

FEDERAL SPECIFICATION

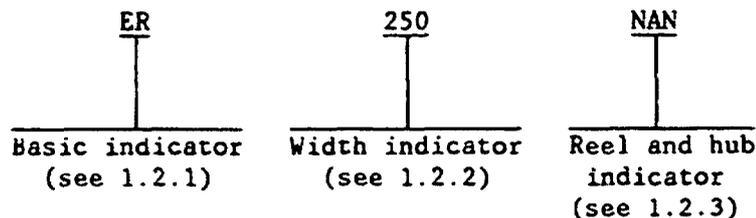
REELS AND HUBS FOR MAGNETIC RECORDING TAPE, GENERAL SPECIFICATION FOR

This specification is approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal Agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers the general requirements for reels and hubs used in conjunction with magnetic recording tape.

1.2 Classification. Reels and hubs furnished under this specification shall be designated in the following form, as specified (see 6.2).



1.2.1 Basic indicator. The basic indicator denotes the following:

ER = empty reels
EH = empty hubs

1.2.2 Width indicator. The width indicator is the nominal width of tape for which the reel is designed, in thousandths of an inch, for example, 1/4-inch tape is 250, 1/2-inch tape is 500.

1.2.3 Reel and hub indicator. The reel and hub indicator is expressed by three letters (see 3.1) as follows:

- (a) The first letter identifies the flange or hub diameter, as applicable (see table I).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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(b) The second letter identifies the material and center hole diameter (see table I).

(c) The third letter denotes the following:

- (1) P = Precision reel or hub requiring very close tolerances.
- (2) N = Non-precision reel or hub requiring tolerances which are not considered precise.

TABLE I. Reel and hub indicator.

First letter	Nominal flange diameter ¹	Second letter	Materials	Center-hole diameter ¹
E	8 (203.2)	A	Plastic or fiberglass filled plastic	0.319 (8.10)
J	9.75 (247.65)			
K	3 (76.2)			
L	4 (101.6)	B	Plastic or fiberglass	3 (76.2)
M	5 (127)	C	Metallic	3 (76.2)
N	7 (177.8)	D	Metallic flange phenolic hub	3 (76.2)
R	Not applicable			
P	10.5 (266.7)	G	Glass flange metallic hub	3 (76.2)
Q	12.5 (317.5)			
S	14 (355.5)			
T	15 (381)			
U	16 (406.4)			

¹ Dimensions are in inches, metric equivalents are given for information only.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

Federal Specifications:

- FF-S-92 - Screw, Machine: Slotted, Cross-Recessed or Hexagon Head.
- GGG-P-441 - Plate, Angle, Adjustable and Solid.
- GGG-P-463 - Plate, Surface, (Granite) (Inch and Metric).
- PPP-T-60 - Tape: Packaging, Waterproof.

Federal Standard:

FED-STD-123 - Marking for Shipment (Civil Agencies).

(Activities outside the Federal Government may obtain copies of Federal specifications and standards as outlined under General Information in the Index of Federal Specifications, Standards and Commercial Item Descriptions. The Index, which includes cumulative bimonthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single copies of this specification, and other Federal specifications and standards required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston, MA; New York, NY; Philadelphia, PA; Washington, DC; Atlanta, GA; Chicago, IL; Kansas City, MO; Fort Worth, TX; Houston, TX; Denver, CO; San Francisco, CA; Los Angeles, CA; and Seattle, WA.

(Federal Government activities may obtain copies of Federal standardization documents and the Index of Federal Specifications, Standards and Commercial Item Descriptions from established distribution points in their agencies.)

Military Specifications:

- MIL-R-214 - Reel, Photographic Film; and Can or Case, Photographic Film Storage (16mm and 35mm Film).
- MIL-E-17555 - Electronic and Electrical Equipment, Accessories, and Provisioned Items (Repair Parts): Packaging of.

Military Standards:

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 - Marking for Shipment and Storage.

(Copies of military specifications and standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between this specification and the applicable specification sheet, the latter shall govern.

3.2 Qualification. Reels and hubs furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list at the time set for opening of bids (see 4.2 and 6.3).

3.3 Materials. The reels and hubs shall be constructed of materials as specified herein and in the applicable specification sheet (see 3.1).

3.3.1 Corrosion resistance. Metal parts shall be corrosion resistant or shall be treated to resist corrosion. There shall be no evidence of corrosion on any surface extending beyond the scratch when tested in accordance with 4.4.14.

3.4 Construction. Reels and hubs shall be constructed as specified in 3.4.1 through 3.4.16.

3.4.1 Symmetry. Unless otherwise specified (see 3.1), each reel or hub shall be symmetrical to permit mounting from either side.

3.4.2 Dimensions and measurements. The dimensions and measurements of the reels or hubs shall be as specified (see 3.1).

3.4.3 Mounting surfaces. The following characteristics of the lateral mounting surfaces for reels or hubs shall not exceed the value specified (see 3.1):

- (a) Parallelism (see 4.4.3).
- (b) Flatness (see 4.4.4).

3.4.4 Hub surfaces. The following characteristics of hub surfaces shall not exceed the value specified (see 3.1):

- (a) Inside surface shall be perpendicular to the lateral mounting surface (see 4.4.5).
- (b) Inside and outside surfaces shall be cylindrical (see 4.4.5 and 4.4.6).

3.4.5 Concentricity. The following shall be related to the inside hub surface within the runout values specified (see 3.1):

- (a) Outside hub surface (see 4.4.7).
- (b) Periphery of the flanges (see 4.4.7).

3.4.6 Flange wobble. The wobble of the reel flanges shall not exceed the value specified (see 3.1 and 4.4.8).

3.4.7' Tape path clearance. The inside surface of the reel flanges shall not lie within the tape path as specified (see 3.1 and 4.4.9).

3.4.8 Moment of inertia. The moment of inertia for reels shall not exceed the value specified (see 3.1 and 4.4.10).

3.4.9 Roughness of surfaces. The roughness of the following surfaces shall not exceed the value specified (see 3.1):

- (a) Inside flange (see 4.4.11).
- (b) Outside hub (see 4.4.12).

3.4.10 Flange deflection. The flange deflection shall not exceed the value specified (see 3.1 and 4.4.13).

3.4.11 Temperature and humidity stability. Plastic reels and hubs shall conform to 3.4.2 through 3.4.10 after being subjected to the test of 4.4.14.

3.4.12 Drop resistance. Reels and hubs shall not exhibit any splitting, cracking, or chipping when subjected to the test of 4.4.16.

3.4.13 Percentage of open flange area. The percentage of the open flange area or flange holes for reels shall not exceed the value specified (see 3.1). The total area of the flange shall be that area bounded by the outside hub diameter and the periphery of the flange. The periphery of the flange shall be continuous. Unless otherwise specified (see 3.1), flange holes in one flange shall be directly in line with flange holes in the opposite flange.

3.4.14 Threading method. Reels shall have a method of threading as specified (see 3.1). Unless otherwise specified (see 3.1), all reel flanges shall have a minimum of one flange hole or cutout to facilitate tape threading. A boundary of any such opening shall be adjacent to the outside cylindrical hub surface within 1/4 inch (6.350 (millimeters) mm) and shall be a minimum of 1/2 square inch (322.58 mm) in area.

3.4.15 Flange mounting holes and drive holes. The flange mounting holes and drive holes for reels or hubs shall be as specified (see 3.1).

3.4.16 Reel flange fastening method. The method of fastening the reel flanges to the hub for other than molded plastic reels shall be as specified (see 3.1).

3.4.17 Friction rings. When specified (see 6.2), friction rings shall be provided as specified (see 3.1) and shall be examined as specified in 4.4.15.

3.5 Workmanship. The reel and hub surfaces which are exposed to the tape and the mounting surfaces of the reel and hub shall be free from voids, nicks, scratches, and other imperfections. Voids and nicks which do not fall completely within a circle 1/16 inch (1.5875 mm) in diameter and scratches which exceed 1/2 inch (12.700 mm) in length shall be cause for rejection.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- (a) Qualification inspection (see 4.2).
- (b) Quality conformance inspection (see 4.3).

4.1.3 Test environment. Unless otherwise specified, tests required by this specification shall be made at an ambient temperature of between 78 and 68 degrees Fahrenheit (°F) (25.56 and 20.00 degrees Celsius (°C)) and a relative humidity of between 40 and 60 percent.

4.2 Qualification inspection. Qualification inspection shall be conducted at a laboratory approved by the Naval Sea Systems Command (NAVSEA) and shall consist of the tests specified in table II (see 3.2 and 6.3). Qualification approval of a particular reel or hub covered under this specification and specified in an applicable detail specification shall constitute qualification for all reels or hubs of the particular group represented by that reel or hub.

TABLE II. Qualification and quality conformance inspection and examination.

Group	Examination and test	Applicable requirement	Applicable test	Qualification	Quality conformance inspection	
					Inspection level	AQL (percent)
A	Visual examination	3.5	4.4.1	X	Nonprecision reels and hubs S-3	4.0
	Dimensions (see 3.1)	3.4.2	4.4.2	X		
	Tape path clearance	3.4.7	4.4.9	X	Precision reels and hubs S-4	4.0
B	Mounting surface: Parallelism	3.4.3	4.4.3,	X	Nonprecision reels and hubs S-3	10
	Flatness		4.4.4	X		
	Hub surface ¹ Perpendicularity (inside)	3.4.4	4.4.5,	X	Precision reels and hubs S-3	6.5
	Cylindricity		4.4.6			
Concentricity ¹	3.4.5	4.4.7	X			
	Outside hub surface					
	Periphery of flanges					
	Flange wobble	3.4.6	4.4.8	X		

See footnotes at end of table.

TABLE II. Qualification and quality conformance inspection examination. - Continued

Group	Examination and test	Applicable requirement	Applicable test	Qualification	Quality conformance inspection	
					Inspection level	AQL (percent)
C ²	Dimensions	3.4.2	4.4.2	X	5 Samples	----
	Moment of inertia	3.4.8	4.4.10	X		
	Roughness of surfaces	3.4.9	4.4.11,	X		
	Inside flange		4.4.12			
	Outside hub					
	Flange deflection	3.4.10	4.4.13	X		
	Temperature and humidity stability	3.4.11	4.4.14	X		
	Friction rings	3.4.17	4.4.15	X		
Drop resistance	3.4.12	4.4.16	X			

¹ When performance of these tests results in destruction of the reel under test, the applicable sampling procedures of 4.3.1.1 and 4.3.1.2 shall not apply. A minimum of five samples from each lot shall be subjected to these tests, with any one failure being cause for rejection.

² See 4.3.1.1.1 through 4.3.1.2.1.

4.2.1 Qualification samples. Not less than five reels or hubs for which qualification is desired shall be subjected to each of the tests specified in table II.

4.3 Quality conformance inspection. Empty reels and hubs shall be selected in accordance with 4.3.1, from each lot offered for delivery, and shall be subjected to the appropriate group A, B, and C examinations and tests of table II. The minimum lot size shall be 1000 reels or hubs for orders of 1000 or more. For orders of less than 1000, the lot size may be the order size. Orders of less than 1000 may be grouped to form a lot of 1000 or more, or may be filled from previously approved standby stock.

4.3.1 Sampling for quality conformance inspection. Sampling for quality conformance inspection shall be in accordance with MIL-STD-105 and as specified in table II (see 4.3.1.1 and 4.3.1.2).

4.3.1.1 Non-precision reels and hubs. Lot sampling for non-precision reels and hubs shall be in accordance with table II and 4.3.1.1.1.

4.3.1.1.1 Lot sampling for group C quality conformance inspection for non-precision reels and hubs. Group C examinations and tests of table II shall be performed initially and as often thereafter as necessary to assure continued compliance with this specification. Failure to conform to any of the group C examinations and tests shall be cause for rejection of the lot represented by the samples. Non-precision reels and hubs of the particular designation specified shall not be offered for delivery until an initial lot has been tested and passed the group C examinations and tests of table II.

4.3.1.2 Lot sampling for precision reels. Lot sampling for precision reels and hubs shall be in accordance with table II and 4.3.1.2.1.

4.3.1.2.1 Lot sampling for group C quality conformance inspection examinations and tests for precision reels. Group C examinations and tests of table II shall be performed initially with the specified requirements. Failure to conform to any of the group C examinations and tests shall be cause for rejection of the lot represented by the samples. Precision reels of the particular designation specified (see 6.2) shall not be offered until an initial lot has been tested and passed the group C examinations and tests of table II.

4.4 Examinations and tests. Examinations and tests shall be performed as specified in 4.4.1 through 4.4.16.

4.4.1 Visual examination. Each reel or hub shall be visually examined with the normal unaided eye to determine conformance to 3.3.1, 3.4 and 3.5.

4.4.2 Dimensional measurements. Each reel or hub shall be measured in accordance with 4.4.2.1 through 4.4.2.14 (see 3.4).

4.4.2.1 Inside diameter (id) of hub. The apparatus shall consist of a special "GO NO-GO" gauge constructed of hardened tool steel as shown on figure 1. The id of the hub shall be placed over the "GO" portion of the gauge and shall not pass over the "NO-GO" portion of the gauge.

4.4.2.2 Outside diameter (od) of flange. The apparatus shall consist of a special "GO NO-GO" gauge constructed of hardened tool steel as shown on figure 2. The flange of a reel shall be placed flat on the surface of the gauge. The flange shall pass between the "GO" gauge pins and shall not pass between the "NO-GO" gauge pins.

4.4.2.3 Od of hub. The apparatus shall consist of a special "GO NO-GO" gauge constructed of hardened tool steel as shown on figure 3. The gauge shall be placed on the od of the hub. The hub shall pass through the "GO" portion of the gauge and shall not pass through the "NO-GO" portion of the gauge.

4.4.2.4 Keyslot pitch diameter (3-inch center hole and angle between successive keyslots). The apparatus shall consist of the special "GO NO-GO" gauge constructed of hardened tool steel as shown on figure 4. The id of the reel or hub shall be placed on the gauge. The keyslots shall pass over the "GO" gauge pin of the gauge and shall not pass over the "NO-GO" gauge pin of the gauge.

4.4.2.5 Keyslot width. The apparatus shall consist of a special "GO NO-GO" plug gauge constructed of hardened tool steel as shown on figure 5. The "GO" portion of the plug gauge shall be inserted into a keyslot. The "GO" portion of the gauge shall pass through the keyslot and the "NO-GO" portion of the gauge shall not pass through the keyslot. The procedure shall be repeated for the remaining keyslots.

4.4.2.6 Flange thickness. The apparatus shall consist of a standard micrometer. The thickness of each flange shall be measured using a micrometer in three places approximately equidistant.

4.4.2.7 Diameter for flange clearance. The apparatus shall consist of a reel pedestal. The pedestal shall be a disc with a diameter equal to the "L" dimension specified (see 3.1). At least one surface of the disc shall be flat to within 0.0005 inch (0.01270 mm) full indicator movement (FIM). The reel shall be placed with one face of the mounting surface flat on the flat precision surface of the reel pedestal. The reel shall be centered on the reel pedestal and shall be subjected to a visual examination with the normal, unaided eye. The procedure shall be repeated on the other surface of the reel.

4.4.2.8 Overall width of reel or hub. The test apparatus shall consist of a surface plate, grade A or AA in accordance with GGG-P-463; a vernier height gauge; and a special fixture constructed of hardened tool steel as shown on figure 6. The base of the fixture shall be placed on the surface plate and the reel or hub shall be placed with one face of the mounting surface flat on the base. The top plate shall be placed on the other face of the reel or hub mounting surface. The reel or hub shall be centered on the fixture. The vernier height gauge shall be placed on the surface plate and shall contact the top plate surface. The test set-up shall be as shown on figure 7. With the reel or hub set up as specified above, the overall height of the fixture and the reel or hub shall be measured with the vernier height gauge in at least two places. Remove the reel or hub and reassemble the fixture. The overall height of the assembled fixture without the reel or hub from the surface of the surface plate shall be measured. The difference between these measurements shall be used to determine conformance to the width requirement as specified (dimension M).

4.4.2.9 Distance between flanges at hub. The test apparatus shall consist of a special "GO NO-GO" gauge constructed of hardened tool steel as shown on figure 8. The "GO" portion of the gauge shall be inserted between the flanges and shall contact the hub surface. The "NO-GO" portion of the gauge shall not fit between the flanges so as to make contact with the hub surface.

4.4.2.10 Flange mounting hole diameter. The test apparatus shall consist of a special "GO NO-GO" plug gauge constructed of hardened tool steel as shown on figure 5. The "GO" portion of the plug gauge shall be inserted into the flange mounting hole of the hub. The "GO" portion of the gauge shall pass through the hole and the "NO-GO" portion of the gauge shall not pass through the flange mounting hole of the hub. The procedure shall be repeated for the remaining flange mounting holes.

4.4.2.11 Diameter of flange mounting hole bolt circle and the angle between adjacent keyslots and flange mounting holes. The test apparatus shall consist of a special gauge constructed of hardened tool steel as shown on figure 9. The flange mounting holes and keyslots shall be aligned with the mounting hole gauge pins and keyslot gauge pins of the gauge. The gauge pins shall pass through the mounting holes and keyslots.

4.4.2.12 Mounting hole diameter (plastic reels). The test apparatus shall consist of a special "GO NO-GO" plug gauge constructed as shown on figure 5. The "GO" portion of the plug gauge shall be inserted into the mounting hole of the reel. The "GO" portion of the gauge shall pass through the hole and the "NO-GO" portion of the gauge shall not pass through the hole.

4.4.2.13 Keyslot (dimensions). The test apparatus shall consist of the special "GO NO-GO" gauge constructed of hardened tool steel as shown on figure 10. The mounting hole of the reel shall be placed on the gauge. The keyslots of the reel shall pass over the "GO" portion of the gauge and shall not pass over the "NO-GO" portion of the gauge.

4.4.2.13.1 Keyslot width (plastic reels). The test apparatus shall consist of the special "GO NO-GO" plug gauge constructed of hardened tool steel in accordance with figure 5. The "GO" portion of the gauge shall be inserted into the keyslot of the reel. The "GO" portion of the gauge shall pass through the keyslot and the "NO-GO" portion of the gauge shall not pass through the keyslot. The procedure shall be repeated for the remaining keyslots.

4.4.2.14 Drive hole. The test apparatus shall consist of the special gauge constructed of hardened tool steel in accordance with figure 11(a) or 11(b) as applicable. The mounting hole of the reel and a drive hole shall be aligned with the mounting hole pin and drive hole gauge pins of the gauge. The pins shall pass through the mounting hole and drive hole of the reel. This procedure shall be repeated for any remaining drive holes.

4.4.3 Mounting surface parallelism. The test apparatus shall consist of the apparatus specified in 4.4.2.8 except the vernier height gauge shall be replaced with a dial indicator. The test set-up shall be as specified in 4.4.2.8. With the reel or hub set up as specified in 4.4.2.8, the dial indicator shall be placed on the surface plate and the stylus of the dial indicator shall contact the top plate. A total of six measurements shall be taken in three separate groups of two each. Each group of measurements shall be taken approximately 60 degrees apart and shall be diametrically opposite each other at a diameter not less than 0.9 times the outside diameter of the mounting surface. The total difference in each group of opposite measurements shall be divided by the diameter at which these measurements were taken. The result of each of these three calculations shall not exceed the value specified (see 3.1).

4.4.4 Mounting surface flatness. The test apparatus shall consist of a surface plate, grade A or AA in accordance with GGG-P-463, or equivalent, and a dial indicator gauge. The mounting surface of the hub, prior to assembly or completely disassembled, shall be placed on the surface plate. A dial indicator gauge shall be placed on the surface and the stylus of the dial indicator shall contact the mounting surface. The dial indicator shall be moved from a point at the inside diameter of the mounting surface to a point at the inside diameter of flange and mating hub diameter of the mounting surface. FIM shall

be recorded. The reading shall be repeated at three places approximately 90 degrees apart. The hub shall be inverted and the procedure repeated for the opposite mounting surface. The FIM shall be not greater than the value specified (see 3.1).

4.4.5 Inside hub surface perpendicularity. The test apparatus shall consist of the apparatus specified in 4.4.4 and an angle plate, type 1, class 2, grade A or B in accordance with GGG-P-441, or equivalent. The angle plate shall be placed on the surface plate so that one face of the angle plate is at 90 degrees to the surface plate. The hub of the reel, prior to assembly or completely disassembled, shall be placed and held with one face of the mounting surface flat against the angle plate so that the outside cylindrical hub surface shall not contact the surface plate. A dial indicator shall be placed on the surface plate and the stylus of the dial indicator shall contact the inside cylindrical hub surface. The dial indicator shall be moved along each edge of the hub surface and the minimum dial indicator reading on each edge shall be recorded. Unless otherwise specified (see 3.1), the difference between the minimum edge readings shall not exceed the value specified. The hub shall be rotated approximately 120 degrees and the procedure shall be repeated until three measurements have been taken.

4.4.6 Outside hub surface cylindricity. The test apparatus shall consist of one of the following test set-ups, as applicable:

- (a) Unless otherwise specified (see 3.1), the hub of a reel, prior to assembly or completely disassembled, shall be tested and the hub shall be set up as specified in 4.4.5.
- (b) When specified (see 3.1), a fully assembled reel shall be set up as specified in 4.4.7.

With the reel or hub in the applicable test set-up (see 4.4.6), the stylus of a dial indicator gauge shall contact the outside cylindrical hub surface. The dial indicator shall be moved along each edge of the hub surface and the maximum dial indicator reading on each edge shall be recorded. Unless otherwise specified (see 3.1), the total difference between the maximum edge readings divided by the width of the hub shall not exceed the value specified. The reel or hub shall be rotated approximately 120 degrees and the procedure repeated until a total of three measurements have been taken.

4.4.7 Runout (5/16- and 3-inch center hole reels and hubs). The test apparatus shall consist of a lathe bed or similar apparatus; a dial indicator gauge; and a runout fixture which shall be constructed of hardened tool steel consisting of two parts (reel and hub mounting part and reel and hub centering part). These two parts shall be constructed in accordance with figure 12 for 5/16-inch (7.9375 mm) center hole reels and figure 13 for 3-inch (76.2 mm) center hole reels and hubs. The reel mounting part shall be mounted between two standard lathe centers on a lathe bed or similar apparatus. The lathe centers shall be adjusted using a dial indicator gauge to align the lathe centers. The runout on surface "d" of the reel mounting part for a 5/16-inch center hole reel (see figure 12) or surface "b" of the reel mounting part for a 3-inch center hole reel or hub (see figure 13) shall be measured to ensure the perpendicularity

of surface "b" or "d", as applicable, of the mounting fixture to the centerline between the lathe centers. The completely assembled reel or hub to be tested shall be securely clamped in the applicable runout fixture, and the applicable runout fixture shall be mounted between the adjusted lathe centers as shown on figure 14 or 15, as applicable. With the reel or hub set up as specified above, a dial indicator gauge shall be positioned on the outside cylindrical hub surface. The reel or hub shall be rotated, and the hub runout shall be measured to determine conformance to 3.4.5. The dial indicator gauge shall then be positioned on the outside flange rim. The reel shall be rotated and the flange runout shall be measured to determine conformance to the specified value. This measurement shall be repeated on the other flange rim. These three measurements may be made simultaneously after the dial indicators have been properly positioned.

4.4.8 Flange wobble. The test apparatus and test set-up shall be the same as specified in 4.4.7. While the reel is still mounted in the runout fixture set-up, a dial indicator gauge shall be positioned to contact the inside surface of the reel flange, approximately 1/4 inch (6.350 mm) from the outside flange rim. To prevent flange deflection during the measurement, another indicator gauge shall be positioned on the outside flange surface directly opposite the gauge in contact with the inside flange surface to exert approximately equal pressure on each side of the flange. The reel shall then be rotated, and the lateral runout of the flange shall be measured with the indicator gauge in contact with the inside flange surface to determine conformance to the specified value. The test shall be repeated on the other reel flange.

4.4.9 Tape path clearance. The test apparatus and test set-up shall be the same as specified in 4.4.7 except the dial indicator gauges shall be replaced with a flange width gauge having the dimensions specified in table III.

TABLE III. Width gauge dimensions.¹

Nominal tape width (inches)	Dimensions	
	max	min
1/4 (6.350)	0.2522 (6.4059)	0.2520 (6.4008)
1/2 (12.7000)	.5044 (12.8118)	.5040 (12.8016)
3/4 (19.050)	.7544 (19.1618)	.7540 (19.1516)
1 (25.400)	1.0044 (25.5118)	1.0040 (25.5016)
1-1/2 (38.100)	1.5044 (38.2118)	1.5040 (38.2016)
2 (50.800)	2.0044 (50.9118)	2.0040 (50.9016)

¹ Dimensions are in inches. Metric equivalents are given for information only.

With the reel mounted in the runout fixture set-up (see 4.4.7), the applicable flange width gauge (see table III) shall be mounted such that it is centered on the tape path center line, as specified (see 3.1), relative to either reel mounting surface, and such that it can be moved between the reel flanges in a straight line which is 90 degrees to the centerline between both lathe

centers. The reel shall be rotated and the width gauge shall be moved between the flanges from the outside flange rim to the hub surface to determine conformance to 3.4.7. The flange width gauge shall then be centered on the specified tape path centerline relative to the opposite reel mounting surface. The reel shall be rotated and the width gauge shall be moved between the flanges from the outside flange rim to the hub surface to determine conformance to the specified value.

4.4.10 Moment of inertia. The test apparatus shall consist of a rigid, level knife-edge; a stopwatch accurate to 1/10 second; and a scale accurate to within 1/16 pound. A fully assembled reel shall be weighed and placed on a rigidly supported, absolutely level knife-edge arranged to make a line contact with the inner cylindrical hub surface. The reel shall be started into motion to swing as a pendulum, and 20 complete oscillations (forward and back) shall be timed to within 1/10 second with a stopwatch. The moment of inertia shall be calculated by the following formula to determine conformance to 3.4.8:

$$I = wh \left(\frac{T^2 g - h}{4\pi^2} \right)$$

or: $I = wh(0.815 T^2 - h)$

or (in SI units):

$$I = wh(1.249 T^2 - h)$$

Where:

I = moment of inertia - pound-feet² (grams-meter²)

w = weight of reel - pounds (grams)

h = hub hole radius - feet (meters)

T = period of one complete oscillation - second

g = 32.17 feet per second per second (9.81 meters per second per second)

π = 3.14 - dimensionless number

4.4.11 Roughness of inside flange surface. The test apparatus shall consist of a profilometer or similar surface analyzer. The reel shall be disassembled into the flanges and hubs. Reels which cannot be disassembled shall be tested prior to assembly, completely assembled, or destructively disassembled. Using a profilometer or similar surface analyzer, the inside surface of each flange shall be measured to determine conformance to the specified value.

4.4.12 Roughness of outside hub surface. The test specified in 4.4.11 shall be repeated on the outside cylindrical hub surface to determine conformance to the specified value.

4.4.13 Flange deflection. The test apparatus shall consist of a reel support; a dial indicator gauge; a 10-pound (4.536-kilogram) weight; and a method of applying load on reel. The reel support shall be a metallic ring having a line of contact only between the ring support and the outside surface of the flange. The line of contact shall be a circle of a diameter equal to 0.9 times the outside reel flange diameter. The method of applying the measurement load to the reel shall consist of an aluminum disc 1/2 inch (12.70 mm) thick and having a diameter larger than the hub hole diameter and less than the reel lateral

mounting surface diameter. The reel shall be placed on the leveled support as shown on figure 16 so that the circular line contact shall be concentric with the outer diameter of the flange. The weight-holding disk shall then be positioned in the center of the lateral mounting surface of the reel. The dial indicator gauge shall be positioned to measure the vertical movement of the disc. The 10-pound (4.536-kilogram) weight shall be added to the center of the weight-holding disc and the resulting deflection shall be measured to determine conformance to the specified value.

4.4.14 Temperature and humidity stability. The test apparatus shall consist of a temperature-humidity chamber. The reel or hub (plastic or metal) shall be subjected not less than four times to the temperature and humidity sequence specified in table VI. The metal reel or hub shall be scratched in three places (hub to rim) through the surface treatment of the base material. Immediately after completion of the test, only the plastic reel or hub shall be measured to determine conformance with the specified values. The scratches made on the metal reel or hub shall be examined to determine if corrosion has extended beyond the scratch in accordance with 3.3.1.

TABLE VI. Temperature and humidity sequence.

Period ¹ (hours)	Temperature (°F)(°C)	Humidity (percent)
1	75 (23.9)	50
3	40 (4.4)	90
3	130 (54.4)	90
1	40 (4.4)	90

¹Periods shall be measured immediately after stable temperature and humidity conditions have been obtained.

4.4.15 Friction rings. When required (see 3.1), the friction ring shall meet the measurements as specified (see 3.4.17), and shall show no signs of looseness, buckling or puckering, cracking, splitting, or other signs of deterioration.

4.4.16 Drop resistance. When the reel or hub is packaged in its individual paperboard container (see 5.1), the packaged reel or hub shall be dropped a vertical distance of at least 5 feet (1.524 meters) above a concrete floor to strike on edge. The reel or hub shall be examined for conformance to 3.4.12.

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition.)

5.1 Packaging and packing. Unless otherwise specified (see 6.2), empty reels or hubs shall be individually packaged in a paperboard container. When specified (see 6.2), empty reels or hubs shall be individually packaged in an envelope of 40-pound basis weight kraft paper or metal container conforming to

MIL-R-214. Envelopes shall permit easy insertion and removal of a full reel of tape. Each metal container shall be sealed against moisture with 1/2-inch (12.70-mm) pressure sensitive tape conforming to class 1 of PPP-T-60.

5.1.1 Intermediate packs and packing. Intermediate packs shall be in accordance with level A or C, packs (exterior containers) level A, B or C as specified (see 6.2), in accordance with MIL-E-17555.

5.2 Marking. Marking for military shipment shall be in accordance with MIL-STD-129. Marking for civil agencies shipment shall be in accordance with FED-STD-123.

6. NOTES

6.1 Intended use. Reels and hubs covered by this specification shall be used in the following applications:

- (a) Non-precision reels and hubs. Non-precision reels and hubs are used for those applications that do not require extremely accurate operation and the recorder/reproducer performance requirements are significantly less than the state-of-the-art limits.
- (b) Precision reels. Precision reels are used for those applications that require extremely accurate operation and impose state-of-the-art limitations on recorder/reproducer performance.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

- (a) Title, number, and date of this specification, applicable specification sheet and part number.
- (b) Reel and hub classification (see 1.2 and 3.1).
- (c) When friction rings are required (see 3.1 and 3.4.17).
- (d) When precision reels are required (see 4.3.1.2.1).
- (e) Individual packaging container (see 5.1).
- (f) When empty reels or hubs are to be furnished in paperboard or metal containers (see 5.1).
- (g) Level of intermediate packaging or packing (see 5.1.1).
- (h) Marking requirements (see 5.2).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time set for opening of bids, qualified for inclusion in the Qualified Products List QPL-W-R-175 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101, and information pertaining to qualification of products may be obtained from that activity. Application for qualification tests shall be made in accordance with "Provisions Governing Qualification SD-6" (see 6.3.1).

6.3.1 Copies of "Provisions Governing Qualification SD-6" may be obtained upon application to Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

6.4 Subject term (key word) listing.

Fiberglass
Glass flange
Hubs
Magnetic tape
Metallic flange
Plastic
Reels

6.5 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

MILITARY INTERESTS:

Custodians

Army - CR
Navy - SH
Air Force - 99

Review activities

Navy - NV, OM
Air Force - 80
DLA - ES

User activity

Navy - AS

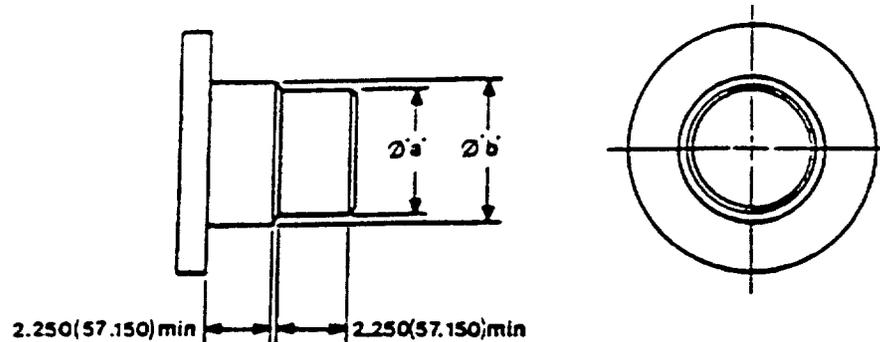
CIVIL COORDINATING ACTIVITY:

NASA - NPPO

Preparing activity:

Navy - SH
(Project 5835-0079)

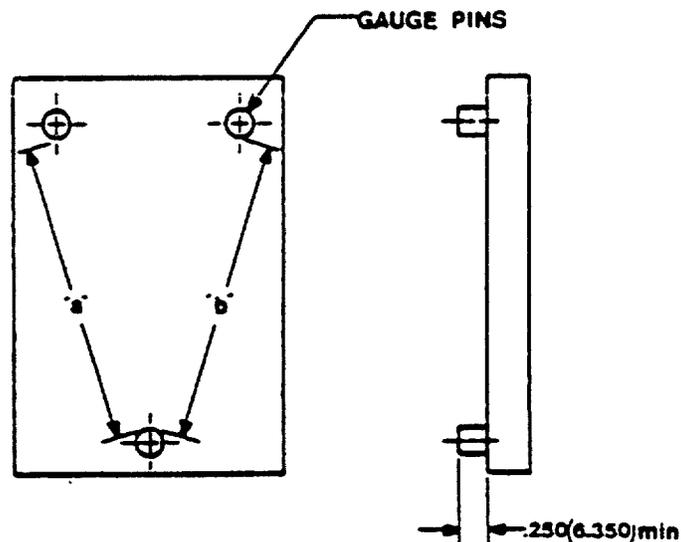
SH 13202754

FIGURE 1. Inside diameter gauge.

NOTES:

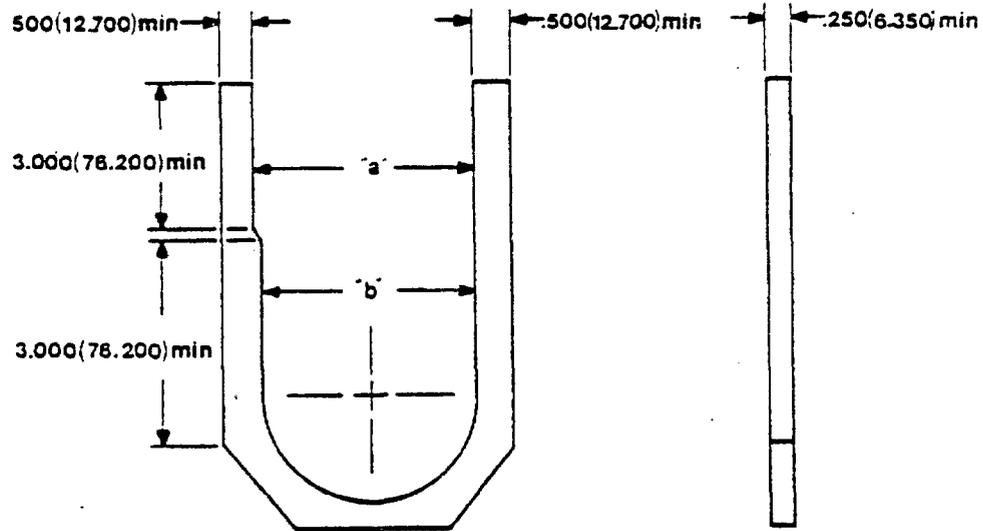
1. Diameter "a" shall be the "GO" portion of the gauge and shall be 0.0005 inch (0.0127 mm) less than the minimum applicable dimension specified (see 3.1).
2. Diameter "b" shall be the "NO-GO" portion of the gauge and shall be equal to the maximum applicable dimension specified (see 3.1) accurate to 0.0001 inch.
3. A tolerance of 0.0001 inch shall be applied plus on the GO member and plus on the NO-GO member.

SH 13202755

FIGURE 2. Outside diameter of flange gauge.

NOTES:

1. Dimension "a" shall be the "GO" portion of the gauge and shall be 0.0005 inch (0.0127 mm) larger than the maximum "B" dimension specified (see 3.1).
2. Dimension "b" shall be the "NO-GO" portion of the gauge and shall be equal to the minimum "B" dimension specified (see 3.1) accurate to 0.0001 inch.
3. A tolerance of 0.0001 inch shall be applied minus on the GO member and minus on the NO-GO member.

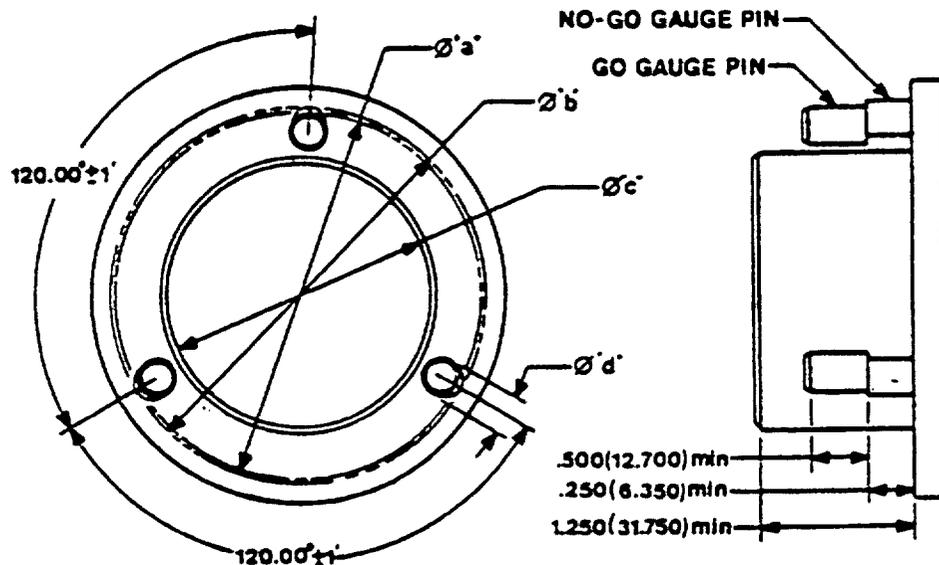


SH 13202756

FIGURE 3. Outside diameter gauge.

NOTES:

1. Dimension "a" shall be the "GO" portion of the gauge and shall be 0.0005 inch (0.0127 mm) larger than the maximum applicable dimension specified (see 3.1).
2. Dimension "b" shall be the "NO-GO" portion of the gauge and shall be equal to the minimum applicable dimension specified (see 3.1) accurate to 0.0001 inch.
3. A tolerance of 0.0001 inch shall be applied minus on the GO member and minus on the NO-GO member.



SH 13202757

FIGURE 4. Keyslot dimension gauge.

NOTES:

1. Diameter "a" shall be the "GO" portion of the gauge and shall be 0.0005 inch (0.0127 mm) less than the sum of the minimum "D" dimension and the minimum "E" dimension specified (see 3.1).
2. Diameter "b" shall be the "NO-GO" portion of the gauge and shall equal the sum of the maximum "D" dimension and the maximum "E" dimension specified (see 3.1) accurate to 0.0001 inch.
3. Diameter "c" shall be 0.0005 inch (0.0127 mm) less than the minimum "A" dimension specified (see 3.1).
4. Diameter "d" shall be 0.0005 inch (0.0127 mm) less than $E - \frac{\pi D \theta}{360}$ or $E - 0.00873 D \theta$.

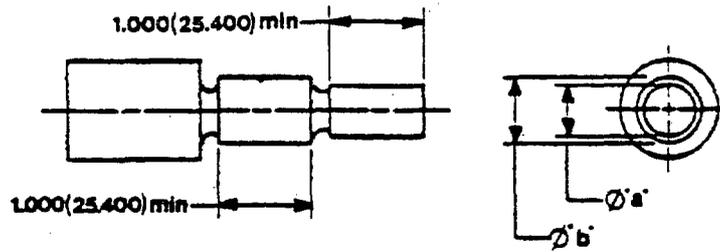
Where:

E = minimum "E" dimension specified (see 3.1)

D = nominal "D" dimension specified (see 3.1)

 θ = total angular tolerance in degrees of the "G" dimension (see 3.1)

5. A tolerance of 0.0001 inch shall be applied plus on the GO member and plus on the NO-GO member.

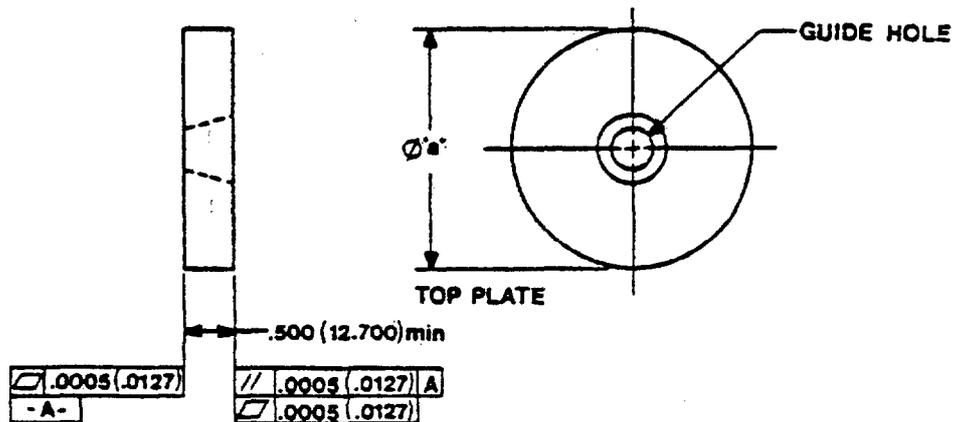
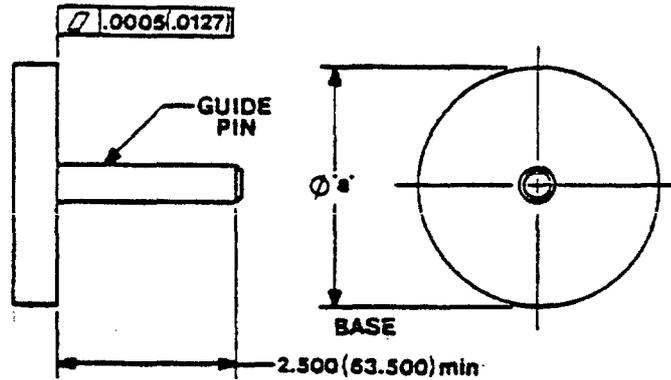


SH 13202758

FIGURE 5. Plug gauge.

NOTES:

1. Diameter "a" shall be the "GO" portion of the gauge and shall be 0.0005 inch (0.0127 mm) less than the minimum applicable dimension specified (see 3.1).
2. Diameter "b" shall be the "NO-GO" portion of the gauge and shall be equal to the maximum applicable dimension specified (see 3.1) accurate to 0.0001 inch.
3. A tolerance of 0.0001 inch shall be applied plus on the GO member and plus on the NO-GO member.

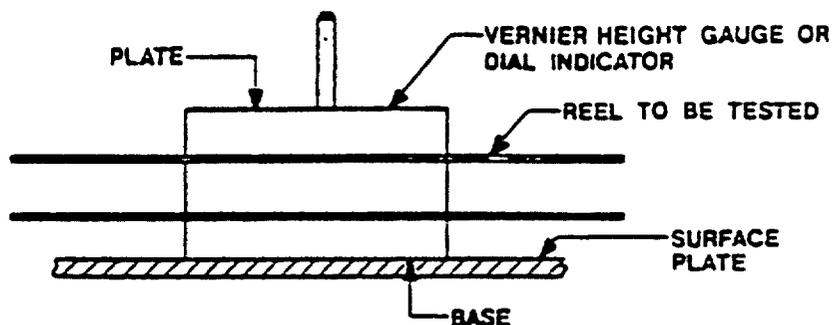


SH 13202759

FIGURE 6. Width and mounting surface parallelism fixture.

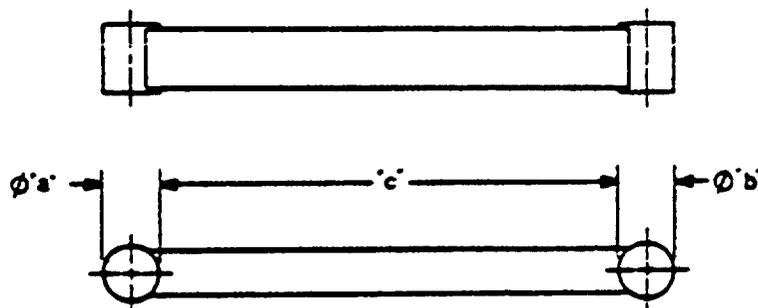
NOTES:

1. Diameter "a" shall be equal to the nominal "C" dimension specified (see 3.1).
2. The guide pin and tapered hole shall facilitate mating the plate to the base. The taper of the guide hole shall permit total contact between the plate and reel mounting surface.



SH 13202760

FIGURE 7. Test set-up for using width and mounting surface parallelism fixture.

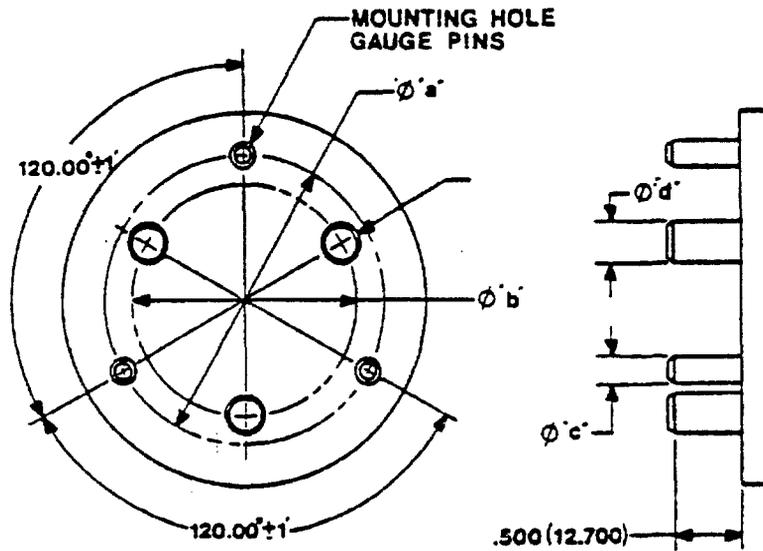


SH 13202761

FIGURE 8. Flange width gauge.

NOTES:

1. Diameter "a" shall be the "GO" portion of the gauge and shall be equal to the minimum "N" dimension specified (see 3.1).
2. Dimension "b" shall be the "NO-GO" portion of the gauge and shall be 0.0001 inch larger than the maximum "N" dimension specified (see 3.1) accurate to 0.0001 inch.
3. Dimension "c" shall provide proper length for the applicable reel tested.
4. A tolerance of 0.0001 inch shall be applied plus on the GO member and plus on the NO-GO member.



SH 13202762

FIGURE 9. Flange mounting hole gauge.

NOTES:

1. Diameter "a" shall be equal to the nominal "Q" dimension specified (see 3.1) accurate to ± 0.0001 inch.
2. Diameter "b" shall be equal to the nominal "D" dimension specified accurate to ± 0.0001 inch.
3. Diameter "c" shall be equal to 0.0005 inch (0.0127 mm) less than $0.190 - \sqrt{p^2 + q^2}$

$$\sqrt{p^2 + q^2}$$

where:

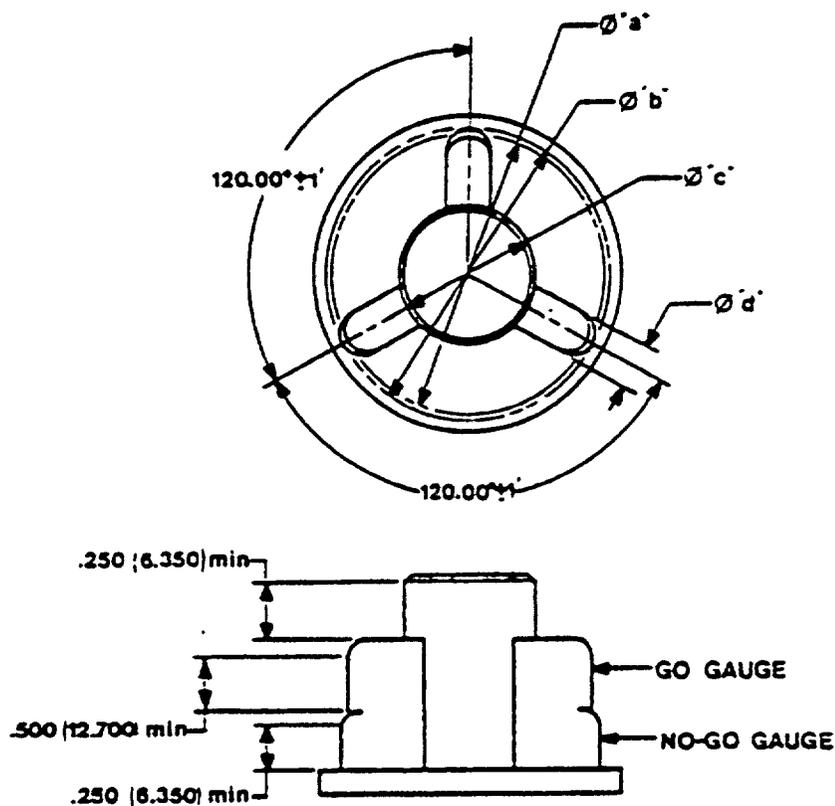
$$p = \frac{\pi Q \theta}{360^\circ} \text{ or } 0.00873 Q \theta.$$

Q = the nominal value of the "Q" diameter specified (see 3.1).

θ = total angular tolerance of the "G" dimension specified (see 3.1).

q = total tolerance of the "Q" diameter specified (see 3.1).

4. Diameter "d" shall be equal to dimension "d" specified on figure 4.



SH 13202763

FIGURE 10. Key slot gauge.

NOTES:

1. Diameter "a" shall be the "GO" portion of the gauge and shall be 0.0005 inch (0.0127 mm) less than the minimum "W" dimension specified (see 3.1).
2. Diameter "b" shall be the "NO-GO" portion of the gauge and shall be equal to the maximum "W" dimension specified (see 3.1) accurate to 0.0001 inch.
3. Diameter "c" shall be 0.0005 inch (0.0127 mm) less than the minimum "U" dimension specified (see 3.1).
4. Dimension "d" shall be equal to 0.0005 inch (0.0127 mm) less than $V - \frac{\pi W \theta}{360}$ or $V - 0.00873W\theta$,

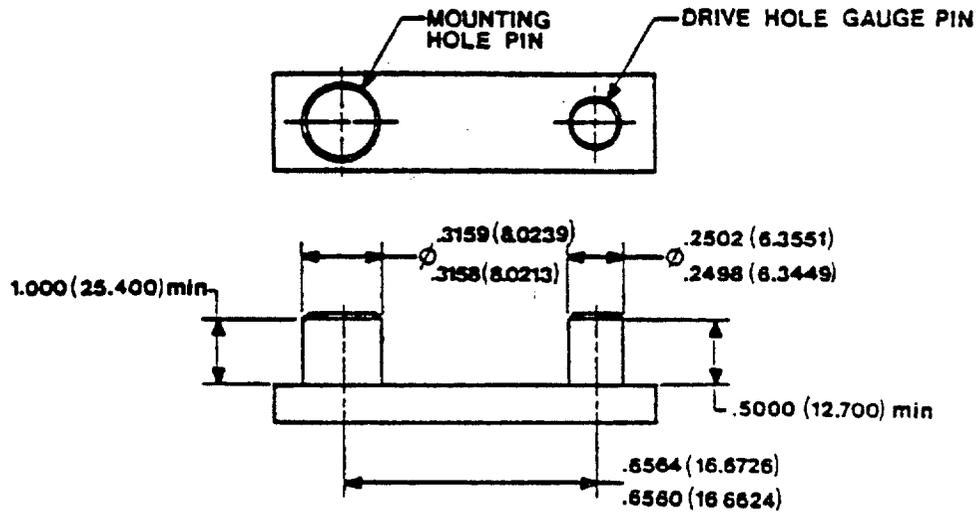
where:

V = minimum "V" dimension specified (see 3.1) accurate to 0.0000 inch.

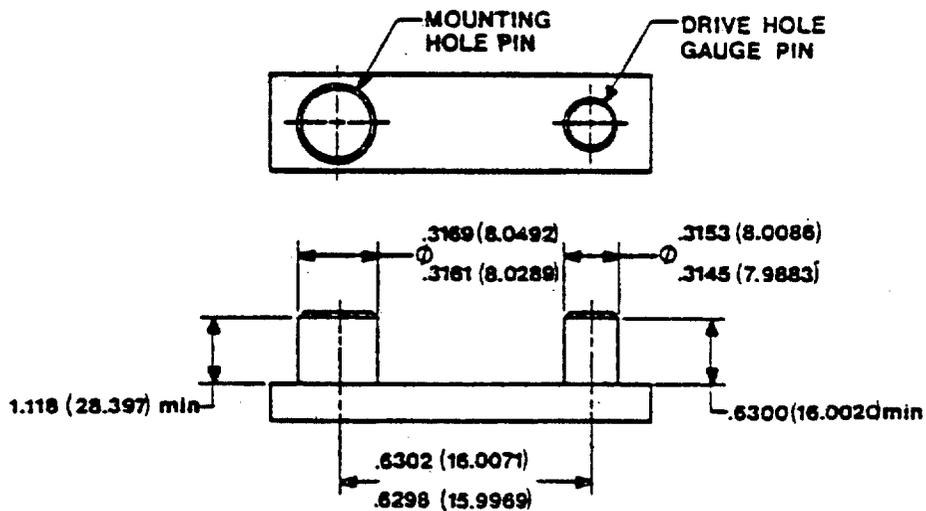
W = nominal "W" dimension specified (see 3.1) accurate to 0.0000 inch.

θ = total angular tolerance of the "G" dimension specified (see 3.1).

5. A tolerance of 0.0001 inch shall be applied plus on the GO member and plus on the NO-GO member.



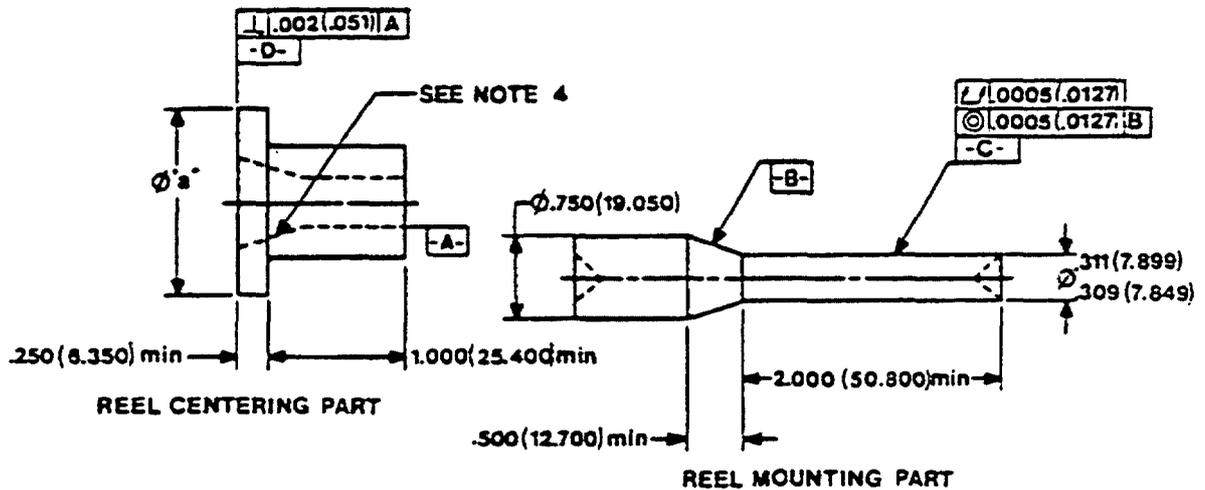
11(a)



11(b)

SH 13202764

FIGURE 11. Drive hole gauge.



SH 13202765

FIGURE 12. Reel concentricity fixture (5/16-inch center hole).

NOTES:

1. Diameter "a" shall be equal to the minimum "C" dimension specified (see 3.1).
2. When the reel centering part is mated to the reel mounting part, the runout of surface "d" at a diameter 1/2-inch (12.7 mm) less than "a" diameter shall be within 0.0001 FIM.
3. Unless otherwise specified, the tolerance on all dimensions shall be 0.0313 inch (0.7938 mm) (see 3.1).
4. Adequate clearance shall be provided when a reel is mounted in the test fixture.
5. The reel centering part shall be provided with a means of securing this part onto the mounting part. The securing method shall positively clamp the reel to be tested (see figure 14).

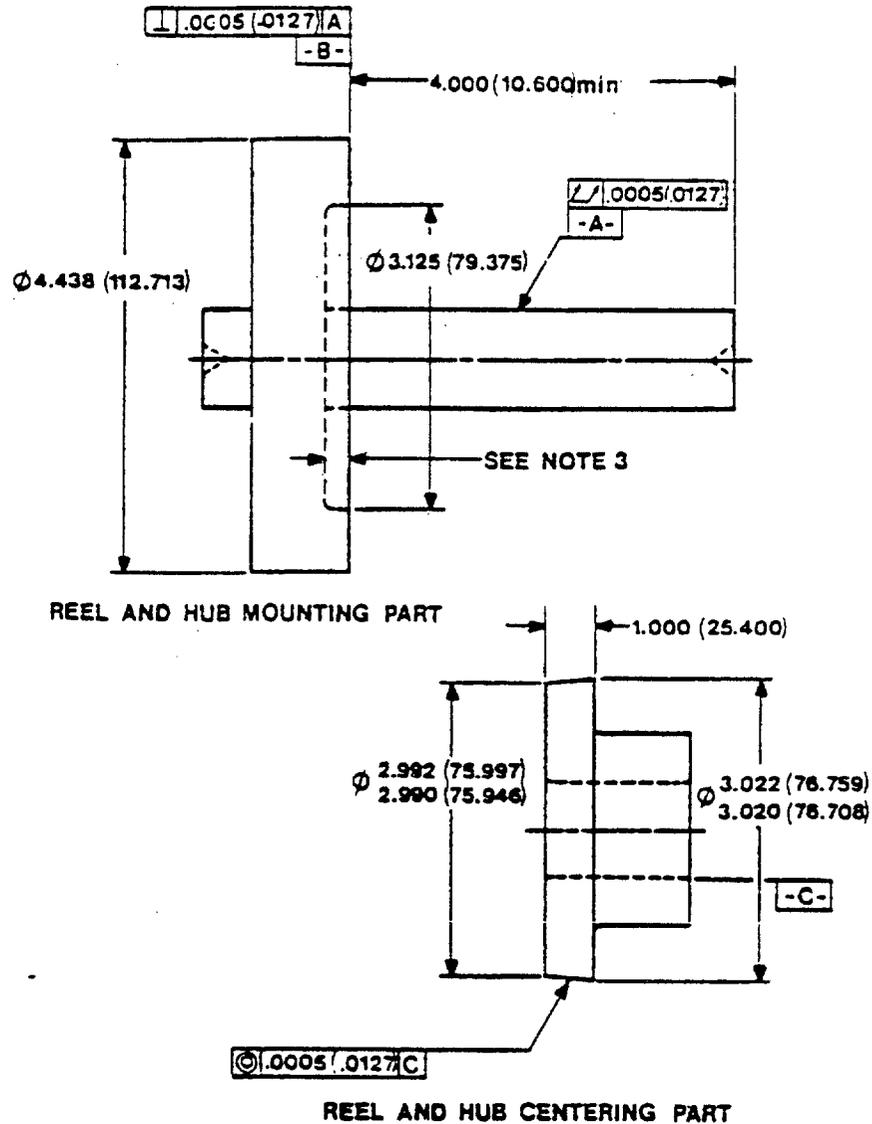
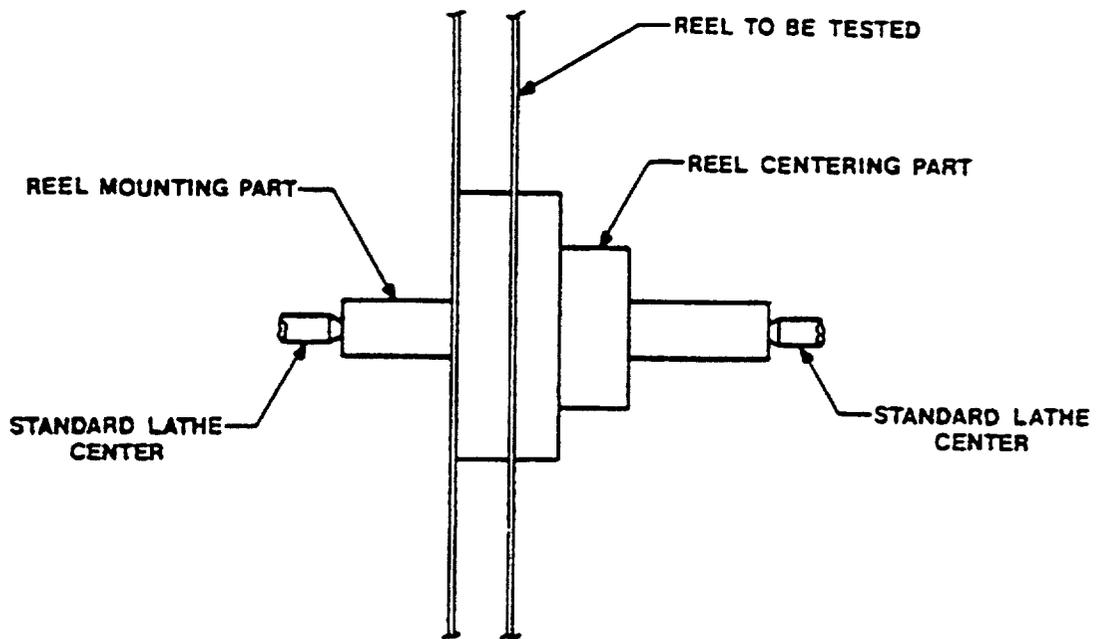


FIGURE 13. Reel concentricity fixture (3-inch center hole).

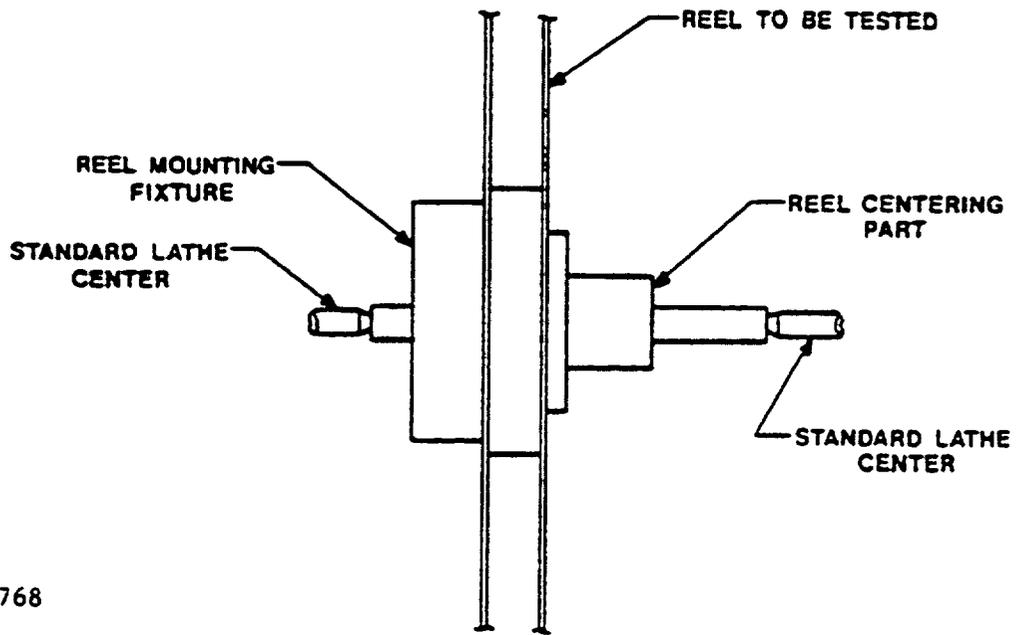
NOTES:

1. Runout of surface "b" at 4.00 inches (101.60 mm) diameter shall be within 0.0001 FIM.
2. Unless otherwise specified, the tolerance on all dimensions shall be 0.0313 inch (0.7950 mm) (see 3.1).
3. The depth shall provide the proper clearance for the reel and hub centering part when a 1/4-inch wide reel or hub is mounted in the test fixture.
4. The reel and hub mounting part may be a solid part or may be constructed of two separate pieces assembled to form the complete mounting part.
5. The reel and hub centering part shall be provided with a means of securing this part to the mounting part. The securing method shall positively clamp the various widths from 1/4 to 2 inches of reels or hubs to be tested in the completely assembled concentricity fixture (see figure 15).



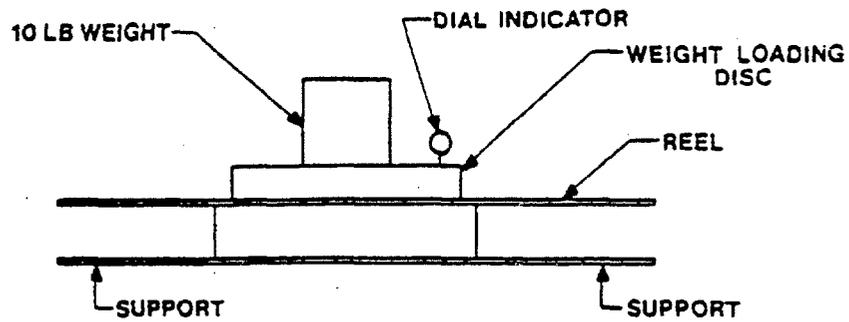
SH 13202767

FIGURE 14. Test set-up for concentricity fixture (5/16-inch center hole).



SH 13202768

FIGURE 15. Test set-up for concentricity fixture (3-inch center hole).



SH 13202769

FIGURE 16. Test set-up for flange deflection measurement.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER
W-R-175D

2. DOCUMENT TITLE
Reels & Hubs For Magnetic Recording Tape, GEN Spec

3a. NAME OF SUBMITTING ORGANIZATION

4. TYPE OF ORGANIZATION (Mark one)

VENDOR

USER

MANUFACTURER

OTHER (Specify): _____

b. ADDRESS (Street, City, State, ZIP Code)

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER (Last, First, MI) - Optional

b. WORK TELEPHONE NUMBER (Include Area Code) - Optional

c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional

8. DATE OF SUBMISSION (YYMMDD)