**Series NRX® NF and RF Frame low-voltage circuit breakers with Power Xpert® Release**
Technical product guide

# Safe, seamless, smart

Series NRX with
Power Xpert Release
trip units low-voltage
power circuit breakers


Powering Business Worldwide

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Series NRX Air Circuit Breakers with Power Xpert Release Trip Units

1

# Eaton offers a more intuitively designed solution for protecting workers and connecting assets.

## Series NRX ANSI and IEC breakers

Eaton's latest innovation in circuit protection technology, Series NRX low-voltage circuit breakers with Power Xpert® Release (PXR) electronic trip units are designed to help reduce costs, equipment and space requirements in global data center, healthcare, oil and gas, marine and other commercial and industrial applications. The Series NRX breakers are designed to simplify communications and support energy metering with one of the smallest footprints in the industry. The Series NRX circuit breakers are designed to make it easier to change set points, perform testing, and review energy and power information. Eaton's Series NRX low voltage circuit breakers meet the needs of low-voltage power distribution for Underwriters Laboratories (UL®) 489 and 891 switchboard applications as well as global International Electrotechnical Commission (IEC), 60947-2 applications.

The compact sizes of the two Series NRX circuit breakers, NF and RF frames, helps reduce non-revenue generating floor space, and the modular design and common accessories allow for easy panel and switchboard integration. The Series NRX circuit breakers combine high interruption and short time withstand ratings with easy to integrate communications. The NF and RF frames are rated up to 1200 and 3000 amperes, respectively, for UL 489 and UL 891 applications.

## Power Xpert® Release (PXR) trip units

Eaton's new Power Xpert® Release (PXR) electronic trip units provide an enhanced and easy-to-use interface, which enables end users and maintenance engineers to more easily change set points, test and configure circuit breakers, and review energy and power information. The intuitive interface provides simple scroll through visibility for critical performance metrics such as battery life, zone-selective interlock settings and breaker health. The Power Xpert® Protection Manager (PXPM) software for the trip units can provide and perform secondary injection and test reporting through a PC to simplify testing, serviceability and customization. This capability avoids the need for customers to purchase test kits to support serviceability and customization which can help reduce time and labor. With the Series NRX low voltage circuit breakers, three ground fault settings are available within one single trip unit (ground fault trip, alarm, and off) to provide flexibility for field adjustments and reduce ordering complexity.

## Arc Flash Reduction Maintenance System™ (ARMS)

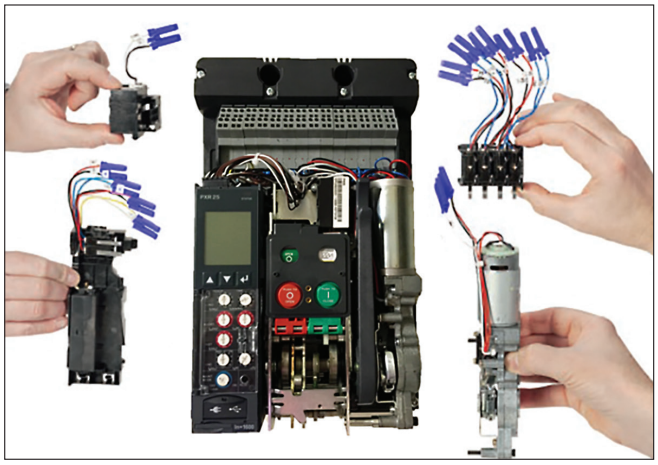
Personnel safety is of paramount importance in today's work environment. Of recent concern is the potential for serious injury due to exposure to electrical arcs. Eaton's Power Xpert Release (PXR) trip units offer the patented Arcflash Reduction Maintenance System™ (ARMS), which offers a non-delayed immediate disconnection in the event of an arc fault. This disconnection is independent and faster than the breaker's instantaneous trip. This function can be activated directly on the circuit breaker or via an external switch, such as when maintenance personnel enter a hazardous area. This innovative safety feature reduces Personal Protective Equipment (PPE) requirements for the operators and enhances productivity.

## Communication options

PCAM, MCAM or ECAM (Profibus-DP / ModBus/ Ethernet Communications Adapter Module) - every circuit breaker of the NRX series is equipped for modern communication and is fit for the future. The databus not only allows to transmit information, but also to receive commands/settings. The trip unit has been engineered with native ModBus communication to simplify setup during commissioning. It saves costs for customers by eliminating the need for separate communication components and associated wiring. Additional PCAM, MCAM or ECAM modules can be installed externally for PXR25 to expand the communication capability and simplify integration into existing electrical system design and protocols. No more than one external CAM module can be installed. Both the CAM and the internal ModBus RTU can be operated simultaneously.

**Series NRX NF frame & NRX RF frame**

## Space-saving circuit breakers with useful accessories



Breaker rear side (withdrawable breaker)

### Value propositions

- Increased worker safety with faster response
- Seamless integration to enable faster installation and commissioning
- Smarter solution enabling connectivity, reliability and diagnostics

### Features and benefits

- Eaton's software simplifies testing, serviceability and customization—yielding significant time and labor savings
- An enhanced user interface enables engineers to view and adjust the trip unit settings
- The compact size of Series NRX frames reduces non-revenue generating floor space
- Modular design and common accessories allow for easy panel and switchboard integration

### Certifications and standards

- Underwriters Laboratories (UL) 489
- International Electrotechnical Commission (IEC) 60947-2
- Canadian Standards Association 22.2

### Options/accessories/components

- Variety of continuous amperages and interruption ratings
- Configurations with 3- and 4-pole designs
- Fixed and drawout options
- Rear, front and hybrid connect configurations (NF Frame, UL 489 only)
- Additional options include: automatic and non-automatic configurations, shunt trips, under-voltages releases, remote motor operation, latch check switches, auxiliary switches, trip indication, padlock and keylock provisions, cassettes configurations

### Why Eaton?

Finding safe, seamless, and smart protection for your electrical system and personnel is your number one priority. With a complete portfolio of circuit protection products, including molded case, low and medium voltage circuit breakers, you can feel confident that whatever the application, Eaton has the solution.

For more information, visit www.eaton.com/SeriesNRX

## 2.1 Introduction

The Series NRX Low Voltage Power Circuit Breaker affords customers the opportunity to meet the increasingly complex requirements of modern distribution systems. It is designed and tested for use in low voltage power distribution assemblies applied at 240, 480, and 600 Vac (600 Vac for NF only) nominal voltages. Series NRX is available in drawout and fixed circuit breaker mounting configurations. Continuous current ratings from 800 through 3000 amperes and high interruption ratings up to 100 kA without fuses are covered by two different frame sizes.

Series NRX circuit breakers are UL listed, and are built and tested in an ISO 9000 certified facility and meet or exceeds all applicable NEMA, ANSI, IEEE, and UL standards. It is a 100% rated device, designed to carry 100% of its nameplate current rating in an enclosure without derating.

- Suitable in UL 891 Switchboards
- Suitable in UL CSA 22.2.31 LV Assemblies

### Design and testing standards

The standards outlined establish the minimum requirements. There is nothing prohibiting a circuit breaker design from exceeding standards by offering additional features and/or higher levels of performance. Series NRX does this in a number of areas.

Series NRX circuit breakers can be used in forward or reverse feed applications.

Controls and indicators are functionally grouped on the circuit breaker's front cover. The through-the-door drawout design permits easy and safe access to the front cover controls, as well as the trip unit and racking device.

Series NRX circuit breakers utilize intelligent Power Xpert Release (PXR) electronic trip units to provide system selectivity, advanced coordination and communications.

### Functional and flexible

- Rigid frame of high strength engineered thermoset composite resins
- Compact and lightweight
- Rugged, maintainable construction
- Two frame sizes
- Four position drawout, or fixed mounting configurations
- Through-the-door drawout construction
- Spring stored energy mechanism
- Electrical or manual operation (field convertible)
- Field installable UL Approved accessories

### Performance plus

- Designed and tested to IEEE, NEMA, UL and CSA Standards
- Six continuous current frame sizes (800 through 3000A
- High interrupting ratings
- High withstand ratings
- Rated for 100% continuous operation in enclosure
- 3-cycle closing

### Intelligence systems

- Microprocessor-based true rms sensing trip units
- Protection and coordination
- Energy monitoring
- Communications
- Protective relay features
- Integral testing
- Built-in secondary injection testing

### Special application circuit breakers

- Non-automatic circuit breakers - a non-automatic circuit breaker does not include a trip unit, sensors or over-current release
- Contact Eaton for other special applications

### Functional techniques

- Patented "heal -toe" contact-structure
- Improved contact material
- "C" loop current path
- Braided current path connections (RF only)
- Removable arc chambers

### Reliability, maintenance and safety

- Front accessible and dedicated secondary wiring
- Finger proof secondary contacts
- Drawout rail construction
- Front mounted, plug-in accessories
- Proven operating mechanism
- Fewer individual parts
- One piece removable arc chutes and covers
- Insulating and isolating arc chambers
- Replaceable terminals and trip units

## 2.2 Selection criteria

Fundamental criteria for the selection of circuit breakers:

- **Rated operational current $I_n$** which should flow through the respective branch circuit: This value must not be greater than the maximum switch rated operational current of the circuit breaker. The rated operational current can be adjusted down using additional rated operational current modules.
- **Interrupting rating:** The maximum symmetrical short-circuit current the circuit breaker can interrupt. UL489 doesn't require a short-time withstand rating for breakers. The UL489 NRX breakers have instantaneous override fixed at 22.5 x $I_n$ (asymmetrical peak value). An equivalent symmetrical RMS value would roughly equate to 10 x $I_n$. A 30 cycle withstand option is available for NRX breakers to provide better selectivity. These breakers will have higher instantaneous override to provide short-time withstand capabilities.
- Ambient temperature of the circuit breaker: This is generally the internal temperature in the control panel. Observe the derating values with increased ambient temperature (see Table 2).
- Circuit breaker type: fixed mounted or withdrawable units, 3- or 4-pole.
- Minimum short-circuit current, which flows through the switching device: The release must recognize this value as a short-circuit and may react with a trip.
- Protection functions of the circuit breaker: This is determined by the selection of the respective overcurrent release.

## Fixed circuit breaker

A fixed circuit breaker is rigidly mounted in its structure with no drawout feature, making for a simple and economic construction. It is available in both front and rear-connected configurations. Full visual and physical access to the circuit breaker trip unit, controls, and indicators is available through the compartment front panel. Door escutcheon kits are available as an option to provide a finished trim to the front panel cutout. Extensive accessorization capability of the breaker is retained, including trip units, internal and communication accessories, lock-off devices, and mechanical interlocks. Metal mounting brackets are provided as a standard feature for use in securely bolting the breaker to the enclosure.

### Front connect

Front-connected breakers are for UL 489 applications and can accommodate a number of primary terminal configurations, see Table 1. Front connect is exclusive to the NF-frame and uses mounting brackets for breaker mounting and installation

### Rear connect

A standard fixed rear-connected circuit breaker is supplied with flat primary terminal pads on the rear of the breaker that will accommodate a variety of primary connection configurations including both horizontal and vertical primary adapters as well as long and short lengths (length option for NF only). The breaker bolts directly to the enclosure main bus, which allows for efficient current transfer under loaded conditions. This improves thermal management and provides for the design of compact enclosures with shallow depth.

## Drawout breaker and cassette

A drawout circuit breaker is used in combination with a drawout cassette. Mounted on the drawout breaker are the primary disconnect finger clusters and levering mechanism.

These components are located on the breaker to allow users easy access when performing product inspection or maintenance. The cassette provides all the necessary drawout circuit breaker interfaces, including primary and secondary connections.

Standard flat terminal pads on the rear of the cassette provide for a variety of primary connection configurations. Optional primary adapters are available for front and rear bus or cable connections. Refer to "Minimum Clearances" section for mounting and installation dimensional information.

**Table 1. Front Connect Primary Terminal Configurations**

| Name | Top connection | Bottom connection |
|---|---|---|
| Bus connect | Bus bar | Bus bar |
| Cable connect | Cable adapter | Cable adapter |
| Hybrid | Bus bar | Cable adapter |
| Hybrid | Cable adapter | Bus bar |

**Rear view of fixed NF and RF breakers**

**Front view of drawout NF and RF breakers**

**Sample RF cassette with full complement of secondary terminal blocks**

# Secondary terminals



## Contact blocks

Series NRX with PXR secondary contact blocks consist of four contacts and are designed identically for both breaker frames. Drawout circuit breakers use 67C3246 contact blocks and fixed mounted circuit breakers use 67C3247 with angled customer tension connectors. These contact blocks mount onto an insulated support frame.

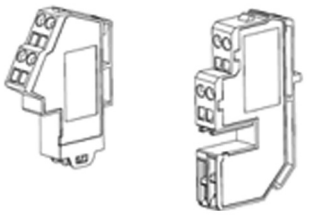
Since each contact block is mounted individually, contact positions may be empty depending on accessories and options ordered. A possible 14 terminal blocks will provide 56 contact points for the type NF frame while a possible 24 terminal blocks will provide 96 contact points for the type RF frame.

## Customer wiring

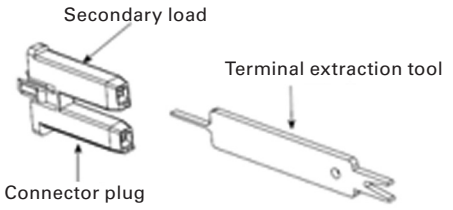
Customer wiring is done using a tension clamp termination on each contact. The tension clamp terminals will support solid or flexible conductors, #12/4 mm2 through #26/0.5 mm2 AWG wire and are rated for 600 V, 10 A. They also support finely stranded conductors with wire end ferrules and plastic collars DIN 46228/4, rated connection. In order to remove leads from secondary contact connector plugs, use the 68D3288H01 extraction tool.

Wire kits and terminal block kits are available to custom configure the blue breaker secondary connectors to the breaker contact blocs. As an option, factory re-wired cassettes are available for drawout circuit breakers.

**Tension connectors and contact blocks**



**Secondary contact connector plugs and extraction tool**



## Temperature and altitude derating factors



### Table 2. Temperature derating

**NF- frame**

| Rated current | 630A | 800A | 1200A |
|---|---|---|---|
| 40°C [A] | 630 | 800 | 1200 |
| 50°C [A] | 630 | 800 | 1200 |
| 60°C [A] | 630 | 800 | 1200 |
| 70°C [A} | 630 | 800 | 1200 |

**RF-frame**

| Rated current | 800A | 1200A | 1600A | 2000A | 2500A | 3000A |
|---|---|---|---|---|---|---|
| 40°C [A] | 800 | 1200 | 1600 | 2000 | 2500 | 3000 |
| 50°C [A] | 800 | 1200 | 1600 | 2000 | 2500 | 3000 |
| 60°C [A] | 800 | 1200 | 1600 | 2000 | 2500 | 3000 |
| 70°C [A} | 800 | 1200 | 1600 | 2000 | 2500 | 3000 |

### Table 3. Altitude derating factors

| Altitude [m] | Voltage correction | Current correction |
|---|---|---|
| 2000 | 1.000 | 1.000 |
| 2150 | 0.989 | 0.989 |
| 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 |

**Note:** Series NRX (PXR) 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.

# Technical data and endurance information for installation

## Test bus configuration

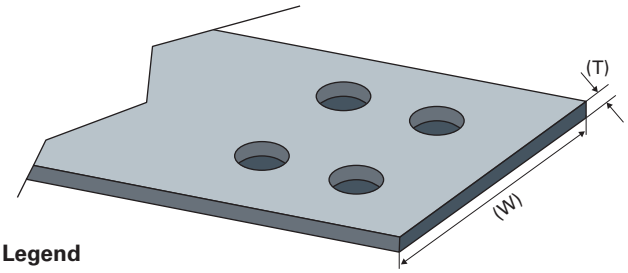
The bus bar size examples shown here are those specified by UL, IEC 947-1 and/or used by Eaton in their breaker type testing. They are for 3 meter long bus bar with the faces vertical and painted flat black. For other bus bar configurations, larger bus bar sizes may be required or the breaker may have to be de-rated. Refer to the tables presented earlier in this section for de-rating information at higher ambient temperatures

### Table 4. UL bus bar sizes and quantities

| Frame rating at 40°C ambient (A) | NF-frame | RF-frame | Recommended bus bar quantities and sizes | |
|---|---|---|---|---|
| | | | (in) | (mm) |
| 800 | ■ | ■ | (1) .25 x 3.0 | (2) 5 x 50 |
| 1200 | ■ | ■ | (2) .25 x 2.5 | (2) 5 x 80 |
| 1600 | | ■ | (2) .25 x 3.0 | (2) 5 x 100 |
| 2000 | | ■ | (2) .25 x 4.0 | (3) 5 x 100 |
| 2500 | | ■ | (4) .25 x 2.5 | (4) 5 x 100 |
| 3000 | | ■ | (4) .25 x 4.0 | (3) 10 x 100 |

### Table 5. IEC bus bar sizes and quantities

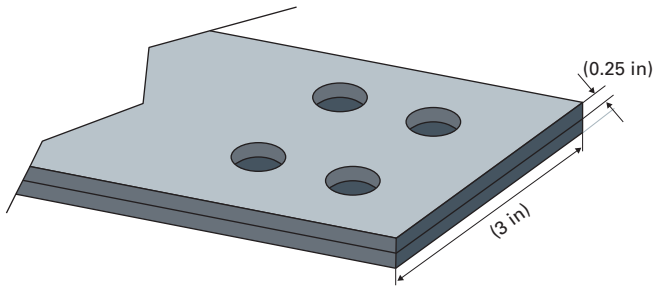
| Frame rating at 40°C ambient (A) | NF-frame | RF-frame | Recommended bus bar quantities and sizes | |
|---|---|---|---|---|
| | | | (in) | (mm) |
| 800 | ■ | ■ | (2) 5 x 50 | (1) .25 x 3.0 |
| 1000 | ■ | ■ | (2) 5 x 60 | (2) .25 x 2.0 |
| 1250 | ■ | ■ | (2) 5 x 80 | (2) .25 x 2.5 |
| 1600 | ■ | ■ | (2) 5 x 100 | (2) .25 x 3.0 |
| 2000 | | ■ | (3) 5 x 100 | (3) .25 x 3.0 |
| 2500 | | ■ | (4) 5 x 100 | (2) .38 x 4 |
| 3200 | | ■ | (3) 10 x 100 | (3) .38 x 4 |
| 4000 | | ■ | (4) 10 x 100 | (4) .38 x 4 |




**Legend**

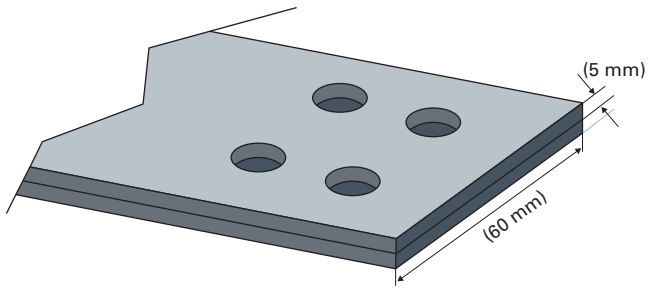
**T = thickness of bus bar**

**W = width of bus bar**




**Example (inches)**

**(2) .25 in by 3 in bus bars stacked to carry 1600 amperes**




**Example (millimeters)**

**(2) 5 mm by 50 mm bus bars stacked to carry 800 amperes**

## 2.3 Breaker technical data

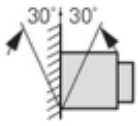


### Table 6. UL 489 ratings

**NRX NF (Front Connect)**

**NRX NF (Rear Connect)**

**NRX RF (Rear Connect)**

| | | | | |
|---|---|---|---|---|
| **General** | | | | |
| Standard ① | | | UL 489 | |
| Ambient temperature | Storage °C | | -20 – 70 | |
| | Operating (open) °C | | -20 – 70 | |
| Mounting position | | |   |   |
| Protection type | | IP20, IP55 device with protective cover, IP41 with door sealing frame | | |
| Direction of incoming supply | | as required | | |
| **Switching capacity** | | | | |
| Rated Current (In , A) | | 200, 250, 300, 400, 500, 600, 800, 1200 | | 800, 1200, 1600, 2000, 2500, 3000 |
| Rated voltage (V) | | 480, 600 | | 480 |
| Interrupting rating (rms, ka) | 240 Vac (50/60Hz) | 42, 50, 65, 85 | | 65, 85, 100 |
| | 480 Vac (50/60Hz) | 42, 50, 65 | | 65, 85, 100 |
| | 600 Vac (50/60Hz) | 42 | | — |
| Instantaneous override (equivalent symmetrical rms, kA) ② | | 8 @ 800A $I_n$ , 12 @ 1200A $I_n$ | | 8 @ 800A $I_n$ , 12 @ 1200A $I_n$ , 16 @ 1600A $I_n$ , 20 @ 2000A $I_n$ , 25 @ 2500A $I_n$ , 30 @ 3000A $I_n$ |
| Short-time withstand current (rms, kA) ③ | 30 cycle withstand option | 42 | | 65 |
| Operating delays (ms) | Closing delay | 25 | | 30 |
| | Closing delay electrical (via SR) | 30 | | 35 |
| | Opening delay electrical (via ST) | 25 | | 22 |
| | Opening delay electrical (via UVR) | 50 | | 37 |
| Maximum operating frequency | Operations/hr | 60 | | 60 |
| **Durability and installation characteristics** | | | | |
| Lifespan (operations) | Mechanical, w/o maintenance | 20,000 | | 10,000 |
| Dimensions (H × W × D, in (mm)) | Fixed 3P | 16.00 × 8.27 × 7.15 (406 × 210 × 182) | 13.31 × 8.27 × 7.24 (338 × 210 × 184) | 15.67 × 14.80 × 11.73 (398 × 376 × 298) |
| | Fixed 4P | 16.00 × 10.98 × 7.15 (406 × 279 × 182) | 13.31 × 10.98 × 7.24 (338 × 279 × 184) | 15.67 × 19.37 × 11.73 (398 × 492 × 298) |
| | Withdrawable 3P | — | 14.17 × 10.00 × 11.38 (360 × 254 × 289) | 17.95 × 16.77 × 15.47 (456 × 426 × 393) |
| | Withdrawable 4P | — | 14.17 × 12.76 × 11.38 (360 × 324 × 289) | 17.95 × 21.30 × 15.47 (456 × 541 × 393) |
| Weight (lb (kg)) | Fixed 3P/4P | 40/53 (18/24) | 33/44 (15/20) | 99/123 (45/56) |
| | Withdrawable 3P/4P | — | 86/104 (39/47) | 216/267 (98/121) |

① For IEC ratings and specifications, please refer to: www.eaton.com/seriesNRX

② UL489 doesn't require a short-time withstand rating for breakers. The UL489 NRX breakers have instantaneous over-ride fixed at 22.5 x $I_n$ (asymmetrical peak value). An equivalent symmetrical RMS value would roughly equate to 10 x $I_n$.

③ A 30 cycle withstand option is available for NRX breakers to provide better selectivity. These breakers will have higher instantaneous override to provide short-time withstand capabilities.

## 2.4 Catalog selection



### Table 7. Series NRX with Power Xpert Release NF-frame circuit breaker (exclusionary rules apply)

**N G S6 08 3 W 2A 8 A B A N 4 X N D X**

**Breaker frame size**
**N** = NF-frame for UL 489 or IEC, (2.75 inches or 70 mm pole spacing)

**Standard, mechanism, device**
**G** = IEC 60947-2, stored energy, air breaker
**Y** = UL 489, stored energy, insulated case breaker

**Fault current rating**
**R4** = 42 kA at 480 Vac (UL 489 only)
**R5** = 50 kA at 480 Vac (UL 489 only)
**R6** = 65 kA at 480 Vac (UL 489 only)
**S4** = 42 kA at 480 Vac (30 cycle, UL 489) or 415 Vac IEC
**S5** = 50 kA at 480 Vac (30 cycle, UL 489) or 415 Vac IEC
**S6** = 65 kA at 480 Vac (30 cycle, UL 489 only), 66 kA at 415 Vac IEC

**Frame rating (amperes)**
**07** = 630 (IEC only)
**08** = 800
**10** = 1000 (IEC only)
**12** = 1200 (UL only)
**13** = 1250 (IEC only)
**16** = 1600 (IEC only)

**Poles, phasing**
**3** = Three-pole, ABC
**4** = Four-pole, NABC

**Mounting configuration**
**W** = Drawout
**B** = Fixed mount rear connected with side mounting brackets
**F** = Front connected, fixed mount, for bus or cable connections with side mounting brackets
**H** = Fixed hybrid breaker, top rear connect and bottom front connect ①
**J** = Fixed hybrid breaker, top front connect and bottom rear connect ①

**Continuous rating ($I_n$ in amperes)**
**1** = 200
**2** = 250
**3** = 300
**4** = 400
**5** = 500
**6** = 600
**7** = 630 (IEC only)
**8** = 800
**A** = 1000 (IEC only)
**B** = 1200 (UL only)
**C** = 1250 (IEC only)
**D** = 1600 (IEC only)

**Trip unit, power supply**
**SW** = Non-automatic switch, 42 kA for IEC and UL 489
**2A** = PXR20 LSI
**2B** = PXR20 LSI with Modbus
**2H** = PXR20 LSI with Modbus and Arcflash Reduction Maintenance System
**2K** = PXR20 LSI with Arcflash Reduction Maintenance System
**2C** = PXR20 LSIG
**2D** = PXR20 LSIG with Modbus
**2E** = PXR20 LSIG with Arcflash Reduction Maintenance System
**2F** = PXR20 LSIG with Modbus and Arcflash Reduction Maintenance System
**2P** = PXR25 LSI with Modbus
**2Q** = PXR25 LSI with Modbus and Arcflash Reduction Maintenance System
**2R** = PXR25 LSIG with Modbus
**2S** = PXR25 LSIG with Modbus and Arcflash Reduction Maintenance System

**Shunt trip**
**N** = No shunt trip
**A** = 110–127 Vac/Vdc
**R** = 208–240 Vac/Vdc
**L** = 24 Vdc
**H** = 48 Vdc
**S** = 60 Vdc

**Motor operator**
**M** = Manually operated
**B** = 110–125 Vac
**W** = 110–125 Vdc
**T** = 208–250 Vac
**P** = 220–250 Vdc
**L** = 24 Vdc
**H** = 48 Vdc
**S** = 60 Vdc

**Spring release, latch check switch**
**N** = No spring release, no LCS
**A** = 110–127 Vac/Vdc, no LCS
**B** = 110–127 Vac/Vdc, spring release LCS
**C** = 110–127 Vac/Vdc, LCS wired external
**R** = 208–250 Vac/Vdc, no LCS
**S** = 208–250 Vac/Vdc, spring release LCS
**T** = 208–250 Vac/Vdc, LCS wired external
**L** = 24 Vdc, no LCS
**P** = 24 Vdc, spring release LCS
**Q** = 24 Vdc, LCS wired external
**H** = 48 Vdc, no LCS
**J** = 48 Vdc, spring release LCS
**K** = 48 Vdc, LCS wired external
**1** = 60 Vdc, no LCS
**2** = 60 Vdc, spring release LCS
**3** = 60 Vdc, LCS wired external

① UL 489 three-pole only.

## Table 7. Series NRX with Power Xpert Release NF-frame circuit breaker (exclusionary rules apply) (continued)

**N G S6 08 3 W 2A 8 A B A N 4 X N D X**

**UVR, second shunt trip**

- **N** = None
- **A** = 110–125 Vac/Vdc UVR
- **R** = 220–250 Vac/Vdc UVR
- **L** = 24 Vdc UVR
- **H** = 48 Vdc UVR
- **S** = 60 Vdc UVR
- **1** = 110–127 Vac/Vdc second shunt trip
- **2** = 208–240 Vac/Vdc second shunt trip
- **4** = 24 Vdc second shunt trip
- **8** = 48 Vdc second shunt trip
- **9** = 60 Vdc second shunt trip

| | Trip indicator and bell alarm ① | OTS | Secondary terminal blocks | Remote reset |
|---|---|---|---|---|
| **N** | None | None | Per breaker options | None |
| **X** | Trip indicator | None | Per breaker options | None |
| **Z** | Trip indicator | 2 Form C | Per breaker options | None |
| **M** | Interlock trip indicator | None | Per breaker options | None |
| **Y** | Interlock trip indicator | 2 Form C | Per breaker options | None |
| **1** | None | None | Full complement | None |
| **2** | Trip indicator | None | Full complement | None |
| **3** | Trip indicator | 2 Form C | Full complement | None |
| **4** | Interlock trip indicator | None | Full complement | None |
| **5** | Interlock trip indicator | 2 Form C | Full complement | None |

**Drawout breaker shipping, fixed breaker terminals (door frame kit ships as standard unless noted otherwise)**

- **D** = Drawout breaker shipping alone, without door frame kit
- **C** = Drawout breaker shipping in cassette, no shutters, no terminals
- **1** = Drawout breaker shipping in cassette, no shutters, short vertical/horizontal
- **2** = Drawout breaker shipping in cassette, no shutters, long vertical/horizontal
- **4** = Drawout breaker shipping in cassette, with shutters, short vertical/horizontal
- **5** = Drawout breaker shipping in cassette, with shutters, long vertical/horizontal
- **9** = Drawout breaker shipping in cassette, with shutters, no terminals
- **K** = Rear connect, fixed breaker, no terminal adapters
- **F** = Fixed breaker, rear connect, with mounting feet and short terminal adapters
- **H** = Fixed breaker, rear connect, with mounting feet and long terminal adapters
- **J** = Front connect, fixed breaker, with no terminal adapters
- **Q** = Fixed Hybrid, no rear terminals, TA1200NB1M front cable terminals
- **T** = Fixed hybrid, no rear terminals, TA1201NB1M front cable terminals

**Auxiliary switches, label language**

- **E** = No auxiliary switches, English
- **2** = 2 Form C, English
- **4** = 4 Form C, English

| | Pushbutton padlock cover | Key Lock Provisions | Operations counter |
|---|---|---|---|
| **N** | No | None | No |
| **A** | No | — | Provided |
| **B** | Yes (plastic/plastic) | — | No |
| **J** | Yes (plastic/plastic) | — | Provided |
| **K** | Yes (metal/metal) | — | No |
| **L** | Yes (metal/metal) | — | Provided |

① Two Form C contacts except on NF with Power Xpert Release and OTS and RRTI, where only one Form C OTS contact will be provided.

## Table 8. Series NRX with Power Xpert Release NF-frame cassette

**NY 12 3 F A B N S N N N C**

**Cassette family and breaker frame**

- **NY** = UL 489 NF-frame
- **NG** = IEC NF-frame

**Continuous ampere range**

- **12** = 800–1200 (UL 489)
- **16** = 630–1600 (IEC)

**Poles and phasing (facing front of breaker)**

- **3** = Three-pole ABC
- **4** = Four-pole NABC

**Load terminal connections**

- **F** = With flat tapped pads only
- **G** = With vertical/horizontal bus adapter kit (short style)
- **H** = With front-connected kit
- **N** = No cassette stabs (interunit only)

**Arc hood**

- **A** = Arc hood installed (default)

**Door frame gasket and rejection kits**

- **B** = Door kit included (default), with rejection kit

**Cell switch options (available on breaker + cassette or cassette only)**

- **N** = Not included
- **3** = Cell switch assembly with 3 Form C Contacts

**Shutters**

- **N** = Not included (default)
- **S** = Included

**Secondary contact terminals installed**

- **N** = None
- **B** = Breaker defined, when breaker ships in cassette
- **F** = Full complement

**Future**

- **N** = None

**Future**

- **N** = None

**Cassette shipping**

- **C** = Cassette only
- **B** = Breaker shipped in cassette

## 2.4 Catalog selection



**Table 9. Series NRX with Power Xpert Release RF-frame circuit breaker (exclusionary rules apply)**

**R G S6 08 3 W 2A 8 A B A N 4 X N D X**

**Breaker frame size**
**R** = RF frame for UL 489 or IEC (4.5 inches or 115 mm pole spacing)

**Standard, mechanism, device**
**G** = IEC 60947-2, stored energy, air breaker
**Y** = UL 489, stored energy, insulated case breaker

**Fault current rating**
**R6** = 65 kA at 480 Vac (UL 489 only)
**R8** = 85 kA at 480 Vac (UL 489 only)
**RC** = 100 kA at 480 Vac (UL 489 only)
**S5** = 55 kA at 415 Vac (IEC only)
**S6** = 65 kA at 480 Vac (30 cycle, UL 489 only), 66 kA at 415 Vac IEC
**S8** = 85 kA at 480 Vac (30 cycle, UL 489 only)
**SC** = 100 kA at 480 Vac (30 cycle, UL 489 only), 105 kA at 415 Vac IEC

**Frame rating (amperes)**

| | |
|---|---|
| **08** = 800 | **20** = 2000 |
| **10** = 1000 (IEC only) | **25** = 2500 |
| **12** = 1200 (UL only) | **30** = 3000 (UL only) |
| **13** = 1250 (IEC only) | **32** = 3200 (IEC only) |
| **16** = 1600 | **40** = 4000 (IEC only) |

**Poles, phasing**
**3** = Three-pole, ABC
**4** = Four-pole, NABC

**Mounting configuration**
**W** = Drawout with universal pads
**U** = Drawout, integral horizontal terminals
**B** = Fixed mount rear connected with side mounting brackets
**C** = Fixed mount rear connected with integral horizontal terminals

**Continuous rating ($I_n$ in amperes)**
**8** = 800
**A** = 1000 (IEC only)
**B** = 1200 (UL only)
**C** = 1250 (IEC only)
**D** = 1600
**M** = 2000
**N** = 2500
**P** = 3000 (UL only)
**Q** = 3200 (IEC only)
**R** = 4000 (IEC only)

**Trip unit, power supply**
**SW** = Non-automatic switch, 42 kA for IEC and UL 489
**2A** = PXR20 LSI
**2B** = PXR20 LSI with Modbus
**2H** = PXR20 LSI with Modbus and Arcflash Reduction Maintenance System
**2K** = PXR20 LSI with Arcflash Reduction Maintenance System
**2C** = PXR20 LSIG
**2D** = PXR20 LSIG with Modbus
**2E** = PXR20 LSIG with Arcflash Reduction Maintenance System
**2F** = PXR20 LSIG with Modbus and Arcflash Reduction Maintenance System
**2P** = PXR25 LSI with Modbus
**2Q** = PXR25 LSI with Modbus and Arcflash Reduction Maintenance System
**2R** = PXR25 LSIG with Modbus
**2S** = PXR25 LSIG with Modbus and Arcflash Reduction Maintenance System

**Shunt trip**
**N** = No shunt trip
**A** = 110–127 Vac/Vdc
**R** = 208–240 Vac/Vdc
**L** = 24 Vdc
**H** = 48 Vdc
**S** = 60 Vdc

**Motor operator**
**M** = Manually operated
**B** = 110–125 Vac
**T** = 208–250 Vac
**L** = 24 Vdc
**H** = 48 Vdc
**S** = 60 Vdc

**Spring release, latch check switch**
**N** = No spring release, no LCS
**A** = 110–127 Vac/Vdc, no LCS
**B** = 110–127 Vac/Vdc, spring release LCS
**C** = 110–127 Vac/Vdc, LCS wired external
**R** = 208–250 Vac/Vdc, no LCS
**S** = 208–250 Vac/Vdc, spring release LCS
**T** = 208–250 Vac/Vdc, LCS wired external
**L** = 24 Vdc, no LCS
**P** = 24 Vdc, spring release LCS
**Q** = 24 Vdc, LCS wired external
**H** = 48 Vdc, no LCS
**J** = 48 Vdc, spring release LCS
**K** = 48 Vdc, LCS wired external
**1** = 60 Vdc, no LCS
**2** = 60 Vdc, spring release LCS
**3** = 60 Vdc, LCS wired external

## Table 9. Series NRX with Power Xpert Release RF-frame circuit breaker (exclusionary rules apply) (continued)

**R G S6 08 3 W 2A 8 A B A N 4 X N D X**

**UVR, second shunt trip**

**N** = None
**A** = 110–125 Vac/Vdc UVR
**R** = 220–250 Vac/Vdc UVR
**L** = 24 Vdc UVR
**H** = 48 Vdc UVR
**S** = 60 Vdc UVR
**1** = 110–127 Vac/Vdc second shunt trip
**2** = 208–240 Vac/Vdc second shunt trip
**4** = 24 Vdc second shunt trip
**8** = 48 Vdc second shunt trip
**9** = 60 Vdc second shunt trip

**Auxiliary switches, label language**

**E** = No auxiliary switches, English
**2** = 2 Form C, English
**4** = 4 Form C, English
**6** = 6 Form C, English
**8** = 8 Form C, English
**A** = 10 Form C, English
**W** = 12 Form C, English

| | Trip indicator and bell alarm ① | OTS | Secondary terminal blocks | Remote reset |
|---|---|---|---|---|
| **N** | None | None | Per breaker options | None |
| **X** | Trip indicator | None | Per breaker options | None |
| **Z** | Trip indicator | 2 Form C ② | Per breaker options | None |
| **M** | Interlock trip indicator | None | Per breaker options | None |
| **A** | Interlock trip indicator | None | Per breaker options | 24 Vdc RR |
| **6** | Interlock trip indicator | None | Per breaker options | 48 Vdc RR |
| **7** | Interlock trip indicator | None | Per breaker options | 60 Vdc RR |
| **B** | Interlock trip indicator | None | Per breaker options | 120 Vdc RR |
| **C** | Interlock trip indicator | None | Per breaker options | 240 Vdc RR |
| **Y** | Interlock trip indicator | 2 Form C ② | Per breaker options | None |
| **D** | Interlock trip indicator | 1 or 2 Form C ① | Per breaker options | 24 Vdc RR |
| **8** | Interlock trip indicator | 1 or 2 Form C ① | Per breaker options | 48 Vdc RR |
| **9** | Interlock trip indicator | 1 or 2 Form C ① | Per breaker options | 60 Vdc RR |
| **E** | Interlock trip indicator | 1 or 2 Form C ① | Per breaker options | 120 Vdc RR |
| **F** | Interlock trip indicator | 1 or 2 Form C ① | Per breaker options | 240 Vdc RR |
| **1** | None | None | Full complement | None |
| **2** | Trip indicator | None | Full complement | None |
| **3** | Trip indicator | 2 Form C ② | Full complement | None |
| **4** | Interlock trip indicator | None | Full complement | None |
| **J** | Interlock trip indicator | None | Full complement | 24 Vdc RR |
| **G** | Interlock trip indicator | None | Full complement | 48 Vdc RR |
| **H** | Interlock trip indicator | None | Full complement | 60 Vdc RR |
| **K** | Interlock trip indicator | None | Full complement | 120 Vdc RR |
| **L** | Interlock trip indicator | None | Full complement | 240 Vdc RR |
| **5** | Interlock trip indicator | 2 Form C ② | Full complement | None |
| **R** | Interlock trip indicator | 1 or 2 Form C ① | Full complement | 24 Vdc RR |
| **U** | Interlock trip indicator | 1 or 2 Form C ① | Full complement | 48 Vdc RR |
| **V** | Interlock trip indicator | 1 or 2 Form C ① | Full complement | 60 Vdc RR |
| **S** | Interlock trip indicator | 1 or 2 Form C ① | Full complement | 120 Vdc RR |
| **T** | Interlock trip indicator | 1 or 2 Form C ① | Full complemen | 240 Vdc RR |

**Options**

**X** = No on-board metering taps (default)
**W** = Low temperature applications (–57 °C)

**Drawout breaker shipping, fixed breaker terminals (door frame kit ships as standard unless noted otherwise)**

**D** = Drawout breaker shipping alone, without door frame kit
**C** = Drawout breaker shipping in cassette, no shutters, no terminals
**1** = Drawout breaker shipping in cassette, no shutters, vertical adapters
**2** = Drawout breaker shipping in cassette, no shutters, horizontal adapters
**4** = Drawout breaker shipping in cassette, with shutters, vertical adapters
**5** = Drawout breaker shipping in cassette, with shutters, horizontal mounting
**9** = Drawout breaker shipping in cassette, with shutters, no terminals
**K** = Rear connect, fixed breaker, no terminal adapters
**F** = Fixed breaker, rear connect with vertical adapters
**H** = Fixed breaker, rear connect with horizontal adapters

| | Pushbutton padlock cover | Key Lock Provisions | Operations counter |
|---|---|---|---|
| **N** | No | None | No |
| **A** | No | — | Provided |
| **B** | Yes (plastic/plastic) | — | No |
| **J** | Yes (plastic/plastic) | — | Provided |
| **K** | Yes (metal/metal) | — | No |
| **L** | Yes (metal/metal) | — | Provided |
| **1** | Yes (metal/metal) | Yes | No |
| **2** | Yes (metal/metal) | Yes | Provided |

① Two Form C contacts except on NF with Power Xpert Release and OTS and RRTI, where only one Form C OTS contact will be provided.

② NF with PXR, 2-point (W) secondaries, OTS and no RRTI: Trip Unit ALM3 contact will not be wired out.

## Table 10. Series NRX with Power Xpert Release RF-frame cassette

**RY 12 3 F A B N S N N N C**

**Cassette family and breaker frame**

**RY** = UL 489 NF-frame
**RG** = IEC NF-frame

**Continuous ampere range**

**30** = 3000 A (UL only)
**40** = 3200–4000 A (IEC only)

**Poles and phasing (facing front of breaker)**

**3** = Three-pole ABC
**4** = Four-pole NABC

**Load terminal connections**

**F** = With flat tapped pads only (no terminals)
**G** = With vertical/horizontal bus adapter kit (short style)
**A** = With vertical/horizontal bus adapter kit (long style)

**Arc hood**

**A** = Arc hood installed (default)

**Door frame gasket and rejection kits**

**B** = Door kit included (default), with rejection kit

**Cell switch options (available on breaker + cassette or cassette only)**

**N** = Not included
**3** = Cell switch assembly with 3 Form C Contacts

**Shutters**

**N** = Not included (default)
**S** = Included

**Secondary contact terminals installed**

**N** = None
**B** = Breaker defined, when breaker ships in cassette
**F** = Full complement

**Future**

**N** = None

**Future**

**N** = None

**Cassette shipping**

**C** = Cassette only
**B** = Breaker shipped in cassette

# The next generation trip unit platform: Power Xpert Release (PXR)



## 3.1 Introduction

The Power Xpert Release (PXR) 20/25 trip unit, along with current sensors and a trip actuator, is the subsystem of a circuit breaker which provides the protective function. The PXR analyzes signals from the current sensors. If current level and time delay settings are exceeded, then the PXR trip unit will trip the circuit breaker. The automatic overload and short circuit tripping characteristics for a specific circuit breaker are determined by the current rating and user selected protection settings. There is no mechanical or direct magnetic action between the primary current and the mechanical tripping parts of the circuit breaker. External control voltage is not required for current protection functionality.

The PXR trip unit consists of two modules, the frame module and the control module. The control module contains a microprocessor that performs true RMS current sensing measurements and algorithm calculations for protection. It may be replaced in the field. The frame module is matched to the ratings of the circuit breaker and permanently attached to the circuit breaker frame. It is not intended to be removed or exchanged.

The current sensors are internal to the circuit breaker frame and consist of two coils; one coil on an iron core and one coil on an air core (Rogowski coil). As current begins to flow through the circuit breaker, the iron core coil generates a secondary current which powers the trip unit. At the same time, the air core coil provides signals which are processed to determine the current through the circuit breaker.

The mechanical action required to initiate tripping of the circuit breaker is provided by a special low-energy trip actuator. This trip actuator is an integral part of the circuit breaker mechanism which enable fast tripping of the circuit breaker. The trip actuator is automatically reset by the mechanism.

The wiring diagrams show how certain functions of the trip unit are connected to external circuits. All wiring is landed on the secondary contact system directly above the circuit breaker.

The PXR trip units are listed by Underwriters Laboratories Inc. (UL) and Canadian Standards Association (CSA) for use in Series NRX-NF and Series NRX- RF circuit breakers. All PXR units have also passed the IEC 60947-2 test program that includes EMC testing. All trip units meet the low voltage and EMC directives and carry the CE mark.

## Key differentiators

- Arcflash Reduction Maintenance System helps reduce arc flash incident energy so users can reduce PPE, which minimize risk and improves personnel safety and productivity
- The Power Xpert Release intuitive user interface allows customers to easily view and adjust breaker settings and system performance
- Power Xpert Protection Manager software eliminates the need to purchase expensive test kits by performing secondary injection tests PC, reducing time and labor. Users can also create and print on-demand test reports after secondary injection is completed.
- Integrated ModBus RTU communications reduces cost by eliminating the need for separate communication components and associated wiring
- Unique three position ground fault settings reduce ordering complexity and increase application flexibility
- Zone Selective Interlocking (ZSI) is a standard feature available in all trip units. If enabled, it clears the fault instantaneously within the zone of protection and reduces arc flash incident energy without compromising the selectivity of the breakers

## Arcflash Reduction Maintenance System™

Eaton's patented Arcflash Reduction Maintenance System (ARMS) technology provides maintenance staff improved safety of downstream maintenance locations using a simple and reliable method to reduce fault clearing times and incident energy in an arc flash event.

ARMS uses a separate analog trip circuit providing faster signal processing and interruption times than the standard (digital) "instantaneous" protection.

The ARMS function is activated either directly on the trip unit, through a local switch/contact or remotely through communications.

Arcflash Reduction Maintenance System is optional on both PXR20 and PXR25 trip units.

### Major benefits of ARMS:

- Increased personnel safety – by limiting the available arc flash energy
- Simple to operate
- Potential to be enabled with the circuit breaker door closed by a remote mounted switch which can be locked out and tagged out
- Meets the NEC® 2014 section 240.87 method to reduce clearing time by providing an energy-reducing maintenance switch with local status indicator
- Enabled only for the time required to perform the desired maintenance work
- Preserves overcurrent coordination under normal conditions
- Reduction in incident energy levels may permit reduced levels of Personal Protective Equipment (PPE), therefore improving worker comfort and mobility

## Power Xpert Protection Manager

Eaton's Power Xpert Protection Manager (PXPM) is a Microsoft® Windows-based software that configures, controls and tests Eaton PXR 20/25 trip units. The PXPM software and PXR trip unit, in conjunction, are designed to make it easier for OEMs and end customers to access breaker load and usage information, conduct diagnosis and troubleshooting activities, configure settings, as well as validate and perform testing.

### Installation:

#### System requirements

***Hardware requirements***

- Eaton PXR 20/25 trip unit
- USB to Micro-USB cable
- Digitrip auxiliary power module (Catalog Number: PRTBAPMDV for U.S. power sockets, DTAUXPMEU for European power sockets, or DTAUXPMUK for U.K. power sockets).

***Software requirements***

- Microsoft® Windows 7 (32-bit or 64-bit)
- Adobe® Acrobat Reader (version 5 or higher).

***Screen resolution***

- 1280 x 1024 pixels or higher resolutions

To download the software, go to the link http://www.eaton.com/SeriesNRX. Click on product "Series NRX NF and RF frame Low-Voltage Power Circuit Breakers with PXR electronic trip units". The PXPM link will be found to download on the Features tab.

#### Installing Power Xpert Protection Manager

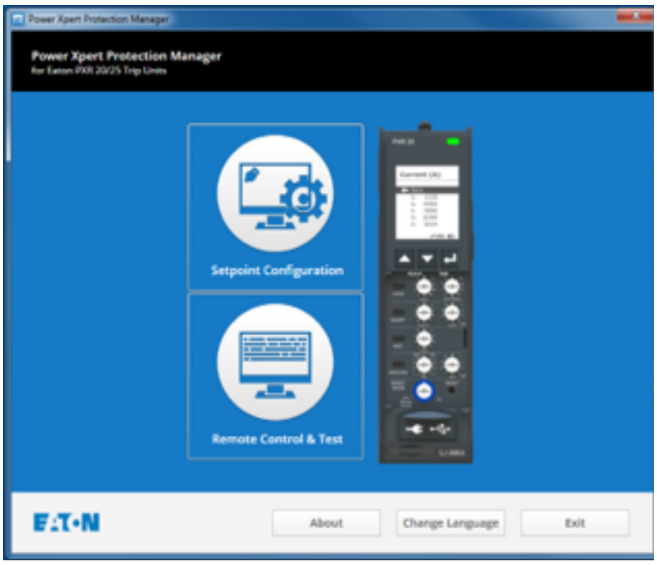
Run "Power Xpert Protection Manager x32.exe" file for Windows 7 32-bit Operating System or "Power Xpert Protection Manager x64.exe" file for Windows 7 64-bit Operating System to launch Power Xpert Protection Manager Installation wizard.

Make sure that your PXR 20/25 trip unit is disconnected from the PC/Laptop. Allow the PXPM installation wizard to complete installation on the desired machine before continuing.

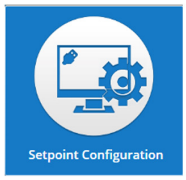
#### Using the PXPM software:

Upon starting PXPM, the user will be presented with the main dashboard. This dashboard provides which allows users to navigate a range of capabilities varying from configuring trip unit settings to performing remote control and test functions. A summary of which capabilities are contained in each path of PXPM's main dashboard.

**PXPM main dashboard**



**Summary of PXPM capabilities by path**




Setpoint Configuration - Functions
- View and configure existing


Remote Control & Test - Functions
- Run secondary injection

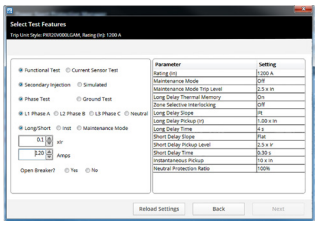
A summary of PXPM capabilities and features is shown below:

- Program settings wizard
- Perform secondary injection testing, no test kit required
- Easy to navigate through graphical interfaces
- Factory acceptance testing
- Time Current Curve (TCC) by setting
- Set point storage
- Printable field reports
- Waveform capture for troubleshooting & diagnosis

## Overview – Seconding Injection Testing:

With PXPM, secondary injection testing becomes as simple as plugging a USB cord from a laptop to the PXR and performing the test. The following image shows how to setup a secondary injection test through PXPM.

**PXPM secondary injection setup**

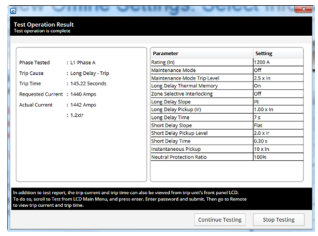


- Choose desired x $I_n$, test amperage, and breaker function
- Hovering over the x $I_n$ value will display its range and step value
- Auxiliary power needs to be connected to the TU in order to open the breaker during testing. Otherwise, select "No

Once all settings have been selected, the user will run the test (see image below).

- If you would like to run another test, select "Continue Testing"
- If testing is complete, select "Stop Testing"

**Example of a completed secondary injection test**



After a completed test, there will be the option to continue testing or to stop testing. If the user chooses to "Stop Testing," then a prompt will occur about printing a test report (.PDF). An example of this printable test report is shown below.

**Example of printable test report**

| System | | |
|---|---|---|
| Parameter | As Found | As Left |
| Timestamp | 16:24:56 PM | 16:33:26 PM |
| Rating (In) | 1200 A | 1200 A |
| Maintenance Mode | Off | Off |
| Maintenance Mode Remote Control | Disable | Disable |
| Maintenance Mode Trip Level | 2.5 x In | 2.5 x In |
| Line Frequency | 60 Hz | 60 Hz |
| Reverse Feed Breaker | Forward | Forward |

| Current Protection Configuration | | |
|---|---|---|
| Parameter | As Found | As Left |
| Long Delay Thermal Memory ** | On | Off |
| Zone Selective Interlocking | Off | Off |
| Long Delay Slope | $I^2t$ | $I^2t$ |
| Long Delay Pickup (Ir) ** | 0.50 x In | 1.00 x In |
| Long Delay Time | 7 s | 7 s |
| Short Delay Slope | Flat | Flat |
| Short Delay Pickup Level | 2.0 x Ir | 2.0 x Ir |
| Short Delay Time | 0.30 s | 0.30 s |
| Instantaneous Pickup | 10 x In | 10 x In |
| Ground Sensing Type | Residual | Residual |
| Local Ground Fault Protection Type Setting | Off | Off |
| Ground Fault Slope | $I^2t$ | $I^2t$ |
| Ground Fault Pickup | Off | Off |
| Ground Fault Trip Time | 0.2 s | 0.2 s |
| Neutral Protection Ratio | 100% | 100% |

EATON
Powering Business Worldwide

Power Xpert Protection Manager for PXR 20/25 Trip Units - Test Report

Created: 11/21/2016 4:34:04 PM

| Customer Information | |
|---|---|
| Customer Name | MM |
| Plant Location | - |
| Job# | - |
| **Device Summary** | |
| Manufacturer | Eaton |
| Circuit Breaker Type/Model | NRX NF / IZMX16 |
| Circuit Breaker Serial Number | |
| Circuit Breaker Frame Rating (A) | 2118 |
| Electronic Trip Unit Model | PXR20V000LGAM |
| Electronic Trip Unit Serial Number | R |
| Electronic Trip Unit In | 1200 A |
| Voltage class | - |
| Frequency | - |
| **Circuit Breaker Location** | |
| Room/vault/switchgear # | - |
| Cell # | - |
| **Environment Data** | |
| Temperature | - |
| Humidity | - |
| **Equipment Condition** | |
| Circuit Breaker | - |
| ETU | - |
| Enclosure | - |

| Protection / Configuration Settings #1 | | | | | |
|---|---|---|---|---|---|
| Parameter | Setting | Parameter | Setting | Parameter | Setting |
| Maint. Mode | Off | HLA | N/A | GF Type | Residual |
| MM Trip Level | 2.5 x In | SDS | Flat | GF Setting | Off |
| LDTM | On | SDPU | 2.0 x Ir | GFS | $I^2t$ |
| LDS | $I^2t$ | SDT | 0.30 s | GFPU | Off |
| LDPU | 1.00 x In | INST | 10 x In | GFT | 0.2 s |
| LDT | 7 s | ZSI | Off | NPR | 100% |

| LSIG Test Results #1 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Test Settings | | | | | | Test Results | | |
| Phase | Current (Amps) | Multiple (xIr/xIn) | Current Type | Test Type | Open Bkr | Cause | Time | Result |
| A | 1442 | 1.2xIr | Sec. Inj. | Long/Short | No | Long Delay | 145.22s | Trip |

## ModBus configuration

Native ModBus is an option on all PXR trip units therefore, depending on your application, eliminating the need to purchase an MCAM. However, if the system requires redundant communication or the ability to remotely open/close the breaker, an external MCAM is required.

Communications module MCAM has a plug-in screw terminal for connection to ModBus. The module operates as a ModBus slave.

- Baud rate, data format and address (max. 247) for ModBus are set with the input keys of the trip unit. The maximum cable length is 3/4 mile.
- The ModBus must be terminated with a 120 Ω terminating resistor.
- To operate the MCAM, a supply voltage of 24 V DC is required.
- The data connection to the circuit breaker is implemented internally through a serial high-speed data connection.

### Data access via ModBus

The data is contained in comprehensive data tables. Each data point is available as a floating-point (IEEE) or fixed-point value. This enables a simple means of implementing a data filter, which facilitates the integration of data in the control system.

## PROFIBUS-DP configuration

Communications module PCAM has a 9-pin D-Sub socket for connection to PROFIBUS. The module works as a slave on PROFIBUS-DP; the data is defined through a standardized device master data file, which permits smooth integration of a DP line.

- On the PROFIBUS-DP side the module supports automatic baud rate detection; the PROFIBUS-DP bus address is set through the trip unit's display. The maximum cable length is 1.5 km.
- To operate the PCAM, a supply voltage of 24 V DC is required.
- The data connection to the circuit breaker is implemented internally through a serial high-speed data connection.

### Data access via PROFIBUS-DP

The data on PROFIBUS-DP are offered according to the profile for low-voltage switchgear (LVSG) of PROFIBUS International (PROFIBUS and PROFINET User Group). Five different data structures with varying numbers of parameters are available through the device master data file. This allows a data filter to be easily implemented, which simplifies integration of the Series NRX data into the control system.

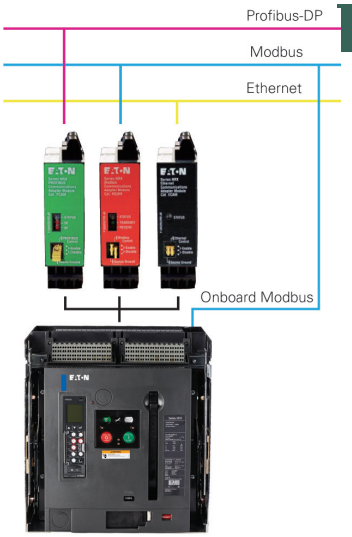
## Ethernet configuration

Communications module ECAM has a standard RJ45 socket for connection to Ethernet. This module has a configured web server on board and supports Simple Network Mail Protocol (SNMP) for alarm or event notifications.

- IP address and related parameters are set through the trip unit's display.
- To operate the ECAM, a supply voltage of 24 V DC is required.
- The data connection to the circuit breaker is implemented internally through a serial high speed data connection.

### Data access via Ethernet

The data is contained in different web pages structured according to Data View, Alarms, Logs, and Configuration. This variance allows the integration of the NRX to be adapted to all Ethernet networks supporting http protocol. An "around the world access" to the breaker becomes reality and using the SNMP protocol alarm messages can be transported everywhere.



## Zone selective interlocking

Zone interlocking is a hard wired communication scheme used with circuit breakers to improve the level of protection in a power distribution system. This is achieved through communication between downstream and upstream breakers in a system continuously sending signals to each other to help identify the location of a fault condition so the appropriate breaker isolates the fault. Zone Selective Interlocking is a standard feature provided on NRX breakers that are supplied with Digitrip 520 or higher trip units. The trip unit Short Time and Ground Fault Time Delay Zone Interlock function is wired out to the breaker secondary terminals.

The zone interlock function provides for hard-wired selective circuit breaker coordination in the power distribution system. In the event that a fault on the system exceeds the trip unit Short Time or Ground Fault pick-up settings, the breaker nearest to the fault trips instantaneously. At the same time the trip unit sends a logic signal to the connected upstream trip unit to restrain it from tripping immediately and follow its protective delay settings. Coordination is maintained, the breaker closest to the fault trips first and power is only selectively disrupted.

### Zone selective interlocking example

#### Example A – Short-circuit at position 3

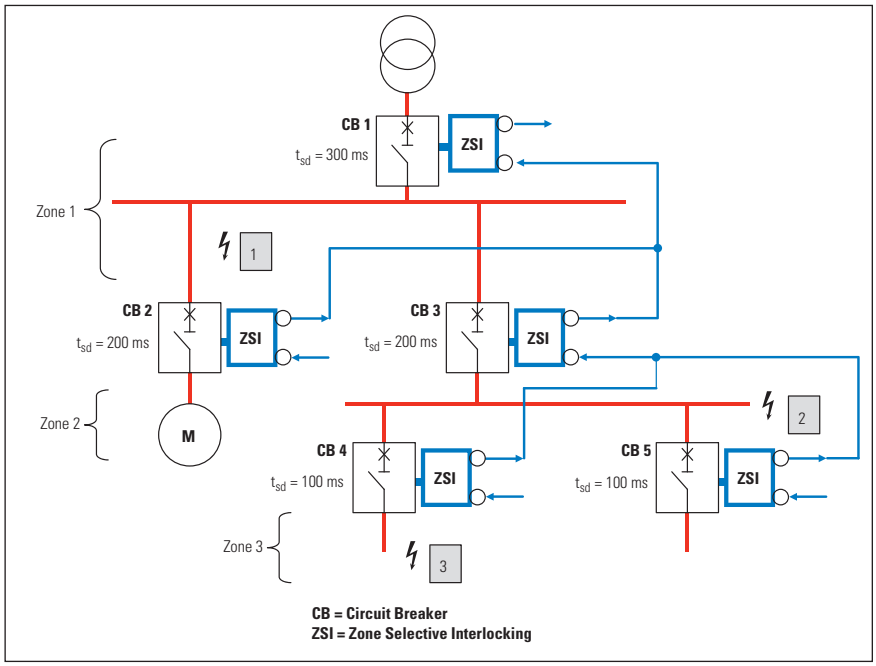
- Circuit breakers CB1, CB3, CB4 all see the short-circuit current and register a short delay pick-up.
- Circuit breaker CB4 sends a ZSI output blocking signal to CB3 ZSI input. CB3 sends a ZSI output blocking signal to CB1 ZSI input. CB1 sends a ZSI output signal that is not wired. This signal could be wired to a MV relay on the other side of the transformer with a compatible ZSI circuitry.
- CB1 registers the ZSI input signal and starts its timer for 300ms. CB3 registers the ZSI input signal and starts its timer for 200ms. CB4 gets no input from any lower zone circuit breaker. This breaker will then trip immediately without any time delay. CB4 interrupts the fault and CB1 and CB3 stop short delay timing because the fault current is gone.
- If for some reason CB4 does not open and interrupt the fault then at the end of the its short delay time CB3 will open and interrupt the fault.

#### Example B – Short-circuit at position 2

- Circuit breakers CB1, CB3, see the short circuit current and register a short delay pick-up. CB4 and CB5 do not see the fault current and do not send a ZSI output.
- Circuit breaker CB3 sends a ZSI output blocking signal to CB1 ZSI input. CB1 sends a ZSI output signal. In this example that signal is not wired.
- CB1 registers the ZSI input signal and starts a timer for 300ms. CB3 gets no input from any lower zone circuit breaker. This breaker will then trip immediately without any time delay. CB3 interrupts the fault and CB1 stops short delay timing because the fault current is gone. The clearance time is reduced by approximately 150ms.

#### Example C – Short-circuit at position 1

- Only Circuit breaker CB1 sees the short circuit current and registers a short delay pick-up. CB2, CB3, CB4 and CB5 do not see the fault current and do not send ZSI outputs.
- CB1 sends a ZSI output signal. In this example that signal is not wired.
- CB1 gets no input from any lower zone circuit breaker. This breaker will then trip immediately without any time delay. CB1 interrupts the fault and the clearing time is reduced by approximately 250ms.



## 3.2 Selection criteria for PXR trip units

**Table 11. Trip unit functions**

| Trip unit type | Catalog number | Protection style | High load alarm | Ground fault | Maintenance mode | ModBus RTU |
|---|---|---|---|---|---|---|
| PXR 20 | PXR20V000L00C | LSI | ● | | | |
| | PXR20V000L00M | LSI | ● | | | ● |
| | PXR20V000LG0C | LSIG | | ● | | |
| | PXR20V000LG0M | LSIG | | ● | | ● |
| | PXR20V000LGAC | LSIG | | ● | ● | |
| | PXR20V000LGAM | LSIG | | ● | ● | ● |
| | PXR20V000L0AC | LSI | ● | | ● | |
| | PXR20V000L0AM | LSI | ● | | ● | |
| PXR 25 | PXR25V000L00M | LSI | ● | | | ● |
| | PXR25V000LG0M | LSI | | ● | | ● |
| | PXR25V000L0AM | LSI | ● | | ● | ● |
| | PXR25V000LGAM | LSIG | | ● | ● | ● |

PXR 20/25 trip units

## Trip unit technical data



### Table 12. PXR 20/25 technical data

| | PRX 20 | PRX 25 |
|---|---|---|
| Protective options | LSI/LSIG (Optional) | LSI; LSIG/LSIA (Optional) |
| Overload protection (L) | | |
| Overload trip ($I_r$), × $I_n$ | 0.4, 0.5, 0.6, 0.7, 0.75, 0.8, 0.9, 0.95, 0.98, 1.0 | 0.4, 0.5, 0.6, 0.7, 0.75, 0.8, 0.9, 0.95, 0.98, 1.0 |
| Long delay time tr (6 × $I_r$) | 0.5, 1 , 2, 4, 7, 10, 12, 15, 20, 24 s | 0.5, 1 , 2, 4, 7, 10, 12, 15, 20, 24 s |
| Short delay protection (S) | | |
| Short delayed pickup (Isd), × $I_r$ | 1.5, 2, 2.5, 3, 4, 5, 6, 7, 8, 10 | 1.5, 2, 2.5, 3, 4, 5, 6, 7, 8, 10 |
| Short delay time, flat characteristic curve (tsd) | 0.0, 0.1, 0.2, 0.3, 0.4, 0.5 s ① | 0.0, 0.1, 0.2, 0.3, 0.4, 0.5 s ① |
| Short delay time at 8 × $I_r$, $I^2t$ curve (tsd) | 0.1, 0.3, 0.4, 0.5 s | 0.1, 0.3, 0.4, 0.5 s |
| Instantaneous protection (I) | | |
| Instantaneous pickup ($I_i$), × $I_n$ | OFF, 2, 4, 5, 6, 7, 8, 10, 12, 15 | OFF, 2, 4, 5, 6, 7, 8, 10, 12, 15 |
| Ground fault protection (G) | ○ | ○ |
| Ground/Earth fault alarm ($I_g$), × $I_n$ | 0.2, 0.4, 0.6, 1.0 | 0.2, 0.4, 0.6, 1.0 |
| Ground/Earth fault trip ($I_g$), × $I_n$ | OFF, 0.2, 0.4, 0.6, 0.8, 1.0 | OFF, 0.2, 0.4, 0.6, 0.8, 1.0 |
| Ground delay time, flat characteristic curve ($t_g$) | 0.1, 0.2, 0.3, 0.4, 0.5 s | 0.1, 0.2, 0.3, 0.4, 0.5 s |
| Ground delay time at 0.625 x In, $I^2t$ curve ($t_g$) | 0.1, 0.2, 0.3, 0.4, 0.5 s | 0.1, 0.2, 0.3, 0.4, 0.5 s |
| Over-temperature trip | ● | ● |
| Thermal memory | ● | ● |
| Zone selectivity ZSI | ● | ● |
| Making current release (MCR) | ● | ● |
| Maintenance Mode ARMS (Arcflash Reduction Maintenance System™) | ○ | ○ |
| System diagnostic | | |
| Status/Overload LED | ● | ● |
| Cause of trip LEDs | ● | ● |
| Current at trip point (display indication) | ● | ● |
| High load or ground fault alarm contact | ● | ● |
| System monitor | | |
| LCD display | ●② | ●② |
| Current metering accuracy | ±1% of Reading | ±1% of Reading |
| Voltage (%) L to L | – | ±1% of Reading ③ |
| Power and energy (%) | – | ±2% of Reading ③ |
| Apparent power kVA and demand | – | ●③ |
| Reactive power kVAR | – | ●③ |
| Power factor | – | ●③ |
| Communications | ○ | ● |
| Onboard (ModBus RTU) | ○ | ○ |
| External (CAM Module) | | |
| Power supply requirement | +24 V DC, optional | +24 V DC, optional |
| Additional functions | | |
| Test Capability | Integral | Integral |
| Trip log | ● | ● |
| Electronic operations counter | ● | ● |
| Event initiated waveform capture (via communication) | ● | ● |
| Breaker health monitor | ● | ● |

① 0s: nominal clear time is 60ms with auxiliary power and 120ms without.

② Requires external 24 VDC control voltage supply when continuous current is below 20% of $I_n$

③ Requires external PT module for voltage sensing input to trip unit

● Standard ○ Optional – not available

## Table 13. Protection features

| Protection | | | PXR 20 | PXR 25 |
|---|---|---|---|---|
| Long delay protection (L) | Slope | | $I^2t$, $I^4t$, $I^{0.5}t$, It | $I^2t$, $I^4t$, $I^{0.5}t$, It |
| | Long delay pickup ($I_r$) | x($I_n$) | 0.4, 0.5, 0.6, 0.7, 0.75, 0.8, 0.9, 0.95, 0.98, 1.0 | 0.4, 0.5, 0.6, 0.7, 0.75, 0.8, 0.9, 0.95, 0.98, 1.0 |
| | Long delay time @ 6 x ($I_r$) | Seconds | 0.5, 1, 2, 4, 7, 10, 12, 15, 20, 24 ① | 0.5, 1, 2, 4, 7, 10, 12, 15, 20, 24 ① |
| | Thermal memory | | Enable/disable | Enable/disable |
| | High load alarm | % x ($I_r$) | Fixed level 85% | Fixed level 85% |
| Short delay protection (S) | Short delay slope | | Flat, $I^2t$ | Flat, $I^2t$ |
| | Short delay pickup | x ($I_r$) | 1.5, 2, 2.5, 3, 4, 5, 6, 7, 8, 10 | 1.5, 2, 2.5, 3, 4, 5, 6, 7, 8, 10 |
| | Short delay time at 8 x (Ir) $I^2t$ | Seconds | 0.1, 0.3, 0.4, 0.5 | 0.1, 0.3, 0.4, 0.5 |
| | Short delay time flat | Seconds | 0.0, 0.1, 0.2, 0.3, 0.4, 0.5 | 0.0, 0.1, 0.2, 0.3, 0.4, 0.5 |
| | Zone interlock | | Enable/disable | Enable/disable |
| Instantaneous protection (I) | Instantaneous | x ($I_n$) | Off, 2, 4, 5, 6, 7, 8, 10, 12, 15 | Off, 2, 4, 5, 6, 7, 8, 10, 12, 15 |
| Neutral protection | 4th pole or external neutral trip | % x ($I_r$) | 0 (Off), 60, 100 | 0 (Off), 60, 100 |
| Ground (earth) fault protection (option G) | Ground fault pickup | x ($I_n$)② | Off, 0.2, 0.4, 0.6, 0.8, 1.0 | Off, 0.2, 0.4, 0.6, 0.8, 1.0 |
| | Ground fault alarm | x ($I_n$) | 0.2, 0.4, 0.6, 1.0 | 0.2, 0.4, 0.6, 1.0 |
| | Ground fault delay at 0.625 x ($I_n$) $I^2t$ | Seconds | 0.1, 0.2, 0.3, 0.4, 0.5 | 0.1, 0.2, 0.3, 0.4, 0.5 |
| | Ground fault delay flat | Seconds | 0.1, 0.2, 0.3, 0.4, 0.5 | 0.1, 0.2, 0.3, 0.4, 0.5 |
| | Zone interlock | | Enable/disable | Enable/disable |
| | Thermal memory | | Enable/disable | Enable/disable |
| Maintenance mode protection (ARMS) (option R) | Setting | | Enable or disable/remote | Enable or disable/remote |
| | Relay contact for remote indication of mode | | Included | Included |
| | Maintenance mode pickup | x ($I_n$) | 2.5, 4.0, 6.0, 8.0, 10.0 | 2.5, 4.0, 6.0, 8.0, 10.0 |
| General | Trip unit over temperature trip | Degrees | 85°C (185°F) fixed | 85°C (185°F) fixed |

① If $I^4t$ slope is selected not all times are available, consult time-current curves.

② PXR 20/25 is limited to 1200A in ANSI/UL frames to comply with standards.

### Table. 14. Current and voltage metering data

| Current metering | Units | Accuracy ① | Notes |
|---|---|---|---|
| IA, IB, IC, IN, IG | Amperes | ±1% of reading | |
| Minimum IA, IB, IC, IN, IG | Amperes | ±1% of reading | Group values held until reset |
| Maximum IA, IB, IC, IN, IG | Amperes | ±1% of Reading | Group values held until reset |

| Voltage metering ③ | Units | Accuracy ② | Notes |
|---|---|---|---|
| VAB, VBC, VCA | Volts | ±1% of reading | Line to line voltage |
| Minimum VAB, VBC, VCA | Volts | ±1% of reading | Group values held until reset |
| Maximum VAB, VBC, VCA | Volts | ±1% of Reading | Group values held until reset |
| VAN, VBN, VCN | Volts | ±1% of Reading | Line to neutral voltage |
| Minimum VAN, VBN, VCN | Volts | ±1% of Reading | Group values held until reset |
| Maximum VAN, VBN, VCN | Volts | ±1% of Reading | Group values held until reset |

| Summary ③ | Units | Notes |
|---|---|---|
| I, avg | Amperes | 3 phase average of the currents |
| V, L-L | Volts | 3 phase average of the voltage |
| P, 3ph | Kw | Average of the real power |
| E, net | Kwh | Real net energy |
| Frequency | Hz | System frequency |

① Accuracy applicable for 10% to 120% of In at 25°C (77°F).

② Accuracy applicable for the voltage range of 34 to 690 Vac at 25°C (77°F).

③ Only the PXR 25 has this function.

### Table 15. Power and energy metering data

| Power metering ③ | Units | Accuracy ① ② | Notes |
|---|---|---|---|
| Real | kW | ±2% of Reading | Approximately 1 second update |
| Apparent | kVA | ±2% of Reading | Approximately 1 second update |
| Reactive | kVar | ±2% of Reading | Approximately 1 second update |
| Real demand | kW | ±2% of Reading | Fixed window of 5 minutes |
| Apparent demand | kVA | ±2% of Reading | Fixed window of 5 minutes |
| Reactive demand | kVar | ±2% of Reading | Fixed window of 5 minutes |
| Real demand (peak) | kW | ±2% of Reading | Value held until reset |
| Apparent demand (peak) | kVA | ±2% of Reading | Value held until reset |
| Reactive demand (peak) | kVA | ±2% of Reading | Value held until reset |
| Power factor | _ | | Approximately 1 second update |

| Energy metering ③ | Units | Accuracy ① ② | Notes |
|---|---|---|---|
| Real total | kWh | ±2% of Reading | Forward + reverse |
| Real net | kWh | ±2% of Reading | Forward + reverse |
| Real forward | kWh | ±2% of Reading | Delivered by source to load |
| Real reverse | kWh | ±2% of Reading | Delivered by load to source |
| Apparent | kVAh | ±2% of Reading | Energy |
| Reactive received | kvarh | ±2% of Reading | Reactive energy in quadrants 1 + 2 |
| Reactive delivered | kvarh | ±2% of Reading | Reactive energy in quadrants 3 + 4 |
| Reactive net | kvarh | ±2% of Reading | kvarh delivered - kvarh received |
| Reactive total | kvarh | ±2% of Reading | kvarh delivered - kvarch received |

① Accuracy applicable for 10% to 120% of In at 25°C (77°F).

② Accuracy applicable for the voltage range of 34 to 690 Vac at 25°C (77°F).

③ Only the PXR 25 has this function.

## Time current curves

The Time-Current Curves (TCC) for the PXR 20/25 when used in Series NRX circuit breakers are referenced below. All protection settings shall be made by following the recommendations of the specifying engineer in charge of the installation.

Time Current Curves for Series NRX Type NF and RF Frame with PXR 20/25 Trip Units are found in document 013001EN

Use the link/path below to access time-current curves at Eaton's Web site: http://www.eaton.com/TCC

# Series NRX air circuit breakers with Power Xpert release trip units

## PXR 20/25 trip units






**Table 16. Technical data**

| | | PCAM | MCAM | ECAM |
|---|---|---|---|---|
| **General** | | | | |
| Dimensions (W x H x D) | mm | 24 x 105 x 80 | 24 x 105 x 80 | 24 x 105 x 80 |
| Mounting | | DIN rail | Din rail | DIN rail |
| Protection type | | IP20 | IP20 | IP20 |
| Power supply | | 24 Vdc | 24 Vdc | 24 Vdc |
| LED display | | Status | Status | Status |
| | | SF | Transmit | |
| | | BF | Receive | |
| **Network** | | | | |
| Ethernet | | – | – | RJ45, socket |
| PROFIBUS | | SUB-D 9 pole, socket | – | – |
| ModBus | | – | Plug-in screw terminals | – |
| Function | | Slave | Slave | TCP/IP user |
| Interfaces | | RS485 | RS485 | Ethernet |
| Protocol | | PROFIBUS DP | ModBus-RTU | ModBus TCP, http(s), SMTP |
| Baud rates | | automatic search up to 12 MBit/s | 1200/4800/9600/19200 Bit/s adjustable via PXR settings | automatic search up to 100 MBit/s |
| Bus terminating resistors | | $I_n$ plug as required | 120 Ω external | – |
| Bus addresses (set via PXR settings) | | 1 - 127 | 1 - 247 | IP |
| Maximum distance | | 1.5 miles (2.4 km) | 3/4 mile (1.2 km) | 325 feet (100 m) |
| Supported functions | | Cyclical data transfer | Function:<br>03 = read register<br>04 = read word variables<br>08 = connection test<br>16 = write register | Webserver onboard |

## 4.1 Overview

### Accessory devices

A variety of accessory devices are available for use with Series NRX circuit breakers. Unless otherwise stated, they are all considered optional devices in the sense that they are not provided as standard on a manually operated circuit breaker. Available accessories are discussed in general terms. For more detailed information and/or installation instructions, refer to individual instruction leaflets dedicated to individual items.

Series NRX circuit breaker accessories are designed to be plug-and-play and can be field installed. The accessories fall into one of three categories:

- Accessory tray devices
- Other internal electrical devices
- Mechanical devices

### Accessory tray devices

Certain accessory devices are mounted in a mounting tray. The tray is then installed in a left- or right-hand slot located in the upper left- and right-hand sides of the circuit breaker

### Left accessory tray

The left accessory tray will accommodate a maximum of four devices as follows:

- Zero, one, or two shunt trips (ST);
- Zero or one undervoltage release (UVR);
- Combination (one ST and one UVR); or
- Zero or two overcurrent trip switches (OTS).

### Right accessory tray

The right accessory tray will accommodate up to two and six 2a/2b auxiliary switch combinations for the NF and RF, respectively.

### Shunt trip (ST)

The shunt trip opens the circuit breaker instantaneously when its coil is energized by a voltage input.

### Undervoltage release (UVR)

The under-voltage release opens the circuit breaker when its supply voltage falls into the range of 35–60% of rated voltage. If the release is not energized to 85% of its supply voltage, the breaker cannot be closed electrically or manually.

### Overcurrent trip switch (OTS)

An overcurrent trip switch (bell alarm) provides an electrical indication when a circuit breaker trips as a result of the trip unit reacting to an overcurrent condition. Opening as a result of a circuit breaker's manual open button, shunt trip, or under-voltage release does not cause the overcurrent trip switch to operate. Overcurrent trip switches are available in two switch combinations only.

### Auxiliary switch

An auxiliary switch provides remote electrical indication if the circuit breaker is open or closed. Each switch has one normally open ("a") and one normally closed ("b") type contact. Auxiliary switches are available in two switch combinations only.

### Other internal electrical devices

There are three types of internally mounted electrical devices:

- Spring release;
- Latch check switch; and
- Motor operator.

### Spring release (SR)

The spring release (closing coil) remotely closes the circuit breaker when the coil is energized by a voltage input. When the spring release is used in conjunction with a latch check switch, the closing spring must be fully charged and the trip latch reset (not held in the tripped position) for the SR to operate. If these conditions are not met, the close signal will be ignored until it is removed and re-applied.

### Latch check switch (LCS)

A latch check switch indicates when the circuit breaker is "ready to close." Two versions of the LCS are available.

1. The LCS wired to the spring release will not permit activation of the spring release until the circuit breaker is fully-charged and the trip latch is reset.
2. The LCS used for remote indication consists of one Form C contact wired to the circuit breaker secondary contacts for integration into external control schemes.

**Note:** Wiring the LCS for remote indication directly in series with the SR accessory is not recommended as this will override the "anti-pump" feature.

### Motor operator

A motor operator is an electric motor assembly internally mounted in the circuit breaker. It charges the closing springs electrically for remote or local operation. The motor operator can be factory or field installed.

### Mechanical devices

The following are optional mechanical type accessories:

- Pop-out trip indicator, non-interlocked and interlocked;
- Operations counter;
- Off key lock;
- Pushbutton cover;
- Prevent close cover;
- Lockout cover;
- Cassette safety shutters;
- Door escutcheon;
- IP55 waterproof cover; and
- Mechanical interlock.

### Non-interlocked pop-out mechanical trip indicator

A non-interlocking red, pop-out mechanical trip indicator, located to the right of the trip unit on the breaker's front faceplate, operates by releasing and popping out any time the breaker trips due to an overcurrent condition. It will not prevent the breaker from being reclosed. The indicator is reset manually by pushing it back in.

An optional overcurrent trip switch (bell alarm) can be used in conjunction with the mechanical trip indicator. The overcurrent trip switch operates off the position of the mechanical trip indicator, and is reset when the indicator is reset.

### Interlocked pop-out mechanical trip indicator

An interlocked, red, pop-out mechanical trip indicator is an optional feature. It is located in the front of the breaker near the top and to the right of the trip unit. It operates by releasing and popping out any time the circuit breaker trips due to an overcurrent condition.

**Note:** The interlocked mechanical trip indicator will prevent the breaker from being reclosed until the red, pop-out indicator is reset or pushed back in.

The indicator is reset manually by pushing it back in. If the interlocked indicator is not reset, the circuit breaker will not close until the indicator is pushed back in.

An overcurrent trip switch (bell alarm), discussed later in this section, that operates off the position of the mechanical trip indicator is also available.

## Operations counter

The operations counter is a mechanical device used to provide a record of the number of circuit operations.

## Off key lock

The off key lock secures the circuit breaker in the OFF position. The customer supplies the key lock. The provisions available are for Kirk, Castell, Ronis, and CES.

## Pushbutton cover

Padlockable covers are available to limit access to the ON and OFF pushbuttons.

## Safe-off pushbutton cover

When padlocked, it maintains the OFF button in the actuated position, which prevents closure of the breaker.

## Cassette safety shutters

Automatically operated insulating type safety shutters are available for use with the drawout cassette to cover the fixed primary contacts when the circuit breaker is not in the CONNECT position.

## Door escutcheon

The door escutcheon is a molded frame used to seal the space between the circuit breaker and the compartment door cutout. It is supplied with a mounting gasket. Refer to IL01301012E for installation information.

## IP55 dust and water resistant cover

A hinged dome-shaped waterproof cover attaches to the metal compartment door to provide waterproof protection for the circuit breaker.

## Mechanical interlock

Mechanical interlocks are available to interlock the closing of two or three Series NRX circuit breakers. The mechanical interlock holds one or more circuit breakers tripped (prevents closure) when others are closed. Consult Eaton for details.

## 4.2 Selection criteria

### Table 17. Shunt trip

| Control voltages | Frequency | Operational voltage range 70-110% | Inrush/continuous power consumption (VA) | Opening time (ms) |
|---|---|---|---|---|
| 24 | DC | 17-26 | 400/2 | 25 |
| 48 | DC | 34-53 | 500/3 | 25 |
| 60 | DC | 42-66 | 500/4 | 25 |
| 110-127 | 50-60 Hz | 77-140 | 800/8 | 25 |
| 110-125 | DC | 77-138 | 800/8 | 25 |
| 208-240 | 50-60 Hz | 146-264 | 850/8 | 25 |
| 220-250 | DC | 154-275 | 850/8 | 25 |

### Table 18. UVR

| Control voltages | Frequency | Operational voltage range 70-110% | Drawout volts 35-60% | Inrush/continuous power consumption (VA) | Opening time (ms) |
|---|---|---|---|---|---|
| 24 | DC | 20-26 | 8-14 | 425/2 | 50 |
| 48 | DC | 41-53 | 17-29 | 750/3 | 50 |
| 60 | DC | 51-66 | 21-36 | 825/4 | 50 |
| 110-127 | 50-60 Hz | 94-140 | 44-66 | 1150/8 | 50 |
| 110-125 | DC | 94-138 | 44-66 | 1150/8 | 50 |
| 208-240 | 50-60 Hz | 177-264 | 84-125 | 1200/8 | 50 |
| 220-250 | DC | 187-275 | 88-132 | 1200/8 | 50 |

### Table 19. Spring release

| Control voltages | Frequency | Operational voltage range 70-110% | Inrush/power consumption (VA) | Opening time (ms) |
|---|---|---|---|---|
| 24 | DC | 20-26 | 400 | 25 |
| 48 | DC | 41-53 | 500 | 25 |
| 60 | DC | 51-66 | 500 | 25 |
| 110-127 | 50-60 Hz | 94-140 | 750 | 25 |
| 110-125 | DC | 94-138 | 750 | 25 |
| 208-240 | 50-60 Hz | 177-264 | 800 | 25 |
| 220-250 | DC | 187-275 | 800 | 25 |

### Table 20. OCT/OTS

| Control voltages | Frequency | Compact rating (amperes) |
|---|---|---|
| 250 | 50-60 Hz | 10 |
| 125 | DC | 0.5 |
| 250 | DC | 0.25 |

### Table 21. Auxiliary switch

| Control voltages | Frequency | Compact rating (amperes) |
|---|---|---|
| 250 | 50-60 Hz | 10 |
| 125 | DC | 0.5 |
| 250 | DC | 0.25 |

### Table 22. Motor operator ratings — NF

| Control voltages | Frequency | Operational voltage range 85-110% | Running current (A) | Typical inrush current | Power consumption (VA) | Maximum charging time (sec) |
|---|---|---|---|---|---|---|
| 24 | DC | 20-26 | 6 | 325% | 160 | 4 |
| 48 | DC | 41-53 | 3 | 500% | 150 | 3 |
| 60 | DC | 51-66 | 2 | 350% | 150 | 4 |
| 110-127 | 50-60 Hz | 94-140 | 2 | 300% | 280 | 3 |
| 110-125 | DC | 94-138 | 1 | 500% | 150 | 3 |
| 208-240 | 50-60 Hz | 177-264 | 1 | 1000% | 280 | 4 |
| 220-250 | DC | 187-275 | 1 | 1000% | 280 | 4 |

### Table 23. Motor operator ratings — RF

| Control voltages | Frequency | Operational voltage range 85-110% | Running current (A) | Typical inrush current | Power consumption (VA) | Maximum charging time (sec) |
|---|---|---|---|---|---|---|
| 24 | DC | 20-26 | 7 | 350% | 200 | 6 |
| 48 | DC | 41-53 | 3 | 450% | 175 | 6 |
| 60 | DC | 51-66 | 3 | 450% | 225 | 6 |
| 110-127 | 50-60 Hz | 94-140 | 3 | 300% | 425 | 6 |
| 110-125 | DC | 94-138 | 2 | 375% | 275 | 6 |
| 208-240 | 50-60 Hz | 177-264 | 1.5 | 300% | 400 | 6 |
| 220-250 | DC | 187-275 | 1 | 400% | 250 | 6 |

### Table 24. Control voltages and currents

| Control voltages | 24 Vdc | 48 Vdc | 110-125 Vdc | 110-127 Vac | 220-250 Vdc | 208-240 Vac |
|---|---|---|---|---|---|---|
| **Current** | | | | | | |
| Close current (inrush) | 21 | 11 | 5 | 5 | 2 | 2 |
| Shunt trip current (ST)—(inrush/continuous) | 21/.2 | 11/.1 | 5/.04 | 5/.04 | 2/.02 | 2/.02 |
| Charge motor current—(inrush/continuous) | TBD | TBD | 5/1 | 6/2 | 10/1 | 10/1 |
| **Operating voltage rating** | | | | | | |
| Close | 17-26 | 34-53 | 77-138 | 77-140 | 154-275 | 146-264 |
| Trip | 17-26 | 34-53 | 77-138 | 77-140 | 154-275 | 146-264 |
| Charge | 20-26 | 41-53 | 94-138 | 94-140 | 187-275 | 177-264 |

### Table 25. Testing procedures NF frame

| Breaker position | Continuity between red and black lead pairs | Continuity between blue and black lead pairs |
|---|---|---|
| Open | No | 47 and 45 |
| | | 48 and 49 |
| | | 53 and 51 |
| | | 54 and 55 |
| Closed | 46 and 45 | No |
| | 50 and 49 | |
| | 52 and 51 | |
| | 56 and 55 | |

### Table 26. Testing procedures RF frame

| Breaker position | Continuity between red and black lead pairs | Continuity between blue and black lead pairs |
|---|---|---|
| Open | No | 55 and 57 |
| | | 60 and 61 |
| | | 65 and 63 |
| | | 66 and 67 |
| | | 71 and 69 |
| | | 72 and 73 |
| | | 77 and 75 |
| | | 78 and 79 |
| | | 83 and 81 |
| | | 84 and 85 |
| | | 89 and 87 |
| | | 90 and 91 |
| Closed | 58 and 57 | |
| | 62 and 61 | |
| | 64 and 63 | |
| | 68 and 67 | |
| | 70 and 69 | |
| | 74 and 73 | |
| | 76 and 75 | |
| | 80 and 79 | |
| | 82 and 81 | |
| | 86 and 85 | |
| | 88 and 87 | |
| | 92 and 91 | |

**NF control circuit terminal assignment**

| 1 | 3 | 5 | 7 | 9 | 11 | 13 | 15 | 17 | 19 | 21 | 23 | 25 | 27 | 29 | 31 | 33 | 35 | 37 | 39 | 41 | 43 | 45 | 47 | 49 | 51 | 53 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| + ST1 | + UV1 | OT1C | OT1B | ACCY2 | N1 | ALMC | ALM2 | G1 | +24V | ZIN | ZCOM | CMM1 | CMM3 | PTVA | PTVC | MODBA | MODBG | ACCY5 | ACCY7 | EO1 | SR1 | C1 | B1 | C2 | C3 | B3 | C4 |
| − ST2 | − UV2 | OT1M | ACCY1 | ACCY3 | N2 | ALM1 | ALM3 | G2 | AGND | ARMSIN | ZOUT | CMM2 | CMM4 | PTVB | PTVN | MODBB | ACCY4 | ACCY6 | SC | EO2 | SR2 | A1 | B2 | A2 | A3 | B4 | A4 |
| 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 |

1, 2 - Shunt trip
3, 4 - UVR/2nd shunt trip
5~7 - Overload trip switch 1 (OTS) ( 5-COM, 6-N.O, 7-N.C.)
8~10 - Overload trip switch 2 (OTS)/ Remote reset
(8-N.C., 9-COM, 10-N.O./9-RR1, 10-RR2)
11,12 - External neutral sensor
13~16 - Alarm
17,18 - Ground fault source sensor
19, 20 - Control voltage supply 24VDC
21,23,24 - Zone selectivity ZSI
20,22 - ARMs
25-28 - External CAM module
29~32 - PT module
33~35 - Onboard ModBus
36 - ACCY4 (Reserved)
37~39 - Latch check switch (37-COM, 38-N.O, 39-N.C.)
40 - Message: spring energy store tensioned
41,42 - Motor operator
43,44 - Spring closing release
45~56 - Auxiliary contact On/off, C-COM, A-N.O., B-N.C.

**RF control circuit terminal assignment**

| 1 | 3 | 5 | 7 | 9 | 11 | 13 | 15 | 17 | 19 | 21 | 23 | 25 | 27 | 29 | 31 | 33 | 35 | 37 | 39 | 41 | 43 | 45 | 47 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| + ST1 | + UV1 | OT1C | OT1B | OT2C | N1 | ALMC | ALM2 | G1 | +24V | ZIN | ZCOM | CMM1 | CMM3 | PTVA | PTVC | MODBA | MODBG | 2CMM3 | 2CMM1 | ARCON2 | RR1 | | |
| − ST2 | − UV2 | OT1M | OT2B | OT2M | N2 | ALM1 | ALM3 | G2 | AGND | ARMSIN | ZOUT | CMM2 | CMM4 | PTVB | PTVN | MODBB | 2CMM2 | 2CMM4 | ARCON1 | ARCON3 | RR2 | | |
| 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 |

1, 2 - Shunt trip
3, 4 - UVR/2nd shunt trip
5~7 - Overload trip switch 1 (OTS) (5-COM, 6-N.O, 7-N.C.)
8~10 - Overload trip switch 2 (OTS) (8-N.C., 9-COM, 10-N.O.)
11,12 - External neutral sensor
13~16 - Alarm
17,18 - Ground fault source sensor
19, 20 - Control voltage supply 24VDC
21,23,24 - Zone selectivity ZSI
20,22 - ARMs
25-28 - External CAM module
29~32 - PT module
33~35 - Onboard ModBus
36~39 - External CAM module (future)
40~42 - ARCON
43,44 - Remote reset
45~48 - Reserved

| 49 | 51 | 53 | 55 | 57 | 59 | 61 | 63 | 65 | 67 | 69 | 71 | 73 | 75 | 77 | 79 | 81 | 83 | 85 | 87 | 89 | 91 | 93 | 95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LCC | LCB | + EO1 | SR1 | C1 | B1 | C2 | C3 | B3 | C4 | C5 | B5 | C6 | C7 | B7 | C8 | C9 | B9 | C10 | C11 | B11 | C12 | | |
| LCM | SC | − EO2 | SR2 | A1 | B2 | A2 | A3 | B4 | A4 | A5 | B6 | A6 | A7 | B8 | A8 | A9 | B10 | A10 | A11 | B12 | A12 | | |
| 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 | 72 | 74 | 76 | 78 | 80 | 82 | 84 | 86 | 88 | 90 | 92 | 94 | 96 |

49~51 Latch check switch (49-COM, 50-N.O., 51-N.C.)
52 - Message: spring energy store tensioned
53, 54 - Motor operator
55~56 - Spring closing release
57~92 - Auxiliary contact On/off, C-COM, A-N.O., B-N.C.

## 5.1 Reference documents and information

### Time current curves

Visit www.eaton.com/tcc and select 'Low Voltage and Medium Voltage Power Breakers' followed by "Series NRX" from the drop-down.

### 2D & 3D drawings

Authorized original equipment manufacturers (OEMs) should contact their local sales representative in order to gain access to the latest customer drawings.

### Circuit breaker user manual

Visit www.eaton.com/SeriesNRX and select the option for Series NRX with PXR then review the "Documents" tab

### IEC standards

Visit www.eaton.com/SeriesNRX and review the "Documents" tab

### PXR trip unit user manual

Visit www.eaton.com/SeriesNRX and select the option for Series NRX with PXR then review the "Documents" tab

### Power Xpert protection manager

Available for download at www.eaton.com/SeriesNRX and select the option for Series NRX with PXR

### Wiring diagrams

Visit www.eaton.com/SeriesNRX and select the option for Series NRX with PXR then review the "Documents" tab

### Breaker and trip unit specifications

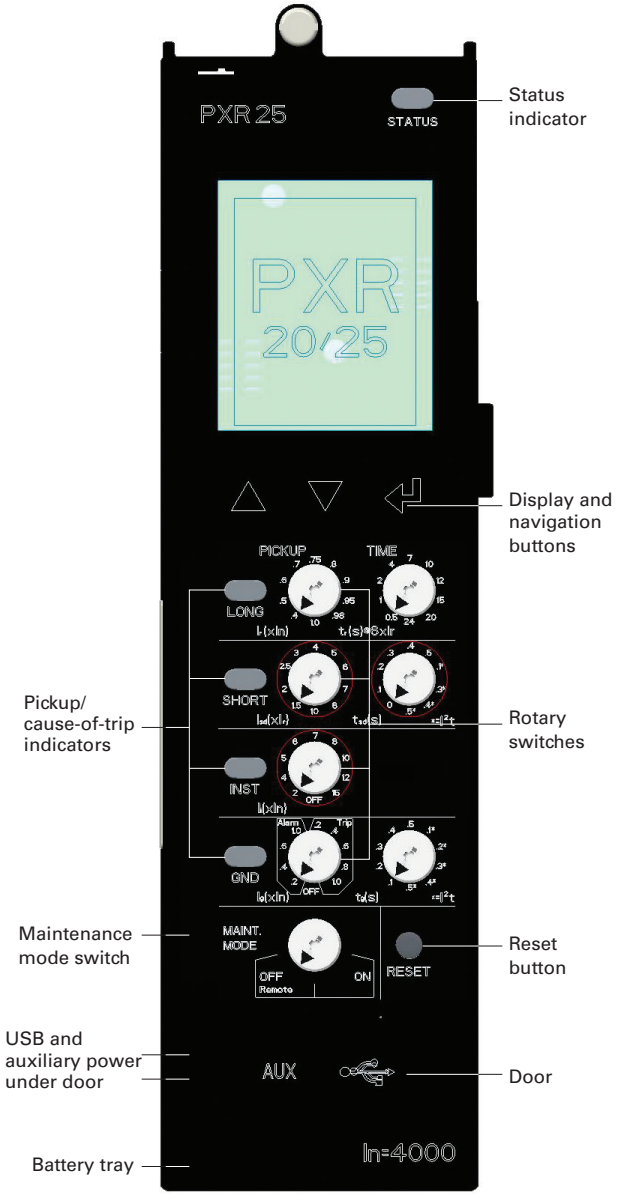
Visit www.eaton.com/consultants and select "Guide Specs"

## 5.2 Excerpt from PXR user manual

The PXR 20/25 is located on the front and to the left side of the circuit breaker. It is encased in a housing which provides protection to the electronics as well as providing an interface for a user to configure protection settings and monitor operation. Details of the interface and operation are contained in the sections which follow. Certain features are available only in selected PXR 20/25 trip unit styles.



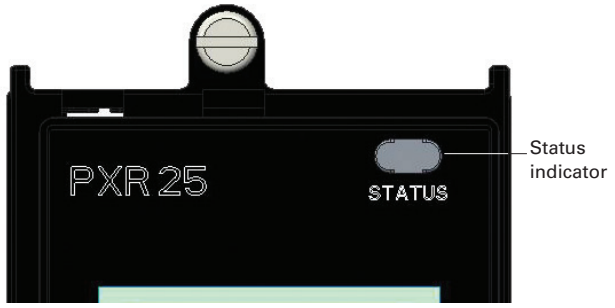
**PXR trip unit front face**




### Status indicator

All PXR trip units have an indicator at the top right labeled "STATUS". During normal operation, this indicator blinks green (on and off approximately every second), indicating that the trip unit is operating normally.

**Status indicator**




The status indicator blinks red if the trip unit detects an internal problem. This indicates a problem with the trip actuator coil, a firmware error, calibration error, or a mechanism error. To view the NRX with PXR Manual click here MN013003EN

When the status indicator remains off, there is no auxiliary power applied or insufficient primary current to power the trip unit. This does not indicate a malfunction. The status indicator will resume blinking when auxiliary power is supplied or breaker load current increases.

### Display and navigation buttons

The PXR trip unit has a back lit digital display on the front of the trip unit. This display provides information such as metered values, events, and the method to select certain configuration options. Information is presented on the display in either English or simplified Chinese.

There are three buttons below the display. They are used to control what information is shown on the display and to select certain configuration options.

**Display and navigation buttons**

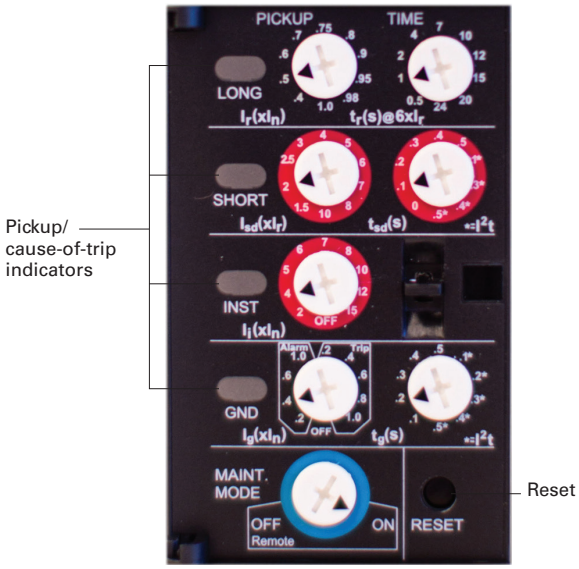
| | | |
|---|---|---|
| ▲ | Up Arrow | Move up in the menu display screens or increase an adjustment value. |
| ▼ | Down Arrow | Move down in the menu display screens or decrease an adjustment value. |
| ↵ | Enter | Confirm selection or go back to previous menu |

When the PXR trip unit is initially powered-up, the display will briefly show a loading screen and then change to the "Main" menu. During this time, the trip unit is already functioning and performing protection operations. Depending on the trip unit style, there are up to 13 submenu selections from the main menu. Each submenu can be accessed by highlighting the appropriate submenu by pressing the Down or Up Arrow buttons, then the Enter button. A complete map of the information and navigation is included in IL0131128EN.

## Pickup/cause-of-trip indicators

There are four pickup/cause-of-trip indicators on the face of the trip unit labeled "LONG", "SHORT", "INST", and "GND".

**Pickup/cause-of-trip indicators and reset**




The appropriate cause-of-trip indicator illuminates when a current level pickup setting is exceeded. After a trip event, the indicator blinks (one second on, three seconds off) and the cause will be shown on the display if auxiliary power is applied. The indicators and the display can be cleared by pressing the RESET button.

Following is a list of conditions detected and displayed by the cause-of-trip indicators.

- "LONG" – Solid indicates long delay pickup. Blinking indicates a long delay trip or overtemperature trip has occurred.
- "SHORT" – Blinking indicates short delay trip or mechanism error.
- "INST" – Blinking indicates instantaneous trip, making current release trip, high instantaneous trip, or maintenance mode trip has occurred.
- "GND" – Blinking indicates ground trip or ground alarm condition has occurred.

## Rotary switches

Depending on the trip unit style, up to 8 switches can be found on the trip unit's front panel. The top 7 rotary switches set protection settings using a surrounding legend indicating the value. These are the core protection settings. Each switch has ten positions and is set to achieve the appropriate trip-curve response. The "PICKUP" switches set the levels as a function of the breaker ratings. The "TIME" switches set the response in seconds. Each switch can be set using a small screwdriver, the arrow pointing to the selected value. When a change is made to the rotary switches, the display will temporarily change to indicate updated value of the setpoints.

## Maintenance mode switch

The PXR trip unit incorporates the Arc Flash Reduction Maintenance System™ (ARMS). If equipped, this switch is labeled "MAINT. MODE" and has two positions labeled; "OFF/Remote" & "ON". A blue colored ring surrounding the maintenance mode switch is illuminated when ARMS is enabled.

**Maintenance mode switch**


## Reset

The button labeled "RESET", located in the lower right face of the trip unit, can be depressed to reset the cause of trip indicators.

## Tamper-resistant cover

A clear, plastic cover is provided which allows the settings to be viewed but not changed. Unauthorized access to change settings can be prevented by the insertion of a standard sealing wire through the security holes in order to meet applicable tamper-resistant requirements.

## Door

Near the bottom of the PXR trip unit, there is a small door with "AUX" and the Universal Serial Bus (USB) icon. The door can be opened downward to expose the temporary auxiliary power port and the USB port.

**Trip unit door**


## USB

The USB is a micro-B USB connector utilizing USB 2.0 protocol. This USB connection may be used in conjunction with the Power Xpert Protection Manager software to configure and monitor the trip unit. A USB connection will also typically provide power from the host side of the USB cable to power up the trip unit when another source of auxiliary power is not available. This connection is intended for temporary use while configuring or monitoring the trip unit.

**Behind the trip unit door**

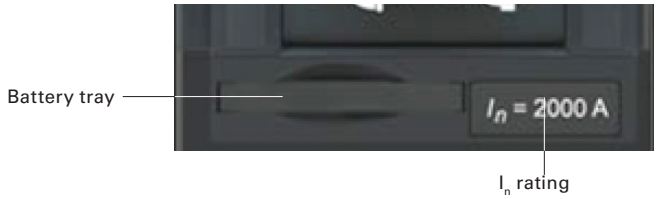

## Temporary auxiliary power

The two-pin socket under the left side of the door (see picture above) accepts the mating connector from a Digitrip auxiliary power module (Catalog Number: PRTBAPMDV for U.S. power sockets, DTAUXPMEU for European power sockets, or DTAUXPMUK for U.K. power sockets). This power source may be used to power the trip unit when another source of auxiliary power is not available. This connection is intended for temporary use while configuring or monitoring the trip unit, or providing a power source to trip the breaker during testing.

## Battery

At the bottom of the trip unit is a small tray which holds the battery. When the trip unit is not powered, this battery supports the cause-of-trip indicators. A battery icon at the bottom of the trip unit display indicates remaining battery life. The battery plays no part in the protection functions of the trip system. This battery is the standard type CR 2032 coin-cell.

**Battery tray**




## $I_n$ rating

This label shows the $I_n$ rating of the breaker. The label is part of the frame module and not the trip unit. It is also shown on the lower left corner of the trip unit display. The trip unit gets this information from the memory in the frame module.

## Side labels

The side of the trip unit has agency certification, model, and manufacturing information printed on a label.

**Typical PXR trip unit side label**

## PXR protection settings

The PXR trip unit protection settings are designed to be easily customized to any application. Settings for long delay pickup, long delay time, short delay pickup, short delay time, instantaneous pickup, ground fault pickup, and ground fault time are all independently configurable. These functions are set using rotary switches on the front of the trip unit. Additional options are chosen using the display and navigation buttons or by using the Power Xpert Protection Manager configuration software.

## Long delay pickup and time setting

The PXR trip unit offers a wide range of settings for Long Delay Pickup ($I_r$). This setting ranges from 0.4 to 1.0 and is expressed as a multiple of the frame's current rating ($I_n$). The pickup value for Long Delay is 105% to 115% of the calculated value to ensure that the circuit breaker can carry the full rating of ($I_r$), without tripping.

The long delay time settings range from 0.5 to 24 seconds. They represent the total clearing times when the current value equals six times $I_r$. All times are referenced from the top of the tolerance band, ensuring that the time never exceeds that maximum setting. When an $I^4t$ slope is selected, an overload creates a very long time delay which could exceed breaker ratings. Therefore, when an $I^4t$ slop is selected and a time delay above seven seconds is selected, a seven second time delay will be used instead.

If a long delay causes the circuit breaker to trip, the "LONG" LED indicator will be illuminated and the "Long Delay" message will be displayed if auxiliary power is present.

### Long delay slope selection

The $I^2t$ setting is the factory default curve for long delay. The curve can be changed using the display and navigation buttons to several alternative curves to better match the requirements for protection and coordination.

| $I_r$ slope type | Time current curve |
|---|---|
| $I^{0.5}t$ | Slightly inverse |
| It | Moderately inverse |
| $I^2t$ | Standard inverse |
| $I^4t$ | Extremely inverse |

### Long delay thermal memory

In addition to the standard Long Delay protection, a Long Time Memory (LTM) function is supported. This protects load circuits from the effects of repeated overload conditions. LTM is configured using the display and navigation buttons or using the Power Xpert Protection Manager software.

As an example, if a circuit breaker is closed soon after a Long Delay trip, and the current again exceeds the Long Delay setting ($I_r$), the LTM automatically reduces the time to trip to allow for the fact that the load conductor temperature is already higher than normal because of the prior overload condition. When the load current returns to normal, the LTM begins to reset (after about ten minutes it will have reset fully) so the next long delay trip time will again correspond to the setting value.

## Short delay pickup and time settings

Settings for Short Delay Pickup ($I_{sd}$) are expressed as multiples ranging from 1.5 to 10 for the long delay pickup ($I_r$).

The short delay time (tsd) is selected in conjunction with one of two short delay slopes, flat, or $I^2t$. There are six settings for the flat curve and four settings for $I^2t$, range from 0 seconds (minimum time) to 0.5 seconds.

The $I^2t$ response curve will provide a longer time delay for currents below eight times $I_r$ as compared with a flat response curve. For currents greater than eight times $I_r$, the $I^2t$ response flattens out to a fixed response time.

If a short delay causes the circuit breaker to trip, the "SHORT" indicator will be illuminated and the "Short Delay Trip" message will be displayed if auxiliary power is present.

The Zone Selective Interlocking (ZSI) feature may affect the tripping times for the short delay protective function. Please refer to the section on ZSI.

## Instantaneous pickup setting

The instantaneous ($I_i$) setting is expressed as multiples ranging from 2 to 15 of the $I_n$ value or can be set to "OFF". The instantaneous protection trips the breaker with no intentional time delay.

## Ground fault pickup

The PXR trip unit provides flexibility in detecting and acting on ground currents. A ground fault alarm can provide an early warning of a ground fault condition and a ground fault trip can provide protection under these conditions. Three modes of operation are selectable from the front of a trip unit that is equipped with the ground fault option.



1. The ground detection may be turned off by setting the rotary switch to "OFF".
2. The ground fault detection pickup level with an alarm only action may be selected using the rotary switch. With the alarm-only selection, four levels of pickup level are available. This set of pickup levels is labeled "Alarm".
3. The ground fault detection pickup level with an action of trip may also be selected using the rotary switch. With detect and trip selection, five levels of pickup level are available, this set is labeled "Trip". If a ground fault causes the circuit breaker to trip, the "GND" indicator will be illuminated and the "Ground Fault Trip" message will be displayed when auxiliary power is present.

**Note:** For ANSI/UL breakers, the pickup level will have a maximum of 1200A per standards.

**Note:** Customer application may require ground fault protection. Consider NEC and/or applicable codes to determine required mode of operation ("OFF", "Alarm", or "Trip")

### Ground fault time

The PXR trip unit provides selection for two different ground fault slopes: a fixed time (flat) or $I^2t$ response. The slope should be chosen to match selective coordination needs. The $I^2t$ response, designated by an asterisk (*), provides a longer time delay for current below 0.625 x $I_n$ than the fixed time (flat) response. Both have a range from 0.1 seconds to 0.5 seconds.

### Ground fault thermal memory

In addition to standard ground fault protection, the PXR trip unit also has a ground fault memory function that serves to protect loads in the event of a sputtering arc to ground. Without this function, the ground fault protection timer resets each time the arc goes out, so that a sputtering fault may not trip the circuit breaker. With the ground fault memory function, the trip unit "remembers" the sputtering ground current. The memory decays with time when the current level is below pickup.

### Ground fault relay

If the Ground Fault Alarm option is selected on the LSIG or LSIGR style trip units, a red ground Alarm indicator will illuminate to show the presence of ground current in excess of the Ground Alarm setting. The trip unit will energize an alarm relay upon this condition if auxiliary power is present. The indicator and relay will reset automatically when the ground current reduces to a value less than the ground fault pickup setting.

If the Ground Fault Trip option is selected, the alarm relay can be configured to indicate when the circuit breaker has tripped on a ground fault. You must then push the "RESET" button in order to reset the relay contact.

## Ground fault sensing

The PXR 20/25 trip unit provides for three modes of sensing through the PXR menu to detect ground fault currents: residual, source ground, and zero sequence. The mode (residual or source/zero seq) is selected using the display and navigation buttons or by using the configuration software. Neutral protection is provided independent of the ground fault function.

### Residual current sensing

Residual sensing is the standard mode of ground fault sensing in Series NRX circuit breakers. This mode uses one current sensor on each phase conductor and one on the neutral for a four-wire system. This mode of sensing sums the outputs of the three or four individual current sensors. If the sum is zero, then no ground fault exists. Residual ground fault sensing features are adaptable to main and feeder circuit breaker applications. If an external neutral sensor is used with reverse feed breaker applications, the proper polarity of the neutral needs to be considered.

### Source ground sensing

The ground return method is usually applied when ground fault protection is desired only on the main circuit breaker in a simple radial system. This method is also applicable to double-ended systems where a mid-point grounding electrode is employed.

### Zero sequence sensing

Zero Sequence sensing, also referred to as vectorial summation, is where the external summing transformer has all of the phase and neutral (if applicable) cables passing through it.

For Source Ground / Zero Sequence applications, the Eaton current transformer style number 70C1527G04 is to be used.

## Maintenance mode

The PXR trip units support Eaton's Arcflash Reduction Maintenance System™ (ARMS), also referred to as Maintenance Mode. When enabled, the trip unit will trip the breaker with no intentional delay whenever the configured pickup level is exceeded. When enabled, the Maintenance Mode function operates regardless of the Instantaneous settings. If Maintenance Mode causes the circuit breaker to trip, the "INST" indicator will be illuminated and the "ARMS Trip" message will be displayed on the trip unit if auxiliary power is present.

The Maintenance Mode pickup level setting is configured using the display and navigation buttons. For the NF frame and the RF frame the settings are 2.5, 4.0, 6.0, 8.0 or 10.0 (x $I_n$). The adjustable current settings allow for different levels of protection. A higher level may be needed when, for example, another load fed from this breaker may contain motors that are being started and create large inrush currents over the pickup current level.


### Enabling maintenance mode

There are three ways to enable the Maintenance Mode function, locally, remotely using a contact, or remotely using communications. A blue colored ring surrounding the switch always illuminates to confirm when the function is enabled. An additional normally open contact is available on the secondary terminal block which can also be used to indicate when maintenance mode is active.

For locally actuating the maintenance mode function, use the selector switch on the front of the trip unit. When in the ON position, maintenance mode is enabled and cannot be turned-off remotely.

When this switch is in the OFF/Remote position, maintenance mode can be remotely actuated by a contact wired to the secondary terminal block of the breaker.

A third method to actuate Maintenance Mode is via communications. This can be done by a Communications Adapter Module (CAM) or by the configuration software using the USB port. When maintenance mode is enabled in either of these ways, it must also be disabled via communications. Moving the switch from "OFF/Remote" to "ON" and back to "OFF/Remote" will not disable maintenance mode if it was enabled by communications.

## High instantaneous

The PXR trip unit can provide a high instantaneous trip function that will trip the circuit breaker at the withstand rating of the circuit breaker frame. This function is factory set within the frame module and reacts to the peak current level. It is always active regardless of the user's instantaneous adjustment selection, including "OFF". The instantaneous ("INST") indicator shows this cause of trip.

All Series NRX NF frame modules have an high instantaneous trip feature. Selected Series NRX RF frame modules have the High Instantaneous feature.

## Making current release (MCR)

All PXR trip unit styles have a making current release (MCR) function. This safety feature prevents the circuit breaker from being closed and latched-in on a faulted circuit. The MCR is enabled only for the first two cycles of current following the initial circuit breaker closing operation. The circuit breaker will trip with no delay and the instantaneous ("INST") indicator will show the cause of trip.

This non-adjustable release is set by the frame module of the circuit breaker. Refer to time current curves for specific values.

## Zone selective interlocking (ZSI)

The Zone selective interlocking (ZSI) function is provided on all trip units and can be enabled or disabled through the menu system or Power Xpert Protection Manager software. ZSI functions in conjunction with the short delay and ground fault protection functions. ZSI provides the fastest possible tripping for faults within the zone of protection of the circuit breaker and also provides positive coordination among all circuit breakers in the system (mains, ties, feeders, and downstream circuit breakers)

When ZSI is enabled, a fault within the zone of protection will immediately trip the breaker and send a signal to upstream trip units to restrain them from tripping immediately. The restraining signal causes the upstream circuit breakers to follow their set coordination time delays so that the service is only interrupted to the isolated fault area, while the fault is cleared in the shortest time possible.

The ZSI is wired using a set of three wires labeled Zone In (Zin), Zone Out (Zout), and Zone Common (Zcom) on the secondary terminals above the circuit breaker. These signals are compatible will all Eaton electronic trip units which have the ZSI function. The zone out signal is sent whenever the ground fault pickup is exceeded or when the phase current value of two times Ir is exceeded. This provides maximum selectivity for coordination with larger upstream circuit breakers. For the furthest downstream breaker the use of a self-interlocking jumper may or may not be needed depending on the application. If immediate tripping is desired on the last breaker the Zin on that breaker can be left open while the Zout is wired to the Zin of the breaker upstream from it. If a time delay is desired on the last breaker then a jumper from the Zout of that breaker should wired to the Zin of the same breaker to provide a self-interlocking feature. Refer to Eaton Application Note AP02602002E for detailed description and examples.

## Event recording and waveform capture

The PXR trip unit will record information surrounding events, alarms, and trips into a set of logs. For summary events, only the reason and a time-stamp (based on the trip unit's real-time clock) are stored. More important events additionally store a snap-shot of real-time values (currents and voltages). The most important events additionally store more information, storing waveforms of current and voltage experienced during the event.

Each log can store a set number of events and is managed as a first-in first-out buffer (FIFO). As the information is stored for the most recent event, the information from the oldest event is eliminated.

### Table 27. Event and log matrix

| Event | Event code and time-stamp | Alarm snapshot | Trip snapshot | User waveform | Alarm waveform | Trip waveform | Notes |
|---|---|---|---|---|---|---|---|
| | 200 | 10 | 10 | 1 | 10 | 10 | Quantity stored |
| User initiated capture | | | | ● | | | USB or network triggered |
| Power up - clock OK | ● | | | | | | |
| Power up - clock bad | ● | | | | | | |
| Event - setpoints download | ● | | | | | | |
| Event - enter test mode | ● | | | | | | |
| Event - exit test mode | ● | | | | | | |
| Event - test complete | ● | | | | | | |
| Event - enter maintenance mode | ● | | | | | | Indicator on front also illuminates |
| Event - exit maintenance mode | ● | | | | | | |
| Event - opened by communications | ● | | | | | | w/ CAM supported module, spring release and shunt trip |
| Event - closed by communications | ● | | | | | | |
| Event - time change (if > 60 seconds) | ● | | | | | | Previous time is recorded |
| Alarm - calibration | ● | ● | | | | | |
| Alarm - setpoints fault | ● | ● | | | | | |
| Alarm - battery low voltage | ● | ● | | | | | |
| Alarm - low control voltage | ● | ● | | | | | |
| Alarm - RTC error | ● | ● | | | | | |
| Alarm - NV memory error | ● | ● | | | | | |
| Alarm - watchdog timer | ● | ● | | | | | |
| Alarm - long delay pickup (test mode) | ● | ● | | | | | |
| Alarm - ground fault (test mode) | ● | ● | | | | | |
| Alarm - trip actuator fault | ● | ● | | | | | |
| Alarm - operations count | ● | ● | | | | | |
| Alarm - long delay pickup | ● | ● | | | ● | | |
| Alarm - ground fault | ● | ● | | | ● | | |
| Alarm - mechanism error | ● | ● | | | ● | | |
| Alarm - high load | ● | ● | | | ● | | |
| Trip - over temperature | ● | | ● | | | | |
| Trip - making current release | ● | | ● | | | | |
| Trip - test | ● | | ● | | | | |
| Trip - long delay | ● | | ● | | | ● | |
| Trip - short delay | ● | | ● | | | ● | |
| Trip - instantaneous | ● | | ● | | | ● | |
| Trip - ground | ● | | ● | | | ● | |
| Trip - maintenance mode | ● | | ● | | | ● | |
| Trip - neutral | ● | | ● | | | ● | |

**Table 28. Information stored**

| | |
|---|---|
| Event code and time-stamp | Event cause and time-stamp<br>Status: primary, secondary |
| Alarm snapshot or trip snapshot | Current: IA, IB, IC, IN, IG<br>Voltages: VAB, VBC, VCA, VAN, VBN, VCN (PXR 25 Only)<br>Power: Watts, Vars, VA (PXR 25 Only)<br>Demand: Watts, Vars, VA (PXR 25 Only)<br>Temperature<br>Frequency<br>Power factor<br>Operations count |
| User waveform or alarm waveform | Waveform of: IA, IB, IC, IN, IG<br>Waveform of: VAB, VBC, VCA, VAN, VBN, VCN (PXR 25 only)<br>1 cycle (64 data points) |
| Trip waveform | Waveform: IA, IB, IC, IN, IG<br>Waveform of: VAB, VBC, VCA, VAN, VBN, VCN (PXR 25 Only)<br>6 cycles (384 data points) |

# PXR communication features

## Integrated ModBus-remote terminal unit (RTU) port

A ModBus communication port is integrated into the PXR trip unit for certain styles. The trip unit responds to messages from the master using the remote terminal unit (RTU) protocol. ModBus port configuration can be viewed and set using the trip unit display and navigation buttons or using Power Xpert Protection Manager software.

**Table 29. Factory defaults**

| | Factory default | Options |
|---|---|---|
| **Slave address** | 001 | 001 to 247 |
| **Baud rate** | 9600 | 9600 to 19,200 |
| **Parity** | Event | Event, odd, none |
| **Stop bits** | 1 | 1 or 2 |

The trip unit uses ModBus function codes 02, 03, 04, 06, 08, and 16 and supports up to 122 registers (244 bytes) in a single ModBus transaction.

## USB port

The PXR includes a micro-B USB port on the front of the trip unit. This USB connection may be used in conjunction with the Power Xpert Protection Manager software to configure, control, and test the trip unit. Alternatively a USB power bank can be used to temporarily power the trip unit if auxiliary power is not available.

## External communications adapter modules (CAMs)

The NRX circuit breakers with PXR 20/25 trip units are equipped to handle a flexible and modular system of communication adapter modules (CAMs). These modules provide communication from the trip unit to a field bus network. Various networks are supported by the following modules, listed with their instruction leaflet:

- ICAM - INCOM: IL0131124EN
- MCAM - ModBus RTU: IL0131091EN
- PCAM - PROFIBUS: IL0131092EN
- ECAM - ETHERNET: IL0131125EN
- PXR-ECAM - ETHERNET: IL0131132EN

These modules are remotely mounted on a DIN rail and wired into the trip unit using the circuit breaker's secondary terminal block. The wiring harness as described in the module's instruction leaflet must be used. The field bus is then wired to a connection on the CAM Supported module.

If so equipped and wired, an added feature of the CAMs is the option to open (using a shunt-trip) or close (using a spring release) the circuit breaker remotely via communications. On some styles of CAM modules, there is a jumper on the front - or via a USB programming port - that will enable or disable the remote communication control capability. It may be desirable to disable remote control when maintenance work or testing is being done on the circuit breaker.

# Important system components

## Potential transformer (PT) module

For the PXR 25, a Potential or Voltage Transformer (PT) module provides the signals to measure the system voltage and calculate power and energy. The PT module is a wye to wye configuration, using a three-wire input to generate the four-wire output signal for the trip unit. It is mounted externally to the circuit breaker and wired to the secondary terminals.

The power and energy metering and the protection functions are calculated with the convention that power flow is from line to load through the circuit breaker. This assumes the top side conductor to be the line side. If the distribution system is configured such that the bottom side is the incoming side, the power values will indicate reverse power. This can be changed through a setting by using the display and navigation buttons.

## Auxiliary power

Providing auxiliary power to the PXR trip unit will provide full functionality even when the circuit breaker is open or when the circuit breaker is under very light load. Auxiliary power is connected to the circuit breaker's secondary terminal block.

**⚠ IMPORTANT!**

Auxiliary power is not required to provide current protection features. Protection is active well below any overload. The trip unit begins to self power-up at very low levels of current (approximately NF frame = 60 A, RF frame = 100 A)

## Power Xpert Protection Manager (PXPM) configuration software

Eaton's PXPM is a Microsoft® Windows-based software that configures, controls, and tests Eaton PXR 20/25 trip units. This software is used to initiate the built in secondary current injection testing of the electronic trip unit. The user can create, modify, and save setting configurations for PXR 20/25 trip units. The software further allows the user to reset trip units, adjust trip unit's date and time, capture current or voltage waveforms, and perform trip or no-trip tests. The software is available as a download from the following link: http://www.eaton.com/SeriesNRX. Click on product "Series NRX NF and RF frame Low-Voltage Power Circuit Breakers with PXR electronic trip units." The PXPM download link will be found on the Features tab.

## Secondary wiring terminals associated with the PXR trip unit

Refer to TD013001EN - "Series NRX with PXR circuit breaker wiring diagrams" for all terminal numbers.

**Table 30. PXR secondary terminal block features**



| Associated feature | Name | Notes |
|---|---|---|
| Neutral sensor - residual ground and overcurrent sensing | N1, N2 | Only available on 3-pole circuit breakers |
| Ground sensor - source ground or zero sequence sensing | G1, G2 | |
| Ground fault or high load alarm relay | ALM2, ALMC | Normally open contact |
| Trip alarm relay | ALM3, ALMC | Normally open contact, non-latching |
| Maintenance mode - enable input | ARMSIN, AGND | Customer supplied dry contact, wetted from the trip unit. When closed, puts the trip unit into maintenance mode. A high quality gold plated or palladium contact is required in this application. |
| Maintenance mode - indicator contact | ALM1, ALMC | Normally open, closes when maintenance mode is enabled. |
| Zone selective interlock (ZSI) | ZIN, ZOUT, ZCOM | These should connect to other ZSI enabled breakers in the system. |
| ModBus | MODBA, MODBB, MODBG | Recommended ModBus cable has twisted-pair wires having an aluminum/Mylar foil shield with drain wire. |
| Communication adapter modules (CAMs) | CMM1, CMM2, CMM3, CMM4 | |

## Testing the trip unit and circuit breaker

Testing prior to startup shall be accomplished with the circuit breaker either in a de-energized system, or in TEST or DISCONNECTED cassette position, or WITHDRAWN from the cell.

**Notes:** Since time-current settings are based on desired system coordination and protection schemes, the protection settings, if altered during any test sequence, should be reset to their as-found conditions.

### ⚠ WARNING

**Do not attempt to install, test, or perform maintenance on equipment while it is energized. Death or severe personal injury can result from contact with energized equipment. De-energize the circuit and disconnect the circuit breaker before performing maintenance or tests.**

### ⚠ CAUTION

Any tripping operation will cause disruption of service and possible personal injury, resulting in the unnecessary switching of connected equipment. Testing a circuit breaker while it is in-service and carrying load current is not recommended. Testing of a circuit breaker that results in the tripping of the circuit breaker should be done only with the circuit breaker in the test or disconnected cell positions or while the circuit breaker is on a test bench.

The built-in test system will prevent a test if more than 5% of the rated current (In) is sensed. A password is required to prevent unauthorized use which could lead to the tripping of the breaker. The default password is 0000.

### Functional opening test (local) via display

This feature allows a simple functional open test command only from the face of the trip unit. This test is a command sent to the microprocessor to exercise the components such as the trip actuator and the interface to the breaker mechanism.

### Functional current testing (remote) via USB/PXPM

The Functional Current Testing uses the PXPM software to control testing of long delay trip, short delay trip, instantaneous trip, maintenance mode, and ground (earth) fault trip via the USB communication. The Functional Current Test feature allows for testing on any phase including neutral. The trip unit's display is used to observe the current being injected and the elapsed time until trip. On the PXPM software, the test mode allows the user to enter a current to be injected, initiate the test, observe operation, and record the results.

The PXR 20/25 trip unit has two built-in test modes available for use. One is an internal simulated current test and the other is an internal secondary injected current test. Either mode can be configured for opening or not opening the breaker.

### Internal simulated test

This is a test to verify the trip unit's firmware integrity. The test current values are simulated in the trip unit's firmware algorithm to check its integrity and can be used as a trip feature to exercise the complete mechanical trip mechanism of the breaker.

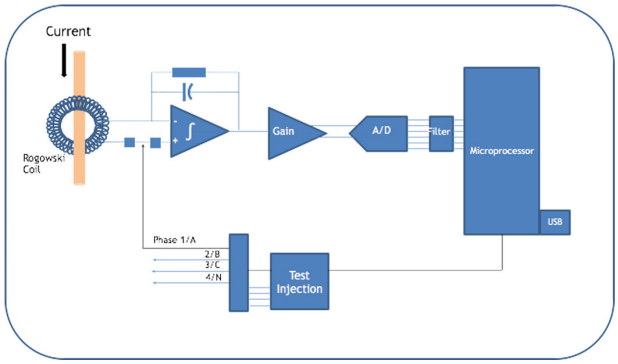
### Internal secondary injection test

The trip unit uses an independent built-in circuit to generate a test signal which is injected into the sensor input circuit. This test feature replaces the need for an external secondary injection test kit.

### Current sensor test (remote) via USB/PXPM

The PXPM software has another mode that can inject current to test for continuity of each sensor. This includes the neutral sensor which can be tested whether or not there is a sensor installed.

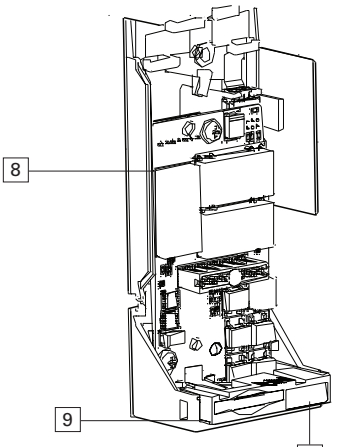
**Sensor input circuit**

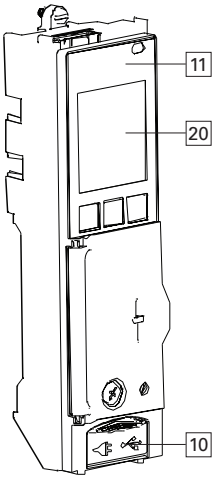


## 5.3 NRX breaker cover details

### RF-frame front cover details

1. Nameplate
2. Charging handle
3. Operations counter (optional)
4. Position Indicator (CONNECT, TEST, DISCONNECT, drawout only)
5. Lockable levering access door interlock (drawout only)
6. Levering access door (drawout only)
7. Levering key lock (optional, drawout only, not shown)
8. Frame rating module (FRM)
9. FRM battery cover
10. USB and aux. power ports
11. PXR trip unit
12. Pop-out trip indicator (optional)
13. OFF key lock (optional, not shown)
14. Contact status (OPEN - Green, CLOSED - Red)
15. Ready-to-close status flag
16. Mechanism spring status (charged - Yellow, discharged - White)
17 Manual OFF
18. Manual ON
19. Pushbutton cover mounting holes
20. $I_n$ rating - LCD display on trip unit
21. $I_n$ rating - FRM battery cover


**Note:** The In rating on the LCD and FRM battery cover should always agree.

**Note:** The frame rating module should not be removed.

# Nameplate identification

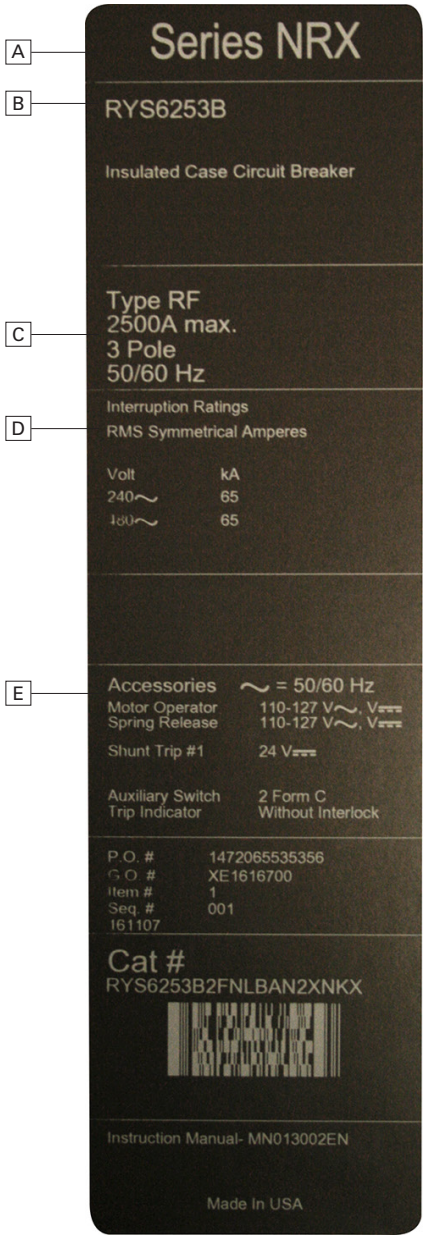
## RF-frame nameplate identification

Nameplates are prominently displayed on the front of the circuit breaker, and provide important information relative to that specific circuit breaker. All low voltage circuit breakers must be applied within their nameplate ratings. It is always advisable to be familiar with the location and information provided on a breaker's nameplate.

A NRX RF circuit breaker is easily identified by its specific nameplate designation. Review the nameplate example provided.

| Characters | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Example | R | Y | S | 6 | 2 | 5 | 3 | B |

| | | | |
|---|---|---|---|
| **Character 1** | **Breaker frame size (Character 2)** | | |
| R | RF-frame for UL 489 or IEC, (4.5 inches (115 mm) pole spacing) | | |
| **Character 2** | **Standard, mechanism, device (Character 2)** | | |
| Y | UL 489, stored energy, insulated case breaker | | |
| G | IEC 60947-2, stored energy, air breaker | | |
| **Character 3, 4** | **Fault current rating (Characters 3,4)** | | |
| R6 | 65 kA at 480 Vac (3 cycle, UL 489 only) | | |
| R8 | 85 kA at 480 Vac (3 cycle, UL 489 only) | | |
| RC | 100 kA at 480 Vac (3 cycle, UL 489 only) | | |
| S6 | 65 kA at 480 Vac (30 cycle, UL 489) or 66 kA at 415 Vac IEC | | |
| S8 | 85 kA at 480 Vac (30 cycle, UL 489) or 415 Vac IEC | | |
| SC | 100 kA at 480 Vac (30 cycle, UL 489) or 105 kA at 415 Vac IEC | | |
| **Character 5, 6** | **Frame rating (amperes) (Characters 5,6)** | | |
| 08 | 800 | | |
| 10 | 1000 (IEC only) | | |
| 12 | 1200 (UL only) | | |
| 13 | 1250 (IEC only) | | |
| 16 | 1600 | | |
| 20 | 2000 | | |
| 25 | 2500 | | |
| 30 | 3000 (IEC only) | | |
| 32 | 3200 (IEC only) | | |
| 40 | 4000 (IEC only) | | |
| **Character 7** | **Poles, phasing (Character 7)** | | |
| 3 | Three-pole, ABC | | |
| 4 | Four-pole, NABC | | |
| **Character 8** | **Mounting configuration (Character 8)** | | |
| | **Breaker type** | **Cell switch** | **Connection type** |
| W | Drawout | — | Rear connect |
| U | Drawout | 3 Form C | Rear integral horizontal terminals |
| Z | Fixed | 3 Form C | Rear connect |
| V | Fixed | — | Rear integral horizontal terminals |
| B | Fixed | — | Rear connect |
| C | Fixed | — | Rear integral horizontal terminals |
| | * - Integral horizontal terminals rated up to 2000A, 66kA | | |

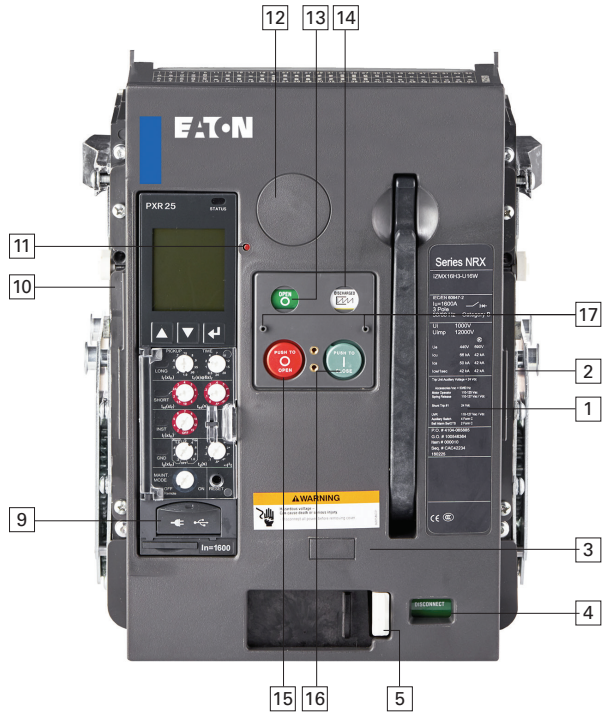


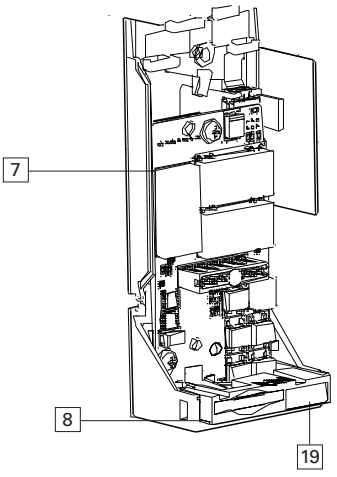

A. Low voltage power circuit breaker name
B. Breaker family designation number
C. Breaker frame size in amperes
D. Interrupting capacity rating
E. Factory equipped accessories

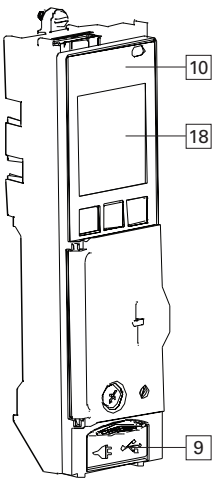
**RYS6253B**

## NF-frame front cover details

1. Nameplate
2. Charging handle
3. Operations counter (optional, not shown)
4. Position Indicator (CONNECT, TEST, DISCONNECT, drawout only)
5. Lockable levering access door interlock (drawout only)
6. Levering access door (drawout only)
7. Frame rating module (FRM)
8. FRM battery cover
9. USB and aux. power ports
10. PXR trip unit
11. Pop-out trip indicator (optional)
12. OFF key lock (optional, not shown)
13. Contact status (OPEN - Green, CLOSED - Red)
14. Mechanism spring status (charged - Yellow, discharged - White)
15 Manual OFF
16. Manual ON
17. Pushbutton cover mounting holes
18. $I_n$ rating - LCD display on trip unit
19. $I_n$ rating - FRM battery cover




**Note:** The In rating on the LCD and FRM battery cover should always agree.

**Note:** The frame rating module should not be removed.

## NF-frame nameplate identification

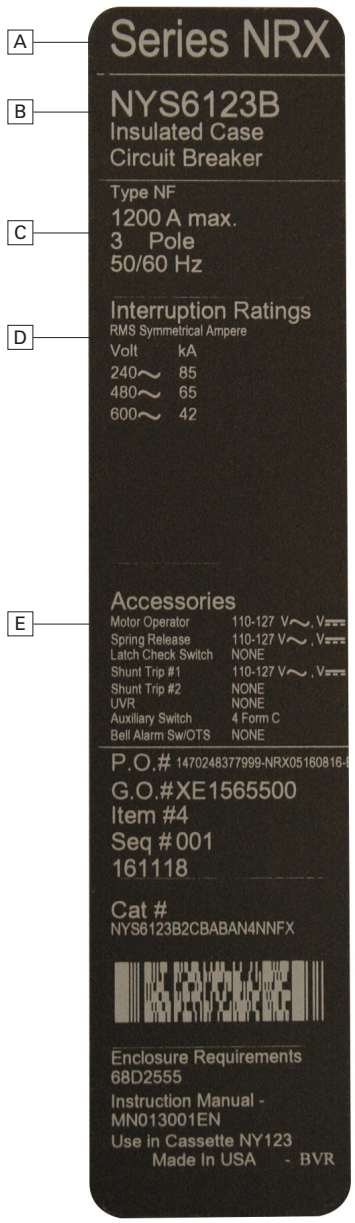
Nameplates are prominently displayed on the front of the circuit breaker, and provide important information relative to that specific circuit breaker. All low voltage circuit breakers must be applied within their nameplate ratings. It is always advisable to be familiar with the location and information provided on a breaker's nameplate.

A NRX NF circuit breaker is easily identified by its specific nameplate designation. Review the nameplate example provided.

| **Characters** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Example** | N | Y | S | 6 | 1 | 2 | 3 | B |

| | | | |
|---|---|---|---|
| **Character 1** | **Breaker frame size** | | |
| N | NF frame for UL 489 or IEC, (2.75 inch (70 mm) pole spacing) | | |
| **Character 2** | **Standard, mechanism, device** | | |
| Y | UL 489, stored energy, insulated case breaker | | |
| G | IEC 60947-2, stored energy, air breaker | | |
| **Character 3, 4** | **Fault current rating (Characters 3,4)** | | |
| R4 | 42 kA at 480 Vac, switchboard protective (3 cycles, UL 489 only) | | |
| R5 | 50 kA at 480 Vac, witchboard protective (3 cycle, UL 489 only) | | |
| R6 | 65 kA at 480 Vac, switchboard protective (3 cycle, UL 489 only) | | |
| S4 | 42 kA at 480 Vac, selective (30 cycle, UL 489) or 415 Vac IEC | | |
| S5 | 50 kA at 480 Vac, selective (30 cycle, UL 489) or 415 Vac IEC | | |
| S6 | 65 kA at 480 Vac, selective (30 cycle, UL 489) or 66 kA at 415 Vac IEC | | |
| **Character 5, 6** | **Frame rating (amperes) (Characters 5,6)** | | |
| 07 | 630 (IEC only) | | |
| 08 | 800 | | |
| 10 | 1000 (IEC only) | | |
| 12 | 1200 (UL only) | | |
| 13 | 1250 (IEC only) | | |
| 16 | 1600 (IEC only) | | |
| **Character 7** | **Poles, phasing (Character 7)** | | |
| 3 | Three-pole, ABC | | |
| 4 | Four-pole, NABC | | |
| **Character 8** | **Mounting configuration (Character 8)** | | |
| | **Breaker type** | **Cell switch** | **Connection type** |
| W | Drawout | — | Rear connect |
| Z | Drawout | 3 Form C | Rear connect |
| B | Fixed | — | Rear connect |
| F | Fixed | — | Front connect |
| H | Fixed hybrid | — | Top rear connect & bottom front connect* |
| J | Fixed hybrid | — | Top front connect & bottom rear connect* |
| | * - UL489 3-pole only | | |

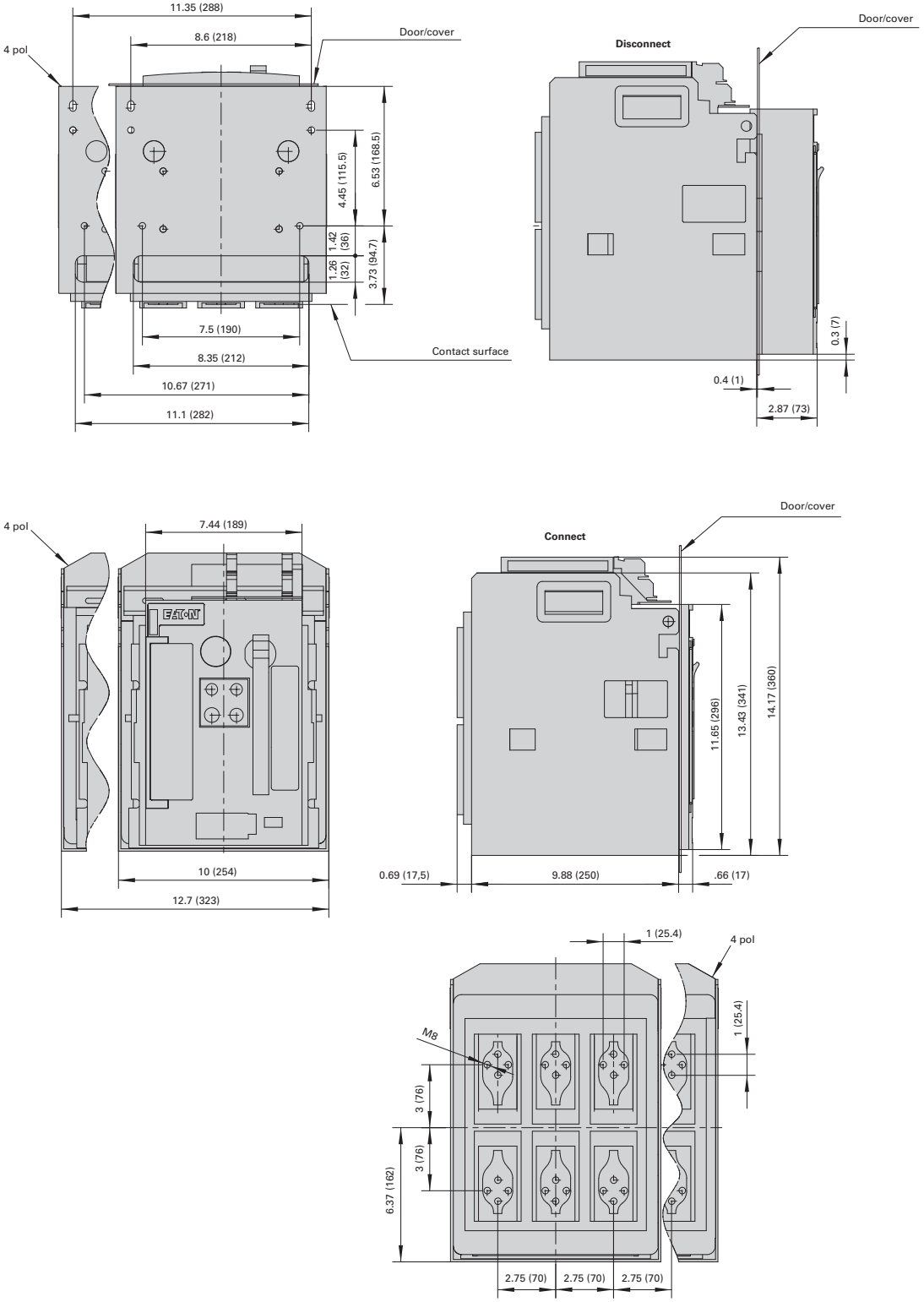
**NYS6123B**




A. Low voltage power circuit breaker name
B. Breaker family designation number
C. Breaker frame size in amperes
D. Interrupting capacity rating
E. Factory equipped accessories

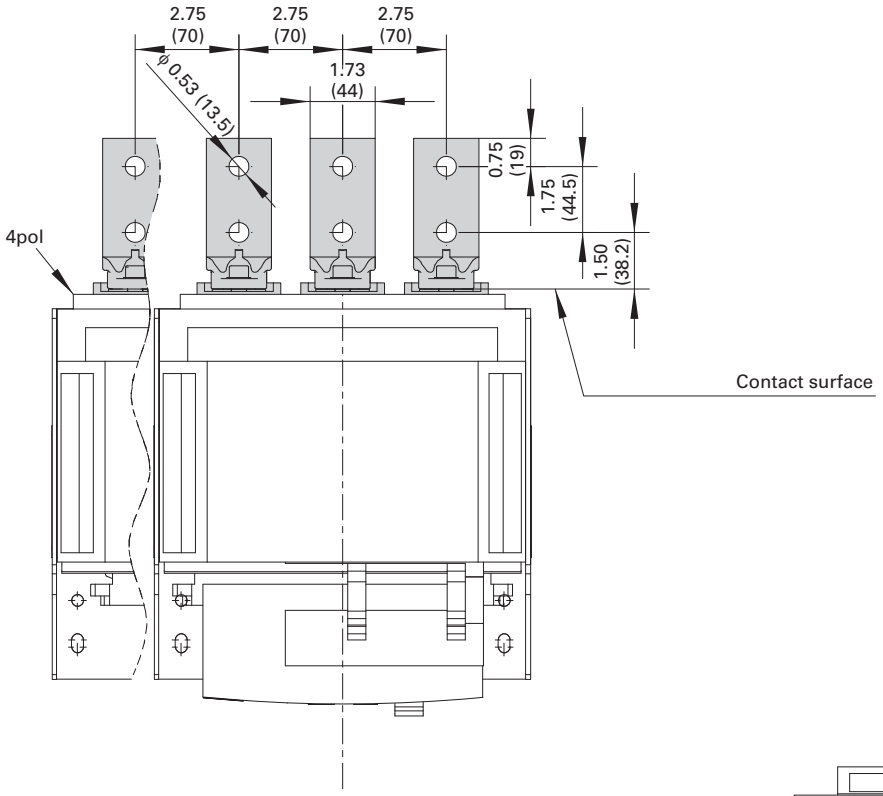
## 5.4 Drawings

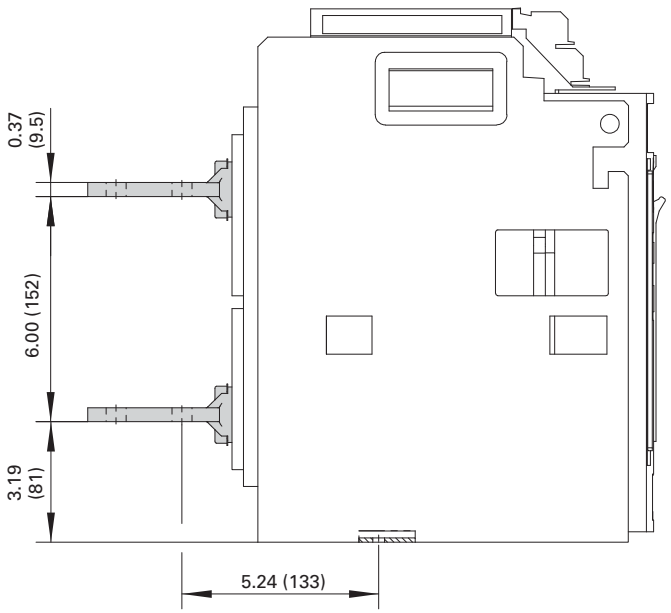
### Series NRX NF frame 3P/4P drawout - top, front, side and rear view




2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

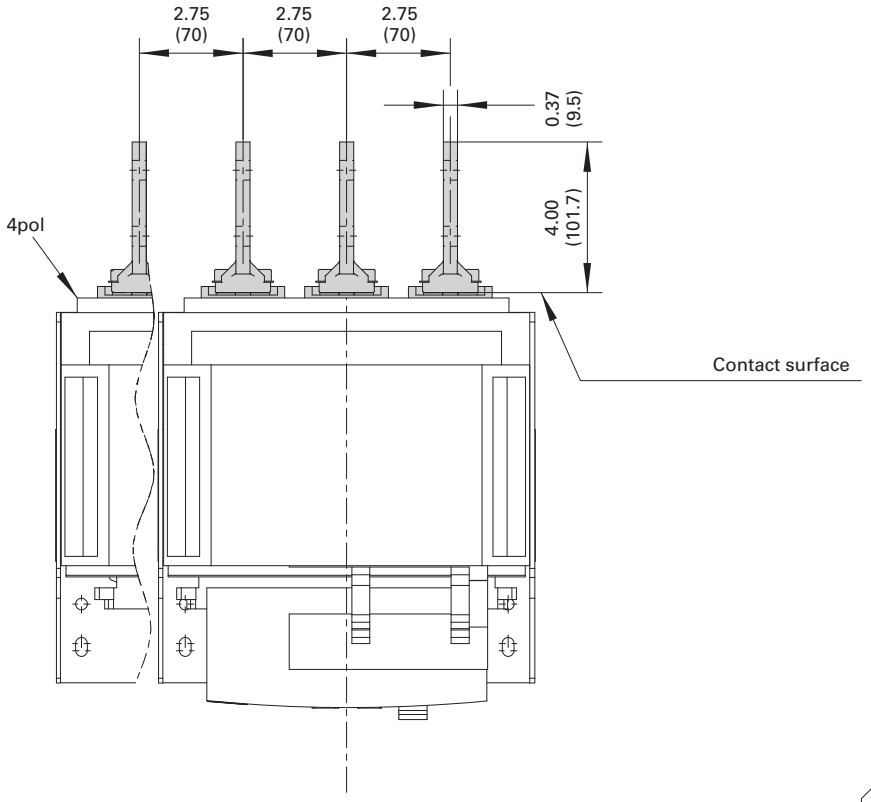
## Series NRX NF frame 3P/4P drawout - long horizontal terminal adapters - top and side view

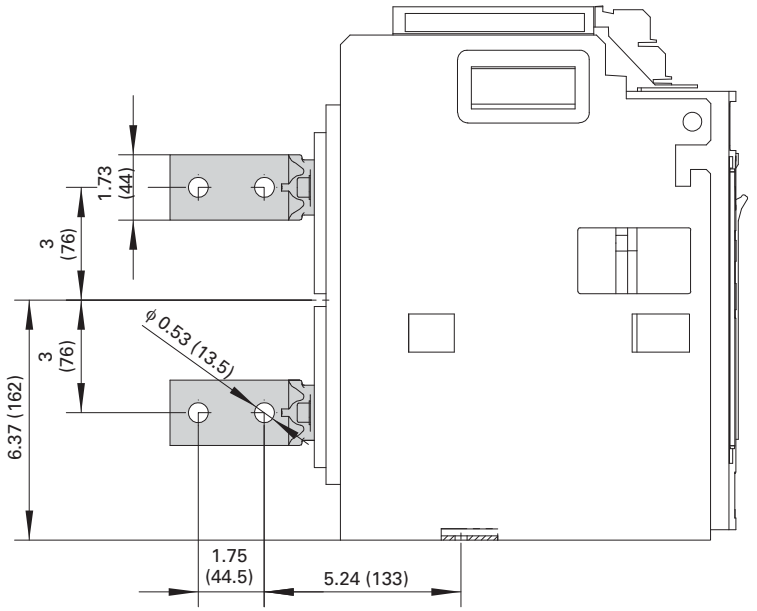



2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

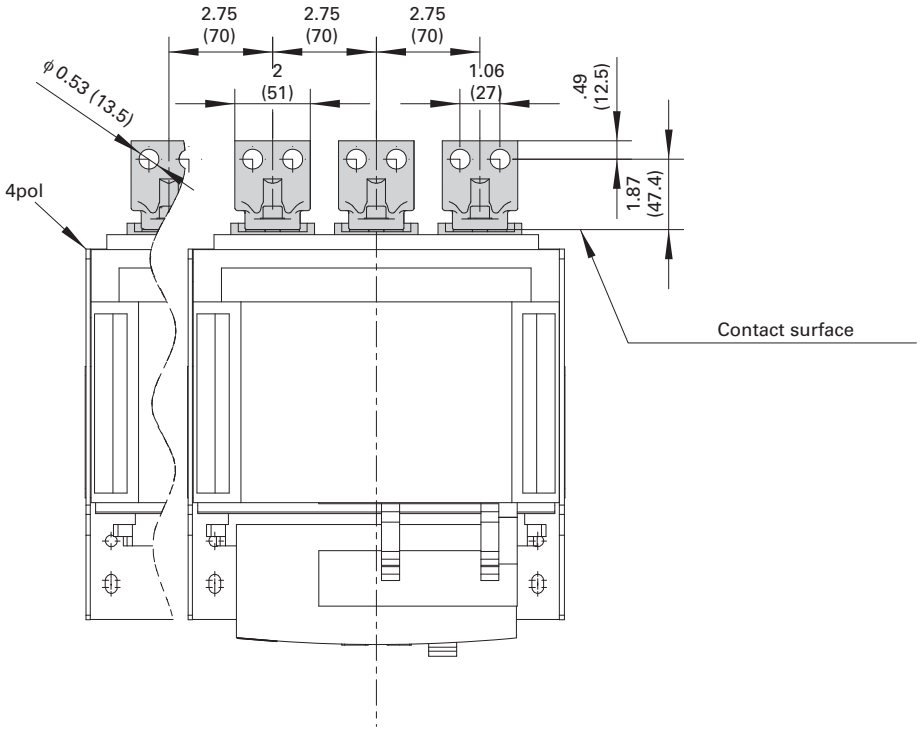
## Series NRX NF frame 3P/4P drawout - long vertical terminal adapters - top and side view

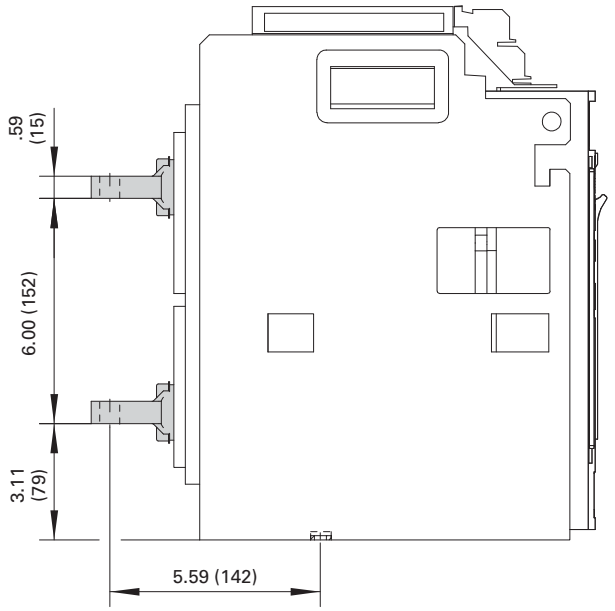



2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

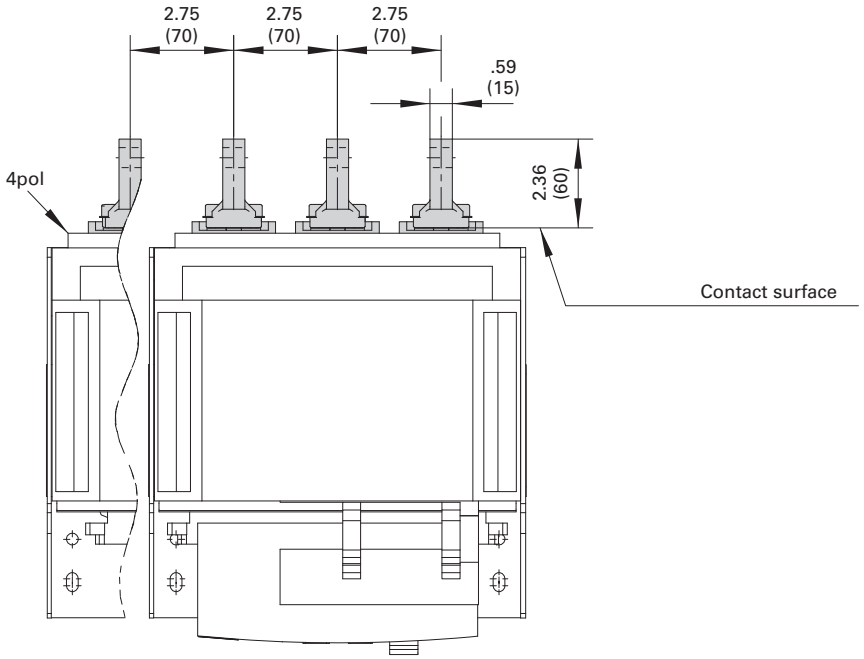
## Series NRX NF frame 3P/4P drawout - short horizontal terminal adapters - top and side view

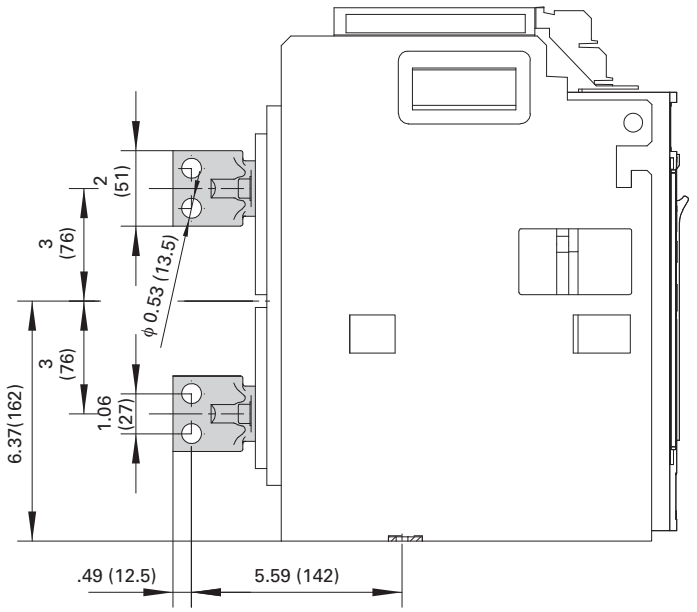



2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

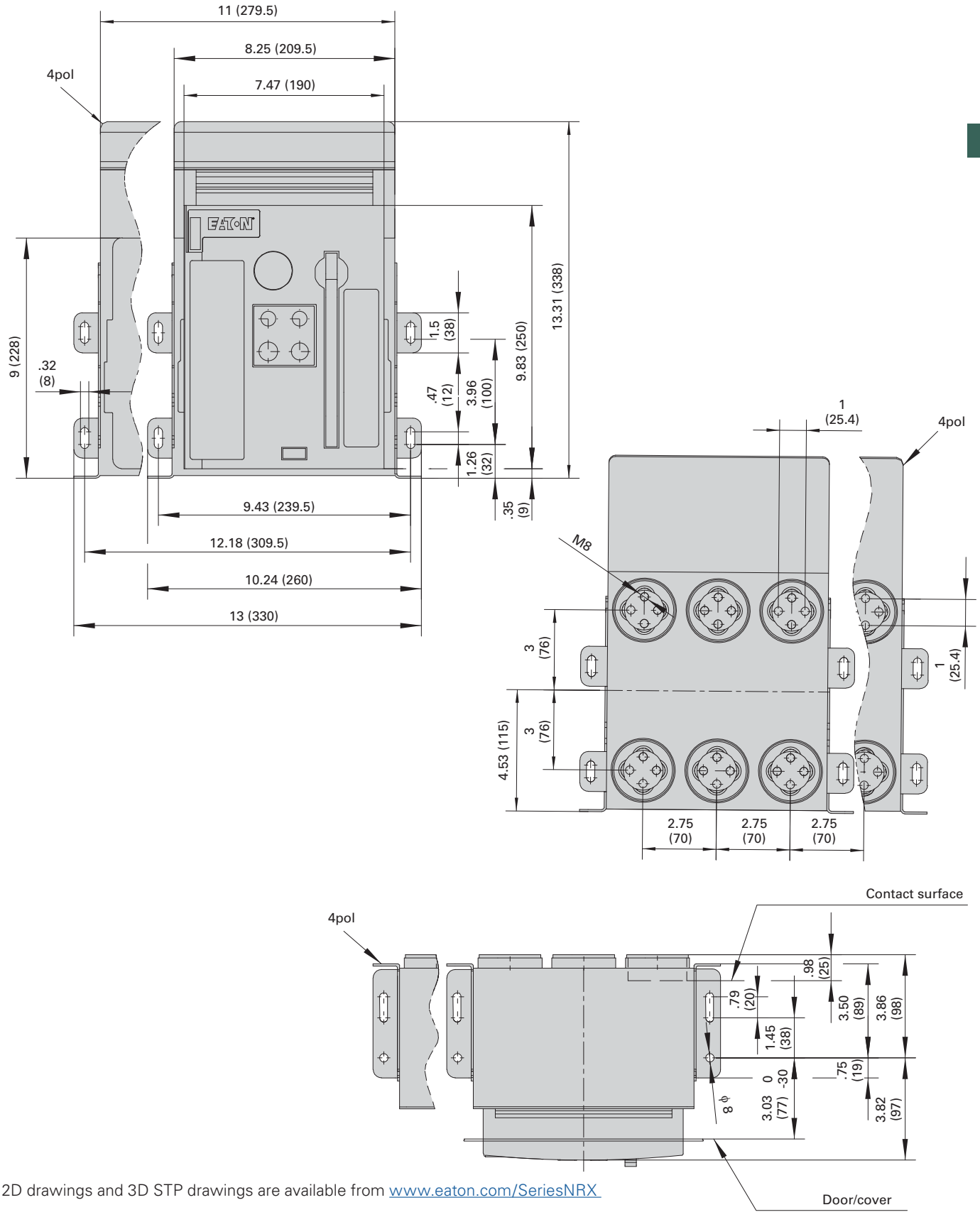
## Series NRX NF frame 3P/4P drawout - short vertical terminal adapters - top and side view



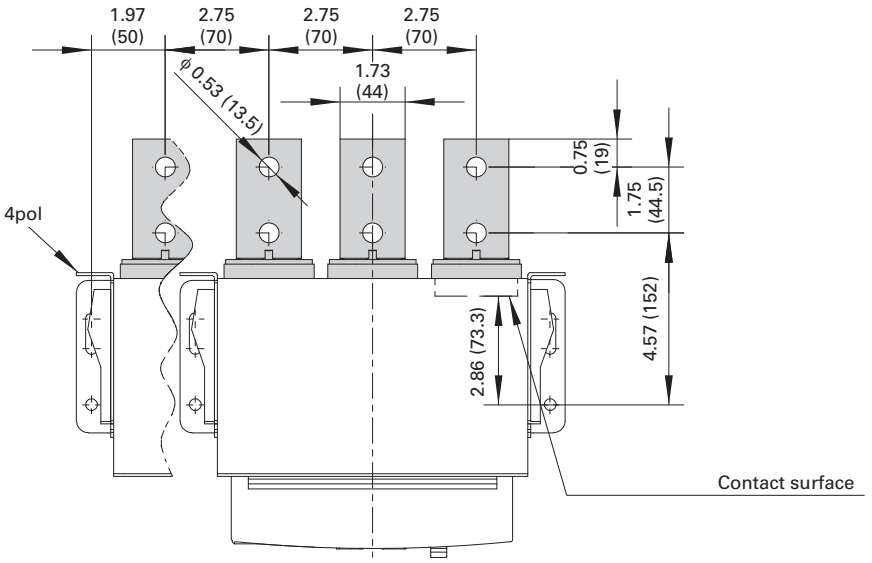

2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

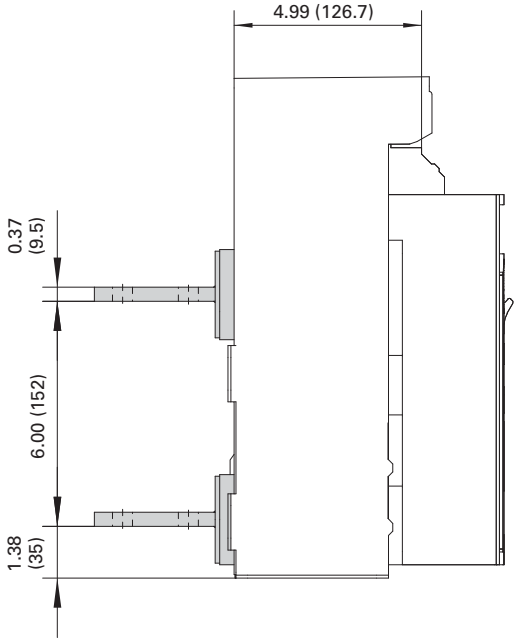
## Series NRX NF frame 3P/4P fixed - front, rear and top view




2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

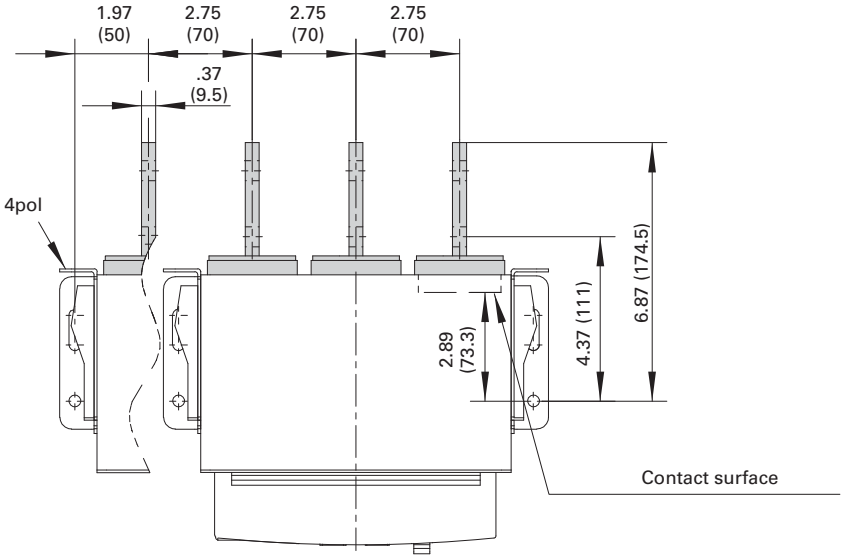
## Series NRX NF frame 3P/4P fixed - long horizontal terminal adapters - top and side view

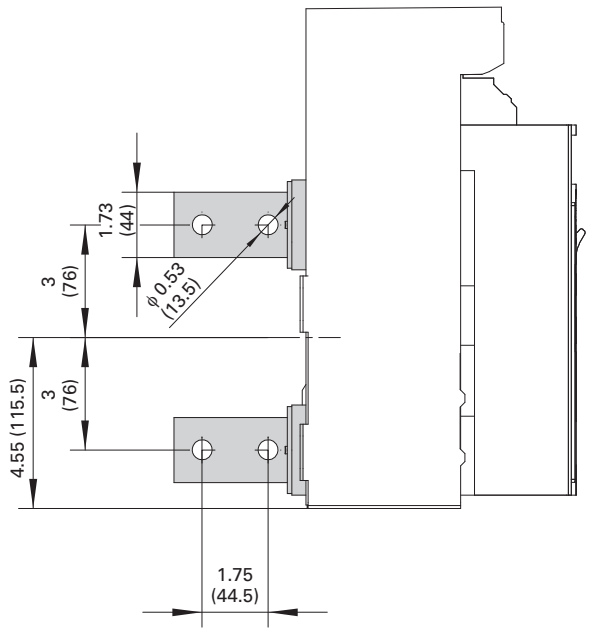



2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

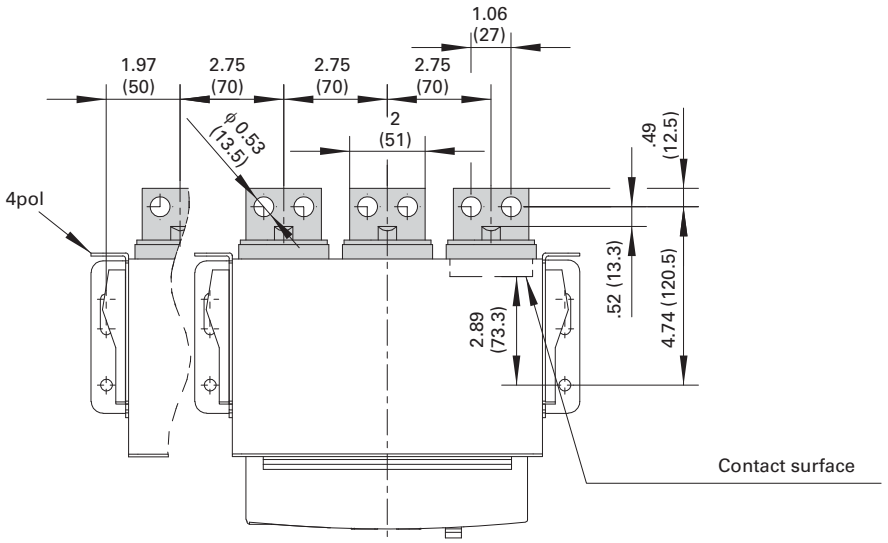
## Series NRX NF frame 3P/4P fixed - long vertical terminal adapters - top and side view

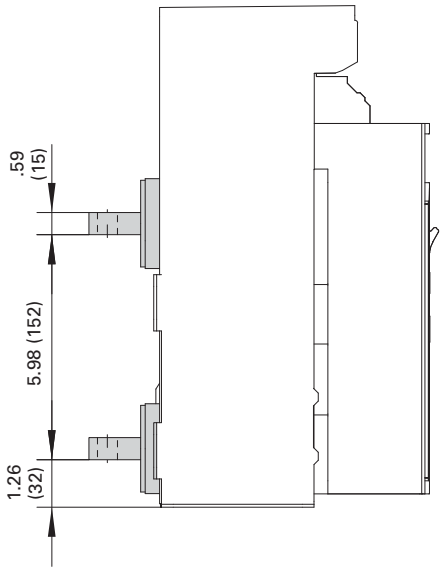



2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

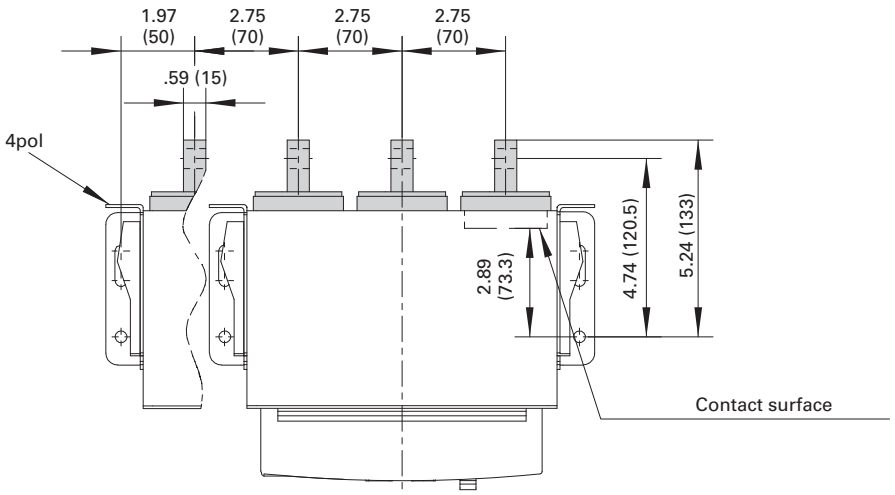
## Series NRX NF frame 3P/4P fixed - short horizontal terminal adapters - top and side view

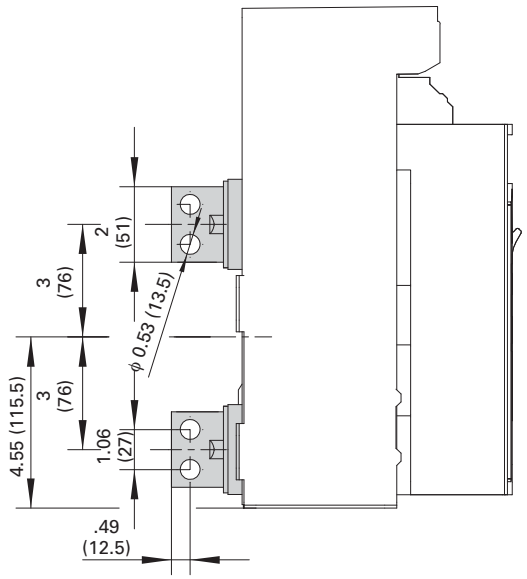



2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

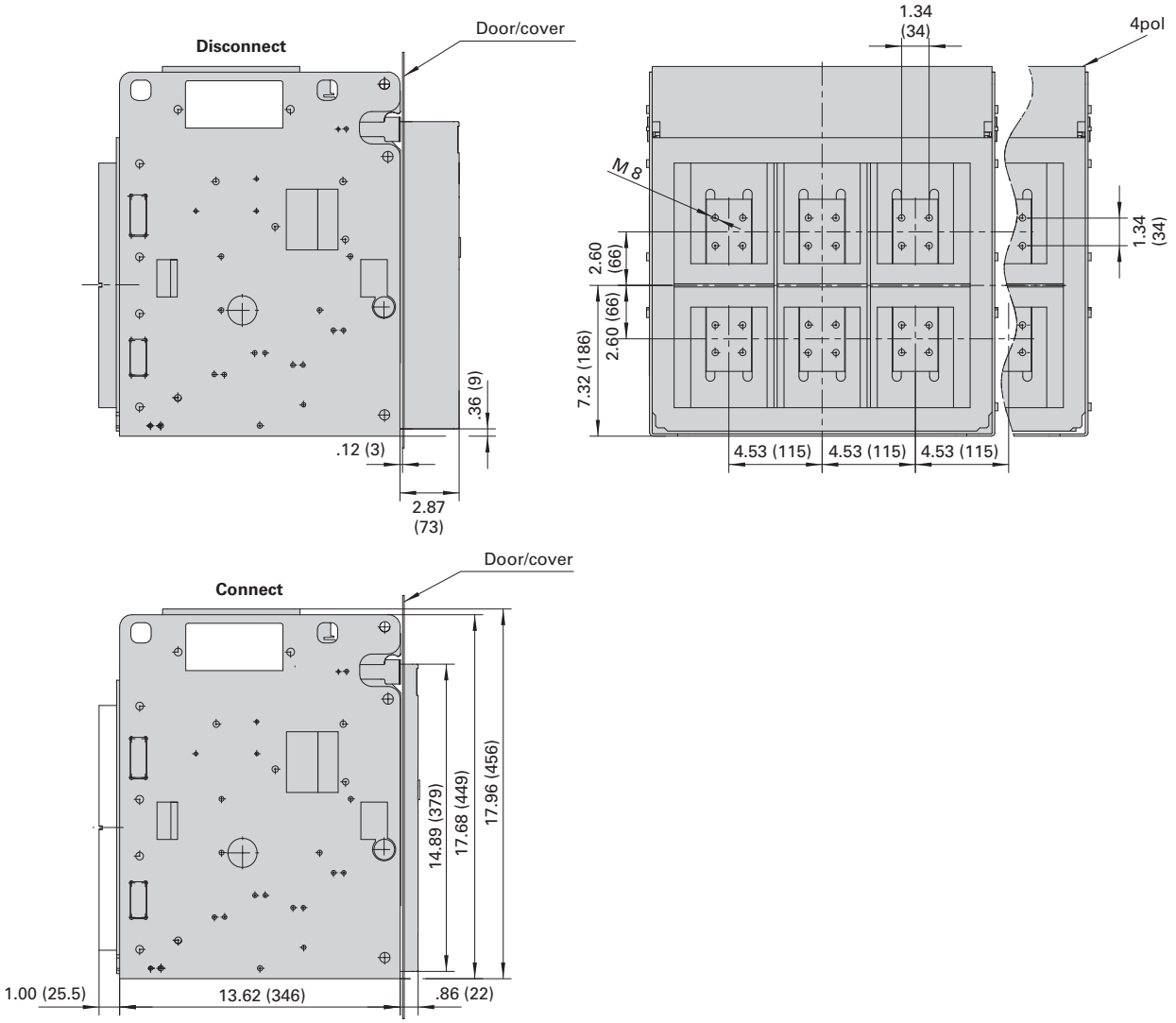
## Series NRX NF frame 3P/4P fixed - short vertical terminal adapters - top and side view



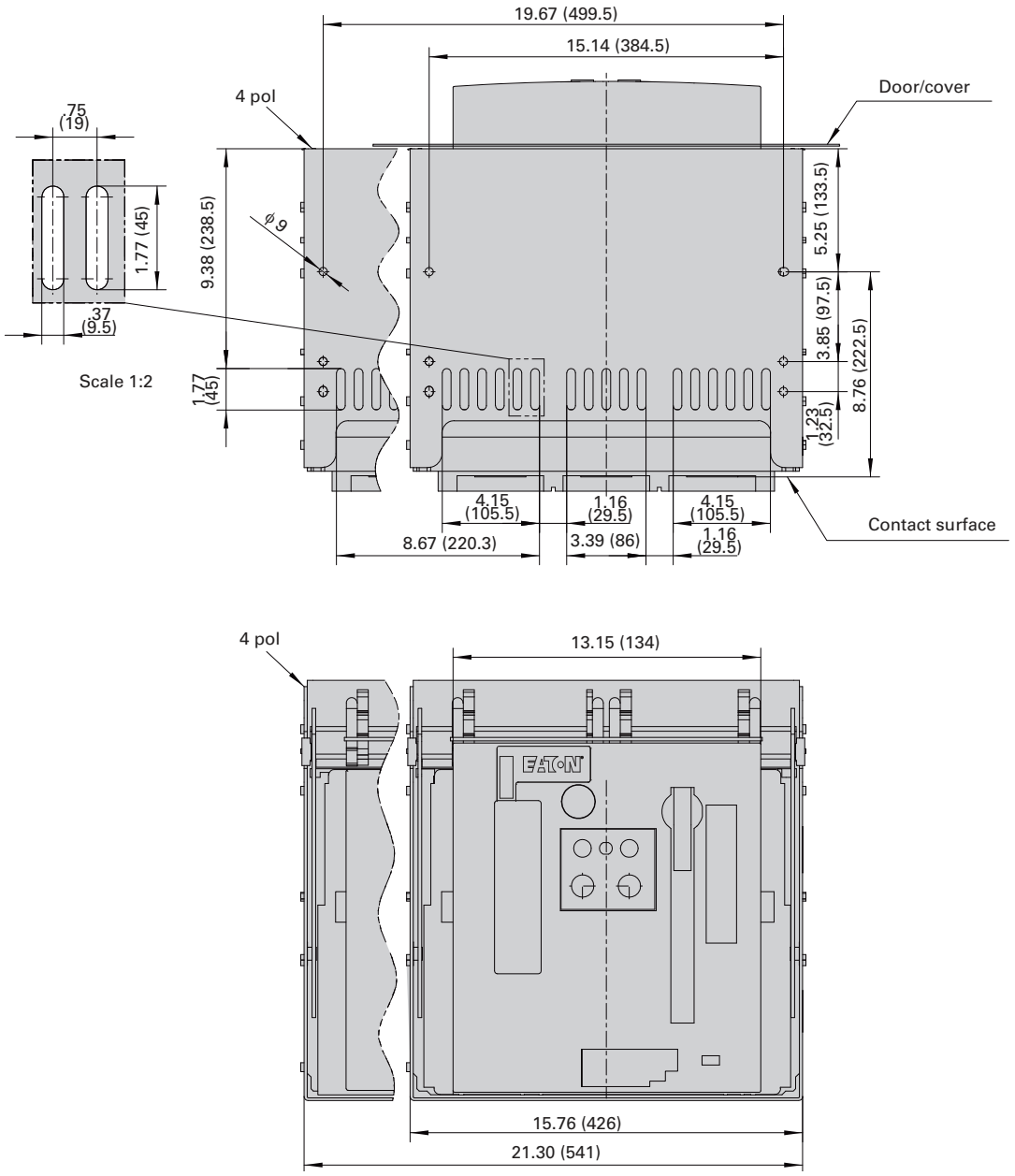

2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

## Series NRX NF frame 3P/4P drawout - cassette side and rear view



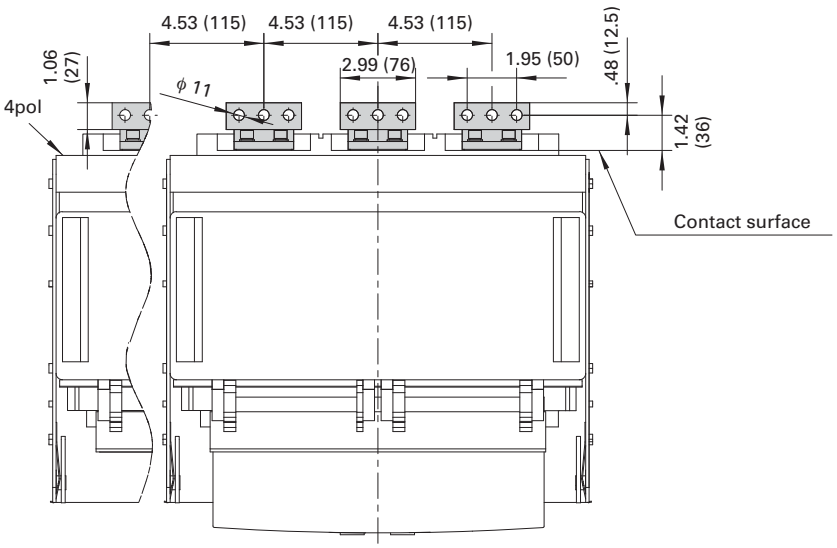

2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

## Series NRX RF frame 3P/4P drawout - rear and front view

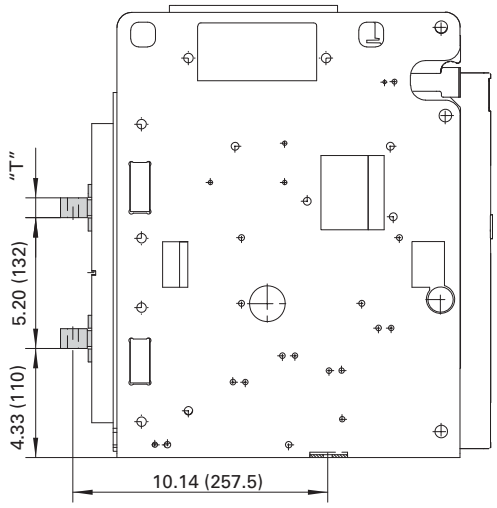



2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

## Series NRX RF frame 3P/4P drawout - with centered three-hole horizontal terminal adapters - top and side view

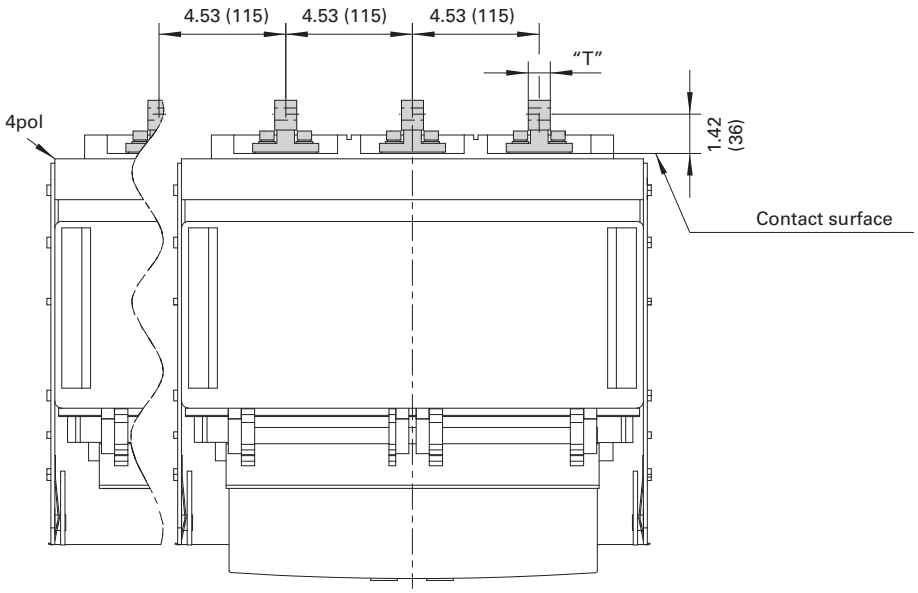



| | IEC | UL |
|---|---|---|
| "T" | .79 (20) | 0.75 (9) |

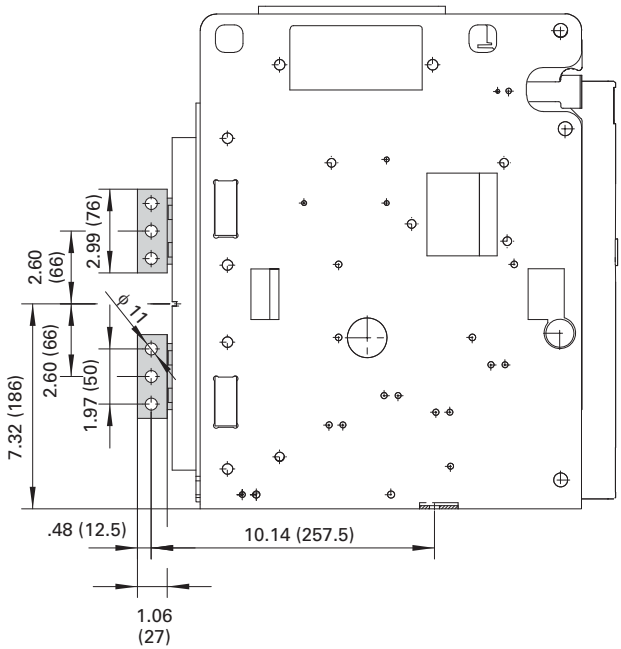



2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

## Series NRX RF frame 3P/4P drawout - with centered three-hole vertical terminal adapters - top and side view

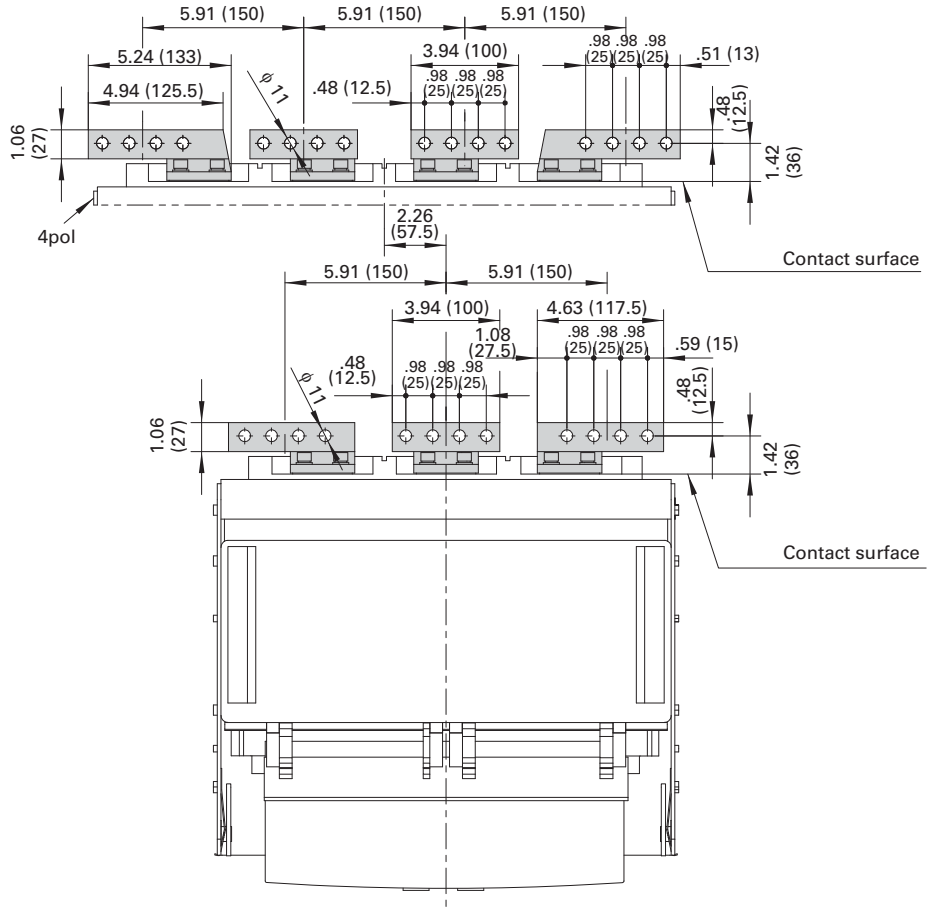


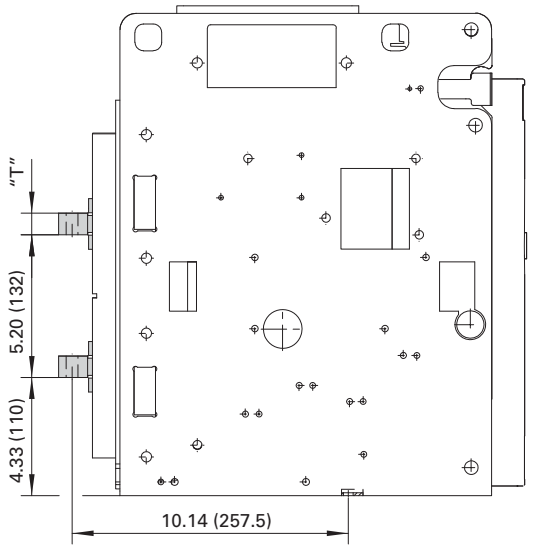

| | IEC | UL |
|---|---|---|
| "T" | .79 (20) | 0.75 (9) |




2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

## Series NRX RF frame 3P/4P drawout - with offset four-hole horizontal terminal adapters - top and side view

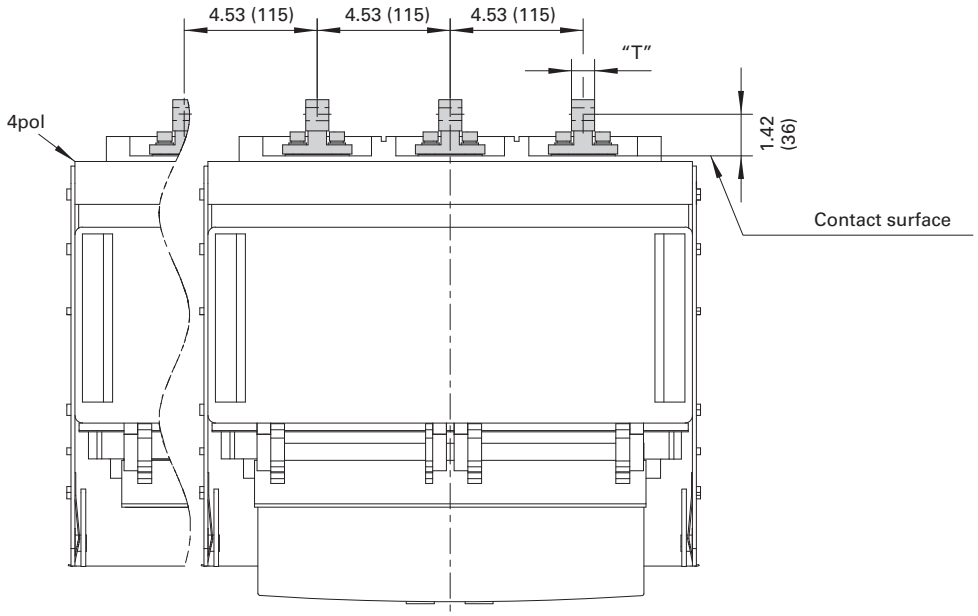


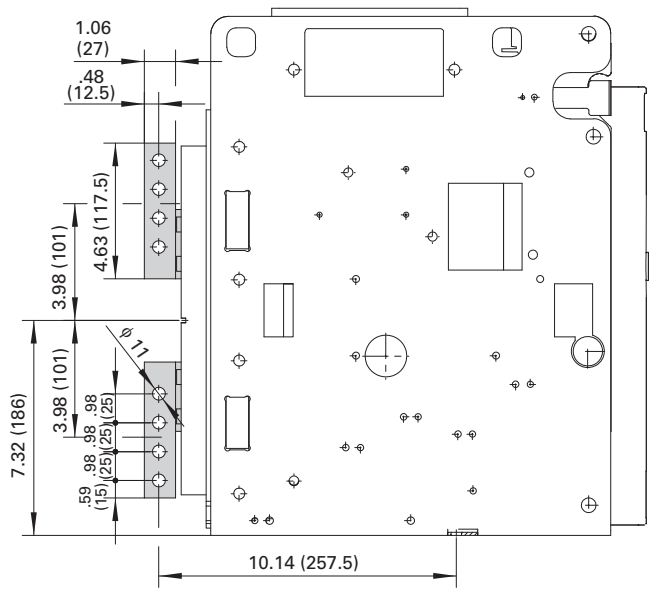

| | IEC | UL |
|---|---|---|
| "T" | .79 (20) | 0.75 (9) |

2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

## Series NRX Type RF 3P/4P drawout - with offset four-hole vertical terminal adapters - top and side view

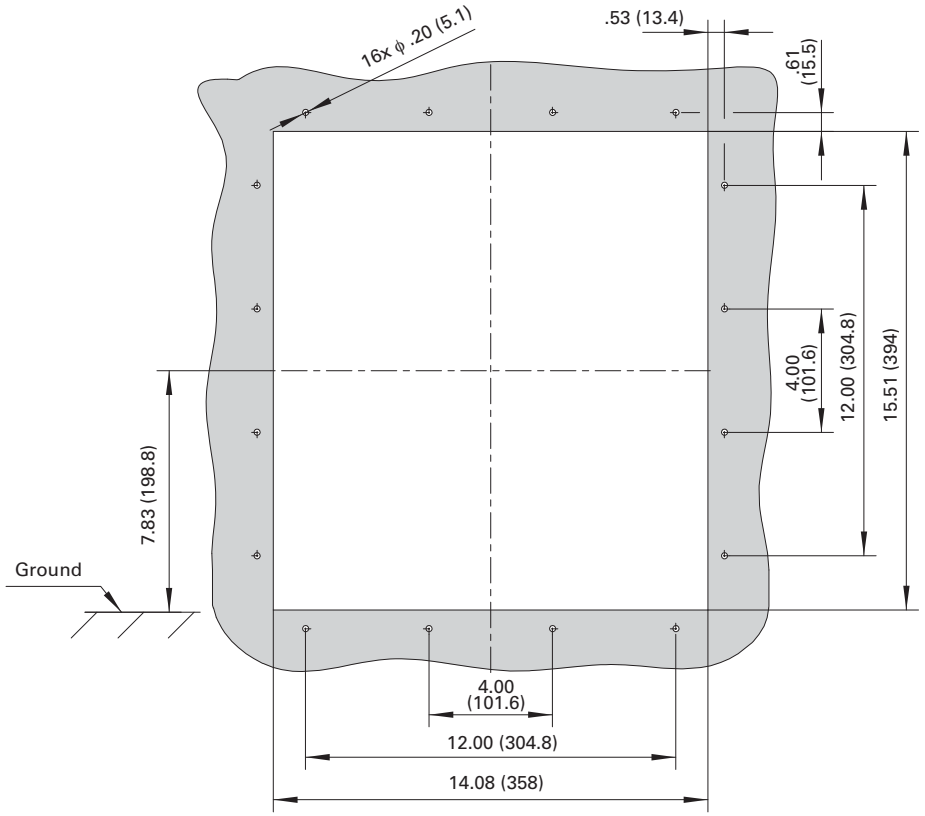



| | IEC | UL |
|---|---|---|
| "T" | .79 (20) | 0.75 (9) |

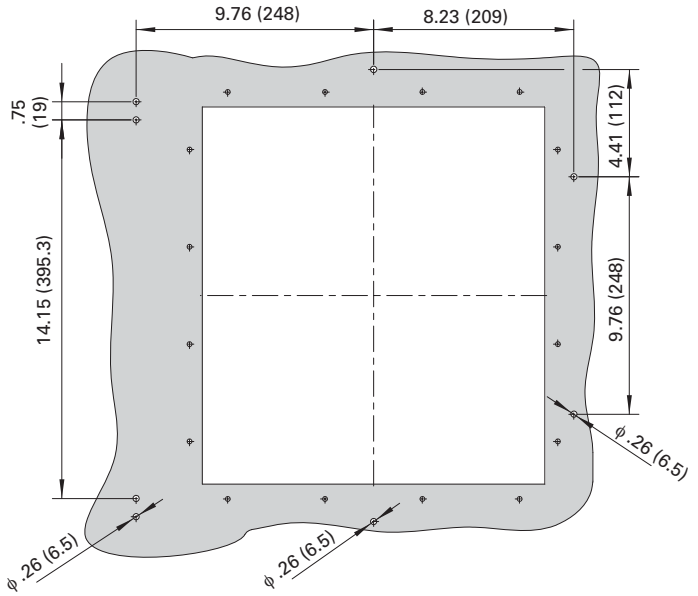



2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

## Series NRX RF frame - drawout front door cutout

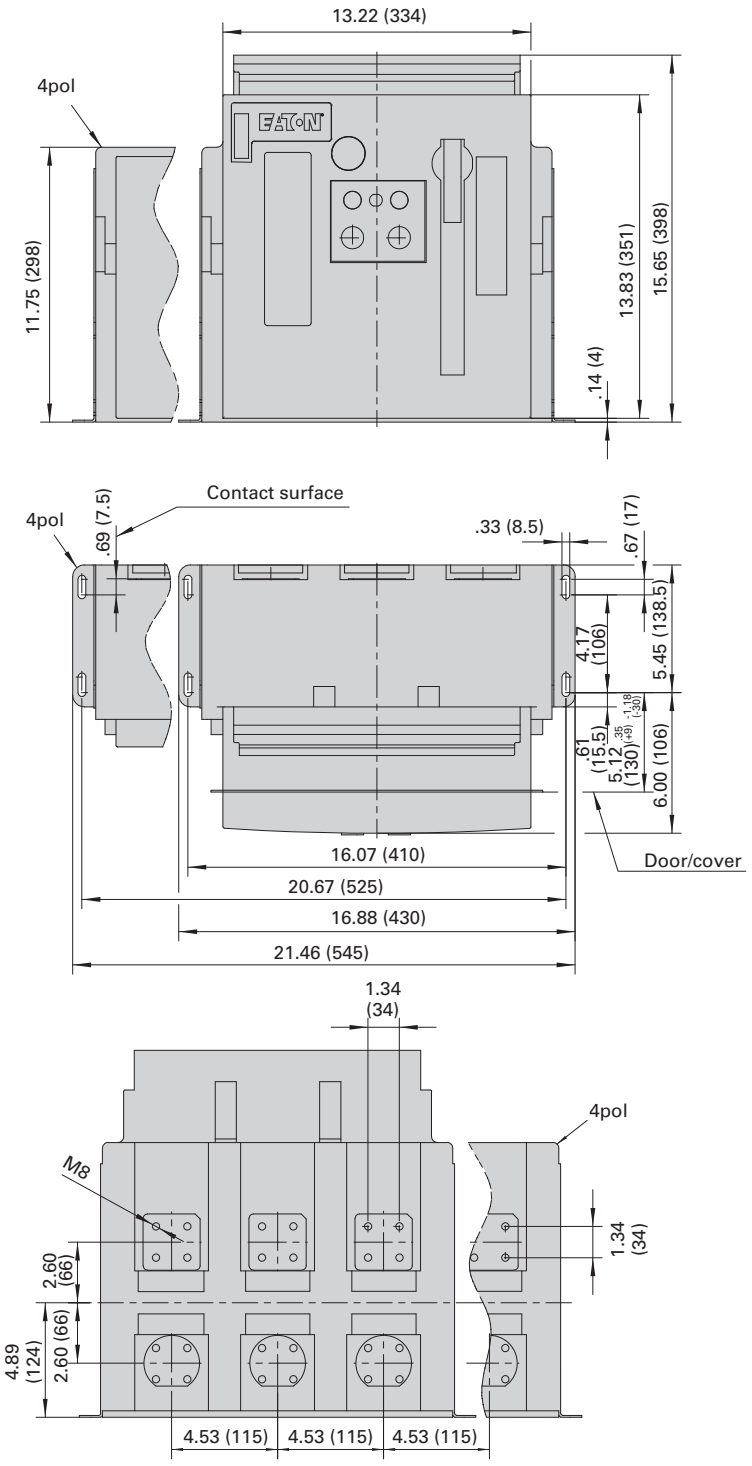



## Series NRX Type RF - drawout IP55 waterproof cover cutout



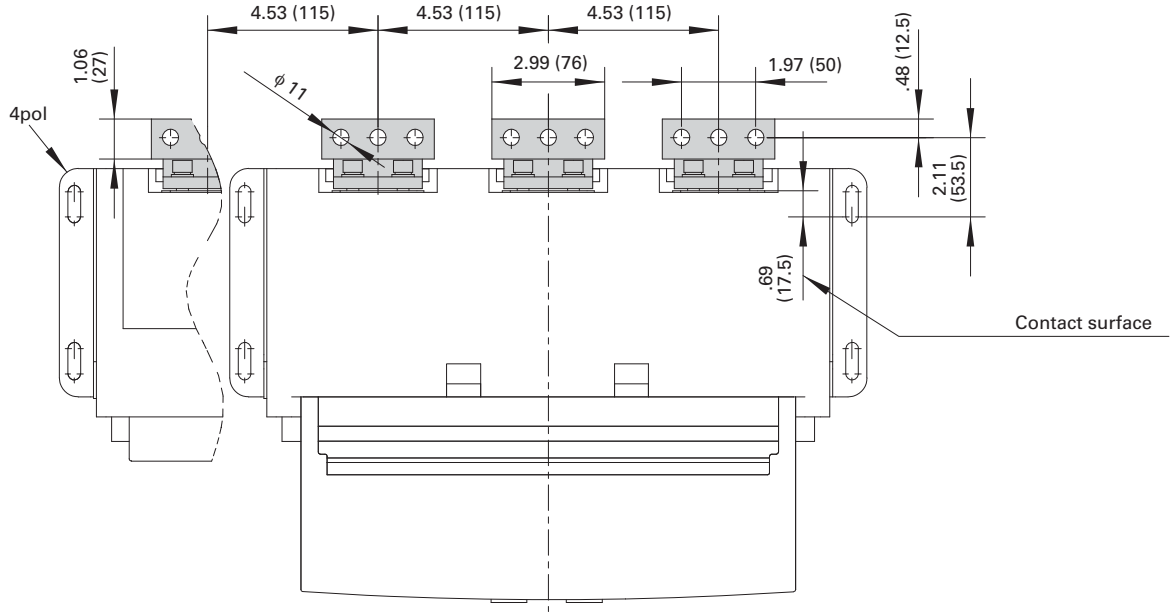

2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

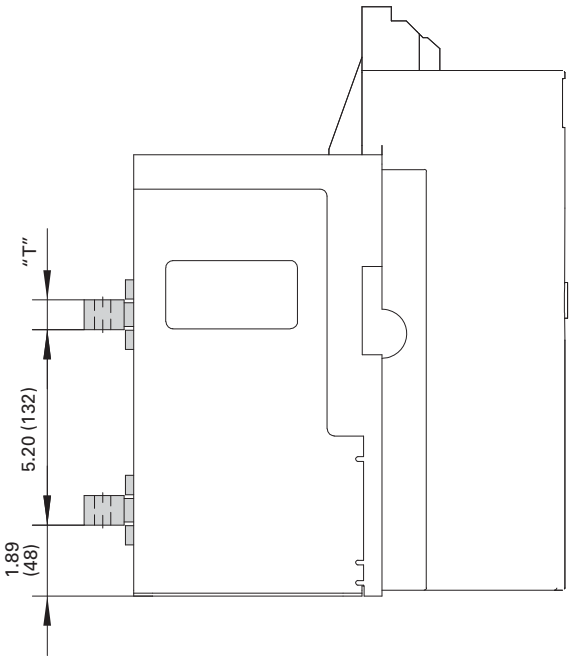
## Series NRX RF frame 3P/4P fixed - front, top and rear view




2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

## Series NRX RF frame 3P/4P fixed - with centered three-hole horizontal terminal adapters - top and side view

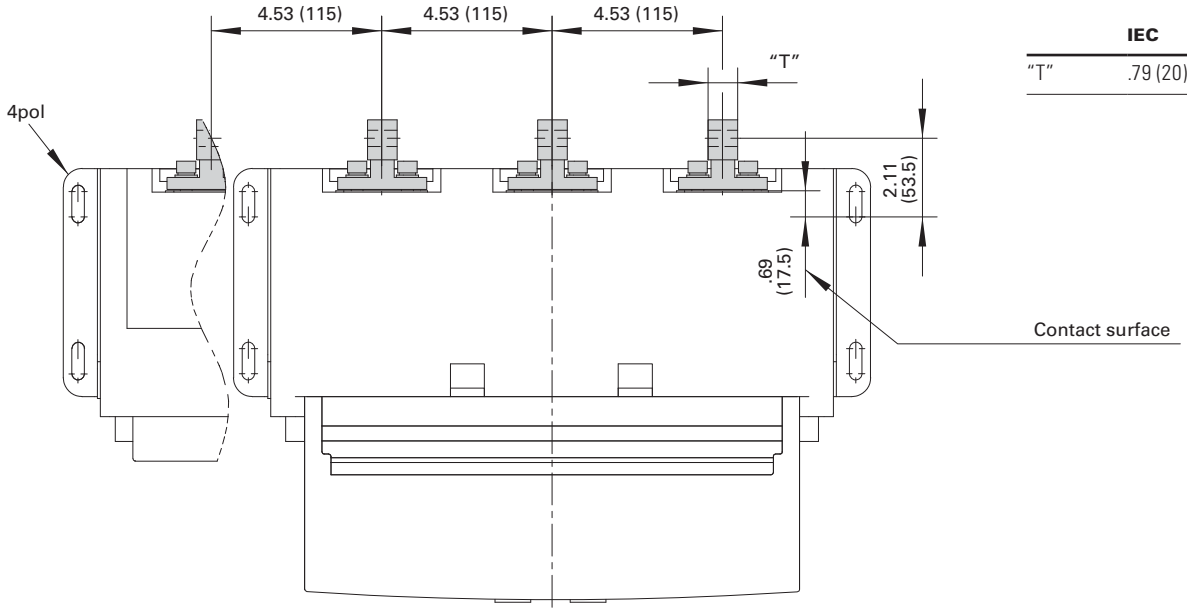


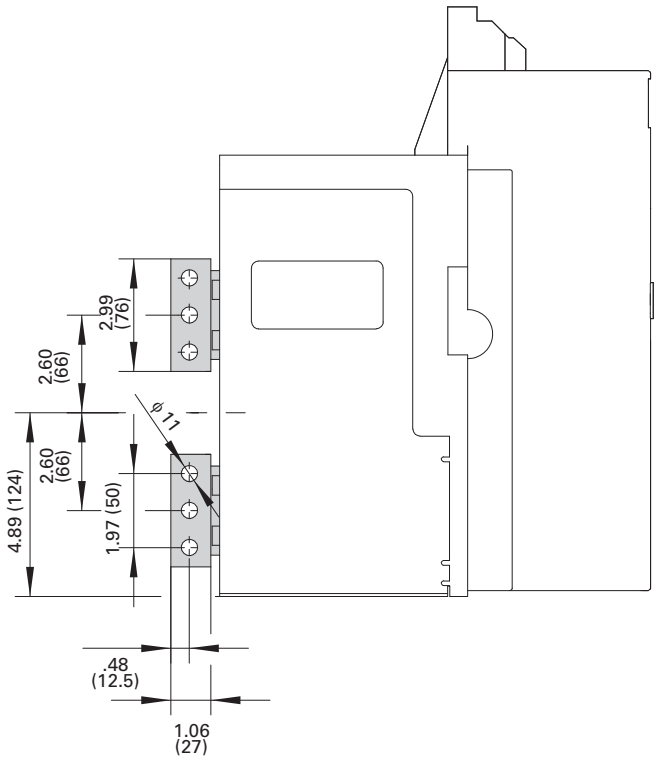

| | IEC | UL |
|---|---|---|
| "T" | .79 (20) | 0.75 (9) |

2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

## Series NRX RF frame 3P/4P fixed - with centered three-hole vertical terminal adapters - top and side view

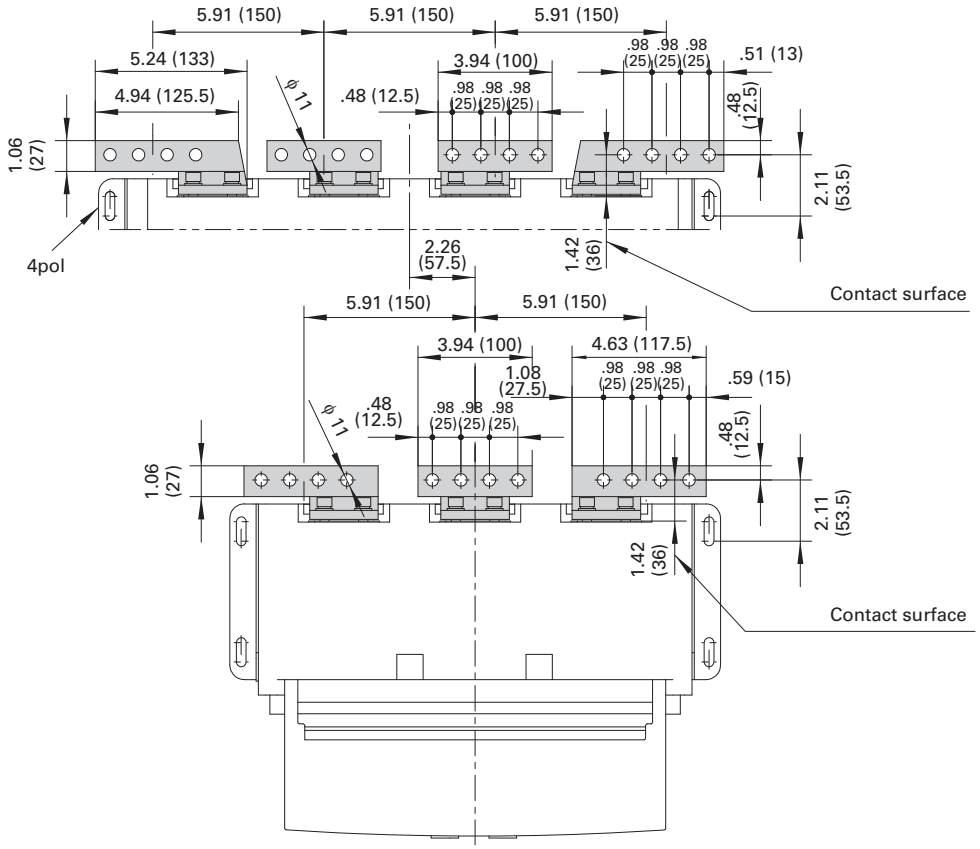


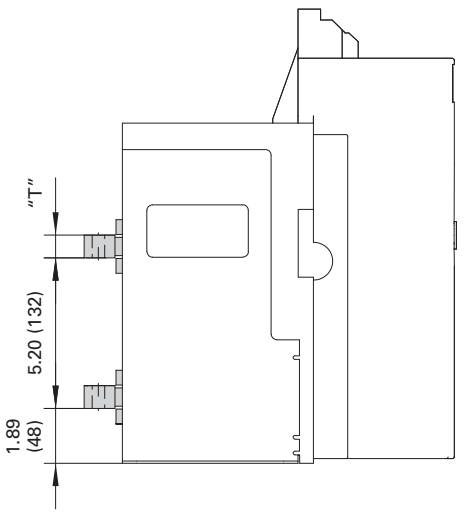

| | IEC | UL |
|---|---|---|
| "T" | .79 (20) | 0.75 (9) |




2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

## Series NRX RF frame 3P/4P fixed - with offset four-hole horizontal terminal adapters - top and side view

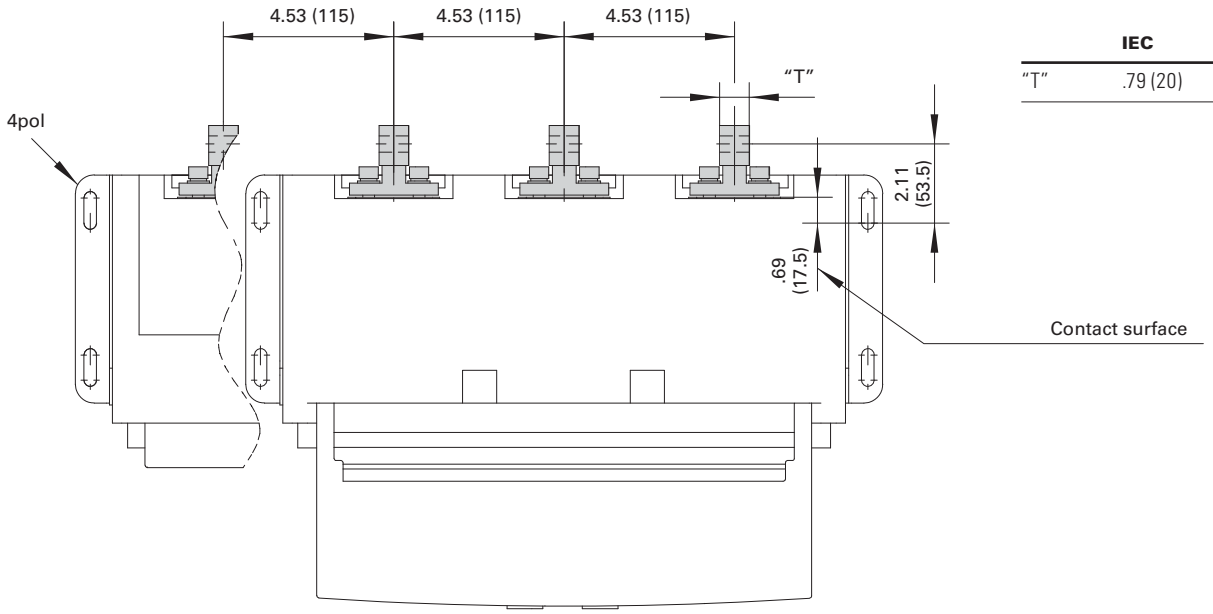


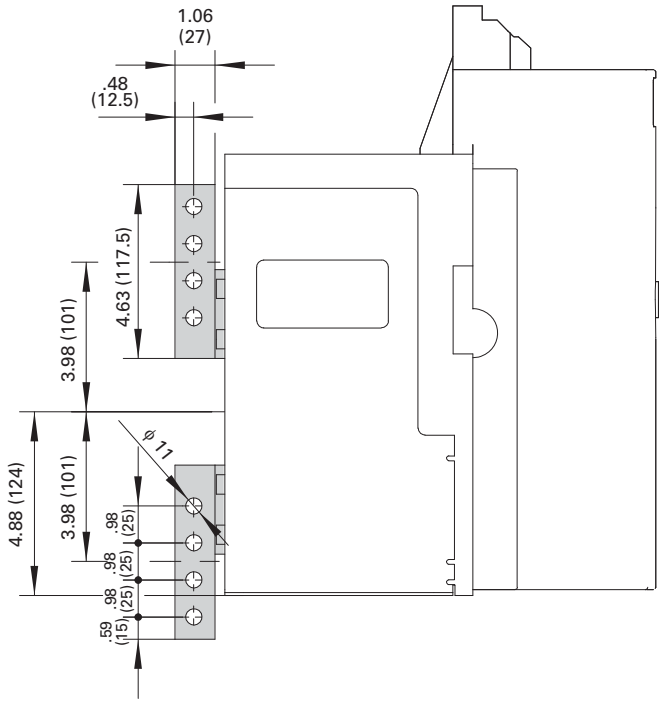

| | IEC | UL |
|---|---|---|
| "T" | .79 (20) | 0.75 (9) |

2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

## Series NRX RF frame 3P/4P fixed - with offset four-hole vertical terminal adapters - top and side view

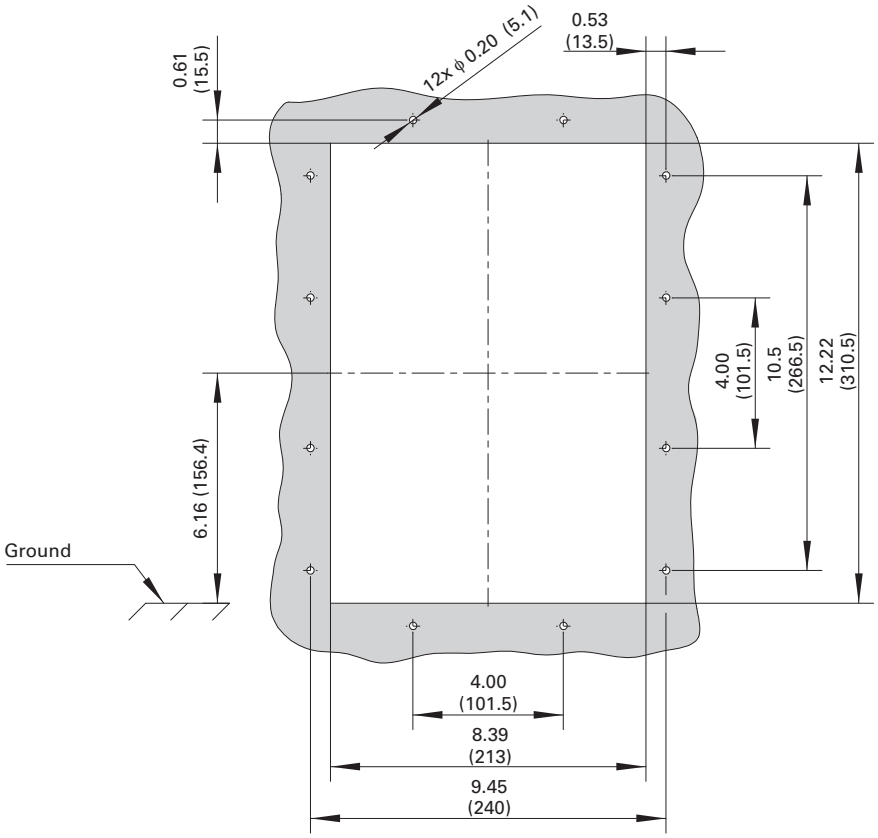


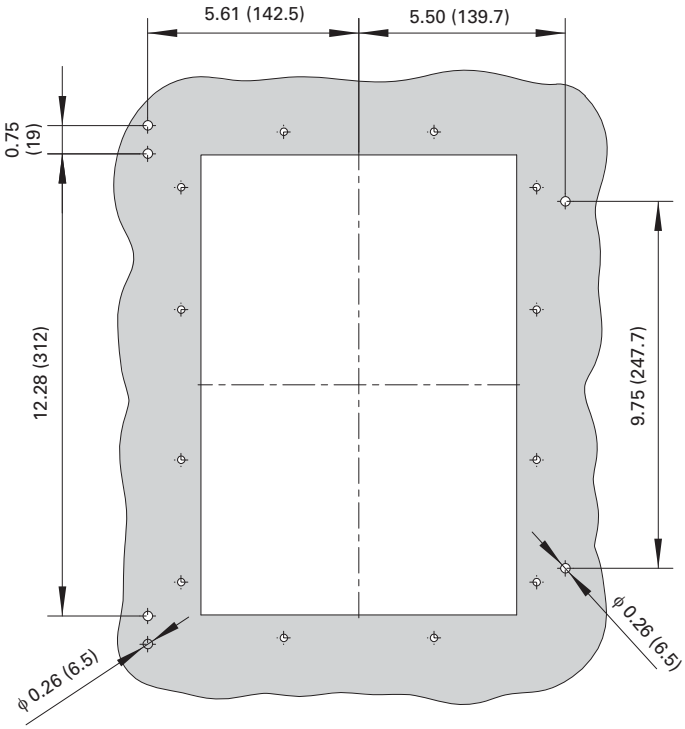

| | IEC | UL |
|---|---|---|
| "T" | .79 (20) | 0.75 (9) |




2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

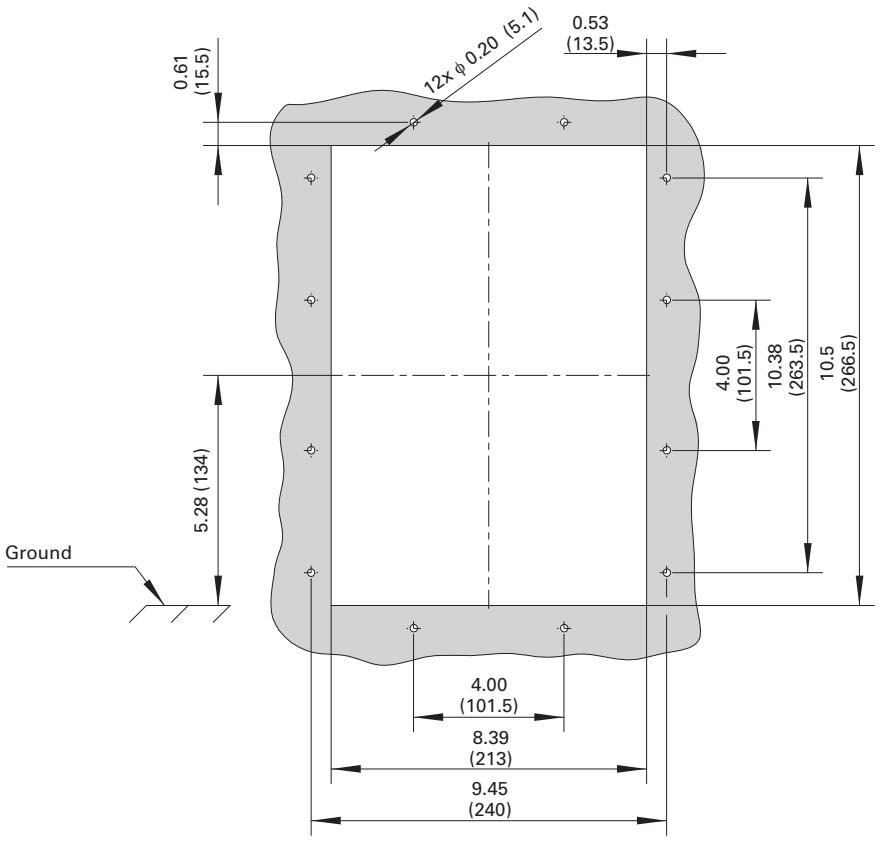
## Series NRX NF frame - drawout front door cutout (top drawing) / IP55 waterproof cover cutout (bottom drawing)

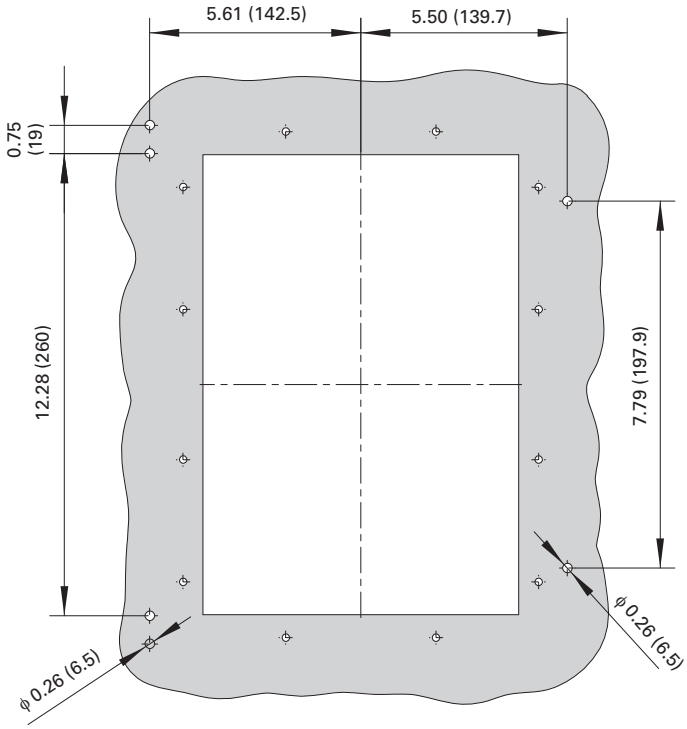



2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

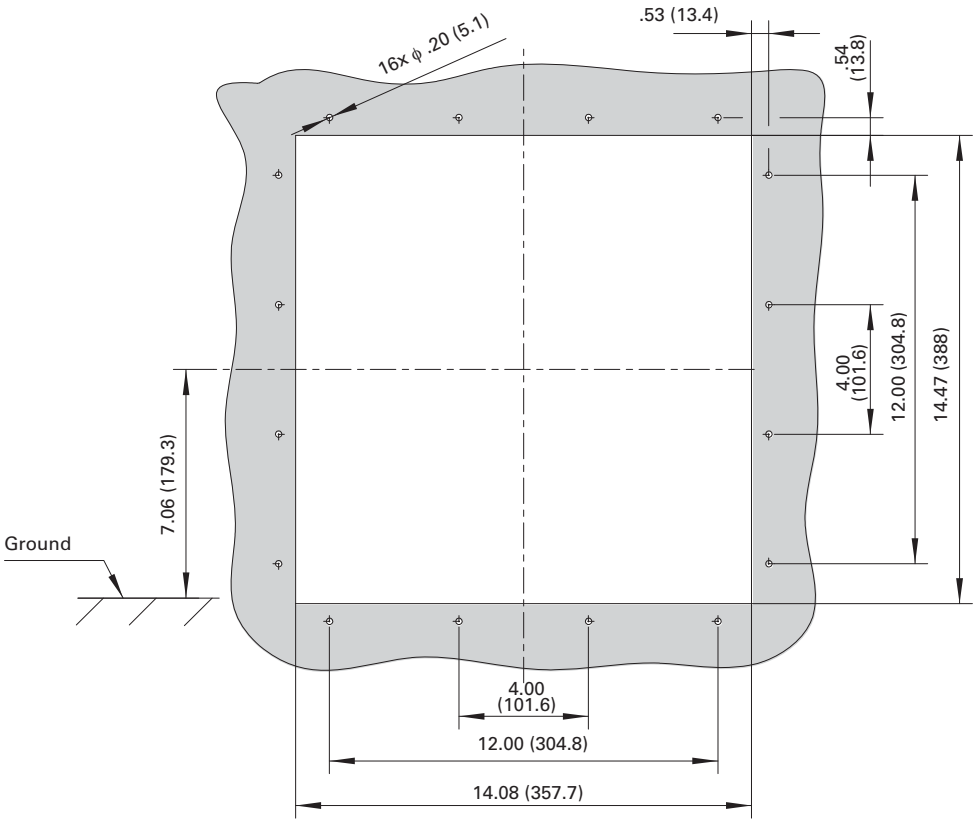
## Series NRX NF frame - fixed front door cutout (top drawing) / IP55 waterproof cover cutout (bottom drawing)



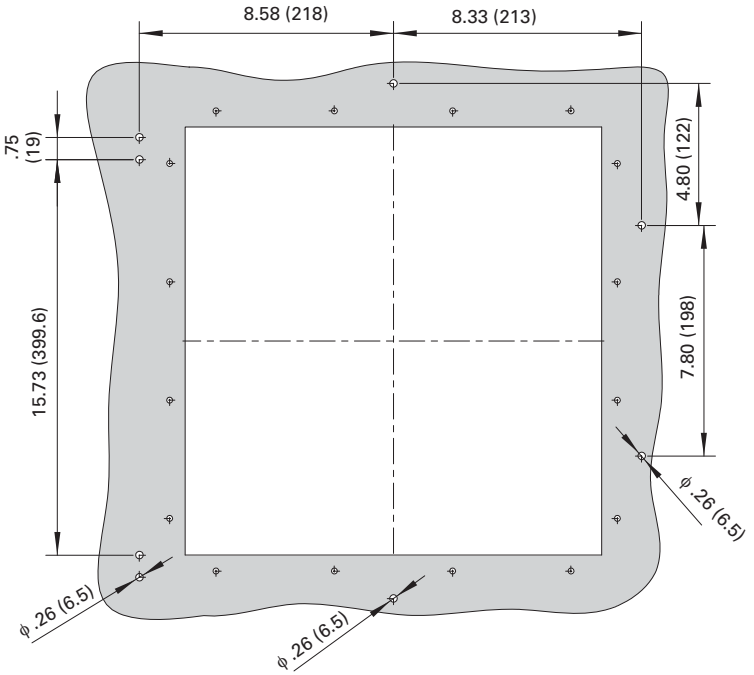




2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

## Series NRX RF frame - fixed front door cutout



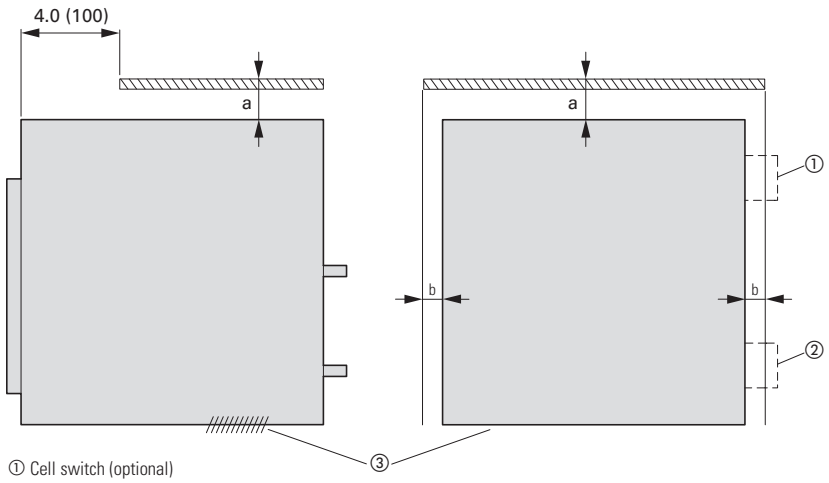

## Series NRX Type RF - fixed IP55 waterproof cover cutout




2D drawings and 3D STP drawings are available from www.eaton.com/SeriesNRX

## Recommended safety clearances

The following information about safety distances is intended to provide a guideline for the installation of circuit breakers in an enclosure.




① Cell switch (optional)
② Key lock (optional)
③ Ventilation openings (do not block!)

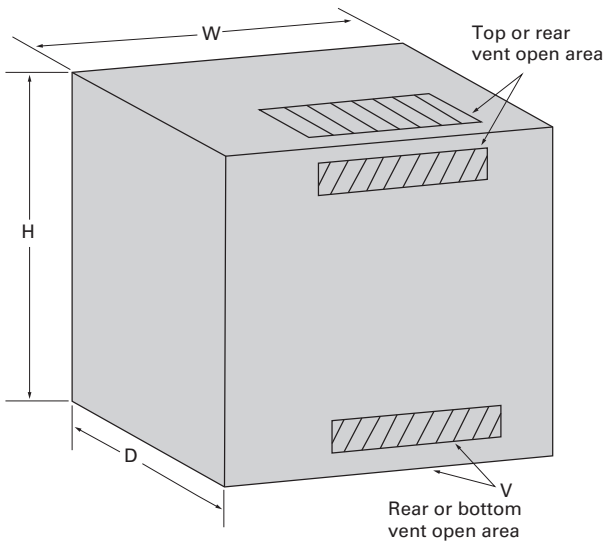
| | Enclosure clearance | To insulated surface | | To ground metal surface | | With cell switch / key lock | |
|---|---|---|---|---|---|---|---|
| | | In | mm | In | mm | In | mm |
| Drawout | a | 0 | 0 | 0 | 0 | 0 | 0 |
| | b | 1.0 | 25 | 1.0 | 25 | 1.0/2.9 | 25/75 |
| Fixed | a | 5.9 | 150 | 9.8 | 250 | – | – |
| | b | 1.2 | 30 | 2.8 | 70 | – | – |

## Recommended enclosure clearance and ventilation

The illustration shows a typical enclosure.

The table below lists the associated minimum distances between enclosures and ventilation openings.

This information is intended as a guideline for constructing a suitable circuit-breaker enclosure. Ensure that integration complies with applicable UL standards.




| | | | |
|---|---|---|---|
| **W** | **- Cassette width** | +3.0 in | +75 mm |
| **H** | **- Height** | 21.7 in | 550 mm |
| **D** | **- Front compartment depth** | 17.7 in | 450 mm |
| **V** | **Ventilation** | 25 $in^2$ | 160 $cm^2$ |

Eaton is a power management company with 2015 sales of $20.9 billion. Eaton provides energy-efficient solutions that help our customers effectively manage electrical, hydraulic and mechanical power more efficiently, safely and sustainably. Eaton has approximately 97,000 employees and sells products to customers in more than 175 countries.

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