

# Laser Alignment and Dynamic Balancing



Adding laser alignment and dynamic balancing to your existing vibration analyzer creates a complete solution for your rotating machinery.

- A complete alignment, balancing and vibration analysis solution
- Use components separately or together to maximize the reliability of your rotating machinery

## **Laser Alignment:**

- Wireless radio frequency operation allows you to collect data from up to 50 feet away
- Dual-visible lasers and oversized targets provide accuracy of less than 1 micron while aligning spans up to 100 feet

## **Dynamic Balancing:**

- Balancing Watchdog identifies mechanical faults that prevent
- Easy graphical user interface with step-by-step process

## **Introduction**

Alignment and balance are critical components of your rotating machinery maintenance strategy. Improved balancing and alignment procedures and tools can extend machine life from months to years. Predictive maintenance and root-cause strategies help maximize the reliability and availability of production assets.

Emerson's alignment and balancing products lead the industry in innovative features that simplify tasks while increasing performance. With minimal training, alignment and balancing is performed to the highest standards in less time than ever



*Easy graphical user interface and wireless communication provides intuitive live machine move updates.*

before. View your predictive diagnostics in AMS Suite: Machinery Health Manager to see a complete picture of your mechanical asset health. PlantWeb® alerts from AMS Machinery Manager will notify operations or maintenance when a specific machine needs attention.

## **Part of a Larger Family**

Emerson offers the flexibility of laser shaft alignment, balancing, rotor bar analysis and vibration analysis in a single handheld analyzer. The CSI 2130 Machinery Health Analyzer provides industry-leading capabilities for machinery health analysis. The CSI 2130 can be equipped with up to 7 different applications:

- Route-based vibration collection
- Advanced vibration analysis
- Dynamic balancing
- Basic/advanced laser alignment
- Transient analysis
- ODS/Modal analysis
- Cross-channel analysis

You can choose only one application, or combine several applications within the same analyzer. The CSI 2130 allows you to begin with the application you currently need while having the option to expand your capabilities as your needs change.

## **Efficient Alignment**

The CSI 8225 Laser Alignment system is designed to get the job done quickly and accurately. It provides a confidence check for every alignment correction before the machine is moved. Review alternate solutions for a boltbound machine with the touch of a button. Adjust the laser heads to a convenient angle to watch the real-time display of changes to alignment. Instant feedback on tolerance is provided in the form of an intuitive bull's-eye graphic. When the job is complete, load the data to AMS Suite: Machinery Health Manager for before-and-after documentation and reporting.



*Easy graphical user interface and wireless communication provides intuitive live machine move updates.*

## **Wireless Alignment**

Emerson offers built-in wireless Radio Frequency (RF) communication so you have freedom from cables without any loss of reliability - indoors and outdoors! The portable CSI 2130 can communicate with laser heads up to a distance of 50 feet (15.25m) while you view real-time changes such as soft foot checks and live machine moves.

Wired cable communication is also available. The laser heads are equipped with an internal memory that allows you to initiate the laser heads, remove the cables, turn the shafts and reconnect the cables to download the information to the CSI 2130. That way, during the rotation of the shaft, there are no cables wrapping around the machine shaft.

## **Large Targets**

Dual-visible lasers and large high-resolution targets enable the system to monitor the exact movement of each shaft for a span of up to 100 feet (30.48m). With these features, long jackshafts

are quick work while rough alignment and problems caused by large thermal growth are virtually eliminated.

## **Easy User Interface**

A step-by-step graphical user interface guides the user easily through the entire alignment process.

## **Accurate Results**

The CSI 8225 Laser Alignment system uses a high-speed angle sensor in each head for a faster shaft rotation with highly accurate results. Excellent data resolution is created by taking a measurement point every 2 degrees of rotation, regardless of sweep angle. Measurements are automatically recorded by the laser heads and can be retrieved using RF communication or cables. With Emerson's Sweep mode, there is no need to start or stop the shaft at specified locations.

## Flexible

The Dual-Pass mode makes easy work of alignment on uncoupled or non-rotational equipment. The Averaging mode is designed for use in high vibration areas and for those machines where rotation is difficult to control. The automatic Sweep modes include Anti-Backlash Processing to eliminate errors introduced by inconsistent shaft rotation. These data acquisition modes combined with a complete offering of mounting brackets and alignment accessories allows Emerson's alignment system to meet most alignment needs.

## CSI 8225 Alignment:

### Modes of Operation:

- Auto Sweep is the default alignment method used for most applications. The arc of rotation can vary from 45° (1/8 sweep) to a full 360° sweep. This mode is useful when shaft obstructions/ clearances make a complete shaft rotation difficult. The Alignment program takes up to 180 readings during a sweep providing extremely accurate data for the alignment.
- Manual Sweep is an alignment method used where data is acquired each time the "number key" is pressed in order for the unit to record data points. This method is useful for performing uncoupled or non-rotational alignments. This method combined with an increased number of data samples is helpful in situations where a lot of background vibration is present.
- Dual-Pass functions are similar to the Auto Sweep mode, except data is automatically acquired as each laser head passes by the other. This method, like Manual Sweep, is useful for performing uncoupled or non-rotational alignments.
- 4-Point Auto/4-Point Manual is used when data is acquired where the laser heads are at the 12 o'clock (0o or 360o), 3 o'clock (90o), 6 o'clock (180o) and 9 o'clock (270o) positions

- Straightness is used to collect elevation readings for a line profile analysis to determine shaft straightness.
- Thermal Growth allows you to enter in the thermal growth data for the alignment job. This information comes from either a thermal profile or manufacturer specifications.
- Vertical Align is used for Cface/ C-flange mounted motors (which are usually oriented in the vertical direction). They include one machine component mounted on another and bolted together at a flange. Measurements are taken with the laser system setup across the coupling to determine the offset and angle between the two shafts.



## CSI Alignment Accessories

Emerson offers a wide range of laser alignment accessories including special mounting brackets, shims and adjustment tools. Chain extensions, base extensions, and alternative mounting brackets make it possible to use the laser fixtures for almost any machine or alignment job. For instance, magnetic bases make assembly easy, while soft mount brackets allow you to perform measurements on non-rotating shafts.

The horizontal alignment tools provide a solution to another important step in the alignment process — the machine move. They act like portable “jackbolts” that enable you to perform controlled machine moves without the expense involved with welding additional components to the machine. The product line is rounded out by a complete selection of pre-cut shims and training tools for your in-house training program.

### **Standard Brackets**

Mounting the fixture device and laser heads to the shaft is key to obtaining accurate measurements. The easy-to-install chain mounting system is expandable to securely mount the laser heads to shafts up to 26" in diameter.

The **Soft Mount Bracket** (A800052) was developed for machines with rotors that are large, heavy or difficult to turn, such as cement kilns, rock crushers, gearboxes, and hammer mills. It has four permanent bearings at the base of the bracket so that the bracket actually rolls around the shaft. Nylon nuts are included in the package and can be added to the chain to allow it to easily slide over the shaft while providing a stable mounting configuration.

The 1/2" (12mm) **Quick Narrow Bracket** (A8AA55) is a chain-type bracket for optimal stability in tight spaces on a wide range of shaft sizes. It is more suitable than a standard magnet-mounted bracket for this narrow space application.

The **Magnetic Mounting Base** (A8AA50) is ideal for straightness measurements. When the magnet is switched on, it can be mounted onto any curved or flat ferrous metal surface, such as rolls and machine bases, and moved forward or backward along the surface. When the magnet is switched off, the base provides enough support that the laser heads can be used on nonferrous materials.

The **Magnetic Bracket** (A800056) mounts to the face of the coupling with seven powerful magnets. The bracket lip overhangs the coupling rim to provide extra stability. The magnetic bracket provides the convenience of quick mounting.

### **Extension Chains**

The standard mounting bracket comes with an 8" (200mm) linkable chain, but this bracket can be mounted on shafts up to 26" (660mm) in diameter when extension chains (D22773) are used.

The soft mount bracket (A800052) can also be mounted on shafts up to 26" in diameter when extension chains (A832001) are used.



**Dynamic Balancing**

Emerson offers a balancing solution that is accurate and easy to use. It is available as a dedicated balancing system or as an additional capability in an existing CSI 2130. Minimal training is required to use the Dynamic Balancing program. The electronic checklist walks you through the balancing procedure, marking off each step as it is completed. If questions arise during the balance job, detailed online help messages are available at the touch of a button. Your job is also simplified by the ability to automatically read data from up to four sensors - eliminating the necessity of switching cables and sensors between each measurement.

**Intuitive and Accurate**

The intuitive balancing interface provides easy-to-use yet powerful tools to meet the needs of field balancing. Job definition and weight placement is clarified by graphical displays. Vector averaging ensures data quality by suppressing inaccuracies from normal variations in amplitude and phase readings. A data stability bar graph cues you when a measurement is ready to be recorded.

**Basic and Advanced Operation**

Basic mode provides a quick solution for one and two plane balancing jobs. Advanced mode handles jobs with more variables and will also automatically split correction weights between available weight locations. Advanced features enable less experienced users to deal with most any situation. The Balancing Watchdog is a revolutionary feature that checks the vibration data on the machine during the balance job.



*The CSI 2130 Machinery Analyzer features an easy-to-use graphical balancing user interface.*

It identifies secondary faults and even compares vibration across the shaft to identify looseness or resonance in the structure. The Balancing Watchdog then reports the nature and location of problems that might prevent successful balancing so that they can be corrected and the balancing job can proceed.

**AMS Machinery Manager Interface**

Balance results are automatically compared to original condition and tolerance specification for display and reporting. Once the job is complete, data can be loaded to AMS Machinery Manager for analysis documentation, reporting and future use. If it is necessary to revisit the same machine, data can be downloaded to provide an opportunity for a one-shot rebalance.

Shaft Diameters	Use These Chain Lengths
Less than 8" (200mm)	Standard Chain Length
8 - 15 1/2" (200 - 390mm)	Standard Chain + 1 Optional Length
15 1/2- 23" (390 - 580mm)	Standard Chain + 2 Optional Length
23 - 26" (580 - 660mm)	Standard Chain + 3 Optional Length

## CSI 8225 Alignment Technical Specifications

### Physical Data

#### Laser Diode

- AlGaInP, visible

#### Wavelength

- 670 nm (typical)

#### Output Power

- Pulsed, <1.0 mW (average)

#### Laser Safety Class

- Class II; FDA 21CFR 1040.10 and 1040.11
- Target Size: 20x20mm\*\*\*

#### Resolution

- Less than 1 micron (0.00004")

#### Linearity

- Better than 1.5%

#### Environment

- Protected from ambient light interference

#### Laser Housing

- Aluminum

#### Inclinometer

- High speed, internal, fully automatic

#### Inclinometer Resolution

- Less than 1 degree

#### Measurement Axes

- 6 total, 2 displacement and 1 rotational per laser head

### Operating Conditions

#### Operating Temperature

- 0° to 115° F (-17° to 46° C)

#### Storage Temperature

- 0° to 140° F (-17° to 60° C)

#### Humidity

- 10-95%, non-condensing

### Power Supply

#### Power Management

- Auto "sleep" and "power down" modes

#### Battery

- Nickel cadmium, rechargeable

#### Battery Life

- 3-4 hours continuous laser operation, 8 hours typical\*

#### Battery Charging Station

- Fully automatic super fast smart charger (Auto-switching 110-240 V AC, 50/60 Hz)

#### Battery Charge Time

- 15 minutes

#### Laser - Analyzer

- Communication Wireless Radio
  - Frequency and/or direct cable connection\*\*
- RF Operating Frequency: 916.5 MHz

### Certification

#### FCC Certification

- Part 15, no user license required; equivalent Canadian rating

### Operating Range

#### Laser separation

- 0-100 ft. (0-30.5 m)\*\*\*

#### RF range

- 0-50 ft. (0-15m), typical

#### Calibration

- Calibration to NIST traceable standards

\* Based on 25% operation, 25% sleep mode, and 50% power down

\*\* RF communication available where certified

\*\*\* Model 8215 Laser heads provide identical functionality except for a target size of 10x10 mm (14 mm diagonal) with a maximum laser separation of 30 ft. (9m)

Specifications subject to change without notice

CSI Part No.	Description	Footprint (Width)	Minimum Shaft Dia.	Maximum Shaft Dia	Extended Diameter	Extension Chain	Application
A800051	Standard Brackets	3/4" 19mm	2" 50mm	8" 200mm	26" 660mm	Part# D22773	Most shaft alignments
A800052	Soft Mounting Bracket	1 1/2" 40mm	2" 50mm	8" 200mm	26" 660mm 4 chains	Part# A832001	Large to difficult-to-turn rotors
A8AA55	Quick Mount Narrow Bracket	1/2" 12mm	1/2" 12mm	8" 200mm	NA	NA	Tight spaces
A8AA50	Magnetic Mounting Base	3.8" 100mm	2" 50mm	Infinite	NA	NA	Straightness measurements
A800056	Magnetic Bracket		3 1/2"	Infinite	NA	NA	Quick Mounting

## Ordering Information

Description	Part Number
<b>CSI 8225 Alignment and CSI 2130 Kit</b>	
CSI 2130 Advanced Alignment System with 10x10 targets and RF communication	A813015-CU
CSI 2130 Advanced Alignment System with 10x10 targets and cabled communication	A813015-IN
CSI 2130 Advanced Alignment System with 20x20 targets and RF communication	A813025-CU
CSI 2130 Advanced Alignment System with 20x20 targets and cabled communication	A813025-IN
CSI 2130 Basic Alignment System with 10x10 targets and RF communication	A8130EZ
CSI 2130 Basic Alignment System with 10x10 targets and cabled communication	A8130EZ-IN
<b>CSI 8225 Alignment and Kit (for existing CSI 2130 users)</b>	
Advanced Laser Expansion Pak with 10x10 targets and RF communication	A873015-CU
Advanced Laser Expansion Pak with 10x10 targets and cabled communication	A873015-IN
Advanced Laser Expansion Pak with 20x20 targets and RF communication	A873025-CU
Advanced Laser Expansion Pak with 20x20 targets and cabled communication	A873025-IN

**CSI Alignment Accessories**

Mounting posts	B8215-POSTS (4)
Super fast smart charging station	A8211
Tape Measure	A8AA10
Direct connect cable	A821510
Screwdriver	MHM-99451
Hard shell suitcase	D24492
Quick mount brackets & chains (2)	A8AA55
Standard mount bracket (2)	B821007
Standard mount chains (2)	B8210-CHN
Hex ball driver	99510
2" (51mm) Extension Blocks (2)	B8100-EXT2
Pass Mode Cable - RF packages only	A8215C2-PM
RF adapter - RF packages only	B8000RF

**Dynamic Balancing and CSI 2130 Kit**

CSI 2130 Balance Analyzer	A2130B1
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**Dynamic Balancing Kit (for existing CSI 2130 or 8130 users)**

Balancing Firmware	A2130S7
CSI 2130 Balance Accessories Kit	A1730B2
2 - 4 Sensor Balancing Accessories Upgrade	A173001

**Dynamic Balancing Accesories**

4-channel multiplexer	A648
1 - 20K RPM Infrared Phototach Kit w/ external power supply	A0404P1
1 - 20K RPM Infrared Phototach	A0404B1
Phototach power supply	A040801
Reflective tape (3 rolls)	A403
Hard shell suitcase	D24786

For more information about Emerson's Laser Alignment and Balancing Solutions contact your local representative.

**Emerson Process Management**

**Asset Optimization Division**

835 Innovation Drive  
Knoxville, TN 37932  
T (865) 675-2400  
F (865) 218-1401

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