

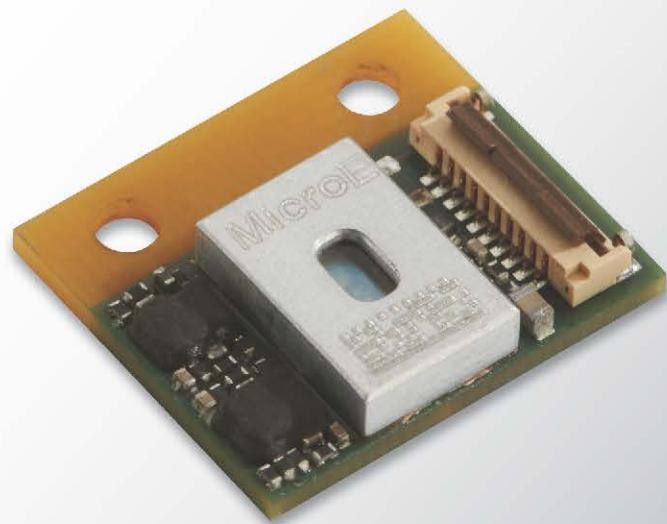


MicroE
Encoders

Optira™ Series Encoders

Installation Manual
and Reference
Guide

► CELERAMOTION.COM



Actual Size



1.0 Table of Contents

2.0	Introduction.....	1
2.1	Overview	1
2.2	Precautions	1
2.3	Laser Safety Information	1
2.4	Standards Compliance	2
2.5	Related Documentation.....	2
2.6	Trademarks	2
2.7	Special Conventions Used	2
3.0	Before Installation.....	3
3.1	Power Recommendations	3
3.2	Installation Considerations	3
3.3	Items Required for Installation	3
3.4	Installation Flowchart.....	4
4.0	System Overview	5
4.1	Top Mounting	5
4.2	Board-to-Board Mounting.....	6
4.3	Optional Development Kit	7
4.4	Optional Connector and Calibration Board	7
4.0	Design Mounting	8
5.0	Sensor Installation.....	8
5.1	Install Sensor.....	8
5.1.1	Sensor Mounting Orientation and Tolerances	9
5.1.2	Top Mounting	9
5.1.3	PCB Mounting	11
5.1.4	Sensor Head Alignment	11
5.1.5	LSB Index Calibration	12
5.2	Install Optional Connector and Calibration Board.....	14
6.0	Appendix	15
6.1	Specifications	15
4.1	Power-Up Timing.....	16
6.2	Sensor Connectors Pinouts	16
6.3	Recommended Signal Termination.....	17
6.4	Board-to-Board Header Wiring Examples.....	18
6.5	Connector and Calibration Board Connector Pinouts	20
6.6	Customer Interface.....	21
6.7	RS-422 Compatibility.....	21
6.8	Troubleshooting.....	21
7.0	Order Guide.....	22
8.0	Introduction to Scale Mounting.....	23
8.1	Overview	23
9.0	Rotary Scales	24
10.0	Tape Scale Installation	24
10.1	Before Installation.....	24
10.1.1	Items Required for Tape Scale Installation	24
10.1.2	Pre-Installation Information and Precautions	24
10.1.3	Flowchart for Tape Scale Installation	26
10.1.4	Design Guide.....	27

MicroE Optira Installation Manual		Celera Motion
	10.1.5 Prepare Mounting Surface	28
10.2	Cutting Tape Scales	29
10.3	Install the Tape Scale	30
	10.3.1 Install Tape Scale Manually	30
	10.3.2 Install Tape Scale Using the Applicator Tool	34
11.0	Linear Glass Scales Installation	43
11.1	Before Installation.....	43
	11.1.1 Items Required for Glass Scale Installation	43
	11.1.2 Flowchart for Glass Scale Installation	43
11.2	Benching Linear Glass Scales	44
11.3	Prepare Mounting Surface	44
11.4	Install Linear Glass Scales.....	44
12.0	Final Cleaning, Inspection, and Cure Time	45
12.1	Reworking to Correct Mistakes	45
12.2	Cleaning Scales	45
13.0	Contacting Celera Motion.....	45

2.0 Introduction

2.1 Overview

The instructions in this manual apply to the following Optira Series Encoders models:

- Model PIA Standard 5 V
- Model PIB Standard 3.3 V

2.2 Precautions



1. Follow standard ESD precautions. Turn **power to off** before connecting sensor.
2. **Do not touch** electrical pins without static protection such as a grounded wrist strap.

2.3 Laser Safety Information

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 U.S. FDA **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.

MicroE Systems 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, install the **encoder sensor in its operational configuration in close proximity to the encoder scale before applying power**.



- Invisible laser radiation; wavelength: 850 nm.
- Maximum power of 4.8 mW CW for Optira.
- **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.

2.4 Standards Compliance

Optira Series Encoders are RoHS, REACH, and CE compliant.



2.5 Related Documentation

- Optira Series Encoders Data Sheet
- Optira Series Encoders Interface Drawings

2.6 Trademarks

Optira trademark of Novanta Inc. d/b/a Celera Motion.

2.7 Special Conventions Used

The following symbols *may* be used in this document.

Symbol	Description
	Warning or caution: potential damage to parts.
	Instructions show correct method.
	Instructions show example of incorrect method.
See Section 2.2	Single click with the mouse on these highlighted references to jump to specified places in instructions.

3.0 Before Installation

Review the items in this section prior to installing the encoder.

3.1 Power Recommendations

Optira Series Encoders can be ordered with either 5 V_{DC} or 3.3 V_{DC} power supplies:

Power Supply	Minimum Input Voltage	Maximum Input Voltage	Maximum Current Draw (Digital)	Maximum Current Draw (Analog)	Maximum Current Draw (No Load)
5.0 V _{DC}	4.75 V _{DC}	5.25 V _{DC}	130 mA	100 mA	75 mA
3.3 V _{DC}	3.13 V _{DC}	3.46 V _{DC}	130 mA	100 mA	75 mA

When designing circuits and extension cables to use Optira encoders, be sure to account for voltage loss over distance and tolerances from the nominal supply voltage so that at least the minimum continuous voltage is available to the Optira encoder under all operating conditions.

3.2 Installation Considerations

The Optira 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 Optira design, 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 clearance for sensor head alignment.
- DO follow setup and calibration instructions for the encoder system.
- DO, where possible, install the scales in an inverted or vertical position to minimize accumulation of dust.
- 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).

3.3 Items Required for Installation

In addition to the items identified in [Section 3.0 System Overview](#), you will need the following items available for installation:

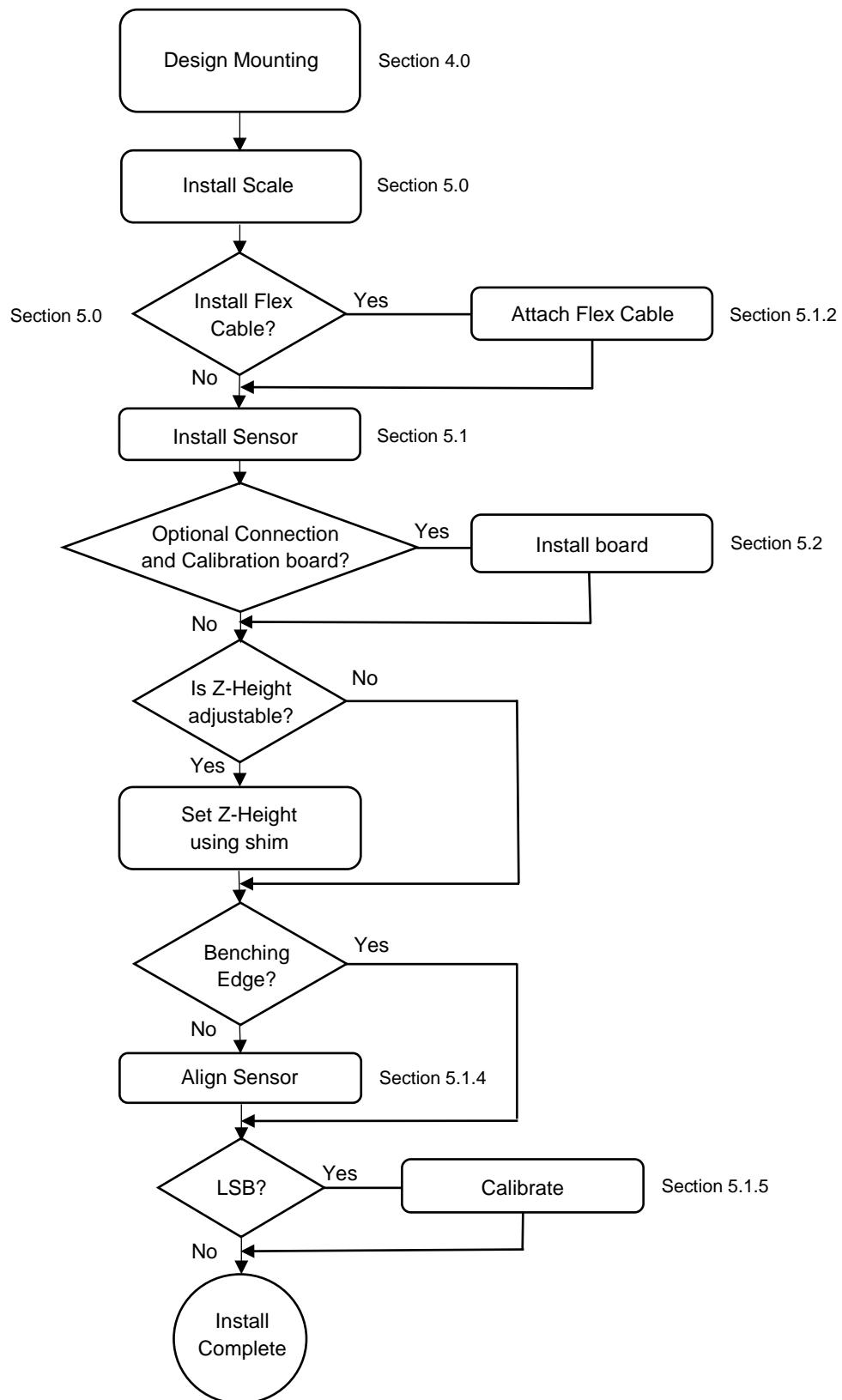
Item
Z-Height shim ¹ (0.020")
Screwdriver
Finger Cots or talc-free gloves
Acetone or isopropyl alcohol
Lint-free cotton cloths or wipes
Epoxy, non-conductive ²
Stick and disposable surface for stirring epoxy ²

Notes:

1. Part of optional Development Kit; not required if using a benching edge for installation.
2. Not required for all installations.

3.4 Sensor Installation Flowchart

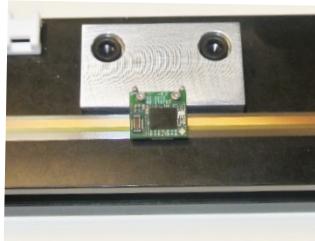
The following flowchart shows the main steps in encoder installation, alignment, and calibration.



4.0 System Overview

This section identifies parts for the Optira sensor installation. Use the information in this section to design the mounting scheme for the sensor and the optional connector and calibration board. Refer to the *Optira Series Encoders Interface Drawings* for details. Alignment not required when benching sensor.

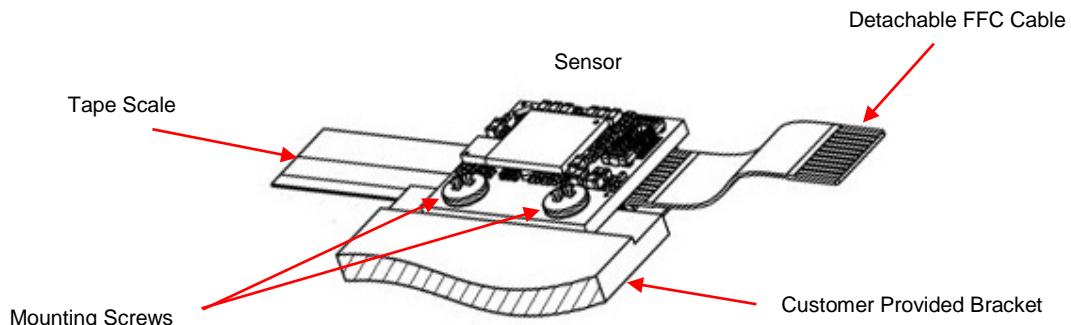
Example of installed sensor



4.1 Top Mounting

This section contains information needed for installing the sensor in a top mount configuration. The sensor can be mounted directly to customer's bracket or equivalent surface using two mounting screws.

Note: For scales, see *Optira Series Encoders Tape and Glass Scales Installation Manual*.



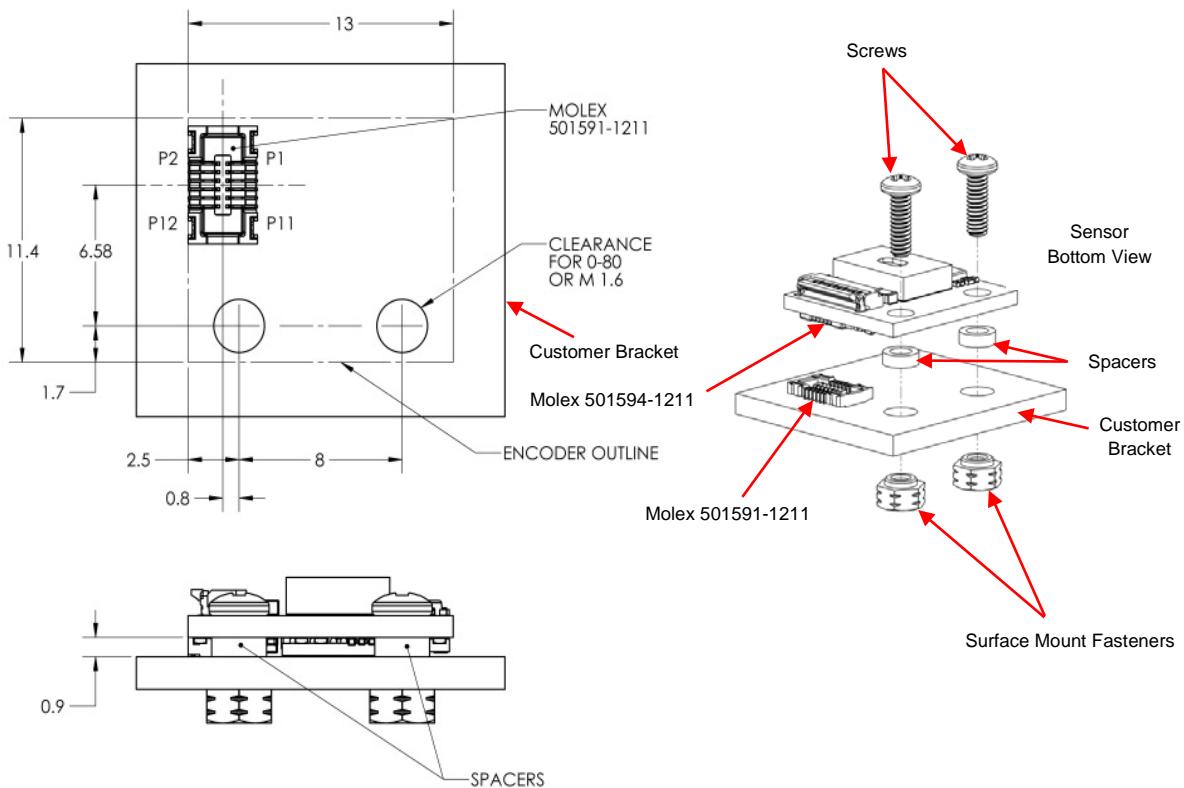
Recommended Customer Required Parts

The following parts or their equivalents are recommended for the mechanical mounting of the Optira sensor.

Item	Description
Mounting Screws (2)	M1.6 or 0-80 screws. Philips head screws are recommended. Do not use slotted-head screws which can allow the screwdriver to slip and damage components. Tighten screws per torque specification: 0.34Nm (3 inch-lbs.) maximum. Caution: Be careful tightening these screws to avoid damaging nearby components.
FFC Cable	Flexible Flat Cable (FFC): 0.5 mm, Type 1, 10 P. Maximum length of 5 m. J1 ZIF Connector is Hirose® FH33J-10S-0.5SH(10). If long flex cables are needed, contact Selmark Associates for Parlex® cables or contact another equivalent manufacturer. Tip: For high mechanical stress environments, secure FFC to ZIF connector using non-conductive epoxy.
ZIF Connector	Various FFC Connectors, Surface Mount, ZIF, 10 pins, .5 mm pitch.
Z-Height Shim Spacer	Shim for setting gap between sensor riser and top of installed scale. Not needed for most installs. (Part of optional Development Kit)

4.2 Board-to-Board Mounting

This section contains information needed for installing the Optira sensor to the customer's PCB.



Recommended Customer Required Parts

The following parts or their equivalents are recommended for the board-to-board mounting of the Optira sensor.

Item	Description
Mounting Screws (2)	M1.6 or 0-80 screws. Philips head screws are recommended. Do not use slotted-head screws which can cause the screwdriver to slip and damage components. Tighten screws per torque specification: 0.34 Nm (3 inch-lbs.) maximum. Caution: Be careful tightening these screws to avoid damaging nearby components.
PCB Mount Connector ¹	Molex® part number 501591-1211: 0.40 mm (.016") pitch board-to-board vertical mating receptacle. Mates to JP1 board-to-board connector (Molex part number 501594-1211) on sensor.
Spacers (2)	Diameter cannot exceed keep-out area of 3.17 mm (see sensor dimensions on Optira Interface Drawing). Height is .9 mm.
Surface Mount Fasteners (2)	MicroPEM® Fasteners, Type is SMTSO .060-80 (#0-80) or equivalent.

Note¹: Header Mating. The header mating connector has a limited durability of 20 mating cycles maximum.

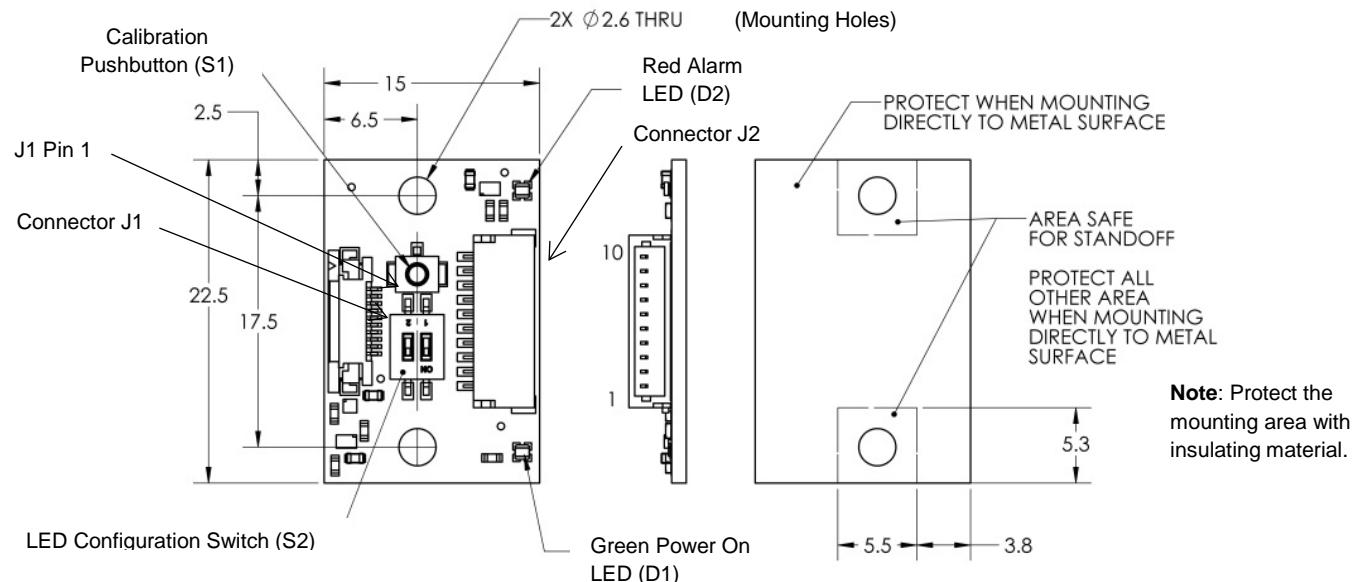
4.3 Optional Development Kit

The following are the components of the optional Development Kit model PI-DK:

Part	Description
Connector and Calibration Board	Interface board located between the Optira sensor and the customer's controller: <ul style="list-style-type: none"> • Provides feedback of sensor operation to customer electronics • Provides control for calibration and alignment • Size: 0.591" x 0.886" • No signal processing
200mm FFC Cable	Flat flexible cable (FFC) that connects sensor to optional interface board or directly to customer electronics: <ul style="list-style-type: none"> • Digikey 732-3556-ND • Wurth Electronics® part number 687610200002 (0.5 mm, Type 1, 10P, 200 mm)
3m Controller Cable	Custom Development Kit Cable with JST® Connector and 15-Pin D-Sub to connect between Connector and Calibration Board and customer's electronics.
Z-Height Shim Spacer	Shim for setting gap between sensor riser and top of installed scale.

4.4 Optional Connector and Calibration Board

This section contains information needed to install the optional Connector and Calibration Board.



LED Configuration Switch S2

Switch	Description	On	Off
1	Red Alarm LED (D2)	Alarm is active low	Alarm is active high
2	Green Power On LED (D1) ¹	Power On LED is On	Power On LED is Off

Default from factory: both S1 and S2 are set to ON.

Note¹: S2 is not a power switch; intended only to turn LED off for light sensitive applications.

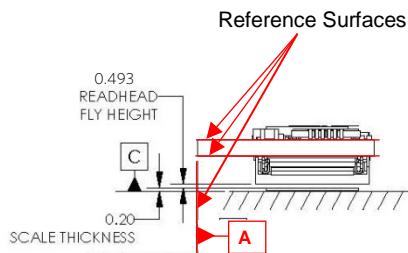
Recommended Customer Required Parts

The following parts or their equivalents are recommended for using the optional Connector and Calibration board.

Item	Description
Custom Connector	Parts required to connect custom cable to header connector J2 (JST SM10B-SRSS-TB): <ul style="list-style-type: none"> • Mating Connector JST 10SR-3S • Crimping Tool JST YRS-859 • Terminal Connector JST SSH-003T-P0.2 (28 – 32 AWG TIN)
Screwdriver	WiHa 26008. Small plastic screw driver to change settings on the DIP switch on the Connector and Calibration Board.
FFC Cable	Flexible Flat Cable (FFC): 0.5 mm, Type 1, 10 P. Maximum length of 5 m. Refer to manufacturer's specification. If long flex cables are needed, contact Selmark Associates for Parlex cables or contact another equivalent manufacturer.

4.0 Design Mounting

This section contains instructions for designing the mounting scheme for installing the sensor. A benching edge is recommended to locate the sensor to meet mechanical mounting tolerances. Refer to the Interface Drawing for recommended location and height of edge. Use the following reference surfaces for sensor installation.



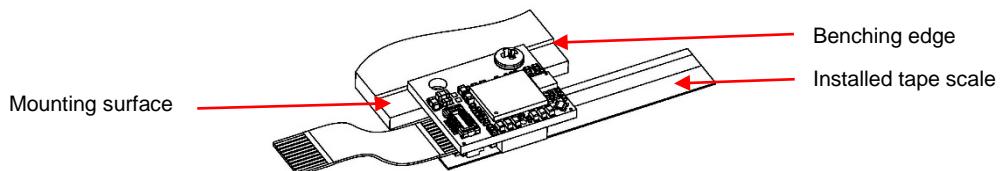
5.0 Sensor Installation

This section contains instructions for installing the sensor and the optional connector and calibration board.

5.1 Install Sensor

Note: Tape or glass scales **must** be installed before installing the sensor. Refer to the *Optira Tape and Glass Scales Installation Manual* for instructions.

Refer to the Optira Interface Drawing ID-00400 for details for sensor installation. A benching edge is recommended to locate the sensor to meet mechanical mounting tolerances. Refer to the Interface Drawing for recommended location and height of edge.

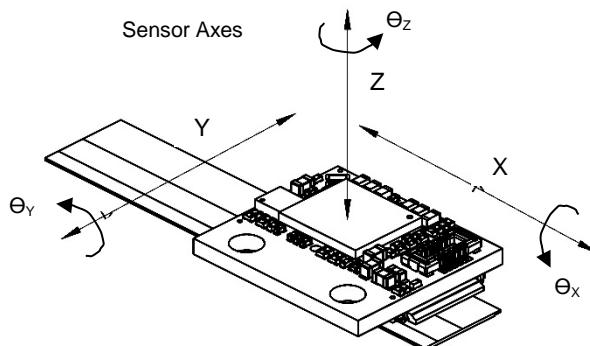


Note: When installing sensor, ensure that the detector is always facing grating.

5.1.1 Sensor Mounting Orientation and Tolerances

Refer to the following specifications when installing and aligning the Optira sensor.

Orientation



Tolerances

Optira Series Encoders Sensor Alignment Tolerances	
Axis	Alignment Tolerance
X	Direction of Motion
Y	± 0.15 mm
Z	± 0.15 mm
θ_X	$\pm 1.0^\circ$
θ_Y	$\pm 1.0^\circ$
θ_Z	$\pm 2.0^\circ$

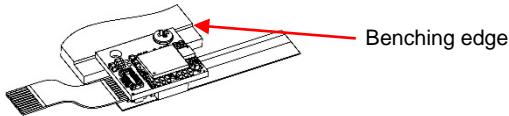
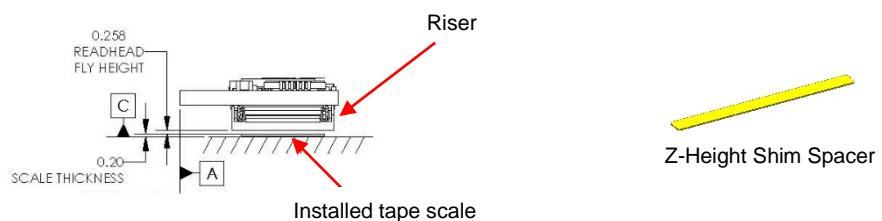
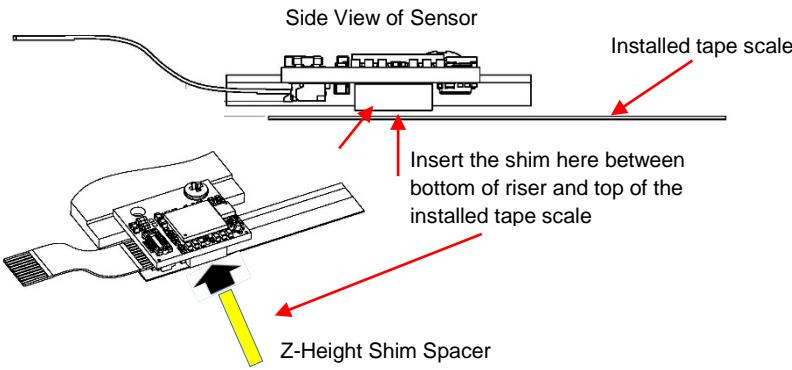
Note: Tolerance for each axis is specified independently, assuming nominal alignment in other axes.

5.1.2 Top Mounting

Perform the following steps to install sensor. Benching the sensor is the preferred method for installation and the sensor will then not require an alignment. Refer to sensor information in **Section 3.0 System Overview**. For installing the sensor to a PCB, go to **Section 5.1.3 PCB Mounting**.

Note: A scale must be installed before installing the sensor. Refer to the *Optira Series Encoders Tape and Glass Scales Installation Manual* for instructions.

Step	Action
1.	<p>Attach the FFC cable to the sensor ZIF connector J1 before installing sensor (see note below about space restriction). Be careful when connecting/disconnecting the FFC to not damage the connector.</p> <p>Note: Once sensor is mounted, there is not sufficient space to safely disconnect or connect the FFC cable. As there is limited clearance between the ZIF connector and the scale surface, it is recommended that the FFC be mounted to the connector prior to mounting the sensor.</p> <p>Tip: For high mechanical stress environments, secure the FFC to ZIF connector using non-conductive epoxy.</p>

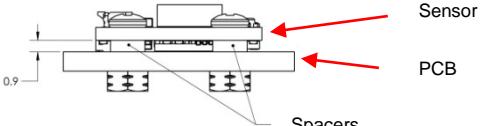
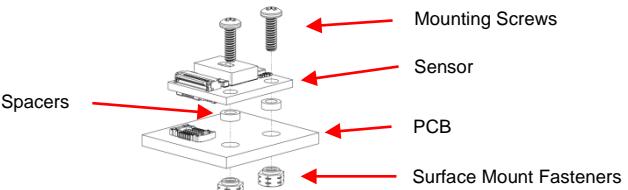
Step	Action
2.	<p>Z-Height: If Z-Height is not adjustable, firmly place sensor against benching edge.</p>  <p>If Z-Height is adjustable, go to Step 5.</p>
3.	<p>Use two M1.6 or 0-80 screws to attach the sensor and tighten per torque specification: 0.34Nm (3 inch-lbs.) maximum.</p>
4.	<p>Connect sensor to customer's electronics or to the optional Connector and Calibration Board.</p> <p>Result: Sensor installation is complete for benching install. Alignment not required with benching installation. If sensor has an LSB index, go to Section 5.1.5 LSB Index Calibration.</p>
5.	<p>If Z-Height is adjustable: Use the Z-Height Shim Spacer (part of optional development kit) to set the proper gap between the sensor's riser and the top of the scale (0.493 mm). Refer to the Optira Interface Drawing for details.</p> <p>Side View of Sensor</p> 
6.	<p>Insert the Z-Height Shim Spacer between the sensor's riser and the top of the scale.</p> <p>Side View of Sensor</p> 
7.	<p>Fully tighten the two M1.6 or 0-80 screws to attach the sensor. Tighten screws per torque specification: 0.34Nm (3 inch-lbs.) maximum. Adjust the Z-Height. The shim should move with minimal friction between the riser and the scale. Remove shim.</p>
8.	<p>Connect sensor to customer's electronics or to the optional Connector and Calibration Board.</p> <p>Result: Sensor installation is complete for adjustable Z-Height install.</p>

Note: If sensor was not installed using benching, then go to [Section 5.1.4 Sensor Head Alignment](#) Sensor Head Alignment to align the sensor.

5.1.3 PCB Mounting

Perform the following steps to mount sensor to customer's PCB. Refer to sensor information in [Section 3.0 System Overview](#).

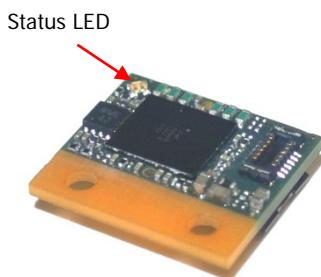
Note: A scale must be installed before installing the sensor. Refer to the *Optira Series Encoders Tape and Glass Scales Installation Manual*.

Step	Action
1.	Use spacers to maintain sufficient space between sensor and PCB. 
2.	Press sensor to PCB carefully ensuring good connection for mating connectors.
3.	Insert mounting screws between sensor and PCB through spacers. 
4.	Attach surface mount fasteners securely.
5.	Install the PCB on the mounting surface referencing the appropriate datum surface as shown in the Optira Interface Drawing. Use two M1.6 or 0-80 screws and tighten per torque specification: 0.34Nm (3 inch-lbs.) maximum.
6.	Connect PCB to customer's electronics or to the optional Connector and Calibration Board.

5.1.4 Sensor Head Alignment

Alignment is positioning of the sensor with respect to the scale to achieve proper signal strength from the count track and the index track. Proper sensor alignment may require minor adjustments to the sensor position with respect to the scale.

Sensor alignment can be performed easily by using the sensor's Status LED indicator, which lights depending on sensor alignment as follows:



LED Color ¹	System Status
Green	Optimal alignment: Optimal position signal with minimum power consumption Encoder system meets specification.
Greenish Yellow	Good alignment: Optimal position signal at specified power consumption Encoder system meets specification.
Orange	Alignment could be improved but fully operational: Sensor is reading position with marginal signal strength. Encoder system functions but vector magnitude may not be 1 Vpp and SDE may exceed specification.
Red	Sensor fault: Sensor is reading position with weak signal strength, or Power supply is less than 4.2 V, or Power supply is greater than 5.5 V, or Sensor moving faster than 5.8 m/s. Encoder system may not function properly. Alarm signal will be asserted.

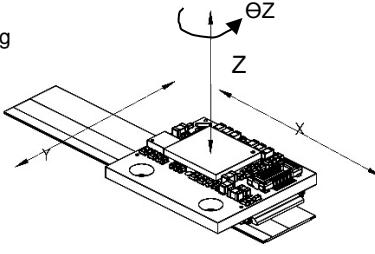
Note¹: The Status LED can be ordered with all four colors available, or with only red available for alarm indication (see [Section 7.0 Order Guide](#)).

LED Indications for Index Detection

- LED flashes bright when passing over index
- LED stays bright if stopped on index

Align Sensor

Perform the following steps to align the sensor:

Step	Action
1.	Apply power to sensor.
2.	Ensure that the sensor's mounting screws are loosely tightened. Slowly move the sensor by allowing it to slide on the mounting surface until the Status LED illuminates blue.
3.	Confirm that the blue LED flashes brightly when passing over the index. If not, readjust the sensor in the Y direction and repeat the above. Slowly slide sensor on its mounting surface in the Y or ΘZ directions 
4.	When alignment is completed, tighten the sensor mounting screws per the torque specification: 0.34Nm (3 inch-lbs.) maximum.
5.	Confirm that the LED remains blue over the full range of motion.
6.	If the sensor is not aligned over the entire range of motion: <ul style="list-style-type: none"> • Loosen the sensor mounting screws and repeat this procedure starting at Step 1. • Confirm that the scale has been installed parallel to the motion axis and that the LED remains blue through the full range of motion.
Result: The LED remains blue throughout travel and flashes over the Index.	

5.1.5 LSB Index Calibration

Calibration is the process where the Least Significant Bit (LSB) index is set to its most stable operating location, which is centered within the sensor's 20 μm wide, raw Index Window (IW).

Calibration is only required for sensors with the LSB Index option (see [Section 7.0 Order Guide](#)). Analog sensors or digital Optira sensors configured with the 20 μm Index Window do not require calibration.

When to perform calibration:

- When installing the sensor for first time
- If the sensor is subsequently remounted
- If the scale is replaced

After installing and aligning the Optira sensor, calibrate the sensor using one of the following methods:

- Manual Calibration
- Using the Calibration Pushbutton

Note: Ensure that the sensor has already been aligned prior to calibration.

Manual Calibration

Use the following instructions to perform a manual calibration when the optional Connector and Calibration Board (Model PI-CB) is not present.

See [Section 6.3 Sensor Connectors Pinouts](#) for pinout details.

Note: Perform procedures below at ≤ 1 meter/second relative motion between the sensor and scale.

Caution: Be careful when performing the following procedure since power is on and there is a potential to damage equipment.



Step	Action
1.	<p>Short the CAL signal to ground: Connect a wire or jumper from the Cal signal on the sensor connector (pin 8 of J1 or JP1) to ground (pin 10 of J1 or JP1) or to ground on the PCB.</p> <p>Result: The system status LED starts blinking at a regular rate.</p>
2.	<p>Move the sensor over the index up to 20 passes (one pass is a single cycle back and forth).</p> <p>Result: The LED stops blinking.</p>
3.	Calibration is complete.

Using the Calibration Pushbutton

Use the following instructions to perform sensor calibration by using the Calibration Pushbutton on the optional Connector and Calibration Board (Model PI-CB).

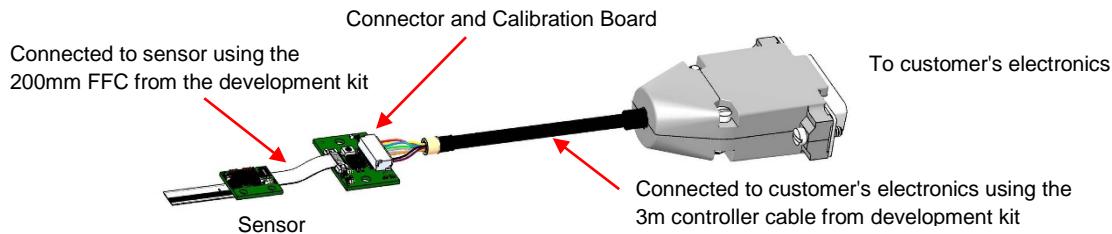
Note: Perform procedures below at ≤ 1 meter/second relative motion between the sensor and scale.

Step	Action
1.	<p>To start calibration, press the Calibration pushbutton (S1) on the Connector and Calibration board.</p> <p>Calibration Pushbutton S1</p> <p>Connector and Calibration board</p> <p>Result: The sensor LED and the Alarm LED start blinking at a regular rate.</p>
2.	<p>Move the sensor over the index up to 20 passes (one pass is a single cycle back and forth).</p> <p>Result: The LEDs stop blinking.</p>
3.	Calibration is complete.

Note: To abort calibration, press the Calibration pushbutton again.

5.2 Install Optional Connector and Calibration Board

The optional Connector and Calibration Board can be connected to the sensor using cables in the optional Development Kit or by using customer's wiring. Refer to the information in [Section 3.0 System Overview](#).



Guidelines

- The optional Connector and Calibration Board can be mounted by using mounting screws and standoffs or epoxy.
- Using Kapton tape is recommended if mounting directly to conductive surface without standoffs.
- Use the board as an indicator of alignment by monitoring the alarm LED. Refer to [Section 5.1.4 Sensor Head Alignment](#) to match Status Led on sensor and if Alarm LED is configured as active high or active low.

Creating Custom Connector to Connector and Calibration Board

Use the crimping tool (JST YRS-859) with crimp connector terminals (JST SSH-003T-P0.2) to connect custom cables to the mating connector (JST 10SR-3S) to J2 shrouded head connector (JST SM10B-SRSS-TB).

6.0 Appendix

6.1 Specifications

System

Scales

Optira Series Encoders are compatible with Optira Tape Scales, Linear Scales, and Rotary Glass Scales

Scale Pitch 20 µm

System Resolution
5 µm, 2.5 µm, 1 µm, 0.5 µm, 0.2 µm,
0.1 µm, 50 nm, 20 nm, 10 nm, 5 nm.
Analog 1 Vpp.
2,000 CPR – 75M CPR (rotary)
(specify resolution at time of ordering)

Accuracy

Tape	SDE:	<100 nm RMS
	Linearity:	<± 5 µm (max/meter)
	Slope:	<±150 µm/m

Linear Glass	SDE:	<100 nm RMS
	Total Accuracy:	<±1 µm/m ¹

Rotary Glass	Total Accuracy:	±2 arc-seconds ²
--------------	-----------------	-----------------------------

Sensor Size and Weight

	Length	Width	Height
Dimensions (mm):	13.0	11.4	3.7
Weight:	<1.5 g sensor head		

Sensor Cable ZIF Flat Flexible Cable (FFC)
10 pins; length up to 5 m.

Reliability Information

MTBF >200,000 hours under normal operating conditions
(calculated using MIL-STD-217)

Notes:

1. 130 mm or less
2. 125 mm diameter, excludes eccentricity

Maximum Velocity – Quadrature Output

Maximum Velocity (before Overspeed Buffer Protection³) vs. Interpolation Depth

Controller Recommended AqB Maximum State Rate (MegaStates/Sec)	Actual Encoder AqB Maximum State Rate (MegaStates/Sec)	5000	2500	1000	500	200	100	50	20	10	5	Resolution (nm)
20	14.50	4000	4000	4000	4000	2900	1450	725	290	145	72	Interpolation Depth
10	7.25	4000	4000	4000	3625	1450	725	362	145	72	36	
5	3.63	4000	4000	3625	1812	725	362	181	72	36	18	
2	1.45	4000	3625	1450	725	290	145	72	29	14	7	
1	0.73	3625	1812	725	362	145	72	36	14	7	3	
												Maximum Velocity (mm/s)

Notes³:

1. Optira implements Overspeed Buffer Protection (OBP). No AqB counts are lost for velocities below 4830 mm/s even if the maximum specified rate is exceeded. If the velocity exceeds the specified state rate, the AqB counts are buffered (buffer length = 21 m at 4000x interpolation depth) and transmitted at the specified state rate.
2. The ALARM bit sets TRUE at 4 m/s, however, Optira will continue to produce valid AqB outputs up to 6 m/s although accuracy specifications are no longer guaranteed.

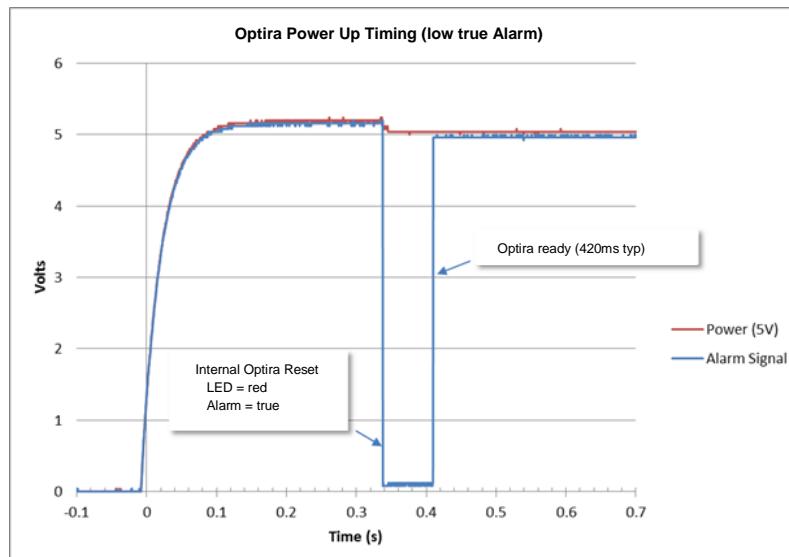
Maximum Velocity (Analog)

Sine/Cosine Vector Magnitude: > 0.5 Vpp at 4 m/s



4.1 Power-Up Timing

The Optira encoder will be ready 420 ms after the 3.3 V or 5 V supply rises, during which the LED will flash red and the Alarm signal will transition true. The encoder will be ready once the Alarm transitions false per the following chart (5 V model is shown; chart also applicable for 3.3 V model):



6.2 Sensor Connectors Pinouts

The following are the pinouts for the two connectors on the Optira sensor.

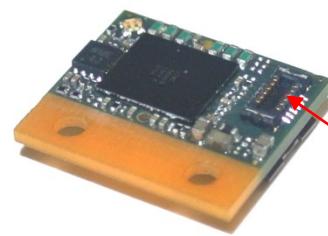
JP1 – Low Profile Board-to-Board Header Connector

Manufacturer Part Number: Molex® 501594-1211

Pin Number	Signal	
	A-quad-B	Analog
1	A+	SIN+
2	A-	SIN-
3	B+	COS+
4	B-	COS-
5	Index+	Index+
6	Index-	Index-
7	Alarm	Alarm
8	CAL	CAL
9	PWR	PWR
10	GND	GND
11	NC	NC
12	NC	NC

NC – No Connect

Optira Sensor Top View



JP1 – Board-to-Board Header Mating Connector¹

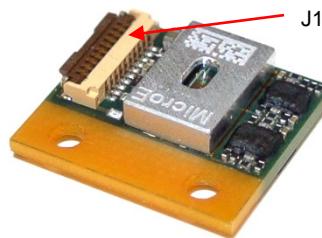
Note¹: The 12-pin header mating connector has a limited durability of 20 mating cycles maximum.

J1 - ZIF Connector

Manufacturer Part Number: Hirose® FH33J-10S-0.5SH(10)

Pin Number	Signal	
	A-quad-B	Analog
1	A+	SIN+
2	A-	SIN-
3	B+	COS+
4	B-	COS-
5	Index+	Index+
6	Index-	Index-
7	Alarm	Alarm
8	CAL	CAL
9	PWR	PWR
10	GND	GND

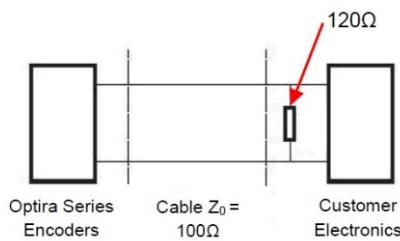
Optira Sensor Bottom View



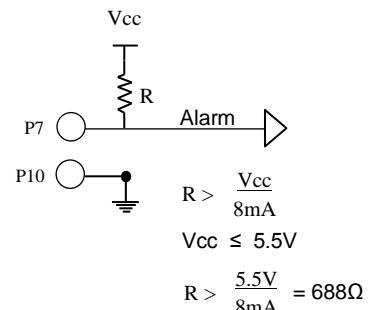
J1 ZIF Connector



6.3 Recommended Signal Termination

Note: Below values are applicable for 5 V models only.**Digital/Analog Outputs****Alarm**

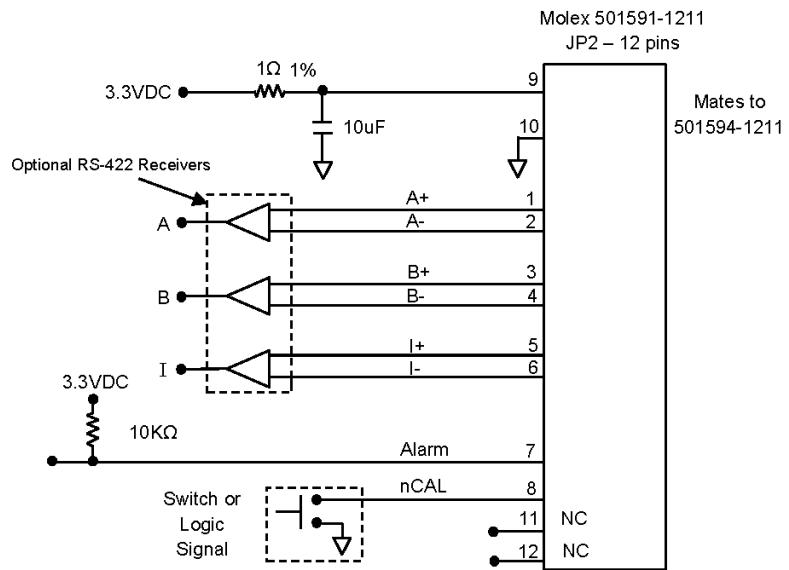
Alarm output is an open collector circuit that is factory programmable: either active high or active low; specify when ordering. Alarm requires an external pull-up resistor. See customer-supplied circuit example on right.

Circuit Example**Note:** Maximum cable length is 5 m. Contact MicroE Applications Engineering if longer lengths are required.

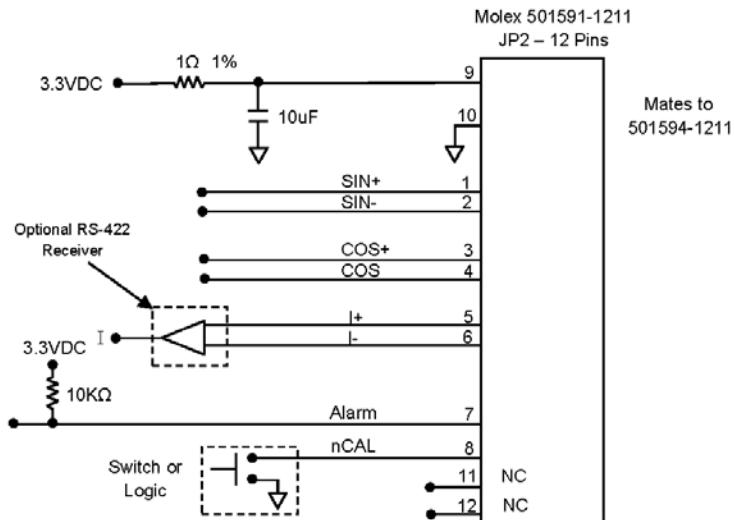
6.4 Board-to-Board Header Wiring Examples

The following are sample customer circuits for connecting to the Optira sensor using board-to-board mounting.

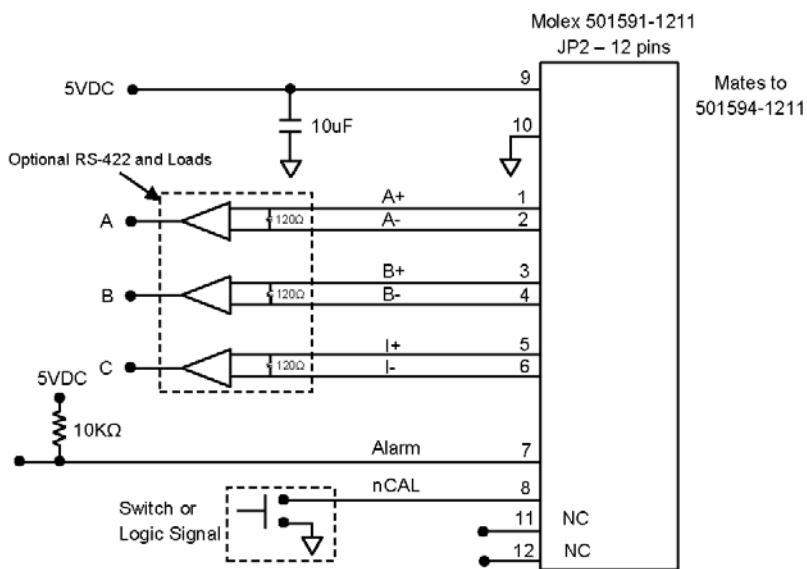
**3.3 V_{DC}
Digital
Operation**



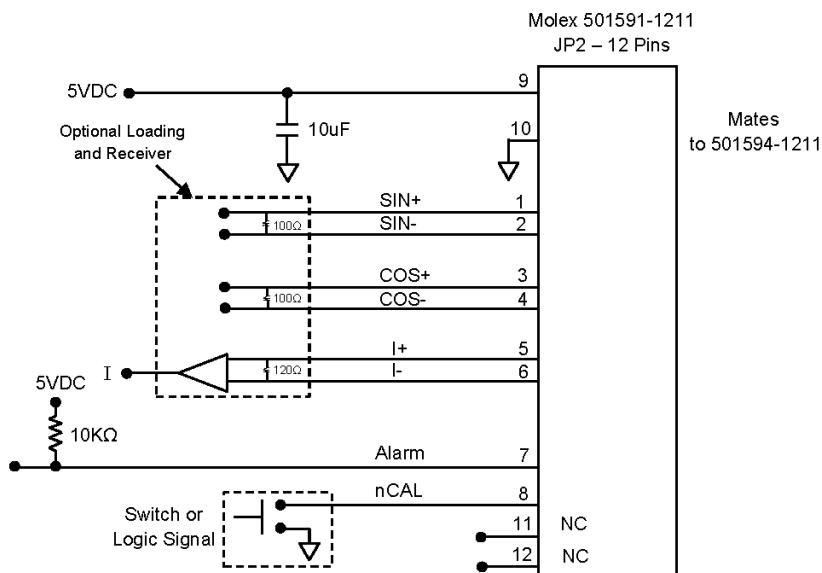
**3.3 V_{DC}
Analog
Operation**



5 V_{DC}
Digital
Operation



5 V_{DC}
Analog
Operation

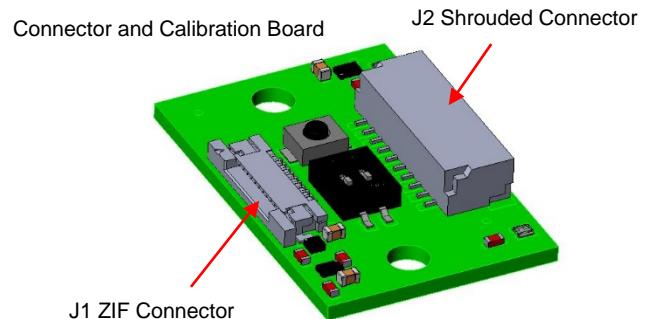


6.5 Connector and Calibration Board Connector Pinouts

Connector J1 - Flat Flexible Cable (FFC) connecting sensor to optional interface board ZIF connector J1

Manufacturer Part Number: Omron XF2L-1025-1A

Pin Number	Signal	
	A-quad-B	Analog
1	A+	SIN+
2	A-	SIN-
3	B+	COS+
4	B-	COS-
5	Index+	Index+
6	Index-	Index-
7	Alarm	Alarm
8	CAL	CAL
9	PWR	PWR
10	GND	GND



Connector J2 - JST 10-pin connector on optional interface board

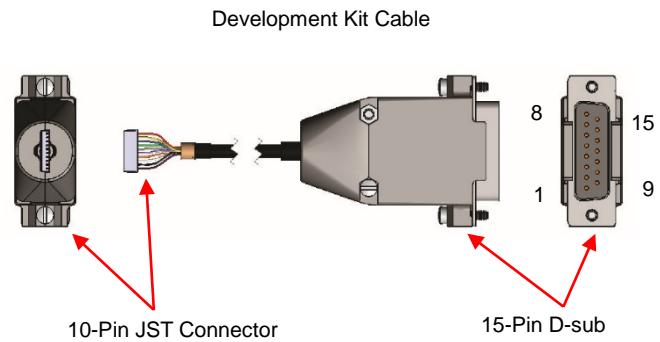
Manufacturer Part Number: JST SM10B-SRSS-TB(LF)(SN)

Pin Number	Signal	
	A-quad-B	Analog
1	B-	COS-
2	GND	GND
3	Alarm+	Alarm+
4	B+	COS+
5	Index-	Index-
6	Alarm-	Alarm-
7	A-	SIN-
8	Index+	Index+
9	A+	SIN+
10	PWR	PWR

Development Kit Cable

15-Pin D-sub/10-Pin JST Cable from Connector/Calibration Board to Customer Interface

10-Pin JST	Signal		15-Pin D-Sub
	A-quad-B	Analog	
NC	NC	NC	1
NC	NC	NC	2
Pin 6	Alarm-	Alarm-	3
Pin 5	Index-	Index-	4
Pin 1	B-	COS-	5
Pin 7	A-	SIN-	6
NC	NC	NC	7
Pin 10	PWR	PWR	8
Pin 2	GND	GND	9
NC	NC	NC	10
Pin 3	Alarm+	Alarm+	11
Pin 8	Index+	Index+	12
Pin 4	B+	COS+	13
Pin 9	A+	SIN+	14
N/A	Inner Shield	Inner Shield	15



NC – No Connect

N/A – Not Applicable

6.6 Customer Interface

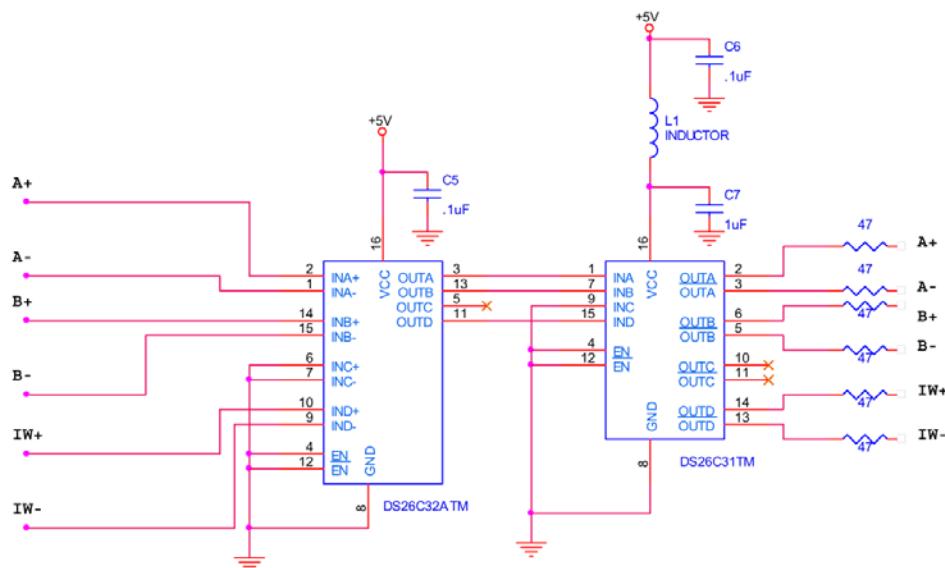
Contact Factory for guidance

6.7 RS-422 Compatibility

Optira Series Encoders are RS-422 compatible. Encoder signals are “sending end terminated” and customer receiving terminations are not required.

For more details, see the following Tech Note: [Proper Termination of Digital Incremental Encoder Signals.](#)

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



6.8 Troubleshooting

Problem	Solution
The LED on the sensor does not light.	<ul style="list-style-type: none"> Confirm power connection is correct. Confirm sensor configuration.
The LED on the sensor displays steady red.	<ul style="list-style-type: none"> Confirm sensor alignment. Confirm scale cleanliness.
Calibration procedure won't initiate.	<ul style="list-style-type: none"> Check sensor configuration for LSB. Check connection between Connector and Calibration board and the sensor.
Calibration procedure won't complete.	<ul style="list-style-type: none"> Check alignment for Index detection.

7.0 Order Guide

Sensor

PIA-1000-A1-02-A (example)

Status LED
A=Blue, Green, Yellow, and Red
B=Red only (Alarm)

A-quad-B Output Rate
20=20 MegaStates/sec
10=10 MegaStates/sec
05=5 MegaStates/sec
02=2 MegaStates/sec
01=1 MegaStates/sec
00=Analog 1 Vpp

Index
1=LSB¹ (2.5 µm and higher)
0=Window (analog and 5 µm only)

Alarm
A=Active High
B=Active Low

Resolution
5000=5 µm
2500=2.5 µm
1000=1 µm
0500=0.5 µm
0200=0.2 µm
0100=0.1 µm
0050=50 nm
0020=20 nm
0010=10 nm
0005=5 nm
0000=Analog 1 Vpp

Sensor Type
A=Standard, 5 V Input
B=Standard, 3.3 V Input

Model
PI = Optira Incremental

Scales² - Optira Tape Scale

PILT-10000I-B-A (example)

Mounting
A=Adhesive

Index Mark
B=Center of measuring length
C=Customer specified
E=None

Continuous or Individual
C=Continuous reel with cut marks
I=Individual length (default selection for Index Mark type E)

Scale Length³
XXXXX=Length in mm

Model
PILT=Optira Tape Scale, Standard

Accessories

PI-DK Development Kit: Connector and Calibration Board, 200 mm FFC Cable, 3 m Controller Cable, and Z-Height Shim Spacer for sensor installation

PI-CB Connector and Calibration Board

PILT-AT Tape Scale Applicator Tool (used for lengths >0.3 m)

Notes:

1. The Connector and Calibration Board is required for calibration when specifying LSB for the index.
2. Scales Availability: linear glass and rotary glass scales are available: contact MicroE for more details:
 - Linear Glass Scales - Model PILG, lengths up to 130 mm
 - Rotary Glass Scales - Model PIRG, diameters up to 130 mm
3. Does not apply for custom scales; contact MicroE for custom part numbers.

8.0 Introduction to Scale Mounting

8.1 Overview

The instructions in this manual apply to the following scales for Optira Series Encoders:

- Optira Tape Scale, Model PILT
- Optira Linear Glass Scales, Model PILG
- Optira Rotary Glass Scales, Model PIRG

Refer to the encoder data sheet or sensor installation manual for details on ordering parts.

9.0 Rotary Scales

For details on rotary scales, see the following:

- Optira Series Encoders Data Sheet
- Optira Series Encoders Interface Drawing

10.0 Tape Scale Installation

Use the steps in this section to install Optira tape scales.

10.1 Before Installation

Review the information in this section prior to installing tape scales.

10.1.1 Items Required for Tape Scale Installation

You will need the following items available for tape scale installation.

Item
Finger Cots or talc-free gloves
Acetone or isopropyl alcohol
Lint-free cotton cloths or wipes
Epoxy, non-conductive
Stick and disposable surface for stirring epoxy
Shears ¹
Tape Applicator Tool ²

Notes:

4. Recommended: Clauss Part Number 18003.
5. Model PILT-AT: required for applications >300 mm (not required for installations <300 mm).

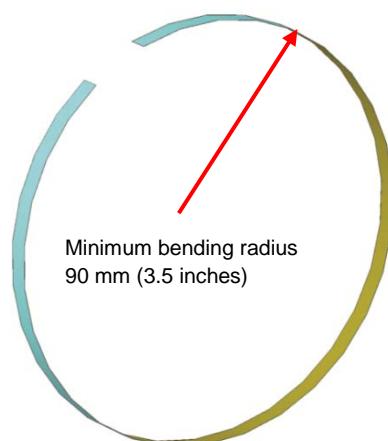
Refer to encoder data sheet or sensor installation manual for details on ordering parts.

10.1.2 Pre-Installation Information and Precautions



Read all instructions completely before beginning the installation process and follow the instruction sequence throughout the installation process. The Optira tape scale is a precision metrological device. Handle it with the utmost care at all times.

- Avoid bending the tape scale to a radius less than 90 mm (3.5 inches)
- Avoid twisting the Optira tape scale.
- The Optira tape scale is protected by a blue film on the top that prevents contamination and damage to the grating pattern during installation.
- DO NOT let any sharp object touch the tape scale after the blue protective film is removed.
- Once the adhesive on the tape scale is exposed (by removing the adhesive backing), do not touch the adhesive or allow any contamination to come into contact with it.
- Optira tape scale is designed for one time installation only.



- If removed from the mounting surface for any reason, they should not be used for any kind of re-application. This will affect the performance and reliability of the encoder system.

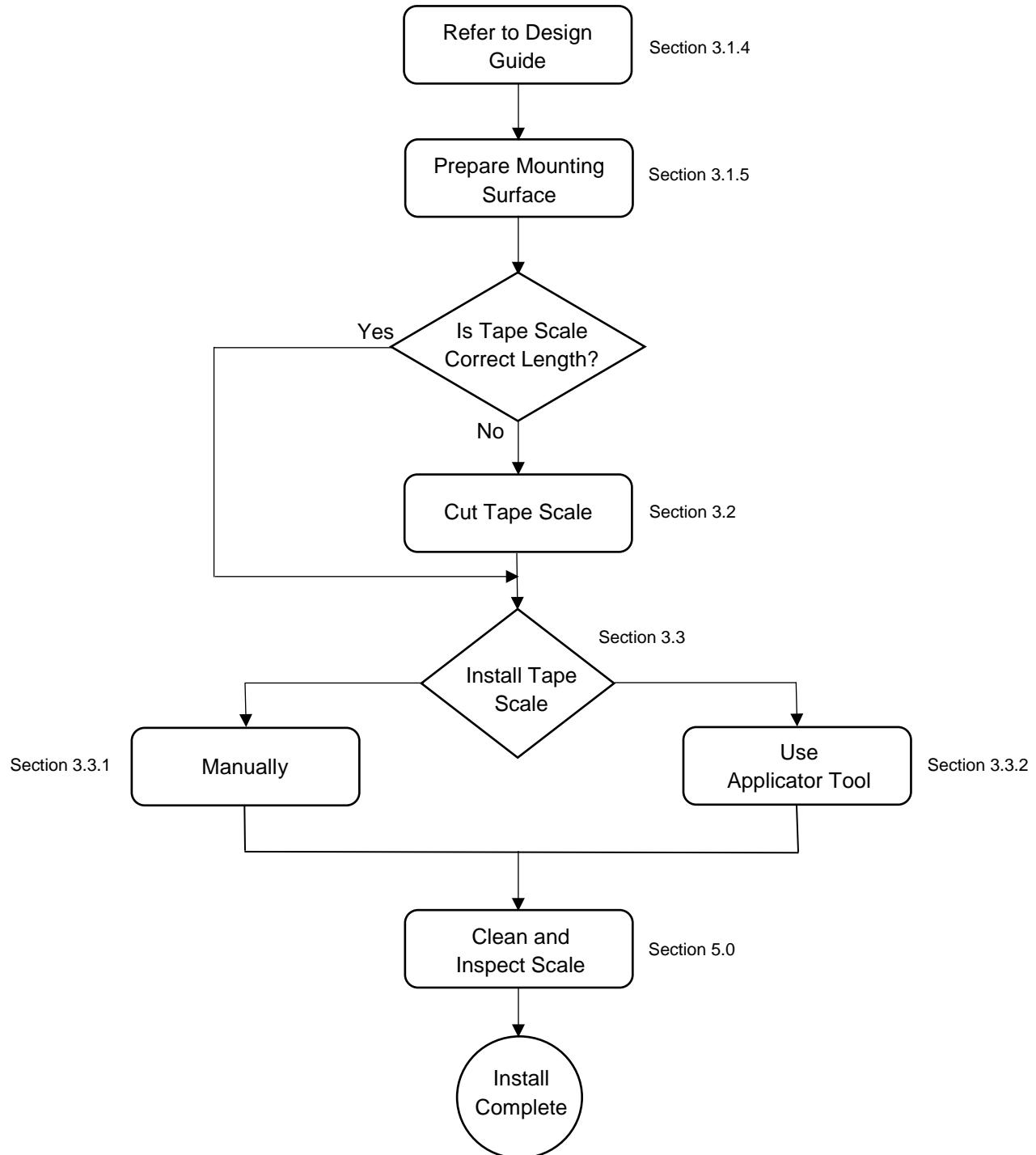


The adhesive on the Optira tape scale is permanent:

- DO NOT touch the adhesive once the adhesive backing is removed.
- DO NOT remove the tape scale from the mounting surface once it has been installed.
- DO NOT reinstall the tape scale if it has already been installed once. If the tape scale is removed and reinstalled again, the encoder performance will be degraded.
- Avoid any contamination to the adhesive. Any particulate matter or contamination trapped between the scale and the mounting surface will affect encoder performance.
- Optira tape scale is not recommended for applications on a radius. Contact MicroE for support.

10.1.3 Flowchart for Tape Scale Installation

The following is a simple flowchart showing the main steps in tape scale installation.



10.1.4 Design Guide

The following table describes the basic mounting configurations for tape scale installation. Also, see all guidelines that follow the table.

#	Type of Installation	Example
1	Machined Edge: Mounting Surface - Hand Application Only Mounting Surface: <ul style="list-style-type: none"> • 6.1 mm mounting surface: applicator tool is not compatible with 6.1 mm mounting surface. • Max radius of 0.13 mm required between scale enching edge and bottom of mounting surface. • Benching edge must be parallel to axis of motion to within .05/100 mm. • Mounting surface flatness to within .003/10 mm. 	
2	Machined Edge: Mounting Surface – Hand Application Only Mounting Surface: <ul style="list-style-type: none"> • Flat mounting surface to edge. • Max radius of 0.13 mm required between scale benching edge and bottom of mounting surface. • Benching edge must be parallel to axis of motion to within .05/100 mm. • Mounting surface flatness to within .003/10 mm. 	
3	Machined Edge: Mounting Surface – Use with Tape Application Tool Mounting Surface: <ul style="list-style-type: none"> • Mounting surface flatness to within .003/10 mm. 	

Design Guidelines:

- MicroE Systems recommends using an edge as a guide to maintain straightness of the scale during mounting. The edge can be temporary or permanent, but permanent edges must follow the above guidelines.
- Use the applicator tool for installation of scales longer than 300 mm. Otherwise, install by hand or with an applicator tool if possible.
- To ensure successful tape installation: verify all tolerances listed for your installation, and verify the dimensions of the scale benching edge (permanent or temporary).

- Calculate the length of the Optira tape scale required for your application using the following formula:

ML + 10 mm = Length of Tape Scale

ML = Measuring Length (refer to the encoder interface drawing)

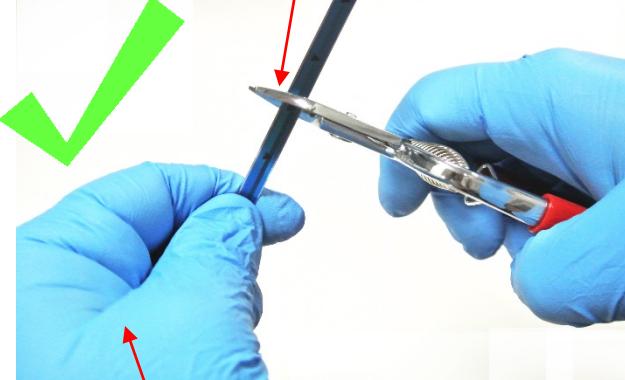
10.1.5 Prepare Mounting Surface

Perform the following steps prior to tape scale installation.

Step	Action
7.	Inspect the mounting surface for any machining irregularities. MicroE Systems recommends a surface finish of better than 3.2 micrometers Ra.
8.	Thoroughly clean the scale mounting surface and reference edge using a cotton swab or lint-free cloth dampened with isopropyl alcohol or acetone. Remove all dust and particles.
9.	Mark the starting location on the mounting surface where the tape scale will be applied to ensure accurate positioning of the scale. The tape scale is designed for one time installation only and not for re-application due to misplacement.

10.2 Cutting Tape Scales

Note: When working with any encoder scales, it is important to use finger cots or talc-free gloves.

Step	Action
1.	<p>1. Uncoil the tape scale and cut it to the required length using the shears provided in the installation kit.</p> <p>Note: Check interface drawing to make sure that the scale is cut to the correct length.</p>
2.	<p>Securely hold the tape scale close to the shears (at an approximate distance of 40 mm [1½ inches]) near the point of cutting. Orient the tape scale perpendicular to the shear.</p> <p>!</p> <p>Shear held perpendicular to the tape scale (not inclined)</p>  <p>Hand approximately at a distance of 40 mm-50 mm (1 1/2 inches to 2 inches) from the cutting point</p> <p>Cut the tape scale in a smooth, continuous motion.</p> <p>Shears held inclined, not perpendicular to the tape scale</p> 

10.3 Install the Tape Scale

Note: Use this procedure for installing tape scale for a board- to-board mounting.

When installing tape scale, always perform the following steps to ensure best system performance:

- Wear talc-free gloves or finger cots during all steps of tape scale installation.
- Thoroughly clean the scale mounting surface and reference edge using a cotton swab or lint-free cloth dampened with isopropyl alcohol or acetone.
- Remove all dust and particles.

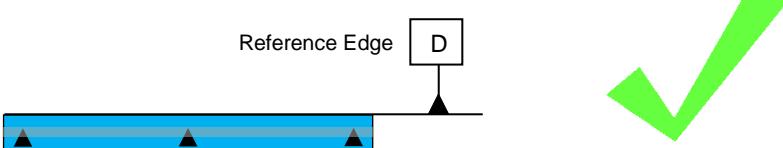
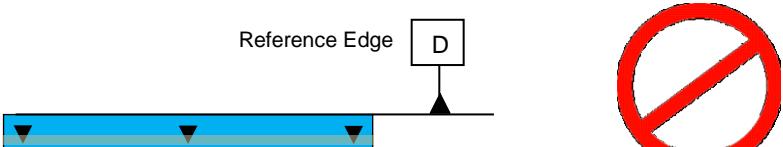
The tape scale can be installed using one of the following methods:

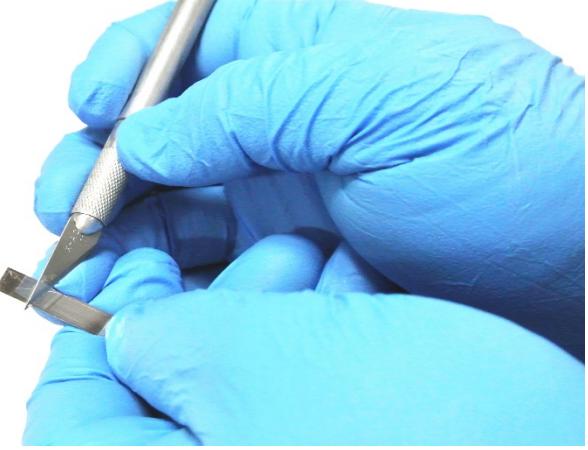
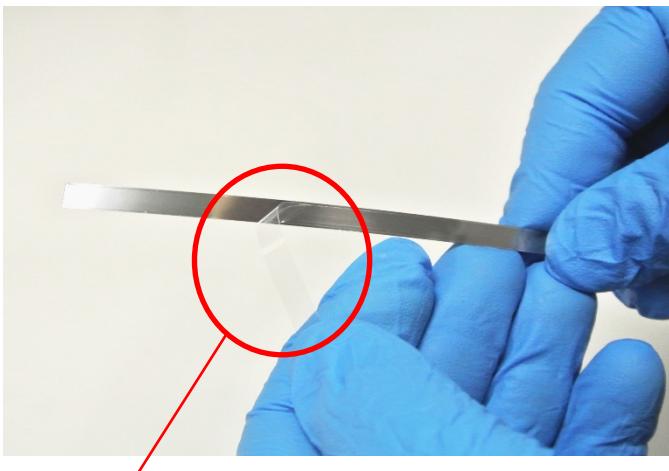
- Manually by hand
- Using the Applicator Tool

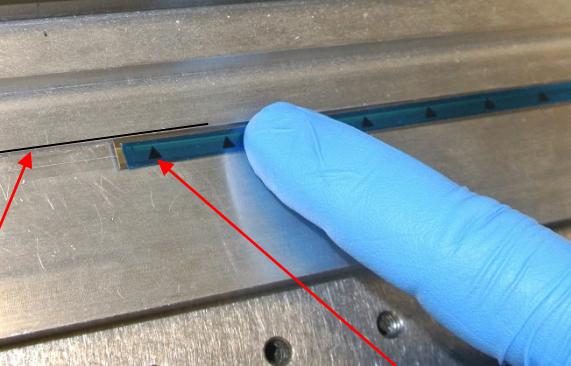
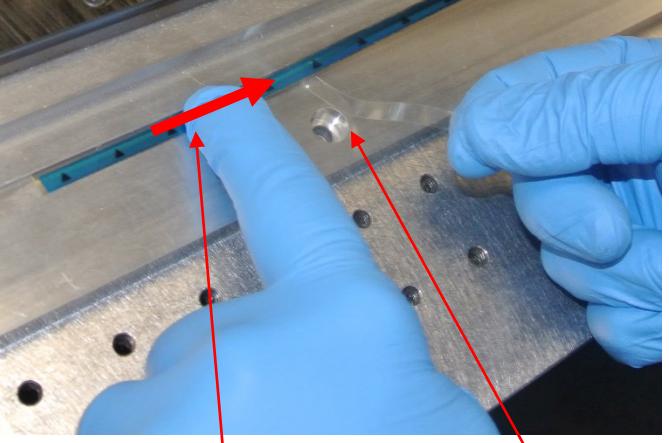
Note: Use the Design Guide to help you select the method of installation.

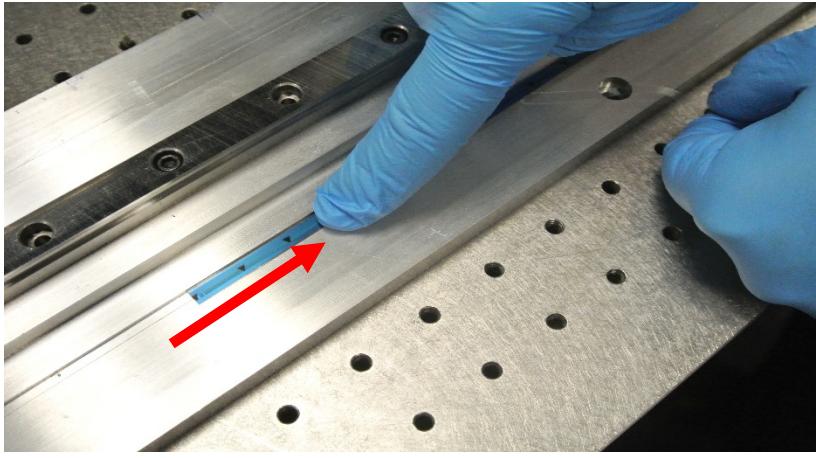
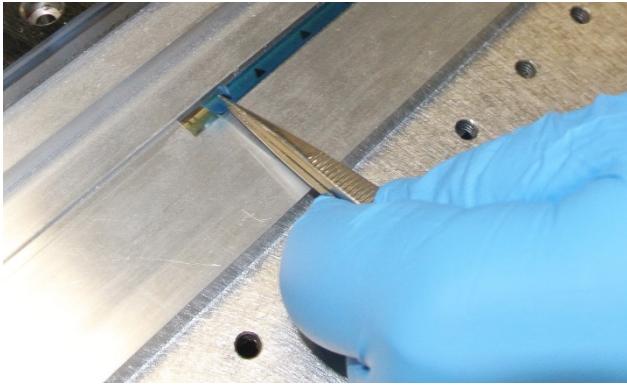
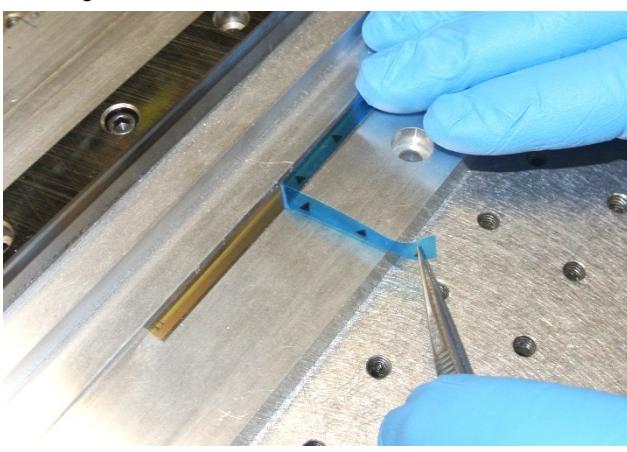
10.3.1 Install Tape Scale Manually

Use the steps in this section to install Optira tape scale manually by hand.

Step	Action
1.	<p>Orient the scale such that the arrowheads on the blue protective film are pointing towards the mounting surface reference edge "D" as shown in the interface drawing for your sensor model. Refer to the correct model number interface drawing for reference edge "D" dimensions and sensor orientation.</p>  <p>Correct: Arrowheads on the blue protective film are pointing towards the mounting surface reference edge.</p>  <p>Incorrect: Arrowheads on the blue protective film are pointing away from the mounting surface reference edge.</p>

Step	Action
2.	<p>Remove/peel the bottom adhesive backing:</p> <ul style="list-style-type: none">Use a sharp tool or fingernails to start peeling the adhesive backing from the left end of the tape scale.  <ul style="list-style-type: none">Remove and peel back approximately 25 mm (1 inch) of the bottom adhesive backing, taking care not to touch the adhesive or allow any particulate contamination.  <p>Adhesive backing peeled off about 25 mm (1 inch) from the left end</p> <p>Note: Be careful not to expose the adhesive backing more than 50 mm (2 inches). Do not peel the blue protective film off at this time.</p>
3.	Flip the tape over so that exposed adhesive surface of the tape scale (surface from which the adhesive backing was removed) faces the surface where the tape will be attached.

Step	Action
4.	<p>Place the tape scale on the mounting surface reference edge: Place the 25 mm (1 inch) exposed adhesive left end of the tape scale against the mounting surface "D" reference edge at the desired starting location and press firmly on the end.</p> <p>Note: Adhesive exposed by removing the adhesive bottom backing can touch the mounting surface only once.</p>  <p>Example of machined reference edge Tape scale orientation arrow</p>
5.	<p>Install the Optira Tape Scale along the remaining length of the mounting surface:</p> <ul style="list-style-type: none"> With one hand pull the adhesive backing progressively away from the scale while the other hand slides evenly along the scale. During the sliding motion, press the remaining tape on to the mounting surface and against the reference edge, and then pull the adhesive backing out of the way. <p>TIP: Peel the backing way just fast enough to stay about 20 mm ahead of the sliding finger. Note: Be sure to keep the blue top protective film in place. Make sure that the tape scale is tight against the "D" reference edge.</p>  <p>"D" reference edge as shown in the encoder interface drawing Sliding motion of finger progressively along the length of the tape Pull adhesive backing out of the way during sliding. No obstruction between tape scale and mounting surface.</p> <p>Once the tape has been installed, discard the adhesive backing.</p>

Step	Action
6.	<p>Once the scale is applied to the mounting surface and before the blue protective film is removed, apply even pressure over the entire tape scale length by sliding a glove or cot-protected finger across the scale. The applied pressure will ensure that the adhesive is set evenly and permanently.</p>  <p>Slide across scale to apply even pressure</p> <p>Performing this operation more than once is not necessary but will not have an adverse effect.</p>
7.	<p>Peel off the blue protective film:</p> <ul style="list-style-type: none"> Start the peeling process using a sharp tool, being careful not to damage the scale.  <ul style="list-style-type: none"> Pull off remaining blue film and discard. 
8.	<p>After removing the blue protective film, the scale is ready for use and will perform to specification. The encoder will not function properly with the blue protective film installed. It must be removed for proper encoder operation.</p>

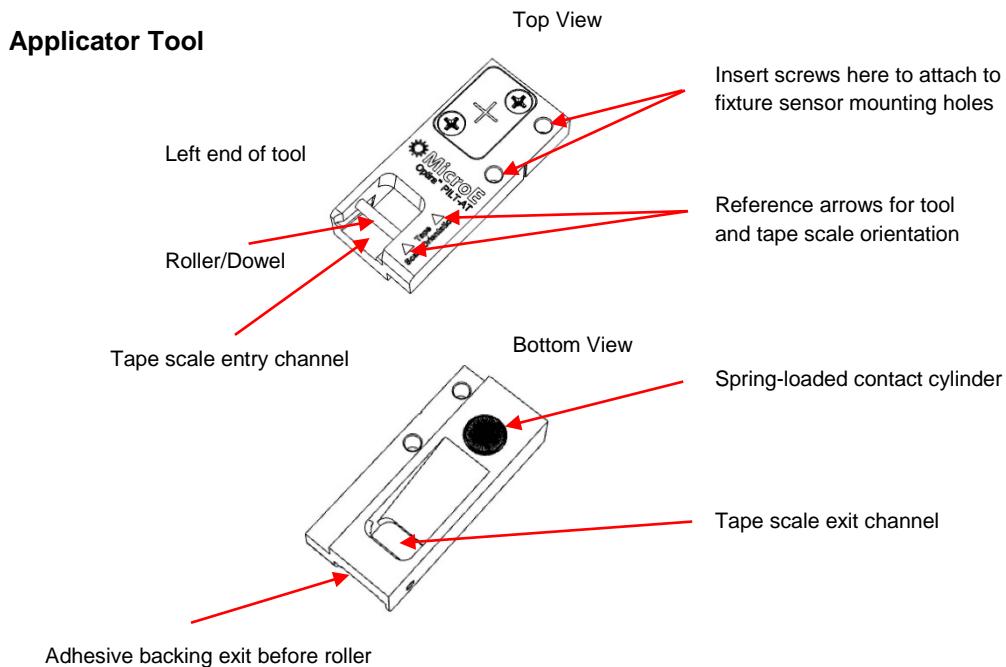
10.3.2 Install Tape Scale Using the Applicator Tool

Use the steps in this section to install Optira Tape Scales using the Applicator Tool.

The Applicator Tool

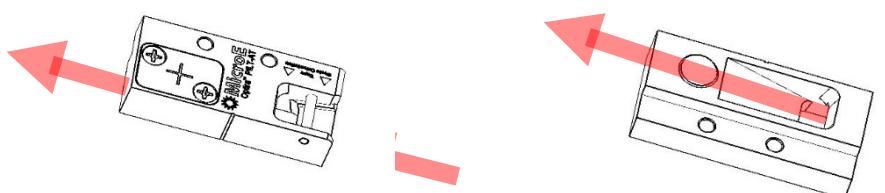
Model PILT-AT

The Applicator Tool is recommended for tape scale lengths greater than 300 mm, but can be used for shorter lengths. It is installed in the sensor mounting holes to slide along the motion axis while feeding the tape scale to attach to a mounting surface.



Tape Travel Path

The path for the tape scale through the applicator tool is shown in the following diagram.

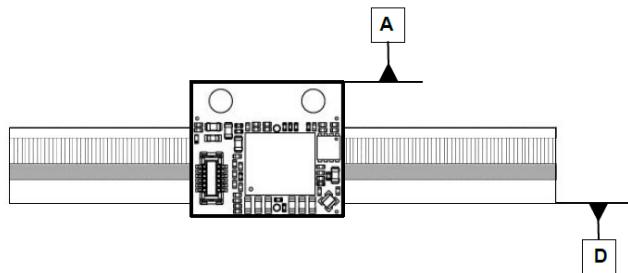


Insert tape scale with adhesive backing under the roller. Separate adhesive backing from scale before going under roller.

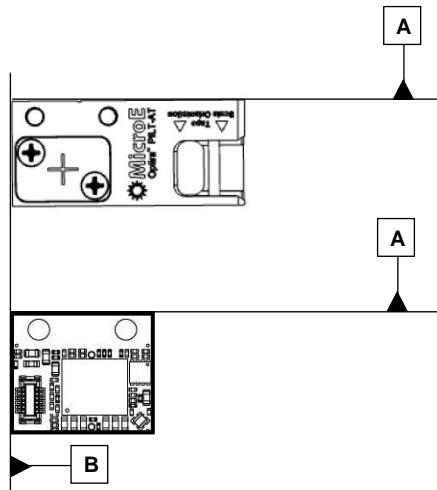
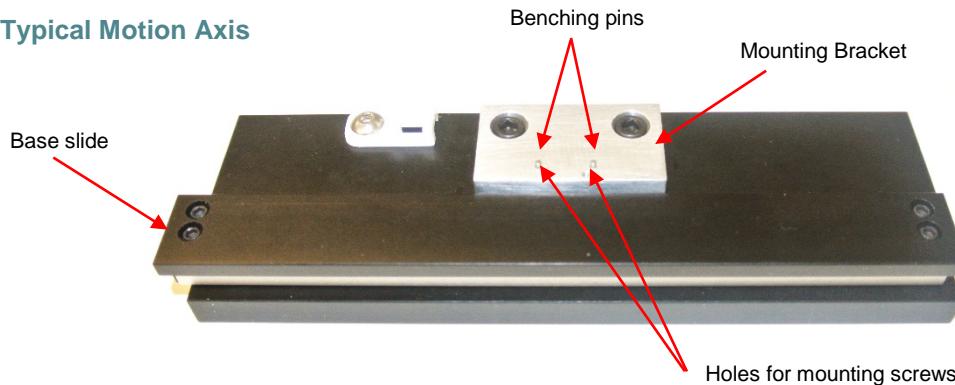
Tape scale runs under applicator tool and exits under contact cylinder.

Reference Edges

Refer to the encoder interface drawing for tape scale reference edges.

**Applicator Tool Mounting**

The orientation of the Optira Applicator Tool corresponds to the Optira encoder as shown below. The benching surfaces correspond to the A and B faces shown in the Optira interface drawing.

**Typical Motion Axis****Recommended Customer Required Parts**

The following parts or their equivalents are recommended to mount the Applicator Tool to the motion axis.

Item	Mounting Scheme
Mounting Screws	M1.6 or 0-80 screws. Philips head screws are recommended

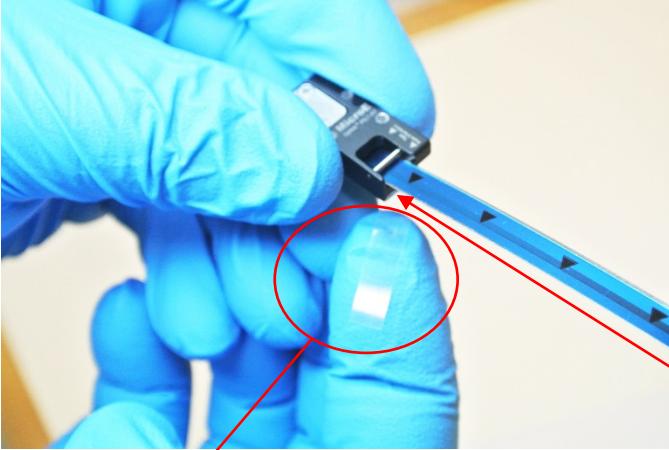
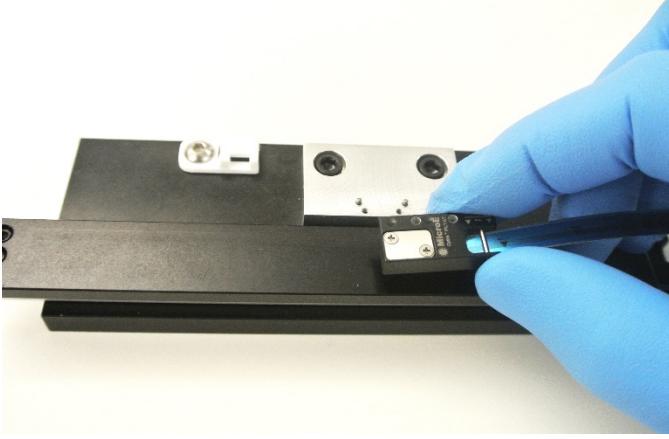
Install Tape Scale

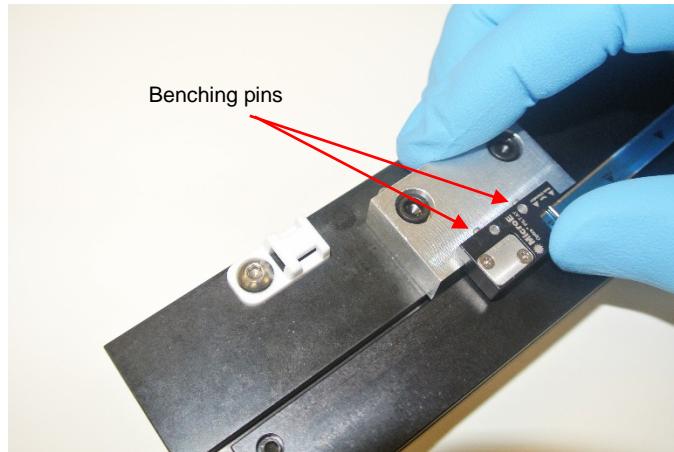
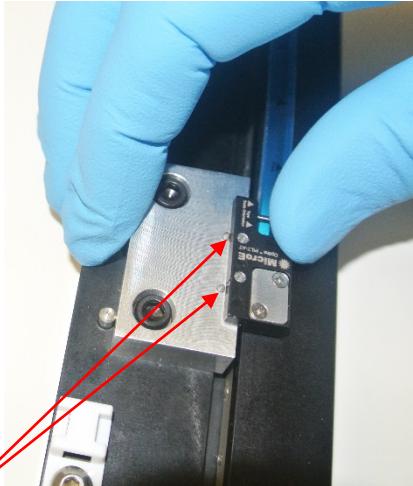
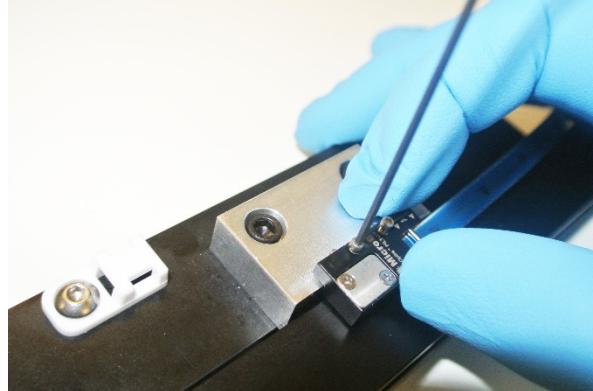
When orienting the tape, both tape scale arrows and applicator tool orientation arrows need to point in the **same direction** for proper orientation.

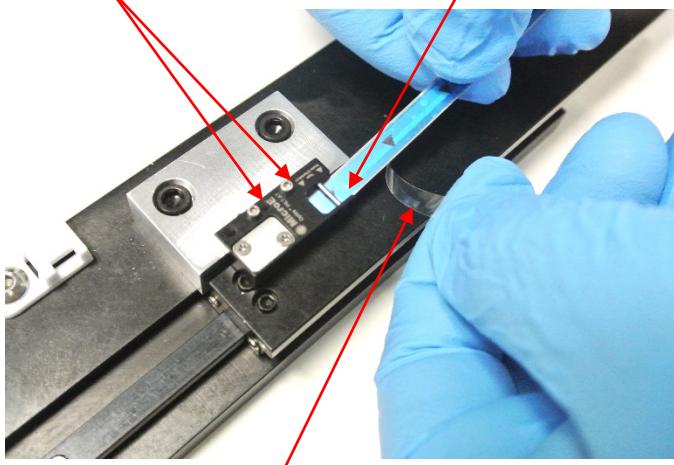
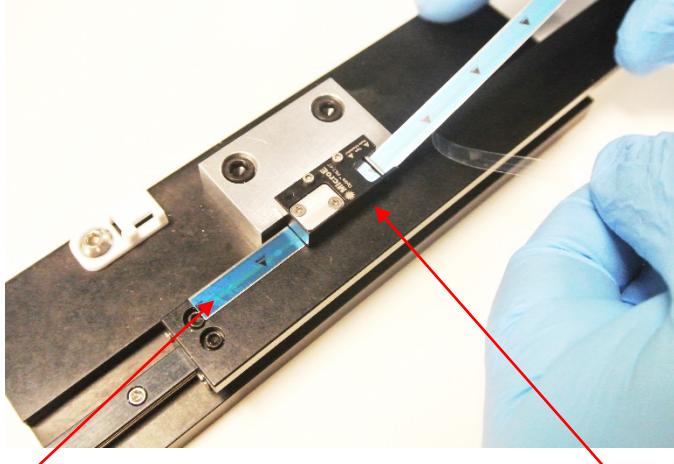
Note: The tape scale orientation arrows always point to the “D” reference edge in the interface drawing.

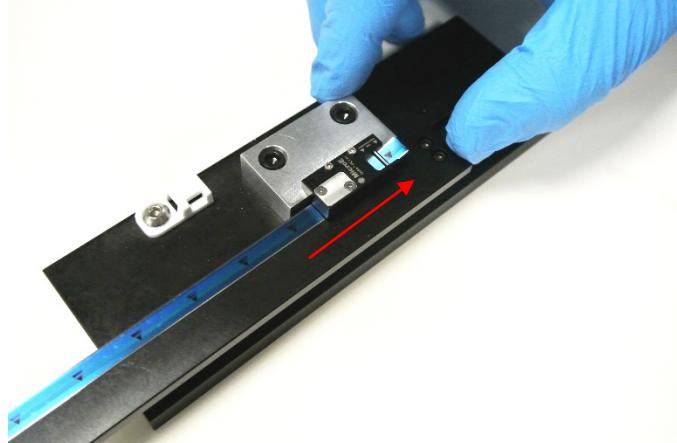
Make sure that the applicator tool is free of any particulate contamination.

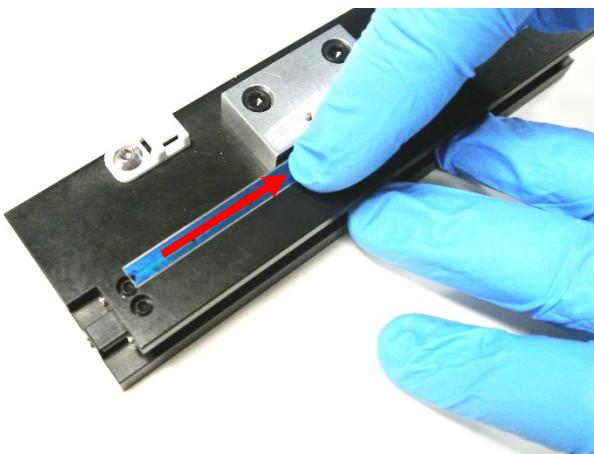
Step	Action
1.	<p>Orient the applicator tool and tape scale:</p> <ul style="list-style-type: none"> With the mounting surfaces reference edge away from you, insert the tape scale in the applicator tool so that arrowheads are pointing towards you as shown. The arrowheads on the applicator tool should also point towards you. Correct orientation of the applicator tool is shown in the example shown below. The left end of the tape scale will go into the applicator tool entry channel first.
2.	Optira tape scales have four layers: blue protective film, Inconel (metal) scale, adhesive, and adhesive backing. The top three layers fit under the roller of the applicator tool. The bottom adhesive backing is peeled away from the scale before going under the roller (see Step 4).
3.	<p>Insert the left end of the tape scale into the applicator tool entry slot. The correct end is determined by the direction of the orientation arrows on both the tape scale blue protective film and the applicator tool arrows. Both sets of arrows have to point in the same direction.</p>

Step	Action
4.	<p>From the left end of the tape scale inserted in the applicator tool, peel and curl back 50-75 mm (2-3 inches) of the adhesive backing as shown so that backing separates from scale before entering tool under the roller. Take care not to touch the adhesive on the bottom of the tape scale or allow any particle contamination.</p> <p>Note: Do not peel the blue protective film off at this time.</p>  <p>Peel and cut back 50-75 mm (2-3 inches) of the adhesive backing</p> <p>Adhesive backing separating from scale before going under roller</p>
5.	<p>Place applicator tool and tape scale against benching pins on benching fixture.</p> <p>Note: Applicator tool benches the same as the sensor and uses the same holes for the mounting screws.</p> 

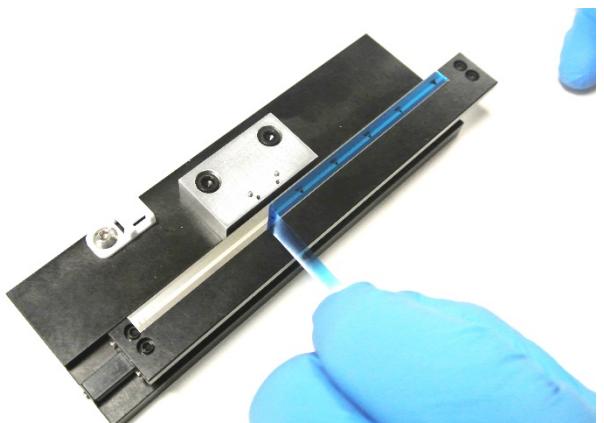
Step	Action
6.	<p>Hold applicator tool firmly against benching pins.</p> 
	
7.	<p>Attach applicator tool using the two mounting screws.</p> 

Step	Action
8.	<p>Start feeding tape scale with blue protective film under the roller and into the entry slot while pulling adhesive backing away from scale.</p> <p>Attached mounting screws</p> <p>Feed tape scale under roller</p> <p>Remove adhesive backing before going under roller</p> 
9.	<p>Feed tape scale into the applicator tool until the end of the tape is past the roller. Place applicator tool along reference edge and firmly press down on mounting surface.</p> <p>Tape scale fed past front tool roller</p> <p>Applicator tool correctly configured for installation</p> 

Step	Action
10.	<p>Apply tape scale with the applicator tool: Once the applicator tool is configured with the adhesive backing exiting from the exit slot and steel tape extending past the front tool roller, the scale is ready to be installed on the mounting surface.</p> 
11.	Slide tool along guide edge face (in direction shown above) with a slow and even pressure motion until all of the tape is installed on the mounting surface. Be sure the adhesive backing film does not bunch up and jam inside the tool and exits freely from the exit slot.
12.	Pull adhesive backing away as applying scale to mounting surface.
13.	Once the scale is applied to the mounting surface, and before the blue protective film is removed, it is recommended that even pressure be applied over the entire tape scale length by sliding a glove-protected finger or the applicator tool across the scale. The applied pressure will ensure that the adhesive is evenly and permanently set.



Apply pressure to ensure good adhesion

Step	Action
14. 	<p>Peel off the blue protective film:</p> <ul style="list-style-type: none">Start the peeling process using a sharp tool, being careful not to damage the scale.Pull off the remaining blue protective film.  

Step	Action
15.	<p>Once tape scale is installed, clean using alcohol or acetone and a lint-free cotton cloth.</p>  <p>Installed tape scale</p>
16. 	<p>Precautions:</p> <ul style="list-style-type: none">• If scale damage has occurred, the tape scale may need to be replaced.• Clean the tape scale using alcohol or acetone and a lint-free cotton cloth.• Tape scales cannot be reused if removed from mounting surface.  <p>Optira sensor with Installed tape scale</p>

11.0 Linear Glass Scales Installation

Use the steps in this section to mount and install Optira linear glass scales.

11.1 Before Installation

Review the information in this section prior to installing Optira linear glass scales.

11.1.1 Items Required for Glass Scale Installation

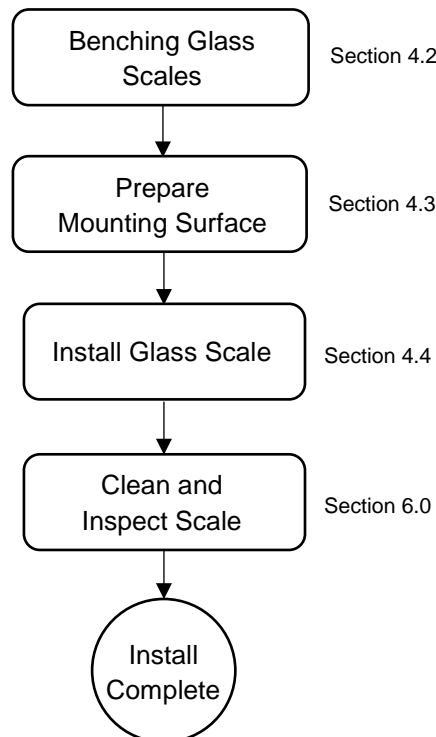
You will need the following items available for Optira linear glass scales installation.

Item
Finger Cots or talc-free gloves
Acetone or isopropyl alcohol
Lint-free cotton cloths or wipes
Epoxy, non-conductive
Stick and disposable surface for stirring epoxy
Silicone adhesive

Refer to encoder data sheet or install manual for details on ordering parts.

11.1.2 Flowchart for Glass Scale Installation

The following is a simple flowchart showing the main steps in glass scale installation.

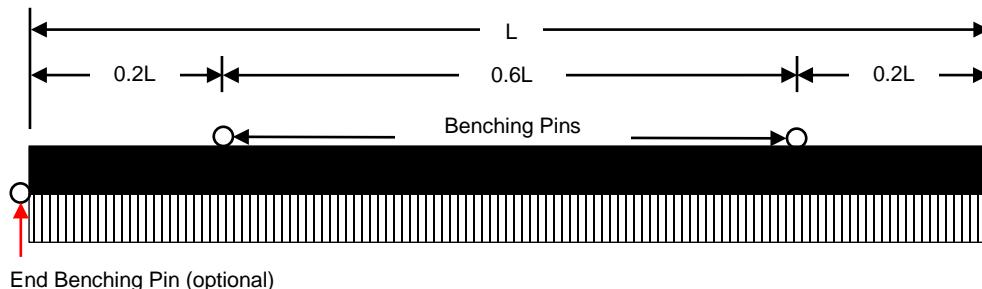


11.2 Benching Linear Glass Scales

'Benching' the scale means aligning the scale by using benching pins. Refer to the Optira interface drawing for dimensions. The benching pins can be set up on either side of the glass scale, but are oriented to the "D" reference edge as shown in the interface drawing.

Benching Guidelines

- Two benching pins are recommended on the long side of the scale and one at the end.



- Position the benching pins inward from either end of the scale. 20% of the overall scale length is the recommended location from the edge.
- Be sure the benching pins do not exceed the height of the scale to prevent mechanical interference with the sensor or sensor mount.

11.3 Prepare Mounting Surface

Perform the following steps prior to mounting the glass scales (for non-adhesive backed scales).

Step	Action
1.	Inspect the mounting surface for any machining irregularities. MicroE Systems recommends a surface finish of better than 3.2 micrometers Ra.
2.	MicroE Systems recommends a mounting surface flatness of 0.0001 inch/inch.
3.	Thoroughly clean the scale mounting surface and reference edge using a cotton swab or lint-free cloth dampened with isopropyl alcohol or acetone. Remove all dust and particles.

11.4 Install Linear Glass Scales

Use the following instructions to install linear glass scales.

Linear glass scales should be permanently attached to the mounting surface using epoxy and silicone adhesive attached to the back of the scale.

Note: Use talc-free gloves or finger cots to handle the scales.

Step	Action
1.	Make sure that the mounting surface is dry and clean.
2.	Align the scale by placing the edges against the benching pins. Optionally, scale clamps may be used to secure the scale while the adhesive cures.
3.	Apply a hard epoxy, such as Tra-Bond 2116, at one point on the scale. If no end benching pin is used, epoxy at the index mark. If an end benching pin is used, epoxy at the end of the scale where the pin is located. Then apply 100% Silicone RTV adhesive around the edges of the scale.
	Caution: Do not allow epoxy to seep under the scale; this will affect scale flatness and therefore encoder accuracy.
4.	After adhesive curing, remove optional scale mounting clamps, if any.

12.0 Final Cleaning, Inspection, and Cure Time

Before using the encoder for servo control, clean the scale using alcohol or acetone and a lint-free cotton cloth or swab. Finally, inspect the scale's surface for scratches, adhesive spots or smears in the measuring length.

For tape scales, a cure time of 12 hours is required for the scale's pressure-sensitive adhesive to achieve the best performance and reliability.

12.1 Reworking to Correct Mistakes

Once installed, the scale cannot be moved or removed and reinstalled. Reworking will require removal and discarding of the old scale, and installation of new scale.

12.2 Cleaning Scales

Step	Action
1.	General Particle Removal: Blow off any contamination with nitrogen, clean air, or a similar gas.
2.	Contamination Removal: Use a lint-free cleanroom wipe or cotton swab dampened with isopropyl alcohol or acetone to wipe the surface clean. Handle the scale by the edges. Do not scrub the scale.

13.0 Contacting Celera Motion

Celera Motion is a world leader in optical encoder technology with offices in major industrial centers around the globe. We deliver enabling technology that brings advanced applications to life in the motion control, medical, semiconductor, electronics, and industrial markets.

To learn more about MicroE encoders, visit www.celeramotion.com.

Celera Motion
World Headquarters & Encoder Center of Excellence
125 Middlesex Turnpike
Bedford, MA 01730-1409 USA
Tel: 781-266-5700
Email: celera_support@celeramotion.com