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STANDARDS PUBLICATION NO. MW 760

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Tapered Flange Magnet Wire Plastic Spools/Reels

NEMA

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION ■ 2101 L STREET, N.W., WASHINGTON, D.C. 20037

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TAPERED FLANGE MAGNET WIRE PLASTIC SPOOLS/REELS

Published by

National Electrical Manufacturers Association
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Foreword

The purpose of this Standard is to provide guidelines to magnet wire manufacturers and plastic spool/reel suppliers in the design and construction characteristics of commonly used plastic spools and reels and to provide technical information and data on plastic spool/reel design to users wishing to select appropriate plastic spools/reels for a particular purpose.

The information contained herein has been thoroughly reviewed by all suppliers of plastic spools/reels, known to be producing these products at the time of publication. The issuance or existence of this Standards Publication does not, in any respect, prevent or restrict any member or non-member of NEMA from supplying customers with magnet wire spools/reels not in conformance with its contents.

This Standards Publication has been developed by the NEMA Magnet Wire Section, which periodically reviews it for any revisions necessary to keep it up to date with changes in technology. Comments or proposed revisions are welcomed and should be submitted to:

Vice President, Engineering
National Electrical Manufacturers Association
2101 L Street, N.W.
Washington, D.C. 20017

Scope

This Standard covers the dimensional, physical, and visual characteristics of newly-molded, taper flange plastic spools/reels for packaging of magnet wire.

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SECTION 1
REFERENCED STANDARDS

1.1 REFERENCED STANDARDS

In this publication reference is made to the following publications. Copies are available from the sources indicated.

DIN 46399 — *Deutsche Industrie Norm*

Part 1 - Delivery Spools for Bare and Insulated Wires;Dimensions (September 1982)

Part 2 - Delivery Spools for Bare and Insulated Wires; Technical Terms of Delivery for Spools of Plastic (April 1986)

Available from:

International Standards and Law Information
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SECTION 2
DEFINITIONS

2.1 SPOOL

A spool is defined as having a flange diameter of less than 8 inches.

2.2 REEL

A reel is defined as having a flange diameter of 8 inches or larger.

2.3 DOUBLE TAPER, STRAIGHT FLANGE, STRAIGHT BARREL SPOOL/REEL

Contains two tapered flanges with a straight barrel within the winding area, as shown in Figure 5-1.

2.4 DOUBLE TAPER FLANGE TAPERED BARREL REEL

Contains two tapered flanges with a tapered barrel within the winding area, as shown in Figure 5-2.

2.5 SINGLE TAPERED FLANGE TAPERED BARREL REEL

Contains one tapered flange with a tapered barrel within the winding area, as shown in Figure 5-3.

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SECTION 3
RAW MATERIALS

3.1 MATERIALS

All spools/reels shall be fabricated from materials specified by the wire producer.

3.2 MARKINGS

Spools/reels shall be permanently marked in a visible location. The marking shall be coded in a manner to identify the family of plastic materials from which the spools/reels are constructed.

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SECTION 4
PHYSICAL APPEARANCE

4.1 FLANGES

Flanges shall be smooth and free from all material flash which could interfere with over-the-flange de-reeling or cause wire damage.

4.2 FLASHING

Flashing shall be kept to a minimum in the bore area to prevent spool removal problems on oven and rewind take-ups.

4.3 FLANGE DIAMETER AND INNER FLANGE SURFACES

The flange diameter and inner flange surfaces and the related radius between these two surfaces shall be free of nicks, scratches, burrs, solvent splash, or solvent runs which will interfere with wire de-reeling and automatic winding.

4.4 BARREL

The barrel of the spool within its winding area shall be smooth in order to prevent damage to the product. For tapered barrel reels the barrel of the reel within its winding area may contain a surface, such as ribs, to prevent fall-down.

4.4.1 Solvent/Adhesive Runs

Solvent/adhesive runs along the barrel shall not raise or depress the as-molded surface of the barrel in excess of 0.002 inch.

4.5 SOLVENT/ADHESIVE WELD LENGTH

The solvent/adhesive weld length shall be such that it shows signs that at least 90 percent of the bond area has been covered and solvent applied.

4.6 BUTT SURFACES AND BOND LINE

There shall be no gap between the butt surfaces and the bond line. The line at this butt area shall not exceed an outward extension of 0.002 inch or recess of 0.002 inch for spools or 0.005 inch and 0.002 inch respectively for reels.

4.7 SINKS

Sinks in the winding area shall be kept to a minimum and shall not be greater than 0.010 inch deep for 3-inch and larger spools, except that 3-inch and smaller spools used for 44½ AWG and finer wire applications shall be 0.005 inch maximum. Sinks in the 60 degree cone area, which will affect barrel concentricity or flange run-out, shall not be acceptable. Sinks in the non-winding area shall be acceptable as long as other properties of the spool are within limits.

4.8 APPEARANCE AND COLOR

Appearance and color of spools/reels shall be specified by the wire producer.

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SECTION 5
DIMENSIONS

5.1 DIMENSIONS AND TOLERANCE

5.1.1 Dimensions - Tapered Flange Spools/Reels

Typical dimensions for standard tapered flange spools/reels shall be in accordance with Figures 5-1 through 5-3 and Tables 5-1 through 5-3.

5.1.2 Reel Sizes

Reel sizes are defined nominally in Tables 5-1, 5-2, and 5-3.

5.2 MEASUREMENT METHODS

Measurement methods employed by spool/reel manufacturers shall be such that they ensure adequate reproducability.

5.2.1 Flange Thickness

Flange thickness shall be measured by placing the spool/reel on a surface plate in the vertical position. The flange thickness measurement shall be taken 0.25 inch from the barrel, by suitable equipment capable of measurements to within 0.001 inch.

5.2.2 Barrel Concentricity

Barrel concentricity, with the exception of 1000 pound reels, shall be measured by engaging the 60 degree counter sink of the bore with 60 degree conical centers. The pick-up point of a calibrated measuring device shall rest on the barrel approximately 0.125 inch away from the flange. The spool/reel shall be rotated using "live" conical centers.

5.2.2.1 BARREL CONCENTRICITY - SPOOLS LESS THAN 8 INCHES

Barrel concentricity for spools greater than 6-inches but less than 8-inches shall not exceed a total indicator reading (TIR) of 0.015-inch.

5.2.2.2 BARREL CONCENTRICITY - REELS LESS THAN OR EQUAL TO 12 INCHES

Barrel concentricity for straight and taper barrel reels sizes 8 through 12 inches, shall not exceed a total indicator reading (TIR) of 0.020 inch.

5.2.2.3 BARREL CONCENTRICITY - REELS GREATER THAN 12 INCHES

Barrel concentricity for reel sizes greater than 12 inches shall not exceed a total indicator reading (TIR) of 0.025 inch.

5.2.3 Flange Wobble

Flange wobble, with the exception of 1000 pound reels, shall be measured using the same holding fixtures as described in paragraph 5.2.2. The pickup point of the calibrated measuring device shall track on the traverse side of the flange 0.25 inch down from the flange outer diameter.

5.2.3.1 FLANGE WOBBLE - SPOOLS 3 INCHES AND GREATER

Flange wobble for spools greater than 3 inches, shall meet a requirement of 0.010 inch total indicator reading (TIR). For 3 inch spools the TIR shall not exceed 0.005 inch.

5.2.3.2 FLANGE WOBBLE - REELS 8 INCHES AND GREATER

Flange wobble for reels with flange diameters 8 inches through 11 inches shall not exceed 0.015 inch total indicator reading (TIR). Flange wobble for reels with flange diameter greater than 11 inches shall be determined by agreement of the wire producer and reel supplier.

5.2.4 Barrel Diameter

Barrel diameter on all two-piece spools shall be measured 0.0625 inch from either side of the bond line, allowing for 0.004 inch bond build to be added to the diameter of the barrel.

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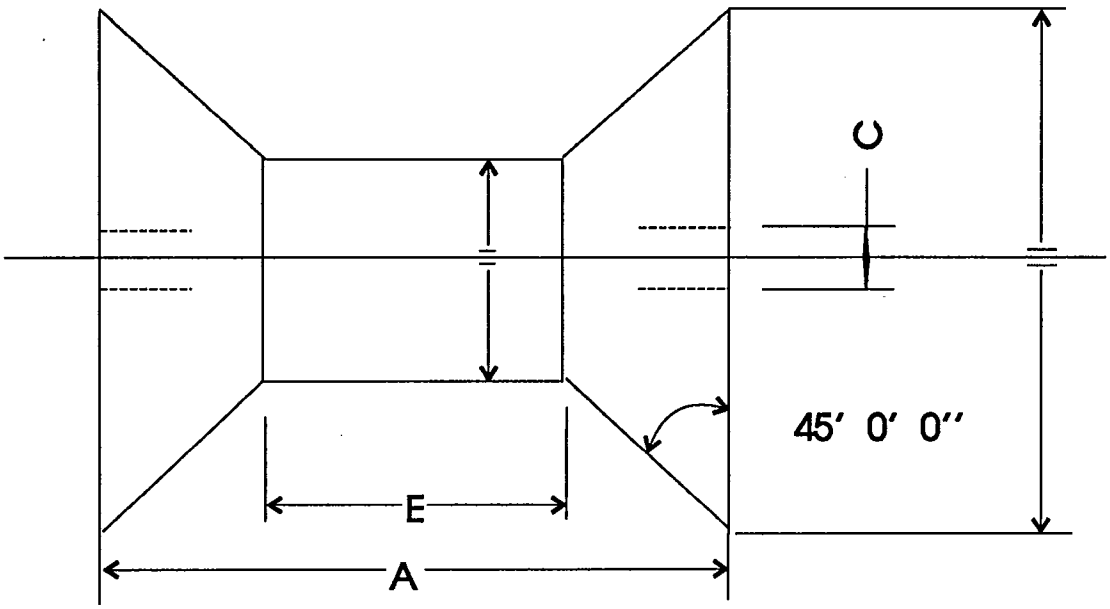


FIGURE 5-1
DOUBLE TAPER, STRAIGHT FLANGE, STRAIGHT BARREL SPOOL

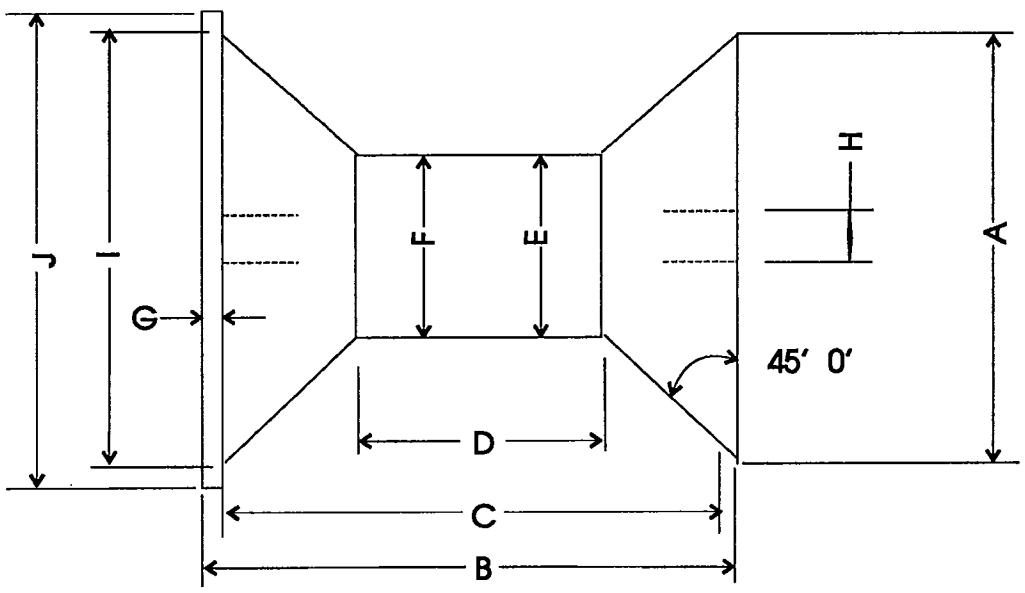


FIGURE 5-2
DOUBLE TAPERED FLANGE TAPERED BARREL

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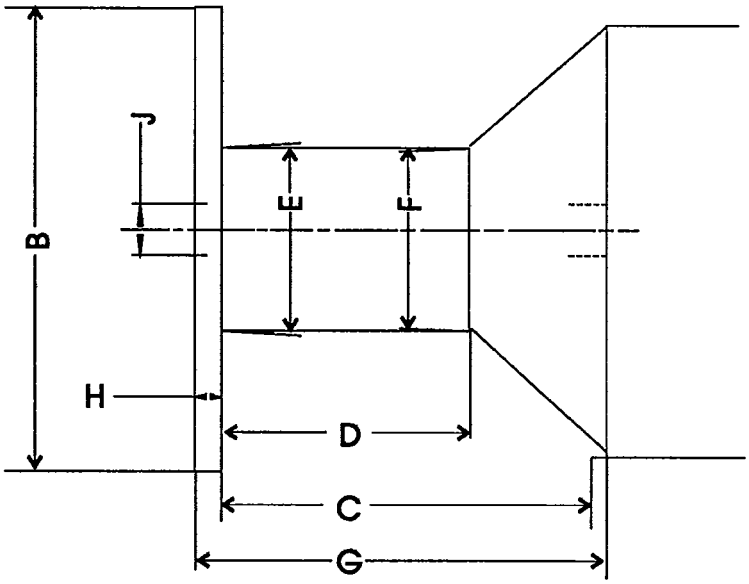


FIGURE 5-3
SINGLE TAPERED FLANGE TAPERED BARREL

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Table 5-1
Double Taper/Straight Barrel Spool/Reel
Dimensions and Tolerances (in Inches)

Standard Nomenclature	Supplier	Nominal Cu.* Net (lbs.)	Nominal Tare (lbs.)	Flange Diameter	Barrel Diameter	Barrel Length	Nominal Overall Length	Flange Angle	Bore Diameter
Figure 5-1 Referenced				B	D	E	A		C
6 × 6/3 × 3	A	15	0.38	6.000 ± 0.020	3.000 ± 0.020	3.000 ± 0.010	6.265	45° ± 2°	0.630 + 0.010 - 0.000
DIN 160/45	A	15	0.49	6.299 ± 0.020	3.150 ± 0.020	2.854 ± 0.010	6.299	45° ± 2°	0.630 + 0.010 -0.000 0.866 + 0.010 -0.000
DIN 200/45	A	30	0.94	7.874 ± 0.020	3.937 ± 0.020	3.646 ± 0.010	7.874	45° ± 2°	0.630 + 0.010 -0.000 0.866 + 0.010 -0.000

* For aluminum, divide by 3.3

** As specified by wire producer

This Table shows dimensions and tolerances for commercially available spools/reels. Inclusion of supplier dimensions is not an endorsement of their products, rather it reflects known products at time of printing.

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Table 5-2
Double Taper/Taper Barrel Spool/Reel
Dimensions and Tolerances (in Inches)

Standard Nomenclature	Supplier	Nominal Cu.* Net (lbs.)	Nominal Tare (lbs.)	Top Flange Diameter	Bottom Flange Diameter	Bottom Flange Thickness	Top Barrel Diameter	Bottom Barrel Diameter	Maximum Base Diameter	Nominal Overall Length	Transverse	Flange Angle	Bore Diameter
Figure 5-2 Referenced				A	I	G	E	F	J	B	C		N
TF 80	C	80	2.03	10.032 ± 0.030	10.032 ± 0.030	.44 ± 0.020	6.00 ± 0.020	6.800 ± 0.020	10.66	12.634	8.23	45° ± 2°	1.530 + 0.010 -0.0000
TF 1000	A	1000	29.8	18.81 ± 0.020	19.36 ± 0.020	6.23 ± 0.030	7.96 ± 0.020	9.00 ± 0.020	20.50	35.16	18.19	45° ± 2°	1.530 + 0.010 -0.0000
TF 10008***	A	1000	17.6	17.81 ± 0.020	19.36 ± 0.020	NA	7.96 ± 0.020	9.00 ± 0.020	NA	29.18	18.19	45° ± 2°	1.530 + 0.010 -0.0000

* For aluminum, divide by 3.3

** As specified by wire producer

*** B = Without Base

This Table shows dimensions and tolerances for commercially available spools/reels. Inclusion of supplier dimensions is not an endorsement of their products, rather it reflects known products at time of printing.

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Table 5-3
Single Taper/Taper Barrel Dimensions and Tolerance (in Inches)

Standard Nomenclature	Supplier	Nominal Net Cu.* Wt. (lbs.)	Nominal Tare Wt. (lbs.)	Top Flange Diameter	Bottom Flange Diameter	Top Flange Edge Radius	Bottom Flange Thickness	Overall Length	Barrel Length	Top Barrel Diameter	Bottom Barrel Diameter	Flange Angle	Bore Diameter
85#	B	85	2.9	9.062 ± 0.01	10.25 ±0.002	0.250	0.630 ± 0.01	11.344 ± 0.01	7.75 ± 0.01	4.25 ± 0.01	5.0 ± 0.01	45°	1.281 ± 0.01
325#	B	325	14.2	19.000 ± 0.01	20.000 ± 0.01	0.50	1.500 ± 0.01	13.317 ± 0.01	6.361 ± 0.01	9.500 ± 0.01	10.000 ± 0.01	45°	1.531 ± 0.01
650#	B	650	17.8	19.000 ± 0.01	20.000 ± 0.01	0.50	1.500 ± 0.01	21.004 ± 0.01	13.796 ± 0.01	9.000 ± 0.01	10.000 ± 0.01	45°	1.531 ± 0.01
1000#	B	1000	23.9	19.000 ± 0.01	20.000 ± 0.01	0.50	1.500 ± 0.01	26.366 ± 0.01	19.150 ± 0.01	9.000 ± 0.01	10.000 ± 0.01	45°	1.531 ± 0.01

* For aluminum, divide by 3.3

** As specified by wire producer

This Table shows dimensions and tolerances for commercially available spools/reels. Inclusion of supplier dimensions is not an endorsement of their products, rather it reflects known products at time of printing.

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SECTION 6
STRENGTH OF SPOOLS/REELS

6.1 STRENGTH OF SPOOLS/REELS

Barrel strength, flange impact and flange deflection are the most critical factors in spool/reel performance, since poor performance in any of these three areas can lead to spool/reel failure. Spool/reel users and suppliers should address the following to ensure required strengths:

1. Spool/reel users will make recommendations for spool/reel size ranges needed for various wire sizes and types;
2. Spool/reel users will require survival of spools/reels under normal shipping and warehousing conditions;
3. Flange deflection must be minimized to prevent wire entrapment during spooling, which will eventually inhibit the de-reeling process;
4. Spool/reel users will work with spool/reel suppliers to establish minimum performance requirements of spools/reels used for various purposes;
5. Any certification of mechanical performance of spools/reels is left to the discretion of the spool/reel user and supplier;
6. Spool/reel users shall specify strength requirements and tests to be performed as required;
7. Spools/reels shall be constructed in a manner that ensures safety during normal in-plant handling operations.

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SECTION 7
GENERAL FEATURES

7.1 LIFTING OF SPOOLS/REELS

All spools/reels supplied under this specification shall have a means for lifting.

7.2 DRIVING OF SPOOLS/REELS

All spools/reels shall have a method for driving by means of a pin through the spool/reel flange or hub, or by another suitable means as agreed upon between the magnet wire manufacturers and the spool/reel supplier.

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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 their particular needs. 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.

(Standardization Policies and Procedures, p. 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.

(Standardization Policies and Procedures, p. 2)

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.

(Standardization Policies and Procedures, p. 8)

Categories of Standards

National Electrical Manufacturers Association Standards are of three classes:

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3. Adoptive Standard, which is adopted in whole or in part from the standards of another organization, either domestic, regional, or international.

(Standardization Policies and Procedures, pp 7 & 16)

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, which standard has been approved by at least two-thirds of the members of the Subdivision eligible to vote on the standard.

(Standardization Policies and Procedures, pp. 7 & 16)

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, and which has been approved by at least 90 percent of the members of the Subdivision eligible to vote thereon. *(Standardization Policies and Procedures, pp 7 & 16)*

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.

July 17, 1990

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