One of the more time-consuming tasks in maintaining continuous-caster steel mills is setting the correct caster roll pass line. Unlike using optics that requires at least 2 operators, the L-740 only requires one operator, and since the laser automatically sweeps a reference plane, it is a very simple process to measure and set the heights of caster segment rolls. The heights can be set using precision inserts with our targets, as the tolerance of the centerline of the target to its base has been accurately controlled.

In addition, all the rolls of a segment can be checked from one setup. Furthermore, the laser can be set up between two segments and both of them can be checked at the same time from the same setup. The flatness of the laser plane is the most important factor in determining the overall accuracy of the system for measuring flatness. No one surpasses the flatness of our laser planes. In a 180º sweep, our L-740’s laser plane is flat to within ½ an arc second (.00003"/ft or 0.0025mm/M) and in a 90º sweep, the laser plane becomes even flatter to within ¼ of an arc second (.000015"/ft or 0.001 mm/M).

PSDs (Position Sensing Detectors) are one of the critical components of our laser alignment systems. It is this PSD that senses the laser beam and turns it into a digital signal. This greatly reduces the man-to-man variability found in optical measurements because sophisticated electronics determine the measurement rather than the human eye. By relying on the PSD to produce highly repeatable measurements, our L-740 makes it much easier to hand off an alignment project from one crew to the next.

The L-740 Ultra-Precision Leveling Laser for Continuous Caster Alignment

The L-740 Ultra-Precision Leveling System offers the fastest, most accurate way of setting the pass line elevations on caster segments. With wireless targets offering resolutions down to .00002" (0.0005 mm), automatically sweeping laser planes and high-powered alignment software, the L-740 is the ideal alignment tool for caster segment applications.

Wireless Targets and Readouts

Hamar Laser’s A-1519-2.4ZB and A-1520-2.4ZB Wireless Scan Targets have up to a 1” (25 mm) measuring range, resolutions as low as .00002” (0.0005 mm) and can be used up to 133 feet (40 meters) from the readout. These targets also have height gage measuring capabilities, making them perfect for most steel mill alignment applications. Multiple targets can be used at the same time, allowing the use of multiple work crews to speed alignments.
Continuously Sweeping Lasers and Live Data Reduces Downtime
Both continuously sweeping lasers and live data output create a powerful combination to align segments up to 70% faster than traditional methods. By providing live alignment data, misalignment errors can be quickly and easily fixed without having to change the setup. This is a tremendous benefit, especially if you are used to using an interferometer, where the entire length of and axis must be measured before the straightness or flatness can be determined and the data provided is not even live.

Laser Planes Have 200' Range
One of the most powerful features of the L-740 is the automatically rotating laser plane with a range of 100 feet (30.5 meters) in radius. That means even the largest segments (or several segments) can be checked with one setup.

Alignment System Features
- Continuously sweeping laser plane with operational range of 100' (30.5 meters) in radius.
- Diode lasers 2 times more stable than HeNe based laser systems.
- Laser plane is flat to ½ an arc second (.00003"/ft or 0.0025mm/M) in 180º sweep and 1/4 arc second (.000015"/ft or 0.001 mm/M) in 90º sweep.
- Includes Pitch/Roll/Yaw base with coarse and fine adjustments.
- Uses A-1519-2.4ZB Single-Axis Wireless Scan Target with 1" Range and .0001" (0.0025 mm) resolution for higher accuracy applications.
- Battery or AC powered.
- Backlit levels accurate to 1 arc second (.00006"/ft or 0.005mm/M).
- Typical setup time 20 minutes or less.
- Completely self-contained.

How the Alignment System Works

Setting Roll Pass Lines
Assuming the caster segment is level to Earth, the following method can be used for checking the elevation of the rolls (i.e., checking the pass line) of a caster segment.

1. Place the laser on an instrument stand so that the laser plane is approximately 6" higher than the highest elevation of the roll and level using the built-in level vials.
2. Place an A-1519-2.4ZB Single-Axis Scan Target on one end of the roll and find the Top Dead Center (see graphic, bottom right) value. Zero the display by pressing the Zero Button in Read9. If more than one target is going to be used for the measurements, then zero those targets on the same exact point as the first target.
3. After zeroing the A-1519-2.4ZB Target (or targets), place it on another roll or point on the same roll and again, find the TDC where the elevation relative to the first roll will be displayed. This is a very quick way of checking both the actual elevations and the parallelism of the rolls to each other. The A-1519-2.4ZB can detect up to 1.2" of elevation changes. Since the readings are live, the rolls can be adjusted to the correct elevation using the readout as a digital indicator.
If there are elevation changes greater than 1.2", the EXT mode in Read9 can be selected, which will add a pre-determined spacer length to the target value and display the actual reading from the base of the target to where the laser beam hits. Precision spacers, either provided by Hamar or the user, are used to span the distance from the roll or other surface to the laser plane.

If the segment has not been leveled, then the L-740 can still be used to check the elevations. The procedure is almost the same as above with the only exception being that the laser is “bucked-in” to the three reference points on the segment mounting locations. The reference points can be the segment mounting pads or three of the rolls themselves. The bucking-in process is very similar to that of optics.

**Checking Parallelism of Caster Segment Location Pins**

This procedure is for checking the upper and lower locating pins for the segments in the mill itself.

1. Place a fixture for holding the laser over the mill at the top set of pins. Place the laser approximately in the center between the two pins and level.
2. Fixture the targets on the locating pins horizontally and square to one of the vertical laser planes using the Top Dead Center method. Adjust the vertical laser plane using the azimuth adjusting knob so that the same readings appear on both targets. This means the laser is parallel to the locating pins and is also plumb to Earth since the laser has been leveled.
3. Zero a measuring target on one of the reference pins and place on one of the lower locating pins. Use the Top Dead Center Method to square the target to the laser beam, and the resulting measurement of the first lower pin is how far out of plumb it is to the upper pin. The difference between the 2 lower-pin measurements is a measure of how far out of parallel the upper pins are to the lower pins. Since the targets provide live alignment data, they can then be used to adjust the pins, if possible, to bring them into alignment.

**Using Plane5 Flatness Software to Collect and Analyze Data**

Hamar Laser’s Plane5 software can be used to quickly analyze almost any layout for flatness or straightness (and squareness when used with our squareness lasers). Squares, rectangles, frames, circles, rings, and up to four sets of ways can all be easily analyzed, and the alignment data is automatically downloaded by using our wireless data receiver, the A-910-2.4ZB, for analysis and reporting. If the user is simply taking data, Plane5 uses a least-squares, best-fit algorithm to eliminate any slope errors in the data from the laser not being parallel to the surface. What this means is that you do not have to buck the laser into reference points to check the flatness, which saves about 10 minutes of setup time.

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1 **TOP DEAD CENTER METHOD** -- Used when measuring the parallelism or levelness of rolls. With the target facing the laser, the roll is rotated slightly back and forth until the highest point is determined, which is the top dead center of the roll. This should be used when tight tolerances are needed or when it is difficult to determine if the target is near top dead center, usually when measuring vertical rolls.
How the Plane5 Flatness Software Works

1. Place the laser on the surface and roughly level, making the laser plane approximately parallel to the surface.
2. Set up the target on one point and zero. The grid pattern is then laid out in Plane5 and on the surface itself. For repeatability, it is important to mark the data points on the surface.
3. Move the target along the surface and press the spacebar to record each data point. The software can be set to average up to 25 readings per data point, however 5 to 10 readings is usually good enough even for the highest grade of surface plates. Once all the points have been taken, the software automatically calculates the flatness data and it can be reviewed in the report section of the software.

The L-743 Ultra-Precision Triple Scan Roll Alignment System for Steel Mill Rolls

Our lasers offer the precision and time savings to meet the ever-tightening tolerances of the steel industry. Our L-743 Ultra-Precision Triple Scan Roll Alignment System is one of only two lasers in the world (L-733 is the other) to offer three automatically rotating laser planes, which creates a powerful tool to not only measure but also fix almost any misalignment problem in continuous caster mills.

Less Manpower Needed for Alignments

The L-743 Roll Alignment System reduces alignment manpower. Wireless targets and automatically rotating laser planes make setting up the laser at each machine section a one-man job, freeing up technicians for other critical work during shut downs. The wireless readout displays both reference/benchmark targets simultaneously, allowing the operator to quickly buck-in to the benchmarks. Traditional optics usually require at least two men to work the instrument.

Multiple Targets and Laser Planes Reduces Downtime

With multiple laser planes and multiple targets, the L-743 can take the place of at least two sets of optics. Once the laser is setup, multiple technicians can each use a target to realign the mill during planned or unplanned outages. This can save tremendous amounts of time and can bring the mill up that much sooner.

Set Roll Pass Line Faster with Fewer Technicians

One of the more time-consuming tasks in maintaining continuous-caster steel mills is setting the correct caster roll pass line. Unlike using optics that requires at least two operators, the L-743 only requires 1 operator, and since the laser automatically sweeps a reference plane, it is a very simple process to measure and set the heights of a caster segment rolls. The heights can be set using precision inserts with our targets, as the tolerance of the centerline of the target to its base has been accurately controlled.

Recommended System Configuration

L-743 Ultra-Precision Triple Scan Laser
A-1519-2.4ZB Single- 2.4 GHz Wireless Scan Target
R-1355-2.4ZB Ruggedized Nomad PDA with Read9 Software
L-106 Instrument Stand including
A-809XL2 case with wheels
A-809XL Shipping Case

Optional Accessories

R-1355-2.4ZB Ruggedized Nomad PDA with Read9 Software
A-910-2.4ZB 2.4 GHz Computer Radio Interface
S-1388 Plane5 Software
Another timesaving feature of the L-743 is that all the rolls of a segment can be checked from one setup and the operator who set the laser up can start doing the measurements himself! Furthermore, the laser can be setup between 2 segments and both of them can be checked at the same time from the same setup.

**Easy Squareness and Plumb Measurements for Segment Pins**
The L-743 has three automatically sweeping laser planes, one horizontal and two vertical, which are all square to each other to within 1 arc second (.00006”/ft or 0.005 mm/M). This means that complex tasks like checking the squareness of the pins to the face of the caster is an easy job for the L-743. This greatly reduces the setups needed to measure squareness when using optics. The L-743 can also be used to easily check the plumbness of the segment pins in the mill itself, as the vertical laser planes have 100 feet (30.5 meters) radius and are plumb when the laser is leveled.

**No Need for Optics’ Recalibration After Plumb Measurements**
Unlike some optics that usually require time-consuming recalibration of the levels each time plumb is checked, the L-743 can simultaneously check level and plumb from a single setup. This is because the squareness measuring capability is built into the instrument. Furthermore, the levels usually only require calibration once a month.

**Alignment System Features**
- 3 continuously rotating laser planes with operational range of 100’ (30.5 meters) in radius.
- Instant on with virtually no warm-up
- Planes are mutually square to 1 arc sec (.00006”/ft or 0.005mm/M).
- Levels accurate to 1 arc second (.00006”/ft or 0.005mm/M).
- Uses A-1520-2.4ZB Single-Axis Wireless Scan Target with 1 Micron (.00004”) resolution for higher accuracy applications.
- Battery or AC powered
- Laser planes flat to ½ arc seconds (.00003”/ft or 0.0025mm/M) in 180º sweep and 1/4 arc second (.00001”/ft or 0.0008mm/M) in 90º sweep).
- Includes Pitch/Roll/Yaw base with coarse and fine adjustments and lighted levels.
- System uses Windows software for quickly recording and analyzing machine geometry data
- Typical setup time 20 minutes or less
- Completely self-contained