Instruction Manual **MN013017EN** May 2022

IZM32 / IN32 low voltage air circuit breaker

IZM32 / IN32

Powering Business Worldwide

Purpose

This instruction booklet is expressly intended to cover the installation, operation, and maintenance of IZM32 air circuit breakers. These circuit breakers may be supplied as part of complete switchboard assemblies or as separate components. This booklet applies only to the circuit breaker and (if drawout) its mating cassette. In the case of fixed circuit breakers, certain sections of this leaflet, referring to such items as position interlocks and the drawout mechanism, will not apply.

Trip units associated with the IZM air circuit breakers will be addressed in a general manner in this leaflet. Specific trip unit details and time-current characteristic curves are covered in separate documents specific to the trip units.

IZM circuit breaker accessory items are not discussed in this leaflet. Field installation instructions for such items, however, are covered in individual instruction leaflets specific to the accessory.

This information is also available from the Eaton Web site at **www.eaton.com**

For application information, consult Eaton or see applicable Product Guides, Technical Documents, and Industry Standards.

Safety

All safety codes, safety standards, and/or regulations must be strictly observed in the installation, operation, and maintenance of this equipment.

⚠ WARNING

The warnings and cautions included as part of the procedural steps in this leaflet are for personnel safety and protection of equipment from damage. An example of a typical warning label heading is shown above to familiarize personnel with the style of presentation. This will help to ensure that personnel are alert to warnings. In addition, cautions are all uppercase and boldface.

All possible contingencies that may arise during installation operation or maintenance, and all details and variations of this equipment, do not purport to be covered by these instructions. If further information is desired by purchaser regarding particular installation, operation, or maintenance of particular equipment, contact the local Eaton representative.

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Section 1: Introduction

1-1 General information

The IZM32 / IN32 air circuit breaker is a fixed or drawout air circuit breaker design using an electronic tripping system. It is designed and tested for use at nominal voltages of AC380/415V, 440V and 500/690V. IZM32 / IN32 circuit breakers are available with continuous current ratings from 800A to 4000A. The withdrawable & fixed frame sizes have common height and depth dimensions. The circuit breaker nameplate provides complete rating information. All IZM32 circuit breakers are 100% rated, and are built and tested in an ISOT 9002 certified facility to applicable IEC and BS standards (Figure 1-2).

IZM32 / IN32 circuit breakers use a rigid frame housing of engineered thermoset composite resins, which has high-strength structural properties, excellent dielectric characteristics, and arc-tracking resistance.

The drawout IZM32 / IN32 circuit breaker is a through-the-door design having three breaker positions with the compartment door closed (CONNECT, TEST, DISCONNECT) and one position out of its compartment on extension rails (REMOVE). The operating mechanism is a two-step stored energy mechanism, either manually or electrically operated.

When withdrawn on captive compartment cassette extension rails, IZM32 / IN32 circuit breakers can be inspected, accessory items added, and minor maintenance performed. The inside of the compartment can also be inspected with the circuit breaker on its extension rails.

NOTICE

Please read and understand these instructions before attempting to unpack, install, operate, or maintain this equipment. Study the breaker and its mechanism carefully before attempting to operate it on an energized circuit.

WARNING

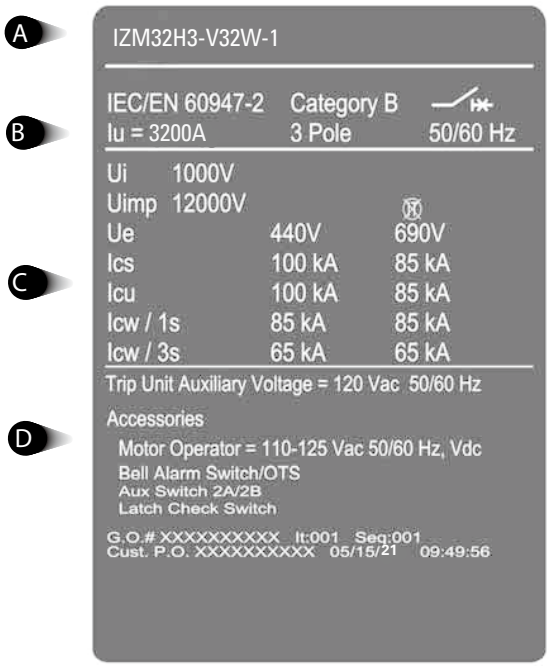
IZM32 / IN32 circuit breakers should not under any circumstances be applied outside their nameplate ratings. Operation outside of these ratings could result in death, bodily injury, or property damage.

IZM32

Figure 1-1 IZM32 / IN32 low voltage circuit breakers (800A-4000A)

1-2 Safety features

IZM32 / IN32 circuit breakers and associated drawout equipment are manufactured with built-in interlocks and safety-related features. They are provided to reduce hazards to operating personnel and provide proper operating sequences.



A) Low Voltage Air Circuit Breaker Family Name
B) Breaker Family Size in Amperes
C) Interrupting Capacity Rating
D) Factory Equipped Accessories

Figure 1-2 Typical IZM32 / IN32 nameplate

⚠ WARNING

Type IZM32 / IN32 circuit breakers are robust and are provided with safety features. nevertheless, the voltages, currents, and power levels available in and around this equipment when it is in operation are extremely dangerous and could be fatal. under no circumstances should interlocks and other safety features be made inoperative, as this may result in death, bodily injury, or property damage.

1-3 Safe practices

To protect personnel associated with the installation, operation, and maintenance of this equipment, the following practices must be followed:

1. Only qualified electrical personnel familiar with the equipment, its operation, and the associated hazards should be permitted to work on the equipment. Additionally, only qualified personnel should be permitted to install or operate the equipment.
2. Always be certain that the primary and secondary circuits are de-energized or the circuit breaker is removed to a safe work location before attempting any maintenance.
3. For maximum safety, only insert a completely assembled breaker into an energized cell.
4. Always ensure that drawout circuit breakers are in one of their designed cell positions, such as CONNECT, TEST, DISCONNECT, or REMOVE. A circuit breaker permitted to remain in an intermediate position could result in control circuits being improperly connected, resulting in electrical failures.

1-4 Qualified personnel

For the purpose of operating and maintaining low voltage air circuit breakers, a person should not be considered qualified if the individual is not thoroughly trained in the operation of the circuit breaker and how it interfaces with the assembly in which it is used.

For the purpose of installing and inspecting circuit breakers and their associated assembly, a qualified person should also be trained with respect to the hazards inherent to working with electricity and the proper way to perform such work. The individual should be able to de-energize, clear, and tag circuits in accordance with established safety practices.

Section 2: Receiving, handling, and installation

2-1 General information

IZM32 / IN32 air circuit breakers, when supplied as part of an assembly, may be shipped already installed in their respective breaker compartments. Receiving and handling of this equipment is addressed in an assembly instruction manual supplied with the assembled equipment. This instruction booklet applies to only the circuit breakers.

2-2 Suggested tools

A large number of different tools are not required to properly install and maintain circuit breakers. The following tools are, however, suggested:

- Flat-blade screwdriver
- Phillips head screwdriver
- 3/8-inch socket (ratchet) wrench
- 10 mm socket
- 17 mm socket
- Secondary wiring removal tool

2-3 Unpacking circuit breaker

Before beginning to unpack new IZM32 / IN32 circuit breakers, read and understand these directions. Following the directions will ensure that no damage is caused.

Shipping containers should be inspected for obvious signs of rough handling and/or external damage incurred during the transportation phase. Record any observed damage for reporting to the transportation carrier and Eaton, once the inspection is completed.

All reports and claims should be as specific as possible and include the order number and other applicable nameplate information. Every effort is made to ensure that circuit breakers arrive at their destination undamaged and ready for installation. Care should be exercised, however, to protect the breakers from impact at all times. Do not remove protective packaging until the breakers are ready for inspection, testing, and/or installation.

When ready to inspect and install the circuit breaker, carefully remove the banding straps and lift off the cardboard box. Remove any additional packing material and internally packed documentation. The circuit breaker and/or cassette are mounted to a wooden shipping pallet.

On drawout circuit breakers shipped without a cassette, two shipping clamps hook into the breaker side plates and are held to the pallet with four lag screws (Figure 2-1). Remove the lag screws and clamps. Save the screws and clamps for future shipment of the breaker.

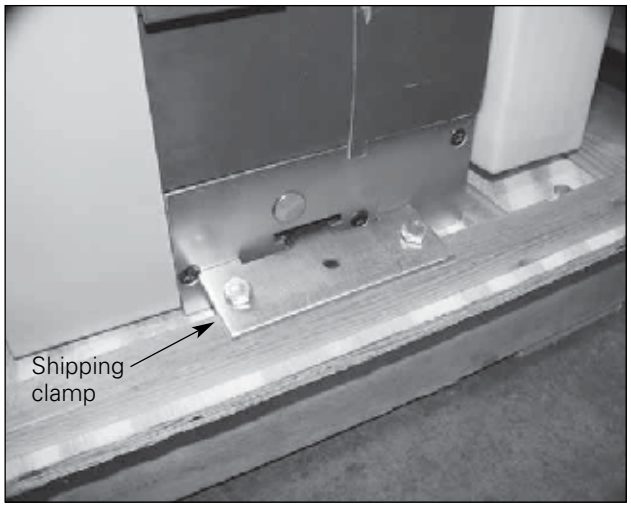


Figure 2-1 Shipping clamps for drawout circuit breaker

On empty cassettes, remove the four or five lag screws and/or machine screws that pass through the floor pan of the cassette holding it to the wooden pallet. On drawout breakers shipped in a cassette, first remove the breaker from the cassette using the levering mechanism and drawout rails. After the breaker is removed, the machine screws passing through the floor pan can be removed. On fixed breakers, remove the lag screws passing through the mounting feet that hold the breaker to the pallet. Circuit breakers are designed to be easily lifted from the wooden pallet using an appropriate lifting yoke and an overhead or a portable lifting device.

2-3.1 Storing circuit breaker

If it is necessary to store a circuit breaker before installation, do so in its original shipping container. Keep the circuit breaker in a clean dry place. Ensure that there is ample air circulation and heat, if necessary, to prevent condensation. It is very important that the circuit breaker not be exposed to dirt or moisture.

⚠ NOTICE

A circuit breaker that has been stored for any length of time should be operated a minimum of five times before it is placed in service.

2-4 Lifting circuit breaker

CAUTION

Do not attempt to lift circuit breakers with ordinary crane hooks, ropes, chains, or other such devices. Failure to follow this caution could result in damage to vital parts, such as arc chutes, barriers, and wiring or the entire circuit breaker.

To closely examine, install, or just become more familiar with the circuit breaker, carefully lift and place the circuit breaker on a solid work surface capable of handling the circuit breaker's weight (Table 2-1) or on the captive drawout extension rails of the breaker compartment. This is accomplished by using the appropriate lifting yoke and lifter. The lifting yoke consists of two steel hooks specially shaped to hook under the integral molded lifting handles on both sides of the circuit breaker. Every effort should be made during lifting to minimize circuit breaker swing and tilt.

If the circuit breaker is to be lifted onto compartment extension rails, follow the instructions in Section 2-7, "Installing drawout circuit breaker."

2-5 Circuit breaker inspection

All circuit breakers, once removed from their shipping containers, should be visually inspected for any obvious damage.

The current rating shown on trip unit label (Figure 2-2a) should match the current rating of the sensors mounted on the lower primary stabs of the circuit breaker. Check to make sure that this match exists. The sensor rating can be viewed through the viewing windows at the rear of the circuit breaker and (Figure 2-2b).

Table 2-1 IZM32 basic circuit breaker weights

	Weights (kg) Fixed		Weights (kg) Drawout	
Breaker model	**3P**	**4P**	**3P**	**4P**
IZM32B…-1	68	86	86	112
IZM32N…-1	68	86	86	112
IZM32H…-1	68	86	86	112

Figure 2-2a PXR trip unit current rating label

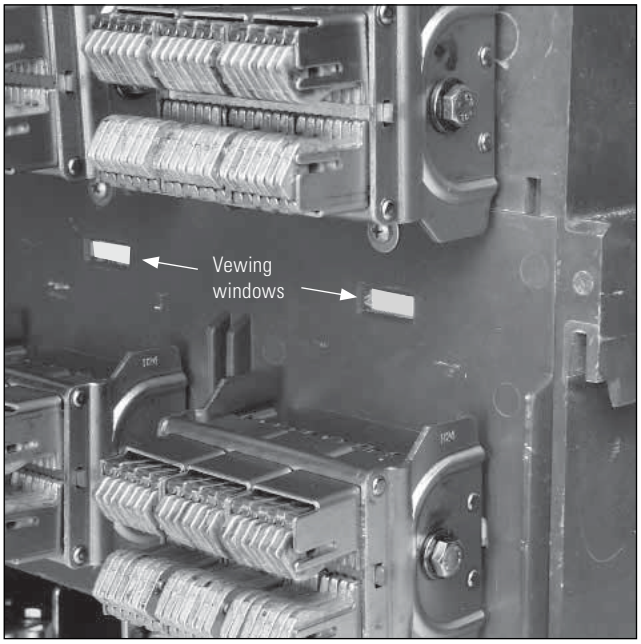


Figure 2-2b Rear view showing current sensor rating through viewing window

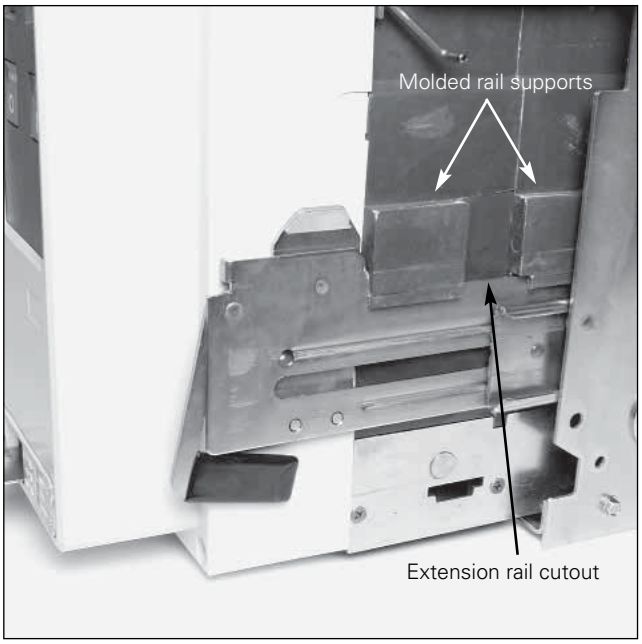


Figure 2-3 One side of drawout circuit breaker properly seated on extension rail

2-6 Adapting cassette

Drawout circuit breaker cassettes are built and shipped in a "basic" configuration that can be adapted in the field to mate with specific circuit breakers. Specifically, the rejection interlock must be configured to the specific circuit breaker to be mated with the cassette, and the automatic secondary connections may have to be installed or upgraded. These operations are described in the following sections.

2-6.1 Rejection interlocks

Within any one physical frame size, the drawout circuit breakers come in a variety of continuous current and interruption ratings, some of which are incompatible with others. Double-wide circuit breakers also come with several phase sequence options that are also incompatible. To prevent the insertion of circuit breakers with (1) inadequate interrupting capability, (2) with physically incompatible primary disconnects, or (3) with an incompatible phase sequence, rejection interlock key plates are provided on both the circuit breaker and the cassette. The key plate on the circuit breaker is pre-assembled at the factory; but the cassette-side rejection plate and key pattern must be assembled and installed by the switchboard builder.

⚠ CAUTION

Do not disable rejection interlocks. Doing so and using a lower capacity circuit breaker in an incompatible cassette could result in an electrical fault that could result in death, bodily injury, and/or equipment damage.

The rejection interlocks are steel pins in the floor of the circuit breaker cassette. As the circuit breaker is pushed into the structure, the mating pins on the bottom of the circuit breaker move past a set of corresponding pins in the cassette if the circuit breaker and cassette are compatible. If the circuit breaker and the cassette are mismatched, the rejection pins will block the insertion of the circuit breaker into the cassette before the levering-in mechanism is engaged.

Before attempting to push the circuit breaker into the DISCONNECT position, compare the positioning of rejection interlock pins in the cassette with the information supplied on the circuit breaker's nameplate. Proceed if the circuit breaker and the cassette are compatible.

2-6.2 Installing secondary jumpers

On drawout and fixed circuit breakers, the automatic secondary connector between the circuit breaker and the cassette is coming as a complete set of control circuit terminals (Terminal blocks and jumpers wires installed); These parts can be ordered separately and installed by the customer well. If the necessary connections are not pre-installed, please contact an Eaton representative. These kits can also be used to add additional secondary wiring to upgrade circuit breakers in the field.

2-7 Installing drawout circuit breaker

In structures equipped for drawout circuit breakers, a bolted-in cassette with movable extension rails supports the circuit breaker. The extension rails must first be pulled all the way out. Once the rails are fully extended, the circuit breaker can be carefully placed on the extension rails.

⚠ CAUTION

It is important to take great care when placing a drawout circuit breaker on its extension rails. If the circuit breaker is not properly seated on the extension rails, it could fall from the rails, causing equipment damage and/or bodily injury.

Carefully lower the circuit breaker down onto the extension rails. Be certain that the circuit breaker's four molded drawout rail supports are fully seated in the extension rail cutouts on both sides (Figure 2-3). Do not remove the lifting yoke from the circuit breaker until it is properly seated on the rails.

Once the circuit breaker is on the extension rails and the lifting yoke is removed, proceed with the rest of the circuit breaker installation.

2-7.1 Circuit breaker positioning

The IZM32 / IN32 drawout circuit breaker has four normal positions:

- REMOVE (withdrawn) (Figure 2-4)
- DISCONNECT (Figure 2-5)
- TEST (Figure 2-6)
- CONNECT (Figure 2-7)

The REMOVE position is a position outside the compartment on the cassette's drawout rails where the circuit breaker is not engaged with the levering mechanism. The DISCONNECT, TEST, and CONNECT, positions are reached by means of the levering mechanism.

With the breaker solidly positioned on the cassette's extension rails and levering-in mechanism in the DISCONNECT position, carefully and firmly push the circuit breaker into the compartment as far as it will go. The outer (recessed) portion of the circuit breaker faceplate should align with the GREEN target line (labeled DISC) on the inside top-left wall of the cassette (Figure 2-8).

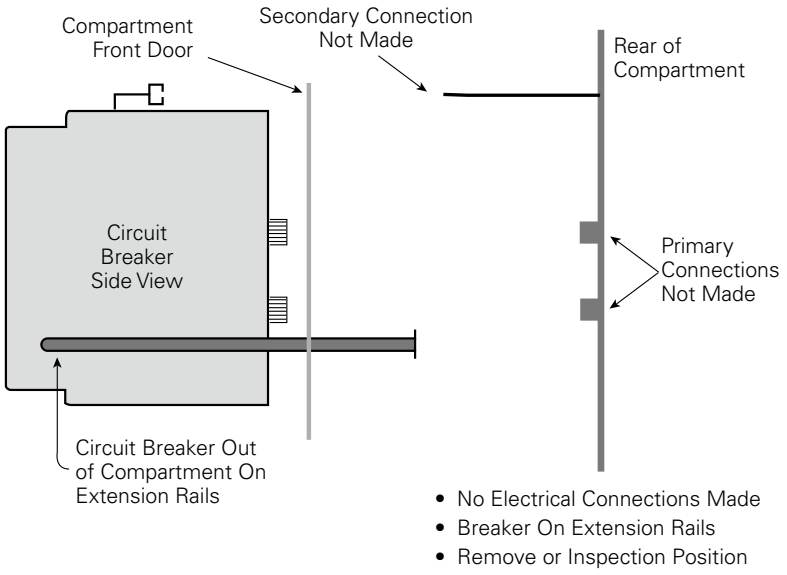
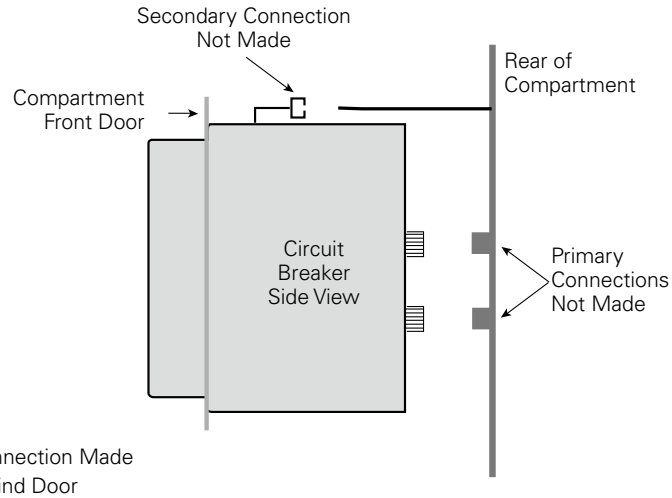
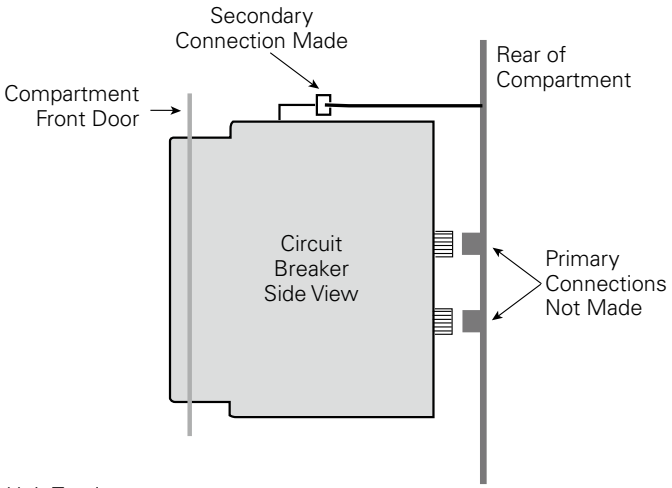


Figure 2-4 REMOVE position



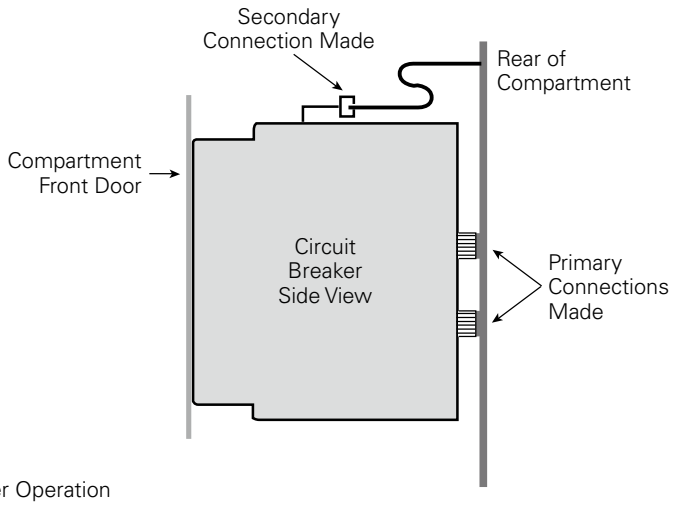
- Only Ground Connection Made
- Breaker Still Behind Door
- Typical Storage Position

Figure 2-5 DISCONNECT Position



- Breaker and Trip Unit Testing
- Primary Connection Not Made
- Secondary and Ground Connections Made

Figure 2-6 TEST position



- Full Breaker Operation
- Primary, Secondary, and Ground Connections Made
- Fully Racked into Cassette (compartment)

Figure 2-7 CONNECT position

⚠ CAUTION

Make certain that the circuit breaker is fully inserted into its compartment before any attempt is made to lever the circuit breaker. Attempting to lever the circuit breaker in before it is fully positioned inside its compartment can result in damage to both the circuit breaker and the compartment.

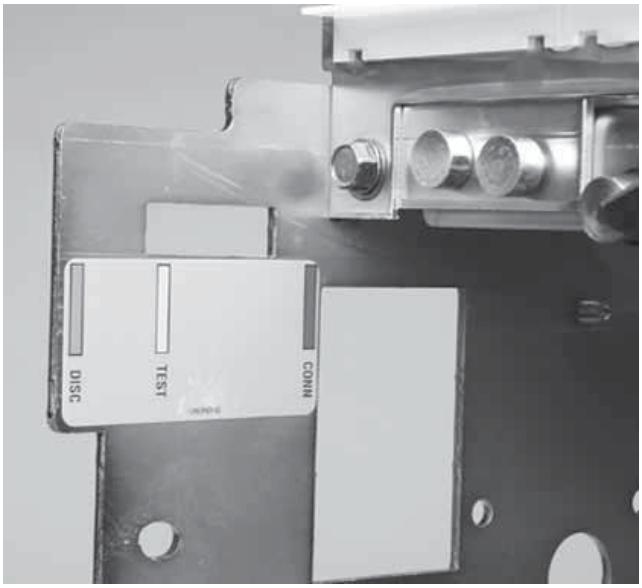


Figure 2-8 Cassette label showing disconnected, test, and connected position of recessed cover

2-7.2 Levering circuit breaker

The circuit breaker is now ready to be levered. With the circuit breaker OPEN, the levering device access door can be raised. The levering device is hand operated using a standard 3/8-inch square drive and ratchet, which is not provided (Figure 2-9). As long as the levering access door is raised, the circuit breaker is held trip-free. Begin by rotating the levering-in screw to the full counterclockwise (DISCONNECT) position.

Close the compartment door and begin levering the breaker into its different positions using a clockwise ratcheting motion. The circuit breaker can be levered with the compartment door open or closed, but it is advisable to close the door prior to levering.

The position of the circuit breaker within its compartment is indicated by color-coded position indicators (red = Connect, yellow = Test, green = Disconnect) (Figure 2-12). When the circuit breaker is levered fully to the DISCONNECT or CONNECT position, the levering shaft hits a hard stop; do not exceed 34.2 Nm of torque or the levering mechanism may be damaged. To remove the circuit breaker from its compartment, follow the procedure just described using a counterclockwise ratcheting motion.

⚠ NOTICE

The circuit breaker mechanism is interlocked such that charged closing springs are automatically discharged if the circuit breaker is levered into or out of the cell. Discharge takes place between the DISCONNECT and the TEST position.

Drawout cassette

A drawout circuit breaker is used in combination with a fixed drawout cassette (Figure 2-9); the drawout circuit breaker is equipped with automatic primary disconnects (Figure 2-10). The cassette provides all of the necessary interfaces to the drawout circuit breaker, including automatic primary and secondary connections. Horizontal stabs and horizontal customer busbar terminals are available as standard (Figure 2-11). The cassette terminal connections can be adapted to vertical busbar connections with a variety of optional vertical adapters.

Mounting locations for cell (TOC) switches, safety shutters, mechanical interlocks, and key interlocks are provided on the cassette.

Drawout circuit breaker dimensions

The drawout circuit breaker connects to the fixed primary stabs of the drawout cassette through the primary finger clusters attached to the rear of the circuit breaker. Two different frame sizes cover all circuit breakers from an overall dimensional standpoint.

Figure 2-9 Drawout circuit breaker cassette

Figure 2-10 Drawout circuit breaker with automatic primary disconnects

(Front View)

1 Extension Rails
2 Extension Rail Cutout
3 Secondary Plug-in Connectors
4 Secondary Terminal Blocks
5 Arc Hood
6 Optional Cell (TOC) Switch
7 Optional Key Interlock
8 Earthing Bar
9 Open Safety Shutters
10 Primary Terminals

(Rear View)

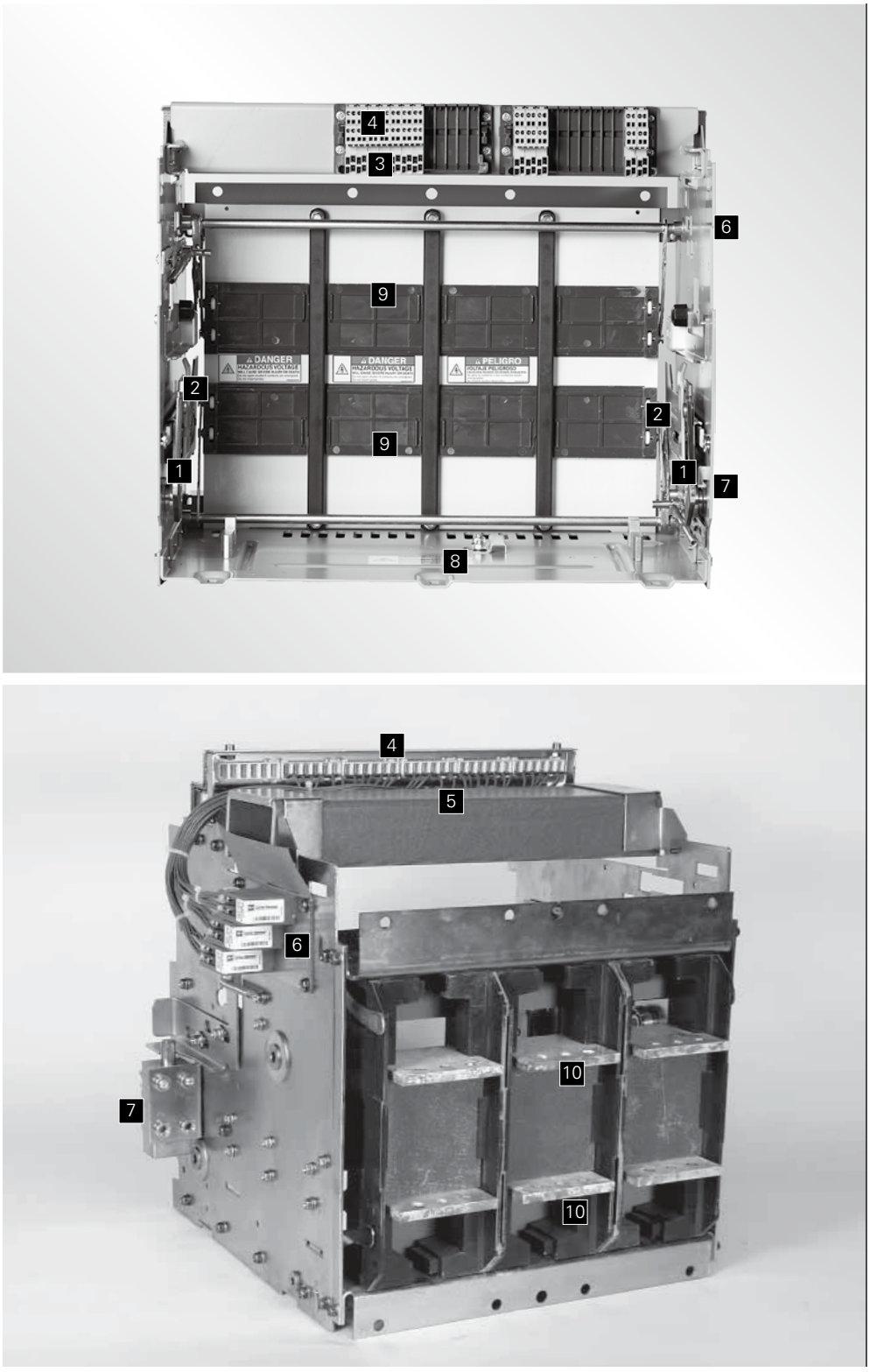


Figure 2-11 Drawout cassette features (front and rear views)

Figure 2-12 Levering position indication

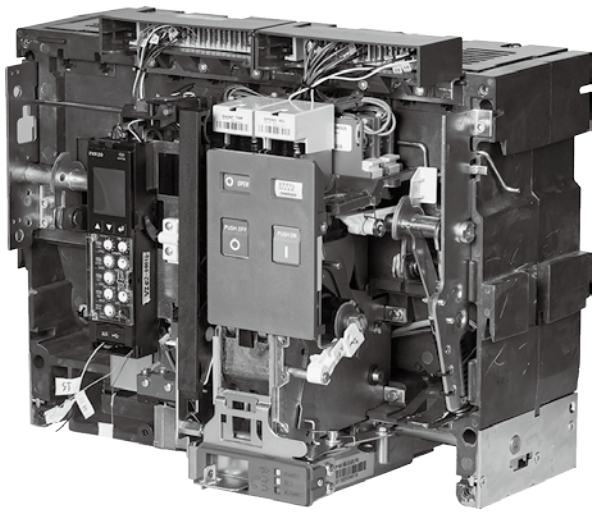


Figure 2-13 Typical fixed circuit breaker

2-8 Fixed circuit breaker

The fixed-type circuit breaker differs from the drawout version in that it has no levering device, primary disconnects, and secondary disconnects (Figure 2-13). In addition, a fixed circuit breaker does not have a standard feature to hold the breaker in a trip-free position. Fixed circuit breakers can be mechanically interlocked using either the optional key interlock (that is mounted through the front panel) or with optional cable interlocks that operate on the tripper bar (Figure 3-1).

Circuit breaker terminals have holes for making bolted horizontal primary bus connections. Adapters are available for making vertical primary bus connections. Secondary connections can be made through standard terminal blocks or a special connector compatible with the drawout circuit breaker's type secondary connector. Both secondary connection devices are mounted at the top front of the circuit breaker.

The fixed circuit breaker frame has two mounting feet, one on each side, to permit the fixed circuit breaker to be securely mounted. Each mounting foot has two slotted mounting holes that are used to bolt the circuit breaker securely in place. Use either M10 or 3/8-inch bolts for this purpose. Refer to the dimensional drawings referred to in Section 4 "Fixed circuit breakers" for circuit breaker and bus stab dimensions.

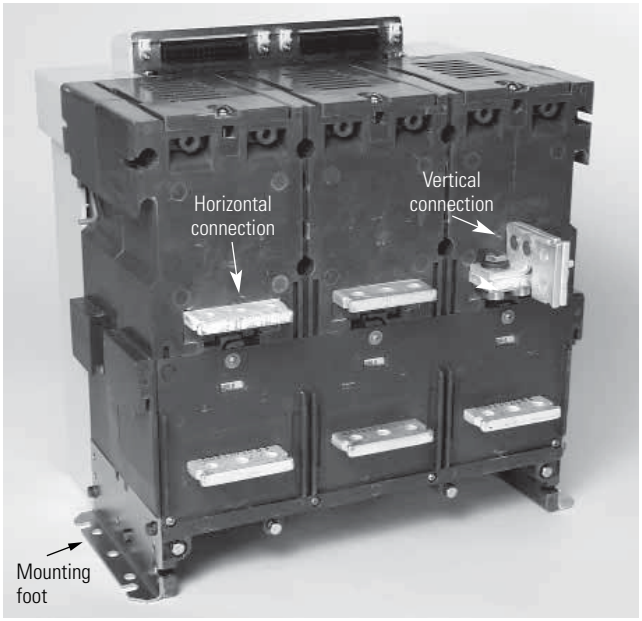


Figure 2-14 Fixed circuit breaker with available vertical adapter

NOTICE

Refer to the circuit breaker weights in table 2-1 to ensure that the panel on which a fixed circuit breaker is to be mounted is capable of supporting the weight.

2-9 Circuit breaker operation

Circuit breakers should be operated manually and/or electrically before they are put into service. This can be done during the installation process or some later date prior to startup. To check circuit breaker operation, follow the operational procedures outlined in Section 3 for both manually operated and electrically operated circuit breakers.

Fixed circuit breaker dimensions

The standard fixed circuit breaker is supplied with horizontally mounted primary connections (Figure 2-14). Optional vertical primary adapters are available for different bus configurations.

2-10 Technical data

Ambient temperature

Derating coefficients are given in the table below when the circuit breaker is operating at different internal ambient temperatures inside the panel. The ambient temperature inside the panel is determined with IEC8900, calculation methods or equivalent methods.

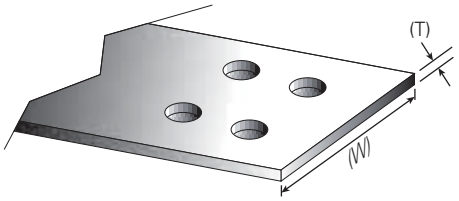
Rated currents of the circuit breakers at different ambient temperature

	Rated Current	800A	1000A	1250A	1600A	2000A	2500A	3200A	4000A
IZM32	40°C [A]	800	1000	1250	1600	2000	2500	3200	4000
	50°C [A]	800	1000	1250	1600	2000	2500	3100	4000
	60°C [A]	800	1000	1250	1600	2000	2500	2800	3650
	70°C [A]	800	1000	1250	1600	2000	2500	2550	3500

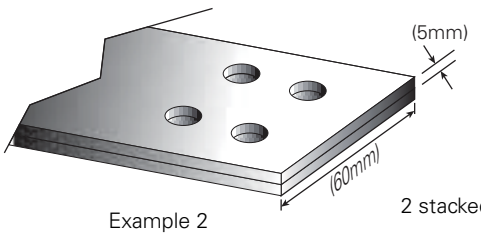
Bus bar dimensions

The bus bar sizes are shown in the table below. This table uses data specified by IEC 60947-1 or obtained by Eaton in their circuit breaker testing. They are 3-meter-long bus bars with the faces vertical and painted flat black. For other bus bar configurations, larger bus bar sizes may be required or the breaker may have to be de-rated. Refer to the table (Rated currents of the circuit breakers at different ambient temperature) presented in this section for de-rating information at higher ambient temperature. Two example diagrams are recommended below.

Max. operating current A (ambient temperature 40°C)	Circuit breaker frame size (IZM32)	Recommended bus bar quantities and sizes	
		(mm)	(I_n)
800	08	(2) 5 x 50	(1) .25 x 3.0
1000	10	(2) 5 x 60	(2) .25 x 2.0
1250	12	(2) 5 x 80	(2) .25 x 3.0
1600	16	(2) 5 x 100	(2) .25 x 3.0
2000	20	(3) 5 x 100	(3) .25 x 3.0
2500	25	(4) 5 x 100	(4) .25 x 3.0
3200	32	3) 10 x 100	(3) .25 x 6
4000	40	4) 10 x 100	(4) .25 x 6



Example 1



Example 2

T = Thickness of bus bar

w = Width of bus bar

2 stacked 5mm × 60 mm bus bars to carry 800A

Derating factors

IZM32 / IN32 circuit breakers can be applied at their full voltage and current ratings up to a maximum attitude of 2000 meters above sea level. When installed at higher attitudes, the ratings are subject to correction factors. Rated short-circuit current is not affected as long as the voltage is rated in accordance with the table below.

Power consumption data

It is recommended to use IZM32 / IN32 resistance and power consumption data table, calculated to IE (890) temperatures.

Altitude derating factors

Altitude (m)	Voltage correction	Current correction
2000	1.000	1.000
2150	0.989	0.998
2300	0.976	0.995
2450	0.963	0.993
2600	0.950	0.990
2750	0.933	0.987
2900	0.917	0.983
3050	0.900	0.980
3200	0.883	0.977
3350	0.867	0.973
3500	0.850	0.970
3650	0.833	0.967
3800	0.817	0.963
3950	0.800	0.960
5000	0.700	0.940

Notes

IZM series circuit breakers can be applied at their full voltage and current ratings up to a maximum altitude of 2000 meters above sea level. When installed at higher altitudes, the ratings are subject to correction factors. Short circuit current is not affected as long as the voltage is rated in accordance with the table.

IZM32 / IN32 resistance and power consumption data

Breaker frame	RDC (mW/pole) Fixed type	RDC (mW/pole) Drawout type	AC watt loss (3 pole sum) Fixed type	AC watt loss (3 pole sum) Drawout type
IZM32B3-..08	15	33	40	85
IZM32N3-..08	12	24	35	70
IZM32H3-..08	12	24	30	60
IZM32B3-..10	15	33	60	130
IZM32N3-..10	12	24	50	95
IZM32H3-..10	12	24	50	95
IZM32B3-..12	15	33	90	200
IZM32N3-..12	12	24	70	140
IZM32H3-..12	12	24	70	140
IZM32B3-..16	15	33	150	330
IZM32N3-..16	12	24	120	240
IZM32H3-..16	12	24	120	240
IZM32B3-..20	12	24	190	330
IZM32N3-..20	12	24	190	380
IZM32H3-..20	12	24	190	380
IZM32B3-..25	8	20	200	500
IZM32N3-..25	8	20	200	500
IZM32H3-..25	8	20	200	500
IZM32B3-..32	8	20	320	800
IZM32N3-..32	8	20	320	800
IZM32H3-..32	8	20	320	800

Based on RAC/RDC = 1.30, the total loss is under the full rated current.

Electrical clearance

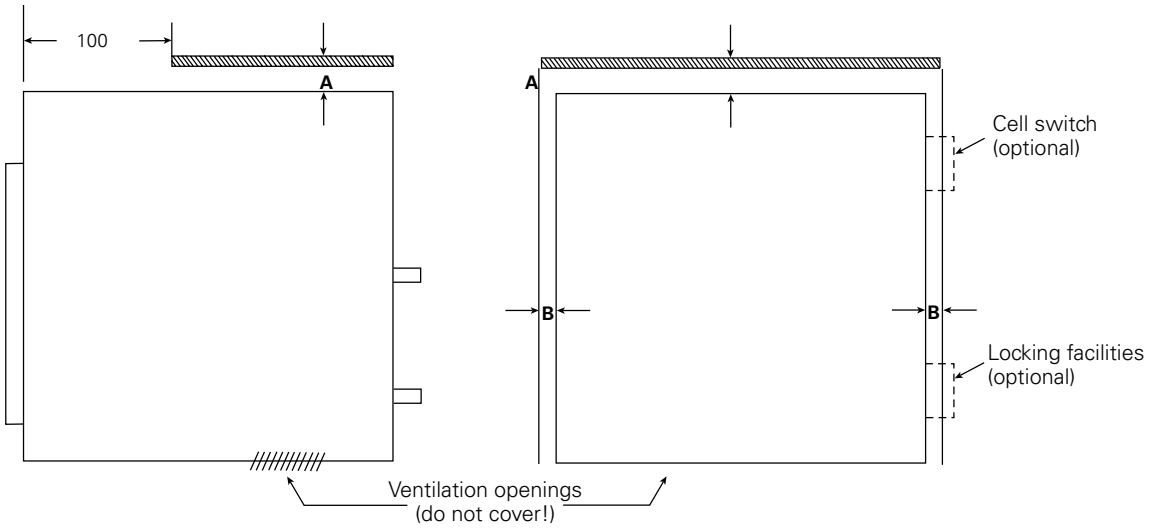
The following information about electrical clearance is intended to provide a guideline for the installation of fixed type or drawout type circuit breakers in an enclosure. The diagram and related dimensions can be used for reference.

Electrical clearance dimension (mm)

Recommended enclosure clearance and ventilation

Breaker type	Enclosure clearance	To insulated surface	To grounded metal surface	With cell switch or locking facilities
Withdrawable	A	0	0	0
	B	25	25	25/75
Fixed	A	150	250	-
	B	30	70	-

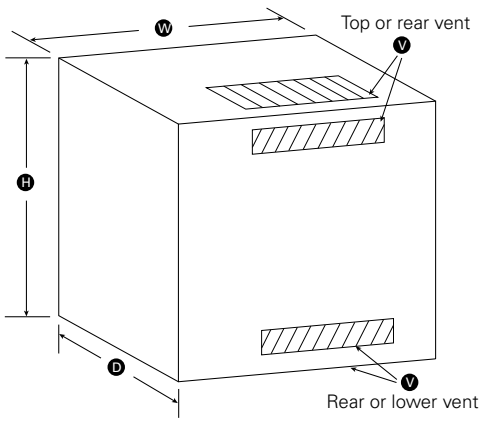
Recommended safety clearances



The typical enclosure drawing and dimension table is intended as a guideline for designing a circuit breaker enclosure. The enclosure dimensions and required ventilation openings should be considered at the designing phase.

Recommended enclosure/ventilation opening dimensions

Ⓦ Width	Width of cassette + 75 mm
Ⓗ Height	550 mm
Ⓓ Depth	450 mm (front control panel bay)
Ⓥ Ventilation holes	320 cm² (4000-6300A)



Section 3: Circuit breaker description and operation

3-1 Introduction

IZM32 / IN32 circuit breakers are available in two physical frame sizes (3 & 4 poles) in both drawout and fixed mounting configurations (Figure 3-1 and Figure 3-2). A majority of features are common to both configurations, and will be discussed in this section. The mounting features unique to the drawout and the fixed configurations will be covered individually in Sections 4 and 5 respectively.

Controls and indicators for both drawout and fixed circuit breakers are functionally grouped on the front of the circuit breaker. The front escutcheon (faceplate) covers all continuous current ratings through 4000A.

3-2 Basic circuit breaker assembly

1 Baffled arc chute cover
2 Secondary disconnects (contacts)
3 Faceplate (front cover)
4 Drawout rail supports
5 Integral lifting handle

6 Primary disconnect finger cluster
7 Arc chamber
8 Tripper bar
9 Levering device bearing plate
10 Padlockable levering device access door
11 Circuit breaker nameplate

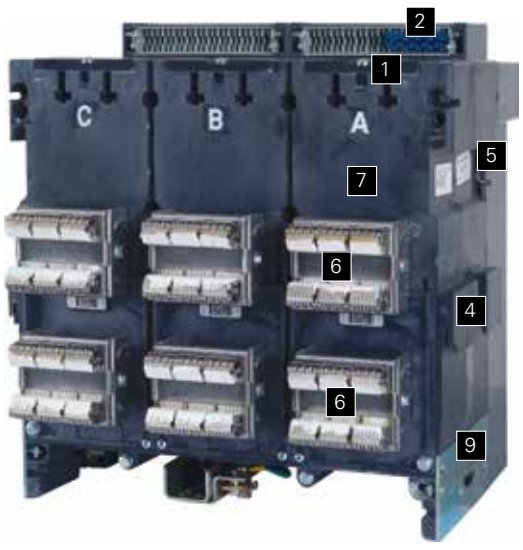


Figure 3-1 Typical drawout circuit breaker features (front and rear views)

1 Baffled arc chute cover

2 Secondary disconnect

3 Faceplate (front cover)

4 Integral lifting handle

5 Fixed horizontal primary terminal

6 Fixed primary terminal (with optional vertical adapter)

7 Arc chamber

8 Mounting foot

9 Circuit breaker nameplate

10 Tripper bar

Figure 3-2 Typical fixed circuit breaker features (front and rear views)

1 Trip flag (pop-out indicator)

2 Three accessory windows

3 Trip unit

4 Contact status (open-close)

5 Spring status (charged-discharged)

6 Manual OFF button (push)

7 Manual ON button (push)

8 Manual charge handle

9 Optional operation counter

10 Padlockable levering device access door for drawout breaker

11 Color-coded breaker position indicator

12 Nameplate

13 Trip unit test port

14 Trip unit cover. Plastic cover is provided which allows the settings to be viewed but not changed.

Figure 3-4 Typical standard drawout circuit breaker front cover

IZM32 circuit breakers use a rigid frame housing construction of engineered thermoset composite resins. This construction provides high-strength structural properties, excellent dielectric characteristics, and resistance to arc tracking.

The three-piece construction approach provides support while isolating and insulating power conductors.

A two-piece engineered thermoset composite resin case encloses current paths and arc chambers. The chambers act to channel arc gases up and out of the circuit breaker during interruption.

The operating mechanism sits on the front of the case and is electrically isolated and insulated from current contact structures. It is covered by an insulating front cover.

Figure 3-5 Typical construction (right side view)

3-3 Operating mechanism

The IZM32 / IN32 operating mechanism is based on the proven cam and spring design. It is easily accessed by removing few cover screws and the front cover (Figure 3-6). The mechanism is a two-step stored energy mechanism. Potential energy is stored to close the circuit breaker. Sufficient energy to open the circuit breaker remains available after a closing operation.

1. Secondary wiring points
2. Field installable accessories (3 maximum)
3. Trip unit
4. Electric charging motor
5. Manual charge handle
6. Operations counter (optional)
7. Padlockable levering device access door
8. Breaker position indicator

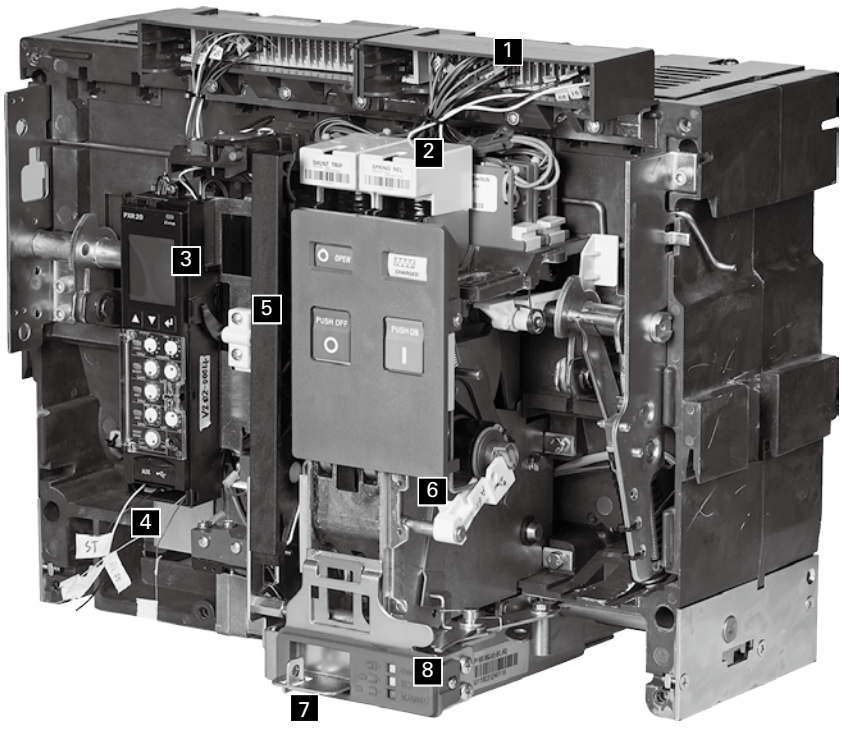


Figure 3-6 Electrically operated drawout circuit breaker with front cover removed

3-3.1 Manual operation

On manually operated circuit breakers, the closing spring can only be charged manually. To manually charge the spring, insert one finger in the recess of the charging handle and pull out. This permits a gloved hand to grasp the handle and begin charging. It takes from five to seven downward strokes on the charging handle to complete the manual charging process. It is possible to manually recharge the spring immediately after closing the circuit breaker and before it has been tripped open. Standard manually operated circuit breakers are closed and opened by hand using the Manual ON and Manual OFF buttons respectively located on the front of the circuit breaker (Figure 3-4).

Performing either operation is accomplished by pressing and releasing the appropriate button. Access to these pushbuttons can be limited by the use of an optional, padlockable cover. In addition, complete access to the ON button can be prevented with an optional prevent close cover. The status of the springs and the primary contacts is always indicated in an indicator window just above the pushbuttons.

Electrically operated optional devices are available to automatically close or trip a manually operated circuit breaker. An electrical spring release is available to close a manually operated circuit breaker. Two optional devices, a shunt trip, and an undervoltage release, are available to automatically trip (open) a manually operated circuit breaker. These optional devices can be installed easily in the field. For more details on these devices, refer to the corresponding instructions leaflet.

An electrical motor operator that is used to charge the closing spring automatically can be added to a manually operated circuit breaker in the field (Figure 3-8). Manually operated circuit breakers are pre-wired to accept this addition.

3-3.2 Electrical operation

For electrically operated circuit breakers, the springs are normally charged through the use of an electrical motor operator (Figure 3-8). The springs can, however, be charged manually as just described in the previous paragraph (Figure 3-7).

Like the manually operated circuit breaker in the previous paragraph, electrically operated circuit breakers can also be manually closed and opened through the use of the front-mounted Manual ON and Manual OFF buttons.

An electrically operated circuit breaker from the factory is also equipped as standard with a spring release to close the circuit breaker electrically. An optional shunt trip and undervoltage release are also available to trip (open) an electrically operated circuit breaker. Refer to the corresponding instructions leaflet for more details on both standard and optional devices.

3-3.3 Anti-pump feature

The circuit breaker has both mechanical and electrical antipump features. If the circuit breaker is closed on a fault condition (and trips open while the CLOSE signal is maintained), using either the mechanical pushbutton or the electrical close coil, it will not make another attempt to close until the close command is removed and reapplied. For electrical closing, a Latch Check Switch (LCS) option is available (check the corresponding instructions leaflet for more details) that will block the application of the electrical close command until the breaker is ready to close.

Figure 3-7 Electrical motor operator to charge closing spring

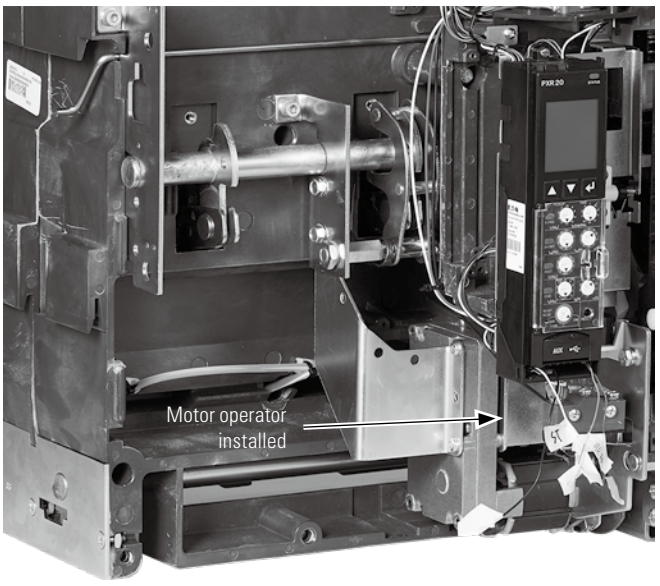


Figure 3-8 Charging motor can be installed in the field (installed)

3-4 Electronic tripping system

Series IZM32 / IN32 circuit breakers use a three-part tripping
system:

- Microprocessor-based trip unit connected to a frame rating module;
- Rogowski coil type current sensors; and
- Trip actuator.

All three parts of the tripping unit are discussed here in general. For detailed information pertaining to the different available trip unit models and other breaker or accessory information, refer to PXR20/25 instructions manual.

See important frame rating module information on next page regarding the tripping system.

3-4.1 Microprocessor-based trip unit

Series IZM32 / IN32 circuit breakers utilize the PXR family of electronic trip units whose main features are summarized in Table 3.1.

The electronic trip units are self-powered devices. The protection settings can be set from the front panel. When the circuit breaker is closed, no external power is required to operate their protective systems. Current signal levels and the control power are derived from the current sensors. All trip units are true RMS current sensing devices.

A functional local test of the trip unit's primary electronic circuitry and the circuit breaker's mechanical tripping action can be performed through the trip unit's USB receptacle.

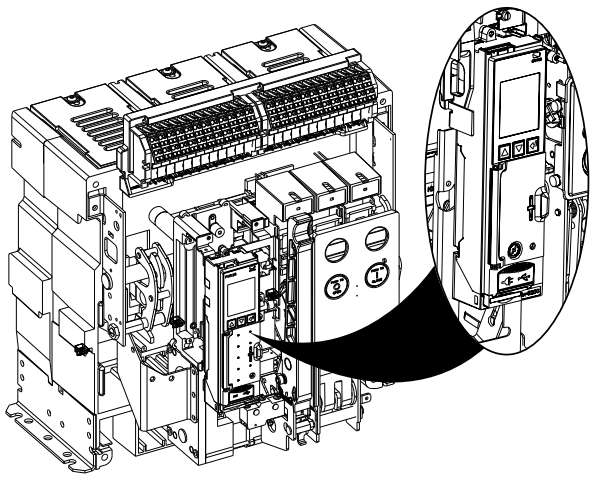


Figure 3-9 Installed PXR trip unit

Table 3.1 Series PXR trip units.

Functions	PXR 20	PXR 25
LSIG protection	Yes	Yes
Disable (I)	Yes	Yes
GF protection	Option	Option
GF alarm	Option	Option
Display	Yes	Yes
Programmable	No	No
Current metering	Yes	Yes
Power/energy metering	No	Yes
Power quality metering	No	No
Communication	Yes	Yes

3-4.2 Rating plug

A rating plug is not required with PXR trip units. See frame rating module information on next page.

3-4.3 Current sensors

Rogowski coil type current sensors are installed on the load terminals at the bottom rear of the circuit breaker. The sensors furnish the trip unit with a signal and the energy required to trip the circuit breaker.

An external neutral current sensor is available for customer installation, and must be ordered separately.

3-4.4 Frame rating module

The PXR frame rating module is mounted just behind the trip unit and stores data related to the breaker's ratings (including the maximum continuous RMS current), manufacturing information, and health of the breaker frame.

The interchangeable trip unit attaches to the permanent frame rating module. Since the PXR trip unit no longer requires a fixed type rating plug, the continuous current (In) rating is factory programmed in the frame rating module.

The programmed value of I_n is shown on the trip unit's LCD display and printed on the Battery cover at the lower right corner of the trip unit. The In rating displayed and programmed will be equal to or less than the breaker frame's maximum rated current as listed on the nameplate.

The breaker's I_n rating can be re-programmed by interfacing with the USB port on the trip unit. Please contact your Eaton sales representative for details on proper re-programming of the trip unit.

Frame rating modules installed on series IZM32 / IN32 air circuit breakers with PXR are permanent and SHOULD NEVER BE REMOVED. The frame rating module battery cover with printed I_n rating should not be changed without proper reprogramming of the trip unit. The I_n rating programmed from the factory is displayed in the lower left hand corner in the LCD screen whenever power is applied to the trip unit. The I_n displayed on the LCD reflects the actual I_n rating of the breaker, while the value on the battery cover is for reference only when the LCD is not powered. The I_n rating displayed on the LCD screen and I_n rating printed on the frame rating module battery cover MUST ALWAYS MATCH.

3-4.5 Trip actuator

The low-energy trip actuator is a small electromagnetic device that provides the necessary mechanical force to initiate the tripping action of the circuit breaker. The electronic trip unit provides a pulse to the coil of the trip actuator, allowing the mechanical tripping action to take place. The trip actuator is reset by the operating mechanism.

3-4.6 Fixed high instantaneous non-adjustable trip

Series IZM32 circuit breakers have a fixed instantaneous non-adjustable setting. This fixed instantaneous trip will initiate a trip at a high current peak which depends on the circuit breaker type and rating. This setting is always active, regardless of the instantaneous setting.

3-4.7 Non-automatic device

Series IZM32 / IN32 is available in a non-automatic configuration. It is derived from the corresponding IZM32 / IN32 automatic breaker but does not include the trip unit, Rogowski coil type current sensors, and the high instantaneous trip feature. The overall dimensions and the capability of mounting most accessory items are maintained. Non-automatic device are tested in keeping with IEC 60947-2 requirements.

1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47
E01 +		OT1C	OT1B	OT2C	N1	ALMC	ALM2	G1	+ 24V	ZIN	ZCOM	CMM1	CMM3	PTVA	PTVC	MODB	MODG	2CMM	2CMM	ARCO			
E02 -	SC	OT1M	OT2B	OT2M	N2	ALM1	ALM3	G2	AGND	ARMS	ZOUT	CMM2	CMM4	PTVB	PTVN	MODB	2CMM	2CMM	ARCO	ARCO			
2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48

49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95
C1	B1	C2	C3	B3	C4	C5	B5	C6	C7	B7	C8	C9	B9	C10	C11	B11	C12	LCC	LCB	ST1	SR1	UV1+	
A1	B2	A2	A3	B4	A4	A5	B6	A6	A7	B8	A8	A9	B10	A10	A11	B12	A12	LCM		ST2	SR2 -	UV2 -	
50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96

Figure 3-10 Secondary connector top view

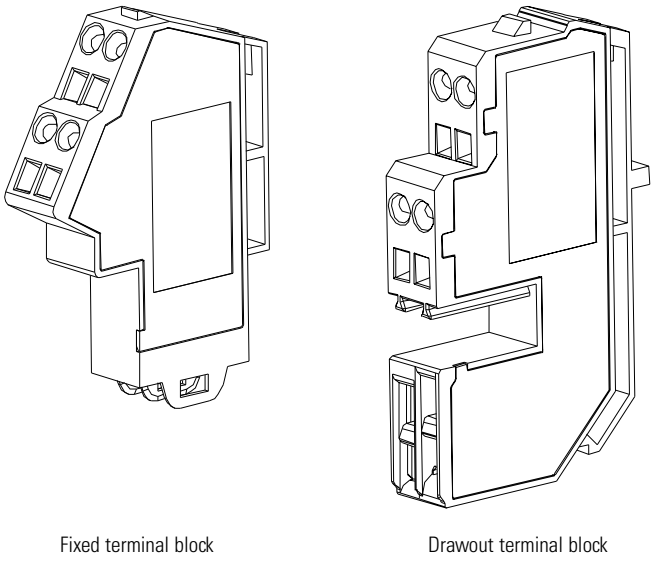
3-5 Secondary contacts and connection diagrams

A maximum of 96 secondary wiring connection points are available, each dedicated to specific functions. The number of secondary blocks mounted depends on a number of considerations, such as whether the circuit breaker is electrically or manually operated and how many features are required. All necessary customer secondary connection point are accessible without removing the breaker's front cover. Each connection point is permanently identified.

The customer secondary wiring contact point map is identifiable on the product (Figure 3-10). This is a label applied to the top of the front cover of the breaker.

General wiring notes:

1. Each secondary terminal block contains four independent contacts (Figure 3-11) A possible 24 terminal blocks will provide 96 contact points.



Fixed terminal block Drawout terminal block

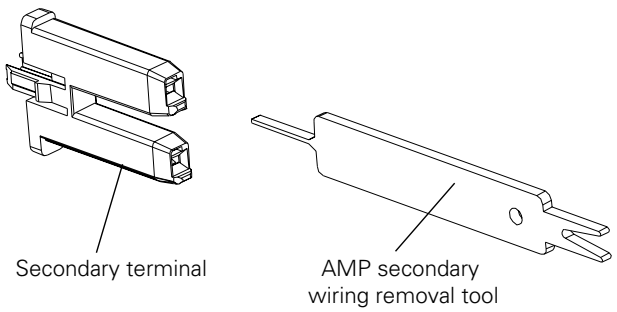
Figure 3-11 Secondary point identification

2. Drawout circuit breakers use contact blocks that mount onto an insulated support frame on the cassette.
3. Fixed mounted circuit breakers use contact blocks that mount onto an insulated support frame. The customer tension connectors are at an angle.
4. Customer wiring is done using a tension clamp termination on each contact.
5. Contact blocks are individually mounted and hence contact positions may be empty depending on accessories and options ordered.
6. The tension clamp terminals will support solid or flexible conductors, #12/4 mm^2 through #26 /0 5 mm^2 AWG and are UL/CSA rated for 600 V, 10 A.
7. The recommended wire strip length is 10-12 mm (0 39 - 0 47 in).
8. The tension clamp terminals also support finely stranded conductors with wire-end ferrules and plastic collars DIN 46228/4, rated connection.
9. The two-point blue plugs house two female crimp contacts, with the odd assigned numbers having the coded rib feature on the blue plug.
10. For secondary contacts, odd numbers should be treated as positive voltage for any accessory. This will not apply for AC ratings.

Customer wiring details

Type of conductor	Tension clamp connection	Recommended strip length or ferrule length
Solid cross section (min - max)	0.5 - 4 mm2	10 - 12 mm (.39 - .47 in.)
Flexible cross section (min - max)	0.5 - 4 mm2	10 - 12 mm (.39 - .47 in.)
American wire gauge - AWG (min - max)	26 - 12 AWG	10 - 12 mm (.39 - .47 in.)
Flexible cross-section with wire end ferrule without plastic sleeve - DIN 46228/1 (min - max)	0.5 - .2.5 mm2 (26 - 14 AWG)	10 - 12 mm (.39 - .47 in.)
Flexible cross-section with wire end ferrule with plastic sleeve - DIN 46228/4 (min - max)	0.5 - 1.5 mm2 (26 - 16 AWG)	16 - 18 mm (.63 - .71 in.)
Gauge to IEC 60947-1	A3	-

Figure 3-12 Secondary point identification

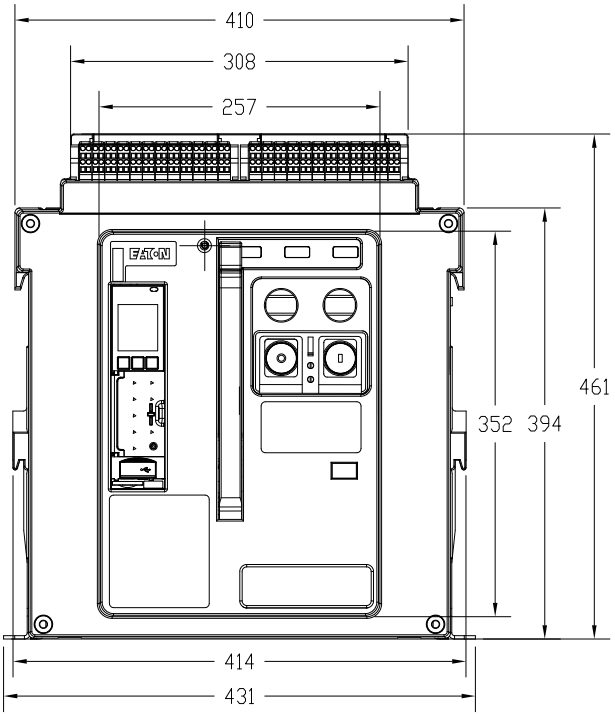


Secondary terminal AMP secondary wiring removal tool

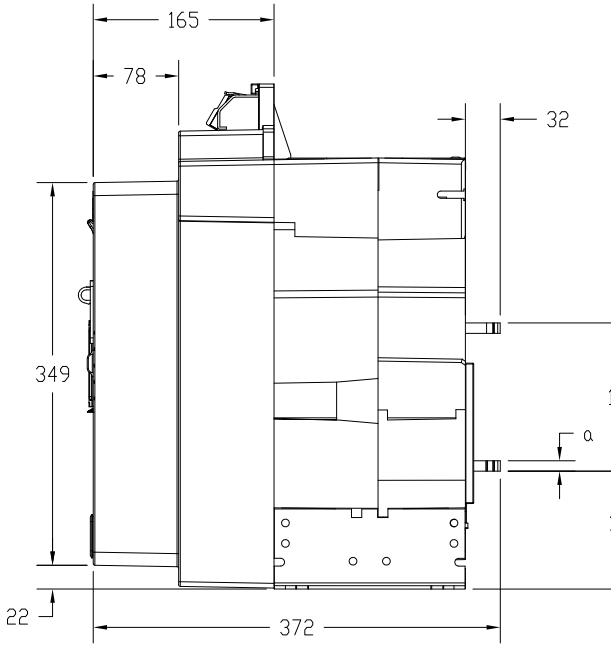
Figure 3-13 AMP secondary wiring removal tool

Section 4: Dimensional drawings

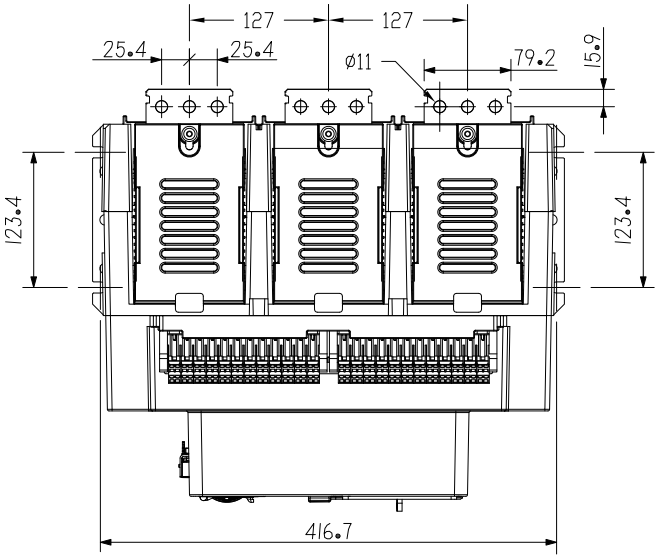
IZM32 Fixed Type Dimensions and Horizontal Board Dimensions (3P, 800~3200A)



Front view



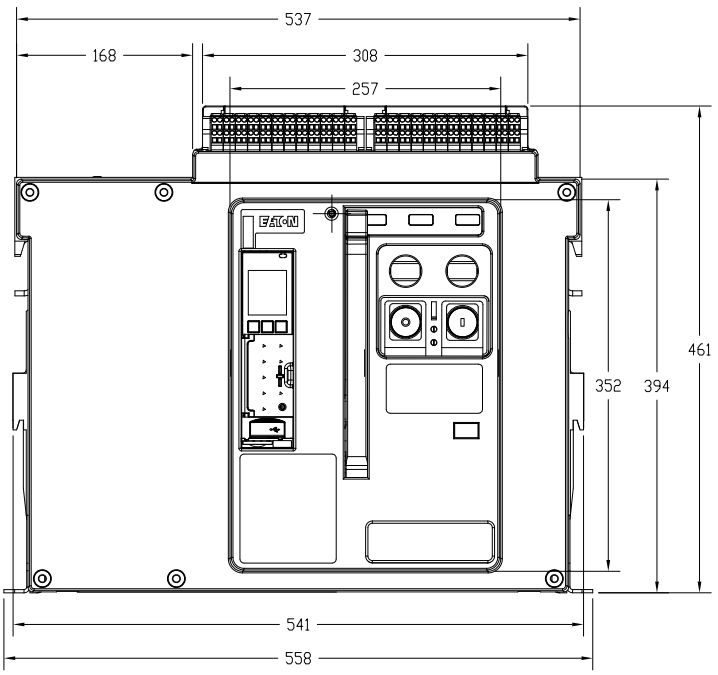
Right view



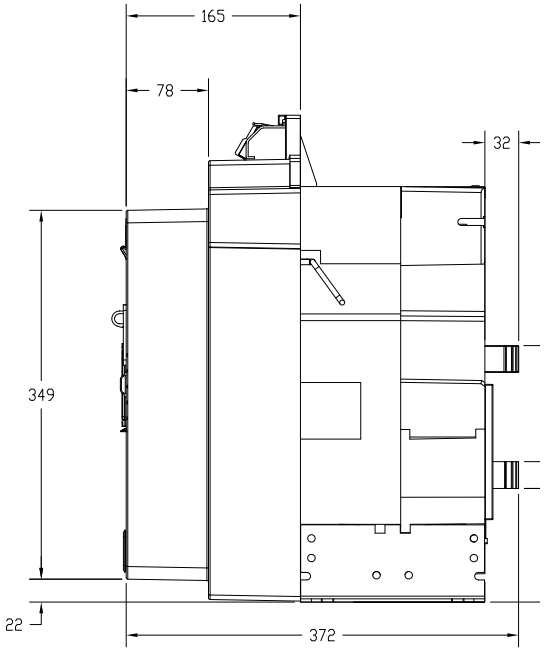
Top view

In(A)	800~2000	2500~3200
a(mm)	9.5	25.4

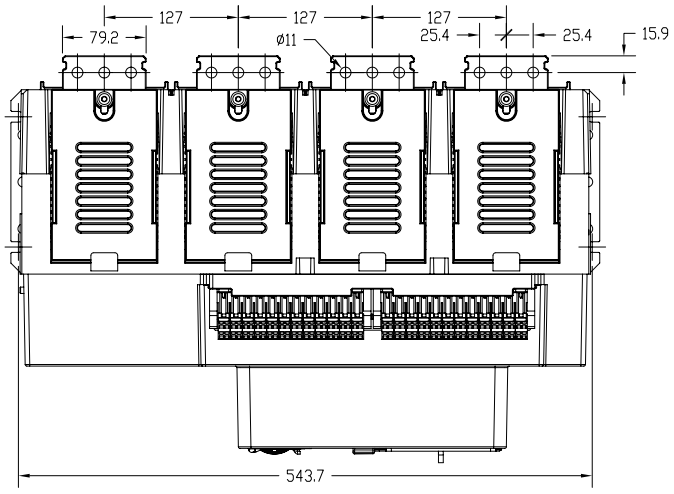
IZM32 Fixed Type Dimensions and Horizontal Board Dimensions (4P, 800~3200A)



Front view



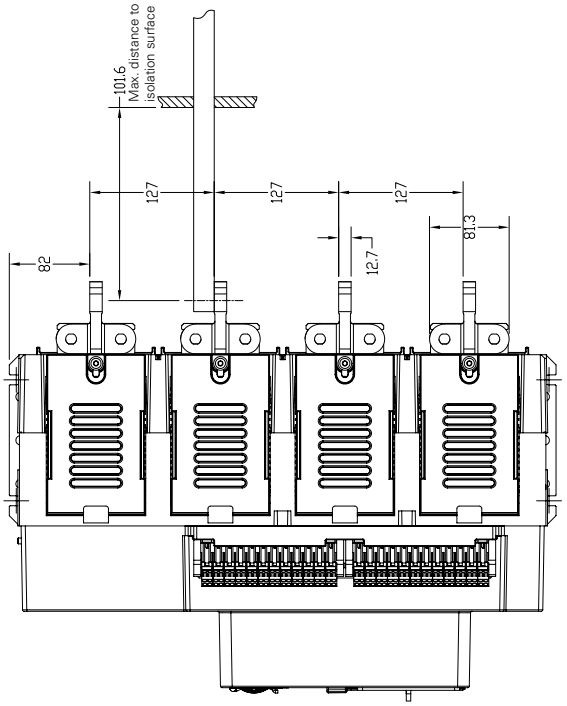
Right view

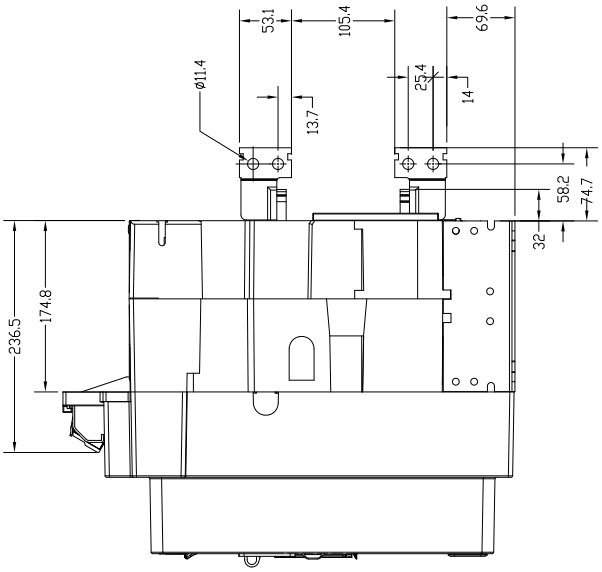


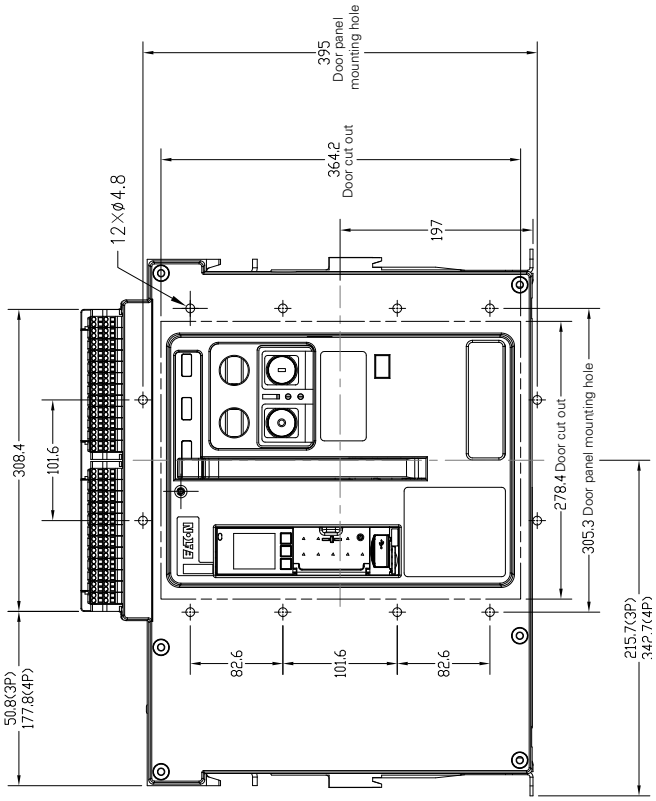
Top view

In(A)	800~2000	2500~3200
a(mm)	9.5	25.4

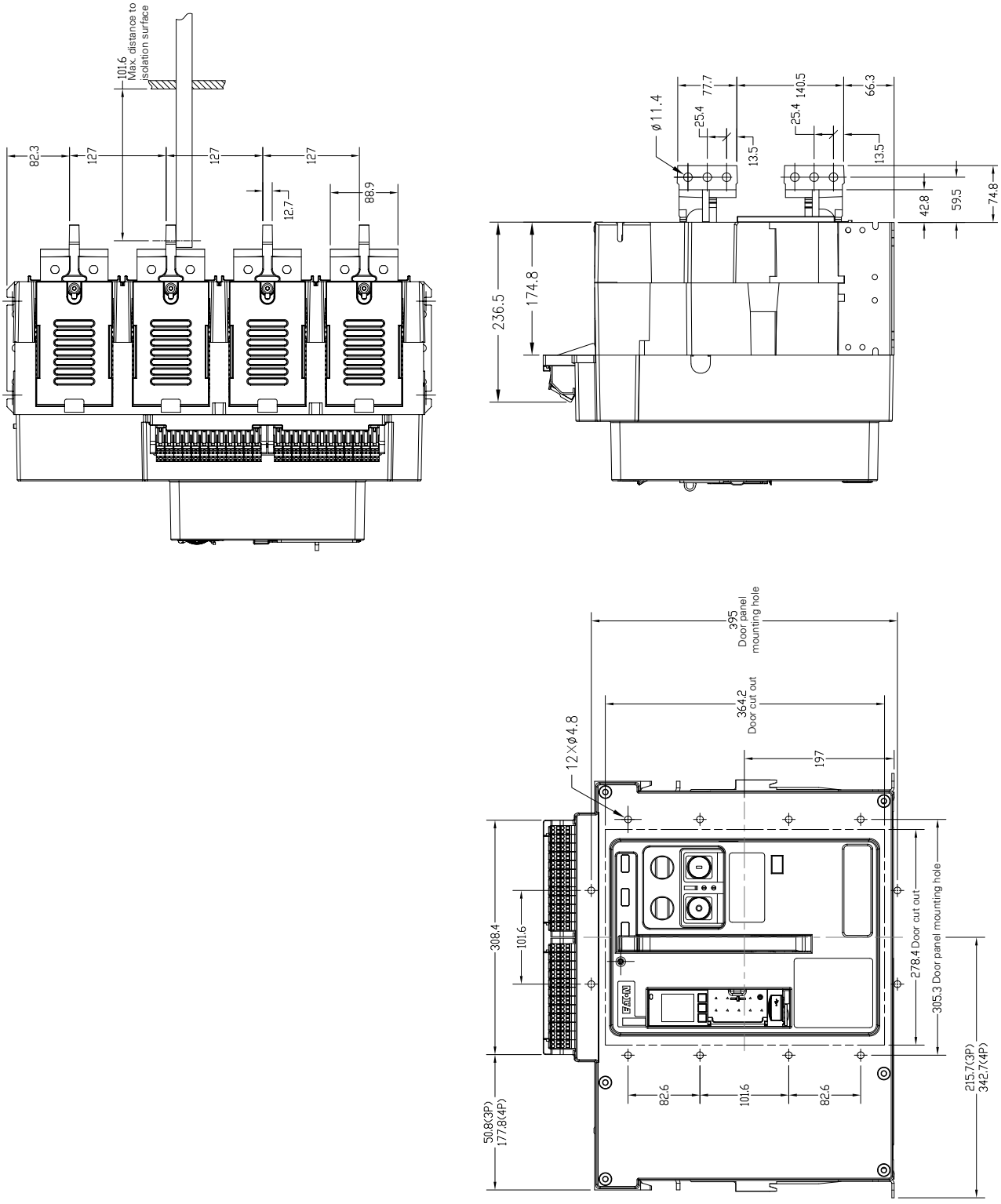
IZM32 Fixed Type Panel Cutout and External Vertical Board Dimensions (3P and 4P, 800~1600A)



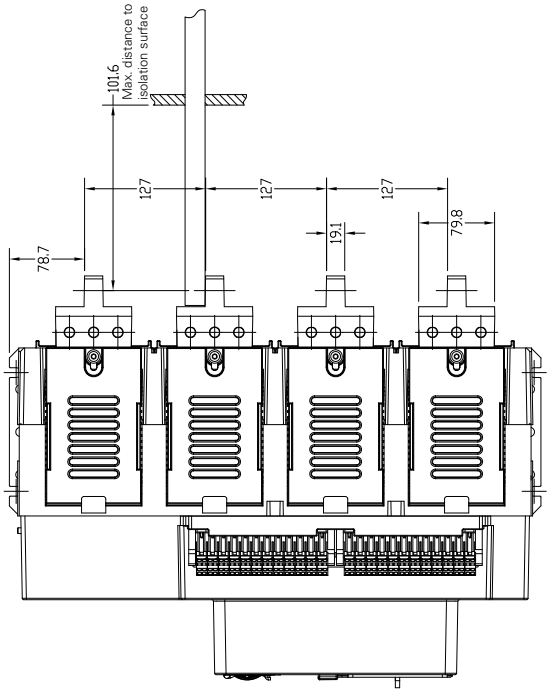


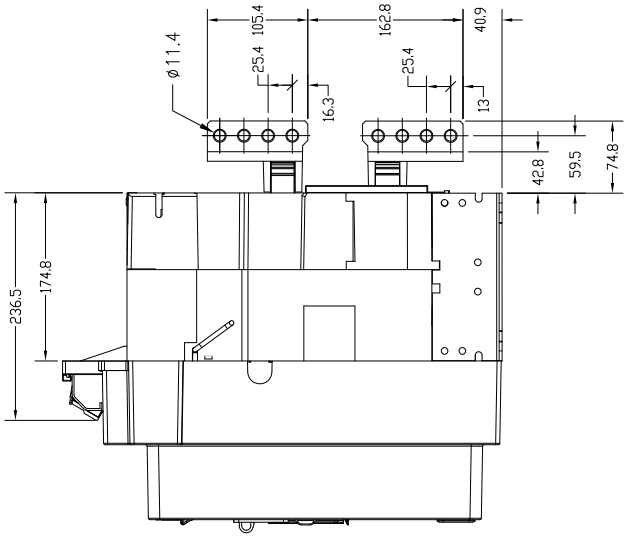


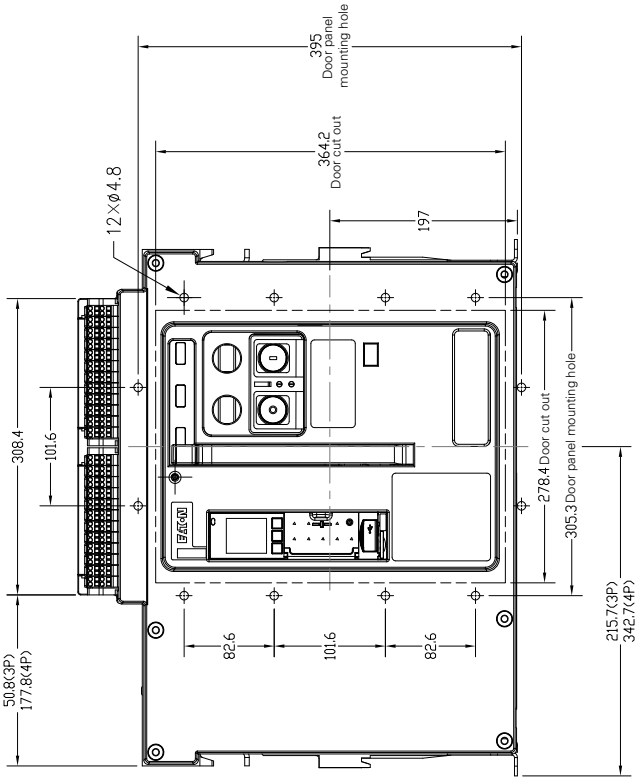
IZM32 Fixed Type External Vertical Board Dimensions (3P and 4P, 2000A)



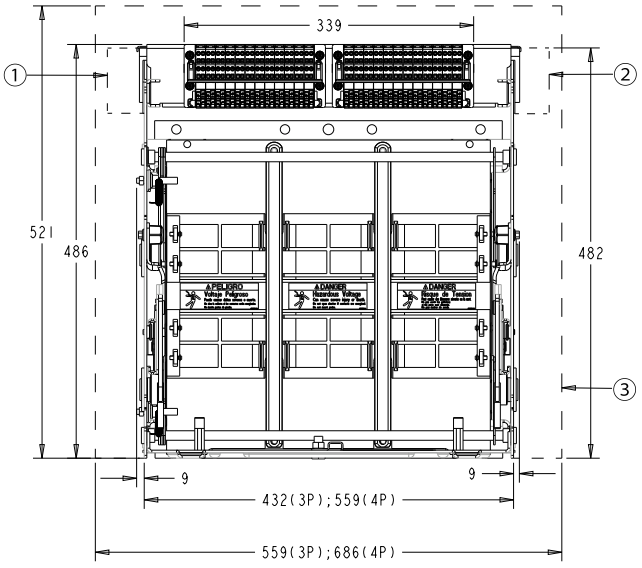
IZM32 Fixed Type External Vertical Board Dimensions (3P and 4P, 2500~3200A)

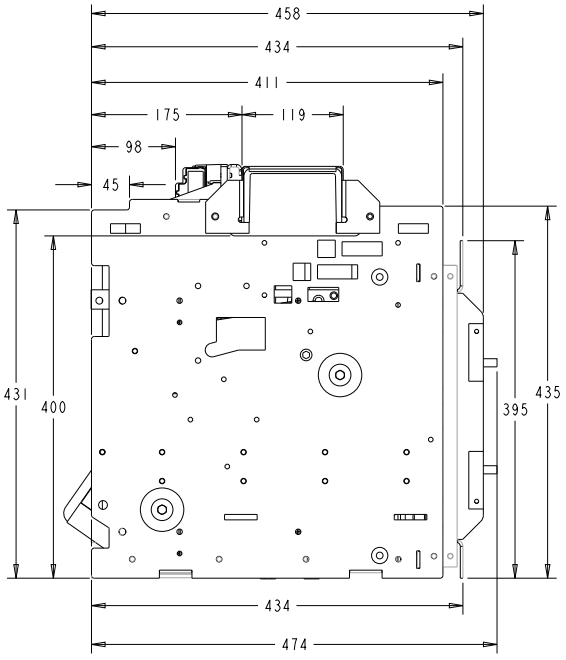






ZM32 Withdrawable Type Dimensions (3P and 4P, 800~3200A)

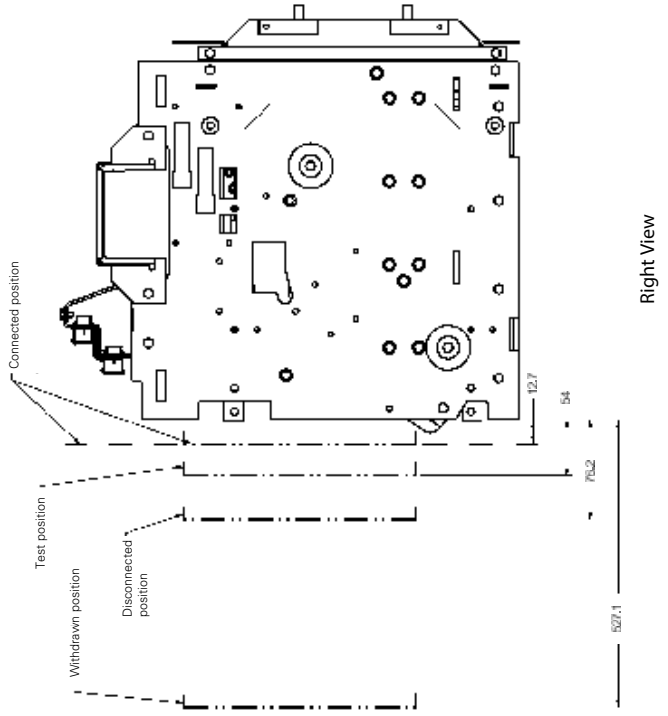


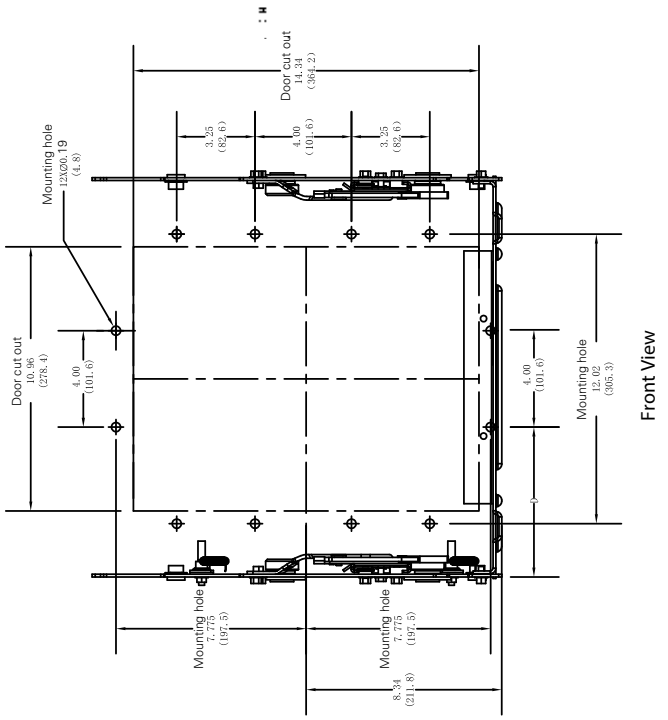


Notes: ①② Drawer switch position ③ Recommended minimum mounting space

IZM32 Withdrawable Type Panel Cutout Dimensions (3P and 4P, 800~4000A)

ITEM	D
3 POLE	6.50 [165.10]
4 POLE	11.50 [292.10]



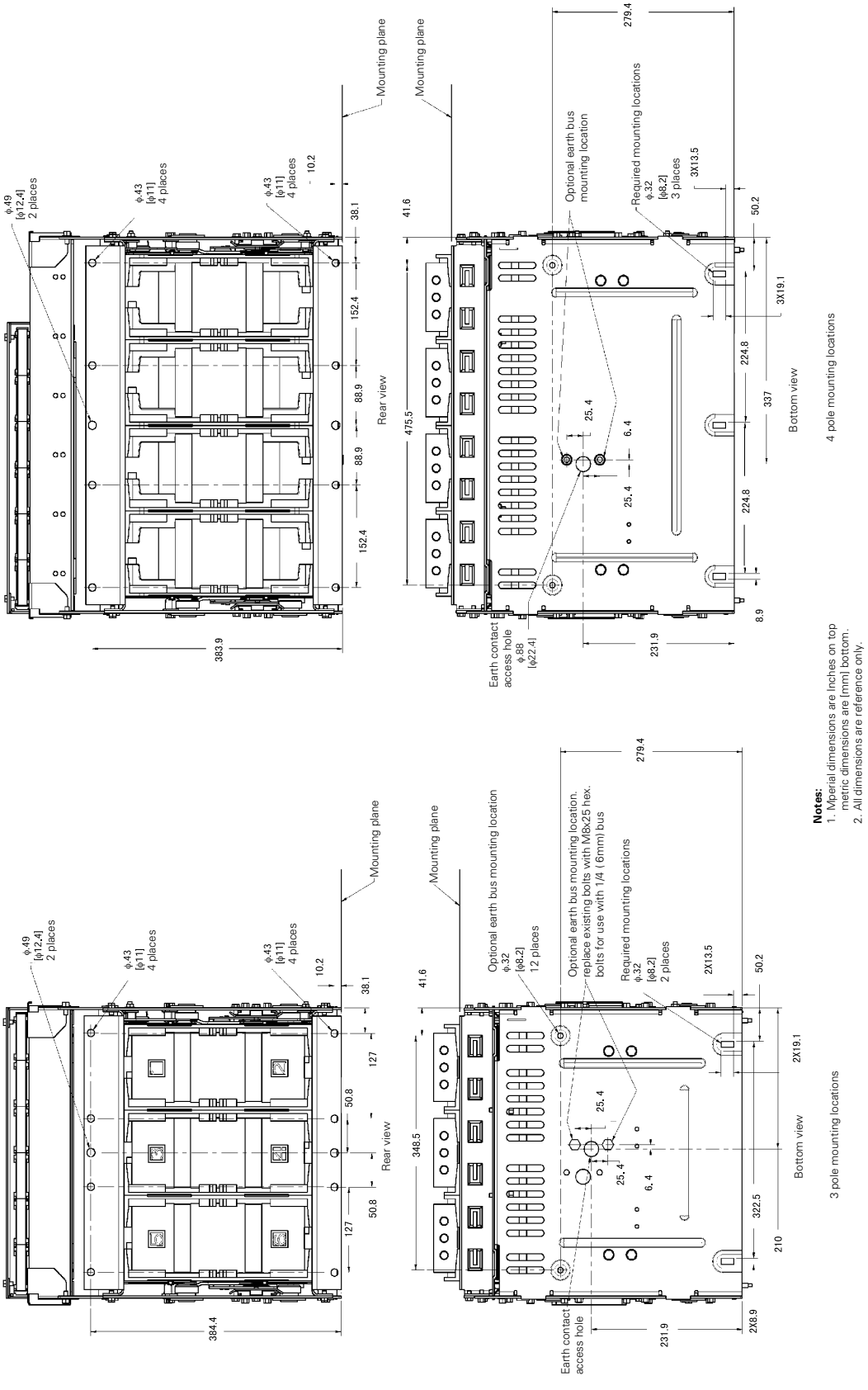


Panel cutout size and circuit breaker position

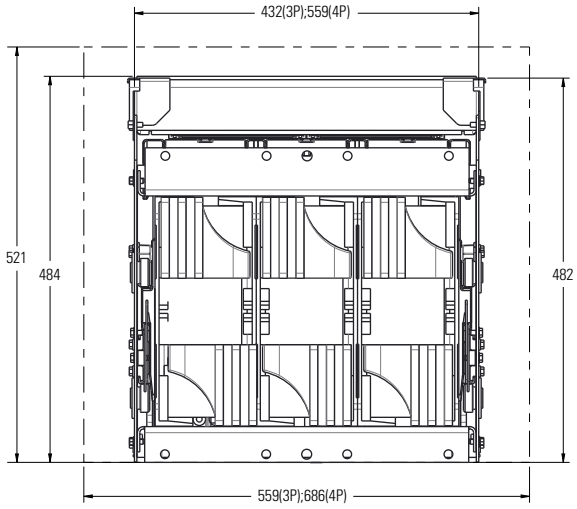
Note:
1. Mperial dimensions are Inches on top metric dimensions are [mm] bottom.
2. All dimensions are reference only
3. Tolerance range is shown as follow:

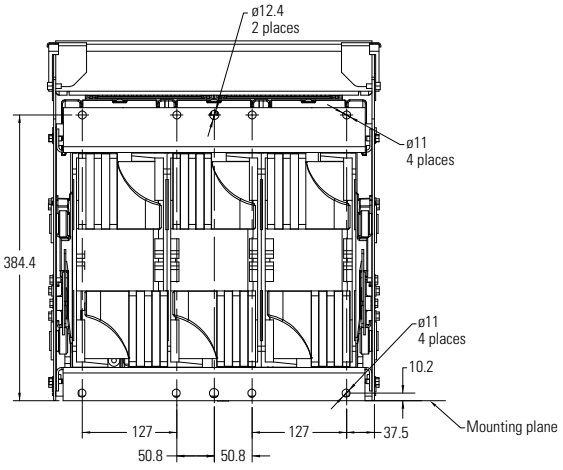
0~5mm	±0.1mm
5~10mm	±0.2mm
10~50mm	±0.5mm
50~200mm	±3.0mm

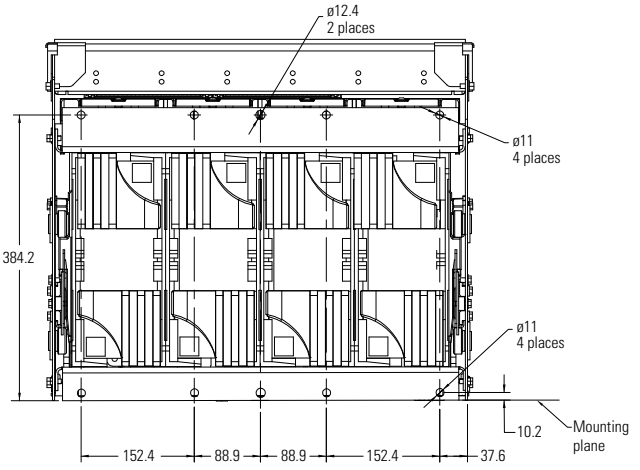
IZM32 Withdrawable Type Cassette Dimensions and Mounting Dimensions (3P and 4P, 800~3200A)

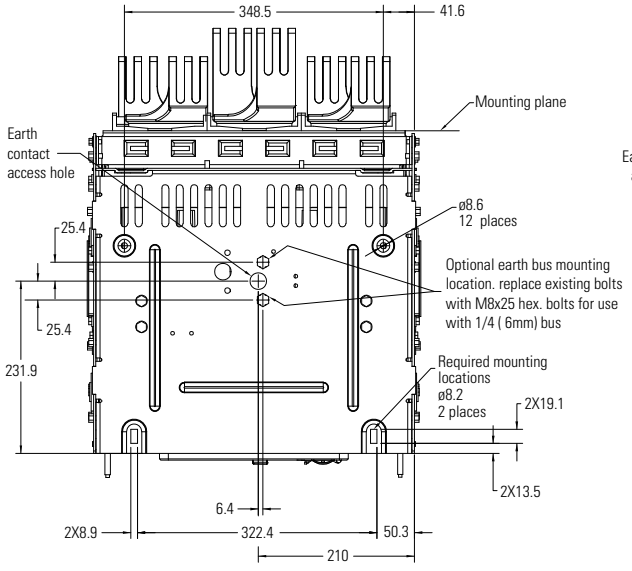


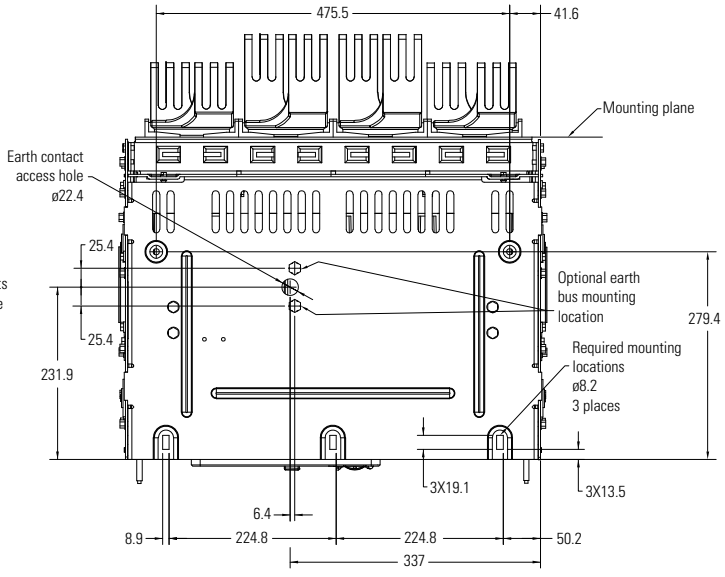
IZM32 Withdrawable Type Cassette Dimensions and Mounting Dimensions (3P and 4P, 4000A)



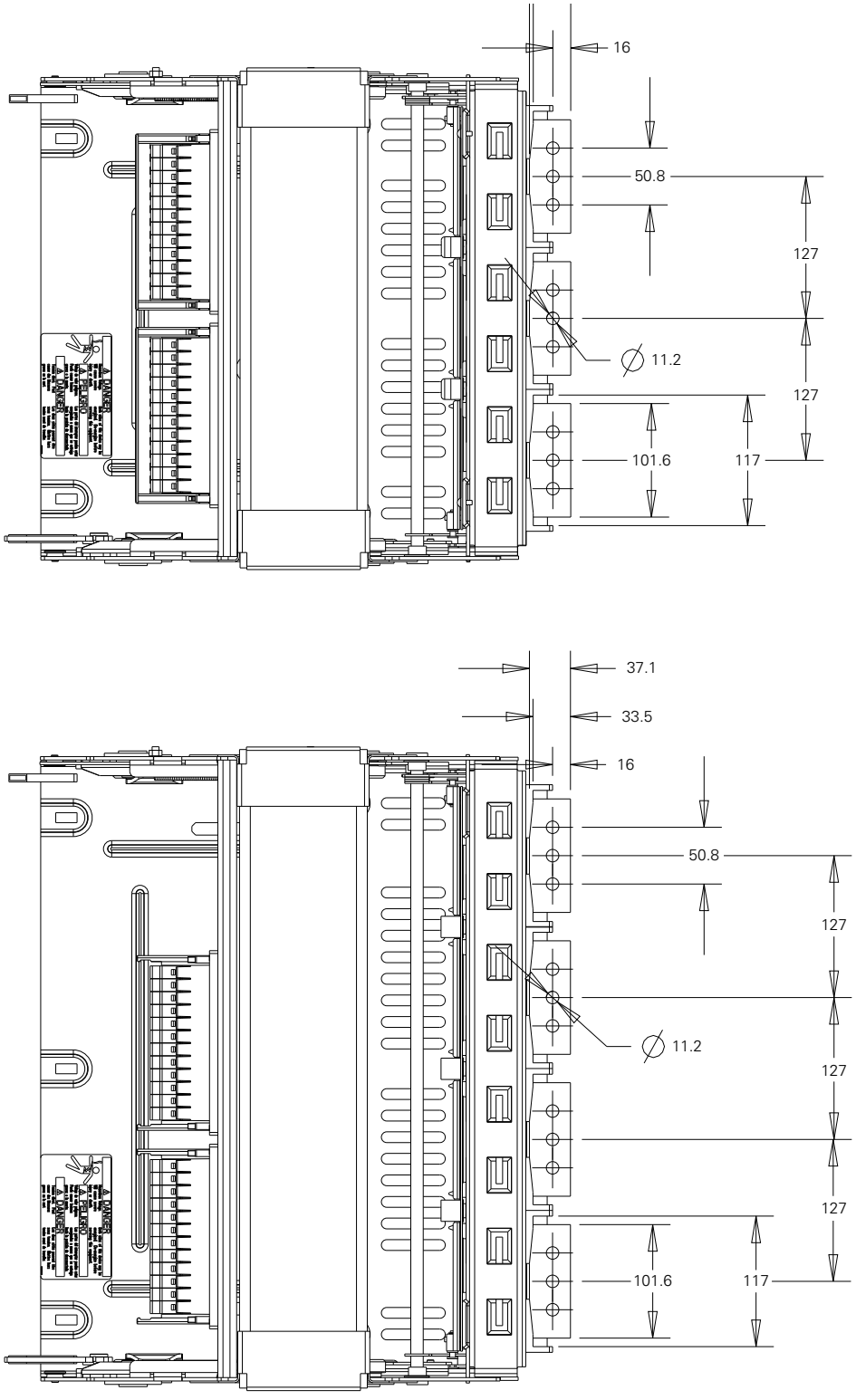




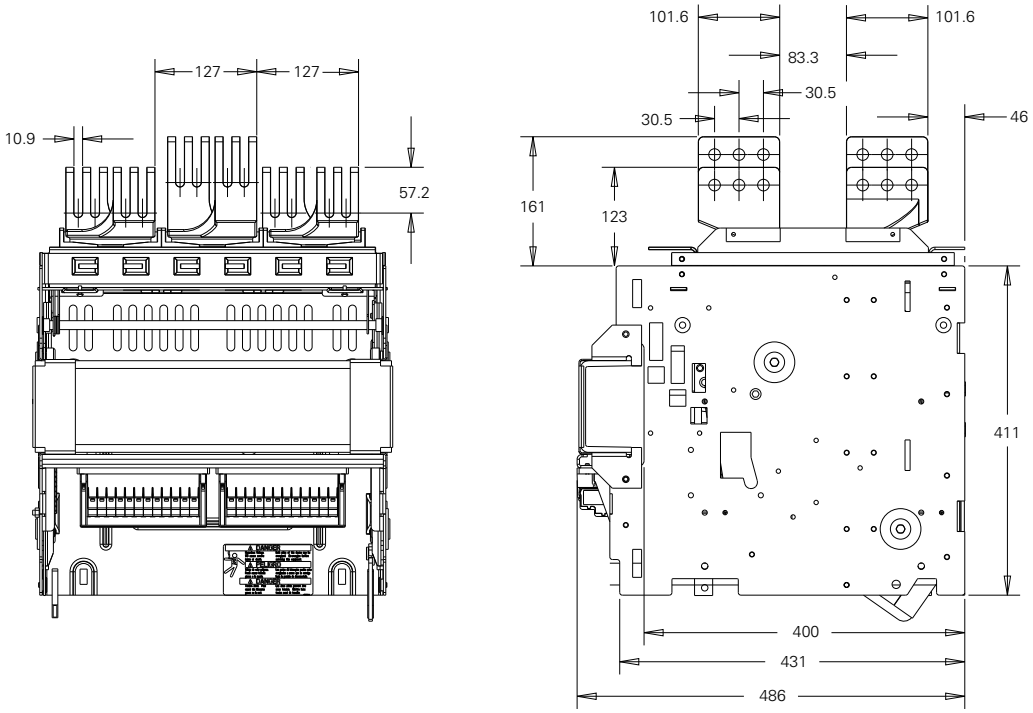


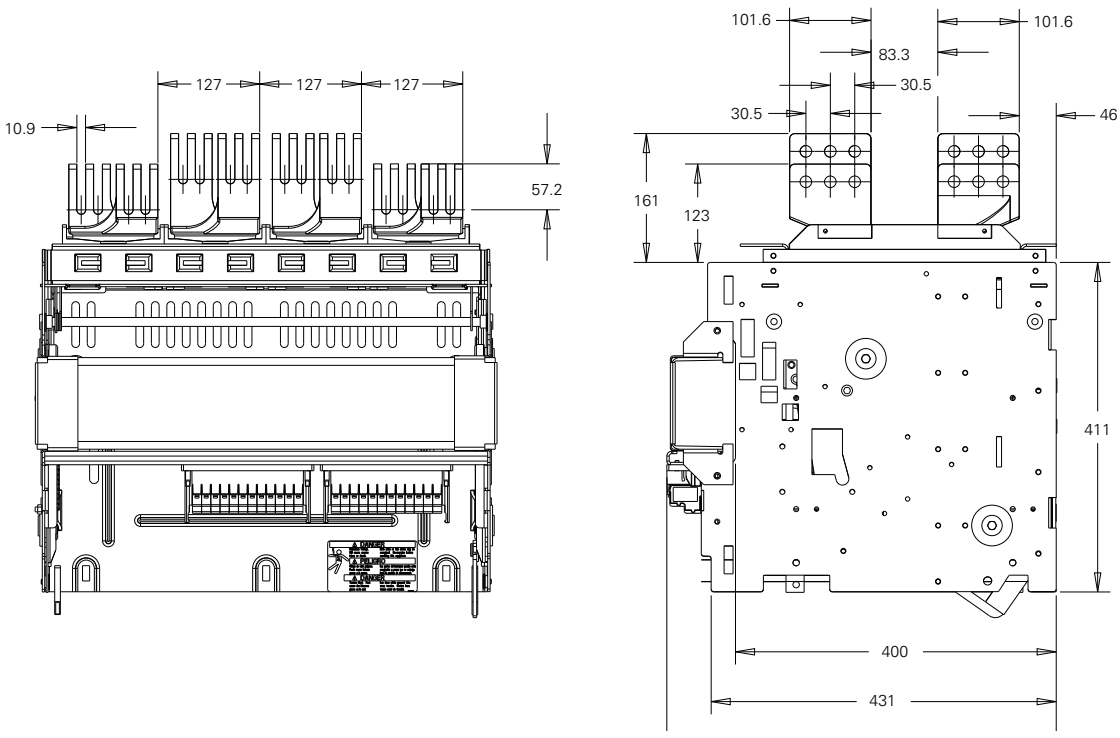


IZM32 Withdrawable Type Cassette Horizontal Board Wiring Dimensions (3P and 4P, 800~3200A)



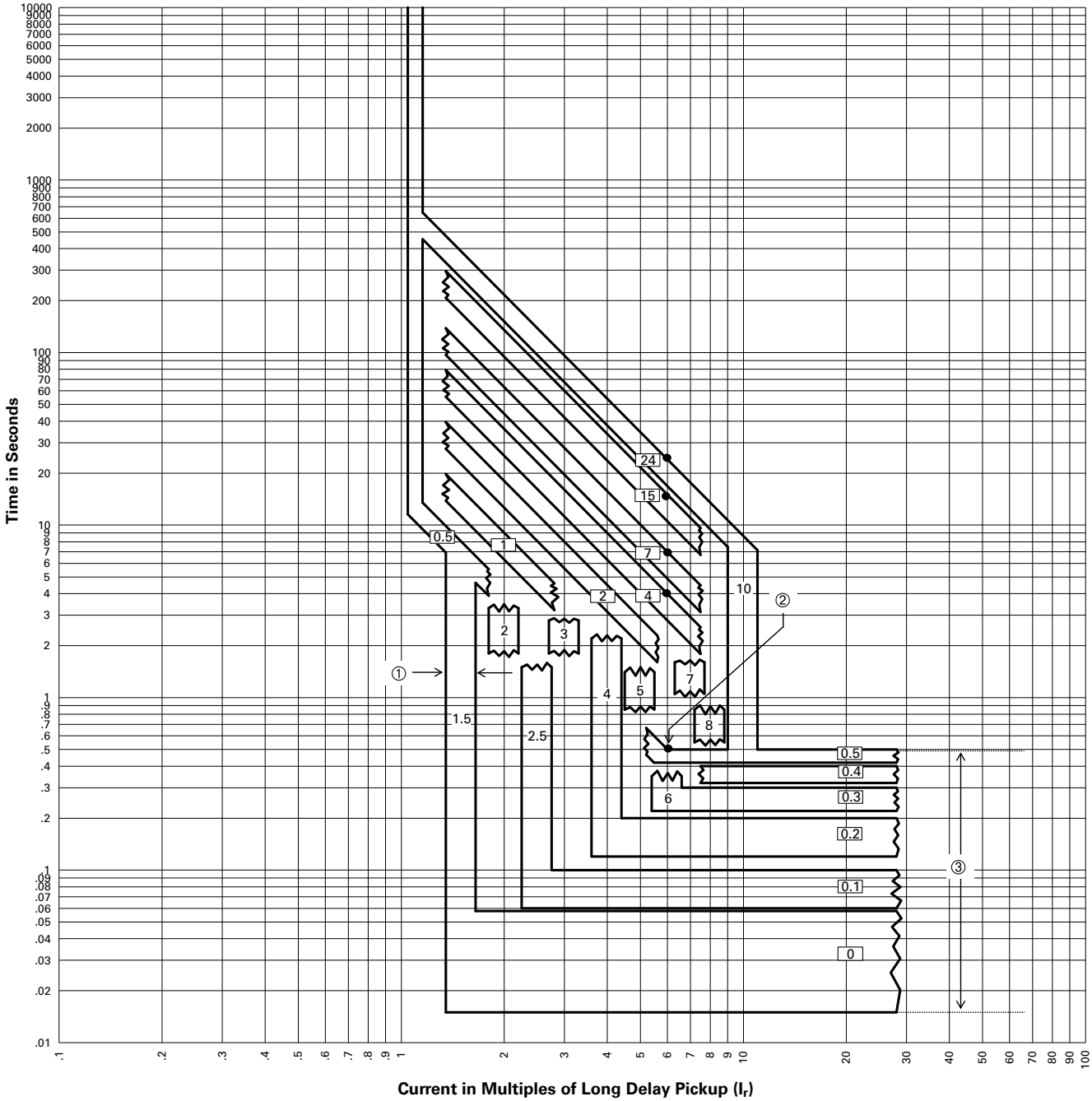
IZM32 Withdrawable Type Cassette Vertical Board Wiring Dimensions (3P and 4P, 4000A)





Section 5: Protective Characteristic Curves

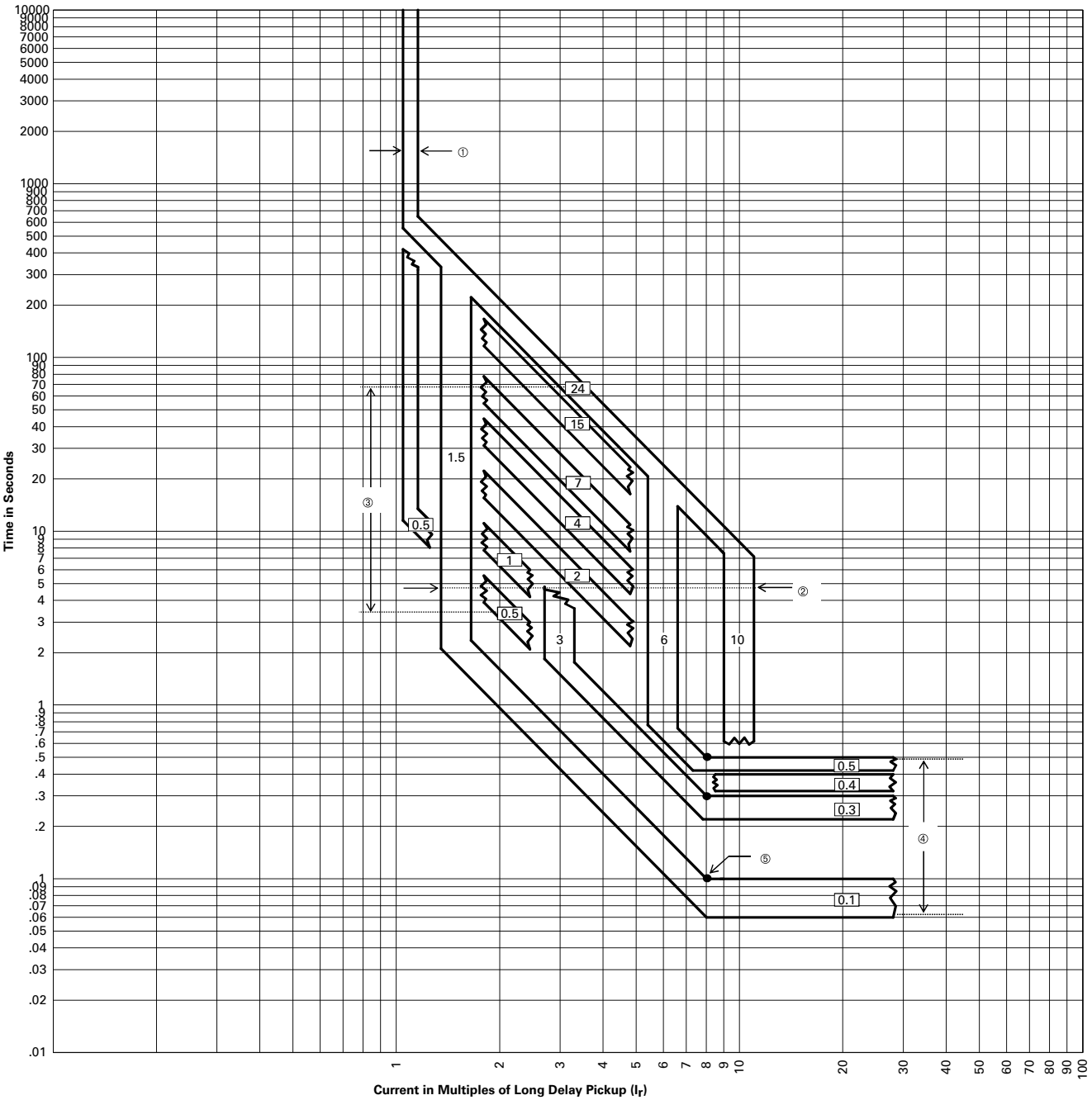
IZM32...V(P)...PXR20/25 Long Delay(L) and Short Delay(S) Curves
L-Protection: I²t-Characteristic curve and S-Protection: Flat characteristic curve



Notes:

1. Short slope: Flat, the actual pickup point has 100% ±10% tolerance.
2. Long delay I²T slopes flattens out at 6x of I_r.
3. Short time delay from 0(50ms) to 0.5s, with +0 / -80ms tolerance except 0.1s and 0s setting
   0.1s setting, trip time is 0.06s to 0.1s
   0s settting, nominal clear time is 60ms with auxiliary power and 120ms without.
4. If long delay thermal memory is enabled, trip times may be shorter than indicated in this chart.
5. Curves applies from -20°C to +70°C ambient. Temperatures above +85°C will cause over temperature trip.
6. This curve is for 50Hz, 60Hz applications.
7. These curves are comprehensive for series IZM circuit breakers including all frame sizes, ratings, and constructions.
   The total clearing times shown include the response time for trip unit, the breaker opening and the interruption of the current

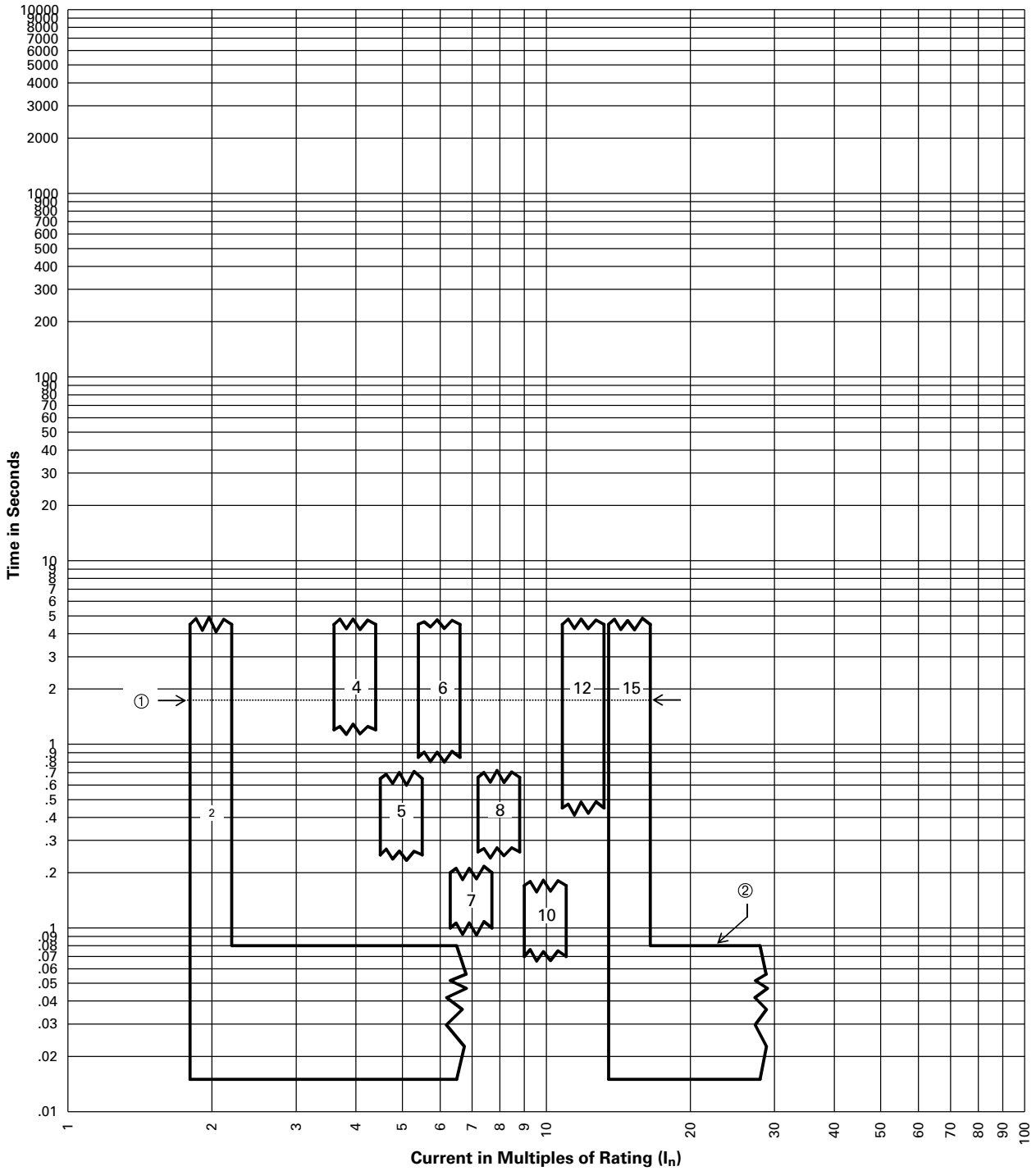
IZM32...V(P)...PXR20/25 Long Delay(L) and Short Delay(S) Curves
S-Protection with: I²t-Characteristic curve ON



Notes:

1. This curve shown as a multiple of the LONG PU setting(I_r). The actual pickup point occurs at 110% of the I_r, with ±5% tolerance.
2. SDPU = 1.5x to 10x of I_r, have 100% ± 10% tolerance.
3. LD Time = 0.5s to 24s, have 100% +0 / -30% tolerance.
4. SD Slope = I²T. The short pickup points have ±10% tolerance.
   time setting from 0.1s to 0.5s, with steps of 0.1s, except 0.2s.
   tolerance is 100% +0 / -30% except 0. 1s, has tolerance 100% +0 / -40%.
5. I²T slopes flattens out at 8x of I_r for top of band with FLAT time minimum value prevailing for bottom of band. For all curves the lower flat response time value projected to I²T line will determine the other break point and shape of the curve.
6. If long delay thermal memory is enabled, trip times may be shorter than indicated in this chart.
7. Curves applies from -20°C to +70°C ambient. Temperatures above +85°C will cause over temperature trip.
8. This curve is for 50Hz, 60Hz applications.
9. These curves are comprehensive for series IZM circuit breakers including all frame sizes, ratings, and constructions.

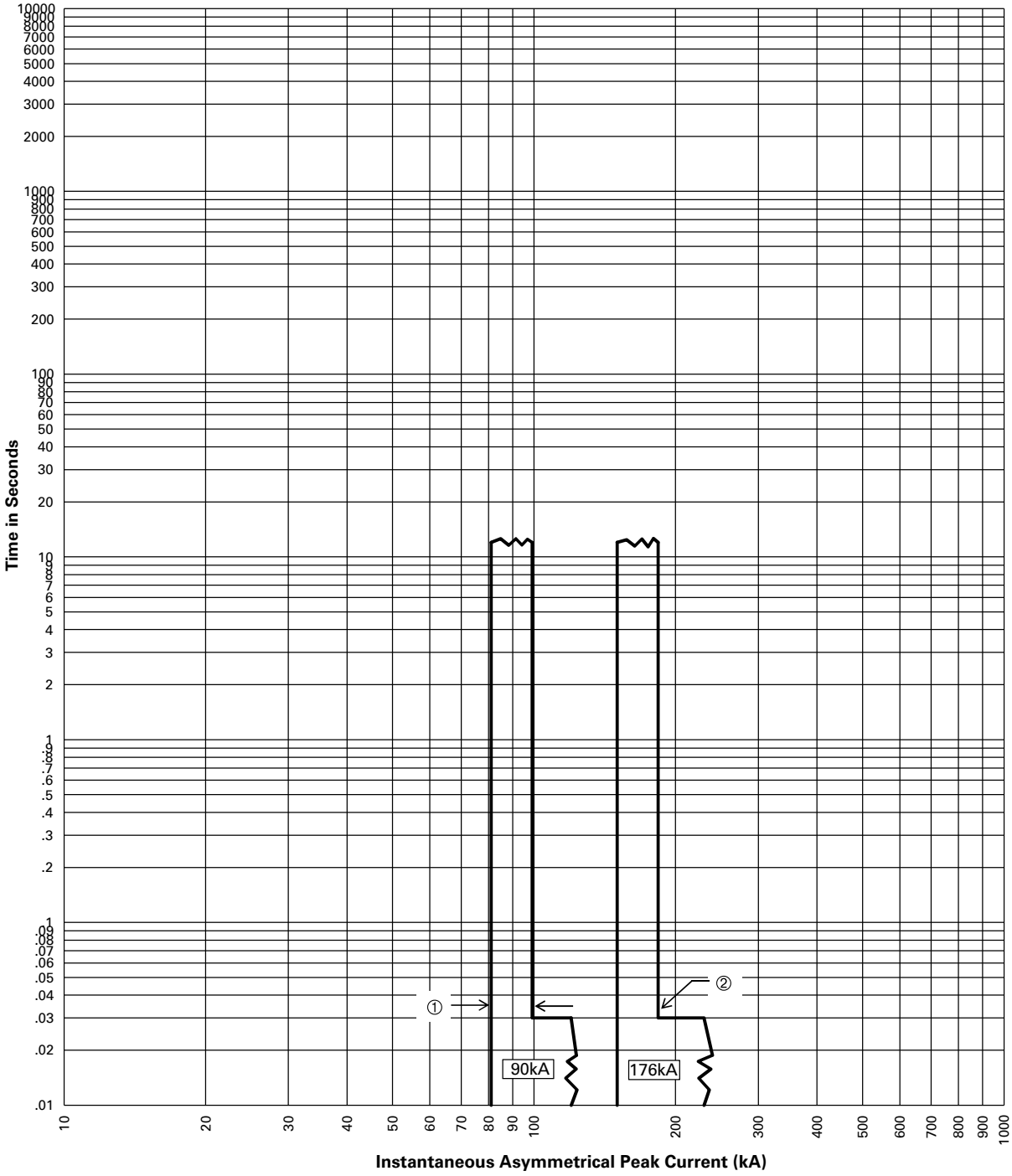
IZM32...V(P)...PXR20/25 Instantaneous(I) Curves
I-Protection: Adjustable



Notes:

1. The Instantaneous settings have conventional 100% ±10% as the pickup points.
2. The nominal Instantaneous trip time is 60ms with auxiliary power supply and 100ms without.
3. Instantaneous protection could be disabled by setting Instantaneous PU switch to OFF position.
4. The curve is shown as a multiple of the Current Rating (I_n).
5. The end of the curve is determined by the interrupting rating of the circuit breaker.
6. Curves applies from -20°C to +70°C ambient. Temperatures above +85°C will cause over temperature trip.
7. This curve is for 50Hz, 60Hz applications.
8. These curves are comprehensive for series IZM circuit breakers including all frame sizes, ratings, and constructions.
   The total clearing times shown include the response time for trip unit, the breaker opening and the interruption of the current.

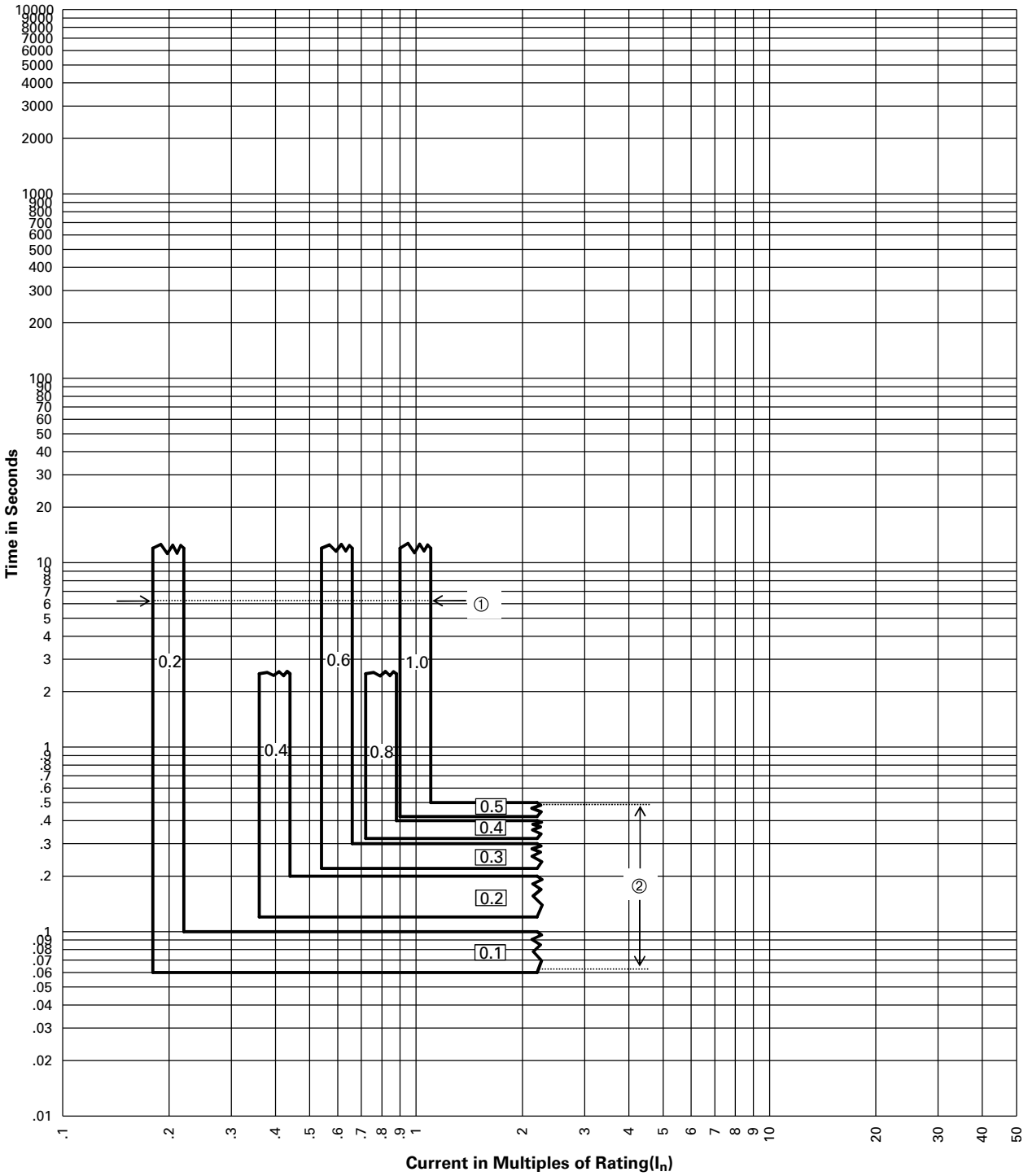
IIZM32/IZM63...V(P)...PXR20/25 Instantaneous(I) Curves
Instantaneous Trip at High Fault Currents



Notes:

1. Fixed High Instantaneous Trip function is provided in the circuit breaker for Series IZM32 set to pickup at 90kA. Instantaneous peak current level. The tolerance is 100% ±10% as the pickup points.
2. The peak current level setting for IZM63 is fixed at 176kA.
3. This protection is functional even when the Instantaneous is set to the OFF position.
4. The PXR will light the Instantaneous LED for a High Instantaneous trip.
5. The total Instantaneous clearing times shown are conservative and consider the maximum response times of the trip unit, the circuit breaker opening, and the interruption of the current under factors that contribute to worst case conditions, like:
   maximum rated voltages, single phase interruption, and minimum power factor. Faster clearing times are possible depending on the specific system conditions, the type of circuit breaker applied, and if any arc reduction settings are employed.

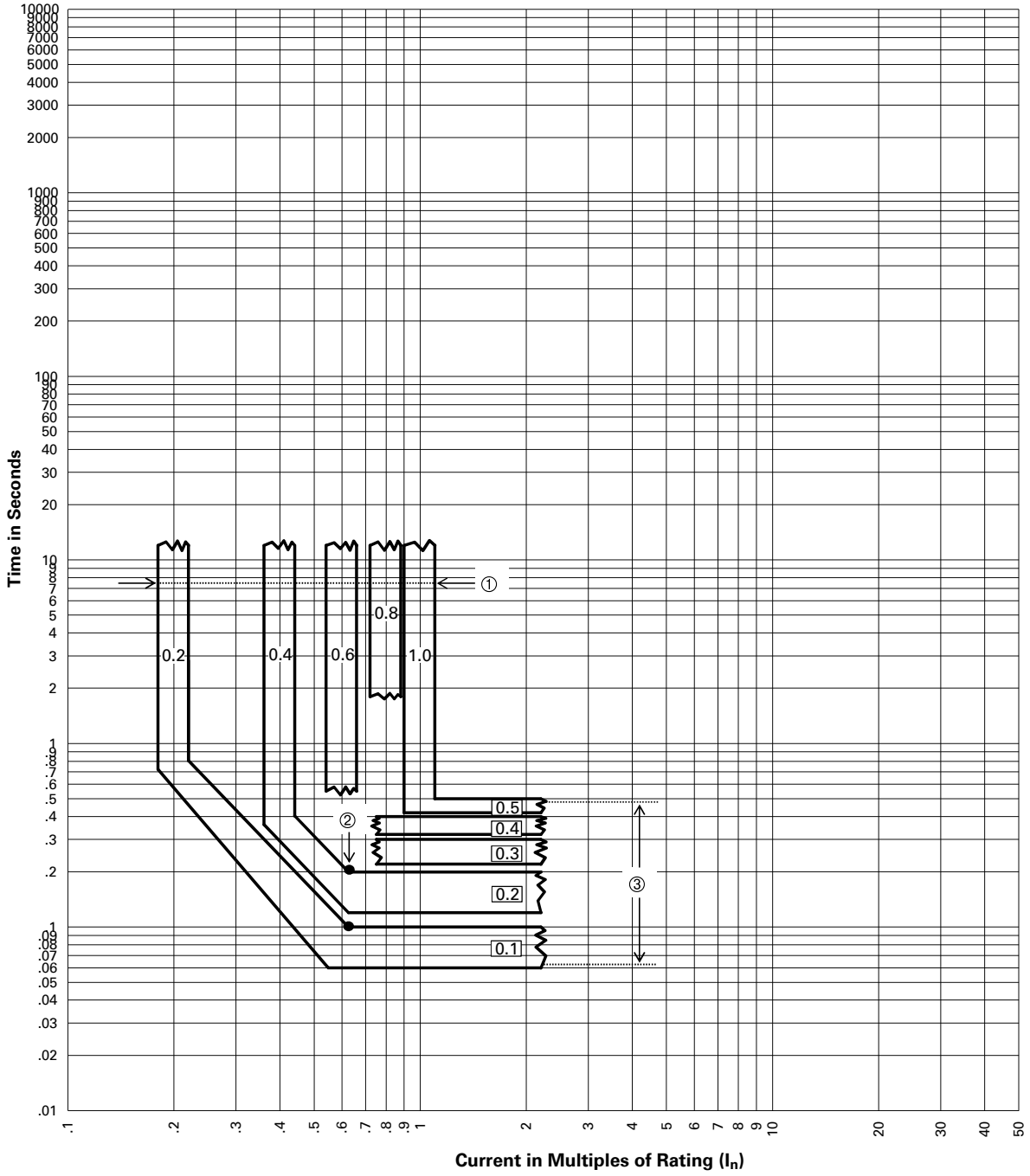
IZM32...V(P)...PXR20/25 Ground(G) Curves
G: Ground fault protection - Flat characteristic curve



Notes:

1. Ground PU setting from 0.2 to 1.0 of I_n with steps of 0.2 , have tolerance of 100% ± 10%.
2. Ground Flat time from 0.1s to 0.5s, with 0.1s increments.
3. Ground slope: Flat, trip time tolerance is +0 / -80ms for all settings except 0.1s setting is 0.06s to 0.1s.
4. The curve is shown as a multiple of the Current Rating (I_n).
5. The end of the curve is determined by the interrupting rating of the circuit breaker.
6. Curves applies from -20°C to +70°C ambient. Temperatures above +85°C will cause over temperature trip.
7. This curve is for 50Hz, 60Hz applications.
8. These curves are comprehensive for series IZM breakers including all frame sizes, ratings, and constructions.
   The total clearing times shown include the response time for trip unit, the breaker opening and the interruption of the current.

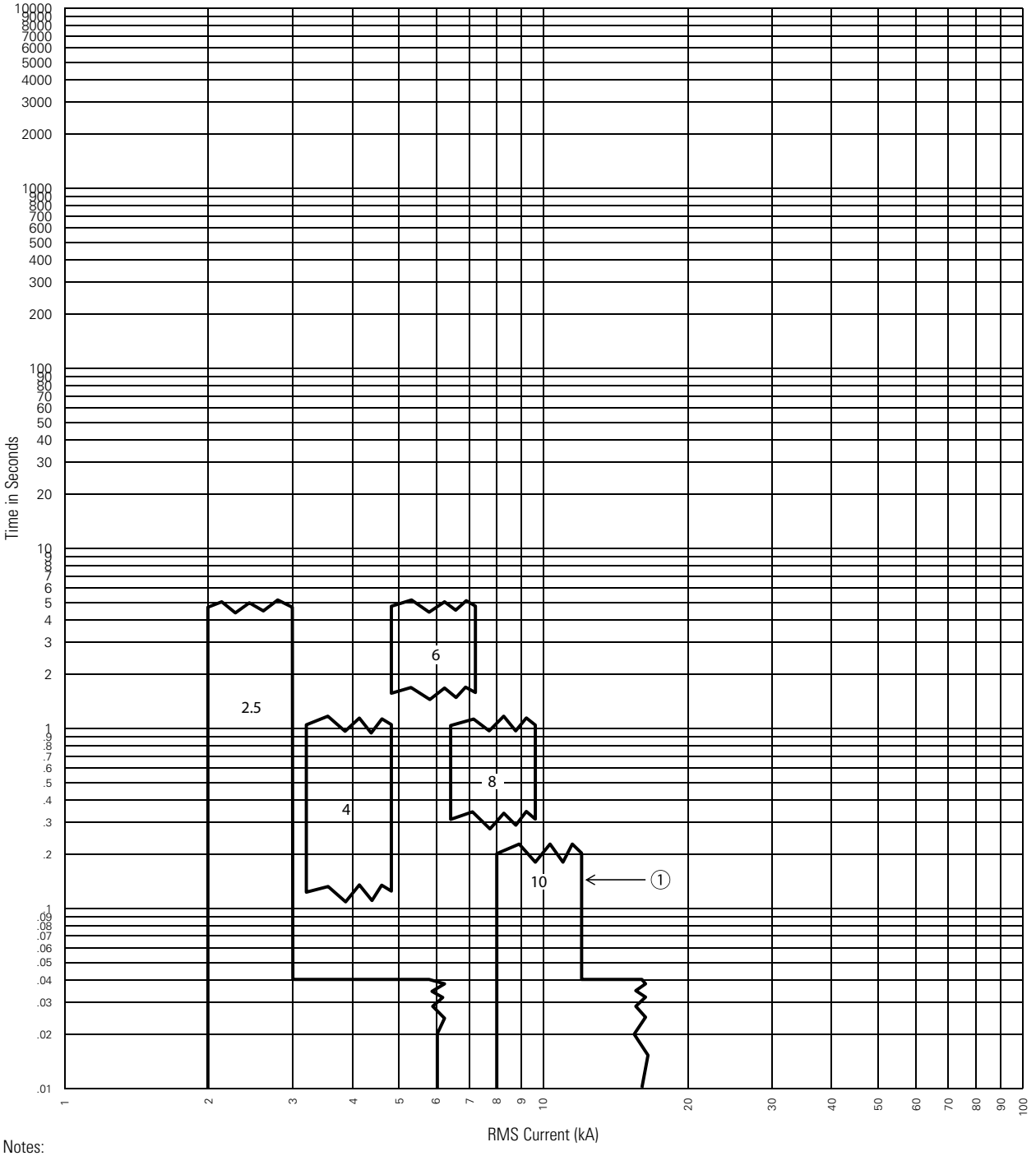
IZM32/IZM63...V(P)...PXR20/25 Ground(G) Curves
G: Ground fault protection-I²t-Characteristic curve ON



Notes:

1. Ground PU setting from 0.2 to 1.0 of I_n with steps of 0.2 , have tolerance of 100%± 10%.
2. Beak points at 0.625 x I_n to flat.
3. Ground I²T time from 0.1s to 0.5s, with 0.1s increments.
4. Ground slope: Flat, trip time tolerance is +0 / -80ms for all settings except 0.1s setting is 0.06s to 0.1s.
   Ground slope: I²T , tolerance is
   0.1s, 0.2s : +0 / -40%
   0.3s, 0.4s, 0.5s : +0 / -30%
5. The curve is shown as a multiple of the Current Rating (I_n).
6. The end of the curve is determined by the interrupting rating of the circuit breaker.
7. Curves applies from -20 °C to +50°C ambient. Temperatures above +85 °C will cause over temperature trip.
8. This curve is for 50Hz ,60Hz applications.
9. These curves are comprehensive for series IZM32/IZM63 circuit breakers including all frame sizes, ratings, and constructions.
   The total clearing times shown include the response time for trip unit, the breaker opening and the interruption of the current.

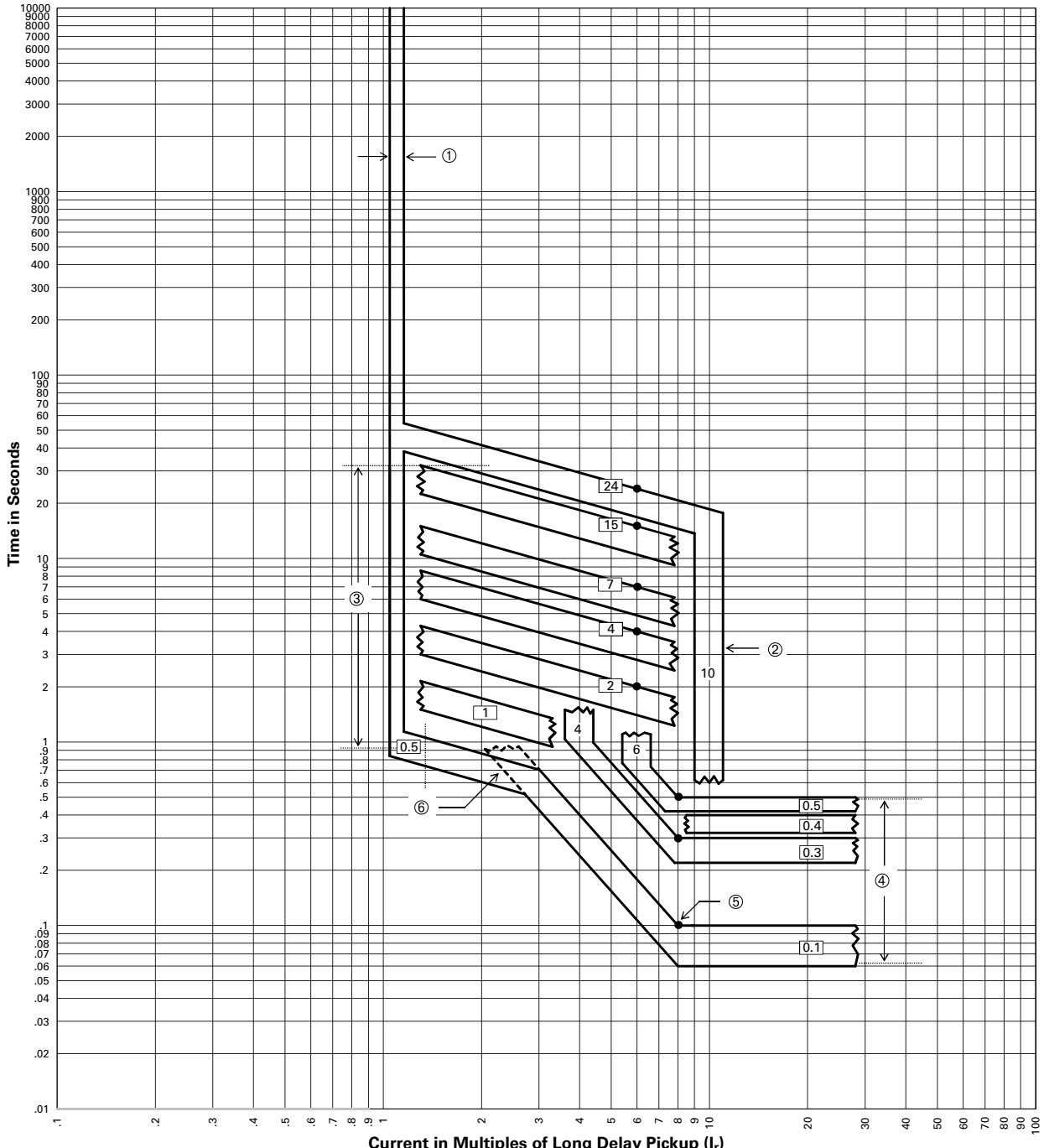
IZM32...V(P)...PXR20/25 Maintenance Mode Curve
Arc-flash Reduction Maintenance Mode for IZM32



Notes:

1. Nominal reduction values have a tolerance of ± 20%.
2. The nominal Arcfault Reduction Maintenance System™ trip time is 40ms with auxiliary power supply.
3. The Maintenance Mode feature must be ENABLED via setting Maintenance Mode switch to ON position remote switch, or communications for these curves to apply.
   Maintenance Mode is in use being shown by blue LED.
4. The PXR will light the Instantaneous LED for a Maintenance Mode Trip.
5. The end of the curve is determined by the interrupting rating of the circuit breaker.
6. Curves applies from -20^0 C to +50^0 C ambient. Temperatures above +85^0 C will cause over temperature trip.
7. This curve is for 50Hz ,60Hz applications.
8. These curves are comprehensive for series IZM circuit breakers including all frame sizes, ratings, and constructions.
   The total clearing times shown include the response time for trip unit, the breaker opening and the interruption of the current.

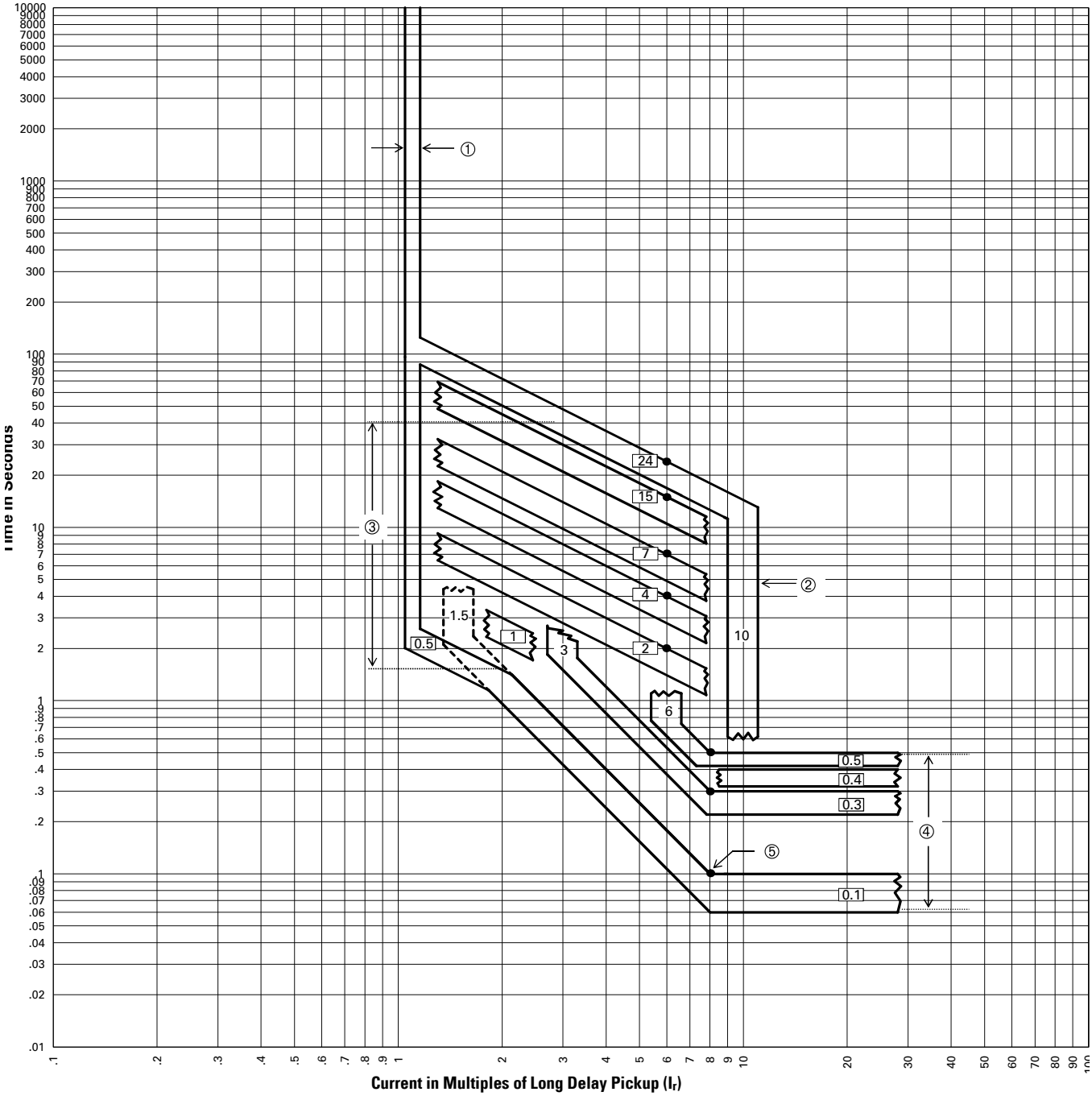
IZM32...V(P)...PXR20/25 Long Delay(L) Curves
L-Protection: $I^{0.5}t$-Characteristic curve



Notes:

1. This curve shown as a multiple of the LONG PU setting (I_r). The actual pickup point occurs at 110% of the I_r, with ±5% tolerance.
2. SDPU = 1.5x to 10x of I_r, have 100% ± 10% tolerance.
3. LD Time = 0.5s to 24s, have 100% +0 / -30% tolerance.
4. SD Slope = I^2T. The short pickup points have ±10% tolerance. time setting from 0.1s to 0.5s, with steps of 0.1s, except 0.2s. tolerance is 100% +0 / -30% except 0.1s, has tolerance 100% +0 / -40%.
5. I^2T slopes flattens out at 8x of I_r for top of band with FLAT time minimum value prevailing for bottom of band. For all curves the lower flat response time value projected to I^2T line will determine the other break point and shape of the curve.
6. If the short delay time is longer than long delay time, the short delay trip time will follow the long time setting.
7. If long delay thermal memory is enabled, trip times may be shorter than indicated in this chart.
8. Curves applies from -20°C to +70°C ambient. Temperatures above +85°C will cause over temperature trip.
9. This curve is for 50Hz, 60Hz applications.
10. These curves are comprehensive for series IZM circuit breakers including all frame sizes, ratings, and constructions. The total clearing times shown include the response time for trip unit, the breaker opening and the interruption of the current.

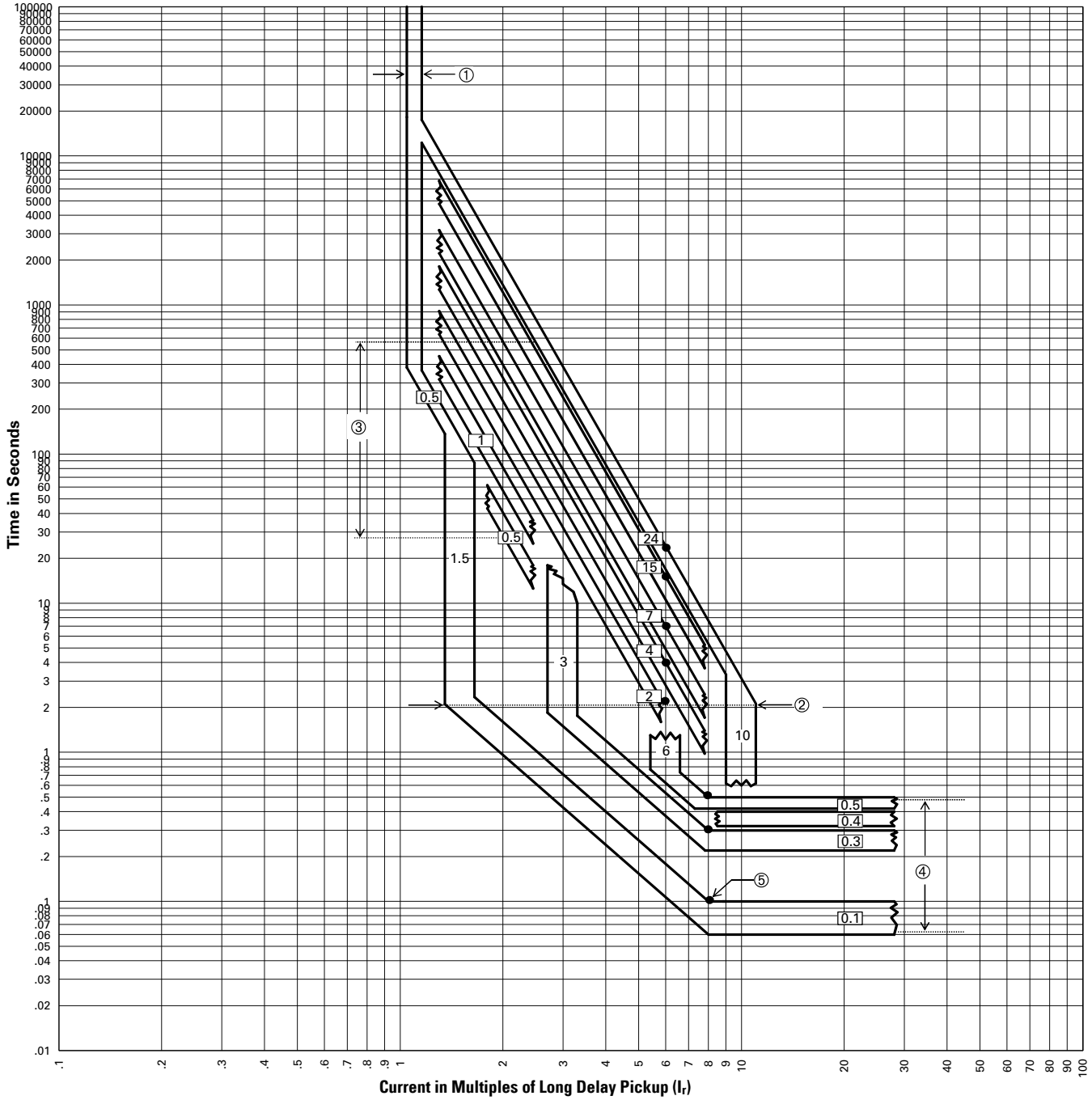
IZM32...V(P)...PXR20/25 Long Delay(L) Curves
L-Protection: I²t-Characteristic curve



Votes:

. This curve shown as a multiple of the LONG PU setting(I_r). The actual pickup point occurs at 110% of the I_r, with ±5% tolerance.
'. SDPU = 1.5x to 10x of I_r, have 100% ± 10% tolerance.
(. LD Time = 0.5s to 24s, have 100% +0 / -30% tolerance.
). SD Slope = I²T. The short pickup points have ±10% tolerance.
time setting from 0.1s to 0.5s, with steps of 0.1s, except 0.2s.
tolerance is 100% +0 / -30% except 0. 1s, has tolerance 100% +0 / -40%.
*. I²T slopes flattens out at 8x of I_r for top of band with FLAT time minimum value prevailing for bottom of band. For all curves the lower flat response time value projected to I²T line will determine the other break point and shape of the curve.
+. If long delay thermal memory is enabled, trip times may be shorter than indicated in this chart.
,. Curves applies from -20°C to +70°C ambient. Temperatures above +85°C will cause over temperature trip.
-. This curve is for 50Hz, 60Hz applications.
.. These curves are comprehensive for series IZM circuit breakers including all frame sizes, ratings, and constructions.

IZM32...V(P)...PXR20/25 Long Delay(L) Curves
L-Protection: I^4t-Characteristic curve

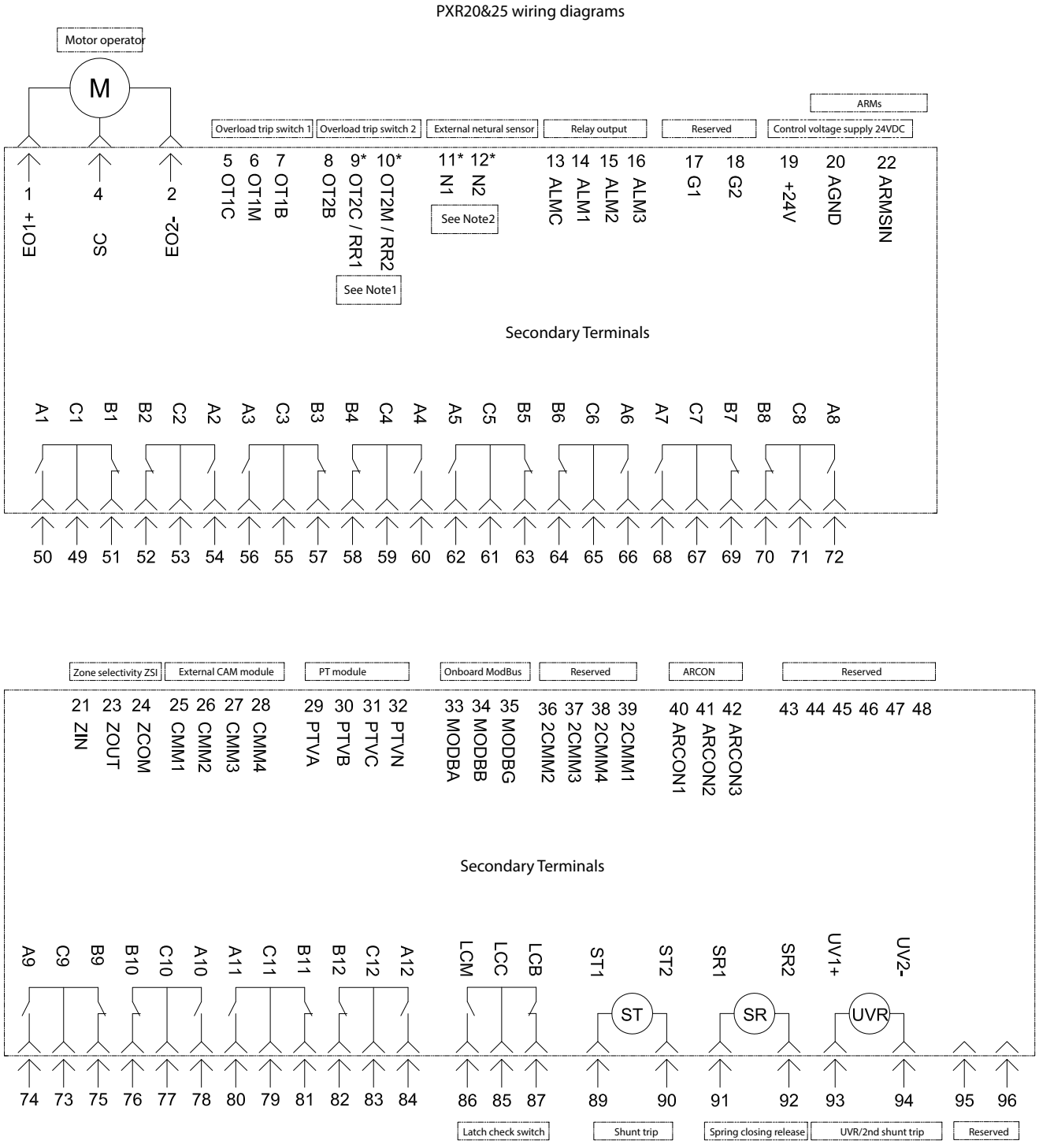


Notes:

1. This curve shown as a multiple of the LONG PU setting(I_r). The actual pickup point occurs at 110% of the I_r, with ±5% tolerance.
2. SDPU = 1.5x to 10x of I_r, have 100% ± 10% tolerance.
3. LD Time = 0.5s to 24s, have 100% +0 / -30% tolerance.
4. SD Slope = I^2T. The short pickup points have ±10% tolerance.
   time setting from 0.1s to 0.5s, with steps of 0.1s, except 0.2s.
   tolerance is 100% +0 / -30% except 0. 1s, has tolerance 100% +0 / -40%.
5. I^2T slopes flattens out at 8x of I_r for top of band with FLAT time minimum value prevailing for bottom of band. For all curves the lower flat response time value projected to I^2T line will determine the other break point and shape of the curve.
6. If long delay thermal memory is enabled, trip times may be shorter than indicated in this chart.
7. Curves applies from -20°C to +70°C ambient. Temperatures above +85°C will cause over temperature trip.
8. This curve is for 50Hz, 60Hz applications.
9. These curves are comprehensive for series IZM circuit breakers including all frame sizes, ratings, and constructions.
   The total clearing times shown include the response time for trip unit, the breaker opening and the interruption of the current.

Section 6: Wiring diagrams

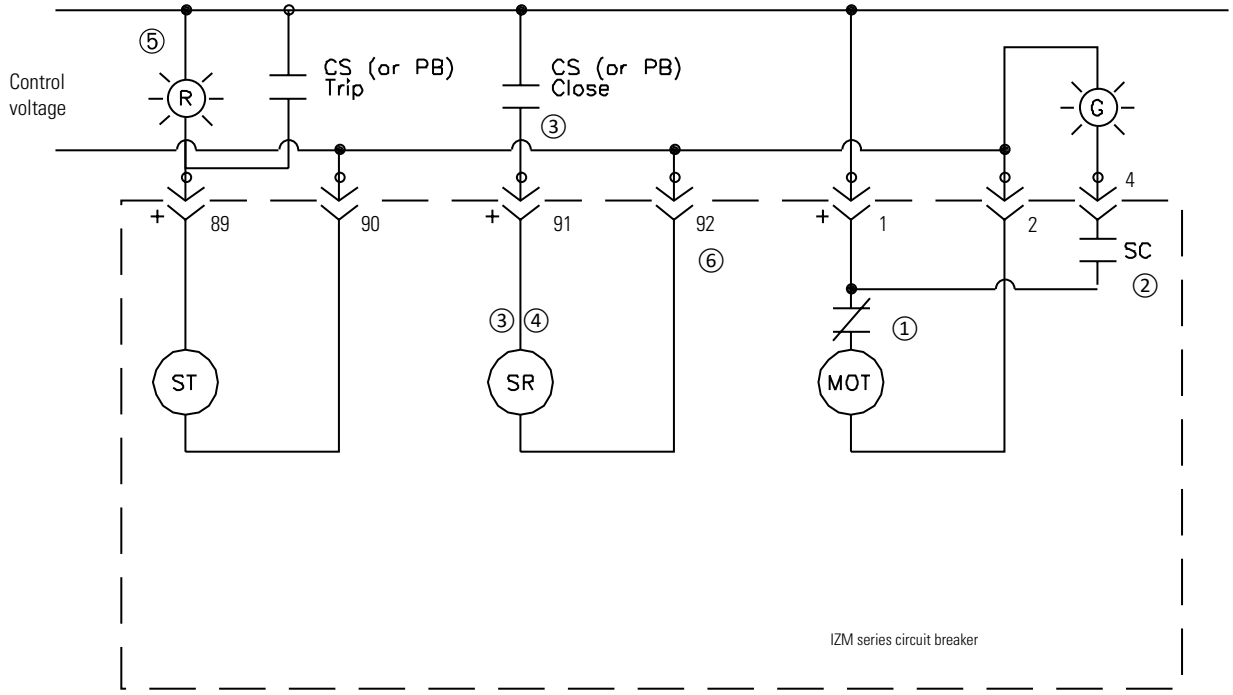
IZM32 / IN32 control circuit internal wiring diagram



Note 1:
1). Remote reset tripping indication, to be wired as shown here: 5(OT1C), 6(OT1M), 7(OT1B) + 9(RR1), 10(RR2)
2). No remote reset tripping indication, to be wired as shown here: 5(OT1C), 6(OT1M), 7(OT1B) + 8(OT2B), 9(OT2C), 10(OT2M)

Note 2:
On a 4P circuit breaker, the neutral current sensor has the same style and wiring method as the phase sensor, located within the circuit breaker frame, no need to connect the secondary terminals 11N1, 12N2

Electrical control diagram of IZM32 / IN32 circuit breakers – Open/Close and motor



Legend:

MOT – Motor Operator for Charging Closing Spring

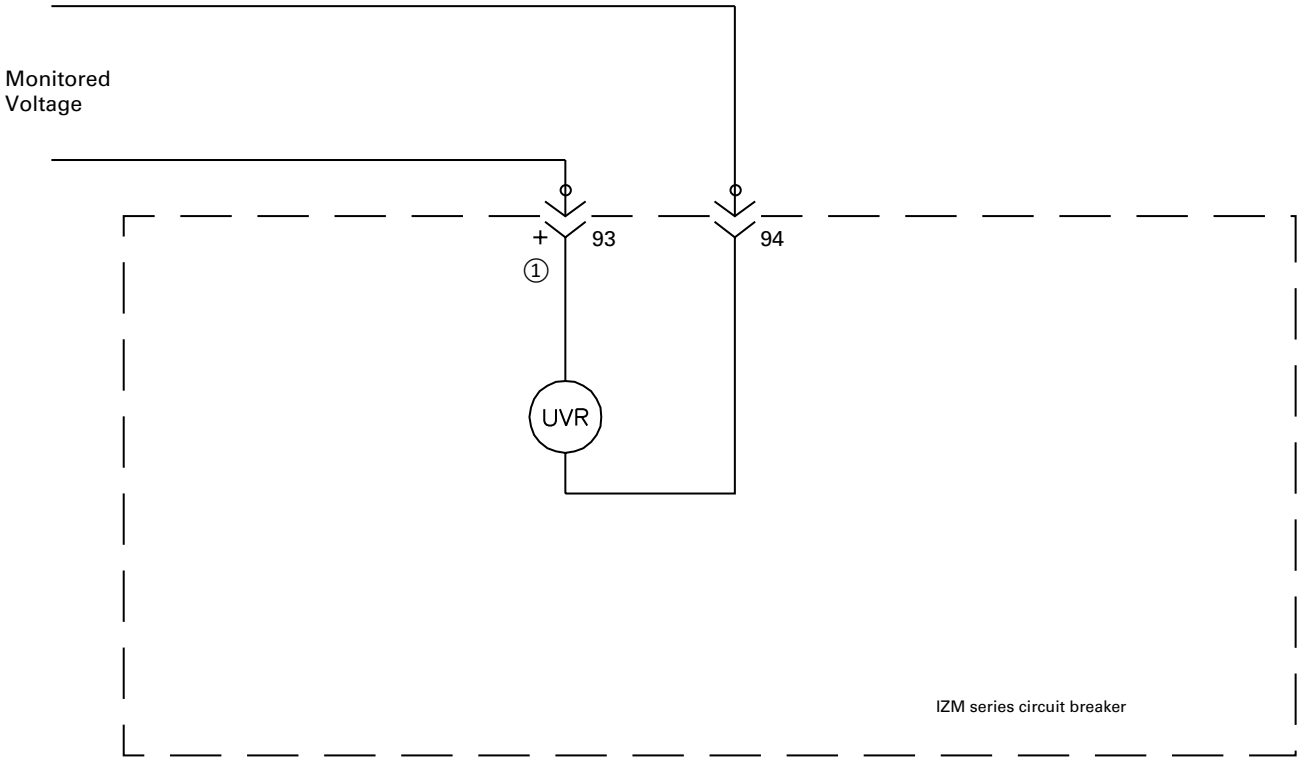
ST – Shunt Trip

SR – Spring Release

Description of Operation:

1. The motor is energized and runs, charges closing spring, and is cut off by switch.
2. When the spring is charged, the SC closes and the green indicating light will illuminate (if applicable).
3. Closing the CS-C contact energizes the Spring Release Coil and closes the circuit breaker. The Spring Release internal electronics pulse the SR coil and then provides a high impedance circuit. This provides anti-pumping.
4. When the spring discharges its energy, the motor switch will re-energize the charging motor until the spring is charged again.
5. To detect the presence of voltage (Health Light), use Omron Red indicator LED Port # C22-L-R-120 for 120 Vac application. For 230 Vac application, use C22-L-R-230. For 24 Vdc application, use C22-L- R-24. Remove the white (22 mm [0.89 in.]) diameter pilot light) Light Diffuser from the assembly to give better indication of voltage present. Activate the push-button to trip the circuit breaker. See Eaton for other voltages.
6. For secondary contacts, odd numbers should be treated as positive for any accessory. This will not apply to AC ratings.
7. Reference Page 44 for internal circuit breaker wiring.

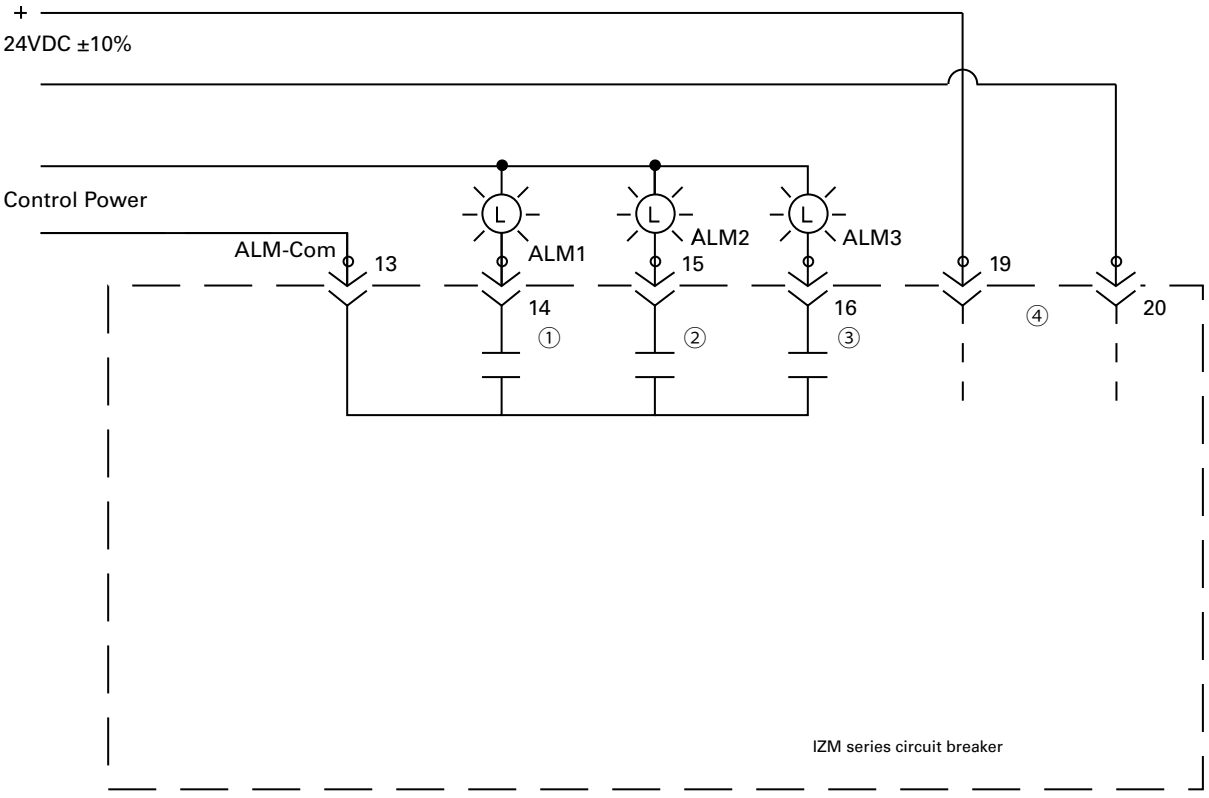
Under voltage release



Notes:

1. Treated as the positive voltage for DC ratings.

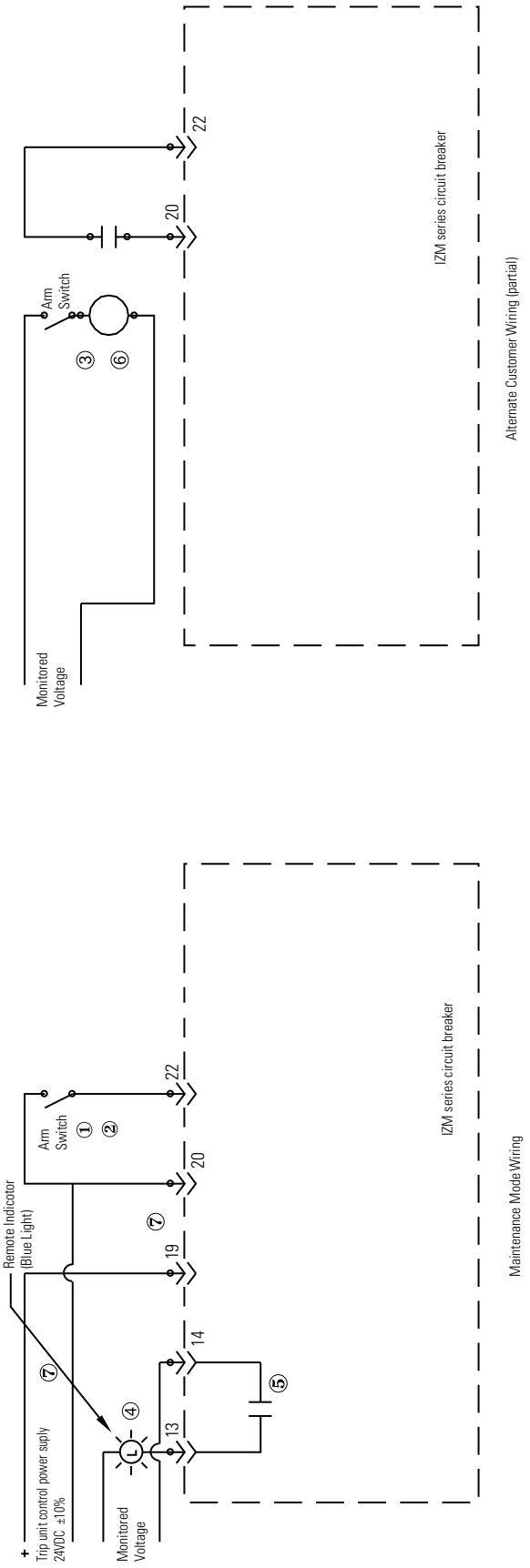
PXR alarm wiring



Notes:

1. For the PXR20/25, the Alarm 1 is for Remote Indication/ Maintenance Mode indication. Contact rating 1 A @ 120 Vac, 1 A @ 24 Vdc, and 0.5 A @ 230 Vac.
2. For the PXR20/25, the Alarm 2 is for High Load alarm/Ground Fault alarm. Contact rating 1 A @ 120 Vac, 1 A @ 24 Vdc, and 0.5 A @ 230 Vac.
3. For the PXR20/25, the Alarm 3 is for Trip N.O. contact. Contact rating 1 A @ 120 Vac, 1 A @ 24 Vdc, and 0.5 A @ 230 Vac.
4. If the control voltage is +24 Vdc, the trip unit should be fed from a separate, galvanically isolated + 24 V voltage dc supply.

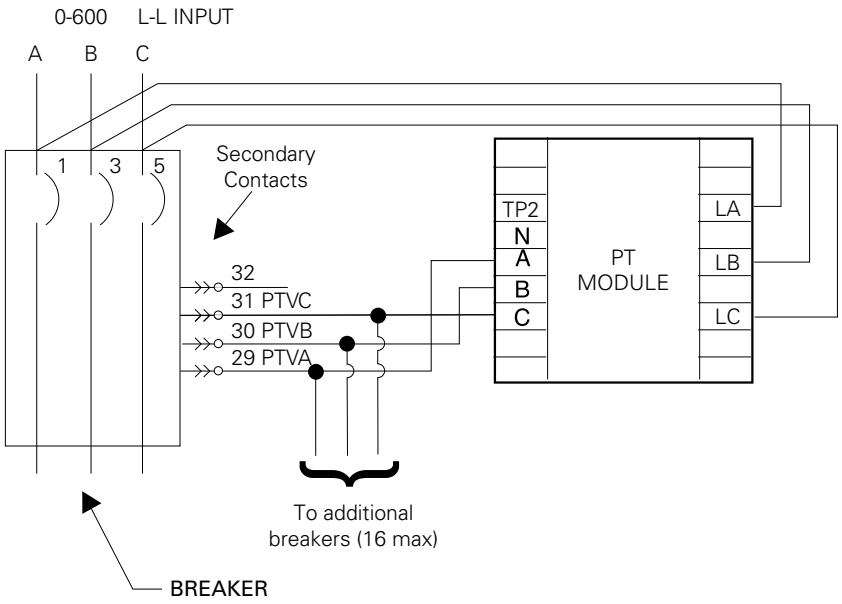
Maintenance mode wiring



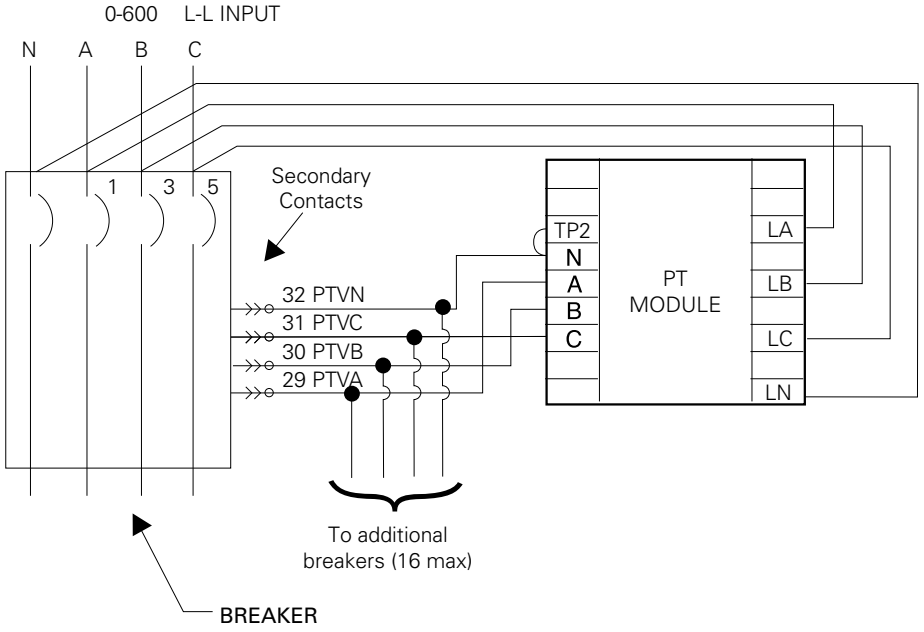
Notes:

1. PXR20/25 can locally be placed in Maintenance Mode via a two position switch located on the trip unit. The function can be armed via a remote switch as shown. In addition, the function can be activated via communication modules. A blue LED on the PXR verifies the PXR release in Maintenance Mode.
2. The recommended selector switch for this low voltage application is Eaton part number 10250T133-2E which includes a contact block rated for logic level and corrosive use.
3. The maximum length of this wiring to remotely arm the switch (or alternate relay contact) is 63.78 feet (3 m). Use #20 AWG wire or larger.
4. A remote Stack Light Annunciator panel or other remote indication device can be connected to verify that PXR is in the Maintenance Mode.
5. The relay in the PXR release makes when in Maintenance Mode. Contact is rated 1 A @ 120 Vac, 1 A @ 24 Vdc, and 0.5 A @ 230 Vac.
6. The PXR release can also be placed remotely in its Maintenance Mode via a general purpose relay (ice cube type with logic level contacts) and activated by a remote control switch. A recommended type is IDEC Relay RY22. Choose the voltage as desired.
7. If a Communication Module is used, The Communication Module will require 24 Vdc power and will provide isolated power to the PXR release in the circuit breaker. If a Communication Module is not used, the PXR release that requires auxiliary voltage for alarms which should be fed from a galvanically isolated, 24 Vdc supply.

External PT Module for PXR25 P type trip unit

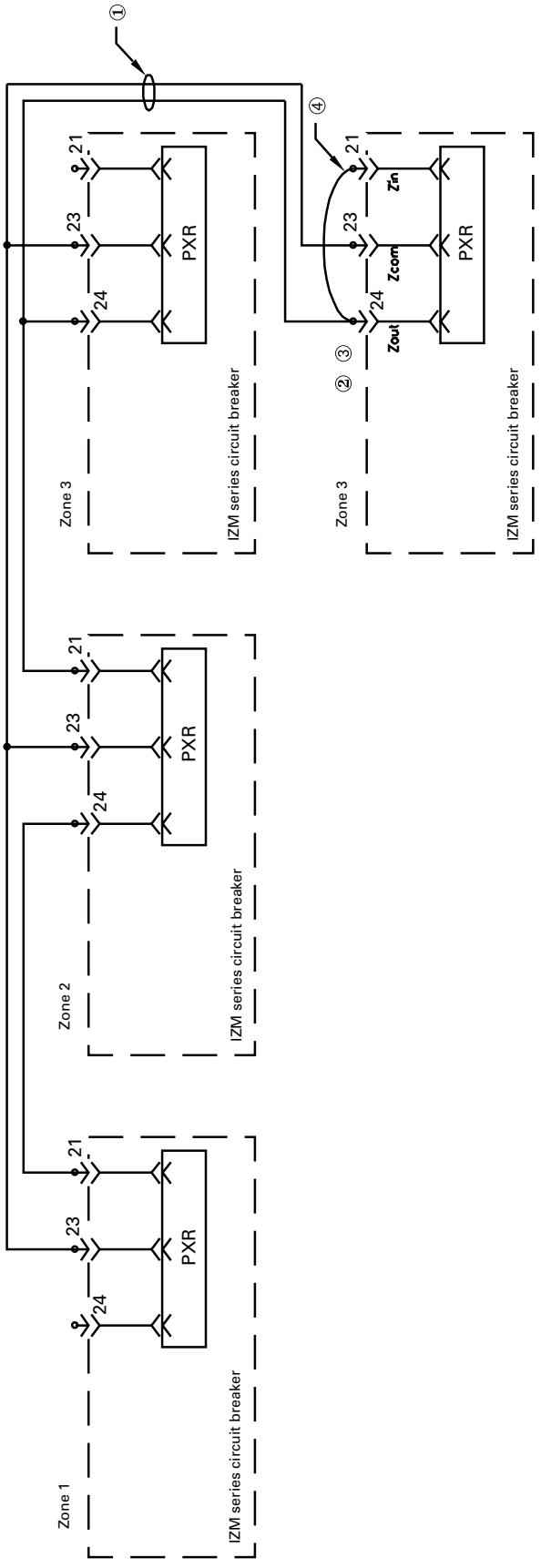


IZM circuit breaker - 3 pole - 3 wire



IZM circuit breaker - 3 pole or 4 pole - 4 wire

Zone interlock wiring



Notes:

1. Twisted together AWG #14 to #20 copper wire. Route the Zone Interlock wiring separate from power conductors. DO NOT GROUND any Zone Interlock wiring.
2. The maximum distance between two farthest breakers on different zones (from the Z_{out} downstream to the Z_{in} upstream terminals) is 250 feet (75 m).
3. A maximum of 20 breakers may be contained in parallel in one zone.
4. Provide a self interlocking jumper (on Zone 3), if coordination is desired with other downstream breakers not providing the Zone Interlock feature.

Section 7: Inspection and maintenance

7-1 General

WARNING

Failure to inspect, clean, and maintain circuit breakers can reduce equipment life or cause the equipment not to operate properly under fault conditions. This could result in equipment damage, bodily injury, or even death.

NOTICE

Inspection and maintenance procedures should be carried out only by personnel familiar with the hazards associated with working on power circuit breakers. Additionally, they should become familiar with the specifics associated with type magnum ds circuit breakers as presented in this instruction booklet.

IZM32 circuit breakers are “top of the line” equipment. This means that they are manufactured under a high degree of quality control, with the best available materials, and with a high degree of tooling for accuracy and parts interchangeability. Design tests and actual installation experience show them to have durability well beyond minimum standards requirements. However, because of the variability of application conditions and the great dependence placed upon these circuit breakers for protection and the assurance of service continuity, inspection and maintenance activities should take place on a regularly scheduled basis.

Because maintenance of these circuit breakers consists mainly of keeping them clean, the frequency of scheduled inspection and maintenance depends to some degree on the cleanliness of the surroundings. Cleaning and preventive measures are a part of any good maintenance program. Plant operating and local conditions can vary to such an extent that the actual schedule should be tailored to the conditions. When the equipment is subject to a clean and dry environment, cleaning is not required as frequently as when the environment is humid with a significant amount of dust and other foreign matter.

It is recommended that maintenance record sheets be completed for the equipment. Careful and accurate documentation of all maintenance activities provides a valuable historical reference on equipment condition over time.

7-2 General cleaning recommendations

Circuit breaker cleaning activities should be a part of an overall activity that includes the assembly in which the circuit breaker is installed. Loose dust and dirt can be removed from external surfaces using an industrial quality vacuum cleaner and/or lint-free cloth. Unless otherwise indicated, never use high-pressure blowing air, because dirt or foreign objects can be driven into areas, such as the breaker mechanism, where additional friction sources could create problems. Never use a wire brush to clean any part of the circuit breaker.

7-3 When to inspect

Do not wait for specific scheduled periods to visually inspect the equipment, if there are earlier opportunities. If possible, make a visual inspection each time a circuit breaker compartment door is opened, and especially when a circuit breaker is withdrawn on its compartment extension rails. This preventive measure could help to avoid future problems. Industry standards for this type of equipment recommend a general inspection and lubrication after the number of operations listed in Table 8-1 of this section. This should also be conducted at the end of the first six months of service, if the number of operations has not been reached.

Breaker Frame Size	Interval (Breaker Cycles) ①
800 A and below	1750
800 A - 3000 A	500
3000 A and above	250

① Breaker cycle = one no load open/close operation.

Table 7.1 Inspection frequency

After the first inspection, inspect at least once a year. If these recommended inspections show no maintenance requirements, the period may be extended to a more economical point. Conversely, if the recommended inspection shows, for instance, a heavy accumulation of dirt or other foreign matter that might cause mechanical, insulation, or other electrical damage, the inspection and maintenance interval should be decreased.

7-4 What to inspect

What to inspect and to what extent is dictated by the nature of the maintenance function. Routine inspections require one type of observation. Inspections following a known high-level fault require more detailed inspections.

A drawout type circuit breaker should first be withdrawn from its compartment onto the compartment’s extension rails. When the inspection is complete, the circuit breaker can be levered to the TEST position to check the electrical operations of the circuit breaker. During the levering-out and levering-in of the circuit breaker, be aware for any signs that would indicate that this process is not working properly.

During the inspection of fixed type circuit breakers, bus systems supplying the fixed circuit breakers should be de-energized for convenience and safety.

For functional testing of the trip unit, refer to the separate detailed instruction booklet dedicated to the trip unit.

Once the circuit breaker has been cleaned as specified in Section 7-2, inspect it for any signs of damage, missing or loose parts, and unusual wear. Be especially alert for foreign matter that must be removed. On drawout circuit breakers, inspect the primary disconnect finger clusters for signs of wear and erosion. Make appropriate corrections to anything found out of order.

7-4.1 Functional field testing

NOTICE

Before doing any work on drawout type circuit breakers, make sure that the breaker is levered out to the TEST or the DISCONNECT position. During the levering-out and levering-in of the circuit breaker, be aware of any signs that would indicate that the levering process is not working properly . If working on a fixed circuit breaker, bus systems should be de-energized for convenience and safety. The circuit breaker should be switched to the OFF position and the mechanism springs discharged.

Eaton recommends that the following functional tests be performed on the circuit breakers as part of any maintenance procedure. The circuit breaker should be removed from service and Eaton notified if the circuit breaker fails to perform any of these tests successfully.

Manual operation functional test

Charge the breaker mechanism springs either using the charging handle or the motor operator. Press the ON pushbutton to close the breaker manually and verify closing by noting the state of the indicating flag. Charge the breaker mechanism springs either using the charging handle or the motor operator. If using the motor operator, disconnect power to it to prevent automatic recharging. Press the OFF pushbutton to manually open the breaker. Press the ON pushbutton to manually close the breaker. Is the breaker closed? Press the OFF pushbutton to manually open the breaker. Is the breaker open? Repeat this entire described test procedure three times.

Electrical operation functional test

This test procedure is based on the assumption that the breaker is equipped with optional shunt trip and spring release accessories. If one accessory is missing, substitute the manual button to replace the accessory's function. Charge the breaker mechanism springs either using the charging handle or the motor operator. Close the breaker by applying rated voltage to the spring release accessory and verify closing by noting the state of the indicating flag. Charge the breaker mechanism springs either using the charging handle or the motor operator. If using the motor operator, disconnect power to it to prevent automatic recharging. Open the breaker by applying rated voltage to the shunt trip accessory. Close the breaker using the spring release accessory. Is the breaker closed? Open the breaker using the shunt trip accessory. Is the breaker open? Repeat this entire described test procedure three times.

Trip unit overload functional test

This test uses the self-test function or the PXPM software. Charge the breaker either using the charging handle or the motor operator. Press the ON pushbutton to close the breaker manually and verify the state of the closing indicator. Charge the breaker either using the charging handle or the motor operator. If using the motor operator, disconnect power to it to prevent automatic recharging. Trip the breaker with a trip unit and verify whether the indicator is popped out, and then reset it. Press the ON pushbutton to manually close the breaker. Is the breaker closed? Trip the breaker with a trip unit. Verify whether the indicator (if so equipped) is popped out and then reset it. Reset the blinking red LED on the trip unit by pressing the Reset/Battery Test pushbutton.

7-4.2 Arc chute inspection

When a circuit breaker experiences a high-level fault or during regularly scheduled maintenance periods, the circuit breaker's arc chutes and arc chambers should be inspected for any kind of damage or dirt. Be especially alert for signs of significant erosion of the V-shaped plates inside the arc chute.

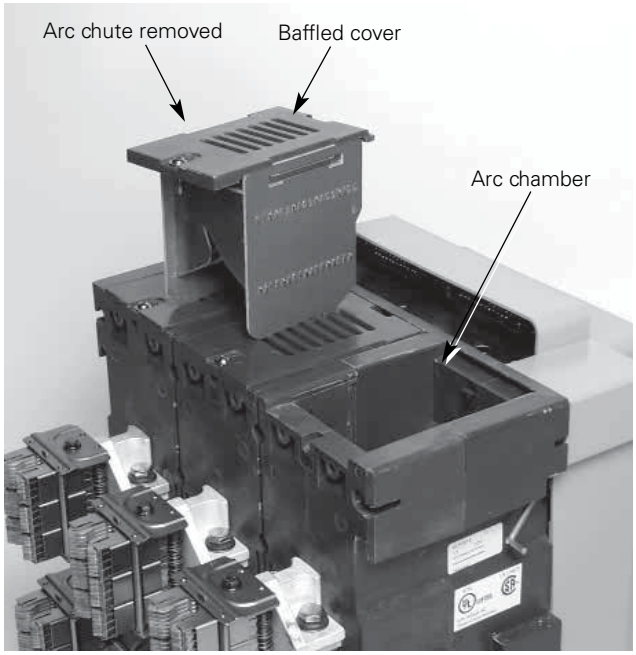


Figure 7-1 Top rear view of circuit breaker (with one arc chute removed)

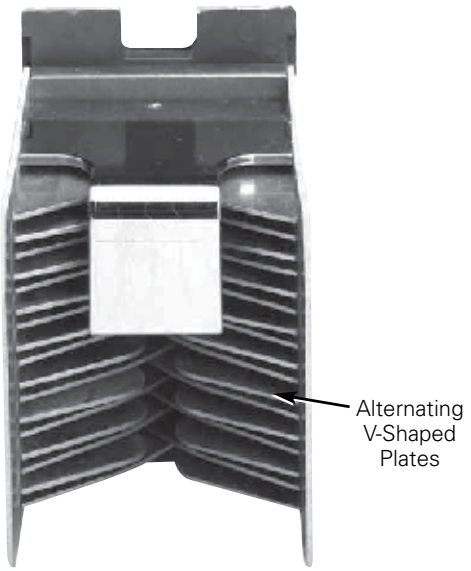


Figure 7-2 Bottom view of arc chute

Arc chutes fit inside the arc chambers and down over the primary contacts. Each arc chute is held in place by one top-inserted screw (Figure 7-1). Begin by removing the arc chute screws and all three arc chutes. Turn each arc chute upside down to visually inspect the inside (Figure 7-2).

WARNING

Arc chutes must always be secured properly in place before a circuit breaker is installed in a circuit breaker compartment. Failure to do this could result in equipment damage, bodily injury, or even death.

When the inspections are complete, position each arc chute down over its respective set of primary contacts, and secure in place with the screw removed earlier. Torque the arc chute screws to 4–5 Nm.

7-4.3 Primary contact inspection

With the arc chutes removed, visually inspect each primary contact structure for signs of wear and/or damage. The primary contacts with the circuit breaker open can be viewed by looking directly down into the arc chamber (Figure 7-3 and Figure 7-4). A contact wear indicator is provided for each primary contact and indicates whether or not the contact should be replaced. Inspection of the contacts using the contact wear indicators is conducted only with the circuit breaker closed (Figure 7-5).

NOTICE

When making a contact wear inspection, always make the inspection by looking straight down into the arc chamber for the proper perspective. Viewing the contact wear area from an angle could distort the view.

The contact wear indicator is the relative position of the individual contact fingers to a narrow, side-to-side ledge inside the arc chamber. The ledge is actually part of the arc chamber. When the circuit breaker is closed and the contacts are in good condition, the narrow ledge is covered by the back end of the contacts. If the back end of the contacts do not totally cover the ledge, the contacts should be replaced.

WARNING

Arc chutes must always be secured properly in place before a circuit breaker is installed in a circuit breaker compartment. Failure to do this could result in equipment damage, bodily injury, or even death.

Once the inspection is completed, be sure to put the arc chutes back to its original place.

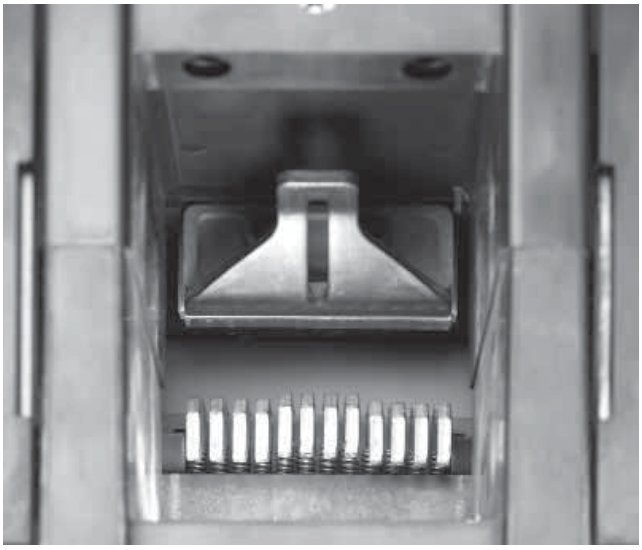


Figure 7-3 Primary contacts with circuit breaker open(not used for contact wear inspection)

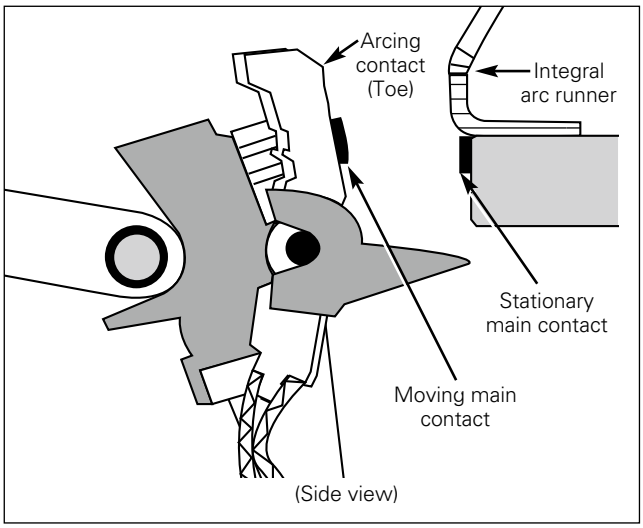


Figure 7-4 Contact inspection area with circuit breaker open

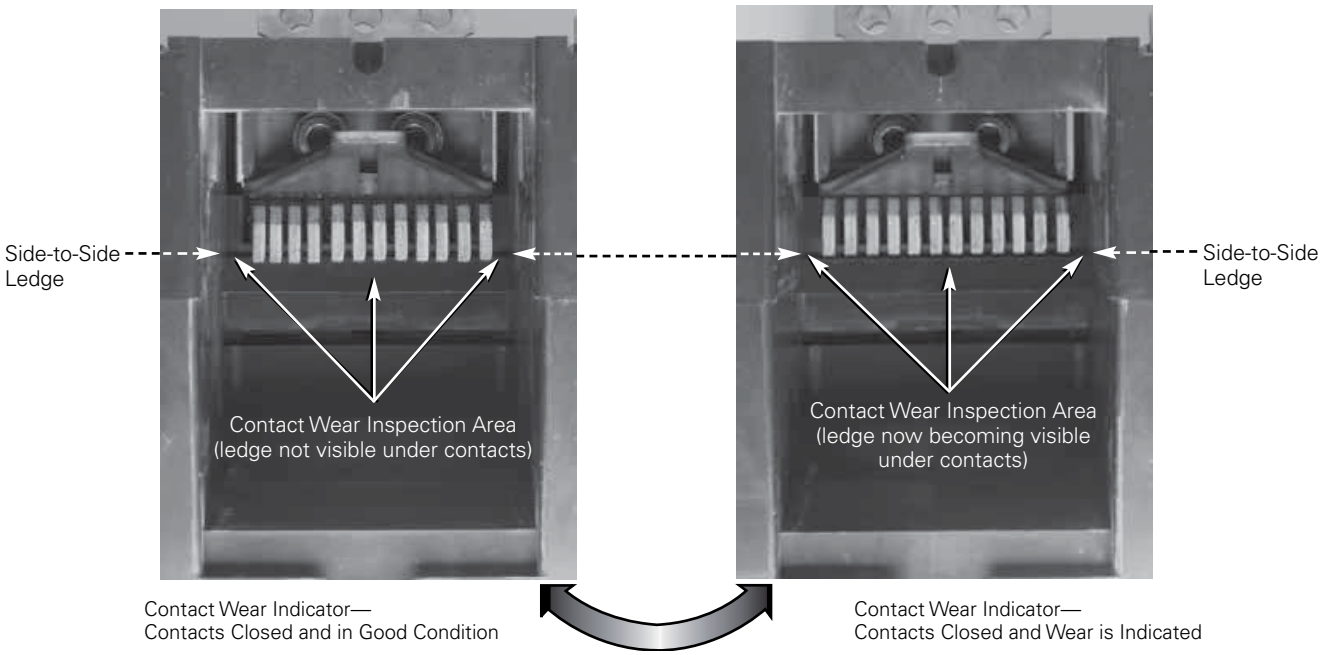


Figure 7-5 Use of contact wear indicator with circuit breaker closed

Section 8: Troubleshooting

8-1 Introduction

Table 8.1 will help to determine the probable causes of simple circuit breaker problems and possible corrective actions. Possible problems associated with the electronic trip unit are covered in PXR20/25 instructions manual. If the problem cannot be resolved with the aid of one or both of these guides, contact the Eaton service center for more in-depth assistance.

Table 8.1 Circuit breaker troubleshooting guide.

Symptom	Probable cause	Corrective actions
The circuit breaker trips open (red fault trip indicator buttonis out and/ or fault indicator LED is lighted) when closed on a load current	Rating plug not installed and load current through the breaker	Install rating plug that corresponds to current sensors
	Repeated closing on transient (in-rush) current with thermal memory active	Wait for circuit breaker (and loads) to cool before re-closing
	An overload or fault current condition	Use status and fault indicators to help locate and remove overload or fault condition
Circuit breaker opens (fault trip indicator button is not out)	Undervoltage release operates; voltage too low or zero	Check and correct the UVR supply voltage (85–110% rated voltage)
	Shunt trip operates	Check control signal(s) to shunt trip; correct if necessary
	Trip latch is defective	Inspect latch condition and engagement before closing; consult Eaton service center
Circuit breaker cannot be opened remotely, but can be opened locally	Shunt trip control signal absent or too low	Check supply voltage exceeds 70% of rated voltage when signal is applied to shunt trip
	Shunt trip is faulty or improperly installed	Remove front cover; check voltage supplied to shunt trip; make sure shunt trip is seated and retainer snapped into place. Check for shunt trip motion; replace shunt trip if faulty
	Secondary contact wiring problem	Make sure electrical pin and socket connectors are properly seated in molded plug. Verify proper wiring
Circuit breaker cannot be opened locally	OPEN pushbutton locked	Remove lock
	Faulty mechanism or main contacts welded	Contact Eaton service center
Circuit breaker makes no attempt to close with either local (manual) or remote controls; springs do not discharge	Closing spring not fully charged (check SPRING CHARGED indicator)	Charge spring manually; check voltage to electrical operator; replace electrical operator if faulty
	If equipped with undervoltage release, undervoltage release is not energized or is faulty	Unplug undervoltage release from mounting deck and retry closing operation; if OK, check release (>85%); replace undervoltage release if faulty
	Circuit breaker locked in OPEN position	Check reason for lock
	Drawout position interlock is operating; levering screw	Make sure that circuit breaker is at a position that permits closure; door is open and check that shutter (door) over the levering screw is fully closed
	Circuit breaker interlocked with another circuit breaker or device	Check for presence of an interlocking scheme (cable interlock or key interlock); check to see if interlocked circuit breaker is CLOSED
Circuit breaker cannot be closed remotely (can be closed locally)	Spring release (closing) coil supply voltage low or spring release faulty	Check power supply voltage; replace spring release if faulty
	Secondary contact wiring problem	Make sure electrical pin and socket connectors are properly seated in molded plug. Verify proper wiring
	Spring release closing coil signal blocked	Clean Type P release relay contact
Circuit breaker cannot be closed locally (but can be closed remotely)	Opening and/or closing pushbuttons locked	Check reason for lock
Circuit breaker does not recharge electrically but will recharge manually	Charging motor supply voltage absent or too low (<85%)	Check charging motor electrical circuit voltage (check under load)
	Charging motor faulty	Replace charging motor assembly
Drawout circuit breaker will not lever-in	Circuit breaker will not fully enter cell (cell rejection code plate)	Circuit breaker ratings do not correspond to the cassette requirements
	Levering-in screw not in fully DISCONNECT position at insertion	Rotate levering-in screw counterclockwise to DISCONNECT position, then insert breaker fully into cassette
	Levering-in screw in DISCONNECT position but not pushed in far enough	Push circuit breaker in as far it will go, cover should be flush with front of cassette side plate
	Protective boots covering stationary disconnects	Remove boots
	Shutter jammed or locked	Clear problem

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