



## NECA 230-2010

Standard for

# Selecting, Installing, and Maintaining Electric Motors and Motor Controllers

AN AMERICAN NATIONAL STANDARD



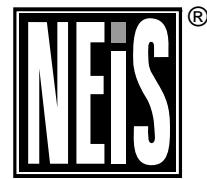
Published by  
National Electrical Contractors Association

# NECA 230-2010

Standard for Selecting,  
Installing, and Maintaining

## Electric Motors and Motor Controllers

An American  
National Standard



Published by  
National Electrical  
Contractors Association



*<This page intentionally left blank>*

# Table of Contents

<b>Foreword .....</b>	<b>v</b>
<b>1. Scope .....</b>	<b>1</b>
1.1 Products and Applications Included .....	1
1.2 Regulatory and Other Requirements .....	1
<b>2. Receiving and Storage .....</b>	<b>2</b>
2.1 Packaged Units .....	2
2.2 Loose Motors .....	2
2.3 Motor Controls .....	2
2.4 Physical Damage and Moisture Protection .....	2
<b>3. Motor Selection .....</b>	<b>3</b>
3.1 Power Supply Characteristics .....	3
3.2 Motor Design-Designations .....	3
<b>4. Motor Branch Circuit Conductors .....</b>	<b>4</b>
4.1 Single Motor .....	4
4.2 Several Motors .....	4
4.3 Full-Load Current (FLC) Rating .....	4
4.4 Motor Nameplate .....	4
4.5 Full-Load Current (FLC) Tables .....	4
4.6 Full-Load Current (FLC) Values .....	4
4.7 Conductor Temperature Rating .....	5
<b>5. Motor Branch-Circuit Short-Circuit and Ground-Fault Protection .....</b>	<b>6</b>
5.1 Locked-Rotor Current (LRC) .....	6
5.2 Rating or Setting .....	6
5.3 Individual Motor Circuit .....	6
5.4 Taps from Feeders .....	6
5.5 More Than One Motor or Motor(s) and Other Loads .....	7
5.6 Single-Phasing .....	7
<b>6. Motor and Branch-Circuit Overload Protection .....</b>	<b>8</b>
6.1 Continuous Duty Motors .....	8
6.2 Separate Overload Devices .....	8
6.3 Service Factor .....	8
6.4 Motor Temperature Ratings .....	8
6.5 Fuses as Overload Protection .....	9
<b>7. Disconnecting Means for Motor and Controller .....</b>	<b>10</b>
7.1 Motor .....	10
7.2 Controller .....	10
7.3 Types of Motor Disconnects .....	10

**NECA 230 Standard for Selecting, Installing, and Maintaining Electric Motors and Motor Controllers**

<b>8. Motor Control Circuits . . . . .</b>	<b>12</b>
8.1 Source of Supply . . . . .	12
8.2 Overcurrent Protection . . . . .	12
8.3 Control Circuit Transformer . . . . .	12
8.4 Disconnection . . . . .	12
8.5 Protection from Physical Damage . . . . .	13
8.6 Adjustable-Speed Drive System . . . . .	13
<b>9. Motor Controllers . . . . .</b>	<b>14</b>
9.1 Rating . . . . .	14
9.2 Controller Enclosure . . . . .	14
9.3 Controller Classification . . . . .	14
9.4 Wiring Space in Enclosures . . . . .	15
9.5 Controller Grounding . . . . .	15
<b>10. Motor Terminal Housings . . . . .</b>	<b>16</b>
10.1 Dimensions and Space . . . . .	16
10.2 Equipment Grounding Connections . . . . .	16
<b>11. Motor Wiring Connections . . . . .</b>	<b>17</b>
11.1 High-Voltage Connections . . . . .	17
11.2 Low-Voltage Connections . . . . .	17
11.3 Motor Rotation . . . . .	17
<b>12. Installing a 3-Phase Motor . . . . .</b>	<b>18</b>
<b>13. Electric Motor Maintenance . . . . .</b>	<b>19</b>
13.1 Lubrication and Bearings . . . . .	19
13.2 Cleaning . . . . .	19
13.3 Protection . . . . .	19
<b>Annex A: Tables . . . . .</b>	<b>21</b>
Motor Starter Selection Data Sheet ( <i>Courtesy Square D Company</i> ) . . . . .	21
NEC Table 310.16 ( <i>Courtesy National Fire Protection Association</i> ) . . . . .	22
NEC Table 430.10(B) ( <i>Courtesy National Fire Protection Association</i> ) . . . . .	23
NEC Table 430.12(B) ( <i>Courtesy National Fire Protection Association</i> ) . . . . .	23
NEC Table 430.52 ( <i>Courtesy National Fire Protection Association</i> ) . . . . .	23
NEC Table 430.72(B) ( <i>Courtesy National Fire Protection Association</i> ) . . . . .	24
NEC Table 430.248 ( <i>Courtesy National Fire Protection Association</i> ) . . . . .	24
NEC Table 430.250 ( <i>Courtesy National Fire Protection Association</i> ) . . . . .	25
NEC Table 430.251(B) ( <i>Courtesy National Fire Protection Association</i> ) . . . . .	26
<b>Annex B: Wiring Diagrams . . . . .</b>	<b>27</b>
Wiring Diagram: High Voltage and Low Voltage Delta Motor Windings . . . . .	27
Wiring Diagram: High Voltage and Low Voltage Star (Y) Motor Windings . . . . .	27
Wiring Diagram: One Three-Wire Stop-Start Station . . . . .	28
Wiring Diagram: Two Three-Wire Stop-Start Stations . . . . .	29
Wiring Diagram: Hand-Off Automatic Control . . . . .	30
One Line Diagram: Motor Installation . . . . .	31
<b>Annex C: Reference Standards . . . . .</b>	<b>32</b>

(This foreword is not a part of the standard)

# Foreword

*National Electrical Installation Standards™ (NEIS®)* are intended to improve communication among specifiers, purchasers, and suppliers of electrical construction services. They define a minimum baseline of quality and workmanship for installing electrical products and systems. *NEIS* are intended to be referenced in contract documents for electrical construction projects. The following language is recommended:

Electric motors and motor controllers rated 600 volts or less shall be installed and maintained in accordance with NECA 230-2010, *Standard for Selecting, Installing, and Maintaining Electric Motors and Motor Controllers* (ANSI).

Use of *NEIS* is voluntary, and the National Electrical Contractors Association assumes no obligation or liability to users of this publication. Existence of a standard shall not preclude any member or non-member of NECA from specifying or using alternate construction methods permitted by applicable regulations.

This publication is intended to comply with the edition of the National Electrical Code (NEC) in effect at the time of publication. Because they are quality standards, *NEIS* may in some instances go beyond the minimum requirements of the NEC. It is the responsibility of users of this publication to comply with state and local electrical codes when installing electrical products and systems.

Suggestions for revisions and improvements to this standard are welcome. They should be addressed to:

NECA Standards & Safety  
3 Bethesda Metro Center, Suite 1100  
Bethesda, MD 20814  
(301) 657-3110 Telephone  
(301) 215-4500 Fax  
[www.neca-neis.org](http://www.neca-neis.org)  
[neis@necanet.org](mailto:neis@necanet.org)

To purchase *National Electrical Installation Standards*, contact the NECA Order Desk at (301) 215-4504 tel, (301) 215-4500 fax, or [orderdesk@necanet.org](mailto:orderdesk@necanet.org). *NEIS* can also be purchased in .pdf download format at [www.neca-neis.org/standards](http://www.neca-neis.org/standards).

Copyright © 2010, National Electrical Contractors Association. All rights reserved. Unauthorized reproduction prohibited.

*National Electrical Installation Standards*, *NEIS*, and the *NEIS* logo are registered trademarks of the National Electrical Contractors Association. National Electrical Code and NEC are registered trademarks of the National Fire Protection Association.

*<This page intentionally left blank>*

# 1. Scope

## 1.1 Products and Applications Included

This standard describes recommended procedures for selecting and installing stationary electric motors and motor controllers rated 600 volts or less. It also covers routine maintenance procedures to be followed after the installation is complete.

## 1.2 Regulatory and Other Requirements

a) All information in this publication is intended to conform to the National Electrical Code (ANSI/NFPA 70), and, in general, the typical recommendations of electrical motor and controller manufacturers. Installers should always follow the NEC, applicable state and local codes, manufacturer's instructions when installing motors and motor controllers.

b) Only qualified persons as defined in the National Electrical Code and familiar with the construction and installation of motors should perform the work described in this publication. For electrical safety training refer to NFPA 70E, *Standard for Electrical Safety in the Workplace*.

c) General requirements for installing electrical products and systems are described in NECA 1, *Standard for Good Workmanship in Electrical Construction* (ANSI). Other *National Electrical Installation Standards* provide additional guidance for installing particular types of electrical products and systems. A complete list of *NEIS* is provided in Annex C.