NEMA Standards Publication

NEMA ICS 8-2019

Application Guide for Industrial Control and Systems Crane and Hoist Controllers

National Electrical Manufacturers Association

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Published by

National Electrical Manufacturers Association
1300 North 17th Street, Suite 900
Rosslyn, Virginia 22209

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Foreword

This Standards Publication was prepared by a technical committee of the NEMA Industrial Control and Systems Section. It was approved in accordance with the bylaws of NEMA and supersedes the indicated NEMA Standards.

Replacement:

Part 10 supersedes ICS 9 Part 1
Part 11 supersedes ICS 9 Part 2

This Standards publication 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 Standards publication 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 Standards publication 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. However, equipment conforming with these Standards is properly selected and is installed in accordance with the National Electrical Code 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 Control 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. Users should secure the latest editions. Comments or proposed revisions to this Standards Publication should be submitted to:

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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
Cummins Inc. —Minneapolis, MN
Danfoss Drives—Chambersburg, PA
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. —Ashville, NC
Joslyn Clark Controls, Inc. —Elizabethtown, NC
Master Control Systems, Inc.—Lake Bluff, IL
Mitsubishi Electric Automation, Inc. —Vernon Hills, IL
NORD Gear Corporation—Waunakee, IL
Omron Electronics LLC—Schaumburg, IL
Phoenix Contact—Middletown, PA
Post Glover Resistors, Inc. —Erlanger, KY
Reliance Controls Corporation—Racine, WI
Rockwell Automation—Milwaukee, WI
Schneider Electric—Palatine, IL
SEW-Eurodrive, Inc. —Lyman, SC
Siemens Industry, Inc. —Norcross, GA
Software Motor Corporation—Sunnyvale, CA
TE Connectivity—Harrisburg, PA
Tornatech Inc. —Saint-Laurent, QC
Toshiba International Corporation USA—Houston, TX
WAGO Corporation—Germantown, WI
Yaskawa America, Inc. Drives & Motion Division—Waukegan, IL

Introduction

The Standards pertaining to crane and hoist controller in NEMA Standards Publication ICS 8 are subdivided into the following clauses:

1.1 General

a. Referenced Standards
b. Scope
c. Normative Standards
d. General Requirements

2.1 Definitions

Terms which supplement the IEEE *Standard Dictionary of Electrical and Electronics Terms* (Std 100) or assist in clarifying the product Standard.

3.1 Classification

Product classifications where they have been established.

4.1 Characteristics and Ratings

Descriptions of the kinds of ratings applicable to the product and tables of Standard ratings for the product where they have been established.

5.1 Product Marking, Installation, and Maintenance Information

Product information to be provided to assist the user in the installation, use, and maintenance of the devices.

6.1 Service and Storage Conditions

A description of service and storage conditions for which the devices are intended.

7.1 Construction

Marking, color coding, and similar production requirements to be incorporated into the product as manufactured, as well as production test requirements where they have been established (i.e., the rules that the manufacturer follows in producing the product).

8.1 Performance Requirements and Tests

The performance required to pass each design test specified for the product.

Publication No.	NEMA Standards Title
ICS 1-2000	*Industrial Control and Systems General Requirements*
ICS 10-2005	*Industrial Control and Systems AC Transfer Switch Equipment: Part 1*
ICS 10- 2005	*Industrial Control and Systems AC Transfer Switch Equipment: Part 2—Static AC Transfer Equipment*
ICS 12.1-1997	*Profiles of Networked Industrial Devices—Part 1: General Rules*
ICS 14-2007	*NEMA Application Guide for Electric Fire Pump Controllers*
ICS 15-2004	*Instructions for the Handling, Installation, Operation, and Maintenance of Electric Fire Pump Controllers Rated Not More Than 600V*

ICS 2-2000 *Industrial Control and Systems Controllers, Contactors, and Overload Relays Rated Not More Than 2000 Volts AC or 750 Volts DC*

Part 1: Standards for Manual and Magnetic Controllers
Part 2: Noncombination Magnetic Motor Controllers, Rated 600 Volts
Part 3: Nonmagnetic Motor Controllers
Part 4: Overload Relays
Part 5: DC General-Purpose Constant-Voltage Controllers
Part 6: AC Combination Motor Controllers
Part 7: Magnetic Lighting Contactors
Part 8: Disconnect Devices for Use in Industrial Control Equipment

ICS 3-2005 *Industrial Control and Systems Factory-built Assemblies*

Part 1: Motor Control Centers Rated Not More Than 600 Volts AC
Part 2: Medium Voltage Controllers Rated 2001 to 7200 Volts AC Part 3: AC General-Purpose Controllers for Synchronous Motors

ICS 4-2005 *Industrial Control and Systems Terminal Blocks*

ICS 5-2017 *Industrial Control and Systems Control Circuit and Pilot Devices*

Part 1: General Standards for Control Circuit and Pilot Devices
Part 2: Industrial Control Relays
Part 3: Industrial Control Input Devices Actuated by Force, Temperature, and Pressure
Part 4: Proximity Switches
Part 5: Pushbuttons, Selector Switches, Indicating Lights, and Pushbutton Stations

ICS 6-1993 *Industrial Control and Systems Enclosures*

ICS 7-2006 *Industrial Control and Systems Adjustable Speed Drives*

Part 1: General Standards for Drive Converters, Drives, and Drive Systems
Part 2: Loop Position and Tension Control Drive Systems
Part 3: Wind and Unwind Drive Systems
Part 4: Variable-Frequency, Three-Phase Controllers, Rated Not More Than 600 Volts
Part 5: Adjustable-Voltage Packaged-Drive Systems (Where DC Armature Power Is Obtained from AC Lines Using Controlled Semiconductor Rectifiers)
Part 6: Variable-Frequency Drive Systems Rated Not More Than 600 Volts Using Semiconductor Power Conversion
Part 7: Variable-Frequency. Three-Phase Drives, Rated 601 to 7,200 Volts

ICS 8-2019 *Industrial Control and Systems Crane and Hoist Controllers*

Part 1: General Standards for Crane Controllers Rated 600 Volts or Less AC and DC
Part 2: Constant-Voltage DC Magnetic Controllers for Motors on Cranes
Part 3: Adjustable-Voltage DC Controllers for Motors on Cranes
Part 4: Magnetic Controllers for AC Wound-Rotor Motors on Cranes
Part 5: Static Controllers for AC Wound-Rotor Motors on Cranes
Part 6: Crane and Hoist Power-Circuit Limit Switches
Part 7: Heavy-Duty DC Magnetic Contactors Rated 600 Volts
Part 8: AC Adjustable Frequency Controllers for Motors and Cranes
Part 9: Wireless Control Systems for Cranes
Part 10: Electromagnetic Brakes
Part 11: Resistors and Rheostats

Part 1
General Standards for Crane Controllers Rated 600 Volts or Less, AC and DC

1.1 General

1.1.1 Referenced Standards

In this NEMA Standards, publication reference is made to the Standards listed below. Copies are available from the indicated sources.

American National Standards Institute
11 West 42nd Street
New York, NY 10036

ANSI/ASME B30.2-2005	*Overhead and Gantry Cranes*
ANSI/ASME B30.3-2009	*Hammerhead Tower Cranes* ANSI/ASME B30.4-2010 *Portal, Tower, and Pillar Cranes*
ANSI/IEEE 100--2009	*Standard Dictionary of Electrical and Electronics*
AIST 1-1968	*DC Mill Motor Standard*
AIST 1A-1964	*AC Mill Motor Standard*
AIST 6-2000	*Specifications for Electric Overhead Traveling Cranes for Steel Mill Service (Technical Report)*
AIST 11-1997	*Brake Standards for Mill Motors (Technical Report)*
UL 674-2003	*Motors for Use in Hazardous Locations*

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ICS 1-2000 (R2015)	*Industrial Control and Systems General Requirements*
ICS 1.3-1986 (R2015)	*Preventive Maintenance of Industrial Control and Systems Equipment*
ICS 2-2000 (R2005)	*Industrial Control and Systems Controllers, Contactors, and Overload Relays Rated not More Than 2000 Volts AC or 750 Volts DC*
ICS 5-2017	*Industrial Control and Systems Control Circuit and Pilot Devices*
ICS 6-1993 (R2016)	*Industrial Control and Systems Enclosures*
ICS 7-2014	*Industrial Control and Systems Adjustable Speed Drives*
MG 1-2016	*Motors and Generators*

Power-Circuit Accessories
Crane Manufacturers Association of America
8720 Red Oak Blvd. Suite 201
Charlotte, NC 28217

Publication No. 70-2010	*Specifications for Top Running Bridge & Gantry Type Multiple Girder Electric Overhead Traveling Cranes*
Publication No. 74-2010	*Specifications for Top Running & Under Running Single Girder Electric Overhead Traveling Cranes Utilizing Under Running Trolley Hoist*

National Fire Protection Association
Batterymarch Park
Quincy, MA 02269

NFPA 70-2017	*National Electrical Code*

1.1.2 Scope

This guide was developed from the experience of the member companies working with their customers and users. It provides information that will be useful to architects, electrical engineers, electrical contractors, maintenance engineers, and others who are responsible for the installation of this equipment.

It is not intended to replace the manufacturer's instructions and does not purport to cover all possible circumstances arising from the application, handling, storage, and installation of this equipment. Any problems or questions should be discussed with the manufacturer.

The Standards referenced in this section apply to controllers for crane service as applied to DC, wound-rotor AC, and inverter duty motors, rated 600 volts or less. The types of cranes to which these Standards are applicable are defined in the following American National Standards Institute publications:

ANSI/ASME B30.1-2004
ANSI/ASME B30.10-2005
ANSI/ASME B30.12-2006
ANSI/ASME B30.13-2003
ANSI/ASME B30.17-2006
ANSI/ASME B30.18-1998
ANSI/ASME B30.20-2006
ANSI/ASME B30.21-1999
ANSI/ASME B30.22-2005
ANSI/ASME B30.25-2007
ANSI/ASME B30.4-2003
ANSI/ASME B30.6-2003
ANSI/ASME B30.7-2006
ASME B30.11-2004
ASME B30.14-2004
ASME B30.16-2007
ASME B30.18-2004
ASME B30.19-2005
ASME B30.2-2005
ASME B30.21-2005
ASME B30.23-2005
ASME B30.24-2008
ASME B30.27-2009
ASME B30.3-2004
ASME B30.5-2007
ASME B30.8-2004
ASME B30.9-2006
ASME B30.26-2004

1.1.3 Normative References

Crane Manufacturers Association of America (CMAA) Publication No. 70 defines the crane service classes referred to in this section.

The definitions and Standards of ICS 1 apply to this section unless otherwise stated.

1.2 DEFINITIONS

For the purposes of this Standard, the following definitions apply. (*Indicates definition from ANSI/IEEE Standard 100 and CMAA).