

# LC, LF, LS Sealed Linear Encoders with slimline scale housing



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Sealed linear encoders with **slimline scale housing** are used primarily where installation space is limited.

Absolute linear encoders of the **LC 400** series provide the **absolute position value** without any previous traverse required. Incremental signals can also be provided. Like the **LS 400** series incremental linear encoders, their high accuracy and defined thermal behavior make them especially well suited for use on **numerically controlled machine tools**.

The incremental encoders of the **LF** type feature measuring standards with relatively fine grating periods. This makes them particularly attractive for applications requiring very **high repeatability**.

The **LS 300** series incremental linear encoders are used for simple positioning tasks, for example on **manual machine tools**.

## LC 400 Series

- **Absolute position measurement**
- Defined thermal behavior
- Single-field scanning

## LS 487

- **Incremental position measurement**
- Defined thermal behavior
- Single-field scanning

## LF 481

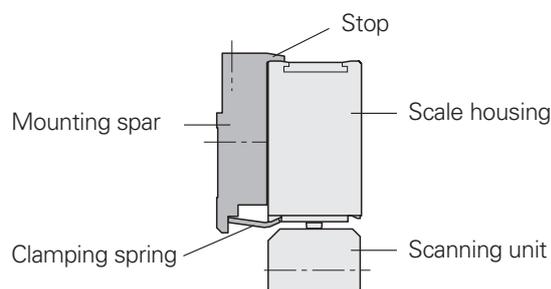
- **Very high repeatability**
- Thermal behavior similar to steel or cast iron
- Single-field scanning

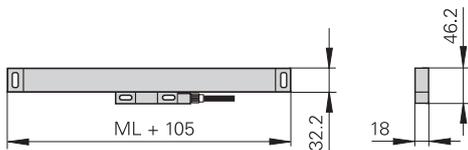
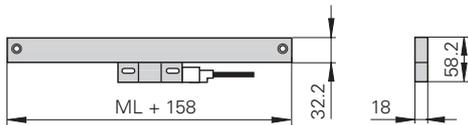
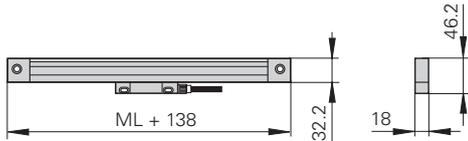
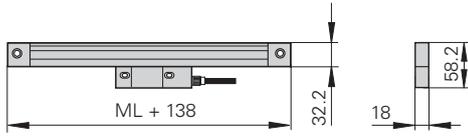
## LS 300 Series

- **Typically for manual machines**

## Simple installation with mounting spar

The use of a mounting spar can be of great benefit when mounting slimline linear encoders. They can be fastened as part of the machine assembly process. The encoder is then simply clamped on during final mounting. Easy exchange also facilitates servicing.





	Absolute	Incremental		
	LC 483 LC 493F/M	LF 481	LS 487 LS 477	LS 388C LS 328C
<b>Measuring standard</b>	DIADUR glass scale	DIADUR phase grating on steel	DIADUR glass scale	DIADUR glass scale
<b>Incremental signals</b>	Optional for LC 483	~ 1 V <sub>PP</sub>	LS 487: ~ 1 V <sub>PP</sub> LS 477: □□TTL	LS 388C: ~ 1 V <sub>PP</sub> LS 328C: □□TTL
Signal period	20 μm	4 μm	20 μm LS 477: 4 μm/2 μm	20 μm
<b>Absolute position values</b>	EnDat 2.2 Fanuc/Mitsubishi	-		
<b>Accuracy grade</b>	± 5 μm, ± 3 μm	± 3 μm, ± 2 μm		± 10 μm
<b>Recommended measuring step</b>	0.05 to 0.005 μm <sup>1)</sup>	1 to 0.1 μm	1 to 0.1 μm	LS 388C: to 1 μm LS 328C: 5 μm
<b>Meas. lengths ML</b>	70 to 2040 mm <sup>2)</sup>	50 to 1220 mm	70 to 2040 mm <sup>2)</sup>	70 to 1240 mm
<b>Reference mark</b>	-	One or distance-coded		Distance-coded

<sup>1)</sup> Absolute position values    <sup>2)</sup> over ML 1240 mm only with mounting spar or tensioning element

# Length Measurement

## Sealed linear encoders

Sealed linear encoders from HEIDENHAIN are protected from dust, chips and splash fluids and are ideal for operation on **machine tools**.

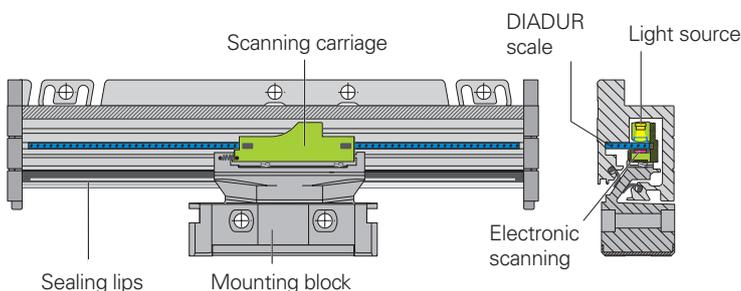
- Accuracy grades as fine as  $\pm 2 \mu\text{m}$
- Measuring steps to  $0.005 \mu\text{m}$
- Measuring lengths up to 30 m
- Fast and simple installation
- Large mounting tolerances
- High acceleration loading
- Protection against contamination



Sealed linear encoders are available with

- **Full-size scale housing**
  - For high vibration rating
  - Up to 30 m measuring length
- **Slimline scale housing**
  - For limited installation space
  - Up to 1240 mm measuring length, up to 2040 mm with mounting spar or tensioning elements

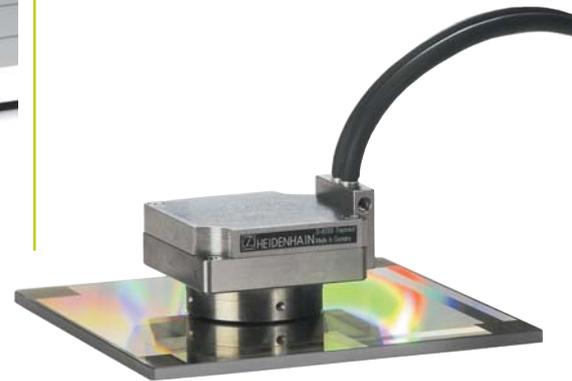
The aluminum housing of a HEIDENHAIN sealed linear encoder protects the scale, scanning carriage, and its guideway from chips, dust, and fluids. Downward-oriented elastic lips seal the housing. The scanning carriage travels in a low-friction guide within the scale unit. It is connected to the external mounting block by a coupling that compensates unavoidable misalignment between the scale and the machine guideways.



## Exposed linear encoders

Exposed linear encoders from HEIDENHAIN operate with no mechanical contact between the scanning head and the scale or scale tape. Typical areas of application for these encoders include **measuring machines, comparators** and other **precision devices** in linear metrology, as well as **production and measuring equipment**, for example in the semiconductor industry.

- Accuracy grades of  $\pm 0.5 \mu\text{m}$  and better
- Measuring steps to  $0.001 \mu\text{m}$  (1 nm)
- Measuring lengths up to 30 m
- No friction between scanning head and scale
- Small dimensions and low weight
- High traversing speed



### Length gauges

Length gauges from HEIDENHAIN feature integral guideways for the plunger. They are used to monitor measuring equipment, in industrial metrology, and also as position encoders.

- Accuracy grades as fine as  $\pm 0.1 \mu\text{m}$
- Measuring steps to  $0.005 \mu\text{m}$  (5 nm)
- Measuring lengths up to 100 mm
- High measuring accuracy
- Available with automated plunger drive
- Simple mounting

With **incremental linear encoders**, the current position is determined by starting at a reference point and counting measuring steps, or by subdividing and counting signal periods. Incremental encoders from HEIDENHAIN feature reference marks, which must be scanned after switch-on to reestablish the reference point. This process is especially simple and fast with distance-coded reference marks. After traverse of no more than 20 mm (LS, LF) or 80 mm (LB), the display value is shown with respect to the datum as it was last defined.

**Absolute linear encoders** from HEIDENHAIN require no previous traverse to provide the current position value. The encoder transmits the absolute value through the **EnDat interface** or another serial interface.

### Measuring steps

The recommended measuring steps listed in the table refer primarily to position measurements. Smaller measuring steps, which are attained through higher interpolation factors of sinusoidal output signals, are useful in particular for applications in rotational speed control, e.g. on direct drives.



Sealed Linear Encoders		Series	Page
With full-size scale housing	Absolute position measurement	LC 100	8
	Incremental position measurement	LS 100	
	Very high repeatability	LF 100	
	Typically for manual machines	LS 600	
	Large measuring lengths	LB 300	
With slimline scale housing	Absolute position measurement	LC 400	10
	Incremental position measurement	LS 400	
	Very high repeatability	LF 400	
	Typically for manual machines	LS 300	
Exposed Linear Encoders	Accuracy grades better than $\pm 3 \mu\text{m}$	LIP, LIF	12
	Two-coordinate encoders	PP	13
	Accuracy grades to $\pm 5 \mu\text{m}$	LIDA	14
Length Gauges	Accuracy $\pm 0.1 \mu\text{m}$	HEIDENHAIN-CERTO	16
	Accuracy $\pm 0.2 \mu\text{m}$	HEIDENHAIN-METRO	17
	Accuracy to $\pm 0.5 \mu\text{m}$	HEIDENHAIN-METRO	18
	Accuracy $\pm 1 \mu\text{m}$	HEIDENHAIN-SPECTO	19

# LC, LF, LS, LB Sealed Linear Encoders with full-size scale housing



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Linear encoders with **full-size scale housing** are characterized particularly by high tolerance to vibration.

Absolute linear encoders of the **LC 100** series provide the **absolute position value** without any previous traverse required. Incremental signals can also be provided. They can be mounted to the same mating dimensions as the incremental linear encoders of the **LS 100** series and feature the same mechanical design. Because of their high accuracy and defined thermal behavior, LC 100 and LS 100 series linear encoders are especially well suited for use on **numerically controlled machine tools**.

The incremental encoders of the **LF** type feature measuring standards with relatively fine grating periods. This makes them particularly attractive for applications requiring very **high repeatability**.

The **LS 600** series incremental linear encoders are used for simple positioning tasks, for example on **manual machine tools**.

The **LB** type of incremental linear encoders were conceived for very **long measuring lengths up to 30 meters**. Their measuring standard—a steel tape with AURODUR graduation—is delivered as a single piece, and after the housing sections have been mounted, is pulled into the housing, drawn to a defined tension and fixed at both ends to the machine casting.

## LC 100 Series

- **Absolute position measurement**
- Defined thermal behavior
- High vibration rating
- Two mounting attitudes
- Single-field scanning

## LS 187

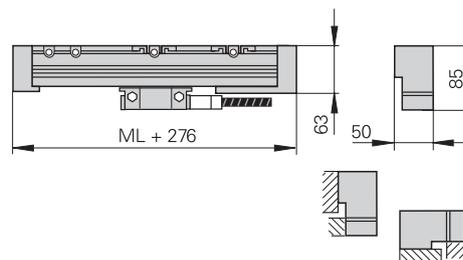
- **Incremental position measurement**
- Defined thermal behavior
- High vibration rating
- Two mounting attitudes
- Single-field scanning

## LF 183

- **Very high repeatability**
- Thermal behavior similar to steel or cast iron
- High vibration rating
- Two mounting attitudes
- Single-field scanning

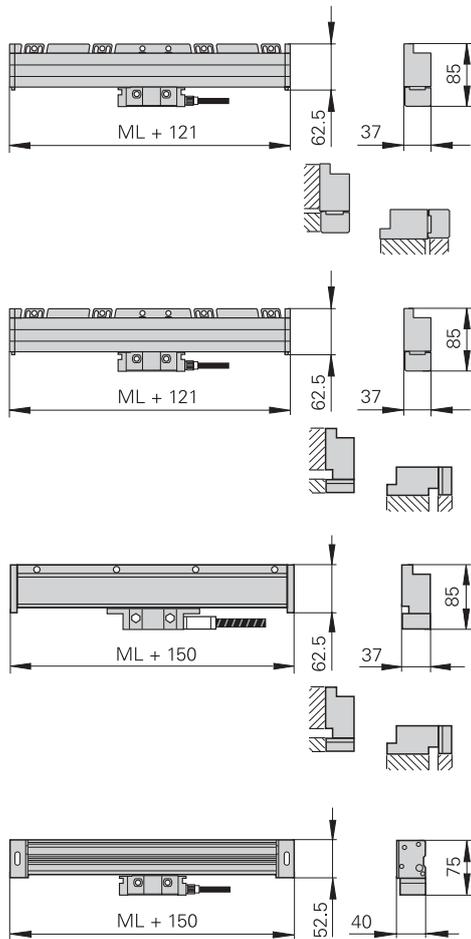
## LS 600 Series

- **Typically for manual machines**
- Simple installation



## LB 382

- **For large measuring lengths**  
up to 30 m
- Defined thermal behavior
- High vibration rating
- Two mounting attitudes
- Single-field scanning



	Absolute	Incremental			
	LC 183 LC 193 F/M	LF 183	LS 187 LS 177	LS 688C LS 628C	LB 382
<b>Measuring standard</b>	DIADUR glass scale	DIADUR phase grating on steel	DIADUR glass scale	DIADUR glass scale	AURODUR steel scale tape
<b>Incremental signals</b>	Optional for LC 183	$\sim 1 V_{PP}$	LS 187: $\sim 1 V_{PP}$ LS 177: $\square$ TTL	LS 688C: $\sim 1 V_{PP}$ LS 628C: $\square$ TTL	$\sim 1 V_{PP}$
Signal period	20 $\mu m$	4 $\mu m$	20 $\mu m$ LS 177: 4 $\mu m$ /2 $\mu m$	20 $\mu m$	40 $\mu m$
<b>Absolute position values</b>	EnDat 2.2 Fanuc/Mitsubishi	-			
<b>Accuracy grade</b>	$\pm 5 \mu m, \pm 3 \mu m$	$\pm 3 \mu m, \pm 2 \mu m$	$\pm 5 \mu m, \pm 3 \mu m$	$\pm 10 \mu m$	$\pm 5 \mu m$
<b>Recommended measuring step</b>	0.05 to 0.005 $\mu m$ <sup>1)</sup>	1 to 0.1 $\mu m$	1 to 0.1 $\mu m$	LS 688C: to 1 $\mu m$ LS 628C: 5 $\mu m$	10 to 0.1 $\mu m$
<b>Meas. lengths ML</b>	140 to 4240 mm ( $\pm 3 \mu m$ to 3040 mm)	140 to 3040 mm		170 to 3040 mm	440 to 30040 mm
<b>Reference mark</b>	-	One or distance-coded; LS 6xxC: distance-coded			

<sup>1)</sup> Absolute position values