

PREFORMED PACKING - DIMENSIONAL INSPECTION GUIDE

Issued 1-31-65
Revised

1. PURPOSE - To establish standardized methods for checking dimensions of preformed packings or circular elastomeric seals (commonly known as O-rings).
2. SCOPE - This standard controls the dimensional measurement of preformed packings or circular elastomeric packings. The inspection level, sampling plan, visual inspection for defects and certification or inspection records used to establish acceptability of preformed packings are not controlled by this standard.
3. REQUIREMENTS
 - 3.1 Dimensional inspection shall be performed in addition to other requirements for conformance to the applicable material specification, manufacturing specifications, defects, or other requirements specified on the packing drawing and the purchase order. Care shall be exercised in the handling of the preformed packings to avoid distortion and stretch resulting in any measurable dimensional change.
 - 3.2 The packings shall conform to drawing dimensions.
 - 3.3 The following dimensions shall be checked by the methods specified herein:
 - a. Cross-section
 - b. Inside diameter
 - c. Off-register (see Figures 1 and 2)
 - d. Mismatch (see Figures 1 and 2)
 - 3.4 Cross-Section - The cross-sectional diameter of the packing shall be checked by one of the following methods: micrometer, vernier calipers, optical comparator, or a rotating-type fixture with dial indicator.
 - 3.4.1 The micrometer or calipers may be preset to the dimension to be checked. Readings shall be taken at four (4) locations, 90° apart, around the circumference, radially and parallel to the axis of the O-ring. Abrupt changes in diameter, within the tolerance limit, shall be cause for rejection.
 - 3.4.2 The rotating fixture may be one of two types: cylindrical, with the packing mounted on a cylinder of predetermined diameter, with rotatable dial indicator attachment. The other type consists of a surface plate and .500-inch diameter flat contact button. The dimension shall be measured between a surface plate and a .500-inch diameter flat contact button attached to an indicator. The measurement shall be made with the packing cross-section centered under the contact button and with packing rotated so that parting line projection, if any, does not interfere.
 - 3.4.3 Dial indicators used in the inspection of packings shall be graduated in maximum increments of .001 inch and shall have a maximum contact pressure of one ounce.

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The indicator reading shall not exceed the tolerance for any nominal cross-section when rotated through 360°. The packing flash, if any, shall not interfere with the reading.

- 3.4.4 An optical comparator of 10X magnification may be used to determine compliance with drawing requirements.

- 3.5 Inside Diameter - Inside diameter shall be checked as indicated in the following paragraphs. There shall be no lubrication used on the gages or packings during inspection of packings. Measurements shall be taken at room temperature. In cases of dispute, material and gages shall be stabilized at a temperature of 68 ± 2 F before inspection of rings.

- 3.5.1 Sizes up to 2.510, exclusive, diameter shall be gaged for a sliding fit over a standard cylindrical "go" and "not go" diameter plug gage, a calibrated taper gage, or over a flat plug gage. (See Figures 3 and 4.)

- 3.5.2 Sizes 2.510 and over may be gaged for a sliding fit over a flat plug gage (see Figure 4) or on a tapered, stepped gage (calibrated or uncalibrated) that represents the specified minimum and maximum inside diameter.

- 3.5.3 The latter gage may be designed to be multi-purpose by having a series of truncated cones in the form of layers (see Figure 5). Each step shall consist of a taper of such angularity that the sloping portion of the step shall cover the "go" diameters and the flat step the "not go" diameters. It will be necessary to have gages for each cross-section series and size. The top of each step shall be so sized that when a minimum I. D., maximum cross-sectional diameter packing is dropped freely, in a radial plane over the step, the top of the step and the top of the packing will be in a plane. Similarly, the bottom of each step shall be sized so that a maximum I. D., maximum cross-sectional diameter packing will just clear the flat bottom step of the gage.

- 3.5.3.1 Mandrels, with a .020/in. taper, which are calibrated with a height gage can be used to measure O-ring I. D. The height gage is arranged so that the tolerance spread is indicated for the particular O-ring measured. A micrometer adjustment is provided to permit realignment of the pointers for taking readings at the outside surfaces rather than the centerline of the packing. (See Figure 6.)

- 3.5.3.2 A typical calibrated taper gage with .200/ft taper measured on the diameter and along the axis, is similar to the taper gage shown in Figure 6 except that lines are scribed or etched on the gage at .020 intervals. Length of the gage may vary depending on O-ring applications.

- 3.5.4 Other methods may be used to check the inside diameter of large size packings after it has been determined that the cross-section dimensions and the parting

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line projections are within tolerance. One method consists of a flat gage incorporating a predetermined rectangular groove. The groove shall have an inside diameter minimum and an outside diameter equal to the packing inside diameter maximum plus two times the cross-section maximum dimension. Depth shall be at least one-half the cross-section and no more than the cross-section. If the packing falls into this groove without stretching or "snaking", it will be considered as within tolerance.

- 3.5.4.1 Another method utilizing an adjustable indicating type gage may be used. This method employs two half circles of fixed diameter, one of which is adjustable to the proper distance from the other for the diameter O-ring specified. The other half is adjustable by a spring-loaded inclined plane, the movement of which is controlled by a knob. The spring to be used depends upon the size and hardness of the ring to be checked. An indicating gage is attached to this end to ascertain that the I. D. dimension of the O-ring is within tolerances. A table of predetermined numbers for the I. D. to be checked must be furnished with this type of gage for proper setting of the adjustable gage blocks.
- 3.6 Off-Register - This is a condition where the center point of one-half of the packing is not the same with respect to the center point of the other half. It is permitted only to the extent that the cross-section dimension and tolerance in any direction does not exceed the maximum or minimum limits. Parts shall be sectioned and suitable optical means shall be used to inspect for this condition.
- 3.7 Mismatch - Mismatch is a condition when one-half the packing is larger than the other. It is permitted only to the extent that the cross-section dimension and tolerance in any direction does not exceed the maximum or minimum limits. Parts shall be sectioned and suitable optical means shall be used to inspect for this condition.
- 3.8 Surface Roughness - The contacting surfaces of the measuring gages shall have a maximum surface roughness of 16 microinches per AS 291.
- 3.9 Cleanliness Requirement - All packings shall be kept clean at all times to avoid contaminants, dirt, or other deleterious material.

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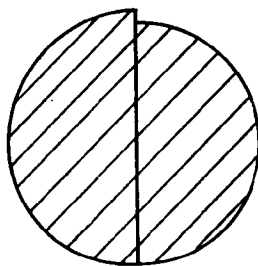
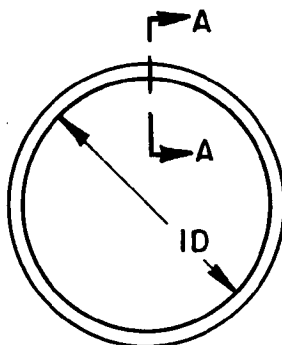
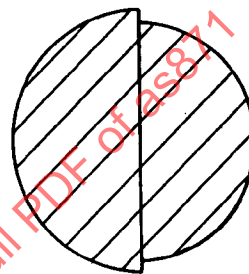
SECTION A-A
SHOWING MISMATCHSECTION A-A
SHOWING MISMATCH

FIGURE 1

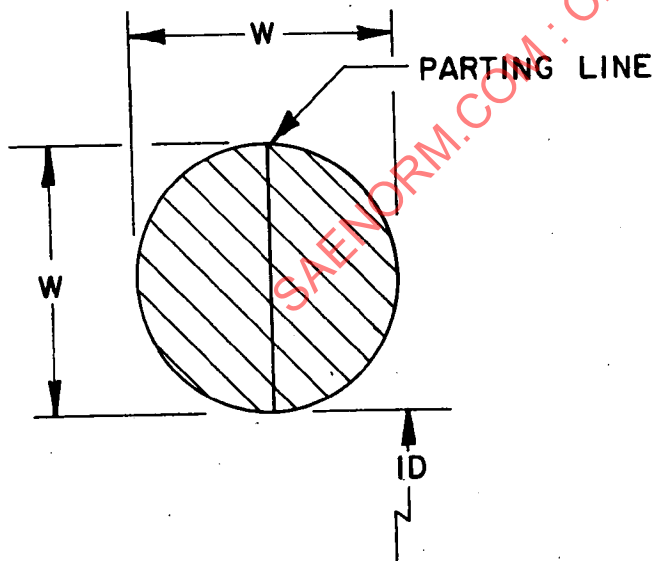
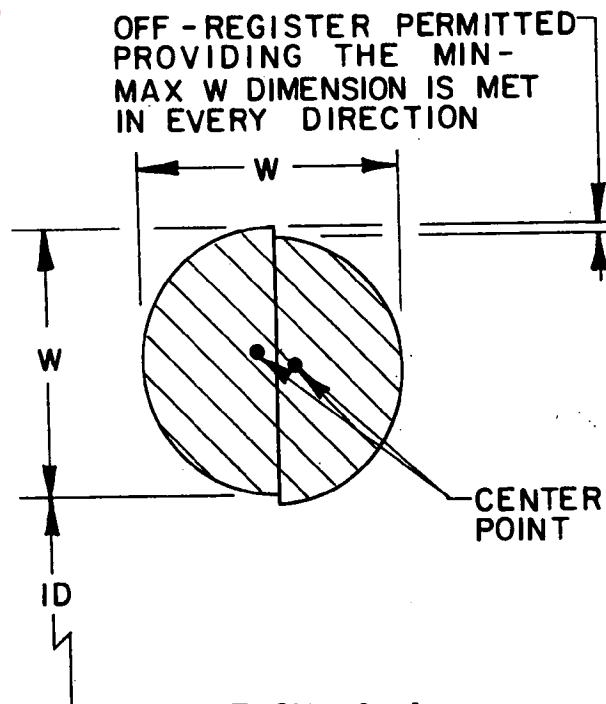
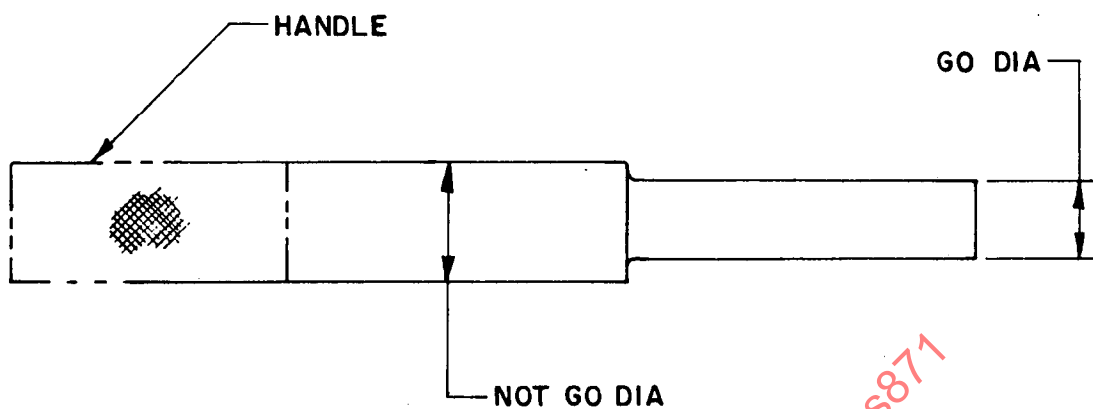
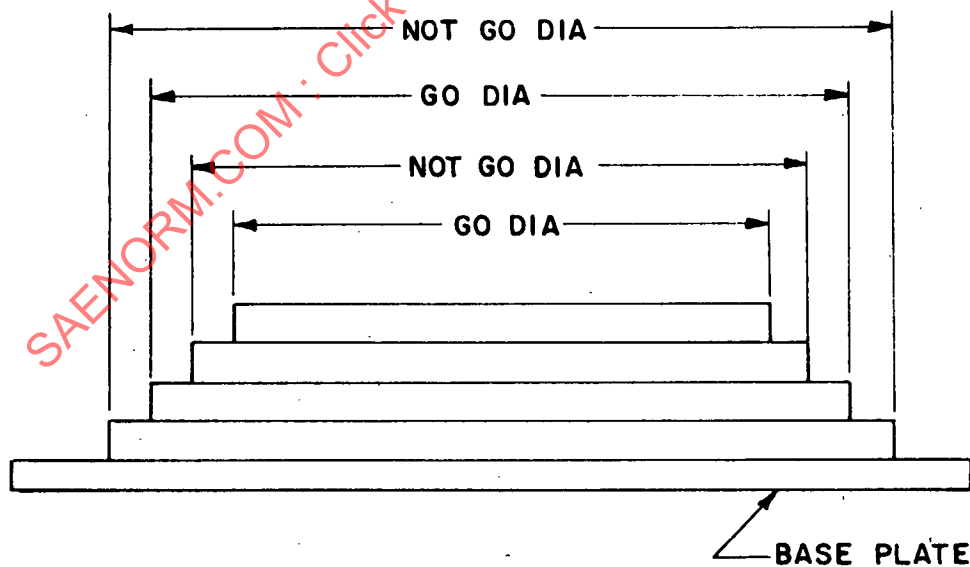
SECTION A-A
SHOWING PARTING LINE
ZERO MISMATCH AND
ZERO OFF-REGISTERSECTION A-A
SHOWING PARTING LINE
MAX OFF-REGISTER AND
ZERO MISMATCH

FIGURE 2

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CYLINDRICAL GAGE
FIGURE 3



FLAT PLUG GAGE
FIGURE 4