Technical Data

Original Instructions

Legacy Molded Case Circuit Breaker Specifications

Bulletin 140G/140MG Frame Size K, M, N, and NS

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IMPORTANT The information provided in this document refers to the following legacy Bulletin 140G MCCB frame sizes listed below:

- 140G/140MG Frame Size K
- 140G/140MG Frame Size M
- 140G/140MG Frame Size N
- 140G-NS

For information on the current series products, see Molded Case Circuit Breaker Specifications Technical Data, publication 140G-TD101.

Notes:

Circuit Breaker Basics

Throughout this section, the term Bulletin 140G broadly refers to both Bulletin 140G devices and accessories.

A circuit breaker is a reusable semi-automatic switching device. Circuit breakers are designed to protect downstream devices and wiring from harmful conditions in the power supply that run through the breaker, while also allowing the complex power demands of the system to pass through.

Breaker design specifics are defined by multiple standards: Bulletin 140G circuit breakers are broadly designed for global industrial application for low-voltage, three-phase power systems and are subject to the details of both UL and IEC standards. The technical definition of a circuit breaker varies between standards organizations. Following are some commonly used definitions:

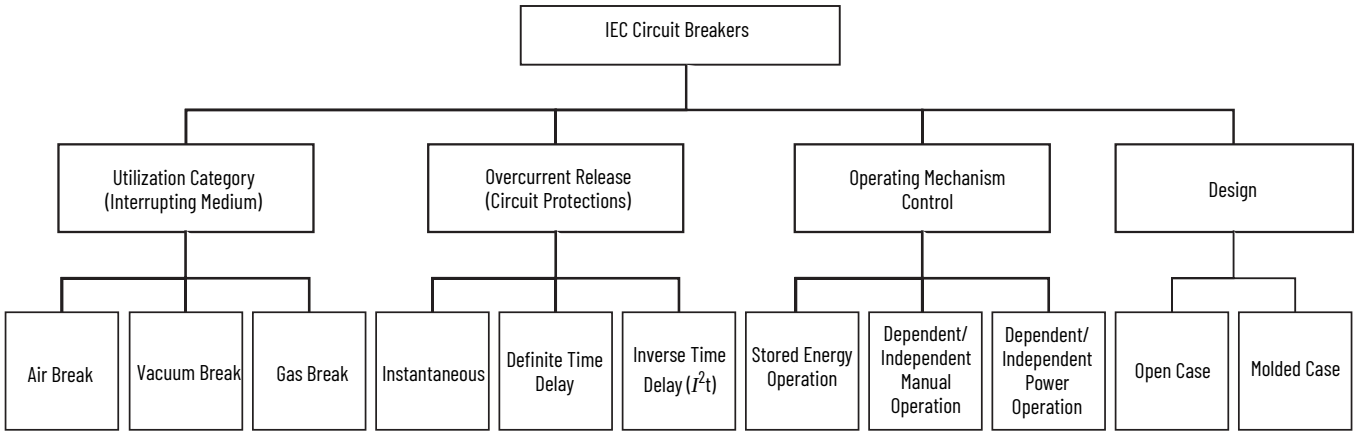
- The National Electrical Manufacturers Association (NEMA) defines circuit breakers as "devices designed to open and close a circuit by non-automatic means, and to open the circuit automatically on a predetermined overcurrent without injury to itself when properly applied within its rating."
- The International Electrotechnical Commission (IEC) Standard IEC 60947-2 defines a circuit breaker as "a mechanical switching device, capable of making, carrying and breaking currents under normal circuit conditions and also making, carrying for a specified time, and breaking currents under specified abnormal circuit conditions such as those of short-circuit."

Circuit breakers are referred to by specific design elements for type of construction and functionality. For example, Figure 1 shows the IEC specification that includes several distinctions of circuit breakers. Under these classifications, Bulletin 140G circuit breakers can be referred to as molded-case and air-break devices, with a mix of dependent operation and stored-energy operation, as well as a variety of overcurrent release protection packages.

The term **molded case** means that the construction of the circuit breaker is an assembled unit surrounded by an insulated housing. The term **air-break** means that the internal arcing chambers of the circuit breaker have normal air — as opposed to an inert gas or a sealed vacuum space.

The Anatomy of Bulletin 140G Circuit Breakers on page 6 explains operating mechanism types and circuit protection options.

Figure 1 - IEC Circuit Breaker Classifications



The Bulletin 140G product family offers circuit breakers that are tailored to specific applications, including industrial control panels, motors, and general switching use. The breakers are designed to operate with high interrupting capacity and a minimal mounting footprint in global three-phase power applications that range from 10...3000 A, at 220...690V AC.

You can also apply Bulletin 140G circuit breakers in single-phase systems, DC power systems, and systems with neutral conductors. Your exact circuit breaker selection is driven by the needs of your application. Table 1 on page 4 lists the broad hardware categories and considerations required for each. You must consider all of the categories to develop a full solution.

Table 1 - Circuit Breaker and Accessory Considerations

Device Type	Functional Consideration	More Information
Main device type	Application purpose, standards compliance, high-level features	Bulletin 140G Device Types on page 4
Breaking Frame size	Operating current, interrupting capacity	Anatomy of Bulletin 140G Circuit Breakers on page 6
Trip Unit type	Circuit protection features, adjustability	
Internal Accessories	Additional protection, data signaling, control	
External Accessories	Operation, isolation, personnel protection	
Terminal Connection Accessories	Power supply connection on line and load sides	

Bulletin 140G Device Types

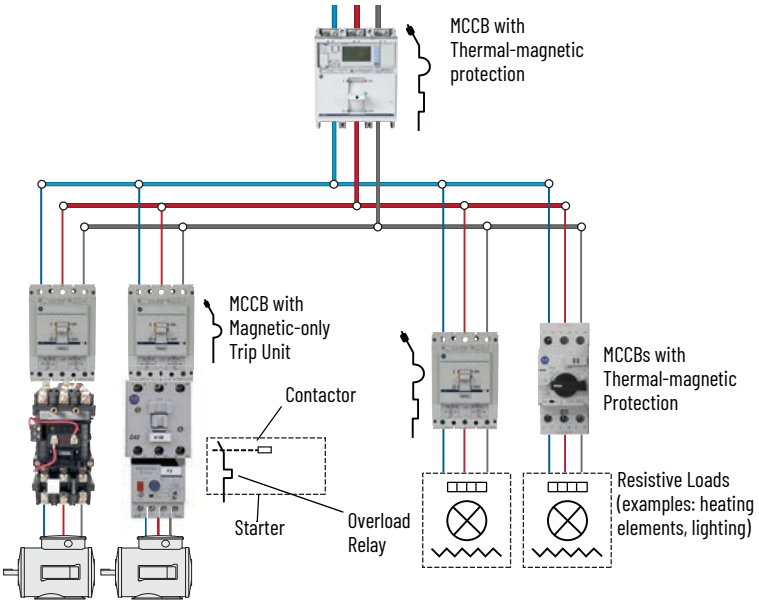
There are three types of devices in the Bulletin 140G product families:

- Two of these devices — Molded Case Circuit Breakers (MCCBs) and Motor Circuit Protectors (MCPs) — are full circuit breakers with various circuit protections tailored to their intended application.
- The other one — Molded Case Switches (MCSs) — are switches that use the molded case breaker platform for improved performance.

These five device types are often used together in an electrical system to distribute power and protect devices and connections. Figure 2 represents a typical multi-starter control panel that is comprised of multiple 140G products:

- The device at the top is an MCCB, which serves as the main disconnect and feeder protection.
- The main MCCB feeds several branches downstream.
- The MCPs on the left protect the motor loads from short circuit events.
- The MCCBs on the right provide branch short-circuit protection and overload protection for general loads.

Figure 2 - Typical Multi-starter Control Panel



MCCBs

MCCBs are designed to provide overcurrent protection for conductors and equipment by opening automatically before the current reaches a value and duration that causes excessive or dangerous temperature to the conductors or conductor insulation. These devices can also serve as the main disconnecting means for a control panel. MCCBs are commonly implemented as feeder breakers or branch protection devices. The main purpose of these devices is to provide low-level overcurrent and short-circuit current protections. These types of circuit breakers are often described as thermal-magnetic devices. However, electronic circuit breakers are becoming more widely used due to their enhanced functionality and adjustability, which allows the protection curves to be customized to a specific application.

Bulletin 140G MCCBs include a variation of the MCCB that is defined as **current limiting**. Current limiting circuit breakers under UL 489 have a specific additional function that limits the energy that is allowed through the breaker when the breaker is tripped. According to UL 489 standard, current-limiting circuit breakers are identified with "Current Limiting" on the front and have a label on the right side that specifies peak current and specific let-through energy values.

In the United States, the National Electrical Code (NEC) defines how this protection is selected in Sections 240-2, 240-3, and 240-4. In Canada, there are similar references in the Canadian Electric Code, C22.1-12. For IEC applications, IEC 60204-1 provides guidance for the construction of industrial control panels.

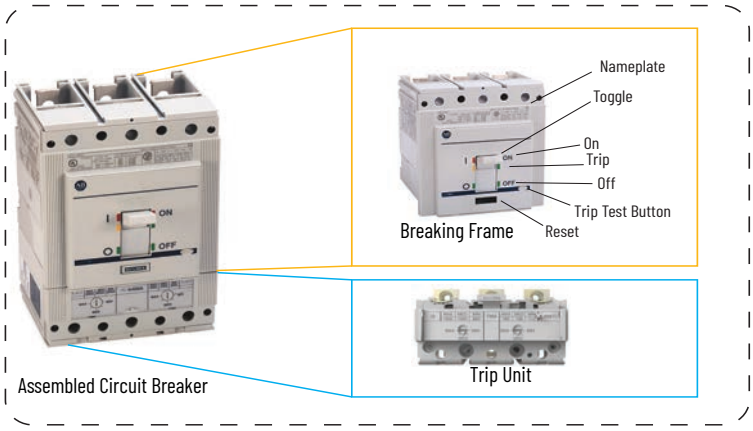
MCSs

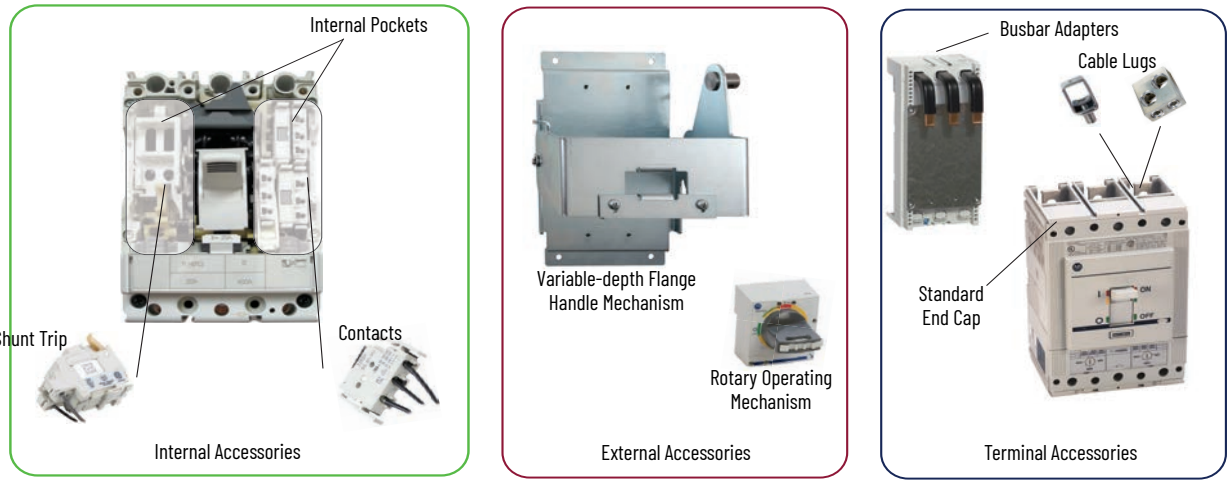
The function of a MCS is to disconnect the downstream circuit in which it is installed. In the OFF position, the switch ensures sufficient electrical isolation to the circuit by using the same design theory as the MCCBs. Other types of devices applied as a disconnecting means may not have these same properties. The mechanical function of a molded case switch is the same as that of a circuit breaker with both an ON and OFF feature that is controlled with a toggle switch. It features the same overall dimensions and can accept the same electrical and mechanical accessories as an MCCB. The MCS provides local motor installation isolation. When disconnected, the MCS can isolate a single machine or group of machines. Likewise, MCSs can provide bus-tie isolation.

MCSs are not designed to automatically break under short-circuit or overload conditions. For this reason, the circuit must be protected with a coordinated device that protects against short-circuit currents. Bulletin 140G MCSs feature a self-protection magnetic override for high-fault conditions, so the device does not experience damage. This is not considered circuit protection.

Anatomy of Bulletin 140G Circuit Breakers

Bulletin 140G circuit breakers have five main physical components in a full assembly, shown below. Each of the four device types we discussed has these five elements, except for the molded case switch, which does not have a trip unit because it does not provide circuit protection in this way. Breaking frames and trip units are both required to create a fully functional assembled circuit breaker, while terminal accessories, internal accessories, and external accessories are optional components that depend on your desired features and the needs of your electrical system.





Each of these five components must be selected to fit with each other and the application. All products in the family are broadly arranged by a frame size (K, M, N, and NS), which has a specific mechanical size and electrical range. Most accessories are compatible with several frame sizes and can be user installed or factory installed.

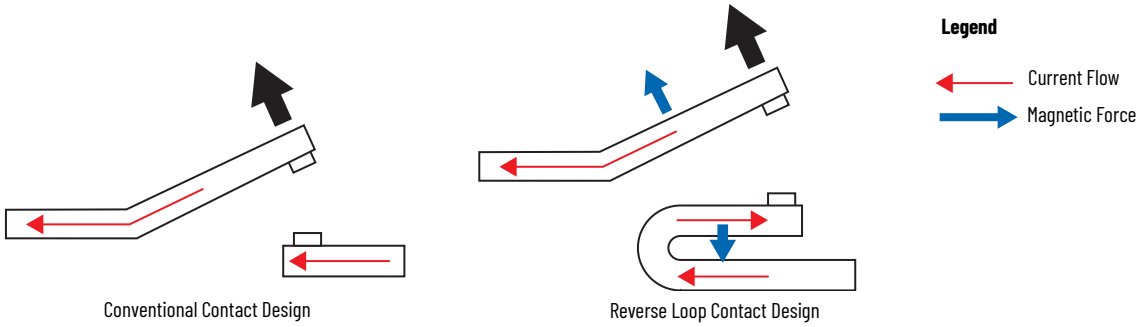
Breaking Frame

The breaking frame makes up the physical majority of the assembled circuit breaker and contains the **switching contacts** and **arc chambers**. These switching contacts are the mechanism that allows the current flow through the breaker to be physically interrupted, either when the breaker is manually turned off or when the circuit protections automatically detect a condition that requires the breaker to open. The switching contacts are mechanically linked so that if one pole experiences an event that causes the breaker to open, all poles open together. The arc chambers surround each switching contact and include arc chutes and splitter plates that conduct the electricity away from the contacts and divide and dissipate an arc when the breaker is opened. An arc forms when electricity flows through the air gap between the contacts as they open. The electricity flow stops when the arc is successfully extinguished. Each breaking frame and trip unit also has venting chutes, which allow exhausting from the arc chambers during a trip under power. Each pole on the breaker is joined together by a **trip bar**, which enables the trip unit to activate the switching contacts.

Depending upon the design of the circuit breaker and intended short-circuit interruption capability, there are differences in the construction of the contact assemblies. Figure 3 on page 7 shows the most commonly used contact assemblies.

Modern circuit breakers use the reverse loop design because it uses the magnetic forces that are created by current flowing in opposite direction to help open the contacts under short-circuit conditions. The amount of repulsive force that is generated is proportional to the value of the short-circuit current that the circuit breaker experiences. This allows faster interruption time as the short-circuit currents increase.

Figure 3 - Conventional Contact Design Compared to Reverse Loop Contact Design



Each frame size is designed to be able to survive different high current conditions, referred to as **interrupting ratings** (see Interrupting Ratings (Breaking Capacity; I_c or I_{cu})). To safely handle these high current levels — sometimes up to 200,000 amps — contact material and geometry must change, affecting physical size and cost of the frame and trip unit. Each frame size is a balance between the range of operating currents, the ability to handle fault currents common in industrial electrical systems, and the panel space footprint of the device. See Product Overview on page 24 for more information about features and accessories for each of the frame sizes.

The breaking frame also includes the top terminals for each pole, internal pockets for accessories, the toggle or integral spring operator assembly, informational nameplates, a trip test button, internal pole connections for the trip unit, and mounting holes to install the assembled breaker to a panel. The toggle shows the status of the circuit breaker and can be operated by hand. The figure shown in Anatomy of Bulletin 140G Circuit Breakers on page 6 shows the toggle positions. The ON position is when the breaker contacts are closed, the OFF position is when the breaker contacts are open, TRIP shows when a breaker has been automatically opened by the trip test button or a trip condition, and the RESET position on the toggle allows the breaker to be closed again after a trip. The trip test button releases a mechanical latch that allows the contact assemblies to open and sets the toggle position to TRIP. On most breakers, this button is on the front face near the toggle.

In the frame size NS, the high mechanical forces needed to manually open or close the contacts require an integral spring operator assembly to replace the toggle. The spring is charged by a ratcheting handle, activated with buttons on the face of the breaker, and must be recharged after every operation.

In the largest frame sizes (N and NS), a **terminal strip** made of labeled plug-in connections is at the top of the breaker. This replaces the wires in many accessories with a terminal connector that you can adapt to your desired control panel wiring.

You must select breaking frames for operational current range, interrupting capacity, let-through energy needs, energy system configuration for phases and poles, and continuous rating requirements. See Approximate Dimensions on page 125 for mounting information and dimension drawings for breakers and accessory assemblies.

Trip Unit

The trip unit is the second required component of the assembled circuit breaker. It determines how the breaker behaves while automatically protecting a circuit. The trip unit simultaneously monitors for all circuit protections by analyzing the power on each line and calculating when to trip the breaker. Bulletin 140G devices offer several types of protection packages ranging from fixed, mechanical, thermal-magnetic units to heavily adjustable, electronic, multi-protection units. Figure 4 on page 8 shows these two major trip unit types: the thermal-magnetic unit is identified by a simple interface, and the electronic unit shows various protections and configuration switches.

Figure 4 - Thermal-Magnetic and Electronic Trip Unit Interface Comparison

Thermal-magnetic Trip Unit

Electronic DIP Switch Trip Unit

Thermal-magnetic trip units use mechanical assemblies and material properties to determine when the current flow is too high. The thermal portion protects against thermal overcurrent conditions in which the slightly elevated current causes heat buildup in conductor elements due to each component's resistance. This thermal overcurrent detection is achieved by using the different heating rates in a bimetallic heater element similar to those found in overload relays. The current flow is broken as the element heats up and curls away. Once the element has cooled and the contact uncurls back into place, the breaker can be reset. The magnetic portion protects against short-circuit current conditions, which are high-current spikes that have many causes. Magnetic short-circuit detection is achieved by an assembly that uses magnetic forces to activate a lever, which releases the trip bar. This magnetic assembly is different from the switching contacts that are found in the breaking frame but uses the same principles on a smaller scale. Some thermal-magnetic trip units are adjustable to different thresholds by turning settings indicators on the front of the breaker. Thermal-magnetic trip units are used with MCCBs (magnetic-only version).

Electronic trip units achieve the same circuit protections as thermal-magnetic units by using electronic sensors to detect current flow, processors to model the associated protection behavior, and solenoids to activate the trip bar and interrupt the current flow. Electronic trip units offer additional protections and wide adjustability of each protection to fully customize the behavior of the breaker to an application. Electronic units use small vertical switches (DIP switches) on the face of the breaker to configure threshold, time, and other settings for each protection. Electronic trip units are used with MCCBs. The protection is set based on the motor class and adjusts the current threshold and time response for the common needs of that motor class.

Circuit Protections and Device Self-Protections on page 15 discusses individual circuit protections in detail.

Table 2 illustrates the thermal-magnetic and electronic trip units that are available with the 140G family of MCCBs and their adjustment ranges. Each trip unit is tuned to a system's operating current by a rating or by a replaceable **rating plug**. These ratings adjust the trip unit from the frame's maximum to the desired operating current. Rated current is covered in more detail in Rated Current (I_n).

The trip unit also includes the bottom terminals for each pole, internal pole connections for the frame, wired connection ports for specific accessories, and mounting holes to install the assembled breaker to a panel.

Trip units must be selected for compatible frame size, protections package with adjustability or specialty function, compatible pole configuration, and rated current.

Table 2 - Trip Unit Adjustment Range Comparison, 120...1200 A Devices

Frame Size	Type (1)	Rated Current [A] (2)																												
		120	122	125	140	150	157	160	175	200	210	225	240	250	252	280	300	320	350	400	420	480	560	600	630	800	900	1000	1200
K	T-M										0																		
																0													
	E									0																			
								0																					
M	T-M																				0								
																							0						
	E												0																
															0														
																		0											
N/NS	E																					0							

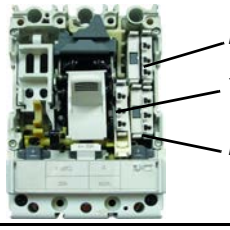
(1) T-M = Thermal-magnetic; E = Electronic
(2) X = Denotes fixed thermal and Fixed Magnetic; 0 = denotes adjustable thermal and adjustable magnetic

Internal Accessories

Circuit breakers contain internal pockets that are designed to accommodate internal accessories that can add data sharing and extra abilities to the device. These accessories are supplied with connection wires that are routed behind the cover and out the side of the breaker. In frame size N, NS, and R, the terminal strip on the breaking frame and a 3-pin quick connector replaces these connection wires. All frame sizes allow multiple internal accessories to be installed simultaneously.

Signaling contacts are micro-switches that sit on status levers inside the breaker and transmit a signal to a controller or panel light when the lever positions change. Most contacts are used for **auxiliary** (breaker ON or OFF), **alarm** (TRIP for any reason, including accessories), and **trip unit alarm** (TRIP from protection or trip button only) and are offered as multi-switch packages.

Table 3 - Auxiliary, Alarm, or Trip Unit Alarm Contact Change in Response to Device Status

Contact Location	Device Status	Contact Type		
		Auxiliary (AX)	Alarm (AL)	Trip Unit Alarm (TU AL)
	On	✓	–	–
	Trip (test or accessory)	✓	✓	–
	Trip (circuit protection by trip unit)	✓	✓	✓
	Off	–	–	–

Other internal accessories are also used for circuit protections. **Shunt trip** and **undervoltage release** units are activated by controller signals or panel pushbuttons and use solenoids to make contact with the trip bar and cause the breaker to trip. Shunt trip is activated when a signal is sent, and undervoltage release is activated when a steady signal is removed (common for many safety applications). Shunt trip and undervoltage release units are both additionally applicable as circuit protections for undervoltage and overvoltage conditions and are available for voltages ranging from 12V DC to 525V AC. **Shunt Close** units are used with frame size NS breakers to remotely close the breaker (to the ON position). **Trip Reset** is used with frame size NS breakers to remotely recover from a TRIP state.

Spring charging motors use an electric motor to recharge the integral springs of the frame size NS breakers. A common application of accessories for integral spring operation breakers in frame size NS use a combination of accessories to initiate breaker status change and recharge the springs with an electric motor. Several of these components are required for full function: spring charging motor, shunt close, and shunt trip. For systems where a manual reset is not desired when the breaker is tripped for any reason, the trip reset is recommended. Optional accessories for this application include the spring charged contact, ready-to-close contact, trip unit alarm contact, and mechanical operations counter. This system is often referred to as **remote operation** and can be driven either by PLC signals or local push button control.

Mechanical counters are available for frame size NS breakers and record of the number of operation cycles of the breaker when it is installed with the spring charging motor.

You can order Bulletin 140G devices with factory-installed internal accessories. See Internal Accessories on page 56 for more information.

External Accessories

External accessories serve many purposes, including additional circuit protections, a variety of mechanical assemblies to operate the circuit breaker, insulation and guarding components, locking components, mounting adapters, and troubleshooting accessories.

Assembled circuit breakers and breaking frames are supplied by default with the following external and terminal accessories: end caps, back insulators, phase barriers, mounting hardware, and both side and front covers. The section Replacement Parts on page 67 lists the catalog numbers to order replacements for these components and common replacement parts for flexible cable operators.

Additional Circuit Protections

Externally installed circuit protections include earth leakage protectors, external neutral sensors, rating plugs, and maintenance mode connections. **Earth leakage protectors** attach to the bottom of a circuit breaker and analyze the total current flow across all three lines to check for power leaking out from a fault. They also allow the breaker to protect equipment at a 30 mA level. Earth protectors feature terminals at the bottom to accommodate the full variety of Bulletin 140G terminal accessories. **External neutral sensors** allow a 3-pole breaker to analyze a 4th neutral line for the return current flow. See Neutral Pole and Protection on page 14 for more information. **Rating Plugs** change the rated current for a device. See Rated Current (I_n) for more information on rated current. **Maintenance Mode Connectors** enable signaling to operate maintenance mode on enabled devices.

Device Operation Options

Operator assemblies and accessories are commonly used to let personnel actuate the circuit breaker between states without opening an enclosure and being exposed to potentially dangerous power levels. Table 4 compares the available options for device operation.

Table 4 - MCCB Operation Comparison

Operator Type	Photo	Accessory	Accessory Purpose
No Operator		None	• Use toggle on frame size K, M, and N to manually operate device • Can be mounted through enclosure door when installed with escutcheon plate
		None	• Use lever and buttons on frame size NS to manually operate device • Can be mounted through enclosure door when installed with escutcheon plate
Rotary Operators		Variable-depth Rotary Operators (RVM/NVM/RMX)	• Control the device with manual rotary handle that is attached to outside of enclosure door • Handle is connected to device by shaft modified to enclosure depth and rotary mechanism • NFPA options available
		Direct Rotary Operators (RMB/RMY)	• Control the device with manual rotary handle connected to face of device • Can be mounted through enclosure door when installed with included rotary escutcheon plate
Flange-mounted Handle Operators		Flexible Cable Operators (FCX)	• Control the device with manual vertical flange handle while the device is installed almost anywhere in enclosure
		Bulletin 1494V Variable-Depth Flange Operator (1494V-M)	• Control the device with manual vertical flange handle while the device is installed directly behind flange of enclosure
Remote Control Operators		Stored Energy Motor Operator (EOP)	• Control the device with remote operation signals from push button or PLC in one device on the face of the breaker • Control toggle device with manual lever and buttons • Can be mounted through enclosure door when installed with included motor escutcheon plate
		Spring Charging Motor (SCM) for Remote Operation System	• Enable remote operation system on frame size NS • See Table 89 for details; system requires multiple internal components

Rotary operators change vertical toggle motion into rotary turning of a handle and are available in direct-mounting and variable-depth varieties to accommodate enclosure styles and needs. Some rotary operators are offered with NFPA 79-compliant handles, which have a secondary handle for deliberate operation of the breaker when the enclosure is open. **Flexible cable operators** use a flexible cable to transfer the toggle motion to a vertical-travel handle that is mounted outside the enclosure (often on an enclosure flange), allowing you to install the connected breaker anywhere on the panel. All handles are available in a selection of materials and finishes that are designed to withstand a variety of industrial environmental conditions. **Stored energy motor operators** are a single device that performs three

functions: provides a closing spring similar to the frame size NS, which uses a lever to charge a spring mechanism and buttons to drive the toggle; provides signal input to electronically control the opening and closing of the breaker, which uses an electric motor to charge the spring mechanism; and provides a padlock to lock the whole device and breaker into the OFF position.

Early-Make and **Early-Break** signal contacts are available for use with direct rotary handles and variable-depth rotary operators to prevent nuisance undervoltage trips while operating the handles or transient voltage damage.

Insulation and Guarding Components

A variety of covers and seals are offered for connection insulation and breaker guarding. We offer **covers**, including front covers, side covers, and standard, high, and low terminal covers, that protect personnel and control wiring from power connections. **Phase barriers** and **terminal covers** also insulate line connections and prevent dangerous arcing conditions between poles of the breaker. **IP30 escutcheon frames** and **IP54 protective covers** are available to protect through-the-door installations. **Sealable screws** are available to prevent tampering with terminal covers.

Locking Components

Locking accessories include **padlock adapters** that allow a breaker to be mechanically fixed in an OFF position, and **door interlocks**, which allow a breaker to trip when an enclosure is opened to protect personnel from an enclosure's power supply.

Mounting Options

Bulletin 140G circuit breakers are panel mounted (as opposed to withdrawable styles) and can be installed to a panel either by the 4 mounting holes in the assembled breaker or by using mounting adapters. Bulletin 140G adapters include **EZ-plates**, which allow a breaker to be mounted by two 1/4 in.-20 bolts. See Mounting Conditions on page 22 for more information. **Bulletin 141A Busbar Mounting Adapters**, which allow terminal connection and panel mounting in one accessory, are also available. See Bulletin 141A Busbar Mounting Adapters on page 67 for more information.

Troubleshooting Accessories

You can use special powered accessories to aid in troubleshooting. An **external battery unit** and a **trip test unit** allow electronic trip units to be powered when not in use under load, as well as evaluated for trip conditions, error indicators, and proper accessories installation (for those that would be affected by a breaker trip).

Phase Barriers and Terminal Covers

Phase barriers and terminal covers let you increase the insulation characteristics between the phases at the connections. They are mounted from the front, even with the circuit breaker already installed. Medium and high phase barriers and terminal covers provide additional electrical clearance between each phase when special connections extend past the circuit breaker housing, like extended and spread terminals or ring lug collars on cables.

Terminal Connection Accessories

Terminal connection accessories convert the standard line- and load-side terminals of the breaker to accommodate a variety of cable terminations and busbars. Each breaker comes with an **end cap kit** that includes a bolt and a nut that fixes in place to the breaker's housing. The 140G product line includes, as standard, the capability to terminate wiring using customer furnished crimp-on ring lug (ring tongue) or forked lug termination. Using Allen-Bradley terminal lugs in applications that follow UL guidelines for panel short-circuit current rating (SCCR) permits the termination to be rated at the SCCR level of the circuit breaker. This rating may allow a higher SCCR than may be available using a separate power distribution block.

Terminal lugs are available in copper (Cu) and copper-aluminum (CuAl) construction and include saddle-clamp-style lugs, machined block lugs, and multi-terminal lugs. These accessories bolt on to the front terminals on the breaker (requires the end caps) and allow cables up to 750 MCM to be attached to the breaker. **Multi-terminal lugs** allow up to 6 wires to be attached to each pole of the breaker.

Most terminal lugs include control tap screws for external voltage or current sensing purposes. For frame size N and NS, **vertical** and **rear terminals** are available, which are designed for busbar systems. For frame size K, **Bulletin 141A busbar adapters** allow mounting and electrical connection of the breaker to a busbar system.

For conductor sizing information, see Conductor Selection on page 21. The installation instructions for each breaking frame contain details on allowable connections to front terminals; details on terminal lug connections are contained in each terminal accessory's installation instructions. See Additional Resources on page 153 for more information.

Factory-Installed Options

Many components are available as factory-installed options. These options offer a faster installation time and streamlined accessory selection for certain common functions. These options include:

- Assembly of breaking frame and trip unit (for products that are available separately).
- Remote operation via combined use of spring charging motor, shunt trip, shunt close, trip reset, and mechanical counter.
- Shunt trip and undervoltage release for controls or protections.
- Variety of contact kits, including auxiliary, alarm, and trip unit alarm contacts.
- Terminal connections with saddle-clamp style lugs or busbar adapter.

Properties of a Circuit Breaker

In addition to the five main physical components of an assembled 140G circuit breaker, there are several non-physical properties they share. Each property is a critical function of the breaker, which must be identified and specified to select the right breaker for the application.

Definitions

Threshold current: the root mean squared (rms) symmetrical prospective at the highest interrupting capacity of the current limiting range, where:

- the peak current let-through in each phase is less than the peak of that symmetrical prospective current, and
- the I^2t in each phase is less than the I^2t of a 1/2 cycle wave of the symmetrical current

Interrupting rating: the highest current at rated voltage that a device is intended to interrupt under standard test conditions.

Current Definitions

Throughout this publication, we refer to several types of current. Table 5 explains these types of current and their abbreviations.

Table 5 - Current Definitions

Abbreviation	Current Type	Description
I_n	Rated current	The value of current that characterizes the protection release that is installed on board the circuit breaker and determines, based on the settings available for the release, the protective characteristic of the circuit breaker itself.
I_c	Breaking capacity	The value of current that a circuit breaker is able to interrupt without being destroyed or causing an electric arc with unacceptable duration.
I_{cu}	Ultimate breaking capacity	The maximum short-circuit current that a circuit breaker can break without damage.
I_{cs}	Service breaking capacity	The maximum short-circuit current that a circuit breaker can break three times and still resume normal service. Expressed as a percentage ratio of I_{cu}.
I_{cm}	Rated short-circuit making capacity	The highest instantaneous value of current that the circuit breaker can establish at rated voltage in specified conditions.
I_{cw}	Rated short-time withstand current	The value of the current the equipment can withstand for a specified time without damage occurring
I_p	Peak current	The maximum (or peak) instantaneous current that is allowed to pass during a specific short-circuit event. The value is determined from either a table as shown above or evaluated from an SCCR table based upon the available short-circuit current at a specific voltage.
I_{rms}	Short-circuit current rating	The maximum rms prospective (available) current that a device can interrupt. The rating is expressed in Amperes and volts.
I_s	Selectivity limit current	The current co-ordinate of the intersection between the total time-current characteristic of the protective device on the load side and the tripping time-current characteristic of the other protective device. See publication 140G-TD050 for more information about circuit breaker selectivity.
I^2t	Amperes squared seconds	An expression related to the energy that is let through for a specific short circuit event. With respect to circuit breakers, the I^2t [A^2s] is expressed for the current flow between the initiation of the fault current and the clearing of the circuit.

Interrupting Ratings (Breaking Capacity; I_c or I_{cu})

The interrupting rating, or breaking capacity, of a breaker refers to the maximum amount of fault current that a specific breaker can safely interrupt without damage to itself. Fault current is the maximum amount of current a system can send downstream to the breaker during a failure like a short circuit or ground fault, typically measured in kiloamperes (kA). The maximum amount of fault current that is supplied by a system can be calculated at any point in that system. The interrupting rating of the breaker must be greater than or equal to the amount of fault current that can be delivered at the point in the system in which the breaker is applied. Breakers and other circuit interrupting devices can be arranged in an electrical system to effectively step down the fault current to appropriately limit the danger to downstream devices.

A breaker's interrupting rating always decreases as the voltage increases. For example, a Bulletin 140G K frame circuit breaker with a high interrupting capacity of 100 kA at 480V can only provide 20 kA capacity at 690V. Interrupting rating is one of the most critical factors in the breaker selection process. The figure at the right shows a closeup of this rating information on a Bulletin 140G breaker. Ratings for UL (which uses the term interrupting rating) are shown on the front nameplate, while ratings for IEC (which uses the term breaking capacity) are shown on a label on the left side of the breaker.

Interrupting Rating Nameplate Information

Rated Current (I_n)

Each breaker is tuned to a rated current, which is the expected operating current of the device and the reference point that circuit protections are based on.

The operating current is determined by the needs of the application, and each breaker can be operated at as low as 20% of the rated current of the device. Each protection for circuit current is defined by a threshold in comparison to the rated current, I_n. The protection thresholds have settings as a multiple of the rated current. See Circuit Protections and Device Self-Protections on page 15 for more information.

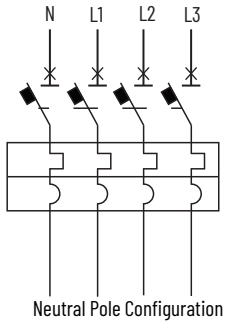
The breaking frame defines the range the breaker can operate on, and the trip unit defines the specific rated current the breaker will be tuned to within that range. In larger frame sizes (N and NS), the rating is instead determined by a rating plug, which is a component that fits into the front of the trip unit and lowers the trip unit's rating to the desired operating current. In these trip units, the rating plug that comes with the unit can be replaced with a lower-value rating plug. To achieve a higher value, you must select a different trip unit with a higher base rated current. You cannot change rating plugs in MCPs.

The rated current of each trip unit is identified by the labeling tab at the top of the trip unit (marked with In = ###A), which shows through a small window on the assembled circuit breaker just below the toggle as shown in the figure to the right. On frame sizes N and NS, the rating is shown in text on the front center of the trip unit or on the rating plug on the left side of the front of the trip unit..

Trip Unit Rated Current Information

Neutral Pole and Protection

Breakers are available in 3- and 4-pole configurations. The 4-pole units come with an integral neutral pole, and many of the 3-pole devices can be applied to a 4-pole system by using an external neutral sensor accessory. Using a 4-pole device has the benefit of the neutral pole isolated within the MCCB housing and utilizes a switching contact with arc chambers to interrupt current flow on the line. Proper selection of a neutral pole solution is dependent on the power supply and electrical system design.



Neutral Pole Configuration

Neutral line protection is the addition of the neutral current sensor data to the other protections enabled on the device. Neutral settings are available as a percentage of the rated current and are used as a threshold modifier for the protections. For example, if a protection is enabled at 1 times (100%) the rated current and neutral is at 50%, then the trip unit will monitor the neutral current sensor for that protection on that pole at 0.5 times (50%) the rated current. This is simultaneously true for all enabled protections, and their protection timings are the same as for the other poles. For 4 pole thermal-magnetic trip units, neutral is offered at 100%, and for electronic trip units neutral can be adjusted from 50...200%. Neutral protection can also be turned off, where the neutral pole is not monitored but will be interrupted as a 4th pole when the breaker is opened for any reason.

For all 4-pole 140G MCCB and Molded Case Switches, the neutral is the left outside pole.

Opening Time

The opening time of the circuit breaker is the time required to fully interrupt the current flow on all poles. This is also referred to as clearing time or break time. The protection threshold and time determine when a trip is triggered by the trip unit. Once the trip is triggered, the opening time includes the activation of the trip bar, the motion of the switching contacts from closed to open, the redirection of the electricity through the arc chutes and splitters, and the extinguishing of the arc. The opening time for all Bulletin 140G devices is 8.5 milliseconds, or half of one cycle at 60 Hz.

During the opening time, the breaker allows energy through the poles while the arc is still active. This energy is measured and documented in two forms: **peak let-through current** and **total let-through energy**. This energy can damage highly sensitive downstream equipment and should be considered when you select a device. For information on each frame's let-through data, see Trip and Let-through Curves on page 97.

80% and 100% Continuous Rated Breakers

All 140G MCCBs are rated for 80% continuous load unless they are marked for 100% loads. The NEC requires that only 100% rated continuous loads be marked special with the load designation. In all general applications, the unmarked circuit breaker is to be applied at no more than 80% continuous load of its rated current (I_n). Typically 100% rated current MCCBs are devices with electronic trip units. Visit www.rockwellautomation.com for specific devices.

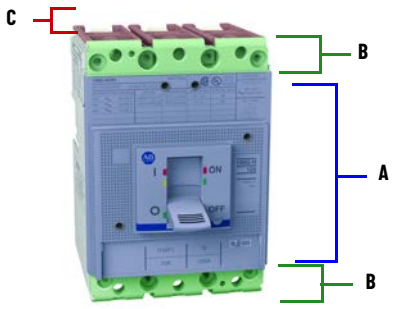
At higher rated currents, separate trip units are required to achieve either 80% or 100% continuous rating. For frame size N and NS, the trip unit and frame must both be selected according to the percent rating required for the end application.

Ingress Protection

The Ingress Protection rating (IP rating) is an international standard (EN/IEC 60529) that is used to rate the degree of protection or sealing effectiveness in electrical enclosures against intrusion of objects, water, dust, or accidental contact.

Table 6 indicates the degrees of protection against intrusion and accidental contact according to IEC 60529.

Table 6 - Ingress Protection Rating



Location	Terminal Covers		
	None	High (1)	Low
A	–	–	
B	IP20 (2)	IP40	IP40
C	–	IP40 (3)	IP30 (3)

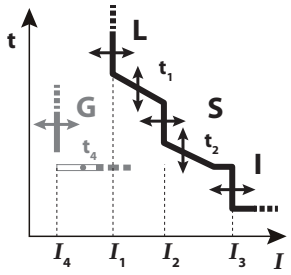
(1) High terminal covers have a height of 60 mm (2.36 in) and are designated with a suffix "H" in the catalog number (140G-K-TC3**H**)
(2) Frame size K only.
(3) After correct installation.

Circuit Protections and Device Self-Protections

Each breaker's device type or trip unit defines the protections for the circuit. All four device types also contain device self-protections, which are not considered circuit protections. Each of these protections perform together to define each breaker's **trip curve**, which is a time-current chart of the adjustable settings and cumulative effect of the protections on the response of the breaker to excess current conditions.

Figure 5 shows a generic version of a trip curve. Each threshold ($I_{\#}$) and time ($t_{\#}$) adjustment on the protections lets you tune the curve to respond to or ignore specific conditions in the circuit, depending on the application. Each current protection threshold is expressed as a multiple of the nominal current, I_n, unless otherwise noted. The breaker has no response to the left of the curve and when the time and current level of an event aligns with the tuned curve, a device responds within the published tolerance.

Figure 5 - Generic Trip Curve with LSIG Protections Parameters



Each trip unit monitors all poles and all protections simultaneously, including a neutral pole if using a 4-pole breaker or external neutral sensor. Table 7 on page 16 compares device types and protections.

Table 7 - Comparison of Protections and Device Types

Protection Type		MCCB		Molded Case Switch
		Thermal-magnetic	Electronic	
Current-based Circuit Protections	L	✓	✓	–
	S	–	✓	–
	I	✓	✓	–
	G	–	Optional	–
	N	Optional	Optional	–
	U	–	–	–
Device Self Protections	Magnetic Override	✓	✓	✓

Each protection's segment of the curve features a slope that defines the protection's response: t = k, where the response is a constant trip time and is shown as a right angle on the chart, or t = k/I^2, where the response follows this formula, resulting in a constant let-through energy and creates an angled slope on the chart. Each trip curve for thermal-magnetic devices displays differences in hot trip, where the device has recently experienced a thermal overload condition and is physically still warm from the event, and cold trip, when it has not experienced this condition. Hot trip conditions cause the breaker to trip faster, and electronic devices feature a calculation (referred to as **thermal memory**) to simulate this response and protect a circuit from repeat thermal overload conditions. When a trip is initiated and the breaker is interrupting the circuit, a certain amount of energy is allowed through- these details are documented in peak let-through current and total let-through energy curves. Trip and Let-through Curves on page 97 contains additional details on reading, interpretation, and tolerances for trip curves and let-through curves. Table 8 on page 16 compares circuit protections for current; Table 9 on page 17 lists device self protections.

Table 8 - Current-based Circuit Protections

Protection Code	Name	Function	Parameters and Limits
L	Long (thermal)	Long overcurrent condition (current experienced is slightly higher than the nominal current of the system) where thermal rise due to resistance of the system observed in the conductors and connections is undesirable and may cause damage to the insulation and some current-sensitive circuit components. Generally active 125…1000% of nominal current during an overcurrent event.	• Threshold: I_1; adjust 0.4…1.0 x I_n • Time: t_1; adjust 3…144 s • Shape: t = k/I^2; 3 additional IEC profiles for N and NS LCD trip unit If S Protection is enabled, I_1 threshold must be less than I_2
S	Short	Short short-circuit condition (current experienced is moderately higher than the nominal current of the system) where undesirable low short-circuit current faults may occur, but motor inrush currents may need to be allowed through the breaker to avoid nuisance trips. Generally active 125…10,000% of nominal current during an overcurrent event. Short protection can have a sloped line for t = k/I^2 behavior and a flat line for t = k behavior.	• Threshold: I_2; Off (1), adjust 0.6…10 x I_n • Time: t_2; adjust 0.05…0.8s • Shape: t = k/I^2; t = k
I	Instant (magnetic)	Instantaneous short-circuit condition (current experienced is significantly higher than the nominal current of the system) where high short-circuit current faults can cause damage to downstream equipment. Generally active 500…15,000% of nominal current during an overcurrent event.	• Threshold: I_3; Off (1), adjust 1…15 x I_n • Time: none • Shape: t = k
G	Ground	Ground current condition where ground/earth fault current is detected across the sum of all phases and can cause equipment damage. Generally active 20…100% of nominal current during an overcurrent event.	• Threshold: I_4; Off (1), adjust 0.2…1.0 x I_n • Time: t_4; adjust 0.1…0.8s • Shape: t = k/I^2; t = k • Limits: frame size K, M, N, and NS are disabled at 4/6/8x I_n in favor of I Protection response time
N	Neutral	Neutral protection allows the addition of a 4th pole to the analysis of the L, S, and I protections at the specified percentage of the nominal current. See Neutral Pole and Protection on page 14.	Options: • Thermal-magnetic: Off, 100% I_n • Electronic: Off, adjust 50…200% I_n • Time, Shape, Limits: See other enabled protections and settings
U	Imbalance	Imbalance of current condition on the 3-pole of the device, where unbalanced loads or uneven power draw can damage downstream equipment or indicate a fault. Protection fixed at 50% of long protection threshold.	• Options: Off, 50% of I_1 • Time: 2s • Shape: t = k

(1) Off option for protection available on electronic trip units only.

Table 9 - Device Self Protections

Protection Name	Function	Parameters and Limits
Magnetic Override; Hardware Override	High fault current condition where current experienced may cause damage to downstream equipment. Override is below interrupting capacity of breaking frame (maximum value breaker can withstand) to protect breaker from damage over time. Ranges from 10...200 kA.	Threshold and Time: • See override region window in device trip curve • Molded Case Switch: see magnetic override values that are listed in product selection tables

For information about maintenance mode, see Maintenance Mode on page 23.

Circuit Breaker Applications

Circuit breaker selection and terminology is very specific to the regional governing standards of the end application. Some applications may require derating of the circuit breaker for proper function.

Standards Compliance and Certifications

To provide customers with third-party assurance that Allen-Bradley MCCBs meet industry standards, Bulletin 140G devices comply with various global standards. The Bulletin 140G MCCBs comply with UL, CSA, and IEC standards and are UL Listed, CSA Certified, and CCC Certified.

MCCBs comply with certification requirements from other agencies. The certification of these products is an ongoing process and additional ratings and certifications are continually being pursued. For specific information about declarations of conformity, certificates, and other certification details, see our product certifications website, rok.auto/certifications, or contact your local Rockwell Automation sales office or Allen-Bradley distributor.

Reverse-fed Circuit Breaker

Due to physical equipment arrangements in panelboards, switchboards, and industrial control panels, it is often desirable to reverse feed a molded case circuit breaker. Traditionally, the line that feeds the circuit is connected to the top and the load that draws the current is connected to the bottom. Reverse feeding is achieved by trading the line and load connections on the breaker. For this type of application, the circuit breaker must be tested and listed accordingly. All Bulletin 140G circuit breakers can be reverse fed. When reverse feeding these devices, you must properly identify the line and load side terminals.

Figure 6 - Reverse Feed Configuration

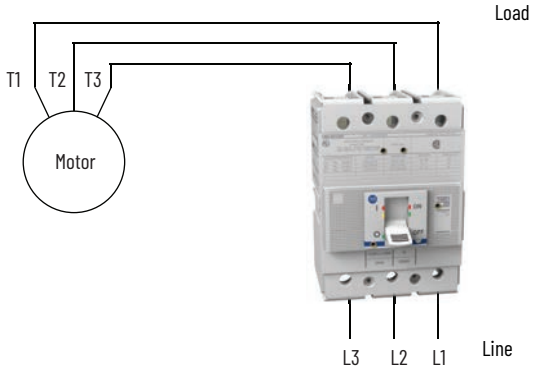


Table 10 - Maximum Voltage for Reverse-fed Circuit Breakers

Frame Size	Maximum Voltage [V AC] (1)	
	UL/CSA	IEC
K	600	690
M	600	690
N, NS	600	690

(1) NEC Article 404.7 states "Where these switch or circuit breaker handles are operated vertically rather than rotationally or horizontally, the up position of the handle shall be the (on) position." Refer to applicable codes and standards for specific application requirements.

Applying MCCBs to North American Guidelines

MCCBs are most commonly used as either feeder breakers or as a single circuit breaker where disconnecting, short-circuit, and thermal protection functionality is required. When selecting an MCCB, you must consider the following items.

- Application voltage
- Available short-circuit current
- Amperage of the load or wiring to be protected

You must consider local code requirements; these requirements can ultimately affect the type and functionality of the MCCB that you select.

MCCBs

- Magnetic and thermal trip currents can be fixed or adjustable
  - Magnetic trip current is generally set at 1000% (10x) of circuit breaker thermal ratings
- Must be sized per NEC/CEC rules
- Can be UL Listed as part of UL 508/UL 60947-4-1
- Can be used for motor circuits or motor control circuit transformers, though Bulletin 1489 miniature circuit breakers (MCBs) are a more appropriate choice
- Motor current (thermal rating):
  - ≤ 250% motor full load amperes (FLA)
  - ≤ 300% for motors ≤ 100 A if the circuit trips on start
  - 400% for motors ≥ 100 A if the circuit breaker trips on start

MCPs

MCPs are the most popular choice for motor circuits in the North American market. they have been used in combination starters and MCC unit inserts (buckets) for many years.

- Magnetic only
- Magnetic trip current is adjustable
- Motor current setting (thermal) is not specified by NEC/CEC
- Thermal capability should be ≥ motor FLA and ≤ overload relay setting
- Motor overload protection must be provided separately
- UL Recognized
- UL Listing is obtained as part of UL 508/UL 60947-4-1
- Provide choice in overload protection
- Must be tested and listed with specific contactors and overloads
- Adjustability is required by UL489 standard
- Must be sized per NEC/CEC rules
  - ≤ 800% motor FLA for standard efficiency motors
  - ≤ 1300% motor FLA allowed if motor does not start
  - ≤ 1100% motor FLA for high efficiency motors
  - ≤ 1700% motor FLA allowed if motor does not start

Selecting a Circuit Breaker When Application Follows U.S. Guidelines

Selecting a circuit breaker for use in an industrial control panel requires focus on the MCCB for use as a feeder and as a branch circuit protective device.

Selecting the MCCB for Use as the Main Disconnect or Feeder

A typical industrial control panel is a feeder circuit as defined by the NEC, where a feeder is composed of the wires between the service entrance of the panel or line side of the MCCB and the line side of the branch protective devices.

Motor control is involved in many industrial control applications. The application must then follow Article 430 of the NEC, which states that breakers for feeders having mixed loads should have ratings suitable for carrying the heating loads, plus the capacity required by the motor loads. Examples of mixed loads include heating (lighting and heat appliances) and motors.

For motor loads, NEC Article 430 states that breakers for motor feeders shall have a rating not greater than the sum of the highest breaker rating of any of its branches and the full-load currents of all other motors that are served by the feeder.

Feeder Breaker Thermal Rating Selection Example

This assumes that the circuit breaker selected has a voltage rating equal or greater than the application and that the interrupting rating is equal or greater to the available short-circuit current. The panel contains a main feeder breaker supply with three motor branch circuits.

In our application, the feeder is supplying a 3-motor system at a voltage of 480V.

Motor	Hp	Current value from Table 430.250 [A]
Motor 1	10	14
Motor 2	5	7.6
Motor 3	5	7.6

Calculation of panel wiring includes:

- For single motors: Per [430.22], size motor branch circuit conductors no smaller than 125 percent of the motor FLC rating listed in Table 430.147 or 430.148 (Figure 430-4). Size the branch circuit short-circuit and ground-fault protection device per 240.6(A) and 430.52(C)(1) Ex. 1.
- For multiple motors. Per [430.24], size multiple motor conductors as follows. First, multiply the full-load current rating of the highest-load motor by 1.25. Then, add up the full-load current ratings of all other motors in the group. Add these two numbers. That's your motor load for calculating ampacity. Add any other loads on that conductor, to calculate total conductor ampacity.

Current calculation is:

Motor 1	(14 A x 1.25) =	17.5 A
Motor 2		7.6 A
Motor 3		7.6 A
	TOTAL	32.7 A

Because the total load comes to 32.7 A and there is not a commercially available breaker available for 32.7 A, the NEC lets you use the next largest standard-sized breaker. Therefore, you could select a 35 A MCCB to protect this control panel.

Each motor branch also needs protection.

Selecting the MCCB for Use as the Branch Short-Circuit Device

You can also use an MCCB as a branch protective device for a motor load. While we show the calculation for applying an MCCB in this manner, the MCP is better suited for this application. After the calculation for sizing is completed, it should be apparent that, even though this is technically correct, in some cases, the motor protection and wire protection can be less than ideal.

Per NEC Article 430.52(B), the motor branch circuit short-circuit and ground fault device shall be capable of carrying the starting current of the motor. Further, 430.52(C) indicates that the protective device must have a rating or setting not exceeding the value that is calculated according to the values given in Table 430.52. In the case of an inverse time MCCB, such as the 140G, the calculation for the maximum setting or rating of the protective device is 250% of the motor being protected. Figure 2 on page 4 shows an example of this type of configuration.

Thermal-magnetic Circuit Breaker Branch Selection Example

An MCCB is being used to protect a branch motor circuit with a 10 Hp 460V motor. Using Table 430.250 of the NEC, a value of FLC of 14 A is supplied for this motor.

Calculating the maximum branch circuit protective device rating or setting is: 14 A x 250% = 35 A

Therefore, the maximum size MCCB that could be used in this example is 35 A. This is the maximum rating and therefore smaller devices could be selected for this application. A point to consider is that generally MCCBs have a magnetic trip of approximately 10x the rating of the MCCB. When starting, motors usually exhibit an inrush characteristic of 6...10 times the full load rating of the motor, depending on the type of motor being used. In this case, the circuit breaker trip point is approximately 350 A and the motor starting current of locked rotor current is approximately 140 A if a 10x ratio of running to starting current is assumed. You could select a smaller breaker without concern for nuisance tripping. In that case, there may be more concern about the thermal protection provided by the circuit breaker being based on a 35 A breaker with only a 14 A load. The motor and the wiring may not be adequately protected if larger wire isn't selected or if a motor overload relay is not used.

MCCB Application and Sizing

Bulletin 140G MCCBs are traditionally used to protect branch and feeder circuits in industrial control applications. In the role of a feeder circuit breaker, the MCCB provides isolation and short-circuit protection for the panel and thermal protection for the feeder wires. As a branch circuit breaker, an MCCB provides the same protection for the branch wires in the panel. For illustrative purposes, the feeder is shown at the wiring from the load side of the main or feeder MCCB to the line connection of the branch short-circuit protective devices to which the feeder is supplying power.

The following example is a generic interpretation of the US National Electrical Code (NEC), and should be used only as a reference for applying the MCCB. Final authority regarding the sizing and components used is governed by local and/or national electrical standards and the Jurisdiction Having Authority. Consult these standards before installing or designing any electrical system using short-circuit protective devices (SCPDs).

While this discussion is not intended to be a comprehensive guidebook to designing industrial control panels, we present several categories of typical applications where you can apply a feeder SCPD device. A panel in which the:

- Breaker feeds only motor loads,
- Breaker feeds fixed loads, and
- Feeder breaker protects mixed loads.

In all cases, the examples that are given here are for reference and you should reference your local electrical code requirements, as they may vary from location to location. You should verify that the breaker selection and installation complies with local codes, regulations, and/or standards.

A feeder is composed of the conductors of a wiring system between the service equipment or the generator switchboard of an isolated plant and the branch circuit overcurrent device.

NEC Article 220 states:	Where a feeder supplies continuous loads or any combination of continuous and noncontinuous loads, the rating of the overcurrent device shall not be less than the noncontinuous load plus 125% of the continuous load. Exception: Where the assembly including the overcurrent devices protecting the feeder(s) are listed for operation at 100% of their rating, neither the ampere rating of the overcurrent device nor the ampacity of the feeder conductors shall be less than the sum of the continuous load plus the noncontinuous load. Only breakers listed for 100% application, and so labeled can be applied under the exception (for example N Frame and R Frame 140G devices that are specifically marked and rated 100%). Breakers without a 100% application listing and label are applied at 80% of rating.
NEC Article 430 states:	Breakers for feeders having mixed loads; such as heating (lighting and heat appliances) and motors, should have ratings suitable for carrying the heating loads plus the capacity that is required by the motor loads...breakers for motor feeders shall have a rating not greater than the sum of the highest breaker rating of any of its branches and the full load currents of all other motors served by the feeder.

A MCCB is rated in rms amperes at a specific ambient temperature. This ampere rating is the maximum continuous current it may carry in the ambient temperature for which it is calibrated. To minimize the need for derating, Allen-Bradley thermal-magnetic breakers are calibrated for an ambient temperature of 40 °C (104 °F), which is the average temperature within an enclosure. If the enclosure ambient temperature is known to exceed 40 °C (104 °F), the breaker used should either be specially calibrated for that temperature, or be derated accordingly.

Conductor Selection

UL Listed circuit breakers that are rated 125 A or less shall be marked as being suitable for 60 °C (140 °F), 75 °C (167 °F) only or 60/75 °C (140/167 °F) wire. All Allen-Bradley breakers that are rated 125 A or less are marked for 60/75 °C wire. All UL Listed circuit breakers rated over 125 A are suitable for 75 °C (167 °F) conductors. Conductors rated for higher temperatures may be used, but must not be loaded to carry more current than the 75 °C (167 °F) ampacity of that size conductor for equipment that is marked or rated 75 °C (167 °F), or the 60 °C (140 °F) ampacity of that size conductor for equipment that is marked or rated 60 °C (140 °F). However, the full 90 °C (194 °F) ampacity may be used when applying derating factors, so long as the actual load does not exceed the lower of the derated ampacity or the 75 °C (167 °F) or 60 °C (140 °F) ampacity that applies.

Short Circuit Current Ratings

Short Circuit Current Ratings (SCCR) are tested results for the limit of a circuit breaker to successfully protect downstream equipment from a short circuit condition. Individually, each device's breaking frame indicates the limit as the interrupting rating or breaking capacity. If a device is not capable of protecting on its own, such as an MCP, Rockwell Automation provides UL listed combinations of devices. Visit rok.auto/sccr to use our Global Short-circuit Rating Tool.

Selectivity and Back-up Coordination

For breaker coordination in main and branch circuits, see publication 140G-TD050.

Specialty Operating Conditions

Operation below 0 °C (32 °F)

Bulletin 140G MCCBs may be applied in ambient temperatures (near the MCCB within an enclosure) below 0 °C (32 °F). Applications below 0 °C (32 °F) must consider the possibility of ice forming within or on the MCCB and interfering with the internal or external operating mechanisms. All ratings below 0 °C (32 °F) are based on the absence of freezing water or other elements.

Trip Unit Temperatures

Thermal-magnetic circuit breakers are temperature sensitive. At ambient temperatures below 40 °C (104 °F), circuit breakers may carry more current than their continuous current rating. Nuisance tripping is not a problem under these lower temperature conditions, although consideration should be given to closer protection coordination to compensate for the additional current-carrying capability. In addition, the actual mechanical operation of the breaker could be affected if the ambient temperature is significantly below the 40 °C (104 °F) standard.

Electronic trip units are insensitive to ambient temperatures within a certain temperature range. The temperature range for most electronic trip units is -25 °C...+70 °C (-13 °F...+158 °F). Electronic trip units are not recommended for application temperatures below this range.

Breaking Frame Temperatures

All Allen-Bradley standard breakers are calibrated to a 40 °C (104 °F) ambient temperature. Breaking frames are not recommended at temperatures below -25 °C (-13 °F) because of the risk of critical components freezing.

Operation above 40 °C (104 °F)

Trip Unit Temperatures

For ambient temperatures above 40 °C (104 °F), thermal-magnetic circuit breakers should carry less current than their continuous current rating. Under this condition, the circuit breaker should be derated for the higher ambient temperature.

Electronic trip units are insensitive to ambient temperatures within a certain temperature range: -25 °C...+70 °C (-13 °F...+158 °F). Allen-Bradley MCCBs are designed to include temperature protective circuits that initiate a tripping operation and provide self-protection, should the internal temperature rise to an unsafe level. At temperatures above 70 °C (158 °F), the circuit breaker should be derated for the higher ambient temperature.

Breaking Frame Temperatures

All Allen-Bradley standard breakers are calibrated to a 40 °C (104 °F) ambient temperature.

Altitude

Low voltage circuit breakers must be derated for voltage and interrupting rating at altitudes above 2000 m (6560 ft) above sea level. The thinner air at higher altitudes reduces cooling and dielectric characteristics compared to the denser air found at lower altitudes. Use Table 11 to derate as appropriate.

Table 11 - Voltage and Current Rating

Attribute	Operational Voltage U_e [V]				Rated Uninterrupted Current I_u [A]			
Altitude [m (ft)]	2000 (6560)	3000 (9840)	4000 (13,120)	5000 (16,400)	2000 (6560)	3000 (9840)	4000 (13,120)	5000 (16,400)
All Frames [%]	100%	90%	79%	67%	100%	98%	93%	90%

Tropicalization (Humidity)

Bulletin 140G circuit breakers are tested in compliance with IEC standards, making these devices suitable for hot-humid conditions defined in IEC 60721-2-1, climatograph 8. Bulletin 140G breakers include the following features to protect against humid conditions:

- Housings and components molded from glass-fiber-reinforced synthetic resins
- Metallic parts treated for anti-corrosion
- Zinc plating protected by a conversion layer (hexavalent-chromium free)
- Electronic circuits protected for anti-condensation

Electromagnetic Compatibility

The electronic trip units and electronic residual current releases for 140G/MG Circuit Breakers are in compliance with EN 60947-2 Appendix B and Appendix F and European Directive No. 2004/108/EC regarding EMC – electromagnetic compatibility.

Mounting Conditions

Unusual Mounting Configurations

Circuit breakers may be mounted in any position—sideways or upside-down-- without affecting the tripping characteristics or interrupting rating. However, mounting circuit breakers in a vertical position with the ON position other than UP are in violation of Article 240-81 of the NEC (valid for U.S. applications).

Shock and Vibration

Allen-Bradley MCCBs are shock tested to conform with IEC 60068-2-27, and vibration tested to IEC 60068-2-6.

Table 12 - MCCB Shock and Vibration Test Values

Frame Size	Vibration	Shock (peak acceleration)
K	2 ...13.2 Hz ±1 mm; 13.2...100 Hz ±0.7 g	120m/s^2 peak; pulse duration 11 ms
M		–
N		–
NS		–

Maintenance Mode

Maintenance Mode (MM) in electronic LSIG-MM trip units offer an additional set of protection that temporarily lowers the trip curve of the breaker. When it is activated by a control signal, the instantaneous-style response of the breaker is temporarily lowered to limit arc flash availability and allow testing or maintenance on a system while the MCCB is energized or ON. This feature is adjustable on the trip unit, either with DIP switches or through menu selections on an LCD.

Bulletin 140G products with MM can be used to make a NEC 240.87 Arc Energy Reduction compliant solution when you complete the following required steps:

1. Complete an arc flash study on the specific application to determine the available short-circuit current at the site of the MM breaker in the circuit.
2. Perform arc flash and incident arc energy calculations with and without maintenance mode protection to ensure reduction in energy by available settings on the specific device in application (Rockwell Automation offers consultants and software for this purpose).
3. Enable and adjust the MM settings to appropriately reduce the energy from the study's findings in the specific application.
4. Install the circuit breaker with a local status indicator to show when MM is active (wiring diagrams are provided for MM indicators to assist you with the implementation of this functionality).
5. Make available documentation about the installation per requirements in NEC 240.87 (A).

Figure 7 shows a generic version of a trip curve with MM protections enabled. Table 13 lists the preset values for MM. Figure 8 shows the DIP switch settings for neutral protection.

Frame size N and NS devices feature a MM test function within the Test menu. MM connections are achieved using the terminal strip on the device. See publications 140G-IN067 and 140G-IN069 for details.

Figure 7 - Generic Trip Curve with LSIG and MM Protections Parameters

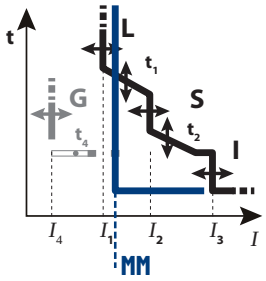
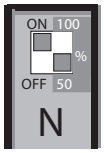


Table 13 - Default Settings for Maintenance Mode

Frame Size	Interface		Parameter	Setting Options	Required Components	
					Input Connection	Output Connection
K, M	DIP Switch		Enable	ON or OFF	Cat. No. 140G-K-CC maintenance mode connector (Table 95)	Cat. No. 140G-K-CIC MM connector (Table 95 on page 59) or Cat. No. 140G-K-CEAA or 140G-M-CEAA auxiliary contact for MM (Table 83 on page 56)
			Threshold	1.5, 2.5, or 4; t=k instantaneous		
			Time	≤ 30 ms		
N, NS, R	LCD		Enable	ON or OFF	• Maintenance Mode Test function within the Test menu • Maintenance mode connections are achieved using the terminal strip on the device. – See publications 140G-IN067 and 140G-IN069 for input, output, and power supply connections to the terminal strip..	
			Threshold	1.5...4 in 0.1 increments; t=k instantaneous		
			Time	≤ 30 ms		

Figure 8 - DIP Settings for Neutral Protection on LSIG-MM Trip Units



The Neutral (N) setting is available via DIP switch for LSI and LSIG only. For LSIG-MM, the DIP switch setting is fixed ON, 100%.

Product Overview

Technical Data by Frame Size

Attribute		 Frame Size K				 Frame Size M				 Frame Size N			 Frame Size NS		
Rated Current I_n		400 A				800 A				1200 A			1200...1250 A		
Number of Poles		3, 4				3, 4				3, 4			3, 4		
Dimensions [mm (in.)]	Height	205 (8.07)				268 (10.55)				268 (10.55)			268 (10.55)		
	Width, 3-pole	139.5 (5.49)				210 (8.27)				210 (8.27)			210 (8.27)		
	Width, 4-pole	186 (7.32)				280 (11.02)				280 (11.02)			280 (11.02)		
	Depth	103.5 (4.07)				103.5 (4.07)				125 (4.92)			125 (4.92)		
Interrupting Rating [kA]	240V	100	150	200	200	100	200	200		65	100	150	65	100	150
	480V	35	65	100	150	50	65	100		50	65	100	50	65	100
	600V	25	35	65	100	25	35	42		25	50	65	25	50	65
	600Y/347V	–				–				–			–		
	250V DC, 2 poles in series	–				–				–			–		
	500V DC, 3 poles in series	25	35	50	100	35	35	50		–			–		
	500V DC, 4 poles in series	–				–				–			–		
	600V DC, 3 poles in series	16	25	35	65	20	20	35	50	–			–		
Breaking Capacity I_{cu} [kA]	220...240V	85	100	150	200	70	100	200		85	100	200	85	100	200
	415V	50	70	120	150	36	70	100		50	70	120	50	70	120
	440V	40	65	100	180	45	50	80		50	65	100	50	65	100
	690V	25	40	70	80	20	25	30		30	42	50	30	42	50
	250V DC	50	100	150		–				–			–		
	500V DC	36	50	70	100	–				–			–		
	750V DC	25	35	70	70	16	36	50		–			–		
Protection Type	Thermal-magnetic	✓				✓				–			–		
	Electronic (LSI, LSIG)	✓				✓				✓			✓		
	LSIG-MM	✓				✓				✓			✓		
	MCP	✓				✓				✓			–		
	Molded Case Switch	✓				✓				✓			–		
Internal Accessories	Auxiliary Contact	✓				✓				✓			✓		
	Alarm Contact	✓				✓				✓			✓		
	AX/AL Combo	✓				✓				✓			✓		
	Trip Unit Contact	–				–				✓			✓		
	Shunt Trip	✓				✓				✓			✓		
	Shunt Close	–				–				–			✓		
	UV Relay	✓				✓				✓			✓		
	Field Installable	✓				✓				✓			✓		

Technical Data by Frame Size (Continued)

Attribute		 Frame Size K	 Frame Size M	 Frame Size N	 Frame Size NS
External Accessories	End Cap (Bolt-on) Terminals	Standard	Standard	Standard	Standard
	Terminal Lugs	✓	✓	✓	✓
	Multi-cable Terminal Lugs	✓	–	–	–
	Extended Terminal	✓	✓	✓	✓
	Spreader Terminal	✓	✓	✓	✓
	Rear Terminal	–	–	✓	✓
	25 mm Phase Barriers	Standard	–	–	–
	Extended Phase Barriers	✓	✓	✓	✓
	Back Plates	Standard	Standard	–	–
	DIN Mounting	–	–	–	–
	Padlock	✓	✓	✓	✓
	Terminal Cover	✓	✓	✓	✓
	Direct Rotary	✓	✓	✓	–
	Variable Depth (Door)	✓	✓	✓	–
	Internal NFPA 79 Handle	✓	✓	✓	–
	Flange Operator	✓	✓	✓	–
	Flange Cable	✓	✓	✓	–
	Motor Operator	✓	✓	–	✓
	Residual Current	✓	–	–	–
	Neutral Current	✓	✓	✓	✓
	Field Installable	✓	✓	✓	✓

The Bulletin 140G family of Molded Case Circuit Breakers (MCCBs) offers a wide range of features include thermal/magnetic and electronic protection devices, high interrupting/breaking capacities and complete line of factory and field installed accessories. The Bulletin 140G MCCBs are ideal for use in line protection of control panels.


Frame Size K


Frame Size M


Frame Size N


Frame Size NS

MCCBs have the following features:

- 120…1200 A current range
- 3-pole and 4-pole devices
- Space-saving dimensions
- End cap/bolt-on terminals are standard
- Thermal/magnetic protection: 120…800 A
- Electronic protection: 120…1200 A
- Approved for global application: UL, CSA, CCC, and IEC performance interrupting/breaking capacity
- Wide range of mounting options
- Extensive range of factory-installed or field-installed accessories

Standards Compliance and Certifications

Standards Compliance	Certifications
IEC 60947-2	CE Marked
UL489	CCC
CSA 22.2, No. 5	CSA Certified
	UL Listed
	HACR Type

400 A, Frame Size K MCCBs

Catalog Number Explanation

Examples that are given in this section are not intended to be used for product selection. Not all combinations generate a valid catalog number. Use ProposalWorks™ software to configure the MCCB. ProposalWorks software is available from rok.auto/systemtools.

Frame size K MCCBs are available both as assembled circuit breakers and individual breaking frame and trip unit components that can be ordered for field assembly or factory installation.

Terminal lugs are not supplied and can be ordered separately. See Table 116 on page 65 for available lugs.

140G	-	K	3	F	3	-	D30	-	Z1	-	SD	-	AA
a		b	c	d	e		f		g		h		h

a	
Bulletin Number	
Code	**Description**
140G	Global MCCB

b	
Frame/Rating	
Code	**Description**
K	400 A
KC	400 A, current limiting

c	
Interrupting Rating/Breaking Capacity (based on I_c at 480V)	
Code	**Description**
3	35 kA
6	65 kA
0	100 kA
15	150 kA
T	Trip unit

d	
Protection Type	
Code	**Description**
F	Adjust thermal/ adjust magnetic
H	Electronic LSI (long, short, instant)
I	Electronic LSIG (long, short instant, and ground fault)
K	Electronic LSIG-MM (long, short, instant, ground fault, maintenance mode)
S	Molded case switch (isolator)
X	Breaking frame

e	
No. of Poles	
Code	**Description**
3	3-pole
4	4-pole

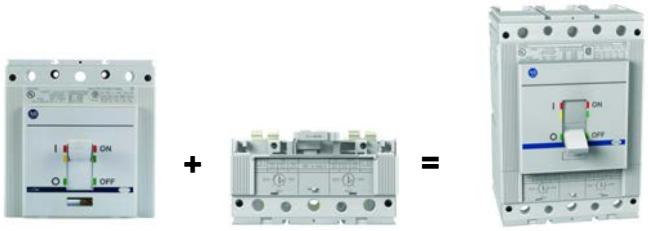
f	
Rated Current	
Code	**Description**
D30	300 A
D40	400 A
Blank	Frame only

g	
Continuous Rated (1)	
Code	**Description**
Blank	80% Rated
Z1	100% Rated

h	
Factory-installed Options	
Code	**Description**
See Factory-installed Options on page 55	

(1) For more information about 80% and 100% ratings, see 80% and 100% Continuous Rated Breakers on page 14.

Breaking Frames and Trip Units



Frame Trip Unit MCCB

Table 14 - Breaking Frames, 400 A Rated Current

Interrupting Rating (50/60 Hz), UL 489/CSA 22.2, No. 5 [kA]					Breaking Capacity (50/60 Hz), IEC 60947-2 I_{cu} [kA]/I_{cs} %								Breaking Capacity (DC), IEC 60947-2 (1)		Cat. No.	
240V	480V	600V	2 poles in series	3 poles in series	220V		415V		440V		690V		500V DC (2 poles in series)			
			500V DC (1)	600V DC (1)	I_{cu} [kA]	I_{cs} [%I_{cu}]	I_{cu} [kA]	I_{cs} [%I_{cu}]	I_{cu} [kA]	I_{cs} [%I_{cu}]	I_{cu} [kA]	I_{cs} [%I_{cu}]	I_{cu} [kA]	I_{cs} [%I_{cu}]	3-pole	4-pole
100	35	25	35	25	85	100	50	100	40	100	25	100	36	100	140G-K3X3	140G-K3X4
150	65	35	50	35	100		70		65		40		50		140G-K6X3	140G-K6X4
200	100	65	65	50	200		120		100		70		70		140G-K0X3	140G-K0X4
200	150	100	100	65	200		200		180		80		100		140G-K15X3	140G-K15X4
Current-limiting Breaking Frames																
150	65	35	50	35	100	100	70	100	65	100	40	100	50	100	140G-KC6X3	–
200	100	65	65	50	200	100	120	100	100	100	70	100	70	100	140G-KC0X3	–

(1) DC rating applies to thermal-magnetic trip unit only.

Table 15 - Breaking Frames, 400 A Rated Current, 100% Rated(1)

Interrupting Rating (50/60 Hz), UL 489/CSA 22.2, No. 5 [kA]					Breaking Capacity (50/60 Hz), IEC 60947-2 I_{cu} [kA]/I_{cs} %								Breaking Capacity (DC), IEC 60947-2 (2)		Cat. No.
240V	480V	600V	2 poles in series	3 poles in series	220V		415V		440V		690V		500V DC (2 poles in series)		
			500V DC (1)	600V DC (1)	I_{cu} [kA]	I_{cs} [%I_{cu}]	I_{cu} [kA]	I_{cs} [%I_{cu}]	I_{cu} [kA]	I_{cs} [%I_{cu}]	I_{cu} [kA]	I_{cs} [%I_{cu}]	I_{cu} [kA]	I_{cs} [%I_{cu}]	3-pole
100	35	25	35	25	85	100	50	100	40	100	25	100	36	100	140G-K3X3-Z1
Current-limiting Breaking Frames															
150	65	35	50	35	100	100	70	100	65	100	40	100	50	100	140G-KC6X3-Z1
200	100	65	65	50	200	100	120	100	100	100	70	100	70	100	140G-KC0X3-Z1

(1) For more information about 80% and 100% ratings, see 80% and 100% Continuous Rated Breakers on page 14.
(2) DC rating applies to thermal-magnetic trip unit only.

Table 16 - Trip Units, Thermal-magnetic

Rated Current I_n [A]	Thermal Trip I_r [A] (1)	Magnetic Trip I_m [A] (2)	Protection Type	Cat. No.	
				3-pole	4-pole
300	210...300	1500...3000	F (Adjustable Thermal/Adjustable Magnetic)	140G-KTF3-D30	140G-KTF4-D30
400	280...400	2000...4000		140G-KTF3-D40	140G-KTF4-D40

(1) Adjustable thermal trip with nine possible settings. The table shows minimum and maximum values.
(2) Adjustable magnetic trip with nine possible settings. The table shows minimum and maximum values.

Table 17 - Trip Units, Electronic LSI (Long, Short, Instantaneous)

Rated Current I_n [A]	Protection Type					Cat. No.	
	L		S		I	3-pole	4-pole
	I_1 = 0.4...1 x I_n	t_1 = s	I_2 = 1...10 x I_n	t_2 = s	I_3 = 1...10 x I_n		
300	120...300	3, 6, 9, 18	180...3000	0.05, 0.1, 0.25, 0.5	450...3600	140G-KTH3-D30	140G-KTH4-D30
400	160...400		240...4000		600...4800	140G-KTH3-D40	140G-KTH4-D40

Table 18 - Trip Units, Electronic LSIG (Long, Short, Instantaneous, Ground Fault)

Rated Current I_n [A]	Protection Type							Cat. No.	Cat. No.
	L		S		I	G		3-pole	4-pole
	I_1 = 0.4...1 x I_n	t_1 = s	I_2 = 1...10 x I_n	t_2 = s	I_3 = 1...10 x I_n	I_4= 0.2...1 x I_n	t_4 = s		
300	120...300	3, 6, 9, 18	180...3000	0.05, 0.1, 0.25, 0.5	450...3600	60...300	0.1, 0.2, 0.4, 0.8	140G-KTI3-D30	140G-KTI4-D30
400	160...400		240...4000		600...4800	80...400		140G-KTI3-D40	140G-KTI4-D40

Table 19 - Trip Units, Electronic LSIG-MM (Long, Short, Instantaneous, Ground Fault - Maintenance Mode) (1)

Rated Current I_n [A]	Protection Type								Cat. No.	Cat. No.
	L		S		I	G		MM	3-pole	4-pole
	I_1 = 0.4...1 x I_n	t_1 = s	I_2 = 1...10 x I_n	t_2 = s	I_3 = 1...10 x I_n	I_4= 0.2...1 x I_n	t_4 = s	I_5 = 1.5...4 x I_n		
300	120...300	3, 6, 9, 18	180...3000	0.05, 0.1, 0.25, 0.5	450...3600	60...300	0.1, 0.2, 0.4, 0.8	450...1200	140G-KTK3-D30	140G-KTK4-D30
400	160...400		240...4000		600...4800	80...400		600...1600	140G-KTK3-D40	140G-KTK4-D40

(1) See Maintenance Mode on page 23 for a list of the preset values for Maintenance Mode.

Assembled MCCBs — 400 A Frame Size K

Table 20 - Interrupting Rating/Breaking Capacity — Thermal-magnetic Circuit Breakers

Interrupting Rating (50/60 Hz) UL 489/CSA 22.2, No. 5 [kA]					Breaking Capacity (50/60 Hz), IEC 60947-2 I_{cu} [kA]/I_{cs} %								Breaking Capacity (DC), IEC 60947-2 (1)		Interrupting Code (2) (3)
240V	480V	600V	2 poles in series	3 poles in series	220V		415V		440V		690V		500V DC (2 poles in series)		
			500V DC	600V DC	I_{cu} [kA]	I_{cs} [%I_{cu}]	I_{cu} [kA]	I_{cs} [%I_{cu}]	I_{cu} [kA]	I_{cs} [%I_{cu}]	I_{cu} [kA]	I_{cs} [%I_{cu}]	I_{cu} [kA]	I_{cs} [%I_{cu}]	
100	35	25	35	25	85	100	50	100	40	100	25	100	36	100	K3
150	65	35	50	35	100		70		65		40		50		K6
200	100	65	65	50	200		120		100		70		70		K0
200	150	100	100	65	200		200		180		80		100		K15

(1) DC rating applies to thermal-magnetic trip unit only.
(2) See Table 21 and Table 22 for catalog number selection.
(3) Add a "C" after the "K" in the interrupting code to select 3-pole current-limiting devices. Example, Cat. No. 140G-KC6...

Table 21 - Thermal-magnetic, Adjustable

Rated Current I_n [A]	Thermal Trip I_r [A] (1)	Magnetic Trip I_m [A] (2)	Protection Type	Interrupting Code K3		Interrupting Code K6	
				Cat. No.		Cat. No. (3)	
				3-pole	4-pole	3-pole	4-pole
300	210...300	1500...3000	F (Adjustable Thermal/Adjustable Magnetic)	140G-K3F3-D30	140G-K3F4-D30	140G-K6F3-D30	140G-K6F4-D30
400	280...400	2000...4000		140G-K3F3-D40	140G-K3F4-D40	140G-K6F3-D40	140G-K6F4-D40

(1) Adjustable thermal trip with nine possible settings. The table shows minimum and maximum values.
(2) Adjustable magnetic trip with nine possible settings. The table shows minimum and maximum values.
(3) Add a "C" after the "K" in the interrupting code to select 3-pole current-limiting devices. Example, Cat. No. 140G-KC6F3-D30

Table 22 - Thermal-magnetic, Adjustable

Rated Current I_n [A]	Thermal Trip I_r [A] (1)	Magnetic Trip I_m [A] (2)	Protection Type	Interrupting Code K0		Interrupting Code K15	
				Cat. No. (3)		Cat. No.	
				3-pole	4-pole	3-pole	4-pole
300	210...300	1500...3000	F (Adjustable Thermal/Adjustable Magnetic)	140G-K0F3-D30	140G-K0F4-D30	140G-K15F3-D30	140G-K15F3-D30
400	280...400	2000...4000		140G-K0F3-D40	140G-K0F4-D40	140G-K15F3-D40	140G-K15F3-D40

(1) Adjustable thermal trip with nine possible settings. The table shows minimum and maximum values.
(2) Adjustable magnetic trip with nine possible settings. The table shows min and max values.
(3) Add a "C" after the "K" in the interrupting code to select 3-pole current-limiting devices. Example, Cat. No. 140G-KC0F3-D30

Table 23 - Thermal-magnetic, Adjustable, 100% Rated (1)

Rated Current I_n [A]	Thermal Trip I_r [A] (2)	Magnetic Trip I_m [A] (3)	Protection Type	Interrupting Code K3	Interrupting Code K6	Interrupting Code K0
				3-pole	3-pole	3-pole
300	210...300	1500...3000	F (Adjustable Thermal/Adjustable Magnetic)	140G-K3F3-D30-Z1	140G-K6F3-D30-Z1	140G-K0F3-D30-Z1
400	280...400	2000...4000		140G-K3F3-D40-Z1	140G-K6F3-D40-Z1	140G-K0F3-D40-Z1

(1) For more information about 80% and 100% ratings, see 80% and 100% Continuous Rated Breakers on page 14.
(2) Adjustable thermal trip with nine possible settings. The table shows minimum and maximum values.
(3) Adjustable magnetic trip with nine possible settings. The table shows minimum and maximum values.

Table 24 - Interrupting Rating/Breaking Capacity — Electronic Circuit Breakers

Interrupting Rating (50/60 Hz) UL 489/CSA 22.2, No. 5 [kA]			Breaking Capacity (50/60 Hz), IEC 60947-2 I_{cu} [kA]/I_{cs} %								Interrupting Code (1) (2)
			220V		415V		440V		690V		
240V	480V	600V	I_{cu} [kA]	I_{cs} [%I_{cu}]	I_{cu} [kA]	I_{cs} [%I_{cu}]	I_{cu} [kA]	I_{cs} [%I_{cu}]	I_{cu} [kA]	I_{cs} [%I_{cu}]	
100	35	25	85	100	50	100	40	100	25	100	K3
150	65	35	100		70		65		40		K6
200	100	65	200		120		100		70		K0
200	150	100	200		200		180		80		K15

(1) See Table 25...Table 32 on page 33 for catalog number selection.
(2) Add a "C" after the "K" in the interrupting code to select 3-pole current-limiting devices. Example, Cat. No. 140G-KC6...

Table 25 - Electronic LSI

Rated Current I_n [A]	Protection Type					Interrupting Code K3		Interrupting Code K6	
	L		S		I	Cat. No.		Cat. No. (1)	
	I_1 = 0.4...1 x I_n	t_1 = s	I_2 = 1...10 x I_n	t_2 = s	I_3 = 1...10 x I_n	3-pole	4-pole	3-pole	4-pole
300	120...300	3, 6, 9, 18	180...3000	0.05, 0.1, 0.25, 0.5	450...3600	140G-K3H3-D30	140G-K3H4-D30	140G-K6H3-D30	140G-K6H4-D30
400	160...400		240...4000		600...4800	140G-K3H3-D40	140G-K3H4-D40	140G-K6H3-D40	140G-K6H4-D40

(1) Add a "C" after the "K" in the interrupting code to select 3-pole current-limiting devices. Example, Cat. No. 140G-KC6H3-D30

Table 26 - Electronic LSI

Rated Current I_n [A]	Protection Type					Interrupting Code K0		Interrupting Code K15	
	L		S		I	Cat. No. (1)		Cat. No.	
	I_1 = 0.4...1 x I_n	t_1 = s	I_2 = 1...10 x I_n	t_2 = s	I_3 = 1...10 x I_n	3-pole	4-pole	3-pole	4-pole
300	120...300	3, 6, 9, 18	180...3000	0.05, 0.1, 0.25, 0.5	450...3600	140G-K0H3-D30	140G-K0H4-D30	140G-K15H3-D30	140G-K15H4-D30
400	160...400		240...4000		600...4800	140G-K0H3-D40	140G-K0H4-D40	140G-K15H3-D40	140G-K15H4-D40

(1) Add a "C" after the "K" in the interrupting code to select 3-pole current-limiting devices. Example, Cat. No. 140G-KC0H3-D30

Table 27 - Electronic LSI, 100% Rated (1)

Rated Current I_n [A]	Thermal Trip I_r [A] (2)	Magnetic Trip I_m [A] (3)	Protection Type	Interrupting Code K6	Interrupting Code K0
				3-pole	3-pole
300	210...300	1500...3000	F (Adjustable Thermal/Adjustable Magnetic)	140G-K6H3-D30-Z1	140G-K0H3-D30-Z1
400	280...400	2000...4000		140G-K6H3-D40-Z1	140G-K0H3-D40-Z1

(1) For more information about 80% and 100% ratings, see 80% and 100% Continuous Rated Breakers on page 14.
(2) Adjustable thermal trip with nine possible settings. The table shows minimum and maximum values.
(3) Adjustable magnetic trip with nine possible settings. The table shows minimum and maximum values.

Table 28 - Electronic LSIG

Rated Current I_n [A]	Protection Type							Interrupting Code K3		Interrupting Code K6	
	L		S		I	G		Cat. No.		Cat. No.(1)	
	I_1 = 0.4... 1 x I_n	t_1 = s	I_2 = 1... 10 x I_n	t_2 = s	I_3 = 1... 10 x I_n	I_4 = 0.2...1 x I_n	t_4 = s	3-pole	4-pole	3-pole	4-pole
300	120...300	3, 6, 9, 18	180...3000	0.05, 0.1, 0.25, 0.5	450...3600	60...300	0.1, 0.2, 0.4, 0.8	140G-K3I3-D30	140G-K3I4-D30	140G-K6I3-D30	140G-K6I4-D30
400	160...400		240...4000		600...4800	80...400		140G-K3I3-D40	140G-K3I4-D40	140G-K6I3-D40	140G-K6I4-D40

(1) Add a "C" after the "K" in the interrupting code to select 3-pole current-limiting devices. Example, Cat. No. 140G-KC6I3-D30

Table 29 - Electronic LSIG

Rated Current I_n [A]	Protection Type							Interrupting Code K0		Interrupting Code K15	
	L		S		I	G		Cat. No.(1)		Cat. No.	
	I_1 = 0.4... 1 x I_n	t_1 = s	I_2 = 1... 10 x I_n	t_2 = s	I_3 = 1... 10 x I_n	I_4= 0.2...1 x I_n	t_4 = s	3-pole	4-pole	3-pole	4-pole
300	120...300	3, 6, 9, 18	180...3000	0.05, 0.1, 0.25, 0.5	450...3600	60...300	0.1, 0.2, 0.4, 0.8	140G-K0I3-D30	140G-K0I4-D30	140G-K15I3-D30	140G-K15I4-D30
400	160...400		240...4000		600...4800	80...400		140G-K0I3-D40	140G-K0I4-D40	140G-K15I3-D40	140G-K15I4-D40

(1) Add a "C" after the "K" in the interrupting code to select 3-pole current-limiting devices. Example, Cat. No. 140G-KC0I3-D30

Table 30 - Electronic LSIG, 100% Rated (1)

Rated Current I_n [A]	Thermal Trip I_r [A] (2)	Magnetic Trip I_m [A] (3)	Protection Type	Interrupting Code K3	Interrupting Code K6	Interrupting Code K0
				3-pole	3-pole	3-pole
300	210...300	1500...3000	F (Adjustable Thermal/Adjustable Magnetic)	140G-K3I3-D30-Z1	140G-K6I3-D30-Z1	140G-K0I3-D30-Z1
400	280...400	2000...4000		140G-K3I3-D40-Z1	140G-K6I3-D40-Z1	140G-K0I3-D40-Z1

(1) For more information about 80% and 100% ratings, see 80% and 100% Continuous Rated Breakers on page 14.
(2) Adjustable thermal trip with nine possible settings. The table shows minimum and maximum values.
(3) Adjustable magnetic trip with nine possible settings. The table shows minimum and maximum values.

Table 31 - Electronic LSIG-MM (1)

Rated Current I_n [A]	Protection Type								Interrupting Code K3		Interrupting Code K6	
	L		S		I	G		MM	Cat. No.(2)		Cat. No.	
	I_1 = 0.4... 1 x I_n	t_1 = s	I_2 = 1... 10 x I_n	t_2 = s	I_3 = 1... 10 x I_n	I_4 = 0.2...1 x I_n	t_4 = s	I_5 = 1.5... 4 x I_n	3-pole	4-pole	3-pole	4-pole
300	120...300	3, 6, 9, 18	180...3000	0.05, 0.1, 0.25, 0.5	450...3600	60...300	0.1, 0.2, 0.4, 0.8	450...1200	140G-K3K3-D30	140G-K3K4-D30	140G-K6K3-D30	140G-K6K4-D30
400	160...400	3, 6, 9, 18	240...4000		600...4800	80...400		600...1600	140G-K3K3-D40	140G-K3K4-D40	140G-K6K3-D40	140G-K6K4-D40

(1) See Maintenance Mode on page 23 for a list of the preset values for Maintenance Mode.
(2) Add a "C" after the "K" in the interrupting code to select 3-pole current-limiting devices. Example, Cat. No. 140G-KC6I3-D30

Table 32 - Electronic LSIG-MM [1]

Rated Current I_n [A]	Protection Type								Interrupting Code K0		Interrupting Code K15	
	L		S		I	G		MM	Cat. No.[2]		Cat. No.	
	I_1 = 0.4... 1 x I_n	t_1 = s	I_2 = 1... 10 x I_n	t_2 = s	I_3 = 1... 10 x I_n	I_4 = 0.2...1 x I_n	t_4 = s	I_5 = 1.5... 4 x I_n	3-pole	4-pole	3-pole	4-pole
300	120...300	3, 6, 9, 18	180...3000	0.05, 0.1, 0.25, 0.5	450...3600	60...300	0.1, 0.2, 0.4, 0.8	450...1200	140G-K0K3-D30	140G-K0K4-D30	140G-K15K3-D30	140G-K15K4-D30
400	160...400		240...4000		600...4800	80...400		600...1600	140G-K0K3-D40	140G-K0K4-D40	140G-K15K3-D40	140G-K15K4-D40

(1) See Maintenance Mode on page 23 for a list of the preset values for Maintenance Mode.
(2) Add a "C" after the "K" in the interrupting code to select 3-pole current-limiting devices. Example, Cat. No. 140G-KC6I3-D30

Table 33 - Electronic LSIG-MM, 100% Rated [1] [2]

Rated Current I_n [A]	Protection Type								Interrupting Code K3	Interrupting Code K6	Interrupting Code K0
	L		S		I	G		MM	Cat. No.	Cat. No.	Cat. No.
	I_1 = 0.4... 1 x I_n	t_1 = s	I_2 = 1... 10 x I_n	t_2 = s	I_3 = 1... 10 x I_n	I_4 = 0.2... 1 x I_n	t_4 = s	I_5 = 1.5... 4 x I_n	3-pole	4-pole	3-pole
300	120...300	3, 6, 9, 18	180...3000	0.05, 0.1, 0.25, 0.5	450...3600	60...300	0.1, 0.2, 0.4, 0.8	450...1200	140G-K3K3-D30-Z1	140G-K6K3-D30-Z1	140G-K0K3-D30-Z1
400	160...400		240...4000		600...4800	80...400		600...1600	140G-K3K3-D40-Z1	140G-K6K3-D40-Z1	140G-K0K3-D40-Z1

(1) For more information about 80% and 100% ratings, see 80% and 100% Continuous Rated Breakers on page 14.
(2) See Maintenance Mode on page 23 for a list of the preset values for Maintenance Mode.

800 A, Frame Size M MCCBs

Catalog Number Explanation

Examples that are given in this section are not intended to be used for product selection. Not all combinations generate a valid catalog number. Use ProposalWorks™ software to configure the MCCB. ProposalWorks software is available from rok.auto/systemtools.

Frame size M MCCBs are available both as assembled circuit breakers and individual breaking frame and trip unit components that can be ordered for field assembly or factory installation.

Terminal lugs are not supplied and can be ordered separately. See Table 116 on page 65 for available lugs.

140G	-	M	6	K	3	-	D60	-	Z1	-	SD	-	AA
a		b	c	d	e		f		g		h		h

a	
Bulletin Number	
Code	**Description**
140G	Global MCCB

b	
Frame/Rating	
Code	**Description**
M	800 A

c	
Interrupting Rating/Breaking Capacity (based on I_c at 480V)	
Code	**Description**
5	50 kA
6	65 kA
0	100 kA
T	Trip unit

d	
Protection Type	
Code	**Description**
F	Adjust thermal/adjust magnetic
H	Electronic LSI
I	Electronic LSIG
K	Electronic LSIG-MM
X	Breaking frame
S	Molded case switch (isolator)

e	
Number of Poles	
Code	**Description**
3	3-pole
4	4-pole

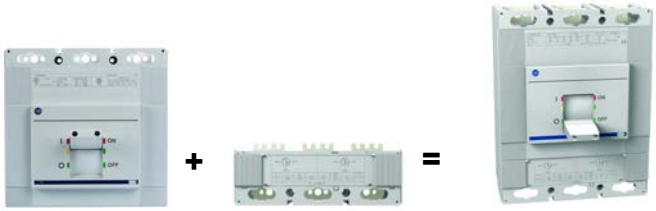
f	
Rated Current	
Code	**Description**
D60	600 A
D63	630 A
D80	800 A

g	
Continuous Rated (1)	
Code	**Description**
Blank	80% Rated
Z1	100% Rated

h	
Factory-installed Options	
Code	**Description**
See Factory-installed Options on page 55	

(1) For more information about 80% and 100% ratings, see 80% and 100% Continuous Rated Breakers on page 14.

Breaking Frames and Trip Units



Frame Trip Unit MCCB

Table 34 - Breaking Frames, 800 A Rated Current

Interrupting Rating (50/60 Hz), UL 489/CSA 22.2, No. 5[kA]				Breaking Capacity (50/60 Hz), IEC 60947-2 I_{cu} [kA]/I_{cs} %						Breaking Capacity (DC), IEC 60947-2 (1)		Cat. No.	
240V	480V	600V	3 poles in series	220V		415V		690V		750V DC (3 poles in series)			
			600V DC (1)	I_{cu} [kA]	I_{cs} [%I_{cu}]	I_{cu} [kA]	I_{cs} [%I_{cu}]	I_{cu} [kA]	I_{cs} [%I_{cu}]	I_{cu} [kA]	I_{cs} [%I_{cu}]	3-pole	4-pole
100	50	25	20	85	100	50	100	22	75	16	75	140G-M5X3	140G-M5X4
200	65	35	35	100	100	70	100	25	75	36	75	140G-M6X3	140G-M6X4
200	100	42	50	200	75	100	75	30	75	50	75	140G-M0X3	140G-M0X4

(1) DC rating applies to thermal-magnetic trip unit only.

Table 35 - Breaking Frames, 800 A Rated Current, 100% Rated (1)

Interrupting Rating (50/60 Hz), UL 489/CSA 22.2, No. 5[kA]				Breaking Capacity (50/60 Hz), IEC 60947-2 I_{cu} [kA]/I_{cs} %						Breaking Capacity (DC), IEC 60947-2 (2)		Cat. No.
240V	480V	600V	3 poles in series	220V		415V		690V		750V DC (3 poles in series)		
			600V DC(1)	I_{cu} [kA]	I_{cs}[%I_{cu}]	I_{cu} [kA]	I_{cs}[%I_{cu}]	I_{cu} [kA]	I_{cs}[%I_{cu}]	I_{cu} [kA]	I_{cs}[%I_{cu}]	3-pole
100	50	25	20	85	100	50	100	22	75	16	75	140G-M5X3-Z1
200	65	35	35	100	100	70	100	25	75	36	75	140G-M6X3-Z1
200	100	42	50	200	75	100	75	30	75	50	75	140G-M0X3-Z1

(1) For more information about 80% and 100% ratings, see 80% and 100% Continuous Rated Breakers on page 14.
(2) DC rating applies to thermal-magnetic trip unit only.

Table 36 - Trip Units, Thermal-magnetic

Rated Current I_n [A]	Thermal Trip I_r [A] (1)	Magnetic Trip I_m [A] (2)	Protection Type	Cat. No.	
				3-pole	4-pole
600	420...600	3000...6000	F (Adjustable Thermal/Adjustable Magnetic)	140G-MTF3-D60	140G-MTF3-D60
800	560...800	4000...8000		140G-MTF3-D80	140G-MTF4-D80

(1) Adjustable thermal trip with five possible settings. The table shows min and max values.
(2) Adjustable magnetic trip with five possible settings. The table shows min and max values.

Table 37 - Trip Units, Electronic LSI

Rated Current I_n [A]	Protection Type					Cat. No.	
	L		S		I	3-pole	4-pole
	I_1 = 0.4...1 x I_n	t_1 = s	I_2 = 1...10 x I_n	t_2 = s	I_3 = 1...10 x I_n		
600	240...600	3, 6, 12, 18	360...6000	0.05, 0.1, 0.25, 0.5	900...7200	140G-MTH3-D60	140G-MTH4-D60
800	320...800	3, 6, 9, 18	480...8000		1200...8400	140G-MTH3-D80	140G-MTH4-D80

Table 38 - Trip Units, Electronic LSIG

Rated Current I_n [A]	Protection Type							Cat. No.	
	L		S		I	G		3-pole	4-pole
	I_1 = 0.4...1 x I_n	t_1 = s	I_2=1...10 x I_n	t_2 = s	I_3 = 1...10 x I_n	I_4 = 0.2...1 x I_n	t_4 = s		
600	240...600	3, 6, 12, 18	360...6000	0.05, 0.1, 0.25, 0.5	900...7200	120...600	0.1, 0.2, 0.4, 0.8	140G-MTI3-D60	140G-MTI4-D60
800	320...800	3, 6, 9, 18	480...8000		1200...8400	160...800		140G-MTI3-D80	140G-MTI4-D80

Table 39 - Electronic LSIG-MM [1]

Rated Current I_n [A]	Protection Type									Cat. No.	
	L		S		I	G		MM		3-pole	4-pole
	I_1 = 0.4...1 x I_n	t_1 = s	I_2 = 1...10 x I_n	t_2 = s	I_3 = 1...10 x I_n	I_4 = 0.2...1 x I_n	t_4 = s	I_5 = 1.5...4 x I_n			
600	240...600	3, 6, 12, 18	360...6000	0.05, 0.1, 0.25, 0.5	900...7200	120...600	0.1, 0.2, 0.4, 0.8	900...2400		140G-MTK3-D60	140G-MTK4-D60
800	320...800	3, 6, 9, 18	480...8000		1200...8400	160...800		1200...3200		140G-MTK3-D80	140G-MTK4-D80

(1) See Maintenance Mode on page 23 for a list of the preset values for Maintenance Mode.

Assembled MCCBs — 800 A, Frame Size M

Table 40 - Interrupting Rating/Breaking Capacity — Thermal-magnetic and Electronic Circuit Breakers

Interrupting Rating (50/60 Hz), UL 489/ CSA 22.2, No. 5 [kA]				Breaking Capacity (50/60 Hz), IEC 60947-2 I_{cu} [kA]/I_{cs} %						Breaking Capacity (DC), IEC 60947-2[1]		Interrupting Code [2]
240V	480V	600V	3 poles in series	220V		415V		690V		750V DC (3 poles in series)		
			600V DC[1]	I_{cu} [kA]	I_{cs}[%I_{cu}]	I_{cu} [kA]	I_{cs}[%I_{cu}]	I_{cu} [kA]	I_{cs}[%I_{cu}]	I_{cu} [kA]	I_{cs}[%I_{cu}]	
100	50	25	20	85	100	50	100	22	75	16	75	M5
200	65	35	35	100	100	70	100	25	75	36	75	M6
200	100	42	50	200	75	100	75	30	75	50	75	M0

(1) DC ratings applicable to thermal magnetic trip unit only.
(2) See Table 41 through Table 50 on page 38 for Cat. No. selection

Table 41 - Thermal-magnetic

Rated Current I_n [A]	Thermal Trip I_r [A] [1]	Magnetic Trip I_m [A] [2]	Protection Type	Interrupting Code M5		Interrupting Code M6		Interrupting Code M0	
				Cat. No.		Cat. No.		Cat. No.	
				3-pole	4-pole	3-pole	4-pole	3-pole	4-pole
600	420...600	3000...6000	F (Adjustable Thermal/ Adjustable Magnetic)	140G-M5F3-D60	140G-M5F4-D60	140G-M6F3-D60	140G-M6F4-D60	140G-M0F3-D60	140G-M0F4-D60
630[3]	441...630	3150...6300		140G-M5F3-D63	140G-M5F4-D63	140G-M6F3-D63	140G-M6F4-D63	140G-M0F3-D63	140G-M0F4-D63
800	560...800	4000...8000		140G-M5F3-D80	140G-M5F4-D80	140G-M6F3-D80	140G-M6F4-D80	140G-M0F3-D80	140G-M0F4-D80

(1) Adjustable thermal trip with five possible settings. The table shows minimum and maximum values.
(2) Adjustable magnetic trip with five possible settings. The table shows minimum and maximum values.
(3) IEC only.

Table 42 - Thermal-magnetic, 100% Rated [1]

Rated Current I_n [A]	Thermal Trip I_r [A] [2]	Magnetic Trip I_m [A] [3]	Protection Type	Interrupting Code M5	Interrupting Code M6	Interrupting Code M0
				Cat. No., 3-pole	Cat. No., 3-pole	Cat. No., 3-pole
600	420...600	3000...6000	F (Adjustable Thermal/ Adjustable Magnetic)	140G-M5F3-D60-Z1	140G-M6F3-D60-Z1	140G-M0F3-D60-Z1
800	560...800	4000...8000		140G-M5F3-D80-Z1	140G-M6F3-D80-Z1	140G-M0F3-D80-Z1

(1) For more information about 80% and 100% ratings, see 80% and 100% Continuous Rated Breakers on page 14.
(2) Adjustable thermal trip with five possible settings. The table shows minimum and maximum values.
(3) Adjustable magnetic trip with five possible settings. The table shows minimum and maximum values.

Table 43 - Electronic LSI

Rated Current I_n [A]	Protection Type					Interrupting Code M5		Interrupting Code M6	
	L		S		I	Cat. No.		Cat. No.	Cat. No.
	I_1 = 0.4...1 x I_n	t_1 = s	I_2 = 1...10 x I_n	t_2 = s	I_3 = (1)	3-pole	4-pole	3-pole	4-pole
600	240...600	3, 6, 12, 18	360...6000	0.05, 0.1, 0.25, 0.5	900...7200	140G-M5H3-D60	140G-M5H4-D60	140G-M6H3-D60	140G-M6H4-D60
630 (2)	252...630	3, 6, 12, 18	378...6300		945...7560	140G-M5H3-D63	140G-M5H4-D63	140G-M6H3-D63	140G-M6H4-D63
800	320...800	3, 6, 9, 18	480...8000		1200...8400	140G-M5H3-D80	140G-M5H4-D80	140G-M6H3-D80	140G-M6H4-D80

(1) 600 A, 630 A I_3 max =12 I_n; 800 A I_3 max = 10.5 I_n
(2) IEC only.

Table 44 - Electronic LSI

Rated Current I_n [A]	Protection Type					Interrupting Code M0	
	L		S		I	Cat. No.	
	I_1 = 0.4...1 x I_n	t_1 = s	I_2 = 1...10 x I_n	t_2 = s	I_3 = (1)	3-pole	4-pole
600	240...600	3, 6, 12, 18	360...6000	0.05, 0.1, 0.25, 0.5	900...7200	140G-M0H3-D60	140G-M0H4-D60
630 (2)	252...630	3, 6, 12, 18	378...6300		945...7560	140G-M0H3-D63	140G-M0H4-D63
800	320...800	3, 6, 9, 18	480...8000		1200...8400	140G-M0H3-D80	140G-M0H4-D80

(1) 600 A, 630 A I_3 max =12 I_n; 800 A I_3 max = 10.5 I_n
(2) IEC only.

Table 45 - Electronic LSI, 100% Rated (1)

Rated Current I_n [A]	Protection Type					Interrupting Code M5	Interrupting Code M6	Interrupting Code M0
	L		S		I	Cat. No.	Cat. No.	Cat. No.
	I_1 = 0.4...1 x I_n	t_1 = s	I_2 = 1...10 x I_n	t_2 = s	I_3 = (2)	3-pole	3-pole	4-pole
600	240...600	3, 6, 12, 18	360...6000	0.05, 0.1, 0.25, 0.5	900...7200	140G-M5H3-D60-Z1	140G-M6H3-D60-Z1	140G-M0H3-D60-Z1
800	320...800	3, 6, 9, 18	480...8000		1200...8400	140G-M5H3-D80-Z1	140G-M6H3-D80-Z1	140G-M0H3-D80-Z1

(1) For more information about 80% and 100% ratings, see 80% and 100% Continuous Rated Breakers on page 14.
(2) 600 A, 630 A I_3 max =12 I_n; 800 A I_3 max = 10.5 I_n

Table 46 - Electronic LSIG

Rated Current I_n [A]	Protection Type							Interrupting Code M5		Interrupting Code M6	
	L		S		I	G		Cat. No.		Cat. No.	
	I_1 = 0.4... 1 x I_n	t_1 = s	I_2 = 1... 10 x I_n	t_2 = s	I_3 = (1)	I_4 = 0.2... 1 x I_n	t_4 = s	3-pole	4-pole	3-pole	4-pole
600	240...600	3, 6, 12, 18	360...6000	0.05, 0.1, 0.25, 0.5	900...7200	120...600	0.1, 0.2, 0.4, 0.8	140G-M5I3-D60	140G-M5I4-D60	140G-M6I3-D60	140G-M6I4-D60
630 (2)	252...630	3, 6, 12, 18	378...6300		945...7560	126...630		140G-M5I3-D63	140G-M5I4-D63	140G-M6I3-D63	140G-M6I4-D63
800	320...800	3, 6, 9, 18	480...8000		1200...8400	160...800		140G-M5I3-D80	140G-M5I4-D80	140G-M6I3-D80	140G-M6I4-D80

(1) 600 A, 630 A I_3 max =12 I_n; 800 A I_3 max = 10.5 I_n
(2) IEC only.

Table 47 - Electronic LSIG

Rated Current I_n [A]	Protection Type							Interrupting Code M0	
	L		S		I	G		Cat. No.	
	I_1 = 0.4...1 x I_n	t_1 = s	I_2 = 1...10 x I_n	t_2 = s	I_3 = (1)	I_4 = 0.2...1 x I_n	t_4 = s	3-pole	4-pole
600	240...600	3, 6, 12, 18	360...6000	0.05, 0.1, 0.25, 0.5	900...7200	120...600	0.1, 0.2, 0.4, 0.8	140G-M0I3-D60	140G-M0I4-D60
630 (2)	252...630	3, 6, 12, 18	378...6300		945...7560	126...630		140G-M0I3-D63	140G-M0I4-D63
800	320...800	3, 6, 9, 18	480...8000		1200...8400	160...800		140G-M0I3-D80	140G-M0I4-D80

(1) 600 A, 630 A I_3 max =12 I_n; 800 A I_3 max = 10.5 I_n
(2) IEC only.

Table 48 - Electronic LSIG, 100% Rated [1]

Rated Current I_n [A]	Protection Type							Interrupting Code M5	Interrupting Code M6	Interrupting Code M0
	L		S		I	G		Cat. No.	Cat. No.	
	I_1 = 0.4... 1 x I_n	t_1 = s	I_2 = 1... 10 x I_n	t_2 = s	I_3 = [2]	I_4 = 0.2... 1 x I_n	t_4 = s	3-pole	3-pole	3-pole
600	240...600	3, 6, 12, 18	360...6000	0.05, 0.1, 0.25, 0.5	900...7200	120...600	0.1, 0.2, 0.4, 0.8	140G-M5I3-D60-Z1	140G-M6I3-D60-Z1	140G-M0I3-D60-Z1
800	320...800	3, 6, 9, 18	480...8000		1200...8400	160...800		140G-M5I3-D80-Z1	140G-M6I3-D80-Z1	140G-M0I3-D80-Z1

(1) For more information about 80% and 100% ratings, see 80% and 100% Continuous Rated Breakers on page 14.
(2) 600 A, 630 A I_3max =12 I_n; 800 A I_3 max = 10.5 I_n

Table 49 - Electronic LSIG-MM [1]

Rated Current I_n [A]	Protection Type								Interrupting Code M5		Interrupting Code M6	
	L		S		I	G		MM	Cat. No.		Cat. No.	
	I_1 = 0.4...1 x I_n	t_1 = s	I_2 = 1...10 x I_n	t_2 = s	I_3 = [2]	I_4 = 0.2...1 x I_n	t_4 = s	I_5 = 1.5...4 x I_n	3-pole	4-pole	3-pole	4-pole
600	240... 600	3, 6, 12, 18	360... 6000	0.05, 0.1, 0.25, 0.5	900... 7200	120... 600	0.1, 0.2, 0.4, 0.8	900... 2400	140G-M5K3-D60	140G-M5K4-D60	140G-M6K3-D60	140G-M6K4-D60
630[3]	252... 630	3, 6, 12, 18	378... 6300		945... 7560	126... 630		945... 2520	140G-M5K3-D63	140G-M5K4-D63	140G-M6K3-D63	140G-M6K4-D63
800	320... 800	3, 6, 9, 18	480... 8000		1200... 8400	160... 800		1200... 3200	140G-M5K3-D80	140G-M5K4-D80	140G-M6K3-D80	140G-M6K4-D80

(1) See Maintenance Mode on page 23 for a list of the preset values for Maintenance Mode.
(2) 600 A, 630 A I_3max =12 I_n; 800 A I_3 max = 10.5 I_n
(3) IEC only.

Table 50 - Electronic LSIG-MM [1]

Rated Current I_n [A]	Protection Type								Interrupting Code M0	
	L		S		I	G		MM	Cat. No.	
	I_1 = 0.4...1 x I_n	t_1 = s	I_2 = 1...10 x I_n	t_2 = s	I_3 = [2]	I_4 = 0.2...1 x I_n	t_4 = s	I_5 = 1.5...4 x I_n	3-pole	4-pole
600	240...600	3, 6, 12, 18	360...6000	0.05, 0.1, 0.25, 0.5	900...7200	120...600	0.1, 0.2, 0.4, 0.8	900... 2400	140G-M0K3-D60	140G-M0K4-D60
630 [3]	252...630	3, 6, 12, 18	378...6300		945...7560	126...630		945... 2520	140G-M0K3-D63	140G-M0K4-D63
800	320...800	3, 6, 9, 18	480...8000		1200...8400	160...800		1200... 3200	140G-M0K3-D80	140G-M0K4-D80

(1) See Maintenance Mode on page 23 for a list of the preset values for Maintenance Mode.
(2) 600 A, 630 A I_3max =12 I_n; 800 A I_3 max = 10.5 I_n
(3) IEC only.

Table 51 - Electronic LSIG-MM, 100% Rated [1] [2]

Rated Current I_n [A]	Protection Type								Interrupting Code M5	Interrupting Code M6	Interrupting Code M0
	L		S		I	G		MM	Cat. No.	Cat. No.	Cat. No.
	I_1 = 0.4...1 x I_n	t_1 = s	I_2 = 1...10 x I_n	t_2 = s	I_3 = [3]	I_4 = 0.2...1 x I_n	t_4 = s	I_5 = 1.5...4 x I_n	3-pole	3-pole	3-pole
600	240... 600	3, 6, 12, 18	360... 6000	0.05, 0.1, 0.25, 0.5	900... 7200	120... 600	0.1, 0.2, 0.4, 0.8	900... 2400	140G-M5K3-D60-Z1	140G-M6K3-D60-Z1	140G-M0K3-D60-Z1
800	320... 800	3, 6, 9, 18	480... 8000		1200... 8400	160... 800		1200... 3200	140G-M5K3-D80-Z1	140G-M6K3-D80-Z1	140G-M0K3-D80-Z1

(1) See Maintenance Mode on page 23 for a list of the preset values for Maintenance Mode.
(2) For more information about 80% and 100% ratings, see 80% and 100% Continuous Rated Breakers on page 14.
(3) 600 A, 630 A I_3max =12 I_n; 800 A I_3 max = 10.5 I_n

1200 A, Frame Size N MCCBs

Catalog Number Explanation

Examples that are given in this section are not intended to be used for product selection. Not all combinations generate a valid catalog number. Use ProposalWorks™ software to configure the MCCB. ProposalWorks software is available from rok.auto/systemtools.

Frame size N MCCBs are available as assembled circuit breakers. Individual trip unit components can be ordered for field assembly or as replacement parts.

Terminal lugs are not supplied and can be ordered separately. See Table 116 on page 65 for available lugs.

140G	-	N	5	H	3	-	E12	-		-	SD	-	AB
a		b	c	d	e		f		g		h		i

a	
Bulletin Number	
Code	**Description**
140G	Global MCCB

b	
Frame/Rating	
Code	**Description**
N	1200 A

c	
Interrupting Rating/Breaking Capacity (based on I_c at 480V)	
Code	**Description**
5	50 kA
6	65 kA
0	100 kA
T	Trip unit

d	
Protection Type	
Code	**Description**
H	Electronic LSI
I	Electronic LSIG
K	Electronic LSIG-MM
S	Molded case switch (isolator)

e	
Poles	
Code	**Description**
3	3-pole

f	
Rated Current	
Code	**Description**
E12	1200 A trip unit with 1200 A rating plug

g	
Continuous Rated (1)	
Code	**Description**
Blank	80% Rated

h	
Factory-installed Options	
Code	**Description**
See Factory-installed Options on page 55	

(1) For more information about 80% and 100% ratings, see 80% and 100% Continuous Rated Breakers on page 14.

Assembled MCCBs — 1200 A, Frame Size N

Table 52 - Interrupting Rating/Breaking Capacity — Electronic Circuit Breakers

Interrupting Rating (50/60 Hz), UL 489/CSA 22.2, No. 5 [kA]			Breaking Capacity (50/60 Hz), IEC 60947-2 I_{cu} [kA]/I_{cs} %										Interrupting Code (1)
240V	480V	600V	220V		415V		440V		500V		690V		
			I_{cu} [kA]	I_{cs}[%I_{cu}]	I_{cu} [kA]	I_{cs}[%I_{cu}]	I_{cu} [kA]	I_{cs}[%I_{cu}]	I_{cu} [kA]	I_{cs}[%I_{cu}]	I_{cu} [kA]	I_{cs}[%I_{cu}]	
65	50	25	85	100	50	100	50	100	40	100	30	100	N5
100	65	50	100		70		65		50	100	42	75	N6
150	100	65	200		120		100		85	75	50	75	N0

(1) See Table 53...Table 64 on page 42 for Cat. No. selection

Table 53 - Electronic LSI

Rated Current I_n [A]	Protection Type (1)					Interrupting Code N5		Interrupting Code N6	
	L		S		I	Cat. No.		Cat. No.	
	I_1 = 0.4...1 x I_n	t_1 = [t_s] at 6 x I_1	I_2 = 0.6... 10 x I_n	t_2 = [t_s] at 10 x I_n	I_3 = 1.5... 12 x I_n	3-pole	4-pole	3-pole	4-pole
1200	480...1200	3,6,12,18	OFF, 720...12000	0.1, 0.25, 0.5, 0.8	OFF, 1800...14400	140G-N5H3-E12	140G-N5H4-E12	140G-N6H3-E12	140G-N6H4-E12

(1) Listed I_1, I_2, and I_3 values are based on a 1200 A rating plug value.

Table 54 - Electronic LSI

Rated Current I_n [A]	Protection Type (1)					Interrupting Code N0	
	L		S		I	Cat. No.	
	I_1 = 0.4...1 x I_n	t_1 = [t_s] at 6 x I_1	I_2 = 0.6... 10 x I_n	t_2 = [t_s] at 10 x I_n	I_3 = 1.5... 12 x I_n	3-pole	4-pole
1200	480...1200	3, 6, 12, 18	OFF, 720...12000	0.1, 0.25, 0.5, 0.8	OFF,1800...14400	140G-N0H3-E12	140G-N0H4-E12

(1) Listed I_1, I_2, and I_3 values are based on a 1200 A rating plug value.

Table 55 - Electronic LSIG

Rated Current I_n [A]	Protection Type (1)							Interrupting Code N5		Interrupting Code N6	
	L		S		I	G		Cat. No.		Cat. No.	
	I_1 = 0.4... 1 x I_n	t_1 = [t_s] at 6 x I_1	I_2 = 0.6... 10 x I_n	t_2 = [t_s] at 10 x I_n	I_3 = 1.5... 12 x I_n	I_4 = 0.2... 1 x I_n	t_4 = s	3-pole	4-pole	3-pole	4-pole
1200	480...1200	3, 6, 12, 18	OFF, 720... 12000	0.1, 0.25, 0.5, 0.8	OFF, 1800... 18000	OFF, 240...1200	0.1, 0.2, 0.4, 0.8	140G-N5I3-E12	140G-N5I4-E12	140G-N6I3-E12	140G-N6I4-E12

(1) Listed I_1, I_2, I_3, and I_4 values are based on a 1200 A rating plug value.

Table 56 - Electronic LSIG

Rated Current I_n [A]	Protection Type (1)							Interrupting Code N0	
	L		S		I	G		Cat. No.	
	I_1 = 0.4... 1 x I_n	t_1 = [t_s] at 6 x I_1	I_2 = 0.6... 10 x I_n	t_2 = [t_s] at 10 x I_n	I_3 = 1.5... 12 x I_n	I_4 = 0.2... 1 x I_n	t_4 = s	3-pole	4-pole
1200	480... 1200	3, 6, 12, 18	OFF, 720...12000	0.1, 0.25, 0.5, 0.8	OFF, 1800...18000	OFF, 240...1200	0.1, 0.2, 0.4,0.8	140G-N0I3-E12	140G-N0I4-E12

(1) Listed I_1, I_2, I_3, and I_4 values are based on a 1200 A rating plug value.

Table 57 - Electronic LSIG-MM [1]

Rated Current I_n [A] [1]	Protection Type [2]							Interrupting Code N5		Interrupting Code N6	
	L		S		I	G		Cat. No.		Cat. No.	
	I_1 = 0.4... 1 x I_n	t_1 = [t_s] at 6 x I_1	I_2 = 0.6... 10 x I_n	t_2 = [t_s] t 10 x I_n	I_3 = 1.5... 12 x I_n	I_4 = 0.2... 1 x I_n	t_4 = s	3-pole	4-pole	3-pole	4-pole
1200	480...1200	3, 12, 24, 36, 48, 72, 108, 144	OFF, 720... 12000	0.1, 0.25, 0.5, 0.8	OFF, 1800... 18000	OFF, 240...1200	0.1, 0.2, 0.4, 0.8	140G-N5K3-E12	140G-N5K4-E12	140G-N6K3-E12	140G-N6K4-E12

(1) See Maintenance Mode on page 23 for a list of the preset values for Maintenance Mode and information about maintenance mode adjustment.
(2) Listed I_1, I_2, I_3, and I_4 values are based on a 1200 A rating plug value.

Table 58 - Electronic LSIG-MM [1]

Rated Current I_n [A] [1]	Protection Type [2]								Interrupting Code N0	
	L		S		I	G		MM	Cat. No.	
	I_1 = 0.4... 1 x I_n	t_1 = [t_s] at 6 x I_1	I_2 = 0.6... 10 x I_n	t_2 = [t_s] at 10 x I_n	I_3 = 1.5... 12 x I_n	I_4 = 0.2...1 x I_n	t_4 = s	I_5 = 1.5...4 x I_n	3-pole	4-pole
1200	480...1200	3, 12, 24, 36, 48, 72, 108, 144	OFF, 720...12000	0.1, 0.25, 0.5, 0.8	OFF, 1800...18000	OFF, 240...1200	0.1, 0.2, 0.4, 0.8	1.5...4, 0.1 step	140G-N0K3-E12	140G-N0K4-E12

(1) See Maintenance Mode on page 23 for a list of the preset values for Maintenance Mode and information about maintenance mode adjustment.
(2) Listed I_1, I_2, I_3, and I_4 values are based on a 1200 A rating plug value.

Table 59 - Electronic LSI, 100% Rated [1]

Rated Current I_n [A]	Protection Type [2]					Interrupting Code N5		Interrupting Code N6	
	L		S		I	Cat. No.		Cat. No.	
	I_1 = 0.4...1 x I_n	t_1 = [t_s] at 6 x I_1	I_2 = 0.6... 10 x I_n	t_2 = [t_s] at 10 x I_n	I_3 = 1.5... 12 x I_n	3-pole	4-pole	3-pole	4-pole
1200	480...1200	3, 6, 12, 18	OFF, 720...12000	0.1, 0.25, 0.5, 0.8	OFF, 1800... 14400	140G-N5H3-E12-Z1	140G-N5H4-E12-Z1	140G-N6H3-E12-Z1	140G-N6H4-E12-Z1

(1) For more information about 80% and 100% ratings, see 80% and 100% Continuous Rated Breakers on page 14.
(2) Listed I_1, I_2, I_3, and I_4 values are based on a 1200 A rating plug value.

Table 60 - Electronic LSI, 100% Rated [1]

Rated Current I_n [A]	Protection Type [2]					Interrupting Code N0	
	L		S		I	Cat. No.	
	I_1 = 0.4...1 x I_n	t_1 = [t_s] at 6 x I_1	I_2 = 0.6... 10 x I_n	t_2 = [t_s] at 10 x I_n	I_3 = 1.5... 12 x I_n	3-pole	4-pole
1200	480...1200	3, 6, 12, 18	OFF, 720...12000	0.1, 0.25, 0.5, 0.8	OFF, 1800... 14400	140G-N0H3-E12-Z1	140G-N0H4-E12-Z1

(1) For more information about 80% and 100% ratings, see 80% and 100% Continuous Rated Breakers on page 14.
(2) Listed I_1, I_2, I_3, and I_4 values are based on a 1200 A rating plug value.

Table 61 - Electronic LSIG, 100% Rated [1]

Rated Current I_n [A]	Protection Type [2]							Interrupting Code N5		Interrupting Code N6	
	L		S		I	G		Cat. No.		Cat. No.	
	I_1 = 0.4... 1 x I_n	t_1 = [t_s] at 3 x I_1	I_2 = 1... 10 x I_n	t_2 = [t_s] at 10 x I_n	I_3 = 1.5... 15 x I_n	I_4 = 0.2... 1 x I_n	t_4 = s	3-pole	4-pole	3-pole	4-pole
1200	480...1200	3, 6 12, 18	OFF, 720... 12000	0.1, 0.25, 0.5, 0.8	OFF, 1800... 18000	OFF, 240...1200	0.1, 0.2, 0.4, 0.8	140G-N5I3-E12-Z1	140G-N5I4-E12-Z1	140G-N6I3-E12-Z1	140G-N6I4-E12-Z1

(1) For more information about 80% and 100% ratings, see 80% and 100% Continuous Rated Breakers on page 14.
(2) Listed I_1, I_2, I_3, and I_4 values are based on a 1200 A rating plug value.

Table 62 - Electronic LSIG, 100% Rated (1)

Rated Current I_n [A]	Protection Type (2)							Interrupting Code N0	
	L		S		I	G		Cat. No.	
	I_1 = 0.4... 1 x I_n	t_1 = [t_s] at 3 x I_1	I_2 = 1... 10 x I_n	t_2 = [t_s] at 10 x I_n	I_3 = 1.5... 15 x I_n	I_4 = 0.2... 1 x I_n	t_4 = s	3-pole	4-pole
1200	480...1200	3, 6, 12, 18	OFF, 720...12000	0.1, 0.25, 0.5, 0.8	OFF, 1800...18000	OFF, 240...1200	0.1, 0.2, 0.4, 0.8	140G-N0I3-E12-Z1	140G-N0I4-E12-Z1

(1) For more information about 80% and 100% ratings, see 80% and 100% Continuous Rated Breakers on page 14.
(2) Listed I_1, I_2, I_3, and I_4 values are based on a 1200 A rating plug value..

Table 63 - Electronic LSIG-MM, 100% Rated (1)(2)

Rated Current I_n [A]	Protection Type (3)							Interrupting Code N5		Interrupting Code N6	
	L		S		I	G		Cat. No.		Cat. No.	
	I_1 = 0.4... 1 x I_n	t_1 = [t_s] at 3 x I_1	I_2 = 1... 10 x I_n	t_2 = [t_s] at 10 x I_n	I_3 = 1.5... 15 x I_n	I_4 = 0.2... 1 x I_n	t_4 = s	3-pole	4-pole	3-pole	4-pole
1200	480... 1200	3, 12, 24, 36, 48, 72,108,144	OFF, 720...12000	0.1, 0.25, 0.5, 0.8	OFF, 1800...18000	OFF, 240... 1200	0.1, 0.2, 0.4, 0.8	140G-N5K3-E12-Z1	140G-N5K4-E12-Z1	140G-N6K3-E12-Z1	140G-N6K4-E12-Z1

(1) For more information about 80% and 100% ratings, see 80% and 100% Continuous Rated Breakers on page 14.
(2) See Maintenance Mode on page 23 for a list of the preset values for Maintenance Mode.
(3) Listed I_1, I_2, I_3, and I_4 values are based on a 1200 A rating plug value.

Table 64 - Electronic LSIG-MM, 100% Rated (1)(2)

Rated Current I_n [A]	Protection Type (3)							Interrupting Code N0	
	L		S		I	G		Cat. No.	
	I_1 = 0.4... 1 x I_n	t_1 = [t_s] at 3 x I_1	I_2 = 1... 10 x I_n	t_2 = [t_s] at 10 x I_n	I_3 = 1.5...15 x I_n	I_4 = 0.2... 1 x I_n	t_4 = s	3-pole	4-pole
1200	480...1200	3, 12, 24, 36, 48, 72, 108,144	OFF, 720...12000	0.1, 0.25, 0.5, 0.8	OFF, 1800...18000	OFF, 240...1200	0.1, 0.2, 0.4, 0.8	140G-N0K3-E12-Z1	140G-N0K4-E12-Z1

(1) For more information about 80% and 100% ratings, see 80% and 100% Continuous Rated Breakers on page 14.
(2) See Maintenance Mode on page 23 for a list of the preset values for Maintenance Mode.
(3) Listed I_1, I_2, I_3, and I_4 values are based on a 1200 A rating plug value.

Table 65 - Trip Units, Electronic LSI, LSIG, LSIG-MM

Rated Current I_n [A]	Protection Type	Cat. No. (1)
1200	H (LSI)	140G-NTH-E12
1200	I (LSIG)	140G-NTI-E12
1200	K (LSIG-MM)	140G-NTK-E12

(1) Supplied installed with each MCCB. The Cat. Nos. listed are replacement parts.

1200 A, Frame Size NS MCCBs

Catalog Number Explanation

Examples that are given in this section are not intended to be used for product selection. Not all combinations generate a valid catalog number. Use ProposalWorks software to configure the MCCB. ProposalWorks software is available from rok.auto/systemtools.

Frame size NS MCCBs are available as assembled circuit breakers. Individual trip unit components can be ordered for field assembly or as replacement parts.

Terminal lugs are not supplied and can be ordered separately. See Table 116 on page 65 for available lugs.

140G	-	NS	5	H	3	-	E12	-		-	MJ	-	RK	-	SD	-	SD
a		b	c	d	e		f		g		h		i		j		k

a	
Bulletin Number	
Code	**Description**
140G	Global MCCB

b	
Frame/Rating	
Code	**Description**
NS	1200 A

c	
Interrupting Rating/Breaking Capacity (based on I_c at 480V)	
Code	**Description**
5	50 kA
6	65 kA
0	100 kA
T	Trip unit

d	
Protection Type	
Code	**Description**
H	Electronic LSI
I	Electronic LSIG
K	Electronic LSIG-D-MM
S	Molded Case Switch (isolator)

e	
Poles	
Code	**Description**
3	3-pole
4	4-pole

f	
Rated Current	
Code	**Description**
E12	1200 A trip unit with 1200 A rating plug

g	
Continuous Rated (1)	
Code	**Description**
Blank	80% Rated

h, i	
Remote MCCB Operation	
Code	**Description**
See Factory-installed Options on page 55	

j, k	
Factory-installed Options	
Code	**Description**
See Factory-installed Options on page 55	

(1) For more information about 80% and 100% ratings, see page 14.

Assembled MCCBs — 1200 A, NS Frame

Table 66 - Interrupting Rating/Breaking Capacity — Electronic Circuit Breakers

Interrupting Rating (50/60 Hz), UL 489/CSA C22.2, No. 5[kA]			Breaking Capacity (50/60 Hz), IEC 60947-2 I_{cu} [kA]/I_{cs} %										Interrupting Code (1)
240V	480V	600V	220V		415V		440V		500V		690V		
			I_{cu} [kA]	I_{cs}[%I_{cu}]	I_{cu} [kA]	I_{cs}[%I_{cu}]	I_{cu} [kA]	I_{cs}[%I_{cu}]	I_{cu} [kA]	I_{cs}[%I_{cu}]	I_{cu} [kA]	I_{cs}[%I_{cu}]	
65	50	25	85	100	50	100	50	100	40	100	30	100	NS5
100	65	50	100		70		65		50	100	42	75	NS6
150	100	65	200		120		100		85	75	50	75	NS0

(1) See Table 67...Table 72 on page 45 for catalog number selection.

Table 67 - Electronic LSI

Rated Current I_n [A]	Protection Type (1)					Interrupting Code NS5		Interrupting Code NS6	
	L		S		I	Cat. No.		Cat. No.	
	I_1 = 0.4...1 x I_n	t_1 = [t_s] at 6 x I_1	I_2 = 0.6...10 x I_n	t_2 = s	I_3 = 1.5...12 x I_n	3-pole	4-pole	3-pole	4-pole
1200 (2)	480...1200	3, 6, 12, 18	OFF, 720...12000	0.1, 0.25, 0.5, 0.8	OFF, 1800...14400	140G-NS5H3-E12	140G-NS5H4-E12	140G-NS6H3-E12	140G-NS6H4-E12

(1) Listed I_1, I_2, and I_3 values are based on a 1200 A rating plug value.
(2) Rated current = 1200 A for UL Ratings.

Table 68 - Electronic LSI

Rated Current I_n [A]	Protection Type (1)					Interrupting Code NS0	
	L		S		I	Cat. No.	
	I_1 = 0.4...1 x I_n	t_1 = [t_s] at 6 x I_1	I_2 = 0.6...10 x I_n	t_2 = [t_s] at 10 x I_1	I_3 = 1.5...12 x I_n	3-pole	4-pole
1200 (2)	480...1200	3, 6, 12, 18	OFF, 720...12000	0.1, 0.25, 0.5, 0.8	OFF, 1800...14400	140G-NS0H3-E12	140G-NS0H4-E12

(1) Listed I_1, I_2, and I_3 values are based on a 1200 A rating plug value.
(2) Rated current = 1200 A for UL Ratings; 1250 A for IEC.

Table 69 - Electronic LSIG

Rated Current I_n [A]	Protection Type (1)							Interrupting Code NS5		Interrupting Code NS6	
	L		S		I	G		Cat. No.		Cat. No.	
	I_1 = 0.4... 1 x I_n	t_1 = [t_s] at 3 x I_1	I_2 = 0.6... 10 x I_n	t_2 = [t_s] at 10 x I_1	I_3 = 1.5... 15 x I_n	I_4 = 0.2... 1 x I_n	t_4 = s	3-pole	4-pole	3-pole	4-pole
1200 (2)	480...1200	3, 6, 12, 18	OFF, 720...12000	0.1, 0.25, 0.5, 0.8	OFF, 1800...18000	OFF, 240...1200	0.1, 0.2, 0.4, 0.8	140G-NS5I3-E12	140G-NS5I4-E12	140G-NS5I4-E12	140G-NS6I4-E12

(1) Listed I_1, I_2, and I_3 values are based on a 1200 A rating plug value.
(2) Rated current = 1200 A for UL Ratings.

Table 70 - Electronic LSIG

Rated Current I_n [A]	Protection Type (1)							Interrupting Code NS0	
	L		S		I	G		Cat. No.	
	I_1 = 0.4...1 x I_n	t_1 = [t_s] at 3 x I_1	I_2 = 0.6...10 x I_n	t_2 = [t_s] at 10 x I_1	I_3 = 1.5...15 x I_n	I_4 = 0.2... 1 x I_n	t_4 = s	3-pole	4-pole
1200 (2)	480...1200	3, 6, 12, 18	OFF, 720...12000	0.1, 0.25, 0.5, 0.8	OFF, 1800...18000	OFF, 240...1200	0.1, 0.2, 0.4, 0.8	140G-NS0I3-E12	140G-NS0I4-E12

(1) Listed I_1, I_2, I_3, and I_4 values are based on a 1200 A rating plug value.
(2) Rated current = 1200 A for UL Ratings; 1250 A for IEC.

Table 71 - Electronic LSIG-MM [1]

Rated Current I_n [A]	Protection Type [2]							Interrupting Code NS5		Interrupting Code NS6	
	L		S		I	G		Cat. No.		Cat. No.	
	I_1 = 0.4... 1 x I_n	t_1 = [t_s] at 3 x I_1	I_2 = 0.6...10 x I_n	t_2 = [t_s] at 10 x I_1	I_3 = 1.5...15 x I_n	I_4 = 0.2...1 x I_n	t_4 = s	3-pole	4-pole	3-pole	4-pole
1200 [3]	480...1200	3, 12, 24, 36, 48, 72, 108, 144	OFF, 720... 12000	0.1, 0.25, 0.5, 0.8	OFF, 1800... 18000	OFF, 240...1200	0.1, 0.2, 0.4, 0.8	140G-NS5K3-E12	140G-NS5K4-E12	140G-NS6K3-E12	140G-NS6K4-E12

(1) See Maintenance Mode on page 23 for a list of the preset values for Maintenance Mode.
(2) Listed I_1, I_2, I_3, and I_4 values are based on a 1200 A rating plug value.
(3) Rated current = 1200 A for UL Ratings.

Table 72 - Electronic LSIG-MM [1]

Rated Current I_n [A]	Protection Type [2]								Interrupting Code NS0	
	L		S		I	G		MM	Cat. No.	
	I_1 = 0.4... 1 x I_n	t_1 = [t_s] at 3 x I_1	I_2 = 0.6...10 x I_n	t_2 = [t_s] at 10 x I_1	I_3 = 1.5...15 x I_n	I_4 = 0.2... 1 x I_n	t_4=s	I_5 = 1.5...4 x I_n	3-pole	4-pole
1200 [3]	480...1200	3, 12, 24, 36, 48, 72, 108, 144	OFF, 720...12000	0.1, 0.25, 0.5, 0.8	OFF, 1800...18000	OFF, 240...1200	0.1, 0.2, 0.4, 0.8	1.5...4, 0.1 step	140G-NS0K3-E12	140G-NS0K4-E12

(1) See Maintenance Mode on page 23 for a list of the preset values for Maintenance Mode.
(2) Listed I_1, I_2, I_3, and I_4 values are based on a 1200 A rating plug value.
(3) Rated current = 1200 A for UL Ratings; 1250 A for IEC.

Table 73 - Trip Units, Electronic LSI, LSIG, LSIG-MM [1]

	Rated Current I_n [A]	Protection Type	Cat. No.
	1200	H (LSI)	140G-NTH-E12
	1200	I (LSIG)	140G-NTI-E12
	1200	K (LSIG-MM)	140G-NTK-E12

(1) Supplied installed with each MCCB. The catalog numbers listed are replacement parts.

Motor Circuit Protectors

The Bulletin 140MG Motor Circuit Protectors (MCPs) provide short-circuit protection for individual motor loads. Factory-installed internal accessories make installation and wiring easy.

MCPs may provide the following protective and control functions.

- Disconnect for motor branch circuit
- Branch circuit, short-circuit protection (magnetic protection)
- Switching (manual)

Features include:

- Current range 300...1200 A
- End cap/bolt-on terminals are standard
- Visible trip indication
- High current limiting
- High switching capacity
- UL Listed/Recognized for motor loads
  - Short-circuit protection - magnetic trip
  - Overload protection must be provided separately

Standards Compliance and Certifications

Standards Compliance	Certifications
IEC 60947-2	CE Marked
UL489	CCC
EXAMPLE: CSA 22.2, No. 5	CSA Certified (File No. LR1234)
	UR Recognized (File No. E224135)

In North America, electrical codes require that an individual motor branch circuit be protected by a UL/CSA Listed fuse, circuit breaker or self-protected combination motor controller.

The 140MG MCPs are UL/CSA Recognized as circuit breakers. They are UL/CSA Recognized, rather than UL/CSA Listed, because they only provide short-circuit protection and not thermal overload protection for the motor.

400 A, Frame Size K and 800 A, Frame Size M

140MG	-	M	8	P	-	D40	-	SD	-	AA
a		b	c	d		e		f		f

a	
Bulletin Number	
Code	**Description**
140MG	Global MCP

b	
Frame/Rating	
Code	**Description**
K	400 A
M	800 A

c	
Interrupting Rating/Breaking Capacity (based on I_c at 480V)	
Code	**Description**
8	High break (2)

d	
Protection Type	
Code	**Description**
P	Adjustable magnetic only (less than 13 x I_n)

e	
Rated Current (1)	
Code	**Description**
D30	Example: 300 A
D40	Example: 400 A
D60	example: 600 A
D80	Example: 800 A
Blank	Frame only

f	
Factory-installed Options	
Code	**Description**
See Factory-installed Options on page 55	

(1) MCPs that have electronic trip units come with a rating plug installed that matches the trip unit rating. Different value rating plugs are not compatible with these devices.
(2) The interrupting rating for MCPs is dependent upon the controller used. Please see the Global Short-circuit Rating Tool, rok.auto/sccr.

1200 A, Frame Size N

140MG	-	N	8	P	-	E12	-	SD	-	AB
a		b	c	d		e		f		f

a	
Bulletin Number	
Code	**Description**
140MG	Global MCP

b	
Frame/Rating	
Code	**Description**
N	1200 A

c	
Interrupting Rating/Breaking Capacity (based on I_c at 480V)	
Code	**Description**
8	High break (2)

d	
Protection Type	
Code	**Description**
P	Adjustable magnetic only (less than 13 x I_n)

e	
Rated Current (1)	
Code	**Description**
E12	1200 A

f	
Factory-installed Options	
Code	**Description**
See Factory-installed Options on page 55	

(1) MCPs that have electronic trip units come with a rating plug installed that matches the trip unit rating. Different value rating plugs are not compatible with these devices.
(2) The interrupting rating for MCPs is dependent upon the controller used. Please see the Global Short-circuit Rating Tool, rok.auto/sccr.

Motor Ratings

Use Table 74 and Table 75 to find the motor FLA for your application. Then, use that value in Table 76 and Table 76 to select the MCP. The values are extracted from the standards for the given relationship between rated operational current and the operational kilowatt/horsepower rating. Actual selection should be based on the motor nameplate rating and performance for the specific motor.

Table 74 - Kilowatt to Full-load Amperes for AC Induction Motors

Rated Operational Power [kW] (1)	Guide Values of Rated Operational Currents [A]			
	230V	400V	500V	690V
0.06	0.35	0.20	0.16	0.12
0.09	0.52	0.30	0.24	0.17
0.12	0.70	0.44	0.32	0.23
0.18	1.0	0.60	0.48	0.35
0.25	1.5	0.85	0.68	0.49
0.37	1.9	1.10	0.88	0.64
0.55	2.6	1.5	1.2	0.87
0.75	3.3	1.9	1.5	1.1
1.1	4.7	2.7	2.2	1.6
1.5	6.3	3.6	2.9	2.1
2.2	8.5	4.9	3.9	2.8
3.0	11.3	6.5	5.2	3.8
4	15	8.5	6.8	4.9
5.5	20	11.5	9.2	6.7
7.5	27	15.5	12.4	8.9
11	38	22.0	17.6	12.8
15	51	29	23	17
18.5	61	35	28	21
22	72	41	33	24
30	96	55	44	32
37	115	66	53	39
45	140	80	64	47
55	169	97	78	57
75	230	132	106	77
90	278	160	128	93
110	340	195	156	113
132	400	230	184	134
150	–	–	–	–

Rated Operational Power [kW] (1)	Guide Values of Rated Operational Currents [A]			
	230V	400V	500V	690V
160	487	280	224	162
185	–	–	–	–
200	609	350	280	203
220	–	–	–	–
250	748	430	344	250
280	–	–	–	–
300	–	–	–	–
315	940	540	432	313
335	–	–	–	–
355	1061	610	488	354
375	–	–	–	–
400	1200	690	552	400
425	–	–	–	–
450	–	–	–	–
475	–	–	–	–
500	1478	850	680	493
530	–	–	–	–
560	1652	950	760	551
600	–	–	–	–
630	1844	1060	848	615
670	–	–	–	–
710	2070	1190	952	690
750	–	–	–	–
800	2340	1346	1076	780
850	–	–	–	–
900	2640	1518	1214	880
950	–	–	–	–
1000	2910	1673	1339	970

(1) Preferred rated values according to IEC 60072-1 (primary series).

Table 75 - Horsepower to Full-load Amperes for AC Induction Motors

Rated Operational Power [Hp] (1)	Guide Values of Rated Operational Currents [A]						
	110... 120V	200V	208V	220... 240V	380... 415V	440... 480V	550... 600V
1/2	4.4	2.5	2.4	2.2	1.3	1.1	0.9
3/4	6.4	3.7	3.5	3.2	1.8	1.6	1.3
1	8.4	4.8	4.6	4.2	2.3	2.1	1.7
1-1/2	12.0	6.9	6.6	6.0	3.3	3.0	2.4
2	13.6	7.8	7.5	6.8	4.3	3.4	2.7
3	19.2	11.0	10.6	9.6	6.1	4.8	3.9
5	30.4	17.5	16.7	15.2	9.7	7.6	6.1
7-1/2	44.0	25.3	24.2	22.0	14.0	11.0	9.0
10	56.0	32.2	30.8	28.0	18.0	14.0	11.0
15	84	48.3	46.2	42.0	27.0	21.0	17.0
20	108	62.1	59.4	54.0	34.0	27.0	22.0
25	136	78.2	74.8	68	44	34	27
30	160	92	88	80	51	40	32
40	208	120	114	104	66	52	41
50	260	150	143	130	83	65	52
60	–	177	169	154	103	77	62
75		221	211	192	128	96	77
100		285	273	248	165	124	99
125		359	343	312	208	156	125
150		414	396	360	240	180	144
200		552	528	480	320	240	192
250	–	–	–	604	403	302	242
300				722	482	361	289
350				828	560	414	336
400				954	636	477	382
450				1030	–	515	412
500				1180	786	590	472

(1) Horsepower and currents values according to UL 508 (60 Hz).

Table 76 - MCP Frame Sizes K, M, and N: Electronic DIP Switch

Frame Size	Rated Operational Current I_e [A]	Magnetic Trip Current [A]	Cat. No. (1)
		I_3 (adjustable) [A]	
K	300	300...3000	140MG-K8P-D30
	400	400...4000	140MG-K8P-D40
M	600	600...6000	140MG-M8P-D60
	800	800...8000	140MG-M8P-D80
N	1200	1200...12000 (2)	140MG-N8P-E12

(1) The interrupting rating for MCPs is dependent upon the controller used.
See the global short-circuit ratings tables at rok.auto/sccr, or contact your local Rockwell Automation sales office or Allen-Bradley distributor.
(2) I_3 is adjustable between 1...10x motor FLA.

Molded Case Switches

Features include:

- 400...1200 A current range
- 3-pole and 4-pole devices
- End cap/bolt-on terminals are standard
- These switches are like an MCCB, but they are not supplied with thermal overload protection
- Self protecting, supplied with instantaneous magnetic trip override
- Suitable for use as motor branch circuit and motor disconnect
- Must be protected on the supply side of the switch against short circuits that use a fuse or breaker at or below the listed maximum rated current of the protective device

Standards Compliance and Certifications

Standards Compliance	Certifications
IEC 60947-1, -2	CE Marked
UL489	CCC
CSA 22.2, No. 5	CSA Certified (File No. LR1234)
	UL Listed
	HACR Type E118548

Catalog Number Explanation

Examples that are given in this section are not intended to be used for product selection. Not all combinations generate a valid catalog number. Use ProposalWorks™ software to configure the molded case switch. ProposalWorks software is available from rok.auto/systemtools.

Terminal lugs are not supplied and can be ordered separately. See Table 116 on page 65 for available lugs.

140G	-	K	6	S	3	-	D12	-	SD	-	AA
a		b	c	d	e		f		g		g

a	
Bulletin Number	
Code	Description
140G	Molded Case Switch

b	
Frame/Rating	
Code	Description
K	400 A
M	800 A
N	1200 A

c	
Interrupting Rating/Breaking Capacity (based on I_c at 480V)	
Code	Description
6	65 kA
15	150 kA

d	
Protection Type	
Code	Description
S	Molded Case Switch (Isolator)

e	
Number of Poles	
Code	Description
3	3-pole
4	4-pole

f	
Rated Current	
Code (1)	Description
D⊗	Example: D30 = 300 A
E⊗	Example: E12 = 1200 A

g	
Factory-installed Options	
Code	Description
See Factory-installed Options on page 55	

(1) Rated current equals the value of ⊗ multiplied by the first letter of the code. B = 0.1 ⊗, C = 1 ⊗, D = 10 ⊗, and E = 100 ⊗.

Table 78 - Interrupting Rating/Breaking Capacity

Required Upstream Fuse or Breaker Up to Max Rated Current [A]	AC Interrupting Rating (50/60 Hz), UL 489/CSA C22.2, No. 5 [kA]				Breaking Capacity (DC), IEC 60947-3			Interrupting Code (1)
	240V	480V	600Y/347V	600V	250V (2 poles in series)	500V (3 poles in series)	600V 3 poles in series	
400	200	150	–	100	–	100	65	K15
800	200	65		35		–	35	M6
2000	100	65		50		–	–	N6

(1) See Table 79 on page 54 for catalog number selection.

Table 79 - Molded Case Switches

UL 489, CSA C22.2, No. 5				IEC 60947-3							Cat. No.	
Withstand Current I_s [A]	Magnetic Override I_{cw} (1) [A]	Rated Voltage		Rated Service Voltage U_e [V]			Rated Service Current		Rated Insulation Voltage	Rated Impulse Withstand	3-Pole	4-Pole
		AC (50/60 Hz) [V]	DC [V]	AC (50/60 Hz)	DC	Poles in series	AC23 I_e [A]	DC23 I_e [A]	U_i [V]	U_{imp} [kV]		
400	5000	600	600	690	750	3	400	400	1000	8	140G-K15S3-D40	140G-K15S4-D40
800	10000	600	600				800	–			140G-M6S3-D80	140G-M6S4-D80
2000	20000	600	–				1200	–			140G-N6S3-E12	140G-N6S4-E12

(1) Does not provide overcurrent protection; may open above this current value.

Factory-assembled components are compatible with all Bulletin 140G device types and offer faster installation time and streamlined accessory selection for certain common functions. These options include:

- Assembly of breaking frame and trip unit (for products that are available separately)
- Remote operation via combined use of spring charging motor, shunt trip, shunt close, trip reset, and mechanical counter
- Shunt trip and undervoltage release for controls or protections
- Variety of contact kits including auxiliary, alarm, and trip unit alarm contacts
- Terminal connections with saddle clamp-style lugs or busbar adapter

See Accessories on page 56 for complete descriptions of available options.

Table 80 - Internal Options (1)

Left-side Mounting (Maximum 1)			
Shunt Trip and Undervoltage Release Units			
Code	**Description**	**Voltage**	**Frame Size**
SJ	Shunt Trip	24...30V AC/DC	K, M, N, NS (2)
SK		48...60V AC/DC	
SD		110...127V AC; 110...125V DC	
SA		220...240V AC; 220...250V DC	
SB		380...440V AC	
SC		480...525V AC	K, M
UJ	Undervoltage Release	24...30V AC/DC	K, M, N, NS
UK		48V AC/DC	K, M
UY		60V AC/DC	N, NS
UD		110...127V AC; 110...125V DC	K, M, N, NS
UA		220...240V AC; 220...250V DC	
UB		380...440V AC	
UC		480...525V AC	
Blank	No Selection	–	K, M, N, NS

Right-side Mounting (Maximum 1)			
Auxiliary and Alarm Contacts			
Code	**Description**	**Voltage**	**Frame Size**
AJ	1 Aux., 1 Alarm Contact	24V DC	N, NS
CJ	3 Aux., 1 Alarm Contact		K, M
FJ	2 Aux. Contact		N, NS
AA	1 Aux., 1 Alarm Contact	250V AC	K, M
CA	3 Aux., 1 Alarm Contact		K, M
DA	1 Trip Unit Alarm Contact		N
AB	1 Aux., 1 Alarm Contact	400V AC	K, M, N, NS
FB	2 Aux. Contacts		
Blank	No Selection	–	K, M, N

(1) Select up to two internal options: 1 for left side mounting (shunt trip or undervoltage release), 1 for right (auxiliary or alarm contact).
(2) When the MCCB has been configured for remote operation (Table 81), you can select only one additional undervoltage release. Additional shunt trip is not available for factory installation, but can be field installed.

Table 81 - Options for Remote MCCB Operation (1)

Spring Charge Motor		
Code	**Voltage**	**Frame Size**
MJ	24...30V AC/DC	NS
MKY	48...60V AC/DC	
MD	110...130V AC/DC	
MA	220...250V AC/DC	
MB	380...415V AC	NS
Blank	No Selection	NS

Shunt Trip and Shunt Close Units for Spring Charge Motor		
Code	**Voltage**	**Frame Size**
RJ	24V AC/DC	NS
RK	48V AC/DC	
RD	110...120V AC/DC	
RA	220...240V AC/DC	
RB	380...400V AC	
Blank	No Selection	NS

(1) Select up to one option from spring charge motor, one option from shunt trip and shunt close units for spring charge motor, and one additional undervoltage release from Table 80. An additional shunt trip is not available for factory installation, but can be field installed.

Table 82 - Mounting Options

Busbar Adapter Options		
Code	**Description**	**Frame Size**
MU	Universal (top or bottom) Connection, Supplied Unassembled (1)	K

(1) Lugs are not required or included. If your application requires terminal lugs, see Table 116 on page 65 for compatible options. Lugs must be installed on the side of the unit that is not connected to the adapter.

Photos in this section are representative. Appearance of actual product may differ from the photo shown.

Internal Accessories

Table 83 - Auxiliary and Alarm Contacts (AX/AL/TUAL)

Description		Rated Voltage	Contact Type	No. of Contacts			Electrical Diagram	Frame Size	Cat. No.
				Auxiliary	Alarm	Trip Unit Alarm			
	Auxiliary/Trip Unit Contact • Indicates ON/OFF status of the MCCB • Form C-style switches for internal MCCB wiring snap-fit into internal pockets of the device • Frame size K and M: Supplied with 1 m (39 in.) pig tail wiring, with each terminal wire labeled • Terminated with a 3-pin quick connector (140G-N-CIC) – Frame size N, NS • Designation: AX1/AX2/AX3/AX4) • See Table 3 on page 9 for contact function description	250V AC	Auxiliary, alarm, and trip unit alarm combination	1	1	–	Figure 18	K, M	140G-K-EA1R1A
				3	1	–	Figure 14	K, M	140G-K-EA3R1A
		250V AC	Trip unit alarm	–	–	1	Figure 20	N, NS	140G-N-EA1TA
		24V DC, PLC (1)	Auxiliary	2	–	–	Figure 17	N, NS	140G-N-EA2J
			Auxiliary and alarm combination	3	1	–	Figure 14	K, M	140G-K-EA3R1J
				1	1	–	Figure 18	N, NS	140G-N-EA1R1J
		400V AC (1)	Auxiliary	2	–	–	Figure 17	K, M	140G-K-EA2B
								N, NS	140G-N-EA2B
			Auxiliary and alarm combination	1	1	–	Figure 18	K, M	140G-K-EA1R1B
							Figure 18	N, NS	140G-N-EA1R1B
	Auxiliary Contact for Maintenance Mode • For LSIG-MM devices only	24V DC	Auxiliary and alarm combination	1	1	–	Figure 33	K	140G-K-CEAA
								M	140G-M-CEAA

(1) See Table 150 on page 83 for additional specifications, including AC and DC ratings.

Table 84 - Shunt Trips

Description		Voltage	Diagram	Frame Size	Cat. No.
	• Allows remote tripping of the MCCB by applying control voltage to the shunt trip coil • Supplied with 1 m (39 in.) pig tail wiring, with each terminal wire labeled • 140G-K-CC2 available for 2nd Shunt install for frame size K and M – Second shunt configuration is not compatible with Undervoltage Release (UVR) – Second shunt application only available on 4-pole devices. • UL 489 **TIP:** 4-Pole devices require Cat. No. 140G-K-CC2 connector. See Table 85 on page 57.	12V DC	Figure 25	K, M	140G-K-SNR
		24...30V AC/DC			140G-K-SNJ
		48...60V AC/DC			140G-K-SNKY
		110...127V AC/ 110...125V DC			140G-K-SND
		220...240V AC/ 220...250V DC			140G-K-SNA
		380...440V AC			140G-K-SNB
		480...525V AC			140G-K-SNC
	• Allows remote tripping of the MCCB by applying control voltage to the shunt trip coil • Wired internal to the breaker – Terminated with a (140G-N-CIC) 3-pin quick connector • UL 489 • Terminals C1 and C2 are designated C11 and C12	24V AC/DC	Figure 25	N, NS	140G-N-SNJ
		48V AC/DC			140G-N-SNKY
		110...120V AC/DC			140G-N-SND
		220...240V AC/DC			140G-N-SNA
		380...400V AC			140G-N-SNB

Table 85 - Shunt Trip Connector for 4-Pole Devices

Description		Frame Size	Cat. No.
	Connector to mount shunt trip in third pole pocket for a 4-pole MCCB • 4-pole devices only	K, M	140G-K-CC2

Table 86 - Undervoltage Release Units

Description		Voltage	Diagram	Frame Size	Cat. No.
	• Opens the MCCB when supply voltage drops between 35...70% of the UV voltage rating • Trip rating from 0.7...0.35. • The MCCB can be reset when the supply voltage > 85% of the relay rating. • When the UV is de-energized, MCCB main contacts cannot close. • For frame size K and M: Supplied with 1 m (39 in.) pig tail wiring, with each terminal wire labeled • Frame size N, NS: – Wired internal to the breaker – Terminated with a (140G-N-CIC) 3-pin quick connector (Frame Size N, NS) • R resistor is supplied with the MCCB when reset is required. • UL 489SIDE	24...30V AC/DC	Figure 28	K, M	140G-K-UVJ
		48V AC/DC			140G-K-UVKY
		60V AC/DC			140G-K-UVY
		110...127V AC/110...125V DC			140G-K-UVD
		220...240V AC/220...250V DC			140G-K-UVA
		380...440 V AC			140G-K-UVB
		480...525 V AC			140G-K-UVC
		24V AC/DC	Figure 28	N, NS	140G-N-UVJ
		60V AC/DC			140G-N-UVKY
		110...120V AC/DC			140G-N-UVD
		220...240V AC/DC			140G-N-UVA
		380...400V AC			140G-N-UVB
		415...440V AC			140G-N-UVC

Table 87 - Shunt Close (SNC) Units

Description		Voltage	Diagram	Frame Size	Cat. No.
	• Allows remote closing of the MCCB when the spring motor is charged • Wired internal to the breaker – Terminated with a (140G-N-CIC) 3-pin quick connector (Frame size N, NS) • UL 489	24V AC/DC	Figure 27	NS	140G-NS-SNCJ
		48V AC/DC			140G-NS-SNCKY
		110...120V AC/DC			140G-NS-SNCD
		220...240V AC/DC			140G-NS-SNCA
		380...400V AC			140G-NS-SNCB

Table 88 - Trip Reset

Description		Voltage (Form C)	Diagram	Frame Size	Cat. No.
	• Allows remote reset of MCCB following an overcurrent trip • Wired internal to the breaker – Terminated with a Cat. No. 140G-N-CIC 3-pin quick connector	24...30V AC/DC, PLC	Figure 24	N, NS	140G-NS-RRJ
		110...130V AC/DC			140G-NS-RRD
		200...230V AC/DC			140G-NS-RRA

Table 89 - Spring Charging Motor (SCM) for Remote Operation System

Description		Voltage	Diagram	Frame Size	Cat. No.
	• Electric motor to recharge closing springs • Compatible with mechanical counter to measure operations completed with device (optional) • Remote Operation System also requires Shunt Trip (SNT) and Shunt Close (SNC); Trip Reset (RR) is recommended • Wired internal to the breaker – Terminated with a Cat. No. 140G-N-CIC 3-pin quick connector	24...30V AC/DC	Figure 36	NS	140G-NS-SCMJ
		48...60V AC/DC			140G-NS-SCMKY
		100...130V AC/DC			140G-NS-SCMD
		220...250V AC/DC			140G-NS-SCMA
		380...415V AC			140G-NS-SCMB

Table 90 - Signal Contacts for Remote Operation System

	Description	Voltage	Diagram	Frame Size	Cat. No.
	Ready-to-Close (RTC) Auxiliary Contact • Recommended, but not required) for remote operation • Signals that the breaker is ready to accept closing (ON) command if: – breaker is open (OFF) – spring charging motor has fully charged the integral breaker springs – a shunt trip is de-energized (no signal to TRIP) – an undervoltage release is energized (no signal to TRIP) – the trip bar activation mechanism is energized • Form C • Wired internal to the breaker – Terminated with a (140G-N-CIC) 3-pin quick connector	24V PLC	Figure 22	NS	140G-NS-RTCJ
		250V			140G-NS-RTCA
	Springs Charged Auxiliary Contact • Recommended, but not required) for remote operation • Signals that the spring charging motor has completely charged the integral breaker springs	24V PLC	Figure 36	NS	140G-NS-SCJ
		250V			140G-NS-SCA
	Trip Unit Alarm Contact • Signals when system has tripped, a fault needs to be evaluated, and system needs to be reset				See Table 83

Table 91 - Mechanical Counter for Remote Operation System

	Description	Frame Size	Cat. No.
	• Recommended, but not required) for remote operation • Indicates number of times the MCCB has been toggled from ON to OFF when it is installed with the spring charging motor • Operation count is visible through breaker front cover	NS	140G-N-MOC

External Accessories

Table 92 - Earth Leakage Protector (ELP) (Residual Current Release Module) — IEC Only

	Description	Diagram	Frame Size	Cat. No.
	• Alarm and Trip indication • For 4-pole only • Test function • Protection against 30 mA (0.03 A) of earth (ground) fault currents • Compliant with IEC 60947-2 annex B, IEC 61000 for protection against unwarranted tripping • Installs surrounding the circuit breaker0.03 A with 0 second override • Current adjustment: 0.5...10 A • Time adjustment: 0.0...3.0 s	Figure 31	K	140G-K-ELP

Table 93 - External Neutral Current Sensors (NCT)

Description	Rated Current	Diagram	Frame Size	Cat. No.
 • Provides data to trip unit for external neutral current line in system; see Neutral Pole and Protection on page 14. • Measures current on neutral line not connected to breaker • Not compatible with MCP (140MG-K8P, 140MG-M8P, 140MG-N8P) or frame size N and NS DIP LSI trip unit (140G-N_H_, 140G-NS_H_) • Supplied with 1 m (39 in.) pig tail wiring, with each terminal wire labeled • UL 489	300 A	Figure 32	K (1)	140G-K-NCTD30
	400 A		K (1)	140G-K-NCTD40
	600 A		M (1)	140G-M-NCTD60
	800 A		M (1)	140G-M-NCTD80
	400...1600 A		N, NS	140G-N-NCTE16

(1) Order with connector (Cat. No. 140G-K-CC).

Table 94 - Rating Plugs (RP) for I_n

Description	Rated Current I_n	Frame Size	Cat. No.
 • Supplied as standard on frame size N and NS matching the trip unit's maximum rated current • Change rated current value I_n on compatible electronic trip units – Protections are automatically adjusted to new rated current value • Plugs acceptable 20...100% of frame rating • Plugs above frame rating are not compatible.	400 A	N, NS	140G-NRP-D40
	600 A		140G-NRP-D60
	800 A		140G-NRP-D80
	1000 A		140G-NRP-E10
	1200 A (1)		140G-NRP-E12
	1250 A (IEC only)		140G-NRP-E125

(1) A 1200 A rating plug is supplied installed from the factory for all frame size N MCCBs.

Table 95 - Maintenance Mode Connectors

Description	Connections to	Diagram	Frame Size	Cat. No.
 **NOTE:** You must use both Cat. Nos. 140G-K-CC and 140G-K-CIC for maintenance mode. • Connects signal input and output to LSIG-MM trip units to activate and validate maintenance mode (see Maintenance Mode on page 23) • Install to connector ports at back of frame size K and M breakers • Not required for frame size N and NS • Supplied with 1 m (39 in.) pig tail wiring, with each terminal wire labeled, and panel mount terminal	External neutral connection and MM control input	Figure 33	K, M	140G-K-CC
	24V DC power supply and MM output for indication			140G-K-CIC

Table 96 - Rotary Variable Depth Operator (RVM/NVM) Kits with External Handle

Description	Handle Color	Shaft Length	Frame Size	Cat. No.
 • Allows actuation and status indication of breaker states: On, Off, Trip, and Reset – Requires deliberate action to operate handle and turn breaker on when enclosure door is open – Internal handle must be pulled out before it can be turned, otherwise the handle retracts back onto the shaft and does not turn • IP40 protection against intrusion and accidental contact on the face of the device under IEC 60529. See Table 6 on page 15 • Breaker can be mounted anywhere on the panel; operator is installed to face of breaker • 140U medium style handle installs to the outside of the enclosure door • Kit contains: – External handle: 140U medium style handle – Operating shaft – MCCB-mounted operating mechanism (RMX) – See Table 129 on page 69 to select as components • See Table 106 on page 62 for Early-Make and Early-Break Contact options • Standards Compliance: UL 489, CSA C22.2 No. 5, CSA C22.2 No. 94.2	Black	305 mm (12 in.)	K	140G-K-RVM12B
	Red/yellow			140G-K-RVM12R
	Black	559 mm (22 in.)		140G-K-RVM21B
	Red/yellow			140G-K-RVM21R
	Black	305 mm (12 in.)	M	140G-M-RVM12B
	Red/yellow			140G-M-RVM12R
	Black	559 mm (22 in.)		140G-M-RVM21B
	Red/yellow			140G-M-RVM21R
	Black	305 mm (12 in.)	N	140G-N-RVM12B
	Red/yellow			140G-N-RVM12R
	Black	559 mm (22 in.)		140G-N-RVM21B
	Red/yellow			140G-N-RVM21R

Table 97 - Rotary Variable Depth Operator (RVM/NVM) Kits with Internal NFPA 79 Operating Handle

Description	Handle Color	Shaft Length	Frame Size	Cat. No.
 • Allows actuation and status indication of breaker states: On, Off, Trip, and Reset – Requires deliberate action to operate handle and turn breaker on when enclosure door is open – The internal handle must be pulled out before it can be turned, otherwise the handle retracts back onto the shaft and does not turn • IP40 protection against intrusion and accidental contact on the face of the device under IEC 60529; see Table 6 on page 15 • Breaker can be mounted anywhere on the panel; operator is installed to face of breaker • Medium style handle installs to the outside of the enclosure door • Kit contains: – External handle – NFPA handle with operating shaft – MCCB-mounted operating mechanism (RMX) – Support bracket – See Table 129 on page 69 to select as individual components • See Table 106 on page 62 for Early-Make and Early-Break Contact options • Standards Compliance: UL 489, CSA C22.2 No. 5, CSA C22.2 No. 94.2	Black	305 mm (12 in.)	K	140G-K-NVM12B
	Red/yellow			140G-K-NVM12R
	Black	559 mm (22 in.)		140G-K-NVM21B
	Red/yellow			140G-K-NVM21R
	Black	305 mm (12 in.)	M	140G-M-NVM12B
	Red/yellow			140G-M-NVM12R
	Black	559 mm (22 in.)		140G-M-NVM21B
	Red/yellow			140G-M-NVM21R
	Black	305 mm (12 in.)	N	140G-N-NVM12B
	Red/yellow			140G-N-NVM12R
	Black	559 mm (22 in.)		140G-N-NVM21B
	Red/yellow			140G-N-NVM21R

Table 98 - Direct Rotary Operators (RMB/RMY)

Description	Handle Color	Frame Size	Cat. No.
 • Mount with direct handle operation of the MCCB • Lockable in OFF position (three padlocks maximum • Breaker can be mounted anywhere on the panel; operator is installed to face of breaker • Handle can protrude through the door when used with escutcheon plate • Allows actuation and status indication of breaker states: On, Off, Trip, and Reset • See Table 106 on page 62 for Early-Make and Early-Break Contact options • Direct Rotary Operators achieve IP40 protection against intrusion and accidental contact on the face of the device under IEC 60529; see Table 6 on page 15 for Ingress Protection details • Standards Compliance: UL 489	Black	K	140G-K-RMB
	Red/yellow		140G-K-RMY
	Black	M	140G-M-RMB
	Red/yellow		140G-M-RMY
	Black	N	140G-N-RMB
	Red/yellow		140G-N-RMY

Table 99 - Flexible Cable Operator (FC_/FM_) Kits

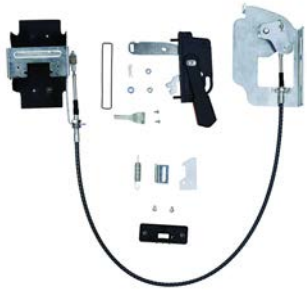
Description	Handle Type	Cable Length	Frame Size	Cat. No.
 • Includes handle, bail mechanism, cable, and assembly hardware • For 3-pole devices only • For use with NEMA-style flange enclosures • Pre-assembled for ease of installation • Breaker can be mounted anywhere on the panel; operator is installed to surround breaker • Flexible cable transmits handle motion to actuator at breaker • Allows actuation and status indication of breaker states: On, Off, Trip, and Reset • Standards Compliance: UL 489, CSA C22.2 No. 5, CSA C22.2 No. 94.2	Non-metallic handle Type 1/3/3R/12/4/4X	0.91 m (3 ft.)	K	140G-K-FCXB03
		1.3 m (4 ft.)		140G-K-FCXB04
		1.9 m (6 ft.)		140G-K-FCXB06
		3.0 m (10 ft.)		140G-K-FCXB10
	Painted metal handle Type 1/3/3R/12/4/4X	0.91 m (3 ft.)		140G-K-FMXB03
		1.3 m (4 ft.)		140G-K-FMXB04
		1.9 m (6 ft.)		140G-K-FMXB06
		3.0 m (10 ft.)		140G-K-FMXB10
	Stainless handle Type 4/4X	0.91 m (3 ft.)		140G-K-FCSB03
		1.3 m (4 ft.)		140G-K-FCSB04
		1.9 m (6 ft.)		140G-K-FCSB06
		3.0 m (10 ft.)		140G-K-FCSB10

Table 100 - Flexible Cable Operator (FC_/FM_) Kits and Left-hand Brackets

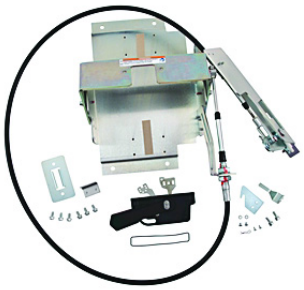
Description		Frame Size	Handle Type	Cable Length	Cat. No.
	Flexible Cable Operator Kit • For use with NEMA-style flange enclosures. • Includes handle, MCCB operator, cable, and necessary hardware. • Pre-assembled for ease of installation. • Breaker can be mounted anywhere on the panel; operator is installed to surround breaker • Flexible cable transmits handle motion to actuator at breaker • Allows actuation and status indication of breaker states: On, Off, Trip, and Reset • Standards Compliance: UL 489, CSA C22.2 No. 5, CSA C22.2 No. 94.2 • Replacement Hardware is listed on Table 130 on page 69	M	Non-metallic Handle Type 1/3/12/4/4X	1.3 m (4 ft)	140G-M-FCX04
				1.9 m (6 ft)	140G-M-FCX06
				3 m (10 ft)	140G-M-FCX10
			Stainless handle with chrome-plated steel handle base Type 4/4X	1.3 m (4 ft)	140G-M-FCS04
				1.9 m (6 ft)	140G-M-FCS06
				3 m (10 ft)	140G-M-FCS10
			Painted Metal Handle Type 1/12	1.3 m (4 ft)	140G-M-FMX04
				1.9 m (6 ft)	140G-M-FMX06
				3 m (10 ft)	140G-M-FMX10
		N	Non-metallic Handle Type 1/3/12/4/4X	1.3 m (4 ft)	140G-N-FCX04
				1.9 m (6 ft)	140G-N-FCX06
				3 m (10 ft)	140G-N-FCX10
	Left-hand Flange-mount Bracket • Relocates cable to left side • Ideal for enclosures less than 15 in. (38.1 cm) deep	M	–	–	140G-BML
		N	–	–	140G-BNL

Table 101 - Variable Depth Flange-mounted Circuit Breaker Operating Mechanism

Description		Compatible 3-Pole Circuit Breaker (1)		Cat. No.
		Frame Size [A]	Frame Size	
	**TIP:** This product must be combined with a connecting rod, operating handle, and a circuit breaker (supplied by customer) to obtain a functional device. • Allows actuation and status indication of breaker states: On, Off, Trip, and Reset • Standards Compliance: UL 489, CSA C22.2 No. 5, CSA C22.2 No. 94.2 • Breaker must be installed directly behind flange handle cutout – Operator is installed to surround breaker • Complete mechanism consists of: – Connecting rod (Table 102 on page 61) – Operating mechanism and handle (Table 103 on page 62) – Auxiliary contacts (if required) (Table 104 on page 62)	400	K	1494V-M71
		800, 1200	M, N	1494V-M72

(1) Circuit breakers are customer supplied.

Table 102 - Connecting Rods for Circuit Breaker Operating Mechanism

Description		Enclosure Working Depth [in (mm)]		Circuit Breaker Frame Size [A]	Cat. No.
		Minimum	Maximum		
	Connecting Rod	6-3/4 (172)	21-5/8 (549)	125, 150, 225, 250	1494V-RA4
		8-1/2 (216)	21-5/8 (549)	400	1494V-RA4
		9-1/2 (241)	23 (584)	800, 1200	1494V-RB4

Table 103 - Operating Handle for Circuit Breaker Operating Mechanism

Description		Handle Type	Description	Circuit Breaker Frame Size [A]	Cat. No.
	Operating Handle	Type 1, 3R, 4, 4X, 12	Non-metallic	400	1494U-HP1
		Type 1, 3R, 4, 12	Painted Metal		1494U-HM1
		Type 4, 4X	Stainless with chrome-plated steel handle base		1494U-HS1
		Type 1, 3R, 4, 12	Painted Metal	800, 1200	1494F-M2
		Type 4, 4X	Stainless with chrome-plated steel handle base		1494F-S2

Table 104 - Auxiliary Contacts for Circuit Breaker Operating Mechanism

Description		For Use With	Contact Type	Cat. No.
	• Includes contacts and adapter	125...1200 A 140G Frame Size N Circuit Breakers	1 N.O.	1495-N85
			1 N.C.	1495-N86

Table 105 - Stored Energy Motor Operators (EOP)

Description		Voltage	Diagram	Frame Size	Cat. No.
	**TIP:** Motor-operated circuit breakers are used in applications where switching is done infrequently and are not suitable to replace contactors for switching applications. • Remotely opens, closes, and resets the MCCB • Breaker can be mounted anywhere on the panel; operator is installed to face of breaker • Manual: Uses a lever to charge a spring mechanism, which actuates the toggle at the press of a button. • Automatic: Uses signaling control for remote opening and closing of the circuit breaker by driving an electric motor to charge the manual springs. • Includes integral padlock for OFF position and 1 m (39 in) wiring terminated in socket-plug connectors. • Uses a stored energy motor for local control of the motor without the use of special tools and includes: – auto/manual/lock selection – lever to recharge the motor • Open/close push button operation • Standards Compliance: UL 489	24V DC	Figure 35	K	140G-K-EOPJ
		48...60V DC			140G-K-EOPKY
		110...125V AC/DC			140G-K-EOPD
		220...250V AC/DC			140G-K-EOPA
		380V AC			140G-K-EOPB
		24V DC	Figure 35	M	140G-M-EOPJ
		48...60V DC			140G-M-EOPKY
		110...125V AC/DC			140G-M-EOPD
		220...250V AC/DC			140G-M-EOPA
		380V AC			140G-M-EOPB

Table 106 - Early-Make and Early-Break Signal Contacts (EAM/EAB) for Auxiliary Contact Handle Mechanism

Description		For Use With (1)	Diagram	Frame Size	Cat. No.
	• Typically used with an undervoltage release • Contacts close before the MCCB main contacts • Supplies power to the undervoltage release, which helps prevent nuisance tripping of the relay • Supplied with 1 m (39 in.) pig-tail wiring (each terminal wire is marked) • Close 250V • Package quantity of 2	• 140G-K-RMB • 140G-K-RMY • 140G-K-RMX	Figure 21	K	140G-K-EAM1A
		• 140G-M-RMB • 140G-M-RMY • 140G-M-RM	Figure 21	M	140G-M-EAM1A

(1) Mounted inside rotary mechanism or direct handle. Not compatible with other handles.

Table 107 - Phase Barriers

Description		Length	Frame Size	Cat. No.	
				3-Pole	4-Pole
	• Provide additional clearance when special connections that extend beyond the frame of the MCCB are used • Insulation between phases at terminal connections using individual flexible barriers • Extended length options for extended and spread terminal applications • Front mounted, even with the circuit breaker and terminal connections already installed • Frame size K is supplied with 25 mm (1 in) barriers as standard • Package quantity: 4 for 3-pole, 6 for 4-pole	100 mm (4 in.)	K, N, NS	140G-K-PB3L	140G-K-PB4L
		200 mm (8 in.)		140G-K-PB3H	140G-K-PB4H
		100 mm (4 in.)	M	140G-M-PB3L	140G-M-PB4L

Table 108 - Terminal Covers

Description		Cover Type	Height	Frame Size	Cat. No.	
					3-Pole	4-Pole
	• Helps prevent accidental contact with live parts • Front mounted, even with the circuit breaker and terminal connections already installed • Provides phase-to-phase insulation using a molded plastic cover • Pre-punched to simplify installation. • Supplied as standard with the selection of multiple cable terminal lugs. See Table 109 on page 63 • Not for use with spreader terminals. • Package quantity of 2	High Covers IP40 protection against intrusion and accidental contact at terminals under IEC 60529. See Table 6 on page 15	60 mm (2.4 in.)	K	140G-K-TC3H	140G-K-TC4H
			60 mm (2.4 in.)	M	140G-M-TC3H	140G-M-TC4H
			70 mm (2.75 in.)	N, NS	140G-N-TC3H	140G-N-TC4H
		Low Covers IP30 protection at terminals	At terminal (no extended height)	K	140G-K-TC3L	140G-K-TC4L
				M	140G-M-TC3L	140G-M-TC4L
				N, NS	140G-N-TC3L	140G-N-TC4L

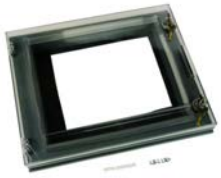
Table 109 - Sealable Screws (TS)

Description		Frame Size	Cat. No.
	• Tamper seals for terminal cover mounting screws • Provides protection against tampering with installed terminal cover • Supplied with two screws and two seals – One kit sufficient for one terminal cover • Sealing wire and lead are customer supplied • Quantity one required for Line cover, one required for load cover • Package quantity of 2	K	140G-K-TS
		M, N, NS	140G-M-TS

Table 110 - IP30 Escutcheon Frames

Description		Frame Size	Cat. No.
	• For use with 3-pole and 4-pole devices • Finish Frame with marking provision window • For flush mounted (to door) MCCB applications	K	140G-K-EP
		M	140G-M-EP
		N, NS	140G-N-EP

Table 111 - IP54 Protective Covers

Description		Frame Size	Cat. No.
	• Transparent plastic cover that is flush mounted to the enclosure door • Mounted on hinges and provided with a keyed lock	N, NS	140G-N-BC12

Padlock Adapters

Table 112 - Padlock Adapters

Description		Frame Size	Cat. No.
	Padlockable Handle Block • Allows padlocking of the device into the OFF position • Padlocking hasp • Lock-OFF only • Metal construction	N	140G-N-PL
		NS	140G-NS-PL
	Padlocking Flange • Allows padlocking of the device into the OFF position • Supplied with toggle extension and escutcheon. Lock-OFF only	K	140G-K-TPA
		M	140G-M-TPA

Table 113 - Door Interlock (SINT)

Description		Frame Size	Cat. No.
	• Direct mechanical lock to door • Trips breaker when enclosure door is opened unless deliberately defeated using defeater feature • Mechanically links trip bar in breaker to the enclosure door's position; when door is opened, breaker is tripped • Installs on the right side of frame size NS – Not compatible with breakers that have a toggle mechanism • Includes defeater mechanism for deliberate operation by qualified personnel while breaker is ON	NS	140G-N-SINT

Table 114 - EZ-Plate Mounting Adapter Kit (Optional)

Description		Frame Size	Cat. No.
	• Converts breakers from standard panel mounting screws to 0.25 in. (6.4 mm) sheet metal screws • Eliminates precision drilling and tapping for MCCB mounting screws • Includes plate with mounting fasteners • Compatible with both MCCBs and bail operators	K	140G-J-EZ

Table 115 - Troubleshooting Accessories

Description		Frame Size	Cat. No.
	Trip Test Battery • Supplies temporary battery power for settings changes and troubleshooting	K M (LSI, LSIG, MM) N, NS (LSI)	140G-ELTT
	Battery Unit • Use to interrogate the last trip of the MCCB when supplemental control power is not present or is lost • Use with LSIG and LSIG-MM breakers	N, NS	140G-ELBU

Terminal Accessories

Bulletin 140G Terminal lugs are compatible with solid and stranded cable of stranding class AA, A, B, and C.

Flexible fine-stranded cable found in stranding class D, G, H, DLO, I, K, and M (example: welding cable) is not compatible because of the clamping contact necessary within the lug.

Applications that require flexible cable may use a UL Listed crimp lug with the integral terminal and end cap of the breaker instead of a machined lug.

Table 116 - Terminal Lugs (TLA/TLC/MTL [1])

Description		Conductor Type	Number of Conductors	Wire Size		Frame Size	Cat. No.	
				[mm²]	[AWG]		Package Qty: 3	Package Qty: 4
	• Converts standard breaker terminals to accommodate desired size of line and load wiring • Screws are not supplied for voltage tap • Multi-terminal Lugs (MTL) – Available with 6 connections of smaller-diameter wire for ease of installation • Standards Compliance: UL 489, CSA C22.2 No. 5	Al or Cu wire	1	120...240	250...500 MCM	K	140G-K-TLA13	140G-K-TLA14
			2	95...120	2/0...250 MCM		140G-K-TLA23 [2]	140G-K-TLA24 [2]
			2	95...240	3/0...500 MCM		140G-K-TLA2A3	–
		Cu wire	1	120...240	250...500 MCM		140G-K-TLC13	140G-K-TLC14
			2	95...120	2/0...250 MCM		140G-K-TLC23 [2]	140G-K-TLC24 [2]
		Multiple cables Cu wire	6	16...50	6...1/0		140G-K-MTL63 [2][3]	140G-K-MTL64 [2]
		Al or Cu wire	2	120...240	250...500 MCM	M	140G-M-TLA23	140G-M-TLA24
			3	70...185	2/0...400 MCM		140G-M-TLA33 [2]	140G-M-TLA34 [2]
		Cu wire	2	85...185	3/0...350 MCM		140G-M-TLC23	140G-M-TLC24
			3	70...185	2/0...350 MCM		140G-M-TLC33 [2]	140G-M-TLC34 [2]
		Al or Cu wire	2	...	500...750 MCM		140G-M-TLA2A3 [4]	–
		Al or Cu wire	4	120...240	4/0...500 MCM	N, NS	140G-N-TLA43 [2]	140G-N-TLA44 [2]
		Cu wire	4	120...240	4/0...500 MCM		140G-N-TLC43 [2]	140G-N-TLC44 [2]
		Al or Cu wire	3	–	500...750 MCM		140G-N-TLA33 [4]	140G-N-TLA34 [4]

(1) For applications that follow the UL guidelines for panel SCCR: Use of multiple wire termination on the load size lets the termination be rated at the SCCR level of the circuit breaker, which may allow a higher SCCR than may be available using a separate power distribution block.
(2) Includes the high terminal cover.
(3) Multiple cable lugs for use with load side connectors only.
(4) Screws are supplied for voltage tap.

Table 117 - Extended Terminals (EXT)

Description		Supplied With	Frame Size	Cat. No.	
				3-Pole	4-Pole
	• For busbar or ring type connection (crimp lugs) • Package quantity: 3 for 3-pole and 4 for 4-pole • IEC onlyf • See Table 156 on page 86 and Table 157 on page 86 for breaker terminal connection limits • See Table 158 on page 87 for extended spreader terminal limits • Standards Compliance: UL 489, CSA C22.2 No. 5	• Extended back plate • 100 mm phase barrier (140G-K-PB_L)	K	140G-K-EXT3	140G-K-EXT4
		• Terminals only	M	140G-M-EXT3	140G-M-EXT4
		• Extended back plate • 100 mm phase barrier (140G-K-PB_L)	N, NS	140G-N-EXT3	140G-N-EXT4

Table 118 - Spreader Terminals (EXS)

Description		Supplied with	Frame Size	Cat. No.	
				3-Pole	4-Pole
	Spreader Terminals • For busbar or ring-type connection • Converts standard breaker terminals to extended and spread position for busbar or ring-type connection • IEC only • See Table 156 on page 86 and Table 157 on page 86 for breaker terminal connection limits • See Table 158 on page 87 for extended spreader terminal limits • Package quantity: 3 for 3-pole, 4 for 4-pole • Standards Compliance: UL 489, CSA C22.2 No. 5	• Extended back plate • 200 mm (8 in.) phase barrier (140G-K-PB_H)	K	140G-K-EXS3	140G-K-EXS4
			N, NS	—	140G-N-EXS4
		• Terminals only	M	—	140G-M-EXS4
	Top Spreader Terminals • For busbar or ring-type connection • Converts standard breaker terminals to extended and spread position for busbar or ring-type connection • IEC only • See Table 156 on page 86 and Table 157 on page 86 for breaker terminal connection limits • See Table 158 on page 87 for extended spreader terminal limits • Package quantity: 3 for 3-pole, 4 for 4-pole • Standards Compliance: UL 489, CSA C22.2 No. 5	• Terminals only	M	140G-M-EXSLI3	—
		• Extended back plate • 200 mm (8 in.) phase barrier (140G-K-PB_H)	N, NS	140G-N-EXSLI3	—
	Bottom Spreader Terminals • For busbar or ring-type connection • Converts standard breaker terminals to extended and spread position for busbar or ring-type connection • IEC only • See Table 156 on page 86 and Table 157 on page 86 for breaker terminal connection limits • See Table 158 on page 87 for extended spreader terminal limits • Package quantity: 3 for 3-pole, 4 for 4-pole • Standards Compliance: UL 489, CSA C22.2 No. 5	• Terminals only	M	140G-M-EXSL03	—
		• Extended back plate • 200 mm (8 in.) phase barrier (140G-K-PB_H)	N, NS	140G-N-EXSL03	—

Table 119 - Rear Terminals (TLH/TLV ; IEC Only)

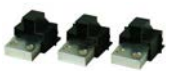
Description			Frame Size	Cat. No.	
				3-Pole	4-Pole
	• Convert standard breaker terminals to attach to vertical or horizontal busbar • Package quantity: 3 for 3-pole, 4 for 4-pole	Rear flat horizontal terminals	N, NS	140G-N-TLH3	140G-N-TLH4
		Rear flat vertical terminals		140G-N-TLV3	140G-N-TLV4

Table 120 - Bulletin 141A Busbar Mounting Adapters

	Description	Frame Size	Cat. No.
	• Convert standard breaker terminals to attach to horizontal busbar • Busbar adapter with flexible connections – For factory-installed mounting options, see Table 82 on page 55 **TIP:** Lugs are not required or included. If your application requires terminal lugs, see Table 116 on page 65 for compatible options. Lugs must be installed on the side of the unit that is not connected to the adapter. • Rated thermal current I_{th}: 400A • Width: 140 mm (5.51 in) • Configurations include: – Top feed (branch applications) – Bottom feed (main applications) – Universal • Adapters clamp or plug directly on to the busbar • Requires terminal lugs for adapter connection • For 5 mm or 10 mm thick busbar	K	141A-GKU

Replacement Parts

All 140G MCCBs are furnished with end caps mounted on the circuit breaker as standard. Replacement end cap kits are available.

Many customers prefer to use a "crimp-on" ring lug (ring tongue terminal) or forked terminal as the wire termination method to the MCCB. Others prefer wire connection to a terminal lug. We offer a broad selection of terminal lugs to meet specific application requirements.

Table 121 - Replacement End Caps (ECM)

	Description	Frame Size	Cat. No.	
			3-Pole	4-Pole
	• Provide direct connections to device terminals for ring type or bolt-on terminals without using terminal lugs (see Table 157 on page 86) • Provide connections for all terminal accessories. • Includes supplies for 3 or 4 device terminals: end caps with captive nut, terminal bolts, and washers. • Standards Compliance: UL 489, CSA C22.2 No. 5 • End caps are supplied as standard for frame size K, M, N, and NS • Provide connections for ring type or bolt-on terminals • Package quantity: 3 for 3-pole, 4 for 4-pole	K	140G-K-ECM	140G-K-ECM4
		M	140G-M-ECM	140G-M-ECM4
		N	140G-N-ECM	140G-N-ECM4

Table 122 - Replacement Backplate (BP)

	Description	Frame Size	Cat. No.	
			3-Pole	4-Pole
	• Supplied as standard for frame size K and M • Insulates back of device and terminals against shorts to mounting panel • Required for all applications with a U_e > 440V • Package quantity of 10 • Replaced by insulation barrier in some operator kits	K	140G-K-BP3	140G-K-BP4
		M	140G-M-BP3	140G-M-BP4

Table 123 - Replacement Mounting Hardware (MH)

	Description	Frame Size	Cat. No.
	• Metric threads for mounting device to panel • Supplied as standard with each breaker • For use with 3-pole and 4-pole devices • Package quantity of 4	K	140G-K-MH4
		M	140G-M-MH4
		N, NS	140G-N-MH4

Table 124 - Replacement Trip Units

Description		Rated Current	Trip Unit Type	Frame Size	Cat. No.
	• Supplied as standard for frame size N and NS • Compatible with 3- and 4-pole devices	1200 A	H — DIP LSI	N, NS	140G-NTH-E12
			I — DIP LSI		140G-NTI-E12
			K — LCD LSIG-MM		140G-NTK-E12

Table 125 - Replacement Internal Terminal Block for Trip Units

Description		Frame Size	Cat. No.
	• Supplied as standard for frame size N and NS	N	140G-N-CBP
		NS	140G-NS-CBP

Table 126 - Replacement Rating Plugs (RP)

Description		Rated Current I_n	Frame Size	Cat. No.
	• Supplied as standard for frame size N and NS matching trip unit's maximum rated current • Plugs above frame rating are not compatible • See Table 94 on page 59 for additional rating plugs at lower values	1200 A	N, NS	140G-NRP-E12

Table 127 - Replacement Terminal Strip Connectors

Description		Frame Size	Cat. No.
	• Supplied as standard with each frame size N and NS accessory with wire terminations • 3-pin quick connector for customer termination at terminal strip – Press fit into terminal strip slots • Installs to terminal strip on all N and NS devices • Allows control wiring (solid or stranded), 22...14 AWG – Strip length 8 mm (0.31 in)	N, NS	140G-N-CIC

Table 128 - Replacement Door Interlock (SINT)

Description		Frame Size	Cat. No.
	• Direct mechanical lock to door • Trips breaker when enclosure door is opened unless deliberately defeated using defeater feature • Mechanically links trip bar in breaker to the enclosure door's position; when door is opened, breaker is tripped • Installs on the right side of frame size NS breakers – Not compatible with breakers that have a toggle mechanism • Includes defeater mechanism for deliberate operation by qualified personnel while breaker is ON	NS	140G-N-SINT

Table 129 - Replacement Variable-Depth Rotary Operator Kit (RVM/NVM) Components [1]

	Description		Frame Size	Cat. No.
	Operating Handle • Medium handles • Rated 3/3R/4/4X/12 • Accepts 3 padlocks	Black/grey handle	K, M, N	140U-HM4
		Red/yellow handle		140U-HM4E
	Extension Shaft	305 mm (12 in.)	K, M, N	194R-R7
		559 mm (22 in.)		194R-R8
	NFPA 79 internal operating handle with shaft • Internal handle permits operation of the molded case circuit breaker when the door is open in compliance with NFPA 79.	305 mm (12 in.)	K, M, N	140G-N7
		559 mm (22 in.)		140G-N8
	Rotary Variable Depth Operating Mechanism • Direct molded case circuit breaker mount • Frame size K, M, and N use 194R-R7 or 194R-R8 shafts (140G-R7 or 140G-R8 NFPA) • Shaft is secured with set screw or cotter pin		K	140G-K-RMX
			M	140G-M-RMX
			N	140G-N-RMX
	Support Bracket • Supplied as standard with NFPA variable depth operator kits		K	140G-K-OSB
			M	140G-M-OSB
			N	140G-N-OSB

(1) Supplied as standard on all variable-depth operator kits.

Table 130 - Replacement Parts for Flex Cable Operators and Bulletin 1494V Variable-Depth Flange Operators

Description		Supplied with	Frame Size	Cat. No.
	Non-metallic Flange Handle	• Mounting hardware	K, M	140G-P1
	Stainless Flange Handle, Chrome Plated			140G-S1
	Painted Metal Flange Handle	• Mounting hardware	K, M	140G-M1
	Long Non-metallic Flange Handle	• Mounting hardware	N	140G-P2
	Flange Handle Mounting Hardware for Cat. No. 140G-_-FCX_	• **Plastic Bail** • Handle mounting nuts • Door interlock and fasteners • Hitch pin and washer • Seal	K	140G-FH3
		• **Metal Bail** • Handle mounting nuts • Door interlock and fasteners • Hitch pin and washer • Seal	M, N	140G-FH3

Table 130 - Replacement Parts for Flex Cable Operators and Bulletin 1494V Variable-Depth Flange Operators (Continued)

Description		Supplied with	Frame Size	Cat. No.
	Flange Handle Mounting Hardware for Cat. No. 140G-_-FCXB_	• Metal bail • Handle mounting nuts • Door interlock and fasteners • Hitch pin and washer • Seal	K	140G-FH1B
	Actuator Mounting Hardware	• Cotter pin • Fasteners	K	140G-BH3
	Toggle Plate and Mounting Hardware	• Metal ball • Bail plate • Spring • Door hook • Hitch pin • Washer and fasteners	K	140G-BH2B
			M, N	140G-BH3B
	Defeater Bracket Extender		K, M, N	1494V-H12
	Long Door Catch • For doors with depth > 25.4 mm (1 in)		K, M, N, NS	140G-HK1B

Flange Cable Operators

Table 131 - Flange Cable Operators with Plastic Bail Mechanisms

Description		Handle Type	Cable Length	Frame Size	Cat. No.
	• For use with NEMA-style flange enclosures. • Includes handle, MCCB operator, cable, and necessary hardware. • Pre-assembled for ease of installation. • Replacement hardware is listed on Table 130 on page 69	Non-metallic handle Type 1/3/12/4/4X	0.91 m (3 ft.)	K	140G-K-FCX03
			1.3 m (4 ft.)		140G-K-FCX04
			1.9 m (6 ft.)		140G-K-FCX06
			3.0 m (10 ft.)		140G-K-FCX10
		Stainless handle chrome-plated steel handle base Type 4/4X	0.91 m (3 ft.)		140G-K-FCS03
			1.3 m (4 ft.)		140G-K-FCS04
			1.9 m (6 ft.)		140G-K-FCS06
			3.0 m (10 ft.)		140G-K-FCS10
		Painted metal handle Type 1/12	0.91 m (3 ft.)		140G-K-FMX03
			1.3 m (4 ft.)		140G-K-FMX04
			1.9 m (6 ft.)		140G-K-FMX06
			3.0 m (10 ft.)		140G-K-FMX10

Bulletin 140G MCCBs

Frame Size K and M MCCBs

Table 132 - Performance Characteristics: Frame Size K and M MCCBs

Attribute			K				M		
Maximum Rated Current		[A]	400				800		
Rated insulation voltage, U_i, IEC		[V]	1000				1000		
Rated impulse withstand voltage, U_{imp} / Overvoltage Category		[kV]	8 / III				8 / III		
NEMA, UL, CSA Ratings									
	Interrupting Rating Code (1)		**K3**	**K6**	**K0**	**K15**	**M5**	**M6**	**M0**
240V AC, 50/60 Hz		[kA]	100	150	200	200	100	200	200
480V AC, 50/60 Hz			35	65	100	150	50	65	100
600V AC, 50/60 Hz			25	35	65	100	25	35	42
500V DC- 2 poles in series (2)			35	50	65	100	–	–	–
600V DC – 3 poles in series (2)			25	35	50	65	20	35	50
IEC 60947-2 Ratings									
Rated ultimate short-circuit breaking capacity, I_{cu}	220...230V AC, 50/60 Hz	[kA]	85	100	200	200	85	100	200
	380V AC, 50/60 Hz (AC)		50	70	120	200	50	70	100
	400...415V AC, 50/60 Hz		50	70	120	200	50	70	100
	440V AC, 50/60 Hz		40	65	100	180	45	50	80
	500V AC, 50/60 Hz		30	50	85	150	35	50	65
	525V AC, 50/60 Hz		25	40	70	100	25	35	42
	690V AC, 50/60 Hz		25	40	70	100	22	25	30
	250V DC- 2 poles in series (2)		50	70	100	150	50	70	100
	500V DC- 2 poles in series (2)		36	50	70	100	35	50	65
	500V DC- 3 poles in series (2)		–	–	–	–	–	–	–
	750V DC- 3 poles in series (2)		25	36	50	70	20	36	50
Rated service short-circuit breaking capacity, I_{cs}	220...230V AC, 50/60 Hz	% I_{cu}	100%	100%	100%	100%	100%	100%	100%
	380V AC, 50/60 Hz								
	400...415V AC, 50/60 Hz								
	440V AC, 50/60 Hz								
	500V AC, 50/60 Hz								
	525V AC, 50/60 Hz		100%	100%	100%	75% (80 kA)	75% (18 kA)	50% (19 kA)	50% (22.5 kA)
	690V AC, 50/60 Hz		100%	100%	100%	100%	75%	75%	75%
	250V DC- 2 poles in series (2)								
	500V DC- 2 poles in series (2)								
	500V DC- 3 poles in series (2)		–	–	–	–	–	–	–
	750V DC- 3 poles in series (2)		100%	100%	100%	100%	75%	75%	75%
Rated Short-time Withstand Rating (3) (I_{cw}) per IEC 60947-4-2, Utilization Category: Class B			5 kA at 1 s				10 kA at 1 s		

(1) Explanation of Interrupting Code. Example: code G2, G=G-Frame; 2= 25 kA at 480V. See product selection for complete ratings
(2) DC rating is applicable for thermal-magnetic trip units only
(3) Short-time withstand ratings are only valid for frames when they are assembled to a trip unit with Short protection (S) and at a frame size used to ride through short-time short circuit events in an application with selectivity. See publication 140G-TD050 for coordination data.

Table 133 - Mechanical and Environmental Ratings: Frame Size K and M MCCBs

Attribute			K	M
Mechanical Life	Number of Operations		20000	20000
	Operations per Hour		120	120
Electrical Life at 415V (AC)	Number of Operations		7000 (400 A) 5000 (600 A)	7000 (600...630 A) 5000 (800 A)
	Operations per Hour		60	60
Wire Temperature Rating [1]			Al or Cu; 75 °C (167 °F)	Al or Cu; 75 °C (167 °F)
Ambient Temperature without derating			40 °C (104 °F)	40 °C (104 °F)
Operating Temperature			-25 °C...+70 °C (-13 °F...+158 °F)	-25 °C...+70 °C (-13 °F...+158 °F)
Storage Temperature			-40 °C...+80 °C (-40 °F...+176 °F)	-40 °C...+80 °C (-40 °F...+176 °F)
Pollution Degree			3	3
Dimensions Width x Depth x Height	3-pole	[mm (in)]	140 x 108.5 x 205 (5.5 x 4.3 x 8)	210 x 103.5 x 268 (8.3 x 4 x 10.5)
	4-pole		185 x 103.5 x 205 (7.3 x 4 x 8)	280 x 103.5 x 268 (11 x 4 x 10.5)
Weight	3-pole	[lb (kg)]	7.17 (3.25)	26.68 (12.1)
	4-pole		9.15 (4.15)	33.29 (15.1)

(1) Wire temperature rating is determined by testing the circuit breaker under full load current with the conductors sized for 75 °C (167 °F).

Frame Size N and NS MCCBs

Table 134 - Performance Characteristics: Frame Size N and NS MCCBs

Attribute			N and NS		
Maximum Rated Current		[A]	1200		
Rated insulation voltage, U_i, IEC		[V]	1000		
Rated impulse withstand voltage, U_{imp} / Overvoltage Category		[kV]	8 / III		
NEMA, UL, CSA Ratings					
Interrupting Rating Code (1)			**N5**	**N6**	**N0**
240V AC, 50/60 Hz		[kA]	65	100	150
480V AC, 50/60 Hz			50	65	100
600V AC, 50/60 Hz			25	50	65
IEC 60947-2 Ratings					
Rated ultimate short-circuit breaking capacity, I_{cu}	220...230V AC, 50/60 Hz	[kA]	85	100	200
	380V AC, 50/60 Hz		50	70	120
	400...415V AC, 50/60 Hz		50	70	120
	440V AC, 50/60 Hz		50	65	100
	500V AC, 50/60 Hz		40	50	85
	525V AC, 50/60 Hz		30	50	65
	690V AC, 50/60 Hz		30	42	50
Rated service short-circuit breaking capacity, I_{cs}	220...230V AC, 50/60 Hz	% I_{cu}	100%	100%	100%
	380V AC, 50/60 Hz (AC)				
	400...415V AC, 50/60 Hz				
	440V AC, 50/60 Hz				
	500V AC, 50/60 Hz		100%	100%	75%
	525V AC, 50/60 Hz		75% (30 kA)	50% (31.5 kA)	50% (37.5 kA)
	690V AC, 50/60 Hz		100%	75%	75%
Rated Short-time Withstand Rating (2) (I_{cw}) per IEC 60947-4-2, Utilization Category: Class B			15 kA at 1 second		

(1) Explanation of Interrupting Code. Example: code G2, G = Frame Size G; 2= 25 kAat480V. See product selection for complete ratings.
(2) Short-time withstand ratings are only valid for frames when they are assembled to a trip unit with Short protection (S) and at a frame size used to ride through short-time short circuit events in an application with selectivity. See publication 140G-TD050 for coordination data.

Table 135 - Mechanical and Environmental Ratings: Frame N and NS MCCBs

Attribute			N	NS
Mechanical Life	Number of Operations		10,000	10,000
	Operations per Hour		60	60
Electrical Life at 415V (AC)	Number of Operations		2000	2000
	Operations per Hour		60	60
Wire Temperature Rating (1)			Al or Cu; 75 °C (167 °F)	Al or Cu; 75 °C (167 °F)
Ambient Temperature without Derating			40 °C (104 °F)	40 °C (104 °F)
Operating Temperature			-25 °C...+70 °C (-13 °F...+158 °F)	-25 °C...+70 °C (-13 °F...+158 °F)
Storage Temperature			-40 °C...+80 °C (-40 °F...+176 °F)	-40 °C...+80 °C (-40 °F...+176 °F)
Pollution Degree			3	3
Dimensions Width x Depth x Height	3-pole	[mm (in.)]	210 x 154 x 268 (8.3 x 6 x 10.5	210 x 178 x 268 (8.3 x 7 x 10.5)
	4-pole		280 x 154 x 268 (11 x 6 x 10.5)	280 x 178 x 268 (11 x 7 x 10.5)
Weight	3-pole	[lb (kg)]	21.39 (9.7)	24.25 (11)
	4-pole		27.56 (12.5)	30.86 (14)

(1) Wire temperature rating is determined by testing the circuit breaker under full load current with the conductors sized for 75 °C (167 °F).

Bulletin 140G MCSs

Table 136 - Performance Characteristics: Frame Size K, M, and N MCSs

Attribute			K	M	N
Maximum Rated Current		[A]	400	800	1200
Rated insulation voltage, U_i, IEC		[V]	1000	1000	1000
Rated impulse withstand voltage, U_{imp} / Overvoltage Category		[kV]	8 / III	8 / III	8 / III
NEMA, UL, CSA Ratings					
Interrupting Rating Code (1)			**K15**	**M6**	**N6**
240V AC, 50/60 Hz		[kA]	200	200	100
480V AC, 50/60 Hz			150	65	65
600Y/347V AC, 50/60 Hz			–	–	–
600V AC, 50/60 Hz			100	35	50
500V DC – 2 poles in series (2)			100	–	–
600V DC – 3 poles in series (2)			65	35	–
IEC 60947-2 Ratings					
Rated ultimate short-circuit breaking capacity, I_{cu}	220...230V AC, 50/60 Hz	[kA]	200	100	100
	380V AC, 50/60 Hz		200	70	70
	400...415V AC, 50/60 Hz		200	70	70
	440V AC, 50/60 Hz		180	50	65
	500V AC, 50/60 Hz		150	50	50
	525V AC, 50/60 Hz		100	35	50
	690V AC, 50/60 Hz		100	25	42
	250V DC – 2 poles in series (2)		150	70	–
	500V DC – 2 poles in series (2)		100	50	–
	500V DC – 3 poles in series (2)		–	–	–
	750V DC – 3 poles in series (2)		70	36	–
Rated service short-circuit breaking capacity, I_{cs}	220...230V AC, 50/60 Hz	% I_{cu}	100%	100%	100%
	380V AC, 50/60 Hz				
	400...415V AC, 50/60 Hz				
	440V AC, 50/60 Hz				
	500V AC, 50/60 Hz				
	525V AC, 50/60 Hz		75% (80 kA)	50% (19 kA)	50% (31.5 kA)
	690V AC, 50/60 Hz		100%	75%	75%
	250V DC – 2 poles in series (2)		100%	75%	–
	500V DC – 2 poles in series (2)		100%	75%	–
	500V DC – 3 poles in series (2)		–	–	–
	750V DC – 3 poles in series (2)		100%	75%	–
Rated Short-time Withstand Rating (3) (I_{cw}) per IEC 60947-4-2, Utilization Category: Class B			5 kA at 1 second	10 kA at 1 second	15 kA at 1 second

(1) Explanation of Interrupting Code. Example: code K15, K= Frame Size K; 2= 25 kA at 480V. See product selection for complete ratings.
(2) DC rating is applicable for thermal-magnetic trip units only
(3) Short-time withstand ratings are only valid for frames when they are assembled to a trip unit with Short protection (S) and at a frame size used to ride through short-time short circuit events in an application with selectivity. See publication 140G-TD050 for coordination data.

Table 137 - Mechanical and Environmental Ratings: Frame Size K and M MCSs

Attribute			K	M	N	NS
Mechanical Life	Number of Operations		20,000	20,000	10,000	10,000
	Operations per Hour		120	120	60	60
Electrical Life at 415V (AC)	Number of Operations		7000 (400 A)/ 5000 (600 A)	7000 (600...630 A)/ 5000 (800 A)	2000	2000
	Operations per Hour		60	60	60	60
Wire Temperature Rating [1]		[°C (°F)]	Al or Cu; 75 (167)	Al or Cu; 75 (167)	Al or Cu; 75 (167)	Al or Cu; 75 (167)
Ambient Temperature without Derating			40 (104)	40 (104)	40 (104 °F)	40 (104 °F)
Operating Temperature			-25...+70 (-13...+158)	-25...+70 (-13...+158)	-25...+70 (-13...+158)	-25...+70 (-13...+158)
Storage Temperature			-40...+80 (-40...+176)	-40...+80(-40...+176)	-40...+80 (-40...+176)	-40...+80 (-40...+176)
Pollution Degree			3	3	3	3
Dimensions Width x Depth x Height	3-pole	[mm (in)]	140 x 108.5 x 205 (5.5 x 4.3 x 8)	210 x 103.5 x 268 (8.3 x 4 x 10.5)	210 x 154 x 268 (8.3 x 6 x 10.5	210 x 178 x 268 (8.3 x 7 x 10.5)
	4-pole	[mm (in)]	185 x 103.5 x 205 (7.3 x 4 x 8)	280 x 103.5 x 268 (11 x 4 x 10.5)	280 x 154 x 268 (11 x 6 x 10.5)	280 x 178 x 268 (11 x 7 x 10.5)
Weight	3-pole	[lb (kg)]	7.17 (3.25)	26.68 (12.1)	21.39 (9.7)	24.25 (11)
	4-pole	[lb (kg)]	9.15 (4.15)	33.29 (15.1)	27.56 (12.5)	30.86 (14)

(1) Wire temperature rating is determined by testing the circuit breaker under full load current with the conductors sized for 75 °C (167 °F).

Bulletin 140G Current-limiting MCCBs

Table 138 - Performance Characteristics: Frame Size KC MCCBs

Attribute			KC	
Maximum Rated Current		[A]	400	
Rated insulation voltage, U_i, IEC		[V]	1000	
Rated impulse withstand voltage, U_{imp}		[kV]	8	
NEMA, UL, CSA Ratings				
Interrupting Rating Code (1)			**KC6**	**KC0**
240V AC, 50/60 Hz		[kA]	150	200
480V AC, 50/60 Hz			65	100
600V AC, 50/60 Hz			35	65
500V DC – 2 poles in series (2)			50	65
600V DC – 3 poles in series (2)			35	50
IEC 60947-2 Ratings				
Rated ultimate short-circuit breaking capacity, I_{cu}	220...230V AC, 50/60 Hz	[kA]	100	200
	380V AC, 50/60 Hz (AC)		70	120
	400...415V AC, 50/60 Hz		70	120
	440V AC, 50/60 Hz		65	100
	500V AC, 50/60 Hz		50	85
	525V AC, 50/60 Hz		40	70
	690V AC, 50/60 Hz		40	70
	250V DC- 2 poles in series (2)		70	100
	500V DC- 2 poles in series (2)		50	70
	500V DC- 3 poles in series (2)		–	–
	750V DC- 3 poles in series (2)		36	50
Rated service short-circuit breaking capacity, I_{cs}	220...230V AC, 50/60 Hz	% I_{cu}	100%	100%
	380V AC, 50/60 Hz			
	400...415V AC, 50/60 Hz			
	440V AC, 50/60 Hz			
	500V AC, 50/60 Hz			
	525V AC, 50/60 Hz			
	690V AC, 50/60 Hz			
	250V DC, 2 poles in series (2)			
	500V DC, 2 poles in series (2)			
	500V DC, 3 poles in series (2)		–	–
	750V DC, 3 poles in series (2)		100%	100%

(1) Explanation of Interrupting Code. Example: code KC6, KC = Current-limiting Frame Size K; 6= 65 kA at 480V. See product selection for complete ratings.
(2) DC rating is applicable for thermal-magnetic trip units only.

Table 139 - Mechanical and Environmental Ratings: Frame Size KC MCCBs

Attribute			KC
Mechanical Life	Number of Operations		20,000
	Operations per Hour		120
Electrical Life at 415V (AC)	Number of Operations		7000 (400 A)/5000 (600 A)
	Operations per Hour		60
Wire Temperature Rating [(1)]		[°C (°F)]	Al or Cu; 75 (167)
Ambient Temperature without Derating			40 (104)
Operating Temperature			-25...+70 (-13...+158)
Storage Temperature			-40...+80 (-40...+176)
Pollution Degree			3
Dimensions Width x Depth x Height	3-pole	[mm (in)]	140 x 108.5 x 205 (5.5 x 4.3 x 8)
Weight	3-pole	[lb (kg)]	7.17 (3.25)

(1) Wire temperature rating is determined by testing the circuit breaker under full load current with the conductors sized for 75 °C (167 °F).

Let-through Current

See Trip and Let-through Curves on page 97 for let-through energy curves.

Table 140 - Let-through Current: Frame Size KC MCCBs

Frame Size	Rated Current I_n [A]	Rated Voltage [V AC]	Threshold Current			Intermediate Point			Interrupting Rating		
			I_{rms} [kA]	I_p [kA]	I^2t [x10^3]	I_{rms} [kA]	I_p [kA]	I^2t [x10^3]	I_{rms} [kA]	I_p [kA]	I^2t [x10^3]
140G-KC6	up to 400 A	480	10	20	1.4	65	43.9	2.8	100	47.3	3
		600	10	21	1.5	30	36	2.6	65	44	3
140G-KC0	up to 400 A	480	10	20	1.4	30	35	2.4	65	43.9	2.8
		600	10	21	1.5	22	31	2.2	35	38	2.8

Bulletin 140MG MCPs

Table 141 - Performance Characteristics: Frame Size K, M, and N MCPs

Attribute			K	M	N
Frame Size		[A]	400	800	1200
Poles			3	3	3
Instantaneous Trip Settings		[A]	300 and 400	600 and 800	1200 (1)
Rated insulation voltage, U_i IEC		[V]	1000	1000	1000
Rated impulse withstand voltage, U_{imp}		[kV]	8	8	8
NEMA, UL, CSA Ratings —UL 489 Instantaneous Trip Circuit Breaker (Magnetic Only) Max SCCR. Combination Controller Rating (2)					
480V AC		[kA]	65	65	–
600Y/347V AC			–	–	–
600V AC			35	35	–
IEC 60947-2 GB14048.2 Ratings					
Rated ultimate short-circuit breaking capacity, I_{cu}	220-230V AC	[kA]	100	100	100
	380V AC		70	70	70
	400-415V AC		70	70	70
	440V AC		65	50	65
	500V AC		50	50	50
	525V AC		40	25	42
	690V AC		40	25	42
	250V DC- 2 poles in series		–	–	–
	500V DC- 3 poles in series		–	–	–
Rated service short-circuit breaking capacity, I_{cs}	220-230V AC	% I_{cu}	100%	100%	100%
	380V AC				
	400-415V AC				
	440V AC				
	500V AC				
	525V AC		100%	75%	75%
	690V AC				
	250V DC, 2 poles in series		–	–	–
	500V DC, 3 poles in series				

(1) Adjustable between 1...10x motor FLA.
(2) The short-circuit value is based on a combined of MCP, motor contactor and overload relay as a UL60497-4-1 Type D Combination Motor Controller. See our Global Short-circuit Rating Tool, rok.auto/sccr.

Table 142 - Mechanical and Environmental Ratings: Frame Size K, M, and N MCPs

Attribute			K	M	N
Mechanical Life	Number of Operations		20000	20000	10000
	Operations per Hour		120	120	60
Electrical Life at 415V (AC)	Number of Operations		7000	5000	2000
	Operations per Hour		60	60	60
Wire Temperature Rating (1)		[°C (°F)]	Al or Cu; 75 (167)	Al or Cu; 75 (167)	Al or Cu; 75 (167)
Ambient Temperature without Derating			40 (104)	40 (104)	40 (104)
Operating Temperature			-25...+70 (-13...+158)	-25...+70 (-13...+158)	-25...+70 (-13...+158)
Storage Temperature			-40...+70 (-40...+158)	-40...+70 (-40...+158)	-40...+70 (-40...+158)
Dimensions Width x Depth x Height		[mm (in)]	140 x 108.5 x 205 (5.51 x 4.27 x 8.07)	210 x 103.5 x 268 (8.27 x 4.07 x 10.55)	210 x 154 x 268 (8.27 x 6.06 x 10.55)
Approximate Weight		[lb (kg)]	7.2 (3.25)	21 (9.5)	21.4 (9.7)

(1) Wire temperature rating is determined by testing the circuit breaker under full-load current with the conductors sized for 40 °C (104 °F).

Bulletin 140G MCSs

Table 143 - Performance Characteristics: Frame Size K, M, and N MCSs

Attribute			K	M	N
Maximum Rated Current		[A]	400	800	1200
Rated insulation voltage, U_i, IEC		[V]	1000	1000	1000
Rated impulse withstand voltage, U_{imp} / Overvoltage Category		[kV]	8 / III	8 / III	8 / III
NEMA, UL, CSA Ratings					
Interrupting Rating Code (1)			**K15**	**M6**	**N6**
240V AC, 50/60 Hz		[kA]	200	200	100
480V AC, 50/60 Hz			150	65	65
600Y/347V AC, 50/60 Hz			–	–	–
600V AC, 50/60 Hz			100	35	50
500V DC – 2 poles in series (2)			100	–	–
600V DC – 3 poles in series (2)			65	35	–
IEC 60947-2 Ratings					
Rated ultimate short-circuit breaking capacity, I_{cu}	220...230V AC, 50/60 Hz	[kA]	200	100	100
	380V AC, 50/60 Hz		200	70	70
	400...415V AC, 50/60 Hz		200	70	70
	440V AC, 50/60 Hz		180	50	65
	500V AC, 50/60 Hz		150	50	50
	525V AC, 50/60 Hz		100	35	50
	690V AC, 50/60 Hz		100	25	42
	250V DC, 2 poles in series (2)		150	70	–
	500V DC, 2 poles in series (2)		100	50	–
	500V DC, 3 poles in series (2)		–	–	–
	750V DC, 3 poles in series (2)		70	36	–
Rated service short-circuit breaking capacity, I_{cs}	220...230V AC, 50/60 Hz	% I_{cu}	100%	100%	100%
	380V AC, 50/60 Hz				
	400...415V AC, 50/60 Hz				
	440V AC, 50/60 Hz				
	500V AC, 50/60 Hz				
	525V AC, 50/60 Hz		75% (80 kA)	50% (19 kA)	50% (31.5 kA)
	690V AC, 50/60 Hz		100%	75%	75%
	250V DC, 2 poles in series (2)		100%	75%	–
	500V DC, 2 poles in series (2)		100%	75%	–
	500V DC, 3 poles in series (2)		–	–	–
	750V DC, 3 poles in series (2)		100%	75%	–
Rated Short-time Withstand Rating (3) (I_{cw}) per IEC 60947-4-2, Utilization Category: Class B			5 kA at 1 second	10 kA at 1 second	15 kA at 1 second

(1) Explanation of Interrupting Code. Example: code K15, K= Frame Size K; 2= 25 kA at 480V. See product selection for complete ratings.
(2) DC rating is applicable for thermal-magnetic trip units only.
(3) Short-time withstand ratings are only valid for frames when they are assembled to a trip unit with Short protection (S) and at a frame size used to ride through short-time short circuit events in an application with selectivity. See publication 140G-TD050 for coordination data.

Table 144 - Mechanical and Environmental Ratings: Frame Size K, M, N, and NS MCSs

Attribute			K	M	N	NS
Mechanical Life	Number of Operations		20,000	20,000	10,000	10,000
	Operations per Hour		120	120	60	60
Electrical Life at 415V (AC)	Number of Operations		7000 (400 A)/5000 (600 A)	7000 (600…630 A) 5000 (800 A)	2000	2000
	Operations per Hour		60	60	60	60
Wire Temperature Rating (1)		[°C (°F)]	Al or Cu; 75 (167)	Al or Cu; 75 (167)	Al or Cu; 75 (167)	Al or Cu; 75 (167)
Ambient Temperature without Derating			40 (104)	40 (104)	40 (104 °F)	40 (104 °F)
Operating Temperature			-25…+70 (-13…+158)	-25…+70 (-13…+158)	-25…+70 (-13…+158)	-25…+70 (-13…+158)
Storage Temperature			-40…+80 (-40…+176)	-40…+80(-40…+176)	-40…+80 (-40…+176)	-40…+80 (-40…+176)
Pollution Degree			3	3	3	3
Dimensions Width x Depth x Height	3-pole	[mm (in)]	140 x 108.5 x 205 (5.5 x 4.3 x 8)	210 x 103.5 x 268 (8.3 x 4 x 10.5)	210 x 154 x 268 (8.3 x 6 x 10.5	210 x 178 x 268 (8.3 x 7 x 10.5)
	4-pole	[mm (in)]	185 x 103.5 x 205 (7.3 x 4 x 8)	280 x 103.5 x 268 (11 x 4 x 10.5)	280 x 154 x 268 (11 x 6 x 10.5)	280 x 178 x 268 (11 x 7 x 10.5)
Weight	3-pole	[lb (kg)]	7.17 (3.25)	26.68 (12.1)	21.39 (9.7)	24.25 (11)
	4-pole	[lb (kg)]	9.15 (4.15)	33.29 (15.1)	27.56 (12.5)	30.86 (14)

(1) Wire temperature rating is determined by testing the circuit breaker under full load current with the conductors sized for 75 °C (167 °F).

Type D Combination Ratings

The short-circuit value is based on a combination of MCP, motor contactor, and overload relay, rated as a UL 60947-4-1 Type D Combination Motor Controller. Values in Table 145 are for Type 2 coordination with Allen-Bradley contactors and overload relays.

Combination motor controller components:

- Circuit breaker: Bulletin 140MG/140MG2 frame sizes K and L
- Contactor: Bulletin 100-C, 100S-C, 100-D, 100S-D
- Overload relay: Bulletin 193/592 E1 Plus™, E3™, E3 Plus™, E300™

Table 145 - Type D Combination Ratings per IEC 60947-2/GB 14048.2

Attribute		K	M
Rated Ultimate Short-circuit Breaking Capacity, I_{cu}			
220…230V AC	[kA]	65	65
380V AC			
400…415V AC			
440V AC			
500V AC		50	50
525V AC			
690V AC		25	25
Rated Service Short-circuit Breaking Capacity I_{cs}			
220…230V AC	% I_{cu}	100%	100%
380V AC			
400…415V			
440V AC			
500V AC			
525V AC			
690V AC			

Thermal-magnetic Circuit Breakers

Frame size K and M thermal-magnetic circuit breakers are calibrated at 40 °C (104 °F). For applications at other temperatures, the thermal trip varies as shown in Table 146.

Table 146 - Maximum Thermal Trip Rating: Frame Size K

Frame Size	Rated Current I_n [A]	Ambient Temperature [°C (°F)]			
		40 (104)	50 (122)	60 (140)	70 (158)
K	300	300	286	267	247
	320	320	305	285	263
	400	400	380	355	325
M	600	600	552	514	476
	630 (IEC only)	630	580	540	500
	800	800	740	670	610

Electronic Trip Circuit Breakers, MCSs, and MCPs

Electronic trip circuit breakers do not undergo tripping variations based on ambient temperature. Even though ambient temperature does not affect the tripping characteristic, for temperatures exceeding 40 °C (104 °F), it is advisable to reduce the maximum current to help prevent terminal overheating. The same considerations are appropriate for MCSs and MCPs. Table 147 shows the maximum current to help prevent terminal overheating.

Table 147 - Maximum Operating Current I_n above 40 °C (104 °F): Frame Size K

Frame Size	Rated Current	Rating	Ambient Temperature [°C (°F)]			
			40 (104)	50 (122)	60 (140)	70 (158)
K	I_n [A]	North American (UL) Ratings	300	264	228	189
			400 (1)	352 (1)	304 (1)	252 (1)
		IEC Ratings	320	320	320	320
			400 (1)	400 (1)	400 (1)	352 (1)
M	I_n [A]	North American (UL) Ratings	600	528	456	378
			800 (1)	704 (1)	608 (1)	504 (1)
		IEC Ratings	630	630	598.5	567
			800 (1)	800 (1)	760 (1)	720 (1)
N, NS	I_n [A]	North American (UL) Ratings	1200 (1)	1056 (1)	815 (1)	756 (1)
		IEC Ratings	1250 (1)	1250 (1)	1118 (1)	980 (1)

(1) MCS rated current.

Watt Loss for All Bulletin 140G/140MG Devices

Table 148 - Circuit Breakers Watt Loss: 140G

	Frame Size	Type	Rated Current I_n [A]	Watt Loss	
				3-pole	4-pole
	K	Thermal-magnetic	300	40.8	54.4
			400	58.5	78.0
		MCS	300	31.8	42.4
			400	49.5	66.0
	M	Thermal-magnetic	600	90.0	120.0
			630 (1)	91.8	122.4
			800	93.0	124.0
		MCS	600	86.4	115.2
			630 (1)	90.0	120.0
			800	96.0	128.0
	N, NS	Electronic	1200	252	336
		MCS	1200	252	336

(1) IEC only.

Table 149 - MCPs Watt Loss: 140MG

	Frame Size	Rated Current I_n [A]	Watt Loss
	K	300	31.8
		400	49.5
	M	600	86.4
		800	96.0
	N	1200	252

Accessory Specifications

Table 150 - Auxiliary Contacts

Cat. No.	Factory-installed Modification Order Code	Electrical Operating Ratings (Nominal Values)						
		Description	Electrical Specifications (1)					
			Rated Voltage U_e [V]	Wire Size (2)		IEC Rating		UL Rating
				AWG	mm^2	Rated Operational Current (AC)	Rated Operational Current (DC)	
140G-K-EA1R1A	-AA	1 Aux — N.O./N.C.; 1 AL - N.O./N.C.	250V	20	0.5	6 A at 250V AC (2)	0.5 A at 110V DC; 0.3 A at 250V DC Minimum 0.03 A DC	5 A at 125V AC; 6 A at 250V AC
140G-K-EA1R1B	-AB	1 Aux — N.O./N.C.; 1 AL - N.O./N.C.	400V	17	1	12 A at 250V AC; 3 A at 400V AC	0.5 A at 125V DC; 0.3 A at 250V DC	12 A at 125V AC; 12 A at 250V AC
140G-N-EA1R1B		1 Aux — N.O./N.C.; 1 AL — N.O./N.C.	400V	17	1	12 A at 250V AC; 3 A at 400V AC	0.5 A at 125V DC; 0.3 A at 250V DC	12 A at 125V AC; 12 A at 250V AC
140G-N-EA1R1J	-AJ	1 Aux — N.O./N.C.; 1 AL — N.O./N.C.	24V	20	0.5	—	Maximum 0.1 A at 24V DC; Min 0.01 A at 5V DC	Yes
140G-K-EA3R1A	-CA	3 Aux — N.O./N.C.; 1 AL— N.O./N.C.	250V	20	0.5	6 A at 250V AC (2)	0.5 A at 110V DC; 0.3 A at 250V DC Minimum 0.03 A DC	5 A at 125V AC; 6 A at 250V AC
140G-K-EA3R1J	-CJ	3 Aux — N.O./N.C.; 1 AL — N.O./N.C.	24V	20	0.5	—	Maximum 0.1 A at 24V DC; Minimum 0.01 A at 5V DC	Yes
140G-K-EA2B	-FB	2 Aux — N.O./N.C.	400V	17	1	12 A at 250V AC; 3 A at 400V AC	0.5 A at 125V DC; 0.3 A at 250V DC	10 A at 125V AC; 10 A at 250V AC
140G-N-EA1TA	—	1 AL — N.O./N.C. (Thermal)	250V	20	0.5	6 A at 250V AC (2)	0.5 A at 110V DC; 0.3 A at 250V DC Minimum 0.03 A DC	—
140G-N-EA2B		2 Aux — N.O./N.C.	400V	17	1	12 A at 250V AC; 3 A at 400V AC	0.5 A at 125V DC; 0.3 A at 250V DC	12 A at 125V AC; 12 A at 250V AC
140G-N-EA2J		2 Aux — N.O./N.C.	24V	20	0.5	—	Maximum 0.1 A at 24V DC; Minimum – 0.01 A at 5V DC	Yes
140G-K-EAM1A		1 N.O. Early Make	250V	20	0.5	6 A at 250V AC (2)	0.5 A at 110V DC; 0.3 A at 250V DC Minimum 0.03 A DC	—
140G-M-EAM1A		1 N.O. Early Make	250V	20	0.5	6 A at 250V AC (2)	0.5 A at 110V DC; 0.3 A at 250V DC Minimum 0.03 A DC	—

(1) Contacts are wired with 600 V (UL/CSA) insulated wire. No voltage derating of circuit breaker required.
(2) Wire length: 1 m (39 in.)

Table 151 - 250 V AC/DC Expanded Description

Voltage	Class of Use	AC	DC
110V DC	DC-12	—	0.5 A
	DC-14	—	0.05 A
125V AC/DC	AC-12, AC-13, AC-14	6 A	—
250V AC/DC	AC-15	5 A	—
	AC-12 and DC-12	6 A	0.3 A
	AC-13	6 A	—
	AC-14, DC-14	5 A	0.03 A
	AC-15	4 A	—

All shunt trip devices are wired with 600V (UL/CSA) insulated wire. No voltage derating is required.

Table 152 - Shunt Trip Devices

Cat. No.	Application Ratings				Electrical Operating Ratings (Nominal Values)				
	Factory-installed Modification Order Code	Rated Voltage U_e [V]	Wires (1) Size	Shunt Trip Type	Operation Voltage [V] Minimum	Operation Voltage [V] Maximum	Inrush Power Consumption AC [VA]	Inrush Power Consumption DC [W]	Opening Time [ms]
140G-K-SNR	–	12V DC	0.5 mm^2/20 AWG	Shunt Open Release	8.4	13.2	–	50	≤ 15
140G-K-SNJ	-SJ	24...30V AC/DC			16.8	33	50	50	
140G-K-SNKY	-SK	48...60V AC/DC			33.6	66	60	60	
140G-K-SND	-SD	110...127V AC 110...125V DC			77	139 AC 137 DC	50	50	
140G-K-SNA	-SA	220...240V AC 220...250V DC			154	278 AC 274 DC	50	50	
140G-K-SNB	-SB	380...440V AC	1 mm^2/17 AWG		266	484	55	–	
140G-K-SNC	-SC	480...525V AC			336	577	55	–	
140G-N-SNJ	-SJ	24V AC/DC	0.5 mm^2/20 AWG	Shunt Open Release	16.8	26.4	–	300	≤ 20
140G-N-SNKY	-SK	48V AC/DC			33.6	52.8	300		
140G-N-SND	-SD	110...120V AC/DC			77	132	300		
140G-N-SNA	-SA	220...240V AC/DC			154	264	300		
140G-N-SNB	-SB	380...400V AC	1 mm^2/17 AWG		266	440	300	–	
140G-NS-SNCJ	-RJ	24V AC/DC	0.5 mm^2/20 AWG	Shunt Close Release	20.4	26.4	300	300	≤ 80
140G-NS-SNCKY	-RK	48V AC/DC			40.8	52.8			
140G-NS-SNCD	-RD	110...120V AC/DC			93.5	126.5			
140G-NS-SNCA	-RA	220...240V AC/DC			187	196.5			
140G-NS-SNCB	-RB	380...400V AC	1 mm^2/17 AWG		323	440	300	–	

(1) Wire size: 1 m (3.3 ft)

All undervoltage release devices are wired with 600V (UL/CSA) insulated wire. No voltage derating is required.

Table 153 - Undervoltage Release Devices

Cat. No.	Application Ratings			Electrical Operating Ratings (Nominal Values)					
	Factory-installed Modification Order Code	Rated Voltage U_e [V]	Wires (1)	Electrical Specifications					
			Size	Dropout Voltage [V]		Pickup Voltage Maximum [V]	UVR Power Absorbed During Normal Operation		Opening Time [ms]
				Minimum	Maximum		AC [VA]	DC [W]	
140G-K-UVJ	-UJ	24...30V AC/DC	0.5 mm^2/20 AWG	8.4	21	25.5	1.5	1.5	≤ 25
140G-K-UVR	-UR	48V AC/DC		16.8	33.6	40.8	1	1	
140G-K-UVKY	–	60V AC/DC		21	42	51	1	1	
140G-K-UVD	-UD	110...127V AC 110...125V DC		38.5	88.9 AC 87.5 DC	108 AC 106 DC	2	2	
140G-K-UVA	-UA	220...240V AC 220...250V DC		77	154 AC 175 DC	208 AC 212.5 DC	2.5	2.5	
140G-K-UVB	-UB	380...440V AC	1 mm^2/17 AWG	133	308	374	3	–	
140G-K-UVC	-UC	480...525V AC		168	367.5	446	4	–	
140G-N-UVJ	-UJ	24V AC/DC	0.5 mm^2/20 AWG	8.4	21	25.5	–	5	≤ 20
140G-N-UVKY	–	60V AC/DC		21	42	51	5	5	
140G-N-UVD	-UD	110...120V AC/DC		38.5	88.9 AC 87.5 DC	108 AC 106 DC	5	5	
140G-N-UVA	-UA	220...240V AC/DC		77	154 AC 175 DC	208 AC 212.5 DC	5	5	
140G-N-UVB	-UB	380...400V AC	1 mm^2/17 AWG	133	308	374	5	–	
140G-N-UVC	-UC	415...440V AC		168	367.5	446	5	–	

(1) Wire length: 1 m (3.3 ft).

All motor operators are wired with 600V (UL/CSA) insulated wire. No voltage derating is required.

Table 154 - Motor Operators

Cat. No.	Application Ratings			Application Specifications, Electrical Operating Ratings (Nominal Values)									
	Rated Voltage U_e [V]	For Use with Frame Size	Wire (1)	Operating Voltage [V]		Time [s]			Minimum Control Impulse Time	Inrush Power		UVR Power Absorbed During Normal Operation	
			Size	Minimum	Maximum	Open	Close	Reset		AC [VA]	DC [W]	AC [VA]	DC [W]
140G-K-EOPJ	24 V DC	K	0.5 mm^2/ 20 AWG	20.4	26.4	1.5	< 0.1	3	≥ 100 ms (2)	–	300	–	150
140G-M-EOPJ		M		20.4	26.4	3		5					
140G-K-EOPKY	48...60 V DC	K		40.8	66	1.5		3					
140G-M-EOPKY		M		40.8	66	3		5					
140G-K-EOPD	110...125 V AC/DC	K		106.3	137	1.5		3		300	300	150	150
140G-M-EOPD		M		106.3	137	3		5					
140G-K-EOPA	220...250 V AC/DC	K		212.6	275	1.5		3					
140G-M-EOPA		M		212.6	275	3		5					
140G-K-EOPB	380 V AC	K	1 mm^2/ 17 AWG	374	484	1.5	< 0.1	3	≥ 100 ms (2)	300	–	150	–
140G-M-EOPB		M		374	484	3		5					

(1) Wire length: 1 m (3.3 ft).
(2) Opening and closing times.

Table 155 - Spring Charging Motors

Cat. No.	Application Ratings			Application Specifications, Electrical Operating Ratings (Nominal Values)					
	Rated Voltage U_e [V]	For Use with Frame Size	Wires (1)	Operating Voltage [V]		Time [s]		Inrush Power	
			Size	Minimum	Maximum	Inrush	Charging	AC [VA]	DC [W]
140G-NS-SCMJ	24...30 V AC/DC	NS	0.5 mm^2/20 AWG	20.4	33		8...10	–	≤ 400
140G-NS-SCMKY	48...60 V AC/DC			40.8	66			≤ 400	
140G-NS-SCMD	100...130 V AC/DC			106.3	143			≤ 400	
140G-NS-SCMA	220...250 V AC/DC			212.6	275			–	
140G-NS-SCMB	380...415 V AC		1 mm^2/17 AWG	323	456			≤ 400	–

(1) Wire length: 1 m (3.3 ft).

Table 156 - Busbar Specifications for Compatibility with Circuit Breaker Terminals

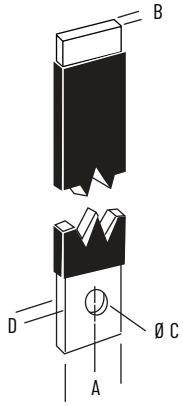
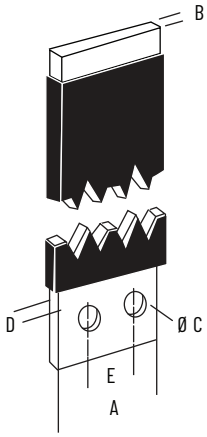
Diagram	Frame Size	Busbar Dimensions [mm (in)]							Terminal Torque		Hex Tool/ Wrench Size
		Width (A)		Thickness (B)		Terminal Hole Ø (C)	Hole Center (D)	Space Between Terminal Holes (E)	Fastener	[N•m (lb•in)]	
		Minimum	Maximum	Minimum	Maximum						
	K	35 (1.38)	35 1.38)	0.39 (0.19)	10 (5)	10.5 (0.41)	0.11 (0.43)	–	M8	28 (248)	M8
	M	50 (1.57)	–	5 (0.19)	10 (0.38)	6.5 each (0.25)	12 (0.47)	22.5 (0.88)	(2) M6	9 (80)	M5
	N	50 (1.96)	–	10 (0.4)	20 (0.78)	11 each (0.433)	14 (0.55)	25 (0.984)	(2) M10	18 (161)	M5

Table 157 - Cable (Ring) Terminal Specifications for Compatibility with Circuit Breaker Terminals

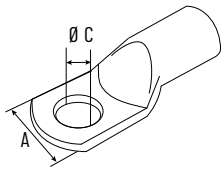
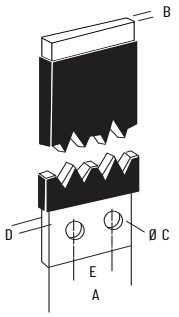
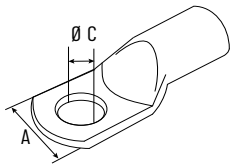
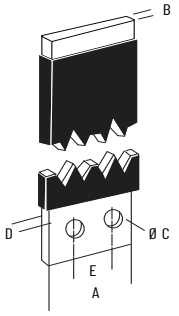
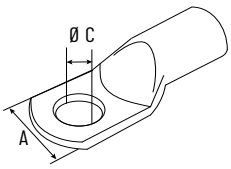
Diagram	Frame Size	Cable (Ring) Terminal Dimensions		Number of Cables	Cable (Ring) Terminal Torque		Fastener Terminal Tool
		Width (A)	Terminal Hole Ø (B)		Fastener	[N•m (lb•in)]	
	K	35 (1.38)	10.5 (0.41)	1	M8	28 (248)	CH8
	M	Select extended terminals from Table 158 on page 87 or spreader terminals from Table 159 on page 87					
	N, NS						

Table 158 - Busbar or Cable (Ring) Terminal Specifications for Compatibility with Extended Terminal Accessories

Diagram	Frame Size	Max Width (A)	Depth to Hole (D)	Terminal Hole Ø (C)	Number of Pieces	Number of Cables	Fastener	Cable Tightening Torque [N•m (lb•in)]
	K	30 (1.180	7 (0.28)	2 x 11 (2 x 0.43)	2	–	Not specified	18 (161)
	M	50 (1.97)	5 (0.20)	14 (0.55)	2	–	Not specified	30 (268)
	N, NS	50 (1.97)	10 (0.39)	4 x 11 (1) (4 x 0.43)	2	–	Class 4.8 screws (not supplied)	4040 (355)
	K	30 (1.18)		11 (0.43)	–	2	Class 4.8 screws (not supplied)	
	M	50 (1.97)		14 (0.55)	–	2		
	N, NS	–		–	–	–	Class 8.8 screws (not supplied)	

(1) Only use two holes diagonally.

Table 159 - Busbar or Cable (Ring) Terminal Specifications for Compatibility with Spreader Terminal Accessories

Diagram	Frame Size	Max Width (A)	Depth to Hole (D)	Terminal Hole Ø (C)	Number of Pieces	Number of Cables	Fastener	Cable Tightening Torque [N•m (lb•in)]
	K	40 (1.58)	10 (0.394)	11 (0.43)	1	–	Not specified	–
	M	80 (3.15)	5 (0.20)	3 x 13 (3 x 0.51)	1	–		–
	N, NS	50 (1.97)	10 (0.39)	3 x 13 (3 x 0.51)	2	–		–
	K	40 (1.58)	–	11 (0.43)	–	1	Class 4.8 screws (not supplied)	18 (161)
	M	45 (1.77)	–	13 (0.51)	–	3		30 (268)
	N, NS	45 (1.77)	–	13 (0.51)	–	3		40 (355)

Throughout this section, wiring diagrams have a reference number in the upper left corner, underneath the figure title. This reference number correlates to the reference number that appears on the individual instruction sheet for that device.

Status Contacts

Auxiliary/Alarm Contacts (AX/AL/TU AL)

Figure 9 - Auxiliary Contact (AX2)

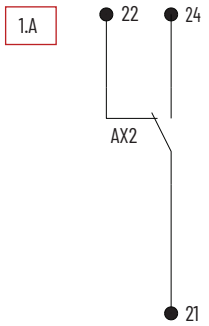


Figure 10 - Alarm Contact (AL1)

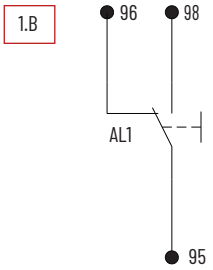


Figure 11 - Trip Unit Alarm Contact (TU AL)

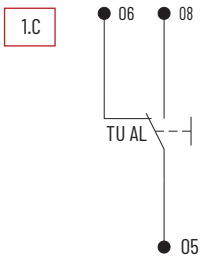


Figure 12 - Auxiliary/Alarm Contacts (AX2/AL1)

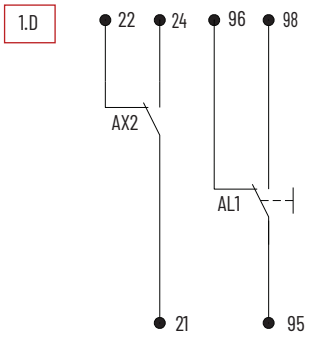


Figure 13 - Auxiliary/Alarm Contacts (AX1/AX2/AL1)

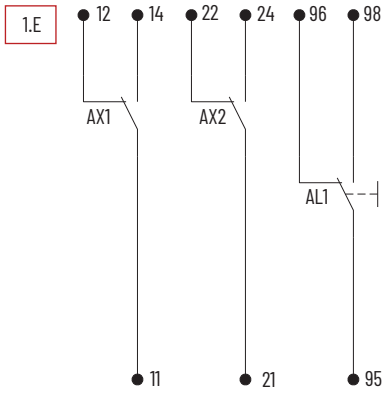


Figure 14 - Auxiliary/Alarm Contacts (AX1/AX2/AX3/AL1)

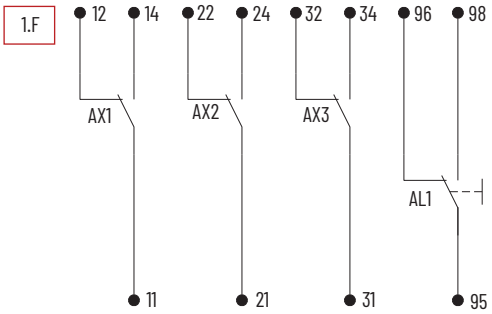


Figure 15 - Auxiliary/Alarm Contacts (AX1/AX2/AX3/AL1/AL2)

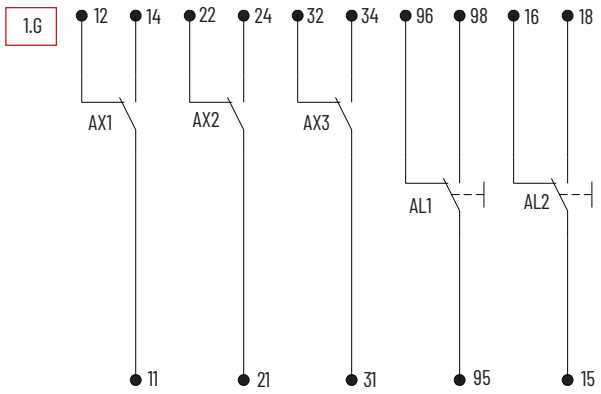


Figure 16 - Auxiliary/Alarm/Trip Unit Contacts (AX2/AX3/AL1/AL2/TU AL)

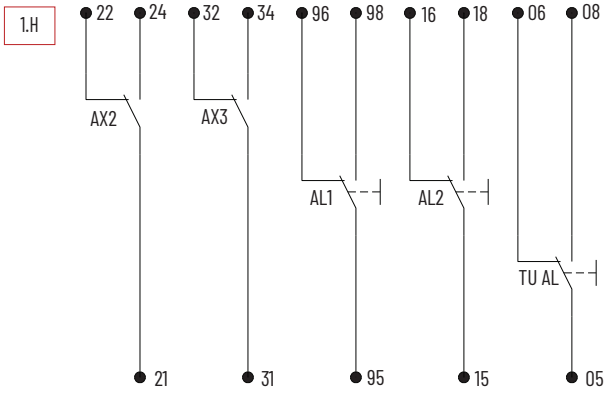


Figure 17 - Auxiliary Contacts (AX1/AX2)

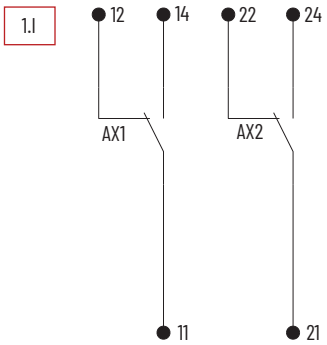


Figure 18 - Auxiliary/Alarm Contacts (AX1/AL1)

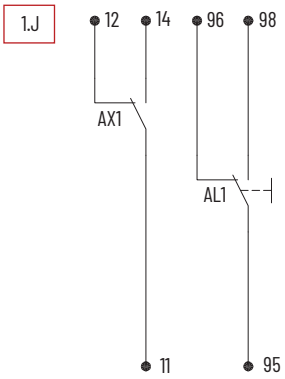


Figure 19 - Auxiliary Contacts (AX1/AX2/AX3/AX4)

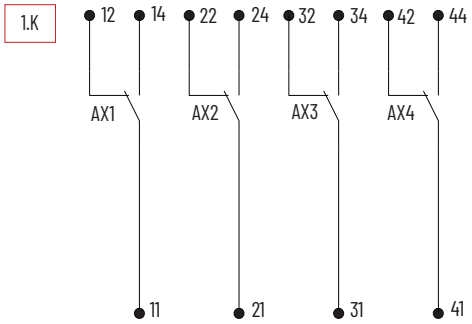
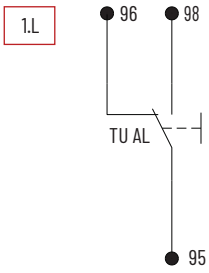
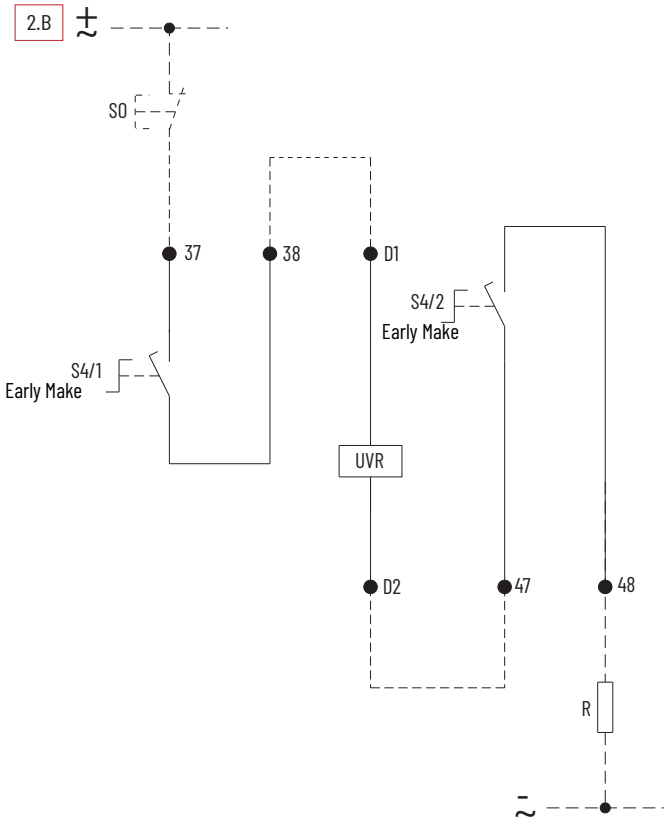


Figure 20 - Trip Unit Alarm Contact (TU AL)



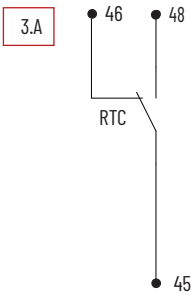
Auxiliary Contacts for Handles

Figure 21 - Rotary Handle (140G-K)



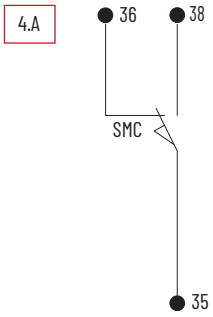
Ready-to-Close Auxiliary Contacts

Figure 22 - Ready-to-Close Auxiliary Contact (140G-NS)



Spring Charged Auxiliary Contacts

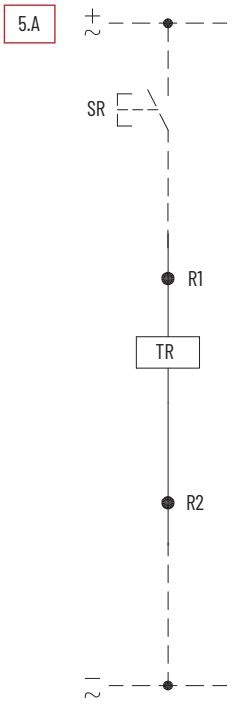
Figure 23 - Auxiliary Contact for Signaling Springs Charged



Protection/Control Accessories

Trip Reset Module

Figure 24 - Trip Reset Module (140G-NS)



Shunt Trip Modules

Figure 25 - Shunt Trip Module (140G-N, 140G-NS)

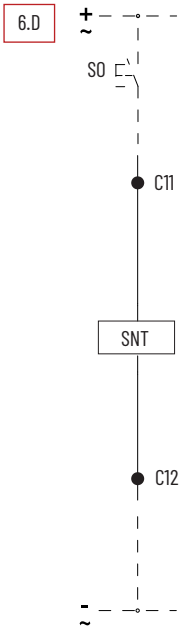
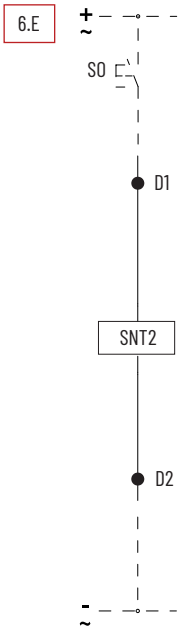
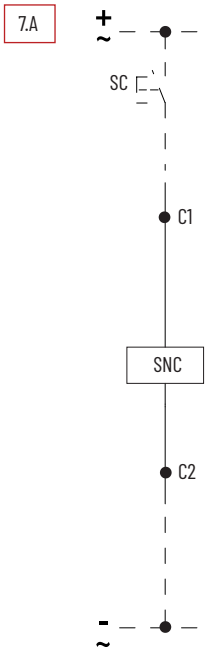


Figure 26 - Second Shunt Trip (140G-N, 140-NS)



Shunt Close Module

Figure 27 - Shunt Close Module (140G-NS)



Undervoltage Release Modules

Figure 28 - Undervoltage Release Module (140G-N, 140-NS)

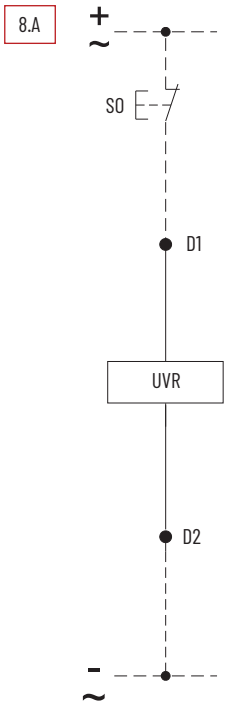


Figure 29 - Undervoltage Release Module with E-Stop (140G-N,140 -NS)

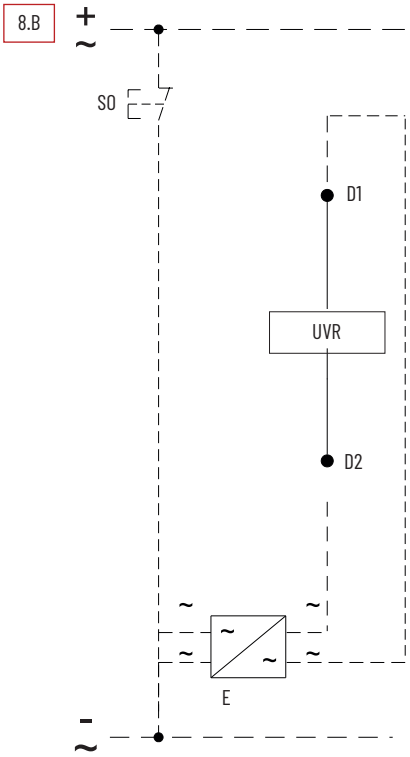
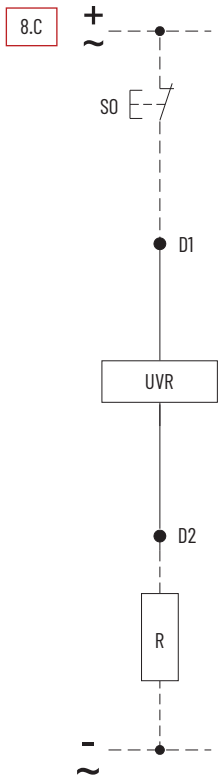
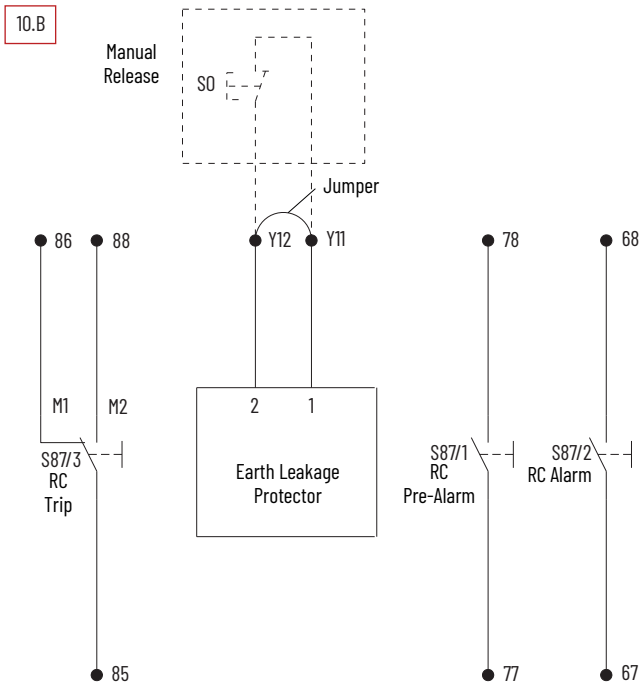


Figure 30 - Undervoltage Release Module with Resistor (140G-K, 140G-M)



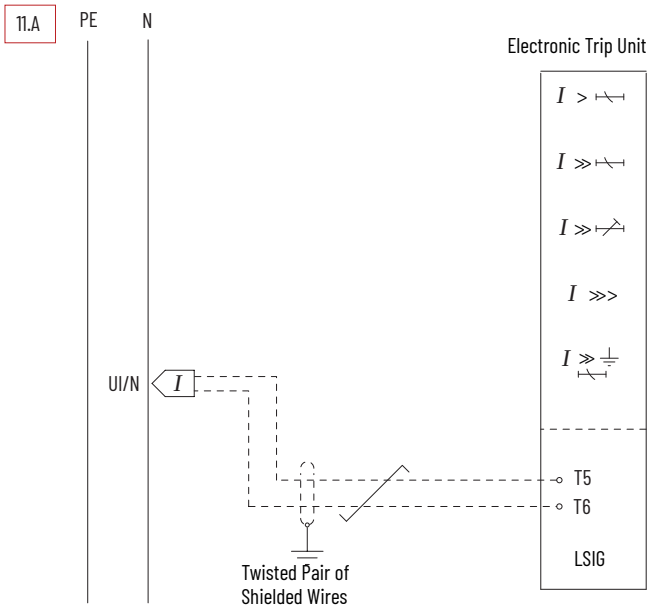
IEC Residual Current Release Modules

Figure 31 - Earth Leakage Protector (140G-K)



Neutral Current Transformer Modules

Figure 32 - Current Sensor for External Neutral Conductor (140G-N, 140G-NS)



Maintenance Mode Accessories

Figure 33 - LSIG-MM Trip Unit Connectors (140G-K, 140G-M)

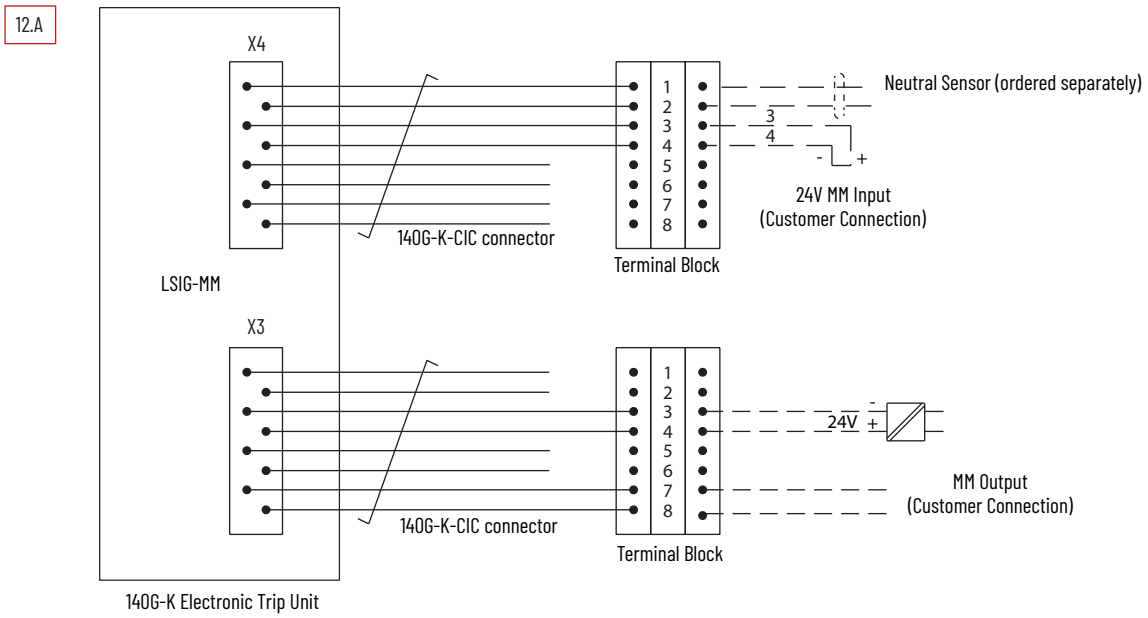
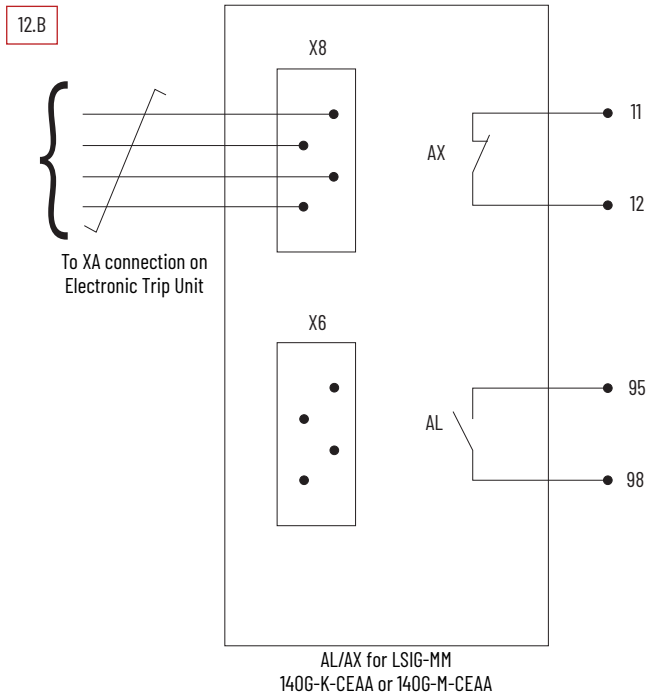


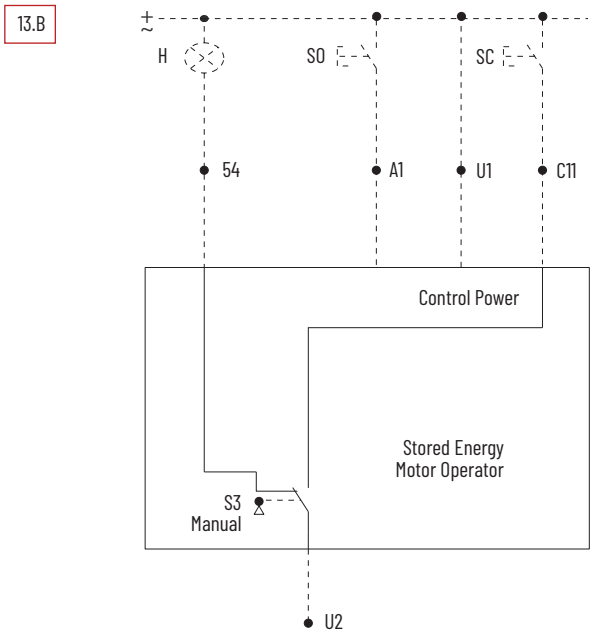
Figure 34 - LSIG-MM Maintenance Mode Signal Contacts (140G-K, 140G-M)



Operators

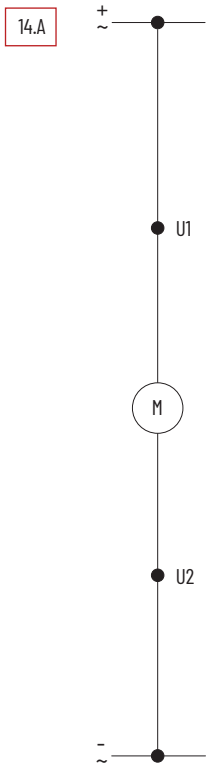
Motor Operators

Figure 35 - Stored Energy Operating Mechanism (140G-K, 140G-M)



Spring Charging Motor

Figure 36 - Spring Charging Motor (140G-NS)



Notes:

Using Trip and Let-through Curves

A trip curve is a representation of how a circuit breaker reacts to overcurrents and short-circuit currents. The curve is determined by a specific set of test conditions, so you should use the curve as a guideline with the documented tolerances; real-world deviations from the test criteria may alter the individual results as compared to the curve.

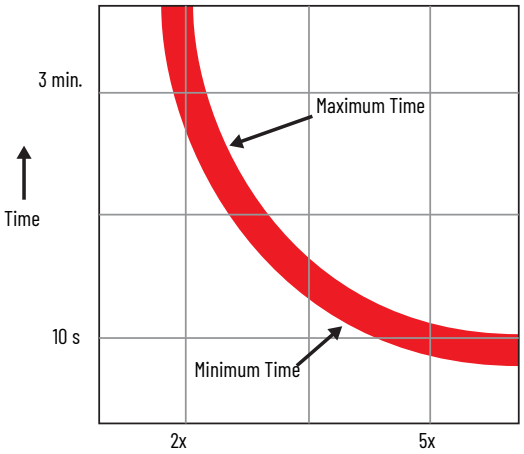
The curves for thermal magnetic trip units show two protections; the curves for electronic trip units will show up to four protections on the same graph. Some trip curve graphs also display a side graph that shows the device self-protections interacting with the circuit protections. To more quickly respond at certain current conditions, slower protections may be disabled in favor of faster protections. The bottom axis of each graph displays current as a multiple of the nominal current. Each chart is valid for multiple rated currents.

A let-through curve is a representation of the peak current and total let-through energy a breaker experiences while interrupting the current. This energy affects downstream devices. Each graph shows the available short-circuit current as root mean square (rms) values, making each chart valid for both AC and DC.

Trip Curve for a Thermal-magnetic MCCB

The most commonly selected form of thermal protection is the bimetallic version. This works similarly to a traditional overload relay in which a bimetallic element is heated, causing a deflection, which then exerts pressure on a trip bar and causes the circuit breaker to trip.

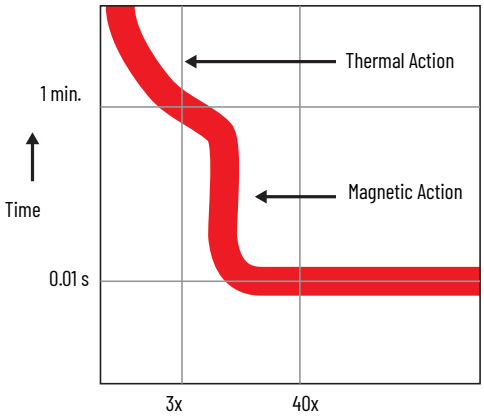
Figure 37 - Example Bimetallic Trip Curve



Using the bimetallic model, we can provide a thermal protection curve as shown here.

The outer edges of the line reflect the minimum and maximum times. The area between is the trip setting range.

Figure 38 - Example Thermal-magnetic MCCB Trip Curve



Combining the short-circuit and overcurrent protection provides us with a protection curve that looks like this.

Trip Curve for an Electronic MCCB

An alternative to using fixed-thermal protection is to use electronic overcurrent protection, which electronically replicates the function of the mechanical overcurrent device.

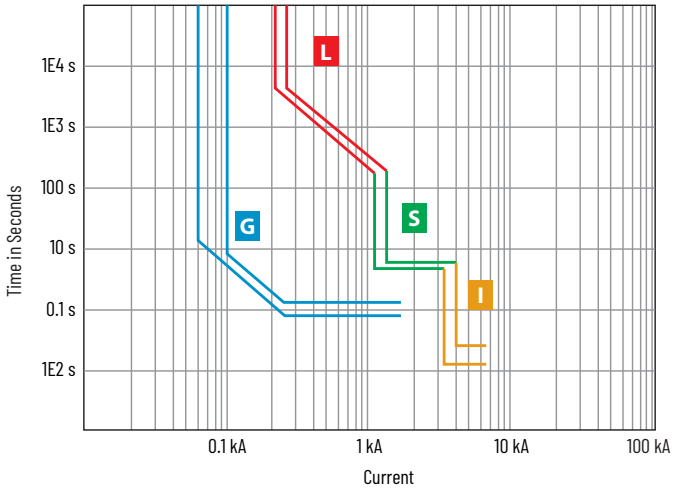
One of the benefits of using electronic trip units is their ability to tailor the tripping characteristics of the circuit breaker for the application.

The electronic trip unit has the ability to provide advanced protection in the form of additional trip functionality such as adjustable:

- Long Time: Allows the long time between 1.05 and ~1.3 x the thermal rating to be delayed, similar to how an adjustable relay changes classes
- Short Time: Adjustable short time between thermal and short-circuit
- Instantaneous Trip: Adjustable instantaneous short-circuit trip time
- Ground Fault: Adjustable time and value of ground fault tripping

Figure 39 shows an example trip curve for electronic MCCBs.

Figure 39 - Example Electronic MCCB Trip Curve



Legend	
L	Overcurrent protection long time delay
S	Short-circuit protection short time delay
I	Short-circuit protection instantaneous trip
G	Ground fault protection

Electronic trip units are available in a variety of trip settings. The most common combinations are LSI, LSIG, and LIU trip settings; therefore a wide variety of options exist for customizing the protection the circuit breaker provides within the control panel.

Trip and Let-through Curve Index

Table 160 through Table 163 on page 99 list the individual curves that are available for Bulletin 140G MCCBs and 140MG MCPs. You can find the most up-to-date versions of these publications by clicking the links in the tables or by searching by the publication number at rok.auto/literature. Figure 40 on page 100 through Figure 74 on page 124 show the trip curves that are listed in the tables, current as of the date of publication.

Table 160 - Bulletin 140G Thermal-magnetic MCCB Time-current Curves

Frame Size	Voltage Rating	Current Rating [A]	Figure No.
K	600V AC	300, 400	Figure 40 on page 100
M	600V AC	600	Figure 41 on page 101
		630	Figure 42 on page 102
		800	Figure 43 on page 103

Table 161 - Bulletin 140G Electronic MCCB Time-current and Ground Fault Protection Curves

Frame Size	Voltage Rating	Frequency [Hz]	Current Rating [A]	Protection Type	Figure No.
K	600V AC	50/60	300, 400	LSI	Figure 44 on page 104
				G	Figure 45 on page 105
M	600V AC	50/60	600	LSI	Figure 46 on page 106
			600, 800	G	Figure 47 on page 107
N, NS	600V AC	50/60	1200	LSI	Figure 48 on page 108
				G	Figure 49 on page 109
			400, 600, 800, 1000, 1200, 1250	LSIG-MM	Figure 50 on page 110, Figure 51 on page 111

Table 162 - Bulletin 140G MCCB Let-through Curves

Frame Size	Voltage Rating	Curve Type	Figure No.
M, N	240V AC	Let-through Energy	Figure 55 on page 115
		Peak Let-through Current	Figure 56 on page 115
K, M, N	415V AC	Let-through Energy	Figure 57 on page 116
		Peak Let-through Current	Figure 58 on page 116
	480V AC	Let-through Energy	Figure 59 on page 117
		Peak Let-through Current	Figure 60 on page 117
	500V AC	Let-through Energy	Figure 61 on page 118
		Peak Let-through Current	Figure 62 on page 118
	600V AC	Let-through Energy	Figure 63 on page 119
		Peak Let-through Current	Figure 64 on page 119
	690V AC	Let-through Energy	Figure 65 on page 120
		Peak Let-through Current	Figure 66 on page 120

Table 163 - Bulletin 140G Current-limiting MCCB Let-through Curves

Frame Size	Voltage Rating	Interrupt Rating [kA]	Curve Type	Figure No.
KC	480V AC	65	Let-through Energy	Figure 67 on page 121
			Peak Let-through Current	Figure 68 on page 121
		100	Let-through Energy	Figure 69 on page 122
			Peak Let-through Current	Figure 70 on page 122
	600V AC	65	Let-through Energy	Figure 71 on page 123
			Peak Let-through Current	Figure 72 on page 123
		100	Let-through Energy	Figure 73 on page 124
			Peak Let-through Current	Figure 74 on page 124

Bulletin 140G Thermal-magnetic MCCB Trip Curves

Figure 40 - 140G-K Time-current Curve

- Maximum voltage: 600V AC
- Maximum current: 300, 400 A
- Adjustable thermal/ adjustable magnetic release
- Instantaneous (magnetic) trip tolerance: -20%/+30%

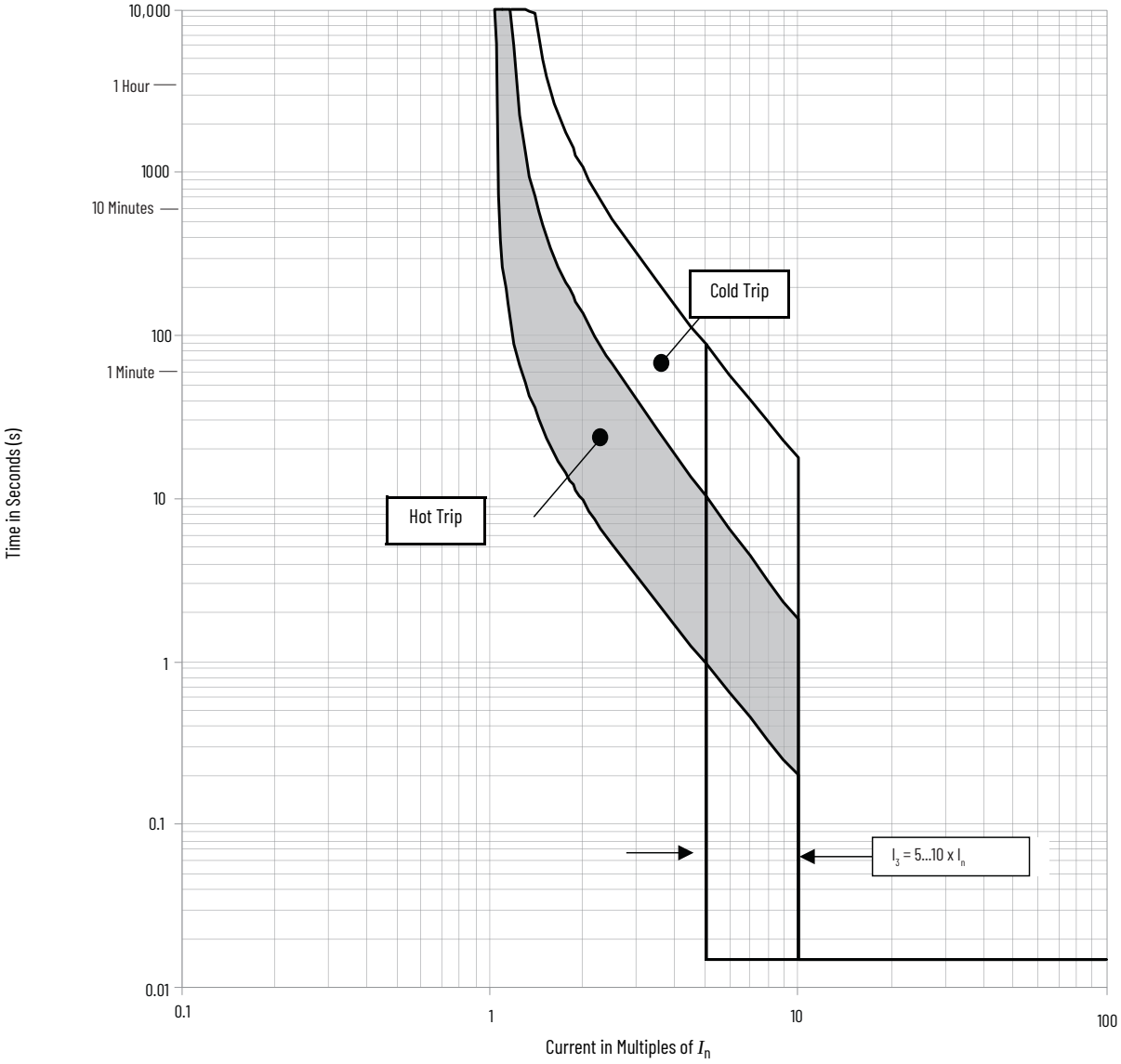


Figure 41 - 140G-M Time-current Curve

- Maximum voltage: 600V AC
- Maximum current: 600 A
- Instantaneous (magnetic) trip tolerance: -20%/+30%

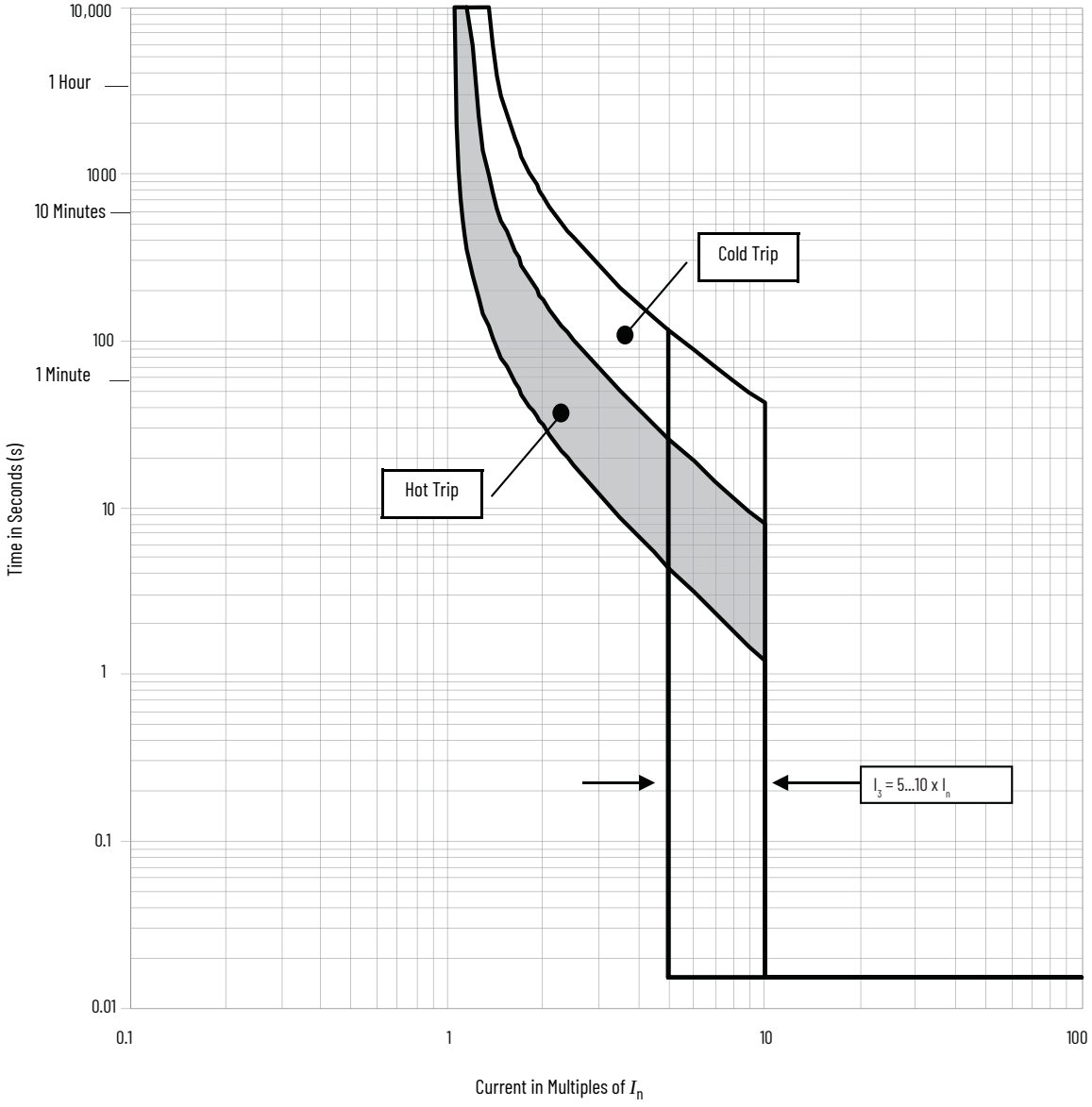


Figure 42 - 140G-M Time-current Curve

- Maximum voltage: 600V AC
- Maximum current: 630 A
- Instantaneous (magnetic) trip tolerance: -20%/+30%

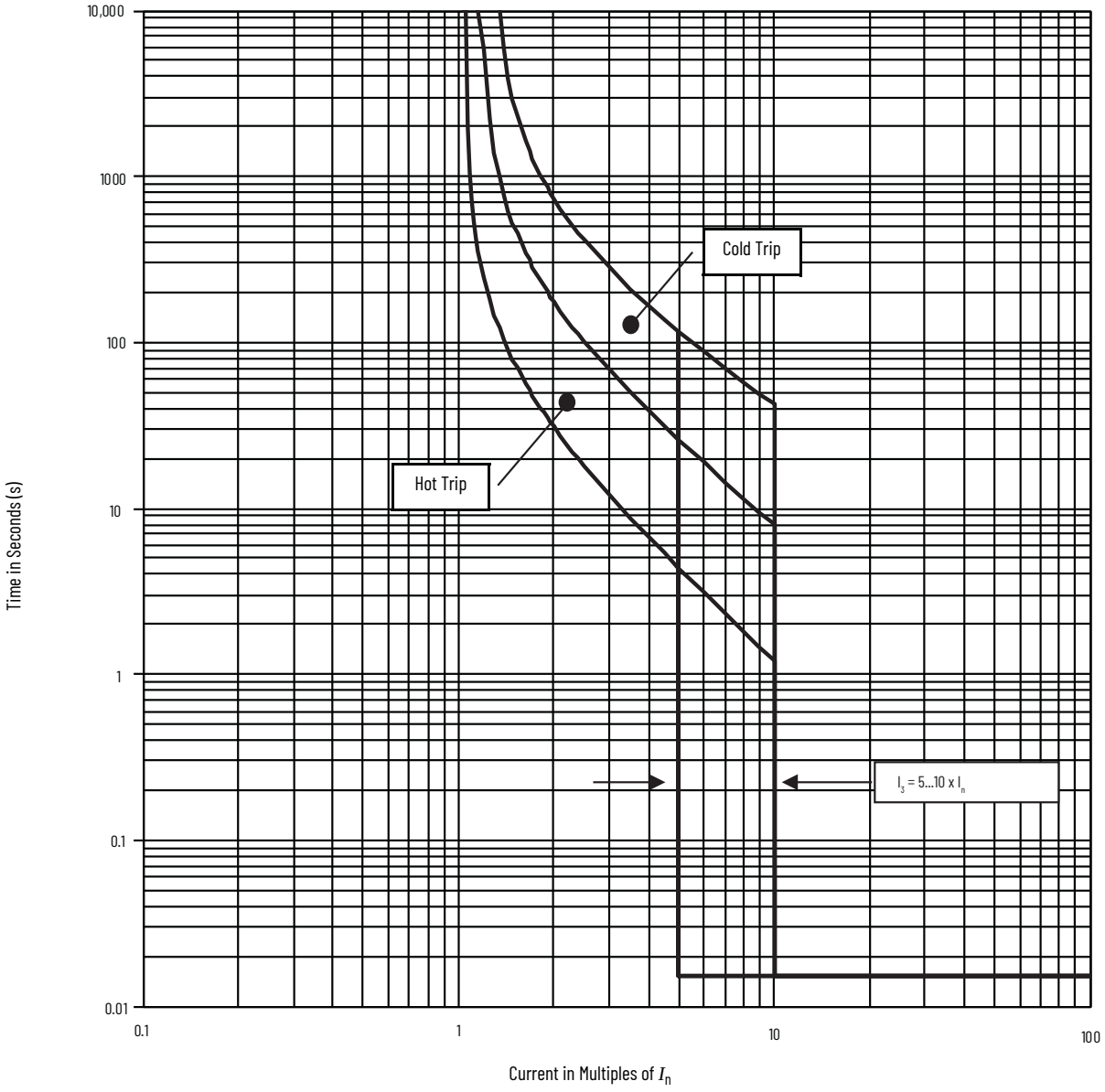
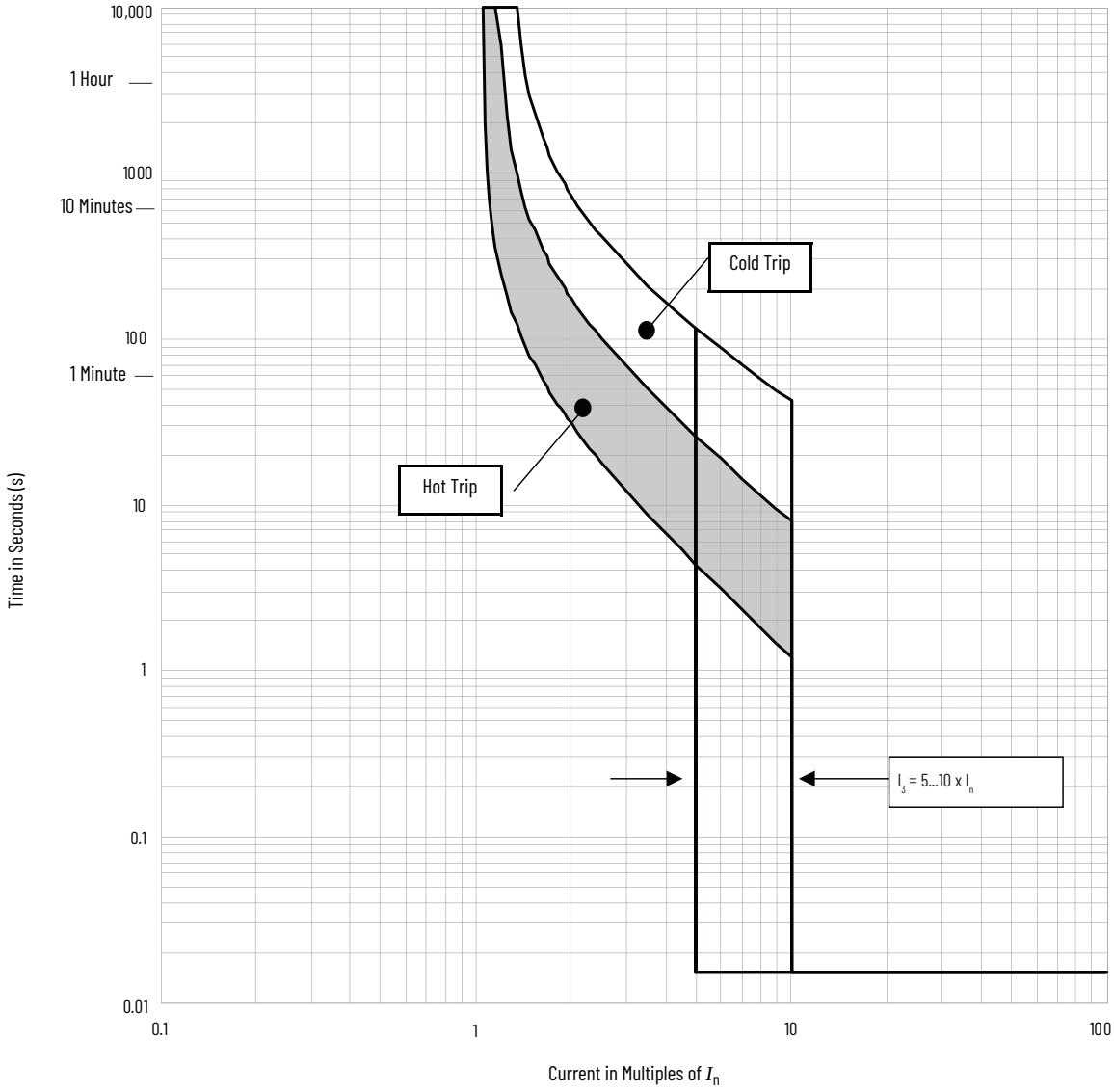


Figure 43 - 140G-M Time-current Curve

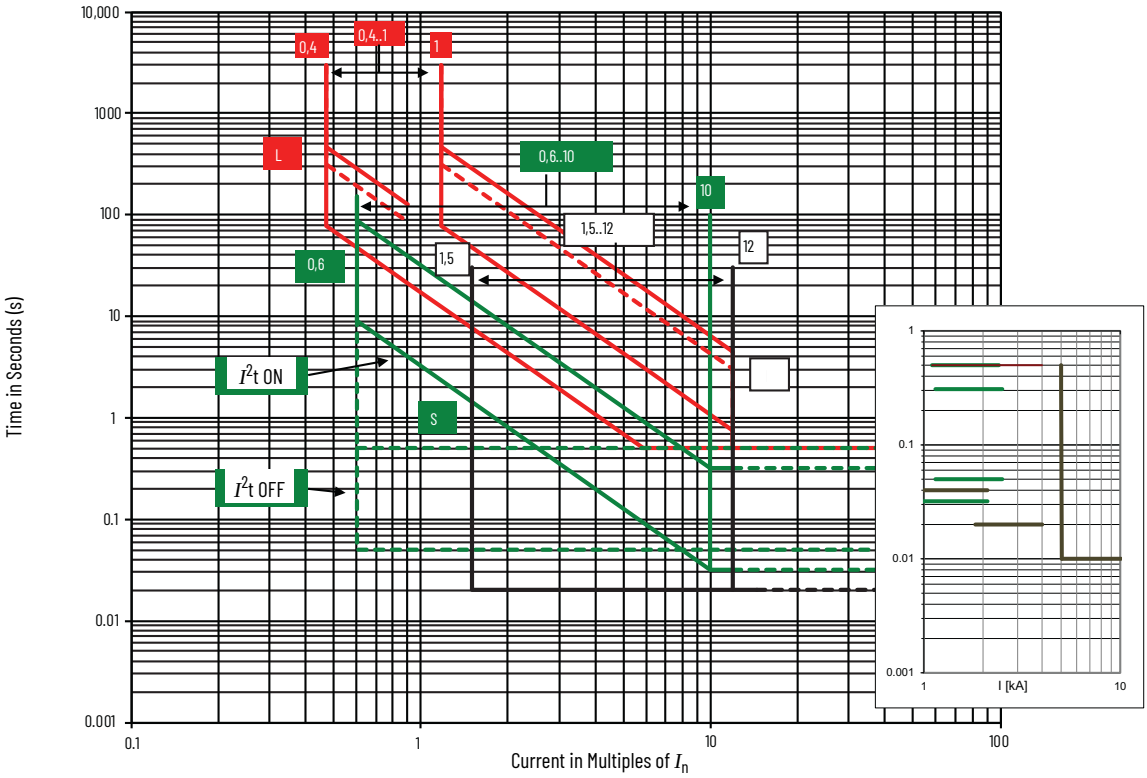
- Maximum voltage: 600V AC
- Maximum current: 800 A
- Adjustable thermal/ adjustable magnetic release
- Instantaneous (magnetic) trip tolerance: -20%/+30%



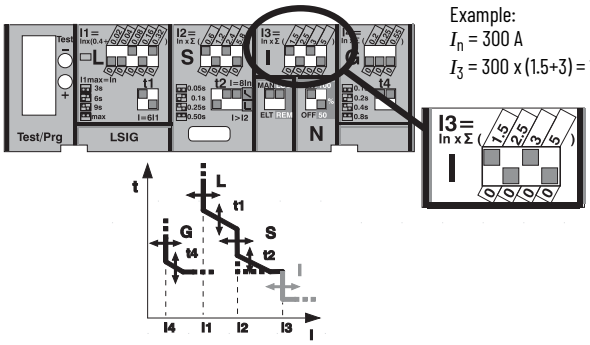
Bulletin 140G Electronic MCCB Trip Curves

Figure 44 - 140G-K Time-current Curve

- Maximum voltage: 600V AC, 50/60 Hz
- Trip unit rated current (I_n): 300 A; 400 A
- Electronic trip unit. Long delay response, short delay with I^2t response, and instantaneous curve



Tolerance Values		
Protection	**Trip Threshold**	**Trip Time**
L	1.05 ≤ x I_1 ≤ 1.25	± 20%
S	± 10%	± 20%
I	± 15%	≤ 60 ms
Others	± 20%	–



Example:
I_n = 300 A
I_3 = 300 x (1.5+3) = 1350

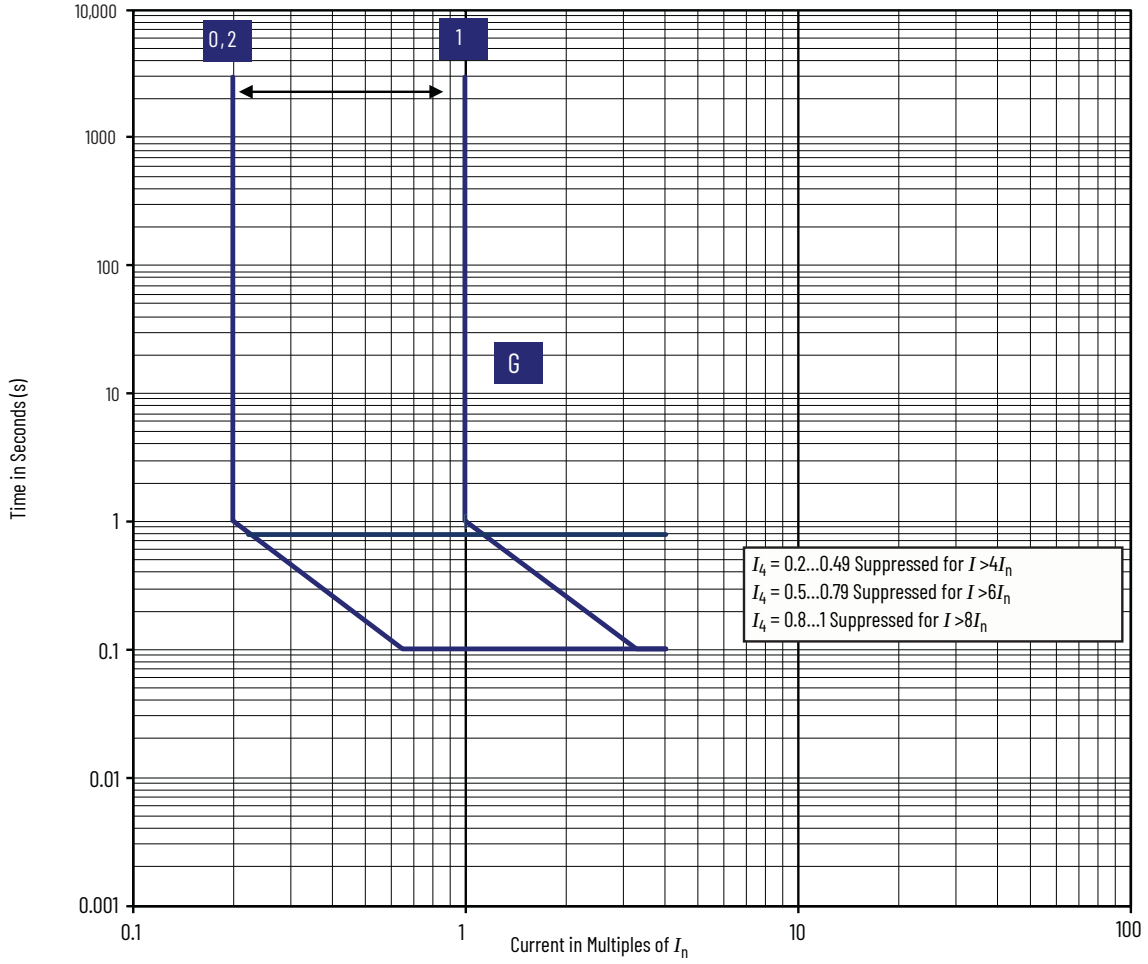
Notes:

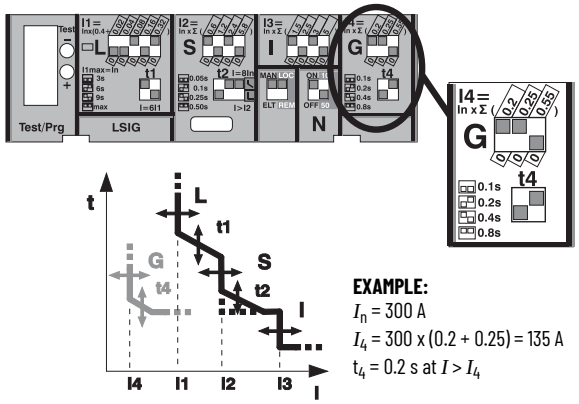
1. Curve accuracy applies from -20...+55 °C (-4...+131 °F) ambient temperature. For possible continuous ampere derating for ambient temperature above 40 °C (104 °F), consult your local Rockwell Automation sales office or Allen-Bradley distributor.
2. The right portion of the curve is determined by the interrupting rating of the circuit breaker.
3. Total clearing times shown include the response times of the trip unit, the breaker opening, and the interruption of the current.
4. For high fault current levels, an additional fixed instantaneous hardware override is provided at 10.5 x I_n.

Current Ratings															
	I_3 (I_n)														
I_n [A]	**1.5**	**2.5**	**3**	**4**	**4.5**	**5**	**5.5**	**6.5**	**7**	**7.5**	**8**	**9**	**9.5**	**10.5**	**12**
300	450	750	900	1200	1350	1500	1650	1950	2100	2250	2400	2700	2850	3150	3600
400	600	1000	1200	1600	1800	2000	2200	2600	2800	3000	3200	3600	3800	4200	4800

Figure 45 - 140G-K Ground Fault Protection Curve for LSIG MCCBs

- Maximum voltage: 600V AC, 50/60 Hz
- Trip unit rated current (I_n): 300 A, 400 A



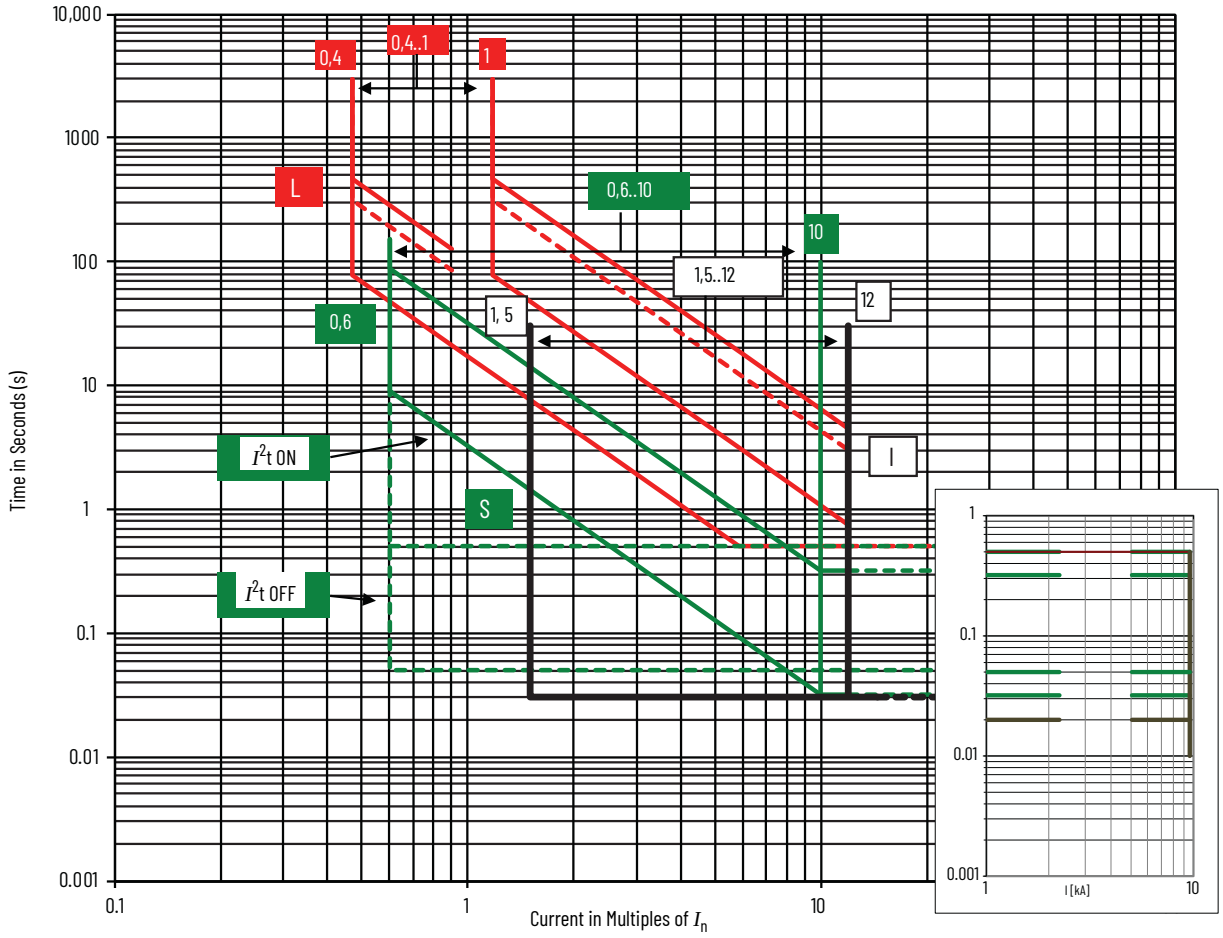


EXAMPLE:
I_n = 300 A
I_4 = 300 x (0.2 + 0.25) = 135 A
t_4 = 0.2 s at $I > I_4$

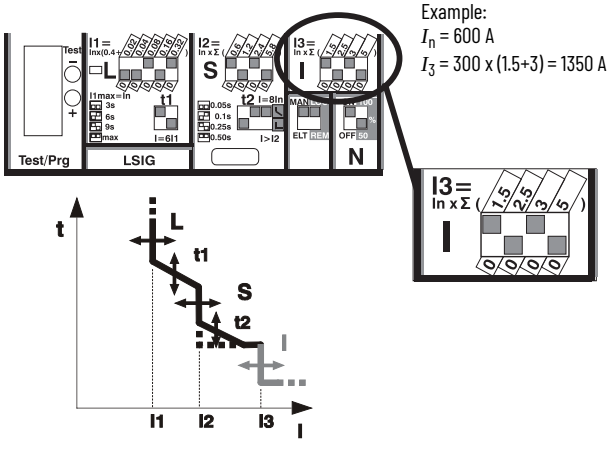
Ground Fault Current Ratings							
	I_4 [I_n]						
I_n [A]	0.2	0.25	0.45	0.55	0.75	0.8	1
300	60	75	135	165	225	240	300
400	80	100	180	220	300	320	400

Figure 46 - 140G-M Time-current Curve

- Maximum voltage: 600V AC, 50/60 Hz
- Trip unit rated current (I_n): 600 A
- Electronic trip unit. Long delay response, short delay with I^2t response, and instantaneous curve



Tolerance Values		
Protection	**Trip Threshold**	**Trip Time**
L	1.05 ≤ x I_1 ≤ 1.25	± 20%
S	± 10%	± 20%
I	± 15%	≤ 60 ms
Others	± 20%	–



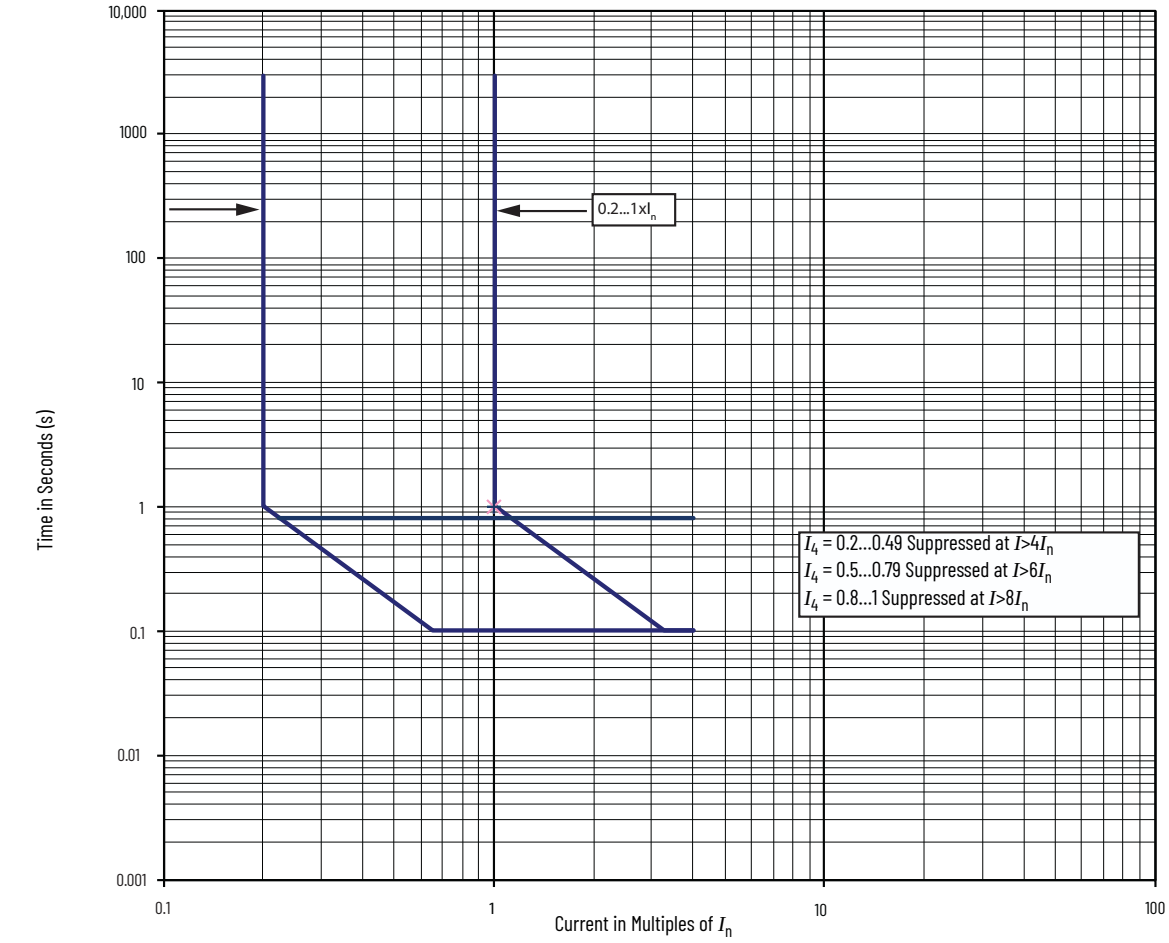
Example:
I_n = 600 A
I_3 = 300 x (1.5+3) = 1350 A

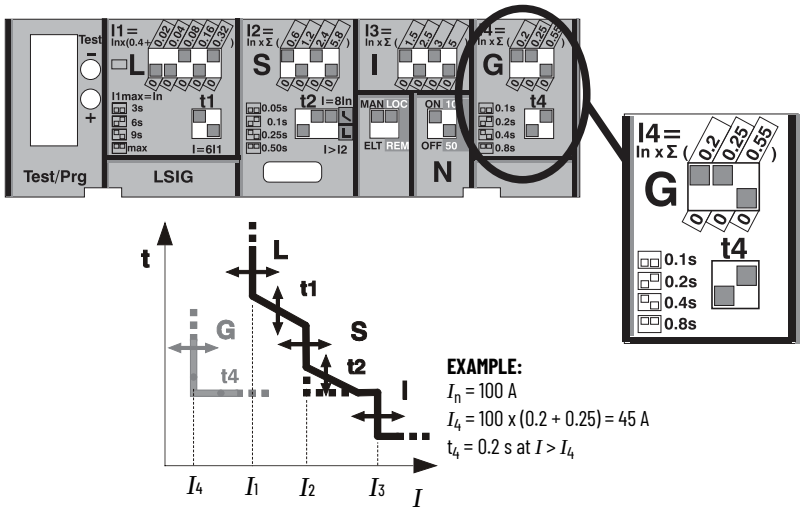
Notes:

1. Curve accuracy applies from -20...+55 °C (-4...+131 °F) ambient temperature. For possible continuous ampere derating for ambient temperature above 40 °C (104 °F), consult your local Rockwell Automation sales office or Allen-Bradley distributor.
2. The right portion of the curve is determined by the interrupting rating of the circuit breaker.
3. Total clearing times shown include the response times of the trip unit, the breaker opening, and the interruption of the current.
4. For high fault current levels, an additional fixed instantaneous hardware override is provided at 10.5 x I_n.

Figure 47 - 140G-M Ground Fault Protection Curve for LSIG MCCBs

- Maximum voltage: 600V AC, 50/60 Hz
- Trip unit rated current (I_n): 600 A, 800 A

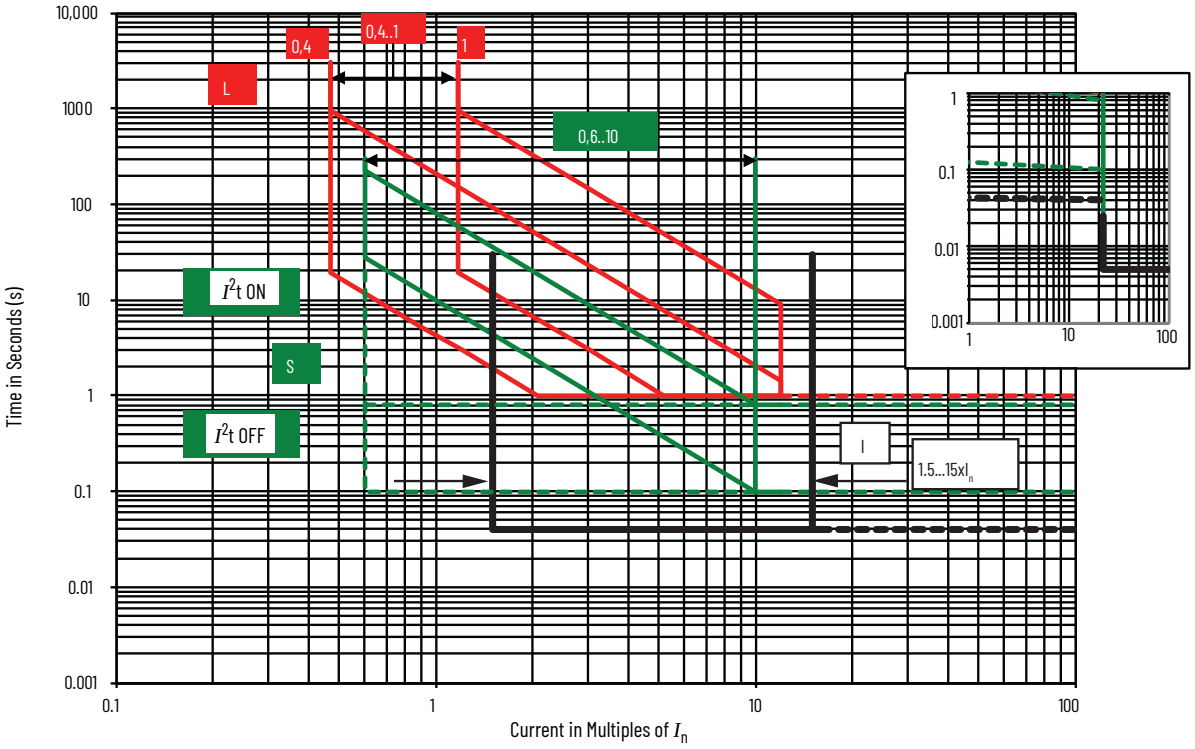




EXAMPLE:
I_n = 100 A
I_4 = 100 x (0.2 + 0.25) = 45 A
t_4 = 0.2 s at $I > I_4$

Figure 48 - 140G-N, 140G-NS Time-current Curve

- Maximum voltage: 600V AC, 50/60 Hz
- Trip unit rated current (I_n): 1200 A
- Electronic trip unit. Long delay response, short delay with I^2t response, and instantaneous curve



Trip Threshold Tolerance Value					
Protection	**Disable**	**Trip Threshold**	**Trip Time**	**Trip Threshold Tolerance**	**Trip Time Tolerance**
L (t = k/I^2)		I_1 = 0.4-0.425-0.45-0.475-0.5-1 x I_n	t_1 = 3-12-24-36-48-72-108-144 s at 3 I_1	Release between 1.05 and 1.2 I_1	±10% I_g ≤ 6 x I_n
S (t = k)	✓	I_2 = 0.6-0.8-1.2-1.8-2.4- 3-3.36-4. 2-5-5.8-6.6-7.4-8.2-9-10 x I_n	with $I > I_2$ t_2 = 0.1-0.2-0.3-0.4-0.5-0.6-0.7-0.8 s	±7% I_g ≤ 6 x I_n; ±10% I_g > 6 x I_n	The best of ±10% or ±40 ms
S (t = k/I^2)	✓	I_2 = 0.6-0.8-1.2-1.8-2.4- 3-3.36-4. 2-5-5.8-6.6-7.4-8.2-9-10 x I_n	t_2= 0.1-0.2-0.3-0.4-0.5-0.6-0.7-0.8 s at 10 I_n	±7% I_g ≤ 6 x I_n; ±10% I_g > 6 x I_n	±15% I_g ≤ 6 x I_n; ±20% I_g > 6 x I_n
I (t = k)	✓	I_3 = 1.5-2-3-4-5-6-7-8-9-10-11-12-13-14-15 x I_n	≤ 30 ms	±10%	–

For all cases not covered in the Trip Threshold Tolerance Values table above, the tolerance values in the Tolerance Values table below apply.

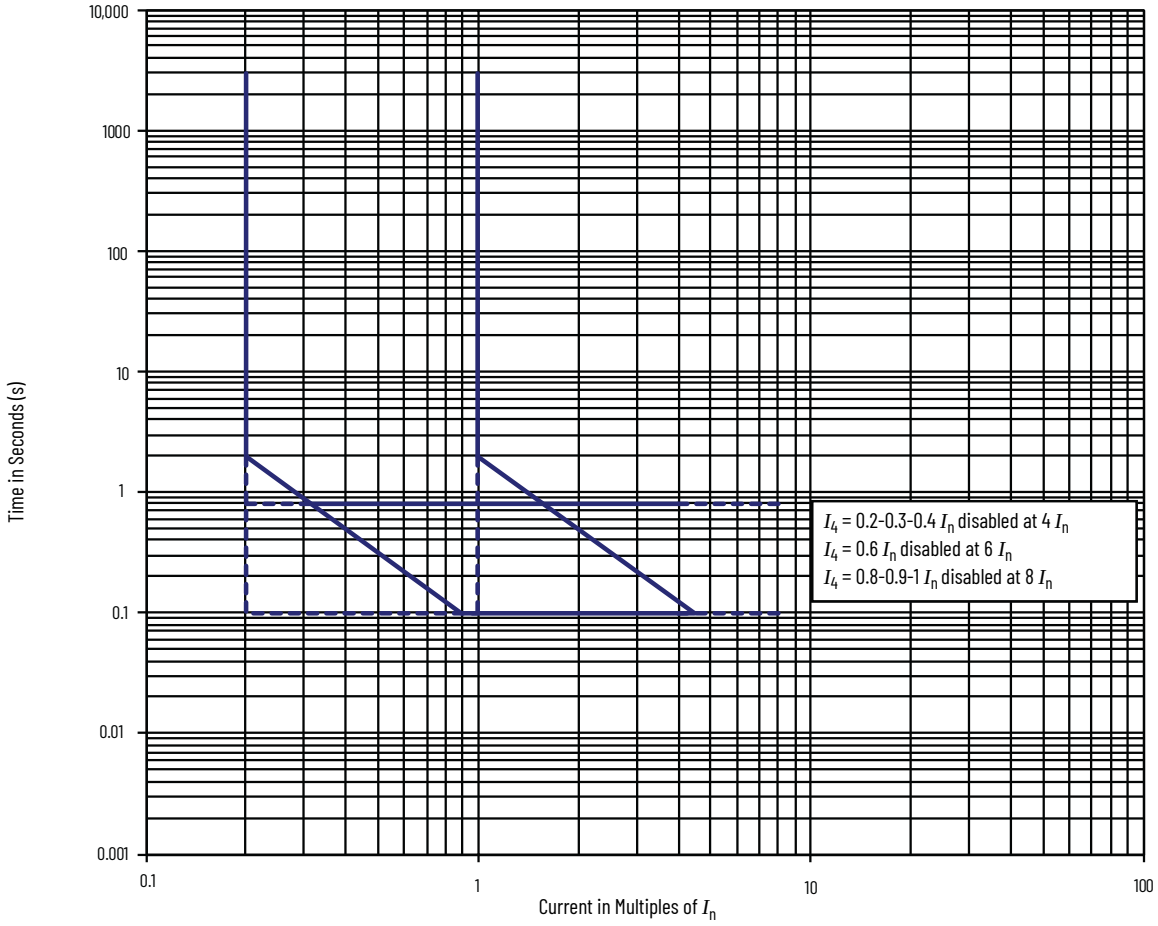
Tolerance Values		
Protection	**Trip Threshold**	**Trip Time**
L	1.05 ≤ x I_1 ≤ 1.25	± 20%
S	± 10%	± 20%
I	± 15%	≤ 60 ms
Others	± 20%	–

Notes:

1. The minimum value of this trip is 1 s regardless of curve type (self-protection)
2. These tolerances apply under the following conditions:
   - self-powered relay at full power (without start-up)
   - presence of auxiliary power supply
   - two-phase or three-phase power supply
   - preset trip time ≥ 100 ms
3. The value of this trip is ensured between 40 and 500 ms from circuit breaker closing; you must set this value yourself.
4. Curve accuracy applies from -20...+55 °C (-4...+131 °F) ambient temperature. For possible continuous ampere derating for ambient temperature above 40 °C (104 °F), consult your local Rockwell Automation sales office or Allen-Bradley distributor.
5. The right portion of the curve is determined by the interrupting rating of the circuit breaker.
6. Total clearing times shown include the response times of the trip unit, the breaker opening, and the interruption of the current.
7. For high fault current levels, an additional fixed instantaneous hardware override is provided at 18 kA.

Figure 49 - 140G-N, 140G-NS Ground Fault Protection Curve for LSIG MCCBs

- Maximum voltage: 600V AC, 50/60 Hz
- Trip unit rated current (I_n): 1200 A



Trip Threshold Tolerance Values					
Protection	**Disable**	**Trip Threshold**	**Trip Time**	**Trip Threshold Tolerance**	**Trip Time Tolerance**
G (t = k)	✓	I_4 = 0.2-0.3-0.4-0.6-0.8-0.9-1 x I_n	with $I > I_4$ t_4=0.1-0.2-0.4 s	± 7%	The best of ± 10% or ± 40 ms
G (t = k/I^2)	✓	I_4 =0.2-0.3-0.4-0.6-0.8-0.9-1 x I_n	t_4=0.1 at 4.47I_4 t_4=0.2 at 3.16 I_4 t_4=0.4 at 2.24 I_4 t_4=0.8 at 1.58 I_4	± 7%	± 15%

For all cases not covered in the Trip Threshold Tolerance Values table above, the tolerance values in the Tolerance Values table below apply.

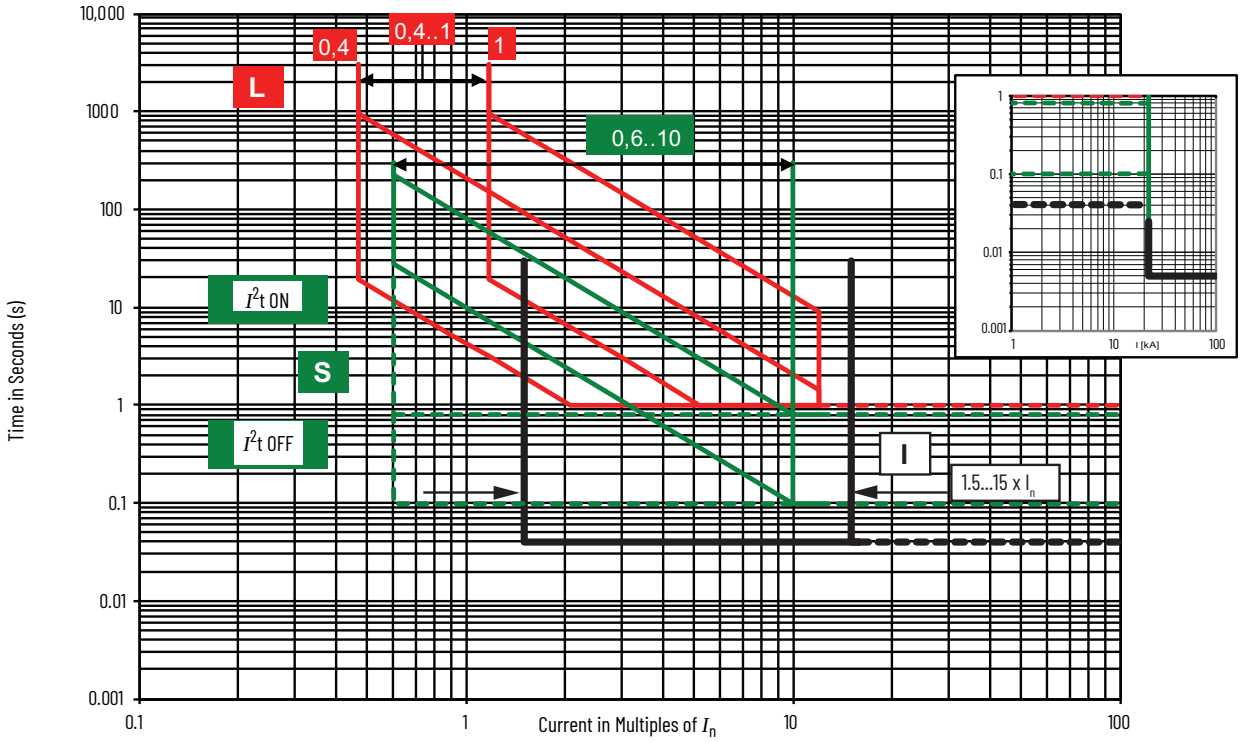
Tolerance Values		
Protection	**Trip Threshold**	**Trip Time**
G	± 10%	± 20%
Others	± 20%	–

Ground Fault Protection (I_4) is suppressed at the following levels, where the breaker uses Instantaneous Protection (I_1) to achieve a faster response to these higher current levels

- I_4 = 0.2...0.4 I_n disabled at 4 x I_n
- I_4 = 0.6 x I_n disabled at 6 x I_n
- I_4 = 0.8...1 I_n disabled at 8 x I_n

Figure 50 - 140G-N, 140G-NS Time-current Curve for LSIG-MM MCCBs

- Maximum voltage: 600V AC, 50/60 Hz
- Trip unit rated current (I_n):
  400 A, 600 A, 800 A, 1000 A, 1200 A, 1250 A (IEC)



Trip Threshold Tolerance Values

Protection	Disable	Trip Threshold	Trip Time	Trip Threshold Tolerance	Trip Time Tolerance
L (t = k/I^2)		0.4 x $I_n \le I_1 \le 1$ x I_n	3 s ≤ t_1 ≤ 144 s, step 3 s t_1 at 3 x I_1	Release between 1.05 and 1.2 I_1	±10% $I_g \le 6$ x I_n
S (t = k)	✓	0.6 x $I_n \le I_2 \le 10$ x I_n 0.6 x $I_n \le I_2$ startup ≤ 10 x I_n step 0.1 x I_n	Min. 0.05 s ≤ t_2 ≤ 0.8 s, step 0.01 s 0.10 s ≤ t_2 startup <30 s, step 0.01 s 0.04 s ≤ t_2 sel ≤ 0.20 s, step 0.01 s	± 7% $I_g \le 6$ x I_n; ± 10% $I_g > 6$ x I_n	The best of ± 10% or ± 40 ms
S (t = k/I^2)	✓	0.6 x $I_n \le I_2 \le 10$ x I_n; step 0.1 x I_n	0.05 s ≤ t_2 ≤ 0.8 s, step 0.01 at 10 x I_n	± 7% $I_g \le 6$ x I_n; ± 10% $I_g > 6$ x I_n	± 15% $I_g \le 6$ x I_n; ± 20% $I_g > 6$ x I_n
I (t = k)	✓	1.5x $I_n \le I_3 \le 15$ x I_n; step 0.1 x I_n	≤ 30 ms	± 10%	–

For all cases not covered in the Trip Threshold Tolerance Values table above, the tolerance values in the Tolerance Values table below apply.

Tolerance Values

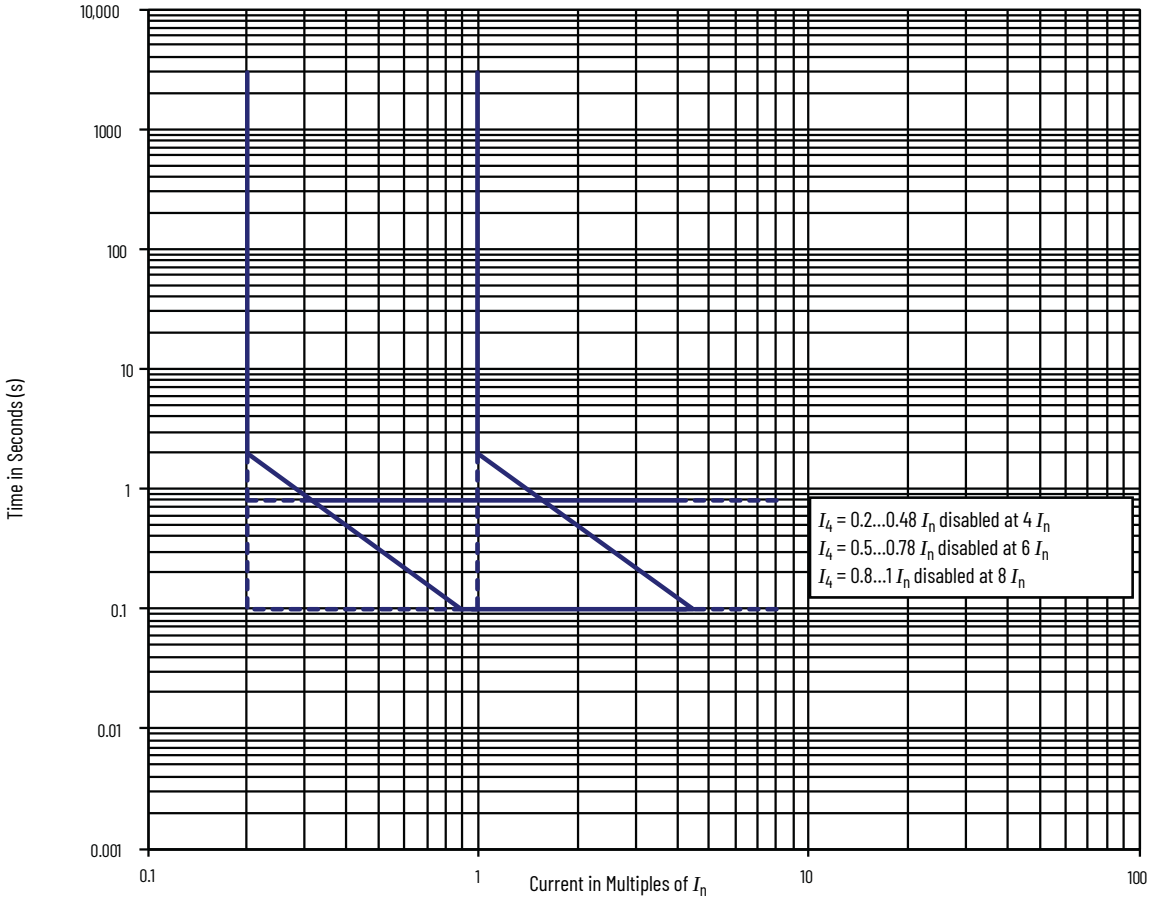
Protection	Trip Threshold	Trip Time
L	1.05 ≤ I_1 ≤ 1.25	± 20%
S	± 10%	± 20%
I	± 15%	≤ 60 ms
Others	± 20%	–

Notes:

1. The minimum value of this trip is 1 second regardless of curve type (self-protection)
2. These tolerances apply under the following conditions:
   - self-powered relay at full power (without start-up)
   - presence of auxiliary power supply
   - two-phase or three-phase power supply
   - preset trip time ≥ 100 ms
3. The value of this trip is ensured between 40 and 500 ms from circuit breaker closing; you must set this value yourself.
4. Curve accuracy applies from -20...+55 °C (-4...+131 °F) ambient temperature. For possible continuous ampere derating for ambient temperature above 40 °C (104 °F), consult your local Rockwell Automation sales office or Allen-Bradley distributor.
5. The right portion of the curve is determined by the interrupting rating of the circuit breaker.
6. Total clearing times shown include the response times of the trip unit, the breaker opening, and the interruption of the current.
7. For high fault current levels, an additional fixed instantaneous hardware override is provided at 18 kA.

Figure 51 - 140G-N, 140G-NS Ground Fault Protection Curve for LSIG-MM MCCBs

- Maximum voltage: 600V AC, 50/60 Hz
- Trip unit rated current (I_n): 400 A, 600 A, 800 A, 1000 A, 1200 A, 1250 A (IEC)



Trip Threshold Tolerance Values					
Protection	**Disable**	**Trip Threshold**	**Trip Time**	**Trip Threshold Tolerance**	**Trip Time Tolerance**
G (t = k)	✓	0.2 x $I_n \le I_4 \le 1$ x I_n step 0.02 x I_n when $I > I_4$	0.1 s ≤ t_4 ≤ 1 s, step 0.05 s 0.10 s ≤ t_4 startup ≤ 1 s, step 0.02 s 0.04 s ≤ t_4 sel ≤ 0.20 s, step 0.01 s	±7%	The best of ±10% or ±40 ms
G (t = k/I^2)	✓	0.2 x $I_n \le I_4 \le 1$ x I_n step 0.02 x I_n	0.1 s ≤ t_4≤ 1 s, step 0.05 at I_g > 4x I_n	±7%	±15%

For all cases not covered in the Trip Threshold Tolerance Values table above, the tolerance values in the Tolerance Values table below apply.

Tolerance Values		
Protection	**Trip Threshold**	**Trip Time**
G	± 10%	± 20%
Others	± 20%	–

Ground Fault Protection (I_4) is suppressed at the following levels, where the breaker uses Instantaneous Protection (I_1) to achieve a faster response to these higher current levels

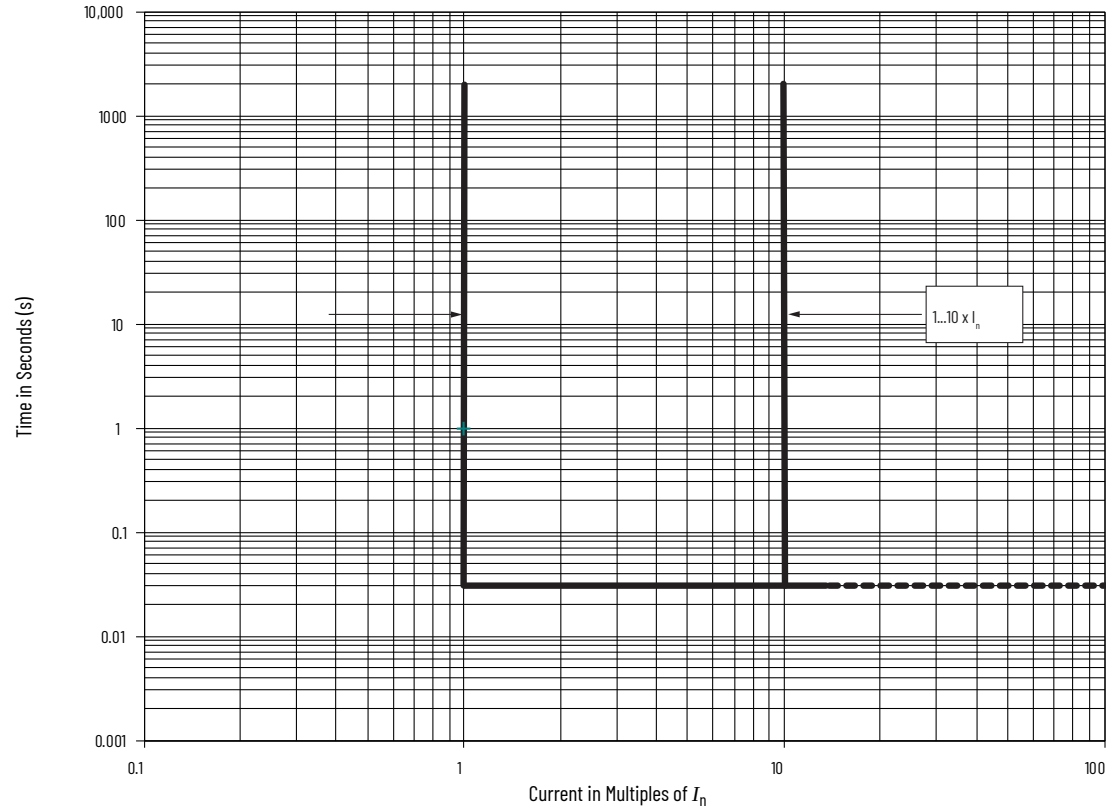
- I_4 = 0.2...0.4 I_n disabled at 4 x I_n
- I_4 = 0.6 x I_n disabled at 6 x I_n
- I_4 = 0.8...1 I_n disabled at 8 x I_n

Bulletin 140MG MCP Trip Curves

Motor circuit protectors are for use only in combination controllers. For DC applications, pick-up settings are approximately 40% higher.

Figure 52 - 140MG-K Time-current Curve

- Maximum voltage: 600V AC, (50/60 Hz)
- Maximum current: 300, 400 A



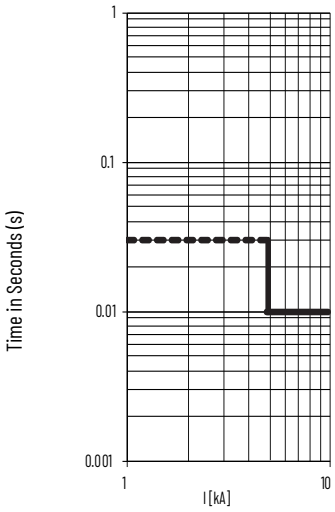
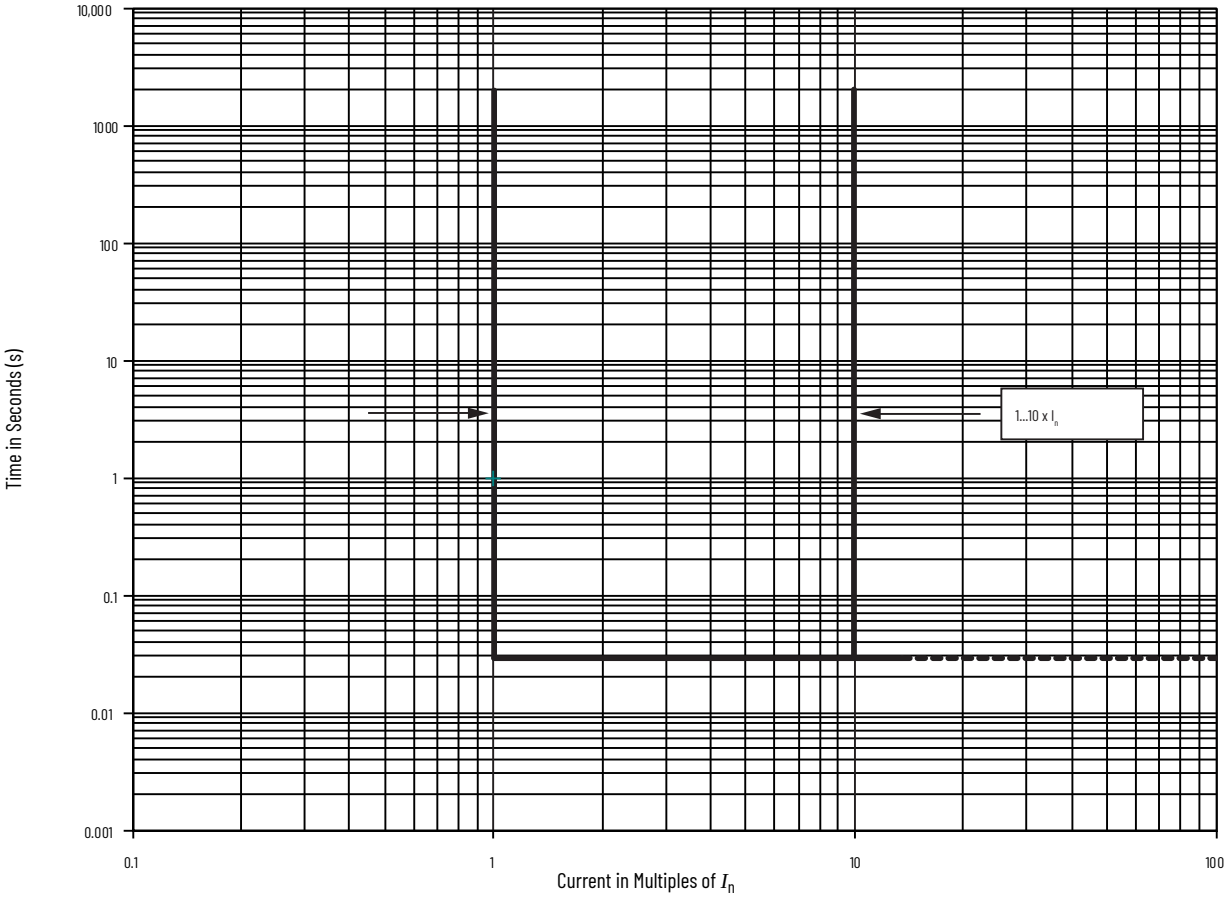


Figure 53 - 140MG-M Time-current Curve

- Maximum voltage: 600V AC, (50/60 Hz)
- Maximum current: 600, 800 A



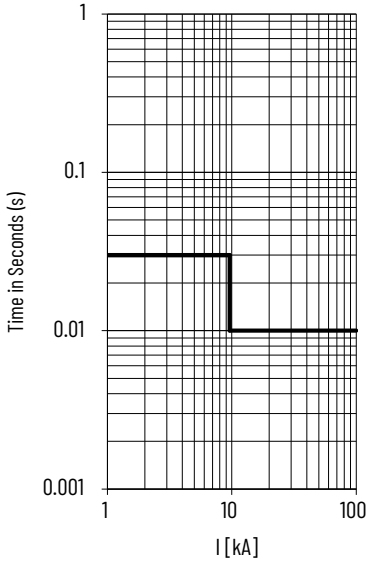
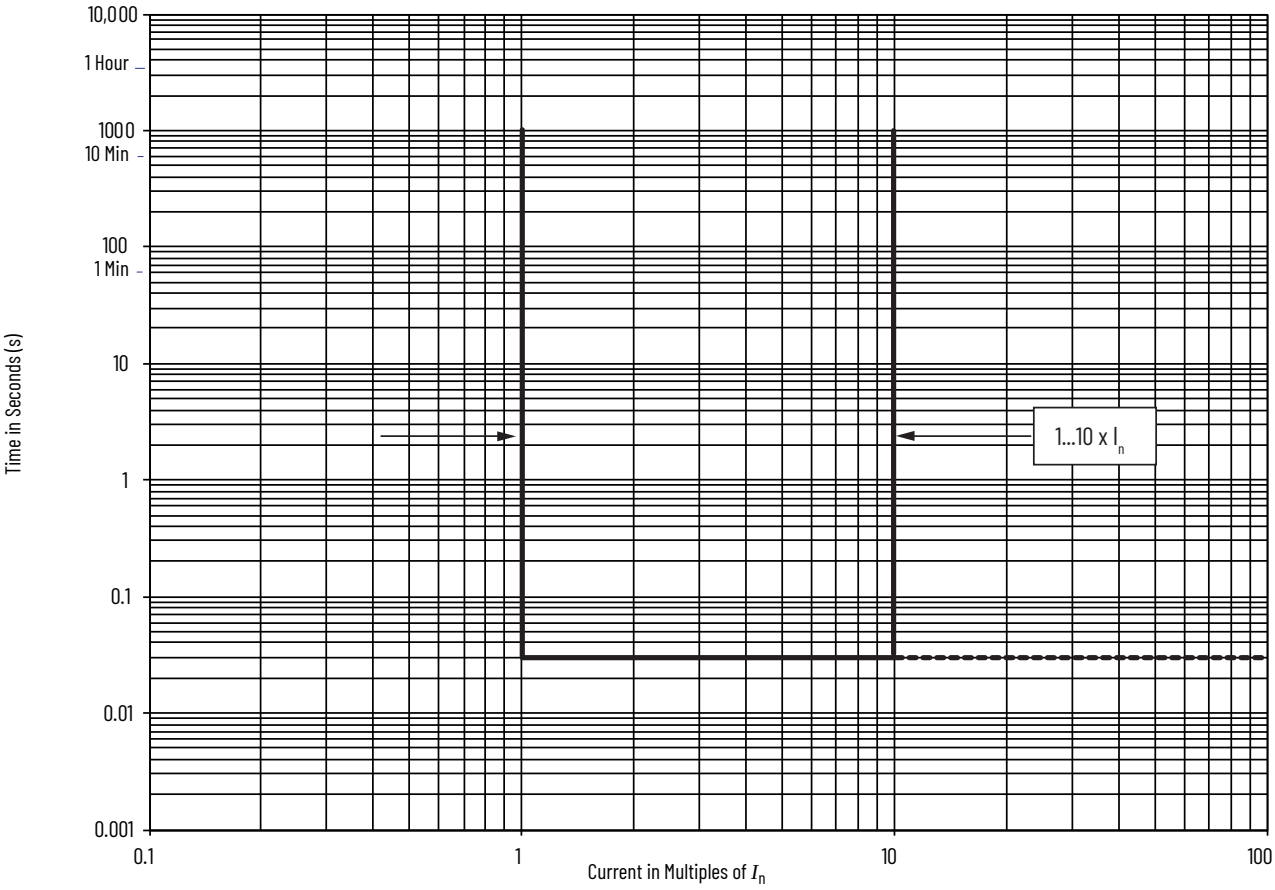
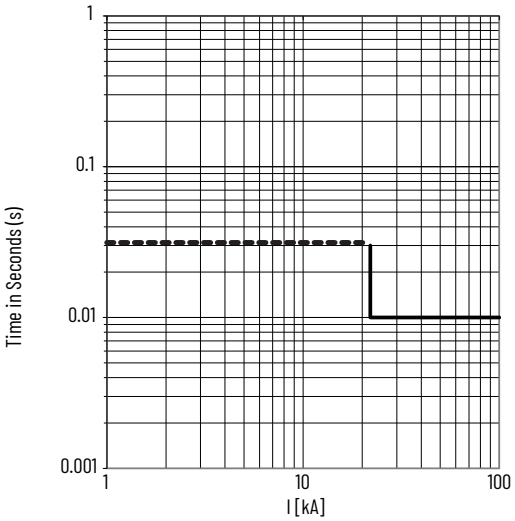


Figure 54 - 140MG-N Time-current Curve

- Maximum voltage: 600V AC, (50/60 Hz)
- Maximum current: 1200 A





Bulletin 140G MCCB Let-through Curves

Figure 55 - Total Let-through Energy Curve for MCCBs, 240V

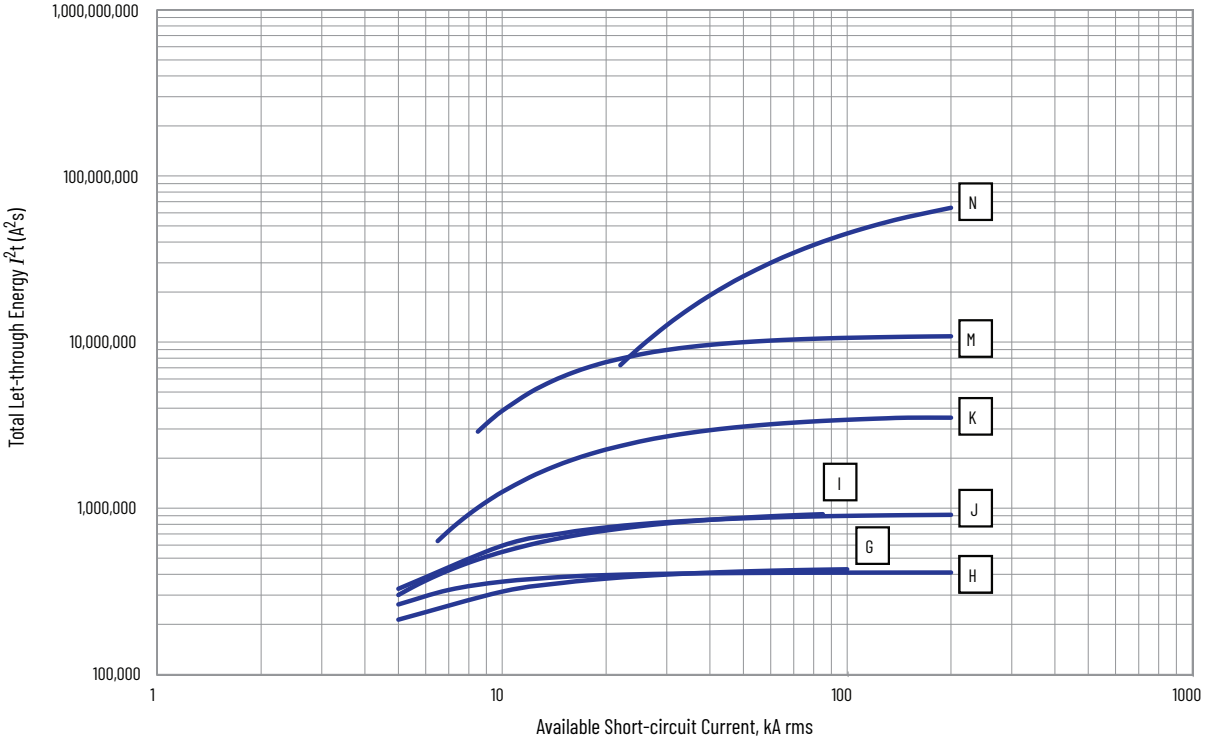


Figure 56 - Peak Let-through Current Curve for MCCBs, 240V

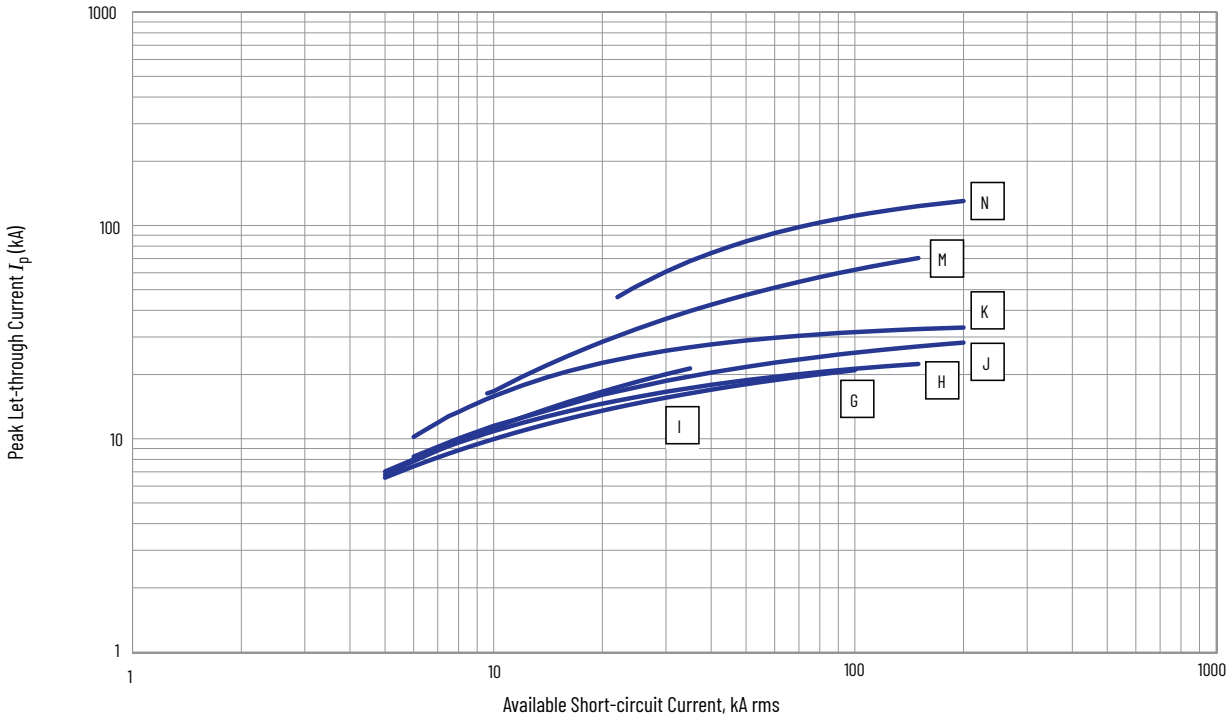


Figure 57 - Total Let-through Energy Curve for MCCBs, 415V

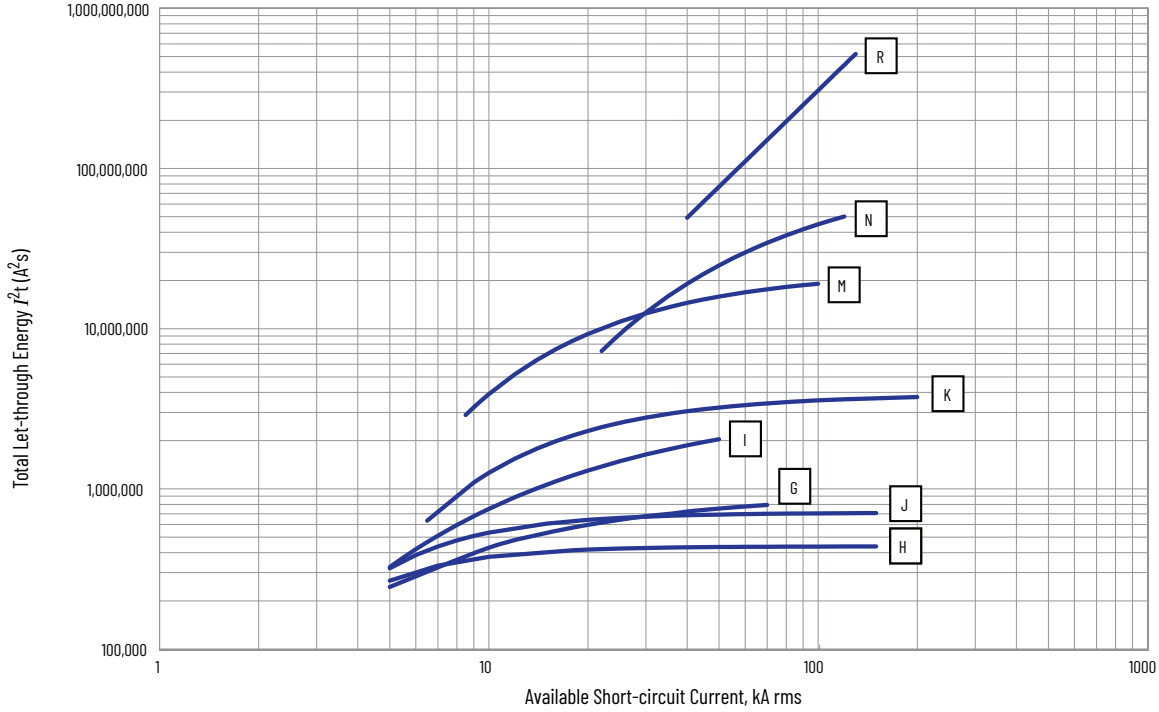


Figure 58 - Peak Let-through Current Curve for MCCBs, 415V

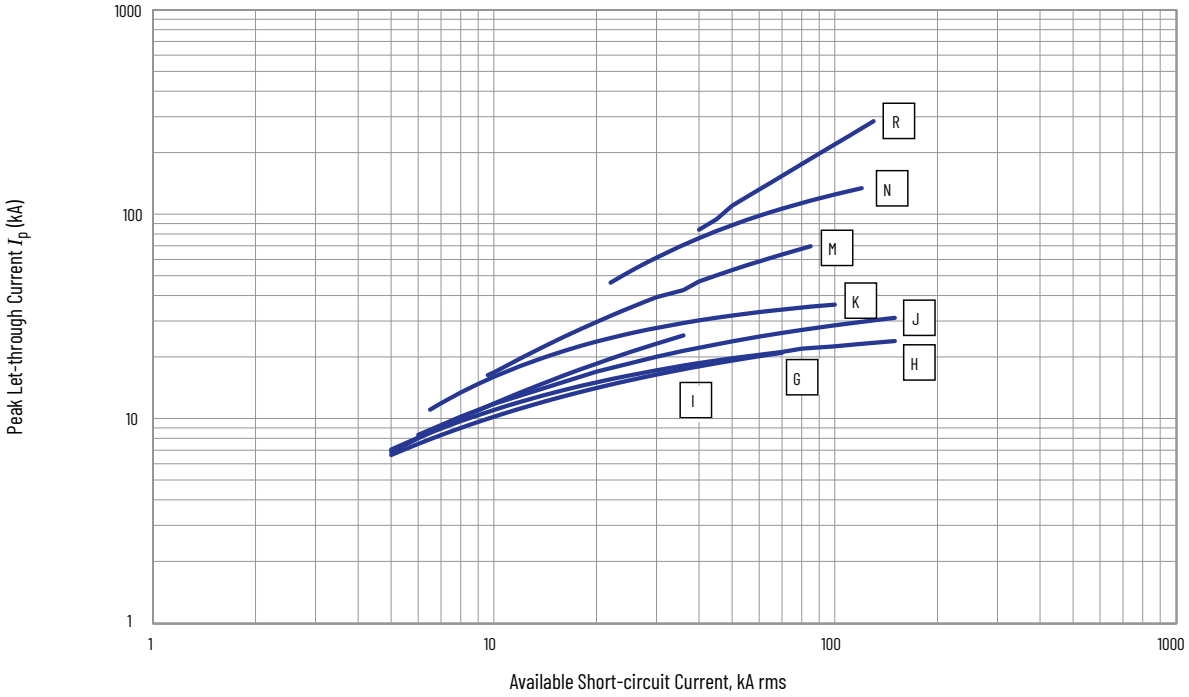


Figure 59 - Total Let-through Energy Curve for MCCBs, 480V

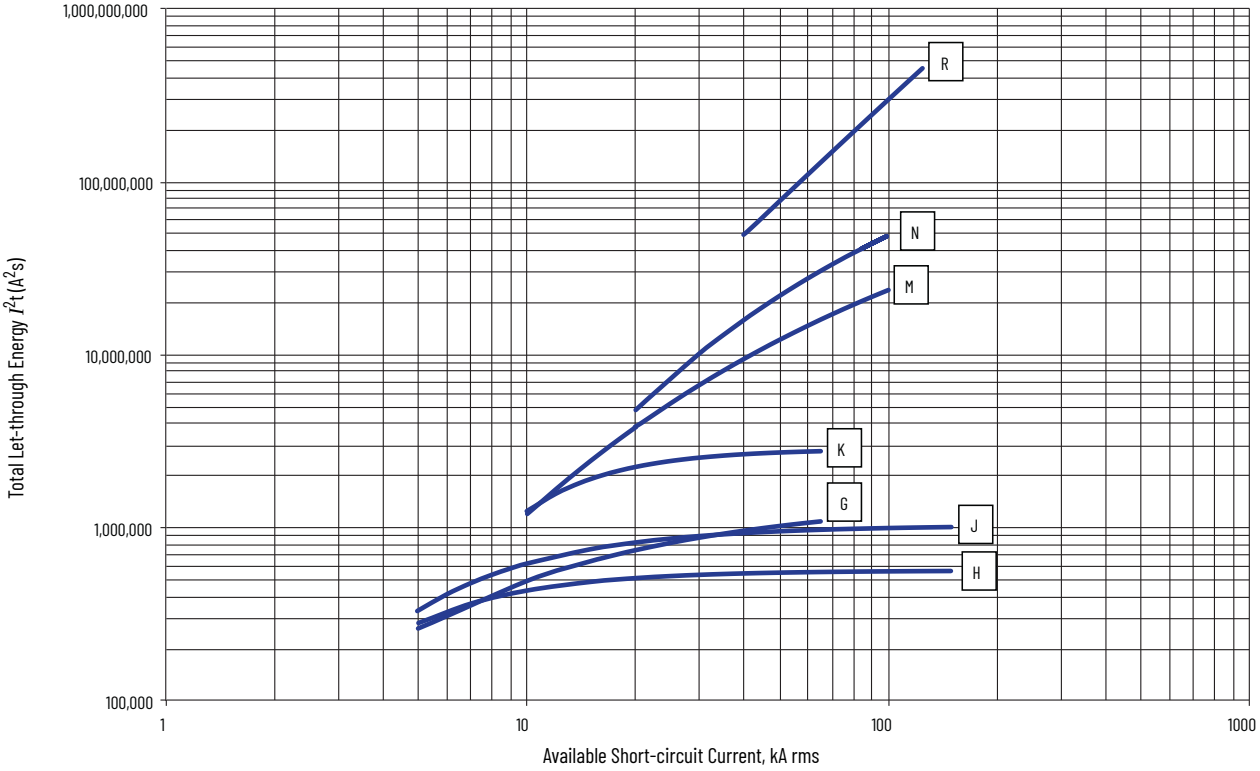


Figure 60 - Peak Let-through Current Curve for MCCBs, 480V

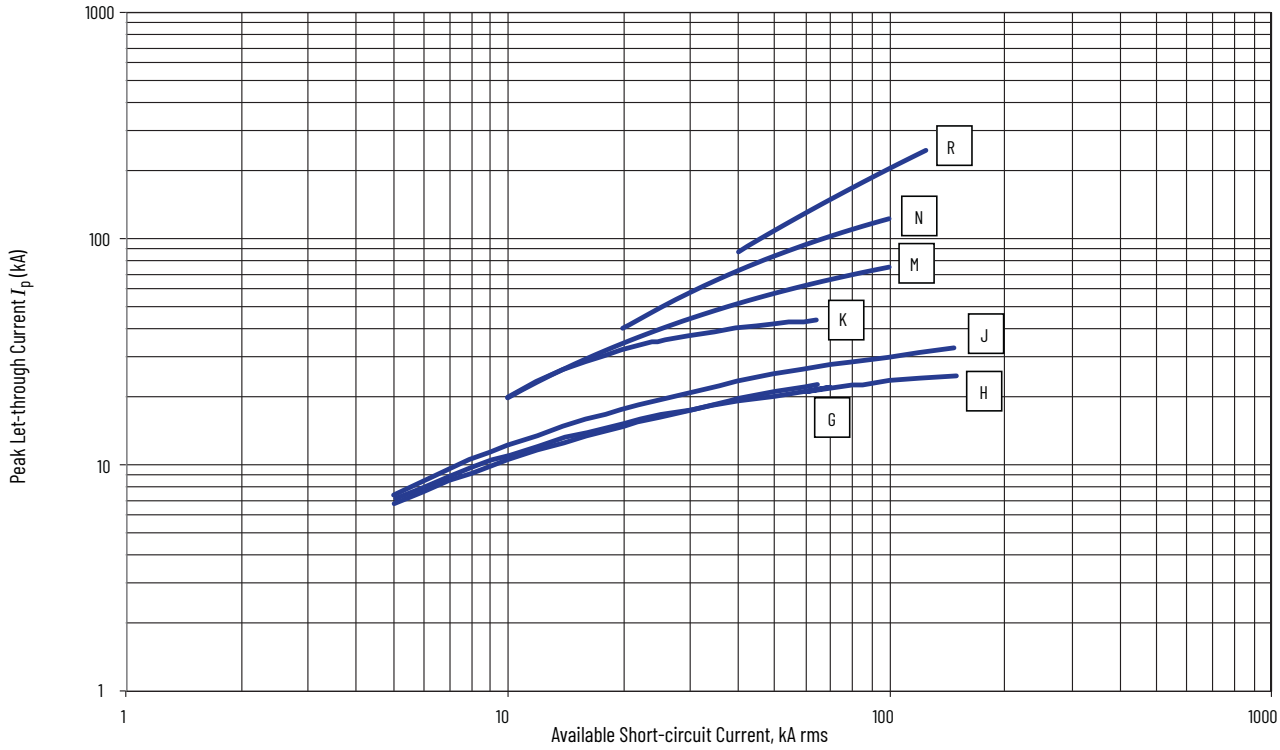


Figure 61 - Total Let-through Energy Curve for MCCBs, 500V

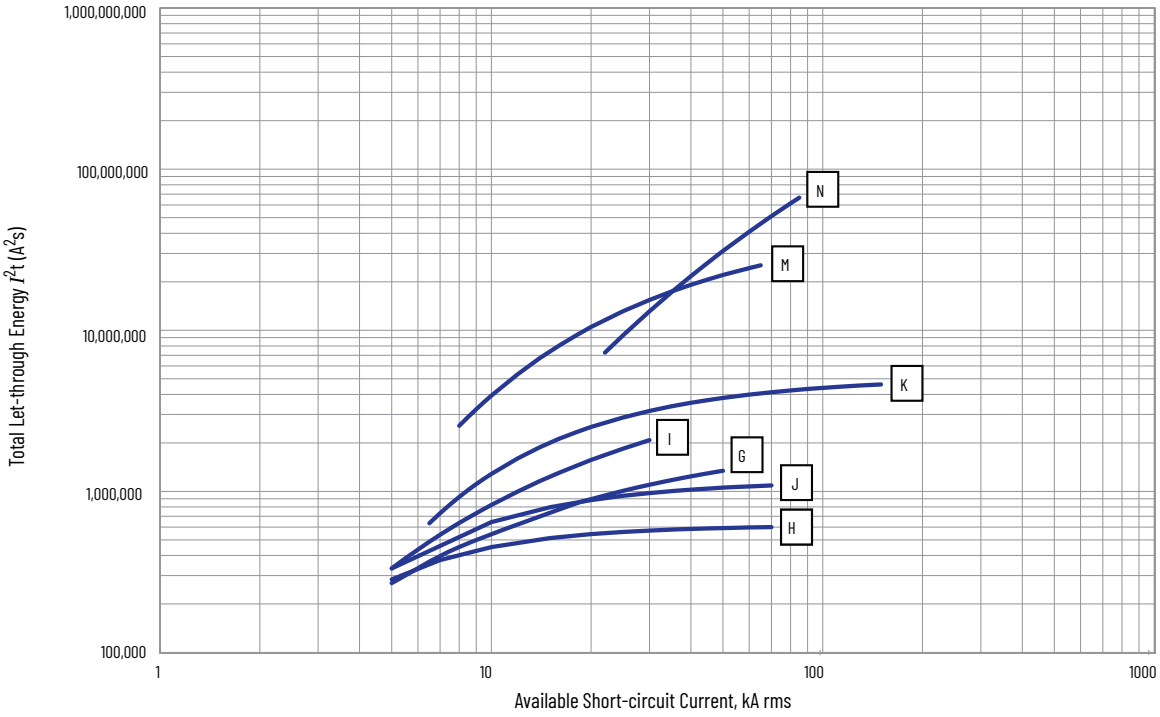


Figure 62 - Peak Let-through Current Curve for MCCBs, 500V

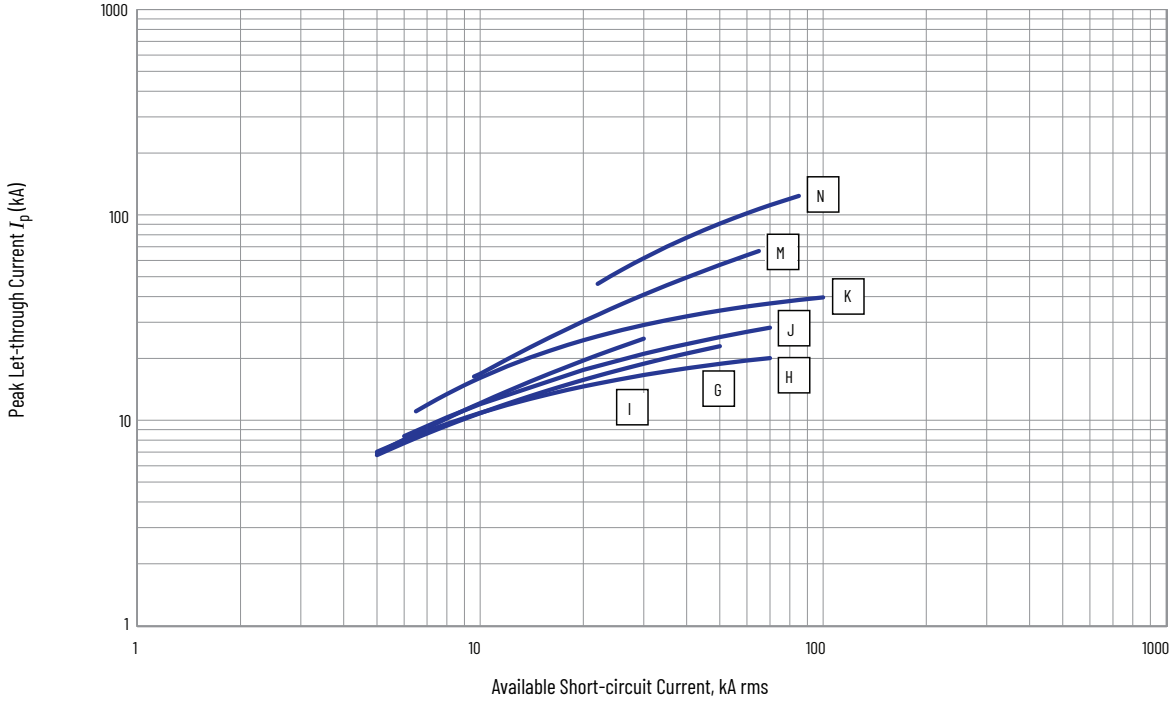


Figure 63 - Total Let-through Energy Curve for MCCBs, 600V

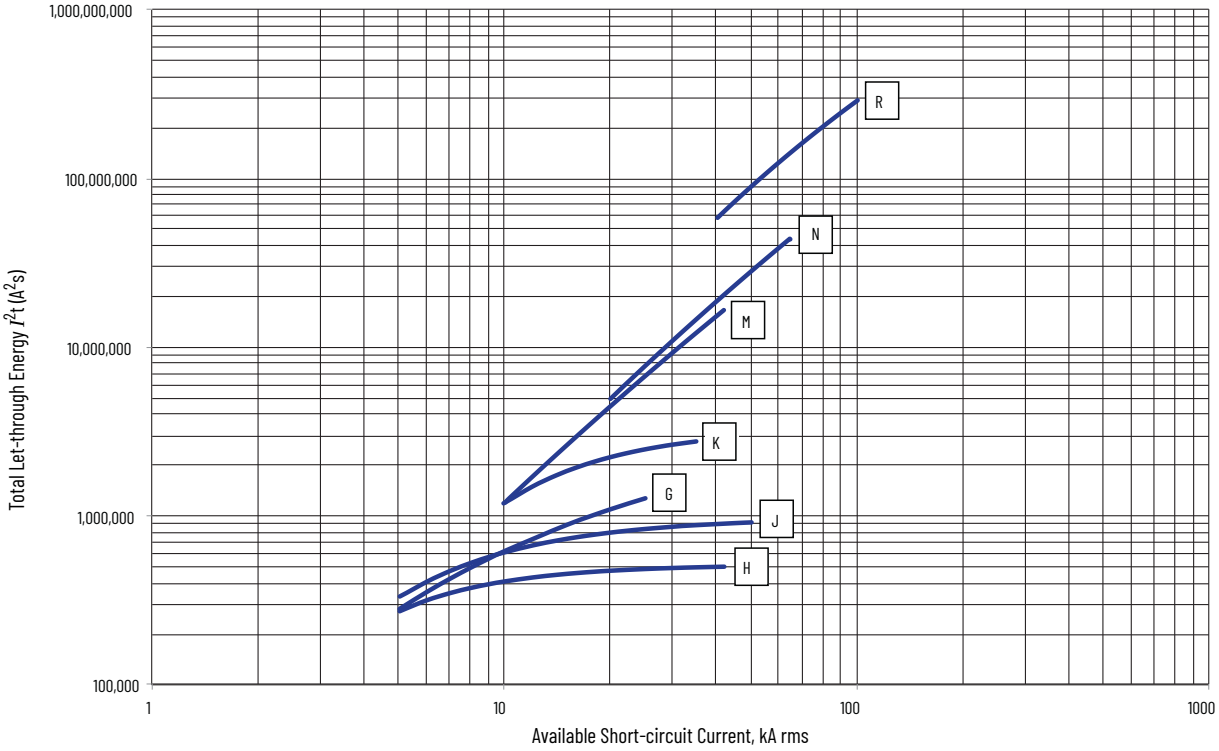


Figure 64 - Peak Let-through Current Curve for MCCBs, 600V

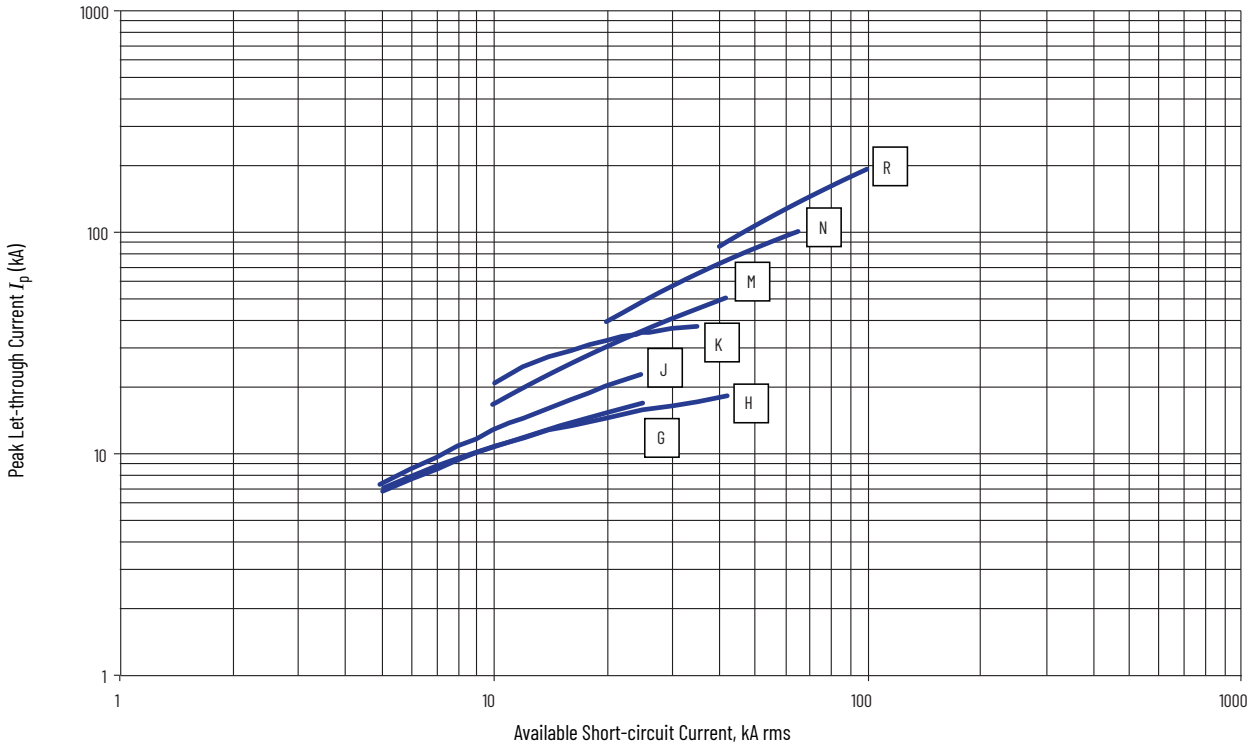


Figure 65 - Total Let-through Energy Curve for MCCBs, 690V

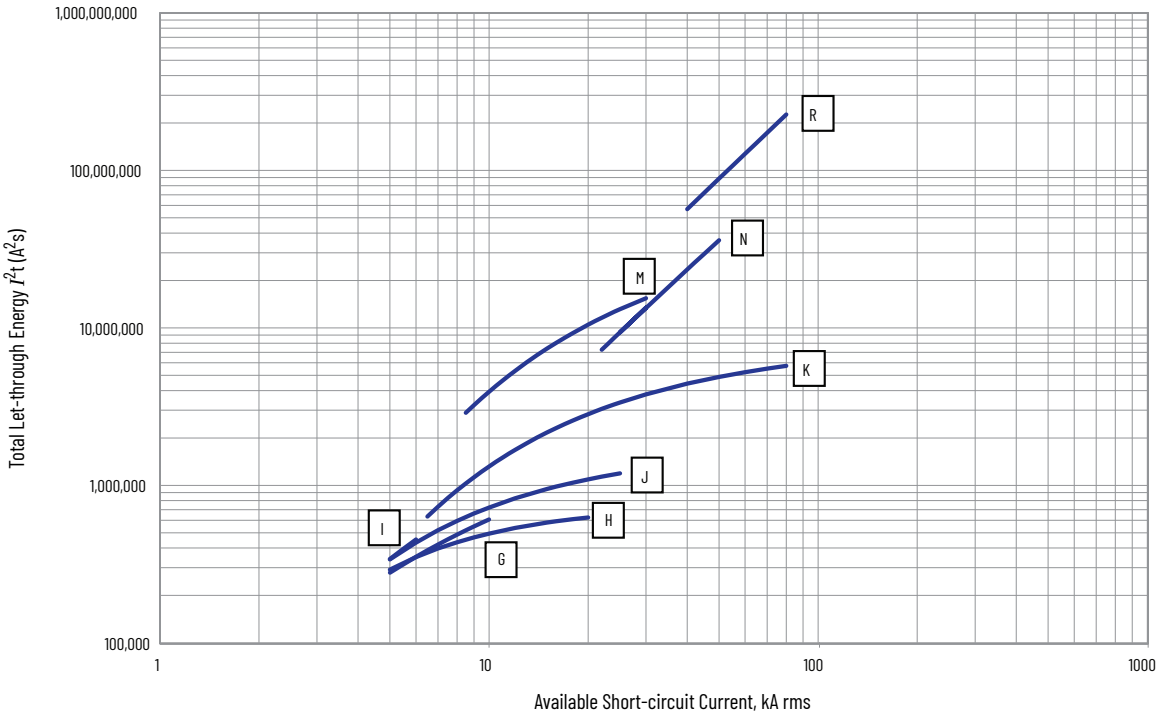
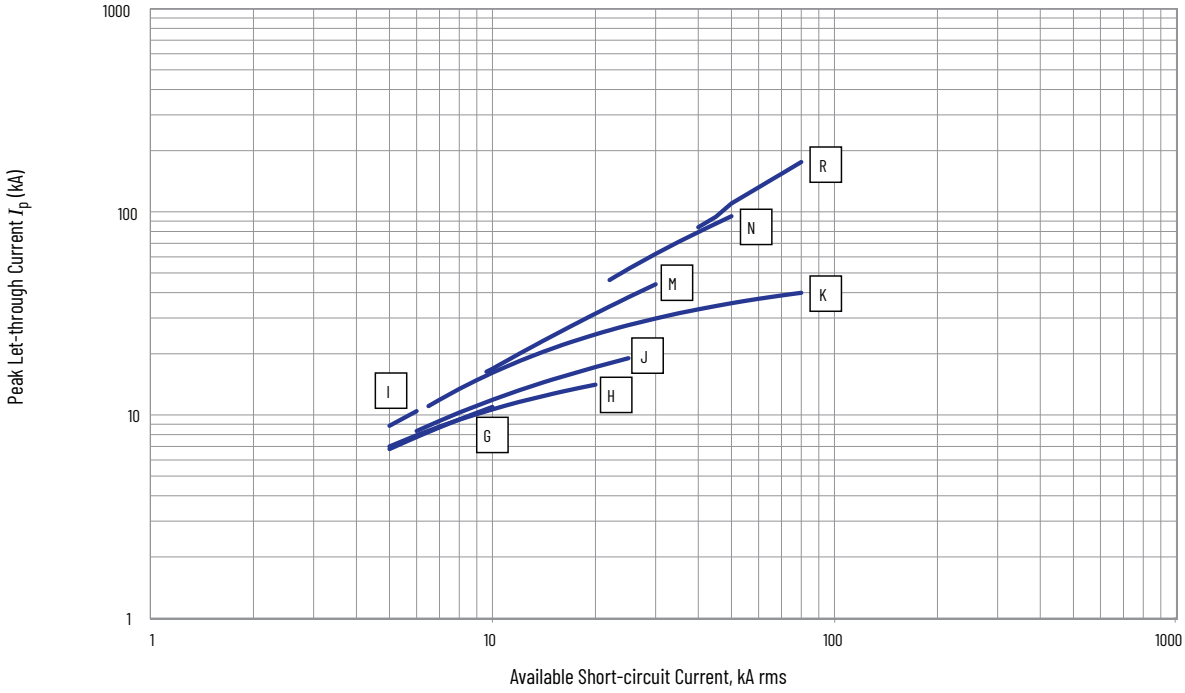


Figure 66 - Peak Let-through Current Curve for MCCBs, 690V



Bulletin 140G Current-limiting MCCB Total Let-through Curves

Figure 67 - Total Let-through Energy Curve for 65 kA Current-limiting MCCBs, 480V

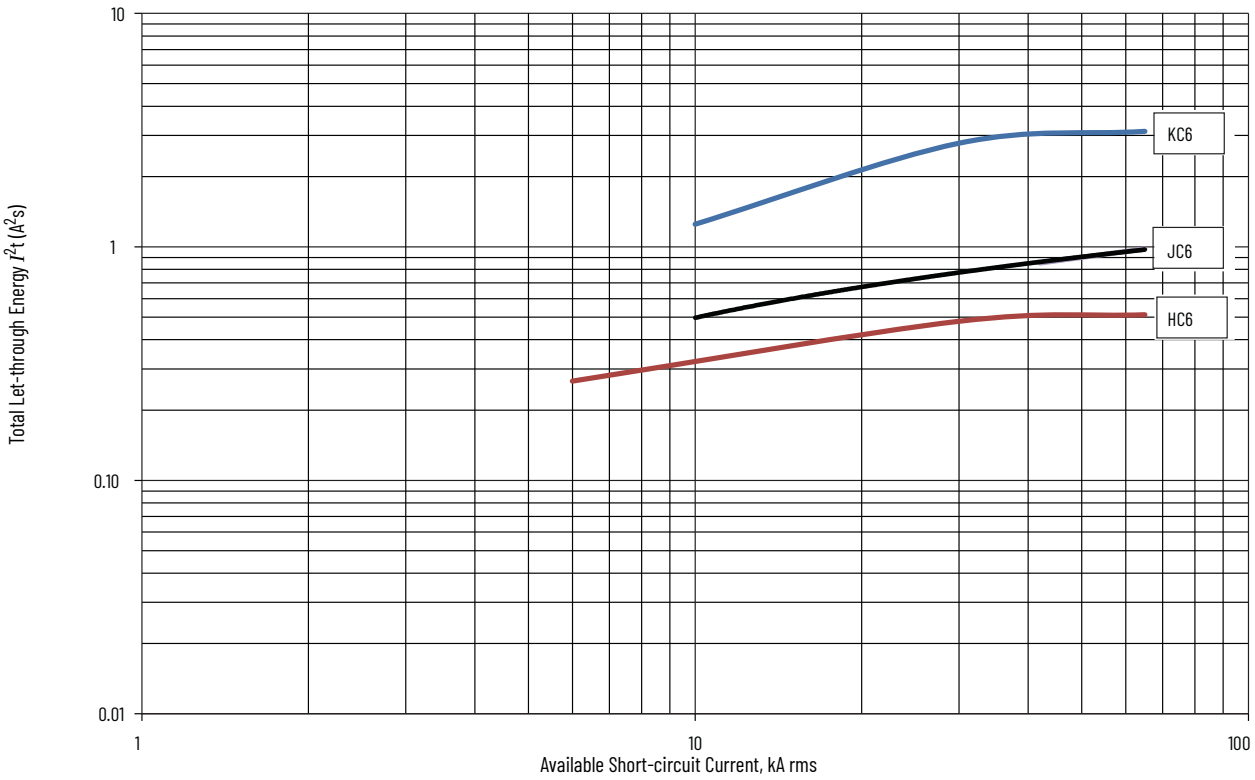


Figure 68 - Peak Let-through Current Curve for 65 kA Current-limiting MCCBs, 480V

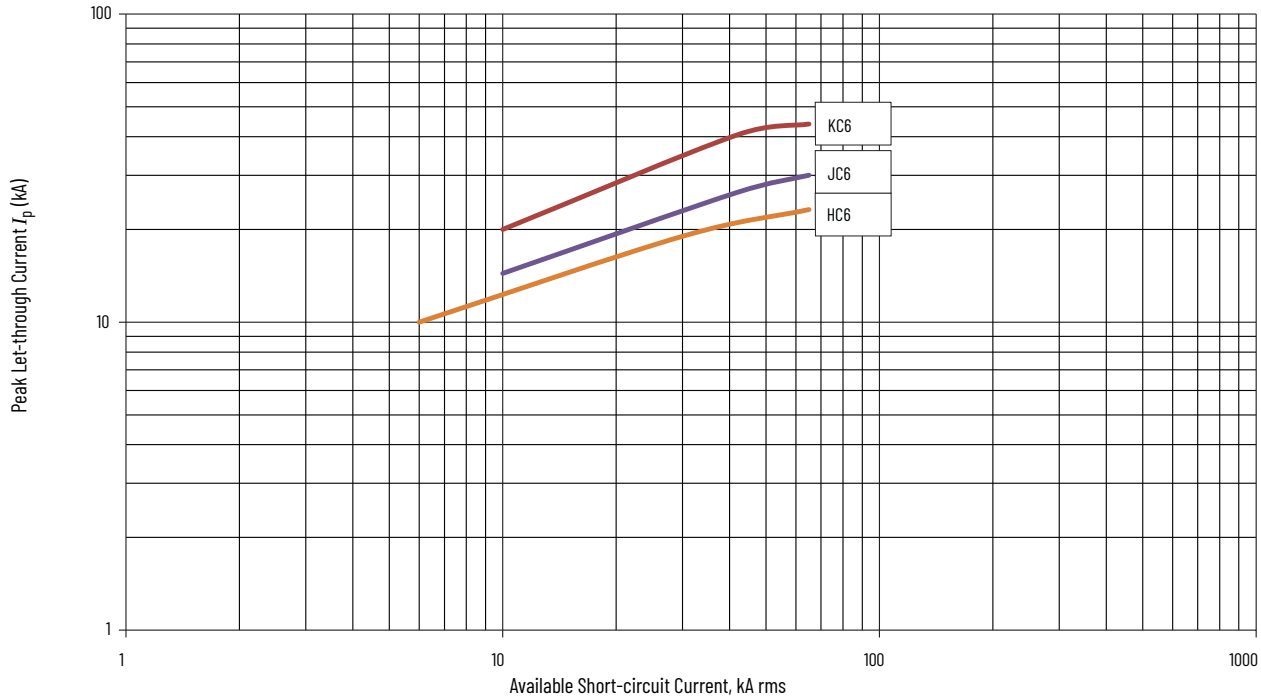


Figure 69 - Total Let-through Energy Curve for 100 kA Current-limiting MCCBs, 480V

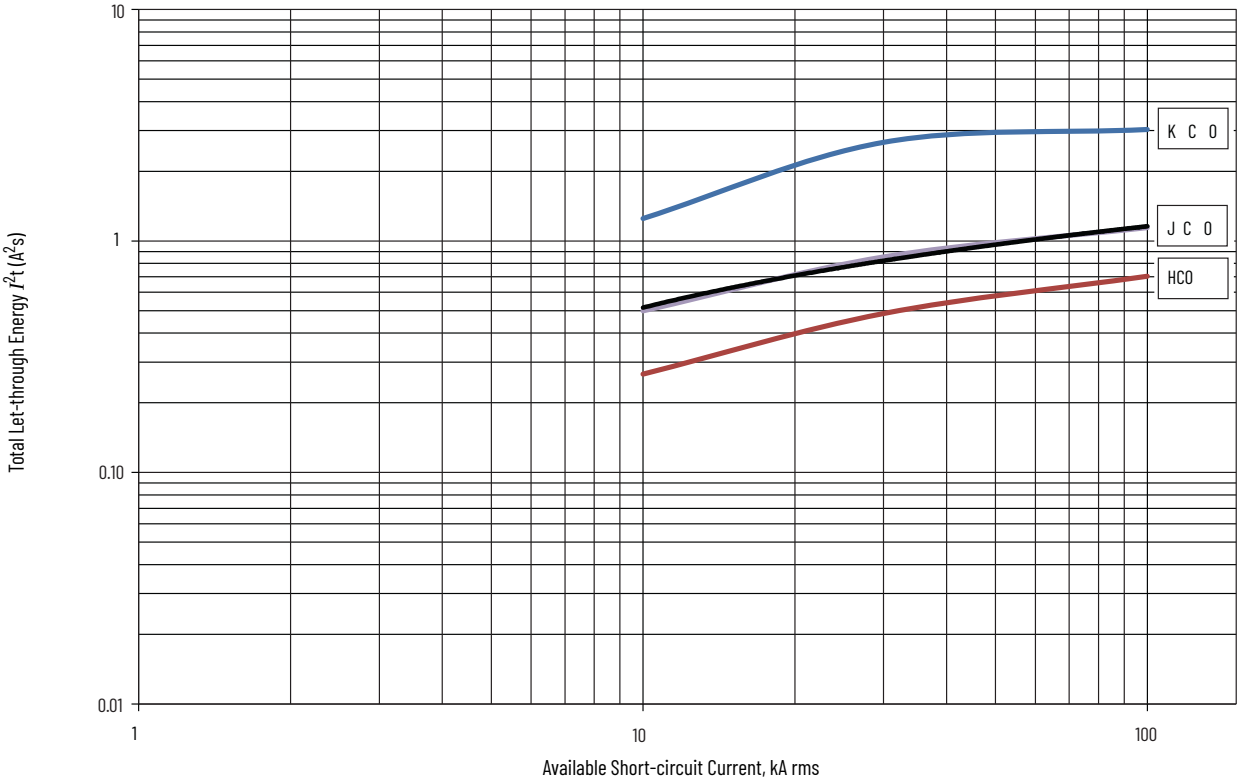


Figure 70 - Peak Let-through Current Curve for 100 kA Current-limiting MCCBs, 480V

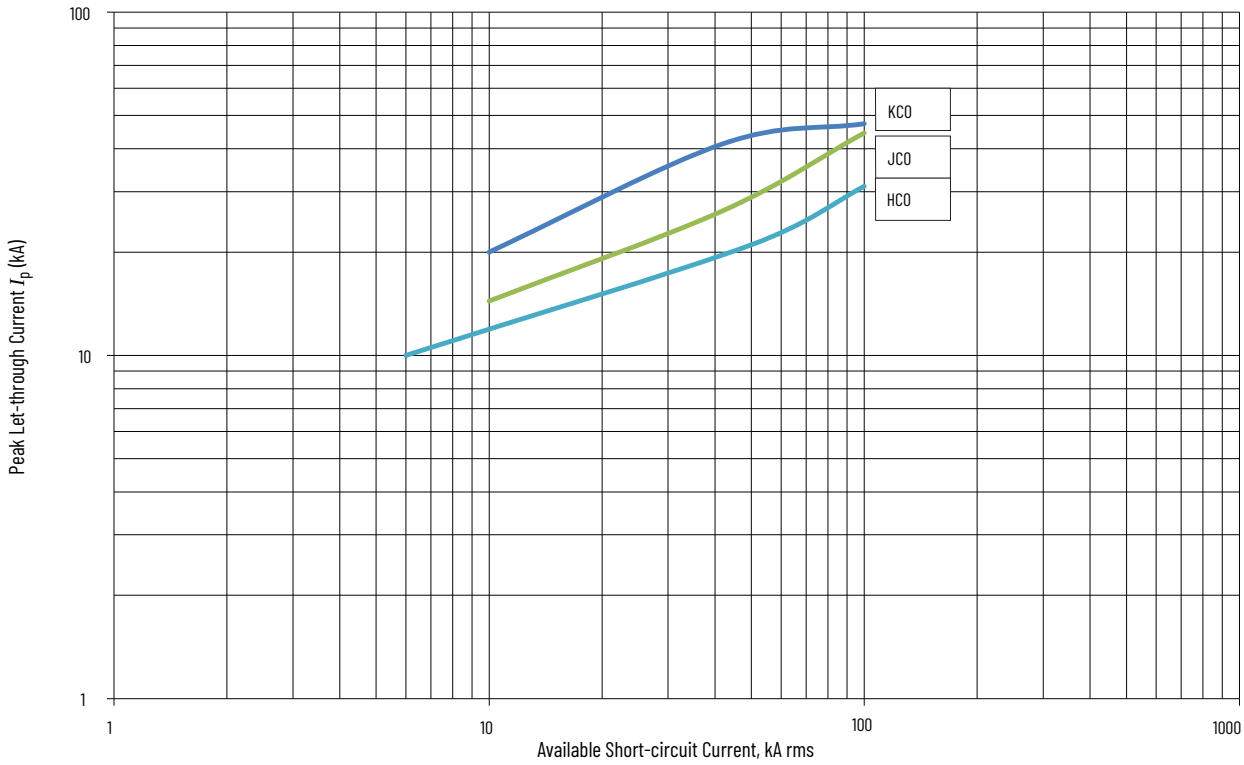


Figure 71 - Total Let-through Energy Curve for 65 kA Current-limiting MCCBs, 600V

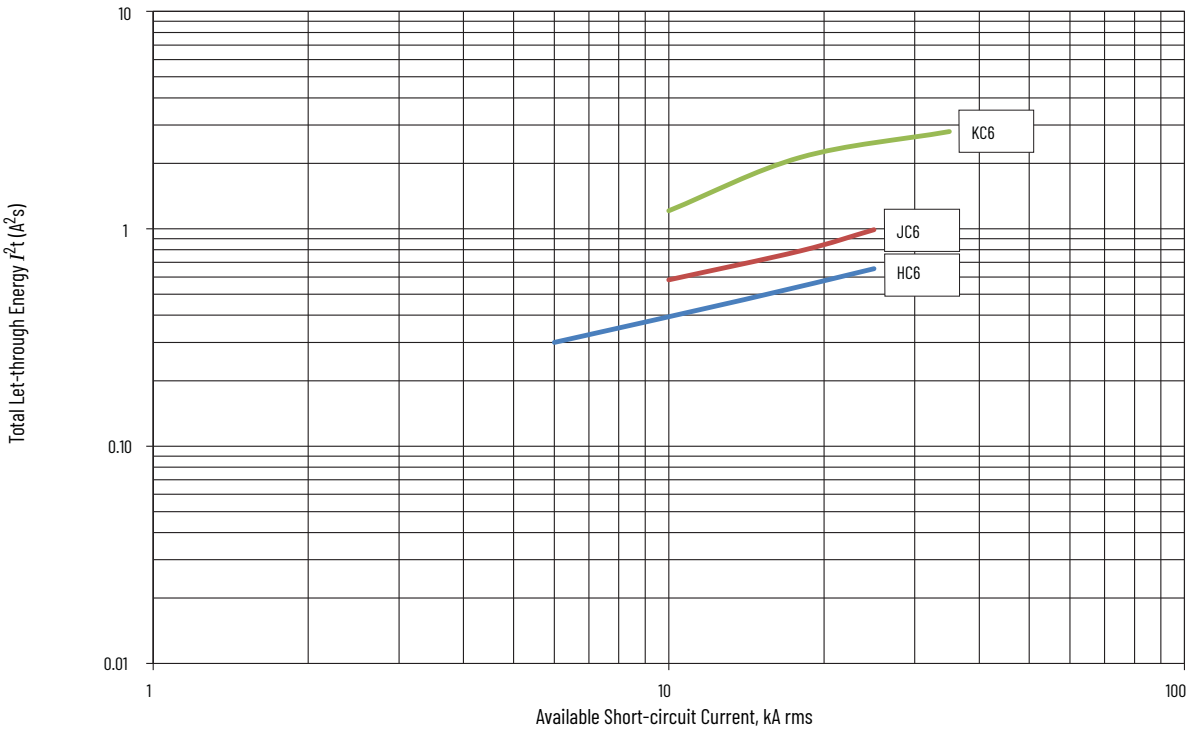


Figure 72 - Peak Let-through Current Curve for 65 kA Current-limiting MCCBs, 600V

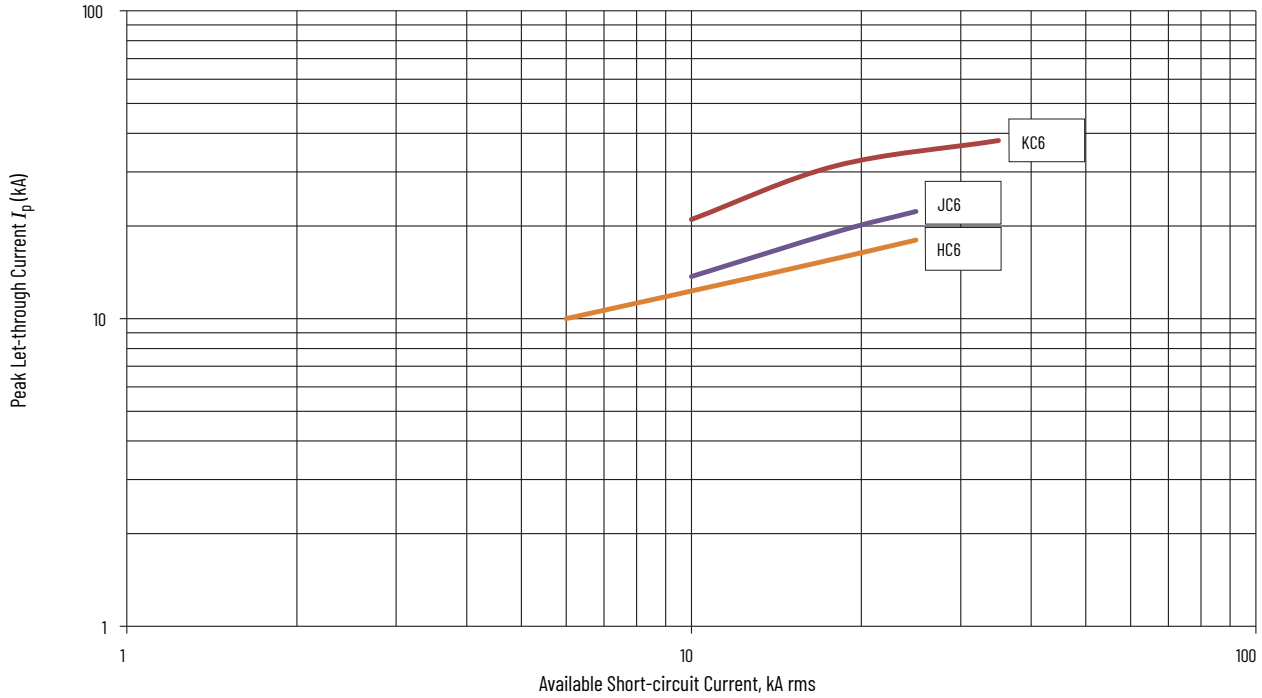


Figure 73 - Total Let-through Energy Curve for 100 kA Current-limiting MCCBs, 600V

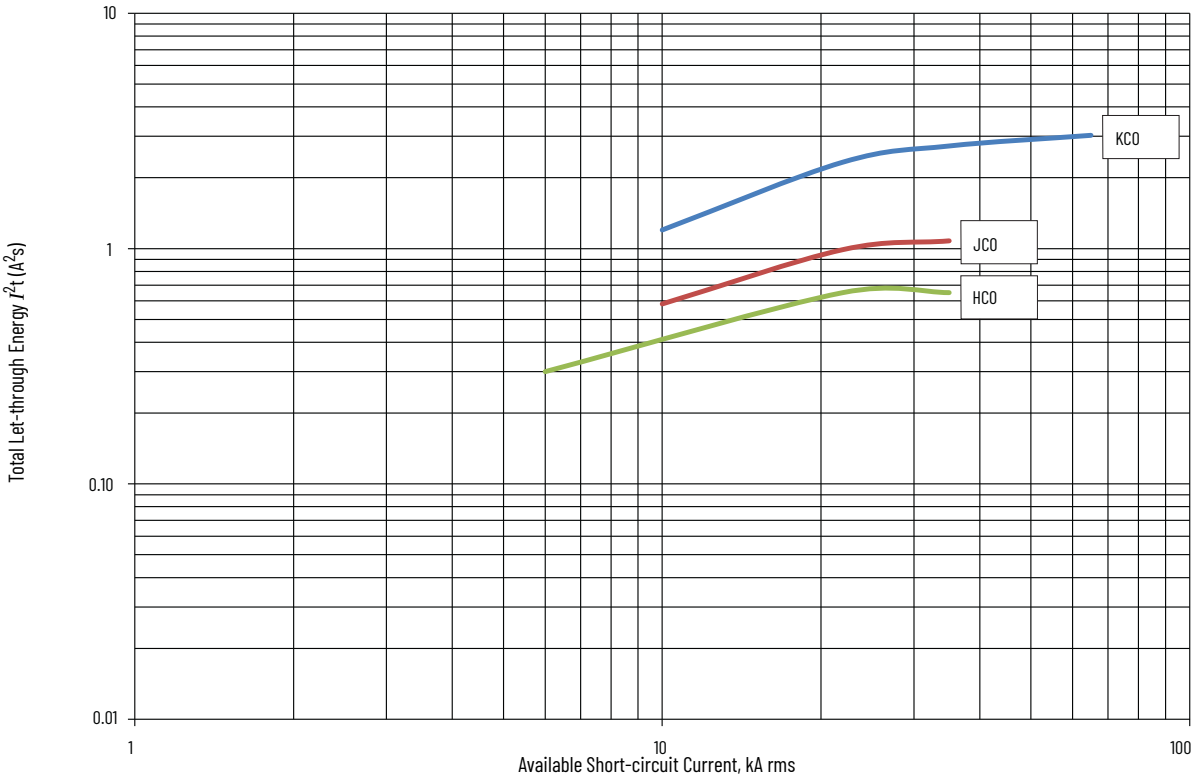
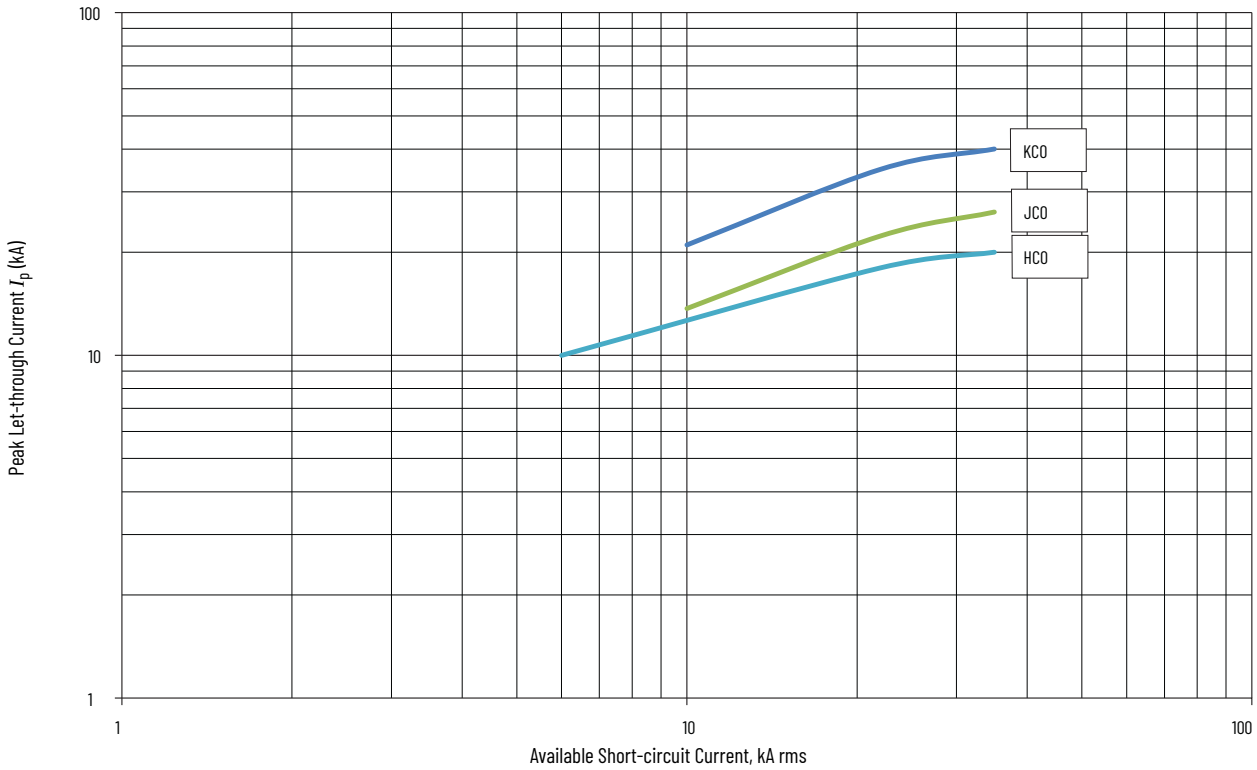


Figure 74 - Peak Let-through Current Curve for 100 kA Current-limiting MCCBs, 600V



Dimensions are in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. Dimension tolerances are ± 0.1 mm (0.004 in).

Bulletin 140G Frame Size K

Figure 75 - Panel-mounted MCCB

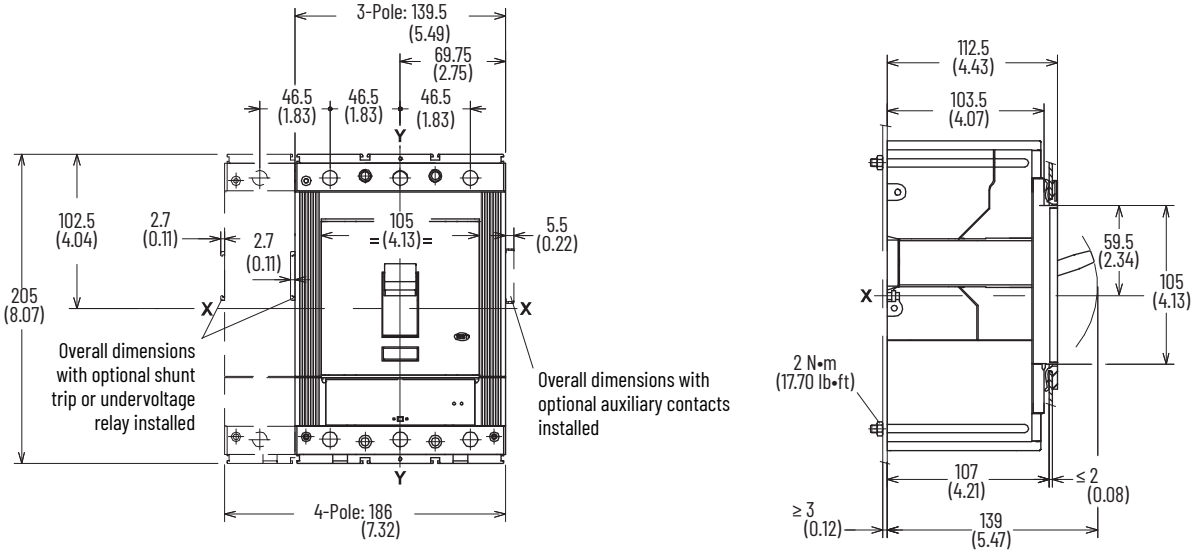


Figure 76 - Drilling Templates for MCCB Mounting

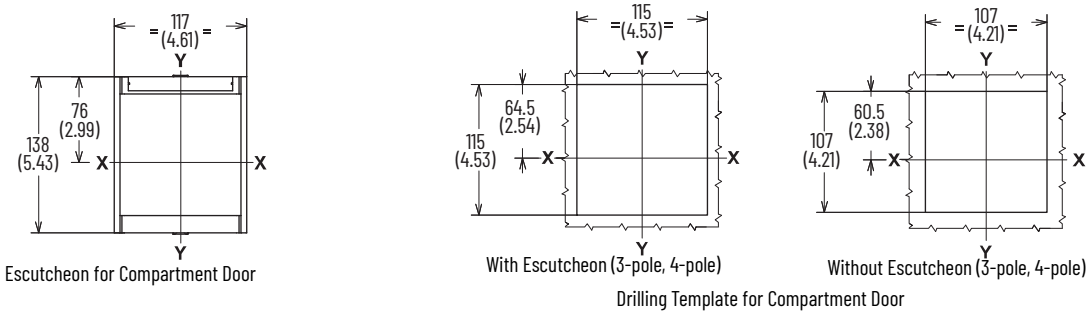


Figure 77 - Terminals: Cat. No. 140G-K-ECM, 140G-K-ECM4

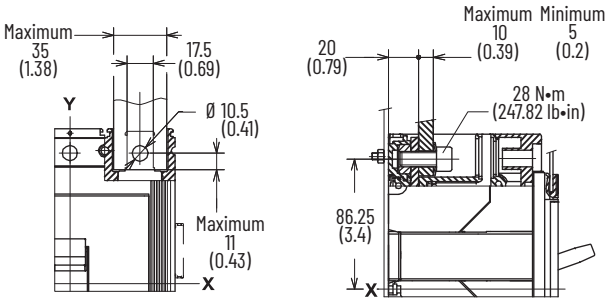
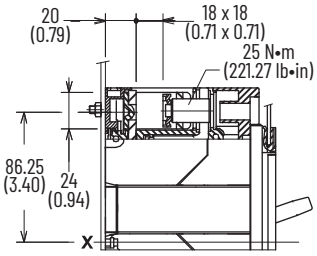
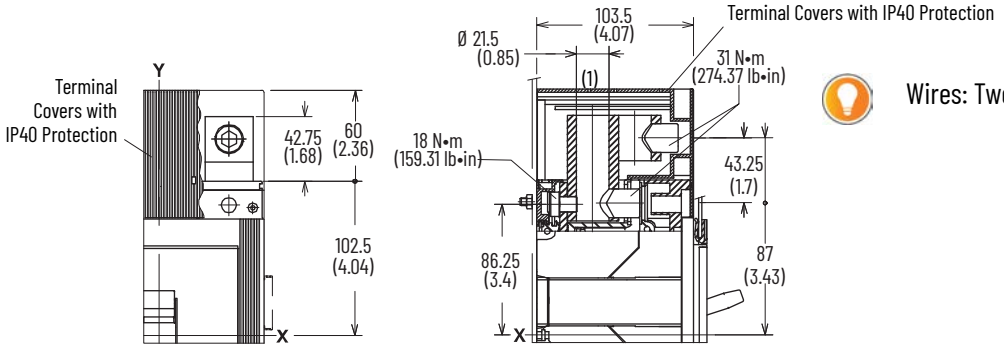


Figure 78 - Terminals: Cat. No. 140G-K-TLC13, 140-K-TLC14



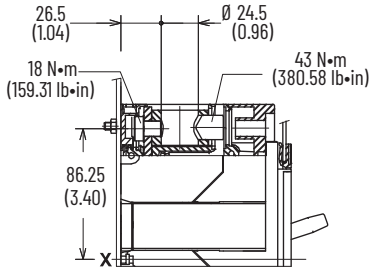
Wires: 250...500 MCM (120...240 mm^2)

Figure 79 - Terminals: Cat. No. 140G-K-TLA23, 140G-K-TLA24, 140G-K-TLC23, 140G-K-TLC24



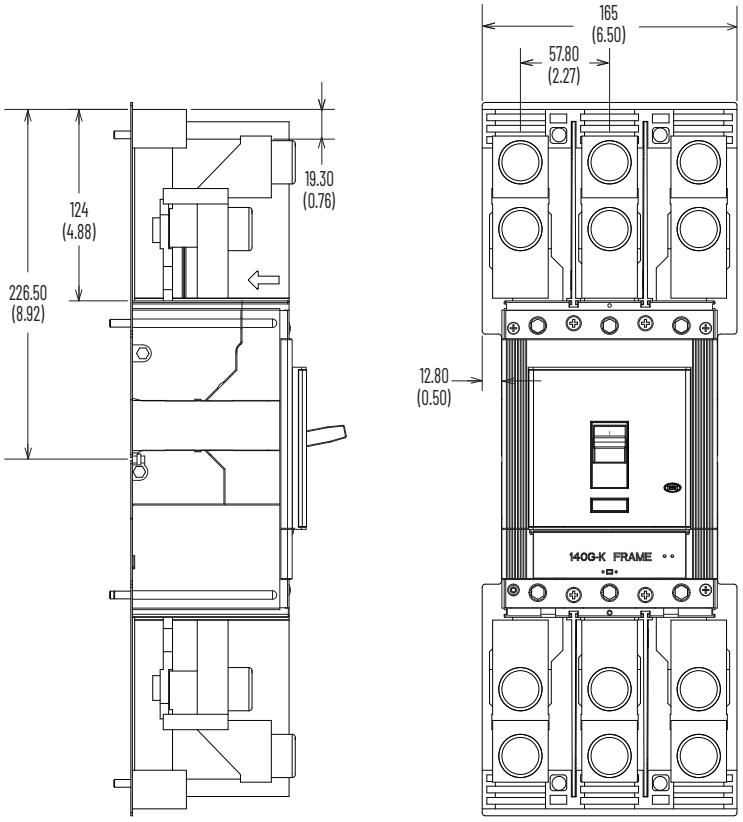
Wires: Two 2/0...250 MCM (95...120 mm^2)

Figure 80 - Terminals: Cat. No. 140G-K-TLA13, 140G-K-TLA14



Wires: 250...500 MCM (120...240 mm^2)

Figure 81 - Cat. No. 140G-K-TLA2A3 Terminals



Wires: Two 3/0...500 MCM (95...240 mm^2)

Figure 82 - Extended Terminals: Cat. No. 140G-K-EXT3, 140-K-EXT4

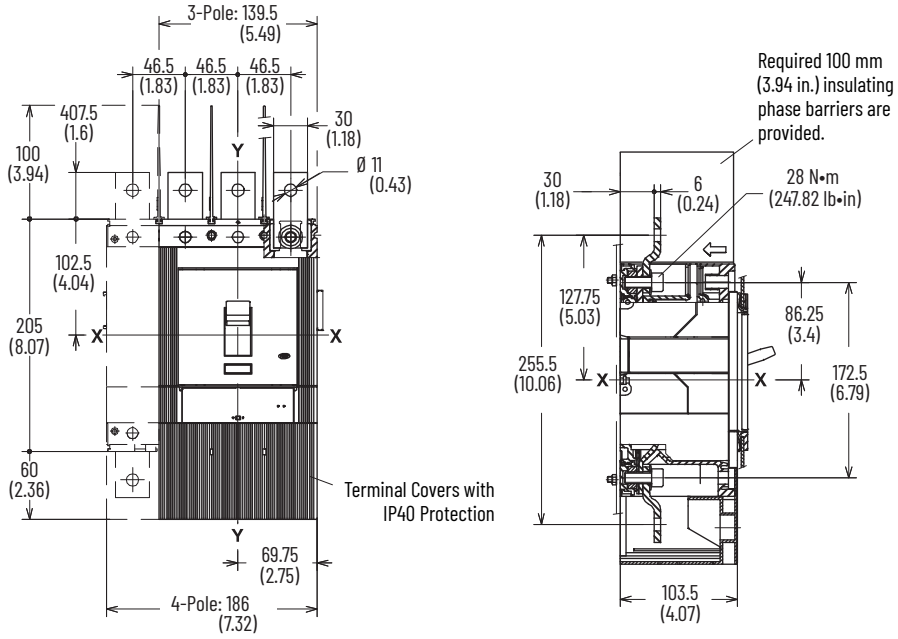


Figure 83 - Spreader Terminals: Cat. No. 140G-K-EXS3, 140G-K-EXS4

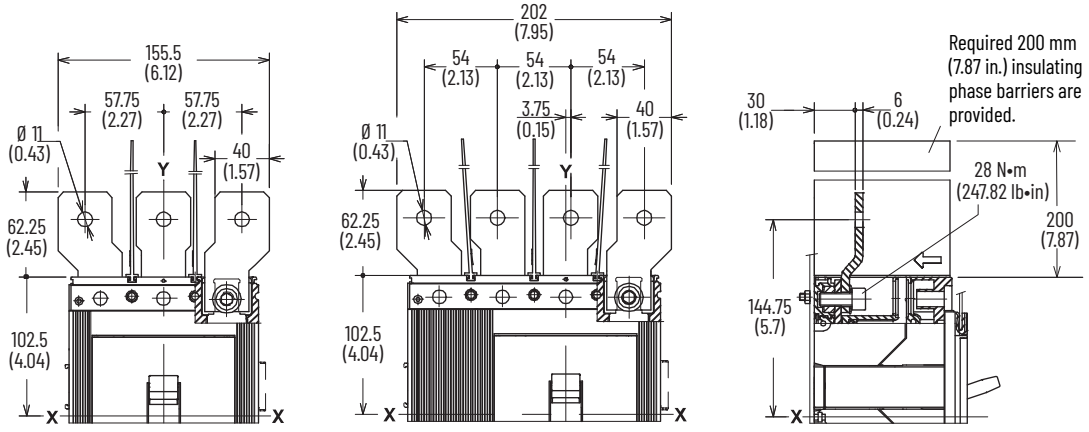


Figure 84 - Rotary Handle Operating Mechanism — Door Mounted: Cat. No. 140G-K-RMB, 140G-K-RMY

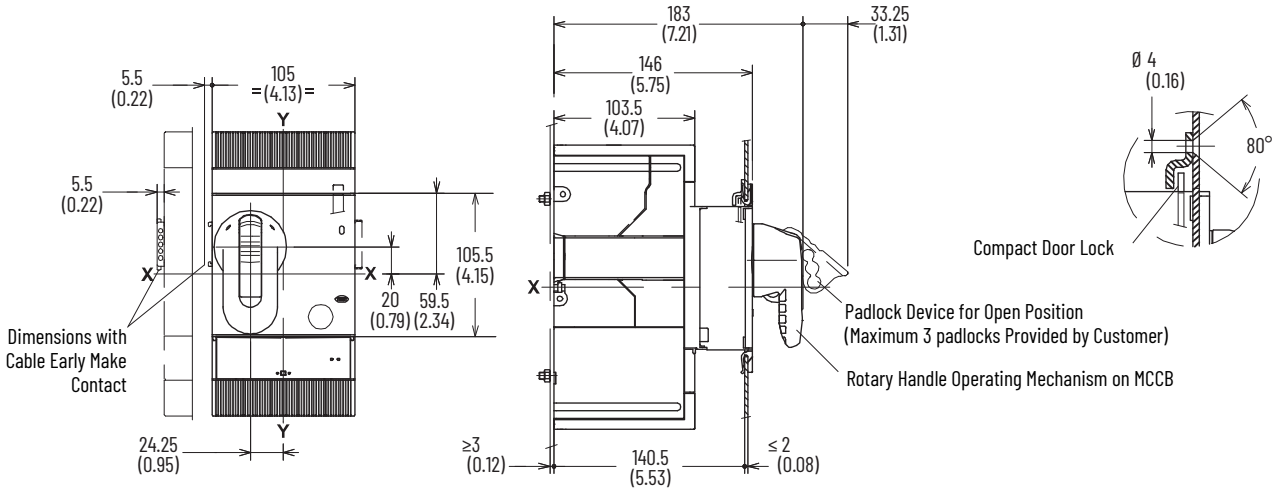
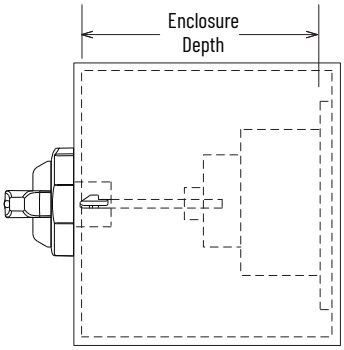


Figure 85 - Minimum/Maximum Enclosure Depth: Cat. No. 140G-K-RVM...



This figure depicts the minimum and maximum enclosure sizes that accommodate the MCCB, operator, and handle. See Figure 86 on page 127 for overall assembly dimensions and handle cutout.

Description	Minimum	Maximum
12 in Shaft	229 (9)	450 (17.75)
21 in Shaft		679 (26.75)
12 in Shaft with NFPA	280 (11)	450 (17.75)
21 in Shaft with NFPA		679 (26.75)

Figure 86 - Variable Depth Rotary Handle Operating Mechanism: Cat. No. 140G-K-RVM...

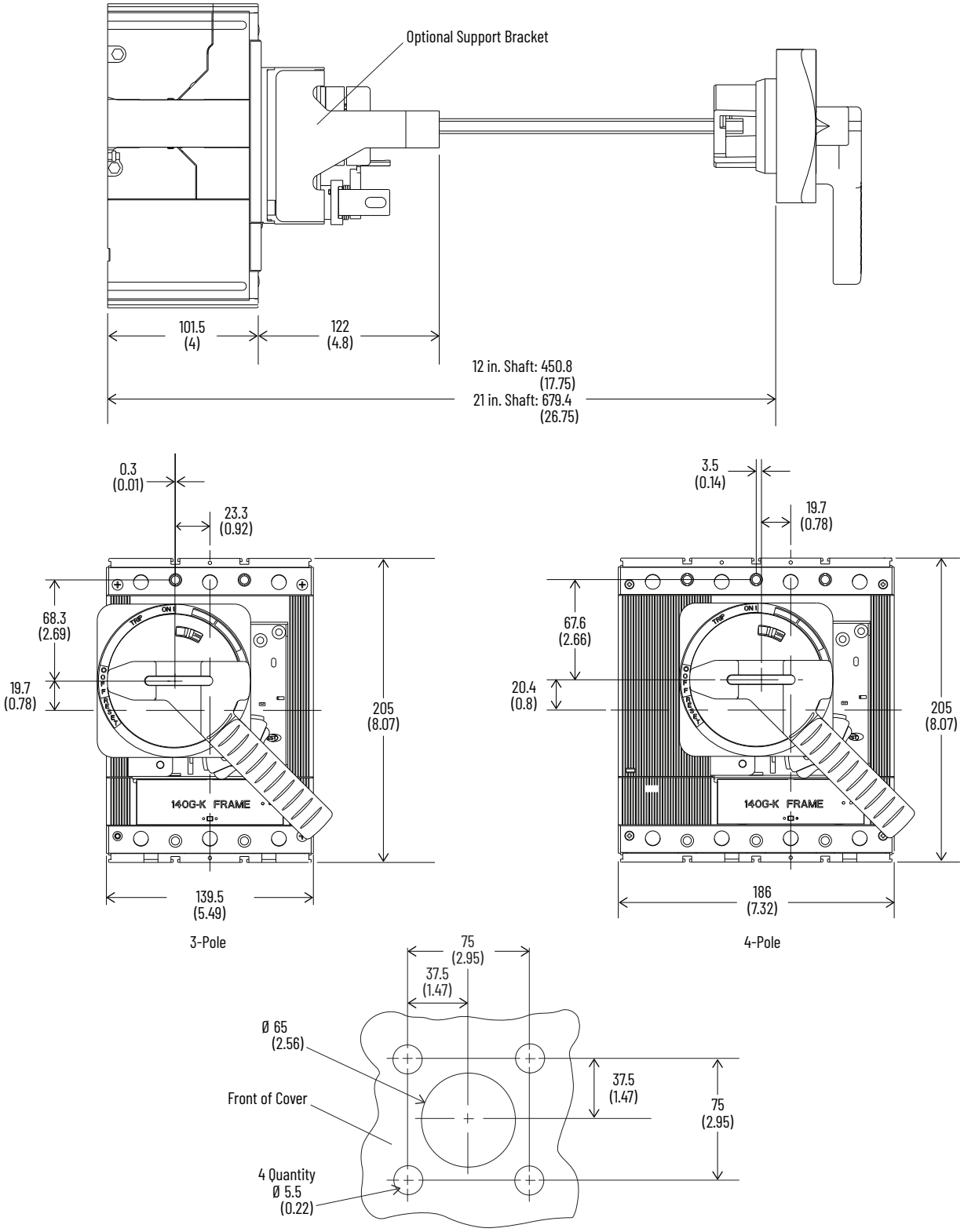


Figure 87 - Motor Operator: Cat No. 140G-K-EOP...

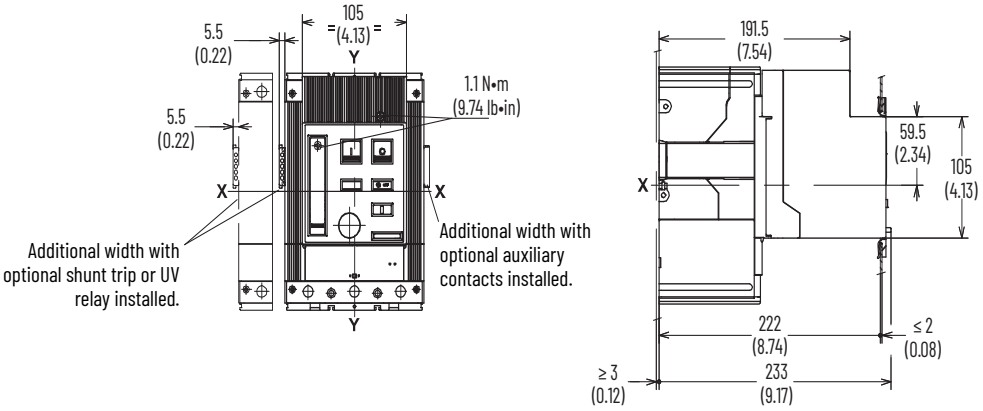


Figure 88 - Residual Current Release Module for 4-Pole MCCBs: Cat. No. 140G-K-ELP

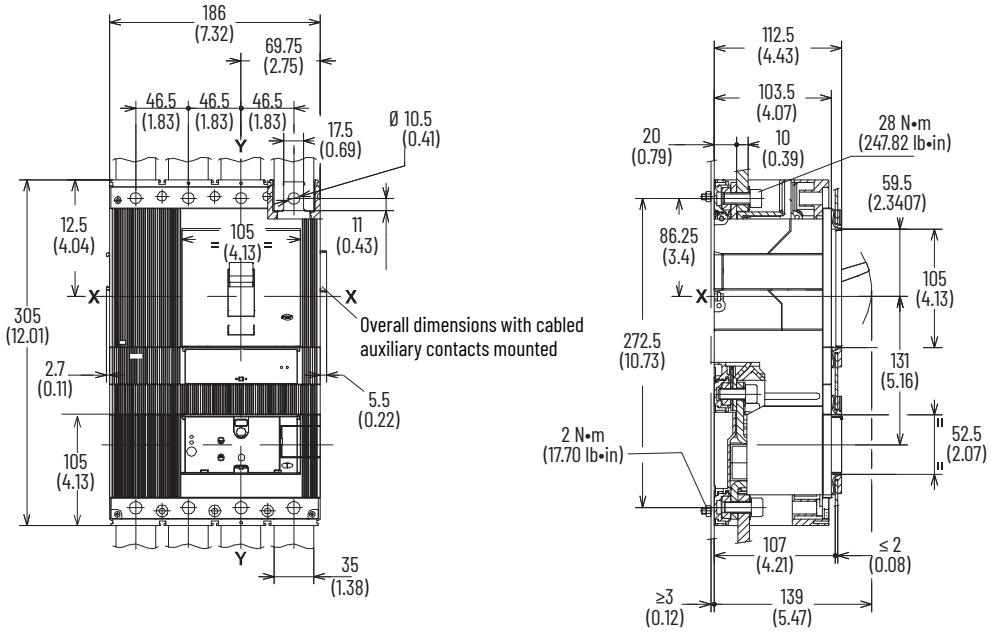


Figure 89 - Metal Bail Flex Cable Operator and Actuator: Cat. No. 140G-K-FCXB...

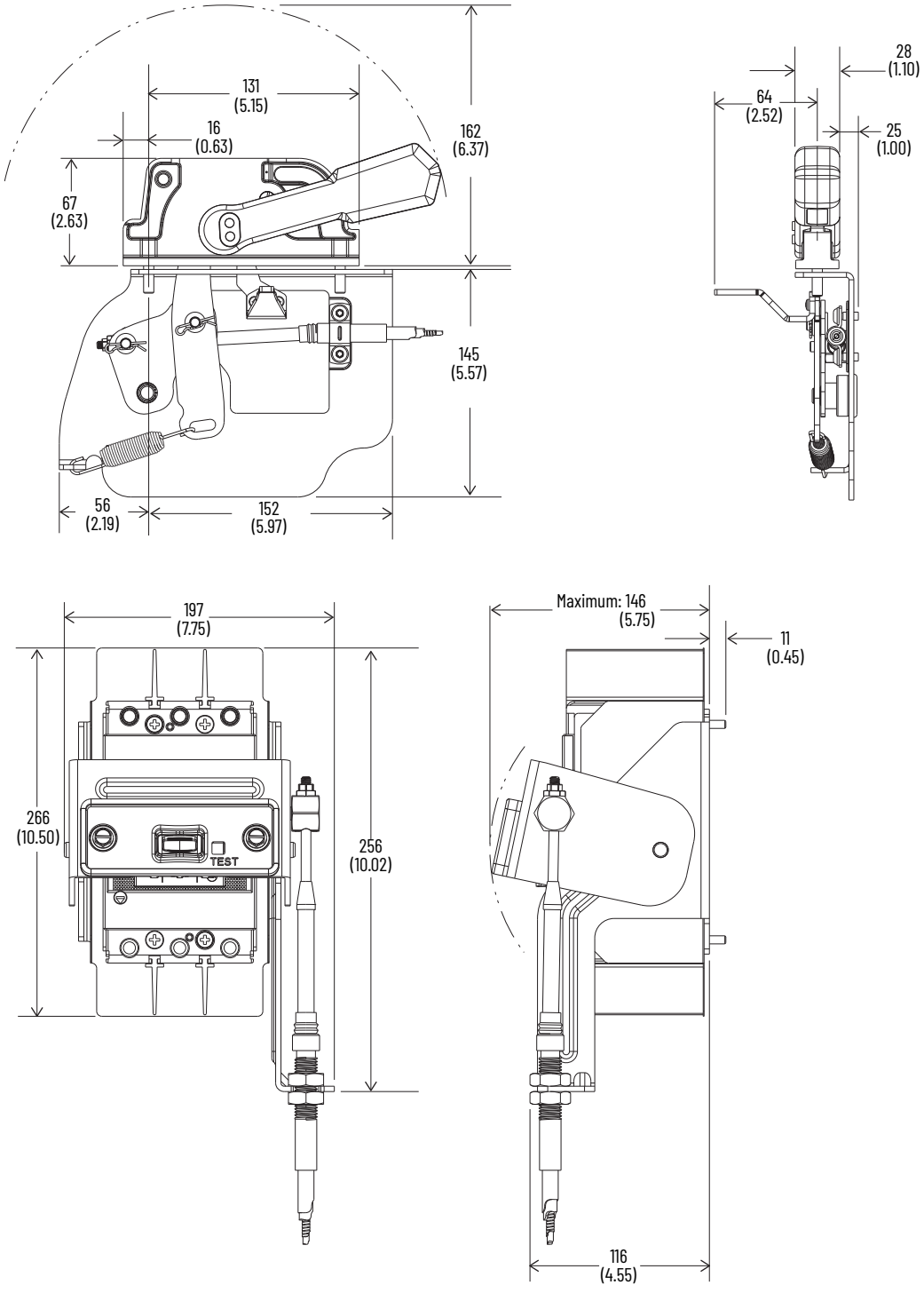
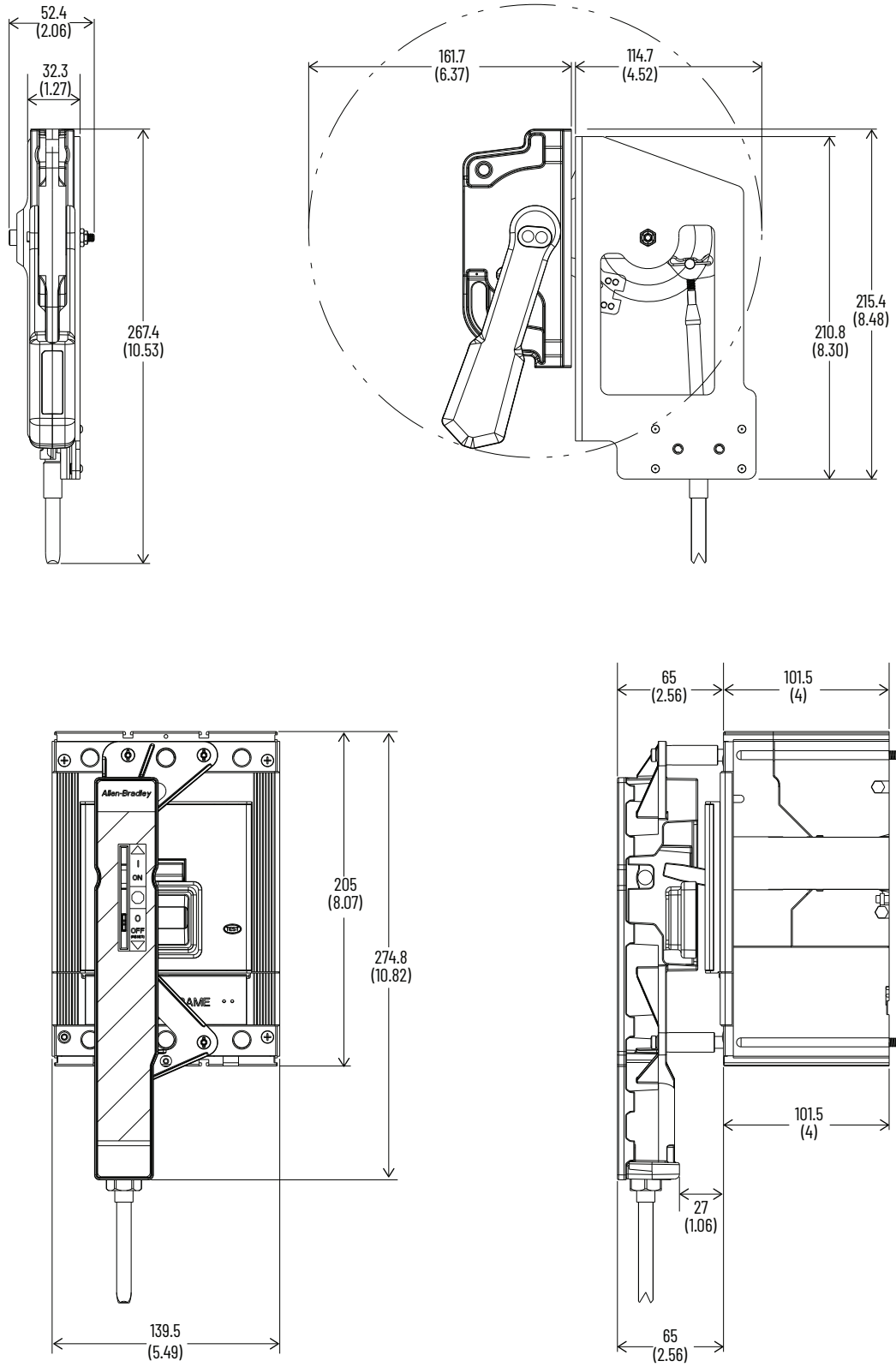


Figure 90 - Replacement 140G-K Frame Flex Cable Operator and Actuator: Cat. No. 140G-K-FCX...



Bulletin 140G-M

Figure 91 - Panel Mounted MCCB

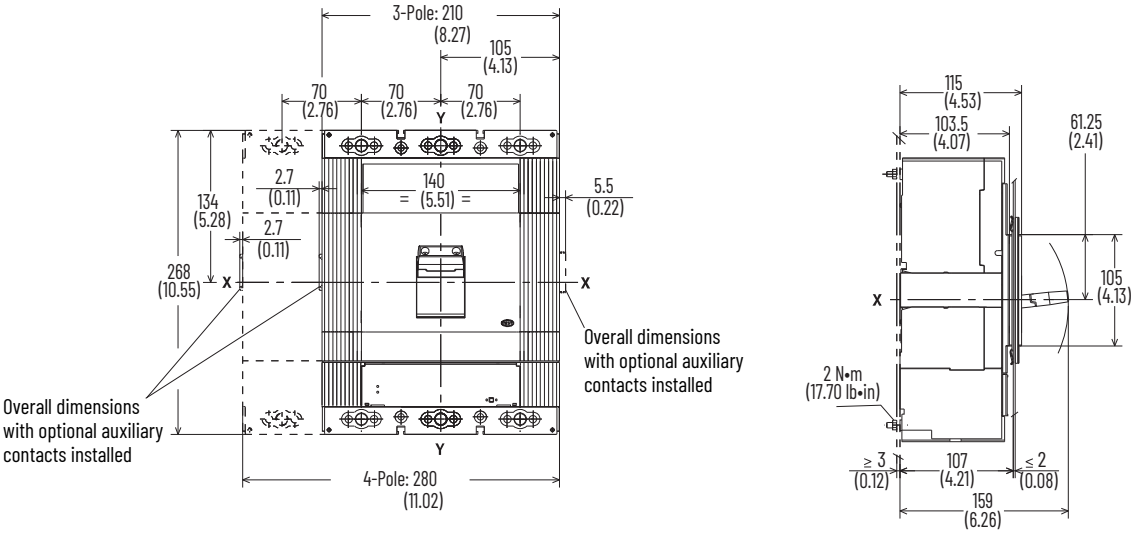
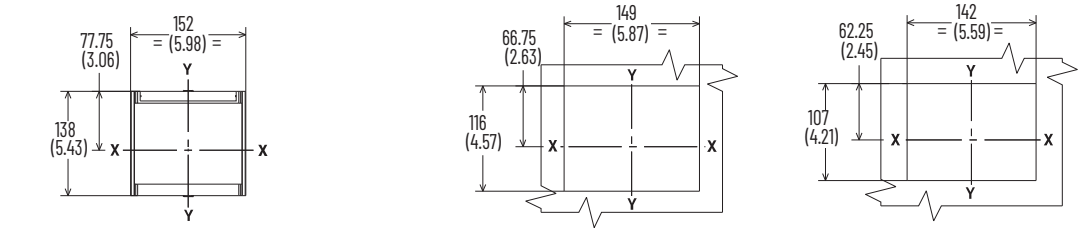


Figure 92 - Drilling Templates for MCCB Mounting

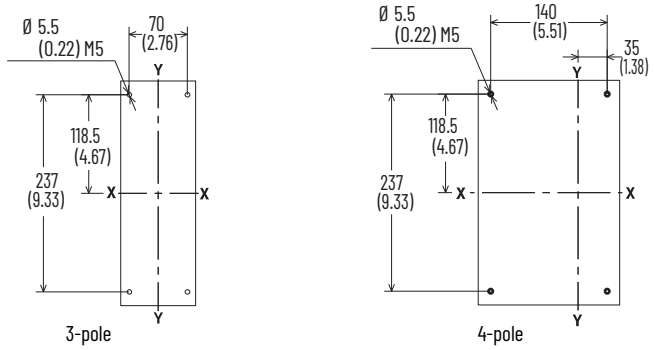


Escutcheon for Compartment Door

With Escutcheon

Without Escutcheon

Drilling Template for Compartment Door



3-pole

4-pole

Drilling Template for Mounting Plate

Figure 93 - Terminals: Cat. No. 140G-M-ECM

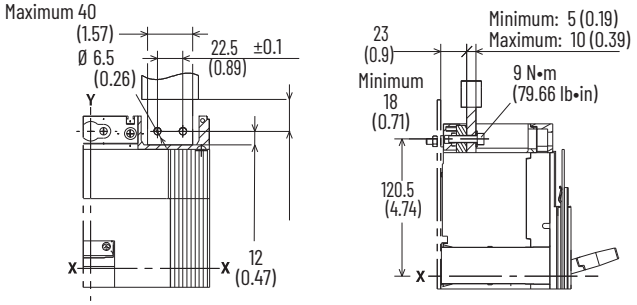


Figure 94 - Terminals: Cat. No. 140G-M-TLA23, 140G-M-TLA24, 140G-M-TLC23, 140G-M-TLC24

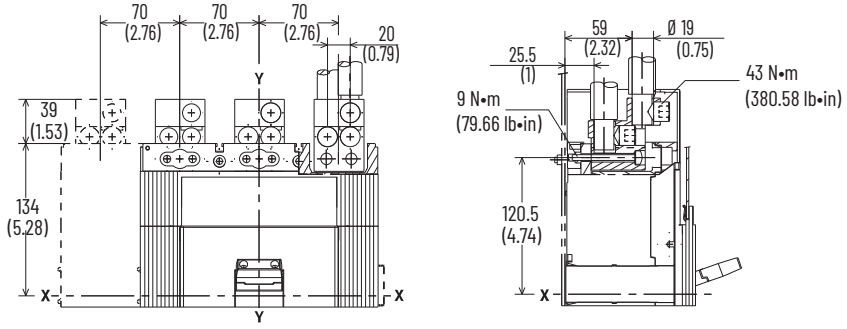


Figure 95 - Extended Terminals: Cat. No. 140G-M-EXT3, 140G-M-EXT4

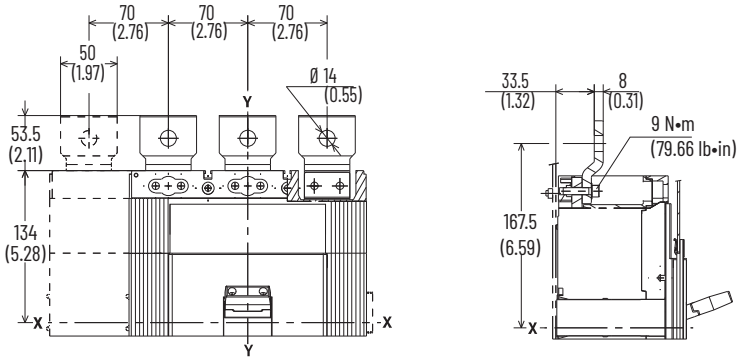


Figure 96 - Spreader Terminals: Cat. No. 140G-M-EXSLI3, 140G-M-EXSLO3, 140G-M-EXS4

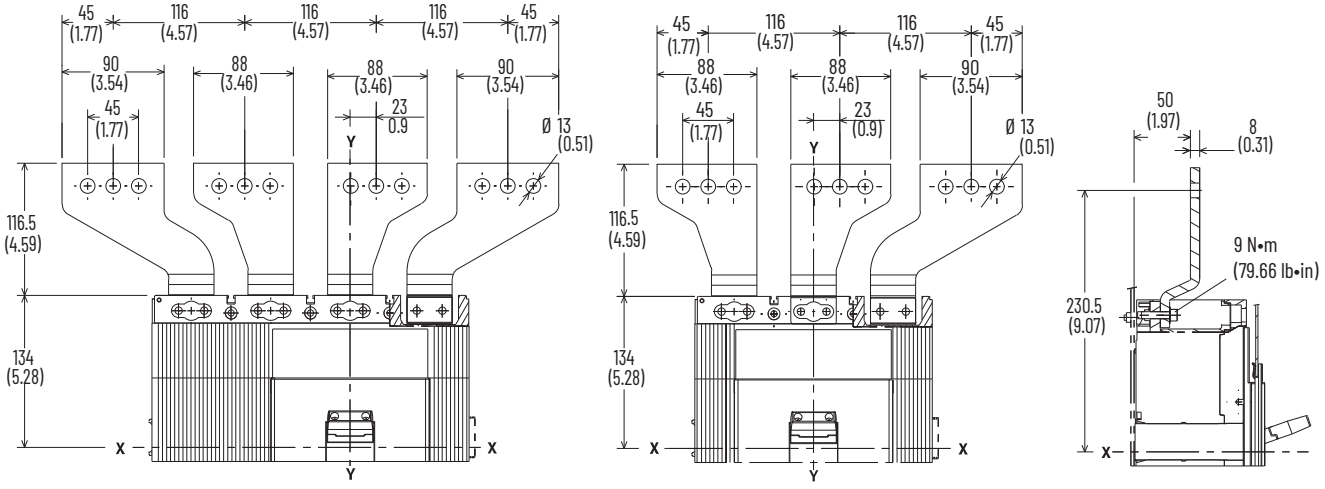


Figure 97 - Rotary Handle Operating Mechanism — Door Mounted: Cat. No. 140G-M-RMB and 140G-M-RMY

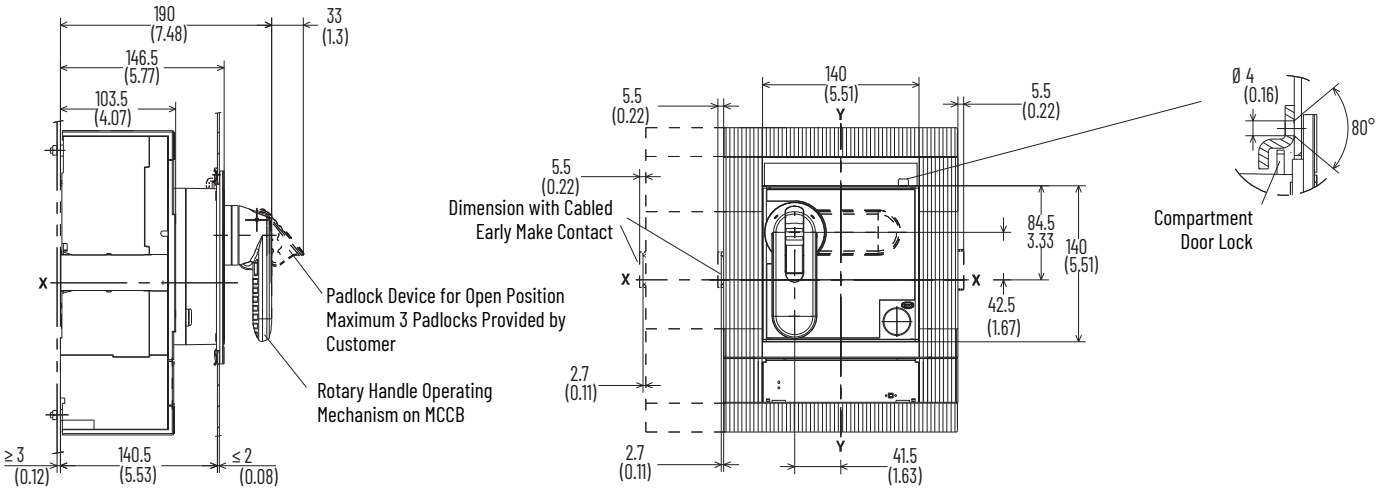


Figure 98 - Drilling Templates for MCCB Mounting

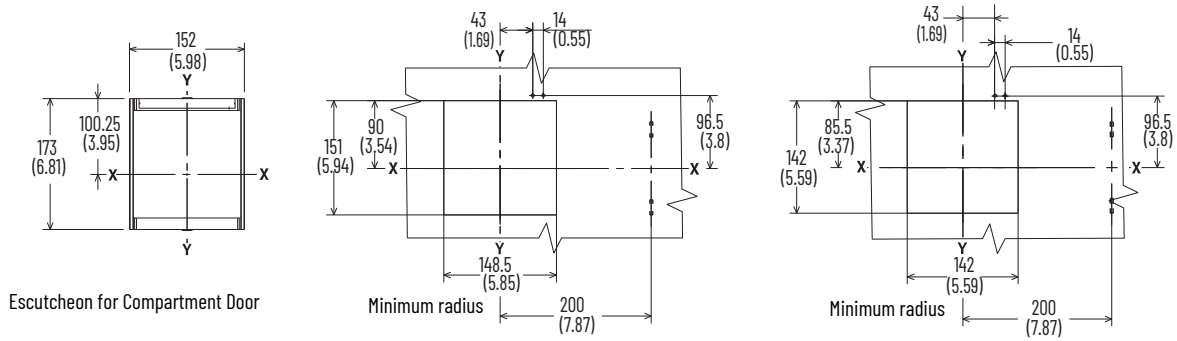
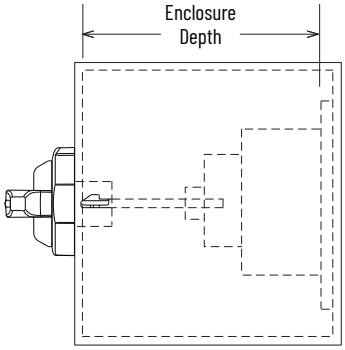


Figure 99 - Minimum/Maximum Enclosure Depth for M-Frame MCCBs: Cat. No. 140G-M-RVM...



This figure depicts the minimum and maximum enclosure sizes that accommodate the MCCB, operator, and handle. See Figure 86 on page 127 for overall dimensions and handle cutout.

Description	Minimum	Maximum
12 in Shaft	229 (9)	450 (17.75)
21 in Shaft		679 (26.75)
12 in Shaft with NFPA	280 (11)	450 (17.75)
22 in Shaft with NFPA		679 (26.75)

Figure 100 - Variable Depth Rotary Handle Operating Mechanism: Cat. No. 140G-M-RVM...

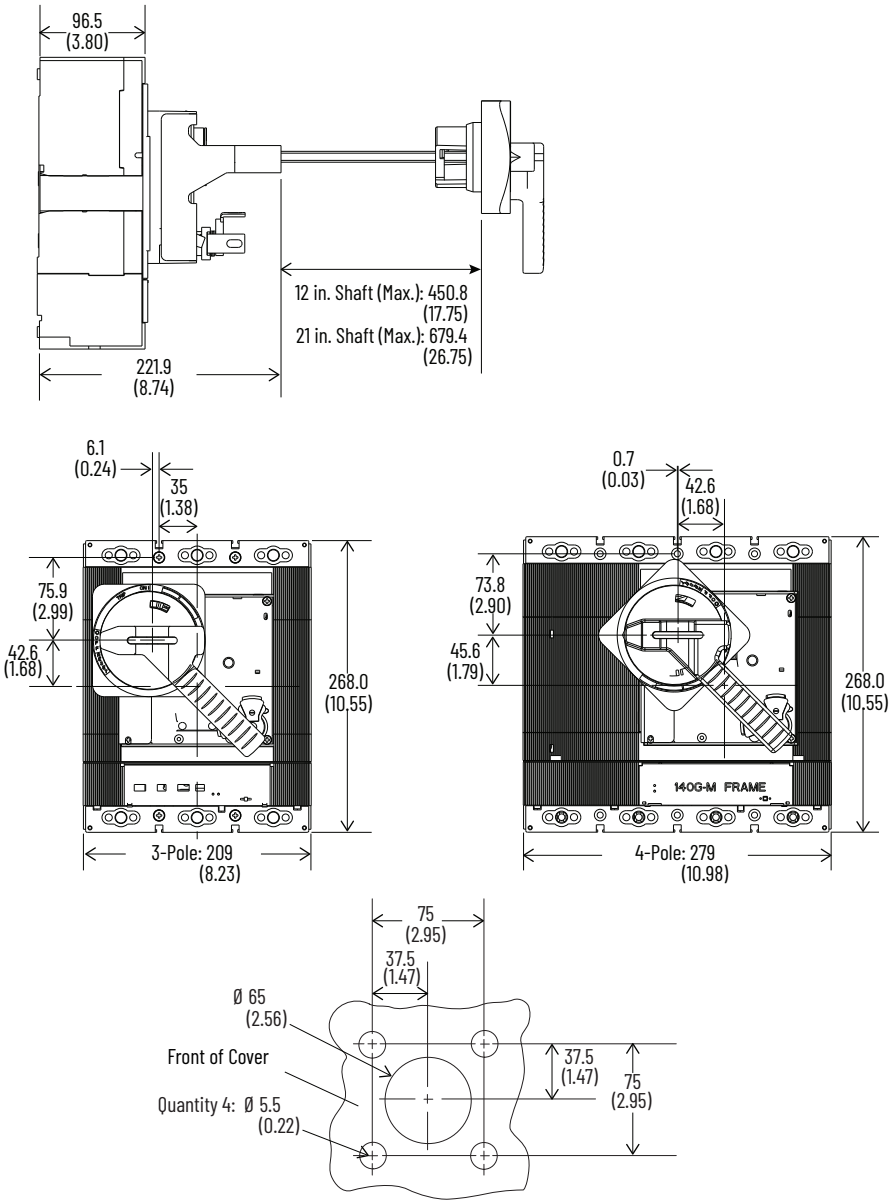


Figure 101 - Motor Operator: Cat. No. 140G-M-EOP, 140G-M-ECOP

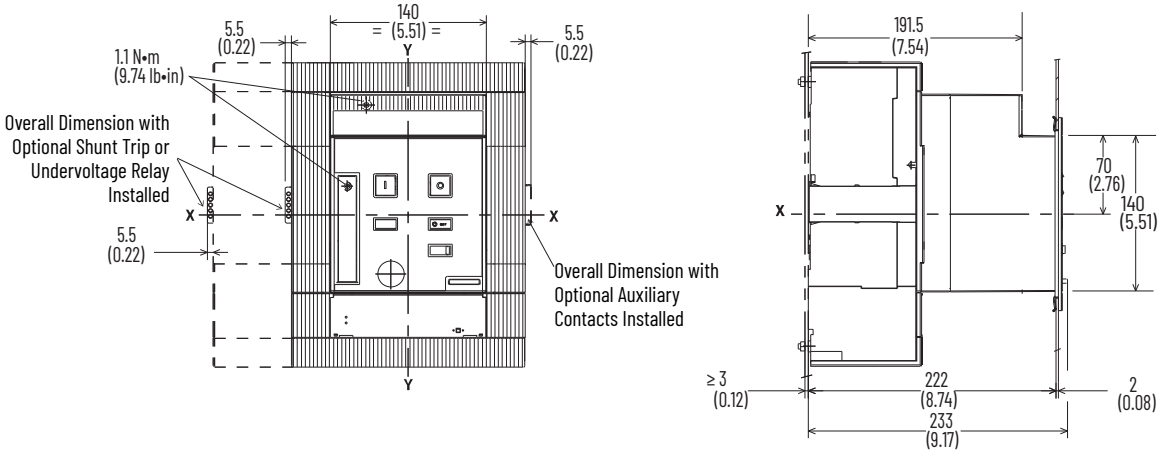


Figure 102 - Drilling Templates for MCCB Mounting

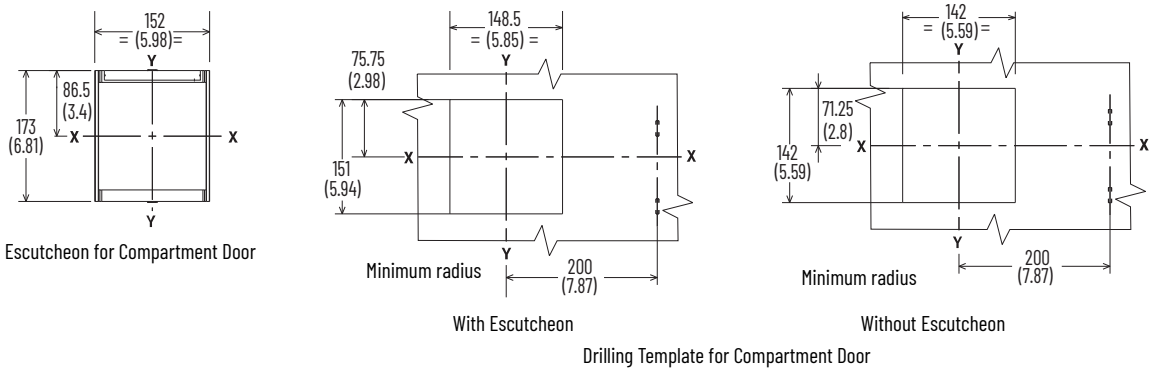


Figure 103 - Bulletin 140G-M Frame Flex Cable Operator and Actuator, Right Hand

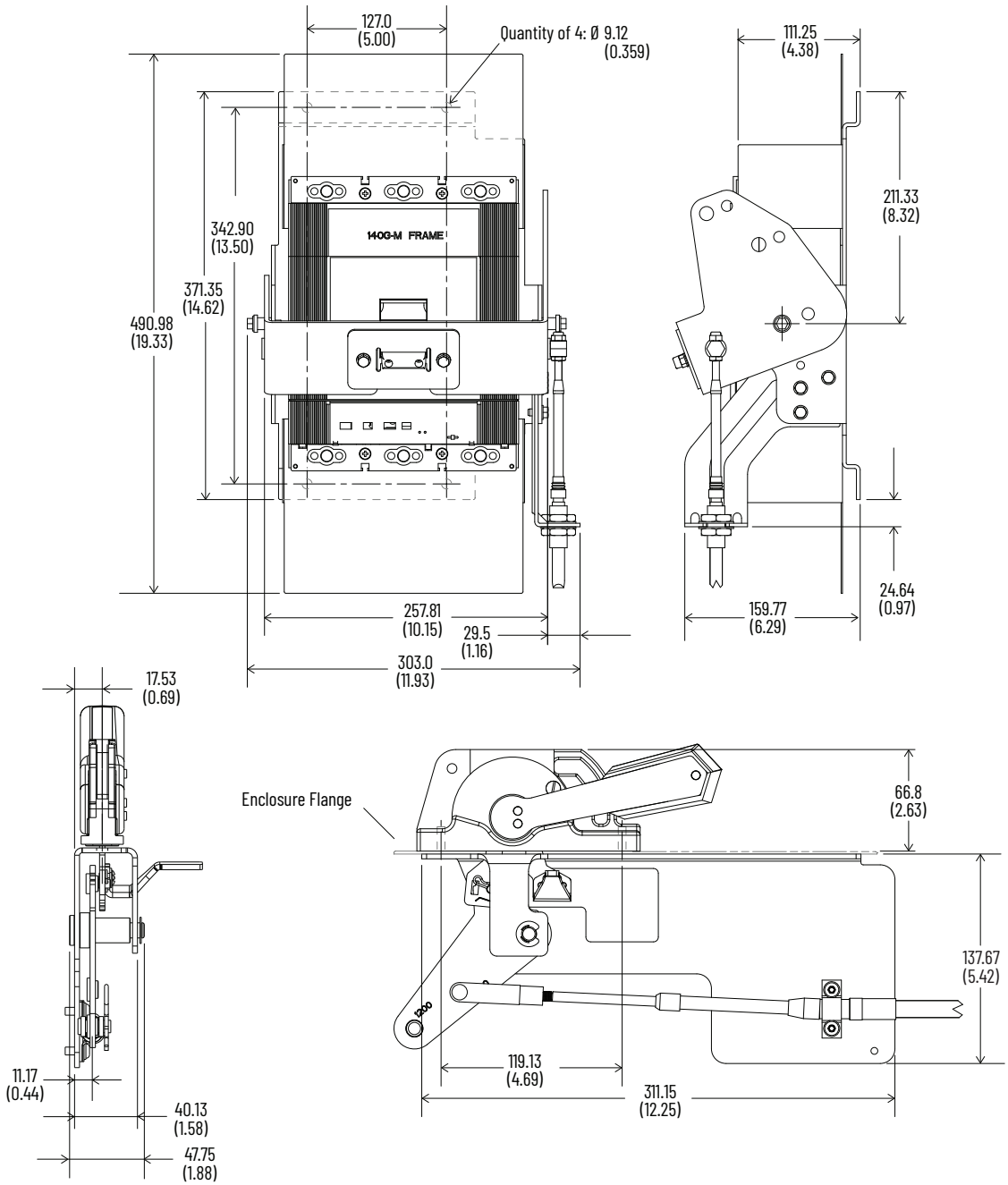
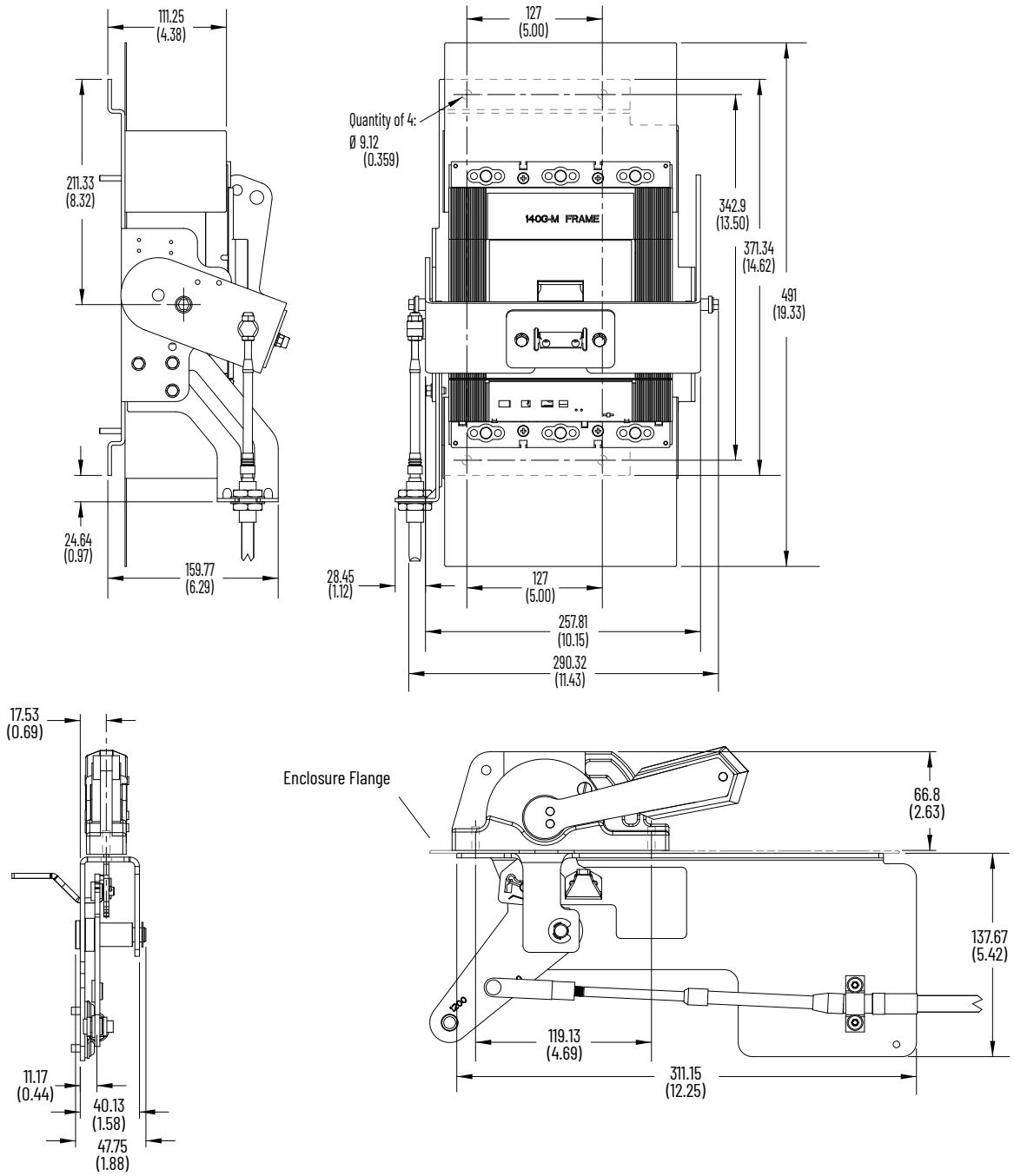
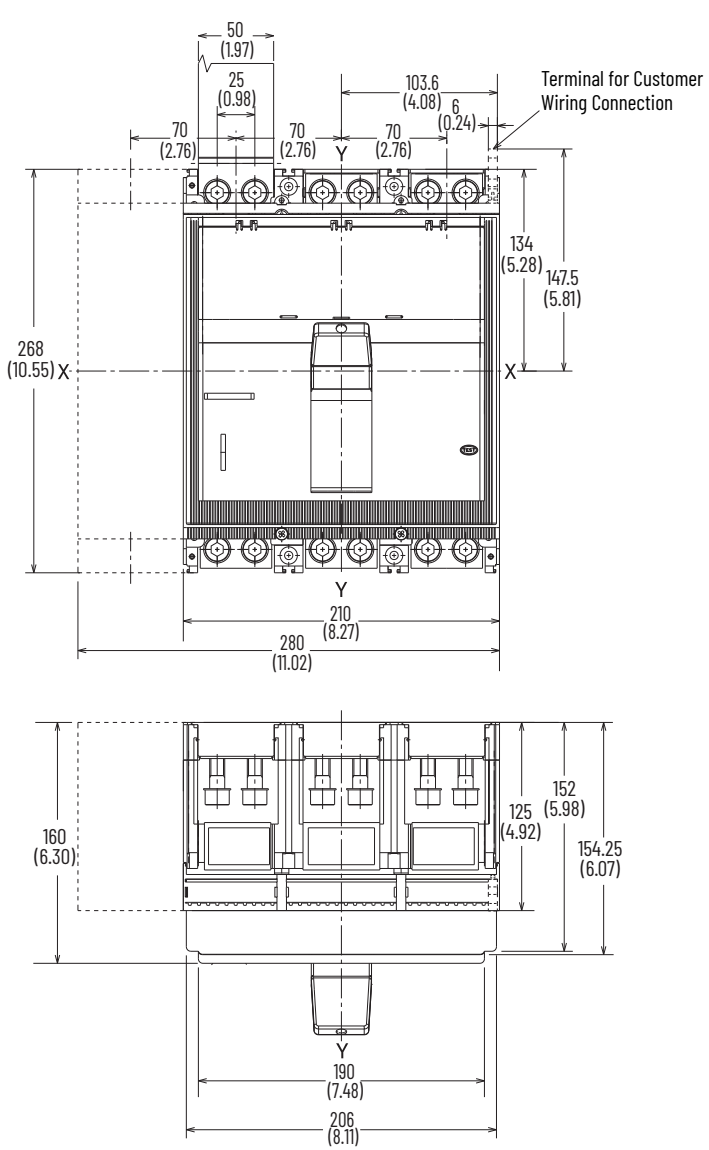


Figure 104 - M-Frame Flex Cable Operator and Actuator, Left Hand (requires 140G-BML, sold separately)



Bulletin 140G-N Frame

Figure 105 - Panel Mounted MCCB



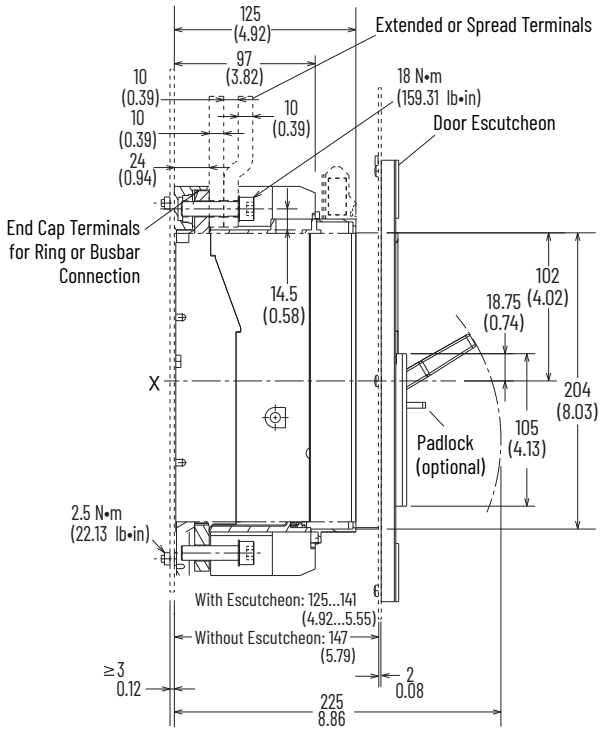
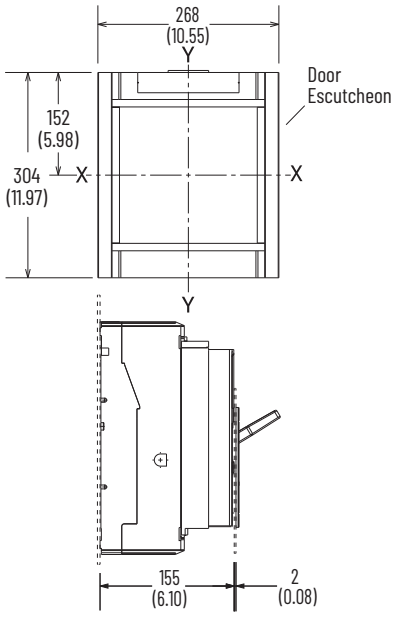
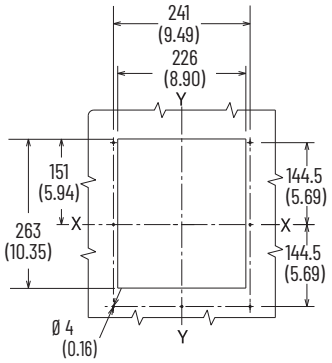


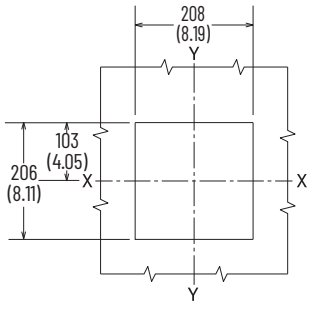
Figure 106 - Drilling Templates for MCCB Mounting



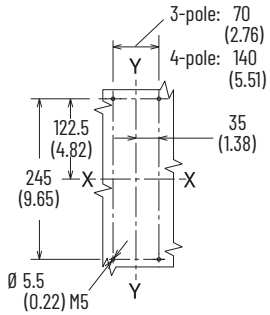
Escutcheon for Compartment Door



With Escutcheon

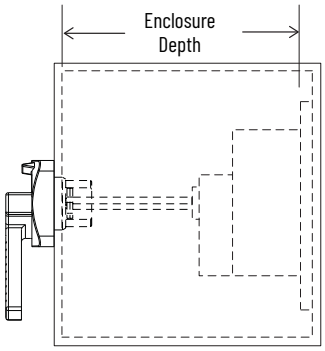


Front 206 x 204



Drilling Template for Mounting Plate

Figure 107 - Minimum/Maximum Enclosure Depth: Cat. No. 140G-N-RVM...



This figure depicts the minimum and maximum enclosure sizes that accommodate the MCCB, operator, and handle. See Figure 108 on page 139 for operator dimensions.

Description	Minimum	Maximum
12 in Shaft	196 (7.75)	450 (17.75)
21 in Shaft		679 (26.75)

Figure 108 - Variable Depth Rotary Handle Operating Mechanism: Cat. No. 140G-N-RVM...

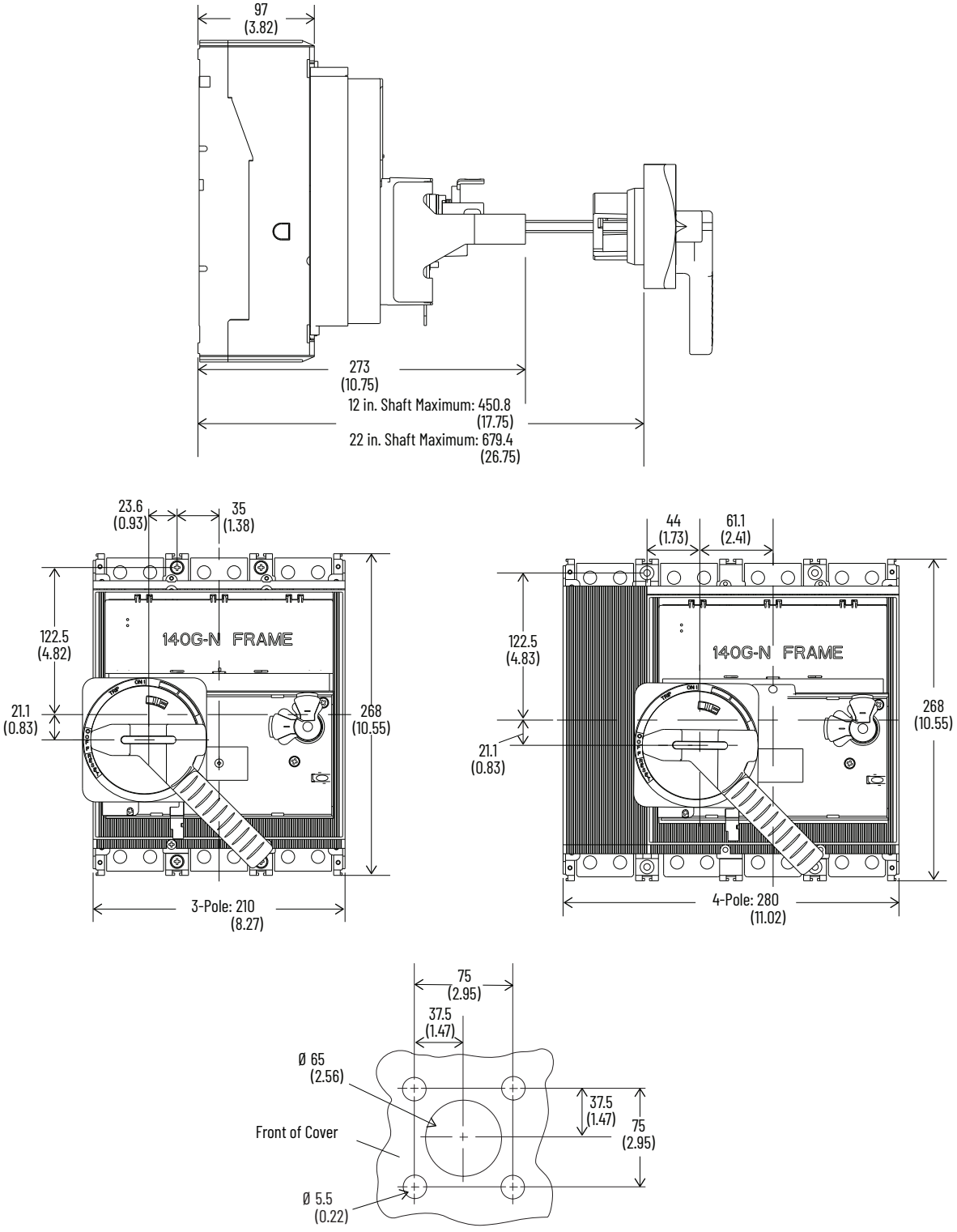


Figure 109 - Terminals: Cat. No. 140G-N-TLH3, 140G-N-TLV3, 140G-N-TLH4, 140G-N-TLV4

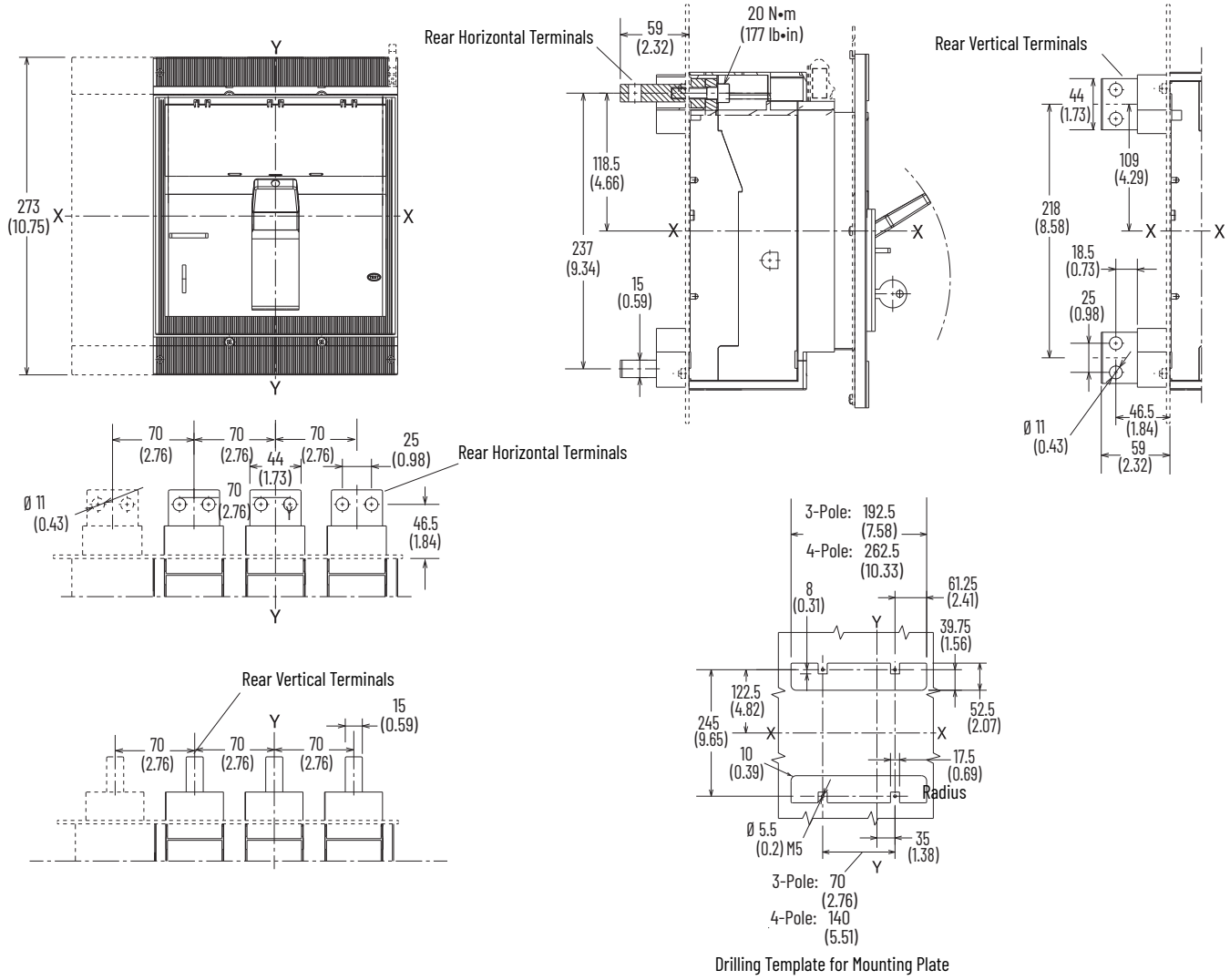


Figure 110 - Extended Front Terminals: Cat. No. 140G-N-EXT3, -EXT4

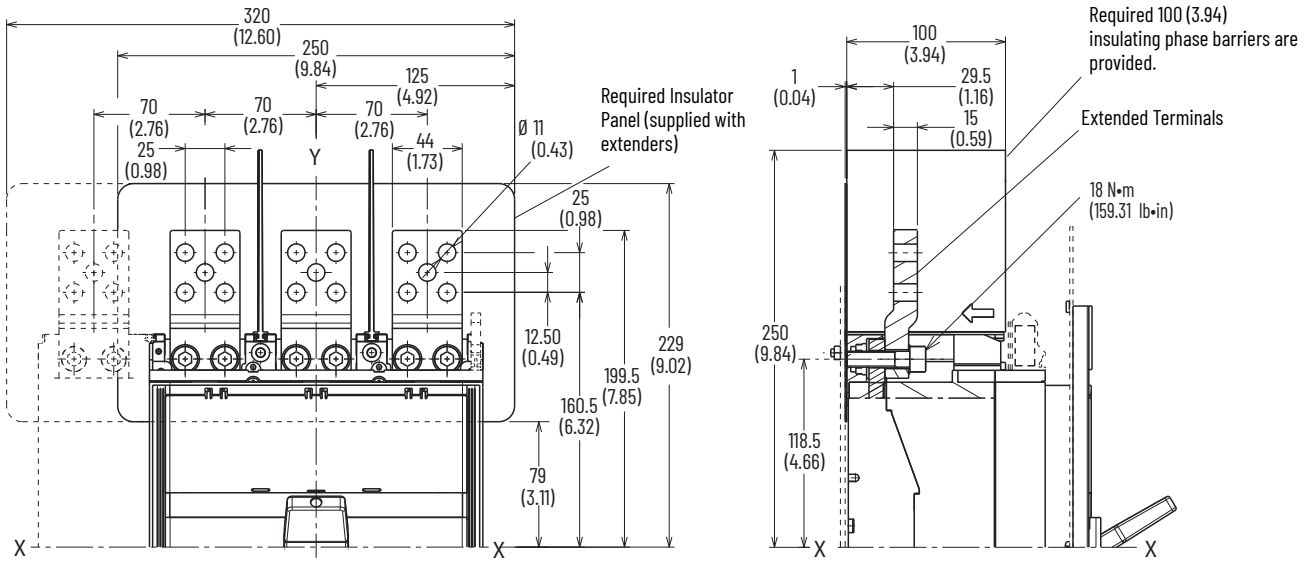


Figure 111 - Rear Spread Terminals (IEC only): Cat. No. 140G-N-EXSL13 Top (3-Pole) and 140G-N-EXS4 (4-Pole)

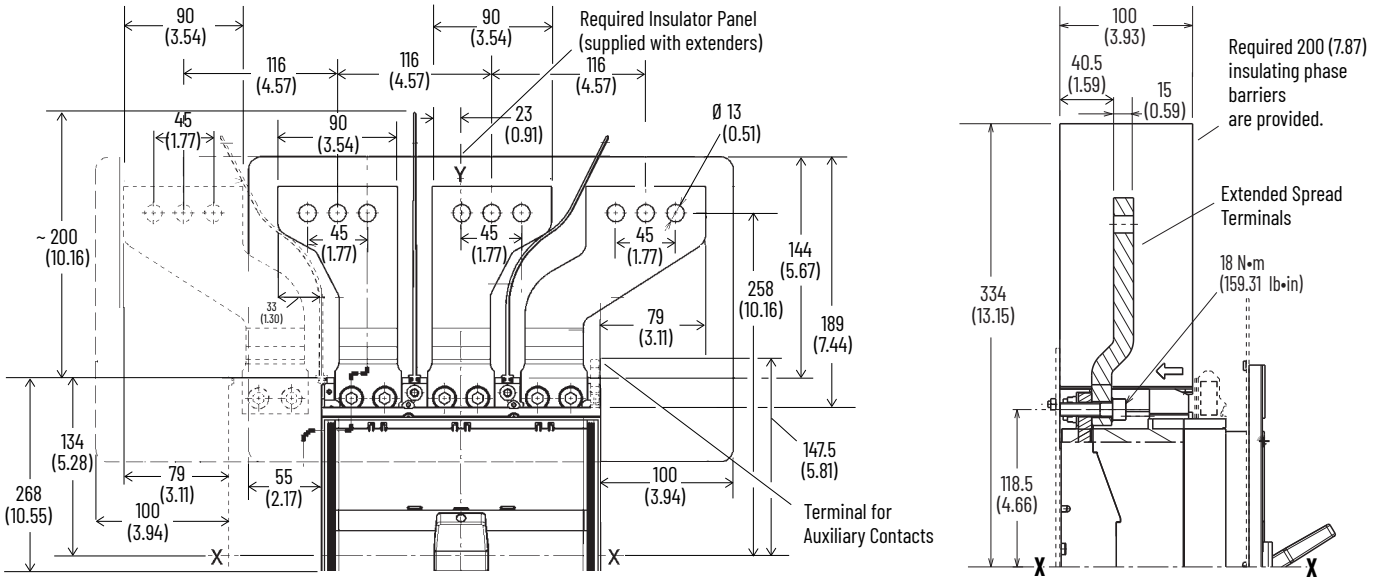


Figure 112 - Cat. No. 140G-N-RMB, 140G-N-RMY Rotary Handle Operating Mechanism

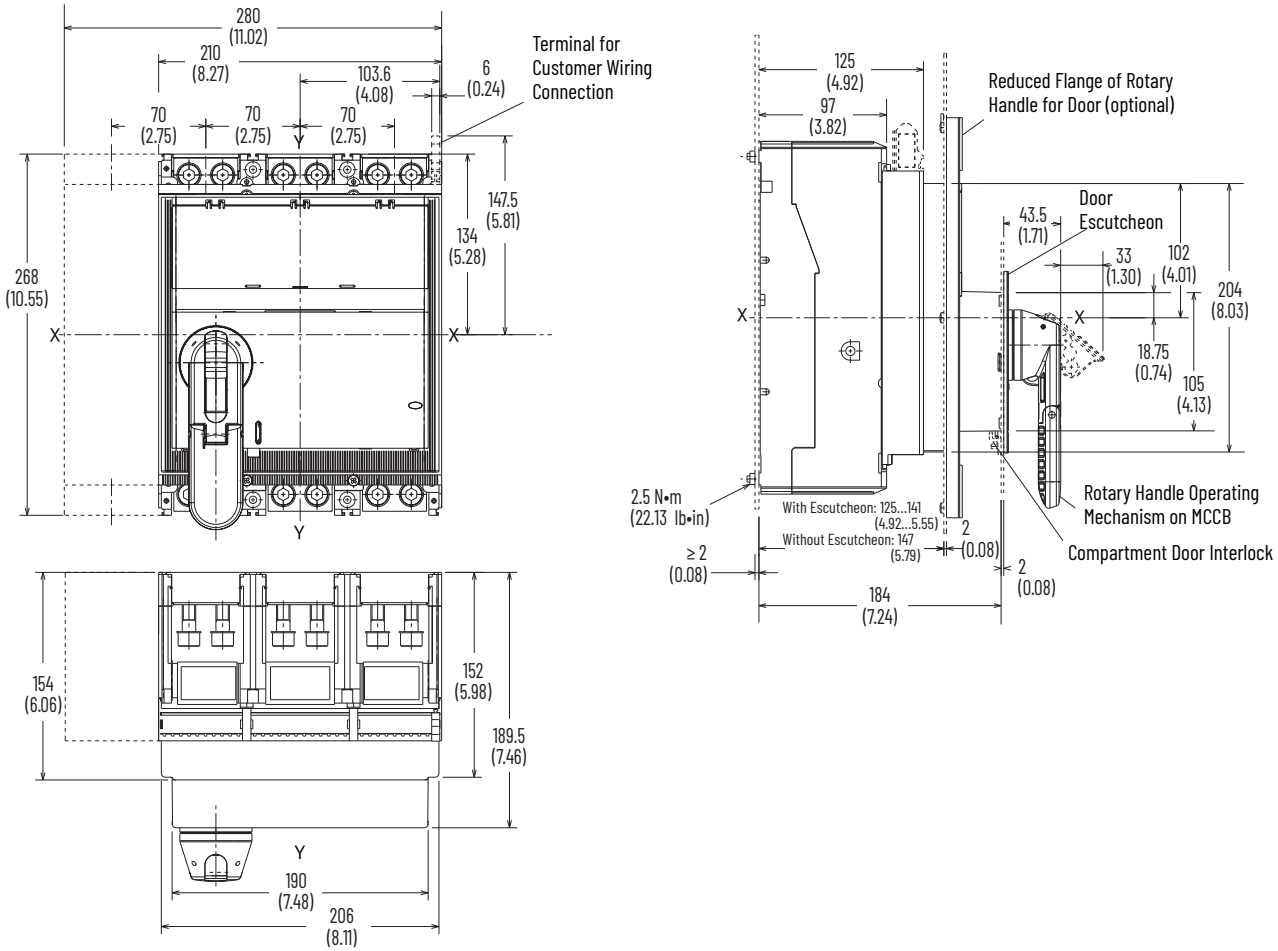


Figure 113 - Cat. No. 140G-N-TLA43, -TLA44, -TLC43, -TLC44 Terminals

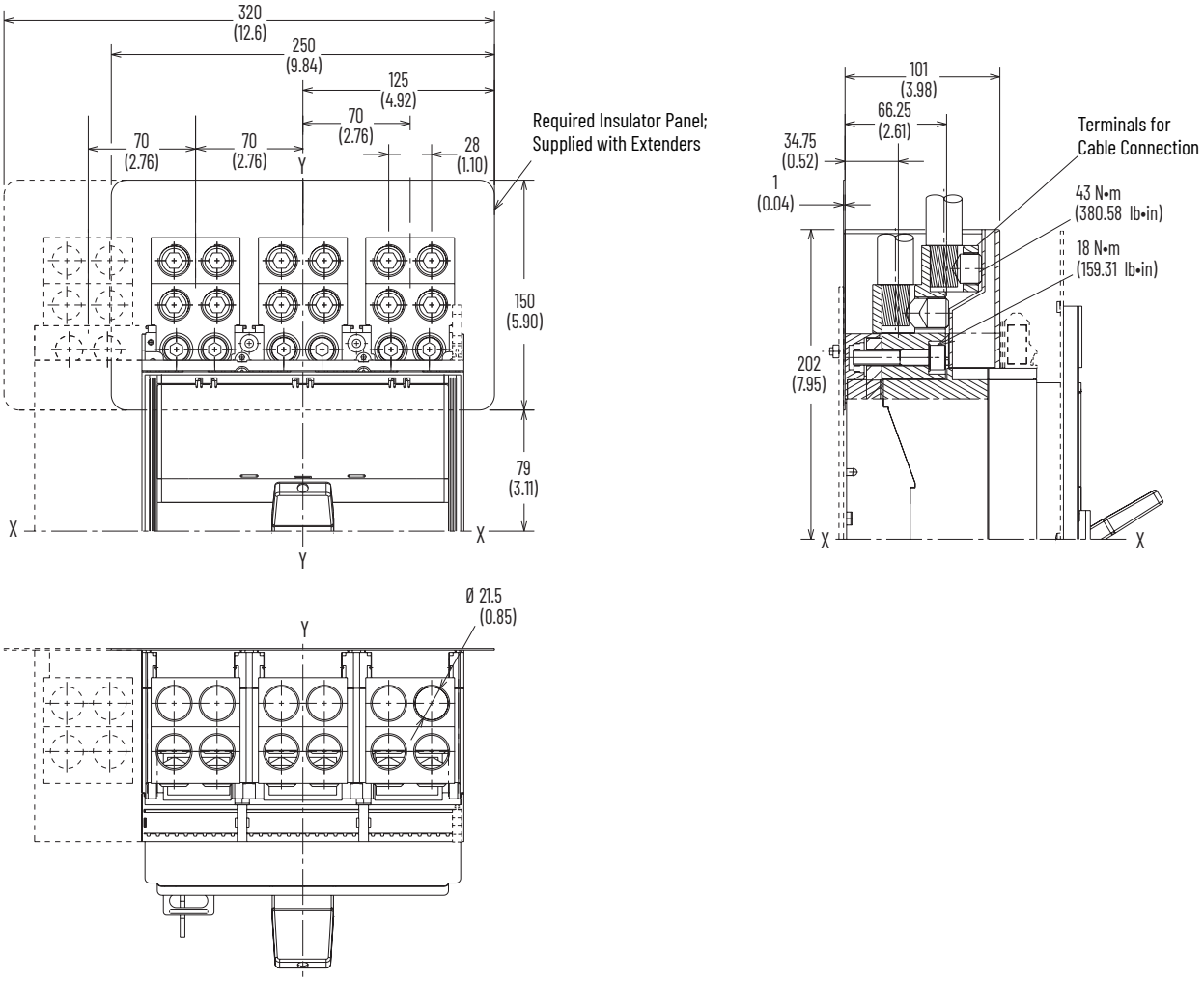


Figure 114 - N-Frame Flex Cable Operator and Actuator, Right Hand

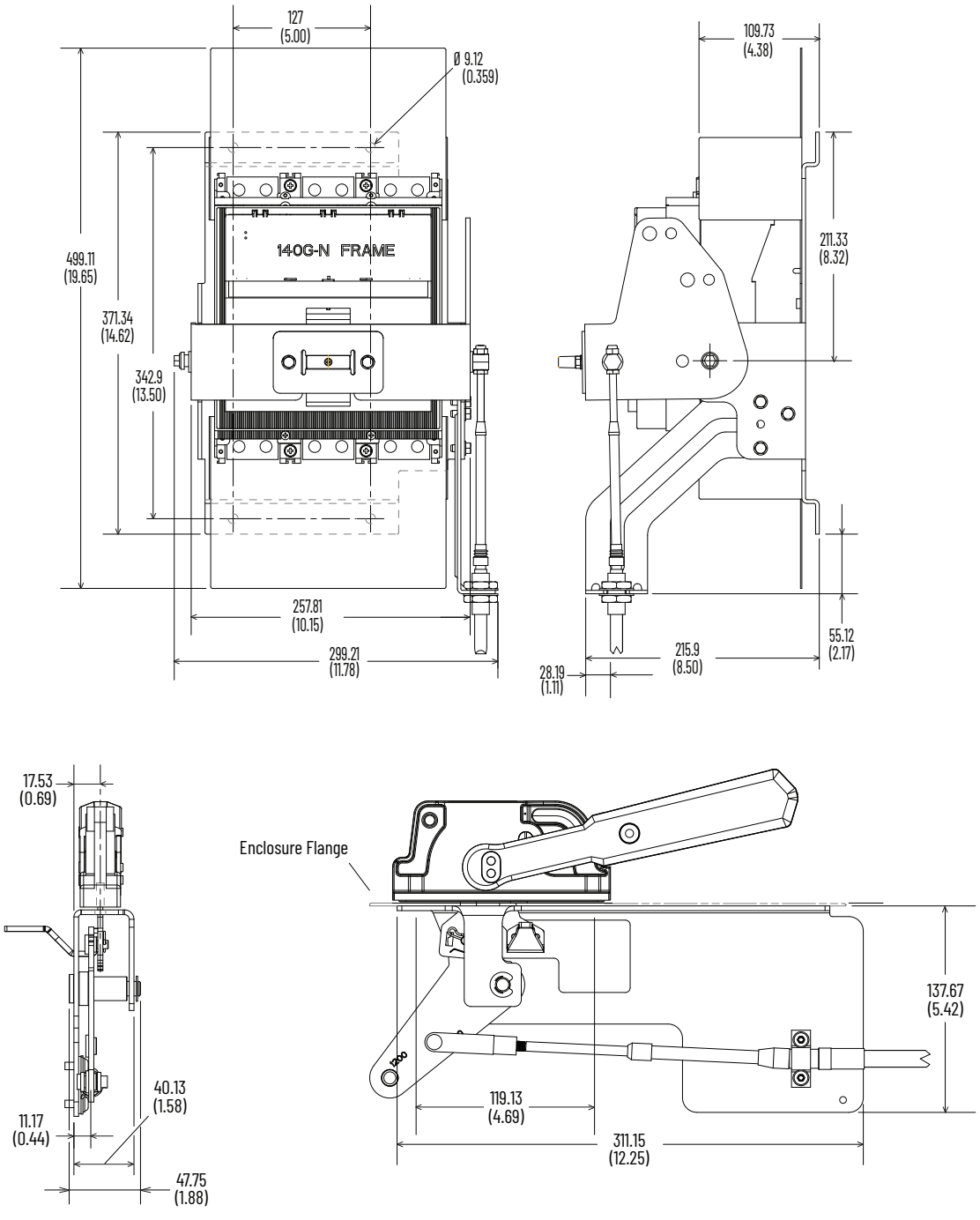
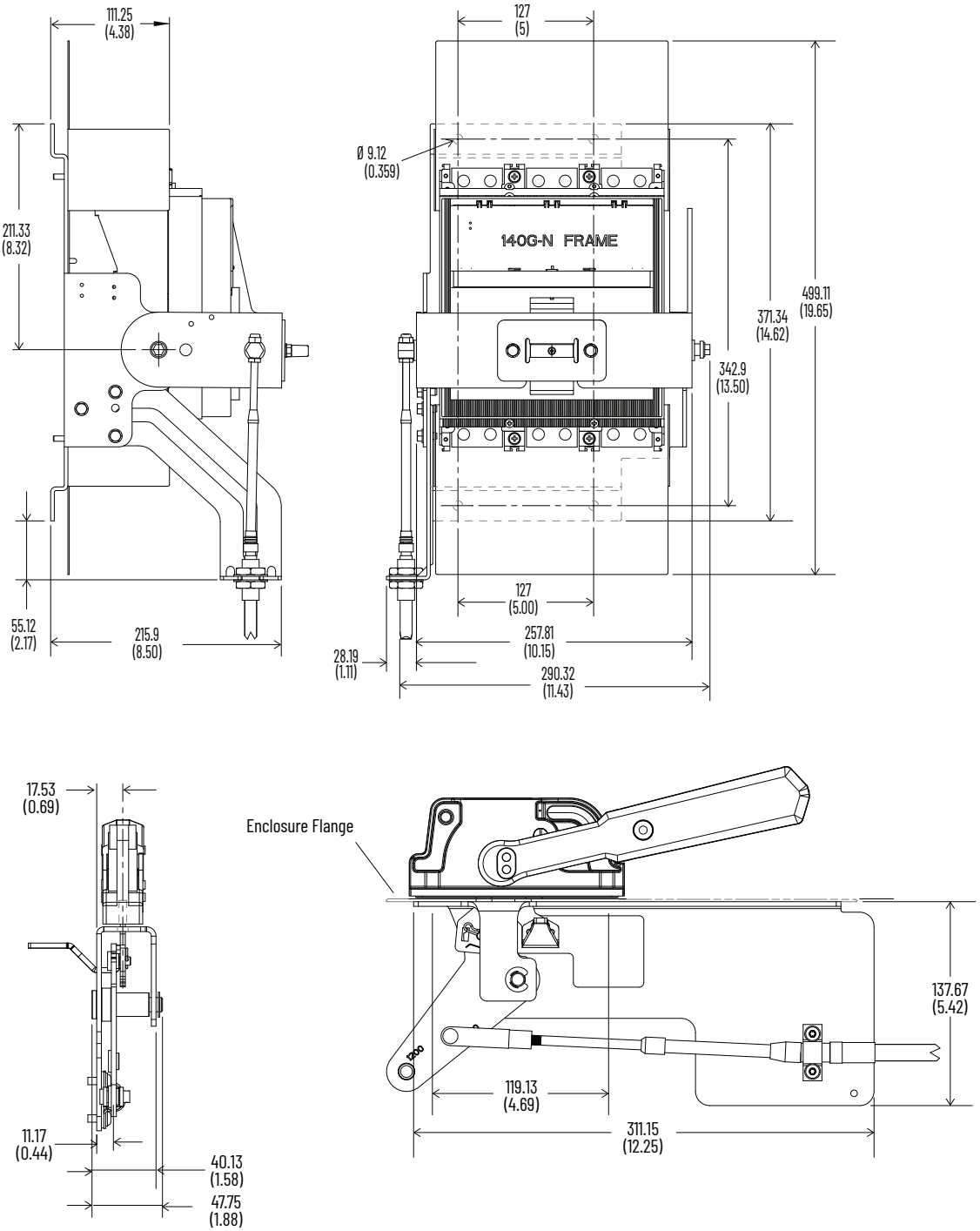


Figure 115 - Frame Size N Flex Cable Operator and Actuator, Left Hand (requires 140G-BML, sold separately)



Bulletin 140G NS-Frame

Figure 116 - Panel Mounted MCCB

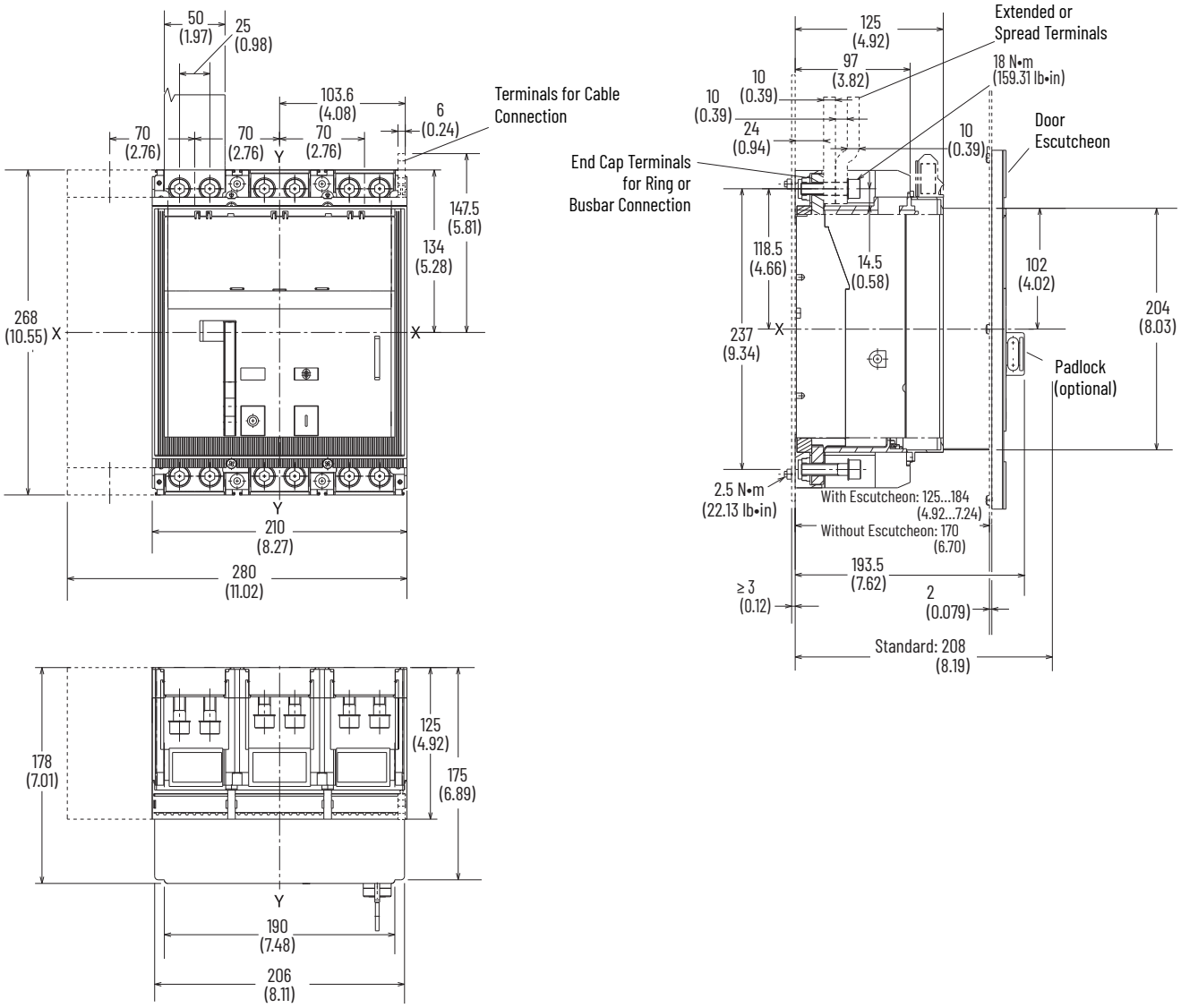


Figure 117 - Drilling Templates for MCCB Mounting

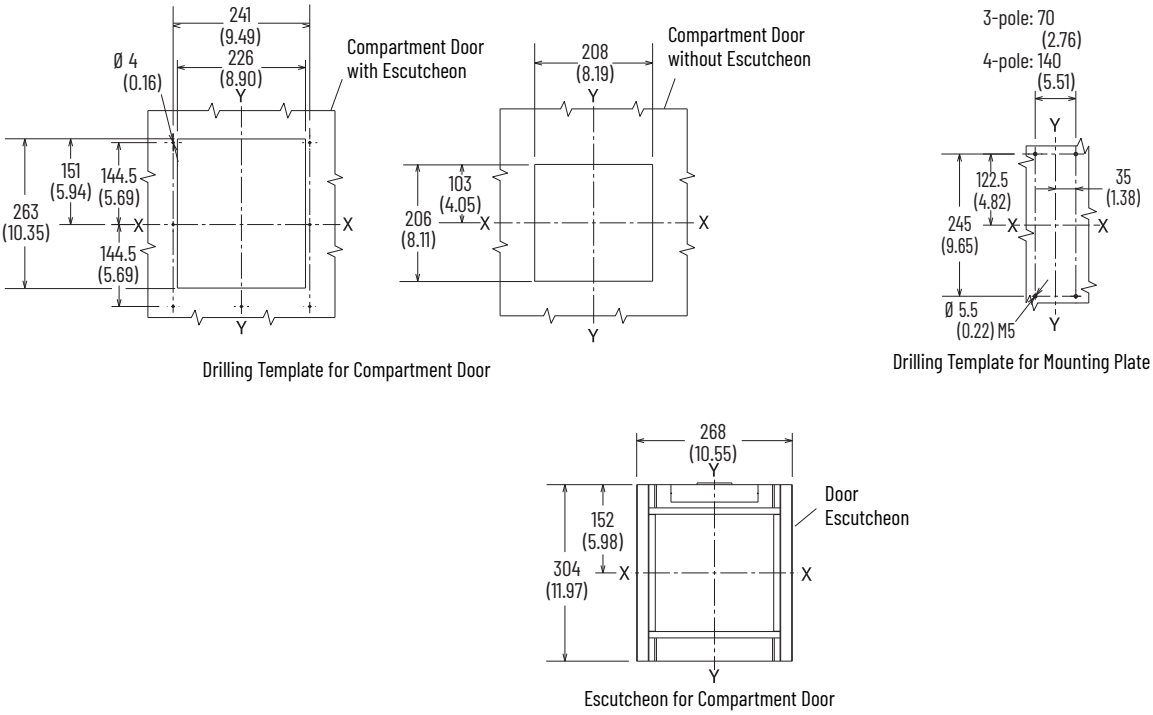


Figure 118 - Cat. No. 140G-N-TLA63, 140G-N-TLA64, 140G-N-TLC63, 140G-N-TLC64 Terminals

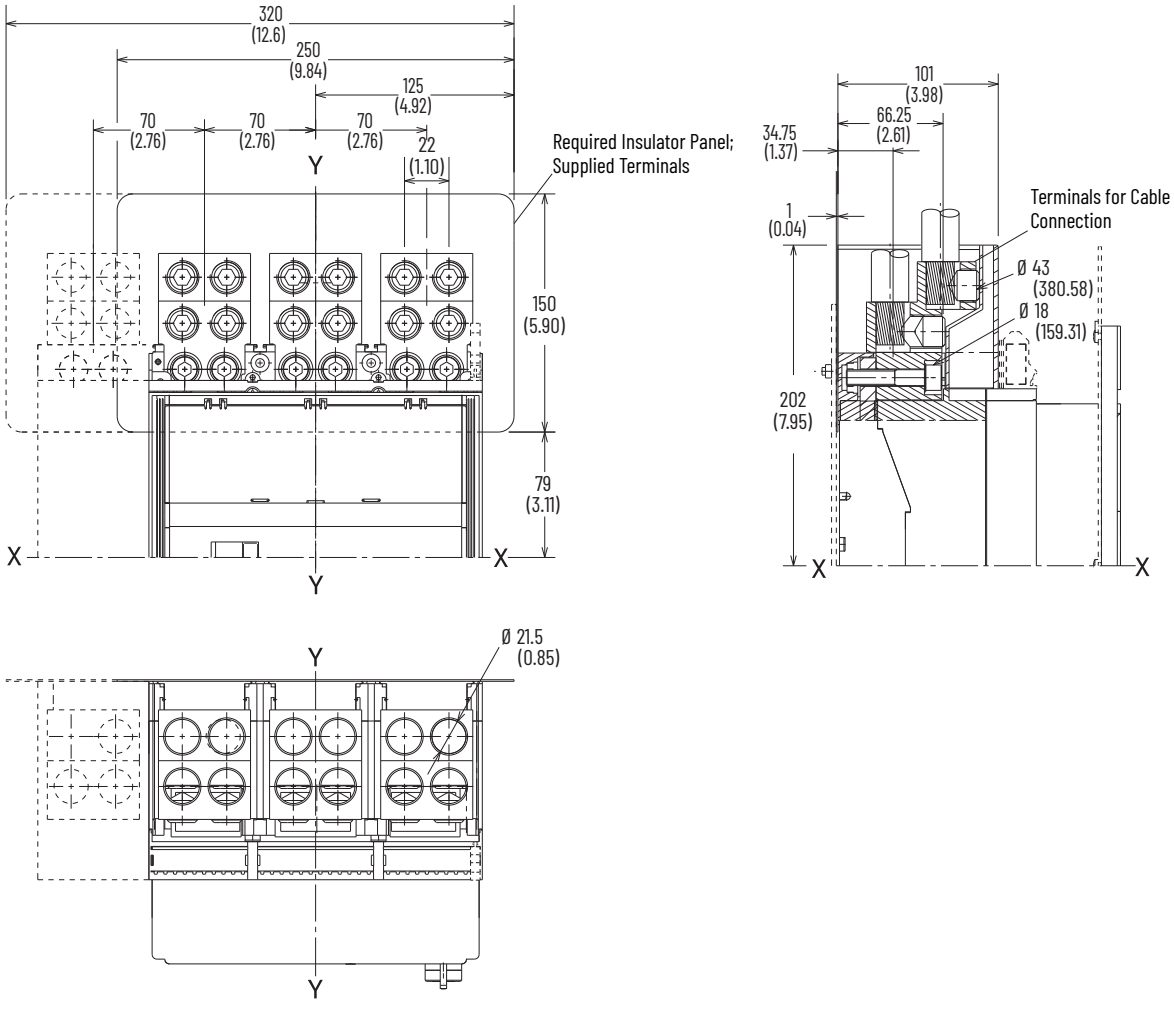


Figure 119 - Cat. No. 140G-N-TLV3, 140G-N-TLV4, 140G-N-TLH3, 140G-N-TLH4 Rear Terminals

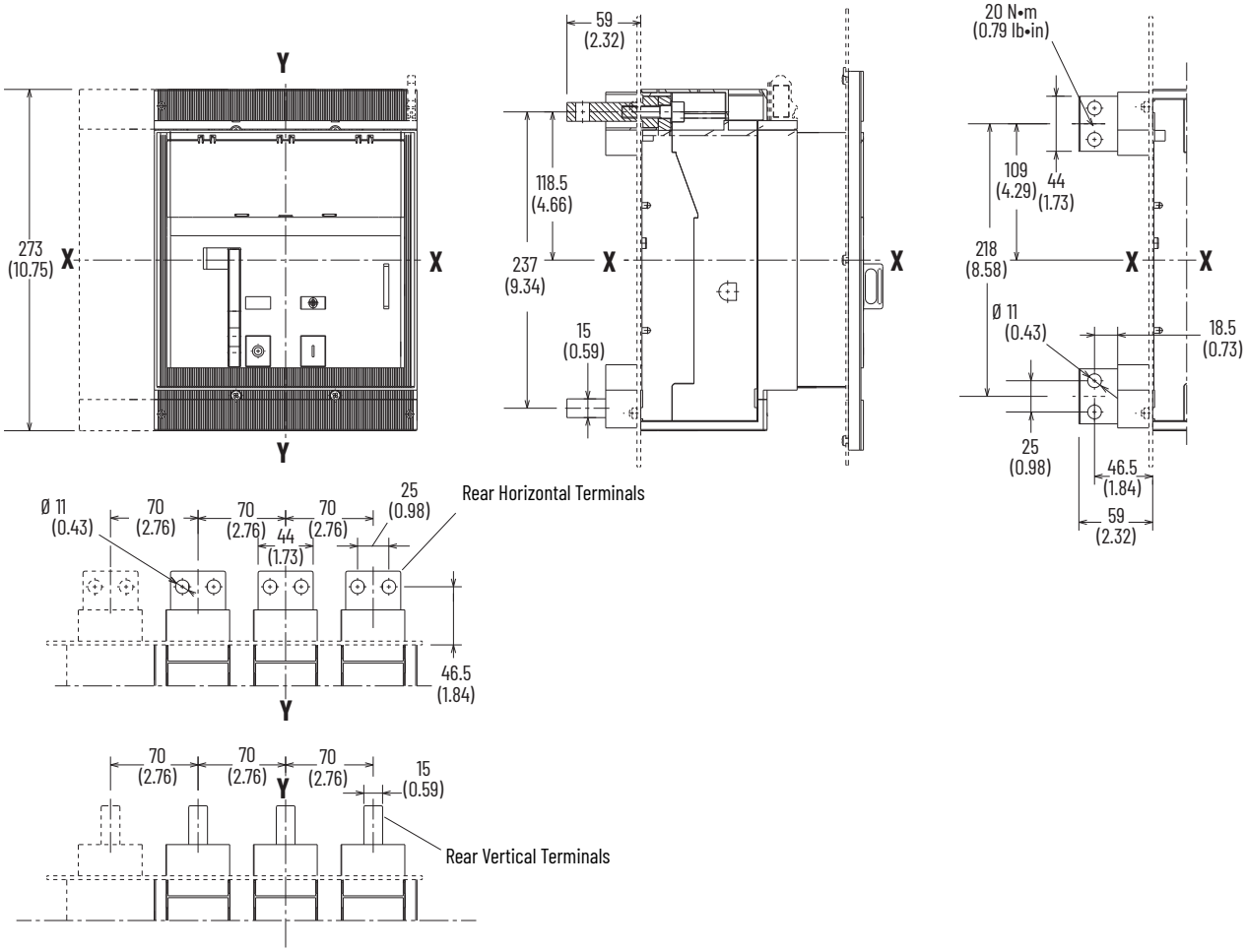


Figure 120 - Drilling Template for Mounting Plate

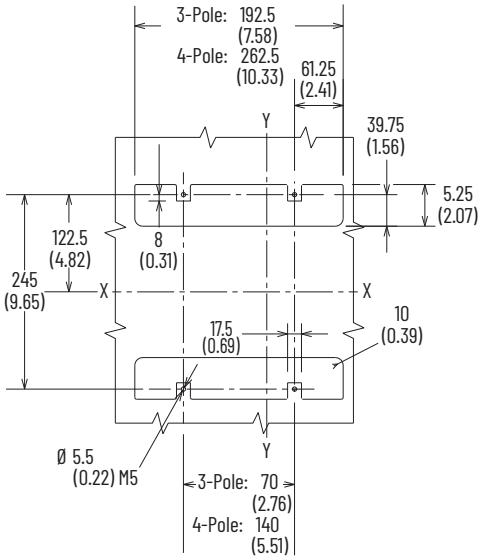


Figure 121 - Cat. No. 140G-N-EXSLI3, -EXSL03, -EXS4 Extended Front Spreader Terminals (IEC only)

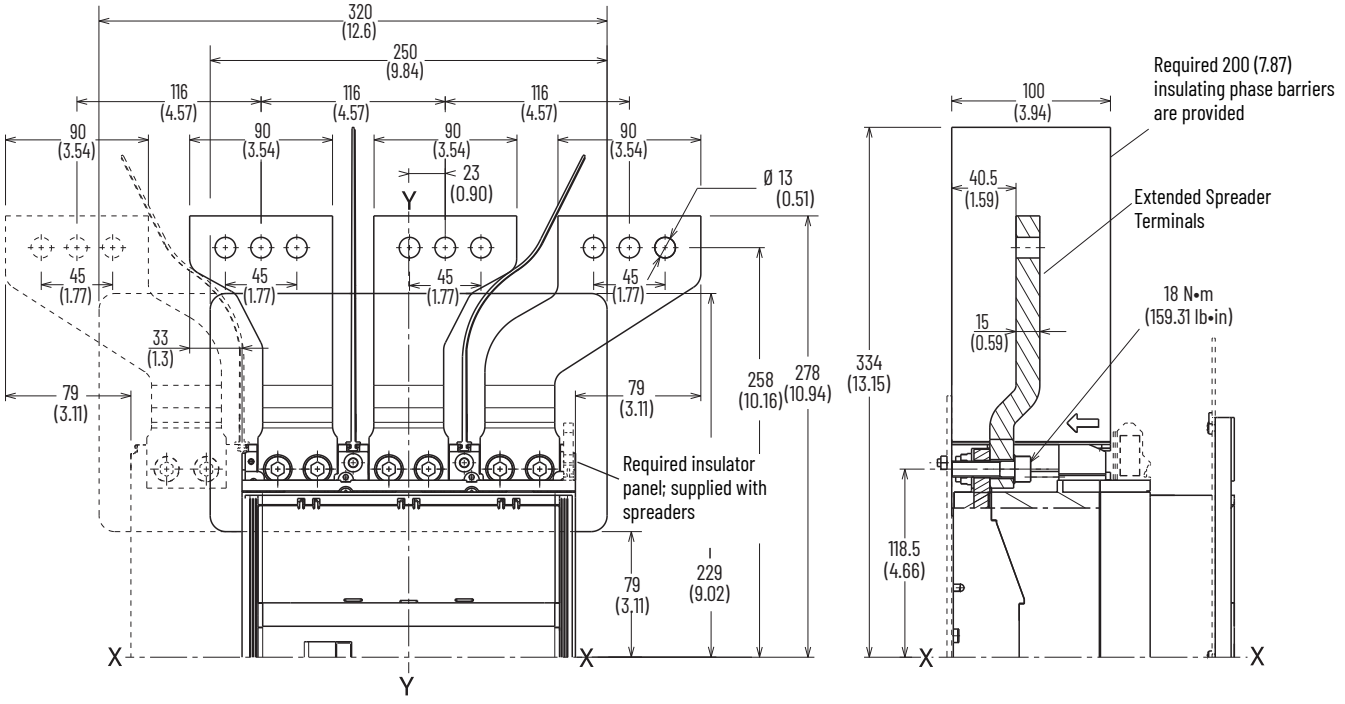
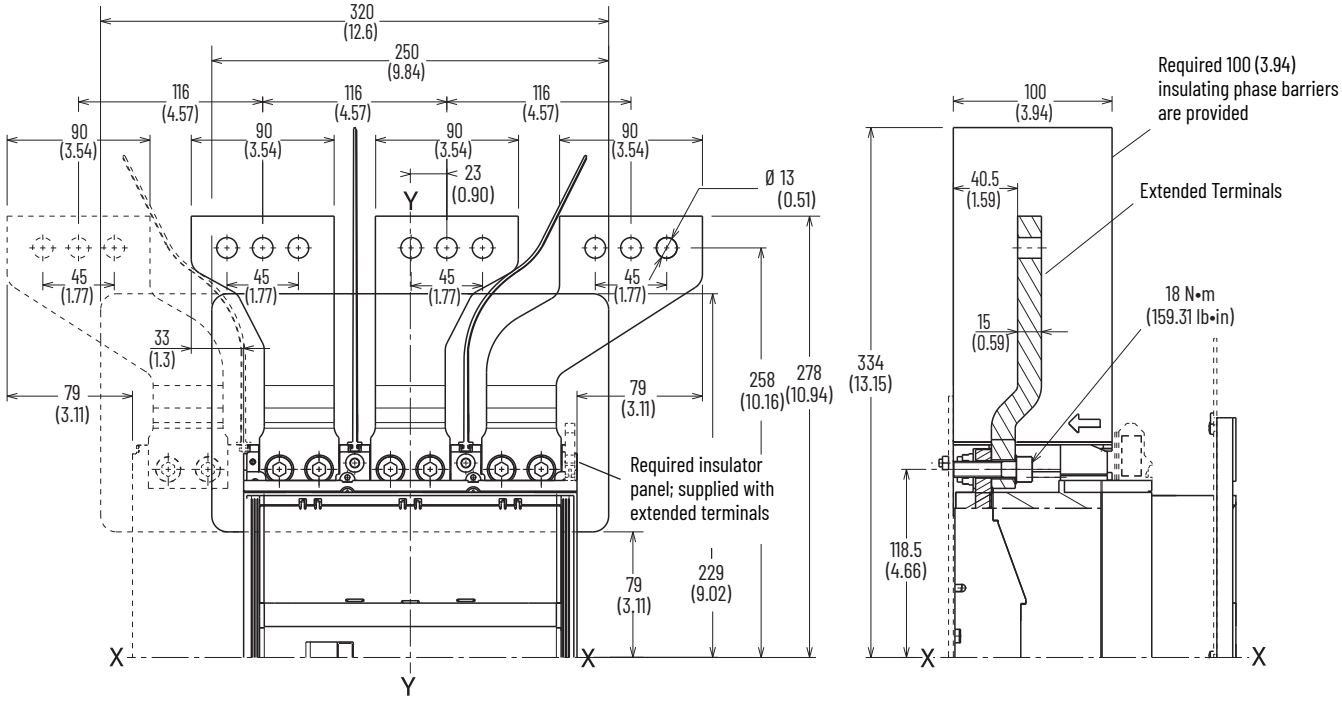
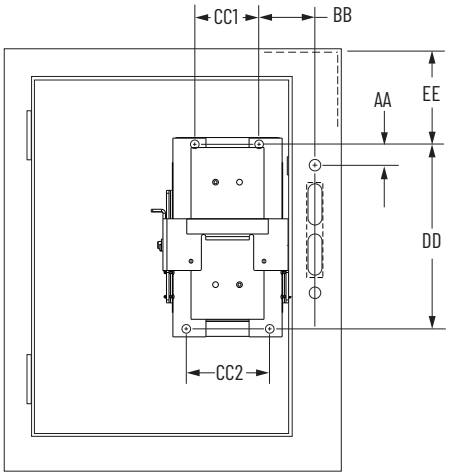


Figure 122 - Cat. No. 140G-N-EXT3, Cat. No. 140G-N-EXT4 Extended Front Terminals (IEC only)



Bulletin 1494V Variable Depth, Flange-operated Circuit Breaker Operating Mechanisms

Figure 123 - Enclosure with Handle Cutout



Frame Size	AA	BB	CC1	CC2	DD	EE Wire Bending Space
K	29/64 (11.51)	1-47/64 (44.05)	4 (101.6)	4-1/2 (114.3)	9-5/16 (236.54)	12 (304.8)
M, N	4-1/2 (114.3)	4-1/32 (102.4)	5 (127)	5 (127)	13-1/2 (342.9)	12 (304.8)

Figure 124 - Enclosure without Handle Cutout

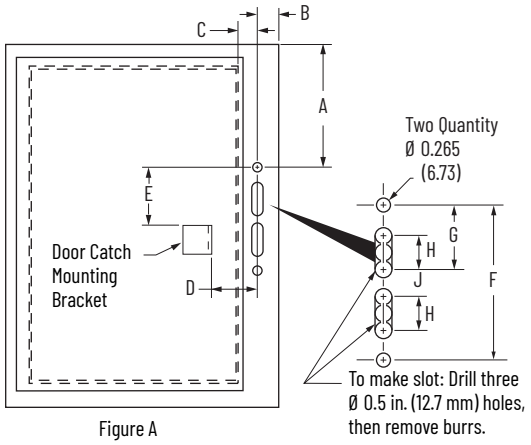


Figure A

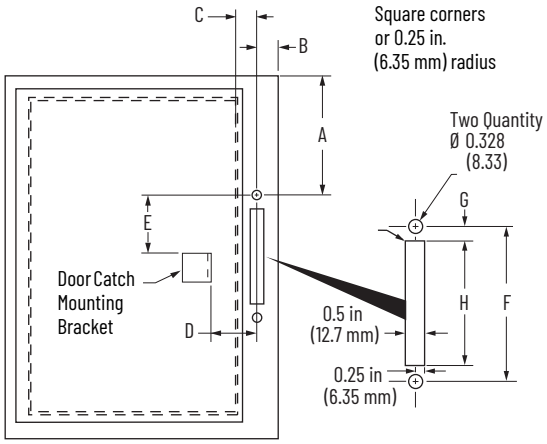


Figure B

Frame Size	Handle Cat. No.	A (min)	B (Min)	C (Max)	D	E	F	G	H	J
K	1494F-M1 (Figure A)	13-3/32 (332.6)	29/32 (23.01)	1-3/32 (27.8)	1-5/8 (41.3)	2-11/32 (59.5)	4-11/16 (119.1)	1-9/16 (39.7)	1 25.4)	7/8 (22.23)
M	1494F-M2 (Figure B)	17-5/16 (439.74)	1-3/8 (34.9)	1-3/32 (27.8)	2 (50.8)	3-23/3 (94.5)	6-1/2 (165.1)	5/16 (7.94)	5-1/2 (139.7)	–
N		21-7/8 (555.63)								

Notes:

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation. You can view or download publications at rok.auto/literature.

Resource	Description
Molded Case Circuit Breaker Selection Guide, publication 140G-TD050	Aids in selecting circuit breaker pairs for line and load side protection.
Molded Case Circuit Breaker Technical Data, publication 140G-TD101	Provides product selection, technical specifications, electrical diagrams, trip and let-thru curves, approximate dimensions, available accessories, and factory installed options Bulletin 140G and 140MG frame size G, H, I, J, K, L, N, NS, and R.
Selecting 80% or 100% Rated Molded Case Circuit Breakers, publication 140G-AT001	Defines terms applicable to circuit breakers, explains the ratings for 100% versus 80% operation, and provides cases where 100% rated MCCBs could be beneficial.
Short-circuit Current Ratings and Your Industrial Control Panel, publication SCCR-AT002	Provides examples for short-circuit current ratings of panels based on the methods stated in UL 508A Supplement B.
UL Standards Listing for Industrial Control Products, publication CMPNTS-SR002	Assists original equipment manufacturers (OEMs) with construction of panels, to help ensure that they conform to the requirements of Underwriters Laboratories.
American Standards, Configurations, and Ratings: Introduction to Motor Circuit Design, publication IC-AT001	Provides an overview of American motor circuit design based on methods that are outlined in the NEC.
Industrial Components Preventive Maintenance, Enclosures, and Contact Ratings Specifications, publication IC-TD002	Provides a quick reference tool for Allen-Bradley industrial automation controls and assemblies.
Global Short-circuit Rating Tool, rok.auto/sccr	Provides coordinated high-fault branch circuit solutions for motor starters, soft starters, and component drives.
Safety Guidelines for the Application, Installation, and Maintenance of Solid-state Control, publication SGI-1.1	Designed to harmonize with NEMA Standards Publication No. ICS 1.1-1987 and provides general guidelines for the application, installation, and maintenance of solid-state control in the form of individual devices or packaged assemblies incorporating solid-state components.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, rok.auto/certifications.	Provides declarations of conformity, certificates, and other certification details.
Maintenance	
Bulletin 140G Maintenance Instructions, publication 140G-IN108	Provides general installation and maintenance instructions for Bulletin 140G/MG devices.
Bulletin 140G-N and 140G-NS LSI, LSIG, and LSIG-MM Servicing Instructions publication 140G-IN075	Provides servicing and maintenance instructions for Bulletin 140G frame size N and NS devices.
Installation, Spacing, and General Instructions for Main Breaking Frames and Assembled Breakers	
Bulletin 140G-K Installation Instructions, publication 140G-IN021	Provides installation instructions for Bulletin 140G/MG frame size K devices.
Bulletin 140G-M Installation Instructions, publication 140G-IN042	Provides installation instructions for Bulletin 140G/MG frame size M devices.
Bulletin 140G-N and 140G-NS Installation Instructions, publication 140G-IN070	Provides installation instructions for Bulletin 140G/MG frame size N and NS devices.
Trip Unit Adjustment	
Adjustment instructions for 140G-K and 140G-M LSIG, LSI, LSIG-MM, publication 140G-IN066	Provides setup instructions for DIP switch trip units for frame size K and M MCCBs.
Bulletin 140G-N and 140G-NS LSI Getting Started, publication 140G-IN118	Provides setup instructions for DIP switch trip units for frame size N and NS devices.
Bulletin 140G-N and 140G-NS LSIG and LSIG-MM Release Installation Instructions, publication 140G-IN067	Provides setup instructions for DIP switch trip units for frame size N and NS MCCBs.
Bulletin 140G LSIG Getting Started Guide, publication 140G-IN068	Provides setup instructions for DIP switch trip units for frame size N, and NS MCCBs.
Bulletin 140G-N and 140G-NS LSIG-MM Getting Started, publication 140G-IN069	Provides setup instructions for LCD trip units for frame size N and NS MCCBs.

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Technical Documentation Center	Quickly access and download technical specifications, installation instructions, and user manuals.	rok.auto/techdocs
Literature Library	Find installation instructions, manuals, brochures, and technical data publications.	rok.auto/literature
Product Compatibility and Download Center (PCDC)	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	rok.auto/pcdc

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