Standard Compliance

- UL489: MP08 to MP50 circuit breakers and their accessories are Listed under UL files E63335, E103955 and E113555.
- UL1066/ANSI: MC08 to MC50 circuit breakers are UL Listed according to UL1066 (ANSI C37-13) under file E161835.
- International Standards: the MASTERPACT® circuit breaker has been designed to meet all the major standards including:
  - IEC 947-2 and related standards such as VDE, BS, EN, etc.
  - JEC, JIS
- UL 1008: MP12, MP20 and MP30 circuit breakers are suitable for use in transfer switch equipment.
- Marine Applications:
  - Homologated by Bureau Veritas
  - Approved by Det Norske Veritas and Germanische Lloyd's
  - Listed by Lloyd’s Register of Shipping
  - American Bureau of Shipping application
  - UL marine

High Short-time Current Rating: Up to 100 kA for 1 sec.

The exceptional short-time rating of 75,000 A in a 3000 A frame and 100,000 A in a 4000 A frame and above allows the circuit breakers to be fully selective up to their interrupting ratings.

100% Rated

The circuit breakers are designed for continuous operation at 100% of their current rating.

Other Performances

The UL 489 and UL1066 (ANSI C37-13) standard performance tests assure that the circuit breaker has sufficient characteristics to be used in normal conditions. However, the circuit breaker exceeds, without additional costs, the UL standard 1,500 operations required in endurance. The heavy-duty mechanism and the contact design provide a mechanical endurance of 10,000 operations (approx.) without maintenance (see page 64).

Tropicalization

The standard moisture and fungus protection ensure normal operation under extreme ambient conditions. MASTERPACT circuit breakers comply with T2 tropicalization (IEC Standard 68-2-30); relative humidity 95% at 113°F (45°C) and 80% at 131°F (55°C) (hot, humid climate). Salt spray resistance as per IEC 68-2-11.

Poles

The 4-pole version is an efficient solution to ground fault problems created by incorrectly grounded standby generators and incorrect transfer switching systems. By isolating the neutral of multiple sources coupled together, 4-pole circuit breakers prevent ground faults from returning to the source via unintended paths. Where unintended paths exist, ground fault sensing can become inaccurate or create nuisance tripping.

<table>
<thead>
<tr>
<th>Ampere Rating (A)</th>
<th>3-Pole</th>
<th>4-Pole</th>
</tr>
</thead>
<tbody>
<tr>
<td>800</td>
<td>MP-MC</td>
<td>MP-MC</td>
</tr>
<tr>
<td>1200</td>
<td>MP</td>
<td>MP</td>
</tr>
<tr>
<td>1600</td>
<td>MP-MC</td>
<td>MP-MC</td>
</tr>
<tr>
<td>2000</td>
<td>MP-MC</td>
<td>MP-MC</td>
</tr>
<tr>
<td>2500</td>
<td>MP</td>
<td>MP</td>
</tr>
<tr>
<td>3000</td>
<td>MP</td>
<td>MP</td>
</tr>
<tr>
<td>3200</td>
<td>MC</td>
<td></td>
</tr>
<tr>
<td>4000</td>
<td>MP-MC</td>
<td>MP (1)</td>
</tr>
<tr>
<td>5000</td>
<td>MP-MC</td>
<td>MP (1)</td>
</tr>
<tr>
<td>6300</td>
<td>MP (1)</td>
<td></td>
</tr>
</tbody>
</table>

(1) Not UL Listed.
## Ratings

<table>
<thead>
<tr>
<th>Type</th>
<th>Ampere Rating (A)</th>
<th>Sensor Ratings (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP/MC08</td>
<td>800</td>
<td>250–400–600–800</td>
</tr>
<tr>
<td>MP12</td>
<td>1200</td>
<td>800–1200</td>
</tr>
<tr>
<td>MP/MC16</td>
<td>1600</td>
<td>1200–1600</td>
</tr>
<tr>
<td>MP/MC20</td>
<td>2000</td>
<td>1600–2000</td>
</tr>
<tr>
<td>MP25</td>
<td>2500</td>
<td>2000–2500</td>
</tr>
<tr>
<td>MP30</td>
<td>3000</td>
<td>2500–3000</td>
</tr>
<tr>
<td>MC32</td>
<td>3200</td>
<td>2500–3200</td>
</tr>
<tr>
<td>MP/MC40</td>
<td>4000</td>
<td>2500–3000–4000</td>
</tr>
<tr>
<td>MP/MC50</td>
<td>5000</td>
<td>4000–5000</td>
</tr>
<tr>
<td>MP63</td>
<td>6300</td>
<td>5000–6300</td>
</tr>
</tbody>
</table>

## Interrupting Ratings

### UL489/NEMA AB1

<table>
<thead>
<tr>
<th>Type</th>
<th>Rating (A)</th>
<th>480 Vac</th>
<th>600 Vac</th>
<th>Short-time</th>
</tr>
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<tbody>
<tr>
<td><strong>Standard Interrupting Rating</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MP08 H1</td>
<td>800</td>
<td>65 kA</td>
<td>65 kA</td>
<td>50 kA</td>
</tr>
<tr>
<td>MP12 H1</td>
<td>1200</td>
<td>65 kA</td>
<td>65 kA</td>
<td>50 kA</td>
</tr>
<tr>
<td>MP16 H1</td>
<td>1600</td>
<td>65 kA</td>
<td>65 kA</td>
<td>50 kA</td>
</tr>
<tr>
<td>MP20 H1</td>
<td>2000</td>
<td>75 kA</td>
<td>75 kA</td>
<td>75 kA</td>
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<tr>
<td>MP25 H1</td>
<td>2500</td>
<td>75 kA</td>
<td>75 kA</td>
<td>75 kA</td>
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<tr>
<td>MP30 H1</td>
<td>3000</td>
<td>75 kA</td>
<td>75 kA</td>
<td>75 kA</td>
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<tr>
<td>MP40 H1</td>
<td>4000</td>
<td>100 kA</td>
<td>100 kA</td>
<td>100 kA</td>
</tr>
<tr>
<td>MP50 H1</td>
<td>5000</td>
<td>100 kA</td>
<td>100 kA</td>
<td>100 kA</td>
</tr>
<tr>
<td>MP63 H1</td>
<td>6300 (1)</td>
<td>100 kA</td>
<td>100 kA</td>
<td>100 kA</td>
</tr>
<tr>
<td><strong>High Interrupting Rating</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MP08 H2</td>
<td>800</td>
<td>100 kA</td>
<td>65 kA</td>
<td>50 kA</td>
</tr>
<tr>
<td>MP12 H2</td>
<td>1200</td>
<td>100 kA</td>
<td>65 kA</td>
<td>50 kA</td>
</tr>
<tr>
<td>MP16 H2</td>
<td>1600</td>
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<td>MP30 H2</td>
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<td>MP63 H2</td>
<td>6300 (1)</td>
<td>150 kA</td>
<td>100 kA</td>
<td>100 kA</td>
</tr>
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</table>

(1) Not UL Listed.

### UL1066/ANSI C37–13/NEMA SG3

<table>
<thead>
<tr>
<th>Type</th>
<th>Rating (A)</th>
<th>508 V</th>
<th>635 V</th>
<th>Short-time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Special Interrupting Rating</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MC08 N1</td>
<td>800</td>
<td>50 kA</td>
<td>50 kA</td>
<td>42 kA</td>
</tr>
<tr>
<td>MC16 N1</td>
<td>1600</td>
<td>50 kA</td>
<td>50 kA</td>
<td>50 kA</td>
</tr>
<tr>
<td><strong>Standard Interrupting Rating</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MC08 H1</td>
<td>800</td>
<td>65 kA</td>
<td>65 kA</td>
<td>50 kA</td>
</tr>
<tr>
<td>MC16 H1</td>
<td>1600</td>
<td>65 kA</td>
<td>65 kA</td>
<td>50 kA</td>
</tr>
<tr>
<td>MC20 H1</td>
<td>2000</td>
<td>65 kA</td>
<td>65 kA</td>
<td>65 kA</td>
</tr>
<tr>
<td>MC32 H1</td>
<td>3200</td>
<td>65 kA</td>
<td>65 kA</td>
<td>65 kA</td>
</tr>
<tr>
<td>MC40 H1</td>
<td>4000</td>
<td>100 kA</td>
<td>100 kA</td>
<td>100 kA</td>
</tr>
<tr>
<td>MC50 H1</td>
<td>5000</td>
<td>100 kA</td>
<td>100 kA</td>
<td>100 kA</td>
</tr>
</tbody>
</table>
**Advantages**

**Drawout Circuit Breaker Design**

- The drawout assembly mechanism allows the circuit breaker to be racked in four positions (connected, test, disconnected and withdrawn).
- The closing and opening push buttons, the racking handle and racking mechanism are accessible through the front door cutout. Therefore the circuit breaker can be disconnected without opening the door and accessing live parts. Safety shutters can be provided as an option for protection from live parts when the circuit breaker is removed.

![Connected Position](image1)

![Test Position](image2)

![Disconnected Position](image3)

**True Two-step Stored Energy Mechanism**

The closing time is less than five cycles. The circuit breaker is operated via a stored-energy mechanism which can be manually or motor charged. Closing and opening operations can be initiated either from the local push buttons on the circuit breaker front face or by remote control. O–C–O cycle is possible without recharging.

**Designed for No Maintenance...**

The circuit breaker has fewer parts (by a factor of at least five) than conventional circuit breakers while performing the same functions. This leads to greatly enhanced reliability and reduction in maintenance. Under normal operating conditions, according to standards and controlled by tests, the circuit breaker does not require maintenance.

**...But Exceeds Standards with an Easy and Reduced Maintenance**

It is easy to remove the arc chutes and visually inspect the contacts and wear indicator. The operation counter (spring-charging motor option) can also indicate when inspections and possible maintenance should be done. After operating conditions exceeding those given by standards, it is possible to extend the circuit breaker life by:

- Replacement of arc chutes and spring charging motor by the user.
- Replacement of main contacts by an after sale service team.

*Note: See pages 62–63 for additional information.*

![Contact Good](image4)

![Contact Worn](image5)
Advantages

Single Design up to 6300 A

All frame sizes have been designed with the same technology featuring identical depth and door cutouts, and common control units and accessories.

Field-installable Accessories

- As the installation develops and changes, the circuit breaker can develop and change with it. Most accessories are field-installable, without losing the UL Listing mark, without any adjustment and with only the aid of a screwdriver.
- The uniform design of the circuit breaker line allows these accessories to be common for the whole line.

Front Connection of Secondary Circuits

All accessory terminals are located on a connecting block which is accessible from the front even with the circuit breaker in the test or disconnected position. This is particularly useful for field inspection and modification.
Advantages

Disconnecting through Door
The racking handle and racking mechanism are accessible through the front door cutout. Disconnecting the circuit breaker will therefore be possible without opening the door and giving access to live parts.

Isolation Function by Positive Indication of Contact Status
The mechanical indicator is truly representative of the status of all three main contacts.

Segregated Compartment
Once the front cover has been removed to provide access to the auxiliary compartment, the main contacts remain fully isolated. Furthermore, interphase partitioning allows full insulation between each pole even if the front cover has been removed.

Reinforced Insulation
Two insulation barriers separate the front of the circuit breaker from main circuits.
Description

1. Arc chamber and terminal covers
2. Accessories and control unit front connecting block
3. Position carriage switches
4. Opening coils
5. Arc chute
6. Spring charging motor
7. Front cover
8. Control unit
9. Racking crank
10. Pull-out handgrip
11. Retractable rails
12. Handling handgrip
13. Safety shutters

Front View

1. Charging handle
2. Manual opening push button
3. Manual closing push button
4. Stored energy mechanism status indicator (charged or discharged)
5. Main contact position indicator (open or closed)
6. Disconnected position locking (key interlock)
7. Disconnected position padlocking
8. Drawout position indicator showing that the circuit breaker is in the connected, test or disconnected position
9. Racking crank storage
10. Door escutcheon
11. Fault indicator and reset button
12. Open position locking (key interlock)
The circuit breaker can be equipped with a microprocessor-based, electronic control unit which provides all the traditional protection of the universal power circuit breaker (long-time, short-time, instantaneous and ground-fault) plus other built-in functions:

- RMS sensing (standard)
- Alarm switch (standard)
- Overcurrent trip switch (standard)
- Interchangeable rating plugs (on STR28DP, STR38SP and STR58UP)
- Thermal memory and I^2t ramp (standard on STR 38-58 control unit)
- Defeatable instantaneous (standard on STR 38-58 control unit)
- Zone-selective interlocking for ground-fault and short-time (option)
- Current and load meter (option)
- Load-monitoring outputs (option)
- Fault indicators (option)
- Communication ability (option)

### Control Units

<table>
<thead>
<tr>
<th>Control Units</th>
<th>STR 18M</th>
<th>STR 28D</th>
<th>STR 38S</th>
<th>STR 58U</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic Features</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long-time (1)</td>
<td>Setting</td>
<td>Adjustable</td>
<td>Adjustable</td>
<td>Adjustable</td>
</tr>
<tr>
<td>Delay</td>
<td>Fixed</td>
<td>Fixed</td>
<td>Adjustable</td>
<td></td>
</tr>
<tr>
<td>Short-time</td>
<td>Pickup</td>
<td>Adjustable</td>
<td>Adjustable</td>
<td>Adjustable</td>
</tr>
<tr>
<td>Delay</td>
<td>Adjustable</td>
<td>Adjustable</td>
<td>Adjustable</td>
<td></td>
</tr>
<tr>
<td>Instantaneous</td>
<td>Adjustable</td>
<td>Adjustable</td>
<td>Fixed (2)</td>
<td>Adjustable (2)</td>
</tr>
<tr>
<td>Test Receptacle</td>
<td>Standard</td>
<td>Standard</td>
<td>Standard</td>
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<tr>
<td><strong>Additional Features (Options)</strong></td>
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<tr>
<td>Ground-fault Protection (3)</td>
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<td></td>
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<tr>
<td>Built-in Ammeter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fault Indicators</td>
<td></td>
<td></td>
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<tr>
<td>Segregated Alarm Switch</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Zone-selective Interlocking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load Monitoring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication Outputs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) Long-time pickup at 1.1 current setting.
(2) Defeatable on N1 and H1 types.
(3) Two types: residual sensing (T) or residual source ground return (W).
STR 28D Control Unit for General Application

1. Mechanical pop-out type fault indicator and reset button:
   - Indicates that a fault trip has occurred
   - Prevents closing of the circuit breaker after fault until reset
2. Ammeter (LCD digital display)
3. Ammeter selector used to read:
   - Phase currents (1, 2, 3, N)
   - Or the phase with the highest load current (max.)
4. Load indication (bar graph in % of current setting)
5. Sensor rating
6. Rating plug (on STR 28DP)
7. Long-time current setting
8. Instantaneous pickup
9. Local and remote pre-trip alarm:
   - LED on at 90% of current setting
   - LED flashing on overload (1)
   - Remote indication by static contact
10. Available spaces for setting identification
11. Test receptacle

Overcurrent Protection—RMS Sensing

<table>
<thead>
<tr>
<th>Rating Plug</th>
<th>Rating Plug Current Setting</th>
<th>Rating Plug Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 A</td>
<td>400–300–250–200 A</td>
<td>400–300–250–200 A</td>
</tr>
<tr>
<td>600 A</td>
<td>600–500–400–300 A</td>
<td>600–500–400–300 A</td>
</tr>
<tr>
<td>800 A</td>
<td>800–600–500–400 A</td>
<td>800–600–500–400 A</td>
</tr>
<tr>
<td>1200 A</td>
<td>1200–1000–800–600 A</td>
<td>1200–1000–800–600 A</td>
</tr>
<tr>
<td>1600 A</td>
<td>1600–1200–1000–800 A</td>
<td>1600–1200–1000–800 A</td>
</tr>
<tr>
<td>5000 A</td>
<td>5000–4000–3000–2500–2000–1600 A</td>
<td></td>
</tr>
<tr>
<td>6300 A</td>
<td>6300–6000–5000–4000–3000–3000 A</td>
<td></td>
</tr>
</tbody>
</table>

Instantaneous Pickup 1.5 to 10 x Current Setting

Built-in Ammeter (Optional)

<table>
<thead>
<tr>
<th>Option</th>
<th>Values Displayed</th>
<th>Accuracy</th>
<th>Bar Graph Indication</th>
<th>Control Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Phase 1, 2, 3, Max., Neutral Current</td>
<td>±1.5 % (2)</td>
<td>Phase 1, 2, 3—10% Steps</td>
<td>Not Required (3)</td>
</tr>
</tbody>
</table>

Fault or Alarm Indicators

Not Discriminated Local Pop-out Type Indicator and LED Pre-trip Alarm
Remote Overcurrent Trip and Pre-trip Alarm Switches (see pp. 14–15)

(1) According to time-current curves: between 105% and 120% of current setting.
(2) Total accuracy including current sensors: ±4.5%.
(3) Control power not required for loads greater than 20% of current sensor. Required for load less than 20% of current sensors if maximum demand memory requested (see diagram on p. 43).

Note: Io: Rating plug  tm: Short-time delay
In: Sensor rating  I: Instantaneous pickup
Ir: Long-time pickup  lh: Ground-fault pickup
tr: Long-time delay  th: Ground-fault delay
lm: Short-time pickup
STR 38S Control Unit for Selective Application

1. Mechanical pop-out type fault indicator and reset button:
   - Indicates that a fault trip has occurred
   - Prevents closure of the circuit breaker after fault until reset
2. Ammeter (LCD digital display)
3. Ammeter selector used to read:
   - Phase currents (1, 2, 3, N, ground)
   - Or the phase with the highest load current (max.)
4. Load indication (bar graph in % of current setting)
5. Sensor rating
6. Local and remote pre-trip alarm:
   - LED on at 90% of current setting
   - LED flashing on overload (1)
   - Remote indication by static contact
7. Rating plug (on STR 38SP)
8. Long-time current setting
9. Short-time pickup
10. Short-time delay
11. Instantaneous ON/OFF selector
12. Available space for setting identification
13. Ground-fault (option T) pickup
14. Ground-fault (option T) time delay
15. Local (option F) fault indicators consisting of built-in light emitting diodes; fault indicators differentiate the three causes of tripping: overload, short circuit and ground fault, if any
16. Test receptacle
17. Fault indicator saving battery (option PIL)
18. Fault indicator reset or battery test button
19. Fault indicator reactivating button (option PIL) (2)

Overcurrent Protection—RMS sensing

<table>
<thead>
<tr>
<th>Type</th>
<th>Setting</th>
<th>Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-time</td>
<td>STR 38SP: 0.8 to 1 x Rating Plug (Pickup at 1.1 x Setting)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>STR 38S: 0.4 to 1 x Current Sensor (Pickup at 1.1 x Setting)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fixed: 7.5 sec. at 6 x Current Setting</td>
<td></td>
</tr>
<tr>
<td>Thermal Memory as Standard</td>
<td></td>
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</tr>
</tbody>
</table>

Rating Plug: 4 to 6 Rating Plugs Available Per Sensor Rating; See STR 28D Control Unit, p. 8

Short-time:
- Pickup: 1.5 to 10 x Current Setting
- Delay Bands: 0.1–0.2–0.3–0.4 with I2t OFF
  - 0.1–0.2–0.3–0.4 with I2t ON

Instantaneous:
- Pickup: High-set Fixed Type (3)—Defeatable on N1 and H1 Types

Ground-fault Protection (Option T or W) (4)
- Pickup: 0.1 x Current Sensor to 1200 A
  - 0.1–0.2–0.3–0.4 with I2t Ramp ON/OFF Switch

Fault Indicators (Option F)
- Not Discriminated
  - Local Mechanical Pop-out Type Indicator and LED Pre-trip Alarm
  - Remote Overcurrent Trip and Pre-trip Alarm Switches (see pp. 14–15)
- Discriminated
  - Local With Option F (see p. 14)

Built-in Ammeter (Option I)
- Values Display Phase 1, 2, 3, Max., Neutral and Ground Current
- Accuracy ±1.5% (6)
- Bar Graph Indication Phases 1, 2, 3—10% steps
- Control Power Not Required (7)

(1) According to time current curves: 105% to 120% of current setting.
(2) With PIL option, fault indicator lights (15) will light up only when this button is pushed in.
(3) See values on pp. 38–40.
(4) Residual scheme (T). The maximum ground-fault pickup meets 1999 National Electrical Code paragraph 230-95 (a) (not exceeding 1200 A). Source Ground Return scheme (W) on request.
(5) 0.1 minimum pickup requires 24 Vdc external power.
(6) Total accuracy including current sensors: ±4.5%.
(7) Control power not required for loads greater than 20% of current sensor. Required for loads less than 20% of current sensor if maximum demand memory requested (see diagram, p. 43).
STR 58U Control Unit for Universal Application

1. Mechanical pop-out type fault indicator and reset button:
   - Indicates that a fault trip has occurred
   - Prevents closure of the circuit breaker after fault until reset
2. Switch selector for the type of fault to be remotely indicated and reset
   flat push button (see option FV, p. 15)
3. Ammeter (LCD digital display)
4. Ammeter selector used to read:
   - Phase currents (1, 2, 3, N, ground)
   - Or the phase with the highest load current (max.)
5. Load indication (bar graph in % of current setting)
6. Sensor rating
7. Local and remote pre-trip alarm:
   - LED on at 90% of current setting
   - LED flashing on overload (according to time current curves: 105% to 120% of current setting)
   - Remote indication by static contact
8. Rating plug (on STR 58UP)
9. Long-time current setting
10. Long-time delay setting
11. Short-time pickup
12. Short-time delay
13. Thermal memory min./max. selector
14. Instantaneous pickup
15. Ground-fault (option T or W) pickup
16. Ground-fault (option T or W) time delay
17. Available space for setting identification
18. Load monitoring (option R) pickups (see p. 16)
19. Test receptacle
20. Fault indicator saving battery (option PIL)
21. Local (option F) fault indicators consist of built-in light emitting diodes which differentiate the three causes of tripping: overload, short circuit and ground fault, if any
22. Fault indicator reset or battery test button
23. Fault indicator reactivating button (with PIL option, fault-indicator lights (21) will only light up when this button is pushed in)
Overcurrent Protection—RMS Sensing

**Long-time**
- Current Setting: STR 58UP: 0.8 to 1 x Rating Plug (Pickup at 1.1 x Setting)
- STR 58: 0.4 to 1 x Current Sensor (Pickup at 1.1 x Setting)
- Delay Bands: 0.94–1.88–3.75–7.50–15–30s at 6 x Current Setting
- Thermal Memory as Standard with Min./Max. Selector

**Rating Plug**
- Current Sensor Plug Rating
  - 250 A: 250–200–150–125 A
  - 400 A: 400–300–250–200 A
  - 600 A: 600–500–400–300 A
  - 800 A: 800–600–500–400 A
  - 1200 A: 1200–1000–800–600 A
  - 1600 A: 1600–1200–1000–800 A
  - 2500 A: 2500–2000–1600–1200 A
  - 3000 A: 3000–2500–2000–1600 A
  - 3200 A: 3200–3000–2500–2000–1600 A
  - 4000 A: 4000–3200–3000–2500–2000 A
  - 5000 A: 5000–4000–3200–3000–2500 A

**Short-time**
- Pickup: 1.5 to 10 x Current Setting
- Delay bands: 0–0.1–0.2–0.3–0.4 with \(I^2t\) OFF
  - 0.1–0.2–0.3 with \(I^2t\) ON
- Zone-selective Interlocking with Option Z (see p. 13)

**Instantaneous**
- Pickup: Adjustable from 2 to Max. Value (1); Defeatable on N1 and H1 Types

**Ground-fault Protection (Option T or W)**
- Pickup Delay Band: 0.1 x Current Sensor to 1200 A (3)
  - 0.1–0.2–0.3–0.4 with \(I^2t\) Ramp ON/OFF Switch
- Zone-selective Interlocking with Option Z (see p. 13)

**Fault Indicators (Option F)**
- Not Discriminated
  - Local: Mechanical Pop-out Type Indicator and LED Pre-trip Alarm
  - Remote: Overcurrent Trip and Pre-trip Alarm Switches (see pp. 14–15)
- Discriminated
  - Local: With Option F (see p. 14)
  - Remote: With Option FV (see p. 15)

**Built-in Ammeter (Option I)**
- Values Display: Phase 1, 2, 3, Max., Neutral and Ground Current
- Accuracy: ±1.5% (4)
- Bar Graph Indication: Phase 1, 2, 3—10% Steps
- Control Power: Not Required (5)

**Load Monitoring (Option R)**
- Inverse Time Alarm
  - \(Ic1\) = 0.8 to 1 x Current Setting
  - \(Ic2\) = 0.5 to 1 x Current Setting
- Time delay: See Curve, p. 41

**Outputs for Communication through DIGIPACT® System (Option C)**
- Transmitted Values
  - Entire Settings of the Trip Unit
  - Circuit Breaker Status: Open, Tripped, Closed
  - Alarms: Overload, Type of Fault, Internal Watchdog (6)
  - Ammeter Values: Phase, Neutral, Ground, Max. Currents

---

1. See values on pp. 38–40.
2. Residual scheme (T). The maximum ground-fault pickup meets 1999 National Electrical Code paragraph 230-95 (a) (not exceeding 1200 A). Source Ground Return scheme (W) on request.
3. 0.2 minimum pickup only with external power.
4. Total accuracy including current sensors: ± 4.5%.
5. Control power not required for loads greater than 20% of current sensors. Required for loads less than 20% of current sensor if maximum demand memory requested (see diagram, p. 43).
6. Internal watchdog: Control unit internal temperature.
Control Units

Thermal Memory

Purpose
The thermal memory function allows an optimization of cables or bus bar protection in case of low amplitude repetitive faults. Such faults can be due to repetitive motor startings, fluctuating load or subsequent closing after a fault.

Traditional electronic protection has no effect when facing such repetitive faults because the duration of each overload above the pickup setting is too short to achieve effective tripping. Nevertheless, each overload involves a temperature rise in the installation, the cumulative effect of which could lead to overheating of the system.

Principle

HAZARD OF ELECTRICAL SHOCK, BURN OR EXPLOSION.

Use “min” position for emergency only when closing on fault is absolutely necessary.

Failure to observe these precautions will cause death, personal injury or electrical shock.

The thermal memory function remembers and integrates the thermal heating caused by each pickup setting overrun. Before tripping, the integrated heating value will reduce the associated time delay and, therefore, the reaction of the control unit will be closer to the real heating of the power network system. After tripping, the memory will also reduce the time delay when closing the circuit breaker on fault.

STR Trip Units

The STR 38S and STR 58U trip units incorporate the thermal memory as standard:
- Before tripping on long-time and ground-fault protection (if provided)
- After tripping on long-time protection only, adjustable min./max. position for the STR 58U trip unit is standard

The control unit measures the internal temperature rise of the circuit breaker by thermal resistors. The cooling time constant of the memory is not fixed, but depends on the over-temperature condition.
Neutral Sensor

Ground-fault protection may be applied on 3Ø4W or 3Ø3W circuits. On 3Ø4W circuits an external neutral sensor must be used. This neutral current sensor must have the same ampere rating as the circuit breaker sensor.

Zone-selective Interlocking (ZSI)

Option Z on the STR58U control unit provides selective interlocking on short time or ground fault. A pilot wire links several trip units in the distribution network, as shown in the opposite figure. In the event of a fault, the trip unit will respond to the preset delay only if receiving a signal from the downstream unit. If not receiving a signal, the tripping will be instantaneous. Therefore, the fault is cleared instantaneously by the nearest circuit breaker: the thermal stresses ($I^2t$) in the network are minimized, without any effect on the correct time-delay coordination in the installation.

**Fault 1**

Circuit breaker A will clear the fault instantaneously, regardless of its time-delay setting.

**Fault 2**

Circuit breaker B will inform upstream circuit breaker A that it is clearing the fault and will prevent it from tripping instantaneously. Circuit breaker A will trip at the end of its time delay setting if the fault is not cleared during this time.

*Note:*

- Drawout circuit breaker terminals are delivered with "in" terminals jumpered. Remove the jumper when interlocking with a downstream circuit breaker.
- The MASTERPACT circuit breaker may also be interlocked with COMPACT® NS and CK type molded case circuit breakers with ZSI option.
- Do not ground ZSI wiring.

<table>
<thead>
<tr>
<th>Cable Size</th>
<th>#18–#14 AWG/1.5mm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Length</td>
<td>90 ft./30 m</td>
</tr>
<tr>
<td>Wiring</td>
<td>Twisted in Pairs One Turn per 4 in./10 cm</td>
</tr>
<tr>
<td>No. of Circuit Breakers</td>
<td>Upstream: 2</td>
</tr>
<tr>
<td></td>
<td>Downstream: No Limit</td>
</tr>
</tbody>
</table>

Note:

#18 to #14 AWG cables, max. length 90 ft./30m.
Fault Indicator (F)

In addition to the mechanical fault indicator, this indicator differentiates the three causes of tripping: overload, short circuit or ground fault, if any. Three light-emitting diodes indicate separately long-time, short-time/ instantaneous and ground-fault trip. A flat push button allows resetting of the indicator after tripping. A separate power supply is required to maintain the indication after tripping of the circuit breaker. Two different possibilities are offered:

- Connecting a reliable 24 Vdc control voltage on F1-F2. Auxiliary power module (AD) is used for other voltages. When the control source is considered as unreliable, a battery pack (BAT) is to be added to an AD power module.
- From a built-in battery module. When no external control source is available, a built-in battery module may be ordered (option PIL). This module integrates battery testing and indicator reactivating buttons.

Alarm Indicator Pre-trip Alarm Switch (ALR)

Delivered as standard with control unit. The alarm indicator is a fixed, front face light-emitting diode which operates as follows:

- Fixed when the current exceeds 90% of the current setting.
- Flashing on overload: according to time-current curves, 105% to 120% of current setting.

The pre-trip alarm switch is a static contact which closes when in the overload zone, up to the tripping of the circuit breaker. This contact can be used for ultimate load shedding, alarm before tripping, etc.

Output Characteristics

| 0.1 A/240 Vac (Optical Triac) |

Power Supply

Not Required
Control Units

Overcurrent Trip Switch (SDE)

Delivered standard with control unit. In addition to the fault trip indicator/reset button, one SPDT switch provides alarm/lockout information. This SPDT switch is operated only when the circuit breaker is tripped by the control unit. When the circuit breaker is reset, the "a" switch (alarm) is open and the "b" switch (lockout) is closed.

<table>
<thead>
<tr>
<th>Output Characteristics</th>
<th>SPDT 10 A/240 Vac</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply</td>
<td>Not Required</td>
</tr>
</tbody>
</table>

Segregated Trip Switch (FV)

This switch works exactly as the standard overcurrent trip switch (SDE) except that a commutator on the front face is used to choose the type of fault which will operate the contact: overload, short-circuit, ground-fault, or any combination of these types. This option can be used in addition to the SDE switch for remote signalization of particular types of faults. A flat push button allows resetting of the indicator after tripping.

<table>
<thead>
<tr>
<th>Output Characteristics</th>
<th>5 A/240 Vac</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply</td>
<td>Required</td>
</tr>
</tbody>
</table>

Wired in parallel with the remote opening button which operates the shunt trip, the option FV contact provides an electrical interlock which prevents the circuit breaker from being closed after the pre-selected type of faults: for example the circuit breaker will be able to be remotely closed after overload, but not after short circuit.
Control Units

Load monitoring (R)

Option R provides two independent static contacts which operate when the current exceeds adjustable pickup limits:

- When the current exceeds the limit $I_{c1}$ (or $I_{c2}$), the contact C-R1 (or C-R2) closes following an inverse time characteristic A.
- When the current drops below the limit $I_{c1}$ (or $I_{c2}$), the contact C-R1 (or C-R2) opens with constant time delay (10 seconds) B.

These contacts can be used for load shedding, alarms, indications, etc.

<table>
<thead>
<tr>
<th>Voltage</th>
<th>240 Vac max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outputs</td>
<td>0.1 A triac</td>
</tr>
</tbody>
</table>

Test Kits

Every control unit is equipped with a test receptacle that can be used with a test kit. Tests performed by test kits are only functional tests designed to electrically test the operating integrity of the control unit, the flux transfer device and the mechanical operation of the circuit breaker. Tests are not designed to calibrate the circuit breaker. Calibration can only be done at the factory.
Communication

MASTERPACT circuit breakers can be easily connected to a supervising personal computer using the DIGIPACT® system. The following four functions can thus be provided:

- **Indication:**
  - Status of the circuit breaker (on, off or tripped; connected or disconnected)
  - Causes of tripping (overload, short circuit or ground fault)

- **Monitoring:**
  - Operation of circuit breaker (open, closed or reset)
  - Resetting a molded case circuit breaker (COMPACT NS and CK)

- **Management:**
  - Control unit settings
  - Pre-trip alarm
  - Load monitoring status
  - Control unit internal temperature alarm
  - Number of operation cycles performed by the circuit breaker

- **Metering:**
  - RMS value of the current in three phases
SC150 Indication and Control Interface

Function
The SC150 indication and control interface is used to:
- Transmit to the DC150 data concentrator:
  - Status information (on, off, tripped, tripped due to electrical fault, tripped due to ground fault) for COMPACT CK and MASTERPACT circuit breakers or any other power circuit actuator
  - The connected or disconnected status of withdrawable COMPACT CK and MASTERPACT circuit breakers
  - The status of any external contact
- Receive commands transmitted by a personal computer or programmable logic controller (PLC) via the DC150 data concentrator (on, off and reset of the COMPACT CK and MASTERPACT circuit breakers or any other power circuit actuator)
- Receive the information transmitted by the communications option on electronic control units (STR43, STR53, STR55 and STR58) installed in COMPACT NS, COMPACT CK and MASTERPACT circuit breakers:
  - Trip-unit settings
  - The RMS value of the current in the three phases and the neutral
  - Current overloads
  - The causes of tripping (overloads, short circuits or ground fault)
  - Count the number of cycles carried out by the device

The SC150 interface is connected to:
- The DC150 data connector
- The auxiliary switches (OF, SD, SDE, SDV, CE, CD) on the circuit breaker with which the interface is associated
- The motor operator for execution of the on, off and reset commands
- The communications outputs of the STR43, STR53, STR55 and STR58 control units installed in COMPACT NS, COMPACT CK and MASTERPACT circuit breakers

A non-assigned digital input is available for other use. The SC150 interface is associated with a single circuit breaker.

Important: The SC150 interface is used with COMPACT NS circuit breakers to:
- Remote to the user the information supplied by the communications option on STR43 and STR53 control units
- Actuate non-communicating motor operators
- Count the number of cycles carried out by the circuit breaker

Note: When associated with the SC150 interface, COMPACT NS circuit breakers equipped with standard auxiliary switches and motor operators. The SC150 indication and control interface is not required with COMPACT NS circuit breakers equipped with communication-type auxiliary switches or a communication-type motor operator.

Information or Function Managed by the SC150 Indication and Control Interface

<table>
<thead>
<tr>
<th>Information Transmitted or Function Carried Out</th>
<th>Devices Associated with the SC150 Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Device Status:</td>
<td>Circuit Breaker or Other Power-circuit Actuator</td>
</tr>
<tr>
<td>• On, Off</td>
<td>+ Standard OF Auxiliary Switches</td>
</tr>
<tr>
<td>• Tripped</td>
<td>+ Standard SD Auxiliary Switches (COMPACT Circuit Breakers)</td>
</tr>
<tr>
<td>• Tripped Due to Electrical Fault</td>
<td>+ Standard SDE Auxiliary Switches</td>
</tr>
<tr>
<td>• Tripped Due to Ground Fault</td>
<td>+ SDV Auxiliary Switches (COMPACT NS) or Output Contact of a Ground-fault Relay</td>
</tr>
<tr>
<td>• Connected or Disconnected Position</td>
<td>+ Standard CE and CD Auxiliary Switches</td>
</tr>
<tr>
<td>Remotely Control a Device (On, Off or Reset)</td>
<td>COMPACT or MASTERPACT Circuit Breaker Equipped with Standard Motor Operator</td>
</tr>
<tr>
<td>Count the Number of Operating Cycles</td>
<td>As Above</td>
</tr>
<tr>
<td>Display the Cause of Tripping and the Trip Unit Settings (Settings and Time Delays)</td>
<td>COMPACT or MASTERPACT Circuit Breaker Equipped with STR43, STR53, STR55 or STR58 Electronic Trip Unit with Communications Option (COM)</td>
</tr>
<tr>
<td>Trip an Alarm for Long-time Fault</td>
<td>As Above</td>
</tr>
<tr>
<td>Display the Value of the Current for Each Phase</td>
<td>As Above</td>
</tr>
<tr>
<td>Display Internal Temperature of Switchboard</td>
<td>PT100 Probe –4 to 212°F (–20 to 100°C)</td>
</tr>
</tbody>
</table>
Control Units

SC150 Indication and Control Interface (continued)

Technical Data

<table>
<thead>
<tr>
<th>Digital Inputs (24 V, Self-powered by the SC150 Interface)</th>
</tr>
</thead>
<tbody>
<tr>
<td>O Auxiliary Switch</td>
</tr>
<tr>
<td>F Auxiliary Switch</td>
</tr>
<tr>
<td>SD Auxiliary Switch (Tripping)</td>
</tr>
<tr>
<td>SDE Auxiliary Switch (Tripping Due to Electrical Fault)</td>
</tr>
<tr>
<td>CE Auxiliary Switch</td>
</tr>
<tr>
<td>CD Auxiliary Switch</td>
</tr>
<tr>
<td>SDV Auxiliary Switch (Tripping Due to Ground Fault)</td>
</tr>
<tr>
<td>Other Uses</td>
</tr>
</tbody>
</table>

**Electrical Characteristics**

- **Voltage (Supplied by SC150):** 24 Vdc
- **Current (Supplied by SC150):** 120 mA dc
- **Resistance in On-state:** < 30 mΩ
- **Resistance in Off-state:** > 10000 MΩ

**Control Outputs**

- **Opening:** One N.O. and N.C. Control Terminal
- **Closing:** One N.O. Control Terminal
- **Reset:** One N.O. Control Terminal
  
  *Note: The opening, closing and reset control signals delivered by the SC150 interface are of the impulse type. The pulse duration is one second for the closing signal and two seconds for the opening and reset signals.*

**Voltage**

- AC: 2500 VA
- DC: 300 W Continuous/500 W for Two Seconds

**Utilization Category**

- AC15/DC13 as Defined by IEC 947-5

**Operating Temperature Range**

- –13 to 158°F (–25 to 70°C)

**Storage Temperature Range**

- –67 to 185°F (–55°C to 85°C)

**Damp Heat Not in Operation (IEC 68-2-30)**

- 6 cycles 77°F (25°C)/131°F (55°C)/RH 95%

**Damp Heat in Operation (IEC 68-2-56)**

- 2 days 86°F (30°C)/RH 93%

**Salt Mist (IEC 68-2-52)**

- Kb Test, Severity Level 2

**Electromagnetic Compatibility**

- Electrostatic Discharges (IEC 1000-4-2): Level 3
- Radiated Susceptibility (IEC 1000-4-3): Level 3
- Low-energy Conducted Susceptibility (IEC 1000-4-4): Level 4
- High-energy Conducted Susceptibility (IEC 1000-4-5): Level 4
- Conducted and Radiated Emissions (EN 50081-1): Class A

**Dimensions**

- 2 x 4 x 6.5 in. (50 x 105 x 165 mm)

**Weight**

- 2.5 lb. (1 kg)

**Degree of Protection (as Per IEC 529)**

- **Front Face:** IP30
- **Other Faces:** IP30
- **Connections:** IP20

**Vibrations (Lloyd's 1996)**

- Fc Test: 5–13.2 Hz: 0.04 in. (0.1 mm)
- 13.2–100 Hz: 0.3 oz. (0.7 g)

**Wiring Diagram**

- See p. 44

**Dimensions**

- See pp. 61
Control Units

DC150 Data Concentrator

Function

The DC150 data concentrator is used to:
- Centralize all the information supplied by the various communicating devices:
  - Auxiliary switches and motor operator
  - SC150 indication and control interface
- Make information available to a personal computer or programmable logic controller (PLC) via the MODBUS/JBUS protocol
- Log status changes and tripping of the communicating circuit breakers in order to provide the user with a list of time-stamped events
- Supply the 24 V and 15 V power required by the communicating devices
- Carry out addressing for the communicating devices

Each DC150 data concentrator can be connected to a maximum of 48 instrumented outgoing or incoming circuits.

Information or Function Managed by the DC150 Data Concentrator

<table>
<thead>
<tr>
<th>Information Transmitted or Function Carried Out</th>
<th>Devices Required to Display the Information or Carry Out the Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Device Status:</td>
<td>Circuit Breaker or Other Power-circuit Actuator</td>
</tr>
<tr>
<td>On, Off, Tripped, Tripped Due to Electrical Fault, Connected, Disconnected</td>
<td>○ COMPACT NS Circuit Breaker + Communicating Auxiliary Switches</td>
</tr>
<tr>
<td></td>
<td>○ COMPACT/MASTERPACT Circuit Breaker + SC150 Indication and Control Interface</td>
</tr>
<tr>
<td></td>
<td>○ COMPACT NS Circuit Breaker + Communicating Auxiliary Switches</td>
</tr>
<tr>
<td>Tripped Due to Ground Fault</td>
<td>○ MULTI 9 Control Device + ATB Interface</td>
</tr>
<tr>
<td></td>
<td>○ COMPACT NS Circuit Breaker + Vigi or Ground-fault Relay + SC150 Indication and Control Interface</td>
</tr>
<tr>
<td>Remotely Operate a Circuit Breaker (On, Off or Reset)</td>
<td>○ COMPACT NS Circuit Breaker + Communicating Motor Operator</td>
</tr>
<tr>
<td></td>
<td>○ COMPACT/MASTERPACT Circuit Breaker + SC150 Indication and Control Interface</td>
</tr>
<tr>
<td></td>
<td>○ MULTI 9 Control Device + ATB Interface</td>
</tr>
<tr>
<td>Inhibit Reset Following Tripping Due to Electrical Fault</td>
<td>As Above</td>
</tr>
<tr>
<td>Select Operating Mode of Motor Operators (Local or Remote)</td>
<td>As Above + CLS150 Indication and Local Control Module</td>
</tr>
<tr>
<td>Measure Currents (Phases and Neutral)</td>
<td>COMPACT/MASTERPACT Circuit Breaker Equipped with Electronic Control Unit Comprising Communications Option + SC150 Indication and Control Interface</td>
</tr>
<tr>
<td>Count Number of Operating Cycles</td>
<td>SC150 Indication and Control Interface</td>
</tr>
<tr>
<td>Display Causes of Tripping</td>
<td>COMPACT/MASTERPACT Circuit Breaker Equipped with Electronic Control Unit Comprising Communications Option + SC150 Indication and Control Interface</td>
</tr>
<tr>
<td>Display Trip Alarm for Long-time Fault</td>
<td>As Above</td>
</tr>
<tr>
<td>Display Trip Unit Settings (Thresholds and Time Delay)</td>
<td>As Above</td>
</tr>
</tbody>
</table>

Accessories

<table>
<thead>
<tr>
<th>Connection</th>
<th>Accessory</th>
<th>Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable for Internal Bus</td>
<td>Cable for Internal Bus</td>
<td>50779 65 ft. (20 m) or 50780 330 ft. (100 m)</td>
</tr>
<tr>
<td>Junction Block for Internal Bus</td>
<td>Junction Block for Internal Bus</td>
<td>50778</td>
</tr>
<tr>
<td>RS485/RS232 Conversion Unit</td>
<td>RS485/RS232 Conversion Unit</td>
<td>50786</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Connection to Personal Computer</th>
<th>Accessory</th>
<th>Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>An RS232/RS485 converter is required for connection to a personal computer equipped with an RS232 output to the MODBUS/RS485 bus.</td>
<td>RS232/RS485 Converter</td>
<td>50776</td>
</tr>
</tbody>
</table>

RS232/RS485 Converter   Junction Block   Connector   Internal Bus Cable

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Control Units

DC150 Data Concentrator (continued)

Description
1. LED indicating that address is correct
2. LED indicating that address is incorrect
3. LED indicating presence of 24 V power
4. LED indicating communication on internal bus
5. LED indicating MODBUS/JBUS communication
6. LED indicating MODBUS/JBUS error
7. MODBUS/JBUS speed setting
8-9. Coding wheels for JBUS address
10. JBUS connector
11. Power supply connector
12. Internal bus connector
13. Confirmation button
14-15. Keys for DIGIPACT module addresses
16. Address display

Technical Data

Electrical Characteristics
Voltage 110–240 Vac/115–125 Vdc
Tolerance +10%–15%
Operating Temperature Range –13 to 158°F (–25 to 70°C)
Storage Temperature Range –67 to 158°F (–55 to +70°C)

Electromagnetic Compatibility
- Electrostatic Discharges Level 3 (IEC 1000-4-2)
- Radiated Susceptibility Level 3 (IEC 1000-4-3)
- Low-energy ConductedSusceptibility Level 4 (IEC 1000-4-4)
- High-energy ConductedSusceptibility Level 4 (IEC 1000-4-5)
- Conducted and Radiated Class A Emissions (EN 50081-1)

Protocol MODBUS/JBUS (Slave)
Speed 9600 or 19200 Baud
Data Format Eight Bits, No Parity, One Stop
Physical Link RS485 (2-Wire or 4-Wire)

Implemented MODBUS/JBUS Protocol Functions
- Read N Consecutive Bits Function 1 or 2
- Read N Words Function 3 or 4
- Write One Bit Function 5
- Write One Word Function 6
- Write N Bits Function 15
- Write N Words Function 16

Weight 4 lb. (1.5 kg)
Degree of Protection (as Per IEC 529)
- IP30
- IP20 (Connections)

Wiring Diagrams
See p. 45

Dimensions
See p. 61
Control Units

Sizing of the DIGIPACT Internal Bus

Sizing of the DIGIPACT internal bus depends on two factors:
- The number of devices on the bus
- The length of the bus

Number of Devices

As on any communications network, the number of devices that may be connected on the DIGIPACT internal bus is limited. The maximum number of devices is calculated in terms of "communication points." Each type of device represents a number of points indicated in the table below. The total number of points for the various devices connected to a single bus must not exceed 100. If the required devices represent more than 100 points, simply add a second DIGIPACT internal bus with a second DC150 data concentrator. The same sizing rules apply to the second bus as well.

<table>
<thead>
<tr>
<th>Communicating Device</th>
<th>Number of Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC150 Data Concentrator</td>
<td>4</td>
</tr>
<tr>
<td>Communicating Auxiliary Switches OF, SD, SDE for COMPACT® NS Circuit Breakers</td>
<td>2</td>
</tr>
<tr>
<td>Communicating Motor Operator and Auxiliary Switches for COMPACT NS Circuit Breakers</td>
<td>2</td>
</tr>
<tr>
<td>Communicating Auxiliary Switches CE and CD for COMPACT NS Circuit Breakers</td>
<td>0</td>
</tr>
<tr>
<td>SC150 Indication and Control Interface</td>
<td>4</td>
</tr>
<tr>
<td>CLS150 Indication and Local Control Module Associated with:</td>
<td></td>
</tr>
<tr>
<td>- Communicating Auxiliary Switches</td>
<td>0</td>
</tr>
<tr>
<td>- Communicating Motor Operator and Auxiliary Switches</td>
<td>0</td>
</tr>
<tr>
<td>- SC150 Indication and Control Interface</td>
<td>0</td>
</tr>
<tr>
<td>PM150 Power Meter</td>
<td>4</td>
</tr>
<tr>
<td>ATB MULTI 9 Interface</td>
<td>2</td>
</tr>
</tbody>
</table>

Length of Bus

The table below indicates the cross-sectional area of the cable that must be used depending on the total length of the bus.

<table>
<thead>
<tr>
<th>Cross-sectional Area</th>
<th>Maximum Length of Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.03 in.² (0.75 mm²)</td>
<td>660 ft. (200 m)</td>
</tr>
<tr>
<td>0.06 in.² (1.5 mm²)</td>
<td>1310 ft. (400 m)</td>
</tr>
<tr>
<td>0.1 in.² (2.5 mm²)</td>
<td>2300 ft. (700 m)</td>
</tr>
</tbody>
</table>

The total resistance of the two wires for the bus must be less than 12 ohms. If the bus is too long, simply:
- Increase the cross-sectional area of the cable.
- Create two shorter buses for the installation (in this case, a second DC150 data concentrator is required).
Secondary Disconnects

Electrical accessories are UL Listed for field installation per UL file E113554. They are provided with terminals and located on secondary disconnecting blocks above the circuit breaker:

- **Fixed-mounted**: By one or two connecting plugs (provided).
- **Drawout-mounted**: To terminal block A located in the front of the stationary assembly for easy access. (This terminal block is then wired to another connection block B that operates automatically to isolate the internal accessories when the circuit breaker is in the disconnected position.)

**Additional Connections (BS):**

Single connection only is allowed in the terminal block. Multiple connections have to be made by adding extra terminals in the block located on the stationary assembly. The BS option consists of five additional terminals.

**Connection:**

Accessory terminals are maintenance-free and may be connected by standard #18 to #14 AWG copper wires. Cable strip length: 3/8 in. (10 mm).
Accessories

The MASTERPACT circuit breaker is equipped with a true two-step stored energy mechanism which ensures fast opening and closing operations and complete open-close-open sequence without recharging the mechanism. The MASTERPACT circuit breaker has manual actuators that include a charging handle and push-to-open and push-to-close buttons. In addition, remote operation is possible with the following field-installable accessories:

- Spring charging motor (MCH)
- Closing release (XF)
- Undervoltage trip device (MN) or shunt trip (MX) for opening

The manual operating mechanism can still be used in an emergency. The addition of the electrical operating mechanism does not alter circuit breaker dimensions.

Spring-charging Motor (MCH)

The spring-charging motor automatically charges the stored energy mechanism (when the circuit breaker closes) making O–C–O cycles possible without recharging. Opening and closing operations are instantaneous.

<table>
<thead>
<tr>
<th>Control Voltage (V)</th>
<th>Consumption</th>
<th>Inrush Current</th>
<th>Charging Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 Hz</td>
<td>AC 180 VA</td>
<td>2 to 3 x In for 0.1 sec.</td>
<td>3 to 4 sec.</td>
</tr>
<tr>
<td>DC 24–48–125</td>
<td>DC 180 W</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Operation Counter (CDM)

With spring-charging motor option only. The operation counter is read from the front and gives the total number of circuit breaker operating cycles.

Spring-charged Switch

This type "b" switch is closed when the spring is charged. It comes standard with the spring charging motor and is provided with a common terminal.

<table>
<thead>
<tr>
<th>Max. Current (A)</th>
<th>60 Hz</th>
<th>DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>240 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>125 V</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>250 V</td>
<td>0.25</td>
<td></td>
</tr>
</tbody>
</table>
Closing Coil (XF)

This device releases the circuit breaker closing mechanism when the spring is charged. The closing coil is rated for continuous duty. The closing release is supplied on request and can be fitted even on a manual operating mechanism.

Anti-pumping Function

When the closing coil (XF) is permanently energized, the circuit breaker remains in the open position after it has been opened, either by manual or electrical operation. The circuit breaker can only be closed if the closing coil is momentarily de-energized (see p. 32).

Note: This anti-pumping function can be disabled by series connecting a ready-to-close (“b” contact) switch (PF) to the closing coil.

<table>
<thead>
<tr>
<th>Circuit Breaker Closing Time</th>
<th>Less Than 80 ms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Voltage Range</td>
<td>0.85 to 1.1 x Rated Voltage</td>
</tr>
<tr>
<td>Control Voltage (V)</td>
<td>60 Hz 120–240</td>
</tr>
<tr>
<td></td>
<td>DC 24–48–125</td>
</tr>
<tr>
<td>Consumption (Inrush and Sealed)</td>
<td>60 Hz 20 VA</td>
</tr>
<tr>
<td></td>
<td>DC 15 W</td>
</tr>
</tbody>
</table>
Opening Coils

Three types of voltage releases can be used for remote opening of the circuit breakers:
- Shunt trip (MX)
- Instantaneous undervoltage trip device (MN)
- Time-delayed undervoltage trip device (MNR)

Possible Combinations

Each MASTERPACT circuit breaker can be equipped with:
- One shunt trip (MX) + one undervoltage trip device (MN or MNR)
- Or two shunt trips (MX)

Shunt Trip (MX)

This release is rated for continuous duty and operates with control voltages between 85% and 110% of its rating. However, when series connected with an “a” auxiliary switch, the shunt trip can be operated with 55% or more of its rated voltage and can be used for ground-fault protection when combined with a Class 1 ground-fault sensing element. The shunt trip is field-installable.

<table>
<thead>
<tr>
<th>Control Voltage (V)</th>
<th>Ac 60 Hz</th>
<th>120–240–480</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC</td>
<td>24–48–125–250</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Consumption (Inrush and Sealed)</th>
<th>AC 20 VA</th>
<th>DC 15 W</th>
</tr>
</thead>
</table>

Operating Time 40 ms

Instantaneous Undervoltage Trip Device (MN)

This release instantaneously opens the circuit breaker when supply voltage drops below a value between 35% and 70% of rated voltage. If the release is not energized, the circuit breaker cannot be closed (either manually or electrically). Any attempt to close it will have no effect on the main contacts. Closing is possible when the release voltage reaches 85% of its rated value. The instantaneous undervoltage trip device is field-installable.
Accessories

Time-delayed Undervoltage Trip Device (MNR) (1)

To prevent the circuit breaker from tripping in the event of transient voltage drops, this release has a built-in adjustable time delay. If required, this time delay can be overridden by connecting an external switch on an additional circuit (wired by the user). The undervoltage trip device is field-installable.

<table>
<thead>
<tr>
<th>Control Voltage (V)</th>
<th>MN</th>
<th>MNR (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 Hz 120 240 480</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC 24 48 125 250</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Consumption (Inrush and Sealed)</th>
<th>AC 20 VA</th>
<th>MNR (1) 20 VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC 15 W</td>
<td>15 W</td>
<td></td>
</tr>
</tbody>
</table>

Operating Time (s) 0.09 0.5–0.9–1.5–3

(1) Not UL Listed.

Heavy Usage Auxiliary Switches (OF)

Four SPDT switches with double break construction. They are directly operated by the main contacts and ensure a large insulation distance in open position. They are therefore particularly suitable for insulation of auxiliary circuits or reliable interlockings.

- "a" contacts are open when the circuit breaker is open and closed when the circuit breaker is closed.
- "b" switches are closed when the circuit breaker is open and open when the circuit breaker is closed.

See page 30 for operating diagrams. Auxiliary switches are field-installable.
Accessories

24 Additional Auxiliary Switches (OFSUP)
An external plate holds a set of 24 SPDT switches operated by means of a cable. They are available only for drawout circuit breakers.

Standard Auxiliary Switches (O and F)
2a + 2b switches available as standard:
- "a" contacts are open when the circuit breaker is open and closed when the circuit breaker is closed.
- "b" switches are closed when the circuit breaker is open and open when the circuit breaker is closed.
See page 30 for operating diagrams.

Ready-to-close Switch (PF)
This SPDT switch indicates that the circuit breaker is ready to close and that the following conditions exist:
- The circuit breaker is open
- The stored energy mechanism is charged
- The control unit is reset
- The circuit breaker opening push button is neither locked nor padlocked
- The circuit breaker is in the fully-connected or test position
The switch is field-installable.
Accessories

**Connected Position Switches (CE)**
A block of four SPDT switches operate when a drawout circuit breaker is in the connected position. The switch block is field-installable.

**Disconnected Position Switches (CD)**
A block of two SPDT switches operate when a drawout circuit breaker is in the disconnected position. The switch block is field-installable. See page 30 for operating diagrams.

**Test Position Switch (CT)**
One SPDT switch is operated only when the circuit breaker is in the test position. The switch is field-installable.

---

**Current Ratings (A)**

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Heavy Usage</th>
<th>Auxiliary Switch Ready-to-close</th>
<th>Position Switch</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard 24 Additional</td>
<td>Connected</td>
<td>Disconnected</td>
<td></td>
</tr>
<tr>
<td>60 Hz</td>
<td></td>
<td>12</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>240</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>480</td>
<td>10</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>(1) 6</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>600</td>
<td>(1) 3</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>DC</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>125</td>
<td>3</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>250</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
</tr>
</tbody>
</table>

See page 65 for IEC voltage ratings.
(1) 8 A for MC08.
Operating Diagrams

Auxiliary Switches

Main Contact Position

Heavy Usage (OF)

Standard (O)

Standard (F)

24 Additional (OFSUP)

Note: Contacts are shown with the circuit breaker in the open position. Scale applies only to distance between main contacts.

Position Switches

Main Disconnect Position

Secondary Disconnect Position

Connected Position Switches (CE)

Disconnected Position Switches (CD)

Test Position Switches (CT)

Note: Position switches are shown with the circuit breaker in the connected position.
Accessories

**Push Button Locking Device (VBP)**
This device prevents local manual operation of the circuit breaker by covering the opening and/or closing the push buttons. This locking device can be locked by a padlock or a sealing lead.

**Open Position Lock (VSKA)**
A key interlock that locks the circuit breaker in the open position by holding the push button in its depressed position. The key interlock is provided.

**Door Interlock (VPEC)**
This lock prevents the compartment door from being opened when the circuit breaker is in the connected position. If the circuit breaker is put into the "connected" position with the door open, the door can be closed without disconnecting the circuit breaker.

*Note: For greater protection, this interlock can be used with racking interlock (VPOC) below.*

**Racking Interlock (VPOC)**
This lock prevents racking in the circuit breaker when the door is open. (Insertion of the circuit breaker racking crank is not possible when the compartment door is open.)

**Disconnected Position Locking**
The circuit breaker can be locked in the disconnected position by means of one to three padlocks (padlocks not provided) or one key interlock (factory-mounted option VSKC). The key interlock is on the stationary assembly and accessible with the cubicle door locked.

*Note:*
- Key interlock is of the captive key type, free when locked.
- By special order, locking may be possible on disconnected, test and connected positions (VSEKC).

**Spring Charge Interlock (VEAA)**
This selection is for a device that prevents the circuit breaker or switch from being fully withdrawn from its cradle when the closing spring is charged. It is standard for ANSI (UL1066) circuit breakers and an option on others. The VEAA interlock is not compatible with undervoltage releases (MN, MNR or MNRI).
Accessories

Mechanical Interlocks

- **Disconnecting When Circuit Breaker Is Closed:**
  During any disconnecting attempt when the circuit breaker is closed, an interlocking device ensures the tripping of the circuit breaker before the actual separation of the main disconnects. The circuit breaker remains, however, operable in the other positions: test, disconnected and withdrawn.

- **Circuit Breaker Closing When Not Completely Connected:**
  The interlocking device mentioned above prevents closing of the circuit breaker if the connecting operation is not completely achieved.

- **Connecting Circuit Breaker When Door Opened:**
  VPEC and VPOC options prevent the compartment door from being opened when the circuit breaker is in the connected position and from connecting the circuit breaker when the door is open.

Electrical Interlocks

- **Priority of Opening Orders (Standard):**
  Opening coils (undervoltage trip devices, shunt trip) and opening push button have priority over the closing coils and closing push button.

- **Mechanical Pop-out Type Indicator (Standard):**
  Under overcurrent or ground-fault conditions, the trip indicator located in the control unit will pop out. It is not possible to close the circuit breaker until this trip indicator is reset. This standard function can be disabled upon request.

- **Anti-pumping Function (Standard):**
  In case the closing coil (XF) becomes permanently energized, the circuit breaker remains in the open position A after it has been opened, either by manual or electrical operation. The circuit breaker can be closed only if the closing coil is momentarily de-energized B.

  Note: This anti-pumping function can be disabled by series connecting a "ready to close" (NC contact) switch (PF) with the closing coil (XF).
Interlocking Rods and Cables

Two or three MASTERPACT circuit breakers can be mechanically interlocked by means of rods or cables. This accessory is mountable on the right side of the circuit breaker. This adaptation can be made on site without modifying the circuit breaker.

Mechanical Interlock Between Two or Three Stacked Circuit Breakers

This interlocking is obtained by the joining of:
- One adaptation block
- One or two adjustable and nonadjustable rods

Maximum distance between the two fixing surfaces of the devices: 35 in. (0.89 m)

Mechanical Interlocks Between Two Side-by-Side Circuit Breakers

This interlocking is obtained by the joining of:
- One adaptation block
- One set of adjustable cables with a maximum length of 78 in. (2 m)

Possible Mounting Arrangements Among Three Stacked Circuit Breakers

One use, power supplied by:
- Two transformers N1 and N2 which are connected in parallel
- Or one standby source G

Two uses, independently powered supply by two transformers N1 and N2, standby through a circuit breaker or a connection tie switch, preventing the connection in parallel of the two current transformers.

One use, power supplied by one group of transformers N1, N2 or N3 or of generators, preventing any connection in parallel.
Accessories

Safety Shutters (VO)
Comprising two independent parts, line and load side, the safety shutters automatically block access to the main disconnects when the circuit breaker is in the disconnected, test or fully withdrawn position.

Shutters Lock (VVC)
A factory-mounted movable and lockable slide (padlock not supplied) is used to:
- Lock the line or load shutters in the closed position
- Hold the line or load shutters in the open position
A support is provided at the back of the stationary assembly to hold the slide when not in use.

Rejection Feature (VDC)
The rejection feature ensures that only the properly designated circuit breaker is matched with the selected cradle assembly. It is made of two parts (one for the frame and one for the stationary assembly), and allows 20 different combinations.

Possible Arrangements

<table>
<thead>
<tr>
<th>Frame</th>
<th>Stationary Assembly</th>
<th>Frame</th>
<th>Stationary Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>A–B–C</td>
<td>4–5–6</td>
<td>B–C–D</td>
<td>1–5–6</td>
</tr>
<tr>
<td>A–B–D</td>
<td>3–5–6</td>
<td>B–C–E</td>
<td>1–4–6</td>
</tr>
<tr>
<td>A–B–E</td>
<td>3–4–6</td>
<td>B–C–F</td>
<td>1–4–5</td>
</tr>
<tr>
<td>A–C–D</td>
<td>2–5–6</td>
<td>B–D–F</td>
<td>1–3–5</td>
</tr>
<tr>
<td>A–C–E</td>
<td>2–4–6</td>
<td>B–E–F</td>
<td>1–3–4</td>
</tr>
<tr>
<td>A–C–F</td>
<td>2–4–5</td>
<td>C–D–E</td>
<td>1–2–6</td>
</tr>
<tr>
<td>A–D–F</td>
<td>2–3–5</td>
<td>C–E–F</td>
<td>1–2–4</td>
</tr>
<tr>
<td>A–E–F</td>
<td>2–3–4</td>
<td>D–E–F</td>
<td>1–2–3</td>
</tr>
</tbody>
</table>
Interphase Barrier (EIP)

Mounted between terminals of the stationary assembly, the interphase barrier prevents arc prolongation to the circuit breaker in the event of a line side fault and isolates the circuit breaker connections in insulated bus bar installations.

Transparent Cover (CB)

Hinged-mounted and locked with a milled head, this cover is designed to be installed on the door escutcheon. It provides a higher degree of protection and is suitable for drawout or fixed-mounted circuit breakers.
Switch

Ratings

<table>
<thead>
<tr>
<th>Type</th>
<th>Ampere Rating (A)</th>
<th>Short-time Rating (RMS Sym. Amperes) 600 Vac Max.</th>
<th>Short-circuit Withstand When Protected by a MASTERPACT Circuit Breaker (A) Max. Frame (A) 600 Vac Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP08 NA</td>
<td>800</td>
<td>50,000</td>
<td>800 50,000</td>
</tr>
<tr>
<td>MP12 NA</td>
<td>1200</td>
<td>50,000</td>
<td>1200 50,000</td>
</tr>
<tr>
<td>MP16 NA</td>
<td>1600</td>
<td>50,000</td>
<td>1600 50,000</td>
</tr>
<tr>
<td>MP20 NA</td>
<td>2000</td>
<td>50,000</td>
<td>2000 50,000</td>
</tr>
<tr>
<td>MP25 NA</td>
<td>2500</td>
<td>50,000</td>
<td>2500 50,000</td>
</tr>
<tr>
<td>MP30 NA</td>
<td>3000</td>
<td>50,000</td>
<td>3000 50,000</td>
</tr>
<tr>
<td>MP40 NA</td>
<td>4000</td>
<td>85,000</td>
<td>4000 85,000</td>
</tr>
<tr>
<td>MP50 NA</td>
<td>5000</td>
<td>85,000</td>
<td>5000 85,000</td>
</tr>
<tr>
<td>MP63 NA (1)</td>
<td>6300</td>
<td>85,000</td>
<td>6300 85,000</td>
</tr>
</tbody>
</table>

(1) Not UL Listed.

CAUTION

HAZARD OF EQUIPMENT DAMAGE.

This switch contains no overcurrent protection. It is suitable for use at its ampere rating when protected by a MASTERPACT circuit breaker of the same ampere rating.

Failure to observe this precaution can cause equipment damage.

Construction

The MASTERPACT switch is identical to the MP circuit breaker, except that the switch is not equipped with current transformers or an actual control unit. However, it does have an STR08 dummy unit.

Accessories, Dimensions and Connections

Switch accessories, dimensions and connections are identical to those of the corresponding circuit breaker, except that the overcurrent trip switch is not available with the switch version.
Overcurrent Protection STR 28D Control Unit

Current Setting:
- STR 28D = 0.4–1 x Sensor Rating
- STR 28DP = 0.8–1 x Plug Rating

Instantaneous Pickup
- \( I = 1.5–10 \times I_r \)
Trip Curves

Overcurrent Protection STR 38S Control Unit

(*) Instantaneous

Rating  | In (A)  | 630 | 800/1000 | 1200/1600 | 2000 | 2500 | 3000/3200 | 4000/5000/6300
---|---|---|---|---|---|---|---|---
Fixed Threshold  | I = In x ... | 28 | 28 | 24 | 20 | 14 | 12 | 10

Current Setting: STR 38S = 0.4–1 x Sensor Rating  
STR 38SP = 0.8–1 x Plug Rating

Short-time Pickup  
Im = 1.5–10 x (In)
Overcurrent Protection STR 58U Control Unit

Instantaneous Pickup

I = 2 x In Max (*)

Short-time Pickup

Im = 1.5–10 x (Ir)

Current Setting:

- STR 58U = 0.4–1 x Sensor Rating
- STR 58UP = 0.8–1 x Plug Rating

(*) Instantaneous

<table>
<thead>
<tr>
<th>Rating</th>
<th>In (A)</th>
<th>630</th>
<th>800/1000</th>
<th>1200/1600</th>
<th>2000</th>
<th>2500</th>
<th>3000/3200</th>
<th>4000/5000/6300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Threshold</td>
<td>I = ln x</td>
<td>28</td>
<td>28</td>
<td>24</td>
<td>20</td>
<td>14</td>
<td>12</td>
<td>10</td>
</tr>
</tbody>
</table>

Instantaneous Dial Settings

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4000/5000/6300 A</td>
<td>H1: 2–4–6–6–8–8–8–Off</td>
<td>H2: 2–4–6–6–8–8–8–Max.</td>
<td></td>
</tr>
</tbody>
</table>
Trip Curves

Ground-fault Protection STR 38S–STR 58U Control Units

Ground-fault Pickup
In = 0.1 x In 1200 A Max.

Time in Seconds

Multiple of Current Sensor (In)
Load Monitoring STR 58U Control Unit

Current Setting
Ir = 0.8–1 x Plug Rating

Ic1 = 0.8–1 x Ir
Ic2 = 0.5–1 x Ir

tr1 = tr / 2
tr2 = tr / 4

Multiple of Current Setting (Ir)
Note: Circuit breaker shown in connected, charged and open position with undervoltage releases energized.
(1) 84 terminal not available with Z or C option.
(2) Zone-selective interlocking with downstream circuit breaker: remove
the jumper.
(3) Communication output through DIGIPACT module.
(4) Use 24 Vdc supply for loads less than 20% of current sensor
rating, or one-phase load less than 40% of sensor rating.
(5) Use 24 Vdc supply for lower setting.
(6) Use 24 Vdc supply for F option if not supplied with PIL (battery)
option; use 24 Vdc supply (mandatory) for FV option.
Wiring Diagrams

SC150 Indication and Control Interface

MOTOR OPERATOR POWER SUPPLY

PT100 TEMPERATURE PROBE

EXTERNAL CONTACT

To Power Supply "L"

To SC150 Terminals "T+" and "T–"

To "C4" SC150 Input Terminals

To "ON" SC150 Control Output Terminals

To "NO" SC150 Control Output Terminals

To Power Supply "L"

To Power Supply "N"

MOTOR OPERATOR POWER SUPPLY

PT100 TEMPERATURE PROBE

EXTERNAL CONTACT

To Power Supply "L"

To SC150 Terminals "T+" and "T–"

To "C4" SC150 Input Terminals

To "ON" SC150 Control Output Terminals

To "NO" SC150 Control Output Terminals

To Power Supply "L"

To Power Supply "N"

MASTERPACT CIRCUIT BREAKER

CONTROL UNIT STR28 / 38 / 58

REMOTE CONTROL

INTERNAL BUS

MARKING COLOR

24 V Red

0 V Black

Internal Bus – White

Internal Bus + Blue

This document provided by Barr-Thorp Electric Co., Inc. 800-473-9123 www.barr-thorp.com
Connectors

The DC150 concentrator is connected using a SUBD9 male connector with a metal hood (e.g., ITT canon, DE9P K83 + hood or DE115-500-5-RD). The DC150 concentrator is equipped with a SUBD9 female connector. For a multidrop configuration, the tap-offs can be made either via a branching off of RS485 connector Catalog No. 50788 or standard connection boxes, taking care to respect the necessary precautions when connecting the shieldings. The adaptation of an RS232 output on a personal computer to accept the RS485 standard connector should be done with the RS485/RS232 converter Catalog No. 50786.

Recommended Protection and Cable Sizes

<table>
<thead>
<tr>
<th>Recommended Protection</th>
<th>Type</th>
<th>Catalog No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C60N Supplementary Circuit Protector</td>
<td>3-Phase</td>
<td>MG24466 or 24214</td>
</tr>
<tr>
<td>Fuse-link 10 A</td>
<td>aM</td>
<td>15660</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Marking (1)</th>
<th>Connection</th>
<th>Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Voltages</td>
<td>0.06 to 0.1 in.² (0.75 to 2.5 mm²)</td>
</tr>
<tr>
<td>B</td>
<td>Internal Bus</td>
<td>0.03 to 0.1 in.² (0.75 to 2.5 mm²) (Twisted)</td>
</tr>
<tr>
<td>C</td>
<td>MODBUS/JBUS</td>
<td>0.03 to 0.1 in.² (0.75 to 2.5 mm²) (Shielded)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Internal bus</th>
<th>Marking</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 V</td>
<td>24 V</td>
<td>Red</td>
</tr>
<tr>
<td>0 V</td>
<td>0 V</td>
<td>Black</td>
</tr>
<tr>
<td>Internal Bus –</td>
<td>White</td>
<td></td>
</tr>
<tr>
<td>Internal Bus +</td>
<td>Blue</td>
<td></td>
</tr>
</tbody>
</table>

(1) See first drawing above.
Circuit Breaker Dimensions

Door Escutcheon (Drawout Mounting)

Note: The door interlock can be mounted on either the right side or the left side of the circuit breaker.

Door Escutcheon (Fixed Mounting)

Drilling of the Door

Note: Refer to shop drawings for verification.

Door Interlock

Rear Cutout

Note: The door interlock can be mounted on either the right side or the left side of the circuit breaker.

Dimensions: inch | mm
Circuit Breaker Dimensions

External Neutral Sensor

MP08 to MP20, MC08 to MC20

MP25/MP30/MP40, MC32/MC40

MP50 to MP63

Dimensions: inch

mm
Circuit Breaker Dimensions

MP08–MP12–MP16 Fixed Mounting

3-Pole

Note: Suitable for continuous operation at 100% rating in a minimum cubicle space 17.5 in. (440 mm) h. by 21 in. (530 mm) w. by 14.25 in. (360 mm) d. Ventilation is not required. Refer to shop drawing #688 378 for verification. Vertical terminals are optional for MP08–MP12 circuit breakers.

4-Pole

Note: Suitable for continuous operation at 100% rating in a minimum cubicle space 17.5 in. (440 mm) h. by 25.5 in. (645 mm) w. by 14.25 in. (360 mm) d. Ventilation is not required. Refer to shop drawing #691 378 for verification. Vertical terminals are optional for MP08–MP12 circuit breakers.

Dimensions: inch

mm
Circuit Breaker Dimensions

MP08–MP12–MP16–MC08–MC16 Drawout Mounting

3-Pole

Note: Suitable for continuous operation at 100% rating in a minimum cubicle space 17.5 in. (440 mm) h. by 21 in. (530 mm) w. by 14.25 in. (360 mm) d. Ventilation is not required. Refer to shop drawing #688 378 for verification. Vertical terminals are optional for MP08–MP12–MC08 circuit breakers.

4-Pole

Note: Suitable for continuous operation at 100% rating in a minimum cubicle space 17.5 in. (440 mm) h. by 25.5 in. (645 mm) w. by 14.25 in. (360 mm) d. Ventilation is not required. Refer to shop drawing #691 381 for verification. Vertical terminals are optional for MP08–MP12–MC08 circuit breakers.

Dimensions: inch

mm
Circuit Breaker Dimensions

MP20 Fixed Mounting

3-Pole

Note: Suitable for continuous operation at 100% rating in a minimum cubicle space 17.5 in. (440 mm) h. by 21 in. (530 mm) w. by 14.25 in. (360 mm) d. Ventilation is not required. Refer to shop drawing #688 379 for verification.

4-Pole

Note: Suitable for continuous operation at 100% rating in a minimum cubicle space 17.5 in. (440 mm) h. by 25.5 in. (645 mm) w. by 14.25 in. (360 mm) d. Ventilation is not required. Refer to shop drawing #691 379 for verification.
Circuit Breaker Dimensions

MP20–MC20 Drawout Mounting

3-Pole

Note: Suitable for continuous operation at 100% rating in a minimum cubicle space 17.5 in. (440 mm) h. by 21 in. (530 mm) w. by 14.25 in. (360 mm) d. Ventilation is not required. Refer to shop drawing #688 379 for verification.

4-Pole

Note: Suitable for continuous operation at 100% rating in a minimum cubicle space 17.5 in. (440 mm) h. by 25.5 in. (645 mm) w. by 14.25 in. (360 mm) d. Ventilation is not required. Refer to shop drawing #691 382 for verification.
Circuit Breaker Dimensions

MP25–MP30 Fixed Mounting

3-Pole

Note: Suitable for continuous operation at 100% rating in a minimum cubicle space 26 in. (660 mm) h. by 21 in. (530 mm) w. by 14.25 in. (360 mm) d. with a ventilation of 30 sq. in. (200 cm²) at top and bottom. Refer to shop drawing #688 380 for verification.

4-Pole

Note: Suitable for continuous operation at 100% rating in a minimum cubicle space 26 in. (660 mm) h. by 25.5 in. (645 mm) w. by 14.25 in. (360 mm) d. with a ventilation of 30 sq. in. (200 cm²) at top and bottom. Refer to shop drawing #691 380 for verification.

Dimensions: inch

mm
MP25–MP30 Drawout Mounting

3-Pole

0.56 Dia. Ø14.3

0.25 6,35

0.25 6,35

0.65 16,5

(4) Mounting Holes 0.44 Dia. Ø11

2.17 55

12.9 325

17.14 435

2.17 55

Note: Suitable for continuous operation at 100% rating in a minimum cubicle space 26 in. (660 mm) h. by 21 in. (530 mm) w. by 14.25 in. (360 mm) d. with a ventilation of 30 sq. in. (200 cm²) at top and bottom. Refer to shop drawing #688 380 for verification.

4-Pole

0.56 Dia. Ø14.3

0.25 6,35

0.25 6,35

0.65 16,5

(4) Mounting Holes 0.44 Dia. Ø11

2.75 70

16.73 425

21.65 550

2.17 55

Note: Suitable for continuous operation at 100% rating in a minimum cubicle space 26 in. (660 mm) h. by 25.5 in. (645 mm) w. by 14.25 in. (360 mm) d. with a ventilation of 30 sq. in. (200 cm²) at top and bottom. Refer to shop drawing #691 380 for verification.

Circuit Breaker Dimensions

Dimensions: inch mm
Circuit Breaker Dimensions

MC32 Drawout Mounting

3-Pole

Note: Suitable for continuous operation at 100% rating in a minimum cubicle space 22 in. (560 mm) h. by 25.25 in. (640 mm) w. by 14.25 in. (360 mm) d. with a ventilation of 30 sq. in. (200 cm²) at bottom. Refer to shop drawing #689 074 for verification.
Circuit Breaker Dimensions

MP40–MP50 Fixed Mounting

3-Pole

Note: Suitable for continuous operation at 100% rating in a minimum cubicle space 26 in. (660 mm) h. by 34 in. (870 mm) w. by 14.25 in. (360 mm) d. with a ventilation of 30 sq. in. (200 cm²) both at top and bottom. Refer to shop drawing #688 381 for verification.

Dimensions:  inch

mm
Circuit Breaker Dimensions

MP40–MP50–MC50–MC50 Drawout Mounting

3-Pole

Note: Suitable for continuous operation at 100% rating in a minimum cubicle space 26 in. (660 mm) h. by 34 in. (870 mm) w. by 14.25 in. (360 mm) d. with a ventilation of 30 sq. in. (200 cm²) both at top and bottom. Refer to shop drawing #688 381 for verification.

Dimensions: inch mm

Withdrawn Position

Disconnected Position

Cell (Insulation Not Required)
MP40–MP50 Drawout Mounting

4-Pole (Not UL Listed)

MP40

MP50

Withdrawn Position
Disconnected Position

Cell (Insulation Not Required)

(6) Mounting Holes

Note: Refer to shop drawing #691 384 for verification.

Dimensions: inch mm
Circuit Breaker Dimensions

MP63 Drawout Mounting (Not UL Listed)

3-Pole

Note: Refer to shop drawing #688 382 for verification.
Mechanical Interlocks for Drawout or Fixed Circuit Breakers

Connecting Links for Two Stack-mounted Circuit Breakers

**Drawout Mounting**

**Fixed Mounting**

**Circuit Breaker Dimensions**

Dimensions: **inch** **mm**

- **Dimensions:**
  - **1.17**
  - **30**
  - **52**
  - **30**
  - **1.57**
  - **40**
  - **4.9**
  - **125**
  - **1.96**
  - **50**
  - **2.03**
  - **52**
  - **1.17**

**Circuit Breaker Basis**

- **MP08 to MP30 (4-Pole),**
  - **MC08 to MC32**

- **MP40 (3-Pole) to MP63,**
  - **MC40 (3-Pole)**

- **Dimensions:**
  - **6.86**
  - **175**
  - **4.11**
  - **105**
  - **1.17**
  - **30**
  - **7.05**
  - **180**
  - **1.17 / 2.35**
  - **30 Min. / 60 Max.**

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Circuit Breaker Dimensions

Connecting Links for Three Stack-mounted Circuit Breakers

Drawout Mounting

Fixed Mounting

Mechanical Interlocks for Drawout or Fixed Circuit Breakers

Cables for Two Side-by-Side Circuit Breakers

Dimensions: \( \text{inch} \)  
\( \text{mm} \)  
(Except as otherwise indicated)
Circuit Breaker Dimensions

DC150 Data Concentrator

Dimensions: **inch**  **mm**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Inch</th>
<th>Millimeter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>7.60</td>
<td>193</td>
</tr>
<tr>
<td>Height</td>
<td>3.94</td>
<td>100</td>
</tr>
<tr>
<td>Depth</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SC150 Indication and Control Interface

Dimensions: **inch**  **mm**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Inch</th>
<th>Millimeter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>6.50</td>
<td>165</td>
</tr>
<tr>
<td>Height</td>
<td>4.13</td>
<td>105</td>
</tr>
<tr>
<td>Depth</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Routine Maintenance Guidelines

<table>
<thead>
<tr>
<th><strong>DANGER</strong></th>
<th><strong>CAUTION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HAZARD OF ELECTRICAL SHOCK, BURN OR EXPLOSION.</strong></td>
<td><strong>HAZARD OF EQUIPMENT DAMAGE.</strong></td>
</tr>
<tr>
<td>Turn OFF all power supplying the equipment before installing or removing circuit breaker.</td>
<td>Since circuit breakers contain factory-sealed and calibrated elements. Do not break seal. In case of malfunction, repairs must be made at a Square D factory or by an authorized company representative.</td>
</tr>
<tr>
<td>Failure to observe these precautions will cause death, personal injury or electrical shock.</td>
<td>Failure to observe this precaution can cause equipment damage.</td>
</tr>
</tbody>
</table>

Recommended Inspection Intervals

MASTERPACT circuit breakers are designed to be maintenance free (see page 64). However, all equipment with moving parts requires periodic inspection to ensure optimum performance and reliability. It is recommended that the circuit breakers be routinely inspected six months after installation, followed by an annual inspection. Intervals can vary depending on particular use and experience.

Inspection of Circuit Breaker Terminals

- Inspect terminals; if there is discoloration due to overheating, the joint should be disassembled and the surface cleaned before reinstallation. It is essential that electrical connections are made carefully in order to prevent overheating.
- Check for terminal tightness.

Inspection of Main Contacts

The arc chutes are easily removed to allow access to the main contacts and to the wear indicator. The wear indicator consists of a groove located within the contacts support (see page 3). When the circuit breaker is closed, this groove is entirely covered up by the moving contacts. Over time, the wear of the contacts will make the groove appear. When the groove is fully visible, replace the breaker or have an authorized service center change the contacts.

Inspection of Clusters

Totally maintenance free, they have to be replaced only after overheating due to a defective connection or after a major fault. Inspection is advised when checking the terminal connections.

Cleaning

Remove any dust and dirt that may have accumulated on the circuit breaker surface and terminals.

Mechanical Checks

For long periods circuit breakers may not be required to operate on overload or short-circuit conditions. Therefore it is essential to operate the circuit breaker periodically to avoid mechanical gumming.
Insulation Resistance Tests

When circuit breakers are subjected to severe operating conditions, an insulation resistance test may be performed as indicated in NEMA standard publication No. AB4-1991. An insulation resistance test is used to determine the quality of the insulation between phases and phase-to-ground. The resistance test is made at a dc voltage higher than the rated voltage to determine the actual resistance of the insulation. The most common method employs a “megger” type instrument. A 1000-volt instrument will provide a more reliable test because it is capable of detecting tracking on insulated surfaces. Investigate resistance values below 1 megohm. The insulation test shall be made:
- Between line and load terminals of individual poles with the circuit breaker contacts open
- Between adjacent poles and from poles to the metallic supporting structure with the circuit breaker contacts closed
This test may be made with the circuit breaker in place after the line and load conductors have been removed, or with the circuit breaker bolted to a metallic base which simulates the in-service mounting.

Electrical Tests

These tests require equipment for pole resistance measurement and for overcurrent and instantaneous tripping in accordance with NEMA Standard publication No. AB4. They are not within the scope of normal field operation.
Appendix

Endurances

A–Endurance Without Maintenance

<table>
<thead>
<tr>
<th>MASTERPACT MP or MC</th>
<th>08</th>
<th>12</th>
<th>16</th>
<th>20</th>
<th>25</th>
<th>30 - 32</th>
<th>40</th>
<th>50</th>
<th>63</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical</td>
<td>12,500</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Electrical 480 Vac</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>9,000</td>
<td>8,000</td>
<td>4,000</td>
<td>3,000</td>
<td>3,000</td>
<td>2,000</td>
</tr>
<tr>
<td>600 Vac</td>
<td>10,000</td>
<td>10,000</td>
<td>7,000</td>
<td>6,000</td>
<td>2,600</td>
<td>2,500</td>
<td>2,500</td>
<td>1,500</td>
<td>1,500</td>
</tr>
</tbody>
</table>

B–Endurance With Service Maintenance

<table>
<thead>
<tr>
<th>Electrical (480 Vac) or Mechanical</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

C–Endurance Required by Standards

<table>
<thead>
<tr>
<th>Frame size</th>
<th>800</th>
<th>1200</th>
<th>1600</th>
<th>2000</th>
<th>2500</th>
<th>3000</th>
<th>4000</th>
<th>5000</th>
<th>6300</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL489</td>
<td>Mechanical</td>
<td>3,500</td>
<td>2,000</td>
<td>2,000</td>
<td>2,000</td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
</tr>
<tr>
<td></td>
<td>Electrical</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>ANSI</td>
<td>Mechanical</td>
<td>12,500</td>
<td>NS</td>
<td>4,000</td>
<td>4,000</td>
<td>NS</td>
<td>1,500</td>
<td>1,500</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>Electrical</td>
<td>2,800</td>
<td>NS</td>
<td>800</td>
<td>800</td>
<td>NS</td>
<td>400</td>
<td>400</td>
<td>NS</td>
</tr>
</tbody>
</table>

Important Notice:

All endurances given are based on normal operating conditions and conventional tests:

- Closing and opening operations at rated current
- Power factor: 0.75–0.80

As actual conditions differ, use these values only as inspection guidelines and periodically check contact wear.

Under normal operating conditions of use, as determined by UL 489 or ANSI Standards (see table C) and controlled by tests, MASTERPACT circuit breakers do not require maintenance. However, these circuit breakers exceed, without maintenance and additional costs, the endurances required by standards. See tables A and C. Service maintenance by a field service representative will extend the endurance according to table B. This service can be performed on site and consists in changing contacts, arc chutes and some other parts.

Example:

MP16 at 480 V requires no maintenance before 10,000 cycles (mechanical or electrical). Endurance may be increased after servicing at 10,000 operations.
IEC 947-2 Interrupting Ratings

In addition to UL 489 and ANSI C37-13, MASTERPACT circuit breakers comply with the IEC 947-2 Standard as per the table below. For further information, contact a sales representative.

<table>
<thead>
<tr>
<th>Type 3-Pole</th>
<th>Ampere Rating (A)</th>
<th>Interrupting Ratings UL489</th>
<th>IEC 947-2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RMS Symmetrical Amps</td>
<td>480 Vac 600 Vac Short-time</td>
<td>440 Vac lcu lcs 690 Vac lcu lcs</td>
</tr>
<tr>
<td>Standard Interrupting Rating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MP08 H1</td>
<td>800</td>
<td>65 kA 65 kA 50 kA</td>
<td>65 kA 65 kA 65 kA 65 kA</td>
</tr>
<tr>
<td>MP12 H1</td>
<td>1200</td>
<td>65 kA 65 kA 50 kA</td>
<td>65 kA 65 kA 65 kA 65 kA</td>
</tr>
<tr>
<td>MP16 H1</td>
<td>1600</td>
<td>65 kA 65 kA 50 kA</td>
<td>65 kA 65 kA 65 kA 65 kA</td>
</tr>
<tr>
<td>MP20 H1</td>
<td>2000</td>
<td>75 kA 75 kA 75 kA</td>
<td>75 kA 75 kA 75 kA 75 kA</td>
</tr>
<tr>
<td>MP25 H1</td>
<td>2500</td>
<td>75 kA 75 kA 75 kA</td>
<td>75 kA 75 kA 75 kA 75 kA</td>
</tr>
<tr>
<td>MP30 H1</td>
<td>3000</td>
<td>75 kA 75 kA 75 kA</td>
<td>75 kA 75 kA 75 kA 75 kA</td>
</tr>
<tr>
<td>MP40 H1</td>
<td>4000</td>
<td>100 kA 100 kA 100 kA</td>
<td>100 kA 100 kA 85 kA 85 kA</td>
</tr>
<tr>
<td>MP50 H1</td>
<td>5000</td>
<td>100 kA 100 kA 100 kA</td>
<td>100 kA 100 kA 85 kA 85 kA</td>
</tr>
<tr>
<td>MP63 H1</td>
<td>6300 (1)</td>
<td>100 kA 100 kA 100 kA</td>
<td>100 kA 100 kA 85 kA 85 kA</td>
</tr>
<tr>
<td>High Interrupting Rating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MP08 H2</td>
<td>800</td>
<td>100 kA 65 kA 50 kA</td>
<td>100 kA 100 kA 85 kA 85 kA</td>
</tr>
<tr>
<td>MP12 H2</td>
<td>1200</td>
<td>100 kA 65 kA 50 kA</td>
<td>100 kA 100 kA 85 kA 85 kA</td>
</tr>
<tr>
<td>MP16 H2</td>
<td>1600</td>
<td>100 kA 65 kA 50 kA</td>
<td>100 kA 100 kA 85 kA 85 kA</td>
</tr>
<tr>
<td>MP20 H2</td>
<td>2000</td>
<td>100 kA 75 kA 75 kA</td>
<td>100 kA 100 kA 85 kA 85 kA</td>
</tr>
<tr>
<td>MP25 H2</td>
<td>2500</td>
<td>100 kA 75 kA 75 kA</td>
<td>100 kA 100 kA 85 kA 85 kA</td>
</tr>
<tr>
<td>MP30 H2</td>
<td>3000</td>
<td>100 kA 75 kA 75 kA</td>
<td>100 kA 100 kA 85 kA 85 kA</td>
</tr>
<tr>
<td>MP40 H2</td>
<td>4000</td>
<td>125 kA 100 kA 100 kA</td>
<td>150 kA 125 kA 85 kA 85 kA</td>
</tr>
<tr>
<td>MP50 H2</td>
<td>5000</td>
<td>125 kA 100 kA 100 kA</td>
<td>150 kA 125 kA 85 kA 85 kA</td>
</tr>
<tr>
<td>MP63 H2</td>
<td>6300 (1)</td>
<td>150 kA 100 kA 100 kA</td>
<td>150 kA 125 kA 85 kA 85 kA</td>
</tr>
</tbody>
</table>

(1) Not UL Listed.
# IEC 947-2 Ratings

## Auxiliary and Position Switches

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Auxiliary Switch</th>
<th>Overcurrent Trip Switch</th>
<th>Ready to Close Switch</th>
<th>Position Switches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OF</td>
<td>O</td>
<td>OFSUP</td>
<td>SDE</td>
</tr>
<tr>
<td>50/60 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>15</td>
<td></td>
<td></td>
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<tr>
<td>240</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
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<tr>
<td>380</td>
<td>10</td>
<td>6</td>
<td>6</td>
<td>5</td>
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<tr>
<td>480</td>
<td>10</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>DC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>125</td>
<td>3</td>
<td>0.5</td>
<td>0.5</td>
<td>0.3</td>
</tr>
<tr>
<td>250</td>
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OF: Heavy Duty  O: Standard  OFSUP: 24 Additional  CE: Connected  CD: Disconnected  CT: Test

## Spring Charging Motor

### Rated Voltage (V)

<table>
<thead>
<tr>
<th>UL 489 Listed</th>
<th>IEC 947-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 Hz</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>240</td>
</tr>
<tr>
<td>DC</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>125</td>
</tr>
</tbody>
</table>

## Closing Coil

### Rated Voltage (V)

<table>
<thead>
<tr>
<th>UL 489 Listed</th>
<th>IEC 947-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 Hz</td>
<td>120</td>
</tr>
<tr>
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<td>240</td>
</tr>
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<td>48</td>
</tr>
<tr>
<td></td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>250</td>
</tr>
</tbody>
</table>

## Shunt Trip

### Rated Voltage (V)

<table>
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<th>IEC 947-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 Hz</td>
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</tr>
<tr>
<td></td>
<td>240</td>
</tr>
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<td></td>
<td>460</td>
</tr>
<tr>
<td>DC</td>
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<tr>
<td></td>
<td>125</td>
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<tr>
<td></td>
<td>250</td>
</tr>
</tbody>
</table>

## Undervoltage Trip

### Rated Voltage (V)

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<th>IEC 947-2</th>
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