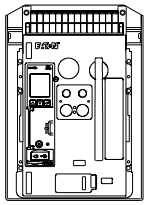
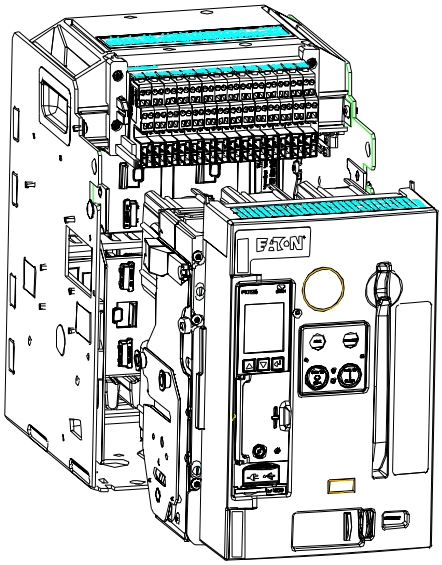
Series NRX with PXR – Type NF Low Voltage Power (Air) Circuit Breaker Instruction Manual

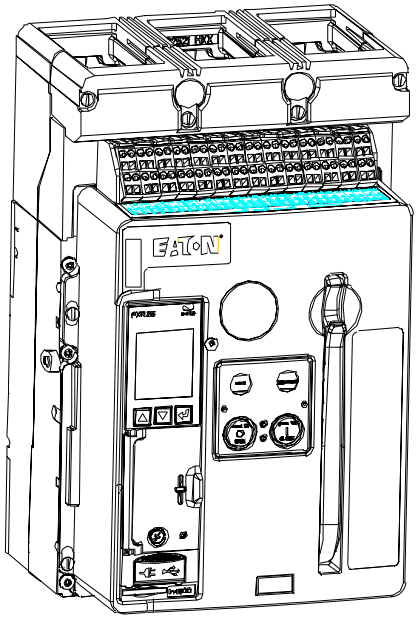
Instructions Apply to:



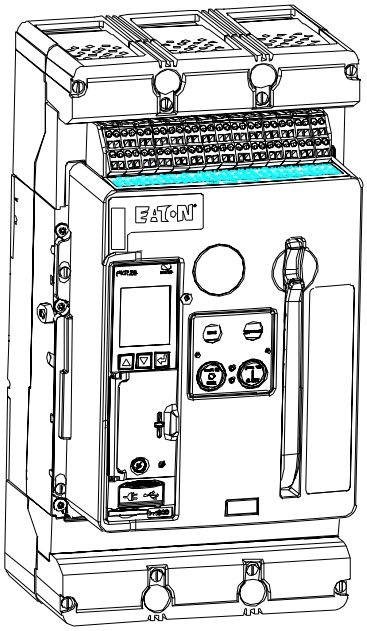
Type NF Frame Series NRX
ANSI, UL1066, UL489/IEC IZMX16



Typical Drawout Circuit Breaker and Cassette



Typical Fixed Circuit Breaker (Rear Connect)



Typical Fixed Circuit Breaker (Front Connect)

Powering Business Worldwide

Table of Contents

WARNING

The Warnings and Cautions included as part of the procedural steps in this manual are for personnel safety and protection of equipment from damage. This example of a typical Warning is intended to familiarize personnel with the style of presentation.

WARNING

Series NRX circuit breakers are provided with safety features. Nevertheless, the voltages, currents, and power levels available around operational equipment are extremely dangerous. Under no circumstances should interlocks and other safety features be made inoperative, as this may result in death, bodily injury, or property damage.

WARNING

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

WARNING

Never attempt to disable any interlocks. Doing so could result in an electrical fault that could result in death, bodily injury, and/or equipment damage.

WARNING

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

WARNING

Arc chutes and their cover plates must always be secured properly in place before a breaker is installed in its compartment. Failure to do so could result in equipment damage, bodily injury, or even death.

CAUTION

Do not attempt to lift a breaker or cassette with ordinary crane hooks or chains. Damage to vital circuit breaker parts could result. Use two appropriate lifting straps when using any type of lifting device.

CAUTION

Make certain that the cassette is properly mounted or seated securely on a work table before attempting to have the breaker fully extended on the cassette's drawout rails. Failure to comply could result in the cassette tipping forward resulting in equipment damage and/or bodily injury.

CAUTION

Do not store equipment on its back. This could result in equipment damage.

CAUTION

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

CAUTION

Inspection and maintenance procedures should be carried out only by personnel familiar with the hazards associated with working on power circuit breakers. Additionally, they should become familiar with the specifics associated with Series NRX circuit breakers as presented in this manual.

IMPORTANT

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

IMPORTANT

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

IMPORTANT

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

IMPORTANT

Different degrees of access to push-buttons on the front of the circuit breaker can be achieved through the use of optional accessory devices.

IMPORTANT

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

IMPORTANT

Fixed breakers have an arc hood positioned over the arc chutes/arc chambers that must be removed first. Refer to IL01301014E for installation and removal instructions. After the inspection, reinstall the arc hood.

Section 1: Introduction

Purpose

This instructional manual is intended to generally cover the installation, operation, and maintenance of Series NRX™ low voltage power (air) circuit breakers and drawout cassettes. Basic dimensional information is provided for the installation of both the circuit breaker and cassette.

Refer to other documentation for more specific details.

1. IL0131098EN – Operating Manual for Series NRX PXR 20/25 Trip Unit
2. AD013001EN – PXR 20/25 Time Current Curves
3. TD013001EN – Wiring Diagrams for PXR 20/25
4. Accessory field installation instruction leaflets (IL) dedicated to specific items are available for download at www.eaton.com/seriesnrx.
5. Visit www.eaton.com/seriesnrx for additional support documentation.

Safety

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

⚠ WARNING

The warnings and cautions included as part of the procedural steps in this manual are for personnel safety and protection of equipment from damage. This example of a typical warning is intended to familiarize personnel with the style of presentation.

⚠ IMPORTANT

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

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

⚠ WARNING

Series NRX circuit breakers are provided with safety features. Nevertheless, the voltages, currents, and power levels available around operational equipment are extremely dangerous. Under no circumstances should interlocks and other safety features be made inoperative, as this may result in death, bodily injury, or property damage.

Safe Practices

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

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

Qualified Personnel

For the purpose of operating and maintaining power circuit breakers, a person should not be considered qualified if the individual is not thoroughly trained in the operation of the circuit breaker and how it interfaces with the assembly in which it is used. In addition, the individual should have knowledge of the connected loads.

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

General Information

The Series NRX low voltage power (air) circuit breaker uses an electronic tripping system. It is designed, manufactured, and tested for use in both switchboard and metal-enclosed switchgear assemblies in keeping with UL® 1066/ANSI C3750, UL 489, and IEC 60947-2 requirements. The Series NRX circuit breakers are available in a variety of different connection and mounting possibilities.

Continuous current rating from 800 - 1600 A and interrupting capacities to 85 kA are available depending on the applicable standard. The circuit breaker nameplate provides complete rating information and should always be inspected to ensure the information shown is in keeping with the product ordered (Figure 1). All Series NRX circuit breakers are 100 percent rated except for UL 489 rated breakers. All are built and test in an ISO 9002 certified facility.

A series NRX non-automatic breaker is available in a fixed or drawout configuration, and designed in keeping with IEC 60947-2, UL 1066, and UL 489.

The fixed configuration is designed for front/rear bus connections. The drawout version, in conjunction with its drawout cassette, is a through-the-door design having three breaker positions with the compartment door closed (CONNECT, TEST, DISCONNECT) and one position out of its compartment on extension rails (WITHDRAWN).

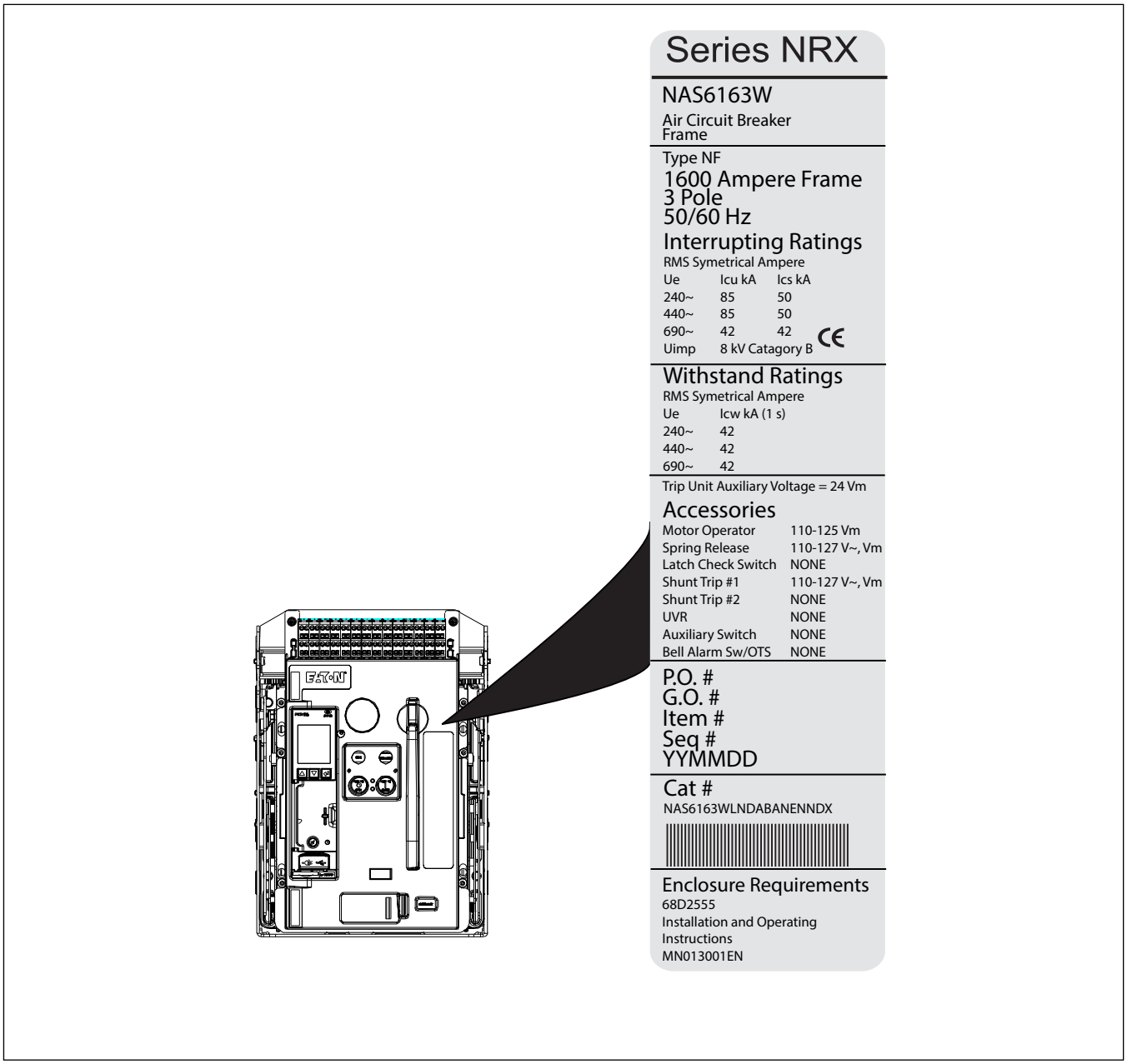
Product Labeling and Identification

The circuit breaker nameplate, located on the right side of the breaker, provides complete rating information and should always be inspected to ensure the information shown is in keeping with the product ordered (Figure 1). Become familiar with the nameplate.

WARNING

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

Figure 1. Series NRX Nameplate Location.



The circuit breaker can be identified by a 20-digit catalog number located on the name plate (Figure 2). The drawout cassette can be identified by a 14-digit catalog number (Figure 2a). An overview of the Catalog number code is provided for reference.

Figure 2. Series NRX with PXR Catalog Numbering System. (Continued on Next Page.)

	Basic Device Selection (Position 1-8)								Overcurrent Protection (Position 9-11)			Breaker Options (Position 12-20)								
Positions	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Example	N	A	S	6	1	6	3	W	L	N	D	A	B	A	N	4	X	N	D	X

Position 1	**Breaker Frame Size**
N	Type NF 630 to 1600 A
Position 2	**Standard, Mechanism, Device**
Q	UL 1066, Stored Energy, Power Breaker
Y	UL 489, Stored Energy, Insulated case Breaker
G	IEC 60947-2 Stored Energy, Air Breaker - Global
A	IEC 60947-2, Stored Energy, Air Breaker - China
Position 3, 4	**Fault Current Rating**
S4	42 kA at 480 Vac UL or 415 Vac IEC
S5	65 kA at 480 Vac UL or 415 Vac IEC
S6	65 kA at 480 UL or 415 Vac IEC
Position 5, 6	**Frame Rating (Amps)**
07	630 (UEC Only)
08	800
10	1000 (UEC Only)
13	1250 (UEC Only)
16	1600 (On NF: IEC Only)
Position 7	**Poles, Phasing**
3	3-Pole, ABC
4	4-Pole, NABC
Position 8	**Mounting Configuration**
W	Drawout
X	Drawout – Optimized primary disconnects
Z	Drawout , with 3 Form C Cell Switches
Y	Drawout – Optimized primary disconnects, with 3 Form C Cell Switches
B	Fixed Mount Rear Connect, Mounting Bracket, with Secondary Terminal
R	Fixed Mount Rear Connect, Surface Mount, with Secondary Terminal Row
T	Fixed Mount Front Connect, Surface Mount, Cable Connect, with Secondary Terminal Row
F	Fixed Mount Front Connect, Mounting Bracket, Bus Connect, with Secondary Terminal Row
S	Fixed Mount Front Connect, Surface Mount, Bus Connect, with Secondary Terminal Row

Position 9 & 10	**Electronic Trip Unit Selection**	**Protection**	**ZSI + COMM**	**ARMS**
No Protection - Switch Disconnector				
SW		None		
PXR20				
LN	High Load Alarm	LI	ZSI	--
LM	Instantaneous Override	LI	ZSI W/Modbus	--
2A	Breaker Health Summary	LSI	ZSI	--
2B	Standard CAM Connection	LSI	ZSI W/Modbus	--
2C	Optional Modbus RTU 50/60Hz	LSIG+A	ZSI	--
2D		LSIG+A	ZSI	--
2E		LSIG+A	ZSI	ARMS
2F		LSIG+A	ZSI W/Modbus	ARMS
PXR25				
2P	Advanced Protection	LSI	ZSI W/Modbus	--
2Q	Monitoring features	LSI	ZSI W/Modbus	ARMS
2R	CAM and Modbus RTU Standard	LSIG+A	ZSI W/Modbus	--
2S	50/60/400Hz capability	LSIG+A	ZSI W/Modbus	ARMS
2T		LSI	ZSI W/Modbus	--
2V		LSI	ZSI W/Modbus	ARMS
2W		LSIG+A	ZSI W/Modbus	--
2X		LSIG+A	ZSI W/Modbus	ARMS

(Continued on Next Page)

Figure 2. Series NRX with PXR Catalog Numbering System (Continued).

Position 11	In (Amps) – For PXR
1	200
2	250
3	300
4	400
5	500
6	600
7	630
8	800
A	1000
B	1200
C	1250
D	1600
Position 12	**Shunt Trip**
N	No Shunt Trip
A	110-127 Vac/dc
R	208-240 Vac/dc
L	24 Vdc
H	48 Vdc
S	60 Vdc
Position 13	**Motor Operator**
M	Manually Operated
B	110-127 Vac/dc
W	110 - 125 Vdc
T	208-250 Vac/dc
P	220 - 250 Vdc
L	24 Vdc
H	48 Vdc
S	60 Vdc

Position 14	Spring Release/Latch Check Switch (LCS)
N	No Spring Release, No LCS
A	110-127 Vac/dc, No LCS
B	110-127 Vac/dc, With LCS
C	110-127 Vac/dc, External LCS
R	208-240 Vac/dc, No LCS
S	208-240 Vac/dc, With LCS
T	208-240 Vac/dc, External LCS
L	24 Vdc, No LCS
P	24 Vdc, With LCS
Q	24 Vdc, External LCS
H	48 Vdc, No LCS
J	48 Vdc, With LCS
K	48 Vdc, External LCS
1	60 Vdc, No LCS
2	60 Vdc, With LCS
3	60 Vdc, External LCS
Position 15	**UVR, Second Shunt Trip**
N	None
A	110 - 125 Vac/dc, UVR
R	208 - 240 Vac/dc, UVR
L	24 Vdc UVR
H	48 Vdc UVR
S	60 Vdc UVR
1	110 - 127 Vac/dc, Second Shunt Trip
2	208 - 240 Vac/dc, Second Shunt Trip
4	24 Vdc Second Shunt Trip
8	48 Vdc Second Shunt Trip
9	60 Vdc Second Shunt Trip
Position 16	**Auxiliary Switches**
E	No Aux. Switches, No Label (Parent)
2	2 Form C, English
4	4 Form C, English
N	None

Figure 2. Series NRX with PXR Catalog Numbering System (Continued).

Position 17	Trip Indicator and Bell Alarm/OTS, Secondary Terminal Blocks
N	No Indicator, No OTS, Secondary Terminal Blocks Per Breaker Options
X	Trip Indicator Provided, No OTS, Secondary Terminal Blocks Per Breaker Options
Z	Trip Indicator Provided, 2 Form C OTS, Secondary Terminal Blocks Per Breaker Options
M	Interlocked Trip Indicator Provided, No OTS, Secondary Terminal Blocks Per Breaker Options
Y	Interlocked Trip Indicator Provided, 2 Form C OTS, Secondary Terminal Blocks Per Breaker Options
1	No Indicator, No OTS, Full Compliment of Secondary Terminal Blocks
2	Trip Indicator Provided, No OTS, Full Compliment of Secondary Terminal Blocks
3	Trip Indicator Provided, 2 Form C OTS, Full Compliment of Secondary Terminal Blocks
4	Interlocked Trip Indicator Provided, No OTS, Full Compliment of Secondary Terminal Blocks
5	Interlocked Trip Indicator Provided, 2 Form C OTS, Full Compliment of Secondary Terminal Blocks

Position 18	Padlocking	Operations Counter
N	No PB Covers	No Counter
A	No PB Covers	Counter Provided
B	PB Covers (Plastic/Plastic)	No Counter
J	PB Covers (Plastic/Plastic)	Counter Provided
K	PB Covers (Metal/Metal)	No Counter
L	PB Covers (Metal/Metal)	Counter Provided
5	PB Covers (Metal/Metal), Safe-Off	No Counter
6	PB Covers (Metal/Metal), Safe-Off	Counter Provided

Position 19	Drawout Breaker Shipping, Fixed Breaker Terminals, Door Frame Kit
D	Drawout (or Parent) Breaker Shipping Alone, Without Door Frame Kit, Without Terminals
C	Drawout Breaker in Cassette, No Shutters, No Terminals, With Door Frame Kit
K	Fixed Breaker Rear Connect, No Terminals, Not Mounting Foot, With Door Frame Kit
A	Fixed Breaker Rear Connect, Short Vertical/Horizontal Terminals, No Mounting Foot, With Door Frame Kit
B	Fixed Breaker Rear Connect, No Terminals, No Mounting Foot, With Door Frame Kit
E	Fixed Breaker Rear Connect, Long Vertical/Horizontal Terminals, No Mounting Foot, With Door Frame Kit
F	Fixed Breaker Rear Connect, With Short Vertical/Horrizontal Terminals, With Mounting Foot, With Door Frame Kit
H	Fixed Breaker Rear Connect, With Long Vertical/Horizontal Terminals, With Mounting Foot, With Door Frame Kit
1	Drawout Breaker in Cassette, No Shutters, Short Vertical/ Horizontal Terminals, With Door Frame Kit
2	Drawout Breaker in Cassette, No Shutters, Long Vertical/ Horizontal Terminals, With Door Frame Kit
4	Drawout Breaker in Cassette, Shutters, Short Vertical/ Horizontal Terminals, With Door Frame Kit
5	Drawout Breaker in Cassette, Shutters, Long Vertical/Horizontal Terminals, With Door Frame Kit
9	Drawout Breaker in Cassette, Shutters, No Terminals, With Door Frame Kit
Position 20	**Future Use**
X	All Product

Figure 2A. Series NRX Type RF - Frame Cassette Catalog Numbering System.

NF Cassette Catalog Numbering System

Positions	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Position 1-2	Cassette Family and Breaker Frame
NQ	UL 1066 N-Frame
NY	UL 489 N-Frame
NG	IEC 60947-2 N-Frame - Global
NA	IEC 60947-2 N-Frame - China
Position 3-4	**Continuous Ampere Range**
08	800 A (UL 1066)
12	800 - 1200 A (UL 489)
16	630 - 1600 A (IEC)
Position 5	**Poles, Phasing (Facing Front of Breaker)**
3	3-pole, ABC
4	4-pole, NABC
Position 6	**Load Terminal Connections**
F	With Flat Tapped Pads Only
G	With Vertical/Horizontal Bus Adaptor Kit (Short Style)
H	With Front Connected Kit
N	No Flat Tapped Pads or Cassette Stabs Inter Unit Only)
Position 7	**Arc Hood**
A	Arc Hood Installed (Default)

Position 8	Door Frame Gasket and Rejection Kits
B	Door Kit Included (Default)
Position 9	**TOC Switches (Truck Operated Cell)**
N	Not Included (Default)
Position 10	**Shutters**
N	Not Included (Default)
S	Included
Position 11	**Secondary Contact Terminals Installed**
N	None
F	Full Complement
B	Defined by Breaker
C	Common Options
Position 12	**Future Use**
N	None
Position 13	**Future Use**
N	None
Position 14	**Cassette Shipping**
C	Cassette Only
B	Breaker Shipped in Cassette

Breaker Overview

Figures 3 through 6 highlight the main components that make up a Series NRX breaker.

Drawout Breaker and Cassette

A drawout circuit breaker is used in combination with a drawout cassette (Figures 3 and 4). Mounted on the drawout breaker are the primary 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. For specific details and mounting instructions for primary adapters, refer to www.Eaton.com/seriesnrx.

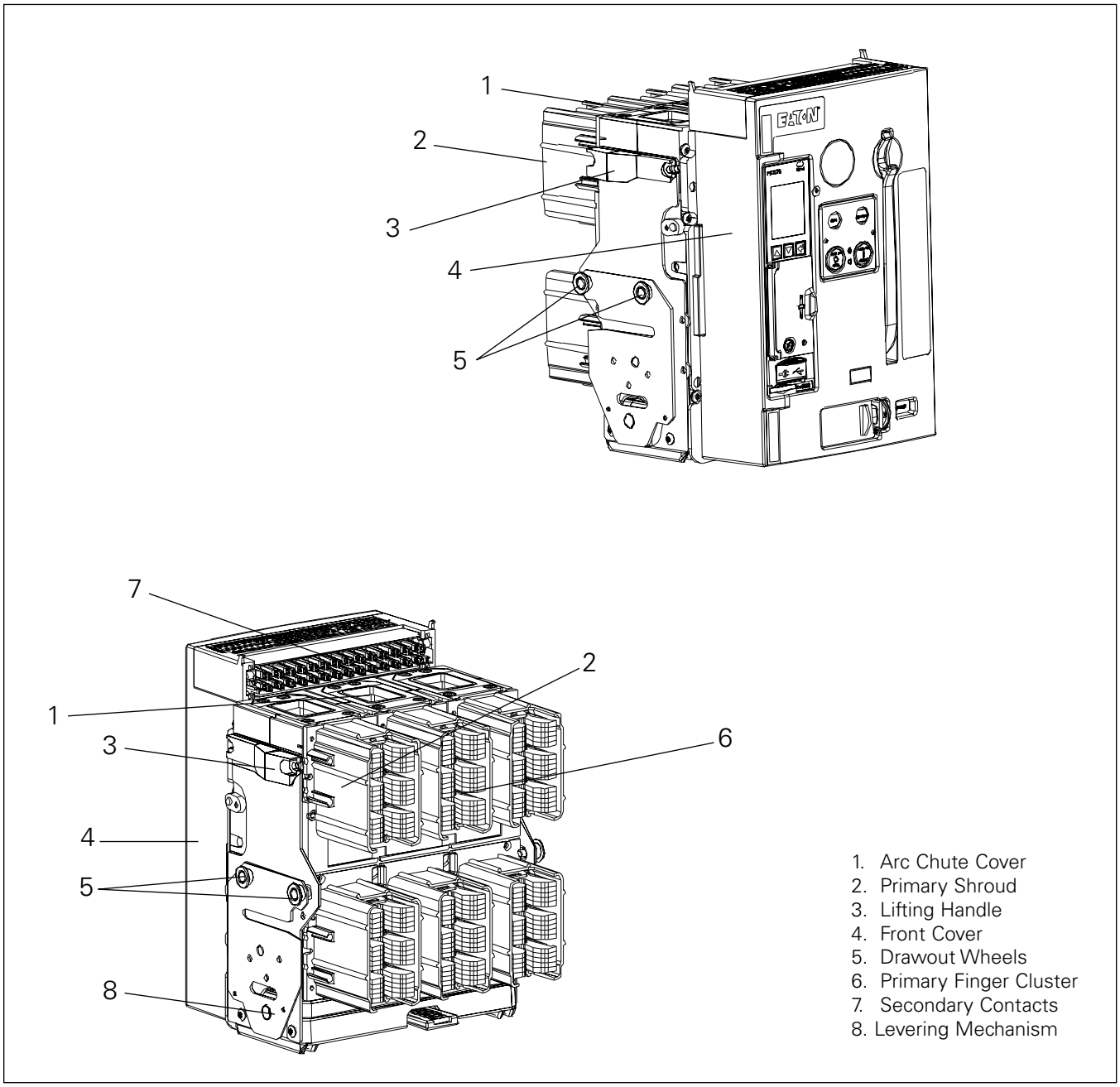
Refer to Section 5 for mounting and installation dimensional information. Electronic files of dimensional drawings for customer use are available for download at www.eaton.com/seriesnrx.

Fixed Circuit Breaker

A fixed circuit breaker is rigidly mounted in its structure with no drawout feature. The circuit breaker is available in front and rear-connected configurations (Figure 5).

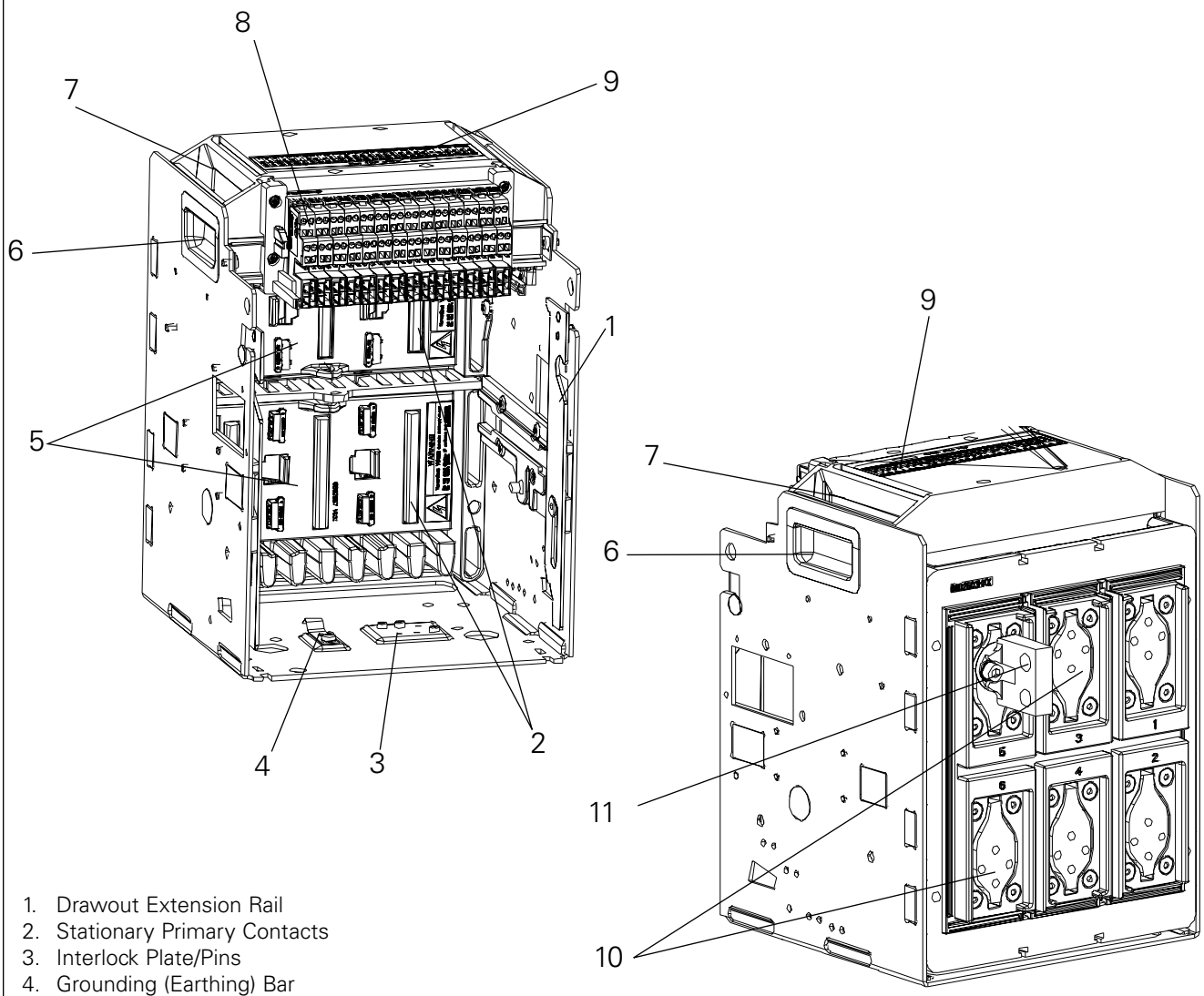
The breaker can be mounted on a suitable horizontal mounting surface using left and right-side mounting feet. A standard fixed circuit breaker is supplied with flat primary terminal pads on the rear of the breaker that will accommodate a variety of primary connection configurations.

Figure 3. Typical NRX Type NF Drawout Circuit Breaker (Front and Rear Views).



Note: Refer to Figure 6 for more visual details of front cover.

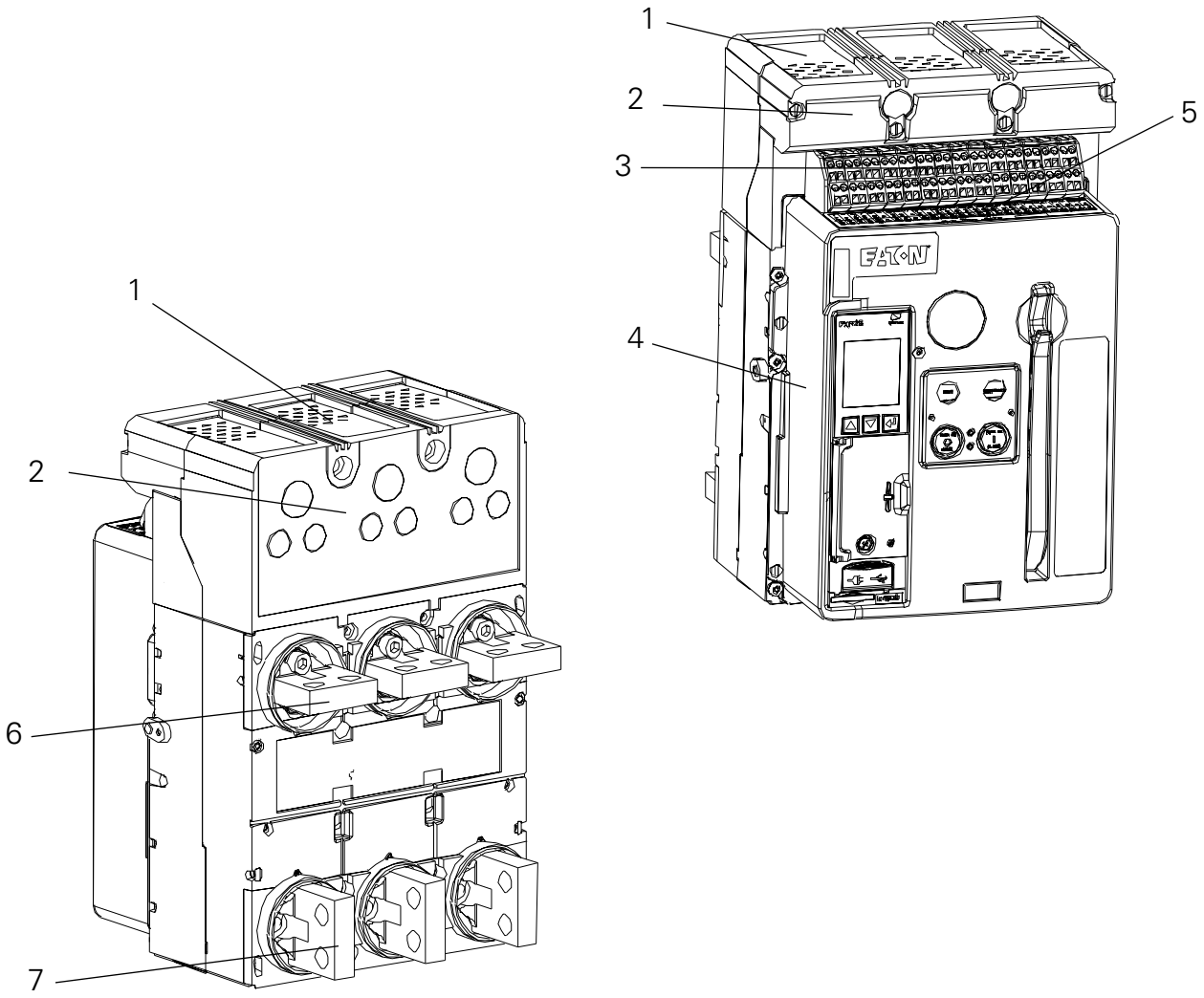
Figure 4. Typical NRX Type NF Drawout Cassette (Front and Rear Views).



1. Drawout Extension Rail
2. Stationary Primary Contacts
3. Interlock Plate/Pins
4. Grounding (Earthing) Bar
5. Safety Shutters (Open)
6. Hand Lifting Indentation
7. Gas Ventilation Opening
8. Secondary Connectors
9. Secondary Wiring Contact Points
10. Primary Terminal Pad
11. One Typical Rear Bus Adapter

Note: Refer to Figure 6 for more visual details of front cover.

Figure 5. Typical NRX Type NF Fixed Circuit Breaker (Rear Connected Type).



1. Arc Hood Baffle
2. Arc Hood
3. Secondary Contacts
4. Front Cover
5. Secondary Wiring Contact Points
6. Typical Rear Bus Adapter (Horizontally Mounted to Primary Terminal Pad)
7. Typical Rear Bus Adapter (Vertically Mounted to Primary Terminal Pad)

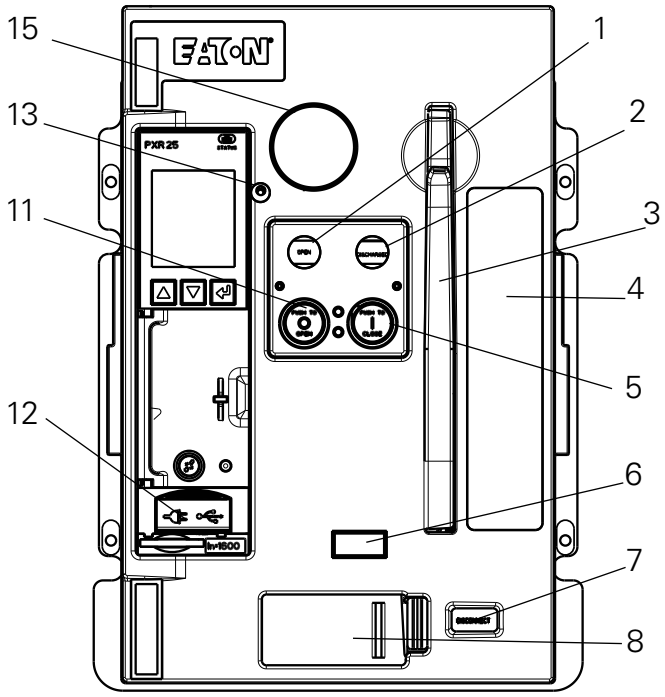
Note: Refer to Figure 6 for more visual details of front cover.

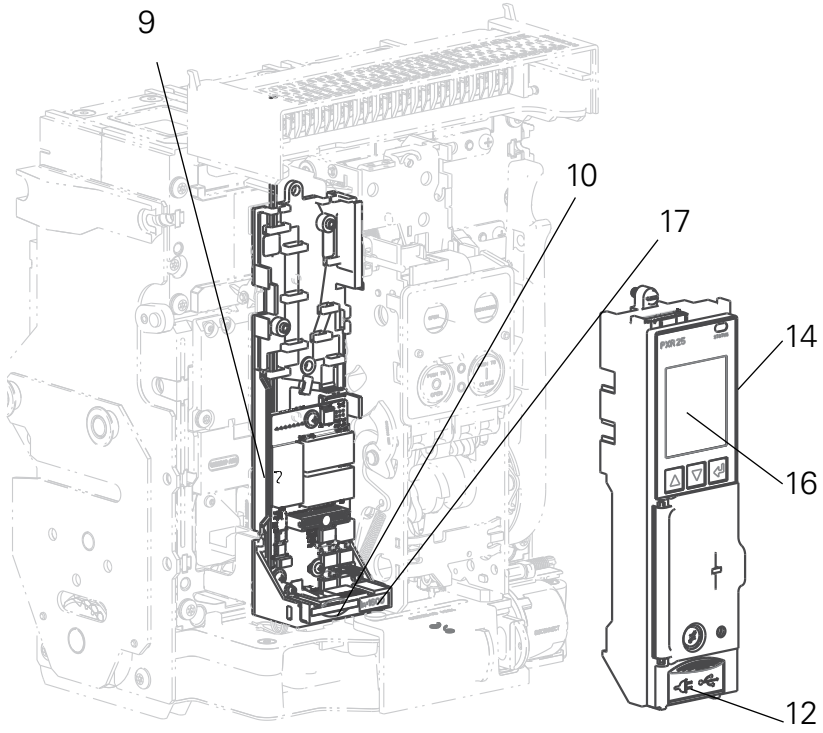
Figure 6. Typical NRX Type NF Drawout Circuit Breaker Front Cover.

1. Contact Status
2. Spring Status
3. Charging Handle
4. Nameplate
5. Manual ON
6. Operations Counter
7. Position Indicator
8. Levering Access Door
9. Frame Rating Module
10. FRM Battery Cover
11. Manual OFF
12. USB and Aux. Power Ports
13. Pop-out Trip Flag
14. Trip Unit
15. OFF Key Lock
16. I_n Rating - LCD Display on Trip Unit
17. I_n Rating - FRM Battery Cover

Note: The I_n Rating on the LCD and FRM Battery Cover should ALWAYS agree.

Note: Frame Rating Module should NOT be removed.





Section 2: Receiving, Handling, and Installation

Suggested Tools

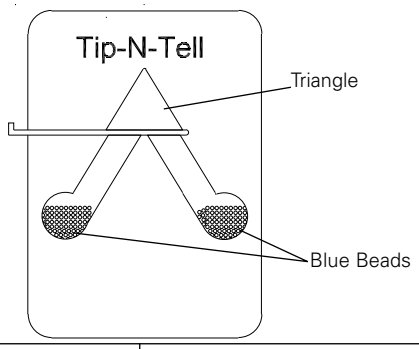
- Flat-blade and Phillips head screwdrivers
- 3/8-inch levering tool or extension/ratchet
- 3 mm Allen head screwdriver
- 1/2 inch socket and ratchet or 1/2 inch wrench

Circuit Breaker Unpacking and Inspection

Inspect the shipping container(s) for obvious signs of external damage. Record any observed damage for reporting to the transportation carrier and Eaton. All reports and claims should be as specific as possible and include the order number and other applicable nameplate information.

Note: The outside of the circuit breakers shipping container includes a transport "Tip-N-Tell" indicator alerting the receiver as to whether or not the shipping container was transported and handled in the required manner. Refer to Table 1 for details about the indicator before removing the circuit breaker from its container.

Table 1. Transport Indicator.

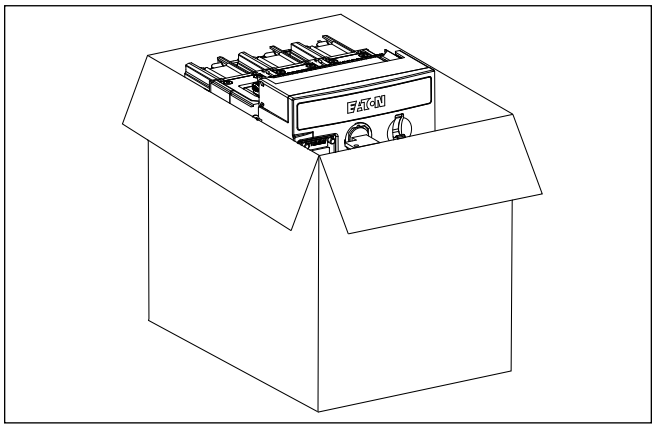


Triangle at top of indicator is partially full or totally full of blue beads. • Transport was not in keeping with instructions (breaker container was tilted or overturned). • Check breaker closely for damage.	Triangle at top of indicator has no blue beads in it. • Breaker container was not tilted or overturned during transport.

When ready to inspect and/or install a Series NRX circuit breaker, proceed with the following steps:

Step 1: Carefully open the container and remove all packing/shipping material and documentation.

Figure 7. Step 1.



Note: Also follow Step 1 when handling a separately shipped drawout cassette.

Step 2: Save all packing/shipping material and documentation for future shipments or breaker storage purposes.

Step 3: Move the breaker to a convenient place for closer examination. Drawout breakers are provided with a lifting handle on both sides to assist lifting. Repeat for a drawout cassette. The cassette is provided with a lifting indentation on each side.

Use an appropriate device to lift the breaker or cassette (Table 2). If one is not available, it is recommended that a minimum of two people be used to lift/move a breaker or cassette.

Note: Refer to Table 2 for additional precautions and lifting procedures.

Figure 8. Step 3.