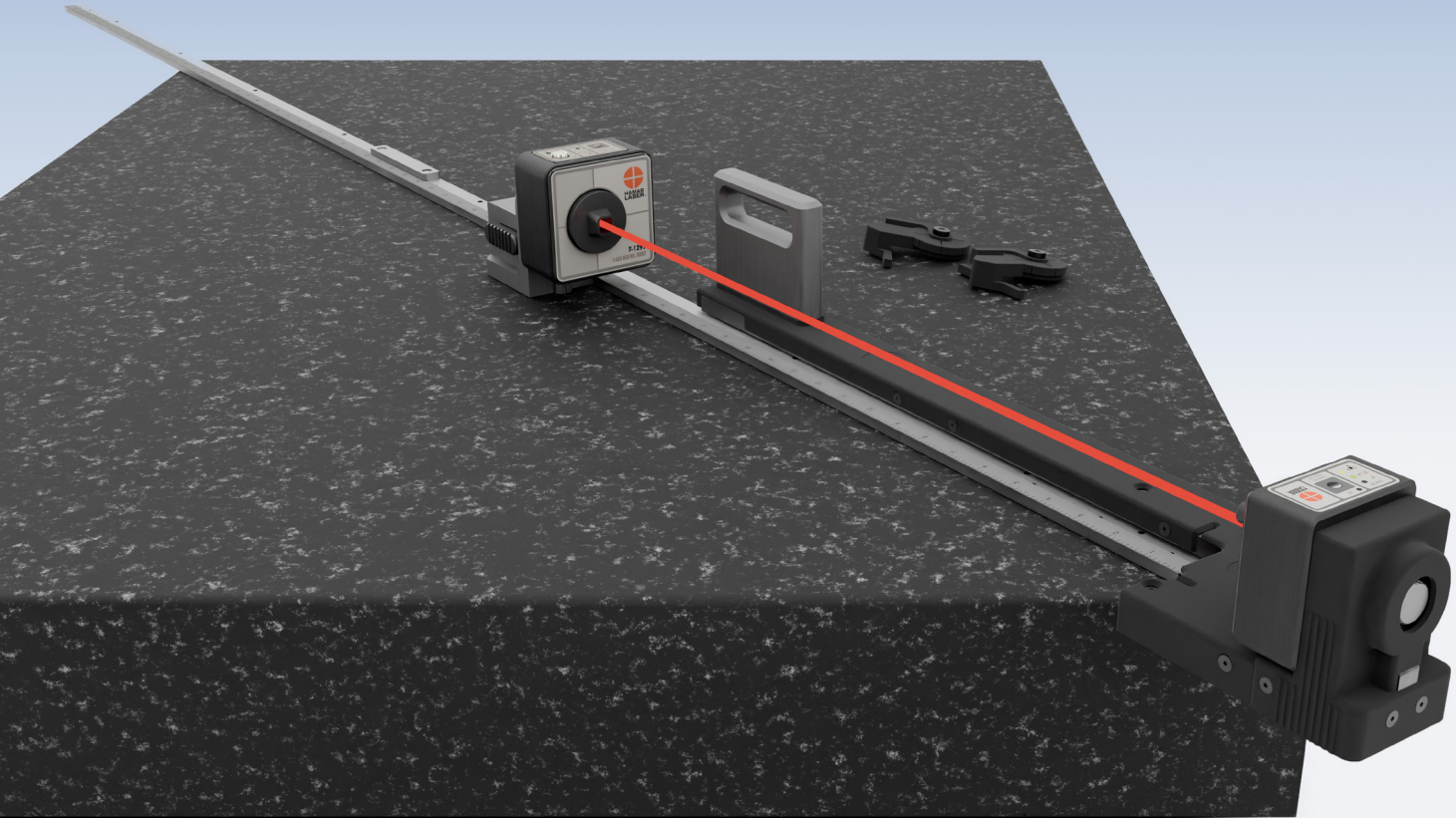


L-703SP Surface Plate Calibration System

A fast, highly repeatable
laser for calibrating
surface plates



- Geometry laser, not interferometer
- Fast setup that does not require the plate to be level
- 10 $\mu\text{in.}$ (0.25 μm) resolution, 2-axis super-linear PSD sensor
- $\pm 10 \mu\text{in.}$ ($\pm 0.25 \mu\text{m}$) mechanical repeatability
- Small, compact and light weight
- Built-in straight-edge ruler
- Lapping Line View™ for quick checks when resurfacing
- 30–40% faster than conventional methods
- Li-Ion rechargeable batteries for laser/target with 14+ hrs life
- Bluetooth wireless communication
- Patented surface plate calibration system

Surface Plate Flatness Calibration

Hamar Laser's patented 2-axis, L-703SP Surface Plate Calibration System is a powerful calibration tool that offers extremely high resolution and accuracy, easy setup and significant savings in time for data-collection.

The L-703SP utilizes a geometry laser and super-linear, 2-axis PSD with a resolution of to 10 $\mu\text{in.}$ (0.25 μm) and mechanical repeatability of $\pm 10 \mu\text{in.}$ ($\pm 0.25 \mu\text{m}$).

Applications include:

- Surface plate flatness calibration
- Surface vertical & horizontal straightness
- Axis vertical & horizontal straightness
- Guideway vertical & horizontal straightness



L-703SP Spindle and Straightness Laser

Geometry Laser, not Interferometer

The L-703S is a geometry laser and does not have any problems with breaking the laser beam like an interferometer has. This means faster setups and no do-overs if you break the beam.

Fast Setup

The laser and target fixtures are engineered to put the laser and PSD zero point on the same height from the surface, making the setup very fast. Just point the laser to zero and start taking data. We also designed the laser fixture to hold the setup when moving to another plate segment.

Laser 30-40% Faster Than Levels

It takes about 3-5 seconds to get a data point with the L-703SP, while electronic levels typically take 15-20 seconds per point. Taking into account line-segment setups, this means the L-703 is 30-40% faster than electronic levels and easier to use since the plate doesn't need to be level to get good readings.

3-Point Measuring Base Fits Any Line Length

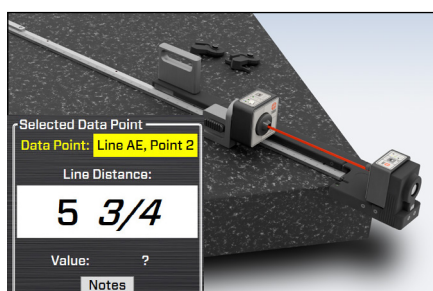
Our technique for measuring flatness does not use an angular measuring device, so we can accommodate nearly any measuring increment. The measuring pad is .38 in. (9.7 mm), which means measuring increments can be as little as .38 in. (9.7 mm).

High Mechanical Repeatability

The T-1297 Target and measuring fixture feature a $\pm 10 \mu\text{in.}$ ($\pm 0.25 \mu\text{m}$) mechanical repeatability to give you the confidence that the numbers are right the first time.

Kit Comes with a Set of Straight-Edge Rulers

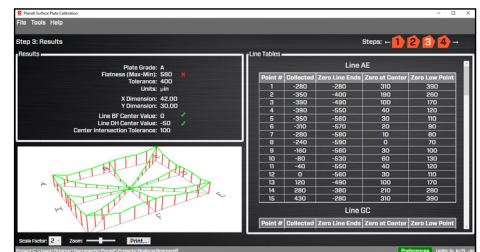
The system comes with a set of straight-edge rulers to easily see the measurement point along each line segment, so you don't need to measure and mark the points on the plate. Just set the straight edge down, roughly align it to the markers. Then Plane6 calculates the line distance for each point and displays it in the data taking screen.



Plane6 Step 2 - Line Distance

Plane6 Software

Easy to follow 3-step procedure is built into our Plane6 software to calibrate the plates. The standard surface-plate tolerance table is built into the setup screen for quick reference. Also the data-taking procedure is optimized to take the least amount of time. A full report with a color 3d graph can be emailed to the customer.



Plane6 - Step 3 Alignment Results

Utilizes Standard Windows PCs

Use any typical Windows laptop to run the software. No proprietary data display box is needed to use the system.

Key Features:

- Geometry laser, not interferometer
- Fast, easy setup – 30-40% faster than levels
- Resolution of 10 $\mu\text{in.}$ (0.25 μm).
- Super-linear PSD sensor with <0.25% linearity error
- Bluetooth wireless with 100 ft. (30 m) of range
- 3-point measuring base accommodates nearly any measuring increment
- Kit includes a set of straight-edge rulers for fast setups
- Also includes corner & midpoint straight-edge locating tools
- Plane6 Surface Plate Calibration Software corrects setup errors and quickly records data, producing calibration report with graph
- Plane6 software runs on most typical Windows® laptops/tablets
- Li-Po rechargeable batteries for laser/target with 14+ hrs life

L-703SP System Components

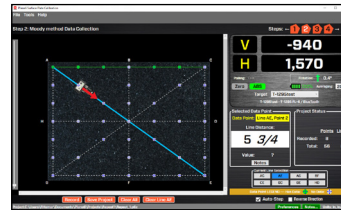
Small, Compact and Highly Accurate

The L-703S is a newly designed spindle and straightness laser for use in high-resolution straightness applications, such as surface plates, machine-tool guideways and spindle axes. The L-703SP System features wireless communication, newly designed software, extremely high resolution, excellent mechanical repeatability and easy setups.



L-703S Spindle and Straightness Laser

The L-703S's laser beam is centered to its mounting stud to within .0003 in. (0.0075 mm). It features pitch and yaw angular adjustments to accurately align the laser to a reference point. The operating range is up to 50 feet (15 m).



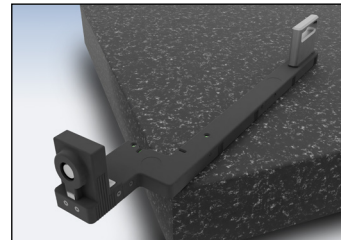
Plane6 Software

Plane6 is a Windows-based program that runs on any standard laptop or tablet. It features 3 main screens that guide you through the calibration. It also features real-time data and a 2-axis display, which warns you if the measurement point is off the line laterally.



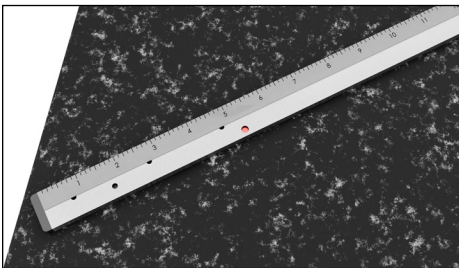
T-1297 3-Axis Wireless Straightness Target

The T-1297 3-Axis Wireless Straightness Target has a resolution of 10 μ m. (0.25 μ m). It features a 2-axis, super-linear PSD sensor, Bluetooth communication and a Li-Ion rechargeable battery with 14-hour battery life.



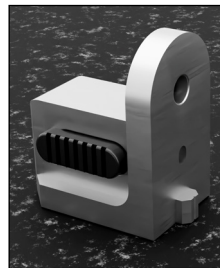
A-703SP-LM Laser Mounting Fixture

The A-703SP-LM is special fixture designed for surface plates to make the laser setup process go faster. It works with the L-703S Laser and A-703SP-SE-A/B/C/D Straight Edge & Scale, which gives the target a straight line to slide against when taking data.



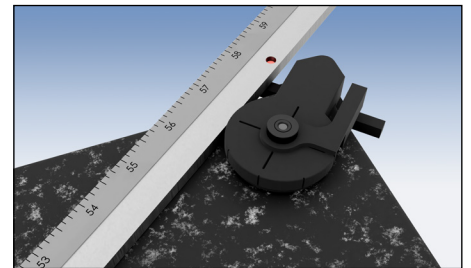
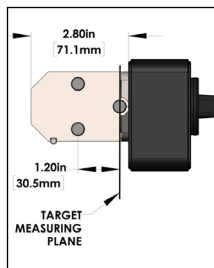
A-703SP-SE Straight Edge & Scale

The standard L-703SP kit comes with a set of 4 A-703SP-SE straight edges, with lengths from 18 to 72 in. (457-1,829 mm). Each straight-edge ruler has a measuring scale to locate the measurement points along a line segment without having to mark the plate. Plane6 automatically calculates and displays the dimension of each measurement point to speed up data taking.



A-1297-SP High-Accuracy Flatness-Measuring Base

The A-1297-SP has been designed for the T-1297 3-Axis Target to measure the flatness of surface plates to a very high degree of accuracy. It features .38 in. (9.5 mm) tooling buttons as the measuring feet. With the A-1297-SP, the T-1297 Target is mechanically repeatable to ± 10 μ m. (± 0.25 μ m).



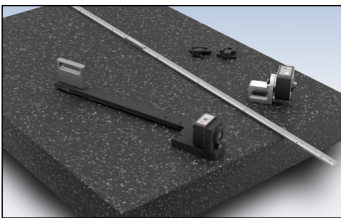
A-703SP-SE-CLT Corner & Midpoint, Straight-Edge Locating Tool

The L-703SP comes with a corner and mid-point locating tool to position the straight edges to the end points for each segment. No need to draw lines or mark your points. The straight edge does the work for you.

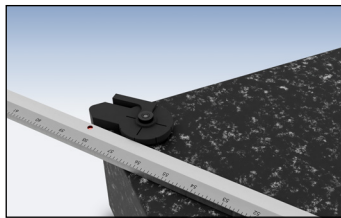
How It Works: Surface Plates

Quick, easy and designed to get the job done as fast as possible. The Plane6 software leads you right through it, so training is easy! Plunk the laser/fixture down on the plate, orient it to the line segment, tweak the laser to zero and start measuring. *It's that easy.*

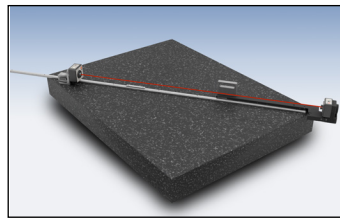
Surface Plate Calibration Procedure with the L-703SP



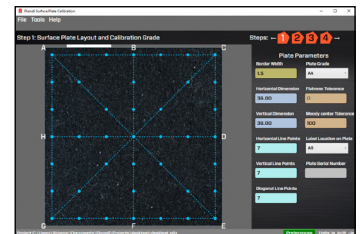
Step 1 - Assemble laser and targets to their fixtures.



Step 2 - Use corner and mid-point locating tool to set the straight-edge end points for each segment. No need to draw lines or mark your points. The straight edge does the work for you.



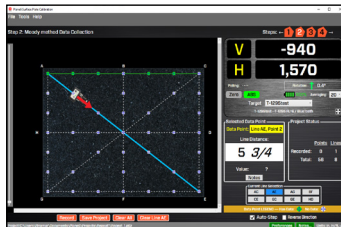
Step 3 - Orient laser fixture and straight edge to the end point marks. Open Plane6 and setup new project in Step 1.



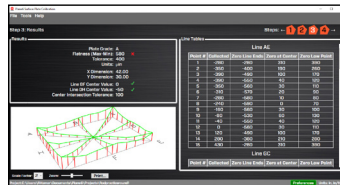
Step 4 - Pick the plate grade tolerance, border width, enter the line lengths, number of points for each line and the plate label location.



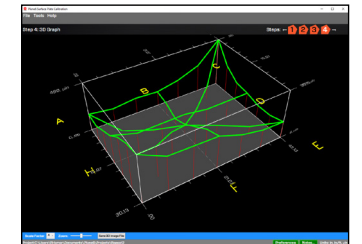
Step 5 - Turn on the T-1297 Target and go to Step 2, where it will connect to Plane6. Move the T-1297 to the far end of the straight edge and adjust the L-703SP's pitch/yaw angular knobs until the readout is within 5000 μm . (130 μm).



Step 6 - Start measuring the line segment. Plane6 shows a target icon on the current data point, what direction to move the target and automatically calculates the line dimension for the measurement point.



Step 7 - When done, go to Step 3 to review the results, which shows the overall flatness versus the grade tolerance, as well as the data tables used to calculate it. Also shows a Moody Method graph of the flatness.



Step 8 - Go to Step 4 for a 3D graph that you can manipulate to analyze the results. The graph can be zoomed, rotated and enhanced to see segment line flatness in greater detail.

Lapping Line View™

When it's time to resurface the plate, the L-703SP has a very useful feature, called the Lapping Line View™. To use this feature, you first find the line segment that has the highest error. Then you resurface the plate and use the Line View™ to check the flatness of the segment. It takes about 2 minutes to set up the laser to record data. After recording the data, Plane6 plots it against the original line data so you can see how much it improved. You can then upload the data back into the overall plate data and Plane6 will recalculate the flatness so you can see if it now passes calibration. You can record up to 5 sets of data for each line.



L-703S Spindle and Straightness Laser

Size	(See line drawings)
Weight	1.2 lbs. (0.5 kilograms)
Battery	3.6v LiPo rechargeable
Battery Life	20+ hours continuous use
Laser Concentricity to Mounting Stud	.0003 in. (0.0075 mm) - no adjustment
Angular Adj. Resolution	.00002 in/ft (1.6 µm/m)
Angular Adj. Range	±0.36° (±.075 in/ft. or ± 6.26 mm/m)
Operating Distance	up to 50 ft. (15 m) with standard laser. Longer distances available with L-703LD
Laser Type	Laser < 0.9 mW, BRH Class II
Wavelength	650 nanometers
Materials	Plastic housing, aluminum frame and 440 SS steel mounting stud with hardness of RC 54-60.
Laser Beam Modes	Continuous and double-blink mode (for ambient light correction). Supports T-1294/T-1295/T-1296/T-1297 Targets plus the T-261 (with R-358).

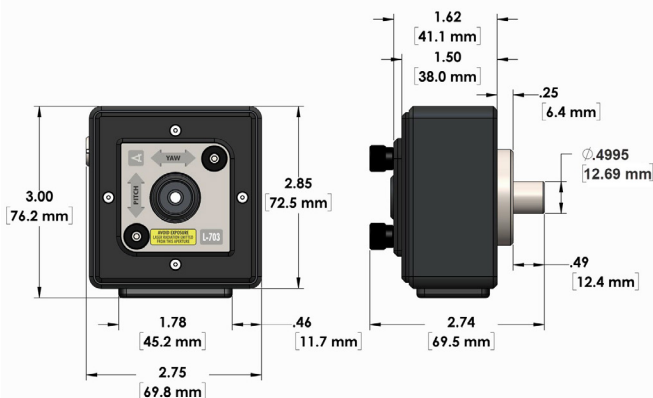
Laser and Target Mounting Fixtures

Fixture Material	440C Stainless Steel
Target Measuring Feet	.375 in. (9.5 mm) Tooling Buttons
Straight-Edge Lengths	18, 36, 54 and 72 inches (46 cm, 91 cm, 137 cm, 183 cm). Use A-703SP-SE-EXT extensions with 72-in. straight-edge to get up to 14 ft. (427 cm).
Dimensions	See drawings

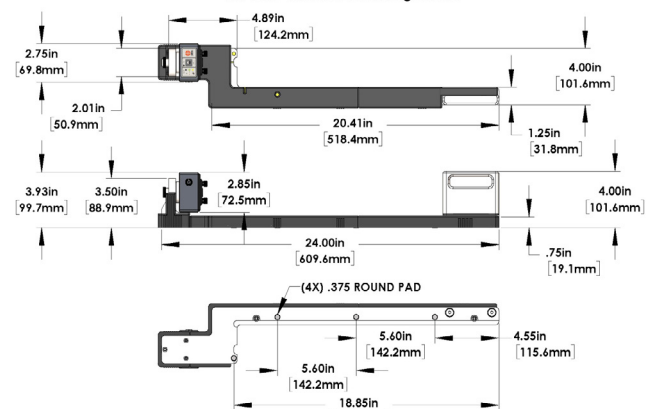
T-1297 3-Axis Target

Dimensions	3.23 x 3.23 x 1.8 in. (82 x 82 x 45 mm) – see more details below
Sensor	10 x 10 mm 2-Axis, Super-Linear PSD
PSD Resolution	Center Mode: .00001 in. (0.00025 mm) – 2 axis (X/Y) Scanning Mode (w/L-702SP): .00001 in. (0.00025 mm) – 1 axis
PSD Accuracy	Center: <0.25% of change in measurement
PSD Concentricity to Stud Mount	<.0003 (0.008 mm) - remaining errors removed by NORMIN procedure.
Measuring Range	Center: ±.12 in. (±3 mm)
Rotation Sensor Resolution	0.1 deg. Accuracy: ±1 deg.
Wireless Range	Bluetooth Class 1 with 100 ft. (30 m) communication range
Material	Plastic cover and aluminum frame
Mounting Stud	.4995 in. (12.687 mm) diameter. 440C stainless steel, RC54-58 hardness. Can be customized.
Weight	15 oz. (452 g)
Battery	LiPo rechargeable with 14 hours battery life. Target can be used while plugged in.
Ambient Light Protection	Blinking laser capability removes ambient light effect on accuracy. The light shield is for using target in Center Mode to reduce ambient light effects in bright light conditions.
Measurement Modes	2-Axis Center - supports L-702, L-702SP and L-703 beam lasers. 1-Axis Scanning - supports L-702SP, L-730/L-740 Series, and L-750 Scanning lasers for measuring flatness of axes, surfaces and guideways.

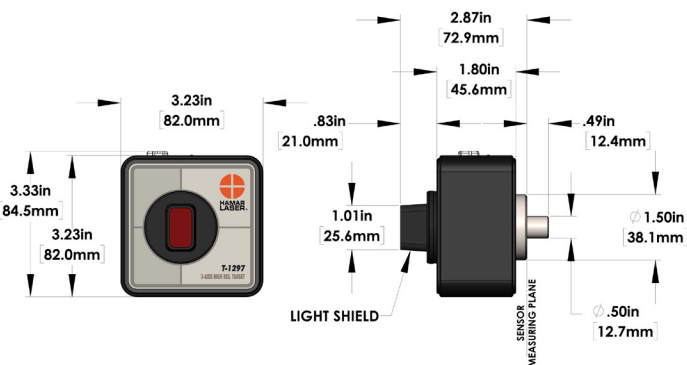
L-703S Spindle and Straightness Laser



A-703SP-LM Laser Mounting Fixture



T-1297 3-Axis Target



A-1297-SP Flatness-Measuring Base

