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(Revision of IEEE Std 303-1984)

IEEE Recommended Practice for Auxiliary Devices for Motors in Class I, Groups A, B, C, and D, Division 2 Locations

Sponsor
Petroleum and Chemical Industry Committee of the Industry Applications Society

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IEEE Standards Board

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Abstract: Installation procedures and wiring methods and materials are recommended. Termination housings, motor surge protection, and power-factor-correction capacitors are discussed. The aim is to promote consistent application of the devices covered.
Keywords: auxiliary devices for motors, device wiring methods, motor surge protection

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Foreword

(This Foreword is not a part of IEEE Std 303-1991, IEEE Recommended Practice for Auxiliary Devices for Motors in Class I, Groups A, B, C, and D, Division 2 Locations.)

This standard was originally published in 1969 and was revised in 1984. In keeping with the goals of maintaining progressive standards, in 1988 the standards group of the IEEE Petroleum and Chemical Industry Committee assigned a working group to revise and update this standard. References to other documentation were corrected. The wording in this standard was modified to reflect changes in other industry standards and to more fully define the intent of this standard.

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CLAUSE PAGE

IEEE Recommended Practice for Auxiliary Devices for Motors in Class I, Groups A, B, C, and D, Division 2 Locations

1. Scope

This recommended practice is limited to auxiliary devices associated with motors operating in Division 2 areas, classified as Class I, Groups A, B, C, and D locations. This recommended practice is not an attempt to rewrite or otherwise supersede application sections of ANSI/NFPA 70-1990 [1],[1] or any other codes or ordinances. Rather, it is intended to serve as a supplement to existing codes that in this area are not sufficiently specific to serve as a guide to good engineering practice. The guidance contained herein, therefore, is in addition to the ANSI/NFPA 70-1990 requirements for wiring systems for hazardous (classified) locations.

2. Purpose

The following information is intended to bring together a brief description of basic electrical practices in regard to the application and installation of auxiliary devices to motors operating in Class I, Groups A, B, C, and D, Division 2 locations It should be understood that this information is only a guide to promote consistent application of such devices and must be used with sound engineering judgment.

3. References

This recommended practice shall be used in conjunction with the following publications:

[1] ANSI/NFPA 70-1990, National Electrical Code.[2]

[2] ANSI/NFPA 496-1989, Purged and Pressurized Enclosures for Electrical Equipment.

[1]The numbers in brackets correspond to those of the references listed in Section 3.

[2]NFPA documents are available from the Publication Sales, National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269-9101, USA. This document is also available from the Sales Department, American National Standards Institute, 11 West 42nd St., New York, NY 10036, USA.

[3] ANSI/NFPA 497A-1986, Classification of Class I Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas.

[4] API-RP500-1991 Classification of Locations for Electrical Installations in Petroleum Facilities.[3]

4. Definitions

auxiliary devices: Components installed either integrally within the motor, located adjacent to or mounted on the motor, or attached to its terminals for the purpose of monitoring the operating conditions or protecting the motor. Refer to 5.2 and 5.3 for examples.

Class I, Division 2 Locations: Basically those in which there may be flammable gas present due to a failure of a process system. Under normal conditions a flammable mixture of gas is not present.

For a complete definition, refer to the latest edition of ANSI/NFPA 70-1990 [1], Chapter 5, Article 500. For a guide in establishing the limits of these locations, refer to API-RP500-1991 [4] and ANSI/NFPA 497A-1986 [3].

5. Device Installation Recommendations

5.1 Motor Auxiliary Device Categories

For installation requirements, auxiliary devices generally fall in one of two categories:

1) Devices containing a make or break contact, or both (arcing devices).
2) Devices without a make or break contact, or both (non-arcing devices).

5.2 Motor Auxiliary Devices Containing a Make or Break Contact, or Both

Included are bearing temperature switches or relays, certain types of motor winding temperature sensors, vibration switches, air filter differential pressure switches, zero speed switches, leak detector relays, and other types of relays or switches either mounted inside a motor where there is a free exchange of ambient atmosphere or outside the motor housing.

These devices must be installed in enclosures suitable for the application class, group, and division (e.g., Class I, Group D, Division 2). If the enclosure will be subject to outdoor weather conditions, the enclosure should be additionally designed for the stated conditions. General purpose enclosures are permitted if any of the following conditions is satisfied:

1) Contacts are immersed in oil.
2) Circuits are intrinsically safe, ANSI/NFPA 70-1990 [1], Articles 500 and 504.
3) Circuits are nonincendive, ANSI/NFPA 70-1990 [1], Article 501-3(b) (exception c).
4) Enclosure is pressurized, ANSI/NFPA 496-1989 [2].
5) Contacts are mounted in a hermetically sealed chamber.

Specifically with regard to Item (5), if the device is susceptible to mechanical, chemical, or other environmental types of damage that may result in the possibility of exposing the contact structure to the surrounding atmosphere, appropriate precautions must be taken to prevent its occurrence. Furthermore, the contact circuit must be adequately protected to ensure that a short circuit anywhere in the contact circuit will not damage the contact structure or enclosure.

[3]API documents are available from the American Petroleum Institute, 1220 L Street, Northwest, Washington, DC 20005.

5.3 Devices Without a Make or Break Contact, or Both

Included in this category are resistance temperature detectors, space heaters, current transformers, motor surge capacitors, gapless type arresters, noncontacting shaft vibration probes and their oscillator/demodulators (drivers), and other devices that do not arc during normal operation. Such devices installed either inside or outside of the motor housing may be of the general-purpose type unless other environmental considerations dictate the use of a specific enclosure especially designed for operation in that environment.

5.3.1

Space heaters should produce sufficient heat to prevent moisture condensation on the motor windings. However, the temperature of all space heaters should not exceed 80% of the auto ignition temperature of the gas or vapor involved when continuously energized at rated voltage at the maximum rated ambient air temperature.

5.3.2

Space heaters must be so constructed as to be unaffected by the accumulation of moisture and should have terminals adequately protected against moisture under severe weather conditions. Space heaters should be mounted on noncombustible material and should operate without thermal damage to the motor or themselves. The maximum surface temperature of space heaters should be indicated on the space heater nameplate or on an auxiliary nameplate mounted on the space heater terminal box. A cautionary note that replacement heaters must not have a surface temperature greater than this nameplate value should be included. These recommendations supplement the requirements in ANSI/NFPA-70-1990 [1], Article 501.

6. Device Wiring Methods and Materials

6.1

The general and specific rules of ANSI/NFPA70-1990 [1] with regard to wiring methods are not intended to apply to internal motor wiring. Refer to ANSI/NFPA 70-1990 [1], Article 300-1(b). It is suggested that the user notify the manufacturer of any specific environmental considerations that dictate the use of a specific wiring material especially designed for operation in that environment.

6.2

Device wiring located outside the motor should meet the requirements of ANSI/NFPA-70-1990 [1], Article 501, pertaining to wiring methods and installations.

7. Terminal Housings

7.1

These terminal housings are in the category of junction boxes containing no arcing devices and as such are not required to be explosionproof. See ANSI/NFPA70-1990 [1], Article 501.

7.2

When auxiliary devices are to be mounted in a terminal housing, the housing should be designed to permit ready access to all parts for maintenance and inspection. The terminal housing should be designed with ample space for mounting of and wiring to the auxiliary devices.

7.3

The construction of the terminal housing is basically determined by environmental conditions other than the hazardous (classified) location.

7.4

If a locknut-bushing attachment is used instead of a threaded fitting, a bonding jumper must be provided across the junction to provide a continuous path of adequate capacity for ground-fault currents that may pass through the junction. Refer to ANSI/NFPA 70-1990 [1], Articles 250-78 and 501.

7.5

Control, r elay, and ammeter conductors used in connection with any motor may occupy the same terminal housing as the motor circuit conductors only if the motor voltage does not exceed 600 V. Refer to ANSI/NFPA 70-1990 [1], Article 300-3(c).

7.6

If the rated motor voltage exceeds 600 V, accessory leads should terminate in a terminal box or boxes separate from the motor terminal housing. As an exception, current and potential transformers located in the motor terminal housing may be permitted to have their secondary connections terminated in the motor terminal housing if separated from the motor leads by a suitable physical barrier to prevent accidental contact. The physical barrier should provide the equivalent of a separate terminal housing except for the common external cover.

7.7

Motor surge protective equipment may occupy the same terminal housing as the motor circuit conductors provided such equipment will, under normal operating conditions, not be exposed to temperatures beyond its ratings.

7.8

Motors may have windings and auxiliary devices terminated within the motor enclosure, provided such terminations are conveniently accessible and are protected against mechanical damage and accidental contact by personnel.

8. Motor Surge Protection

8.1

Motor surge protection equipment, consisting of surge arresters and surge capacitors, does not replace nor is it intended that it be substituted for similar equipment required for the electrical system by ANSI/NFPA70-1990 [1], Articles 230-209 and 280.

8.2

When motor surge protection is installed at the motor, every effort should be made to keep the conductors between the motor terminals and the surge protection, and between the surge protection equipment and ground, shorter than 3 ft (0.9 m).

8.3

When motor surge-protective equipment is installed in a metal enclosure other than the motor terminal housing, a general purpose enclosure, requiring tools for access and provided with a suitable warning plate may be used.

8.4

Motor surge arresters should be the gapless (typically metal-oxide) type with sealed construction to confine normal electric discharges within themselves.

8.5

Motor surge capacitors should be of a sealed type especially designed for surge-protective duty.

8.6

Ground terminals of motor surge protective equipment must be connected to the motor (equipment) grounding terminal located within the terminal housing using a conductor sized in accordance with ANSI/NFPA70-1990 [1], Article 280. The surge protective equipment and the stator support structure should be connected to the motor (equipment) grounding terminal by the shortest practical route.

9. Power Factor Correction Capacitors

A power-factor correction capacitor installation that meets the installation requirements as outlined in ANSI/NFPA 70-1990 [1], Article 460, will be acceptable for installation in Class I, Division 2 locations, except that any overcurrent device, disconnecting means, and associated wiring that may be provided with the capacitors should conform to the requirements of ANSI/NFPA 70-1990 [1], Article 501.