FASTENERS & METALS INSTRUCTIONS

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General Instructions

Please review the following information before testing.

- Data entry forms are located on the CTS Portal (https://www.cts-portal.com/).
- The Sample Pack Code is located on the data entry forms to assist labs in matching the forms with the samples.
- Use the same instrument and procedure throughout a test. If the instrument fails during a test, contact CTS as soon as possible for instructions on how to proceed.
- Submit your results online on the Portal (https://www.cts-portal.com/) by the data due date. Late data may not be included in the final analysis and report.
- If the Portal is not feasible, results may be submitted by Fax or Mail of printed data entry forms.
- We suggest all test materials to be checked upon receipt. If any materials are missing, damaged or are not in good shape, please notify CTS and we will replace the samples. All requests for replacements must be received no later than two weeks before the data due date.

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DIMENSIONAL: OUTSIDE DIAMETER OF PLAIN PLUG GAGE

Analysis: 1001
Pack: PI

Properties Measured: Diameter of the samples.

Sample Information: The two samples are 2" long individual gage pins. The samples are made from Carbon Chrome alloy steel and heat treated to 60-62 Rockwell C hardness. Laboratories are cautioned that the specimens are NOT etched with the sample codes found on the data entry form. However, the carrier packaging tubes are labeled with samples codes. The laboratory will need to mark the specimens with the sample codes (Do not make any marks on measured surfaces).

Sample Preparation: The samples are ready to test; no sample preparation required.

Test Procedure: Follow your normal testing procedure. Make five determinations per sample. Do not measure closer than $\frac{1}{16}$" to the edges. Diameter measurements should be taken at different axial locations along the sample, with the specimen rotated between successive measurements. Use one instrument and one operator for all measurements. Measure both samples on the same day.

Expanded Uncertainty: Please also report the Expanded Uncertainty for your measurement, U, along with its associated Coverage Factor (*k*) and Coverage Probability in the spaces provided on your data entry form. The Expanded Uncertainty is the combined standard uncertainty, u_c, multiplied by a Coverage Factor, k. The Coverage Probability is the probability associated with the Coverage Factor used.

Expanded Uncertainty Equation:

$$U = u_c * k$$

Where:

u_c, Combined Standard Uncertainty (of your measurement)
k, Coverage Factor
U, Expanded Uncertainty

How to Report Data: For the purposes of this interlaboratory testing program, please report test results to the precision appropriate for your particular Expanded Uncertainty. Ensure that your Expanded Uncertainty is reported in the same unit as the test results.

CHARPY V-NOTCH

Analysis: 1003 (-30°C)
Analysis: 1004 (Room Temp.)
Pack: PU

Properties Measured: Absorbed Energy.

Sample Information: The specimens are NOT etched with the sample codes found on the data entry forms. Alphanumeric codes used by CTS are present on the specimens, but do not correspond to the sample codes. The laboratory must mark the specimens with the sample codes.

Sample Preparation: Each package contains two samples. Each sample includes three test specimens. Machine each specimen into a full-sized Charpy V-Notch test piece according to ASTM E23 or ISO 148.

Test Temperature: According to the test method, condition the samples immediately prior to testing at the appropriate temperature for the analysis:

- Analysis 1003: -30°C ± 1°C
- Analysis 1004: 20°C ± 5°C

Test Procedure: After preparing the samples, test them according to ASTM E23 or ISO 148. Use one instrument and one operator for all measurements. Measure both samples on the same day.

How to Report Data: Report the absorbed energy to the nearest whole number. (Joules is the default unit for this test.)

TENSILE PROPERTIES: LAB-MACHINED FLAT ALUMINUM SPECIMENS

Analysis: 1101-1103
Pack: PR

Test Method: ASTM B557. If you use a different test method that is comparable to B557, note this on the data entry form.

Properties Measured: Tensile Strength, Yield Strength, and Elongation. CTS does not require participants to report for all three properties. Elongation should be measured as elongation-after-fracture.

Sample Information: The two samples are 3" x 14" blanks. The specimens are NOT etched with the sample codes found on the data entry form. Alphanumeric codes used by CTS are present on the specimens, but do not correspond to the sample codes. The laboratory must mark the specimens with the sample codes.

Sample Preparation: Machine one tensile specimen from the center of each blank. The preferred specimen has a 2 inch gage length and 0.5 inch wide reduced section. Do not use sub-size specimens. See ASTM B557 for specimen diagrams.

Test Procedure: After preparing the samples, test them according to ASTM B557. Use one instrument and one operator for all measurements. Measure both samples on the same day. If you use a different test method that is comparable to B557, note this on the data entry form.

How to Report Data: For the purposes of this interlaboratory testing program, please report test results to the following precision:

Tensile Strength and Yield Strength: To nearest 0.1 ksi or 100 psi or 0.1 MPa

Elongation: Report the percentage increase to the nearest 0.1%. If equipment can only measure to nearest 0.5%, report the data and indicate this fact on the data entry form.

Verify that preselected units on the data entry form of the Portal are correct. If not, select and indicate one of the valid, listed units (***ksi*** is the default unit for tensile strength and yield strength values).

TENSILE PROPERTIES: PRE-MACHINED ROUND STEEL SPECIMENS

Analysis: 1111-1114
Pack: PA

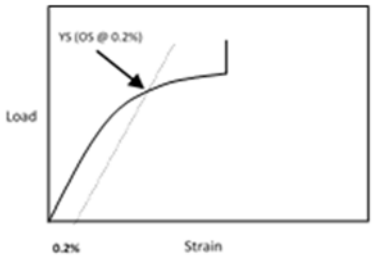
Test Method: ASTM E8. If you use a different test method that is comparable to E8, note this on the data entry forms.

Properties Measured: Tensile Strength, Yield Strength, Elongation, and Reduction of Area. CTS does not require participants to report for all four properties. Elongation should be measured as elongation-after-fracture.

Sample Information: The two samples are machined, R1 tensile specimens (5 inches long, 0.505 inch diameter, 3/4-10 UNC-2). The specimens are NOT etched with the sample codes found on the data entry forms. Alphanumeric codes used by CTS are present on the specimens, but do not correspond to the sample codes. The laboratory must mark the specimens with the sample codes.

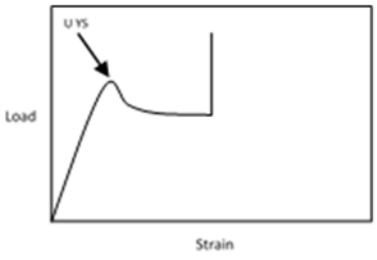
Special Requirements: *Determine the Yield Strength that is specified on your dataseet*. Follow the instructions in ASTM E8. The samples may exhibit continuous or discontinuous yielding. Determine the Yield Strength using the 0.2% Offset Method in the case of continuous yielding. If material undergoes discontinuous yielding, please report the Upper Yield Strength (UYS) for both samples if it is available. Use the Autographic Diagram Method or the Halt-of-Force Method (Drop-of-the-Beam). Please refer to ASTM E8 for definition of these terms.

Continuous Yielding



Report YS using 0.2% offset method.

Discontinuous Yielding



Report UYS, the first stress maximum at the onset of plastic deformation.

How to Report Data: For the purposes of this interlaboratory testing program, please report test results to the following precision:

Tensile Strength and Yield Strength: To nearest 0.1 ksi or 100 psi or 0.1 MPa

Elongation and Reduction of Area: Report the percentage increase to the nearest 0.1%. If equipment can only measure to nearest 0.5%, report the data and indicate this fact on the data entry form.

Verify that preselected units on the data entry form of the Portal are correct. If not, select and indicate one of the valid, listed units (***ksi*** is the default unit for tensile strength and yield strength values).

TENSILE PROPERTIES: LAB-MACHINED ROUND STEEL SPECIMENS

Analysis: 1121-1124
Pack: PP

Test Method: ASTM E8. If you use a different test method that is comparable to E8, note this on the data entry forms.

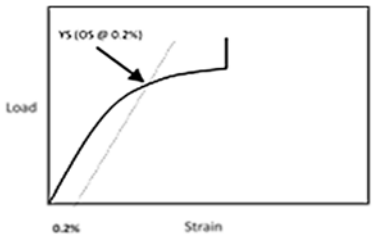
Properties Measured: Tensile Strength, Yield Strength, Elongation, and Reduction of Area. CTS does not require participants to report for all four properties. Elongation should be measured as elongation-after-fracture.

Sample Information: The specimens are NOT etched with the sample codes found on the data entry forms. Alphanumeric codes used by CTS are present on the specimens, but do not correspond to the sample codes. The laboratory must mark the specimens with the sample codes.

Sample Preparation: It is first necessary to machine a tension specimen from each of the two bars. Refer to ASTM E8 for diagrams of appropriate specimens. The preferred specimen is 0.5 inches in diameter with a 2 inch gage length.

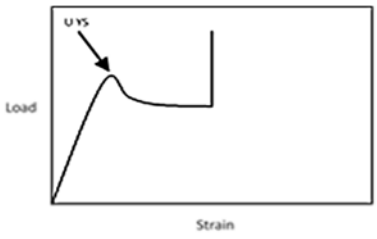
Special Requirements: Determine the Yield Strength that is specified on your dataseet. Follow the instructions in ASTM E8. The samples may exhibit continuous or discontinuous yielding. Determine the Yield Strength using the 0.2% Offset Method in the case of continuous yielding. If material undergoes discontinuous yielding, please report the Upper Yield Strength (UYS) for both samples if it is available. Use the Autographic Diagram Method or the Halt-of-Force Method (Drop-of-the-Beam). Please refer to ASTM E8 for definition of these terms.

Continuous Yielding



Report YS using 0.2% offset method.

Discontinuous Yielding



Report UYS, the first stress maximum at the onset of plastic deformation.

How to Report Data: For the purposes of this interlaboratory testing program, please report test results to the following precision:

- Tensile Strength and Yield Strength - To nearest 0.1 ksi or 100 psi or 0.1 MPa
- Elongation and Reduction of Area - Report the percentage increase to the nearest 0.1%. If equipment can only measure to nearest 0.5%, report the data and indicate this fact on the data entry form.

Verify that preselected units on the data entry form of the Portal are correct. If not, select and indicate one of the valid, listed units (***ksi*** *is the default unit for tensile strength and yield strength values*).

TENSILE PROPERTIES: LAB-MACHINED FLAT STEEL SPECIMENS

Analysis: 1131-1135
Pack: PF

Test Method: ASTM E8, E517, & E646. If you use a different but comparable test method, note this on the data entry forms.

Properties Measured: Tensile Strength, Yield Strength, Elongation, Strain Ratio (r-Value), & Strain Hardening Exponent (n-Value). CTS does not require participants to report for all five properties. Elongation should be measured as elongation-after-fracture.

Sample Information: The two samples are 3" x 14" blanks. The specimens are NOT etched with the sample codes found on the data entry forms. Alphanumeric codes used by CTS are present on the specimens, but do not correspond to the sample codes. The laboratory must mark the specimens with the sample codes.

Sample Preparation: Machine one tensile specimen from the center of each blank. The preferred specimen has a 2 inch gage length and 0.5 inch wide reduced section. Do not use sub-size specimens. See ASTM E8 for specimen diagrams.

Test Method: After preparing the samples, test them according to ASTM E8. Determine the Yield Strength using the 0.2% Offset Method. Determine r-Value using the “Automatic” method described in ASTM E517. Use one instrument and one operator for all measurements. Measure both samples on the same day.

How to Report Data: For the purposes of this interlaboratory testing program, please report test results to the following precision:

Tensile Strength and Yield Strength: To nearest 0.1 ksi or 100 psi or 0.1 MPa

Elongation:	Report the percentage increase to the nearest 0.1%. If equipment can only measure to nearest 0.5%, report the data and indicate this fact on the data entry form.	
r-Value:	To nearest 0.01	Report at 17% Strain
n-Value:	To nearest 0.001	Report at 10%-20% Strain Range

Verify that preselected units on the data entry form of the Portal are correct. If not, select and indicate one of the valid, listed units (***ksi*** *is the default unit for tensile strength and yield strength values*).

FASTENER WEDGE TENSILE (10˚) - INCH SIZE

Analysis: 1201
Pack: PX

Test Method: ASTM F606

Properties Measured: Wedge tensile strength using a 10 degree wedge.

- **Report** tensile strength; **do not report proof load values!** See the stress area calculation in ASTM F606.

Sample Information: Each sample contains four fasteners made from low alloy steel. Ignore head markings. The markings are for CTS use only and do not correlate with the sample codes.

Sample Preparation: Label each fastener with the sample codes found on the outside of the envelopes. Do not mix the two samples.

Test Procedure: Leave six threads exposed on the fastener between the grips. Measure the wedge tensile strength of three fasteners from each sample. The fourth fastener may be used for instrument setup or retest. Use one instrument and one operator for all measurements. Measure both samples on the same day.

How to Report Data: For the purposes of this interlaboratory testing program, please report test results to the following precision:

Wedge Tensile Strength - To nearest 0.1 ksi or 100 psi or 0.1 MPa

Verify that preselected units on the data entry form of the Portal are correct. If not, select and indicate one of the valid, listed units (***ksi*** is the default unit for tensile strength and yield strength values).

FASTENER AXIAL TENSILE - INCH SIZE

Analysis: 1202
Pack: PQ

Test Method: ASTM F606

Properties Measured: Axial tensile strength.

- **Report** tensile strength; **do not report proof load values!** See the stress area calculation in ASTM F606.

Sample Information: Each sample contains four fasteners made from low alloy steel. Ignore head markings. The markings are for CTS use only and do not correlate with the sample codes.

Sample Preparation: Label each fastener with the sample codes found on the outside of the envelopes. Do not mix the two samples.

Test Procedure: Leave six threads exposed on the fastener between the grips. Measure the axial tensile strength of three fasteners from each sample. The fourth fastener may be used for instrument setup or retest. Use one instrument and one operator for all measurements. Measure both samples on the same day.

How to Report Data: For the purposes of this interlaboratory testing program, please report test results to the following precision:

Axial Tensile Strength - To nearest 0.1 ksi or 100 psi or 0.1 MPa

Verify that preselected units on the data entry form of the Portal are correct. If not, select and indicate one of the valid, listed units (***ksi*** is the default unit for tensile strength and yield strength values).

FASTENER WEDGE TENSILE (10˚) - METRIC

Analysis: 1203
Pack: PB

Test Method: ASTM F606M

Properties Measured: Wedge tensile strength using a 10 degree wedge.
Do not report load values!

Sample Information: Each sample contains four fasteners made from low alloy steel. Ignore head markings. The markings are for CTS use only and do not correlate with the sample codes.

Sample Preparation: Label each fastener with the sample codes found on the outside of the envelopes. Do not mix the two samples.

Test Procedure: Leave six threads exposed on the fastener between the grips. Measure the wedge tensile strength of three fasteners from each sample. The fourth fastener may be used for instrument setup or retest. Use one instrument and one operator for all measurements. Measure both samples on the same day.

How to Report Data: For the purposes of this interlaboratory testing program, please report test results to the following precision:

Wedge Tensile Strength - To nearest 1 MPa

Verify that preselected units on the data entry form of the Portal are correct. If not, select and indicate one of the valid, listed units (***MPa*** *is the default unit for tensile strength and yield strength values*).

FASTENER AXIAL TENSILE - METRIC

Analysis: 1204
Pack: PT

Test Method: ASTM F606M

Properties Measured: Axial tensile strength. Do not report load values!

Sample Information: Each sample contains four fasteners made from low alloy steel. Ignore head markings. The markings are for CTS use only and do not correlate with the sample codes.

Sample Preparation: Label each fastener with the sample codes found on the outside of the envelopes. Do not mix the two samples.

Test Procedure: Leave six threads exposed on the fastener between the grips. Measure the axial tensile strength of three fasteners from each sample. The fourth fastener may be used for instrument setup or retest. Use one instrument and one operator for all measurements. Measure both samples on the same day.

How to Report Data: For the purposes of this interlaboratory testing program, please report test results to the following precision:

Axial Tensile Strength - To nearest 1 MPa

Verify that preselected units on the data entry form of the Portal are correct. If not, select and indicate one of the valid, listed units (***MPa*** *is the default unit for tensile strength and yield strength values*).

ROCKWELL HARDNESS: EXTERNALLY THREADED FASTENERS

Analysis: 1210
Pack: PG

Test Method: ASTM F606/F606M & ASTM E18

Properties Measured: Rockwell hardness C scale.

Sample Information: Each sample contains five fasteners made from low alloy steel. Ignore head markings. The markings are for CTS use only and do not correlate with the sample codes.

Sample Preparation: Label each fastener with the sample codes found on the outside of the envelopes. Do not mix the two samples.

Test Procedure: Test four fasteners from each sample. The fifth fastener may be used for retest if needed. Cut each fastener approximately one diameter from the point end. Use the same cutting procedure for all fasteners. After sectioning a fastener there are two pieces; the shank/head piece and the smaller point piece. The point piece is the preferred location for measurements. Take four mid-radius readings approximately 90˚ apart on each fastener. A diagram for sample preparation can be found in ASTM F606/F606M. Use one instrument and one operator for all measurements. Measure both samples on the same day.

How to Report Data: Report the values up to the first decimal place. If your instrument only determines hardness values to the whole number, report these values.

VICKERS HARDNESS: EXTERNALLY THREADED FASTENERS

Analysis: 1211
Pack: PV

Test Method: ASTM E92

Properties Measured: Vickers hardness

Sample Information: Each sample contains five fasteners made from low alloy steel. Ignore head markings. The markings are for CTS use only and do not correlate with the sample codes.

Sample Preparation: Label each fastener with the sample codes found on the outside of the envelopes. Do not mix the two samples.

Test Procedure: Test four fasteners from each sample. The fifth fastener may be used for retest if needed. Cut each fastener approximately one diameter from the point end. Use the same cutting procedure for all fasteners. After sectioning a fastener there are two pieces; the shank/head piece and the smaller point piece. The point piece is the preferred location for measurements. Take four mid-radius readings approximately 90˚ apart on each fastener using a test force of 20 kgf. Use one instrument, test force, and operator for all measurements. Measure both samples on the same day. If your instrument is not capable of applying a test force of 20 kgf, use 10 kgf.

How to Report Data: Report the values to the nearest whole number.

If a test force other than 20 kgf was used, record the test force in the space marked “Variations from specified procedure.”

FASTENER DOUBLE SHEAR

Analysis: 1220
Pack: PZ

Test Method: NASM 1312-13. If you use a different test method that is comparable to NASM 1312-13, note this on the data entry forms.

Properties Measured: Individual Ultimate Load.

Sample Information: Each sample contains four fasteners made from low alloy steel. Ignore head markings. The markings do not correlate with the sample codes.

Sample Preparation: Label each fastener with the sample codes found on the outside of the envelopes. Do not mix the two samples.

Test Procedure: For this test please apply your load at a uniform rate of 22,000lb/min. Test three fasteners from each sample. The 4th fastener may be used for instrument setup or retest if needed. Use one instrument and one operator for all measurements. Measure both samples on the same day.

How to Report Data: Report load values to the whole number. (***Lb*** *is the default unit for this test*)

ROCKWELL HARDNESS (B Scale)

Analysis: 1301 & 1302
Pack: PN

Test Method: ASTM E18

Properties Measured: Rockwell hardness B scale.

Sample Information: Each sample is a hardness test block manufactured from brass or steel and heat treated to specified hardness levels.

Sample Preparation: The samples are ready to test; do not refinish the samples.

Test Procedure: Use one instrument and one operator for all measurements. Measure both samples on the same day. Test the side of the sample that has been pre-tested.

How to Report Data: Report the values up to the first decimal place. If your instrument only determines hardness values to the whole number, report these values.

ROCKWELL HARDNESS (C Scale)

Analysis: 1301 & 1303
Pack: PE

Test Method: ASTM E18

Properties Measured: Rockwell hardness C scale.

Sample Information: Each sample is a hardness test block manufactured from steel and heat treated to specified hardness levels.

Sample Preparation: The samples are ready to test; do not refinish the samples.

Test Procedure: Use one instrument and one operator for all measurements. Measure both samples on the same day. Test the side of the sample that has been pre-tested.

How to Report Data: Report the values up to the first decimal place. If your instrument only determines hardness values to the whole number, report these values.

VICKERS HARDNESS 10 KGF

Analysis: 1311
Pack: PE

Test Method: ASTM E92 or ISO 6507-1

Properties Measured: Vickers Hardness at 10 kgf.

Sample Information: Each sample is a hardness test block manufactured from steel and heat treated to specified hardness levels.

Sample Preparation: Prepare the pretested surface of each block as necessary according to your normal procedures to ensure suitability for testing.

Test Procedure: Use one instrument and one operator for all measurements. Measure both samples on the same day. Test the side of the sample that has been pre-tested.

How to Report Data: Report the values to the nearest whole number.

MICROHARDNESS (HK500, HK200, & HV500)

Analysis: 1321-1323
Pack: PS

Test Method: ASTM E384

Properties Measured: Determine the microhardness of two samples using a Knoop indenter and/or a Vickers indenter. CTS does not require participants to report for all three indenter/load configurations.

Test Parameters: Participants may report data for one, two, or all three of the parameters listed below:

Knoop Indenter with a 500 gf test load
Knoop Indenter with a 200 gf test load
Vickers Indenter with a 500 gf test load

Sample Information: The hardness test blocks are made from plate tool steel and heat treated to specified hardness levels. Samples were pretested to assure homogeneity.

Sample Preparation: Prepare the pretested surface of each block using your normal sample preparation procedures. Remove enough material to ensure a flat, polished surface suitable for microhardness testing.

Test Procedure: Use one instrument and one operator for all measurements. Measure both samples on the same day. Test the side of the sample that has been pretested.

How to Report Data: Report Knoop and Vickers hardness values to the nearest ***whole number***. There is a separate data entry form for each indenter/load. Record the data on the correct form.

BRINELL HARDNESS (HBW Scale)

Analysis: 1341
Pack: PD

Test Method: ASTM E10

Properties Measured: Brinell hardness

Sample Information: Each sample is a hardness test block manufactured from steel and heat treated to specified hardness levels.

Sample Preparation: The samples are ready to test; do not refinish the samples.

Test Procedure: Test both samples using a 3000 kg load and a 10 mm diameter tungsten carbide ball. Apply the full test force for 10 to 15 seconds. Use one instrument and one operator for all measurements. Measure both samples on the same day. Test the side of the sample that has been pretested.

How to Report Data: Report the values up to the first decimal place. If your instrument only determines hardness values to the whole number, report these values.

ROCKWELL SUPERFICIAL HARDNESS (30N Scale)

Analysis: 1351
Pack: PH

Test Method: ASTM E18

Properties Measured: Rockwell superficial hardness 30N scale.

Sample Information: Each sample is a hardness test block manufactured from steel and heat treated to specified hardness levels.

Sample Preparation: The samples are ready to test; do not refinish the samples.

Test Procedure: Use one instrument and one operator for all measurements. Measure both samples on the same day. Test the side of the sample that has been pre-tested.

How to Report Data: Report the values up to the first decimal place. If your instrument only determines hardness values to the whole number, report these values.

CASE DEPTH

Analysis: 1401-1402
Pack: PC

Test Method: SAE J423, J78. If you use a different test method that is comparable to J423, note this on the data entry forms.

Analysis 145: Total Case Depth – Use visual or chemical methods defined in SAE J423
Analysis 146: Effective Case Depth – Use mechanical method defined in SAE J423

Properties Measured: Total Case Depth, Effective Case Depth (The hardness criterion is 50 HRC). Participants may report data for only one or for both two properties. CTS does not require participants to report Case Depth Hardness.

Sample Information: The two 3/4” diameters, 1" long samples are made from AISI 8620 steel and have a carbonitrided case.

Sample Preparation: Prepare each specimen using your normal sample preparation procedure appropriate for a method you are using (visual, mechanical, chemical).

Test Method: After preparing the samples, test them according to SAE J423. Use one instrument and one operator for all measurements. Measure both samples on the same day. Please report the results of five (5) measurements for each sample. This is maximum number of replicates that will be accepted per sample. If you unable to make five measurements please report as many as you can.

How to Report Data: For the purposes of this interlaboratory testing program, please report test results to the following precision:

Total Case Depth - To nearest 0.0001 in or 0.001 mm.
Effective Case Depth - To nearest 0.001 in or 0.01 mm.

If you are unable to report to the precision above, please report with the precision that is allowed by your instrument.

GRAIN SIZE

Analysis: 1411 – Stainless Steel Pack: PY
Analysis: 1412 – Inconel Pack: PJ

Test Method: Samples should be prepared as described in ASTM E3 and ASTM E407. Average Grain Size is determined using ASTM E112 or ASTM E1382 depending on your lab's normal testing procedure. If you use a different test method that is comparable to ASTM E112 or ASTM E1382, note this on the data entry forms.

Properties Measured: Average Grain Size using ASTM Grain Size Number, G.

Sample Information: The material information is listed on the data entry form.

Sample Preparation: Prepare each specimen using your normal sample preparation procedure.

Test Method: After preparing the samples, test them according to ASTM E112 or ASTM E1382 using your normal laboratory procedure. Use one instrument and one operator for all measurements. Measure both samples on the same day. Please report the results of five (5) measurements in five (5) random locations for each sample. This is the maximum number of determinations that will be accepted per sample. If you are unable to make five measurements please report as many as you can.

How to Report Data: For the purposes of this interlaboratory testing program, please report test results to the following precision:

Average Grain Size (using comparison method) - To nearest 0.5 G.

Average Grain Size (using automatic image analysis) – To nearest 0.1 G.

If you are unable to report to the precision above, please report with the precision that is allowed by your instrument.

ALPHA CASE DEPTH

Analysis: 1421 – Titanium
Pack: PW

Test Method: Samples should be prepared as described in ASTM E3 and ASTM E407. Determine the Alpha Case Depth in accordance with the approved method routinely used by the laboratory. Please note your test method on the data entry form.

Properties Measured: Alpha Case Depth

Sample Information: The material information is listed on the data entry form.

Sample Preparation: Prepare each specimen using your normal sample preparation procedure. Prepare the non-identified face of the specimen.

Test Method: After preparing the samples, test them according to your lab's approved testing method using your normal laboratory procedure. Use one instrument and one operator for all measurements. Measure both samples on the same day. Please report the results of five (5) measurements in five (5) random locations along the periphery of each sample. Report the average depth in each location. Five is the maximum number of determinations that will be accepted per sample. If you are unable to make five measurements please report as many as you can.

How to Report Data: For the purposes of this interlaboratory testing program, please report test results to the following precision:

Average Alpha Case Depth - To nearest 1 Micro-inch (µin)
To nearest 0.1 Micrometer (µm)

If you are unable to report to the precision above, please report with the precision that is allowed by your instrument.

ALLOY DEPLETION: INCONEL

Analysis: 1422 – Inconel
Pack: PK

Test Method: Samples should be prepared as described in ASTM E3 and ASTM E407. Determine the Alloy Depletion Depth in accordance with the approved method routinely used by the laboratory. Please note your test method on the data entry form.

Properties Measured: Alloy Depletion Depth

Sample Information: The material information is listed on the data entry form.

Sample Preparation: Prepare each specimen using your normal sample preparation procedure. Prepare the non-identified face of the specimen.

Test Method: After preparing the samples, test them according to your lab's approved testing method using your normal laboratory procedure. Use one instrument and one operator for all measurements. Measure both samples on the same day. Please report the results of five (5) measurements in five (5) random locations along the periphery of each sample. Report the average depth in each location. Five is the maximum number of determinations that will be accepted per sample. If you are unable to make five measurements please report as many as you can.

How to Report Data: For the purposes of this interlaboratory testing program, please report test results to the following precision:

Average Alloy Depletion Depth - To nearest 1 Micro-inch (µin)
To nearest 0.01 Micrometer (µm)

If you are unable to report to the precision above, please report with the precision that is allowed by your instrument.

CHEMICAL ANALYSIS

Analysis: 1500 – 1519 - NICKEL-BASED ALLOY	Pack: CJ
Analysis: 1520 – 1539 - TITANIUM-BASED ALLOY	Pack: CT
Analysis: 1540 – 1559 - ALUMINUM ALLOY	Pack: CA
Analysis: 1600 – 1639 - CARBON & LOW ALLOY STEEL	Pack: CL
Analysis: 1640 – 1679 - CORROSION RESISTANT STEEL	Pack: CM
Analysis: 1700 – 1719 - COPPER-BASED ALLOY	Pack: CK

Properties Measured: Determine the percentage of the elements listed on the data entry form. DO NOT report data for an element that your facility typically does not analyze or is outside of your calibrated range. CTS does not require participants to report for all elements.

Sample Information: The sample alloys are listed on the data entry forms. For the titanium-based alloy test, an additional thinner chemical disk is provided with the sample for the determination of the gas elements.

Test Parameters: Make three determinations per element, taking each measurement from a different area of the sample. IMPORTANT: Use the same test method for all determinations of a particular element in both samples!

How to Report Data: Data reported as “<“or “0.000" cannot be included in the report. Use the following guidelines to determine the maximum number of decimal places to be used when reporting data:

- If less than 0.05% of element is present, use up to 4 decimal places.
- If between 0.05% and 10% of element is present, use up to 3 decimal places.
- If greater than 10% of element is present, use up to 2 decimal places.

Special Requirements: Note the method used to perform testing by selecting the appropriate option from the drop-down menu on the data entry form.

IMPORTANT: Although a different method may be used for each element, the same method must be used for both samples. Both samples must be tested on the same day by one person.