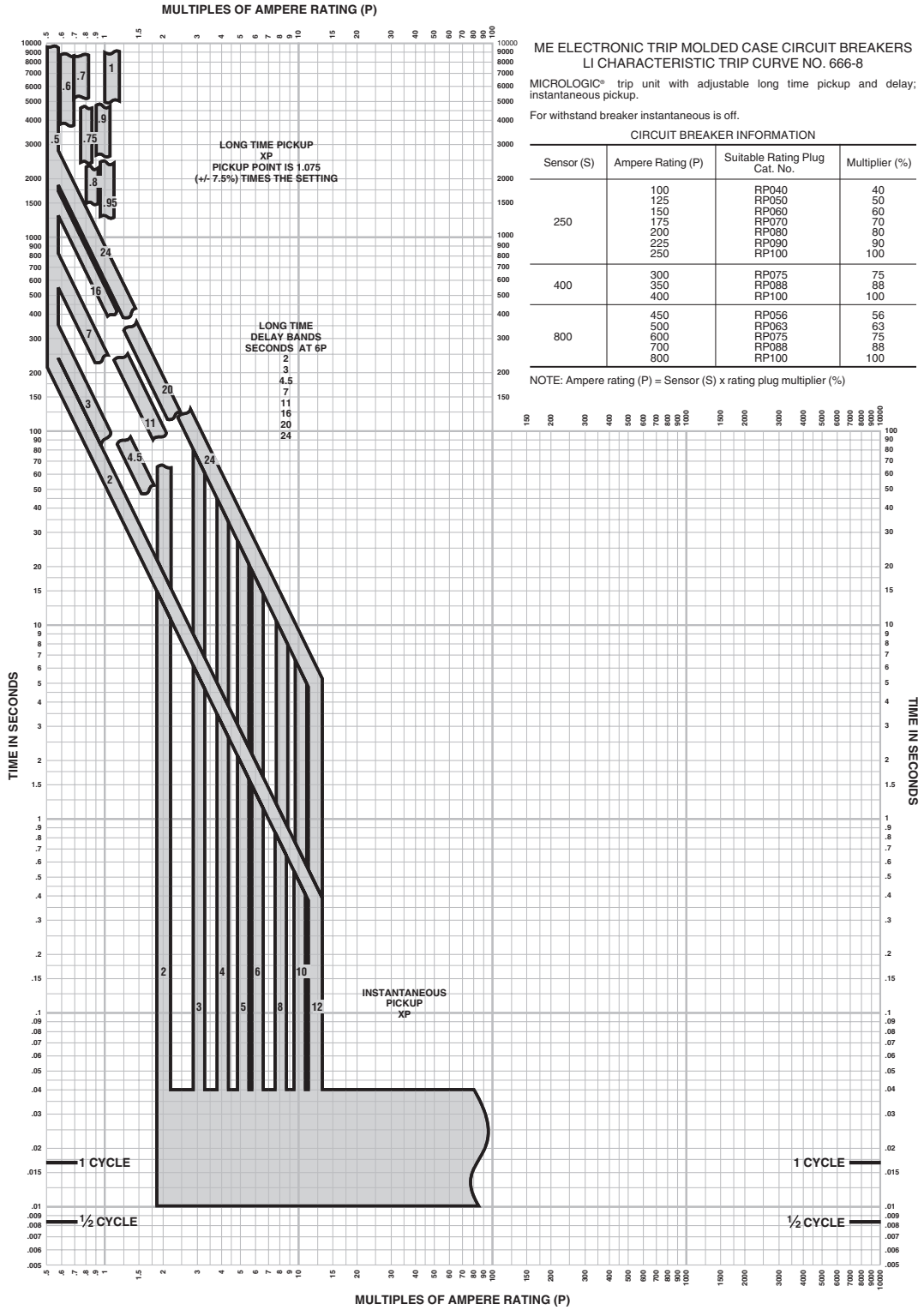


Figure 28. ME 250 A, 400 A and 800 A Sensor LI Circuit Breaker Trip Curve



ME ELECTRONIC TRIP MOLDED CASE CIRCUIT BREAKERS
LI CHARACTERISTIC TRIP CURVE NO. 666-8

MICROLOGIC® trip unit with adjustable long time pickup and delay; instantaneous pickup.

For withstand breaker instantaneous is off.

CIRCUIT BREAKER INFORMATION

Sensor (S)	Ampere Rating (P)	Suitable Rating Plug Cat. No.	Multiplier (%)
250	100	RP040	40
	125	RP050	50
	150	RP060	60
	175	RP070	70
	200	RP080	80
	225	RP090	90
	250	RP100	100
400	300	RP075	75
	350	RP088	88
	400	RP100	100
800	450	RP056	56
	500	RP063	63
	600	RP075	75
	700	RP088	88
	800	RP100	100

NOTE: Ampere rating (P) = Sensor (S) x rating plug multiplier (%)

Figure 29. ME 250 A Sensor Ground-Fault Circuit Breaker Trip Curve

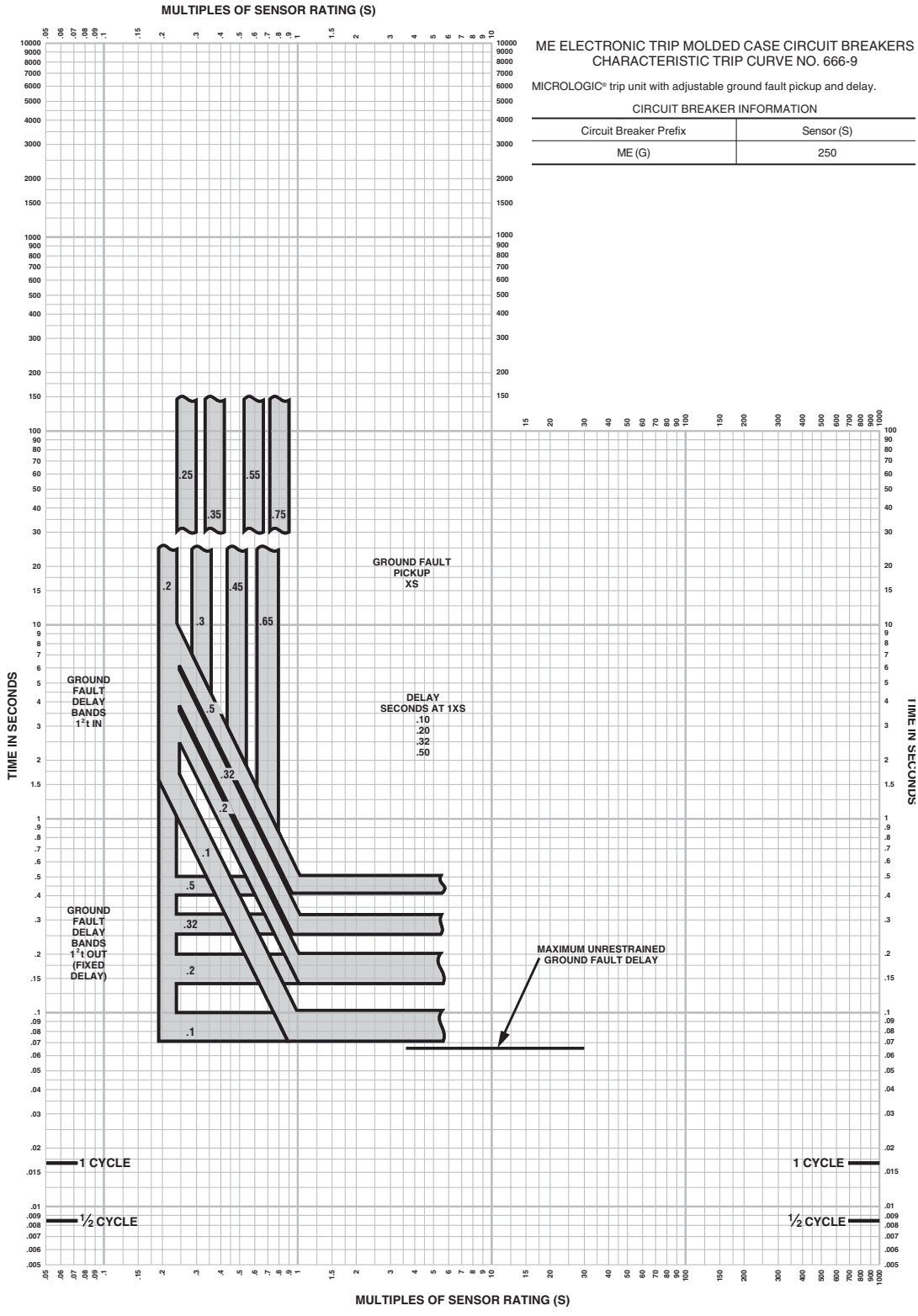


Figure 30. ME 400 A and 800 A Sensor Ground-fault Circuit Breaker Trip Curve

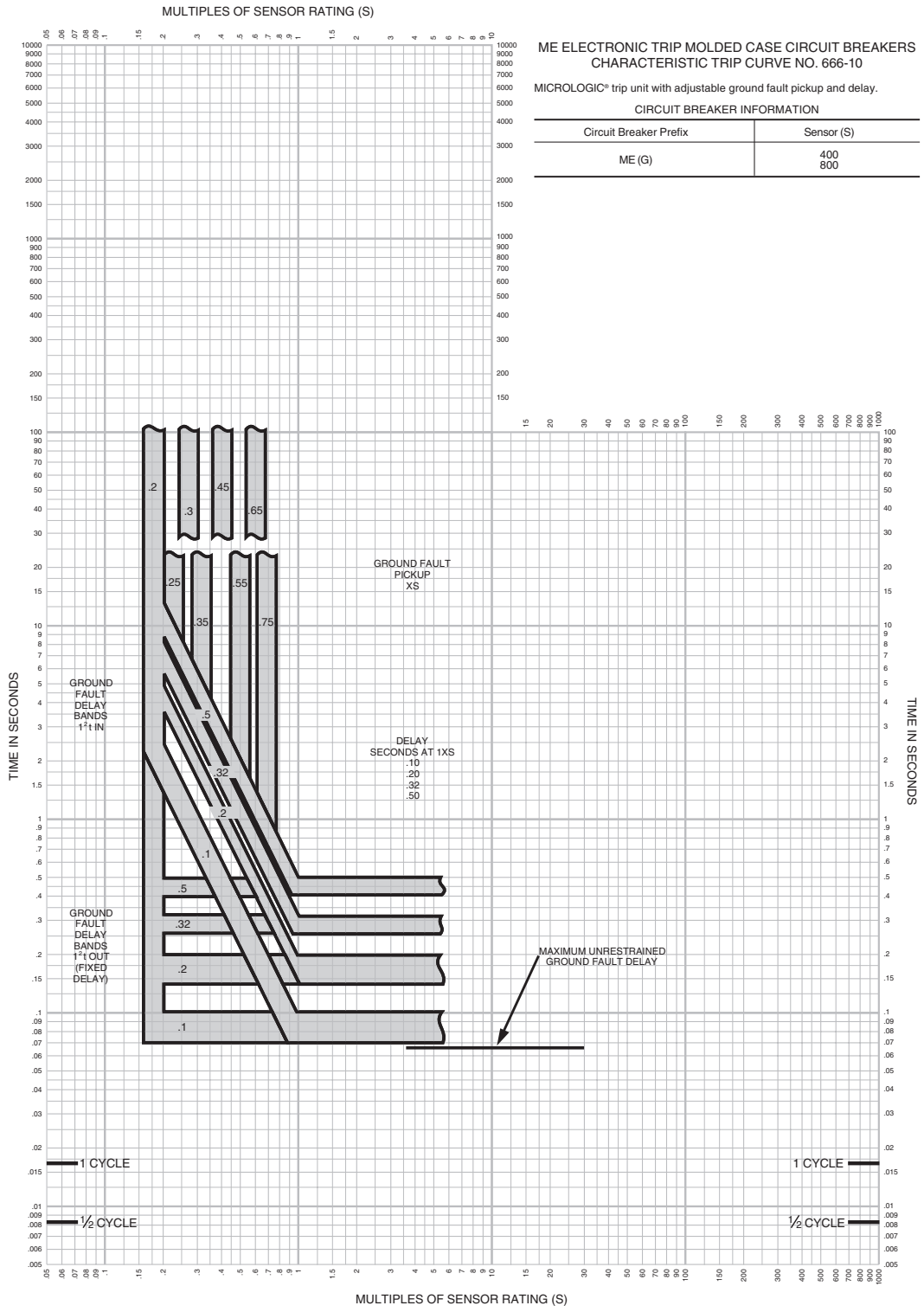
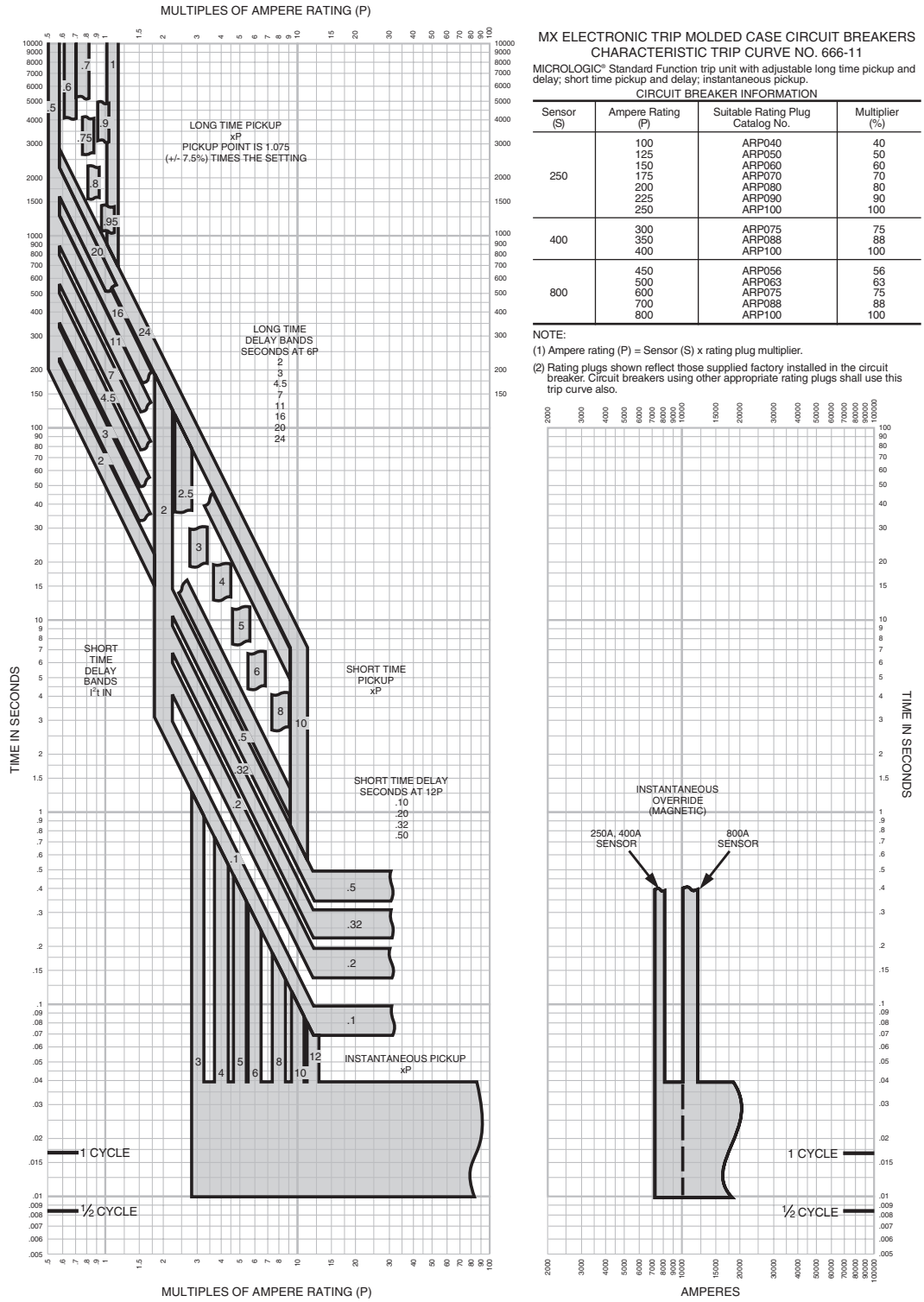


Figure 31. MX 250 A, 400 A and 800 A Sensor Circuit Breaker Trip Curve



MX ELECTRONIC TRIP MOLDED CASE CIRCUIT BREAKERS
CHARACTERISTIC TRIP CURVE NO. 666-11

MICROLOGIC® Standard Function trip unit with adjustable long time pickup and delay; short time pickup and delay; instantaneous pickup.

CIRCUIT BREAKER INFORMATION

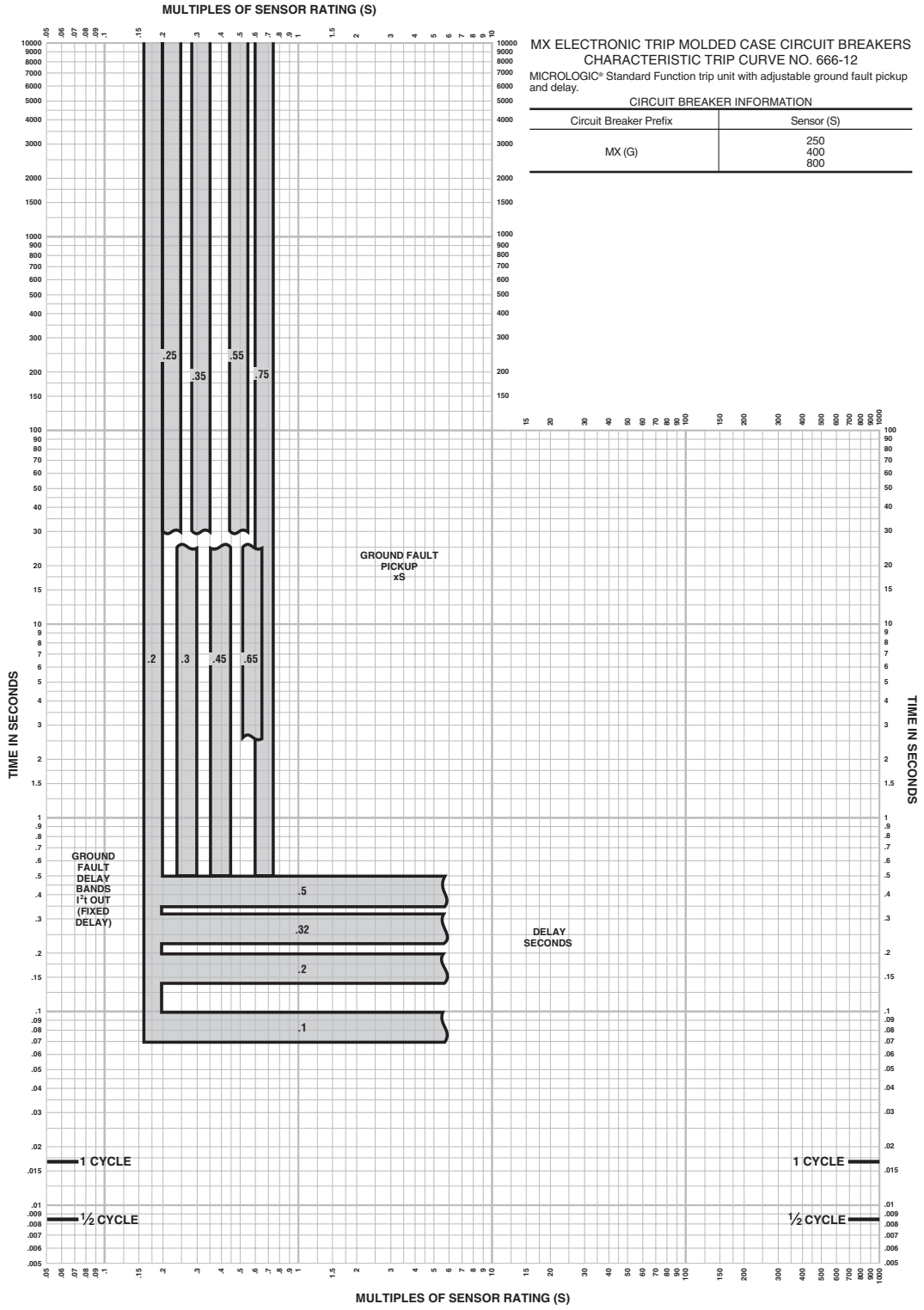
Sensor (S)	Ampere Rating (P)	Suitable Rating Plug Catalog No.	Multiplier (%)
250	100	ARP040	40
	125	ARP050	50
	150	ARP060	60
	175	ARP070	70
	200	ARP080	80
	225	ARP090	90
	250	ARP100	100
400	300	ARP075	75
	350	ARP088	88
	400	ARP100	100
800	450	ARP056	56
	500	ARP063	63
	600	ARP075	75
	700	ARP088	88
	800	ARP100	100

NOTE:

(1) Ampere rating (P) = Sensor (S) x rating plug multiplier.

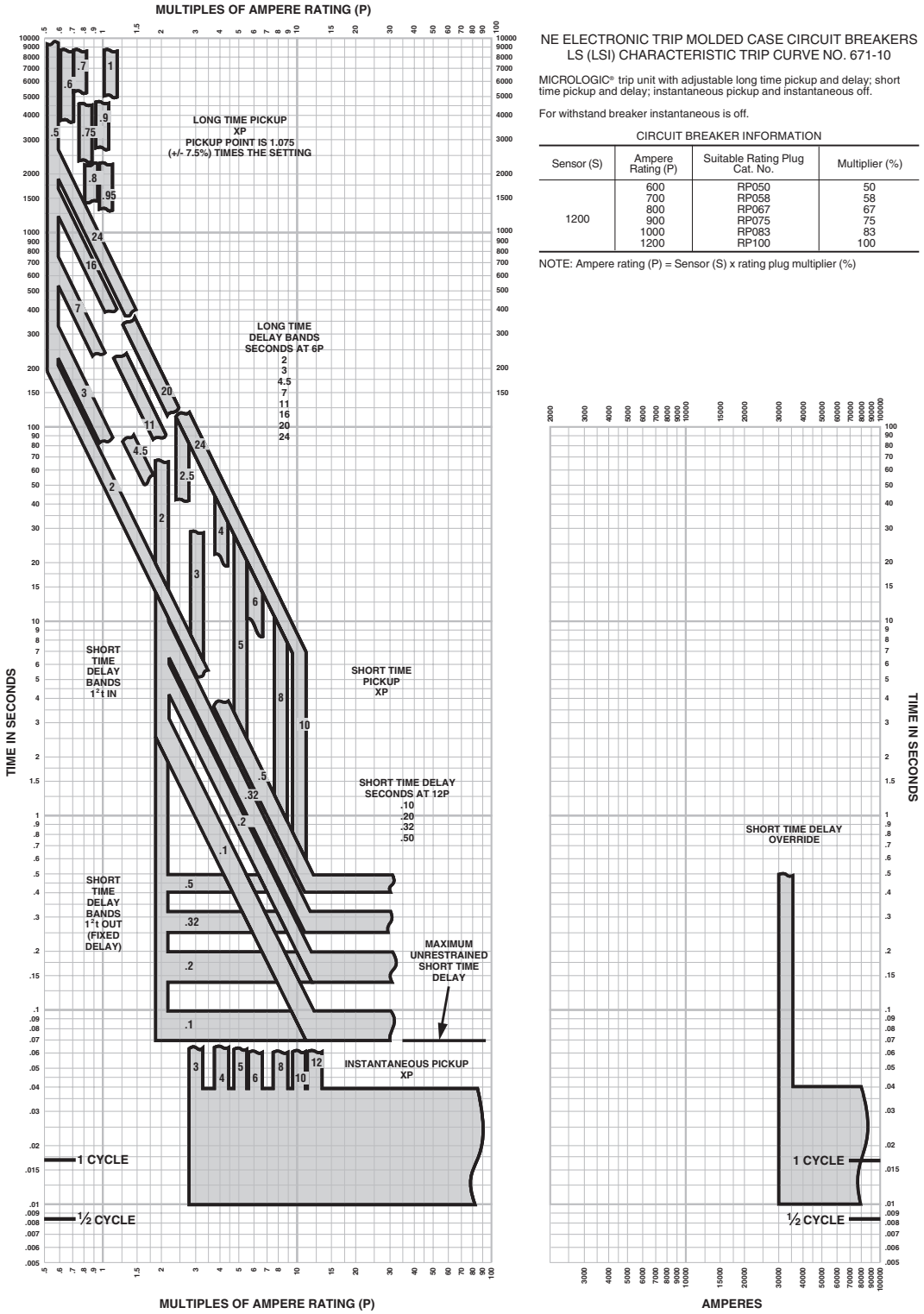
(2) Rating plugs shown reflect those supplied factory installed in the circuit breaker. Circuit breakers using other appropriate rating plugs shall use this trip curve also.

Figure 32. MX 250 A, 400 A, and 800 A Sensor Circuit Breaker Trip Curve



NE AND NX CIRCUIT BREAKERS

Figure 33. NE 600 A and 1200 A Sensor LS Circuit Breaker Trip Curve



NE ELECTRONIC TRIP MOLDED CASE CIRCUIT BREAKERS
LS (LSI) CHARACTERISTIC TRIP CURVE NO. 671-10

MICROLOGIC® trip unit with adjustable long time pickup and delay; short time pickup and delay; instantaneous pickup and instantaneous off.

For withstand breaker instantaneous is off.

CIRCUIT BREAKER INFORMATION

Sensor (S)	Ampere Rating (P)	Suitable Rating Plug Cat. No.	Multiplier (%)
1200	600	RP050	50
	700	RP058	58
	800	RP067	67
	900	RP075	75
	1000	RP083	83
	1200	RP100	100

NOTE: Ampere rating (P) = Sensor (S) x rating plug multiplier (%)

Figure 34. NE 600 A and 1200 A Sensor LI Circuit Breaker Trip Curve

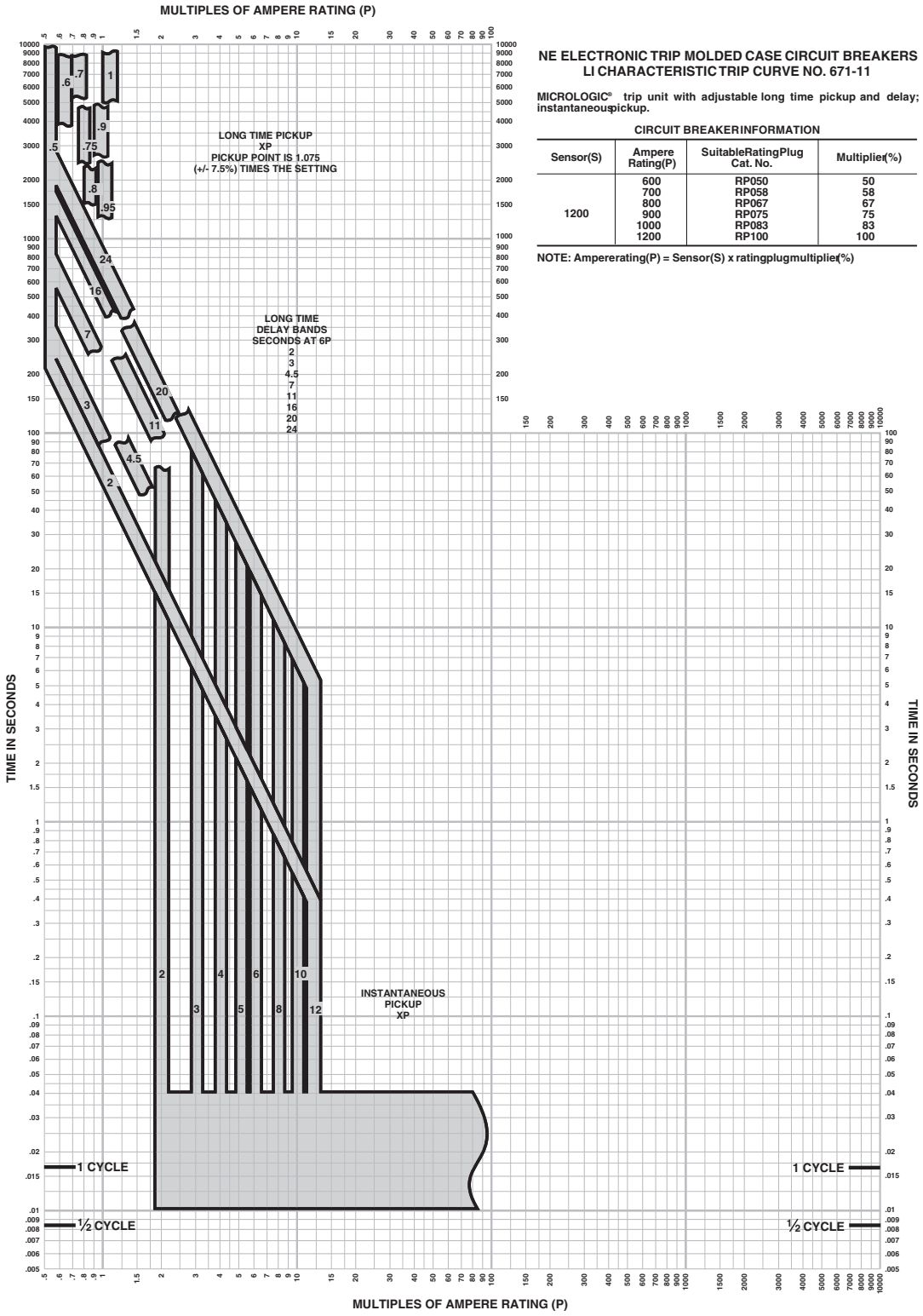


Figure 35. NE 600 A and 1200 A Sensor Ground-Fault Circuit Breaker Trip Curve

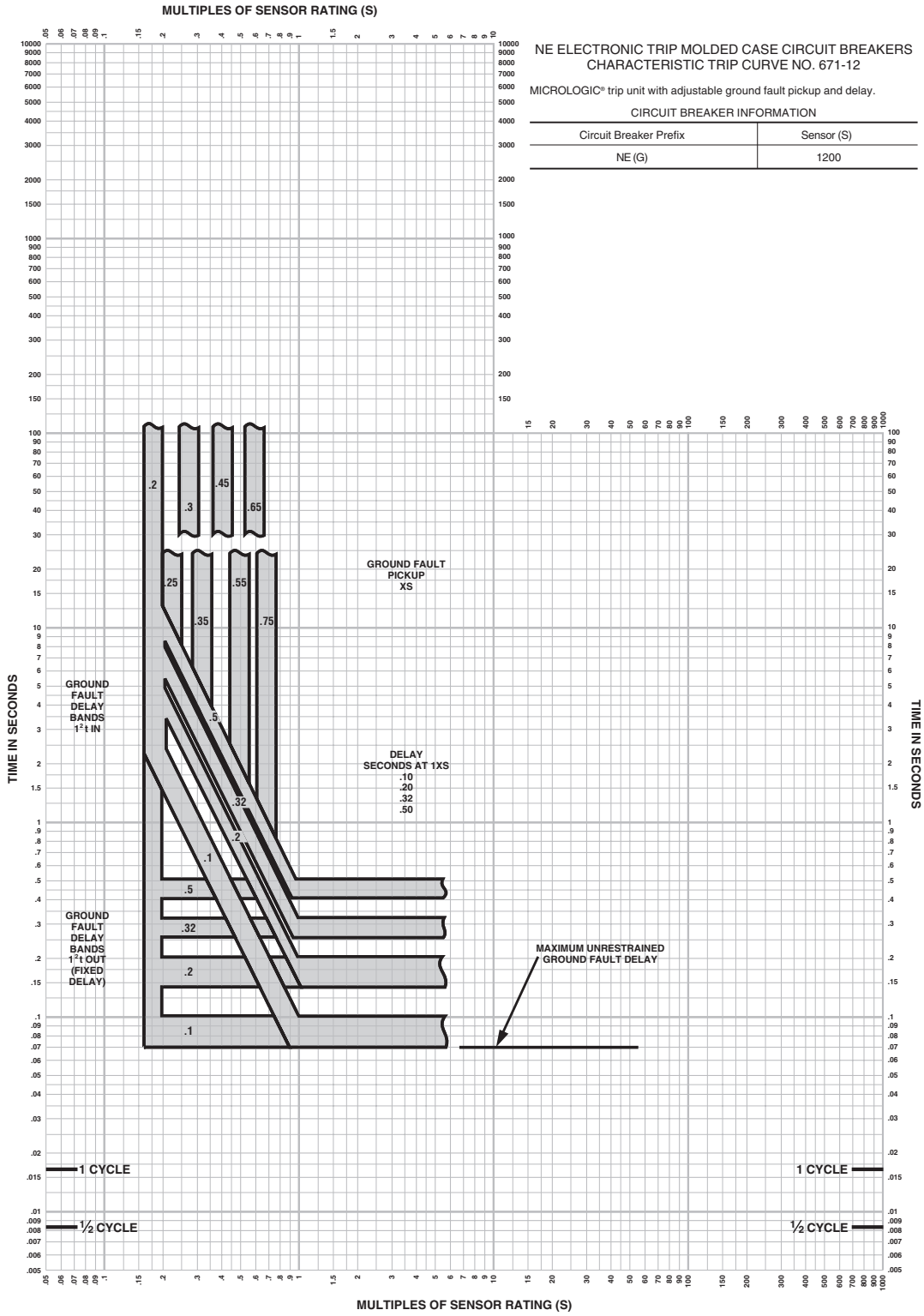
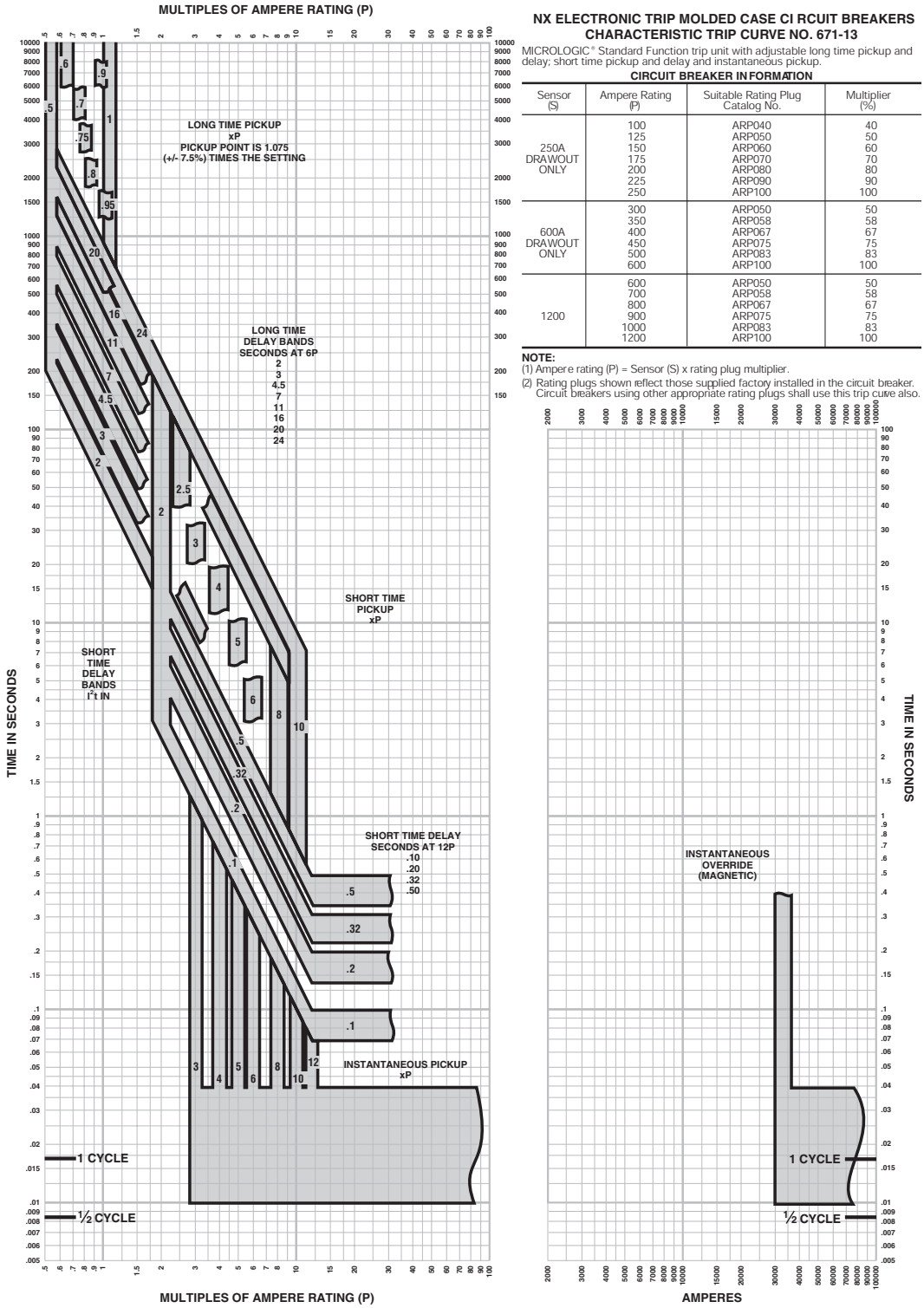


Figure 36. NX 250 A, 600 A and 1200 A Sensor Circuit Breaker Trip Curve



NX ELECTRONIC TRIP MOLDED CASE CI RCUIT BREAKERS
CHARACTERISTIC TRIP CURVE NO. 671-13

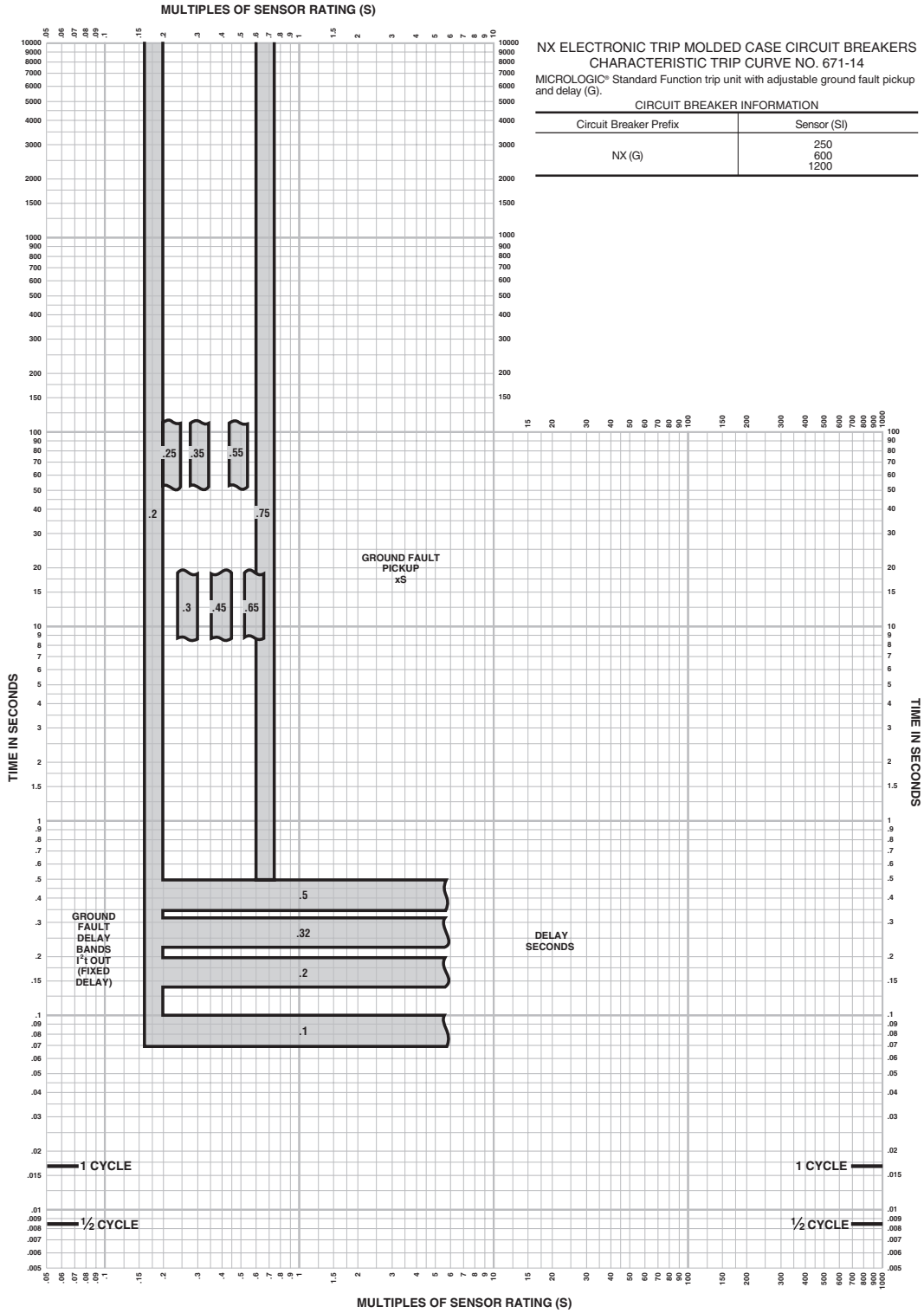
MICROLOGIC® Standard Function trip unit with adjustable long time pickup and delay; short time pickup and delay and instantaneous pickup.

CIRCUIT BREAKER INFORMATION

Sensor (S)	Ampere Rating (P)	Suitable Rating Plug Catalog No.	Multiplier (%)
250A DRAWOUT ONLY	100	ARP040	40
	125	ARP050	50
	150	ARP060	60
	175	ARP070	70
	200	ARP080	80
	225	ARP090	90
	250	ARP100	100
600A DRAWOUT ONLY	300	ARP050	50
	350	ARP058	58
	400	ARP067	67
	450	ARP075	75
	500	ARP083	83
	600	ARP100	100
1200	600	ARP050	50
	700	ARP058	58
	800	ARP067	67
	900	ARP075	75
	1000	ARP083	83
	1200	ARP100	100

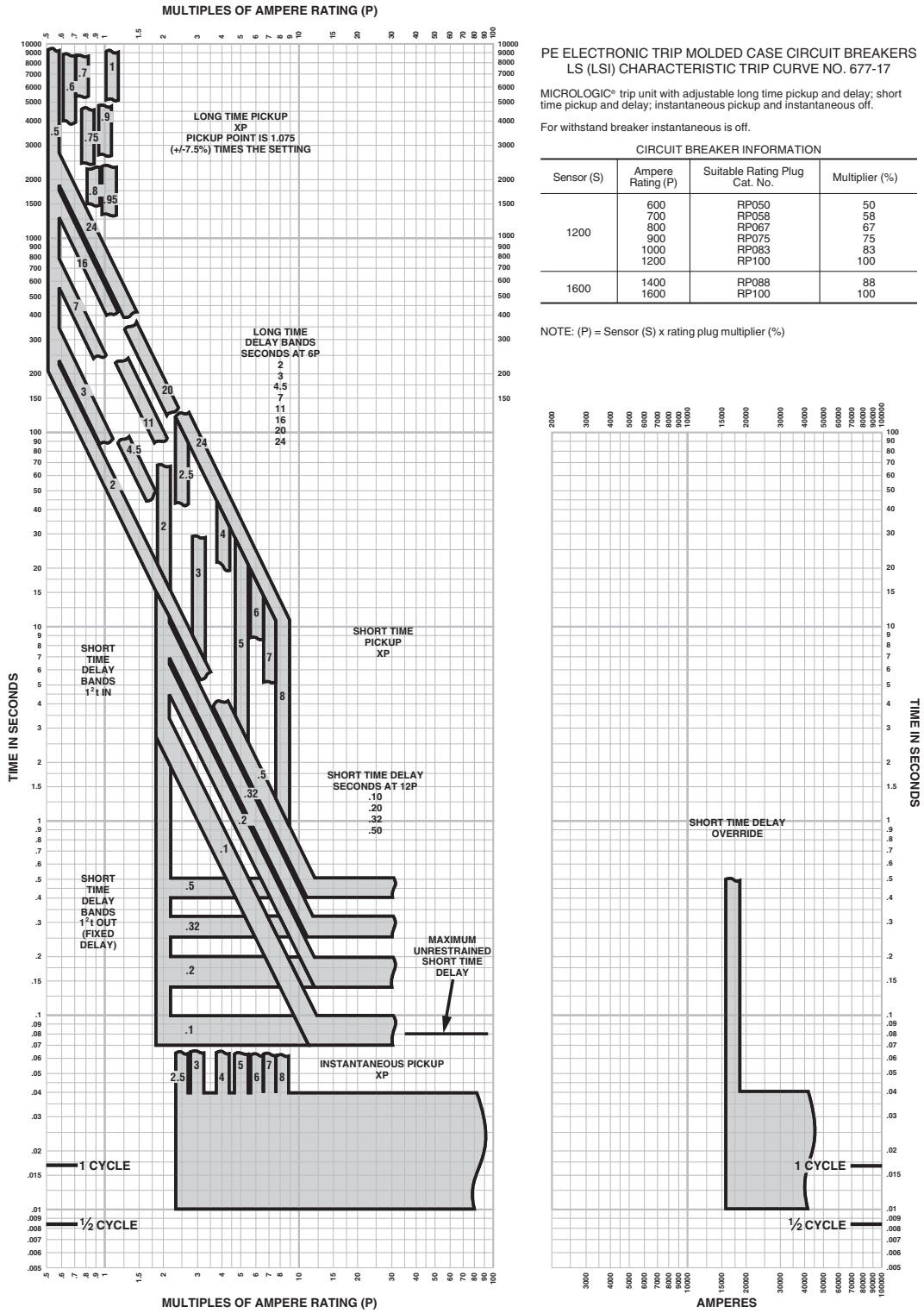
NOTE:
(1) Ampere rating (P) = Sensor (S) x rating plug multiplier.
(2) Rating plugs shown reflect those supplied factory installed in the circuit breaker. Circuit breakers using other appropriate rating plugs shall use this trip curve also.

Figure 37. NX 250 A, 600 A and 1200 A Sensor Ground-Fault Circuit Breaker Trip Curve



PE AND PX CIRCUIT BREAKERS

Figure 38. PE 1200 A and 1600 A Sensor LS Circuit Breaker Trip Curve



PE ELECTRONIC TRIP MOLDED CASE CIRCUIT BREAKERS
LS (LSI) CHARACTERISTIC TRIP CURVE NO. 677-17

MICROLOGIC® trip unit with adjustable long time pickup and delay; short time pickup and delay; instantaneous pickup and instantaneous off.

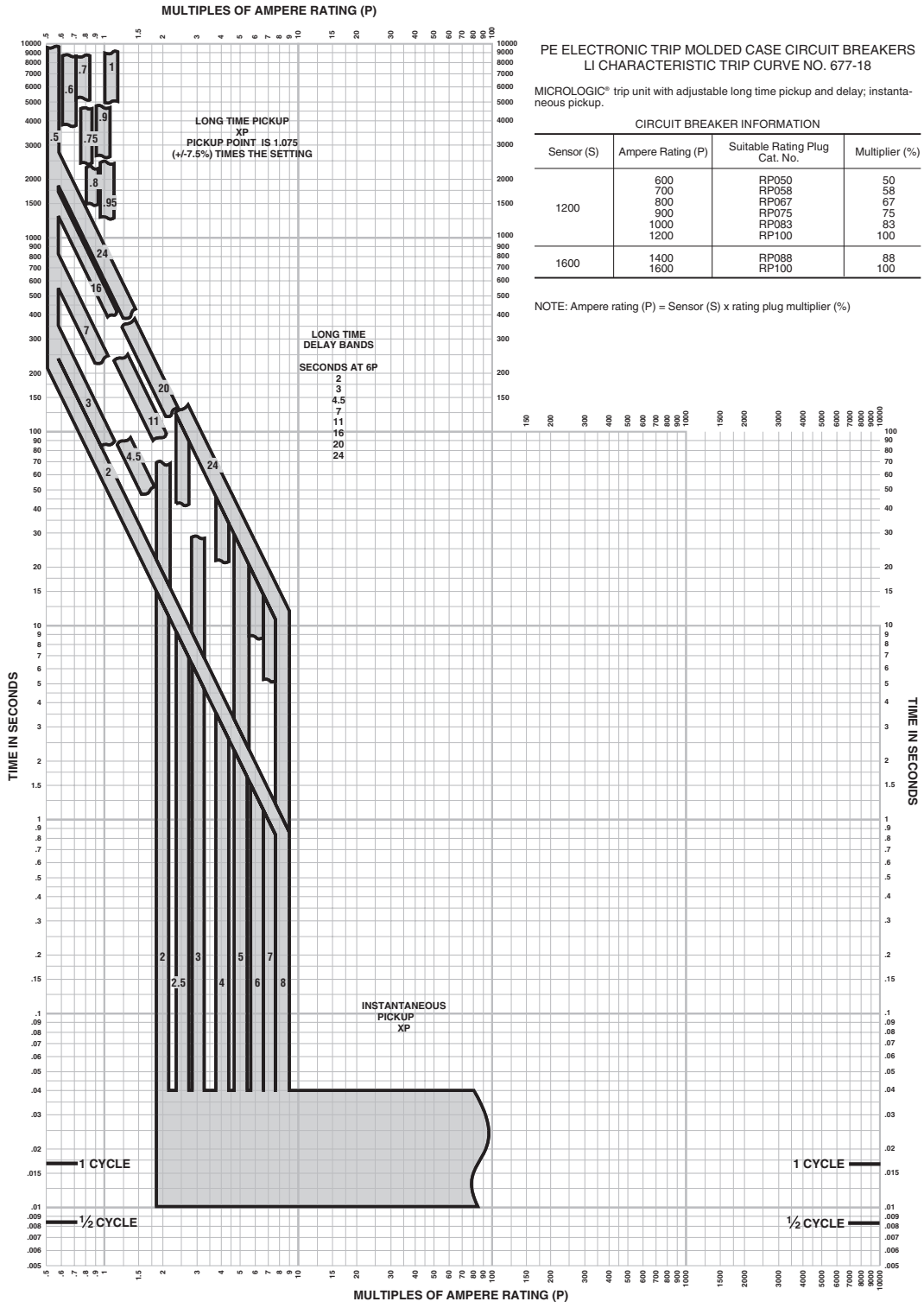
For withstand breaker instantaneous is off.

CIRCUIT BREAKER INFORMATION

Sensor (S)	Ampere Rating (P)	Suitable Rating Plug Cat. No.	Multiplier (%)
1200	600	RP050	50
	700	RP058	58
	800	RP067	67
	900	RP075	75
	1000	RP083	83
	1200	RP100	100
1600	1400	RP088	88
	1600	RP100	100

NOTE: (P) = Sensor (S) x rating plug multiplier (%)

Figure 39. PE 1200 A and 1600 A Sensor LI Circuit Breaker Trip Curve



PE ELECTRONIC TRIP MOLDED CASE CIRCUIT BREAKERS
LI CHARACTERISTIC TRIP CURVE NO. 677-18

MICROLOGIC® trip unit with adjustable long time pickup and delay; instantaneous pickup.

CIRCUIT BREAKER INFORMATION

Sensor (S)	Ampere Rating (P)	Suitable Rating Plug Cat. No.	Multiplier (%)
1200	600	RP050	50
	700	RP058	58
	800	RP067	67
	900	RP075	75
	1000	RP083	83
	1200	RP100	100
1600	1400	RP088	88
	1600	RP100	100

NOTE: Ampere rating (P) = Sensor (S) x rating plug multiplier (%)

Figure 40. PE 1200 A and 1600 A Sensor Ground-Fault Breaker Trip Curve

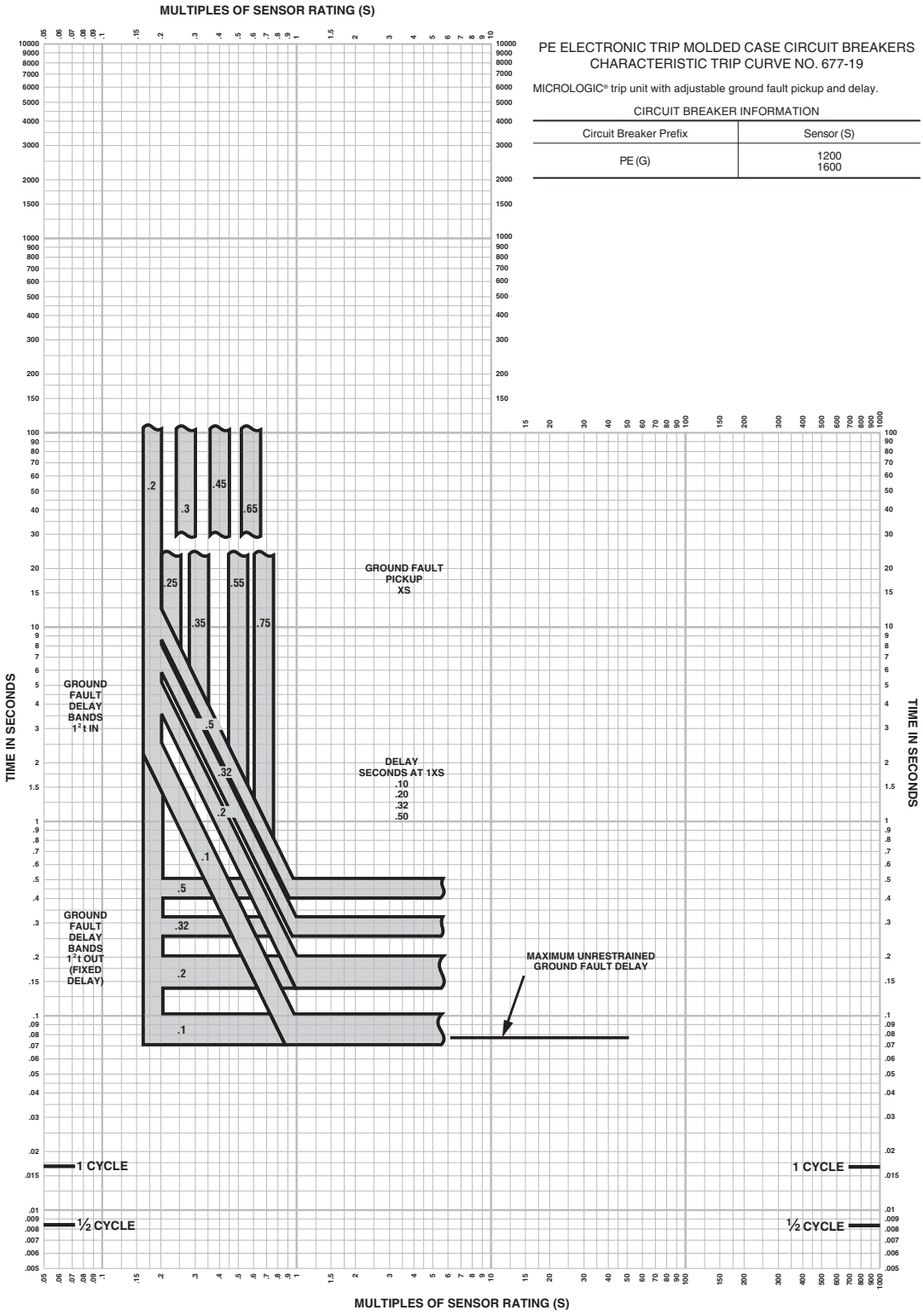
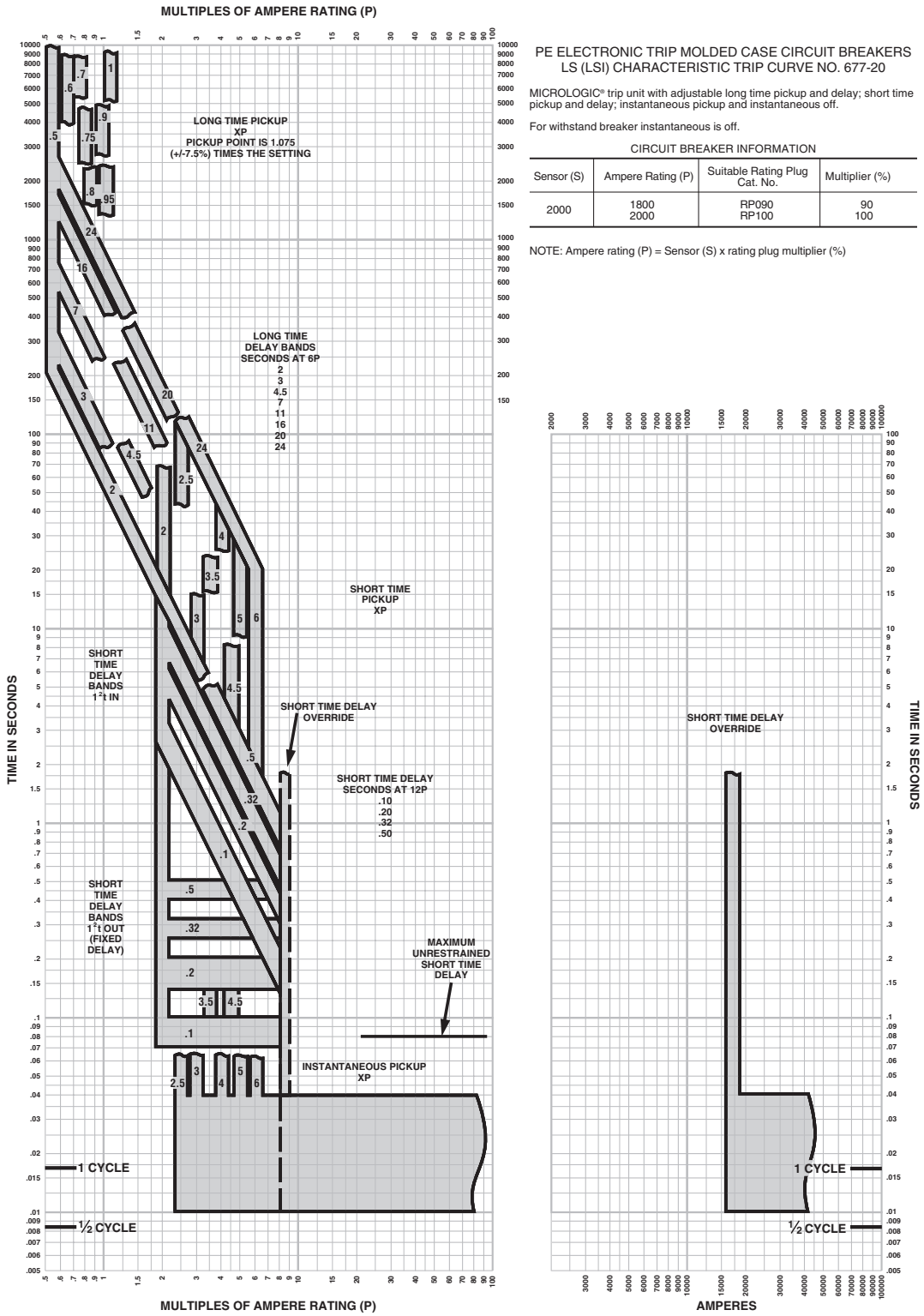


Figure 41. PE 2000 A Sensor LS Circuit Breaker Trip Curve



PE ELECTRONIC TRIP MOLDED CASE CIRCUIT BREAKERS
LS (LSI) CHARACTERISTIC TRIP CURVE NO. 677-20

MICROLOGIC® trip unit with adjustable long time pickup and delay; short time pickup and delay; instantaneous pickup and instantaneous off.

For withstand breaker instantaneous is off.

CIRCUIT BREAKER INFORMATION

Sensor (S)	Ampere Rating (P)	Suitable Rating Plug Cat. No.	Multiplier (%)
2000	1800 2000	RP090 RP100	90 100

NOTE: Ampere rating (P) = Sensor (S) x rating plug multiplier (%)

Figure 42. PE 2000 A Sensor LI Circuit Breaker Trip Curve

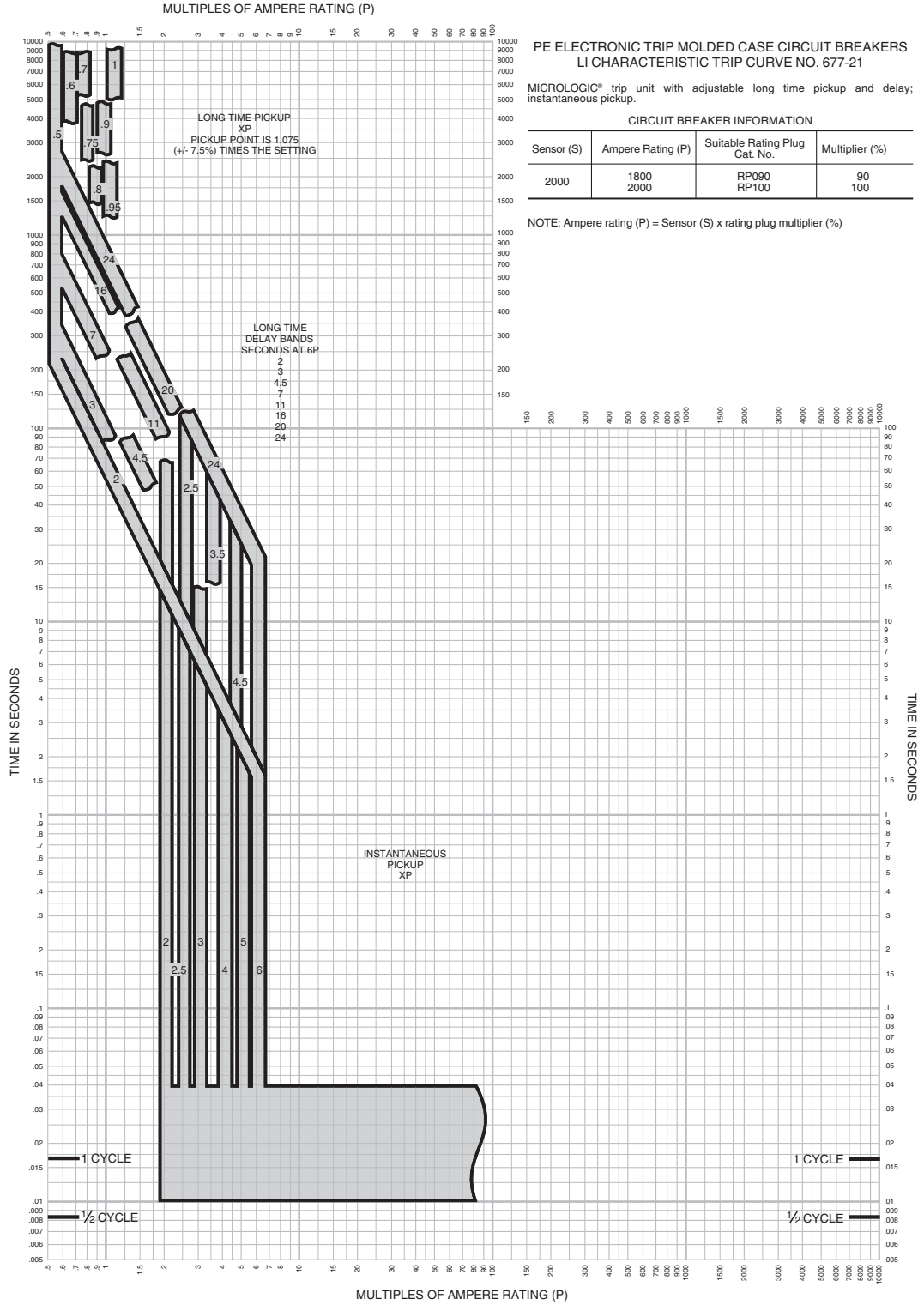
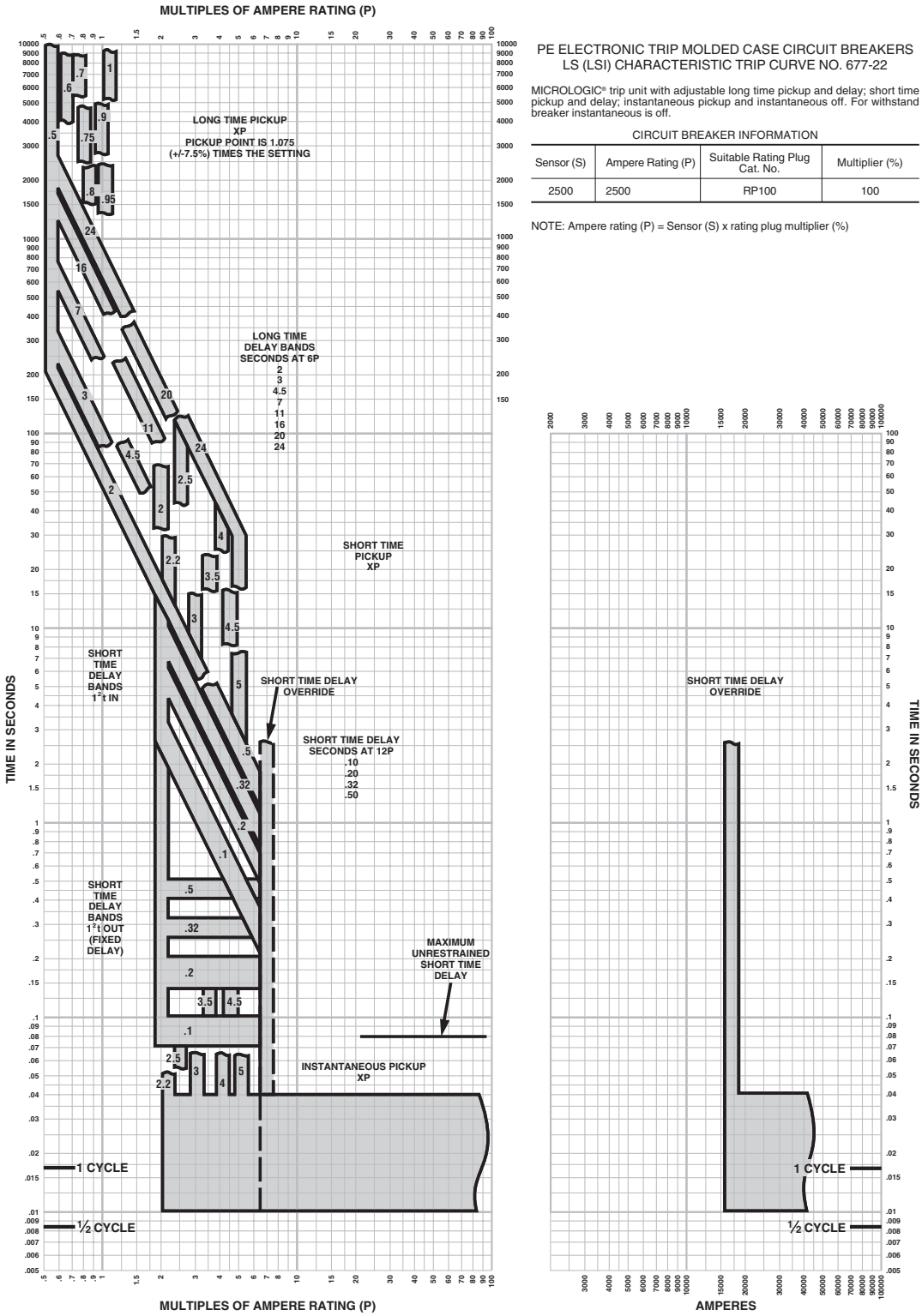


Figure 43. PE 2500 A Sensor LS Circuit Breaker Trip Curve



PE ELECTRONIC TRIP MOLDED CASE CIRCUIT BREAKERS
LS (LSI) CHARACTERISTIC TRIP CURVE NO. 677-22

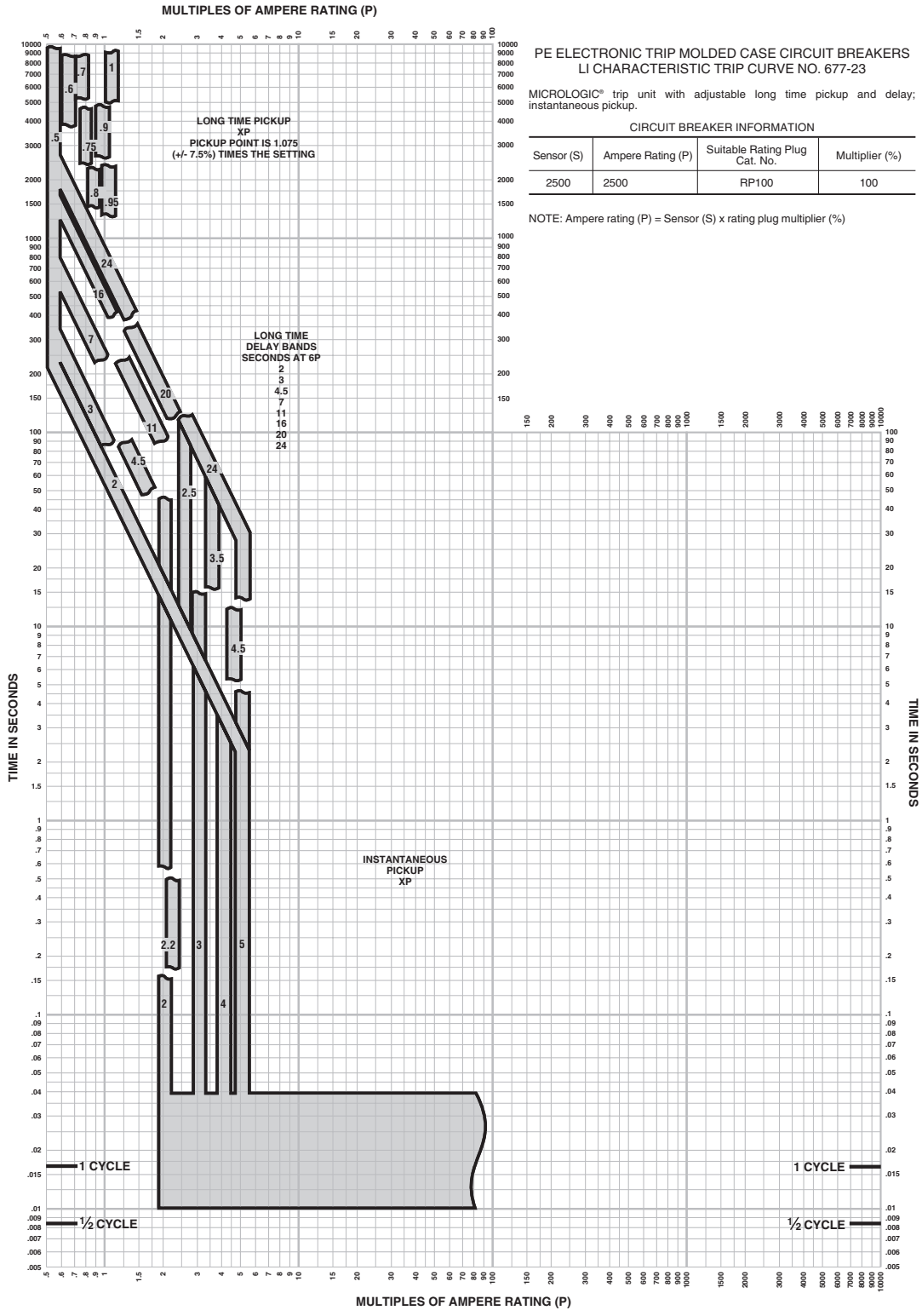
MICROLOGIC® trip unit with adjustable long time pickup and delay; short time pickup and delay; instantaneous pickup and instantaneous off. For withstand breaker instantaneous is off.

CIRCUIT BREAKER INFORMATION

Sensor (S)	Ampere Rating (P)	Suitable Rating Plug Cat. No.	Multiplier (%)
2500	2500	RP100	100

NOTE: Ampere rating (P) = Sensor (S) x rating plug multiplier (%)

Figure 44. PE 2500 A Sensor LI Circuit Breaker Trip Curve



PE ELECTRONIC TRIP MOLDED CASE CIRCUIT BREAKERS
LI CHARACTERISTIC TRIP CURVE NO. 677-23

MICROLOGIC® trip unit with adjustable long time pickup and delay; instantaneous pickup.

CIRCUIT BREAKER INFORMATION

Sensor (S)	Ampere Rating (P)	Suitable Rating Plug Cat. No.	Multiplier (%)
2500	2500	RP100	100

NOTE: Ampere rating (P) = Sensor (S) x rating plug multiplier (%)

Figure 45. PE 2000 A and 2500 A Sensor Ground-Fault Circuit Breaker Trip Curve

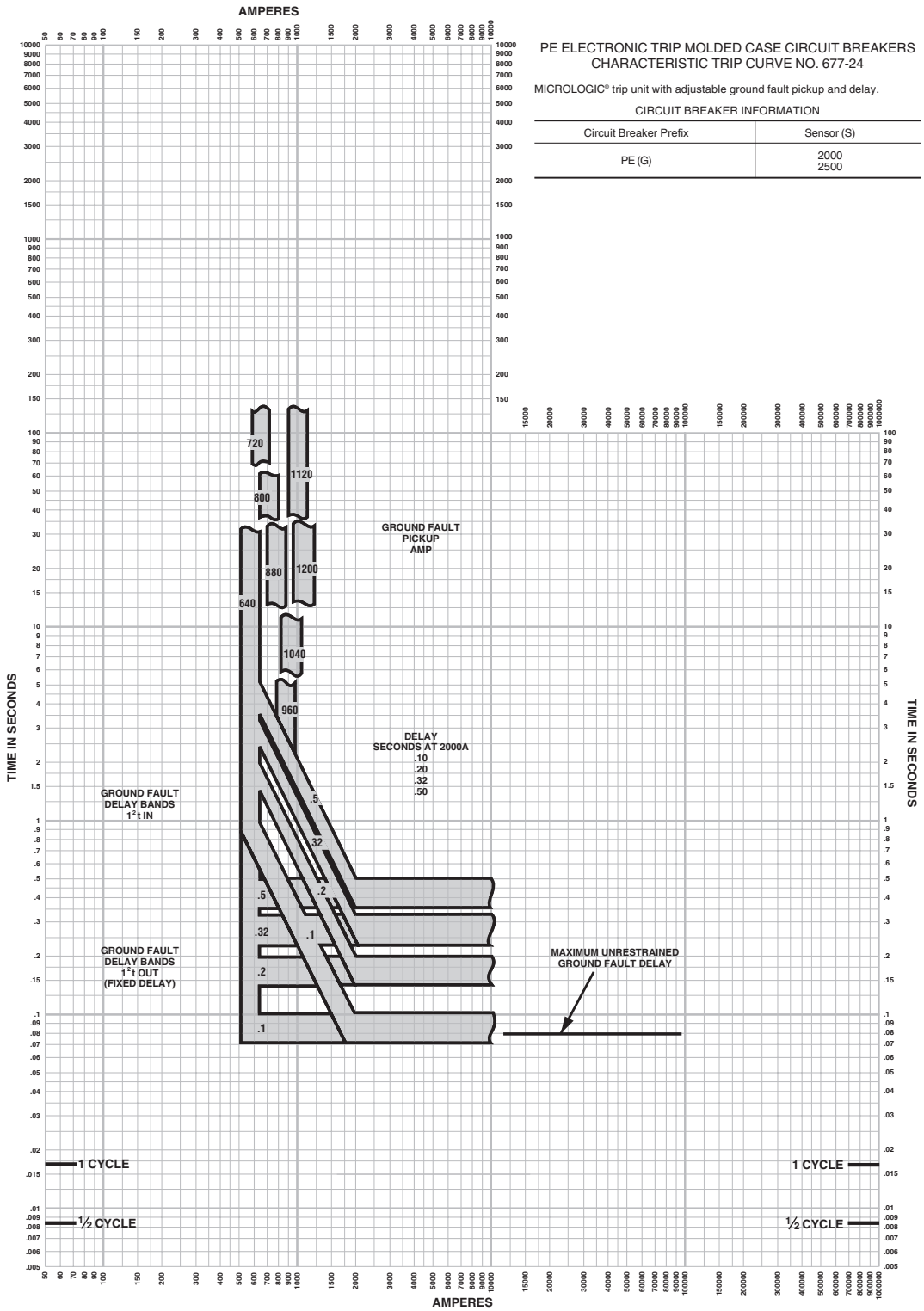
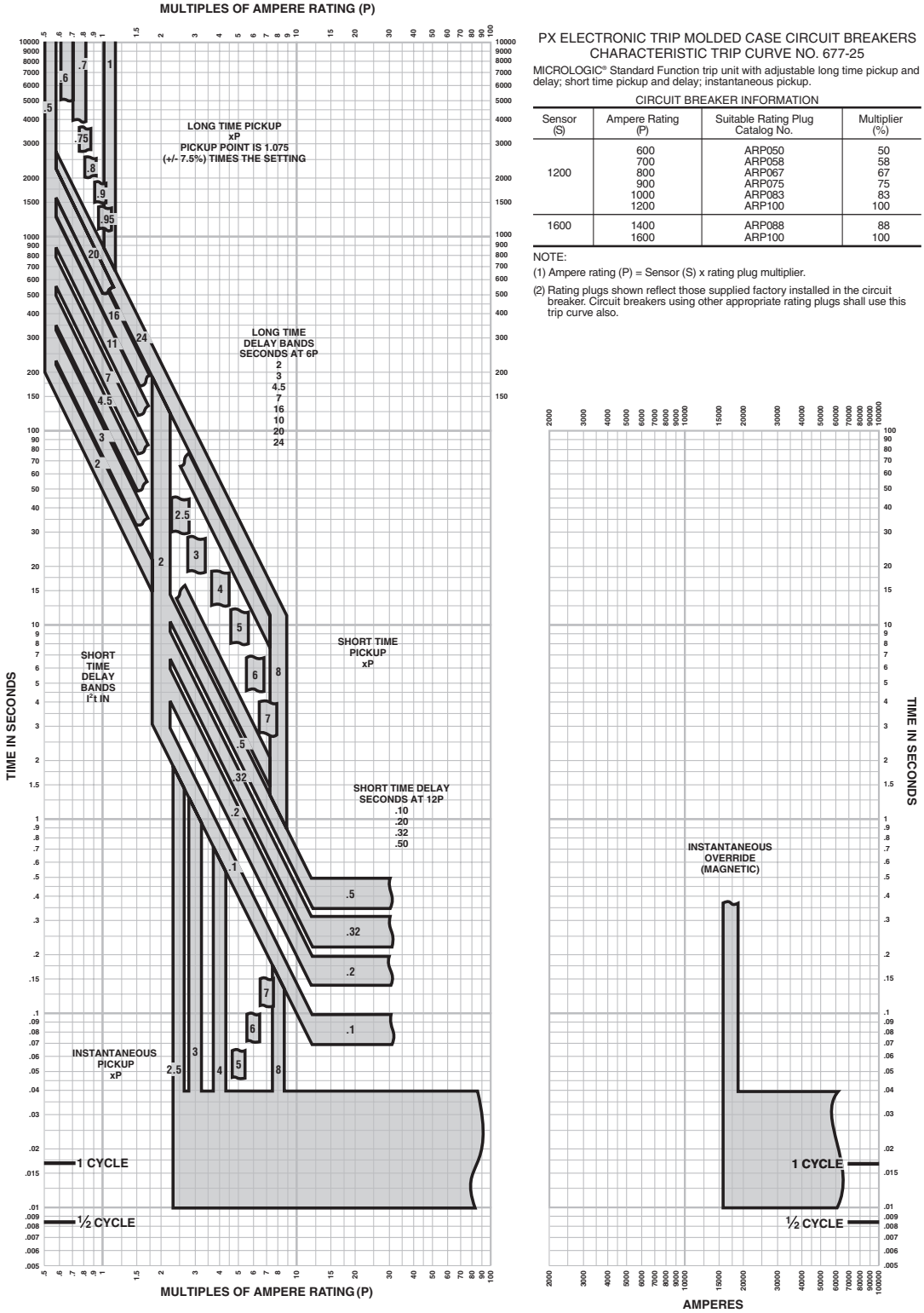


Figure 46. PX 1200 A and 1600 A Sensor Circuit Breaker Trip Curve



PX ELECTRONIC TRIP MOLDED CASE CIRCUIT BREAKERS
CHARACTERISTIC TRIP CURVE NO. 677-25

MICROLOGIC® Standard Function trip unit with adjustable long time pickup and delay; short time pickup and delay; instantaneous pickup.

CIRCUIT BREAKER INFORMATION

Sensor (S)	Ampere Rating (P)	Suitable Rating Plug Catalog No.	Multiplier (%)
1200	600	ARP050	50
	700	ARP058	58
	800	ARP067	67
	900	ARP075	75
	1000	ARP083	83
	1200	ARP100	100
1600	1400	ARP088	88
	1600	ARP100	100

NOTE:

(1) Ampere rating (P) = Sensor (S) x rating plug multiplier.

(2) Rating plugs shown reflect those supplied factory installed in the circuit breaker. Circuit breakers using other appropriate rating plugs shall use this trip curve also.

Figure 47. PX 1200 A and 1600 A Sensor Ground-Fault Circuit Breaker Trip Curve

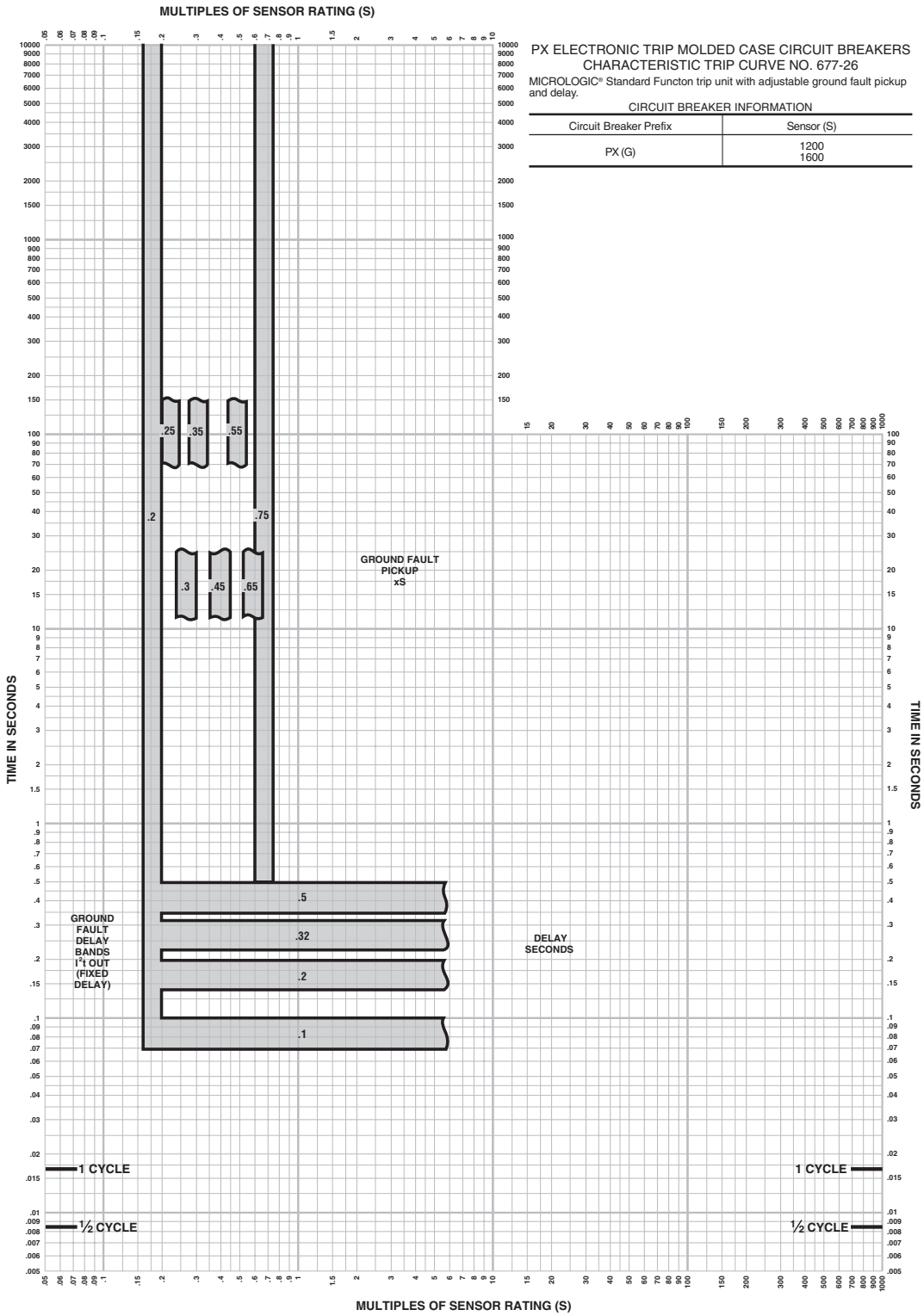
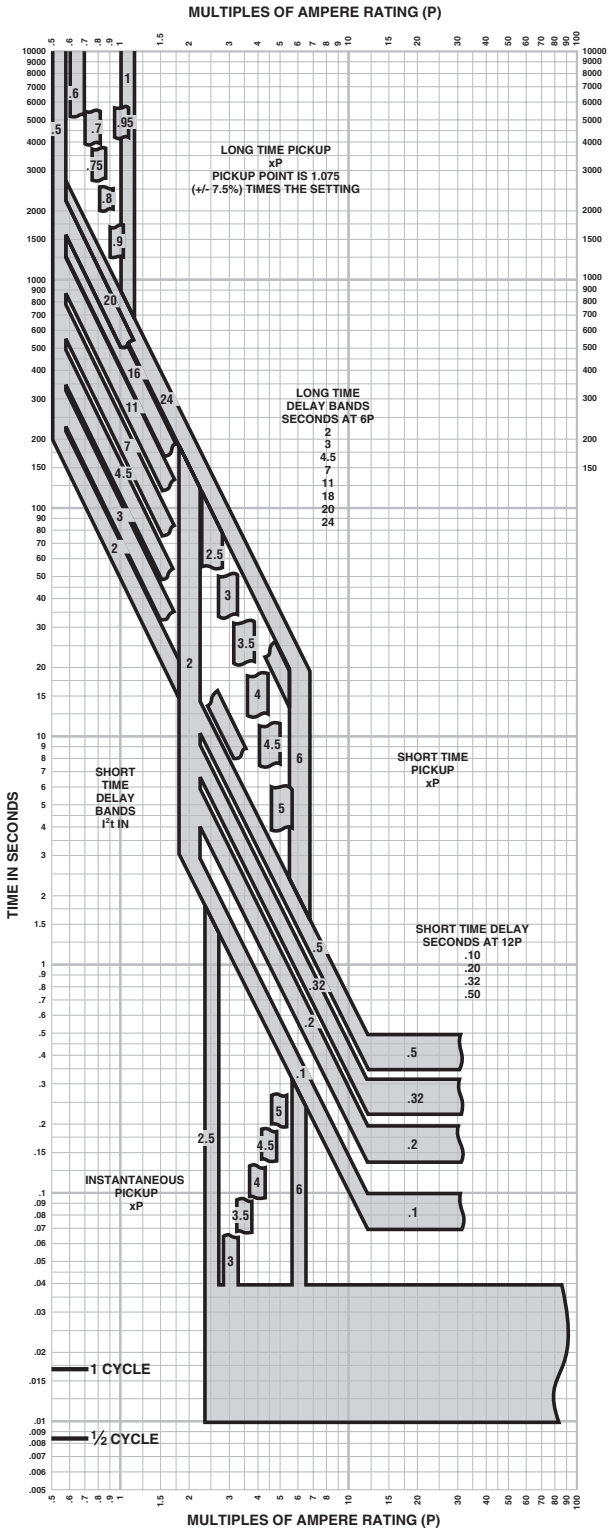


Figure 48. PX 2000 A Sensor Circuit Breaker Trip Curve



PX ELECTRONIC TRIP MOLDED CASE CIRCUIT BREAKERS
CHARACTERISTIC TRIP CURVE NO. 677-27

MICROLOGIC® Standard Function trip unit with adjustable long time pickup and delay; short time pickup and delay; instantaneous pickup.

CIRCUIT BREAKER INFORMATION

Sensor (S)	Ampere Rating (P)	Suitable Rating Plug Catalog No.	Multiplier (%)
2000	1800 2000	ARP088 ARP100	88 100

NOTE:

(1) Ampere rating (P) = Sensor (S) x rating plug multiplier.

(2) Rating plugs shown reflect those supplied factory installed in the circuit breaker. Circuit breakers using other appropriate rating plugs shall use this trip curve also.

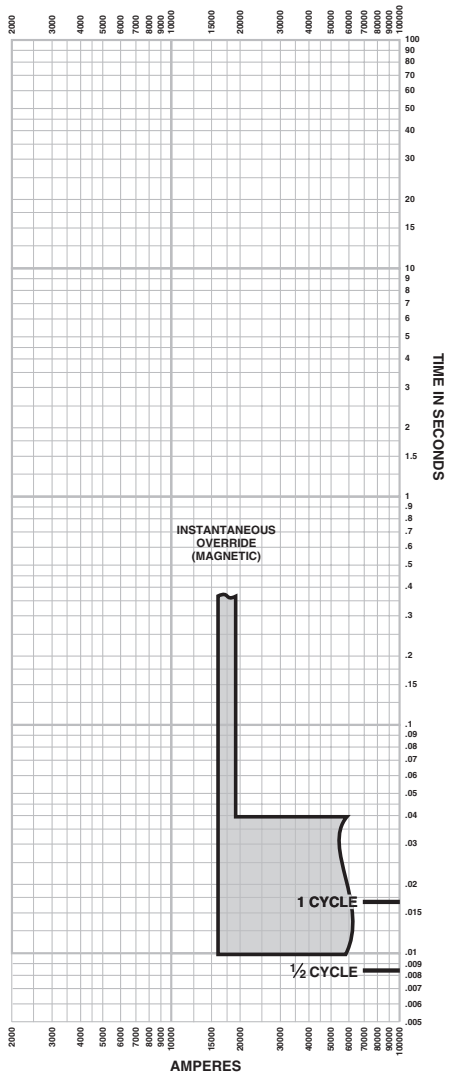


Figure 49. PX 2000 A and 2500 A Sensor Ground-Fault Circuit Breaker Trip Curve

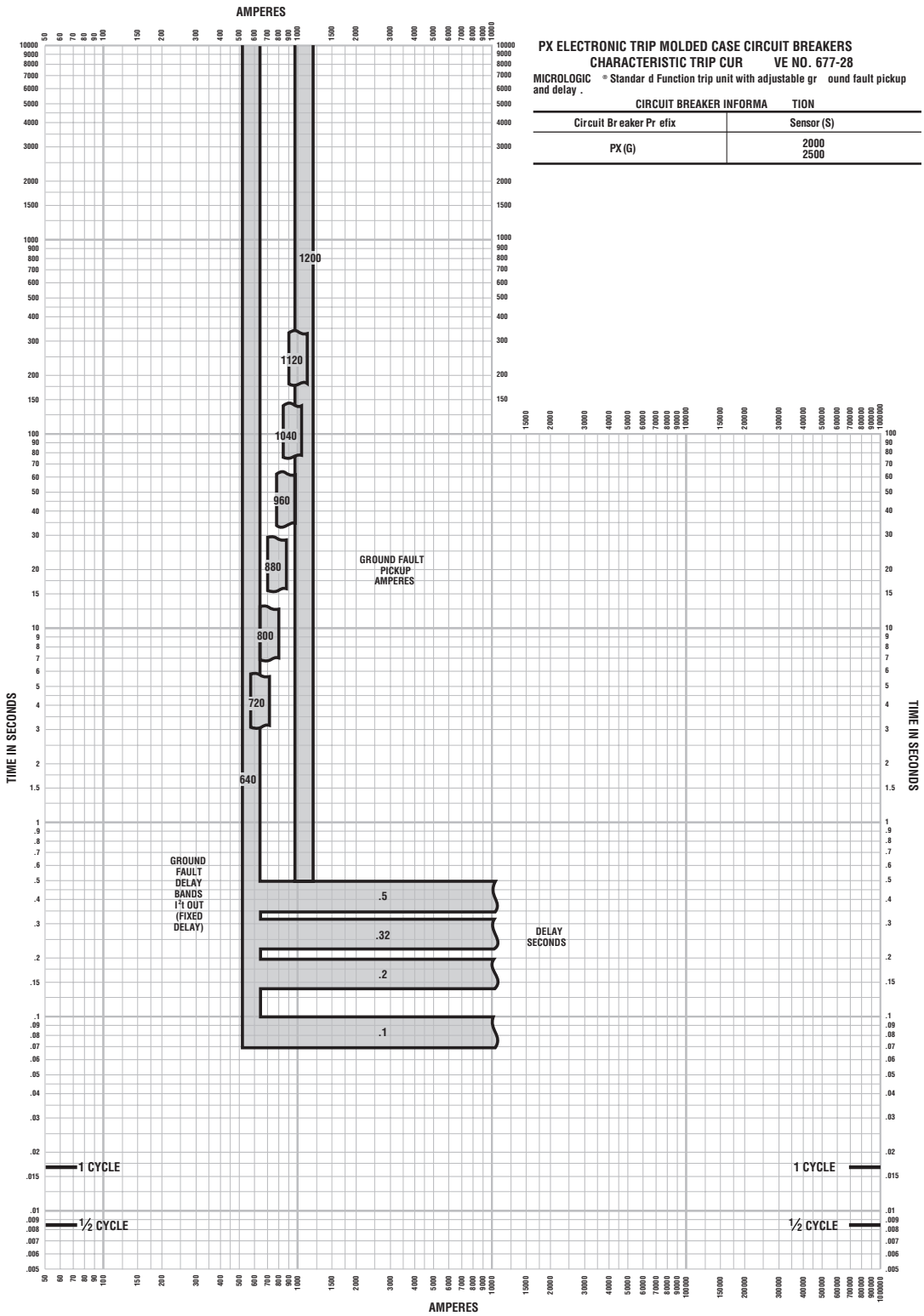
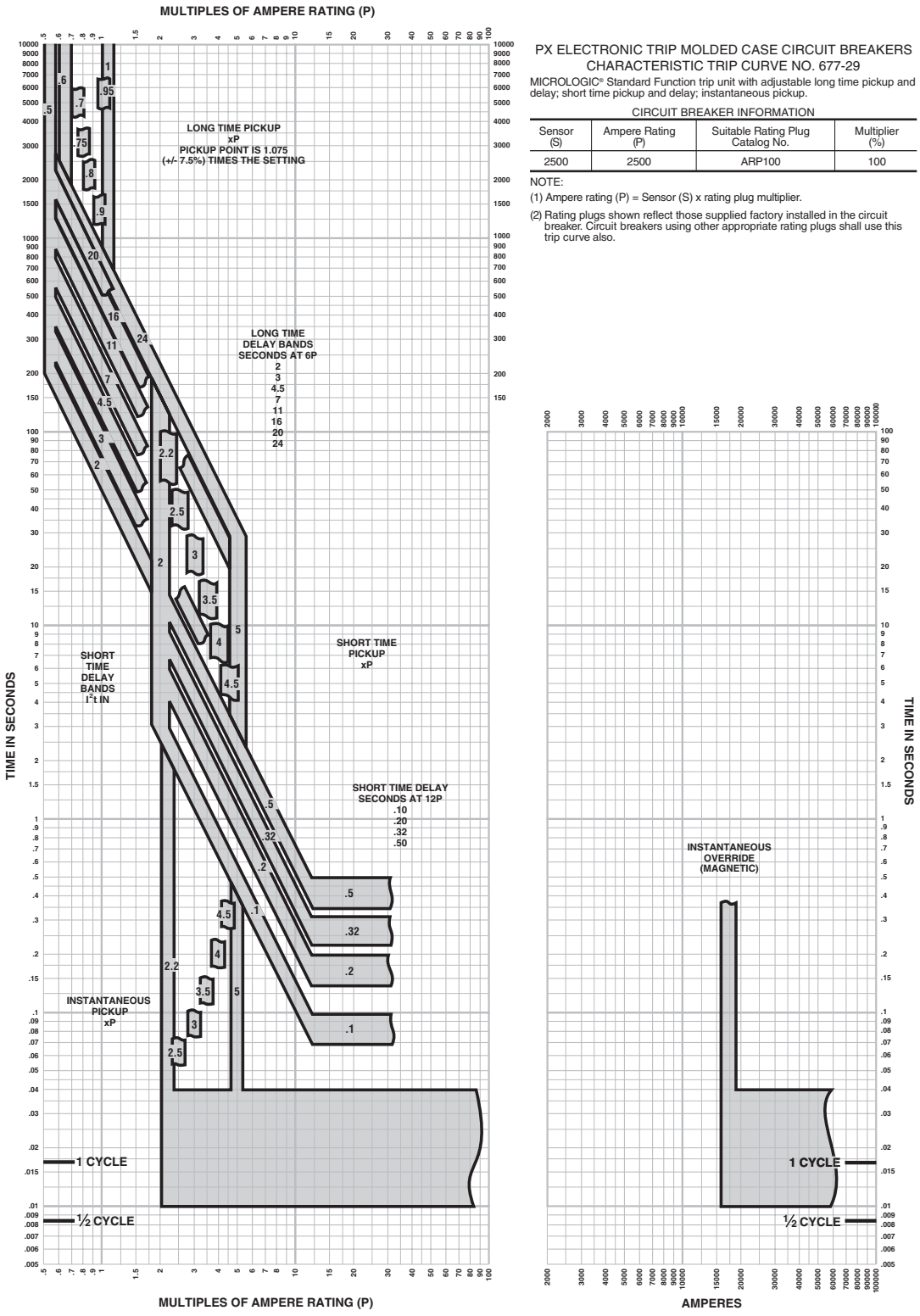


Figure 50. PX 2500 A Sensor Circuit Breaker Trip Curve



PX ELECTRONIC TRIP MOLDED CASE CIRCUIT BREAKERS
CHARACTERISTIC TRIP CURVE NO. 677-29

MICROLOGIC® Standard Function trip unit with adjustable long time pickup and delay; short time pickup and delay; instantaneous pickup.

CIRCUIT BREAKER INFORMATION

Sensor (S)	Ampere Rating (P)	Suitable Rating Plug Catalog No.	Multiplier (%)
2500	2500	ARP100	100

NOTE:

(1) Ampere rating (P) = Sensor (S) x rating plug multiplier.

(2) Rating plugs shown reflect those supplied factory installed in the circuit breaker. Circuit breakers using other appropriate rating plugs shall use this trip curve also.

GLOSSARY

accessory. An electrical or mechanical device that performs a secondary or minor function apart from overcurrent protection.

AIC. *See* **AIR**

AIR. Abbreviation for *amps interrupting rating*.

alarm switch *or* **bell alarm.** A mechanically-operated switch which indicates when a circuit breaker has tripped due to overcurrent conditions.

ambient temperature rating. The temperature of the air immediately surrounding the circuit breaker which can affect the thermal (overload) tripping characteristics of thermal-magnetic circuit breakers. Electronic trip circuit breakers, however, are insensitive to normal (-20 to 50°C) ambient conditions.

ammeter/trip indicator *or* **local current meter/ trip indicator.** A module that mounts directly to the circuit breaker trip unit. The ammeter (current meter) reports rms phase and ground-fault current values as seen by the trip unit. Current values are displayed one phase at a time. The trip indicator displays whether the circuit breaker tripped due to an overload, short-circuit or ground-fault condition.

auxiliary switch. A switch mechanically operated by the main device for signaling, interlocking, or other purposes.

bell alarm. *see* **alarm switch**.

branch circuit. The circuit conductor between the final overcurrent device protecting the circuit and the outlet(s).

circuit breaker. A device designed to open and close a circuit by non-automatic means and to open the circuit automatically on an overcurrent without damage to itself when properly applied within its rating.

circuit breaker frame. The circuit breaker housing which contains the current carrying components, the current sensing components, and the tripping and operating mechanism.

coil clearing switch. A mechanically-operated switch in series with the coil of a shunt trip device which breaks the coil current when the circuit breaker opens.

continuous current rating (handle rating). The designated rms alternating current in amperes which a device or assembly will carry continuously in free air without tripping or exceeding temperature limits.

continuous load. A load where the maximum current on the circuit is expected to continue for three hours or more.

CSA. Canadian Standards Association.

CT. Abbreviation for *current transformer*.

current path. The current-carrying conductors within a circuit breaker between, and including, line and load terminations.

current sensor. *see* **current transformer.**

current transformer *or* **current sensor (CT).** An instrument to measure current, encircling a conductor carrying the current to be measured or controlled.

electrical operator *or* **motor operator.** An electrical controlling device which is used to open and close a circuit breaker or switch and reset a circuit breaker.

electronic trip circuit breaker. A circuit breaker which uses current sensors and electronic circuitry to sense, measure and respond to current levels.

frame size. A group of circuit breakers of similar physical configuration. Frame size is expressed in amperes, corresponding to the largest ampere rating available in the group.

frequency. The number of cycles per second for an alternating current system.

frequency rating. The range of frequencies within which a product can be applied.

ground fault. An unintentional current path, through ground, back to the source.

ground-fault delay. The length of time the circuit breaker trip unit will delay before initiating a trip signal to the circuit breaker after a ground fault has been detected.

ground-fault module. An electronic accessory used in combination with thermal-magnetic circuit breakers to provide branch circuit ground-fault protection and ground-fault indication.

ground-fault pickup. The level of ground-fault current at which the trip system begins timing.

handle rating. See continuous current rating.

IEC. International Electrotechnical Commission

instantaneous pickup. The current level at which the circuit breaker will trip with no intentional time delay.

instantaneous trip. A qualifying term indicating that no delay is purposely introduced in the tripping action of the circuit breaker during short-circuit conditions.

integral ground-fault protection. Equipment ground-fault protection on grounded neutral

systems provided by components internal to the circuit breaker.

interchangeable trip unit. A trip unit which can be interchanged by a user among circuit breaker frames of the same design.

interrupting rating. The highest current at rated voltage available at the incoming terminals of the circuit breaker. When the circuit breaker can be used at more than one voltage, the interrupting rating will be shown on the circuit breaker for each voltage level. The interrupting rating of a circuit breaker must be equal to or greater than the available short-circuit current at the point at which the circuit breaker is applied to the system.

inverse time. A qualifying term indicating there is purposely introduced a delay in the tripping action of the circuit breaker, which delay decreases as the magnitude of the current increases.

I^2t. See let-through.

I^2t IN. An inverse time delay characteristic.

I^2t OUT. A constant time delay characteristic.

let-through (I^2t). An expression related to energy (measured in ampere-squared seconds) which passes through an overcurrent protective device during an interruption.

LI (dual trip device). A combination of adjustable trip functions including long-time ampere rating, long-time delay, and instantaneous pickup.

LIG (dual with ground trip device). A combination of adjustable trip functions including long-time ampere rating, long-time delay, instantaneous pickup, ground-fault pickup and ground-fault delay.

local current meter. See ammeter/trip indicator.

long-time ampere rating. An adjustment which, in combination with the installed rating plug, establishes the continuous current rating of an electronic trip circuit breaker.

long-time delay. The length of time the circuit breaker will carry a sustained overload (greater than the long-time pickup) before initiating a trip signal.

long-time pickup. The current level at which the circuit breaker long-time delay function begins timing.

LS (LSI). A combination of adjustable trip functions including long-time ampere rating, long-time delay, short-time pickup, short-time delay and a defeatable instantaneous pickup.

LSG (LSIG). A combination of adjustable trip functions including long-time ampere rating, long-time delay, short-time pickup, short-time delay, defeatable instantaneous pickup, ground-fault pickup and ground-fault delay.

molded case circuit breaker. A circuit breaker which is assembled as an integral unit in a supportive and enclosed housing of insulating material.

molded case switch. A device designed to open and close a circuit by non-automatic means that is not intended to provide overcurrent protection.

motor operator *or* **electrical operator.** An electrical controlling device which is used to open and close a circuit breaker or switch and reset a circuit breaker.

neutral current transformer. A current transformer which encircles the neutral conductor; required for use with circuit breakers with integral ground-fault protection, when applied on a grounded system.

operating mechanism. An internal mechanical system which opens and closes the circuit breaker contacts.

overcurrent. Any current in excess of the rated continuous current of electrical equipment or the ampacity of a conductor.

overload delay. The length of time the circuit breaker will carry a sustained low-level overcurrent before initiating a trip signal.

peak current sensing. A method of determining the current flowing in a circuit by measuring the peak amplitude of the current wave each half cycle, then calculating the effective rms. (The effective rms value is assumed to equal 0.707 times the measured peak. This results in accurate rms values on pure sinusoidal waveforms only.)

peak let-through. The maximum peak current in a circuit during an overcurrent condition.

push-to-trip button. A button for manually tripping the circuit breaker.

rating plug. A component which plugs into the trip unit, establishing the ampere rating of the circuit breaker.

residual sensing. A means of checking for current imbalance by using a current sensor across each current-carrying conductor to check the magnitude of current flowing in each conductor, then summing all current sensors to check for a current imbalance.

restraint interface module (RIM). A component which allows zone-selective interlocking communication between Square D full-function electronic trip systems, add-on ground-fault modules and zero-sequence ground-fault relays.

RIM. Abbreviation for *restraint interface module*.

rms. Abbreviation for *root-mean-square*.

rms current sensing. A method of determining the true rms current of sinusoidal and non-sinusoidal waveforms by sampling the current

waveform a number of times per cycle, then calculating the true rms value. (Square D circuit breakers sample 33 times per cycle.)

sensor. Current sensing element within a circuit breaker frame. The sensor has a current rating less than or equal to the frame size and provides the sensing function for a specific group of current ratings within the frame size.

short-circuit delay. The length of time the circuit breaker will carry a short circuit (current greater than the short-circuit pickup) before initiating a trip signal.

short-circuit pickup. The current level at which the circuit breaker short-circuit delay function begins timing.

short-time delay. The length of time the circuit breaker will carry a short circuit (current greater than the short-time pickup) before initiating a trip signal.

short-time pickup. The current level at which the circuit breaker short-time delay function begins timing.

shunt trip. An accessory which trips the circuit breaker from a remote location using an external voltage source.

STD. See short-time delay.

terminal block. The connections for control wiring.

thermal-magnetic circuit breaker. A general purpose term for circuit breakers that use bimetals and electromagnetic assemblies to provide both overload and short circuit protection.

trip indicator. A module that mounts directly to the circuit breaker trip unit that displays whether the circuit breaker tripped due to an overload, a short-circuit or a ground-fault condition.

trip indicator reset. A button on the trip indicator module used to reset the trip indicator.

trip system. A system which consists of a MICROLOGIC® trip unit, current transformers, and trip coil.

trip unit. A programmable microprocessor-based device which measures and times current flowing through the circuit breaker and initiates a trip signal when appropriate.

UL®. Underwriters Laboratories® Inc.

undervoltage trip (UVR). An accessory which trips the circuit breaker automatically when the monitored circuit voltage falls below a predetermined percentage of its specified value.

UVR. Abbreviation for *undervoltage trip release*.

withstand rating. The level of rms symmetrical current that a circuit breaker can carry with the contacts in a closed position for a stated period of time (usually described as the number of cycles).

zero-sequence sensing. A means of sensing the current flowing on a circuit by using one current sensor surrounding all current-carrying conductors, then checking for current imbalance in the currents flowing in all directions.

zone-selective interlocking (ZSI). A communication capability between electronic trip systems and ground-fault relays which permits a short circuit or ground fault to be isolated and cleared by the nearest upstream device with no intentional time delay.

ZSI. Abbreviation for *zone-selective interlocking*.

INDEX OF CATALOG NUMBERS

Numerics

A

C

L

M

N

P

R

S

T

U

V

INDEX

Numerics

A

B

C

D

E

F

G

H

I

J

L

M

N

P

R

S

T

U

W

Z

Square D Company
PO Box 3069
3700 Sixth St SW
Cedar Rapids, IA 52406-3069 USA
1-888-SquareD (1-888-778-2733)
www.SquareD.com

Catalog No. 0602CT9201R1/02 June 2002 Replaces 0602CT9201R11/97