



LE50, LE10, and LE05 Glass Linear Encoders

Installation Guide

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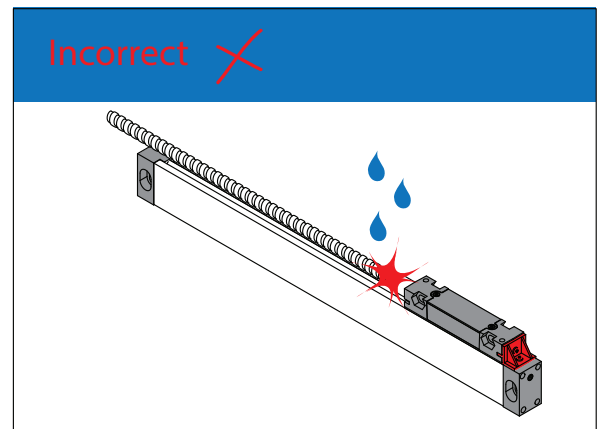
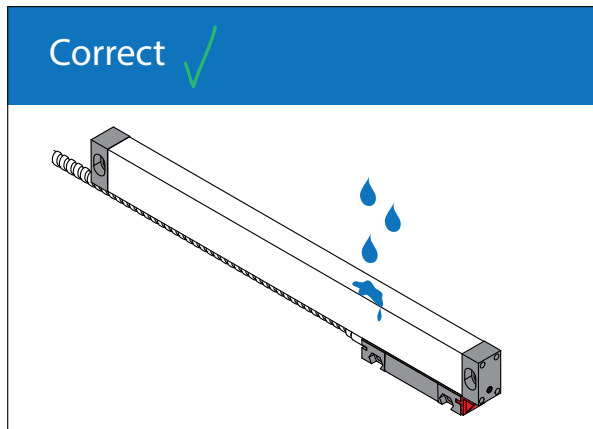
Before Getting Started . . .

→ Check Your Travel Length

Verify the travel length of the encoder is correct for your machine. The overall length of the linear encoder is not the travel (See page 13 for travel lengths and corresponding overall dimensions). Do not offset the encoder (extra travel on one end, insufficient travel on the other end). If your machine travel is longer than the encoder travel, please contact your dealer to obtain the properly sized encoder or install hard stops on the machine.

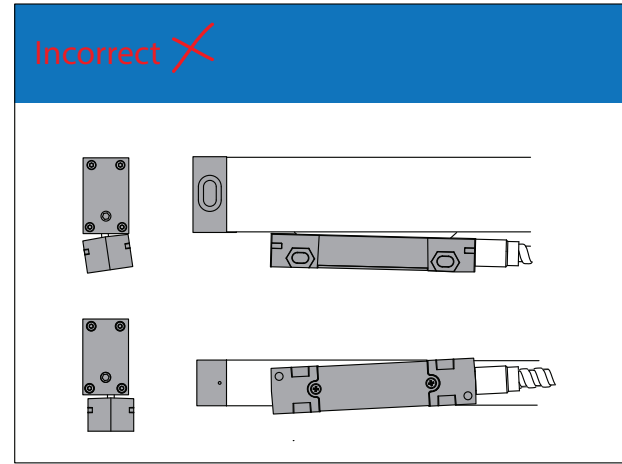
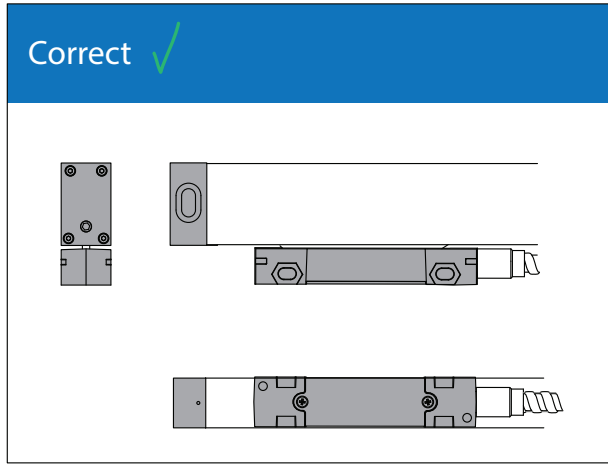
→ Locate Mounting Position

Determine encoder orientation, mounting position, and cable exit direction. To achieve rated protection against the environment, linear encoders must be mounted with lip seals facing downward. If mounting vertically, seals must face backwards (away from the cutting tool).



➔ Squareness & Parallelism

It is extremely important that the encoder is parallel to the axis of movement, and the reader head is parallel to the encoder. Avoid skewed installs, as loss of accuracy, premature wear, and/or irreversible damage can occur.

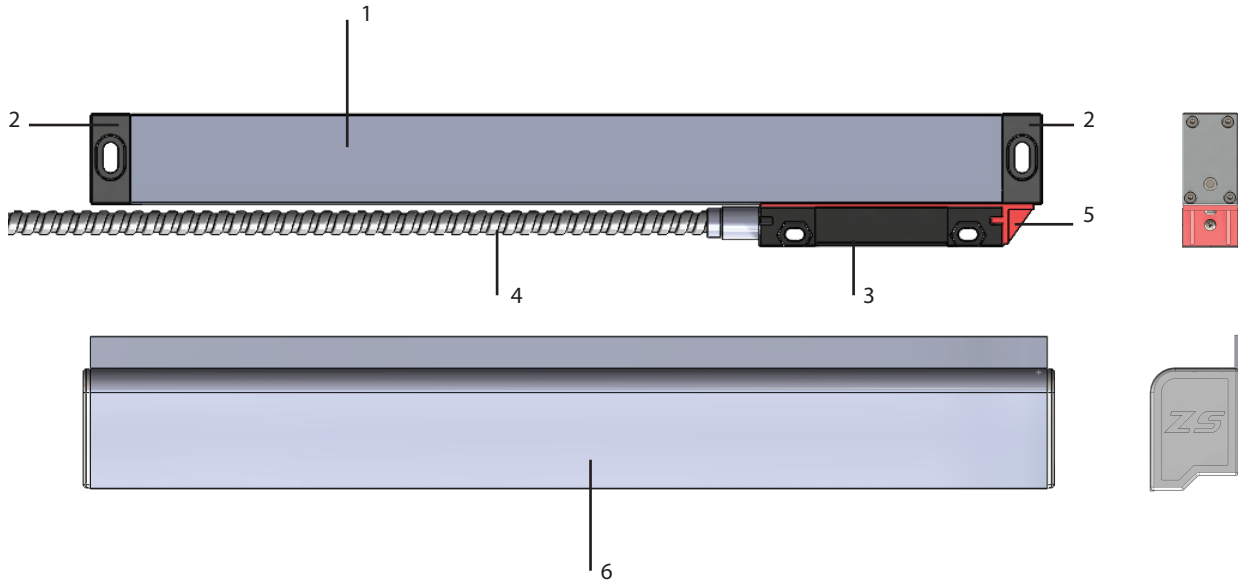


➔ Disassembly & Modifications

The encoder is a delicate instrument which contains precision optical and electronic components. Never attempt to remove the reader head from the encoder as irreversible damage will occur and all warranties will be void. Never drill, mill, or cut encoder components. Do not enlarge any of the mounting holes. Modifications or repair attempts performed by end user will void all warranties.

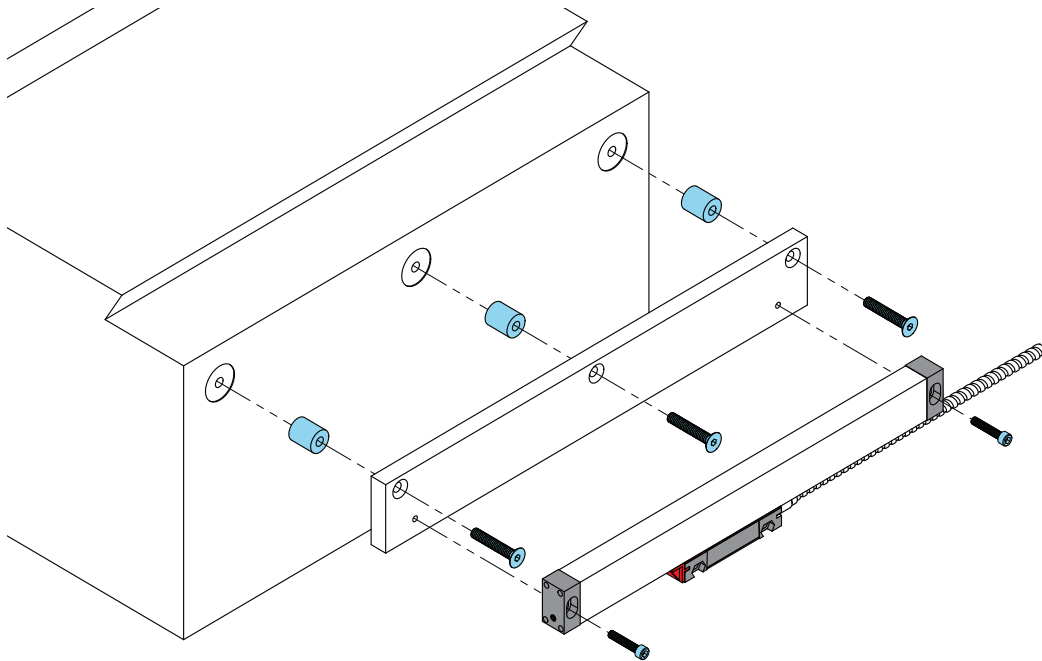
Major Components:

1. Linear Encoder body
2. End Caps
3. Reader head
4. Armored Cable
5. Shipping Bracket
6. Protective Cover



Mounting Procedures

1. Wherever possible, the encoder end caps need to be mounted to a machined flat surface parallel to the axis of movement. In the case where no machined flat surfaces are available on the machine, mounting spars with leveling setscrews should be used.



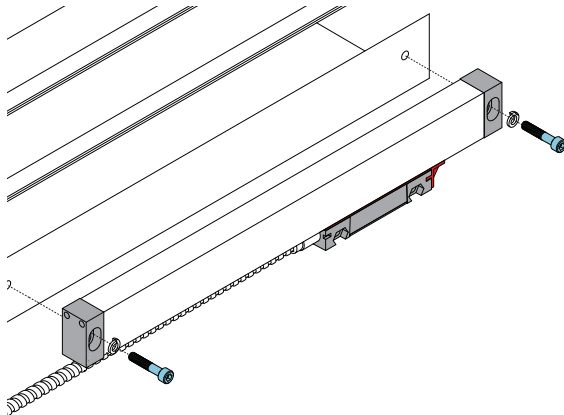
2.

Hold the encoder in place at the desired location and transfer punch one mounting hole.

Drill and tap with #10-32 standard tap. Required thread depth is 1/2".

Temporarily mount the encoder to the machine, and approximately align it to the axis travel (slots in the end caps will allow for fine adjustment). Transfer punch 2nd hole. Remove the encoder, drill and tap 2nd hole.

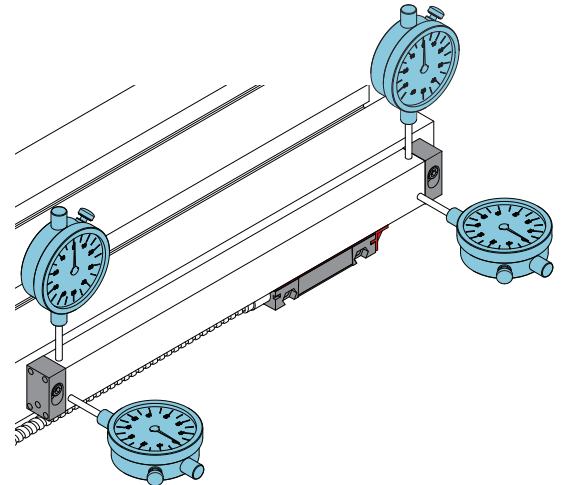
Assemble encoder to the machine using 10-32 x 3/4" Button Head Screws. Do not fully torque at this point.



3.

Check the alignment using dial indicator to indicate the front and the top of the encoder body. It must be parallel to the axis of travel to within a Total Indicator Reading (TIR) of 0.010 inch (0.25mm), in both planes, over the entire travel of the encoder.

Fully tighten mounting screws and verify alignment again. Re-adjust if TIR is not within the specification.



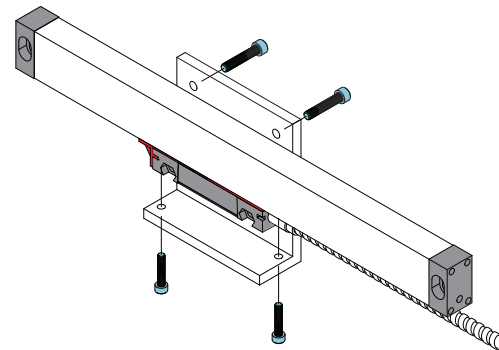
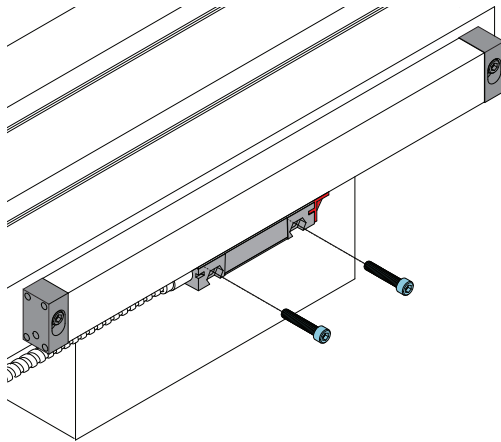
4.

Determine reader head attachment method and prefabricate mounting hardware, if necessary, to match your particular machine.



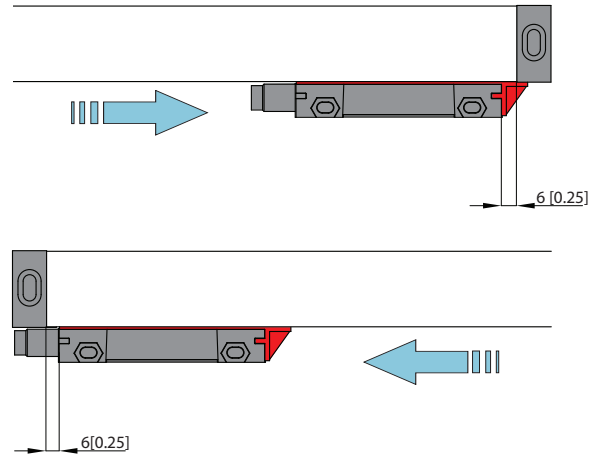
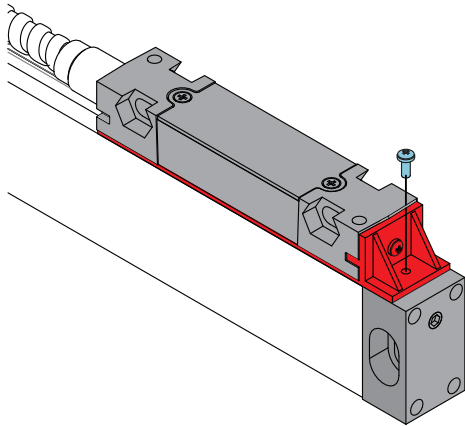
The reader head must be attached to a flat surface parallel to the encoder body. Depending on the situation there are two mounting options:

- A. Utilize #8 through holes on the side of the readerhead. The mounting surface on the machine should be center punched, drilled and tapped for #8-32 Socket Head Screw. Use stainless steel shims to offset the reader head if needed. This option is typically used for the X axis on milling machines.
- B. Utilize the pretapped M4 holes on the bottom of the reader head. You may use this feature to attach a mounting bracket to the encoder. This option is typically used for the Y axis on the milling machines and the Z axis on lathes.

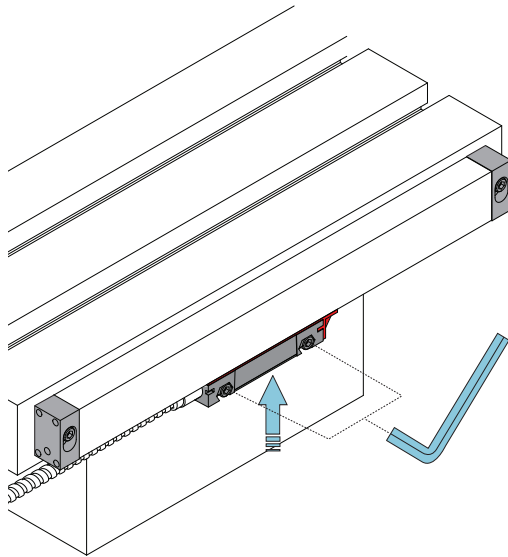


5. Remove the screw holding the shipping bracket to the encoder end cap. Do not remove the shipping bracket from the reader head yet. Move the machine axis to the dead stop on one end, and mark the reader head location. Gently slide the reader head towards the same end and then slide it back 1/4" (6mm) to allow for a travel reserve (safety factor).

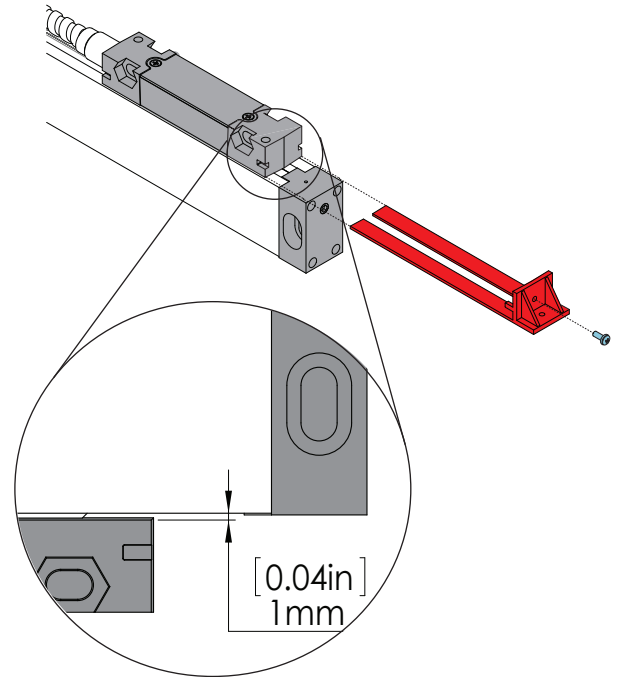
Mark the reader head position on the moving axis of the machine. Move the machine axis to the opposite end and gently slide reader head to align it with previously made mark. Verify that at least 1/4" (6mm) of travel is available. Make sure to avoid overtravel! Obtain larger size encoder if necessary or install hard stops on the machine to limit the travel.



6. After the mounting location has been determined and all preparations complete, hand tighten reader head mounting screws and apply light pressure to the reader head, so it firmly touches red plastic shipping bracket. Fully tighten the screws while maintaining uniform pressure on the reader head.

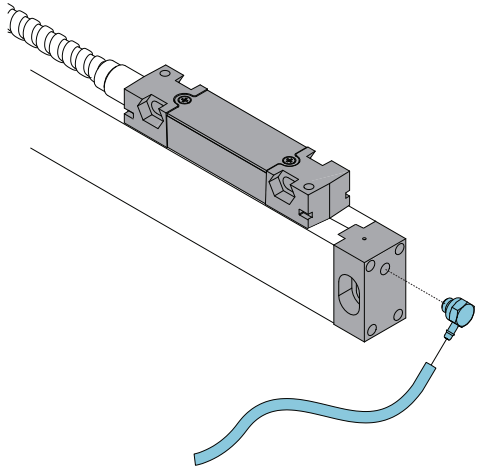


7. Remove the remaining screw holding the shipping bracket to the reader head, and slide the shipping bracket free of the encoder. Save it in case you need to ship encoder in the future. Verify the gap between the reader head and encoder. Gap thickness should be uniform and measure 0.040 ± 0.005 " (1 ± 0.13 mm)



8. Use of the optional air inlet allows IP64 environmental protection level to be achieved.

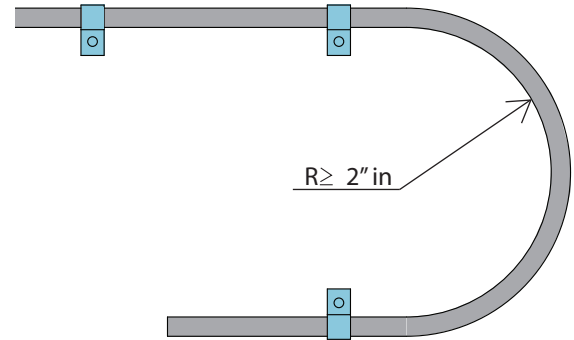
To install the air inlet, remove the M5 plug from either end of the encoder using a 2.5mm Allen wrench, and install the air fitting. Securely route the air hose and connect it to a 10-15 psi source of dry and oil



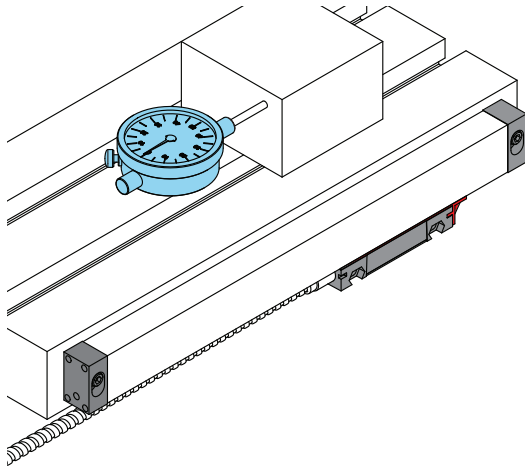
9. Route the cable and connect it to the DRO. Use cable clamps to securely attach the cable to the machine. Make sure there is enough slack to allow for the full range of machine axis movements



Avoid bends smaller than the minimum allowed bend radius (2"). Bends smaller than the minimum radius will cause permanent damage to the cable!



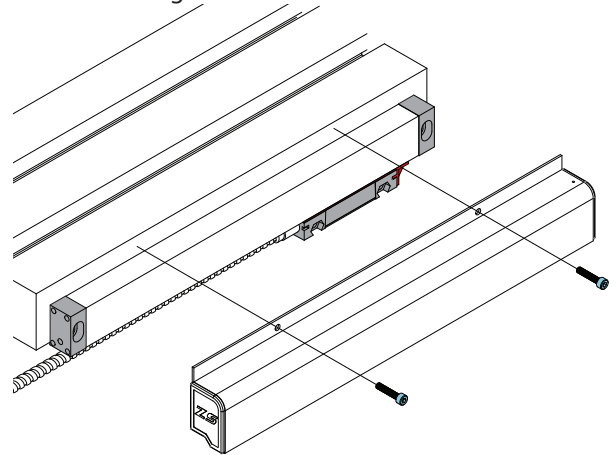
10. Perform a Zero Repeat Check. Move the machine axis to the end of its travel. Use a dial indicator to indicate a flat block or vise placed on the table, or the table itself. Zero the indicator and display, then move the axis to the opposite end of its travel. Once there, return to the zero position on the readout. The dial indicator should have a reading of zero \pm 1 count.



11. Place the protective cover over the encoder, and check to make sure it does not interfere with the machine movements and/or the cable. Center punch mark, drill and tap 2 holes with a standard 10-32 tap. Mount protective cover using 10-32 x 3/8 button head screws.

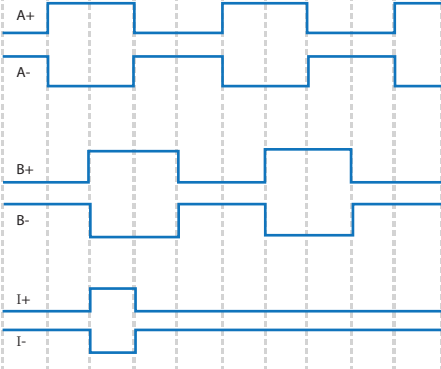
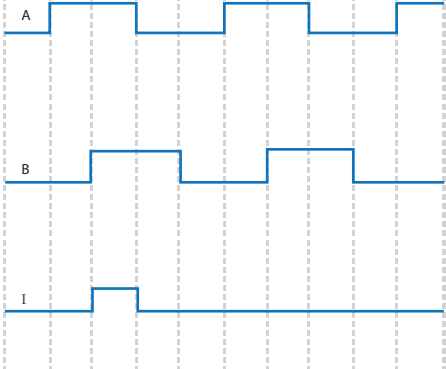


Always install protective cover if space allows. The protective cover reduces chances of contamination and physical damage.

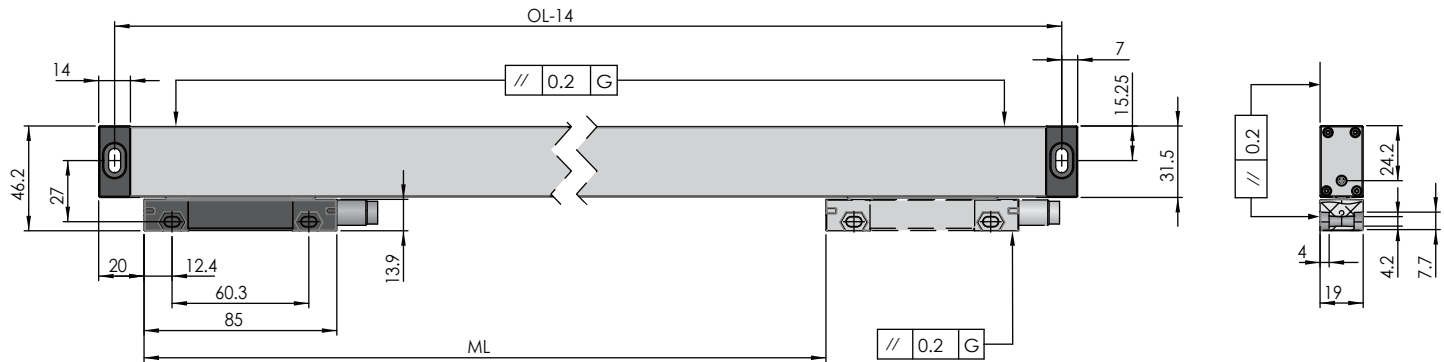
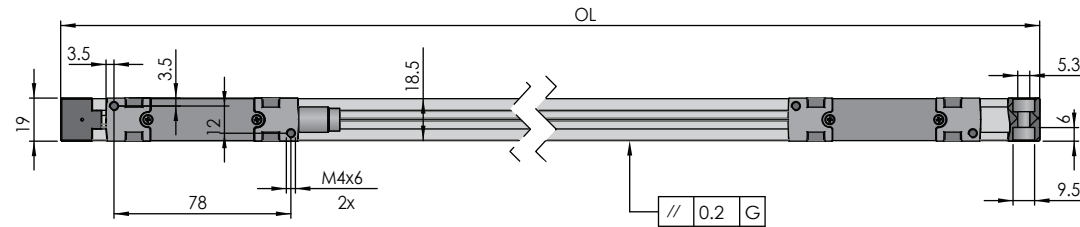


Technical Specifications

Encoder Model	LE50	LE10	LE05
Resolution	5.0 μm	1.0 μm	0.5 μm
Optical grating pitch	20 μm		
Measuring accuracy	5 μm per 1000 mm of length (as measured at 20 °C /68 °F)		
	Metric (m / mm / °C)	Standard (ft. / in / °F)	
Measuring lengths	75 mm ~ 1100 mm	3 in ~ 44 in	
Maximum speed	60 m/min	197 ft./min	
Sliding force	340 g or less	0.75 lbs or less	
Standard cable length	2.7 m	8.9 ft.	
Optional cable length	Up to 20 m	Up to 65.6 ft.	
Minimum cable bend radius	50 mm	2 in	
Operating temperature	0 °C ~ 45 °C	32 °F ~ 113 °F	
Storage temperature	- 20 °C ~ 70 °C	- 68 °F ~ 158 °F	
Humidity (non-condensing)	20% ~ 90%		
Protection rating	IP53 IP64 (with air inlet)		

Parameter	RS422	TTL
<p data-bbox="140 328 314 357">Output Signals</p> <p data-bbox="120 525 386 554">Reference Mark Signals</p>		
Signal Levels	<p data-bbox="455 655 871 684">Conforming to IEA RS-422 standard:</p> <p data-bbox="455 693 560 722">UH>2.5V</p> <p data-bbox="455 731 555 759">UL<0.5V</p> <p data-bbox="455 769 790 797">Sink/source current $\geq 20\text{mA}$</p>	<p data-bbox="942 655 1372 684">Conforming to 5V TTL specifications:</p> <p data-bbox="942 693 1053 722">UH>3.5V</p> <p data-bbox="942 731 1048 759">UL<0.5V</p> <p data-bbox="942 769 1282 797">Sink/source current $\geq 20\text{mA}$</p>
Power Supply	5V +/-5%, 50mA max at no load	5V +/-5%, 50mA max at no load

Dimensions & Available Sizes



OL = Overall Length
 ML = Measuring Length
 G = Machine guideway

ML 75 to 150: OL= ML+126
 ML 200 to 450: OL= ML+131
 ML 500 to 750: OL= ML+136
 ML 800 to 1100: OL= ML+141

Nominal Advertised Size (ML)		Absolute Maximum Travel		Overall Length	
mm	in	mm	in	mm	in
75	3	90	3.54	201.00	7.91
100	4	115	4.53	226.00	8.90
125	5	140	5.51	251.00	9.88
150	6	165	6.50	276.00	10.87
200	8	220	8.66	331.00	13.03
250	10	270	10.63	381.00	15.00
300	12	320	12.60	431.00	16.97
350	14	370	14.57	481.00	18.94
400	16	420	16.54	531.00	20.91
450	18	470	18.50	581.00	22.87
500	20	525	20.67	636.00	25.04
560	22	575	22.64	686.00	27.01
600	24	624	24.61	736.00	28.98
650	26	675	26.57	786.00	30.94
700	28	725	28.54	836.00	32.91
750	30	775	30.51	886.00	34.88
800	32	830	32.68	941.00	37.05
900	36	930	36.61	1041.00	40.98
1000	40	1030	40.55	1141.00	44.92
1100	44	1130	44.49	1241.00	48.86

Troubleshooting

Most common causes of Linear Encoder errors are misaligned encoder body, skewed reader head, improper gap spacing, loose mounting, wore out machine, damaged parts or faulty equipment.

Following the steps below will often determine if the Readout or Linear Encoders are at fault, and if it is due to installation errors or equipment failure.

1. Readout Check

Perform the following steps to determine if the Readout display is faulty:

Verify Linear Encoder connectors are seated and secured. Make sure encoder connector does not have any bent and/or missing pins. If the problem persists, swap out the Linear Encoders cables between axis and check again.

If the same axis of the Readout Display remains at fault, refer to Additional Assistance for further instructions.

If the fault changed axis during the cable swap, the Linear Encoder might be at fault, refer to the Linear Encoder Check below.

2. Linear Encoder Check

Check mounting for security. Ensure all mounting screws are secured and torqued to the correct values. If mounting screws are loose, verify alignment of the encoder and retighten them according to the installation instructions.

Confirm all installation components are free from obstruction and do not interfere with the surrounding equipment. If an issue is found, reevaluate the mounting position and reinstall the encoder .

Verify that machine components are tight and do not have excessive (TIR>0.005") play in the guideways. Adjust the gibbs and/or repair wore out machine components if excessive play persists.

Verify correct encoder alignment by performing a dial indicator check as described on page 6 of this manual, adjust if necessary. Verify reader head parallelism and a proper gap, adjust if necessary.

If the above steps are performed correctly and a fault still exists, perform a Zero Repeat Check as described on page 10. If the Repeatability Check fails, the encoder is faulty. Refer to Additional Assistance for further instructions.

3. Additional Assistance

Contact ZS Instruments or your nearest distributor for further assistance with faulty encoders and/or digital readouts



Warning: Attempting to repair the equipment will void any and all product warranties. Please, allow only qualified factory trained technicians to perform necessary repairs.

Three Year Warranty

Linear encoders manufactured by ZS Instruments come with three (3) years limited warranty and guaranteed to be free of manufacturing defects in materials and/or workmanship. If product is found to be defective within 3 year period from the date of original purchase, ZS Instruments will replace or repair the product free of charge. See below for limitations.

All defective products must be first returned to ZS Instruments and pass an inspection process for warranty claim to be approved. ZS Instruments, under its sole discretion, will repair, replace or refund the cost of the defective products. Defects caused by normal wear and tear, improper installation, use for not intended purpose and/or abuse are not covered. Warranty is void if any part of the product was physically damaged, submersed in liquids, subjected to electrostatic discharge or electromagnetic pulse, altered by any way, disassembled, or repaired by unauthorized personnel.

This warranty does not apply to installation and shipping costs. Any expenses occurred as a result of ZS Instruments product failure, including but not limited to product installation, and defective output are sole responsibility of the purchaser.

ZS Instruments makes no warranty, express or implied, as to merchantability or fitness for a particular purpose. ZS Instruments shall not be liable for any direct, indirect, punitive, incidental or consequential injury, loss or damage, including but not limited to lost data, lost savings, production downtime, cancellation of contracts, lost profits or lost business opportunity arising from the use of ZS Instruments products.

This warranty applies only to LE50, LE10 and LE05 Linear Encoders. Warranty terms for other categories of products and other models of linear encoders may vary.

The liability of ZS Instruments under this warranty may not exceed the original purchase price of the product, regardless of legal theory applied, including but not limited to, contract, warranty, negligence, or strict liability.

ZS Instruments products are not authorized for use in critical applications. Critical applications defined herein as systems in which the failure of a single component could cause a life loss or substantial property damage (life support systems, nuclear, military etc). If you intend to use our products in such applications, you must first obtain a written authorization and have a written agreement with ZS Instruments regarding such a use.



If you have any questions related to ZS Instruments Products, Installation, Warranties, or Returns, please contact us by using one of the methods listed in this manual or on our website:

www.zsinstruments.com

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