

DISCONNECT SWITCHES AND OPERATING MECHANISMS

1 PURPOSE AND SCOPE:

This Standard applies to disconnects and operating mechanisms used in combination motor starters and industrial control enclosures at 600 VAC and below. It also applies to separately mounted self-enclosed safety switches used for service disconnects and auxiliary equipment. This Standard does not apply to 480 VAC power distribution equipment, such as unit substations and busways.

1.1 MANDATORY AND PREFERRED ITEMS

Mandatory requirements of this Standard are characterized by the use of the word "shall". Preferred items are characterized by the use of the word "should".

1.2 DEFINITIONS:

- 1.2.1 **DISCONNECT (Disconnecting Means):** A disconnect switch, circuit breaker, automatic molded case switch (MCS), or safety switch used as an energy isolating device on industrial equipment in accordance with 29 CFR 1910.147. The disconnect shall isolate the equipment from all ungrounded conductors of the supply circuit and shall be capable of being locked out with at least 3 standard Ford-issued padlocks, refer to Section 6.7.
- 1.2.2 **OPERATING MECHANISM:** The external handle, linkage, and coupling mechanism to the disconnect.
- 1.2.3 **EXTERNAL HANDLE:** That portion of the operating mechanism that is mounted on the right-most enclosure flange for main disconnect switches, or to the front of the switch enclosure for IEC rotary switches (see Clause 3.5).
- 1.2.4 **LINKAGE:** The connection between the external handle and the coupling mechanism.
- 1.2.5 **COUPLING MECHANISM:** The device which operates the disconnect to the ON and OFF positions.
- 1.2.6 **AUTOMATIC MOLDED CASE SWITCH (MCS):** An enclosed switching device which looks like a circuit breaker, but that contains a nonadjustable, magnetic instantaneous trip unit providing only short-circuit protection.
- 1.2.7 **CURRENT LIMITING CIRCUIT BREAKER:** An enclosed thermal magnetic switching device that does not employ a fusible element and that when operating within its current-limiting range:

- 1.2.7.1 Limits the let-through I^2t current to a value less than the I^2t current of the first half cycle wave of the symmetrical prospective current.
- 1.2.7.2 Interrupts before the current peak and clears the fault completely within the first half cycle.
- 1.2.8 IEC DISCONNECT: An IEC designed manual motor controller/isolator (load break switch) additionally marked "Suitable As Motor Disconnect".

2. NORMATIVE REFERENCES:

Disconnects shall conform to the latest revisions of the following standards, except where noted. Where differences exist this standard shall take precedence.

SAE HS-1738 (1995) – Electrical Standard for Industrial Machinery
IEC/EN 60204-1 – Safety of Machinery – Electrical Equipment of Machines,
Part 1. General Requirements
ANSI/NFPA 70 - National Electrical Code (N.E.C.)

Knife Blade Type Disconnect Switches:

National Electrical Manufacturers Association (NEMA) KS-1 "Enclosed Switches".
Underwriters Laboratories (UL) ANSI/UL 0098 "Enclosed and Dead-Front Switches".
Canadian Standards Association (CSA) C22.2.4, "Enclosed Switches".

Rotary Type Disconnect Switches:

Underwriters Laboratories (UL) ANSI/UL 508 "Industrial Control Equipment".
Canadian Standards Association (CSA) C22.2.14, "Industrial Control Equipment".
IEC 60947-3 "Low Voltage Switchgear and Controlgear – Part 3: Switches,
Disconnectors, Switch-Disconnectors, and Fuse-Combination Units".

Circuit Breakers and Molded Case Switches:

National Electrical Manufacturers Association (NEMA) AB-1, "Molded Case Circuit Breakers and Switches".
Underwriters Laboratories (UL) ANSI/UL 498, "Molded Case Circuit Breakers and Circuit Breaker Enclosures".
Underwriters Laboratories (UL) ANSI/UL 1087, "Molded Case Switches".
Canadian Standards Association (CSA) C22.2.5, "Molded Case Circuit Breakers, Molded Case Switches, and Circuit Breaker Enclosures".

- 2.1 All disconnecting means shall be UL Listed, CSA Certified, and CE Marked in accordance with the above standards and shall bear these mark(s).

Note: Safety disconnect switches are either UL Listed or CSA Certified. This is due to differences in requirements for bonding the neutral bar inside the switch enclosure.

3. GENERAL REQUIREMENTS – ALL TYPES:

- 3.1 DISCONNECT SWITCHES shall have visible knife blades OR positive-opening contacts. Both types shall have durable handle position markings that indicate all switch contacts are open in the OFF or "0" position.
- 3.2 CIRCUIT BREAKERS and MOLDED CASE SWITCHES (MCS) shall have a position indicator which cannot indicate OFF until all contacts are actually open with an adequate isolating distance between the contacts in conformance with NEMA and IEC requirements for its maximum voltage rating.
- 3.3 SAFETY SWITCHES shall have NEMA 12 (or minimum IP54) "Heavy Duty" steel enclosures without knockouts, unless otherwise specified by the requisitioning activity.
- 3.4 AUXILIARY CONTACTS: N.O./N.C. interlock contact kits, either single or dual, shall be available from the disconnect switch manufacturer. These interlocks shall open their contact(s) slightly before the disconnect opens.
- 3.5 OPERATING HANDLE SHALL BE PERMANENTLY AFFIXED to the disconnect so the HANDLE IS IN CONTROL OF THE DISCONNECT AT ALL TIMES, including when the enclosure door(s) are open. This requirement does not preclude removal of the handle or enclosure cover with tools.
- 3.6 TERMINAL CONNECTIONS:
 - 3.6.1 Protection: There shall be no exposed live parts when the disconnect is in the OFF (open) position. An insulating cover, shield, or other means shall be provided by the disconnect manufacturer to guard against inadvertent contact with the line terminals. If test probe holes are provided in this cover, they shall be designed with an IP2X finger-safe rating, and prevent shorting between live parts or live parts and other metal parts.
 - 3.6.2 Terminal Connectors: Connectors shall be pressure screw type for suitable for copper wire and in conform to UL 98 Section 11.3. Terminals for #8 AWG (10 mm²) or smaller conductors shall be the pressure plate type.
- 3.7 SUPPLEMENTARY SHIELDS: The Standards listed under the Normative References do not require shields over fusible disconnects. Where local government regulations or Ford Division-level specifications dictate shields, they shall be provided only by the disconnect manufacturer in order to maintain the UL/CSA/CE safety rating of the disconnect.