POWER-ZONE® 4
Low Voltage Metal-Enclosed Drawout Switchgear with MASTERPACT® NW
Low Voltage Power Circuit Breakers

Class 6037

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SECTION 1—PRODUCT DESCRIPTION

Introduction

POWER-ZONE® 4 low voltage metal-enclosed drawout switchgear is designed to provide superior electrical distribution, protection, and power quality management for the entire facility. The prime component of the switchgear is the MASTERPACT® NW ANSI rated circuit breaker. POWER-ZONE 4 switchgear is designed to maximize the functionality of the MASTERPACT NW circuit breaker, which, in turn, delivers maximum uptime, system selectivity, ease of maintenance and circuit protection. All of this in the smallest footprint available for low voltage drawout switchgear.

Features and Benefits

- POWER-ZONE 4 is designed and built to ANSI® C37.20.1 and is listed to UL® 1558.
- MASTERPACT NW drawout low voltage power circuit breakers are designed and built to ANSI C37.13 and C37.16. Listed to UL1066.
- Short-circuit current rating up to 200 kA without fuses.
- High short-time withstand ratings up to 100 kA for 30 cycles.
- Family of field installable and upgradeable MICROLOGIC® trip units with optional POWERLOGIC® data communications features.
- Smallest equipment footprint available in this product class.
- Front access to control and communications wire connections.
- Bolted copper bus provided as standard (up to 5000 A maximum).
- Large rear cable compartment pull area allows maximum room for power cables.
- Bus provision for future equipment expansion.
- System designed for maximum uptime with low maintenance.
- Modular circuit breaker design for easy addition of control accessories.
POWER-ZONE® 4 Switchgear
Features and Benefits

Compartmentalization
Structures are compartmentalized and are built with barriers as required by ANSI C37.20.1. The structure has large conduit space within the main and feeder sections.

UL Listing
POWER-ZONE 4 switchgear is designed and engineered to comply with UL1558 requirements. MASTERPACT NW circuit breakers are UL1066 listed. A UL label can be affixed where UL coverage exists for all component material, parts, and devices in a switchgear section.

Functional Capacity
High current carrying capacity frame sizes and high withstand rating make the MASTERPACT NW circuit breaker ideal for application on today's high capacity distribution systems.

Maximum Uptime
Drawout construction allows quick and simple replacement of circuit breaker elements. If an emergency occurs, circuit breakers may be removed from low-priority circuits and re-installed to serve high-priority circuits.

Ease of Maintenance
MASTERPACT NW circuit breakers provide disconnecting and overload protection for the circuit it controls. Each is contained in an individual compartment and can be easily isolated from the energized circuit and withdrawn from the compartment for quick inspection, maintenance, or replacement. The entire switchgear or any other feeder circuits need not be shut down during this operation, thus minimizing production downtime.

Auxiliary Instrument Compartments
Optional control power transformers, meters, and other control devices can be mounted in the auxiliary instrument compartments. These compartments are furnished with hinged doors for easy access.

Secondary Horizontal and Vertical Wireways
The secondary wiring design allows for front access to circuit breaker control and communications wiring without removing the circuit breaker from its compartment. The vertical wireway is located on the right side of the circuit breaker for easy access and wiring installation. The horizontal wireway is located directly above the circuit breaker, providing direct access to control and communication terminations.

ANSI Interrupting and Short-Time (Withstand)
POWER-ZONE 4 switchgear with MASTERPACT NW circuit breakers has the highest interrupting and short-time (withstand) ratings for low voltage switchgear in the smallest physical size. The elimination of limiter fuses for high interrupting circuit breakers reduces space and cost. The ANSI rated circuit breaker’s improved coordination with downstream devices increase system uptime.

Through-the-Door Construction
MASTERPACT NW circuit breakers provide clear access to all circuit breaker controls, indicators, and trip unit functionality without opening the compartment door. Circuit breaker racking is also achieved with the compartment door closed.

Disconnecting Contacts
The main disconnecting contacts (power plug-on fingers) on the rear of the circuit breaker are spring loaded and self-aligning to ensure positive electrical contact when the circuit breaker is in the connected position. The secondary disconnecting contacts are located on the top front of the circuit breaker element and are used for connecting the accessories to the control power source, other control circuits, or communication circuits.
MICROLOGIC Enhanced Functionality

A new family of MICROLOGIC electronic and programmable trip units provide you with a choice of expanded information, power quality readings, and communication capabilities. MICROLOGIC trip units can be integrated into the optional POWERLOGIC system.

POWERLOGIC Monitoring System

POWER-ZONE 4 switchgear is available with the POWERLOGIC metering, data acquisition, and control system. The optional POWERLOGIC system is used in addition to, or in lieu of, the Type A, Type P, and Type H MICROLOGIC trip units for the MASTERPACT NW circuit breaker. POWERLOGIC functions are included in MICROLOGIC high-end trip units. Several highly accurate circuit monitors are available to work in conjunction with the POWERLOGIC System Manager Software to manage and control your electrical distribution system.

Equipment Standards

All POWER-ZONE 4 switchgear is 100% rated; assembled and tested in an ISO 9001 facility to applicable standards including:

<table>
<thead>
<tr>
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<tr>
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<td>Metal-enclosed low voltage circuit breaker switchgear</td>
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<td>ANSI C.37.51</td>
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<td>CAN/CSA C22.2 No. 31-M89</td>
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<td>Zone 4 seismic applications</td>
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<td>UL 1558</td>
<td>Switchgear assemblies</td>
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All MASTERPACT NW circuit breakers are 100% rated; assembled and tested in an ISO 9001 facility to applicable standards including:

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<td>ANSI C37.13</td>
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<td>Preferred rating, related requirement and application recommendations for low voltage power circuit breakers and ac power circuit breakers</td>
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<td>Trip devices for ac and general-purpose dc low voltage power circuit breakers</td>
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<td>ANSI C37.50</td>
<td>Testing of low voltage ac circuit breakers</td>
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Equipment Ratings

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<td>600 Vac Maximum</td>
<td>1600 A–5000 A</td>
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<tr>
<td>1Ø3W, 3Ø3W, 3Ø4W</td>
<td>(main circuit breaker or main lugs only)</td>
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<td>240 V</td>
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<tr>
<td>42 kA</td>
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<tr>
<td>65 kA</td>
<td>65 kA</td>
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<td>85 kA</td>
<td>85 kA</td>
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<tr>
<td>200 kA</td>
<td>200 kA</td>
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<td>100 kA (maximum)</td>
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SECTION 2—GENERAL AND APPLICATION INFORMATION

POWER-ZONE 4 switchgear with MASTERPACT NW circuit breakers provide the necessary switchgear solutions in an industrial environment. The switchgear is designed for ease of use, system selectivity, system uptime, and low maintenance. The switchgear is easy to operate and maintain because of the technological advances in communications, power quality monitoring, and measuring capabilities.

The switchgear with drawout MASTERPACT NW circuit breakers provide overload, short-circuit, and ground fault protection for circuits up to 600 volts. All trip unit and circuit breaker functions are operational from the front without opening the circuit breaker compartment door. MASTERPACT NW circuit breakers carry the highest interruption ratings without fuses and require minimal space.

All MASTERPACT NW circuit breakers can be equipped with MICROLOGIC electronic and programmable trip units to provide you with a choice of expanded information, power quality measurement, protection, and communication capabilities. Additionally, the optional high-end MICROLOGIC trip units are compatible with the optional POWERLOGIC system.

The optional POWERLOGIC data communications system can be used in lieu of or in addition to MICROLOGIC trip units. The POWERLOGIC system uses highly accurate circuit monitors that work in conjunction with its System Manager Software to manage and control your electrical distribution system.

POWER-ZONE 4 switchgear is commonly found as the electrical service in the following applications:

- Chemical Refinery
- Manufacturing
- Heavy Assembly Plants
- Large Warehouses
- Semi-conductor Manufacturing
- Textile Mills
- Large Office Buildings
- University Facilities
- Airports
- Water Treatment Facilities

Structure

The switchgear assembly is composed of vertical sections arranged according to customer requirements. Each section is divided into a maximum of four compartments. One or more of these compartments can be used as an auxiliary instrument compartment containing potential transformers, meters, relays, and control devices.

A horizontal secondary wireway, containing the accessory terminal blocks is directly above each circuit breaker. A spacious vertical wireway is on the right side of each circuit breaker compartment that allows wire routing through the switchgear.
POWER-ZONE® 4 Switchgear

The examples below depict a typical POWER-ZONE 4 switchgear assembly.

POWER-ZONE 4 switchgear offers compartmentalized construction. Each vertical section consists of three compartments: a front compartment (including secondary wireway), a bus compartment, and a rear cable compartment. The front compartment is divided into a maximum of four compartments that can contain MASTERPACT NW circuit breakers or auxiliary equipment. If desired, all compartments may be used for auxiliary equipment, circuit breakers, or a combination. The circuit breaker is positioned to allow ample room for control and communications wiring. Hinged doors on the auxiliary instrument compartment are available for mounting meters, relays, or other control equipment when it does not contain a circuit breaker. A circuit monitor display may be mounted on the hinged door of a compartment containing a main circuit breaker.
Enclosures

NEMA Type 1 Indoor Enclosures

The standard POWER-ZONE 4 switchgear enclosure is NEMA Type 1, general purpose. NEMA Type 1 enclosures are dead front, metal-enclosed structures. All sheet steel parts of the enclosure, inside and out, are painted using an electro-deposition process.

Standard Features:

- Secondary wiring areas
- Removable, steel top plates over conduit entrance
- Hinged front doors with latches
- Circuit breaker or instrument compartment
- Bus compartment
- Cable compartment
- Capability for future expansion
- Two piece removable side and back plates
- 1 1/2-inch high base channels
- Electro-deposition paint process on structural parts
- ANSI #49 paint color
- Customer nameplates for each compartment

Available Options:

- Vertical bus barriers
- Strip heaters in circuit breaker, bus, and cable compartments
- Overhead circuit breaker lifting device or floor crane
- Gasketing around doors and between sections
- Filtering of doors and vents
- Lockable hinged rear doors
- Lockable front hinged doors
- 18-inch high pull box
- Bottom plates
- Rodent barriers
POWER-ZONE® 4 Switchgear
Enclosures

POWER-ZONE 4 switchgear is also available in a NEMA Type 3R walk-in POWER ZONE center enclosure for outdoor installation. A non-walk-in NEMA Type 3R enclosure is also available.

NEMA Type 3R Non-Walk-In Enclosures

Standard Features:
- Strip heaters in circuit breaker and bus compartments
- Front and rear lockable equipment doors with three point latching and filtered openings for ventilation
- Removable gasketed steel cover plates over conduit entrance
- Angled roof to deter water buildup

Available Options:
- Overhead circuit breaker lifting device or mobile floor crane to handle circuit breaker
- Top entry/exit for incoming and outgoing cables
- Capability for future expansion
- Interior and exterior lighting and convenience outlets

POWER ZONE Center, NEMA Type 3R, Non Walk-In Outdoor Enclosure

NEMA Type 3R Walk-In Enclosures

Standard Features:
- Front aisle with steel entrance door equipped with panic hardware
- Lockable hinged rear doors
- Interior fluorescent lighting
- Three-way light switch and convenience outlets near the entrance door
- Strip heaters in circuit breaker and bus compartments
- Overhead circuit breaker lifting device (traveling lifter assembly)
- Removable gasketed steel cover plates over conduit entrance
- One-piece construction for ease of installation
- Inside emergency lighting
- Wall-mounted ac distribution panel
- Top entry/exit for incoming and outgoing cables

POWER ZONE Center, NEMA Type 3R, Walk-In Outdoor Enclosure

Available Options:
- Extended aisle for additional work space
- Exhaust fan ventilation/inside temperature control
- Exterior lighting

NOTE: NEMA Types 4, 4X, 7, and 9 are also available.
Control and Communications Wiring

Control and communication wiring is installed and connected from the front of the switchgear. The secondary wiring design allows for circuit breaker compartment wiring without removing the circuit breaker from its compartment.

Control Conduit Entrances

The control wiring conduit entrance is in both the top and bottom of each section for maximum flexibility.

A removable top plate (4-inch by 5-inch) can be punched easily; up to four individual 3/4-inch control conduits per section.

Two bottom conduit entrances in each circuit breaker compartment permit cables to exit through the bottom of the compartment.

Horizontal Wireway

The secondary horizontal wireway (see page 16) is directly above each circuit breaker compartment, allowing easy access to finger-safe secondary terminals. Each secondary terminal is dedicated to a specific function, allowing standardized wiring.

The secondary disconnecting contacts are on the top front of the circuit breaker element and connect the accessories to the control power source or other control circuits. These contacts are in the connected position when the circuit breaker is in the connect and test positions.

Vertical Wireway

The vertical wireway is on the right side of the circuit breaker for quick and easy wiring installation.

Control and Communications Terminals

All accessory terminals are on a connecting block on the top front of the circuit breaker cradle and are accessible from the front, even with the circuit breaker in the test or disconnect position. This is particularly useful for field inspection and modification. The field-installable electrical accessories are UL Listed.
Secondary Wiring System

**Standard Features:**

- Control wires in wiring trough above the circuit breaker compartment
- Originates directly from the circuit breaker without the use of an intermediate terminal block for factory and customer wiring
- Snap-in wire tie provisions
- Cage clamp terminal blocks locked directly on the circuit breaker cradle
- Control wiring AWG #14 SIS
- Metering CT wiring AWG #10 SIS
- Locking pull apart terminal blocks at shipping splits
- Sleeve type “destination” wire markings
- Grommeted holes between circuit breaker compartments

**Available Options:**

- Ring tongue control wiring
- Communications wiring AWG #22 shielded
Rear Cable Compartment

The rear cable compartment is behind the bus compartment. It provides room for rear access cable installation. Silver plated copper load bars extend from the load side of the circuit breaker stationary connecting contacts into the cable compartment. Cable terminations on the load bars permit cables to exit through either the top or bottom of the vertical sections.

Standard Features:
- Mechanical lugs provided for customer connections
- Largest conduit area in this product class
- Two-piece removable rear covers (not shown)
- 3/0–750 kcmil lugs

Available Options:
- Anderson® compression lugs
- Cable supports
- Hinged full height rear door with padlock provisions
- Load connection to I-LINE® busway
- 18-inch pull box

Mechanical Lugs

Mechanical cable lugs are standard for customer cable connections. Optional compression lugs are available with POWER-ZONE 4 switchgear. Optional cable supports (not shown) provide additional assistance in customer wiring.
Bus Compartment

The bus compartment contains the horizontal and vertical bus, and is between the circuit breaker compartment and the cable compartment. The bus compartment is separated from the circuit breaker compartment with grounded steel barriers. The optional side and rear barriers isolate the bus compartment from the rear cable compartment. In addition, service entrance barriers provide isolation around the incoming lines to meet UL and NEC requirements. Optional insulated bus aids in protecting the bus in harsh environments.

On four-wire systems, a neutral bus extends the length of the line-up and includes taps for the neutral cables in each vertical section. Feeder circuit breaker neutral sensors (current transformers) are provided on these taps when ground fault protection is supplied. A removable link to the ground bus is furnished, but not connected in the main vertical section for grounded, four-wire systems. The ground bus is a plated copper bus bar and is bolted to the rear bottom of the cable compartment and extends the entire length of the switchgear.

All bus joints use a minimum of two grade-5 bolts and are secured with conical-type spring washers for maximum joint integrity. Bus sizing is based on ANSI/IEEE C37.20.1 continuous current test criteria. Standard bus is plated copper and is fully rated. All vertical and cross bus ratings in POWER-ZONE 4 switchgear are based on a standard temperature rise of 149 °F (65 °C) above a maximum ambient air temperature of 104 °F (40 °C).

**Standard Features:**
- Silver plated copper bus bars
- Up to 5000 A continuous, 100% rated
- All bus bars are sized for full system capacity
- Minimum of two grade-5 bolt conical washer joints
- Sleeve type insulated runbacks

**Available Options:**
- Bus compartment barriers
- Side barriers in cable compartment
- Neutral bus center for easy terminations
- Tin plated copper bus
- Bus sized to 1,000 amps/in²
- Full insulated bus-sleeve type insulated with boots over joints
Auxiliary Instrument Compartments

Auxiliary instrument compartments are the same size as circuit breaker compartments. Typical auxiliary instrument compartments contain control power transformers, control components, meters, relays, and other optional devices. Circuit monitor displays and other metering devices can be mounted on the door.

![Typical Auxiliary Instrument Compartment](image)

Auxiliary Sections

Optional, full-height, auxiliary sections with hinged front doors are available that can be bolted to feeder and main switchgear sections. In addition, auxiliary sections can be provided with through bus as needed.

Key Locks and Padlocks

Optional key locks and padlocks can be provided for the door latches on circuit breaker compartments, auxiliary instrument compartments, auxiliary sections, and the rear doors on switchgear sections.

Moving and Handling Options

POWER-ZONE 4 switchgear enclosures are designed to withstand the rigors of lifting, handling, shipping, and setting into place; either as a single unit or as multiple units assembled together within a shipping group. Maximum sizes are determined by shipping dimensions required for transportation on common carrier trucks and movement through standard equipment location openings (door and portals).
POWER-ZONE® 4 Switchgear
Moving and Handling Options

Lifter Bar

The circuit breaker lifter bar is used with both 3-pole and 6-pole MASTERPACT NW circuit breakers. The size of the circuit breaker determines whether the inside or outside notches on the lifter bar will be used.

Adjustable Circuit Breaker Lifter Bar

Traveling Lifter Assembly

A rail-mounted traveling type circuit breaker lifting device is optionally available with indoor type switchgear. The lifting device is available on enclosures with drip hoods and is capable of lifting MASTERPACT NW circuit breakers into and out of any compartment. The circuit breaker is raised or lowered by manually cranking the hoisting mechanism. The traveling lifter assembly is supplied with outdoor walk-in enclosures.

Rail-mounted Circuit Breaker Lifting Device

Floor Crane

In addition, a floor crane can be used with the lifter bar to move a MASTERPACT NW circuit breaker into a dedicated work area.

MASTERPACT NW Circuit Breakers

The primary component of the POWER-ZONE 4 switchgear is the MASTERPACT NW circuit breaker. The drawout circuit breaker design allows easy access to circuit breaker controls, indicators, and the trip unit without opening the circuit breaker compartment door.

MASTERPACT NW circuit breaker features and benefits:

- Through-the-door construction with front-accessible key interlocks, buttons, and indicators
- Individually-mounted, ANSI rated four position, low voltage power circuit breaker
- Up to 200 kA interrupting rating without fuses
- 100% rated, two-step stored energy mechanism
- 800 A–5000 A frame
- Field-installable MICROLOGIC trip units with optional POWERLOGIC communications and monitoring features
- Enhanced functionality with low maintenance requirements
Through-the-Door Construction

The closing and opening push buttons, the racking handle, and racking mechanism are accessible through the front door cutout, allowing circuit breaker operation and disconnection without opening the door. Optional shutters (see "Secondary Wiring System" on page 16) can be provided, covering live parts when the circuit breaker is removed.

MASTERPACT NW circuit breakers meet ANSI interlock requirements, including closing spring interlocking.

Circuit Breaker Compartment

The circuit breaker compartment consists of the circuit breaker cradle, a horizontal secondary terminal block on top of the cradle, and a vertical wireway on the right side of the compartment allowing for top and bottom customer wiring. The cradle structure is a bolted-in assembly that supports the circuit breaker. Integrated into the cradle are the circuit breaker interference interlocks or cell keys.

Cell keys are steel pins on the left side of the cradle. As the circuit breaker is pushed into the compartment, the bracket on the circuit breaker moves past a corresponding bracket on the cradle. If the circuit breaker is not matched correctly for the compartment, the brackets will interfere and the circuit breaker will not go into the compartment. Cell keying is a standard POWER-ZONE 4 switchgear feature.

The racking crank storage hole, racking crank hole, and "Push Stop Release" button are on the bottom of the cradle. Circuit breaker racking is achieved with the circuit breaker compartment door closed.

When required for metering, optional current transformers are positioned around the stationary main contacts.
POWER-ZONE® 4 Switchgear
 Interruption and Short-Time (Withstand) Ratings

Interruption and Short-Time (Withstand) Ratings
POWER-ZONE 4 switchgear with MASTERPACT NW circuit breakers have the highest interrupting (200,000 A at 480 V without using fuses) and short-time (withstand) ratings for low voltage switchgear in the smallest physical size. The small switchgear footprint and the elimination of limiters reduces cost. The MASTERPACT NW circuit breaker’s wide range of coordination with downstream devices increases system uptime.

MASTERPACT NW circuit breakers are available in various levels of interrupting ratings (AIR), see “Interrupting Ratings of MASTERPACT NW Circuit Breaker (RMS Symmetrical Amperes)” on page 36. Circuit breakers of like frame sizes and interrupting ratings are interchangeable.

Circuit Breaker Types

<table>
<thead>
<tr>
<th>Number</th>
<th>Amperes</th>
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<tbody>
<tr>
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NW08, NW16, NW20, NW32 (800 A–3200 A) N1, H1, H2
NW08, NW16 (800 A–1600 A) L1
NW20 (2000 A) L1-Feeder

NW40, NW50 (4000 A–5000 A) H2, L1
NW20, NW32 (2000 A–3200 A) L1

Family of MASTERPACT NW Circuit Breakers (800 A–5000 A)
Circuit Breaker Parts

The MASTERPACT NW circuit breaker has fewer parts than conventional circuit breakers while performing the same functions.

The main disconnecting contacts on the rear of the circuit breaker are spring loaded and self-aligning. These contacts are designed so the pressure at the point of contact on the stationary connectors becomes greater under short-circuit conditions.
Circuit Breaker Operation

POWER-ZONE 4 switchgear with MASTERPACT NW circuit breakers have through-the-door circuit breaker racking. The connect, test, and disconnect positions can be made with the circuit breaker compartment door closed.

<table>
<thead>
<tr>
<th>Through-the-Door Circuit Breaker Position (side view)</th>
<th>Primary Connectors</th>
<th>Secondary (Control) Connectors</th>
<th>Circuit Breaker Functionality</th>
<th>Circuit Breaker Door Position</th>
</tr>
</thead>
</table>
| Connect                                              | Engaged            | Engaged                        | a) Can be operated mechanically and electrically.  
b) Ready for service. | Closed                      |
| Test                                                 | Disengaged         | Engaged                        | a) Can be operated mechanically and electrically.  
b) Can have operation and control systems tested. | Closed |
| Disconnect                                           | Disengaged         | Disengaged                     | a) Can not be operated remotely.  
b) Can not be removed from circuit breaker compartment. | Closed |
| Remove                                               | Disengaged         | Disengaged                     | a) Can not be operated remotely.  
b) Can be removed from circuit breaker compartment. | Open

Circuit breaker is fully extended on rails.
Two-Step Stored Energy Mechanism

MASTERPACT NW circuit breakers are stored energy devices with a two-step operating mechanism.

Electrically operated circuit breakers have a motor to charge the stored energy mechanism, electric close feature, and electric open feature.

On manually operated circuit breakers, the closing springs are charged by hand. For electrically operated circuit breakers, the springs are charged by an internal electric motor, but can also be manually charged if no control power is available.

Status indicators on the front of the circuit breaker indicate when the closing springs are charged or discharged.

Circuit Breaker Inspection

When the MASTERPACT NW circuit breaker is withdrawn on its rails, the circuit breaker is accessible for visual inspection. It is easy to remove the arc chutes and visually inspect the contacts and wear indicator. The operations counter can also indicate when inspections and possible maintenance should be done.

Removable, replaceable, and upgradeable circuit breaker parts include:

- Arc chutes
- Main disconnecting contacts or clusters
- Internal movable contacts
- Spring charging motor
- Trip units
A number of MASTERPACT NW circuit breaker accessories are available with POWER-ZONE 4 switchgear. A few of the most common accessories are listed below.

**Shutters:**
Optional shutters in the cradle automatically block access to the main disconnects when the circuit breaker is in the disconnect, test, or remove position. An optional padlock attachment to lock shutters closed is also available.

**Key Interlocks, Key Locks, and Padlocks:**
Optional key interlocking can be provided with MASTERPACT NW circuit breakers. Key interlocking capability is available for circuit breaker operation and the cradle.

Key interlock operation is outlined in the POWER-ZONE 4 switchgear order assembly drawings. To facilitate installation procedures, a key is supplied with each lock. After installation, only the necessary keys called out on the key interlock diagrams should be present on the switchgear.

**Cell Keying:**
Cell keying, a standard feature on POWER-ZONE 4 switchgear, is provided to avoid insertion of circuit breakers with similar dimensions but insufficient interrupting ratings, or incorrect frame sizes into an inappropriate circuit breaker compartment.

**Auxiliary Switches:**
A family of auxiliary switches that include:
- Open and close position switches (OF)
- Connected and closed position switches (EF); also known as cell switches
- Cradle position switch (CE, CD, CT)

**Field-installable and Upgradeable Options:**
A family of field-installable coils, buttons, motors, connectors, and trip units that include, but are not limited to:
- Trip units with or without POWERLOGIC monitoring capabilities (see pages 27–28)
- Opening and closing coils (MX, XF)
- Shunt trip unit (MX)
- Undervoltage release (MN)
- Spring charging motor (MCH)
- Sensor plug

Refer to the MASTERPACT NW circuit breaker catalog for additional information.
MICROLOGIC Trip Units

A new family of field-installable trip units is available with MASTERPACT NW circuit breakers. The circuit breaker overcurrent protection consists of a solid-state, microprocessor-based tripping device that requires no external power source. The complete tripping system has three main components: the molded sensors, the trip device (with rating plug), and the trip actuator. The microprocessor-based trip unit uses true RMS current level sensing. For additional information, refer to the trip unit functionality matrix on page 39.

When the MASTERPACT NW circuit breaker is closed, no external power is required for the protection system. The trip unit is powered by current signal levels and current sensors integrally mounted in the MASTERPACT NW circuit breaker. All trip units are UL Listed for use in MASTERPACT NW circuit breakers.

Basic Trip Unit

**Standard Trip Features:**
- True RMS sensing
- LI trip configuration
- Field interchangeable long-time rating plugs
- LED long-time pickup indication
- Thermal imaging

**Available Options:**
- LSI trip configuration
- Test kits

Type A (Ammeter) Trip Unit

**Standard Trip Features:**
- True RMS sensing
- LI trip configuration
- Field interchangeable long-time rating plugs
- LED long-time pickup indication
- LSIG trip configurations
- Digital ammeter–phase and neutral
- Phase loading bar graph
- LED trip indication
- Zone selective interlocking (ZSI) with short-time and ground fault
- Thermal imaging

**Available Options:**
- LSI trip configuration
- LSIG (ground fault trip)
- Test kits

**Available POWERLOGIC Features:**
- Amps metering
- Circuit breaker open/close trip status
- Tripping curves
POWER-ZONE® 4 Switchgear
MICROLOGIC® Trip Units

Type P (Power Metering) Trip Unit

Standard Trip Features:
- All standard features of MICROLOGIC Type A trip unit
- LSI trip configuration
- Incremental “fine tuning” of L, S, I, and, when selected, G pickup and delay settings
- LCD dot matrix display and LED trip indication
- Advanced user interface
- Advanced user protection (includes, but not limited to):
  - over/under voltage
  - over/under frequency
- IDMTL: selectable long-time delay bands
- Thermal imaging
- Power measurement
- Contact wear indication
- Temperature indication
- Zone selective interlocking (ZSI) with short-time and ground fault

Available Options:
- LSIG (ground fault trip with programmable ground fault alarm)
- Test kits

Available POWERLOGIC Features:
- Amps metering
- Volts metering
- Energy accumulation
- Remote operation
- Circuit breaker open/close trip status
- Date/time stamping

Type H (Harmonics) Trip Unit

Standard Trip Features:
- All standard features of MICROLOGIC Type P trip unit
- Advanced power measurements functions
- Fault waveform capture

Available Options:
- LSIG (ground fault trip) with programmable ground fault alarm
- Zone selective interlocking (ZSI) with short-time and ground fault
- Test kits

Available POWERLOGIC Features:
- Amps metering
- Volts metering
- Energy accumulation
- Remote operation
- Waveform capture
- Data logging
- Circuit breaker open/close trip status
- Power quality measurements
- Harmonics measurements through 51st
- Date/time stamping

Refer to the MASTERPACT NW circuit breaker catalog for detailed information about the family of MICROLOGIC trip units.
POWERLOGIC System

POWER-ZONE 4 switchgear is available with POWERLOGIC metering, data acquisition, and control system features. The POWERLOGIC system is used in conjunction with MICROLOGIC Type A, Type P, and Type H trip units for the MASTERPACT NW circuit breaker. The complete system is comprised of several devices including, circuit monitors, power meters, trip units, programmable logic controllers, digital relays, transformer temperature controllers, I/O, lighting control, and more. System Manager Software is available to work in conjunction with these devices to manage and control your electrical distribution system.

MODBUS industry standard data communications allow the POWERLOGIC system to replace discrete meters, multiple transducers, analog wires, and analog-to-digital conversion equipment. Extensive information can be transmitted over a single communications cable to a POWERLOGIC system display, a personal computer, programmable logic controller, or other host system.

The following MICROLOGIC trip units are POWERLOGIC compatible:

- Type A
- Type P
- Type H

Basic circuit information, such as amperes, can be monitored using MICROLOGIC Type A trip unit. Circuit breaker remote operation is available using the MICROLOGIC Type P, and Type H trip units with POWERLOGIC functionality. For additional information, see the trip unit functionality matrix on page 39. For more sophisticated metering, power quality monitoring, data acquisition and control, POWERLOGIC circuit monitors may also be used.

MICROLOGIC Trip Unit System Summary

In addition to its metering capabilities, the MICROLOGIC trip unit system is available with optional status inputs and relay outputs for monitoring discrete contacts and remote control of devices by way of the data communications channel.

MICROLOGIC trip unit metering functions include:

- Amperes and volts
- Frequency
- Power
- Power demand
- Energy
- Energy demand
- Power factor
- Power quality measurements
- Communications
- Fault waveform capture
- Waveform capture
- Data logging
- Programmable contacts

MICROLOGIC trip unit relaying functions include:

- Current unbalance
- Over/under voltage
- Over/under frequency
- Voltage unbalance
- Phase loss
- Phase sequence
- Reverse power

MASTERPACT NW circuit breaker maintenance information:

- Thermal imaging
- Contact wear indicator
- Temperature indication
The POWERLOGIC monitoring system is available, as an option, with POWER-ZONE 4 switchgear. The POWERLOGIC power monitoring and control system uses a high-performance ethernet backbone with MODBUS communications. Information about the switchgear and its components is passed to and from a local or remote computer system using POWERLOGIC MODBUS data communications.
System Components

POWERLOGIC system components and additional features are listed below.

**POWERLOGIC System Components:**
- System Manager Software
- POWERLOGIC ethernet gateway
- NOE ethernet card
- TCP/IP MODBUS
- Modicon PLCs
- Circuit monitor
- Power meters
- Automatic control
- Digital relay
- Motor protection
- Transformer module
- MICROLOGIC trip units

**Available POWERLOGIC Features:**
- Custom software applications
- Communication interfaces

Circuit Monitors

POWERLOGIC circuit monitors provide highly accurate meter readings along with disturbance monitoring, analog and digital I/O, onboard logging, and more. Circuit monitors can be mounted on POWER-ZONE 4 switchgear, auxiliary instrument compartments, and auxiliary sections.

**POWERLOGIC Circuit Monitor Display**

Detailed information about the POWERLOGIC system and components can be found in the POWERLOGIC monitoring and control system catalogs.
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SECTION 3—TECHNICAL OVERVIEW

This section contains basic technical information pertaining to the POWER-ZONE 4 switchgear, MASTERPACT NW circuit breakers, and MICROLOGIC trip units.

POWER-ZONE 4 Switchgear Ratings

POWER-ZONE 4 switchgear is industrial-duty equipment built to ANSI standards and uses 100% rated MASTERPACT NW circuit breakers. Switchgear ratings are listed below.

Nominal Ratings

| Switchgear          | 120/208 to 600 Vac, 1Ø3W, 3Ø3W, or 3Ø4W | 1600 A – 5000 A | 50/60 Hz | up to 200 kA symmetrical short-circuit current |

Short-circuit and Withstand Ratings

<table>
<thead>
<tr>
<th>Bus Type</th>
<th>Continuous Amperes</th>
<th>Short-circuit current</th>
<th>Short-time Withstand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross</td>
<td>1600, 2000, 3200, 4000, 5000</td>
<td>65 kA, 85 kA, 100 kA, 130 kA, 200 kA</td>
<td>50 kA, 65 kA, 85 kA, 100 kA</td>
</tr>
<tr>
<td>Vertical</td>
<td>1600, 2000, 3200, 4000, 5000</td>
<td>65 kA, 85 kA, 100 kA, 130 kA, 200 kA</td>
<td>50 kA, 65 kA, 85 kA, 100 kA</td>
</tr>
<tr>
<td>Neutral</td>
<td>1600, 2000, 3200, 4000, 5000</td>
<td>65 kA, 85 kA, 100 kA, 130 kA, 200 kA</td>
<td>50 kA, 65 kA, 85 kA, 100 kA</td>
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</tbody>
</table>

NOTE: 50% ratings available

MASTERPACT NW Circuit Breakers

This section contains basic MASTERPACT NW circuit breaker interrupting, sensor, operating time, control power requirements, and switch ampere ratings. In addition, an overview of key interlock operation is described on page 38.

Ratings

POWER-ZONE 4 switchgear with MASTERPACT NW circuit breakers has the highest interrupting and short-time (withstand) ratings for low voltage switchgear in the smallest physical size. The small switchgear footprint and the elimination of limiters reduces cost. The circuit breaker’s improved coordination with downstream devices increases system uptime.
MASTERPACT NW circuit breakers are available in various levels of interrupting ratings (AIR) as listed below.

Interrupting Ratings of MASTERPACT NW Circuit Breaker (RMS Symmetrical Amperes)

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>40–800</td>
<td>NW08N1</td>
<td>42,000</td>
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<td>320–1600</td>
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</tr>
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</table>

Note: Minimum sensor rating is 50% of frame rating (except for 800 A frame).

Available Sensor Ratings

<table>
<thead>
<tr>
<th>Circuit Breaker Type</th>
<th>Sensor Rating (Amperes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NW08N1</td>
<td>100, 250, 400, 600, 800</td>
</tr>
<tr>
<td>NW08H1</td>
<td></td>
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<td>NW08H2</td>
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<tr>
<td>NW08L1</td>
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<tr>
<td>NW16N1</td>
<td>800, 1200, 1600</td>
</tr>
<tr>
<td>NW16H1</td>
<td></td>
</tr>
<tr>
<td>NW16H2</td>
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</tr>
<tr>
<td>NW16L1</td>
<td></td>
</tr>
<tr>
<td>NW20H1</td>
<td>1200, 1600, 2000</td>
</tr>
<tr>
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<tr>
<td>NW32H1</td>
<td>1600, 2000, 2500, 3000, 3200</td>
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<tr>
<td>NW32H2</td>
<td>1600, 2000, 2500, 3000, 3200</td>
</tr>
<tr>
<td>NW32L1</td>
<td>1600, 2000, 2500, 3000, 3200</td>
</tr>
<tr>
<td>NW40H2</td>
<td>2000, 2500, 3000, 3200, 4000</td>
</tr>
<tr>
<td>NW40L1</td>
<td>2000, 2500, 3000, 3200, 4000</td>
</tr>
<tr>
<td>NW50H2</td>
<td>2500, 3000, 3200, 4000, 5000</td>
</tr>
<tr>
<td>NW50L1</td>
<td></td>
</tr>
</tbody>
</table>

Note: L1 circuit breakers cannot be combined with N1, H1, or H2 circuit breakers within the same switchgear lineup.
MASTERPACT NW circuit breaker approximate operating time ratings are listed below.

### MASTERPACT NW Approximate Operating Time Ratings

<table>
<thead>
<tr>
<th>Action</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring charging motor (MCH)</td>
<td></td>
</tr>
<tr>
<td>Response time</td>
<td>70–80 milliseconds</td>
</tr>
<tr>
<td>Charging time</td>
<td>2–3 seconds</td>
</tr>
<tr>
<td>Shunt trip (MX)</td>
<td>50 milliseconds</td>
</tr>
<tr>
<td>Shunt close (XF)</td>
<td>70–80 milliseconds</td>
</tr>
</tbody>
</table>

The table below shows control power requirements for MASTERPACT NW circuit breakers.

### MASTERPACT NW Control Power Requirement Ratings

<table>
<thead>
<tr>
<th>Action</th>
<th>Power Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring Charging Motor Current (electrically operated circuit breakers)</td>
<td>180 VA</td>
</tr>
<tr>
<td>Closing coil (XF)</td>
<td>4.5 VA</td>
</tr>
<tr>
<td>Shunt trip coil (MX)</td>
<td>4.5 VA</td>
</tr>
<tr>
<td>Time delay under/voltage trip (MN)</td>
<td>20 VA</td>
</tr>
<tr>
<td>Status indicating lights (each)</td>
<td>2 VA</td>
</tr>
<tr>
<td>Circuit monitor</td>
<td>22 VA</td>
</tr>
<tr>
<td>Strip heater (each)</td>
<td>125 VA</td>
</tr>
</tbody>
</table>

This table shows approximate ampere ratings for MASTERPACT NW circuit breaker switches.

### MASTERPACT NW Circuit Breaker Switch Ampere Ratings

<table>
<thead>
<tr>
<th>Action</th>
<th>Ampere (240 V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auxiliary switch (OF)</td>
<td>10 A</td>
</tr>
<tr>
<td>Overcurrent trip switch (SDE)</td>
<td>10 A</td>
</tr>
<tr>
<td>Combined (connect/close) switch (EF)</td>
<td>10 A</td>
</tr>
<tr>
<td>Cradle cell switch</td>
<td>10 A</td>
</tr>
</tbody>
</table>
Key Interlock Operation

As shown in the example below, a main-tie-main manual key interlock scheme is designed to keep all three circuit breakers from being closed simultaneously. Only two of the three circuit breakers can be closed simultaneously.

**NOTE:** Spare keys should be removed and kept safely stored and under the control of responsible supervision.

---

**Main-Tie-Main Key Interlocking**

Main 1 and main 2 circuit breakers are closed with their keys placed in the lock cylinders. The tie circuit breaker is locked open; a key is required to unlock it and put the circuit breaker into service.

The main 1 circuit breaker is opened and taken out of service, it is locked open, permitting key A1 to be removed to operate the lock associated with the tie circuit breaker. Then the main 1 circuit breaker cannot be put into service and closed until either the tie circuit breaker, or the main 2 circuit breaker is opened and locked out of service. This would free one key for use in unlocking the main 1 circuit breaker.

**MICROLOGIC Trip Units**

MICROLOGIC trip unit ratings, functionality, and curves are listed below.

**Ratings**

Standard MICROLOGIC adjustable trip settings, including time/current characteristics, pickup settings, pickup points, and time band in seconds are listed below.

**MICROLOGIC Adjustable Trip Setting Ratings**

<table>
<thead>
<tr>
<th>Time/Current Characteristic</th>
<th>Pickup Setting</th>
<th>Pickup Point</th>
<th>Time Band, Seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-time Delay</td>
<td>0.4, 0.45, 0.5, 0.625, 0.7, 0.8, 0.9, 1.0</td>
<td>$I_n$ Times Long-time Delay Setting</td>
<td>0.5, 1, 2, 4, 8, 12, 16, 20, 24 (at 6 times pickup value)</td>
</tr>
<tr>
<td>Instantaneous</td>
<td>2, 3, 4, 6, 8, 12, 15, OFF</td>
<td>$I_n$ Times Instantaneous Setting</td>
<td></td>
</tr>
<tr>
<td>Short-time Delay</td>
<td>1.5, 2, 2.5, 3, 4, 5, 6, 8,10</td>
<td>$I_n$ Times Short-time Delay Setting</td>
<td>0.0, 0.1, 0.2, 0.3, 0.4 (Flat Response) 0.0, 0.1, 0.2, 0.3, 0.4 (f^2 R Response)</td>
</tr>
<tr>
<td>Ground Fault</td>
<td>A (0.3), B (0.2), C (0.4), D (0.5), E (0.6), F (0.7), G (0.8), H (0.9), J (1.0) (1200 A Max.)</td>
<td>$I_n$ Times Ground Fault Setting</td>
<td>0.0, 0.1, 0.2, 0.3, 0.4 (Flat Response) 0.0, 0.1, 0.2, 0.3, 0.4 (f^2 R Response)</td>
</tr>
</tbody>
</table>

---

\[I_n = \text{Sensor Plug Value} \quad I_l = \text{Long Delay Pickup Setting} \times I_n\]
Functionality

The table below lists the standard and optional trip unit features for MICROLOGIC Type A (Ammeter), Type P (Power Metering), and Type H (Harmonics) trip units for use in POWER-ZONE 4 switchgear.

**MICROLOGIC Trip Unit Functionality**

<table>
<thead>
<tr>
<th>Functions</th>
<th>Basic</th>
<th>Type A</th>
<th>Type P</th>
<th>Type H</th>
</tr>
</thead>
<tbody>
<tr>
<td>True RMS sensing</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>LI trip configuration</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>LSI</td>
<td>O</td>
<td>O</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>LSI/G/ground fault trip</td>
<td>–</td>
<td>O</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Ground fault alarm (no trip)</td>
<td>–</td>
<td>–</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Ground fault trip and programming alarm</td>
<td>–</td>
<td>–</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Adjustable rating plugs</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>LED – long-time pickup</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>LED – trip indication</td>
<td>–</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Digital ammeter</td>
<td>–</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Phase loading bar graph</td>
<td>–</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Zone selective interlocking</td>
<td>–</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Communications</td>
<td>–</td>
<td>O</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>LCD dot matrix display</td>
<td>–</td>
<td>–</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Advanced user interface</td>
<td>–</td>
<td>–</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Protective relay functions</td>
<td>–</td>
<td>–</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Thermal imaging</td>
<td>–</td>
<td>–</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Contact wear indication</td>
<td>–</td>
<td>–</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Temperature indication</td>
<td>–</td>
<td>–</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Incremental fine tuning of settings</td>
<td>–</td>
<td>–</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Selective long-time delay bands</td>
<td>–</td>
<td>–</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Power measurement</td>
<td>–</td>
<td>–</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Waveform capture</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>X</td>
</tr>
<tr>
<td>Data logging</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>X</td>
</tr>
</tbody>
</table>

Table Values:
-  Not Applicable
  X  Standard Feature
  O  Optional Feature

Curves

This section contains typical characteristic trip curves for MICROLOGIC trip units in POWER-ZONE 4 switchgear. Detailed information about MICROLOGIC trip units can be found in the MASTERPACT NW circuit breaker catalog.
The time-current curve information is to be used for application and coordination purposes only. Curves apply from -30°C to +60°C ambient temperature.

Notes:
1. There is a memory effect that can act to shorten the Long-time Delay. The memory effect comes into play if a current above the long-time delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in a shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately 20 minutes is required between overloads to completely reset memory.
2. The end of the curve is determined by the Short-time or Instantaneous setting.
3. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of the current.

The time-current curve information is to be used for application and coordination purposes only.

Curves apply from -30°C to +60°C ambient temperature.
Typical MICROLOGIC Basic Instantaneous Pickup Characteristic Curve
Notes:

1. There is a memory effect that can act to shorten the Long-time Delay. The memory effect comes into play if a current above the long-time delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in a shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately 20 minutes is required between overloads to completely reset memory.

2. The end of the curve is determined by the interrupting rating of the circuit breaker.

3. With zone-selective interlocking on, Short-time Delay utilized and no restraining signal, the minimum time band applies regardless of the setting.

4. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of the current.

5. For a withstand circuit breaker, turn Instantaneous OFF. See Trip Curve 613-7.

6. Overload indicator illuminates at 100%.

The time-current curve information is to be used for application and coordination purposes only.

Curves apply from -30°C to +60°C ambient temperature.
Notes:
1. There is a memory effect that can act to shorten the Long-time Delay. The memory effect comes into play if a current above the long-time delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in a shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately 20 minutes is required between overloads to completely reset memory.
2. The end of the curve is determined by the interrupting rating of the circuit breaker.
3. With zone-selective interlocking on, Short-time Delay utilized and no restraining signal, the minimum time band applies regardless of the setting.
4. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of the current.
5. For a withstand circuit breaker, turn Instantaneous OFF. See Trip Curve 613-7.

The time-current curve information is to be used for application and coordination purposes only.
Curves apply from -30 °C to +60 °C ambient temperature.
Trip Unit Curves

Typical MICROLOGIC Basic/A/P/H Instantaneous Pickup Characteristic Curve

NOTES:
1. Maximum sensor plug 250 A. See chart above.
2. The end of the curve is determined by the interrupting rating of the circuit breaker.
3. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of the current.
4. The instantaneous region of the trip curve shows maximum total clearing times. Actual clearing times in this region can vary depending on the circuit breaker mechanism design and other factors. The actual clearing time can be considerably faster than indicated. Contact your local Sales Office for additional information.
5. For withstand circuit breakers, turn Instantaneous OFF.

The time-current curve information is to be used for application and coordination purposes only.

Curves apply from -30°C to +60°C ambient temperature.
The time-current curve information is to be used for application and coordination purposes only.
Curves apply from -30˚C to +60˚C ambient temperature.
The time current information trip curve is to be used for application and coordination purposes only.

Curves apply from -30°C to +60°C ambient temperature.
The time-current information is to be used for application and coordination purposes only.

Curves apply from -30°C to +60°C ambient temperature.
Application of MASTERPACT NW Circuit Breakers (with Standard Three-Phase Transformers: Liquid Filled and Ventilated Dry Types)

Transformer ratings for MASTERPACT NW circuit breakers in POWER-ZONE 4 switchgear are listed below.

<table>
<thead>
<tr>
<th>Transformer Base (100%) Rating</th>
<th>Secondary Short-Circuit Currents RMS Symmetrical Amperes</th>
<th>Minimum Size Circuit Breakers for Selective Trip Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>kVA and Percent Impedance</td>
<td>Through Transformer Only</td>
<td>Motor Contribution</td>
</tr>
<tr>
<td>Amperes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200 V Three-Phase - 50% Motor Load</td>
<td>300 5.0%</td>
<td>833</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>500 5.0%</td>
<td>1389</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>750 5.75%</td>
<td>2083</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1000 5.75%</td>
<td>2778</td>
</tr>
<tr>
<td>240 V Three-Phase - 100% Motor Load</td>
<td>300 5.0%</td>
<td>722</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>500 5.0%</td>
<td>1203</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>750 5.75%</td>
<td>1804</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1000 5.75%</td>
<td>2406</td>
</tr>
</tbody>
</table>

1. At transformer self-cooled rating.
2. Next larger frame size main circuit breaker may be required for 55/65 °C rise and/or forced air-cooled (FA) transformer. Check Transformer Secondary Ampere Rating.
## Application of MASTERPACT NW Circuit Breakers (with Standard Three-Phase Transformers: Liquid Filled and Ventilated Dry Types)

<table>
<thead>
<tr>
<th>Transformer Base (100%) Rating</th>
<th>Max. Short-circuit kVA Available from Primary System</th>
<th>Secondary Short-Circuit Currents Through Transformer Only</th>
<th>Minimum Size Circuit Breakers for Selective Trip Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>kVA and Percent Impedance</td>
<td>Amperes ①</td>
<td>RMS Symmetrical Amperes</td>
<td>Motor Contribution</td>
</tr>
<tr>
<td>480 V Three-Phase - 100% Motor Load</td>
<td>①</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500 5.0%</td>
<td>601</td>
<td>50000</td>
<td>10000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100000</td>
<td>10900</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150000</td>
<td>11300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>250000</td>
<td>11600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500000</td>
<td>11800</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unlimited</td>
<td>12000</td>
</tr>
<tr>
<td>750 5.75%</td>
<td>902</td>
<td>50000</td>
<td>12400</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100000</td>
<td>13900</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150000</td>
<td>14400</td>
</tr>
<tr>
<td></td>
<td></td>
<td>250000</td>
<td>14900</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500000</td>
<td>15300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unlimited</td>
<td>15700</td>
</tr>
<tr>
<td>1000 5.75%</td>
<td>1203</td>
<td>50000</td>
<td>15500</td>
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<tr>
<td></td>
<td></td>
<td>100000</td>
<td>17800</td>
</tr>
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<td></td>
<td></td>
<td>150000</td>
<td>18700</td>
</tr>
<tr>
<td></td>
<td></td>
<td>250000</td>
<td>19600</td>
</tr>
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<td></td>
<td></td>
<td>500000</td>
<td>30200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unlimited</td>
<td>20900</td>
</tr>
<tr>
<td>1500 5.75%</td>
<td>1804</td>
<td>50000</td>
<td>20600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100000</td>
<td>24900</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150000</td>
<td>26700</td>
</tr>
<tr>
<td></td>
<td></td>
<td>250000</td>
<td>28400</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500000</td>
<td>31700</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unlimited</td>
<td>31400</td>
</tr>
<tr>
<td>2000 5.75%</td>
<td>2406</td>
<td>50000</td>
<td>24700</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100000</td>
<td>31000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150000</td>
<td>34000</td>
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<td></td>
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<td>250000</td>
<td>36700</td>
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<td></td>
<td></td>
<td>500000</td>
<td>39100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unlimited</td>
<td>41800</td>
</tr>
<tr>
<td>2500 5.75%</td>
<td>3008</td>
<td>50000</td>
<td>28000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100000</td>
<td>36500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150000</td>
<td>40500</td>
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<tr>
<td></td>
<td></td>
<td>250000</td>
<td>44600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500000</td>
<td>48100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unlimited</td>
<td>52300</td>
</tr>
<tr>
<td>3000 5.75%</td>
<td>3609</td>
<td>50000</td>
<td>30700</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100000</td>
<td>41200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150000</td>
<td>46600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>250000</td>
<td>51900</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500000</td>
<td>56800</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unlimited</td>
<td>62800</td>
</tr>
<tr>
<td>3750 5.75%</td>
<td>4511</td>
<td>50000</td>
<td>34000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100000</td>
<td>47500</td>
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<td></td>
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<td>150000</td>
<td>54700</td>
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<tr>
<td></td>
<td></td>
<td>250000</td>
<td>62200</td>
</tr>
<tr>
<td>3750 5.75%</td>
<td>4511</td>
<td>500000</td>
<td>69400</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unlimited</td>
<td>78500</td>
</tr>
</tbody>
</table>

① At transformer self-cooled rating.
② Next larger frame cooled circuit breaker may be required for 55/65 °C rise and/or forced air-cooled (FA) transformer. Check Transformer Secondary Ampere Rating.
Application of MASTERPACT NW Circuit Breakers (with Standard Three-Phase Transformers: Liquid Filled and Ventilated Dry Types)

<table>
<thead>
<tr>
<th>Transformer Base (100%) Rating</th>
<th>Secondary Short-Circuit Currents RMS Symmetrical Amperes</th>
<th>Minimum Size Circuit Breakers for Selective Trip Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>kVA and Percent Impedance</td>
<td>Through Transformer Only</td>
<td>Motor Contribution</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------------------------------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>500 5.0%</td>
<td>481</td>
<td>8000</td>
</tr>
<tr>
<td>750 5.75%</td>
<td>722</td>
<td>10000</td>
</tr>
<tr>
<td>1000 5.75%</td>
<td>962</td>
<td>12400</td>
</tr>
<tr>
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<td>1443</td>
<td>16500</td>
</tr>
<tr>
<td>2000 5.75%</td>
<td>1924</td>
<td>19700</td>
</tr>
<tr>
<td>2500 5.75%</td>
<td>2406</td>
<td>22400</td>
</tr>
<tr>
<td>3000 5.75%</td>
<td>2886</td>
<td>24600</td>
</tr>
<tr>
<td>3750 5.75%</td>
<td>3608</td>
<td>27200</td>
</tr>
</tbody>
</table>

1. At transformer self-cooled rating.
2. Next larger frame size main circuit breaker may be required for 55/65 °C rise and/or forced air-cooled (FA) transformer. Check Transformer Secondary Ampere Rating.
Distribution Systems

This section contains a brief overview of Wye and Delta distribution systems.

Wye Solidly Grounded Systems

A Wye system is the most common type of three-phase distribution system for low voltage switchgear. Wye systems are either three- or four-wire distribution systems that are normally grounded, either in the equipment (see “Four-Wire Wye Distribution—Solidly Grounded System”), or at the transformer source (see “Three-Wire Wye Distribution—Solidly Grounded System”).

Four-Wire Wye Distribution—Solidly Grounded System

When the system is grounded in the equipment and the neutral phase is carried through the equipment, the system is described as a four-wire solidly grounded system with neutral connections available to supply single phase-to-neutral loads, such as lighting loads.

Three-Wire Wye Distribution—Solidly Grounded System

When the system is grounded at the transformer source and no neutral phase is carried through the equipment, the system is described as a three-wire solidly grounded system. No neutral connections are available; all loads must be three-phase (or single “phase-to-phase”) loads.

In some cases, the neutral is delivered to the service entrance where it is bonded to ground similar to the four-wire solidly grounded system.
Delta Grounded and Ungrounded Systems

Formerly common, Delta three-wire systems are rarely used in low voltage distribution systems. Delta three-wire distribution systems can be grounded or ungrounded services. Generally, Delta systems are ungrounded. In some cases, they are grounded on the “corner” of the delta or some other point. Ungrounded Delta systems do not have a reference point or ground. Corner or Grounded B Phase Delta distribution systems do provide a reference point but require one phase to be connected to the ground.

Low voltage drawout switchgear with MASTERPACT NW circuit breakers are designed and built to ANSI C37.20.1 and is tested for single phase-to-phase faults. They can be applied on “corner” grounded Delta distribution systems. POWER-ZONE 4 switchgear with MASTERPACT NW circuit breakers are suited for corner grounded or ungrounded systems.

Three-Wire Delta Distribution—Ungrounded

Although ungrounded systems have been used for many years, they are not recommended in newly designed low voltage distribution systems. Ungrounded power systems may be unstable. High resistance grounded systems as shown on pages 56 and 57 are recommended for use in newly designed low voltage distribution systems.

Ground Fault Protection for Wye Systems

The need for ground fault protection in three-phase solidly grounded Wye systems is due to the possibility of low magnitude ground fault currents. Phase-to-phase faults are of such a large magnitude that overcurrent protection devices (trip units) can operate rapidly and positively to signal the circuit breaker to open. Ground faults can be of a much lower magnitude and require specialized elements in the trip unit for detection.

POWER-ZONE 4 switchgear with MASTERPACT NW circuit breakers equipped with MICROLOGIC trip units have the capability of providing ground fault sensing (alarm with no tripping) and ground fault protection (tripping) on three-phase, three-wire and three-phase, four-wire solidly-grounded systems. MASTERPACT NW circuit breakers can be used for overcurrent protection on ungrounded or resistance grounded systems, but are not suitable for ground fault protection on these systems.
Ground faults are an inadvertent flow of current between the normal current-carrying conductors and ground. These ground faults usually start at a low level and, if left undetected, escalate causing significant heat and mechanical damage to the electrical system. Ground faults can escalate to a phase-to-phase fault causing major system damage. The ground fault system in the MASTERPACT NW circuit breaker monitors the flow of current in the system and detects ground fault currents. The circuit breaker will trip to protect the circuit, or send an alarm through the appropriate interface equipment, depending on the option installed.

**MASTERPACT NW Circuit Breaker Ground Fault System Sensing Capabilities**

The National Electric Code® (NEC) requires ground fault protection on solidly grounded Wye electrical services of more than 150 V to ground, but not exceeding 600 V phase-to-phase for each service disconnect rated 1000 A or more. This includes service entrance, feeders and building disconnects. The NEC also requires ground fault alarm (no tripping) on emergency systems and allows ground fault alarm on continuous processes, fire pumps, and other circuits that would be more hazardous if stopped without an orderly shutdown.

Ground Fault Protection with Tripping

Ground fault protection is available as an option on MASTERPACT NW circuit breakers with MICROLOGIC 6.0A and higher trip units. MASTERPACT NW circuit breakers offer three different ground fault sensing options: residual, ground-source return and modified differential. The sensing options make it possible to match the number and location of current sensors to the application. The pickup and delay settings for ground fault are adjustable locally with the dial settings or through the key pad. The pickup and delay settings for ground fault are also adjustable remotely over a computer network on MICROLOGIC 6.0 and higher trip units. A neutral current sensor (NCT) must be installed in the neutral if ground fault alarm is used on a three-phase, four-wire system.

Ground Fault Protection without Tripping

All MASTERPACT NW circuit breakers with MICROLOGIC 5.0P and higher trip units come standard with the ability to sense and report a ground fault alarm through the optional programmable contact module or communication network. A neutral current sensor (NCT) must be installed in the neutral if ground fault alarm is used on a three-phase, four-wire system.

The pickup and delay settings for the ground fault alarm are adjustable locally through the key pad on the trip unit or remotely over a computer network.
Residual Ground Fault Sensing

Residual ground fault sensing systems use one current sensor for each current-carrying conductor. The trip unit vectorially sums the secondary outputs from each sensor to determine if there is a ground fault and the magnitude of the ground fault. The following diagram shows the current sensors for a three-phase, four-wire system. There is a current sensor on each phase and the neutral.

Typical Residual Ground Fault Sensing System with Phase Conductors

The sensors for the phase conductors A, B and C are inside the circuit breaker. The neutral current transformer is installed in the neutral circuit. If the circuit breaker were used on a three-phase, three-wire system, the neutral current transformer would not be necessary.

Ground Source Return

Ground source return ground fault sensing systems use one current sensor on the ground conductor. The current sensor measures the ground current flow. The following diagram shows the current sensor for a three-phase, four-wire system. Ground source return can also be used on three-phase, three-wire systems.

Typical Ground Source Return Sensing System with Ground Fault Interface Module and Current Sensor

- Minimum #14 AWG wire.
- Wiring must be shielded cable or twisted pair.
- Maximum of 500 ft (152.4 m) between ground fault interface module and current sensors.

- Minimum #14 AWG wire.
- Wiring must be shielded cable or twisted pair.
- Maximum of 32 ft. (10 m) between ground fault interface module and trip unit.
Ground-source return sensing systems require the use of the optional ground fault interface module and a sensor installed in the ground circuit.

The current sensor and ground fault interface module must be wired per the installation and wiring instructions included with the ground fault interface module.

*Modified Differential Ground Fault System*

A modified differential ground fault system (MDGF) is used for multiple sourced systems. Normal residual and ground-source return systems will not correctly sum all of the circulating currents caused by the multiple neutral paths and multiple grounds. The following diagram shows a typical main-tie-main system. Each source transformer is grounded, and the service entrance neutral is bonded to ground. Multiple neutral paths allow neutral current to circulate and return to the supplying transformer by several different paths. The ground fault system must be capable of correctly summing these circulating currents.

**Typical Modified Differential Ground Fault System with Ground Fault Interface Modules**

The modified differential ground fault sensing system requires the use of ground fault interface modules and current sensors installed in all normal current-carrying conductors.

The current sensors and ground fault interface modules must be wired in parallel and the polarity of the current sensors must be maintained per the installation and wiring instructions included with the ground fault interface module.
High Resistance Grounded Systems

Where continuance of service for your distribution system is a high priority, high-resistance grounding adds the features of a grounded system on an ungrounded system while minimizing the risk of service interruptions resulting from ground faults.

High resistance grounding simultaneously provides a system reference point (or ground) to overcome the negative effects of low level ground faults and limits the magnitude of current that can flow during a ground fault. A resistance value is selected to limit the overvoltage during arcing faults. Industry practice has established that the resistance value should be selected relative to the system capacitive charging current.

An ammeter, in the circuit of a grounding resistor/grounding transformer assembly, reads the total amount of the ground current flowing through the system. When a current-sensing relay is added, any levels in excess of the capacitive charging current can be monitored. Alternatively, a voltmeter-relay (not shown) can be connected across ground resistors to monitor the capacitive charging current in a resistor/grounding transformer assembly. The ground current ammeter provides a linear reading of the existent ac ground current present in the system for both the current and voltage detection methods described above.

Circuit breakers rated to C37.13 are recommended for high resistance grounded systems. POWER-ZONE 4 switchgear with MASTERPACT NW circuit breakers are rated to C37.13.

Wye Systems Configured

High resistance grounding for Wye-connected systems is established by placing resistors in series with the neutral-to-ground connection of the power source. Grounding resistors are chosen to limit the ground current to a maximum value of five amperes. Line-to-neutral loads cannot be connected to a system where the neutral is resistance-grounded. For additional information, see 1999 NEC 250-36.

Four-Wire Wye System Fault Detection By Way of Current Relay
Delta Systems Configured

A neutral point must be established in an ungrounded Delta-connected system using three single-phase transformers. Typically, grounding resistors and transformers are chosen to limit the ground current to a maximum value of five amperes. This technique can be applied on Wye-connected sources when the neutral point is not accessible from the service entrance conduit. The neutral point cannot be used to service phase-to-neutral loads.

Wire Delta System with Zig Zag Grounding Transformers
Automatic Transfer Systems

Automatic transfer systems minimize power interruption by transferring the load from the normal source to an alternate source when the normal source is temporarily unavailable. The system uses multiple connections to power sources, usually utility sources, and a programmable logic controller (PLC) to achieve this transfer. These systems also feature redundant supplies of control power. Examples of automatic transfer systems with main-main circuit breakers and main-tie-main circuit breakers are shown on pages 58 and 59.

Main-Main Circuit Breakers

Each main circuit breaker connects to a utility source. When the normal source becomes unavailable, the system transfers to the alternate. If the system comes equipped with a preferred source selector option, the system reverts to the preferred source automatically once it is available. Without the selector, automatic retransfer does not occur.

Main-Main Circuit Breaker Configuration
Main-Tie-Main Circuit Breakers

Both main circuit breakers, connected to a utility source, are connected together by means of a normally open tie circuit breaker. Each main circuit breaker feeds independent load buses. Various settings of the preferred source selector switch and the retransfer on/off options determine which circuit breakers are closed during various operating conditions.

Main-Tie-Main Circuit Breaker Configuration

Special Applications

This section contains information regarding low voltage systems in seismic and high altitude applications.

Seismic Applications

POWER-ZONE 4 switchgear has been tested for applications according to Uniform Building Code (UBC) zone 4 requirements. Equipment must be anchored properly to fully comply with zone 4 installations. Additional information can be found in Bulletin No. 80298-002-01, POWER-ZONE® 4 Low Voltage Metal-Enclosed Drawout Switchgear with MASTERPACT NW Power Circuit Breakers.

High Altitude Applications

When POWER-ZONE 4 switchgear with MASTERPACT NW circuit breakers is installed at a location greater than 6600 feet above sea level, the ratings must be de-rated.

Altitude De-rating Factors

<table>
<thead>
<tr>
<th>Altitude</th>
<th>Voltage</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>6600 ft (2,000 m) and below</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>8500 ft (2,600 m)</td>
<td>95%</td>
<td>99%</td>
</tr>
<tr>
<td>13000 ft (3,900 m)</td>
<td>80%</td>
<td>96%</td>
</tr>
</tbody>
</table>

*NOTE: Ref. ANSI C37.20.1, Table 10.*
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SECTION 4—WIRING DIAGRAMS

Basic Electrically Operated Circuit Breaker Diagrams

This section contains MASTERPACT NW circuit breaker diagrams. Refer to the MASTERPACT NW circuit breaker catalog for additional information.

Alarm and Cradle Contacts

Alarm Contacts

OF4  “Open/close” circuit breaker or switch position contacts
OF3
OF2
OF1

OF24  “Open/close” circuit breaker or switch position contact or EF24; Combined “connected and closed” contact
OF23
OF22
OF21

OF14  or EF14
OF13  or EF13
OF12  or EF12
OF22  or EF22
OF11  or EF11

Cradle Contacts

CD3  “Disconnected” position contacts
CD2  “Disconnected” position contacts
CD1  “Disconnected” position contacts

CE3  “Connected” position contacts
CE2  “Connected” position contacts
CE1  “Connected” position contacts

CT3  “Test” position contacts
CT2  “Test” position contacts
CT1  “Test” position contacts

or

C6  “Connected” position contacts
CE5  “Connected” position contacts
CE4  “Connected” position contacts

or

CD6  “Disconnected” position contacts
CD5  “Disconnected” position contacts
CD4  “Disconnected” position contacts

NOTE: OF1, OF2, OF3 and OF4 contacts are standard equipment.
POWER-ZONE® 4 Switchgear
Power, Trip Unit, and Remote Operation

Power, Trip Unit, and Remote Operation

NOTE: When networked MX1 or XF coils are used, the third wire (C3, A3) must be connected even if the communications module is not installed.
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  System Design ........................................................................ 74
  Weights ................................................................................... 76
SECTION 5—DIMENSIONS

Layouts

Top and Bottom Conduit Entrance Dimensions—Not for Construction (consult factory drawings)

Top Conduit Entrance—Auxiliary Section (22-inch wide)

Bottom Conduit Entrance—Auxiliary Section (22-inch wide)
POWER-ZONE® 4 Switchgear
Top and Bottom Conduit Entrances

Top and Bottom Conduit Entrance Dimensions—Not for Construction (consult factory drawings)

Top Conduit Entrance–Auxiliary Section (36-inch wide)

Bottom Conduit Entrance–Auxiliary Section (36-inch wide)
Top and Bottom Conduit Entrance Dimensions—Not for Construction (consult factory drawings)

Top Conduit Entrance—Main, Tie, and Feeder Sections (22-inch wide)

NOTE: Top conduit entrance area is reduced when close-coupled with a transformer.

Bottom Conduit Entrance—Main, Tie, and Feeder Sections (22-inch wide)
Top and Bottom Conduit Entrance Dimensions—Not for Construction (consult factory drawings)

**Top Conduit Entrance—Main, Tie, and Feeder Sections (36-inch wide)**

*NOTE: Top conduit entrance area is reduced when close-coupled with a transformer.*

**Bottom Conduit Entrance—Main, Tie, and Feeder Sections (36-inch wide)**
Front Elevation Dimensions—Not for Construction (consult factory drawings)

Typical Auxiliary Section—A (22-inch wide)

Location Description
AB Blank or instrument
CD Blank or instrument

Typical Auxiliary Section—B (36-inch wide)

Location Description
AB Blank or instrument
CD Blank or instrument

Typical Main and Tie Circuit Breakers—A (22-inch wide)

Location Description Frame Size Frame SCCR
A Blank or instrument – –
B Main or tie 800 A–2000 A N1–H2
C Feeder 800 A–2000 A N1–H2
D Feeder 800 A–2000 A N1–H2

Typical Main and Tie Circuit Breakers—B (22-inch wide)

Location Description Frame Size Frame SCCR
A Blank or instrument – –
BC Main or tie 3200 A H1–H2
D Feeder 800 A–2000 A N1–H2

NOTE: Any main, tie, or feeder compartment positions may be used as a blank, or instrument compartment. Not convertible for future circuit breaker use.
Front Elevation Dimensions—Not for Construction (consult factory drawings)

Typical Main and Tie—C (36-inch wide)

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
<th>Frame Size</th>
<th>Frame SCCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Blank or instrument</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>BC</td>
<td>Main or tie</td>
<td>4000 A–5000 A</td>
<td>H2</td>
</tr>
<tr>
<td>D</td>
<td>Feeder</td>
<td>800 A–2000 A</td>
<td>N1–H2</td>
</tr>
</tbody>
</table>

Typical Feeder—A (22-inch wide)

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
<th>Frame Size</th>
<th>Frame SCCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Feeder</td>
<td>800 A–2000 A</td>
<td>N1–H2</td>
</tr>
<tr>
<td>B</td>
<td>Feeder</td>
<td>800 A–2000 A</td>
<td>N1–H2</td>
</tr>
<tr>
<td>C</td>
<td>Feeder</td>
<td>800 A–2000 A</td>
<td>N1–H2</td>
</tr>
<tr>
<td>D</td>
<td>Feeder</td>
<td>800 A–2000 A</td>
<td>N1–H2</td>
</tr>
</tbody>
</table>

Typical Feeder—B (22-inch wide)

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
<th>Frame Size</th>
<th>Frame SCCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB</td>
<td>Feeder</td>
<td>3200 A</td>
<td>N1–H2</td>
</tr>
<tr>
<td>CD</td>
<td>Feeder</td>
<td>3200 A</td>
<td>H1–H2</td>
</tr>
</tbody>
</table>

Typical Feeder—C (22-inch wide)

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
<th>Frame Size</th>
<th>Frame SCCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Feeder</td>
<td>800 A–2000 A</td>
<td>N1–H2</td>
</tr>
<tr>
<td>B</td>
<td>Feeder</td>
<td>800 A–2000 A</td>
<td>N1–H2</td>
</tr>
<tr>
<td>CD</td>
<td>Feeder</td>
<td>32000 A</td>
<td>H1–H2</td>
</tr>
</tbody>
</table>

NOTE: Any main, tie, or feeder compartment positions may be used as a blank, or instrument compartment. Not convertible for future circuit breaker use.
Front Elevation Dimensions—Not for Construction (consult factory drawings)

Typical Feeder Circuit Breakers—D (36-inch wide)

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
<th>Frame Size</th>
<th>Frame SCCR</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>Feeder</td>
<td>800 A–2000 A</td>
<td>N1–H2</td>
</tr>
<tr>
<td>B</td>
<td>Feeder</td>
<td>800 A–2000 A</td>
<td>N1–H2</td>
</tr>
<tr>
<td>CD</td>
<td>Feeder</td>
<td>4000 A–5000 A</td>
<td>H2</td>
</tr>
</tbody>
</table>

Typical Feeder Circuit Breakers—E (36-inch wide)

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
<th>Frame Size</th>
<th>Frame SCCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB</td>
<td>Feeder</td>
<td>4000 A–5000 A</td>
<td>H2</td>
</tr>
<tr>
<td>CD</td>
<td>Feeder</td>
<td>4000 A–5000 A</td>
<td>H2</td>
</tr>
</tbody>
</table>

Typical L1 Main and Tie—A (200 kA @ 480 V) (36-inch wide)

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
<th>Frame Size</th>
<th>Frame SCCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Blank or instrument</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>BC</td>
<td>Main or tie</td>
<td>2000 A–5000 A</td>
<td>L1</td>
</tr>
<tr>
<td>D</td>
<td>Feeder</td>
<td>2000 A</td>
<td>L1</td>
</tr>
</tbody>
</table>

Typical L1 Feeder—A (200 kA @ 480 V) (22-inch wide)

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
<th>Frame Size</th>
<th>Frame SCCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Feeder</td>
<td>800 A–2000 A</td>
<td>L1</td>
</tr>
<tr>
<td>B</td>
<td>Feeder</td>
<td>800 A–2000 A</td>
<td>L1</td>
</tr>
<tr>
<td>C</td>
<td>Feeder</td>
<td>800 A–2000 A</td>
<td>L1</td>
</tr>
<tr>
<td>D</td>
<td>Feeder</td>
<td>800 A–2000 A</td>
<td>L1</td>
</tr>
</tbody>
</table>

NOTE: Any main, tie, or feeder compartment positions may be used as a blank, or instrument compartment. Not convertible for future circuit breaker use.
System Design

Front Elevation Dimensions—Not for Construction (consult factory drawings)

Typical 5 Bay Representation (22-inch wide) with 3200 A Main-Tie-Main, Double-ended Lineup
Front Elevation Dimensions—Not for Construction (consult factory drawings)

Typical 3 Bay Representation (36-inch and 22-inch wide)
Weights
Refer to the shipping documents for the correct weights and dimensions. The weights given here are approximate values. Consult shipping documents for actual weights.

Switchgear 4 High without Circuit Breakers

<table>
<thead>
<tr>
<th>Bus Rating</th>
<th>22 Wide</th>
<th></th>
<th>36 Wide</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Lbs.</td>
<td>Kg.</td>
<td>Lbs.</td>
</tr>
<tr>
<td>1600 A–2000 A</td>
<td>1200</td>
<td>545</td>
<td>1300</td>
</tr>
<tr>
<td>3200 A</td>
<td>1400</td>
<td>636</td>
<td>1500</td>
</tr>
<tr>
<td>40000 A–5000 A</td>
<td>1700</td>
<td>773</td>
<td>1800</td>
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</table>

MASTERPACT NW Circuit Breaker Weights

<table>
<thead>
<tr>
<th>Amperes</th>
<th>Lbs.</th>
<th>Kg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>800</td>
<td>110</td>
<td>50</td>
</tr>
<tr>
<td>1600</td>
<td>110</td>
<td>50</td>
</tr>
<tr>
<td>2000</td>
<td>110</td>
<td>50</td>
</tr>
<tr>
<td>3200</td>
<td>110</td>
<td>50</td>
</tr>
<tr>
<td>2000 ①</td>
<td>230</td>
<td>105</td>
</tr>
<tr>
<td>3200 ①</td>
<td>230</td>
<td>105</td>
</tr>
<tr>
<td>4000 ①</td>
<td>230</td>
<td>105</td>
</tr>
<tr>
<td>5000 ①</td>
<td>230</td>
<td>105</td>
</tr>
</tbody>
</table>

① 6 Pole (double-wide)
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SECTION 6—SUGGESTED SPECIFICATIONS

1.0 General

This specification and associated drawings describe POWER-ZONE 4 switchgear constructed to ANSI C37.20.1 industry standards. The main components of the switchgear are MASTERPACT NW circuit breakers.

NOTE: Square D Type MASTERPACT NW circuit breakers are described in “Square D Specifications, Section 16410-5—Low Voltage Power Circuit Breakers”.

1.1 Standards

POWER-ZONE 4 switchgear equipment shall be designed, tested and manufactured according to the following standards.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSI C37.20.1</td>
<td>Metal-enclosed low voltage circuit breaker switchgear</td>
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<tr>
<td>ANSI C37.51</td>
<td>Testing of metal-enclosed low voltage ac circuit breaker switchgear</td>
</tr>
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<td>NEMA SG-5</td>
<td>Power switchgear assemblies</td>
</tr>
<tr>
<td>CAN/CSA C22.2 No. 31-M89</td>
<td>Switchgear assemblies</td>
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<td>Zone 4 seismic applications</td>
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<tr>
<td>UL 1558</td>
<td>Switchgear assemblies</td>
</tr>
</tbody>
</table>

Main and feeder MASTERPACT NW circuit breakers used in POWER-ZONE 4 switchgear shall be designed, tested, and manufactured to the following standards.

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<thead>
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<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSI C37.13</td>
<td>Low voltage ac power circuit breakers used in equipment</td>
</tr>
<tr>
<td>ANSI C37.16</td>
<td>Preferred rating, related requirement and application recommendations for low voltage power circuit breakers and ac power circuit breakers</td>
</tr>
<tr>
<td>ANSI C37.17</td>
<td>Trip devices for ac and general-purpose dc low voltage power circuit breakers</td>
</tr>
<tr>
<td>ANSI C37.50</td>
<td>Testing of low voltage ac circuit breakers</td>
</tr>
<tr>
<td>NEMA SG-3</td>
<td>Low voltage circuit breakers</td>
</tr>
<tr>
<td>UL 1066</td>
<td>Low voltage circuit breakers</td>
</tr>
</tbody>
</table>

1.2 Ratings

POWER-ZONE 4 switchgear available ampacity ratings are outlined below.

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<th>System Ampacity</th>
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</thead>
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<tr>
<td>1600</td>
</tr>
<tr>
<td>2000</td>
</tr>
<tr>
<td>3200</td>
</tr>
<tr>
<td>4000</td>
</tr>
<tr>
<td>5000</td>
</tr>
</tbody>
</table>

The short-circuit current rating of the system shall be determined by the available fault current at the POWER-ZONE 4 switchgear. All circuit interruption shall be accomplished by the MASTERPACT NW circuit breaker without the aid of limiter fuses. The short-time rating shall also be a function on the desired selectivity of the electrical system. Short-time ratings shall be equal to interrupting ratings for systems delivering up to 85 kA available fault current.
POWER-ZONE® 4 Switchgear

2.0 Products

Available short-circuit current ratings are outlined below.

<table>
<thead>
<tr>
<th>Short-Circuit Current Rating</th>
<th>Short-Time</th>
<th>Close and Latch</th>
</tr>
</thead>
<tbody>
<tr>
<td>240 V</td>
<td>85 kA</td>
<td>42 kA</td>
</tr>
<tr>
<td>480 V</td>
<td>85 kA</td>
<td>42 kA</td>
</tr>
<tr>
<td>600 V</td>
<td>85 kA</td>
<td>42 kA</td>
</tr>
<tr>
<td>200 kA</td>
<td>200 kA</td>
<td>50 kA</td>
</tr>
</tbody>
</table>

POWERZONE 4 switchgear is designed for use on 50 Hz or 60 Hz electrical systems up to 600 Vac and shall be properly braced to the ratings of the MASTERPACT NW circuit breaker(s) installed within the switchgear.

2.0 Products

2.1 Manufacturers

POWER-ZONE 4 switchgear shall be manufactured by Square D company. The MASTERPACT NW circuit breaker shall be manufactured by Square D company.

2.2 Structure

Structure specifications for the POWER-ZONE 4 switchgear are outlined below.

General
a. Each steel section of the switchgear shall contain one or more individual circuit breaker compartments or auxiliary instrument compartments, as well as a bus compartment and rear compartment for outgoing cable connections.
b. A rigid removable steel base channel shall be provided at the front and rear of each section.
c. The exterior and interior switchgear finish shall be medium ANSI #49 gray.

Dimensions
a. Section widths shall be 22-inches or 36-inches wide, depending on the size of the MASTERPACT NW circuit breakers being installed in the switchgear.
b. The switchgear lineup shall provide adequate wire bending space for main and feeder MASTERPACT NW circuit breakers using up to 750 kcmil wires.
c. Section depth shall be 54-inches minimum when using 800 A feeders. Additional depth to the lineup shall be for the sole purpose of additional wire bending and conduit space.
d. Adequate conduit space that allows all conductors to exit the section at the same location.

Moving and Handling
a. The switchgear lineup shall be divided into shipping splits not to exceed 88-inches wide and shall be capable of being lifted overhead or by using a forklift.
b. Each shipping split shall have removable lifting straps.
c. Removable base channels shall be provided with prying slots for ease of final positioning at the job site.
d. For MASTERPACT NW circuit breakers, an overhead lifter or floor crane shall be provided to ease the installation or removal of circuit breakers in excess of 75 pounds.
2.3 Circuit Breaker Compartment

POWER-ZONE 4 switchgear circuit breaker compartments shall contain MASTERPACT NW circuit breakers with MICROLOGIC trip units.

**MASTERPACT NW Circuit Breakers**

a. Each circuit breaker shall be mounted in its own barriered compartment.

b. Feeder circuit breakers rated 2000 A or less shall be capable of being mounted in the uppermost compartment without de-rating.

c. The front of the circuit breaker shall protrude through the door of the switchgear allowing access to circuit breaker controls, indicators, and the trip unit.

d. The design shall allow for closed door racking in circuit breaker compartments.

e. Circuit breakers of like frames shall be interchangeable, as standard.

f. Prepared circuit breaker compartments shall include the racking mechanism, bussing, and secondary contacts, as necessary.

g. Circuit breaker and prepared circuit breaker compartments shall be “keyed” to avoid insertion of circuit breakers with similar dimensions but insufficient interrupting ratings, or incorrect frame sizes into an inappropriate circuit breaker compartment.

**Secondary Connections**

a. All customer secondary control and communications connections shall be made from the front of the switchgear lineup.

b. A dedicated wiring channel accessible from the front of the switchgear shall allow easy access to all control or communications terminations.

c. Control connections shall be either cage clamp or optional ring tongue terminals. All control wire shall be #14 gauge SIS.

d. Dedicated conduit entry for control wires shall be provided at the top and bottom of each section, capable of landing up to four 3/4-inch conduits and accessible from the front of the switchgear.

e. All interconnections between switchgear sections at shipping splits shall use locking, pull-apart type terminal blocks.

f. All secondary and communication wiring shall be securely fastened to the switchgear with minimal use of adhesive backed wire anchors. Adhesive backed anchors shall be allowed on doors to aid in wire routing.

**Instrumentation**

a. Where additional space is required for instrumentation, such as CPTs and metering, a barriered auxiliary instrumentation compartment shall be used in the switchgear.

b. The auxiliary instrumentation compartment shall not inhibit the routing of control or communication wires.

2.4 Bus Compartment

a. All vertical and cross bus shall be rated for the full ampacity of the switchgear lineup.

b. All bus joints shall consist of grade 5 hardware and conical washers to withstand mechanical forces exerted during short circuits. All bus joints shall consist of a minimum of 2 bolts.

c. Bus shall be plated along its entire length.

d. Bus shall be braced to withstand the instantaneous interrupting rating of the main breaker(s) or 65 kA minimum.

e. Optional barriers shall be available to separate the bus and cable compartments.
2.5 Cable Compartment

a. All incoming or outgoing power conductors shall be routed through the rear cable compartment.

b. Feeder circuit breakers shall have adequate wire bending space, regardless of the circuit breaker interrupting rating.

The table below lists the section depth needed to meet wire bending requirements.

<table>
<thead>
<tr>
<th>Feeder Circuit Breaker</th>
<th>Section Depth (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>800 A (max.)</td>
<td>54</td>
</tr>
<tr>
<td>4000 A (max.)</td>
<td>60</td>
</tr>
<tr>
<td>4000 A (max.)</td>
<td>72 (optional)</td>
</tr>
<tr>
<td>4000 A (max.)</td>
<td>80 (optional)</td>
</tr>
</tbody>
</table>

c. The conduit area for each section shall be a minimum of 17-inches wide and provide adequate depth for all section conduits.

d. Select depth based on the table requirements listed below. The dimensions in the table indicate approximate conduit area for cable fed mains and feeders. All dimensions are in inches.

<table>
<thead>
<tr>
<th>Section Width (inches)</th>
<th>54-inches</th>
<th>60-inches</th>
<th>72-inches</th>
<th>80-inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>17 W x 8 D</td>
<td>17 W x 14 D</td>
<td>17 W x 26 D</td>
<td>17 W x 34 D</td>
</tr>
<tr>
<td>36</td>
<td>31 W x 8 D</td>
<td>31 W x 14 D</td>
<td>31 W x 26 D</td>
<td>31 W x 34 D</td>
</tr>
</tbody>
</table>

e. Barriers to separate the cable compartment from the adjacent cable compartment shall be available for the switchgear assembly.

2.6 Circuit Breakers and Trip Units

MASTERPACT NW Circuit Breakers

a. Circuit breakers shall be Square D MASTERPACT NW circuit breakers. Listed to UL 1066.

b. Circuit breakers shall be suitable for the required instantaneous rating without the use of external current limiting fuses.

c. All circuit breakers shall have field interchangeable electrical accessories, including shunt trip, auxiliary contacts, electrical operating mechanism, shunt close, and trip unit.

d. All secondary connections shall be made directly to the front of the circuit breaker cradle.

e. Each circuit breaker shall have built-in contact temperature sensors and contact wear indicators.

MICROLOGIC (Basic, Type A, Type P, and Type H) Trip Units

a. All trip units shall be removable to allow for field upgrades.

b. Trip units shall incorporate “true RMS sensing,” and have LED long-time pickup indications.

c. The table on page 83 lists the standard and optional trip unit features for MICROLOGIC Type A (ammeter), Type P (Power Metering), and Type H (Harmonics) trip units for use in POWER-ZONE 4 switchgear.
Select the appropriate trip unit(s) for the system performance desired.

<table>
<thead>
<tr>
<th>Functions</th>
<th>Basic</th>
<th>Type A</th>
<th>Type P</th>
<th>Type H</th>
</tr>
</thead>
<tbody>
<tr>
<td>True RMS sensing</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>LI trip configuration</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>LSI</td>
<td>O</td>
<td>O</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>LSIG/ground fault trip</td>
<td>–</td>
<td>O</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Ground fault alarm (no trip)</td>
<td>–</td>
<td>–</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Ground fault trip and programming alarm</td>
<td>–</td>
<td>–</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Adjustable rating plugs</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>LED – long-time pickup</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>LED – trip indication</td>
<td>–</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Digital ammeter</td>
<td>–</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Phase loading bar graph</td>
<td>–</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>Zone selective interlocking</td>
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<td>X</td>
<td>X</td>
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<tr>
<td>Communications</td>
<td>–</td>
<td>O</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>LCD dot matrix display</td>
<td>–</td>
<td>–</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Advanced user interface</td>
<td>–</td>
<td>–</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Protective relay functions</td>
<td>–</td>
<td>–</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Thermal imaging</td>
<td>–</td>
<td>–</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Contact wear indication</td>
<td>–</td>
<td>–</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Temperature indication</td>
<td>–</td>
<td>–</td>
<td>X</td>
<td>X</td>
</tr>
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<td>–</td>
<td>–</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Selective long-time delay bands</td>
<td>–</td>
<td>–</td>
<td>X</td>
<td>X</td>
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<td>–</td>
<td>–</td>
<td>X</td>
<td>X</td>
</tr>
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<td>–</td>
<td>–</td>
<td>–</td>
<td>X</td>
</tr>
<tr>
<td>Data logging</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>X</td>
</tr>
</tbody>
</table>

Table Values:
- Not Applicable
- Standard Feature
- Optional Feature

2.7 Metering and Instrumentation

Metering and communication requirements for POWER-ZONE 4 switchgear are listed below.

Main Metering

a. Metering requirements that exceed the capabilities of the circuit breaker trip units shall use the optional Square D POWERLOGIC Power Monitoring System.

b. Three metering current transformers shall be appropriately sized for use on the incoming section.

c. Separate low voltage HMI and circuit monitor display shall be mounted near the incoming section.

d. Optional input/output (I/O) and the Ethernet communications card shall be provided as necessary.

Communications

a. Internal communications in the switchgear shall be MODBUS protocol.

b. Where necessary, an Ethernet gateway shall be located near the switchgear assembly and be capable of accepting inputs from the MICROLOGIC trip unit(s), POWERLOGIC circuit monitor(s), and Modicon PLCs.
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