Description: Crosshead Velocity Verification for Material Testing Systems

Reference Standard: ASTM E2658

Reference Documents: Calibration Kit Certificates of Calibration (All artifacts)

Equipment Necessary:
Starrett Calibration Kit containing the following items and with current and valid Certificates of Calibration traceable to NIST:

- Certified Clock
- Personal Computer with Load Calibration Worksheet (Excel Form)
- Mechanical Adapters: grip pins, clevis alignment spacers
- EXTECH Digital Thermometer and Humidity Indicator

Personnel: Individuals who have received authorized training by The L.S. Starrett Company on this Work Instruction are certified to perform this Work Instruction.

Procedure:

1.0 Starrett Material Test System "Warm-up".
System should warm-up for at least 15 MINUTES before carrying out your calibration.

1.1 Connect the Starrett loadcell to be calibrated to the Starrett Material Test Frame.

1.2 Place the Starrett loadcell in a horizontal position on top of the test frame's crosshead to compensate for zero offset.
DO NOT INSTALL LOADCELL TO THE CROSSHEAD.

1.3 Turn Material Test Frame to ON using the power On/Off switch located on the test frame's back panel.

1.4 Turn on the Starrett user interface device (tablet or all-in-one personal computer) that is used with this Starrett loadcell and material test
system.

1.5 Set the Material Test frame's jog switch speed to **NORMAL MODE**.

1.5.1 On tablet devices using Starrett L2 software, select the arrow icons displayed on the tablet. Select until the arrows are shown with a thin line denoting NORMAL SPEED mode.

1.5.2 On all-in-one personal computer devices using Starrett L2 Plus software, select the speed indicator icon in the upper tool bar until the pointer displays pointing to the right indicating NORMAL SPEED mode.

Procedure:

2.0 Lx System Settings Adjustments

Select Lx to setup SETTINGS prior to calibration.

IMPORTANT

It is recommended you use SI units for verification, e.g. Newtons (N) for load and millimeters (mm) for displacement/distance. However, if your customer prefers USA/Imperial units, e.g. pounds-force (lbf) for load and inches (in) for displacement/distance, make the necessary changes as required on your Lx System and your Calibration Worksheet.

2.1 Select the Lx icon to display the Main Settings dialog.

2.2 Select the SETTINGS icon.

2.3 Select the DISPLAY FORMATS target to launch the Display Formats settings options.

2.4 Verify and change if necessary your Display Formats Setting.
Display Format settings should be:
- Current inch/mm flag = mm
- Current load flag = N

Select DONE on your Lx software. This will take you to the main Settings view again.

Procedure:

3.0 Document your Verification setup on your Calibration Worksheet for Load per ASTM E2658.

3.1 Record Starrett Service Representative information onto Calibration Worksheet. Enter the following:
- Technician Name
- Service Date
- Service Time In

3.2 Record the Customer information for your calibration. Enter the following on to your Calibration Worksheet:
- Customer Name (Company)
- Customer PO Number
- Customer Address (Company)
- Customer Contact Name
- Customer Contact Phone
- Customer Contact Email

3.3 Record the Instrument information for your calibration. Enter the following on to your Calibration Worksheet:
- Starrett Loadcell being used Model No.

- Starrett Loadcell Serial No.
- Starrett Loadcell FS Capacity
- Starrett Loadcell Type (T, C or T/C)

- Starrett Test Frame Model No.
- Starrett Test Frame Serial No.
- Starrett Test Frame FS Capacity
- Starrett Test Frame FS Travel
- Starrett User Interface, specify interface is either a Tablet or an All-in-One (AIO) computer.
- Starrett Lx Type, specify the system as either an L2, L2 Plus, S2, or L3 system.
- Lx Software Revision Number

NOTE
Locate the Lx software revision level by selecting ABOUT at the main Settings page.

- Starrett Lx Firmware Revision Number

NOTE
Locate the Lx firmware revision level by selecting ABOUT at the main Settings view, the selecting the HARDWARE target.

3.4 Record the Test Conditions for the location where the calibration is being performed. Enter the following on to the Calibration Worksheet:
- Room Temperature

NOTE
Record the Room Temperature using the certified instrument supplied in your Calibration Kit.

- Room Humidity

NOTE
Record the Room Temperature using the certified instrument supplied in your Calibration Kit.

- Local Gravity

NOTE
Record the Room Temperature using the certified instrument supplied in your Calibration Kit.

- Excitation = 10V

NOTE
The Excitation Voltage for all Starrett loadcells and for the standard loadcells is 10V.

3.5 Enter the Traceability information for all standards and artifacts being used for your calibration.

IMPORTANT
All standards and artifacts must be the property of the L.S. Starrett Company and be a component within your Starrett Calibration Kit.

All standards and artifacts must be current, e.g. their calibration date must be within one year of the Last Calibration Date and before the Next Calibration Date.

Your Calibration Kit will included copies of the Certificate of Calibration traceable to NIST (or your local accrediting body). If these copies of the Certificate of Calibrations are not included in your Calibration Kit, contact Starrett Technical Support immediately for this information.

3.6 Enter the Verification Test Method and Standard being used for the calibration. The recommended standard is ASTM E2658, however, other recognized standards and methods that are identical or reciprocal to the ASTM standard may be used.

Enter the following on to your Calibration Worksheet:
- Test Method being used = ASTM (may differ in locations outside the USA)
- Standard = E2658 (may differ in locations outside the USA)

3.7 Enter Verification Identification of Artifacts/Standards used in this calibration. Each standard or artifact used must have the following information:
- Make (Manufacturer)
- Model Number (Manufacturer's Model Number)
- Cal Agency (the agency that calibrates this standard or artifact for the L.S. Starrett Company)
- Cal Date (the current Cal Date located on the Certificate of Calibration)
- Cal Due Date (the date when the standard or artifact is due for re-calibration and certification)
- Standard or Artifact Identification Number (ID is the serial number of the device located and recorded on its Calibration Certificate).
- Cal Units of Measure (what the units of measure are that the standard or artifact was calibrated with, if recorded).
- Standard or Artifact Resolution (identify the standard or artifacts resolution capability recorded on its Calibration Certificate).
- Accuracy of the Standard or Artifact as stated on the Certificate of Calibration.

Record the Verification Identification information for each of the following standards or artifacts that are possibly used for this Work Instruction:

- Standard Clock
- Standard Thermometer
- Standard Humidity Reader

Procedure:

4.0 Document the Velocity Verification Points

Enter the Velocity Verification points that are being used for the calibration on to the Calibration Worksheet.

4.1 Enter your Verification Points (in mm or your units used) into the four (4) columns on your Calibration Worksheet entitled “Indicated Speed”. Enter these Verification Points in the Calibration Worksheet for each of these sections:
- Verification Run 1
- Verification Run 2
- Verification Run 3

4.2 Enter your verification Units of Measure on to your Calibration Worksheet. Enter the units into the box entitled VELOCITY UNITS.

4.3 Enter your verification Direction (Ascending or Descending).

Procedure:

5.0 Measure Verification Points - VELOCITY

Perform the data acquisition of VELOCITY verification points as follows:

IMPORTANT

Velocity verification uses the Stop and Start Method of ASTM E2658. This method requires that a set of starting and stopping displacement and time readings be recorded from the displacement and time calibration device.

IMPORTANT

SAVE OFTEN!. When you are entering your Nominal and Observed results into the Calibration Worksheet, Save Often. If a computer crash occurs, the risk of losing your calibration data is minimized.

IMPORTANT

It is STRONGLY RECOMMENDED that you manually write down all Nominal and Observed calibration results. This ensures that you have a hard-copy backup.

5.1 You must perform three (3) Runs at each of your Indicated Speed points.

5.2 Zero your Lx System.

5.3 Create a test setup using a Go To Distance and at a velocity equal to your Indicated Speed Point #1. The Go To Distance should allow for a ramp-up to speed. For example, if your Indicated Speed Point = 1mm/min, you should set a Go To Distance of 10mm. Record the distance traveled and speed between 5mm and 6mm.

5.4 Record the following for each Indicated Speed Point:

- Distance Traveled
- Time using Clock

5.5 Record the corresponding Distance Traveled and Time on to the Calibration Worksheet.

5.6 Repeat for Indicated Speed Points #2, #3 and #4 and enter into the Calibration Worksheet.

Procedure:

6.0 Complete the Calibration Worksheet for All Verification Runs 1,2 and 3.

Make sure all Nominal and Observed measurements for Velocity, for all three (3) Runs, have been entered accurately into the
Calibration Worksheet.

6.1 Double verify all values entered into Verification Run 1, Verification Run 2 and Verification Run 3 for each Verification Point. The
Calibration Worksheet will automatically calculate the Error (N) and the Error (%).

Procedure:

7.0 Submit Calibration Worksheet to Starrett for Certificate of Verification Document for Customer.

In order for a Certificate of Verification to be prepared for your customer, you must save your Calibration Worksheet with data and
submit via email to L.S. Starrett.

The information on your Calibration Worksheet will be used to generate and print the Certificate of Verification for this test frame
for your customer.

The Certificate of Verification will be mailed to your customer contact within 48 hrs.

Starrett will retain the Calibration Worksheet for your customer and this verification service, and Starrett will retain a pdf of the
Certificate of Verification for this test frame. The pdf will be identified as an “Uncontrolled Document” using a watermark.

IMPORTANT

The Calibration Worksheet with data should be archived in a secure, password-protected area, e.g. server, cloud, etc. The Calibration Worksheet with data should be archived for three (3) years.