L-742 Ultra-Precision Dual-Scan®
Roll Alignment System

Aligning Parallelism of Rolls Has Never Been Faster

HAMAR LASER®
ALIGN WITH THE BEST
Today’s alignment lasers are better, faster and more accurate than any other method for aligning rolls and there is no better laser than our L-742 Ultra-Precision Dual-Scan® Roll Alignment System. The system is so easy to use and accurate that you can get the alignment done right the first time, saving significant costs in reduced downtime, scrapped product and quality problems.

**L-742 Up to 3X More Accurate than Optics**
With a target electronic resolution of .00002” (0.0005 mm), Hamar Laser’s L-742 Roll Alignment System is accurate to +/- .002” (0.06 mm) in 200’ (61 meters) under good atmospheric conditions, and that’s an honest +/- .002” that everyone can see, not what some optics tech says he “sees” in his scope. The L-742 alignment results are very repeatable from one operator to the next.

**2X Faster and 10X More Accurate than Other Laser Systems**
Continuously rotating laser planes with multiple wireless targets means the L-742 is 2 times faster than competitive lasers that use manually rotated lasers and penta-prisms to “bend” the beam. The parallelism accuracy is .000045 in/ft (0.0038 mm/m), which is 10 times more accurate than competitive systems that have up to .0005 in/ft (0.040 mm/m) parallelism error in their laser optics!

**Multiple Wireless Targets Speeds Alignments up to 70%**
The L-742 utilizes up to 5 A-1519-2.4ZB targets, with up to 150 feet (45 m) of range, to send their data to our R-1355-2.4 ZB IP67 Rugged PDA Readout. The R-1355 can display up to 5 targets simultaneously, reducing alignment times by up to 70% over optics or other alignment systems.

**Minimal Training, Less Manpower**
The L-742 is very similar to using optics but is much easier, so the required training is a lot less. And since the measuring is done at the target, the L-742 reduces alignment manpower because a second operator is not needed to look through the optical scope. Our R-1355 Wireless PDA Readout simultaneously displays both reference targets and the measuring target, allowing the user to quickly set up to the offset centerline reference benchmarks.

**100-Foot Vertical Range Reduces Setups**
The L-742 offers 2 automatically rotating laser planes with range of 100-foot (30.5 m) in radius, vertically and horizontally, which means rolls 100 feet (30.5 m) in the air can be measured without having to move the laser vertically. Few setups, faster alignments!
Measure More Rolls With Each Setup
By using a laser plane, the L-742 has the ability to measure multiple rolls from the same setup. Rolls up to 100 feet (30.5 m) above the laser can easily be measured!

Read9 Multi-Target Display Speeds up Laser Transfer
The setup process is easy and fast because our Read9 PDA Display program displays up to 5 wireless targets simultaneously, so when using the Laser Transfer Method, you simply look at the data for the 2 reference targets (usually #2 & #3) and adjust the laser until both numbers are the same. Then use the measuring target to measure the roll or rolls.

Flexibility to Use Reference Roll or Benchmarks
Normally, we recommend using a reference roll as the laser datum reference since cracks in the floor can seriously affect the position of the optical benchmarks and often result in poor alignments. However, the L-742 also offers the flexibility to use the T-1500 Floor Fixtures to pick up the benchmarks if required.

Tram Bar Measurement Method
For situations where it’s impossible to put the target on the side of the roll, we use the Tram Bar Method. Here you put a tram bar over the end of the shaft and put a target on it. Zero at 12:00 and measure at 6:00 to check roll levelness. Then zero at 3:00 and measure 9:00 to get the parallelism relative to the reference roll.

L-742 System Features
- Two continuously rotating laser planes with operational range of 100’ (30.5 m) in radius
- Laser planes flat to .00003”/ft (0.0025 mm/m)
- Using a reference roll, the measuring laser plane is parallel to roll datum to .000045 in/ft (0.0038 mm/m) at any location along the machine
- Split-Prism levels accurate to .00006 in/ft (0.005 mm/m)
- A-1519-2.4ZB Single-Axis Wireless Target with 1.3” (33 mm) PSD and .00002” (0.0005 mm) resolution
- R-1355-2.4ZB Wireless PDA displays up to 5 targets simultaneously
- Factory-built benchmark reference fixtures for easy laser transfers and referencing floor benchmarks
- L-106 X-Y Tripod Translation Slide to speed up laser transfers and target setup
- Typical setup time 15 minutes or less

Upgrade to L-743 Triple Scan® to Add Leveling
Add a third laser plane to the L-742, you get the L-743 Triple Scan® laser, which can add flatness, leveling, straightness and squareness to the roll alignment capabilities of the L-742.
HLI vs. the Competition

<table>
<thead>
<tr>
<th>Item</th>
<th>HLI L-742</th>
<th>European Systems</th>
<th>Optical Theodolites</th>
<th>Gyroscope System*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement</td>
<td>Dual Scan® Orthogonal</td>
<td>Manually Rotating Planes +</td>
<td>Optical Telescope +</td>
<td>High-Accuracy</td>
</tr>
<tr>
<td>Technology</td>
<td>Auto-Rotating Planes</td>
<td>Penta-Prism Optical Square</td>
<td>Optical Scale</td>
<td>Gyroscopes</td>
</tr>
<tr>
<td>Speed of Measurement</td>
<td>60-70% faster</td>
<td>30-35% faster</td>
<td>0% faster</td>
<td>60-70% faster</td>
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<tr>
<td>Ease of Use</td>
<td>Simple, easy setups</td>
<td>Complicated, long setups</td>
<td>Complicated, long setups</td>
<td>Easy to use but</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>complicated software</td>
</tr>
<tr>
<td>Auto Rotating</td>
<td>Yes, 2</td>
<td>No, manual rotation</td>
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<td>No</td>
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<tr>
<td>Laser Planes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auto Rotating</td>
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<td>Yes</td>
<td>Yes</td>
<td>No. Report only!</td>
</tr>
<tr>
<td>Auto Rotating</td>
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<td>Must use another</td>
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<td>Laser Planes</td>
<td>Flatness: .00003 in/ft (0.0025 mm/m)</td>
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<tr>
<td>&amp; Squareness</td>
<td>Squareness: .00018 in/ft (0.015 mm/m)</td>
<td>Las. Sqness: 0.01 mm/m</td>
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<td>align.</td>
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<td>Roll-to-Roll parallelism</td>
<td>.000045 in/ft (0.0038 mm/m)</td>
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<tr>
<td>measuring accuracy</td>
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<td>(Total accuracy: las. + penta)</td>
<td></td>
<td>Accuracy not</td>
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<tr>
<td>Penta Prism Step Error</td>
<td>+/-.0001 in. (-/0.0025 mm)</td>
<td>1.0 mm**</td>
<td>n/a</td>
<td>specified.</td>
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<tr>
<td>Tripods Required</td>
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<td>2</td>
<td>1</td>
<td>Resolution: 0.008</td>
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<tr>
<td>Resolution of</td>
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<td></td>
<td>mm/m</td>
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<tr>
<td>Measurement</td>
<td>.00002 in. (0.0005 mm)</td>
<td>.00004 in. (0.001 mm)</td>
<td>.0010 in. (0.025 mm)</td>
<td>.00005 in/ft</td>
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<td>Detector PSD Size</td>
<td>33x12 mm</td>
<td>20x20 mm</td>
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<td>(0.004 mm/m)</td>
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<tr>
<td>Operating Range</td>
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<td>Software Required?</td>
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<td></td>
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<tr>
<td>Manpower Required to Run System</td>
<td>1 optical technician</td>
<td>2 optical technicians</td>
<td>2 optical technicians</td>
<td>1 service engineer</td>
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</tbody>
</table>

* Gyroscopes not available for purchase. Service only. ** European systems do not calibrate Penta Prism centering, a source of large errors.

Parallelism Accuracy: HLI’s L-742 Dual Scan® Technology vs. The Competitor's Pentaprism

HLI’s Laser Transfer Method

When using HLI’s Laser-Transfer Method and a reference roll, the squareness between the L-742’s laser planes is effectively eliminated when moving the laser from section to section. This means the measuring laser plane is parallel to where it was upon the initial setup to within the combined flatness of the laser planes or .000045 in/ft (0.0038 mm/m)!

Competitor’s Pentaprism Method

When using the Pentaprism Method with a reference roll, after the Pentaprism is moved to another location along the machine, the laser beam at the second location will not be parallel to the laser at the reference roll by up to .0005 in/ft (0.040 mm/m). Not very good for 3-7 meter rolls! Furthermore, rotating the prism to reach an upper or lower roll could result in an additional error of up to .040” (1.0 mm).

1 0.0188 mm/m Plane Flatness/Squareness
2 0.015 mm/m Plane Squareness
3 (1) - (2) = 0.0038 mm/m Parallelism Error since Squareness Error Does Not Add in!
4 0.02 mm/m Beam Squareness/Flatness
5 0.02 mm/m Beam Squareness/Flatness
6 (4) + (5) = 0.040 mm/m Parallelism Error Between 2 Beams!
7 Additional Step Error of up to 1.0 mm
How L-742 Works for Roll Alignment

Here’s how the process works for using a reference roll as the laser datum to measure rolls for parallelism to the reference roll.

1. The L-742 is placed on the L-106 stand outside the machine near the reference roll at the side of the machine and leveled.

2. A-1519-2.4ZB Target #1 is placed on the reference roll horizontally at the closest point to laser, is leveled and zeroed in Read9 PDA software. Target #1 is then moved to the far end of the roll.

3. Laser Plane #1 (LP#1) is then “Bucked-in” or tilted until Target #1 reads zero at the far point. Target #1 is then moved back to the near point and re-zeroed and the process is repeated until the target reads zero at both locations.

4. The laser plane is now parallel to the reference roll.

5. Since the LP#2 is perpendicular to LP#1, LP#2 becomes the offset centerline of the mill. This offset centerline has a range of 100 feet (30.5 meters) on both sides of the laser.

6. Now we place Target #2 & #3, on floor fixtures at both ends of the machine and are adjusted until the laser hits the middle of the target windows. The targets are then zeroed, establishing the offset centerline, and are not touched during the remainder of the alignment.

7. To check the parallelism of a section of rolls, the L-742 and L-106 stand are moved along the offset centerline to the desired section and the laser is positioned so LP#1 is about 4-5” from the roll to be measured. The L-742 is then leveled.

8. Then the yaw adjustment on the laser base is adjusted to tilt LP#2 until both Target #2 & #3 show the same readings, which means LP#2 is now parallel to the offset centerline.

9. Now to measure one of the rolls for parallelism, Target #1 is placed horizontally on the roll closest to the laser and zeroed. It is then moved to the far end of the roll to measure the alignment. A +.025” reading means the far end of the roll is pointing to the right relative to the reference roll.

10. With targets producing live readings, the roll can then be adjusted until the target reads zero, which means the roll is aligned and parallel to the reference roll. Since the laser generates a plane, rolls up to 100 feet (30.5 m) in elevation in that section that are within 2 feet (610 mm) of the laser plane can be measured for parallelism without changing the setup of the laser.
L-742 Dual-Scan® Roll Alignment System

Weight
- Laser: 3 lbs. (1.3 kg)
- Base: 4.8 lbs. (2.2 kg)
- Battery Pack: 1 lb. (0.45 kg)

Material
- Laser: Aluminum and stainless steel
- Base: Aluminum

Laser Type
- Class II visible diode, 635 nM wavelength (class 1 in Scanning Mode);
- 0.160" (4.06 mm) beam diameter

Beam Power
- 0.9 mW per straight beam

Beam Stability
- .0001°/hr/°F (0.005 mm/hr/°C) translational
- 0.2 arc sec./hr/°F (0.36 arc sec./hr/°C) angular

Laser Plane Flatness
- 180/360° Sweep: 0.5 arc sec (.00003 in/ft or 0.0025 mm/m), plus translational error of ± .0001° (0.0025 mm)
- 90° Sweep: 0.25 arc sec (.00015 in/ft or 0.0013 mm/m) plus translational error of ± .00005° (0.00013 mm).

Beam/Plane
- Left-to-Back Plane squareness 3 arc secs (.00018 in/ft or 0.0025 mm/m);

Operating Range
- 100 feet (30.5 m) in radius

Operating Modes
- 2 beams or 1 or 2 continuously rotating laser planes in any combination, individually switched

Power Supply
- 9V DC external battery pack (4 cells) or 115V AC adapter

Power Draw
(See chart, below)

Coarse Adjustment
- Range: ± 3 degrees

Fine Adjustment
- Range: ± 0.3 degrees

Fine Adjustment Resolution
- .001" (0.025 mm) in 100 feet (30.5 meters)

A-1519 Wireless Target

Resolution
- .00002" (0.0005 mm)

Linearized Accuracy
- ±.00015" (±0.0038 mm) over ± 14 mm of PSD

Detector Size/Type
- 2-Axis PSD 1.3" x 0.51" (33x13 mm)

Operating Range
- 100 feet (30.5 m) from laser to target

Target Angle
- ± 10°

Acceptance Range

Battery Life
- 11.5 hours continuous duty

Operating Temperature
- 5° F to 140° F (-15° C to 60° C)

Power Supply
- 7.5-12vDC, 500mA

Size
- 2.00" W x 3.09" H x 4.14" D (50.8 mm x 78.5 mm x 105.2 mm)

Magnetic Base Weight
- 2.78 lb. (1.26 Kg)

* Wireless range may be limited by obstructions, antenna type and orientation. Outdoors line-of-sight range, with dipole antenna, may be greater.