

## Spindle Error Analyzer Components Options



Last update: 2021-05-31

---

## Table of Contents

<b>1</b>	<b>SPINDLE ERROR ANALYZER COMPONENTS</b>	<b>3</b>
<b>2</b>	<b>NUMBER OF CHANNELS</b>	<b>3</b>
<b>3</b>	<b>DRIVER ELECTRONICS</b>	<b>4</b>
3.1	DISPLACEMENT SENSOR DRIVERS	4
3.2	OPTIONAL TEMPERATURE SENSOR AND INDEX/ENCODER DRIVER	5
3.3	OPTIONAL METER MODULE	5
3.4	ELECTRONICS ENCLOSURE	6
<b>4</b>	<b>DISPLACEMENT SENSOR PROBES</b>	<b>7</b>
4.1	STANDARD SYSTEM	7
<b>5</b>	<b>PROBE MOUNT HARDWARE</b>	<b>8</b>
5.1	STANDARD SYSTEM	8
<b>6</b>	<b>MASTER BALL TARGET HARDWARE</b>	<b>9</b>
6.1	STANDARD SYSTEM	9

Last update: 2021-05-31

---

## 1 Spindle Error Analyzer Components

A SEA system has many components. Assembling a complete system requires choosing from options in each of these categories:

- Number of Channels
- Driver Electronics
  - Displacement Sensor Drivers
  - Optional Temperature Sensor and Index/Encoder Driver
  - Optional Meter Module
- Displacement Sensor Probes
- Probe Mount Hardware
- Master Target Hardware

Each of these categories and the available options are shown below.

*We will help you choose the right options for your needs. This information is only presented for your information.*

## 2 Number of Channels

Three or five channels of displacement measurement.

**Five channel** systems can do comprehensive testing in all axes simultaneously including Tilt Measurements.

**Three channel** systems must be physically reconfigured to make Tilt Measurements and then can only make the measurement in one axis at a time.

Last update: 2021-05-31

### 3 Driver electronics

Elite Series electronics feature a modular design and the high-resolution performance required to measure very precise spindles. In addition to the capacitive displacement sensor electronics, modules are also available for temperature sensors, encoder/index input processing, and a meter/display module.

#### 3.1 Displacement Sensor Drivers

Two options are available for the displacement sensors. One driver is required for each channel of displacement measurement. The drivers will be calibrated with the selected probes for a particular measurement range (sensitivity)

##### CPL190 Single Sensitivity Driver

One calibration for general use.



##### CPL290 Dual-Sensitivity Driver

Two selectable calibrations allow this system to measure spindles of varying performance levels. A high-sensitivity (short range, high resolution) is selectable for extremely high performing spindles allowing sub-nanometer measurements.



Last update: 2021-05-31

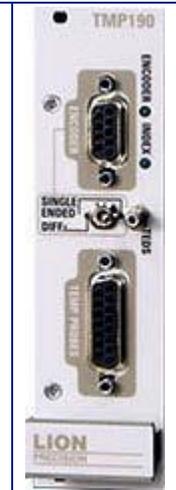
### 3.2 Optional Temperature Sensor and Index/Encoder Driver

Temperature tests (ETVE, Thermal Stability) are required by international standards.

#### TMP190 Temperature and Index/Encoder Module

**Temperature** is the primary factor in machining errors. Measuring the machine's ability to reliably place the tool in the correct position relative to the workpiece is very informative. This module can use up to seven "button" style magnetic-mount temperature sensors to monitor temperatures at different points on the machine.

**Index and/or Encoder** inputs from the spindle is the ideal way to control the spindle measurement data acquisition system. This module conditions those signals and connects them to the SEA system.



### 3.3 Optional Meter Module

#### MM190 Meter Module

A meter module that displays in metric or inch units. Includes peak capture functions and channel summing.



Last update: 2021-05-31

### 3.4 Electronics Enclosure

The number of modules selected will determine which Elite Series enclosure will be used. The Data Acquisition device is installed directly on the six- and eight-slot enclosures; it is a separate desktop device with the three-slot enclosure.

<p><b>Three-Slot Enclosure</b></p> <p>Basic three-channel systems. 3 CPL190 or CPL290</p> <p><b>Six-Slot Enclosure</b></p> <p>Enclosure with tip-up handle. For five channel systems or three-channel systems with Temperature or Meter module.</p> <p>3 CPL190 or CPL290, 1 TMP190</p> <p>3 CPL190 or CPL290, 1 MM190</p> <p>5 CPL190 or CPL290</p> <p>5 CPL190 or CPL290, 1 TMP190</p>	 
<p><b>Eight-Slot Enclosure</b></p> <p>Enclosure with tip-up handle. For five channel systems with Temperature and/or Meter modules.</p> <p>5 CPL190 or CPL290, 1 TMP190</p> <p>5 CPL190 or CPL290, 1 MM190</p> <p>5 CPL190 or CPL290, 1 TMP190, 1 MM190</p>	

Last update: 2021-05-31

---

## 4 Displacement Sensor Probes

Standard probe has three measurement ranges. Use two of them with a CPL290 Driver.

### 4.1 Standard System

Probe Options	Calibrations	Mount Hardware (see below)	Master Target (see below)
C8-2.0	Standard: 250 $\mu\text{m}$ Fine: 50 $\mu\text{m}$ Ultrafine: 10 $\mu\text{m}$	Standard 3- or 5-Probe Nest	Dual or Single Ball, 1"

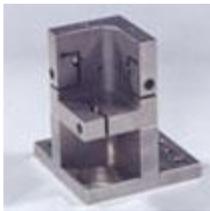
Last update: 2021-05-31

## 5 Probe Mount Hardware

Accuracy of the measurements are dependent on stiffness and reliability of the mounting hardware. Precision probe holders are designed to maintain precise perpendicularity required for accurate measurement of high-resolution error motion. Also available are more generic adjustable probe holders for single channel measurements and micro- and nano-sized probe nests.

### 5.1 Standard System

#### 3 Probe Nest



X, Y, and Z axes measurements with a three channel system.

#### 5 Probe Nest



2X, 2Y, and Z measurements for tilt and error motion with 5-channel systems.

#### Turning Centre Adaptor



Fits in turning centre tool holder and holds a standard three probe nest.

#### Adjustable



For mounting probes where standard probe nests cannot be used.

#### XYZ Positioning Stage



For use with 3- and 5-Probe Nest when fine positioning of the target/spindle is not available.



Shown with Standard 5-Probe Nest

Last update: 2021-05-31
 

---

## 6 Master Ball Target Hardware

Master targets are manufactured to exacting standards. Our master ball targets boast a roundness of better than 50 nm (2 µinch).

If not using an encoder/index output from the spindle to determine angular location, targets require some eccentricity for the software to establish a "once-around" signal. Some master balls have fixed 50 µm eccentricity. Master balls are also available with adjustable eccentricity for very high precision spindles in which 50 µm eccentricity is too much. A dual master ball is required for five channel systems.

A precision 1 inch gage pin with two finished surfaces, a 1/8" gage pin and a 2 mm gage pin are also available.

### 6.1 Standard System

**Single 1"  
50 µm Eccentricity**



One precision ball for three channel systems.

Not for Micro or Nano systems

**Dual 1"  
50 µm Eccentricity**



Two precision balls for five channel systems.

Not for Micro or Nano systems

**Single 0.5"  
Adjustable Eccentricity**



One precision 0.5" ball for three channel systems on smaller machine tools.

Not for Nano systems

**Precision Pin (20 mm)  
No Eccentricity**



Two finished target areas.

Not for Micro or Nano systems

**Single 1"  
Adjustable Eccentricity**



One precision ball for three channel systems.

Not for Micro or Nano systems

**Dual 1"  
Adjustable Eccentricity**



Two precision balls for five channel systems.

Not for Micro or Nano systems