NEMA Standards Publication

NEMA ICS 2.4-2020

# Standard for NEMA and IEC Devices for Motor Service— A Guide for Understanding the Differences

National Electrical Manufacturers Association

**NEMA Standards Publication ICS 2.4-2020**

*NEMA and IEC Devices for Motor Service—*
*A Guide for Understanding the Differences*

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# Foreword

This Standard was prepared by a technical committee of the NEMA Industrial Automation Control Products and Systems Section. It was approved in accordance with the bylaws of NEMA and supersedes the indicated NEMA Standard. This Standard supersedes ICS 2.4-2003 (R2012).

This Standard provides practical information concerning ratings, construction, test, performance, and manufacture of industrial control equipment. These Standards are used by the electrical industry to provide guidelines for the manufacture and proper application of reliable products and equipment and to promote the benefits of repetitive manufacturing and widespread product availability.

NEMA Standards represent the result of many years of research, investigation, and experience by the Members of NEMA, its predecessors, its Sections and Committees. They have been developed through continuing consultation among manufacturers, users, and national engineering societies and have resulted in improved serviceability of electrical products with economies to manufacturers and users.

One of the primary purposes of this Standard is to encourage the production of reliable control equipment which, in itself, functions in accordance with these accepted Standards. Some portions of these Standards, such as electrical spacings and interrupting ratings, have a direct bearing on safety; almost all of the items in this publication, when applied properly, contribute to safety in one way or another.

Properly constructed industrial control equipment is, however, only one factor in minimizing the hazards which may be associated with the use of electricity. The reduction of hazard involves the joint efforts of the various equipment manufacturers, the system designer, the installer, and the user. Information is provided herein to assist users and others in the proper selection of control equipment.

The industrial control manufacturer has limited or no control over the following factors which are vital to a safe installation:

a. Environmental conditions
b. System design
c. Equipment selection and application
d. Installation
e. Operating practices
f. Maintenance

This publication is not intended to instruct the user of control equipment with regard to these factors except insofar as suitable equipment to meet needs can be recognized in this publication, and some application guidance is given.

This Standard is necessarily confined to defining the construction requirements for industrial control equipment and to providing recommendations for proper selection for use under normal or certain specific conditions. Since any piece of industrial control equipment can be installed, operated, and maintained in such a manner that hazardous conditions may result, conformance with this publication does not by itself assure a safe installation. When, however, equipment conforming with these Standards is properly selected and is installed in accordance with the *National Electrical Code*® (NEC) and properly maintained, the hazards to persons and property will be reduced.

To continue to serve the best interests of users of industrial control and systems equipment, the Industrial Automation Control Products and Systems Section is actively cooperating with other standardization organizations in the development of simple and more universal metrology practices. In this publication, the U.S. customary units are gradually being supplemented by those of the modernized metric system known as the International Systems of Units (SI). This transition involves no changes in Standard dimensions, tolerances, or performance specifications.

NEMA Standards publications are subject to periodic review. They are revised frequently to reflect user input and to meet changing conditions and technical progress. Proposed revisions to this Standard should be submitted to:

NEMA Technical Operations Department
National Electrical Manufacturers Association
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Rosslyn, Virginia 22209

This Standards publication was developed by the Industrial Automation Control Products and Systems Section. Section approval of the Standard does not necessarily imply that all section Members voted for its approval or participated in its development. At the time it was approved, the section was composed of the following Members:

ABB, Inc.—Cary, NC
ASCO Power Technologies—Florham Park, NJ
Carlo Gavazzi, Inc.—Buffalo Grove, IL
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Delta Electronics (Americas) Ltd.—Research Triangle Park, NC
E+I Engineering US Corporation—Anderson, SC
Eaton—Milwaukee, WI
Electro Switch Corporation—Weymouth, MA
Elliott Control Company, Ltd.—Willis, TX
Franklin Control Systems—Hillsboro, OR
Fuji Electric Corporation of America—Roanoke, VA
Generac Power Systems—Waukesha, WI
Hubbell Industrial Controls, Inc.—Archdale, NC
Joslyn Clark Controls, Inc.—Elizabethtown, NC
Master Controls Systems, Inc.—Lake Bluff, IL
Mitsubishi Electric Automation, Inc.—Vernon Hills, IL
NORD Gear Corporation—Waunakee, WI
Phoenix Contact, Inc.—Middletown, PA
Post Glover Resistors, Inc.—Erlanger, KY
Reliance Controls Corporation—Racine, WI
Rockwell Automation—Milwaukee, WI
Schneider Electric—Lexington, KY
SEW-Eurodrive, Inc.—Lyman, SC
Siemens Industry, Inc.—Norcross, GA
Software Motor Corporation—Sunnyvale, CA
TE Connectivity—Harrisburg, PA
Toshiba International Corporation USA—Houston, TX
WAGO Corporation—Germantown, WI
Weidmuller Inc.—Richmond, VA
Yaskawa America, Inc. Drives and Motor Division—Waukegan, IL

**CONTENTS**

# Section 1
# General

## 1.1 Referenced Standards

In this publication, reference is made, in part or in full, to the Standards listed below. Copies are available from the indicated source.

**International Electrotechnical Commission**
1 Rue de Varembe
Geneva, Switzerland

| | |
|---|---|
| IEC 60204-1:2016 | *Safety of machinery—Electrical equipment of machines—Part 1: General requirements* |
| IEC 60947-1 2007 | *Low Voltage Switchgear and Controlgear, Part 1: General Rules* |
| IEC 60947-4-1 2009 | *Low Voltage Switchgear and Controlgear, Part 4-1: Contactors and Motor-Starters* |

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|---|---|
| ICS 1-2000 (R2005, R2008) | *Industrial Control and Systems, General Requirements* |
| ICS 2-2000 (R2005, 2008, 2015) | *Industrial Control and Systems, Controllers, Contactors, and Overload Relays* |

**Underwriters Laboratories Inc.**
333 Pfingsten Road
Northbrook, IL 60062

| | |
|---|---|
| UL 489-2016 | *Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures (13th Edition)* |
| UL 60947-4-1 | *Low-Voltage Switchgear and Controlgear—Part 4-1: Contactors and Motor-Starters - Electromechanical Contactors and Motor-Starters* |

## 1.2 Scope

The features, conventions, characteristics, and attributes identified in this guide are those of magnetic contactors and thermal overload relays. These are components that may be used alone or combined with other components, to serve as full-voltage or reduced-voltage, reversing or non-reversing, single-speed or multi-speed motor controllers. Control products compared or contrasted in this guide are those with equivalent electrical ratings; such ratings are expressed via nameplates, catalogs, or technical literature.