O.P.S.™ Series Encoders

Sensor Installation Manual and Reference Guide

OPS-IM Sensor Installation Rev A

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Table of Contents

OPS™ Sensor Installation

Manual Version Numbers

OPS-IM Sensor Installation Rev A, issued January 2014
Changes: N/A

Related Documents

-OPS Data Sheet
-OPS Interface Drawing
-PurePrecision Tape and Glass Scale Installation Manual for OPS

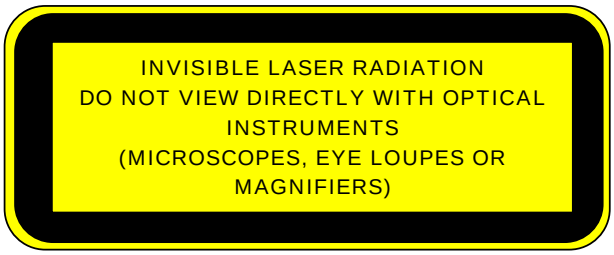
Precautions

1. Follow standard ESD precautions. Turn power off before connecting the sensor. Do not touch the electrical pins without static protection such as a grounded wrist strap.
2. Do not touch the tape/glass scale unless you are wearing talc-free gloves or finger cots. Please read this installation manual for full instructions.

LASER SAFETY INFORMATION: OPS Series

This product is sold solely for use as a component (or replacement) in an electronic product; therefore it is not required to, and does not comply with, 21 CFR 1040.10 and 1040.11 which pertain to complete laser products. The manufacturer of the complete system-level electronic product is responsible for complying with 21 CFR 1040.10 and 1040.11 and for providing the user with all necessary safety warnings and information.

MicroE encoders contain an infrared laser diode or diodes. Emitted invisible laser radiation levels have been measured to be within the CDRH Class 1 range, which is not considered hazardous; however, to minimize exposure to the diverging beam, the encoder sensor should be installed in its operational configuration in close proximity to the encoder scale before power is applied.



- Invisible laser radiation; wavelength: 850 nm
- Max power 4.8 mW CW
- CAUTION – The use of optical instruments with this product will increase eye hazard. DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS (MICROSCOPES, EYE LOUPES OR MAGNIFIERS).
- All maintenance procedures such as cleaning must be performed with the MicroE encoder turned off.
- Do not insert any reflective surface into the beam path when the encoder is powered.
- Do not attempt to service the MicroE encoder.

Patents

Covered by the following patents: US 5,991,249; EP 895,239; JP 3,025,237; US 6,897,435; and EP 1,451,933. Additional patents and patents pending may apply.

RoHS OPS models are CE and RoHS compliant.

CE

Recommendations for Power; Installation Considerations

OPS™ Sensor Installation

1.

Recommendations for Power

OPS™ encoders require a minimum of 4.75V DC continuously. When designing circuits and extension cables, be sure to account for voltage loss over distance and tolerances from the nominal supply voltage so that at least 4.75V DC is available to the OPS encoder under all operating conditions. The input voltage should not exceed 5.25V DC.

2.

Installation Considerations

The OPS encoder is a precision electronic instrument. It has been designed to function in a wide range of applications and environments. To take full advantage of the modular system design, considerations should be made to allow easy access to the sensor for service and/or replacement.

For optimal performance and reliability:

DO follow standard ESD precautions while handling the sensor.

DO allow proper alignment clearance for sensor head alignment.

DO follow setup instructions for the encoder system.

DO, where possible, install the scales in an
“upside down” or vertical position to minimize accumulation of dust.

DO consider redundant encoders or additional feedback devices as part of an overall risk management program for medical applications.

DO NOT store sensors in an uncontrolled environment.

DO NOT electrically overstress the sensor (Power supply ripple/noise).

DO NOT intentionally “hot swap” the sensor if the device is energized.

DO NOT use in high contamination applications (dust, oil, excessive humidity, or other airborne contaminants.).

System Overview

OPS™ Series Encoders

Refer to encoder model data sheets for detailed ordering guide and more information about MicroE Part Numbers.

Items Required for OPS Encoder Installation

- Hex wrench (M3.5 for Side Mount, 5/64" or M2.5 for Top Mount)
- Alignment Tool Kit (Model AT-OPS)
- For OPS-SM

  - Z height spacer shim (ships with each sensor - 1.00mm (red) for use with tape scales
    - 0.83mm (blue) for use with glass scales
- For OPS Top Mount

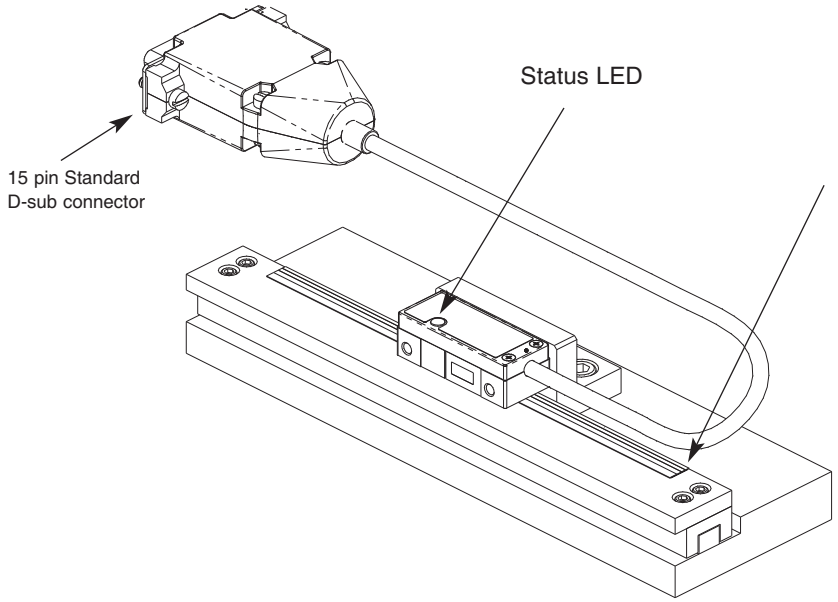
  - Z height spacer shim, ZG-PP1 for tape scales (black)
  - Z height spacer shim, ZG-GS1 for glass scales (white)
- Optional: MK-FFA bracket kit for installation into industry-standard mounting hole patterns.

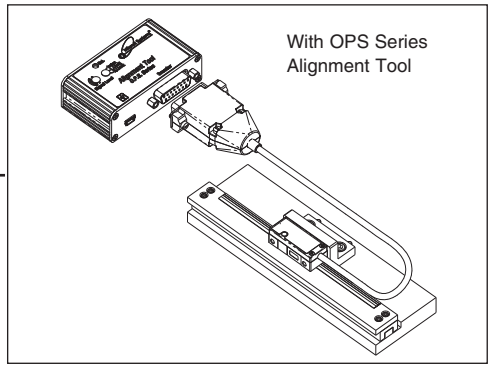
System Overview, OPS Side Mount

OPS™ Sensor Installation

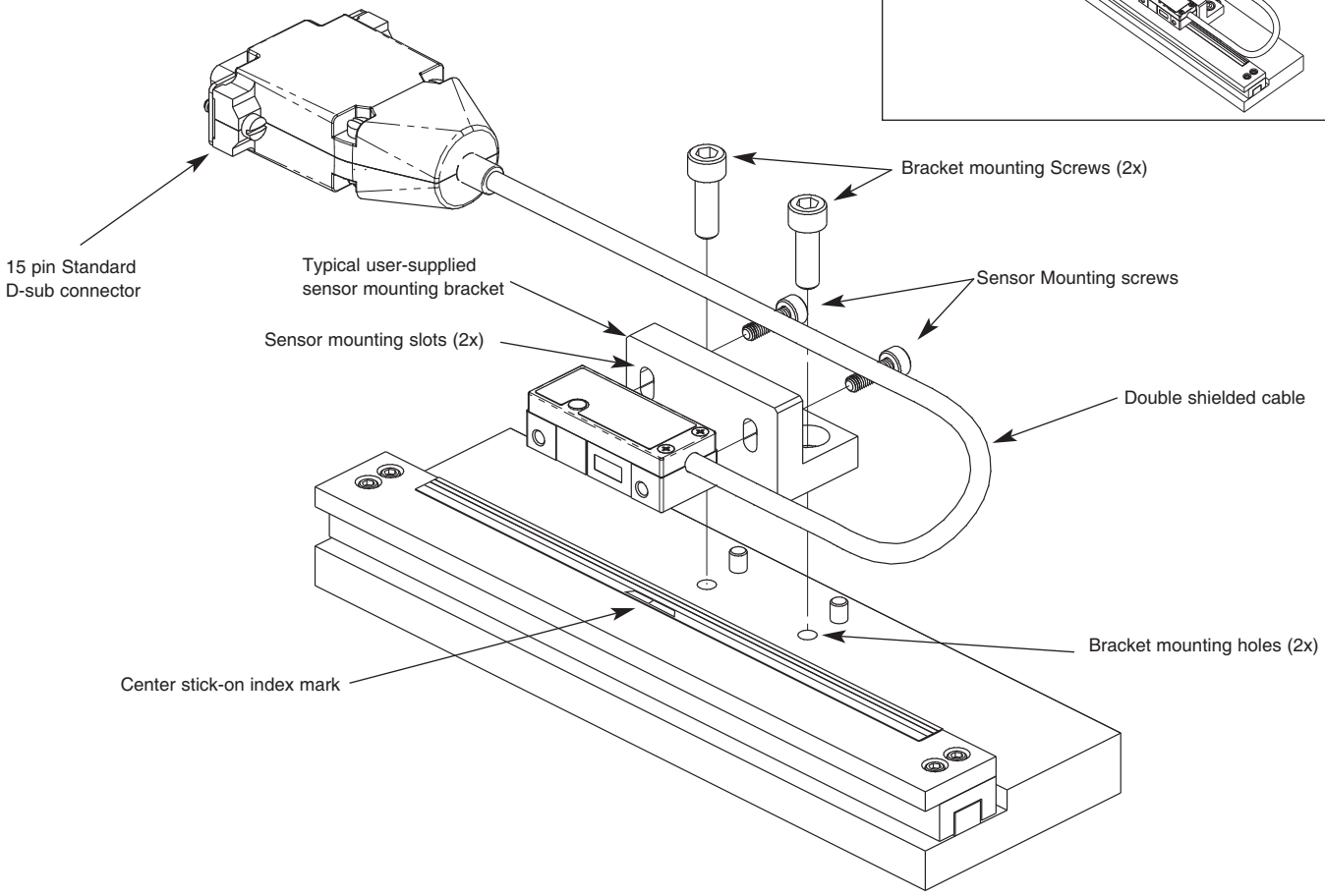
OPS™ Series, Side Mount Configuration

System View





Expanded View

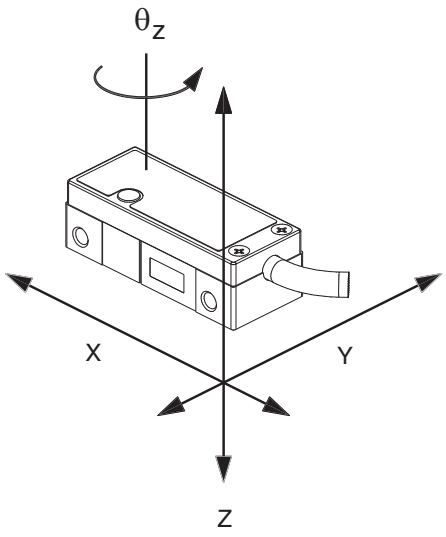


Sensor Head Installation (Side Mount Configuration)

OPS™ Series Encoders

Sensor Mounting Orientation and Tolerances

Axis diagram.



OPS Side Mount Configuration Sensor Alignment Tolerances	
Axis	**Alignment Tolerance**
X	Direction of Motion
Y	± 0.20mm
Z	± 0.15mm
θ_X	± 1.0°
θ_Y	± 1.0°
θ_Z	± 2.0°

Sensor Head Installation (Side Mount Configuration)

OPS™ Series Encoders

1.

Install the Sensor

Use a wrench and M3 screws to install the sensor. Refer to interface drawing to make sure sensor is oriented properly with reference to the scale.

2.

Verify Sensor Mounting Surface Height

Refer to the OPS interface drawing for detailed dimensions.

Use Z-Height spacer shim to verify that the Z-height distance between the bottom surface of the sensor and the top of the scale is as follows:

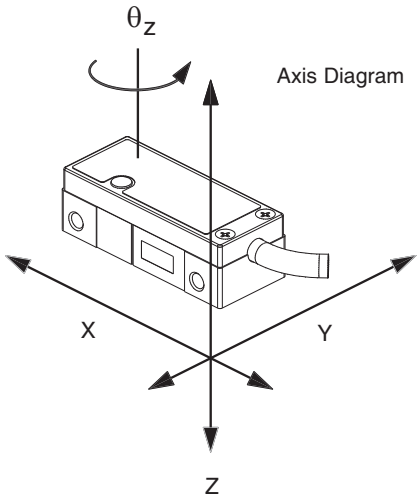
Tape Scales:

Use red spacer (1.00mm) to set the proper Z-Height for PurePrecision Marker Tape II and Laser Tape II Scales

Glass Scales:

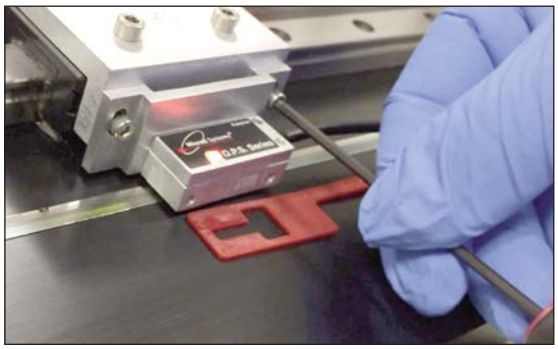
Use blue spacer (0.83mm) to set the proper Z-Height for PurePrecision Performance and Value Linear Glass Scales

See step 3 below for installation steps.

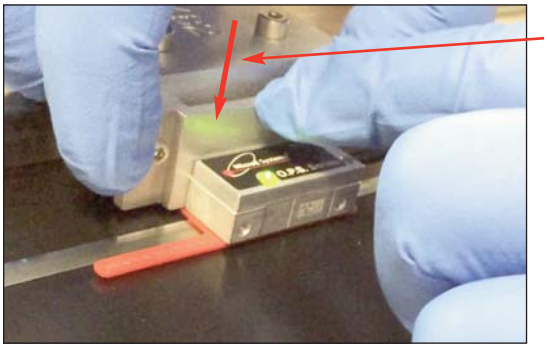


3.

Installation Steps



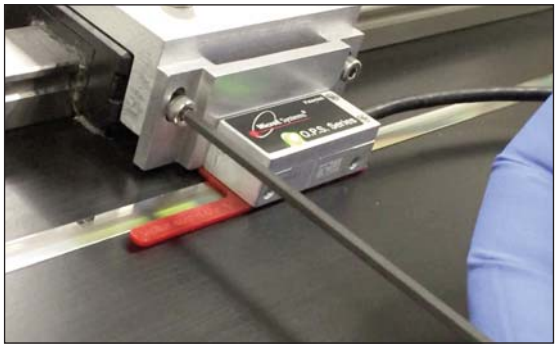
3.1 Loosen the sensor in the z-axis



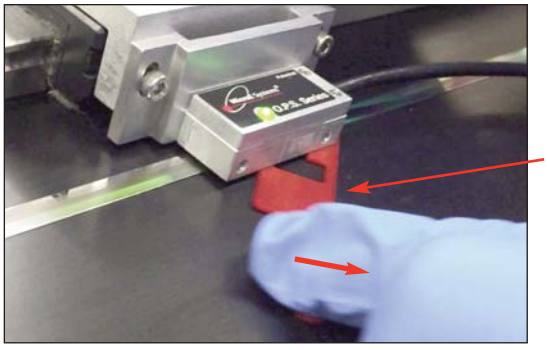
Gently push the sensor and mounting against the top of the tape scale in the z-axis.

3.2 Place shim between the bottom of the sensor head and the top of the scale and press down in the Z-axis.

Shim can be inserted either parallel or perpendicular to the scale. The shim features cut-outs to allow signal level to be monitored during sensor mounting.



3.3 Tighten the sensor in the z-axis.



Rotational movement to remove shim.

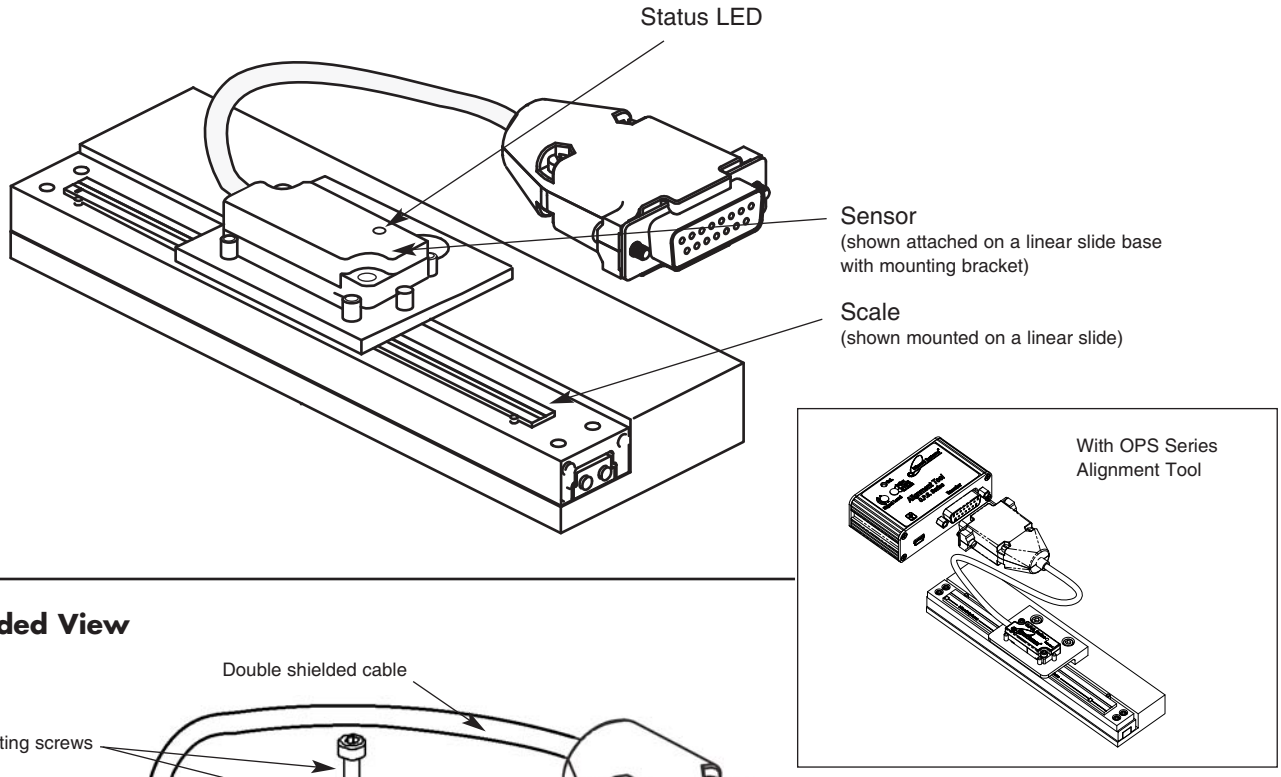
3.4 Carefully remove the shim by rotating it off the scale with the shim's handle.

System Overview, OPS Top Mount

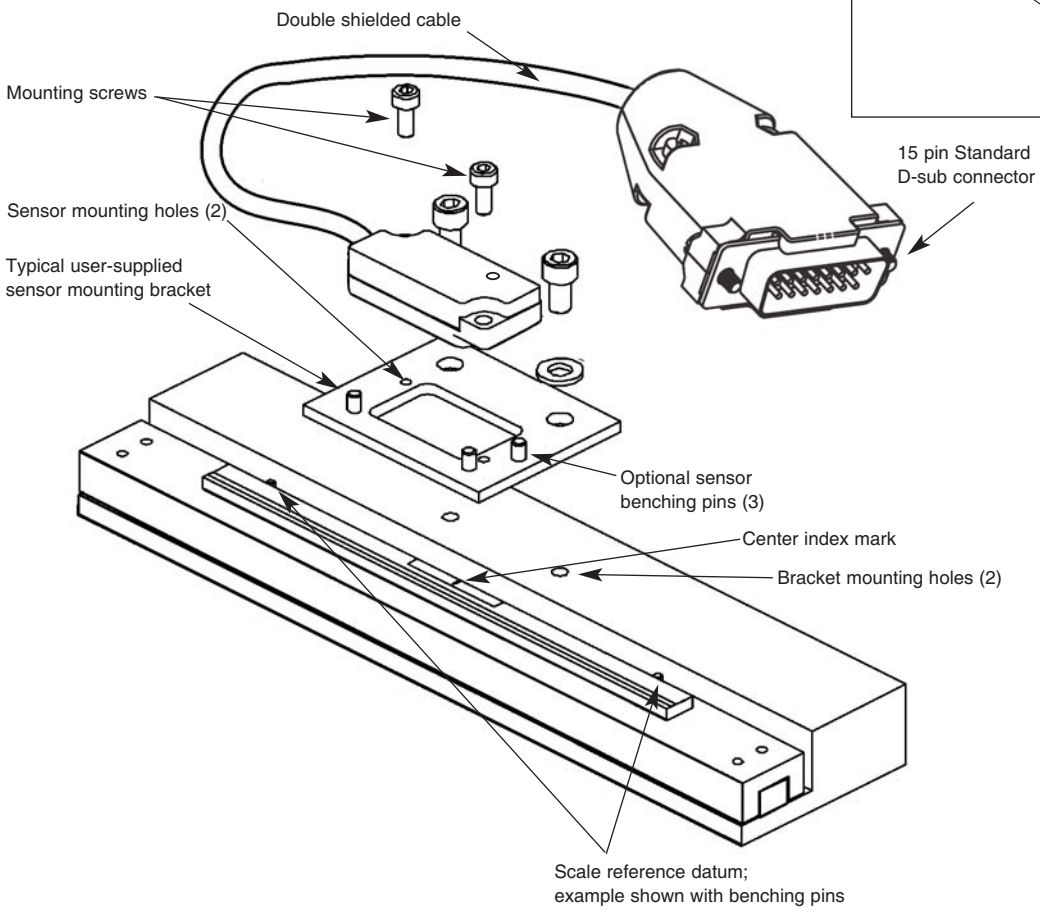
OPS™ Sensor Installation

OPS™ Series, Top Mount Configuration

System View



Expanded View

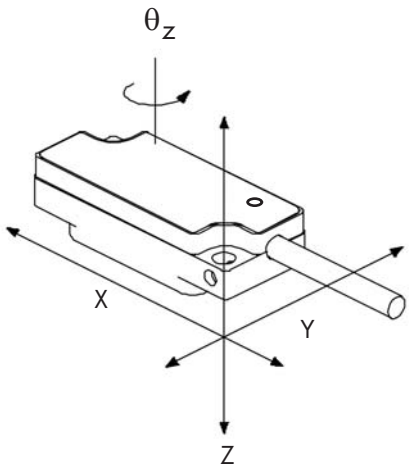


Sensor Head Installation (Top Mount Configuration)

OPS™ Series Encoders

Sensor Mounting Orientation and Tolerances

Axis diagram.



OPS Top Mount Configuration Sensor Alignment Tolerances	
Axis	**Alignment Tolerance**
X	Direction of Motion
Y	± 0.20mm
Z	± 0.15mm
θ_X	± 1.0°
θ_Y	± 1.0°
θ_Z	± 2.0°

Sensor Head Installation (Top Mount Configuration)

OPS™ Series Encoders

1.

Verify Sensor Mounting Surface Height

Refer to the OPS interface drawing for the latest dimensions.

Verify that the Z-height distance between the sensor mounting surface datum “A” and the top of the scale is as follows:

Tape Scales:

Z-axis distance from top of tape scale after blue protective film is removed to Datum “A” of sensor: 3.09 mm ±0.15

Z-Height Gauge (Model number ZG-PP1) can be used to verify proper Z-Height for PurePrecision Marker Tape II and Laser Tape II scales

Glass Scales:

Z-axis distance from top of glass scale to Datum “A” of sensor: 2.93 mm ±0.15

Z-Height Gauge (Model Number ZG-GS1) can be used to verify proper Z-Height for PurePrecision Performance and Value Linear Glass Scales

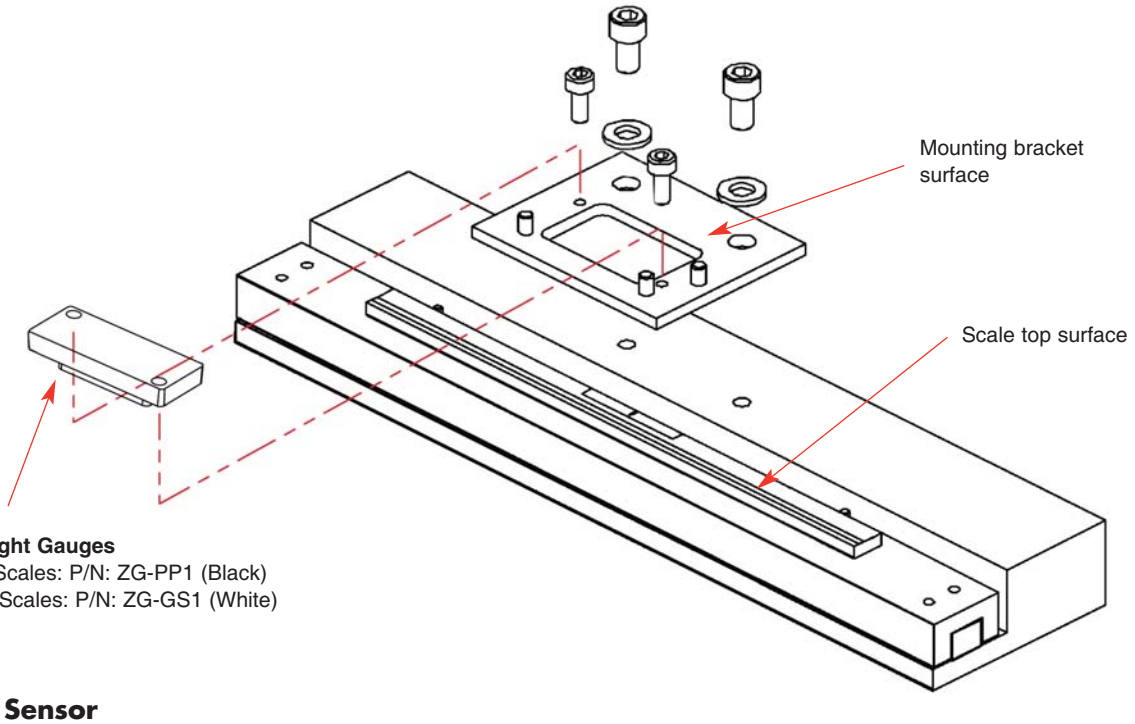
Use the correct gauge to check that there are no gaps between:

1.1 The mounting surface of the gauge and the mounting bracket, or

1.2 The bottom surface of the gauge and the scale.

Place the gauge in position and use the mounting screws as guides. If the bottom of the gauge hits the scale, you will see the gap between the gauge bottom mounting surface and your mounting bracket surface.

If you hand tighten the sensor mounting screws, there should be no gap between the tape scale and the bottom of the plastic gauge tool.



Z- Height Gauges

Tape Scales: P/N: ZG-PP1 (Black)

Glass Scales: P/N: ZG-GS1 (White)

2.

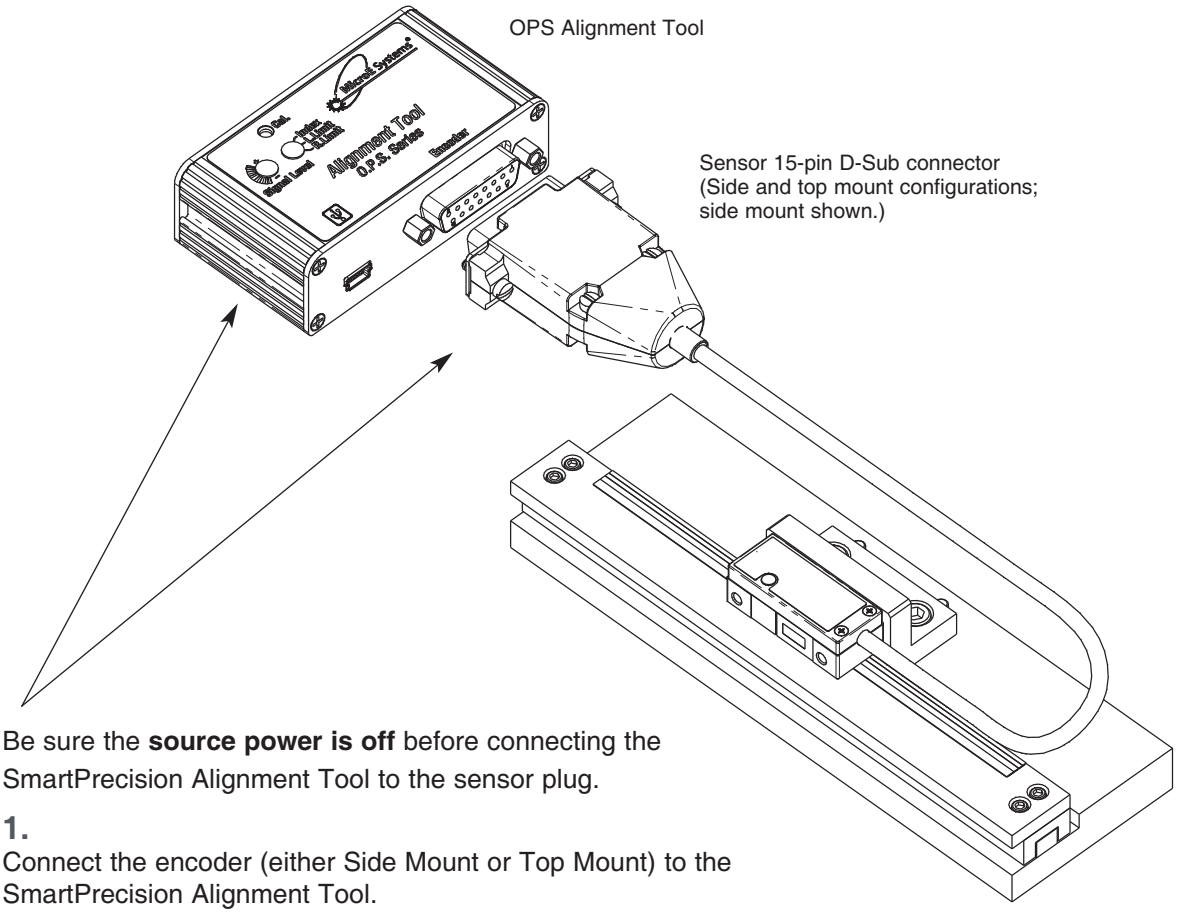
Install Sensor

Install the sensor on the mounting surface referencing the appropriate datum surface as shown on the Interface Drawing. Use two M2 or 2-56 screws to loosely affix the sensor.

A benching edge is recommended to locate the sensor to meet the mechanical mounting tolerances. Refer to the Interface Drawing for recommended location and height of edge.

Sensor Alignment - by Alignment Tool

OPS™ Series Encoders, Side and Top Mount Configurations



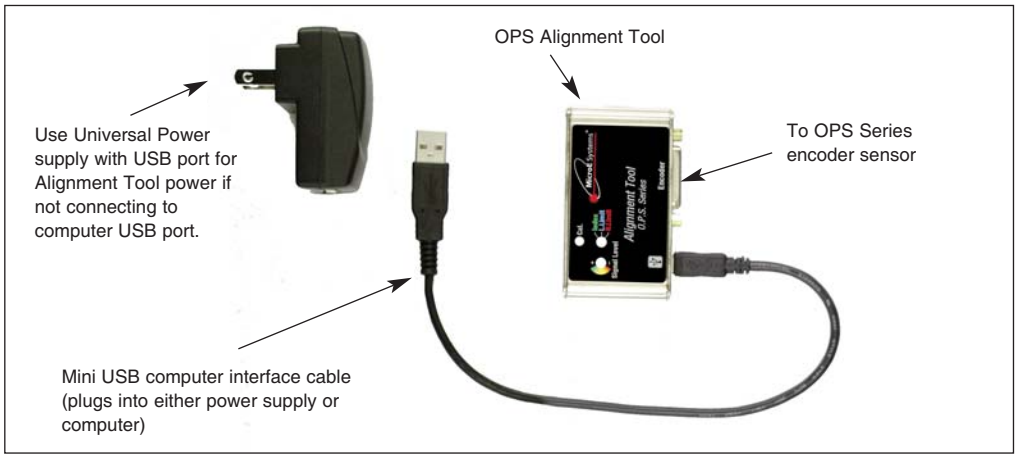
Be sure the **source power is off** before connecting the SmartPrecision Alignment Tool to the sensor plug.

1.

Connect the encoder (either Side Mount or Top Mount) to the SmartPrecision Alignment Tool.

Connect the USB cable to either a computer's USB port or to the DC power supply provided.

OPS Alignment Tool kit, Model Number AT-OPS (Includes SmartPrecisionII Software)



Sensor Alignment - by Alignment Tool

OPS™ Series Encoders, Side and Top Mount Configurations

2.

Alignment

Connect the USB cable to the Alignment Tool with power from either the Universal Power supply or computer USB port.

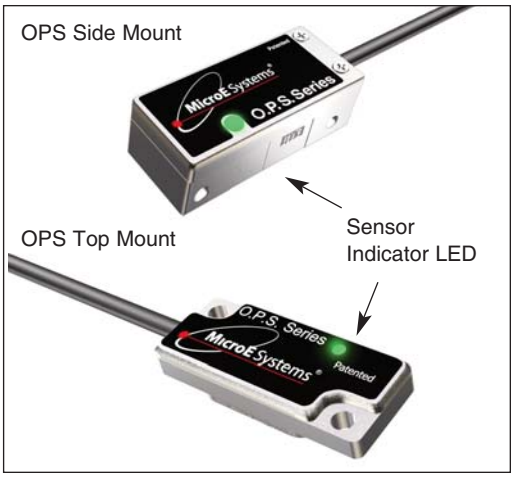
The Alignment Tool Signal Level and Sensor head LED's are now used for alignment. Proper alignment is indicated by green sensor head and Alignment Tool Signal Level LED's.

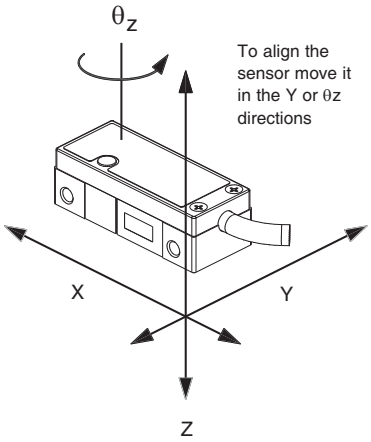
3.

Position the sensor over a section of the scale. Adjust the sensor's Y or θ_Z directions until the Signal Level and sensor head LED's are green.

4.

Move the sensor across the entire length of travel. The LED should be green over the entire length of travel. If the LED is Yellow or Red, adjust Y and θ_Z and refer to the interface drawing to ensure proper mechanical design. (Passing over an Index will cause the Alignment Tool Index/Limit LED to flash green.)



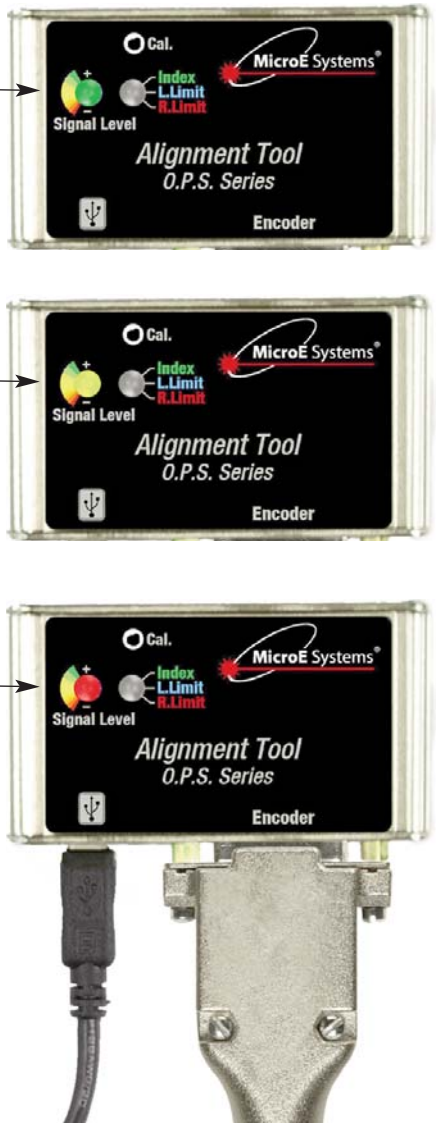


Alignment Tool

Green = Optimal Performance

Yellow = Marginal Performance

Red = Improper Performance



NOTE:

If you are having any difficulties getting a green light over the entire travel length, refer to the OPS interface drawing to check mechanical design. Also, check to make sure the scale is properly installed, the sensor is properly oriented with respect to the scale, and the blue protective film has been removed from the tape scales.

Sensor Calibration - by Alignment Tool

OPS™ Series Encoders, Side and Top Mount Configurations

Calibration, Index, and Limits

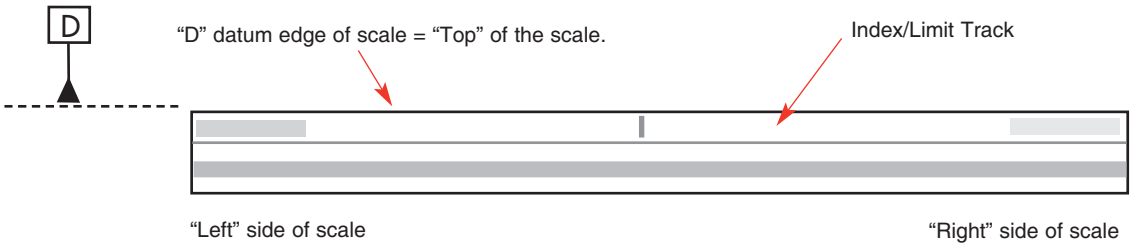
1.
Press the Alignment Tool **Cal** button to start. (Be sure the sensor has been aligned to the scale, across the entire length.)

Both the Alignment Tool **Signal Level** and **Index/Limit** LED's will turn solid green. This starts the Gain Offset Phase (GOP) calibration.

2.
Move the sensor back and forth anywhere on the scale, 10mm or more. This movement adapts and ends the GOP calibration when the **Signal Level** LED turns blue, with the **Index/Limit** LED solid green.

3.
Index calibration: move the sensor back and forth across the index until both **Signal Level** and **Index/Limit** LED's turn blue. (At this step, the Index has been calibrated and the left limit is ready to be calibrated.)

NOTE:
Correct orientation of the scale for Left/Right Limit calibration is shown below. The "D" datum edge from the OPS Interface Drawing is designated as the "Top" of the scale. The Index/Limit track is also the "Top" track on a scale (tape and glass).



4.
Left limit calibration: move the sensor over to the "left limit" area on the scale, with both **Signal Level** and **Index/Limit** LED's solid blue. Push the **Cal** button. The **Index/Limit** LED will turn red. (At this step, the Left Limit has been calibrated and the right limit is ready to be calibrated.)

5.
Right limit calibration: Move the sensor over to the "right limit" area on the scale with **Signal Level** LED solid blue and **Index/Limit** LED solid red. Push the **Cal** button. (At this step, the Right Limit has been calibrated.)

Both the **Signal Level** and **Index/Limit** LED's will quickly flash green 5 times to indicate that calibration has been completed.

(Note: to skip a step, push and hold the Cal button for 2 seconds until LED's change color, then release button.)

Both Signal Level and Index/Limit LED's flash green 5 times to indicate calibration complete.

Sensor Alignment and Calibration - by SmartPrecision™ II Software

OPS™ Series Encoders, Side and Top Mount Configurations

Install the OPS SmartPrecision II Software (included with Alignment Tool kit, AT-OPS):

NOTE:
Be sure the Alignment Tool is “not” plugged in to the computer USB while installing the software. The Alignment Tool needs to be plugged in “after” the software is installed, in order to properly load the USB driver.

1) Insert CD into drive. Installer should automatically start up and install SmartPrecision II software to C:\Program Files\MicroE Systems\SmartPrecision_OPS.
2) If it does not start automatically browse to CD and run setup.exe to install software.

Install the USB Driver:

Windows 2000:

1) Connect the USB cable between the host computer and the OPS Alignment Tool/OPS Sensor.
2) When the electronics are on, Windows will notify you it has found new hardware prompting you with a "Found New Hardware" wizard. Press the Next button.
3) Select "Search for a suitable driver for my device (recommended)" and press the Next button.
4) Select "Specify a location" under “Optional search locations:” and press the Next button.
5) Press the Browse button to locate the OPS.inf driver Installation file. It is located in the directory C:\Program Files\MicroE Systems\SmartPrecision_OPS. Once this file is selected press the OK button.
6) Verify that the correct path and filename are shown and press the Next button.
7) Press the Finish button.

Windows XP, Vista, 7, and 8:

1) Connect the USB cable between the host computer and the OPS Alignment Tool/OPS Sensor.
2) When the electronics are on,, Windows will notify you it has found new hardware prompting you with a "Found New Hardware" wizard.
3) The wizard may prompt “Can Windows connect to Windows Update to search for software?” Select “No, not this time” and press the Next button.
4) Select "Install from a list or specific location (Advanced)" and press the Next button.
5) Select "Include this location in the search".
6) Press the Browse button to locate the MicroE_USB.inf driver installation file OPS.inf driver. It is located in the directory C:\Program Files\MicroE Systems\SmartPrecision_OPS. Once this file is selected press the OK button.
7) Verify that the correct path and filename are shown and press the Next button.
8) Press the Finish button.

Using the Software:

1) To Run Software, go to directory C:\Program Files\MicroE Systems\SmartPrecision_OPS. Double-click ‘OPS.exe’.

Sensor Alignment - by SmartPrecision™ II Software

OPS™ Series Encoders, Side and Top Mount Configurations

Connect the encoder to the Alignment Tool before connecting USB cable. Connect the USB cable to the Alignment Tool

Run SmartPrecision II Software

1. Align the sensor:

   SmartPrecision II software automatically begins in **Alignment Mode**, with AGC off.

   Position the sensor over a section of the scale. Adjust the sensor's Y or θ_Z directions until the **Signal Level** is in the Optimal Green level.

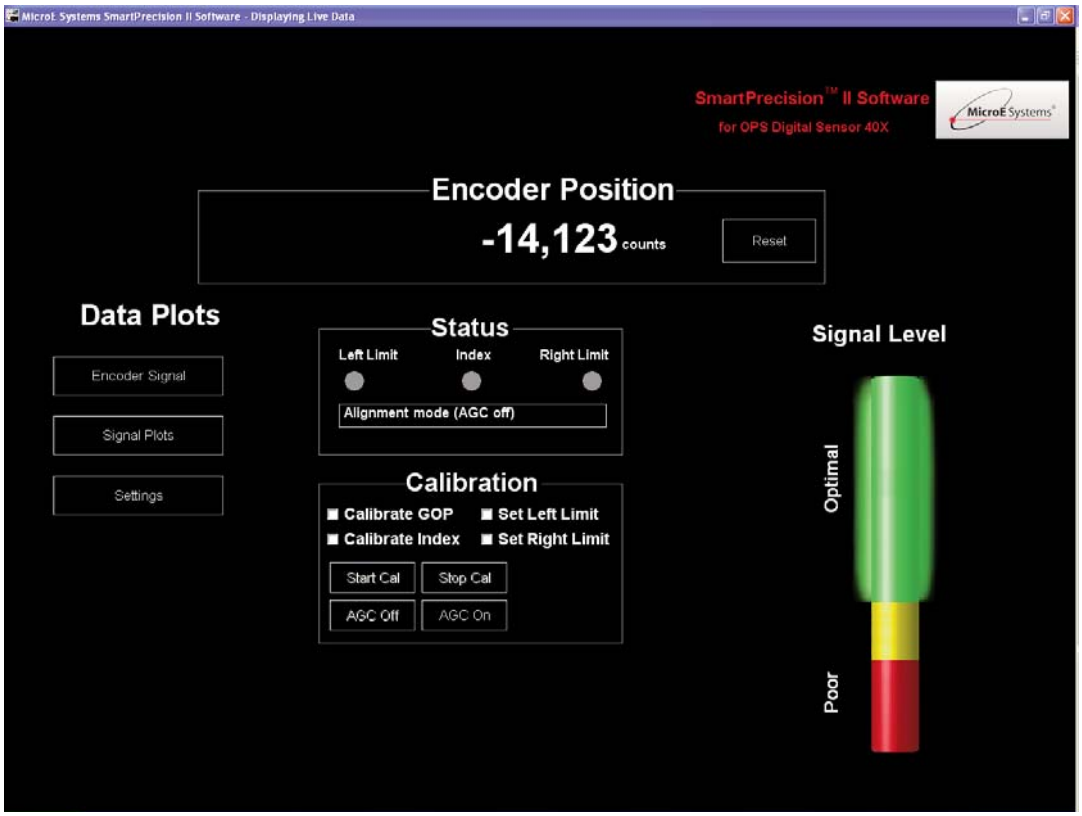
   Move the sensor across the entire length of travel. The **Signal Level** should be in the Optimal Green level over the entire length of travel. If the **Signal Level** is in the Yellow or Red areas, adjust Y and θ_Z and refer to the interface drawing to ensure proper mechanical design. (Passing over an Index will cause the Alignment Tool Index/Limit LED to flash green.)

   Check that Index LED blinks as sensor passes over index. Tighten sensor mounting screws.

   Sensor LED Indicator Indicates signal strength – green for optimal performance, yellow for marginal performance, and red for improper performance. Sensor LED will blink as sensor passes over index.

   Alignment Mode is turned off automatically when you begin sensor calibration.

NOTE:
If you are having any difficulties getting a green light over the entire travel length, refer to the OPS interface drawing to check mechanical design. Also, check to make sure the scale is properly installed, the sensor is properly oriented with respect to the scale, and the blue protective film has been removed from the tape scales.

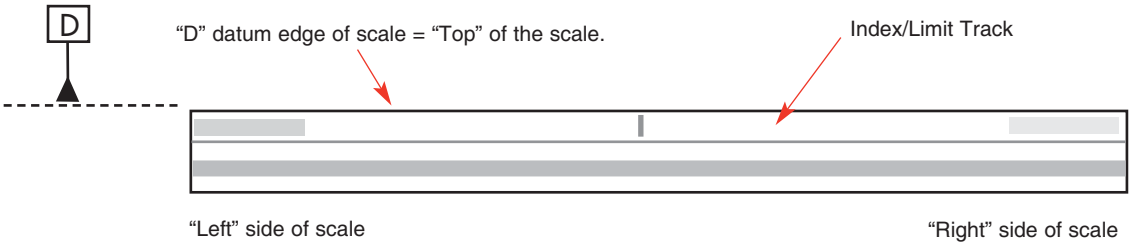


Sensor Calibration - by SmartPrecision™ II Software

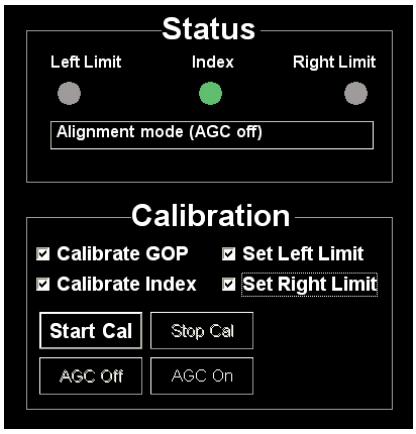
OPS™ Series Encoders, Side and Top Mount Configurations

Note: all procedures below must be performed at ≤1m/s relative motion between the sensor and the scale.

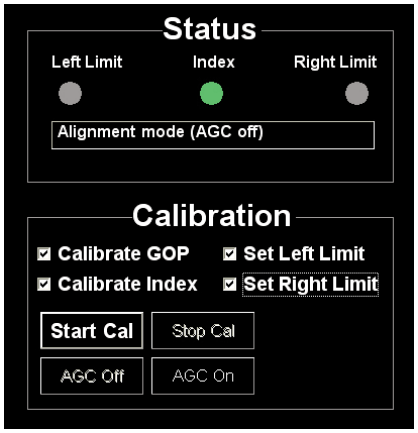
NOTE:
Correct orientation of the scale for Left/Right Limit calibration is shown below. The "D" datum edge from the OPS Interface Drawing is designated as the "Top" of the scale. The Index/Limit track is also the "Top" track on a scale (tape and glass).



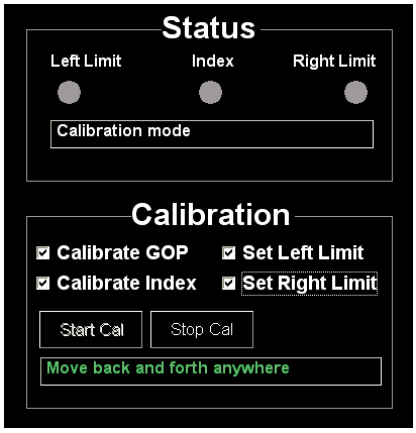
1.
Click appropriate checkboxes before calibrating:
Calibrate GOP
Calibrate Index
Set Left Limit (optional)
Set right Limit (optional)



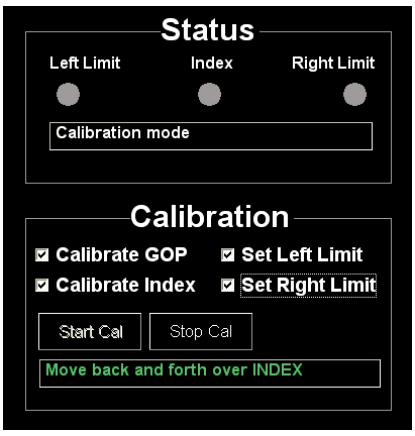
2.
Click **Start Cal** button.



3.
Move the sensor back and forth (Gain Offset Phase).



4.
Move the sensor back and forth over the **Index** until the **Left Limit** blue light turns on. (The Index is now calibrated.)

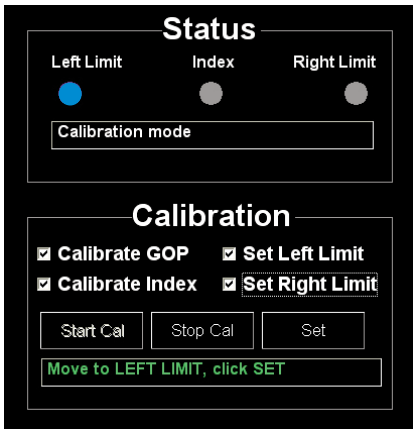


Note: It is important that if you choose to calibrate only the limits, the sensor must be placed in the "no limit" area of the scale (neither the left or right limit) when you click the "Start Cal" button.

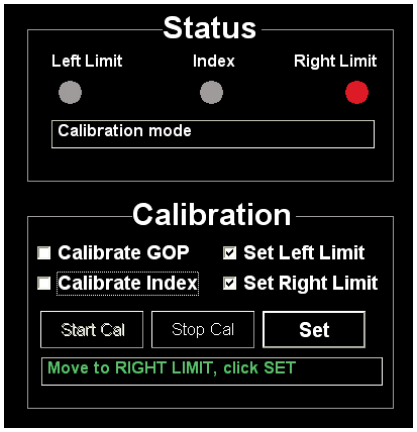
Sensor Calibration - by SmartPrecision™ II Software

OPS™ Series Encoders, Side and Top Mount Configurations

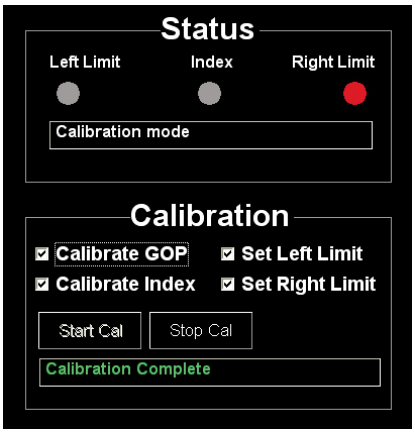
5.
Move the sensor to the **Left Limit** and click the **Set** button.



6.
Move the sensor to the Right Limit and click the **Set** button.



7.
Calibration complete.



8.
"Calibration Complete" message will disappear after a few seconds, ending the calibration mode. SmartPrecision II will automatically revert to the mode in use prior to calibration.

Note: It is important that if you choose to calibrate only the limits, the sensor must be placed in the "no limit" area of the scale (neither the left or right limit) when you click the "Start Cal" button.

Appendix A

Specifications

System

OPS sensors are compatible with:
- PurePrecision™ Marker Tape II and Laser Tape II
- Linear and rotary glass scales

Scale Pitch	20µm
Signal Period	20µm
System Resolution	1µm, 0.5µm, 0.1µm or 50nm (specify at time of ordering)
Maximum Output Frequency	30 million states/sec

Accuracy/Linearity

Linearity	Tape Scale: ≤ ±5µm over 1m*
Accuracy	Linear Glass Scale: ≤ ±3µm over 1m Rotary Glass Scale: 3.9 arc-sec with 64mm OD scale
Cyclical Error	(over any 20µm movement) Tape Scale: ±40nm typical Glass Scale: ±25nm typical

*After two point correction in the customer's controller.

Note: Accuracy is the maximum error over the specified movement when compared to a NIST-traceable laser interferometer standard, used at room temperature.

Sensor Size & Weight (side mount sensor)

Height	Width	Length
0.46 [11.67mm]	0.56 [14.30mm]	1.35 [34.25mm]

Weight	8g (without cable)

Reliability Information

5 Year Expected Reliability >99.8% under normal operating conditions

Operating and Electrical Specifications

Power Supply	5VDC ±5% @ 120mA when used with recommended termination, 80mA unterminated
Temperature	
Operating	0 to 70°C
Storage	-20 to 85°C
Humidity	10 to 90% RH non-condensing

Agency Standards Conformance: In accordance with Electromagnetic Compatibility Directive 2004/108/EC:
EN 55011:2007
EN 61000-4-2, -3, -4, -6

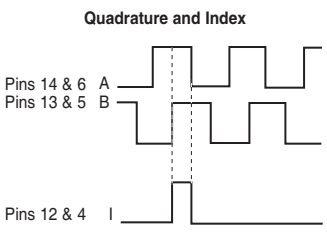
Shock	300G 0.5 ms half sine
Vibration	30G at 17Hz
Sensor Cable	Double Shield (contact MicroE Systems for applications >5m) Diameter 3.6mm (0.142") Flex Life 20x10^6 cycles @ 20mm bending radius Standard 15 pin D-sub connector

Outputs
Digital A-quad-B, 1LSB index pulse, left and right limits. A, B and I signals are differential. Limits are single ended. Index is gated to AB high.

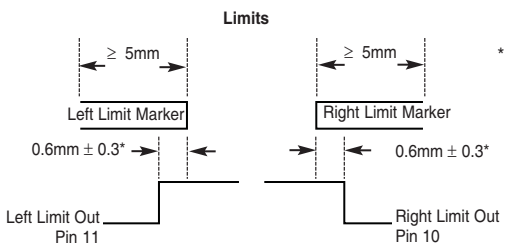
Signal Level
A/B/I (differential): RS-422 compatible
Limits: 3.3VDC max., LVTTL compatible (High>2.4VDC, Low <0.4VDC), maximum current output (source and sink): 14mA
Limits programmable as active high, active low or disabled
Alarm: Tri-state of A, B and I outputs, latched for minimum 30ms

Output Frequency (at maximum speed)
OPS 200/400: 7.5Mhz per channel
OPS 40: 2.25Mhz per channel
OPS 20: 1.125Mhz per channel
Note: Output frequency must not exceed maximum input frequency of customer electronics.

Digital Output Signals



Inverse signals are not shown for clarity.



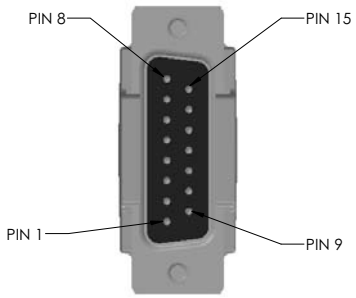
Active low limit configuration is shown.

* With reference to the sensor's optical centerline (see interface drawings).

Appendix B

Wiring Diagrams

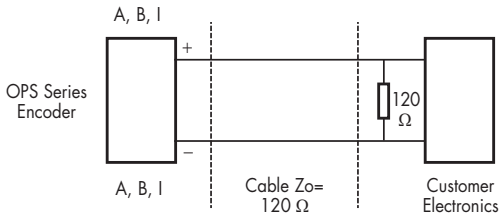
Connector Pin Configuration



NOTE: GND and INNER SHIELD ARE INTERNALLY CONNECTED.

Recommended Signal Termination

Digital Outputs:

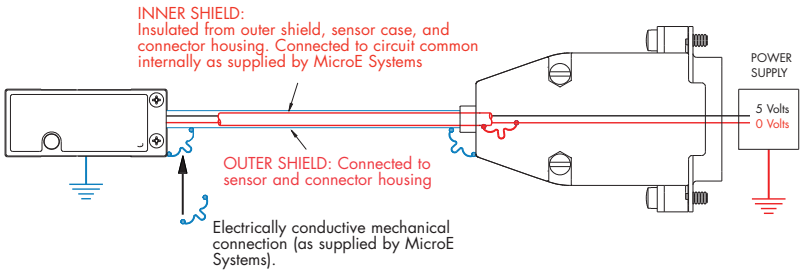


Standard RS-422 Line Receiver Circuitry

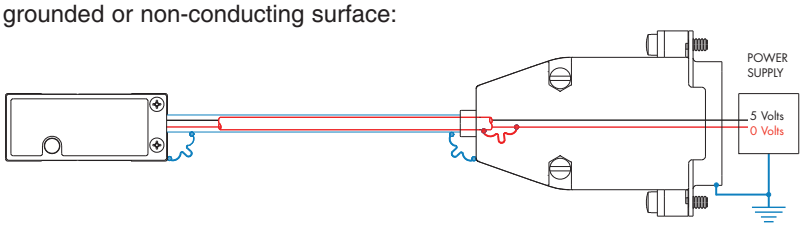
Max cable length: 5m. Contact MicroE Applications Engineering if longer length required.

Grounding Considerations

Sensor mounted with good electrical contact to well grounded surface (preferred):



Sensor mounted to poorly grounded or non-conducting surface:



Appendix C

Interface Cable Requirements

1. Customer Interface Cable Requirements

Customer cables that interface to OPS™ series encoders must have the following characteristics:

- Twisted pair signal wiring.
- Characteristic impedance of 100-120 ohms.
- Sufficient wire gauge to meet the minimum voltage requirement at the encoder, for example 24AWG gauge wire for a 2m length cable. Examples of acceptable cables with 24AWG gauge wire and 4 twisted pairs are Belden 9831, 8104, and 9844 or other manufacturer's equivalents.
- Single shield cable with a minimum of 90% coverage. Note that a double shielded cable may be required in high-noise applications.

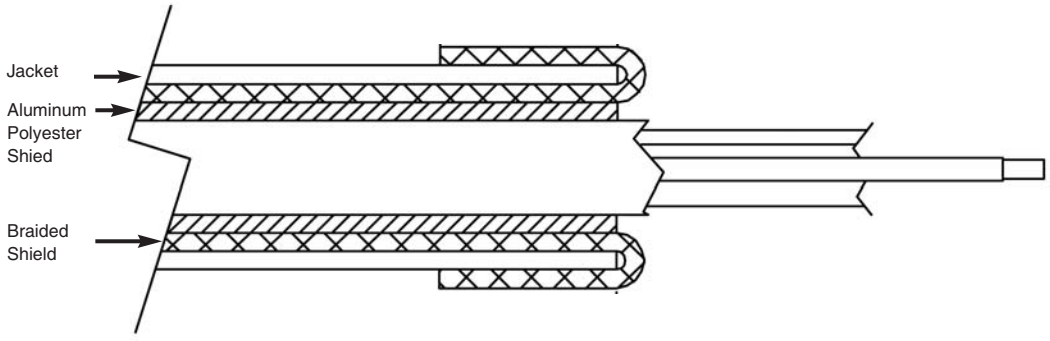
2. Signal Wiring

Each differential signal should be connected to a corresponding twisted pair as follows:

OPS Series	
Signal	**Twisted Pair**
A+	Pair 1
A-	
B+	Pair 2
B-	
Index+	Pair 3
Index-	
+5V	Pair 4
GND	
Left Limit	Pair 5
Right Limit	

3. Shield Termination:

The customer's cable shield should be in 360° contact with the connector shroud and the connector shell to provide complete shielding. The connector shell should be metal with conductive surfaces. Suggested metal connector shells for use with OPS™ encoders: AMP 748676-1 or equivalent. The shield should be terminated as illustrated in the following diagram.



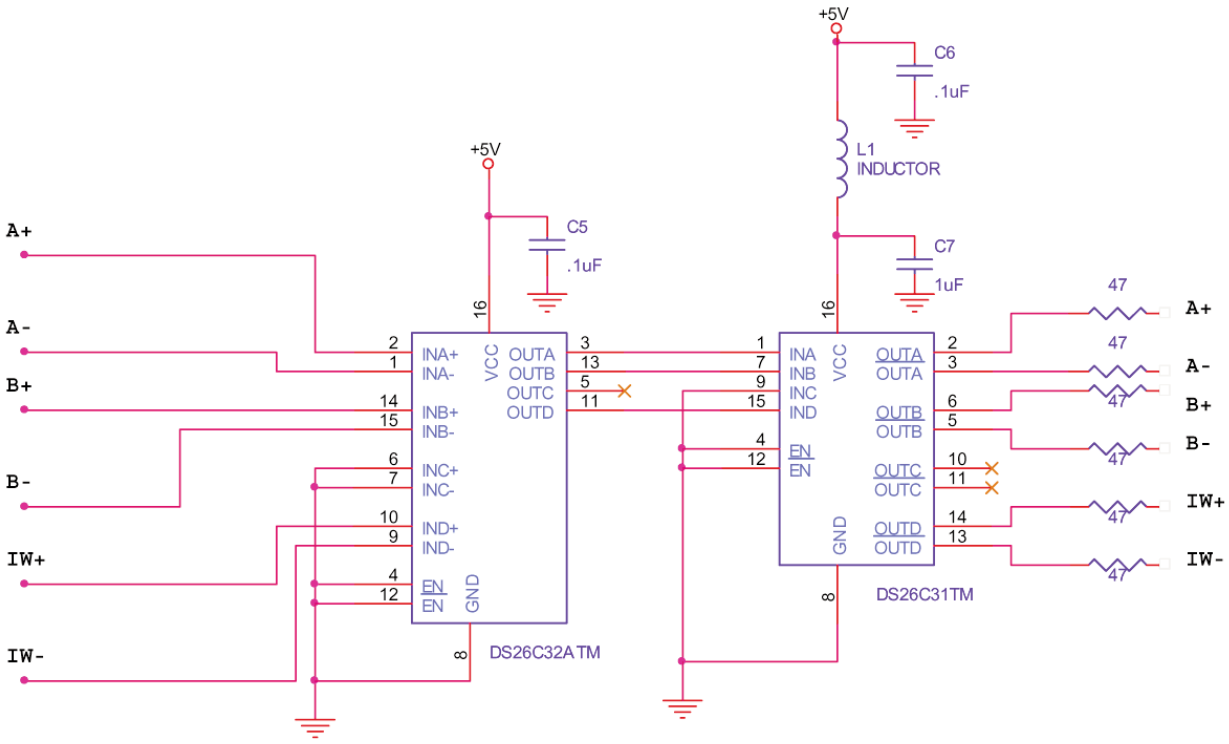
Fold braided shield back over jacket. Example shows double-shielded cable.
Dimensions shown are for illustration only.

Appendix D

RS-422 Compliance

The OPS Series is RS-422 compatible. Encoder signals are “sending end terminated.” Therefore customer receiving terminations are not required. If you elect to use them, the supply current will increase.

Optional RS-422 compliant circuitry for long cable runs in harsh electrical environments is illustrated below.



Appendix E

Troubleshooting

Problem

The Sensor LED indicator won't turn on.

Solution

- Make sure that the OPS Series electronics' 15-pin D-sub connector is fully seated and connected.
- Confirm that +5 Volts DC is being applied to the OPS Sensor. Refer to the OPS interface drawing for proper pinouts.

Problem

Can't get the OPS Series electronics' "Signal" OPS better than red or yellow; or the green, " Proper Alignment" indicator doesn't stay illuminated over the full length of the scale.

Solution

- Verify that the sensor is mounted in the correct orientation with reference to the scale and scale mounting reference edge. Refer to the Interface Drawing.
- Verify that the sensor has been aligned to the scale and that the mounting screws are tight. Check the dimensions for the mechanical mounting holes (and clamps if any) to make sure that the sensor is correctly located over the scale in the Y and Z dimensions. Refer to the Interface Drawing.
- Check that the scale is firmly mounted and can't jiggle or move in any direction.
- Make sure that the scale is clean over its entire length or circumference.

Appendix F

Order Guide

How to Order

Sensor

OPS-SM-400 – 3 – 1

- Limit Outputs
  - 1 = Active Low
  - 2 = Active High
  - 3 = Disabled
- Cable Length*
  - 1 = 1.0m
  - 3 = 3.0m
  - 5 = 5.0m
- Interpolation (Resolution)
  - 20 = x20 (1µm)
  - 40 = x40 (0.5µm)
  - 200 = x200 (0.1µm)
  - 400 = x400 (50nm)
- -SM = Side Mount
  (blank) = Top Mount

* Custom cable lengths and connectors are available. Contact MicroE Applications Engineering.

Sensor Installation Tools

AT-OPS	Alignment Tool Kit for OPS encoders includes Alignment Tool, SmartPrecisionII™ Software, USB Cable, Power Supply (100V-240VAC, US 2-prong plug)
ZG-PP1	Z-Height Gauge, PurePrecision™ Tape Scales, Top Mount Sensor
ZG-GS1	Z-Height Gauge, Glass Scales, Top Mount Sensor

FlexFit™ Adaptor

MK-FFA	FlexFit Adaptor Mounting Kit. Reference design is available upon request.

End Cap Kit, PurePrecision Tape Scales

EC	Optional Tape Scale End Caps

Adaptor for Open Collector Limit Outputs

MIIA-OCL	Small DB15 adaptor to convert 3.3V left and right limit output signals to open collector type (7407).

Scales

PurePrecision™ Marker Tape II

HPMT – N – A – L – 5000 – I

- I = Individual Lengths
  C = Continuous reel with index and cut marks (unless otherwise specified)
- Length in mm (40mm - 30,000mm)
  For length >5000mm, contact MicroE for custom P/N.
- L = Center Index and End Limits
  I = Center Index Only
  C = Custom

PurePrecision™ Laser Tape II

HPTS – 30000 – N

- Length in mm (70mm - 30,000mm)

Performance and Value Linear Glass

PVGL – 1000 – T

- T = Adhesive backing
- Length in mm (70mm - 1,000mm)**

** For lengths <70mm or >1m, contact MicroE Applications Engineering.

Stick-on Index and Limit Markers (for Laser Tape II and Performance and Value Linear Glass Scales)

NRIMS	Qty. 8 Stick-On Index Markers
NRLMS	Qty. 4 Stick-On Left Limit Markers and Qty. 4 Stick-On Right Limit Markers

Rotary Glass

Contact MicroE Applications Engineering to discuss your requirements.

Tape Scale Applicator Tools (use for lengths >300mm)

TSAT-SM-PPT	Tape Applicator Tool for OPS-SM, Side Mount Sensors
TSAT-PPT	Tape Applicator Tool for OPS, Top Mount Sensors

All specifications subject to change.

Contacting MicroE

MicroE Systems is a world leader in optical encoder technology with offices in major industrial centers around the globe.

To learn more about MicroE Systems products, visit: *www.microesystems.com*.

Our products have been used by thousands of companies worldwide to solve a wide range of motion control applications. Our advanced encoder technology and application expertise has driven innovations in the design of machinery, equipment and instrumentation in many industries, including medical, industrial, robotics, automation, metrology, semiconductor manufacturing, packaging equipment, entertainment, energy, military, and scientific research.

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