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STANDARDS PUBLICATION/NO. DC 4-1975

nema

residential controls– warm air limit and fan controls

NEMA

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION ■ 155 EAST 44TH STREET, NEW YORK, N.Y. 10017

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SCOPE

This standards publication describes the characteristics of temperature actuated electric devices intended to control the temperature of air through air heating equipment intended primarily for residential use.

Excluded are limit controls for use on baseboard heaters.

PREFACE

This publication has been developed in the public interest and is designed to promote a better understanding between the manufacturer and the user and to assist the user in selecting and obtaining the proper limit and fan control for his particular need.

To assure a meaningful publication, copies were sent during the draft stage to a number of typical individuals and organizations in the public and private sector having an interest in or responsibility for the purchase, testing, application, use or inspection of these controls. The resulting comments and suggestions provided a vital user and general interest input, prior to final NEMA approval, and resulted in a number of substantive changes being made in this publication.

As future major revisions to this publication are proposed, it is intended to offer the same or similar individuals or organizations a further opportunity to participate in the development of this publication.

These standards are periodically reviewed by the Residential Controls Section of NEMA for any revisions necessary to keep them up to date with advancing technology. Proposed or recommended revisions should be submitted to:

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HISTORY OF STANDARDS

The Residential Controls Section of NEMA was formed in 1940 to promote the standardization of products within the scope of the Section. These product standards cover definitions, ratings, performance, testing, and dimensions. NEMA Standards are voluntary and are designed to eliminate misunderstandings between the purchaser and the manufacturer.

This publication is one of a series sponsored by the Residential Controls Section. Other publications in this series are identified as Pub. No. DC _____ (followed by the year of issue).

The General Engineering Committee of the Residential Controls Section of NEMA first formed a subcommittee to develop standards for warm air limit and fan controls in 1951. The deliberations of this committee resulted in the NEMA Standards Publication for Dial Arrangement of Warm Air Limit and Fan Controls, DC 4-1959, which was rescinded in July 1972.

This revised publication is published in accordance with NEMA's policy of periodic review and revision to keep NEMA Standards contemporary with industry needs and technological advancement.

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WARM-AIR LIMIT AND FAN CONTROLS

Part 1
DEFINITIONS

DC 4-1.01 FAN CONTROL

A thermally actuated electrical device which acts to control the fan that provides for the circulation of air between predetermined temperatures.

A. Adjustable Fan Control

A fan control which has means for varying the required air temperature for fan operation.

B. Adjustable Differential Fan Control

A fan control which has means for varying the required difference in the sensed air temperature between fan ON and fan OFF.

C. Adjustable or Fixed-time-delay Fan Control

A device which, on energization, acts to start the fan after a time delay. The device may shut off the fan upon de-energization after a time delay or may be shut off by a lowering of the circulated air temperature.

D. Two-speed Fan Control

A device consisting of a means for providing two-speed operation of the fan.

E. Variable-speed Fan Control

A device consisting of a means for providing a variable fan speed.

NEMA Standard 3-12-1975.

DC 4-1.02 LIMIT CONTROL

A thermally actuated device which limits the outlet air temperature. Resetting may be automatic or manual.

NEMA Standard 3-12-1975.

DC 4-1.03 FAN-AND-LIMIT CONTROL

A control which combines independent fan control and limit control devices in one unit, using either one air temperature sensor for both functions or independent air temperature sensors for each function.

NEMA Standard 3-12-1975.

DC 4-1.04 OPERATING DIFFERENTIAL

The difference in temperature of the sensing element between the cut-in and cut-out points.

NEMA Standard 3-12-1975.

DC 4-1.05 MANUAL FAN SWITCH

An optional switching device on a fan control which permits manual switching, either ON or OFF, or both, depending upon the temperature of the thermal (or energizing) actuator.

NEMA Standard 3-12-1975.

DC 4-1.06 SCALE MARKINGS

The temperature settings marked on the device.

NEMA Standard 3-12-1975.

DC 4-1.07 SETTING

A. Fixed Setting

The temperature setting which, because of the nature of the actuator, cannot be changed or which can be changed only by means of a special tool.

B. Shipping Setting

The temperature settings at which the control is shipped.

NEMA Standard 3-12-1975.

DC 4-1.08 RANGE

The difference between the minimum and maximum temperature settings marked on the device.

NEMA Standard 3-12-1975.

DC 4-1.09 STOP

The means which prevents an unauthorized person from adjusting the control above or below a specified value.

NEMA Standard 3-12-1975.

DC 4-1.10 MILLIVOLTAGE CIRCUIT

A circuit which is supplied by a thermoelectric source.

NEMA Standard 3-12-1975.

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Part 2
RATINGS AND CLASSIFICATIONS

DC 4-2.01 ELECTRICAL RATINGS

The electrical ratings of the fan control, limit control, or fan-and-limit control may be one or more of the following:

120 volts AC	16 amperes full load	96 amperes locked rotor
	14 amperes full load	84 amperes locked rotor
	10 amperes full load	60 amperes locked rotor
	8 amperes full load	48 amperes locked rotor
	6 amperes full load	36 amperes locked rotor
	4 amperes full load	24 amperes locked rotor
240 volts AC	12 amperes full load	72 amperes locked rotor
	7 amperes full load	42 amperes locked rotor
	6 amperes full load	36 amperes locked rotor
	4 amperes full load	24 amperes locked rotor
	3 amperes full load	18 amperes locked rotor
	2 amperes full load	12 amperes locked rotor
240 volts AC	25 amperes or less, noninductive	
24 volts AC	2 amperes maximum or 50 voltampere pilot duty	
0.25 to 12 volts DC	1 ampere	
120 to 240 volts pilot duty	Express in voltamperes as specified by the manufacturer	
Millivolts		

NEMA Standard 3-12-1975.

DC 4-2.02 SCALE MARKINGS AND DIFFERENTIALS

The scale markings and differentials shall be as follows:

A. Scale Markings

1. Fan Control—50°F minimum to 200°F maximum.*
2. Limit Control—100°F minimum to 250°F maximum.*

B. Differentials

1. Fan Control—Adjustable—8°F minimum to 55°F maximum.*
2. Limit Control—Fixed—20°F minimum to 50°F maximum.

*Fixed settings in the same range may be provided in lieu of an adjustable setting.

NEMA Standard 3-12-1975.

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Part 3
CONSTRUCTION

DC 4-3.01 ENCLOSURES

Limit and fan controls may be constructed with or without enclosures.

Authorized Engineering Information 3-12-1975.

DC 4-3.02 CONNECTIONS

Terminals shall be of a type which meets the requirements of the latest revision of the Underwriters Laboratories Inc. Safety Standard for Limit Controls, UL 353-1972, and the NEMA Standards Publication for Quick Connect Terminals, DC 2-1970 (ANSI C109.1-1972).

NEMA Standard 3-12-1975.

DC 4-3.03 CORROSION PROTECTION

Iron and steel parts (except for bimetals, bearings, etc., where such protection is impracticable) shall be suitably protected against corrosion by enameling, galvanizing, plating, or other equivalent means.

NEMA Standard 3-12-1975.

DC 4-3.04 ASSEMBLY

Limit and fan controls shall be assembled in a quality and workmanlike manner to afford normal protection to the installer and user with regard to sharp edges, surfaces, adjusting means, etc.

NEMA Standard 3-12-1975.

Part 4
TEST AND PERFORMANCE

DC 4-4.01 ENDURANCE

Limit controls shall meet the endurance requirements specified in the Underwriters Laboratories Inc. Safety Standard for Limit Controls, UL 353-1972.

NEMA Standard 3-12-1975.

DC 4-4.02 DIELECTRIC TESTS

Fan and limit controls shall meet the dielectric test requirements specified in the Underwriters Laboratories Inc. Safety Standard for Limit Controls, UL 353-1972.

NEMA Standard 3-12-1975.

DC 4-4.03 OPERATING DIFFERENTIAL

The operating differential of fan controls shall be tested in accordance with the following and shall be within the rated differential of the control:

1. The control shall be mounted in its normal mounting position.

2. The body of the control shall be in an ambient temperature of 80°F ± 5°F.

3. The temperature sensing element(s) shall be placed in an air stream having a velocity not less than 300 feet per minute nor more than 600 feet per minute.

4. Using an oven which delivers essentially convected heat to the sensor, the temperature of the air stream shall be raised rapidly to within 15 degrees of the control set point, allowed to reach equilibrium, further raised at not more than 1°F per minute to the point at which the switch operates and then lowered at the same rate to again effect operation of the switch.

NEMA Standard 3-12-1975.

DC 4-4.05 OPERATING POINTS

The operating points versus control settings of fan and limit controls shall meet the operation tolerances specified in the Underwriters Laboratories Inc. Safety Standard for Limit Controls, UL 353-1972.

NEMA Standard 3-12-1975.

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Part 5
MARKINGS

DC 4-5.01 LIMIT AND FAN CONTROLS

A. Limit and fan controls shall have the following minimum markings or shall be otherwise suitably identified:

1. Company name or trademark.
2. Catalog number or the equivalent.
3. Voltage rating.
4. Current rating in amperes.
5. Control function—
   a. Fan.
   b. Limit.

B. Labels, stampings or decalcomanias shall be of a permanent nature and located where they will not be exposed to mechanical damage.

C. Markings shall be visible after installation. (Markings which are on the base or inside of a cover and which are exposed when the cover is removed are considered to be visible.)

NEMA Standard 3-12-1975.

Part 6
INSTALLATION AND SERVICE INSTRUCTIONS

DC 4-6.01 GENERAL

The manufacturer should make available suitable installation and service instructions, including warnings against damaging operating practices.

Authorized Engineering Information 3-12-1975.

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NEMA STANDARDIZATION

The purpose of NEMA Standards, their classification and status are set forth in certain clauses of the NEMA Bylaws, which are quoted below:

Purpose of Standards

National Electrical Manufacturers Association Standards are adopted in the public interest and are designed to eliminate misunderstandings between the manufacturer and the purchaser and to assist the purchaser in selecting and obtaining the proper product for its particular need. Existence of a National Electrical Manufacturers Association Standard does not in any respect preclude any member or nonmember from manufacturing or selling products not conforming to the standard.

(Bylaw—Art. V, Sec. 1)

Definition of a Standard

A standard of the National Electrical Manufacturers Association defines a product, process or procedure with reference to one or more of the following: nomenclature, composition, construction, dimensions, tolerances, safety, operating characteristics, performance, rating, testing, and the service for which they are designed.

(Bylaw—Art. V, Sec. 2, Subsection A)

Dimensions

Where dimensions are given for interchangeability purposes, alternate dimensions satisfying the other provisions of the standards publication may be capable of otherwise equivalent performance.

(NEMA Policy Memorandum 84-2, dated June 7, 1984)

Classes of Standards

National Electrical Manufacturers Association Standards are of two classes:

1. NEMA Standard, which relates to a product commercially standardized and subject to repetitive manufacture, which standard has been approved by at least 90 percent of the members of the Subdivision eligible to vote thereon;
2. Suggested Standard for Future Design, which may not have been regularly applied to a commercial product, but which suggests a sound engineering approach to future development, which standard has been approved by at least two-thirds of the members of the Subdivision eligible to vote thereon.

(Bylaw—Art. V, Sec. 2, Subsection B)

Authorized Engineering Information

Authorized Engineering Information consists of explanatory data and other engineering information of an informative character not falling within the classification of NEMA Standard or Suggested Standard for Future Design.

(Bylaw—Art. V, Sec. 6, 1st Sentence)

Official Standards Proposal

An Official Standards Proposal is an official draft of a proposed standard which is formally recommended to an outside organization(s) for consideration, comment and/or approval.

(Bylaw—Art. V, Sec. 4, Subsection A)

Identification of Status

Standards in NEMA Standards Publications are identified in the foreword or following each standard as "NEMA Standard" or "Suggested Standard for Future Design." These indicate the status of the standard. These words are followed by a date which indicates when the standard was adopted in its present form by the Association.

The material identified as "Authorized Engineering Information" and "Official Standards Proposal" is designated similarly.

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