Designation: E 602 – 03

Standard Test Method for
Sharp-Notch Tension Testing with Cylindrical Specimens[1]

This standard is issued under the fixed designation E 602; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method covers the determination of a comparative measure of the resistance of thick-section materials to fracture under plane-strain conditions originating from a very sharp stress-concentrator or crack (Note 1). The quantity determined is the sharp-notch strength of a specimen of particular dimensions, and this value depends upon these dimensions as well as the characteristics of the material. The sharp-notch strength-to-yield strength ratio is also determined.

NOTE 1—Direct measurements of the plane-strain fracture toughness may be made in accordance with Test Method E 399. Comparative measures of resistance to fracture for sheet and thin plate may be obtained in accordance with Test Method E 338.

1.2 This test method is restricted to sharp machine-notched specimens (notch tip radii less than or equal to 0.018 mm (0.0007 in.)), and applies only to those materials (for example, aluminum and magnesium alloys) in which such sharp notches can be reproducibly machined.

1.3 This test method is restricted to cylindrical specimens of two diameters as shown in Fig. 1. The 27.0-mm (1 1⁄16- in.) diameter specimen extends the range of application of this test method to higher toughness levels than could be accommodated by the 12.7-mm (0.5-in.) diameter specimen.

1.4 This test method is restricted to materials equal to or greater than 12.7 mm (0.5 in.) in thickness. Since the notch strength depends on the specimen diameter and, within certain limits, on the length, comparison of various material conditions must be based on tests of specimens having the same nominal diameter and a test section length sufficient to prevent significant interaction between the stress field of the specimen heads and that of the sharp notch (see Fig. 1).

1.5 The sharp-notch strength may depend strongly upon temperature within a certain range depending upon the characteristics of the material. This test method is suitable for tests at any appropriate temperature. However, comparisons of various material conditions must be based on tests conducted at the same temperature.

1.6 The values stated in SI (metric) units are to be regarded as the standard.

NOTE 2—Further information on background and need for this type of test is given in the Fourth Report of ASTM Committee E-24 **(1)**[2] on Fracture Testing, as well as other committee documents **(2, 3, 4)**.

1.7 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

B 557 Test Methods of Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products[3]
E 4 Practices for Force Verification of Testing Machines[4]
E 8 Test Methods for Tension Testing of Metallic Materials[4]
E 21 Test Methods for Elevated Temperature Tension Tests of Metallic Materials[4]
E 338 Test Method for Sharp-Notch Tension Testing of High-Strength Sheet Materials[4]
E 388 Test Method for Spectral Bandwidth and Wavelength Accuracy of Fluorescence Spectrometers[5]
E 399 Test Method for Plane-Strain Fracture Toughness of Metallic Materials[4]
E 602 Test Method for Sharp Notch Testing with Cylindrical Specimens[4]
E 1823 Terminology Relating to Fatigue and Fracture Testing[4]

3. Terminology

3.1 *Definitions:*

3.1.1 *crack strength*, σ_c [FL^{-2}]—the maximum value of the nominal (net-section) stress that a cracked specimen is capable of sustaining.

3.1.1.1 *Discussion*—See definition of nominal stress in Terminology E 1823.

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[1] This test method is under the jurisdiction of ASTM Committee E08 on Fatigue and Fracture and is the direct responsibility of Subcommittee E08.02 on Standards and Terminology.

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[2] The boldface numbers in parentheses refer to the list of references appended to the method.

[3] *Annual Book of ASTM Standards*, Vol 02.02.

[4] *Annual Book of ASTM Standards*, Vol 03.01.

[5] *Annual Book of ASTM Standards*, Vol 03.06.

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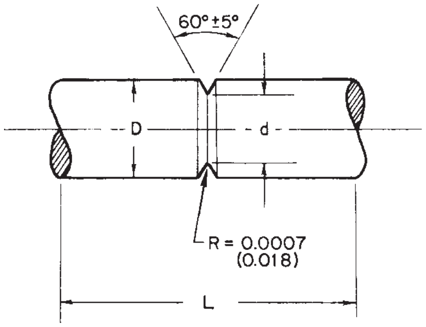


NOTE 1—Dimensions are in inches and (millimetres).
NOTE 2— d must be concentric with D within 0.025 mm (0.001 in.).

Nominal Size	D	d	L, minimum
½ in.	12.7 ± 0.13 (0.500± 0.005)	8.96 ± 0.13 (0.353± 0.005)	25.4 (1.00)
1¹⁄₁₆ in.	26.9 ± 0.13 (1.060± 0.005)	19.0 ± 0.13 (0.750± 0.005)	54.1 (2.13)

FIG. 1 Standard Test Sections

3.1.1.2 *Discussion*—Crack strength is calculated on the basis of the maximum force and the original minimum cross-sectional area (net cross section or ligament). Thus, it takes into account the original size of the crack, but ignores any crack extension which may occur during the test.

3.1.1.3 *Discussion*—Crack strength is analogous to the ultimate tensile strength, as it is based on the ratio of the maximum force to the minimum cross-sectional area of the specimen at the start of the test.

3.1.2 *nominal (net-section) stress*, σ_N [FL^{-2}]—*in fracture testing*, a measure of the stress on the net cross section calculated in a simplified manner and without taking into account stress gradients produced by geometric discontinuities such as holes, groove, fillets, etc.

3.1.2.1 *Discussion*—In tension specimens (tension only), the average stress is used: $\sigma_N = P/A$, where $A = B(W - a)$ for rectangulars, and $A = (\pi d^2)/4$ for circulars.

3.1.2.2 *Discussion*—In bend specimens (bending only), a fiber stress is used:

$$\sigma_n = \frac{6M}{B(W-a)^2} \tag{1}$$

3.1.2.3 *Discussion*—In compact specimens (tension and bending),

$$\sigma_N = \frac{2P(2W+a)}{B(W-a)^2} \tag{2}$$

3.1.2.4 *Discussion*—In C-shaped specimens (tension and bending),

$$\sigma_N = \frac{2P(3X+2W+a)}{B(W-a)^2} \tag{3}$$

In 3.1.2.1 to 3.1.2.4:
d = diameter of notched section of a circumferentially-notched specimen, m (or in.),
P = force, N (or lbf),
B = specimen thickness, m (or in.),
W = specimen width, m (or in.),
a = crack size (length of notch or notch plus precrack), m (or in.),
X = loading hole offset, m (or in.), and
M = bending moment, N·m (in.·lbf), and the result, σ_N, is given in Pa (or psi). See Test Method E 399 for further explanations of symbols.

3.1.3 *sharp-notch strength,* σ_s [FL^{-2}]—the maximum nominal (net-section) stress that a sharply notched specimen is capable of sustaining.

3.1.3.1 *Discussion*—See definition of nominal (net-section) stress.

3.1.3.2 *Discussion*—Values of sharp-notch strength may depend on notch and specimen configuration as these affect the net cross section and the elastic stress concentration.

3.1.3.3 *Discussion*—The tensile specimens used in Test Methods E 388 and E 602 have notch root radii that approach the limit of machining capability. For these specimens, the radius is believed to be small enough that any smaller radius that is obtainable by standard machining methods would not produce changes, in notch strength, that are significant from an engineering viewpoint.

4. Significance and Use

4.1 The sharp notch-to-yield strength ratio provides a comparative measure of resistance to plane-strain fracture originating from cracks or crack-like discontinuities. However, at sufficiently high values, the notch-to-yield strength ratio progressively loses sensitivity to changes in plane-strain fracture toughness. Available data indicate that useful sensitivity is maintained up to a value of about 1.3. At a given level of toughness the notch-strength ratio decreases with an increase in notch specimen size. Therefore, when the notch-to-yield strength ratio of the 12.7-mm (0.5-in.) diameter specimen exceeds 1.3, the 27.0-mm (1 ¹⁄₁₆-in.) diameter specimen is recommended. The sharp notch-to-yield strength ratio is not intended to provide an absolute measure of resistance to crack propagation which might be used in calculations of the strength of structures. However, it can serve the following purposes:

4.1.1 In research and development of materials, to study the effects of the variables of composition, processing, heat-treatment, etc.

4.1.2 In service evaluation, to compare the resistance to plane-strain fracture of a number of materials that are otherwise equally suitable for an application, or to eliminate materials when an arbitrary minimum acceptable sharp-notch strength can be established on the basis of service performance correlation, or some other adequate basis.

4.1.3 For specifications of acceptance and manufacturing quality control when there is a sound basis for establishing a minimum acceptable sharp-notch strength or ratio of sharp-notch strength to tensile yield strength. Detailed discussion of the basis for setting minimum values in a particular case is beyond the scope of this method.

4.2 The sharp-notch strength may vary with temperature. The temperature of the specimen during each test shall, therefore, be controlled and recorded. Tests shall be conducted throughout the range of expected service temperatures to ascertain the relation between notch strength and temperature.

Care shall be taken that the lowest and highest anticipated service temperatures are included.

4.3 Limited results suggest that the sharp-notch strengths of aluminum and magnesium alloys at room temperature **(5)** are not appreciably sensitive to rate of loading within the range of loading rates normally used in conventional tension tests. At elevated temperatures, rate effects may become important and investigations should be made to determine their magnitude and establish the necessary controls. Where very low or high rates of loading are expected in service, the effect of loading rate should be investigated using special procedures that are beyond the scope of this test method.

4.4 The sharp-notch strength is a fracture property and like other fracture properties will normally exhibit greater scatter than the conventional tensile or yield strength. In addition, the sharp-notch strength can be influenced by variations in the notch radius and by bending stresses introduced by eccentric loading. In order to establish a reasonable estimate of the average fracture properties it is recommended that replicate specimens be tested for each metal condition to be evaluated.

5. Apparatus

5.1 *Tension-Testing Machine* conforming to the requirements of Practices E 4.

5.2 *Loading Fixtures*—Any loading fixture may be used provided that it meets the requirements of Section 7 for percent bending. Axial alignment fixtures for threaded end specimens **(6)** have been designed which exceed these requirements. Tapered seat grips incorporating a quick operating feature have been proposed for testing smooth specimens **(7).** These have also been used in tests of sharply notched cylindrical specimens **(5).** It has been shown **(8)** that these grips can meet the bending requirements of Section 7 if loading rod aligners are used and if the component parts of the loading train are so positioned that bending introduced by one component is cancelled by that introduced by another.

NOTE 3—The apparent strength of sharply notched cylindrical specimens can be reduced by bending stresses resulting from displacement between a line normal to the center of the notch plane and the load line. These misalignments can arise from errors in machining the specimen but more frequently are associated with the relative fits and angular relationships between the mating parts of the loading train components including attachments to the tensile machine. Generally, these misalignments will vary in a random manner from test to test and thereby contribute to the scatter in the notch strength values. The effect of misalignment on the notch strength will depend on its magnitude and the toughness of the material with the toughest metal conditions showing the smallest effects. Misalignments can be reduced to negligible levels by proper design of the loading train components which incorporate devices to provide isolation from misalignments inherent in the tensile machine. To function effectively these components must be designed to close tolerances and precision machined so that very low bending stresses will be encountered regardless of the relative position of the various components of the loading train.

5.3 *Temperature-Control Systems*—For tests at other than room temperature, any suitable means may be used to heat or cool the specimen and to maintain a uniform temperature over the region that includes the notch. The ability of the equipment to provide a region of uniform temperature shall be established by measurements of the temperature directly on the specimen in the region of the notch. A temperature survey shall be conducted either at each temperature level at which tests are to be made, or at a series of temperature levels at intervals of 30°C (50°F) over the range of test temperatures. At least three thermocouples shall be utilized in making the survey, one in or at the notch and one at each end of the reduced section. The temperature shall be held within ±1.5 °C (±2.5 °F) during the course of the test. At the test temperature, the difference between the indicated temperatures at any of the three thermocouple positions shall not exceed 3°C (5°F).

NOTE 4—Use of liquefied gases as coolants for tests below room temperature is generally satisfactory, but the use of liquid baths for heating specimens shall be avoided unless it can be established that the liquid has no effect on the sharp-notch strength of the material.

5.3.1 *Calibrated Thermocouples*—Temperature shall be measured with calibrated thermocouples used in conjunction with potentiometers or millivoltmeters. Such measurements are subject to various errors and reference should be made to Test Method E 21 for a description of these errors. Thermocouple beads should be formed in accordance with the“ Preparation of Thermocouple Measuring Junctions,” which appears in the “Related Material” section of this publication. Base metal thermocouples used at elevated temperatures can be subject to errors on re-use unless the depth of immersion and the temperature gradients of the initial exposure are reproduced. These immersion effects should be very small at the temperatures of interest for the testing of aluminum and magnesium alloys. However, when thermocouples are re-used it is desirable to occasionally check them against new thermocouples. For further information on the use of thermocouples, see Ref **(9)**.

5.3.2 The temperature of the specimen during any test at other than room temperature shall be measured at one, or preferably more than one, position within the uniform temperature region during the test. The only exception to this would involve liquefied gases, where it is shown by a temperature survey that constant temperature can be maintained following an initial holding period. The thermocouples and measuring instruments shall be calibrated and shall be accurate to within ±1.5 °C (±2.5 °F).

5.3.3 The method of temperature measurement must be sufficiently sensitive and reliable to ensure that the temperature of the specimen is within the limits specified in 5.3.

5.3.4 The temperature-measuring apparatus should be calibrated periodically against standards traceable to the National Institute of Standards and Technology. An overall calibration accuracy of ±1½ °C (±2½ °F) of the nominal test temperature should be readily achieved.

5.3.5 It should be appreciated that the strength of some alloys will be altered by sufficiently long soaking periods at elevated temperature with or without force. For this reason, heating and soaking times should be considered in analyzing the results.

6. Test Specimens

6.1 The two recommended designs of notched test sections are shown in Fig. 1. The test section of the 12.7-mm (½-in.) diameter specimen shall have a minimum length, L = 25.4 mm

(1 in.). The test section of the 27.0-mm ($1\frac{1}{16}$-in.) diameter specimen shall have a minimum length, *L* = 55.0 mm (2⅛ in.).

6.2 *Specimen Heads*—The notched test sections may be forced through tapered heads **(5, 7, 8)** or threads **(6)** or any other type of fastening that will not exceed the maximum bending requirements of Section 7. Examples of typical specimens with tapered heads and threaded heads are shown in Fig. 2 and Fig. 3, respectively.

6.3 The sharpness of the machined notches is a critical feature of the specimen and special care is required to prepare them **(10)**. In particular, the final cuts shall be light and slow, to avoid the introduction of significant residual stresses. For each specimen, the notch-tip radius shall be measured prior to testing and any specimen that does not meet the 0.018-mm (0.0007-in.) limit in Fig. 1 shall be discarded or reworked. (See Section 8.)

6.4 Because it is necessary to minimize bending stresses during testing, particular care should be taken to machine the notched specimens with minimum run-out. Cylindrical surfaces and specimen heads shall be machined with an eccentricity with respect to the notch not exceeding 0.025 mm (0.001 in.). Normally the specimens will be machined between centers and where possible, all machining should be completed in the same setup. If this is not possible, the centers used in the first operation should be retained and care should be taken to keep them free from dirt or damage.

6.5 It is recommended that replicate specimens be tested for each distinct set of values of the controlled variables (material factors, thickness, and temperature; see 4.4).

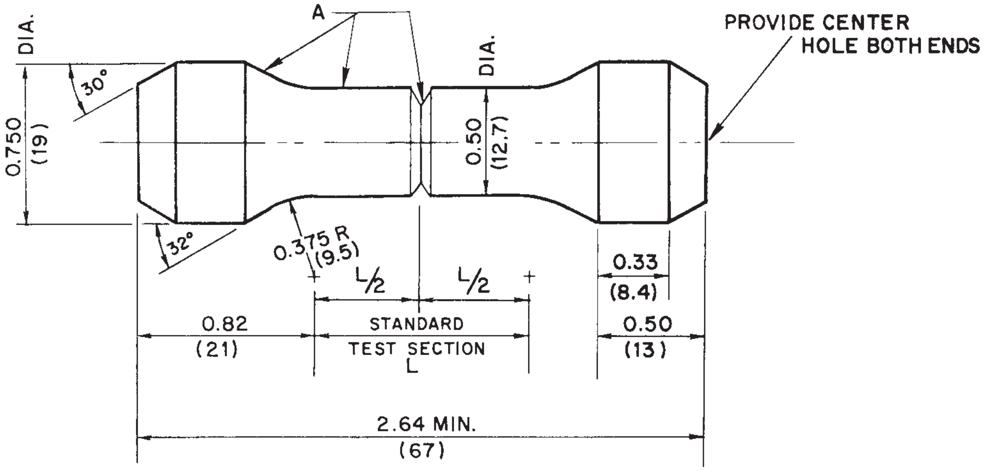
7. Verification

7.1 The purpose of the verification procedure is to demonstrate that the loading fixture can be used by the test operator in such a way as to consistently meet the limitation on percent bending specified in 7.3.1. Thus, the verification procedure should involve no more care in setup than will be used in the routine testing of the sharply notched cylindrical specimens. For example, if aligners are to be used in the notch tests, these devices should be employed in exactly the same way during the verification procedure. The bending stresses under tensile force shall be measured using the verification specimens of the design shown in Fig. 4. These measurements should be repeated whenever (*1*) the fixtures are installed in a different tensile machine, (*2*) a different operator is making the notch tests, or (*3*) damage is suspected. The verification specimen must be machined very carefully with attention to all tolerances and concentricity requirements. This specimen shall be carefully inspected with an optical comparator before strain gages are attached in order to ensure that these requirements are met. After the gages are applied, it will no longer be possible to meaningfully inspect the specimen, so care should be exercised in its handling and use.

7.2 The verification specimens shall be instrumented with four foil resistance strain gages mounted at 90° positions around the circumference of the specimen at the center of the length of the reduced section. These gages should be as narrow as possible to minimize strain averaging. Gages having a width of 0.25 mm (0.010 in.) and a length of about 2.5 mm (0.1 in.) are commercially available and have been used in this application **(6)**.

7.3 Details of the verification procedure and reduction of the strain gage data have been described **(6)** and the reader is referred to this information before proceeding with the measurements. For the present purposes two cases can be recognized: (*1*) a case in which the fixtures have been specially designed to provide low bending stresses and are expected to give satisfactory results without the use of any special precautions during their service life, and (*2*) a case in which the fixtures have been designed for some less rigorous application and are to be adapted to tests on sharply notched cylindrical specimens.

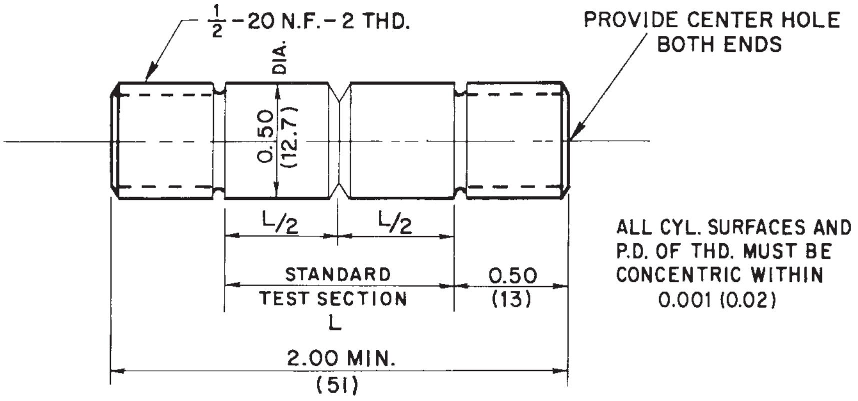
7.3.1 *Case 1*—Install the verification specimen in the upper portion of the loading fixtures and take zero readings on all four gages. Connect the lower fixtures and reference all rotatable components of the loading train in a common line. Load the assembly to produce 205-MPa (30-ksi) stress in the



NOTE 1—Dimensions are in inches and millimetres.

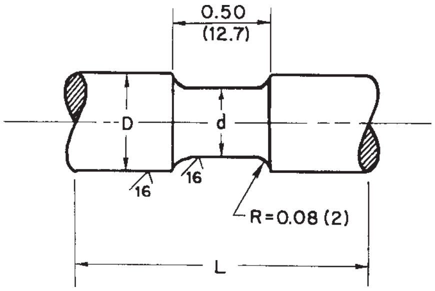
NOTE 2—*A* surfaces must be concentric with each other to within 0.025 mm (0.001 in.).

FIG. 2 Typical Tapered-Head Notched Tension Specimen



NOTE 1—Dimensions are in millimetres and (inches).

FIG. 3 Typical Threaded-End Notched Tension Specimen



NOTE 1—Dimensions are in inches and (millimetres).

NOTE 2—*D*, *d* and specimen heads must be concentric with each other within 0.025 mm (0.001 in.).

NOTE 3—All 0.000 dimensions ± 0.13 mm (0.005 in.).

NOTE 4—Total specimen length must not exceed the length of the shortest notched specimen.

Nominal Size, in.	*D*	*d*	*L*, maximum
½	12.7	8.96	38.1
	(0.500)	(0.353)	(1.50)
1¹⁄₁₆	26.9	19.0	66.8
	(1.060)	(0.750)	(2.63)

FIG. 4 Verification Specimens

reduced section of the verification specimen and record the readings of all four gages. Unload the specimen and rotate any selected component of the loading train (except the specimen) 90°, reload to the previous force, and record the readings of all four gages. Repeat this procedure, rotating the selected component in 90° increments in order to find the rotational position giving the highest percent bending. The component should remain in that position and the same procedure followed for the remaining components, one at a time, each being retained in the position giving the highest bending. If the bending is less than 10 % at all times, rotate each loading train component 360° so that the same rotational positions are maintained but different thread engagement is produced, and repeat the gage readings. If the bending is still less than 10 %, remove and reinstall the verification specimen three times, maintaining the same relationship between the components of the loading train. After the last installation, remove the lower portion of the loading fixtures and repeat the zero readings on all four gages. These should agree with the original zero readings within 0.5 µm (20 µin.). If the bending at all stages of the verification procedure is less than 10 %, the fixture and tensile machine combination can be assumed to be satisfactory for the testing of sharply notched cylindrical specimens with no attention being given to the relative rotational position of the components of the loading train. If the maximum bending is greater than 10 % at any stage of the verification procedure, the strain gage data should be examined to determine the misalignment contribution of the various components. A procedure for doing this has been described **(6)**. Based on the information obtained from this examination, the fixture should be reworked or treated as in Case 2.

7.3.2 *Case 2*—Proceed as in Case 1, except retain the component parts of the loading train in the positions giving minimum bending. If an arrangement cannot be found that yields less than 10 % bending, the fixtures should not be used for testing sharply notched cylindrical specimens. If an arrangement can be found that yields less than 10 % bending, the components should be marked in a common line to reference this position. Each component should then be rotated 360° and the strain gage readings repeated. If the maximum bending is still less than 10 %, the verification specimen should be removed and reinstalled three times with the strain gage readings repeated each time. If the bending remains below 10 %, the fixture may be used for testing sharply notched cylindrical specimens in accordance with this method. However, care shall be taken to always maintain the same relative rotational positions of the components of the loading train, and if for any reason the loading train is disassembled, the percent bending shall be redetermined.

7.4 The percent bending stress is defined as follows:

$$PBS = (\Delta\sigma_m / \sigma_o) \times 100$$

where:

$\Delta\sigma_m$ = difference between the maximum outer fiber stress and the average stress, σ_o, in the specimen.

7.4.1 The following relationships may be used to calculate percent bending:

$$PBS = [(\Delta g_{1,3})^2 + (\Delta g_{4,2})^2]^{1/2} \; 100/g_0$$

where:

$\Delta g_{1,3} = (g_1 - g_0) - (g_3 - g_0)/2 = (g_1 - g_3)/2,$
$\Delta g_{4,2} = (g_4 - g_0) - (g_2 - g_0)/2 = (g_4 - g_2)/2,$ and
$g_0 = g_1 + g_2 + g_3 + g_4 /4$

where:

g_1, g_2, g_3, and g_4 are the strain gage readings in microinches per inch, and compressive strains are considered to be negative.

7.4.2 The reliability of the gage readings may be checked by comparing the average readings of each pair of opposite gages; they should agree within 1 %.

7.5 For a satisfactory test setup, the percent bending stress, *PBS*, shall be no greater than 10 % at 205 MPa (30 ksi) average tensile stress.

8. Procedure

8.1 *Dimensions*—With the specimen mounted between centers, use an optical comparator with a magnification of at least 50 to determine the total run-out at the notched section, along the barrel and at the heads. If the specimen has threaded ends, run-out measurements should be made on the root diameter of the threads, following cleaning with a brush and acetone or a similar quick drying solvent. If the total run-out at any of these sections exceeds 0.05 mm (0.002 in.) the specimen should be rejected. Conformance to the notch radius specification can be determined on the comparator by matching the projected notch contour against circles of known radius. If, when rotating the specimen, the notch radius at any point exceeds 0.018 mm (0.0007 in.) the specimen should be rejected. **Warning—**It is necessary that the notch be free from dirt or fluids which could obscure the true contour at the root. Careful cleaning is essential. This may be accomplished by washing with acetone or a similar solvent to remove cutting oil and loose foreign matter. Following this washing, *dry* compressed air or a *clean dry* camel's hair brush, or both, can be used to remove the remaining foreign matter. The notch diameter *d* and the barrel diameter *D* can be measured on the comparator. Alternatively, the notch diameter can be measured with chisel micrometers provided the chisel is sharp enough to bottom in the notch and care is taken not to brinell the notch root. The barrel diameter may be measured with conventional micrometers. Reject specimens that do not meet the cylindrical dimension tolerances shown in Fig. 1.

8.2 *Testing*—Conduct the test in a manner similar to a conventional tension test except that no extensometer is required. Control the testing speed so that the maximum stress rate on the notched section does not exceed 690 MPa (100 ksi)/min at any stage of the test. Record the maximum force *P* reached during the test to the smallest increment of force that can be estimated.

9. Calculation

9.1 *Sharp-Notch Strength*—Calculate the sharp-notch strength as follows:

$$\sigma_s = 4P/\pi d^2$$

9.2 *Sharp-Notch Strength-to-Yield Strength Ratio*:

9.2.1 The ratio of the sharp-notch strength to the 0.2 % offset tensile yield strength (NSR) is of significance as a comparative index of plane-strain fracture toughness **(11)**. Prepare standard tension specimens from the same stock that was used to prepare the sharply notched cylindrical specimens. The orientation of these tension specimens with respect to the major deformation direction should be identical to the orientation of the notched specimens, and the location of the tension specimens in the stock should be as close as possible to that of the notched specimens. If heat treatment is involved, process the tension and the notched specimens together. Test the tension specimens in accordance with Test Methods E 8 and B 557.

9.2.2 For the purpose of calculating the sharp-notch strength-to-yield strength ratio at other than room temperature, the yield strength may be interpolated from values at temperatures not more than 50°C (100°F) above and below the temperature at which the sharp-notch test is performed.

10. Report

10.1 The report shall include the following information for each specimen tested:

10.1.1 Test section length (*l*),
10.1.2 Major diameter (*D*),
10.1.3 Original notch diameter (*d*),
10.1.4 Notch root radius (*r*),
10.1.5 Temperature,
10.1.6 Maximum force (*P*), and
10.1.7 Sharp-notch strength (σ_s).

10.2 The tensile ultimate and 0.2 % offset yield strength corresponding to each set of controlled variables used for the notch tests shall also be reported, along with the sharpnotch strength-to-yield strength ratio (*NSR*).

11. Precision and Bias

11.1 *Precision*—It is not practicable to specify the precision of the procedure in Test Method E 602 for measuring sharp-notch strength as the available data are not of a type that permits a meaningful analysis.

11.2 *Bias*—There is no accepted standard value for the sharp-notch strength of any material. In the absence of such a true value, no meaningful statement can be made concerning bias of data.

12. Keywords

12.1 aluminum alloys; crack strength; cylindrical specimen; magnesium alloys; sharp-notch strength; sharp-notch strength/yield strength ratio; sharp-notch tension test

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