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QO® and QOB Miniature Circuit Breakers

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2008
Class 730



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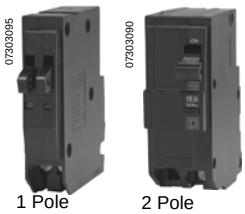
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General Information

QO® and QOB Circuit Breakers



QO® (plug-on) and QOB (bolt-on) one-, two- and three-pole thermal-magnetic circuit breakers provide overcurrent protection and switching on ac and dc systems. Plug-on QO circuit breakers are for use in QO load centers, NQ and NQOD panelboards, OEM mounting bases, and Speed-D® switchboard distribution panels. Bolt-on QOB circuit breakers are for use in NQO and NQOD panelboards.

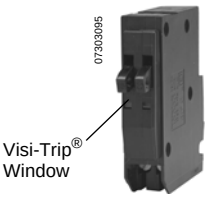
Operating mechanism



QO Circuit Breakers

QO and QOB circuit breakers have an overcenter, trip-free toggle mechanism with quick-make, quick-break action and positive handle indication. The tripping mechanisms in two-and three-pole circuit breakers operate such that an overcurrent on any pole of the circuit breaker will cause all poles of the circuit breaker to open simultaneously. Each pole has an individual thermal-magnetic trip element calibrated for 40°C ambient temperature.

Trip Indication



QO and QOB circuit breakers have Visi-Trip® trip indication, which provides a visual indication that the circuit breaker has tripped and interrupted the circuit. When the circuit breaker has tripped, the handle assumes a center position and the red Visi-Trip indicator appears in a window in the circuit breaker case. The Visi-Trip indicator is only visible when the circuit breaker has tripped. Trip indication immediately distinguishes the circuit from any other circuit which is merely in the on or off position. The circuit breaker can be reset by pushing the handle to OFF and then to ON.

Construction Standards

QO and QOB circuit breakers are built to comply with UL Standard 489, CSA 22.2 No. 5, NOM/ANCE and NEMA Standard AB1 and to meet Federal Specification W-C-375B/GEN. QO circuit breakers are UL Listed under UL File E84967 and are CSA Certified under CSA Master Contract 153555.

QO Circuit Breaker	UL Type
QO280–QO210	QOA, QOB
QO2110–QO2125	QOC, QOCB
QO2150–QO2200	QOC (no bolt-on version)

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Ratings

When designing an electrical distribution system, overcurrent protective devices are generally selected based on performance requirements. Factors influencing this selection include system voltage, continuous current, interrupting rating, and frequency.

Voltage Rating

The circuit breaker must have a voltage rating greater than, or equal to, the system voltage. When a circuit breaker clears an overcurrent, it is done in two steps. First, the current sensing system identifies the overcurrent and releases the tripping mechanism. This results in a parting of the contacts. The circuit breaker must then extinguish the voltage arc across the contacts. If the circuit breaker has the correct voltage rating, it can efficiently extinguish this voltage arc. QO and QOB circuit breakers are rated for use in the following voltage systems:

- 120 Vac
- 208/120 Vac
- 120/240 Vac
- 240 Vac
- 48 Vdc (10–70 A for 1 and 2 pole circuit breakers, 10–60 A for 3 pole circuit breakers)

Continuous Current Rating

The continuous current rating of a circuit breaker is the maximum current in amperes (dc or rms ac at rated frequency) which a device will carry continuously without exceeding the specified allowable temperature rise. Sometimes referred to as the ampere rating or handle rating of the circuit breaker, the continuous current rating relates to the system current flow under normal conditions.

UL and CSA require that circuit breakers must be able to carry their continuous current rating indefinitely at 40°C in free air in order to achieve a UL Listing/CSA Certification. The National Electrical Code (NEC) and the Canadian Electrical Code (CEC) recognize that devices applied in end-use equipment can be affected by heat build up during normal operating conditions. For this reason, the codes require that circuit breakers be selected based on the characteristics of the load (particularly, the portion of the load which will be on continuously for three hours or more at a time).

Frequency Rating

The standard rated frequency for circuit breakers is 60 Hz. Circuit breakers are also rated for dc applications as shown in Table 1. Many Square D circuit breakers can also be applied on 50 Hz systems without derating. GFCI, AFCI and EPD devices are rated for 60 Hz operation only. Frequencies can affect the thermal, magnetic and short-circuit characteristics of circuit breakers. See Data Bulletin 0100DB0101 *Determining Current Carrying Capacity in Special Applications*. Contact the Field Sales office before applying circuit breakers on systems at frequencies other than 50/60 Hz.

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Interrupting Rating

The interrupting rating of a circuit breaker is the highest current at rated voltage that the circuit breaker is intended to interrupt under standard test conditions. A circuit breaker must be chosen so that the interrupting rating is equal to or greater than the maximum available short-circuit current at the point where the circuit breaker is applied in the system.

Table 1: Interrupting Ratings

Circuit Breaker Type	Number of Poles	Ampere Rating	UL Listed Interrupting Rating[1]			
			120 Vac	120/240 Vac	240 Vac	48 Vdc[2]
QO	1	10–70 A	10 kA	10 kA	—	5 kA
	2	10–70 A	10 kA	10 kA	10 kA	5 kA
		80–100 A	10 kA	10 kA	10 kA	—
		110—200 A	10 kA	10 kA	—	—
	3	15–60 A	10 kA	10 kA	10 kA	5 kA
		70–100 A	10 kA	10 kA	10 kA	—
QOB	1	10–70 A	10 kA	10 kA	—	5 kA
	2	10–70 A	10 kA	10 kA	10 kA	5 kA
		80–100 A	10 kA	10 kA	10 kA	—
		110—125 A	10 kA	10 kA	—	—
	3	15–60 A	10 kA	10 kA	10 kA	5 kA
		70–100 A	10 kA	10 kA	10 kA	—
QO-H, QOB-H	2	15–100 A	10 kA[3]	10 kA[3]	10 kA[3]	—
QO-VH	1	15–30 A	22 kA	22 kA	—	—
	2	15–200 A	22 kA	22 kA	—	—
	3	15–100 A	22 kA	22 kA	22 kA	—
QOB-VH	1	15–30 A	22 kA	22 kA	—	—
	2	15–125 A	22 kA	22 kA	—	—
	3	15–150 A	22 kA	22 kA	22 kA	—
QOH	1	40–125 A	42 kA	42 kA	—	—
QH, QHB	1	15–30 A	65 kA	65 kA	—	—
	2	15–30 A	65 kA	65 kA	—	—
	3	15–30 A	65 kA	65 kA	65 kA	—
QO-GFI, QOB-GFI	1	15–30 A	10 kA	—	—	—
	2	15–60 A	10 kA	10 kA	—	—
QO-VHGFI, QOB-GFI	1	15–30 A	22 kA	—	—	—
QO-AFI, QOB-AFI	1	15–30 A	10 kA	—	—	—
QO-CAFI, QOB-CAFI	1	15–30 A	10 kA	—	—	—
QO-VHCAFI, QOB-VHCAFI	1	15–30 A	22 kA	—	—	—
QO-EPD, QOB-EPD	1	15–30 A	10 kA	—	—	—
	2	15–60 A	10 kA	10 kA	—	—
QO-PL	1	15–30 A	10 kA	10 kA	10 kA	—
	2	15–30 A	10 kA	10 kA	10 kA	—
	3	15–30 A	10 kA	10 kA	10 kA	—

1 10 kA and 5 kA are 1Ø-3Ø.

2 DC ratings do not apply to circuit breakers rated 10 A.

3 UL Listed 5,000 AIR on 3Ø grounded B-Phase Delta system.

DC Voltage Rating

QO and QOB circuit breakers are available with a UL Listed 48 Vdc rating. See Table 1. Refer to Square D Data Bulletin 0601DB0401 for additional information on dc-rated circuit breakers.

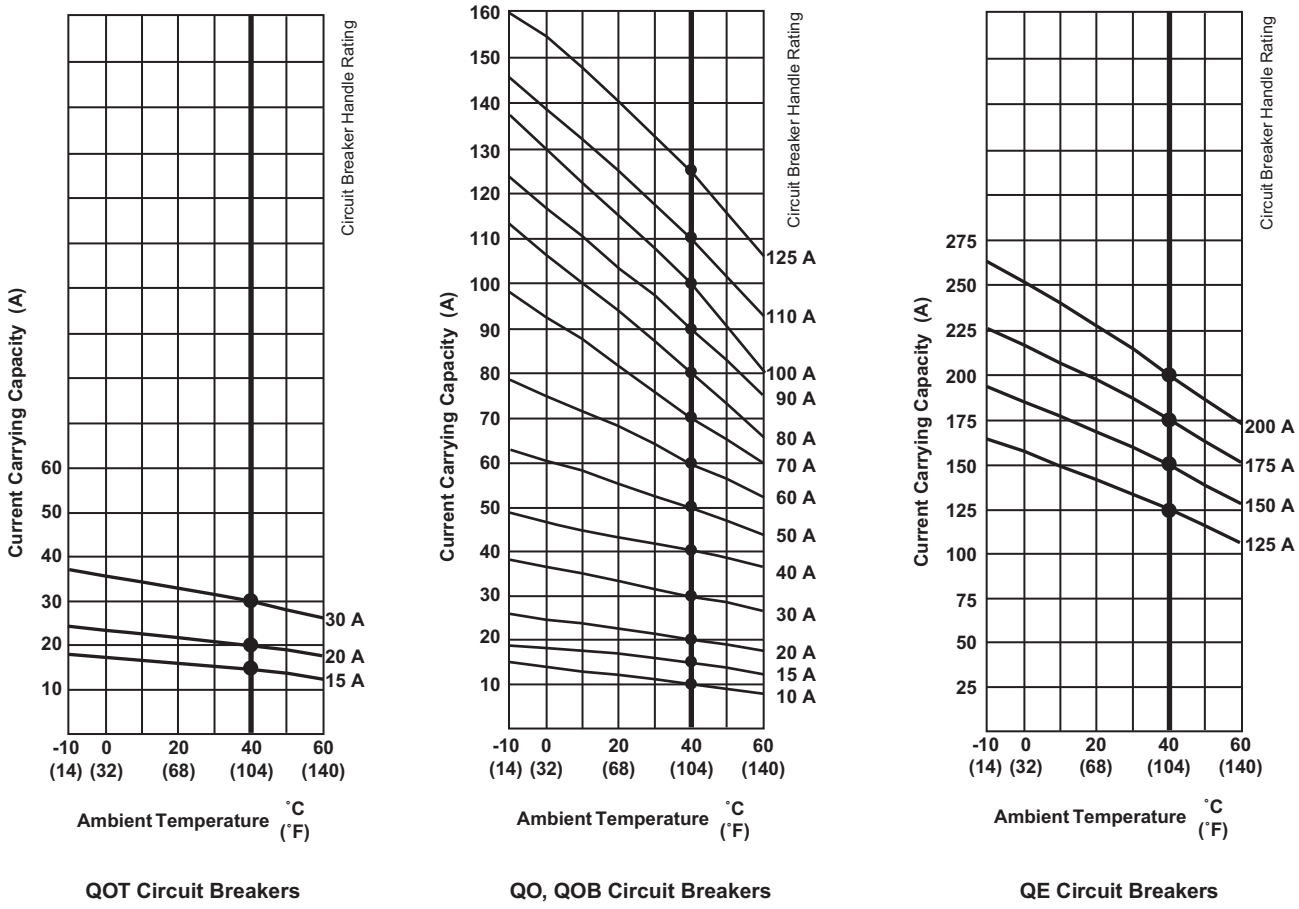
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Temperature Rating

To meet the requirements of Underwriters Laboratories Standard 489, molded case circuit breakers are designed, built, and calibrated for us on 60 Hz ac systems in 40°C (104°F) ambient temperature. When applied at ambient temperatures other than 40°C, the current-carrying capacity and/or trip charasteristics of the circuit breaker may vary.

Figure 1: Ambient Rerating Curves



QOT Circuit Breakers | QO, QOB Circuit Breakers | QE Circuit Breakers

IEC Rating

IEC rated QO circuit breakers are available. For further information contact the Field Sales office.

Terminology

HACR

HACR is a term used to designate circuit breakers which have been certified to be used on multi-motor and combination loads such as are found in heating, air conditioning and refrigeration equipment. QO circuit breakers meet the UL requirements for HACR circuit breakers and are suitable for group motor applications requiring HACR listing.

This means that QO and QOB circuit breakers meet the code requirements that HACR circuit breaker must be of the inverse time type and be approved for group installation. QO and QOB circuit breakers, except for GFI, AFI and EPD, are Listed with UL as HACR Type and are labeled accordingly.

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Switching Duty (SWD) Circuit Breakers

QO and QOB circuit breakers are suitable for switching 120 Vac fluorescent lighting loads. The switching duty (SWD) listing applies only to one-pole 15 and 20 A circuit breakers rated at 347 Vac or less. The circuit breakers are subjected to specified temperature rise tests at predetermined periods during the endurance operations.

Terminations

The 10–30 A circuit breakers have pressure plate terminals suitable for single or two-wire terminations. Copper or aluminum conductors may be used as outlined in Table 2. QO-GFI 15–30 A and QO-AFI circuit breakers have pressure plate terminals suitable for single-wire terminations. These circuit breakers are suitable for use with 60°C or 75°C conductors.

The QO 35–200 A and all QO-PL and QOT tandem circuit breakers have box-type lugs suitable for single-wire terminations. These circuit breakers are suitable for use with 75°C conductors.

Table 2: Terminations

Circuit Breaker Types	Rating	Wire Size
QO, QOB, QO-VH, QOB-VH	10–30 A	(1) 14–8 AWG (1.5–3.3 mm^2) Al/Cu (2) 14–10 AWG (1.5–2.6 mm^2) Cu
	35–70 A	(1) 8–2 AWG (3.3–6.5 mm^2) Al/Cu
	80–125 A	(1) 4–2/0 AWG (5.2–9.3 mm^2) Al/Cu
QO, QOB, QO-VH	150–200 A	(1) 4 AWG–300 kcmil (5.2–50 mm^2) Al/Cu
QOB-VH	110–175 A	(1) 4 AWG–300 kcmil (5.2–50 mm^2) Al/Cu
QOT	15–20 A	(1) 12–8 AWG (2.0–3.3 mm^2) Al (1) 14–8 AWG (1.6–3.3 mm^2) Cu
QO-CAFI, QO-AFI, QO-GFI, QO-EPD, QOB-CAFI, QOB-AFI, QOB-GFI, QOB-EPD	15–30 A	(1) 12–8 AWG (2.0–3.3 mm^2) Al (1) 14–8 AWG (1.6–3.3 mm^2) Cu
QO-GFI, QO-EPD, QOB-GFI, QOB-EPD	40–60 A	(1) 12–4 AWG (2.0–4.1 mm^2) Al (1) 14–6 AWG (1.6–4.1 mm^2) Cu
QO-PL	10–60 A	(1) 12–2 AWG (2.0–6.5 mm^2) Al

Special Application Circuit Breakers

There are several special application circuit breakers in the QO family:

- QO-HM and QOB-HM High-Magnetic Circuit Breakers
- QO-HID and QOB-HID Circuit Breakers
- QO and QOB Miniature Switches
- QOK and QOBK Key-Operated Circuit Breakers
- QO-GFI and QOB-GFI Qwik-Gard® Circuit Breakers
- QO-EPD and QOB-EPD Equipment Protection Devices
- QO-SWN and QOB-SWN Switch Neutral Circuit Breakers
- QOT Tandem Circuit Breakers
- QO-PL and QOB-PL Powerlink® Circuit Breakers
- QO-AFI and QOB-AFI Branch Feeder Arc-Fault Circuit Interrupters (AFCI)
- QO-CAFI, QOB-CAFI Combination Arc-Fault Circuit Interrupters (AFCI)

This following sections describe the special application circuit breakers and provides application information for their use.

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QO-HM and QOB-HM High Magnetic Circuit Breakers

QO-HM and QOB-HM high-magnetic circuit breakers are recommended for area lighting (such as athletic fields, parking lots, and outdoor signs), when using lamps of inherent high inrush current, individual dimmer applications or other applications where high inrush currents exceed standard tripping conditions. These circuit breakers are available in one-pole 15 and 20 A ratings only. QO-HM and QOB-HM circuit breakers are physically interchangeable with standard QO and QOB circuit breakers and accommodate the complete range of QO accessories.

QO-HM and QOB-HM circuit breakers are manufactured with the magnetic trip point calibrated at a much higher level than standard QO and QOB circuit beakers, as shown in Table 3.

Table 3: QO-HM and QOB-HM Circuit Breaker Magnetic Hold Levels

Continuous Current Rating	Maximum Full Cycle Magnetic Hold Level
15 A	315–525 A
20 A	322–537 A

QO-HID and QOB-HID High Intensity Discharge Circuit Breakers

QO-HID and QOB-HID circuit breakers are for use in high intensity discharge (HID) lighting systems, such as systems using mercury vapor, metal halide or high-pressure sodium lighting units. These circuit breakers are designed to handle the high inductive loads, harmonic currents and cycling which are inherent in HID lighting systems. QO-HID and QOB-HID circuit breakers are physically interchangeable with standard QO circuit breakers and accommodate the complete range of QO accessories.

QO-HID and QOB-HID circuit breakers are manufactured with larger contacts than standard QO and QOB circuit breakers to allow switching of high inductive loads. They also have magnetic characteristics similar to QO-HM and QOB-HM high-magnetic circuit breakers to allow the circuit breaker to hold in against the high starting inrush currents which are typical in HID lighting systems.

QO and QOB Miniature Switches

Miniature switches are intended for use as disconnecting devices only. They provide no overcurrent protection. QO and QOB switches are UL Certified for use on circuits capable of delivering not more than 10 kA when protected by an equivalent rated circuit breaker or fuse. These switches are available in 60 and 100 A rating.

QO and QOB switches are available with auxiliary switches only. (Shunt trip and bell alarm electrical accessories are not available on QO and QOB miniature switches.) QO and QOB switches are available with the complete range of handle accessories.

QOK and QOBK Key-Operated Circuit Breakers



1P QOK
Circuit Breaker

Key-operated QOK and QOBK circuit breakers provide an alternative means for turning a circuit breaker ON or OFF, as well as for resetting a tripped circuit breaker. The circuit breaker is turned on, off or reset with a special key included with the circuit breaker. Key-operated circuit breakers are available in one-pole construction only and can be mounted in any one-pole space which will accept a standard QO circuit breaker. These circuit breakers are available in 10–30 A ratings, with interrupting ratings of 10 kA at 120 Vac.

Replacement keys are available separately. Factory-installed or field-installable accessories are not available on key-operated circuit breakers.

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1P QO-GFI
Circuit Breaker



2P QO-GFI
Circuit Breaker

QO-GFI and QOB-GFI Qwik-Gard® Ground-Fault Circuit Interrupters

Qwik-Gard® Ground-Fault Circuit Interrupters offer a means of providing ground-fault protection for people. Qwik-Gard “people protection” ground-fault circuit interrupters are built as Class A devices in accordance with UL Standard 489 and CSA C22.2 #144 for ground-fault circuit interrupters (GFCIs). Class A devices must trip at 6 milliamperes of ground-fault current and above, and hold below 4 milliamperes of ground-fault current.

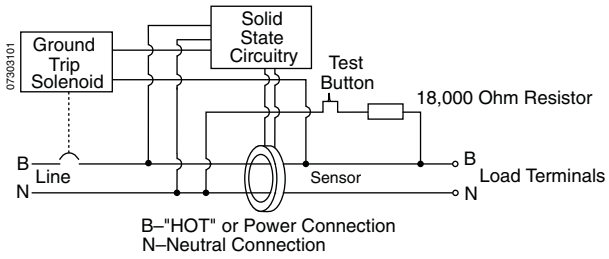
Qwik-Gard GFCIs provide the same branch circuit protection as standard QO circuit breakers. They are longer than standard QO circuit breakers, and thus require more gutter space. All QO electrical accessories except shunt trip and all QO mechanical accessories are available for QO-GFI and QOB-GFI circuit breakers.

Qwik-Gard circuit breakers are UL Listed and CSA Certified and available in both one- and two-pole constructions.

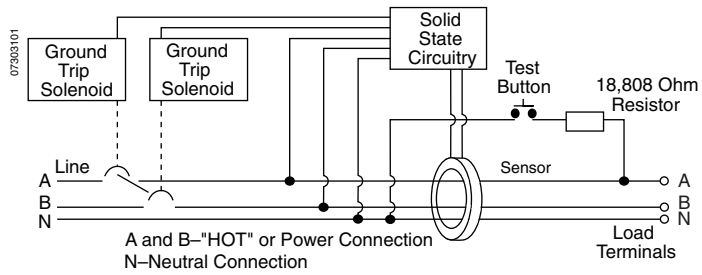
Qwik-Gard Ground-Fault Circuit Interrupter Operation

The ground-fault sensor in a Qwik-Gard GFCI continuously monitors the current flow in the load and neutral conductors. The sensor compares the current flow in all directions. If the current flowing back to the source is less than the current flowing out to the load, a ground fault exists. When the difference in current flow exceeds 6 milliamperes, the sensor sends a signal to trip the GFCI. The trip will be indicated by the Visi-Trip® indicator and the operating handle will move to the center tripped position.

Qwik-Gard Class A GFCIs include a self-contained means of testing the ground-fault circuitry. If the GFCI is connected correctly, with the pigtail connected to the neutral assembly in the load center or panelboard, pressing the test button will trip the GFCI and show a trip indication. UL requires that GFCIs must be operational at 85% of the rated voltage.



One-Pole Qwik-Gard Circuit Breaker



Two-Pole Qwik-Gard Circuit Breaker

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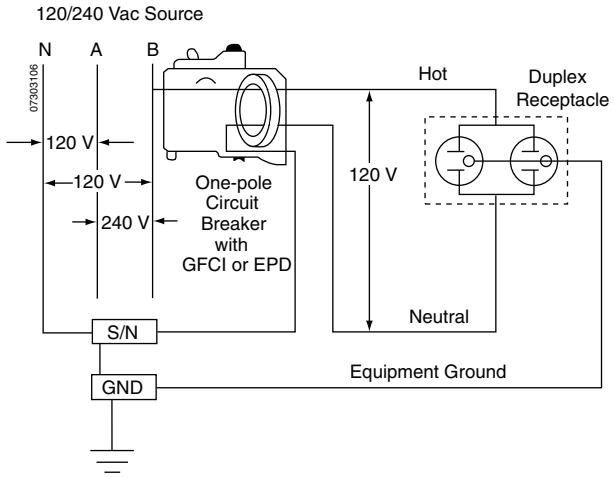
Proper Application of Qwik-Gard GFCIs

- Do not connect to swimming pool equipment installed before adoption of the 1965 National Electric Code
- Do not connect to electrical ranges or clothes dryers whose frames are grounded by a connection to the grounded circuit conductor.
- Do not use as a main circuit breaker in a panelboard or in reverse connected (backfed) applications.
- Do not megger, high-voltage or hi-pot test. Any voltage in excess of 240 Vac will damage the GFCI electronics so that the circuit breaker will not protect against low-level ground faults.
- Must be located no more than 250 ft. (76 m) from the load being served.
- RequiresS the same mounting space as standard QO circuit breakers.

One-Pole Qwik-Gard Ground-Fault Circuit Interrupters

One-pole Qwik-Gard GFCIs must be installed on independent circuits. Circuits which have a neutral common to more than one panel circuit conductor cannot be protected against ground faults by a one-pole GFCI because the current returning to the source through the neutral cannot be effectively split to prevent the Qwik-Gard GFCI from tripping under normal use.

Figure 2: Typical One-Pole Qwik-Gard GFCI Wiring



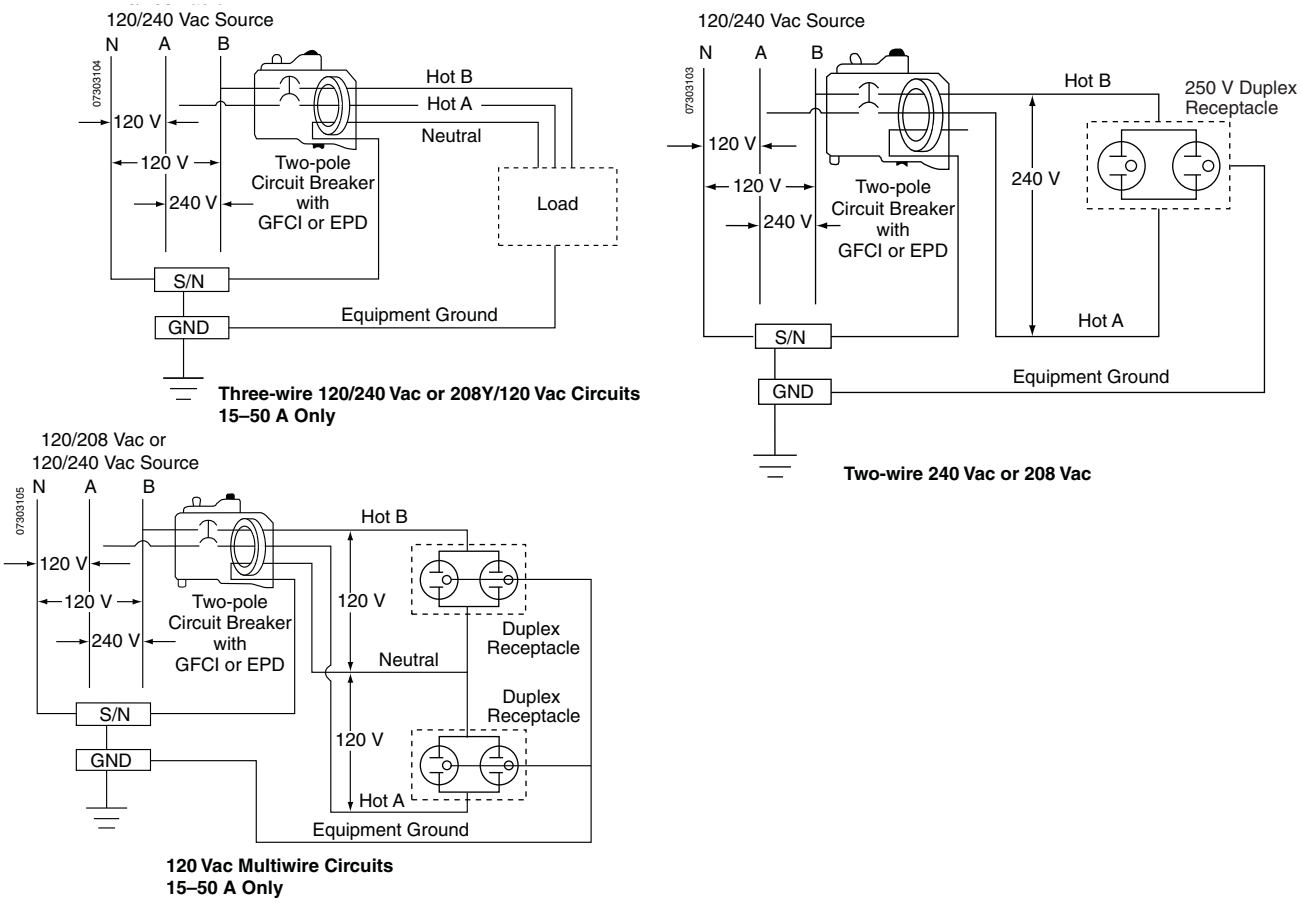
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Two-Pole Qwik-Gard GFCIs

Two-pole Qwik-Gard GFCIs can be installed on a 120/240 Vac 1Ø3W system, the 120/240 Vac portion of a 120/240 Vac 3Ø4W system, or two phases and neutral of a 208Y/120 Vac 3Ø4W system. Regardless of the application, connections must be made to two “hot” busses and the panel neutral assembly. When installed on these systems, protection is provided for two-wire 240 Vac or 208 Vac circuit, three-wire 120/240 Vac or 208Y/120 Vac circuits and 120 Vac multiwire circuits.

The 60 A QO260GFI and QOB260GFI GFCIs are limited for use on 208 Vac and 240 Vac two-wire systems. These GFCIs require the panel neutral connection to provide the 120 Vac power necessary for testing the ground-fault circuitry.

Figure 3: Typical Two-Pole Qwik-Gard GFCI Wiring



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QO-EPD and QOB-EPD Equipment Protection Devices

QO-EPD and QOB-EPD circuit breakers are one- and two-pole thermal-magnetic circuit breakers with integral **equipment** ground-fault protection. These circuit breakers are rated for use on 120/240 Vac and 120/208 Vac electrical systems to provide overcurrent protection, short-circuit protections and equipment ground-fault protection.

EPD circuit breakers are built in accordance with UL Standard 489. QO-EPD and QOB-EPD circuit breakers are not designed to protect people from the hazards of electrical shock. The ground-fault protection level is 30 milliamperes to protect electrical equipment such as heat trace tape.

QO-EPD and QOB-EPD circuit breakers include a self-contained means of testing the ground-fault circuitry. If the circuit breaker is connected correctly, with the pigtail connected to the neutral assembly in the load center or panelboard, pressing the test button will trip the circuit breaker and show a trip indication. EPD circuit breakers must be operational at 85% of the rated voltage.

EPD circuit breakers provide the same branch circuit protection as standard QO and QOB circuit breakers. They are longer than standard QO circuit breakers, and thus require more gutter space. All QO electrical accessories except shunt trip and all QO mechanical accessories are available for QO-EPD and QOB-EPD circuit breakers.

QO-SWN and QOB-SWN Switch Neutral Circuit Breakers



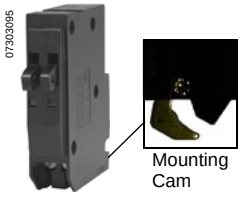
2 Wire and 3 Wire
QO-SWN Circuit Breaker

The QO-SWN and QOB-SWN switch neutral circuit breakers are designed to protect gas pump assemblies.These circuit breakers have provisions for switching the grounded conductor as outlined in the National Electrical Code.

The QO-SWN and QOB-SWN circuit breakers are designed to simultaneously open all grounded and ungrounded conductors. All branch circuit wiring is terminated on the load side of the circuit breaker. The panel neutral connection is made using the pigtail lead built into the circuit breaker. Two-wire circuit breakers require two pole spaces; three-wire circuit breaker require three pole spaces.

QO-SWN and QOB-SWN circuit breakers are available with the complete range of QO accessories.

QOT Tandem Circuit Breakers



1P QOT Tandem
Circuit Breaker

QOT tandem circuit breakers are manufactured so two one-pole, thermal-magnetic circuit breakers occupy only one QO pole space. They are used in applications where circuit loading is light and/or noncontinuous, as in residential applications. QOT circuit breakers are available in 15/15 ampere, 15/20 ampere and 20/20 ampere construction.

QOT circuit breakers have a mounting cam to limit their installation in QO load centers to only those positions having a mounting rail slot. This physically limits the total number of circuit beakers permitted in the panelboard for safe operation.

Each one-pole QOT circuit breaker provides individual switching and tripping action. Individual trip, two-pole circuit with common switching may be assembled by using a handle tie (kit QOTHT) between two adjacent QOT circuit breakers.

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QO-PL and QOB-PL Powerlink® Remotely Operated CIrcuit Breakers



1P QO-PL
Circuit Breaker



2P QO-PL
Circuit Breaker



QOPLPS
Power Supply

QO-PL and QOB-PL circuit breakers combine overcurrent and short-circuit protection with remote switching. These circuit breakers are ideal for lighting loads or wherever power switching is required.

These circuit breakers are designed to be used with many types of control devices, from simple push buttons to programmable controllers and energy management systems. QO-PL and QOB-PL circuit breakers have all of the features of standard QO circuit breakers including Visi-Trip®, plus the added ability to be remotely switched on and off. They are rated for a minimum of 30,000 remote operations.

Remote switching is accomplished using a 24 Vdc power supply. Square D offers QOPLPS and QOBPLPS power supplies. These power supplies mount directly in any QO load center or NQ or NQOD panelboard just like a QO circuit breaker. They provide power to switch up to three QO-PL or QOB-PL circuit breakers simultaneously. A minimum of two seconds recharge time must be allowed between operation for non-simultaneous operations of circuit breakers being supplied by a power supply.

Table 4: Maximum Circuit Breakers per Power Supply

Voltage	Maximum QO-PL and QOB-PL Circuit Breakers Recommended per QOPLPS[1]
208Y/120 Vac	2
240 Vac	3

1 At ambient temperature of -25° through 40°C.

QO Arc-Fault Circuit Interrupter Circuit Breakers



1P QO-AFI
Circuit Breaker

QO arc-fault circuit interrupters (AFCI) quickly detects a wide range of arc-fault conditions, recognizes the nature and specific wave-form of an arc fault and trips the circuit breaker. Traditional circuit breakers and fuses are designed to detect overloads and short circuits. Arc-fault circuit breakers are designed to detect overloads, short circuits and arc faults.

An arc-fault circuit breaker opens the circuit and stops the arcing and high intensity heat before a fire is likely to ignite. It is designed with the same quick-open and Visi-Trip® features and reliability of other QO circuit breaker products, fits into most existing Square D load centers, and can generally be used as a direct replacement for a standard Square D circuit breakers. The AFCI overall size is larger than an equivalent QO circuit breaker.

Arc-fault circuit breakers:

- Have special microprocessor-based arc identification to differentiate necessary operational arcs (associated with loads such as electric motors, switches and receptacles) from actual arc faults which can cause damage and fires.
- Differentiate true arc faults from chopped wave-forms associated with switched-mode power supplies on electrical appliances, computers and lamp dimmers.

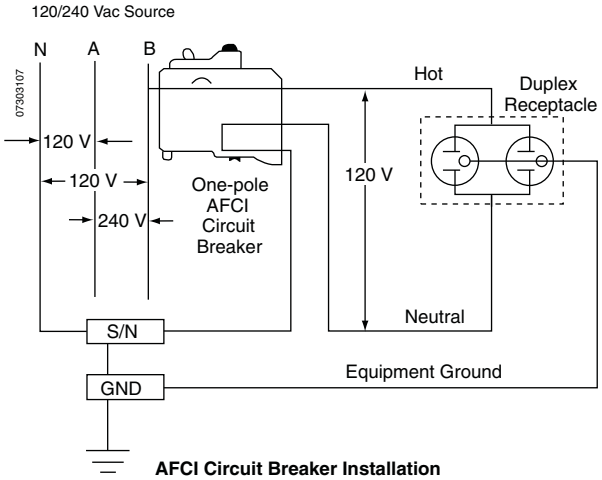
QO AFCI's are available as Branch Feeder Type and Combination Type. Branch AFCI circuit breakers provide arc-fault protection of the branch circuit wiring. Combination AFCI circuit breakers provide arc-fault protection for the branch circuit and also provides protection of cord sets and power-supply cords.

The AFCI type required for an installation is generally governed by the installation codes which are adopted by local inspection authorities. Consult local building codes and inspection authorities to determine which type is required in your area.

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Figure 4: Typical AFCI Circuit Breaker Installation



AFCI Circuit Breaker Installation

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Accessories

Most QO and QOB circuit breakers can be supplied with electrical accessories factory-installed on one-, two- or three-pole circuit breakers. Electrical accessories are not available on AFCI circuit breakers.

Handle accessories are also available for field installation on QO and QOB circuit breakers. All field-installed handle accessories must be ordered separately.

Electrical Accessories

Only one electrical accessory can be installed per circuit breaker, and are factory-installed only. All electrical accessories occupy one additional pole space. The proper suffix number must be added to the circuit breaker catalog number to order an accessory. No field modification or field installation is possible on electrical accessories.

Table 5: Factory-Installed Electrical Accessory Suffix Numbers

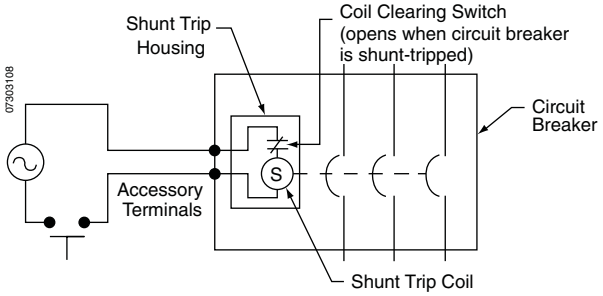
Accessory	Description	Voltage	Coil Burden	Max. Load	Catalog Suffix
Shunt Trip	Trips the circuit breaker from a remote location by means of a trip coil energized from a separate circuit. All shunt trips will operate at 75% or more of rated voltage. • For use with momentary or maintained push button. • Not available on QO-GF or QO-EPD circuit breakers. • Shunt trip terminals accept (2) 14–12 AWG Cu leads.	12 Vac/dc 24 Vac/dc	60 VA 168 VA	—	1042
		120 Vac 208 Vac 240 Vac	72 VA 228 VA 288 VA	—	1021
Auxiliary Switch “A” Contact	Circuit breaker open—One contact only, opens when circuit breaker is off or tripped. 5 A max at 120 Vac.	120 Vac	—	5 A	1200
Auxiliary Switch “B” Contact	Circuit breaker open—One contact only, closed when circuit breaker is off or tripped. 5 A max at 120 Vac.	120 Vac	—	5 A	1201
Alarm Switch	Used with control circuits and is actuated only when the circuit breaker has tripped. Standard construction includes a normally-open contact. • Alarm switch terminals accept (2) 14–12 AWG Cu leads.	120 Vac	—	5 A	2100

Shunt Trip

The shunt trip is used to trip the circuit breaker from a remote location by using a tripping coil energized from a separate circuit. When energized by a push-button or other pilot device, the shunt trip caused the circuit breaker to trip. The handle moves to the tripped position and the Visi-Trip® indicator appears. The trip coil has a coil clearing contact to break the coil circuit when the circuit breaker trips.

Shunt trips are available for QO and QOB circuit breakers only with standard control voltage ratings up to 240 Vac or 24 Vdc. (Shunt trips are not available on QO and QOB GFCI, AFCI, EPD and miniature switches.) Shunt trips operate at 75% or more of rated voltage.

Figure 5: Shunt Trip Wiring Diagram



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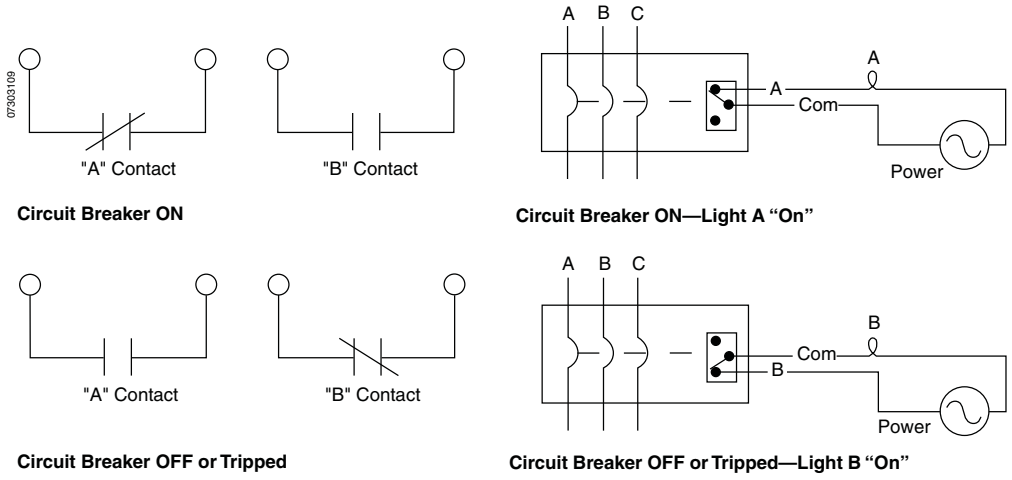
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Auxiliary Switch

The auxiliary switch accessory monitors the circuit breaker contact status and provides a remote signal indicating whether the circuit breaker contacts are open or closed. When the circuit breaker is off or tripped, the auxiliary switch with an “A” contact is open and the auxiliary switch with a “B” contact is closed. When the circuit breaker is on, the auxiliary switch with an “A” contact is closed and the auxiliary switch with a “B” contact is open.

Auxiliary switches are available for QO and QOB circuit breakers and miniature switches. (Auxiliary switches are not available on QO and QOB AFI and CAFI products.)

Figure 6: Auxiliary Switch Wiring Diagrams



Circuit Breaker ON

Circuit Breaker ON—Light A “On”

Circuit Breaker OFF or Tripped

Circuit Breaker OFF or Tripped—Light B “On”

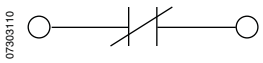
Alarm Switch

The alarm switch accessory monitors the circuit breaker trip status and is used to provide a remote warning signal indicating that the circuit breaker has tripped. This signal can be used in conjunction with a horn, pilot light, or some other indicator.

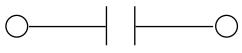
The contact on the standard alarm switch is open when the circuit breaker is in the off or on position and is closed when the circuit breaker is in the tripped position.

Alarm switches are actuated when the circuit breaker has tripped as a result of an overload, short circuit or shunt trip operation. Alarm switches are available for QO and QOB circuit breakers and miniature switches. (Alarm switches are not available on QO and QOB AFI and CAFI products.)

Figure 7: Alarm Switch Wiring Diagram



Normally-open Alarm Switch Circuit Breaker Tripped



Circuit Breaker OFF or ON

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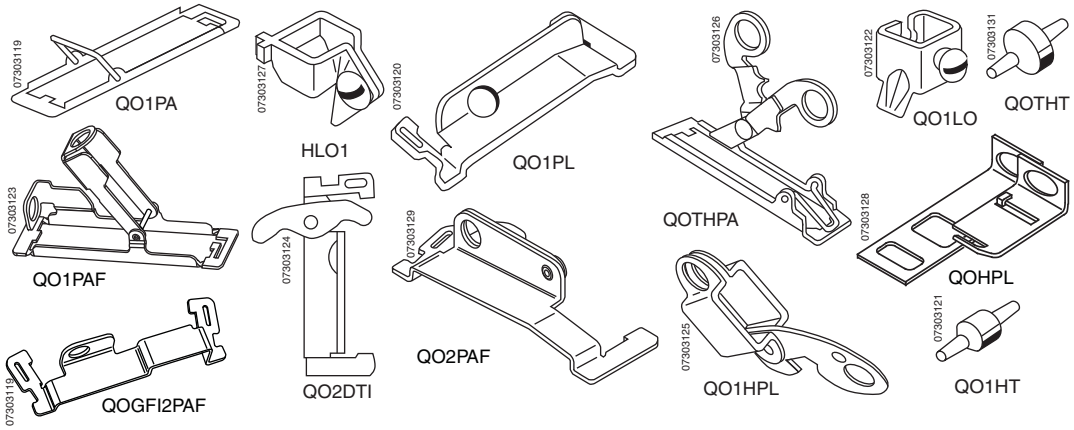
Handle Accessories

Field-installed handle accessories are also available.

Table 6: Field-Installable Handle Accessories

Accessory	Description	Catalog Number
Handle Tie	Converts any two adjacent 120/240 Vac 1P QO circuit breakers to independent trip 2P.	QO1HT
	Converts any two adjacent 120/240 Vac 1P side-by-side QOT circuit breakers to independent trip 2P.	QOTHT
Handle Clamp	Clamp for holding QO 1P handle in ON or OFF position.	QO1LO
	Clamp for holding QO or Q1 (1P, 2P, or 3P) circuit breaker handle in ON or OFF position.	HLO1
Handle Padlock Attachment for Padlocking in ON or OFF Position	Loose attachment for padlocking 1P QO circuit breaker in ON or OFF position.	QOHPL
	Fixed attachment for padlocking 1P QO circuit breaker in ON or OFF position.	QO1PA
	Attachment for padlocking 1P side-by-side QOT circuit breaker in ON or OFF position.	QOTHPA
	Fixed attachment for padlocking 2P QO-GFI circuit breaker in ON or OFF position.	GF12PA
	Loose attachment for padlocking 2P and 3P standard QO circuit breaker in ON or OFF position.	QO1HPL
	Fixed attachment for padlocking 2P and 3P standard QO circuit breaker in ON or OFF position.	QO1PL
Handle Padlock Attachment for Padlocking in OFF Position	Fixed attachment for padlocking 1P QO circuit breaker in OFF position only.	QO1PAF
	Fixed attachment for padlocking 2P and 3P QO circuit breakers in OFF position only.	QO2PAF
	Fixed attachment for padlocking 1P QO-GFI, QO-AFCI and QO-EPD circuit breakers in OFF position only.	QOGFI1PAF
	Fixed attachment for padlocking 2P QO-GFI and QO-EPD circuit breakers in OFF position only.	QOGFI12PAF
Sub-Feed Lugs	60 A 2P plug-on—2 spaces required (6–2 Al/Cu)	QO60SL
	125 A 2P plug-on—2 spaces required (12–2/0 Al/Cu)	QO2125SL
	225 A 2P plug-on—4 spaces required (4–300 Al/Cu)	QO2225SL
	125 A 3P plug-on—3 spaces required (12–2/0 Al/Cu)	QO3125SL
Mechanical Interlock Attachment	For interlocking the handles of two 2P or one 2P and one 1P QO and Q1 circuit breaker mounted side-by-side so that only one circuit breaker can be ON at a time (Not for QOU)	QO2DTI
Mechanical Interlock with Retaining Kit	For securing two adjacent back-fed circuit breakers in dual power supply applications. Can be used with two 2P or one 2P and one 1P QO circuit breaker in QO816L100 load center.	QO2DTIM

Figure 8: Handle Accessories



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Handle Tie

The handle tie accessory converts any two adjacent one-pole QO circuit breakers to one independent trip multi-pole circuit breaker.

Handle Lock-Off (Clamp)

The handle lock-off accessories fasten the handle in the ON or OFF position. These handle lock-offs cannot be padlocked.

Handle Padlock Attachment

The handle padlock attachment allows padlocking the circuit breaker handles in either the ON or OFF position or in the OFF only position. Handle padlock attachments are available in two styles: removable and fixed.

The removable style is intended to be a temporary device. Once work on the circuit breaker has been completed, the attachment can be removed from the circuit breaker to resume normal operation.

The fixed style is intended to be a permanent device. Once the work on the circuit has been completed, the padlock can be removed for the circuit breaker to resume normal operation, but the attachment stays in place.

Mechanical Interlock Attachment

The mechanical interlock attachment locks the handles of two adjacent circuit breakers to prevent both circuit breakers from being on at the same time. Both circuit breakers may be switched to the off position with the mechanical interlock in place.

Mechanical Interlock Attachment with Retaining Kit

The mechanical interlock attachment locks the handles of two adjacent back-fed circuit breakers in dual power supply applications.

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Trip Curves

The tripping characteristics of QO and QOB circuit breakers can be represented by a characteristic tripping curve that plots tripping time versus current level. The curve shows the amount of time required by a circuit breaker to trip at a given overcurrent level. The curve has a performance band that is bound by a minimum and a maximum value of clearing time. Total clearing time is the sum of the sensing time, unlatching time, mechanical operating time and arcing time of the circuit breaker. For currents in excess of 135% of the circuit breaker rating at rated ambient temperature (40°C), the circuit breaker will automatically open the circuit within limits specified by the band.

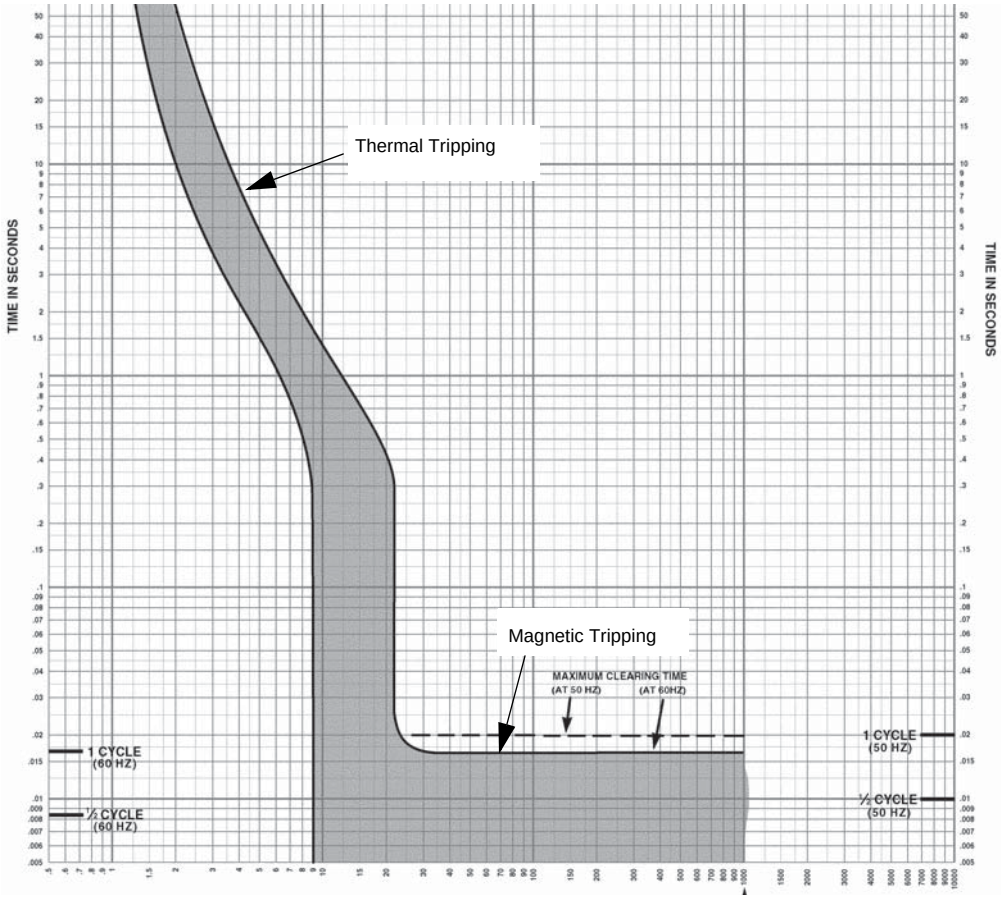
Thermal Tripping Characteristics

The upper left portion of each trip curve displays the thermal response of the circuit breaker. On low-fault current levels, up to the magnetic tripping level, thermal tripping occurs when a bimetal in the circuit breaker responds to heat associated with the overcurrent. The bimetal deflects, unlatching the mechanism and mechanically causing the circuit breaker to trip and open the circuit. The greater the overcurrent, the faster the circuit breaker will operate to clear the circuit.

Magnetic Tripping Characteristics

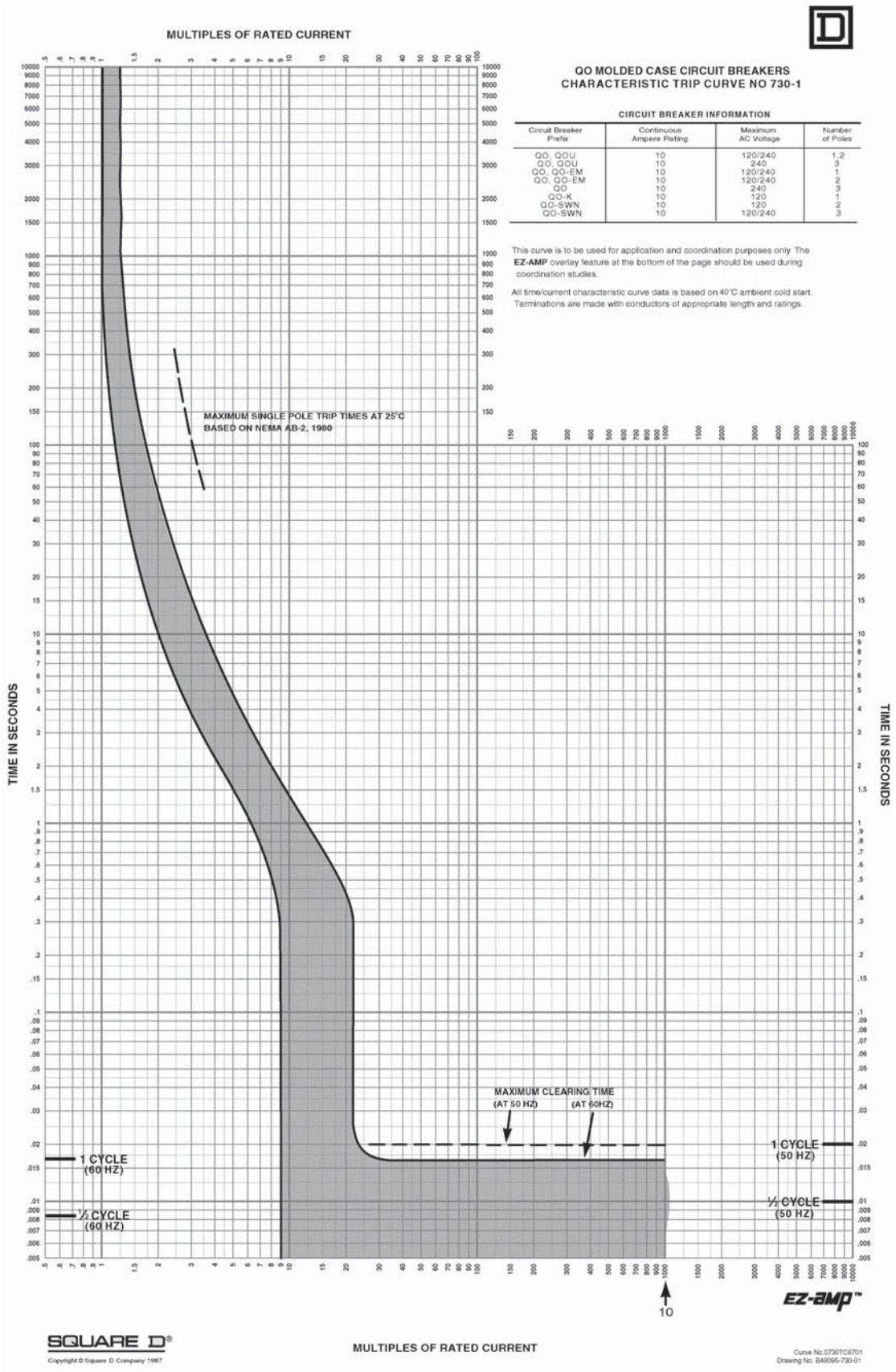
The lower right portion of each trip curve displays the magnetic tripping response of the circuit breaker. This takes place when overcurrents of sufficient magnitude operate in an internal magnetic armature which unlatches the mechanism. Magnetic tripping occurs with no intentional time delay.

Figure 9: Typical QO Trip Curve



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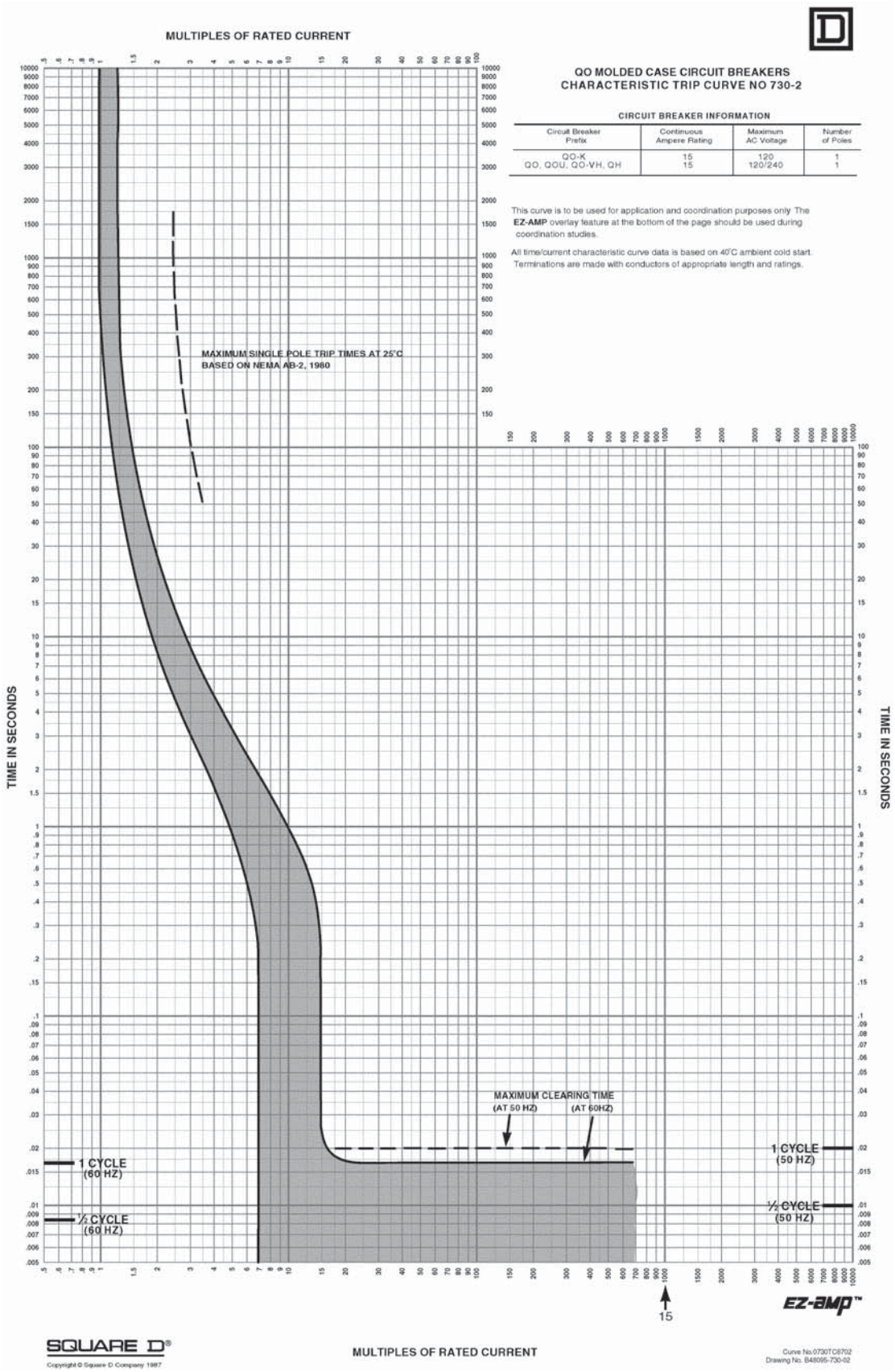
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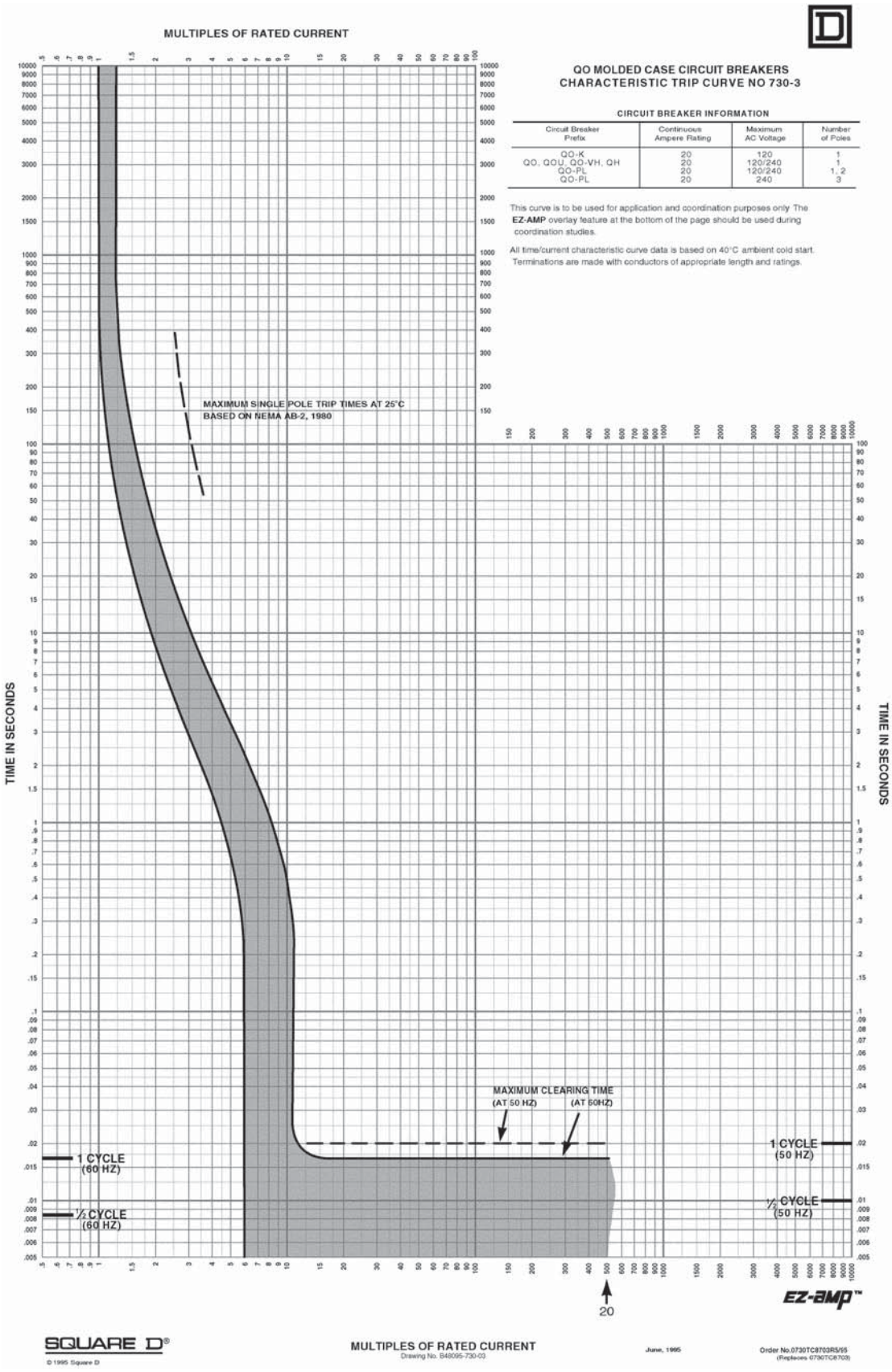
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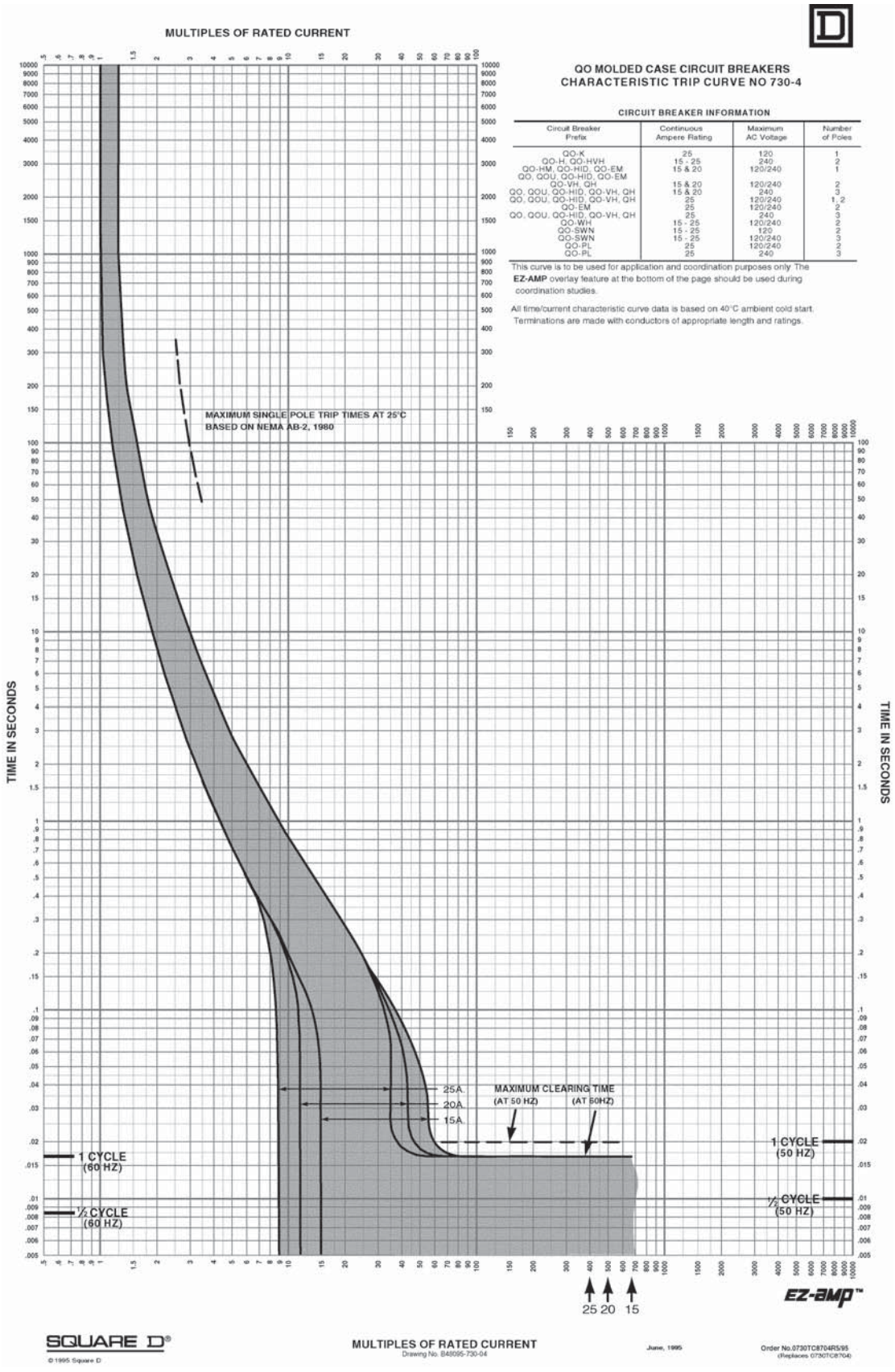
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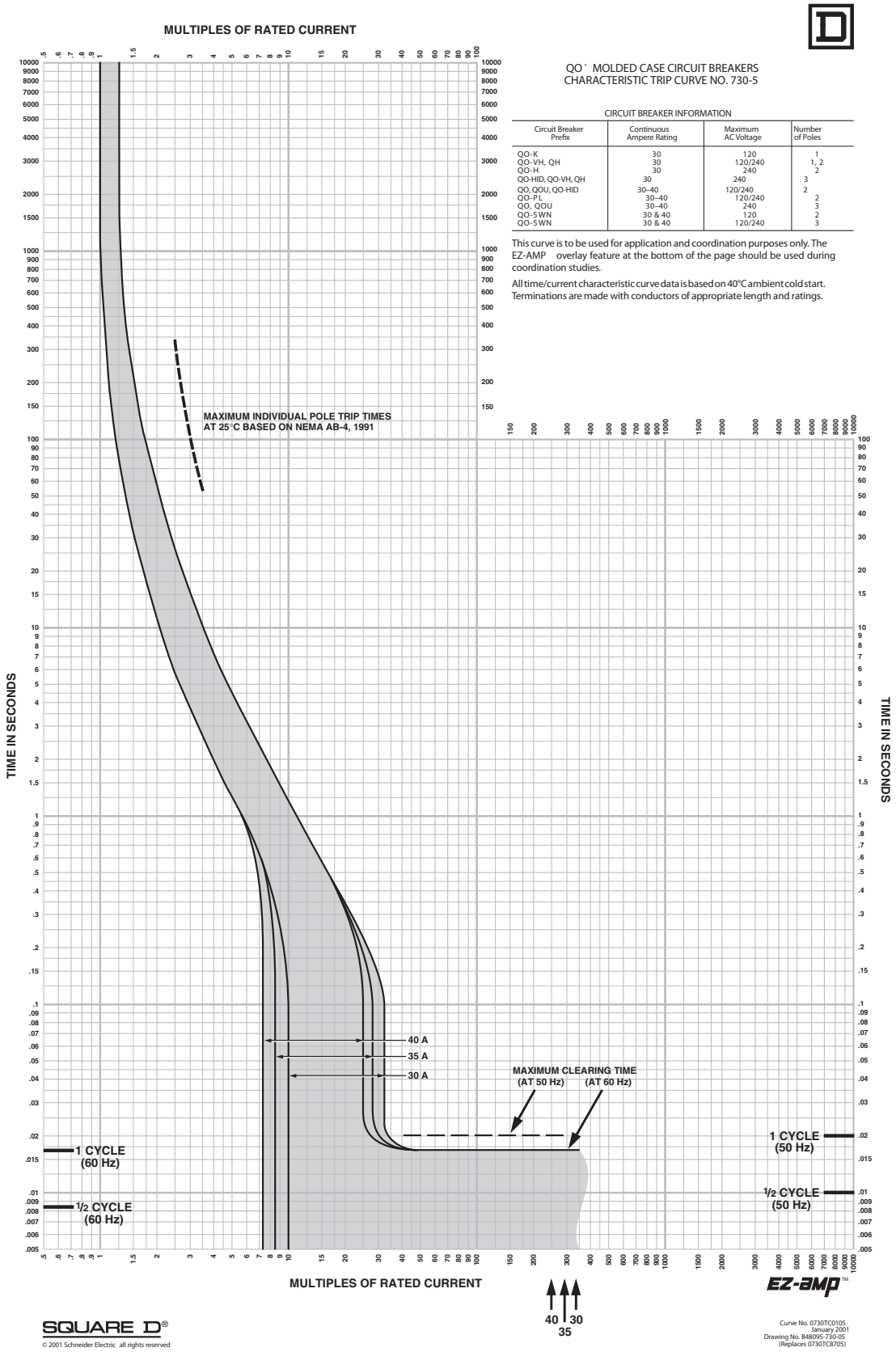
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QO® MOLDED CASE CIRCUIT BREAKERS
CHARACTERISTIC TRIP CURVE NO. 730-5

CIRCUIT BREAKER INFORMATION

Circuit Breaker Prefix	Continuous Ampere Rating	Maximum AC Voltage	Number of Poles
QO-K	30	120	1
QO-VH, QH	30	120/240	1, 2
QO-H	30	240	2
QO-HID, QO-VH, QH	30	240	3
QO, QOU, QO-HID	30–40	120/240	2
QO-PL	30–40	120/240	2
QO, QOU	30–40	240	3
QO-SWN	30 & 40	120	2
QO-SWN	30 & 40	120/240	3

This curve is to be used for application and coordination purposes only. The EZ-AMP® overlay feature at the bottom of the page should be used during coordination studies.

All time/current characteristic curve data is based on 40°C ambient cold start. Terminations are made with conductors of appropriate length and ratings.

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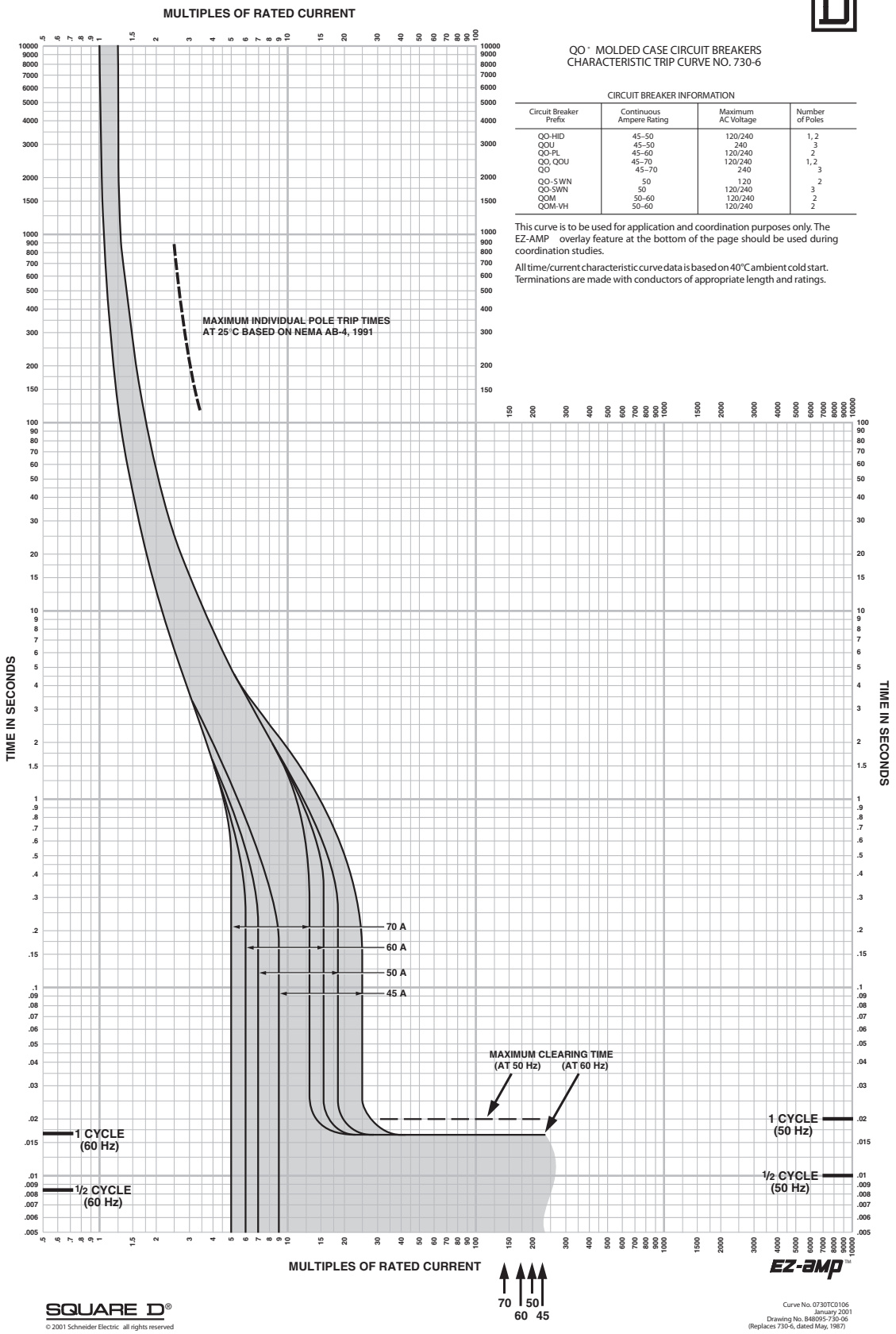
QO® MOLDED CASE CIRCUIT BREAKERS
CHARACTERISTIC TRIP CURVE NO. 730-6

CIRCUIT BREAKER INFORMATION

Circuit Breaker Prefix	Continuous Ampere Rating	Maximum AC Voltage	Number of Poles
QO-HID	45–50	120/240	1, 2
QOU	45–50	240	3
QO-PL	45–60	120/240	2
QO, QOU	45–70	120/240	1, 2
QO	45–70	240	3
QO-SWN	50	120	2
QO-SWN	50	120/240	3
QOM	50–60	120/240	2
QOM-VH	50–60	120/240	2

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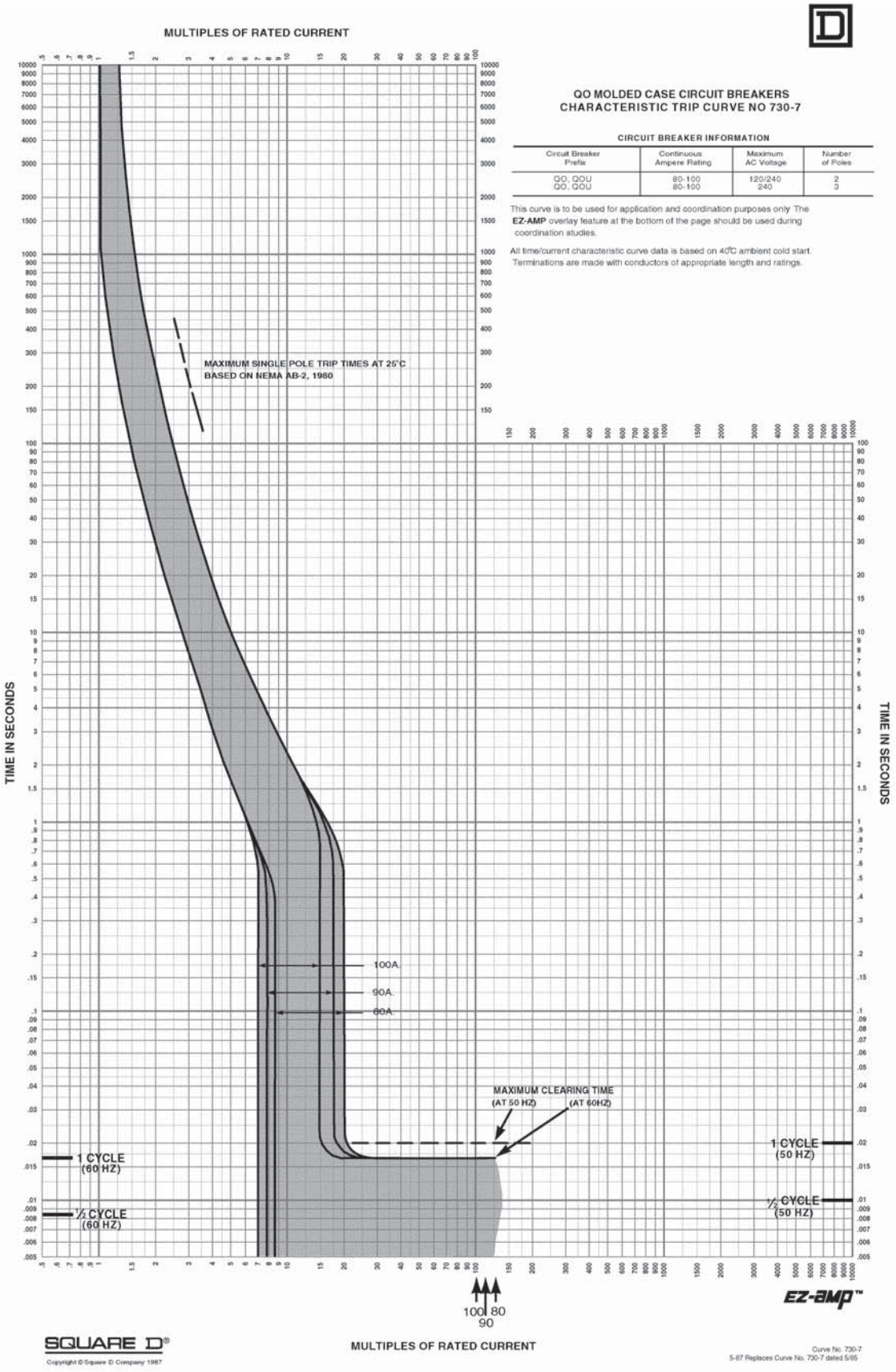


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January 2001
Drawing No. B48095-730-06
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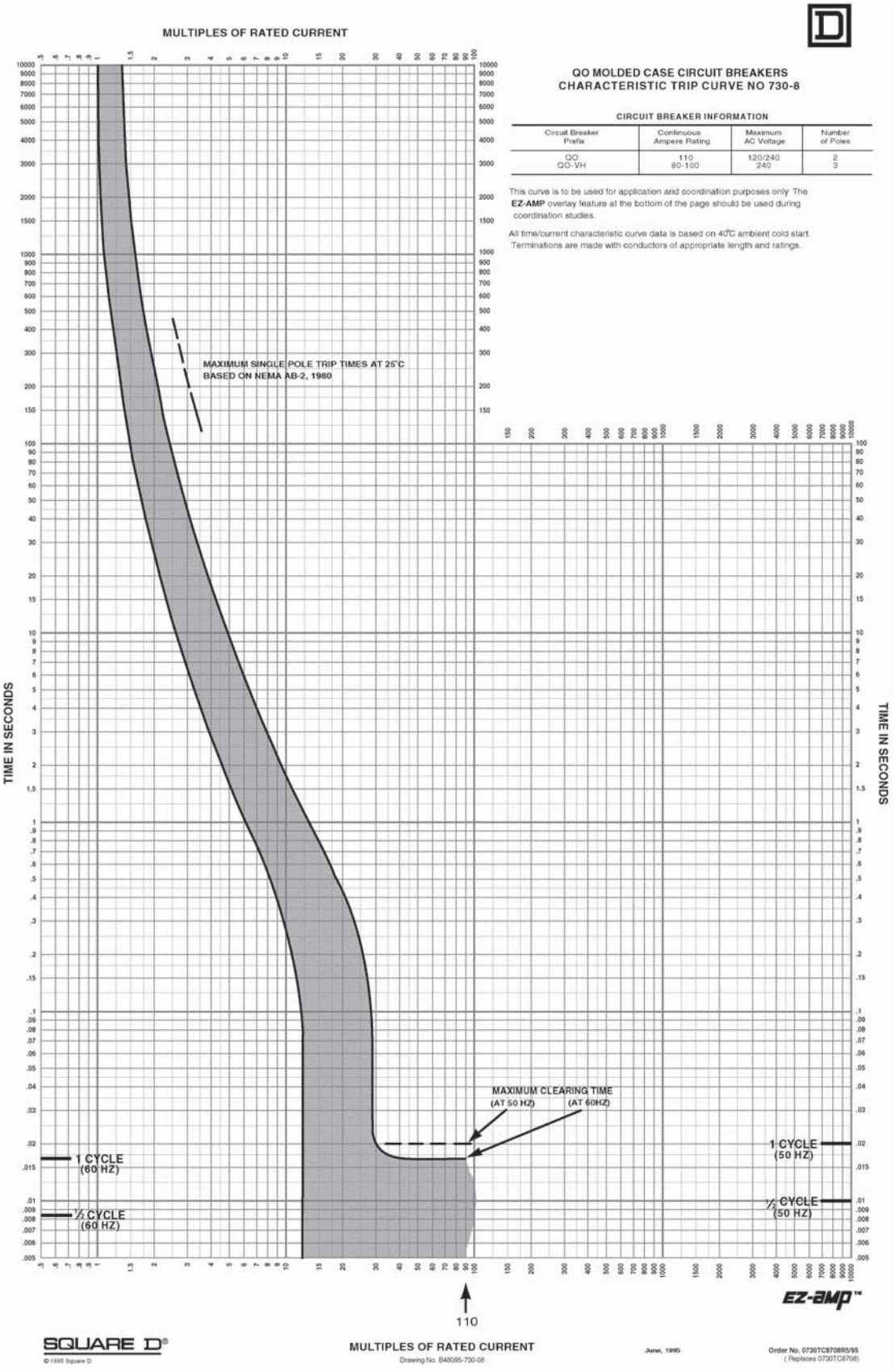
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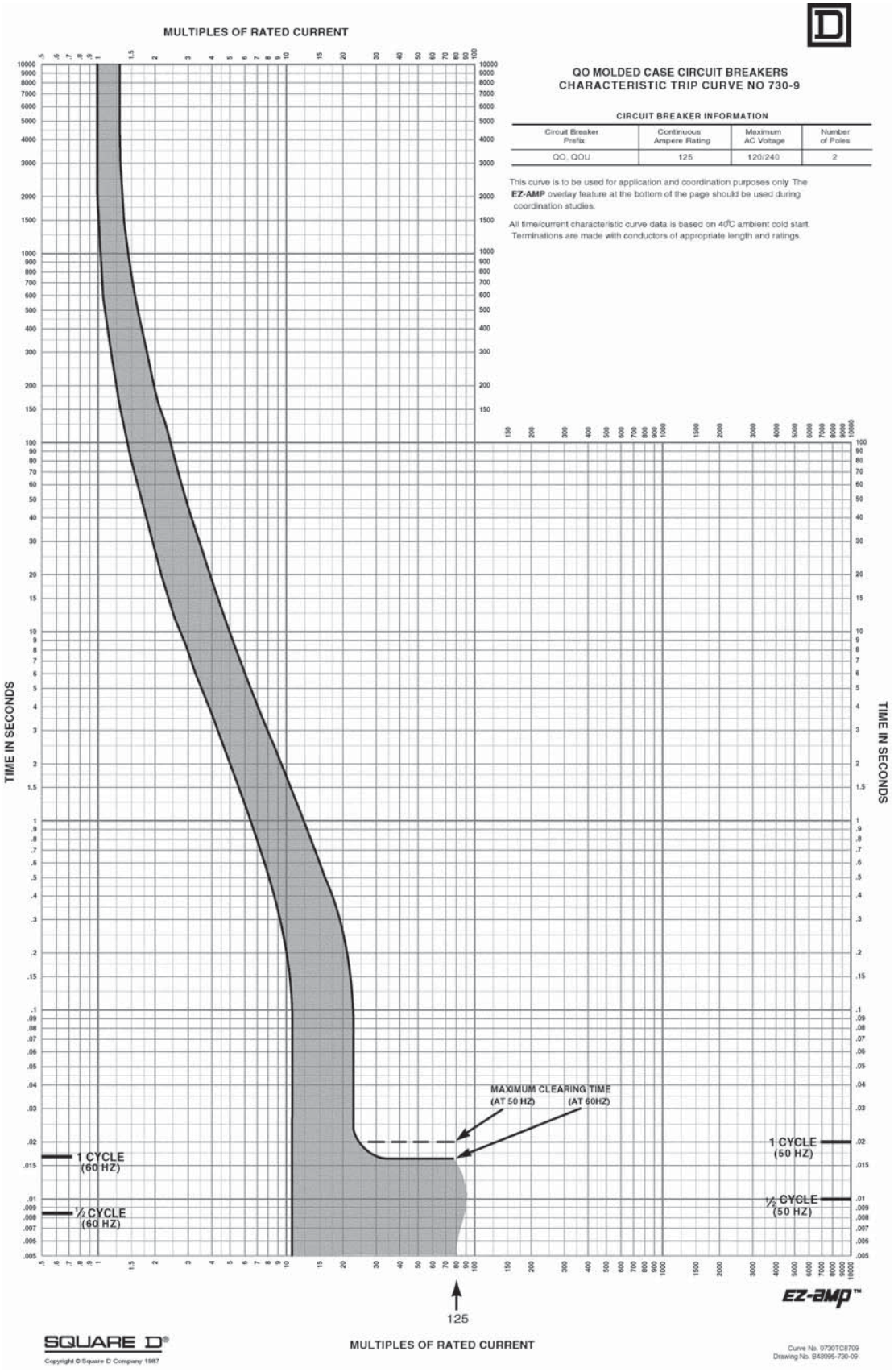
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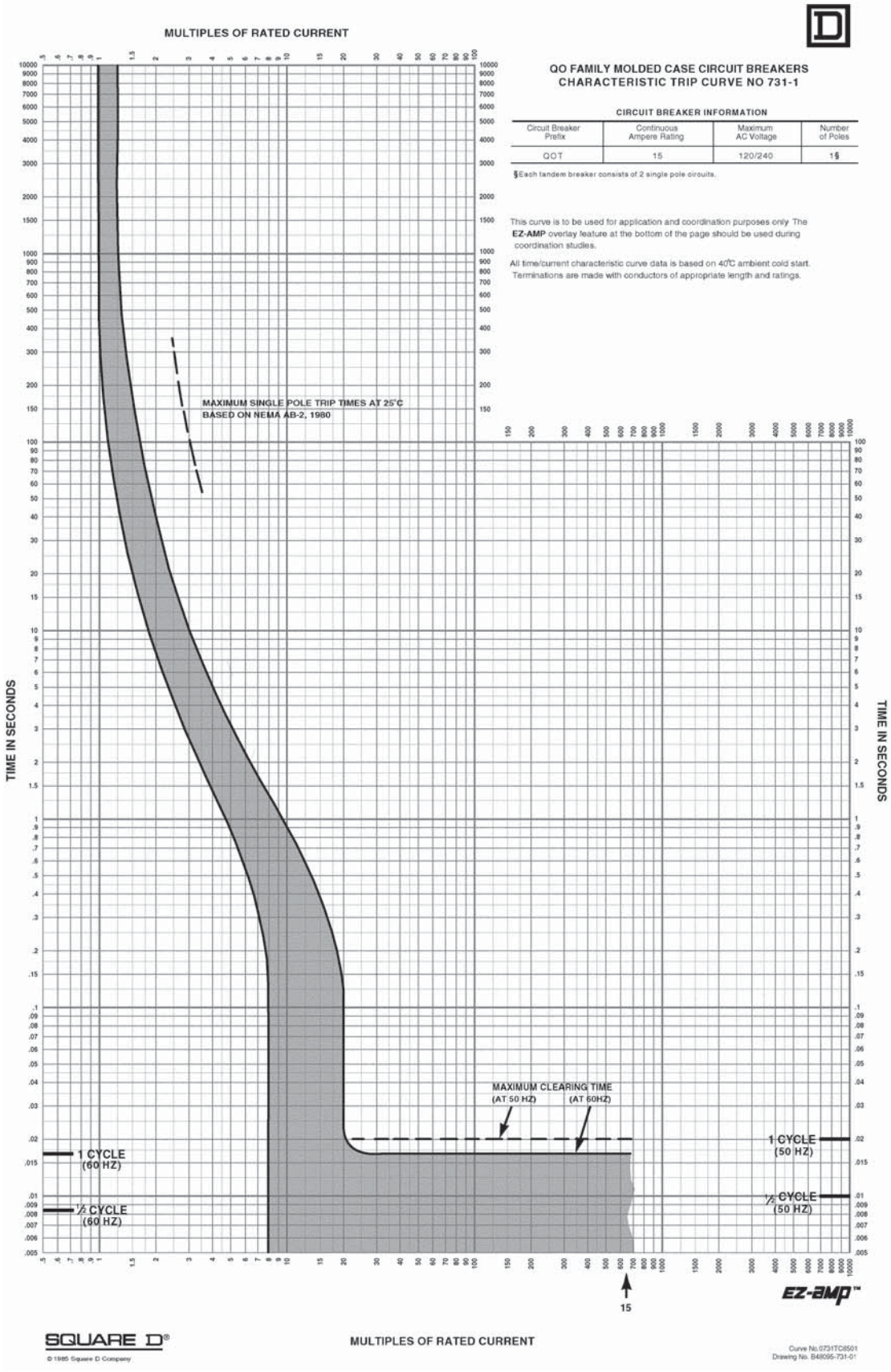
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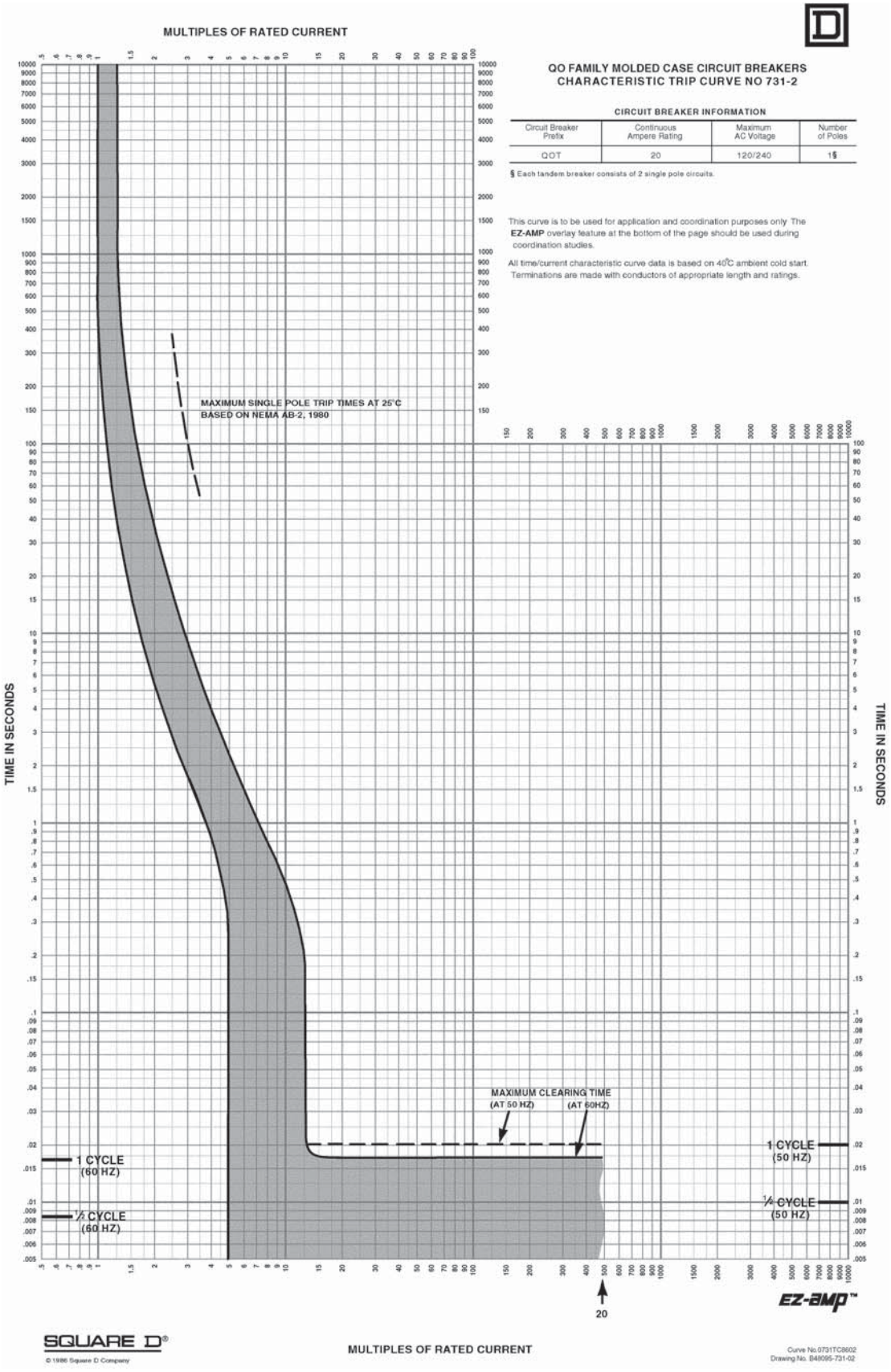
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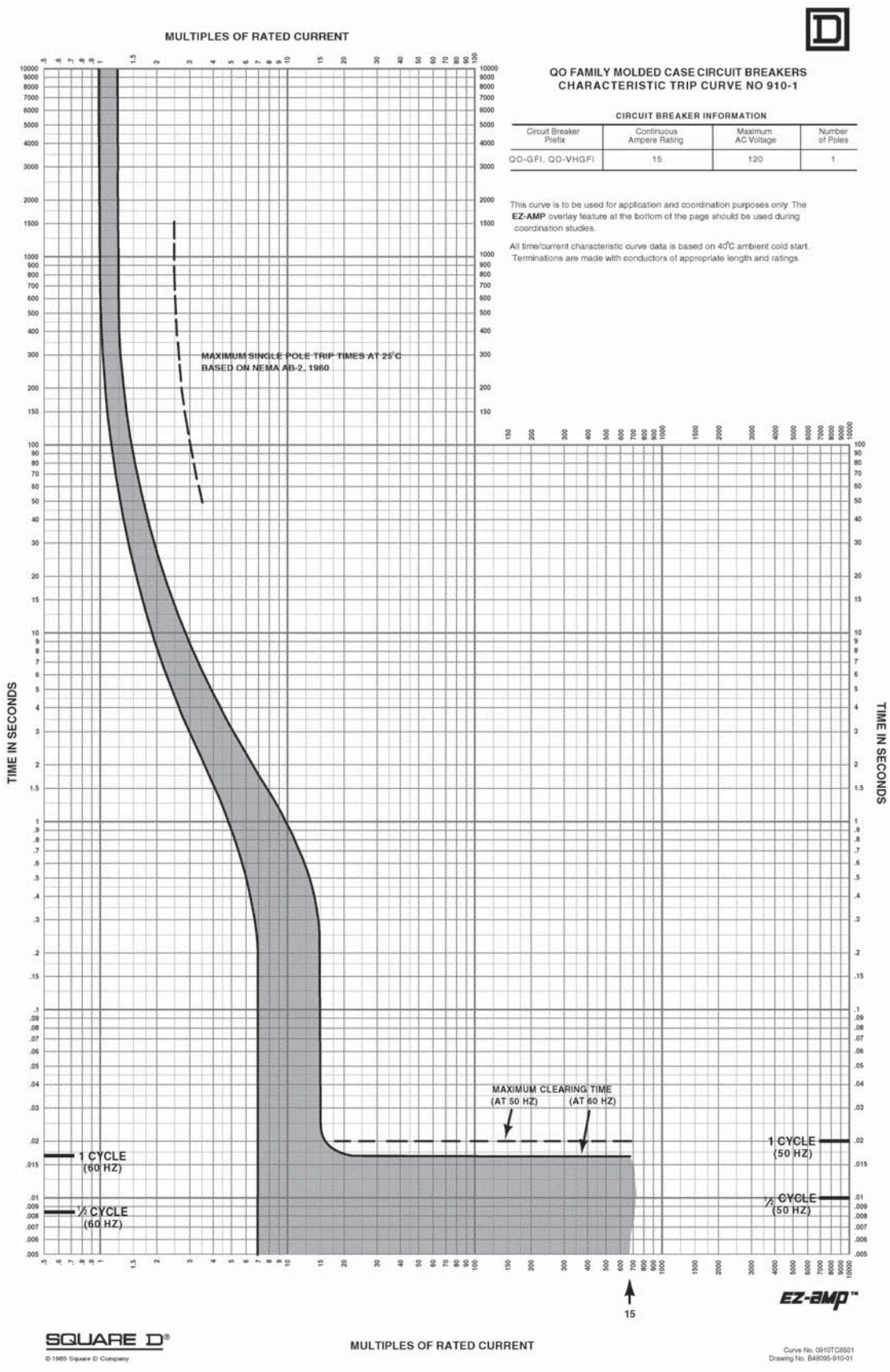
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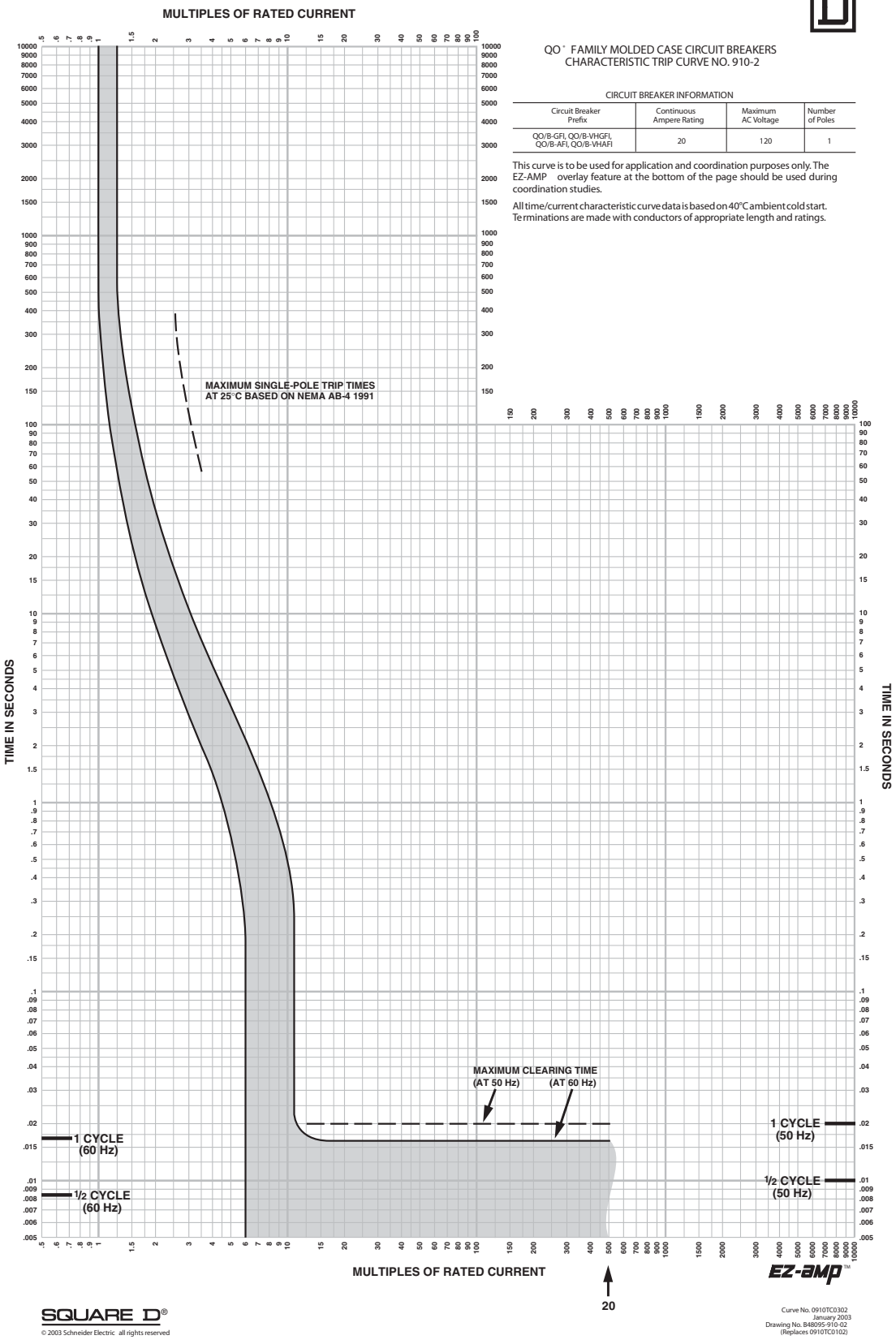
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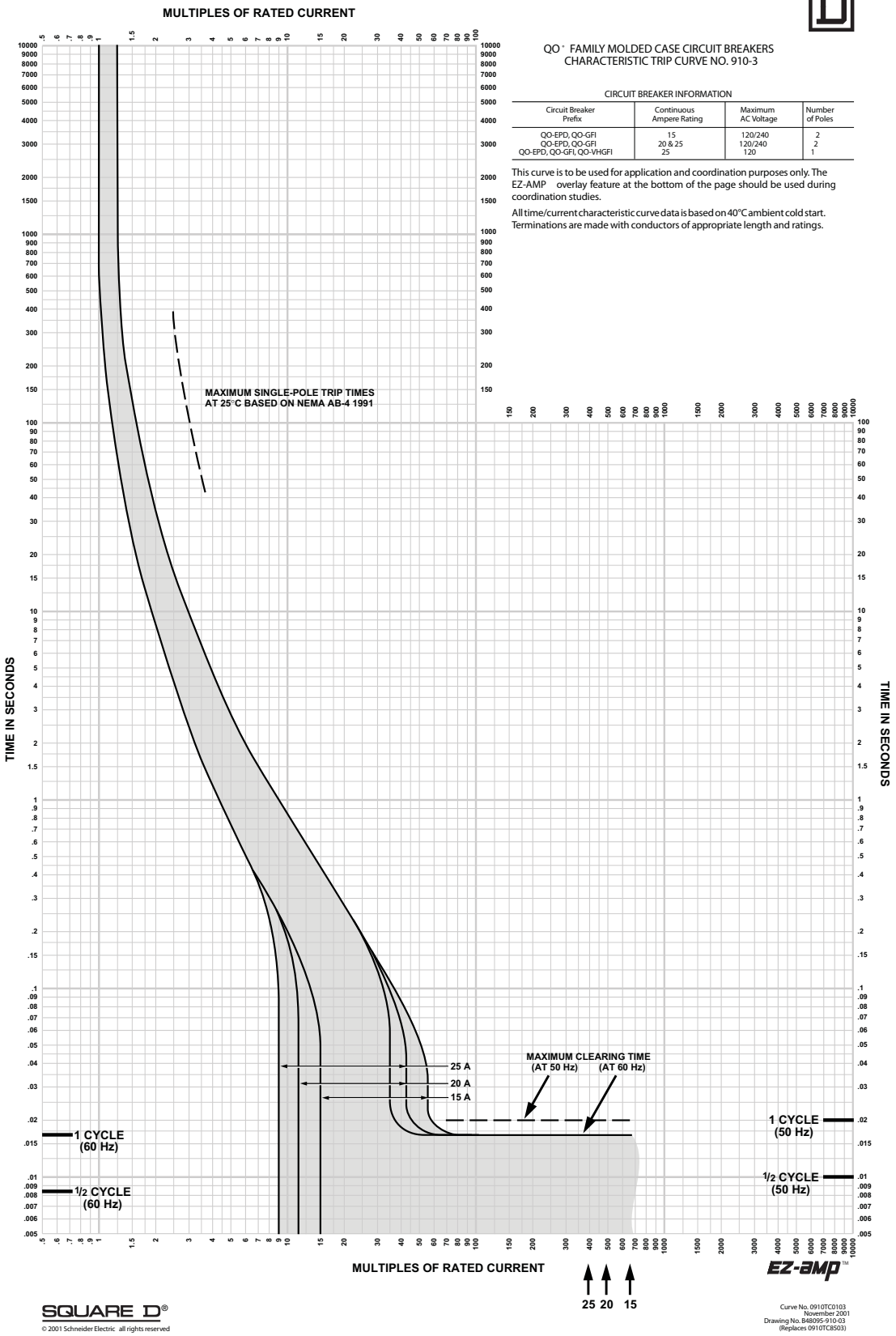
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QO® FAMILY MOLDED CASE CIRCUIT BREAKERS
CHARACTERISTIC TRIP CURVE NO. 910-3

CIRCUIT BREAKER INFORMATION

Circuit Breaker Prefix	Continuous Ampere Rating	Maximum AC Voltage	Number of Poles
QO-EPD, QO-GFI	15	120/240	2
QO-EPD, QO-GFI	20 & 25	120/240	2
QO-EPD, QO-GFI, QO-VHGFI	25	120	1

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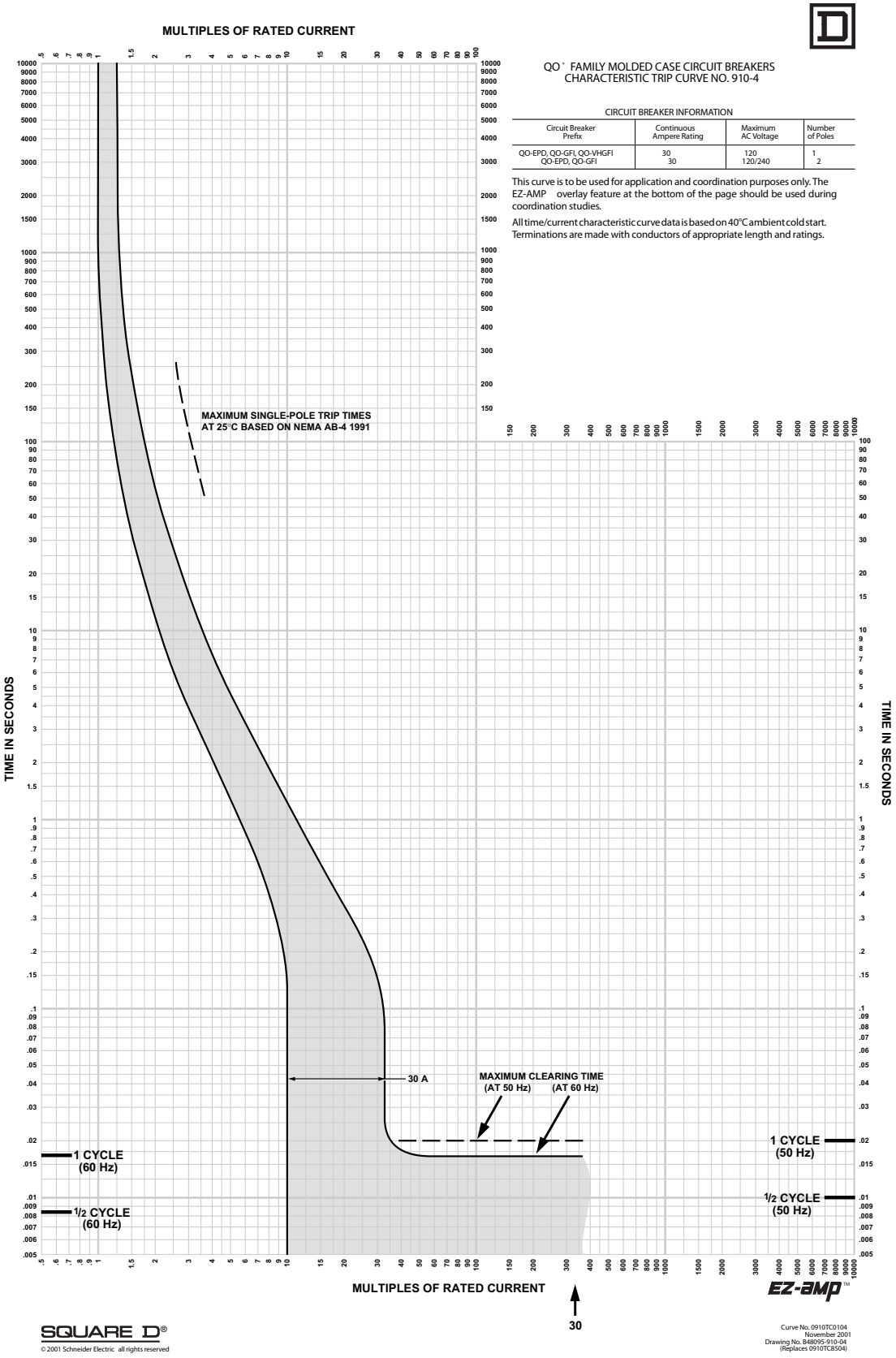
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November 2001
Drawing No. B48095-910-03
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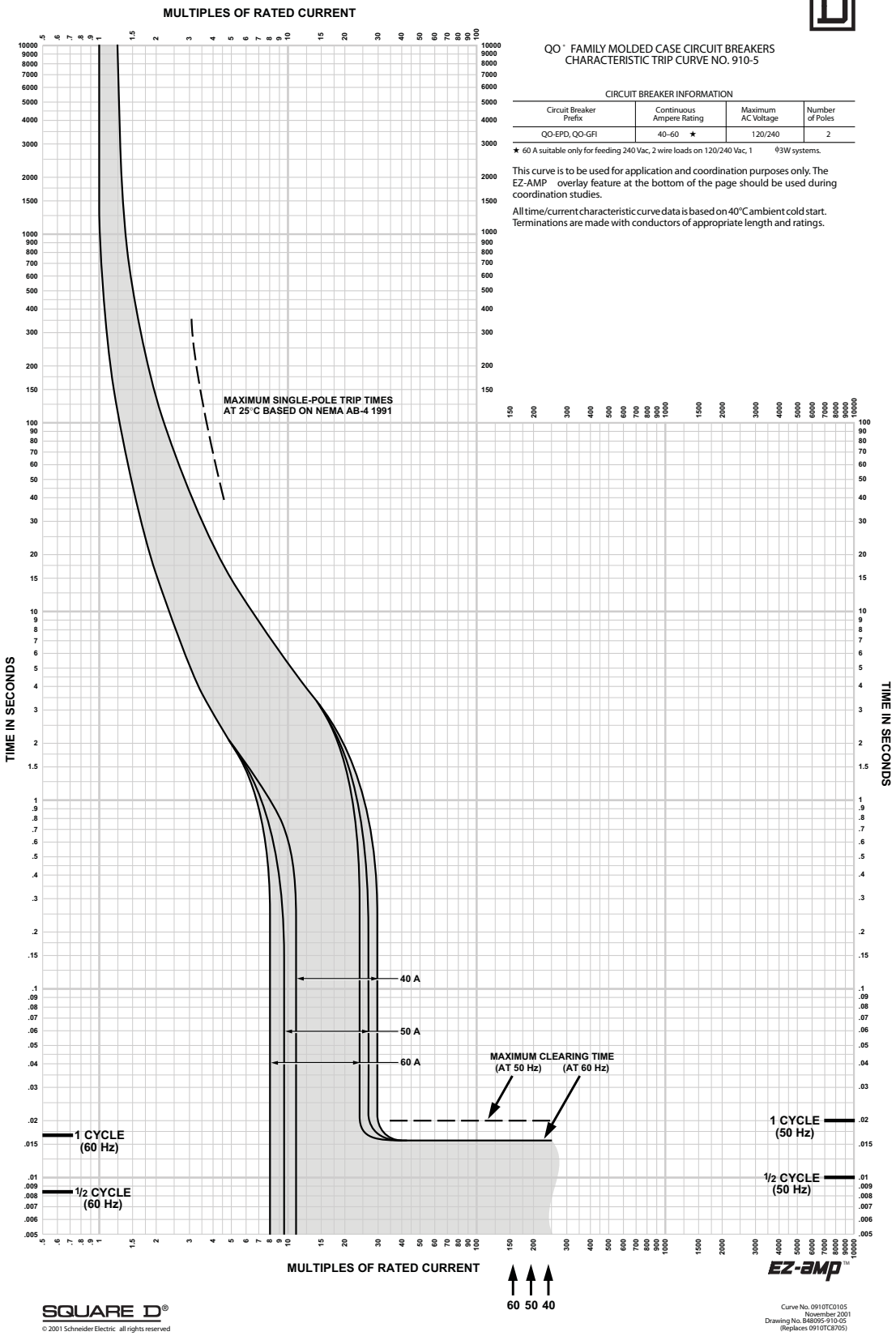
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QO® FAMILY MOLDED CASE CIRCUIT BREAKERS
CHARACTERISTIC TRIP CURVE NO. 910-5

CIRCUIT BREAKER INFORMATION

Circuit Breaker Prefix	Continuous Ampere Rating	Maximum AC Voltage	Number of Poles
QO-EPD, QO-GFI	40–60 ★	120/240	2

★ 60 A suitable only for feeding 240 Vac, 2 wire loads on 120/240 Vac, 1 Φ3W systems.

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All time/current characteristic curve data is based on 40°C ambient cold start. Terminations are made with conductors of appropriate length and ratings.

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Dimensions

Figure 10: Type QO Plug-On Circuit Breaker

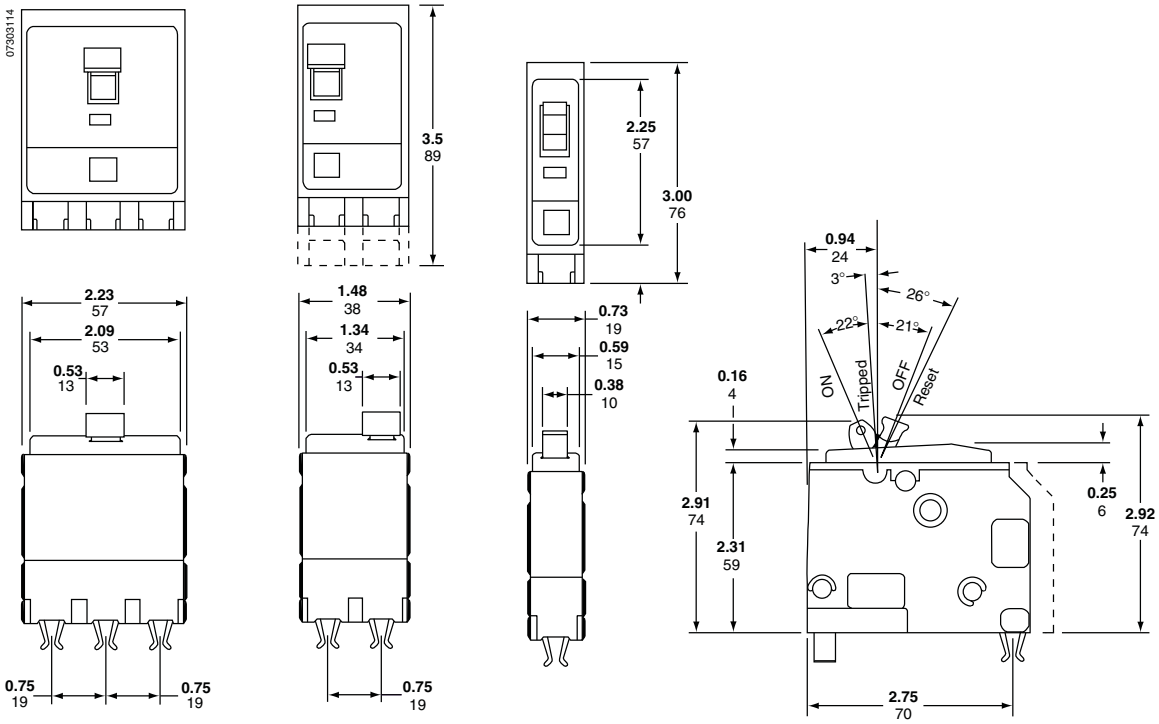
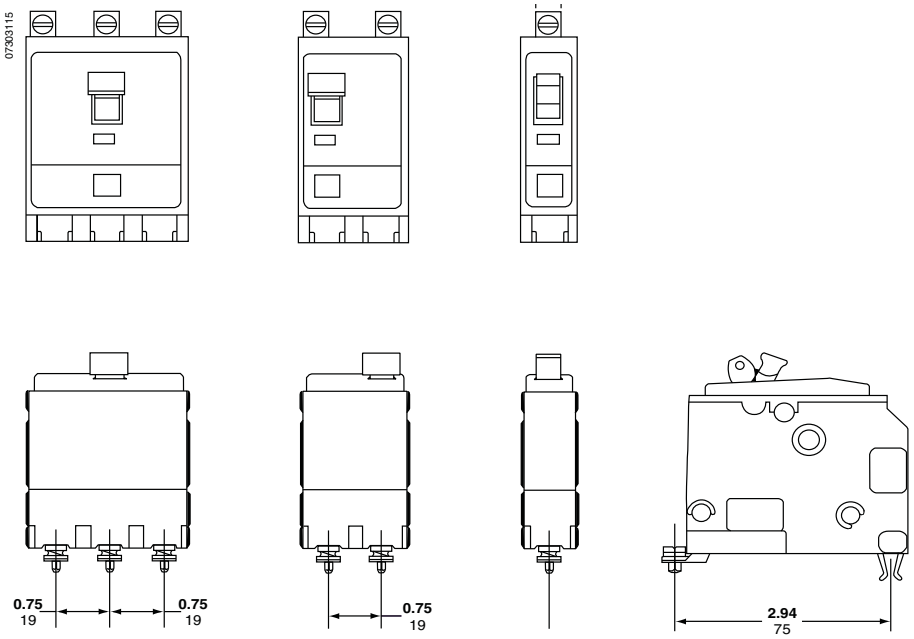


Figure 11: Type QOB Bolt-On Circuit Breaker



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Figure 12: Type QO-GFI Circuit Breaker

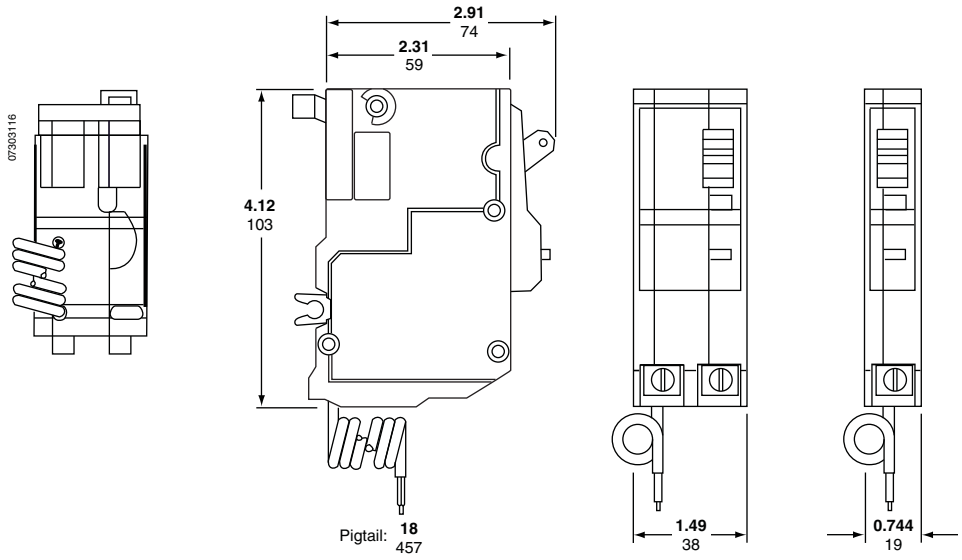
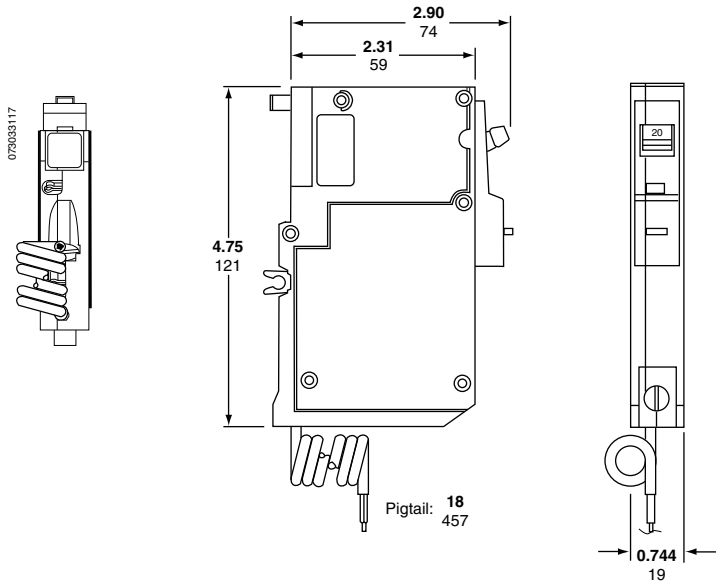


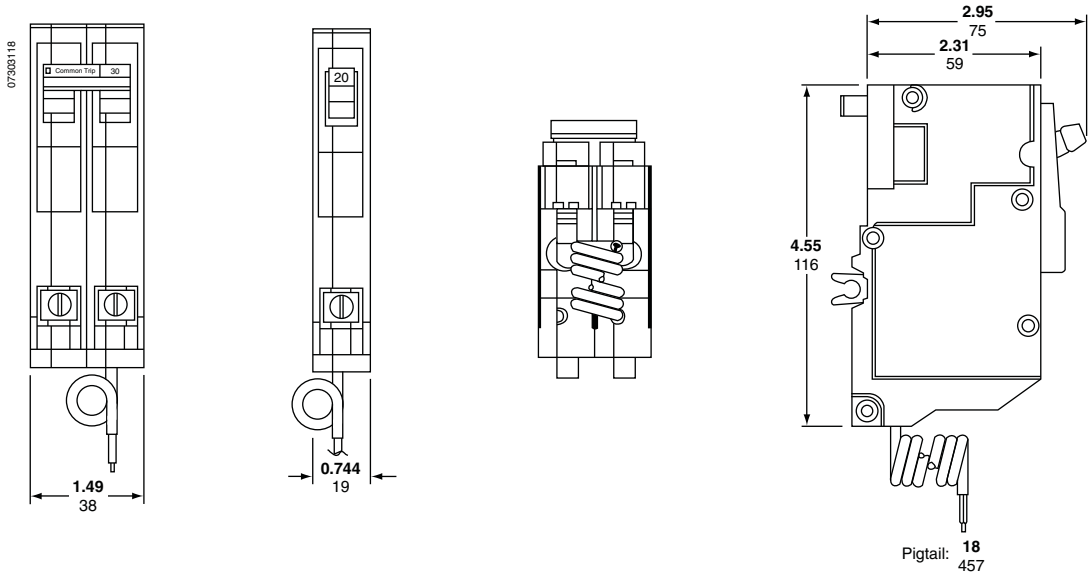
Figure 13: Type QO-AFI and QO-AFCI Circuit Breakers



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Figure 14: Type QO-PL Remote Control Circuit Breaker



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