

External Operating Handles and Terminal Covers for Molded-Case Circuit Breakers and Earth Leakage Circuit Breakers

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Molded-case circuit breakers and earth leakage circuit breakers (hereinafter “circuit breakers”) mounted on the control panels of electrical and mechanical equipment widely use optional accessories such as external operating handles used for turning ON and OFF the devices from outside the panel, as well as terminal covers that cover the live part of terminals to prevent electric shock. In recent years, the diversification of usage environments has been progressing. As such, control panels are required to deliver better waterproof performance, improved safety for in-panel equipment maintenance, ease of installation, and maintainability.

In response to these needs, we simultaneously developed N-shaped external operating handles (directly attached to the circuit breaker) and terminal covers for the “G-TWIN Series” of 32 to 100 ampere frames (AF). Launched in December 2021, these accessories provide latest protection structure for electrical safety (see Fig. 1).

1. External Operating Handles

1.1 Features of the N-shaped external operating handles for the 32 to 100AF

The features of the newly developed external operating handles are as follows.

- (1) The waterproof structure has been improved to IP54 compared to the conventional model (IP50 equivalent).
- (2) The product conforms to regional standards of

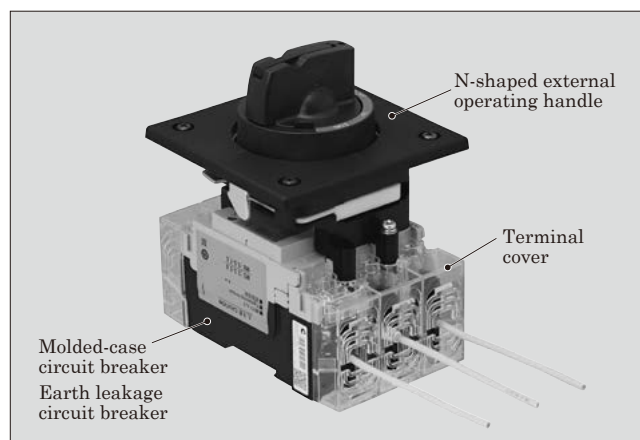


Fig.1 N-shaped external operating handle and terminal cover

IEC, JIS, GB, and UL/CSA. They have also obtained the EN/CE mark through a third-party assessment.

- (3) The lineup includes a flat handle provided with a flat decorative plate to prevent the handle operation parts from protruding from the panel surface. It reduces the risk of damage during panel transportation and erroneous operation after installation.
- (4) Alignment marks are added to both the handle itself and the decorative plate to reduce the time required for fitting and adjustment.
- (5) The door can be opened while the handle is in the locked state (locked with a padlock in the off position) (optional). This saves the trouble of removing the padlock when opening the door and enables safe maintenance and inspection work.

1.2 Applied technologies

- (1) Waterproof rating

Although the conventional N-shaped external operating handles comply with the U.S. NFPA 79 (U.S. Electrical Standard for Industrial Machinery) standard, additional waterproof performance is required at some installation sites. For this reason, we have completely revised the structure of the operation parts of the N-shaped external operating handles. To prevent water from entering from the outside, we have innovated the engagement of the electromechanical parts and installed packing at the surface contacts between the decorative plate and the door panel and between the latch and the cover (see Fig. 2). In addition, we

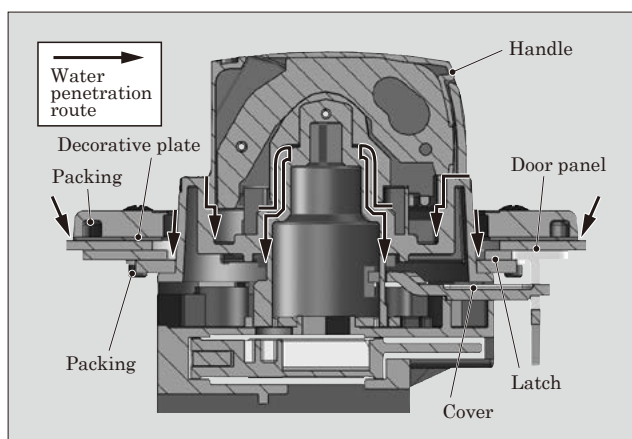


Fig.2 Internal structure of the N-shaped external operating handle

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have revised the design to comply with IP54 and provide dust protection, thereby obtaining third-party performance certification.

(2) Door panel opening function

The external operating handle has a locking mechanism that prevents the door panel from opening even when the circuit breaker is OFF (no current flows through the circuit). This is a standard safety feature to prevent the door panel from being opened carelessly. On the other hand, there is a need for some users to prioritize maintainability so that they can open the door to perform maintenance on internal equipment when the circuit breaker is OFF. We therefore offer a special product with a redesigned handle operation locking mechanism. Only when the panel is not energized and the handle is locked by a padlock so that ON operation cannot be done, the release mechanism allows the door panel to be open with a tool such as a screwdriver (see Fig. 3).

(3) Non-protruding door panel surface

As shown in Fig. 4, conventional external operating handles commonly protrude from the door panel surface. However, protrusion from the door panel surface sometimes leads to unintentional erroneous operation or damage during transportation or installation. Therefore, to prevent erroneous operation and damage, we have added a new special product with a decorative

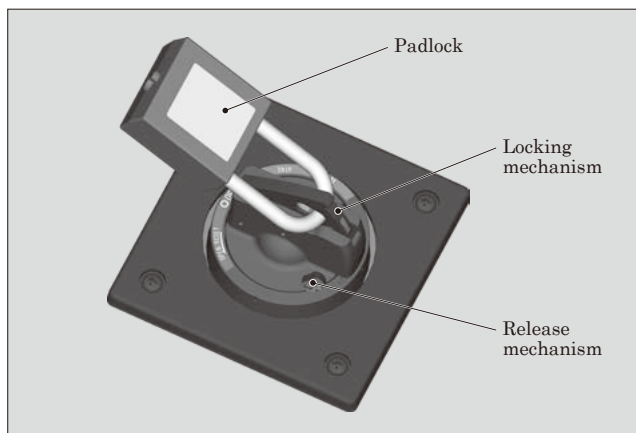


Fig.3 Panel door-opening structure in the OFF state of the circuit breaker

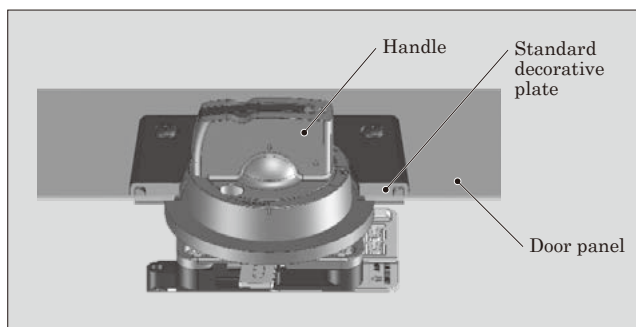


Fig.4 External operating handle (standard decorative plate) structure

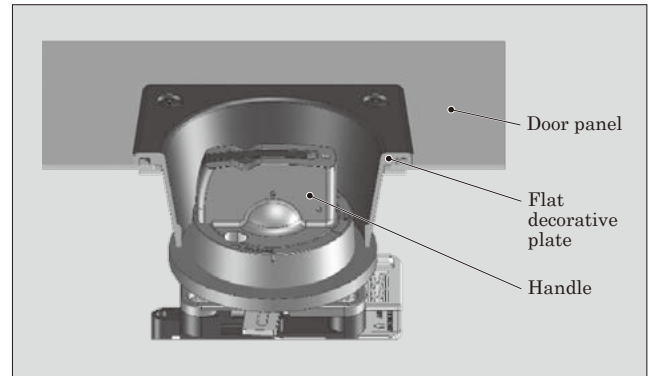


Fig.5 External operating handle (flat decorative plate) structure

plate attached to the door panel. This prevents the entire handle from protruding from the door panel surface, as shown in Fig. 5.

2. Terminal Covers

2.1 Features of the terminal covers for the 32 to 100AF

The features of the newly developed terminal covers are as follows:

- (1) A short type and a long type can be selectable according to the protective structure of the exposed live part of connected round crimp terminals.
- (2) The products comply with the IP20 protection requirement for the power supply side of the power disconnector in the control panel standard. It also complies with IP20 on all sides, providing electric shock protection even when accessed from the back side for maintenance and inspection. By cutting the terminal cover opening in accordance with the wire size, an IP20 degree of protection can be maintained for the live part.
- (3) The products conform to regional standards of IEC, JIS, and UL/CSA. Furthermore, they have also obtained the EN/CE mark through a third-party assessment.
- (4) A protective hole structure has been adopted, allowing the terminal screws to be tightened and the power to be tested without removing the terminal cover.
- (5) The terminal cover can be attached and detached even when the main unit is mounted in a dense, side-by-side configuration, making attachment and detachment easy even when used for a branch circuit.
- (6) Fire-resistant materials have been adopted as standard (UL 94 flame retardant level: V-2).

2.2 Applied technologies

(1) Degree of protection

The conventional terminal cover has a structure that prevents fingertips from touching the live part of the terminal from the front, but with the recent increase in the demand for safety, it has become necessary to protect the live part from all sides, including

the back. Therefore, to prevent fingers and tools from entering from the front, back, sides, and wire opening, we have restructured the terminal cover into two parts, a lower terminal cover and an upper terminal cover. In this manner, IP20 compliance is achieved in all directions (see Fig. 6).

(2) Improved maintainability

A new guide hole has been added to allow tools to be inserted when tightening terminals and conducting power inspections. This makes it possible to perform maintenance work without removing the terminal cover (see Fig. 6).

(3) Improved applicability

As shown in Fig. 7, the wire openings on the terminal covers have a structure that enables cutting with

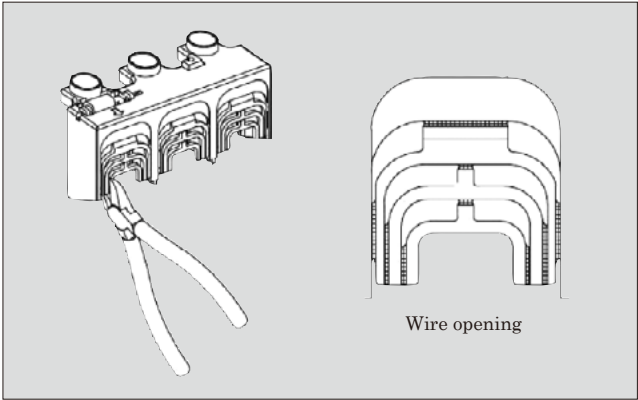


Fig.7 Wire opening structure of the terminal cover

a nipper according to the size of the wires, thereby achieving IP20 compliance for wires of 2 to 60 mm² used for currents of 3 to 100 A. Furthermore, it is possible to modify the upper and lower terminal covers to widen the wire openings, thereby enabling the parallel connection of two wires (see Fig. 7).

Launch Date

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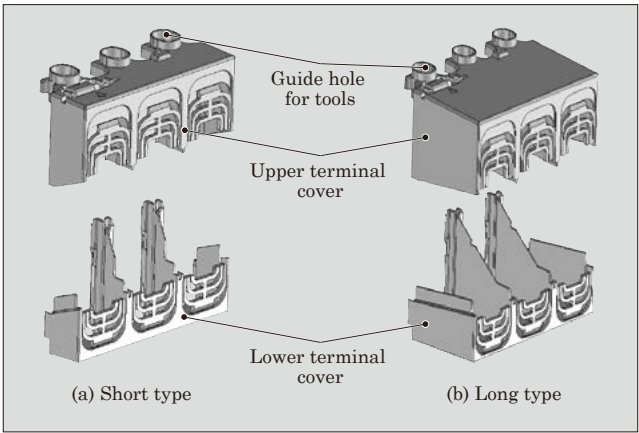


Fig.6 Terminal cover (3-pole product) structure



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