# Masterpact™ MP circuit breaker

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Masterpact™ MP circuit breaker introduction, advantages

standard compliance
- UL489: Masterpact™ MP 08 to MP 30 circuit breakers and their accessories are listed under UL file E63335, E113554 and E113555
- international standards: Masterpact™ has been designed to meet all the major standards including:
  - IEC 157-1
  - british BS 47-52
  - french NF C63-120
  - german VDE 660
  - australian AS 1930
- 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.

other performances
The UL 489 standard assures that the circuit breaker has sufficient characteristics to be used in normal conditions. However, Masterpact™ exceeds without additional costs the standard 1,500 operations required in endurance. The heavy duty mechanism and the contact design provide a mechanical endurance of 10,000 operations without maintenance.

interrupting ratings

<table>
<thead>
<tr>
<th>type</th>
<th>ampere rating (A)</th>
<th>Interrupting ratings RMS Sym. Amps 240V 480V 600V</th>
<th>short time rating (A) (0.5 sec)</th>
</tr>
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<tbody>
<tr>
<td>3-pole</td>
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| standard interrupting rating

<table>
<thead>
<tr>
<th>type</th>
<th>MP 08H1</th>
<th>MP 12H1</th>
<th>MP 16H1</th>
<th>MP 20H1</th>
<th>MP 25H1</th>
<th>MP 30H1</th>
<th>MP 40H1</th>
<th>MP 50H1</th>
<th>MP 63H1</th>
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<tbody>
<tr>
<td>rating (A)</td>
<td>800</td>
<td>1200</td>
<td>1600</td>
<td>2000</td>
<td>2500</td>
<td>3000</td>
<td>4000</td>
<td>5000</td>
<td>6300</td>
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<td>240V</td>
<td>50,000</td>
<td>65,000</td>
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high interrupting rating

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<th>MP 12H2</th>
<th>MP 16H2</th>
<th>MP 20H2</th>
<th>MP 25H2</th>
<th>MP 30H2</th>
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<th>MP 50H2</th>
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<td>rating (A)</td>
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<td>1200</td>
<td>1600</td>
<td>2000</td>
<td>2500</td>
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<td>6300</td>
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<tr>
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<td>65,000</td>
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<tr>
<td>600V</td>
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<td>65,000</td>
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tropicalisation
The standard moisture and fungus protection ensure normal operation under extreme ambient conditions. Masterpact™ breakers comply with T2 tropicalisation (IEC standard 6230); relative humidity 95% and 113°F (45°C) and 80% at 131°F (55°C) (hot-humid climate). Salt spray resistance as per IEC 68 2 11.

single design up to 6300A
All frame sizes have been designed with the same technology featuring a single depth and door cutout, common control units and accessories.

high short time current rating:
up to 100kA for 1 sec.
The exceptional short time rating of 65,000A in a 3000A frame and 100,000A in a 4000A frame and above allows Masterpact™ to be fully selective up to its interrupting rating.

100% rated
Masterpact™ circuit breakers are designed for continuous operation at 100% of their current rating as permitted by the NEC. (UL listing applies up to 3000A)
Masterpact™ MP circuit breaker advantages

drawout breaker design
- The drawout assembly mechanism allows the breaker to be racked in 4 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. Disconnecting the breaker will be therefore possible without opening the door and accessing live parts. Safety shutters can be provided for protection from live parts when the breaker is removed.

true 2-step stored energy mechanism
The closing time is less than 5 cycles. Masterpact™ 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 pushbuttons on the circuit breaker front face, or by remote control. O-C-O cycle is possible without recharging.

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

design for no maintenance...
Masterpact™ circuit breaker has fewer parts (by a factor of at least 5) than conventional lines while performing the same functions. This leads to greatly enhanced reliability and reduction in maintenance. Under normal operating conditions, given by standards and controlled by tests, Masterpact™ does not require maintenance.

...but exceeds the standard provided an easy and reduced maintenance
It is easy to remove the arc-chutes and visually inspect the contacts and wear indicator. The operation counter (option of the spring charging motor) can also indicate on the moment where the inspection should be done and possibly the maintenance. After operating conditions exceeding those given by standards, it is possible to extend the Masterpact™ life accordingly proceeding to a reduced maintenance:
- replacement of arc chutes and spring charging motor by the user
- replacement of main contacts by our after sale service man.
This operation can take place on site.

note: see page 37 for additional information

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

advantages

improved safety
- segregated compartment
  Once the front cover has been removed, leaving 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.
- isolation function by positive indication of contact status
  The mechanical indicator is truly representative of all three main contacts status.
- reinforced insulation
  Two insulation barriers separate the front of the circuit breaker from main circuits.
- disconnecting thru door
  The racking handle and racking mechanism are accessible through the front door cutout. Disconnecting the breaker will be therefore possible without opening the door and giving access to live parts.

solid state protection and control

Masterpact™ is equipped with solid state control units which provide all the traditional protection of the universal power breaker (long time, short time, instantaneous and ground fault) plus other built-in functions:

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<th>ST 318S</th>
<th>ST 408S</th>
<th>ST 418S</th>
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<td>pickup</td>
<td>adjustable</td>
<td>adjustable</td>
<td>adjustable</td>
<td>adjustable</td>
</tr>
<tr>
<td></td>
<td>delay</td>
<td>fixed</td>
<td>fixed</td>
<td>fixed</td>
<td>adjustable</td>
</tr>
<tr>
<td>short time</td>
<td>pickup</td>
<td>adjustable</td>
<td>adjustable</td>
<td>adjustable</td>
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</tr>
<tr>
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<td>delay</td>
<td>adjustable</td>
<td>adjustable</td>
<td>adjustable</td>
<td>adjustable</td>
</tr>
<tr>
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<td>adjustable</td>
<td>fixed</td>
<td>without</td>
<td>fixed</td>
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<tr>
<td>test receptacle</td>
<td></td>
<td></td>
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</table>

| additional functions   |         |         |         |         |         |
| ground fault           |         |         |         |         |         |
| load monitoring        |         |         |         |         |         |
| fault indicators       |         |         |         |         |         |
| built-in ammeter       |         |         |         |         |         |

© not available on MP 63 type.
description
1 control terminal covers
2 accessories and control unit front connecting block
3 position carriage switches
4 arc chute
5 opening coils
6 spring charging motor
7 front cover
8 control unit
9 racking crank
10 handling handgrip
11 retractable rails
12 pull out 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 (ON or OFF)
6 disconnected position locking (Kirk key lock)
7 disconnected position padlocking
8 drawout position indicator showing that the circuit breaker is in the connected, test or disconnected position
9 racking crank housing
10 door escutcheon
11 fault indicator and reset button
12 open position locking (Kirk key lock)
Masterpact™ MP circuit breaker
control units

1 mechanical pop-out type fault indicator and reset button
   - indicates that a fault trip has occurred
   - prevents reclosure of the circuit breaker after fault until reset
2 ammeter (LED digital display)
3 ammeter selector used to:
   - read phase currents (1, 2, 3)
   - read the phase with the highest load current (max)
4 sensors rating
5 long time current setting
6 instantaneous pickup
7 test receptacle

overcurrent protection

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<td>Control Voltage</td>
</tr>
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<td></td>
<td>120 to 240V 50-60Hz</td>
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<td></td>
<td>Display</td>
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<tr>
<td></td>
<td>Phase 1, Phase 2, Phase 3, Phase Max.</td>
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<tr>
<td></td>
<td>Accuracy</td>
</tr>
<tr>
<td></td>
<td>± 1.5%CD</td>
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fault indicators

| Local                   | By mechanical pop-out type indicator |
| Remote                  | By overcurrent trip switch see page 15 |
1. Mechanical pop-out type fault indicator and reset button
   - Indicates that a fault trip has occurred
   - Prevents reclosure of the circuit breaker after fault until reset
2. Ammeter (LED digital display)
3. Ammeter selector used to:
   - Read phase currents (1, 2, 3)
   - Read the phase with the highest load current (max)
4. Sensors rating
5. Local (option F) or local and remote (option J) fault indicators:
   - They consist of built-in light emitting diode:
     - Fault indicators differentiate the 3 causes of tripping: overload, short circuit and ground fault if any.
     - Alarm indicator indicates before the breaker trips that the long time pickup has been exceeded.
6. Ground fault (option T) or load monitoring (option R):
7. Ground fault time delay or load monitoring pickup
8. Long time pickup
9. Short time pickup
10. Short time delay
11. Test receptacle

**Overcurrent protection**
- Long time current setting: 0.4 to 1 x sensor rating
- Short time pickup: 2 to 10 x current setting
- Delay bands: 0 - 0.1 - 0.2 - 0.3
- Instantaneous pickup (multiple of sensor rating): ST 308S
  - Ratings (A):
    - Standard: 20 - 21 - 18 - 14 - 11 - 11
    - Factory set: 12 - 14 - 18 - 12 - 12 - 6 - 8 - 6 - 8
- Test receptacle: For overcurrent and ground fault testing

**Ground fault protection**
- Pickup: Option T (ground fault protection) and option R (load monitoring) cannot be combined.
- Delay band: 0.1 - 0.2 - 0.3 - 0.4
- Zone selective: With option Z

**Load monitoring**
- Inverse time pickup: \( I_c1 = 0.8 \) to 1 x current setting
- Alarm pickup: \( I_c2 = 0.8 \) to 1 x current setting
- Option R: Time delay - See time-current curve page 27

**Fault indicators**
- Not discriminated:
  - Local: By mechanical pop-out type indicator
  - Remote: By overcurrent trip switch. See page 15
- Discriminated:
  - Local with option F - See page 10
  - Local and remote with option J - See page 10

**Built-in ammeter**
- Option 1: Control voltage 120 to 240V 50-60Hz
- Display: Phase 1, phase 2, phase 3, phase max.
- Accuracy: ± 1.5 %
Masterpact™ MP circuit breaker control units

1. Mechanical pop-out type fault indicator and reset button
   - Indicates that a fault trip has occurred
   - Prevents reclosure of the circuit breaker after fault until reset

2. Ammeter (LED digital display)

3. Ammeter selector used to:
   - Read phase currents (1, 2, 3)
   - Read the phase with the highest load current (max)

4. Sensors rating

5. Local fault indicators (option F):
   - Consist of built-in light emitting diode
   - Fault indicators differentiate the 3 causes of tripping: overload, short circuit and ground fault if any.
   - Alarm indicator indicates before the breaker trips that the long time pickup has been exceeded.

6. Ground fault (option T) or load monitoring (option R):
   - Ground fault or load monitoring pickups
   - Ground fault time delay or load monitoring pickup

7. Long time pickup

8. Short time pickup

9. Short time delay

10. Long time delay

11. Test receptacle

12. Overcurrent protection

   **Long time**
   - Current setting: 0.4 to 1 x sensor rating
   - Delay bands: G - MIN. - INT. - MAX.
   - Pickups:
     - ST 408S
     - Ratings (A): 250-1600
     - Standard: 10 8 6 4 2 1 (standard)
     - Factory set: 12-14-18-21
   - Pickups:
     - ST 418S
     - Without test receptacle

   **Short time**
   - Current setting: 1.6 to 10 x current setting
   - Delay bands: 0 - 0.1 - 0.2 - 0.3

   **Instantaneous**
   - ST 408S
   - Ratings (A): 250-1600
   - Pickups:
     - Multiple sensors
   - Pickups:
     - Factory set: 12-14-18-21

   **Load monitoring**
   - Inverse time
     - Pickup: LC1 = 0.8 to 1 x current setting
   - LC2 = 0.8 to 1 x current setting
   - Option R
     - Time delay: See time-current curve page 27

   **Fault indicators**
   - Not discriminated: local by mechanical pop-out type indicator
   - Remote: by overcurrent trip switch - see page 15
   - Discriminated: local with option F - see page 10

   **Built-in ammeter**
   - Option I
     - Control voltage: 120 to 240V 50-60Hz
     - Display: phase 1, phase 2, phase 3, phase max.
     - Accuracy: ±1.5 %

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neutral sensor
Ground fault protection may be applied on 304W or 303W circuits. On 304W an external neutral sensor must be used. This neutral current sensor shall have the same ampere rating as the breaker.

Zone Selective Interlocking
Option Z provides selectivity and reduces the duration of fault compared to traditional time-delayed selectivity. By interconnecting several control units, it locates the ground fault and allows the upstream circuit breaker to trip at the minimum time regardless of the time delay setting of this breaker.

ground fault 1
Circuit breaker A will clear the fault within the minimum time delay regardless of its time delay setting.

ground fault 2
Circuit breaker B will inform the upstream circuit breaker A that it is clearing the fault and will prevent it from tripping instantaneously. As a safety feature, the breaker A will trip at the end of its time delay setting if the fault is not cleared during this time.

note:
- circuit breaker terminals are delivered with "in" terminals jumpered. Remove the jumper when interlocking with a downstream breaker.
- Masterpact circuit breaker with control units ST308S - ST318S - ST408S and ST418S with option Z and W may be also interlocked with Compact CK type molded case circuit breakers with ZSI ground fault option.
- no. 18 to 14 AWG cables, twisted in pairs (approx. one turn per 4") Max. length 60 feet. Do not ground.
Masterpact™ MP circuit breaker control units

load monitoring (option R)
The option R provides 2 independent static contacts which operate when the current exceeds adjustable pickup limits (two independent limits lc1 and lc2 adjustable from 0.8 to 1 x the long time setting. The current exceeds the limit lc1 (or lc2) the contact R1-R2 (or R3-R4) closes, following an inverse time characteristic a. The current drops below the limit lc1 (or lc2) the contact R1-R2 (or R3-R4) opens with constant time delay (3 seconds) b. These contacts can be used for load shedding, alarms, indications, etc...

- **voltage**: 240V AC max
- **outputs**: 0.5A triac

fault and alarm indicators (option F and J)
In addition to the mechanical fault indicator, long time, short time/instantaneous and ground fault trips are indicated separately. Fault indications differentiate the 3 causes of tripping: overload, short circuit and ground fault if any.

- **Option F** provides LED's indicators located on the front face of the control unit.
- **Option J** provides LED's indicators and opto-decoupled outputs (terminals 612-622-632)

Alarm indication (option F only) indicates before the breaker trips that the long time pickup has been exceeded.

A separate control source is required. Fault indications are maintained as long as the control voltage is provided. When the control voltage is considered as unreliable, auxiliary power module (AD) and battery pack module (BAT) may be added to preserve memory.

- **Input voltage**
  - option F: 24 to 240V AC or DC
  - option J: 24 to 48V DC
- **Outputs**
  - option J: 1A - triac - 240V AC max

Input voltages available for the module (AD):
- DC: 24 - 48 - 125V
- Consumption: 10W
- 60Hz: 120V
- Consumption: 10VA

Safeguard period of the battery pack module (BAT): approximately 12 hours.
**Masterpact™ MP circuit breaker control units**

### Built-in Ammeter

- **Built-in Ammeter**
  - This built-in ammeter avoids installation of current transformers, ammeter and selector switches.
  - Current measurements using internal CT's.
  - Current measurements may be selected by a push-button: phase 1, 2 or 3 or the maximum current in any phase. Lights indicate the phase selected.
  - Current indication is done on numerical display. The LED type display and the 1/2 high figures allows easy reading regardless of lighting conditions.
  - This ammeter must be supplied by a 120 to 240V control voltage.

### Test Procedure

#### Mini Test Kit

- **Overcurrent Protection Test Procedure**
  1. Operate on "OFF load" conditions.
  2. Record the short time or instantaneous pickup setting and set the control unit to the minimum setting.
  3. Close the circuit breaker.
  4. Connect the two + and - test leads into trip unit receptacle, observing the "+ - overcurr" markings.
  5. Press the test kit push button, the circuit breaker will trip.
  6. Return to initial setting.

- **Batteries**
  - The mini test kit requires five 9 Volt batteries. Alkaline batteries are recommended.
  - Dimensions: 5 1/2 x 3 x 1 1/2

### Portable Test Kit

- **Warning**
  - Touching test plug pins may cause electrical shock when power cord is plugged and power switch should never be in the ON position unless test plug is connected.

- **Prior Testing**
  1. Operate in "OFF load" conditions.
  2. Set control voltage selector located at the back of test kit to proper voltage.
  3. Switch for control power has to be in the OFF position.
  4. Remove the transparent trip unit cover and connect test leads according to + -.
  5. Plug in the power cord.
  6. Turn control power switch ON. The "power on" lamp should light. If not, check the source, then the test kit fuse (1A fuse).
  7. Close breaker.

### Test Kits

- **Every control trip unit is equipped with a test receptacle that can be used with a test kit.**
- This particular design allows a safe and simple testing.
- 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 breaker. Tests are not designed to calibrate the breaker.
- Calibration can best be done at the factory.

### Built-in Ammeter

- **Mini Test Kit**
- **Portable Test Kit**

### Control Unit Parameters

<table>
<thead>
<tr>
<th>Control Unit</th>
<th>Long Time Delay Setting</th>
<th>Maximum Tripping Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST 208S - ST 308S - ST 318S</td>
<td>150 sec.</td>
<td></td>
</tr>
<tr>
<td>ST 408S - ST 418S</td>
<td>G 20 sec.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MIN 40 sec.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>INT 180 sec.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MAX 500 sec.</td>
<td></td>
</tr>
</tbody>
</table>
Masterpact™ MP circuit breaker accessories

**secondary disconnects**
Electrical accessories are listed for field installation per UL file E113554.
They are provided with their terminals. They are gathered and accessible on secondary disconnecting blocks located above the circuit breaker.
- **fixed mounted**
  By one or two connecting plugs (provided).

- **drawout mounted**
To a terminal block located in the front of the stationary assembly making the connections easy.
This terminal block is then wired to another connection block that operates automatically to isolate the internal accessories when the breaker is in the disconnected position.

**connection**
Accessory terminals are of screwless type and may be connected by standard copper wires 18 to 14 AWG.
Cable strip length: 3/8" approximate.
Masterpact™ MP circuit breaker accessories

Masterpact™ circuit breaker is equipped with true two step stored energy mechanism which insures fast opening and closing operations and complete sequence open-close-open without recharging mechanism. Masterpact™ always has manual actuators: charging handle, push to open and push to close buttons. In addition, remote operation is possible with field installable accessories:
- the spring charging motor (MCH)
- a closing release (XF)
- an 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)
Added to the manual operating mechanism, a motor charges automatically the stored energy mechanism (when the breaker closes) making possible O-C-O cycles without recharging. Opening and closing operations are instantaneous.

operation counter (CDM)
With gear motor option only. The operation counter is read from the front and gives the total number of breaker operating cycles.

"spring charged" switch
Type b switch, it is closed when spring is charged.
It is delivered as standard with the spring charging motor and has a common terminal with it.

closing coil (XF)
This device releases the 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 manual operating mechanism.

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

note: this anti-pumping function can be disabled by series connecting a "ready to close" switch (PF).
Three types of voltage release can be used for remote opening of Masterpact circuit breakers:

- shunt trip (MX)
- instantaneous undervoltage trip device (MN)
- time delayed undervoltage trip device (MNR)

### shunt trip (MX)

The release is rated for continuous duty and operates with control voltages between 85 and 110%.

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. Field installable.

### instantaneous undervoltage trip device (MN)

This release instantaneously opens the breaker when its supply voltage drops below a value between 35% and 70% of its rated voltage.

If the release is not energized, the breaker cannot be closed (either manually or electrically). Any attempt to close will have no effect on the main contacts.

Closing is possible when the release voltage reaches 85% of its rated value. Field installable.

### time delayed undervoltage trip device (MNR)

To prevent the 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).

Field installable.
heavy usage auxiliary switches (OF)

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

"a" contacts are open when the breaker is open and closed when the breaker is closed.

"b" switches are closed when the breaker is open and open when the breaker is closed.

See page 17 for operating diagrams.

standard auxiliary switches (O and F)

2a + 2b switches available as standard.

"a" contacts are open when the breaker is open and closed when the breaker is closed.

"b" switches are closed when the breaker is open and open when the breaker is closed.

See page 17 for operating diagrams.

24 additional auxiliary switches (QFSUP)

An external plate holds a set of 24 SPDT switches. They are operated by the means of a cable. Not UL listed.

overcurrent trip switch (SDE)

delivered as 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 breaker is tripped by the control unit.

When the breaker is reset, the "a" switch (alarm) is open and the "b" switch (lockout) is closed.

"ready to close" switch (PF)

This SPDT switch indicates that the breaker is ready to close and that the following conditions are simultaneously effective:

- the breaker is open,
- the stored energy mechanism is charged,
- the control unit is reset,
- the breaker opening pushbutton is neither locked nor padlocked,
- the breaker is in the fully connected position.

This contact can be series connected to the closing release (XF) to disable the anti-pumping function.

Field installable.
Masterpact™ MP circuit breaker accessories

connected position switches (CE)
A block of 4 SPDT switches is operated close to the connected position.
Field installable.

disconnected position switches (CD)
A block of 2 SPDT switches is operated close to the fully disconnected position.
Field installable.

note:
- these switches also enable the linking of the normally closed auxiliary contacts (N/C) of the circuit breaker in open position when they are used in automatisms which do not have to be interfered by the circuit breaker drawout.
- see page 17 for operating diagrams

test position indication
By series connection of CD and CE contacts the test position may be discriminated.

---

connected and disconnected position switches

---

current ratings (A)

<table>
<thead>
<tr>
<th>voltage (V)</th>
<th>auxiliary switch heavy usage</th>
<th>standard</th>
<th>24 additional</th>
<th>overcurrent trip switch</th>
<th>ready to close switch</th>
<th>position switch connected</th>
<th>position switch disconnected</th>
</tr>
</thead>
<tbody>
<tr>
<td>60Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>DC</td>
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<td>250</td>
<td>3</td>
<td>0.25</td>
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</tr>
</tbody>
</table>

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### Auxiliary Switches

<table>
<thead>
<tr>
<th>Description</th>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Contact Position</td>
<td><img src="#" alt="Diagram" /></td>
</tr>
<tr>
<td>Heavy Usage (OF)</td>
<td><img src="#" alt="Diagram" /></td>
</tr>
<tr>
<td>Standard (O)</td>
<td><img src="#" alt="Diagram" /></td>
</tr>
<tr>
<td>Standard (F)</td>
<td><img src="#" alt="Diagram" /></td>
</tr>
<tr>
<td>24 Additional (OFSUP)</td>
<td><img src="#" alt="Diagram" /></td>
</tr>
</tbody>
</table>

Note: Contacts are shown with the breaker in the open position.

### Connected and Disconnected Position Switches

<table>
<thead>
<tr>
<th>Description</th>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Disconnect Position</td>
<td><img src="#" alt="Diagram" /></td>
</tr>
<tr>
<td>Secondary Disconnect Position</td>
<td><img src="#" alt="Diagram" /></td>
</tr>
<tr>
<td>Connected Position Switches (CE)</td>
<td><img src="#" alt="Diagram" /></td>
</tr>
<tr>
<td>Disconnected Position Switches (CD)</td>
<td><img src="#" alt="Diagram" /></td>
</tr>
</tbody>
</table>

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

---

**MERLIN GERIN**

---
Masterpact™ MP circuit breaker accessories

lock ing devices
summary of interlockings

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

"open" position lock (VSKA)
A Kirk key lock that locks the breaker in the open position by holding the pushbutton in its depressed position.
The Kirk key lock is provided. Factory mounted.

door interlock (VPEC)
This lock prevents the compartment door from being opened when the breaker is in the 'connected' position. If the breaker is put into the 'connected' position with the door open, the latter can be closed without disconnecting the breaker.

note: For more safety, this interlock may be used with racking interlock (VPOC) below.

racking interlock (VPOC)
This lock prevents racking the breaker when the door is open. (Insertion of the breaker racking crank is not possible when the compartment door is open).

mechanical interlocks
- disconnecting when breaker closed
  During any disconnecting attempt when the breaker is closed, an interlocking device ensures the tripping of the breaker before the real separation of the main disconnects. The breaker remains, however, operable in the other positions: test, disconnected and withdrawn.
- breaker closing when incompletely connected
  The same above interlocking device avoids the closing of the breaker if the connecting operation is not completely achieved.
- connecting when door opened
  VPEC and VPOC options prevent the compartment door from being opened when the breaker is in the "connected" position and from connecting the 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. Reclosing of the breaker is impossible until this trip indicator is reset.
  This standard function can be disabled on request.
- anti-pumping function (standard)
  In case of permanently energization of the closing coil (XF), the breaker remains in the open position after it has been opened, either by manual or electrical operation. The breaker can be closed only if closing coil is momentarily deenergized.
  note: This anti-pumping function can be disabled by series connecting a "ready to close" switch (PF) with the closing coil (XF).
Two or three Masterpact™ can be mechanically interlocked by means of rods or cables. This accessory is mountable on the right side of the breaker. This adaptation can be made on site without modifying the breaker.

**Mechanical interlock between 2 or 3 stacked breakers**
This interlocking is obtained by the adjunction of:
- one adaptation block
- one or two adjustable and unadjustable rods.
- maximum distance between the 2 fixing surfaces of the devices: 35\" (890 mm)

**Mechanical interlocks between 2 side by side breakers**
This interlocking is obtained by the adjunction of:
- one adaptation block
- one set of adjustable cables with a maximum length of 78\" (2 meters).

Possible mounting arrangements between 3 stacked breakers

1 use, power supplied by:
- either 2 transformers N1 and N2 which are connected in parallel
- or one stand-by source G

2 uses independently powered supply by 2 transformers N1 and N2, stand-by through a circuit breaker or a connection tie switch, forbidding the connection in parallel of the 2 current transformers.

1 use power supplied by 1 group of transformers N1, N2 or N3 or of generators, forbidding any connection in parallel.
Masterpact™ MP circuit breaker accessories

**safety shutters**
Comprising two independent parts, line and load side, the safety shutters automatically block access to the main disconnects when the breaker is in the disconnected, test or full withdrawn position.

**rejection feature**
Installed as option on drawout mounting type breakers, rejection feature allows or not to connect or to disconnect a frame within a stationary assembly having similar features.
They are made of 2 parts (one for the frame and one for the stationary assembly) and allows the possibility of 20 combinations.

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

**transparent cover**
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 fixed or drawout mounted breakers.
Masterpact™ MP circuit breaker
time current curves

overcurrent protection ST208D

---

**current setting**
\[ I_r = 0.4 \times \text{sensor rating} \ (I_n) \]

---

**standard interrupting rating**

<table>
<thead>
<tr>
<th>Type</th>
<th>Type ampere rating (A)</th>
<th>Ampere sensor rating (A)</th>
<th>Interrupting ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP0H1</td>
<td>600</td>
<td>250-600</td>
<td>50,000 65,000 50,000</td>
</tr>
<tr>
<td>MP12H1</td>
<td>1200</td>
<td>800-1200</td>
<td>65,000 65,000 65,000</td>
</tr>
<tr>
<td>MP16H1</td>
<td>1600</td>
<td>1200-1600</td>
<td>65,000 65,000 65,000</td>
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<tr>
<td>MP20H1</td>
<td>2000</td>
<td>1600-2000</td>
<td>65,000 65,000 65,000</td>
</tr>
<tr>
<td>MP25H1</td>
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<td>2000-2500</td>
<td>65,000 65,000 65,000</td>
</tr>
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<td>2500-3000</td>
<td>65,000 65,000 65,000</td>
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<td>4000</td>
<td>2500-4000</td>
<td>100,000 100,000 100,000</td>
</tr>
<tr>
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<td>5000</td>
<td>4000-5000</td>
<td>100,000 100,000 100,000</td>
</tr>
<tr>
<td>MP63H1</td>
<td>6300</td>
<td>5000-6300</td>
<td>100,000 100,000 100,000</td>
</tr>
</tbody>
</table>

**high interrupting rating**

<table>
<thead>
<tr>
<th>Type</th>
<th>Type ampere rating (A)</th>
<th>Ampere sensor rating (A)</th>
<th>Interrupting ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP0H2</td>
<td>600</td>
<td>2500-600</td>
<td>100,000 100,000 65,000</td>
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<tr>
<td>MP12H2</td>
<td>1200</td>
<td>800-1200</td>
<td>100,000 100,000 65,000</td>
</tr>
<tr>
<td>MP16H2</td>
<td>1600</td>
<td>1200-1600</td>
<td>100,000 100,000 65,000</td>
</tr>
<tr>
<td>MP20H2</td>
<td>2000</td>
<td>1600-2000</td>
<td>100,000 100,000 65,000</td>
</tr>
<tr>
<td>MP25H2</td>
<td>2500</td>
<td>2000-2500</td>
<td>100,000 100,000 65,000</td>
</tr>
<tr>
<td>MP30H2</td>
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<td>2500-3000</td>
<td>100,000 100,000 65,000</td>
</tr>
<tr>
<td>MP40H2</td>
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<td>2500-4000</td>
<td>150,000 150,000 100,000</td>
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<tr>
<td>MP50H2</td>
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<td>4000-5000</td>
<td>150,000 150,000 100,000</td>
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<tr>
<td>MP63H2</td>
<td>6300</td>
<td>5000-6300</td>
<td>150,000 150,000 100,000</td>
</tr>
</tbody>
</table>

---

**multiple of current setting**
\[ 2 = 2 \times \text{current setting} \ (I_r) \]

---

**RMS Sym. Amps**

- 300 V: 50,000
- 400 V: 65,000
- 500 V: 70,000
- 600 V: 75,000

---

**Multiple of current setting**
\[ 10 \times \text{current setting} \ (I_r) \]

---

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**MERLIN GERIN**
Masterpact™ MP circuit breaker
overcurrent protection ST 308S - ST 308ST

current setting:
I = 0.6 \times 1 \times \text{sensor rating (in)}

Type and ampere rating (A)
- Overcurrent pickup
- Instantaneous pickup

Example:
- MP08H1 800 250 28 7200
- MP12H1 1200 650 28 16800
- MP16H1 1600 65 28 22400
- MP20H1 2000 65 28 28000
- MP25H1 2500 65 28 33600
- MP30H1 3000 65 28 44800

Multiple of instantaneous pickup
- MP08 800 250 28 7200
- MP12 1200 650 28 16800
- MP16 1600 65 28 22400
- MP20 2000 65 28 28000
- MP25 2500 65 28 33600
- MP30 3000 65 28 44800

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Masterpact™ MP circuit breaker
time current curves

overcurrent protection ST 318S - ST 318ST

Type | Ampere sensor rating (A) | Interrupting ratings RMS Sym. Amps
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MP08H1</td>
<td>800</td>
</tr>
<tr>
<td>MP12H1</td>
<td>1200</td>
</tr>
<tr>
<td>MP16H1</td>
<td>1600</td>
</tr>
<tr>
<td>MP20H1</td>
<td>2000</td>
</tr>
<tr>
<td>MP25H1</td>
<td>2500</td>
</tr>
<tr>
<td>MP30H1</td>
<td>3000</td>
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<tr>
<td>MP40H1</td>
<td>4000</td>
</tr>
<tr>
<td>MP50H1</td>
<td>5000</td>
</tr>
<tr>
<td>MP63H1</td>
<td>6300</td>
</tr>
</tbody>
</table>

Current setting:

- Short time pickup:
  \[ I_m = 2 \times 10 \times \text{current setting (in)} \]

- Multiple of current setting (in):

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Masterpact™ MP circuit breaker
time current curves

overcurrent protection ST 408S - ST 408ST
Masterpact™ MP circuit breaker

time current curves

overcurrent protection ST 418S - ST 418ST

---

- **Type**: MPOBH
- **Ampere rating**: 1000 - 3000 A
- **Interrupting rating**: 65,000 - 100,000 A

---

**Short time pickup**:
- $I_s = 1.6 \times I_e$
- $T_s = 10 \times I_e$
Masterpact™ MP circuit breaker

wiring diagrams

for breakers only equipped
with options I, F, J, T and R

<table>
<thead>
<tr>
<th>ammeter</th>
<th>local fault indications</th>
<th>remote fault indications</th>
<th>ground fault protection or load monitoring</th>
</tr>
</thead>
</table>

---

(option J)

terminal 84 not available with option J (remote fault indicators)

(2) Zone Selective Interlocking with a downstream circuit breaker. Remove the jumper.
Masterpact™ MP circuit breaker dimensions

Inch / mm

door escutcheon, door interlock, rear cutout, external neutral sensor

Note: the door interlock can either be mounted on the right side or the left side of the breaker.
Masterpact™ MP circuit breaker dimensions

Inch / mm

fixed mounting

note: suitable for continuous operation at 100% rating in a minimum cubicle space H17½ by W2½ by D16 inches. Ventilation is not required.

drawout mounting

note: suitable for continuous operation at 100% rating in a minimum cubicle space H17½ by W2½ by D16 inches. Ventilation is not required.
Masterpact™ MP circuit breaker dimensions
inch / mm

fixed mounting

drawout mounting

note: suitable for continuous operation at 100% rating in a minimum cubicle space H17 by W21 by D16 inches. Ventilation is not required.
Masterpact™ MP circuit breaker dimensions

fixed mounting

drawout mounting

note: suitable for continuous operation at 100% rating in a minimum cubicle space H26 by W21 by D16 inches with a ventilation of 30 sq. inches both at top and bottom.
Masterpact™ MP switch

construction
Masterpact™ switch is designed identically to MP circuit breaker, except that it is not equipped with a control unit.

Caution:
switch does not provide overcurrent protection.
Switch can be protected by a Masterpact™ circuit breaker.

ratings

<table>
<thead>
<tr>
<th>type</th>
<th>ampere rating (A)</th>
<th>short time rating (RMS Sym. Amps) 600V AC max.</th>
<th>short circuit withstand when protected by Masterpact™ circuit breaker (A) max. frame (A)</th>
<th>600V AC max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP 08 NA</td>
<td>800</td>
<td>50,000</td>
<td>800</td>
<td>50,000</td>
</tr>
<tr>
<td>MP 12 NA</td>
<td>1200</td>
<td>50,000</td>
<td>1200</td>
<td>50,000</td>
</tr>
<tr>
<td>MP 16 NA</td>
<td>1600</td>
<td>50,000</td>
<td>1600</td>
<td>50,000</td>
</tr>
<tr>
<td>MP 20 NA</td>
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<td>2000</td>
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</tr>
<tr>
<td>MP 25 NA</td>
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<td>MP 40 NA</td>
<td>4000</td>
<td>85,000</td>
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<td>85,000</td>
</tr>
<tr>
<td>MP 50 NA</td>
<td>5000</td>
<td>85,000</td>
<td>5000</td>
<td>85,000</td>
</tr>
<tr>
<td>MP 63 NA</td>
<td>6300</td>
<td>85,000</td>
<td>6300</td>
<td>85,000</td>
</tr>
</tbody>
</table>

accessories - dimensions - connections
Switch accessories, dimensions and connection are identical to those of the corresponding circuit breaker. Overcurrent trip switch is not available with switch version.

<table>
<thead>
<tr>
<th>page</th>
</tr>
</thead>
<tbody>
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<td>page</td>
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</tbody>
</table>

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recommended inspection intervals
Masterpact™ circuit breakers are designed to be maintenance-free (see page 37). However, all equipment with moving parts requires periodic inspection to ensure optimum performance and reliability. We recommend that the circuit breakers be routinely inspected six months after installation, followed by an annual inspection. Intervals can vary depending on your particular use and experience.

inspection of terminals
Connections of circuit breaker:
- Terminals may be inspected. 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 removable to allow access to the main contacts and to the wear indicator. It consists of a groove located within the contacts support (see p.3). When the breaker is closed, this groove is entirely covered up by the moving contacts. In the end, the wear of the contacts will make the groove appear. The contacts will have to be changed when the groove is fully visible.

cleaning
Remove the 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 breaker periodically.

insulation resistance tests
When breakers are subjected to severe operating conditions, an insulation resistance test may be performed as indicated in NEMA standard publication no AB2-1984. 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. Resistance values below 1 megohm should be investigated. 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, overcurrent and instantaneous tripping, in accordance with NEMA standard publication no AB 2. They are not within the scope of normal field operation.

Important
All tests shall be made on circuit breakers which have been de-energized, and disconnected so as to prevent accidental contact with live parts.

Caution
Since circuit breakers contain factory-sealed and calibrated elements, it is essential that the seal not be broken and the circuit breaker not be tampered with. In the case of malfunction, the breaker shall be replaced at the Merlin Gerin factory, or by an authorized representative.
importance notice:
all the 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 check periodically contacts wear.

Under normal operating conditions of use, given by UL 489 or ANSI standards (see table 4) and controled by tests, Masterpact™ do not require maintenance. However, Masterpact™ exceeds without maintenance and additional costs the endurances required by standards. See table 1.
It is nevertheless possible to exceed these values by an easy maintenance:
■ on site by end user, this maintenance consists of changing arc chutes and some visual inspections. See table 2.
■ on site by our after sales service. This maintenance consists of changing contacts, arc chute and some other parts. See table 3.
example
MP 25 at 480 V requires no maintenance below 10,000 cycles (mechanical) or 1,000 cycles (electrical at 480 V).
Endurance may be increased by simple maintenance (changing arc chutes and some visual inspections) every 1,000 operations, and on site by our after sales service every 3,000 electrical operations and at 10,000 mechanical operations.

### table 1 - endurance without maintenance

<table>
<thead>
<tr>
<th>Masterpact™</th>
<th>MP 08</th>
<th>MP 12</th>
<th>MP 16</th>
<th>MP 20</th>
<th>MP 25</th>
<th>MP 30</th>
<th>MP 40</th>
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Masterpact™ MP circuit breaker appendix

molded case circuit breaker
In addition to UL 489, Masterpact™ circuit breakers comply with IEC 157-1 standard as per table below:

A 4-pole version complements the product line. For further information, please contact your Merlin Gerin representative.

<table>
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auxiliary and position switches (IEC 157-1 ratings)

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<th>position switch</th>
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<td>O</td>
<td>OFSUP</td>
<td>CE</td>
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<td>15</td>
<td>10</td>
<td>10</td>
<td>10</td>
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<td>240</td>
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international standards

spring charging motor

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shunt trip

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# Masterpact® circuit breaker

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Masterpact® circuit breaker

interruption

interruption ratings

<table>
<thead>
<tr>
<th>UL489/NEMA AB1 type</th>
<th>rating (A)</th>
<th>480V</th>
<th>600V</th>
<th>short time</th>
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<tr>
<td>standard interrupting rating</td>
<td></td>
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<tr>
<td>MP08 H1</td>
<td>800</td>
<td>65kA</td>
<td>65kA</td>
<td>50kA</td>
</tr>
<tr>
<td>MP12 H1</td>
<td>1200</td>
<td>65kA</td>
<td>65kA</td>
<td>50kA</td>
</tr>
<tr>
<td>MP16 H1</td>
<td>1600</td>
<td>65kA</td>
<td>65kA</td>
<td>50kA</td>
</tr>
<tr>
<td>MP20 H1</td>
<td>2000</td>
<td>75kA</td>
<td>75kA</td>
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<td>MP25 H1</td>
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<td>MP30 H1</td>
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<td>MP50 H1</td>
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<td>100kA</td>
<td>100kA</td>
<td>100kA</td>
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<tr>
<td>MP63 H1</td>
<td>6300 ②</td>
<td>100kA</td>
<td>100kA</td>
<td>100kA</td>
</tr>
</tbody>
</table>

high interrupting rating

| MP08 H2            | 800        | 100kA| 65kA | 50kA       |
| MP12 H2            | 1200       | 100kA| 65kA | 50kA       |
| MP16 H2            | 1600       | 100kA| 65kA | 50kA       |
| MP20 H2            | 2000       | 100kA| 75kA | 75kA       |
| MP25 H2            | 2500       | 100kA| 75kA | 75kA       |
| MP30 H2            | 3000       | 100kA| 75kA | 75kA       |
| MP40 H2            | 4000       | 125kA| 100kA| 100kA      |
| MP50 H2            | 5000       | 125kA| 100kA| 100kA      |
| MP63 H2            | 6300 ②     | 150kA| 100kA| 100kA      |

② drawout only

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 38).

single design up to 6300A

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

high short-time current rating: up to 100kA for 1 sec.

The exceptional short-time rating of 75,000A in a 3000A frame and 100,000A in a 4000A 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.

ratings

<table>
<thead>
<tr>
<th>type</th>
<th>ampere rating (A)</th>
<th>sensor ratings (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>08</td>
<td>800</td>
<td>250-400-500-800</td>
</tr>
<tr>
<td>12</td>
<td>1200</td>
<td>800-1200-1600</td>
</tr>
<tr>
<td>16</td>
<td>1600</td>
<td>1200-1600</td>
</tr>
<tr>
<td>20</td>
<td>2000</td>
<td>1600-2000</td>
</tr>
<tr>
<td>25</td>
<td>2500</td>
<td>2000-2500</td>
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<tr>
<td>30</td>
<td>3000</td>
<td>2500-3000</td>
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<tr>
<td>32</td>
<td>3200</td>
<td>2500-3200</td>
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<tr>
<td>40</td>
<td>4000</td>
<td>2500-3000-4000</td>
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<tr>
<td>50</td>
<td>5000</td>
<td>4000-5000</td>
</tr>
<tr>
<td>63</td>
<td>6300</td>
<td>5000-6300</td>
</tr>
</tbody>
</table>

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.

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, etc.
  - marine applications: homologated by Bureau Veritas, Det Norske Veritas, and Germanischer Lloyd's; listed by Lloyd's Register of Shipping and American Bureau of Shipping.

other performances

The UL 489 and UL 1066 (ANSI C37-13) standard performance assure that the circuit breaker has sufficient characteristics to be used in normal conditions. However,
Masterpact® circuit breaker
advantages

drawout circuit breaker design
- the drawout assembly mechanism allows
the circuit breaker to be racked in 4 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.
Disconnecting the circuit breaker will be
therefore possible without opening the door
and accessing live parts. Safety shutters can
be provided for protection from live parts
when the circuit breaker is removed.

true 2-step stored energy
mechanism
The closing time is less than 5 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.

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.

connected position

![connected position](image)

test position

![test position](image)

disconnected position

![disconnected position](image)

designed for no
maintenance...
The circuit breaker has fewer parts (by a
factor of at least 5) than conventional circuit
breakers while performing the same
functions. This leads to greatly enhanced
reliability and reduction in maintenance.
Under normal operating conditions, given by
standards and controlled by tests, the circuit
breaker does not require maintenance.

... but exceeds the standard
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 page 37 for additional information.

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.
Masterpact® circuit breaker

advantages

improved features

- segregated compartment
  Once the front cover has been removed, giving 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.

- isolation function by positive indication of contact status
  The mechanical indicator is truly representative of the status of all three main contacts.

- reinforced insulation
  Two insulation barriers separate the front of the circuit breaker from main circuits.

- 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.

state of the art protection and control

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 (standard)
- thermal memory and I1 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 28D</th>
<th>STR 38S</th>
<th>STR 58U</th>
</tr>
</thead>
<tbody>
<tr>
<td>basic features</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>long-time pickup</td>
<td>adjustable</td>
<td>adjustable</td>
<td>adjustable</td>
</tr>
<tr>
<td>short-time pickup</td>
<td>adjustable</td>
<td>adjustable</td>
<td>adjustable</td>
</tr>
<tr>
<td>instantaneous</td>
<td>adjustable</td>
<td>fixed</td>
<td>adjustable</td>
</tr>
<tr>
<td>test receptacle</td>
<td>standard</td>
<td>standard</td>
<td>standard</td>
</tr>
<tr>
<td>additional features</td>
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<tr>
<td>ground-fault protection</td>
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<td>◆</td>
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<tr>
<td>built-in ammeter</td>
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<td>◆</td>
<td>◆</td>
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<tr>
<td>fault indicators</td>
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<td>◆</td>
<td>◆</td>
</tr>
<tr>
<td>segregated alarm switch</td>
<td>◆</td>
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<td>◆</td>
</tr>
<tr>
<td>zone-selective interlocking</td>
<td>◆</td>
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<td>◆</td>
</tr>
<tr>
<td>load monitoring</td>
<td>◆</td>
<td>◆</td>
<td>◆</td>
</tr>
<tr>
<td>communication outputs</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)
Masterpact® circuit breaker
description

description
1 control terminal covers
2 accessories and control unit front
connecting block
3 position carriage switches
4 arc chute
5 opening coils
6 spring charging motor
7 front cover
8 control unit
9 racking crank
10 handling handgrip
11 retractable rails
12 pull-out 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 housing
10 door escutcheon
11 fault indicator and reset button
12 open position locking (key interlock)
Masterpact® circuit breaker control units

1 mechanical pop-out type fault indicator and reset button
   • indicates that a fault trip has occurred
   • prevents reclosure 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 - % of current setting)
5 sensor rating
6 rating plug
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
   • 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>current sensor plug rating</th>
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</thead>
<tbody>
<tr>
<td>250A</td>
<td>250-200-150-125A</td>
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<tr>
<td>400A</td>
<td>400-300-250-200A</td>
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<td>600A</td>
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<td>5000-4000-3200-3000-2500A</td>
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<tr>
<td>6300A</td>
<td>6300-6000-5000-4000-3200-3000A</td>
</tr>
</tbody>
</table>

long-time current setting 0.8 to 1 x rating plug (pick up at 1.1 x setting)
max. delay fixed: 7.5s at 6 x current setting
instantaneous pickup 1.5 to 10 x current setting

built-in ammeter (optional)

option I
values displayed phase 1, 2, 3, max., neutral current
accuracy ± 1.5 %
bar graph indications phase 1, 2, 3 - 10% steps
control power not required

fault or alarm indicators
not discriminated local by pop-out type indicator and LED pre-trip alarm
remote by overcurrent trip and pre-trip alarm switches. See p. 11
Masterpact® circuit breaker control units

STR 38S for selective application

1. Mechanical pop-out type fault indicator and reset button
   - Indicates that a fault trip has occurred
   - Prevents reclosure 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 - % of current setting)

5. Sensor rating

6. Local and remote pre-trip alarm:
   - LED on at 90% of current setting
   - LED flashing on overload

7. Rating plug

8. Long-time current setting

9. Short-time pick-up

10. Short-time delay

11. Instantaneous ON/OFF selector

12. Available space for setting identification

13. Ground-fault (option T) pick-up

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 re-activating button (option PIL)

20. Fault indicator re-activating button

Overcurrent protection - rms sensing

Rating plug: 4 to 6 rating plugs available per sensor rating; see STR 28D p. 6

Long-time current setting:
   - 0.8 to 1 x rating plug (pick up at 1.1 x setting)
   - Delay fixed: 7.5 s at 6 x current setting
   - Thermal memory as standard

Short-time current setting:
   - 1.5 to 10 x current setting
   - Delay bands: 0.1 - 0.2 - 0.3 - 0.4 with I't ramp ON/OFF

Instantaneous current setting:
   - High-set fixed type - defeatable on N1 and H1 types

Ground-fault protection (option T or W)

- Pickup: 0.1 x current sensor to 1200A
- Delay band: 0.1 - 0.2 - 0.3 - 0.4 with I't ramp ON/OFF switch

Fault indicators

- Not discriminated local
- By mechanical pop-out type indicator and LED pre-trip alarm

Built-in ammeter

Option I
   - Values display: phase 1, 2, 3, max., neutral and ground current
   - Accuracy: ± 1.5 %
   - Bar graph indication: phases 1, 2, 3 - 10% steps

Control power: not required
1 mechanical pop-out type fault indicator and reset button
- indicates that a fault trip has occurred
- prevents reclosure 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 (option V, p. 11)
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 - % or current setting)
6 sensor rating
7 local and remote pre-trip alarm:
- LED on at 90% of current setting
- LED flashing on overload
8 rating plug
9 long-time current setting
10 long-time delay setting
11 short-time pick-up
12 short-time delay
13 thermal memory min./max. selector (see p. 40)
14 instantaneous pickup
15 ground-fault (option T) pickup
16 ground-fault (option T) time delay
17 available space for setting identification
18 load monitoring (option R) pickups
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 re-activating button (option PIL)

---

1 according to time current curves: 105% to 120% of current setting
2 with PIL option, fault indicator lights (21) will only light up when this button is pushed in
overcurrent protection - rms sensing

rating plug  4 to 6 rating plugs available per sensor rating; see STR 280 control unit
long-time  current setting  0.8 to 1 \times \text{rating plug} (pick up at 1.1 \times \text{current setting})
delay bands  0.94 - 1.88 - 3.75 - 7.50 - 15 - 30s at 6 \times \text{current setting}
thermal memory as standard with min./max. selector
short-time  pickup  1.5 to 10 \times \text{current setting}
delay bands  0 - 0.1 - 0.2 - 0.3 - 0.4 with PT OFF
           0.1 - 0.2 - 0.3 with PT ON
zone-selective interlocking with option Z - see p. 10
instantaneous  pickup  adjustable from 2 to max. value, \( \hat{1} \) defeatable on N1 and H1 types

ground-fault protection (option T or W) \( \hat{2} \)

pickup  0.1 \times \text{current sensor to 1200A} \( \hat{3} \)
delay band  0.1 - 0.2 - 0.3 - 0.4 with PT ramp ON/OFF switch
zone-selective interlocking with option Z - see p. 10

fault indicators

not discriminated  local by mechanical pop-out type indicator and LED pre-trip alarm
remote by overcurrent trip and pre-trip alarm switches. See p. 11
discriminated  local with option F - see p. 11
remote with option V - see p. 11

built-in ammeter (option I)

option I  values display  phase 1, 2, 3, max., neutral and ground current
accuracy  \( \pm 1.5\% \) \( \hat{4} \)
bar graph indication  phase 1, 2, 3 - 10% steps
control power  not required \( \hat{5} \)

load monitoring (option R)

inverse time  pickups  \( \text{lc} = 0.8 \text{ to } 1 \times \text{current setting} \)
alarm  \( \text{lc} = 0.5 \text{ to } 1 \times \text{current setting} \)
time delay  see curve p. 27

outputs for communication through Dialpact system (option C)

transmitted  entire settings of the trip unit
values  circuit breaker status: open, tripped, closed
alarms: overload, type of fault, internal watchdog

\( \hat{1} \) see values on pp. 24 to 26
\( \hat{2} \) residual scheme. The maximum ground-fault pickup meets 1993 National Electrical Code paragraph 230-95 (a) (not exceeding 1200A)
\( \hat{3} \) Source Ground Return scheme on request
\( \hat{4} \) 0.1 minimum pickup only with external power
\( \hat{5} \) control power not required for loads greater than 20% of current sensors. Required for load less than 20% of current sensors if maximum demand memory requested. (See diagram p. 29)
Neutral Sensor

Ground-fault protection may be applied on 304W or 303W circuits. On 304W circuits an external neutral sensor must be used. This neutral current sensor must have the same ampere rating as the circuit breaker.

Zone-selective Interlocking (ZSI)

Option Z on the STR 58U trip 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 obey the pre-set 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 in the network are minimized, without any effect on the correct time delay coordination in the installation.

1. **Fault 1**
   - Circuit breaker A will clear the fault instantaneously, regardless of its time delay setting.

2. **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:
- 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 CK type molded case circuit breakers with ZSI option.
- Do not ground.

<table>
<thead>
<tr>
<th>Cable Size</th>
<th>#18 - #14 AWG/1.5 mm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Length</td>
<td>60 ft./18.3 m</td>
</tr>
<tr>
<td>Wiring</td>
<td>Twisted in pairs</td>
</tr>
<tr>
<td>No. of Circuit Breakers</td>
<td>Upstream: 2, Downstream: no limit</td>
</tr>
</tbody>
</table>
Masterpact® circuit breaker
control units

fault indicator (option 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 re-activating buttons.

alarm indicator
pre-trip alarm switch
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.

overcurrent trip switch (SDE)
Delivered as 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.

segregated trip switch (option V)
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.

interlock which prevents the circuit breaker from being reclosed after the pre-selected type of faults: for example the circuit breaker will be able to be remotely reclosed after overload, but not after short circuit.
load monitoring (option R)
The option R provides two independent static contacts which operate when the current exceeds adjustable pickup limits.

- when the current exceeds the limit lc1 (or lc2) the contact C-R1 (or C-R2) closes, following an inverse time characteristic a.
- when the current drops below the limit lc1 (or lc2) 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 trip 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 best be done at the factory.

### mini test kit test procedure

**Overcurrent protection test procedure**

1. operate in "OFF load" conditions.
2. record the short-time or instantaneous pickup setting and set the control unit to the minimum setting.
3. close the circuit breaker.
4. connect the two + and – test leads into trip unit test receptacle, observing the "+ – overcurr" markings.
5. press the test kit push button, the circuit breaker will trip.
6. return to initial setting.

**Batteries**
The mini test kit requires five 9-volt batteries.

**Dimensions**: 5-1/2 x 3 x 1-1/2 in. (140 x 76 x 38 mm)

### portable test kit test procedure

**HAZARD OF ELECTRICAL SHOCK, BURN OR EXPLOSION.**

Do not touch test plug pins when power cord is plugged in and power switch is ON. The power switch should never be in the ON position unless test plug is connected.

Failure to do so will cause death, personal injury or electrical shock.

<table>
<thead>
<tr>
<th>control unit</th>
<th>STR 280 - STR 36S</th>
<th>STR 58U</th>
</tr>
</thead>
<tbody>
<tr>
<td>long-time delay setting</td>
<td>15 sec.</td>
<td>120 sec.</td>
</tr>
<tr>
<td>maximum tripping time</td>
<td>75 sec.</td>
<td>70 sec.</td>
</tr>
<tr>
<td></td>
<td>30 sec.</td>
<td>240 sec.</td>
</tr>
<tr>
<td></td>
<td>60 sec.</td>
<td>240 sec.</td>
</tr>
<tr>
<td></td>
<td>120 sec.</td>
<td>240 sec.</td>
</tr>
<tr>
<td></td>
<td>240 sec.</td>
<td>180 sec.</td>
</tr>
<tr>
<td></td>
<td>480 sec.</td>
<td>300 sec.</td>
</tr>
</tbody>
</table>

---

1. prior to testing:
2. connect test leads according to "+ – overcurr” markings.
3. set selector K of test kit to control unit long-time setting.
4. press Ip switch. The circuit breaker will trip (see max. tripping time in table below).
Masterpact® circuit breaker accessories

**secondary disconnects**

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

- **fixed-mounted:**
  By one or two connecting plugs (provided).

- **drawout-mounted:**
  To a terminal block located in the front of the stationary assembly making the connections easy. This terminal block is then wired to another connection block that operates automatically to isolate the internal accessories when the circuit breaker is in the disconnected position.

**location**

- **disconnected position switches**
- **terminal block**
- **connected position switches**
- **auxiliary switches**
- **overcurrent trip switch**
- **opening coil**
- **closing coil**
- **heavy usage auxiliary switches**
- **‘ready to close’ switch**
- **spring charging motor**

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

**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. BS option consists of five additional terminals.
The Masterpact circuit breaker is equipped with a true two-step stored energy mechanism which insures fast opening and closing operations and complete open-close-open sequence without recharging the mechanism. The Masterpact circuit breaker has manual actuators: charging handle, push-to-open and push-to-close buttons. In addition, remote operation is possible with 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.

### Operation Counter (CDM)

With gear 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.

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

**Note:** This anti-pumping function can be disabled by series connecting a "ready to close" switch (PF).

---

### Table: Spring Charging Motor

<table>
<thead>
<tr>
<th>Control Voltage (V)</th>
<th>AC 60 Hz 120-240</th>
<th>DC 24-48-125</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumption (W)</td>
<td>AC 180 VA</td>
<td>DC 180 W</td>
</tr>
<tr>
<td>Inrush Current</td>
<td>AC 300 VA</td>
<td>DC 180 W</td>
</tr>
<tr>
<td>Charging Time</td>
<td>2 to 3 x In for 0.1 sec.</td>
<td>3 to 4 sec.</td>
</tr>
</tbody>
</table>

---

### Table: Breaking Capacity

<table>
<thead>
<tr>
<th>Operating Voltage Range</th>
<th>Rated Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC 60 Hz 120-240</td>
<td>240 V 10 A</td>
</tr>
<tr>
<td>DC 24-48-125</td>
<td>125 V 0.5 A</td>
</tr>
</tbody>
</table>

---

### Table: Control Voltage

<table>
<thead>
<tr>
<th>Control Voltage (V)</th>
<th>AC 60 Hz 120-240</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumption (W)</td>
<td>AC 20 VA</td>
</tr>
<tr>
<td>DC</td>
<td>15 W</td>
</tr>
</tbody>
</table>

---

### Diagram: Remote Close
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)

**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.

**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.

**Time-delayed undervoltage trip device (MNR)**
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.
heavy usage auxiliary switches (OF)
4 SPDT switches with double break construction. They are directly operated by the main contacts and insure 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 18 for operating diagrams. Auxiliary switches are field-installable.

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 18 for operating diagrams.

24 additional auxiliary switches (OFSUP)
An external plate holds a set of 24 SPDT switches. They are operated by the means of a cable. Only available for drawout circuit breakers.

“ready to close” switch (PF)
The 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.
**Masterpact® circuit breaker accessories**

**connected and disconnected position switches**

**connected position switches (CE)**
A block of four SPDT switches operated close to the connected position. The switch block is field-installable.

**disconnected position switches (CD)**
A block of two SPDT switches operated close to the fully-disconnected position. The block is field-installable. See page 18 for operating diagrams.

**test position switch (CT)**
One SPDT switch is operated only in the test position. The switch is field-installable.

---

![Diagrams of switches](image1.png)

**current ratings (A)**

<table>
<thead>
<tr>
<th>voltage (V)</th>
<th>auxiliary switch heavy usage</th>
<th>standard</th>
<th>24 additional</th>
<th>ready to close switch</th>
<th>position switch connected</th>
<th>disconnected</th>
<th>test</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 Hz</td>
<td>240</td>
<td>10</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>480</td>
<td>10є</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>DC</td>
<td>125</td>
<td>3</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>250</td>
<td>3</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
</tr>
</tbody>
</table>

---

see p. 39 for IEC ratings
є 8A for MC08
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.

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.
Masterpact® circuit breaker 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. Reclosing of the circuit breaker is impossible until this trip indicator is reset.
  This standard function can be disabled on request.
- anti-pumping function (standard)
  In case of permanent energization of the closing coil (XF), the circuit breaker remains in the open position 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.  
  Note: this anti-pumping function can be disabled by series connecting a “ready to close” (NC contact) switch (PF) with the closing coil (XF).

locking devices

push button locking device (VBP)
  This device prevents local manual operation of the circuit breaker by covering the opening and/or closing push buttons.
  The 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.

disconnected position locking
  The circuit breaker can be locked in the disconnected position by means of 1 to 3 padlocks (padlocks not provided) or 1 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 (VSKEC).

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.)

same anti-pumping function with undervoltage trip device
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 unadjustable 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 between three stacked circuit breakers**

One use, power supplied by:
- either 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
Masterpact® circuit breaker accessories

safety shutters
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.

rejection feature
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.

shutters lock (VVC)
A 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.
Factory-mounted.

interphase barrier
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.

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-B-F</td>
<td>3-4-5</td>
<td>B-D-E</td>
<td>1-3-6</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-E</td>
<td>2-3-6</td>
<td>C-D-F</td>
<td>1-2-5</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>

transparent cover
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.
The Masterpact switch is designed identically to the MP circuit breaker, except that it is not equipped with a control unit and current transformers, but with an STR 08 dummy unit.

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.

<table>
<thead>
<tr>
<th>type</th>
<th>ampere rating (A)</th>
<th>short-time rating (rms sym. amps) 600 Vac max.</th>
<th>short-circuit withstand when protected by a Masterpact circuit breaker (A) max. frame (A)</th>
<th>600 Vac max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP08 NA</td>
<td>800</td>
<td>50,000</td>
<td>800</td>
<td>50,000</td>
</tr>
<tr>
<td>MP12 NA</td>
<td>1200</td>
<td>50,000</td>
<td>1200</td>
<td>50,000</td>
</tr>
<tr>
<td>MP16 NA</td>
<td>1600</td>
<td>50,000</td>
<td>1600</td>
<td>50,000</td>
</tr>
<tr>
<td>MP20 NA</td>
<td>2000</td>
<td>50,000</td>
<td>2000</td>
<td>50,000</td>
</tr>
<tr>
<td>MP25 NA</td>
<td>2500</td>
<td>50,000</td>
<td>2500</td>
<td>50,000</td>
</tr>
<tr>
<td>MP30 NA</td>
<td>3000</td>
<td>50,000</td>
<td>3000</td>
<td>50,000</td>
</tr>
<tr>
<td>MP40 NA</td>
<td>4000</td>
<td>85,000</td>
<td>4000</td>
<td>85,000</td>
</tr>
<tr>
<td>MP50 NA</td>
<td>5000</td>
<td>85,000</td>
<td>5000</td>
<td>85,000</td>
</tr>
<tr>
<td>MP63 NA</td>
<td>6300</td>
<td>85,000</td>
<td>6300</td>
<td>85,000</td>
</tr>
</tbody>
</table>

Switch accessories, dimensions and connections are identical to those of the corresponding circuit breaker. The overcurrent trip switch is not available with switch version.

- accessories: page 13
- wiring diagrams: page 28
- dimensions: page 30

1 control unit not required
2 not UL listed
Masterpact® circuit breaker
time current curves

overcurrent protection STR 28D

- Current setting
  \[ I_r = 0.8 \ldots 1 \times \text{plug rating} \]

- Instantaneous pickup
  \[ I = 1.5 \ldots 10 \times I_r \]

- Multiple of current setting (\( I_r \))
Masterpact® circuit breaker
time current curves

overcurrent protection STR 38S

In (A)  630  800/1000  1200/1600  2000  2500  3000/3200  4000/5000/6300
fixed threshold  I = ln x...  28  28  24  20  14  12  10
overcurrent protection STR 58U
Masterpact® circuit breaker
time current current curves

ground-fault protection STR 38S - STR 58U
Masterpact® circuit breaker

load monitoring STR 58U

[Graph showing load monitoring with current setting, Ic1, Ic2, tr, and current rating multiple.]
Masterpact® circuit breaker
wiring diagrams

diagram no. 689 889

drawout position switches
auxiliary switches
remote operation

note: circuit breaker shown in connected, charged, and open position, undervoltage releases energized
Masterpact® circuit breaker
diagram no. 689 889

remote fault and overload indication
ammeter
ground-fault protection
local fault indications and remote selected fault indication
zone-selective interlocking
load monitoring
data transmission

---

fault alarm
overload alarm
selected fault
upstream circuit breaker
communication network

---

T2
T1
S3
S1

S1
LR1

1 option
For W option
LT
Gnd

LT

Z1
Z2

C

---

S2
S4

LR2

---

24 Vdc

---

downstream circuit breaker

---

CD
84
terminal not available with Z or C option

---

zone-selective interlocking with downstream circuit breaker: remove the jumper

---

use 24 Vdc supply for loads less than 20% of current sensor rating

---

use 24 Vdc supply for lower setting

---

use 24 Vdc supply if not supplied with PIL (battery) option;
use 24 Vdc supply (mandatory) for FV option
Masterpact® circuit breaker
dimensions

in./mm

**Door Escutcheon**
- **(Drawout Mounting)**
  - Door cutout
  - Drilling of the door

- **(Fixed Mounting)**
  - Door cutout
  - Drilling of the door

Refer to shop drawings for verification.

**Door Interlock**
- Mounting -+ 1.48 holes

**Rear Cutout**
- External neutral sensor

**Door Interlock Mounting**
- Basis: MP08 to MP30, MC08 to MC32
- MP40 to MP63, MC40/MC50

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

**External Neutral Sensor**
- MP08 to MP20, MC08 to MC20
- MP20/MC20
- MP25/MP30/MP40, MC32/MC40

---

Masterpact® circuit breaker dimensions

**fixed mounting (MP only)**

Note: suitable for continuous operation at 100% rating in a minimum cubicle space 17.5 in. (445 mm) h. by 21 in. (533 mm) w. by 16 in. (406 mm) d. Ventilation is not required. Refer to shop drawings for verification.

**drawout mounting**

Note: suitable for continuous operation at 100% rating in a minimum cubicle space 17.5 in. (445 mm) h. by 21 in. (533 mm) w. by 16 in. (406 mm) d. Ventilation is not required. Refer to shop drawings for verification.
Masterpact® circuit breaker dimensions
in./mm

fixed mounting (MP only)

Note: suitable for continuous operation at 100% rating in a minimum cubicle space 17.5 (445 mm) h. by 21 in. (533 mm) w. by 16 in. (406 mm) d. Ventilation is not required. Refer to shop drawings for verification.

drawout mounting

Note: suitable for continuous operation at 100% rating in a minimum cubicle space 17.5 (445 mm) h. by 21 in. (533 mm) w. by 16 in. (406 mm) d. Ventilation is not required. Refer to shop drawings for verification.
Masterpact® circuit breaker
dimensions

in./mm

**fixed mounting (MP only)**

- 0.56 dia. 0.14
- 5.85 149
- 5.85 149
- 2.01 51
- 0.25 6

- 14.88 378
- 0.43 11
- 15.75 400
- 16.61 422
- 0.43 11

**drawout mounting**

- 0.56 dia. 0.14
- 5.75 146
- 5.75 146
- 0.65 17
- 0.25 6

- 2.17 55
- 12.8 323
- 17.14 436

**Note:** suitable for continuous operation at 100% rating in a minimum cubicle space 26 in. (660 mm) h. by 21 in. (533 mm) w. by 16 in. (406 mm) d. with a ventilation of 30 sq. in. (0.02 sq. m) both at top and bottom.

Refer to shop drawings for verification.
Masterpact® circuit breaker dimensions

**Drawout Mounting**

Note: suitable for continuous operation at 100% rating in a minimum cubicle space 22 in. (559 mm) by 25 in. (635 mm) w. by 16 in. (406 mm) d. with a ventilation of 30 sq. in. (0.02 sq. m) at bottom. Refer to shop drawings for verification.
**Masterpact® circuit breaker dimensions**

**in./mm**

**fixed mounting (MP only)**

**MP40**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>29.88</td>
</tr>
<tr>
<td>Height</td>
<td>0.43</td>
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<td>Depth</td>
<td>30.71</td>
</tr>
<tr>
<td>Overall</td>
<td>8.02</td>
</tr>
</tbody>
</table>

**Note:** suitable for continuous operation at 100% rating in a minimum cubic space 26 in. (660 mm) h. by 34.25 in. (870 mm) w. by 16 in. (406 mm) d. with a ventilation of 30 sq. in. (0.02 sq. m) at bottom. Refer to shop drawings for verification.

**drawout mounting**

**MP40/MC40**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>Width</td>
<td>2.17</td>
</tr>
<tr>
<td>Height</td>
<td>13.78</td>
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<tr>
<td>Depth</td>
<td>13.78</td>
</tr>
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<td>Overall</td>
<td>32.08</td>
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</table>

**Note:** suitable for continuous operation at 100% rating in a minimum cubic space 26 in. (660 mm) h. by 34.25 in. (870 mm) w. by 16 in. (406 mm) d. with a ventilation of 30 sq. in. (0.02 sq. m) at bottom. Refer to shop drawings for verification.
drawout mounting

Refer to shop drawings for verification.

Masterpact® circuit breaker dimensions
in./mm

MP63
DANGER
HAZARD OF ELECTRICAL SHOCK, BURN OR EXPLOSION

Turn OFF all power supplying the equipment before installing or removing circuit breaker.

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

recommended inspection intervals

Masterpact® circuit breakers are designed to be maintenance-free (see page 38). However, all equipment with moving parts requires periodic inspection to ensure optimum performance and reliability. We recommend that the circuit breakers be routinely inspected six months after installation, followed by an annual inspection. Intervals can vary depending on your particular use and experience.

inspection of terminals

Connections of circuit breaker:

- inspect terminals. If there is discoloration due to overheating, the joint should be disassembled and the surface cleaned before reinstallation.
- check for terminal tightness.

inspection of main contacts

The arc chutes are easily removable 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.

The contacts will have to be changed when the groove is fully visible.

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 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. Resistance values below 1 megohm should be investigated.

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.

CAUTION
HAZARD OF EQUIPMENT DAMAGE

Since circuit breakers contain factory-sealed and calibrated elements.

Do not break seal. In case of malfunction, repairs must be made at a Merlin Gerin factory or by an authorized representative.

Failure to observe this precaution may cause equipment damage.
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, given by UL 489 or ANSI standards (see table 3) 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 1 and 3.

Service maintenance by a Merlin Gerin representative will extend the endurance according to table 2. This service can be performed on site and consists in changing contacts, arc chutes and some other parts.

Example:
MP16 at 480V: requires no maintenance before 10,000 cycles (mechanical or electrical).
Endurance may be increased after servicing at 10,000 operations.

<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>
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</thead>
<tbody>
<tr>
<td>mechanical</td>
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<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</td>
<td>480V</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>
</tr>
<tr>
<td></td>
<td>600V</td>
<td>10,000</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>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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<th>1200</th>
<th>1600</th>
<th>2000</th>
<th>2500</th>
<th>3000</th>
<th>4000</th>
<th>5000</th>
<th>6300</th>
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</thead>
<tbody>
<tr>
<td>UL489</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>ANSI</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mechanical</td>
<td>12,500</td>
<td>NS</td>
<td>4,000</td>
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<td>NS</td>
<td>1,500</td>
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</tr>
<tr>
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<td>NS</td>
<td>800</td>
<td>800</td>
<td>NS</td>
<td>400</td>
<td>400</td>
<td>NS</td>
<td>NS</td>
</tr>
</tbody>
</table>
In addition to UL 489 and ANSI C37-13, Masterpact circuit breakers comply with IEC 947-2 standard as per the table below:

<table>
<thead>
<tr>
<th>Type</th>
<th>Ampere Rating (A)</th>
<th>Interrupting Ratings UL489</th>
<th>IEC 947-2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>rms sym. amps.</td>
<td>480V</td>
<td>600V</td>
</tr>
<tr>
<td>3-pole</td>
<td>65kA</td>
<td>50kA</td>
<td>65kA</td>
</tr>
<tr>
<td>4-pole</td>
<td>100kA</td>
<td>100kA</td>
<td>100kA</td>
</tr>
</tbody>
</table>

A 4-pole version complements the product line. For further information, please contact a sales representative.

### Closing Coil

<table>
<thead>
<tr>
<th>Rated Voltage (V)</th>
<th>UL 489 Listed</th>
<th>IEC 947-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 Hz</td>
<td>120</td>
<td>110-127</td>
</tr>
<tr>
<td>DC</td>
<td>24</td>
<td>24-30</td>
</tr>
<tr>
<td>48</td>
<td>48-60</td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>100-125</td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>250</td>
<td></td>
</tr>
</tbody>
</table>

### Shunt Trip

<table>
<thead>
<tr>
<th>Rated Voltage (V)</th>
<th>UL 489 Listed</th>
<th>IEC 947-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 Hz</td>
<td>120</td>
<td>110-127</td>
</tr>
<tr>
<td>DC</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>48</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td>250</td>
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</tr>
</tbody>
</table>

### Undervoltage Trip

<table>
<thead>
<tr>
<th>Rated Voltage (V)</th>
<th>UL 489 Listed</th>
<th>IEC 947-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 Hz</td>
<td>120</td>
<td>110-127</td>
</tr>
<tr>
<td>DC</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>48</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>250</td>
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</tbody>
</table>

### Auxiliary and Position Switches

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Auxiliary Switch</th>
<th>Overcurrent Trip Switch</th>
<th>Under Voltage Trip</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/60 Hz</td>
<td>OF</td>
<td>O</td>
<td>OFSUP</td>
</tr>
<tr>
<td>110</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>240</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>380</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>480</td>
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<td>10</td>
<td>10</td>
</tr>
<tr>
<td>600</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>DC</td>
<td>48</td>
<td>48</td>
<td>48</td>
</tr>
</tbody>
</table>

OF: heavy duty; O: standard; OFSUP: 24 additional; CE: connected; CD: disconnected; CT: test
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 reclosing 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.

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 trip unit will be closer to the real heating of the power network system. After tripping, the memory will also reduce the time delay when reclosing the circuit breaker on fault.

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 trip 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.

**WARNING**

HAZARD OF EQUIPMENT DAMAGE

“min” position must be used only for emergency, when reclosing on fault is absolutely necessary.

Failure to observe this precaution can cause death, severe personal injury or equipment damage.